Penn Energy Ridgefield SOLAR FACILITY

In the City of Kawartha Lakes

FIT Contract No. F-001549-SPV-130-505 FIT Application No. FIT-FITFRZ1

Water Assessment

Prepared for: Penn Energy Renewables Ltd. 620 Righters Ferry Road, Bala Cynwyd, PA 19004

Prepared by: Bowfin Environmental Consulting 168 Montreal Road, Cornwall, ON K6H 1B3

October 2012



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1.0 INTRODUCTION

Penn Energy Renewables Ltd. (where after referred to as the proponent) has obtained a Feed-in-Tariff (FIT) contract from the Ontario Power Authority (OPA) for the construction of a 8,000 kW Solar Facility approximately 7 km north Lindsay, Ontario (Figure 1). The subject lands are located on Part of Lot 5, Concession 10 (except for pt. 1, 57R5407) in the Geographic Township of Fenelon in the City of Kawartha Lakes, known municipally as 59 Kennedy Bay Road.

The solar facility will consist of single photovoltaic (PV) modules that are approximately 1 m x 2 m in dimension. The modules are grouped in arrays which are aligned in east-west rows; these rows are separated by access aisles approximately 5 m in width. The project area will consist of approximately 44, 000 PV modules and 8 or more modular collection houses. The modules are static. The construction of this facility will require the upgrading of an existing farm lane located on Kennedy Bay Road. A transmission line will be constructed within the project location and it will connect to Hydro One on Kennedy Bay Road at the end of the access road (Figure 2). The project location will be fenced for safety and security reasons. The total area occupied by the facility will be approximately 25 ha.

The Environmental Protection Act (EPA) administered by the Ministry of the Environment (MOE) regulates Renewable Energy Approvals (REA) under Part V.0.1 of the act, per Ontario Regulation 359/09. As part of this act, a Water Assessment (WA) is required in order to identify water bodies in and within up to 300 m of the proposed project location. Bowfin Environmental Consulting Inc. (Bowfin) has been retained by the proponent to conduct the WA.

A water assessment study includes two activities: a <u>review of records</u> (background information), and a <u>site investigation</u>. The records review includes the identification of the presence of the annual high water mark of a water feature that is within 120 m (or 300 m of a lake trout lake) from the project location. These water features include:

- a water body;
 - o lake;
 - \circ permanent or intermittent stream; or
- seepage area.

Should any water feature be found within the project location or the appropriate adjacent lands, then a report that identifies and assesses any negative environmental effects of the project on the water body/ies is required (Water Body Report). The following report provides a summary of the records review and site investigations and includes a Water Body Report where required.

Figure 1 Location of the Subject Lands



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2.0 RECORDS REVIEW

2.1 Methodology

The records review was conducted in order to identify potential environmental concerns and included identifying water features within the project location or within up to 300 m of the project location. The water features examined were: water bodies, lakes (including kettle and lake trout lakes), permanent and intermittent streams, and seepage areas. Preliminary mapping of candidate features was completed through the use of satellite imaging, Land Information Ontario (LIO) mapping, Ontario Base Mapping (OBM) and the Official Plan (City of Kawartha Lakes). The records review was conducted in order to identify potential environmental concerns and included identifying natural heritage features within the study area. The following sources of information were used during the records review:

- 1. Ministry of Natural Resources
 - a. Natural Heritage Information Centre (NHIC)
 - b. Land Information Ontario (LIO)
 - c. Ontario Crown Land Use Atlas
 - d. Renewable Energy Atlas
- 2. Conservation Authority
 - a. Conservation Ontario Website
 - b. Correspondence with Kawartha Conservation
- 3. Municipal Planning Authority or Local Planning Board, and Local and Upper-tier Municipality
 - a. City of Kawartha Lakes Official Plan (OP)

(Note this project does not fall within the jurisdiction of either the Local Roads or Local Services Boards)

- 4. Other
 - a. Niagara Escarpment Plan
 - b. Satellite imaging (google earth)

See Appendix A for mapping and copies of correspondences from the above records where applicable.

2.2 Results

The proposed facility is approximately 7 km to the north of the Town of Lindsay, in the City of Kawartha Lakes (Figure 1). The project location is found to the south of Snug Harbour Road, west of Kennedy Bay Road, north of County Road 36 and east of County Road 11 (Figure 2). The subject lands are approximately 25 ha. All construction and operation activities, including the transmission line and access road, will occur within the project location as identified on Figure 2. The surrounding land-uses include primarily crop/grazing lands with a few rural residential and woodlands.

The land is zoned rural (OP Schedule A5). There are no constraints listed for the project location on the official plan. The only candidate water bodies identified in the available records are located outside of the study area (more than 120 m from the project location).

The study area is not located within the jurisdiction of any planning boards, local roads boards or local services boards. The Planner with the City of Kawartha Lakes contacted via email indicated that there was no additional information available other than what was provided in the Official Plan (September 6, 2011).

The study area is located <u>outside</u> of the Oak Ridges Moraine, the Greenbelt Protected Countryside and the Niagara Escarpment. This was confirmed by Peterborough District MNR in their Records Review template (Appendix A).

There are no provincial parks or conservation reserves within the study area as per the Renewable Energy Atlas and as confirmed by Peterborough District MNR in their Records Review template (Appendix A).

The Coordinator, Environmental Protection/GIS Specialist with the Kawartha Conservation, provided the Sturgeon Lake Watershed Maps and confirmed by phone that the conservation authority did not have any information on valleylands within the study area. The Resource Planner indicated that there are wetlands within the surrounding 120 m.

A summary of the record review results pertaining to the presence of significant natural heritage features in the study area is provided in Table 1 and those with known records are shown on Figure 2, as applicable.

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Water Feature	Un or Adjacent to Project Location?	Records Review Findings
Lakes	No	 No lakes in or within 120 m of the project location (OP, satellite imaging, LIO). No lakes or lake trout lakes are in or within 300 m of the project location.
Permanent Streams	No	 No watercourses in or within 120 m of the project location (OP, LIO, satellite imaging).
Intermittent Stream	No	 None identified in or within 120 m of the project location (OP, satellite imaging, LIO)
Seepage area	Unknown	• Requires site investigation.

Table 1Summary of Water Bodies Located in or within 120 m of the ProjectLocation (based on the records review)

OP = official plan of the City of Kawartha Lakes

3.0 SITE INVESTIGATION

3.1 Methodology

The site investigation was conducted by <u>visiting the site</u>. The purpose of the site investigation was to confirm the presence, location and boundary of any candidate water body feature identified during the records review and to document any new candidate features. Should a water body be found, then it would be described and the distance from the project location to the boundary of the annual high water mark would be measured as part of the site investigations. The site visit was complete by systematically cruising the area by foot to determine if any water body features were present within the study area. The study area includes the project lands (where any construction activities, including support facilities and staging areas, would take place) as well as all surrounding lands within 120 m for all features with the exception of lake trout lakes where the study area was enlarged to include 300 m from the project location (Figure

2). During the site investigation visit the records review mapping was corrected through ground truthing.

The definition of water body under the REA legislation is:

"a water body includes a lake, permanent stream, an intermittent stream and a seepage area but does not include: grassed waterways, temporary channels for surface drainage, rock chutes and spillways, roadside ditches that do not contain a permanent or intermittent stream, temporarily ponded areas that are normally farmed, dugout ponds or artificial bodies of water intended for the storage, treatment or recirculation of runoff...."

The definition of a permanent stream is:

"...those that continually flow during an average year."

And the definition for an intermittent stream is:

"... natural or artificial channels, other than dams, that carry water intermittently and are free from vegetation dominated by plant communities that require or prefer the presence of water or continuously saturated soil to survive."

No definition of lakes is provided in the REA document; as such, the *Ontario Wetland Evaluation System* definition was used:

"Areas of open water that are greater than 8 ha in size and at some location are greater than 2 m in depth from the normal low water mark"

These definitions were utilized to identify the presence of water bodies. The aquatic habitat was described based on the appropriate methodologies such as: *Ontario Wetland Evaluation System, Southern Manual* (OWES) for wetland habitats and *Environmental Guide for Fish and Fish Habitat* (MTO 2006) for watercourses. Data collected included information on morphology, substrate, structure and in-water cover and aquatic flora and fauna.

Resumes of the key personnel are provided in Appendix B.

Field notes are included in Appendix B. Site visit was completed by Michelle Lavictoire, M.Sc. (Natural Resources) on August 9 2012 between 0830 and 1615 hours (7 hours and 45 min in total). The weather conditions were overcast with periods of heavy rains.

3.2 Results

No candidate waterbodies were identified during the records review. No additional water bodies were found during the site investigations. It was noted that roadside ditches were present along Snug Harbour and Kennedy Bay Roads, outside of the project location but within the surrounding 120 m lands. These ditches were dry within the study area during the 2012 visit, despite the heavy rain. They did not contain a defined channel and were vegetated with terrestrial and aquatic vegetation. None of the roadside ditches contained a permanent or intermittent stream and as such did not meet the O. Reg 359/09 definition of a waterbody.

It is also noted that there was a grassy waterway present on private property to the east of Kennedy Bay Road (note shown on Figure 3). Again, this area was grassed, mowed and dry. It did not meet the O. Reg 359/09 definition of a waterbody.

No seepage areas were found during the site investigations.

Conclusion: None of the candidate waterbodies (roadside ditches or grassy mowed waterways) contained permanent or intermittent streams. None met the O. Reg 359/09 definition of a waterbodies.





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3.3 Site Investigations Including Confirmation of, Corrections/additions to Records Review Findings

The records review indicated that there were no candidate waterbodies in or within 120 m of the project location. During the site investigations, the roadside ditches were investigated to ensure that none met the definition of a stream (permanent or intermittent), none did. A mowed waterway was noted on an adjacent landowner's property (outside of the project location but within 120 m). This feature also did not meet the O. Reg 359/09 definition of a waterbody as it was a grassed waterway.

Site investigations confirmed the records review findings that there were no water bodies located in the project location or within 120 m of the project location. No lake trout lakes were located in the project location or within 300 m of the project location. The ditches associated with the railway lines were vegetated and did not contain a permanent or intermittent stream and as such are not water bodies per the O. Reg. 359/09 definitions. No seepage areas were observed within the study area.

Water Feature	Findings (on or within project location and surrounding lands)		Changes (corrections to
	Records Review	Site Investigations	records review and/or addition of new water body features)
Lakes	 No lakes in or within 120 m of the project location (OP, satellite imaging, LIO). No lakes or lake trout lakes are in or within 300 m of the project location. 	 No lakes within 120 m of the project location. No lake trout lakes are within 300 m of the project location. 	
Permanent Streams Intermittent Stream	 No watercourses are identified in or within 120 m of the project location (OP, LIO, satellite imaging). None identified in or within 120 m of the project location (OP, satellite imaging, LIO) 	• None	None
Seepage Area	• Requires site investigation.	 No seepage areas were found 	-

Table 2Summary of Water Features Located within the Project Location or theAdjacent Lands (based on the Site Investigations)

4.0 CONCLUSION

The records review indicated that there were no water bodies in or within 120m of the project location and no lakes or lake trout lakes in or within 300 m of the project location. No water bodies were found during the site investigation confirming that there were no water bodies as defined by O.Reg. 359/09 in or within 120 m or 300 m (for lake trout lakes) of the project location.

Section 39 of REA indicates prohibits a solar facility in or within 30 m of the average annual high water mark of a lake, permanent stream, intermitting stream or a seepage area. As documented in this Water Assessment (records review and site investigation), the proposed solar facility complies within this requirement.

Additionally, subsection (1) of section 40 prohibits a solar facility within 300 m of the average water mark of a lake trout lake or within 120 m of any other lake, or a permanent stream, intermittent stream or seepage area. This proposed facility also complies with this requirement.

As such no Water Bodies Report is required.

5.0 **REFERENCES**

Ministry of Natural Resources. Ontario Wetland Evaluation System. Southern Manual. NEST Technical Manual TM-002. March 1993 (updated December 2002).

MTO 2006. Ministry of Transportation Environmental Guide for Fish and Fish Habitat.

APPENDIX A Records Review

Communications with the City of Kawartha Lakes

RE: Information request

Linda Russell (Irussell@city.kawarthalakes.on.ca) Add contact

To: agiroux@niblett.ca;

4025_001.pdf

View slide show

Hi Ali,

The Natural Heritage Features shown on Schedule B-5, City of Kawartha Lakes Official Plan, are identified by the MNR. Therefore, the City has no additional information to provide.

I have attached the Preconsultation Application, which is the formal venue for introducing the project to the Municipality. Once we receive Part A of the REA application, we will schedule the application for Preconsultation. This provides the Municipality and other relevant agencies an opportunity to address concerns and request additional information, if necessary. Part B of the REA application is completed after Preconsultation.

Please let me know if you have any questions.

Correspondence with MNR Peterborough

Ministry of Natural Resources Peterborough District Office 300 Water Street 1[#] Floor, South Tower Peterborough, ON K9J 8M5 Telephone: (705) 755-2001 Facsimile: (705) 755-3125

Ministère des Richesses naturelles Le bureau du district de Peterborough C.P. 7000, 300 rue Water Peterborough, ON K9J 8M5 Telephone: (705) 755-2001 Facsimile: (705) 755-3125



September 15, 2011

PENN Energy Trust, LLC 620 Righters Ferry Road Bala Cynwyd, PA USA 19004 Attention: Mr. Max Frable

Dear Mr. Frable:

Re: Request for Records for Penn Energy – Ridgefield (Barta) Solar Energy Facility

This letter is in response to your request for information regarding natural heritage features for the proposed Penn Energy – Van Dorp Solar Energy Facility in accordance with the Records Review phase of the Natural Heritage Assessment as outlined tin the Renewable Energy Approvals (REA) process (Ontario Regulation 359/09).

Based on the map and information provided, MNR has completed an internal search of available natural heritage information for the East ½ of Lot 5, Concession 10 in the geographic Township of Fenelon in the City of Kawartha Lakes. According to MNR's known and available records, we offer the following comments with respect to the presence of natural heritage features in and around the property boundary as displayed in Figure 1: Natural Features & Vegetation Communities provided to this office on August 30, 2011. Please note that any changes to the project location should be promptly brought to our attention.

MNR suggests that you review the Natural Heritage Assessment Guide for Renewable Energy Projects (NHAG), and the Significant Wildlife Habitat Technical Guide, early in your planning process to ensure that project related field work and data collection meets the appropriate standards and requirements. Additionally, please review the MNR's Approval Permitting and Requirements Document (APRD) to assess if additional permitting or authorizations under other MNR administered legislation, including the Endangered Species Act, are required to facilitate the construction and operation of the proposed solar facility.

Wetlands

There are several pockets of unevaluated wetlands located beyond the 120 metre buffer of the project location. There are Provincially Significant wetlands within the general area, however, located well beyond the 120 metre buffer. Please note that the REA Regulation defines wetlands as lands that are seasonally or permanently covered by shallow water and display the presence of particular soils and vegetation, other than land that is being used for agricultural purposes and no longer exhibits wetland characteristics. When conducting site investigations for wetlands, applicants must verify the boundaries of any wetlands identified through the records review, and establish the presence of any additional wetlands and their boundaries.

Areas of Natural and Scientific Interest (ANSI)

There are no known ANSI's within the project location or 120 metres thereof. Please note that MNR assesses ANSIs as being provincially, regionally or locally significant. To date, more than 500 have been confirmed across the province. When conducting site investigations for ANSIs, applicants must verify the boundaries of all ANSIs identified through the records review. With the exception of specified provincial plan areas only ANSIs confirmed by MNR as provincially significant are afforded protection through the REA Regulation. Applicants are not required to identify additional ANSIs during the site investigation.

Woodland

There are several woodlands within the project location and the 120 metre buffer. The woodland within the northern portion of the 120 metre buffer is associated with an unevaluated wetland noted above. Site investigation for woodlands involves confirming that woodlands identified through the records review meet the criteria in the definition of woodland as outlined in the REA Regulation and verifying their boundaries. Any previously un-assessed treed areas which meet the criteria for a woodland must be identified and their boundaries established. MNR recommends referring to the Natural Heritage Reference Manual for procedures and criteria to determine whether the woodland is significant. Additionally, the woodland features within the project location and 120 metres thereof should be considered for wildlife habitat.

Wildlife Habitat

There is no known significant wildlife habitat within the project location and the 120 meter buffer. However, please note that the Renewable Energy Approval Regulation defines "natural feature" as among other features, wildlife habitat MNR recommends that you review the Significant Wildlife Habitat Technical Guide (SWHTG) and the NHAG early in the site investigation planning process to ensure that the wildlife habitats identified and described within the guide are appropriately captured through the NHA process. Additionally, those wildlife habitats may be considered as candidate significant wildlife habitat and may require further evaluation through evaluation of significance if required.

Fish and Fish Habitat

There is a watercourse located in the northwest corner of the project location and 120 meter buffer. MNR recommends that fish, fish habitat, thermal regimes and stream locations should be verified through the site investigation process. A permit under other legislation may be required to proceed with the development of the proposed facility.

Provincial Parks and Conservation Reserves

There are no Provincial Parks or Conservation Reserves within the project location or the 120 metre buffer. Where a project location is proposed within the setback of a natural feature which is inside a provincial park or conservation reserve, the park superintendent or conservation reserve manager should be contacted prior to undertaking site investigations, as a permit may be required. Applicants proposing projects within the setback of a provincial park or conservation reserve will also have to address the potential negative environmental effects to the Provincial Park or conservation reserve itself, through an Environmental Impact Study. Applicants should consider discussing the features, functions and values of the protected area, as well as any field work required to complete an EIS during the site investigation stage.

Natural features in Specified Provincial Plan Areas - Oak Ridges Moraine & Greenbelt Plan

The project location is not within the Oak Ridges Moraine or the Greenbelt Plan areas. Project locations which are proposed in the Oak Ridges Moraine Plan Area or the Greenbelt Plan's Protected Countryside Area require the identification of additional natural features during the records review, including sand barrens, savannahs, tallgrass prairies, and alvars. When

conducting site investigations for natural features in the Oak Ridges Moraine Plan Area or the Greenbelt Plan's Protected Countryside Area, applicants must also verify the boundaries of any sand barrens, savannahs, tallgrass prairies, and alvars identified through the records review and establish any additional instances of these natural features and their boundaries. Applicants should note that although the site investigation must consider these additional natural features throughout the Greenbelt Plan's Protected Countryside Area, their development prohibitions and setbacks apply only to the Natural Heritage System of the Protected Countryside Area.

Oil, Gas and Salt Resources

There are no known oil, gas and salt resources in the project location. However, we suggest you consult the Oil, Gas and Salt Library to confirm there are none of these resources within the general area and the project boundary. Please visit the online library at the following link: http://www.ogsrlibrary.com/

Sincerely,

Eric R. Prevost Renewable Energy Planning Ecologist Peterborough District MNR

Cc: Chris Ellingwood, Terrestrial Biologist, Niblett Environmental Associates

Correspondence with Kawartha Conservation

Email from Leah:

Good morning Cyrus, thank you for following up with KRCA. I apologize for not responding sooner however I have been tied up as work gets quite busy this time of year. I have looked over our Information Request response letter and at this point in time, it covers all of the information that we have for the site. Based on the site plan provided at the CKL preconsultation meeting, it appears as though the project substation and some of the solar panels/connecting "roadways" in the northern limits of the project area are within 120 metres of the wetlands areas located to the north and east of the subject property and therefore, located within areas regulated under Ontario Regulation 182/06 (Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses), which is administered by KRCA. I mentioned this at the preconsultation meeting. As such, a permit from this office would be required for work in these areas prior to the commencement of any on-site work.

If you would like to discuss further, I could give you a call on Friday this week.

Sincerely, Leah Stephens

Official Plan Schedule A5



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Official Plan Schedule B5



Bowfin Environmental Consulting Inc. October 16, 2012

APPENDIX B - QUALIFICATIONS

MICHELLE L. (NUNAS) LAVICTOIRE, M. Sc.

EDUCATION

M. Sc. Natural Resources, Macdonald Campus, McGill University – Supervisor Dr. Curtis, 2011 B. Sc. Wildlife Biology, Macdonald Campus, McGill University, 1997

LANGUAGES

Fluent in English, French, advanced in Spanish.

PROFESSIONAL AFFILIATIONS

American Fisheries Society (AFS), Association Québécoise pour l'évaluation d'impacts (AQEI), International Association for Impact Assessment (AIAI), Ontario Waterpower Association.

POSITIONS HELD

2002-:	Bowfin Environmental Consulting Inc., Principal/Biologist
2000-2002:	Self-employed, Biologist
1999-2000	Tera Environmental Consultants, Calgary, AB, Environmental Planner
1998-1999:	Enviroconsult Inc. Calgary, AB, Biologist
1998:	Golder Associates Ltd., Calgary, AB, Contract Technician
1997-1998:	Envirowest Consultants Ltd., Prince George, BC, Biologist
1996:	Heritage Laurentien, Montreal, PQ, Naturalist
1996:	Martineau-Walker, Montreal, PQ, Naturalist
1995:	Ottawa-Carleton Wildlife Centre, Ottawa, ON, Wildlife Intern

CERTIFICATIONS/COURSES

Participated in the:

- Aboriginal Awareness Training (Ripple Effects on-line course)
- First Nations Environmental Assessment Toolkit for Ontario workshop
- Ontario Fish Identification course offered by the Centre for Biodiversity and Conservation Biology at the Royal Ontario Museum
- Ontario Freshwater Mussel Identification Workshop
- Natural Heritage Assessment Training for Environmental Consultants (MNR)
- MTO/DFO/OMNR Fisheries Specialist Training Sessions

Certified in / Registered as:

- MNR certified for: Ontario Wetland Evaluation System, Ecological Land Classification and Butternut Health Assessor
- MTO R.A.Q.S. Fisheries Assessment, Environmental Inspection during Construction and Fisheries Compliance during Contracts and Natural Sciences.
- Class 1 WSC Electroshocking Certification

• First aid and CPR, PADI Instructor, Marine radio operator, Pleasure Craft Operator Card

EXPERIENCE

Experience in environmental assessments, peer/technical reviews, aboriginal consultation, public consultation, environmental protection plans, terrestrial habitat assessment, freshwater and marine habitat assessment, route selection, watershed studies and terrestrial and fisheries inventories including habitat mapping, stream classification, underwater surveys (marine and freshwater), electroshocking, Species at Risk inventories, development of mitigation and compensation measures, obtaining permits and approvals from DFO, MNR, MOE and Mohawk Council of Akwesasne.

SELECTED PROJECTS

Renewable Resources – Solar and Small Waterpower Facilities

- Bonnechere River Proposed Thomas Low Waterpower Project Environmental Impact Assessment and the Mississippi River Enerdu Proposed Expansion Waterpower Project. Roles included: agency and aboriginal consultation, terrestrial and aquatic habitat descriptions, reptile surveys, breeding birds inventories, benthic macroinvertebrate and fish community sampling, species at risk assessment, development of mitigation measures and assessment of impacts.
- MNR Natural Heritage Assessment, Environmental Impact Study, APRD and the Water Body reports for a 500kw solar facility near Rodney, Ontario (Aylmer District). Activities included: completion of Ecological Land Classification, wetland evaluation, evaluation of significance of natural features, wildlife observations, evaluation of the potential for and impact to species at risk, recommendation of mitigation measures, development of SAR monitoring program, identification of water bodies (as per Renewable Energy Approval definitions) and agency consultations. MNR confirmation and APRD letters were obtained.
- MNR Natural Heritage Assessment, Environmental Impact Study and Water Body reports for three anaerobic digesters in eastern Ontario (Kemptville District) and one on Wolfe Island, ON (Peterborough District). Activities included: completion of ecological land classification, evaluation of significance, evaluation of potential to impact natural features and Species at Risk and agency consultation. MNR confirmation and APRD letters were obtained.
- Monitoring plan and Species at Risk approval for a small hydroelectric facility producer on the South Nation River.
- MNR Natural Heritage Assessment, Environmental Impact Study, Water Body and Water Body Assessment reports for three 10 MW solar facilities in the Townships of Hamilton, Edwardsburgh and South Glengarry (Kemptville and Peterborough Districts). Roles included: Ecological Land Classification, Ontario Wetland Evaluation, Aquatic habitat description, fish community sampling, reptile survey, breeding bird and Loggerhead Shrike surveys, Species at Risk assessment and agency consultation. MNR confirmation and APRD letters were obtained.
- Terrestrial and aquatic evaluation of three proposed small waterpower options on behalf of a Cree community in northern Quebec. Activities include field visits, fish community and larvae sampling, breeding bird surveys, plant inventories, habitat descriptions, consultations with Cree community, compilation and mapping of aboriginal traditional knowledge, ranking of options and reporting. Work is completed in both English and French.
- Bonnechere River Douglas Hydroelectric Site Facility Re-Development Aquatic Habitat and Community Assessment, Mitigation measures and Impact Assessment and Species at Risk assessment. Roles include: agency consultation, study design, fish community and walleye spawning surveys, benthic invertebrate inventory, habitat descriptions and development of mitigation measures.

- Collection terrestrial and aquatic baseline data for the proposed First Chute small hydroelectric facility on the Bonnechere River (near Renfrew, ON). Work included: terrestrial and aquatic habitat descriptions using ecological land classification, and Ontario wetland evaluation system, inventories (plant, species at risk, breeding birds, reptile, fish, molluscs and benthic invertebrates), spawning surveys (Lake sturgeon and walleye).
- South River Hydroelectric Facility Existing Environmental Conditions and Impact Analysis and Fish Compensation and Monitoring Plan. Activities included: agency consultation, fish community inventories, terrestrial and aquatic habitat descriptions and development of mitigation measures.

Aggregate Resources – Sand Pits and Quarries

- Level 2 Fisheries Assessment for several sand pits and quarries including: Wendover II Quarry (Wendover, ON), Leduc Sand Pit (Moose Creek, ON), Yelle Pit Expansion (Greely, ON), Pommerleau Pit Expansion (Greely, ON), Brown Sand Pit (Finch, ON), Gagne Pit Expansion (Hammond, ON), Dillabough Sand Pit (Kemptville, ON). Activities included: completion of fish community inventories and habitat descriptions as well as the evaluation of potential impacts and recommendation of mitigation measures.
- Wetland Community Description and Impact Assessment and Intermittent Drain Fish Habitat Assessment for a proposed quarry near Moose Creek, ON. Activities included: agency consultation, Ontario Wetland Evaluation, Species at Risk inventories (Least Bittern and Blanding's Turtle), and fish community sampling and habitat description.
- Plantagenet Asphalt Plant Fish Habitat and Community Assessment. Activities included: fish habitat description, fish community sampling and evaluation of impacts.
- Sarrazin Pit Natural Environment Assessment Level 1 and 2 (near Plantagenet ON). Activities included: Ecological Land Classification and fish habitat descriptions, breeding bird survey, fish community sampling, Species at Risk evaluation, Butternut inventory and impact assessment and development of mitigation measures.
- Private client. Level 1 and Level 2 Natural Environment Assessment for a proposed quarry expansion (eastern Ontario). Activities included: ecological land classification and fish habitat descriptions, fish community sampling, breeding bird surveys and butternut inventory.
- Aquatic impact assessment in support of obtaining a PTTW for the Apple Hill Quarry.
- Level 2 Fisheries Assessment for Vermiculite Canada (Peterborough area, ON). Activities included: aquatic habitat description, project management of environmental team, agency consultation and reporting outlining potential impact assessment.
- Level 1 Natural Environmental Assessment for Vermiculite Canada several projects (Peterborough area, ON). Activities included: terrestrial and aquatic habitat descriptions.

Land Use Planning - Subdivisions, Lot Severances and Forestry Projects

- Municipal Campus Kingston Ecological Assessment. Activities included: habitat descriptions using ecological land classification, Ontario wetland evaluation and Ontario stream assessment protocol. Also completed breeding bird and fish community inventories. Field work was required to evaluate the significance of the natural features present within the study area, and to develop mitigation measures, enhancement measures and complete an impact assessment.
- Ontario Wetland Evaluation descriptions and boundary determinations for: Morrisburg Industrial Park (Morrisburg, ON) and Doran Creek Estates (Iroquois, ON). Activities included: consultation with agencies, habitat descriptions (OWES and ELC), mapping, impact assessment and recommendation of mitigation measures.
- Environmental Impact Assessments/ Statements and Ontario Wetland Evaluation surveys for several single lot severances in United Counties of South Glengarry, Dundas and Stormont as well as in the Casselman and Ottawa Areas.
- Fish Habitat and Community Assessments for: Trillium Proposed Subdivision (Rockland, ON), Shadow Ridge Subdivision Phases 2 and 3 (Greely, ON), Single Lot Development (Casselman, ON), Laviolette

Proposed Subdivision (Rockland, ON), Legault Proposed subdivision (St. Albert, ON), and Proposed Medical Office and Retail drugstore on Mitch Owens (Manotick, ON). Activities included: agency consultation, fish community and habitat description, evaluation of impacts and recommendation of mitigation measures and enhancement/compensation measures, as required.

- Natural Environmental Impact Statement for: Doran Creek Estates (Iroquois, ON) and Heron Bay Subdivision (South Lancaster, ON). Roles included: habitat descriptions using ecological land classification and Ontario wetland evaluation system, surveys (plant, breeding bird and butternut), determination of impact assessment, species at risk assessment and the recommendation of mitigation measures.
- Ecological Site Assessment for Morrisburg Industrial Park (Morrisburg, ON) and Ottawa Landfill Ditch Realignment. Roles included: review of known information, air photo interpretation, identification and obtaining of required permits and approvals.
- Aquatic habitat and community assessment in support of a MOE permit to take water for the Amberwood and Riverbend Golf Courses (Ottawa, ON) and Summersheights Golf Course (Cornwall ON).
- Natural Environment Level 1 for Ferguson Lake Development (Renfrew County). Roles included: terrestrial habitat description and screening.
- Aquatic Assessment and Environmental Screening Report for Loughborough Lake. Roles included: agency consultation, field surveys and report writing. (Kingston Area, ON).
- Assisted with terrestrial environmental impact assessments, in identification of environmental features to identify constraints and opportunities in support of a proposed Official Plan amendment in Tatlock, Ontario.
- Wrote Environmental Overview for Tanglewood and Creekside Mills residential developments in Calgary.
- Wrote Environmental Overview for Elbow Valley Environmental Protection Plan in Calgary.
- Fish habitat assessment on various waterbodies throughout Ontario and in Quebec, Alberta and British-Columbia. Waterbodies assessed include: Lafontaine Drain (Rockland, ON), Clarence Creek (Rockland, ON), Brook Creek (Port Hope, ON), Young Creek (Norfolk, ON), Hay Creek (Norfolk, ON), Spring Creek (Norfolk, ON), Lynn River (Norfolk, ON), Poole Creek (Ottawa, ON), Grey's Creek (Cornwall, ON), Shirley's Brook (Ottawa, ON), Adam's Pond (Ottawa, ON), Foster Drain (Ottawa, ON), Carp River (Ottawa, ON), Jock River (Ottawa, ON), Feedmill Creek (Ottawa, ON), Little Cataraqui River (Kingston, ON), Tay River (Perth, ON), Ottawa River (L'Orignal, ON), Athabasca River (Fort McMurray, AB), Fraser River (Prince George, BC) as well as numerous unnamed watercourses throughout Ontario and near Prince George and MacKenzie in British Columbia.
- Conducted Forest Resources stream inventories for Lakeland Mills in Prince George, BC and north of MacKenzie BC. Work included backpack electrofishing, minnow trapping and snorkel surveys. Work was completed by helicopter, ATV or by foot and required accurate orienteering and mapping skills.

Route Section Studies – WTTP, WPCP, Pipelines

- Natural Heritage Assessment for the proposed water intake pipe in Picton, ON. Roles includes: agency consultation, terrestrial and aquatic habitat assessment, ranking of proposed routes.
- Natural Heritage Existing Conditions Report for the Petewawa River Crossing Route Selection for Muncaster Environmental Planning. Activities included: terrestrial and aquatic habitat descriptions using ecological land classification and Ontario wetland evaluation system.
- Environmental Impact Statement for the route selections for the Caron Street Expansion in Rockland, ON. Activities included: description of the terrestrial and aquatic habitats.
- Aquatic assessment of alternative routes for the proposed Cataraqui Bridge Crossing (Kingston, ON). Activities included: agency consultation, habitat description and ranking of alternatives and construction methods.
- Route Selection Assessment for the Simcoe WPCP. Activities included: completion of terrestrial and aquatic habitat assessments, plant inventories and fish community inventories as well as the ranking of the route alternatives.
- Terrestrial and Aquatic Environmental Screening Reports for sewer and water mains projects: Westley's

Point (Township of South Glengarry) and Cataraqui River Crossing (Kingston, ON). Roles included: agency consultation, terrestrial and aquatic habitat descriptions, ranking of routes and identification of potential impacts.

• Assisted with environmental impact assessments, environmental field reports and fieldwork for various pipeline projects (Calgary area and Fort McMurray, AB and Strait of Georgia, BC).

Linear Development - Bridges, Roads, and WPCP, WTTP, Natural Gas and Oil Pipelines

- Aquatic component of environmental assessment for: the proposed Cataraqui Bridge Crossing (Kingston, ON), Morrisburg Waste Water Tunnel (Morrisburg, ON), Clarkson WWTP Outfall (Lake Ontario), Town of Saugeen Shores WPP Upgrade (Lake Huron), Burloak Water Purification Tunnel Project (Lake Ontario), L'Orignal Wastewater Treatment Plant (L'Orignal, ON), Alexandria Wastewater Treatment Plant Expansion (Alexandria, ON).
- Environmental Impact Assessment for: Caron Street Expansion (Rockland, ON), Cataraqui Utilities Crossing (Kingston, ON), Proposed WPCP Expansion in the Town of Greater Napanee (ON), Proposed WTTP Expansion (Iroquois, ON), Morrisburg Wastewater Treatment Plant (Morrisburg to Iroquois ON), Harbour Front Trunk Sewer Overflow Control (Kingston, ON). Roles included: agency consultation, terrestrial and aquatic habitat descriptions (including wetland evaluations), surveys (breeding bird, fish community and plants), evaluation of the potential for Species at Risk, identification of potential impacts and recommendations of mitigation measures, compensation and/or enhancement measures as required.
- Assisted with environmental impact assessments, environmental field reports and fieldwork for various pipeline projects in Alberta (southern AB and Fort McMurray, AB) and the proposed marine pipeline in the Strait of Georgia.
- Wrote Environmental Overview and Environmental Protection Plan for Beddington Trail (Calgary, AB).

Aquatic Inventories

- Spawning and fall community surveys for: lake trout and lake whitefish on Lakes Barlow and Opémisca (Oujé-Bougoumou, Quebec). Sampling methods included: neuston nets, egg traps, seine nets, backpack electrofishing, gill nets and hoop nets.
- Designed and conducted fish kill monitoring of the recently upgraded water treatment facility in Southampton, ON.
- Completed boat electofishing and habitat mapping for Port of Prescott proposed expansion (Prescott, ON).
- Collected and analyzed fish and benthic macroinvertebrates from Pattingale and Hoople Creeks for a comparison study of impacted and non-impacted sites for the Raisin Region Conservation Authority (Cornwall, ON).
- Developed and conducted sampling for a benthic macroinvertebrate monitoring program for PTTW, Riverbend Golf Course (near Ottawa, ON).
- Completed R.I.N. (OMNR) gill netting protocol on the Bonnechere River (Renfrew, ON).
- Conducted young-of-the-year walleye monitoring on the Raisin River and Lake St. Francis using boat electrofishing (Cornwall ON).
- Provided fish removal services for Poole Creek at Huntmar (Kanata, ON).
- Conducted young-of-the-year muskie seining for Muskies Canada and OMNR (Gananoque, ON) and on Lake St. Francis (Cornwall, ON) for the Raisin Region Conservation Authority. Sampling method consisted of seine netting.
- Conducted shoreline boat and beach seining along Lake St. Francis for the Lake St. Francis Fish Habitat Plan (Cornwall, ON)
- Walleye spawning surveys on Lakes Barlow and Opémisca (Oujé-Bougoumou, Quebec), Hoople Creek (Ingleside, ON), Raisin River (Martintown, ON), Bonnechere River (Renfrew and Douglas ON), Mississippi River (Almonte, ON), Tay River (Perth, ON). Rideau River (Ottawa, ON). Surveys were completed using night visual surveys methods, modified neuston nets and/or egg traps.
- Conducted and analyzed data from a stream assessment project of Hoople, Hoasic and Sutherland Creeks

(OSAP protocol) (eastern ON).

- Benthic macroinvertebrate community sampling on several watercourses including: Clarence and Lafontaine Creeks (Rockland, ON), Bonnechere River (Douglas and Renfew, ON), South River (Village of South River, ON), tributary to the Beaudette River (Alexandria, ON), Hosaic and Hoople Creeks (Morrisburgh, ON), Sutherland Creek and Raisin River (Cornwall, ON), Jock River (Ottawa, ON), and a tributary to Feedmill Creek (Ottawa, ON).
- Conducted boat electrofishing along the shoreline of Lake St. Francis and Raisin River with the RRCA (Cornwall, ON).
- Completed fish community sampling for various projects on the Cataraqui River (Kingston, ON). Sampling methods included boat electrofishing and seine netting.
- Developed and conducted a fish survey on West Nose Creek (Calgary, AB).
- Assisted in a fry monitoring project at the NOVA pump house on Red Deer River (Red Deer, AB). Responsibilities included setting and monitoring fry traps, and data collection.
- Northern pike spawning and spring/ summer/fall fish community sampling for the assessment of potential impacts and as part of monitoring programs. Waterbodies sampled include: Lafontaine Drain (Rockland, ON), Clarence Creek (Rockland, ON), Brook Creek (Port Hope, ON), Young Creek (Norfolk, ON), Hay Creek (Norfolk, ON), Lynn River (Norfolk, ON), Poole Creek (Ottawa, ON), Grey's Creek (Cornwall, ON), Beaudette River (Cornwall, ON), Raisin River (Lancaster, ON), Hosaic Creek (Morrisburg, ON), Shirley's Brook (Ottawa, ON), Foster Drain (Ottawa, ON), Carp River (Ottawa, ON), Jock River (Ottawa, ON), Feedmill Creek (Ottawa, ON), Little Cataraqui River (Kingston, ON), Tay River (Perth, ON), Athabasca River (Fort McMurray, AB), Fraser River (Prince George, BC), West Nose Creek (Calgary, AB) as well as numerous unnamed watercourses throughout Ontario and near Prince George and MacKenzie British Columbia. Sampling methods included: backpack electrofishing, dip netting and minnow and Windermere traps.

Environmental and Fisheries Inspections

- Currently providing the lead support for environmental permitting and approvals for all levels of government (Federal, Provincial and First Nations) and the fisheries inspections for the construction of the Three Nations Bridge Phase 2 (Cornwall, ON).
- Provided the lead environmental support and fisheries inspections for the construction of the three inwater pier of the Three Nations Bridge Phase 1 (Cornwall, ON).
- Designed and managed Clarkson's wastewater tunnel monitoring program for suspended sediments during in-water drilling (Lake Ontario).
- Burloak Water Purification Tunnel Monitoring. Roles included: agency consultation, development and completion of monitoring of fish kill and suspended sediment levels during in-water blasting (Lake Ontario, ON)
- Environmental Inspections during Construction and Fisheries Compliance During Contracts for: the Poole Creek Re-alignment/Huntmar Drive Crossing (Ottawa, ON), Three Nations Bridge Phases 1 & 2 and Cataraqui Utilities Crossing (Kingston, ON) and several MTO projects (Napanee, Vankleek Hill, Lancaster, Ottawa, Peterborough, Iroquois, Kingston).
- Fish removals for:
 - MTO projects: HWY 125, HWY 7, Green's Creek,
 - Trans-Northern Pipeline in eastern Ontario
 - Bonnechere River (waterpower project)

Roles included: design and completion of fish salvage methods.

• Conducted Environmental inspection of the dewatering process for the Elbow Valley Residential sanitary sewer system, Calgary Alberta.

Species at Risk Inventories (note that in addition to the studies listed below, most terrestrial and aquatic projects described above included assessment on the potential to impact SAR)

- Design and monitoring of Golden-winged Warbler breeding and habitat over a 20 year period for a solar facility.
- Completed SAR surveys for the Three Nations Bridge Phases 1 & 2, Cornwall ON
- Obtained SAR clearances for three 10 MW solar facilities, 1 500 kW facility and 5 anaerobic digesters located between London, Ottawa and Cornwall.
- Obtained SAR clearance for new channel to be constructed near Carp, ON.
- Completed search for Bobolinks, whip-poor-will, chimney swifts at various locations in eastern Ontario.
- Completed searches for turtles nests along road shoulders in Eastern Ontario.
- Completed search for Least Bittern near Moose Creek, Ontario.
- Lake Sturgeon surveys on South Nation River for South Nation Conservation Authority.
- American Eel boat electrofishing surveys on the South Nation River and the St. Lawrence River near the Port of Prescott for South Nation Conservation.
- Completed Protection of SAR assessment for MTO Contract 2010-4028 near Perth, ON.
- Completed SAR surveys for three ditch re-alignments in SD&G
- Larvae Lake Sturgeon surveys on the Bonnechere River.
- Completed Butternut Health Assessments in Port Hope, Colborne, Prescott, Bourget, Moose Creek, Lancaster, Cornwall, Ottawa, Stittsville, Renfrew, Douglas and along several drains in United Counties of Stormont, Dundas and Glengarry.
- Completed searches for Blanding's Turtle, Eastern Musk Turtle, Spotted Turtle for various projects including those in: Picton, Kemptville, Renfrew, Douglas and Moose Creek.
- Worked with Dr. David Bird on Peregrine falcons in Montreal, Quebec.

Marine Environment – Route Section, Environmental Impact Assessments, Inventories, Habitat Assessments

- Environmental Impact Assessment for the Proposed Strait of Georgia Pipeline (BC). Roles included: route selection, marine habitat description, development of sampling methodologies, completion of marine fish and invertebrate surveys, project management of sub-consultants during marine survey period, literature search and potential impact assessment for all marine life and habitats.
- Population Study on Host Sea Anemones and Anemonefishes in Sulawesi, Indonesia. Roles: Realized, completed and presented a population study on the host sea anemones and anemonefishes in Sulawesi, Indonesia in cooperation with McGill University, Ecosurveys Ltd (UK) and Newman Biomarine Pte Ltd (Singapore). The study involved coral habitat mapping and fish surveys.
- Participated in Operation Wallacea on Pulau Hoga Indonesia. Roles included: participation in scuba diving inventories of marine fish communities and mapping of marine habitats.

Environmental Protection Plans

- Environmental Protection Plan for the Three Nations Bridge Phases 1 & 2 (Cornwall, ON).
- Wrote Environmental Protection Plans for Tanglewood, Creekside Mills and Elbow Valley residential developments (Calgary, AB).

Aboriginal Consultation

- Currently acting as liaison with the Mohawk Council of Akwesasne for natural environment matters on behalf of the contractor during Phase 2 of the Three Nations Bridge Phase 2, Cornwall, ON.
- Environmental Lead for the Construction of Phase 1 of the Three Nations Bridge (Cornwall, ON). Roles included: coordination of meetings, obtaining permits and communications with Mohawk Council of Akwesasne for environmental matters for the contractor.
- Natural Environment Consultant for a proposed small hydroelectric facility in Northern Quebec for the Eenou Companee (Oujé-Bougoumou, Quebec). Roles included: conducting interviews and community consultation regarding the traditional and cultural uses of the natural environment.

Other

- Co-authored the Walleye Management Plan for Lake St. Francis with the Raisin Region Conservation Authority and OMNR.
- Peer review of the Talston Hydroelectric project, NWT Canada.
- Presented a talk on monitoring walleye larvae and BMPs at the IAGLR Conference, May 2006.
- Presented *How to Develop a Monitoring Program for BMPs* at the Great Lakes Sustainability Non Point Source Symposium, March 2006
- Co-authored Lake St. Francis Fish Habitat Plan for Raisin Region Conservation Authority.
- Coordinated the 2003 Strategic Habitat Restoration Working Group workshop for the Raisin Region Conservation Authority.
- Contributing author for the Raisin Region Natural Heritage Strategy
- Co-authored a paper on the Effects of Marine Pipelines on the Benthic Environment, presented at the 7th International Symposium on Environmental Concerns in Right-of-Way Management.
- Created and conducted environmental education programs in French for children and the general public.

APPENDIX C – FIELD NOTES



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