Programmatic Design Features for Soil Resources and Geologic Hazards

The following design features have been identified to avoid, minimize, and/or mitigate potential soil impacts and potential geologic hazards from solar energy development identified and discussed in Sections 5.7.1 and 5.7.2 (soil impacts) and 5.7.3 (geologic hazards) of the Draft and Final Solar PEIS.

General

SR1-1 Project developers shall coordinate with the BLM and other Federal, state, and local agencies early in the project planning process to assess soil erosion and geologic hazard concerns and to minimize potential impacts.

(a) Assessing soil erosion and geologic hazard concerns shall include, but is not limited to, the following:

- Identifying soil erosion and geologic hazard concerns on-site and in proximity to the proposed projects. In coordination with the BLM, developers shall consult existing land use plans, updated inventories, soil surveys, etc.
- Identifying local factors that can cause slope instability (e.g., groundwater conditions, precipitation, earthquake activity, slope angles, and the dip angles of geologic strata).
- Consulting with local Federal, state, and county agencies regarding road design on the basis of local meteorological conditions, soil moisture, and erosion potential.
- Determining the potential safety and resource impacts associated with soil erosion.
- Evaluating soil erosion and geologic hazard concerns as part of the environmental impact analysis for the project and considering options to avoid, minimize, and/or mitigate adverse impacts in coordination with the BLM.

Site Characterization, Siting and Design, Construction

SR2-1 Solar facilities shall be sited, designed, and constructed to minimize soil erosion and geologic hazard concerns.

(a) Methods to minimize soil erosion may include, but are not limited to, the following:

- Designing structures to meet the requirements of all applicable Federal, state, and county permits and building codes.
- Minimizing ground-disturbing activities.
- Preventing channel erosion from project runoff.
- Controlling culvert outlets with appropriate structures (e.g., rock lining or apron) to reduce soil erosion and scouring.
- Recontouring and revegetating project roads that are no longer needed in order to increase infiltration and reduce soil compaction.
- Considering utilizing originally excavated materials for backfill.
- Controlling project vehicle and equipment speeds to reduce dust erosion.
- Controlling water runoff and directing it to settling or rapid infiltration basins.
- Retaining sediment-laden waters from disturbed, active areas within the project through the use of barriers and sedimentation devices (e.g., berms, straw bales, sandbags, jute netting, or silt fences). Removing sediment from barriers and sedimentation devices to restore sediment-control capacity.
- Placing barriers and sedimentation devices around drainages and wetlands.
- Siting project structures and facilities to avoid disturbance in areas with existing biological soil crusts.
- Replanting project areas with native vegetation at spaced intervals to break up areas of exposed soil and reduce soil loss through wind erosion.
- Minimizing land disturbance (including crossings) in natural drainage systems and groundwater recharge zones (i.e., ephemeral washes and dry lake beds).
- Locating and constructing drainage crossing structures so as not to decrease channel stability or increase water volume or velocity.

- Providing adequate space (i.e., setbacks) between solar facilities and natural washes to preserve hydrologic function.

- Considering the use of existing roads, disturbance areas, and borrow pits before creating new infrastructure. The use of any existing infrastructure shall be analyzed in the environmental analysis for the proposed project.

- Siting, designing, and constructing new roads and walking trails consistent with the appropriate design standards and criteria, such as those described in BLM Manual 9113 and 43 CFR 8342.1. Roads and trails should follow natural land contours, and hill cuts should be minimized in the project area.

- Avoiding areas with unstable slopes and soils.

- Avoiding excessive grades on roads, road embankments, ditches, and drainages during site preparation and construction.

- Considering use of special construction techniques in areas of steep slopes, erodible soil, and drainageways.

- Considering implementing construction in stages to limit the areas of exposed and unstabilized soils.

- Reducing construction activity timeframes so that ground-disturbing activities take place over as short a timeframe as possible.

- Lessening fugitive dust emissions and site soils compaction by avoiding unpaved surfaces with construction traffic.

- Avoiding clearing and disturbing areas outside the construction zone.

- Clearly identifying construction zone boundaries on the ground (e.g., through the use of construction fencing) to minimize conflict with other resource concerns.

- Avoiding ground disturbance in areas with intact biological soil crusts and desert pavement.

- Burying electrical lines from solar collectors along existing features (e.g., roads or other paths of disturbance) to minimize the overall area of surface disturbance.

- Obtaining borrow materials from authorized and permitted sites.

- Conducting construction grading in compliance with industry practice (e.g., the American Society for Testing and Materials [ASTM] international standard methods) and other requirements (e.g., BLM and/or local grading and construction permits).

- Using temporary stabilization devices (i.e., erosion matting blankets, or soil stabilizing agents) for areas that are not actively under construction.

- Salvaging topsoil from all excavation and construction and reapplying it to disturbed areas upon completion of construction.

- Restoring native plant communities as quickly as possible in disturbed areas through natural revegetation or by seeding and transplanting (using weed-free native grasses, forbs, and shrubs), on the basis of BLM recommendations.

- Minimizing soil-disturbing activities on wet soils.

- Performing studies to determine the effects from construction activities on the eolian processes that maintain any nearby sand dunes, if applicable.

- Incorporating environmental inspection and monitoring measures into the POD and other applicable plans to monitor and respond to impacts on soil resources during construction, operations, and decommissioning of a solar energy development, including adaptive management protocols.

(b) Methods to minimize geologic hazard concerns may include, but are not limited to, the following:

- Building project structures in accordance with the design-basis recommendations in the project-specific geotechnical investigation report.

- Considering special siting, design, and engineering strategies in areas that involve high seismic activity or have potential for flooding or debris flow.

Operations and Maintenance

SR3-1 Compliance with the conditions for soil resources and geologic hazards shall be monitored by the project developer. Consultation with the BLM

shall be maintained through the operations and maintenance of the project, employing an adaptive management strategy and modifications, as necessary and approved by the BLM.

(a) Methods to maintain the soil erosion and geologic hazard design elements during operations and maintenance of the project shall include, but are not limited to, the following:

- Applying design features developed for the construction phase to similar activities during the operations phase.
- Performing routine site inspections to assess the effectiveness of maintenance requirements for erosion and sediment control systems.
- Maintaining permanent barriers and sedimentation devices to ensure effective control.
- Regularly maintaining catch basins, roadway ditches, and culverts.
- Identifying soil erosion and geologic hazard requirements within the POD and other applicable plans.

SR3-2 Permanent stabilization of disturbed areas shall occur during final grading and landscaping of the site and be maintained through the life of the facility.

Reclamation and Decommissioning

SR4-1 All design features for soil erosion and geologic hazards developed for the construction phase shall be applied to similar activities undertaken during the decommissioning and reclamation phase.

SR4-2 To the extent possible, the original grade and drainage pattern shall be re-established.

SR4-3 Native plant communities in disturbed areas shall be restored by natural revegetation or by seeding and transplanting (using weed-free native grasses, forbs, and shrubs), on the basis of recommendations by the BLM, once decommissioning is completed.