

# **Highland Wind Farm, LLC**

## **Revised Certificate of Public Convenience and Necessity Application**

**St. Croix County, Wisconsin**

**December 16, 2011**

**Revised February 28, 2012**

**PSC Docket No 2535-CE-100**

---

# Table of Contents

<u>1.0 PROJECT DESCRIPTION AND OVERVIEW</u> .....	1
<u>1.1 GENERAL PROJECT LOCATION AND DESCRIPTION</u> .....	1
<u>1.1.1 Project Location</u> .....	1
<u>1.1.2 Project Maps</u> .....	1
<u>1.1.3 Project Information</u> .....	1
<u>1.2 OWNERSHIP AND OPERATING ENTITY</u> .....	2
<u>1.3 PROJECT NEED/PURPOSE</u> .....	2
<u>1.3.1 – 1.3.5 - Not Applicable to Independent Power Producers</u> .....	2
<u>1.3.6 Energy Agreements</u> .....	2
<u>1.4 ALTERNATIVES</u> .....	2
<u>1.4.1 Supply Alternatives - Not Applicable to Independent Power Producers</u> ...	3
<u>1.4.2 Project Area Selection</u> .....	3
<u>1.5 TURBINE SITE SELECTION</u> .....	5
<u>1.5.1 Individual Factors or Characteristics Used to Select Turbine Sites</u> .....	5
<u>1.5.2 Information on How Turbine Site Characteristics and Type of Turbines</u> <u>Chosen Factored Into the Selection of Final Turbine Sites</u> .....	7
<u>1.5.3 Turbine Setback Distances</u> .....	7
<u>1.6 COST</u> .....	9
<u>1.6.1 – 1.6.6 Not Applicable to Independent Power Producers</u> .....	9
<u>1.7 MISO AND PROJECT LIFE SPAN</u> .....	9
<u>1.7.1 Miso market</u> .....	9
<u>1.7.2 Estimate of Expected Project Life Span</u> .....	10
<u>1.7.3 Facility Decommissioning</u> .....	10
<u>1.8 REQUIRED PERMITS AND APPROVALS</u> .....	10
<u>1.8.1 Approvals and Permits</u> .....	10
<u>1.8.2 Correspondence with Permitting Agencies verify that copies of all official</u> <u>correspondence with state, federal, and local government agencies have been</u> <u>provided in the application</u> .....	13
<u>2.0 TECHNICAL DESCRIPTION OF TURBINES AND TURBINE SITES</u> .....	13
<u>2.1 ESTIMATED WIND SPEEDS AND ENERGY PRODUCTION</u> .....	13
<u>2.1.1 Wind Speeds and Source of Wind Speed Data Used In Analysis</u> .....	13

---

2.1.2 Wind Roses (Monthly and Annual) .....	13
2.1.3 Gross and Net Capacity Factor.....	13
2.1.4 Estimated Energy Production of Project.....	13
2.2 TURBINE TYPE AND TURBINE CHARACTERISTICS.....	13
2.2.1 Manufacturer and Model of Turbines Under Consideration.....	13
2.2.2 Turbine Delivery Date .....	14
2.2.3 Total Number of Turbines Required for Project .....	14
2.2.4 Technical Characteristics of Turbines .....	14
2.2.5 Technical Characteristics of Turbine Towers .....	15
2.2.6 Drawings of Turbines Including Turbine Pad and Transformer .....	16
2.3 CONSTRUCTION EQUIPMENT AND DELIVERY VEHICLES.....	17
2.3.1 Types of Construction Equipment and Delivery Vehicles .....	17
2.3.2 Gross Vehicle Weight for All Vehicles Using Local Roads .....	17
2.3.3 Vehicles for Turbine, Tower, Blade and Crane Delivery .....	17
2.3.4 Cranes - Types and Uses .....	19
2.3.4 Crane and Crane hardstanding information:.....	20
2.3.5 Roads and Infrastructure .....	20
2.3.6 Construction Traffic .....	24
2.4 OTHER PROJECT FACILITIES.....	25
2.4.1 Turbine Site Foundation .....	25
2.4.1 Turbine Site Foundation Information .....	25
2.4.2 Turbine Site Construction Area.....	25
2.4.3 Access Roads.....	26
2.4.3 Provide a non-confidential version of the access road information; .....	27
2.4.4 Crane Paths .....	27
2.4.5 General Construction Areas.....	28
2.4.6 Transmission Interconnection .....	30
2.4.7 Collector Circuits .....	30
2.4.8 Construction Site Lighting .....	31
2.5 SUBSTATION.....	32
2.5.1 Drawing or Diagram of the Substation .....	32

---

2.5.1	Indicate the actual size of the substation or substation addition in square feet, the dimensions of the proposed substation facilities, and the orientation of the substation within the property parcel: .....	32
2.5.2	Plat and Topographic Maps - Location of the Substation .....	32
2.5.3	Size of the Land Purchase Required and Orientation of Substation Within the Parcel .....	32
2.5.4	Current Land Ownership and Control of Property .....	32
2.5.5	Required Substation Facilities .....	32
2.5.6	New Substation .....	33
2.5.7	Modifications to Existing Substations .....	33
2.5.7	Construction Procedures .....	33
2.6	OPERATIONS AND MAINTENANCE BUILDING .....	34
2.6.1	Purpose and Use of the Proposed O&M building .....	34
2.6.2	Number of Full-Time Employees Working at the Facility .....	34
2.6.3	Size of Property Needed .....	34
2.6.4	Building and Building Footprint .....	34
2.6.5	Lighting and Security Plan for O&M Property .....	34
2.6.6	Other Facilities Needed .....	35
3.0	DEVELOPMENT, APPROVAL, ENGINEERING, AND CONSTRUCTION PROCESS AND SEQUENCE .....	35
3.1	CONSTRUCTION SEQUENCE .....	35
3.1.1	Construction Schedule .....	36
3.1.2	Staging and Construction Sequence .....	36
3.1.2	The Discussion in Section 3.1.2 of the application appears to indicate that construction has commenced. If construction has begun, provide a narrative describing the location, the type of construction activities and the date that construction commenced: .....	38
3.1.3	Estimate of Time Required to Complete Construction at a Typical Turbine Site .....	39
3.2	WORKFORCE .....	40
3.2.1	Information on Workforce Size and Skills Required for Plant Construction and Operation .....	40
3.2.1	Estimate of Expected Workforce from Local Sources .....	40
4.0	PROJECT MAPS AND PHOTO SIMULATIONS .....	40
4.1	GENERAL PROJECT MAPS .....	41
4.1	PROVIDE PRINTED COPIES OF APPENDIX L: .....	41

---

4.1.1 Project Area Maps.....	41
4.1.2 Topographic Maps .....	42
4.1.3 Natural Resources and Land Use/Ownership Maps .....	42
4.2 COMMUNITY MAPS .....	44
4.2.1 Zoning Maps.....	44
4.2.2 Sensitive Sites .....	45
4.3 PHOTO SIMULATION .....	45
5.0 NATURAL AND COMMUNITY RESOURCES, DESCRIPTION AND POTENTIAL IMPACTS.....	45
5.1 SITE GEOLOGY .....	45
5.1.1 Geology of the Project Area.....	45
5.1.2 Geotechnical Report on Soil Conditions .....	46
5.2 TOPOGRAPHY.....	48
5.2.1 General Topography of the Project Area .....	48
5.2.2 Expected Changes to Site Topography Due to Grading Activities. ....	48
5.3 LAND COVER .....	48
5.3.1 Vegetative Communities in the Project Area .....	49
5.3.2 Acres of Land Cover Categories in Project Area .....	49
5.3.3 Land Cover Impacts.....	50
5.3.3 The CPCN application appears to limit the definition of temporary disturbance to removal or grading of soils. Vegetation clearing and tree trimming adjacent to crane and other access paths, laydown (i.e., staging) areas, temporary access routes are all temporary disturbance and should be considered. Reassess and recalculate the estimates to include the full range of temporary disturbance .....	53
5.3.1 Describe What is Referred to in the Category "Marshes/Water" (i.e. Whether any Rivers, Ponds, Waterways, etc. are Included) .....	53
5.4 WILDLIFE .....	56
5.4.1 Existing Wildlife Resources and Estimate Expected Impacts to Plant and Animal Habitats and Populations .....	56
5.4.1 The Bald Eagle is Briefly Discussed in Appendix O and is Identified as Protected under the Federal Bald and Golden Eagle Protection Act. Provide Information Regarding Consultation with USFWS.....	56
5.4.1 Pre-construction Bird/Bat Survey Plans, a Detailed Description of the Survey and Acoustic Monitoring Methodologies and Documentation as Approved by the WDNR Prior to Start of the Survey.....	56

---

5.4.1 For blanding's turtle indicate in Appendix O that afer final project design and prior to construction avoidance measures will be defined for areas of potentially suitable or occupied habitat that may overlap with temporary or permanent disturbance. These measures will be developed based on consultation with WDNR .....	56
5.4.2 Avian and Bat Pre-Construction Surveys .....	58
5.5 PUBLIC LANDS .....	58
5.5.1 Provide a Listing and GIS Shapefile of State and Federal Properties, and County Parks within 10 Miles of the Project Area .....	58
5.6 LOCAL ZONING .....	59
5.6.1 Copies of Zoning Ordinances .....	60
5.6.2 Zoning Changes Needed for the Project .....	60
5.6.3 Zoning Changes Requested .....	61
5.7 LAND USE PLANS .....	61
5.8 ARCHAEOLOGICAL AND HISTORIC RESOURCES .....	61
5.8 HISTORICAL AND ARCHEOLOGICAL .....	61
5.8.1 Historic and Archaeological Sites Potentially Affected .....	61
5.8.2 Archaeological Site Locations in Which Construction Would Occur .....	62
5.8.3 Archaeological or Historical Resources .....	62
5.9 ER REVIEW – ENDANGERED, THREATENED, AND SPECIAL CONCERN SPECIES AND COMMUNITIES .....	63
6.0 WATERWAY/WETLAND PERMITTING ACTIVITIES .....	63
6.1 WATERWAY PERMITTING ACTIVITY .....	64
6.2 WETLANDS .....	64
6.3 MAPPING WETLANDS AND WATERWAY CROSSINGS .....	64
6.4 WATERWAY/WETLAND CONSTRUCTION METHODS .....	65
6.5 EROSION CONTROL AND STORM WATER MANAGEMENT PLAN .....	66
6.6 MATERIALS MANAGEMENT PLAN .....	66
6.6.1 Haul Routes .....	66
6.6.2 Stockpile Areas .....	66
6.6.3 Equipment Staging Areas .....	67
6.6.4 Field Screening Protocol for Contaminant Testing .....	67
6.6.5 Estimated Types, Concentrations and Volumes of Contaminated Materials .....	67
6.6.6 Method for Dewatering of Excavated Materials .....	67

---

6.6.7 Estimated Volumes of In-channel and Upland Excavated Materials.....	67
6.6.8 Estimated Volumes and Location of Re-used In-channel and Upland Excavated Materials.....	68
6.6.9 Off-site Disposal Plans for Contaminated or Non-contaminated Materials .....	68
6.7 DEWATERING PLAN.....	68
6.7.1 Dewatering/Diversion of Flow.....	68
6.7.2 Downstream Impact Minimization .....	69
6.7.3 Analysis of Possible System Overload Scenarios .....	69
6.7.4 Impacts of System Overload on Construction Activities and Water Quality .....	70
6.7.5 Water Discharge Locations .....	70
6.7.6 Details of a Back-up System.....	70
6.7.7 High Flow Plan.....	70
6.7.8 Contaminated Water .....	70
7.0 AGRICULTURAL IMPACTS .....	71
7.1 INFORMATION ON ONGOING FARMING ACTIVITIES IN CONSTRUCTION AREAS .....	71
7.1.1 Current Cropping Patterns.....	71
7.1.2 Location of Drainage Tile or Irrigation Systems.....	71
7.1.3 Farmland Preservation Agreements (FPA) for Proposed Sites .....	71
7.1.4 Conservation Reserve Program (CRP) Lands Inside the Project Boundary .....	72
7.1.4 Provide a GIS Shapefile Showing the Locations of Properties Enrolled in the CRP.....	72
8.0 AIRPORTS AND LANDING STRIPS .....	72
8.1 PUBLIC AIRPORTS.....	72
8.2 PRIVATE AIRPORTS/GRASS LANDING STRIPS.....	73
8.2.4 Describe any Mitigation Measures that would be used to Address Private Airport or Airstrip Impacts .....	754
8.3 COMMERCIAL AVIATION.....	74
8.4 FEDERAL AVIATION ADMINISTRATION .....	74
8.4 Identify the Provider of Air Ambulance Services within the Project Area. Also Describe any Planned Mitigation Measures that would be used to Ensure Safe Use of Those Services after Construction.....	74
8.4.1 Copies of All FAA Determinations of Hazard/No Hazard .....	75

---

8.4.2 Status of FAA Determinations.....	75
8.4.3 Obstruction Marking and Lighting Required by FAA .....	75
8.5 WISCONSIN DEPARTMENT OF TRANSPORTATION – HIGH STRUCTURE PERMITS....	75
8.5.1 Turbine Sites Requiring WisDOT High Structure Permits .....	75
8.5.2 Permit Status and Conditions for Each Turbine Site Requiring High Structure Permits.....	76
9.0 EMF .....	76
9.1 ESTIMATE OF MAGNETIC PROFILE CREATED BY COLLECTOR CIRCUITS .....	76
10.0 LINE-OF-SIGHT AND BROADCAST COMMUNICATIONS.....	76
10.1 MICROWAVE COMMUNICATIONS .....	76
10.1.2 List the Potential Impacts and Mitigation Measures that would be used to Correct Microwave Communications Interference in both the Design and Post- construction Phases of the Project.....	75
10.3.1 Describe Whether the Proposed Development is Likely to Interfere with any of the Following Doppler Weather Radar Installation .....	75
10.2 TELEVISION INTERFERENCE.....	77
10.3 OTHER COMMUNICATIONS SYSTEMS.....	78
11.0 NOISE.....	79
11.1 EXISTING NOISE MEASUREMENTS AND PROJECTED NOISE IMPACTS FROM PROJECT .....	80
11.2 COPIES OF ANY LOCAL NOISE ORDINANCE .....	82
11.3 TURBINE MANUFACTURERS DESCRIPTION OF NOISE ATTENUATING METHODS...	82
11.4 DESCRIBE HOW NOISE COMPLAINTS WILL BE HANDLED AFTER CONSTRUCTION IS COMPLETE:.....	82
11.5 DISCUSS ANY MITIGATION MEASURES THAT WOULD BE USED TO ADDRESS NOISE COMPLAINTS DURING THE OPERATION OF THE PROJECT: .....	83
12.0 SHADOW FLICKER.....	83
12.1 SHADOW FLICKER AT A TYPICAL WIND TURBINE SITE .....	83
12.2 MITIGATION AVAILABLE TO REDUCE SHADOW FLICKER .....	85
12.3 INQUIRIES OR COMPLAINTS.....	86
13.0 LOCAL GOVERNMENT IMPACTS.....	86
13.1 JOINT DEVELOPMENT AND OTHER AGREEMENTS.....	86
13.1 DESCRIBE WHETHER ANY PORTIONS OF THE TOWN OF FOREST WIND DEVELOPMENT AGREEMENT DATED AUGUST 12, 2010 WOULD BE HONORED	86
13.2 PROVIDE DOCUMENTATION FOR ANY PUBLIC MEETINGS HELD IN THE PROJECT AREA PRIOR TO AUGUST 12, 2010.....	86



---

<u>13.2 INFRASTRUCTURE AND SERVICE IMPROVEMENTS</u> .....	88
<u>13.2.1 LOCAL GOVERNMENT INFRASTRUCTURE REQUIRED</u> .....	88
<u>13.2.2 Effects of proposed project on city/village/town and/or county budgets</u> .....	88
<u>13.2.3 Estimate of Revenue to local community</u> .....	88
<u>13.2.4 OTHER BENEFITS TO THE COMMUNITY</u> .....	89
<u>14.0 LANDOWNERS AFFECTED AND PUBLIC OUTREACH</u> .....	89
<u>14.1 LISTS</u> .....	89
<u>14.1 PROVIDE A SEPARATE ALPHEBETIZED LIST (NAMES AND ADDRESSES IN MS EXCEL</u> <u>FOR EACH OF THE GROUPS DESCRIBED BELOW</u> .....	89
<u>14.2 PUBLIC OUTREACH</u> .....	91
<u>14.3 PLANS AND SCHEDULES FOR MAINTAINING COMMUNICATION WITH THE PUBLIC</u> .....	91
<u>14.4 LOCAL MEDIA INFORMED ABOUT THE PROJECT</u> .....	91

## List of Tables

TABLE 1.5-1 DESIGN SETBACKS .....	8
TABLE 1.8-1 PERMITS, NOTICES, CONSULTATIONS AND APPROVALS .....	11
TABLE 2.2-1 TURBINE MODEL AND NAMEPLATE CAPACITY .....	14
TABLE 2.2-2 TECHNICAL CHARACTERISTICS OF TURBINE TOWERS CONSIDERED .....	15
TABLE 2.2-3 TECHNICAL CHARACTERISTICS OF TURBINE TOWERS CONSIDERED .....	16
TABLE 2.3-1 APPROXIMATE GROSS VEHICLE WEIGHT .....	17
TABLE 2.3-2 DELIVERY VEHICLE CONFIGURATIONS .....	18
TABLE 2.3-3 TYPICAL CRANE CAPACITY AND TECHNICAL DATA .....	20
TABLE 5.3-1 VEGETATIVE COMMUNITIES IN PROJECT AREA .....	49
TABLE 5.3-2 LAND COVER IN PROJECT AREA .....	50
TABLE 5.3-3 LAND COVER IMPACTS IN ACRES .....	52
TABLE 5.6-1 APPLICABLE ZONING ORDINANCES.....	60
TABLE 13.2-1 TOTAL ESTIMATED ANNUAL PAYMENTS TO AFFECTED COUNTY AND TOWNS .....	89
TABLE 14.1-1 CLERKS OF MUNICIPALITIES DIRECTLY AFFECTED .....	90

---

## List of Figures

FIGURE 2.2-1 TURBINE DRAWING INCLUDING PAD AND TRANSFORMER .....	16
FIGURE 2.3-1 STRAIGHT ROUTE TURBINE COMPONENT CLEARANCE PROFILE.....	19
FIGURE 2.3-2 INTERSECTION WITH INSIDE TURNING RADIUS IMPROVEMENT .....	23
FIGURE 11.1-1 MEASURED SOUND LEVELS (L90, DBA).....	81
FIGURE 12.1-1 SHADOW HOURS FROM A TYPICAL TURBINE .....	85

## List of Appendices

A	Project Maps
B	Project Facility and Environment Mapbook
C	Transmission and Interconnection
D	Wind Resource and Energy Assessments
E	Turbine and Tower Technical Data
F	Construction and Equipment Information
G	Roads, Infrastructure and Transportation
H	O&M Building and Laydown Yard
I	Collector Circuits and EMF
J	Substation Information
K	General Project Maps
L	Oversized Project Maps
M	Photo Simulation Study
N	Geotechnical Report
O	Natural, Wildlife, Avian and Endangered Resources
P	Local Ordinances, Zoning and Comprehensive Plans
Q	Archeological and Historic Reviews
R	Wetland and Waterway Permitting
S	FAA Determinations and WisDOT Permits
T	Local Permitting
U	Communication Studies
V	Sound Studies
W	Shadow Study
X	Local Community Agreements and Correspondence
Y	Property and Community Lists
Z	Public Outreach

## Acronyms

AHI	Architecture and History Inventory
AOI	Area of Interest
APE	Area of Potential Effect
BMPs	Best Management Practices
CPCN	Certificate of Public Convenience and Necessity
CRP	Conservation Reserve Program
DATCP	Department of Agriculture, Trade and Consumer Protection
dBA	A-weighted decibel level
D-FIRMS	Digital Flood Insurance Rate Maps
EEW	EEW Services, LLC
ER	Endangered Resources
ERIS	Energy Resource Interconnection Service
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FPA	Farmland Preservation Agreements
FSA	Farm Service Agency
GIS	Geographic Information Systems
GLARC	Great Lakes Archaeological Research Center
HWF	Highland Wind Farm, LLC – the entity
kHz	KiloHertz
Met	Meteorological
MISO	Midwest Independent System Operator
MW	Megawatts
NAIP	National Agriculture Imagery Program
NHI	Natural Heritage Inventory
NOAA	National Oceanic and Atmospheric Administration
NRCS	National Resources Conservation Service
NRIS	Network Resource Interconnection Service
NTIA	National Telecommunications and Information Administration
O&M	Operations and Maintenance

PFW	Partners for Fish & Wildlife
Plan	Erosion Control and Stormwater Management Plan
Project	Highland Wind Farm
PSC	Public Service Commission (of Wisconsin)
REM	Remnant Population Study
ROW	Right-of-Ways
RPS	Renewable Portfolio Standard
SCADA	Supervisory Control and Data Acquisition
SSURGO	Soil Survey Geographic
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geologic Survey
WCWRPC	West Central Wisconsin Regional Planning Commission
WisDOT	Wisconsin Department of Transportation
WDNR	Wisconsin Department of Natural Resources
WHS	Wisconsin State Historical Preservation Society
WPA	Waterfowl Production Area
WPDES	Wisconsin Pollutant Discharge Elimination System
WRAPP	Water Resource Application for Project Permits
WTG	Wind Turbine Generator
WWI	Wisconsin Wetland Inventory

## 1.0 PROJECT DESCRIPTION AND OVERVIEW

Highland Wind Farm, LLC ("HWF") submits this Application for a Certificate of Public Convenience and Necessity ("CPCN") in accordance with Wis. Stat. § 196.491(3) and Wis. Admin Code § PSC 111.53 to the Public Service Commission of Wisconsin ("PSC" or "Commission").<sup>1</sup> The application was prepared in consideration of the guidance provided by the PSC's Application Filing Requirements for Wind Energy Projects in Wisconsin, Version 4.5, May, 2008 and Version 5, January, 2010 ("Filing Requirements") and consultations with the PSC and Wisconsin Department of Natural Resources ("WDNR") staffs.<sup>2</sup>

EEW is seeking a CPCN and all other approvals and authorizations required to construct, install operate and maintain a wind generating facility of approximately 102.5 megawatts ("MW") in size, known as the Highland Wind Farm ("Highland Wind" or "Project") to be located in the Townships of Forest and Cylon in St. Croix County, Wisconsin. The Project is designed to comply with the Commission's wind siting rules in proposed Wis. Admin. Code § PSC 128.

### 1.1 GENERAL PROJECT LOCATION AND DESCRIPTION

#### 1.1.1 PROJECT LOCATION

The proposed Project is located in western Wisconsin in the northeast corner of St. Croix County. The facilities are predominantly located in the Town of Forest, with the exception of the substation and associated transmission to be constructed on the eastern edge of the Town of Cylon.

#### 1.1.2 PROJECT MAPS

Two figures are provided in Appendix A, depicting the general Project location and a more detailed map of proposed Project facilities. A detailed, large-scale mapbook of the Project area including Project facilities, transmission, hydrology, wetlands and other basemap information (Fig 1.1-3) is located in Appendix B.

Figure 1.1-1 Project Location

Figure 1.1-2 Project Facilities

Figure 1.1-3 Project Facilities and Environment Mapbook

#### 1.1.3 PROJECT INFORMATION

The Project will be 102.5 MW. The Project study area boundary includes approximately 26,500 acres of land. Approximately 6,200 acres are under lease with land owners and available for development, before consideration of siting restrictions. The Project boundary, as shown in Figure 1.1-1 (Appendix A) was drawn taking into consideration the following:

---

<sup>1</sup> HWF is managed by EEW Services, LLC ("EEW").

<sup>2</sup> Numbering in this application is consistent with numbering in the Filing Requirements.

- Location of Project facilities (turbines, access roads, substation, operations and maintenance)
- Project properties under contract
- Public roads utilized for construction and maintenance
- Approximate zone of shadow and sound impacts of turbines

As currently proposed, the Project consists of 41 wind turbines ("WTG" or "turbine") with a rated capacity of approximately 102.5 MW. A total of 52 possible turbine sites have been identified, with 41 designated as preferred and 11 as alternate sites. The proposed sites and the evaluation process are described in detail in Section 1.5 below.

HWF possesses signed land owner agreements for the parcels currently proposed to host turbines (primary and alternate), access roads, substation, operations and maintenance ("O&M") building, laydown yard, meteorological ("Met") towers, transformers, junction boxes and the collection system. The Project will require permits from local, county and state departments of transportation to allow partial placement of the collection system in public road right-of-ways ("ROW"). HWF is in the process of purchasing five acres of land on which the substation will be located. The current owners have executed an option agreement to sell the land for the substation to HWF.

## **1.2 OWNERSHIP AND OPERATING ENTITY**

The Project facilities and all necessary land owner agreements either are or will be owned by HWF.

## **1.3 PROJECT NEED/PURPOSE**

### **1.3.1 – 1.3.5 - Not Applicable to Independent Power Producers**

### **1.3.6 ENERGY AGREEMENTS**

At the time of this application, HWF has had communication with several utilities and investors. While discussions are ongoing, there is no power purchase agreement in place. HWF expects to sell the power produced by the Project to one or more public, municipal or cooperatively owned utilities. If any utility is interested in owning the Project, HWF would consider developing and then selling the Project to a utility or other purchaser.

## **1.4 ALTERNATIVES**

EEW, as a private developer, is continually seeking and evaluating prospective areas for wind energy development in Wisconsin and the Midwest. Section 1.4.2 describes the process used to evaluate and prioritize potential areas for development.



**1.4.1 SUPPLY ALTERNATIVES - Not Applicable to Independent Power Producers****1.4.2 PROJECT AREA SELECTION**

EEW is a developer of small to medium sized (5-150 MW) utility-scale wind farms. It seeks wind development opportunities throughout Wisconsin and the Midwest. As a Wisconsin company, owned by Wisconsin residents, EEW prefers to develop within, or in close proximity to, the State of Wisconsin. This is in part due to a desire to assist Wisconsin utilities with meeting their Renewable Portfolio Standard ("RPS") goals, but also because of its principals' personal commitment to develop job opportunities within the region and help decrease the state's dependence on carbon-based fuels.

The process that EEW follows in finding and evaluating potential project sites varies; however, the elements described below are fundamental to the process.

**Phase I**

The first phase of assessment eliminates areas of poor wind resource or other siting flaws as described below.

- Wind resource – sufficient wind must be consistently present to drive the large wind turbine rotors and make a project profitable.
- Transmission availability – nearby electric transmission infrastructure is necessary to connect a project to the power grid. A project substation and additional transmission lines are often necessary, however the cost required to connect a project to the grid increases with the distance over which project-specific transmission must be built.
- Population density – Large open areas are necessary for wind farms in addition to sufficient distances between the turbines and homes, airports and other sensitive community resources. Cities, suburbs and areas of active residential development are eliminated in the first phase of the search for an eventual project site.

**Phase II**

The second phase of assessment is a more focused evaluation of areas identified as feasible in Phase I.

- Land use – large tracts of open land must be available to support the responsible siting of large wind turbines. Agricultural land is ideally suited for wind farms, due to the size of most farm fields and the ability of farmers to continue utilizing the land for agricultural purposes after a project is developed.
- Brownfields – Brownfield sites are considered, if the site meets the criteria noted in the Phase I requirements. No acceptable brownfields have been found by EEW at this time.
- Community – EEW prefers communities that are accepting of renewable energy projects. Regarding the Highland Wind Project location, the Town of Forest Comprehensive Plan

states within their Utilities and Community Facilities Goal, Objectives and Strategies that “The Town will be open to all forms (of) renewable energy projects, including wind, solar and bio-energy.”<sup>3</sup>

- Potential host landowners – Prospective landowners are visited to gauge interest in hosting project facilities.
- Environmental concerns – Desktop reviews are performed to assess the area’s environmental resources and potential impacts on sensitive habitats, such as wetlands and woodlands.
- Federal Aviation Administration (FAA), military and radar interference – Preliminary siting tools provided by the FAA are utilized to determine site acceptability.
- Detailed wind resource assessment – Met towers are erected to assess wind resources at a micro-siting level.
- Constructability – Topography (elevation and slope), as well as soils and subsurface geology are reviewed at a desktop level. Detailed field analyses are performed later in the development process.
- Road infrastructure – Highways and roads within the proposed project area are reviewed for compatibility with large construction vehicles and delivery trucks. Main highways feeding into the area from major ports or rails are also considered for delivery of turbine components.

### Phase III

The final phase of preliminary site assessment often overlaps with the tasks outlined in Phase II. Land owner commitments are signed. Resource assessments, feasibility, suitability and environmental reviews are performed in the field. These activities are discussed in detail in Section 1.5 below.

#### **ITEM 1.02<sup>4</sup> 1.4.2.1.3 PROVIDE A LIST OF ALL PROJECT AREAS REVIEWED WITH WEIGHTED SCORES FOR EACH SITING CHARACTERISTIC USED IN ANALYSIS:**

EEW prospects and responds to inquiries to develop additional wind energy projects as a normal part of the company’s business process. Four additional project areas were under consideration by EEW at the time that HWF was initiated. These sites and their weighted scores are shown in Appendix D. These additional projects were located in East Central Wisconsin, Central Wisconsin and West Central Illinois.

---

<sup>3</sup> Town of Forest Comprehensive Plan 2009-2030; Adopted December 08, 2009. As of the date of this Application, there has been no amendment to the Town of Forest Comprehensive Plan.

<sup>4</sup> Item references are to items identified as incomplete in PSC correspondence dated January 17, 2012 (PSC Reference No. 158314)

All projects that are advanced by EEW are initially evaluated based on:

The proposed project area wind resource.

Access to permitted easements on large land parcels to enable placement of turbines.

Access to power lines to convey the generated power.

Interconnection process and deliverability confidence.

A constructability review

Each of these factors are researched, discussed, and weighed before additional work is done to further develop an individual site. The wind speed is determined from wind resource maps and each of the additional items 2 through 5 are subjectively weighted on a "0" (do not proceed) to a "5" (most favorable) scale. General project scores are calculated by factoring together wind speeds squared and multiplying by the "0" to "5" ranking for each of the other line items 2 through 5.

**ITEM 1.03 1.4.2.2 PROVIDE A NARRATIVE DESCRIBING WHY THE PROPOSED PROJECT AREA WAS CHOSEN:**

The Project is located in the Town of Forest for a number of reasons. The Project area has a good wind resource and is proximate to necessary transmission lines. The Town of Forest also has the lowest population density in St. Croix County. Additionally the town and many of its residents were highly supportive of the Project. Finally, the Project area scores high for constructability.

## **1.5 TURBINE SITE SELECTION**

### **1.5.1 INDIVIDUAL FACTORS OR CHARACTERISTICS USED TO SELECT TURBINE SITES**

HWF, along with its consultant Stantec<sup>5</sup> evaluated each of the participating landowner's properties for turbine siting potential. (For purposes of evaluation, a "participating landowner" is one that receives financial compensation for allowing use of their land for the Project.) The evaluation process was performed with the use of a Geographic Information System ("GIS") allowing the consideration and iterative analysis of many factors. This process included, but was not limited to, the following:

- Landowner control – after obtaining final leases and agreements, the Project footprint was established and a preliminary assessment of possible sites based on wind resource was performed.
- Non-participating landowner setbacks – Setbacks from non-participating homes and properties were established and mapped. Setback distances used to site turbines are summarized in Section 1.5.3.

---

<sup>5</sup> Formerly Bonestroo

- Other setbacks – Setbacks from public ROWs, utilities and sensitive community resources, such as churches, schools and nursing homes were established and mapped.
- A design standard of 600 feet from non-inhabited buildings (barns, sheds, etc.) was used.
- Unavailable or restricted land – Managed and public lands, conservancies, land under contracts such as Conservation Reserve Program ("CRP"), Managed Forest Law and Farmland Preservation Agreements ("FPA") were reviewed and considered for restrictions.
- Airport locations – Airports, airstrips and runways were assessed to verify sufficient distances existed from runways to Project facilities.
- Environmental review – a desktop environmental review was performed to identify preliminary turbine locations which would minimize impacts. Other environmental assessments were initiated or continued; such as sensitive habitat assessment and avian/bat surveys.
- Shadow flicker and noise – Shadow and noise analyses were performed; turbine locations were adjusted to minimize impacts based on the model results. The sites selected meet a 50 dBA standard.
- Microwave paths – A preliminary communication study was completed in 2007 and updated in 2010; results were used to avoid interference with microwave paths.
- Constructability, crane and collection – Construction restrictions due to factors such as slopes and soils were considered. Construction efficiency and costs were also evaluated. Crane movement and the ability to network the collection system between turbine sites were additional considerations.
- Wind resource – Proposed wind turbines were sited in what the designers determined as the best available location within the chosen parcels. Though wind resource is an important consideration, often the best site for capturing the maximum wind energy is not available due to the setbacks, restrictions and potential environmental impacts previously discussed. The interference of wind within the turbine array from other turbines (waking) is also considered.
- Topography and land use within the Project footprint and individual sites were both factors in site selection.
- Land owner preferences – Potential locations of turbines and access roads were discussed with hosting landowners and their concerns and preferences were considered in the preliminary design. Upon completion of the layout design submitted in this application, each landowner was presented with a map displaying the design on an aerial photograph of the participant's property for their approval. HWF reserves the right to make minor changes in the field to accommodate unforeseen circumstances. Any such minor changes shall take

into account the basic premise of setbacks, sound and shadow considerations that were used in modeling the current Project layout.

The steps described above were often repeated in an iterative process to arrive at a Project design that minimized impacts to the environment and landowners while maximizing the efficiency of the Project. The final Project design consists of 52 total turbine sites; 41 primary (or preferred) sites and 11 alternate sites. The alternate sites are all viable and buildable locations; however they often represent additional impacts to the environment, lower energy production estimates or higher construction costs. The alternate sites will be utilized, should the permitting process or PSC review reveal that one or more of the primary sites is unacceptable, or if circumstances arise prior to construction that prohibit the use of a primary location. Revisions to the turbine layout design may also require revisions in cable routes, access roads, cross-country crane routes, and possibly slight shifts in other turbine locations to minimize wake effects. These changes may require revisions in construction permits already submitted and/or obtained.

#### **1.5.2 INFORMATION ON HOW TURBINE SITE CHARACTERISTICS AND TYPE OF TURBINES CHOSEN FACTORED INTO THE SELECTION OF FINAL TURBINE SITES**

HWF is considering turbines manufactured by Nordex and Siemens, due to the characteristics discussed in Section 2.2 below. The Nordex N100, Nordex N117, Siemens SWT-2.3-113, or similar model, allows the Project to obtain maximum power generation while minimizing impacts to land owners and natural resources.

In addition to the numerous factors discussed above, a consideration in designing the Project was HWF's goal to retain the local agricultural feel of the region by dispersing turbine sites, rather than concentrating them within a small area. The choice of a 2.5 MW turbine aided in this design; allowing 41 turbines to deliver up to 102.5 MW of generation versus, for example, 68-1.5 MW turbines required for an equal amount of generation.

#### **1.5.3 TURBINE SETBACK DISTANCES**

The proposed primary and alternative turbine sites for the Project were chosen conservatively using the design criteria outlined in Sections 1.5.1 and 1.5.2. These criteria included the setback distances determined by the most recent PSC wind farm approval (We Energies' Glacier Hills Wind Park) and are consistent with the setbacks proposed in the December, 2010 revision of proposed Wis. Admin. Code § PSC 128. The Project does not require any easements from non-participating landowners to accommodate the setbacks utilized. The set backs are summarized in Table 1.5-1 below.

**Table 1.5-1 Design Setbacks**

Setback Description	Setback Distance *
Non-participating, Occupied Community Buildings (schools, churches hospitals or public libraries)	1,250 feet
Non-participating Residences	1,250 feet
Participating Residences	600 feet
Non-participating Property Lines	1.1 x tip height (550 feet)
Participating Property Lines	0 feet
Public Road ROW	1.1 x tip height (550 feet)
Overhead Communication and Electrical Lines (not including lines to individual houses or outbuildings)	1.1 x tip height (550 feet)
Overhead Utility Service Lines (lines to individual houses or outbuildings)	0 feet
<p>* Distance is considered from center point of turbine tower.</p> <p>Tip Height is considered the total height of the turbine, measured to the highest point of the blade tip.</p>	

**ITEM 1.05 1.5.3.3 DESCRIBE THE STATUS OF EASEMENT AGREEMENTS:**

**-Identify all turbine sites, proposed and alternate, for which an easement agreement has been signed:**

All 52 turbine sites are shown on Figure 1.1-2 (Appendix A) (41 proposed/11 alternate). Each of the 52 sites have fully executed easement agreements in place with the current landowners. Microsited locations of primary and alternate turbine sites have also been signed off by host landowners.

**-Identify turbine sites where easement agreements have not been signed and provide a short description of status of negotiations:**

None.

**Item 1.06 Describe the status of easement agreements for project facilities other than the turbine sites:**

Additional agreements for the O&M Building (lease) and substation (purchase agreement) have been negotiated and executed with the host landowners.

**ITEM 1.04 1.5.3.4 IDENTIFY ANY SITES WHERE SETBACK WAIVERS ARE NEEDED OR HAVE BEEN EXECUTED:**

No setback waivers are required for the Project. HWF's proposed turbine layout does require one (1) overhang easement. That site is the Northeast Quarter of the Southeast Quarter (NE ¼ SE ¼) of Section 22, Township 31 North, Range 15 West, Town of Forest, St. Croix County, Wisconsin. The overhang easement has been fully executed with the property owner in the form of a First Amendment to Wind Energy Lease and Easement Agreement. HWF also has an executed Wind Energy Lease and Easement Agreement with the applicable property owner.

**1.6 COST**

**1.6.1 – 1.6.6** Not Applicable to Independent Power Producers

**1.7 MISO AND PROJECT LIFE SPAN****1.7.1 MISO MARKET**

HWF has applied to the Midwest Independent Service Operator ("MISO") for interconnection to the electric transmission grid. As an intermittent resource the Project is as an energy resource only at this time. HWF may consider a ratio of energy-resource versus network-resource depending upon the queue reform in process and the options that become available as the planning process reaches conclusion.

In November, 2010 HWF filed an application for generator interconnection with MISO. This initial application for a 97.5 MW project is known as queue position J177. The Feasibility Study Phase for J177 has been completed and it is currently in the System Planning and Analysis (SPA) phase. It is anticipated, that J177 will be able to move to the Definitive Planning Phase ("DPP") during the first half of 2012. The J177 Feasibility Study is included in Appendix C.

This initial MISO application for 97.5 MW relied upon the Wind Development Agreement Resolution that EEW had entered into with the Town of Forest on April 10, 2008. Based on developments with the Town of Forest, HWF chose to increase the size of the Project in order to use the CPCN process under Chapter 196 of the Wisconsin statutes. In June, 2011 HWF filed an incremental increase of 5 MW to its initial J177 generator interconnection application. The 5 MW incremental increase to the Project size is now known in the MISO queue as J221. The Feasibility Study Phase for J221 has been completed and advanced to the DPP. J221 is now parked waiting for the next DPP cycle. It is anticipated that J177 will complete the SPA phase and be considered along with J221 during the DPP cycle beginning in March 2012. The J221 Feasibility Study is included in Appendix C.

**Item 1.07 Appendix C of the application appears to include summaries of the status of the MISO interconnection requests for the project, but does not include copies of the reports:**

HWF specifically requested the MISO results for the various phases of the MISO Queue that projects J221/J177 have gone through, or are currently in. The only thing that MISO has provided to us is the link to the public generator interconnection application queue. Table summaries of the studies can be found

in Appendix C and updates can be viewed on the MISO Queue:

<https://www.midwestiso.org/planning/generatorinterconnection/pages/interconnectionqueue.aspx> .

Click on: "Queue Projects Complete List (xls)" to view HWF at J177 and J221 within a Microsoft Excel document. HWF will furnish copies of any new MISO study results to the PSC staff as they are received.

### **1.7.2 ESTIMATE OF EXPECTED PROJECT LIFE SPAN**

The design life for the Project is approximately 30 years. All lease agreements have been negotiated to allow for that term of operation. HWF understands that the value of a wind farm lies in its operation, and looks to a premium level of operation and maintenance service throughout its life. At this premium level of maintenance HWF expects that the operating condition of the turbines in 30 years will be the same as it is in the first year of operation. Based upon the needs of the marketplace, the community, the landowners, and HWF, it is anticipated there will be an opportunity to extend the Project life beyond 30 years.

### **1.7.3 FACILITY DECOMMISSIONING**

Upon termination of the Project, facilities will be removed and land restored to pre-construction (or equivalent) condition as outlined in the agreements signed by participating landowners and HWF. The facilities to be removed include the turbine towers and foundations (to four feet below grade). Access roads will be left in place at landowner's request or removed and land restored to original or equivalent condition. Underground collection cables will be cut off and left in place. The O&M building will be left for the landowner's use. Typical restoration activities include placement of fill with soils similar to the surrounding area, grading to nearby land contours and planting with appropriate vegetation.

#### **ITEM 1.08 1.7.3.1 PROVIDE AN ESTIMATE OF THE COST OF AND SOURCE OF FUNDING FOR DECOMMISSIONING**

The decommissioning estimate for the Project can be found in Appendix F. Based upon this estimate there will be no decommissioning cost. Rather, decommissioning will result in additional revenue for the Project. However, HWF will honor the original decommissioning plan agreed to with the Town of Forest, as stated in the 2008 agreement and confirmed in the 2010 agreement (Appendix X). This will result in the posting of a letter of credit with the town in the amount of \$391,000.00.

## **1.8 REQUIRED PERMITS AND APPROVALS**

### **1.8.1 APPROVALS AND PERMITS**

Table 1.8-1 summarizes the permits and approval types that are required at the federal, state and local level for the Project. HWF is in contact with the local townships and will update the list if additional requirements are identified. The necessary permits and approvals will be obtained before commencing construction activities.



**Table 1.8-1 Permits, Notices, Consultations and Approvals**

Agency	Interest or Permit	Contact	Application/ Notice Date	Status
<b>Federal</b>				
Federal Aviation Administration	Impacts on aviation	Michel Blaich/Angelique M. Lestrad (718) 553-2611	Various	52 No Hazard Determinations received – See Appendix S
U.S. Fish and Wildlife Service	Migratory Bird Treaty Act and Endangered Species Act	Jill Utep (920) 866-1734	Various	In process; has reviewed documents and visited site
U.S. Army Corps of Engineers	Impact of Project construction activities on waterways and wetlands	Daniel Munson (651) 290-5191	12/12/2011	Filed with WDNR Wetland Water Quality Certification Application
National Oceanic and Atmospheric Administration (NOAA)	NexRAD	To be completed with Comsearch Study		See NTIA - no concerns listed in response
National Telecommunications and Information Administration (NTIA) - Department of Commerce	Determine if Project will impact Federal Government communication links	Edward M. Davison (202) 482-1164	8/24/2011	Response received - No concerns from Federal agencies at this time (see Appendix U)
<b>State</b>				
Public Service Commission	CPCN for construction of large energy generation facility	Jim Lepinski (608)266-0478	12/16/2011	Pending Completion
Department of Natural Resources	Wetland Water Quality Certification	Ben Callan (608) 266-3524	12/12/2011	Pending
Department of Natural Resources	Water Resources Application for Project Permit	Tim Ryan (608) 266-5239	12/12/2011	Pending
Department of Natural Resources	Endangered Resources Review (ERR) and Incidental Take (IT) Permit (if needed)	Shari Koslowsky (608) 261-4382	Various	Received – See Appendix O
Wisconsin State Historical Society (WHS)	Protection of WHS- listed historical properties	Sherman Banker (608) 264-6507		WHS will review after CPCN submission
State Historical Society – Tribal Preservation	Cultural and archaeological resources	Various Tribes	10/10/2011	Response Received – See Appendix Q

Agency	Interest or Permit	Contact	Application/ Notice Date	Status
Department of Transportation	High structure permit (turbines)	Gary Dikkers/Scott Brummond (608) 267-5018 (608) 266-1745	Various	Permits Received – See Appendix S
Department of Transportation	Heavy and oversized load permits	WisDOT Transport Permit Unit (608) 266-7320		Contingent upon CPCN approval
Department of Transportation	Utilities underground in state highway ROW	Tammy Ricksecker (715) 836-3905		Contingent upon CPCN approval
Department of Transportation	Driveway permits for access roads on state highways	Tammy Ricksecker (715) 836-3905		Contingent upon CPCN approval
Department of Commerce / St. Croix County	Sanitary Permit for Private On-site Wastewater Treatment System (POWTS) (O&M)	Safety and Buildings Division (608) 266-3151 Pam Quinn (St Croix) (715) 386-4742		Contingent upon CPCN approval
<b>Local</b>				
St. Croix County Highway Department	Heavy and oversized load permits	Jeff Durkee (715) 796-2227	Various	Contingent upon CPCN approval
St. Croix County Highway Department	Utilities underground in county road ROW	Jeff Durkee (715) 796-2227	Various	Contingent upon CPCN approval
St. Croix County Highway Department	Driveway permits for access roads on county roads	Jeff Durkee (715) 796-2227		Contingent upon CPCN approval (See Appendix T)
Town of Forest	Utilities underground in town road ROWs	Rick Steinberger (715) 265-4845		See Section 13
Town of Forest	Driveway permits for access roads on town roads	Rick Steinberger (715) 265-4845	Issued on 2/10/2010	See Appendix T
Town of Cylon	Driveway Permit	Randy Zemke (715) 269-5599		Contingent upon CPCN approval
St. Croix County / Town of Cylon	Land Division (substation)	Alex Blackburn (715) 386-4684		Contingent upon CPCN approval
Town of Cylon	Building Permit (substation)	Randy Zemke (715) 269-5599		Contingent upon CPCN approval
Town of Forest	Building Permits (turbines, O&M)	Rick Steinberger (715) 265-4845	Issued 2/14/2011	See Section 13 and Appendix T
Town of Forest	Wind Development Agreement	Town Board	Executed 8/12/2010	See Section 13 and Appendix X

**ITEM 1.09 1.8.2 CORRESPONDENCE WITH PERMITTING AGENCIES VERIFY THAT COPIES OF ALL OFFICIAL CORRESPONDENCE WITH STATE, FEDERAL, AND LOCAL GOVERNMENT AGENCIES HAVE BEEN PROVIDED IN THE APPLICATION.**

HWF has verified that copies of all correspondence with applicable agencies are provided within the related Appendices and the revised Data DVD. HWF will continue to provide copies of agency correspondence to the PSC, following submittal of this application.

## **2.0 TECHNICAL DESCRIPTION OF TURBINES AND TURBINE SITES**

### **2.1 ESTIMATED WIND SPEEDS AND ENERGY PRODUCTION**

The confidential report – Site Wind Analysis of the Highland Wind Farm (“AWS Study”) can be found in Appendix D.

#### **2.1.1 WIND SPEEDS AND SOURCE OF WIND SPEED DATA USED IN ANALYSIS**

The locations of the two Project meteorological ("met") towers are displayed on Figure 1.1-2 (Appendix A). Met Tower 1 was erected in May, 2008 and has collected data from that time to the present. Met Tower 2 was erected in February, 2011, and has been collecting data from that time. Data collected from the towers has been accumulated and confirmed by Pioneer Wind Works, LLC, a Wisconsin company and further analyzed by AWS. Estimated wind speeds for the Project can be found in the AWS Study (Appendix D).

#### **2.1.2 WIND ROSES (MONTHLY AND ANNUAL)**

A wind rose is a graphical representation of the frequency and strength of the wind from different directions. The wind roses from the Project area monitoring gathered from May 2008 to present demonstrate variable prevailing winds. The confidential graphs and analyses are available in the AWS Study (Appendix D).

#### **2.1.3 GROSS AND NET CAPACITY FACTOR**

Gross and net capacity factors were calculated for each turbine within the Project footprint and the full Project. The gross and net capacity factors for the Project, along with the methodology used, can be found in the AWS Study (Appendix D).

#### **2.1.4 ESTIMATED ENERGY PRODUCTION OF PROJECT**

Gross and net energy production estimates for the Project can be found in the AWS Study (Appendix D).

### **2.2 TURBINE TYPE AND TURBINE CHARACTERISTICS**

#### **2.2.1 MANUFACTURER AND MODEL OF TURBINES UNDER CONSIDERATION**

HWF is planning on utilizing the Nordex N100, Nordex N117, Siemens SWT-2.3-113, or a similar model of turbine for the Project. These turbines are all upwind, three-bladed, horizontal axis turbines mounted

on a tubular steel tower. HWF is considering these designs (blade length and tower height differences) all with a total maximum tip height of approximately 500 feet. The detailed technical attributes of the turbines are presented in Sections 2.2.4 and 2.2.5 below.

### 2.2.2 TURBINE DELIVERY DATE

HWF expects to schedule delivery of the turbines before or within the first quarter of 2013, to support an on-line date target of fourth quarter, 2013. The consideration of the multiple turbine designs allows flexibility in turbine purchase and delivery dates.

### 2.2.3 TOTAL NUMBER OF TURBINES REQUIRED FOR PROJECT

The Project is designed for 41 wind turbines with generating capacity equal to 102.5 MW. As described in Table at 2.2-1 the final turbine selection could vary from a low 2.3 MW per turbine to a high of 2.5 MW per turbine. The full Project nameplate capacity (102.5 MW) can be achieved with 41 turbine sites using a 2.5 MW turbine. However, if the final selection is a 2.3 or 2.4 MW machine additional sites would be required to reach the full capacity of the Project. If the selection is 2.4 MW machines 42 sites would be requested, similarly if the selection were a 2.3 MW machine, up to 44 sites would be required. The initial siting for the Project allowed for as many as 57 turbine locations. Several of those sites were eliminated based on environmental or other concerns leaving 52 quality sites for turbines to be situated on. Regardless of the size of the turbine selected eleven alternative sites are sufficient to meet the Commission's 25 percent standard for alternative sites.

Table 2.2-1 Turbine Model and Nameplate Capacity

Turbine Model	Nameplate Capacity per Turbine (MW)	Required Number of Turbines	Project Nameplate Capacity (MW)
Nordex N100/100	2.5	41	102.5
Nordex N117/91	2.4	42	100.8
Siemens SWT-2.3-113	2.3	44	101.2

### 2.2.4 TECHNICAL CHARACTERISTICS OF TURBINES

The Nordex N100, Nordex N117 and Siemens SWT-2.3-113 turbines have design differences in blade length and tower height. Table 2.2-2 summarizes the technical characteristics of the preferred models for the Project. Additional technical information for these turbines can be found in Appendix E.

**Item 1.60** HWF has specified and required the use of "cold weather packages" on all turbines being considered for the Project. The specific availability of a "cold weather package" was required for a turbine to be considered for the Project

**Table 2.2-2 Technical Characteristics of Turbine Models Considered**

Turbine Characteristic	Nordex N100/100	Nordex N117/91	Siemens SWT-2.3-113
Rated Power (MW)	2.5	2.4	2.3
Hub Height (m)/(ft)	100/328	91/299	95/312
Blade Length (m)/(ft)	49/161	57/187	55/180
Swept Area (sq.m)/(sq.ft)	7,823/84,206	10,751/115,723	10,023/107,887
Total Height (m)/(ft)	150/493	149.5/491	151.5/497
Cut-in Speed (m/s)/(mph)	3/6.7	3/6.7	3/6.7
Cut-out Speed (m/s)/(mph)	20/44.7	20/44.7	25/56
Variable Speed (rpm)	7.5-13.2	6-13	9.6-14.8
Rated Wind Speed (m/s)/(mph)	12/26.8	11/24.6	12.5/28
Power Curve Available*	Yes	Yes	Yes

\* Power curves for the three turbine models are provided in Appendix E.

### 2.2.5 TECHNICAL CHARACTERISTICS OF TURBINE TOWERS

The Nordex N100, Nordex N117 and Siemens SWT-2.3-113 all sit atop a tubular steel tower. The tower is delivered as 4-5 sections consisting of base, mid(s) and top sections. The total assembled tower height for the turbines considered varies by model, ranging from 91 to 100 meters. The tower may be a site specific design by the manufacturer to accommodate a total tip height up to 500 feet including rotor length. Table 2.2-3 is a listing of tower characteristic for the three turbine designs being considered.

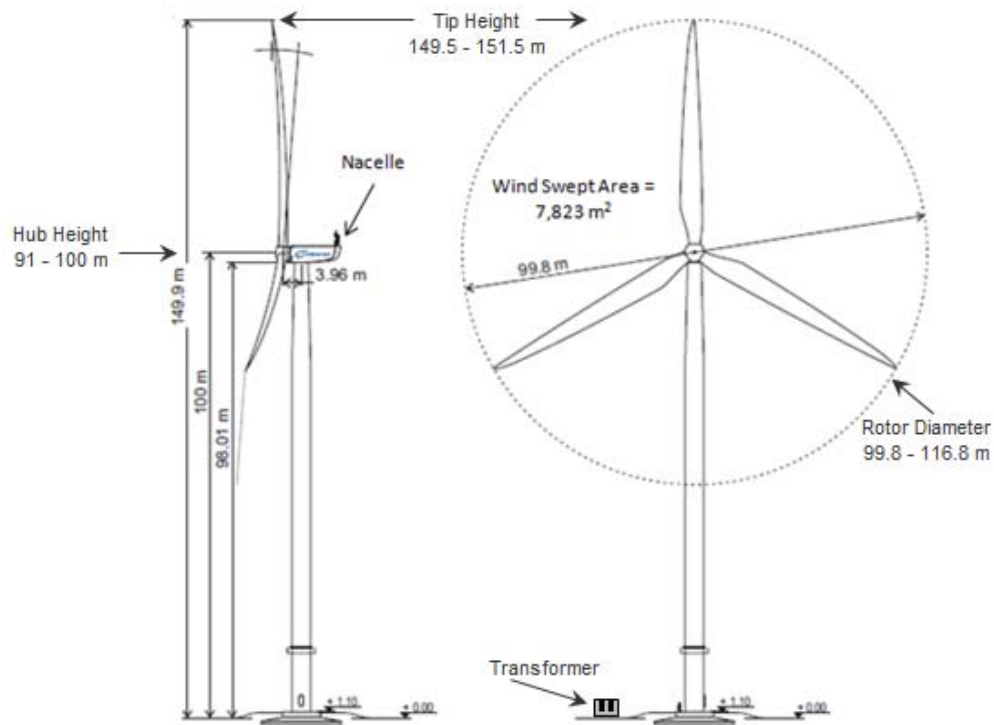
The tower sections are prefabricated and painted at the factory, arriving on site ready to assemble. The diameter at the base of the tower is approximately 13 feet, tapering slightly to an approximate 10 foot diameter at the top.

**Table 2.2-3 Technical Characteristics of Turbine Towers Considered**

Tower Characteristic	Nordex N100/100	Nordex N117/91	Siemens SWT-2.3-113
Type	Tubular monopole	Tubular monopole	Tubular monopole
Material	Steel	Steel	Steel
Number of Sections	5	5	5

**2.2.6 DRAWINGS OF TURBINES INCLUDING TURBINE PAD AND TRANSFORMER**

Figure 2.2-1 provides a scaled drawing of the Nordex N100 wind turbine\*.

**Figure 2.2-1 Turbine Drawing Including Pad and Transformer**

\*The two additional preferred turbine models are similar in design (ranges of rotor diameter, hub and tip height shown on drawing). See Table 2.2-2 and Appendix E for additional technical information on turbines.

## 2.3 CONSTRUCTION EQUIPMENT AND DELIVERY VEHICLES

### 2.3.1 TYPES OF CONSTRUCTION EQUIPMENT AND DELIVERY VEHICLES

Construction equipment will include the following: graders, bulldozers, excavators, cranes, concrete pumps, forklifts, trailers, plows, trenchers and directional boring rigs. It is anticipated that most equipment will be initially delivered to the Project laydown yard located near the proposed O&M building. Equipment will be transported from the laydown yard to the appropriate construction site, as needed.

Additional deliveries of construction materials and components will be made directly to the construction sites. The materials and delivery vehicles include the following:

Culvert sections and road fabric (flatbed semis)

Road aggregate (end dump, side dump and belly dump trucks)

Reinforced steel for foundation, anchor bolts and padmount transformers (flatbed semis)

Ready-mixed concrete (traditional ready-mix trucks)

Turbine components and main substation main transformer (heavy/oversize load tractor trailers)

Fiber optic spools, electrical cable and electrical conductors (lowboy or flatbed semis)

### 2.3.2 GROSS VEHICLE WEIGHT FOR ALL VEHICLES USING LOCAL ROADS

Table 2.3-1 summarizes the approximate gross weight of the various construction vehicles.

**Table 2.3-1 Approximate Gross Vehicle Weight**

Delivery Vehicle	Loaded Weight (lbs)	Unloaded Weight (lbs)
Aggregate Truck (quad axle)	73,000	35,000
Concrete Truck	73,000	35,000 (approx. 10 yards)
Lowboy Semi Truck	100,000	50,000
Component Delivery Vehicles	330,000 (12 per axle)	180,000

### 2.3.3 VEHICLES FOR TURBINE, TOWER, BLADE AND CRANE DELIVERY

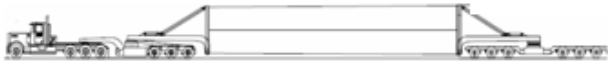




Turbine component delivery vehicles are specifically designed to carry the size and loads of the tower sections, blades, nacelles and hubs. Table 2.3-2 and Figure 2.3-1 illustrate the various transportation vehicle configurations that will be utilized to transport the components to the turbine sites.

Transportation vehicle types are to be specified according to the manufacturer's recommendations based on final turbine selection and site detail for each turbine. Maximum overall vehicle length ranges are presented in Table 2.3-2. The ranges given reflect the various lengths of tower sections and blades for the Nordex N100, Nordex N117 and Siemens SWT-2.3-113 turbines.

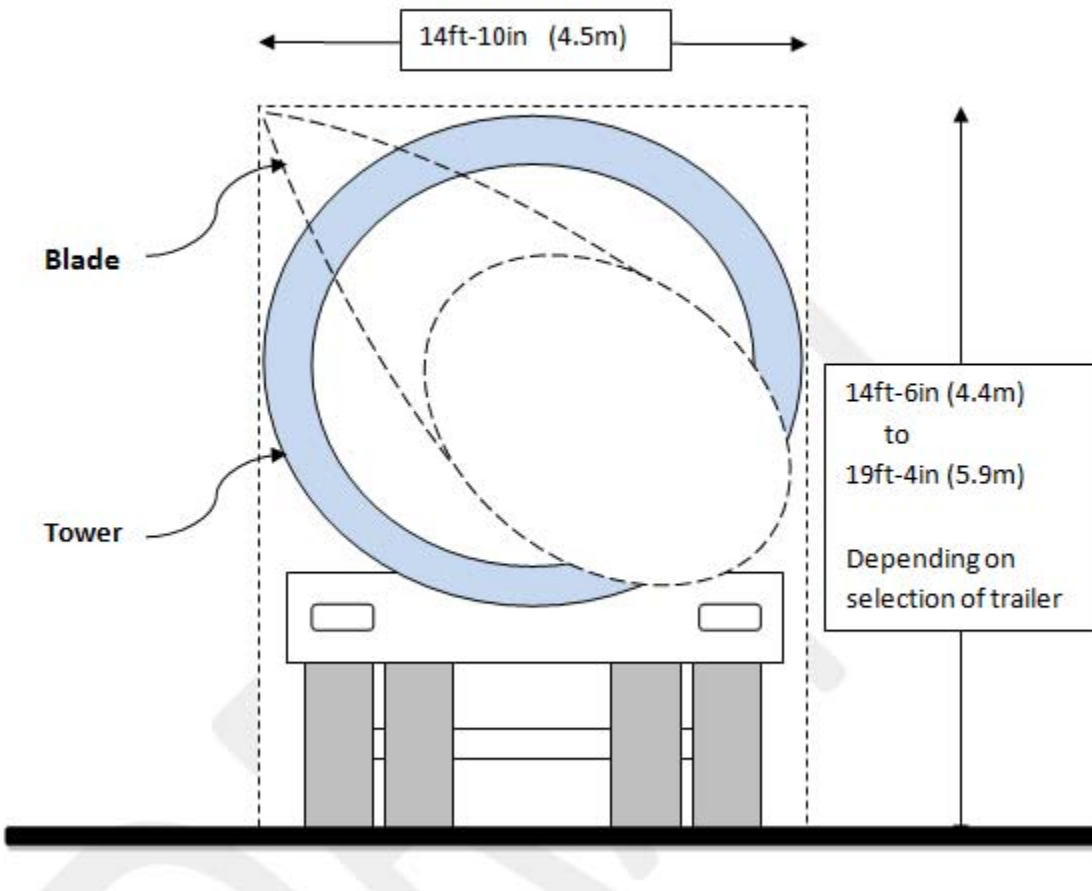
In general, the component delivery vehicles and trailers have become significantly maneuverable to improve mobility and obstacle avoidance through use of mechanisms to steer and elevate or lower working loads as needed.

Additional delivery information is contained in a technical report titled "Nordex: Transport, Access Roads and Crane Requirements" located in Appendix F.

**Table 2.3-2 Delivery Vehicle Configurations**

Truck Type	Maximum Overall Vehicle Length (ft)	Turning Radius (ft)	Minimum Ground Clearance (in)	Maximum Slope Tolerance (%)
Tower Section Delivery 	144 to 180	150	6	10
Blade Delivery 	196 to 222	150	20	12
Turbine Nacelle Delivery 	115	150	6	10
Lowboy (typical) 	85	100	6	12
Flatbed (typical) 	85	100	20	12



**Figure 2.3-1 Straight Route Turbine Component Clearance Profile**

### 2.3.4 CRANES - TYPES AND USES

HWF will utilize several types of construction cranes for the installation and erection of the Project facilities. The largest cranes used for turbine assembly will arrive on site via multiple flatbed semi-trailer loads and require 2- 5 days to assemble, depending on crane type. Preferred movement between turbine sites for the largest cranes is to “walk” the crane from site to site in lieu of dis-assembling and transporting and then re-assembling at each turbine site. This is discussed in detail in Section 2.4.4. Crane walks are sometimes impractical due to obstacles, sensitive resources or excessive slope. Cranes may then be partially or fully disassembled, transported as components by semi- flatbed loads, and reassembled.

On a project of this size there will typically be 1 to 2 main erection crawler lattice boom cranes capable of lifting the size and height requirement for the proposed turbine types. There may also be up to 3 medium sized crawler lattice boom cranes used for off-loading components and performing some erection functions. Depending on the final construction reviews and operational needs, the Project may

include self propelled all terrain and rough terrain cranes to support all the operations at the turbine sites and at the various lay-down areas of the Project.

Project cranes will range from 60 ton to 600 ton lift capacity and will offer boom lengths and reaches that range from approximately 75 feet to over 400 feet. General technical data is offered in Table 2.3-3 for anticipated project cranes.

Table 2.3-3 Typical Crane Capacity and Technical Data

Crane type	Weight (tons)	Lift Rating (tons)	Transport Loads (# loads)	Assemble Time (days)	On site Mobility
Large lattice boom crawler	650	600	35	2 - 5	Crane walk or flatbed semi
Medium lattice boom crawler	300	200-300	6 to 10	1 - 2	Crane walk or flatbed semi
Support lattice boom crawler	200	100-200	3 to 5	1 - 2	Crane walk or flatbed semi
All Terrain telescopic boom	200	100-200	Self propelled	1	Self propelled
Rough Terrain telescopic boom	50	60-90	2	1	Self propelled

Large construction cranes are delivered disassembled and assembled on site. The large erection cranes require approximately 35 loads of varying weights and dimensions. Several smaller support cranes consisting of only 2 to 3 transportation loads are used to off-load and assemble the large main erection crane. The number and size of cranes will vary slightly on each site based on site construction space and accessibility. When partially disassembling the large erection crane to move from one site to another, the number of loads may change due to the efficiencies with moving the cranes short distances and at low speeds.

#### **Item 1.10 2.3.4 Crane and Crane hardstanding information:**

HWF did receive approval from Nordex to release the previously confidential Nordex:Transportation, Access Roads and Crane Requirements document included in Appendix F. Please see pages 16-18 of that document for the Nordex hardstanding information. The crane configuration is a confidential item that is proprietary to the erection contractor. A copy of the Manitowoc 18,000 specifications was already provided. A wind-jib will likely be used for the Project. A typical/generic crane pad drawing can be found in Appendix F.

#### **2.3.5 ROADS AND INFRASTRUCTURE**

Stantec performed a preliminary review of the regional roads, bridges and intersections within the Project footprint as well as possible routing to the turbine sites. Stantec also compiled data on public

infrastructure from the WisDOT's Wisconsin Information System for Local Roads ("WISLR") and Highway Structures Inventory System ("HSIS") to evaluate the suitability of the infrastructure to support expected construction traffic.

At intersections along the possible route for turbine construction activities, data was collected to determine the configuration including the measurement of the turning radii from shoulder point to shoulder point. Additionally, roadway geometrics, type of roadway surfaces at the intersections, approximate ditch in-slopes, and culverts in the intersection area were logged.

Stantec's Report- Roads, Infrastructure and Transportation for the Preliminary Road Infrastructure Study -can be found in Appendix G ("Stantec Road Study").

The area roads are primarily asphalt pavement, cold mix asphalt surface, or gravel. The roads serve the area farm industry traffic and local vehicle traffic. No roads are posted for weight restrictions in the area, except for one bridge posting on 210th Avenue. The "no posting" of roads suggests that the local road system has sufficient load bearing capacity and width to support the needs of the Project, however each possible route considered for delivery and transportation of construction materials will be evaluated individually for potential mitigation requirements prior to construction. To determine the sub-surface load bearing capacities of local roads, testing processes such as ground penetrating radar or falling weight deflectometer may be used.

In general, haul vehicles that have axle and wheel loads similar to standard highway vehicles will not have an adverse effect on bridges and structures that have been designed for modern highway loadings. This would apply to Trunk Highways and other major roadways that have been designed for and routinely carry this type of traffic. Also, this would apply to minor roads with newer structures designed in accordance with current codes. Minor roads with older and smaller structures would require investigation and evaluation of individual structures. A preliminary understanding of the local roads and bridges within the Project area is presented in the Stantec Road Study.

#### **2.3.5.1 METHODS TO BE USED TO HANDLE HEAVY OR LARGE LOADS ON LOCAL ROADS**

The Stantec Road Study identifies roads that should be avoided to reduce the possibility of failure or damage. Bridges or culverts with load restrictions will similarly be avoided or improved to support construction needs. The impact of the transport of heavy loads will be mitigated by utilizing vehicles which meet the ratings for the equipment transported. The following measures may be taken depending on time and location, to facilitate the movement of construction equipment and heavy loads:

- Appropriate haul vehicles utilized for specific loads;
- Distribution of weight load over appropriate truck/trailer lengths and axles to reduce damage to roads by spreading weight over larger surface areas;
- The use of wood mats and steel plates to cover roads at crane crossings and provide protection from outrigger pads;
- Construction of temporary turn lanes and enlarging turning radii at intersections to ensure vehicles are able to safely maneuver predetermined routes;

- Improvement of public roads at points of intersect with turbine access roads, including temporary turn lanes and shoulder improvements, where necessary;
- Appropriate haul vehicles utilized for specific loads during the winter season when frozen soil conditions allow for heavier loads.

#### **2.3.5.2 PROBABLE ROUTES FOR DELIVERY OF HEAVY/OVERIZED EQUIPMENT AND MATERIALS**

Turbine components will approach the Project area via US Highway (USH) 63 and State Highway (STH) 64 in St. Croix County. From USH 63 and STH 64, access to the turbine sites will require travel on the county and local road way systems. Final routes for heavy hauls or equipment have not been chosen at this time. The initial phase of the Stantec Road Study consisted of a preliminary inspection of roads, bridges and intersections within the Project area, to assist in determining the final routes. Figures A-1 and A-2 of the Stantec Road Study (Appendix G) provide summaries of the road ratings, bridges and intersections within the Project area. This information will be utilized in defining routes that minimize impacts to the county and local roadway system, while also meeting Project objectives.

#### **2.3.5.3 POTENTIAL FOR ROAD DAMAGE AND COMPENSATION FOR SUCH DAMAGE**

Prior to commencement of construction, a survey of county and local road conditions within the Project boundary will be performed. Roads will be video-taped both before and after construction, and assessed by an independent consultant acceptable to HWF, St. Croix County and the Townships of Cylon and Forest.

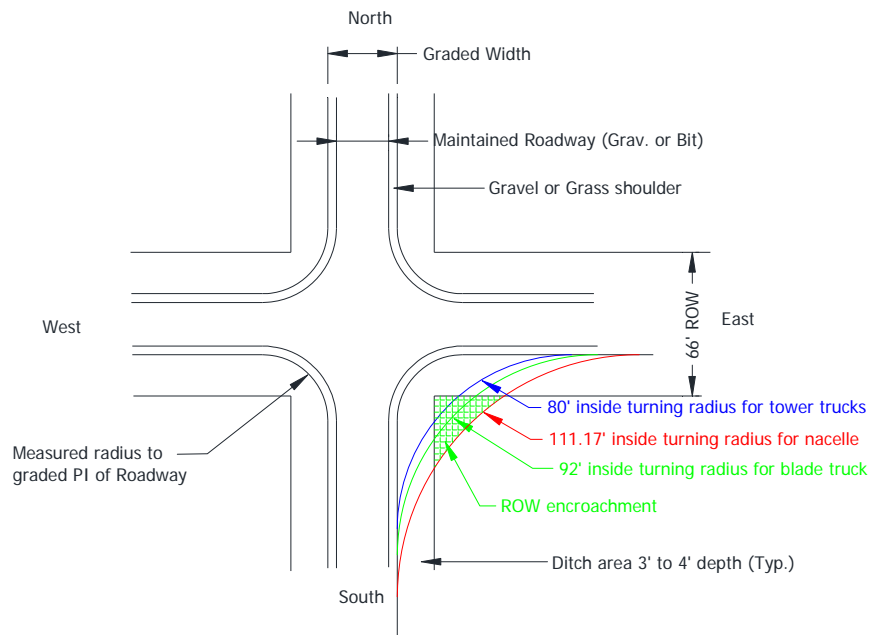
Direct damage resulting from the Project traffic loads will be repaired and returned to conditions mutually agreed upon by the affected jurisdictions, not to exceed pre-construction conditions as determined by the pre-construction survey. Alternatively, HWF and the affected jurisdictions may agree on a rate of compensation directly caused by and related to the Project traffic.

Deliveries to Project sites will be compliant with statutory heavy-haul axle loading requirements.

#### **2.3.5.4 PROBABLE LOCATIONS OF ROAD MODIFICATIONS TO ACCOMMODATE DELIVERIES**

The preliminary assessment of the intersection geometry within the Project area indicated that most turning radii are not sufficient to accommodate long wheel-base transport vehicles.

To accommodate delivery of oversize loads, the intersections will require modifications such as temporarily enlarging the turn radius. The process will include grading and base construction, bituminous, and culvert extension where required. Depending on the extent of the necessary grading, temporary easements may be required for grading that extends out of the ROW. Figure 2.3-2 demonstrates a typical existing road intersection within the Project area, and the approximate enlargement needed to accommodate the turbine delivery vehicles.

**Figure 2.3-2 Intersection with Inside Turning Radius Improvement**

Visual inspection of the local roads identified culverts (bridges less than 20' in roadway length) that will require further evaluation to determine the load capacity of the structure. The evaluation process of these structures will take place once final delivery routes are determined for equipment and materials. Structures that will not support expected construction traffic will be improved or replaced prior to construction. HWF will ensure the selected transportation carrier has significant experience and a good safety record.

#### **2.3.5.5 ESTIMATE TREE PRUNING OR REMOVAL**

Trees along equipment delivery routes may require additional pruning to accommodate the large loads. Routes will be surveyed prior to deliveries and areas requiring attention will be pruned according to accepted tree and shrub trimming practices. Trimming or clearing of trees on participating landowners' property to accommodate equipment delivery is discussed and agreed upon prior to construction. This responsibility will be part of the scope of the balance of plant contract.

#### **2.3.5.6 ELECTRIC DISTRIBUTION INTERRUPTION**

The interruption of electrical service due to construction activities will be minimized as much as possible. Local overhead distribution lines may need to be temporarily disconnected, relocated or buried to accommodate equipment delivery or passage of the cranes along crane routes.

Disconnection of a line to allow passage of the cross-country crane would be approximately 30 minutes in duration. In instances where lines are temporarily relocated or buried (line drop), the temporary line would be pre-installed resulting in a short disconnect time as the current is re-routed.

The interruption of service due to the passage of delivery trucks and equipment underneath low hanging distribution lines can often be mitigated by manually raising the line as the equipment passes underneath. If this is not possible and the line cannot be dropped, a short interruption of service may result. No line drops are anticipated at this time. Figure 1.1-3 (Appendix A) identifies power pole locations in close proximity to access road entrances where line drops or alternative procedures may be needed.

Interruptions will be scheduled in advance to reduce inconvenience to local residents and businesses. HWF, or its authorized Project partners, will communicate with the local utilities and designated town officials to coordinate unavoidable interruptions to service and notify impacted local residents.

### **2.3.6 CONSTRUCTION TRAFFIC**

The Project is in a rural area and thus general traffic congestion will be limited. During the road building and improvement phases, little to no interference with local traffic patterns will be affected. At no time during the road building and improvement phases are any closures to state, county or local town roads anticipated.

During the foundation building phases of the Project there will be large trucks delivering concrete materials to each turbine site. The total number of trucks will depend on the final design of the foundations but could be between thirty-five and seventy-five truck loads per turbine site. The loads will be spaced out in 5 to 10 minute intervals (approximate), so that traffic congestion will be limited. All of the access road entrances and sites have been surveyed for safety and efficiency for construction, along with consideration for reducing and limiting the amount of local traffic pattern impacted.

The erection phases of the work will require larger and over-sized loads to maneuver throughout the site. The loads will require slower moving trucks to maneuver through corners and will have lead and follow safety vehicles to alert traffic in all directions. In some instances, there may be a several minute delay in order to safely navigate some of the intersections and corners. Please see the Stantec Road Study for a more detailed discussion of the current intersections within the Project boundary and anticipated improvements.

Figures A-1 and A-2 (Appendix G) show the locations of turbine sites and the roads potentially affected. Until the roads are surveyed for pre-construction conditions and permits applied for the specific location of affected roadways will not be finalized.

Other than foundation phases for concrete transportation, most of the work and transportation disturbances will occur during low volume and off-peak times. To maximize the work conditions, the foundation construction phases will start in the early hours of the day and go through morning peak times. See the Stantec Road Study for a more detailed discussion of traffic routes and impacts.

## **2.4 OTHER PROJECT FACILITIES**

### **2.4.1 TURBINE SITE FOUNDATION**

HWF engaged Renewable Resource Consultants, LLC ("RRC") to perform preliminary soil borings and prepare a preliminary technical report ("Geotechnical Report"). The complete Geotechnical Report can be found in Appendix N. Based on the report's findings and the Turbine models being contemplated by HWF, RRC has suggested a Preliminary Foundation Design for the purpose of this application. This spread footing design contemplates the conditions found at various sampling points within the Project boundary. However, the final design can only be provided after soil borings are taken from each specific site and final selection of the Project Turbine.

At the beginning of the excavation process top soil will be stripped and stock piled for reclamation. Approximately 3000 yards (less however much top soil is removed) will be excavated for the foundation construction. After the foundation has been completed and passed testing, the previously removed soils will be backfilled on top of the spread footing as indicated on sheet S3 of the Preliminary Foundation Design (Appendix E). Excess soils, if present, will be utilized or disposed of in a manner consistent with the methods outlined in the WDNR Highland Wind Wetland Water Quality Permit Application. These methods may include:

- Placement at the discretion of the landowner to benefit agricultural operations;
- Placement to benefit any other participating landowner needs;
- Placement for the benefit of the town or non-participating residence;
- Remaining soils will be disposed of by HWF.

The estimated material requirements are listed on sheet S1 of the Preliminary Foundation Design (Appendix E). All of the information provided at this time is subject to change based on specific site conditions.

The anchoring mechanism is anticipated to be as indicated in the Nordex Anchor Bolt Cage Design found in the N100 Technical Description (Appendix E).

#### **ITEM 1.11 2.4.1 TURBINE SITE FOUNDATION INFORMATION**

Non-confidential Turbine site foundation information can be found in Appendix E.

### **2.4.2 TURBINE SITE CONSTRUCTION AREA**

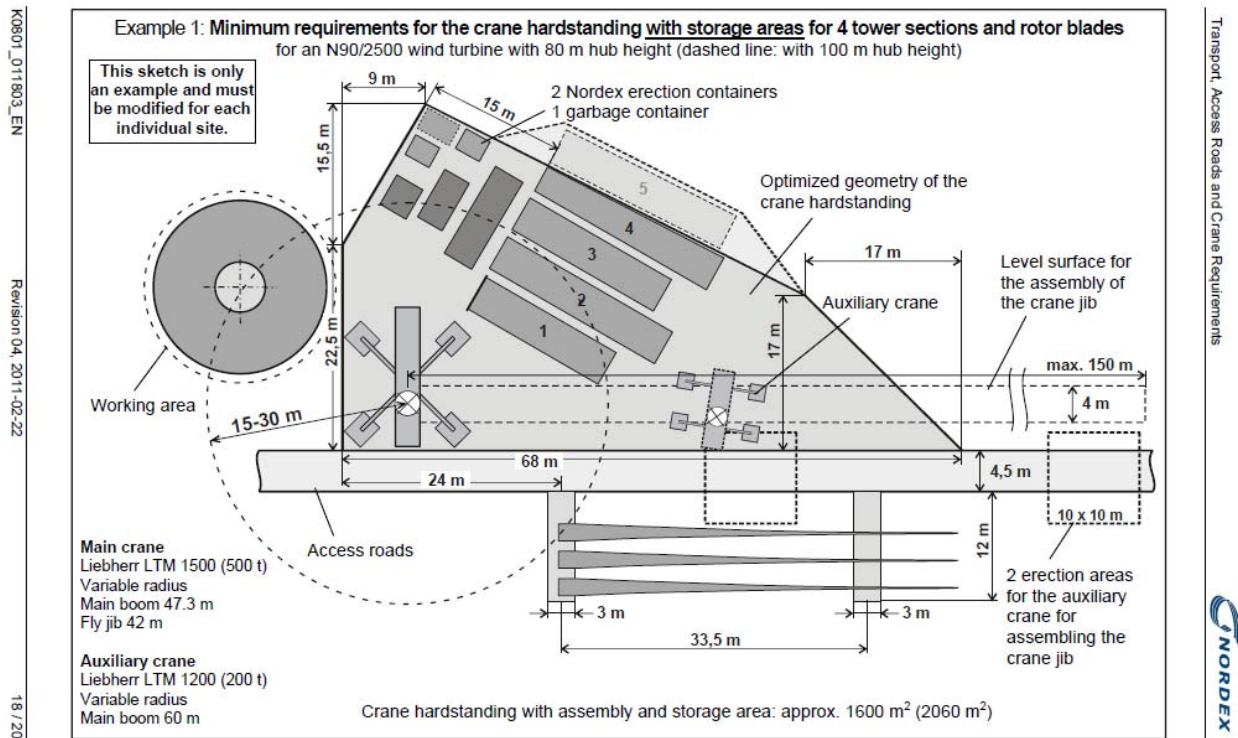
The staging of a typical turbine site construction area can be found on page 17 of the Nordex:Transport, Access Roads and Crane Requirements (Appendix F). The figure depicts a typical turbine construction site for a similar turbine model. Each turbine construction site layout will be individually modified to account for topography, soils, environmental concerns or other unique features.

In addition to the indicated laydown area at each site, the Project will also have a 20 acre laydown yard adjacent to the O&M building. Crews will be expected to park their personal vehicles at the O&M building and laydown yard and will be shuttled to the individual turbine sites in company vehicles.

**ITEM 1.12 2.4.2.4 PROVIDE A SCALE DRAWING SHOWING GENERAL CONSTRUCTION SETUP AND MATERIAL LAYDOWN FOR TURBINE SITES:**

Nordex has agreed to release the formerly confidential General Construction Setup and Material Laydown drawing (Figure 2.4-1). It is provided below and in Appendix F.

Figure 2.4-1 General Construction Setup and Material Laydown



### 2.4.3 ACCESS ROADS

Access to turbine sites is provided by gravel roads extending from a public road to the turbine location. Access roads utilize existing farm roads and driveways where practicable. The total length of access roads for the 41 primary turbines is approximately 11.5 miles as currently designed. The length of the alternate access roads, totals approximately three miles; however, alternate turbines would be chosen individually to replace primary turbines, thus the total length would depend on the final wind farm design.

The access road construction sequence will include initial removal of topsoil (stored for restoration upon completion), compaction of the road subgrade, placement of geotextile fabric and finished application and grading of an 8 – 12 inch depth of crushed gravel. The finished roads will be at-grade with the



surrounding land and blend with the contours whenever practicable. The roads will be 16 feet wide and widen at the base of the turbine to accommodate the erection crane. The access roads and crane pads will remain in place during the life of the Project.

During construction the temporary impact from some access roads may be greater than 16 feet, if the road runs concurrent with a proposed crane path. In these cases the temporary impact (clearing and compaction of ground) will be approximately 40 feet to accommodate the oversized crane. Additionally, temporary turning radii may be constructed where roads contain right angles or tight turns. These turning radiuses, along with turn radii at entrances from public roads, will be restored upon completion of access road construction.

Topsoil removed during access roads construction will be stockpiled for restoration of temporary impact areas after construction is complete. No fences or gates are contemplated for the access road entrances. Access to turbine towers is limited by locked doors on the tower base.

A map of the primary and alternate access road locations can be found in Appendix A. Temporary access road features, such as turning radii can be found within Appendix B. A shapefile of access road features is provided on the Data DVD filed with this application.

**ITEM 1.13 2.4.3 PROVIDE A NON-CONFIDENTIAL VERSION OF THE ACCESS ROAD INFORMATION;**

Nordex has agreed to release previously confidential information regarding “Nordex:Transportation, Access Road and Crane Requirements.” The document can be found in Appendix F. The configuration of Project access roads is shown on Figure 1.1-2 (Appendix A).

**2.4.4 CRANE PATHS**

The erection of the large wind turbines requires specialized erection crawler lattice boom cranes that may extend to over 400 feet. Due to the time and expense of dis-assembling and re-assembling the large cranes, they are generally “walked” cross-country from one turbine location to another, whenever possible. Because of the size, the largest cranes cannot utilize public roads, though access roads (expanded in width) are used whenever practicable.

Crane paths are roughly 40 feet wide, and prepared by removing large vegetation. Temporary wetland impacts due to the route of the crane are identified and applicable permits applied for. No grading of soils occurs during the use of crane paths. Temporary matting may be used if soft spots or soil conditions are identified that are unable to support the cranes. Farm fields may be compacted by the weight of the crane and are de-compacted upon completion. Public roads are protected with temporary matting or other appropriate materials.

Crane cross-country routes were reviewed for sensitive resources, steep slopes or other features that would limit the movement of the cranes. A map of proposed crane routes for the Project is included in Appendix A. Larger scale figures are provided within the Appendix B Mapbook. A shapefile of proposed crane routes is also provided on the Data DVD filed with this application.

**ITEM 1.14 2.4.4.2 PROVIDE A DESCRIPTION OF MATERIALS TO BE USED AND METHODS FOR CONSTRUCTION OF CRANE PATHS:**

At this time constructing roads for crane paths is not anticipated. Natural foliage (grass and crops) are good bases for stabilization. Leaving the natural foliage in place lessens the environmental impact as compared to stripping and adding gravel. In areas specified by the operator and equipment superintendent wood construction mats will be used for stabilization. In places where the crane paths cross wetlands and waterways, temporary construction mats will be used as described within the Wetland Water Quality Permit Application ("WWQPA") (Appendix R).

**ITEM 1.15 2.4.4.3 PROVIDE CRANE PATH WIDTHS AND DEPTHS:**

As noted above crane paths are approximately 40 feet wide. A typical/generic crane path drawing can be found in Appendix F. Since actual crane paths will not be constructed there is no depth except for special mats which are approximately 8-12 inches thick.

**ITEM 1.16 2.4.4.4 DISCUSS WHEN AND HOW CRANE PATHS WOULD BE REMOVED AND LAND RECOVERED:**

Cross country crane routes do not need to be removed but will be restored to pre-construction conditions. Compacted soil will be decompacted using a 12-18" deep chisel plow, backfilled with topsoil and the surface will be restored to original condition. HWF is committed to restoring disturbed lands to pre-construction status regardless of type of disturbance as is required by provisions in our agreements with the landowners.

**2.4.5 GENERAL CONSTRUCTION AREAS****2.4.5.1 PROJECT STAGING AREAS AND LAYDOWN YARD**

Individual temporary construction areas are planned at each turbine site to stage the turbine pieces for erection. Upland agricultural areas are identified for this purpose. The areas will be compacted if necessary and decompacted upon completion of construction for future agricultural use. See Section 2.4.2 for a description and a figure depicting the typical layout of these areas.

In addition to the individual turbine staging areas, a general, temporary construction laydown yard is located at the O&M building site. The temporary laydown yard will be approximately 20 acres in size and consist of a graveled surface. The laydown yard will serve several purposes including:

- Parking of HWF and contractor trailers. Upon completion of the permanent O&M building, HWF will utilize the office space as needed when overseeing the operations and maintenance aspects of the park. The primary occupant of the O&M building will be the operation and maintenance contractor.
- Employee and contractor parking for personal vehicles
- Temporary storage of turbine components and equipment.
- Temporary storage of other construction materials as needed.

- Material storage at the laydown yard will be a combination of open-air storage, storage in containers, storage in trailers, and storage in the O&M building itself.

Upon completion of construction, the laydown yard will be restored for agricultural use by removing the aggregate, decompacting the land and restoring the topsoil.

The permanent O&M building will be located on approximately 2.5 acres, with a parking area for employee and visitor use. The parking lot is anticipated to be approximately 50 x 100 feet in size.

#### **2.4.5.2 HAZARDOUS CHEMICALS, SPILL CONTAINMENT AND CLEANUP MEASURES**

Hazardous chemicals including fuel for vehicles, paints and lubricants will be stored on site during the construction period. Gasoline and diesel fuel will be stored in individual tanks. Refueling of the vehicles will be contracted with a local fuel delivery service to be completed in the evening hours. Other hazardous chemicals on site will be stored in trailers either at turbine locations or the O&M Building, once constructed. Table 2.4-1 (Appendix H) lists chemicals anticipated to be on-site during the construction cycle. Table 2.4-2 (Appendix H) provides a list of chemicals that are anticipated to be on-site during the operation of the wind farm.

HWF will require that a Spill Prevention, Containment and Countermeasures (SPCC) Plan be provided by the contractor awarded the construction contract for the Project. The SPCC Plan will outline the procedures and preventative measure that will be followed throughout the construction period. HWF and all of its contractors will be required to comply with the plan. At a minimum the SPCC Plan will identify the following:

- Typical fuels, chemicals, lubricants and paints to be used or stored in the Project area.
- Methods and location of storage.
- Locations designated for lubrication and refueling (i.e. outside of sensitive resource areas).
- Preventive measures to be used to minimize potential impacts.
- Mitigation methods to be employed, should a spill occur.
- Location of construction spill kits (gloves, brooms, absorbents, barrier materials, etc.).
- Emergency notification procedures and forms.
- Contact information for individuals requiring notification if a spill should occur.

The SPCC Plan will be kept on-site during construction and will meet all EPA requirements. The SPCC Plan, because of its specificity, will be written by the balance of plant contractor prior to the commencement of construction.

**ITEM 1.17 2.4.6 TRANSMISSION INTERCONNECTION**

The Project will be interconnected to the transmission grid via a 161 kV line owned by Xcel Energy. The line is located approximately one mile west of the Forest /Cylon Town boundary, immediately west of the proposed substation location. See Section 1.7.1 for the current status of the MISO interconnection process.

The output of the MISO studies will determine the design details for the substation. See Figure 2.4-2 (Appendix C) for a 1-line drawing of the proposed interconnection with the existing 161kV system. HWF has had two informal meetings with Xcel Energy regarding the Project and the proposed connection to its transmission line. HWF needs to better understand the system impacts and related costs to move the conversations forward.

HWF anticipates that additional pole structures will need to be added to both sides of 250<sup>th</sup> Street to connect the substation to the existing 161kV transmission line. The pole structure on the east side of the road will fall within the proposed substation footprint. The land to be impacted within the substation footprint is currently utilized as agricultural cropland. A utility pole currently exists on the west side of 250<sup>th</sup> Street that may be used, depending on the final interconnection design. If a new structure is necessary, it will be constructed within the current road and utility ROW. The proposed location is currently disturbed active ROW, however, the land cover immediately to the west appears to be wetland, based on a review of aerial images, WWI data and hydric soils. Upon receipt of the final substation and interconnection design, if a new utility pole is necessary on the west side of 250<sup>th</sup> Street, the extent of the construction impact and accurate location of the wetland will be assessed and permitted, as needed.

**2.4.7 COLLECTOR CIRCUITS**

The collection system for the Project will be broken into four separate circuits. Each of the four circuits will carry approximately 25 percent of the generating capacity of the Project. The voltage of the collection system will be 34 kV. The entire route is planned as an underground system. The four circuits may be collected at one point in the northwestern quadrant of the Project and delivered to the substation through one 'home run'; or as currently contemplated, the four collector circuits will travel to the substation and each circuit will be connected to its own grounding transformer at that point.

The current configuration for the collection system contains approximately 57 miles of cable; though there are numerous areas where multiple circuits share the route. An example of this "sharing" is the final approximately 4.5 miles of the system where the four circuits meet and proceed toward the substation. As mentioned in the previous paragraph, this section of the system may be collected into a "home run". At a minimum, the four cables will share the same route and thus minimize impacts to the environment.

Installation of the collection system will be by use of a vibratory plow or trenching method in upland areas. The vibratory plow directly impacts an area approximately 6-8 inches wide, though the tracking system is approximately 8 feet wide. There is minimal impact on the land due to the tracking system. The collection system will be buried at a depth of 42 inches. Underground horizontal directional drilling

("HDD") will be utilized in environmentally sensitive areas, such as wetlands and waterways, to avoid impacts to these resources. The aluminum conductor cable used will vary in size. The majority of the cable will be 4/0 AWG, though some of the runs may be as large as 1250 MCM. These medium voltage cables will be VLF hi-pot tested. HWF has had numerous discussions with the host landowners and understands that there are no drain tiles in this area.

**Item 1.18 4.2 Provide GIS shapefile for the transmission line and structure locations;**

The transmission line is indicated on the Project maps. GIS files of the transmission line have been provided. A GIS file of power pole locations within one-half mile of the substation is provided in the revised Data DVD. A number of pole locations were estimated by span length due to tree cover on current aerial images. Structure locations associated with the substation will be provided when the output of the complete electrical engineering becomes available.

**ITEM 1.19 2.4.7.3 PROVIDE A DESCRIPTION OF THE TRANSFORMER TYPE, LOCATION, AND PHYSICAL SIZE OF TRANSFORMER PAD AT EACH TURBINE SITE:**

The pad mount transformer type will vary depending on the interconnection agreement and final turbine selection. The location of the pad mount transformer will typically be within 10-20 feet of each turbine base. The size of the pad will vary; however the approximate size is about 10' x 10'. The transformer within the substation will vary depending on the interconnection agreement and utility requirements. Final engineering has not been performed to estimate or determine the specifics.

**2.4.8 CONSTRUCTION SITE LIGHTING**

It is expected that at the O&M building lighting will be installed either on pole(s) or on the building to provide adequate light for safety and security. The preferred method of construction will be during daylight hours in the event that site lighting is needed to accommodate safe working conditions for construction portable lighting and generators will be used as needed.

**ITEM 1.20 2.4.8.2 PROVIDE COPIES OF ANY LOCAL ORDINANCES RELATING TO LIGHTING THAT COULD APPLY:**

There is no county or township lighting ordinance. However, after speaking with the St. Croix County zoning code administrator, the conditional use permit for the substation may require typical permit conditions "if lighting is needed" such as all lighting must face downward to lessen the impact to adjacent landowners. The only lighting that HWF currently contemplates on the turbines is that which is directed by the FAA.<sup>6</sup> The Town of Forest as well as the Town of Cylon have no lighting requirements.

---

<sup>6</sup> The Town of Forest has recently created a Wind Energy Systems Licensing Ordinance and on page 28 it describes lighting of wind turbines. However, this ordinance is not applicable to the Project as it was passed after the Project received all required Town of Forest approvals and will be preempted by state statute if the Commission issues the requested CPCN. Nevertheless a copy of the ordinance can be found in Appendix P.

## **2.5 SUBSTATION**

### **2.5.1 DRAWING OR DIAGRAM OF THE SUBSTATION**

Substation layout figures can be found in Appendix J.

Figure 2.5-1 Substation Location – Aerial Image

Figure 2.5-2 Substation Location and Property – USGS Topoquad

Figure 2.5-3 Substation Impact Area with Elevation Contours

Figure 2.5-1 displays the proposed layout for the substation overlaying a current aerial image and parcel boundaries. The approximate dimensions of the proposed construction areas are given on the drawing. Additionally, a 1-line drawing of the proposed interconnection with the existing 161kV system is provided in Appendix C.

**ITEM 1.21 2.5.1 INDICATE THE ACTUAL SIZE OF THE SUBSTATION OR SUBSTATION ADDITION IN SQUARE FEET, THE DIMENSIONS OF THE PROPOSED SUBSTATION FACILITIES, AND THE ORIENTATION OF THE SUBSTATION WITHIN THE PROPERTY PARCEL:**

Figures 2.5-1 and 2.5-2 have been revised to include the square footage and acreage of the proposed substation impact area. Figure 2.5-3 has been added to provide a large-scale map of the proposed substation area with dimensions and contours of elevation as surveyed in January, 2012.

### **2.5.2 PLAT AND TOPOGRAPHIC MAPS - LOCATION OF THE SUBSTATION**

Figure 2.5-2 (Appendix J) provides a USGS Topographic Map along with the general location of the substation. Parcel information (current landowner, parcel ID number) from the St. Croix County Land Information Department is shown on the figure.

### **2.5.3 SIZE OF THE LAND PURCHASE REQUIRED AND ORIENTATION OF SUBSTATION WITHIN THE PARCEL**

The proposed substation site will be located on a parcel approximately five acres in size. See Figures 2.5-1 and 2.5-2 (Appendix J) for the approximate orientation of the substation on the property.

### **2.5.4 CURRENT LAND OWNERSHIP AND CONTROL OF PROPERTY**

The land designated for the substation is currently owned by Wayne C. and Beverly A. Alvermann. The Alvermanns have executed an option agreement to sell the land for the substation to HWF.

### **ITEM 1.22 2.5.5 REQUIRED SUBSTATION FACILITIES**

A one-line drawing for the substation interconnection can be found in Appendix C. This drawing was prepared for, and is part of, the interconnection agreement with MISO. As described in Section 2.4.6, the output of the Definitive Planning Phase studies will determine the design details for the substation. Interconnection facilities will not be finalized until execution of an interconnection agreement with MISO.

**2.5.6 NEW SUBSTATION**

As the substation for the Project will be newly constructed, the proposed locations of the power lines entering and leaving the substation and the location of the access road are shown on the design drawings and layout Figures 2.5-1 and 2.5-2 (Appendix J).

**2.5.7 MODIFICATIONS TO EXISTING SUBSTATIONS**

Not applicable to Highland Wind.

**2.5.7 CONSTRUCTION PROCEDURES**

The timeline for the construction of the substation is dependent on the output of the MISO studies. The new tariff for MISO has been submitted to FERC as of the date of this application. It is anticipated that FERC will rule on the new tariff by March 2012. Once the ruling has taken place MISO will provide a new calendar which would serve as a guideline for the timing of these activities.

The construction sequence for the substation is as follows:

1. Install erosion control measures for entrance drive to planned area for substation
2. Install safety fence approximately 10 feet beyond the construction boundaries
3. Install construction erosion control measures including silt fence, straw bale barriers and riprap
4. Construct storm water runoff basin if required
5. Begin earth work operations and grade the substation to rough grade
6. Install concrete foundations
7. Install ground grid and below grade conduits
8. Finish grading the substation area and install crushed stone yard surface
9. Install and ground permanent substation fencing
10. Install steel structures, substation equipment and control building
11. Install power and control cable and terminate cables
12. Test and commission all equipment and relays
13. Connect the substation to the transmission system and energize
14. Complete permanent stabilization and remove temporary erosion control measures.

## **2.6 OPERATIONS AND MAINTENANCE BUILDING**

### **2.6.1 PURPOSE AND USE OF THE PROPOSED O&M BUILDING**

The completed Project will include an operations and maintenance (O&M) building. This building is planned to have office spaces, a conference room for presentations, kitchen, separate locker areas for men and women, Supervisory Control and Data Acquisition (SCADA) room, storage and service area as well as an outdoor covered storage area. Deliveries will be made to the facility from time to time by mail or truck. The O&M building will be constructed prior to commercial operation.

### **2.6.2 NUMBER OF FULL-TIME EMPLOYEES WORKING AT THE FACILITY**

It is expected that 6 to 8 full-time factory trained wind farm operators will be employed for the ongoing operation and maintenance of the Project. These future employees will be involved in the commissioning phase of the Project so as to be completely familiar with all aspects of the Project as they gradually take over the day-to-day responsibilities of operating and maintaining the wind farm. Additional trained support staff will be brought in from time to time to fulfill specific needs as they occur.

In addition to those direct employees is expected that others will likely be engaged as subcontract labor in the areas of snow removal, landscape maintenance, access road maintenance, etc. These positions will be filled from the surrounding local community when feasible, given the requirements of the necessary skill sets involved.

### **2.6.3 SIZE OF PROPERTY NEEDED**

The size of the property needed for the O&M building with parking lot is approximately 2.5 acres.

### **ITEM 1.26 2.6.4 BUILDING AND BUILDING FOOTPRINT**

Scaled drawings of the O&M building and parcels are provided in Appendix H.

Figure 2.6-1 O&M Building and Laydown Yard (Layout and Property Information)

Drawing 2.6-2 O&M Building Draft Floor Plan

The building will be 93 feet in length and 70 feet in width with an outdoor roof extension near the garage area. The outdoor extension is designed to be 16 feet by 45 feet. The building will have an overall height of approximately 18-22 feet. It will be a metal framed structure, constructed on an at-grade slab. As more specific design details and drawings of the O&M building become available they will be provided to the PSC staff.

The O&M building location within the Project area is shown on Figure 1.1-2 (Appendix A) and Figure 1.1-3 (Appendix B).

### **2.6.5 LIGHTING AND SECURITY PLAN FOR O&M PROPERTY**

The O&M building will have security lighting at each entrance to the building along with a potential yard light that would point down to minimize effects to nearby residences. Access to the building will be with



a card key system enabling only approved personnel to enter the building when not occupied. Additionally, intrusion detection and electronic surveillance will be provided to make sure the site is secure. The closest resident to the O & M building is a participating landowner whose home is approximately 500 feet away from the building.

#### **2.6.6 OTHER FACILITIES NEEDED**

Other facility services required for the O&M building are electric, natural gas (if available), telecom services, and potable water. A well will be drilled to supply water to the facility. A private septic system will be required. During construction and operation, discharges from the O&M building will be to the building's septic system.

Runoff from the parking area during construction and operation will be directed to existing culverts as required by permits. At this time, a retention basin is not anticipated for the O&M building/parking lot area. The parking lot will be approximately 50 feet x 100 feet and contain a limited number of parking stalls.

## **3.0 DEVELOPMENT, APPROVAL, ENGINEERING, AND CONSTRUCTION PROCESS AND SEQUENCE**

### **3.1 CONSTRUCTION SEQUENCE**

A preliminary construction schedule is contained in Appendix F. The start and finish dates will be adjusted to accommodate the timing of the CPCN approval and MISO studies.

The critical path items include:

1. Access Road & Crane Pad Construction
2. Foundation Excavation
3. Rebar & Anchor Bolt Assembly
4. Foundation Concrete Pour
5. Tower Erection
6. Substation Energization
7. Mechanical Completion
8. Commissioning

The tasks that can start (subject to over-all schedule requirements) include the substation engineering and construction, electrical collection system, O&M building and padmount transformer installation.

**3.1.1 CONSTRUCTION SCHEDULE**

The construction schedule contained in Appendix F is subject to change based upon permit approvals, turbine delivery and availability and other events beyond the scope and control of HWF. Because of these uncertainties HWF would ask that the Commission approve a two year period for the commencement of construction upon approval of the CPCN.

**3.1.2 STAGING AND CONSTRUCTION SEQUENCE**

The construction phase of the Project began with the onsite constructability reviews which were performed by Michels Corporation and Stantec in the fourth quarter of 2010. The initial constructability reviews have been revisited to take into account the changes necessary for the current CPCN application.

Actual construction will begin with preparation of the laydown yard and the construction of the O&M building. The laydown yard topsoil will be stripped and stockpiled for restoration and reclamation of the yard after the construction phase of the Project is completed. After removing topsoil the laydown yard will be graveled and graded. Temporary office trailers will be moved to the graveled portion of the yard. The O&M building will be constructed complete with well, septic, and electrical service. Once completed the O&M building will serve as a portion of the construction offices for the development of the Project. After the Project is commissioned the O&M building will function for the purposes it is named.

As soon as is practicable, and possibly even concurrent with O&M building construction, the following construction sequence will begin on the balance of the Project.

- Access roads to the turbine locations will be surveyed and staked for construction
- Turbine locations will be surveyed and staked.
- Silt fencing will be installed as required by DNR permits and pursuant to best management practices.
- Collection system will begin to be installed by means of vibratory plow, directional drilling, and trenching as required to meet commissioning and generation schedules.
- Topsoil will be stripped from access roads and turbine foundation areas. Spoils will be stockpiled for restoration.
- Geotextile fabric will be placed for the access road subgrades to stabilize the roads for use.
- Access roads graveled and graded as per the site plan.
- Turbine foundations will be excavated.
- Excavated soils will be separated (topsoil from fill) and stockpiled so as to minimize erosion and runoff.
- Reinforcing steel and anchor bolt cages will be delivered to the individual turbine locations, so the anchor bolt cages can commence assembly.
- Reinforcing steel will be cut, formed, placed and tied as per the foundation plan.

- Concrete mud mats will be poured on the excavated turbine foundation to create a stable work surface.
- The initial grounding will be laid on and bonded to the reinforcing steel.
- Anchor bolt cage will be assembled and set on reinforcing steel base grid.
- The balance of the foundation reinforcing steel will be cut formed and placed tying in the anchor bolt cage.
- Additional electrical grounding will be laid on and bonded to the anchor bolt cage and reinforcing steel.
- Conduits will be placed from the pad mount transformer location adjacent to the turbine, down to a trench in the excavated area to the center of the turbine location and then up above grade (these conduits will allow the conductors from the turbine to the pad mount transformer to pass through the anchor bolt cage without creating any adverse impact to the structural integrity of the anchor bolt cage).
- Concrete conveyor will be moved to the foundation area. The preferred concrete conveyor will be one manufactured in Wisconsin (Putzmeister).
- Concrete will be delivered to each individual turbine site, moved in place by conveyor, and vibrated. Multiple sources of concrete from portable batch or ready mix plants will be used to pour the foundation bases and pedestals. Concrete will be sampled before and after transport to site for third-party testing as per engineered foundation protocol and ASTM standards.
- Electrical grounding is placed over concrete foundation and bonded to previous layers of grounding.
- After the required curing and monitoring, the foundation is backfilled in lifts and compacted as per engineered foundation and geotechnical specifications. As with all other aspects of the foundation a third-party inspector measures, tests, and verifies compliance with the engineer's foundation plan.
- When backfill, compaction, and grading are complete, gravel is placed around the turbine base and graded.
- Pad mount transformer base is delivered to site, positioned over turbine conduits and collection cables, and a concrete base is formed and poured for the transformer.
- Crane pad is built up in lifts and compacted as per manufacturer and or foundation engineer specifications. Once again third-party oversight verifies compliance.
- Turbine tower base flange is installed to anchor bolt studs, leveled, and grouted.
- Components are delivered and staged as per staging plan. Preference will be given to towers, tower internals, manufactured in Wisconsin, or manufactured with Wisconsin made components.
- Cranes, forklifts, platform lifts, specialized fixtures, and erection equipment are moved to the site.

- The converter box is mounted to the turbine foundation. Preference will be given to converters made in Wisconsin.
- The base section of the tower is lifted by the crane, placed over the converter box, secured to the anchor bolt cage, and torqued or tensioned.
- The intermediate and top tower sections are individually lifted by the main erection crane, positioned over the previous section, secured in place with bolts, and torque as per manufacturer specifications.
- The nacelle is lifted by the crane, placed on top of the tower, bolted to the tower, and torqued per manufacturer specifications.
- The drivetrain is lifted by the crane and installed in the nacelle. In some cases the drivetrain can be installed on the ground and lifted in combination with the nacelle.
- The blades are assembled to the hub to create the rotor assembly.
- The rotor assembly is lifted by the cranes and secured to the drivetrain.
- The pad mount transformer is set in place.
- Cabling and connections are completed in the transformer base, and through the tower to the generator in the nacelle.
- If the substation is complete, connected to the grid, and the collection system, the cables to the pad mount transformer can be energized and the commissioning of the turbine can begin.
- The cranes and other erection equipment move on to the next site.
- The crane path is then decompacted.
- Topsoil is placed and finish graded.
- Excess soils are relocated as per the needs of both landowners and HWF in the Project area. Areas are graded to nearby land contours and planted with appropriate vegetation in concurrence with WDNR requirements.

**ITEM 1.23 3.1.2 THE DISCUSSION IN SECTION 3.1.2 OF THE APPLICATION APPEARS TO INDICATE THAT CONSTRUCTION HAS COMMENCED. IF CONSTRUCTION HAS BEGUN, PROVIDE A NARRATIVE DESCRIBING THE LOCATION, THE TYPE OF CONSTRUCTION ACTIVITIES AND THE DATE THAT CONSTRUCTION COMMENCED:**

In Section 3.1.2 the reference that construction has begun, refers to an on-site meeting with Michels Corporation and Stantec evaluating each primary and alternate turbine location. This on-site meeting and review identified that at this current time no issues of constructability were seen or identified. Commencement of actual physical construction of the Project has not commenced and will not until all permits and approvals are received.

**Also describe how any construction activities conducted to-date are reflected in the project schedule provided as Appendix F:** The Project schedule in Appendix F will be adjusted to accommodate the timing of the CPCN approval and MISO studies.

### 3.1.3 ESTIMATE OF TIME REQUIRED TO COMPLETE CONSTRUCTION AT A TYPICAL TURBINE SITE

The actual time needed to erect a turbine can be as little as two days; however, the time needed for construction at each site may require up to several months. Skilled crews from different disciplines will be scheduled as the process dictates. Some tasks will be performed in a serial process, such as the excavation prior to the foundation placement. Some of these tasks can be a parallel process. For example, the collection system may be installed concurrent with the access road and foundation excavation. Upon completion of the foundation pour, approximately 28-days will be required for the curing of the concrete (without high early strength concrete) before turbine erection can begin. As with any construction process, weather delays cause variability to contemplated schedules and timelines. Wind turbine erection faces the additional challenge of windy days, which adds to the schedule variability. Naturally, no two sites are identical and the unique attributes of each turbine location may reduce or increase the actual time required for that particular site.

Given all of the aforementioned considerations the following is offered as an average timeline for each turbine site:

- Access road and collection system – 5 days
- Excavation, mud mat, bottom mat rebar, anchor bolt cage, upper mat rebar, forming, and curing – 45 days (this can be reduced by using high early strength concrete to achieve the required concrete strengths in 7 days)
- Pour concrete – 1 day
- Backfill, compact, grade, crane pad – 3 days
- Erect turbine – 2 days
- Electrically wire each turbine – 2 days
- Decompaction and site restoration – 2 days

The above timeline does not consider the time required to move the main erection cranes from site to site. This may take from one to four days depending on the clusters of available turbines and potential routes between them.

Due to the number of turbine sites for this Project there will be gaps in time when there is no particular activity at a particular turbine site. Therefore, the time to complete construction will vary depending on the gap in time between the different activities.

## **3.2 WORKFORCE**

### **3.2.1 INFORMATION ON WORKFORCE SIZE AND SKILLS REQUIRED FOR PLANT CONSTRUCTION AND OPERATION**

The size of the construction workforce will fluctuate based on weather and the general needs of the Project. It is anticipated that the average workday would host approximately 100 skilled workers on site for the duration of the Project construction phase. Preference will not only be given to Wisconsin-based contractors, but to skilled workers from Wisconsin as well. The construction of the Project will require skilled, trained, and experience workers from the following disciplines;

- crane operators
- operating engineers / equipment operators
- electricians
- masons
- steelworkers / ironworkers
- communications specialists
- truck drivers
- project management
- civil engineers
- electrical engineers
- structural engineers
- laborers

After commissioning the Project will require an ongoing O&M staff of 6 to 8 factory-trained technicians. It is expected that additional jobs would be created to accommodate services, such as snow plowing, landscape maintenance, and Project access road maintenance.

The lists provided above, suggest the individuals who will be directly involved with the construction and ongoing activities of the wind farm. They do not take into account other ancillary jobs and local support positions that will be created in areas such as food service, housing/lodging, hospitality, fuel, fuel delivery, sanitation, gravel, asphalt, road repair and other resource requirements.

### **3.2.1 ESTIMATE OF EXPECTED WORKFORCE FROM LOCAL SOURCES**

The jobs referred to in Section 3.2.1 will be filled first by the existing staff of the firms involved. Additional assistance needed would be hired from sources as close to the Project site as possible, given the requirements of the necessary skillsets involved.

## **4.0 PROJECT MAPS AND PHOTO SIMULATIONS**

Orthorectified aerial photography was acquired by St. Croix County in spring of 2010. It has been provided on a Data DVD with other Project digital data. In addition, 2010 aerial imagery acquired by the

U.S. Department of Agriculture ("USDA") National Agriculture Imagery Program ("NAIP") has also been provided for St. Croix, Dunn, Polk and Baron Counties, providing a context of the area within ten miles of the Project. Coordinate systems, data sources and file names are provided in the technical summary document of the GIS Data DVD filed with this application.

**Item 1.01 General Instructions - Provide \*.PMF format files for all GIS maps submitted as part of the application:**

A complete set of \*.PMF files corresponding to GIS maps has been provided on the revised Data DVD with this submission. If figures have changed in response to items listed in the incompleteness review a \*.PMF file corresponding to the most recent figure is provided. Additionally, GIS shapefiles or geodatabase files of the most recent data are included on the revised Data DVD.

**4.1 GENERAL PROJECT MAPS**

In addition to the Project maps previously described, and provided in Appendices A and B, maps of the Project and surrounding region are provided in Appendix K with the exception of Figure 4.1-1, found in Appendix L – Oversized Maps. The general Project maps include the following:

Figure 4.1-1 Project Area (10 Mile)

Figure 4.1-2 Topographic Mapbook

Figure 4.1-3 Wisconsin Wetland Inventory (WWI) and Field/Aerial Delineated Wetlands Mapbook

Figure 4.1-4 Land Ownership Mapbook

Figure 4.1-5 Public Lands within 2 Miles

Figure 4.1-6 Flood Insurance Rate (FIRM) Maps

Figure 4.1-7 Soil Survey

Figure 4.1-8 Geology and Bedrock

**ITEM 1.30 4.1 PROVIDE PRINTED COPIES OF APPENDIX L:**

Copies have been hand delivered to the PSCW/WDNR/DATCP.

**4.1.1 PROJECT AREA MAPS**

The Project area and the surrounding ten miles are shown in Figure 4.1-1 (Appendix L). Project facilities including proposed turbine sites, access roads, collection system, new substation, O&M building, laydown yard and crane paths are displayed on the maps. Basemap and sensitive site data includes:

- Municipalities
- Roads and highways
- Railroads
- Transmission lines (10 miles) and distribution lines (2 miles)

- Gas pipelines (2 miles)
- Licensed child care facilities
- Health care facilities
- Cemeteries
- Airports and registered private airstrips
- Public and recreational lands
- Major rivers and lakes

#### 4.1.2 TOPOGRAPHIC MAPS

Figure 4.1-2 (Appendix K) provides the Project boundary, turbine sites, access roads and collection system with a US Geologic Survey (USGS) 7.5 Minute Topoquad background at a scale of 1:24,000. The figure extent is at a two-mile minimum from the Project's boundary.

#### ITEM 1.27 PROVIDE MAPS SHOWING THE FOLLOWING:

**- Industrial/commercial facilities out to 1.0 mile from project area boundary**

**- Hospitals or other health care facilities out to 1.0 mile from project area boundary.**

Several sources of information have been utilized in an attempt to identify commercial and industrial facilities within one mile of the Project boundary. These sources include parcel ownership information, internet searches and facility licensing data. Figure 4.2-2 has been modified to include industrial and commercial facilities that were determined to be within one mile of the Project boundary. A conservative approach was used, thus points may be indicated on properties where possible facilities exist, but have not been confirmed. Farming operations identified as incorporated or limited liability corporations have been included as "industrial/commercial facilities". A GIS file and summary table of information has been provided on the revised Data DVD.

No hospitals or health care facilities have been identified within one mile of the Project boundary, thus no GIS file has been provided.

#### 4.1.3 NATURAL RESOURCES AND LAND USE/OWNERSHIP MAPS

##### 4.1.3.1 WETLAND MAPS

Figure 4.1-3 (Appendix K) is a mapbook of the Project area and 2 miles beyond. It illustrates the Wisconsin Wetland Inventory (WWI) data acquired from the Wisconsin DNR, where available and field or aerial delineated wetlands. The mapping extent of field delineated wetlands is only within the Project boundary near areas considered for facilities. Properties owned by non-participating land owners were not accessible, and thus not delineated in the field. Because of this restriction, actual wetlands may continue beyond edges of mapped features onto land that will not be impacted by the Project.



Additional detail on field delineated wetlands and waterways can be found within Appendix R where a large-scale mapbook of the Project area, facilities, wetlands and waterways is provided (Attachment C) on a current aerial background.

#### **4.1.3.2 LAND OWNERSHIP MAPS**

Figure 4.1-4 (Appendix K) provides a mapbook of the Project area displaying property ownership information along with Project facilities. Parcel ownership information includes the land owner name, parcel boundary, roads and municipalities. The Project facilities include turbines, access roads, collection system, crane paths, substation, O&M building and laydown yard.

Digital parcel ownership information was acquired in July, 2011 from St. Croix and Dunn County Land Information Offices and is current as of that time. Parcel attribute data was enhanced to track Project participation. The enhanced data set, with attributes documented by HWF, is provided on the GIS Data DVD filed with this application.

#### **ITEM 1.31 4.1.3.3 PUBLIC LANDS**

Figure 4.1-5 (Appendix K) maps public lands within two miles of the Project boundary. The data represented includes:

- National, State and County Forests (if any)
- Parks
- Trails
- Other managed lands as identified through Wisconsin DNR, US Fish and Wildlife (USFWS) and USGS Gap Analysis data.

#### **4.1.3.3 PROVIDE A REVISED FIGURE 4.1-5 WITH PUBLIC LANDS CLEARLY LABELED:**

A revised Figure 4.1-5 has been provided with public lands labeled by owner or managing agency. Lands identified as owned by towns, counties, state or federal agencies have been mapped and labeled.

#### **4.1.3.4 FLOOD INSURANCE RATE (FIRM) MAPS**

Figure 4.1-6 (Appendix K) provides a map of the Digital FIRMS (D-FIRMS) acquired from the Federal Emergency Management Agency (FEMA) website. The extent of data acquired is within one-half mile of the Project.

#### **4.1.3.5 SOIL SURVEY MAPS**

Figure 4.1-7 (Appendix K) displays soil information acquired from the USDA-Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) Database. The extent of the data is within the immediate Project area.

#### **4.1.3.6 BEDROCK GEOLOGY MAPS**

The Project area subsurface was tested for construction suitability in the spring of 2011. Results of the test are discussed in Section 5.1.2 and the Geotechnical Report (Appendix N). Figure 4.1-8 (Appendix K) presents the bedrock geological information gathered for the Project area. The information is from state/regional-scale studies and cannot be used for individual turbine siting.

**ITEM 1.43 4.1.3.6 THE LEGEND AND MAP DO NOT SEEM CONSISTENT FOR “BEDROCK BETWEEN 100 AND 50 FEET...” AND “BEDROCK >50FEET...” VERIFY WHETHER THIS MAP APPEARS AS INTENDED. IF NOT, PROVIDE A REPLACEMENT MAP AND DESCRIPTION OF THE CHANGES VERSUS THE ORIGINAL;**

The legend and map data for Figure 4.1-8 Geology and Bedrock had an error in the legend describing the color scheme for “Bedrock between 100 and 50 feet” versus “Bedrock >50 feet”. The error has been corrected and a replacement figure is provided on the revised Data DVD.

**Item 1.24 4.1.4.1 Provide a map showing the following: the location , dimensions in feet and acres and layout of any new substation/ the location of powerlines/show parcel data;**

As information becomes available from electrical engineering, MISO, and utility direction HWF will forward on any and all information to PSC staff. A map of the proposed substation impact area is provided in Figure 2.5-3 (Appendix J). It includes parcel information, dimensions and contours of elevation.

**ITEM 1.49 4.1.8.1 IDENTIFY RADIO AND MICROWAVE TOWERS, AND ANY NEXRAD OR DOPPLER WEATHER RADAR INSTALLATIONS ON A MAP, AND SHOW THE RESULTS OF THE LINE OF SITE ANALYSIS. INCLUDE COMMUNICATIONS AND NEXRAD OR DOPPLER INSTALLATIONS WITHIN A 150 MILE RADIUS OF THE PROJECT;**

HWF contracted with Comsearch to prepare the Wind Power GeoPlanner Communication Tower Study in 2011. The study can be found in Appendix U. HWF contracted with Comsearch to prepare the Wind Power GeoPlanner Doppler and NEXRAD Radar System in 2012 to encompass a 250 km radius (greater than 150 miles) of the Project; it also can be found in Appendix U.

## **4.2 COMMUNITY MAPS**

Maps representing nearby community resources are provided in Appendix K. Data was acquired within one-half mile of the Project Site. The figures include:

Figure 4.2-1 Zoning

Figure 4.2-2 Sensitive Sites

Additional detail and data source information is described in the following sections.

### **4.2.1 ZONING MAPS**

Digital zoning data was acquired from the St. Croix and Dunn County Planning and Zoning Departments. The Towns of Forest (St. Croix County) and New Haven (Dunn County) do not have generalized zoning. The area within one-half mile in the Towns of Cylon, Glenwood and Emerald (St. Croix County) and

Tiffany (Dunn County) are predominantly zoned Agricultural or Agricultural Residential. Figure 4.2-1 (Appendix K) displays the zoning information acquired within one-half mile of the Project.

#### **4.2.2 SENSITIVE SITES**

Sensitive community resources were researched and are presented on Figure 4.2-2 in Appendix K. The sites include public schools, churches, cemeteries, licensed child-care facilities, hospitals, nursing homes and recreational parks.

#### **4.3 PHOTO SIMULATION**

Photo simulations are an important phase in the pre-visualization of a modern-day wind farm project. They provide a much needed glimpse into how designs will ultimately impact existing surroundings. HWF engaged Stantec to perform a photo simulation on the proposed layout of the Project.

The initial images of various sites within the Project boundary were obtained in September, 2011. The camera used in all photo simulation is a full sized CCD digital camera with a fixed 50mm lens. A 50mm lens most closely reproduces the way a human eye sees the world and provides the most "fair" visual representation of the site. The camera is placed on a tripod and made level by using a bubble level built into the tripod. The camera is rotated and leveled with each photo to support the creation of a panoramic view from each location.

A 3-dimensional (3-D) model of the existing Project area topography was generated with proposed turbine site locations overlaid. The site photos are then used to generate a rendering of the existing conditions and a proposed visualization after the turbines are erected. Individual images and panoramic views of both before and after (rendered) landscapes are presented in Appendix M.

## **5.0 NATURAL AND COMMUNITY RESOURCES, DESCRIPTION AND POTENTIAL IMPACTS**

### **5.1 SITE GEOLOGY**

#### **5.1.1 GEOLOGY OF THE PROJECT AREA**

St. Croix County lies near the intersection of the Superior Upland and Central Lowland Physiographic Provinces of the United States. The Project area lies in a glaciated area of ground moraine, with unconsolidated deposits of sand, clay, gravel and boulders. The underlying bedrock surface ranges in elevation from approximately 1000 to 1,200 feet. Bedrock materials from the Prairie du Chien Group and Ancell Group of the Ordovician Period and bedrock from the Cambrian, undivided Group of the Cambrian Period underlie the surface till. The bedrock materials of the periods consist of Dolomite with some sandstone and shale, Orthoquartzitic sandstone with minor limestone, shale and conglomerate, and Sandstone with some dolomite and shale. In general, the depth to bedrock in the Project area is approximately 50 feet below the land surface, ranging from 5 feet to over 100 feet.

Based upon review of the Lexicon of Pleistocene Stratigraphic Units of Wisconsin (Syverson et al, 2011) and Bedrock Geologic Map of Wisconsin, (Mudrey et al, 1982) Copper Falls and River Falls Formation were mapped within the Project boundary. The Poskin Member of the Copper Falls Formation is located along the northwestern portion of the site, while the Prairie Farm Member of the River Falls Formation is located along the southeastern portion of the site. The Poskin Member and Prairie Farm Member are comprised of till materials. Till of the Poskin Member is slightly gravelly to gravelly sandy loam.

The Poskin Member till typically overlies sand and gravel. Till of the Poskin Member is very thick, ranging from 3 to 164 feet (average thickness of 49 feet). Till of the Prairie Farm Member is un-bedded and contains slightly gravelly to gravelly sandy loam with some slightly gravelly to gravelly loamy sand. The Prairie Farm Member till ranges from 7 to 33 feet in thickness. Sandstone bedrock underlies the till of the Prairie Farm Member and Poskin Member in areas where the till is shallow.

Ground water availability in the area is generally good, as a large sandstone aquifer underlies all of St. Croix County. Contamination of ground water from construction activities is not a concern, due to the depth of unconsolidated materials protecting the bedrock from impacts.

The Cottage Grove and Hasting faults are mapped west of the Project site. These faults are considered inactive and therefore, hazards associated with fault ruptures are considered low for the Project site.

#### **References (Section 5.1.1)**

Syverson, K.M., L. Clayton, J.W. Attig, and D.M. Mickelson, Eds., 2011. Lexicon of Pleistocene Stratigraphic Units of Wisconsin. Wisconsin Geological and Natural History Survey Technical Report 1.

Mudrey, M.G. Jr., B.A. Brown and J.K. Greenburg. 1982. Bedrock Geologic Map of Wisconsin. United States Geological Survey.

#### **5.1.2 GEOTECHNICAL REPORT ON SOIL CONDITIONS**

HWF hired RRC to perform a preliminary subsurface exploration and geotechnical engineering evaluation for the Project. The purpose of the investigation and report was to explore subsurface conditions, conduct field and laboratory testing to characterize the subsurface soils and bedrock properties and to provide preliminary geotechnical engineering parameters for the design and construction of turbine foundations.

The preliminary geotechnical investigation was performed on eight representative, proposed turbine sites in May, 2011. A summary is presented here. The full preliminary geotechnical report with boring logs can be found in Appendix N.

##### **5.1.2.1 SUMMARY OF GEOTECHNICAL REPORT**

The preliminary subsurface exploration of the Project area included the drilling of eight subsurface borings at proposed turbine sites WTG 1, 9, 12, 23, 31, 34, 42 & 44. The borings were advanced to depths in the range of 33 to 55 feet below existing grade. The field boring logs, soil and bedrock samples were reviewed by the project engineer. Final boring logs include modifications based on lab samples and interpretations of field information.

## Summary of Boring Results

Based on the boring data, native soils in the area generally consist of sand with varying amounts of clay, silt, gravel and cobbles. Sandy soils varied from loose to very dense in relative density. Silt and clay soils with varying amounts of sand, gravel, cobbles and boulders were also encountered in some borings.

Limestone and sandstone bedrock were encountered in two borings at depths of approximately 23 to 40 feet below existing grade. The sandstone bedrock was weathered. The limestone varied from medium hard to hard in hardness. Both the limestone and sandstone encountered were very poor to poor rock quality. These descriptions are generalized and depth ranges are approximate.

Groundwater was encountered in borings at WTG 1 and 44 at depths ranging from approximately 19 to 33 feet. Groundwater was not encountered at the remaining borings to the full depth of exploration. These field observations represent short-term conditions and are not an accurate evaluation of groundwater level. The groundwater level at the time of construction will depend on current and preceding climatic and hydrologic conditions. It is not anticipated that groundwater will present major construction difficulties. Groundwater seepage or surface runoff that accumulates in the foundation excavations during construction will be removed so as to not adversely affect the quality of the bearing surface. Post construction grading will establish proper drainage so as to maintain the long-term stability of the structure.

## Preliminary Geotechnical and Foundation Recommendations

The sites investigated for the proposed turbines appeared suitable for the proposed construction. In general, turbine foundations bear at a depth of about 8 to 9 feet below existing site grade. Based upon the Logs of Boring drilled at the 8 pre-selected turbine sites, suitable foundation bearing conditions were encountered at majority of the turbine sites. However, loose and/or soft unsuitable foundation bearing conditions may be encountered at some turbine locations. Unsuitable foundation bearing soils will require modification and/or replacement prior to construction.

Because not all turbine sites were drilled as part of this preliminary study, site-specific modification and/or mitigation measures cannot be determined for the remaining turbine locations. However, based upon information for borings drilled as part of this study, it appears that the majority of turbine sites will not require extensive mitigation measures. Geotechnical explorations of the remaining turbines will be performed and considered in the final foundation design.

The use of gravity foundation systems for support of the turbines is considered acceptable. An overall factor of safety of 3 along with an inclination factor of 0.36 and corrections for eccentricity and size were used in the bearing capacity analysis. Please see Appendix N for more detailed preliminary geotechnical and foundation recommendations.

### 5.1.2.2 DEPTH TO BEDROCK

Based upon a review of the surface and bedrock geology of the area (Section 5.1.1), and information gathered during the preliminary geotechnical review, the predominant depth to bedrock within the

Project area should be greater than the proposed construction activities. The construction activities include turbine foundation excavations approximately 15 feet deep, collection system trenches at approximately 4 feet in depth and other shallow excavations for access roads, laydown yard and an O&M building slab foundation.

During the course of construction, shallow bedrock may be encountered requiring limited drilling or blasting. If fractured rock is found during foundation excavations, penetration to groundwater will be avoided by utilizing concrete mud mats, or a similar system, to seal the surface. Though not anticipated, the presence of bedrock and need for blasting during construction will be managed by the use of proper techniques and mitigation methods. Utilizing these methods, construction on bedrock, will not likely impact private wells in the area.

## **5.2 TOPOGRAPHY**

### **5.2.1 GENERAL TOPOGRAPHY OF THE PROJECT AREA**

The surface topography of the Project area is predominantly gently rolling hills and plains, reflecting the underlying bedrock and glacial ground moraine deposits. The surface features were formed from deposition and erosion during periods of glaciation. The elevation ranges from 1000 to 1300 feet above sea level. The highest known elevation within the Project boundary is approximately 1310 feet and is located in the southwest quarter of the northwest quarter of Section 26, Township 31N, Range 15W in the southeast quadrant of the Project near wind turbine generator (WTG) 49. Northern and western portions of the Project area are generally more gently sloping in nature, with greater topographic variation existing in the south and east.

### **5.2.2 EXPECTED CHANGES TO SITE TOPOGRAPHY DUE TO GRADING ACTIVITIES.**

The topography of the Project area will be temporarily altered by construction activities. Grading of the surface for access roads, excavation for foundations and trenching for the collection system will provide the most visible changes during construction. Temporary soil stockpiles will also be present. Upon completion of activities, the temporarily impacted areas will be returned to their pre-construction topography. Areas immediately surrounding each turbine will be graded with a slight slope, away from center to facilitate water run-off. The graded area will be blended into the surrounding topography, consistent with approved WDNR practices and outlined in the Highland Wind Farm Water Quality Certificate Application (Appendix R—Attachments A, G and H). Access roads will be constructed as close to existing grade as possible; restoring pre-existing hydrologic flow patterns and allowing farm equipment to easily cross.

## **5.3 LAND COVER**

The Project lies within a farm-based community. The land cover is dominated by agricultural crops and pasture grasses for grazing animals. Areas not utilized for farming activities consist of woods and wetlands. There are limited areas of surface mining to extract the underlying sand and gravel deposits. Figure 5.3-1 (Appendix K) provides an overview of the land cover existing within the Project area.

### 5.3.1 VEGETATIVE COMMUNITIES IN THE PROJECT AREA

The vegetative communities in the Project area are dominated by actively tilled agricultural crops. Non-agricultural uplands are vegetated by woodlands and grassy swales. Wetland areas are often cropped otherwise they contain plants such as Reed Canary Grass, Bull Thistle and other wet tolerant. Table 5.3-1 summarizes the community types and predominant vegetation within the Project area.

**Table 5.3-1 Vegetative Communities in Project Area**

Community	Dominant Vegetation
<b>Agricultural</b>	
Row Crops	Corn, Soy
Hay/Pasture/Old fields	Hay, wheat, alfalfa
Other	Fallow land with grass and weedy plants.
<b>Non-agricultural Upland</b>	
Prairie/Grasslands	None present
Upland Woods	Oak, maple and pine trees
<b>Wetlands</b>	
Wooded Wetlands	Ash, elm, box elder
Marshes	Reed Canary Grass, cattails and sedges
Bogs	None present
Fens	None present

### 5.3.2 ACRES OF LAND COVER CATEGORIES IN PROJECT AREA

Land within the Project area was split into the land cover types listed in Table 5.3-2. The acreage associated with each land cover type is also listed in the table. The land cover GIS dataset was created by combining several GIS data layers for multiple sources including:

- WDNR Hydrology
- WDNR Wetland (WWI)
- Road ROW (St. Croix County)
- Parcels less than 10 acres (assumed residential) (St. Croix County)
- Digital delineations of forests, farm buildings, crops and pastureland (Stantec).

**Table 5.3-2 Land Cover in Project Area**

Land Cover Classification	Acres
<b>Agricultural</b>	<b>17,605</b>
Row Crops	6,600
Hay/Pasture/Old fields	10,330
Other	675
<b>Non-agricultural Upland</b>	<b>6,550</b>
Prairie/Grasslands	0
Upland Woods	6550
<b>Wetlands and Water</b>	<b>1,260</b>
Wooded Wetlands	620
Marshes	525
Bogs	0
Fens	0
Water	115
<b>Developed Land</b>	<b>1,135</b>
Residential	350
Commercial/Industrial (includes Road ROW)	785
<b>Total Project Acreage</b>	<b>26,550</b>

**5.3.3 LAND COVER IMPACTS**

**ITEM 1.33 5.3.3 THE CPCN APPLICATION APPEARS TO LIMIT THE DEFINITION OF TEMPORARY DISTURBANCE TO REMOVAL OR GRADING OF SOILS. VEGETATION CLEARING AND TREE TRIMMING ADJACENT TO CRANE AND OTHER ACCESS PATHS, LAYDOWN (I.E., STAGING) AREAS, TEMPORARY ACCESS ROUTES ARE ALL TEMPORARY DISTURBANCE AND SHOULD BE CONSIDERED. REASSESS AND RECALCULATE THE ESTIMATES TO INCLUDE THE FULL RANGE OF TEMPORARY DISTURBANCE.**

Temporary disturbance and impacts during construction have been reassessed and the following impact types have been added or changed:

- vegetation cleared for the passage of cranes (field breaks)
- agricultural lands used for temporary laydown of turbine components
- vibratory plow passage through various land cover types

Table 5.3-3 has been updated to include these temporary impacts.

**Item 1.34 5.3.3.1 The turbines and crane pad land cover impact acres listed in Table 5.3-3 include a footnote that states the “[t]emporary turbine impacts do not include the turbine component staging**



**areas (soils will not be removed or graded). Similar statements are made in the text in Section 5.3.3.1 on page 46. Agricultural crop and hay/pasture lands will be used for these activities. Given the hilly topography of this project area, verify whether any grading/leveling of laydown areas would be done at any of the turbine sites.**

HWF has reviewed elevation contours and aerial images of the turbine sites and verified that sufficient area exists within agricultural land near each turbine appropriate for component laydown and staging. Though no grading is anticipated, if during construction, minor leveling or grading of farmland is unavoidable, the land will be restored to the natural contour of the pre-construction land as outlined in the WWQPA (Appendix R). Additionally, the crane pad is intended to be a widening of the access road as it approaches the wind tower where practical. The crane pad area will be approximately 60 feet wide and 80-100 feet long, with depth varying depending on soil conditions. See Appendix F.

The land cover analysis described in Section 5.3.2 along with desktop and field notes of impacted land were used to calculate the acreage of impacts due to construction of Project facilities. Temporary versus permanent impacts are listed. Please note that the areas of impact are often lessened by the overlap of construction corridors (e.g. cranes will utilize access roads, resulting in a 24 ft wide impact rather than a 40 ft wide impact in areas not coincident with access roads).

**Table 5.3-3 Land Cover Impacts in Acres**

Land Cover Classification	Turbines w/Crane Pads		Collection System		Access Roads		Crane Routes (Paths) +		Substation		O&M Building / Laydown	
	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm	Temp	Perm
<b>Agricultural</b>												
Row Crops	36.5	4.2	1.5		0.5	13.6	19.5		0.5	2.0	20.0	0.2
Hay/Pasture/ Old fields	17.5	1.8	0.5			6.6	10.6					0.3
Other*	1.0	0.2	.5			1.2	0.9					
<b>Non-agricultural Upland</b>												
Prairie/Grassland												
Upland Woods						0.3						
<b>Wetlands</b>												
Wooded Wetlands												
Marshes/ Water						0.16	0.25					
Bogs												
Fens												
<b>Developed Land</b>												
Residential												
Comm/Indust (includes ROW)			8.0		4.0	0.5	0.4				0.1	

\* Land Cover Classification "Other" includes land in CRP Program that will be removed prior to construction, as required

+ Temporary impacts for crane paths in agricultural lands are listed due to the possible need to decompact soils after crane passage. No additional soil disturbance or grading is needed for crane passage.

**ITEM 1.32 5.3.1 DESCRIBE WHAT IS REFERRED TO IN THE CATEGORY “MARSHES/WATER” (I.E. WHETHER ANY RIVERS, PONDS, WATERWAYS, ETC ARE INCLUDED);**

The category “Marshes and Water” in Table 5.3-3 Land Cover Impacts includes:

- lands identified as wetlands in WWI or through desktop research or field survey
- areas identified as water (streams and ponds) in the WDNR 24k Hydro dataset or through desktop research or field survey.

**5.3.3.1 TURBINE PADS**

Grading of areas near each turbine location, movement of equipment and construction of the foundation will result in approximately 0.5 acres of impact to agricultural land. Of the 0.5 acres, approximately 0.35 acres will be temporary impacts and 0.15 acres permanent impact. Additionally, approximately 0.75 to 1.0 acres of land will be disturbed for the staging of turbine blades and other large components. This approximately 1.0 acre area will not be graded, nor will soil be removed. Compacted areas that may occur due to the movement of equipment will be decompacted as construction is completed. Construction activities and the area of impact will generally be centered on the turbine location; however, flexibility exists in staging the turbine components, stockpiling soils and final placement of the crane pad. Temporary impacts will be limited to agricultural uplands to the extent practicable. Nearby waterways and wetland boundaries will be flagged and avoided. Best management practices (BMPs) will be employed to protect wetlands and waterways near the construction areas. See Attachment E in Appendix R for additional detail and presentation of erosion control devices. The total temporary project-wide impact to agricultural lands at the turbine sites will be approximately 55 acres including the area used to stage turbine components that will not be graded or have soil removed.

The 0.15 acre of permanent impact at each turbine site will include the turbine foundation, a graveled area approximately 15 feet wide surrounding the turbine and a permanent crane pad. All foundations and pads are proposed in agricultural uplands. The total permanent Project-wide impact to agricultural land at the turbine sites will be approximately 6.2 acres.

**5.3.3.2 COLLECTOR CIRCUITS**

The collection system will be installed utilizing vibratory plow (trenching) and directional bore methods. The temporary disturbance of the plow equipment is an 8 foot wide corridor centered on the collection line. This method will be used in upland areas, and decompacted where necessary upon completion of installation. The majority of the collection system route is planned for agricultural fields and road right-of-ways. When wetland crossings cannot be avoided, a horizontal directional boring method will be used to eliminate impacts. The methodology of the boring and placement of bore pits in upland areas is discussed in the WWQPA (see Appendix R).

**Item 1.35 5.3.3.2 To determine a reasonable worst case scenario, estimate how much additional wetland disturbance would occur if wetlands cannot be bored for installation of the collector circuit.**

Michels, as the preferred contractor, has indicated that they do not anticipate any problems with HDD boring under wetlands and waterways. For this reason, these sensitive areas have not been field

delineated for exact boundaries nor permitted for impacts. If directional boring could not be used the estimated area of wetland impact that would require permitting is approximately 0.95 acres. This assumes an eight-to-ten foot wide path for the vibratory plow to pass through the wetland. If this method were necessary, permits would be acquired from the WDNR/ACOE prior to construction and wetlands would be restored upon completion of construction.

**Item 1.36 5.3.3.2 The collector circuits discussion states that some woodlots would have the collector circuit installed by HDD under the woods, avoiding “unnecessary impacts.” For each area where HDD would be used, provide an estimate [of] what woodland clearing [would be] necessary if HDD is not feasible at the sites.**

The collection system design avoids woodlots where practicable. Two wooded areas were identified for HDD boring. If these woodlots could not be directionally bored, the clearing necessary for collection line installation is less than 0.03 acres.

***Item 1.37 5.3.3.2 - The collector circuits discussion also notes that “majority of the collection system route is planned for agricultural fields and road rights-of-way.” The temporary impacts noted for the collectors in Table 5.3-3 includes entries only for temporary impacts to agricultural lands, and no impacts are noted for “Comm/Indust includes ROW” lands. Provide a summary of the amounts of collector circuits that would be constructed inside of existing ROW, and the amounts that would be constructed outside of, but adjacent to existing ROW. Also, provide a summary of the impacts to the various land cover types, most notably woodlands, for collector circuits constructed both inside and outside of existing ROW. In addition, provide a land cover type summary assuming that all collector circuits would need to be constructed outside the existing ROW.***

Table 5.3-2 has been corrected to reflect the distribution of land cover impacts between agricultural land and road ROW.

The land cover analysis does not consider small patches of trees as forest or woodlands, and thus are not included as woodland impacts. Any clearing of trees or other vegetation has been included in temporary impacts.

As indicated in our map (Fig. 1.1-2 Project Facilities, Appendix A), the collection circuits are intended to run in the ROW. The collection system between the road right of way and the turbine site follows access roads, so as to minimize impacts to the land. For cartographic clarity, the collection system may appear to fall outside the ROW in areas of multiple circuits. An analysis of land cover type assuming that all collectors would need to be constructed outside of the existing ROW has not been performed, as HWF intends and has planned to run in the ROW.

The collection system will need to cross linearly aligned wooded areas, such as field breaks. These areas may be temporarily cleared to allow equipment passage. Large wooded areas have been avoided in the collection system planning whenever possible. If woodlots cannot be practicably avoided, the horizontal-directional boring methodology will be employed to avoid unnecessary impacts. These areas are shown in the Project Mapbook provided in Attachment C of Appendix R.

The total temporary impact associated with the collection system is approximately 10.5 acres. It is broken down by land-cover type in Table 5.3-3 above.

#### **5.3.3.3 ACCESS ROADS**

The majority of access road impacts will be to upland agricultural land. Unavoidable impacts to wetlands and waterways have been minimized to extent practicable. Please refer to Appendix R for details regarding the minimal impacts to wetlands and waterways. Access road width will be 16 feet wide, unless paralleling a crane route, where the temporarily width will be 40 feet. Temporary turning radii will be constructed at the junction of access roads and public roads or in fields where turns are necessary. These radii will be removed upon completion of construction.

The total permanent impact due to access road construction will be approximately 22 acres. Temporary construction impacts due to turning radii in the field and at public roads will be approximately 4.5 acres. Temporary impacts due to widening of roads for crane paths have been included in Section 5.3.3.4. See Table 5.3-3 above for a breakdown of land-cover types affected by access road construction.

#### **5.3.3.4 CRANE PATHS**

The cross-country movement of cranes between turbine sites will result in temporary impacts to land. The majority of land affected is agricultural uplands, though some farmed (only) wetland areas and waterways may also be impacted. The wetland and waterway crossings are discussed in Attachment F of Appendix R. Upland vegetation removal will be limited to small or linear features, such as field breaks.

Upland areas compacted for crane routes will be decompacted and restored to pre-construction conditions. Field breaks or other limited areas of vegetation removal will be allowed to naturally re-vegetate. The total area of impact will be approximately 32 acres as broken down in Table 5.3-3.

#### **5.3.3.5 SUBSTATION**

The proposed substation will impact approximately 2.5 acres of agricultural land. A five acre parcel of land will be purchased by HWF to construct the facility. No wetland or waterway impacts are anticipated on the substation site.

#### **5.3.3.6 O&M BUILDING AND LAYDOWN YARD**

The O&M building, parking lot and temporary equipment laydown yard will be built on land leased from a participating land owner. The impacts will be primarily to agricultural uplands. The O&M building and parking lot will cause permanent impacts to approximately one-half acre of land. The equipment parking and laydown yard will be graded and graveled for use during the construction period. Upon completion the area will be restored to preconstruction condition and made available for farming activity. The temporary impact to agricultural land will be approximately 20 acres.

## **5.4 WILDLIFE**

### **5.4.1 EXISTING WILDLIFE RESOURCES AND ESTIMATE EXPECTED IMPACTS TO PLANT AND ANIMAL HABITATS AND POPULATIONS**

HWF contracted with David Drake at the UW-Madison to evaluate and study the Town of Forest for wind development. Several site visits had been made by the contractor in the early spring and summer seasons to assess the habitats of animals and plants. See Appendix O for a summary of Dr. Drake's findings ("Drake Report") on wildlife resources and habitats in the Project area.

#### **ITEM 1.38 5.4.1 THE BALD EAGLE IS BRIEFLY DISCUSSED IN APPENDIX O AND IS IDENTIFIED AS PROTECTED UNDER THE FEDERAL BALD AND GOLDEN EAGLE PROTECTION ACT. PROVIDE INFORMATION REGARDING CONSULTATION WITH USFWS.**

HWF is consulting with the USFWS regarding potential impacts to Bald Eagles and whether an incidental take permit under the federal Bald and Golden Eagle Protection Act would be appropriate. HWF has provided USFWS with its avian survey results for 2011. HWF has also agreed to continue its bird survey points counts through spring 2012 and conduct an eagle nest search in the Project area in March. HWF will continue to coordinate with the USFWS and the WDNR to evaluate potential Bald Eagle impacts and will update PSC staff as the evaluation progresses.

#### **Provide the pre-construction bird and bat data collected at the site from the May start date through the autumn survey period.**

An updated Appendix O is provided that includes the bird and bat survey data collected through the end of 2011.

#### **ITEM 1.39 5.4.1 PRE-CONSTRUCTION BIRD/BAT SURVEY PLANS, A DETAILED DESCRIPTION OF THE SURVEY AND ACOUSTIC MONITORING METHODOLOGIES AND DOCUMENTATION AS APPROVED BY THE WDNR PRIOR TO START OF THE SURVEY.**

Pre-construction bird/bat survey plans and methodologies have been discussed with the WDNR and are described in the updated Appendix O.

#### **Post Construction Bird and Bat Survey Plans;**

HWF has had general discussions with the WDNR regarding post-construction plans for bird and bat surveys and has agreed that surveys will be completed during one year of operation of the wind farm. These surveys will include mortality, bat acoustics, and eagle surveys. HWF will work with the WDNR and review the proposed plans and agree to the surveys before the surveys begin. HWF will routinely update the survey work completed in the Spring and Fall reports and will send any communication onto the PSC staff for documentation.

**Discussion of the potential impacts to the project might have on resident and migrating bat populations;**

HWF recorded 93% of all bat passes at the 2 m level compared to the 60 m level, and recorded bats at the 2 m level throughout the majority of the time the Anabats were active. We did not record the first bat on the 60 m microphone until the second week of August. While bats experience greater turbine-caused mortality than birds (Kunz et al. 2007), it is encouraging that most of the bats recorded flew below the swept area, suggesting that post-construction mortality to bats may be reduced. Although bats recorded at the 60 m microphone level would be within the swept area, the number of bat passes were relatively low with only one peak of activity. However, the 60 m microphone most likely captured migrating bats and that was the reason no bats were recorded until the second week of August. Migratory bats are typically the species most commonly killed by turbines (Kunz et al. 2007).

More low-frequency bats (57%) were recorded at both microphone levels than high-frequency bats. This is possibly due to there being more low-frequency bats in the area. More likely, however, is that low-frequency sounds travel further distance and are less distorted, therefore low-frequency bats are recorded at a greater proportion than high-frequency bats.

**Item 1.40 A discussion of any known bat hibernacula within 10 miles of project area. Include a discussion regarding what resources were checked to develop a list of hibernacula;**

HWF did have discussions with the WDNR regarding any potential bat hibernacula within St Croix County. The WDNR has noted at this time there is one location of a hibernacula approximately 9 miles from the Project boundary

**Item 1.40 If post-construction bird/bat mortality requires mitigation, discuss the forms of mitigation available for the proposed wind turbine models if they differ in functionalities. Include items such as adjustment of the cut-in speed, and other forms of mitigation;**

HWF has or will implement the following measures that should help decrease potential impacts to birds/bats resulting from the Project:

- \*Construct turbines in cultivated agriculture lands, and not placing turbine(s) in woodlots or wetlands.

- \*Avoid locating turbines in known local bird migratory pathways or in areas where birds are highly concentrated.

- \*Configure turbine locations to avoid areas or features of landscape known to attract raptors.

- \*Avoid fragmenting large, contiguous tracts of wildlife habitat. Where practical, place turbines on land already altered or cultivated, and away from areas of intact and healthy native habitats. If not practical, select fragmented or degraded habitats over relatively intact areas.

- \*Providing bat “houses” to state land where identified hibernacula in County are located to encourage re-population of species.

Additional mitigation measures may include turbine(s) that have options of operational control and could be modified or programmed for cut-in speeds if warranted. Turbine options under consideration by HWF will be able to be programmed.

HWF recognizes that the impact of wind projects on bats as well as potential minimization and mitigation measures are dynamic and HWF is willing to continue to work with the WDNR and USFWS on these issues.

**ITEM 1.41 5.4.1 FOR BLANDING’S TURTLE INDICATE IN APPENDIX O THAT AFTER FINAL PROJECT DESIGN AND PRIOR TO CONSTRUCTION AVOIDANCE MEASURES WILL BE DEFINED FOR AREAS OF POTENTIALLY SUITABLE OR OCCUPIED HABITAT THAT MAY OVERLAP WITH TEMPORARY OR PERMANENT DISTURBANCE. THESE MEASURES WILL BE DEVELOPED BASED ON CONSULTATION WITH WDNR;**

The following wording has been added to the Plant and Animal Habitats Section of the Existing Wildlife Resource Review in Appendix O;

Upon determination of a final Project design, and prior to construction, HWF will consult with the WDNR to identify potential areas of suitable or occupied habitat for Blanding’s turtles that may overlap with proposed construction sites. Areas of both temporary disturbance and permanent impact will be considered. HWF, along with WDNR, will develop measures of avoidance (e.g. exclusionary fencing during active periods, etc) that have been successfully used on other energy construction projects in Wisconsin.

#### **5.4.2 AVIAN AND BAT PRE-CONSTRUCTION SURVEYS**

HWF met with the WDNR several times over the course of 2010. In January, 2011 additional meetings were conducted as well as conference calls with the WDNR to understand what information would be necessary to provide for a complete survey. In March, 2011 both parties came to agreement on the site surveys for the Project and a map was provided with locations for documentation. Timing of the surveys will last one calendar year from the start date of site surveys. Throughout this process HWF continues to have frequent calls with the WDNR to make sure all questions and concerns are addressed. A full report discussing the results of the surveys will be submitted upon completion. See the Drake Report (Appendix O) for all survey data collected to date as well as a description of survey procedures.

#### **5.5 PUBLIC LANDS**

Various data sources were researched to identify public lands within ten miles of the Project boundary. Wildlife areas, fisheries, parks and trail data were gathered from sources including state and federal agencies, county websites, Esri and other publicly available data sources.

Table 5.5-1 (Appendix O) lists the information acquired regarding State and Federal public lands within ten miles of the Project area. Management information is also provided. County forests are also listed in Table 5.5-1.

Table 5.5-2 (Appendix O) lists local parks and recreational areas within a ten mile radius.



In addition to public lands listed in table 5.5-1, there are various private properties enrolled in state land management programs (such as Managed Forest Law and Forest Crop Law). These programs may allow public access for activities such as hunting and fishing. These private properties, as identified by the WDNR in their Managed Lands database, have been mapped for consideration within the Project area. A GIS file of lands obtained from the WDNR, within two miles of the Project boundary, is included with this submission.

**ITEM 1.42 5.5.1 PROVIDE A LISTING AND GIS SHAPEFILE OF STATE AND FEDERAL PROPERTIES, AND COUNTY PARKS WITHIN 10 MILES OF THE PROJECT AREA;**

A listing of federal and state properties and county parks within ten miles of the Project area was provided in the original application. GIS files are provided on the revised Data DVD. A replacement figure for 4.1-5 “Public Lands within Two Miles” has also been provided, with public lands labeled.

## **5.6 LOCAL ZONING**

HWF identified local governments within a two mile radius of the Project and acquired the applicable zoning ordinances. The local governments within a two-mile radius include:

- St. Croix County
  - Towns of Forest, Cylon, Emerald and Glenwood
- Dunn County
  - Towns of New Haven and Tiffany
- Polk County
  - Towns of Black Brook and Clear Lake
- Barron County
  - Town of Vance Creek

Project facilities will be located in the Towns of Forest and Cylon (within St. Croix County). The Towns of Emerald and Glenwood in St. Croix County and the Towns of New Haven and Tiffany in Dunn County are touched by the Project boundary, but do not include Project facilities. Zoning ordinances available for the above listed governments were reviewed for zoning authority over development of the Project. Table 5.6-1 summarizes the potentially applicable codes or ordinances.

**Table 5.6-1 Applicable Zoning Ordinances**

Government	Topic	Code Reference
St. Croix County/Town of Cylon	Land Division Ordinance	Section 5 – Standards for Subdividing Land
Dunn County	None Applicable	
Polk County	None Applicable	
Barron County	None Applicable	
Town of Forest	Wind Energy System Licensing Ordinance	Not applicable*
Town of Cylon	Driveway Ordinance	Section 4- Requirements Section 5- Standards

\* The Ordinance was passed and adopted on August 11, 2011; after the date on which HWF had received all applicable town permits.

#### 5.6.1 COPIES OF ZONING ORDINANCES

The relevant sections of the zoning ordinances listed in Table 5.6-1 are provided in Appendix P.

#### 5.6.2 ZONING CHANGES NEEDED FOR THE PROJECT

On August 11, 2011 the Town Board of the Town of Forest adopted Ordinance No. 2011-3 entitled Wind Energy Systems Licensing Ordinance ('Wind Ordinance').<sup>7</sup> Since HWF has received all necessary permits<sup>8</sup> and approvals from the Town of Forest prior to the adoption of the Wind Ordinance, it has no impact on and is not applicable to the Project. See Section 13. The substation and feed-in transmission lines are located in the Town of Cylon within properties currently zoned as agricultural. Properties requiring zoning changes include the following.

##### Substation Property:

The substation area, currently under an option for purchase will be zoned through St. Croix County. A re-zoning of the property will be done by HWF to AG residential along with a special exemption permit. The driveway leading into the substation will be under the applicable Town of Cylon driveway ordinance.

<sup>7</sup> The conditions imposed on wind projects in the Wind Ordinance effectively act as a moratorium for such projects in the Town of Forest (e.g. setback from non-participating residence of one mile "or a distance that meets the sound requirements of [the] ordinance, whichever is greater....").

<sup>8</sup> HWF will need to procure ministerial permits for the two additional turbines added to the Project (e.g. building and driveway permits).

**O&M Facility and Laydown Yard:**

The Town of Forest currently has no zoning requirements, thus zoning changes are not applicable in regards to the O&M facility or the temporary laydown yard. A building permit will be required from the Town of Forest. The building footprint does not require a land division.

**Wind Turbines:**

The construction and erection of the wind turbines do not require any zoning changes by the Town of Forest or St. Croix County.

**5.6.3 ZONING CHANGES REQUESTED**

At this time, no zoning changes have been requested.

**5.7 LAND USE PLANS**

The land use and development plans for the local governments within the Project area and a two mile radius, as listed in Section 5.6, were acquired, if available. The plans were reviewed to identify possible conflicts with the development of a wind farm. The review found that contrary to limitations being placed on wind development, the areas near the Highland Wind Farm state that they will positively encourage renewable energy development within their jurisdiction. In fact, the Town of Forest Comprehensive Plan states: Objective 5 (“Adopt renewable energy policies and practices as part of a strategy to meet future energy needs.”) and Strategy #4 (“The Town will be open to all forms renewable energy projects, including wind, solar and bio-energy.”)<sup>9</sup> The West Central Wisconsin Regional Planning Commission (WCWRPC), which serves St. Croix County and the area surrounding the Project, adopted a Regional Comprehensive Plan on September 9, 2010. A summary list of the documents reviewed and links to the document websites can be found in Table 5.7-1 (Appendix P). Additionally maps of the existing and planned future land use for the Town of Forest are provided in Appendix P.

**5.8 ARCHAEOLOGICAL AND HISTORIC RESOURCES****ITEM 1.44 5.8 HISTORICAL AND ARCHEOLOGICAL**

Non-confidential historical and archeological information can be found in Appendix Q.

**5.8.1 HISTORIC AND ARCHAEOLOGICAL SITES POTENTIALLY AFFECTED**

HWF and its consultant, Midwest Archaeological Consultants (Sturgeon Bay, Wisconsin), performed a Phase IA archeological review. The assessment includes a review of the Wisconsin State Historical Preservation Society (WHS) database to identify if the Project will potentially affect any previously recorded historic properties. A full report on the archaeological findings can be found in Appendix Q.

---

<sup>9</sup> The current Town Board's attempt to rescind the Project's permits and agreements (See Section 13) stands in stark contrast to the Town's adopted comprehensive plan.

The National Register of Historic Places database was also searched. It lists no historic sites within ten miles of the Project boundary.

The WHS Wisconsin Architecture and History Inventory (AHI) Database was reviewed by Stantec for listings within one mile of the Project boundary. See Appendix Q for the full review including a summary table and maps.

### **5.8.2 ARCHAEOLOGICAL SITE LOCATIONS IN WHICH CONSTRUCTION WOULD OCCUR**

The archaeological review revealed eleven sites within one mile of the Project. Two sites fall within 1000 feet of Project construction or are located within the same quarter-quarter section as construction activities (SC-0117 and BSC-0023):

- Site SC-0117 is prehistoric lithic scatter located approximately 950 feet from Project facilities within a gas pipeline ROW. It is located within the same quarter-quarter section as WTG 15
- Site BSC-0023 is a Historic Euro-American cemetery currently associated with Immanuel Lutheran Church on 210th Ave. It is located on church property on an opposite side of a public road from construction activities.

Additional detail including quarter-quarter section listings and maps can be found in the Table 5.8-1 and Midwest Archaeological Report (Appendix Q). In cases of historic cemeteries adjacent to road ROWs, collection system construction will be routed to the opposite side of the road.

The Stantec AHI Review (Appendix Q) lists historical architectural sites within one mile of the Project boundary. The source of this data is discussed in Section 5.8.3. The exact location of these sites is generally not known, nor are the sites given any special status or protection. Utilizing the locational information available from WHS, several of the structures may be located in quarter-quarter sections where collection system construction will occur (within road ROWs). These include AHI Site ID's 23755, 23757, 23759 and 23761 (two houses, an industrial building and a church, respectively). See the table within the AHI review (Appendix Q) for quarter-quarter section listings.

### **5.8.3 ARCHAEOLOGICAL OR HISTORICAL RESOURCES**

The Phase IA archaeological review included a literature search of the WHS database for previously recorded historic properties. The search revealed that there are six previously recorded archaeological sites and three historic cemeteries within an approximate one-mile radius of the potential 52 wind turbine locations. There is one small archaeological survey within a one-mile radius of the proposed Project area. There are no potential direct impacts to the properties as they do not lay within the area of potential effect (APE) as defined in the Midwest Archaeological Report (Appendix Q).

Historic and architectural sites listed in the Wisconsin AHI Database were reviewed. The database is housed in the WHS and maintained by the Society's Division of Historic Preservation. It is a collection of information on historic buildings, structures and sites throughout Wisconsin, and inclusion in the

database does not infer any special status or protection.<sup>10</sup> Some structures may no longer exist. There are 12 sites within one mile of the Project boundary including five houses, two barns, three churches, one former schoolhouse and one former industrial building. They are summarized within the AHI Review (Appendix Q). No impact on historical architectural sites is anticipated from the Project.

The National Register of Historic Places database did not list any historic sites within ten miles of the Project boundary.

HWF informed Tribal entities of the proposed Project in September, 2011. Please see Appendix Q for a listing of the Tribes contacted, a sample of the correspondence sent, and responses to date.

#### **5.9 ER REVIEW – ENDANGERED, THREATENED, AND SPECIAL CONCERN SPECIES AND COMMUNITIES**

HWF worked with the WDNR Office of Energy to obtain an Endangered Resources (ER) review for the Project and surrounding area. This review includes a search of the Natural Heritage Inventory (NHI) database and consultation with Fish and Wildlife Services (FWS). Please see Appendix O for a confidential copy of the ER report provided by the WDNR.

## **6.0 WATERWAY/WETLAND PERMITTING ACTIVITIES**

HWF retained the services of Stantec to assist in the design and permitting of the Project. An initial desk top environmental review was completed in the summer of 2010 and the results were used to adjust the siting of the preliminary Project facilities. Stantec completed a field survey of wetlands and waterways at each of the proposed turbine sites and access roads in the fall of 2010. Additional field surveys were performed in spring and summer of 2011 to accommodate changes in design and additional turbine sites that bring the Project to 102.5. The information gathered was used to prepare the appropriate Wetland/Water Quality Certification (WWQC) and Erosion Control Permits required of the WDNR and US Army Corps of Engineers (USACE). Detailed information on wetland and waterway locations and the methodology used for the Project is found in the most recent permit package, as submitted on December 12, 2011 to the WDNR and USACE (Appendix R—Attachments G and H).

No sensitive wetlands, state or federally listed waterways, trout streams, fisheries, wilderness areas, recreational areas or other sensitive resources of state or federal concern are impacted by construction activities. No surface waters identified as outstanding or exceptional resources (Ch. NR 102, Wis. Adm. Code.) are impacted.

Table 6.0-1 Wetland and Waterway Impacts (Appendix R--Attachments I and J) lists the wetlands and waterways impacted along with the information requested in the Filing Requirements sample Table 1.

---

<sup>10</sup> Wisconsin Historical Society - <http://www.wisconsinhistory.org/ahi/>

### **6.1 WATERWAY PERMITTING ACTIVITY**

Based on desktop and field review, it was determined that the Project could not be built without some limited impacts on waterways. Access roads and crane paths were designed to minimize impacts to waterways. Intermittent streams cross six participating properties causing limited access to the associated turbine sites. The access roads must cross each stream to reach turbine locations that comply with the various set-back requirements. Information pertaining to the General Permit Application for the necessary culverts can be found in Attachment B of Appendix R.

Crane paths cross seven intermittent streams within the Project area. The waterways can be crossed utilizing temporary clear span bridges ("TCSBs") that are removed after crane passage. The information pertaining to the seven TCSB permits required can be found in Attachment F of Appendix R. Table 1 within Attachment B of Appendix R lists anticipated permanent and temporary waterway impacts associated with the construction activities.

### **6.2 WETLANDS**

Initial desktop surveys utilizing Wisconsin Wetland Inventory (WWI) data and colored high-resolution aerial imagery identified wetlands and areas of concern within the Project area. Stantec then performed field surveys of the proposed turbine sites and access road locations in the third quarter of 2010 in order to confirm wetland locations and redesign facility sites to minimize waterway and wetland impacts. Changes were made to numerous turbine and access road designs to avoid or minimize impacts to these resources.

Wetland delineations were completed in accordance with the January 1987 Technical Report Y-87-1 entitled, "Corps of Engineers Wetland Delineation Manual" for areas to be temporarily or permanently impacted by construction activities. Additional surveys were performed in the spring and summer of 2011 to accommodate turbine additions and changes to the Project design. The December, 2011 revised WWQC permit application is provided in Attachments G and H of Appendix R. Table 6.0-1 (Appendix R—Attachments I and J) lists permanent and temporary wetland impacts identified with unique wetland identifiers. Attachment D to Appendix R provides the Wetland Delineation Report and associated analyses, figures and data forms.

### **6.3 MAPPING WETLANDS AND WATERWAY CROSSINGS**

Wetland and waterway maps are provided in Appendix R. These include a mapbook with a page for each town section grid containing construction activities within the Project area (Attachment C, Appendix R). This figure displays Project facilities, WWI data, delineated wetlands, streams and ponds (per Wisconsin 24k Hydrography Database), elevation contours, hydric soils, TCSBs, wetland and waterway crossings and other activities related to the Chapter 30 permit. The figures are shown with a 2010 colored aerial background for reference. Additional large-scale figures are included within corresponding attachments to Appendix R that provide the information specified within the permitting requirements.

#### **6.4 WATERWAY/WETLAND CONSTRUCTION METHODS**

The final proposed design for the Highland Wind Farm takes into account delineated wetland boundaries and minimizes impacts to the extent practicable. No turbines are located in wetlands or waterways. Access roads were designed to take advantage of existing farm lanes when practicable. New roads are placed such that permanent impacts to the wetlands are minimized. The wetlands that will be impacted as part of this Project are typically pasture land, man-made agricultural drainage ditches and windrows, or farmed wetlands. The pasture land and agricultural ditches are dominated by invasive and weedy species (Reed canary grass, Canada thistle, Kentucky blue grass, box elder). The farmed wetlands are generally dominated by planted crops (i.e. alfalfa, soy or corn).

Permanent access roads in wetlands will utilize a metal corrugated culvert to maintain wetland flow and hydrology. Silt fences will be utilized to protect nearby wetlands and waterways during construction of the Project. The placement of fill for turning radii will occur prior to component delivery. These turning radii will remain in place approximately 30 days and then will be removed and restored. Geotextile fabric will be laid on the ground surface prior to installing the clean gravel radius to better enable removal.

TCSBs will be utilized to allow crane passage over waterways. The structures will be constructed using wooden construction mats. A mat will be laid parallel to the channel on each bank followed by two mats laid perpendicular to the channel. If a ramp onto the bridge is needed, wood logs or similar materials will be used. No off-site fill will be used for the construction of access ramps. The bridge will be anchored either to the ground or a nearby tree using steel cables to prevent the transport of the bridge downstream during flood flows. A plan and profile drawing of the typical TCSB construction is presented in Attachment F to Appendix R.

Temporary impacts to wetlands due to crane passage will occur on seven routes. These impacts are due to the placement of construction matting or other approved methods (e.g. working in frozen conditions) in the wetlands. These temporary impacts will remain in place approximately 14 days and will then be removed. All temporary impacts will be completed in accordance with best management practices. Maps showing the temporary impacts to these wetlands can be found in the WWQC Application (Attachment A of Appendix R).

The collection system will be installed in upland area through the use of a vibratory plow or trenching. HDD will be utilized when collection lines encounter waterways or wetlands, thus avoiding impacts. The bore entry and exit pits, approximately 8 feet by 20 feet, will be located in upland areas. Silt fence or similar erosion control devices will be located between the disturbance and nearby wetlands/waterways. Associated temporary soil stockpiles will be located in upland areas. Adequate supplies of containment materials will be kept at HDD bore sites to be used in the event of an inadvertent release of drilling mud ("frac out"). Written site specific contingency plans for a frac-out event will be developed and kept at the Project site. Details of the proposed bore pit locations and associated erosion control can be found in the Project Mapbook in Attachment C to Appendix R. Proper erosion control devices in the form of silt fence, straw bales, surface roughness and temporary seeding will be used to stabilize disturbed areas near wetlands during construction and following the completion

of the work. Monitoring of disturbed areas will occur until these areas have stabilized to 70% vegetative cover. Original ground surface elevations will be restored following construction and native soil profiles will be maintained to the extent practicable. Location of erosion control devices are shown in Attachment E of Appendix R.

## **6.5 EROSION CONTROL AND STORM WATER MANAGEMENT PLAN**

HWF has prepared and submitted a Water Resource Application for Project Permits (WRAPP) to the WDNR in accordance with NR 216 (formerly known as a Notice of Intent). The application includes a site specific Erosion Control and Storm Water Management Plan (Plan). The Plan includes technical drawings and descriptions of the Best Management Practices (BMPs) that will be followed in compliance with WDNR technical standards. Please see Attachments A, G and H to Appendix R for a copy of the application submitted in December, 2011. The Plan will also be provided to St. Croix County for review and compliance with its Shoreland Zoning requirements.

## **6.6 MATERIALS MANAGEMENT PLAN**

Construction materials for the Project will be handled in accordance with the methodology outlined within this document and the WDNR WWQC and WRAPP permit application. A copy of this application is included in Attachments A, G and H to Appendix R.

### **6.6.1 HAUL ROUTES**

The main haul route for construction materials will be into the Project area on STH 64 and CTH P to the laydown yard. Materials to be routed directly to individual turbine sites will be determined upon selection of a final construction contractor and turbine delivery contractor. Haul routes, construction laydown and staging areas are discussed in Sections 2.3.5 and 2.3.6, 2.4.5 and the Stantec Road Study (Appendix G). It is not anticipated that contaminated materials will be found during Project construction. In the unlikely event that contaminated materials are discovered they will be handled in a manner compliant with state and local regulations.

### **6.6.2 STOCKPILE AREAS**

Construction material stockpiles will be located at the construction laydown yard as discussed in Section 2.4.5.1. Soils stripped or removed due to grading and excavation will be separated into topsoils and subsoils and stored in upland areas only. Subsoils will be stockpiled near turbine sites and used as backfill upon completion of foundation pours. Topsoils will be used during the reclamation process for disturbed areas near turbines and access roads. See Sections 2.4.1 and 2.4.2 for a discussion of turbine foundation construction and the handling of removed soils.

Sediment control measures will be in place prior to any removal of topsoil or grading work and will be maintained until the potential for erosion has stabilized. Stormwater and erosion control measures along with drawings of proposed BMPs are provided in the WRAPP (Appendix R-Attachment E).



**6.6.3 EQUIPMENT STAGING AREAS**

Equipment will be staged from the temporary laydown yard and individual turbine staging areas as discussed in Section 2.4.5.

Spill control kits will be kept at the Project laydown yard and within construction vehicles. HWF will acquire an SPCC Plan from the contractor awarded the construction contract. The SPCC Plan will outline the procedures and preventative measures that will be followed throughout the construction period.

**6.6.4 FIELD SCREENING PROTOCOL FOR CONTAMINANT TESTING**

HWF will notify a firm experienced in the analysis and treatment of such materials if contaminated soils or materials are encountered during construction. The suspected materials will be tested, treated and disposed of according to the proper protocol for the situation encountered and the corresponding statutory requirements. The WDNR will be contacted as required under state statutes.

**6.6.5 ESTIMATED TYPES, CONCENTRATIONS AND VOLUMES OF CONTAMINATED MATERIALS**

The Project area land use is predominantly agricultural. Farm owners will store hazardous materials such as fuels and chemicals on their properties. These materials are stored within farm buildings such as barns and sheds, and will not be disturbed during Project construction. Other than the materials utilized in the agricultural operations HWF is not aware of any hazardous materials on participating Project properties.

**6.6.6 METHOD FOR DEWATERING OF EXCAVATED MATERIALS**

If conditions warrant during construction, dewatering at turbine locations may occur. The contractor will construct and maintain all dewatering BMP's necessary to comply with discharge requirements contained in local or state permits, ordinances, and rules. The contractor will consult with the engineer before constructing a dewatering device.

Excavated materials will be stored in upland areas away from wetlands and waterways. The dewatering of excavated materials will employ the use of filtration and erosion control devices, such as straw bales and geotextiles. These methods will control the release of water containing sediment from stockpiles and graded areas. Water will be released into upland areas only and prevented from directly entering wetlands or waterways.

**6.6.7 ESTIMATED VOLUMES OF IN-CHANNEL AND UPLAND EXCAVATED MATERIALS**

Excavation of materials in wetlands and waterways will be minimized to the extent practicable. No wetlands or waterways will be impacted by collection system installation, due to the use of HDD methods. No wetlands or waterways will be impacted by turbine construction. The construction of permanent access roads will permanently impact six intermittent streams as described in Attachment B of Appendix R. The total area to be excavated from waterways for the installation of access road culverts is approximately 550 cubic feet (20 cubic yards). The material removed will be utilized as backfill within the construction site or disposed of as discussed in Section 2.4.1 of this application.

Excavation within eight wetlands will be necessary for the installation of access roads. The material removed has been minimized by crossing wetlands at narrow points. Many of the wetlands to be impacted are currently being farmed or used as pastureland; thus the soils removed will be agricultural top and sub-soils. The volume of material to be excavated will vary with the depth of topsoil and overburden present above a stable sub-strata. The estimated removal to a depth of two feet results in approximately 12,000 cubic feet (450 cubic yards) of excavated material. The materials removed will be utilized or disposed of as discussed in Section 2.4.1 of this application.

Upland excavation of approximately 11.5 miles of access roads will result in approximately 55,000 cubic yards of removed materials. The excavation of turbine foundation sites will result in approximately 3,000 cubic yards per turbine or 123,000 cubic yards for the 41 turbine sites. The turbines are all located in upland areas.

#### **6.6.8 ESTIMATED VOLUMES AND LOCATION OF RE-USED IN-CHANNEL AND UPLAND EXCAVATED MATERIALS**

HWF anticipates that the majority of material excavated during construction will be used as backfill at turbine sites or during construction of access roads and crane pads. Topsoil will be stockpiled separately from sub-soils and utilized in the reclamation of areas after construction is completed.

The Project collection system will be installed using a vibratory plow or trenching method in upland areas. The process causes minimal impact to the soils; all materials will be replaced as backfill into the opening. Bore pits excavated for the entrance and exit of the HDD components will be placed in upland areas. A typical bore pit is approximately 8 feet by 20 feet. Approximately 1600 cubic feet (60 cubic yards) of material may be excavated for each pit. Materials removed from bore pits will be used as backfill of the pit upon completion of the bore.

#### **6.6.9 OFF-SITE DISPOSAL PLANS FOR CONTAMINATED OR NON-CONTAMINATED MATERIALS**

HWF anticipates that the majority of material excavated during construction will be used as backfill during construction. Material not re-used in the construction process will be disposed of in upland areas as discussed in Section 2.4.1. If contaminated materials are encountered, they will be disposed of in a manner compliant with state and local regulations.

### **6.7 DEWATERING PLAN**

Dewatering activities may be necessary during the excavation of turbine foundations and digging of directional drill bore pits. Water pumped during these activities will be discharged into upland vegetated areas. The contractor awarded the construction contract will comply with the standards and methodologies as presented in the WDNR Technical Standard 1061.

#### **6.7.1 DEWATERING/DIVERSION OF FLOW**

Pumping of water during construction of turbine foundations and drill bore pits will be discharged into upland vegetated areas. The general guidelines that will be followed during these dewatering activities are as follows:

- Floats will be placed on pump intakes
- Discharges will be directed to upland vegetated areas
- Soils in the vicinity of the discharge point will be assessed before discharge
- Discharge outlets will be protected from scouring
- Topography between the discharge point and the nearest receiving waters will be evaluated for erosion potential
- No water will be discharged to karst features, wetlands or waterways
- Settling or filtration devices may include –
  - settling basins or tanks
  - filter bags
  - straw bales or gravel bag structures

Construction of Project access roads will impact six intermittent streams as identified during desktop reviews and field surveys. Field observations noted minimal standing water and/or minor flow associated with the features. Construction of culverts within these access roads may require temporary diversion of flow depending on the season of the year in which the construction is completed. Weather forecasts will be monitored in advance of these activities, and construction postponed if large rain or melt events are predicted.

Advanced dewatering techniques are not anticipated to be necessary during construction of the Project. The contractor will construct and maintain all dewatering BMP's necessary to comply with the discharge requirements contained in local or state permits, ordinances, and rules. The contractor will consult with the Project engineer before constructing a dewatering device.

#### **6.7.2 DOWNSTREAM IMPACT MINIMIZATION**

No downstream impacts to waterways are expected during Project construction. As noted in Section 6.7.1 all dewatering discharges will be made to vegetated upland areas. Waterways with planned culvert installations carry minimal flow and will be monitored so that construction activities are not performed during high flow events.

#### **6.7.3 ANALYSIS OF POSSIBLE SYSTEM OVERLOAD SCENARIOS**

As overload scenarios are not anticipated due to the limited flow of waterways near construction sites, no overload analyses were performed. If heavy rainfall or melt events are predicted, waterways will be monitored for possible near or overflow conditions. In the event that overflow conditions are likely, construction activities near the affected waterway will be postponed.

**6.7.4 IMPACTS OF SYSTEM OVERLOAD ON CONSTRUCTION ACTIVITIES AND WATER QUALITY**

HWF and its contractors will install erosion control devices and employ BMPs as described in the Stormwater and Erosion Control Plan (Attachment E of Appendix R). These devices will be properly maintained, deterring sediment flow into wetlands and waterways near construction sites.

Construction activities will be postponed during extreme rain events, though natural overflow conditions may still result in sediment flow from prior construction activities. In an effort to minimize impacts, sediment control devices will be inspected weekly for integrity, and also following precipitation events producing 0.5 inches or more of rainfall within a 24 hour period as outlined in WDNR Technical Standards.

**6.7.5 WATER DISCHARGE LOCATIONS**

Water discharging may be necessary at turbine foundation sites and bore pit locations. As these facilities are installed in upland locations, discharges will be made to nearby upland vegetated areas. No discharges will be made directly to wetlands or waterways; areas between discharge locations and sensitive resources will be assessed for infiltration capabilities.

Devices anticipated to be utilized include those listed in Section 6.7.1. Advanced sediment trapping practices are not anticipated; however, if needed the devices will comply with WDNR Technical Standards and be approved by the Project engineer.

**6.7.6 DETAILS OF A BACK-UP SYSTEM**

The primary dewatering device will be a gas-powered pumping system. Back-ups will include additional gas-powered pumps which will be stored on-site at the Project laydown yard.

**6.7.7 HIGH FLOW PLAN**

Due to the topography of the Project site and the low percentage of impervious area, flooding events are not anticipated. In the event of heavy rainfall, construction activities will be postponed. No turbines or bore pits are located in flood plains. Soil and material stockpiles will be located in upland areas away from mapped flood plains. In the unlikely event of storage areas being inundated with flood waters, the materials will be relocated by truck via public roads to an appropriate alternative site within the Project boundary.

No vehicles or construction equipment will be stored within flood conveyance channels. In the event of high precipitation or a high-flow period, equipment will be kept out of possible flood conveyance channels and stored at the Project laydown yard.

**6.7.8 CONTAMINATED WATER**

Due to the agricultural nature of the Project area, contaminated water is not expected to be encountered. If construction or agricultural activities cause a spill of hazardous fuels or if unexpected contamination is encountered the procedures outlined in the Project SPCC Plan will be followed. See

Section 2.4.5.2 for a discussion of the SPCC Plan. Contaminated water and/or soils will be disposed of in a manner compliant with state and local regulations.

Adequate supplies of containment materials will be kept at HDD bore sites to be used if a frac out event occurs. Written site specific contingency plans for a frac-out event will be developed and kept at the Project site.

## 7.0 AGRICULTURAL IMPACTS

### 7.1 INFORMATION ON ONGOING FARMING ACTIVITIES IN CONSTRUCTION AREAS

The Project is being constructed predominantly on agricultural lands. The construction activities will be performed in a manner to minimize disruption of concurrent farming activity to the extent practicable. Agricultural land that is temporarily impacted will be restored to pre-construction condition. Farm land that is compacted by heavy loads, such as crane paths will be de-compacted in accordance with BMPs for agricultural lands. Topsoil stripped from construction areas will be stockpiled and used to restore impacted lands to agricultural productivity.

#### 7.1.1 CURRENT CROPPING PATTERNS

Crops predominantly grown within the Project boundary include corn, soybean, hay, oats, alfalfa and wheat. Crops are generally rotated according to agricultural practices for the area. Spatial cropping patterns generally follow the contours of the land, with plow lines perpendicular to slope. The siting of turbines and associated access roads was performed with the intent of minimizing inconvenience to farming activities to the extent practicable. Access roads are often located along an existing farm road or along field edges, providing more convenient and reliable access to distant fields. The final location of facilities takes into consideration environmental and landowner concerns with final approval by the hosting land owner.

#### 7.1.2 LOCATION OF DRAINAGE TILE OR IRRIGATION SYSTEMS

The St. Croix County Farm Service Agency ("FSA") office in Baldwin, Wisconsin was contacted regarding the location of drain tiles within the Project boundary. Published maps of tiles were not available as of September 21, 2011. Individual land owners were consulted to gather relevant drain tile information; responses did not identify any known drain tile locations. As final construction activities are presented to land owners, additional drain tile information will be requested and recorded. Known drain tile locations in construction areas will be flagged and avoided to the extent practicable. Tiles determined to be damaged by construction activity will be repaired. Communication with the participating landowners will be maintained to ensure their satisfaction.

#### 7.1.3 FARMLAND PRESERVATION AGREEMENTS FOR PROPOSED SITES

Farmland Preservation Agreements ("FPA") exist for two landowners hosting Project facilities. Several conversations, one as recent as October 21, 2011, again confirmed steps needed to withdraw land from the FPA. Of the two landowners that currently have agreements, one of the agreements will expire at

the end of 2011 and the other in 2014. Before construction begins, HWF will contact these individuals well in advance to see what steps need to be taken to remove the remaining agreements and will follow the steps necessary to complete the process.

St. Croix County maintains a Farmland Preservation Plan that is set to expire in December, 2011. The county is in the process of developing a new plan that will be incorporated into the Comprehensive Plan for the County. The goal is to develop an integrated Agricultural and Farmland Preservation Plan that meets the State's requirements for certification.

Sources of Information:

[http://datcp.wi.gov/Programs/Agricultural\\_Resource\\_Management/index.aspx](http://datcp.wi.gov/Programs/Agricultural_Resource_Management/index.aspx)

[http://www.co.saint-croix.wi.us/index.asp?Type=B\\_BASIC&SEC={BED77BFD-EA74-421F-87E0-08E7115EB1AC}](http://www.co.saint-croix.wi.us/index.asp?Type=B_BASIC&SEC={BED77BFD-EA74-421F-87E0-08E7115EB1AC})

#### **7.1.4 CONSERVATION RESERVE PROGRAM LANDS INSIDE THE PROJECT BOUNDARY**

Due to privacy concerns, the USDA does not release the names of participants in the CRP program. Information can be released for individual properties with written permission by the land owner. HWF requested CRP participation information from the participating landowners involved in the Project and understands that there are several properties that have these agreements in place. Information has been received regarding the steps necessary to remove property from CRP. HWF will ensure all applicable properties are removed from CRP prior to construction, if required.

#### **ITEM 1.45 7.1.4 PROVIDE A GIS SHAPEFILE SHOWING THE LOCATIONS OF PROPERTIES ENROLLED IN THE CRP;**

Due to privacy concerns CRP information is released by the USDA only at the request of landowners; thus locations of CRP land within the Project boundary have been limited to participating lands only. GIS files are provided on the revised Data DVD for four (4) properties that contain CRP land near construction activities. Estimated extents of the land within the program have been mapped using communications with the USDA and landowners.

## **8.0 AIRPORTS AND LANDING STRIPS**

HWF researched multiple sources of aviation information to determine the location of public and private airports and airstrips within a ten-mile radius of the Project boundary. Additionally, attempts were made to determine if local land owners utilized crop dusting services within the Project boundary.

### **8.1 PUBLIC AIRPORTS**

The Federal Aviation Administration ("FAA") website<sup>11</sup> was searched for registered airport listings of public airports near the Project Site. Additionally, the Wisconsin Department of Transportation<sup>12</sup>

---

<sup>11</sup> FAA - [http://www.faa.gov/airports/airport\\_safety/airportdata\\_5010/](http://www.faa.gov/airports/airport_safety/airportdata_5010/)

("WisDOT") and several private sources of airport/airstrip information, such as Esri<sup>13</sup> and AirNAV<sup>14</sup> were searched. According to the sources listed there are no public airports within the Project boundary. The public airports within 10 miles of the Project include the following:

- Amery Municipal Airport (FAA Location ID AHH)
- Boyceville Municipal Airport (FAA Location ID 3T3)

The Amery Municipal Airport is approximately six miles from the Project boundary in the City of Amery, Polk County, Wisconsin. The airport serves the public with one asphalt runway 4000 feet in length, trending north/south. The distance from the end of the runway to the nearest turbine (WTG 12) is approximately 47,800 feet.

The Boyceville Municipal Airport is approximately 7.5 miles from the Project boundary in the Village of Boyceville, Dunn County, Wisconsin. The airport serves the public with one asphalt runway 3299 feet in length, trending east/west (40/220°). The distance from the end of the runway to the nearest turbine (WTG 12) is approximately 46,500 feet.

There are no public airports within 10,000 or 20,000 feet of any proposed turbine site.

Airports within a 10-mile radius of the Project are displayed on Figure 4.1-1 (Appendix L). A Shapefile of the airport data acquired is provided on the Data DVD, filed with this application.

## 8.2 PRIVATE AIRPORTS/GRASS LANDING STRIPS

The FAA, WisDOT and sources listed in Section 8.1 were searched for listings of private airports and airstrips within two miles of the Project. There are no registered private airports or airstrips listed within the Project boundary.

In addition to researching the above defined official listings of airports and airstrips, an attempt was made to identify single, privately owned, grass airstrips that may be used for local flying enthusiasts or crop dusters. Websites used by small aircraft operators were searched for possible locations near the Project<sup>15</sup>. Additionally, the area within the Project boundary and surrounding two miles were studied on current high resolution aerial photographs in an attempt to identify field-based areas for take-offs and landings. One possible grass airstrip in the Town of Clear Lake approximately one mile north of the Project boundary was identified through a WisDOT Polk County Map. The area was observed using current aerial photography and no landing strip could be identified. The airstrip is not registered with

---

<sup>12</sup> WisDOT - <http://www.dot.wisconsin.gov/travel/air/airportdirectory.htm>

<sup>13</sup> Esri - <http://www.esri.com/data/free-data/index.html>

<sup>14</sup> AirNav, LLC. <http://www.airnav.com/airports/>

<sup>15</sup> GlobalAir - [http://www.globalair.com/airport/Airports\\_in\\_Wisconsin.aspx](http://www.globalair.com/airport/Airports_in_Wisconsin.aspx); Great Circle Mapper - <http://www.gcmap.com/>.

the FAA or WisDOT. Assuming the location to be near the symbol on the Polk County map, the nearest turbine (WTG 4) is approximately 11,400 feet from the possible landing area.

A visible search of the Project area and surrounding two-mile radius utilizing 2010 aerial imagery identified one possible grass landing strip in the Town of Glenwood, NE ¼ of Section 3, Township 30N Range 15W. It is not registered with the FAA or WisDOT, nor listed on the websites searched for private airfields. The nearest turbine (WTG 45) is approximately one mile northeast the site.

**ITEM 1.46 8.2.4 DESCRIBE ANY MITIGATION MEASURES THAT WOULD BE USED TO ADDRESS PRIVATE AIRPORT OR AIRSTRIP IMPACTS;**

HWF has reviewed FAA and WisDOT listings for registered airports and airstrips and found none within the Project boundary. Visual and desktop research has also been completed in an attempt to identify any un-licensed airstrips that existed prior to this application. If, despite these efforts, an unregistered private airstrip currently exists within the Project boundary and was in active operation prior to the erection of HWF's met towers, HWF will perform an analysis to determine possible turbine impacts. The analysis will include mapping the approach zones and cones of ascent and descent from the edges of the airstrip. HWF will make a good-faith attempt to mitigate the impacts.

### **8.3 COMMERCIAL AVIATION**

There are no known, registered commercial air services operating within the Project boundary. Inquiries to local farmers concerning crop-dusting operators in the area revealed that crop dusting is not a preferred method of crop application in the area. No land owners were identified that use crop dusting services within the Project area.

The Wisconsin Department of Agriculture, Trade and Consumer Protection ("DATCP") and WDNR websites were searched for aerial application information. The Gypsy Moth control programs do not list St. Croix County as a current treatment or quarantine area. Heavy die-offs due to disease and spraying efforts have reduced egg masses and gypsy moth activity. Decreases in 2012 spraying efforts are anticipated.<sup>16</sup> No other aerial application programs sponsored by DATCP, WDNR or St. Croix County were located in the search.

### **8.4 FEDERAL AVIATION ADMINISTRATION**

The FAA regulates obstructions to navigable airspace (14CFR77.13(a)). Regulations state that the FAA Administrator must be notified of any structure whose : (1) height exceeds 200 feet above ground level or (2) exceeds an imaginary surface extending 20,000 ft (3.79 miles) from the nearest airport runway at a slope of 100:1 (horizontal: vertical). If the structure is within 10,000 ft (1.89 miles) of an airport whose longest runway does not exceed 3,200 ft, the slope is reduced to 50:1. As all turbines under consideration for the Project exceed 200 feet above the ground surface, FAA notification is required.

---

<sup>16</sup> WDNR - [http://dnr.wi.gov/news/DNRNews\\_article\\_Lookup.asp?id=1878](http://dnr.wi.gov/news/DNRNews_article_Lookup.asp?id=1878).



**ITEM 1.47 8.4 IDENTIFY THE PROVIDER OF AIR AMBULANCE SERVICES WITHIN THE PROJECT AREA. ALSO DESCRIBE ANY PLANNED MITIGATION MEASURES THAT WOULD BE USED TO ENSURE SAFE USE OF THOSE SERVICES AFTER CONSTRUCTION:**

HWF reached out to several surrounding communities EMS services to further understand services that are provided to the public. It is HWF's intent that when the Project begins construction through commissioning that it will not interrupt medical services and support to the area. HWF has already received FAA approval for each of the specified wind turbines and they will be marked with lighting that has been approved and specified. It is also the intent of HWF to personally visit and create "safe landing sites" with local EMS services before construction begins as they are professionals that know the area and best place(s) for transfer of patient if needed to an air ambulance. From our research at the time of this application Air Ambulance by Air Tek/ Life link/ and North Air are services that are available.

**8.4.1 COPIES OF ALL FAA DETERMINATIONS OF HAZARD/NO HAZARD**

HWF submitted FAA notifications for 46 turbine locations in September 2010. In September, 2011, 32 additional and/or revised notifications were submitted and four of the original 46 turbines were abandoned. In November, 2011 one alternate turbine site was abandoned and replaced with a new alternate site. The final count of turbine sites submitted to the FAA is 52 in locations described in this application. Copies of the final determinations for the final 52 turbines are included in Appendix S.

**8.4.2 STATUS OF FAA DETERMINATIONS**

HWF has received no-hazard determinations for all of the 52 proposed turbine sites. Copies of the determination letters are included in Appendix S.

**8.4.3 OBSTRUCTION MARKING AND LIGHTING REQUIRED BY FAA**

The FAA has determined the turbines within the array that require white paint and synchronized red lights. See Figure 8.4-1 within Appendix S for a summary of the FAA accepted lighting scheme.

**8.5 WISCONSIN DEPARTMENT OF TRANSPORTATION – HIGH STRUCTURE PERMITS**

Upon receipt of the no-hazard determinations from the FAA, WisDOT reviews the information to determine the need for Tall Structure Permits from the Bureau of Aeronautics (Wis. Stat. § 114.135; Wis. Admin Code § Trans 56).

**8.5.1 TURBINE SITES REQUIRING WISDOT HIGH STRUCTURE PERMITS**

All 52 proposed primary and alternate turbine sites for the Project require a WisDOT Permit to Erect Tall Structures. HWF provided information to WisDOT in September, 2010 and November, 2011 for the current Project turbines locations.

### **8.5.2 PERMIT STATUS AND CONDITIONS FOR EACH TURBINE SITE REQUIRING HIGH STRUCTURE PERMITS**

As of December, 2011 HWF has received the Tall Structure Permits from WisDOT for all Project turbines at the locations proposed within this application. Copies of the permits are included in Appendix S within the WisDOT Permit Application Section.

## **9.0 EMF**

HWF contracted with Raasch Engineers and Architects of Green Bay, Wisconsin to perform an analysis of the estimated magnetic profile of the proposed collector system for the Project. This analysis was to be performed per the PSCW requirements, as detailed in Section 9.1 (9.1.1 – 9.1.4) of the Filing Requirements.

Results of the analysis are summarized here; a copy of the complete EMF Study by Raasch is provided in Appendix I.

### **9.1 ESTIMATE OF MAGNETIC PROFILE CREATED BY COLLECTOR CIRCUITS**

Trenches that took feeds from more turbines showed higher EMF levels. Also, maximum EMF levels were found at or near the centerline of the trench. As far as the electric field strength is concerned, maximums were seen at four feet on either side of the trench centerline. The maximums ranged from 0.569 kV / meter for the single-turbine trenches to 1.154 kV / meter for the 41-turbine trench (MAIN 1). The maximum electric field values were very narrow in range; by 25 feet from the trench centerline, electric field strength was below 0.112 kV / meter and by 100 feet from the trench, electric field strength was 0.005 kV / meter or less. By way of comparison, the typical electric blanket gives off 0.250 kV / meter.

Magnetic field strength maximums were seen at trench centerlines and ranged from 0.200 milli-Gauss (mG) for the single-turbine trenches to 389.83 mG for the 41-turbine trench. Again, the highest magnetic field levels were found in very narrow ranges; by 25 feet from the trench centerlines, magnetic field strength was below 29 mG and by 100 feet from trench centerlines, magnetic field strength was below 2 mG. By way of comparison, the typical microwave gives off 60 mG and hair dryers can give off up to 700 mG.

Please see Appendix I for a copy of the complete analysis, report and profiles.

## **10.0 LINE-OF-SIGHT AND BROADCAST COMMUNICATIONS**

### **10.1 MICROWAVE COMMUNICATIONS**

HWF contracted with Comsearch to prepare a Wind Power GeoPlanner™ - Licensed Microwave Report that includes all of St. Croix County, Wisconsin. The report identifies 54 total microwave paths within the county, none of which intersect with the Project's turbine locations. This report can be found in its entirety in Appendix U.

**ITEM 1.48 10.1.2 LIST THE POTENTIAL IMPACTS AND MITIGATION MEASURES THAT WOULD BE USED TO CORRECT MICROWAVE COMMUNICATION INTERFERENCE IN BOTH THE DESIGN AND POST-CONSTRUCTION PHASES OF THE PROJECT:**

HWF contracted with Comsearch to prepare a Wind Power GeoPlanner™- Licensed Microwave Report that includes all of St. Croix County, Wisconsin. The report identifies 54 total microwave paths within the county, none of which intersect with the Project's turbine locations (Appendix U). HWF asked Comsearch to provide further confirmation that there would be no impacts between any of our mapped tower locations and any microwave beam paths. Please see their letter and map in Appendix U. Please note according to their letter, no mitigation measures are necessary because there are no potential obstructions. The impact wind turbines can create is the interruption of the beam path created by the rotating blades of the turbine. In the unlikely event such impacts occur the following are typical mitigation techniques: 1) Adjust the height of the antennae at either or both ends of the beam path, or 2) Increase the diameter of the affected beam path antennae. HWF will work with owners of an affected path found to be the result of turbine rotors intersecting a microwave beam path.

**ITEM 1.50 10.3.1 DESCRIBE WHETHER THE PROPOSED DEVELOPMENT IS LIKELY TO INTERFERE WITH ANY OF THE FOLLOWING DOPPLER WEATHER RADAR INSTALLATION;**

**-National Weather Service WSR-88D NEXRAD Doppler radar network installations within 150 miles 250 kilometers of the project boundary.**

**-Doppler radar installations operated by broadcast television stations with Federal Communications Commission authorized service areas that completely or partially include the project area;**

Please see Section 4.1.8.1 and Appendix U for Comsearch studies and analyses.

**10.2 TELEVISION INTERFERENCE**

An on-site Television ("TV") Broadcast Off-Air Reception Measurement was performed by Comsearch for the Project during the period of August 22-24, 2011 at fourteen test site locations. The W47CO-D TV tower was also audited due to its proximity to the Area of Interest ("AOI").

The purpose of these measurements was to identify and document Off-Air TV reception (TV channel) in the area. These measurements establish the conditions for the reception of each Off-Air TV channel by determining each TV channel signal strength reception level and by evaluating the video and audio quality at each selected test site. The purpose of the report is to document the results of these measurements. The analysis in the report is based upon the following:

- Video Quality Rating
- Code of Federal Regulations Title 47, Part 73, Section 73.685
- Television channels
- Type of reception: analog and digital
- Measured Centerline

The reports titled “TV Broadcast Off-Air Reception Measurement Report” and “Off Air TV Report” can be found in Appendix U.

After commercial operation any TV interference reports will be investigated. Any reports determined to be caused by the installation of wind turbines will be mitigated so as to provide the same level of coverage prior to the installation of the wind turbine facility. Mitigation methods may include:

- Installation of a high-gain TV antenna on a tower with rotors and preamplifier to boost the received signal level (at individual homes);
- If cable television exists, provide cable hookups to homes affected;
- Installation of a cable system to provide hookups to homes affected;
- Installation of a wireless TV distribution system, to provide TV channels to clusters of homes affected;
- Provide basic satellite TV reception service to homes affected; and
- Provide a satellite head end reception point with a cable distribution system to a cluster of homes near the head end.

### **10.3 OTHER COMMUNICATIONS SYSTEMS**

HWF also contracted with Comsearch to conduct a Radio Astronomy Report. The results found that no radio astronomy coordination zones intersect the AOI. The full Radio Astronomy Report can be found in Appendix U.

HWF also contracted Comsearch to do a Communication Tower Study. The study identified one tower structure in the Project area. Based on the search, the tower is located 876 meters (2,874 feet) from the closest proposed turbine. At this distance the cellular services on the tower should not be impacted. The full Communication Tower Study Report can be found in Appendix U.

HWF also contracted Comsearch to do a Mobile Phone Carrier Report. Communications in the mobile phone carrier bands are typically not affected by the presence of wind turbines. As stated in the report, HWF does not anticipate any significant harmful effect to the mobile phone services. In regard to the Verizon tower located inside the Project boundary, from an obstruction standpoint, no setback distance is required other than physical clearance of the blades. The full Mobile Phone Carrier Report can be found in Appendix U.

Finally, Comsearch contacted the National Telecommunications and Information Administration ("NTIA") who in turn notified federal agencies represented in the Interdepartment Radio Advisory Committee of plans for the Project. After a 45 day period of review, no federal agencies identified concerns regarding the blockage of radio frequency transmissions. A copy of the communication with the NTIA is included in Appendix U.

**ITEM 1.51 10.4.1.4 DESCRIBE MITIGATION MEASURES THAT WOULD BE USED SHOULD CELLULAR COMMUNICATIONS, RADIO BROADCAST, OR WIRELESS INTERNET INTERFERENCE OCCUR DURING PROJECT OPERATION;**

The three categories of telecommunications are cellular communications, radio broadcast and wireless internet. Cellular communications includes mobile phone services in the cellular frequency band (800 MHz), Personal Communication Services band (PCS) (1900 MHz) and the Advanced Wireless Services band (AWS) (1700/2100 MHz). Radio broadcast includes AM and FM station broadcasts. Wireless internet includes data and video systems in the 900, 2400, 2500, 3650 and 5800 MHz bands.

Cellular Telephone: Mitigation for lost mobile telephone coverage can be achieved through optimization of the closest base station to the area suffering the lost coverage. Optimization may include increasing the gain of the base station antennas or increasing transmitter power. Adding cell sites or even the turbine tower to service as the platform for a new cell or repeater site.

Broadcast Radio Coverage: The best mitigation for avoiding degradation to AM and FM broadcast stations coverage is to ensure that no wind turbines are constructed within 0.8 kilometers of an AM station's omni-directional antenna, within 3.2 kilometers of an AM station's directional antenna or within 4.0 kilometers of an FM station antenna. All of these conditions have been met for the HWF Project based on the FCC database search.

Wireless Internet: Mitigation may be necessary for wireless internet subscribers that have a wind turbine directly in their signal path causing attenuation of the signal. To mitigate any of these effects, the subscribers can move their directional antenna so that an unobstructed path to the original base station, or alternate base station, is obtained. In some cases, especially if there is only one base station, the wireless internet provider may have to construct additional base stations for those residences or businesses that have lost service. HWF would work with such providers to find a practical solution that resolves a challenge found to be the direct result of a wind turbine(s).

HWF will do a pre-and post-baseline evaluation of cell service in the immediate area per Comsearch 'standard protocol.

## 11.0 NOISE

Sound and vibration are generated by wind turbines during normal operation due to mechanical movements and rotating blades. Sound from the rotor movement is often described as a "swooshing" noise. Mechanical noise from turbines is generally associated with older models and has been nearly eliminated in modern machines. Sound diminishes with distance from the source and is also reduced by barriers, such as ground surfaces, shrubs, trees and buildings. Environmental factors and the state of the atmosphere also effect how sound travels and diminishes.

HWF researched the marketplace for turbine models with low sound emissions; specifically, those that take advantage of the latest technology in the Wisconsin wind-speed class. It was determined that these characteristics would fit favorably within the community and the surrounding agricultural

environment. The siting process then built on the turbine design considerations by modeling turbine locations that respect a 50 dBA sound level.

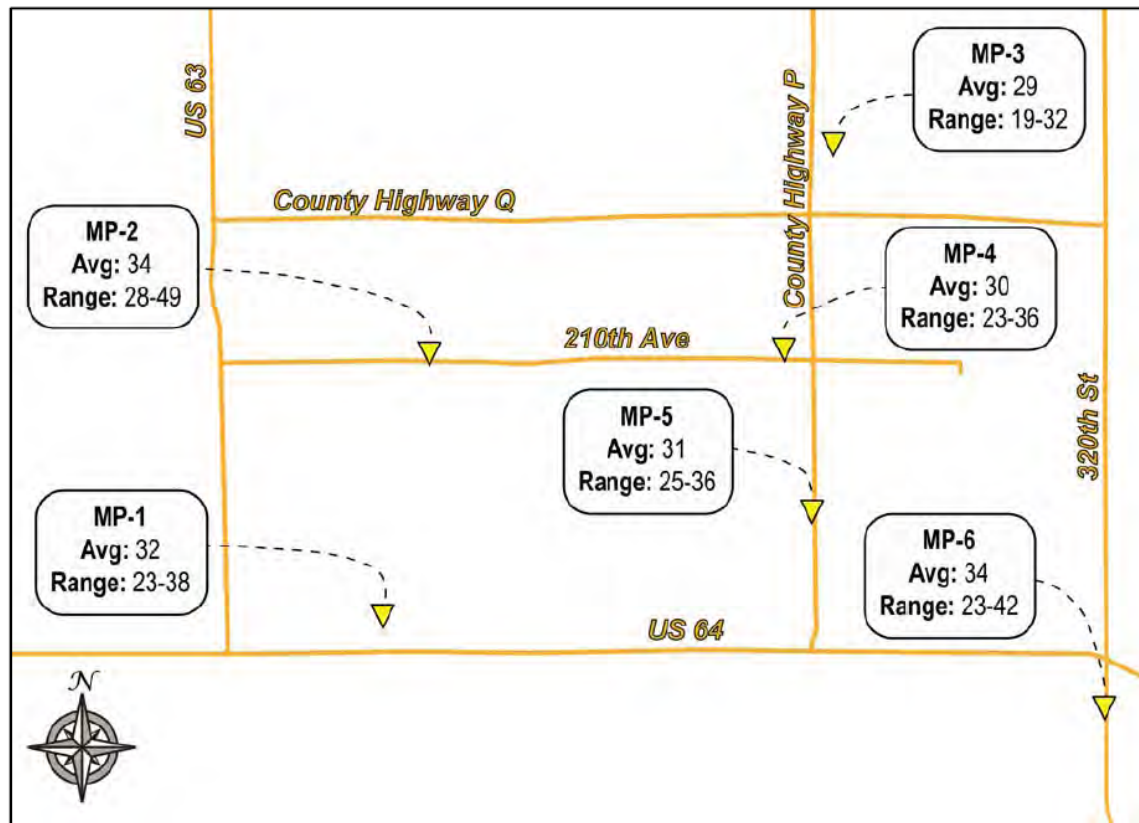
### **11.1 EXISTING NOISE MEASUREMENTS AND PROJECTED NOISE IMPACTS FROM PROJECT**

HWF contracted with Hankard Environmental and Stantec to study the existing sound levels within the Project boundary and provide projections of the sound impact on residents from the proposed wind turbines. The studies were performed under the guidance of the PSC; applying the standards and procedures outlined in the PSC document “Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Electric Power Plants” (PSC 2008b). Results of the studies are summarized below; the actual reports can be found in Appendix V.

Hankard Environmental has over 20 years of experience in conducting ambient sound surveys for power generation facilities, including six wind turbine projects. Sound level measurements were conducted at six locations shown in Figure 11.1-1 (below). The measurement locations were selected to be representative of the residences located closest to the proposed turbines. Measurements were taken at locations that will be generally downwind of the proposed turbines, and at locations that were set back from the nearest roadway in a manner similar to nearby residences. Each measurement location was visited eight times over the course of a two week period in late June – early July, 2011. Levels were measured for 10 minutes during each visit. Measurements were conducted during the different times of day specified by PSC guidelines, and under various ground wind conditions.

A summary of the measurement results is shown in Figure 11.1-1. The levels shown are the A-weighted (dBA) “L90”, which is a descriptor commonly used to define ambient sound level conditions. The A weighting network is designed to approximate the response of the human hearing system to noise at levels less than 55dBA. “L90” means background sound, defined over a continuous ten-minute period to be the average sound level during the quietest one continuous minute of the ten minutes. The term refers to sound that is normally present at least 90 percent of the time. Average L90 sound levels ranged from 29 to 34 dBA across the entire study area. This range is relatively narrow, and results from the fact that natural sources of sound, such as wind and birds, often dominate the audible landscape. Other, more intermittent, sources of sound found in the area include traffic (both distant and local), farming activity (tractors, fans). The lowest levels were observed on calm quiet evenings, while the louder levels are generally related to daytime traffic.

Two continuously operating monitors placed at MP2 and MP3 measured a range of sound levels similar to that of the attended measurements discussed above. The lowest sound levels occurred in the early morning hours, and generally ranged from 20 to 25 dBA. During the daytime, sound levels generally ranged from 30 to 40 dBA, with occasional levels from 40 to 50 dBA. Additionally, meteorological conditions were continuously measured and recorded at MP2 during the survey. Measured parameters include wind speed and direction, temperature, and relative humidity. The sound studies can be found in Appendix V.

**Figure 11.1-1 Measured Sound Levels ( $L_{90}$ , dBA)**

HWF contracted with Stantec to model turbine noise at full production using the manufacturer's power curves for the Nordex N100 and N117 turbines and the Siemens 2.3 turbine model using WindPro, an industry accepted software application that takes into consideration turbine sound output and attenuation of sound between the source and receptors. The model predicts that the sound level due to turbines at the outside of non-participating residents in the Project area does not exceed 50 dBA. The model results indicate that there are residences that may experience sound levels between 45 and 50 dBA from one of the three preferred turbine models being considered. Stantec also modeled the expected sound at the monitoring point locations described in the Hankard study (Figure 11.1-1). Summary tables and results of the Stantec study can be found in Appendix V.

**Item 1.55 11.0 Table 1 of Appendix V [sic] lists the non-participating residences that modeling shows predicted sound levels exceeding 45 dBA. Following that table is the sound level modeling results. The results show a predicted sound level for 401-NP of 45.5 dBA, yet that residence is not listed in Table 1. Reconcile this discrepancy and verify that Table 1 accurately lists all other residences that would exceed 45 dBA.**

Sound modeling was performed for three of the considered turbine models. The modeling was performed using a conservative approach with no attenuation of sound due to vegetation. Using these parameters, the predicted sound levels do not exceed 50 dBA at any non-participating residence. The

model indicates a number of residences that may exceed the 45 dBA sound level; however, the mitigation effect of vegetation during the summer months will likely diminish the sound to less than 45 dBA. A corrected list of non-participating residences (including land owner 401-NP) that exceed 45 dBA using the conservative “no-vegetation” model scenario is provided. See Sections 11.4 and 11.5 for a discussion of mitigation methods that will be employed should sound levels exceeding 45 dBA occur during summer evening hours. The corrected table can be found in Appendix V

### **11.2 COPIES OF ANY LOCAL NOISE ORDINANCE**

St. Croix County currently has no noise ordinances in effect. The Town of Forest recently passed the Wind Ordinance discussed in Section 5.6.2. The Wind Ordinance does contain noise standards. As noted previously, the Forest Wind Ordinance is not applicable to the Project. HWF is committed to limiting the noise at non-participating residences to 50 dBA.

### **11.3 TURBINE MANUFACTURERS DESCRIPTION OF NOISE ATTENUATING METHODS**

The turbines studied have had gradual reductions in the warranted sound signature due to fine tuning of operation since initial installments. The selection of materials for manufacture of nacelles and blades has evolved to the quietest known materials at this time.

References for Section 11:

Colby, D. W., R Dobie, G. Leventhall, D. Lipscomb, R. McCunney, M Seilo, B Sondergaard (2009). Wind Turbine Sound and Health Effects – An Expert Panel Review, December 2009

DeGagne, D., A. Lewis, C. May. Evaluation of Wind Turbine Noise, Prepared for Alberta Energy and Utilities Board, Calgary, AB.

PSC-Application Filing Requirements for Wind Energy Projects in Wisconsin (2008a). Version 4.5. Public Service Commission of Wisconsin and Wisconsin Dept. of Natural Resources, Dept. of Agriculture, Trade, and Consumer Protection, and Wisconsin Department of Transportation, August 2008.

PSC (2008b). Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Electric Power Plants, Public Service Commission of Wisconsin, November, 2008.

### **ITEM 1.52 11.4 DESCRIBE HOW NOISE COMPLAINTS WILL BE HANDLED AFTER CONSTRUCTION IS COMPLETE:**

All complaints concerning construction or operation of the Project, including noise, will be addressed as follows:

Citizens may communicate any complaint through:

1. A call in system will be in place where citizens can leave a voicemail. Voicemails will be checked daily; or
2. A website will be established where citizens can log any complaint or concern.



HWF will investigate any complaints or concerns expeditiously and, if necessary, perform any necessary mitigation. In the event the person lodging the complaint is dissatisfied with HWF's investigation/mitigation, he/she may appeal to a complaint committee composed of an equal number of participating and non-participating landowners.

**ITEM 1.53 11.5 DISCUSS ANY MITIGATION MEASURES THAT WOULD BE USED TO ADDRESS NOISE COMPLAINTS DURING THE OPERATION OF THE PROJECT:**

HWF plans to perform a post construction noise assessment per PSC protocol. In the event mitigation is necessary measures to be taken may include installing insulation or sound deadening material in the offending wind turbine(s), installing landscaping, insulation, and sound deadening material(s) at the residence; or changing the operation of the wind turbine(s) to reduce noise output.

**Item 1.54 Appendix V - Provide ArcGIS shapefiles for the anticipated sound level contours for each of the turbine models under consideration for the project;**

GIS files corresponding to the sound level contours for each of the turbine models under consideration are provided on the revised Data DVD.

## 12.0 SHADOW FLICKER

### 12.1 SHADOW FLICKER AT A TYPICAL WIND TURBINE SITE

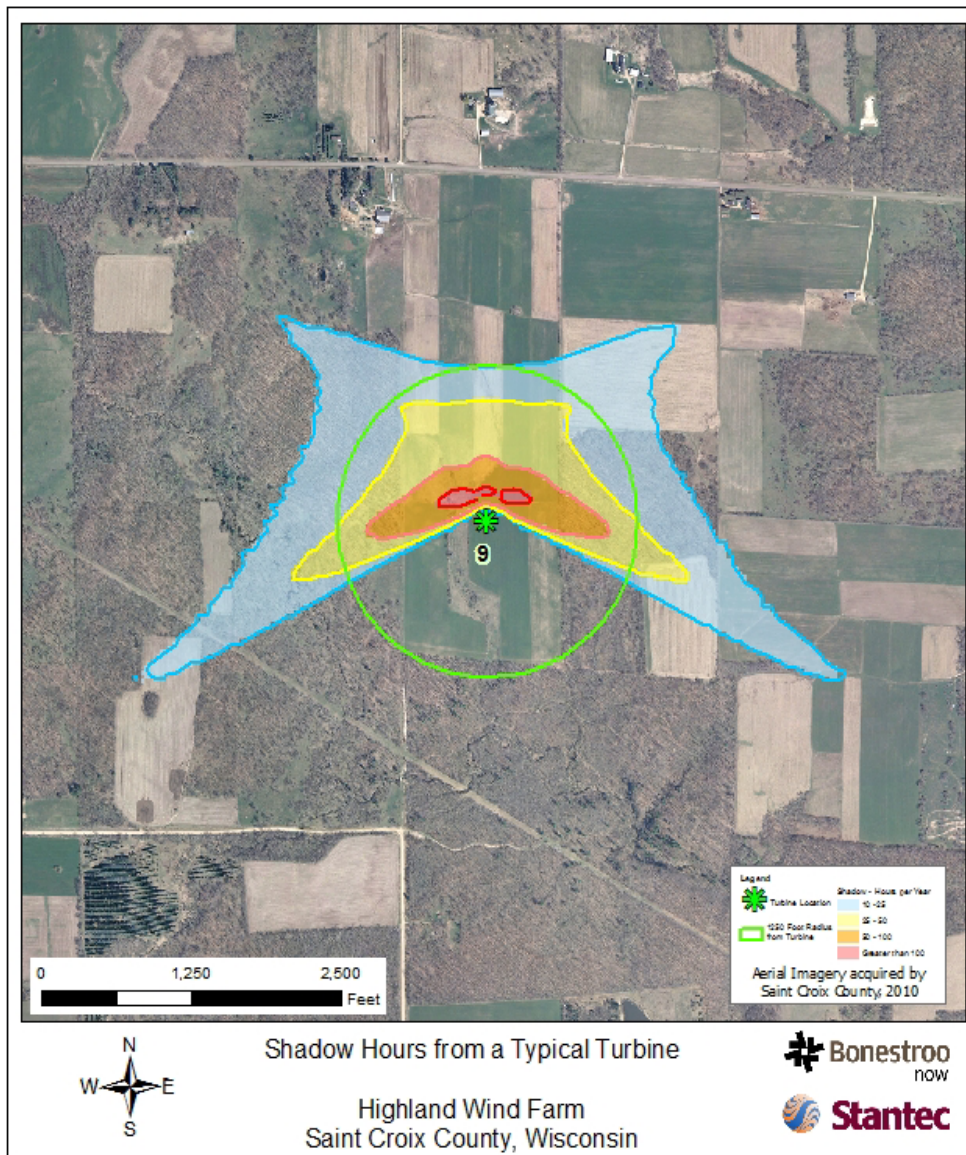
Shadow flicker occurs due to the position of a turbine's rotor blades in relation to the sun. It does not occur during cloudy periods or nighttime, and diminishes with distance of the receptor (residence) from the turbine. The amount of shadow impact on a residence is a function of numerous factors including position and distance from turbines. As seen on Figure 12.1-1 below areas to the northeast, northwest, southeast and southwest of a turbine have greater potential for impact at the latitude of the Project.

Shadow flicker can be modeled by taking into account the attributes of the wind turbine, the position of the turbines and receptors, typical climatic conditions and the position of the sun in the sky. Shadow flicker potential was modeled for the Project by Stantec, using WindPro, an industry accepted software application that takes the above factors into account. The software calculates potential shadow flicker at any given time of day throughout a calendar year. The information provided by the WindPro model was used to site the turbines in a manner to minimize potential impact to non-participating landowners and plan mitigation if needed. A copy of the Shadow Flicker Study is included in Appendix W. The report includes results for the predicted, cumulative shadow impact hours per year within the Project area for the three top turbine choices (Nordex N100, Nordex N117 and Siemens SWT 2.3-113). The model predicts that 11 non-participating residences may experience shadow on their homes greater than 30 hours per year from one of the three preferred turbine models. A summary table is provided in Appendix W.

**Item 1.56 Appendix W - Provide ArcGIS shapefiles for the anticipated hours of shadow flicker for both a single turbine and for the proposed project;**

GIS files corresponding to the shadow contours for each of the turbine models under consideration are provided on the revised Data DVD. Files for both a single turbine and the proposed Project as a whole are included.

Figure 12.1-1 shows a typical turbine (Nordex N100 - WTG 9) within the Project area. The shading represents areas of potential shadow flicker in hours per year. The result takes into consideration the reduction of sun-hours due to cloud cover, direction of blades and operational down-time. The green circle in the figure represents the 1250 foot setback distance used as a minimum distance to site a turbine from a non-participating residence. In this example, a home within the area shaded light blue area would have an estimated shadow impact of less than 25 hours per year; within the light yellow, the shadow impact would be less than 50 hours per year; within the orange, the impact would be less than 100 hours per year and within the red, the impact may be greater than 100 hours per year.

**Figure 12.1-1 Shadow Hours from a Typical Turbine**

## 12.2 MITIGATION AVAILABLE TO REDUCE SHADOW FLICKER

The location of each turbine and its surroundings were analyzed during the Project planning process in order to minimize shadow impact on non-participating residences and community buildings. Shadow impact imposed by individual turbines and turbines in aggregate were considered during the design phase.

If mitigation of shadow impact is necessary, HWF will work with the resident to provide an acceptable solution. Blocking vegetation; shades and blinds on windows; and ultimately curtailment of turbine operational hours are effective tools for mitigation.

### 12.3 INQUIRIES OR COMPLAINTS

HWF has shared shadow-potential analysis results at public meetings held near the Project site. Residents with concerns can contact HWF, and review the shadow model, and discuss the results. Additional analysis may be performed, expanding the evaluation to consider other factors; such as topography of surrounding land, orientation of the home and windows, existing barriers (trees and buildings) and number of turbines effecting the residence.

Detailed information available for discussion includes an individual shadow-potential figure similar to Figure 12.1-1 and a breakdown of the total shadow-potential hours each year. The breakdown includes:

Month, day and time of potential impact

Duration of impact in minutes

Graphical calendar summary displaying time-of-day and month of impact for each turbine

Mitigating factors

Complaints concerning shadow flicker will be handled via the complaint procedure discussed in Section 11.4.

## 13.0 LOCAL GOVERNMENT IMPACTS

### 13.1 JOINT DEVELOPMENT AND OTHER AGREEMENTS

The turbine array for the Project is situated entirely within the Town of Forest in St. Croix County, Wisconsin. While desktop studies to understand the area wind resources began in 2004, the first actual scouting trip took place in November, 2007.

In January, 2008 the Project developers attended a Town Board meeting in the Town of Forest to make their presence and intentions known to the community. Throughout the first quarter of 2008, EEW worked with the Town Board and Plan Commission in a series of publicly noticed meetings, to develop the Wind Development Agreement Resolution (2008-01). The purpose of the resolution was to create a set of guidelines that EEW could rely on to develop the Project. Action by the Town Board on the wind resolution was scheduled for the annual meeting in April in hopes that a greater representation of the community would be present. At the April 10, 2008 annual meeting the Wind Development Agreement Resolution (Appendix X) was approved by the action of the Town Board of the Town of Forest.

In May, 2008 the first tower was erected. In July, 2009 HWF was created and the Project so named. After sufficient wind data was collected, AWS Truepower was engaged to do the initial micrositing for the Project. Additional micrositing was performed by Stantec and a preliminary turbine layout was presented at a town meeting in August, 2010. At a meeting on August 12, 2010 the Resolution of Town of Forest Board of Supervisors (Authorizing Highland Wind Farm Development Agreement) (Appendix X) was voted on and passed (2-0) and the Wind Development Agreement was executed by the Forest Town

Board and HWF. On February 10, 2011 Driveway Permits were issued by the Town. On February 14th, 2011 the Town issued 40 Building Permits – one for each Turbine and the met tower.

A recall election on February 15, 2011 brought a new Town Board that was sworn in on February 18th, 2011. Less than one month later on March 17th, 2011 the new board attempted to rescind the Wind Development Agreement Resolution (2008-01), Resolution of Town of Forest Board of Supervisors (Authorizing Highland Wind Farm Development Agreement), Wind Development Agreement, Town Driveway Permits, and the Building Permits. On May 18, 2011 HWF filed a Notice of Claim and Claim with the Town of Forest putting the town on notice of potential legal claims surrounding the attempted rescission of agreements and permits for the Project. On August 11, 2011 the Town of Forest Town Board passed the Wind Ordinance previously described. HWF considers its agreements with the Town of Forest and permits issued for the Project by the Town to be in full force and effect. Notwithstanding HWF's legal rights pursuant to the Notice of Claim, issuance of a CPCN for the Project pursuant to state statutes will preempt the Wind Ordinance pursuant to Wis. Stat. § 196.491(3)(i).<sup>17</sup>

Appendix X contains copies of the Local Agreements and Resolutions obtained by HWF from January 2008 through the date of this application. Legal correspondence is also included in Appendix X. The documents include the following:

- Wind Development Agreement Resolution (2008-01)
- Resolution of Town Of Forest Board Of Supervisors (Authorizing Highland Wind Farm Development Agreement)
- Wind Development Agreement
- Legal Correspondence
- Town Board Resolutions Attempting to Rescind Permits and Agreements

**ITEM 1.57 13.1 DESCRIBE WHETHER ANY PORTIONS OF THE TOWN OF FOREST WIND DEVELOPMENT AGREEMENT DATED AUGUST 12, 2010 WOULD BE HONORED:**

HWF intends to adhere to the terms and conditions of the August 12, 2010 agreement in its entirety with the exception of provisions concerning payments to the town which will be pursuant to the Wisconsin Shared Revenue Plan that can be seen on Table 13.2-1.

**ITEM 1.58 13.2 PROVIDE DOCUMENTATION FOR ANY PUBLIC MEETINGS HELD IN THE PROJECT AREA PRIOR TO AUGUST 12, 2010.**

EEW made its first trip to the Project area in November, 2007, with a follow up trip announcing our presence to the Forest Town Board on January 10, 2008. Additional meetings with the Forest Town Plan Commission and Forest Town Board occurred and all meetings were properly noticed in the local paper and at the Forest Town Hall. Dates listed below are times that EEW made various presentations at the Forest Town Hall:

---

<sup>17</sup> Based on the existence of the preemption statute HWF has decided to forego the filing of a lawsuit against the Town of Forest.

1. January 10, 2008
2. February 7, 2008
3. March 6, 2008
4. March 13, 2008
5. April 3, 2008
6. April 10, 2008
7. March 11, 2010
8. August 12, 2010

Meeting minutes for these various meetings can be found in Appendix Z.

## **13.2 INFRASTRUCTURE AND SERVICE IMPROVEMENTS**

### **13.2.1 LOCAL GOVERNMENT INFRASTRUCTURE REQUIRED**

Neither the past nor present Town Boards in Forest have suggested any infrastructure or facility improvements needed for the construction or operation of the Project. It is expected that some turning radii will need to be temporarily changed for oversized deliveries. When such changes are necessary, HWF will follow good construction practices; stripping topsoil and stockpiling for use, laying down of road felt, delivering /grading /compacting stone to accommodate deliveries and ultimately restore such areas to preconstruction conditions. See Section 2.3.5 and Appendix G for additional detail on infrastructure improvements. HWF will coordinate the video taping of roads before, during, and at the conclusion of construction or of any major maintenance event. This video will assist HWF, St. Croix County and the Town of Forest in accurately assessing any possible damage to county and town roads. Any such damage will be repaired to at least original condition.

### **13.2.2 EFFECTS OF PROPOSED PROJECT ON CITY/VILLAGE/TOWN AND/OR COUNTY BUDGETS**

HWF does not anticipate any budget impacts to the Town of Forest during the construction cycle other than legal costs in the event that the Town of Forest chooses not to honor its agreements and issued permits.

### **13.2.3 ESTIMATE OF REVENUE TO LOCAL COMMUNITY**

State revenue sharing is funded by power companies through license fees (gross receipts tax). Shared revenue payments are tied to the MW capacity of power plants. If the power plant is located in a city or village, the municipality receives an annual payment equal to two-thirds of the plant's MW capacity multiplied by \$2,000. The county receives an annual payment equal to one-third of the plant's capacity multiplied by \$2,000. The two-third/one-third relationship is reversed if the power plant is built in a town (rather than a city or village). The annual payment may not exceed the municipality's population multiplied by \$300 or the county's population multiplied by \$100. Shared revenue payments are not distributed during construction; the payments begin after the plant is operational. Under the current formula, the payments would continue at the same level until the facility is decommissioned.

As a renewable energy installation there is also a \$1,000 per nameplate MW annual incentive payment to the town and the county.

**Table 13.2-1 Total Estimated Annual Payments To Affected County And Towns**

<b><u>SHARED REVENUE UTILITY PAYMENTS</u></b>
<i>(Formula provided by the Wisconsin Department of Revenue and Based on 102.5 MW installed nameplate capacity)</i>
Town of Forest Base Payment: \$2,000.00 per MW per year x 102.5 MW x 1/3 = \$68,333.33 per year
St Croix County Base Payment: \$2,000.00 per MW per year x 102.5 MW x 2/3 = \$136,666.67 per year
Total Base Payment to Town and County: \$205,000.00 per year
Town of Forest Incentive Payment: \$1,000.00 per MW per year x 102.5 MW = \$102,500.00 per year
St Croix County Incentive Payment: \$1,000.00 per MW per year x 102.5 MW = \$102,000.00 per year
Total Incentive Payment to Town and County: \$205,000.00 per year
<b>Total Shared Revenue Utility Payments to Town of Forest and St Croix County for turbines installed: \$410,000.00 per year</b>
In addition to the payments to the town and county listed above the owner of the substation will also make the following payments to St Croix County and The Town of Cylon for the substation located there, based on the Annual Net Book Value as follows: Town of Cylon 0.003 x Net Book Value St Croix County 0.006 x Net Book Value

#### 13.2.4 OTHER BENEFITS TO THE COMMUNITY

Benefits to the community and surrounding area include the possible hiring of Project construction, commissioning, operations and maintenance staff as discussed in Section 3.2. Additional jobs would be created to accommodate services, such as snow plowing, landscape maintenance, and Project access road maintenance. Other economic benefits not directly controlled by HWF include ancillary jobs and local support positions in areas such as food service, housing/lodging, hospitality, fuel, fuel delivery, sanitation, gravel, asphalt, road repair and other resource requirements.

## 14.0 LANDOWNERS AFFECTED AND PUBLIC OUTREACH

### 14.1 LISTS

A list of property owners and residents within the Project boundary is provided in Appendix Y. A list of schools and other government owned buildings is also provided in Appendix Y.

The following communities are located within the Project area, and thus may be directly affected by Project activities. The community name, clerk and phone number are provided in table 14.1-1. Excel

spreadsheets containing land owner lists, public property and clerks of affected municipalities are included in the Data DVD provided to the PSC.

**ITEM 1.59 14.1 \_PROVIDE A SEPARATE ALPHABETIZED LIST (NAMES AND ADDRESSES IN MS EXCEL FOR EACH OF THE GROUPS DESCRIBED BELOW:**

- **Property owners and residents within the project boundary, and a separate list of property owners and residents from the project boundary out to a distance of 1.0 mile.**
- **Public property, such as schools or other government land.**
- **Clerks of cities, villages, townships, counties, and Regional Planning Commissions directly affected.**
- **The main public library in each county in which the project is to be located. Also include public libraries near the project area.**

An MS Excel spreadsheet has been provided on the revised Data DVD that includes the following separate tables:

- Property Owners and residents within the Project boundary
- Property Owners and residents within one mile of the Project boundary
- Public property, such as schools or other government land within one mile of the Project boundary
- Clerks of cities, villages, townships, counties and Regional Planning Commissions (RPCs) directly affected

Public libraries near the Project including Hudson Public Library, New Richmond Public Library, Clear Lake Public Library, Glenwood City Public Library, Boyceville Public Library, Amery Public Library and Deer Park Public Library.

**Table 14.1-1 Clerks of Municipalities Directly Affected**

Municipality	Clerk Name	Phone Number
St Croix County	Cindy Campbell	(715) 386-4610
Town of Forest	Jennifer Anderson	(715) 688-9032
Cylon	Brenda Kaczmariski	(715) 269-5592
Glenwood	Amy Barstad	(715) 265-4352
Dunn Co.	Marilyn Hoyt	(715) 232-1677
Town of New Haven	Diane Duerst	(715) 643-2088



## **14.2 PUBLIC OUTREACH**

Throughout development of the project, HWF has taken a multi-faceted approach to maintaining communication with the public. These approaches include, but are not limited to:

- Public Meetings held at the Forest Town Hall
- Written mailings to participating and non-participating residences
- DVD mailing to all residences in the Forest Township
- Local newspapers
- One-on-one communication with landowners and area residences
- Website updates
- HWF Newsletters mailed to residents in the Township of Forest

Copies of the public outreach mailings are included in Appendix Z.

## **14.3 PLANS AND SCHEDULES FOR MAINTAINING COMMUNICATION WITH THE PUBLIC**

Throughout the final design and construction of the Project, HWF plans to continue to communicate with local residents. This includes Public Meetings, mailings and announcements in local newspapers, one-on-one communication and website updates. Upon completion of construction communication will be maintained by the full-time staff at the O&M building, as well as the owners or managers of HWF.

## **14.4 LOCAL MEDIA INFORMED ABOUT THE PROJECT**

HWF has utilized several local media outlets to disseminate Project information and upcoming events. Included are the following:

- New Richmond News
- Glenwood Tribune Press

These same local newspapers (New Richmond and Glenwood City) have reported on Project developments since its inception.

HWF will continue to utilize these outlets as one method of notifying the local community of planned events.