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NATION RISE WIND FARM

Construction Plan Report

Nation Rise Wind Farm Limited Partnership

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Issue	Date	Reason for Issue	Prepared by	Verified by	Approved by
A	22 March 2017	Draft report	N. O'Neill	G. Constantin	M. Roberge
B	12 April 2017	Updated draft report	N. O'Neill	G. Constantin	M. Roberge
C	13 July 2017	Updated for final REA submission	N. O'Neill	G. Constantin	M. Roberge
D	11 August 2017	Minor updates	N. O'Neill	G. Constantin	M. Roberge
E	29 November 2017	Rectify the number of petroleum wells within 75m of the Project to 0	N. O'Neill	G. Constantin	M. Roberge
F	25 April 2018	Removal of temporary concrete plant on project site	N. O'Neill	G. Constantin	M. Roberge

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List of abbreviations

Abbreviation	Meaning
APRD	Approval and Permitting Requirements Document
CPR	Construction Plan Report
DNV GL	GL Garrad Hassan Canada Inc.
EASR	Environmental Activity and Sector Registry
ESA	*Endangered Species Act*
EPA	Ontario *Environmental Protection Act*
ERP	Emergency Response Plan
HONI	Hydro One Network Inc.
IESO	Independent Electricity System Operator
LRP	Large Renewable Procurement
MNRF	Ministry of Natural Resources and Forestry
MOECC	Ontario Ministry of the Environment and Climate Change
MTO	Ministry of Transportation Ontario
MW	Megawatt
NHA	Natural Heritage Assessment
NIA	Noise Impact Assessment
OESC	Ontario Electrical Safety Code standards
O.Reg.	Ontario Regulation
REA	Renewable Energy Approval
SWH	Significant Wildlife Habitat
SNCA	South Nation Conservation Authority
SESMP	Stormwater, Erosion and Sediment Management Plan
TMP	Traffic Management Plan

1 PREAMBLE

Nation Rise Wind Farm Limited Partnership (the "Proponent") is proposing to develop the Nation Rise Wind Farm (the "Project") which is subject to *Ontario Regulation* (*O. Reg.*) *359/09* (Renewable Energy Approvals (REA) [1] under Part V.0.1 of the Ontario *Environmental Protection Act* (EPA)), as amended. The Proponent was awarded a contract for this Project in March 2016 from the Independent Electricity System Operator (IESO) under the Large Renewable Procurement (LRP), and is seeking a Renewable Energy Approval (REA) from the Ontario Ministry of the Environment and Climate Change (MOECC). The Project will be owned and operated by Nation Rise Wind Farm Limited Partnership, a wholly-owned subsidiary of EDP Renewables Canada Ltd.

This Construction Plan Report (CPR) has been prepared in accordance with Table 1 of *O. Reg. 359/09* and the Technical Guide to Renewable Energy Approvals, Chapter 5: Guidance for preparing the Construction Plan Report [2]. Table 1-1 below presents the corresponding sections within this report that satisfy each CPR requirement, as per these guidelines.

Table 1-1: Construction Plan Report Requirements and Corresponding Sections

Requirement	Section
Details of any construction or installation activities.	4
The location and timing of any construction or installation activities for the duration of the construction or installation.	4.13
Negative environmental effects that may result from construction or installation activities.	11.1
Mitigation measures in respect of negative environmental effects that may occur.	11.1

2 GENERAL INFORMATION

2.1 Project Name and Project Proponent

The name of the Project is Nation Rise Wind Farm (hereafter referred to as "the Project") and Nation Rise Wind Farm Limited Partnership is the Project Proponent (hereafter referred to as the "Proponent").

2.2 Location of Project

The Nation Rise Wind Farm is located in eastern Ontario, within the Township of North Stormont and the United Counties of Stormont, Dundas and Glengarry, Ontario. More specifically, the Project is located in the western portion of North Stormont bounded to the south by the Township of South Stormont and to the west by the boundary of the Township of North Dundas. The north portion of the Project is delimited by the municipality boundaries of Russell and The Nation. Courville Road and MacMillan Road are the east boundaries of the Project. The Project has a total study area of approximately 8,974 hectares.

Project components will be installed predominantly on privately-owned agricultural lots. It is anticipated that the electrical collector lines will be partially sited within public road allowances to connect to the substation that is located in the northern section of the Project study area. There is no proposed transmission line for the Project.

The proposed Project study area is located on private and public lands; the geographic coordinates of the extreme points of the Project study area are presented in Table 2-1 and Figure 2-1. The location of the study area was defined early in the planning process and was selected based on the availability of wind resources, the approximate area required for the proposed Project, and availability of existing infrastructure for connection to the electrical grid. The Project substation is located along the existing L24A 230 kV transmission line just south of County Road 13. Most of the agricultural fields are planted annually with common crops (e.g. corn, soybeans and winter wheat) or are used as pasture lands.

Table 2-1: Geographic coordinates of Project study area

Site Location	Easting	Northing
North	483970	5008222
East	480929	5004950
West	494722	5001252
South	487941	4992782

The Project Location, situated within the broader Project study area, is defined in *O. Reg. 359/09* as "...*a part of land and all or part of any building or structure in, on or over which a person is engaging in or proposes to engage in the project and any air space in which a person is engaging in or proposes to engage in the projec*t". As described therein, the Project Location boundary is the outer limit of where site preparation and construction activities will occur (i.e., *Disturbance Areas* described below) and where permanent infrastructure will be located, including the air space occupied by turbine blades.

Disturbance Areas surrounding various Project components have been identified; such areas correspond to the "Project Location" boundaries on the Site Plan Maps provided within Appendix A. These areas represent zones where temporary disturbance during the construction phase may occur such as temporary Project

component laydown and storage areas. With the exception of the Project components described in Section 3.1, no permanent infrastructure is proposed within these areas. Following construction activities, the land will be returned to pre-construction conditions.

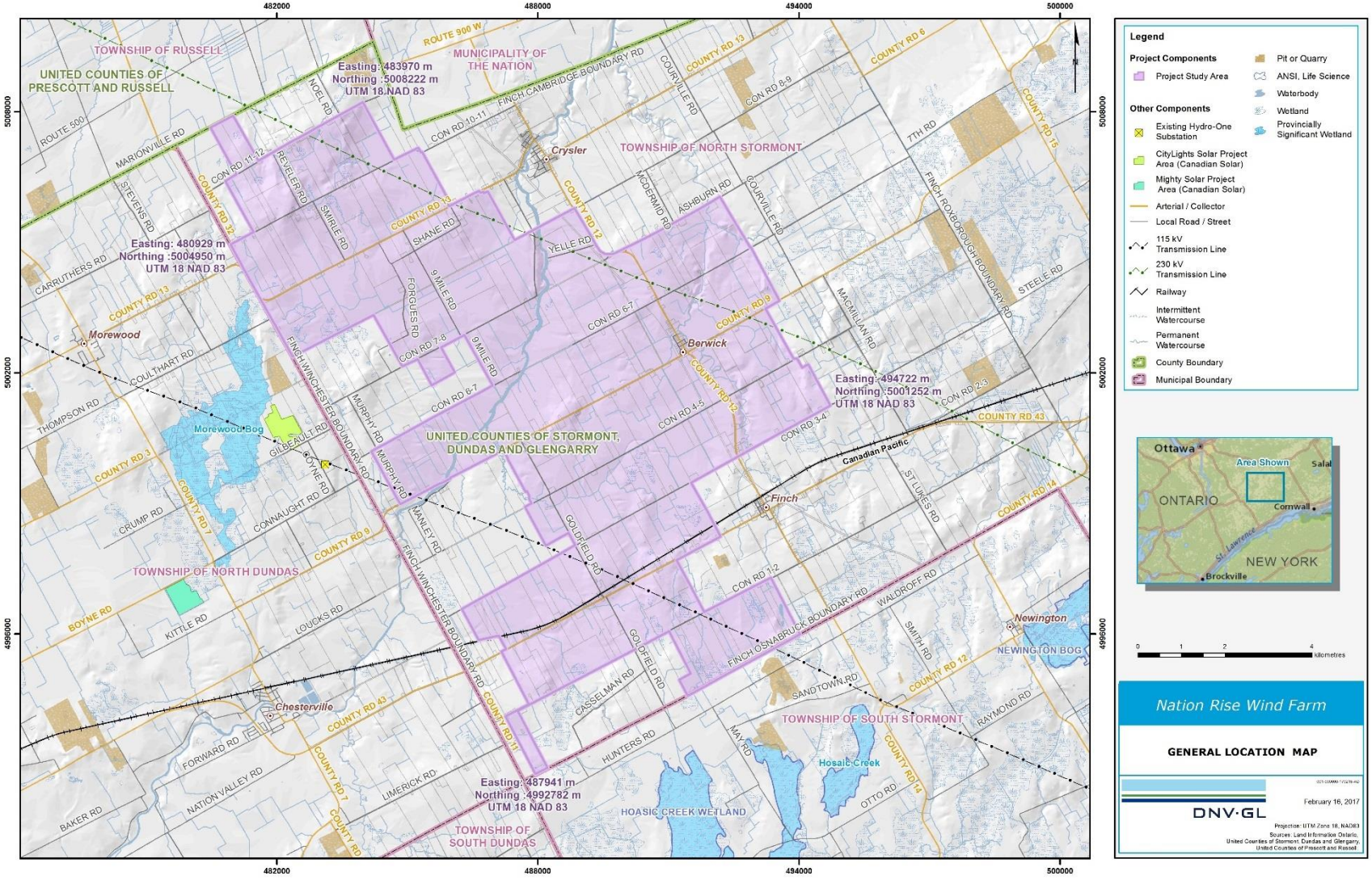


Figure 2-1: General Project study area

2.3 Energy Source, Nameplate Capacity, and Class of Facility

The wind turbine generators of the Project will convert wind energy into electricity to feed into the Ontario IESO transmission system. This Project with a total nameplate capacity of approximately 100 megawatts (MW) is considered to be a Class 4 wind facility. A total of 33 wind turbine locations are being permitted and the Proponent is currently evaluating different wind turbine technologies for the Project. It is likely to be a 3.0 to 3.6 MW turbine and for the purposes of reference, the Vestas V136-3.45 MW turbine model will be considered in the Project REA application, although an acoustically equivalent wind turbine may be chosen.

2.4 Contact Information

2.4.1 Project Proponent

The Project proponent is the Nation Rise Wind Farm Limited Partnership, a renewable energy developer, owner and operator, with an office in Toronto, Ontario. The primary contact for this Project is:

Kenneth Little
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Nation Rise Wind Farm Limited Partnership
110 Spadina Ave., Suite 609,
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Project email: nationrise@edpr.com
Project website: http://nationrisewindfarm.com/

2.4.2 Project Consultant

GL Garrad Hassan Canada Inc. (hereafter referred to as "DNV GL"), a member of the DNV GL Group and part of the DNV GL brand, has been retained to lead the REA for the Project. The Environmental and Permitting Services team of DNV GL has completed mandates throughout Canada, the United States and in many other parts of the world. These mandates include permitting management, permit applications, environmental impact assessment, and various environmental studies for more than 15,000 MW of wind and solar-PV projects.

DNV GL's environmental team is composed of over 20 environmental professionals, including environmental impact specialists, planners, GIS technicians and engineers. DNV GL has no equity stake in any Project. This rule of operation is central to its philosophy, distinguishing it from many other players and underscoring its independence. DNV GL's contact information is as follows:

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3 PROJECT INFORMATION

3.1 Facility Components

The Project will be made up of the following main components:

- Wind turbine generators;
- Meteorological towers;
- Access roads and crane pads;
- Electrical collector lines, substation and switchyard; and
- Construction staging and laydown areas (including temporary staging areas).

3.1.1 Wind Turbines

At the time of this report, the wind turbine technology has not been confirmed; however, it is likely to be a 3.0 to 3.6 MW turbine. For the purposes of reference, the Vestas V136-3.45 MW turbine will be considered. The proposed turbine will be a 3-bladed and horizontal-axis turbine.

The total rotor diameter of the V136 is 136 m, resulting in a swept area of 14,527 m^2. The turbine rotors and nacelles will be mounted on 132 m tubular towers consisting of up to seven steel sections, although other hub heights are being evaluated. Depending on the turbine technology selected, a pad mounted transformer will be installed adjacent to the tower or alternatively, an up-tower transformer may be used.

The complete technical specifications for the selected technology are available within the Wind Turbine Specification Report as part of the complete REA application package.

The acoustic emissions data, including the sound power level and frequency, is available as part of the Noise Impact Assessment (NIA) included as part of the complete REA application packagee.

All Project turbines will meet specifications as directed by Transport Canada.

3.1.2 Permanent Meteorological Tower(s)

Wind speed, wind direction, temperature and humidity will be measured by up to three (3) meteorological towers that will be constructed on small concrete pad(s) and extend to a maximum of up to 140 m in height. The tower type selected will either be lattice or monopole and the tower(s) may be supported by guy wires (monopole only).

While only up to three (3) meteorological towers will be installed, six (6) potential locations are being permitted for the Project; the exact locations will be determined prior to construction. The tower(s) will remain on site for the duration of the Project for wind turbine performance testing.

3.1.3 Access Roads

Transportation of machinery, turbine components and other equipment will use existing municipal roads and private access roads. New access roads will be constructed on private lands to provide access for components and equipment to the private properties during the construction phase and for maintenance activities during operation. Typically access roads will be constructed to be up to 20 m wide during construction. Areas adjacent to the access road within the larger disturbance area may be utilized during the

construction phase in order to accommodate cranes, transportation equipment and other construction activities. After construction, these roads may be reduced in size to approximately 5-6 m in width, to allow access to turbines and associated infrastructure for maintenance and repairs during operations.

3.1.4 Electrical Collector Lines, Substation and Switchyard

Energy generated by the Project will be collected via underground cabling and overhead lines and directed to a substation.

3.1.4.1 Electrical Collector Lines

The power generated at each of the wind turbine generators will be transported through 34.5 kV underground or overhead cables to the Project substation. Electrical collector lines will generally be located on private property as well as some sections along public road allowances to reach the Project substation. Moreover, fiber optic lines will run with the collection system to the Project substation.

Junction boxes will also be installed below or above ground where needed along the collection circuit.

3.1.4.2 Substation and Switchyard

Measuring a total footprint of approximately 4-7 ha, the electrical substation and switchyard for the Project will be adjacent to each other and located on privately owned property. The substation and switchyard may be comprised of, but not limited to the following components:

- Isolation switch(es);
- Circuit breaker(s);
- Step-up power transformer(s);
- Reactive compensation equipment with harmonics filter if required;
- Instrument transformers;
- Grounding (consistent with Ontario Electrical Safety Code standards (OESC));
- Containment system;
- Oil/water separator;
- Revenue metering;
- Communication tower and associated equipment;
- Control building;
- Grounding transformer;
- Neutral grounding reactor;
- Support steel;
- Busbar;
- Sound barrier; and
- Fence.

A secondary containment system will be included to prevent soil contamination in the event of a leak from the main transformer.

Power will be stepped up to a transmission voltage of 230 kV at the substation and will be fed into the existing Hydro One Network Inc. (HONI) transmission system adjacent to the Project substation.

3.1.5 Construction Staging and Laydown Areas

It is anticipated that up to three temporary construction staging areas will be constructed on privately owned lands for the purposes of staging and storing equipment during the construction phase. Activities and facilities within these staging areas will include material storage, equipment refuelling, construction offices, a parking lot, temporary toilet facilities, rinsing and water facilities, and communications equipment. Each temporary staging area will have a footprint of approximately 2-7 ha.

In addition, a temporary area of approximately 3 ha around each wind turbine will be established for the laydown and assembly of the wind turbine components. These temporary areas will be restored following the construction phase to agricultural uses.

4 CONSTRUCTION AND INSTALLATION ACTIVITIES

4.1 Surveying and Geotechnical Study

Surveys will be required for the micro-siting of the turbines, crane pads, access roads, electrical lines and the substation. Crews will drive light trucks to reach sites primarily using existing roads. They will then survey the site on foot or ATV and mark the locations using stakes.

Existing buried infrastructure located on public property will be identified using the Ontario One Call service and buried infrastructure located on private property will be identified by private contractors prior to construction or geotechnical sampling, and updated throughout construction, as required.

Typically, a truck-mounted drill rig visits the sampling locations, drills the borehole and collects geotechnical cores. Lab analysis will be performed on the sample cores collected to obtain geotechnical information. This operation typically uses two operators and requires one to two hours per turbine location.

Any archaeological sites, as identified during the Archaeological Assessment, will be clearly marked in the field. All personnel working on or entering the construction area will be instructed to avoid these areas, if present.

This activity can be summarized as follows:

- Equipment required: At a minimum, trucks, a truck-mounted drill rig, and possibly a track-mounted drill rig. Where vegetation removal is allowed in accordance with the NHA, equipment could require the use of large scale wood chippers and various sizes of wood and tree harvesting machinery. Depending on the size of trees and type of terrain encountered, industrial size chainsaws used by qualified logging professionals could be required as well.
- Materials brought on site: None. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Fuel-handling will be conducted in compliance with the mitigation measures outlined in Section 11.
- Timing: These activities will take place prior to construction and are not season-dependent. This operation typically uses two operators and requires a couple of hours per site.

- Material generated: Some drill cuttings (composed of soil) will be generated and will be disposed of on site by scattering in the vicinity of the borehole. Wood waste generated from vegetation removal will be sorted, mulched and either left on site or removed by qualified logging professionals.

4.2 Access Road, Crane Paths and Crane Pad, Turbine Laydown Area

This activity generally involves the determination of roadway surfacing and road limits, as well as stabilizing of backfill, excavated material, and stripped soil. Where applicable, new road construction and upgrades will use existing material on site, such as excavated material from turbine sites, or off-site clean fill. The required amount and type of gravel will be the responsibility of the contractor and an effort will be made to obtain gravel locally.

The Project may require the clearing and grubbing of vegetation, as applicable, as well as the subsequent excavation of the topsoil layer and addition of a compacted material layer. Construction staff will be required to be familiar with and work within the extent of the approved construction area to avoid damage to wildlife habitat as identified in the Natural Heritage Assessment (NHA) beyond the Project Location, which could include installing protective fencing, marking trees or other means to delineate the construction limits. Damaged trees should be pruned through implementation of proper arboricultural techniques. Any required vegetation removal will be conducted in accordance with the mitigation measures proposed by the NHA and approved by the Ministry of Natural Resources and Forestry (MNRF). The complete NHA is available as part of the complete REA submission.

Access roads during the construction and operation phases of the Project will have the following characteristics:

- During construction, access roads may measure up to 20 m wide and be reduced to 5-6 m wide for operations.
- Access roads are composed of a layer of compacted material to a typical thickness of 300-600 mm plus clean granular material (typically “A” or “B” Gravel).
- Access roads will be designed and constructed with adequate dimensions to ensure that ingress and egress can occur with delivery trucks.

In some cases, off road crane paths are proposed for turbines in close proximity to each other in order to transport the crane without any dismantling.

Each wind turbine area will include a crane pad installed during construction. The crane pad will be constructed of the same material as the access roads and have the following characteristics:

- Crane pads will be constructed at the same time as the road and will be located adjacent to the turbine locations. The crane pads complete within the turbine construction area will typically measure 30 m x 70 m (actual size to be finalized). The topsoil at the crane pad will be removed and approximately 600 mm of clean compacted crushed gravel will be imported, as needed. The excavated topsoil will be re-used on site as feasible.

At each wind turbine generator location, a laydown area of approximately 3 ha will be required. This area will include both laydown and turnaround areas required for the construction of the turbine.

The above mentioned activity can be summarized as follows:

- Equipment required: At a minimum, trucks, graders, and bulldozers. The trucks and graders will be driven to the site and the bulldozers will be transported via flatbed trailers. Where vegetation removal is allowed in accordance with the NHA, equipment could require the use of large scale wood chippers and various sizes of wood and tree harvesting machinery. Depending on the size of trees and type of terrain encountered, industrial size chainsaws used by qualified logging professionals could be required as well.
- Materials brought on site: Granular material for road construction, geotechnical mats, as needed, and culverts. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Fuel-handling will be conducted in compliance with the mitigation measures outlined below in Section 11.
- Timing: This activity will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in early spring or fall, depending on the amount of rainfall. Total estimated time to complete the road improvements, new roads and crane pads would be 2-4 months.
- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner. Wood waste generated from vegetation removal will be sorted, mulched and either left on site or removed by qualified logging professionals.

4.3 Culvert Installations

To the extent possible, Project infrastructure will be sited to minimize the number of water crossings. The Water Assessment and Water Body Reports, which are included as part of the REA application package, describe the water crossings and associated mitigation measures for the Project.

Early consultation with the South Nation Conservation Authority (SNCA) occurred in 2016. Additional conversations will be held in 2017 to confirm permitting requirements for construction. Each culvert will be adequately designed and sized to meet flow conditions and maintain the natural alignment and grade and using streambank protection measures.

This activity can be summarized as follows:

- Equipment required: This construction task would utilize one or more excavator(s), dump truck(s) and compaction equipment.
- Materials brought on site: Steel or plastic culverts and backfill material, where required.
- Timing: These activities will take place during construction and in some cases are subject to timing restrictions associated with in-water works.
- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner.

4.4 Delivery of Equipment

The activity described in this section covers all transportation related to the Project and Project components.

Transportation of turbine parts and sections will be done using trucks or convoys. Heavy-load hauling trucks will be required for each turbine installed, including trucks for each tower section, the nacelle, the hub and

cone, and one for each blade. Trucks or and heavy-load hauling trucks will also be mobilized to bring concrete, cranes, electrical components, and other equipment to the site.

All proposed transportation routes will be discussed with the appropriate municipal engineering departments prior to construction as discussed in Section 9.

This activity can be summarized as follows:

- Equipment required: At a minimum, trucks and heavy-load hauling trucks. The trucks and graders may be driven to the site and the bulldozers may be transported via flatbed trailers. Vegetation removal could require the use of large scale wood chippers and various sizes of wood and tree harvesting machinery. These will be transported via flatbed trailers.
- Materials brought on site: Packaging materials will be brought on site with components delivery. The recyclable material will be separated from the non-recyclable material on site. Both streams of waste will be removed by a licensed sub-contractor. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Fuel-handling will be conducted in compliance with the mitigation measures outlined below in Section 11.
- Timing: This activity will preferentially be completed in late spring, summer, fall or early winter to take advantage of typically drier weather and avoid load restrictions.
- Material generated: Some packing material waste will be generated. The recyclable material will be separated from the non-recyclable material on site. Both streams of waste will be removed by a licensed sub-contractor.

4.5 Wind Turbine Foundations

The final foundation design will depend on the geotechnical results of each proposed turbine location. The two types of foundations that could be used are described in Section 4.5.1 and 4.5.2 below.

4.5.1 Spread Footing Foundations

This activity includes excavation of soil at turbine sites, preparation of the excavation bases which may include placement and compaction of gravel fill, installation of mud mats, installation of reinforcing steel (rebar), and pouring of concrete foundations. For typical spread footing foundations, the anticipated dimensions of the foundation excavation are approximately 20 - 25 m diameter with a depth of approximately 5 m. While blasting could possible be required for spread footing turbine foundation, it is not anticipated to be required for the Project.

4.5.2 Deep Foundations

In instances where soil conditions require deep foundations, case, steel, concrete or aggregate piles will be installed to support the turbine. Once piles have been installed to a suitable depth, a pile cap will be installed and a concrete slab will be poured to allow for the installation of steel rods and pouring of concrete foundations.

For both foundation types described above, concrete foundations will cure for approximately 28 days. Excavated rock will be spread onto the crane pad and adjacent access roads. Concrete will be sourced from plants in proximity to the Project.

Typical construction equipment, on a per-turbine basis, will include:

- Equipment required (per turbine): Flatbed trucks (four to six) for delivery of rebar, turbine mounting assembly and forms, truck mounted crane or rough terrain forklift for unloading and placement of rebar and forms, concrete trucks for delivery of concrete, construction trucks, dozer, loader, excavator, vibratory compactor, aggregate pier, pile driver or pile boring machinery (for deep foundations), and dump trucks to backfill and compact foundation and remove surplus excavated materials.
- Materials brought on site: Rebar and concrete. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Fuel-handling will be conducted in compliance with the mitigation measures outlined below in Section 11.
- Timing: This activity will preferably be completed in late spring, summer, fall or early winter to take advantage of typically drier weather and avoid load restrictions.
- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner. Wood waste generated from vegetation removal will be sorted, mulched and left on site or removed by qualified logging professionals.

While cleaning the concrete mixers (hopper and unloading chute) and accessories for the pouring of the concrete, the washing water will be poured into a small excavation (cleaning basin) within the turbine pad or in the excavation of the wind turbine foundation. The quantity of water and concrete residue from this operation will be insignificant and not anticipated to have any negative environmental effects on the natural heritage features. The water used for this operation will be transported in a tank directly to the cement mixer.

When backfilling the foundation, concrete residues in the cleaning basin will be recovered and deposited near the foundation. Concrete residues will be used for backfilling associated with foundation construction. The concrete residues will be less than 30 cm in size and will not infiltrate into the groundwater. Complete washing of the cement mixing tank will be carried out at the concrete plant, the operation of which will be subject to separate and specific permits. The final decision, however, will be trusted to the contractor on site. Potential water taking that may occur during turbine foundation excavation work is discussed in Section 6 of this report.



Figure 4-1: Preparation of a typical spread footing foundation

4.6 Wind Turbine Assembly

Tower assembly will be decided by the general contractor based on the final wind turbine technology. Blades may be lifted one at a time, or alternatively, a fully assembled rotor with all three blades may be elevated to the nacelle. The latter case would require a larger footprint area at the base of the tower.

Installation of the turbines consists of lifting and bolting typically 6-7 tower sections to the base foundation and then to themselves, lifting and securing the nacelle to the top tower section, and, lastly, either (i) lifting and securing the assembled blades and rotor to the nacelle as a single unit, or (ii) lifting and securing the hub to the nacelle and then lifting the three blades individually and securing them to the hub.

This activity can be summarized as follows:

- Equipment required: At a minimum, service trucks, two cranes, graders, and bulldozers. The trucks and graders may be driven to the site and the cranes and bulldozers may be transported via trailers. Crane crawling between turbine locations may also be done.
- Materials brought on site: Wood, towers, nacelles, blades and hub. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Fuel-handling will be conducted in compliance with the mitigation measures outlined below in Section 11.

- Timing: This will preferentially be completed in summer or early fall to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall, depending on weather conditions. Total assembly time will be typically 2-3 weeks per turbine.
- Material generated: Some packing material waste will be generated. The recyclable material will be separated from the non-recyclable material on site. Both streams of waste will be removed by a licensed sub-contractor. Spent welding rods may also be generated, which will be disposed of as hazardous waste by a licensed contractor. Packing frames for the turbine components will be returned to the turbine vendor. Some wood waste will be generated from the wood used to construct the foundations. This will be removed from the site and recycled.

4.7 Installation of Electrical Network

All electrical installation work will meet or exceed OESC regulations.

Vegetation removal will be required for many of the electrical collector lines. Construction staff will be required to be familiar with the extent of the approved construction area to avoid damage to wildlife habitat beyond the Project Location, which could include installing protective fencing, marking trees or other means to delineate the construction limits. Damaged trees should be pruned through implementation of proper arboricultural techniques. Any required vegetation removal allowed will be conducted in accordance with the mitigation measures proposed by the NHA and approved by the MNRF. The complete NHA is available as part of the complete REA application package.

Underground cabling will be placed through the concrete tower foundations and buried underground or installed overhead, linking the turbines to the Project substation. Easements will be obtained through municipality, county and landowners for the exact locations of the collector lines where applicable.

The underground cabling system, including grounding cable and fiber optic cable, will be buried at a depth of approximately 1 to 1.5 m.

Construction constraints or municipal recommendations for public road allowances may require the electrical collector lines to be installed in conduits or overhead on wooden poles similar to distribution lines in the area.

For installation of junction boxes, construction will require typical equipment for site preparation and grading. There may be some poured-in-place concrete work required. The electrical equipment will be delivered in units, with final assembly on site.

For any HONI work activity, customers may be affected for a short time. In coordination with HONI and IESO, determinations will be made regarding the potential for any outages required for Project integration.

This activity can be summarized as follows:

- Equipment Required: At a minimum, trucks, graders, backhoes, track excavators, cable plow. The trucks and graders may be driven to the site and the bulldozers and other equipment may be transported via flatbed trailers. Where vegetation removal is allowed in accordance with the NHA, equipment could include large scale wood chippers and various sizes of wood and tree harvesting machinery. This will depend on size of trees encountered and terrain. Logging professionals with industrial size chainsaws could be used as well.
- Materials brought on site: Materials may include but are not limited to: electrical collector lines, conduit and junction boxes and general construction components. Poles may be required for

overhead lines but is not anticipated. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Fuel-handling will be conducted in compliance with the mitigation measures outlined below in Section 11.

- Timing: This will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed during any season. The construction timeframe is dependent upon the required length of the lines.
- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner. Wood waste generated from vegetation removal will be sorted then mulched and left on site or removed by qualified logging professionals. Some packing material waste will be generated. The recyclable material will be separated from the non-recyclable material on site. Both streams of waste will be removed by a licensed sub-contractor.

4.8 Construction of the Substation, Switchyard and Interconnection

Components required for the substation, switchyard and interconnection are likely to be prefabricated and transported to site. The components will be supported by either cast-in place concrete foundations/slabs-on-grade or structural steel piers and the entire substation and switchyard area will be graded and overlaid with a stone granular material. The specific make of the associated electrical components will be selected by the Proponent or general contractor during the detailed design phase and based on the Proponent specifications. The components of the substation will also provide a supervisory control and data acquisition (SCADA) system for protection, control and monitoring of the substation and the facility.

The substation and adjacent switchyard will be accessible from a new access road; a small gravelled parking area will be constructed adjacent to the substation to accommodate staff vehicles. To prepare for construction of the substation and parking area, topsoil will be stripped, stockpiled and reused to the extent possible during site landscaping. Excavations will be required for the equipment and building foundations, as well as for placing underground utilities.

Concrete will be necessary for the footings for the control building, component pad and supports. Excavations will be backfilled using granular fill and excavated materials.

Prior to start-up, all systems will be commissioned to verify that they are operating correctly. Acceptance testing will be completed on the components to verify that it meets the engineering specifications. Operating staff will be trained on equipment control and operation.

This activity can be summarized as follows:

- Equipment required: Earthworks equipment, small trenchers, crane(s), forklifts, and concrete trucks and a bulldozer. The trucks and graders may be driven to the site and the bulldozers may be transported via trailers.
- Materials brought on site: Gravel, disconnect switch, circuit breakers, a main power transformer, station service transformer, grounding and metering equipment, insulators, transformer oil, electrical cabling and concrete for bases. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment and transformer oil. Fuel-handling will be conducted in compliance with the mitigation measures outlined below in Section 11.
- Timing: This will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the early spring or fall, depending on weather conditions.
- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner. Wood waste generated from vegetation removal will be sorted

then mulched and left on site or removed by qualified logging professionals. Some packing material waste will be generated. The recyclable material will be separated from the non-recyclable material on site. Both streams of waste will be removed by a licensed sub-contractor.

4.9 Construction Staging and Laydown Areas

During construction of the staging and laydown areas, topsoil will be stripped, stockpiled and reused to the extent possible for site landscaping and reclamation. Gravel will be laid and compacted, the depth of which will vary depending upon site conditions/requirements at the time of construction. Once construction is complete, the areas will be restored to a condition acceptable to the landowner. Any topsoil that is removed and/or stockpiled during construction will be redistributed, as appropriate, during site clean-up and restoration. This will enable the land to be returned to its prior use following the construction of the Project.

- Equipment required: Earthworks equipment, small trenchers, a crane, forklifts, compactors and concrete trucks and a bulldozer. The trucks and graders may be driven to the site and the bulldozers may be transported via trailers.
- Materials brought on site include: Gravel. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment and transformer oil. Fuel-handling will be conducted in compliance with the mitigation measures outlined below in Section 11.
- Timing: This will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall, depending on weather conditions.
- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner.

4.10 Permanent Meteorological Tower(s)

The permanent meteorological tower (s) will be installed using cranes and secured to a concrete foundation or with guy wires tied off to anchors, depending on the tower type that is selected for the Project. Local geotechnical conditions will be considered in the foundation design. Details on tower location(s), height(s) and lighting will be submitted to NAV CANADA and Transport Canada for review and approval prior to installation. Construction is anticipated to take approximately one week and require up to six people.

- Equipment required: Small trenchers, crane and concrete pick-up trucks and a bulldozer. The pick-up trucks will be driven to the site and the bulldozer, crane and trencher will be transported via trailers.
- Materials brought on site include: Gravel and concrete. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment. Fuel-handling will be conducted in compliance with the mitigation measures outlined below in Section 11.
- Timing: This will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the early spring or fall, depending on weather conditions.

- Material generated: Any stock piled material generated from excavation will be handled in an approved and appropriate manner. Some packing material waste may be generated. The recyclable material will be separated from the non-recyclable material on site. Both streams of waste will be removed by a licensed sub-contractor.

Access to the tower will be required throughout the construction and operations phases. The access roads will be designed and constructed as described in Section 4.2 of this report.

4.11 Clean-up and Reclamation of Agricultural Lands

Waste and debris generated during the construction activities will be collected and disposed of at an approved facility. All reasonable efforts will be made to minimize waste generated and to recycle materials including returning packaging material to suppliers for reuse/recycling. During construction, industry best practices for spill prevention will be utilized. In the unlikely event of a minor spill, it will be cleaned up immediately and any impacted soils will be removed from site and disposed of at an approved and appropriate facility. At the conclusion of construction, vehicles and construction equipment will be removed from the site.

High-voltage warning signs will be installed at the transformer substation and elsewhere, as appropriate.

Gravel will be removed from turbine assembly areas, and access roads where no longer needed. The gravel will likely be placed as a top layer on the new project roads, or in parking areas. The disturbed areas will then be de-compacted, and returned to their prior use. Any remaining stockpile material generated from excavation will be handled in an approved and appropriate manner.

4.12 Turbine Commissioning

Turbine commissioning will occur once the wind turbines and substation are fully installed and HONI is ready to accept grid interconnection. The commissioning activities will consist of testing and inspection of electrical, mechanical, and communications systems.

Temporary portable generator sets may be used to electrically commission the turbines prior to connection to the grid. These generators are required for approximately two days per turbine and are supplied with a Certificate of Approval to the generator owners, where required. Following the commissioning phase, the portable generators will be removed from the site.

This activity can be summarized as follows:

- Equipment required: Support trucks which will be driven to the construction site.
- Materials brought on site: Gearbox oil, lubricating grease and temporary portable generators. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment and portable generators, gearbox oil, and lubricants. Fuel-handling will be conducted in compliance with the mitigation measures outlined below in Section 11.
- Timing: This will preferentially be completed in fall or winter.
- Material generated: Some packing material waste will be generated. The recyclable material will be separated from the non-recyclable material on site. Both streams of waste will be removed by a licensed sub-contractor.

4.13 Timing and Operational Plans of Proposed Construction and Installation Activities

A description of the main construction activities is provided in Table 4-1. Commencement of the construction phase is anticipated to occur in the fall of 2018. In any scenario, construction activities leading up to Project operations are anticipated to take approximately up to 16 months. The exact calendar dates of construction activities have not yet been determined and will be based on the timing of the REA approval and the assistance of the selected general contractor.

Tree removal may be required to facilitate construction of the electrical collector lines and access roads. Should clearing be required during the breeding bird season, best management practices will be implemented to reduce risks to migratory birds and their habitats as outlined Section 11.1. Breeding bird surveys will be undertaken during this season prior to construction by a qualified biologist to identify the presence/absence of nesting birds or breeding habitat. If a nest is located, a designated buffer will be marked off within which no construction activity will be allowed while the nest is active. Additional seasonal timing requirements with respect to natural heritage features such as wildlife and wildlife habitat are provided in the NHA.

The planned start of construction for the Project is anticipated to occur in the fall of 2018, with testing and commissioning planned at the end 2019 or early 2020. Construction activities will commence once all necessary permits have been obtained and weather conditions allow. Testing and commissioning will occur over the last few weeks of construction in accordance with MNRF and HONI requirements.

If required, tree planting will occur in 2020 after construction activities are completed.

Table 4-1 outlines the duration of each activity and approximate order of construction activities for the proposed Project.

Table 4-1: Duration of Construction Activities

Activity	Timing of Activity	Estimated Schedule
Surveying	Prior to and during construction – not seasonably dependant	2017-2018-2019
Geotechnical Sampling	Prior to and during construction	2017-2018-2019
Installation of Culverts	Preferably during drier months or winter to avoid timing constraints	Q4 2018-Q1 2019
Land Clearing and Construction of Access Roads	Preferably during drier months – winter months for any tree clearing to avoid timing constraints	Q3 2018-Q2 2019
Construction Laydown Areas	Preferably during drier months	Q3 2018-Q2 2019
Temporary Crane Paths	Preferably during drier months	Q1-Q4 2019
Turbine Site and Crane Pad Construction	Preferably during drier months	Q3 2018-Q3 2019
Electrical Collector Lines	Preferably during drier months	Q2-Q3 2019
Turbine Foundations	Preferably during drier months	Q2-Q3 2019

Activity	Timing of Activity	Estimated Schedule
Delivery of Equipment	Throughout construction phase as needed, and in compliance with Traffic Management Plan	Q4 2018-Q3 2019
Substation, including main power transformer	Preferably during drier months	Q2-Q4 2019
Wind Turbine Assembly and Installation	Preferably during drier months	Q2-Q4 2019
Turbine Commissioning	Late fall or early winter	Q4 2019-Q1 2020
Clean-up and Reclamation	Following turbine construction	Q3 2020
Tree Planting (if required)	Preferably during spring or fall	Q2 2020

5 STORMWATER, EROSION AND SEDIMENT MANAGEMENT PLAN

The installation and construction of man-made infrastructure, such as building a wind farm, can disturb the natural ground cover and increase stormwater runoff and erosion. A conceptual Stormwater, Erosion and Sediment Management Plan (SESMP) has been developed with the aim of reducing impacts of stormwater runoff arising from Project activities and minimizing the erosion and sedimentation of the natural habitats. The conceptual SESMP plan has been appended as Appendix B to this report.

6 TEMPORARY WATER TAKINGS

Localized temporary drawdown of the groundwater table has the potential to temporarily reduce or eliminate groundwater (baseflow) contributions to adjacent water bodies that are located within the zone of influence (ZOI). Although dewatering activities would only occur for the duration of the construction of foundation, collection line and access road or until groundwater levels have receded to a suitable depth, it may generate small changes on groundwater flow immediately adjacent to the foundation location.

Groundwater dewatering is expected to occur as a result of excavation for foundation construction. In the event 50,000 L/day is surpassed, the mitigation measures discussed in Section 11 the are expected to mitigate against potential negative impacts associated with dewatering activities. Additionally, if a volume of 50,000 L/day is surpassed but is less than 400,000 L/day, then registration on the MOECC's Environmental Activity and Sector Registry (EASR) for water taking may be required. It is also possible that that the Project encounters conditions that necessitate additional water takings during turbine foundation dewatering beyond 400,000 L/day. Water taking completed during the construction is subject the REA and does not require a separate PTTW, however, a similar assessment that would be required to obtain a PTTW is provided as part of this REA application. As such, an Hydrogeological Assessment and Effects Assessment was completed for the Project and is presented in Appendix C to this report.

Further information on water takings is outlined in the Water Body and Water Assessment Reports which are included within the Design and Operations Report, as part of the complete REA application package.

7 EMERGENCY RESPONSE PLAN

The Emergency Response Plan (ERP) is described in Section 7 of the Design and Operations Report [3] as part of the complete REA application package. The Project ERP will be implemented throughout all phases of the Project. The purpose of the ERP is to establish and maintain emergency procedures required to effectively respond to accidents and other emergency situations, as well as minimize energy losses.

8 HEALTH AND SAFETY PLAN

Nation Rise Wind Farm Limited Partnership and the general contractor will implement and communicate a Health and Safety Plan during the construction phase of the Project.

9 TRAFFIC MANAGEMENT PLAN

A Traffic Management Plan (TMP) for the Project will be developed in coordination with local municipalities and the Ministry of Transportation Ontario (MTO). The overall purpose of the TMP is to ensure that access to the Project study area will be maintained through all phases of the Project in a safe manner for public users. The TMP will therefore provide the strategies, procedures and mitigation measures necessary to ensure continuous and safe access to the Project study area.

The TMP is meant to be utilised during construction and post-construction activities. It will describe the potential impacts caused by Project-related traffic and will provide methods and mitigation measures designed to reduce these impacts.

10 WASTE MANAGEMENT

Waste generated during the construction phase will be removed by a licensed operator and disposed of at an approved facility. Any lubricants or oils resulting from turbine maintenance will be drummed on site and disposed of in accordance with applicable provincial regulations. The spill prevention protocols followed during construction will continue to be observed throughout the facility operations and maintenance activities. All reasonable efforts will be made to minimize waste generated and to recycle materials including returning packaging material to suppliers for reuse/recycling. The excavated soil removed for installation of infrastructure such as access roads, collector lines, crane pads, substation and foundations will be re-used on site as feasible or disposed of at an approved facility. If contaminated soil is found during excavations activities, the contaminated material will be disposed of in accordance with the current provincial regulations. Sanitary waste generated during the construction phase will be collected via portable toilets and wash stations supplied by a licensed operator.

11 ENVIRONMENTAL EFFECTS MONITORING PLAN

This section presents a summary of potential effects, mitigation measures and residual effects associated with Project-environment interactions during the construction and decommissioning phase of the Project. For the sake of completeness, decommissioning phase effects are discussed and presented here, but can also be found in the Decommissioning Plan Report.

More detailed discussions relating to natural heritage impacts, archaeological and heritage impacts, noise impacts, land use impacts and water body impacts are found in the NHA reports, Archaeological Assessment Reports, Heritage Report, Noise Impact Assessment and Water Body Reports, as part of the complete REA application package.

As requested under REA, potential effects from the construction, installation and operation and of the wind farm must be assessed while considering applicable mitigation and compensation measures. The Project *residual effects* (i.e. after considering mitigation/compensation measures) will be determined and their significance will be based on the level of concern and likelihood of each effect.

Depending on the outcome of the effects assessment, follow-up and/or monitoring programs could be proposed in order to further investigate the potential effects, or verify the significance of the effect following Project commissioning.

11.1 Construction & Decommissioning

Table 11-1: Potential Negative Effects and Mitigation Measures – Construction & Decommissioning

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Cultural Heritage (Protected Properties, Archaeological and Heritage Resources)				
Disturbance or displacement of archaeological resources by any ground disturbance activity.	Avoid disturbance/loss of archaeological sites.	Conduct Archaeological Assessment and apply recommended avoidance measures and other measures from licensed archaeologist or MTCS to project design. Details of the Archaeological Assessment can be found in the reports on this subject as part of the complete REA application package.	The Archaeological Assessment was undertaken as per MTCS guidelines and it is anticipated that the Project will receive confirmation from the MTCS. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Immediate notification of the Archaeologist and the MTCS in the event archaeological resources are found. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Construction vibrations to sensitive cultural heritage buildings	Minimize direct impacts from vibrations.	Apply avoidance and minimization measures recommended in the Cultural Heritage Assessment. Details of the Cultural Heritage Assessment can be found in the reports on this subject as part of the complete REA application package.	The Cultural Heritage Assessment was undertaken as per MTCS guidelines and it is anticipated that the Project will receive confirmation from the MTCS. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: No monitoring required. Contingency: If the avoidance and minimization measures cannot be implemented, a more detailed vibration analysis will be undertaken by a qualified engineer.
Natural Heritage				

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Disturbance of local wildlife (Amphibian Breeding Habitat)	Avoid disturbance and displacement of breeding amphibians.	Avoid construction and decommissioning activities in amphibian breeding habitat within the peak amphibian breeding season (April 15 – June 15), in areas identified as being vulnerable to direct impact.	The NHA was undertaken per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Environmental supervision will be implemented during construction as part of a routine inspection program to ensure adherence to the mitigation measures. Contingency: Schedule construction or decommissioning activities during daylight hours, wherever practicable, to limit potential impacts from light, noise, or vehicle interactions.
Disturbance of local wildlife (Bat Maternity Colony)	Avoid disturbance, displacement and mortality of roosting bats.	Avoid construction and decommissioning activities during the critical roosting period (June 1 – June 30) within designated areas that have been identified as being vulnerable to direct impact.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Environmental supervision will be implemented during construction as part of a routine inspection program to ensure adherence to the mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Disturbance of local wildlife (Butterfly Species of Conservation Concern Habitats)	Avoid disturbance and displacement of butterflies within significant butterfly species of conservation concern habitats.	Avoid construction and decommissioning activities during the flight season (May 1 – September 30) within significant butterfly species of conservation concern habitats that have been identified as being vulnerable to direct impact. Schedule construction and decommissioning activities to occur during daylight hours, wherever practicable, to avoid excessive noise and/or light disturbances to butterflies. If construction and decommissioning activities must occur outside of daylight hours, spotlights will be	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Environmental supervision will be implemented during construction as part of a routine inspection program to ensure adherence to the mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		directed downward and/or away from the features.		
Disturbance of local wildlife (Bird Species of Conservation Concern Habitats – Crepuscular Species)	Avoid disturbance, displacement and mortality to birds that might be breeding within these habitats and that are active at night.	Avoid construction and decommissioning activities (including rock blasting, trenching, sawing, or hammering) during the breeding bird period (May 1 – July 31), within designated areas that have been identified as being vulnerable to direct impact. Where possible, schedule construction and decommissioning activities to occur during daylight hours to increase visibility and to avoid light pollution effects during the night. If an active bird nest is identified in the location where natural vegetation clearing is proposed, the area will be protected and no construction activities will occur until the young have fledged or until the nest is no longer active, as confirmed by a qualified biologist. If confirmed significant, where regular Project maintenance activities within 30 m of significant habitats must occur outside of daylight hours, spotlights will be directed downwards and/or away from the identified habitats.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: If construction or decommissioning vegetation removal activities must occur during the breeding bird period (May 1 – July 31), nest searches will be conducted in affected areas. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Disturbance of local wildlife (Bird Species of Conservation Concern Habitats – Diurnal Species)	Avoid disturbance, displacement and mortality to birds that might be breeding within these habitats and that are inactive at night.	Avoid construction and decommissioning activities (including rock blasting, trenching, sawing, or hammering) during the breeding bird period (May 1 – July 31) within designated areas that have been identified as being vulnerable to direct impact Schedule construction and decommissioning activities to occur during daylight hours to avoid excessive noise and/or light disturbances to wildlife, wherever practicable. If an active bird nest is identified in the location where natural vegetation clearing is proposed, the area will be protected and no	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: If construction or decommissioning vegetation removal activities must occur during the breeding bird period (May 1 – July 31), a biologist will conduct nest searches in affected areas. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		construction activities will occur until the young have fledged or until the nest is no longer active, as confirmed by a qualified biologist. If construction or decommissioning activities must occur outside of daylight hours, spotlights will be directed downward and/or away from the features.		
Disturbance of local wildlife (Generalized significant wildlife habitats (SWHs))	Avoid disturbance, displacement or mortality to species that might be breeding within these habitats and that are not accustomed to nighttime disturbances.	Avoid construction and decommissioning activities (including Rock blasting, trenching, sawing, or hammering) during the breeding bird period (May 1 – July 31) within designated areas that have been identified as being vulnerable to direct impact. Schedule construction and decommissioning activities to occur during daylight hours to avoid excessive noise and/or light disturbances to wildlife, wherever practicable. If an active bird nest is identified in the location where natural vegetation clearing is proposed, the area will be protected and no construction activities will occur until the young have fledged or until the nest is no longer active, as confirmed by a qualified biologist. If construction or decommissioning activities must occur outside of daylight hours, spotlights will be directed downward and/or away from the features.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: If construction or decommissioning vegetation removal activities must occur during the breeding bird period (May 1 – July 31), a biologist will conduct nest searches in affected areas. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Disturbance of local wildlife (Open Country Bird Breeding Habitat)	Avoid disturbance, displacement, and mortality to birds that might be breeding within these habitats, and that are relatively inactive at night and not	Avoid construction and decommissioning activities (including Rock blasting, trenching, sawing, or hammering) during the breeding bird period (May 1– July 31) within designated areas that have been identified as being vulnerable to direct impact.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF.	Monitoring: If construction or decommissioning vegetation removal activities must occur during the breeding bird period (May 1 – July 31), a biologist will conduct nest searches in affected areas. Contingency:

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
	accustomed to nighttime disturbances.	Schedule construction and decommissioning activities to occur during daylight hours to avoid excessive noise and/or light disturbances to wildlife, wherever practicable. If an active bird nest is identified in the location where natural vegetation clearing is proposed, the area will be protected and no construction activities will occur until the young have fledged or until the nest is no longer active, as confirmed by a qualified biologist. If construction or decommissioning activities must occur outside of daylight hours, spotlights will be directed downward and/or away from the features.	The likelihood and magnitude of this residual effect is considered non-significant.	The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Disturbance of local wildlife (Reptile Hibernacula)	Avoid disturbance to hibernating snakes.	Schedule construction and decommissioning activities (including rock blasting, trenching, sawing, or hammering) to occur outside of the snake hibernation period (September 15 – May 15) within designated areas that have been identified as being vulnerable to direct impact. If construction and decommissioning activities must occur during the snake hibernation period September 15 – May 15), install exclusionary fencing around the perimeter of the construction disturbance area within areas identified as being vulnerable to direct impact. If a snake is identified where construction or decommissioning activities are proposed, including during habitat removal, the area will be protected and no construction activities will occur until the snake can be relocated by a qualified biologist. If a snake is identified outside of the snake hibernation period (September 15 – May 15) where rock blasting, trenching, sawing, or hammering is proposed, including during	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: If construction or decommissioning activities must occur during the snake hibernation season (September 15 – May 15), a biologist will search the area of disturbance immediately prior to habitat removal. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		habitat removal, the area will be protected and no construction activities will occur until the snake can be relocated by a qualified biologist.		
Disturbance of local wildlife (Turtle Wintering Area)	Avoid disturbance to overwintering turtles.	Schedule construction and decommissioning activities to occur outside of the turtle overwintering period (October 15 – April 15) within designated areas that have been identified as being vulnerable to direct impact. If construction and decommissioning activities must occur during the turtle overwintering season (October 15 – April 15, exclusionary fencing will be installed around the perimeter of the construction disturbance area to avoid directly impacting turtles within designated areas that have been identified as being vulnerable to direct impact. If a turtle is identified where construction or decommissioning activities are proposed, the area will be protected and no construction activities will occur until the turtle can be relocated by a qualified biologist.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: If construction or decommissioning activities must occur during the turtle overwintering season (October 15th – April 15th), a biologist will search the area of disturbance immediately prior to activities occurring. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Disturbance of local wildlife (Waterfowl Stopover and Staging Area)	Avoid disturbance, displacement, and mortality to staging waterfowl.	Schedule construction and decommissioning activities in Waterfowl Stopover and Staging Areas to occur outside of the most important period for staging waterfowl (March 1 – April 30) within designated areas that have been identified as being vulnerable to direct impact. Schedule construction or decommissioning activities during daylight hours, wherever practicable, to limit potential impacts from light, noise, or vehicle interactions. If construction or decommissioning activities must occur during the peak waterfowl staging season, a biologist will confirm that	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Regular biological monitoring of staging waterfowl will be conducted if construction or decommissioning activities will occur during the peak stopover and staging season. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		birds are not impacted by construction or decommissioning activities.		
Damage or removal of vegetation within significant woodlands, SWHs, and Generalized SWHs.	To avoid accidental damage or removal of vegetation within significant woodlands, SWHs, and Generalized SWHs.	Clearly delineate work areas using erosion fencing or other suitable barrier to avoid accidental damage or removal of retained species. The on-site environmental monitor may also consider substituting other demarcating types for fencing, such as staking and flagging, where it is determined that there is no apparent risk to significant woodlands, SWHs, or Generalized SWHs. This could include instances where the significant features are at a higher elevation than the occurring construction activity. The on-site environmental monitor will be a contractor with experience providing environmental recommendations on a large-scale construction site. Erect erosion fencing, or other barrier, to correspond to the disturbance area limits. Place the erosion fencing, or other barrier, as far away as practicable from the feature or SWH, and no closer than the dripline. Locate all directional drill entry and exit pits a sufficient distance from the edge of significant natural features, SWHs, and Generalized SWHs, to maintain a vertical depth of at least 1.5m at all times below the natural feature to protect the critical root zone.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Undertake weekly monitoring of the dripline when construction or decommissioning activities are anticipated within 10m of a significant woodland, SWH, or Generalized SWH. Undertake regular monitoring of the dripline to ensure the work area is clearly delineated and dripline boundaries are respected when construction is anticipated to occur within 10-30m of significant woodlands, SWHs, or Generalized SWHs, at a minimum frequency of once per month. Contingency: Prune any tree limbs or roots that are accidentally damaged by construction activities using proper arboricultural techniques. Accidental damage to trees, or unexpected vegetation removal, may require replanting of similar, native species, depending on the extent of damage incurred.
Damage to significant woodlands/wetlands, SWHs, and Generalized SWHs.	Avoid impacts to natural vegetation species in significant woodlands/wetlands, SWHs, and Generalized SWHs.	Avoid the use of herbicides (Project related activities only).	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF.	Monitoring: No monitoring required. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
			The likelihood and magnitude of this residual effect is considered non-significant.	recommended mitigation measure is applied.
Damage to retained trees within significant woodlands and wildlife habitats.	Avoid impacts to retained trees within significant woodlands and wildlife habitats.	Prune any tree limbs or roots that are accidentally damaged by construction activities using proper arboricultural techniques.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Depending on the amount of vegetation removal proposed and proximity to trees to be retained outside of public road allowances, the on-site environmental monitor may recommend monitoring by a Certified Arborist during tree removal or pruning. Contingency: Accidental damage to trees, or unexpected vegetation removal, may require replanting of similar, native species, depending on the extent of damage incurred.
Erosion and sedimentation in significant natural features, SWHs, and Generalized SWHs.	Avoid impacts associated with erosion and sedimentation in significant natural features, SWHs, and Generalized SWHs.	The general contractor will develop and implement an erosion and sediment control (ESC) plan. Install, monitor, and maintain ESC measures (i.e. erosion fencing) around the Project Location for the duration of the construction or decommissioning activities, as identified within the ESC plan. Erect erosion fencing, or other barrier, to correspond to the construction disturbance area limits. Place the erosion fencing, or other barrier, as far away as practicable from the identified feature(s), and no closer than the dripline. Depending on site-specific conditions, such as steep topography and the presence of direct, or regular, surface water flow, the on-site environmental monitor may consider	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Undertake regular monitoring and routine inspections to ensure proper installation of erosion control measures are in place. Monitor sediment and erosion control measures, such as erosion fencing, and check dams daily in areas where work is taking place and prior to and after any storm events. Monitor sediment and erosion control measures weekly in areas where active construction is not occurring until the construction phase is complete. Contingency: If deficiencies in sediment and erosion control measures are noted, the on-site environmental monitor will notify the

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		substituting other styles of fencing, when appropriate. Utilize erosion blankets, silt fencing, straw bales, etc. for construction. Store any stockpiled material more than 30m from significant natural features, SWHs, and Generalized SWHs throughout the construction and decommissioning phases. Schedule grading to avoid times of high run-off volumes, wherever practicable. Re-vegetate areas adjacent to the feature(s) as soon as practicable after construction activities are complete. Collect directional drill cuttings as they are generated and placed in a soil bin or bag for off-site disposal. Restore and revegetate directional drill entry/exit pits to pre-construction conditions as soon as practicable after construction.		general contractor and the Proponent and recommend remedial actions. Silt fencing, or other applicable sediment and erosion control measures, that is not working properly will be corrected. If sedimentation and erosion control measures fail or/and degradation of the natural feature occurs, appropriate contingency measures will be implemented, which may include re-establishing mitigation measures, habitat remediation, and/or seeding of permanently damaged areas, depending on the extent of degradation incurred.
Fugitive dust within significant natural features, SWHs, and Generalized SWHs.	Avoid fugitive dust within significant natural features, SWHs, and Generalized SWHs.	On-site speed limits will be clearly posted, applied, and followed by construction staff. Apply dust suppressants to unpaved areas when necessary to suppress dust, as determined by the on-site environmental monitor and the general contractor. Application frequency will vary, but will be determined by site specific weather conditions, including recent precipitation, temperatures, and wind speeds. Re-vegetate cleared areas as soon as reasonably practicable after construction activities are complete. Install wind fences where determined to be necessary by the on-site environmental monitor. Installation of these fences will depend on site-specific conditions, including wind speeds,	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Undertake regular monitoring and routine inspections to ensure proper fugitive dust control measures are in place. Monitor dust control measures at least once per week in areas where work is taking place. Monitor dust control measures at least once per month in areas where active construction is not occurring until the construction phase is complete. Contingency: If fugitive dust is noted, the on-site environmental monitor will notify the general contractor and the Proponent

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		topography, land cover, and the extent of surrounding natural wind breaks.		and recommend remedial actions, if necessary. If fugitive dust control measures fail and degradation of the natural feature occurs, appropriate contingency measures will be implemented, which may include re-establishing mitigation measures, habitat remediation, and/or seeding of permanently damaged areas depending on the extent of degradation incurred.
Fugitive dust and debris from blasting within significant natural features and SWHs.	Avoid fugitive dust and debris within significant natural features and SWHs.	Use blasting mats to contain debris and spray the surface of the blast site with water to reduce the amount of dust emitted.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Monitor to ensure proper fugitive dust and debris control measures for blasting are in place and functioning as intended for all blasting activities. Contingency: If fugitive dust or debris is noted, the on-site environmental monitor will notify the general contractor and the Proponent and recommend remedial actions, if necessary. If fugitive dust and debris control measures fail and degradation of the natural feature occurs, appropriate contingency measures will be implemented, which may include re-establishing mitigation measures, habitat remediation, and/or seeding of permanently damaged areas depending on the extent of degradation incurred.
Loss of vegetation communities and significant wetlands.	Avoid direct impacts on vegetation communities and protect significant wetlands. Avoid impacts to hydrological connectivity of significant wetlands.	Clearly delineate work areas using erosion fencing, or other barrier, to minimize potential impacts to hydrological connectivity from loss of riparian vegetation. Depending on site-specific conditions, such as steep topography and the presence of	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF.	Monitoring: Undertake regular monitoring of the identified features to ensure the work area is clearly delineated for the duration of the construction and decommissioning phases of the Project. Undertake monitoring at least once per

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		direct, or regular, surface water flow, the on-site environmental monitor may consider substituting other styles of fencing for erosion fencing, when appropriate. Where the temporary construction area is proposed to be within 5m of, but not overlapping by a method other than directional drilling, a wetland (excluding along existing municipal roads), design any permanent infrastructure (i.e., access roads) to be 5m from the wetland edge and plant native vegetation in the 5m buffer between the infrastructure and wetland edge as soon as reasonably practicable after construction. Re-vegetate cleared areas as soon as reasonably practicable after construction activities are complete.	The likelihood and magnitude of this residual effect is considered non-significant.	week when activities are occurring within 10m of a feature. Undertake regular monitoring of the feature to ensure the work area is clearly delineated and respected when construction is anticipated to occur within 10-30m of the features, at a minimum frequency of once per month. Depending on the season and site-specific conditions, such as topography, surface water flow patterns, and the presence or absence of vegetative buffers, monitoring frequency will be increased at the discretion of the on-site environmental monitor. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Change in groundwater discharge affecting significant wetlands and Generalized SWHs.	To minimize direct impacts on significant wetlands and Generalized SWHs.	Monitor rate of water pumping and timing to meet the requirement of less than 50,000L per day, or otherwise obtain an appropriate permit from the Ministry of the Environment and Climate Change (MOECC) that addresses increased water taking, if more than 50,000L per day is required. Restrict taking of groundwater and surface water during extreme low flow time periods. Control quantity and quality of stormwater discharge using best management practices, and avoid direct discharge into wetlands, SWHs, and Generalized SWHs.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Undertake regular monitoring of significant wetlands and Generalized SWHs to ensure the work area is clearly delineated within 10m of construction activities for the duration of the construction and decommissioning phases of the Project. This monitoring will be conducted at least once per week when construction is anticipated within 10m of a significant wetland or Generalized SWH. Undertake regular monitoring of significant wetlands and Generalized SWHs to ensure the work area is clearly delineated and respected when construction is anticipated to occur within 10-30m of the features, at least once per month. Depending on the

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
				season and site-specific conditions, such as topography, surface water flow patterns, and the presence or absence of vegetative buffers, monitoring frequency will be increased at the discretion of the on-site environmental monitor. Contingency: If impacts to groundwater discharge occur as a result of construction activities, the MNRF will be notified of appropriate contingency measures that will be implemented.
Changes on infiltration affecting significant wetlands and Generalized SWHs.	To minimize impacts to infiltration within significant wetlands and Generalized SWHs.	Minimize the use of impervious surfaces where practicable, such as utilizing and contouring permeable surface material (e.g. aggregate) to increase infiltration, and reduce surface water run-off.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Environmental supervision will be implemented during construction as part of a routine inspection program to ensure adherence to the prescribed mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Changes in soil moisture regime affecting vegetation species composition within significant natural features, SWHs, and Generalized SWHs.	Avoid changes in soil moisture regime and vegetation species composition within significant natural features, SWHs, and Generalized SWHs.	Minimize the use of impervious surfaces where practicable, such as utilizing and contouring permeable surface material (e.g. aggregate) to increase infiltration, and reduce surface water run-off. Minimize paved surfaces and design roads to promote infiltration.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Environmental supervision will be implemented during construction as part of a routine inspection program to ensure adherence to the prescribed mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Change in water quality affecting significant wetlands	Avoid changes to water quality (i.e. associated with increased turbidity) within significant wetlands.	Clearly delineate work areas using erosion fencing, or other barrier, to minimize potential impacts to water quality which may result from accidental loss of riparian vegetation. Apply dust suppressants to unpaved areas when necessary to suppress dust, as determined by the on-site environmental monitor and general contractor. Application frequency will vary, but will be determined by site specific weather conditions, including recent precipitation, temperatures, and wind speeds. On-site speed limits will be clearly posted, applied, and followed by construction staff. Re-vegetate areas adjacent to significant wetlands as soon as practicable after construction activities are complete. Install wind fences where determined to be necessary by the on-site environmental monitor. Installation of these fences will depend on site-specific conditions, including wind speeds, topography, land cover, and the extent of surrounding natural wind breaks. No use of herbicides (Project related activities only) within significant wetlands.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Undertake regular monitoring of significant wetlands to ensure the work area is clearly delineated within 10m of construction activities for the duration of the construction and decommissioning phases of the Project. This monitoring will be conducted at a minimum frequency of once per week when construction is anticipated within 10m of a significant wetland. Undertake regular monitoring of significant wetlands to ensure the work area is clearly delineated and respected when construction is anticipated to occur within 10-30m of significant wetlands, at a minimum frequency of once per month. Depending on the season and site-specific conditions, such as topography, surface water flow patterns, and the presence or absence of vegetative buffers, monitoring frequency will be increased at the discretion of the on-site environmental monitor. Contingency: If reduced water quality (i.e. increased turbidity) as a result of construction activities is observed, the MNRF will be notified of appropriate contingency measures that will be implemented.
Invasive Seed Transfer	Avoid impacts to sensitive habitats and maintain vegetated buffers, including riparian zones.	Clearly delineate work areas using erosion fencing, or other barrier, to minimize seed transfer into suitable habitat. Regularly clean vehicles and equipment. Vehicle use will occur primarily on access roads and in agricultural habitats, where	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF.	Monitoring: Environmental supervision will be implemented during construction as part of a routine inspection program to ensure adherence to the prescribed mitigation measures. Contingency:

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		invasive and non-native vegetation species are less likely to be concentrated.	The likelihood and magnitude of this residual effect is considered non-significant.	The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Soil compaction within significant natural features, SHWs, and Generalized SWHs.	Avoid soil compaction within significant natural features, SHWs, and Generalized SWHs.	Minimize vehicle traffic on exposed soils during site clearing, grubbing, grading and topsoil removal. Clearly delineate the dripline and root zone of all trees within 10m of construction activities with erosion fencing or other barrier.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Environmental supervision will be implemented during construction as part of a routine inspection program to ensure adherence to the prescribed mitigation measures. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Contamination of significant natural features, SWHs, and Generalized SWHs.	Avoid spills within 30m of significant natural features, SWHs, and Generalized SWHs.	The general contractor will develop and implement a spill response plan and train staff on appropriate procedures. The general contractor will develop a "frac-out" contingency plan and train staff on appropriate procedures during the construction phase. Keep emergency spill kits on site. Keep contact information for the MOECC Spills Action Centre in a designated area on-site. Dispose of waste material by authorized and approved off-site vendors. Store hazardous materials in designated areas. Locate all vehicle refuelling or washing, as well as the storage of chemical and construction equipment more than 30m from applicable features.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Regular environmental monitoring will occur at least once every two weeks during the construction and decommissioning phase to ensure vehicle refuelling and storage of chemicals is occurring more than 30m from the applicable features. An on-site environmental monitor will be present when active directional drilling is occurring within 30m of significant natural features, SWHs, and Generalized SWHs. Contingency: If "frac-out" occurs, immediately implement "frac-out" contingency plan. In the event of a spill notify the MOECC Spills Action Centre, immediately stop work, and ensure all efforts are made to

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
				completely remediate affected areas, especially prior to rain events. If a spill occurs within a significant natural feature, SWH, or Generalized SWH, the on-site environmental monitor will be notified and a follow-up site inspection will be conducted to document extent of degradation of the features, if any. If degradation of significant natural features, SWHs, or Generalized SWHs occurs as a result of the spill, appropriate contingency measures will be implemented, which may include re-establishing mitigation measures, habitat remediation, and/or seeding of permanently damaged areas depending on the extent of degradation incurred.
Disturbance, displacement or mortality of wildlife.	Avoid disturbance, displacement, and mortality to wildlife.	On-site speed limits will be clearly posted, applied, and followed by construction staff throughout the construction and decommissioning phases. Re-vegetate disturbed areas of significant wildlife habitats as soon as practicable after construction activities are complete using an appropriate plant species composition for the habitat type.	The NHA was undertaken as per MNRF guidelines and this Project is anticipated to receive approval from the MNRF. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Environmental supervision will be implemented during construction as part of a routine inspection program to ensure adherence to the prescribed mitigation measures. Contingency: Wildlife fatalities due to construction and decommissioning activities will be documented and may be used to determine if any additional mitigation measures should be implemented.
Water bodies				
Damage to water body banks or removal of riparian vegetation adjacent to water bodies	Avoid accidental damage to water body banks or removal of riparian vegetation adjacent to water bodies.	Clearly delineate work area using erosion fencing or other suitable barrier to avoid accidental damage to water body banks, including damage to or removal of riparian vegetation.	The Water Body Assessment was undertaken as per MOECC guidelines and this Project is expected to receive	Monitoring: Undertake regular monitoring of the work delineation fencing at a minimum frequency of once per month to ensure damage has not occurred to the fencing, and boundaries are clearly delineated

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		Place the erosion fencing, or other barrier, as far away as practical from the water body, and where possible from the average annual high-water mark of the water body (e.g. bankfull level or top of bank). The on-site environmental monitor may also consider substituting other demarcating types for fencing, such as staking and flagging, where it is determined that there is no apparent risk to water bodies. Locate directional drilling entry/exit shafts, if applicable, beyond the top of bank at a distance that allows the minimum depth, as established by geotechnical studies, to be reached while below the water body. This distance should be agreed upon with regulatory agencies. Operate construction equipment (i.e., cranes, back hoes, etc.) in a manner that minimizes disturbance to the water body banks and stays outside of the water body and bank area. Implement riparian planting after construction, as soon as weather permits, to stabilize water body banks and encourage rapid revegetation of disturbed soils. This will aid in preventing bank collapse and erosion, which, in turn, will minimize sedimentation and protect sensitive ecological functions that occur in water bodies. If insufficient time is available in the growing season to establish vegetative cover, overwintering treatments should be applied, such as erosion control blankets, fibre matting, rock (i.e. large, clean angular rocks) reinforcement/armouring or equivalent to contain the site over the winter period. Plant vegetative cover as soon as is feasible in the next growing	confirmation from the MOECC. The likelihood and magnitude of this residual effect is considered non-significant.	and respected when construction is occurring within 30m of a water body. Contingency: Accidental damage to riparian vegetation may require replanting of similar, native species, depending on the extent of damage incurred.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		season, followed by maintenance and inspection.		
Contamination of water bodies.	Avoid spills and contamination of water bodies.	Clearly delineate the work area and place the fencing/barriers, as far away as practical from the average annual high-water mark of the water body (e.g. bankfull level or top of bank). Locate directional drilling entry/exit shafts, if applicable, beyond the top of bank, at a distance that allows the minimum depth, as established by geotechnical studies, to be reached while below the water body. This distance should be agreed upon with regulatory agencies. Develop a Spill Response Plan (SRP) prior to commencement of construction and train staff on appropriate procedures. Keep emergency spill kits on site at all times. Keep contact information for the MOECC (Ministry of the Environment and Climate Change) Spills Action Centre in a designated area on-site. Dispose of waste material by authorized and approved off-site vendors. Store fuel, hazardous materials, and other construction related materials securely away from any drainage features. Locate all vehicle refuelling or washing stations a minimum of 30m from any water body. Develop and implement an emergency "frac-out" response plan including steps to contain, monitor and clean-up in response to the event.	The Water Body Assessment was undertaken as per MOECC guidelines and this Project is expected to receive confirmation from the MOECC. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Environmental monitoring will occur at least once every two weeks during the construction and decommissioning phase to ensure vehicle refuelling and storage of chemicals is occurring more than 30m from any water body. An on-site environmental monitor will be present when active directional drilling is occurring within 30m of a water body to identify "frac-out", if it occurs. Contingency: In the event of a spill, notify the MOECC Spills Action Centre, immediately stop work, and ensure all efforts are made to completely remediate affected areas, especially prior to rain events. If a spill occurs within a water body, the on-site environmental monitor will be notified and a follow-up site inspection will be conducted to document extent of degradation of the features, if any. If degradation of a water body occurs because of the spill, appropriate contingency measures will be implemented, which may include re-establishing mitigation measures, habitat remediation, and/or seeding of banks and/or riparian areas in permanently damaged areas, depending on the extent of degradation incurred. If "frac-out" occurs, immediately implement "frac-out" contingency plan, identified
Changes in infiltration and	Avoid changes to infiltration and changes	Minimize the use of impervious surfaces, where practical, such as utilizing and	The Water Body Assessment was	Monitoring:

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
surface drainage patterns and run-off.	in surface drainage patterns and run-off.	contouring permeable surface material (e.g. aggregate) to increase infiltration, and reduce surface water run-off. Minimize vehicle traffic on exposed soils during site clearing, grubbing, grading and topsoil removal. Confine construction equipment to designated areas, controlled vehicle access routes to minimize the potential for soil compaction. Clearly delineate work areas using erosion fencing or other suitable barrier to avoid accidental damage to water body banks or removal of riparian vegetation. Place the erosion fencing, or other barrier, as far away as practical from the water body from the average annual high-water mark of the water body (e.g. bankfull level or top of bank). Avoid construction during high volume rain events and substantial snow melt/thaw events, where possible, to avoid risk of soil compaction.	undertaken as per MOECC guidelines and this Project is expected to receive confirmation from the MOECC. The likelihood and magnitude of this residual effect is considered non-significant.	Undertake regular monitoring of the work delineation fencing at a minimum frequency of once per month to ensure damage has not occurred to the fencing, and boundaries are clearly delineated and respected when construction is occurring within 30m of a water body. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.
Erosion and sedimentation of waterbodies.	Avoid erosion and sedimentation of water bodies.	Develop and implement an erosion and sediment control (ESC) plan. Install, monitor, and maintain ESC measures (e.g. erosion fencing, blankets, straw bales, etc.) around the Project Location for the duration of the construction or decommissioning activities, as identified within the ESC plan. Clearly delineate work areas using erosion fencing or other suitable barrier to avoid accidental damage or removal of retained species. Erect erosion fencing, or other barrier, to correspond to the construction disturbance area limits and as far away as practical from	The Water Body Assessment was undertaken as per MOECC guidelines and this Project is expected to receive confirmation from the MOECC. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Undertake regular monitoring and routine inspections to ensure proper installation of erosion control measures are in place. Monitor sediment and erosion control measures, such as erosion fencing, and check dams daily in areas where work is taking place, and prior to, during, and after any storm events or significant snowmelt events. During extended rain or snowmelt periods, monitor erosion control measures daily.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		the average annual high-water mark of the water body (e.g. bankfull level or top of bank). Depending on site-specific conditions, such as steep topography and the presence of direct, or regular, surface water flow, the on-site environmental monitor may consider substituting other styles of fencing, when appropriate. Utilize erosion blankets, silt fencing, straw bales, etc., for construction. Store any stockpiled material more than 30m from the average annual high-water mark of water bodies (e.g. bankfull level for intermittent/permanent watercourses). Schedule grading to avoid times of high run-off volumes, wherever possible. Where possible, time clearing, grubbing, and grading activities to avoid seasonally wet periods (i.e., spring and fall). Collect directional drill cuttings as they are generated and placed in a soil bin or bag for off-site disposal. Re-vegetate areas adjacent to water bodies, and directional drill entry/exit pits, to pre-construction conditions as soon as practical after construction activities are complete. Schedule construction activities within 30m of a water body to occur within the low flow period of the late summer months, where possible, to avoid or minimize impacts. Remove construction debris from the site and stabilize stockpiles, where practical, to prevent debris from entering the nearby water bodies. Develop a Flood Response Plan (FRP) to deal with on-site flooding in order to		Monitor sediment and erosion control measures monthly in areas where active construction is not occurring until the construction phase is complete. Undertake regular monitoring of the work delineation fencing at a minimum frequency of once per month to ensure damage has not occurred to the fencing, and boundaries are clearly delineated and respected when construction is occurring within 30m of a water body. Contingency: If deficiencies in sediment and erosion control measures are noted, the on-site environmental monitor will notify the general contractor and the Proponent and recommend remedial actions. Silt fencing, or other applicable sediment and erosion control measures, that is not working properly will be corrected. If sedimentation and erosion control measures fail and/or degradation of a water body occurs, appropriate contingency measures will be implemented, which may include re-establishing mitigation measures, water body clean out and/or bank stabilization, depending on the extent of degradation incurred. Repair or replace any damaged fencing immediately

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		mitigate any possible effects to the aquatic environment.		
Groundwater discharge	Avoid direct impacts to water quantity/quality in water bodies.	Monitor rate of water pumping and timing to meet the requirement of less than 50,000 L per day per turbine location, and contact the local Ministry of the Environment and Climate Change (MOECC) if a total of more than 400,000 L per day situation arises. Restrict taking of groundwater and surface water during extreme low flow time periods. Control quantity and quality of stormwater discharge using best management practices, and avoid direct discharge into wetlands, SWHs, and Generalized SWHs. When discharging to a water body follow the ESC Plan and implement best management practices to avoid degradation of the water body. Adhere to MOECC water quality Policy 1 and 2 Standards for discharging to water bodies. If discharging to a municipal storm sewer system, ensure that water quality meets the objectives of the municipal storm sewer by-law prior to discharge. Obtain water quality and turbidity samples prior to discharge to ensure the quality is suitable for discharge and will not result in an impact to the receiving water body. If the water quality is not suitable for discharge, identify alternate disposal locations or undertake all practical measures to upgrade water quality prior to discharge.	The Water Body Assessment was undertaken as per MOECC guidelines and this Project is expected to receive confirmation from the MOECC. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Monitor water levels of adjacent water body during groundwater dewatering activities to determine if activities are resulting in alteration of water levels within the water body. Monitor endpoint of dewatering discharge for water quality and erosion (if dewatering). Conduct daily erosion checks during discharge of water. Monitor water quality (turbidity) prior to discharge, once a week thereafter or as described by agencies. Contingency: If impacts to groundwater discharge occur because of construction activities, the MNRF will be notified of appropriate contingency measures that will be implemented.
Water Quality Impairment	Avoid degradation of surface water quality and changes in water quantity related to construction activities.	Clearly delineate the work area using erosion fencing, or other barrier, to minimize potential impacts to water quality which may result from loss of riparian vegetation.	The Water Body Assessment was undertaken as per MOECC guidelines and this Project is expected to receive	Monitoring: Follow the ESC Plan monitoring commitments.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		Place erosion fencing as far as practical from the average annual high-water mark of the water body (e.g. bankfull level or top of bank). Erect erosion fencing, or other barrier, to correspond to the disturbance area limits. Place the erosion fencing, or other barrier, as far away as practical from the average annual high-water mark of the water body (e.g. bankfull level or top of bank). Locate directional drilling entry/exit shafts, if applicable, beyond the top of bank, at a distance that allows the minimum depth, as established by geotechnical studies, to be reached while below the water body. This distance should be agreed upon with regulatory agencies. On site speed limits will be clearly posted, applied, and followed by construction staff to reduce fugitive dust. Apply dust suppressants to unpaved areas when necessary to suppress dust, as determined by the on-site environmental monitor and general contractor. Application frequency will vary, but will be determined by site-specific weather conditions, including recent precipitation, temperatures, and wind speeds. Install wind fences, where determined to be necessary by the on-site environmental monitor. Installation of these fences will depend on site-specific conditions, including wind speeds, topography, land cover, and the extent of surrounding natural wind breaks. Restrict taking of groundwater and surface water during extreme low flow time periods. If in-water work is required (e.g. for culvert installation and/or electrical collector line	confirmation from the MOECC. The likelihood and magnitude of this residual effect is considered non-significant.	Monitor surface water quality for turbidity prior to conducting in-water work or surface water dewatering. Conduct pre-construction sampling immediately prior to beginning work and during the same season in which work will be conducted, where possible. Locate pre-construction monitoring stations upstream of construction area to provide baseline conditions. Monitor surface water turbidity during the construction activity at a frequency relative to the proximity to the water body, duration of the construction activity, and type of construction activity, as determined by the Environmental Construction Monitor. Obtain water quality and turbidity samples prior to discharge to ensure the quality is suitable for discharge and will not result in an impact to the receiving water body. When discharging to a different drainage feature, monitor general water quality parameters as required to meet MOECC Policy 1 and 2 standards for discharging to a water body. In addition, measure turbidity levels of water to be discharged. If the water quality is not suitable for discharge, identify alternate disposal locations or undertake all practical measures to upgrade water quality prior to discharge. Monitor water levels immediately before and during dewatering activities, to determine if dewatering activities are resulting in alteration of water levels within the water body.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		installation), adhere to required timing windows confirmed through consultation with regulatory agencies, including the MNRF. If required, perform in-water work in dry conditions, where possible. Where work in dry conditions is not possible, short-term, isolated surface water dewatering is required. Prior to dewatering, isolate the work area with the installation of a temporary water containment structure. The structure should form an impermeable enclosure that will prevent debris and sediment from escaping into the surrounding water body. Construct a bypass channel to maintain flow through the water body and prevent back flooding, which could ultimately overtop the water containment structure. Obtain applicable permits, where required, for surface water dewatering. Prior to surface water dewatering, obtain a Fish Salvage Plan, prepared by a qualified fisheries biologist and relocate fish to a suitable location, preferably downstream and away from the construction area, as detailed in the plan. Install an in-stream sediment filter (e.g. Siltsoxx or Filtersoxx) downstream of water containment structure. Dewatering discharge should be dissipated (i.e. splash pads, sand bags, hay bales, etc.) and may require splitting discharge to more than one location. Dewatering discharge rates should be evaluated to ensure they do not result in erosion and sedimentation to the receiving water body.		Monitor the discharge location for dewatering activities to ensure erosion and sedimentation of the receiving water body is not occurring. Monitor erosion and sediment control systems frequently for effectiveness at a minimum of once daily during discharge activities. Repair deficient controls in a timely manner and using an adaptive management approach when deemed appropriate. Monitor bypass channel (if applicable) daily to ensure it is functioning appropriately and water is flowing through as designed. Undertake regular monitoring of the work delineation fencing at a minimum frequency of once per month to ensure damage has not occurred to the fencing, and boundaries are clearly delineated and respected when construction is occurring within 30m of a water body. Contingency: If reduced water quality (i.e. increased turbidity) because of construction activities is observed, the MNRF will be notified of appropriate contingency measures that will be implemented. Repair or replace any damaged fencing immediately upon discovering an issue.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
		If discharging to a municipal storm sewer system, ensure that water quality meets the objectives of the municipal storm sewer by-law prior to discharge. Re-vegetate disturbed area adjacent to water bodies as soon as practical after construction activities are complete.		
Alterations to water bodies.	To minimize fugitive dust deposits within water bodies.	On-site speed limits will be clearly posted, applied, and followed by construction staff. Apply dust suppressants to unpaved areas when necessary to suppress dust, as determined by the on-site environmental monitor and the general contractor. Application frequency will vary, but will be determined by site specific weather conditions, including recent precipitation, temperatures, and wind speeds. Re-vegetate cleared areas as soon as reasonably practical after construction activities are complete. Install wind fences where determined to be necessary by the on-site environmental monitor. Installation of these fences will depend on site-specific conditions, including wind speeds, topography, land cover, and the extent of surrounding natural wind breaks.	The Water Body Assessment was undertaken as per MOECC guidelines and this Project is expected to receive confirmation from the MOECC. The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Undertake regular monitoring and routine inspections to ensure proper fugitive dust control measures are in place. Monitor dust control measures at a minimum weekly frequency in areas where work is taking place. Monitor dust control measures at a minimum monthly frequency in areas where active construction is not occurring until the construction phase is complete. Contingency: If fugitive dust is noted, the on-site environmental monitor will notify the general contractor and the Proponent and recommend remedial actions, if necessary. If fugitive dust control measures fail and degradation of water bodies occurs, appropriate contingency measures will be implemented, which may include re-establishing mitigation measures, and/or seeding of permanently damaged areas depending on the extent
Emissions to Air, including Odour and Dust				

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Reduction in air quality due to CAC emissions and dust.	Minimize deterioration of air quality.	Ensure proper operation and maintenance of vehicles and machinery to limit noise, CAC emissions and leaks. Use water or water-based dust suppressant to control dust on unpaved roads. Implement speed limits on unpaved roads. Minimize vehicular traffic on exposed soils and stabilize high traffic areas with clean gravel surface layer or other suitable cover material. Minimize mud tracking by construction vehicles along access routes and areas outside of the immediate work site, and ensuring timely clean-up of any tracked mud, dirt and debris. Cover or otherwise contain loose construction materials that have potential to release airborne particulates during transport, installation or removal. Restore temporary construction road areas as soon as possible to minimize the duration of soil exposure.	The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in emergency Response and Communications Plan Section 7 of the Design and Operations Report (DOR)) Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Noise				
Increase in noise levels in Project study area.	Minimize noise increases for inhabited areas.	Ensure proper operation and maintenance of vehicles and machinery to limit noise, CAC emissions and leaks. Implement speed limits on unpaved roads. Construction equipment will be kept in good condition and will not exceed the noise emissions as specified in MOECC publication NPC-115 and any applicable municipal by-laws	The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in emergency Response and Communications Plan Section 7 of the DOR) Contingency: Faulty equipment resulting in increased noise levels are to be repaired in a timely fashion.

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
Local and Provincial Interests, Land, Use and Infrastructure				
Increased congestion due to increase in truck traffic and short-term lane closures on local roads during delivery of Project components.	Minimize disturbance to local community and achieve zero human safety incident.	Notify the community in advance of construction delivery schedules and installing signage to notify road users of construction activity. If required by municipal authorities develop a traffic management plan for the construction phase and submit to the Municipalities prior to construction and communicate truck routes.	The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan Section 7 of the DOR) Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation/compensation measures and best management practices are applied.
Damage to local infrastructure.	Minimize damage to local infrastructure.	Adhere to the best practices regarding the operation of construction equipment and delivery of construction materials. If required by municipal authorities, undertake roads condition surveys prior to construction and post-construction.	The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: Track all complaints and conduct follow-up monitoring (see Complaints Resolution Process in Emergency Response and Communications Plan Section 7 of the DOR) Contingency: If required by local authorities, return damaged infrastructure to original condition (or better) where appropriate.
Areas Protected under Provincial Plans and Policies				
N/A	-	-	-	-
Public Health and Safety				
Effects on public health and safety during construction have been described above under Emissions to air,	-	-	-	-

Potential Effect	Performance Objective	Mitigation/Compensation Measures	Residual Effect	Monitoring / Contingency
including Odour and Dust, Noise and Local and Provincial Interests Land Use and Infrastructure.				
Other Resources				
Potential impacts to petroleum wells or facilities (APRD)	No negative effects on petroleum resources or the renewable energy project	As part of the APRD and as per the MNR "Template for Renewable Energy Projects: Setbacks from Petroleum Operations" a search was conducted using the OGSR database to identify any petroleum wells or facilities within 75 m of project infrastructure. The search concluded that there are no active petroleum wells or facilities existing within 75 m of the Project Location. Notice of the findings was reported to the local District MNR office.	The likelihood and magnitude of this residual effect is considered non-significant.	Monitoring: The magnitude of the residual effect is considered non-significant therefore no monitoring is required provided the recommended mitigation measures and best management practices are applied. Contingency: The magnitude of the residual effect is considered non-significant therefore no contingency is required provided the recommended mitigation measures and best management practices are applied.

12 REFERENCES

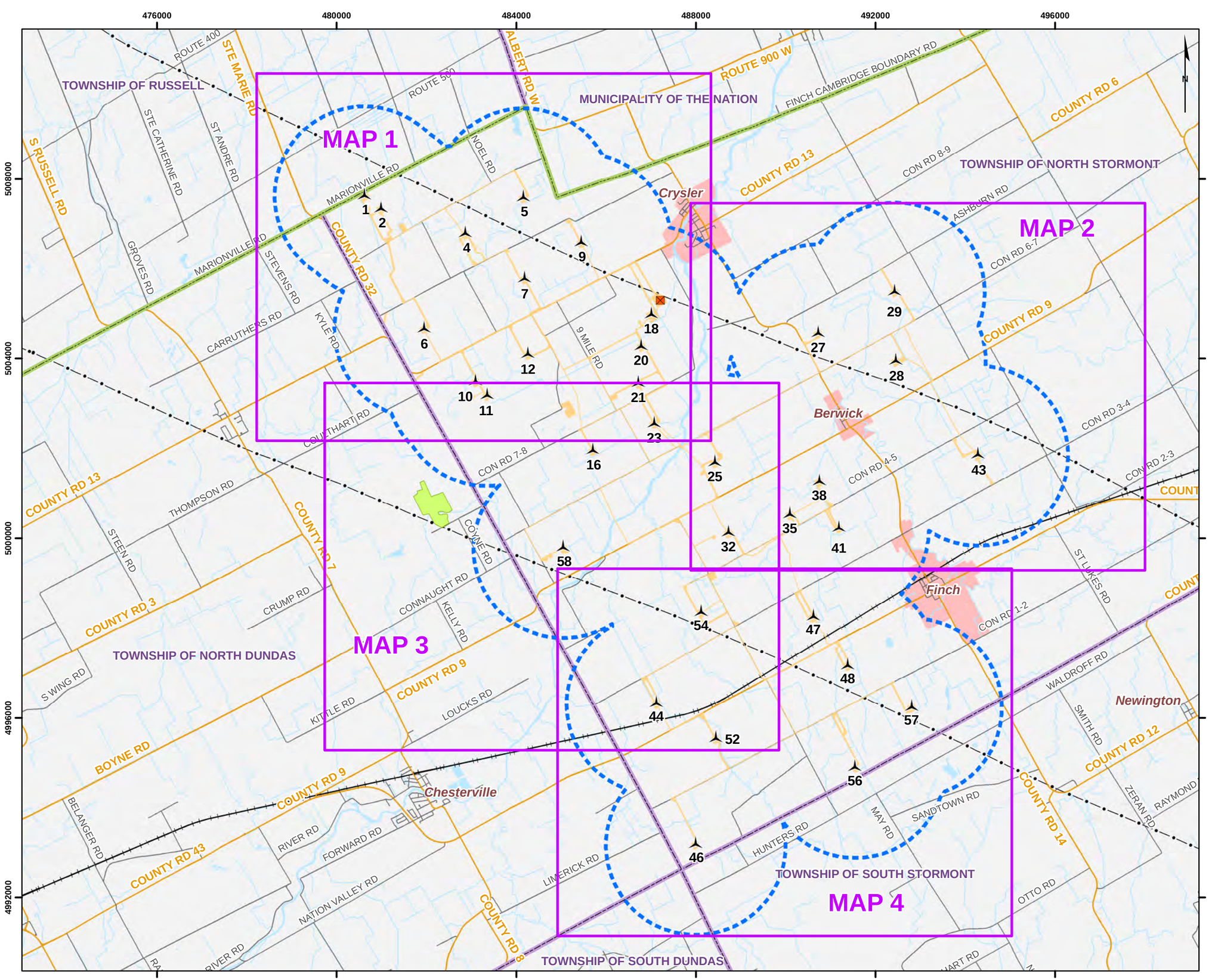
[1] Ontario Regulation 359/09, made under the Environmental Protection Act, Renewable Energy Approvals under Part 1.0 of the Act.

[2] Ontario Ministry of the Environment and Climate Change, Technical Guide to Renewable Energy Approvals, 2017.

[3] DNV GL, Design and Operations Report, Nation Rise Wind Farm, 13 July 2017

[4] Raisin Region Conservation Authority, South Nation Conservation Authority, Source Protection Plan - Raisin-South Nation Source Protection Region, 23 October 2014.

APPENDIX A – SITE PLAN MAPS



Legend

Project Components

- Wind Turbine (34)
- Substation, Switchyard
- Project Location
- Wind Turbine (2 km Buffer)
- City Light Solar Farm

Other Components

- Railroad
- Local Road
- Secondary Road
- Existing HONI Transmission Line
- Watercourse
- Built Up Area
- Waterbody



0 0.5 1 2 3 4 Kilometers

Nation Rise Wind Farm

SITE PLAN MAP EXTENTS

001-10021027-170303-AD

6 July 2017

DNV·GL

Projection: UTM Zone 18, NAD83

Sources: Land Information Ontario, ArcGIS Online, United Counties of Stormont, Dundas and Glengarry, United Counties of Prescott and Russell, DRAPE (Sept 2014), First Base Solutions (March 2017), NRSI, Golder.

480000
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484000
486000
488000
5008000
5006000
5004000
5002000

UNITED COUNTIES OF PRESCOTT AND RUSSELL
TOWNSHIP OF RUSSELL
MUNICIPALITY OF THE NATION
TOWNSHIP OF NORTH STORMONT
UNITED COUNTIES OF STORMONT, DUNDAS AND GLENGARRY
TOWNSHIP OF NORTH DUNDAS
Crysler

Legend

Project Components

- Wind Turbine (33)
- Substation, Switchyard
- Meteorological Mast
- Collection System
- Access Road
- Crane Path
- Temporary Construction Access Road
- Turning Radii
- Project Location
- Substation Area
- Laydown Area
- Property Boundary Setback (132 m)
- Road and Railway Setback (81 m)
- Noise Receptor Setback (550 m)
- Project Location (120 m)
- Project Location (300 m)

Waterbody Assessment *

- Watebody Assessment Point

Natural Heritage Features*

- Significant Wetland [1]
- Significant Woodland
- Significant Habitats for Species of Conservation Concern
- Treated as Significant Specialized Wildlife Habitats and Rare Vegetation Communities [2]
- Significant Seasonal Concentration Areas
- Treated As Significant Seasonal Concentration Areas [2]
- Generalized Significant Wildlife Habitat [3]

Cultural Heritage Features

- Cultural Heritage Value Interest

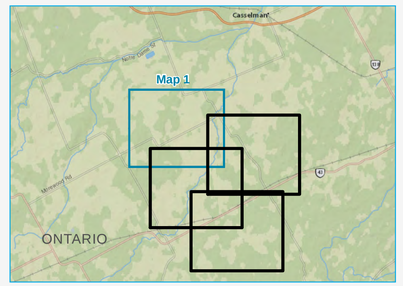
Noise Receptor *

- 1 Storey Receptor
- 2 Storey Receptor
- 3 Storey Receptor
- Vacant Lot Receptor
- Participant Receptor

Other Components

- Arterial / Collector
- Local Road / Street
- Railway
- Existing HONI Transmission Line
- Intermittent Watercourse
- Permanent Watercourse
- Municipal Drain
- Contour (Interval: 5 m)
- County Boundary
- Municipal Boundary
- Property Boundary
- Waterbody

* Natural Features Distance: See App. E Evaluation of Significance Report Table 7 and 8.
Waterbody Distance: See App. F Water Body Report Table 4.
Receptor Distance: See App. G NIA Table 7-2.
1 - Natural Features that have been Treated as Significant following Appendix C: Wetland Characteristics and Ecological Functions Assessment for Renewable Energy Projects of the Natural Heritage Assessment Guide for Renewable Energy Projects. (OMNR 2012).
2 - Candidate Significant Wildlife Habitats that have been Treated As Significant with a commitment to conduct pre-construction surveys to determine significance, or which access to the habitat to conduct surveys has been denied.
3 - Generalized Candidate Significant Wildlife Habitats that have been Treated As Significant following the Natural Heritage Assessment Guide for Renewable Energy Projects (OMNR 2012).



0 375 750 1,500 Meters

Nation Rise Wind Farm

SITE PLAN
MAP 1

001-10021027-170706

11 July 2017

DNV·GL

Projection: UTM Zone 18, NAD83

Sources: Land Information Ontario, ArcGIS Online, United Counties of Stormont, Dundas and Glengarry, United Counties of Prescott and Russell, DRAPE (Sept 2014), First Base Solutions (March 2017), NRSI, Golder.



Legend

Project Components

- Wind Turbine (33)
- Meteorological Mast
- Collection System
- Access Road
- Crane Path
- Turning Radii
- Project Location
- Property Boundary Setback (132 m)
- Road and Railway Setback (81 m)
- Noise Receptor Setback (550 m)
- Project Location (120 m)
- Project Location (300 m)

Waterbody Assessment *

- Watebody Assessment Point

Natural Heritage Features*

- Significant Wetland[1]
- Significant Woodland
- Significant Habitats for Species of Conservation Concern
- Treated as Significant Specialized Wildlife Habitats and Rare Vegetation Communities[2]
- Significant Seasonal Concentration Areas
- Treated as Significant Seasonal Concentration Areas[2]
- Generalized Significant Wildlife Habitat[3]

Cultural Heritage Features

- Cultural Heritage Value Interest

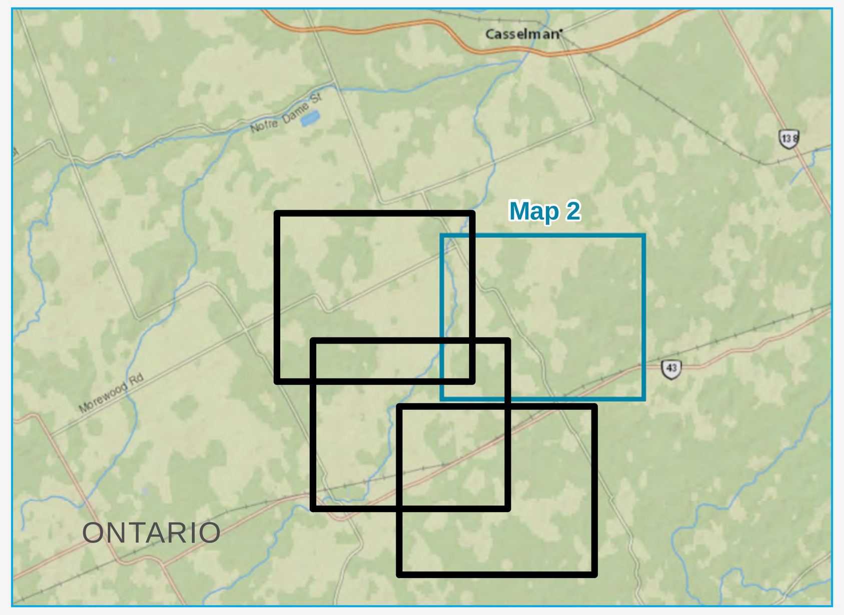
Noise Receptor *

- 1 Storey Receptor
- 2 Storey Receptor
- 3 Storey Receptor
- Vacant Lot Receptor
- Participant Receptor

Other Components

- Arterial / Collector
- Local Road / Street
- Railway
- Existing HONI Transmission Line
- Intermittent Watercourse
- Permanent Watercourse
- Municipal Drain
- Contour (Interval: 5 m)
- County Boundary
- Municipal Boundary
- Property Boundary
- Waterbody

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0 375 750 1,500 Meters

Nation Rise Wind Farm

SITE PLAN MAP 2

001-10021027-170706

11 July 2017

DNV·GL

Projection: UTM Zone 18, NAD83

Sources: Land Information Ontario, ArcGIS Online, United Counties of Stormont, Dundas and Glengarry, United Counties of Prescott and Russell, DRAPE (Sept 2014), First Base Solutions (March 2017), NRSI, Golder.



Legend

Project Components
- Wind Turbine (33)
- Meteorological Mast
- Collection System
- Access Road
- Crane Path
- Turning Radii
- Project Location
- Laydown Area
- Property Boundary Setback (132 m)
- Road and Railway Setback (81 m)
- Noise Receptor Setback (550 m)
- Project Location (120 m)
- Project Location (300 m)

Waterbody Assessment *
- Watebody Assessment Point

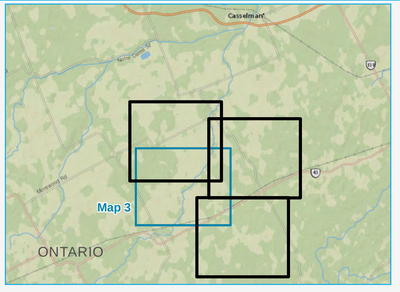
Natural Heritage Features*
- Significant Wetland[1]
- Significant Woodland
- Significant Habitats for Species of Conservation Concern
- Treated as Significant Specialized Wildlife Habitats and Rare Vegetation Communities [2]
- Significant Seasonal Concentration Areas
- Treated as Significant Seasonal Concentration Areas[2]
- Generalized Significant Wildlife Habitat[3]

Cultural Heritage Features
- Cultural Heritage Value Interest

Noise Receptor *
- 1 Storey Receptor
- 2 Storey Receptor
- 3 Storey Receptor
- Vacant Lot Receptor
- Participant Receptor

Other Components
- Arterial / Collector
- Local Road / Street
- Railway
- Existing HONI Transmission Line
- Intermittent Watercourse
- Permanent Watercourse
- Municipal Drain
- Contour (Interval: 5 m)
- County Boundary
- Municipal Boundary
- Property Boundary
- City Lights Solar Project Area
- Waterbody

* Natural Features Distance: See App. E Evaluation of Significance Report Table 7 and 8.
Waterbody Distance: See App. F Water Body Report Table 4.
Receptor Distance: See App. G NIA Table 7-2.
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0 375 750 1,500 Meters

Nation Rise Wind Farm

SITE PLAN
MAP 3

001-10021027-170706

11 July 2017

DNV·GL

Projection: UTM Zone 18, NAD83

Sources: Land Information Ontario, ArcGIS Online, United Counties of Stormont, Dundas and Glengarry, United Counties of Prescott and Russell, DRAPE (Sept 2014), First Base Solutions (March 2017), NRSI, Golder.



Legend

Project Components

- Wind Turbine (33)
- Substation, Switchyard
- Meteorological Mast
- Collection System
- Access Road
- Project Location
- Laydown Area
- Substation Area
- Property Boundary Setback (132 m)
- Road and Railway Setback (81 m)
- Noise Receptor Setback (550 m)
- Project Location (120 m)
- Project Location (300 m)

Waterbody Assessment *

- Watebody Assessment Point

Natural Heritage Features*

- Significant Wetland[1]
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- Significant Habitats for Species of Conservation Concern
- Significant Specialized Wildlife Habitats and Rare Vegetation Communities
- Treated as Significant Specialized Wildlife Habitats and Rare Vegetation Communities[2]
- Treated as Significant Seasonal Concentration Areas[2]
- Generalized Significant Wildlife Habitat[3]

Cultural Heritage Features

- Cultural Heritage Value Interest

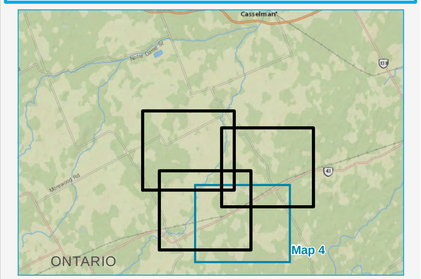
Noise Receptor *

- 1 Storey Receptor
- 2 Storey Receptor
- 3 Storey Receptor
- Vacant Lot Receptor
- Participant Receptor

Other Components

- Arterial / Collector
- Local Road / Street
- Railway
- Existing HONI Transmission Line
- Intermittent Watercourse
- Permanent Watercourse
- Municipal Drain
- Contour (Interval: 5 m)
- County Boundary
- Municipal Boundary
- Property Boundary
- City Lights Solar Project Area
- Waterbody

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0 375 750 1,500 Meters

Nation Rise Wind Farm

SITE PLAN
MAP 4

001-10021027-170706

11 July 2017

DNV·GL

Projection: UTM Zone 18, NAD83

Sources: Land Information Ontario, ArcGIS Online, United Counties of Stormont, Dundas and Glengarry, United Counties of Prescott and Russell, DRAPE (Sept 2014), First Base Solutions (March 2017), NRSI, Golder.

APPENDIX B – CONCEPTUAL STORMWATER, EROSION AND SEDIMENT MANAGEMENT PLAN

DNV·GL

NATION RISE WIND FARM

Conceptual Stormwater, Erosion and Sediment Management Plan

Nation Rise Wind Farm Limited Partnership

Document No.: 10021027-CAMO-R-07
Date: 10 August 2017



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Project name:	Nation Rise Wind Farm	DNV GL - Energy
Report title:	Conceptual Stormwater, Erosion and Sediment Management Plan	Advisory Americas 4100 Rue Molson, Suite 100,
Customer:	Nation Rise Wind Farm Limited Partnership, 110 Spadina Ave, Suite 609 Toronto, ON M5V 2K4	Montreal, QC, H1Y 3N1 CANADA Tel: 514 272-2175 Enterprise No.: 860480037
Contact person:	Kenneth Little	
Date of issue:	10 August 2017	
Project No.:	10021027	
Document No.:	10021027-CAMO-R-07	
Issue:	D	
Status:	FINAL	

Prepared by:	Verified by:	Approved by:
Anna Danaitis GIS Analyst, Environmental and Permitting Services	Michael Roberge, Section Head, Environmental and Permitting Services	Gabriel Constantin Team Leader, Environmental and Permitting Services

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☒ Customer's Discretion
☐ Published

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Reference to part of this report which may lead to misinterpretation is not permissible.

Issue	Date	Reason for Issue	Prepared by	Verified by	Approved by
A	22 March 2017	Initial issue for review	Anna Danaitis	Nancy O'Neill	Gabriel Constantin
B	12 April 2017	Updated report	Anna Danaitis	Nancy O'Neill	Gabriel Constantin
C	13 July 2017	Updated report for final REA submission	Anna Danaitis	Nancy O'Neill	Gabriel Constantin
D	10 August 2017	Minor updates	Anna Danaitis	Nancy O'Neill	Gabriel Constantin

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List of abbreviations

Abbreviation	Meaning
DNV GL	Garrad Hassan Canada, Inc.
MW	Megawatt
REA	Renewable Energy Approval
SESMP	Stormwater, Erosion and Sediment Management Plan

1 INTRODUCTION

Nation Rise Wind Farm Limited Partnership (the "Proponent") has requested Garrad Hassan Canada, Inc., (hereafter referred to as "DNV GL"), to provide environmental and permitting services including a conceptual Stormwater, Erosion and Sediment Management Plan (SESMP) for the Nation Rise Wind Farm (the "Project") located within the western portion of North Stormont bounded to the south by the Township of South Stormont and to the west by the boundary of the Township of North Dundas. The north portion of the Project is delimited by the municipality boundaries of Russell and the Nation. Courville Road and MacMillan Road are the east boundaries of the Project. This Project, with a total nameplate capacity of approximatively 100 megawatts (MW), is considered a Class 4 wind facility. A total of 33 wind turbine locations are being permitted for the Project.

The main objective of the conceptual SESMP is to present the prevention and mitigation measures that will be taken to avoid or minimize the Project impacts on potential stormwater runoff or soil erosion. This report includes an overview of the Project components, existing conditions, and the stormwater, erosion and sediment management and mitigation measures.

2 PROJECT COMPONENTS

The Project will include the following components:

- **Wind turbines –** Up to 33 turbines location will be permitted. The final wind turbine technology has not been selected yet, but for reference purposes the Vestas V136-3.45 MW turbine is being considered.
- **Permanent Meteorological Tower(s) –** Wind speed, wind direction, temperature and humidity will be measured by up to three (3) meteorological towers that will be constructed on small concrete pad(s) and extend to a maximum of up to 140 m in height. The tower type selected will either be lattice or monopole and the tower(s) may be supported by guy wires (monopole only).

  While only up to three (3) meteorological towers will be installed, six (6) potential locations are being permitted for the Project; the exact locations will be determined prior to construction. The tower(s) will remain on site for the duration of the Project for wind turbine performance testing.
- **Access roads and crane pads –** Transportation of machinery, turbine components and other equipment will use existing municipal roads and private access roads. New access roads will be constructed on private lands to provide access for components and equipment to the private properties during the construction phase and for maintenance activities during operation. Typically access roads will be up to 20 m wide during construction. Areas adjacent to the access road within the larger disturbance area may be utilized during the construction phase in order to accommodate cranes, transportation equipment and other construction activities. After construction, these roads may be reduced in size to approximately 5-6 m in width, to allow access to turbines and associated infrastructure for maintenance and repairs.
- **Electrical collector lines, substation and switchyard –** The power generated at each of the wind turbine generators will be transported through 34.5 kV underground or overhead cables to the Project's substation. Electrical collector lines will generally follow public road allowances to reach the Project substation. Junction boxes will also be installed below or above ground in instances where more than one circuit must be connected together. Measuring a total footprint of approximately 4-7 ha, the electrical substation and switchyard for the Project will be adjacent to each other and located on privately owned property. Power will be stepped up to a transmission voltage of 230 kV at the substation and will be fed into the existing Hydro One Network Inc. (HONI) transmission system adjacent to the Project substation.
- **Construction staging and laydown areas (including temporary staging areas) –** It is anticipated that up to three temporary construction staging areas will be constructed on privately owned lands for the purpose of staging and storing equipment during the construction phase. Activities and facilities within these staging areas will include material storage, equipment refuelling, construction offices, a parking lot, temporary toilet facilities, rinsing and water facilities, and communications equipment. Each temporary staging area will have a footprint of approximately 2-7 ha. In addition, a temporary area of approximately 3 ha around each wind turbine will be established for the laydown and assembly of the wind turbine components. These temporary areas will be restored following the construction phase to agricultural uses.

3 EXISTING CONDITIONS

The Nation Rise Wind Farm is located in eastern Ontario, within the United Counties of Stormont, Dundas and Glengarry. More specifically, the Project is located within the western portion of North Stormont and bounded to the south by the Township of South Stormont and to the west by the boundary of the Township of North Dundas. The north portion is delimited by the municipality boundaries of Russell and the Nation. Courville Road and MacMillan Road are the east boundaries of the Project. It has a total Project study area of approximately 8,974 hectares.

The majority of the habitat in the Project study area is composed of agricultural lots, deciduous, mixed, and coniferous wood lots, watercourses, and the occasional wetland. The presence of several water features were confirmed within the Project study area, the majority of which have been identified as intermittent/permanent watercourses. One seepage area was also identified within the Project study area. A total of 61 water bodies were identified within the Project area, all of which have been identified as intermittent/permanent watercourses and ponds. A total of 39 of the identified water bodies intersect project infrastructure. The remaining 22 identified water bodies are present within 120 m of the Project Location but do not overlap project infrastructure. A total of 63 non-waterbody stations were assessed during the waterbody evaluation as indicated in the Water Body Assessment included in Appendix F of the Design and Operations Report, as part of the Renewable Energy Approval (REA) application submission. All potential watercourses within 120 m of the Project Location have been examined to determine if they meet the definition under the REA regulation of a confirmed waterbody feature. The results of the determination of each feature as a waterbody or non-waterbody have been outlined in Table 3-1 [5].

There are 19 wetlands that are treated as significant within 120 m of the Project Location as indicated in the Natural Heritage Assessment. There are no known Provincially Significant ANSIs, Important Bird Areas, Bird Sanctuaries, National Wildlife Refuges or Lake Trout lakes identified within the Project study area [5].

The Project is located partially within the Lower Ottawa Secondary watershed and more specifically within the Lower Ottawa – South Nation Tertiary watershed as presented in Figure 3-1. The Project is characterized by various soils. Approximately 40% of the Project is characterized by North Grower, 13 % of the project is characterized by Genville soil and the remainder is characterized by 20 different other soils. The Project is characterized predominantly by clay loam or loam soil. The soil within the Project study area is predominantly covered with poorly draining soil with areas of well drained soil. Bedrock geology consists of Limestone, dolostone, shale, arkose and sandstone.

Since the majority of the Project study area is represented by agricultural land, the runoff coefficient value is approximately 0.55 [1]. According the Ontario Soil Survey Complex, the project consists of very gentle slopes (Between 1.3º – 3.5º).

Table 3-1: Waterbody Assessment Observations

Watercourse Name	Report ID	Water Body (Y/N)
Water Bodies		
McConnell Steven Municipal Drain	WB-003	Y
McConnell Steven Municipal Drain	WB-005	Y
McConnell Steven Municipal Drain	WB-006	Y
Paquette McMahon Municipal Drain	WB-007	Y

Watercourse Name	Report ID	Water Body (Y/N)
Paquette McMahon Municipal Drain	WB-008	Y
Paquette McMahon Municipal Drain	WB-009	Y
Paquette McMahon Municipal Drain	WB-010	Y
Trib 3 of Paquette McMahon Municipal Drain	WB-011	Y
Parent Municipal Drain	WB-012	Y
Whissell Creek	WB-013	Y
Byers Municipal Drain	WB-014	Y
R. Stevens Municipal Drain	WB-015	Y
Genier Municipal Drain	WB-016	Y
Genier Municipal Drain	WB-017	Y
Genier Municipal Drain	WB-018	Y
Genier Extension Municipal Drain	WB-019	Y
Trib 1 of Smirle McConnell Municipal Drain	WB-021	Y
Smirle McConnell Municipal Drain	WB-023	Y
Johnstone Municipal Drain	WB-029	Y
Johnstone Municipal Drain	WB-030	Y
Johnstone Municipal Drain	WB-031	Y
Trib 5 of Johnstone Municipal Drain	WB-032	Y
Trib 5 of Johnstone Municipal Drain	WB-033	Y
Trib 5 of Whissell Creek Municipal Drain	WB-034	Y
Whissell Creek Municipal Drain	WB-035	Y
Whissell Creek Municipal Drain	WB-036	Y
Whissell Creek Municipal Drain	WB-037	Y
Whissell Creek Municipal Drain	WB-038	Y
Whissell Creek Municipal Drain	WB-039	Y
Donald Shane Municipal Drain	WB-040	Y
Trib 2 of Whissell Creek Municipal Drain	WB-041	Y
Farley Branch of Whissell Creek Municipal Drain	WB-042	Y
Trib 1 of Whissell Creek	WB-043	Y
Pond A	WB-044	Y
Geo. S. Johnston Municipal Drain	WB-045	Y
Geo. S. Johnston Municipal Drain	WB-046	Y
Landy Municipal Drain	WB-047	Y
Landy Municipal Drain	WB-048	Y
Trib 3 of South Nation River	WB-049	Y
J.P. Grady Municipal Drain	WB-050	Y
J.P. Grady Municipal Drain	WB-051	Y
South Nation River	WB-052	Y
Watson Ouderkirk Municipal Drain	WB-053	Y
Watson Ouderkirk Municipal Drain	WB-055	Y
Watson Ouderkirk Municipal Drain	WB-056	Y
Foley Municipal Drain	WB-057	Y
Foley Municipal Drain	WB-058	Y
Foley Municipal Drain	WB-059	Y
Foley Municipal Drain	WB-060	Y
Foley Municipal Drain	WB-061	Y

Watercourse Name	Report ID	Water Body (Y/N)
Trib 1 of Foley Municipal Drain	WB-062	Y
Trib 1 of Foley Municipal Drain	WB-063	Y
Moriarity Municipal Drain	WB-064	Y
Moriarity Municipal Drain	WB-065	Y
Foley Municipal Drain	WB-066	Y
Foley Municipal Drain	WB-067	Y
Foley Municipal Drain	WB-068	Y
Foley Municipal Drain	WB-069	Y
Trib 2 of Foley Municipal Drain	WB-070	Y
Trib 2 of Dunbar Campbell Adams Municipal Drain	WB-071	Y
Dunbar Campbell Adams Municipal Drain	WB-072	Y
Dunbar Campbell Adams Municipal Drain	WB-073	Y
Dunbar Campbell Adams Municipal Drain	WB-074	Y
Campbell Municipal Drain	WB-076	Y
Unnamed Creek A	WB-077	Y
Unnamed Creek A	WB-079	Y
Unnamed Creek A	WB-080	Y
Dunbar Campbell Adams Municipal Drain	WB-081	Y
Fetterly Municipal Drain	WB-083	Y
Fetterly Municipal Drain	WB-085	Y
Fetterly Municipal Drain	WB-086	Y
Fetterly Municipal Drain	WB-087	Y
Pond C	WB-089	Y
Ray McLeod Municipal Drain	WB-090	Y
Ray McLeod Municipal Drain	WB-091	Y
Ray McLeod Municipal Drain	WB-092	Y
J. Boggart Municipal Drain	WB-093	Y
J. Boggart Municipal Drain	WB-094	Y
Payne River	WB-095	Y
Alex Rutley Municipal Drain	WB-096	Y
Trib 1 of McIntyre Lagrove Municipal Drain	WB-097	Y
McIntyre Lagrove Municipal Drain	WB-098	Y
McIntyre Lagrove Municipal Drain	WB-099	Y
McIntyre Lagrove Municipal Drain	WB-100	Y
Duff Creek	WB-101	Y
Gilles Municipal Drain	WB-102	Y
Gilles Municipal Drain	WB-103	Y
Gilles Municipal Drain	WB-104	Y
Branch of Dirven Municipal Drain	WB-105	Y
Don Smirl Municipal Drain	WB-106	Y
Unnamed Creek A	WB-107	Y
Trib 3 of Foley Municipal Drain	WB-108	Y
Trib 1 of Whissell Creek Municipal Drain	WB-109	Y
Trib 1 of R. Stevens Municipal Drain	WB-110	Y
Trib 3 of R. Stevens Municipal Drain	WB-111	Y
South Nation River	WB-112	Y

Watercourse Name	Report ID	Water Body (Y/N)
Alex Rutley Municipal Drain	WB-113	Y
McConnell Steven Municipal Drain	WB-114	Y
Seepage Area 1	WB-115	Y
Trib 3 of Dunbar Campbell Adams Municipal Drain	WB-116	Y
Stark and Branches Municipal Drain	WB-117	Y
Whissell Creek Municipal Drain	WB-118	Y
Stephenson Municipal Drain	WB-119	Y
Bazinet Municipal Drain	WB-121	Y
Alex Rutley Municipal Drain	WB-122	Y
Unnamed Trib of South Nation River	WB-123	Y
Trib 2 of Unnamed Creek A	WB-124	Y
Ray McLeod Municipal Drain	WB-125	Y
Trib 4 of Grady Municipal Drain	WB-126	Y
Trib 3 of Grady Municipal Drain	WB-127	Y
Grady Municipal Drain	WB-128	Y
Grady Municipal Drain	WB-129	Y
Trib 4 of R. Stevens Municipal Drain	WB-130	Y
Trib 1 of Geo. S. Johnston Municipal Drain	WB-131	Y
Non-Water Bodies		
Trib 1 of Paquette McMahon Municipal Drain	NWB-001	N
Trib 2 of Paquette McMahon Municipal Drain	NWB-002	N
Trib 2 of Whissell Creek	NWB-003	N
Furney Municipal Drain	NWB-004	N
Trib 3 of Johnstone Municipal Drain	NWB-005	N
Trib 4 of Johnstone Municipal Drain	NWB-006	N
Trib 6 of Johnstone Municipal Drain	NWB-007	N
Trib 6 of Johnstone Municipal Drain	NWB-008	N
Pond E	NWB-011	N
Trib 1 of J.P. Grady Municipal Drain	NWB-012	N
Trib 2 of South Nation River	NWB-013	N
Trib 1 of South Nation River	NWB-014	N
Pond G	NWB-015	N
Trib 1 of Moriarity Municipal Drain	NWB-017	N
Trib 4 of Foley Municipal Drain	NWB-018	N
Trib 1 of Fetterly Municipal Drain	NWB-019	N
Duff Sanders Municipal Drain	NWB-026	N
Duff Sanders Municipal Drain	NWB-027	N
Trib 1 of Ray McLeod Municipal Drain	NWB-028	N
Trib 3 of Unnamed Creek A	NWB-029	N
Trib 1 of Unnamed Creek A	NWB-030	N
Trib 1 of Unnamed Creek A	NWB-031	N
Pond D	NWB-033	N
Trib 2 of McIntyre Lagrove Municipal Drain	NWB-034	N
Trib 1 of McIntyre Lagrove Municipal Drain	NWB-035	N
Pond F	NWB-036	N
Trib 1 of R. Stevens Municipal Drain	NWB-037	N

Watercourse Name	Report ID	Water Body (Y/N)
Trib 3 of Whissell Creek Municipal Drain	NWB-038	N
Trib 3 of Dunbar Campbell Adams Municipal Drain	NWB-039	N
Trib 2 of Gilles Municipal Drain	NWB-041	N
Trib 1 of Gilles Municipal Drain	NWB-042	N
McConnell Steven Municipal Drain	NWB-043	N
Bachler Municipal Drain	NWB-044	N
Trib 2 of R. Stevens Municipal Drain	NWB-045	N
Trib 4 of Whissell Creek Municipal Drain	NWB-046	N
Fourges Municipal Drain	NWB-047	N
Lafleche Municipal Drain	NWB-048	N
Landy Municipal Drain	NWB-050	N
Trib 2 of Ray McLeod Municipal Drain	NWB-051	N
Dirven Municipal Drain	NWB-052	N
Whetters Snaders Branch of Foley Municipal Drain	NWB-053	N
Trib 5 of Foley Municipal Drain	NWB-054	N
Denis McMahon Municipal Drain	NWB-055	N
Trib 1 of Unnamed Creek A	NWB-056	N
Trib 1 of Grady Municipal Drain	NWB-058	N
Trib 2 of Grady Municipal Drain	NWB-059	N
Trib 1 of MacCadden Municipal Drain	NWB-060	N
Trib 2 of MacCadden Municipal Drain	NWB-061	N
Pond I	NWB-062	N
J.P. Grady Municipal Drain	NWB-063	N
Pond J	NWB-064	N
Trib 1 of Stephenson Municipal Drain	NWB-065	N
Trib 2 of Foley Municipal Drain	NWB-066	N
Geo. S. Johnston Municipal Drain	NWB-067	N
Trib 4 of Grady Municipal Drain	NWB-068	N
Pond K	NWB-069	N
Trib 2 of Parent Municipal Drain	NWB-070	N
Trib 3 of Parent Municipal Drain	NWB-071	N
Trib 1 of Genier Extension Municipal Drain	NWB-072	N
Trib 1 of Fourges Municipal Drain	NWB-073	N
Pond L	NWB-074	N
Trib 3 of Ray McLeod Municipal Drain	NWB-075	N
Pond M	NWB-076	N

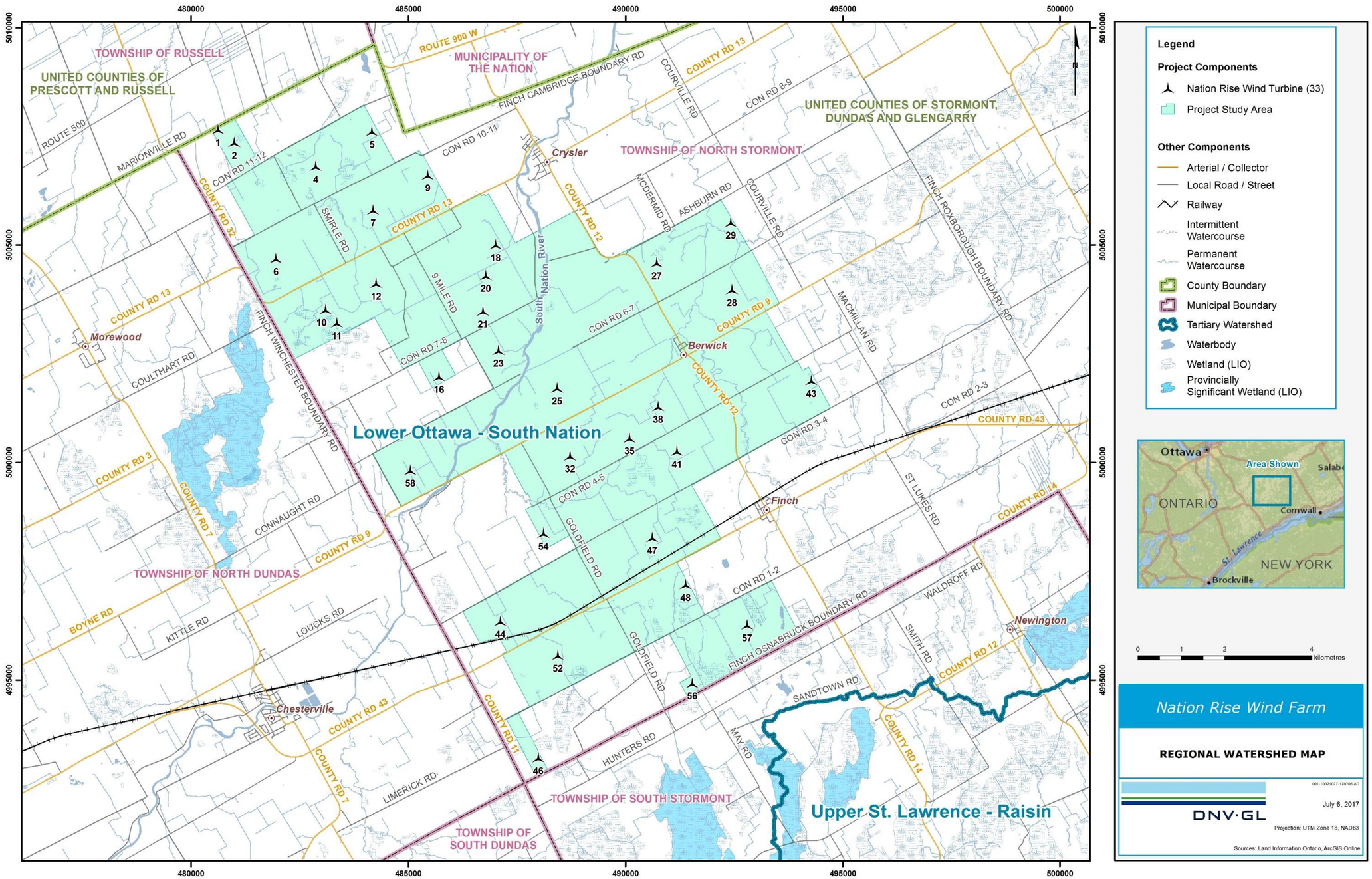


Figure 3-1 Regional Watershed Map

To evaluate the potential hydrologic impact associated with increased impervious coverage, the catchment areas for all draining features within 300 m from the Project Location are delineated. Then, the total number of features intersecting Project Location are calculated for each catchment area. The Project Location would represent the maximum potential addition in impervious coverage within the catchment area. The assumption that the whole Project Location consists of 100% impervious coverage is conservative. The summary of delineated catchment areas and the conservative estimate of the percent increase of the impervious coverage is presented in Table 3-2.

The existing draining pattern will be maintained by using limited grading, by maintaining surrounding agricultural land use and with the installation of conveyance infrastructure such as culverts. Therefore, the change in impervious surface represents the primary factor associated with potential impact to the hydrology within the Project study area. Percent increase in impervious areas per catchment resulting from the Project will be low by conservative estimates. Thus, the potential hydrologic impact associated with the Project would be limited.

Table 3-2: Existing conditions Impervious Coverage

Catchment Area / Discharge Point	Stream Order	Catchment Area (ha)	Additional Impervious Coverage on Private Land (ha)	Additional Impervious Coverage (%)
Main Catchment Area	6	123 826	348	0.3
Sub-Catchment 1	3	445	5	1.1
Sub-Catchment 2	3	2 980	38	1.3
Sub-Catchment 3	3	1 744	22	1.3
Sub-Catchment 4	3	343	6	1.7
Sub-Catchment 5	3	1 712	73	4.3
Sub-Catchment 6	3	477	16	3.4
Sub-Catchment 7	3	490	18	3.7
Sub-Catchment 8	3	462	6	1.3
Sub-Catchment 9	3	600	6	1.0
Sub-Catchment 10	3	3 483	72	2.1
Sub-Catchment 11	3	1 120	2	0.2
Sub-Catchment 12	3	1 340	20	1.5

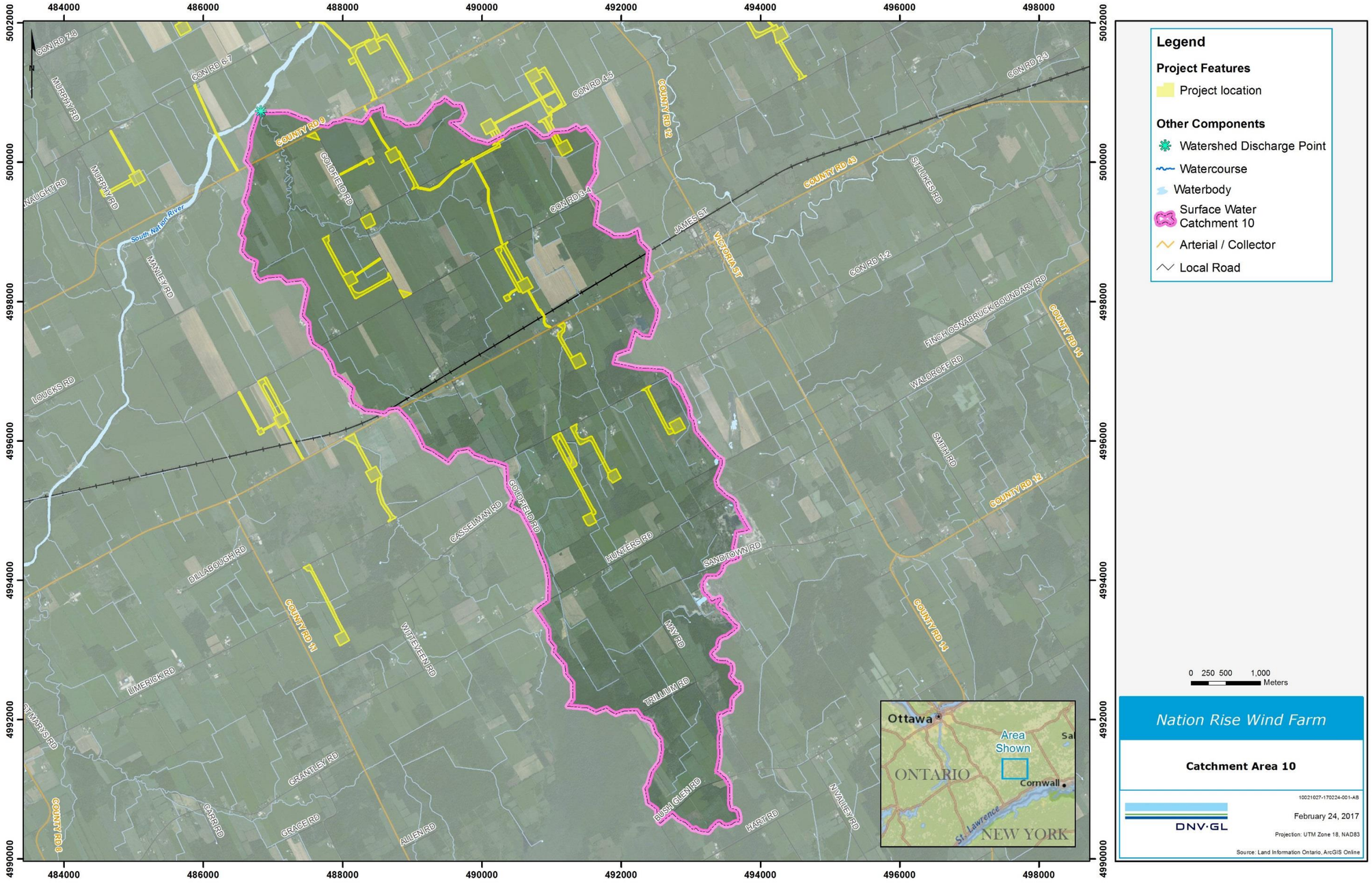


Figure 3-2 Example of delineated catchment area

4 STORMWATER, EROSION AND SEDIMENT MANAGEMENT AND MITIGATION MEASURES

The SESMP aims to reduce contaminants in stormwater runoff coming from the Project, and minimize the erosion and sedimentation of the natural habitats for all phases of the Project. The following paragraphs present the different processes involved in stormwater, erosion and sedimentation events and mitigation measures that will be implemented.

4.1 Erosion and Sediment Control

Erosion and sedimentation are natural processes that consist of soil surface detachment and transportation and deposition of soil particles. Erosion prevention is defined as any practice that protects the soil surface and prevents the soil particles from being detached by rainfall or wind, while sediment control is any practice that traps the soil particles after they have been detached and moved by wind or water. The Project construction and decommissioning activities, such as intensified traffic, topsoil stripping, grading activities involving cutting or filling, will modify the land features while impairing these natural processes. The goal of the erosion and sediment control measures is to prevent the transportation of sediment overland and deposition into surrounding natural areas, including watercourses, woodlands and wetlands.

The following stormwater, erosion and sediment control measures will be implemented to minimize the potential for erosion and off-site transfer of sediment of the Project:

Construction and Decommissioning Phase

- Where soil has lost its structure from grading or compacting, it must be covered or otherwise managed to prevent its migration from the site. Land and water uses upstream and downstream must be protected from works generating sediment [3].
- Minimize grading activities to maintain existing drainage patterns where possible.
- Limit changes in land contours and maintain streams and timing and quantity of flow.
- Schedule clearing, grubbing and grading activities to avoid times of very high runoff volumes, wherever possible.
- As applicable and where required by topography, clearly delineate work area using erosion fencing, or similar barrier, to avoid accidental damage to retained wetland vegetation and to avoid impacting hydrological connectivity.
- Crossing structure should be properly sized and positioned appropriately (angle and embedded) as to minimize erosion issues and creation of potential fish barriers.
- 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.

- Erect silt fence before grading activities on the downstream side of the area to be graded to protect the downstream lands from potential sediment transport that could be transported overland.
- Redirect stormwater runoff via swales and erosion control berms, where appropriate, to ensure that no untreated runoff is discharged from the site.
- Install temporary rock check dams in swales where appropriate or necessary to attenuate flows, reduce erosive velocities, and encourage sediment deposition.
- Install, monitor, and maintain erosion and sediment control measures (i.e. silt fences) around the construction areas within 30 m of a significant natural feature or wildlife habitat.
- Drainage system may be incorporated under turbine foundations to allow for drainage of perched water.

Operations Phase

- Crossing structure for access road should be properly sized and positioned appropriately (angle and embedded) as to minimize erosion issues and creation of potential fish barriers.
- Drainage system may be incorporated under turbine foundations to allow for drainage of perched water.
- To manage stormwater runoff during operation, drainage channels will be constructed adjacent to access roads when required.
- Precipitation runoff from wind turbine towers will be able to percolate through the gravelled area around each turbine foundation, ensuring infiltration into the ground.

4.2 Vegetation and Habitat Conservation

The protection of graded surfaces from erosion can be achieved through vegetation that limits erosion during stormwater event. Vegetation helps to minimize the impacts of stormwater because vegetation roots hold soil together, leaves and stems break up rainfall impact, groundcover slows down runoff and filters sediment out of water while plants evapotranspire moisture from soil [2]. Therefore, the removal of vegetation and other construction activities may degrade soil, leading to a higher potential for erosion [3]. Vegetation may be removed to allow the construction and safe operation of the Project, but the following mitigation measures related to vegetation and natural habitats will be implemented:

- Vegetation removal will be done only when necessary and where natural heritage assessments have been completed as part of the REA.
- Slash, logs, roots and stumps and other cleared/grubbed material may result in a fire hazard, disrupt other standing vegetation and/or watercourses, disrupt/block surface drainage and disturb ground surface potentially leading to increased erosion and sedimentation in watercourses; therefore, the construction and decommissioning site will be cleaned up on a regular basis of all debris [3].
- 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 and fiber matting should be applied to contain the site over the winter period.

4.3 Contaminant Prevention and Vehicle Maintenance

Hazardous material is used in certain situations during the Project life-cycle and can be spread by stormwater events if proper mitigation measures are not enforced. Vehicles travelling on Project access roads during the construction, operation and decommissioning phases can generate an important amount of fugitive dust emissions, especially in dry or windy conditions. While sustainable source of water should be utilized to maximize reuse of the resource, proper wet cleaning methods should be enforced so that no contaminants are present in dust suppression liquids and that stormwater episodes do not propagate hazardous material in the surrounding environment. Spill prevention measures for machinery and vehicles should also be implemented to prevent soil contamination and potential propagation of contaminant during stormwater events. The following contaminant prevention measures and vehicles maintenance policy will be implemented:

Construction and Decommissioning Phase

- All vehicles must be in good condition and must not have fuel and/or oil leaks.
- All maintenance activities, vehicle refueling or washing, and chemical storage will be located more than 30 m from any significant natural feature or significant wildlife habitat.
- Movement of sediment from the construction site poses a risk to surrounding aquatic and terrestrial habitats; therefore, machinery and trucks will be cleaned regularly and refuel well away from any water body (>30 m) [3].
- Oil trays should be placed under stationary equipment that could present oil or fuel leaks, where practicable.
- Develop a site-specific Spill Prevention, Control and Response Plan and train staff on appropriate procedures.
- Minimize carriage of sediment from construction vehicle tires into or outside the Project area a construction entrance feature may be provided at the site entrance [4].
- Minimize vehicular traffic on exposed soils and stabilize high traffic areas with clean gravel surface layer or other suitable cover material.
- For dust suppression of unpaved surface, only products that are safe for the environment and human health and safety will be used (water or water-based dust suppressant).
- Implement speed limits on unpaved roads. Clearly post construction speed limits.

Operations Phase

- All vehicles must be in good condition and must not have fuel and/or oil leaks.
- All maintenance activities, vehicle refueling or washing, and chemical storage will be located more than 30 m from any significant natural feature or significant wildlife habitat.

- Oil trays should be placed under equipment that could present oil or fuel leaks.
- Develop a site-specific Spill Prevention, Control and Response Plan and train staff on appropriate procedures.
- Implement speed limits on unpaved roads. Clearly post operation speed limits on Project access roads.

4.4 Monitoring

To ensure that the stormwater, erosion and sedimentation mitigation measures are adequate, a monitoring program will be implemented during the construction and decommissioning phases of the Project to inspect the erosion and sediment control measures after each significant rainfall, and at least once a week. Moreover, every silt fences, rock-check dams, swales and erosion control berms will be examined. An Environmental Monitor will be hired to ensure that vegetation will be removed in designated areas only and that revegetation is successfully completed. Vehicle maintenance and monitoring will be completed in accordance with industry best practices.

5 CONCLUSION

This conceptual SESMP provides an overview of the current site conditions and multiple mitigation measures to avoid or minimize the impacts of stormwater events on the natural environment by increasing erosion and sedimentation or by transportation of contaminant. Preventive control measures to limit erosion and sedimentation processes, the removal of vegetation and modification of habitat, as well as the maintenance of vehicles and proper dust suppression techniques will be implemented. A monitoring program will be executed from the start of construction to examine the success of the SESMP. Given the mitigation measures proposed, DNV GL considers that the proposed conceptual SESMP is adequate for the nature and size of the Project.

6 REFERENCES

[1] Mountain Empire Community College, Values of Runoff Coefficient (C) for Rational Formula, Consulted on 6 August 2014 <http://water.me.vccs.edu/courses/civ246/table2.htm>

[2] GeoSyntec Consultants *for the* Oregon Department of Environmental Quality, Erosion and Sediment Control Manual, April 2005

[3] Ontario Ministry of Transportation, Environmental Reference for Contract Preparation - Erosion & Sediment Control and Vegetation Management, February 2007

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[5] Natural Resource Solutions, Nation Rise Wind Project Water Body Report, July 2017.

APPENDIX C – HYDROGEOLOGICAL ASSESSMENT AND EFFECTS ASSESSMENT

DNV·GL

NATION RISE WIND FARM

Hydrogeological Assessment and Effects Assessment

Nation Rise Wind Farm Limited Partnership

Document No.: 10021027-CAMO-R-11
Date: 11 August 2017



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1 INTRODUCTION

Nation Rise Wind Farm Limited Partnership has requested GL Garrad Hassan Canada, Inc., (hereafter DNV GL), to provide environmental and permitting services including a Draft Hydrogeological and Water Resource Protection Information for the Nation Rise Wind Farm ("Project") located within the western portion of North Stormont bounded to the south by the Township of South Stormont and to the west by the boundary of the Township of North Dundas. The north portion of the Project is delimited by the municipality boundaries of Russell and the Nation. Courville Road and MacMillan Road are the east boundaries of the Project. This Project with a total nameplate capacity of approximately 100 megawatts (MW) is considered a Class 4 wind facility. A total of 33 wind turbine locations are being permitted for the Project.

The objective of this Hydrogeological and Water Resource Protection Information report was to conduct a preliminary review of existing hydrogeological conditions and elaborate a strategy to assess potential effects of the construction and installation of the Project on the local and regional hydrogeology.

DNV GL reviewed all readily available data related to hydrogeology of the region. The following databases have been consulted:

- Bedrock Geological Mapping from Ontario Geological Survey (OGS) [1];
- Physiographic Units of Southern Ontario from OGS [2];
- Drift thickness Map from OGS [3];
- Quaternary Geological Mapping from OGS [4];
- Ministry of the Environment and Climate Change (MOECC) Water Well Information System (WWIS) [5]; and
- MOECC Permit to Take Water Records (PTTW) [6].

2 PROJECT COMPONENTS

The Project will include the following components:

- **Wind turbines –** Up to 33 turbines location will be permitted. The final wind turbine technology has not been selected yet, but for reference purposes the Vestas V136-3.45 MW turbine is being considered.
- **Permanent Meteorological Tower(s) –** Wind speed, wind direction, temperature and humidity will be measured by up to three (3) meteorological towers that will be constructed on small concrete pad(s) and extend to a maximum of up to 140 m in height. The tower type selected will either be lattice or monopole and the tower(s) may be supported by guy wires (monopole only). While only up to three (3) meteorological towers will be installed, six (6) potential locations are being permitted for the Project; the exact locations will be determined prior to construction. The tower(s) will remain on site for the duration of the Project for wind turbine performance testing.
- **Access roads and crane pads –** Transportation of machinery, turbine components and other equipment will use existing municipal roads and private access roads. New access roads will be constructed on private lands to provide access for components and equipment to the private properties during the construction phase and for maintenance activities during operation. Typically access roads will be up to 20 m wide during construction. Areas adjacent to the access road within the larger disturbance area may be utilized during the construction phase in order to accommodate cranes, transportation equipment and other construction activities. After construction, these roads may be reduced in size to approximately 5-6m in width, to allow access to turbines and associated infrastructure for maintenance and repairs.
- **Electrical collector lines, substation and switchyard –** The power generated at each of the wind turbine generators will be transported through 34.5 kV underground or overhead cables to the Project's substation. Electrical collector lines will generally follow public road allowances to reach the Project substation. Junction boxes will also be installed below or above ground in instances where more than one circuit must be connected together. Measuring a total footprint of approximately 4-7 ha, the electrical substation and switchyard for the Project will be adjacent to each other and located on privately owned property. Power will be stepped up to a transmission voltage of 230 kV at the substation and will be fed into the existing Hydro One Network Inc. (HONI) transmission system adjacent to the Project substation.
- **Construction staging and laydown areas (including temporary staging areas) –** It is anticipated that up to three temporary construction staging areas will be constructed on privately owned lands for the purpose of staging and storing equipment during the construction phase. Activities and facilities within these staging areas will include material storage, equipment refuelling, construction offices, a parking lot, temporary toilet facilities, rinsing and water facilities, and communications equipment. Each temporary staging area will have a footprint of approximately 2-7 ha. In addition, a temporary area of approximately 3 ha around each wind turbine will be established for the laydown and assembly of the wind turbine components. These temporary areas will be restored following the construction phase to agricultural uses.

3 BASELINE CONDITIONS

3.1 Physical characterization

3.1.1 Topography

The topography of the area is characterized by low relief, varying between 65 and 100 m above sea level (asl). The elevation within the Project Study Area is decreasing towards the South Nation River, crossing the Project Study Area.

3.1.2 Physiographic units

The Project Study Area is overlying two distinct Physiographic Units; 1) Winchester Clay Plain and 2) Glengarry Till Plain. Most of the Project is located within the Winchester Clay Plain, whereas the southern part of the Project is located within the Glengarry Till Plain [2] (Figure 1).

The Winchester Clay Plain is described as an area of low relief lying almost entirely within the drainage basin of the South Nation River. The unit can be divided into two classes. Grey clay can be observed in the south and west of the unit, whereas the northeast part is formed of alternately banded pink and grey clays. The soils of Winchester Clay Plains are imperfectly and poorly drained. Water wells are commonly drilled to depths of greater than 30 m because clay soil is impermeable to ground water [2].

The Glengarry Till is also a region of low relief, with some undulations where morainic ridges and drumlins are found. Numerous streams, tributaries of the South Nation River, characterize the landscape of this physiographic unit. This glacial till unit is composed of a large proportion of limestone and sandstone cobbles. The till also has a medium texture and is very stony, a result of sorting caused by wave action in the Champlain Sea during the last ice age [2].

3.2 Geology

3.2.1 Bedrock geology

The bedrock geology of the region consists of Precambrian igneous and metamorphic rocks overlain by a series of Paleozoic sedimentary rocks, including limestone, dolostone, shale, arkose and sandstone [1][7].

Briefly, conglomerates and sandstones of the Covey Hill Formation and sandstones of the Nepean Formation lie above the Precambrian lower layer. Above these Formations are sandstones and limestone of the Ottawa Group (also Simcoe Group), which include the Gull River Formation (limestone/dolostone/shale), the Bobcaygeon Formation (limestone/shale), the Verulam Formation (limestone/shale) and the Lindsay Formation (limestone/shale) [1][7].

According to the bedrock mapping from OGS [3], the bedrock depth varied from 0 to 17 m within the Project Study Area.

3.2.2 Overburden geology

The surficial geology of the region mostly consists of unconsolidated Pleistocene deposits. These deposits include glaciomarine sediments (deep-water Quaternary deposits) and glacial tills, which formed moraines,

deposited during the advance and retreat of the Laurentide Ice Sheet. According to the available OGS drift thickness map, overburden thickness varies from 0 to 17 m [3].

Surficial geology within the Project Study Area is shown in Figure 2 and the major units are briefly described below [4]:

- Glaciomarine and marine deposits (clay): Silt and clay basin and quiet water deposits (Pleistocene);
- Till deposits: Undifferentiated, predominantly sandy silt to silt matrix, commonly rich in clasts, often high in total matrix carbonate content (Pleistocene); and
- Bedrock (rocky outcrop): Undifferentiated carbonate and clastic sedimentary rock, exposed at surface or covered by a discontinuous, thin layer of drift (Paleozoic).

3.3 Hydrogeological setting

The hydrogeology setting of the Project Study Area was developed based on previous studies and available data.

3.3.1 Hydrostratigraphy

Knowledge of surficial geology and physiography of the region was essential to characterize the general hydrostratigraphy of the lands within the Project Study Area. This information along with a number of borehole logs within the Project Study Area was utilized to classify the major stratigraphic units into aquifers and aquitards.

An aquifer corresponds to a geologic formation of water bearing permeable rocks, rock fractures and unconsolidated materials that has the ability to provide significant supply of water to a well while an aquitard corresponds to a geologic formation of mainly fine grained consolidated materials or hard rocks that prevent the flow of water. According to the hydrostratigraphic model defined by Geological Survey of Canada (GSC) (2009), the Project Study Area consists of the following surficial sedimentary units:

- Basin Mud (Clay, Silt) – Aquitard;
- Glaciofluvial (Esker) Sediments (Sand, gravel) – Aquifer;
- Sandy-Silt Till – Poor Aquifer /Aquitard; and
- Sub-till Sediments – Aquifer.

Major part of the Project Study Area consists of Basin Mud and Sandy-Silt Till and a thin expanse of Sub-Till Sediments overlying bedrock. Basin Mud mainly consists of clay and silt with poor hydraulic conductivity and act as aquitard. Due to the low hydraulic conductivity, these can also act as a protective barrier for surface spills reaching the lower aquifers. Most of the remaining area is covered with Sandy-Silt Till deposits with low hydraulic conductivity. These Till deposits mainly consist of sandy silt with a maximum thickness of 18 m within the Project Study Area and act as a poor aquifer. Esker and Sub-Till deposits consist of higher conductive materials like sand and gravel, but they are only present in small areas within the Project Study Area away from Project infrastructure. Therefore, most of the pumping wells penetrates through the bedrock and pumps water from the upper part of fractured bedrock aquifer.

3.3.1.1 Groundwater flow

South Nation River crosses through the middle of the Project Study Area. Water table is around 65 m asl near the river and increases up to 75 m asl about 6 km away towards northwest and southeast near the Project boundaries that may act as sub-watershed boundaries. General direction of groundwater flow is towards the South Nation River.

3.3.2 Groundwater resource

3.3.2.1 Known bedrock aquifer and surficial aquifer

According to Singer et al.[8], 5 bedrock aquifer units were found in the South Nation Source Protection Area (Table 3-1).

The Central South Nation Aquifer Complex was identified as a surficial aquifer. It extends from within the Winchester Clay Plain between St. Isidore de Prescott and the western boundary of the South Nation Source Protection Area. This surficial aquifer consists of coarse-textured sediments resting on bedrock and is confined by fine-textured glaciomarine and till deposits [7].

Table 3-1 Bedrock Aquifer Units [7].

Unit	Water-Yield	Water Quality
Precambrian (close to surface)	Poor Producer	Poor Quality
Nepean-March-Oxford	Excellent to Good Producer	Good Quality
Rockcliffe	Poor Producer	Good Quality
Ottawa Group (Gull River, Bobcaygeon, Verulam and Lindsay)	Good Producer	Fair Quality
Billings-Carlsbad-Queenston	Poor Producer	Inferior Quality

3.3.2.2 Wells

According to the South Nation Source Protection Report [7], no municipal groundwater drinking water system is found within 1 km of the Project Study Area.

DNV GL assumed that the properties within the Project Study Area are not serviced by any municipal water supply and therefore the primary potable water source is private water wells (Figure 3 and Figure 4).

Table 3-2, below, summarizes the records of well properties within 1 km of the Project Study Area, which were available in the MOECC database [6]. MOECC records include 666 wells within 1 km of the Project Study Area, of which 620 are active water supply wells. Domestic wells account for 72 % of the MOECC well records, followed by Livestock and Irrigation wells (20 %).

The presence of groundwater resources can be deducted from the location and depth of wells in the MOECC records within the Project Study Area. Only 5 % of the MOECC records showed wells located within overburden deposits whereas 85 % of the wells are located within bedrock aquifer.

Table 3-2 Summary of wells located within 1 km of the Project Study Area.

Primary Water Use	Number of Well	Well Depth (m)	Primary Well Type
Domestic	449	3.7 – 260.6	Bedrock: 405 Overburden: 18 Unknown: 26
Commercial and Industrial	11	9.1 – 84.4	Bedrock: 10 Unknown: 1
Irrigation and Livestock	126	7.6 – 76.2	Bedrock: 111 Overburden: 10 Unknown: 5
Public	7	9.1 – 52.7	Bedrock: 4 Overburden: 2 Unknown: 1
Unknown	23	15 – 54.9	Bedrock: 6 Unknown: 17
Not used	4	Unknown	Unknown

Figure 3 and Figure 4 show the approximate location of water supply wells (Abandoned Wells, Observation Wells, Monitoring and Test Hole were excluded from these figures). According to the MOECC, location accuracy of wells ranges from 10 m to 3 km. A complete listing of MOECC water well records is present in Appendix B.

3.3.2.3 Permit to take water records

Ontario enhanced the PTTW program to ensure water takings in Ontario are managed to the standards of the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement. According to the PTTW, a permit is required if the Project plans to take 50,000+ litres of water in a day from the environment [6].

Based on the review of MOECC database, there is no PTTW within the Project Study Area and three active PTTWs are found within a 1 km buffer. These PTTW records are used for dewatering (2) and industrial (1) purposes (Figure 5) [6].

3.3.2.4 Depth to water table

All the MOECC water level data [5] within an area of 24 km by 21 km encompassing the Project Study Area were analyzed to assess the local water table. Depth of water level is up to 20 m within the Project Study Area. Minimum depth is observed along the South Nation River while it increases further from it. The groundwater divide passes along the northwest corner of the proposed Project Study Area. Maximum depth to water level is observed along the divide. The direction of groundwater flow is towards the South Nation River. Water levels fluctuate seasonally depending on wet and dry period. Since the MOECC measurements were taken through a wide range of time periods falling during both wet and dry periods, these data should

be considered as a rough estimate. Based on the krigged water level surface from the MOECC well records and the geotechnical studies [10][11], the following table shows approximate depth to water level at each of the proposed wind turbine locations, varying from approximately 0.5 m to 12.4 m.

Table 3-3 Water table (m) at each wind turbine generator (WTG).

WTG	Depth WL	WTG	Depth WL	WTG	Depth WL	WTG	Depth WL
1	0.5	12	6.2	29	0.25*	48	8.9
2	0.5	16	3.4	32	0.8*		
4	0.8*	18	3.9	35	1.7	52	0.0*
5	0.25*	20	5.1	38	0.25*	54	0.5
6	7.5	21	5.0	41	2.2	56	1.2
7	3.2	23	1.0	43	12.4	57	0.0*
9	1.0*	25	3.2	44	0.5	58	0.0*
10	2.0*	27	8.7	46	2.2		
11	4.2	28	3.8	47	5.8		

*MOECC data was replaced with field test data reported in geotechnical study [10][11].

3.3.3 Highly vulnerable aquifers

Aquifers are commonly considered highly vulnerable (HVA) based on numerous characteristics: depth, soil type, overburden sediment, etc. The faster an aquifer can be recharged by surface water, the more likely it is to be classified as highly vulnerable [7]. Based on the South Nation Source Protection studies, the type of sedimentary deposit comprising the ground surrounding an aquifer influences the classification of the aquifer. For example, thick, impermeable clays result in low aquifer vulnerability, whereas sand or gravel units can be highly permeable [7].

Based on the *Aquifer Vulnerability Assessment* of South Nation Source Protection studies, the Project Study Area is located mostly in a zone with a high rate of surface water recharge [7][12]. This zone is mostly due to the thinness and relative permeability of the overburden sediments. However, mitigation measures including those presented in Table 5-1 and in the Water Body Report [17] of the Project, will be implemented to minimize any potential impacts to groundwater resources.

3.3.4 Significant groundwater recharge areas

Aquifer recharge areas usually have permeable soil, such as sand or gravel, which allows water to infiltrate the ground. Shallow, fractured bedrock can also be a good recharge area [7]. By definition, "a significant groundwater recharge area (SGRA) means an area within which it is desirable to regulate or monitor drinking water threats that may affect the recharge of an aquifer"[7].

Based on the study done by Intera Engineering Limited (2010), SGRAs cover only small areas outside of the Project Study Area to the south and east [13].

3.3.5 Well head protection and intake protection zones

A wellhead protection area (WHPA) corresponds to an area around a well where land-use activities have the potential to affect the quality and quantity of water that flows into the well. The size and shape of a WHPA is determined by the amount of water being pumped and the direction and speed at which the groundwater travels through the aquifer to get to the well [7].

No WHPA are found within the Project Study Area. The closest three WHPAs are the following:

1. The closest is Finch drinking water source protection located southeast of the Project (Figure 5). The Finch drinking water system is owned by the Township of North Stormont and operated by the Ontario Clean Water Agency (OCWA). The well field contains 2 wells and serves a population of approximately 440 residents [14].
2. The Crysler drinking water system, located east of the Project is also owned by the Township of North Stormont and operated by the OCWA. The well field contains 2 wells and serves a population of approximately 600 residents [15].
3. Finally, one of the well fields of the village of Winchester is located just west of the Project. This system, combined with 3 other well fields (located further), services a population of approximately 2,300 [16].

No intake protection zones (IPZ) were found within the Project Study Area. The closest IPZ is in the village of Casselman, located about 6 km northeast of the Project Study Area.

4 WATER TAKING

Water takings during construction phase can impact local and regional water resources. Proper hydrogeological assessment is important to identify any adverse impact that may result from the Project activities.

4.1 Predicted short-term water takings during construction phase

Localized temporary drawdown of the groundwater table has the potential to temporarily reduce groundwater (baseflow) contributions to adjacent water bodies that are located within the zone of influence (ZOI). Although dewatering activities would only occur for the duration of the construction of foundation, collection line and access road or until groundwater levels have receded to a suitable depth, it may generate small localized changes on groundwater flow immediately adjacent to the foundation location.

Subject to the proposed mitigation measures of the Project, groundwater dewatering is expected to occur as a result of excavation for foundation construction. In the event 50,000 L/day is surpassed, the mitigation measures discussed in the Water Body Report and in Section 11 the Construction Plan Report of the Project are expected to mitigate against potential negative impacts associated with dewatering activities. Additionally, if a volume of 50,000 L/day is surpassed but is less than 400,000 L/day, then registration on the MOECC's Environmental Activity and Sector Registry (EASR) for water taking may be required. It is also possible that that the Project encounters conditions that necessitate additional water takings during turbine foundation dewatering beyond 400,000 L/day. Water taking completed during the construction is subject the REA and does not require a separate PTTW, however, a similar assessment that would be required to obtain a PTTW is provided as part of this REA application.

In order to estimate the dewatering required for keeping the foundation dry, a "big well" approach has been used. In this approach, the radius of influence for a pumping well at the centre of the foundation has been estimated by replacing the group of dewatering wells around the foundation with a single equivalent well.

For unconfined aquifer, groundwater flow to the assumed big well can be written based on Dupuit's formula:

$$Q = \frac{\pi K(H^2 - h^2)}{\ln(\frac{R_0}{r_s})} \quad \text{----------(1)}$$

Where,

K = Hydraulic conductivity of the aquifer
H = Pre-construction saturated aquifer thickness
h = Post-construction saturated aquifer thickness
R_0=Radius of influence
r_s= Radius of the assumed big well

The radius of the assumed big well, r_s is:

$$r_s = \sqrt{\frac{BL}{\pi}} \quad \text{----------(2)}$$

Where,

b = Width of foundation
l= Length of foundation
d= Distance of dewatering wells from the edge of foundation
B= Width of excavation = (b + 2d)
L = Length of excavation =(l + 2d)

For a typical 25 m x 25 m foundation with the dewatering wells at 5 m away from the edge of the foundation:

$$r_s = \sqrt{\frac{(b+2d)*(l+2d)}{\pi}}\sqrt{\frac{(b+10.0m)*(l+10.0m)}{\pi}} = \sqrt{\frac{35.0m * 35.0m}{\pi}} = 19.75m$$

The radius of influence, R_0, is the distance up to which drawdown occurs. R_0 is a function of hydraulic conductivity of the soil, K, and drawdown, h, and can be expressed by using an empirical relationship developed by Sichart and Kryieleis:

$$R_0 = Ch\sqrt{K} \quad \text{---------- (3)}$$

Where, C is a factor equal to 3,000 for radial flow to pumping wells.

Using equations (1), (2) and (3), the anticipated dewatering requirements at individual wind turbine locations were assessed. The calculated values range between 135,000 L and 800,000 L per day. It was assumed in this analytical estimate that there is no connection between the drawdown cone and nearby surface water bodies. The estimate can also be influenced by surface runoff or shallow infiltration. In order to account for these uncertainties, the estimated dewatering requirement has been taken by multiplying the calculated flow of water with a conservative factor of safety of three. Therefore, the estimated daily dewatering at individual turbine site may range between 400,000 L and 2,400,000 L per day.

Dewatering requirement depends mainly on the depths to water level, which were estimated from an interpolated surface based on the water level data compiled from the MOECC water wells collected over a long range of time period. Since water level can vary seasonally and can also change over time, these data should be verified in the field. Therefore, water table data was updated from geotechnical study reports wherever available (see Table 3-3) and at least one geotechnical borehole will be drilled at each turbine foundation prior to turbine foundation construction. Additional groundwater information will be available at that time and revise groundwater dewatering rates will be provided to the MOECC if groundwater rates are expected to exceed 2,400,000 L per day.

During the excavation work, contractor should carefully monitor appropriate sources of surface water and groundwater contribution towards the total dewatering amount and log them separately.

Water can also be needed to suppress dust and use as a directional drilling fluid. Maximum daily demand for this purpose is expected to be less than 50,000 L/d.

4.2 Predicted long-term water takings during operations phase

The activities that will occur during the operational phase of the Project are not anticipated to exceed >50,000 L per day in water takings and no long-term water takings are anticipated.

5 IMPACT ASSESSMENT AND MONITORING RECOMMENDATIONS

Table 5-1 presents the mitigation strategy for potential effects to groundwater. Additional mitigation strategy for potential impacts to groundwater is detailed in the Water Body Report [17].

Table 5-1 Potential Effects Mitigation and Monitoring for Wells

Potential Effect	Project phase	Mitigation Strategy and Monitoring Plan	Performance Objective
Temporary reduction of water quality and quantity in private wells	Construction Phase (Dewatering)	• If any change in well conditions is reported or observed during dewatering period through the complaints procedure, actions will be taking: - Supply water will be provided; - Reduction of the rate and amount of water taking (during dewatering) to prevent negative effect on wells. • Limit duration of dewatering to minimal possible; • Dewatering discharge rates should be evaluated as to not result in erosion and sedimentation to receiving water body; and • Implement groundwater cut-offs, as applicable, to limit groundwater taking.	Minimize any temporary reduction of water quality and quantity on private wells.
Permanent reduction of water quality and quantity in private wells	Operation Phase	If any change in well conditions is reported or observed after the construction period through the complaints procedure, action will be taken to restore water supply, such as drilling a new well, etc.	Avoid any permanent reduction of water quality and quantity on private wells.
Contamination of groundwater due to accidental spills	Construction / Operation / Decommissioning Phase	• All vehicles must be in good condition and have proper operation and maintenance to limit leaks. • Oil trays should be placed under equipment that could present oil or fuel leaks, as applicable. • Develop a site-specific Spill Response Plan and train staff on appropriate procedures.	Avoid any contamination of groundwater.

6 CONCLUSIONS AND RECOMMENDATIONS

This high level hydrogeological assessment was conducted as a desktop study to review the existing hydrogeological conditions within the Project Study Area, describe potential groundwater taking during the construction and operation phase, and identify mitigation measures on potential effects of the Project on groundwater.

This desktop review shows that the Project Study Area is outside the municipal water supply zones, and the only source of drinking water is through private wells. Although there are three WHPAs defined by the South Nation Source Protection Studies falling within 3 km of the Project Study Area, none of those WHPAs intercept it.

Eighty-five percent of the private wells are screened within the fractured bedrock zone. Average overburden thickness is approximately 10 m, mostly composed of till deposits with certain areas of protective clay zones. As a result, proposed mitigation measures, including a site-specific Spill Response Plan, will mitigate potential impacts to water quality and quantity. No permanent or otherwise significant negative potential effects are anticipated, including in the vicinity of wind turbines and other Project components.

There is a potential for groundwater dewatering to exceed 50,000 L/day or 400,000 L/day at certain turbine foundations during the construction phase. Mitigation measures presented in Table 5-1 and in the Project Water Body Report [17] will be implemented to minimize potential impacts to groundwater resources.

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APPENDIX A : MAPS

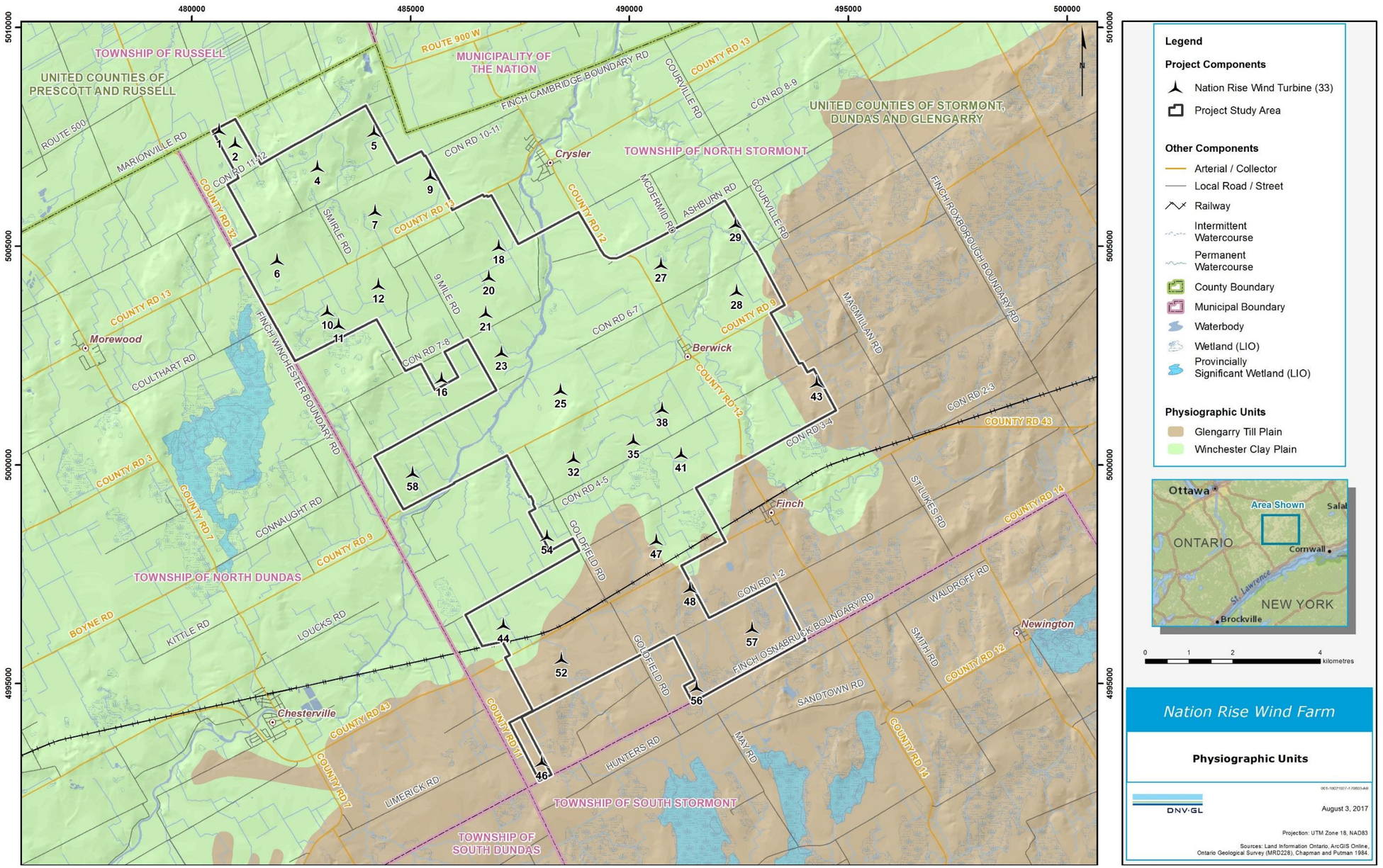


Figure 1 Physiographic Units Map

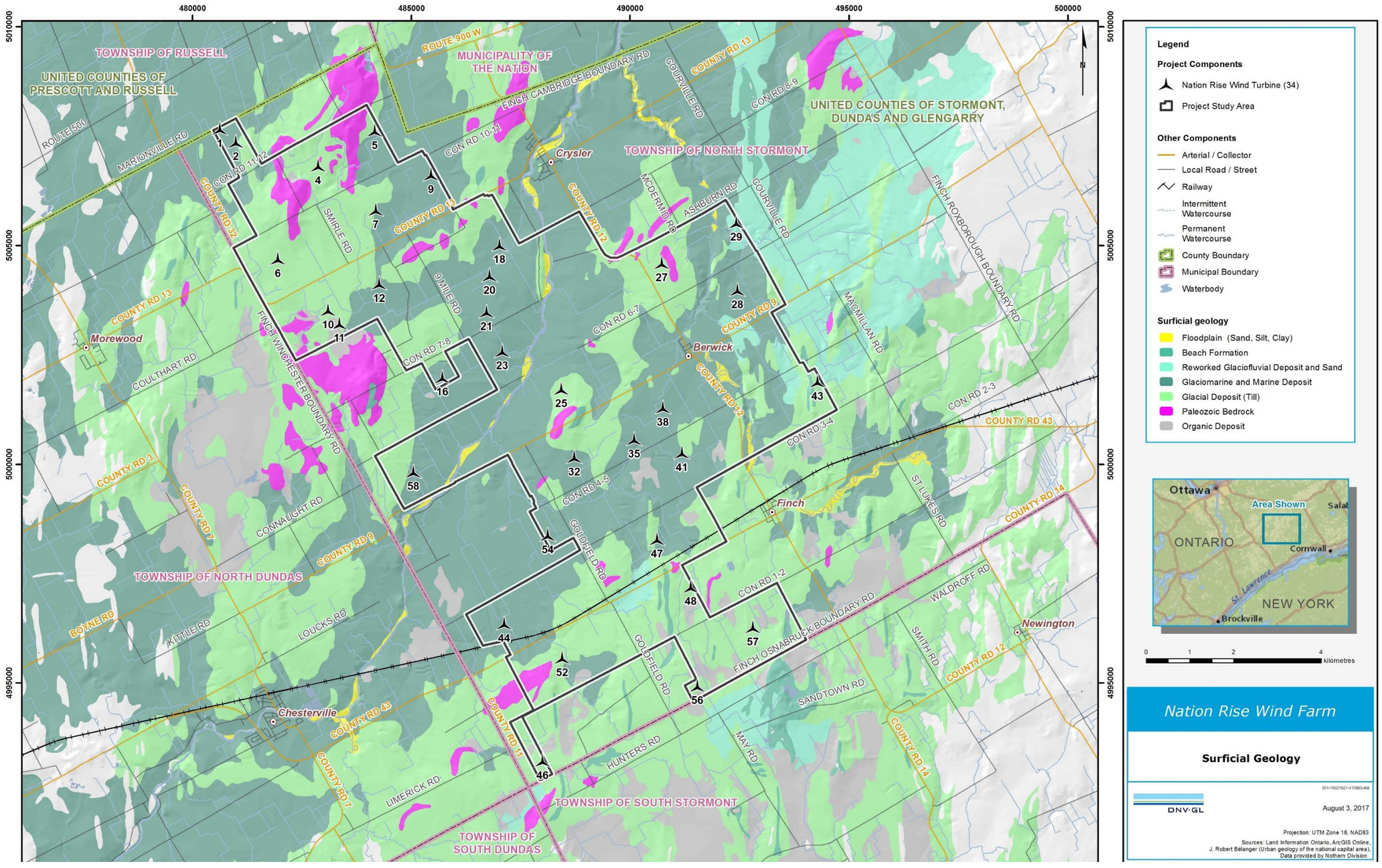


Figure 2 Surficial Geology Map

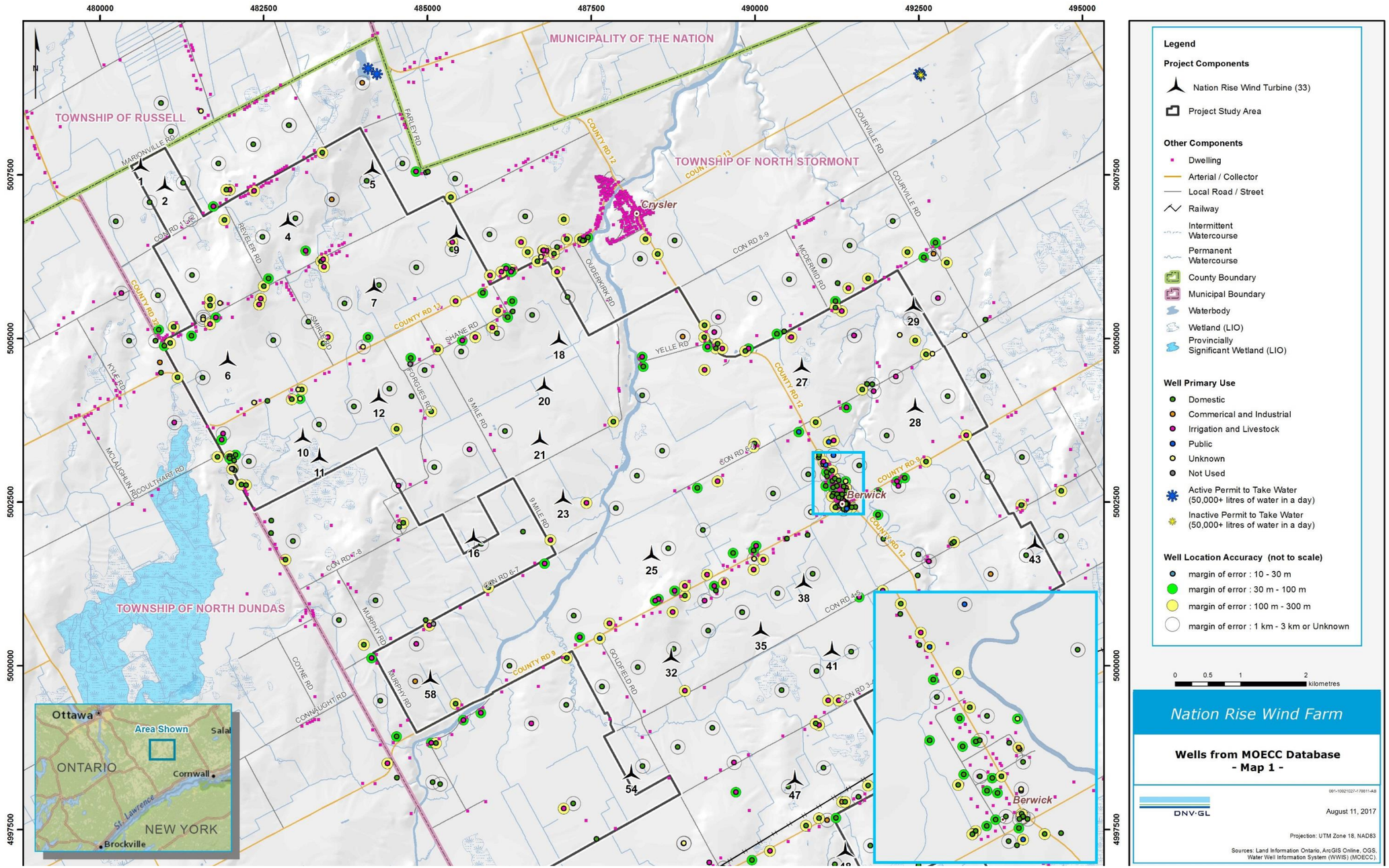


Figure 3 Wells within 1 km of the Project Study Area (Map 1)

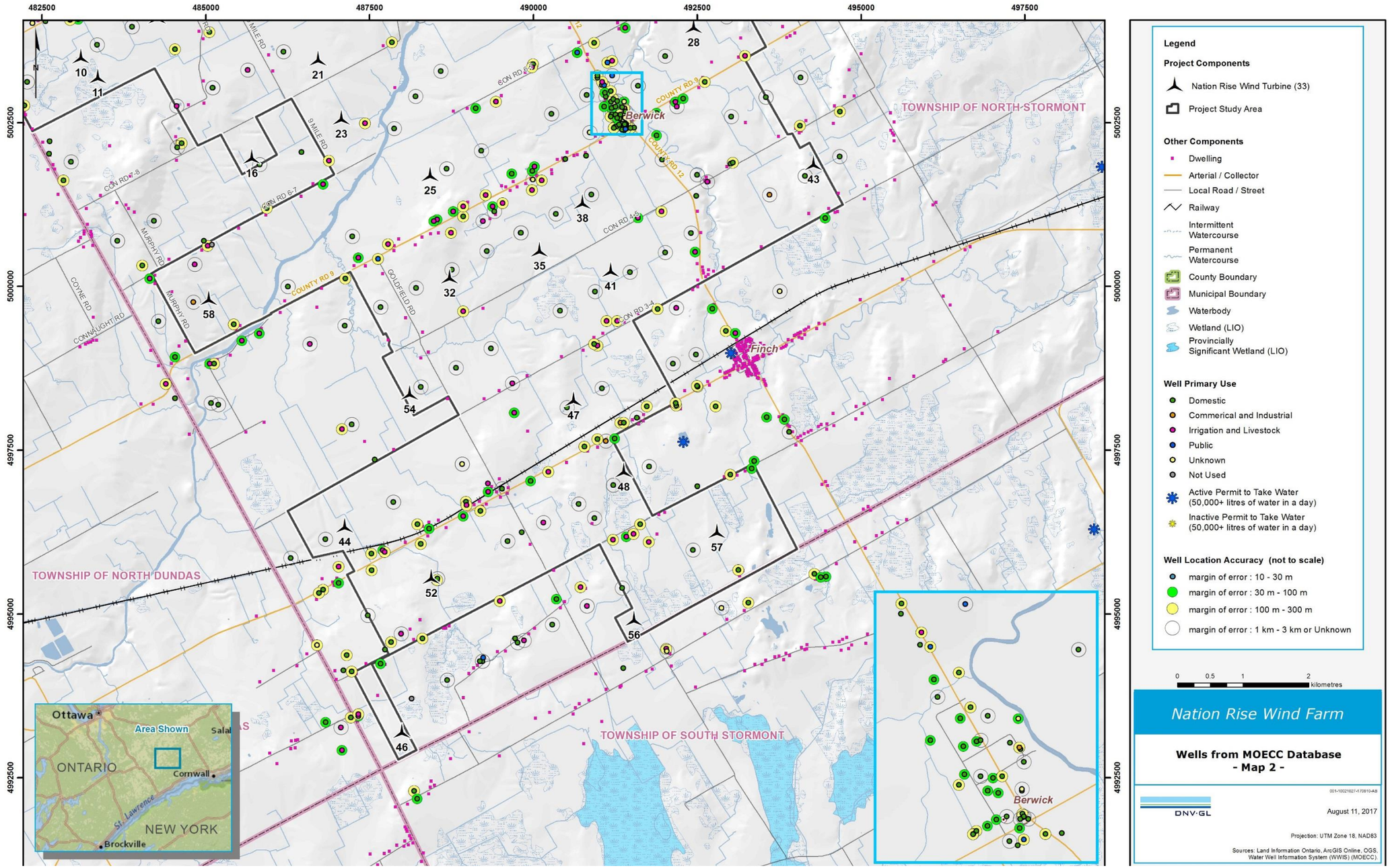


Figure 4 Wells within 1 km of the Project Study Area (Map 2)

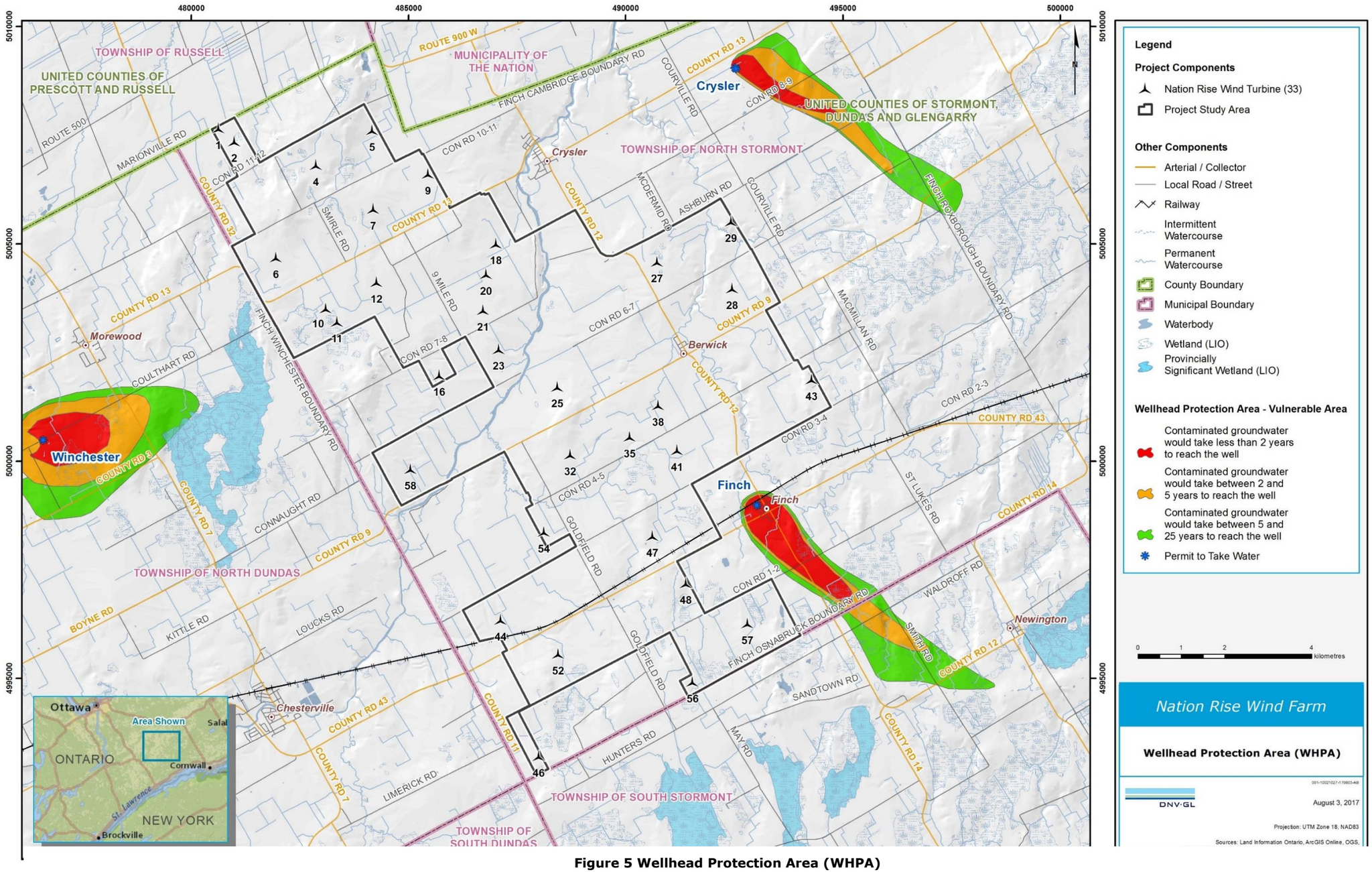


Figure 5 Wellhead Protection Area (WHPA)

APPENDIX B: MOECC WATER WELLS RECORDS

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10415346	5801956	61.00	6.40	18.30	45.1131	-75.1458	Livestock	LIMESTONE	Bedrock	52	86.80
10417503	5804177	27.40	2.70	6.70	45.2057	-75.2004	Domestic	TILL	Bedrock	7	92.44
10417314	5803985	36.00	1.20	4.60	45.2057	-75.2004	Domestic	TILL	Bedrock	7	92.44
10416864	5803529	16.20	9.80	1.20	45.2057	-75.2004	Domestic	TOPSOIL	Bedrock	7	92.44
10417180	5803850	38.10	0.60	1.20	45.2057	-75.2004	Domestic	ROCK	Bedrock	7	92.44
10417146	5803813	53.30	4.90	8.50	45.2057	-75.2004	Domestic	LIMESTONE	Bedrock	7	92.44
10417147	5803814	76.20	5.50	8.50	45.2057	-75.2004	Domestic	HARDPAN	Bedrock	7	92.44
10416692	5803357	30.50	6.10	3.00	45.1132	-75.1457	Domestic	TOPSOIL	Bedrock	52	95.56
10416892	5803557	30.50	10.70	4.60	45.1132	-75.1457	Domestic	TOPSOIL	Bedrock	52	95.56
10414261	5800644	14.30	12.20	0.60	45.2116	-75.1862	Livestock	LIMESTONE	Bedrock	9	113.48
10416213	5802875	30.50	3.00	6.10	45.1368	-75.1207	Domestic	HARDPAN	Bedrock	47	129.83
10417476	5804150	23.80	0.90	1.20	45.2148	-75.2167	Domestic	TILL	Bedrock	4	134.21
10416859	5803524	31.70	1.20	12.20	45.2148	-75.2167	Domestic	SAND	Bedrock	4	134.21
10417074	5803741	18.30	0.60	4.60	45.2148	-75.2167	Domestic	HARDPAN	Bedrock	4	134.21
10416427	5803089	22.90	2.40	3.70	45.2148	-75.2167	Domestic	TOPSOIL	Bedrock	4	134.21
10417195	5803865	19.80	2.10	0.00	45.2148	-75.2167	Domestic	HARDPAN	Bedrock	4	134.21
10417313	5803984	21.30	0.90	3.00	45.2148	-75.2167	Domestic	TILL	Bedrock	4	134.21
10417466	5804140	67.10	0.90	4.60	45.2148	-75.2167	Domestic	LIMESTONE	Bedrock	4	134.21
10417373	5804046	17.40	9.10	3.00	45.1701	-75.1804	Domestic	LIMESTONE	Bedrock	16	135.81
10416464	5803127	19.20	5.50	3.70	45.1557	-75.1430	Domestic	LIMESTONE	Bedrock	32	157.71
10417433	5804107	18.30	1.50	0.00	45.2200	-75.2029	Domestic	TILL	Bedrock	5	179.60
10417383	5804057	18.30	5.20	2.40	45.2200	-75.2029	Domestic	TILL	Bedrock	5	179.60
10417191	5803861	21.30	10.70	5.50	45.2011	-75.0971	Domestic	CLAY	Bedrock	29	181.53
10417370	5804043	25.60	11.60	7.90	45.1687	-75.0745	Domestic	SILT	Bedrock	43	198.80
10417384	5804058	13.70	9.40	2.10	45.1687	-75.0745	Domestic	TILL	Bedrock	43	198.80
10417395	5804069	15.20	11.30	2.70	45.1687	-75.0745	Domestic	TILL	Bedrock	43	198.80
10417458	5804132	22.90	5.80	3.70	45.1661	-75.1160	Domestic	SANDSTONE	Bedrock	38	210.89
10416009	5802666	22.90	6.10	6.10	45.2106	-75.1862	Domestic	CLAY	Bedrock	9	212.50
10415783	5802438	12.20	8.50	0.30	45.2106	-75.1862	Domestic	TOPSOIL	Bedrock	9	212.50
10417469	5804143	39.60	10.70	2.10	45.1396	-75.1490	Domestic	LIMESTONE	Bedrock	54	218.71
10417616	5804290	17.70	9.10	4.60	45.1914	-75.1983	Domestic	TILL	Bedrock	12	226.60
10416812	5803477	67.10	7.00	0.00	45.1914	-75.1983	Domestic	HARDPAN	Bedrock	12	226.98
10416282	5802944	21.30	6.10	4.90	45.1512	-75.1932	Commercial	HARDPAN	Bedrock	58	234.41
10417724	5804398	53.30	22.90	3.70	45.1261	-75.1116	Domestic	PREVIOUSLY DUG	Bedrock	48	239.35
10417332	5804003	76.20	0.30	4.60	45.1261	-75.1116	Domestic	TOPSOIL	Bedrock	48	239.46

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10416611	5803276	54.90	2.10	5.50	45.1261	-75.1116	Domestic	LIMESTONE	Bedrock	48	239.46
10416821	5803486	23.80	4.00	6.10	45.1696	-75.1441	Livestock	HARDPAN	Bedrock	25	281.71
10416014	5802671	15.20	6.10	3.00	45.1696	-75.1441	Domestic	HARDPAN	Bedrock	25	281.71
10416966	5803632	19.80	6.10	1.50	45.2197	-75.2386	Domestic	CLAY	Bedrock	2	284.25
10417336	5804007	91.40	3.70	8.50	45.1554	-75.1085	Domestic	LIMESTONE	Bedrock	41	291.19
10417374	5804047	10.10	9.10	3.70	45.1865	-75.2120	Domestic	CLAY	Bedrock	10	329.36
10417257	5803928	19.80	14.90	3.00	45.1865	-75.2120	Domestic	CLAY	Bedrock	10	329.36
10417048	5803715	13.70	5.20	1.50	45.2170	-75.2451	Domestic	HARDPAN	Bedrock	2	329.52
10416601	5803266	12.20	0.00	3.00	45.1186	-75.1675	Domestic	TOPSOIL	Overburden	44	335.35
10414223	5800606	11.90	0.00	2.10	45.1758	-75.1600	Livestock	GRAVEL	Overburden	23	360.23
10416550	5803214	67.10	5.50	9.10	45.1527	-75.1152	Domestic	SAND	Bedrock	41	372.72
11100094	5804779	22.90	4.30	3.00	45.1287	-75.1047	Domestic	CLAY	Bedrock	48	398.52
10417155	5803822	22.30	7.90	1.50	45.1890	-75.2053	Domestic	GRAVEL	Bedrock	12	399.70
10415942	5802598	13.70	7.00	4.90	45.1890	-75.2053	Domestic	LIMESTONE	Bedrock	12	399.70
10417014	5803681	16.20	12.20	6.40	45.1890	-75.2053	Domestic	ROCK	Bedrock	12	399.70
10417397	5804071	20.70	17.70	3.70	45.2040	-75.0917	Livestock	TILL	Bedrock	29	403.26
10416302	5802964	29.00	1.80	6.10	45.1608	-75.1297	Domestic	HARDPAN	Bedrock	35	417.41
10522163	5804567	56.40	3.70	9.10	45.1608	-75.1297	Domestic	LIMESTONE	Bedrock	35	420.59
10416939	5803604	15.20	12.50	1.50	45.1713	-75.0678	Domestic	TOPSOIL	Bedrock	43	423.44
10416819	5803484	15.20	7.60	0.00	45.1634	-75.1229	Domestic	HARDPAN	Bedrock	38	426.57
10416285	5802947	29.00	25.90	0.00	45.1172	-75.0962	Domestic	HARDPAN	Bedrock	57	439.95
10417030	5803697	22.90	1.20	6.10	45.2123	-75.2231	Domestic	SHALE	Bedrock	4	444.22
10417157	5803824	25.90	2.40	3.70	45.2123	-75.2231	Domestic	TILL	Bedrock	4	444.22
10417457	5804131	12.20	1.80	3.70	45.2123	-75.2231	Domestic	CLAY	Bedrock	4	444.22
10417399	5804073	26.50	1.20	6.70	45.2123	-75.2231	Domestic	LIMESTONE	Bedrock	4	444.22
10417222	5803893	27.40	3.40	3.70	45.2123	-75.2231	Domestic	TILL	Bedrock	4	444.22
10417417	5804091	39.60	3.70	3.00	45.2123	-75.2231	Domestic	LIMESTONE	Bedrock	4	444.22
10416541	5803205	6.70	0.00	0.90	45.1929	-75.2347	Domestic	TOPSOIL	Overburden	6	450.71
10416810	5803475	25.30	3.70	4.90	45.1929	-75.2347	Domestic	LIMESTONE	Bedrock	6	450.71
10417077	5803744	40.50	2.40	2.40	45.1929	-75.2347	Domestic	ROCK	Bedrock	6	450.71
10416556	5803220	6.70	0.00	6.10	45.1929	-75.2347	Domestic	TOPSOIL	Overburden	6	450.71
10416928	5803593	22.90	6.70	3.00	45.1929	-75.2347	Domestic	TOPSOIL	Bedrock	6	450.71
10416596	5803261	24.40	4.30	4.60	45.1929	-75.2347	Domestic	LIMESTONE	Bedrock	6	450.71
10417658	5804332	18.30	6.10	4.60	45.1929	-75.2347	Domestic	TOPSOIL	Bedrock	6	450.71
1002689807	7110376	0.00	0.00	0.00	45.1989	-75.0991				29	466.04
10417043	5803710	18.90	3.70	3.00	45.2224	-75.1959	Domestic	HARDPAN	Bedrock	5	469.39
10416381	5803043	38.10	4.60	4.60	45.2224	-75.1959	Livestock	HARDPAN	Bedrock	5	469.39
10417223	5803894	31.70	0.60	3.70	45.2224	-75.1959	Domestic	TOPSOIL	Bedrock	5	469.39

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10416335	5802997	18.30	3.00	3.00	45.2224	-75.1959	Domestic	LIMESTONE	Bedrock	5	469.39
10415779	5802434	13.70	4.30	2.40	45.2224	-75.1959	Domestic	HARDPAN	Bedrock	5	469.39
10416553	5803217	16.80	5.50	4.60	45.1394	-75.1139	Domestic	LIMESTONE	Bedrock	47	481.89
10522191	5804595	46.60	11.30	3.70	45.1904	-75.1940	Domestic	LIMESTONE	Bedrock	12	499.24
10415359	5801969	18.60	17.70	3.70	45.1982	-75.0961	Domestic	TOPSOIL	Bedrock	29	500.78
10417069	5803736	15.20	1.20	9.80	45.2127	-75.1790	Domestic	HARDPAN	Bedrock	9	502.69
10416249	5802911	3.70	1.20	12.20	45.2127	-75.1790	Domestic	HARDPAN	Bedrock	9	502.69
10414861	5801250	25.90	1.50	3.00	45.2104	-75.2147	Livestock	HARDPAN	Bedrock	4	504.78
10417179	5803849	32.90	25.00	1.20	45.2032	-75.2071	Domestic	TILL	Bedrock	7	505.42
10416163	5802824	18.30	2.40	3.00	45.2032	-75.2071	Domestic	HARDPAN	Bedrock	7	505.42
10416780	5803445	20.70	4.60	0.00	45.2032	-75.2071	Domestic	SHALE	Bedrock	7	505.42
10416536	5803200	19.20	2.40	3.00	45.2032	-75.2071	Domestic	ROCK	Bedrock	7	505.42
10416337	5802999	18.30	3.70	4.60	45.2032	-75.2071	Domestic	HARDPAN	Bedrock	7	505.42
10414225	5800608	21.30	4.90	4.60	45.1986	-75.1202	Livestock	HARDPAN	Bedrock	27	505.67
10415545	5802184	23.20	14.90	4.90	45.1481	-75.1853	Domestic	CLAY	Bedrock	58	521.45
10414187	5800570	10.70	0.00	3.00	45.1500	-75.1408	Livestock	PREVIOUSLY DUG	Overburden	32	525.47
10416474	5803137	22.90	0.00	6.10	45.1532	-75.1500	Domestic	LIMESTONE	Bedrock	32	527.51
10415689	5802341	18.90	7.90	4.90	45.1859	-75.1969	Domestic	CLAY	Bedrock	12	528.24
10541690	5804750	17.40	10.40	3.70	45.1905	-75.0898	Domestic	LIMESTONE	Bedrock	28	532.13
10417529	5804203	76.20	24.40	6.10	45.1120	-75.1099	Domestic	HARDPAN	Bedrock	50	546.24
11325927	5804924	36.60	2.10	3.70	45.1325	-75.1114	Domestic	TILL	Bedrock	48	551.34
10417446	5804120	14.60	14.30	2.40	45.1856	-75.1759	Domestic	CLAY	Bedrock	21	553.54
10417600	5804274	25.30	11.60	4.60	45.1856	-75.1759	Livestock	CLAY	Bedrock	21	553.54
10415755	5802410	15.20	12.20	3.70	45.1856	-75.1759	Domestic	TILL	Bedrock	21	553.54
10415572	5802216	18.60	7.60	3.00	45.1166	-75.1585	Domestic	TILL	Bedrock	44	559.49
10547662	5804777	0.00	0.00	0.00	45.0967	-75.1507	Not Used			46	561.96
10414137	5800520	36.60	6.10	2.40	45.1322	-75.1131	Commercial	LIMESTONE	Bedrock	48	568.53
10414220	5800603	12.20	0.00	3.70	45.1932	-75.0999	Livestock	HARDPAN	Overburden	28	573.51
10415493	5802127	13.10	6.10	1.80	45.1180	-75.1490	Domestic	LIMESTONE	Bedrock	52	573.67
10416867	5803532	32.00	0.30	6.10	45.2016	-75.1706	Domestic	LIMESTONE	Bedrock	18	575.12
10415514	5802150	19.20	5.50	4.60	45.1148	-75.1649	Livestock	HARDPAN	Bedrock	44	589.08
10416301	5802963	42.70	2.10	1.50	45.1851	-75.1017	Domestic	LIMESTONE	Bedrock	28	599.16
10415719	5802372	30.50	1.20	6.10	45.2178	-75.1864	Domestic	ROCK	Bedrock	9	600.01
10414198	5800581	15.20	0.00	1.80	45.1563	-75.1930	Livestock	CLAY	Overburden	58	602.13
1004602161	7209382	31.80	0.00	0.00	45.1900	-75.2157		CLAY		10	611.28
10415380	5801998	13.10	3.70	2.40	45.1183	-75.1048	Livestock	LIMESTONE	Bedrock	50	615.45
10415645	5802297	24.40	0.60	6.10	45.1899	-75.2173	Domestic	HARDPAN	Bedrock	10	623.24

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10414336	5800719	17.70	6.70	5.50	45.2146	-75.2371	Livestock	PREVIOUSLY DUG	Bedrock	2	626.43
10414827	5801215	41.10	3.70	3.70	45.1637	-75.1428	Livestock	HARDPAN	Bedrock	25	627.64
11178703	5804856	47.50	7.90	2.50	45.1994	-75.1216	Domestic	TILL	Bedrock	27	627.95
10414257	5800640	21.30	4.60	2.40	45.2002	-75.2332	Livestock	HARDPAN	Bedrock	6	638.46
10415304	5801910	17.10	3.00	4.60	45.1145	-75.0873	Domestic	SAND	Bedrock	57	638.67
10414222	5800605	16.20	0.00	2.40	45.1707	-75.1669	Livestock	HARDPAN	Overburden	23	639.55
10415448	5802073	33.50	3.40	2.10	45.1037	-75.1013	Livestock	LIMESTONE	Bedrock	56	640.26
11107763	5804836	25.90	11.30	3.60	45.1756	-75.0755	Domestic	TOPSOIL	Bedrock	43	652.35
11325931	5804928	32.90	0.30	1.80	45.1991	-75.1230	Domestic	TILL	Bedrock	27	653.87
10414874	5801263	34.10	1.50	10.70	45.1626	-75.1459	Livestock	HARDPAN	Bedrock	25	654.44
10414157	5800540	24.40	2.10	7.60	45.1325	-75.1147	Domestic	HARDPAN	Bedrock	48	662.31
10415077	5801477	17.10	7.90	1.50	45.2213	-75.1933	Livestock	HARDPAN	Bedrock	5	667.15
10414711	5801096	18.00	12.80	1.80	45.1171	-75.1564	Livestock	PREVIOUSLY DUG	Bedrock	44	667.63
1006097750	7265860	35.40	0.00	16.40	45.1033	-75.1012				56	669.67
10414822	5801210	31.40	0.00	15.20	45.1624	-75.1466	Livestock	LIMESTONE	Bedrock	25	673.23
10415539	5802178	50.00	3.70	5.50	45.1644	-75.1408	Livestock	BOULDERS	Bedrock	25	673.76
10415071	5801471	21.60	1.50	6.70	45.1986	-75.2368	Domestic	HARDPAN	Bedrock	6	682.87
10414219	5800602	33.50	0.00	6.10	45.1912	-75.1042	Livestock	LIMESTONE	Bedrock	28	687.43
10415786	5802441	18.30	6.70	9.10	45.2041	-75.1637	Domestic	TOPSOIL	Bedrock	18	688.80
10414158	5800541	27.10	1.50	15.20	45.1314	-75.1172	Domestic	HARDPAN	Bedrock	47	696.87
10414881	5801270	21.30	1.50	5.50	45.2011	-75.2321	Livestock	HARDPAN	Bedrock	6	702.18
10414154	5800537	18.90	7.90	4.30	45.1169	-75.1560	Livestock	CLAY	Bedrock	44	706.08
10415919	5802575	21.30	1.50	3.40	45.2186	-75.2248	Irrigation	HARDPAN	Bedrock	4	713.33
10417723	5804397	55.80	3.70	3.70	45.1583	-75.1363	Domestic	LIMESTONE	Bedrock	32	713.49
10414189	5800572	54.30	5.50	11.60	45.1608	-75.1432	Livestock	CLAY	Bedrock	32	717.36
10414656	5801040	21.30	2.40	1.50	45.0943	-75.1610	Livestock	HARDPAN	Bedrock	46	718.33
11557161	5805043	21.20	7.90	3.70	45.1648	-75.1782	Domestic	CLAY	Bedrock	16	719.09
11107755	5804827	0.00	0.00	0.00	45.1948	-75.1943	Not Used			12	719.65
10377623	5605280	31.70	1.20	3.00	45.2267	-75.2409	Domestic	CLAY	Bedrock	1	723.46
10416725	5803390	15.20	4.60	4.90	45.2081	-75.1932	Domestic	CLAY	Bedrock	7	723.65
10415782	5802437	16.80	13.70	0.90	45.2081	-75.1932	Domestic	CLAY	Bedrock	7	723.65
10415561	5802203	32.00	0.90	4.90	45.1680	-75.1256	Livestock	HARDPAN	Bedrock	38	725.63
11695273	5805242	18.30	8.50	2.10	45.1010	-75.1097	Domestic	TILL	Bedrock	56	725.84
10415120	5801521	21.30	8.50	6.10	45.0946	-75.1610	Livestock	HARDPAN	Bedrock	46	730.40
10535702	5804662	25.00	14.90	5.50	45.1963	-75.0940	Domestic	CLAY	Bedrock	29	737.34
10415205	5801608	26.80	5.50	4.90	45.1487	-75.1129	Livestock	LIMESTONE	Bedrock	41	738.57

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
1001620153	7106923	25.30	0.00	4.20	45.1895	-75.2246		TILL		6	740.85
10415426	5802049	26.50	4.90	4.30	45.1487	-75.1109	Livestock	HARDPAN	Bedrock	41	742.68
10415063	5801463	15.50	9.80	3.00	45.1985	-75.2025	Domestic	HARDPAN	Bedrock	7	744.94
1001776769	7110905	36.40	0.00	2.50	45.1709	-75.1210	Domestic	SAND		38	747.98
1006215014	7268965	0.00	0.00	0.00	45.2009	-75.2346				6	749.70
10416303	5802965	49.40	1.50	0.90	45.1921	-75.1044	Domestic	HARDPAN	Bedrock	28	751.05
10414236	5800619	15.20	9.40	4.00	45.1913	-75.2154	Domestic	HARDPAN	Bedrock	10	751.14
1003602977	7171309	15.20	0.00	2.70	45.1913	-75.2161		CLAY		10	752.20
10415646	5802298	61.00	13.70	4.60	45.1144	-75.1585	Domestic	HARDPAN	Bedrock	44	756.05
1003351371	7152983	15.20	0.00	3.00	45.1714	-75.1170	Domestic	CLAY		38	756.20
10417465	5804139	45.70	1.80	2.10	45.2174	-75.2097	Domestic	LIMESTONE	Bedrock	4	757.50
10416593	5803258	39.60	0.90	6.10	45.2174	-75.2097	Domestic	HARDPAN	Bedrock	4	757.50
10417583	5804257	16.20	14.00	3.70	45.2174	-75.2097	Domestic	CLAY	Bedrock	4	757.50
10417042	5803709	25.00	1.50	2.10	45.2174	-75.2097	Domestic	HARDPAN	Bedrock	4	757.50
10417527	5804201	30.50	8.50	6.10	45.2174	-75.2097	Domestic	LIMESTONE	Bedrock	4	757.50
10417441	5804115	39.60	1.80	3.00	45.2174	-75.2097	Domestic	ROCK	Bedrock	4	757.50
10417032	5803699	25.90	2.70	3.70	45.2174	-75.2097	Domestic	TILL	Bedrock	4	757.50
10416776	5803441	38.10	0.90	6.10	45.2174	-75.2097	Domestic	HARDPAN	Bedrock	4	757.50
10416592	5803257	39.60	0.90	6.10	45.2174	-75.2097	Cooling And A/C	HARDPAN	Bedrock	4	757.50
10417728	5804402	63.40	0.90	6.10	45.1095	-75.1167	Domestic	LIMESTONE	Bedrock	56	758.23
10417353	5804024	54.30	0.00	7.60	45.1095	-75.1167	Domestic	HARDPAN	Bedrock	56	758.68
10415952	5802608	30.50	6.70	4.90	45.1095	-75.1167	Livestock	LIMESTONE	Bedrock	56	758.68
1002689798	7110376	0.00	0.00	0.00	45.1964	-75.0928				29	761.97
10522192	5804596	23.50	5.50	5.20	45.1718	-75.1723	Domestic	LIMESTONE	Bedrock	16	764.33
10414221	5800604	14.00	0.00	6.70	45.1641	-75.1790	Domestic	HARDPAN	Overburden	16	769.05
10414260	5800643	15.20	0.00	4.60	45.2092	-75.2113	Livestock	LIMESTONE	Bedrock	4	772.32
10416729	5803394	29.00	1.20	3.00	45.1981	-75.2209	Domestic	LIMESTONE	Bedrock	6	772.51
10416730	5803395	25.90	1.50	3.00	45.1981	-75.2209	Domestic	BOULDERS	Bedrock	6	772.51
10416063	5802724	30.20	0.90	6.10	45.1981	-75.2209	Domestic	HARDPAN	Bedrock	6	772.51
10414161	5800544	13.70	6.70	1.50	45.1347	-75.1096	Domestic	HARDPAN	Bedrock	48	776.99
10535710	5804670	15.20	0.00	2.40	45.2089	-75.2117	Domestic	UNKNOWN TYPE	Overburden	4	777.27
10415250	5801653	10.70	4.90	1.20	45.1347	-75.1103	Commercial	HARDPAN	Bedrock	48	778.62
10414904	5801296	18.30	5.20	0.60	45.1201	-75.1473	Domestic	HARDPAN	Bedrock	52	780.72
1006158486	7267304	24.30	0.00	8.20	45.2012	-75.2346				6	781.01
10415491	5802125	19.50	7.60	3.00	45.1630	-75.1408	Domestic	TOPSOIL	Bedrock	25	781.21
10414685	5801069	13.10	11.90	1.50	45.1459	-75.1838	Livestock	HARDPAN	Bedrock	58	785.80

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10414298	5800681	7.60	2.40	0.90	45.2071	-75.1788	Livestock	CLAY	Bedrock	9	785.94
10414864	5801253	19.20	17.40	5.20	45.2096	-75.0945	Domestic	LIMESTONE	Bedrock	29	786.03
11557173	5805055	78.00	4.00	2.90	45.1260	-75.0953	Domestic	LIMESTONE	Bedrock	57	790.53
11178731	5804884	30.30	3.00	2.70	45.1897	-75.2221	Domestic	CLAY	Bedrock	10	791.75
10414695	5801080	30.50	1.20	1.80	45.2165	-75.2327	Livestock	STONES	Bedrock	2	794.20
10415097	5801497	48.80	1.50	10.70	45.1957	-75.1942	Domestic	LIMESTONE	Bedrock	12	795.53
10065474	1801105	21.90	5.50	7.60	45.1929	-75.2395	Domestic	LIMESTONE	Bedrock	6	800.98
10415433	5802056	38.10	7.60	4.90	45.1667	-75.1275	Livestock	HARDPAN	Bedrock	38	802.06
10541631	5804691	25.90	5.80	6.10	45.1661	-75.0814	Commercial	LIMESTONE	Bedrock	43	804.38
10414131	5800514	20.10	0.90	3.00	45.1194	-75.1077	Livestock	LIMESTONE	Bedrock	50	806.32
1004202412	7191365	24.30	0.00	6.70	45.1629	-75.0706	Domestic	CLAY		43	809.93
10415540	5802179	30.50	3.70	3.40	45.1208	-75.1064	Domestic	HARDPAN	Bedrock	48	812.13
10416440	5803102	38.10	10.70	6.10	45.1751	-75.1543	Domestic	GRAVEL	Bedrock	23	813.19
11107753	5804825	30.50	0.60	2.70	45.2239	-75.2115	Domestic	TILL	Bedrock	5	813.50
11328884	5804913	0.00	0.00	0.00	45.1216	-75.1153	Domestic			48	816.81
1003576376	7169522	45.00	0.00	4.40	45.2212	-75.1913	Domestic	CLAY		5	817.50
10065280	1800908	14.60	5.20	2.10	45.0941	-75.1625	Domestic	HARDPAN	Bedrock	46	818.30
10415780	5802435	15.20	8.50	0.60	45.1883	-75.1902	Domestic	HARDPAN	Bedrock	12	819.36
10414195	5800578	10.10	0.00	0.90	45.1815	-75.0940	Domestic	HARDPAN	Overburden	28	824.06
10416763	5803428	25.60	0.90	5.20	45.1940	-75.1915	Domestic	CLAY	Bedrock	12	825.02
10415520	5802156	18.30	2.70	5.20	45.2067	-75.1053	Domestic	HARDPAN	Bedrock	29	825.64
11766562	7044128	24.40	7.90	1.80	45.1922	-75.1055	Domestic	CLAY	Bedrock	28	826.97
10416475	5803139	25.90	15.20	3.00	45.1485	-75.2000	Domestic	SAND	Bedrock	58	827.77
10417178	5803848	19.20	1.80	1.50	45.1485	-75.2000	Domestic	SHALE	Bedrock	58	827.77
10414663	5801047	30.50	5.50	4.00	45.1191	-75.1091	Livestock	LIMESTONE	Bedrock	50	827.83
10417337	5804008	15.80	10.70	4.30	45.1422	-75.1422	Domestic	TILL	Bedrock	54	828.07
10417670	5804344	30.50	7.00	7.00	45.1235	-75.1183	Domestic	HARDPAN	Bedrock	48	832.45
1006097831	7265862	16.70	0.00	5.50	45.1972	-75.2035				12	835.51
10414962	5801356	13.70	4.30	3.70	45.1126	-75.1649	Domestic	TOPSOIL	Bedrock	44	835.93
10535711	5804671	17.70	0.00	2.40	45.2082	-75.2111	Livestock	UNKNOWN TYPE	Overburden	7	838.13
10522213	5804617	18.30	7.00	7.00	45.2021	-75.1744	Domestic	LIMESTONE	Bedrock	18	842.66
10415560	5802201	13.70	12.20	3.00	45.1589	-75.1905	Livestock	HARDPAN	Bedrock	58	846.13
10415950	5802606	42.70	10.10	4.90	45.1238	-75.1543	Domestic	HARDPAN	Bedrock	44	847.83
10417317	5803988	31.40	6.10	3.00	45.1238	-75.1543	Livestock	CLAY	Bedrock	44	847.83
10415897	5802553	27.40	6.70	1.80	45.1238	-75.1543	Domestic	CLAY	Bedrock	44	847.83
1003564720	7168579	47.00	0.00	6.20	45.2213	-75.1910	Domestic	CLAY		5	848.21
10415544	5802183	31.10	10.10	4.90	45.1869	-75.1155	Domestic	HARDPAN	Bedrock	27	849.13

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
1006260607	7272467	0.00	0.00	0.00	45.1681	-75.1274				38	852.88
10415674	5802326	22.30	0.00	4.90	45.2103	-75.0977	Domestic	HARDPAN	Overburden	29	854.09
10415906	5802562	25.30	17.70	1.20	45.2089	-75.0900	Domestic	GRAVEL	Bedrock	29	858.12
10414226	5800609	48.20	5.20	3.00	45.1914	-75.1064	Domestic	HARDPAN	Bedrock	28	859.50
10535728	5804688	0.00	0.00	0.00	45.1591	-75.1896	Not Used			58	865.32
10415085	5801485	18.90	3.70	6.70	45.2013	-75.1754	Domestic	HARDPAN	Bedrock	18	865.44
1004964861	7224491	8.50	0.00	2.60	45.1629	-75.1069	Livestock	HARDPAN		38	868.21
10414883	5801272	19.80	2.40	1.50	45.1970	-75.1285	Livestock	HARDPAN	Bedrock	27	869.52
10414262	5800645	29.90	4.60	8.20	45.2075	-75.1766	Livestock	LIMESTONE	Bedrock	9	874.09
10414159	5800542	7.90	6.10	1.20	45.1354	-75.1071	Domestic	HARDPAN	Bedrock	48	874.97
10415634	5802286	19.20	5.80	1.80	45.1207	-75.1496	Domestic	HARDPAN	Bedrock	52	876.34
10417062	5803729	19.80	12.80	1.50	45.2203	-75.1857	Domestic	CLAY	Bedrock	9	877.23
10416039	5802698	39.60	0.90	2.40	45.1721	-75.1374	Domestic	HARDPAN	Bedrock	25	880.23
10414227	5800610	19.50	18.30	3.40	45.2101	-75.0926	Cooling And A/C	QUICKSAND	Bedrock	29	880.65
10414196	5800579	14.60	5.20	4.30	45.1851	-75.0862	Livestock	HARDPAN	Bedrock	28	881.57
1001759032	7110376	15.80	0.00	0.00	45.1989	-75.0866		SAND		29	885.49
10415998	5802655	22.90	6.10	3.00	45.1581	-75.1016	Domestic	CLAY	Bedrock	41	887.90
10535703	5804663	30.50	0.60	6.10	45.1659	-75.1365	Livestock	LIMESTONE	Bedrock	25	888.76
10414491	5800874	12.20	4.60	4.60	45.0840	-75.1502	Domestic	LIMESTONE	Bedrock	46	888.86
10417226	5803897	29.00	0.00	4.60	45.1814	-75.2256	Domestic	LIMESTONE	Bedrock	10	891.39
10415760	5802415	21.30	8.80	3.00	45.1814	-75.2256	Domestic	HARDPAN	Bedrock	10	891.39
10417124	5803791	25.00	1.50	2.40	45.1814	-75.2256	Domestic	LIMESTONE	Bedrock	10	891.39
10417581	5804255	25.90	0.00	5.50	45.2224	-75.2317	Domestic	CLAY	Bedrock	2	893.94
10414980	5801377	22.90	0.90	4.60	45.2066	-75.2219	Domestic	TOPSOIL	Bedrock	4	896.71
10414859	5801248	61.00	45.70	15.80	45.2080	-75.1757	Livestock	PREVIOUSLY DUG	Bedrock	9	901.71
10535706	5804666	50.30	0.90	6.10	45.2028	-75.2332	Domestic	TOPSOIL	Bedrock	6	903.50
10416865	5803530	47.50	6.40	12.20	45.2143	-75.2516	Domestic	CLAY	Bedrock	1	903.84
10417123	5803790	25.00	3.00	3.70	45.2143	-75.2516	Domestic	TILL	Bedrock	1	903.84
10417078	5803745	260.60	4.30	3.00	45.2143	-75.2516	Domestic	TILL	Bedrock	1	903.84
10416965	5803631	27.40	0.60	2.10	45.2143	-75.2516	Domestic	TOPSOIL	Bedrock	1	903.84
10416037	5802696	73.20	7.60	3.00	45.1050	-75.1486	Domestic	LIMESTONE	Bedrock	52	904.11
10415001	5801398	32.00	4.00	6.70	45.1890	-75.1095	Livestock	TOPSOIL	Bedrock	27	904.22
10416905	5803570	82.30	42.70	0.00	45.1503	-75.1030	Domestic	LIMESTONE	Bedrock	41	904.67
1001649110	7107858	15.00	0.00	4.70	45.2031	-75.2313		TOPSOIL		6	905.32
10414231	5800614	18.30	2.40	3.70	45.1967	-75.1291	Domestic	HARDPAN	Bedrock	27	905.59
10415009	5801406	14.30	13.10	3.00	45.1469	-75.1804	Livestock	LIMESTONE	Bedrock	58	914.65

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10414722	5801107	12.20	7.30	0.90	45.1360	-75.1309	Livestock	LIMESTONE	Bedrock	47	917.91
23048392	7048392	6.20	0.00	3.70	45.1596	-75.1912	Domestic	SILT		58	925.92
1005114595	7226736	32.90	0.00	9.80	45.1693	-75.1275	Domestic	CLAY		38	926.13
10415936	5802592	22.90	4.30	4.60	45.1186	-75.1117	Livestock	CLAY	Bedrock	50	926.55
10415149	5801551	18.90	15.20	4.60	45.1775	-75.0677	Domestic	HARDPAN	Bedrock	43	926.82
10417241	5803912	18.90	4.90	5.50	45.1976	-75.2410	Domestic	HARDPAN	Bedrock	6	927.02
10415146	5801547	13.70	3.70	1.50	45.1276	-75.0889	Domestic	TOPSOIL	Bedrock	57	931.56
10414190	5800573	21.00	1.80	2.70	45.1637	-75.1348	Domestic	LIMESTONE	Bedrock	35	934.25
10417138	5803805	11.90	8.80	2.10	45.1160	-75.1742	Domestic	CLAY	Bedrock	44	935.84
10065279	1800907	13.70	2.70	3.70	45.0928	-75.1644	Livestock	LIMESTONE	Bedrock	46	937.66
10414160	5800543	8.50	0.00	2.40	45.1453	-75.1147	Livestock	HARDPAN	Overburden	47	937.88
10414988	5801385	27.70	2.40	4.60	45.1699	-75.1270	Livestock	HARDPAN	Bedrock	38	938.80
11100106	5804791	27.40	12.20	7.60	45.1988	-75.1080	Livestock	TILL	Bedrock	27	939.76
10415644	5802296	25.00	3.00	4.90	45.2187	-75.2301	Domestic	HARDPAN	Bedrock	2	939.87
10417493	5804167	18.30	4.30	1.20	45.1501	-75.1220	Domestic	CLAY	Bedrock	35	940.38
10415652	5802304	16.80	7.30	1.20	45.1455	-75.1154	Domestic	TOPSOIL	Bedrock	47	941.66
10416188	5802849	15.20	7.60	3.70	45.1988	-75.1080	Domestic	HARDPAN	Bedrock	27	941.89
10417053	5803720	19.20	10.40	3.00	45.1988	-75.1080	Domestic	TOPSOIL	Bedrock	27	941.89
11325965	5804962	31.80	0.00	7.90	45.2035	-75.1745	Domestic	TOPSOIL	Bedrock	18	941.96
10415432	5802055	30.50	7.60	3.00	45.1649	-75.1332	Livestock	HARDPAN	Bedrock	35	943.44
10065608	1801240	39.90	11.60	2.40	45.0896	-75.1642	Livestock	LIMESTONE	Bedrock	46	945.26
10414135	5800518	16.50	2.10	3.00	45.1056	-75.1528	Livestock	HARDPAN	Bedrock	52	946.11
10414955	5801349	22.90	13.10	1.50	45.2046	-75.1802	Domestic	LIMESTONE	Bedrock	9	952.62
10414692	5801077	11.90	0.00	4.30	45.1427	-75.1900	Livestock	CLAY	Overburden	58	953.11
10415517	5802153	17.40	16.20	3.00	45.1427	-75.1891	Domestic	GRAVEL	Bedrock	58	957.55
10416674	5803339	9.10	6.10	1.50	45.1991	-75.1775	Domestic	GRAVEL	Bedrock	18	958.19
10414908	5801300	19.50	4.60	3.00	45.1544	-75.2017	Livestock	HARDPAN	Bedrock	58	963.96
10415274	5801679	34.40	5.50	9.10	45.2146	-75.2305	Domestic	HARDPAN	Bedrock	4	969.54
10414659	5801043	12.50	11.60	3.70	45.1856	-75.1187	Public	HARDPAN	Bedrock	27	973.33
10414130	5800513	11.00	6.10	2.70	45.1121	-75.1180	Livestock	TOPSOIL	Bedrock	56	974.62
10414182	5800565	45.70	2.70	2.70	45.1401	-75.1312	Livestock	TOPSOIL	Bedrock	47	976.98
10415687	5802339	25.00	4.90	6.70	45.1999	-75.2403	Domestic	SHALE	Bedrock	6	983.14
10414134	5800517	12.80	7.00	2.40	45.1117	-75.1679	Domestic	HARDPAN	Bedrock	44	987.79
10417757	5804431	25.30	4.30	10.70	45.1344	-75.1624	Domestic	TILL	Bedrock	54	987.91
10414188	5800571	32.30	1.20	1.80	45.1624	-75.1370	Livestock	HARDPAN	Bedrock	35	988.47
10414264	5800647	45.70	7.30	6.10	45.2116	-75.1728	Livestock	LIMESTONE	Bedrock	9	989.40
10415372	5801990	53.30	0.60	4.60	45.2187	-75.2295	Livestock	LIMESTONE	Bedrock	2	989.84
10414852	5801241	45.70	1.50	27.40	45.2076	-75.1748	Livestock	HARDPAN	Bedrock	9	991.85

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10415847	5802503	61.00	1.50	27.40	45.2078	-75.1745	Domestic	LIMESTONE	Bedrock	9	992.38
10415139	5801540	16.50	8.50	2.10	45.2035	-75.1855	Livestock	HARDPAN	Bedrock	9	993.08
10415317	5801923	31.40	1.80	5.50	45.2037	-75.2333	Domestic	TOPSOIL	Bedrock	6	995.98
10414793	5801181	15.20	12.20	1.50	45.1436	-75.1968	Domestic	HARDPAN	Bedrock	58	996.95
10414733	5801119	16.20	4.90	3.00	45.1973	-75.2421	Domestic	STONES	Bedrock	6	1000.47
10415376	5801994	35.70	3.70	5.20	45.2030	-75.2237	Livestock	HARDPAN	Bedrock	6	1000.64
10414907	5801299	21.60	8.50	4.60	45.1644	-75.1351	Livestock	HARDPAN	Bedrock	35	1004.09
10414633	5801016	11.60	10.10	1.80	45.1674	-75.1681	Livestock	HARDPAN	Bedrock	23	1010.18
1003843555	7182064	24.30	0.00	2.00	45.0830	-75.1496	Domestic	CLAY		46	1012.61
10414259	5800642	24.40	5.80	4.60	45.1985	-75.2103	Livestock	HARDPAN	Bedrock	7	1021.31
23050350	7050350	50.30	0.00	0.00	45.1935	-75.2428	Domestic	HARDPAN		6	1033.27
11107756	5804828	43.00	0.00	8.70	45.2055	-75.2228	Domestic	LIMESTONE	Bedrock	4	1034.14
1000067597	7101025	9.10	0.00	0.00	45.1950	-75.2430	Commercial	HARDPAN		6	1035.04
10415492	5802126	61.90	18.00	4.60	45.2054	-75.1091	Livestock	LIMESTONE	Bedrock	29	1036.30
10377392	5605049	18.30	4.30	4.60	45.2306	-75.2429	Domestic	TILL	Bedrock	1	1037.17
10377415	5605072	19.20	7.60	4.30	45.2306	-75.2429	Domestic	HARDPAN	Bedrock	1	1037.17
10377102	5604557	22.90	2.40	6.70	45.2306	-75.2429	Domestic	ROCK	Bedrock	1	1037.17
10415323	5801929	21.30	8.20	5.50	45.2021	-75.1772	Domestic	HARDPAN	Bedrock	18	1038.71
10415443	5802068	18.30	6.10	5.50	45.1999	-75.1784	Livestock	LIMESTONE	Bedrock	18	1042.16
10415099	5801499	12.80	0.00	2.10	45.2116	-75.0922	Domestic	SAND	Overburden	29	1047.76
1004077617	7184813	55.10	0.00	9.90	45.1823	-75.2282	Domestic	CLAY		10	1053.82
10415288	5801893	16.20	8.20	2.40	45.1112	-75.1687	Domestic	LIMESTONE	Bedrock	44	1055.71
10417133	5803800	54.90	6.70	0.00	45.1093	-75.0906		CLAY	Bedrock	50	1061.63
10415389	5802008	21.30	3.00	6.10	45.2076	-75.1658	Livestock	HARDPAN	Bedrock	18	1062.17
10415849	5802505	15.80	9.80	4.60	45.2027	-75.1116	Domestic	HARDPAN	Bedrock	27	1062.31
10415709	5802361	19.20	10.40	3.70	45.2022	-75.1104	Livestock	HARDPAN	Bedrock	27	1067.78
10414940	5801333	13.70	6.10	1.50	45.1793	-75.0981	Domestic	SAND	Bedrock	28	1071.00
10417532	5804206	43.60	12.80	9.10	45.0993	-75.1438	Domestic	CLAY	Bedrock	46	1075.87
10416748	5803413	51.80	4.00	6.10	45.0993	-75.1438	Domestic	HARDPAN	Bedrock	46	1075.87
10416482	5803146	20.70	19.80	5.50	45.1831	-75.1827	Livestock	SAND	Bedrock	21	1081.18
10415425	5802048	19.80	5.50	3.70	45.1370	-75.1052	Domestic	HARDPAN	Bedrock	48	1084.72
10414655	5801039	32.90	1.80	0.60	45.1218	-75.1407	Livestock	LIMESTONE	Bedrock	52	1085.30
10414197	5800580	24.40	4.30	4.60	45.1592	-75.1555	Livestock	PREVIOUSLY DUG	Bedrock	32	1087.61
10417599	5804273	19.20	7.60	1.80	45.2152	-75.1720	Livestock	CLAY	Bedrock	9	1091.18
10416251	5802913	24.10	0.90	7.60	45.2152	-75.1720	Domestic	LIMESTONE	Bedrock	9	1091.18
10415784	5802439	22.90	6.10	3.00	45.2152	-75.1720	Livestock	ROCK	Bedrock	9	1091.18
10415850	5802506	45.70	10.70	18.30	45.2152	-75.1720	Domestic	SHALE	Bedrock	9	1091.18

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10417096	5803763	48.80	2.10	4.60	45.2152	-75.1720	Domestic	TILL	Bedrock	9	1091.18
10417377	5804051	45.70	0.90	3.00	45.2152	-75.1720	Domestic	HARDPAN	Bedrock	9	1091.18
10414258	5800641	27.70	7.60	9.10	45.2038	-75.2234	Livestock	HARDPAN	Bedrock	6	1093.15
10414126	5800509	28.00	18.90	6.40	45.1102	-75.1336	Livestock	PREV. DRILLED	Bedrock	52	1096.15
10414235	5800618	21.30	7.00	5.50	45.1852	-75.2306	Livestock	LIMESTONE	Bedrock	6	1098.20
23053861	7053861	115.80	0.00	5.70	45.1815	-75.2285	Domestic	SAND		10	1099.95
10415718	5802371	29.00	3.70	5.50	45.1730	-75.1956	Domestic	HARDPAN	Bedrock	16	1103.95
10522121	5804525	18.30	14.00	1.20	45.1296	-75.1579	Domestic	CLAY	Bedrock	54	1110.43
10415542	5802181	19.80	1.20	9.10	45.2102	-75.1715	Domestic	HARDPAN	Bedrock	9	1111.15
10417575	5804249	19.20	4.60	2.40	45.1081	-75.1592	Domestic	LIMESTONE	Bedrock	52	1111.49
1006219629	7268977	24.30	0.00	4.10	45.1746	-75.1163				38	1112.37
10522105	5804509	15.20	0.00	3.00	45.2010	-75.0825	Domestic	HARDPAN	Overburden	29	1112.46
10415243	5801646	30.50	1.20	5.50	45.1781	-75.2262	Domestic	CLAY	Bedrock	10	1118.49
10416535	5803199	32.60	0.90	4.30	45.2006	-75.2141	Domestic	TILL	Bedrock	7	1120.72
10417163	5803830	34.10	1.20	3.70	45.2006	-75.2141	Domestic	HARDPAN	Bedrock	7	1120.72
10417162	5803829	22.90	1.20	3.70	45.2006	-75.2141	Domestic	HARDPAN	Bedrock	7	1120.72
10417199	5803869	27.40	1.20	1.80	45.2006	-75.2141	Domestic	TILL	Bedrock	7	1120.72
10417122	5803789	33.50	1.20	3.40	45.2006	-75.2141	Domestic	CLAY	Bedrock	7	1120.72
10417099	5803766	50.30	1.20	5.20	45.2006	-75.2141	Domestic	TOPSOIL	Bedrock	7	1120.72
10414698	5801083	22.90	3.00	3.00	45.1015	-75.1567	Domestic	CLAY	Bedrock	46	1123.53
10415272	5801677	55.50	11.00	2.10	45.1280	-75.1242	Livestock	LIMESTONE	Bedrock	47	1128.85
10414136	5800519	31.70	9.10	9.80	45.1045	-75.1547	Domestic	PREVIOUSLY DUG	Bedrock	52	1130.72
10414819	5801207	15.80	4.30	4.30	45.1284	-75.0848	Domestic	HARDPAN	Bedrock	57	1132.61
10414164	5800547	14.60	11.60	2.40	45.1505	-75.0995	Livestock	LIMESTONE	Bedrock	41	1133.75
10416869	5803534	24.40	7.00	4.90	45.1505	-75.1569	Domestic	LIMESTONE	Bedrock	32	1136.80
10416691	5803356	21.30	10.10	4.60	45.1505	-75.1569	Domestic	SAND	Bedrock	32	1136.80
10414186	5800569	9.10	0.00	1.50	45.1572	-75.1574	Public	QUICKSAND	Overburden	32	1138.00
10415868	5802524	35.10	6.70	5.50	45.1976	-75.2112	Domestic	HARDPAN	Bedrock	7	1139.52
10414941	5801334	13.40	0.00	1.50	45.1788	-75.0997	Livestock	SAND	Overburden	28	1144.58
10415538	5802177	44.20	1.50	4.30	45.1821	-75.2294	Domestic	LIMESTONE	Bedrock	10	1147.10
10522122	5804526	22.90	3.40	3.70	45.1801	-75.2284	Domestic	TILL	Bedrock	10	1147.58
10414889	5801279	15.20	2.70	2.70	45.2036	-75.1117	Domestic	HARDPAN	Bedrock	27	1147.62
10065497	1801128	13.40	4.00	9.40	45.1979	-75.2439	Domestic	HARDPAN	Bedrock	6	1150.99
10416510	5803174	19.80	16.20	6.10	45.1933	-75.0829	Domestic	TILL	Bedrock	28	1151.66
10416946	5803611	25.00	10.40	4.30	45.1933	-75.0829	Domestic	HARDPAN	Bedrock	28	1151.66
10414180	5800563	19.80	11.60	1.50	45.1338	-75.1643	Livestock	HARDPAN	Bedrock	54	1151.72

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10415287	5801892	15.50	8.20	2.70	45.1100	-75.0854	Domestic	SAND	Bedrock	57	1151.81
10415656	5802308	30.50	1.50	9.10	45.1562	-75.2032	Domestic	LIMESTONE	Bedrock	58	1153.98
10414764	5801150	28.70	20.70	7.60	45.1818	-75.2294	Domestic	HARDPAN	Bedrock	10	1154.51
10414229	5800612	17.40	4.90	5.50	45.1724	-75.1964	Domestic	LIMESTONE	Bedrock	16	1155.55
10414990	5801387	15.80	6.70	4.60	45.1994	-75.2432	Domestic	HARDPAN	Bedrock	6	1160.50
10535691	5804651	27.40	1.20	3.00	45.1804	-75.2287	Domestic	CLAY	Bedrock	10	1160.55
10416053	5802714	13.70	13.10	3.00	45.1869	-75.1548	Domestic	CLAY	Bedrock	21	1162.19
10415778	5802433	22.90	2.40	4.30	45.1782	-75.2271	Domestic	HARDPAN	Bedrock	10	1168.50
10535690	5804650	35.10	0.90	3.00	45.1803	-75.2289	Domestic	LIMESTONE	Bedrock	10	1172.34
10066057	1801700	54.90	1.80	3.70	45.0935	-75.1674	Domestic	HARDPAN	Bedrock	46	1178.69
10535693	5804653	0.00	0.00	0.00	45.1803	-75.2290	Not Used			10	1179.45
10417235	5803906	24.40	0.30	3.00	45.1969	-75.1889	Domestic	TOPSOIL	Bedrock	12	1180.50
10415111	5801512	25.90	4.30	4.60	45.1689	-75.1315	Domestic	FILL	Bedrock	38	1181.46
10416794	5803459	53.30	11.30	6.10	45.1795	-75.1502	Domestic	GRAVEL	Bedrock	23	1187.76
10414937	5801330	15.20	3.40	3.70	45.1843	-75.2309	Livestock	LIMESTONE	Bedrock	6	1192.61
10415691	5802343	13.70	0.00	3.00	45.1842	-75.1129	Public	CLAY	Overburden	27	1195.17
11695275	5805244	53.90	4.30	5.20	45.1732	-75.2212	Domestic	CLAY	Bedrock	11	1196.79
10415809	5802464	16.80	11.00	9.10	45.1844	-75.1120	Livestock	HARDPAN	Bedrock	27	1201.58
10414194	5800577	10.70	0.00	2.40	45.1782	-75.0994	Livestock	CLAY	Overburden	28	1209.77
10414183	5800566	15.20	6.40	5.50	45.1638	-75.1024	Livestock	HARDPAN	Bedrock	38	1209.93
11695262	5805231	24.40	7.90	2.10	45.2060	-75.1112	Domestic	TILL	Bedrock	29	1215.93
10416010	5802667	21.30	15.20	4.60	45.1810	-75.1070	Domestic	SAND	Bedrock	28	1216.26
10417249	5803920	25.30	1.80	5.50	45.1810	-75.1070	Domestic	HARDPAN	Bedrock	28	1216.26
10416712	5803377	19.80	7.90	1.80	45.1810	-75.1070	Domestic	TILL	Bedrock	28	1216.26
10416957	5803623	16.80	10.70	5.50	45.1810	-75.1070	Domestic	CLAY	Bedrock	28	1216.26
10415728	5802382	61.00	2.40	3.00	45.1004	-75.1623	Domestic	LIMESTONE	Bedrock	46	1223.16
10417372	5804045	38.10	2.40	2.40	45.1449	-75.1354	Domestic	LIMESTONE	Bedrock	32	1224.37
10417125	5803792	17.70	13.40	1.50	45.1533	-75.1749	Domestic	GRAVEL	Bedrock	58	1226.77
10416442	5803104	19.50	11.60	2.40	45.1533	-75.1749	Domestic	CLAY	Bedrock	58	1226.77
10068832	1804605	48.80	9.10	1.80	45.1867	-75.2402	Livestock	SHALE	Bedrock	6	1233.53
1005668032	7247817	14.90	0.00	2.40	45.1705	-75.0885	Domestic	HARDPAN		43	1235.26
10414961	5801355	19.80	10.70	4.30	45.1105	-75.1227	Domestic	LIMESTONE	Bedrock	56	1236.73
10417733	5804407	37.50	8.50	3.00	45.1070	-75.1235	Domestic	TILL	Bedrock	56	1250.97
10414232	5800615	45.70	2.40	2.40	45.1970	-75.1336	Livestock	HARDPAN	Bedrock	27	1252.18
1004213439	7192526	53.30	0.00	2.90	45.1295	-75.0843	Domestic	CLAY		57	1252.74
10417563	5804237	38.70	1.50	3.70	45.1806	-75.1896	Livestock	CLAY	Bedrock	16	1254.73
10417786	5804460	35.40	1.80	3.00	45.1806	-75.1896	Domestic	TILL	Bedrock	16	1256.82
1003708279	7178901	30.90	0.00	2.30	45.1779	-75.1385	Domestic	CLAY		25	1260.02

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10415260	5801663	16.80	9.40	0.60	45.1233	-75.1401	Livestock	FILL	Bedrock	52	1260.15
1003359220	7153905	21.30	0.00	2.50	45.2295	-75.2351		ROCK		1	1263.46
10414239	5800622	37.50	7.60	9.10	45.2090	-75.1696	Domestic	HARDPAN	Bedrock	18	1265.57
11178702	5804855	23.80	11.60	4.50	45.1703	-75.0889	Domestic	TILL	Bedrock	43	1267.53
10415557	5802197	35.10	10.70	4.60	45.1752	-75.1116	Domestic	HARDPAN	Bedrock	38	1271.13
10415870	5802526	23.50	2.70	3.70	45.1781	-75.1965	Livestock	HARDPAN	Bedrock	11	1271.50
10414202	5800585	13.70	12.20	1.80	45.1752	-75.1116	Domestic	CLAY	Bedrock	38	1272.44
11173211	1805146	30.50	4.00	2.10	45.1035	-75.1559	Domestic	LIMESTONE	Bedrock	52	1278.63
10517061	1804849	29.60	0.60	6.10	45.1785	-75.2291	Domestic	LIMESTONE	Bedrock	10	1279.39
10416971	5803637	29.00	12.80	7.60	45.1795	-75.0821	Domestic	TOPSOIL	Bedrock	43	1281.23
10417526	5804200	19.20	15.20	4.60	45.1795	-75.0821	Domestic	TILL	Bedrock	43	1281.23
10416333	5802995	30.50	10.40	4.60	45.1795	-75.0821	Domestic	HARDPAN	Bedrock	43	1281.23
10415513	5802149	27.70	1.20	6.10	45.1985	-75.1817	Livestock	HARDPAN	Bedrock	18	1282.90
10414203	5800586	11.60	0.00	1.80	45.1753	-75.1115	Domestic	CLAY	Overburden	38	1285.48
10415290	5801895	31.40	7.90	1.80	45.1225	-75.1374	Domestic	HARDPAN	Bedrock	52	1288.58
10414878	5801267	16.80	14.60	0.30	45.1959	-75.1492	Livestock	CLAY	Bedrock	18	1291.69
10415785	5802440	15.20	4.90	1.50	45.2039	-75.1274	Domestic	HARDPAN	Bedrock	27	1293.54
10415921	5802577	36.60	3.00	4.90	45.2039	-75.1274	Domestic	HARDPAN	Bedrock	27	1293.54
10415846	5802502	36.60	3.00	4.90	45.2039	-75.1274	Domestic	LIMESTONE	Bedrock	27	1293.54
10414155	5800538	9.10	5.80	3.00	45.1238	-75.1402	Domestic	CLAY	Bedrock	52	1301.39
10414192	5800575	19.80	9.40	1.80	45.1750	-75.1100	Domestic	HARDPAN	Bedrock	38	1302.52
10541658	5804718	24.40	11.30	3.00	45.1749	-75.1096	Domestic	TOPSOIL	Bedrock	38	1303.23
10415935	5802591	60.40	2.40	3.00	45.1184	-75.1322	Domestic	CLAY	Bedrock	52	1303.54
10414139	5800522	13.40	6.10	0.90	45.1371	-75.0994	Domestic	CLAY	Bedrock	48	1309.13
10535724	5804684	19.80	15.80	4.30	45.1290	-75.1410	Domestic	LIMESTONE	Bedrock	54	1309.94
10417323	5803994	44.50	5.80	0.00	45.1290	-75.1410		GRAVEL	Bedrock	54	1311.22
10416380	5803042	45.70	3.70	3.70	45.1290	-75.1410	Domestic	HARDPAN	Bedrock	54	1311.22
10416283	5802945	12.20	0.00	1.20	45.1290	-75.1410	Livestock	HARDPAN	Bedrock	54	1311.22
10415837	5802493	37.50	4.60	3.70	45.1290	-75.1410	Domestic	LIMESTONE	Bedrock	54	1311.22
10417324	5803995	44.50	5.80	0.00	45.1290	-75.1410		SAND	Bedrock	54	1311.22
10416529	5803193	22.90	0.00	3.70	45.2250	-75.2249	Domestic	TILL	Bedrock	4	1311.76
10417076	5803743	18.90	0.30	2.40	45.2250	-75.2249	Domestic	HARDPAN	Bedrock	4	1311.76
10417188	5803858	22.90	3.00	0.90	45.2250	-75.2249	Domestic	SHALE	Bedrock	4	1311.76
10416012	5802669	15.20	6.40	3.00	45.2250	-75.2249	Domestic	HARDPAN	Bedrock	4	1311.76
10541671	5804731	12.20	5.50	3.70	45.2250	-75.2249	Domestic	CLAY	Bedrock	4	1312.59
10414973	5801369	13.10	11.00	1.50	45.1755	-75.1110	Domestic	CLAY	Bedrock	38	1317.28
1001647682	7107753	46.50	0.00	6.00	45.2096	-75.1689		TOPSOIL		18	1319.17
23047849	7047849	53.60	0.00	10.10	45.1006	-75.1639	Domestic	CLAY		46	1319.25

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10417072	5803739	20.70	2.10	6.10	45.1704	-75.2170	Domestic	CLAY	Bedrock	11	1322.87
10415098	5801498	18.00	3.70	2.10	45.1582	-75.0958	Livestock	HARDPAN	Bedrock	41	1326.40
10068705	1804478	36.60	0.60	5.80	45.1820	-75.2317	Domestic	HARDPAN	Bedrock	10	1328.59
10414191	5800574	52.70	13.10	2.40	45.1750	-75.1094	Public	LIMESTONE	Bedrock	38	1330.93
10414138	5800521	14.00	5.50	2.10	45.1374	-75.0996	Domestic	HARDPAN	Bedrock	48	1335.10
10535726	5804686	0.00	0.00	0.00	45.2105	-75.1686	Livestock			9	1335.55
10414238	5800621	36.60	3.00	9.10	45.2100	-75.1664	Domestic	CLAY	Bedrock	18	1339.92
10415036	5801435	16.50	15.20	1.50	45.1946	-75.1490	Domestic	CLAY	Bedrock	18	1341.10
10415580	5802225	43.30	2.40	6.10	45.1977	-75.1346	Domestic	HARDPAN	Bedrock	27	1344.25
10535725	5804685	0.00	0.00	0.00	45.2105	-75.1684	Livestock			9	1345.76
10415370	5801983	13.70	6.10	4.90	45.1824	-75.1148	Domestic	HARDPAN	Bedrock	27	1347.31
10414658	5801042	21.00	10.40	3.70	45.1757	-75.1106	Domestic	HARDPAN	Bedrock	38	1350.08
10416528	5803192	31.70	1.80	2.70	45.2335	-75.2038	Industrial	TILL	Bedrock	5	1350.93
10415848	5802504	45.70	1.80	10.70	45.1971	-75.1349	Domestic	HARDPAN	Bedrock	27	1351.31
11766738	7044313	20.00	2.40	2.30	45.1715	-75.2213	Domestic	LIMESTONE	Bedrock	11	1356.59
10415836	5802492	46.60	5.80	8.50	45.1840	-75.1273	Domestic	LIMESTONE	Bedrock	27	1358.01
10414760	5801146	18.00	12.80	4.90	45.1754	-75.1096	Domestic	LIMESTONE	Bedrock	38	1358.73
10417394	5804068	15.80	14.00	1.50	45.2146	-75.1005	Domestic	TILL	Bedrock	29	1359.45
10416013	5802670	22.90	4.60	6.10	45.2112	-75.1089	Livestock	HARDPAN	Bedrock	29	1361.21
10416972	5803638	16.80	10.70	3.00	45.2112	-75.1089	Domestic	GRAVEL	Bedrock	29	1361.21
10417542	5804216	12.20	4.00	3.70	45.1608	-75.0966	Domestic	HARDPAN	Bedrock	41	1364.46
10416572	5803237	15.20	11.60	4.60	45.1822	-75.0754	Domestic	SAND	Bedrock	43	1367.74
10416824	5803489	36.60	16.80	4.60	45.1822	-75.0754	Domestic	ROCK	Bedrock	43	1367.74
10416742	5803407	39.60	16.80	5.50	45.1822	-75.0754	Domestic	GRAVEL	Bedrock	43	1367.74
10414942	5801335	18.60	14.30	3.70	45.1267	-75.1277	Domestic	HARDPAN	Bedrock	47	1369.36
10414201	5800584	7.60	0.00	4.00	45.1758	-75.1101	Domestic	GRAVEL	Overburden	38	1373.98
10416253	5802915	44.20	1.50	2.40	45.2066	-75.1207	Domestic	HARDPAN	Bedrock	27	1375.01
10417672	5804346	36.60	1.50	4.60	45.2066	-75.1207	Domestic	LIMESTONE	Bedrock	27	1375.01
10417675	5804349	31.40	0.60	5.50	45.1965	-75.1844	Domestic	CLAY	Bedrock	20	1378.99
23053656	7053656	30.00	0.00	4.40	45.1821	-75.1148	Domestic	SAND		27	1382.26
10414193	5800576	11.60	8.50	3.00	45.1752	-75.1084	Domestic	HARDPAN	Bedrock	38	1386.41
10414210	5800593	12.50	11.30	3.40	45.1757	-75.1095	Domestic	MEDIUM SAND	Bedrock	38	1387.95
10415140	5801541	61.00	8.50	6.70	45.2105	-75.1678	Livestock	HARDPAN	Bedrock	9	1391.20
10414209	5800592	12.50	0.00	10.10	45.1757	-75.1094	Domestic	MEDIUM SAND	Overburden	38	1397.01
10414972	5801368	16.50	8.50	1.50	45.1773	-75.1033	Domestic	HARDPAN	Bedrock	28	1397.72
10416102	5802763	24.40	10.10	2.40	45.1709	-75.1023	Domestic	CLAY	Bedrock	38	1399.23
10414205	5800588	13.70	0.00	4.60	45.1758	-75.1094	Domestic	GRAVEL	Overburden	38	1401.06
10414211	5800594	29.90	12.20	1.80	45.1757	-75.1092	Domestic	CLAY	Bedrock	38	1401.10

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10417315	5803986	22.90	0.00	3.00	45.2070	-75.2368	Domestic	LIMESTONE	Bedrock	2	1407.22
10414224	5800607	20.10	5.50	4.60	45.1835	-75.1275	Livestock	ROCK	Bedrock	27	1407.24
10414217	5800600	13.10	12.20	6.10	45.1759	-75.1094	Domestic	HARDPAN	Bedrock	38	1407.61
10417642	5804316	22.90	5.80	0.00	45.1824	-75.1120	Public	LIMESTONE	Bedrock	27	1409.00
10414204	5800587	19.50	10.40	4.60	45.1768	-75.1122	Domestic	HARDPAN	Bedrock	38	1415.19
11768026	7045681	18.30	11.30	2.20	45.1753	-75.1077	Domestic	TILL	Bedrock	38	1419.70
10066208	1801860	16.80	9.40	0.60	45.1399	-75.1985	Livestock	HARDPAN	Bedrock	58	1423.25
1002478464	7124269	22.90	0.00	0.90	45.1024	-75.1368	Public	HARDPAN		52	1428.69
10414821	5801209	9.10	0.00	3.00	45.1766	-75.1110	Domestic	HARDPAN	Overburden	38	1430.27
10414794	5801182	25.90	9.10	3.00	45.1766	-75.1110	Domestic	HARDPAN	Bedrock	38	1430.27
10415010	5801407	28.30	8.50	3.00	45.1573	-75.1612	Livestock	HARDPAN	Bedrock	32	1433.43
10414906	5801298	19.80	9.80	1.20	45.1765	-75.1105	Domestic	HARDPAN	Bedrock	38	1436.62
10414263	5800646	9.80	2.10	7.60	45.2109	-75.1658	Domestic	HARDPAN	Bedrock	18	1437.00
10416805	5803470	16.80	7.60	3.00	45.1210	-75.1252	Livestock	LIMESTONE	Bedrock	48	1439.38
10414700	5801085	36.60	1.20	7.60	45.1981	-75.1842	Livestock	HARDPAN	Bedrock	20	1444.32
1003359228	7153909	24.40	0.00	1.10	45.1019	-75.1375	Domestic	ROCK		52	1444.85
10417318	5803989	33.50	0.60	0.00	45.2276	-75.2180	Domestic	HARDPAN	Bedrock	5	1448.55
10414230	5800613	27.40	3.00	1.50	45.1993	-75.1352	Livestock	LIMESTONE	Bedrock	27	1449.63
11100109	5804794	31.40	3.70	5.50	45.2276	-75.2180	Domestic	SAND	Bedrock	5	1452.13
10417576	5804250	25.30	9.10	5.50	45.1768	-75.0888	Domestic	TILL	Bedrock	28	1454.23
10414974	5801370	19.20	9.10	0.30	45.1771	-75.1120	Domestic	HARDPAN	Bedrock	38	1456.31
10415428	5802051	19.80	1.80	6.10	45.1815	-75.1139	Livestock	LIMESTONE	Bedrock	27	1459.75
10417749	5804423	19.20	7.60	2.10	45.1480	-75.1638	Domestic	CLAY	Bedrock	54	1463.76
10416509	5803173	7.00	1.20	2.70	45.1019	-75.1370	Domestic	SAND	Bedrock	52	1467.14
10416693	5803358	15.20	4.90	1.50	45.1019	-75.1370	Domestic	LIMESTONE	Bedrock	52	1467.14
10416858	5803523	16.20	7.30	2.40	45.1019	-75.1370	Domestic	CLAY	Bedrock	52	1467.14
10414199	5800582	13.70	0.00	3.00	45.1770	-75.1113	Domestic	LIMESTONE	Bedrock	38	1467.93
10417470	5804144	56.40	7.00	12.20	45.1771	-75.1237	Domestic	TILL	Bedrock	38	1470.21
10415326	5801932	68.30	1.50	4.60	45.1027	-75.1633	Domestic	TOPSOIL	Bedrock	46	1471.55
10417508	5804182	16.80	4.30	5.50	45.2042	-75.2434	Domestic	LIMESTONE	Bedrock	6	1473.95
10417137	5803804	77.70	2.70	6.10	45.2042	-75.2434	Domestic	TOPSOIL	Bedrock	6	1473.95
10417020	5803687	70.10	0.90	4.60	45.2042	-75.2434	Domestic	HARDPAN	Bedrock	6	1473.95
10414853	5801242	22.90	3.70	2.10	45.1973	-75.1365	Livestock	LIMESTONE	Bedrock	27	1476.92
10414995	5801392	11.00	8.20	0.90	45.1770	-75.1107	Domestic	LIMESTONE	Bedrock	38	1477.77
1003571368	7169246	24.30	0.00	3.00	45.1766	-75.1095	Domestic	CLAY		38	1478.11
1006226770	7270086	0.00	0.00	0.00	45.1766	-75.1095				38	1483.51
10541630	5804690	40.80	0.60	6.70	45.1623	-75.2009	Domestic	TOPSOIL	Bedrock	58	1484.46
10415495	5802129	31.40	4.60	4.60	45.1941	-75.1371	Domestic	HARDPAN	Bedrock	27	1490.19

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10415442	5802067	13.70	6.40	3.00	45.1941	-75.1371	Livestock	CLAY	Bedrock	27	1490.19
10522084	5804487	13.70	6.10	1.80	45.1603	-75.1624	Domestic	CLAY	Bedrock	25	1493.68
10414212	5800595	12.80	11.30	4.90	45.1770	-75.1103	Domestic	LIMESTONE	Bedrock	38	1495.44
10417261	5803932	18.90	0.00	3.00	45.1906	-75.1492	Domestic	HARDPAN	Overburden	20	1500.06
11695110	5805079	18.30	4.90	3.80	45.1811	-75.1140	Domestic	LIMESTONE	Bedrock	27	1501.64
10417731	5804405	52.70	1.80	0.00	45.2014	-75.1344	Livestock	TILL	Bedrock	27	1501.99
10414218	5800601	21.30	4.30	4.30	45.1811	-75.1135	Public	LIMESTONE	Bedrock	27	1515.38
10415543	5802182	21.30	7.60	4.90	45.1788	-75.1345	Livestock	HARDPAN	Bedrock	25	1528.90
1004013580	7184357	18.20	0.00	3.20	45.1788	-75.1096		CLAY		28	1534.05
10417601	5804275	25.30	2.40	4.60	45.2091	-75.1138	Domestic	LIMESTONE	Bedrock	29	1537.81
10416597	5803262	8.20	0.60	1.50	45.2091	-75.1138	Domestic	LIMESTONE	Bedrock	29	1537.81
10416519	5803183	75.30	1.20	1.80	45.2091	-75.1138	Domestic	HARDPAN	Bedrock	29	1537.81
10417165	5803832	76.20	0.60	3.00	45.2091	-75.1138	Domestic	CLAY	Bedrock	29	1537.81
10417063	5803730	61.90	0.60	4.60	45.2091	-75.1138	Domestic	HARDPAN	Bedrock	29	1537.81
10417148	5803815	20.10	1.20	3.00	45.2091	-75.1138	Domestic	TILL	Bedrock	29	1537.81
10416884	5803549	47.20	1.20	3.40	45.2091	-75.1138	Domestic	HARDPAN	Bedrock	29	1537.81
10416881	5803546	13.70	12.20	3.00	45.2091	-75.1138	Domestic	TILL	Bedrock	29	1537.81
10416870	5803535	32.00	1.20	1.80	45.2091	-75.1138	Domestic	SHALE	Bedrock	29	1537.81
10416734	5803399	6.70	1.50	6.10	45.2091	-75.1138	Domestic	ROCK	Bedrock	29	1537.81
10417265	5803936	16.80	0.60	2.40	45.2091	-75.1138	Domestic	HARDPAN	Bedrock	29	1537.81
10414816	5801204	18.60	11.30	4.90	45.1781	-75.1135	Domestic	CLAY	Bedrock	38	1538.97
10067055	1802814	25.30	2.70	5.50	45.1979	-75.2490	Domestic	CLAY	Bedrock	6	1539.04
10414985	5801382	19.80	8.50	1.50	45.1780	-75.1121	Domestic	HARDPAN	Bedrock	38	1547.67
1005265681	7234397	45.70	0.00	4.30	45.1742	-75.1033	Domestic	CLAY		38	1552.83
10414185	5800568	11.30	0.00	6.10	45.1373	-75.1897	Domestic	GRAVEL	Overburden	58	1553.32
10522162	5804566	43.60	5.20	7.60	45.1050	-75.1307	Domestic	TILL	Bedrock	52	1559.78
1003506092	7162824	23.40	0.00	1.40	45.1196	-75.1294	Domestic	CLAY		52	1560.63
10415594	5802241	30.50	8.80	4.90	45.2121	-75.1639	Domestic	CLAY	Bedrock	18	1565.18
10415851	5802507	21.90	21.30	4.60	45.1986	-75.1371	Domestic	LIMESTONE	Bedrock	27	1566.85
10524145	1804955	19.80	16.50	4.30	45.1379	-75.1967	Domestic	CLAY	Bedrock	58	1570.81
10414208	5800591	11.30	9.80	7.30	45.1775	-75.1094	Domestic	HARDPAN	Bedrock	38	1571.44
10415075	5801475	22.60	10.10	3.70	45.1781	-75.1115	Domestic	LIMESTONE	Bedrock	38	1577.65
10414614	5800997	17.40	7.90	5.80	45.2118	-75.1608	Domestic	LIMESTONE	Bedrock	18	1579.40
10415394	5802015	19.20	7.90	2.70	45.1803	-75.1122	Domestic	GRAVEL	Bedrock	28	1582.60
10414206	5800589	10.10	0.00	2.40	45.1782	-75.1113	Domestic	GRAVEL	Overburden	38	1585.95
10417266	5803937	19.20	8.80	2.40	45.1371	-75.1883	Domestic	CLAY	Bedrock	58	1587.79
10414900	5801292	13.10	9.80	2.40	45.2119	-75.1605	Domestic	HARDPAN	Bedrock	18	1590.41
10415126	5801527	12.50	8.20	3.00	45.2121	-75.1613	Domestic	CLAY	Bedrock	18	1594.08

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10415673	5802325	22.90	8.20	1.20	45.1544	-75.1637	Domestic	HARDPAN	Bedrock	32	1594.11
1003711961	7179681	19.80	0.00	0.60	45.1252	-75.1359	Livestock	HARDPAN		52	1599.39
10414207	5800590	10.70	0.00	3.40	45.1789	-75.1110	Domestic	STONES	Overburden	28	1602.40
10414213	5800596	53.90	12.20	4.00	45.1779	-75.1096	Industrial	LIMESTONE	Bedrock	28	1605.09
10414216	5800599	84.40	53.90	3.00	45.1779	-75.1096	Industrial	LIMESTONE	Bedrock	28	1605.09
10416217	5802879	19.80	7.30	2.70	45.1139	-75.0726	Domestic	PREVIOUSLY DUG	Bedrock	57	1606.49
10522195	5804599	13.70	11.00	3.00	45.1779	-75.1095	Domestic	LIMESTONE	Bedrock	38	1606.71
1003589110	7170474	18.20	0.00	3.40	45.1781	-75.1100	Domestic	CLAY		38	1613.00
10416804	5803469	45.70	6.10	6.10	45.1798	-75.1169	Domestic	GRAVEL	Bedrock	27	1620.75
10416054	5802715	19.20	11.00	4.60	45.1798	-75.1169	Domestic	GRAVEL	Bedrock	27	1620.75
10417018	5803685	25.90	4.30	3.00	45.1798	-75.1169	Domestic	LIMESTONE	Bedrock	27	1620.75
10417248	5803919	33.50	2.40	5.50	45.1798	-75.1169	Domestic	HARDPAN	Bedrock	27	1620.75
10416590	5803255	10.40	6.10	3.00	45.1798	-75.1169	Domestic	TOPSOIL	Bedrock	27	1620.75
10415835	5802491	19.20	13.40	1.20	45.1798	-75.1169	Domestic	TOPSOIL	Bedrock	27	1620.75
10417086	5803753	24.40	12.20	4.60	45.1798	-75.1169	Domestic	CLAY	Bedrock	27	1620.75
10415941	5802597	25.90	6.40	2.40	45.1798	-75.1169	Domestic	HARDPAN	Bedrock	27	1620.75
10415289	5801894	20.10	7.90	5.50	45.1679	-75.2185	Domestic	HARDPAN	Bedrock	11	1626.44
10547661	5804776	39.00	0.90	4.00	45.1045	-75.1302	Domestic	LIMESTONE	Bedrock	52	1626.52
10414104	5800487	10.10	2.10	0.90	45.1428	-75.1001	Domestic	HARDPAN	Bedrock	47	1626.63
10415275	5801680	7.90	0.00	2.10	45.1792	-75.1117	Domestic	HARDPAN	Overburden	28	1626.83
10417029	5803696	44.20	1.20	4.60	45.1830	-75.1453	Domestic	LIMESTONE	Bedrock	25	1627.85
10415305	5801911	29.90	6.70	4.60	45.2002	-75.1371	Domestic	HARDPAN	Bedrock	27	1628.78
10415076	5801476	14.30	5.50	3.00	45.1800	-75.1134	Domestic	HARDPAN	Bedrock	27	1629.25
10414926	5801319	21.60	11.60	2.10	45.1788	-75.1122	Domestic	HARDPAN	Bedrock	38	1637.85
10414184	5800567	19.80	0.00	1.80	45.1678	-75.0935	Livestock	LIMESTONE	Bedrock	43	1640.64
10414854	5801243	41.10	3.70	1.50	45.1504	-75.0925	Domestic	HARDPAN	Bedrock	41	1642.38
10414928	5801321	30.50	7.30	5.50	45.2123	-75.1598	Domestic	HARDPAN	Bedrock	18	1645.24
10415166	5801569	18.30	7.90	3.00	45.2148	-75.1645	Domestic	LIMESTONE	Bedrock	9	1655.06
10416554	5803218	76.20	4.30	6.70	45.1454	-75.1706	Livestock	CLAY	Bedrock	58	1674.06
10416926	5803591	19.80	0.00	3.00	45.1596	-75.2080	Domestic	ROCK	Bedrock	58	1674.56
10417401	5804075	25.90	1.20	1.80	45.1596	-75.2080	Domestic	TILL	Bedrock	58	1674.56
10416724	5803389	18.30	0.00	2.40	45.1596	-75.2080	Domestic	TILL	Overburden	58	1674.56
10415948	5802604	18.90	0.30	4.90	45.1596	-75.2080	Domestic	TOPSOIL	Bedrock	58	1674.56
10414125	5800508	19.80	3.70	3.00	45.1048	-75.1289	Livestock	HARDPAN	Bedrock	52	1687.96
10414200	5800583	11.60	9.10	6.10	45.1795	-75.1132	Domestic	HARDPAN	Bedrock	38	1690.91
23049749	7049749	48.80	0.00	8.00	45.1263	-75.1360	Livestock	TILL		52	1705.83
1005693036	7248420	36.60	0.00	1.80	45.1135	-75.0713	Domestic	CLAY		57	1715.44

BOREHOLE ID	WELL ID	DEPTH (m)	BEDROCK DEPTH (m)	STATIC LEVEL	Lat (NAD83)	Long (NAD83)	PRIMARY USE	MATERIAL	WELL TYPE	CLOSEST WIND TURBINE (m)	DISTANCE (m)
10414156	5800539	7.00	6.10	1.80	45.1256	-75.1332	Domestic	HARDPAN	Bedrock	47	1715.47
10415301	5801907	11.00	6.70	2.40	45.1370	-75.0918	Domestic	CLAY	Bedrock	48	1735.48
10414163	5800546	11.90	5.80	2.10	45.1397	-75.0953	Domestic	LIMESTONE	Bedrock	48	1739.07
1003614296	7172608	24.30	0.00	3.50	45.1659	-75.0956	Domestic	SILT		38	1743.44
10414162	5800545	23.20	1.50	1.50	45.1398	-75.0954	Domestic	LIMESTONE	Bedrock	48	1743.48
10065512	1801143	11.30	1.80	4.60	45.2045	-75.2505	Livestock	HARDPAN	Bedrock	2	1747.48
10417154	5803821	59.40	9.10	7.60	45.2094	-75.1497	Domestic	SHALE	Bedrock	18	1763.04
10417245	5803916	36.60	9.10	1.80	45.2094	-75.1497		CLAY	Bedrock	18	1763.04
10416379	5803041	18.90	13.70	4.60	45.2094	-75.1497	Domestic	HARDPAN	Bedrock	18	1763.04
10416336	5802998	15.20	8.20	3.00	45.1688	-75.0955	Domestic	LIMESTONE	Bedrock	43	1785.00
10417010	5803676	16.80	15.20	4.60	45.1688	-75.0955	Domestic	LIMESTONE	Bedrock	43	1785.00
1004217105	7193104	43.00	0.00	3.60	45.1136	-75.0703	Domestic	CLAY		57	1787.78
10414172	5800555	18.30	2.40	2.40	45.1441	-75.0956	Domestic	HARDPAN	Bedrock	41	1800.02
10415702	5802354	25.30	1.20	5.20	45.1041	-75.1691		TILL	Bedrock	44	1826.05
10417095	5803762	48.80	2.10	14.60	45.1987	-75.1414	Domestic	LIMESTONE	Bedrock	27	1887.16
10417120	5803787	68.60	2.10	6.10	45.1987	-75.1414	Commercial	CLAY	Bedrock	27	1887.16
10414144	5800527	7.60	6.40	1.80	45.1335	-75.0775	Domestic	HARDPAN	Bedrock	57	1912.18
1004165632	7188075	91.70	0.00	3.60	45.1355	-75.0819	Domestic	SAND		57	1938.70
10414165	5800548	28.00	6.10	2.40	45.1473	-75.0898	Domestic	LIMESTONE	Bedrock	41	1969.54
10522154	5804558	32.00	2.10	3.00	45.1528	-75.0794		SAND	Bedrock	43	1979.15
10414249	5800632	15.20	7.30	2.10	45.2100	-75.1462	Domestic	HARDPAN	Bedrock	18	2009.34
10414784	5801171	38.10	5.20	1.20	45.1352	-75.0785	Domestic	MEDIUM SAND	Bedrock	57	2031.36
10415378	5801996	30.50	8.50	6.10	45.2121	-75.1486	Domestic	HARDPAN	Bedrock	18	2043.17
10414975	5801371	30.50	1.80	3.00	45.1470	-75.0880	Livestock	LIMESTONE	Bedrock	41	2113.29
10416866	5803531	26.20	17.10	5.50	45.2119	-75.1429	Domestic	ROCK	Bedrock	18	2341.95
10416334	5802996	10.40	10.10	6.10	45.2119	-75.1429	Domestic	GRAVEL	Bedrock	18	2341.95
10415944	5802600	11.00	9.80	6.10	45.2119	-75.1429	Domestic	CLAY	Bedrock	18	2341.95

About DNV GL

Driven by our purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. We provide classification and technical assurance along with software and independent expert advisory services to the maritime, oil and gas, and energy industries. We also provide certification services to customers across a wide range of industries. Operating in more than 100 countries, our 16,000 professionals are dedicated to helping our customers make the world safer, smarter, and greener.