

**Grand Bend Wind Farm Final
Modifications Document**

**Grand Bend Wind Limited Partnership
c/o Northland Power Inc.
30 St. Clair Avenue West 12th Floor
Toronto, ON M4V 3A1**

**Neegan Burnside Ltd.
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**April 12, 2017
PIA019991.0006**

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Record of Revisions

Revision	Date	Description
0	March 17, 2017	Initial Submission to Ministry of the Environment and Climate Change
1	April 12, 2017	Application to Ministry of the Environment and Climate Change for Amendment of Renewable Energy Approval #5186-9HBJXR

Neegan Burnside Ltd.**Report Prepared By:**


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1.0 Introduction

Grand Bend Wind Limited Partnership (GBWLP), by its general partners Grand Bend Wind GP Inc., and with Northland Power Inc. (Northland) as agent, has constructed a 100 MW wind facility located north of Grand Bend, Ontario. The project is classified as a Class 4 Wind facility and has been approved by the Ministry of the Environment and Climate Change (MOECC) under *Ontario Regulation 359/09* of the Environmental Protection Act. The Grand Bend Wind Farm (the Project) is located in Huron County, spanning the lower-tier municipalities of Bluewater and Huron South. Portions of the transmission line also traverse the municipality of Huron East and municipality of West Perth in Perth County.

The Project received Renewable Energy Approval (#5186-9HBJXR) on June 26, 2014, which was amended on March 24, 2015. The application documents for Renewable Energy Approval were based on a defined "Project Location", as described therein. This Final Modifications Document describes proposed modifications to the Project within the previously defined Project Location referenced above.

A Draft Modifications Document was previously submitted to MOECC for the purpose of pre-consultation. MOECC confirmed that the proposed modification constitutes a Project Design Change (i.e. minimal increases in negative environmental effects that will or are likely to occur). They confirmed the necessary notification and documentation requirements to prepare an application for amendment of Renewable Energy Approval.

The purpose of this Final Modifications Document is to provide MOECC with a written description and rationale for the proposed modifications, as well as a summary of related effects and pertinent Project information. This document forms one component of an application for amendment of the Project's Renewable Energy Approval.

2.0 General Project and Applicant Information

General information about the Project, Applicant, and Consultant is provided in Table 1, Table 2, and Table 3 below.

Table 1: General Project Information

Project Name	Grand Bend Wind Farm
Energy Source	Wind
Nameplate Capacity	100 MW
Facility Class	Class 4, Wind Facility
Renewable Energy Approval Number	5186-9HBJXR
FIT Contract #	F-002178-WIN-130-601

Table 2: General Applicant Information

Name of Applicant	Grand Bend Wind Limited Partnership, by its general partners Grand Bend Wind GP Inc., and with Northland Power Inc. as agent
Primary Contact	Jim Mulvale, P.Eng., Director, EH&S
Mailing Address	Northland Power Inc. 30 St. Clair Avenue West, 12 th Floor Toronto, ON M4V 3A1
Phone	416-962-6262

Table 3: General Consultant Information

Name of Consultant	Neegan Burnside Ltd.
Primary Contact	Lyle Parsons, B.E.S., VP Environment, Technical Leader Renewable Energy & Energy Conservation Services
Mailing Address	Neegan Burnside Ltd. 15 Townline Orangeville, ON L9W 3R4
Phone	519-938-3044

3.0 Proposed Modifications

3.1 Summary of Proposed Project Modifications

Three 34.5 kV air core (air cooled) reactors rated at 40 MVA_r and their associated electrical equipment are proposed at the transformer substation, as illustrated in Figure R1 of Appendix A. All construction, operation, maintenance, and decommissioning activities associated with the proposed equipment are expected to remain within the previously defined Project Location for the Project.

3.2 Description of Proposed Project Modifications

The existing transformer substation converts electricity from 34.5 kV to 230 kV and is located on privately held, leased lands near the intersection of Sararas Road and Blackbush Line in the Municipality of Bluewater. Refer to Figure A5 of Appendix A for the location of the substation, as submitted with the initial application for Renewable Energy Approval. The substation currently occupies an area of approximately 85 m x 50 m (4,250 m²), and is constructed with a granular base. The substation was designed and constructed in accordance with the requirements of the authorities having jurisdiction, and includes mitigation measures such as oil spill containment systems, lightning arresters, a shunt reactor, fire protection, electrical grounding, perimeter fencing, and appropriate warning signage.

Proposed modifications to the existing substation include the installation of three (one per electrical phase) 34.5 kV air core (air cooled) reactors rated at 40 MVA and their associated electrical equipment, including bus supports, circuit switcher, lightning mast, surge arresters, neutral voltage transformer, and underground cables in conduit, which connect the air core reactors to the existing 34.5 kV switchgear building within the existing substation. The proposed air core reactors and neutral voltage transformer do not use or store oil as part of their operation.

The substation footprint with gravel base and perimeter fence is proposed to be expanded by approximately 20 m x 35 m (700 m²) to accommodate the proposed above ground equipment; and new underground cables will be installed around the south side of the substation, partially outside the perimeter fence. These proposed modifications are illustrated in Figure R1 of Appendix A. The proposed modifications remain within the previously defined Project Location for the Project, and GBWLP holds a lease with the affected landowner such that the proposed modifications can be implemented.

Conceptual drawings and representative photos of the proposed equipment are provided in Appendix B.

3.3 Rationale

The Ontario electrical grid complies with the North American Electric Reliability Corporation (NERC) standards. As part of the grid reliability, NERC issued a set of standards (PRC-025-1), which apply to existing facilities, and are required to be complied with by the year 2019 (when no upgrades/changes to the plant are necessary) or 2021 (when changes/upgrades are necessary). The Grand Bend Wind Farm falls into the second category, since the facility requires changes to fully accommodate the PRC-025-1 requirements. The additional reactance installation is the necessary upgrade to make the Grand Bend Wind Farm compliant with PRC-025-1. Although the rules do not come into effect until the year 2021, GBWLP made a decision to install the additional reactance equipment earlier. The installation of additional reactance will also provide additional operational flexibility to the Project and lower the overall electrical losses.

4.0 Potential Negative Environmental Effects, Mitigation, and Monitoring

The proposed Project modifications do not introduce any new negative environmental effects as compared to those identified in the initial application documents for Renewable Energy Approval; however, there are minor additional noise emissions associated with the proposed equipment. A summary of matters relevant to natural heritage, cultural heritage, and noise are provided in the following sections.

4.1 Natural and Cultural Heritage

The natural and cultural heritage features of the Project Location were fully evaluated in support of the initial application for Renewable Energy Approval of the Project. Furthermore, the proposed modifications do not present new or unevaluated potential negative environmental effects to natural or cultural heritage features. Since the proposed modifications remain within the previously studied Project Location and for the reasons above, it is recommended that all applicable mitigation and monitoring measures as outlined in the application for Renewable Energy Approval be implemented for the construction, operation, maintenance, and decommissioning of the proposed Project modifications outlined herein.

Furthermore, MOECC confirmed through pre-consultation that the Ministry of Natural Resources and Forestry (MNR), and the Ministry of Tourism, Culture and Sport (MTCS) previous REA confirmation is adequate as part of a complete application for amendment of Renewable Energy Approval. No further consultation of those agencies is required for this minor amendment.

4.2 Noise

Aercoustics Engineering Ltd. has conducted an acoustic assessment of the proposed Project modifications. The report was prepared as an amendment to an Environmental Noise Impact Assessment (“ENIA”) issued April 14, 2014, which was prepared for the Grand Bend Wind Limited Partnership, with Northland Power Inc. (“Northland”) as agent, Grand Bend Wind Farm (the “Project”). The report has been documented under a separate cover, and forms a component of the application for amendment of Renewable Energy Approval. The report concluded the following:

“After assessing the receptors most significantly impacted by the proposed addition of the 3-phase reactor unit to the existing transformer substation, it was concluded that the sound pressure levels remain below MOECC exclusion limits and it is expected the installation of the additional 3-phase reactor unit at the Grand Bend Wind Project will not interfere with site wide environmental noise compliance of the facility. Furthermore, updated noise model predictions demonstrate there will be no sound level increase at any of the identified receptor locations as compared with the original ENIA, and thus compliance with the approved noise conditions submitted in the original REA will be maintained.”

For further details, refer to Grand Bend Wind Farm – Reactor Noise REA Addendum, under a separate cover with this application.

5.0 Consultation

A notice has been prepared and distributed in accordance with paragraphs 1, 2, 3 and 4 of subsection 15(6) of *Ontario Regulation 359/09*, to the persons mentioned in paragraph 5 of subsection 15(6) of *Ontario Regulation 359/09*. In accordance with the regulation, the following consultation efforts were undertaken:

- Hard copy mail out and email (if available) to approximately 830 persons as mentioned in paragraph 5 of subsection 15(6) of *Ontario Regulation 359/09*, dated April 12th
- Newspaper advertisements on April 5th and April 12th in the Mitchell Advocate, Huron Examiner, Lakeshore Advance, and April 12th and 19th in the Clinton News Record
- Cover Letter along with the formal notice to Aboriginal communities within and surrounding the project area. The cover letter encouraged them to publish the notice in their community newspaper or post it.
- Email to persons that identified themselves as having an interest in the project
- Written copies of this report and supporting documents will be made available for public inspection on April 12, 2017 on the Grand Bend Wind Farm Project website: <http://grandbend.northlandpower.ca/index.cfm?pagepath=Reports&id=35972>.

In consultation with the MOECC and updated consultation report was not required for the purposes of this Final Modifications Document. A copy of the notice sent to those noted above including the cover letter sent to Aboriginal Communities is provided in Appendix C.

6.0 Documents in Support of Application for Amendment of Renewable Energy Approval

Based on pre-consultation with MOECC, the following documents have been prepared in support of an application for amendment of Renewable Energy Approval:

- Final Modifications Document; and
- Grand Bend Wind Farm – Reactor Noise REA Addendum.

7.0 Conclusions and Recommendations

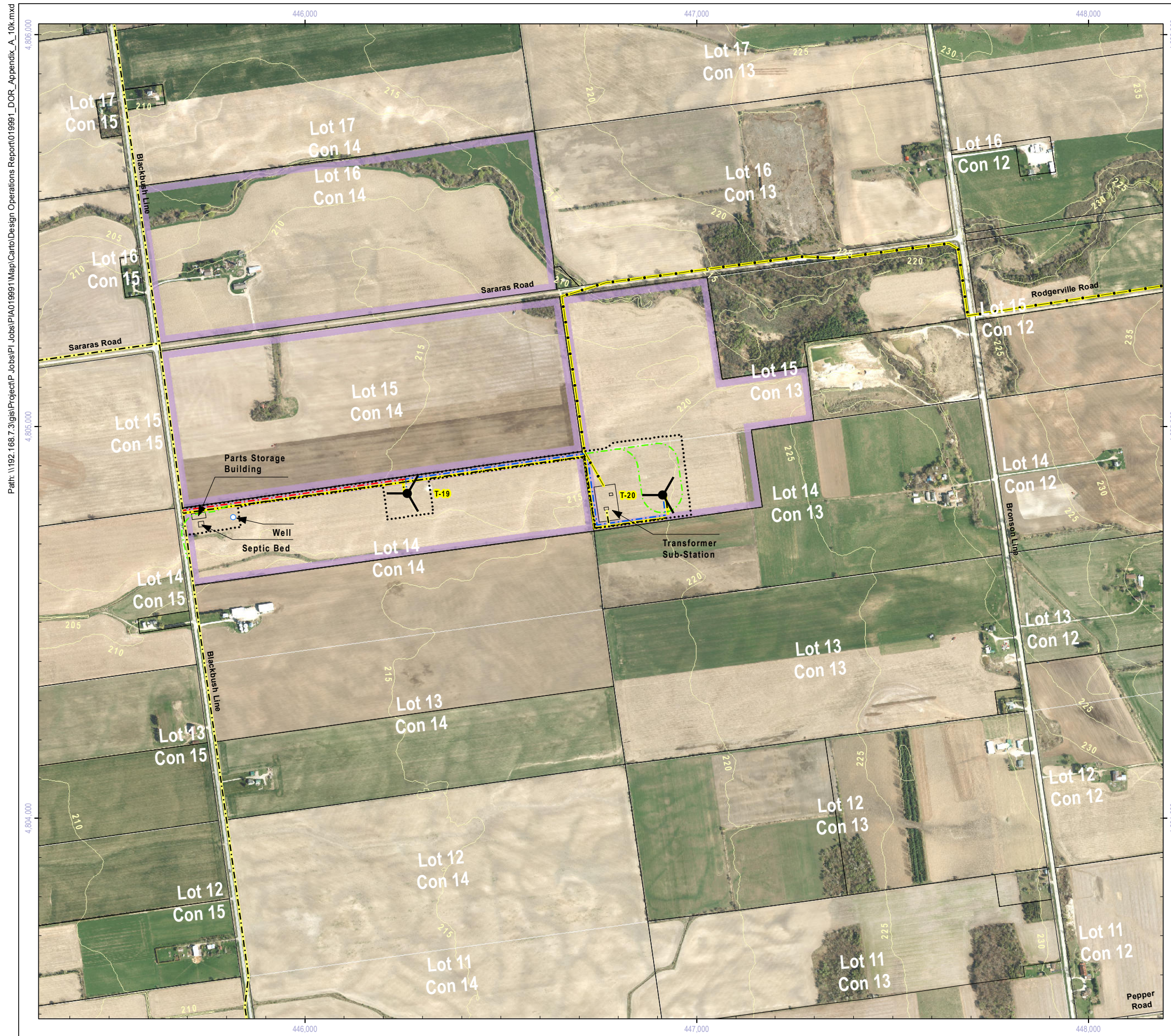
This Final Modifications Document provides a written description of the proposed Project modifications, and summarizes potential impacts, mitigation, and monitoring measures that are recommended to address the proposed modifications.

Previously natural heritage and cultural impacts were assessed for the proposed project area amendment involved. Construction impact mitigation measures proposed in the original REA approval should be observed.

Appendix A

Site Plans

Original Site Plan	A5
Revised Site Plan	R1



Appendix A Figure A5

Grand Bend Wind Farm Design and Operations Report

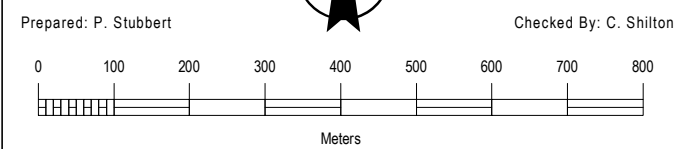
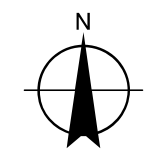
	Proposed Project Wind Turbine (Grand Bend Wind Farm)		Proposed Other Wind Turbine (NextEra Bluewater Wind Engery Centre)
	Permanent Access Road & Collector Line		Permanent Access Road (No Collector Line)
	Permanent Access Road Supporting Crane Crawling & Collector Line		Temporary Access Road (Removed After Construction)
	Transmission Line		Area of Construction on Private Land
	Collector Line		Participating Property
	Existing Transmission Line: Overhead		Building / Transformer Sub-Station / Switching Yard
	MET Tower		Contour (5m Interval)

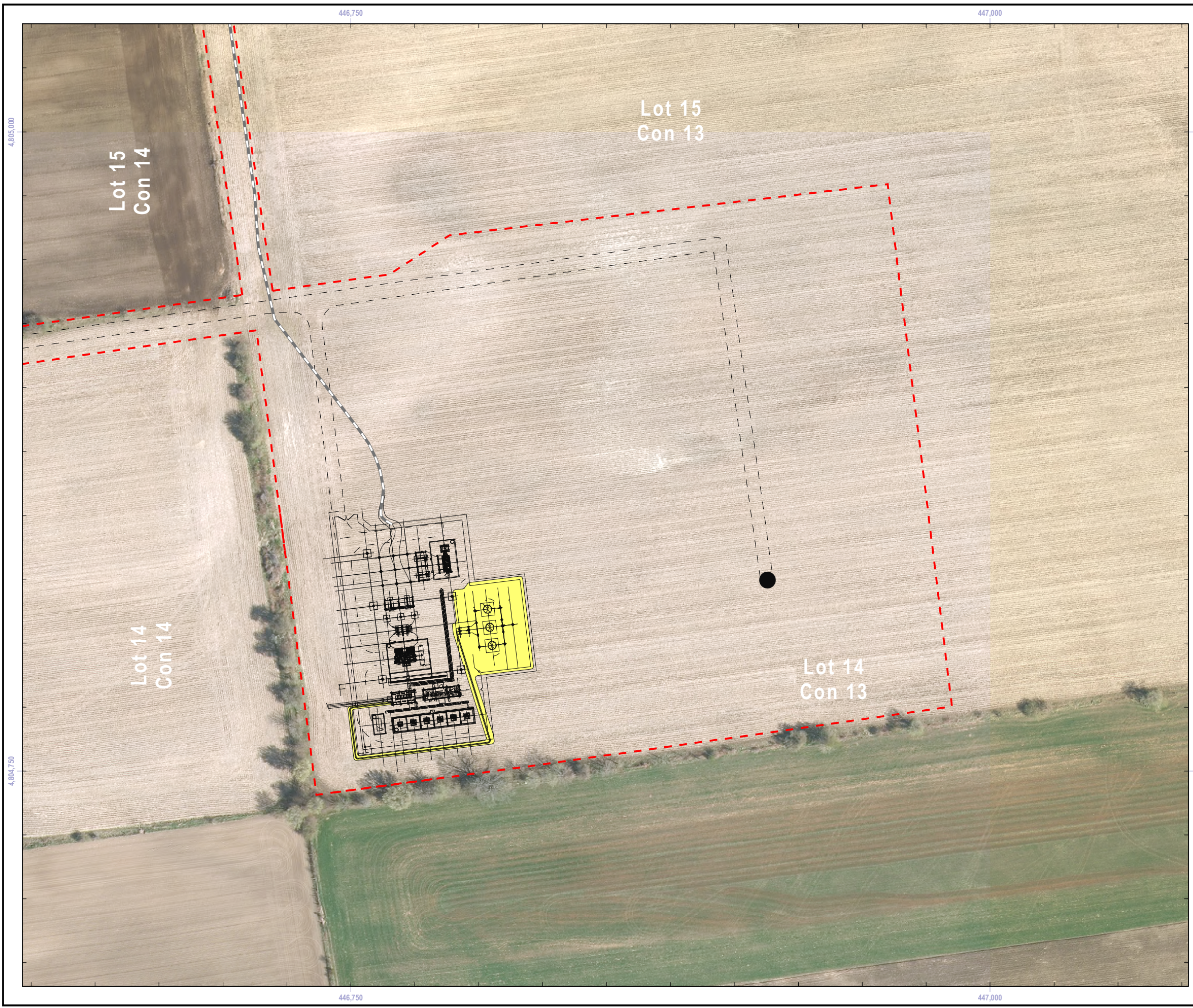
Siemens SWT-2.3-113 Turbine:
Base Diameter 4.2m | Hub Height 99.5m | Blade Length 55m

- NOTES:
- Reference the Figure 1 Key Map for location in the overall project area.
 - NextEra Turbine Locations taken from the document DRAFT Site Plan - Bluewater Wind Engery Centre, December 2011.

- DATA SOURCES:
- County of Huron (including Imagery: 2010)
 - Ministry of Natural Resources, © Queen's Printer for Ontario
 - Natural Resources Canada © Her Majesty the Queen in Right of Canada

Scale: 1:10,000
Date: 21 January 2013
Project Number: PIA019991





4,805,000

4,804,750

446,750

447,000

4,805,000

4,804,750

446,750

447,000

- Wind Turbine Footprint
- Transmission Line (Underground)
- Access Road
- Project Location
- Area of Proposed Modifications

Datum: North American 1983		
Coord. System: NAD 1983 UTM Zone 17N		
Projection: Transverse Mercator		
Central Meridian: 81°0'0.00"W		
False Easting: 500,000m	False Northing: 0m	
Page Orientation: 0°	Scale Factor: 0.99960	

0 10 20 30 40 50 60 70 80
Metres

BURNSIDE

Client

GRAND BEND WIND LIMITED PARTNERSHIP

Figure Title

**GRAND BEND WIND FARM
REACTOR MODIFICATIONS AT
TRANSFORMER SUBSTATION**

Drawn	Checked	Date	Figure No. R1
PS	CS	2017/03/17	
Scale	Project No.		
H 1:1,500	PIA019991		

Appendix B

Conceptual Drawings

Trench Reactor Brochure	B1
Equipment Layout 1	B2
Equipment Layout 2	B3
Representative Photo	B4

Reactors



TRENCH

Reactors

Introduction

With 40 years of successful field experience, Trench is the recognized world leader in the design and manufacture of air core, dry type, power reactors for all utility and industrial applications. The unique, custom design approach, along with fully integrated engineering and manufacturing facilities in both North America and Europe have enabled Trench to become the technical leader for high voltage inductors worldwide.

A deep commitment to the power industry, along with extensive investment in engineering, manufacturing and test capability give Trench customers the utmost in high quality, reliable products which are individually designed for each application. Trench reactor applications have grown from small, distribution class, current limiting reactors to complex EHV applied reactors surpassing 300 MVA per coil. Trench Management systems is certified to ISO 9001, ISO 14001 and OHSAS18001. Trench's highly developed research and development program constantly addresses new technologies and their potential application in reactor products. Trench welcomes challenges for new applications for power reactors.

This brochure outlines the features, capabilities and applications of Trench reactors. Although air-core, dry type reactors

represent the majority of reactor production volume, Trench also produces a highly successful line of iron core/iron shielded and oil type reactors for specific application (eg. Resonance Grounding/Petersen Coils). These reactors are also described in detail in other sections of the Trench product catalogue.

Design Features of Air-Core Dry Type Reactors

- Epoxy impregnated, fibreglass encapsulated construction
- Aluminum construction throughout with all current carrying connections welded
- Highest mechanical and short circuit strength
- Essentially zero radial voltage stress, with uniformly graded axial voltage distribution between terminals
- Low noise levels are maintained throughout the life of the reactor
- Weatherproof construction, with minimum maintenance requirements
- Design service life in excess of 30 years
- Designs available in compliance with ANSI/IEEE, IEC and other major standards.

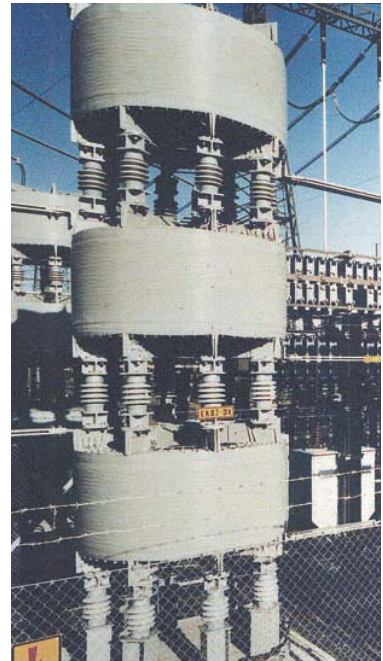


Fig. 1
Three-phase stacked
current limiting reactor

Static VAR Compensators are used on transmission systems to improve the overall reliability, correct for voltage fluctuations and power factor as well as increasing the transmission capability and reducing losses.

Shunt Reactors

Shunt Reactors are used to compensate for capacitive VARs generated by lightly loaded transmission lines or underground cables. They are normally connected to the transformer tertiary winding but can also be directly connected on systems up to 115 kV.

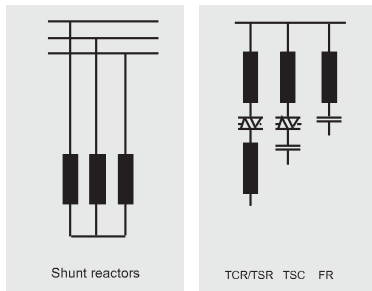


Fig. 11
Schematic diagram

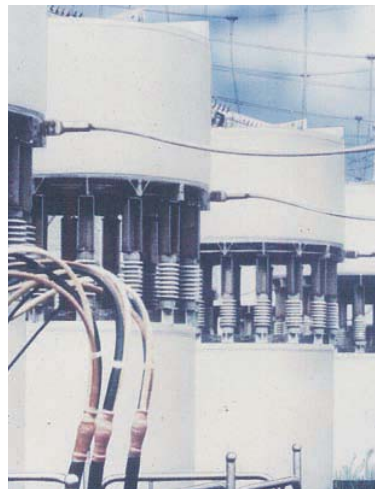


Fig. 12
Tertiary connected shunt reactors

Thyristor Controlled Shunt Reactors are extensively used in static VAR systems, where reactive VARs are adjusted by thyristor circuits. Static VAR compensator reactor applications normally include:

- Thyristor controlled shunt reactors (TCR). The compensating power is changed by controlling the current through the reactor by means of the thyristor valves.
- Thyristor switched reactors (TSR)
- Thyristor switched capacitor reactors (TSC)
- Filter reactors (FR)

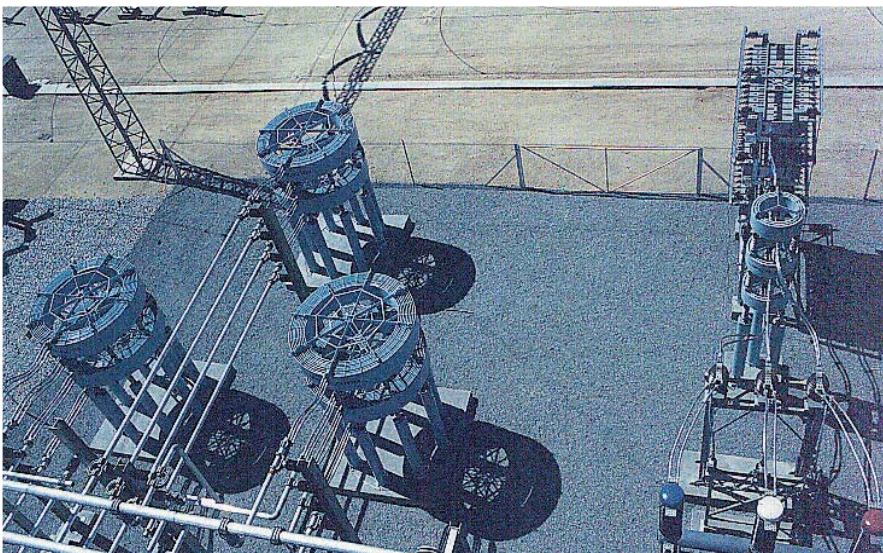


Fig. 13
Thyristor controlled shunt reactors and filter reactors in a Static VAR Compensator

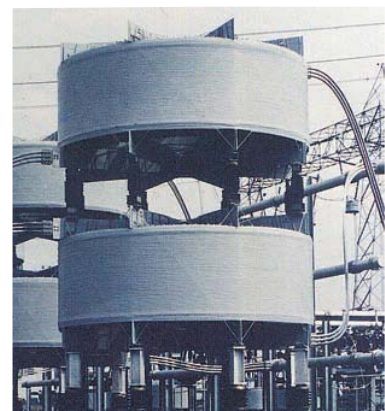


Fig. 14
Thyristor controlled reactor



WARNING
HIGH
VOLTAGE
Danger
Do Not Touch

Appendix C

Consultation

Notice of a Proposed Change	C1
Cover Letter to Aboriginal Communities	C2

Notice of a Proposed Change to an Approved Renewable Energy Project

Project Name: Grand Bend Wind Farm **Renewable Energy Approval (REA) #:** 5186-9HBJXR

OPA Reference Number: FIT Contract #: F-002178-WIN-130-601

Project Location: North of Grand Bend, in the Municipalities of Bluewater and South Huron, in Huron County. Portions of the transmission system also traverse the Municipality of Huron East in the County of Huron and Municipality of West Perth, in the County of Perth (see map below).

Dated at: West Perth, South Huron, Bluewater and Huron East this the 5th of April, 2017.

Grand Bend Wind Limited Partnership, by its general partners Grand Bend Wind GP Inc., and with Northland Power Inc. as agent (hereafter referred to as "GBWLP"), was issued a Renewable Energy Approval on June 26, 2014 in respect of the Grand Bend Wind Farm (the "Project"). Information with respect to the decision on the Project can be viewed on the Ministry of the Environment and Climate Change's Environmental Registry by searching 011-9928.

GBWLP is proposing to make a minor change to the project and the Project itself is subject to the provisions of the *Environmental Protection Act (Act)* Part V.0.1 and Ontario Regulation 359/09 (Regulation). This notice must be distributed in accordance with section 32.2 of the Regulation. This notice is being distributed to make the public aware of a proposed change to the Project.

Project Description and Proposed Change: Pursuant to the Act and Regulation, the project in respect of which the Renewable Energy Approval was issued, is a Class 4 Wind Facility.

An application will be submitted to the Ministry of the Environment and Climate Change to change the Project and alter the terms and conditions of the existing Renewable Energy Approval to accommodate a minor change. The proposed change consists of the addition of three new air-cooled capacitance reactors and associated electrical equipment at the transformer substation, including a slight increase in the size of the substation to accommodate the new equipment. The reactors are required to enhance operability of the Project and to comply with impending changes to system protection/controls, as required by the electricity grid operator.

The Project's wind turbines and all other areas of the project location will remain unaffected by the proposed change. The Project's total nameplate capacity (100 MW) is not altered by this request. The project location is illustrated in the map below and is likewise unchanged by this request.

Documents for Public Inspection:

GBWLP has been required to update the supporting documents that are required to form part of the application or which must otherwise be submitted to the Ministry of the Environment and Climate Change and be made available to the public. Written copies of the supporting documents will be made available for public inspection on April 12, 2017 on the Grand Bend Wind Farm Project website: <http://grandbend.northlandpower.ca/index.cfm?pagepath=Reports&id=35972>.

Project Contacts and Information:

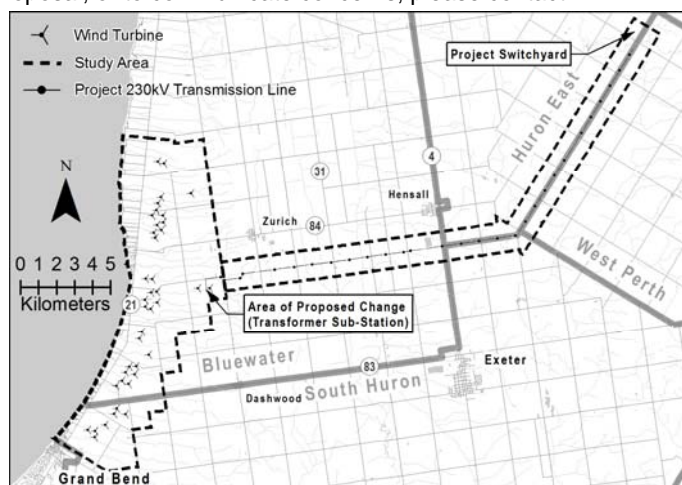
To learn more about the Project proposal, or to communicate concerns, please contact:

Jim Mulvale, Director, EH&S
Northland Power Inc.
30 St. Clair Avenue West,
12th Floor
Toronto, Ontario M4V 3A1
416-962-6262

Lyle Parsons, Project Manager,
Neegan Burnside Ltd.
15 Townline
Orangeville, Ontario L9W 3R4
519-941-1161

Free Telephone Hotline:
1-800-696-8093

Project E-mail Address:
grandbendwind@neeganburnside.com





April 2017

Dear "[Name]":

Re: Notice of a Proposed Change to an Approved Renewable Energy Project

The Grand Bend Wind Limited Partnership is submitting an application to the Ministry of the Environment and Climate Change to alter the terms and conditions of the existing Renewable Energy Approval to accommodate a minor project change. The proposed minor change to the project is provided in the attached Notice of Proposed Change to a Renewable Energy Project.

As part of this project change (and as required by O.Reg. 359/09), consultation efforts are being conducted. This notice is being provided to Aboriginal communities within and surrounding the project area. If it is reasonable to do so, we encourage you to publish or post this notice in your local community.

We would appreciate if you would let us know if you do plan on posting or publishing the notice in your community newspaper by contacting grandbendwind@neeganburnside.com.

Yours truly,

Neegan Burnside Ltd.

A handwritten signature in blue ink, appearing to read "Lyle Parsons".

Lyle Parsons, B.E.S.
Project Manager
Vice President, Environment

Enclosure(s)

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