RE SMITHS FALLS 1 SOLAR PROJECT

Waterbodies Environmental Impact Study

July 8, 2011

RECURRENT ENERGY

RE Smiths Falls 1 ULC

Waterbodies
Environmental Impact Study

RE Smiths Falls 1 Solar Project

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Project Report

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1. Introduction

RE Smiths Falls 1 ULC is proposing to develop and operate a 10-megawatt (MW) solar photovoltaic (Solar PV) facility, on an approximately 48-hectare (ha) parcel of land, located about 3 km south of Smiths Falls in the Township of Rideau Lakes in the United Counties of Leeds and Grenville (see Figure 1.1); herein referred to as "RE Smiths Falls 1" or the "Project".

As stated in Sections 39 and 40 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 (EIS) is required for all waterbodies determined to be within a specified setback in order to obtain a Renewable Energy Approval (REA). The EIS identifies the potential negative environmental effects, documents the proposed mitigation measures, and describes the environmental effects monitoring plan for the waterbodies.

1.1 Renewable Energy Approval Legislative Requirements

As per Section 4 of the REA Regulation, ground-mounted solar facilities with a nameplate 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 waterbodies on and adjacent to the Project site, including the Records Review Report, Site Investigation Report and if necessary, the EIS. The legislative requirements for these reports are summarized in the following sections.

1.1.1 Records Review Report

Section 30 of the REA Regulation requires proponents of Class 3 solar projects to undertake a water body records review to identify "whether the Project is

1. in a water body
2. within 120 m of the average annual high water mark of a lake, other than a lake trout lake that is at or above development capacity
3. within 300 m of the average annual high water mark of a lake trout lake that is at or above development capacity
4. within 120 m of the average annual high water mark of a permanent or intermittent stream, or
5. within 120 m of a seepage area." (O. Reg. 359/09, s. 30, Table).

Subsection 30(2) 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). The Water Body Records Review Report (Hatch Ltd., 2010a) was prepared to meet these requirements. The report was also prepared in accordance with the Ministry of Environment's DRAFT Technical Bulletin – Guidance for Preparing the Water Assessment and Water Body Reports (dated January 28, 2011).

1.1.2 Site Investigation Report

Section 31 of the REA Regulation requires proponents of Class 3 solar projects to undertake a water site investigation for the purpose of determining

- whether the results of the analysis summarized in the (Water Body Records Review) report prepared under Subsection 30(2) are correct or require correction, and identifying any required corrections
- whether any additional waterbodies exist, other than those that were identified in the (Water Body Records Review) report prepared under Subsection 30(2)
- the boundaries, located within 120 m of the Project location, of any water body that was identified in the records review or the site investigation; and
- the distance from the Project location to the boundaries determined under Clause 3.

The Water Body Site Investigations Report (Hatch Ltd., 2010b) was prepared to meet these requirements. The report was also prepared in accordance with the Ministry of Environment's DRAFT Technical Bulletin – Guidance for Preparing the Water Assessment and Water Body Reports (dated January 28, 2011).

1.1.3 Environmental Impact Study Report

Section 39(1) of the REA Regulation prohibits the construction, installation or expansion of any component of a solar Project within the following locations:

- a lake or within 30 m of the average annual high water mark of a lake
- a permanent or intermittent stream or within 30 m of the average annual high water mark of a permanent or intermittent stream
- a seepage area or within 30 m of a seepage area.

However, Section 39(2) allows proponents to construct Project components other than solar panels or transformers (e.g., access roads or distribution lines) within the locations noted above, subject to the completion of an EIS to assess negative effects and required mitigation and monitoring measures.

Section 40(1) of the REA Regulation prohibits construction, installation or expansion of any component of a solar Project within the following locations:

- within 120 m of the average annual high water mark of a lake, other than a lake trout lake that is at or above development capacity
- within 300 m of the average annual high water mark of a lake trout lake that is at or above development capacity
- within 120 m of the high water mark of a permanent or intermittent stream
- within 120 m of a seepage area.

However, Section 40(2) allows proponents to construct Project components within the locations noted above, subject to the completion of an EIS.

Sections 39 and 40 of the REA Regulation indicate that the EIS report must

identify and assess any negative environmental effects of the projects on the waterbodies and on land within 30 m of the water body

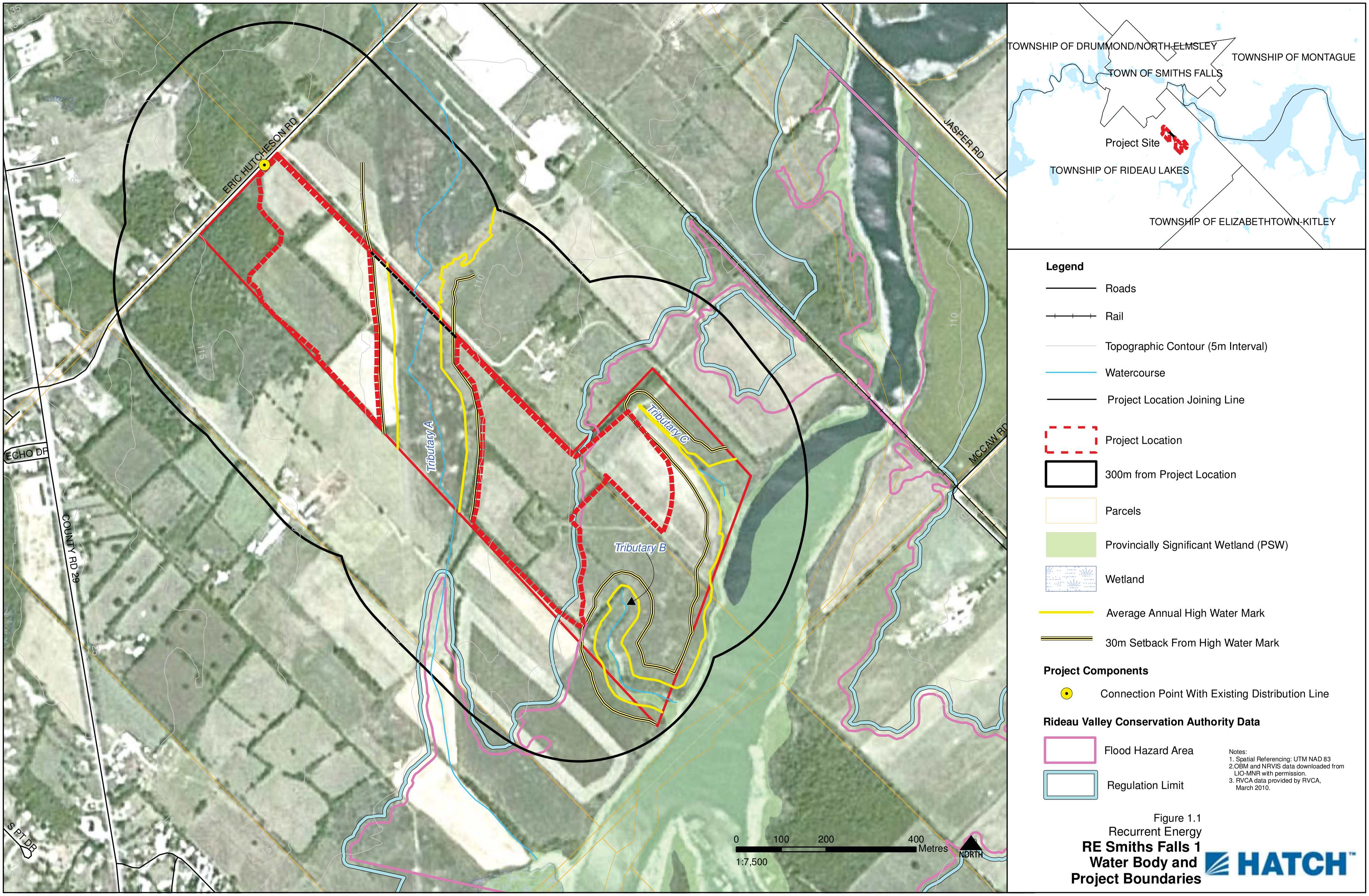

Figure 1.1
Recurrent Energy
RE Smiths Falls 1 Water Body and Project Boundaries

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- identify mitigation measures in respect of any negative environmental effects
- describe how the environmental effects monitoring plan in the Design and Operations Report (RE Smiths Falls 1 ULC, 2010a) addresses any negative environmental effects
- describe how the Construction Plan Report (RE Smiths Falls 1 ULC, 2010b) addresses any negative environmental effects.

This EIS has been prepared to address these requirements for the construction of Project components between 30 and 120 m from the waterbodies noted in the following section. The EIS has also been prepared in accordance with the Ministry of Environment's DRAFT Technical Bulletin – Guidance for Preparing the Water Assessment and Water Body Reports (dated January 28, 2011).

1.2 Background Information on Waterbodies

The Water Body Records Review (Hatch Ltd., 2010a) and Water Body Site Investigations Report (Hatch Ltd., 2010b) confirmed that there are three unnamed watercourses (Watercourses A, B and C) on the Project site, all of which drain into Otter Creek. Otter Creek is located immediately south of the Project site. The proposed Project may be constructed between 30 and 120 m away from the average annual high water mark of these four waterbodies. In addition, the existing access road that crosses Watercourse A may require upgrading, which may necessitate installation of a new water crossing structure. The proposed distribution line from the Project will also cross Watercourse A. Therefore, an EIS is required to assess the effects and mitigation.

1.3 Environmental Impact Study Format

Section 1 of this Waterbodies EIS has identified the legislative requirements for an EIS under the REA Regulation and identified the reasons why an EIS is required for the Project. Section 2 summarizes methodology that was used to prepare the EIS. Section 3 summarizes the activities associated with Project construction, operation and decommissioning. Section 4 identifies and assesses negative environmental effects on the waterbodies and mitigation measures to prevent/minimize the potential effects. Section 5 describes the environmental effects monitoring plan from the Design and Operations Report (RE Smiths Falls 1 ULC, 2010a) and Section 6 describes how the Construction Plan Report (RE Smiths Falls 1 ULC, 2010b) addresses the potential negative environmental effects. Section 7 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:

- documentation of Project components and activities during all Project phases, including construction, operations and decommissioning, including identification of temporal and spatial boundaries
- background data collection on the waterbodies within 120 m of the Project site through the Records Review and Site Investigation processes
- identification of the effects that are likely to occur on the environmental components as result of implementing the Project

- development of mitigation measures to eliminate, alleviate or avoid the identified negative effects
- design of an environmental effects monitoring program to confirm the predicted effects and the effectiveness of mitigation measures.

3. Project Components and Activities

The following sections briefly describe the construction, operation and decommissioning phases of the Project. More detailed information on the Project phases can be found in the Construction Plan Report (RE Smiths Falls 1 ULC, 2010b), Design and Operations Plan (RE Smiths Falls 1 ULC, 2010a) and Decommissioning Plan Report (RE Smiths Falls 1 ULC, 2010c). The Site Layout from RE Smiths Falls 1 ULC (2010b) is provided in Appendix A to show the detailed components of the facility, including solar panel, inverter, transformer and access road locations.

3.1 Construction

The activities associated with construction are summarized in Table 3.1.

Table 3.1 General Description of Construction Activities (From RE Smiths Falls 1 ULC, 2010b)

Activity	Description
Temporary Power Installation	A temporary connection to the existing electrical system will be constructed to supply power for construction activities.
Survey and Stake Facility	The site will be surveyed and staked to delineate the outline of excavations, roads and foundation locations.
Laydown Area Preparation and Setup	Construction of the construction laydown/long-term parking area (~30 m by 50 m) will include • clearing and grubbing laydown area • stripping and removing all topsoil • shaping and proof-rolling subgrade • shaping ditches and swales • placing, shaping and compacting granular sub-base and base materials • revegetating ditches and swales.
Access Road Construction	Activities associated with construction of internal access roads will include • clearing and grubbing laydown area • stripping and removing all topsoil • shaping and proof-rolling subgrade • shaping ditches and swales • placing, shaping and compacting granular sub-base and base materials • revegetating ditches and swales • upgrading water crossing over Watercourse A.
Water Well Installation	A water well will be installed to supply water for construction purposes. Water extracted is anticipate to be around 10,000 L/d but will not exceed 45,000 L/d. Water will be temporarily stored in a bladder tank on site.

Activity	Description
Solar PV Field Preparation	Hedgerows and scrub land in the solar PV field will be cleared. Larger trees will be felled by chainsaw, smaller brush will be removed by a bulldozer with a brush rake. Material will be re-used on site or managed in accordance with regulatory requirements. Minor grading will be undertaken as required.
Substation Preparation	The substation area (~20 m by 20 m) will be excavated for the transformer foundation and oil containment area. The substation site will be prepared and excavated for the footings required for the termination equipment and control house foundation pad.
Array Foundation Installation	Array foundations will consist of structural footings (e.g., structural piles, augured pre-cast concrete piers or direct bolting to bedrock) designed and installed depending on the geotechnical conditions.
Foundations for Substation, Transformer and Inverters	Foundations will be formed with plywood and reinforced with structural steel. Concrete will be poured from a ready-mix concrete truck to create foundations.
Cable Trench and Conduit Installation	Cable trench and conduits will be installed for the PV collection and aggregation system. Activities include • trench excavation by backhoe • installation of levelled layer of compacted stone on base of trench • installation of conduit within trench • installation of cables within the conduit • burying of conduit a minimum of 46 cm below grade.
Dead End Structures	Wood pole dead end structures consisting of wood poles and associated insulators and connectors will be installed to connect the substation to the distribution line.
Control House Installation	A pre-fabricated control house (approximately 6 m by 9 m) will be installed on the foundation pad in the substation area.
Fencing	A 2.7-m (9-ft) high chain-link security fence, with provision for barbed wire, will be erected around the perimeter of the Project site.
PV Array Installation	Activities include • installation of outdoor transformers and inverter units on the foundation pads • erection of PV support structures • installation of PV modules in the support structures • installation of combiner boxes on the rear of the finished PV arrays.
Substation Installation	Installation of main power transformer, switchgear cells, metering, service transformer and disconnect switches in the substation area.
Commissioning	The substation equipment, inverters, collector system and PV array systems will be tested and commercial operations will commence. Activities will include testing, calibration and troubleshooting.
Rehabilitate Site	Once major construction has been completed, the site will be reseeded/revegetated.

3.2 Operation

The facility will operate 365 d/yr when sufficient solar radiation exists to generate electricity. The facility will be remotely monitored with no regular on-site employees. Periodic inspections will be conducted during the operations phase, with maintenance conducted as required. Operations and maintenance requirements are summarized in Table 3.2. It is anticipated that the facility will operate for 30 years.

Table 3.2 General Description of Operating Activities

Activity	Description
Milestone Commercial Operation Date	June 14, 2012
On-Site Employees	Zero (0) on-site employees
Periodic Inspection and Maintenance	Periodic inspections will be conducted with minor maintenance undertaken as required. Activities may include vegetation control, panel washing, transformer inspection, inspection of primary system components, replacement of air filters and other minor adjustments or maintenance as needed.
Major Maintenance	In the event of a component failure, all major maintenance can be performed utilizing existing roads and site access.
Cleaning of Panels	Approximately three times per year on average, utilizing water from the on-site well. Approximately 25,700 L of water over a 4 to 5 day period is anticipated for each cleaning event. Water only is used for cleaning – no cleaning solutions of any kind are used to wash the panels.
Fuel Consumption	None.
Solid Waste	None – the system does not produce waste of any type. All debris as a result of maintenance or cleaning will be removed from the site immediately by the contracted party.

3.3 Decommissioning

Decommissioning would occur when the decision has been made that it is no longer economically feasible to continue operation or refurbish generating equipment. It is anticipated that decommissioning would not occur until 2043.

All decommissioning and site restoration activities would adhere to the requirements of appropriate regulatory authorities and would be conducted in accordance with all applicable federal, provincial and municipal permits and other requirements. The decommissioning and restoration process comprises the following activities:

- removal of above-ground structures (i.e., solar panels, upper racking, inverters, distribution line and interconnection equipment and access road materials)
- removal of below ground structures to a depth of at least 1.2 m (i.e., below ground racking/piers, transformer/inverter pads and footings)
- site grading (to remove ditches, access road, etc) and restoration of topsoil to facilitate a return to agricultural conditions
- site grading (to remove ditches, access road, etc) and replacement of topsoil where moved and reseed with native grass species.

4. Potential Negative Environmental Effects and Proposed Mitigation Measures

This section describes the anticipated negative environmental effects on the indentified waterbodies and land within 30 m of the waterbodies that could occur as a result of construction, operation and decommissioning phases of the Project (as described in Section 3).

Potential negative effects are discussed under each environmental component associated with waterbodies and adjacent lands, where effects on the land could negatively affect the water body. Mitigation measures are proposed to minimize, eliminate or alleviate any negative effects. Relevant environmental components include

- surface water runoff (patterns and rates)
- surface water quality
- groundwater
- aquatic biota
- aquatic and riparian habitat.

4.1 Surface Water Runoff

Surface water runoff occurs when snow melts and/or precipitation hits the ground and runs along the surface of the land, following the path of least resistance, typically toward a watercourse or other stormwater conveyance feature. Descriptors of runoff can include the pattern that runoff takes en route to its discharge to water features (i.e., the overland runoff routes) and the rate at which runoff leaves the land (e.g., the volume of runoff per unit area per unit time, such as m^3/m^2/minute).

Surface water runoff can interact with a number of other environmental components and biophysical processes occurring on land and in water. Examples include

- recharge of groundwater supplies due to infiltration into the land
- uptake of water by vegetation (either through the roots or by interception on the plant)
- erosion of land due to changes in runoff patterns or rates
- alterations in watercourse hydrology
  - higher peak flows if surface water runoff rates increase (e.g., if more water leaves the land and enters the watercourse) or lower peak flows if runoff rates decrease (e.g., if more water infiltrates the land and is taken up by vegetation)
  - alterations in the rate of change in watercourse flows (e.g., flows increase at a higher rate if water runs off the land faster), including increase in 'flashiness' of watercourses
- alterations in watercourse geomorphology (e.g., channel conditions) due to changes in flows or water levels resulting in changes in sediment transport (bed and bank erosion or sediment deposition).

Surface water runoff can potentially be affected by any activities that result in

- changes in land topography
- changes in infiltration to the land
- changes in vegetation surface water uptake via interception or in-ground uptake.

4.1.1 Construction Phase

Activities that could occur during the construction phase that would have the potential to affect surface water runoff patterns and rates include

- land grading and ditching
- soil compaction due to heavy equipment or stockpiling
- vegetation removal.

The potential negative effects and mitigation measures associated with these activities are discussed in the following sections.

4.1.1.1 Land Grading and Ditching

All solar panel installation activities will take place in existing hay fields, hedgerows and small naturally vegetated patches of scrub land or wooded area, and no major grading works are anticipated to be required to install any of the temporary or permanent Project components. Minor, localized grading may be required for temporary laydown areas, inverter/transformer pads and access roads. This minor grading may locally alter runoff patterns compared to the existing diffuse runoff from the agricultural fields. Any minor grading will take into consideration the current land grade and will try to replicate the present stormwater flow pattern. However, the size of the graded area will be very small relative to the size of the Project site, so no measurable effect on surface water runoff is anticipated to occur as a result of this grading. No grading or site development will occur within the Regulated Area adjacent to Otter Creek.

Drainage features including ditching and cross culverts will be required to maintain site drainage across access roads traversing the Project site. These drainage features will serve to concentrate site runoff at discharge points, which, depending on site gradient, will consist of areas adjacent naturally vegetated features, or adjacent to watercourses. Surface runoff from ditches into adjacent fields or non-agricultural areas is not anticipated to have any adverse effect on waterbodies since the runoff will be dissipated prior to entering watercourses. However, surface runoff at discharge points to watercourses may be at a higher rate than runoff from the existing hay fields, since runoff from the fields is more diffuse.

This higher rate of runoff from the access road ditches could potentially result in negative effects on the nearby waterbodies. In order to mitigate negative effects, RE Smiths Falls 1 ULC is proposing to undertake a number of measures including the following:

- Within the 30-m buffer adjacent to watercourses, flow dissipation measures (e.g., enhanced vegetated swales, rock check dams) will be installed to temporarily retain water and decrease flow velocity, and offshoot ditches will be installed from the main ditch within the 30-m buffer zone, to promote diffuse overland flow through the vegetated buffer area (where grades allow) or swales, so flow is dissipated prior to entering watercourses.

- Ditches will be grassed to the extent possible to further retain water (via uptake in vegetation) and also reduce erosion potential. Filter strips will be used at discharge area where possible.

Therefore, surface water runoff from the site may be increased at ditch discharge areas compared to more diffuse runoff from the existing fields. However, the mitigation noted above to control runoff entering the waterbodies downstream from the ditch discharge locations will prevent negative effects on waterbodies.

4.1.1.2 Soil Compaction

Soil compaction may result from the use of heavy equipment (e.g., tracked bulldozers and backhoes), and stockpiling of heavy materials (e.g., soils). Soil compaction occurs when heavy equipment or material causes the soil particles to be pushed together, thereby increasing soil density and reducing the pore space within the soil structure (DeJong-Hughes et al., 2001). Excessive soil compaction can result in inhibited water infiltration due to decreased pore space within the soil structure (DeJong-Hughes et al., 2001). Decreased water infiltration into the soil could also potentially result in an increase in surface runoff.

It is likely that some compaction will occur around the site. Prior to site rehabilitation, disturbed areas will be visually monitored to assess if compaction has occurred, as noted by rutting or flattened areas beneath stockpiles. Restoration efforts (e.g., discing or other soil loosening methods) will be undertaken as required to prevent long-term impacts due to excessive amounts of compaction. Soil compaction will likely occur in localized areas within the zone of disturbance during the short-term construction period. However, no significant long-term change in soil structure is anticipated following implementation of site restoration and associated mitigation to remediate significantly compacted areas, although minor amounts of compaction may persist in localized areas.

Therefore, no measurable change in surface water runoff is anticipated to occur due to minor, localized soil compaction occurring during the construction phase.

4.1.1.3 Vegetation Removal

The Project site currently consists of mostly hay field, pasture land and scrub land, with some hedgerows and a small wooded area (see Figure 1.1). Some of the scrub land and possibly a portion of the wooded area will have to be removed and land grading may occur in these areas to smooth the surface, if necessary to facilitate solar panel installation. This vegetation removal and grading could decrease the amount and rate of water uptake and evapotranspiration and therefore increase surface water runoff. The small amount of scrub land and wooded area to be removed will likely result in a minor increase in the rate and quantity of runoff from these existing areas. This runoff may accumulate in ditches along the Project access roads. However, the mitigation noted in Section 4.1.1.1 to mitigate runoff impacts in ditches will mitigate this effect. Therefore, there should be no significant overall effect to surface water runoff from the Project site due to vegetation removal.

No vegetation removal is anticipated to be required for the overhead distribution line crossing of Watercourse A. It is anticipated that the poles will span the 30-m setback zone on either side of the watercourse.

Minor vegetation removal may be required to upgrade the access road and watercrossing. The mitigation measures specified above for ditches will be installed along the access road to control stormwater runoff. Therefore, this vegetation removal will be very minor and will not have a measurable effect on surface water runoff.

4.1.2 Operations Phase

Long-term site alterations associated with the operational phase of the Project that could potentially affect surface water runoff include

- long-term changes in land grading and ditches
- presence of impervious or less pervious surfaces
- changes in vegetation structure and density.

The potential negative effects and mitigation measures associated with these activities are discussed in the following sections.

4.1.2.1 Long-Term Changes in Land Grading and Ditches

As discussed in Section 4.1.1.1, the ditches and drainage conveyance features installed during the construction period will remain in place throughout the operations period. Mitigation measures also discussed in Section 4.1.1.1 (e.g., vegetated buffer and filter strips, diffuse runoff patterns, flow retention features in ditches) will also remain in place for the duration of the operations phase. These measures are anticipated to be effective in preventing localized changes in surface water runoff from impacting the receiving waterbodies. Maintenance will be undertaken as required.

4.1.2.2 Impervious or Less Pervious Surfaces

Inverter/Transformer Pads

Each of the inverter concrete pads and the single transformer pad will be an impervious surface that will not allow infiltration of surface water into the soil. Surface precipitation landing on the pads will immediately run off to the adjacent ground surface. Therefore, the runoff from the area of the pad will be higher than would normally occur for the existing fields and scrub areas, since there will be no infiltration. However, the size of these impervious areas will be negligible compared to the overall size of the Project site. Therefore, no overall effect on surface water runoff from the Project site is anticipated to occur as a result of these concrete pads.

Solar Panels

Each of the solar panels will also be an impervious surface. Due to the tilt of the solar panels, all precipitation landing on the panel surface will runoff the lower edge of the panel onto the ground. Therefore, discharge from each individual panel to the ground surface will be concentrated at the base of each panel. However, given that rows of panels will be separated from each other, panels effectively function as temporary interceptors of precipitation with only minor concentration at the point where water runs off their surface. Once the water reaches the ground surface, there will be no impacts on surface drainage due to the presence of the panel. Therefore, the impervious panels will not have any effects on overall surface drainage (rate and quantity) from the Project site. Erosion potential is discussed in Section 4.2.2.1.

Access Roads

Access road surfaces, which will be comprised of granular material, may be less pervious than the existing fields. Therefore, more surface runoff per unit area may occur on the access roads compared to the existing conditions. This runoff will likely enter the roadside ditches and drain toward the waterbodies. However, the mitigation noted in Section 4.1.1.1 will be sufficient to prevent any long-term effects due to this minor change in local runoff.

Parking Area

The long-term parking area will consist of a 300-mm thick layer of Granular B sub-base, overlaid by a 150-mm thick layer of Granular A material. These granular materials will be permeable, but likely less so than the existing fields in this location. Therefore, it is anticipated that a slightly higher rate of runoff will occur from the parking area compared to existing conditions. Runoff from the parking area will enter the adjacent ditch network or diffuse into the surrounding fields. Higher runoff in the ditch may have a minor effect on hydrology in the adjacent watercourse.

Summary

Overall, the total area that will be occupied by access roads, transformer pads and parking areas will only be 7.6% of the total Project site (RE Smiths Falls 1 ULC, 2010a). RE Smiths Falls 1 ULC (2010a) indicates that this small increase in impervious area on the Project site will result in an approximately 6.4% increase in total peak flow and a 3.6% increase in the total volume of stormwater generated from the Project site. Given that this stormwater will be discharged to adjacent undisturbed fields and the vegetated buffer next to waterbodies, where it will be subject to infiltration, uptake and retention, a negligible overall change in hydrology of the local waterbodies is anticipated.

4.1.2.3 Changes in Vegetation

As noted in Section 4.1.1.3, existing vegetation on the Project site consists of hay field and scrub land, with a small portion of wooded area in the northwest corner. The ground surface beneath and around the solar panels will be vegetated with a low-growing, native ground cover of various grasses and forbs. This same vegetation mix will be planted in disturbed areas following construction and will comprise the long-term vegetation community on the site. Given that the long-term ground cover will be dense vegetation mix, no changes in surface water runoff due to any change in vegetation community on the site are anticipated to occur.

4.1.3 Decommissioning Phase

Short-term activities and long-term site alterations associated with the decommissioning of the Project that could potentially affect surface water runoff include

- long-term changes in land grading
- changes in vegetation structure and density.

The potential negative effects and mitigation measures associated with these activities are discussed in the following sections.

4.1.3.1 Long-Term Changes in Land Grading

The decommissioning process will revert the Project site as close as possible back to the existing conditions. Access roads and ditches will be removed and grading will be conducted to restore the natural grades of the fields where they have been affected by Project features.

This is anticipated to restore existing surface water runoff patterns with no negative effects on surface water runoff compared to existing conditions.

4.1.3.2 Changes in Vegetation

Decommissioning will result in the rehabilitation of the land to existing conditions, as per the direction of the landowner. Therefore, vegetation restoration is not anticipated to have any adverse effects on surface water runoff compared to existing conditions.

4.2 Surface Water Quality

Surface water quality includes both the physical characteristics of the watercourse and any overland flow (e.g., clarity, turbidity, pH, temperature) and chemical characteristics (e.g., dissolved oxygen, metals, nutrients and other potentially hazardous contaminants). Surface water quality affects a number of other natural environmental components and biophysical processes in watercourses, including receiving waterbodies that can be located substantial distances from the water body where the initial change was effected. This includes

- adverse effects on aquatic biota (e.g., fish and benthic invertebrates)
- adverse effects on aquatic habitat (e.g., due to deposition of sediment from turbid water).

4.2.1 Construction Phase

Activities that could occur during the construction phase that would have the potential to affect surface water quality in ditches and nearby watercourses include

- increased erosion and sedimentation
- dust generation
- accidental spills of fuels
- accidental spills of concrete
- water crossing structure upgrading
- distribution line crossing of Watercourse A (if directionally drilled).

The potential negative effects and mitigation measures associated with these activities are discussed in the following sections.

4.2.1.1 Increased Erosion and Sedimentation

Disturbance of the Project site due to vegetation clearing, topsoil and subsoil stripping (if necessary), grading, use of heavy machinery, stockpiling and concentration of flow in drainage features (e.g., ditches) has the potential to increase soil erosion due to exposure of bare soil (not protected by vegetation) to the effects of surface water (e.g., rain, overland flow due to rain/snow melt). Erosion is defined as the process where individual soil particles are detached from the ground, whereas sedimentation is defined as the subsequent transport and deposition of the detached soil particles. Erosion and sedimentation have the potential to affect surface water quality by resulting in higher levels of turbidity and possibly contaminants associated with the soil surface in receiving waterbodies.

In order to mitigate this potential, a conceptual erosion and sediment control (ESC) plan is proposed below which should be supplemented by an ESC drawing prepared by the proponent's engineer or contractor. Additional information on the sediment and erosion control plan is also provided in the Construction Plan Report (RE Smiths Falls 1 ULC, 2010b).

Preventing erosion from occurring in the first place is the primary goal of the ESC plan and measures including proper construction phasing, minimizing the size and duration of soil disturbance and exposure and revegetating or stabilization as soon as possible after disturbance are all identified as effective erosion control measures. Sediment control measures are the last line of defence and are implemented to ensure that eroded soil particles are not transported off the Project site or to watercourses. Sediment control measures include measures such as silt fence barriers to trap and retain sediments.

The main mitigation measures that will form the basis for the ESC plan will include the following:

- Minimize the size of the cleared and disturbed areas at the construction site. Install limit of work devices to prevent the contractor from operating outside the defined construction area (e.g., silt fences at the edge of the water crossing work area).
- Existing ground cover vegetation will be left on site, to the extent possible to minimize exposure of bare soils.
- Phase construction to minimize the time that soils are exposed.
- Limit vegetation removal to areas within the development footprint and solar panel buffer requirements. Limit of work devices should be installed outside the drip line of residual trees, where possible to prevent damage.
- An adequate supply of erosion control devices (e.g., geotextiles, revegetation materials) and sediment control devices (e.g., silt fence barriers) to be provided on site to control erosion and sedimentation and respond to unexpected events.
- Sediment control fencing may be installed along the periphery of the Project site where there is the potential for sedimentation off site as one of the first construction activities. These silt fence barriers should remain in place until construction is complete and site vegetation, and other long-term protection measures, is stabilized and adequate to prevent further erosion.
- Divert runoff from the temporary and permanent access roads or laydown areas through vegetated areas or into a properly designed and constructed drainage collection system to ensure that exposed soils are not eroded. Runoff velocities in ditches or other drainage routes, or along slopes, to be kept low via proper installation of flow velocity control measures such as rock flow check dams or enhanced vegetated swales, to minimize erosion potential. Runoff discharge locations to be protected with erosion resistant material, if required.

- Grade stockpiles to a stable angle as soon as possible after disturbance to eliminate potential slumping. Revegetation (if during the growing season) or some other means of stabilization (e.g., tarping) should occur for any disturbed surface that is to be left exposed for longer than 30 days.
- Revegetate or stabilize exposed sites as soon as possible after they have been disturbed, using quick growing grasses or other native vegetation species approved by the Rideau Valley Conservation Authority (RVCA) and/or Ministry of Natural Resources (MNR). Where revegetation is not possible other erosion protection methods, such as erosion matting may be used.
- Excavated erodible material stockpiles to be placed in suitable designated areas away from waterbodies (i.e., outside the 30-m buffer, away from drainage channels and ditches) and properly constructed silt fence barriers should be installed around the stockpiles to limit the transport of sediment.
- Monitoring the tracking of mud onto local roads during construction. If mud is transferred to the road, the contractor will be required to implement a system to prevent transfer of this material to local ditches and waterbodies. This could potentially include wheel washing areas at the exit from the construction site or end-of-day street sweeping/scraping to remove accumulated materials from local streets.

Implementation of these mitigation measures is anticipated to be effective in minimizing soil erosion and off-site transport from the construction area, such that waterbodies are not negatively affected. Monitoring will be conducted throughout the construction period to ensure ESC measures are functioning as designed (see Section 5).

4.2.1.2 Dust Generation

Dust may be mobilized due to vehicular traffic and heavy machinery use, drilling and soil moving activities. If unmitigated, excessive dust levels could adversely impact surface water quality and aquatic habitat if it were to be deposited in waterbodies.

However, it is not anticipated that dust generation will be a significant problem since the potential impacts can be substantially mitigated through the use of standard construction site best management practices and mitigation measures. In this regard, the document entitled "Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities" (Cheminfo Services Inc., 2005) will be used as a guideline for contractors. Mitigation measures to be used, as required, to control dust include

- use of approved dust suppression (i.e., water or other materials that will not have adverse effects on surface water quality or vegetation growth) on exposed areas including access roads, stockpiles and works/laydown areas as necessary
- hard surfacing (addition of coarse Granular A material free of fine soil particles) of access roads or other high-traffic working areas
- phased construction, where possible, to limit the amount of time soils are exposed
- avoid earth moving works during excessively windy weather. Stockpiles to be worked (e.g., loaded/unloaded) from the downwind side to minimize wind erosion.

- stockpiles and other disturbed areas to be stabilized as necessary (e.g., tarped, mulched, graded, revegetated or watered to create a hard surface crust) to reduce/prevent erosion and escape of fugitive dust.

Visual monitoring of dust generation will occur during the construction period, and if dust is observed to be of concern, additional mitigation will be implemented. Given the mitigation and monitoring proposed, it is anticipated that dust generation will be relatively low in magnitude and limited in duration and geographical area, such that no negative effects on waterbodies occur as a result of dust.

4.2.1.3 Accidental Spills

Fuels, lubricants and other hazardous materials will be used on the construction site. Activities during the construction phase that could potentially result in transport of these materials to the watercourse, with subsequent negative impacts on water quality, include

- refuelling and maintenance
- use of equipment containing fuels, lubricants or other materials within, or in the vicinity of watercourse
- storage of hazardous materials.

There are a number of general mitigation practices to be followed by the contractor during construction to minimize the potential for negative environmental impacts associated with the scenarios above which could be caused by the storage, use and disposal of fuels, lubricants and other hazardous materials. These include the following:

- Establish designated refuelling and maintenance areas at least 30 m from waterbodies, including the Otter Creek Flood Hazard Zone, drainage ditches, channels or other wet areas.
- Locate designated hazardous material storage areas at least 30 m away from waterbodies for all hazardous materials to be stored outside. Storage areas should be above ground and enclosed by an impervious secondary containment structure (e.g., berm or container) capable of holding the entire volume of the stored material, as well as some additional volume of rainwater. The area should be equipped with a drain so that it can be cleared of any spilled material or accumulated rainwater, which would be disposed of in a suitable manner. Secondary containment areas should be monitored throughout the construction period to ensure their integrity.
- A barrier will be erected around the storage area to prevent accidental damage to containers.
- Machinery is to arrive on site in a clean condition and is to be maintained free of fluid leaks.
- An emergency spill kit will be kept on site in case of fluid leaks or spills from machinery.
- Provide adequate spill clean-up materials/equipment (e.g., absorbents) on site. The contractor must have a spill clean-up procedure/emergency contingency plan in place prior to commencement of work at the site. All site staff should be trained in implementation of the procedure.

Given this mitigation, no adverse effects on surface water quality due to use of fuels, lubricants and other hazardous materials during Project construction is anticipated to occur.

4.2.1.4 *Accidental Spills of Concrete*

Concrete will be used to construct the inverter and transformer pads, and depending on soil strength conditions, may also be used as ballast for the solar panel racking. Concrete will be brought on site by a ready-mix concrete supplier in concrete trucks and poured directly into the form for each transformer/inverter pad. If concrete ballast is required for the panel racking structures, it would likely consist of pre-fabricated structures brought to the site. No cement is anticipated to be stored or mixed on site.

Concrete, grout and associated materials (e.g., cement, mortars) typically have high pH values (i.e., highly basic or alkaline), which, if they enter a watercourse, could create adverse surface water quality conditions that are toxic to aquatic biota (Province of British Columbia, 2007).

Although the use of concrete during Project construction is relatively limited and will not occur within 30 m of any water body, mitigation measures are proposed to prevent negative effects. The Province of British Columbia (2007) has identified a number of construction best management practices to prevent adverse impacts on surface water quality and biota due to the use of concrete. Therefore, in order to mitigate potential adverse effects due to concrete and cement use, the following mitigation measures are to be implemented:

- No alkaline cement products will be deposited directly or indirectly into or adjacent to any watercourse.
- Concrete truck rinsing will occur at a designated area at least 120 m from any waterbodies or drainage routes in a manner to contain the rinse water and concrete residue to prevent off site transport. However, if all wastewater arising from truck rinsing will be contained and treated to meet pH requirements before discharge, then the truck rising may occur within the laydown area; however, this should be avoided if possible.
- No cement is anticipated to be stored on site. However, if some cement bag storage is required, bags are to be stored indoors, where possible. If outdoor storage is required, cement bags should be covered with waterproof sheeting and raised off the ground (e.g., on wooden palates) to ensure no contact with surface water runoff. Impervious material will be placed under the elevating mechanism to collect any spills (e.g., due to ripped bags). Empty cement bags are to be collected as soon as possible after use and spills of cement or concrete cleaned up as appropriate.

Given this mitigation, no negative effects on surface water quality due to use of concrete during construction is anticipated to occur.

4.2.1.5 *Access Road and Water Crossing Construction*

As noted previously, Watercourse A traverses the approximate mid-point of the Project site. The existing farmer’s access road crosses Watercourse A on the east side of the Project site. To facilitate heavy equipment access to the southern section of the Project site, the access road and water crossing structure may require upgrading.

Upgrading of the access road and water crossing have the potential to result in adverse effects on surface water quality due to erosion and sedimentation as well as to aquatic habitat and biota (see Section 4.4).

To minimize the potential impact of this water crossing upgrade, the access road and associated drainage features will be constructed in accordance with the *Environmental Guidelines for Access Roads and Water Crossings* (MNR, 1990) and sediment and erosion controls will be installed per the guidance in the *Erosion & Sediment Control Guideline for Urban Construction* (GGHACA, 2006). Typical mitigation measures that could be employed include the following:

- Sediment and erosion controls should be in place prior, during and following to construction, until revegetation is stabilized and adequate to protect from erosion.
- Depending on the amount of flow in the drain during the installation, it may be necessary to work in a dry condition behind instream cofferdams, with flow being pumped or otherwise diverted around the work area.
- Culvert upgrading will occur during low flow periods outside the springtime period when no work in water would be conducted (March 15 to June 30).
- Heavy construction machinery use on the stream bed will be limited to the extent possible and only in the dewatered area behind cofferdams.
- All disturbed areas will be revegetated as soon as possible to limit erosion. If vegetation is not possible other stabilizing methods should be used to limit erosion (e.g., erosion matting, bioengineering).
- Riprap should be placed on the upstream and downstream fill slope around the culvert inlet to prevent erosion of fill.

The potential for adverse effects on surface water quality will be minimized through the use of these techniques, which will be finalized during the detailed design process and as part of the contractor's pre-construction planning. Some short-term, localized increase in sedimentation may occur during the culvert installation process. Visual monitoring will be conducted during the culvert upgrading period, and if adverse water quality conditions are occurring, work will be stopped until the issues can be mitigated.

4.2.1.6 Distribution Line Crossing of Watercourse A

A crossing of Watercourse A will be required to electrically connect the portion of the facility south of the watercourse to the proposed substation north of the watercourse. The method of crossing the watercourse will either be via an overhead line or an underground, directionally drilled line. The preferred method of crossing will be determined during the detailed design process, therefore, both options have been assessed in this EIS.

If the overhead option is selected, construction will follow Fisheries and Oceans Canada (DFO) Ontario Operational Statement for Overhead Line Construction (DFO, 2007a) in order to prevent adverse effects on surface water quality, aquatic habitat and biota. If directional drilling is selected, construction will follow DFO's Ontario Operational Statement for High-Pressure Directional Drilling (DFO, 2007b). Mitigation specified in the operational statements would minimize the potential for adverse effects on surface water quality in Watercourse A during the crossing construction. Additional detail on the mitigation that would be utilized is provided in Section 4.4.2.

4.2.2 Operations Phase

Long-term site alterations associated with the operations phase that would have the potential to affect surface quality in nearby watercourses include

- erosion and sedimentation from the Project site
- maintenance activities such as panel cleaning
- accidental spills.

The potential negative effects and mitigation measures associated with these activities are discussed in the following sections.

4.2.2.1 Erosion and Sedimentation from the Project Area

Given the mitigation associated with long-term stormwater management on the site as discussed in Section 4.1.2, no erosion is anticipated to occur throughout the operations period. Precipitation running off each solar panel face will be concentrated at the point where it intercepts the ground surface and, therefore, could potentially have more erosive force than normal diffuse precipitation patterns. However, the dense ground cover vegetation beneath the solar panel will be sufficient to prevent erosion of the underlying soils due to this concentrated impact. Precipitation will then drain from the site in a similar manner as presently occurs. Therefore, no erosion is anticipated due to runoff from the solar panels.

General site monitoring will be conducted during the general site inspections throughout the life of the Project to determine if erosion is occurring on or adjacent to the site, including in the runoff area from the panels. Remediation would be undertaken as necessary to prevent any further erosion.

Given this mitigation and monitoring, no adverse effects on surface water quality are anticipated to occur during the operations period.

4.2.2.2 Maintenance Activities

As noted in Section 3.2, normal maintenance activities will include inspection of components, replacement of air filters and panel washing. Normal maintenance and inspection are not anticipated to have any negative effects on waterbodies. It is anticipated that panel washing will occur approximately three times per year. During each washing event, up to approximately 25,700 L of groundwater will be withdrawn from the on-site well over a 4 to 5 day period. Water will be discharged to the ground surface adjacent to the panels. Given that the volume of water utilized will be less than that which would occur during a normal rain storm and that no cleaning agents will be used, no adverse effects on surface water quality are anticipated to occur due to panel washing maintenance activities.

4.2.2.3 Accidental Spills

Use of fuels, lubricants and other potentially hazardous materials during the operations phase will be limited to those materials brought on site during maintenance activities. This would include fuel and other lubricants in maintenance vehicles and that are used to maintain the solar facilities. All maintenance vehicles will be equipped with a spill kit and a spill contingency and response plan will be in place for the duration of the operational period. Given this mitigation, and the limited quantity of material on site and the limited frequency and duration that it will be on site, no adverse effects due to accidental spills are anticipated to occur.

Transformers will contain a small volume of transformer oil that could potentially be transferred to waterbodies in the event of a leak. In order to mitigate this potential, a containment structure with an oil-water separator will be installed around the transformer. If oil is collected, it would be removed and disposed of in accordance with regulatory requirements. More details on the proposed containment system are provided in the Design and Operations Report (RE Smiths Falls 1 ULC, 2010a). No adverse effects on surface water are anticipated to occur due to presence of transformer oils on site.

4.2.3 Decommissioning Phase

Short-term activities and long term site alterations associated with the decommissioning phase that would have the potential to affect surface quality in nearby watercourses include

- increased erosion and sedimentation from the facility
- accidental spills during decommissioning.

The potential negative effects and mitigation measures associated with these activities are discussed in the following sections.

4.2.3.1 Erosion and Sedimentation

Standard construction site erosion and sedimentation measures will be installed during the decommissioning process, since heavy equipment may be needed, which will result in some exposure of soil. However, decommissioning is anticipated to be a relatively quick process with minimal amounts of ground disturbance required to remove panels and other features. Once the field is returned to its existing agricultural condition, erosion will be similar as it is today. Therefore, given the mitigation that will be implemented during decommissioning and the fact that the site will be restored to existing agricultural conditions, no negative effects on water quality are anticipated to occur.

4.2.3.2 Accidental Spills

Equipment associated with the decommissioning process could potentially result in accidental spills and/or leaks. The mitigation noted in Section 4.2.1.3 for use during the construction process, would also be implemented during the decommissioning process. It is anticipated that this mitigation will be effective in preventing spills and minimizing the magnitude and extent of any small spills that do occur. Therefore, no adverse effects on surface water quality are anticipated to occur due to small leaks or spills during decommissioning.

4.3 Groundwater

Groundwater will likely be present in the sub-soils and bedrock underneath the site at various depths throughout the year. Groundwater is important to a number of natural environment components since it may provide baseflow to water courses, which in turn supports aquatic biota and habitat and it also provides drinking water for adjacent residences utilizing wells.

Impacts on groundwater quantity and quality (including quality at adjacent residential wells) could potentially occur due to excavations below the groundwater table (e.g., for transformer pad footings), withdrawals from a new on-site well for construction or operational maintenance purposes, or due to accidental spills (including accidental releases of sediment) during construction, operations or decommissioning. Those potential effects and associated mitigation is discussed by Project phase in the following sections.

Given the mitigation proposed in Section 4.1 to prevent any changes in soil structure that may affect infiltration, the Project is not anticipated to have any effect on groundwater recharge that may occur during precipitation or snow melt events.

4.3.1 Construction Phase

During construction, groundwater could potentially be affected by any Project excavation if it is deep enough to intersect the groundwater table. Groundwater could also be affected by withdrawals from the new on-site well for construction water purposes, or by any spills, including releases of sediment that infiltrate the soil, or migrate down pathways created during the construction process (e.g., drill holes for panel support structures) and enter the groundwater table. Potential negative effects and proposed mitigation measures are discussed in the following sections.

4.3.1.1 Effects on Groundwater Due to Project Excavations

The only Project excavation anticipated to be potentially deep enough to intersect the groundwater table would be the excavations for transformer/inverter pads. Should these excavations intersect the groundwater table, some pumping of groundwater may be required to keep the excavation area dry to facilitate construction and such pumping could potentially result in localized decrease in groundwater levels.

Any groundwater entering Project excavations, as well as any accumulated precipitation, is to be pumped out of the excavated area, treated, if required to meet MOE water quality discharge criteria, and discharged to a vegetated buffer area.

Given the very small size of the excavations required for transformer/inverter pads and the limited duration that they will be exposed (2 weeks or less), it is not anticipated that pumping of groundwater at these sites will have any measurable effect on the local groundwater table.

4.3.1.2 Effects Due to Well Withdrawals for Construction Purposes

Water for construction purposes will be withdrawn from a new on-site water well installed during the construction period. Water will be extracted at a rate not to exceed 45,000 L/d in order to minimize changes in the local groundwater table and groundwater availability. It is anticipated that groundwater requirements during construction will be around 10,000 L/d. Water extracted from the well will be stored in an on-site bladder tank prior to use.

Therefore, construction water withdrawals could potentially result in a localized decrease in the groundwater table around the well; although given the small volume to be utilized, no significant changes in groundwater supplies are anticipated to occur.

4.3.1.3 Accidental Spills

Mitigation proposed in Section 4.2.1.3 is anticipated to be effective in minimizing the potential for accidental spills, including releases of sediment, and in the event of a spill, minimizing the magnitude of that spill. Accordingly, it is not anticipated that spills, including those of fine sediments would be large enough to have any noticeable effect on groundwater supplies, including those used for drinking water at nearby residences. However, if spills do occur, the spill response and contingency plan protocol will be implemented and this will involve notifying the MOE Spills Action Centre. If the spill is determined to have the potential to impact groundwater, remedial measures will be taken, such as excavated the soil that was contaminated by the spill, in order to prevent infiltration of contaminants into the groundwater table.

RE Smiths Falls 1 ULC is proposing to monitor baseline well water quality at residences within 500 m of the Project location prior to the start of construction, in accordance with a protocol provided by MOE. In the event that nearby residents experience deteriorated water quality during construction, the well would be re-sampled to determine if groundwater was adversely affected by the Project. Remedial measures would be implemented as appropriate, including identifying and stopping the source of contamination and supplying bottled water until well water quality returns to acceptable levels.

4.3.2 Operations Phase

During the operations phase, potential effects on groundwater could include reductions in the groundwater table due to withdrawals from the well for maintenance purposes (e.g., panel cleaning) and due to accidental spills associated with maintenance activities and the presence of transformer oil.

4.3.2.1 Withdrawal of Water for Maintenance Purposes

It is anticipated that panel washing will occur approximately three times per year. During each washing event, up to approximately 25,700 L of groundwater will be withdrawn from the on-site well over a 4 to 5 day period. There may be other periodic uses for water withdrawn from the on-site well during operations, such as access road dust control. The amount of groundwater withdrawn for these uses would be limited to a maximum of 45,000 L/d. Given this relatively small amount of water to be withdrawn from the well on the periodic basis, no significant effect on the local groundwater table is anticipated to occur.

4.3.2.2 Accidental Spills

Mitigation proposed in Section 4.2.2.3 is anticipated to be effective in minimizing the potential for accidental spills and in the event of a spill, minimizing the magnitude of that spill. Accordingly, it is not anticipated that spills would be large enough to have any noticeable effect on groundwater supplies. However, if spills do occur, the spill response and contingency plan protocol will be implemented and this will involve notifying the MOE Spills Action Centre. If the spill is determined to have the potential to impact groundwater, remedial measures will be taken, such as excavated the soil that was contaminated by the spill, in order to prevent infiltration of contaminants into the groundwater table.

4.3.3 Decommissioning Phase

Similarly, the only potential effect on groundwater during decommissioning would be due to accidental spills associated with decommissioning equipment (e.g., spills or leaks during equipment dismantling or from heavy equipment, vehicles or generators). However, given the mitigation proposed and the small volume of fluids that will actually be used on site, no negative effects on groundwater quality are anticipated to occur as a result of small accidental spills that may occur.

4.4 Aquatic Biota and Habitat

Aquatic biota (e.g., fish and benthic invertebrates) and their habitat in Otter Creek and its tributaries on the Project site (Watercourses A, B and C) will not be directly affected by solar panel, inverter and transformer installation activities, since none of these will occur within 30 m of the average annual high water mark.

No Project fencing will be installed within the 30-m buffer adjacent to watercourses or within the watercourses themselves to prevent adverse effects on fish movements.

However, upgrading of the existing access road and water crossing and the installation of the new electrical line crossing of Watercourse A have the potential to have adverse effects on aquatic biota and habitat, as discussed in Sections 4.4.1 and 4.4.2. Indirect effects on aquatic biota and habitat due to changes in surface water runoff and quality could also occur, and these are discussed in Section 4.4.3.

4.4.1 Water Crossing Upgrading

In-water work may be required to facilitate upgrading of the existing water crossing of Watercourse A. In order to mitigate the potential for adverse effects on aquatic biota in the watercourse, water crossing upgrading will occur outside the warm water timing restriction specified for the MNR Kemptville District. Therefore, no in-water work will be conducted between March 15 and June 30 to protect the reproductive activities of the warm water fish community within and downstream from the water crossing. Therefore, no adverse effects on critical reproductive activities will occur.

In order to install the upgraded water crossing under a dry condition, it may be necessary to construction cofferdams upstream and downstream from the existing culvert and divert flows around the work area (by pumping or other diversion method). The cofferdams would be installed and the area between them dewatered. The type of crossing structure has not been determined at this time, but will likely consist of an upgraded corrugated steel plate (CSP), appropriate sized to handle the design flow. Widening of the access road may also be required.

Prior to dewatering (if necessary), the area between the cofferdams will be electrofished (under authority of a License to Collect Fish for Scientific Purposes from the MNR) to remove fish from the area to prevent stranding. All fish will be transferred to the watercourse upstream from the work area. Some mortality of benthic invertebrates is anticipated to occur in the dewatered area and some short-term effect on fish movement at the crossing location will occur during the construction period. Dewatering and water diversion around the work will be conducted with a shrouded pump to prevent fish entrainment and mortality through the pump.

Therefore, water crossing construction may result in a short-term loss of habitat in the dewatered area, some disruption to aquatic biota due to in-water work (i.e., cofferdam installation) and some potential adverse effects on fish movement during the construction period. These effects will be mitigated to the extent possible by construction outside the reproductive period and limiting the duration and footprint of construction. Effects that do occur will be relatively minor in magnitude and short term in duration.

The wider culvert (if required) may increase the amount of aquatic habitat in the culvert itself. Appropriate installation techniques will occur to ensure the culvert is not perched (to maintain fish passage) and to provide aquatic habitat in the culvert (through backfilling with substrate material on the invert of the culvert. Access road widening, if necessary, would result in a loss of aquatic habitat, since the footprint of the access road would encroach upon the adjacent watercourse, which consists primarily of a cattail marsh. Mitigation measures (e.g., habitat enhancement or creation) may be required to mitigate effects on aquatic habitat if access widening is necessary. This will be determined during the detailed design stage. Enhancement measures could include creation of additional wetland habitat or riparian planting within the 30-m buffer zone adjacent to Watercourse A or Otter Creek.

A permit for water crossing installation and access road upgrading will likely be required from the RVCA and possibly the MNR. The activities will also be screened by DFO to determine if an authorization under the Fisheries Act is required. Additional mitigation measures may be required.

4.4.2 Distribution Line Crossing of Tributary

As discussed in Section 4.2.1.6, an electrical line crossing of Watercourse A will be required, although the preferred method of installation (i.e., overhead or underground). Potential effects and mitigation associated with either option are discussed in the following sections.

4.4.2.1 Overhead Line Crossing

If this method is selected as the preferred alternative, construction follows DFO's Ontario Operational Statement for Overhead Line Construction (DFO, 2007a) in order to prevent adverse effects on aquatic habitat and biota. In this regard, mitigation to be undertaken will include

- installing the overhead line perpendicular to the watercourse to minimize the length of the disruption
- locating distribution line poles outside the annual high water mark of the watercourse and preferably, outside the 30-m buffer on either side of the watercourse
- preventing or minimizing vegetation removal within the riparian area adjacent to the watercourse
- no fording of the watercourse will occur with any equipment being used to install the overhead line
- no machinery will be operated on the banks or within the annual high water mark of the watercourse
- sediment and erosion controls would be installed as necessary

- disturbed areas will be vegetated as soon as possible after construction to prevent further erosion.

With the implementation of the measures outlined above, no adverse effects on aquatic biota and habitat are anticipated to occur due to distribution line installation.

4.4.2.2 Underground Directionally Drilled Line Crossing

If this method is selected as the preferred alternative, construction follows DFO's Ontario Operational Statement for High-Pressure Directional Drilling (DFO, 2007b) in order to prevent adverse effects on aquatic habitat and biota. In this regard, mitigation to be undertaken will include the following:

- Existing or upgraded water crossing will be utilized to access either end of the line drilling location – no fording of the watercourse will occur at the crossing location itself.
- The drill path and elevation will be set to an appropriate depth below the watercourse to minimize the risk of frac-out (e.g., tunnel collapse) and prevent long-term scouring of the watercourse channel from exposing the line.
- The drill entry and exit points will be located outside the average annual high water mark and preferably, if possible, outside the 30-m setback to avoid disrupting existing riparian vegetation.
- Removal of vegetation at the drill entry and exit points should be minimized to the extent possible.
- Machinery will arrive on site in a clean condition and will be maintained to be free of leaks throughout the construction period.
- Spill prevention and response measures will be in place throughout the construction period.
- Drilling mud will be prevented from entering the watercourse by sediment and erosion control measures or a dugout/settling basin at the drilling exit site. These measures will be regularly inspected throughout the construction period.
- Drilling mud, cuttings and other waste from the operation will be disposed of at an appropriate location to prevent it from entering the watercourse.
- The watercourse will be monitored for signs of a frac-out during the construction period.
- An emergency frac-out response and contingency plan will be in place .
- Containment and clean up material will be present in an easily accessible location during the operation in the event of an emergency.
- In the event of a frac-out, work will cease, drilling mud will be contained to minimize spread, authorities will be alerted and clean up will commence with more sensitive areas being prioritized for clean up.
- A contingency crossing plan will be in place. This would include re-drilling at a more appropriate location, installing an overhead line or using a different crossing method (e.g., open

cut crossings). If a different method is utilized, approvals from regulatory authorities may be required prior to implementation.

- Disturbed areas will be revegetated with appropriate plantings and temporary stabilization measures will be implemented as required.

Therefore, some potential for short-term adverse effects on aquatic habitat and biota exists during the directional drilling period, but given the effective implementation of the measures identified here and in DFO (2007b), it is anticipated that no significant adverse effects will occur.

4.4.3 Indirect Effects on Aquatic Habitat and Biota

Aquatic biota and habitat could potentially be indirectly affected if changes in surface water runoff, surface water quality and groundwater quality or quantity were to occur as a result of any phase of the Project. However, the mitigation proposed in Sections 4.1, 4.2 and 4.3 is anticipated to be effective in preventing/minimizing negative effects associated with these other biophysical components of the environment, such that there are no adverse effects on aquatic biota and habitat within the watercourses on the Project site. Given this, no specific mitigation measures, other than those noted in the above-mentioned sections are required to prevent adverse effects to aquatic biota and habitat.

5. Environmental Effects Monitoring Requirements

As discussed in the Design and Operations Report (RE Smiths Falls 1 ULC, 2010a), environmental effects monitoring is proposed in respect of any negative environmental effects that may result from engaging in the Project. As per the REA Regulation, the monitoring plan identifies

- performance objectives in respect of the negative environmental effects
- mitigation measures to assist in achieving the performance objectives
- a program for monitoring negative environmental effects for the duration of the time the Project is engaged in, including a contingency plan to be implemented if any mitigation measures fail.

For the purposes of this EIS report, the effects monitoring measures with respect to negative effects on waterbodies and lands within 30 m of waterbodies have been reproduced here, in Table 5.1.

The monitoring proposed in Table 5.1 will confirm that mitigation measures are functioning as designed to meet performance objectives. If monitoring shows that performance objectives are not being met, the contingency measures documented in Table 5.1 will be used to ensure that remedial action is undertaken as necessary to meet the performance objectives.

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Table 5.1 Summary of Environmental Effects Monitoring Requirements with Respect to Waterbodies

Negative Effect	Mitigation Strategy	Performance Objective	Monitoring Plan					Contingency Measures
			Methodology	Monitoring Locations	Frequency	Rationale	Reporting Requirements	
Construction Phase								
Increases in surface water runoff from the construction site	Stormwater management measures including grassed swales, enhanced vegetated swales, ditch flow controls and filter strips, and temporary construction measures as necessary (e.g., hay bales).	Minimize changes to surface water runoff conditions to watercourses.	Visual assessment of structural stability of mitigation measures and identification of unintended impacts.	Throughout construction site.	Once per week and during/after storm events.	Visual monitoring will confirm that stormwater management measures remain as designed (e.g., rock flow check dams, straw bale flow checks, ditches, etc) and identify deficiencies.	Reported in monthly environmental monitoring report during construction.	Stormwater management measures will be remediated as necessary to ensure that they are functioning as designed. Alternate measures may be required and will be determined based on on-site issues and conditions.
Soil compaction due to heavy equipment use and stockpiling	Remediation of compaction following construction.	No significant compaction that would inhibit vegetative growth.	Visual monitoring for signs of compaction.	Throughout construction site.	Once after remediation.	Visual monitoring will identify areas requiring remediation.	At close-out of project.	Areas of compaction will be remediated as necessary to alleviate compaction (e.g., discing).
Erosion and sedimentation resulting in increased turbidity in site runoff	Erosion and sediment control measures.	No significant changes to surface water quality in watercourse.	Visual monitoring of sediment and erosion controls (e.g., silt fence barriers).	All ESC controls throughout work site.	Once per week and in advance and following major precipitation.	ESC measures to be monitored to ensure they are functioning as designed and in good working order to meet performance objectives.	Reported in monthly environmental monitoring report during construction.	Alternate ESC measures will be used as necessary to ensure required control.
			Visual monitoring of surface water quality conditions in watercourses during construction.	Throughout length of the watercourses on Project site.	Once per week and once during all in-water works.	Visual monitoring would identify areas of turbidity and would show that remedial measures would be necessary to prevent further erosion issues.	Reported in monthly environmental monitoring report during construction.	Alternate ESC measures will be used as necessary to ensure required control.
Dust generation and off-site transport	Standard construction site best management practices to prevent fugitive dust (see Section 4.2.1.2).	Minimize fugitive dust from the construction site.	Visual monitoring of visible dust plumes during construction.	Throughout construction site.	Periodically during all construction activities.	Visual dust monitoring would identify if dust plumes are an issue and where their source may be.	Reported in monthly environmental monitoring report during construction.	Alternative dust control measures implemented as necessary to prevent/ minimize dust generation.
Potential for adverse water surface and groundwater quality due to accidental spills	Standard mitigation to prevent spills and minimize magnitude of spills that do occur (see Section 4.2.1.3).	No long-term environment effects due to spills.	Visual monitoring of spill prevention/mitigation measures.	Throughout construction site.	Once per week.	Spill prevent and control measures to be monitored to ensure they are functioning as designed and protocols are being implemented as specified in plans to meet performance objectives.	Reported in monthly environmental monitoring report during construction.	Spill contingency measures implemented as necessary in the event of a spill. Following spill event, response will be reviewed to determine if additional or altered response protocols are necessary to meet performance objectives.
Adverse effects on well water quality at adjacent residences	Standard mitigation to prevent spills, including releases of sediment and minimize magnitude of spills that do occur.	No adverse effects on drinking water quality due to Project construction.	Monitoring of well water quality at all residences that agree to it within 500 m of the Project location prior to construction. Resampling of wells were landowners complain of deteriorated well quality.	All residential wells within 500 m of the Project location, where property owners allow sampling to occur.	Once prior to construction and again following receipt of complaints (if necessary).	Baseline and follow up monitor used to determine if project has adverse effects on drinking water quality in accordance with MOE protocols.	Re-sampling results reported to MOE, Township and landowner.	If adverse effects occur due to construction, bottled water will be provided to resident until well water quality returns to acceptable levels. Remedial measures implemented to ensure no ongoing effects on groundwater quality.

Negative Effect	Mitigation Strategy	Performance Objective	Monitoring Plan					Contingency Measures
			Methodology	Monitoring Locations	Frequency	Rationale	Reporting Requirements	
Adverse effects on aquatic habitat and biota due to access road installation and culvert upgrading	Work in water and culvert installation best management practices and habitat enhancements.	Adverse effects on aquatic habitat and biota minimized to extent possible.	Visual monitoring of contractor's activities during in-water works associated with culvert installation to confirm that they are operating in accordance with plans and specifications and terms of permits/ approvals.	At the culvert installation locations.	Constantly during in-water works.	Visual monitoring will confirm that contractor is working in and around water in accordance with plans and will allow assessment of potential areas of concern (e.g., erosion, water quality).	Reported in monthly environmental monitoring report during construction.	Contractor will be instructed to ensure conformity with plans and specifications if deficiencies are observed. Contractor will be required to cease work and remediate issues if adverse environmental effects are observed.
Adverse effects on aquatic biota, habitat and surface water quality due to frac-out during line drilling	Mitigation measures specified in DFO (2007b).	Adverse effects resulting from unanticipated frac-out minimized to extent possible.	Visual monitoring of surface water quality along drilling path during installation.	In Watercourse A along proposed drilling path.	Continuously during drilling activities.	Visual monitoring would identify turbidity associated with a frac-out occurrence and trigger implementation of response plan.	Reported in monthly environmental monitoring report during construction.	An emergency frac-out response and contingency plan would be initiated to contain and clean-up any spilled mud or drill spoils. Contingency crossing methods would include re-drilling at more suitable location, installing overhead line or utilizing other underground crossing methodology.
Decrease in groundwater table should groundwater from an on-site well be used for construction purposes.	Limit the daily use of groundwater for construction purposes to 45,000 L or less. Usage anticipated to typically be around 10,000 L/d.	Less than 45,000 L/d groundwater used for construction purposes.	A flow meter will be installed on the pump to monitor the amount of groundwater withdrawn during pumping activities.	At the groundwater well.	During periods when groundwater is withdrawn for maintenance purposes.	Monitoring of amount of groundwater taken will ensure that performance objective is met.	Reported in annual operational environmental monitoring report.	If maintenance cannot be achieved with the amount of water specified in the performance objective, Recurrent will consider bringing in water from an off-site source, or applying for an amendment to the REA to allow more water to be withdrawn from the well. This latter option may require additional study on local groundwater resources and identification of additional mitigation and monitoring measures.
Operations Phase								
Increases in surface water runoff from Project site	Stormwater management measures including grassed swales, enhanced vegetated swales and filter strips.	Minimize changes to surface water runoff conditions to watercourses.	Visual assessment of structural stability of mitigation measures and identification of unintended impacts.	Throughout Project site.	Twice per year during site inspections.	Visual monitoring will confirm that stormwater management measures are effective and identify deficiencies.	Reported in annual operational environmental monitoring report.	Stormwater management measures will be remediated as necessary to ensure that they are functioning as designed.
Erosion and sedimentation resulting in increased turbidity in site runoff	Vegetation to prevent erosion due to stormwater.	No long-term erosion from site over and above existing conditions.	Visual monitoring of Project area to identify areas of erosion (e.g., rills, gullies).	Throughout Project site.	Twice per year during site inspections.	Visual monitoring of erosion would identify potential areas of concern.	Reported in annual operational environmental monitoring report.	Erosion remediated as necessary to ensure no long term erosion issues. Additional measures such as mulch, modified grass species etc could be considered.

Negative Effect	Mitigation Strategy	Performance Objective	Monitoring Plan					Contingency Measures
			Methodology	Monitoring Locations	Frequency	Rationale	Reporting Requirements	
Potential for adverse surface and groundwater quality due to accidental spills	Standard mitigation to prevent spills and minimize magnitude of spills that do occur.	No long-term environment effects due to spills.	Visual monitoring of spill prevention/mitigation measures during maintenance activities.	Throughout Project site where maintenance occurs and at transformer locations.	Twice per year during site inspections.	Spill prevent and control measures to be monitored to ensure they are functioning as designed and protocols are being implemented as specified in plans to meet performance objectives.	Reported in annual operational environmental monitoring report.	Spill contingency measures implemented as necessary in the event of a spill. Following spill event, response will be reviewed to determine if additional or altered response protocols are necessary to meet performance objectives.
Decommissioning Phase								
Erosion and sedimentation resulting in increased turbidity in site runoff	Erosion and sediment control measures.	No significant changes to surface water quality in watercourses.	Visual monitoring of sediment and erosion controls (e.g., silt fence barriers).	All ESC controls throughout work site.	Once per week and in advance and following major precipitation and snow melt events.	ESC measures to be monitored to ensure they are functioning as designed and in good working order to meet performance objectives.	Reported in monthly environmental monitoring report during construction.	Alternate ESC measures will be used as necessary to ensure required control.
			Visual monitoring of surface water quality conditions in watercourses during construction.	Throughout length of tributary on Project site.	Once per week and once during all in-water works.	Visual monitoring would identify areas of turbidity and would show that remedial measures would be necessary to prevent further erosion issues.	Reported in monthly environmental monitoring report during construction.	Alternate ESC measures will be used as necessary to ensure required control.
Potential for adverse surface and groundwater quality due to accidental spills	Standard mitigation to prevent spills and minimize magnitude of spills that do occur.	No long-term environment effects due to spills.	Visual monitoring of spill prevention/mitigation measures.	Throughout construction site.	Once per week.	Spill prevent and control measures to be monitored to ensure they are functioning as designed and protocols are being implemented as specified in plans to meet performance objectives.	Reported in environmental monitoring report during decommissioning.	Spill contingency measures implemented as necessary in the event of a spill. Following spill event, response will be reviewed to determine if additional or altered response protocols are necessary to meet performance objectives.

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6. Construction Plan Report

The REA Regulation requires proponents of Class 3 solar projects to prepare a Construction Plan Report (CPR). RE Smiths Falls 1 ULC prepared the CPR with technical assistance from Wardrop Engineering and input from Hatch Ltd. regarding potential negative effects and mitigation measures. The CPR is a stand-alone report (RE Smiths Falls 1 ULC, 2010b) that will be included as part of the REA application.

The CPR details the construction and installation activities, location and timing of construction and installation activities, any negative environmental effects that result from construction activities within 300 m of the Project and mitigation measures for the identified negative environmental effects. The CPR addresses all potential effects of construction on waterbodies within 300 m of the Project site in a general manner. The mitigation proposed in the CPR with respect to preventing/minimizing negative effects on waterbodies is the same as that discussed in this EIS. Additional mitigation is proposed to address negative effects during construction not related to waterbodies and associated features. Therefore, the CPR and this EIS should be read in conjunction with each other, although all negative effects and mitigation requirements with respect to waterbodies are contained within this EIS and duplicated in the CPR.

7. Summary and Conclusions

As discussed in the Water Body Site Investigations Report (Hatch Ltd., 2010b), the Project footprint will occur within 30 m of the high water mark of three unnamed tributaries of Otter Creek (Watercourses A, B and C), upgrading of the existing access road and water crossing structure of Watercourse A will be required and a new distribution line (overhead or underground) will cross Watercourse A.

This EIS has been prepared to identify potential negative effects that all phases of the Project may have on these waterbodies. Potential negative effects are associated with

- alterations in surface water runoff due to
  - changes in topography associated with land grading and ditching
  - soil compaction during construction
  - changes in vegetation structure and density
  - increase in impervious and less pervious surfaces
- alterations in surface water quality due to
  - erosion and sediment from Project site
  - dust generation during construction
  - accidental spills during construction, operations and decommissioning
  - use of concrete during construction

- alterations in groundwater levels and quality due to
  - Project excavations below the groundwater table during construction
  - Water takings from a new on-site well during construction and operations
  - accidental spills during construction, operations and decommissioning, including those of sediment due to project activities (e.g., drilling for support structures)
- adverse effects on aquatic biota
- adverse effects on aquatic habitat.

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. The primary mitigation measure that will prevent adverse effects on waterbodies is adherence to the 30-m setback requirement. Monitoring measures have been proposed to confirm that mitigation measures are having the intended effect and that performance objectives are being met.

Overall, while the Project will result in some changes to the natural environment, no negative effects on waterbodies are anticipated to occur following implementation of the mitigation and monitoring measures proposed in this EIS.

8. References

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DFO. 2007b. High Pressure Directional Drilling – Fisheries and Oceans Canada Ontario Operational Statement. Version 3. Her Majesty the Queen in Right of Canada.

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Province of British Columbia. 2007. Interim Standards and Best Practices for Instream Work, Appendix IV: Concrete Work. On-line at http://www.env.gov.bc.ca/wld/BMP/concrete.html. Accessed February 20, 2009.

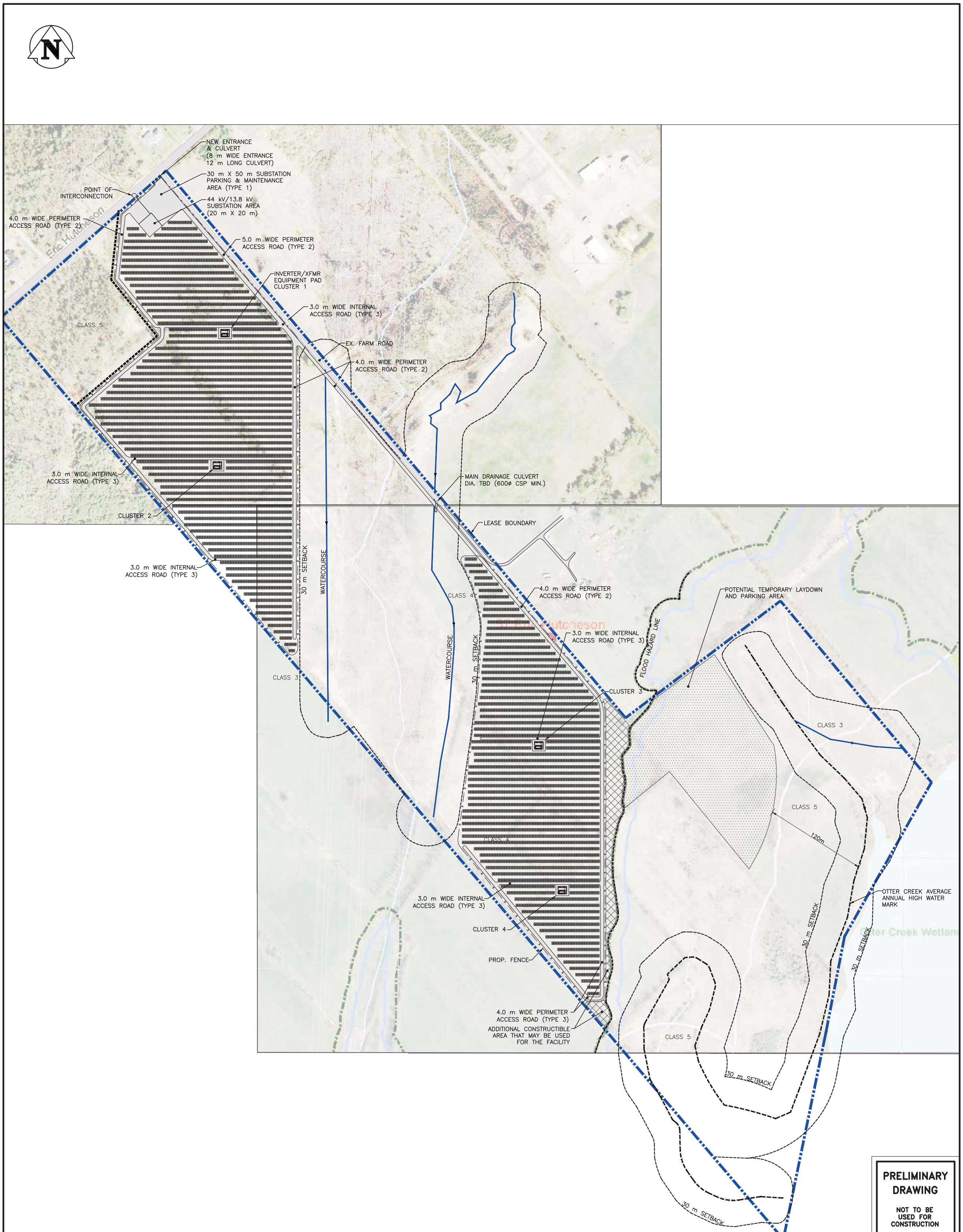
RE Smiths Falls 1 ULC. 2010a. RE Smith Falls 1 Solar Project – Design and Operations Report.

RE Smiths Falls 1 ULC. 2010b. RE Smith Falls 1 Solar Project – Construction Plan Report.

RE Smiths Falls 1 ULC. 2010c. RE Smith Falls 1 Solar Project – Decommissioning Plan Report.

Appendix A

Site Layout
(RE Smiths Falls 1 ULC, 2010b)



PRELIMINARY DRAWING

NOT TO BE USED FOR CONSTRUCTION

NOTES:

1. AERIAL IMAGERY OBTAINED FROM GOOGLE EARTH PRO, IMAGERY DATE 2006
2. ROAD CONSTRUCTION PROCEDURES

-CLEAR & GRUB ALL AREAS PROPOSED FOR ROAD AND PARKING LOT CONSTRUCTION.
-STRIP & REMOVE ALL TOPSOIL.
-SHAPE & PROOF-ROLL SUBGRADE.
-SHAPE & GRADE DITCHES & SWALES.
-PLACE, SHAPE AND COMPACT GRANULAR SUBBASE AND BASE MATERIALS AS FOLLOW:

TYPE 1 – 300mm GRANULAR "B" SUBBASE, 150mm GRANULAR "A" BASE.
TYPE 2 – 200mm GRANULAR "B" SUBBASE, 150mm GRANULAR "A" BASE.
TYPE 3 – 150mm TO 200mm GRANULAR "A".

-RE-VEGETATE DITCHES AND SWALES.

CULVERTS:

1. CULVERT SHALL BE CORRUGATED STEEL PIPE OR RIBBED PVC PIPE INSTALLED IN ACCORDANCE WITH OPSD.
2. MINIMUM CULVERT DIAMETER:
   300mm Min. Dia. FOR MINOR CULVERTS
   600mm Min. Dia. FOR MAIN CULVERTS
   REFER TO PLANS FOR CULVERT LOCATIONS.

APP. SCALE:

1:2000 — 20 0 25 50 75 100m

LEGEND:

- INVERTER / XFMR EQUIPMENT PAD
- SOLAR ARRAY
- LEASE BOUNDARY
- ACCESS ROAD
- PROPOSED FENCE
- ADDITIONAL CONSTRUCTIBLE AREA THAT MAY BE USED FOR THE FACILITY
- POTENTIAL TEMPORARY LAYDOWN & PARKING AREA

REFERENCE NO. 1088760100-DWG-E0017-06

REV.	DATE	DESCRIPTION	APPROVED BY
06	11.03.10	ISSUED FOR REVIEW	
05	10.09.14	ISSUED FOR REVIEW	ENERGY
04	10.08.16	ISSUED FOR REVIEW	ENVIRO.
03	10.07.08	ISSUED FOR REVIEW	INFRAS.
02	10.06.21	ISSUED FOR REVIEW	STRUCT.

RECURRENT ENERGY – SMITHS FALLS 1
10MW AC

SOLAR GENERATION FACILITY – SITE LAYOUT

WARDROP | A TETRA TECH COMPANY