



## **Design and Operations Report Ernestown Wind Park**

Submission to: Ministry of the Environment  
Renewable Energy Approval Unit  
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- Appendix 1: Emergency Response Plan
- Appendix 2: Waterbodies Assessment Report
- Appendix 3: Heritage Assessment Report
- Appendix 4: Noise Impact Assessment Report

## SUMMARY OF CHANGES – Design & Operations Report

The following changes have been made to this report to update it from the report released in July of 2012.

1. The report format was retooled and its presentation was altered slightly, as a result some table and figure numbers have changed.
2. The report was updated to reflect the selection of the Enercon E92 Turbine. Additional clarifications have been added where necessary and references to the Vestas turbine have therefore been removed. The Enercon E92 has a transformer mounted inside the turbine tower, therefore all references to any other transformer type have been removed.
3. Clarifications regarding the connection voltage were added throughout this report.
4. The proponent opted to construct a smaller less intrusive switching station instead of a substation; the location and footprint of this station remain unaltered. Minor editorial changes were made to reflect this change.
5. Sections of this report were updated to reflect the decision to carry the collector lines above ground, subsequently all references to below ground collector lines have been removed.
6. *Section 2.1.1* was updated to include more detail regarding the construction of the new entrance onto Millhaven Road, and provide additional clarification regarding the upgrades to the existing farm lane, as well as to clarify the two different types of water crossings.
7. Minor typographical errors were corrected in the text.
8. The Site Plan map in Figure 1 was updated to reflect the above changes, **no turbine locations were changed.**
9. The Facility Design diagrams in Figures 5-9 were updated to reflect updates above.
10. Section 4.6: Transformer Sub Station Spills Prevention Contingency Plan was removed as there will no longer be a substation at this site.
11. Table 3 and Section 2.2 were updated to reflect updated knowledge gained as a result of ongoing field programs, particularly the sections pertaining to waterbodies, and natural heritage
12. Table 1 and Figure 3 were updated to reflect updated knowledge pertaining to noise receptors gained as a result of ongoing stakeholder consultations.

## **1. INTRODUCTION**

### **1.1 Project Background and Location**

Ernestown Windpark LP is proposing the development of the Ernestown Wind Park (the Project) located in Loyalist Township, the County of Lennox and Addington, Ontario. The project is located on privately owned land, municipally zoned as agricultural and industrial.

### **1.2 Project Components**

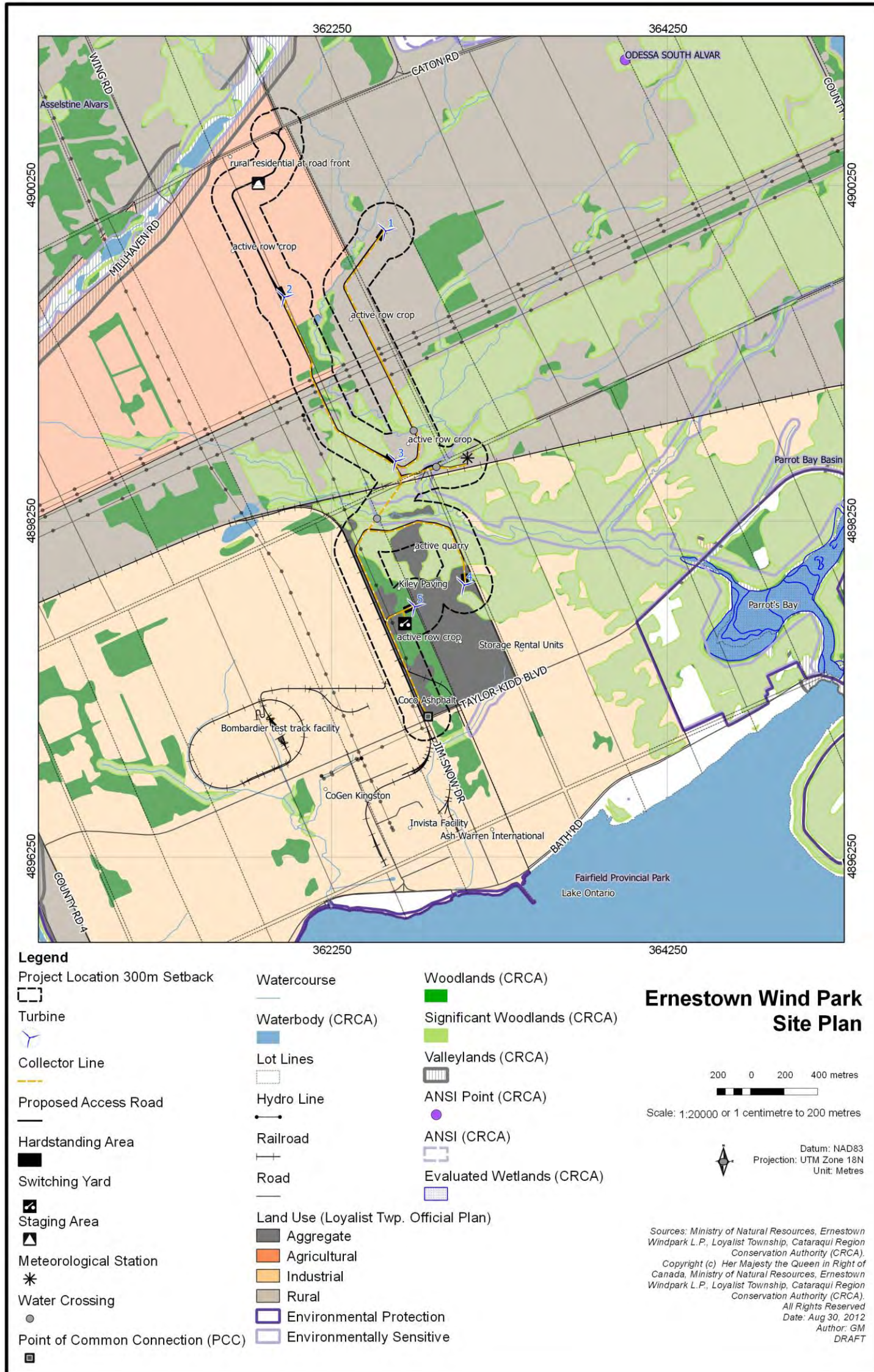
The Project involves construction, operation and decommissioning of five Enercon E92 2.3 MW wind turbines modified to operate at 2 MW for a total nameplate capacity of 10MW. The Project requires construction of new access roads to the turbine sites. In order to connect to the Hydro One Networks Inc. (HONI) distribution system, construction of a new 44 kV overhead or below ground electrical connection line will occur, which will connect with an existing distribution line located along Taylor Kidd Boulevard.



2. SITE PLAN

2.1 Facility Components

Figure 1: Site Plan



## **2.2 Cultural/Natural Features and Waterbodies**

### **Cultural Heritage**

AMICK Consultants Limited was engaged by the proponent to undertake a Cultural Heritage Evaluation of lands potentially affected by the proposed undertaking and was granted permission to carry out archaeological fieldwork on 1 September 2010. This study included a field reconnaissance of the affected lands and adjacent lands as well as documentary research. The study area was subject to reconnaissance and photographic documentation on 17 September 2010.

The Ontario Ministry of Tourism, Culture and Sport approved the report with revisions in 2012. On July 1, 2012, subsequent to MTCS approval, Ontario Regulation 359/09 detailing the Renewable Energy Approval process was amended. The report has been likewise amended to reflect changes regarding cultural heritage to the approvals process. Specifically the REA Checklist for cultural heritage has been appended to this report and a statement has been added to the front of the report describing the qualifications of Michael Henry, the primary investigator for AMICK Consultants Limited on this project. As a result of the study, it has been determined that there are no cultural heritage features within the proposed project area properties or on any properties adjacent to these lands. There are no further concerns with respect to Cultural Heritage resources.

### **Archaeological Features**

AMICK Consultants Limited was engaged by the proponent to undertake a Stage 1 and 2 Archaeological Assessment of the study area. This assessment was completed in December of 2010 and recommended that a Stage 2 assessment be completed.

AMICK Consultants Limited was engaged by the proponent to undertake a Stage 2 Archaeological Assessment of lands potentially affected by the proposed undertaking. The original Stage 2 assessment was completed in December 2011, however due to project changes and updates subsequent addendums were completed in November 2011, March 2012 and August 2012. The entirety of the study area was subject to reconnaissance, photographic documentation and physical assessment during these study periods consisting of test pit survey at an interval of 5 metres between individual test pits where possible due to low-lying and wet areas, exposed bedrock, and woodlot density and high intensity pedestrian survey at an interval of 5 metres between individual transects. Those portions of the property which did not consist of previous disturbance or existing structures were subject to reconnaissance, photographic documentation and physical

assessment on during the study periods consisting of high-intensity test pit survey at an interval of five metres between individual test pits and high intensity pedestrian survey at an interval of five metres between individual transects.

As a result of the physical assessments of the properties, no archaeological resources were encountered. Consequently, it is recommended no further archaeological assessment of the property is required.

It is further recommended that any portion of the study area that has not been subject to Stage 2 Physical Assessment be restricted from any ground altering activity through appropriate zoning and that should the proposed land use for these areas change, a condition requiring Stage 2 Archaeological Assessment be applied.

On March 1, 2012, June 21, 2012, and September 24, 2012 MTCS issued confirmation letters stating that they were satisfied with the assessment carried out on the project location. This correspondence can be found in the *Ernestown Wind Park Project Description Report Appendix C*

### **Natural Heritage**

A detailed assessment of the natural habitat within and adjacent to the proposed Ernestown Wind Park was performed by M.K. Ince and Associates Ltd. throughout June and July 2012. The assessment included a Records Review, Site Investigation, Evaluation of Significance and Environmental Impact Study.

The results of this assessment found 41 natural features that were determined to be significant within 120m of the Project location, these consisted of wetlands, woodlands, concentration areas for raptors, bats, migratory butterflies, migratory birds, rare vegetation communities, habitat for species of conservation concern and generalized significant wildlife habitat. Additionally it was found that construction will occur within 16 significant features, many of which will require preconstruction surveys to evaluate significance. All features, including those features requiring preconstruction surveys have been mitigated for negative impacts.

It is anticipated that implementation of the mitigation and monitoring measures outlined in the *Ernestown Wind Park Natural Heritage Environmental Impact Study Report*, in addition to those included in the *Construction Plan Report* and the *Environmental Effects Monitoring Plan* within the *Design and Operations Report* will minimize or prevent negative environmental impacts on the natural environment. Following the restoration of natural features, at the end of the project (after decommissioning and re-vegetation), no residual impacts are anticipated.



Further information on the findings of this report can be found in the *Ernestown Wind Park Natural Heritage Assessment*.

### **Waterbodies**

A detailed assessment of the waterbodies within and adjacent to the proposed Ernestown Wind Park was performed by M.K. Ince and Associates Ltd. (M.K. Ince). This assessment included a records review, site investigation and a waterbodies impact assessment.

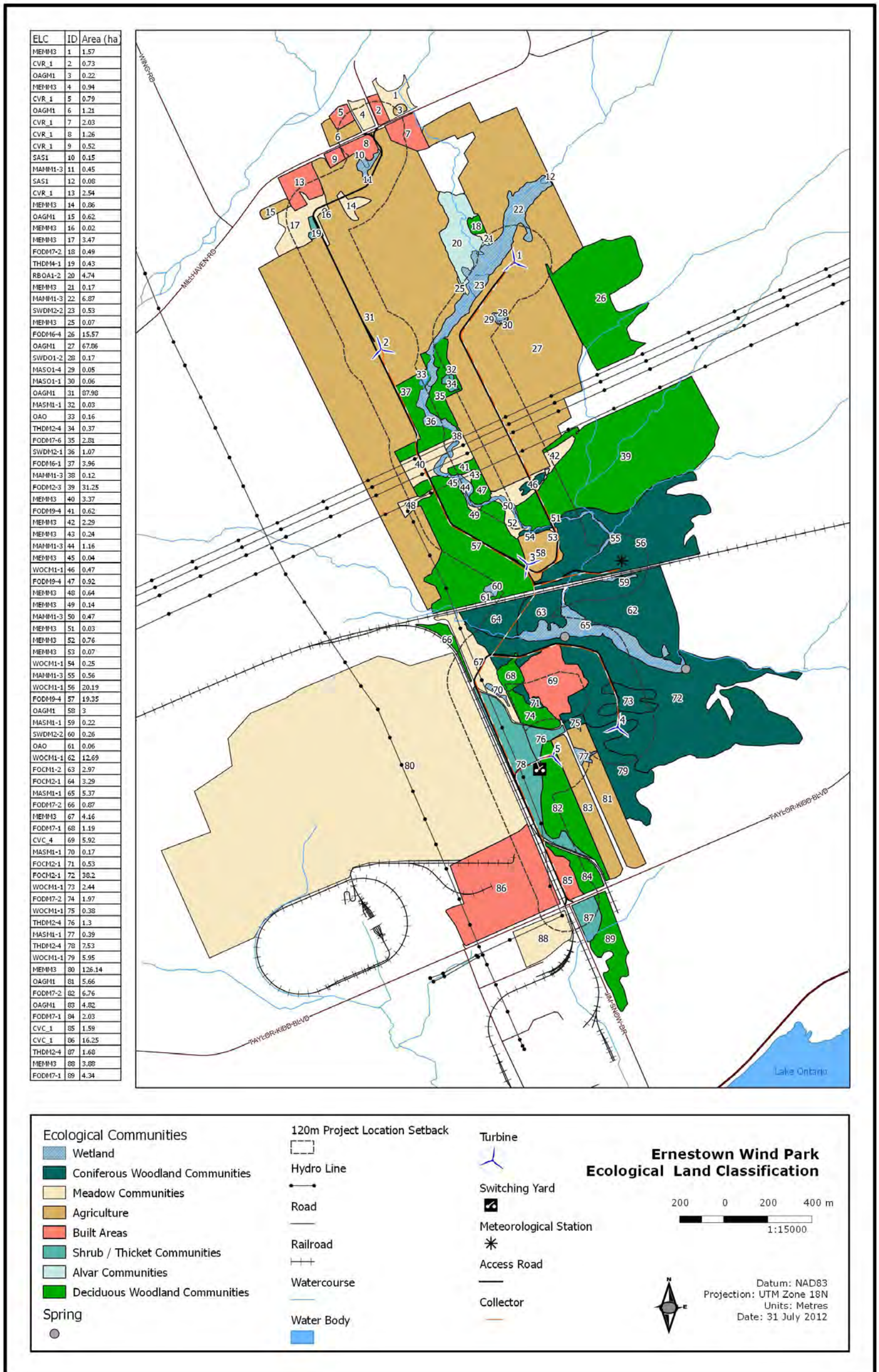
Through the completion of a Records Review and subsequent Site Investigation M.K. Ince identified five waterbodies within 120m of the proposed Project Location, one of which will be crossed at three locations by access roads and overhead collector lines.

Based on these findings a *Waterbodies Impact Assessment Report* was prepared to evaluate impacts of the project on those waterbodies, and to develop measures to mitigate such impacts. The *Water Bodies Impact Assessment Report* concluded that after implementation of the mitigation measures contained in the report and in the Construction Plan Report and the Design and Operations Report, no significant net effects on the identified waterbodies are anticipated.

Further information can be found in Appendix 2 of the *Ernestown Wind Park Design and Operations Report* in the *Ernestown Wind Park: Water Assessment Report & Ernestown Wind Park: Water Bodies Impact Assessment Report*

Figure 9 below illustrates the presence and location of cultural/natural features and waterbodies in relation to the proposed project site.

Figure 2: Cultural/Natural Features & Waterbodies



### 2.3 Noise Receptors

A detailed Noise Impact Assessment (NIA) was prepared for the Enercon E92 by GL GH in September 2012 in accordance with Ontario Regulation 359/09 (Renewable Energy Approvals under the Environmental Protection Act) and Ontario Ministry of the Environment (MOE) Noise Pollution Control (NPC) guidelines. The NIA is provided in Appendix 4.

Receptor locations were identified using base data from recent aerial photos and field reconnaissance to verify locations and building types. Field reconnaissance was completed by GL GH in February 2012. The height of each Point of Reception – taken to be 1.5 m and 4.5 m for one-storey and two-storey houses respectively – was also noted. Noise receptor locations (i.e. Points of Reception) as defined by the Ontario Ministry of the Environment (MOE) within 1,500 m of any turbine location as well as receptors located on the same premises and the wind turbines (Participating Receptors) and vacant lot receptors (VLRs) within 1,500 m of any turbine location were considered. Points of Reception can be seen in Table 1. The modelling results are compared with the MOE NPC criteria and are summarized below.

It is noted that the calculated results below do not consider potential noise attenuation associated with foliage and thus the results presented may be conservative where there is foliage present in the line of sight between the noise source and the receptor.

***Five (5) Enercon E92 2.3 MW Wind Turbines - Modified for 2MW:***

Considering the cumulative impacts of the five turbines at various wind speed levels ranging from 6 to 10 m/s, the highest calculated noise level (at a wind turbine speed of 10 m/s) was found at a vacant lot receptor (VLR258) at 40.0 dB(A) followed by a Point of Reception (R205) at 39.7 dB(A). The calculated noise levels for the majority of the Points of Reception and VLRs are below 35 dB(A) at all wind turbine speeds. The results indicated that the Project complies with the MOE environmental noise guidelines at all wind speeds considered in the evaluation.



Table 1: Points of Reception

Point of Reception ID	Receptor Height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at Selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
R8	4.5	1417	1	30.5	30.5	30.5	30.5	30.5	40	43	45	49	51	40	Yes
R9	1.5	1392	1	28.9	28.9	28.9	28.9	28.9	40	43	45	49	51	40	Yes
R10	1.5	1328	1	29.3	29.3	29.3	29.3	29.3	40	43	45	49	51	40	Yes
R11	4.5	1223	1	31.8	31.8	31.8	31.8	31.8	40	43	45	49	51	40	Yes
R12	1.5	1177	1	30.5	30.5	30.5	30.5	30.5	40	43	45	49	51	40	Yes
R13	1.5	1142	1	30.8	30.8	30.8	30.8	30.8	40	43	45	49	51	40	Yes
R14	4.5	1099	1	32.8	32.8	32.8	32.8	32.8	40	43	45	49	51	40	Yes
R15	1.5	1059	1	31.5	31.5	31.5	31.5	31.5	40	43	45	49	51	40	Yes
R16	1.5	1096	1	31.2	31.2	31.2	31.2	31.2	40	43	45	49	51	40	Yes
R17	4.5	1057	1	33.2	33.2	33.2	33.2	33.2	40	43	45	49	51	40	Yes
R18	4.5	996	1	33.8	33.8	33.8	33.8	33.8	40	43	45	49	51	40	Yes
R19	4.5	971	1	34.0	34.0	34.0	34.0	34.0	40	43	45	49	51	40	Yes
R20	4.5	1012	1	33.6	33.6	33.6	33.6	33.6	40	43	45	49	51	40	Yes
R21	1.5	1001	1	32.1	32.1	32.1	32.1	32.1	40	43	45	49	51	40	Yes
R22	4.5	944	1	34.3	34.3	34.3	34.3	34.3	40	43	45	49	51	40	Yes
R23	4.5	912	1	34.6	34.6	34.6	34.6	34.6	40	43	45	49	51	40	Yes
R24	1.5	900	1	33.2	33.2	33.2	33.2	33.2	40	43	45	49	51	40	Yes
R25	4.5	1062	1	33.3	33.3	33.3	33.3	33.3	40	43	45	49	51	40	Yes
R26	4.5	1119	1	32.8	32.8	32.8	32.8	32.8	40	43	45	49	51	40	Yes
R27	1.5	1164	1	30.7	30.7	30.7	30.7	30.7	40	43	45	49	51	40	Yes
R28	1.5	1222	1	30.3	30.3	30.3	30.3	30.3	40	43	45	49	51	40	Yes
R29	4.5	1294	1	31.5	31.5	31.5	31.5	31.5	40	43	45	49	51	40	Yes
R30	1.5	1338	1	29.4	29.4	29.4	29.4	29.4	40	43	45	49	51	40	Yes
R31	4.5	1371	1	30.9	30.9	30.9	30.9	30.9	40	43	45	49	51	40	Yes
R32	1.5	1409	1	28.9	28.9	28.9	28.9	28.9	40	43	45	49	51	40	Yes
R33	1.5	1444	1	28.7	28.7	28.7	28.7	28.7	40	43	45	49	51	40	Yes
R34	1.5	1481	1	28.4	28.4	28.4	28.4	28.4	40	43	45	49	51	40	Yes
R47	1.5	854	1	33.8	33.8	33.8	33.8	33.8	40	43	45	49	51	40	Yes

Table 1: Points of Reception - Continued

Point of Reception ID	Receptor Height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at Selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
R48	4.5	829	1	35.6	35.6	35.6	35.6	35.6	40	43	45	49	51	40	Yes
R49	4.5	791	1	36.1	36.1	36.1	36.1	36.1	40	43	45	49	51	40	Yes
R50	1.5	792	1	34.7	34.7	34.7	34.7	34.7	40	43	45	49	51	40	Yes
R51	1.5	788	1	34.8	34.8	34.8	34.8	34.8	40	43	45	49	51	40	Yes
R52	4.5	791	1	36.4	36.4	36.4	36.4	36.4	40	43	45	49	51	40	Yes
R53	1.5	796	1	35.2	35.2	35.2	35.2	35.2	40	43	45	49	51	40	Yes
R54	1.5	922	1	34.0	34.0	34.0	34.0	34.0	40	43	45	49	51	40	Yes
R56	1.5	1021	1	33.0	33.0	33.0	33.0	33.0	40	43	45	49	51	40	Yes
R57	1.5	1070	1	32.7	32.7	32.7	32.7	32.7	40	43	45	49	51	40	Yes
R58	4.5	1028	1	35.0	35.0	35.0	35.0	35.0	40	43	45	49	51	40	Yes
R59	1.5	906	1	34.9	34.9	34.9	34.9	34.9	40	43	45	49	51	40	Yes
R60	4.5	916	2	36.1	36.1	36.1	36.1	36.1	40	43	45	49	51	40	Yes
R61	4.5	975	2	35.5	35.5	35.5	35.5	35.5	40	43	45	49	51	40	Yes
R62	1.5	971	2	33.8	33.8	33.8	33.8	33.8	40	43	45	49	51	40	Yes
R63	1.5	948	2	33.8	33.8	33.8	33.8	33.8	40	43	45	49	51	40	Yes
R65	4.5	783	2	36.8	36.8	36.8	36.8	36.8	40	43	45	49	51	40	Yes
R66	4.5	867	2	35.8	35.8	35.8	35.8	35.8	40	43	45	49	51	40	Yes
R67	1.5	972	2	32.8	32.8	32.8	32.8	32.8	40	43	45	49	51	40	Yes
R68	4.5	885	2	35.3	35.3	35.3	35.3	35.3	40	43	45	49	51	40	Yes
R69	4.5	901	2	35.2	35.2	35.2	35.2	35.2	40	43	45	49	51	40	Yes
R70	4.5	842	2	35.9	35.9	35.9	35.9	35.9	40	43	45	49	51	40	Yes
R71	4.5	815	2	36.0	36.0	36.0	36.0	36.0	40	43	45	49	51	40	Yes
R72	1.5	992	2	32.7	32.7	32.7	32.7	32.7	40	43	45	49	51	40	Yes
R73	4.5	1002	2	34.1	34.1	34.1	34.1	34.1	40	43	45	49	51	40	Yes
R74	1.5	925	2	33.2	33.2	33.2	33.2	33.2	40	43	45	49	51	40	Yes
R75	4.5	949	2	34.5	34.5	34.5	34.5	34.5	40	43	45	49	51	40	Yes
R76	4.5	938	2	34.6	34.6	34.6	34.6	34.6	40	43	45	49	51	40	Yes
R77	1.5	955	2	32.8	32.8	32.8	32.8	32.8	40	43	45	49	51	40	Yes
R78	1.5	1081	2	31.7	31.7	31.7	31.7	31.7	40	43	45	49	51	40	Yes
R79	1.5	1205	2	30.7	30.7	30.7	30.7	30.7	40	43	45	49	51	40	Yes

Table 1: Points of Reception - Continued

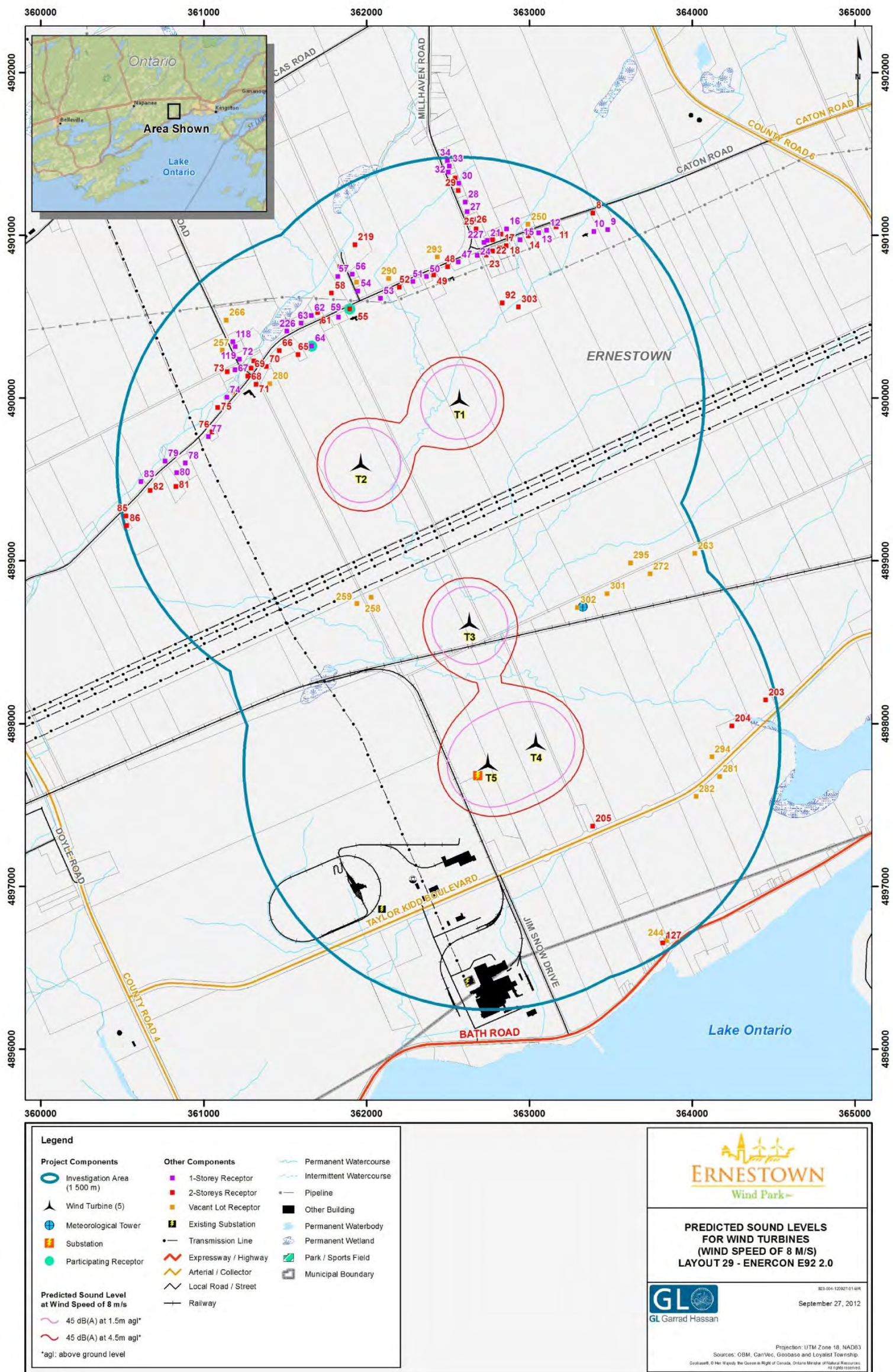
Point of Reception ID	Receptor Height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at Selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
R80	1.5	1134	2	31.3	31.3	31.3	31.3	31.3	40	43	45	49	51	40	Yes
R81	4.5	1145	2	32.9	32.9	32.9	32.9	32.9	40	43	45	49	51	40	Yes
R82	4.5	1305	2	31.8	31.8	31.8	31.8	31.8	40	43	45	49	51	40	Yes
R83	1.5	1356	2	29.6	29.6	29.6	29.6	29.6	40	43	45	49	51	40	Yes
R85	4.5	1477	2	30.8	30.8	30.8	30.8	30.8	40	43	45	49	51	40	Yes
R86	4.5	1488	2	30.8	30.8	30.8	30.8	30.8	40	43	45	49	51	40	Yes
R92	4.5	657	1	37.5	37.5	37.5	37.5	37.5	40	43	45	49	51	40	Yes
R118	1.5	1095	2	31.8	31.8	31.8	31.8	31.8	40	43	45	49	51	40	Yes
R119	1.5	1064	2	32.1	32.1	32.1	32.1	32.1	40	43	45	49	51	40	Yes
R127	4.5	1448	4	31.6	31.6	31.6	31.6	31.6	40	43	45	49	51	40	Yes
R128	4.5	1437	4	31.6	31.6	31.6	31.6	31.6	40	43	45	49	51	40	Yes
R203	4.5	1438	4	31.9	31.9	31.9	31.9	31.9	40	43	45	49	51	40	Yes
R204	4.5	1209	4	33.3	33.3	33.3	33.3	33.3	40	43	45	49	51	40	Yes
R205	4.5	611	4	39.7	39.7	39.7	39.7	39.7	40	43	45	49	51	40	Yes
R218	4.5	1104	1	34.0	34.0	34.0	34.0	34.0	40	43	45	49	51	40	Yes
R219	4.5	1156	1	33.3	33.3	33.3	33.3	33.3	40	43	45	49	51	40	Yes
R225	4.5	919	2	35.0	35.0	35.0	35.0	35.0	40	43	45	49	51	40	Yes
R226	1.5	943	2	33.7	33.7	33.7	33.7	33.7	40	43	45	49	51	40	Yes
R227	1.5	986	1	32.3	32.3	32.3	32.3	32.3	40	43	45	49	51	40	Yes
VLR244	4.5	1448	4	31.6	31.6	31.6	31.6	31.6	40	43	45	49	51	40	Yes
VLR246	4.5	1048	1	33.3	33.3	33.3	33.3	33.3	40	43	45	49	51	40	Yes
VLR247	4.5	966	1	35.1	35.1	35.1	35.1	35.1	40	43	45	49	51	40	Yes
VLR250	4.5	1165	1	32.3	32.3	32.3	32.3	32.3	40	43	45	49	51	40	Yes
VLR251	4.5	907	2	35.0	35.0	35.0	35.0	35.0	40	43	45	49	51	40	Yes
VLR257	4.5	1106	2	33.3	33.3	33.3	33.3	33.3	40	43	45	49	51	40	Yes
VLR258	4.5	626	3	40.0	40.0	40.0	40.0	40.0	40	43	45	49	51	40	Yes
VLR259	4.5	701	3	39.2	39.2	39.2	39.2	39.2	40	43	45	49	51	40	Yes
VLR263	4.5	1452	3	33.2	33.2	33.2	33.2	33.2	40	43	45	49	51	40	Yes
VLR266	4.5	1218	2	32.6	32.6	32.6	32.6	32.6	40	43	45	49	51	40	Yes
VLR272	4.5	1152	3	35.2	35.2	35.2	35.2	35.2	40	43	45	49	51	40	Yes



Table 1: Points of Reception - Continued

Point of Reception ID	Receptor Height [m]	Distance to Nearest Turbine [m]	Nearest Turbine [ID]	Calculated Sound Pressure Level at Receptor [dB(A)] at selected Wind Speed in m/s					Sound Level Limit [dB(A)] at Selected Wind Speed in m/s					Applicable Background Sound Level	Compliance With Limit (Yes/No)
				6 or <	7	8	9	10	6 or <	7	8	9	10	NPC 232 (C 3)	
VLR280	4.5	753	2	36.7	36.7	36.7	36.7	36.7	40	43	45	49	51	40	Yes
VLR281	4.5	1146	4	33.7	33.7	33.7	33.7	33.7	40	43	45	49	51	40	Yes
VLR282	4.5	1034	4	34.6	34.6	34.6	34.6	34.6	40	43	45	49	51	40	Yes
VLR290	4.5	870	1	35.7	35.7	35.7	35.7	35.7	40	43	45	49	51	40	Yes
VLR293	4.5	894	1	35.0	35.0	35.0	35.0	35.0	40	43	45	49	51	40	Yes
VLR294	4.5	1084	4	34.2	34.2	34.2	34.2	34.2	40	43	45	49	51	40	Yes
VLR295	4.5	1059	3	35.8	35.8	35.8	35.8	35.8	40	43	45	49	51	40	Yes
VLR301	4.5	867	3	37.5	37.5	37.5	37.5	37.5	40	43	45	49	51	40	Yes
VLR302	4.5	671	3	39.4	39.4	39.4	39.4	39.4	40	43	45	49	51	40	Yes
R303	4.5	681	1	37.1	37.1	37.1	37.1	37.1	40	43	45	49	51	40	Yes

Figure 3: Points of Reception – Enercon E92





### 3. FACILITY DESIGN PLAN

The Project requires the installation of five (5) Enercon E92 2.3MW wind turbine generators modified to operate at 2MW Step up transformers -mounted inside the tower at the base of each turbine, will be connected by above ground collector lines. The collector lines will travel along access roads to a new switching station located north of Taylor Kidd Boulevard. The switching station will facilitate the electrical connection of the Project to the Hydro One Networks Inc. (HONI) distribution system, as show in Figure 1.

The wind turbine will be a pitch regulated upwind turbine; the major components such as the generator, converter, and the braking system are located on top of the tower in the nacelle. Sensors within the nacelle communicate with operations software (Supervisory Control and Data Acquisition (SCADA) system) which controls the operations and direction of the turbine. Through this set up the turbine will follow the wind direction, control the pitch and speed of the blades automatically; it will also inform the turbine when conditions require the system to shut down. A remote operations centre will be located offsite which will be confirmed by the construction contractor. The nacelle will sit atop a 98 metre tower supported by a concrete foundation that is generally up to 3m deep and 18m in diameter. Each foundation will be designed according to the site conditions at each turbine location (Figure 4). Each tower will be affixed with a standard light beacon as required by Transport Canada.

#### **Modification for Curtailment of the ENERCON E-92 Wind Energy Converter (WEC)**

The basic electrical design is identical for all ENERCON WECs. The hub of an ENERCON WEC is directly, i.e. without an intermediate gearbox, connected to the rotor of a multi-pole, field-excited annular generator. The variable frequency Alternating Current (AC) output of the annular generator's stator terminals is connected to the grid through a full-scale power converter. The latter consists of a rectifier, a Direct Current (DC) link and multiple inverters, the number of which depends on the rated active power output and the required reactive power capability for the respective WEC. Therefore, the annular generator is completely decoupled from the power system allowing a wide operating speed range. The electrical performance of an ENERCON WEC when connected to the grid is defined by its inverters and the associated Flexible AC Transmission System (FACTS). Hence, the power output of an ENERCON WEC can be set to any desired limits up to the design rated capacity.

The three elements of a WEC which govern the active power injection into the grid are (i) active blade pitching, (ii) excitation control of the generator and (iii) ENERCON FACTS control system. In order to curtail a turbine, a maximum power  $P_{max}$  can be set within the ENERCON FACTS control system, leading to a modified power curve. This task is undertaken by ENERCON personnel on site prior to

commissioning of the machine. The FACTS control system then interacts and coordinates with the blade pitching system, the generation excitation controller and the inverter controller in order to ensure that the modified power curve is followed and the maximum power output does not exceed  $P_{max}$ .

Operating in parallel to the FACTS control system of the WEC, a relay provides redundant protection so that the pre-set value of  $P_{max}$  is not exceeded. The relay ensures any unintended breach of  $P_{max}$  is prevented.

### 3.1 Wind Turbine Specifications

**Table 2: Wind Turbine Specifications**

Wind Turbine Type and Model:	Enercon E92
Name plate capacity:	2.3 MW modified to 2.0 MW
Wind farm total capacity:	10 MW
Hub Height:	98 Metres
Blade length:	43.8 Metres
Blade swept area	6648 M <sup>2</sup>
Rotational speed:	5-16 rpm
Maximum acoustic emissions (95% rated):	105 dB

Figure 4: Site Entrance and Staging Area

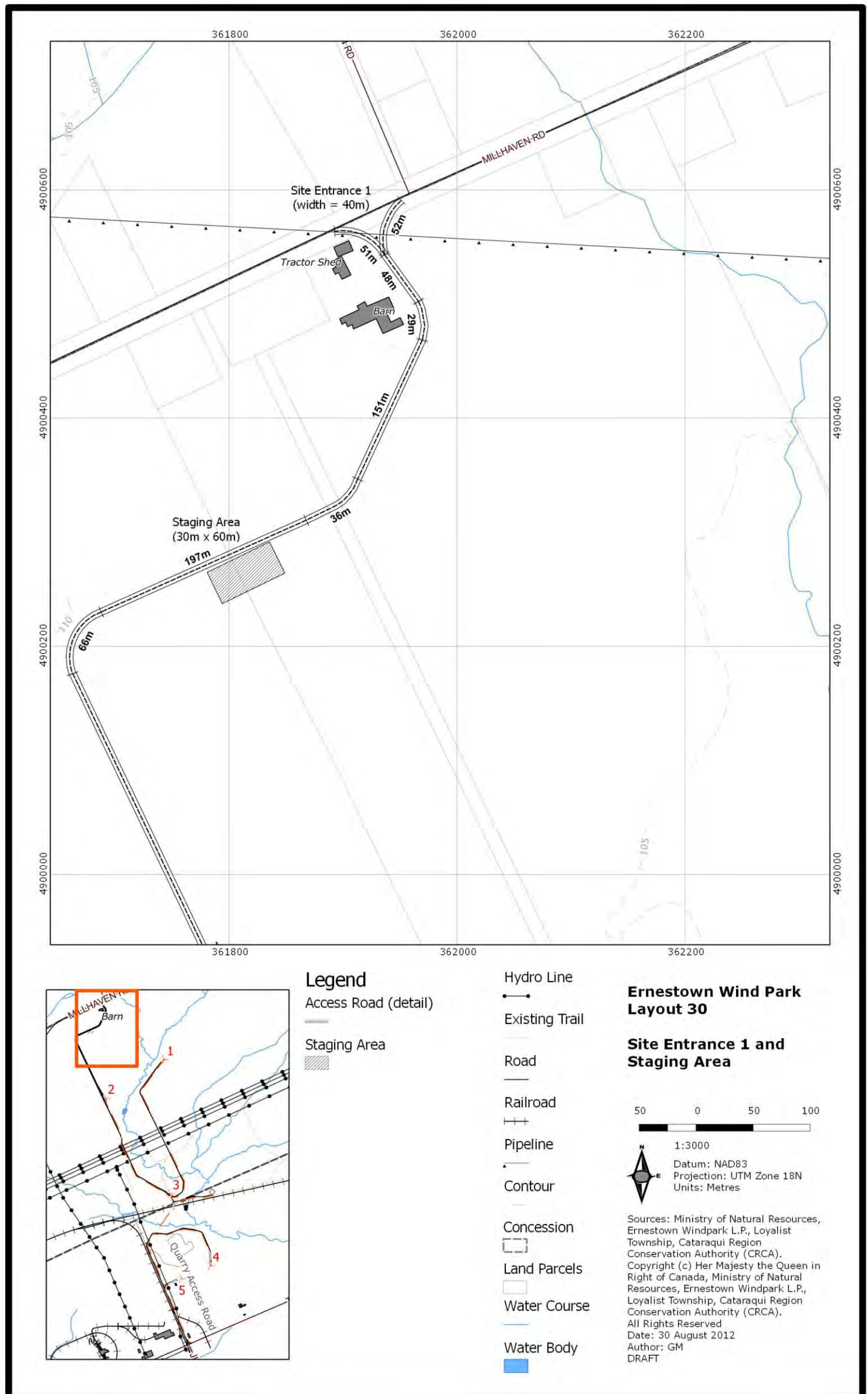


Figure 5: Wind Turbine 1: Access Road, Laydown & Crane Pad

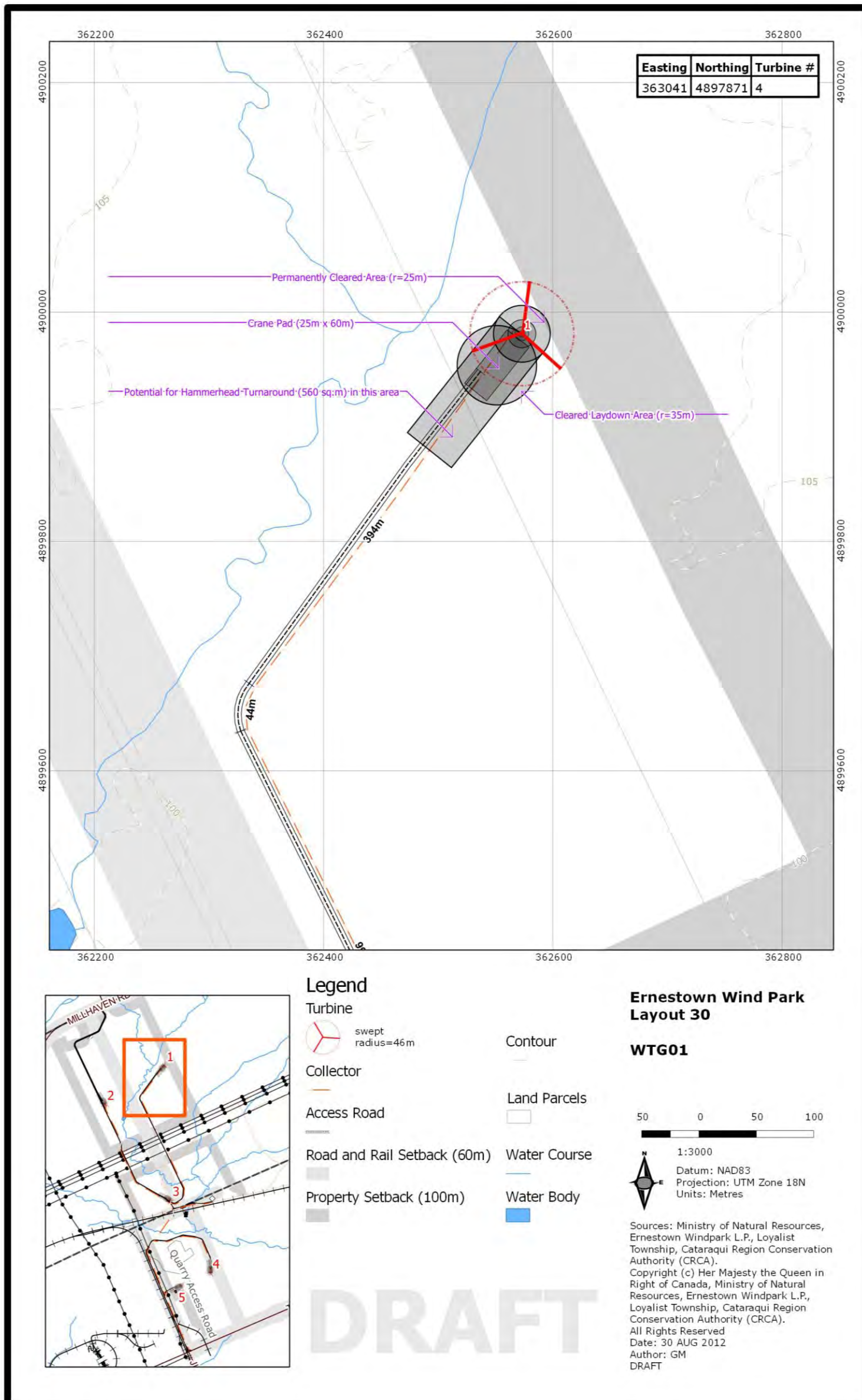




Figure 6: Wind Turbine 2: Access Road, Laydown & Crane Pad

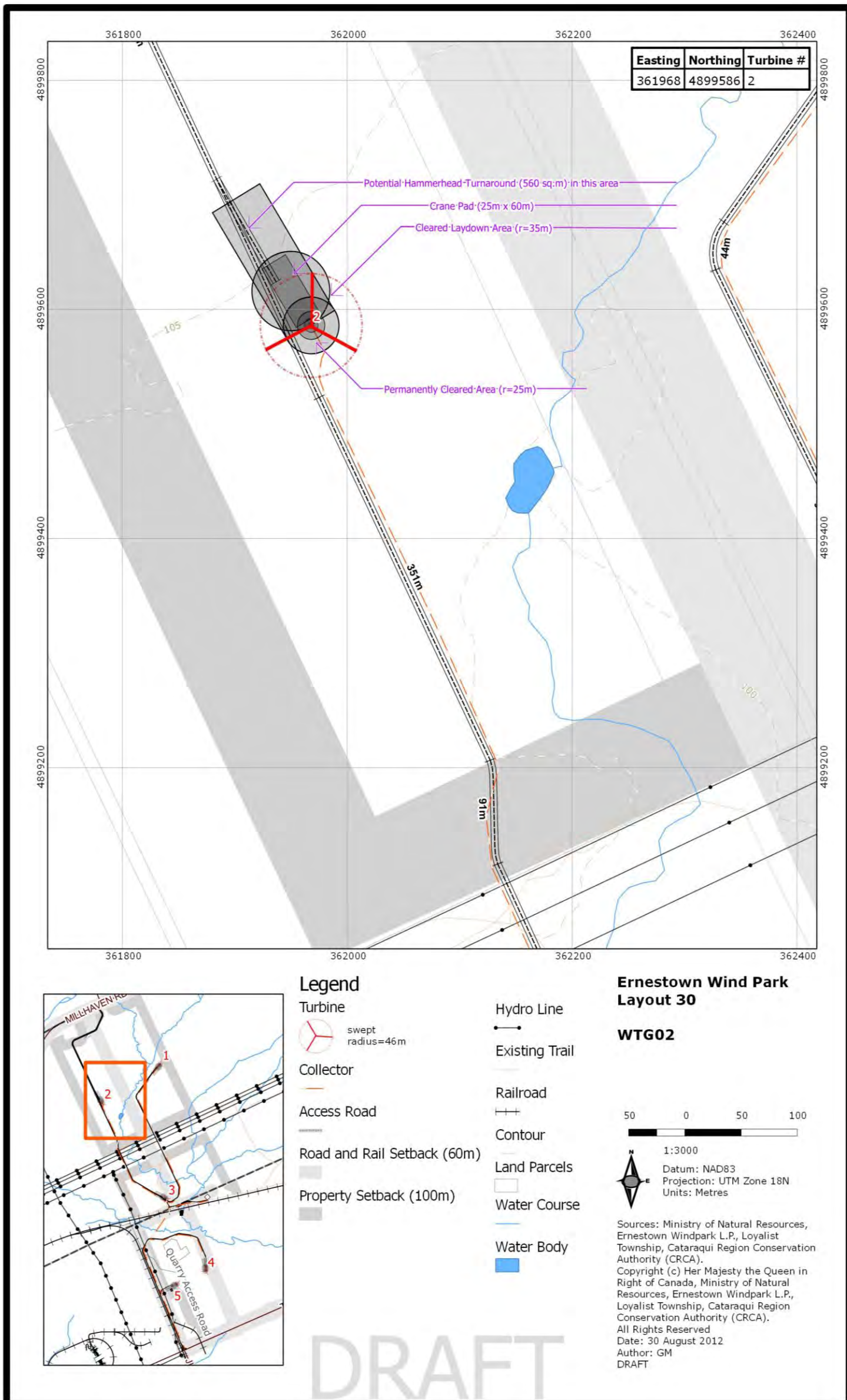




Figure 7: Wind Turbine 3: Access Road, Laydown & Crane Pad

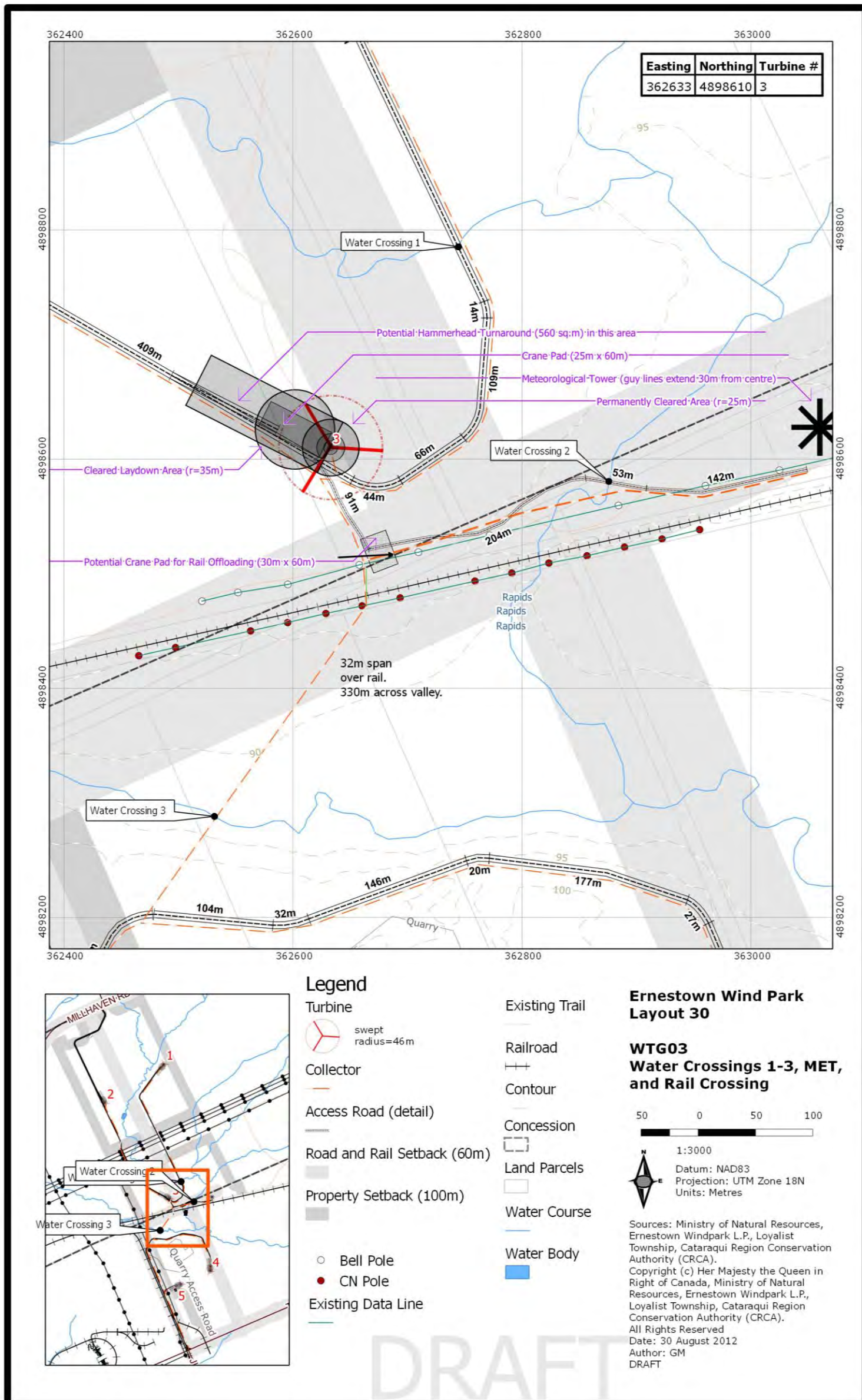




Figure 8: Wind Turbine 4, 5 & Switching Station Yard

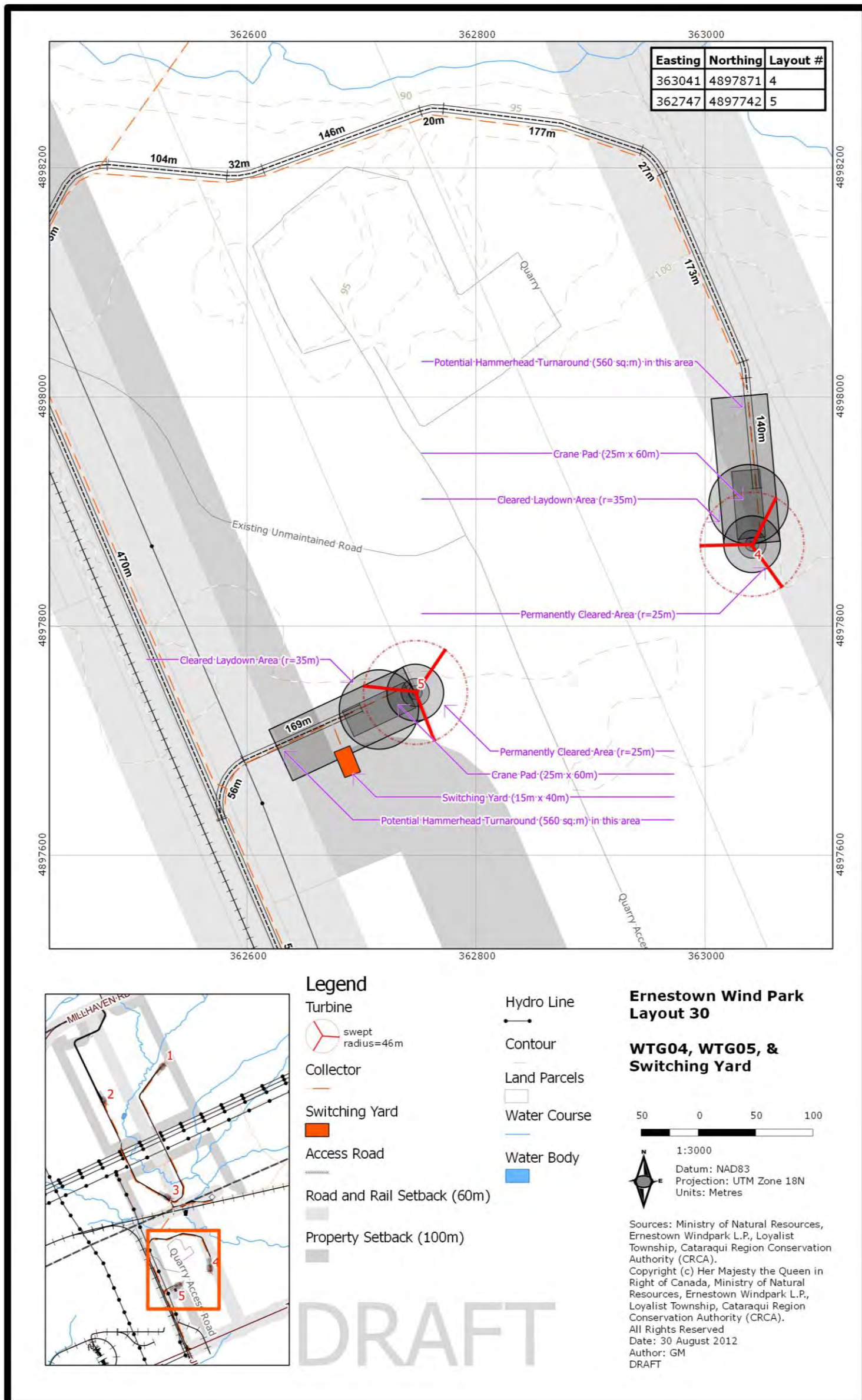
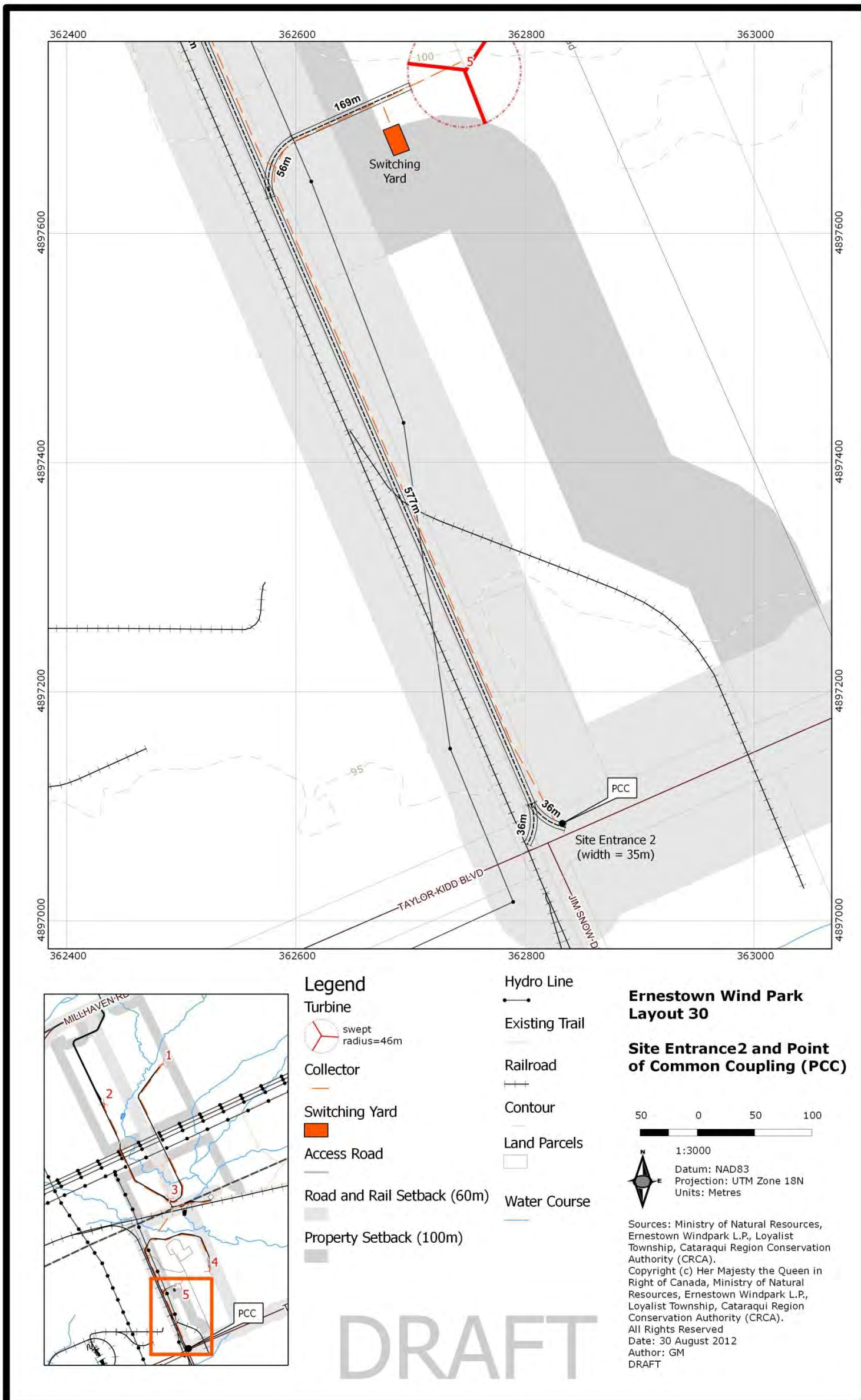


Figure 9: Site Entrance 2 & Switching Station Yard





### 3.2 Electrical Collector System & Grid Connection

The wind turbine generates power at 400kV. In order to connect to the HONI distribution system the voltage must be transformed upwards to 44kV, which is the voltage of the circuit the project will connect to. To transform power to 44 kV, a step up transformer will be located in base of each turbine. An above ground collector line will deliver electricity from each turbine to a new switching station

### 3.3 Switching Station

The above ground electrical line will connect into a switching station located south of turbine 5. The above ground electrical line will enter the switching station yard and connect to the switching station. The electrical current routed through the station will exit the station and travel south towards Taylor Kidd Boulevard in order to connect to the HONI distribution system (Figure 9). The switching station incorporates disconnect and protection equipment providing the ability to isolate the Project from the HONI distribution system. This will allow for manual disconnection for services and will automatically trip for over or under voltage situations.

## 4. FACILITY OPERATIONAL PLAN

The Facility operations plan will be confirmed by the turbine manufacturer prior to turbine delivery. What follows is a general plan for operational monitoring and maintenance which will be supplemented by specific operations required by the manufacturer.

### 4.1 Daily Operations & Monitoring Activities

The project will be monitored remotely 24 hours a day through the SCADA system which will monitor wind speed and direction, voltage, vibration, status of the internal gearbox, generator and bearing temperatures. This system will also control when the wind turbines operate and shut down based on internal or weather conditions. Sensors on the turbine nacelle will measure wind speed, direction and temperature.

As a minimum, one site visit will occur weekly, during this site visit the operator will visually inspect the turbines for any damage and make note of any unusual or excessive noise. An inspection log will be kept which will record dates and times of the inspections. Site inspections will be used in conjunction with the prescribed timing of routine maintenance activities to initiate repairs as needed. In the event a turbine or component is found to be operating outside the range specified by the equipment supplier repairs will be initiated as recommended by the manufacturer.

#### **4.2 Scheduled Maintenance**

Scheduled maintenance will include a detailed inspection of the nacelle, blades, rotor, tower and other components related to the project including the switching station. A crane will only be required for major repairs. In addition to annual maintenance, between years 7 and 10 a major overhaul of some turbine components is anticipated.

#### **4.3 Unscheduled Maintenance**

As inspections and scheduled maintenance recommend replacement of components repair crews will be dispatched to the site. Maintenance can include minor components such as small electronic parts or major components. Some large components may require mobilization of a crane to the site.

#### **4.4 Site Supervision & Employee Training**

All on site staff will be fully trained and certified by the turbine manufacturer as per the warranty conditions. A health and safety policy will be drafted which complies with the Ontario Workplace Health and Safety Act. Annual health and safety training will occur, and all contractors will report directly to the operations manager.

#### **4.5 Waste Management & Water Takings**

Wastes will be created as a result of scheduled and unscheduled maintenance and periodic parts replacement. Lubricants, packaging products, electrical wiring and component parts are expected to be the types of waste by-products produced as a result of these activities. There will be no on site storage of any waste materials. All waste will be disposed of in an appropriate MOE registered facility. Any metal items will be taken to an appropriate scrap and salvage facility for recycling. Waste products will conform to the requirements of Ontario Regulation 347 "General Waste Management".

The continued operations of the project will not require any water takings or sewage works.



**5. ENVIRONMENTAL EFFECTS MONITORING PLAN**

An Environmental Effects Monitoring Plan was prepared as a component of the Natural Heritage Study. This plan addresses aspects related to ecological features. The table below summarizes the monitoring proposed:

**Table 3 – Environmental Effects Monitoring Plan**

Criterion	Potential Effect	Performance Objective	Mitigation Measure	Monitoring Plan and Contingency Measures
	Activity/Description			
<b>Heritage and Archaeological Resources</b>				
Archaeological	None Identified	<b>To maintain no impact</b>	No impacts Identified, Stage I and II assessments conducted for all areas to be disturbed by project.	<b>None required</b>
Cultural Heritage	None Identified	<b>To maintain no impact</b>	No impacts identified	<b>None required</b>
<b>Natural Heritage Resources</b>				
Raptor Wintering Area	<ul style="list-style-type: none"> <li>Indirect effects from operation could temporarily disturb wildlife living in this habitat</li> </ul>	<ul style="list-style-type: none"> <li>Maintain function of habitat</li> <li>Minimize changes to form of habitat</li> <li>Ensure minimal residual disturbance to wildlife using habitat</li> </ul>	<ul style="list-style-type: none"> <li>Use of access road will be restricted for maintenance vehicles only when required</li> </ul>	<ul style="list-style-type: none"> <li>Post construction habitat monitoring will occur to ensure ongoing use of habitat by birds during migration</li> <li>If a change in species richness and/or abundance is noted during post construction monitoring then MNR will be contacted to discuss further measures</li> <li>Upon submission of annual post-construction reports to MNR it will be determined in consultation with MNR whether contingency measures are required.</li> </ul>

Criterion	Potential Effect	Performance Objective	Mitigation Measure	Monitoring Plan and Contingency Measures
	Activity/Description			
<b>Natural Heritage Resources – Continued</b>				
Bat Maternity Roosts	<ul style="list-style-type: none"> <li>Indirect effects from operation could temporarily disturb wildlife living in this habitat</li> <li>Localized displacement of bats using this habitat</li> </ul>	<ul style="list-style-type: none"> <li>Maintain form and function of the habitat</li> <li>Ensure minimal residual disturbance to wildlife using habitat</li> </ul>	<ul style="list-style-type: none"> <li>Post-construction habitat monitoring to ensure ongoing use of habitat by bats</li> <li>Use of access road will be restricted for maintenance vehicles only when required</li> </ul>	<ul style="list-style-type: none"> <li>If change in species richness and/or abundance is noted during post-construction monitoring then MNR will be contacted to discuss further measures</li> <li>Upon submission of annual post-construction reports to MNR it will be determined in consultation with MNR whether contingency measures are required</li> </ul>
Migratory Butterfly Stopover Area	<ul style="list-style-type: none"> <li>Indirect effects from operation could temporarily disturb wildlife living in this habitat</li> </ul>	<ul style="list-style-type: none"> <li>Maintain function of habitat</li> <li>Minimize changes to form of habitat</li> <li>Ensure minimal residual disturbance to wildlife using habitat</li> </ul>	<ul style="list-style-type: none"> <li>Post-construction habitat monitoring to ensure ongoing use of habitat by bats</li> <li>Use of access road will be restricted for maintenance vehicles only when required</li> </ul>	<ul style="list-style-type: none"> <li>If change in species richness and/or abundance is noted during post-construction monitoring then MNR will be contacted to discuss further measures</li> </ul>
Landbird Migratory Stopover Habitat	Indirect effects from operation could temporarily disturb wildlife living in this habitat	<ul style="list-style-type: none"> <li>Maintain function of habitat</li> <li>Ensure minimal residual disturbance to</li> </ul>	<ul style="list-style-type: none"> <li>Post-construction habitat monitoring to ensure ongoing use of habitat by birds during migration</li> </ul>	<ul style="list-style-type: none"> <li>If change in species richness and/or abundance is noted during post-construction monitoring then MNR will be contacted to discuss further measures</li> </ul>

		wildlife using habitat		<ul style="list-style-type: none"> <li>Upon submission of annual post-construction reports to MNR it will be determined in consultation with MNR whether contingency measures are required</li> </ul>
Waterfowl Nesting Area	Indirect effects from operation could temporarily disturb wildlife living in this habitat	<ul style="list-style-type: none"> <li>Maintain function of habitat</li> <li>Minimize changes to form of habitat</li> <li>Ensure that habitat significance is maintained</li> <li>Ensure minimal residual disturbance to wildlife using habitat</li> </ul>	<ul style="list-style-type: none"> <li>Use of access road will be restricted for maintenance vehicles only when required</li> <li>Post-construction habitat monitoring to ensure ongoing use of habitat by birds during migration</li> </ul>	<ul style="list-style-type: none"> <li>If change in species richness and/or abundance is noted during post-construction monitoring then MNR will be contacted to discuss further measures</li> <li>Upon submission of annual post-construction reports to MNR it will be determined in consultation with MNR whether contingency measures are required</li> </ul>
Amphibian Breeding Habitat(Woodland)	Indirect effects from operation could temporarily disturb wildlife living in this habitat	<ul style="list-style-type: none"> <li>Maintain function of habitat</li> <li>Minimize changes to form of habitat</li> <li>Ensure that habitat significance is maintained</li> <li>Ensure minimal residual</li> </ul>	<ul style="list-style-type: none"> <li>Use of access road will be restricted for maintenance vehicles only when required</li> <li>Post-construction habitat monitoring to ensure ongoing use of habitat by birds during migration</li> </ul>	<ul style="list-style-type: none"> <li>If change in species richness and/or abundance is noted during post-construction monitoring then MNR will be contacted to discuss further measures</li> </ul>

		disturbance to wildlife using habitat		
Marsh Bird Breeding Area	Indirect effects from operation could temporarily disturb wildlife living in this habitat	<ul style="list-style-type: none"> <li>• Maintain form and function of habitat</li> <li>• Ensure minimal residual disturbance to wildlife using habitat</li> </ul>	<ul style="list-style-type: none"> <li>• Post-construction habitat monitoring to ensure ongoing use of habitat by birds during nesting season (April-June)</li> </ul>	<ul style="list-style-type: none"> <li>• If change in species richness and/or abundance is noted during post-construction monitoring then MNR will be contacted to discuss further measures</li> <li>• Upon submission of annual post-construction reports to MNR it will be determined in consultation with MNR whether contingency measures are required</li> </ul>
Early Successional Bird Breeding Habitat	Indirect effects from operation could temporarily disturb wildlife living in this habitat	<ul style="list-style-type: none"> <li>• Maintain function of habitat</li> <li>• Minimize changes to form of habitat</li> <li>• Ensure that habitat significance is maintained</li> <li>• Ensure minimal residual disturbance to wildlife using habitat</li> </ul>	<ul style="list-style-type: none"> <li>• Post-construction habitat monitoring to ensure ongoing use of habitat by birds during nesting season (April-June)</li> </ul>	<ul style="list-style-type: none"> <li>• If change in species richness and/or abundance is noted during post-construction monitoring then MNR will be contacted to discuss further measures</li> <li>• Upon submission of annual post-construction reports to MNR it will be determined in consultation with MNR whether contingency measures are required</li> </ul>

Criterion	Potential Effect	Performance Objective	Mitigation Measure	Monitoring Plan and Contingency Measures
	Activity/Description			
<b>Waterbodies</b>				
Stream WA07	<ul style="list-style-type: none"> <li>• Use of road salt during winter months may increase salinity of the streams</li> <li>• Indirect effects from operation could temporarily disturb wildlife living in this habitat</li> </ul>	<ul style="list-style-type: none"> <li>• Minimize changes to form of waterbody</li> </ul>	<ul style="list-style-type: none"> <li>• Minimize use of road salt; use licensed contractor for winter road clearing and maintenance</li> <li>• Use of access road will be restricted for maintenance vehicles only when required</li> </ul>	None
Natural Pond/Shallow Marsh	<ul style="list-style-type: none"> <li>• Use of road salt during winter months may increase salinity of the streams</li> <li>• Indirect effects from operation could temporarily disturb wildlife living in this habitat</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure no encroachment into feature or 30m buffer</li> </ul>	<ul style="list-style-type: none"> <li>• Minimize use of road salt; use licensed contractor for winter road clearing and maintenance</li> <li>• Use of access road will be restricted for maintenance vehicles only when required</li> </ul>	None
Natural Pond	<ul style="list-style-type: none"> <li>• Use of road salt during winter months may increase salinity of the streams</li> <li>• Indirect effects</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure no encroachment into feature or 30m buffer</li> </ul>	<ul style="list-style-type: none"> <li>• Minimize use of road salt; use licensed contractor for winter road clearing and maintenance</li> <li>• Use of access road will be restricted for maintenance vehicles only when required</li> </ul>	None

	from operation could temporarily disturb wildlife living in this habitat			
Spring WA14, WA15	<ul style="list-style-type: none"> <li>• Use of road salt during winter months may increase salinity of the streams</li> <li>• Indirect effects from operation could temporarily disturb wildlife living in this habitat</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure no encroachment into feature or 30m buffer</li> </ul>	<ul style="list-style-type: none"> <li>• Minimize use of road salt; use licensed contractor for winter road clearing and maintenance</li> <li>• Use of access road will be restricted for maintenance vehicles only when required</li> </ul>	None



Criterion	Potential Effect	Performance Objective	Mitigation Measure	Monitoring Plan and Contingency Measures
	Activity/Description			
<b>Air Odour Dust</b>				
Air and Noise	<ul style="list-style-type: none"> <li>Noise impact of wind turbines on nearby residences and public buildings.</li> </ul>	<ul style="list-style-type: none"> <li>Compliance with the Ministry of Environment Noise Guidelines.</li> </ul>	<ul style="list-style-type: none"> <li>In the event of a noise complaint Ernestown will investigate and/or verify compliance with the applicable noise guidelines. Ernestown will notify the MOE of complaints in a timely manner. Mitigation measures in the event of an actual noise exceedence may include equipment repairs / retrofit, or shut down of the non-conforming turbine.</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring of the noise complaints during operation of the project.</li> <li><i>Contingency measures:</i> Investigate complaints and take appropriate actions to resolve any issues.</li> </ul>
<b>Land Use and Resources</b>				
Land	<ul style="list-style-type: none"> <li>Decline in agriculturally used land. Approximately 18 ha will be occupied by turbines, access roads and other ancillary facilities.</li> </ul>	<ul style="list-style-type: none"> <li>Minimize impacts.</li> </ul>	<ul style="list-style-type: none"> <li>Potential impacts on lands will be minimized as much as possible in the project layout. No additional mitigation measures are considered.</li> </ul>	None
	<ul style="list-style-type: none"> <li>Soil contamination due to accidental spills of oils, fuels or other fluids associated with the</li> </ul>	<ul style="list-style-type: none"> <li>No spills.</li> </ul>	<ul style="list-style-type: none"> <li>All equipment at the site will be properly maintained. A Spill Contingency Plan will be developed and spills will be cleaned up</li> </ul>	<ul style="list-style-type: none"> <li>Operation staff will be trained and instructed on spill reporting requirements.</li> </ul>

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	equipment malfunction.		immediately. Operation personnel will be trained in proper spill clean-up techniques. A spill containment kit will be placed at each turbine location.	
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Criterion	Potential Effect	Performance Objective	Mitigation Measure	Monitoring Plan and Contingency Measures
	Activity/Description			
<b>Provincial and Local Infrastructure</b>				
	<ul style="list-style-type: none"> <li>Interference with communication systems in neighbouring areas due to wind turbine operation and placement.</li> </ul>	<ul style="list-style-type: none"> <li>No Impact</li> </ul>	<ul style="list-style-type: none"> <li>Radio Advisory Board of Canada and Industry Canada guidelines confirmed project layout will have minimal impacts.</li> </ul>	<ul style="list-style-type: none"> <li>Complaints will be investigated and appropriate actions/compensation taken to resolve any issues.</li> </ul>
	<ul style="list-style-type: none"> <li>Additional traffic on local roads associated with the turbine maintenance and operation.</li> </ul>	<ul style="list-style-type: none"> <li>No impacts on the local community.</li> </ul>	<ul style="list-style-type: none"> <li>Ernestown will inform the local community prior to annual maintenance or periodic maintenance which requires oversized loads.</li> </ul>	None
<b>Public Health and Safety</b>				
	<ul style="list-style-type: none"> <li>Aircraft safety due to aeronautical obstruction and / or potential interference of the wind turbines with aviation radars.</li> </ul>	<ul style="list-style-type: none"> <li>Maintain aeronautical safety standards.</li> </ul>	<ul style="list-style-type: none"> <li>Comply with the Transport Canada's marking and lighting standards (CAR 621.19). Consult Transport Canada and Nav Canada early in the project development stage regarding potential project impacts on aircraft safety and appropriate mitigation measures.</li> </ul>	<ul style="list-style-type: none"> <li>Operation personnel will monitor and maintain equipment lighting and other required markings.</li> </ul>
	<ul style="list-style-type: none"> <li>Stray voltage from collector lines to distribution station.</li> </ul>	<ul style="list-style-type: none"> <li>Conformance with Electrical Safety Codes</li> </ul>	<ul style="list-style-type: none"> <li>The project will comply with local grid standards and electrical safety requirements. Prior to</li> </ul>	None

			commissioning testing for stray voltage will occur	
	<ul style="list-style-type: none"> <li>Ice throw from spinning rotor blades during the winter.</li> </ul>	<ul style="list-style-type: none"> <li>Maintain equipment safety standards.</li> </ul>	<ul style="list-style-type: none"> <li>Maintain proper setbacks as per REA requirements. Turbines are programmed to shut off if the blades become unbalanced. This feature protects both from ice throw and other mechanical failures either on the blades or gearbox.</li> </ul>	<ul style="list-style-type: none"> <li>Equipment will be monitored remotely to identify upset conditions. A maintenance program will be developed as per manufacturer's recommendations to ensure reliable operation of the equipment.</li> </ul>
	<ul style="list-style-type: none"> <li>Switching station: Risk to the public due to access to electrical danger.</li> </ul>	<ul style="list-style-type: none"> <li>Conformance with Electrical Safety Codes</li> </ul>	<ul style="list-style-type: none"> <li>The switching station will be contained within a secure fence and gate. Turbines are located on private lands and "No Trespassing" signs will be posted. Electrical distribution lines will conform to electrical safety codes.</li> </ul>	None

## 6. COMMUNICATIONS & EMERGENCY RESPONSE PLANS

During the Project's construction and operational activities, it will be vital to inform the public, Aboriginal communities, the MOE and Loyalist Township regarding activities occurring at the Project site (including any emergencies), as well as provide means by which stakeholders can contact Ernestown and/or the appropriate contractor. The following outlines the actions to be taken during the operation of the Project to facilitate communication, and means by which correspondence received will be recorded and addressed.

A Construction Emergency Response and Communications Plan will be developed by the Construction Contractor and/or Ernestown Wind Park and will include protocols for the proper handling of material spills and associated procedures to be undertaken in the event of a spill.

### 6.1 Emergency Response Plan

Ernestown and/or the Contractor will finalize a detailed Emergency Response Plan for Construction, Operations and Decommissioning phases of the Project in collaboration with local Emergency Services Departments.

The Emergency Response Plan will include a plan for the proper handling of material spills and associated procedures to be undertaken during a spill event. The plan will also specify containment and clean-up materials and their storage locations. The plan will include general procedures for personnel training. As appropriate, the plan may cover response actions to high winds, fire preparedness, evacuation procedures, high angle rescue, and medical emergencies. Developing this plan with local emergency services personnel will allow Ernestown to determine the extent of emergency response resources and response actions of those involved.

The plan will include key contact information for emergency service providers, a description of the chain of communications and how information will be disseminated between Ernestown and/or the Contractor and the relevant responders. The plan will also indicate how Ernestown and/or the Contractor will contact (via phone or in-person) Project stakeholders who may be directly impacted by an emergency so that the appropriate actions can be taken to protect stakeholders health and safety.

### 6.2 Non-Emergency Communications Plan

Ernestown and/or the Contractor will continue contact with Project stakeholders (public, ministries, Aboriginal communities, the municipality) during the operation of the Project, including providing Project updates on the Project website. As a long-term presence in the area, Ernestown will continue to develop

contacts and to develop local relationships and channels of communication, which could provide local benefit.

### **6.3 Public Communications Plan**

Since the beginning of Project consultation, there has been a Project email address Ernestown has made available for stakeholders to use in order to provide input. This email is published on all notices and within draft reports. Ernestown works towards providing a response to public communications within 1-2 weeks; however this is partly dependent on the volume being received during that period. Stakeholder communication will continue during the Project's construction and operation activities. All messages will be recorded in a Communications Response Document.

Should there be a post-construction concern expressed, Ernestown and/or the Contractor will endeavor to respond to messages within 48 hours. All reasonable efforts will be made to take appropriate action as a result of concerns as soon as practicable. Actions taken to remediate the cause of the issue and the proposed actions to be taken to prevent reoccurrences in the future will also be recorded. If appropriate, the MOE Spills Action Centre will be contacted to notify them of the issue. Correspondence will be shared with other stakeholders, such as the MOE, as required and/or as deemed appropriate. Ongoing communication will allow Ernestown and the Operations and Maintenance Contractor to receive and respond to community issues on an ongoing basis.

## **7. OTHER LAND USE PLANS**

This project is not located within the Niagara Escarpment, Oak Ridges Moraine, Lake Simcoe Watershed or the Green Belt.



## 8. ACKNOWLEDGEMENTS & REFERENCES

This report was prepared by:

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&

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ORTECH Environmental

### References

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