

APPENDIX I
Stormwater Management at
Solar Array Construction Projects

Solar development has expanded over the last several years as Connecticut and other policy states have invested in this important resource to further greenhouse gas emission reductions and other renewable policy objectives. However, the large amount of impervious surface inherent in the construction of a large-scale solar array is unlike most other construction activities regulated under the General Permit for the Discharge of Stormwater and Dewatering Wastewaters from Construction Activities (“general permit”) and entails challenges not encountered in traditional development projects. If not properly managed, stormwater discharged during and after the construction of solar arrays can be a significant source of pollution resulting from increased runoff, erosion, and sedimentation, which can adversely impact wetlands or other natural resources. It is vitally important to stabilize soil, minimize soil disturbance and soil compaction, and manage the total runoff volume and velocity. Proper stormwater management practices can significantly mitigate the loss of topsoil, erosion and sediment discharges from disturbed areas and stormwater outlets, and erosion along downstream channels and streambanks. The opportunities to properly manage runoff decrease as site imperviousness increases.

Therefore, in addition to the terms and conditions of the general permit, registrations for construction of a Solar Array (as that term is defined in Section 2 of the general permit) shall, at a minimum, adhere to the conditions listed below. Depending on site-specific conditions for a particular solar array construction project, additional analyses may be required.

Design and construction requirements

- (1) Roadways, gravel surfaces and transformer pads within the solar array are considered effective impervious cover for the purposes of calculating Water Quality Volume (WQV). In addition to these impervious surfaces, all solar panels in the array shall also be considered effective impervious cover for the purposes of calculating the WQV if the proposed post-construction slopes at a site are equal to or greater than 15% or if the post-construction slopes at a site are less than 15% and the conditions in (a) – (e), inclusive, below have not been met:
- (a) The vegetated area receiving runoff between rows of solar panels (see Figures 1 and 2, below) is equal to or greater than the average width of the row of solar panels draining to the vegetated area;
 - (b) Overall site conditions and solar panel configuration within the array are designed and constructed such that the runoff remains as sheet flow across the entire site;
 - (c) The following conditions are satisfied regarding the design of the post-construction slope of the site:
 - For slopes less than or equal to 5%, appropriate vegetation shall be established as indicated in Figure 1, below; and
 - for slopes greater than 5%, but less than 10%, practices including, but not limited to, level spreaders, terraces or berms as described in Figure 2, below, shall be used to ensure long term sheet flow conditions; and
 - for sites with slopes greater than or equal to 8%, erosion control blankets or stump grindings or erosion control mix mulch or hydroseed with tackifier shall be applied within 72 hours of final grading, or when a rainfall of 0.5 inches or greater is predicted within 24 hours, whichever time period is less; and
 - for slopes equal to or greater than 10% and less than 15%, the Plan includes specific engineered stormwater control measures with detailed specifications that are designed to provide permanent stabilization and non-erosive conveyance of runoff to the property line of the site or downgradient from the site.

- (d) The solar panels shall be designed and constructed in such a manner as to allow the growth of vegetation beneath and between the panels.
- (e) A one-hundred (100) foot buffer shall be maintained between any part of the solar array and any of the following: “wetland” as defined in in Conn. Gen. Stat. § 22a-29, “wetlands” as defined in Conn. Gen. Stat. § 22a-38, or “waters” as defined in Conn. Gen. Stat. § 22a-423, which shall include vernal or intermittent waters. The buffer shall consist of undisturbed existing vegetation or native shrub plantings.
- (2) The lowest vertical clearance of the solar panels above the ground should not be greater than ten (10) feet. The panels shall, however, be at an adequate height to support vegetative growth and maintenance beneath and between the panels. If the lowest vertical clearance of the solar panels above the ground is greater than ten (10) feet, non-vegetative control measures will be required to prevent/control erosion and scour along the drip line or otherwise provide energy dissipation from water running off the panels.
 - (3) The registrant shall include staff from the appropriate District (see Appendix F) along with the design professional in a pre-construction meeting pursuant to Section 3(b)(15) of this general permit prior to commencement of any construction activity on the site. The date of such meeting and a report summarizing the meeting shall be included in the registrant’s Plan.
 - (4) The registrant shall ensure that a qualified professional engineer serves as the qualified inspector for the purposes of the routine inspections in Section 5(b)(4) of this general permit. Unless otherwise approved in writing by the Commissioner, such qualified professional shall be retained for the duration of the construction project until the Notice of Termination has been submitted to the Commissioner and determined to be acceptable, as described below in paragraph (7) below. The registrant shall also ensure that the credentials for the qualified professional proposed by the registrant and the proposed inspection checklist prepared by such qualified professional are submitted for the review and approval of the Commissioner and are included with the registration for the general permit. No other professional may serve as the qualified professional without the prior submittal of relevant credentials and inspection checklist for the Commissioner’s review and written approval.
 - (5) In addition to the requirements of this general permit regarding inspection checklists and inspection reports, the registrant shall ensure that a copy of all such checklists and reports are submitted electronically to the Department email (DEEP.stormwaterstaff@ct.gov) within three (3) days from the date an inspection of the site was performed.
 - (6) The permittee shall notify the appropriate District (see Appendix F of this general permit) when construction begins and when each phase of construction is complete. The District shall then conduct Plan Implementation, Interim, Post-Construction and Final Stabilization inspections in accordance with Appendix F and Section 6(a) of the general permit.
 - (7) The registrant shall ensure, after completion of a construction project, that a Notice of Termination is filed in compliance with Section 6 of this general permit, including the requirement that such Notice of Termination be signed by a District representative certifying that such District representative has personally conducted a Post-Construction Inspection and Final Stabilization Inspection in accordance with Section 6(a) of this general permit and verified compliance with the requirements of that section.
 - (8) Prior to undertaking construction activity, the registrant shall secure a letter of credit. The amount of the Letter of Credit shall be \$15,000.00 per acre of disturbance. The wording of such letter of credit must be identical to the wording specified in Appendix J of the general permit. The Permittee shall maintain such letter of credit in effect until the Commissioner notifies the permittee that the Notice of Termination, filed in compliance with Section 6 of the general permit has been accepted by the Commissioner.

Design requirements for post-construction stormwater management measures.

- (1) Post-construction stormwater control measures shall be designed and constructed to provide permanent stabilization and non-erosive conveyance of runoff to the property line of the site or downgradient from the site.

- (2) Orientation of panels shall be considered with respect to drainage pattern, flow concentration, drainage area and velocity (i.e. rows perpendicular to the contours may result in higher runoff).
- (3) The permittee shall conduct a hydrologic analysis that:
- (a) Evaluates 2, 25, 50 and 100-year storm post-construction stormwater flows; and
 - (b) Is based on site specific soil mapping to confirm soil types; and
 - (c) Is able to determine and confirm the infiltrative capacity of any stormwater management measures and, in addition, reflects a reduction of the Hydrologic Soil Group present on-site by one (1) step (e.g. soils of HSG B shall be considered HSG C) to account for the compaction of soils that results from extensive machinery traffic over the course of the construction of the array; and
 - (d) Is based on slope gradient, surveyed soil type (adjusted per subparagraph (c), above), infiltration rate, length of slope, occurrence of bedrock, and change in drainage patterns (see also page 23 at [https://www.ct.gov/deep/lib/deep/Permits_and_Licenses/Land_Use_Permits/Inland Water Permits/IWRD inst.pdf](https://www.ct.gov/deep/lib/deep/Permits_and_Licenses/Land_Use_Permits/Inland_Water_Permits/IWRD_inst.pdf)); and
 - (e) For an engineered stormwater management system, demonstrates no net increase in peak flows, erosive velocities or volumes, or adverse impacts to downstream properties.

Figure 1
Solar Panel Installation with Slopes $\leq 5\%$

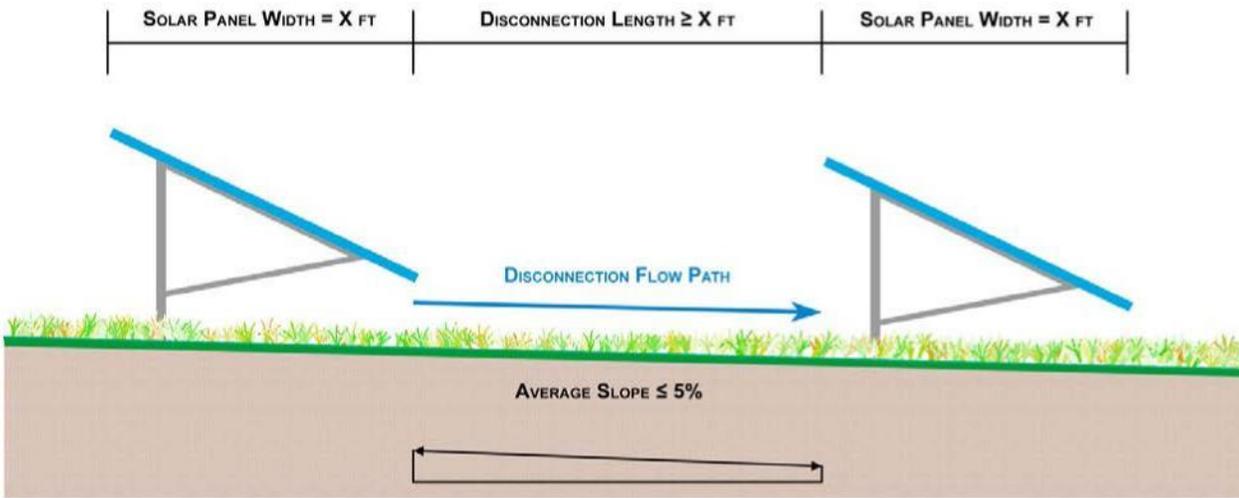
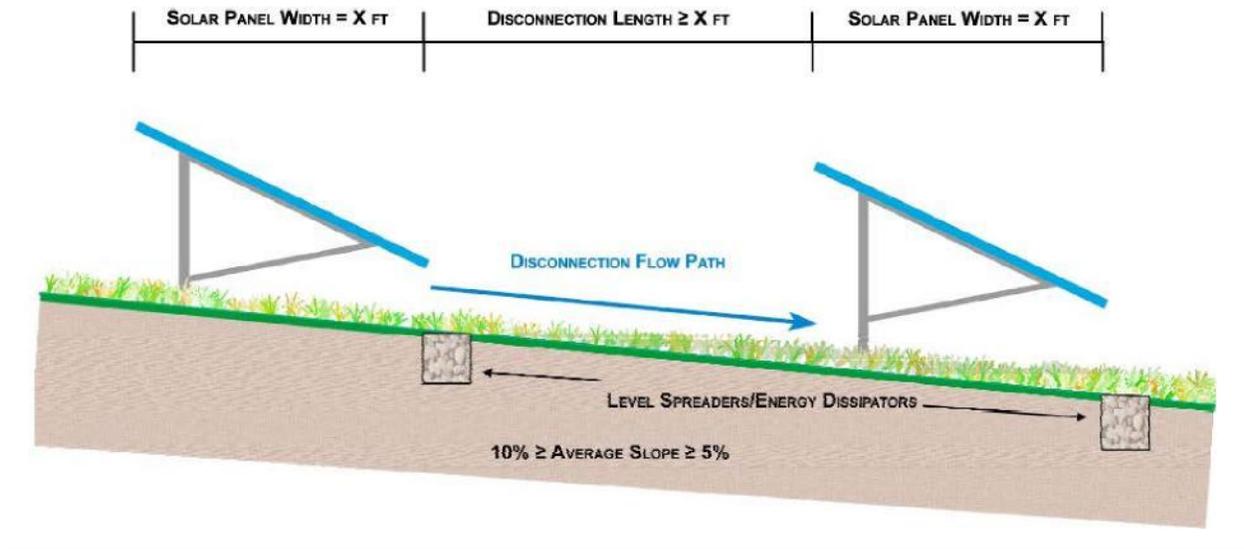


Figure 2
Solar Panel Installation with Slopes $> 5\%$ and $\leq 10\%$



Source: Maryland Department of the Environment: Stormwater Design Guidance – Solar Panel Installations

