CAROLINE SOLAR PROJECT

CONSERVATION AND RECLAMATION PLAN

VERSION 1

Plan Completed By

May 24, 2023

Version History

Version	Date	Changes Made By	Changes to Sections
1	May 24, 2023	N/A	N/A

1 Introduction

This Conservation and Reclamation Plan (C&R) will serve as a field guide to ensure successful conservation and reclamation of soils and vegetation components at the proposed Caroline Solar Project (CSP). The CSP is proposed by PACE Canada LP (PACE).

The CSP will include panel areas, access roads, collector lines, a perimeter fence, inverters, and transformers. Foundations for infrastructure are anticipated to be pounded steel piles or helical ground screws. Permanent gravel access roadways will be constructed using a suitable depth of granular material. The entire CSP, except for new access roads, control house and inverter and transformer pads is anticipated to be covered with low growing perennial vegetation.

PACE proposes the construction of a photovoltaic (PV) solar power electrical generation project immediately northwest of the town of Caroline, Alberta. The CSP will be located on privately-owned land and will encompass approximately one half of a quarter section. The CSP will be situated on cultivated land with no native prairie being directly affected by the CSP.

With respect to this C&R plan, the purpose of this C&R is to provide the desktop review assessments ("DRA") to guide effective construction and reclamation practices in the absence of field collected information. The DRA purpose is to define the area which the field-based Pre-disturbance Site Assessment ("PDSA") will be conducted after the AUC approval has been received and the soil and habitat types present which are expected to be affected by the CSP's infrastructure.

The panels will be aligned in table rows and will be mounted on racking structures. It is expected that the racking systems will have negligible effect on the soils of the CSP location, both above and below ground, as the area of the piles compared to the area of the CSP location is small. Re-vegetated ground cover will be located in and around the base of the solar panel racking.

The lands proposed for development include the solar panels, gravel access roads, inverter, and transformer pads and the general fenced area. Although the solar panels themselves are impervious, rainwater will land on the solar panels and runoff directly onto the ground below the individual panels. Minimal erosion is anticipated beneath each solar panel once the ground cover vegetation is re-established after construction. The overall effects of the runoff generated from the solar panels will be minimal, as most of the anticipated ground cover during the operations phase (i.e., a low-growing native grassland species) are expected to improve hydrologic conditions relative to existing conditions (i.e., longer duration flow paths and reduced runoff potential).

2 Conservation and Reclamation Directive

Per the Conservation and Reclamation Directive for Renewable Energy Operations (the "Directive"; Government of Alberta (GOA) and AEP 2018), the C&R plan must meet the requirements under the directive and include a DRA. In this report only the DRA is included and a PDSA will be conducted prior to construction once PACE receives an AUC approval (as per Figure 1 in the Directive).

Per section 5.2.2.2 in the Directive, a PDSA will be required.

3 C&R Plan Assumptions

The C&R Plan was developed using several key assumptions regarding closure planning, detailed reclamation planning, end land uses and final certification and release of certain lands back to the landowner, including the following:

- changes to the construction plan will require modification of the reclamation and closure plans.
- the probability of design changes to the CSP increases over time and changes are therefore expected.
- reclamation of the landscape will be integrated with the surrounding undisturbed terrain.
- reclamation will be stable with self-sustainable drainage patterns.
- the C&R Plan provided is conceptual in nature due to the evolutionary nature of construction technology development, planning and reclamation planning.
- current soil handling practices provide the basis for soil reconstruction and revegetation practices.
- the revegetation program will be guided by success of restoration activities using perennial species and information gained from land users (i.e., landowner(s)) during the reclamation phases; and,
- the C&R Plan is conceptual in nature, and it is recognized that it is not currently possible to accurately predict all outcomes.

4 Desktop Analysis

4.1 Soils

The Agricultural Region of Alberta Soil Inventory Database was consulted to provide data on soils in the Caroline Solar Project area (Alberta Soil Information Viewer, 2019). One mapped soil polygon is present within the Caroline Solar Project and are classified as the Brunisolic soil order. Refer to Table 1 for the soil results obtained from the Alberta Soil Inventory Database search.

Table 1. List of soil series found at the CSP.

Map Unit Name	Soil Order	Soil Subgroup	Drainage
CAZG1/U1h	Brunisolic	Brunisolic Gray Luvisol	Well
CAR1/U1h	Brunisolic	Brunisolic Gray Luvisol	Well

4.2 Vegetation

The CSP footprint is located primarily on cultivated lands, other habitat types include wetlands, ephemeral waterbodies, and oil and gas road infrastructure.

5 Pre-Disturbance site assessment survey locations

The PDSA will occur as per the Conservation and Reclamation Directive for Renewable Energy Operations. For certainty, the PDSA has not yet been completed.

6 SOILS HANDLING

No soil stripping is anticipated to occur under the solar panel arrays unless required for localized grading and/or unforeseen circumstances (e.g., pile refusals requiring localized excavation around pile). Soil stripping is expected to be required along all-weather graveled access roads in the CSP (primary access roads) to accommodate site drainage. Service roads between solar arrays will not be stripped. Additional clearing will occur at the substation, and inverter locations. Soils will be reclaimed following construction in areas of localized stripping.

All soil stripping and leveling should use a two-lift soil stripping method:

1) Topsoil stripping requires accurate depth control of a grader or equivalent machine to ensure that subsoils and topsoils are accurately separated. Multiple passes are preferred to a single pass.
2) The first lift will remove the A-horizon to the color change (B-horizon).
3) The second lift will remove the B-horizon. Both A and B-horizons will be stockpiled on the edges of the lease with a 1m separation between horizons. Care will be taken to avoid mixing while handling and stockpiling soils. The soils will be preserved and used for production and final reclamation. The remaining C-horizon will be used as cut and fill to level each lease to accommodate the necessary equipment.
4) All stripped soils will be stored separately.
5) Conduct topsoil stripping on cultivated lands during nonfrozen conditions.
6) Strip either the trench and spoil area (for collector lines) and store topsoil on edge of spoil side of right-of-way.
7) Suspend stripping during periods of high winds or when soils are excessively wet.

8) Leave breaks in the topsoil windrow at obvious drainage courses.

9) Implement erosion control for wind and water erosion as required.

6.1 Soil Disturbance Timing

Construction procedures which involve surface disturbance such as stripping, grading, or travelling on un-stripped soil will be limited to an as-needed basis, and ideally performed only once, if possible. When surface disturbance is required, it will be conducted under suitably dry and/or frozen ground conditions, as much as possible. This helps to minimize the potential disturbance to un-stripped sod/topsoil and allows construction to take place unimpeded by most adverse weather. Once construction is complete, the soil will be reseeded with a seed mix to preserve the soil and reduce erosion.

6.2 General Soils Management

Activity/Concern	Mitigation
Wet/Thawed Soil Conditions	• Minimize use of heavy machinery in the event of wet or thawed soil conditions to reduce terrain disturbance and soil structure damage. • Initiate contingency measures once one of the following indicators occurs: excessive rutting; wheel slip, build-up of mud on tires and cleats, formation of puddles, and/or tracking of mud down the road as vehicles leave the site. • Employ the following Wet/Thawed Soil Contingency Measures progressively or individually, as warranted, if the above indicators occur: • Limit equipment traffic to the late afternoon or early morning when ground conditions are frozen or delay construction until soils dry or become frozen. • Prevent rubber-tired traffic from driving on the site. • Salvage excess snow from the right-of-way and spread, as well as pack, the snow on the travel lane to avoid premature thawing of the upper soils. • Restrict construction vehicle traffic to equipment with low-ground-pressure tires or wide pad tracks.
Topsoil Salvage Schedule	• For construction scheduled to occur during frozen conditions, attempt to pre-strip topsoil prior to freeze-up, if feasible. Attempt to have all topsoil salvage completed prior to October 31, where possible. • If construction is schedule to occur during non-frozen conditions, post-pone topsoil salvage until after spring break-up when ground conditions are not excessively wet for construction.

Activity/Concern	Mitigation
Topsoil Salvage-Non-Frozen Conditions	Full Topsoil Stripping Scenario: • Restrict the extent of topsoil salvage wherever possible. • Store excavated subsoil on unstripped topsoil adjacent to the excavation. Ensure sufficient space (approximately 0.5m) is left between the edge of the storage pile and the excavation to ensure material does not slough back into the excavation. • If topsoil is being degraded, consider installing matting (or equivalent) to protect topsoil degradation.
Topsoil Salvage - Frozen Conditions	• Reduce the area of land subject to topsoil salvage during frozen conditions to areas that will be subject to grading. • Limit topsoil stripping activities to specialized equipment capable of accurately separating variable depths of topsoil from subsoil (*e.g.*, frozen topsoil cutter, if available). If a frozen topsoil cutter/mulcher is not available, rip frozen topsoil to the same depth as the salvage requirements.
Wind Erosion of Topsoil Windrow	• Erosion-prone soils require wind erosion protection during drought conditions. Tackify or apply water or pack the topsoil windrow with approved equipment. Application of a tackifier following topsoil removal can be more cost effective than repeated watering of topsoil windrows and piles.
Spoil Storage	• During non-frozen conditions, place excavated soil material on the stripped area adjacent to the excavation for underground collector lines. Ensure enough workspace is available to allow for a sufficient distance to be left in place between the soil and the excavation to reduce the risk of soil material sloughing into the excavation. • During frozen conditions, place excavated soil material on a buffer of snow, if available. Otherwise place excavated material on the unstripped topsoil adjacent to the excavation. Ensure enough workspace is available to allow for a sufficient distance to be left in place between the soil and the excavation to reduce the risk of soil material sloughing into the excavation.
Dewatering	• Pump water onto stable and well-vegetated areas, tarpaulins or sheeting in a manner that does not cause erosion or any unfiltered or silted water to directly re-enter a watercourse. Place pumps on polyethylene sheeting above the high-water mark of the watercourse.

Activity/Concern	Mitigation
	• Ensure all erosion control measures are in place to direct run off and reduce the potential for erosion.
Backfilling	• To the extent feasible, attempt to schedule delivery of imported fill so it can be installed directly into the excavation upon arrival at the site rather than being temporarily stored prior to being backfilled. • Avoid mixing snow into backfill material. • Feather out excess spoil material across the area that has been stripped of topsoil. Avoid mixing topsoil and feathered subsoil material. Blend feathered material into the natural grade of the area to not change local surface drainage patterns.
Excess Spoil	• Dispose of excess spoil material on site.

7 RECLAMATION PLAN

The objective of the reclamation plan is to remove all garbage from site, control erosion as necessary, restore soil capability, and reclaim the disturbed areas to pre-disturbance characteristics. The *Conservation and Reclamation Directive for Renewable Energy Operations*, AEP, 2018 will be used to guide revegetation and reclamation of the site, in order to ensure that vegetation is re-established, soils are maintained, and equivalent land capability is maintained during operations.

Reclamation will take place once construction equipment has left the location or as soon as soil and weather conditions permit. The landowner will be notified prior to the initiation of the reclamation activities and again upon completion. Reclamation success is dependent upon landowner communication and favorable conditions in the root zone for optimum crop growth. The key soil factors that determine root zone quality include the water holding capacity, organic content, structure and consistency, salinity, nutrient balance, and soil regime.

The *2010 Reclamation Criteria for Wellsites and Associated Facilities* provides the framework for how final reclamation success will be determined at the time of reclamation certification. As the lifetime of the CSP is estimated at greater than 20 years, it would be expected that the updates to the above-mentioned criteria will be in effect.

7.1 Interim Reclamation

The CSP shall attempt to reclaim all disturbed land surfaces within two growing seasons. Interim reclamation will include:

- site debris clean-up.
- slope stabilizations.
- re-contouring with subsoil.
- spreading of topsoil.

- determination of suitable vegetation species (i.e., hay mixture) for revegetation between solar array rows and under solar panels and around other infrastructure locations; and,
- Development and implementation of a co-operative weed control plan with the landowner(s).

The lands will be reclaimed with a perennial vegetation mixture compatible for the lands and will include species that can grow in sunlight and shaded conditions and will be chosen in consultation with any landowner specifications. At this time, a native seed blend has not been selected. The intent is NOT to reclaim the CSP site to meet AEP-WM's definition of native grassland as current land use is cultivated, and final equivalent land capability at the end of CSP life will be met as per the landowner requirements in place at that time.

7.1.1 Post Construction Vegetation Monitoring

PACE confirms that it will conduct post-construction vegetation health assessments on revegetated/reclaimed vegetation for the minimum number of seasons required under the C&R Directive to confirm that recovering sites are on a positive trajectory towards healthy plant communities.

7.2 Final CSP Reclamation

Reclamation of the CSP will be completed to typical reclamation practice at the time. As no reclamation standards for solar power are currently in place in Alberta, other provincial practices, guidelines, best industry practice, or regulations will be followed. The following would be considered a generic plan in line with current practice.

7.2.1 Typical Timing

Decommissioning	Activity	Typical Timeline
Solar Site/Access Roads	Removal of panels and infrastructure	May – August
	Removal of transformers	May – August
	Partial excavation and removal of concrete base to approximate depth of 1.5m	June – August
	Removal of gravel pads and gravel from access roads	July – August
	Recontouring of pad and access roads	July – August
	Reclamation of surface soils	August – September
	Re-seeding	September - October
	Removal of any aboveground poles and lines	May – July

Decommissioning	Activity	Typical Timeline
Power infrastructure	Belowground collector lines will remain in place if depth greater than 1.5m	N/A
	Removal of inverters and associated infrastructure	May – July
	Removal of gravel pads	June – July
	Removal of access roads	July – August
	Recontouring of pad and access roads	August – September
	Reclamation of surface soils	September - October

7.3 Adaptive Management for Reclamation

The CSP's adaptive management approach will involve establishing end land use objectives according to pre-development land use capability, site-specific conditions, improved practices based on research and monitoring results, and input from the landowner(s). As reclamation proceeds, monitoring of reclamation and revegetation performance will allow land use objectives to be reviewed and, if necessary, modifications can be made to site expectations according to natural revegetation processes.

Adaptive management is intended to respond to changes and advances in technology, such as reclamation material replacement and revegetation, to meet specific objectives. The CSP will incorporate adaptive management techniques as routine components in all of its environmental management activities. These techniques provide the opportunity to develop and fine-tune the reclamation program using data collected on-site and from other regional operators.

Adaptive management may be used at any point throughout the CSP life cycle but will have the greatest benefit in the planning stages prior to reclamation. When reclamation planning begins, the intended end use will facilitate the decision-making process on surface contouring measures and corrective initiatives that could improve surface drainage, decrease erosion, or enhance vegetation performance.