Fact sheet on stormwater guidance for solar farm projects

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Basis for stormwater management on solar projects

Stormwater management is one of the surest ways to improve water quality in Minnesota. Untreated stormwater can contain oil, chemical, excess nutrients (phosphorus and nitrogen), toxic metals, disease-causing organisms that can damage environmental and human health. In addition, stormwater frequently overwhelms streams and rivers, scours streambanks and river bottoms and hurts or degrades habitat for fish and other aquatic organisms.

Stormwater runoff from solar projects is generated primarily from rain that falls on access roads, inverter pads, and solar panels. Water that falls off solar panels, runs across the panel to the dripline, and eventually falls to the underlying surface. Some of this water will infiltrate and some will run-off downslope and eventually off site. One of the most notable impacts that solar sites have on water quality is the potential for erosion and/or scour at the dripline. The Minnesota Pollution Control Agency (MPCA) strongly recommends that the lowest vertical clearance of any solar array be no greater than 10 feet in order to prevent/control erosion and scour along the dripline. Also, erosion prevention and sediment control Best Management Practices (BMPs) must be utilized during construction.

Stormwater regulation required in Minnesota

The MPCA requires that all construction projects that disturb 1 or more acres of land apply for a Minnesota NPDES/SDS Construction Stormwater General Permit (permit), which can be found here (http://stormwater.pca.state.mn.us/index.php/Construction_stormwater_permit). Additionally, any construction project that creates one or more acres of new impervious surface must design and construct a permanent stormwater management system compliant with Part III.D. of the permit. The purpose of the permanent stormwater management system is to minimize the negative effects of stormwater runoff after construction is complete. The permanent stormwater management system helps protect and enhance the quality of our surface and sub-surface waters by removing water volume, excess nutrients, sediment, and pollutants from stormwater runoff before leaving the project site.

Solar projects must follow the permanent stormwater management rules and regulations of the permit. However, because solar farms—particularly the panels— have unique characteristics, not like building a building or road, the MPCA allows for the use of the “disconnected impervious credit method”, which often results in a reduction in treatment volume required. The design of the permanent stormwater management system must first try to utilize volume reduction practices such as infiltration. If it is determined that volume reduction cannot be accomplished due to prohibitions found in the permit, other types of permanent stormwater management such as wet sedimentation basins or filtration systems (e.g. sand filters) must be constructed. This will be explained in greater detail in the Volume Credit to Solar Projects section below.

In addition to the permanent stormwater management system, the NPDES permit requires the use of BMPs during the construction project as well. These BMPs include sediment control practices, which prevent mobilized sediment from leaving the site, and erosion prevention practices, which prevent the mobilization of sediment in the first place.

Temporary stabilization is an erosion prevention BMP that prevents the mobilization of sediment on construction sites. The NPDES permit states that sites must have temporary stabilization in place when areas of exposed soils will not be worked on within 14 days. After that timeframe, temporary erosion control BMPs (https://stormwater.pca.state.mn.us/index.php?title=Erosion_prevention_practices), such as mulch, must be placed on any exposed soil on the site to prevent erosion during rain events.

Another aspect of erosion prevention that should be kept in mind during construction is site phasing. Construction phasing is the practice limiting the disturbed area such that the erosion prevention and sediment control requirements can feasibly be met. This includes the inspection and maintenance of the BMP’s as required by the permit. For example, you might disturb a 100-acre site in 25-acre segments rather than disturbing all 100 acres at one time. Phasing construction sites like this prevents erosion by limiting how much soil is exposed on-site at any one time.

Applying for a permit is fast and easy. Visit MPCA’s Construction stormwater webpage (https://www.pca.state.mn.us/water/construction-stormwater) and apply here online (https://rsp.pca.state.mn.us/TEMPO_RSP/Orchestrate.do?initiate=true). It is important to note that any permit for a construction project, including solar sites, that disturb 50 acres or more and are within 1 mile of a special or impaired water is subject to a mandatory 30-day review by the MPCA. If possible, it is encouraged that the permit applicant requests an early review of the Stormwater Pollution Prevention Plan (SWPPP) in order to resolve conflicts and ensure permit coverage on-time.

Volume Credit to Solar Projects

Solar projects that use traditional elevated solar panels are unique because they contain an impervious surface (elevated solar panel) that often have a pervious surface (vegetation) underneath the panel. It should be noted that this volume credit for solar sites is only available to those site that are vegetated beneath and between panels and excludes sites that have rock bases. This configuration raises challenges when addressing stormwater runoff

and the design and construction of a permanent stormwater management system due to the relationship with the solar panel and underlying surface. Since the standard calculation for the water quality volume (1 inch times the impervious surface) required by the permit does not recognize the vegetated surface left in place under the panels, the water quality volume calculation may be done using the disconnected impervious credit method located from the Solar Panel Calculator on the MPCA's Information for determining stormwater management impacts for solar projects webpage (http://stormwater.pca.state.mn.us/index.php/Information_for_determining_stormwater_management_impacts_for_solar_projects). The disconnected impervious credit method uses an Excel spreadsheet to calculate 1) the total water volume required credited and 2) the remaining water quality volume to be treated.

User supplied information for the calculator:

- Soil type – Hydrologic Soil Group (HSG) A, B, C, or D
- Area of impervious surface
- Area of pervious surface

Calculator output information given to user:

- Total water quality volume performance goal
- BMP volume credit
- % of performance goal achieved
- Remaining water quality volume to be treated

Depending on site conditions, sites can expect a 50% - 85% reduction of required water quality volume. The remainder of the required water quality volume must be treated on site and is discussed below in the Required Water Quality Volume section.

Required Water Quality Volume

As noted above, the natural characteristics of a site may provide a significant portion of the permanent stormwater treatment required on a solar site. The remaining water quality volume required to be treated can be done using a variety of methods common in permanent stormwater management. These methods include, but are not limited to:

- Constructed shallow depressions for infiltration
- Natural depressions on the landscape that infiltrate
- Swales with check dams to create storage and promote infiltration
- Stormwater retention ponds
- Stormwater filtration

Once the remainder of the required water quality volume has been treated using one, or several of the methods above, the solar project site will have met the permanent stormwater management requirements of the permit.

Additional recommendations

The best ways to ensure that a solar project is designing and constructing a permanent stormwater management system correctly according to the permit is to visit the MPCA's webpage Information for determining stormwater management impacts for solar projects (http://stormwater.pca.state.mn.us/index.php/Information_for_determining_stormwater_management_impacts_for_solar_projects) and to read the permit. This webpage contains a more thorough breakdown and explanation of the methodology and guidelines that are recommended for solar panel projects. Additionally, there are examples to help demonstrate how calculations are made using the Solar Panel Calculator mentioned in the Volume Credit to Solar Projects above. Last but not least, feel free to contact Logan Quiggle (mailto:logan.quiggle@state.mn.us) (651-757-2480) at the MPCA with any questions regarding stormwater management design on solar panel sites.

Links

- Construction Stormwater General Permit (http://stormwater.pca.state.mn.us/index.php/Construction_stormwater_program)
- MPCA's Construction Stormwater website (https://www.pca.state.mn.us/water/construction-stormwater)
- On-line permit application (https://rsp.pca.state.mn.us/TEMPO_RSP/Orchestrate.do?initiate=true)
- Information for determining stormwater management impacts for solar projects (http://stormwater.pca.state.mn.us/index.php/Information_for_determining_stormwater_management_impacts_for_solar_projects)