

Natural Heritage Assessment

Environmental Impact Study Report

SunE Westbrook Solar Farm

FIT Contract Number: FIT-FDNXGQE

prepared for

Genivar and SunEdison



ECOLOGICAL SERVICES

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1. Introduction

SunEdison is proposing to develop a 10 megawatt (MW) solar photovoltaic project titled SunE Westbrook Solar Farm. This project has received a 20-year Feed-in Tariff contract from the Ontario Power Authority (FIT Contract Number: FIT0FDNXGQE). The Project Location¹ is a 40 hectare (ha) parcel situated on Pt Lots 4 and 5, Concession 5 WD, within the City of Kingston (single tier municipality) County of Frontenac and within Madoc Ecodistrict 6E-9 (Figure 1.1). The longitude and latitude are 44.300458 and 76.632893.

Additional information regarding the project, including the draft project description report, is available on the study website at www.sunedison.ca/westbrook.

As stated in sections 37 and 38 of Ontario Regulation (O. Reg.) 359/09 *Renewable Energy Approvals Under Part V.0.1 of the Act*, (herein referred to as the “REA Regulation”), an environmental impact study is required for all significant natural heritage features determined to be within a specified distance of the Project Location¹. The environmental impact study identifies the potential negative environmental effects of all Project phases on these significant natural features, documents the proposed mitigation measures to prevent/minimize adverse effects, and describes the environmental effects monitoring plan

1.1. Renewable Energy Approval Legislative Requirements

Ontario Regulation (O. Reg.) 359/09 – *Renewable Energy Approvals Under Part V.0.1 of the Act*, (herein referred to as the REA Regulation), came into force on September 24, 2009 and identifies the Renewable Energy Approval (REA) requirements for renewable energy generation facilities in Ontario. The REA Regulation has since been amended by O. Reg. 521/10, which came in effect as of January 1, 2011.

As per the REA Regulation (Part II, Section 4), ground mounted solar facilities with a name plate capacity greater than (>) 10 kilowatts (kW) are classified as Class 3 solar facilities and require an REA. The REA process requires the preparation of several reports with respect to natural heritage features on and adjacent to the Project Location, including the natural heritage records review report (*NHARR*), natural heritage site investigation report (*SI*), natural heritage evaluation of significance report (*EOS*), and if necessary, an environmental impact study (*EIS*). The legislative requirements for these reports are summarized in the following sections.

1.1.1. Natural Heritage Records Review Report

Subsection 25 (3) of the REA Regulation requires the proponent to prepare a report “setting out a summary of the records searched and the results of the analysis” (O. Reg. 359/09) and to identify whether the Project is:

- (a) in a natural feature
- (b) within 50 m of an area of natural and scientific interest (ANSI) (earth science)
- (c) within 120 m of a natural feature that is not an ANSI (earth science).

Natural features are defined in Section 1 (1) of the REA Regulation to be all or part of:

- a) an ANSI (earth science)
- b) an ANSI (life science)

- c) a coastal wetland
- d) a northern wetland
- e) a southern wetland
- f) a valleyland
- g) wildlife habitat, or
- h) a woodland.

The *NHARR* (Genivar, 2011a) was prepared to meet these requirements.

1.1.2. Natural Heritage Site Investigation Report

Section 26 of the REA Regulation requires proponents of Class 3 solar projects to undertake a natural heritage site investigation (*SI*) for the purpose of determining:

- a) whether the results of the analysis summarized in the *NHARR* (Genivar, 2011a) prepared under subsection 25 (3) are correct or require correction, and identifying any required corrections
- b) whether any additional natural features exist, other than those that were identified in the *NHARR* (Genivar, 2011a)
- c) the boundaries of any natural feature that was identified in the *NHARR* (Genivar, 2011a) or the *SI* (Ecological Services 2011a) within 120 m of the Project Location, and
- d) the distance from the Project Location to the boundaries determined under Clause (c).

The *SI* (Ecological Services, 2011a) was prepared to meet these requirements.

1.1.3. Natural Heritage Evaluation of Significance Report

Subsection 27 (1) of the REA Regulation requires proponents of Class 3 solar projects to prepare an *EOS* for natural features identified during the *NHARR* (Genivar, 2011a) and *SI* (Ecological Services, 2011) that sets out:

- a) a determination of whether the natural feature is:
 - provincially significant or not provincially significant (wetlands)
 - significant or not significant (all other natural features)
- b) a summary of the evaluation criteria or procedures used to make the determinations.
- c) the name and qualifications of any person who applied the evaluation criteria or procedures.

The *NHAEOS* (Ecological Services, 2011b) for the natural features identified within 120 m of the Project Location was prepared to meet these requirements.

1.1.4. Natural Heritage Environmental Impact Study Report

Subsection 38 (1) of the REA Regulation prohibits the construction, installation or expansion of any component of a solar Project is:

- a) within a provincially significant northern wetland or within 120 m of a provincially significant northern wetland
- b) within 120 m of a provincially significant southern wetland
- c) within 120 m of a provincially significant coastal wetland
- d) a provincially significant ANSI (earth science) or within 50 m of a provincially significant ANSI (earth science)
- e) a provincially significant ANSI (life science) or within 120 m of a provincially significant ANSI (life science)
- f) a significant valleyland or within 120 m of a significant valleyland
- g) a significant woodland or within 120 m of a significant woodland
- h) a significant wildlife habitat or within 120 m of a significant wildlife habitat
- i) within 120 m of a provincial park
- j) within 120 m of a conservation reserve.

However, pursuant to subsection 38 (2), construction within the locations noted above may be permitted, subject to the completion of an *EIS* to assess negative effects and evaluate appropriate mitigation and monitoring measures.

Subsection 38 (2) of the REA Regulation indicates that the *EIS* must:

- a) identify and assess any negative environmental effects of the Project on a natural feature, provincial park or conservation reserve referred to in subsection 38 (1)
- b) identify mitigation measures in respect of any negative environmental effects
- c) describe how the environmental effects monitoring plan in the design and operations report (Genivar, 2011a) addresses any negative environmental effects
- d) describe how the Construction Plan Report (Genivar, 2011b) addresses any negative environmental effects.

This *EIS* has been prepared to address these requirements for construction within 120 m of the significant natural features identified in Section 1.1.

1.2. Background Information on Natural Heritage Features

The *EOS* (Ecological Services, 2011b) confirmed the Project will be constructed within 120 m of the following natural heritage features:

- **Significant Wetlands**
- **Significant Wildlife Habitat:**
 - **Seasonal Concentration Areas** – *amphibian breeding habitat* complex
 - **Rare Vegetation Communities** – *alvar*

- **Habitats of Species of Conservation Concern** –*shrub/early successional bird breeding habitat*

1.3. Environmental Impact Study Format

Section 1 of this report identifies the legislative requirements for an *EIS* under the REA Regulation and the reasons why an *EIS* is required for the Project. Section 2 provides the methodology of the *EIS*. Section 3 summarizes the activities associated with Project construction, operation and decommissioning, as described in the associated reports (Genivar, 2010b- d) including negative environmental effects and proposed mitigation measures to prevent/minimize the potential effects. Section 5 describes the environmental effects monitoring plan from the Design and Operations Report (Genivar, 2010c). Section 6 summarizes the results of the *EIS*. References are included in Section 8.

2 Methodology

The following steps outline the methodology that was used to prepare this *EIS*:

1. Documentation of Project components and activities during all Project phases, including construction, operations and decommissioning, including identification of temporal and spatial boundaries.
2. Background data collection on the natural features on and within 120 m of the Project Location through the Records Review and Site Investigation processes.
3. Identification of the effects likely to occur to identified environmental components as result of implementing, operating and decommissioning of the project.
4. Development of mitigation measures to eliminate, alleviate or avoid the identified negative effects.
5. Design of an environmental effects monitoring program to confirm the predicted effects and the effectiveness of mitigation measures.

3 Construction Phase

SunEdison is proposing a single Class 3 Solar Facility with a nameplate capacity of 10 MW (AC) in the area of Kingston, Ontario. If approved, this facility will convert solar energy into electricity to be fed into the Hydro One distribution grid. The defined project location and site layout (Appendix D) covers approximately 40 hectares (ha).

The major components of the projects are as follows:

- Approximately 40,000 x MEMC solar modules (260 to 300-watt generation capacity)
- Approximately 320 disconnect combiners
- 44 kV Substation including pole-top motor-operated disconnect; 44kV switchgear; 10 MVA oil filled pad-mount transformer; interrupter switches, communication equipment, etc.
- Approximately 20 x 500-kW inverters and 10 corresponding 1000 kVA transformers
- Internal access driveways
- Temporary staging areas for the installation of the solar panels
- A 30-m tall communications tower (if required by Hydro One)
- The location of the equipment has not yet been confirmed but will be limited to the defined project area.

The CPR report will detail the construction activities, the duration of these activities, any potential environmental effects that could result from these activities and proposed mitigation measures to be applied to the potential environmental effects.

3.1. Construction Details

The work will meet or exceed all local regulations and standards (such as the Ontario Electrical Safety Code, Ontario Building Code, etc.).

3.1.1. Roads and Land Clearing

No permanent paved roads will need to be constructed for the solar farm. Municipal and provincial roads will be used for transportation of equipment to the construction sites. Minor modifications might be required to some of the existing roads (for example, widen the turning radius) for equipment transportation. Any road damages will be repaired in consultation with the applicable road authority.

On-site access to the array will require new internal roads/driveways. Following completion of the construction phase, the internal driveways will be used for maintenance activities for the duration of the facility's operation.

The construction of the internal driveways typically requires excavation of the top soil layer and adding a layer of compacted material to a typical thickness of 300 mm (depending upon site specific geotechnical conditions). Clean granular material (typically "A" or "B" gravel) will be brought to the site on an as-needed basis and will not be stockpiled onsite. The topsoil will be kept and re-used on site. New culverts may be required to maintain site drainage in ditches and these will be constructed sufficient to support the construction equipment and delivery trucks. The exact culvert details (if any are required), installation details and erosion-control measures will be determined in conjunction with the Cataraqui Region Conservation Authority as a part of their permitting process.

Equipment will include—at minimum— trucks, graders, light cranes, tractor trailers and bulldozers

Materials Brought On Site: Granular material for internal driveway construction, some steel culverts.

Construction Equipment Used: Equipment will include—at a minimum—trucks, graders, and bulldozers. The trucks and graders will be driven to the site and the bulldozers will be brought via trailers. All will be temporarily stored at a Temporary Construction Laydown Area. The construction will emit minor amounts of noise and dust. No chemicals other than fuel will be used. Road dust will be controlled with water, as necessary.

Timing: This will preferentially be completed after mid-July to take advantage of typically drier weather and to avoid impacts to wildlife breeding on site.

Material Generated: Some top soil will need to be stripped; however this will be disposed of or re-used on site.

3.1.2. *Construction Laydown Areas*

One area (< 2 hectares) will be used for construction activities and will be located close to Westbrook or Burbrook roads. The topsoil at the Construction Laydown Areas will be removed and approximately 600 mm of clean compacted crushed gravel will be imported on an as-needed basis.

The excavated topsoil will be re-used on site as feasible.

Materials Brought On Site: Granular material as required to maintain a stable base.

Construction Equipment Used: Equipment will include—at a minimum—cars, trucks, graders, and bulldozers. The cars, trucks and graders will be driven to the site and the bulldozers will be brought via trailers. The construction will emit minor amounts of noise and dust. No chemicals other than fuel will be used.

Timing: This will preferentially be completed immediately following land clearing activities.

Material Generated: Some top soil will need to be stripped; however this will be disposed of or re-used on site.

Temporary Uses of Land: The topsoil will be removed and stored onsite and gravel will be laid down. After the construction of the project is completed, the gravel will be removed, or re-used by the landowner, and the topsoil will be replaced from the stockpile. It is anticipated that the majority of the construction laydown area will be restored after approximately 8 months. A small portion might remain as a parking site for maintenance vehicles over the 20-year life of the solar farm.

3.1.3. *Site Preparation and Inverter Pad Construction*

Prior to construction, the construction area will need to be cleared, grubbed and fenced. The topsoil is typically removed and some material may need to be added depending upon site specific geotechnical conditions. During clearing or excavation, if any significant archaeological resources are found to be in conflict with the proposed facilities, then consideration will be given to modifying the location of the construction. This will be determined in consultation with the Ministry of Tourism and Culture and registered archaeologists. The site will be surrounded by a chain-link fence approximately 2 m tall for site security. The fence post holes will be augured and the fence posts placed into concrete and allowed to set. Once the posts have set, the metal chain link fence will then be secured. The fencing used will allow the free passage of small animals but prevent access to large animals and humans.

Inverter pads will be constructed at the same time as the internal driveways and will typically be 14 m x 5 m in size. The topsoil at the inverter pad will be removed and approximately 600 mm of clean compacted crushed gravel will be imported on an as-needed basis. The pads will be constructed of poured concrete reinforced with rebar. The excavated topsoil will be re-used on site as feasible.

Equipment will include—at minimum—trucks, graders, light cranes, cement trucks, tractor trailers and bulldozers.

Materials Brought On Site: Granular material as required to maintain a stable base. Cement mix for the concrete. Steel for rebar. Metal posts and fencing.

Construction Equipment Used: Equipment will include—at a minimum—trucks, cement trucks, graders, and bulldozers. The trucks and graders will be driven to the site and the bulldozers will be brought via trailers. The construction will emit minor amounts of noise and dust. No chemicals other than fuel will be used.

Timing: This will preferentially be completed as soon as the land area has been graded and access roads are present. If necessary, this can be completed in early spring, depending on the amount of rainfall.

Material Generated: Some top soil will need to be stripped; however this will be disposed of or re-used on site. Spent welding rods may be generated which will be disposed of as hazardous waste by a licensed contractor. Any excavated subsoil will be removed from the site and disposed of in an appropriate manner.

Temporary Uses of Land: The topsoil will be removed and stored onsite and gravel will be laid down. After the construction of the project is completed the gravel will be removed, or re-used by the landowner, and the topsoil will be replaced from the stockpile or reused elsewhere on the site. It is anticipated that this area will be restored after approximately 8 months.

3.1.4. Delivery of Equipment

Equipment will be delivered by truck and trailer as needed throughout the construction phase and stored at the temporary construction laydown area. These deliveries will typically occur during normal construction hours, typically 8 am to 5 pm and may include weekends. A traffic management plan will be developed using MTO Book 7 standards. Prior to the start of construction, a road assessment of Burbrook Road and/or Westbrook Road will be undertaken. An agreement with the City of Kingston for rehabilitation of Burbrook Road and/or Westbrook Road following the completion of construction will be put in place prior to the start of construction.

3.1.5. Installation of Racking System

The Solar Array racking system will consist of a single-axis tracker rack system with the solar modules affixed to a supportive metal rack. The rack/array is then connected to the ground via piles. Variations on the rack connections to the ground are essentially variations on a common theme, and are dependent on the mount type (fixed/tracking) and the geotechnical conditions – regardless of connection method, the piles will be buried.

The general procedure for rack installation varies slightly depending on geotechnical conditions as outlined above, but essentially follows the following procedure:

- piles are either vibrated, driven or screwed into the ground, to specified/engineered depth*

- in cases where special foundations/footing/boreholes are required, *temporary* soil excavation and/or drilling will be required to expose subsurface conditions and prepare them for pile insertion*;
- soil directly beneath the future racking/surrounding inserted piles is compacted and covered with crushed engineered fill (and further compacted/settled); and racking, hardware and module assembly are built over top the piles.

*The preferred pile installation method is via a vibratory system, with no pre-excavation requirements. However, if subsurface conditions are less favourable, subsurface pile work may include borehole pre-drilling, rock grouting and/or cement casting. Once the piles are secured in the ground, the excavated soil will be re-filled and steps 2 and 3 above are completed.

Materials Brought On Site: Steel for rebar, piles, racking and potentially concrete, if necessary.

Construction Equipment Used: Typical construction equipment, will include:

- Excavator for removing material;
- Pile vibration or drill rig
- Flatbed trucks (4-6) for delivery;
- Concrete trucks for delivery of concrete (if necessary)
- Construction trucks (3-4 vehicles with multiple visits); and
- Dozer, loader and trucks to backfill and compact foundation and remove surplus excavated materials

The trucks will be driven to the site and the vibration/drill rig, bulldozers and excavator will be brought via trailers. The construction will emit minor amounts of noise and dust. No chemicals other than fuel will be used.

Timing: This will preferentially be completed as soon as the land area has been graded and access roads are present. If necessary, this can be completed in early spring, depending on the amount of rainfall.

Material Generated: Spent welding rods may be generated which will be disposed of as hazardous waste by a licensed contractor. Any excavated subsoil will be removed from the site and disposed of in an appropriate manner.

3.1.6. *Solar Panel Assembly and Installation*

This portion of the work is labour intensive and requires significant manual assembly. An array row typically holds up to 100 modules, and a 10-MW solar farm can have as many as 400 array rows. With the exception of light crane trucks and flatbed trailers (storage and module transfer), the assembly work is essentially manual and requires little more than hand tools; welding is required to join tubes that comprise the array skeleton (where appropriate – assembly via hardware connection remains the main form of rack assembly).

The installation and assembly procedure consists of mounting rack components to the support columns (piles), fastening the rack elements together, joining and welding tubes, mounting and assembling tracking motors and their associated hardware (where tracking systems are utilized), and finally, mounting and fastening the PV modules to the assembled rack.

Materials Brought On Site: Solar panels, racking material and tracking motors.

Construction Equipment Used: Flatbed trailers. No chemicals other than fuel will be used.

Timing: This will be completed immediately after the racking installation.

Material Generated: Some packing material waste and spent welding rods will be generated. The recyclable material will be separated from the non-recyclable material onsite. Both streams of waste will be removed by a licensed sub-contractor.

3.1.7. *Electrical Collector System*

The electrical collector system will consist of wiring from the panel strings to the disconnect combiner boxes which are connected to the pad-mounted inverters/transformers. Cabling will run from the inverters/transformers to a 12.47-kV / 44-kV transformer which will upgrade the voltage to connect to the Hydro One distribution system. Underground cabling will generally be used on private property and aboveground collector lines will be used along public rights-of-way.

For the installation of electricity poles, the holes are typically augured in the ground using a truck-mounted auger device. The poles are then inserted using special cranes to a typical depth of 1 to 2 m below grade. The poles are then “dressed” (made ready to accept conductors) using a boom truck. Typically, one crew will install the poles and one crew will dress them. Once the poles are in place and dressed, cables are strung in place using boom trucks and special cable reel trucks. It is still to be determined, in conjunction with Hydro One, whether the pole installation work will be done by the proponent or by Hydro One.

Materials Brought On Site: Electrical cabling.

Construction Equipment Used: Flatbed trailers and trenching equipment will typically be used. The construction will emit minor amounts of noise and dust. No chemicals other than fuel will be used.

Timing: This will preferentially be completed in late summer to take advantage of typically drier weather. If necessary, this can be completed in the spring, fall or winter depending on the weather.

Material Generated: Some packing material waste will be generated. The recyclable material will be separated from the non-recyclable material onsite. Both streams of waste will be removed by a licensed sub-contractor.

3.1.8. *Substation*

The electrical substation for the solar farm will be located on the site property. The substation equipment will include an isolation switch, a circuit breaker, a step-up power transformer (12.47 to 44 kV), switch gear, instrument transformers, grounding and metering equipment. It will be surrounded by a chainlink fence with a locked gate to meet Ontario Electrical Safety Authority requirements. The substation area will be gravelled with clean material imported to the site on an as-needed basis and sloped to facilitate drainage.

During the construction of the substation, the topsoil will be removed and approximately 600 mm of clean compacted crushed gravel will be imported on an as-needed basis. The pad will be constructed of poured concrete reinforced with rebar. The excavated topsoil will be re-used on site as feasible.

Materials Brought On Site: Gravel, an isolation switch, a circuit breaker, a step-up power transformer (12.47 to 44 kV), switch gear, instrument transformers, grounding and metering equipment, insulators, transformer oil and electrical cabling.

Construction Equipment Used: A truck mounted crane, flatbed trailers and a bulldozer. The bulldozer will be delivered to the site by a flatbed trailer. The construction will emit minor amounts of noise and dust. No chemicals other than fuel and transformer oil will be used.

Timing: This will preferentially be completed in late summer to take advantage of typically drier weather. If necessary, this can be completed in the spring, fall or winter depending on the weather.

Material Generated: Some packing material waste will be generated. The recyclable material will be separated from the non-recyclable material onsite. Both streams of waste will be removed by a licensed sub-contractor.

3.1.9. Clean-up and Reclamation

Waste and debris generated during the construction activities will be collected and disposed of at an approved facility. All reasonable efforts will be made to minimize waste generated and to recycle materials including returning packaging material to suppliers for reuse/recycling. During construction, industry best practices for spill prevention will be utilized. In the unlikely event of a minor spill, this will be cleaned up immediately and any impacted soils will be removed from site and disposed of at an approved and appropriate facility. At the conclusion of construction, vehicles and construction equipment will be removed from the site.

Stripped soil will be replaced and re-contoured in the construction areas and disturbed areas will be re-seeded, as appropriate. If possible native plant species will be used for the re-vegetation of disturbed areas. Erosion control equipment will be removed once inspections have determined that the threat of erosion has diminished to the original land-use level or lower.

3.1.10. Facility Commissioning

The facility commissioning will occur once the Solar Panels and electrical system are fully installed and Hydro One is ready to accept grid interconnection. The commissioning activities will consist of testing and inspection of the electrical, mechanical and communications systems.

Materials Brought On Site: None.

Construction Equipment Used: None

Timing: This will be completed after the construction activities are completed.

Material Generated: None.

3.2. Location and Timing of Construction

The construction activities will generally be located in two areas.

1. Transportation of equipment to the site will utilize public roadways; and
2. Construction on the leased property.

3.2.1. Schedule

Construction activities will commence once all necessary permits (REA, building permits, etc.) have been obtained and the weather conditions are conducive to construction. The following table outlines the duration each activity typically takes. Following site grading, construction will move from one end of the site to the other and will follow an assembly line like process. Therefore, there will be considerable overlap of activities. Similarly, the construction of the electrical collector system and the substation can be constructed while the foundations are being built and the panels are being installed.

Table 3-1: Duration of Construction Activities

Activity	Total Duration	Notes
Surveying	2 days	
Clearing, grubbing, grading and internal driveway construction	15 days	Will occur outside peak bird breeding season (May – mid July)
Tracker Foundation	1 month	Concurrent with driveway construction
Tracker Assembly and Panel Installation	2-3 months	Concurrent with foundation construction
Installation of electrical collector system	1-2 months	Concurrent with foundation construction and panel installation
Substation installation and connection to distribution grid	1 month	Concurrent with electrical collector system construction
Clean up and reclamation	Concurrent with construction activities	
Site commissioning	2 weeks	

4 Operations

4.1. General

The solar farm will require technical and administrative staff to maintain and operate the facility. Most of the farm's operation will be controlled automatically or remotely, through a central monitoring hub. It is expected that a team of 1-2 full-time workers will be required to keep the facility operating properly and maintained regularly. Generally, a team of maintenance personnel covers a regional territory that houses multiple solar farms. The primary workers will be electricians, grounds keepers and mechanics, as well as software technicians who carry out maintenance on the equipment, along with a general supervisor. Solar panels should operate during daytime hours, in both direct and diffuse light conditions (although at a lesser power output). Each 1-MW block (i.e., a series of array rows connected to two 500-kW inverters) has a comprehensive control system that monitors the panel and electrical subsystems, as well as the local insolation conditions to determine whether operations should be carried out. If an event occurs which is considered to be outside the normal operating range of the array (such as electrical trips, panel weight overload (e.g., snow, extremely high winds), the array will immediately take itself out of service and report the condition to the SCADA system. A communication line connects each 1-MW block to the monitoring hub, which closely monitors and, as required, controls the operation of the array.

4.2. Routine Farm Maintenance

Routine preventative maintenance activities are scheduled at six-month intervals with specific maintenance tasks scheduled for each interval. Maintenance is performed by removing the MW block from service and inspecting the electrical, control and mechanical systems on the array. Consumables are used, such as the various greases used to keep the mechanical components operating at peak performance. Following all maintenance work on the MW block, the area is cleaned. All surplus lubricants and grease-soaked rags are removed and disposed of in a prescribed manner. All maintenance activities will adhere to the same spill prevention industry best practices undertaken during the construction phase. Additional maintenance activities will include grass cutting, vegetation removal and fence repair. No pesticides or herbicides will be used during maintenance activities.

4.3. Unplanned Farm Maintenance

Modern Solar Panels are very reliable and the major components are designed to operate for over 25 years. However, with large numbers of modules it is inevitable that component failures will occur despite the high reliability. Most commonly, the failure of small components such as switches, fans, or sensors will take a MW block, or even the entire farm out of service until the faulty component is replaced. These repairs can usually be carried out by a single technician visiting the farm for several hours.

4.4. Electrical System

The collector lines and substation will require periodic preventative maintenance activities. Routine maintenance will include condition assessment and protective relay maintenance of the substation as well as vegetation control.

5 Decommissioning

The anticipated life of the project is a minimum of 25 years. If the economics of solar power remain viable at that time, the facility would likely be “repowered” with new technology.

5.1. Decommissioning During Construction

It is extremely unlikely that the project would be dismantled during construction. Should this occur the procedures used would depend on the state of construction at the time of project cancellation. The procedures used would be the same as those used after ceasing operation. Any exposed soils would be re-seeded with native grasses or crops, depending on the preference of the landowner.

5.2. Decommissioning After Ceasing Operations

If the project is not repowered, then the equipment will be dismantled and the lands restored to a pre-construction state of open meadow.

5.2.1. Procedures for Dismantling

If the facility is to be decommissioned and the solar array is to be removed at the end of its Feed-in-Tariff contract, the impacts will be similar to the construction phase, but in reverse sequence. The procedures will include:

- The creation of temporary work areas. In order to provide sufficient area for the lay-down of the disassembled panels and racking and loading onto trucks, an area must be cleared, levelled and made accessible. The topsoil will be removed and some material may need to be added;
- Equipment will include, at a minimum: The use of cranes to remove the panels, racking, inverters and transformers and the use of trucks for the removal of panels, racking, inverters and transformers;
- Driveways and culverts (if installed) will be removed unless the landowner requests that they be left in place. Driveway bedding material will be removed and replaced with clean sub- and topsoil for reuse by the landowner for agricultural or other purposes. If requested by the landowner, and subject to approval by the Cataraqui Region Conservation Authority and the Ministry of Natural Resources, the culverts (if installed) will be removed and the land will be contoured to maintain the current drainage patterns; and
- Decommissioning of onsite electrical lines and foundations.

5.3. Restoration of Land

Abandonment of the solar farm will not result in any impacts to surface or groundwater quality. After the abandonment process is completed exposed soils will be revegetated to a naturalized meadow state.

5.3.1. Land Restoration Activities

Once the equipment has been removed the land will be restored to open meadow habitat. Alternatively, *providing an agreement can be reached with the landowner*, appropriate portions of the site may be returned to native shrubland in order to restore shrub/early successional bird breeding habitat. This will be accomplished by removing the foundations (or part of foundation), granular material from roadways and culverts (if installed), depending on the landowner preference. Land use will be restored using stockpiled subsoils and topsoil. If there is insufficient material onsite, topsoil and/or subsoil will be imported from a source acceptable to the landowner.

Although strict spill prevention procedures will be in place, there is the potential through the decommissioning process for small spills of solvents or fuels. The soil conditions of the site will be surveyed to the standards of the day to determine if any impacts have occurred. Should soil impacts be noted, the impacted soils will be delineated, excavated and removed, to the standards of the day, from the site for disposal at an approved and appropriate facility. The removed soils will be replaced with stockpiled sub- and topsoil, if available. If none are available, clean fill and topsoil will be imported. If possible, native plant species will be used for the re-vegetation of disturbed areas.

5.4. Waste Disposal

As discussed above, the waste generated by the installation, operation and decommissioning of the solar farm is minimal, and there are no toxic residues. Any wastes generated will be disposed of according to standards of the day with the emphasis of recycling materials whenever possible.

6 Potential Environmental Effects by Activity and Associated Mitigation Measures

6.1. Vegetation Removal

Prior to construction of the SunE Westbrook Solar Farm, existing tree and shrub vegetation will be removed from the Project Location and the site will be graded. The implications of developing the site to the natural features identified in the *EOS* report (Ecological Services, 2011b) are discussed below along with mitigation measures that are intended to limit the extent of impact. A summary of identified impacts on identified natural features and mitigation measures by development phase is provided in Table 6.2.

6.1.1. Wetlands

The *EOS* report included an evaluation of features and functions associated with the Glenvale Creek wetland complex, which includes marsh and shrub swamp to the west of the Project Location and a mature palustrine maple swamp to the north (Appendix A). Although there will be no direct encroachment by the Project, approx. 1.5 ha of shrub swamp is within 120 m of the Project Location to the west and approx. 2.5 ha of palustrine maple swamp is within 120 m of the Project Location to the north. Potential development related impacts will therefore be considered.

The primary features and functions associated with this wetland complex as determined from the *EOS* evaluation and the implications of Project site revegetation are indicated in Table 6.1 below. Note that not all wetland features and functions occurring beyond 500 m of the Project Location were considered, but these features are considered to be effectively buffered from any proposed development related impact by virtue of distance.

Mitigation measures that will be incorporated into the project design to ensure that wetland features and functions are not impaired during site clearing activities include:

- No encroachment into wetland edge
- Perimeter fencing will be 30 m from a small portion of thicket swamp in the northwest corner and within 2 m of the maple swamp in the northeast. However, fencing is located entirely on upland features and does not interfere with seasonal runoff or small animal movements.
- Clear demarcation of site boundaries and limits of site clearing
- Retention of existing vegetated buffers between the perimeter fence and edge of wetland, which exceeds 30 m in most locations.
- Light Duty Sediment Fence – a sediment fence will be placed at the edge of the work area to prevent sediments from reaching any water feature. Filter fabric is the only acceptable fencing material to be used (i.e. no plastic-braided fencing). Fencing shall be secured along the base by digging in the filter fabric and backfilling with earth to grade, to prevent runoff from flowing underneath the bottom edge. In the area where the work area drains overland flow towards the watercourse, the fencing will be doubled with a row of hay bales installed between the fencing and on the upstream side. The hay bales will be installed in a shallow (~5 cm) trench packed tightly together and staked into position.
- Sediment fencing shall be placed along the base of all spoil piles to prevent sediment-laden runoff from entering wetland areas.
- Site will be revegetated to naturalized meadow following construction

As a result of the incorporation of mitigation measures and the absence of encroachment by the Project, significant impacts to wetland features and functions are not expected to occur.

Table 6-1: Summary of impacts on the main features and functions associated with the Glenvale Creek Wetland Complex for the SunE Westbrook Solar Energy Project.

Characteristic/ Ecological Function	Primary Features	Primary Ecological Functions	Potential impacts	Residual Effects
Wetland Size (ha)	- Approximately 170 ha riverine wetland that runs 8-10 km north of the Project Location		none	none
BIOLOGICAL COMPONENT				
Wetland Type	- Approx. 80% marsh and 20% swamp		none	none
Site Type	- Mostly riverine with few minor palustrine components		none	none
Vegetation Communities	Communities within 120 m of Project Location include: - S1 h, gc, ne, m h, Acer saccharinum, Acer rubrum, Ulmus americana; Fraxinus nigra; gc, ferns; ne, sedge species; m, mosses - S2 ts, gc, ne ts, Salix spp, Cornus spp.; gc Galium, Impatiens; ne, grasses - M1 re, ne, gc, ff re, Typha angustifolia; ne, sedges, rushes; gc, Mentha, Cicuta, Galium; ff Lemna, Hydrocharis	- Swamp and marsh communities provide habitat for species of conservation concern including amphibians, turtles and birds (estimated value: moderate to high)	none	none
Proximity to Other Wetlands	- Hydrologically connected by surface water to other wetlands (different dominant wetland type), or open lake or deep river within 1.5 km	- Hydrological and vegetation community connectivity allows for unrestricted movement of fish and wildlife species, maintaining populations across local region (estimated value: moderate to high)	none	none
Interspersion	- Wetland dominated by single long narrow vegetation community, interspersion would accordingly be at or near the lowest scoring level	- Community interspersion increases species diversity and habitat availability (estimated value: low)	none	none
Open Water Types	- Type 2. Open water occupies 5-25% of the wetland area, occurring in a central area.	- Open water components important for fish and waterfowl production, possible provision of aquatic habitat for turtle species (estimated value: low to moderate)	none	none

Characteristic/ Ecological Function	Primary Features	Primary Ecological Functions	Potential impacts	Residual Effects
HYDROLOGICAL COMPONENT				
Flood Attenuation (Total)	<ul style="list-style-type: none"> - 170 ha wetland with detention area of approx. 250 - Total catchment area approx. 4500 ha 	<ul style="list-style-type: none"> - Flood attenuation reduces risk of flooding into adjacent low-lying habitats (estimated value: moderate to high) 	No impacts anticipated Site will be revegetated and BMP stormwater management actions initiated during construction	none
Water Quality Improvement (Total)	<ul style="list-style-type: none"> - Watershed Improvement - Catchment Land Use - Pollutant Uptake 	<ul style="list-style-type: none"> - Rural farming areas may be associated with excessive nutrient loading that can be mitigated by high productivity within a wetland system, thus reducing downstream impacts to fish habitat and local water supply (estimated value: moderate to high) 	See above	none
Shoreline Erosion Control	<ul style="list-style-type: none"> - Although wetland is mostly marsh, it has a shoreline component of trees and shrubs 	<ul style="list-style-type: none"> - Shoreline erosion potential in this local region low (estimated value: low) 	See above	none
Groundwater Recharge (Total)	<ul style="list-style-type: none"> - Site Type is 95% riverine - Soils are riverine sands, loams 	<ul style="list-style-type: none"> - Water storage across a large detention area maintains water availability particularly during times of drought (wildlife benefit) (estimated value: moderate to high) 	See above	none
SPECIAL FEATURES COMPONENT				
Species Rarity (Total)	<ul style="list-style-type: none"> - None identified within 120 m of Project Location 	<ul style="list-style-type: none"> - No rare species identified, but presume occasional presence of 1 or more turtle species within Glenvale Creek system, including Stinkpot, Painted and Snapping (estimated value: moderate) 	None anticipated	None anticipated
Significant Features and Habitats (Total)	<ul style="list-style-type: none"> - Waterfowl staging and/or moulting known to occur - Waterfowl breeding suitable - 	<ul style="list-style-type: none"> - Local value to waterfowl for foraging and minor stopover, some seasonal movement of Canada Geese and Mallards observed during SI (estimated value: moderate) - Some provision of amphibian habitat 	No impact on wetland habitat provision but some immediate loss of surrounding upland amphibian foraging habitat	Potential recovery of upland foraging habitat for amphibians in and around meadow areas and along creek buffers
Fish Habitat (Total)	<ul style="list-style-type: none"> - Spawning and Nursery Habitat: only high marsh present, cattail, bulrush, - Migration and Staging Habitat: Significance unknown, fish staging and/or migration habitat present 	<ul style="list-style-type: none"> - Fish presence (minnows) presumed based on characteristics of Glenvale Creek (estimated value: low to moderate) 	None anticipated as a result of maintenance of adjacent site hydrology and appropriate BMP actions for stormwater	None anticipated

6.1.2. *Watercourses*

A narrow, seasonally intermittent watercourse occurs within 120 m of the Project Location to the east and southeast (Appendix A, Photo 6.5). Shallow flowing water (<0.25 m) was evident within the channel during a preliminary field investigation in April, 2011, but the watercourse was dry in June. There is no fish habitat present and no associated riparian vegetation community. The stream channel is approximately 1-2 m in width, and 0.25 m deep at centre.

Potential impacts to the identified seasonal watercourse as a result of vegetation removal will be negligible as a result of effective mitigation measures that will be applied during construction. These include the measures identified for wetlands in the section above as well as the following:

- The existing 30 m vegetated buffer will be retained. This buffer will consist of herb, grass and shrub cover which is well established and provides habitat for songbirds and amphibians. Large trees occurring within this buffer zone may be removed to reduce shading effects.
- Rock check dams and/or hay bales should be installed in project-affected drainage ditches to entrap sediments and reduce water velocities to facilitate sediment deposition. Rock check dams will be installed via a standard sediment fence installed perpendicular to the flow and then filled with fine gravel or filter sand on either side. Alternatively, double sediment fencing and the associated hay bales may be installed to achieve the same result; however additional staking may be required to prevent hay bales from floating in the associated deeper waters.



Figure 6-5. Grass swale representing seasonal watercourse in southwest corner of Project Location. Photo taken June 1, 2011.

6.1.3. Significant Rare Vegetation Communities

A 3 ha patch of grassland alvar (Tufted Hairgrass – Canada Bluegrass – Philadelphia Panic Grass Alvar Grassland Type) was identified within the Project Location in the *SI* report (Ecological Services, 2011a). This feature will not be encroached upon by the development, and no vegetation removal is required from within its boundary (Appendix B, Photo 6.6). This area will be demarcated prior to any construction activity and instruction will be given not to enter this area with any form of equipment that may disturb the shallow soils and associated plants. The main anticipated environmental impacts include potential changes to local hydrology and invasion by non-native plants. As the alvar is situated in an elevated section of the property, there will be no changes to local hydrology that might otherwise affect plant succession. Revegetation of exposed soils across the Project site will take place immediately following construction and will be monitored for effectiveness. Furthermore, potential changes to the alvar community will be monitored during the first 3 years following construction. Change monitoring within this community will include:

- identification and extent of invasion by non-native plants that may have resulted from site disturbance on adjacent lands
- monitoring of dominant alvar indicator species through photographic record of community succession during Years 1-3 of operation

Accordingly, no impacts to this feature are anticipated.



Figure 6-6. Grassland alvar in central area of Project Location. Photo taken June 1, 2011.

6.1.4. Shrub/Early Successional Breeding Bird Habitat

The removal of vegetative cover will result in the loss of approximately 25 ha of *shrub/early successional bird breeding habitat* from the Project Location (Appendix C). Six bird species associated with this habitat type were observed within 120 m of the Project Location during field surveys (Ecological Services, 2011a), including the potential nesting habitat of an identified species of conservation concern (Golden-winged Warbler) within the adjacent 120 m lands. The shrub community in which this species was observed is located along the lower vegetated slope of the Glenvale Creek valley and as such is buffered from activities associated with the construction of the solar farm on adjacent uplands. Additional shrubland riparian habitat occurs along Glenvale Creek to the southwest of the Project Location (Figure 6.7) and is presumed to be supportive of this species.

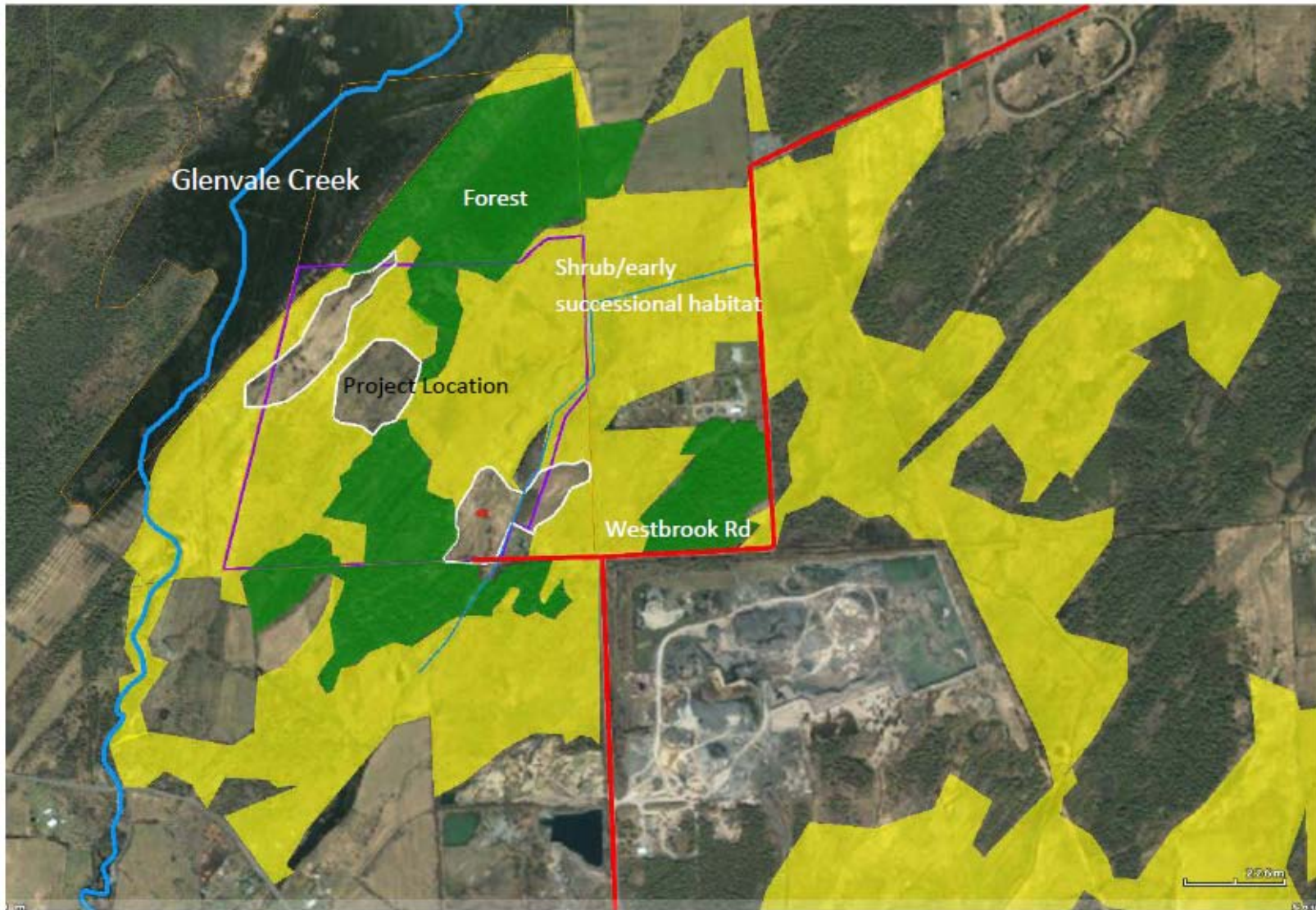
To determine the actual extent of habitat loss, shrubland habitat across the local area was mapped from recent high resolution satellite imagery (Figure 2.7). Area analysis indicated approx. 60 ha of shrubland relatively contiguous with the 25 ha found within the Project Location. An additional 200 ha of shrubland occurs east of Westbrook Road (which for the purposes of this evaluation is presumed to represent a significant gap in ecological connectivity).

The loss of shrub/early successional bird breeding habitat from within the Project Location is unavoidable, but as extensive areas of shrubland habitat remain across the local region, no significant long-term impacts to regional populations are anticipated. It is further noted that the removal of 25 ha of shrubland *will not* result in loss of significance status in terms of habitat size for the remaining shrub/early

successional breeding bird habitat (established as 30 ha in the MNR Wildlife Criteria Schedules). Regardless, SunEdison is proposing to compensate for this loss of habitat by maintaining approximately 30 ha of *existing* shrub/early successional habitat at another project site 6.5 km to the northwest on Unity Road (Appendix F). Over the life of the project, habitat management at this site will involve periodic assessment of habitat condition and breeding bird use by a trained biologist who may recommend the removal of larger trees if deemed necessary to maintain habitat function.

In terms of mitigation within the Project Location, vegetation removal will not be scheduled during the active breeding season from May through mid-July to ensure that there is no destruction of nests or disturbance to breeding birds.

Figure 6.7. Existing shrub/early successional bird breeding habitat (yellow area) associated with SunE Westbrook Project Location.



6.1.5. Amphibian Breeding Habitat

As there will be no encroachment into the identified wetlands to the north and east of the Project Location and mitigation measures will ensure that potential impacts are minimized, there will be no loss or impairment to the significant *amphibian breeding habitat* associated with these areas. (Appendix D). Extensive areas of amphibian breeding habitat will remain in areas surrounding the Project Location. Furthermore, once the site has been revegetated and local hydrology re-established across the Project Location, there is the potential that amphibians will continue to use the site for foraging.

6.2. Dust and Noise

Some minor noise and dust will be generated during the construction and decommissioning phases. Noise will typically be limited to daylight hours and dust will be controlled with watering, as necessary.

6.3. Stormwater Runoff Impacts

No impacts are anticipated from stormwater runoff. No impervious surface treatments are planned and no construction activities will occur near water bodies (e.g., all construction work will occur away from Glenvale Creek). Furthermore, the more distant open water components of the Glenvale Creek wetland are well protected from sediment input by dense shrub and herbaceous cover that occurs within the 120 m buffer zone to the west of the Project Location. A 30 m vegetated buffer will be retained around the identified seasonal watercourse to the southeast, and activities involving land clearing are not expected to take place when there is water within this feature.

6.4. Water Takings

No water takings are planned for this project.

6.5. Fuels Spills

It is possible that fuel spills could occur during construction. All equipment operators will be trained to avoid spills and to respond to spills should they occur. No re-fueling will be permitted within 120 m of a water body. Should a spill occur the following protocol will be implemented:

1. Spill response kits kept onsite will be used to contain the spill;
2. The SunEdison representative will be notified;
3. If the spill is of sufficient quantity, the MOE Spill Action Centre will be notified;
4. An environmental contractor will be brought in to remove any excess fuel and impacted soils; and
5. An environmental consultant will be retained to ensure that all impacted soil and groundwater has been properly removed and the site returned to pre-spill condition.

6.6. Potential Impacts and Mitigation Measures by Activity (Construction Phase)

Identification of potential impacts and mitigation measures related to specific activities during the construction phase of development are presented below.

6.6.1. Site Clearing

Environmental Component Affected Terrain, Wildlife, Watercourse

Potential Impacts Clearing and grubbing and soil excavation will lead to loss of habitat for wildlife and potential disturbance to wildlife breeding activities. Potential sediment input to seasonal watercourse.

Change in habitat type and form upon site revegetation to meadow.

Mitigation Measures Mitigation measures as described in Sections 6.1, 6.2 and 6.3.

6.6.2. Road Construction

Environmental Component Affected Terrain, Wildlife, Watercourse

Potential Impacts Sensory disturbance of wildlife due to construction. Loss of habitat.

Clearing and grubbing and soil excavation for on-site access roads and laying of gravel base will cause disturbance to the terrain. The access roads will remain for project life.

Increased sedimentation and loss of vegetation

Municipal and provincial roads may be damaged during use.

Mitigation Measures Site clearing and grubbing will be kept to a minimum area on-site by staking and marking off the areas that define limits of the work to be done, excavated soil will be re-used on-site where feasible, or disposed of in a proper facility off-site.

Sedimentation controls will be put in place around stockpiled soils, ditches and disturbed areas within 120 m of a watercourse.

Any damage to municipal roads will be repaired and the road returned to its previous condition. No permanent paved roads will need to be constructed for the construction activities. Municipal and provincial roads will be used for transportation of equipment to the construction sites. Any road damages will be repaired in conjunction with the relevant authorities.

Residual Impacts None anticipated.

6.6.3. Laydown Areas

<i>Environmental Component Affected</i>	Terrain, Wildlife, Watercourse
<i>Potential Impacts</i>	<p>Clearing and grubbing and soil compacting for construction of the Construction Laydown Areas may result in sensory disturbance of wildlife and loss of habitat due to construction.</p> <p>Increased sedimentation and loss of vegetation</p>
<i>Mitigation Measures</i>	<p>The Construction Laydown Area will be removed following the completion of construction with tilling (if desired by the owner) and re-seeded to open meadow using a combination of grasses and forbs.</p> <p>Sedimentation controls will be put in place around stockpiled soils, ditches and disturbed areas within 120 m of a watercourse.</p>
<i>Residual Impacts</i>	None anticipated

6.6.4. Solar Array Construction

<i>Environmental Component Affected</i>	Terrain, Wildlife, Water Course
<i>Potential Impacts</i>	<p>Clearing and grubbing and soil compacting for construction of the solar array may result in sensory disturbance of wildlife and loss of habitat due to construction.</p> <p>Increased sedimentation and loss of vegetation.</p>
<i>Mitigation Measures</i>	<p>Site clearing and grubbing will be kept to a minimum area on-site by staking and marking off the areas that define limits of the work to be done, excavated soil will be re-used on-site where feasible, or disposed of in a proper facility off-site.</p> <p>Sedimentation controls will be put in place around stockpiled soils, ditches and disturbed areas within 120 m of a watercourse. A vegetated 30 m buffer will remain around the identified seasonal watercourse.</p>
<i>Residual Impacts</i>	None anticipated

6.6.5. Delivery of Equipment

<i>Environmental Component Affected</i>	Local Public and Traffic Patterns, Vegetation
<i>Potential Impacts</i>	Potential short term traffic delays on local roads to provide room for trucks to deliver project components. Short term increase in truck traffic during construction period.

Mitigation Measures Delivery of equipment will be coordinated with local traffic patterns. Main local roads will be utilized as much as possible to reduce impact to local residents since these roads were designed for truck traffic and higher traffic volumes.

Area of disturbance will be minimized and mitigated as appropriate through re-vegetation with native or otherwise appropriate plantings (e.g., agricultural fallow mix).

Residual Impacts None anticipated

6.6.6. *Installation of Racking System*

Environmental Component Affected Terrain, Unknown Archaeological Resources

Potential Impacts Increased potential for soil erosion due to necessary surficial disturbance by trucks and other heavy equipment used.
Increased sedimentation and loss of riparian vegetation.

There will be a significant amount of on-site traffic (vehicle and heavy equipment) involved in the construction.

Mitigation Measures Any area of surficial disturbance will be re-contoured, with stockpiled material removed during excavation, to match original landscape. Areas that define the limits of the work will be staked and marked.

Equipment movement on-site will be limited to specified travel areas to minimize impacts on land use. Noise and dust control measures will be utilized where required for the construction period.

Sedimentation controls will be put in place around stockpiled soils, ditches and disturbed areas within 120 m of a watercourse.

During construction activities if any archaeological resources are found to be in conflict with the proposed facilities, activities will be halted and the issues assessed with consideration given to modifying the layout. This will be determined in consultation with Ministry of Tourism and Culture and archaeologists, where applicable.

Residual Impacts No residual impacts are anticipated, unless unknown archaeological resources are discovered during construction activities.

6.6.7. *Solar Panel Assembly and Installation*

Environmental Component Affected Local Residents

Potential Impacts Noise from construction activities could disturb local residents for the

duration of the construction period.

Mitigation Measures Construction period is of short duration and conducted during the daylight hours to minimize impact on residents living in nearby houses.

Residual Impacts Solar panel assembly and installation will result in no residual impacts.

6.6.8. Electrical Collector System

Environmental Component Affected Vegetation and Terrain, Wildlife, Watercourse

Potential Impacts Terrain disturbance may occur from trenches between the inverters and the sub-station. Some wildlife and birds may be disturbed for a short term due to the use of backhoes used for excavation.

Increased sedimentation and loss of vegetation

Mitigation Measures By locating the electrical lines within access road allowances (and array area where the vegetation has been previously disturbed for the road to be constructed and maintained), rare and endangered flora and fauna are not likely to be encountered during construction.

Sedimentation controls will be put in place around stockpiled soils and disturbed areas within 120 m of a watercourse.

Residual Impacts No residual impacts are anticipated.

6.6.9. Substation Construction

Environmental Component Affected Terrain, Public Safety, Watercourse

Potential Impacts Construction of the substation will be on existing vacant lands and will not result in loss of agricultural land.

Terrain disturbances from site preparation and grading and excavation.

Increased sedimentation and loss of vegetation.

The electrical substation could potentially have public safety issues due to the presence of high-voltage equipment.

Mitigation Measures To ensure protection of the public, the substation will have a perimeter fence with only authorized personnel wearing proper safety equipment permitted within. All electrical design will meet Ontario Electrical Safety Code requirements.

Sedimentation controls will be put in place around stockpiled soils, ditches and disturbed areas within 120 m of a watercourse.

Residual Impacts No impacts are anticipated.

6.7. Potential Impacts and Mitigation Measures by Activity (Operating Phase)

Potential impacts and mitigation measures related to specific activities occurring during the operating phase is presented below.

6.7.1. Visual Impacts

Activities	Solar Farm operation
Environmental Component Affected	Visual Landscape
Potential Impacts	Passersby may be able to see the solar panels and some may perceive this to be a reduction in the aesthetic quality of the landscape.
Mitigation Measures	Siting of the array away from residents reduces the visual impact. Visual barriers such as fence slats or berms using excess site grading material will be installed during construction where required to reduce the potential visual impact.
Residual Impacts	No to minimal residual impacts are anticipated. However, a change to the landscape will occur for the duration of the project and the site will be somewhat visible to the public.

6.7.2. Noise Impacts

Activities	Solar Farm operation
Environmental Component Affected	Noise Levels – Local Residents
Potential Impacts	No noise above background levels is expected at any receptor.
Mitigation Measures	None required.
Residual Impacts	No residual impacts are anticipated.

6.7.3. Wildlife Disturbances

Activities	Solar Farm operation
Environmental Component Affected	Wildlife
Potential Impacts	As woodland, shrub and open meadow communities within the Project Location envelope were removed during the construction phase, wildlife species associated with these features are not expected to be present. Solar farm operations will therefore have no impact on these wildlife species. Generalist species may continue to use remnant grass and meadow habitat existing around the base of the solar arrays.

Mitigation Measures	None required
Residual Impacts	The small amount of noise associated with inverters and transformers is limited to a small area around each structure, and will not cause any measurable disturbance to birds or other wildlife.
6.7.4. Maintenance Activities	
Activities	The solar array will be visited by maintenance staff for routine inspections monthly after commissioning.
Environmental Component Affected	Wildlife
Potential Impacts	Routine maintenance visits will be less of a disturbance than the regularly occurring farming activities now taking place on farmlands surrounding the site.
Mitigation Measures	Maintenance activities include regular lubrication of the tracking units which generates some waste material. Land will remain privately held, limiting access to the sites. Maintenance personnel will be instructed not to disturb wildlife if encountered during activities at the site. Any waste material from the maintenance activities will be properly disposed of by authorized and approved offsite vendors.
Residual Impacts	Infrequent visits by maintenance staff will have little residual impacts.

6.8. Potential Impacts and Mitigation Measures by Activity (Decommissioning Phase)

Potential impacts and mitigation measures related to specific activities occurring during the decommissioning phase is presented below. These are expected to be similar in many respects to those occurring during the construction phase.

6.8.1. Road Removal

<i>Environmental Component Affected</i>	Terrain, Wildlife, Watercourse
<i>Potential Impacts</i>	Sensory disturbance of wildlife and birds due to construction. Clearing of on-site access roads and removal of gravel base will cause disturbance to the terrain. Increased sedimentation and loss of vegetation Municipal and provincial roads may be damaged during use.

Mitigation Measures Site clearing and restoration will be conducted on-site by staking and marking off the areas that define limits of the work to be done, excavated soil will be re-used on-site where feasible, or disposed of in a proper facility off-site.

Sedimentation controls will be put in place around stockpiled soils, ditches and disturbed areas within 120 m of a watercourse.

Any damage to municipal roads will be repaired and the road returned to its previous condition. No permanent paved roads will need to be constructed for the construction activities. Municipal and provincial roads will be used for transportation of equipment to the construction sites. Any road damages will be repaired in conjunction with the relevant authorities.

Residual Impacts None anticipated.

6.8.2. Solar Array Removal

Environmental Component Affected Terrain, Wildlife, Water Course

Potential Impacts Clearing and grubbing and soil compacting for deconstruction of the solar array may result in sensory disturbance of wildlife and loss of habitat due to construction.

Increased sedimentation and loss of vegetation.

Mitigation Measures Site clearing and grubbing will be kept to a minimum area on-site by staking and marking off the areas that define limits of the work to be done, excavated soil will be re-used on-site where feasible, or disposed of in a proper facility off-site. Exposed soils will be reseeded to naturalized meadow.

Sedimentation controls will be put in place around stockpiled soils, ditches and disturbed areas within 120 m of a watercourse.

Residual Impacts None anticipated

6.8.3. Removal of Racking System

Environmental Component Affected Terrain, Watercourse

Potential Impacts Increased potential for soil erosion due to necessary surficial disturbance by trucks and other heavy equipment used.

Increased sedimentation and loss of existing vegetation.

There will be a significant amount of on-site traffic (vehicle and heavy equipment) involved in the deconstruction.

Mitigation Measures

Any area of surficial disturbance will be re-contoured, with stockpiled material removed during excavation, to match original landscape. Areas that define the limits of the work will be staked and marked.

Equipment movement on-site will be limited to specified travel areas to minimize impacts on land use. Noise and dust control measures will be utilized where required for the construction period.

Sedimentation controls will be put in place around stockpiled soils, ditches and disturbed areas within 120 m of a watercourse.

Residual Impacts

No residual impacts are anticipated.

6.8.4. *Electrical Collector System Removal*

Environmental Component Affected

Vegetation and Terrain, Wildlife, Watercourse

Potential Impacts

Terrain disturbance may occur as trenches between the inverters and the substation are filled. Some wildlife and birds may be disturbed for a short term due to the use of backhoes used for excavation.

Increased sedimentation and loss of vegetation

Mitigation Measures

Electrical lines are within access road allowances (and array area where the vegetation has been previously disturbed for the road to be constructed and maintained).

Sedimentation controls will be put in place around stockpiled soils and disturbed areas within 120 m of a watercourse.

Residual Impacts

No residual impacts are anticipated.

6.8.5. *Substation Deconstruction*

Environmental Component Affected

Terrain, Public Safety, Watercourse

Potential Impacts

Deconstruction of the substation will be on existing vacant lands and will not result in loss of agricultural land.

Terrain disturbances from site preparation and grading and excavation.

Increased sedimentation and loss of vegetation.

The electrical substation could potentially have public safety issues due to

the presence of high-voltage equipment.

Mitigation Measures

To ensure protection of the public, the substation will have a perimeter fence with only authorized personnel wearing proper safety equipment permitted within. All electrical design will meet Ontario Electrical Safety Code requirements.

Sedimentation controls will be put in place around stockpiled soils, ditches and disturbed areas within 120 m of a watercourse.

Residual Impacts

No impacts are anticipated.

Table 6.2. Summary table of potential negative environmental effects and associated mitigation measures for identified natural features by development phase.

Natural Feature	Characteristics and Functions	Potential Negative Environmental Effect		Mitigation Measures	Residual Effects on Natural Feature
		Direct	Indirect		
Significant Wetlands	<p><i>Characteristics</i></p> <p>1. <i>Glenvale Creek Wetland Complex (marsh and shrub swamp)</i></p> <ul style="list-style-type: none"> • Size – 160 ha • Riparian wetland dominated by extensive marsh, with smaller swamp and open water components associated with Glenvale Creek west and north of Project Location • 1.5 ha overlap of shrub swamp within Project Location <p><i>Functions</i></p> <ul style="list-style-type: none"> • significant local hydrological functions incl. water quality protection and flood attenuation • wildlife habitat- waterfowl staging and migratory stopover • potential amphibian breeding habitat <p>2. <i>Glenvale Creek Wetland Complex (mature maple swamp)</i></p> <ul style="list-style-type: none"> • Size – 9 ha • Mature silver and red maple swamp with vernal pools located north of Project Location • 2.5 ha overlap onto 120 m project setback • Part of the Glenvale Creek wetland complex (hydrological connection and proximity) • Located within localized depression and receives diffuse runoff from surrounding lands <p><i>Functions</i></p> <ul style="list-style-type: none"> • amphibian breeding habitat 	<i>i. Vegetation Removal (Construction Phase)</i>			
		<ul style="list-style-type: none"> • None (no vegetation removal required) • No encroachment by any facility component 	<ul style="list-style-type: none"> • Potential reduction in survivorship of adjacent trees and shrubs located near a wetland edge • Degradation of adjacent wildlife habitat • Potential disturbance of wildlife using adjacent habitat 	<ul style="list-style-type: none"> • Minimum 30 m vegetated buffer from edge of wetlands to nearest project component (fenceline) • Clear demarcation of work areas and daily visual monitoring of work area to ensure compliance • Remaining wildlife will be directed away from areas of impact through established protocols. 	<ul style="list-style-type: none"> • Wetlands will retain all identified features and habitat functions, including size, hydrological functions and provision of habitat for wildlife species
		<i>ii. Site Grading (Construction Phase)</i>			
		<ul style="list-style-type: none"> • None (Project Location situated entirely within upland areas and does not encroach into wetland) 	<ul style="list-style-type: none"> • Changes in soil moisture and hydrology of Project area may affect surficial runoff into maple swamp • Increased susceptibility to erosion on adjacent lands • Temporary degradation of water quality within adjacent vernal pools in maple swamp 	<ul style="list-style-type: none"> • Soil grading will not disrupt or significantly alter current site hydrology including surficial flow patterns • Soil grading will occur only within demarcated areas within Project Location • Site will be revegetated as open meadow 	<ul style="list-style-type: none"> • No change to hydrological features and/or functions associated with adjacent wetlands
		<i>iii. Road Construction (Construction Phase)</i>			
		<ul style="list-style-type: none"> • No direct impacts and no encroachment 	<ul style="list-style-type: none"> • Potential reduction in survivorship of adjacent vegetation located near a wetland edge 	<ul style="list-style-type: none"> • Standard BMP measures for road construction 	<ul style="list-style-type: none"> • No change to hydrological features and/or functions associated with adjacent wetlands
		<i>iv. Dust Generation (Construction Phase)</i>			
		<ul style="list-style-type: none"> • No direct impacts as Project Location does not encroach into wetland and a 30 m vegetated buffer is in place 	<ul style="list-style-type: none"> • Temporary disruption in growth of adjacent woodland vegetation • temporary degradation of water quality within adjacent vernal pools 	<ul style="list-style-type: none"> • Standard construction BMP measures taken for dust control measures • Site will be revegetated as open meadow 	<ul style="list-style-type: none"> • No residual effects on wetland features and/or functions expected
<i>v. Facility Operations (Operation Phase)</i>					
<ul style="list-style-type: none"> • No direct impacts 	<ul style="list-style-type: none"> • Potential disturbance to wildlife using adjacent wetland habitat from presence of solar panels • Possible noise disturbance from transformer substation and panel inverters 	<ul style="list-style-type: none"> • No mitigation possible for solar array • Transformer will be situated near Unity Road and not near adjacent woodland (noise control regs. in place) • Wildlife monitoring required to determine which bird species are breeding on and within 120 m of the Project location 	<ul style="list-style-type: none"> • No residual effects on adjacent wetland habitat features and/or functions expected • Noise habituation by local wildlife anticipated 		
<i>vi. Vegetation Management (Operation Phase)</i>					
<ul style="list-style-type: none"> • Mowing operations within cultural meadow associated with Project Location will not influence wetland functions 	<ul style="list-style-type: none"> • None anticipated 	<ul style="list-style-type: none"> • None required 	<ul style="list-style-type: none"> • No residual effects on adjacent wetland features and/or functions expected 		
<i>vii. Component removal and site restoration (Decommissioning Phase)</i>					
<ul style="list-style-type: none"> • No direct impacts 	<ul style="list-style-type: none"> • Increased susceptibility to erosion on adjacent lands as a result of temporary soil exposure and runoff 	<ul style="list-style-type: none"> • Maintain existing hydrology and prevent erosion • Site will be revegetated as open meadow or reforested at discretion of Municipality or resource authority (MNR) 	<ul style="list-style-type: none"> • No residual effects on adjacent wetland features and/or functions expected 		

Natural Feature	Characteristics and Functions	Potential Negative Environmental Effect		Mitigation Measures	Residual Effects on Natural Feature
		Direct	Indirect		
Rare Vegetation Community Type	<p><i>Characteristics</i></p> <ul style="list-style-type: none"> 3 ha Tufted Hairgrass – Canada Bluegrass – Philadelphia Panic Grass Alvar Grassland Type located within Project Location <p><i>Functions</i></p> <ul style="list-style-type: none"> Provincially recognized rare vegetation community type Some provision of habitat for local or regionally uncommon plant species and grassland bird species 	<i>i. Vegetation Removal (Construction Phase)</i>			
		<ul style="list-style-type: none"> No direct impacts as there will be no encroachment into the feature by any of the Project components 	<ul style="list-style-type: none"> Loss of adjacent shrubland and woodland habitat may affect wildlife occupancy Potential disturbance of wildlife using alvar habitat by remote facility operation 	<ul style="list-style-type: none"> Vegetation removal in adjacent lands will occur only within demarcated areas and not during active breeding season for most wildlife species (May-July) Daily visual monitoring of work area to ensure compliance Remaining wildlife will be directed away from areas of impact through established protocols. 	<ul style="list-style-type: none"> Alvar habitat expected to retain all identified features and habitat functions No anticipated reduction in population size of local breeding birds
		<i>ii. Soil Grading (Construction Phase)</i>			
		<ul style="list-style-type: none"> No direct impacts as there will be no encroachment into the feature by any of the Project components 	<ul style="list-style-type: none"> Soil grading on adjacent lands may affect hydrology of alvar perimeter 	<ul style="list-style-type: none"> Soil grading will not disrupt or significantly alter current site hydrology including surficial flow patterns Soil grading will occur only within demarcated areas within Project Location Site will be revegetated as open meadow 	<ul style="list-style-type: none"> No change to hydrological features and/or functions associated with alvar habitat Possible benefits to long term alvar maintenance by removing invasive shrub species from perimeter.
		<i>iii. Dust Generation (Construction Phase)</i>			
		<ul style="list-style-type: none"> No direct impacts as there will be no encroachment into the feature by any of the Project components 	<ul style="list-style-type: none"> No indirect impacts anticipated to alvar habitats provided mitigation measures implemented (see above) 	<ul style="list-style-type: none"> Standard BMP measures for road construction 	<ul style="list-style-type: none"> No change to hydrological features and/or functions
		<i>iv. Facility Operations (Operation Phase)</i>			
<ul style="list-style-type: none"> None anticipated 	<ul style="list-style-type: none"> Potential disturbance to breeding birds using adjacent alvar habitat from reflective solar array surfaces Noise from transformer substation and panel inverters 	<ul style="list-style-type: none"> Standard construction BMP measures taken for dust control measures Site will be revegetated as open meadow 	<ul style="list-style-type: none"> No residual effects on adjacent alvar habitat features and/or functions expected Noise habituation by wildlife anticipated 		
<i>v. Vegetation Management (Operation Phase)</i>					
<ul style="list-style-type: none"> None anticipated 	<ul style="list-style-type: none"> Possible creation of conditions for invasive non-native plant species on exposed soils 	<ul style="list-style-type: none"> Monitoring of alvar for presence of invasive plant species originating from source populations on adjacent lands Photographic record of alvar community succession and vegetation patterns maintained during Years 1-3 	<ul style="list-style-type: none"> No anticipated changes to alvar plant community from invasive species resulting from project Grassland habitat provided by Project Location may augment alvar habitat for some species (determination of use from breeding bird monitoring report) 		
<i>vi. Component removal and site restoration (Decommissioning Phase)</i>					
<ul style="list-style-type: none"> None anticipated 	<ul style="list-style-type: none"> No indirect impacts anticipated provided vegetation removal mitigation measures provided (see above) 	<ul style="list-style-type: none"> Maintain existing hydrology and prevent erosion Site will be revegetated as open meadow 	<ul style="list-style-type: none"> Site restoration may provide additional habitat for grassland species 		

Natural Feature	Characteristics and Functions	Potential Negative Environmental Effect		Mitigation Measures	Residual Effects on Natural Feature
		Direct	Indirect		
Shrub/Early Successional Breeding Bird Habitat	<p><i>Characteristics</i></p> <ul style="list-style-type: none"> 25 ha shrub thicket habitat within Project Location contiguous with 60 ha locally <p><i>Functions</i></p> <ul style="list-style-type: none"> Provision of breeding habitat for range of shrub/early successional species including Willow Flycatcher, Brown Thrasher, Eastern Towhee, and Field Sparrow, Golden-winged Warbler (SC) noted within 120 m adjacent lands to southwest of Project Location 	<p><i>vii. Vegetation Removal (Construction Phase)</i></p>			
		<ul style="list-style-type: none"> Loss of 25 ha of thicket habitat within Project Location Potential disruption of breeding activity or indirect take of wildlife species 	<ul style="list-style-type: none"> Potential degradation of adjacent wildlife habitat Potential disturbance of breeding birds using adjacent habitat (Note: no direct encroachment into habitat of Golden-winged Warbler) 	<ul style="list-style-type: none"> Vegetation removal will occur only within demarcated areas and not during active breeding season for most wildlife species (May-July) Daily visual monitoring of work area to ensure compliance Remaining wildlife will be directed away from areas of impact through established protocols. Provision of >30 ha of managed shrub/early successional woodlands on alternate property within 6.5 km of PL 	<ul style="list-style-type: none"> Remaining local shrub/early successional habitat on adjacent lands will retain habitat significance status in terms of area No anticipated reduction in population size of local breeding birds No impact on identified species of conservation concern (Golden-winged Warbler)
		<p><i>viii. Soil Grading (Construction Phase)</i></p>			
		<ul style="list-style-type: none"> No direct impacts as breeding habitat no longer present within Project Location until site vegetation restored to meadow 	<ul style="list-style-type: none"> No indirect impacts anticipated to adjacent habitats provided woodland mitigation measures provided (see above) 	<ul style="list-style-type: none"> Soil grading will not disrupt or significantly alter current site hydrology including surficial flow patterns Soil grading will occur only within demarcated areas within Project Location Site will be revegetated as open meadow 	<ul style="list-style-type: none"> No change to hydrological features and/or functions associated with adjacent woodlands
		<p><i>ix. Dust Generation (Construction Phase)</i></p>			
		<ul style="list-style-type: none"> No direct impacts as breeding habitat will be absent across Project Location until site is revegetated 	<ul style="list-style-type: none"> No indirect impacts anticipated to adjacent habitats provided woodland mitigation measures provided (see above) 	<ul style="list-style-type: none"> Standard BMP measures for road construction 	<ul style="list-style-type: none"> No change to hydrological features and/or functions associated with adjacent woodlands
		<p><i>x. Facility Operations (Operation Phase)</i></p>			
		<ul style="list-style-type: none"> None anticipated 	<ul style="list-style-type: none"> Potential disturbance to breeding birds using adjacent woodland habitat from reflective solar array surfaces Noise from transformer substation and panel inverters 	<ul style="list-style-type: none"> Standard construction BMP measures taken for dust control measures Site will be revegetated as open meadow Initiate breeding bird monitoring across Project Location in Years 1-3 of operation including monitoring of compensation habitat at Unity Road 	<ul style="list-style-type: none"> No residual effects on adjacent woodland habitat features and/or functions expected Compensation habitat at Unity Road expected to maintain or increase local breeding bird populations Breeding habitat for some species may be provided by Project Location (as determined by breeding bird monitoring) Noise habituation by wildlife anticipated
<p><i>xi. Vegetation Management (Operation Phase)</i></p>					
<ul style="list-style-type: none"> Mowing operation has potential to cause mortality of nesting birds within Project Location 	<ul style="list-style-type: none"> None anticipated 	<ul style="list-style-type: none"> Mowing will be delayed until mid-July after the peak breeding season if possible Bird mortality related to mowing operations will be documented 	<ul style="list-style-type: none"> Some habitat for shrub/early successional species may be provided by Project Location (determination of use from breeding bird monitoring report) 		
<p><i>xii. Component removal and site restoration (Decommissioning Phase)</i></p>					
<ul style="list-style-type: none"> Depending on documented use of the Project Location by this songbird guild, may be temporary loss of habitat (until site vegetation restored) 	<ul style="list-style-type: none"> No indirect impacts anticipated provided vegetation removal mitigation measures provided (see above) 	<ul style="list-style-type: none"> Maintain existing hydrology and prevent erosion Site will be revegetated as open meadow or reforested at discretion of Municipality or resource authority (MNR) 	<ul style="list-style-type: none"> Site restoration may provide additional habitat for shrub/early successional species if allowed to succeed to shrubland 		

Natural Feature	Characteristics and Functions	Potential Negative Environmental Effect		Mitigation Measures	Residual Effects on Natural Feature
		Direct	Indirect		
Amphibian breeding habitat	<p><i>Characteristics</i></p> <ul style="list-style-type: none"> Wetlands north and west of Project Location include marsh, swamp, open water and vernal pools <p><i>Functions</i></p> <ul style="list-style-type: none"> Identified foraging and breeding habitat for several frog species noted including spring peeper, green frog, wood frog and gray tree frog 	<i>i. Vegetation Removal (Construction Phase)</i>		<ul style="list-style-type: none"> Daily visual monitoring of work area to ensure compliance Remaining wildlife will be directed away from areas of impact through established protocols. 	<ul style="list-style-type: none"> Amphibian breeding habitat on adjacent lands will retain all identified features and habitat functions appropriate to amphibian use
		<ul style="list-style-type: none"> No vegetation removal or encroachment within wetland communities 	<ul style="list-style-type: none"> Potential degradation of adjacent habitat quality through alteration to vegetation cover 		
		<i>ii. Soil Grading (Construction Phase)</i>		<ul style="list-style-type: none"> Soil grading will not disrupt or significantly alter current site hydrology including surficial flow patterns that contribute to wetland maintenance and seasonality Soil grading will occur only within demarcated areas within Project Location Site will be revegetated as open meadow 	<ul style="list-style-type: none"> Same as for significant wetlands
		<ul style="list-style-type: none"> No direct impacts 	<ul style="list-style-type: none"> No indirect impacts to adjacent habitats anticipated as a result of effective mitigation measures provided for wetland protection 		
		<i>iii. Dust Generation (Construction Phase)</i>		<ul style="list-style-type: none"> Standard BMP measures for road construction and site clearing 	<ul style="list-style-type: none"> None anticipated
		<ul style="list-style-type: none"> No direct impacts as Project Location does not encroach within identified amphibian breeding habitats 	<ul style="list-style-type: none"> No indirect impacts anticipated 		
		<i>iv. Facility Operations (Operation Phase)</i>		<ul style="list-style-type: none"> Standard construction BMP measures taken for dust control measures Site will be revegetated as open meadow Initiate breeding bird monitoring across Project Location in Years 1-3 of operation 	<ul style="list-style-type: none"> None anticipated
<ul style="list-style-type: none"> No direct impacts as Project Location does not encroach within identified amphibian breeding habitats 	<ul style="list-style-type: none"> None anticipated 				
<i>v. Vegetation Management (Operation Phase)</i>		<ul style="list-style-type: none"> Monitoring and reporting protocols required Mowing should be delayed until after mid-July if possible 	<ul style="list-style-type: none"> May be minor impact to local frog population in the event of indirect take from mowing operations 		
<ul style="list-style-type: none"> Occasional mowing of cultural meadow within Project Location may lead to indirect take (mortality) of amphibians foraging within Project Location 	<ul style="list-style-type: none"> None anticipated 				
<i>vi. Component removal and site restoration (Decommissioning Phase)</i>		<ul style="list-style-type: none"> Maintain existing hydrology and prevent erosion Site will be revegetated as open meadow 	<ul style="list-style-type: none"> Restoration of foraging habitat across Project Location as a result of revegetation and natural succession 		
<ul style="list-style-type: none"> Temporary loss or degradation of cultural meadow foraging habitat during deconstruction 	<ul style="list-style-type: none"> Same as for significant wetlands 				

7 Environmental Effects Monitoring Plan

Monitoring is fundamental to confirming key net effects from the project. The intent of monitoring will be to verify compliance with federal and/or provincial requirements and to assess the actual impacts of the operation. Detailed post-construction monitoring plans, if required, will be developed, following discussions with the applicable agencies (e.g., Environment Canada, Ministry of Natural Resources, and Ministry of Environment) and in accordance with any conditions attached to the Renewable Energy Approval.

7.1. Construction Staging

The timing and execution of construction activities will be scheduled to minimize the potential impacts on the natural environment. The staging aspects which will be incorporated will include scheduling construction and reclamation activities to be conducted as close to each other as feasible so as to minimize the time any area is disturbed. This includes avoidance of vegetation removal during the most active period of bird breeding from May through mid-July.

7.2. Erosion and Sedimentation Control

Erosion and Sediment Control will be used to prevent the release of sediment from construction works within or adjacent to sensitive environmental features, and/or to contain sediments within the work area in cases where erosion is unavoidable. Measures will be implemented so that sediment is prevented from entering any water body. In order for these measures to be effective, it is imperative they are installed correctly in the proper location, inspected, and repaired when necessary. This outcome is achieved through proper coordination by individuals involved in the planning and implementation of these mitigations.

The following is a typical list of measures to be implemented for controlling the release of sediments during construction:

- Areas where erosion potential is high will be identified prior to the start of construction activities;
- Sedimentation control measures will be installed prior to and clearing or construction activities;
- Stripped material will be stockpiled for future use and these stockpiles will be located away from watercourses or drainage features;
- Stockpiled material will be sloped to a maximum of 2:1 to minimize run-off;
- Light duty sediment fencing will be placed along any unconsolidated slope to prevent sediments from reaching the water feature. Filter fabric is the only acceptable fencing material to be used (i.e., no plastic-braided fencing). Fencing shall be secured along the base by digging in the filter fabric and backfilling with earth to grade, to prevent runoff from flowing underneath the bottom edge. In the area where the work area drains overland flow towards the watercourse, the fencing will be doubled with a row of hay bales installed between the fencing and on the upstream side. The hay bales will be installed in a shallow (~5 cm) trench packed tightly together and staked into position;
- Sediment fencing shall be placed along the base of all spoil piles to prevent sediment-laden runoff from entering ditches or watercourses;
- Rock check dams and/or hay bales shall be installed in project-affected drainage ditches to entrap sediments and reduce water velocities to facilitate sediment deposition. Rock check dams will be installed via a standard sediment fence installed perpendicular to the flow and then filled with fine gravel or filter sand on either side. Alternatively, double sediment fencing and the associated hay

bales may be installed to achieve the same result, however additional staking may be required to prevent hay bales from floating in the associated deeper waters;

- All disturbed areas will be stabilized and re-vegetated as soon as feasible; and
- Sedimentation control measures will be left in place until all disturbed areas have been stabilized.

7.3. Vegetation and Wildlife During Construction

The facility has been designed so that the disturbance of native vegetation and wildlife habitat in areas adjacent to the Project Location will be minimized. Additional procedures to be employed include:

- Tree felling and land clearing will not take place during the most active period of wildlife breeding (May to mid-July);
- Clearly marked work areas with vehicle traffic being restricted to the work areas;
- Trees in areas adjacent to the Project Location (e.g., 120 m setback) will not be felled or otherwise injured as a result of construction activities;
- Trees within the 30m watercourse buffer may be felled to reduce shading impacts on adjacent solar panels, however, remaining shrub and herbaceous vegetation will be retained;
- Large wildlife (e.g., deer) encountered within the Project Location will be allowed to move off site prior to tree felling activities;
- Wildlife will not be harassed or fed;
- Vehicle traffic will be limited to 30 km/h or less on access driveways to reduce the potential for collisions with wildlife.

7.4. Soil Quality

The project will attempt to minimize any impacts to soil quality. Procedures to ensure this include:

- Spill clean-up equipment will be on-site at all times and any spills will be reported to the environmental inspector and, if the spill is of sufficient size, to the MOE spill response centre;
- All work areas will be clearly marked;
- Stripped topsoil will be stockpiled during construction; and
- Upon completion of the construction work, the work areas and access driveways will be reduced to the minimum size needed, de-compacted and the topsoil will be used to restore all non-used work areas to productive capacity.

7.5. Waste Management

All wastes will be handled and disposed of in accordance with applicable regulatory requirements and in a manner which is protective of the environment. Proposed procedures to ensure this include:

- Compliance with all applicable regulations including the Environmental Protection Act (EPA)'s Regulation 347 (as amended);
- The contractor will implement a re-use and recycling program in accordance with available municipal programs;

- The Contractor will provide sufficient and appropriate waste containers around all active work sites;
- No waste will be buried or otherwise disposed of onsite;
- Good housekeeping practices including daily work site clean-up will be implemented;
- All oil, grease, hydraulic fluids and any hazardous wastes will be stored in a designated and secure area with secondary containments. These materials will be periodically removed by a licensed contractor;
- All sewage will be collected in holding tanks (portable toilets) and removed from the site by a licensed contractor for disposal at a licensed facility.

7.6.Noise, Air and Dust During Construction

Construction activities have the potential to impact local air quality and increase local noise levels. The following measures will be implemented in order to avoid or minimize these effects.

- Construction traffic will be limited to 30 km/h or less on access driveways to minimize dust generation;
- Dust will be controlled using watering when necessary;
- Construction equipment idling will be minimized;
- All engines (vehicles and generators) will meet all emission requirements specified by the MOE and MTO;
- Stockpiled soil will be covered or wetted during dry and/or windy conditions as needed to minimize dust; and
- SunEdison representatives will respond to any concerns or complaints in an expeditious and courteous manner.

7.7.Inspections

An inspector will make frequent site inspections and to ensure compliance with all environmental policies and plans. Duties of the inspector(s) will include:

- Daily log and weekly reports completed by the contractor's inspector;
- Prior to construction SunEdison and the inspector will jointly determine that all required permits, licenses and approvals are in place prior to the commencement of construction. The inspector will also review the permits on a weekly basis and report to SunEdison any which may be approaching the expiry date;
- The inspector will make daily inspections of all activities which may cause adverse effects and of any implemented mitigation measures (sediment traps and fencing); and
- Should any activities which may cause and adverse effect be observed, the inspector will make a verbal report to the project manager and the SunEdison representative. This will be followed up with a written report.

7.8. Post-Construction Noise Emission Monitoring

The EPA requires that noise emissions for any new project must not have any adverse effects on the natural environment. The Renewable Energy Approvals process is the means by which this is controlled under the EPA. Prior to construction, a Renewable Energy Approval (REA) will be obtained. Any conditions of approval and follow-up measures that may be identified in the REA will be strictly adhered to.

Prior to construction, a monitoring process to address all complaints, including those dealing with noise levels, will be established. This will include a 1-800 number as well as local contact personnel.

7.9. Potential Environmental Effects, Mitigation Measures and Monitoring

The potential environmental effects, mitigation measures, monitoring objectives and monitoring plan are presented in Table 7.1.

Table 7-1: Environmental Effects and Monitoring Requirements

Project Activity	Potential Effects	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures
Construction Activities				
Construction Activities	Disturbances to wildlife due to construction activities	<ul style="list-style-type: none"> No wildlife mortality 	<ul style="list-style-type: none"> Avoidance of land clearing during peak breeding season (May-mid-July) Adherence to woodlot and watercourse setbacks Clearly marked construction limits Minimal time required to complete activities Provision of shrub/early successional bird breeding habitat on alternate property to be managed over life of project 	<ul style="list-style-type: none"> Construction inspection and surveying to maintain setbacks <p><u>Contingency Measures</u></p> <ul style="list-style-type: none"> Temporarily cease local project construction if encounter sensitive species of conservation concern Biologist will determine when re-entry is appropriate Compensation habitat to be monitored for bird use and vegetation managed as necessary to maintain habitat function
	Clearing and grubbing and soil excavation	<ul style="list-style-type: none"> No disturbance of songbird nests or breeding activity in year 1 No loss of soil or soil fertility 	<ul style="list-style-type: none"> Site clearing will be scheduled following the peak songbird nesting period of May-mid-July Site clearing and grubbing will be kept to a minimum area on-site by staking and marking off the areas that define limits of the work to be done Excavated soil will be re-used on-site where feasible, or disposed of in a proper facility off-site. Sedimentation and erosion controls 	<ul style="list-style-type: none"> Adherence to established vegetation removal scheduling Inspection of top soil separating Construction inspection and surveying <p><u>Contingency Measures</u></p> <ul style="list-style-type: none"> Importation of new topsoil
	Impacts to surface water features from construction	<ul style="list-style-type: none"> No increase in sedimentation in watercourses No changes in drainage / hydrological function 	<ul style="list-style-type: none"> Adherence to setbacks Complete permitting process with the CRCA, if required Proper sizing and installation of culverts (if required) Stabilization of disturbed surfaces to prevent erosion Installation of light duty sedimentation fencing installed around work area during construction 	<ul style="list-style-type: none"> Routine inspection of erosion control devices Inspection of final restored surfaces to ensure vegetation re-growth <p><u>Contingency Measures</u></p> <ul style="list-style-type: none"> Repair, replace or installation of additional erosion control measures
	Potential short-term closures on local roads to provide room for trucks to deliver project components. A short-term increase in truck traffic during construction period.	<ul style="list-style-type: none"> Minimal delays 	<ul style="list-style-type: none"> Delivery of equipment will be coordinated with local traffic patterns Traffic control plan will be developed 	<ul style="list-style-type: none"> Complaint tracking <p><u>Contingency Measures</u></p> <ul style="list-style-type: none"> Establish alternate delivery routes

Project Activity	Potential Effects	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures
	Fuel or transformer oil spill	No spills	<ul style="list-style-type: none"> Any leak or spills from trucks or machinery would be contained and site would be properly cleaned up and disposed of at registered disposal facilities Transformers used in the project are silicone based and do not contain hydrocarbons Refuelling of all vehicles and equipment will be done away from watercourses during construction and no re-fuelling on-site during the operation phase 	<u>Contingency Measures</u> <ul style="list-style-type: none"> Notification of Spills Action Centre, if required Assess and remediate impact soils
	May experience annoyance with dust and/or noise		<ul style="list-style-type: none"> Dust suppression measures will be employed, as necessary On-site supervisor to address any noise complaints 	<ul style="list-style-type: none"> Recording and communication of complaints to local authorities <u>Contingency Measures</u> <ul style="list-style-type: none"> Suspension of construction during high winds Suspension of construction during evening hours
Operational Activities				
Solar Farm Operation	Noise impacts on receptors (residents located on non-lease properties)	<40 dBA at non-participating receptors	<ul style="list-style-type: none"> Adherence to noise setbacks Noise modelling to predict sound levels Repair equipment in a timely manner Complaints tracking 	<ul style="list-style-type: none"> Complaints Tracking Follow up monitoring in response to complaints <u>Contingency Measures</u> <ul style="list-style-type: none"> Repair damaged components
	Spill of transformer oil	No spills	<ul style="list-style-type: none"> Secondary containment systems Proper disposal of waste materials 	<u>Contingency Measures</u> <ul style="list-style-type: none"> Notification of Spills Action Centre, if required Assess and remediate impact soils
Decommissioning Activities				
Removal of Equipment	Surficial disturbance	No increase in sedimentation in water bodies	<ul style="list-style-type: none"> Re-grading of site & land use restored after equipment disturbances complete (restoration to open meadow using native forbs and grasses if available) Install erosion control measures 	<ul style="list-style-type: none"> Frequent inspection of erosion control devices Inspection of final restored surfaces On-going consultation with landowners <u>Contingency Measures</u> <ul style="list-style-type: none"> Repair, replace or installation of additional erosion control measures
Removal Equipment	Sensory disturbance (sound and visual presence)	None	<ul style="list-style-type: none"> Complaints tracking Impacts from equipment usage & personnel present will be short term 	<ul style="list-style-type: none"> Recording and communication of complaints to MOE

Project Activity	Potential Effects	Performance Objective	Mitigation Strategy	Monitoring Plan and Contingency Measures
	Dust	No offsite impacts	<ul style="list-style-type: none"> ○ Watering of exposed soils ○ Maximum speeds 	<ul style="list-style-type: none"> ○ Recording and communication of complaints to local authorities
	Surficial disturbance	No increase in sedimentation in water bodies	<ul style="list-style-type: none"> ○ Re-grading of site & land use restored after equipment disturbances complete ○ Install erosion control measures 	<ul style="list-style-type: none"> ○ Frequent inspection of erosion control devices ○ Inspection of final restored surfaces ○ On-going consultation with landowners <p><u>Contingency Measures</u></p> <ul style="list-style-type: none"> ○ Repair, replace or installation of additional erosion control measures
Removal of Transformer	Spill of transformer oil	No spills	<ul style="list-style-type: none"> ○ An oil containment system will be maintained during decommissioning to prevent soil contamination in the event of a leak ○ Proper disposal of waste materials 	<p><u>Contingency Measures</u></p> <ul style="list-style-type: none"> ○ Notification of Spills Action Centre, if required ○ Assess and remediate impact soils
Accidents and Malfunctions				
Accidents & Malfunctions	Land contamination from lubricant/transformer fluid leak or spill and lightning strikes	No spills	<ul style="list-style-type: none"> ○ Small quantities of lubricants present in the tracking system ○ Any leak or spills from trucks or machinery would be contained and site would be properly cleaned up and disposed of at registered disposal facilities ○ Transformers used in the project are silicone based and do not contain hydrocarbons ○ Refuelling of all vehicles and equipment will be done away from watercourses during construction and no re-fuelling on-site during operation phase ○ Use of lightning protection equipment 	<p><u>Contingency Measures</u></p> <ul style="list-style-type: none"> ○ Notification of Spills Action Centre, if required ○ Assess and remediate impact soils
	Public safety	No Accidents	<ul style="list-style-type: none"> ○ Siting on private property which restricts public access to the array ○ Equipment conforms to CSA standards ○ Fencing of the substation for security based on standard utility practices 	<p><u>Contingency Measures</u></p> <ul style="list-style-type: none"> ○ Activation of emergency response plan

8 Summary and Conclusions

As discussed in the *NHARR* (Genivar 2010a), *SI* (Ecological Services, 2011a) and *EOS* reports (Ecological Services, 2011b), there are both significant wetlands and significant wildlife habitat present on and within 120 m of the Project Location.

This *EIS* has been prepared to identify potential negative environmental effects that all phases of the Project may have on these significant natural features. Mitigation measures have been proposed to prevent these effects from occurring or minimize the magnitude, extent, duration and frequency in the event that they do occur to an acceptable level. Monitoring measures have been proposed to confirm that mitigation measures are having the intended effect and that performance objectives are being met.

Table 8.1 below summarizes both significant and non-significant natural features identified in the *SI* report and any requisite mitigation strategies. Appendix E shows the Project site plan and associated constraint features and setbacks.

Table 8.1 Natural Features on and within 120 m of the Project Location

Feature	Attributes/Composition	Function	Significant?	Mitigation Strategy (C=Construction, O=Operation, D=Decommissioning)
Wetlands				
	<ul style="list-style-type: none"> Glenvale Creek riparian wetland complex west of Project Location 9 ha treed swamp north of Project Location hydrologically connected to Glenvale Creek wetland. 	<ul style="list-style-type: none"> Locally significant hydrological functions including water quality improvement and flood attenuation Supportive of waterfowl, turtles and amphibians 	<i>Significant</i>	To be addressed in the CPR (Genivar, 2010b) C – Demarcation of work areas; Dust control measures; Surface water runoff protection O – None required D – same as construction
Woodlands				
W1	<ul style="list-style-type: none"> 9 ha Maple Mineral Deciduous Swamp 8 ha White Cedar Mixed Forest 	Interior habitat, significant wetland, wildlife habitat	Non-significant	To be addressed in the CPR (Genivar, 2010b)
W2	15 ha White Cedar Mixed Forest	wildlife habitat	Non-significant	To be addressed in the CPR (Genivar, 2010b)
W3	0.5 ha Lowland Deciduous Forest	Minor protection of seasonal watercourse	Non-significant	To be addressed in the CPR (Genivar, 2010b)
Wildlife Habitat				
Alvar	3 ha Tufted Hairgrass – Canada Bluegrass – Philadelphia Panic Grass Alvar Grassland Type interior habitat	Rare vegetation community type	<i>Significant</i>	To be addressed in the CPR (Genivar, 2010b) C –Demarcation of work area setbacks O – None required D – None required
Waterfowl stopover and staging areas (terrestrial)	Glenvale Creek riparian wetland includes open water and thicket components. Canada Geese observed	Provision of staging and stopover habitat	Non-significant	To be addressed in the CPR (Genivar, 2010b)
Colonial nesting bird breeding habitat	Maple Mineral Deciduous Swamp north of PL	Provision of nesting and foraging habitat	Non-significant	To be addressed in the CPR (Genivar, 2010b)
Shorebird migratory stopover area habitat	Glenvale Creek riparian wetland includes open water and thicket components Portions of shrub thicket community within PL seasonally inundated	Provision of stopover habitat	Non-significant	To be addressed in the CPR (Genivar, 2010b)
Amphibian breeding habitat	- Glenvale Creek Wetland Complex provides marsh, swamp and vernal pool habitats	Localized breeding area	<i>Significant</i>	To be addressed in the CPR (Genivar, 2010b)
Woodland Raptor nesting habitat	23 ha of White Cedar Mixed Forest in local area 9 ha mature swamp forest 2 ha interior habitat	Potential nesting habitat on and within 120 m of PL	Non-significant	To be addressed in the CPR (Genivar, 2010b)

Feature	Attributes/Composition	Function	Significant?	Mitigation Strategy (C=Construction, O=Operation, D=Decommissioning)
<i>Marsh bird breeding habitat</i>	Glenvale Creek Wetland Complex includes open water and thicket components Portions of shrub thicket community within PL seasonally inundated Indicator species noted	Provision of breeding and foraging habitat	Non-significant	To be addressed in the CPR (Genivar, 2010b)
<i>Shrub/early successional bird breeding habitat</i>	24 ha shrub thicket communities present Indicator species noted	Identified foraging and breeding habitat for several shrub thicket songbird species	Significant	Addressed in this report C –Demarcation of work area setbacks O – Monitoring of use D – None required <i>Compensation habitat provided on alternate site</i>

8.0 REFERENCES

Ecological Services. 2011a. Natural Heritage Assessment Site Investigation Report Westbrook Solar Farm.

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Genivar Limited. 2011a. Westbrook Proposed Solar Power Project Natural Heritage Records Review. September 2011.

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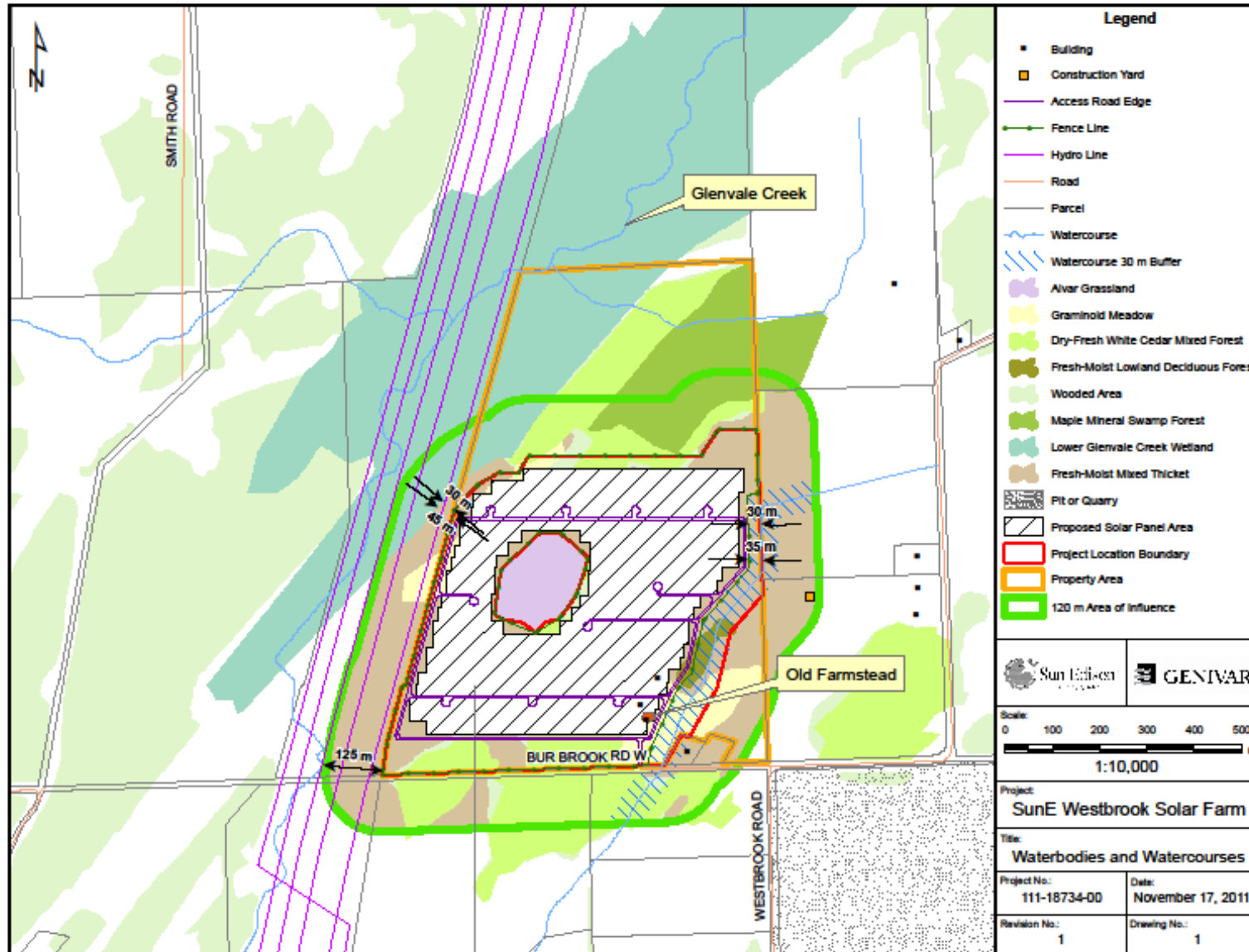
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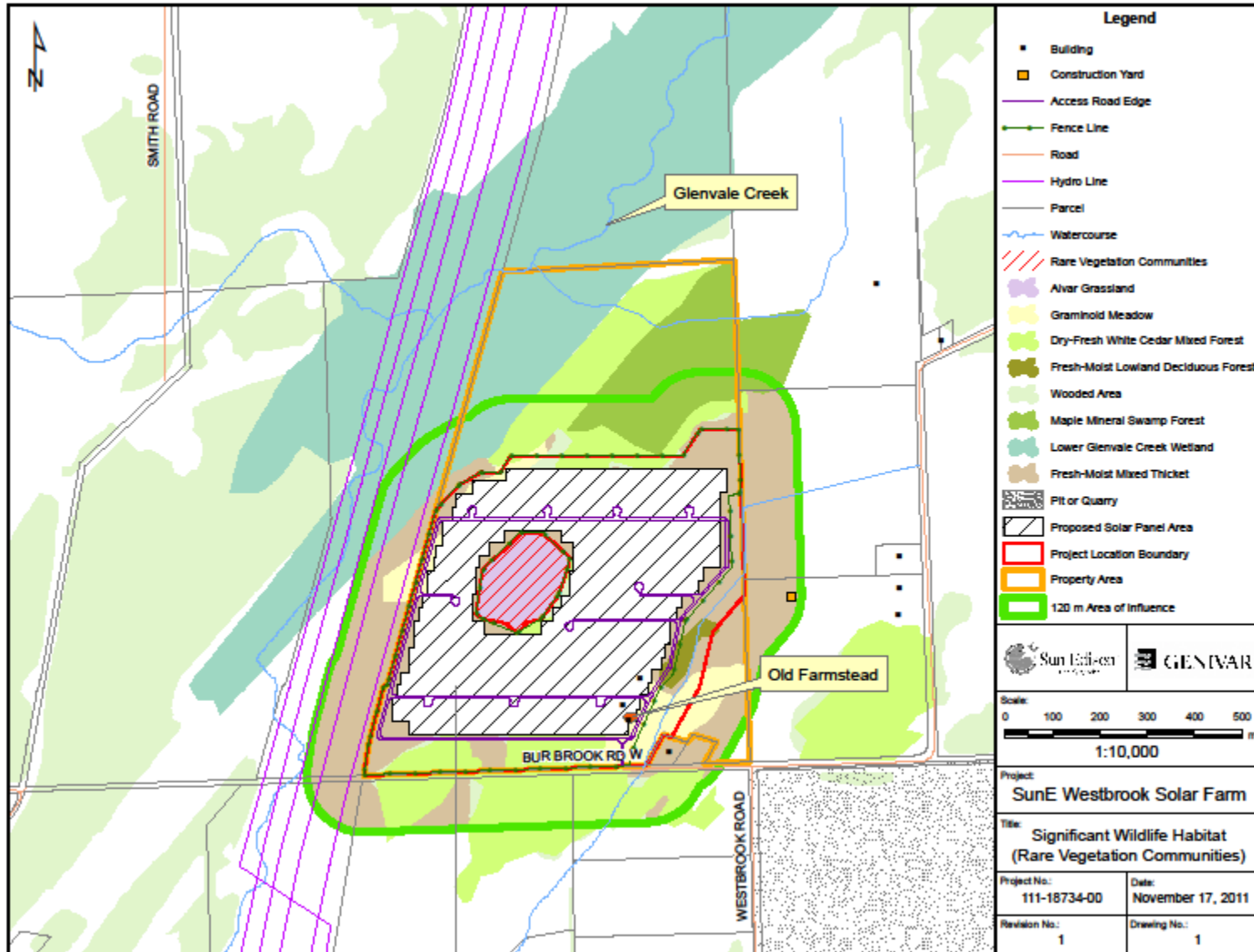
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Henson, B.L. and K.E. Brodribb 2005. *Great Lakes Conservation Blueprint for Terrestrial Biodiversity, Volume 2: Ecodistrict Summaries*. Nature Conservancy of Canada.

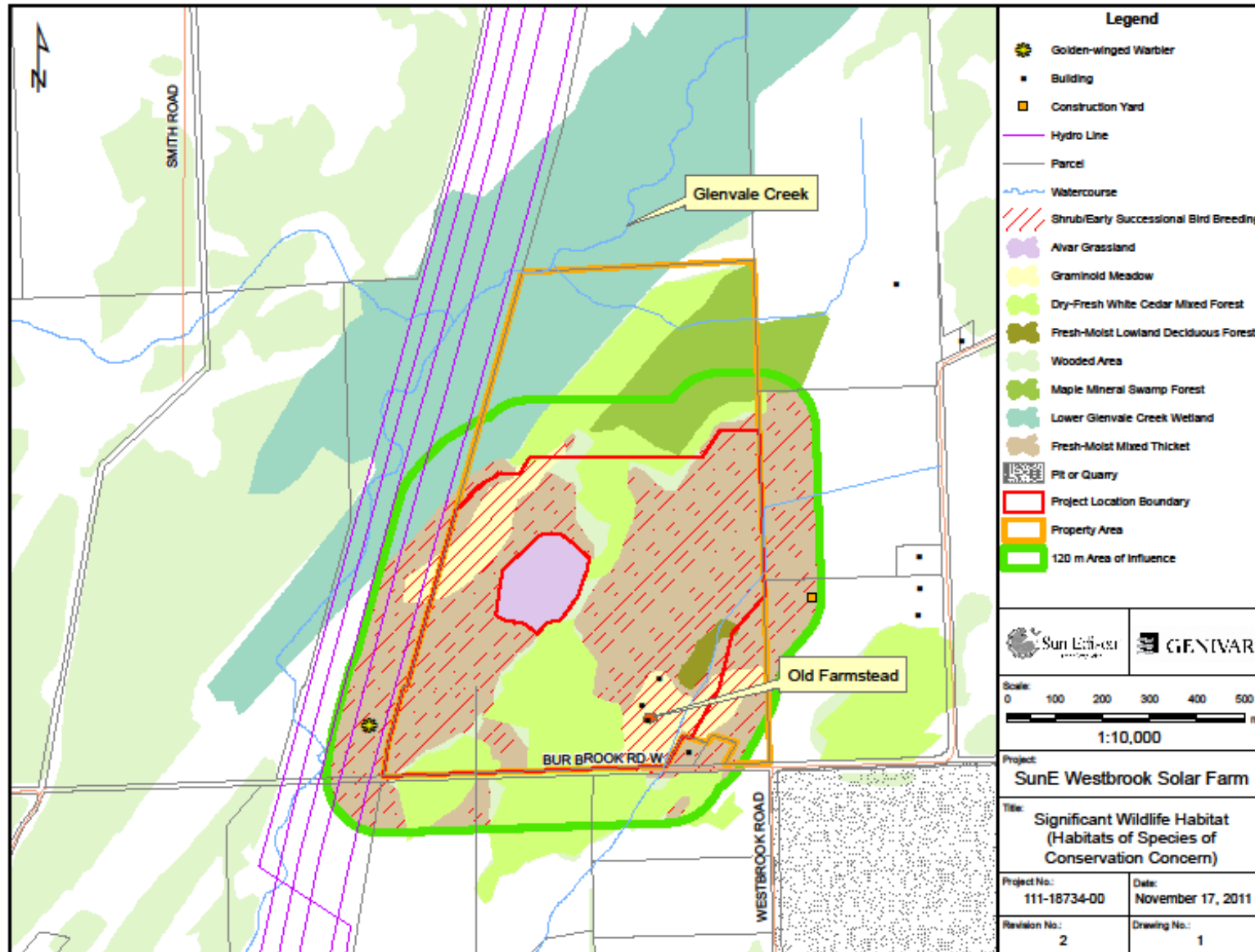
Appendix A Project Location and identified wetlands and watercourses.



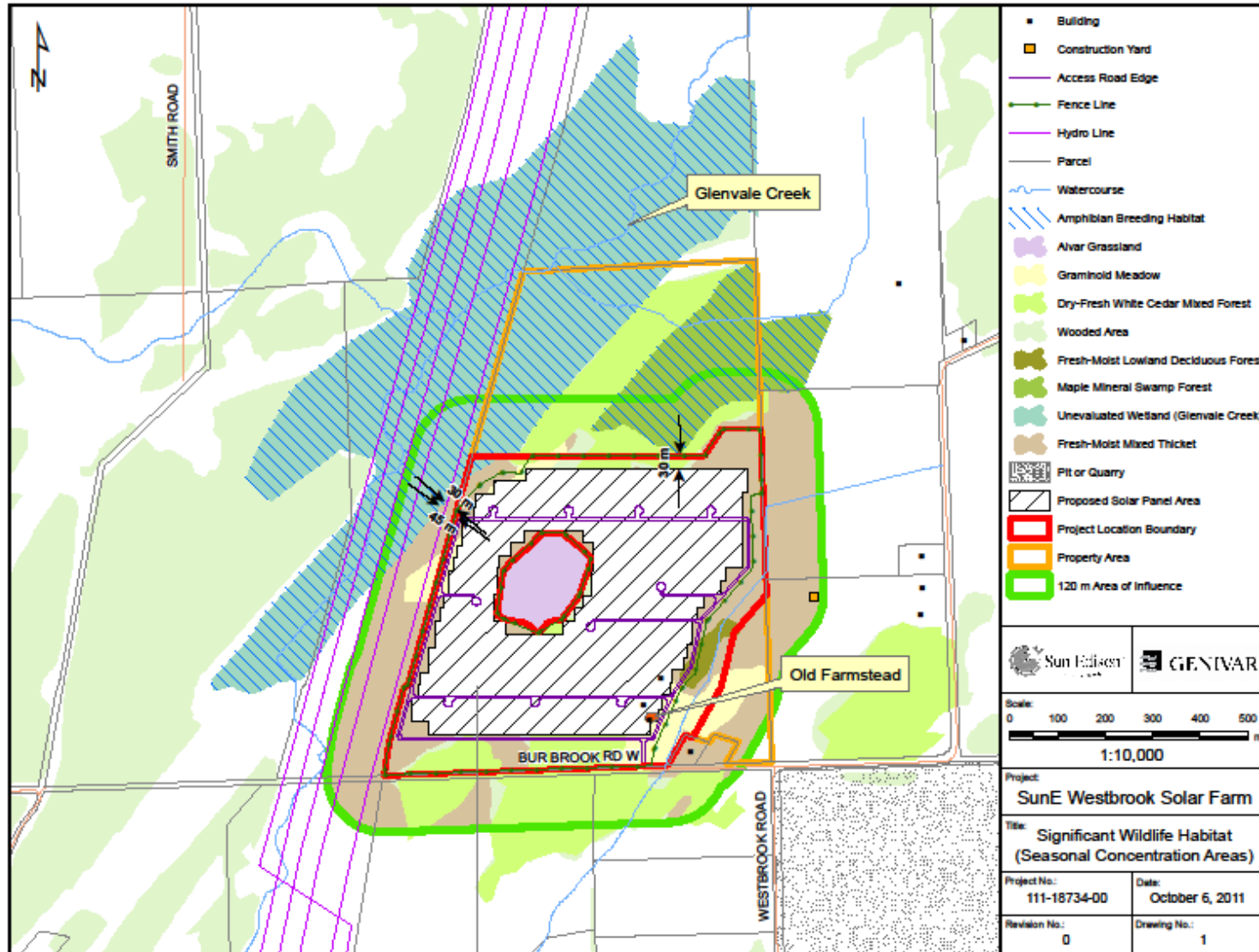
Appendix B. Project Location and rare vegetation community.



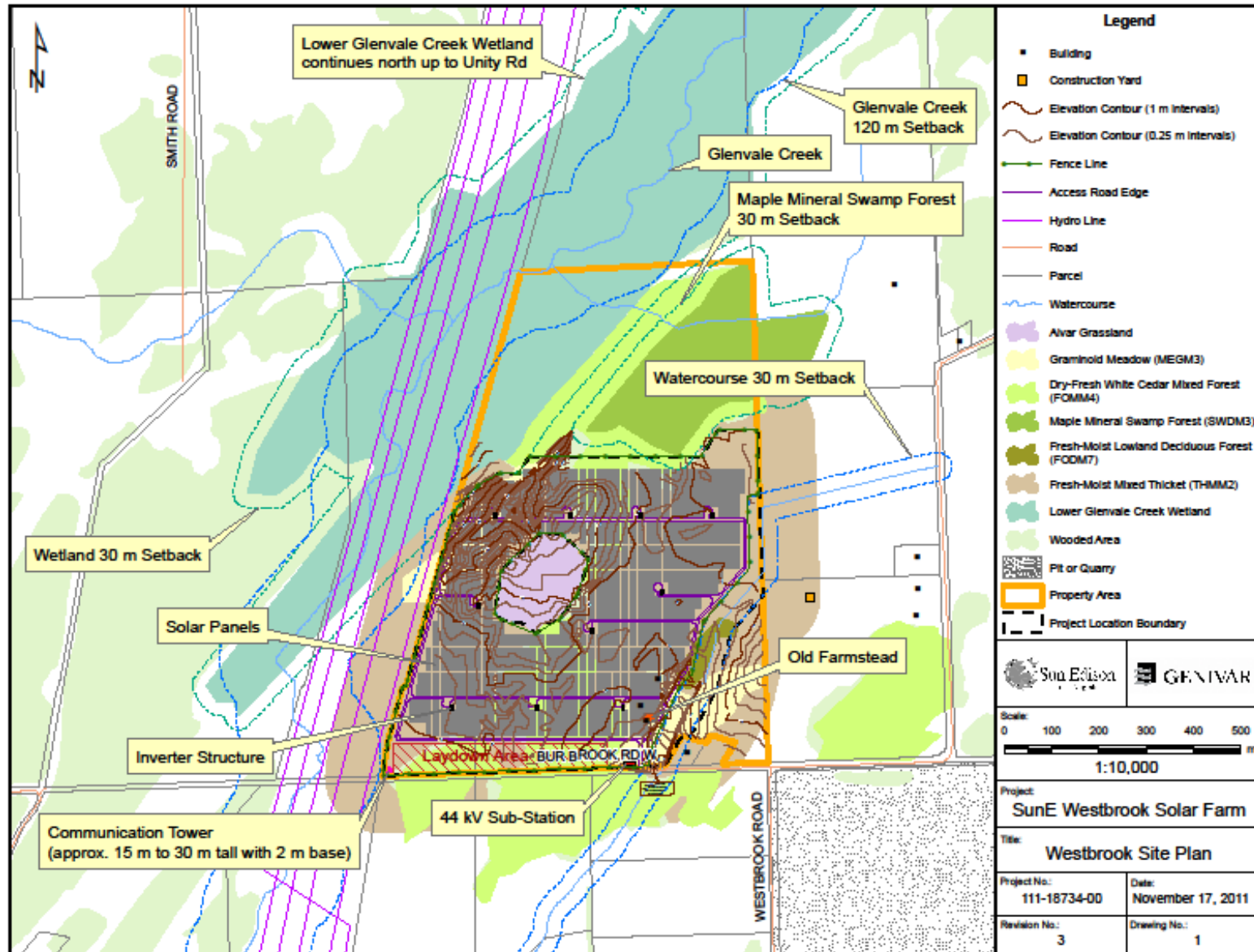
Appendix C. Project Location and shrub/early successional bird breeding habitat.



Appendix D. Project Location and amphibian breeding habitat.



Appendix E. Project layout and constraint features.



Appendix F. Proposed shrub/early successional habitat management area on alternate SunEdison property (Part of Lot 12 Concession 6, City of Kingston)

