

LunarLight

PROJECT DESCRIPTION REPORT



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1. Introduction

Canadian Solar Solutions Inc., acting on behalf of LunarLight LP, proposes to develop a solar facility with a maximum name plate capacity of approximately 10 megawatts (MW) alternating current (AC), located near Stirling, in the City of Belleville, Ontario. The renewable energy facility will be known as LunarLight and will be rated as a Class 3 Solar Facility. Canadian Solar Solutions Inc. is coordinating and managing the approvals process for LunarLight LP. LunarLight LP has received a contract from the Ontario Power Authority (OPA) for the sale of electricity generated by this renewable facility through the province's Feed-in-Tariff (FIT) program (enabled by the *Green Energy and Green Economy Act, 2009*). The project will require a Renewable Energy Approval (REA) as per *Ontario Regulation 359/09* under Part V.0.1 of the Ontario *Environmental Protection Act*.

This *Project Description Report* (PDR) is being submitted to the Ontario Ministry of the Environment (MOE) as required under the Renewable Energy Approvals (REA) process as outlined in *Ontario Regulation 359/09*, and was made available for public review and comment prior to this final submission to the MOE. Other draft reports made available for public review prior to this submission included:

- Design and Operations Report;
- Construction Plan Report;
- Decommissioning Plan Report;
- Noise Study Report;
- Natural Heritage Assessment (4 reports);
- Water; (2 reports);
- Archaeological Assessments; and
- Cultural Heritage Screening.

These documents will be posted on the project website (www.lunarlightsolar.com).

The PDR provides an overview of the proposed project including location, components, activities and potential negative environmental effects and summarizes the content of the above-listed reports.

2. The Proponent

Canadian Solar Solutions Inc. is managing and coordinating the approvals process for DiscoveryLight LP. Canadian Solar is an experienced developer, owner and operator of power generation and energy delivery assets. Company activities include developing, building, owning and operating renewable energy facilities. Canadian Solar strives to satisfy various environmental approval requirements and obtain regulatory approvals that vary depending on the jurisdiction, project capacity and site location. In addition, they build long-term relationships with the communities that host the projects and are committed to the health and welfare of the City of Belleville, Ontario.

Contact information for the proponent is as follows:

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Prime Contact:	<u>Grace Pasceri</u>
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Telephone:	<u>519-837-1881 x2293</u>
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Email:	<u>Grace.Pasceri@na.canadiansolar.com</u>

Dillon Consulting Limited (Dillon) is the consultant responsible for the preparation of REA-related reports for LunarLight. The contact at Dillon is:

Full Name of Company:	<u>Dillon Consulting Limited</u>
Prime Contact:	<u>Katharine Myrans, REA Project Coordinator</u>
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Email:	<u>kmyrans@dillon.ca</u>

3. Project Location

The proposed Class 3 Solar Facility is located at 157 Bethel Road, approximately 10 kilometres from the community of Stirling. **Figure 1** shows the general location of the project in Ontario. The project location covers part of Lot 9 and 10, Concession 9, of the City of Belleville and consists of 41.68 hectares of privately owned land (leased by the proponent) with geographic coordinates (centroids) as follows:

- Latitude: 44° 19' 5.87" N
- Longitude: 77° 25' 53.86" W

“Project location” is defined in *Ontario Regulation 359/09* to be “a part of land and all or part of any building or structure in, on or over which a person is engaging in or proposes to engage in the project”. **Figure 2** shows the project location as the outer boundary within which all project components will be located. **Figure 2** also identifies natural features and water bodies (based on the records review and site investigation) at and within 300 metres of the project location. **Figure 3** provides detail on the location of facility components. Additional site plans are provided in the *Design and Operations Report*.



Figure 1: General Location of LunarLight in Ontario

LunarLight Figure 2: Project Location and Natural Features

Legend

- 5 m Contour
- - - Transmission Line
- Local Road
- Water Body (Permanent)
- - - Water Body (Intermittent)
- Project Location
- 120 m from Project Location
- 300 m from Project Location
- Lots/Concessions
- Prime Agriculture ¹
- Agricultural ²
- Rural Residential ¹
- Rural ¹
- Rural ²
- BCA Candidate Bullfrog Concentration Area
- Unevaluated Wetland
- Unevaluated Woodland

¹ Municipally Zoned

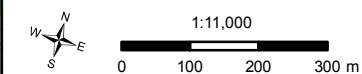
² Municipally Designated

Lands to the north of Clearview Rd. are in the Municipality of Centre Hastings.

Significant Features

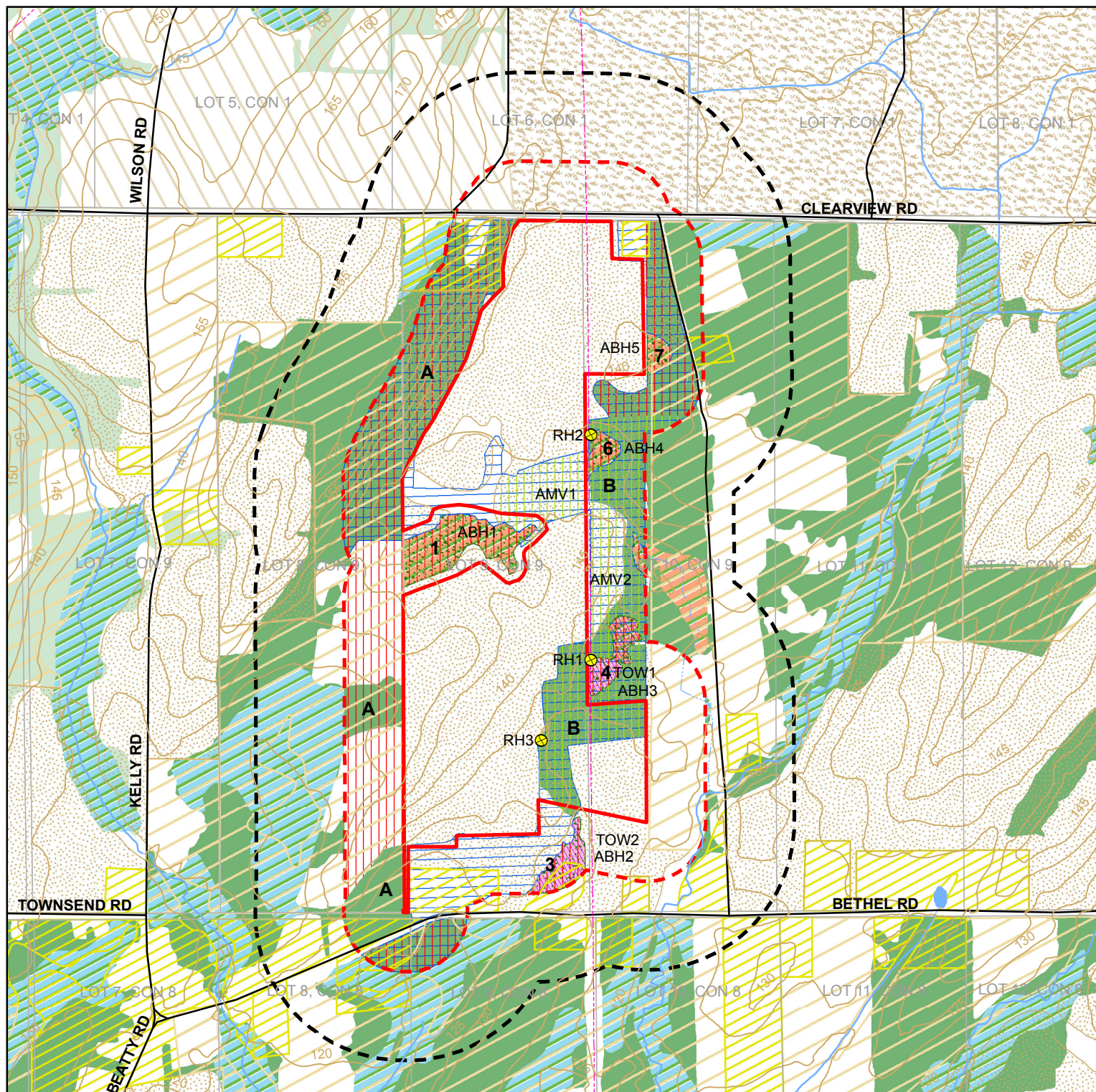
- RH Reptile Hibernacula
- ||| Generalized Candidate Significant Wildlife Habitat
- AMV Amphibian Movement Corridor
- Eastern Milksnake Habitat
- ABH Amphibian Breeding Habitat
- TOW Turtle Over-Wintering Area
- 1 Assumed Provincially Significant Wetland
- A Significant Woodland

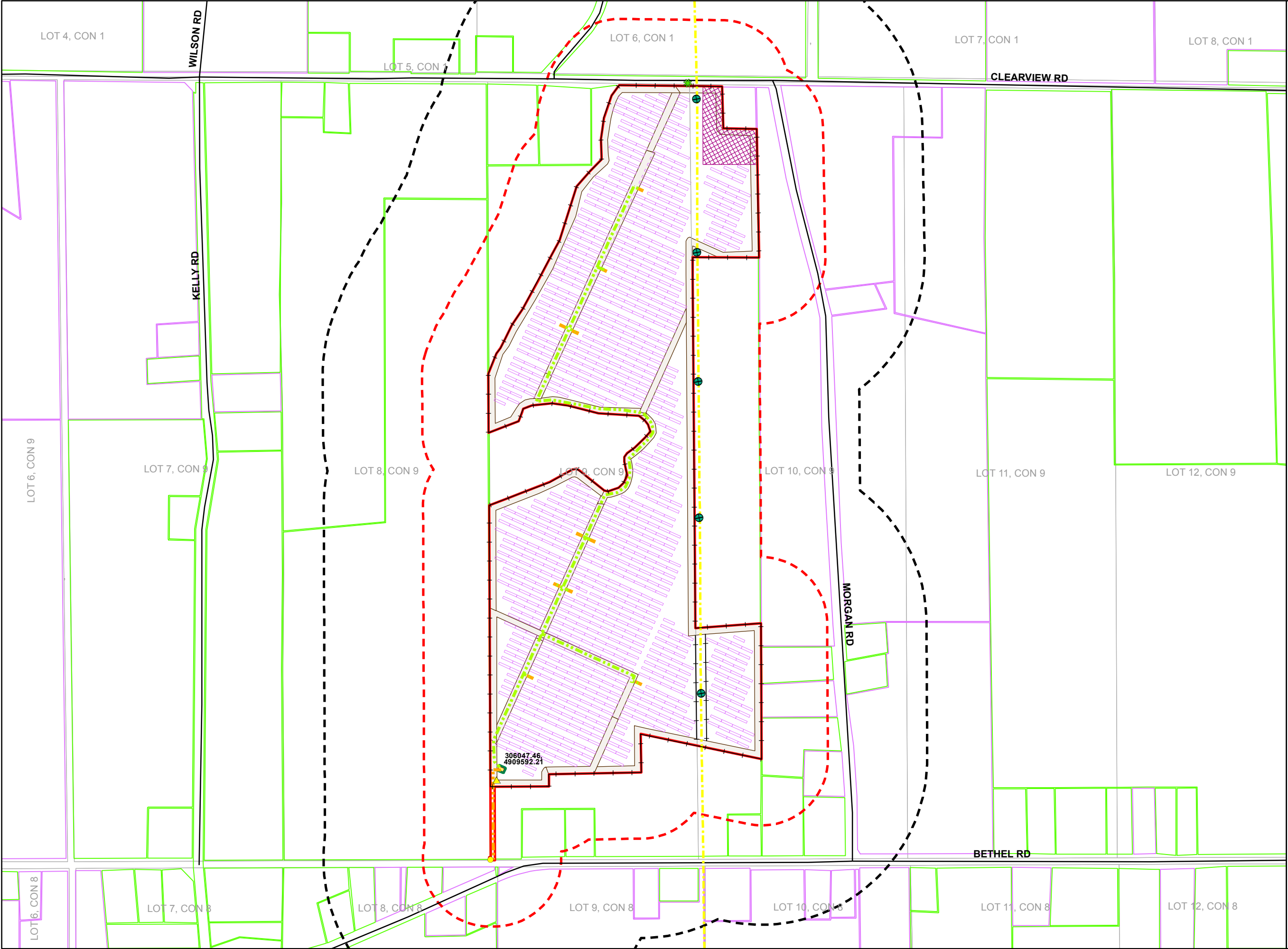
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Date Created: 100810
Date Modified: 031212
Project Centroid: 44.31905, -77.43163
File Path: I:\GIS\114645 - LunarLight,
Mapping\PDRI\Figure 2
LunarLight Project Location PDR.mxd

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**LunarLight
Figure 3:
Site Plan -
Conceptual Component Layout**

- Legend**
- Transmission Tower
 - Utility Line
 - Local Roads
 - Project Location
 - 120 m from Project Location
 - 300 m from Project Location
 - Vacant Parcel
 - Occupied Parcel
 - Lots/Concessions

- Project Components**
- Communication Tower
 - Site Entrance
 - Point of Common Coupling
 - Fence
 - Overhead Line
 - Underground Cable
 - Noise Barrier
 - Inverter Unit
 - Substation
 - Solar Panels and Racks
 - Laydown Area
 - Access Road

All coordinates shown are UTM Zone 18N NAD 83.

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0 50 100 150 200 m

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File Path: I:\GIS\114645 - LunarLight Mapping\PDRI\Figure 3 LunarLight Site Plan-Component Layout.mxd

4. Authorizations Required

Table 1 provides a list of authorizations (applicable permits, agreements, licenses, approvals and confirmation letters) that LunarLight LP expects may be required in addition to the Renewable Energy Approval. These will be obtained prior to construction of the proposed solar facility, if required. It is not anticipated that the project will require a federal environmental assessment.

Table 1: Expected Authorizations for the Project

Authority, Agency or Governing Body	Requirement (if needed)
Electrical Safety Authority	<ul style="list-style-type: none"> ▪ Safety Inspection and Electricity Safety Code Certification (if needed)
Hydro One Networks Inc.	<ul style="list-style-type: none"> ▪ Customer Impact Assessment – Integration of the project within Hydro One and effects on customers (if needed) ▪ Construction Cost Recovery Agreement (if needed)
Landowner	<ul style="list-style-type: none"> ▪ Lease Agreement
Quinte Conservation Authority (QCA)	<ul style="list-style-type: none"> ▪ Regulated Area Permit for development in natural hazard lands under consultation with QCA (if needed)
Ontario Energy Board	<ul style="list-style-type: none"> ▪ License to generate electricity
Ontario Power Authority	<ul style="list-style-type: none"> ▪ FIT contract
City of Belleville	<ul style="list-style-type: none"> ▪ Building Permit(s) (if needed) ▪ Road User Agreement (if needed) ▪ Drainage Assessment (if needed) ▪ Entrance and signage permits (if needed)

5. Project Information

5.1 Nameplate Capacity and Classification

LunarLight is designed to generate a maximum of 10 MW AC of electricity. According to Part II, Section 4 of *Ontario Regulation 359/09*, the proposed project is a Class 3 Solar Facility. The characteristics of a Class 3 Solar Facility, as described in the regulation, are as follows:

- the location of solar photovoltaic (PV) collector panels and devices are at any location other than mounted on the roof or wall of a building; and
- the name plate capacity of the solar facility is greater than 12 kilowatts.

5.2 Land Ownership

The land is privately owned and will be leased to the proponent, LunarLight LP. The legal description for the property is: Lot 9 to 10, Concession 9 Thurlow, as in QR342598 except QR442901 pt 2 and 4 21R10631; S/T QR124331, Belleville.

5.3 Energy Sources

The primary source of energy that will be used to generate electricity will be the kinetic solar energy of moving photons, which will be converted to electrons by the solar PV cells. This will create direct current (DC) electricity which will be inverted to AC at the project location.

5.4 Project Components

PV panels will be the technology used to convert solar energy into electricity. With exposure to sunlight, the solar modules convert solar radiation into direct current (DC) electricity through a PV process. The PV process occurs when the energy from the sunlight is transferred to semiconductors contained in the modules. DC electricity generated from the panels will be collected and converted into AC electricity by inverters. From the inverter units, the electricity will be sent to the step-up substation transformer where it will be metered and sent to the local distribution system.

Details about the project components, both temporary and permanent, that make up the solar energy facility are provided below.

5.4.1 Solar Modules and Mounting System

Approximately 30,000 - 100,000 PV panels of between 60 - 300 watts each will be installed for LunarLight. It is anticipated that the following panels, or similar, will be used: Trina TSM-DA05 220W or Canadian Solar CSA 230W PV solar panels. The modules are designed for outdoor use. The panels will be aligned in rows facing due south (approximately 4 - 10 metres apart) and will be mounted on fixed racking systems which will be attached to galvanized steel and/or aluminum support structures. Based on the results of continued geotechnical assessment during engineering and construction, driven piles, screw piles or concrete foundations will be used as appropriate to minimize potential negative environmental effects.

5.4.2 Inverters, Transformers and Electrical Collection System

DC electricity generated from the panels will be transmitted through underground wires connected to combiner boxes where a number of incoming wires from the racks will be combined into a single outgoing cable. From the combiner box, the DC current will be transmitted below ground to one of ten inverter units (enclosed) which will convert the DC electricity into AC electricity suitable for distribution to the local grid. A total of 10 inverter units will be spread across the project location. The inverter units (SMA's Sunny Central) will be rated for 1000 kVA of continuous output power and will contain two 500 kW inverters, an inverter step-up transformer (1000 kVA), and an internal cooling fan. Each inverter unit will handle 1 MW AC of power from its associated array of panels. The inverters will be equipped with noise mitigation measures to reduce noise emissions, as needed.

The step-up transformers located in the inverter units will increase the voltage of the electricity collected, which will then be distributed below ground (requires trenching) to a main inverter transformer located within the substation. The step-up transformer is expected to be an 11.5 MVA pad mount transformer (make/model to be determined) and will increase the voltage further for connection to the Hydro One transmission grid. A short overhead line mounted on poles will be constructed to the point of common coupling (at the project location boundary and Bethel Road municipal right-of-way). Appropriate grounding systems will be installed for the project, where necessary. The type of support foundation for the inverter units, intermediate transformers and the substation will depend on the results of geotechnical studies and the supplier selected, thus the construction methods may vary.

The substation will be a double-walled transformer or have secondary containment.

5.4.3 Access Roads

A main access road will be needed for the construction equipment and related vehicles to enter the project location off Clearview Road. Internal access roads will also be developed for construction purposes and to provide long-term access for maintenance during operation. The roads will be 3.7 - 5 metres wide and will be granular. Geotextile fabric may be used where necessary to improve structural integrity and preserve the granular. If necessary, culverts will be installed beneath the access roads at locations where conveyance of surface water drainage is required.

5.4.4 Perimeter Fence and Communications Tower and Lighting

For the safety of the public and to prevent vandalism, a perimeter fence will be installed. This will be a chain link fence as required by the Electrical Safety Authority (approximately 2.7 metres in height) around the perimeter of the project location with locked gated entrance(s) and 3-strand barbed wire at the top. For security and maintenance purposes, lights may be installed near the entrance of the facility, and task-specific lights will be provided as necessary. These will be appropriately shielded or directed and may also be motion-sensored to address potential negative effects, as necessary. A communications tower will be installed and operated by Hydro One, for emergency disconnect purposes only.

5.4.5 Temporary Construction Area and Permanent Parking

During construction it will be necessary to designate/construct a temporary storage/laydown and construction staging area for the construction office trailers, portable washrooms, first aid stations, vehicle parking, construction equipment parking, storage sheds, truck unloading/loading, waste disposal pick-up areas, and equipment and material lay-down. All temporary facilities will be removed when the construction period is finished; however, a portion of the construction laydown area may be maintained after construction for maintenance vehicle parking and other uses, as required.

5.4.6 Water Crossings

As shown in **Figure 2**, water bodies have been mapped in relation to the project location. Based on the project layout, no water crossings are anticipated for this project. Water bodies are discussed in further detail in **Section 6.3** of this report.

5.5 Project Activities

The following subsections outline project activities during the construction, operations and decommissioning phases. LunarLight will not require the collection, transmission, treatment, storage, handling, processing or disposal of sewage, biogas, biomass, source-separated organics or surface water. The facility will not discharge contaminants to the air. The facility will be designed and constructed so as to minimize potential negative impacts to stormwater runoff and drainage.

5.5.1 Construction

The following activities associated with construction of the solar facility are anticipated to take between 6 - 9 months and are scheduled to begin spring/summer 2013. They will occur in the relative order in which they are presented in **Table 2**. More information, including construction schedules, materials and equipment, is available in the *Construction Plan Report*.

Table 2: Construction Activities

Activity	Description
Survey and staking of the project location	At the beginning of the construction phase, the site will be surveyed and staked to delineate the boundaries for fencing, access roads, excavations and foundation locations. The survey will identify the location of underground utilities and/or infrastructure. Any significant or provincially significant environmental features and their applicable setbacks (e.g., water bodies, significant wildlife habitat, etc.) will also be clearly demarcated. Areas to be avoided may be fenced and/or flagged, as appropriate.
Clearing, ground levelling, compacting and grading	<p>Graders, bulldozers, scrapers, soil compactors, dump trucks, and wheel loaders will be used to prepare the site. Clearing of some trees and vegetation may be required for the installation of panels and racking. Larger tree cutting will be conducted using chainsaws, and stumps, roots and brush vegetation will be removed using excavators and small bulldozers. Permits for tree removal will be obtained if required by the City of Belleville.</p> <p>Major excavation works or fill placement are not expected for the project. The primary excavation work is likely to be limited to soil removal for various foundations, access roads and digging trenches to run underground electrical cables. Excavation may also be required for the installation of the communications tower.</p>

Activity	Description
Drainage and erosion control	<p>Specific details regarding surface drainage and any construction requirements will be established as part of a stormwater management plan which will be prepared prior to construction and during the detailed design phase of the project. The measures will remain installed throughout the construction period and will be routinely inspected by the contractor.</p>
Installation of perimeter fences and security lighting	<p>Permanent fencing will be installed along the perimeter of the project location. The fence will be approximately 2.7 metres in height with 3-strand barbed wire at the top (or as required by the Electrical Safety Authority (ESA)). A gated entrance will be installed either at the site entrance at Clearview Road or where the internal access road intersects the temporary construction laydown area.</p> <p>For security and maintenance purposes, lights may be installed near the entrance of the facility and task-specific lights will be provided as necessary. They may be motion-sensored and/or shielded or directed to address potential negative effects, as necessary.</p>
Construction of access roads and installation of temporary power	<p>During construction of the access roads, the topsoil will be stripped and stored. Some cut and fill may be required; however, it is expected that the subgrade material will be comprised of existing native granular deposits. The depth of the roadbed will be constructed as required to transport loads associated with construction and maintenance of the project. Geo-grid and geotextile fabric may be used, where necessary, to improve the structural integrity of the road base and to preserve the granular. Where necessary, culverts may be installed beneath the access roads to provide greater stability.</p> <p>During the construction period, on-site electricity to power equipment will be obtained from temporary generators supplied by the contractor. Electricity required for temporary construction offices, lighting and other purposes will be arranged for and obtained from the local electricity provider.</p>
Delineation of temporary storage and construction areas and installation of temporary facilities	<p>After site grading (discussed above) a layer of granular material will be installed to provide an adequate base for construction vehicles, equipment and material laydown. This area may be decommissioned and all temporary facilities removed when the construction period is finished. This area (or a portion of it) may remain as a permanent component after construction for maintenance vehicle parking and other similar uses.</p>

Activity	Description
Construction of foundations	<p>The substation area and ten inverter unit areas will be prepared/ excavated as needed and foundations for the equipment installed. Foundation types may consist of the following:</p> <ul style="list-style-type: none"> ▪ concrete pre-cast pads which are transported to the site by truck and subsequently set into position by a crane; ▪ concrete cast-in place pads, constructed on-site by pouring ready-mix concrete into forms; or ▪ ground screws or plate-mounted steel beams.
Installation of supports, racking and PV modules	<p>An aluminum or steel racking system will be installed on the foundations to support the panels. Foundation types may consist of ground screws or plate-mounted steel beams, which will be installed using a mechanical hydraulic or vibratory pile hammer mounted on a rig to screw or drive the piles into the ground. PV panels will then be mounted on the racks. During the construction phase, the installation of solar panel piles and underground cables may require dewatering if groundwater starts to collect in the trenches and holes dug for these project components. Any water taking would only involve small quantities (<50,000L/day) and will be restricted to low flow time periods.</p>
Installation of wiring and inverters/transformers	<p>Inverter units and the substation transformer will be placed on foundations by a crane. Prior to their installation, trenching will occur using a backhoe (or similar equipment) for the placement of underground cabling. The trenches will be approximately 1 metre deep by 0.5 metres wide and will be backfilled to grade. Overhead cabling supported by poles will be installed within the project location to connect the substation to the point of common coupling, located at the project location boundary and Bethel Road municipal right-of-way.</p>
Clean-up of work areas	<p>After all major construction activities are completed work areas will be returned to their pre-construction condition or similar. All construction-related waste and excess materials brought to the site will be removed by truck and reused, recycled, or disposed of as applicable by a licensed contractor in accordance with provincial guidelines.</p>

Activity	Description
Site landscaping	Site restoration and reclamation is planned for as much of the project location as possible, including along access roads. The restoration and reclamation strategy may include re-contouring of the land to complement natural drainage patterns (in accordance with a stormwater management plan), management and replacement of subsoil (if applicable) and/or topsoil followed by re-vegetation.

All construction activities will be conducted by licensed contractors in accordance with required standards and codes and all activities will abide by local laws and requirements. All construction-related activities will be conducted within the project location outlined in **Figure 2**. Testing and commissioning of the facility will occur over the last few weeks of construction. During construction, no hazardous materials, including fuel, oils or grease will be stored on-site, although equipment will require their use.

In general, the raw materials for construction will include standard building materials such as concrete, wood, aggregate, and metal. To the extent possible, these materials will be procured from local and/or regional sources where they are available in sufficient quality and quantity, and at competitive prices. Beyond the materials required for construction of the facility, resource requirements for ongoing operation of the project include sunlight and the land-base required for the project location, and any associated electrical lines. For more detail on the materials and equipment that will be used during the construction phase, please refer to the draft *Construction Plan Report*.

5.5.2 Operation and Maintenance

LunarLight will operate year round and generate electricity during daylight hours only. The facility will be continuously monitored and managed remotely using an online system that will track performance in real time and identify any problems that may occur. The communications tower will be used for emergency disconnect only.

Given the topography and location of LunarLight, it is not anticipated that significant ongoing stormwater management activities will be required during operation of the facility. LunarLight LP commits to maintaining the existing off-site drainage patterns and conditions off-site and to further mitigating any impacts to the existing site drainage that the proposed solar facility will cause.

The activities in **Table 3** are associated with the operation and maintenance of the solar facility. These activities will take place over the lifetime of the facility. More information is available in the *Design and Operations Report*.

Table 3: Operations and Maintenance Activities

Activity	Description
Monitoring and meter calibrations	The facility will be monitored remotely twenty-four hours a day off-site to ensure proper power output and to alert the operations staff to potential issues. Most issues can be remotely diagnosed so that the correct individual(s) can be dispatched to the facility to correct any problems.
Routine periodic maintenance and inspection of project components	Site visits will occur as scheduled to visually inspect the solar facility and project location and ensure that the facility is in proper working order. Activities that will occur during these visits may include data collection, regular maintenance (as described below) and any necessary minor repairs such as replacement of weathered electrical components. Security visits may also occur periodically. Transformers, inverters, panels and arrays will be visually inspected during scheduled visits.
Lighting	For security and maintenance purposes, task-specific lighting may be installed. No lights are currently planned around the project perimeter. All exterior lights may be motion-sensored and/or shielded or directed, where necessary, to minimize their impact and will be inspected for burned/broken bulbs. Regularly scheduled maintenance will occur.
Cleaning of panels	Cleaning of panels and equipment will take place as required. No water-taking will occur. All water required for panel washing will be trucked to the project location. No harmful cleaning solutions of any type will be used to wash the panels. Manual snow clearing may periodically be required.
Periodic landscape maintenance	Short native vegetation may be planted once construction activities are complete. It will be necessary to maintain the land in such a way that vegetation does not shade or in other ways impact the solar panels. Regular scheduled maintenance will also occur to manage weed growth. This will be done in consideration of any seasonal limitations outlined in the <i>Natural Heritage Assessment</i> . It is not anticipated that herbicides will be used to manage vegetation.

Activity	Description
Major maintenance	Unforeseen, large repairs are not anticipated. Should major maintenance be required it will be performed using existing roads and site access.
Third party inspections and testing	Activities will be carried out as required by the local utility and other governing bodies in addition to any regularly scheduled inspections and testing.
Traffic	No major deliveries are anticipated for maintenance. Minimal vehicle traffic is associated with regular maintenance.
Drainage and erosion control	Stormwater runoff at the project location will be managed as per a stormwater management plan to be developed by the appropriate contractor; and this will be done with consideration to maintaining pre-construction drainage patterns and any recommendations or limitations outlined in the <i>Natural Heritage Assessment</i> or Water Reports. Any implemented measures will be inspected during routine maintenance.
Waste	The operation of the system does not produce waste of any kind. All debris as a result of maintenance or cleaning will be removed from the site immediately by the contractor.

The project will be scheduled for maintenance as required. Typically, maintenance includes checking the structures and connections. Additional maintenance or service may be required if there are issues such as equipment damage or malfunction; however, this is not anticipated to be a common occurrence. Site inspections for all project components will occur on a scheduled basis. Security and minor maintenance are the only regular activities anticipated on-site.

During the operations phase, no hazardous materials will be stored on-site with the exception of oil for transformers, which will be adequately contained and accompanied by a *Spills Response Plan*.

5.5.3 Decommissioning

Decommissioning consists of the removal of above-ground and below-ground facility components, management of excess wastes and materials and the restoration of project location lands and waters, as applicable. Activities are expected to take between 6 - 9 months. Based on the zoning and current land use it is assumed that the probable future use of the project location after decommissioning will be agricultural. This will be confirmed six months prior to decommissioning to ensure that restoring the land for agricultural purposes remains the most appropriate action.

Properly maintained PV panels have an expected lifespan of approximately thirty to fifty years, or more with equipment replacement and repowering. However, it is assumed that the decommissioning process will begin at the end of the power purchase agreement with the OPA (20 years).

The following activities are associated with the decommissioning of the solar facility and will occur in the relative order in which they are presented below:

- disconnection of facility from the utility power grid;
- disconnection of all electrical equipment at the facility;
- dismantling and removal of PV modules, racking and support structures;
- removal of all above-ground electrical lines and poles;
- dismantling and removal of electrical and electronic devices including inverters and transformers;
- dismantling and removal of communication tower, lighting fixtures and their protective shelters;
- removal of underground wiring, as necessary;
- removal of foundations and any other structures;
- removal of access roads (aggregate and geotextile materials) as necessary;
- removal of all non-native materials, including soil, stone, concrete and asphalt;
- site grading and rehabilitation, as necessary;
- re-seeding, as necessary;
- removal of all waste from the project location; and
- removal of perimeter fence.

Most of the materials used in a solar facility are reusable or recyclable and some equipment may have manufacturer take-back and recycling requirements.

Any remaining materials will be removed and disposed of off-site at an appropriate facility. LunarLight LP will establish policies and procedures to maximize recycling and reuse and will work with manufacturers, local subcontractors and waste firms to segregate material to be disposed of, recycled and/or reused. It is not anticipated that any waste materials will be left on-site with the possible exception of some access roads (at the landowners' request). The final decision on waste

disposal or recycling will be made by the on-site contractor who will refer to the standards of the day for waste generated at the facility.

Through the decommissioning phase, the project location could be restored to its pre-construction condition, or a similar state, the site would be restored by grading to restore terrain profiles and the use of a sub-soiler (if necessary) to relieve compaction and restore the soil conditions for agricultural activities. Rehabilitated lands may be seeded with a low-growing species such as clover to help stabilize soil conditions, enhance soil structure and increase soil fertility. Within the project location there are no water bodies as defined by *Ontario Regulation 359/09*. The operation of the solar facility does not release emissions which could pollute the air and water. Thus, decommissioning activities would not include the restoration of any water bodies.

The site will be restored so that the post decommissioning drainage patterns and quality/quantity of stormwater will be similar to pre-construction conditions. It is not expected that the lands surrounding the facility will require any special remediation. More information is available in the *Decommissioning Plan Report*.

6. Potential Environmental Effects

The following subsections provide a summary of potential effects that may result from the construction, installation, operation, maintenance and decommissioning of the renewable energy facility at the project location and within 300 metres. Mitigation and/or monitoring measures to address potential negative environmental effects to natural features, water bodies, cultural heritage and archaeological features, provincial and local infrastructure, land use, public health and safety and land use plan areas are also described below. Further detail on mitigation measures and monitoring is available in the *Natural Heritage Assessment* and Appendix D of the *Design and Operations Report*.

6.1 Cultural Heritage and Archaeological Resources

A Stage 1 and Stage 2 *Archaeological Assessment* was undertaken for LunarLight in July and December 2011 in accordance with the Ministry of Tourism and Culture (MTC) 2011 *Standards and Guidelines for Consultant Archaeologists*.

The Stage 2 *Archaeological Assessment* field work included a pedestrian transect survey and manual test pitting. Results identified one archaeological find of value or interest, which is subject to a Stage 3 *Archaeological Assessment* prior to any development of the property. The Ministry of Tourism, Culture and Sport provided clearance for the Stage 1 and 2 *Archaeological Assessment* on October 11, 2011.

In addition, a *Cultural Heritage Self Assessment* was also completed for the proposed project location. The self assessment concluded there are no areas of identified cultural heritage concern within or abutting the project location and that a full *Cultural Heritage Assessment* would not be required. Should a previously undocumented archaeological resource or cultural heritage feature be discovered during construction, additional field work, in accordance with Section 48 (1) of the *Ontario Heritage Act*, (1990) will be completed before development can continue.

6.2 Natural Heritage Resources

LunarLight LP has undertaken a *Natural Heritage Assessment* consisting of a *Records Review*, *Site Investigation*, *Evaluation of Significance* and *Environmental Impact Study* (EIS). The *Natural Heritage Assessment* identified the following natural features within 120 metres of the project location:

- 6 unevaluated southern wetlands;
- 2 woodland areas; and,
- Candidate wildlife habitat including:

- Reptile Hibernacula (3 units);
- Bullfrog Concentration Areas (2 units);
- Amphibian breeding habitat (6 units);
- Turtle Over-wintering Areas (2 units);
- Habitat for Species of Conservation Concern: Western Chorus Frog, Snapping Turtle, Northern Map Turtle, Golden-winged Warbler, Five-lined Skink, Northern Ribbon snake and Eastern Milksnake;
- Amphibian Movement Corridor (2 units); and,
- Generalized Candidate Significant Wildlife Habitat within 120 metres.

After these natural features were evaluated for significance using procedures and criteria approved by the Ministry of Natural Resources (MNR), the following determinations were made:

- The unevaluated southern wetlands were assumed to be provincially significant using the MNR's Rapid Assessment to determine wetland characteristics and ecological functions.
- The two units of woodland were determined to be significant based on size (223.36 ha and 592.14 ha), amount of interior habitat (57.9 hectares and 142.94 hectares) and location adjacent to other significant natural features.
- The unevaluated southern wetlands were evaluated as significant amphibian breeding habitat based on surveys conducted. Although habitat for Western Chorus Frogs (a Species of Conservation Concern) was included as part of the candidate amphibian breeding habitats, no Western Chorus Frogs were recorded within any of the habitat units evaluated. Based on this evaluation of significance, the land between the habitat units will be studied to determine their significance as an amphibian movement corridor. For the purpose of this NHA, they will be treated as significant.
- Reptile hibernacula are being treated as significant until appropriate studies can be conducted in consultation with the MNR. Habitat for Eastern Milksnake, Northern Ribbon Snake, and Five-lined Skink (Species of Conservation Concern), are being considered in association with the reptile hibernacula, and are therefore also being treated as significant until appropriate studies can be conducted in consultation with the MNR.
- The bullfrog concentration area was determined not significant based on marginal habitat and lack of a documented concentration of bullfrogs.

- Two areas were identified as candidate turtle over-wintering area during site investigation work. This mix of marsh and open water habitat will be treated as significant for turtles until appropriate studies are conducted in consultation with the MNR. Habitat for Northern Map Turtles and Snapping Turtles (both Species of Conservation Concern) will be considered during the planned studies.
- Various other forms of wildlife habitat have the potential to occur within 120 metres of the project location. These wildlife habitats have been grouped together and mapped as Generalized Candidate Significant Wildlife Habitat based on guidance from the MNR. The MNR has determined that the wildlife habitat that has been included in this group will not be impacted by the development and operation of a solar farm.

Figure 2 shows natural heritage features within and adjacent to the project location based on the NHA *Evaluation of Significance* work.

Based on the natural environment information collected, the project location was refined to avoid impacts to significant and/or sensitive natural heritage features. The layout of the solar project (as shown in **Figure 3**) has been developed to minimize its footprint and prioritize the protection of natural features.

The potential negative environmental effects LunarLight may have on significant natural features include:

- Removal of 3.26 hectares of irregularly-shaped woodland area from Woodland B;
- Damage to woodland edge species through soil compaction and trenching where tree roots may occur;
- Permanent obstacle to wildlife movement after construction of perimeter security fence;
- Avoidance of area by wildlife species;
- Displacement of wildlife species from habitat;
- Alteration of surface water flows to adjacent lands (quantity, quality, infiltrations, conveyance patterns and seasonality of water flow);
- Soil mobilization resulting in sedimentation of adjacent habitat;
- Light and/or noise disturbance;
- Disturbance/incidental mortality to wildlife species from project activities.

In consideration of these potential environmental effects, mitigation measures have been proposed to minimize or eliminate these effects and maintain the ecological integrity and functionality of these significant natural features. Mitigation and/or monitoring measures proposed include:

- Erosion and sediment control measures prior to site clearing and regularly maintained until the project is operational and vegetative ground cover is re-established;
- Limit vegetation clearing outside of the core breeding period (May 1 - July 15) to avoid disturbance to breeding birds; if any vegetation clearing must occur during this period a qualified biologist will conduct nest searches prior to clearing;
- Limit the use of heavy machinery within 5 metres of the dripline of the woodland to prevent soil compaction;
- Implement dust suppression measures as necessary during construction;
- Check engines for snakes and other wildlife regularly before machinery use;
- Conduct removal of rock pile during the summer months when it is least likely to be used as winter cover. If removal of feature is not feasible, project components will be setback from the feature at a distance agreed upon with the MNR;
- Conduct searches in the area before grading in order to remove snakes according to safe handling procedures developed in consultation with the MNR and conducted by a qualified biologist;
- Minimize vehicle speeds in the project location to avoid wildlife mortalities
- Re-vegetate land with native grassland species, if necessary;
- Development and implementation of a grading and water flow management plan which maintains pre-construction surface water flows to adjacent lands (quantity, quality, infiltrations, conveyance patterns and seasonality of water flow); and,
- Undertake one-year of post-construction amphibian and reptile surveys to determine species presence, abundance and richness is not significantly different from pre-construction levels.

No residual effects are anticipated after mitigation measures are implemented. The *Natural Heritage Assessment* for this project has been confirmed as complete by the Ministry of Natural Resources on May 14, 2012.

6.3 Water Bodies

LunarLight LP has undertaken a *Water Assessment* and completed a *Water Body Report* to identify all water bodies within the project location and lands within 120 metres. As outlined in the *Water Assessment Report*, two potential water bodies, as defined by *Ontario Regulation 359/09*, were mapped within 120 metres of the project location. After a thorough site investigation was undertaken of the project location and adjacent lands, it was determined that only one of the two unevaluated streams met the definition of a water body.

This stream was determined to be intermittent in nature, with some sections having little to no observable water and/or flow. The channel is defined and has attributes indicative of being channelized. The intermittent stream is approximately 0.50 metres wide, with a bankfull width of 0.75 metres. The wetted depth of the stream was measured at less than 0.01 metres at the time of the site investigation; the mean bankfull depth is approximately 0.15 metres. In-stream cover is limited to overhanging vegetation and floating vegetation was observed. No evidence of groundwater was noted. The lands within 30 metres of the stream consist of old field meadow and mineral cultural woodland. This stream ultimately flows downstream and connects with a larger permanent stream that flows in a southerly direction through a culvert under Bethel Road. This permanent stream occurs more than 120 metres from the project location but is within the 300 metre setback area.

The other potential water body had no features indicative of a permanent or intermittent stream were observed. No defined channel, presence of seepage, or features indicative of a streambed that carries water intermittently were observed. In addition, during the site investigation, a small open water area was identified during the site investigation. This feature was determined to be a dug farm pond and therefore does not meet the definition of a water body under *Ontario Regulation 359/09*.

The potential negative environmental effects LunarLight may have on water bodies include:

- Changes in natural drainage, including increased or decreased surface runoff; increased or decreased stream flows and redirection of surface flow;
- Potential for soil mobilization and erosion resulting in increased sedimentation and turbidity;
- Limited potential to decrease surface permeability and redirect surface runoff;
- Decreased site permeability has potential to increase amount of surface runoff;
- Limited potential for accidental spills of soil and/or surface runoff from equipment and machinery;

- Increased inputs of nutrients;
- Accidental spills from transformers (inverters and substation);
- Increased sedimentation and turbidity may affect fish habitat (e.g., spawning areas, food sources, benthic composition); and,
- Runoff of soil and/or surface runoff may impact fish habitat and water quality of downstream receiving waters.

In consideration of these potential environmental effects, mitigation measures have been proposed to minimize and/or eliminate these effects and maintain the ecological integrity and functionality of applicable water bodies identified within 120 metres of the project location. These mitigation measures will also mitigate effects to water bodies that may occur beyond the 120 metre setback. Mitigation measures proposed include:

- An erosion and sediment control plan will be developed for the site and maintained through the construction and decommissioning phases of the project. This plan will include standard erosion and sediment control measures such as silt fencing, erosion control blankets and/or hay bales, etc.;
- Minimize changes in land contours and maintain natural off-site drainage patterns where possible;
- Develop grading and water flow management plans to emulate pre-construction off-site conditions;
- Operate machinery in the areas designated for construction;
- Control the rate and timing of water pumping. Pump water onto vegetated surfaces if possible or into a temporary retention basin. If possible, restrict groundwater taking to low flow time periods, and to less than 50,000 litres per day;
- Construction equipment and materials will be primarily stored in the construction laydown area. No equipment or materials will be stored within 30 metres of a water body;
- Efforts will be made to avoid tracking soil from the project location onto municipal roads;
- Upon completion of project construction, the project location will be vegetated with a mix of native grasses and/or monitored to ensure land naturally re-vegetates within one growing season;

- Transformers are to be located more than 30 metres from a water body; and,
- Spill containment structures associated with the transformer substation.

For further detail on mitigation and monitoring plans related to potential effects to natural features and water bodies, please refer to the *Water Body Report* and Appendix D of the *Design and Operations Report*.

6.4 Air, Odour and Dust

Once operational, the renewable energy facility is not anticipated to create dust, odour or emissions to air except as a result of some maintenance activities. During construction, an increase in particulate matter (dust) may be experienced in the adjacent area, which is predominantly agricultural, as a result of construction activities such as clearing and grubbing, grading and levelling, construction of access roads and travel of construction vehicles and equipment over gravel roads. Additionally, there will be emissions from the diesel engines of construction machinery and equipment which may cause temporary negative impacts to local air quality and odour nuisance.

The impacts will be localized and temporary and will not have a significant impact on regional air quality or climate change. Appropriate air quality mitigation measures (such as keeping equipment properly maintained, minimizing vehicle idling, using dust mats, and watering roads to reduce dust, as required) will be implemented during construction and should keep these negative impacts to a minimum.

6.5 Noise

During the construction period, which is expected to be 6 - 9 months, construction activities may lead to elevated levels of noise in the area. Mitigation measures will reduce the impact of construction noise on surrounding land uses (e.g. maintaining equipment in good working order, and prohibiting vehicle idling where possible). Minimal noise (vehicles, spray washing) could also be experienced by nearby receptors during times of periodic maintenance. Efforts will be made to minimize this noise and the project will comply with applicable By-laws and restrictions. Based on the results of the *Noise Study Report*, noise mitigation measures are required for all of the inverter units at the project location to ensure that noise levels meet MOE requirements. It was determined through noise modeling iterations that noise mitigation measures would also be required for the substation transformer. With these mitigation measures in place, the project complies with the MOE environmental noise guidelines. For more information, please refer to the *Noise Study Report*.

6.6 Land Use and Resources

The planned solar facility will occur within lands zoned by the City of Belleville as 'Prime Agriculture'. The project location lands are currently under active agricultural production of row crops and the solar facility will temporarily alter the land use. Mitigation measures will be undertaken to ensure there are no impacts to surrounding land uses, which are primarily agricultural operations and residential dwellings. The project location could be returned to its pre-construction condition or future anticipated land use after decommissioning.

The proposed facility is physically low-profile and would be non-obtrusive to the surrounding community. Visual impact studies will be conducted as necessary and landscaping will be implemented as required.

6.7 Provincial and Local Infrastructure

Periodic traffic disruptions may occur along Clearview Road, Kelly Road, Wilson Road, Bethel Road, Morgan Road and School House Road during the construction phase of the project and damage to roads is possible due to heavy and frequent construction vehicle and equipment travel. Roads will be returned to or maintained at pre-construction conditions.

Connection of the solar facility with Hydro One's existing distribution line may result in some temporary power outages of short duration to local customers. Connection to the provincial grid has been considered under the FIT program and no negative effects are anticipated during the operational phase of the project. Any mitigation measures to minimize power outages will be undertaken by Hydro One.

6.8 Public Health and Safety

Potential impacts to public health and safety are minimal but include those generally related to construction. Noise, vibration, dust and equipment emissions during construction are the key causes of human health impacts. These effects will likely be small, localized and temporary in nature and mitigation measures will be implemented to address or minimize the impacts. Mitigation measures include: maintaining equipment in good working order; traffic management; prohibiting vehicle and equipment idling, where possible; and watering down of roads as necessary.

Although highly unlikely, there is also limited potential for injury or death related to the operation of construction equipment and vehicles. Temporary and permanent fencing will prevent unauthorized access and ensure public safety during the construction and operational phases. Applicable safety

policies and procedures will be adhered to during the construction phase of the project. Construction activities will be conducted by licensed on-site contractors in accordance with Health and Safety Plans and applicable regulations.

In addition, it should be noted that there is limited potential for fires at the project location. The solar PV panels and related equipment represent a negligible increase in fire potential. Risk for vegetative fuel build-up is minimal and will be no greater than when the land was used for agricultural purposes.

Emergency Response and Communications Plans will also be prepared in the event of an emergency on the site and will provide key contact information for relevant responders, regulators, landowners and other stakeholders. These plans are discussed in further detail in the *Design and Operations Report*.

6.9 Areas Protected under Provincial Plans and Policies

The project is not located in or adjacent to areas subject to Land Use Plans. Specifically, the project does not lie within the Niagara Escarpment, Lake Simcoe Watershed, Oak Ridges Moraine or the Greenbelt. No negative effects are anticipated.

7. Benefits of the Project

The generation of power from solar energy will displace approximately 10 MW AC of electricity that otherwise may have been generated by fossil fuel burning or non-renewable power plants. As a result the energy generated will not contribute to climate change or emissions-related health impacts. A further benefit is that local jobs will be created, especially during the construction phase. The project supports the goals of the Province's *Green Energy and Green Economy Act, 2009*.