Protected Properties Assessment, Grand Renewable Energy Park, Haldimand County, Ontario

Ministry of Tourism and Culture
Culture Division
Culture Services Unit
Programs and Services Branch
401 Bay Street, Suite 1700
Toronto, ON, M7A 0A7
Telephone: 416-314-3108
Facsimile: 416 314 7175
Email : laura.hatcher2@ontario.ca

Ministère du Tourisme et de la Culture
Division de culture
Unité des services culturels
Direction des programmes et des services
401, rue Bay, Bureau 1700
Toronto, ON, M7A 0A7
Téléphone: 416-314-3108
Télécopieur: 416 314 7175
Email : laura.hatcher2@ontario.ca

April 19, 2011

Marnie Dawson
Manager, Renewable Energy Approvals
Samsung Renewable Energy
55 Standish Court
Mississauga, Ontario
L5R 4B2

RE: **Grand Renewable Energy Park**

Various Lots located within the area bounded by Townline Road, Haldimand Road 20, Grand River, and Lake Erie, County of Haldimand

MTC DPR file no. 28EA021

Dear Ms. Dawson:

This letter constitutes the Ministry of Tourism and Culture's written comments as required by s. 23(3)(a) of O. Reg. 359/09 under the *Environmental Protection Act* regarding heritage assessments undertaken for the above project.

Based on the information contained in the reports you have submitted for this project, the Ministry is satisfied with the heritage assessments. Please note that the Ministry makes no representation or warranty as to the completeness, accuracy or quality of the heritage assessment reports.*

The reports recommend the following:

Protected Properties Assessment Section 6: Study Results and Recommendations:

A total of four (4) municipally designated properties were identified within a reasonable zone of influence of Project components (Figure 4-1). Each of these properties has been assessed for potential Project-related negative impacts. Evaluation of impacts included: destruction, alteration, shadows, isolation, direct or indirect obstruction of views, and change in land use.

No potential negative impacts of significant magnitude have been identified.

Heritage Impact Assessment Section 5: Study Results and Recommendations:

A total of 85 properties and seven cultural landscapes within the Project's zone of influence were evaluated as being significant in terms of their heritage value. All of the significant properties and cultural landscapes were assessed for potential Project-related negative impacts.

No significant resources will be destroyed by the proposed Project.

No significant resources will be altered by the proposed Project.

No significant resources will have shadows cast on them by the proposed Project.

No significant resources will be isolated by the proposed Project.

No views of significant resources and/or their value-defining features will be obscured in an invasive manner.

Based on the current Site Plan, no further mitigation is recommended.

The Ministry is satisfied with these recommendations.

This letter does not waive any requirements which you may have under the Ontario *Heritage Act*. Also, this letter does not constitute approval of the renewable energy project. Approvals of the project may be required under other statutes and regulations. It is your responsibility to obtain any necessary approvals or licences.

Please feel free to contact me if you have questions or require additional information.

Sincerely,

L Hatcher

Laura Hatcher
Heritage Planner

cc. Christienne Uchiyama, Archaeologist and Heritage Planning Consultant
Stantec

Colin Varley, Senior Archaeologist and Heritage Planning Consultant
Stantec

Chris Schiller, Manager, Culture Services Unit
Programs and Services Branch, Ministry of Tourism and Culture

* In no way will the Ministry be liable for any harm, damages, costs, expenses, losses, claims or actions that may result: (a) if the Report(s) or its recommendations are discovered to be inaccurate, incomplete, misleading or fraudulent; or (b) from the issuance of this letter. Further measures may need to be taken in the event that additional artifacts or archaeological sites are identified or the Report(s) is otherwise found to be inaccurate, incomplete, misleading or fraudulent.

FINAL REPORT
Protected Properties Assessment,
Grand Renewable Energy Park,
Haldimand County, Ontario

Prepared for:
Samsung Renewable Energy Inc.,
55 Standish Court, Mississauga, ON
L5R 4B2 (905) 542-3535

Prepared by:
Stantec Consulting Ltd
2791 Lancaster Rd., Suite 200
Ottawa, ON K1B 1A7

March 15, 2011

Project No.: 161010624

EXECUTIVE SUMMARY

Samsung C&T (Samsung), Korea Power Electric Corporation (KEPCO), and Pattern Energy (Pattern) plan to build and operate the world's largest renewable energy cluster in Southern Ontario (Ontario Alternative Energy Cluster). Samsung has previously launched Korea's first solar energy project and built the world's largest skyscraper (Dubai). KEPCO is one of the world's top power utilities and develops low-carbon power generation and smart grid technologies. Pattern Energy develops, constructs, owns and operates clean energy and transmission assets in the United States, Canada and Latin America. Together, these companies (referred to herein as "SPK") will be involved in the development of the first phase of the energy cluster development.

The Grand Renewable Energy Park (the Project) is proposed within the County of Haldimand and is generally bounded by Townline Road to the north, Haldimand Road 20 to the west, the Grand River to the east and Lake Erie to the south. It consists of a 153.1 MW (nameplate capacity) wind project, a 100 MW (nameplate capacity) solar project located on privately owned and Ontario Realty Corporation (ORC) managed lands and a transmission line to convey electricity to the existing power grid. According to subsection 6(3) of O. Reg. 359/09, the wind component of the Project is classified as a Class 4 Wind Facility and the solar component of the Project is classified as a Class 3 Solar Facility.

The basic components of the Project include 69 wind turbines, approximately 425,000 photovoltaic (PV) solar panels installed on fixed ground-mounted racking structures organized into 100 1 MW solar units, a collector sub-station, interconnect station and Operations and Maintenance building, temporary storage and staging areas, approximately 19 km of 230 kV transmission lines along Haldimand Road 20, approximately 96 km of new overhead 34.5 kV collector lines along public roads, approximately 45 km of new underground collector lines along turbine access roads, approximately 43 km of turbine access roads and 40 km of solar panel maintenance roads.

Specific sections of the *Ontario Regulation 359/09, Renewable Energy Approvals Under Part V.0.1 Of The Act* pertain to Heritage Resources, specifically protected properties as listed in the Table in Section 19 or as described in Section 20. In order to meet the conditions of these regulations, Stantec Consulting Ltd. was retained by SPK to conduct a Protected Properties Assessment of the location of the proposed Project in the Regional Municipality of Haldimand-Norfolk.

A Preliminary Protected Properties Assessment was conducted in July, 2010 (Stantec, 2010). The goal of the 2010 preliminary report was to identify the locations of any resources in the general Project area and describe those resources in order to inform the process of planning locations for Project components including: turbines, access roads, solar fields and laydown areas.

The assessment included a review of records and inventories held by the Municipality of Haldimand-Norfolk, local heritage groups and museums and the Ontario Heritage Trust. The report identified a total of ten (10) municipally designated properties within the general Project area.

The ten designated properties found to exist within the general Project area include;

- The Campbell-Pine House;
- The Charles Reicheld House;
- The Cooper-Fess Residence;
- The Cottonwood Mansion;
- The Hoover Log House;
- The John Fry House;
- The Knisley -Lindsay House;
- The S.S. #3 Union School;
- The Wilson P. MacDonald Museum; and
- The Vanderburgh House.

No properties were identified upon which a notice of intention to designate has been given and no Ontario Heritage Trust easements have been identified.

The current report assesses the impacts of the proposed Grand Renewable Energy Park on designated properties within and adjacent to the Project area. In particular, the report assesses potential negative impacts on four properties located within 1 km of Project components; the John Fry House, the Vanderburgh House, the Campbell-Pine House, and the Charles Reicheld House.

Based on the most recent Site Plan, the Project was assessed for potential negative impacts in terms of: destruction, alteration, shadows, isolation, direct or indirect obstruction of views, and change in land use. No potential negative impacts of significant magnitude have been identified.

The following report details the findings of the protected properties assessment.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

LIST OF APPENDICES

1 INTRODUCTION

Samsung C&T (Samsung), Korea Power Electric Corporation (KEPCO) and Pattern Energy (Pattern) plan to build and operate the world's largest renewable energy cluster in Southern Ontario (Ontario Alternative Energy Cluster). Together these companies (herein referred to as "SPK" are proposing to develop, construct, and operate the Grand Renewable Energy Park (the "Project") as the development of the first phase of the energy cluster development.

Stantec Consulting Ltd. (Stantec) was retained by SPK to prepare a Renewable Energy Approval (REA) Application, as required under *Ontario Regulation 359/09 – Renewable Energy Approvals under Part V.0.1 of the Act* of the *Environmental Protection Act (O.Reg. 359/09)*.

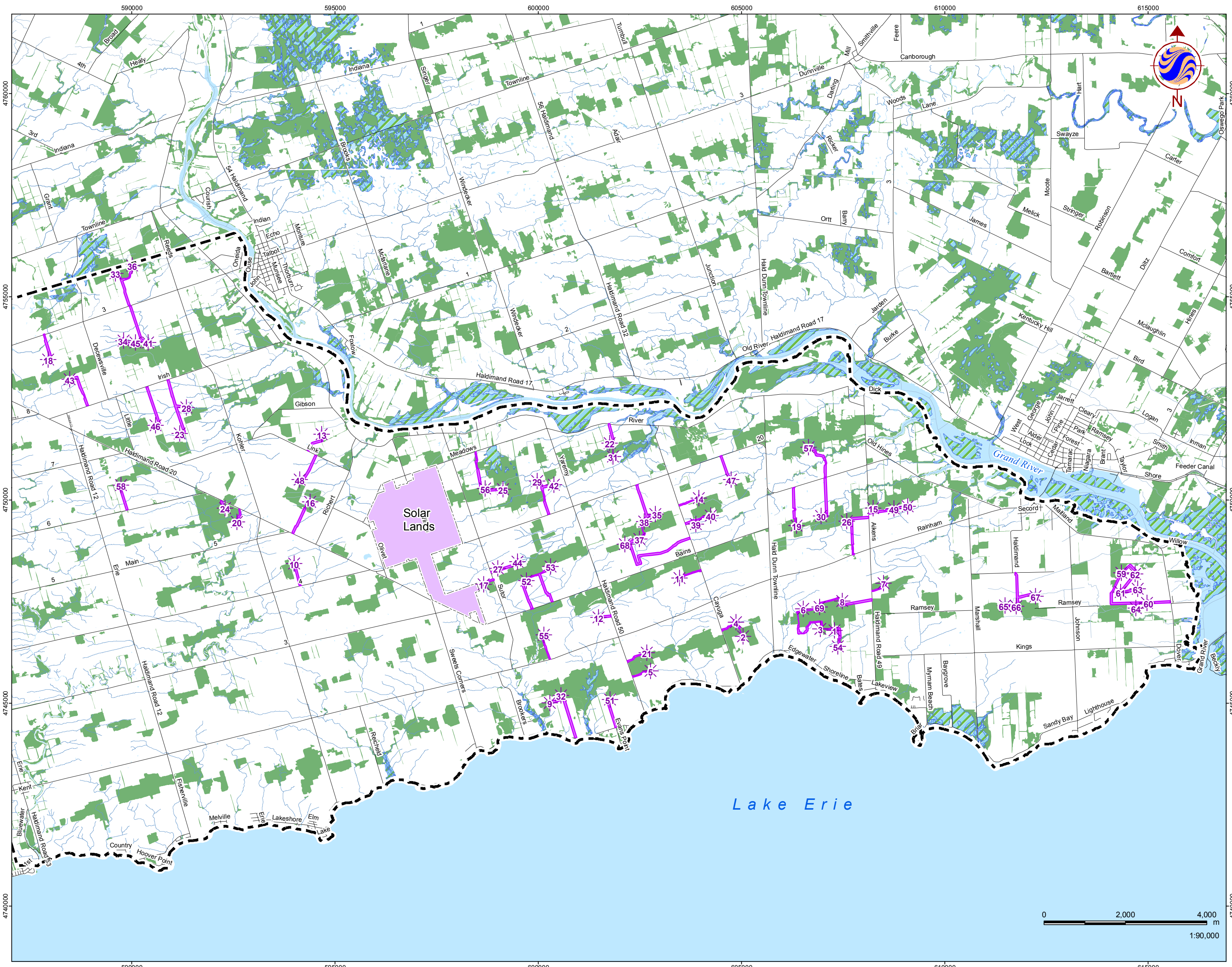
This Protected Properties Report has been prepared to satisfy requirements under *O.Reg. 359/09, s.19*. In July, 2010 a Preliminary Protected Properties Assessment was prepared which encompassed the general Project area, consisting of the Townships of Dunn, Rainham, South Cayuga, North Cayuga and Walpole (Stantec, 2010). The report identified the locations of ten municipally designated properties to be avoided through Project design.

The following report presents the results of previously identified protected resources which fall within a reasonable zone of influence of Project infrastructure. The Protected Properties Assessment was prepared by Christienne Uchiyama, B.A., Archaeologist and Heritage Planning Consultant with Stantec. Colin Varley, M.A., R.P.A., Senior Archaeologist and Heritage Planning Consultant with Stantec acted as Senior Reviewer.

1.1 Project Description

The Project is proposed within the County of Haldimand and is generally bounded by Townline Road to the north, Haldimand Road 20 to the west, the Grand River to the east and Lake Erie to the south. It consists of a 153.1 MW (nameplate capacity) wind power, a 100 MW (nameplate capacity) solar power located on privately owned and Ontario Realty Corporation (ORC) managed lands and a transmission line to convey electricity to the existing power grid.

The basic components of the Project include 69 wind turbines, approximately 425,000 photovoltaic (PV) solar panels installed on fixed ground-mounted racking structures organized into 100 1 MW solar units, a collector sub-station, interconnect station and Operations and Maintenance building, temporary storage and staging areas, approximately 19 km of 230 kV transmission lines along Haldimand Road 20, approximately 96 km of new overhead 34.5 kV collector lines along public roads, approximately 45 km of new underground collector lines along turbine access roads, approximately 43 km of turbine access roads and 40 km of solar panel maintenance roads. Solar panel and turbine schematics are included in Appendix A.



Legend

- Wind Turbine Location
- Road
- Watercourse
- Waterbody
- Wetland
- Woodlot
- Planned Constructable Areas
- Solar Lands
- Project Location

Map Area

Notes

1. Coordinate System: UTM Zone 17 NAD 83.
2. Data Sources: Ontario Ministry of Natural Resources © Queens Printer Ontario, 2009; © GREP, 2010; © Samsung, 2010.
3. Image Sources: © Google Earth Pro, 2010 (© First Base Solutions, 2010; © TeleAtlas, 2010 -Imagery Date: April 7, 2006)

Stantec

January 2011
Project No. 161010624

Client/Project

SAMSUNG C & T
GRAND RENEWABLE ENERGY PARK

Figure No.

1-1

Title

SITE PLAN

1.2 Assessment Methodology

The Protected Properties Assessment (PPA) was composed of a program of archival research, consultation with applicable groups and governmental organisations and visual assessment. To familiarise the study team with the Project area, archival documents were reviewed and a summary historical background of the local area was prepared.

As per requirements outlined in the Table in Section 19 of *O.Reg 359/09* (shown on next page), buildings identified through archival research and the site visit were assessed based on eight (8) descriptions of protection.

The July, 2010 Preliminary PPA identified the locations of ten municipally designated properties within the general Project area to be avoided through Project design:

- The Campbell-Pine House;
- The Charles Reicheld House;
- The Cooper-Fess Residence;
- The Cottonwood Mansion;
- The Hoover Log House;
- The John Fry House;
- The Knisley -Lindsay House;
- The S.S. #3 Union School;
- The Wilson P. MacDonald Museum; and
- The Vanderburgh House (Stantec, 2010).

Based on the current Site Plan four (4) of the properties are considered to be located within a reasonable zone of influence based on their proximity to Project components. A 1 km radius was chosen as a zone of influence as it captures areas that will be directly affected by the Project as well as those that might be indirectly impacted in terms of visual impacts. Assessment of potential negative impacts has been carried out as per InfoSheet #5 in *Heritage Resources in the Land Use Planning Process, Cultural Heritage and Archaeology Policies of the Ontario Provincial Policy Statement, 2005* (MTC, 2006)

Assessment of potential direct or indirect impacts of the Project on identified protected properties in the Project area considered Ministry of Tourism and Culture guidelines concerning *Heritage Impact Assessments and Conservation Plans* (MTC, 2006).

The Ministry of Tourism and Culture outlines seven (7) potential negative impacts on heritage resources:

- **Destruction** of any, or part of any, *significant heritage attributes* or features;
- **Alteration** that is not sympathetic, or is incompatible, with the historic fabric and appearance;

- **Shadows** created that alter the appearance of a *heritage attribute* or change the viability of a natural feature or plantings, such as a garden;
- **Isolation** of a *heritage attribute* from its surrounding environment, context or a *significant* relationship;
- **Direct or indirect obstruction** of *significant* views or vistas within, from, or of built and natural features;
- **A change in land use** such as rezoning a battlefield from open space to residential use, allowing new *development* or *site alteration* to fill in the formerly open spaces; and
- **Land disturbances** such as a change in grade that alters soils, and drainage patterns that adversely affect and *archaeological resource*.

Land disturbances are being assessed in a separate Stage 1 Archaeological Assessment and have not been included in the current evaluation.

Table from Section 19, O. Reg 359/09

Item	Column 1	Column 2	Column 3
	Description of property.	**Person or body whose authorization is required.**	**Type of authorization required to be submitted.**
1	A property that is the subject of an agreement, covenant or easement entered into under clause 10 (0) (b) of the *Ontario Heritage Act*.	Ontario Heritage Trust.	Authorization to undertake any activities related to the renewable energy project that require the approval of the Ontario Heritage Trust pursuant to the easement or covenant.
2	A property in respect of which a notice of intention to designate the property to be of cultural heritage value or interest has been given in accordance with section 29 of the *Ontario Heritage Act*.	Municipality that gave the notice.	If, as part of the renewable energy project, the alteration of the property or the demolition or removal of a building or structure on the property is proposed, consent to alter the property or demolish or remove the building or structure.
3	A property designated by a municipal by-law made under section 29 of the *Ontario Heritage Act* as a property of cultural heritage value or interest.	Municipality that made the by-law.	If, as part of the renewable energy project, the alteration of the property or the demolition or removal of a building or structure on the property is proposed, consent to alter the property or demolish or remove the building or structure.
4	A property designated by order of the Minister of Culture made under section 34.5 of the *Ontario Heritage Act*	Minister of Culture.	If, as part of the renewable energy project, the alteration of the property or the demolition or removal of a building or structure on the property is proposed, consent to alter the property or demolish or remove the building or structure.
5	A property in respect of which a notice of intention to designate the property as property of cultural heritage value or interest of provincial significance has been given in accordance with section 34.6 of the *Ontario Heritage Act*.	Minister of Culture.	If, as part of the renewable energy project, the alteration of the property or the demolition or removal of a building or structure on the property is proposed, consent to alter the property or demolish or remove the building or structure.
6	A property that is the subject of an easement or a covenant entered into under section	Municipality entered into the easement or covenant.	Authorization to undertake any activities related to the renewable energy project require the approval of the municipality that entered into the easement or covenant.
7	A property that is part of an area designated by a municipal by-law made under section 41 of the *Ontario Heritage Act* as a heritage conservation district.	Municipality that made the by-law.	If, as part of the renewable energy project, the alteration of the property or the erection, demolition or removal of a building or structure on the property is proposed, a permit to alter the property or to erect, demolish or remove a building or structure or to erect, demolish or remove a building or structure on the property.
8	A property designated as a historic site under Regulation 880 of the Revised Regulations of Ontario, 1990 (Historic Sites) made under the *Ontario Heritage Act.*	Minister of Culture.	If, as part of the renewable energy project, the excavation or alteration of the property of historical significance is proposed, a permit to excavate or alter the property.

Mitigation measures were recommended in response to identified potential project-related negative impacts.

Assessment of potential impacts on non-protected significant heritage resources and potential archaeological resources have been carried out but are not included in the current report.

2 PROJECT AREA

The Project area is composed of developed and undeveloped land contained within the townships of North Cayuga, South Cayuga, Rainham, Dunn and Walpole in the Regional Municipality of Haldimand County (Figure 1-1). Project components are located primarily in Dunn, South Cayuga and North Cayuga Townships (Figure 1-1).

The closest major topographic features to the Project area are Lake Erie which is located directly to the south and the Grand River which runs to the north and east of the project (Figure 1-1). Lake Ontario is located as close as 28 km to the northeast.

The topography in the Project area is generally flat with some gently rolling areas. The Project area is located in the Haldimand Clay Plain physiographic region, a large region that occupies the majority of the Niagara Peninsula south of the Escarpment down to Lake Erie. It is a region of approximately 1,350 square miles characterized by recessional moraines in the northern part, deep river valley in the middle, and flat and low lying ground to the south (Chapman and Putnam, 1984).

2.1 The Grand River

The Grand River, a Canadian Heritage River, runs along the north and east of the Project area. The river was nominated in 1990 and accepted by the Canadian Heritage Rivers Board in 1994 following completion of *The Grand Strategy* (Grand River Conservation Authority, 2011). Within the Project area, the portion of the Grand River around Dunnville possesses an outstanding combination of both natural and human heritage features including riverboat locks and feeder canals (Heritage Resource Centre, 1989).

3 HISTORICAL BACKGROUND

Named after Sir Frederick Haldimand, a German mercenary soldier fighting for the British in the American War of Independence and later Governor of Quebec, Haldimand County was originally created as part of Norfolk County in 1792 from lands originally seeded to Joseph Brant and the Six Nations Iroquois in 1784, but sold back to, and taken back by, the Crown. Haldimand County was designated as its own county in 1800 (Brueton, 1967). Originally, the land given to the Six Nations was an area of six miles on either side of the Grand River, from its head to its mouth at Lake Erie. Brant, who had fought for and alongside the British in the American War of Independence subsequently leased tracts of the land to allies of the Six Nations, particularly members of the 'Butler's Rangers', a Loyalist unit that fought for the British. These men were the first European settlers in the county.

The county was officially opened for settlement by the Government in 1832 but settlement was slow due to the unforgiving conditions of the heavily forested, and sometimes swampy, lands. The land was so poor in spots that it had been largely unused by Native populations since the destruction and dispersion of the Neutral tribe by the Iroqouis in the mid-15th Century (Harper, 1950). Like much of Ontario, settlers were a mix of United Empire Loyalists (UEL) fleeing the post-revolution United States and immigrants from Britain and other European countries. In Haldimand County, these settlers found that the waterfront (front) of the county was far more acceptable than the interior and tended to set up residence close to the banks of Lake Erie. Even though grants were given for Lots in the rear of the County, it would take a much longer time for these to be cleared and settled (Nelles, 1905).

4 PROTECTED PROPERTIES

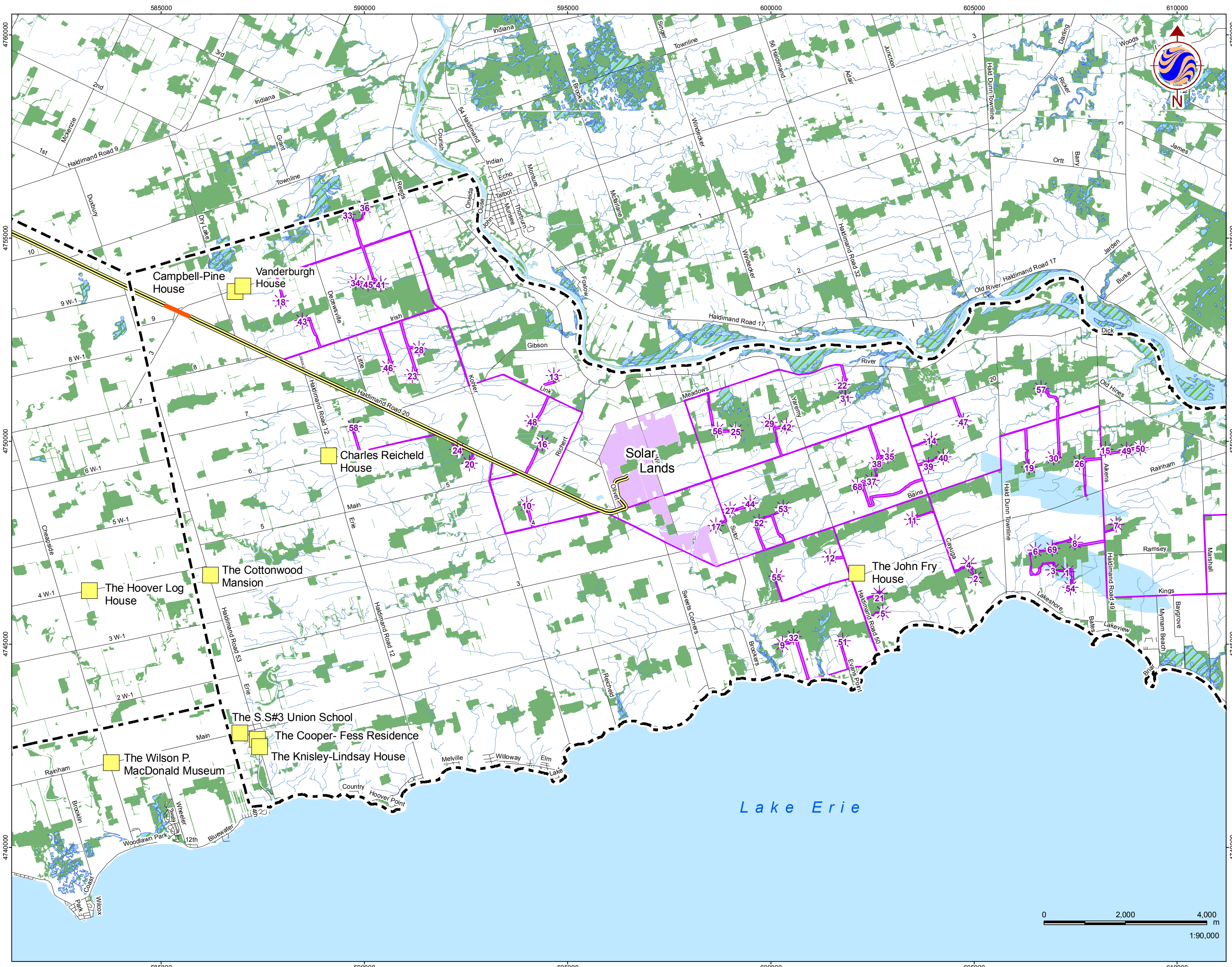
There are ten (10) designated heritage properties in the vicinity of the Project area (OHT, 2010; Haldimand County, 2011; Stavinga, pers. comm.) including:

- The Campbell-Pine House at 393 Highway #3, Cayuga;
- The Charles Reicheld House at 601 Regional Road 12, Fisherville;
- The Cooper - Fess Residence at 27 Erie Street South, Selkirk;
- The Cottonwood Mansion at 740 Regional Road 53, Selkirk;
- The Hoover Log House at 95 Concession 4 Road, Fisherville;
- The John Fry House at 1915 Regional Road 3, South Cayuga;
- The Knisley-Lindsay House at 57 Erie Street North, Selkirk;
- The S.S#3 Union School at 34 Main Street West, Selkirk;
- The Wilson P. MacDonald Museum at 3513 Rainham Road, Walpole; and
- The Vanderburgh House at 455 Highway 3, Cayuga (Figure 4-1; Table 4.1).

Table 4-1 Designated Buildings Within 5 km of the General Project Area

Name/Address	Period	Site Type	Designation
Campbell-Pine House	1850	Residential	Designated in 1989 under Part IV, of the OHA
Charles Reicheld House	1885	Residential	Designated in 1991 under Part IV, of the OHA
Cooper-Fess Residence	1870	Residential	Designated in 1990 under Part IV, of the OHA
Cottonwood Mansion	c. 1860	Residential	Designated in 1989 under Part IV, of the OHA
Hoover Log House	1793	Residential	Designated in 2000 under Part IV, of the OHA
John Fry House	1835	Residential	Designated in 1990 under Part IV, of the OHA
Knisley -Lindsay House	c.1800	Residential	Designated in 1982 under Part IV, of the OHA
S.S.#3 Union School	c. 1918	Public	Designated in 1983 under Part IV, of the OHA
Wilson P. MacDonald Museum	1872	Public	Designated in 1982 under Part IV, of the OHA
Vanderburgh House	1890	Residential	Designated in 1990 under Part IV, of the OHA

No properties were identified for which a notice of intention to designate has been given, nor were any Heritage Conservation Districts noted. There is no record of Ontario Heritage Trust easements within the Project area (Pers. Comm., Unyi, 2011, Fraser, 2011).



Legend

- Protected Property
- Wind Turbine Location
- Planned Constructable Areas
- Transmission Line
- Underground Line
- Road
- Watercourse
- Waterbody
- Wetland
- Woodlot
- Project Location

Project Area

Notes

1. Coordinate System: UTM Zone 17 NAD 83.
2. Data Sources: Ontario Ministry of Natural Resources © Queens Printer Ontario, 2009; © GREP, 2010; © Samsung, 2010.
3. Image Sources: © Google Earth Pro, 2010 (© First Base Solutions, 2010; © TeleAtlas, 2010 -Imagery Date: April 7, 2006)

Stantec

March 2011
Project No. 161010624

Client/Project

SAMSUNG C & T
GRAND RENEWABLE ENERGY PARK

Figure No.

4-1

Title

LOCATION OF PROTECTED PROPERTIES

5 IMPACT ASSESSMENT AND RECOMMENDED MITIGATION

Of the ten designated properties identified in the July, 2010 Preliminary PPA, four have been found to be within a reasonable zone of influence of Project components (a 1 km radius). Potential Project-related impacts have been assessed for these four properties which include;

- The Campbell-Pine House at 393 Highway #3, North Cayuga Township;
- The Vanderburgh House at 455 Highway 3, North Cayuga Township;
- The Charles Reicheld House at 601 Regional Road 12, Rainham Township; and
- The John Fry House at 1915 Regional Road 3, South Cayuga (Figure 4-1).

5.1 The Campbell-Pine House

The Campbell-Pine House is a two-storey limestone building in a vernacular style. It was built in 1850 by Donald Campbell, an early settler in North Cayuga (see Figure 4-1 for location of Campbell-Pine House). The residence is a particularly early example of the Pennsylvania Georgian influence seen throughout the area. The form of the building is symmetrical, having three openings on the front elevation of the first and second floor. The structure has two entrances on the first storey and one door at the centre of the second storey balcony. Value-defining features of the building that have been designated include the cedar shingle roof, pine fascia, moulded soffits, stone masonry on exterior walls, three exterior doors on the front elevation and the verandah (Haldimand County, 2011). The Campbell-Pine House property is not on, or adjacent to, property upon which Project components will be constructed.

Photograph 1 - The Campbell-Pine House, front elevation, facing southwest.

Photograph 2 View from Highway 3 at Campbell-Pine House facing southeast (out of frame). Turbines 18 and 43 have been simulated and are almost invisible through tree-cover (right-hand side of photograph).

Table 5-1 Campbell-Pine House, Potential Negative Impacts

Potential Negative Impact	Results of Analysis
Destruction	No significant heritage attributes or features will be destroyed by the proposed Project.
Alteration	No alterations are expected.
Shadows	The proposed property will not cast any shadows on the property.
Isolation	No part of the property will be isolated as a result of the proposed Project.
Direct or indirect obstruction	Views will not be permanently altered or obstructed by the proposed project as a result of both distance (approximately 1.2 km) from the nearest turbine (#18) which will reduce the scale of the turbine when viewed from the property and also as a result of the treed nature of the property (Figure 4-1). Visual simulations illustrate that views of the property are unlikely to be affected by Turbine 18 (Photograph 2).
Change in land use	Wind energy production is a use that is compatible with agricultural landscapes and the presence of turbines in the landscape is not expected to negatively impact views from the Campbell-Pine House. No change in land use will occur to the Campbell-Pine House proper as a result of the proposed Project.

No negative impacts are expected as a result of the proposed Project.

5.2 The Vanderburgh House

The Vanderburgh House is a two storey dichromatic brick Italianate farmhouse constructed in 1890 (see Figure 4-1 for location of Vanderburgh House). The building is redbrick with yellow brick decorative detail along the corners, below the eaves and the tower on the west elevation (see photo below). Value-defining features which have been designated include the ornate verandah spanning the front elevation, the brickwork, chimneys, roof and cornice brackets. The Vanderburgh House is not on, or adjacent to, property upon which Project components will be constructed.

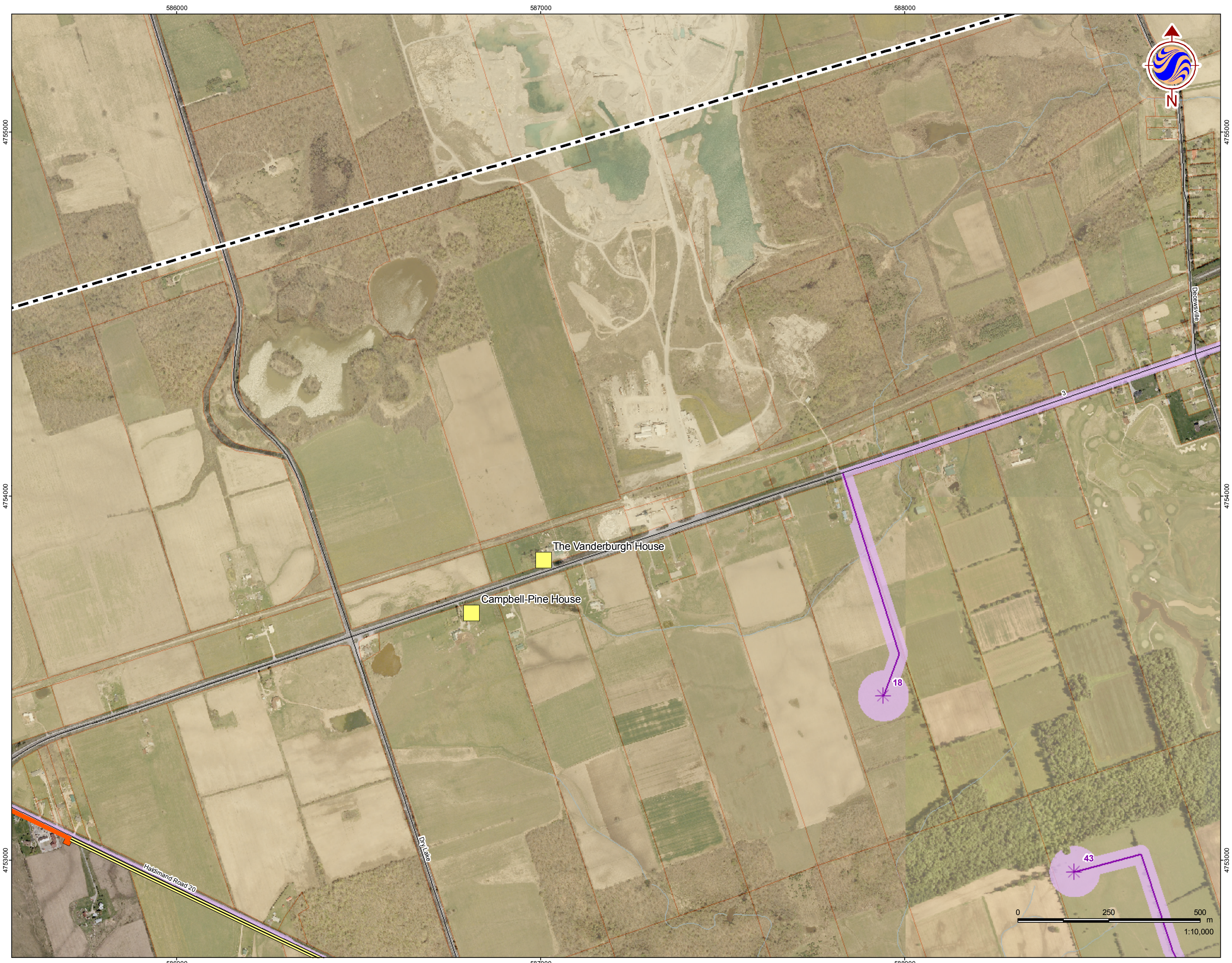
Photograph 3 - The Vanderburgh House, view from Highway 3, facing northeast

Photograph 4 - Vanderburgh House, front elevation, facing north

Table 5-2 Vanderburgh House, Potential Negative Impacts

Potential Negative Impact	Results of Analysis
Destruction	No significant heritage attributes or features will be destroyed by the proposed Project.
Alteration	No alterations are expected.
Shadows	The proposed property will not cast any shadows on the property.
Isolation	No part of the property will be isolated as a result of the proposed Project.
Direct or indirect obstruction	Views will not be permanently altered or obstructed by the proposed Project. The property is located on the north side of Highway 3 and the nearest turbine (#18) is located south of Highway 3, approximately 1 km from the property (Figure 4-1). Photograph 2 illustrates the effectiveness of tree-cover in shielding views from the Vanderburgh House to Turbine 18.
Change in land use	Wind energy production is a use that is compatible with agricultural landscapes and the presence of turbines in the landscape is not expected to negatively impact views from the Vanderburgh House. No change in land use will occur to the Vanderburgh House proper as a result of the proposed Project.

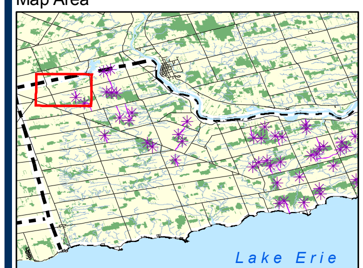
No negative impacts are expected as a result of the proposed Project.



Legend

- Protected Property
- Property Parcel
- Planned Constructable Areas
- Wind Turbine Location
- Transmission Line
- Underground Line
- Road
- Access Road
- Watercourse
- Project Location

Map Area



Notes

1. Coordinate System: UTM Zone 17 NAD 83.
2. Data Sources: Ontario Ministry of Natural Resources © Queens Printer Ontario, 2009; © GREP, 2010; © Samsung, 2010.
3. Image Sources: © Google Earth Pro, 2010 (© First Base Solutions, 2010; © TeleAtlas, 2010 -Imagery Date: April 7, 2006)

Stantec

March 2011
Project No. 161010624

Client/Project

SAMSUNG C & T
GRAND RENEWABLE ENERGY PARK

Figure No.

5-1

Title

LOCATION OF CAMPBELL-PINE & VANDERBURGH HOUSE IN RELATION TO PROJECT COMPONENTS

5.3 The Charles Reicheld House

The Charles Reicheld House is a large, dichromatic brick farmhouse built in 1885 (see Figure 4-2 for location of Charles Reicheld House). The two storey building is constructed in redbrick with yellow brick decoration along the corners and below the eaves. The house is symmetrical in form with a hip roof and three openings on both the first and second storeys of the front elevation. The entire exterior of the building is designated. Specific value-defining features include the chimneys, pressed metal shingle roof, cornice brackets, and the verandah. The wooden clapboard siding of the summer kitchen is also designated (Haldimand County, 2011). The Charles Reicheld House is not on, or adjacent to, property upon which Project components are proposed to be constructed.

Photograph 5 - The Charles Reicheld House, front elevation, facing east

Table 5-3 Charles Reicheld House, Potential Negative Impacts

Potential Negative Impact	Results of Analysis
Destruction	No significant heritage attributes or features will be destroyed by the proposed Project.
Alteration	No alterations are expected.
Shadows	The proposed property will not cast any shadows on the property.
Isolation	No part of the property will be isolated as a result of the proposed Project.
Direct or indirect obstruction	Views will not be permanently altered or obstructed by the proposed Project as a result of both distance from the nearest turbine (#58) which will reduce the scale of the turbine when viewed from the property and also as a result of the treed nature of the property. The building is located on the west side of the street and Turbine 58, located east of the road (approximately 1 km from the property), will not be visible when viewing the Charles Reicheld House (Figure 4-2). Photograph 6 illustrates the impact of the Project on views from the Charles Reicheld House. Visual simulations of turbine locations indicate that the character of the landscape will not be significantly altered by the proposed Project.
Change in land use	Wind energy production is a compatible with agricultural land-use and the turbines are not expected to greatly impact the landscape from a land-use perspective. No change in land use will occur to the Charles Reicheld House proper as a result of the proposed Project.

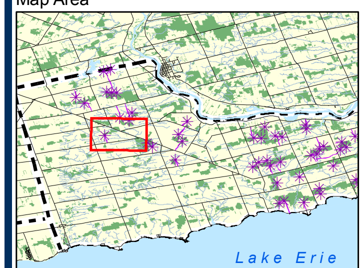
No negative impacts are expected as a result of the proposed Project.

Photograph 6 View from Haldimand Road 2 at Charles Reichfeld House facing northeast towards Turbine 58 (away from Charles Reicheld House).

Legend

- Protected Property
- Property Parcel
- Planned Constructable Areas
- Wind Turbine Location
- Transmission Line
- Road
- Access Road
- Watercourse
- Project Location

Map Area



Notes

1. Coordinate System: UTM Zone 17 NAD 83.
2. Data Sources: Ontario Ministry of Natural Resources © Queens Printer Ontario, 2009; © GREP, 2010; © Samsung, 2010.
3. Image Sources: © Google Earth Pro, 2010 (© First Base Solutions, 2010; © TeleAtlas, 2010 -Imagery Date: April 7, 2006)

Stantec

March 2011
Project No. 161010624

Client/Project

SAMSUNG C & T
GRAND RENEWABLE ENERGY PARK

Figure No.

5-2

Title

LOCATION OF CHARLES REICHELD HOUSE IN RELATION TO PROJECT COMPONENTS

5.4 The John Fry House

The John Fry House is a one and a half storey wood-frame house (see Figure 4-3 for location of John Fry House). John Fry, one of the earliest Mennonite settlers in the area, built the home in three separate episodes dating to around 1835, 1855 and 1885. Value-defining features which have been designated include: the chimneys, shingle roof, doors and windows (including the attic dormer), exterior siding and trim and the front porch (Haldimand County, 2011). The John Fry House is not on, or adjacent to, property upon which Project components will be constructed.

Photograph 7 - The John Fry House, front elevation, facing north

Photograph 8 - Detail of plaque on the John Fry House

Photograph 9 View from Rainham Road at the John Fry House (out of frame, to the right) facing northwest with visual simulations of Project Components.

Table 5-4 John Fry House, Potential Negative Impacts

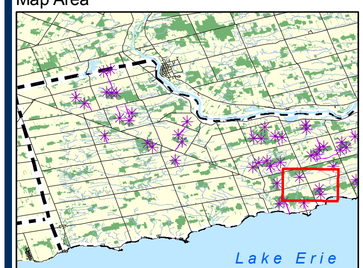
Potential Negative Impact	Results of Analysis
Destruction	No significant heritage attributes or features will be destroyed by the proposed Project.
Alteration	No alterations are expected.
Shadows	The proposed property will not cast any shadows on the property.
Isolation	No part of the property will be isolated as a result of the proposed Project.
Direct or indirect obstruction	Views will not be permanently altered or obstructed by the proposed project as a result of both distance from the nearest turbine locations and the treed nature of the property (Photograph 8). The John Fry House is located on the north side of Rainham Road and will not be obstructed by Turbines 21 and 5, both of which are south of Rainham Road (approximately 650 m from the property). Turbine 12, although north of Rainham Road, is located west of Haldimand Road 50 whereas the John Fry House is located approximately 580m east of Haldimand Road 50 and approximately 800 m from Turbine 12 (Figure 4-3). Photograph 9 illustrates that although turbines may be visible when viewing the John Fry House, their scale is such that the landscape will not be greatly affected visually.
Change in land use	No change in land use will occur as a result of the proposed Project.

No negative impacts are expected as a result of the proposed Project.

Legend

- Protected Property
- Property Parcel
- Planned Constructable Areas
- Wind Turbine Location
- Road
- Access Road
- Watercourse
- Project Location

Map Area



Notes

1. Coordinate System: UTM Zone 17 NAD 83.
2. Data Sources: Ontario Ministry of Natural Resources © Queens Printer Ontario, 2009; © GREP, 2010; © Samsung, 2010.
3. Image Sources: © Google Earth Pro, 2010 (© First Base Solutions, 2010; © TeleAtlas, 2010 -Imagery Date: April 7, 2006)

Stantec

March 2011
Project No. 161010624

Client/Project

SAMSUNG C & T
GRAND RENEWABLE ENERGY PARK

Figure No.

5-3

Title

LOCATION OF THE JOHN FRY HOUSE IN RELATION TO PROJECT COMPONENTS

6 STUDY RESULTS AND RECOMMENDATIONS

A total of four (4) municipally designated properties were identified within a reasonable zone of influence of Project components (Figure 4-1). Each of these properties has been assessed for potential Project-related negative impacts. Evaluation of impacts included: destruction, alteration, shadows, isolation, direct or indirect obstruction of views, and change in land use.

No potential negative impacts of significant magnitude have been identified.

7 CLOSURE

This report has been prepared for the sole benefit of SPK and may not be used by any third party without the express written consent of Stantec Consulting Ltd and SPK. Any use which a third party makes of this report is the responsibility of such third party.

We trust this report meets your current requirements. Please do not hesitate to contact us should you require further information or have additional questions about any facet of this project.

Yours truly,

STANTEC CONSULTING LTD

Christienne Uchiyama, B.A.
Archaeologist and Heritage Planning Consultant
Tel: 613 738-0708 ext. 3278
Fax: 613 738-0721
Christienne.Uchiyama@Stantec.com

Colin Varley, M.A., R.P.A.
Senior Archaeologist and Heritage Planning Consultant
Tel: 613 738-6087
Fax: 613 738-0721
Colin.Varley@Stantec.com

V:\01225\active\other_pc\161010624 - Samsung, Grand Renewable Energy Park\reports\Protected Properties\rpt_161010624_protected_properties_20110301.doc

8 REFERENCES

8.1 Literature Cited

Brueton, Kenneth. 1967. **Walpole Township Centennial History**. Jarvis, Ontario.

Chapman, L.J., and D.F. Putnam, 1984. **The Physiography of Southern Ontario (3rd Edition).** Ontario Geological Survey, Special Volume 2. Toronto: Ontario Ministry of Natural Resources.

Haldimand County Official Website. http://www.haldimandcounty.on.ca/. Accessed July, 2010 and January 2011.

Harper, J. Russell. 1950. **The Early History of Haldimand County.** Grand River Sachem, Caledonia, Ontario,

Ministry of Culture (MTC), 2006a. **Ontario Heritage Toolkit.** Toronto: Queen's Printer for Ontario.

MTC, 2006b. ***Heritage Impact Assessments and Conservation Plans*. Sheet No. 5, Information Sheet Series from Heritage Resources in the Land Use Planning Process: Cultural Heritage and Archaeology Policies of the Ontario Provincial Statement, 2005.** Toronto: Queen's Printer for Ontario.

Ministry of Municipal Affairs and Housing (MAH). **Provincial Policy Statement.** Accessed online at, http://www.mah.gov.on.ca/Asset1421.aspx. June, 2010.

Nelles, Robert Bertram. 1905. **County of Haldimand in the days of auld lang syne.** Hamly Press Book Printers, Port Hope, Ontario.

Ontario Heritage Trust (OHT), 2010. Ontario Heritage Properties Database. http://www.hpd.mcl.gov.on.ca/scripts/hpdsearch/english/default.asp.

Parks Canada, 2003. **Standards and Guidelines for the Conservation of Historic Places in Canada.**

Ontario Regulation 9/06, Criteria for Determining Cultural Heritage Value or Interest, Under the Ontario Heritage Act, 2006.

Ontario Regulation 359/09, Renewable Energy Approvals Under Part V.0.1 Of The Environmental Protection Act, 2009.

Stantec Consulting Inc., 2010. **Preliminary Protected Properties Assessment, Grand Renewable Energy Park**. Report prepared for Samsung Renewable Energy Inc..

8.2 Literature Reviewed

Cowell, Mabel. 1967. **History of Dunn Township**. Dunn, Ontario.

Irwin and Burnham Publishers, 1867. **Gazetteer and directory of the counties of Haldimand and Brant**, Toronto, Ontario

Page, H.R. & Co., 1879. **Illustrated historical atlas of the county of Haldimand, Ont.** Toronto, Ontario.

8.3 Personal Communications

Fraser, Sean. Manager, Conservation Services, Ontario Heritage Trust. Letter dated March 16, 2011.

Stavinga, Dana. Curator, Wilson P. MacDonald Memorial School Museum, Haldimand County.

Unyi, Anne. Head Curator, Community Development and Partnerships Division, Haldimand County. Email dated January 31, 2011.

APPENDIX A

Turbine and Solar Panel Schematics

SWT-2.3-101 Technical Description

General

The following is a brief technical description of the main components of the SWT-2.3-101 wind turbine.

Rotor

The SWT-2.3-101 rotor is a three-bladed cantilevered construction, mounted upwind of the tower. The power output is controlled by pitch regulation. The rotor speed is variable and is designed to maximize the aerodynamic efficiency.

Blades

The B49 blades are made of fibreglass-reinforced epoxy in Siemens' proprietary IntegralBlade® manufacturing process. In this process the blades are cast in one piece to eliminate weaker areas at glue joints. The blades are mounted on pitch bearings and can be feathered 80 degrees for shutdown purposes. Each blade has its own independent pitching mechanism capable of feathering the blade under any operating condition. The blade pitch arrangement allows for optimization of the power output throughout the operating range, and the blades are feathered during standstill to minimize wind loads.

Rotor Hub

The rotor hub is cast in nodular cast iron and is fitted to the main shaft with a flange connection. The hub is sufficiently large to provide a comfortable working environment for two service technicians during maintenance of blade roots and pitch bearings from inside the structure.

Main Shaft and Bearing

The main shaft is forged in alloy steel and is hollow to facilitate the transfer of power and signals to the blade pitching system. The main shaft is supported by a self-aligning double spherical roller bearing which is shrunk onto the main shaft.

Gearbox

The gearbox is a custom-built three-stage planetary-helical design. The first high torque stage is of a helical planetary design. The two high-speed stages are of a normal helical design and provide the offset of the high speed shaft that is needed to allow passage of power and control signals to the pitch systems.

The gearbox is shaft-mounted and the main shaft torque is transferred to the gearbox by a shrink disk connection. The gearbox is supported on the nacelle with flexible rubber bushings.

The gearbox is fitted with an oil conditioning system. All bearings are lubricated with oil fed directly from a large in-line filter and is cleaned by an off-line filter unit.

The gearbox is fitted with sensors for monitoring temperature, oil pressure and vibration levels.

Generator

The generator is a fully enclosed asynchronous generator. The generator has a squirrel-cage rotor without slip-rings. The generator rotor construction and stator winding are designed for high efficiency at partial loads.

The generator is protected with thermal switches and analogue temperature measurement sensors. The generator is fitted with a separate thermostat-controlled ventilation arrangement. Air is re-circulated internally in the generator and heat is transferred through an air-to-air heat exchanger that separates the internal environment in the generator from the ambient air.

Mechanical Brake
The mechanical brake is fitted to the gearbox high-speed shaft and has two hydraulic calipers.

Yaw System
The yaw bearing is an externally geared ring with a friction bearing. Eight electric planetary gear motors drive the yawing.

Tower
The SWT-2.3-101 wind turbine is mounted on a tapered tubular steel tower. The tower has internal ascent and direct access to the yaw system and nacelle. It is equipped with platforms and internal electric lighting.

Controller
The wind turbine controller is a microprocessor-based industrial controller. The controller is complete with switchgear and protection devices. It is self-diagnosing and has a keyboard and display for easy readout of status and for adjustment of settings.

The NetConverter® power conversion system allows generator operation at variable speed, frequency and voltage while supplying power at constant frequency and voltage to the MV transformer. The power conversion system is a modular arrangement for easy maintenance and is water cooled.

SCADA
The SWT-2.3-101wind turbine is equipped with the Siemens WebWPS SCADA system. This system offers remote control and a variety of status views and useful reports from a standard internet web browser. The status views present information including electrical and mechanical data, operation and fault status, meteorological data and grid station data.

Turbine Condition Monitoring
In addition to the Siemens WebWPS SCADA system, the SWT-2.3-101 wind turbine is equipped with the unique Siemens TCM condition monitoring system. This system monitors the vibration level of the main components and compares the actual vibration spectra with a set of established reference spectra. Result review, detailed analysis and reprogramming can all be carried out using a standard web browser.

Operation Systems
The wind turbine operates automatically. It is self-starting when the wind speed reaches an average about 3 to 5 m/s. The output increases approximately linearly with the wind speed until the wind speed reaches 11 to 12 m/s. At this point, the power is regulated at rated power.

If the average wind speed exceeds the maximum operational limit of 25 m/s, the wind turbine is shut down by feathering of the blades. When the average wind speed drops back below the restart average wind speed, the systems reset automatically.

Siemens Wind Power A/S reserves the right to change the above specifications without previous notice.

SWT-2.3-101 Technical Specifications

Rotor

Type	3-bladed, horizontal axis
Position	Upwind
Diameter	101 m
Swept area	8000 m²
Synchronous rotor speed	6-16 rpm
Power regulation	Pitch regulation with variable speed
Rotor tilt	6 degrees

Blade

Type	Self-supporting
Blade length	49 m
Root chord	3.4 m
Aerodynamic profile	NACA63.xxx, FFAxxx, SWPxxx
Material	GRE
Surface gloss	Semi-mat, < 30 / ISO2813
Surface colour	Light grey, RAL 7035

Aerodynamic Brake

Type	Full span pitching
Activation	Active, hydraulic

Load-Supporting Parts

Hub	Nodular cast iron
Main bearing	Spherical roller bearing
Main shaft	Alloy steel
Nacelle bed plate	Steel

Transmission System

Coupling hub - shaft	Flange
Coupling shaft – gearbox	Shrink disc
Gearbox type	3-stage planetary/helical
Gearbox ratio	1 : 91
Gearbox lubrication	Splash / forced lubrication
Oil volume	Approx. 400 l
Gearbox oil filtering	Inline and offline
Gearbox cooling	Separate oil cooler
Gearbox designation	PEAB 4456 (Winergy) or EH851 (Hansen)
Coupling gear - generator	Double flexible coupling

Mechanical Brake

Type	Hydraulic disc brake
Position	High speed shaft
Number of callipers	2

Canopy

Type	Totally enclosed
Material	Steel
Surface gloss	Semi gloss, 30-50, ISO2813
Colour	Light grey, RAL 7035

Generator

Type	Asynchronous
Nominal power	2300 kW
Protection	IP 54
Cooling	Integrated heat exchanger
Insulation class	F

Grid Terminals (LV)

Nominal power	2300 kW
Voltage	690 V
Frequency	50 Hz or 60 Hz

Yaw System

Type	Active
Yaw bearing	Externally geared slewring
Yaw drive	Eight electric gear motors with frequency converter
Yaw brake	Passive friction brake

Controller

Type	Microprocessor
SCADA system	WPS via modem
Controller designation	KK WTC 3.0
Controller manufacturer	KK Electronic A/S

Tower

Type	Cylindrical and/or tapered tubular
Hub height	80 m or site specific
Corrosion protection	Painted
Surface gloss	Semi gloss, 30-50, ISO2813
Colour	Light grey, RAL 7035

Operational Data

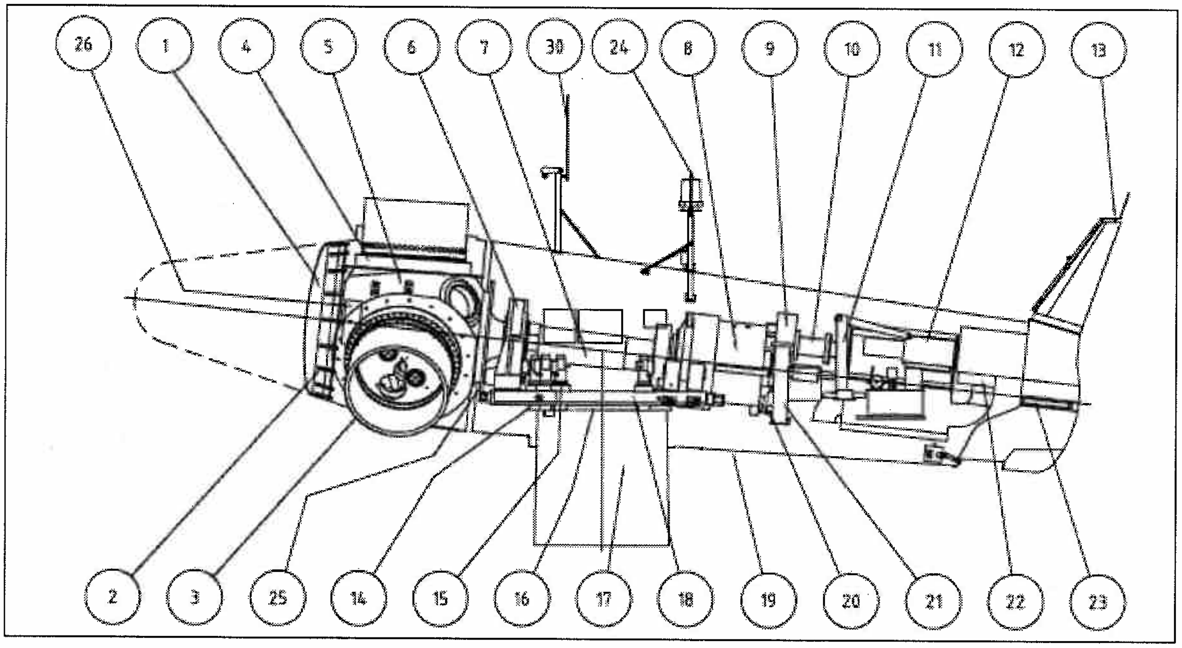
Cut-in wind speed.	4 m/s
Nominal power at	12-13 m/s
Cut-out wind speed	25 m/s
Maximum 3 s gust	59.5 m/s (IEC version)

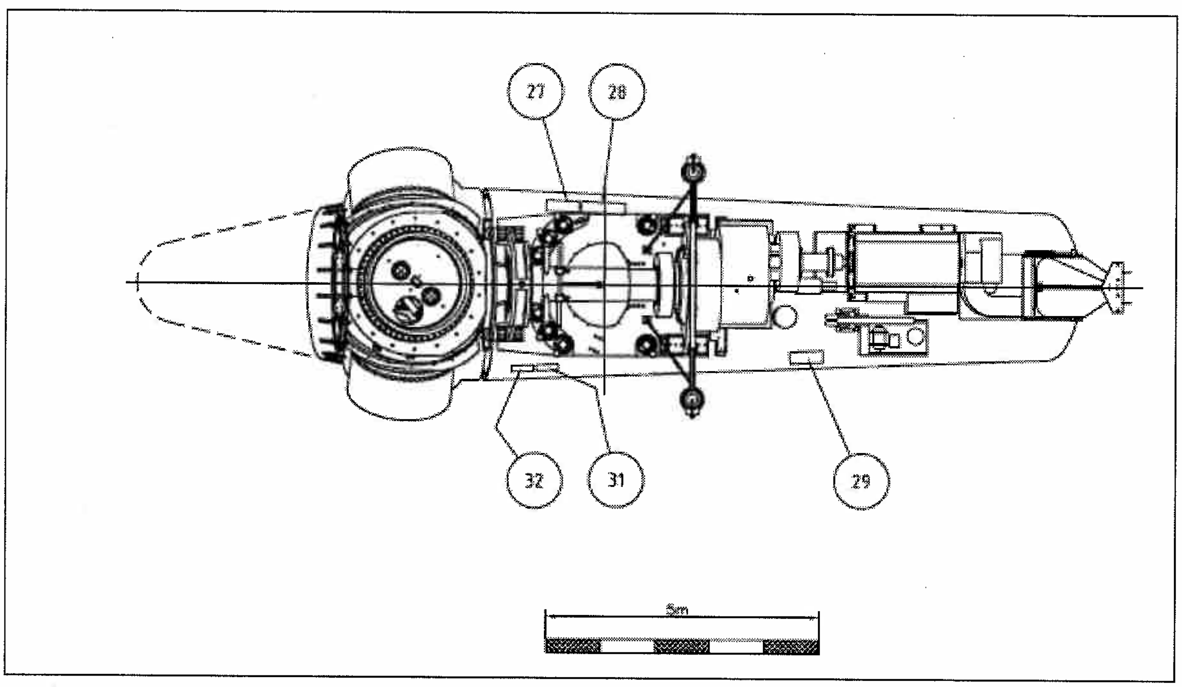
Weights (approximately)

Rotor	62,000 kg
Nacelle	82,000 kg
Tower for 80 m hub height	162,000 kg

Siemens Wind Power A/S reserves the right to change the above specifications without previous notice.

SWT-2.3-101 Nacelle Arrangement





Dansk	English	Deutsch
1. Spinner, option: lang spinner	1. Spinner, optional long spinner	1. Spinner, Option: langer Spinner
2. Spinner beslag	2. Spinner bracket	2. Spinnerhalterung
3. Vinge	3. Blade	3. Rotorblatt
4. Pitchleje	4. Pitch bearing	4. Blattlager
5. Rotornav	5. Rotor hub	5. Nabe
6. Hovedleje	6. Main bearing	6. Hauptlager
7. Hovedaksel	7. Main shaft	7. Hauptwelle
8. Hovedgear	8. Gearbox	8. Getriebe
9. Bremseskive	9. Brake disc	9. Scheibenbremse
10. Kobling	10. Coupling	10. Kupplung
11. Service kran	11. Service crane	11. Servicekran
12. Generator	12. Generator	12. Generator
13. Meteorologiske sensorer	13. Meteorological sensors	13. Windfahne und Anemometer
14. Krøjeleje	14. Yaw bearing	14. Windnachführungslager
15. Krøjegear	15. Yaw gear	15. Windnachführung
16. Krøjering	16. Yaw ring	16. Zahnkranz
17. Tårn	17. Tower	17. Turm
18. Maskinramme	18. Nacelle bedplate	18. Maschinenrahmen
19. Maskinskærm	19. Canopy	19. Gondel
20. Oliefilter	20. Oil filter	20. Öl Filter
21. Oliefilter	21. Oil filter	21. Öl Filter
22. Generatorblæser	22. Generator fan	22. Generator Kühlung
23. Oliekøler	23. Oil cooler	23. Ölkühler
24. Flyadvarselslys, option	24. Aviation warning lights, option	24. Standardhindernisbefeuerung, Option
25. Rotorlås	25. Rotor lock	25. Rotor Arretierung
26. Navboks	26. Hub controller box	26. Nabencontroller
27. Topkontrolboks	27. Top control box	27. Top Controller
28. Relæboks	28. Relay box	28. Relaiskasten
29. Forsyningsboks	29. Supply box	29. Stromversorgung
30. Sigtbarhedsmåler, option	30. Visibility meter, option	30. Sichtweitenmessgerät, Option
31. Kontrolboks flyadvarselslys	31. Control box, aviation warning light	31. Controller, Hindernisbefeuerung
32. Kontrolboks sigtbarhedsmåler	32. Control box, visibility meter	32. Controller, Sichtweitenmessgerät

Siemens Wind Power reserves the right to change the above specifications without notice.

SWT-2.3-101
Design Climatic Conditions

The design climatic conditions are the boundary conditions at which the turbine can be applied without supplementary design review. Applications of the wind turbine in more severe conditions may be possible, depending upon the overall circumstances. A project site-specific review requires the completion by the Client of the "Project Climatic Conditions" form.

Subject	ID	Issue	Unit	Value
1. Wind, operation	1.1	Wind definitions	-	IEC 61400-1 Ed3
	1.2	IEC class	-	IIB
	1.3	Air density, ρ	kg/m^3	1.225
	1.4	Mean wind speed, v_{ave}	m/s	8.5
	1.5	Weibull scale parameter, A	m/s	9.6
	1.6	Weibull shape parameter, k	-	2
	1.7	Wind shear exponent, α	-	0.20
	1.8	Mean turbulence intensity at 15 m/s, I_{ref}	-	0.14
	1.9	Standard deviation of wind direction	Deg	7.5
	1.10	Maximum flow inclination,	Deg	8
	1.11	Minimum turbine spacing, in rows	D	3
	1.12	Minimum turbine spacing, between rows	D	5
2. Wind, extreme	2.1	Wind definitions		IEC 61400-1 Ed3
	2.2	Air density, ρ	kg/m^3	1.225
	2.3	Maximum hub height 10 min.wind, V_{ref}	m/s	42.5
	2.4	Maximum 3 s gust in hub height, V_{e50}	m/s	59.5
	2.5	Maximum hub height power law index, α	-	0.11
3. Temperature	3.1	Temperature definitions	-	IEC 61400-1 Ed3
	3.2	Minimum temperature at 2 m, stand-still, $T_{min,s}$	Deg.C	-20
	3.3	Minimum temperature at 2 m, operation, $T_{min,o}$	Deg.C	-10
	3.4	Maximum temperature at 2 m, operation, $T_{max,o}$	Deg.C	35
	3.5	Maximum temperature at 2 m, stand-still, $T_{max,s}$	Deg.C	45
4. Corrosion	4.1	Corrosion definitions	-	ISO 12944
	4.2	External corrosion class	-	C3
	4.3	Internal corrosion class	-	C2
	4.4	Internal climate control	-	Yes
5. Lightning	5.1	Lightning definitions	-	IEC 62305-1
	5.2	Lightning protection level (LPL) acc to IEC 62305	-	LPL 1
6. Dust	6.1	Dust definitions	-	-
	6.2	Dust conditions, ground level	-	Normal DK
	6.3	Dust conditions, hub height	-	Normal DK
7. Hail	7.1	Maximum hail diameter	mm	20
	7.2	Maximum hail falling speed	m/s	20
8. Ice	8.1	Ice definitions	-	IEC 61400-1 Ed3
	8.2	Ice conditions		Normal DK
9. Trees	9.1	If the height of trees within 500m of any turbine location height exceeds 1/3 of H – D/2 where H is the hub height and D is the rotor diameter then restrictions may apply. Please contact Siemens for information on the maximum allowable tree height with respect to the site and the turbine type.		

SWT-2.3-101, 60 Hz Application Electrical Specifications Americas

Generator

Type	Asynchronous
Nominal power	2300kW
Speed range	600 - 1800 rpm
Nominal voltage	750V @ 1550 rpm
Nominal current	2070 A
Frequency	16,5 - 60 Hz
Protection	IP 54

Generator Protection

Insulation class	F
Winding temperatures	2 x 3 PT100 sensors
Bearing temperatures	1 PT100 at each bearing
Bearing insulation	Insulation at both bearings
Grounding brush	On drive end

Generator Cooling

Cooling system	Air to air
Ventilation	Shaft mounted fan
Ventilation type	Centrifugal
External flow direction	From D-end to N-end
Control parameter	Winding temperature

Frequency Converter

Operation	4Q Full scale converter
Switching	PWM
Switching frequency	1250/2500 Hz
Cooling	Liquid

Power Factor at 690 V and Nominal Grid Conditions

Power factor correction	Frequency converter control
Power factor range	0.9 cap. to 0.9 ind. at nominal balanced voltage

Main circuit protection

Short circuit protection	Circuit breaker
Surge protection per phase Imax (8/20 μs)	30 kA

Peak Power Levels

10 min average	100 % of nominal
30 sec average	104 % of nominal

Grid Requirements

Nominal grid frequency	60 Hz
Minimum voltage	90 % of nominal
Maximum voltage	110 % of nominal
Minimum frequency	95 % of nominal
Maximum frequency	103 % of nominal
Maximum current asym.	5%
Max 1 s. short circuit level at controller's grid Terminals (690 V)	40 kA
Min. 1 s short circuit level at controller's grid terminals (690 V)	5 x Pn
Grid error numbers	Max. 300 per year

Power Consumption from Grid (approximately)

At stand-by	5.0 kW, 9kVAR
At stand-by, yawing	9.6 kW, 9kVAR
Before cut-out (60 s)	18 kW
After cut-out (600 s)	18 kW

Earthing Requirements

Earth system	Acc. To IEC62305-3 ED 1.0:2006
Depth electrodes	Min. 2 pcs 50 mm2 Cu, 120° separation
Inner ring electrode	50 mm2 Cu 1 m from tower
Outer ring electrode	50 mm2 Cu min. 10 m from tower
Foundation reinforcement	Must be connected to earth electrodes
Foundation terminals	Min. 6 stainless pads in two levels corresponding to ring electrodes, separated at 120°
HV connection	HV cable shield shall be connected to earthing system
Cable tray conductor	Min. 50 mm2 bare Cu parallel to HV cable

Transformer Requirements

Transformer impedance requirement	6 %
Secondary voltage	690 V
Vector group	Dyn 11 (star point earthed)

Siemens Wind Power A/S reserves the right to change the specifications without previous notice
All data are subject to tolerances in accordance with IEC.

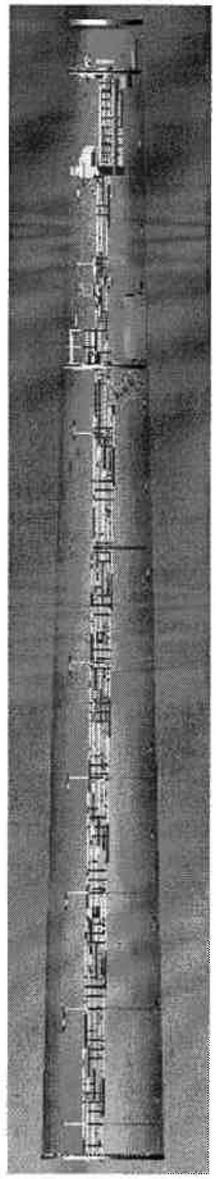
SWT-2.3-101 60 Hz
General 80 m Tower Arrangement

Description
The SWT-2.3-101 wind turbine is mounted on a tapered, tubular, steel tower. The 80 m hub height tower is divided into three sections. The tower has internal ascent and direct access to the yaw system and nacelle. It is equipped with platforms and interior electric lighting.

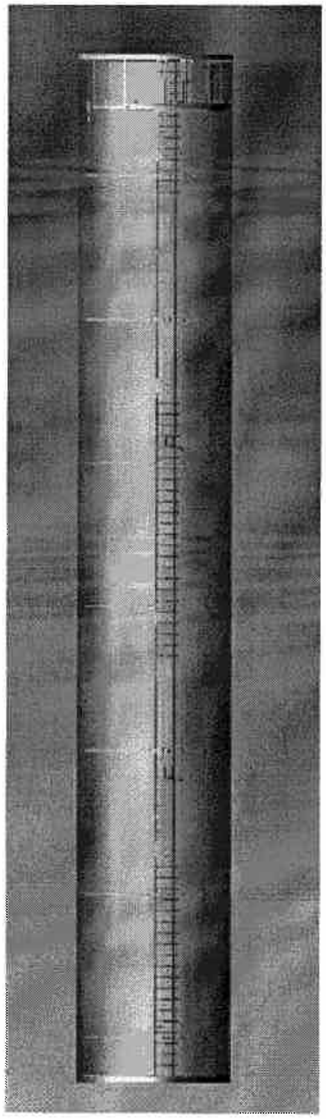
Platforms are located just below the intermediate flange locations for suitable access to connections of cables, for tightening the bolts, and servicing the yaw system.

Siemens can substitute a functionally equivalent, rail able, tower equipment design for the standard tower equipment design set forth in this exhibit.

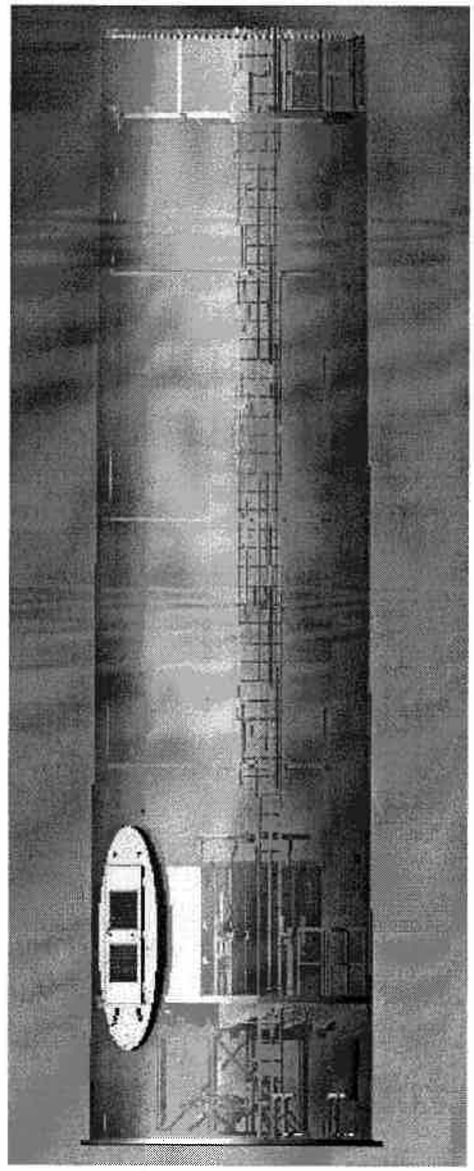
Sketch of Tower Arrangement
The sketch shows the tower top, intermediate and bottoms section.



Top Section



Intermediate Section



Bottom Section

SWT-2.3-101, 80 m Hub Height Codes and Standards for Design, Manufacturing and Testing-Americas

The SWT-2.3-101 Wind Turbine Generator isdesigned, manufactured, and tested to Siemens' technical drawings, procedures, and processes that are generally in compliance with the applicable sections of the codes and standards listed herein.

General

- IEC WT 01:2001, IEC System for Conformity Testing and Certification of Wind Turbines. Rules and procedures
- EN 61400-1:2006, Wind turbine generator systems, Part 1: Design requirements, (IEC 61400-1:2005 Ed. 3, modified).
- IEC 61400-1:2005 Ed. 3, Wind turbine generator systems, Part 1: Design requirements.
- IEC 61400-11:1998, Wind turbine generator systems. Part 11: Acoustic noise measurement techniques.
- IEC 61400-12:1998, Wind turbine generator systems. Part 12: Wind turbines power performance testing
- DS/IEC/TS 61400-13:2002, Wind turbine generator systems, Part 13: Measurement of mechanical loads.
- DS/IEC/TS 61400-23:2002, Wind turbine generator systems, Part 23: Full-scale structural testing of rotor blades.
- DS 412:1998 Code of Practice for the structural use of steel (Weldings)
- VDI 2230 Blatt 1, February 2003, Systematic calculation of high duty bolted joints - Joints with one cylindrical bolt (Bolt calculations
- DS-EN ISO 898-1:1999, Mechanical properties of fasteners made of carbon steel and alloy steel - Part 1: Bolts, screws and studs
- EN 10029:1993, Hot rolled steel plates 3 mm thick or above - Tolerances on dimensions, shape and mass
- DS/EN 10083:2000, Quenched and tempered steels - Part 1: Technical delivery conditions for special steels (Main shaft)
- DS/EN 1563 +A1:2004, Founding - Spheroidal graphite cast irons
- DS/EN 10025-1:2004, Hot rolled products of structural steels - Part 1: General technical delivery conditions
- DS/EN 10025-2:2004, Hot rolled products of structural steels - Part 2: Technical delivery conditions for non-alloy structural steels
- DS/EN 10025-3:2004, Hot rolled products of structural steels - Part 3: Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels
- 97/23/EF Pressure Equipment Directive

Gearbox

- ISO 81400-4:2005 Wind turbines – Part 4: Design and specification of gearboxes
- ISO 6336 1996, Calculation of load capacity of spur and helical gears-- Part 1 Basic principles, introduction and general influence factors (+ correction 1998 and correction 2 1999)
- ISO 6336 1996, Calculation of load capacity of spur and helical gears-- Part 2 Calculation of surface duability (+ correction 1998 and correction 2 1999)
- ISO 6336 1996, Calculation of load capacity of spur and helical gears-- Part 3 Calculation of tooth bending strength (+correction 2 1999)
- ISO 6336 2003, Calculation of load capacity of spur and helical gears-- Part 5 Strength and quality of Materials.

- ISO 281:1990, Rolling bearings – Dynamic load ratings and rating life.
- ISO 527-04:1997 Plastics - Determination of tensile properties - Part 4: test conditions for isotropic and orthotropic fiber-reinforced plastic composite: (wind turbine blades with fiberglass-reinforced epoxy)
- ASTM D3479-96, Standard Test Method for Tension-Tension Fatigue of Polymer Matrix Composite Materials (fiberglass- reinforced epoxy)*

Electrical
- EN61000-6-2:2005 Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments
- EN61000-6-4: 2002 Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments
- EN60204-1 1998 (+correc 1999) Safety of machinery - Electrical equipment of machines - Part 1: General requirements
- EN60034-14: 2004 Rotating electrical machines - Part 14: Mechanical vibration of certain machines with shaft heights 56 mm and higher - Measurement, evaluation and limits of vibration severity (Generator)
- IEC/TR 61400-24: 2002, Wind turbine generator systems - Part 24: Lightning protection
- IEC 61400-21:2001, Wind turbine generator systems - Part 21: Measurement and assessment of power quality characteristics of grid connected wind turbines
- 2006/95/EF Low Voltage Directive
- 2004/108/EF EMC Directive
- IEEE 519-Recommended Practice and Requirements for Harmonic Control on Electric Power Systems
- FERC Order 661-A, Interconnection for Wind Energy
- The Manitoba Electrical Code – 10th Edition
- Code Red-CFE Interconnect Requirements for wind turbines to the Mexican Electrical System

Quality
- ISO 9001:2000, Quality management systems – Requirements.

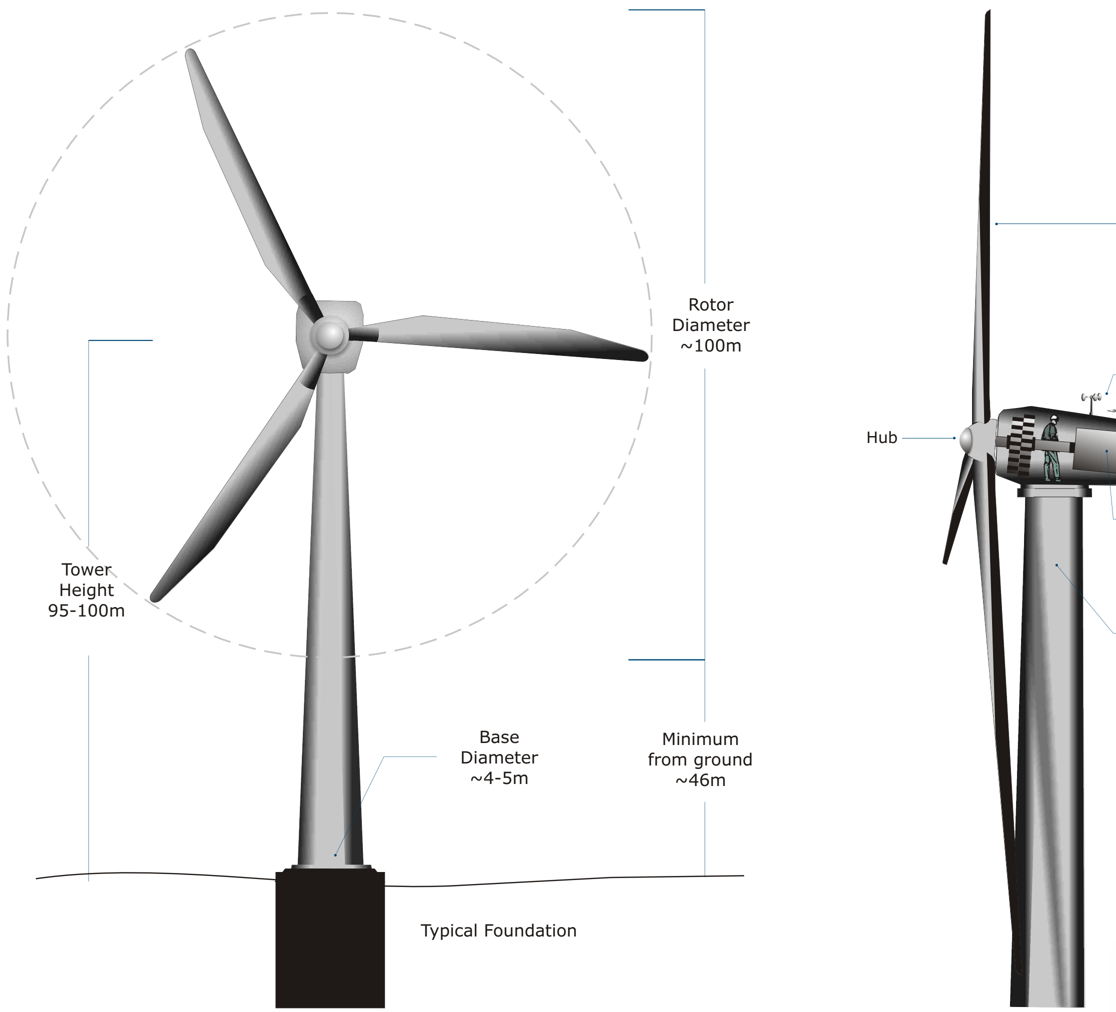
Personal Safety
- DS/EN 50308:2005, Wind turbines – Protective measures – Requirements for design, operation and maintenance
- US Occupational, Health, and Safety (OSHA) Guidelines
- 98/37/EC Machinery Directive
- FAA AC70-7460-1K, Obstruction Marking and Lighting

Corrosion
- DS/EN ISO 12944-1:2000, Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 1: General introduction (class C3 to C4).

GRAND RENEWABLE ENERGY PARK

Typical Wind Turbine Schematic

- Turbine technology (i.e., make and model) will be selected during the Renewable Energy Approval process.
- Schematic at right shows generalized turbine components and dimensions.
- Final design selected for Project may vary from schematic.



Note: not to scale

SAMSUNG

SAMSUNG RENEWABLE ENERGY INC.

GRAND RENEWABLE ENERGY PARK

Typical Solar Panel Schematic and Photos

- Solar panels will utilize crystalline solar cells mounted on ground-based racking systems.
- Solar panel and mounting (i.e., single post, double post, or ballast mount) technology will be selected during the Renewable Energy Approval process.
- Schematics and photos at right show a variety of panel types and mounting designs.
    - Final design selected for Project may vary from those shown.