Henvey Inlet Wind LP

Henvey Inlet Wind Energy Centre (HIWEC) Description Report

Report

Environment

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1. Introduction and Overview

1.1 Henvey Inlet Wind Energy Centre Overview

Nigig Power Corporation ("Nigig") received a Feed-in-Tariff ("FIT") Contract from the Ontario Power Authority ("OPA") in 2011 for a 300 megawatt wind energy generation centre. Henvey Inlet Wind LP ("HIW"), a limited partnership between Pattern Renewable Holdings Canada ULC and Nigig Power Corporation, is proposing to develop the Henvey Inlet Wind Generation Centre (HIWEC), a 300 MW facility on Henvey Inlet First Nation Reserve No. 2 ("HIFN I.R. #2").

HIFN I.R. #2 is a parcel of federal Crown land on the shore of Georgian Bay at Key River (approximately 80 km north of Parry Sound, Ontario) held by the Crown subject to the Aboriginal title of and for the benefit of Henvey Inlet First Nation ("HIFN"). A small residential section comprised of HIFN Members exists immediately west of Highway #69 on Bekanon Road. Private, largely seasonal, cottage lot leases are located on the north side of Henvey Inlet and several HIFN Band Members have cabins within the HIWEC study area Two to three (2 to 3) HIFN Band Members utilize recreational lots within the HIWEC study area. The remainder of the study site is undeveloped and unpopulated.

HIFN I.R. #2 has been in active use by HIFN since pre-contact for habitation, hunting, fishing, gathering, burial, traditional use and cultural gatherings. In recent times, HIFN has used these lands for forestry, aggregate, waste management, and recreation. There have also been various proposals for commercial and economic development. HIFN requires that any future development be located to protect areas of cultural importance. The proposed HIWEC will have precedence over general uses of these lands, but otherwise these uses may continue. Overall the HIWEC footprint will be between 500-700 acres within the 20,000 acres that constitute HIFN I.R. #2.

The HIWEC will include approximately 100 to 120 wind turbine generators ("WTG"), pad-mounted transformers, crane pads, 34.5 kV overhead and/or underground electrical collector cables, communication lines, permanent meteorological towers, access roads, operations and maintenance ("O&M") building, two 34.5 – up to 500 kV transformer stations, construction compounds and storage yards. It may include other ancillary facilities and transmission lines.

HIFN has broad authority to manage and protect its Reserve lands. This authority comes from the *First Nations Land Management Act* ("*FNLMA*"), related instruments, and the HIFN Land Code. This authority includes responsibility for environmental protection and the environmental assessment of projects and physical activities on Reserve lands.

There will be a new transmission line to deliver the electricity generated to the Ontario electricity grid. Two potential routes are currently being considered. One route (Route A) extends east from the HIWEC site and connects to the existing 500 kV Hydro One Networks Inc. ("HONI") transmission line. The second (Route B) follows Highway 69 south to the Parry Sound Transformer Station ("TS") extending approximately 90 kilometres ("km"). Both routes may require a new TS or switchyard to connect to the HONI 500 kV line. The transmission line routes are predominantly located on Crown-owned or managed lands.

The off-Reserve transmission line is not within the regulatory authority of HIFN powers and responsibilities set out in the *FNLMA* or the Land Code. Nevertheless, HIFN seeks to ensure that the Environmental Assessment (EA) considers this off-Reserve electricity transmission and its effects so that HIFN may fully understand the implications of approving what is proposed on-Reserve.

The remainder of this document describes the HIWEC. The off-Reserve transmission line is described in a separate document titled "*Transmission Line Description Report*". The purpose of this document is to describe the characteristics of the study area, the overall design, and the potential environmental effects associated with the construction, operation and decommissioning of the on-Reserve HIWEC.

1.2 Project Rationale and Background

The province of Ontario's Long Term Energy Plan (Government of Ontario, 2013), which is predated by the Integrated Power System Plan (Government of Ontario, 2008), establishes a goal of bringing 20,000 MW of renewable energy online by 2025. As part of the effort to achieve this goal, Nigig Power Corporation was awarded a FIT contract to develop a 300 MW wind energy generation facility on HIFN I.R. #2. It will be a large-scale renewable energy project capable of providing substantial economic benefits to the HIFN local economy. It will also provide economic spin-off benefits accruing to communities outside of HIFN related to procurement, construction and operation. Renewable energy contributes to a reduced reliance on fossil fuel based power generation resulting in additional environmental benefits such as reduced greenhouse gas emissions.

1.3 Geographic Setting

The study area for the HIWEC includes the entirety of HIFN I.R. #2. HIFN I.R. #2 is bounded on the north by Key River, Georgian Bay to the west, Highway 69 on the east with some property located on the east side of the highway. The southern boundary runs from Sandy Bay on the southwest corner in a north easterly direction to Highway #69 just south of Bekanon Road. The geographic location is along the eastern shore of Georgian Bay, south of French River Provincial Park and directly north of North Georgian Bay Shoreline and Islands Conservation Reserve (Figure 1). King's Highway 69, commonly referred to as Highway 69, is a major north-south highway connecting Highway 400 north of Parry Sound with the City of Greater Sudbury at Highway 17.

Generally, the study area has shallow soils, with many rocky outcrops forming longitudinal ridges running on a northwest to southeast axis, and is divided roughly in half by the Henvey Inlet waterbody. Numerous wetland pockets are located between the ridges and across the study area, with upland regions supporting forested areas of poplar and jack pine. Section 4 provides a more detailed description of the existing environmental conditions within the study area.

The study area for the HIWEC also includes lands off-Reserve that are within the impact zone for acoustic emissions from the HIWEC.

1.4 Regulatory Framework

Multiple permits, licenses, and authorizations may be required to facilitate the development of the HIWEC. The ultimate applicability of all permits, licenses, and authorizations will be determined by and based upon the facility design. However, this section provides a preliminary listing of key, potentially applicable regulatory approvals.

1.4.1 Henvey Inlet First Nation

Pursuant to the FNLMA, Canada and HIFN have entered into agreements regarding the management of HIFN's reserve lands, namely the Framework Agreement on Management of First Nation Land and an Individual Agreement. In 2009, HIFN adopted a formal Land Code which was amended in 2012 to apply to HIFN I.R. #2. Pursuant to these instruments, HIFN's Band Council is the decision-making authority with respect to the creation and granting of interests in lands within HIFN I.R. #2. These instruments also provide HIFN Band Council with the legislative, regulatory, and executive authority to ensure environmental management of the Reserve. This authority includes responsibility for environmental assessment, permitting, and environmental protection for projects on HIFN lands.

HIFN has developed principles that address its overall requirements for environmental assessment and environmental protection. The HIWEC EA must be conducted in accordance with these principles, applicable HIFN laws, and approved EA Guidance. The EA must be acceptable to HIFN before HIFN decides whether to issue an environmental permit for the HIWEC. If HIFN decides to issue a permit approving the HIWEC, it will use the EA to assist in developing terms and conditions of approval that may be enforced through its EP laws, powers and responsibilities.

1.4.2 Federal

Any applicable federal permits and approvals required for the HIWEC will be determined during the development process. Should any federal permits be required, the issuing agency (e.g. EC-CWS, DFO, etc.) is required to comply with the requirements under Section 67 of *CEAA, 2012*.

1.4.3 Provincial

Because HIFN I.R. #2 is federal Crown land, provincial permits, licenses and authorizations do not apply.

1.4.4 Municipal

Because HIFN I.R. #2 is federal Crown land, municipal approval processes do not apply.

1.5 Proponent Contact and Key Information

The following table provides key HIWEC information.

Table 1. Key Information

Proponent:	The Henvey Inlet Wind Energy Centre (HIWEC) is being developed by Henvey Inlet Wind LP (the "Proponent"). The Proponent is a limited partnership between Nigig Power Corporation, a company wholly owned by the HIFN, and Pattern Renewable Holdings Canada ULC.	
HIWEC Location:	HIFN I.R. #2	
Energy Source:	Wind energy. No supplementary fuel sources will be used to generate electricity.	
Contracted Nameplate Capacity:	300 MW	
Website:	www.henveyinletwind.com/	
Email:	info@henveyinletwind.com	
Telephone:	(705) 857-5265	
Proponent Contact Information:	**Ken Noble** President Nigig Power Corporation ("Nigig") a company wholly owned by the Henvey Inlet First Nation 295 Pickerel River Road Pickerel, ON P0G 1J0	**Kim Sachtleben** Project Director Pattern Renewable Holdings Canada ULC 100 Simcoe Street, Ste. 105 Toronto, ON M5H 3G2
Consultant Contact Information:	**Kyle Hunt** Project Manager AECOM 105 Commerce Valley Drive West Markham, ON L3T 7W3	**Marc Rose** Project Director AECOM 105 Commerce Valley Drive West Markham, ON L3T 7W3

2. Components

The following subsections provide an overview of the various permanent and temporary HIWEC and on-Reserve transmission line components.

2.1 Permanent Components

2.1.1 Wind Turbines and Foundations

The specific model of Wind Turbine Generator (WTG) has not been selected. The WTG model will assist in determining the number of WTGs proposed as part of the HIWEC. All WTGs will be located on HIFN I.R. #2. Specific WTG details will be confirmed as the EA progresses and before relevant impact studies are concluded.

WTGs will likely be an upwind, horizontal axis unit, with three rotor blades (roughly 45 to 60 m in length) and a hub height of up to 120 m (there is a possibility that a larger turbine hub height could be selected, to be confirmed as the EA progresses). The nacelle on each WTG will be located at the top of the tower and will consist of a generator, gearbox, bearings, couplings, and auxiliary equipment. Typically, the nacelle cover is constructed from reinforced fiberglass and the blades are constructed from fiberglass along with epoxy resin. The WTG tower will be constructed from tubular steel or concrete with an approximate diameter of 5 m at the base. The tower contains an internal ladder for maintenance access.

The height of the WTG from the base to the blade tip is dependent on the rotor diameter and tower height, and will be determined at a later stage. External lighting will be required on some of the WTGs and will be installed in accordance with the Transport Canada and NAV CANADA requirements.

Geotechnical assessments will determine the most suitable foundation design for the WTG. Where site specific conditions permit, rock anchors may be used to bolt the WTGs to bedrock. Alternatively, the WTG foundations may be constructed from reinforced concrete. Gravity spread concrete footings are often octagon shaped with an approximate diameter of 18 - 25 m and range from 3 - 6 m deep. The foundation design will include conduits to connect to the collector system and a grounding grid consisting of copper wire and ground rods.

The land area required for each WTG will be dependent upon the final locations of the WTGs relative to access roads, associated infrastructure, and adjacent environmental and terrain features.

During construction and decommissioning, waste material will be generated by, and transported from, the HIWEC. Waste materials may include: equipment packaging, scrap materials as a by-product of construction (e.g., wood, metals, and plastics), fuels, and other lubricants. These materials will be removed from the site for reuse, recycling, and/or disposal at approved off-site facilities.

Waste oils will be generated during operation and maintenance activities. Waste oils may be temporarily stored onsite at designated locations designed and maintained in accordance with applicable legislation. Waste materials will be removed from the site and disposed of or recycled at approved off-site facilities. There will be no on-site disposal of waste.

2.1.2 Access Roads and Crane Pads

Access roads will be constructed to support construction, operations, and decommissioning activities and to provide access to WTGs and other HIWEC infrastructure. Access roads will be designed to minimize the effects on the

environment (e.g., maintaining local drainage patterns and minimizing width of disturbance). Access roads will range from 8 to 15 m wide, with additional travel clearance required to accommodate large cranes and equipment transport during construction and decommissioning. In some locations it is anticipated that rock will needed to be blasted and some areas filled with crushed rock to reduce grades to allow vehicles to bring in required equipment, cranes and turbine components.

Access roads that intersect with Highway 69 will be designed in accordance with Ministry of Transportation ("MTO") standards. Applicable MTO permits will be obtained prior to construction.

Crane pads will be required to construct each WTG. Typical crane pads are approximately 20 x 30 m in size. Final crane pad design will be determined based the specific requirements of the cranes used for the HIWEC. Crane pads will remain in place to support any crane activities during the operations and/or decommissioning phases of the HIWEC.

2.1.3 Meteorological Towers

Permanent meteorological ("Met") towers are required during the operations phase to validate the performance of the WTGs and provide meteorological data to the Independent Electrical System Operator ("IESO") to support their wind forecasting activities and operation of the provincial electrical system. Permanent Met towers will be connected to the O&M building via fibre optic cables (either overhead and/or underground).

Given the rocky nature of the site, Met tower bases will generally be bolted to surface bedrock with guy wires and anchors for lateral support. All permanent Met towers will be installed as per IESO requirements and the Canadian Standards Association ("CSA") protocol for power performance measurements.

2.1.4 Pad-Mounted Transformers and Collector Lines

A pad-mount transformer will be located at the base of each WTG to step-up the voltage of electricity generated to the collector system voltage (e.g., 6000 V to 34.5 kV). Each pad-mount transformer will be affixed to a precast or poured in place concrete pad. Power cables entering and exiting the pad-mount transformer will be installed underground along with a grounding grid consisting of copper wire and grounding rods.

From each pad-mount transformer, above or below ground 34.5 kV collector lines carry electricity from the WTGs to the HIWEC's TS's. Fibre optic communications lines will be installed along with the collector system.

The collector lines may include overhead or below ground sections dependent on site specific conditions, however it is anticipated that the collector system will be primarily above ground due to the rocky nature of the site. Above ground collector lines will be constructed on standard single wooden pole structures. Collector lines will generally follow the access roads to reduce construction area and to minimize potential construction effects. Water crossings for the collector lines will likely be overhead and will be constructed according to the Ministry of Natural Resources and Forestry (MNRF) and DFO requirements.

2.1.5 Transformer Stations

Up to two transformer stations will be constructed on HIFN I.R. #2 to step up the 34.5 kV voltage of the collector lines to up to 500 kV voltage of the transmission line that will transport electricity to the provincial transmission grid.

The HIWEC TS's will consist primarily of power transformers, grounding transformers, 34.5 kV and up to 500 kV circuit breakers and disconnect switches, surge arrestors, instrument transformers, meters, a protection and control building, ancillary equipment, along with associated concrete foundations to mount the equipment.

The HIWEC TS's will be located on a graded area, the size of which will be determined during the detailed HIWEC design phase. The HIWEC TS's will be fenced and secured to prevent unauthorized entry and maintain public safety. All non-current carrying and conducting metal components within the TS area will be connected to a grounding grid installed below finished grade.

2.1.6 On-Reserve Transmission Towers and Foundations

From the northern HIWEC TS, a section of overhead transmission line of up to 500 kV, consisting of 2 x 3 phase circuits, may be constructed on HIFN I.R #2. The transmission line would consist of Aluminum Steel Reinforced Conductor (ACSR). The conductors would be attached to insulators and tower structures that would be approximately 30 to 40 m in height. An Optical Ground Wire (OPGW) would be installed on the transmission line to facilitate communications between the HIWEC and the terminal TS.

The towers would be steel monopole, steel lattice, fiberglass, concrete or wood structures erected on concrete foundations or bolted to bedrock as appropriate for the tower location. On average, the structures would be spaced approximately 200 to 400 m apart except where site specific conditions require shorter or longer tower spans (e.g. significant changes in line direction, large waterbody crossings, or in compliance with design codes and laws).

2.1.7 Operations and Maintenance Building

An O&M building will be constructed to monitor the day-to-day operations of the HIWEC and provide an area for storage of spare parts and maintenance equipment. The O&M building may include offices, a workshop, parts and vehicle storage, a septic system, water well(s), a storage yard, and other ancillary facilities.

Fencing will surround the building for security purposes. Domestic water, if required, will be supplied from a water well. Wastewater will be delivered to a septic system or existing wastewater services if available. A small amount of domestic solid waste (e.g., garbage, recycling, and organics) will be generated by workers during maintenance activities and will be collected and permanently disposed of at a licensed facility. Power to the O&M building will be supplied through the local distribution network with a back-up, liquid fuel-fired, generator.

2.2 Temporary Components

During HIWEC construction, lands will be temporarily used for: construction compounds and laydown yards; construction areas surrounding infrastructure (e.g., WTG staging areas); concrete batch plant(s); crusher(s) and water withdrawal points. Temporary cleared areas will be minimized as much as possible and will be limited to the minimum area required to safely and efficiently support associated construction activities. Following construction, temporary areas will be restored to a safe and clean condition.

2.2.1 Construction Compounds & Laydown Yards

Temporary construction compounds and laydown yards will be required to support general construction activities and for temporary storage of WTG components, electrical equipment (e.g., cable reels and pad-mounted transformers), construction materials, containers, vehicles, equipment, office trailers, concrete batch plant(s), crusher(s) and portable toilets. Typically, these areas are cleared and graded with aggregate fill on a geotextile base. Temporary storage of materials will conform to applicable codes and any fuel storage will ensure adequate secondary containment.

2.2.2 Wind Turbine Staging Areas

A staging area will be cleared around each WTG location to support assembly of the wind turbines, provide space for construction equipment, and for storage of material excavated for foundation construction. Staging areas will be cleared and leveled (with gravel if required) on land adjacent to the base of the WTGs. Geotextile will be used to facilitate removal of gravel following construction activities if required. Wind turbine components will either be delivered the construction compounds for temporary storage or directly to the staging areas for assembly. If required, portable generator sets used for turbine precommissioning may also be located in these areas.

2.2.3 Concrete Batch Plant(s)

One or more temporary concrete batch plant(s) will be located within a construction compound, and will produce concrete required for HIWEC construction. Site preparation for the plant will consist of clearing, grading and leveling activities. Concrete batching activities will occur in parallel with the relevant HIWEC construction activities (i.e. foundation installation).

Aggregate materials required for concrete will be obtained from HIFN Reserve sources and/or other local licensed aggregate sources in the vicinity of the HIFN Reserve.

2.2.4 Water Extraction Points

Water taking will likely be required during construction to control dust along access roads and for batching of concrete. Water extraction points will be identified at surface water sources with sufficient capacity to provide water.

2.2.5 Crusher(s)

One or more temporary crushers will be located within a construction compound, and will crush rock from blasting activities. Blasting will be needed to remove rock for access roads. The crushed rock will then be used to fill in areas needed for access roads. Site preparation for the crusher will consist of clearing, grading and levelling activities. Crushing activities will occur in parallel with the access road construction.

3. Phases and Schedule

The HIWEC will be designed to operate for 30+ years; however, it is not uncommon for well-maintained facilities to extend beyond this design life. It could also be repowered prior to considering any decommissioning activities to extend the design life. Repowering may involve switching/upgrading gearboxes and generators, replacing turbine blades, and upgrading electrical equipment. The specific schedule for decommissioning will be determined at the time it is undertaken.

With the exception of routine and unplanned maintenance, it is expected that operation of the HIWEC will be 24 hours a day, 7 days a week. The following sections outline the anticipated pre-construction, construction, operation and decommissioning phases of the HIWEC.

3.1 Pre-Construction

Activities that may occur during the pre-construction phase include: planning and resource management, pre-construction surveys, geotechnical investigations, permitting and detailed design.

3.2 Construction

The construction phase may consist of the following key activities:

- Delineation of work area and important natural features, and installation of erosion and runoff controls;
- Road right-of-way (ROW) clearing and widening as required;
- Vegetation clearing and site grading;
- Delineation and preparation of temporary work areas and installation of temporary facilities including concrete batch plants (if required) construction staging and laydown;
- On-site delivery of construction vehicles and equipment;
- Installation of WTG foundations;
- Installation of crane pads;
- Erection of WTGs;
- Installation of pad-mounted transformers;
- Installation of above and/or below ground electrical collector lines;
- Construction of collector substations;
- Installation of Met towers;
- Installation of on-Reserve transmission line components;
- Construction of O&M building; and
- Reclamation of temporary construction areas.

3.3 Operations and Maintenance

The operations and maintenance phase may consist of the following key activities:

- Preventative and unplanned maintenance of HIWEC components;
- Meter calibrations;
- Remote operation of the WTGs;
- Maintenance of the collector system and any on-Reserve transmission lines; and
- Access road maintenance.

3.4 Decommissioning

The decommissioning phase may include the following key activities, at the discretion of HIFN:

- Disassembly and removal of WTG infrastructure;
- Removal of pad-mounted transformers;
- Removal of electrical collector lines;
- Disconnection of collector substation;
- Disassembly and removal of collector substation, Met towers, and on-Reserve transmission infrastructure;
- Disassembly and removal of O&M building infrastructure; and
- Reclamation of disturbed areas.

3.5 Waste Generation

The amount of waste generated by the installation, operation and decommissioning of the HIWEC is expected to be minimal, and will include nominal amounts of hazardous residues such as motor oils. Waste materials generated during the construction phase are anticipated to include excess fill, soil, brush, scrap wood, metal, steel, plastic, packaging, grease, oil and domestic waste. Operation and maintenance will result in waste materials such as oil, grease, batteries, air filters and domestic waste. Any waste generated will be disposed of at appropriate waste facilities with an emphasis on recycling materials, whenever possible.

3.6 Toxic/Hazardous Materials

Typically, there is little material that could be classified as toxic or hazardous that is used in constructing and operating a windfarm. Toxic or hazardous materials used during the construction and operations phases include oils, fuel and lubricants that will be used in vehicles and construction/maintenance equipment. Only minor amounts of these materials will be generated and the small quantities will be disposed of at approved off-site waste facilities.

3.7 Sewage

During the construction phase, portable toilets will be used and a licensed contractor will be responsible for waste removal. The O&M building for the HIWEC will include bathroom facilities that will be constructed and serviced in accordance with federal and provincial regulations.

3.8 Stormwater

All site grading that has the potential to impact stormwater runoff will be done in accordance with applicable law and HIFN guidance. Effective stormwater controls will be employed during construction and decommissioning of the HIWEC.

3.9 Water-taking Activities

Installation of wind turbine foundations will likely require dewatering in some locations which has the potential to interrupt the quantity or flow of groundwater to a natural feature (watercourses, wetlands, other features with seasonal inundation). In addition, pumping of groundwater from foundation excavations and subsequent release to a watercourse has the potential to introduce sediment to the watercourse, change watercourse hydrology and water temperature.

To identify potential effects from construction or operation of the HIWEC on groundwater quality, quantity or movement, a hydrogeological assessment will be conducted to:

- Assess potential water-taking requirements during the construction phase; and,
- Assess the potential for wind turbine foundations and any associated buried services to alter or change shallow groundwater flow patterns and the potential impact on local wells, or ecological features (wetlands or streams).

A desktop study will be completed and included in the EA that will examine potential water-taking and effects on local wells or any ecological features.

3.10 Schedule

The schedule below outlines the anticipated timelines for the development of the HIWEC:

Table 2. HIWEC Milestones

HIWEC Milestone	Anticipated Date
Host Public Information Centre #1	February, 2015
Complete Draft EA Reports	June, 2015
Host Public Information Centre #2	July, 2015
Submit Final EA Report to HIFN	August, 2015
EA Decision by HIFN	September 30, 2015
Obtain Pre-Construction Permits	March, 2016
Start Construction	May, 2016
Commence Operations and Maintenance	November, 2017

4. Description of Potential Environmental Effects

The HIFN EA Guidance requirements for the HIWEC prescribe that the assessment of environmental effects in the EA will be based on the identified Valued Components (VCs). VCs are selected with regard to:

- input from the HIFN;
- federal and provincial law and guidance; and
- any other sources considered relevant, such as scientific or academic publications.

A preliminary list of VCs has been provided to HIFN for consideration and will be verified as the EA process progresses. The effects assessment will be conducted on the final selected VCs. This section provides a summary of potential environmental effects that may result from construction, operation and decommissioning including:

- Terrestrial and Aquatic Environment (Natural Heritage and Waterbodies)
- Surface and Ground Water;
- Topography, Geology and Soils;
- Noise;
- Air Quality;
- Current Use of Land and Resources by Aboriginal Peoples; and
- Cultural Heritage and Archaeology.

The following subsections provide a summary of existing conditions for environmental components followed by a preliminary assessment of potential environmental effects, including preliminary mitigation measures, as a result of construction, operations and decommissioning of the HIWEC.

The assessment of potential environmental effects will be refined as the EA evolves. The Final EA Report will include further information about the anticipated environmental effects, proposed mitigation measures and the significance of any residual environmental effects.

4.1 Terrestrial and Aquatic Environment (Natural Heritage and Waterbodies)

4.1.1 Existing Conditions

The study area falls within the Canadian Shield exhibiting shallow soils, with many rocky outcrops forming longitudinal ridges running on a northwest to southeast axis, and is divided roughly in half by Henvey Inlet. There are numerous wetland pockets located between ridges, with upland areas supporting forested areas of poplar and jack pine. The coastline is predominantly low-lying, rocky and generally complex terrain, with long narrow inlets, numerous bays and islands. Marshes containing cattails, wild rice and other emergents are found along the Henvey Inlet shoreline. Swamps containing willow, cedar, spruce and red maple also exist along the shoreline. Extensive bogs, fens and swamps exist further inland. These wetland areas provide habitat to several amphibian and reptile species.

The area contains wildlife that is typical of the Canadian Shield for this region of Ontario, including beaver, black bear, grey wolf, marten, mink, moose, muskrat, raccoon, red fox, river otter, striped skunk, and white-tailed deer. The study area is also home to numerous species at risk.

Numerous natural environment studies have been conducted within the study area for the purpose of documenting existing conditions, informing the HIWEC design and identifying potential environmental effects including:

- Review of available natural heritage information from provincial databases
- Vegetation ecosite classification
- Wetland delineation/ecosite classification
- Rare flora surveys
- Spring raptor migration surveys
- Spring passerine migration surveys
- Spring waterfowl migration surveys
- Breeding bird surveys (point counts, area searches, call play-back (owls, Least bittern), crepuscular breeding birds (whip-poor-will))
- Spring raptor and colonial nesting bird surveys
- Amphibian and reptile surveys (frogs, salamanders, turtles, lizards, and snakes) – general surveys and focussed species at risk (SAR) surveys
- Bat surveys
- Fall passerine migration surveys
- Fall waterfowl migration surveys
- Fall raptor migration surveys
- Aquatic habitat, fisheries and fish habitat assessments
- Mammal and furbearer surveys

Past field studies have been compiled and an analysis is underway to identify additional studies that will need to be undertaken in spring/summer of 2015 to meet the HIFN EA Guidance requirements. The findings of all the relevant studies will be compiled in the final EA Report.

4.1.2 Potential Effects

Table 3 identifies potential effects on natural heritage resources that could occur during the construction, operations and decommissioning phases of the HIWEC. Once the final layout is confirmed, site specific effects will be assessed and incorporated, along with any associated mitigation measures, into the final EA Report.

Table 3. Potential Effects on Natural Heritage Resources

Potential Effects	Potential Mitigation Measures
<u>*Construction and Decommissioning*</u> • Potential effects to fish and fish habitat (as defined in s.2(1) of the *Fisheries Act*), aquatic species (as defined in s.2(1) of the *Species at Risk Act*), terrestrial species (including species at risk), vegetation and/or wetland features from clearing activities (clearing and grubbing), in-water works, construction of HIWEC components, culvert/bridge modification or construction and dewatering discharge to surface waterbodies. • Potential for increased erosion and sedimentation due to altered natural heritage features. <u>*Operations*</u> • Potential increased risk of bird (including Migratory birds as defined in the *Migratory Birds Convention Act*) and bat mortality from operation of turbines located in flight paths.	<u>*Construction, Operations and Decommissioning*</u> • Minimize clearing requirements and overall area of disturbance by minimizing layout footprint. • Complete field studies to identify measures to mitigate effects to wildlife and its habitat during construction, operations and decommissioning. • Adjust construction timing on a site-specific basis according to recommended timing windows for terrestrial and aquatic species.

4.2 Surface and Groundwater

4.2.1 Existing Conditions

Surface drainage is generally directed westward toward Georgian Bay. Overland flow links small ponds, streams, and pools to the Key River to the north or Henvey Inlet to the south. Surface water features are common across the site given the complex topography of the site and its rocky nature, which tends to pool surface water. MOECC water well records indicate that groundwater levels are less than 1 m from surface. Groundwater serves as the primary source of drinking water for residents within the study area and is typically hydraulically connected to surface water features.

Desktop and field studies will be conducted in 2015 of surface and groundwater resources in the vicinity of the study area. Field studies in the spring/summer of 2015 will review general site conditions as well as representative watercourses including permanent and intermittent water features. A desktop-based preliminary hydrogeological assessment will provide a high-level characterization of existing hydrogeological conditions and determine potential environmental effects related to the construction and operation of the HIWEC on groundwater quality, quantity and/or movement. All waterbody features will be evaluated in the final EA Report.

4.2.2 Potential Effects

Table 4 identifies potential effects on surface and groundwater resources that could occur during the construction, operations and decommissioning phases of the HIWEC. Once the final layout is confirmed, site specific effects will be assessed and incorporated, along with any associated mitigation measures, into the final EA Report.

Table 4. Potential Effects on Surface Water and Groundwater

Potential Effects	Potential Mitigation Measures
Construction and Decommissioning • Potential sedimentation, water quality impairment and/or water temperature changes from site runoff, in-water works (open cut or trenchless watercourse crossing), road construction, culvert/bridge modification or construction and dewatering discharge to surface waterbodies. • Potential flooding and/or alteration of drainage from culvert/bridge modification or construction and in-water works. • Potential for hazardous material spills to waterbodies from construction-related activities. *Operations* • Potential for hazardous material spills to waterbodies from maintenance-related activities.	*Construction, Operations and Decommissioning* • Follow best management practices and HIFN EA Guidance requirements to minimize the direct and indirect adverse effects on waterbodies. • Conduct field assessments in accordance with the HIFN EA Guidance requirements to identify the effects of the HIWEC on waterbodies and implement mitigation measures outlined in the report.

4.3 Topography, Geology and Soils

4.3.1 Existing Conditions

A review of existing information shows that the study area consists primarily of crystalline Precambrian bedrock of the Key Harbour Gneiss Association and intermediate to felsic intrusive rocks overlain in areas by organic deposits. Isolated occurrences of coarse-textured glaciolacustrine deposits of sand and gravel are present to the east of the study area. Within the study area, overburden material is very thin and absent in some locations. The exposed bedrock within the region is highly fractured within the upper 10 to 20 m.

4.3.2 Potential Effects

Table 5 identifies potential effects on topography, geology and soils that could occur during the construction, operations and decommissioning phases of the HIWEC. Once the final layout is confirmed, site specific effects will be assessed and incorporated, along with any associated mitigation measures, into the final EA Report.

Table 5. Potential Effects on Topography, Geology and Soils

Potential Effects	Potential Mitigation Measures
Construction and Decommissioning • Removal of rock/borrow for construction of access roads, turbine foundations, and quarry/borrow pit operations • Potential disturbance to soils including erosion and compaction from use of heavy equipment and stockpiling of cleared materials • Potential soil contamination due to minor spills of fuels and fluids from construction-related activities. *Operations* • Potential soil contamination due to minor spills of fuels and fluids from maintenance-related activities.	*Construction, Operations and Decommissioning* • Follow best management practices and HIFN EA Guidance requirements to minimize the direct and indirect adverse effects on soils. • Conduct field assessments in accordance with the HIFN EA Guidance requirements to identify the effects of the HIWEC on the geophysical environment and implement mitigation measures outlined in the EA.

4.4 Noise

4.4.1 Existing Conditions

As mentioned in the above section, the study area is a predominantly undisturbed natural area with anthropogenic noise sources. Highway 69 runs through the eastern portion of HIFN I.R. #2 resulting in some localized noise in that portion of the study area.

4.4.2 Potential Effects

Table 6 identifies the typical noise effects that could occur during the construction, operations and decommissioning phases of the HIWEC. Once the final layout is confirmed, site specific effects will be assessed and incorporated, along with any associated mitigation measures, into the final EA Report. A noise study will be completed in accordance with the Ontario Noise Guidelines for Windfarms (MOECC 2014).

Table 6. Potential Noise Effects

Potential Effects	Potential Mitigation Measures
Construction and Decommissioning • Potential for increased noise levels from the operation of heavy equipment and increased road traffic. *Operations* • Potential for increased noise levels from aerodynamic noise generated by wind turbine blades, and mechanical noise associated with each turbine and from the transformer located at the substation.	*Construction, Operations and Decommissioning* • Develop a HIWEC layout that complies with the HIFN EA Guidance requirements to address potential noise effects. • Keep all equipment associated with the construction, operations and decommissioning of the HIWEC in good repair and ensure it complies with appropriate noise emission standards.

4.5 Air Quality

4.5.1 Existing Conditions

The study area is a predominantly undisturbed natural area with few local sources of air pollution. Highway 69 runs through the eastern portion of HIFN I.R. #2 resulting in some vehicle emissions in the study area.

4.5.2 Potential Effects

Table 7 identifies potential air, odour, and dust effects that could occur during the construction, operations and decommissioning phases of the HIWEC. Once the final layout is confirmed, site specific effects will be assessed and incorporated, along with any associated mitigation measures, into the final EA Report.

Table 7. Potential Air, Odour and Dust Effects

Potential Effects	Potential Mitigation Measures
Construction, Operations, and Decommissioning • Potential for increased emissions of air contaminants, including but not limited to greenhouses gases, as well as increased levels of dust and odour, associated with the use of equipment for the construction, operations and decommissioning of the HIWEC.	*Construction, Operations and Decommissioning* • Follow best management practices and HIFN EA Guidance requirements to minimize effects on the local community. Some potential mitigation measures may include: ▪ Implement a speed limit, which will lead to reduced disturbance of dust on paved and unpaved surfaces. ▪ Apply dust suppressants to access roads and laydown areas which may include the use of water. ▪ Stage land clearing and heavy construction activities to reduce the simultaneous operation of large dust generating equipment. ▪ Create a complaint response program, whereby complaints received from local residents are recorded and investigated.

4.6 Current Use of Land and Resources by Aboriginal Peoples

4.6.1 Existing Conditions

A Traditional Land Use Study (TLUS) was completed on behalf of HIFN in May 2013 which identified both past and current land uses within the study area. Existing land uses within the study area include:

- Residential areas along Bekanon Road;
- Hunting and fishing; and
- Sacred locations.

4.6.2 Potential Effects

Table 8 identifies potential effects on current use of land and resources by Aboriginal peoples that might occur during the construction, operations and decommissioning phases of the HIWEC. Once the final layout is confirmed, site specific effects will be assessed and incorporated, along with any associated mitigation measures, into the final EA Report.

Table 8. Potential Effects on Current Use of Land and Resources by Aboriginal Peoples

Potential Effects	Potential Mitigation Measures
Construction and Decommissioning • Potential disturbance to fish and wildlife affecting HIFN members' ability to hunt and fish in the study area during construction. • Potential disturbance to sacred locations through siting and construction of the HIWEC. • Potential for nuisance effects on residents along Bekanon Road during construction and decommissioning due to increased noise levels, air contaminants, dust and odour, associated with the use of heavy equipment and increased road traffic. *Operations* • Potential disturbance to bird migration during operations due to presence of turbines affecting HIFN member's ability to hunt within the study area. • Potential nuisance effects related to increased noise levels from aerodynamic noise generated by wind turbine blades, and mechanical noise associated with each turbine and from the transformer located at the substation.	• Develop a HIWEC layout that complies with the HIFN EA Guidance requirements to address potential nuisance effects. • Keep all equipment associated with the construction, operations and decommissioning of the HIWEC in good repair and ensure it complies with appropriate noise emission standards. • Follow best management practices and HIFN EA Guidance requirements to minimize effects on the local community. Some potential mitigation measures may include: ▪ Implement a speed limit, which will lead to reduced disturbance of dust on paved and unpaved surfaces. ▪ Apply dust suppressants to access roads and laydown areas which may include the use of water. ▪ Stage land clearing and heavy construction activities to reduce the simultaneous operation of large dust generating equipment. ▪ Create a complaint response program, whereby complaints received from local residents are recorded and investigated. • Prepare the EA report in accordance with the HIFN EA Guidance requirements to assess the effects of construction, operations and decommissioning on natural heritage resources and develop appropriate mitigation • Site HIWEC components based on the results of the TLUS and ongoing engagement with HIFN to ensure sacred locations are not disturbed.

4.7 Current Use of Land and Resources by Non-Aboriginal Peoples

4.7.1 Existing Conditions

The wind generation activities associated with the HIWEC are completely contained within HIFN I.R. #2. Within the study area there are several cottages leased to non-HIFN members and off-reserve cottages along the north shore of the Key River within 550 m of the study area. There are no non-Aboriginal land uses within HIFN I.R. #2.

4.7.2 Potential Effects

Table 9 identifies potential effects on current use of land and resources by non-Aboriginal peoples that might occur during the construction, operations and decommissioning phases of the HIWEC. Once the final layout is confirmed, site specific effects will be assessed and incorporated, along with any associated mitigation measures, into the final EA Report.

Table 9. Potential Effects on Current Use of Land and Resources by Non-Aboriginal Peoples

Potential Effects	Potential Mitigation Measures
Construction and Decommissioning • Potential for nuisance effects on cottagers during construction and decommissioning due to increased noise levels, air contaminants, dust and odour, associated with the use of heavy equipment and increased road traffic.	• Develop a HIWEC layout to address potential nuisance effects that complies with the HIFN Guidance requirements. • Keep all equipment associated with the construction, operations and decommissioning of the HIWEC in good repair and ensure it complies with appropriate noise emission criteria. • Follow best management practices and HIFN EA Guidance requirements to minimize effects on the local cottagers. Some potential mitigation measures may include:

Potential Effects	Potential Mitigation Measures
Operations • Potential nuisance effects related to increased noise levels from aerodynamic noise generated by wind turbine blades, and mechanical noise associated with each turbine and from the transformer located at the substation.	▪ Implement a speed limit, which will lead to reduced disturbance of dust on paved and unpaved surfaces. ▪ Apply dust suppressants to access roads and laydown areas which may include the use of water. ▪ Stage land clearing and heavy construction activities to reduce the simultaneous operation of large dust generating equipment. ▪ Create a complaint response program, whereby complaints received from local residents are recorded and investigated.

4.8 Cultural Heritage and Archaeology

4.8.1 Existing Conditions

In 2008 and 2009, prior to the development of a preliminary HIWEC layout, HIFN members were engaged to identify known areas of cultural importance to the community. Through this engagement process, approximately two-thirds of the study area was identified as culturally important and removed from areas where potential development could occur. The remaining area was used to generate the preliminary layout for the HIWEC. By engaging community members ahead of developing a preliminary HIWEC layout, the potential for affecting important cultural resources was decreased.

The TLUS identified areas of cultural importance to HIFN. The findings of the TLUS will be incorporated into the final design of the HIWEC to ensure any impacts to traditional land use or culturally important areas are avoided or minimized.

Archaeological assessments are being conducted to evaluate the potential for archaeological resources to be present in the study area. A Stage 1 Archaeological Assessment will be completed, which will consist of an initial desktop review and is anticipated to be completed in the winter of 2015. The objective of the Stage 1 assessment is to determine if there is potential to impact known, or previously undocumented, archaeological resources within the study area and to determine if further field investigation is necessary (Stage 2 Archaeological Assessment). This assessment will provide a description of all features of archaeological potential noted for the study area as well as a detailed evaluation of the archaeological potential. The results of the Stage 1 assessment will be summarized in the EA and the potential effects on any known resources will be assessed.

Preliminary results of the Stage 1 Archaeological Assessment have determined that a Stage 2 Archaeological Assessment will need to be conducted in specific areas. It will be conducted during the spring of 2015. This work consists of archaeologists completing “pedestrian surveys” within the study area. Pedestrian surveys involve an archaeological team walking the areas of potential construction disturbance to document any artifacts encountered.

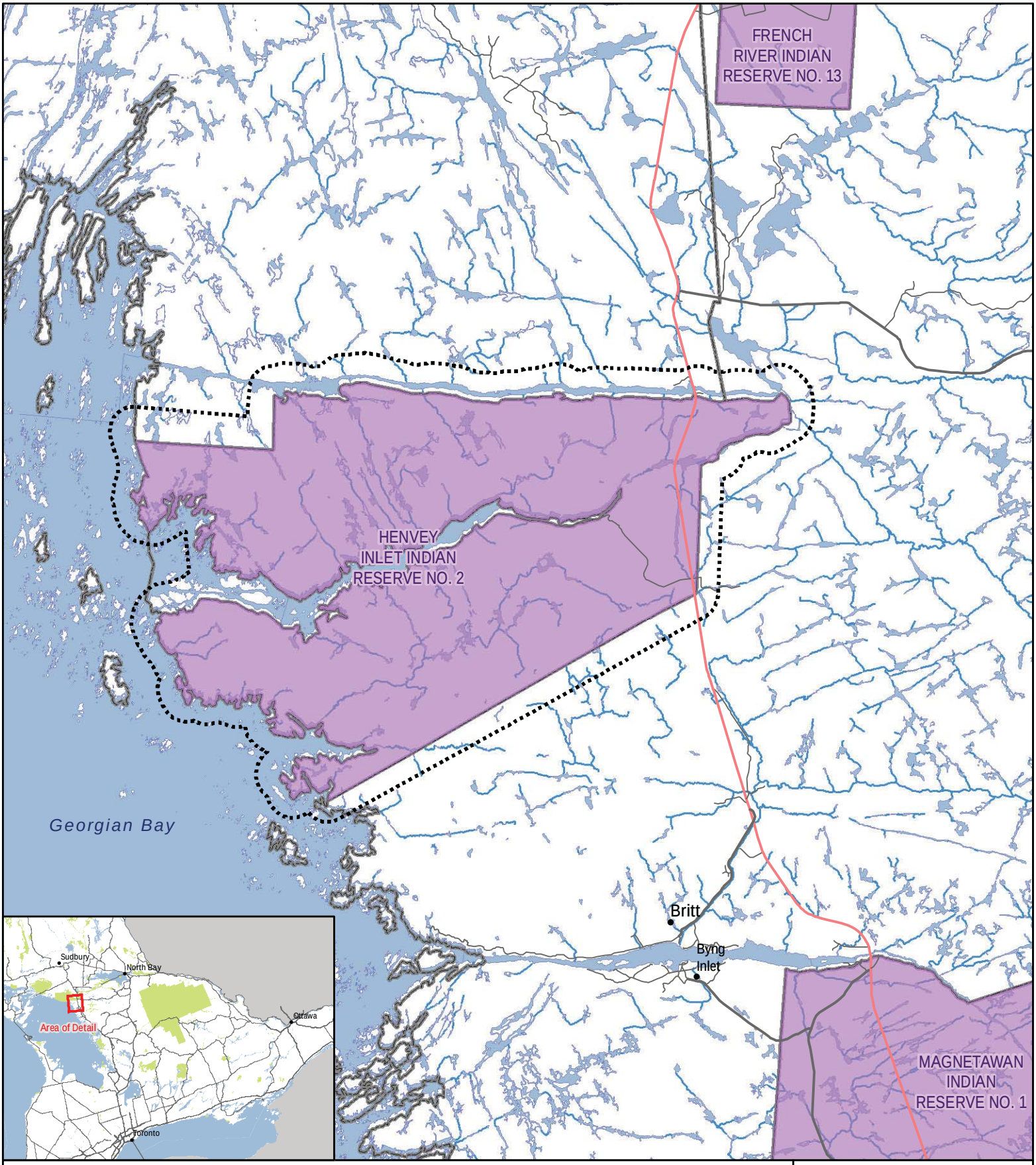
4.8.2 Potential Effects

Table 10 identifies potential effects on cultural heritage and archaeological resources that might occur during the construction, operations and decommissioning phases of the HIWEC. Once the final layout is confirmed, site specific effects will be assessed and incorporated, along with any associated mitigation measures, into the final EA Report.

Table 10. Potential Effects on Cultural Heritage and Archeological Resources

Potential Effects	Potential Mitigation Measures
Construction and Decommissioning • Potential effect on archaeological resources if a Stage 1 Archaeological Assessment indicates that archaeological potential is present within the study area. • Potential visual effect on cultural heritage landscapes from construction activity. *Operation* • Potential visual effect on cultural heritage landscapes from operation of the HIWEC.	*Construction* • Conduct a Stage 3 or Stage 4 Archaeological Assessment, as appropriate, where there is potential for archaeological sites to be affected by construction and, where required, implement any mitigation measures outlined in the report. *Operation* • Implement any mitigation measures for the operations phase outlined in the Archaeological Assessments as well as the Cultural Heritage Assessment Report. *Decommissioning* • Implement any mitigation measures for the decommissioning phase outlined in the Archaeological Assessments as well as the Cultural Heritage Assessment Report.

Figure



Henvey Inlet Wind Energy Centre

Study Area

November 2014	1:120,000	Datum: NAD 83, Zone 17 Source: OBM, LIO
P#:	V#:	

AECOM

Figure 1

Map location: F:\AECOM-Work\60333000 - Henvey Wind\Design\60333000_Study_Area.mxd
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