HIGH RIVER ENERGY CENTER

Case No. 17-F-0597

1001.21 Exhibit 21

Geology, Seismology, and Soils

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Exhibit 21: Geology, Seismology, and Soils

This Exhibit will track the requirements of proposed Stipulation 21, dated August 26, 2019, and therefore, the requirements of 16 NYCRR § 1001.21. This Exhibit contains a comprehensive summary of the geology, seismology, and soil character impacts resulting from proposed construction of the High River Energy Center. Within this Exhibit is the identification and mapping of existing geological and surficial soil conditions, an impact analysis, definition of constraints resulting from these geological conditions, and a discussion on potential impact avoidance and mitigation measures.

Conclusions made within this exhibit are based on the findings of a geotechnical investigation performed by Terracon Consultants, Inc. (Terracon), completed in April 2019. A total of 18 borings and seven test-pits were completed at the Project Area during the geotechnical exploration. A summary of the borings completed to date is presented in the following table.

Table 21-1. Summary of Test Borings During Site Survey

Test Boring No.	Depth of Bore (feet)	Date Completed
B-1	22.0	04/18/2019
B-2	9.6	04/18/2019
B-3	11.9	04/18/2019
B-4	9.7	04/18/2019
B-5	22.0	04/23/2019
B-6	10.4	04/23/2019
B-7	9.5	04/22/2019
B-8	8.3	04/18/2019
B-9	21.5	04/17/2019
B-10	21.5	04/18/2019
B-11	21.5	04/18/2019
B-12	10.9	04/30/2019
B-13	21.5	04/30/2019
B-14	17.8	04/30/2019
B-15	20.9	04/30/2019
B-16	9.4	04/18/2019

Test Boring No.	Depth of Bore (feet)	Date Completed
SS-1	24.1	04/25/2019
SS-2	38.0	04/29/2019
TP-1	9.5	04/25/2019
TP-2	9.5	04/25/2019
TP-3	9.0	04/25/2019
TP-4	8.0	04/25/2019
TP-5	9.5	04/26/2019
TP-6	9.0	04/26/2019
TP-7	9.5	04/26/2019

21(a) Existing Slopes Map

Utilizing the United States Geologic Survey (USGS) National Elevation Dataset and ESRI ArcGIS software, Figure 21-1 was created and demarcates predetermined existing slope ranges (0-3%, 3-8%, 8-15%, 15-25%, 25-35%, and 35% and over) on and within a mapped drainage area which have the potential to be influenced by the Project. Slopes within this area range from 0-3% to >35%, with 85.6% of the Project Area occurring on slopes less than 15%. Table 21-2, below, presents the percent coverage that each slope range encompasses within the influenced drainage area.

Table 21-2. Percent Coverage of Slope Ranges within Drainage Area

Slope Range (%)	Percent within Drainage Area (%)
0 – 3	15.7%
3 – 8	46.0%
8 – 15	23.9%
15 – 25	9.4%
25 – 35	2.9%
> 35	2.1%
Total	**100**

Earth moving and general soil disturbance will increase the potential for wind/water erosion and sedimentation into surface waters and downstream areas. Implementing the erosion and sediment control measures as outlined in the Stormwater Pollution Prevention Plan (SWPPP) will minimize impacts to steep slopes and highly erodible soils that may occur in the event of extreme rainfall or other events that could potentially lead to severe erosion and downstream water quality issues. The Preliminary SWPPP for this Project is included as Appendix 23-3 and will be updated and submitted to the Secretary or the New York Public Service Commission (NYPSC) staff for approval before construction. In addition, impacts to soil will be further minimized by the following means, as necessary:

- Prior to commencing construction activities, erosion control devices will be installed between the work areas and downslope areas to reduce the risk of soil erosion and sedimentation. Erosion control devices will be monitored continuously throughout construction and restoration for function and effectiveness.
- During construction activities, hay bales, silt fence, and other appropriate erosion control measures will be placed as needed around disturbed areas and stockpiled soils.
- Public road ditches and other locations where Project-related runoff is concentrated will be armored with rip-rap to dissipate the energy of flowing water and to hold the soil in place.
- Following construction, all temporarily disturbed areas will be stabilized in accordance with approved plans.

21(b) Slope Impact Avoidance

Approximately 11 acres within the Project Area exceed 15% grade and are too steep for panel installation. Project Components will be sited to avoid steep slopes; therefore, impacts are not expected. Where avoidance is not feasible, site grading will be performed as indicated on the Grading & Drainage Plans presented in Appendix 11-1. No solar arrays will be installed on slopes exceeding 12%. Approximately 56 acres within the Project Area with steep slopes will be graded to slopes of 12% or less. Erosion and sediment control measures are described in greater detail within the Preliminary SWPPP provided as Appendix 23-3 in Exhibit 23 and are also depicted in the Preliminary Design Drawings presented in Appendix 11-1.

21(c) Proposed Site Plan

A proposed preliminary site plan was prepared and included within the Preliminary Design Drawings presented in Appendix 11-1. The site plan shows existing and proposed contours at two-foot intervals for the Project Area and on-site interconnections. The site plan also identifies locations of proposed operation and maintenance Components, solar panel locations, access roads, electrical collection line routes, and interconnections to existing utility infrastructure.

21(d) Preliminary Calculations of Cut and Fill

A preliminary calculation was performed utilizing existing and proposed three-dimensional surfaces generated from two-foot contour data to estimate the quantity of cut and fill necessary for Project construction. The cut and fill volumes stated below are differences calculated between the existing ground conditions, based off of contemporary and Project specific Light Detection and Ranging (LiDAR) data, and the presumed ground surface character which will be left as a direct result of Project development. Specifically, earthwork quantity calculations were prepared using AutoCAD Civil 3D software. An existing conditions surface was created based on two-foot contours generated from a LiDAR survey of the Project Area. From that data set, a proposed conditions surface was created from the Project grading plan. Differences between these two surface designs indicated the amount of material which will be excavated for construction.

These calculations do not take into account the collection line trenching operations as part of the equation. It is presumed that collection line trenching would return soils to near existing conditions with the backfilling of the trench after collection line placement, negating any net change in the soil strata (similar to how it was done on operational solar farms across New York State). Approximately 281,894 cubic yards of material will be excavated from the Project Area. Approximately 15,300 cubic yards of topsoil will be excavated for access roads and the substation and switchyards areas. The remaining excavated topsoil will be replaced in kind, to the maximum extent practicable. Approximately 333,767 cubic yards of fill will be required for the proposed construction. This results in a net earthwork balance of approximately 51,873 cubic yards of fill material needed for the construction of the proposed solar arrays and associated Project infrastructure. Of this total, approximate 23,941 cubic yards of crushed stone is needed for access road, substation, and switchyard construction. Section 21(e) details the quantity of fill material to be imported into the Project Area for construction of the access roads and structure foundations.

It should be noted that the calculation of cut and fill assumed that depths of greater than 78 inches were to be considered as indicating bedrock per the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) lower limit of soil survey presented in Keys to Soil Taxonomy (NRCS, 2014). However, in reference to Figure 21-3, actual depth to bedrock is greater than 78 inches in some instances. Excavations are not expected to reach or exceed 78 inches.

It is anticipated that no material will be exported from the Project Area and any excess materials from on-site excavations will be used as fill throughout the Project Area, with the exception of gravel for the access roads, which will consist of imported fill material. It should be noted, however, that the initial design is likely conservative and overstates the amount of cut that will actually be necessary during construction of the Project, as the access roads and substation will in fact be constructed in both cut and fill conditions.

Invasive Species Management and Control Plan

In order to identify the presence of invasive species in spoil material and prevent the spread of invasive species by the transportation of materials to and from the Project Area, an Invasive Species Management and Control Plan (ISMCP) has been developed and is provided in Appendix 22-9. The primary purpose of the ISMCP is to control the spread or introduction of invasive species in the excavated materials and avoid spreading and/or transporting invasive species by vectors (mechanisms of species transfer) directly correlated to the construction and operation of the Project. The ISMCP will be appended to the Project construction contract, requiring the Contractor to implement the control measures outlined within the ISMCP. The principal construction-related control measures contained within the ISMCP are to prevent introduction and spread of all New York listed invasive species. No fill material will be transported offsite from the Project Area. This action will minimize the potential for introduction and/or transport of invasive species to uncolonized regions.

Management actions will be grouped into four main categories including: material inspection, targeted species treatment and removal, sanitation, and restoration. Within each category, specific actions or combinations thereof can be taken depending on characteristics of a particular species and its density within the target area. Monitoring for invasive species will be conducted throughout the duration of the Project to ensure that the ISMCP is implemented appropriately and that the goals outlined therein are being met. Of note, it should be stated that invasive species identified at the Project Area prior to construction are likely to spread even in the absence of further human intervention. It is therefore necessary to distinguish between natural movement of invasive species and anthropogenic movement caused by Project related construction activities. The ISMCP will propose a goal of a zero-net increase in the number of invasive species present and their distribution in the Project Area is based on actions related specifically to Project construction and operation.

Post-construction monitoring will be conducted for a minimum of five years following completion of Project-related activities on site. This monitoring is to ensure that ISMCP goals are met, as germination and spread of invasive species can continue long after construction activities have concluded. Failure to meet the goals of the ISMCP will result in revision of the control plan and extension of the post-construction monitoring phase for a period of two years from implementation of the revised plan.

21(e) Description and Preliminary Calculation of Fill, Gravel, Asphalt, and Surface Treatment Material

The existing site topography is derived from LiDAR survey data of the Project Area. Proposed topography/final grade was developed based on the design criteria and constraints required for the anticipated delivery of Project Components and construction of the Project facility. As stated previously, a preliminary calculation was performed utilizing existing and proposed three dimensional surfaces generated from two-foot contour data to estimate the quantity of cut and fill necessary for Project construction.

The fill material will be used for several purposes including subgrade material for access roads and substations and grading for laydown areas. Based on the calculation of cut and fill, the material excavated from the site will be utilized for fill for the solar array sites. Importing additional graded fill material will be required for the construction of permanent access roads and the substation and switchyard. It is anticipated that approximately 51,873 cubic yards of fill will be required for construction of the Project Area. Approximately 23,941 cubic yards of crushed stone/gravel fill will be imported from off-site for construction of the access roads, substation, and switchyard. Excess material from excavations will be distributed across disturbed areas and blended into existing topography to return each area to its pre-construction condition to the maximum extent practicable, or as described in the site grading plan, provided in Appendix 11-1.

Imported structural fill (e.g., gravel) should contain no particles larger than three inches and less than 10 percent, by weight, of material finer than a No. 200 mesh sieve. The imported materials should be free of recycled concrete, asphalt, bricks, glass, and pyritic shale rock. Additional laboratory testing will be required to determine if the on-site soils are suitable for use as structural fill on site.

Additional fill materials of surface material and concrete (used for footings and foundations) will also constitute as fill for the Project. The quantity of gravel and surface treatment materials was estimated based on the preliminary site plan. The estimated quantity of each imported material is presented in Table 21-3.

Table 21-3. Estimated Quantity of Imported Material

Imported Material	Quantity (yd^3)
Gravel	23,941
Surface Material	27,932
Concrete Pavement	1,182
TOTAL	**53,055**

At this time, it is assumed that large off-road dump trucks with an approximate capacity of 22 cubic yards will be the primary truck used to transport materials throughout the Project Area. As such, it is presumed that approximately 1,089 truckloads would be required to transport imported gravel fill material into the Project Area throughout the duration of construction. Additionally, 1,269 truckloads of surface material will also be brought into the Project Area utilizing these truck types. Cement truck designs which are presumed to be utilized for this Project will carry approximately 8 cubic yards and weigh 70,000 lbs. With the estimated requirement of 1,182 cubic yards of concrete pavement for this Project, an additional 148 cement truckloads will also be necessary to transport concrete fill materials on-site.

21(f) Description and Preliminary Calculation of Cut Material of Spoil to be Removed

Based on the preliminary cut and fill calculations performed in Section 21(d), it is not expected that any on-site material will be removed from the Project Area during construction. It is not expected that excess topsoil will be stripped from the ground surface where fill will be placed. Stripped topsoil will be replaced in kind, to the maximum extent practicable. This material will be temporarily stockpiled and controlled through erosion and sediment controls along the construction corridors and incorporated in the site restoration where applicable, described in further detail on the Grading and Drainage Plans provided in Appendix 11-1.

During restoration of the Project, all excess topsoil materials will be regraded to approximate pre-construction conditions in order for the site character and drainage areas to be returned to existing conditions to the maximum extent practicable.

As stated in Section 21(e), imported structural fill (e.g., gravel) should contain no particles larger than three inches and less than 10 percent, by weight, of material finer than a No. 200 mesh sieve. The imported materials should be free of recycled concrete, asphalt, bricks, glass, and pyritic shale rock. Additional laboratory testing will be required to determine if the on-site soils are suitable for use as structural fill on site.

21(g) Construction Methodology and Excavation Techniques

The proposed start date for the construction of the Project is currently late-2020. Project excavation and construction will be performed in several stages and will include the main elements and activities described below.

Location and Extent of Horizontal Directional Drilling (HDD) Methods

The Applicant is proposing to utilize trenchless excavation techniques, otherwise known as horizontal directional drilling (HDD), on the Project to route 34.5 kV collection circuits under obstacles including roads (Route 152, Thayer Road, and Mohr Road) and one stream feature. The HDD drill is usually passed four to six feet below ground surface. The HDD method was chosen because it has proven to be a safe and efficient method of crossing roads, railroads, streams, wetlands, and other environmentally sensitive areas with minimal surface impact. The Applicant is currently locating and designing all specific target HDD locations, see the Preliminary Design Drawings in Appendix 11-1 for potential locations and a typical HDD equipment layout diagram. Other areas may also be included, as identified in a Compliance Filing, where topographical or environmental constraints dictate that HDD installation methodology is the best construction practice.

Inadvertent Return Plan for Horizontal Directional Drilling (HDD)

The HDD process involves the use of water and bentonite (a naturally occurring clay) slurry as a coolant and lubricant for the advancing drill head. The slurry also helps to stabilize the bore and aids in the removal of cuttings during the drilling process. Bentonite is nontoxic; however, if released into waterbodies, has the potential to adversely impact fish, fish eggs, aquatic plants, and benthic invertebrates. Therefore, to protect these natural resources, the Applicant has prepared an Inadvertent Return Plan which outlines operational procedures and responsibilities for the prevention, containment, and cleanup of inadvertent releases associated with the HDD process. The objective of this Plan is to:

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) 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, ensure that all appropriate notifications are made immediately.

A detailed Inadvertent Return Plan was created for the Project and is included in Appendix 21-2 of this Application. Details within the Plan indicate:

- Site personnel responsibilities;
- Effective training regimes for handling an inadvertent return;
- Measures to prevent inadvertent releases;
- Equipment and containment materials which will be utilized in the event of an inadvertent return;
- An outline on effective responses to an inadvertent release;
- A list of parties to be notified at the unlikely event of an inadvertent return;
- Details outlining an effective clean up and restoration strategy;
- Steps on construction restart and avoidance of future inadvertent returns; and
- Effective documentation of the incident.

Although HDD has proven to be a safe and reliable method of crossing surface features with very minimal impact, the potential still exists for inadvertent releases of drilling fluid to the surface, which can have a detrimental impact on the environment. These releases typically occur as a result of seeps which can form when pressure in the drill hole exceeds the capability of the overburden to contain it, or when fluids find a preexisting fault in the overburden. The likelihood of these situations occurring can be minimized by taking into consideration the soil type and bedrock composition. Bore depth should be determined based on these site-specific factors; however, a minimum depth of 25 feet in sound soils should be sufficient to prevent an inadvertent release.

The proposed HDD for the Project has a minimal risk of inadvertent release due to the existing site soils and bedrock features. The chance for inadvertent return increases when unfavorable drilling stratum are experienced such as glacial till, highly fractured rock, non-cohesive alluvial material, or cobbles. The soil stratum at the Project Area, as discussed in further detail in Section 21(i), below, is comprised of silty sand and sandy silt with varying amounts of gravel, cobbles, and possible boulders, weathered shale, and shale bedrock. The shale bedrock is weak to moderately hard and close to very close fractured. The HDD bore depths will remain primarily in the silty sand and sandy silt stratum layer, therefore inadvertent return is not expected.

Refer to Appendix 21-2 for the Inadvertent Return Plan for this Project.

Construction Phases

Pre-Construction Survey and Environmental Monitoring

Prior to the commencement of Project related construction, an overall site survey will be performed in order to effectively locate and demarcate the exact location of Project Components and routes. This survey will facilitate assembly strategy and construction efficiency. An Environmental Monitor (EM) will be designated during the construction phase of the Project to oversee all construction and restoration activities in order to ensure compliance with all applicable certificate conditions and other permit requirements. Prior to the start of construction at specific sites, the EM, with support of construction management personnel, will conduct site reviews in locations to be impacted, or potentially impacted, by associated construction activities. Pre-construction site review will direct attention to previously identified sensitive resources to avoid (e.g., wetlands and waterbodies, archaeological, or agricultural resources), as well as the limits of clearing, location of drainage features (e.g., culverts, ditches), location of agricultural tile lines, and layout of erosion and sediment control measures. Work area limits will be defined by flagging, staking, and/or fencing prior to construction.

The pre-construction walk over will also aid in the identification of any specific landowner preferences and concerns. The placement of erosion and sediment control features will also be located during this site review in order to mitigate potential impacts to sensitive sites and also uphold erosion and sediment control State-wide initiatives. The pre-construction site review will serve as a critical means of identifying any required changes in the construction of the Project in a timely manner in order to avoid future delays to Project construction timeframes.

Site Clearing and Preparation

After the initial site review, Project-related construction will be initiated by clearing brush and woody vegetation within the limit of disturbance (LOD) established for the solar arrays, access roads, electrical collection line routes, and other supporting infrastructure (collection substation, switchyard, laydown yard, etc.) Vegetation cleared within this LOD will be removed, organized, and disposed of on site and outside any indicated sensitive sites (see Appendix 11-1). The definitive clearing impacts which will occur as a result of the Project will be based on final engineering design. For more information on clearing impacts, including their description and quantification, refer to Exhibit 22 of this Application.

Laydown Yard Construction

All laydown yard areas were selected for ease of accessibility, strategic location in the construction work flow, relatively flat ground surface, occurrence outside of sensitive resources (wetlands, waterbodies, cultural areas, etc.), and containing limited shrubby or woody vegetation in order to reduce impacts to natural vegetation areas. Most sites are situated within agricultural areas or within old fields left fallow.

Laydown yards will be developed by stripping and stockpiling the topsoil (stockpiles will be stabilized per the SWPPP) and grading the subsoil (as necessary). Geotextile fabric and gravel fill will then be put in place to create level working areas for the staging of temporary construction trailers, equipment, and materials. Laydown areas will also be utilized for contractor parking.

Upon completion of the construction phase of the Project, any gravel fill will be removed, and topsoil stockpiles will be utilized to return laydown areas to existing grades and conditions. For any laydown yards staged in active agricultural areas, subsoils will be “ripped” to reduce compaction caused by construction of the Project. Active agricultural lands will be restored in accordance with the New York State Department of Agriculture & Markets Guidelines for Agricultural Mitigation for Solar Energy Projects (Revision 4/19/2018), or that which is most current at the time of Project construction, to the maximum extent practicable.

Access Road Construction

Access roads will be constructed to provide access from existing roadways for the Project. The new gravel access roads will be constructed to reach the proposed solar array location safely and effectively. Road widths will be approximately 16 feet of gravel for array access roads (with a total vehicle clearance width of at least 20 feet), and 20 feet of gravel for substation/switchyard access roads.

Road construction will initially involve the stripping of topsoil and grubbing of stumps, as necessary, after removal of vegetation. All topsoil will be segregated from subsoil and stockpiled (windrowed) along the access road corridor for use in site restoration and soil surface grading. Following removal of topsoil, exposed subsoils will be graded to the specifications outlined in the site design, compacted for constructability, and surfaced with gravel or crushed stone for intended use as an established Project access road. Geotextile fabric or grid may be installed beneath the road surface where needed in order to provide additional stability support to the access road. Details regarding access road construction are discussed in Exhibits 11 of this Application.

If necessary, dewatering of excavations may occur in order to keep the excavations free of standing water and permit safe and constructible environment. Dewatering methods will involve pumping the water to a predetermined well-vegetated discharge point, away from wetlands, waterbodies, and other sensitive resources. Discharge of water will include measures/devices to slow water velocities and trap suspended sediment (sediment bags). All dewatering activities will also be conducted in accordance with the final Project SWPPP and in accordance with the State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activities in effect at the time of construction. The use of temporary pump-around techniques or coffer dams will be used during the installation of all access road waterbody crossings. Appropriate sediment and erosion control measures will be installed and maintained according to the final Project SWPPP, which will be finalized during final engineering and prior to construction. In order to facilitate effective draining and surface water management within the access road, culverts and/or water bars will also be utilized where necessary. The access roads will be sloped where appropriate to direct water towards the edge of the road and/or down gradient to minimize the potential for ponding on or adjacent to the access roads.

Solar Array Racking System Construction

The construction of solar array racking systems (the supporting structures on which the solar modules will be mounted) will occur after associated access roads to the predefined array sites have been completed or are substantially in place. Upon access to the predetermined array location, strictly adhering to guidance from the site grading plan, the grading and leveling of the array site location will occur. In keeping with conventional topsoil preservation methods, topsoil will be stripped from the excavation area as in the access road construction operation. Topsoil will be stockpiled and stabilized in accordance with SWPPP guidelines for future use in site restoration efforts.

During excavation, subsoil and bedrock will also be segregated and stockpiled for reuse as backfill and for access road development. As stated previously, stockpiled soils will be located outside of sensitive resource areas and will be stabilized in accordance with the final Project SWPPP. Though none is proposed, where blasting is deemed necessary, all blasting operations will adhere to applicable New York State statutes and regulations governing the use of explosives. See Section 21(j) below for more information on the Project Blasting Plan.

Depending on site soil characteristics, racking posts will be installed by one of three methods. First, the post may be driven directly into the soil. This is the primary method of post installation proposed. Second, a ground screw type post will be installed directly into the soil. Third, in cases of high ledge or bedrock, a post hole will be drilled into the rock to an appropriate depth, the post will be installed, and the post hole will be grouted. Refer to the Preliminary Design Drawings for additional racking information. Based on the findings of the geotechnical investigation, soils may not be conductive to the installation of pile-driven foundations. Some areas are likely to encounter refusal above the required embedment depth, and therefore post-holes should be drilled, and foundations reinforced as described above.

34.5 kV Electrical Collection Line Construction

The construction of the 34.5 kV collection circuit between solar arrays will involve multiple methods including direct burial, open trench, and overhead construction methods utilizing equipment such as a rock saw, cable plow, rock wheel, and/or trencher. Direct burial methods involve the installation of a bundle of electric and fiber optic cable directly into a narrow trench in the ground. Where direct burial is not possible due to site specific constraints, an open trench will be utilized. Open trench operations involve the excavation, segregation, and stockpiling of topsoil and subsoil adjacent to the cutting of an open trench. Cable bundles are laid at the base of the trench and the trench is backfilled with suitable fill material and any additional spoils are spread out to match existing grades.

Trench breakers will be put into place as necessary along trench lines in order to prevent erosion caused by the lateral movement of runoff of soil strata in the open trench. These breakers will be located within the trench on steep slopes (based on field conditions) above agricultural, cultural, or wetland/waterbody areas to avoid erosion, sediment build up, and the deposition of sediment into any of the predetermined sensitive resources in the Project Area.

Following installation of the 34.5 kV collection line route, areas will utilize strategically positioned topsoil and subsoil piles to return disturbed areas to pre-construction grades. Installation of buried electrical lines would typically require a width of up to 20 feet of vegetation clearing for this Project. However, in areas where buried electrical lines have been routed collinear with proposed access roads, there will be no additional vegetation or soil disturbance beyond what is expected for the predetermined access road construction. All cleared areas along the buried electrical line routes will be restored through seeding and mulching, and areas outside of the Facility fence line will be allowed to regenerate naturally. As previously noted, HDD will also be employed in select areas in order to navigate collection line around, and prevent damage to, existing roadways and sensitive natural resources. For more information on HDD drilling, refer to the subsection on *Inadvertent Return for Horizontal Directional Drilling (HDD)* above and the Inadvertent Return Plan located in Appendix 21-2.

Solar Array Delivery

The solar array segments and racking will be delivered to the designated construction locations through use of large big-rigs utilizing flatbeds and dry vans (for hardware) and offloaded by crane equipment. No excavation of soil strata or disturbance of bedrock is proposed to occur during this stage of the construction.

Collection Substation and Switchyard Construction

Much like the clearing of laydown areas, substation and switchyard construction will commence with clearing of any woody or shrubby vegetation within the substation footprint. After clearing, the topsoil will be stripped and stockpiled for later use in site restoration. Exposed subsoil will then be graded to specifications outlined in the Project grading plan and foundation areas will be excavated using standard excavation equipment. Construction staging areas for equipment and materials will also be graded and created. Structures will be supported with a combination of shallow and deep foundations. At this stage, the shallow mat/slab foundations will be poured, and deep foundations will be embedded or drilled. After the foundations have set, installation of electrical infrastructure (structural steel skeleton, conduits, cables, bus conductors, insulators, switches, circuit breakers, transformers, control buildings, etc.) will occur.

During substation and switchyard site finalization, gravel fill/crushed stone will be spread throughout the substation and switchyard surface and a perimeter of chain link fence will be erected for security and safety precautions. Finally, the high voltage link-ups will be connected and tested for charge and integrity through electrical control systems in the control house on-site. Restoration of the adjacent areas impacted by construction back to existing conditions in direct vicinity to the substation and switchyard will be completed using stockpiled topsoil, and the appropriate seed and mulch.

Blasting Operations

As stated previously, this Project involves excavation of soil for the installation of foundations for the placement of solar arrays and substation facilities. The excavation consists of drilling holes of various sizes and depths for the installation of foundations to support steel structures. Based upon the geotechnical investigation conducted at the Project Area, blasting is not anticipated. However, there is a possibility that the sub-soil may consist of weathered rock or solid bedrock.

If rock or bedrock is encountered during excavation, the construction crews will extract and excavate it using a backhoe or other appropriate equipment. However, if the bedrock cannot be extracted with a backhoe, other means may be used for excavation (e.g., pneumatic jacking and/or hydraulic fracturing). Consequently, no blasting will be required if the above procedures are used for the excavation. However, if the rock cannot be excavated using above equipment, it may be necessary to use a blasting method to remove bedrock/rock laden foundation sites. In such cases a blasting plan shall be used. See Section 21(j) below for more details on the Project Blasting Plan.

Subsurface Drain Tile Repair Impact and Repair/Replacement

The Applicant is committed to minimizing impacts to agricultural operations and will work with landowners/farm operators to address unanticipated post-construction impacts. The Applicant will work with affected landowners/farmers regarding potential drainage issues on their properties and will utilize trench breakers in areas of moderate to steep slopes on active agricultural land if deemed prudent (base on field conditions) to ensure that the deposition of impacted or stockpiled soils do not occur over agricultural lands.

Existing drain tiles will be identified and located before construction as much as is reasonably possible based primarily on consultation with the landowner. During and after construction operations, any existing drain tiles within the area of disturbance will be checked for damage, and damaged drain tiles will be repaired or replaced as specified in landowner lease agreements and will be performed by qualified drain-tile specialists. The Applicant will coordinate with the landowner to continue to monitor drain tiles post-construction to ensure repairs are properly functioning.

Temporary Cut or Fill Storage Areas

In the initial siting and design process, the strategic placement and design of these Components was undergone with the direct strategy of minimizing the amount of areas which require cut and fill operations to occur. As stated previously, the construction and placement of Project infrastructure will require minor cut or fill to achieve the final grades within the Project Area. A multitude of scenarios would potentially require areas of cut and/or fill including access roads constructed on a side slope, grading areas of the arrays to slopes of 12 percent or less, grading out work areas which are naturally undulatory or crowned, and access roads traversing an existing grade that exceeds the maximum design slope. It is anticipated that approximately 281,894 cubic yards will be fill derived from excavated materials with the exception of gravel for the access roads.

Following the solar array manufacturer's recommendations, array foundations founded on soil will be constructed no less than 5 to 7 feet below the finished grade. Permanent access roads will be constructed using 12 inches of crushed gravel over native sub-soils which will be stockpiled for this said use. Where necessary, the native soils will be reinforced with geo-synthetic fabric.

Proper methods for segregating stockpiled and spoil material will be implemented. All excavated soils will be reused in close proximity to where it was unearthed to the maximum extent practicable. This technique will aide in reducing the proliferation of non-native flora to uncolonized areas within Project.

21(h) Delineation of Temporary Cut of Fill Storage Areas

Excavation and grading plans, including design and location of temporary storage of topsoil and subsoil structures, are provided in Appendix 11-1 to this application. Excess fill materials will be stockpiled and stored for use on-site. Several storage options may be employed to stockpile topsoil materials as determined appropriate for on-site conditions during the construction phase including but not limited to silt fencing and straw bale barriers. Concrete waste may be stored in a constructed concrete wash area sited away from wetlands, wetland buffers, and environmentally sensitive areas.

21(i) Characteristics and Suitability of Material Excavated for Construction

Terracon, an engineering services company, conducted a geotechnical investigation at the Project Area. Eighteen test borings were advanced. Based on the findings of the investigation, the subsurface materials that were encountered within the Project Area are suitable for construction of the proposed structures.

Seven test pits were excavated to approximate depths between 8 and 9 feet. Laboratory corrosion series testing, and thermal resistivity dry-out curves were performed at six locations. Infiltration testing was performed at two locations during the geotechnical investigation.

The results of the corrosion test are detailed in Table 21-4, below. Additional information on the corrosion series testing is provided in Section 21(v) of this Exhibit.

Table 21-4. Results of Laboratory Corrosion Analysis (reproduced from the Geotechnical Engineering Report, Appendix 21-1)

Boring	pH	Sulfates (ppm)	Sulfides (ppm)	Chlorides (ppm)	Red-Ox (mV)	Total Salts (ppm)	Resistivity (ohm-cm)
TP-1	8.02	41	Nil	25	+682	740	5238
TP-3	8.15	110	Nil	25	+677	505	6596
TP-4	8.14	105	Nil	27	+676	403	7469
TP-5	8.15	105	Nil	43	+682	580	3977
TP-6	8.02	72	Nil	40	+678	485	6014
TP-7	8.24	99	Nil	67	+679	459	7663

In general, a chloride concentration greater than 500 parts per million (ppm), or a sulfate concentration greater than 2,000 ppm is considered to be indicative of a corrosive environment for most structures. Based on the test results, it appears that a corrosive environment does not exist, and standard Type I/II cement may be utilized on this Project.

Frost depth in the Project Area is 48 inches. The foundations for new site structures will be below this depth to prevent frost heave.

Organic-laden soil was only encountered at the ground surface during the investigation. The depth of organic material in the topsoil was no more than approximately 12 inches. This material will be stripped during earthwork so that new structures do not bear on organic-laden soil.

The geotechnical investigation findings suggest that the three primary strata to be encountered at boring locations are:

- Stratum 1 – Silty Sand and Sandy Silt, with varying amounts of gravel, cobbles, and possible boulders
- Stratum 2 – Weathered Shale
- Stratum 3 – Shale Bedrock

Stratum 1 –Silty sand and sandy silt was encountered from ground surface to a depth of between eight and 31 feet below ground surface. This stratum is primarily composed of loose to very dense silty sand with gravel. Standard Penetration Testing "N" values in this stratum ranged between zero and greater than 50 blows per foot.

Stratum 2 – Weathered Shale was encountered from approximately 31 feet to a depth of 32 feet below ground surface. This stratum is very dense. Standard Penetration Testing "N" values in this stratum typically require more than 50 blows per foot.

Stratum 3 – Shale Bedrock was encountered at a depth of 38 feet (the maximum exploration depth). The stratum material is weak to moderately hard and close to very close fractured. At locations where augers could not penetrate into this stratum, the Standard Penetration Texting "N" values typically exceed 50 blows per foot.

During the geotechnical investigation, groundwater was encountered at nine of the boring and test pit locations. Groundwater conditions can change with vary based on factors such as season and weather.

Infiltration testing was conducted at two locations across the Project Area. Testing at both locations was conducted at a depth of four feet below ground surface. No infiltration was encountered at the two test locations.

21(j) Preliminary Plan for Blasting Operations

Blasting and/or rock excavation techniques are not anticipated within the Project Area based on the geotechnical investigation and proposed excavation depths, however a Preliminary Blasting Plan has been prepared in the event that blasting is determined to be required. The Preliminary Blasting Plan is provided in Appendix 21-3.

It is anticipated that the contractor for this Project can excavate with relatively little difficulty using an excavator, rock saw, cable trencher, or plow. Where bedrock is encountered, it is anticipated to be rippable due to its content, and thus will be excavated using large excavators, rock rippers, or chipping hammers. The method or combination of methods required will specifically be tailored to the structural integrity, depth, and robustness of rock/bedrock encountered.

In the event that a unique situation requiring blasting arises, the Preliminary Blasting Plan provided as Appendix 21-3, including procedural timeframes for notifying municipal officials and property owners (or persons residing at the location if different) within one-half mile radius of the blasting site of these activities, as well as an assessment of potential blasting impacts, and blasting impact mitigation measures plan, will be used. However, it should be stated that the blasting contractor shall be responsible for generating an overall Contractor Blasting Plan, if required, and also a written site-specific blasting plan if there are differences in selected blasting sites including the subsoil and bedrock conditions. This specification shall also be used for pre-blast surveys, notifications, use of explosives, security, monitoring, and documentation.

21(k) Assessment of Potential Impacts from Blasting

. The bedrock encountered in the geotechnical survey consisted of shale. Stratums were sampled by coring. The recovered bedrock core was typically weak to moderately hard with close to very close fractures. Blasting and/or rock excavation techniques are not anticipated based on bedrock within the Project area, therefore no impacts are expected.

If blasting is determined to be required, the Preliminary Blasting Plan provided in Appendix 21-3 will be used described in section 21(j) above. Impacts from blasting operations may include, but are not limited to, ground vibration, air blast overpressure, generation of fly rock, generation of dust, and generation of noxious gases and chemical residue in the subsurface. Methods to prevent adverse impacts include site-specific design of load/charge configurations, the use of a blasting delay, the use of blasting mats, etc. Federal, state, and Occupational Safety and Health Administration (OSHA) regulations dictating the minimum distance for accessing or protecting from blast impacts will be followed.

The Applicant will conduct pre- and post-blast surveys on structures, wells, septic systems, drain tiles, and pipelines within one-half mile radius of the blasting area if requested by the property owner. Any damage determined to be a result of the blasting activities will be repaired. The Applicant will make all reasonable efforts for complete the post-blast survey within 30 days of a request from a property owner.

21(l) Identification and Evaluation of Reasonable Mitigation Measures Regarding Blasting Impacts

The utilization of blasting techniques is not anticipated for this Project, therefore impacts requiring mitigation are not expected. Should blasting be required, an investigation and evaluation of reasonable mitigation measures will be provided with the Contractor Blasting Plan. To minimize impacts, blasting shall be designed and controlled to meet the limits for ground vibration set forth in United States Bureau of Mines (USBM) Report of Investigation (RI) 8507 Figure B-1 and air overpressure shall be under the limits set forth in the Conclusion section in USBM Report of Investigation 8485 (USBM RI 8507 and USBM RI 8485). Mitigation measures will include alternative technologies and/or relocation of structures in order to negate the need for blasting. Where reasonable alternative measures cannot be employed, blat mats and backfill will be utilized to control any excessive rock movement when blasting in close proximity to identified structures. Additionally, as explained above the Applicant will outline a plan for securing compensation for damages that may occur due to blasting, including pre- and post-blast property surveys, if applicable.

21(m) Regional Geology, Tectonic Setting, and Seismology

In addition to the Geotechnical Engineering Report in Appendix 21-1, several existing published sources were used to better understand regional geology, tectonic setting, and seismology within the Project Area. The sources include the Soil Survey of Montgomery County (USDA, 2019), statewide bedrock geology mapping (NYSM/NYS Geological Survey, 1970), New York State surficial geology mapping (NYSM/NYS Geological Survey, 1970), 2014 New York State Hazard Map (DHSES), and USGS Earthquake Hazard Program (USGS, 2015).

The Project Area is located within the east central part of New York State in the Hudson-Mohawk lowlands and the Erie-Ontario lowlands regions. The Hudson-Mohawk lowlands was created from glacial deposits and is primarily bound by uplands. The Erie-Ontario lowlands border the Great Lakes and has primarily subdued topography. The low relief is provided by a series of proglacial lake beach ridges (NYSDOT, 2013).

The Project Area is a hilly highland area with scattered wetlands. Elevations within the Project Area range from approximately 330 feet to 950 feet above mean sea level, according to the USGS web topographic maps.

Publicly available surficial geologic mapping suggests that the Project Area is primarily composed of till, Lacustrine delta, Lacustrine silt and clay, and bedrock materials. The till material is variable in texture with potential for land instability on steep slopes. The till is typically one to 50 meters thick. Lacustrine delta material is coarse to fine gravel and sand, with a typical thickness of three to 15 meters. Lacustrine silt and clay material has the potential for land instability. The material is typically up to 100 meters thick. The bedrock material may be within one to three meters from the ground surface with possible sporadic crop outs. Surficial geology is comprised of the Lorraine, Trenton, and Black River Groups and can be classified primarily as Canajoharie shale. These units were formed in the upper ordovician and are composed of predominantly shale, mudstone, and sandstone rock types. Most of the rock types consist of soft fragments which pose no obstacles to excavation.

Publicly available mapping indicates that karst topography is present throughout portions of the Project Area. The USGS delineates a narrow band of carbonate rocks with karst potential which extend across the state from Buffalo to Albany. These areas are directly underlain by carbonate bedrock, sometimes covered by a thin layer of sediments. This underlying geology creates the potential for sinkholes, caves, or other karst features at varying densities. Land subsidence, or sink holes, are more commonly observed in karst formed by soluble or evaporated rock. Carbonate rock, consistent with that found within the Project Area is less soluble and such features take more time to form. Collapses are relatively rare, with the most recent occurrence in New York State reported over 20 years ago (New York State Division of Homeland Security and

Emergency Services, 2014). The karst feature within the Project Area is estimated to be less than or equal to 50 feet below glacially derived insoluble sediments.

Construction activities such as excavation, HDD, post installation, and in the unique circumstance, blasting, have the potential to increase sediment discharge, create loose or unstable soils, open voids in soils, and lower the water table. Impacts to karst features and aquifers may include sedimentation within caves, water quality deterioration, landform destruction, sinkhole development or collapse, and decreasing the amount of available water. The Applicant will minimize and avoid construction activities and excavation in karst-prone areas and aquifer regions wherever possible. Assessment of the Project Area did not identify vulnerable karst features such as caves, sinkholes, and fractures.

The Project Area is located adjacent to an unconfined aquifer associated with the Mohawk River, with a capacity of more than 100 gallons per minute. Unconfined aquifer areas are associated with surface-water sources that can produce additional water pumping-induced recharge. Groundwater was encountered in several test borings, however as indicated, this could vary seasonally as perched water conditions could potentially develop. The Project Area is located within an NYSDEC Principal Aquifer. According to data collected for the USGS groundwater monitoring site in Randall, NY (USGS 425511074254011), the average annual depth to the carbonate-rock aquifer's water level is approximately 33 feet below ground surface with seasonal variation of approximately two feet. Impacts to aquifers are not anticipated as a result of excavation, HDD operations, limited blasting operations, and other soil disturbance activities due to the depth of the aquifer water level. General risks to karst features and aquifers associated with HDD include creating loose, unstable soils and open voids along the drill path. More specifically, there may be a loss of drilling fluid to cave areas within a karst feature, creating fractures within the bedrock, and possible sinkhole formation. Although HDD has proven to be a safe and reliable method of crossing surface features with very minimal impact, the potential still exists for inadvertent releases of drilling fluid, which can have a detrimental impact on the environment. These releases typically occur as a result of seeps which can form when pressure in the drill hole exceeds the capability of the overburden to contain it, or when fluids find a pre-existing fault in the overburden. Bore depths for HDD will consider site-specific factors such as soil type and bedrock composition, however, a minimum depth of 25 feet in sound soil should be sufficient to prevent an inadvertent release and impacts to karst areas and aquifer. Refer to the Preliminary Design Drawings in Appendix 11-1 of the Application for additional information on the HDD crossing methods, and the Inadvertent Return Plan in Appendix 21-2, which outlines the operational procedures and responsibilities for the prevention, containment, and cleanup of an inadvertent release.

Risks and impacts to karst features and aquifers are not anticipated as a result of post installation operations. The piles will be embedded to a depth of approximately five feet and, therefore, should not impact the karst features and aquifers due to the shallow pile depths.

If blasting operations were to occur, blast-induced vibration and shock waves may result. Blasting could potentially cause fracturing of bedrock and limit ground-water availability and quality.

Best management practices will be used to reduce these potential impacts to karst and aquifer features to the maximum extent practicable. Best management practices include utilization of erosion and sediment controls, stormwater management, and avoidance of sensitive features. Stormwater management features proposed for the Project will route stormwater around or away from earth disturbing activities and will slowly filter stormwater through the soil, preventing inundation of groundwater to underground features. Disturbed areas will be stabilized as soon as possible to prevent the transport of sediment and silt, and the Project Area will be revegetated following the completion of construction. In areas of excavation, trench breakers will be utilized to prevent erosion caused by the lateral movement of runoff of soil strata in the open trench. These breakers will be located within the trench on steep slopes above agricultural, cultural, or wetland/waterbody areas to avoid erosion, sediment build up, and the deposition of sediment into any of the predetermined sensitive resources in the Project Area. A preliminary SWPPP is contained in Appendix 23-3 of the Application.

There are no known oil and natural gas wells located in the vicinity of the Project Area (NYSDEC, 2014), therefore impacts from any construction activity are not anticipated.

According to USGS Seismic Hazards database, the Project Area is located in an area of relatively low seismic activity with a 2% probability of a magnitude 5.0 earthquake occurring in the next 50 years of peak acceleration exceeding 10% to 14% of the force of gravity. This indicates relative low probability for seismic activity and bedrock shift in the vicinity of the Project area. In addition, the USGS Earthquake Hazards Program does not list any faults within the vicinity of the Project Area. Refer to Figure 21-4 for seismic hazards mapping of the Project Area and surround area.

21(n) Facility Construction and Operation Impacts to Regional Geology

A Geotechnical Engineering Report has been completed and is included in Appendix 21-1. In general, the conditions encountered are favorable for the Project. The available information suggests that the solar array areas will be underlain by sand and silt with varying amounts of gravel, cobbles and possible boulders, and potential shallow bedrock. Based on the subsurface conditions encountered during the investigation performed to date, it appears that the primary geotechnical issue anticipated at the Project is refusal of the installed posts within the proposed array areas. The recommended alternatives to driven posts are either pre-drilling the posts or utilizing a ground screw system.

Given the nature of construction associated with Project development, minimal adverse impacts to regional geology and soils are expected during the construction phase, and little to no temporary or permanent impacts are expected once the facility is operational. Project facilities will be designed and sited to avoid or minimize impacts to geology, topography and soils within the Project Area to the maximum extent practicable.

21(o) Seismic Activity Impacts on Project Location and Operation

The USGS Earthquake Hazard Program does not list any faults within the vicinity of the Project Area. The upland areas have a dense soil cover and will not provide much amplification of seismic waves (Seismic Site Class C soils under the New York State Building Code). Glacial outwash and alluvial sediment in the valleys are looser and typically are classified as Site Class D. In addition, the USGS Earthquake Hazard Program does not identify any young faults within the vicinity of the Project Area. Therefore, the impact due to seismic activity is considered to be negligible. Also, the design of current solar array technology allows for operational control and emergency shut off in case of an emergency such as a significant seismic event.

21(p) Soils Types Map

Figure 21-2 delineates soil types within the Project Area utilizing the USDA NRCS Web Soil Survey application. A detailed discussion of each soil type is provided in Section 21(q), below.

21(q) Soil Type Characteristics and Suitability for Construction

Information regarding on-site soils was obtained from on-site investigations conducted by Terracon, and from existing published sources, including the Soil Survey of Montgomery County (USDA, 1908), USDA Web Soil Survey (2019), and Soil Survey Geographic (SSURGO, 2019).

The Soil Survey of Montgomery County, New York (USDA, 1908) and the USDA Web Soil Survey indicate that all proposed facilities and solar arrays are sited within 25 soil types. The surveys indicate that the Project Area predominantly consists of silty loams, ranging from somewhat poorly drained to well-drained soils.

Appleton series consists of very deep, somewhat poorly drained soils formed in calcareous loamy till. The soils are on low ground moraines and on foot slopes of glaciated hills, ridges, and drumlins. The potential for surface runoff is negligible to very high with moderately high or high hydraulic conductivity in the surface and subsoil, and moderately low to moderately high hydraulic conductivity in the substratum. Appleton soils are nearly level to slightly steep with slopes ranging from zero to 15 percent. The typical soil profile of this series is very dark grayish brown silt loam about 20 centimeters thick with reddish brown and reddish gray fine gravelly loam extending to a depth of 183 centimeters.

> **ApB** is Appleton silt loam with three to eight percent slopes that occur on footslopes and base slopes of drumlins, ridges, and till plains. These soils, typically zero to 79 inches thick, are developed in calcareous loamy lodgment till derived from limestone, sandstone, and shale. These soils are somewhat poorly drained.

Burdett series consists of very deep, somewhat poorly drained soils formed in till dominated shale. The soils formed in silty mantles that overlie till that is strongly influenced by shale. The potential for surface runoff is very low to very high with moderate permeability in the upper silt material and slow or very slow in the lower subsoil and substratum. Burdett soils are nearly level to steep with slope ranging from zero to 25 percent.

> **BuB** is Burdett channery silt loam with three to eight percent slopes on footslopes, summits and base slopes of hills, drumlinoid ridges, and till plains. These soils, typically zero to 60 inches thick, are developed in a thin silt mantle overlying till that is strongly influenced by shale. These soils are somewhat poorly drained.

Cut and fill land (CLF) consists of somewhat excessively drained soils with a parent material of gravelly and very gravelly loam. These soils are typically zero to 70 inches thick.

Churchville series consists of very deep, somewhat poorly drained soils that formed in clayey lacustrine sediments overlying loamy till. The potential for surface runoff is low to very high with moderately high to high hydraulic conductivity in the surface layer and moderately high to low hydraulic conductivity in the subsoil and substratum. Churchville soils are nearly level to slightly steep with slopes ranging from zero to 15 percent. The typical soil profile of this series is very dark grayish brown silt loam about nine inches thick with reddish brown silty clay and reddish gray gravelly loam extending to a depth of 80 inches.

> **ChA** is Churchville silty clay loam with zero to three percent slopes on footslopes, base slopes, and treads of lake plains, and till plains. These soils, typically zero to 84 inches thick, are developed in clayey glaciolacustrine deposits over loamy till. These soils are somewhat poorly drained.

Darien series consists of very deep, somewhat poorly drained soils formed in Wisconsinan age till on till plains, drumlins, and moraines. The potential for surface runoff is low to very high with moderately slow permeability in the subsoil and slow permeability in the substratum. Permeability is moderately slow in the subsoil and slow in the substratum. Darien soils are nearly level to steep with slopes ranging from zero to 25 percent. The typical soil profile of this series is very dark grayish brown silt loam about nine inches thick with olive brown and gray clay loam and channery silty clay loam extending to a depth of 72 inches.

> **DaA** is Darien silt loam with zero to three percent slopes that occur on footslopes and summits of drumlinoid ridges, hills, and till plains. These soils, typically zero to 60 inches thick, are developed in loamy till derived predominantly from calcareous gray shale. These soils are somewhat poorly drained.

> **DaB** is Darien silt loam with three to eight percent slopes that occur on footslopes and summits of hills, till plains, and drumlinoid ridges. These soils, typically zero to 60 inches thick, are developed in loamy till derived predominantly from calcareous gray shale. These soils are somewhat poorly drained.

> **DaC** is Darien silt loam with eight to 15 percent slopes that occur on footslopes and base slopes of hills, till plains, and drumlinoid ridges. These soils, typically zero to 60 inches

thick, are developed in loamy till derived predominantly from calcareous gray shale. These soils are somewhat poorly drained.

Farmington series consists of shallow, well drained and somewhat excessively drained soils formed in till. The potential for surface runoff is high or very high with moderately high or high hydraulic conductivity. The internal drainage of the soil is medium primarily because of joints and cracks in the underlying rock. Farmington soils are nearly level to very steep with slopes ranging from zero to 70 percent. The typical soil profile of this series is dark grayish brown silt loam about eight inches thick with brown and yellow-brown loam and limestone bedrock extending to a depth of 18 inches.

FBD is Farmington-Rock outcrop association that is moderately steep soil that occurs on shoulders and crests of ridges, till plains, and benches. These soils, typically zero to 20 inches this, are developed in loamy till or congeliturbate derived from limestone, dolomite, shale, and sandstone, and in many places mixed with wind and water deposits. These soils are somewhat excessively drained.

Fluvaquents (FL) are loamy, poorly drained soils that occur on toeslopes and dips of floodplains. These soils, typically zero to 70 inches thick, are developed in alluvium with highly variable texture.

Ilion series consists of deep or very deep, poorly drained soils formed in till and are present in upland till plains. The potential for surface runoff is very low to very high with moderate or moderately slow permeability above the subsoil and slow or very slow permeability in the subsoil and substratum. Ilion soils are nearly level or gently sloping with slopes ranging from zero to eight percent. The typical soil profile of this series is very dark gray silt loam about nine inches thick with grayish brown silty clay loam and channery silt loam extending to a depth of 60 inches.

IlA is Ilion silt loam with zero to three percent slopes on toeslopes and footslopes of depressions. These soils, typically zero to 60 inches thick, are developed in loamy till derived from calcareous dark shale. These soils are poorly drained.

IlB is Ilion silt loam with three to eight percent slopes on toeslopes and base slopes of depressions. These soils, typically zero to 60 inches thick, are developed in loamy till derived from calcareous dark shale. These soils are poorly drained.

Lansing series consists of very deep, well drained soils formed in till and are present on till plains. The potential for surface runoff is very low to high with moderately high or high hydraulic conductivity in the mineral solum and moderately low or moderately high hydraulic conductivity in the substratum. The internal soil drainage is slow or very slow. Lansing soils are nearly level to rolling with slopes ranging from zero to 60 percent. The typical soil profile of this series is dark grayish brown gravelly silt loam about 20 centimeters thick with brown gravelly silt loam extending to a depth of 127 centimeters.

LaB is Lansing silt loam with three to eight percent slopes on summits, shoulders, and backslopes of drumlins, hills, and till plains. These soils, typically zero to 79 inches thick, are developed in calcareous loamy lodgment till derived from limestone, sandstone, and shale. These soils are well drained.

LaC is Lansing silt loam with eight to 15 percent slopes on summits, shoulders, and backslopes of till plains, drumlins, and hills. These soils, typically zero to 79 inches thick, are developed in calcareous loamy lodgment till derived from limestone, sandstone, and shale. These soils are well drained.

LaD is Lansing silt loam with 15 to 25 percent slopes on backslopes and side slopes of drumlins, hills, and till plains. These soils, typically zero to 79 inches thick, are developed in calcareous loamy lodgment till derived from limestone, sandstone, and shale. These soils are well drained.

Mohawk series consists of very deep, well drained soils formed in till with a high component of shale. These soils are present on glaciated upland summits through upper toeslopes. The potential for surface runoff is medium to high, with moderately high to high hydraulic conductivity in the surface layer and moderately low to moderately high hydraulic conductivity in the substratum. Mohawk soils are relatively flat to steep with slopes typically ranging from three to 30 percent. The typical soil profile of this series is very dark grayish brown silt loam about eight inches thick with brown to dark grayish brown silt loam extending to a depth of 72 inches.

LMF is Lansing and Mohawk soils with 25 to 60 percent slopes on backslopes and side slopes of drumlins, hills, and till plains. These soils, typically zero to 79 inches thick, are developed in calcareous loamy lodgment till derived from limestone, sandstone, and shale. These soils are well drained.

Madalin series consists of very deep, poorly drained soils on lake plains and depressions in the uplands formed in water-deposited materials. The potential for surface runoff is negligible to very high, with moderately low or moderately high hydraulic conductivity on the surface and moderately low to low hydraulic conductivity in the subsoil and substratum. Madalin soils are relatively flat with slopes ranging typically from zero to three percent. The typical soil profile of this series is very dark grey silt loam about 20 centimeters thick with grayish brown stratified silt to clay subsoils extending to a depth of 132 centimeters.

> **Ma** is Madalin silty clay loam with zero to three percent slopes on toeslopes and treads of depressions. These soils, typically zero to 79 inches thick, are developed in brown, clayey, glaciolacustrine deposits derived from calcareous shale. These soils are poorly drained.

Nunda series consists of very deep and deep, moderately well drained soils formed in silty mantles that overlie till derived from clayey shale on upland till plains. The potential for surface runoff is low to high, with moderate permeability in the surface and upper subsoils, moderately slow permeability in the lower subsoils, and slow or very slow permeability in the substratum. Nunda soils are gently sloping to steep soils located on glaciated uplands. The slope of Nunda soils typically ranges from zero 35 percent. The typical soil profile of this series is dark grayish brown silt loam about nine inches thick with brown to gray silt loam and channery silty clay loam subsoils extending to a depth of 72 inches.

> **NuB** is Nunda channery silt loam with three to eight percent slopes on drumlinoid ridges, hills, and till plains. These soils, typically zero to 60 inches thick, are developed in loamy till derived from calcareous shale and siltstone. These soils are somewhat excessively drained.

> **NuC** is Nunda channery silt loam with eight to 15 percent slopes on drumlinoid ridges, hills, and till plains. These soils, typically zero to 60 inches thick, are developed in loamy till derived from calcareous shale and siltstone. These soils are somewhat excessively drained.

Palatine series consists of moderately deep, well drained and somewhat excessively drained soils formed in till with high amounts of shale. The potential for surface runoff is low to very high, with moderately high to high hydraulic conductivity. Palatine soils are nearly level to very steep soils located on glacially modified, bedrock-controlled landforms. The slope of Palatine soils typically ranges from zero to 60 percent. The typical soil profile of this series consists of very dark grayish brown silt loam about 11 inches thick with very dark grayish brown channery silt loam and calcareous shale bedrock subsoil extending to a depth of 28 inches.

PaB is Palatine silt loam with three to eight percent slopes on summits and crests of benches, ridges, and till plains. These soils, typically zero to 32 inches thick, are developed in channery loamy till dominated by calcareous dark shale. These soils are well drained.

PaC is Palatine silt loam with eight to 15 percent slopes on shoulders and crests of ridges, till plains, and benches. These soils, typically zero to 32 inches thick, are developed in channery loamy till dominated by calcareous dark shale. These soils are well drained.

PaD is Palatine silt loam with 15 to 25 percent slopes on backslopes and side slopes of benches, ridges, and till plains. These soils, typically zero to 32 inches thick, are developed in channery loamy till dominated by calcareous dark shale. These soils are well drained.

Wassaic series consists of moderately deep, well drained soils that formed in loamy till. The potential for surface runoff is low to very high, with moderate to moderately slow permeability. Wassaic soils are nearly level to steep soils located on bedrock controlled by undulating to rolling till plains. The slope of Wassaic soils typically ranges from zero to 50 percent. The typical soil profile of this series consists of dark grayish brown silt loam about nine inches thick with brown gravelly loam and grey hard limestone subsoil extending to a depth of 28 inches.

WaB is Wassaic silt loam with three to eight percent slopes on summits and crests of ridges, till plains, and benches. These soils, typically zero to 31 inches thick, are developed in loamy till derived mainly from limestone, with varying amounts of sandstone, shale, and crystalline rock. These soils are moderately well drained.

Table 21-5. Summary of Soil Types

Map Unit Symbol	Map Unit Name	Slope (%)	Acres within Project Area
ApB	Appleton silt loam	3-8	19.0%
BuB	Burdett channery silt	3-8	0.7%
CFL	Cut and fill land	N/A	0.1%
ChA	Churchville silty clay loam	0-3	0.2%

Table 21-5. Summary of Soil Types

Map Unit Symbol	Map Unit Name	Slope (%)	Acres within Project Area
DaA	Darien silt loam	0-3	3.1%
DaB	Darien silt loam	3-8	27.6%
DaC	Darien silt loam	8-15	0.1%
FBD	Farmington Rock outcrop association	N/A	<0.01%
FL	Fluvaquents, loamy	0-2	3.7%
IlA	Ilion silt loam	0-3	3.1%
IlB	Ilion silt loam	0-3	0.9%
LaB	Lansing silt loam	3-8	5.5%
LaC	Lansing silt loam	8-15	15.4%
LaD	Lansing silt loam	15-25	1.5%
LMF	Lansing and Mohawk soils	25-60	8.2%
Ma	Madalin silty clay loam	0-3	1.7%
NuB	Nunda channery silt	3-8	0.1%
NuC	Nunda channery silt	8-15	0.1%
PaB	Palatine silt loam	3-8	1.8%
PaC	Palatine silt loam	8-15	1.4%
PaD	Palatine silt loam	15-25	5.2%
W	Water	N/A	0.2%
WaB	Wassaic silt loam	3-8	0.2%

The vast majority of soils in the Project area are channery silt loam. Soil drainage among mapped soil units is predominately classified as moderately well to well drained, and approximately 60.1 percent of soils are classified as somewhat poorly to poorly drained. For additional information about agricultural resources within the Project Area, including designated Agricultural District lands, see Exhibit 4 and Exhibit 22 of this Application.

The primary impact to the physical features of the Project Area will be the disturbance of soils during construction. The limit of disturbance (LOD) for the Project is approximately 569 acres. Based on the assumptions outlined in Table 22-2, disturbance to soils from all anticipated construction activities will total approximately 70.14 acres. Of this total, only approximately 16.52 acres will be permanent impacts where soils are converted to access roads, array foundations (posts), and structures, while the remaining will be restored and stabilized following the completion of construction. The area of disturbance calculations presented above assumes significant soil disturbance will occur in all areas in which construction occurs. Actual disturbance will include overlap of some Components and will be highly variable based on the specific construction activity, the construction techniques employed, and soil/weather conditions at the time of construction.

Earth moving and general soil disturbance will increase the potential for wind/water erosion and sedimentation into surface waters. Soils within the Project Area exhibit low permeability and limited depth to bedrock and are rated as most to somewhat limited infiltration capacity. Implementing the erosion and sediment control measures outlined in the Preliminary SWPPP will minimize impacts to steep slopes and highly erodible soils that may occur in the event of extreme rainfall or other event that could potentially lead to severe erosion and downstream water quality issues. In addition, impacts to soils will be further minimized by the following means:

- Public road ditches and other locations where Project-related runoff is concentrated will be armored with rip- rap to dissipate the energy of flowing water and to hold the soils in place.

- Prior to commencing construction activities, erosion control devices will be installed between the work areas and downslope areas, to reduce the risk of soil erosion and siltation. Erosion control devices will be monitored continuously throughout construction and restoration for function and effectiveness.

- During construction activities, hay bales, silt fence, or other appropriate erosion control measures will be placed as needed around disturbed areas and stockpiled soils.

- Following construction, all temporarily disturbed areas will be stabilized and restored in accordance with approved plans.

Impacts to soil resources will be minimized by adherence to best management practices that are designed to avoid or control erosion and sedimentation and stabilize disturbed areas. In addition, erosion and sedimentation impacts during construction will be minimized by the implementation of an erosion and sedimentation control plan developed as part of the SPDES General Permit for the Facility. Erosion and sediment control measures shall be constructed and implemented in accordance with a SWPPP (in Appendix 23-3). All excavations will comply with state and federal regulations.

Construction excavations may encounter areas of perched groundwater if construction occurs during a time when a seasonally high-water table may be present. In addition, construction during rainy periods may see an increase in perched groundwater due to the low hydraulic conductivity and soil permeability within the Project Area. Temporary de-watering may be required during the construction if perched water, groundwater or seepage is encountered. Open sump pumping method is the most common and economical method of dewatering and is anticipated to be sufficient based on relatively low permeability soils anticipated at the site. As stated previously, the water will be discharged properly to an area identified with Final SWPPP. Dewatering methods will involve pumping the water to a predetermined well-vegetated discharge point, away from wetlands, waterbodies, and other sensitive resources. Discharge of water will include measures/devices to slow water velocities and trap any suspended sediment.

21(r) Bedrock and Underlying Bedrock Maps, Figures, and Analyses

Figure 21-3 depicts anticipated depth of bedrock within the Project Area. According to this figure, depth to bedrock within the Project Area will range anywhere from 10 inches to more than 150 inches below the ground surface. However, the mapping seems to indicate that approximately 99.9% of the proposed array locations will have bedrock at a depth of greater than 78 inches below the ground surface.

Results of test borings performed to date by Terracon indicate that the majority of bedrock is shale bedrock at 38 feet below ground surface, with occasional layers of weathered shale. The depth to bedrock, as identified on the available logs, varies across the boring locations and range from eight foot below ground surface to 32 feet below ground surface. The bedrock extended to at least 38 feet below ground surface, which was the maximum depth explored in the borings. The majority of the bedrock encountered consists primarily of weak to moderately hard, close to very close fractured shale.

The Rock Quality Designation (RQD) of the coreable rock ranges from 11% to 55%, indicating "very poor" to "fair" condition using a standard RQD classification. The RQD was recorded from boring SS-2. The RQD of 11% was experienced from a depth of 32 feet below ground surface (bgs) to 35 feet bgs. The shale bedrock at this depth was weathered and weak with very close to close fractures. The RQD of 55% was experienced from a depth of 35 feet bgs to 38 feet bgs. The shale bedrock at this depth was slightly weathered and moderately hard with close fractures.

Groundwater was encountered at nine of the boring locations at depths ranging from three feet bgs to 20.5 feet bgs. The groundwater conditions may vary with seasonal changes and weather conditions. A more detailed geotechnical investigation will need to be completed prior to any site improvements to determine the actual elevations of groundwater in the area of the proposed solar array.

Maps, figures, and analyses on depth to bedrock, underlying bedrock types, vertical profiles of soil, bedrock, water table, seasonal high groundwater roadways to be constructed, and all off-site interconnections required to serve the Project are provided in the Geotechnical Investigation Report, provided as Appendix 21-1. Additionally, Appendix 21-1 provides an evaluation of the potential impacts due to Project construction and operation, including any on-site water disposal systems. These analyses were based on information obtained from publicly available maps, scientific literature, a review of technical studies conducted on and in the vicinity of the Facility, and on-site field observations, test pits and/or borings as available.

21(s) Evaluation of Suitable Building and Equipment Foundations

Foundation construction for Project Components within the collection substation and switchyard occurs in several stages, which typically include excavation; pouring of the concrete mud mat, rebar, and bolt cage assembly; outer form setting, casting, and finishing of the concrete; removal of the forms; backfilling and compacting; and site restoration. Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of excavated areas required to install foundations.

Some equipment may be supported on shallow foundations, while other structures may be supported on deep foundations consisting of drilled shafts, direct embedded poles or rock anchors. Transmission line structures are anticipated to be constructed as poles on drilled shafts or as direct embed poles. Based on the subsurface conditions encountered in the soil borings and test pits, the proposed collection substation and switchyard will be constructed at locations where glacial till soils are underlain by shallow bedrock and not planned near the noted loose silts.

Settlement potential of shallow foundations was analyzed using soil compressibility properties derived from the SPT borings drilled in the planned collection substation and switchyard location and assumed structural loads. Estimated total settlements will be less than one inch provided column loads are less than 150 kips and the applied bearing pressure of small isolated slabs or mats is less than about 3,000 psf. Shallow foundation systems for support of lightly-loaded buildings and equipment pads will be acceptable provided these maximum loads are not exceeded.

Proposed collection substation and switchyard structures may also be supported as direct embed poles or poles supported on drilled shaft foundations designed using the soil properties presented in the Geotechnical Engineering Report. Drilled shafts should be constructed as straight shafts at least 24 inches in diameter. Settlement of drilled shaft foundations using design properties presented in this report is expected to be less than 0.5 inch. All building structure foundations should bear on suitable natural soil, or on properly compacted structural fill. Compaction recommendations for structural fill are provided in the geotechnical investigation (Appendix 21-1).

(1) Preliminary Engineering Assessment

The Geotechnical Engineering Report analyzed spread footing and isolated slab foundations and drilled shaft foundation alternatives for the substation and switchyard foundations. The spread footing and isolated slab foundations were determined to be acceptable to support light-loaded buildings and equipment pads provided the maximum loads are not exceeded. If drilled shaft foundations are utilized for the Project, a minimum shaft diameter of 24 inches is recommended for the foundations. Refer the Appendix 21-1 for additional information regarding the foundation engineering assessment and design recommendations.

The available information suggests that substation and point of interconnection (POI) switchyard foundations will be underlain by glacial till and bedrock.

Solar array racking will be installed by one of three methods. First, the post may be driven directly into the soil. This is the primary method of installation. Second, a ground screw type post will be installed directly into the soil if the posts cannot be directly driven into the soil. Third, in cases of high ledge or bedrock, a post hole will be drilled into the rock to an appropriate depth, the post will be installed, and the post hole will be grouted. See Preliminary Design Drawings included in Appendix 11-1.

Design frost depth is four feet in the Project Area, and foundations must bear below this depth to prevent movement due to frost heave. Additionally, the manufacturer specifications indicate that standard embedment of five to seven feet is required to support racking and panels.

The glacial till typically provides high bearing strength and good short-term excavation stability if it is left undisturbed. The glacial till contains a significant percentage of silt and sand and loses strength rapidly if saturated and subjected to dynamic loading such as that imparted by construction equipment. Due to the potential for a variable rock surface, there is the potential for foundations to be partially founded on bedrock, natural soils, and/or compacted structural fill. If a mixed bearing grade condition exists, where the bearing surface transitions from bedrock to soil, the rock will be undercut at least twelve inches over a length extending back at least ten feet from the transition to soil. The undercut will be backfilled with compacted imported structural fill.

Assuming the foundation excavations are properly managed during construction, an allowable bearing pressure of 5,000 pounds per square foot is appropriate for shallow foundations bearing on undisturbed glacial till. An allowable bearing pressure of 6,500 pounds per square foot is estimated for foundations bearing on Stratum C – Transition Stone Rock (weathered shale) materials. An allowable bearing pressure of 10,000 pounds per square foot is estimated for foundations bearing on Stratum D – Bedrock.

(2) Pile Driving Impact Assessment

Pile driven foundations are not proposed for the substation and switchyard foundations, therefore engineering feasibility and impact assessments were not conducted. If pile driven foundations are determined to be necessary for Project construction, the foundation will be assessed for impacts to surrounding properties and structures, mitigation methods for vibration will be evaluated, and the daily and total pile driving work estimates will be determined.

It is anticipated that the posts for the panel racking system will be installed with end bearing either in the glacial till soils or directly on weathered rock or rock. Based on manufacture specifications approximately 450 posts/MW will be required for a total of 40,500 posts. Posts are galvanized steel and load-carrying capacity will vary based on post dimensions and installation methods. Installation is typically completed using an excavator equipped with a vibratory driving attachment or drilling, setting, and backfilling posts. It is anticipated that the posts can be installed in 170 days utilizing 4 post installation crews working 10 hours per day.

Based on soil types throughout the Project Area, the posts are anticipated to be driven with a vibratory hammer. Helical posts (i.e., pile screws), if utilized, will be installed with the minimum required torque per manufacturer's recommendations. If refusal is encountered during installation, the posts will be installed into pre-drilled holes and filled with grout.

The primary impacts from post installation operations are noise and vibration. The equipment used in post installation is not expected to generate any off-site noise impacts (see Exhibit 19).

(3) Pile Driving Mitigation

In order to minimize impacts associated with noise, post installation activities will be designed to minimize impacts to nearby residences and existing structures. Post installation will be restricted to within the hours of 8:00 am to 6:00 pm on Monday through Friday and will not occur on state or federal holidays.

As mentioned in Section 21(s)(2), pile driven foundation systems are not considered to support the collection substation and switchyard. Mitigation measures are not required for these Components.

(4) Vibrational Impacts

All post installation operations which occur adjacent to residences, buildings, structures, utilities, or other facilities will be undergone with specific planning and insight from industry professionals, contractors, inspectors, and the Applicant, with full consideration for all forces and conditions involved and with the safety as the top priority. To the extent practicable, facilities have been sited to avoid existing structures. Based on air-borne induced vibration modeling conducted by Epsilon Associates Inc. no receptors were found to experience sound levels equal to or greater than 65 dB at 16, 31.5, or 63 Hz. This analysis is further discussed in Exhibit 19 and provided in Appendix 19-1.

Post installation for a solar facility is smaller scale compared to pile driving for heavy infrastructure (i.e., building foundations or bridges). Typically, posts are driven into the ground using hydraulic ram machinery, which is about the size of a small tractor or forklift and have much less vibrational impacts than equipment utilized for heavy infrastructure. Additionally, many posts in the array will require pre-drilling holes which will minimize the use of the hammer to install the posts. As such, no vibrational impacts are anticipated. The closest distance to a structure where post installation is proposed is over 130 feet and is well over several hundred feet in most locations.

As mentioned in Section 21(s)(2), pile driven foundation systems are not considered to support the collection substation and switchyard. Mitigation measures for vibrational impacts not are required for these Components.

21(t) Evaluation of Earthquake and Tsunami Event Vulnerability at the Project Area

The Project Area is located in an area of relatively low seismic activity. The USGS Seismic Hazards database indicates a 2% chance of an earthquake occurring in the next 50 years of peak acceleration exceeding 10% to 14% of the force of gravity in the Project Area. The Project Area has a dense soil cover and will not provide significant amplification of seismic waves. Geophysical surveys are part of the overall scope of services but were not authorized for this phase of the investigation and no site-specific shear wave velocity data is available. The Project Area appears to have minimal vulnerability associated with seismic events based on review of publicly available data. The findings were provided in Section 21(o) above.

The nearest large body of water, Lake Ontario, is over 100 miles from the Project Area, therefore this application will not address vulnerability to tsunami events.

21(u) Consistency with New York State Guidelines

The Project will be in compliance with the New York State Department of Agriculture and Markets (NYSDAM) Guidelines for Agricultural Mitigation for Solar Energy Projects requirements, dated April 19, 2018, to the maximum extent practicable.

The Applicant will hire an Environmental Monitor to oversee construction and restoration work on agricultural land. The Environmental Monitor will coordinate with the NYSDAM Division of Land

and Water Resources as necessary to ensure the guidelines are being met to the maximum extent practicable. The Environmental Monitor will contact the NYSDAM Division of Land and Water Resources if a farm resource concern, management matter pertinent to the agricultural operation, and/or site-specific implementation conditions, cannot be resolved.

The Project will comply, to the maximum extent practicable, with the guideline requirements for construction, restoration, monitoring and remediation, and decommissioning as detailed below.

Construction Requirements

The measures to be followed for the construction of the Project to comply with the NYSDAM guidelines are detailed below.

- Access roads constructed on agricultural fields shall be level with the adjacent field surface.
- Culverts and waterbars shall be installed to maintain the natural drainage patterns.
- Topsoil will be stripped from agricultural lands to be used for vehicle and equipment traffic, parking, and equipment laydown and storage areas. Vehicle and equipment traffic will be limited to designated areas and will not be moved outside the Project Area without prior approval from the landowner and Environmental Monitor, if necessary.
- If open trenching is used for the installation of electric cables, topsoil stripping from the entire work area may be necessary.
- Topsoil stripped from the Project Area shall be stockpiled separate from other excavated material. At least 50 feet of temporary workspace is required for “open-cut” electric cable trenches for proper topsoil segregation. The topsoil will be stockpiled immediately adjacent to the area in which it was removed. The topsoil areas will be clearly designated in the field and on the construction drawings.
- Interconnect cables will be buried in agricultural fields wherever practical in order to prevent long-term interference with farming equipment and operations. Interconnect cables and transmission lines installed aboveground will be located outside of the agricultural field boundaries wherever possible. Where cables and transmission lines must cross farmland, taller structures will be used, allowing longer spanning distances between poles to minimize impacts to the farmland. The poles will be placed along the field edge to the greatest extent practicable.
- Buried electric cables in cropland, hayland, and improved pasture will have a minimum depth of 48 inches of cover. Unimproved grazing areas and land permanently devoted to

pasture will have a minimum depth of 36 inches of cover. Where the depth to bedrock varies from zero to 48 inches, electric cables will be fully buried below the top of the bedrock or at a depth specified for the particular land use, whichever is less. The depth of cover shall never be less than 24 inches.

- Where buried electrical lines alter the natural stratification of soil horizons and natural soil drainage patterns, measures such as subsurface intercept drain lines shall be utilized to rectify the effects. The Soil and Water Conservation District will be consulted regarding the type of intercept drain lines to be installed. The drain lines will be installed in accordance with the NRCS standards and specifications. The drain tile will meet or exceed the American Association of State Highway and Transportation Officials (AASHTO) M2525 specification.
- Excess subsoil and rock, if any, will be removed from the Project Area. On-site disposal is not permitted unless approval is given by the landowner with consideration given to the possibility of agricultural or environmental impacts. Any permits necessary for disposal under local, State, and/or Federal laws and regulations must be obtained where required.
- Construct temporary or permanent fences around work areas, as needed, to prevent access by animals. The fencing will be consistent with the landowner agreements.
- Construction debris and materials such as wire, bolts, and unused metal objects shall be removed from the Project Area and properly disposed.
- Excess concrete will not be buried or left on the soil surface in active agricultural areas. Concrete trucks shall use designated concrete washout facilities, which will be placed outside of active agricultural lands.

Restoration Requirements

Agricultural areas temporarily disturbed during construction will be decompacted to a depth of 18 inches to a level no more than 250 pounds per square inch when measured with a soil penetrometer. In areas where topsoil was stripped, soil decompaction will be conducted prior to replacing the topsoil. Rocks four inches and larger will be removed from the subsoil surface prior to topsoil replacement. The topsoil will be replaced to the original depth and contours where possible.

Rocks four inches and larger will be removed from the surface of the topsoil. Subsoil decompaction and topsoil replacement will be avoided after October 1. If areas are restored after

October 1, provisions will be made to restore and reseed eroded and exposed areas the following spring to establish proper vegetative cover.

Access roads will be regraded as needed to allow farm equipment crossing and to restore the original drainage patterns or incorporate the newly designed drainage pattern. Surface and subsurface drainage structures damaged during construction will be repaired to as close to preconstruction condition as possible unless the structures were to be removed as part of the Project. Drainage problems resulting from the construction of the Project will be corrected with the appropriate mitigation techniques as determined by the Environmental Monitor, Soil and Water Conservation District, and the Landowner.

Restored agricultural areas will be seeded as specified by the landowner to maintain consistency with the surrounding areas.

Restoration practices will be postponed until favorable soil conditions exist. Restoration will not occur when soils are in a wet or plastic state of consistency. Regarding stockpiled topsoil and decompacting subsoils will not occur until the plasticity, as determined by the Atterberg field test, is adequately reduced. Restoration activities will not occur on agricultural fields between October and May unless favorable soil conditions exist.

Construction debris will be removed from the Project Area following restoration efforts and disposed of in a licensed facility.

Monitoring and Remediation

The Applicant will provide monitoring and remediation for a period no less than 365 days following the date upon which the solar arrays are in commercial operations. The monitoring and remediation will identify remaining agricultural impacts associated with construction that need mitigation and follow-up restoration.

Monitoring efforts will assess the topsoil thickness, relative content of rock and large stones, trench settling, crop production, drainage and repair/replacement of severed subsurface drain line, fences, etc. If necessary, topsoil will be imported to the Project Area to repair trench settling and topsoil deficiency issues. Visual inspection will determine the presence of excessive amounts of rock and oversized stone material. Excess rocks and large stones will be removed as appropriate.

When the subsequent crop productivity within affected areas is less than half that of adjacent unaffected agricultural land, the Applicant and other associated parties must determine the appropriate rehabilitation measures to be implemented.

Decommissioning

When the solar arrays are decommissioned, all above ground structures will be removed from the Project Area. Concrete piers, footer, and other supports will be removed to a depth of 48 inches below the soil surface and underground electrical lines will be abandoned in place. The Project Area will be restored to substantially as close to the previous condition as possible. Previous agricultural lands will be restored with recommendations from the landowner, the Soil and Water Conservation District, and the Department of Agriculture and Markets. Access roads in agricultural areas will be removed unless specified otherwise by the landowner.

21(v) Identification of Drain Tiles

The Applicant is committed to minimizing impacts to agricultural operations to the maximum extent practicable, has worked with landowners and will continue to work with landowners/farm operators to address unanticipated post-construction impacts. The Applicant will work with affected landowners/farmers regarding potential drainage issues on their properties.

Existing drain tiles will be identified and located before construction as much as is reasonably possible based primarily on consultation with the landowner. During and after construction operations, any existing drain tiles within the area of disturbance will be checked for damage by inspecting the drain tile areas for unexpected wet spots, evidence of soil erosion or sedimentation, and monitor the inlets and outlets for proper flows and good water quality. If poor drain tile condition is observed, the drain tile may be misaligned, collapsed, or broken and if need of repair or replacement. Damaged drain tiles will be repaired/replaced by a qualified drain-tile specialist. The Applicant will coordinate with the landowner to continue to monitor drain tiles post-construction to ensure repairs are functioning properly.

21(w) Evaluation of Corrosion Potential

Some soil units found within the Project Area are considered to be acidic. Acidic soils are likely to be corrosive to steel and concrete. Steel may need a protective coating and concrete may require additives in the mixture to protect against corrosion. According to the NRCS Web Soil Survey, soils in the Darien, Illion, Madalin, Mohawk, and Nunda series pose high risk of corrosion to steel.

These soil units cover approximately 37% of the Project buildable area. Remaining soils are of low corrosion risk for uncoated steel. All soils, with the exception of alluvial lands, pose low risk of corrosion of concrete.

Six samples were collected during corrosion testing at depths from zero to three feet below the existing ground surface. The samples were tested from pH, water soluble sulfate, sulfides, chlorides, total salts, Red-Ox potential, and electrical resistivity. Refer to Table 21-4 and section 21(i) above for more detrailed corrosion testing information. Additional corrosion potential information is included in the Geotechnical Engineering Report in Appendix 21-1. Detailed design requirements will be determined during the final engineering phase.

21(x) Evaluation of Risk of Damage or Displacement to Foundations and Underground Cables

According to soil maps for the Project Area, mapped soil units indicate moderate to high risk for frost action. Frost heaves exert pressure on underground structures resultant from intermittent freezing and thawing of the soil. The additional pressure causes soils to lift, which may result in displacement of underground structures (e.g. foundations, cables, etc.) which are constructed above the frost line. Frost depth in New York State averages 36 to 48 inches. In accordance with the NYS Building Code, concrete foundations and/or piers will be constructed to a minimum depth of 48 inches and adhere to all American Society for Civil Engineers (ASCE) 32 standards.

Existing soils composed of sand and gravel or imported sand are proposed for re-use as structural and/or compacted fill. The soils observed during geotechnical investigations consist of glacial till, gravelly silt, sandy silt, and have low-to-minimal shrink/swell potential. As a result, specific construction procedures associated with potential expansive clay will not be required for the Facility.

21(y) Evaluation of Foundation Requirement

The Applicant anticipates that the solar array racking systems will be supported by posts driven into the ground and will not require foundations. However, should foundations be required for any of the solar array racking systems, the Applicant will adhere to the steps outlined in the Decommissioning and Restoration Plan return the soil to its preconstruction condition for agricultural use to the maximum extent practicable. Refer to the Decommissioning and

Restoration Plan in Appendix 29-1 of this Application for additional information on the decommissioning procedures for the racking systems.

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