Samsung Renewable Energy Inc. and

Pattern Renewable Holdings Canada ULC

8C Water Body Environmental Impact Study

For

Armow Wind Project

Armow Wind Project
Water Body Environmental Impact Study

Prepared for:
Golder Associates Ltd.
2390 Argentia Road
Mississauga, ON L5N 5Z7

Project No. 1275 Date: February 2013

NATURAL RESOURCE SOLUTIONS INC.
Aquatic, Terrestrial and Wetland Biologists

Armow Wind Project
Water Body Environmental Impact Study

Project Team:

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Valerie Stevenson	Aquatic Biologist
Brian Watson	Aquatic Biologist
Erica Frey	GIS Technician

Report submitted on February 15, 2013

Andrew G. Ryckman

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1.0 Project Description

The Armow Wind Project (the “Project”) is an up to 180 megawatt (MW) commercial wind energy generation facility located substantially on leased privately owned lands in the Municipality of Kincardine, Bruce County, Ontario (Figure 1). The Project is being developed by SP Armow Wind Ontario GP Inc., in its capacity as general partner of SP Armow Wind Ontario LP (the “Proponent”). The Proponent is a joint venture limited partnership owned by affiliates of Pattern Renewable Holdings Canada ULC (“Pattern”) and Samsung Renewable Energy Inc. (“Samsung”).

Natural Resource Solutions Inc. (NRSI) was retained in 2011 by Golder Associates Ltd., on behalf of the Proponent, to conduct a water body assessment in accordance with the Renewable Energy Approval (REA) Regulation. This assessment includes a records review, site investigation, and impact assessment of any water bodies located near the proposed 180MW capacity wind facility in Bruce County, Ontario. The analysis of the water body features is one issue being considered. Other factors, such as natural heritage, land ownership, social impacts, and cultural impacts are also being assessed under separate covers as outlined by the REA Regulation.

The proposed wind project includes the installation of up to 98 operational wind turbines, as well as supporting infrastructure and development activities, including turbine access roads, overhead and underground electrical collector cabling, meteorological towers, junction boxes, interconnect areas and substations.

As identified in the REA Regulation, the proposed layout of these features is collectively referred to as the ‘project location’. This includes turbines and associated infrastructure as described above, as well as any areas that may be used temporarily during construction (i.e. staging areas, crane pads, crane walks etc.) For the purposes of this report, NRSI will refer to the areas within 120m of the project location as the ‘project area’.

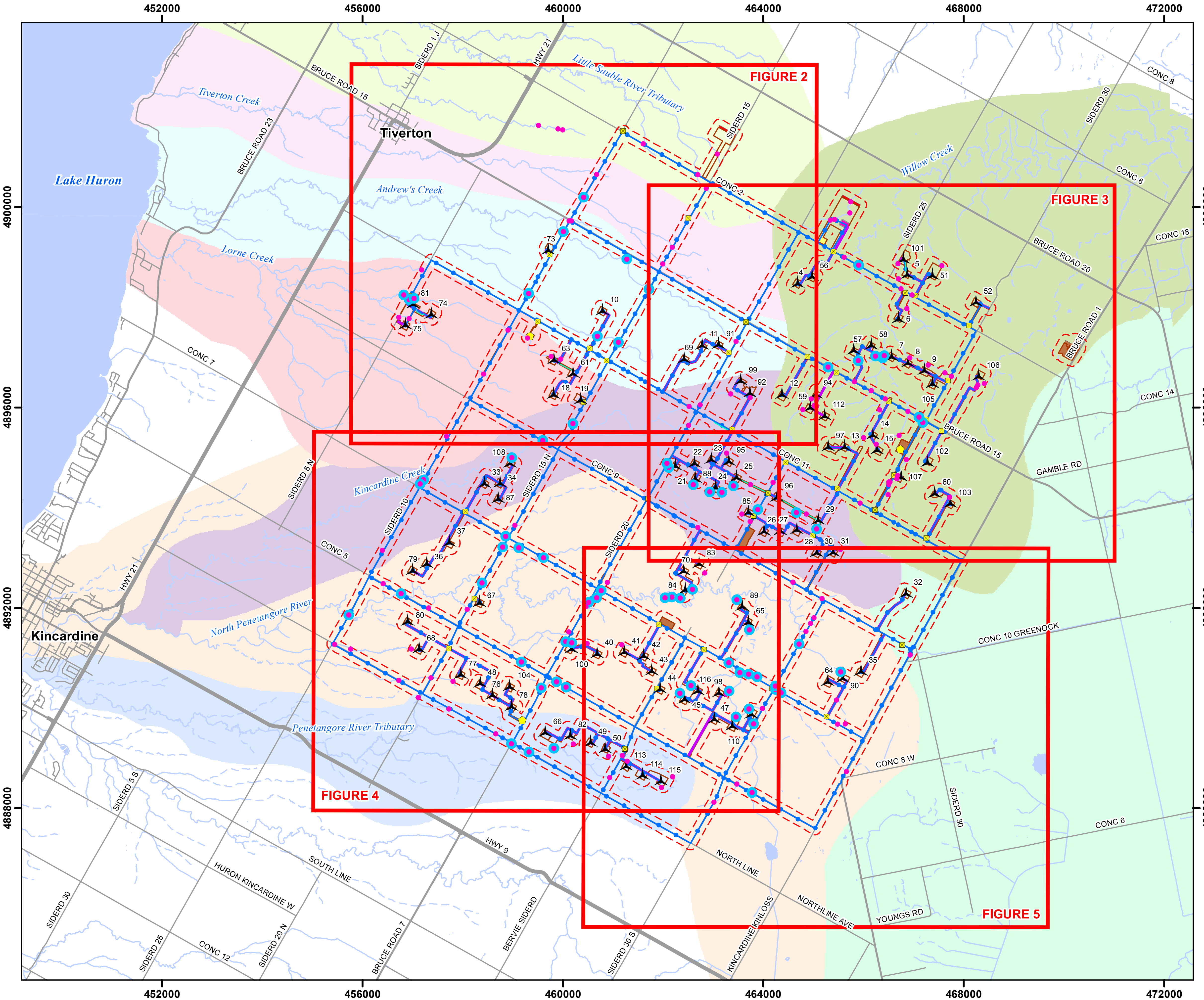
In accordance with the REA Regulation, NRSI has conducted a thorough records review of available background resources to identify any water bodies (lakes, seepages, intermittent/permanent watercourses) within 120m, or Lake Trout (*Salvelinus* *namaycush*) lakes within 300m, of the ‘project location’ as defined by REA Regulation. The records review assessment includes a detailed review of all available background information from a variety of sources, including Ontario Ministry of Natural Resources (OMNR), municipal files, existing biological studies, and other available online and/or published resources. The information from the records review as well as from site investigations performed within the project area were used to assess the impact to water bodies within the project area and suggest mitigation measures to minimize these impacts.

As part of this project, NRSI has considered all aspects relating to provincially Threatened and Endangered species. However, since these species are addressed as part of the *Endangered Species Act* (2007), they have not been discussed within any of these Water Body reports. These species will be addressed in full detail, including a habitat description and results of field assessments, potential impacts, and recommended mitigation measures, as part of a separate *Approval and Permitting Requirements Document (APRD)* to be submitted to the OMNR under separate cover, where necessary.

Figure 1

Armow Wind Project

EIS Water Bodies Key Map



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Legend

- Map Extents
- Project Area (120m)
- Proposed Turbine (L16 Rev0)
- MET Tower
- Junction Box
- Crane Walk
- Cabling
- Access Road
- Disturbance Area
- Potential Operations Building
- Substation
- Staging Area
- Interconnect Area
- Highway
- Primary Road
- Secondary Road
- Waterbody
- Watercourse (Permanent)
- Watercourse (Intermittent)
- Waterbody Location
- Non-waterbody Location

Subwatershed Boundaries

- Andrew's Creek
- Kincardine Creek
- Little Sauble River
- Lorne Creek
- North Penetangore River
- Penetangore River Tributary
- Teeswater River
- Tiverton Creek
- Willow Creek

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Project: 1275
Date: December 5, 2012

NAD83 - UTM Zone 17
Size: 11x17"
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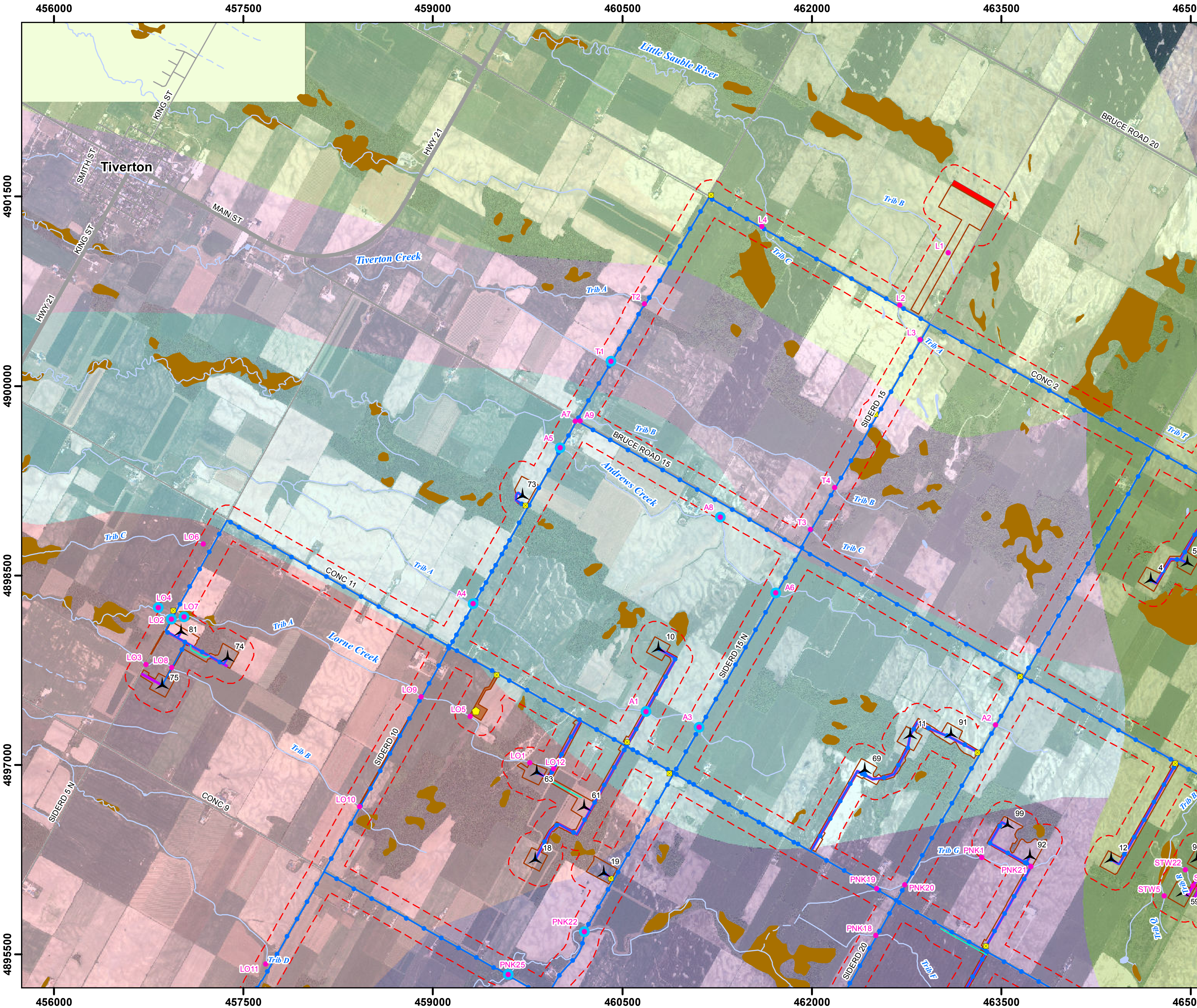
Figure 2

Armow Wind Project

EIS Water Bodies



Legend

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- Watercourse (Intermittent)
- Waterbody
- ANSI, Life Science
- Provincially Significant Wetland
- Non-Provincially Significant Wetland
- Waterbody Location
- Non-waterbody Location

Subwatershed Boundaries

- Andrew's Creek (A)
- Kincardine Creek (PNK)
- Little Sauble River (L)
- Lorne Creek (LO)
- North Penetangore River (PN)
- Penetangore River Tributary (P)
- Teeswater River (TW)
- Tiverton Creek (T)
- Willow Creek(STW)

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NAD83 - UTM Zone 17
Size: 11x17"
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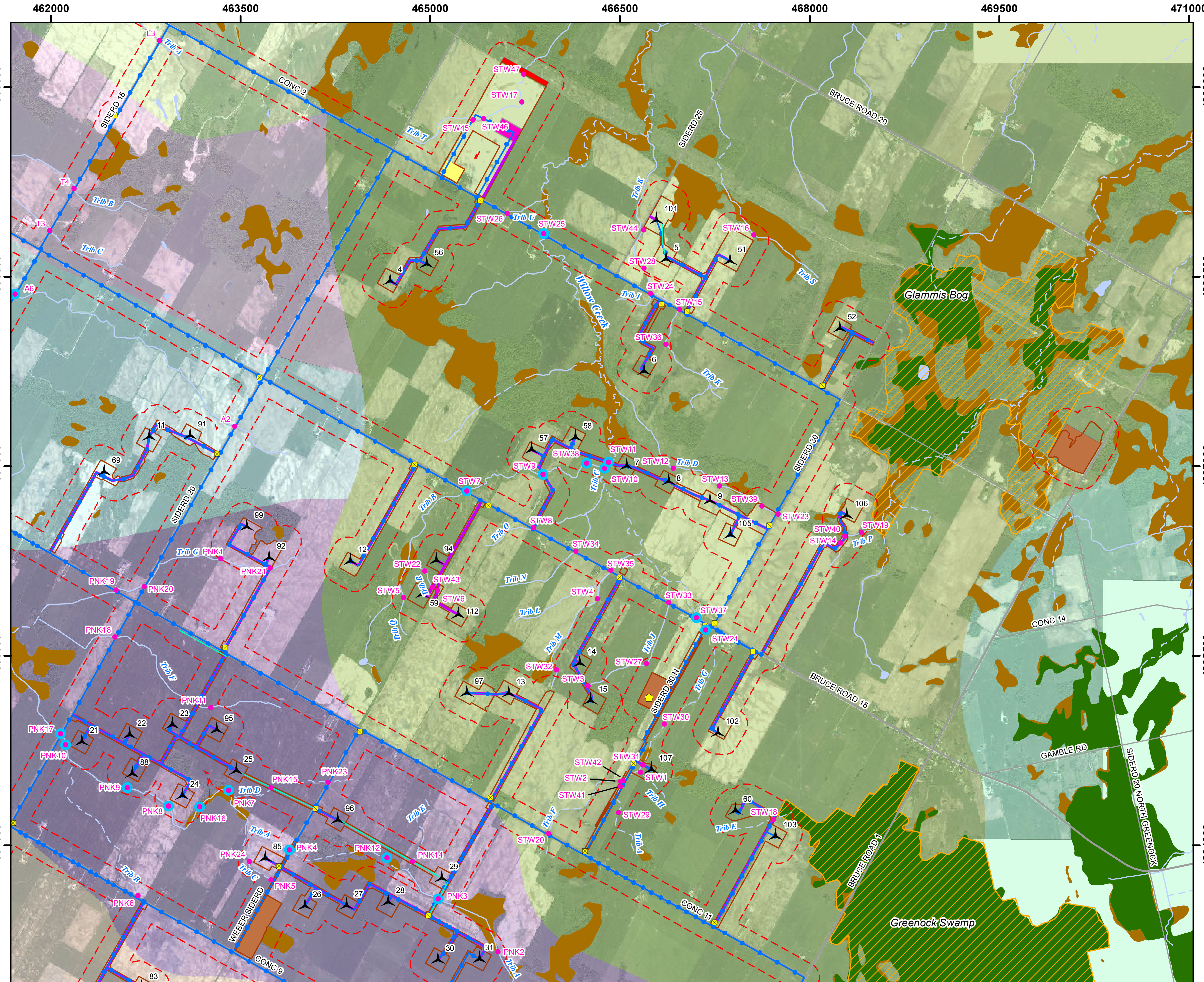
Figure 3

Armow Wind Project

EIS Water Bodies



Legend

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Imagery provided by: Golder Associates, 2011

Project: 1275
Date: December 5, 2012

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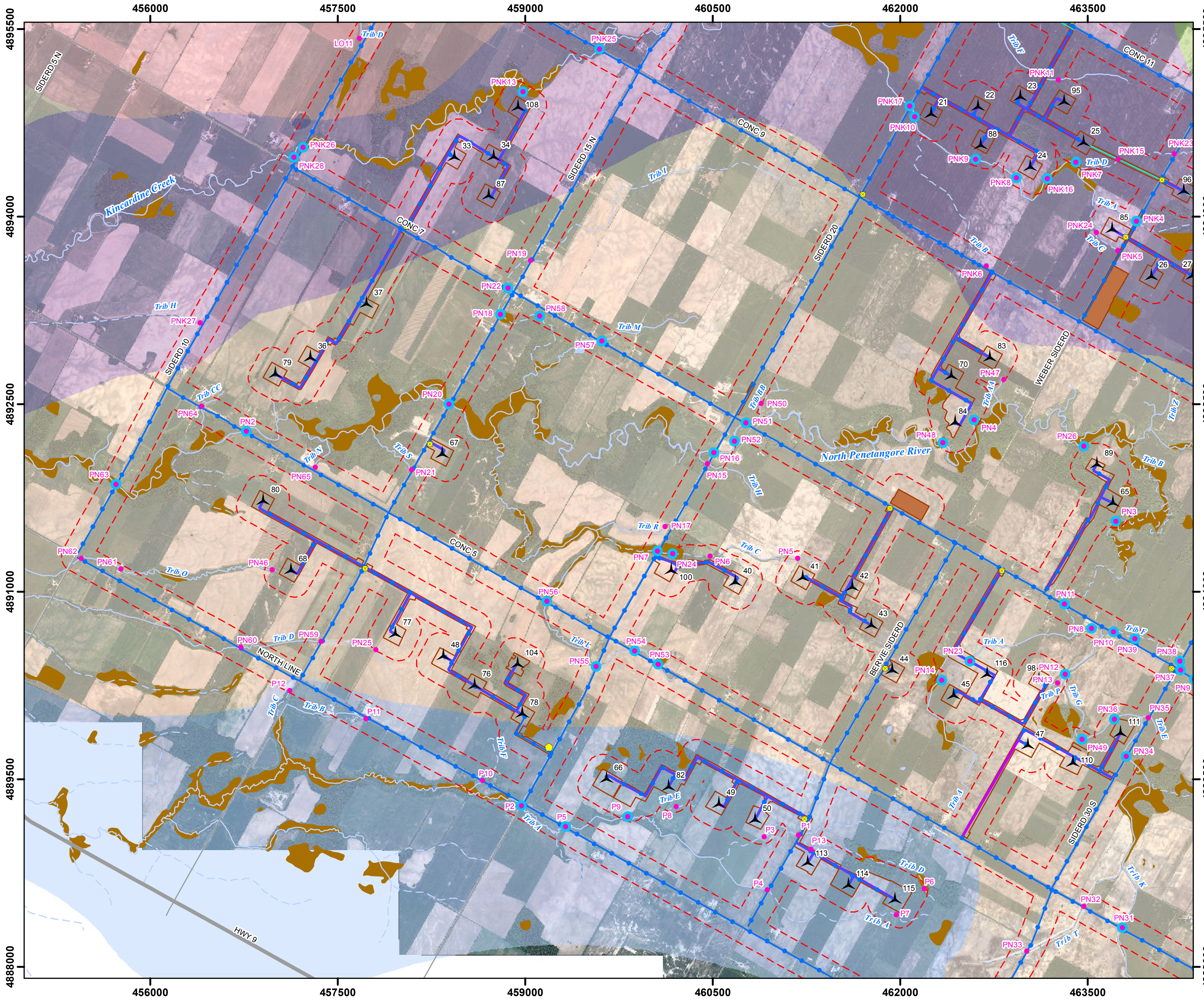
Figure 4

Armow Wind Project

EIS Water Bodies



Legend

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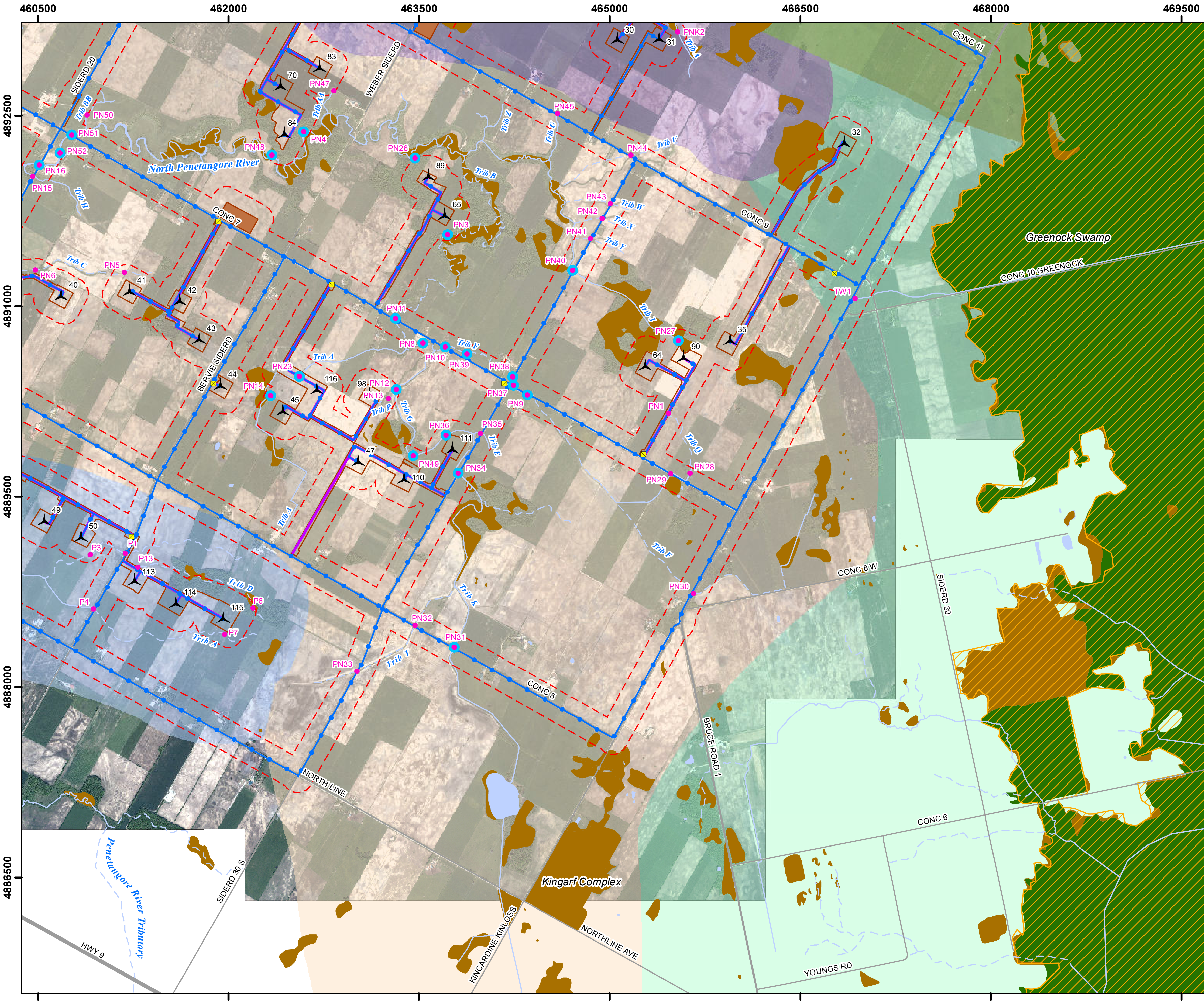

Figure 5

Armow Wind Project

EIS Water Bodies

Legend

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2.0 REA Regulations

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* (*EPA*) identifies the requirements for the development of renewable energy projects in Ontario. In accordance with the REA Regulation, the proposed Armow Wind Project, classified as a Class 4 wind facility, is required to complete a REA submission.

Section 40 of the REA Regulation state that “no person shall construct, install or expand a renewable energy generation facility as part of a renewable energy project at a project location that is in any of the following locations”:

1. within 120 meters of the average annual high water mark of a lake, other than a Lake Trout (*Salvelinus namaycush*) lake that is at or above development capacity;
2. within 300 meters of the average annual high water mark of a Lake Trout lake that is at or above development capacity;
3. within 120 meters of the average annual high water mark of a permanent or intermittent stream; or
4. within 120 meters of a seepage area.

This however does not apply if the applicant submits a report that:

1. identifies and assesses any negative environmental effects of the project on a water body referred to in paragraphs 1 to 4 (above) and on land within 30 meters of the water body;
2. identifies mitigation measures in respect of any negative environmental effects mentioned in clause (i);
3. describes how the environmental effects monitoring plan addresses any negative environmental effects mentioned in clause (i); and describes how the construction plan report prepared in accordance with Table 1 of the REA addresses any negative environmental effects mentioned in clause (i).

3.0 Summary of Site Investigation

Comprehensive site investigations for the Armow Wind Project were undertaken by NRSI biologists from October 24 to 28 2011, November 4, 18 and 23, 2011 as well as on December 9, 2011 (NRSI 2012b). These site investigations included site-specific habitat assessments of water bodies throughout the project area. In areas where site access was not available or project components were located considerable distances from aquatic resources, site investigations were conducted from nearby roadside locations.

Of the 82 potential water body features identified within the study as part of the Records Review, a total of 22 of these features were confirmed as water body features based on site investigation findings. No lakes, Lake Trout lakes, or seepage areas were identified within 120m of the Armow Wind Project location. A summary of the site investigations findings is provided in Table 1 below.

Table 1. Summary of Water Body Site Investigations within the Armow Wind Project Area

Criteria	Associated Water Body Features
i. In a water body	Site investigations have confirmed the presence of 21 water bodies overlapping the project location, more specifically crossing access roads and/or cabling. These water body overlaps are present within several of the drainage areas discussed in more detail within report, including Lorne Creek drainage area (1), Tiverton Creek drainage area (1), Andrew's Creek drainage area (2), Kincardine Creek drainage area (2), North Penetangore River drainage area (11), Willow Creek drainage area (3), and the Penetangore River drainage area (1). All of these water body crossing locations are being treated as cold water fisheries, and represent permanent or intermittent watercourses. Each of these water bodies will be discussed in detail as part of the Environmental Impact Study.
ii. Within 120m of the average annual high water mark of a lake, other than a lake trout lake that is at or above development capacity	None
iii. Within 300m of the average annual high water mark of a lake trout lake that is at or above development capacity	None
iv. Within 120m of the average annual high water mark of a permanent or	Site investigations have confirmed the presence of 22 water bodies within the project area, including 1 within

Criteria	Associated Water Body Features
intermittent stream	the Lorne Creek drainage area, 1 within Tiverton Creek drainage area, 2 within Andrew's Creek drainage area, 2 within Kincardine Creek drainage area, 11 within the North Penetangore River drainage area, 4 within the Willow Creek drainage area, and 1 within the Penetangore River drainage area. All of these water bodies are currently designated as cold water fisheries, and will be discussed in more detail within the Environmental Impact Study.
iv. Within 120m of a seepage area	None

The results of this site investigation will be used, in conjunction with the records review, to identify potential impacts associated with the proposed development activities associated with the Armow Wind Project.

4.0 Description of Proposed Undertaking

The following sections provide information pertaining to the design, construction, operation, and decommissioning activities associated with the proposed undertaking for the Armow Wind Project.

4.1 Design

The proposed design layout includes the installation of up to 98 turbines, as well as associated supporting infrastructure such as underground and above ground electrical collector cabling, access roads, substation transformers, points of interconnection, and associated buildings.

The proposed turbines include up to 98, Siemens SWT-2.3-101 wind turbine generators, wind energy generating turbines for a total installed capacity of up to 180MW. Each turbine is to be mounted on a steel reinforced concrete foundation and equipped with a transformer located outside the base of the tower.

Energy generated by the wind energy project will be collected via 34.5kV underground and above ground cabling and directed to a substation that will step-up the voltage from 34.5kV to 230kV.

Three supporting structures will also be required to be constructed. They include a collector substation, an operation and maintenance building, and point of interconnection (Golder 2012a).

Access roads will be constructed to allow for access to turbines and other supporting facilities. The temporary roads will be designed to be approximately 15m wide, with some turns requiring up to 45m wide entrances off the municipal roads. After the construction phase of the project, much of the temporary road widths will be restored, leaving roads approximately 4-8m wide. Access road construction will include clearing top-soil to a depth of 0.75m. Roads will be topped with a granular based material and crushed gravel (Golder 2012a).

Project design details are provided in the Design and Operations Plan Report (Golder 2012a).

Specific design details regarding water body crossing structures at access roads are not available at this time, although, consultation with OMNR, DFO, and local Conservation Authority will occur during the design process.

4.2 Construction

The construction phase of the project will involve:

- turbine assembly and installation;
- installation of electrical collector cabling (underground and overhead);
- creation of new access roads;
- installation of associate facilities (substation, operations and maintenance building, and point of interconnection) and,
- installation of temporary construction components (i.e. laydown areas, storage areas etc.)

Based on current layouts, vegetation clearing, tree removal grubbing, and grading will occur throughout the project area to accommodate the access roads, turbines, crane pads, lay-down areas, and associated buildings. A detailed impact assessment associated with vegetation removal, from terrestrial and wetland features within the project area, is provided in the Armow Wind Project Natural Heritage Assessment: Environmental Impact Study Report (NRSI 2012c).

A total of up to 98 operational turbines will installed as part of the Armow Wind Project. As part of the turbine erection, laydown areas and crane pads will be placed around the base of the turbine. Within this area, the ground will be leveled.

Electrical cabling installed within the project area may include a combination of both above and below ground approaches, depending on site-specific conditions, other permitting requirements, landowner preferences, etc. As a result, NRSI has assumed that all cabling could be either above or below ground in order to prepare this assessment. Upon installation of cabling, it is expected that the appropriate mitigation measures (described below) are applied accordingly to the different installation methods. In instances where underground cabling may be used, it will be primarily installed through way of open cut trenches. The open cut trenches will be approximately 1.2-

1.5m deep, and all excavated soil will be retained and used to fill the trench after cables have been laid. In certain instances where natural features, water bodies, or other landscape features may be present, the use of horizontal direction drilling may be implemented to reduce the potential for environmental impact. At this time, the specific locations (if any) where directional drilling may occur is unknown, and therefore it is discussed as a possible construction method within this report, including detailed mitigation measures below. Where overhead cabling is proposed, it will be installed using wood, steel, or concrete monopoles to a depth of approximately 5.6m.

Access roads will be constructed to be 15m wide during the construction phase to allow for large cranes, with some of the turns off municipal roads requiring temporary distances as large as 45m wide to accommodate the necessary turning radius from municipal roads for component delivery. After construction, these roads will be reduced to a final post-construction width of 4-8m. Access road construction will include clearing top-soil to a depth of 0.75m. Roads will be topped with a granular based material and crushed gravel (Golder 2012b).

Three supporting buildings will be required to be constructed for the Armow Wind Project. They include a collector substation, an operation and maintenance building, and point of interconnection (Golder 2012b).

A total of 4 temporary construction staging areas are proposed for the Armow Wind Project. These staging areas will range in size from 1.4-9.1ha each, totaling 26ha of area to be used for construction equipment storage and maintenance, operations and maintenance buildings, laydown areas for project components, temporary construction offices, parking areas for project staff, portable generators, waste disposal containers, self-contained temporary toilet facilities, and water and rinsing facilities. Staging area construction will include the clearing of top-soil and sub-soil, and the addition of gravel with compacted surface material suitable for vehicular traffic and equipment/component storage. The depth of the graveled areas will vary and will be dependent upon conditions encountered during the time of construction. Following construction, the temporary construction laydown areas will be restored to the previous land use to allow for agricultural activities to continue.

Detailed construction methods are provided in the Construction Plan Report (Golder 2012b).

4.3 Operation

The operational phase of the Armow Wind Project will include the operation and maintenance of up to 98 wind energy generating turbines. This includes daily monitoring of wind turbines, un-scheduled and scheduled maintenance activities, and monitoring of meteorological data.

No ground water or surface water supplies will be used as part of the operation of the facility as municipal water supplies will be accessed (Golder 2012a). Sewage generated at the operations and maintenance building location will be disposed of through a municipal sewage system, if available, or stored in tanks that will be emptied and transported to a local sewage treatment facility as required. No other component of the project will generate any sewage or require any specific sewage management processes (Golder 2012a).

No permanent sediment control features or storm water management facilities will be implemented. In addition, there are no areas where waste, biomass and source separated organics are stored, handled, processed or disposed of during the operation of the wind project.

The minor application of herbicides may also occur within the project area to help control vegetation growth at the operations and maintenance yard, substation and/or beneath turbines. The potential impacts of this have been considered below.

4.4 Decommissioning

Project components are expected to be in service for the duration of the operational phase. Following the operation, a decision would be made to extend the life of the facility or to decommission. Decommissioning would entail the dismantling and removal of project infrastructure associated with the Armow Wind Project and restoring the land to a use similar to pre-construction activities.

The three buildings associated with the Armow Wind Project including the substation, operations and maintenance building, and point of interconnection would all require demolishing and removal (Golder 2012c).

Up to 98 operational turbines will removed as part of the decommissioning plan for the Armow Wind Project. As part of the turbine removal, laydown areas and crane pads will be constructed around the base of the turbine. Within this area, the ground will be leveled. Following the removal of turbines, the land is expected to return to land use present prior to turbine installation. In all cases this will be agricultural activities. Removal of turbine components will also include the removal of the top 1m of the underground foundation. (Golder 2012c).

Most of the underground cabling within the project area will be installed by way of open cut trenches. This will include all cabling on private land and all of the roadside collector system. It is anticipated that cabling on private lands will be left in place to avoid disturbing the agricultural land or other existing land uses. At the connection points, where cabling comes to the surface, cabling will be cut and excavated to a depth of approximately 1m below grade.

Cabling located at directionally drilled watercourse crossings will remain in place; however, the connection point will be severed at a point located outside of the SVCA Regulation Limit. Other locations where underground cabling may be installed by drilling are yet to be determined, whether the cabling will be removed at these additional locations during decommissioning is therefore unknown (Golder 2012c).

Overhead cabling is also being considered within the project area. Upon decommissioning of the project, lines not shared with another utility will be dismantled and removed. Lines associated with the project that are mounted on shared-use monopoles will be removed. Lines will be removed from the project area, and recycled, reused, or disposed in accordance with regulatory requirements at the time of decommissioning (Golder 2012c).

Upon decommissioning of the project, a total of 4 temporary construction staging areas will be created. These staging areas range in size from 1.4-9.1ha each, totaling 26ha of area to be used for construction equipment storage and maintenance, laydown areas for project components, temporary construction offices, parking areas for project staff, portable generators, waste disposal containers, self-contained temporary toilet facilities, and water and rinsing facilities. Staging area construction will include the clearing of top-soil and sub-soil, and the addition of gravel with compacted surface material suitable for vehicular traffic and equipment/component storage. The depth of the graveled areas will vary and will be dependent upon conditions encountered during the time of construction. Following construction, the temporary construction laydown areas will be restored to pre-construction land use conditions to allow for agricultural activities to continue (Golder 2012c).

Wind turbine access roads will be removed and lands will be restored so that agricultural activities can continue. Granular base material and crushed gravel used to construct access roads will be removed from the site. It is possible that, at the request of landowners, all or portions of wind turbine access roads will be left in place for future use by landowners (Golder 2012c).

Culverts installed during construction and installation activities will also be removed if requested by landowners. Any removal of culverts will be completed in consultation with the Saugeen Valley Conservation Authority (SVCA), Ministry of Natural Resources (MNR), and the Department of Fisheries and Oceans Canada (DFO), where required (Golder 2012c).

5.0 Impact Assessment

5.1 Approach to Impact Assessment

For the purposes of this report, the analysis of potential impacts has been divided into two categories, firstly, generalized potential impacts on water bodies related to each project phase including construction, design, operation and decommissioning will be presented and discussed. Secondly, specific impacts to each water body identified within the project area that considers the site specific features and functions of the water body as well as the proposed works. No lakes, Lake Trout lakes or seepage areas are located within the project area. These impacts are grouped by water body feature type, as identified by O. Reg. 359/09, s. 30 and include intermittent or permanent watercourses.

This approach allows for general impacts to water body features as it relates to project construction, design, operation and decommissioning to be identified up front, avoiding redundancy in subsequent text.

All identified impacts are discussed in this section assuming no mitigations are applied, therefore, are described as a "worst case scenario" for impacts to water bodies. Recommendations to mitigate identified impacts as well as monitoring of effectiveness of these measures are discussed in Section 6.0.

5.2 Generalized Project Phase Impacts

If not mitigated appropriately, impacts to water bodies have potential to be considerable due to the nature of development and construction activities. These impacts have potential to affect surface water quality, fish, fish habitat, benthic organisms, and stream hydrology and range in degree from temporary disturbance to permanent loss or impairment.

Impacts associated with each project phase including design, construction, operation, and decommissioning are discussed below in Sections 5.2.1 through 5.2.4, respectively. Specific impacts associated with each water body within the project area are discussed in Section 5.3. A summary of general project phase impacts are present in Table 8 in Section 7.0.

5.2.1 Design

Impacts associated with wind energy project design are related to 1) project layout and 2) the design of project components (i.e. culvert design at a watercourse crossing).

Project layout will dictate what water bodies will be directly impacted based on project component orientation (i.e. access roads crossing a water body) as well as the level of risk a water body has potential to be impacted based on proximity of a project component to a water body feature (i.e. 25m away versus 100m away). It is inferred that the greater distance a water body is away from a project component, the less risk for impacts to the feature is present, although, topography (slope to the water body), the permeability of soils, and the density of vegetation and/or ground litter (i.e. dead grass, leaves, twigs, and logs) are also all factors in the level of risk of impacts to water bodies. NRSI worked closely with the proponent throughout the REA reporting process to identify water bodies and avoid direct impacts wherever possible.

With respect to project components occurring within a water body, the REA Regulation sets clear guidelines as to where wind project development is acceptable. In the case of Class 4 wind project facilities like the proposed Armow Wind Project, the development of turbines and transformer stations is prohibited within and 30m from all water bodies. All other ancillary project components including electrical collector lines and access roads can occur at any distance from, including within, a water body if it is demonstrated that it will result in no negative environmental effects, through the completion of an impact study.

Within the proposed Armow project area, access roads and electrical collector cabling traverse intermittent/permanent watercourses and therefore are occurring within these features. Design related impacts as a result of project components occurring within these water bodies are discussed below.

A common impact to all water bodies is the alteration of local drainage patterns. This impact is directly related to project layout, stormwater management design, and grading plans. Alteration of drainage patterns has the potential to affect all water bodies occurring within the associated drainage catchment area(s) and is not exclusive to the project area.

Alteration of drainage patterns occurs through a variety of project related activities including the re-grading of land, removal of surrounding forested vegetation, increase in impervious surfaces with the installation of turbine pads, transformer stations and access roads as they are constructed with impervious surfaces (i.e. concrete and asphalt) as well as the implementation of stormwater management measures (i.e. installation of roadside ditches).

Alteration of drainage patterns can cause a variety of impacts to water bodies. This includes changes to watercourse flow (increase or decrease), changes to thermal characteristics of a water body, more specifically, warming of a feature through increased surface water run-off contributions, decreased groundwater base flow, increases and decreases in water levels of seepage areas and lakes. Decreased infiltration to key areas (areas of recharge) due to newly impervious cover interrupts the natural water cycle causing a decrease in infiltration and soil attenuation of precipitation. Additionally, an increase in impervious cover facilitates increased runoff down a steep slope (i.e. a valley feature), could increase potential for erosion and downstream sedimentation.

Specific impacts as a result of alteration of drainage patterns will need to be addressed at the detailed design, permitting and approval phase. As the proposed project location layout considers proximity to water bodies by limiting interference with these features, in addition to utilizing existing access roads where possible, it is anticipated that alterations to drainage patterns will be minimal.

Intermittent/Permanent Watercourses

Design related impacts to watercourses are associated with the specific location of the proposed crossing in the feature as well as the proposed crossing structure, as in the case with road crossings. Of the 43 locations in which a water body overlaps a project component within the project area, only 4 are crossing locations of water bodies and new access roads, requiring the installation of a new water crossing structure. This includes PN23 on Tributary A of the North Penetangore River, STW11 on Willow Creek, STW9 on Tributary B of the Willow Creek drainage area, and A1 on Tributary A of Andrew's Creek (Figure 2). Additional water crossing locations situated along existing municipal roads may also require upgrades, and therefore new crossing structures. However, the need for these upgrades and exact locations (if any) must be determined through consultation with the contractors completing this work. It is expected that any culvert upgrades required along existing municipal roads will follow the same mitigation measures proposed for new crossing locations. Locations of electrical collector cabling and road crossings, if not selected appropriately, have potential to impact key habitat features (i.e. such as refuge pools, spawning beds etc.). Details of proposed crossing locations including structure and specific location are not known at this time and will be addressed during the detailed design phase of the project. Therefore, impacts on specific key habitats cannot be identified.

Depending on crossing structure design, some structures may result in the permanent loss and alteration of fish habitat caused by physical changes to the stream channel, streambed and riparian vegetation through filling, straightening and enclosing a watercourse within the crossing area. In addition to permanent loss of fish habitat, enclosure of a watercourse will result in the alteration of the feature with the loss of natural substrates, loss of instream habitat (structure/cover), and alteration of food supply (i.e. benthos, macrophytes). Alterations to the hydrology (flow volume and dynamics) of a watercourse, is possible through the positioning and sizing of the structure. Impacts from altering hydrology are associated with the alteration of existing morphological habitats (i.e. riffles), potential for flooding and increased erosion potential. Barriers to fish passage are also possible through the improper placement of a culvert structure that results in perched conditions (elevated above the watercourse) that fish are unable to pass. Barriers to fish passage can potentially limit the normal localized movement and migration patterns of fish species. Loss of riparian habitat through the development or alteration of an existing crossing is also possible. This would result in a change to in-stream shading and cover, furthermore reducing watercourse function.

Any loss in the productive capacity of fish habitat as a result of changes to the physical structure, substrate, type and quantity of cover, vegetation, and flow volume and dynamics are considered harmful alteration, disruption or destruction (HADD) to fish habitat and are prohibited under the federal *Fisheries Act (1986)*.

Details of proposed crossing structures will be addressed during the detailed design phase of the project. At that time, specific impacts will be determined based on final design specifications.

5.2.2 Construction

Potential impacts identified for the construction phase of the Armow Wind Project are based on the understanding of project works described in Section 4.2, and include the following project activities:

- turbine assembly and installation;
- installation of electrical collector cabling (underground and overhead);
- creation of new access roads;
- installation of associate facilities (substation, operations and maintenance building, and point of interconnection) and,
- installation of temporary construction components (i.e. laydown areas, storage areas etc.)

Potential for impacts to water bodies during this project phase is generally associated with the length of the construction window (i.e. days, weeks, months); however, un-mitigated impacts have the potential to cause lasting effects beyond the construction window, or permanent impacts that will be evident during the operational phase of the project. In addition, as mentioned in the design related impacts section, project layout will dictate the level of impact that a water body has potential to be exposed to during construction based on proximity of a project component to a water body feature (i.e. 100m away versus 25m away). It is inferred that the greater distance a water body is away from a project component, the less potential for impacts to the feature. The slope to the water body, the permeability of soils, and the density of vegetation and/or ground litter are also factors in the level of impact risk present. The method of construction selected will also dictate the type of impacts that are possible as well as the degree of impact, as is the case with the installation and connection of electrical collector cabling. An open-trench method (as proposed for this project) has the potential for increased risk of impacts at water crossing locations. Trenchless technology (directional drilling) would result in minimal impact both directly and indirectly. Directional drilling is currently not proposed for any water body crossings. As the project progresses, it may be decided that drilling will occur at some locations.

Potential construction related impacts to water bodies have been identified and grouped by the following discussions:

- erosion and sedimentation;
- contaminant spills;
- in-water work;
- dewatering;
- soil compaction;
- construction debris; and
- drilling.

5.2.2.1 Erosion and Sedimentation

Disturbance of the project site as a result of vegetation clearing and grubbing, top-soil and sub-soil stripping, grading, use of heavy machinery, and soil stockpiling all have the potential to increase erosion in areas directly at or adjacent to water bodies, resulting in movement of sediment-laden run-off into receiving watercourses. Precipitation and thaw events, where runoff is in contact with these exposed areas have increased potential for erosion and sedimentation.

Soil compaction also has potential to occur as a result of heavy machinery and the stockpiling of heavy materials (i.e. soils) in the project area. Soil compaction can greatly reduce the permeability of soils and affect their ability to retain water during rain/snow melt events. This will result in an increase in surface water run-off which will ultimately increase the erosion potential and the amount of sediment being transported into adjacent water bodies.

The removal of riparian and buffer vegetation associated with water crossing structures and other development activities will compromise the stability of stream banks and adjacent lands. This again, increases erosion and sedimentation potential around water bodies.

The effects of sedimentation on aquatic life has been well documented (i.e. Newcombe and MacDonald 1991; Ward 1992; Waters 1995; Osterling *et al.* 2010). Sedimentation can negatively alter the aquatic habitat in any water body, and destabilize the existing erosion and sediment transport regimes of watercourses. It has the ability to reduce water clarity, absorb energy from sunlight, and increase turbidity. These effects can reduce the feeding success of sight-feeding fish and invertebrate species, reduce the reproductive success of aquatic species through the loss of nesting habitat and the smothering of eggs, inhibit plant photosynthesis, warm the water in a system, impair respiratory functions, lower tolerance to disease and toxicants and increase physiological stress. Under prolonged conditions where water quality remains at levels unacceptable for aquatic life, death of aquatic organisms may result.

5.2.2.2 Contaminant Spills

Contaminant spills are a concern due to the proximity of construction vehicles and machinery to water bodies. Accidental spills during equipment re-fueling are one of the more frequent spills of concern.

A contaminant spill will result in the degradation of water quality within a water body. Changes in water quality may impose significant behavioral and physiological stress on fish species, resulting in impaired spawning, feeding or routine activities. Under conditions where water quality remains at levels unacceptable for aquatic life, death of aquatic organisms may result. In some case, depending on contaminant physical and chemical properties a spill has potential to result in immediate death of aquatic organisms.

The degree of impact on the water quality and aquatic organisms is dependent on the quantity, chemical composition, and toxicity of the substance spilled, as well as, the spill response time, ability to contain the spill, and dilution capabilities of the receiving water body (flow volume and rate). Watercourses also have the potential to convey hazardous materials for long distances and affect large areas of habitat. The degree to which this impact occurs is directly related to flow within the watercourse. Intuitively, deleterious substances will travel a much greater distance in a water body that experiences relatively high flow rates compared to one with standing water. At the same time, higher flows tend to dilute the contaminant resulting in lower contaminant concentrations.

Ultimately, a release of contaminant or ‘spill’ into a water body is considered a release of a ‘deleterious substance’ and is prohibited under the *Fisheries Act*, the *Environmental Protection Act* and *Ontario Water Resources Act*.

5.2.2.3 In-Water Work

Temporary disruption of substrates/habitat is likely to occur at locations where in-water work is required (i.e. culvert installation, underground cabling crossing). Disruption of fish habitat has potential to impair spawning, feeding or routine activities of the resident fish community, more specifically, tolerant warmwater baitfish species. There is also potential for fish to display avoidance behavior of the actively disturbed area, this can result in the temporary displacement of fish during the construction phase of the project. Fish passage within the channel may also become temporarily (i.e. days) restricted as a result of construction activities, disrupting migration patterns. With the potential for disruption of sediments, there is an increased risk of sedimentation. Sedimentation is discussed further in Section 5.2.2.1.

The completion of in-water work may also require in-stream dewatering. Prior to dewatering, the work area must first be isolated with the installation of a water containment structure. The structure will be temporary and will form an impermeable dyked enclosure, which also prevent escape of debris and sediment to the exterior water body. Impacts associated with the structure include the potential for excess sediment to be suspended and carried downstream by stream flow during the installation and removal of the structure. As discussed in Section 5.2.2.1, a release of sediment is considered a release of a deleterious substance and is prohibited. Depending on the size and type of structure utilized, the structure will have direct impacts on the substrates and habitat on which it has been placed, and has potential to strand fish within the enclosure. Impacts associated with dewatering after the water containment structure has been installed are discussed in Section 5.2.2.4.

Impacts associated with the loss or alteration of habitat is dependent on water crossing design structures and is discussed in Section 5.2.1.

5.2.2.4 Dewatering

Minor, isolated, short term dewatering of shallow groundwater from excavation areas may be required during the construction phase of this project when the proposed excavation intercepts an area of shallow groundwater table conditions. This may be required for the installation of project components such as turbine pads and water crossing structures.

Short term, isolated dewatering to remove surface water from work areas as part of a pump and by-pass may also be required during the construction phase of this project where in-water work is required (i.e. installation of road crossing structures) as to work within dry conditions.

If surface and groundwater dewatering is not managed properly, there is potential for impacts to occur to adjacent and receiving watercourses. Potential impacts to watercourses associated with surface and groundwater dewatering may include:

- **Water Quality Impairment–** dewatered surface or groundwater discharged into nearby watercourses and drainage features that is of a different quality than that of the receiver or is impacted (i.e. high turbidity, temperature differential etc.) has potential to cause immediate impacts on the resident fish population. Changes in water quality may impose significant behavioral and physiological stress on fish species, resulting in impaired spawning, feeding or routine activities. Under prolonged conditions where water quality remains at levels unacceptable for aquatic life, death of aquatic organisms may result.
- **Water Level Alterations –** localized temporary drawdown of the groundwater table has potential to temporarily reduce or eliminate groundwater baseflow contributions to adjacent water bodies that are located within the zone of influence (ZOI). Potential impacts resulting from a loss of baseflow to a watercourse include decreased flow, the temporary restriction of fish passage, increased stream temperatures and decreased water quality. Although dewatering activities would only occur for the duration of construction, a measurable change in local groundwater flow levels within the ZOI has potential to extend beyond the active dewatering period. This is the period in which groundwater levels are recovering to pre-dewatering levels. Potential impacts on water levels resulting from surface water dewatering from portions of a watercourse include the temporary restriction of fish passage and habitat loss within the dewatered area.
- **Stream Erosion & Sedimentation** - discharges to watercourses from temporary groundwater dewatering have potential to cause streambed and/or bank erosion and downstream sedimentation if not managed properly. The level of risk for impacts is associated with the volume of water required to be dewatered.

5.2.2.5 Soil Compaction

Heavy equipment and machinery frequently traveling over soils during construction has potential to result in soil compaction. The risk for soil compaction is greater during wet periods when soils are saturated. Soil compaction decreases soil permeability and interferes with surface and subsurface drainage, resulting in an increase in the ratio of run-off to infiltration. If soils are compacted to where run-off approaches 100%, they may act as an impervious surface. Percent impervious cover in a respective watershed leads to water quality/quantity/habitat degradation, if it exceeds a certain threshold (Stanfield and Kilgour 2006). Compacted soil may also restrict the re-colonization of vegetation, and thus contribute to increased potential for erosion and sedimentation as discussed in Section 6.2.2.1.

5.2.2.6 Construction Debris

Stockpiling of construction related materials in or near a water body has potential to enter a water body if not properly contained. This also includes vegetative debris (i.e. shrubs, tree root wads etc.) left from clearing and grubbing activities. Debris entering a water body has potential to result in the destruction or disturbance of fish habitat, disrupt flow patterns increasing risk for flooding or erosion and sedimentation, as well as impair water quality. The degree of impact on the water body is dependent on the type of material as well as amount entering the watercourse.

5.2.2.7 Drilling

The use of horizontal directional drilling within the project area is currently unknown, however it may be used at proposed crossings of cabling and water bodies. Use of this technology will result in minimal impacts to water bodies in comparison to open trench construction. Although, there are still risks associated with the potential for drilling mud to escape into the environment. This is typically as a result of a spill, tunnel collapse, or rupture of mud to the surface, which is otherwise commonly known as a ‘frac-out’. A frac-out is caused when excessive drilling pressure results in drilling mud propagating toward the surface (DFO 2007). Directional drilling may also result in increased risk of erosion and sedimentation from equipment if located near a water body. In addition, the potential for impairment of water quality from debris or drilling mud (bentonite and water slurry) entering a watercourse is present.

5.2.3 Operation

During the operation phase of the project, it is anticipated that impacts to water bodies will be limited and associated with increased traffic access within the project area as well as ongoing maintenance activities. This includes a risk of contaminant spills, and erosion and sedimentation from maintenance activities (i.e. removal of vegetation). All result in the degradation of surface water quality within receiving water bodies. Contaminant spills are discussed further in Section 5.2.2.2. Erosion and sedimentation is discussed further in Section 5.2.2.1.

5.2.4 Decommissioning

The decommissioning phase impacts are essentially the same as the construction phase impacts, albeit to a lesser extent due of the lack of removal of water body crossings as access roads will likely remain at most locations. As these impacts are redundant with the construction phase impacts, they will not be reiterated here. See Section 6.2.2.

5.3 Site Specific Water Body Impacts

In accordance with the REA Regulation, the proposed Armow Wind Project area has been assessed for the presence of water bodies by NRSI biologists through the completion of a records review and site investigations. Identified water bodies located within 120m of the project location were further evaluated for potential impacts as it relates to the proposed undertaking. General project phase impacts are discussed in Section 6.2., site specific impacts to identified water bodies are discussed below.

For the purposes of this report, the analysis of potential impacts has been divided by water body type, as defined by the REA Regulation. This includes permanent/intermittent watercourses (crossings and within 0 to 120m).

A total of 22 water body features were identified within the project area. All of which have been identified as intermittent/permanent watercourses. There are a total of 71 individual locations where these 22 water bodies are present, crossing or within 120m of the Armow Wind Project location. No lakes, Lake Trout lakes or seepage areas were identified within the Armow Wind Project area.

The following section outlines potential site specific impacts on water bodies associated with the proposed Armow Wind Project.

5.3.1 Intermittent/Permanent Watercourses

A total of 22 intermittent/permanent water bodies have been identified within the Armow Wind Project area. These water bodies provide direct or in-direct habitat for fish and other aquatic organisms and must be given consideration in order to protect them from immediate or prolonged degradation.

NRSI has identified 21 water bodies that will be crossed by project components at 43 individual locations (specific water bodies may have infrastructure crossing at multiple locations). Each of these 43 crossing locations includes at least one type of infrastructure crossing, however in most cases several project components (i.e. access road and cabling) will cross at the same location. Each of these individual crossing locations has been detailed in Table 2 below.

Table 2. Summary of Intermittent/Permanent Watercourse Crossing Locations, Site Specific Considerations & Potential Impacts

Drainage Area	Water Body Feature Name	Water Body Location ID	Crossing Infrastructure	Site Specific Considerations	Potential Impacts
North Penetangore River	North Penetangore River	PN16	• Cabling	high sensitivity fish habitat, coldwater fish species present downstream, no in-water work or drilling will be required if overhead cabling is installed	outlined in Section 5.2
		PN4	• Cabling		
		PN20	• Cabling		
		PN51	• Cabling		
		PN63	• Cabling		
		PN2	• Cabling		
	Tributary A	PN23	• Access Road • Cabling	high sensitivity fish habitat, coldwater fish species present downstream, in-water work will apply as a new culvert installation is required for road crossing and cabling needs to cross the watercourse	outlined in Section 5.2
	Tributary B	PN11	• Cabling	high sensitivity fish habitat, coldwater fish species present downstream, no in-water work or drilling will be required if overhead cabling is installed	outlined in Section 5.2
	Tributary C	PN7	• Cabling		
	Tributary F	PN9	• Cabling		
		PN10	• Cabling		
		PN37	• Cabling		

Drainage Area	Water Body Feature Name	Water Body Location ID	Crossing Infrastructure	Site Specific Considerations	Potential Impacts
		PN38	• Cabling		
	Tributary G	PN34	• Cabling		
	Tributary I	PN18	• Cabling		
		PN22	• Cabling		
	Tributary J	PN40	• Cabling		
	Tributary K	PN31	• Cabling		
		PN65	• Cabling		
	Tributary L	PN53	• Cabling		
		PN54	• Cabling		
		PN55	• Cabling		
		PN56	• Cabling		
	Tributary M	PN57	• Cabling		
Penetangore River Tributary	Tributary A	P5	• Cabling		
Saugeen Teeswater Willow Creek	Willow Creek	STW25	• Cabling		
		STW 11	• Access Road • Cabling	high sensitivity fish habitat, coldwater fish species present, in-water work will apply as a new culvert installation is required for	outlined in Section 5.2

Drainage Area	Water Body Feature Name	Water Body Location ID	Crossing Infrastructure	Site Specific Considerations	Potential Impacts
				road crossing and cabling needs to cross the watercourse	
	Tributary B	STW7	• Cabling	high sensitivity fish habitat, coldwater fish species present, no in-water work or drilling will be required if overhead cabling is installed	outlined in Section 5.2
		STW9	• Access Road • Cabling	high sensitivity fish habitat, coldwater fish species present, in-water work will apply as a new culvert installation is required for road crossing and cabling needs to cross the watercourse	outlined in Section 5.2
	Tributary G	STW21	• Cabling	high sensitivity fish habitat, coldwater fish species present, no in-water work or drilling will be required if overhead cabling is installed	outlined in Section 5.2
		STW37	• Cabling		
Lorne Creek	Tributary A	LO2	• Cabling		
Andrew's Creek	Andrew's Creek	A5	• Cabling		
		A6	• Cabling		
	Tributary A	A1	• Access Road • Cabling	high sensitivity fish habitat, coldwater fish species present downstream, in-water work will apply as a new culvert installation is required for road crossing and cabling needs to cross the	outlined in Section 5.2

Drainage Area	Water Body Feature Name	Water Body Location ID	Crossing Infrastructure	Site Specific Considerations	Potential Impacts
				watercourse	
		A3	• Cabling	high sensitivity fish habitat, coldwater fish species present, no in-water work or drilling will be required if overhead cabling is installed	outlined in Section 5.2
		A4	• Cabling		
Tiverton Creek	Tiverton Creek	T1	• Cabling		
Kincardine Creek	Kincardine Creek	PNK22	• Cabling		
		PNK25	• Cabling		
		PNK26	• Cabling		
	Tributary A	PNK3	• Cabling		
		PNK4	• Cabling		
		PNK17	• Cabling		

Note: fish habitat sensitivity was derived from the DFO *Practitioners Guide to the Risk Management Framework* and considers habitat factors such as species sensitivity, species dependence on habitat, rarity, and habitat resiliency. The assessment should be considered preliminary for the purposes of assessing impact as further assessment would be required for final sensitivity determination.

In addition to the specific crossing locations identified above, NRSI has also noted that there are 22 water bodies that are present within 120m of the project location, including the 21 water bodies that have already been identified as crossing the project location. Along these 22 water bodies, there are 39 additional (non-crossing) locations where these water bodies are present within 120m of the project location, with certain water bodies having multiple locations where the project location is within 120m. These locations are summarized in Table 3 below.

Table 3. Summary of Potential Impacts and Site Specific Considerations for Intermittent/Permanent Watercourse Locations from 0 to 120m of the Armow Project Location (but not crossing)

Drainage Area	Water Body Feature Name	Water Body Location ID	Other Infrastructure Within 120m and Distance (m)	Site Specific Considerations	Potential Impacts
North Penetangore River	North Penetangore River	PN4	**AR – 83** **CB – 83** **CA – 83**	high sensitivity fish habitat, sensitive coldwater species present, no in-water work, increased risk of impacts based on proximity to water body (closer = greater risk)	outlined in Section 6.2., in-water work does not apply, new crossing structures do not apply
		PN26	**CA - 116**		
		PN48	**CA - 80**		
		PN52	**CB - 91**		
	Tributary A	PN14	**WT - 105 (T45)** **CB - 73** **CA - 73**		
	Tributary B	PN3	**WT – 97 (T65)** **CA - 69**		
	Tributary C	PN24	**WT - 84 (T100)** **AR - 60** **CB - 60** **CA - 60**		
	Tributary F	PN39	**CB - 39**		
		PN8	**CB - 55**		
	Tributary G	PN12	**CA - 106**		
		PN36	**WT - 74 (T111)** **AR - 114** **CA - 28**		
		PN49	**CA - 55**		
	Tributary I	PN58	**CB - 65**		
	Tributary J	PN27	**WT - 93 (T90)** **CA - 32**		
Penetangore River Tributary	Tributary A	P2	**CB - 21**	high sensitivity fish habitat, sensitive coldwater species present, no in-water work, increased risk of impacts based on proximity to water body (closer = greater risk)	outlined in Section 6.2., in-water work does not apply, new crossing structures do not apply
		P9	**CA - 80**		
Saugeen Teeswater Willow Creek	Tributary B	STW38	**AR - 49** **CB - 49** **CA - 49**		
	Tributary C	STW10	**AR - 39** **CB - 39**		

Drainage Area	Water Body Feature Name	Water Body Location ID	Other Infrastructure Within 120m and Distance (m)	Site Specific Considerations	Potential Impacts
			CA - 39		
Lorne Creek	Tributary A	LO7	**WT – 73 (T81)** **CA - 84**		
Andrew's Creek	Andrew's Creek	A8	**CB - 100**		
Kincardine Creek	Kincardine Creek	PNK13	**WT – 79 (T108)** **CA - 56**		
		PNK28	**CB - 29**		
	Tributary A	PNK7	**WT – 116 (T25)** **CA - 92**		
		PNK8	**WT – 87 (T24)** **CA - 54**		
		PNK9	**WT – 65 (T88)** **CB - 115** **CA - 78**		
		PNK10	**WT – 82 (T21)** **CB - 69** **CA - 34**		
		PNK12	**WT - 60 (T8)** **CA - 55**	high sensitivity fish habitat, sensitive coldwater species present, no in-water work, increased risk of impacts based on proximity to water body (closer = greater risk)	outlined in Section 6.2., in-water work does not apply, new crossing structures do not apply
		PNK16	**WT – 112 (T24)** **CA - 89**		

Note: fish habitat sensitivity was derived from the DFO *Practitioners Guide to the Risk Management Framework* and considers habitat factors such as species sensitivity, species dependence on habitat, rarity, and habitat resiliency. The assessment should be considered preliminary for the purposes of assessing impact as further assessment would be required for final sensitivity determination.

Legend
WT- Wind Turbine
AR - Access Road
CB - Cabling
CA - Construction Activity (includes crane walk, and staging and disturbance areas)
BU - Building (includes substation and point of interconnection)

6.0 Recommendations

Based on the analysis of potential negative impacts, mitigation measures provided in the following sections are designed to reduce potential impacts to water bodies and their ecological functions. It is anticipated that the implementation of mitigation measures will be achieved through the conditions of approval on the REA Application.

6.1 General Project Phase Mitigation

6.1.1 Design Related Mitigation

Mitigation through design is the first line of defense for avoiding or minimizing impacts to water bodies.

The selection of crossing locations should be made to avoid key habitat features such as spawning habitat or refuge pools. Locations should also be selected within straight reaches of the channel and avoid crossing reaches at the point in which they are meandering etc. as to minimize potential for erosion and sedimentation.

Existing surface water drainage patterns and functions should be maintained through proper stormwater management design considerations. Newly impervious surfaces (i.e. access roads, turbine pads etc.) should consider the use of permeable materials, where possible, as to reduce impacts associated with the increase in newly impermeable surfaces.

Consideration of water body crossing structure design should also be made to limit the degree of impact. This can be achieved by considering maintaining the minimum culvert length possible (i.e. cutting back from grading limit to road limit and support with head wall, utilizing existing culverts, use of open bottom structures such as an open foot box culvert). The culvert should be sized appropriately according to municipal engineering standards as to not result in alterations in stream hydrology, scouring or flooding. Non-open bottomed culverts should be embedded as to avoid perched conditions, and furthermore maintaining passage. Crossing structure type should be determined in consultation with agency and municipality staff and will be dependent on sensitivity of the water body and location. This will be completed during the permitting phase, prior to any in-stream construction activities. In conjunction with determination of appropriate crossing structures, the proposed underground electrical collector lines should also be considered with agency staff and any applicable municipal requirements.

Should a HADD of fish habitat be unavoidable, lost or altered habitat must be compensated for under the *Fisheries Act*. Compensation measures must be employed to ensure there is no net loss of fish habitat. The combination of mitigation and compensation measures will ensure that impact to fish (including freshwater mussels) and their habitats is avoided. Additional information specific to crossing locations may also be necessary to ensure compliance under the federal *Fisheries Act*. This will be addressed in the detailed design, permitting and approvals phase of the project.

6.1.2 Construction Related Mitigation

Mitigation measures are recommended to minimize risk associated with potential impacts to water bodies during construction. These mitigation measures are described in the following sections. Site-specific mitigation measures will be identified during detailed design phase.

6.1.2.1 Timing of Works

All in-stream construction activities must adhere to watercourse specific timing windows set by the OMNR as to avoid critical spawning/migration periods of coldwater species. This timing window will take into consideration that all watercourse features that in-water works is proposed are managed as coldwater fisheries. Preliminary timing window for all in-water work at the Armow project is recommended to avoid the time periods of March 15 to July 15 (spring spawning species) and between October 1 to May 1 (fall spawning species) to protect spring and fall spawning coldwater salmonid species, although the specific details of the work may result exceptions to these timing windows, providing it is confirmed through discussions with the local MNR District office. Based on timing windows above, in-water construction activities should take place within the low flow period in the late summer months, with little potential impact to coldwater spring and fall spawning periods (July 16 to September 30) as to avoid or minimize impacts.

Clearing, grubbing, and grading activities should be timed to avoid seasonally wet periods (i.e. spring), wherever possible. Construction should avoid high volume rain events (20mm in 24 hours) and significant snow melts/thaws, resuming once soils have stabilized as to not increase risk of erosion, soil compaction, or the potential for sediment release into nearby watercourses. A Flood Response Plan should be developed to deal with on-site flooding as to mitigate any possible effects to the aquatic environment.

6.1.2.2 Erosion & Sediment Control Plan

To minimize the potential for construction related sediment release into nearby watercourses a comprehensive Erosion and Sediment Control (ESC) plan will be developed. The ESC plan will minimize sediment and erosion impacts to stream through the incorporation of specific elements. The reader is referred to the E*rosion and Sediment Control Guideline for Urban Construction*, December 2006 (ESC Guideline), prepared by the Greater Golden Horseshoe Area Conservation Authorities (GGHACA) for guidance related to preparation of an ESC plan.

The goal of the ESC plan is to preserve and protect the water body locations that have potential to be affected by the construction. On all sites, multiple layers of protection are to be employed prior to the commencement of construction along with a regulated process for monitoring and maintenance to ensure that the measures are functioning within approved limits. ESC condition reports will be prepared as part of the monitoring and maintenance plan. Where ESC measures are found to be in an unacceptable condition they are to be repaired or replaced immediately. Increased ESC measures (i.e. silt fencing) should be implemented in all situations where a water body or drainage feature (i.e. ephemeral watercourse, swale, ditch etc.) are located within 120m of any construction activity unless otherwise agreed upon with appropriate agency staff.

6.1.2.3 Bank Stabilization

Riparian planting after construction should be implemented to stabilize watercourse channel banks and encourage rapid re-vegetation of disturbed soils to prevent collapse, erosion and sedimentation. Seeding should be completed as soon as weather permits, following reconstruction of the slope. Seeds should also be protected with a layer of erosion control matting to assist in stabilizing the slope and propagating seed. Additional restoration of banks may require application of topsoil, native seed mix and native shrubs. The vegetated banks will also act to buffer potential materials (i.e. sediment) that may flow in from adjacent lands and valleys into water bodies. These riparian areas can substantially reduce erosion of stream banks which, in turn, will minimize sedimentation, support fish habitat, and protect the many sensitive ecological functions that occur in water bodies (River Keepers 1998).

If insufficient time is available in the growing season to establish vegetative cover, an overwintering treatment such as erosion control blankets, fiber matting, rock reinforcement/armoring or equivalent will be applied to contain the site over the winter period. Where rock will be utilized, large, clean, angular rocks should be used. Planting of vegetative cover should then follow in the next growing season. Maintenance and inspection of the vegetative cover will continue until such time as the disturbed areas are sufficiently stabilized through vegetative growth to prevent overland runoff of suspended materials.

6.1.2.4 Construction Equipment

To minimize impacts from construction equipment (i.e. cranes, back hoes etc.), machinery should be operated in a manner that minimizes disturbance to the banks and bed of the watercourse. Equipment should stay outside of the watercourse and bank area as much as possible. Machinery should arrive on site in clean condition and is to be checked and maintained free of fluid leaks. Machinery must be refueled, washed and serviced a minimum of 30m away from all water bodies and other drainage features as to prevent any deleterious substances from entering a watercourse. Fuel and other construction related materials should be stored securely away from any drainage features. Construction staging areas should also be located away from any water body (i.e. 30m away).

A Spill Response Plan (SRP) must be developed prior to commencement of construction. This SRP should provide a detailed response system to deal with events such as the release of petroleum, oils and lubricants or other hazardous liquids and chemicals. A spill kit must also be kept on site at all times and on-site workers must be trained in the use of this kit and be fully aware of the SRP.

A spill is defined in the Ontario EPA as a discharge “into the natural environment, from or out of a structure, vehicle or other container, that is abnormal in quality or quantity in light of all the circumstances of the discharge". Such spills will be identified as major spills, which must be reported to the MOE's provincial spill response center immediately.

To minimize the potential for soil compaction, construction equipment should be restricted to designated controlled vehicle access routes.

6.1.2.5 Construction Debris

Any construction debris removed from the construction site should be stabilized to prevent it from entering the nearby water bodies. This could include covering stockpiles with biodegradable mats or tarps as well as hanging netting or tarps underneath the water body crossing structure (if applicable). Staging and stockpiling areas should also be located away from watercourses (i.e. 30m). Any waste generated from the site should be removed and disposed of appropriately off site according to municipal standards.

6.1.2.6 In-Water Work

At the watercourse crossings, in-water work has potential to release sediment into the watercourse downstream. Mitigation measures include conducting in-water work when flows are low or absent, or by working in dry conditions using accepted methods to bypass flows such as damming and pumping the water around the in-water construction area or using a diversion channel. Mitigation associated with surface water dewatering is discussed in Section 6.1.2.7.

Any watercourse locations requiring in-water work or work within a regulated area (typically watercourse flood plains) will require a permit from the respective jurisdictional conservation authority, including the Saugeen Valley Conservation Authority (SVCA). Permitting will be required under the *Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*, Reg. 169/06. Permitting will be granted upon review and approval of a completed EIS based on the final design details of the project. Review and approval under the *Fisheries Act (1986)* will also be required by the above noted authorities on behalf of the DFO. Should HADD of fish habitat be unavoidable, lost or altered habitat must be compensated for under the *Fisheries Act (1986)*. Compensation measures must be employed to ensure there is no net loss of fish habitat. The combination of mitigation and compensation measures will ensure that impact to fish (including freshwater mussels) and their habitats is avoided. Additional information specific to crossing locations may also be necessary to ensure compliance under the federal *Fisheries Act (1986)*. Regulation 169/06 permitting as well as approval under the *Fisheries Act (1986)* will be addressed in the detailed design, permitting and approvals phase of the project.

6.1.2.7 Dewatering

It is anticipated that groundwater dewatering will be minimal and will likely not exceed 50,000L/day at up to 4 locations within the project area. In the event that this volume is surpassed, the mitigation measures discussed within this section are expected to mitigate against potential negative impacts associated with dewatering activities.

Limited surface dewatering is also anticipated for construction during in-water works. Since these areas will be isolated with use of water containment structures, surface dewatering is not expected to interfere with surrounding watercourse levels.

Typical dewatering mitigation is discussed for the following impacts:

- Water Quality Impairment;
- Water Level Alteration; and,
- Erosion and Sedimentation

<u>Water Quality Impairment</u>

Any discharges of water should meet the Ministry of Environment's *Water Management Policies, Guidelines, Provincial Water Quality Objectives* (MOE 1999) Policy 2 provisions. This policy states that where the existing water quality of a water body does not meet Provincial Water Quality Objectives (PWQO), it should not be degraded further and all practical measures should be taken to upgrade the water quality to PWQO. Furthermore, discharges would be required to be at or better than the quality of the receiving watercourse.

If discharging to a municipal storm sewer system, groundwater quality must meet the objectives of the municipal storm sewer by-law prior to discharge. To mitigate potential effects associated with the discharge, water quality samples must be obtained prior to discharge to ensure the quality is suitable for discharge and will not result in an impact to the receiving watercourse. If the groundwater is not suitable for discharge, alternate locations of disposal must be considered or adequate treatment must be carried out. At a minimum, groundwater is to be passed through a sediment filtration system prior to being discharged to a watercourse. The success of all mitigation will be verified though groundwater quality sampling.

<u>Water level Alteration</u>

Prior to groundwater dewatering, anticipated discharge rates and estimated zones of influence (ZOI) should be evaluated in relation to the associated water bodies to ensure the volumes will not impact water body hydrologic function. A Water Level Response Plan must be developed where a water body is located within a groundwater dewatering ZOI. Water levels of the water body must be monitored to determine if dewatering activities are resulting in alteration of water levels within the water body. Criteria for an acceptable alteration of water levels must be negotiated with agencies during the detailed design, permitting and approvals phase of the project. This will include identification of a level in which the Water Level Response Plan must be initiated. The plan would include contingencies for the supplementation of flow with water of a quality appropriate for discharge.

The by-pass channel must be maintained as to maintain flow through the watercourse and prevent from back flooding and ultimately overtopping the water containment structure and flooding the isolated construction area. This includes frequent monitoring of condition and implementation of contingency plans in the event the by-pass channel fails.

Prior to surface water dewatering, fish must be collected and relocated to a suitable location, preferably downstream and away from the construction area. This should be executed through the development of a Fish Salvage Plan. Dewatering pump hoses should also be fitted with screens at end of pipe as to not entrain or impinge fish in the hose or pumps. *Freshwater Intake End-of Pipe Guidelines* should be referenced to determine appropriate screening standards (DFO 1995). A Scientific Collection Permit will be required from the OMNR, prior to execution of salvage.

<u>Erosion and Sedimentation</u>
Proposed discharge rates should be evaluated to determine if they are ecologically appropriate as to not cause erosion or damage to fish habitat to the receiving water body. Depending on rates, discharge may be required to be split to more that one location in the watercourse. Flow dissipaters (i.e. sand bags, hay bales, etc) should also be installed at the location of discharge(s) to mitigate potential for erosion.

When using water containment structures to isolate a segment of a water body, silt curtains should be installed downstream of or surrounding the proposed dam location prior to the installation and removal of the dam to minimize in-stream sedimentation.

6.1.2.8 Drilling

The greatest potential impact associated with horizontal directional drilling is ‘frac-out’, where drilling mud escapes upwards into a water body. The primary mitigation measure in preventing a frac-out is to have geotechnical studies completed at proposed drilling locations as to ensure drilling is a feasible option and will not likely result in a frac-out based on geological conditions. An emergency frac-out response plan should be developed and implemented in event a frac-out occurs. This plan will include steps to contain, monitor and clean-up in response to the event. The DFO Operational

Statement for Directional Drilling should be referenced in the development of the response plan (DFO 2007).

To minimize risk of drilling related debris or mud entering a watercourse as well as preventing erosion and sedimentation from equipment, drilling entry/exit shafts should be located at least 30m away from any water body.

The Spill Response Plan should also include details associated with drilling operations and be implemented in the event of a spill.

6.1.3 Operational Related Mitigation

As risk of impacts during the operational phase are limited to the potential for water quality impairment from contaminant spills, and erosion and sedimentation from maintenance activities, therefore recommended mitigation measure are focused on water quality and erosion and sedimentation.

Recommendations to mitigate for contaminant spills are discussed in Section 6.1.2.4.

The use of herbicides for the removal of vegetation should be avoided. If application is required, it should be limited and adhere to BMP's for herbicide application, and use herbicides approved for use adjacent to water bodies or within riparian buffer areas.

Recommendations to mitigate for erosion and sedimentation are discussed in Section 6.1.2.2.

6.1.4 Decommissioning Related Mitigation

Recommendations associated with decommissioning activities will generally follow the same guidelines as included above construction related mitigation recommendations noted in Section 6.1.2.

During the decommissioning phase, if a decision is made to discontinue the project and remove all turbines and associated infrastructure, it is anticipated that all watercourse crossing structures will remain in place, which will benefit landowners. Furthermore, leaving structures in place will eliminate the need for additional in-water work which in itself will act to mitigate the potential for sedimentation, contaminant spills, and loss of habitat commonly associated with this type of work. Additionally, this will minimize the necessary remediation activities that are required to rehabilitate the site following the destruction of riparian vegetation and various effects on in-stream aquatic habitat.

If a decision is made to remove all crossing structures upon decommissioning of the project, NRSI recommends that a comprehensive management plan be prepared prior to the commencement of any activities. This plan will include the proper steps required for removing structures with the lowest collective footprint to the site. Steps must be taken in consultation with proper agencies while respecting in-water timing windows provided through the local district OMNR. Finally, a mitigation and rehabilitation strategy will be prepared to counteract any and all negative environmental impacts caused by decommissioning activities.

6.2 Site Specific Water Body Mitigation

Recommended mitigation measures for each water body location are provided Table 4 and Table 5..

Table 4. Summary of Water Body Crossing Sites, Potential Impacts and Recommended Mitigation Measures

Drainage Area	Water Body Feature Name	Water Body Location ID	Crossing Infrastructure	Potential Impacts	Recommended Mitigation Measures
North Penetangore River	North Penetangore River	PN16	• Cabling	outlined in Section 5.2 no in-water work or drilling will be required if overhead cabling is installed	outlined in Section 6.1
		PN4	• Cabling		
		PN20	• Cabling		
		PN51	• Cabling		
		PN63	• Cabling		
		PN2	• Cabling		
	Tributary A	PN23	• Access Road • Cabling	outlined in Section 5.2	outlined in Section 6.1
	Tributary B	PN11	• Cabling	outlined in Section 5.2 no in-water work or drilling will be required if overhead cabling is installed	outlined in Section 6.1
	Tributary C	PN7	• Cabling		
	Tributary F	PN9	• Cabling		
		PN10	• Cabling		
		PN37	• Cabling		outlined in Section 6.1
		PN38	• Cabling		
	Tributary G	PN34	• Cabling		
	Tributary I	PN18	• Cabling		

Drainage Area	Water Body Feature Name	Water Body Location ID	Crossing Infrastructure	Potential Impacts	Recommended Mitigation Measures
		PN22	• Cabling		
	Tributary J	PN40	• Cabling		
	Tributary K	PN31	• Cabling		
		PN65	• Cabling		
	Tributary L	PN53	• Cabling		
		PN54	• Cabling		
		PN55	• Cabling		
		PN56	• Cabling		
	Tributary M	PN57	• Cabling		
Penetangore River Tributary	Tributary A	P5	• Cabling		
Saugeen Teeswater Willow Creek	Willow Creek	STW11	• Access Road • Cabling	outlined in Section 5.2	outlined in Section 6.1
		STW25	• Cabling		
	Tributary B	STW7	• Cabling		
		STW9	• Access Road • Cabling		
	Tributary G	STW21	• Cabling		

Drainage Area	Water Body Feature Name	Water Body Location ID	Crossing Infrastructure	Potential Impacts	Recommended Mitigation Measures
		STW37	• Cabling		
Lorne Creek	Tributary A	LO2	• Cabling		
Andrew's Creek	Andrew's Creek	A5	• Cabling		
		A6	• Cabling		
	Tributary A	A1	• Access Road Cabling		
		A3	• Cabling	outlined in Section 5.2 no in-water work or drilling will be required if overhead cabling is installed	outlined in Section 6.1
		A4	• Cabling		
Tiverton Creek	Tiverton Creek	T1	• Cabling		
Kincardine Creek	Kincardine Creek	PNK22	• Cabling		
		PNK25	• Cabling		
		PNK26	• Cabling		
	Tributary A	PNK3	• Cabling	outlined in Section 5.2	outlined in Section 6.1
		PNK4	• Cabling	outlined in Section 5.2 no in-water work or drilling will be required if overhead cabling is installed	outlined in Section 6.1
		PNK17	• Cabling		

Table 5. Summary of Water Body Sites within 1 to 120m of the Project Location, Potential Impacts and Recommended Mitigation Measures

Drainage Area	Water Body Feature Name	Water Body Location ID	Associated Infrastructure and Distance (m)	Potential Impacts	Recommended Mitigation Measures
North Penetangore River	North Penetangore River	PN4	**AR – 83** **CB – 83** **CA – 83**	outlined in Section 5.2., in-water work does not apply, new crossing structures do not apply	outlined in Section 6.1 (excluding mitigation measure associated with in-water works, drilling and new water crossing design)
		PN26	**CA - 116**		
		PN48	**CA - 80**		
		PN52	**CB - 91**		
	Tributary A	PN14	**WT - 105 (T45)** **CB - 73** **CA - 73**		
	Tributary B	PN3	**WT – 97 (T65)** **CA - 69**		
	Tributary C	PN24	**WT - 84 (T100)** **AR - 60** **CB - 60** **CA - 60**		
	Tributary F	PN39	**CB - 39**		
		PN8	**CB - 55**		
	Tributary G	PN12	**CA - 106**		
		PN36	**WT - 74 (T111)** **AR - 114** **CA - 28**		
		PN49	**CA - 55**		
	Tributary I	PN58	**CB - 65**		
	Tributary J	PN27	**WT - 93 (T90)** **CA - 32**		
Penetangore River Tributary	Tributary A	P2	**CB - 21**		
		P9	**CA - 80**		
Saugeen Teeswater Willow Creek	Tributary B	STW38	**AR - 49** **CB - 49** **CA - 49**		

Drainage Area	Water Body Feature Name	Water Body Location ID	Associated Infrastructure and Distance (m)	Potential Impacts	Recommended Mitigation Measures
	Tributary C	STW10	**AR - 39** **CB - 39** **CA - 39**		
Lorne Creek	Tributary A	LO7	**WT – 73 (T81)** **CA - 84**		
Andrew's Creek	Andrew's Creek	A8	**CB - 100**		
Kincardine Creek	Kincardine Creek	PNK13	**WT – 79 (T108)** **CA - 56**		
		PNK28	**CB - 29**		
	Tributary A	PNK7	**WT – 116 (T25)** **CA - 92**		
		PNK8	**WT – 87 (T24)** **CA - 54**		
		PNK9	**WT – 65 (T88)** **CB - 115** **CA - 78**		
		PNK10	**WT – 82 (T21)** **CB - 69** **CA - 34**		
		PNK12	**WT - 60 (T8)** **CA - 55**		
		PNK16	**WT – 112 (T24)** **CA - 89**		

Legend
WT- Wind Turbine
AR - Access Road
CB - Cabling
CA - Construction Activity (includes crane walk, and staging and disturbance areas)
BU - Building (includes substation and point of interconnection)

6.3 Monitoring

An adaptive management approach to the protection of water body protection requires regular site inspections and monitoring by a designated on-site Environmental Manager(s) (EM). Understanding the condition of the natural ecosystem throughout all phases of the project will form the basis upon which to consider altering construction methods, environmental protection measures, and monitoring programs. Ultimately, any determination related to the application of mitigation and contingency measures will be informed by ongoing analyses of monitoring data, and rely on the experience and judgment of the on-site EM in consultation with the OMNR, MOE and DFO as regulatory agencies.

Pre-construction monitoring is recommended where baseline conditions must be determined (i.e. water quality, water levels etc.). Active construction monitoring will be required at all locations where drainage features and water bodies are present. Active construction monitoring will be required at all locations of construction as well as water bodies located in close proximity. Post-construction monitoring may also be required to certify that proper restoration, stabilization, and overall quality of runoff is returned to pre-construction conditions as well as to satisfy regulatory permitting and/or authorizations. Detailed monitoring plans will be developed within the detailed design phase and will incorporate other monitoring required by regulatory permitting and authorizations i.e.) Letter of Advice (LOA), Fisheries Act Authorization, Permit to Take Water (PTTW) etc. They will also incorporate specific detail of developed plans (i.e. ESC Plan, Flood Response Plan etc.)

General recommended monitoring activities are summarized in Table 6.

Table 6. Summary of General Monitoring Recommendations

Recommended Monitoring	Timing of Monitoring	Estimated Frequency of Monitoring
Monitor on-site conditions (i.e. erosion and sediment control measures, spills, flooding	• Construction phase	• Weekly during active construction periods • Prior to, during and after forecasted rain events (>20mm in 24 hours) or significant snowmelt events • Daily during extended rain or snowmelt periods • Monthly during inactive construction periods • As detailed in the ESC Plan, SRP, and Flood Response Plan
Monitor meteorological conditions from Environment Canada	• Construction phase	• Daily review of weather forecasts
Document changes to existing aquatic habitat	• Pre-construction (to document existing conditions) • Construction Phase	• Once pre-construction • Daily during in-water and work within 30m • Weekly for work occurring within 31-120m of a water body
Monitor end point of dewatering discharge for water quality and erosion (if dewatering)	• Construction phase	• Daily erosion checks during discharge • Water quality prior to discharge, once a week thereafter or as described by agencies
Monitor by-pass channel (if applicable)	• Construction phase	• Daily checks of the channel to ensure it is functioning appropriately and water is flowing through as designed
Monitor aquatic habitat at drilling locations (if drilling)	• Construction phase	• Continuous monitoring of aquatic habitat conditions when drilling underneath a water body
Monitor surface water quality for general parameters (i.e. temperature, pH, dissolved oxygen, conductivity, TSS, turbidity, nutrients, metals)	• Pre-construction (to document baseline conditions) • Construction Phase	• Pre-construction sampling should meet agency requirements as to adequately establish baseline conditions • Frequent measurements of in-situ parameters and turbidity during construction • Other general water quality parameters as required by agency
Monitor water levels within water bodies during groundwater dewatering	• Pre-construction (to document baseline conditions) • Construction Phase • Post-construction	• Pre-construction monitoring frequency adequate to characterize baseline levels • Staff gauge readings daily during dewatering • Continuous level loggers (logged in 1hour increments and downloaded weekly) during active dewatering • Monitor post-construction until water levels return to baseline • As described in the Water Level Response Plan

7.0 Impact Assessment Summary

A summary of general project phase water body potential impacts, recommended mitigations and resulting impacts are presented in Table 7.

A summary of water body specific potential impacts, recommended mitigations and resulting impacts are presented in Tables 2, 3, 4 & 5 in Sections 5.3.1 and 6.2, respectively. With appropriate application of recommended mitigation measures outlined in this report, it is anticipated there will be no resulting significant impacts.

Table 7. Summary of General Project Phase Potential Impacts, Recommended Mitigation Measures and Resulting Significance of Impact

Potential Impact	8.0 Recommended Mitigation Measure(s)	Resulting Impact Significance[1]
Design Phase		
• Alteration of local drainage patterns	• design to maintain existing surface water drainage patterns and functions (including project layout, grading, storm water management facilities and structure designs) • utilize existing roads and road crossing structures where possible • crossing structures should be sized appropriately according to municipal engineering standards as to not result in alterations in stream hydrology, scouring or flooding crossing structures • newly impervious surfaces should consider use of permeable materials	• Not Significant
• Fish habitat alteration/loss	• consideration of design layout to minimize number of crossings • consider layout distances to water body features and sensitivity of those features • crossing locations should be selected as to avoid key habitat features (i.e. refuge pool) and cross the feature within a straight reach of the channel as to avoid meanders etc. and cross perpendicular • crossing structures should be designed to reduce loss and alteration of habitat (i.e. reduce affected area by cutting back from grading limit to road and install headwall, open bottom culvert etc.) • crossing structure should be properly sized and positioned appropriately (angle and embedded) as to avoid erosion issues and creation of potential fish barriers • crossing structures should be sized appropriately according to municipal engineering standards as to not result in alterations in stream hydrology, scouring or flooding crossing structures • crossing structure type should be determined in consultation with agency and municipality staff and should consider sensitivity of the water body and location of crossing • implement trenchless (i.e. directional drilling) technology at water body crossings where possible • any loss to the productive capacity of a watercourse must be compensated for under the *Fisheries Act*	• Not Significant
Construction Phase		
• Erosion and sedimentation	• implement trenchless (i.e. drilling) technology at crossings where possible • minimize potential for soil compaction (see Soil Compaction) • controlled vehicle and machinery access routes, keep away from water bodies • avoid clearing, grubbing and grading activities during seasonally wet periods (i.e. spring) • Avoid work if during high volume rain events (>20mm in 24hrs) or snow melts are observed, resuming once	• Not Significant

[1] Considers if recommended mitigation measures are applied

Potential Impact	8.0 Recommended Mitigation Measure(s)	Resulting Impact Significance[1]
	soils have stabilized • implement Flood Response Plan if on-site flooding occurs • implement Erosion and Sediment Control Plan • stabilize banks as soon as possible after construction disturbance (i.e. plantings, rock etc.), if insufficient time is available in the growing season to establish vegetative cover, an overwintering treatment such as erosion control blankets, fiber matting etc. should be applied to contain the site over the winter period • minimize disturbance by keeping construction equipment outside and away from water bodies • work in dry conditions (i.e. low flow period) or isolate in-water work area with use of a water containment structure • install silt fencing in-water downstream of water containment structures • dewatering discharge rates should be evaluated as to not result in erosion and sedimentation to receiving water body • dewatering discharge should be dissipated (i.e. sand bags, hay bales etc.) and may require to be split to more than one location	
• Water Quality Impairment	• implement Erosion and Sediment Control Plan • implement Spill Response Plan • keep machinery clean and refuel a minimum of 30m away from any water body • fuel and other construction related chemical stored securely away from water bodies • any discharges to a water body must meet MOE Policy 2 standards (at or better water quality that than of the receiving water body) • adequately treat any discharge water prior to discharge as to meet MOE policy 2 standards (i.e. filer bags) • implement Stormwater Management Plan	• Not Significant
• Temporary disruption of fish habitat (in-water work)	• restrict construction to coldwater timing windows, as indicated by local OMNR • work in the dry (i.e. low flow) or isolate work area with a water containment structure or by working in dry conditions using accepted methods to bypass flows such as damming • machinery should be operated in a manner that minimizes disturbance to the banks and bed of the watercourse • when using a water containment structure, implement Fish Salvage Plan to remove any fish prior to dewatering work area • stabilize banks as soon as possible after construction disturbance (i.e. plantings, rock etc)	• Not Significant
• Water Level Alteration	• dewatering ZOI and rates should be determined prior to dewatering and assessed for impact on affected water bodies • implement Water Level Response Plan, trigger criteria to be determined in consultation with OMNR • maintain temporary by-pass channel (when required) during in-water work as to maintain flow and prevent back	• Not Significant

Potential Impact	8.0 Recommended Mitigation Measure(s)	Resulting Impact Significance[1]
	flooding and overtopping of water containment structure	
• Soil Compaction	• controlled vehicle access routes • staging areas should be located away from water bodies (i.e. 30m)	• Not Significant
• Debris entering a water body	• construction debris should be stabilized (i.e. tarps) away from water bodies • refuse and other material should be appropriately disposed of off-site • staging areas should be located away from water bodies (i.e. 30m) • drilling shafts should be located away from water bodies (i.e. 30m)	• Not Significant
• Drilling Frac-out	• conduct appropriate geotechnical studies as to ensure directional drilling is appropriate at that location and reduce likelihood of encountering a 'frac-out' • develop emergency response plan in the unlikely event of a 'frac-out' when drilling below a water body, this plan will deal with issues associated with water level alteration, water quality and erosion & sedimentation	• Not Significant
Operational Phase		
• Water quality impairment	• implement Spill Response Plan • void or limit use of pesticides, implement BMP's • address any impacts resulting from design or construction phases	• Not Significant
Decommissioning		
	• See construction related impacts and recommended mitigation	

9.0 Summary and Conclusions

A detailed assessment of the water bodies within and adjacent to the proposed Armow Wind Project has occurred through the use of a detailed Records Review (NRSI 2012a) and Site Investigations (NRSI 2012b) conducted by Natural Resource Solutions biologists.

Through the completion of these studies, NRSI has confirmed the presence of 22 water bodies within the project area, all of which have been identified as intermittent/permanent watercourses. Within these watercourses, a total of 71 individual locations have been identified within 120m of the project location (including direct crossings).

Twenty-one of the 22 watercourses have been identified as crossing the project location in at least one location, with multiple crossing locations found within the same water body in occasional instances, totally 43 specific crossing locations. The remaining water body is found within 120m of the project location without a specific overlap with the project location.

All watercourses within the project area have been either designated or assumed to be coldwater fisheries based on local OMNR management designations for the associated main watercourse channels. Several salmonid species have been documented in the main channels of the watercourses located within the project area.

No lakes, Lake Trout lakes or seepage areas were identified within the Armow Wind Project area.

If recommended mitigation measures are employed as described in this report, no significant impacts are anticipated on the identified water body features as a result of the development of the Armow Wind Project.

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