



**NORTHLAND
POWER**

Belleville North Solar Project

Draft Water Body Site Investigation Report

February 11, 2011



Northland Power Inc.
on behalf of
Northland Power Solar
Belleville North L.P.
Toronto, Ontario

DRAFT Water Body Site
Investigation Report

Belleville North Solar Project

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Disclaimer

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Project Report

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**Northland Power Inc.
Belleville North Solar Project**

DRAFT Water Body Site Investigation Report

Table of Contents

1. Introduction 3

 1.1 Project Description 3

 1.2 Legislative Requirements..... 3

2. Summary of Results of Records Review..... 4

3. Site Investigation Methodology 5

 3.1 Date, Time, and Duration of Site Investigation 5

 3.2 Weather Conditions during Site Investigation 5

 3.3 Name and Qualifications of Person Conducting Site Investigation..... 5

 3.4 Survey Methods 6

4. Results of Site Investigation..... 6

 4.1 Permanent or Intermittent Streams..... 9

 4.1.1 Watercourse A 9

 4.1.2 Watercourse B..... 10

 4.2 Seepage Areas 10

5. Conclusions 11

6. References..... 12

Appendix A Site Investigation Field Notes

List of Tables

Table 2.1	Summary of Records Review Determinations	5
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List of Figures

Figure 4.1	Water Body and Project Boundaries	7
Figure 4.2	Watercourse A on the Project Site	10
Figure 4.3	Seepage Area in Wetland	11

1. Introduction

1.1 Project Description

Northland Power Solar Belleville North L.P. (hereinafter referred to as “Northland”) is proposing to develop a 10-megawatt (MW) solar photovoltaic (PV) Project titled Belleville North Solar Project (hereinafter referred to as the “Project”). The Project site will be located on approximately 40 hectares (ha) of land, located at Lot 65 Concession V Bay Side in the single-tier municipality of the Corporation of the County of Prince Edward.

1.2 Legislative Requirements

Ontario Regulation (O. Reg.) 359/09 – *Renewable Energy Approvals Under Part V.0.1 of the Act*, (herein referred to as the REA Regulation) made under the *Environmental Protection Act* identifies the Renewable Energy Approval (REA) requirements for renewable energy projects in Ontario. Per Section 4 of the REA Regulation, ground mounted solar facilities with a name plate capacity greater than 10 kilowatts (kW) are classified as Class 3 solar facilities and require a REA.

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

- a) 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
- b) whether any additional waterbodies exist, other than those that were identified in the (water records review) report prepared under Subsection 30(2)
- c) 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
- d) the distance from the Project location to the boundaries determined under clause (c).

The REA Regulation has specific requirements if designated lake trout lakes are present within 300 m of the Project area. These requirements were not deemed applicable to the Project as no such lakes were found within 300 m of the Project site during the Water Records Review (Hatch Ltd., 2010).

Waterbodies are defined in Section 1(1) of the REA Regulation to include a lake, a permanent stream, an intermittent stream or a seepage area, but does not include

- a) grassed waterways
- b) temporary channels for surface drainage, such as furrows, or shallow channels that can be tilled or driven through
- c) rock chutes and spillways
- d) roadside ditches that do not contain a permanent or intermittent stream
- e) temporarily ponded areas that are normally farmed
- f) dug-out ponds, or

- g) artificial bodies of water intended for the storage, treatment or recirculation of runoff from farm animal yards, manure storage facilities and sites and outdoor confinement areas.

Further, intermittent streams are defined as “a natural or artificial channel, other than a dam, that carries water intermittently and does not have established vegetation within the bed of the channel, except vegetation dominated by plant communities that require or prefer the continuous presence of water or continuously saturated soils for their survival” (O. Reg. 359/09).

Seepage areas are defined as “a site of emergence of groundwater where the water table is present at the ground surface, including a spring” (O. Reg. 359/09).

Subsection 3 of Section 31 of the REA Regulation requires the proponent to prepare a report setting out the following:

1. A summary of any corrections to the Water Body Records Review report prepared under Subsection 30(2) and the determinations made as a result of conducting the site investigations under Subsection (1).
2. Information relating to each water body identified in the records review and in the site investigations, including the type of water body, plant and animal composition and the ecosystem of the land and water investigated.
3. A map showing
 - i. the boundaries mentioned in clause (1) (c)
 - ii. the location and type of each water body identified in relation to the Project location, and
 - iii. the distance mentioned in clause (1) (d)
4. The dates and times of the beginning and completion of the site investigation.
5. The duration of the site investigation.
6. The weather conditions during the site investigation.
7. A summary of methods used to make observations for the purposes of the site investigation.
8. The name and qualifications of any person conducting the site investigation.
9. Field notes kept by the person conducting the site investigation.

This Water Body Site Investigation Report has been prepared to meet these requirements.

2. Summary of Results of Records Review

Table 2.1 summarizes the results of the Water Body Records Review (Hatch Ltd., 2010).

Table 2.1 Summary of Records Review Determinations

Determination to be Made	Yes/No	Description
Is the Project in a water body?	No	No part of the Project will be constructed within a waterbody.
Is the Project 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?	No	No lakes are present in the study area.
Is the Project within 300 m of the average annual high water mark of a lake trout lake that is at or above development capacity?	No	No lake trout lakes are present in the study area.
Is the Project within 120 m of the average annual high water mark of a permanent or intermittent stream?	Yes	Two small tributaries of Melville's Creek are present within 120 m of the Project site.
Is the Project within 120 m of a seepage area?	Yes	The entire Project site is identified as a potential groundwater discharge area, although actual seepage areas on the site have not been identified.

Therefore, depending on the layout of the proposed Project, some components could potentially be located within 120 m of the average annual high water mark of two tributaries of Melville's Creek. In addition, there is potential that seepage areas may be found on the Project site, given that the entire area has been identified as a potential groundwater discharge zone.

3. Site Investigation Methodology

3.1 Date, Time, and Duration of Site Investigation

- Date: June 14, 2010
- Start Time: 0930 to 1500 and 2200 to 2300
- Duration: 6.5 hours

3.2 Weather Conditions during Site Investigation

- Temperature: 22°C
- Beaufort Wind: 2
- Cloud Cover: 60%

3.3 Name and Qualifications of Person Conducting Site Investigation

The site investigation was completed by Martine Esraelian.

Martine Esraelian, B.Sc. is an Environmental Scientist specializing in species at risk and terrestrial ecosystems. She has a B.Sc. from Trent University where she specialized in Conservation Biology and Ecological Management and an Ecosystem Management Technician diploma from Sir Sandford Fleming College. During her time at Trent University, she completed a 1-yr internship with the MNR which involved developing a genetic-based protocol for the extraction of DNA from unknown turtle

eggshells to assist with species identification. The Project entailed extensive molecular genetics research and intensive lab work to develop a protocol able to supplement existing conservation management practices.

She offers expertise across the full breadth of the field from environmental assessments and technical analysis of environmental data to conservation management, corporate and government consulting, and community outreach. Martine has liaised with all levels of government, the community, and a portfolio of clients that includes consulting firms, planners, and high-profile developers. She has both technical and hands-on experience conducting site investigations (terrestrial and aquatic), evaluations of significance, environmental and agricultural impact studies, constraint analyses, water quality and soil assessments, species at risk, wildlife management and fisheries studies to meet regulatory requirements.

Martine has a wide range of field experience related to terrestrial and aquatic ecosystems and species at risk. She has conducted reptile and amphibian surveys, small-mammal trapping, benthic invertebrate monitoring and fisheries inventories (seine netting and electrofishing). She has conducted detailed natural areas inventories which involve species identification of flora and fauna, vegetation community mapping, identifying rare vegetation communities and significant wildlife habitats.

Martine has Project management and fieldwork experience for a number of species at risk monitoring projects. Some of the species she has been involved with include: fowler's toad, massasauga rattlesnake, black ratsnake, Jefferson salamander, northern dusky and mountain alleghany dusky salamander, blanding's turtle, map turtle, spotted turtle, snapping turtle, queen snake, milksnake, ribbonsnake, flowering dogwood, swamp rose mallow and spoon-leaved moss.

Martine is a certified Butternut Health Assessor and also holds a certificate in the Ecological Land Classification (ELC) system.

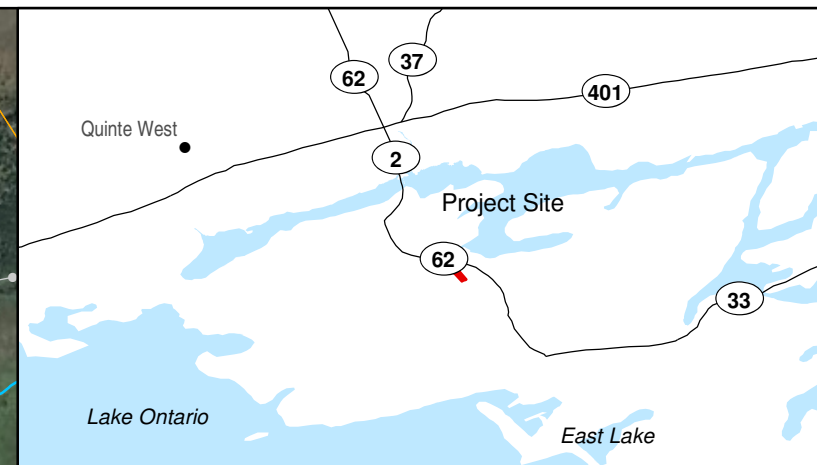
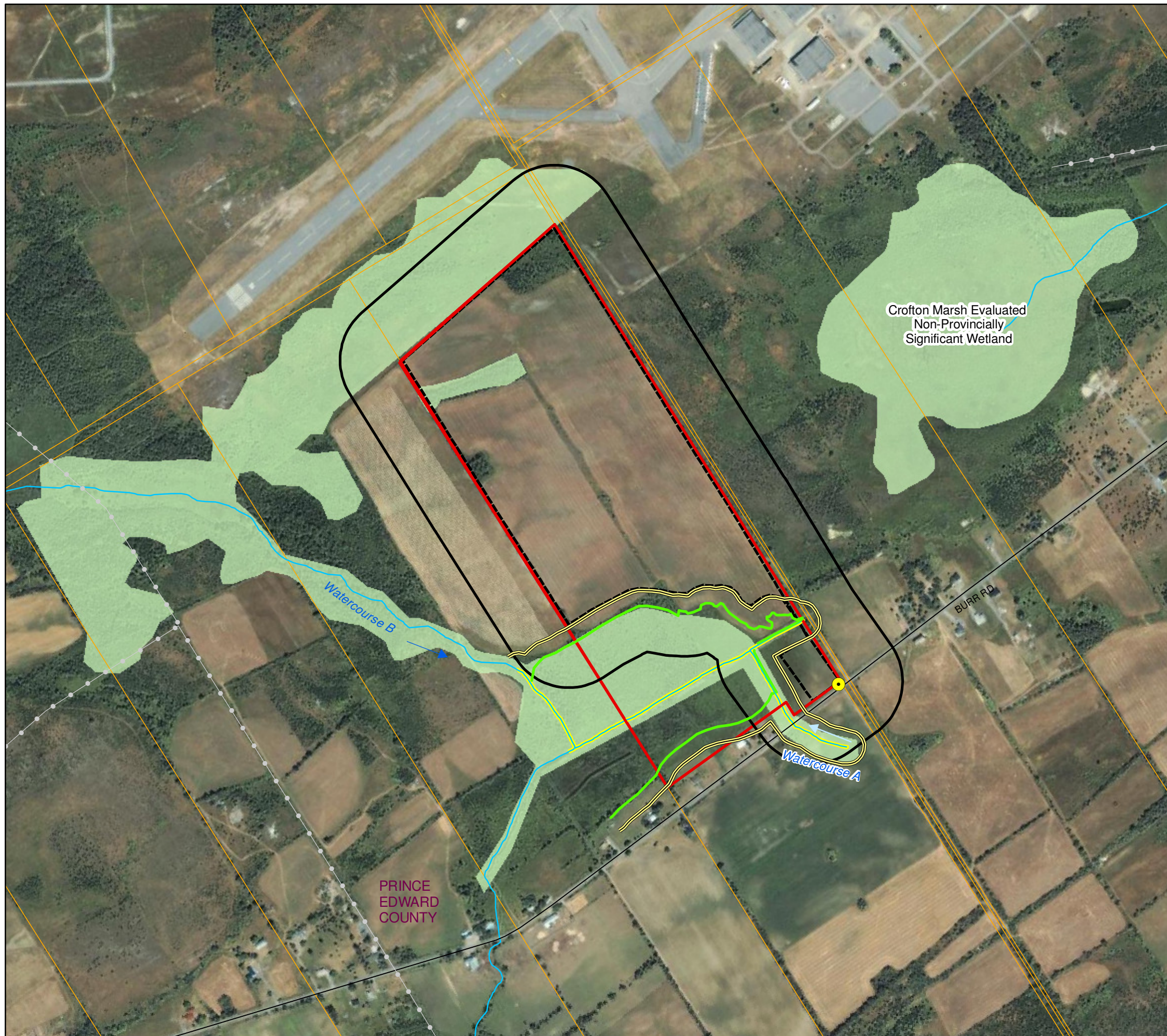
3.4 Survey Methods

The entire site and adjacent lands were searched by the observer on foot in order to document waterbodies. Photographs of the site and water body features were taken. Any observations of waterbodies, including the type of water body, instream habitat types, surrounding riparian areas, average annual high water mark and wildlife use were noted. Geographic coordinates at representative areas of the average annual high water mark were recorded using a sub-meter accuracy GPS for mapping purposes.

A copy of the field notes kept by the observer is provided in Appendix A.

4. Results of Site Investigation

This section documents the results of the Site Investigation and discusses specific water features observed on and adjacent to the subject property. Features noted in the following sections, including the Project footprint boundary and the average annual high water mark and 30-m setback areas associated with watercourses are shown in Figure 4.1.



Legend

- Roads
- Transmission Line
- Watercourse
- Seepage Area
- Average Annual High Water Mark
- 30m Setback from Seepage Area / High Water Mark
- Available Lands
- 120 m from Project Location
- Parcels
- Evaluated Non-Provincially Significant Wetland

Project Components

- Connection Point With Existing Distribution Line
- Project Location



Notes:
 1. OBM and NRVIS data downloaded from LIO, with permission.
 2. Spatial referencing UTM NAD 83.
 3. Satellite imagery from Google Earth Pro

Figure 4.1
 Northland Power Inc.
Belleville North Solar Project
Water Body and
Project Boundaries



Blank back

4.1 Permanent or Intermittent Streams

Two watercourses were observed on and within 120 m of the Project site, including Watercourse A, which is a tributary of Melville's Creek, and Watercourse B, which flows into Watercourse A, both of which were identified during the Water Body Records Review (Hatch Ltd., 2010).

4.1.1 Watercourse A

Watercourse A originates in an agricultural field approximately 100 m south of the Project site (Figure 4.1). It then flows north along the Project boundary and turns west to continue along the Project boundary for approximately 350 m in an excavated, channelized drainage ditch. Another excavated drain runs across the Project site from its eastern boundary to drain into Watercourse A at the point where it turns to flow in a westerly direction. This drain, which was identified as a waterbody, per the definition in the REA Regulation, was not noted during the Records Review process (Hatch Ltd., 2010).

After leaving the Project site boundary, Watercourse A continues to flow approximately west for another 250 m before turning southwest and heading toward Melville's Creek, which is located approximately 2.5 km downstream. Melville's Creek flows for an additional 1.1 km before draining into Consecon Creek, which is a tributary of Consecon Lake.

Watercourse A is approximately 4 to 5 m wide and <0.60 m deep in most locations and is characterized as low-gradient and slow-moving. Emergent, submergent and floating leaved vegetation was present throughout the channel on the Project site. Substrate was primarily fine muck, comprised of organic and mineral material. Riparian zones are dominated by grasses and shrubs and there is overhanging vegetation along the length of the channel.

Where Watercourse A runs along the southern Project boundary in a westerly direction, it runs through a meadow marsh and swamp thicket wetland, which appears to be fed by groundwater discharge. Vegetation within the wetland community included various grasses, sedges, rushes and forbs, as well as shrubs such as willows and dogwoods.

A photograph of Watercourse A where it runs through the Project site is shown in Figure 4.2.

The site investigation has confirmed that Watercourse A is a permanent stream. To establish the average annual high water mark (as per the REA requirement), (i) riparian vegetation was assessed to establish the boundary of vegetation species tolerant of annual flooding, (ii) valley and topographic features such as the top of bank were observed. Based on these observations made during the site investigation, the high water mark along Watercourse A is based on the top of bank feature, although, as discussed in Section 4.1.3, the adjacent wetland has been identified as a seepage area, which also requires a 30-m setback.

As shown in Figure 4.1, the Project footprint boundary is greater than 30 m from the average annual high water mark, but in some areas, it is less than 120 m. In addition, the proposed distribution line from the substation and a new facility access road will cross the unnamed excavated drain on the Project site. Therefore, an EIS will be required to assess the potential for adverse effects and mitigation measures required to prevent/minimize these adverse effects.



Figure 4.2 Watercourse A on the Project Site

4.1.2 Watercourse B

Watercourse B originates in an unnamed wetland approximately 1.2 km northwest of the Project site. It flows through a vegetated corridor and drains into Watercourse A approximately 120 m west of the Project boundary.

Watercourse B had standing water during the site investigation and may be a permanent watercourse. It consists of a relatively narrow (1 m wide) and shallow (<0.30 m) channel with abundant emergent vegetation in the channel and on the banks. Riparian vegetation is similar to that surrounding Watercourse A.

The site investigation has confirmed that Watercourse B is likely a permanent watercourse. The average annual high water mark, based on top of bank features and riparian vegetation communities is shown in Figure 4.1. The Project footprint boundary will be located approximately 120 m from the a small portion of the average annual high water mark of Watercourse B, near its mouth at Watercourse A. Therefore, the EIS will be required to assess the potential for adverse effects and mitigation measures required to prevent/minimize these adverse effects.

4.2 Seepage Areas

The Quinte Conservation Authority Groundwater Study (2009) identified the Project area as a potential groundwater discharge zone. The site investigation confirmed that the wetland at the south end of the Project site noted during the Records Review exhibits indicators of groundwater discharge, including wetland vegetation requiring continuously moist soil conditions and presence of a high groundwater table. The groundwater table appears to intersect the land surface, with groundwater ultimately discharging to Watercourse A.

The wetland is approximately 350 m wide by 375 m long. Vegetation communities are dominated by meadow marsh and shrub thicket vegetation. Common meadow species include various grasses [e.g., Canada blue-joint (*Calamagrostis canadensis*)], sedges and rushes, as well as blue flag (*iris versicolor*), cattail (*Typha sp.*) and mixed upland meadow species including milkweed (*Asclepias syriaca*) and red clover (*trifolium pretense*). Shrubs include various willows (*Salix sp.*) and dogwoods (*Cornus sp.*).

A photograph of the wetland area is provided in Figure 4.3.



Figure 4.3 Seepage Area in Wetland

The REA Regulation requires that all solar panels and inverters be set back at least 30 m from the boundary of the seepage area. This boundary, the 30-m setback and the potential development area are shown in Figure 4.1.

5. Conclusions

Based on the results of the site investigation discussed above, there are two corrections to the results of the Water Body Records Review (Hatch Ltd., 2010). This includes

- addition of an excavated drainage ditch which runs across the southern portion of the Project and flows into Watercourse A
- identification of the wetland at the southern end of the Project site, as noted during the Records Review, as a seepage area.

In addition, the Project Footprint and study area have been refined in this report compared to that shown in the Records Review, which only depicted the leased portion of the property.

Based on the results of the site investigation and the proposed Project footprint shown in Figure 4.1, some components of the facility will be located between 30 and 120 m of Watercourse A and the seepage area in the wetland. In addition, the proposed new distribution line and a new facility access road will cross an excavated drain on the Project site. Therefore, an Environmental Impact Study (EIS) will be required.

6. References

Hatch Ltd. 2010. Belleville North Solar Project – Water Body Records Review Report. Prepared for Northland Power Inc.

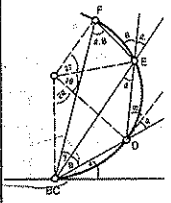
Quinte Conservation Authority. 2009. Groundwater Study. Accessed May 14, 2010. On-line at http://quinteconservation.ca/web/index.php?option=com_content&task=view&id=100&Itemid=85

Appendix A
Site Investigation
Field Notes

TABULATION

OF CIRCULAR CURVE'S DEFLECTION ANGLES AND CHORD LENGTHS FOR LAYING OUT
PURPOSES FROM CURVE TABLE I OR IA AND II

TRANSIT AT THE		$\ell_1 = \dots m$	$C = \dots m$	GIVEN: P.I. STA. $\Delta = \dots^\circ \dots'$		CURVE N ^o
+		$\Delta \ell = \dots m$	$C = \dots m$	$\Delta = \dots^\circ \dots'$	$R = \dots m$	
POINT	STATION SIGHTED	CONSECUTIVE arc length	DEFL. α for STATION	DEFL. α for STATION to nearest second	CONSECUTIVE chord length	CURVE DATA
NOT	•					Az (or Bear) = $\Delta = \dots^\circ \dots'$ $R = \dots m$ $T = \dots m$ $L = \dots m$ $E = \dots m$
	•					$T = R \tan \frac{\Delta}{2}$ } or read off Table II $E = R \operatorname{exsec} \frac{\Delta}{2}$ } with Δ as $L = R \frac{\pi}{180}$ } table entry
						P.I. STA. + - T - B.C. + + L + E.C. +
						$\text{Defl. } \alpha = \frac{90 \ell}{R}$ } or read off Table I or $= \arcsin \left(\frac{C}{2R} \right)$ } IA Chord = $2R \sin \left(\frac{90 \ell}{R} \right)$ } with R as Table entry



Subscript 'i' denotes initial
 Subscript 'e' denotes end or last
 ℓ - any arc length
 $\Delta \ell$ - constant arc increment
 C - chord length

No. Page 1
 Date Belleville North

Date June 14 2010
 Time 0930 - 1500 + 2200 - 2300
 % S.C. 60%
 Temp: 22°C
 Beautiful wind scale = 2

- Northern harrier +
- swallow
- black-capped chickadee
- clay field
- Field - ragwort
- corn patch
- bud for yellow
- self seed
- ox-eye daisy
- red clover
- white clover
- common milkweed
- sedge
- willow sp (R) within field
- Canada thistle
- common milkweed
- bebb's sedge
- salt-tolerant sedge

red-winged blackbird nest with eggs

- babcock.
- leopard frog
- deer tracks
- chickweed or sandwort
- small thistle
- yellow bedstraw
- various
- wild carrot
- rough-fringed cinquefoil
- gold-creed sp.
- allspice
- field horsetail
- fragrant bedstraw
- Canada thistle
- common strawberry
- romaine plantain
- ground cedar?
- aster sp.
- Common buckeye
- riverbank grape
- plum tree
- raspberry sp.
- corn root
- blackfoot trefoil
- wild madder

wild turkey

wetland area

- grasses
- sedge
- small-fruited bulrush
- water hyacinth
- red-elm dogwood
- common cattail
- purple loosestrife
- Virginia creeper
- wild rose
- Canada thistle
- intertid
- spotted jewelweed
- gray dogwood (D)
- field horsetail
- narrow-leaved watercress
- blackberry (D) - hollyhock
- red cedar (D) - hollyhock
- riverbank grape (A) - hollyhock
- riverbank grape
- small groundcover
- gray dogwood (D)
- Common cinquefoil (A)
- red-elm dogwood
- bleated sedge

heterostachya
 heterostachya
 heterostachya

blue oak grass in open area
 north of black oak stand
 mules (A)

Sycamores

Shrubs

banked ridge

White oak sp.

north boundary hedge row

swampy alluvial wood

Red cedar (D)

blackthorn

Shrubs

prickly ash

black oak (R)

Stack near red cedar - all from wood area

corner - bur oak (A)

- 9 wild turkeys

- cotton tail

horned oak

cherry poplar

Killdeer

Robin

White-tailed deer