NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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October 23, 2024

Noah Ginsburg
Executive Director
New York State Energy Industries Association
P.O. Box 1523
Long Island City, New York 11101

Dear Noah Ginsburg,

Thank you for your engagement efforts seeking to clarify New York State Department of Environmental Conservation (NYSDEC) requirements related to solar development. New York State Energy Industries Association (NYSEIA) provided correspondence and questions dated January 25, 2024 and June 26, 2024 seeking engagement on modernization of solar development techniques. In your correspondence, you raised scenarios and questions regarding common stormwater practices related to the NYSDEC Construction Stormwater General Permit (CGP), New York Standards and Specifications for Erosion and Sediment Control (Blue Book) dated November 2016, New York State Stormwater Management Design Manual (2024 White Book) dated July 2024, and use of common solar development methods. Your letter refers to a DEC memo of April 5, 2018 (Solar Memo) providing interpretation of the CGP in relation to solar installation. This letter responds to the correspondence and aids in the implementation of solar development consistent with clean energy goals, the CGP, and design standards while maintaining sound stormwater management related to these developments.

The following answers to these questions should be examined comprehensively as many factors together ultimately decide what post-construction treatment, if any, is required by the CGP and any specific project. When considering whether tables (solar panel arrays) should be modeled as pervious or impervious, NYSDEC recognizes that tables can be designed or constructed in such a way that runoff and infiltration can occur between and underneath tables. Variables such as table height, spacing between tables, site slope, soil conditions, vegetative cover, and hydrology analysis are studied together to determine whether runoff from tables can be considered disconnected for purposes of post-construction treatment practice selection or not.

The following are NYSEIA bullet points/questions and responses. For all responses, these are NYSDEC's interpretation of CGP, Blue Book, and 2024 White Book provisions which should be reviewed and considered for each site-specific application and govern any final determination for that application.

NYSDEC Scenario 1 Issues (Solar Memo):

Item #2: The panels are spaced apart so that rain can flow off the down gradient side of the panel and continue to sheet flow across the ground surface.

1. NYSEIA Question:

   Are the entirety of the solar rows and tables (made up of individual solar modules) considered one large impervious area? Typically, solar modules are installed to include a ~1" gap around all edges which will prevent one large leading drip edge and avoid significant drip edge erosion.

   NYSDEC Response:

   While the actual solar table may be impervious, solar array field areas may be designed to be disconnected impervious area and qualify for impervious area reduction when computing water quality volume requirements. To clarify, NYSDEC has attached a figure (Diagram 1: NYSDEC Solar Plan View) representing common terms and practices. It is typical practice to consider the leading drip edge as the most useful scenario to model in considering impact on sheet flow from the table. Combined with site characteristics like vegetative cover, soil conditions, panel spacing and slope, design professionals can design sites to avoid erosion, promote sheet flow and optimize the perviousness of the ground surface.

   In addition to site characteristics, table height can also influence infiltration capability. For solar panel projects where the panels are mounted directly to the ground with no space below panel to allow for the desired vegetative growth and infiltration of runoff, the panels would not meet the criteria for disconnection of impervious area. NYSDEC has not accepted or developed a specific table height requirement. A height requirement, like the assessment of slope and soil conditions, is a component of a designer's best professional judgement. However, the designer should keep in mind that the tables must be elevated enough to allow for permanent cover of 80% or more as required by the CGP definition for final stabilization. It is also noted that different seed mixes may factor into height requirements and become part of the design consideration for the designer and Landscape Architect team.

2. NYSEIA Question

   Please explain what you mean by the panels need to be spaced apart.

   NYSDEC Response:

   Panel spacing is consistent with the concept of disconnection of impervious area (Section 5.3.4 of the 2024 White Book) and is an important component to consider when avoiding erosive conditions. Disconnection can be achieved through adequate spacing of panel rows over areas of well-established vegetative cover (see Diagram 2: NYSDEC Solar Profile View: Inter-Row Space). For the designer to meet the intent of disconnection, a design should consider the largest solar panel width, considering all solar panel rotations/positions

and provide that width as the minimum spacing downgradient of every row of solar panels in the solar array field area. If inter-row space requirements are insufficient, infiltration is less likely, resulting in panels that are more likely to create concentrated flow paths and perform as impervious. For solar array field areas that have insufficient spacing for infiltration, the disconnection credit for runoff reduction would not be applicable. As a result, the SWPPP would need to address post-construction stormwater management control practices.

Item #3: For solar panels constructed on slopes, the individual rows of solar panels are generally installed along the contour so rainwater sheet flows down slope.

3. NYSEIA Question:

   If panels aren't "generally installed along the contour" does that automatically mean the area of solar panels should be considered impervious?

   NYSDEC Response:

   No. NYSDEC recognizes that rows of solar tables are frequently constructed to track the sun's path, not along the contour. The main intent of considering placement along the contour is to ensure that precipitation coming off the panels consists of sheet flow across the site. As explained in the previous section, practices that maintain sheet flow and promote infiltration are necessary to meet CGP sizing criteria for Water Quality Volume (WQv) and Runoff Reduction Volume (RRv).

4. NYSEIA Question:

   If panels aren't "generally installed along the contour" does that mean the area of solar panels wouldn't be allowed to function as a filter strip?

   NYSDEC Response:

   Through proper design and installation of panels even if not along the contour, the site could still be designed to allow the area to function as a pervious filter strip.

   The concept behind the Sheet Flow to Filter Strip practice is outlined in Section 5.3.2 of the 2024 White Book and is important when considering stormwater management needs on solar array field areas. Precipitation falls to a well-vegetated surface with suitable characteristics between the panels and then across the site, which allows infiltration. This meets the WQv and RRv sizing criteria in the CGP for this portion of the solar array field area. Since the panels are not treated as connected impervious area, the 10 ft. pretreatment requirement is not necessary for each row of tables.

   In accordance with Table 5.7 of the 2024 White Book, it is noted that there are slope limitations for the filter strip. They can only be used on slopes less than or equal to 8%. This is to ensure that sheet flow can be maintained. If slopes are greater than 8%, then there are two main alternatives:

a) Design and implement permanent engineered practices from the Blue Book and White Book or use the NYSDEC Gravel Diaphragm detail (Diagram 3) along the slope/contour, to reestablish and maintain sheet flow, which will meet RRv and WQv requirements. It is worth noting that the use of the gravel diaphragm has been effectively implemented in many scenarios. OR
b) Where sheet flow cannot be maintained, consider the panels in that area to be connected impervious and design post-construction stormwater management control practices to provide water quality and quantity controls for this portion of the solar array field area consistent with the CGP and White Book. Some acceptable design elements used on other sites for RRv and WQv include gravel diaphragms (see Diagram 3: NYSDEC Gravel Diaphragm Along the Contour), level spreaders and flow diffusers. Practices such as water bars have generally been shown to not be effective for large areas as they are diversion practices designed to convey stormwater to a stable outlet. Water bars as a practice to maintain sheet flow have posed their own unique set of issues on several sites including unintended ponding, traffic concerns, and poorly stabilized outlets.

Item #4: The ground surface below the panels shall consist of a well-established vegetative cover (see "Final Stabilization" definition in Appendix A of the CGP).

5. NYSEIA Question:

   Please confirm that in addition to the space under the panel, the ground surface between the rows needs to have well established vegetation.

   NYSDEC Response:

   This is correct. For the ground surface under the panel to aid in creating a pervious area, a well-established vegetative cover is required for the final stabilization of a site post construction. Please see the definition of "final stabilization" in the CGP.

Item #5: The project does not include the construction of any traditional impervious areas (i.e., buildings, substation pads, gravel access roads or parking areas, etc.)

6. NYSEIA Question:

   All solar facilities will require some impervious areas in the form of concrete or gravel equipment areas and access roads that are fire code compliant. These areas are typically treated with stormwater controls (with stone areas or adjacent grass filter strips). Please explain the rationale behind Item # 5 and how developers should address impervious areas within the proposed solar facility.

NYSDEC Response:

The CGP provides sizing criteria in Part I.C and Part III.C. to address impervious areas. When RRv and WQv are not met for the ancillary areas and/or tables, designers must implement post-construction stormwater practices in accordance with the White Book for those areas. If designers are looking for relief from designing post-construction practices, there are some approved alternatives such as limited use pervious access roads and alternative stormwater management practices for substations to achieve sizing criteria and reduce post-construction practices.

7. NYSEIA Question:

   Does DEC require pervious access roads into the solar facility? If so, is there a typical you can provide for developers to reference?

   NYSDEC Response:

   No, pervious access roads are not required by the CGP and are not listed in the 2024 White Book and therefore are not required on renewable energy sites. It is worth noting that on many solar sites, the pertinent design requirements for the pervious access road detail cannot be met. For example, there are slope limitations. Cross slopes cannot exceed 6% and the longitudinal slope should not exceed 15%. Additionally, these roads should not be utilized during construction as it may impact soil or other conditions and require testing and re-construction to be effective as a pervious feature. Many sites do not have enough available area to construct both temporary and permanent roads in separate footprints. Finally, the limited use pervious access road cannot be constructed or used until all areas subject to runoff onto the road have achieved final stabilization. Attached, please find a copy of a typical limited use pervious access road detail that has been accepted in SWPPP review for your reference.

   One alternative that has been accepted on other sites is the revegetated gravel road scarification detail for upland roads and work areas. This can be used in areas that are not wetlands and are not agricultural areas where restoration is required. This road is meant for minimal intermittent use and does not have the load-bearing capacity to serve as emergency access for the site.

Maryland DE's "Stormwater Design Guidance- Solar Panel Installations," Page 1, 2nd Paragraph: "Commonly used with smaller or narrower impervious areas like driveways or open roads, the Disconnection of Non-Rooftop Runoff technique (see pp. 5.61 to 5.65 of the 2000 Maryland Stormwater Design Manual) is a low-cost alternative for treating runoff in situations like rows of solar panels."

8. NYSEIA Question:

   Should the Maryland Department of the Environment (MDE) Stormwater Design Guidance be applicable in NYS? We feel that the guidance is outdated and doesn't represent typical field conditions in New York.

NYSDEC Response:

While the Maryland Department of the Environment's (MDE) Stormwater Guidance aided in NYSDEC's initial understanding of solar guidance standard development, designs should meet New York State standards. NYSDEC did not propose the MDE document as guidance or intend it to be adopted it in its entirety. Primarily, NYSDEC intended to reference use of the diagrams as suitable alternative practices. To eliminate confusion, changes have been proposed in the draft version of the CGP.

Maryland DE's "Stormwater Design Guidance- Solar Panel Installations," Page 1, 3rd Bullet: "Disconnections should be located on gradual slopes (≤ 5%) to maintain sheet flow. Level spreaders, terraces, or berms may be used to maintain sheet flow conditions if the average slope is steeper than 5%. However, installations on slopes greater than 10% will require an engineered plan that ensures adequate treatment and the safe and non-erosive conveyance of runoff to the property line or downstream stormwater management practice."

9. NYSEIA Question:

   If panels are placed on slopes greater than 10% does that automatically make them impervious?

   NYSDEC Response:

   No. Please refer to Question 4.

10. NYSEIA Question:

    Please clarify the requirement for an "engineered plan."

    NYSDEC Response:

    With regard to the Maryland guidance, NYSDEC's original intent was to reference diagrams and not the document as a whole. The draft CGP provides clarification as to the need for post-construction controls for solar array field areas. The need for an "engineered plan" references the use of suitable design practices from the White Book for post-construction controls for RRv, WQv, and quantity based on site conditions and solar table layout.

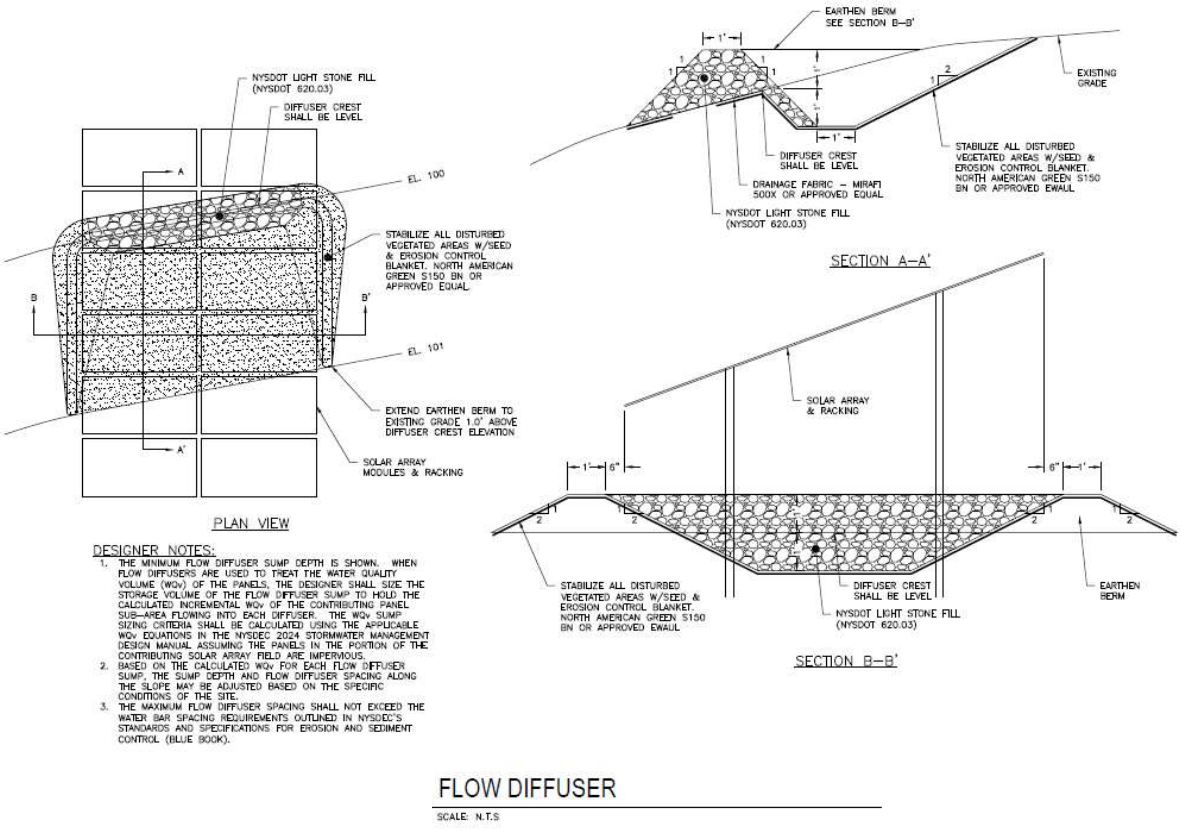
11. NYSEIA Question:

    If the panels are placed on slopes greater than 10%, what is acceptable to demonstrate developers are designing a site with effective stormwater management practices? In our experience we have proposed the following accepted solutions:

    To date, the majority of our solutions have been gravel level spreaders/diaphragms on slopes above 10%, generally spaced throughout the solar panel area site using the NYSDEC blue book spacing for like water bars.

In steep panel areas (e.g. in excess of ~20% slopes), we have had instances where we provided additional attenuation (reducing runoff rates further than what is required by the Stormwater Design Manual) in order to satisfy Town engineers.

An alternative "engineered" solution pioneered by Marathon Engineering have been flow diffusers which he has used at staggered locations primarily beneath the panels to catch water leaving the panels and slow it down while avoiding most of the drive aisles for construction (snip below).



NYSDEC Response:

NYSDEC acknowledges that well-designed projects on slopes steeper than 10 percent have successfully implemented some of the alternative practices mentioned such as flow diffusers and stone diaphragms. The flow diffuser detail (above) from Marathon Engineering has been applied on several sites. If there are instances that trigger 60 day review, please note that it will aid in review if you can provide examples of previous projects that this practice has been approved on.

It has come to NYSDEC's attention that there are a variety of practices that may be useful in managing stormwater on solar sites that have been approved in other states besides New York. NYSDEC will be seeking to include examples of these practices in future training. It is important that when submitting alternative practices for review, that as much documentation is provided to satisfy the Criteria for Practice addition in Section 3.3.2 in the White Book including an 80% reduction in total suspended solids (TSS) and 40% reduction in total phosphorous (TP).

The CGP, White Book, and Blue Book do not exclude solar development on steep slopes or establish specific practices for solar development. For these challenging projects, the designer will need to carefully consider practices and controls during design and provide sufficient information in the SWPPP to facilitate evaluation by NYSDEC staff, and manage erosion and sedimentation during construction, and post-construction stormwater management for the project. For solar projects on steep slopes, it is encouraged that NYSDEC, project developer, designer and contractors work together to ensure that New York's goals for renewable energy are achieved in an environmentally responsible manner and that balance water quality and climate goals.

Additional Question #1

12. NYSEIA Question:

    Are solar trackers (solar tables/rows which move with the sun) considered impervious? Do the current guidelines apply to them? The examples in the 2018 Solar Guidance Memo only show fixed tilt. How can a developer ensure these systems follow DEC guidelines?

    NYSDEC Response:

    Solar trackers are not considered disconnected impervious area unless they meet the criteria discussed above. The SWPPP must demonstrate that the site conditions and placement of the solar panels will allow for disconnection and achieve the runoff reduction objectives of the CGP in order to apply the area reduction credit for the panels in all positions.

Additional Question #2

13. NYSEIA Question:

    On slopes under 8%, can the meadow grass beneath the modules be counted as part of a filter strip to satisfy water quality and RRv? We have typically started our filter strips outside of the system area due to Town Designated Engineer preference and understanding of the "Filter Strip" practice, but we feel the area under the solar panels should suffice as a filter strip.

NYSDEC Response:

The area between the panels counts toward the filter strip. Since the panels are not treated as connected impervious area, the 10 ft. pretreatment requirement is not necessary for each row of tables. Please refer to Question 4.

We hope this information has been of assistance. Although currently solar development falls under Appendix B Table 2 of the current 2020 version of the CGP as "all other construction activities that include the construction or reconstruction of impervious area or alter the hydrology from pre to post development conditions and are not listed in Table 1" the 2024 White Book and the CGP have provisions that allow disconnection of impervious areas. Use of the clarifications provided in this letter will allow design and development practices under the requirements of the CGP and 2024 White Book to be applied for disconnection and should be utilized in lieu of the 2018 Solar Memo. Additionally, provisions for solar development are proposed in the 2024 draft of the new CGP. We hope you were able to review the draft and provide feedback during the public comment period which ended October 1, 2024.

Sincerely,

Edward Hampston

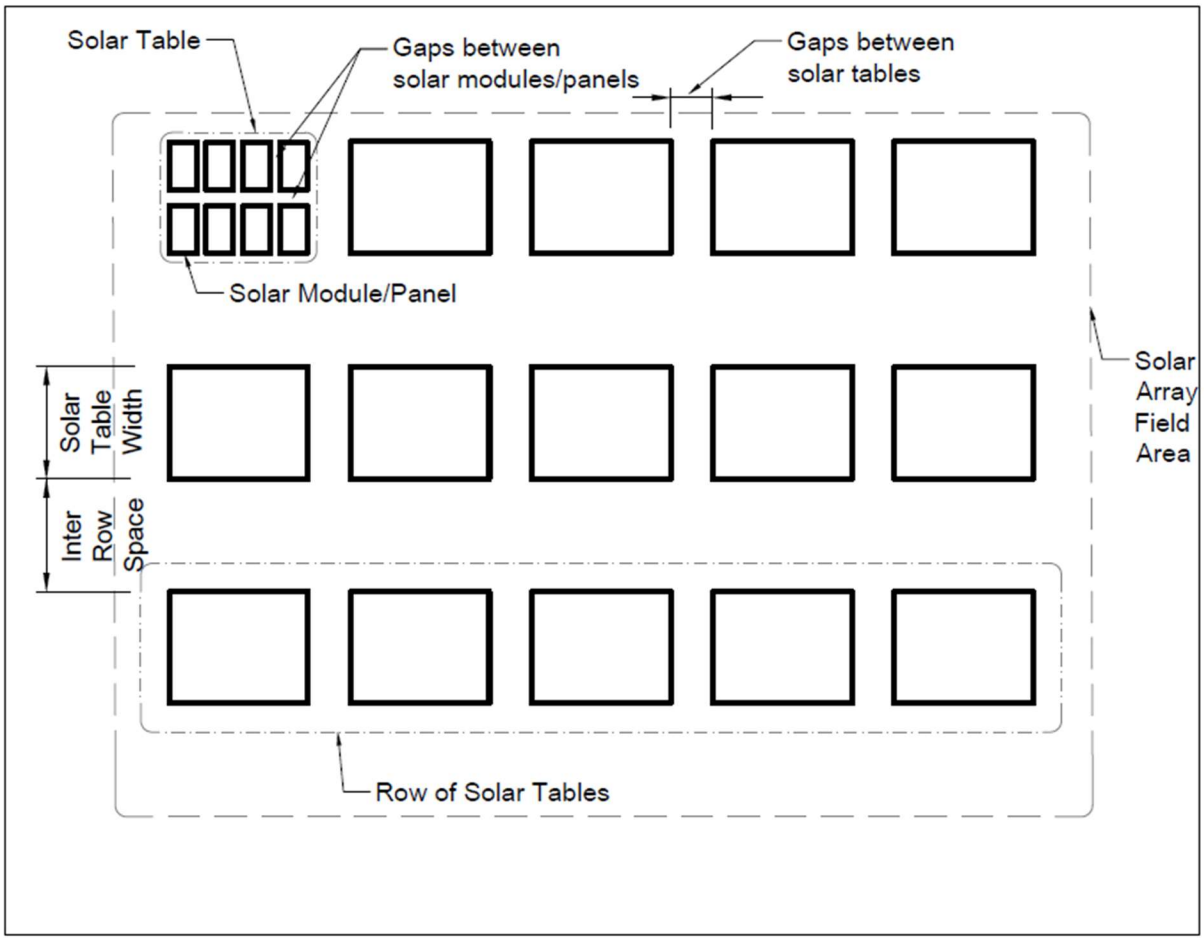
Edward Hampston, P.E.
Director, Bureau of Water Compliance

Attachments:

1. Diagram 1: NYSDEC Solar Plan View
2. Diagram 2: NYSDEC Solar Profile View: Inter-Row Space
3. Diagram 3: NYSDEC Gravel Diaphragm Along the Contour
4. Limited use pervious access road detail
5. Gravel road scarification detail for upland roads and work areas
6. NYSEIA Letter dated June 26th, 2024

cc: C. Lamb-Lafay, PE, NYSDEC
A. Smith, NYSDEC
J. Melançon, CPESC. NYSDEC
C. Warner, NYSERDA

Diagram 1: NYSDEC Solar Plan View N.T.S.

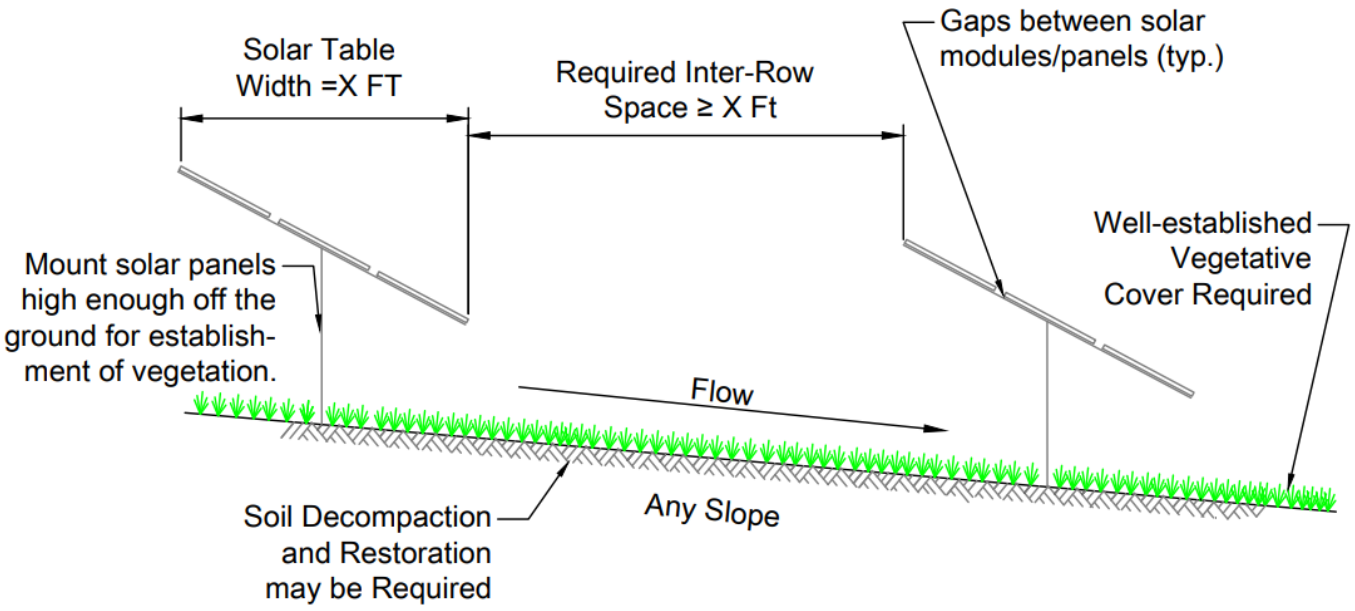


***Definitions:**

**NYSDEC provides the above diagram and the following definitions for solar terminology for the specific purpose of demonstrating how to interpret and apply the NYSDEC solar guidance. The following definitions are intended for that limited context only and are not meant to be used for any other purpose.*

- Gap between solar table: the distance between two solar tables within a row of solar tables. This gap varies depending on the layout and design.
- Gaps between solar modules/panels: the distance(s) between solar modules/panels within a solar table. These gaps vary depending on the layout and design.
- Inter-row space: the plan view distance between two solar table rows. NYSDEC solar guidance sets the minimum inter-row space requirements; see Diagram 2: NYSDEC Solar Profile View: Inter-Row Space Requirements. This requirement is based on the solar table upgradient of the inter-row space.
- Solar array field area: the area of a solar site that includes the rows of solar tables, their inter-row spaces, and the surrounding buffer area. This area does not include access roads and other traditional impervious areas, even if those are located within the solar array field area.
- Solar module/panel: a unit comprised of photovoltaic cells.
- Solar table: one or more modules/panels wired and framed together. Solar tables may be a single module/panel, a single row of modules/panels, or stacked rows of modules/panels. The number of modules/panels framed and stacked together varies.
- Solar table width: the plan view distance, edge to edge, of a solar table. It is the largest distance possible for rotating tables considering all table rotations/positions.

Diagram 2: NYSDEC Solar Profile View: Inter-Row Space N.T.S.



Note:
X= plan view distance,edge to edge (the largest distance possible for rotating tables considering all table rotations/positions).

Diagram 3: NYSDEC Gravel Diaphragm Along the Contour N.T.S.

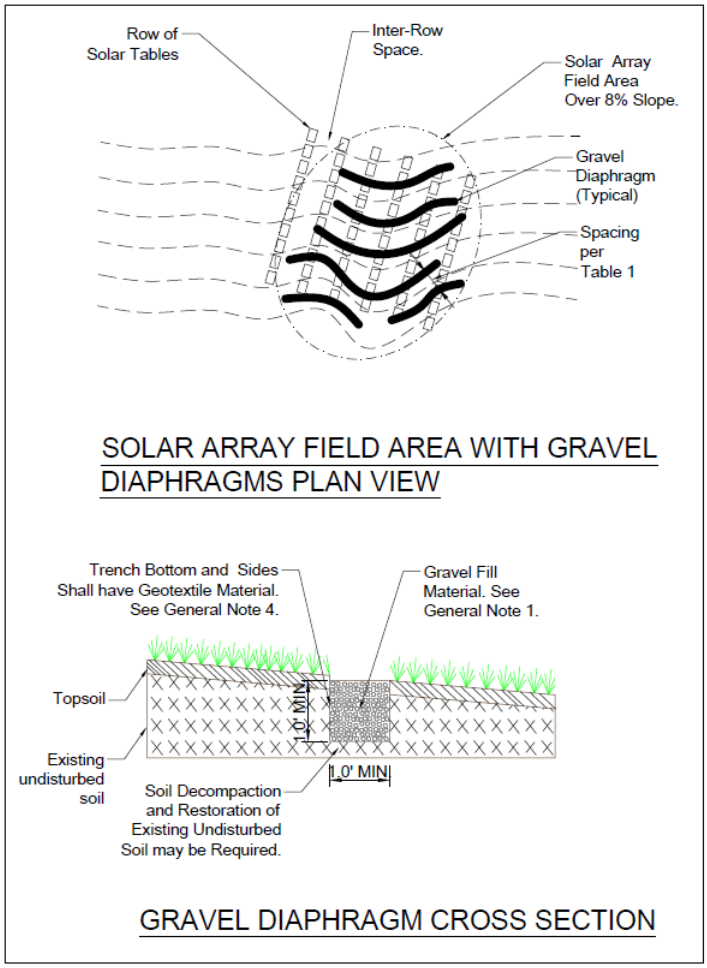


TABLE 1: SPACING	
[1]Slope (%)	[2]Spacing (FT.)
8 to 10	100
10 to 20	75
20 to 35	50

Table 1: Spacing – Notes

1. The average slope downgradient of a given solar panel over a horizontal distance equivalent to the inter-row space.

2. Maximum spacing requirement.

Layout Notes

1. Spacing between gravel diaphragms shall not exceed the maximum spacing specified in Table 1 for any flow path, leaving a solar panel edge for any flow path perpendicular to the contours.

2. Gravel diaphragms may be continuous or staggered to allow maintenance access in the inter-row space. If staggered, provide sufficient overlap, along the contour, to ensure no perpendicular flow path will bypass the downgradient gravel diaphragm and therefore exceed the maximum spacing requirements.

General Notes

1. Gravel fill material shall consist of 1-4” clean, durable, sharp angled crushed stone of uniform quality, meeting the specifications of NYSDOT Item 703-02 Size Designation 3-5 of Table 703-4. Stone may be placed in front of and spread with a tracked vehicle. Gravel shall not be compacted.

2. In addition to meeting the minimum cross section dimensions as shown, when being used to treat the WQv the gravel diaphragm shall be sized to hold the WQv from the contributing drainage area. The sizing criteria shall be calculated assuming that the panels in the portion of the contributing solar array fild area are impervious.

3. To minimize sediment accumulation in the gravel diaphragm, the geotextile fabric shall be wrapped over the top until final stabilization is achieved. The geotextile over the top shall be removed once final stabilization is achieved.

4. The specified geotextile material will be selected based on soil conditions. The geotextile layer shall maintain material separation, allow infiltration to match natural soil conditions, and provide structural support for mowing and other maintenance vehicle activities.To prevent excess silt and debris during construction, it is recommended to leave excess fabric to fold over the diaphragm from the upgradient side. The excess fabric should be removed once the slope has been vegetated and stabilized."

5. The gravel diaphragm shall not be driven upon during solar panel construction activities, unless the gravel is protected with a rigid barrier to minimize compaction, such as with plywood.

GENERAL NOTES:

1. USE OF THIS DETAIL/CRITERION IS LIMITED TO ACCESS ROADS USED ON AN OCCASIONAL BASIS ONLY (I.E. PROVIDE ACCESS FOR MOVING, EQUIPMENT REPAIR OR MAINTENANCE, ETC.).
2. LIMITED USE PERVIOUS ACCESS ROAD IS LIMITED TO LOW IMPACT IRREGULAR MAINTENANCE ACCESS ASSOCIATED WITH RENEWABLE ENERGY PROJECTS IN NEW YORK STATE.
3. REMOVE STUMPS, ROCKS AND DEBRIS AS NECESSARY. FILL VOIDS TO MATCH EXISTING NATIVE SOILS AND COMPACTION LEVEL.
4. REMOVED TOPSOIL MAY BE SPREAD IN ADJACENT AREAS A DIRECTED BY THE PROJECT ENGINEER. DO NOT PLACE IN AN AREA THAT IMPEDES STORMWATER DRAINAGE.
5. GRADE ROADWAY, WHERE NECESSARY, TO NATIVE SOIL AND DESIRED ELEVATION. MINOR GRADING FOR CROSS SLOPE CUT AND FILL MAY BE REQUIRED.
6. REMOVE REFUSE SOILS AS DIRECTED BY THE PROJECT ENGINEER. DO NOT PLACE IN AN AREA THAT IMPEDES STORMWATER DRAINAGE.
7. ROADWAY WIDTH TO BE DETERMINED BY CLIENT.
8. THE LIMITED USE PERVIOUS ACCESS ROAD CROSS SLOPE SHALL BE 2% IN MOST CASES AND SHOULD NOT EXCEED 6%. THE LONGITUDINAL SLOPE OF THE ACCESS DRIVE SHOULD NOT EXCEED 15%.
9. LIMITED USE PERVIOUS ACCESS ROAD IS NOT TO BE UTILIZED FOR CONSTRUCTION WHICH MAY SUBJECT THE ACCESS TO SEDIMENT TRACKING. THIS SPECIFICATION IS TO BE DEVELOPED FOR POST-CONSTRUCTION USE. SOIL RESTORATION PRACTICES MAY BE APPLICABLE TO RESTORE CONSTRUCTION RELATED COMPACTION TO PRE-EXISTING CONDITIONS AND SHOULD BE VERIFIED BY SOIL PENETROMETER READINGS. THE PENETROMETER READINGS SHALL BE COMPARED TO THE RESPECTIVE RECORDED READINGS TAKEN PRIOR TO CONSTRUCTION, EVERY 100 LINEAR FEET ALONG THE PROPOSED ROADWAY.
10. TO ENSURE THAT SOIL IS NOT TRACKED ONTO THE LIMITED USE PERVIOUS ACCESS ROAD, IT SHALL NOT BE USED BY CONSTRUCTION VEHICLES TRANSPORTING SOIL, FILL MATERIAL, ETC. IF ACCESS IS COMPLETED DURING THE INITIAL PHASES OF CONSTRUCTION, A STABILIZED CONSTRUCTION ACCESS/ENTRANCE IS REQUIRED TO REMOVE SEDIMENT FROM CONSTRUCTION VEHICLES AND EQUIPMENT PRIOR TO ENTERING THE LIMITED USE PERVIOUS ACCESS ROAD. MAINTENANCE OF THE PERVIOUS ACCESS ROAD WILL BE REQUIRED IF SEDIMENT IS OBSERVED WITHIN THE CLEAN STONE.
11. THE LIMITED USE PERVIOUS ACCESS ROAD SHALL NOT BE CONSTRUCTED OR USED UNTIL ALL AREAS SUBJECT TO RUNOFF ONTO THE PERVIOUS ACCESS HAVE ACHIEVED FINAL STABILIZATION.
12. PROJECTS SHOULD AVOID INSTALLATION OF THE LIMITED USE PERVIOUS ACCESS ROAD IN POORLY DRAINED AREAS, HOWEVER IF NO ALTERNATIVE LOCATION IS AVAILABLE, THE PROJECT SHALL UTILIZE WOVEN GEOTEXTILE MATERIAL AS DETAILED IN FOLLOWING NOTES.
13. THE DRAINAGE DITCH IS OFFERED IN THE DETAIL FOR CIRCUMSTANCES WHEN CONCENTRATING FLOW COULD NOT BE AVOIDED. THE INTENTION OF THIS DESIGN IS TO MINIMIZE ALTERATIONS TO HYDROLOGY, HOWEVER WHEN DEALING WITH 5%-15% GRADES NOT PARALLEL TO THE CONTOUR, A ROADSIDE DITCH MAY BE REQUIRED. THE NYS STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROLS FOR GRASSED WATERWAYS AND VEGETATED WATERWAYS ARE APPLICABLE FOR SIZING AND STABILIZATION. DIMENSIONS FOR THE GRASSED WATERWAY SPECIFICATION WOULD BE DESIGNED FOR PROJECT SPECIFIC HYDROLOGIC RUNOFF CALCULATIONS, AND A SEPARATE DETAIL FOR THE SPECIFIC GRASSED WATERWAY WOULD BE INCLUDED IN THIS PRACTICE. RUNOFF DISCHARGES WILL BE SUBJECT TO THE OUTLET REQUIREMENTS OF THE REFERENCED STANDARD. INCREASED POST-DEVELOPMENT RUNOFF FROM THE ASSOCIATED ROADSIDE DITCH MAY REQUIRE ADDITIONAL PRACTICES TO ATTENUATE RUNOFF TO PRE-DEVELOPMENT CONDITIONS.
14. IF A ROADSIDE DITCH IS NOT UTILIZED TO CAPTURE RUNOFF FROM THE ACCESS ROAD, THE PERVIOUS ACCESS ROAD WILL HAVE A WELL-ESTABLISHED PERENNIAL VEGETATIVE COVER, WHICH SHALL CONSIST OF UNIFORM VEGETATION, 20 FEET PARALLEL TO THE DOWN GRADIENT SIDE OF THE ACCESS ROAD. POST-CONSTRUCTION OPERATION AND MAINTENANCE PRACTICES WILL MAINTAIN THIS VEGETATIVE COVER TO ENSURE FINAL STABILIZATION FOR THE LIFE OF THE ACCESS ROAD.
15. THE DESIGN PROFESSIONAL MUST ACCOUNT FOR THE LIMITED USE PERVIOUS ACCESS ROAD IN THEIR SITE ASSESSMENT/HYDROLOGY ANALYSIS. IF THE HYDROLOGY ANALYSIS SHOWS THAT THE HYDROLOGY HAS BEEN ALTERED FROM PRE- TO POST-DEVELOPMENT CONDITIONS (SEE APPENDIX A OF GP-0-15-002 FOR THE DEFINITION OF "ALTER THE HYDROLOGY..."), THE DESIGN MUST INCLUDE THE NECESSARY DETENTION/RETENTION PRACTICES TO ATTENUATE THE RATES (10 AND 100 YEAR EVENTS) TO PRE-DEVELOPMENT CONDITIONS.

GEOGRID MATERIAL NOTES:

1. THE GEOGRID, OR COMPARABLE PRODUCT, IS INTENDED FOR USE FOR ALL CONDITIONS, IN ORDER TO ASSIST IN MATERIAL SEPARATION FROM NATIVE SOILS AND PRESERVE ACCESS LOADS.
2. GRAVEL FILL MATERIAL SHALL CONSIST OF 1-4" CLEAN, DURABLE, SHARP-ANGLED CRUSHED STONE OF UNIFORM QUALITY, MEETING THE SPECIFICATIONS OF NYSDOT ITEM 703-02, SIZE DESIGNATION 3-5 OF TABLE 703-4. STONE MAY BE PLACED IN FRONT OF, AND SPREAD WITH, A TRACKED VEHICLE. GRAVEL SHALL NOT BE COMPACTED.
3. GEOGRID SHALL BE MIRAFI BXG110 OR APPROVED EQUAL. GEOGRID SHALL BE DESIGNED BASED ON EXISTING SOIL CONDITIONS AND PROPOSED HAUL ROAD SLOPES.
4. IF MORE THAN ONE ROLL WIDTH IS REQUIRED, ROLLS SHOULD OVERLAP A MINIMUM OF SIX INCHES.
5. REFER TO MANUFACTURER'S SPECIFICATION FOR PROPER TYING AND CONNECTIONS.
6. LIMITED USE PERVIOUS ACCESS ROAD SHALL BE TOP DRESSED AS REQUIRED WITH ONLY 1-4" CRUSHED STONE MEETING NYSDOT ITEM 703-02 SPECIFICATIONS.

BASIS OF DESIGN: TENCATE MIRAFI BXG110 GEOGRIDS; 365 SOUTH HOLLAND DRIVE, PENDERGRASS, GA;800-685-9990 OR 706-693-2226; WWW.MIRAFI.COM

GEOWEB MATERIAL NOTES:

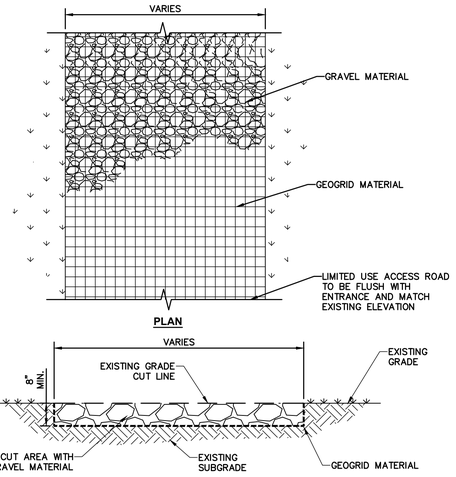
1. THE GEOWEB, OR COMPARABLE PRODUCT, IS SUGGESTED FOR USE ON ROAD PROFILES EXCEEDING 5%. THE GEOWEB PRODUCT IS INTENDED TO LIMIT SHIFTING STONE MATERIAL DURING USE.
2. INSTALLATION TO BE COMPLETED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
3. WHERE REQUIRED, A NATIVE SOIL WEDGE SHALL BE PLACED TO ACCOMMODATE ROAD CROSS SLOPE OF 2% NATIVE SOIL SHALL BE COMPACTED TO MATCH EXISTING SOIL CONDITIONS.
4. GRAVEL FILL MATERIAL SHALL CONSIST OF 1-4" CLEAN, DURABLE, SHARP-ANGLED CRUSHED STONE OF UNIFORM QUALITY, MEETING THE SPECIFICATIONS OF NYSDOT ITEM 703-02, SIZE DESIGNATION 3-5 OF TABLE 703-4. STONE MAY BE PLACED IN FRONT OF, AND SPREAD WITH, A TRACKED VEHICLE. GRAVEL SHALL NOT BE COMPACTED.
5. GEOWEB SYSTEM SHALL BE PRESTO GEOSYSTEM GEOWEB OR APPROVED EQUAL. GEOWEB SHALL BE DESIGNED BASED ON EXISTING SOIL CONDITIONS AND PROPOSED HAUL ROAD SLOPES.
6. LIMITED USE PERVIOUS ACCESS ROAD SHALL BE TOP DRESSED AS REQUIRED WITH ONLY 1-4" CRUSHED STONE MEETING NYSDOT ITEM 703-02 SPECIFICATIONS.
7. THE TOP EDGES OF ADJACENT CELL WALLS SHALL BE FLUSH WHEN CONNECTING. ALIGN THE I-SLOTS FOR INTERLEAF AND END TO END CONNECTIONS. THE GEOWEB PANELS SHALL BE CONNECTED WITH ATRA KEYS AT EACH INTERLEAD AND END TO END CONNECTIONS. REFER TO MANUFACTURER'S SPECIFICATION FOR PROPER INSTALLATION, TYING AND CONNECTIONS.

BASIS OF DESIGN: PRESTO GEOSYSTEMS GEOWEB; 670 NORTH PERKINS STREET, APPLETON, WI; 800-548-3424 OR 920-738-1222; INFO@PRESTOGEO.COM; WWW.PRESTOGEO.COM

WOVEN GEOTEXTILE MATERIAL NOTES:

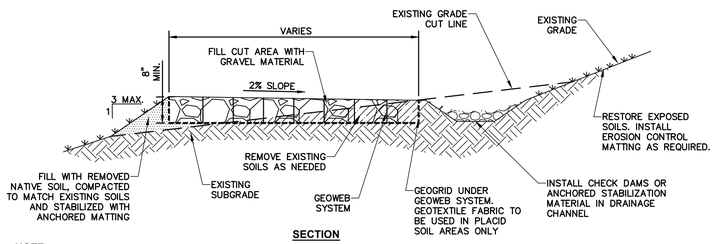
1. SPECIFIED GEOTEXTILE WILL ONLY BE UTILIZED IN PLACID SOILS. PLACID SOILS CONSIST OF POORLY DRAINED SOILS COMPOSED OF FINELY TEXTURED PARTICLES AND ARE PRONE TO RUTTING. PLACID SOILS ARE TYPICALLY PRESENT IN LOW-LYING AREAS WITH HYDROLOGIC SOILS GROUP (HSG) OF C OR D, OR AS SPCIFIED FROM AN ENVIRONMENTAL SCIENTIST, SOIL SCIENTIST, OR GEOTECHNICAL DATA.
2. THE CONCERN FOR POTENTIAL REDUCTION OF NATIVE INFILTRATION RATES DUE TO THE GEOTEXTILE MATERIAL WOULD NOT BE A SIGNIFICANT CONCERN IN POORLY DRAINED SOILS WHERE SEGREGATION OF PERVIOUS STONE AND NATIVE MATERIALS IS CRUCIAL FOR LONG TERM OPERATION AND MAINTENANCE.

BASIS OF DESIGN: TENCATE MIRAFI RSI-SERIES WOVEN GEOSYNTHETICS; 365 SOUTH HOLLAND DRIVE, PENDERGRASS, GA;800-685-9990 OR 706-693-2226; WWW.MIRAFI.COM



1 LIMITED USE PERVIOUS ACCESS ROAD - 0% TO 5% SLOPES

SCALE: N.T.S.



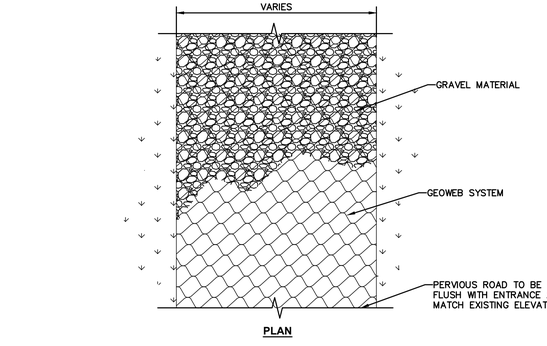
SECTION

NOTE:

1. THE ROADSIDE DITCH SHALL BE DESIGNED IN ACCORDANCE WITH THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROLS FOR GRASSED AND VEGETATED WATERWAYS. ADDITIONAL DETAILS WILL BE PROVIDED SPECIFIC TO THE SITE DESIGN.

2 LIMITED USE PERVIOUS ACCESS ROAD - 5% TO 15% SLOPES WITH DITCH

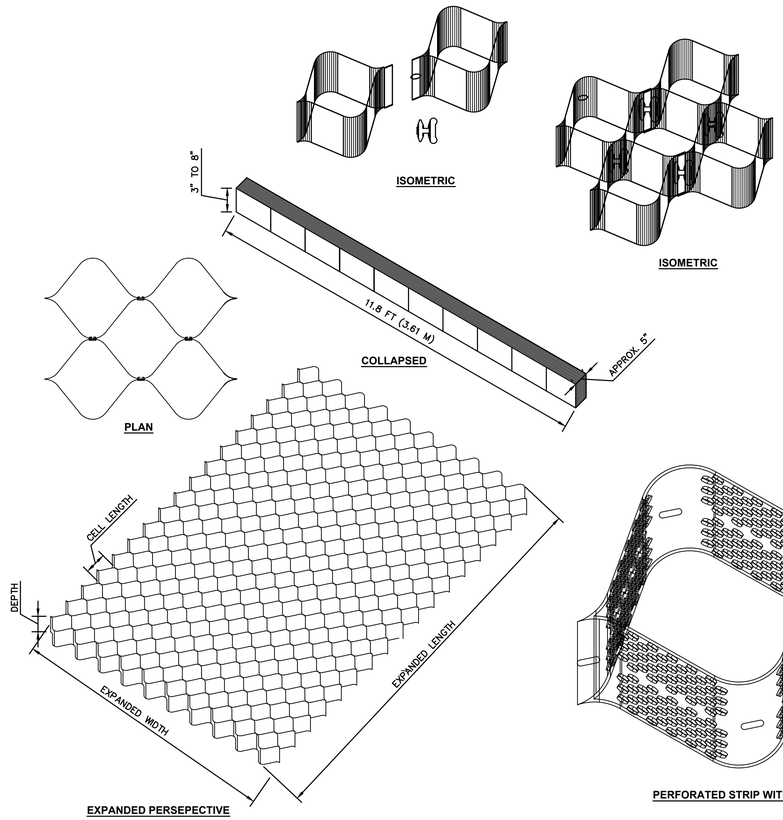
SCALE: N.T.S.



SECTION

3 LIMITED USE PERVIOUS ACCESS ROAD - 5% TO 15% SLOPES

SCALE: N.T.S.



4 GEOWEB SYSTEM

SCALE: N.T.S.

NO.	REVISION	DATE
1	ISSUED AS FINAL	10/30/2018

Client: OWNER OF RENEWABLE ENERGY PROJECTS

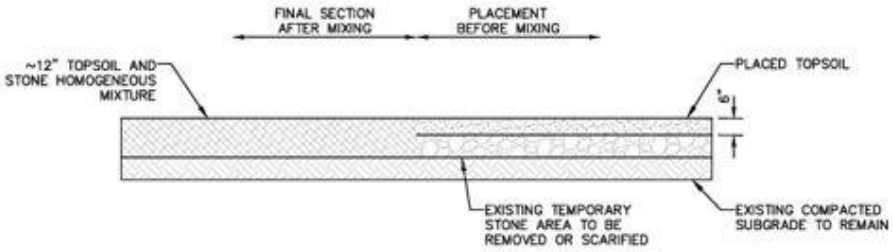
TRC Engineers, Inc.
215 Greenfield Parkway
Liverpool, NY 13088
www.trcsolutions.com

DRAWING TITLE:

LIMITED USE PERVIOUS ACCESS ROAD DETAIL

SCALE:	N.T.S.
DATE:	10/16/2018
DRAWN BY:	CAK
CHECKED BY:	SML
PROJECT:	
DRAWING NO.:	

TTdetdock.DWG



NOTES:

1. REFER TO THE PLAN DRAWINGS FOR LOCATIONS OF STONE WORK PADS AND ACCESS ROADS TO BE SCARIFIED.
2. FINISHED ROAD AND PAD ELEVATIONS SHALL REMAIN AFTER CONSTRUCTION UNLESS OTHERWISE INDICATED ON THE PLANS.
3. IN GENERAL, STONE MATERIAL SHALL REMAIN AFTER CONSTRUCTION AND BE MIXED WITH 6 INCHES OF TOPSOIL, HOWEVER IN SOME CASES THE STONE MAY BE ENTIRELY REMOVED FROM THE SITE REFER TO THE PLAN DRAWINGS FOR SPECIFIC LOCATIONS.
4. STONED AREAS SHALL BE SCARIFIED OR OTHERWISE LOOSENED TO A MINIMUM DEPTH OF 12 INCHES TO PERMIT BONDING OF THE TOPSOIL. TOPSOIL SHOULD BE UNIFORMLY DISTRIBUTED ACROSS THE AREA TO BE RESTORED TO A DEPTH OF 6 INCHES (MINIMUM OF 2 INCHES ON FILL OUTSLOPES) AND INCORPORATED OR TILLED INTO SCARIFIED STONE AREA.
5. SPREADING SHALL BE DONE IN A MANNER SUCH THAT SEEDING CAN BE COMPLETED WITH A MINIMUM OF ADDITIONAL TILLAGE. IRREGULARITIES OF THE SURFACE RESULTING FROM PLACEMENT SHALL BE CORRECTED IN ORDER TO PREVENT FORMATION OF DEPRESSIONS.
6. PRE-PLANTING FERTILIZERS AND PH ADJUSTING AGENTS MAY BE APPLIED PRIOR TO INCORPORATING.
7. RESTORATION AREA TO BE SEEDED IN ACCORDANCE WITH RECOMMENDATIONS OF LOCAL COUNTY EXTENSION SERVICE. SEED SHALL BE APPLIED VIA DRILL SEEDER, HYDROSEEDER OR BROADCAST SPREADER ALONG WITH A CARRIER. RAKE SEEDED AREA TO ENSURE PROPER SOIL-SEED CONTACT AND APPLY STRAW MULCH AT 3 TONS/ACRE TO PRESERVE MOISTURE.
8. ESTABLISHMENT OF VEGETATION ON THE RESTORED ACCESS ROAD SHALL BE MAINTAINED BY THE CONTRACTOR INCLUDING BUT NOT LIMITED TO SUPPLEMENTAL WATERING, FERTILIZATION, SEEDING AND OTHER TECHNIQUES, UNTIL AN ACCEPTABLE STAND OF VEGETATION HAS BEEN ESTABLISHED. ACCEPTABLE STAND IS GENERALLY CONSIDERED 80% VEGETATION COVERAGE OF ALL SURFACES..
9. UPON FINAL RESTORATION, THE SCARIFICATION AREAS SHALL BE REVIEWED BY THE DESIGN PROFESSIONAL TO CONFIRM THAT SITE HYDROLOGY HAS NOT BEEN ALTERED PER APPENDIX C OF THE CONSTRUCTION GENERAL PERMIT IF IT IS DETERMINED THAT THE HYDROLOGY HAS BEEN ALTERED, APPROPRIATE NECESSARY/RETENTION PRACTICES WILL NEED TO BE DESIGNED AND IMPLEMENTED TO RESTORE PRE-CONSTRUCTION HYDROLOGIC CONDITIONS.

REVEGETATED GRAVEL ROAD SCARIFICATION DETAIL FOR UPLAND ROADS AND WORK AREAS

SCALE: N.T.S.

Initial Questions/Bullet Points for DEC regarding the Solar Panel Construction Stormwater Permitting/SWPPP Guidance

A number of solar developers have reached out to us with concerns about the DEC's 2018 Solar Panel Construction Stormwater Permitting/SWPPP Guidance memo (attached). The concerns include inconsistencies in the Memo's interpretation and enforcement. The developers expressed concern about their ability to move their projects forward with upcoming interconnection costs, permit applications, etc.

To ensure we meet NYS climate goals, it is important that well designed projects move forward in a timely manner. Please provide clarification on the following items to ensure that developers and reviewers understand and follow the stormwater guidelines as they relate to solar facilities.

Scenario 1 from 2018 NYSDEC Stormwater and Solar Memo:

Item # 2. The panels are spaced apart so that rain can flow off the down gradient side of the panel and continue to sheet flow across the ground surface.

- Questions: Please explain what you mean by the panels need to be spaced apart? Are the entirety of the solar rows and tables (made up of individual solar modules) considered one large impervious area? Typically, solar modules are installed to include a ~1" gap around all edges which will prevent one large leading drip edge and avoid significant drip edge erosion.

Item # 3. For solar panels constructed on slopes, the individual rows of solar panels are generally installed along the contour so rainwater sheet flows down slope.

- Question: If panels aren't "generally installed along the contour" does that automatically mean the area of solar panels should be considered impervious?
- Question: If panels aren't "generally installed along the contour" does that mean the area of solar panels wouldn't be allowed to function as a filter strip?
- Questions: If the solar facility does not align with the contours, could the developer propose effective engineering designs to ensure sheet flow where the panels can't align with the contours? Are there any designs that you would recommend to meet the intent of this item?

Item # 4. The ground surface below the panels shall consist of a well-established vegetative cover (see "Final Stabilization" definition in Appendix A of the CGP).

- Question: Please confirm that in addition to the space under the panel, the ground surface between the rows needs to have well established vegetation.

Item # 5. The project does not include the construction of any traditional impervious areas (i.e., buildings, substation pads, gravel access roads or parking areas, etc.)

- Question: All solar facilities will require some impervious areas in the form of concrete or gravel equipment areas and access roads that are fire code-compliant. These areas are typically treated with stormwater controls (with stone areas or adjacent grass filter strips). Please explain the rationale behind Item # 5 and how developers should address impervious areas within the proposed solar facility.
- Question: Does DEC require pervious access roads into the solar facility? If so, is there a typical you can provide for developers to reference?

Maryland DE's "Stormwater Design Guidance- Solar Panel Installations"

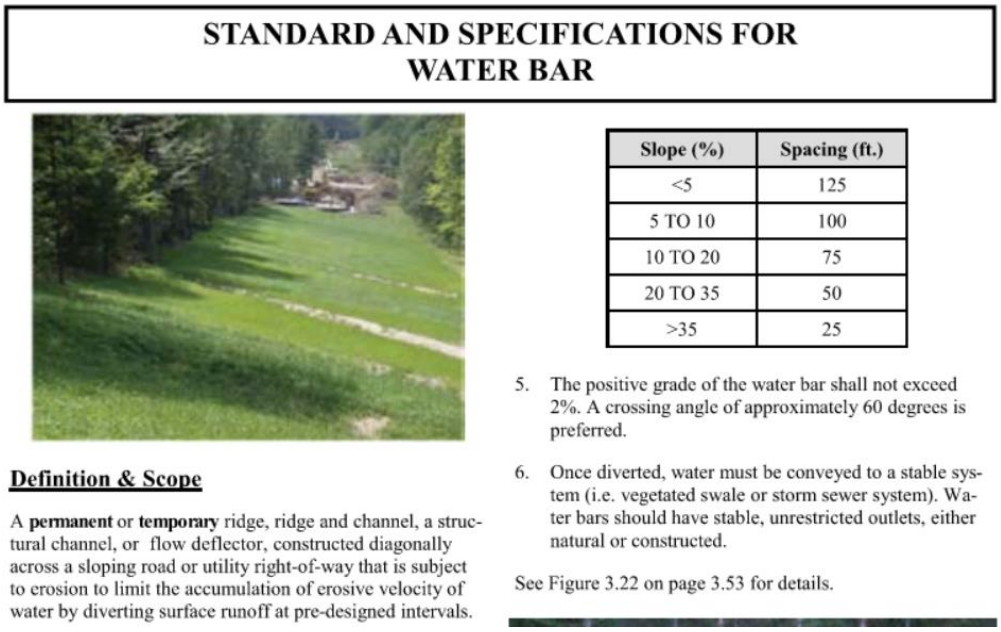
Page 1. 2nd Paragraph. "Commonly used with smaller or narrower impervious areas like driveways or open roads, the Disconnection of Non-Rooftop Runoff technique (see pp. 5.61 to 5.65 of the 2000 Maryland Stormwater Design Manual) is a low-cost alternative for treating runoff in situations like rows of solar panels."

- Question: Should the Maryland Department of the Environment (MDE) Stormwater Design Guidance be applicable in NYS? We feel that the guidance is outdated and doesn't represent typical field conditions in New York.

Page 1. Bullet 3. "Disconnections should be located on gradual slopes (≤ 5%) to maintain sheetflow. Level spreaders, terraces, or berms may be used to maintain sheetflow conditions if the average slope is steeper than 5%. However, installations on slopes greater than 10% will require an engineered plan that ensures adequate treatment and the safe and non-erosive conveyance of runoff to the property line or downstream stormwater management practice."

- Questions: If panels are placed on slopes greater than 10% does that automatically make them impervious? Please clarify the requirement for an "engineered plan". If the panels are placed on slopes greater than 10%, what is acceptable to demonstrate developers are designing a site with effective stormwater management practices ? In our experience we have proposed the following accepted solutions:

To date, the majority of our solutions have been gravel level spreaders /diaphragms on slopes above 10%, generally spaced throughout the solar panel area site using the NYSDEC blue book spacing for like waterbars (see snip below).



STANDARD AND SPECIFICATIONS FOR WATER BAR

Slope (%)	Spacing (ft.)
<5	125
5 TO 10	100
10 TO 20	75
20 TO 35	50
>35	25

Definition & Scope

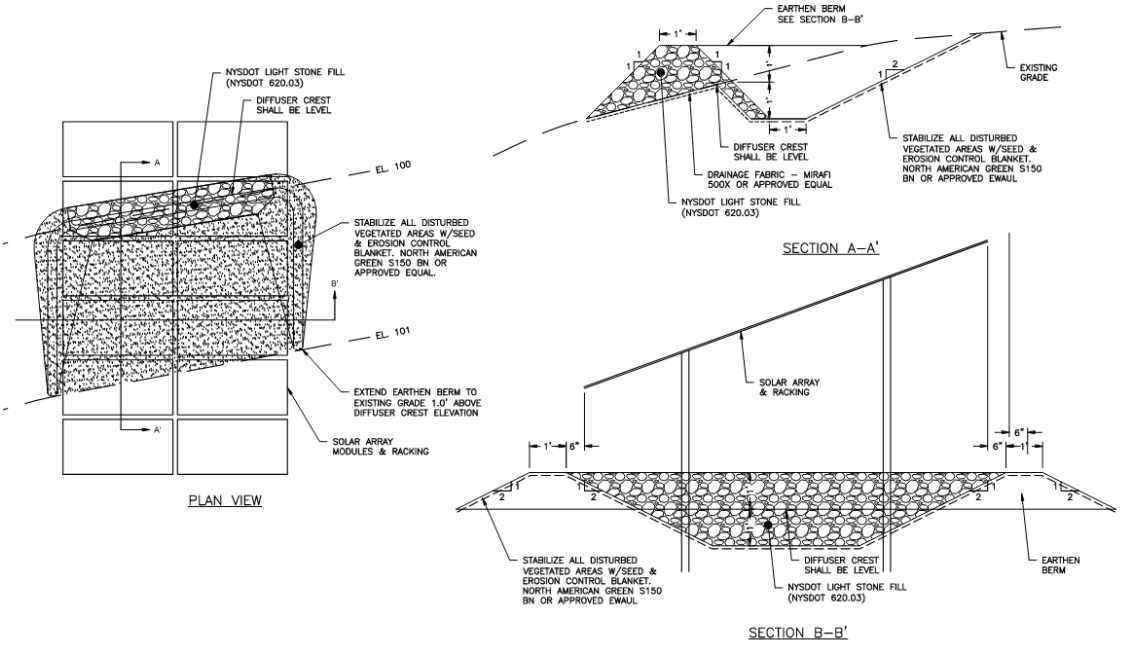
A **permanent** or **temporary** ridge, ridge and channel, a structural channel, or flow deflector, constructed diagonally across a sloping road or utility right-of-way that is subject to erosion to limit the accumulation of erosive velocity of water by diverting surface runoff at pre-designed intervals.

5. The positive grade of the water bar shall not exceed 2%. A crossing angle of approximately 60 degrees is preferred.
6. Once diverted, water must be conveyed to a stable system (i.e. vegetated swale or storm sewer system). Water bars should have stable, unrestricted outlets, either natural or constructed.

See Figure 3.22 on page 3.53 for details.

In steep panel areas (e.g. in excess of ~20% slopes), we have had instances where we provided additional attenuation (reducing runoff rates further than what is required by the Stormwater Design Manual) in order to satisfy Town engineers.

An alternative "engineered" solution pioneered by Adam Fishel from Marathon have been flow diffusers which he has used at staggered locations primarily beneath the panels to catch water leaving the panels and slow it down while avoiding most of the drive aisles for construction (snip below)



2 FLOW DIFFUSER

Additional Questions:

- Are solar trackers (solar tables/rows which move with the sun) considered impervious? Do the current guidelines apply to them? The examples in the 2018 Memo only show fixed tilt. How can a developer ensure these systems follow DEC guidelines?

- On slopes under 8%, can the meadow grass beneath the modules be counted as part of a filter strip to satisfy water quality and RRv? We have typically started our filter strips outside of the system area due to Town Designated Engineer preference and understanding of the "Filter Strip" practice, but we feel the area under the solar panels should suffice as a filter strip.