

STATE OF MINNESOTA
BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION

Katie Sieben
Joseph K. Sullivan
Audrey Partridge
Hwikwon Ham
John Tuma

Chair
Vice-Chair
Commissioner
Commissioner
Commissioner

IN THE MATTER OF WISCONSIN POWER AND LIGHT COMPANY'S SITE PERMIT APPLICATION FOR A LARGE WIND ENERGY CONVERSION SYSTEM OF UP TO 153 MW IN FREEBORN COUNTY, MINNESOTA	DOCKET NO. IP7145/WS-24-349
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DIRECT TESTIMONY OF MARCUS GALANTE

1 **I. INTRODUCTION AND QUALIFICATIONS**

2 **Q. Please state your name, business address, and current position.**

3 A. My name is Marcus Galante. I am employed by Alliant Energy Corporate Services
4 ("AECS"), a service company subsidiary of Alliant Energy Corporation ("Alliant
5 Energy"), as a Senior Renewables Development Specialist. My business address
6 is 500 East Court Avenue, Suite 300, Des Moines, Iowa 50309.

7 **Q. Who are you providing testimony on behalf of in this proceeding?**

8 A. I am testifying on behalf of Wisconsin Power and Light Company ("WPL" or "the
9 Company"), a wholly owned utility subsidiary of Alliant Energy. WPL is the applicant
10 for a site permit to construct and operate the proposed Bent Tree North Wind Farm
11 ("Bent Tree North" or "Project") in Freeborn County, Minnesota.

12 **Q. Please briefly describe your educational background and professional**
13 **experience.**

1 A. I hold a BBA (2009) and an MS in Business Analytics (2021) from The University
2 of Iowa, where I am also pursuing an MBA. I have over 18 years of experience in
3 the energy industry in a variety of roles including engineering, project
4 management, customer service, supply chain, operations, accounting and finance,
5 IT, and project development. Since 2022, I have focused on project development,
6 supporting evaluation, planning, and construction of self-developed and acquired
7 renewable energy generation projects spanning Iowa, Wisconsin, and Minnesota.

8 **Q. Have you testified in previous cases before the Minnesota Public Utilities**
9 **Commission (“Commission”)?**

10 A. I have not.

11 **Q. What is your role with respect to the Project?**

12 A. In my role, I provide project leadership to a cross-functional team that is engaged
13 in development of the Project. Primarily, I am responsible for critically assessing
14 all attributes of the Project, balancing development risks, managing Project costs,
15 engaging stakeholders, securing land rights and permits, and ensuring the Project
16 is positioned for successful construction and operation.

17 **Q. What is the purpose of your Direct Testimony?**

18 A. The purpose of my Direct Testimony is to: (1) provide an overview of the Project;
19 (2) provide information regarding a new turbine model that is under consideration
20 for the Project; (3) respond to comments from state agencies; (4) respond to public
21 comments about the Project; and (5) provide WPL’s comments and suggested
22 revisions to the Proposed Draft Site Permit that was issued by the Commission on
23 September 10, 2025.

1 **Q. What schedules are attached to your Direct Testimony?**

2 A. The following schedules are attached to my Direct Testimony:

- 3 • Schedule 1: Resume;
- 4 • Schedule 2: Noise Results for Proposed Nordex Turbines;
- 5 • Schedule 3: Shadow Results for Proposed Nordex Turbines;
- 6 • Schedule 4: Site Layout for Proposed Nordex Turbines;
- 7 • Schedule 5: Noise Isolines for Proposed Nordex Turbines;
- 8 • Schedule 6: Shadow Contours for Proposed Nordex Turbines;
- 9 • Schedule 7: Energy/Loss Register for Proposed Nordex Turbines;
- 10 • Schedule 8: Wind Turbine Characteristics; and
- 11 • Schedule 9: Table of Proposed Changes to Draft Site Permit.

12 **II. PROJECT OVERVIEW**

13 **Q. Please provide a brief overview of the Bent Tree North Project.**

14 A. The Project consists of an up to 153-megawatt (“MW”) wind farm, consisting of up
15 to 34 wind turbine generators (“WTGs”), on 38 possible locations, and associated
16 infrastructure and facilities including a Project substation, electrical collection lines,
17 access roads, crane paths, a laydown yard, Aircraft Detection Lighting System
18 (“ADLS”), and meteorological towers. The Project Area is approximately 26,046
19 acres of mostly agricultural land. Of this, approximately 22,592 acres are in
20 Freeborn County, approximately 2,312 acres are in Waseca County, and
21 approximately 1,142 acres are in Steele County. The portions of the Project Area
22 within Waseca and Steele Counties are required to satisfy wind access buffers -
23 no Project infrastructure or construction is proposed within these counties.

24 **Q. What is the expected construction schedule for the Project?**

1 A. Construction of the Project is anticipated to start in the third quarter of 2027 with a
2 commercial operations date in the fourth quarter of 2028.

3 **Q. Has WPL obtained the necessary property rights to construct the Project**
4 **within the proposed Project Area?**

5 A. Project participation remains excellent and, in terms of progress and standing,
6 WPL is working on finalizing any remaining agreements prior to title work beginning
7 this fall. We expect to have all land rights and complete all other real-estate activity
8 necessary to build the Project prior to commencing construction.

9 **III. PROJECT DESIGN UPDATE**

10 **Q. Has WPL updated or revised its proposed turbine for the Project since it filed**
11 **its Site Permit Application in April 2025?**

12 A. Yes. In the Site Permit Application, WPL stated it was proposing to use the Vestas
13 V136 turbine model with a 136-meter rotor diameter with hub heights ranging from
14 112 meters to 120 meters (368 feet to 394 feet), and total heights between 180
15 meters and 188 meters (591 feet and 617 feet). WPL is now also considering use
16 of the Nordex 4.8 MW-N133 turbine.

17 **Q. Can you provide a summary of the key characteristics of the Nordex turbine?**

18 A. Yes. As compared to the two Vestas turbine models included in the Site Permit
19 Application, the total height of the Nordex turbine is between the total heights of
20 the two Vestas turbine models. Below is an update to Table 5-3 from the Site
21 Permit Application that provides a summary of the key characteristics of the Nordex
22 turbine as compared to the two Vestas turbine models.

Table 1

Wind Turbine Characteristics

Design Feature	Nordex N133	Vestas V136 - 112	Vestas V136 -120
Nameplate Capacity (MW)	4.8	4.5	4.5
Total Height (m)	184.6 (606 feet)	180 (591 feet)	188 (617 feet)
Hub Height (m)	118 (387 feet)	112 (368 feet)	120 (394 feet)
Rotor Diameter (m)	133.2 (437 feet)	136 (446 feet)	136 (446 feet)
Cut-in Wind Speed (m/s)	3	3	3
Rated Capacity Wind Speed (m/s)	13.5	14.5	14.5
Cut-out Wind Speed (m/s)	28	32	32
Wind Swept Area (m2)	13,935	14,527	14,527
Rotor Speed (rpm)	6.5 – 13.0	5.6 – 14.0	5.6 – 14.0

1 **Q. Has WPL updated the sound and shadow flicker studies based on these new**
2 **proposed Nordex turbines?**

3 A. Yes. Please see attached Schedules 2, 3, 5, and 6. For the new proposed Nordex
4 turbine, alternate turbine locations are modeled to cause greater than 30 hours of
5 shadow flicker a year at eight receptors – this is the same as the Vestas V136 -
6 120 in the Site Permit Application. No exceedance is expected at receptors when
7 only the primary turbine locations are included in the modeling, regardless of the
8 turbine model selected. For noise, modeling results indicated the highest predicted
9 Project noise contribution is 44.7 dBA for Nordex 4.8 MW-N133. Like the Vestas

1 turbines, modeling indicates that the Nordex turbine would comply with state noise
2 standards. As such, no mitigation measures are planned at this time.

3 **Q. Would use of the Nordex turbine change the proposed layout for the Project?**

4 A. No, none of the turbine locations would move. However, because of the higher
5 capacity of the Nordex turbine, two of the primary locations would become
6 alternate locations as noted in attached Schedule 4.

7 **Q. Please discuss the environmental analysis that was conducted for this new
8 turbine model.**

9 A. As described in more detail in the Site Permit Application and related appendices,
10 numerous environmental surveys and studies were conducted for the Project,
11 including analyses related to wildlife and avian impacts, vegetation, wetlands and
12 waterbodies, cultural resources, visual resources, noise and shadow flicker, and
13 other resources. A Bird and Bat Conservation Plan (see Appendix G to the Site
14 Permit Application) was also developed. The environmental analysis conducted in
15 the Site Permit Application was based on the larger Vestas V136 - 120 turbine to
16 estimate the maximum acreage of impacts. Except for the noise and shadow
17 flicker modeling attached to my testimony, all of the environmental analyses
18 conducted for the Vestas turbine models in the Site Permit Application will apply to
19 the new Nordex turbine model. The new Nordex turbine model will have
20 comparable overall environmental impacts.

21 **Q. In your view, should this updated information change the analysis or
22 conclusions provided by Energy Infrastructure Permitting (“EIP”) staff in its
23 comments on the Draft Site Permit on August 4, 2025?**

1 A. As described above, both the Nordex and Vestas turbines comply with state
2 standards and guidelines for noise, shadow flicker, and setbacks. The Nordex and
3 Vestas turbines have comparable environmental impacts that are well addressed
4 by the requirements of the Draft Site Permit. For these reasons, I believe that EIP
5 staff’s analysis and conclusions are equally valid for the Nordex turbine as they
6 are for the Vestas turbines.

7 **IV. RESPONSE TO PUBLIC COMMENTS**

8 **Q. A public comment filed on August 1, 2025, raised concerns about the**
9 **potential impact of the Project on bats.¹ Do you have a response?**

10 A. WPL recognizes the importance of minimizing bat impacts in the development and
11 operation of the Bent Tree North Wind Farm, and will draw on its experience with
12 the existing Bent Tree Wind Farm. While the Project is estimated to have a typical
13 risk profile, WPL has committed to implementing a comprehensive Bird and Bat
14 Conservation Strategy (“BBCS”), developed in coordination with state and federal
15 agencies. WPL believes that the BBCS, which is included as Appendix G in our
16 Site Permit Application, fulfills the same purpose as the Minnesota Department of
17 Natural Resources’ (“MnDNR’s”) proposed Avian Bat Protection Plan (“ABPP”) and
18 looks forward to working with the MnDNR on any revisions to the BBCS. The plan
19 includes pre- and post-construction surveys, operational curtailment strategies
20 such as feathering turbine blades below cut-in speed during peak bat activity, and
21 avoidance of tree clearing from June 1 through August 15. Although, as EIP staff

¹ Comment by Thomas Schiltz (Aug. 1, 2025) (eDocket No. [20258-221676-01](#)).

1 notes in its comments, bat impacts occur at all wind farms in Minnesota, WPL
2 believes that the BBCS, along with the requirements of the Draft Site Permit, will
3 minimize risks to bats while also balancing other interests.

4 **Q. This same commentor also raised concerns about ice thrown from the**
5 **turbines. Do you have a response?**

6 A. Yes. WPL takes such concerns seriously. However, this is a very limited risk,
7 especially based on both the sophisticated operation of modern wind turbines and
8 the setbacks observed through the Project layout. We agree with the EIP staff
9 analysis and comments and the Draft Site Permit, including conditions regarding
10 ice throw.

11 **V. RESPONSE TO AGENCY COMMENTS**

12 **Q. Have you reviewed the comments from the MnDNR? If so, what is your**
13 **response to the MnDNR's comments on the proposed Project?**

14 A. Yes, WPL has reviewed the MnDNR's comments filed on July 9, 2025.² We
15 generally agree with the MnDNR's recommendations regarding proposed Site
16 Permit conditions. I note, however, that the MnDNR recommends that WPL work
17 with the MnDNR to develop an ABPP for the Project which, again, was previously
18 provided in Appendix G of the Site Permit Application as a BBCS. The BBCS
19 summarizes the studies conducted to assess the potential impacts to birds and
20 bats that may result from construction and operation of the Project. It also includes

² Comments (Minnesota Department of Natural Resources) (July 9, 2025) (eDocket No. [20257-220794-01](#)).

1 proposed post-construction monitoring and mitigation measures to address
2 potential avian and bat impacts.

3 The MnDNR also identified potential impacts of the proposed Project on
4 local snowmobile trails. The MnDNR recommends that the Project abide by certain
5 setback requirements from these trails and that WPL coordinates with local
6 snowmobile groups. WPL will work to coordinate with local snowmobile groups to
7 discuss the timing of construction activities that could impact snowmobile trails.
8 WPL has confirmed that our proposed site plan places all turbines at least 250 feet
9 from all existing snowmobile trails as required by the Draft Site Permit.

10 **Q. Have you reviewed the comments from the Minnesota Department of**
11 **Transportation (“MnDOT”)? If so, what is your response to the MnDOT’s**
12 **comments on the proposed Project?**

13 A. Yes, WPL has reviewed MnDOT’s comments filed on July 9, 2025,³ and is
14 committed to consult again with MnDOT later this fall to address their concerns
15 related to the Project’s collection line occupation of state trunk highway 13 at 325th
16 Street. Our site plan submitted in the Site Permit Application is preliminary and we
17 welcome MnDOT’s specific input to changes. Likewise, WPL is currently working
18 with the local counties and townships on establishing Operating Agreements to
19 memorialize the obligations and responsibilities for use of roads, drainage
20 systems, property management, and rights-of-way during construction and

³ Comments (Minnesota Department of Transportation) (July 9, 2025) (eDocket No. [20257-220773-01](#)).

1 operation of the project. This effort is to supplement the requirements in the Draft
2 Site Permit.

3 **Q. Have you reviewed the comments from LIUNA Minnesota and North Dakota**
4 **(“LIUNA”)? If so, what is your response to LIUNA’s comments on the**
5 **proposed Project?**

6 A. Yes, WPL has reviewed LIUNA’s comments filed on July 9, 2025.⁴ WPL remains
7 committed to working with labor unions, local subcontractors, and other vendors
8 to implement a Project construction staffing model that maximizes local hiring and
9 local economic benefits for the Project, while ensuring the Project is safely built on
10 time and on budget. WPL expects to utilize industry best practices and platforms
11 with respect to complying with prevailing wage requirements both with respect to
12 the State of Minnesota via the Draft Site Permit and available federal tax credits.

13 **VI. DRAFT SITE PERMIT**

14 **Q. Have you reviewed the Draft Site Permit issued by the Commission on**
15 **September 10, 2025?**

16 A. Yes.

17 **Q. Do you have any comments concerning the Draft Site Permit?**

18 A. Yes. WPL generally agrees that the Draft Site Permit contains reasonable and
19 appropriate conditions related to the construction and operation of the Project.
20 However, WPL requests that the Site Permit include the Nordex turbine currently
21 under consideration, in addition to the Vestas turbines described in the Draft Site

⁴ Comments (LIUNA) (July 9, 2025) (eDocket No. [20257-220819-01](#)).

1 Permit. See Schedule 9 for WPL's proposed changes to the following sections of
2 the Draft Site Permit: Section 1 (Site Permit), 2 (Project Description), and 4.9 (Wind
3 Turbines) to include the Nordex turbine.

4 WPL also requests certain changes to the Draft Site Permit to better reflect
5 the proposed Project and to facilitate WPL's compliance while maintaining the
6 intended protection for the environment, human impacts, land use, and energy
7 security.

8 **Q. What changes does WPL propose to the Draft Site Permit?**

9 A. WPL requests corrections to Section 2.1 (Associated Facilities), Section 3.0
10 (Designated Site), Section 4.7 (Native Prairie), and Section 4.9 (Wind Turbines).
11 WPL also proposes changes to Section 7.1 (Biological and Natural Resource
12 Inventories), Section 10.5 (Labor Statistic Reporting), and Section 10.9 (GPS
13 Data) to facilitate compliance. Schedule 9 summarizes WPL's proposed changes.

14 **Q. What changes are requested for Section 2.1?**

15 A. WPL requests two changes to Section 2.1. First, WPL proposes adding "Additional
16 O&M building" to the list of associated facilities. Second, WPL proposes to change
17 "Laydown Area (15 acres)" to "Laydown area (approximately 15 acres) and other
18 staging areas as necessary." This reflects our understanding that the lists of
19 associated facilities are intended to match the Site Permit Application. The
20 additional O&M building is described in Section 6.3.1 of the Site Permit Application
21 and laydown areas are described in Sections 6.3.5 Laydown Areas and 10.3 Other
22 Associated Facilities.

23 **Q. What changes does WPL propose to Section 3.0 of the Draft Site Permit?**

1 A. In Section 3.0 (Designated Site), WPL requests changing “no more than 50 acres”
2 to “no more than 63.3 acres”, to align with the permanent impacts identified in Table
3 8-1 of the Site Permit Application.

4 **Q. What changes does WPL propose to Section 4.7 of the Draft Site Permit?**

5 A. WPL requests clarification in Section 4.7 (Native Prairies) to reflect our
6 understanding that a Prairie Protection and Management Plan is only required if
7 the Project impacts native prairie. We request to add the words “and wind turbines
8 or associated facilities are located in a native prairie or construction activities
9 impacting native prairie” at the end of the first sentence of the second paragraph,
10 after the word “Site”.

11 **Q. What corrections are needed in Section 4.9?**

12 A In Section 4.9 (Wind Turbines), WPL proposes replacing “The towers may be up
13 to 120 meters (394 feet) above grade measured at hub height” with “The towers
14 may be up to 120 meters (394 feet) from the top of the pedestal measured at hub
15 height”. The change recognizes that the top of the turbine pedestal may be one to
16 three feet above grade, as described in 5.2.2.1 Turbine Foundation of WPL’s Site
17 Permit Application.

18 **Q. What changes does WPL propose to Section 7.1 of the Draft Site Permit?**

19 A. WPL requests two changes to Section 7.1 (Biological and Natural Resources
20 Inventories). First, WPL proposes to strike the words “and field” from the first
21 sentence. Second, WPL proposes to replace “within the Designated Site and
22 assess the presence of state- or federally-listed or threatened species” with “within
23 the Designated Site. The Permittee shall design and conduct pre- construction field

1 inventories of wetlands identified in the desktop inventory and shall assess such
2 areas for the presence of state- or federally-listed or threatened species.” These
3 changes would allow WPL to leverage the desktop inventories to more efficiently
4 complete field inventories. If the Commission prefers, WPL is open to adding more
5 resources, in addition to wetlands, for which we would perform a field inventory to
6 complement the desktop inventory. This would also clarify our understanding that
7 we need to assess for listed and threatened species in the inventoried areas, not
8 in the entire Designated Site.

9 **Q. What changes does WPL propose to Section 10.5 (Labor Statistic**
10 **Reporting)?**

11 A. As I noted above, WPL remains committed to working with labor unions and to
12 employing local labor to the extent feasible. With regard to the labor statistics
13 reporting required by Section 10.5 of the Draft Site Permit, WPL requests that the
14 requirement to report on workers who are residents of other states, but that
15 maintain a permanent residence within 150 miles of the Project, be removed. WPL
16 requests that this requirement be removed as it would be difficult for WPL to verify
17 whether a worker meets this definition.

18 In addition, WPL wishes to clarify that it proposes to rely on workers self-
19 reporting as Minnesota “residents” because WPL has not identified a feasible
20 means of independently verifying whether a worker meets all criteria listed in the
21 definition of Minnesota resident contained in Minn. Stat. § 290.01, subd. 7.

22 **Q. What changes does WPL propose to Section 10.9 of the Draft Site Permit?**

1 A. WPL requests extending the GPS data submission requirement in Section 10.9
2 (GPS Data) of the Draft Site Permit from 90 to 120 days post-construction. This
3 additional time ensures accurate validation of final turbine and infrastructure
4 locations, integration of as-built data, and coordination with survey and GIS teams.
5 The extension supports compliance with permit conditions while maintaining data
6 integrity for long-term monitoring and regulatory review.

7 **Q. Does WPL have any other changes to the Draft Site Permit?**

8 A. WPL proposes the following typographical and consistency changes.

9 In the document title, replace “Site Permit for Bent Tree Wind Farm” with
10 “Site Permit for Bent Tree North Wind Farm”.

11 In Section 1.0 (Site Permit), replace “consisting of 34” with “consisting of up
12 to 34” to be consistent with language elsewhere, e.g. in Section 2 (Project
13 Description).

14 In Section 2.1 (Associated Facilities), replace “Bath Plant” with “Batch
15 Plant”.

16 **Q. Please summarize the revisions WPL is requesting to the Draft Site Permit.**

17 A. WPL requests that the Commission revise the Draft Site Permit with the changes
18 shown in Schedule 9 to my testimony.

19 **VII. CONCLUSION**

20 **Q. Based on the analysis conducted to date, what actions do you recommend**
21 **the Commission take regarding the Site Permit for the Bent Tree North**
22 **Project?**

1 A. The Bent Tree North Wind Farm meets all applicable Commission siting
2 requirements, and it minimizes potential impacts to existing land uses, cultural
3 resources, natural resources, and existing infrastructure. The Project also has
4 strong landowner and community support and will provide significant economic
5 benefits to the local community and the state. Therefore, WPL respectfully
6 requests that the Commission issue a Large Wind Energy Conversion System Site
7 Permit for the Project.

8 **Q. Does this conclude your prepared Direct Testimony?**

9 A. Yes.

Marcus N. Galante

Professional Experience

Alliant Energy ▪ Des Moines, IA <i>Senior Renewable Generation Specialist (Sr. Project Developer)</i> , Resource Development	April 2025 to Current
MidAmerican Energy Company ▪ Iowa City, IA and Urbandale, IA <i>Project Developer</i> , Resource/Project Development	October 2022 to April 2025
<i>Analytics and BI Specialist 3/Product Manager</i> , IT-Data & Analytics	September 2021 to October 2022
<i>Operations Analyst</i> , Delivery Assurance & Strategic Planning/ Accounting System Support & Analytics	April 2016 to September 2021
<i>Key Account Manager</i> , Key Accounts	August 2012 to April 2016
Acciona Windpower NA ▪ West Branch, IA <i>Materials Planner/Buyer</i> , Post Sales Services-Materials	January 2010 to August 2012
<i>Materials Specialist</i> , Post Sales Services-Materials	August 2009 to January 2010
The University of Iowa ▪ Facilities Management ▪ Iowa City, IA <i>Engineering Support</i> , Utilities and Energy Management	October 2007 to August 2009
<i>Student Maintenance</i> , Operations & Maintenance	March 2005 to October 2007
The University of Iowa ▪ Pomerantz Career Center ▪ Iowa City, IA <i>Peer Advisor</i>	August 2008 to December 2008

Education

The University of Iowa ▪ Master of Business Administration	Target Completion May 2028
The University of Iowa ▪ Master of Science in Business Analytics	May 2021
The University of Iowa ▪ BBA - Management and Organizations	May 2009
The University of Iowa ▪ Career Leadership Academy	April 2009

Community Involvement and Other Activities

• Mentor, MidAmerican Energy Company	2024-2025
• City of Urbandale, Planning and Zoning Board Member	2018-2025
• The University of Iowa, Des Moines Graduate Student Association, VP of Professional Development	2019-2022
• Iowa City Area Chamber of Commerce, MidAmerican Member Representative	2013-2016
• Iowa City Area Development Group, MidAmerican Member Representative	2013-2016
• Cedar Rapids Metro Economic Alliance, MidAmerican Member Representative	2013-2016
• MidAmerican Energy Company Community Contact, Iowa City	2013-2016

Schedule 2: Noise Results for Proposed Nordex Turbines

	34-turbine layout	38-turbine layout
Max Level (dBA)	44.7	47.2
Exceedance count of 47 dBA	0	2

Receptor ID	Easting (m)	Northing (m)	Elevation AMSL (m)	Expected noise level of 34-turbine layout (dBA)	Expected noise level of 38-turbine layout (dBA)
R-003-NP	467,274	4,856,654	385.7	32.4	34.8
R-007-NP	470,686	4,856,546	384.2	30.6	33.7
R-008-NP	468,615	4,856,533	383.8	31.4	34.6
R-009-NP	467,261	4,856,529	392.3	33.0	35.4
R-010-NP	459,366	4,856,513	364.0	30.8	32.9
R-012-NP	465,479	4,856,414	383.2	32.9	35.0
R-013-NP	465,801	4,856,409	392.2	33.2	35.3
R-014-NP	464,044	4,856,316	378.7	31.3	33.4
R-015-NP	464,831	4,856,128	384.3	33.4	35.5
R-016-NP	470,382	4,856,046	390.0	33.3	36.5
R-018-NP	458,303	4,856,025	365.9	31.3	33.5
R-021-NP	470,436	4,855,904	389.8	34.2	37.4
R-022-NP	458,136	4,855,890	367.3	31.4	33.6
R-024-NP	459,562	4,855,803	369.2	34.6	36.7
R-026-NP	472,224	4,855,750	396.8	30.7	33.3
R-028-NP	466,119	4,855,651	392.0	37.3	39.4
R-030-NP	458,858	4,855,493	365.6	35.4	37.5
R-031-NP	465,273	4,855,428	389.0	38.5	40.5
R-032-NP	461,210	4,855,170	372.1	33.3	35.4
R-033-NP	463,607	4,855,169	384.4	33.4	35.5
R-034-P	467,901	4,855,164	388.1	40.6	42.9
R-035-P	468,978	4,855,134	387.2	35.7	42.7
R-037-P	470,970	4,855,116	389.8	42.6	44.9
R-038-NP	472,905	4,855,109	399.3	28.9	31.6
R-043-NP	469,792	4,854,953	389.2	38.5	44.7
R-044-P	465,621	4,854,894	390.9	42.4	44.4
R-045-NP	464,648	4,854,805	386.3	41.6	43.6
R-047-NP	461,221	4,854,699	373.1	34.3	36.3
R-048-NP	471,926	4,854,660	400.6	36.0	38.4
R-050-NP	471,932	4,854,594	401.0	35.9	38.3
R-051-NP	468,832	4,854,440	393.5	39.2	44.7
R-052-NP	471,847	4,854,412	396.0	36.5	38.9
R-054-NP	467,437	4,854,383	384.1	44.7	46.8
R-055-P	464,833	4,854,320	392.5	43.8	45.8
R-056-NP	458,131	4,854,313	370.2	37.4	39.5
R-057-NP	456,985	4,854,289	369.5	33.5	35.8
R-058-NP	456,672	4,854,281	366.8	32.4	34.7

Receptor ID	Easting (m)	Northing (m)	Elevation AMSL (m)	Expected noise level of 34-turbine layout (dBA)	Expected noise level of 38-turbine layout (dBA)
R-059-NP	471,921	4,854,255	389.0	35.3	37.8
R-061-P	470,149	4,854,226	390.5	41.6	45.9
R-062-P	470,448	4,854,216	386.4	43.5	46.2
R-063-P	467,432	4,854,167	387.2	44.3	46.4
R-064-NP	458,757	4,854,132	369.2	40.9	43.0
R-066-P	470,022	4,854,132	391.9	40.3	46.5
R-067-P	460,705	4,854,056	371.6	37.6	39.7
R-068-NP	456,154	4,853,961	368.4	31.3	33.8
R-070-P	457,582	4,853,945	370.0	37.8	39.9
R-071-NP	457,476	4,853,936	369.2	37.4	39.6
R-072-NP	459,419	4,853,877	378.6	42.6	44.7
R-073-NP	471,866	4,853,848	387.1	34.0	36.6
R-078-P	468,577	4,853,582	387.8	39.8	42.8
R-081-NP	461,525	4,853,440	380.1	35.2	37.3
R-082-NP	471,958	4,853,383	396.8	31.7	34.5
R-083-NP	456,156	4,853,362	366.5	32.4	35.1
R-085-P	461,339	4,853,316	376.1	35.9	37.9
R-086-NP	461,915	4,853,205	386.5	35.3	37.3
R-087-NP	467,469	4,853,048	393.5	40.2	42.4
R-089-NP	472,047	4,852,992	388.7	30.1	33.0
R-090-NP	463,792	4,852,966	389.7	38.0	40.0
R-093-NP	457,077	4,852,799	368.7	37.9	40.5
R-094-NP	458,827	4,852,757	378.0	42.1	44.3
R-099-NP	466,640	4,852,665	396.1	39.7	41.7
R-100-NP	461,310	4,852,664	378.0	36.7	38.8
R-101-P	460,401	4,852,660	378.5	41.7	43.7
R-102-P	463,440	4,852,660	389.7	38.8	40.9
R-103-P	464,877	4,852,658	395.7	41.1	43.1
R-104-P	469,709	4,852,649	388.7	34.8	38.4
R-105-NP	465,496	4,852,635	396.5	41.6	43.6
R-106-NP	461,571	4,852,634	383.6	36.6	38.7
R-107-NP	466,357	4,852,633	395.8	40.2	42.2
R-108-NP	465,576	4,852,625	394.7	41.6	43.6
R-110-P	467,417	4,852,545	386.8	38.7	40.8
R-111-NP	468,587	4,852,537	388.8	37.5	40.0
R-112-P	465,534	4,852,533	395.6	42.2	44.2
R-113-P	464,671	4,852,529	391.4	41.7	43.7
R-114-P	467,369	4,852,501	387.9	38.8	40.9
R-118-P	463,468	4,852,275	389.2	41.4	43.4
R-121-P	469,132	4,852,136	390.4	36.8	39.2
R-122-NP	461,728	4,852,030	386.3	39.3	41.4
R-123-P	462,539	4,851,924	382.9	43.6	45.6
R-124-NP	458,413	4,851,871	380.5	38.9	44.3
R-125-P	460,414	4,851,838	375.9	37.7	39.9
R-127-NP	455,838	4,851,738	369.5	35.2	38.2

Receptor ID	Easting (m)	Northing (m)	Elevation AMSL (m)	Expected noise level of 34-turbine layout (dBA)	Expected noise level of 38-turbine layout (dBA)
R-128-P	457,770	4,851,719	379.9	39.8	46.6
R-129-P	468,812	4,851,696	389.3	42.6	44.7
R-132-NP	461,655	4,851,552	387.1	41.5	43.5
R-135-P	458,763	4,851,467	377.4	39.7	43.7
R-136-NP	455,158	4,851,466	368.5	33.2	35.9
R-138-NP	469,680	4,851,397	391.1	33.5	36.0
R-139-NP	457,328	4,851,362	368.4	41.6	47.2
R-140-NP	456,794	4,851,323	369.2	42.0	45.9
R-141-NP	460,061	4,851,210	380.9	37.2	39.5
R-142-P	463,872	4,851,131	394.6	42.6	44.7
R-143-P	469,064	4,851,086	399.9	36.7	38.8
R-144-NP	467,096	4,851,057	394.5	40.9	42.9
R-145-P	467,924	4,851,048	391.0	38.8	40.9
R-146-NP	467,422	4,851,034	393.7	39.0	41.1
R-147-NP	464,005	4,851,034	395.5	41.9	43.9
R-148-NP	470,171	4,851,002	394.6	31.1	33.6
R-149-NP	469,898	4,850,989	389.9	32.0	34.4
R-152-NP	462,328	4,850,948	385.8	43.5	45.5
R-153-P	464,923	4,850,931	393.3	40.9	42.9
R-154-NP	469,239	4,850,862	393.0	34.5	36.7
R-155-P	459,614	4,850,833	381.4	39.0	41.4
R-156-NP	465,542	4,850,820	395.7	40.2	42.2
R-157-NP	460,425	4,850,811	380.8	36.7	39.0
R-158-P	468,022	4,850,804	390.5	37.4	39.4
R-159-P	466,167	4,850,796	396.8	40.7	42.8
R-160-P	468,541	4,850,773	391.2	36.9	39.0
R-161-P	461,395	4,850,748	384.9	38.1	40.2
R-162-P	464,614	4,850,738	395.8	40.0	42.0
R-163-NP	470,092	4,850,723	393.4	30.9	33.3
R-164-NP	458,335	4,850,683	378.2	44.5	47.2
R-165-NP	466,889	4,850,658	390.6	38.6	40.6
R-167-NP	455,863	4,850,559	372.5	40.0	42.4
R-170-NP	457,455	4,850,250	381.1	43.8	46.7
R-173-P	459,306	4,850,090	378.2	40.6	42.8
R-174-NP	467,682	4,850,042	393.3	34.7	36.8
R-175-NP	455,144	4,849,978	370.0	35.0	37.4
R-177-NP	456,729	4,849,881	379.0	43.9	46.2
R-178-NP	460,164	4,849,828	385.2	37.9	40.1
R-179-P	463,116	4,849,825	394.3	40.5	42.6
R-180-P	461,841	4,849,796	392.4	39.4	41.4
R-181-NP	462,563	4,849,723	396.0	40.4	42.4
R-182-NP	468,475	4,849,669	397.1	32.8	34.9
R-188-NP	458,746	4,849,447	384.2	40.7	42.9
R-196-NP	457,456	4,848,776	378.7	41.6	43.7
R-199-NP	456,062	4,848,677	379.2	41.1	43.2

Receptor ID	Easting (m)	Northing (m)	Elevation AMSL (m)	Expected noise level of 34-turbine layout (dBA)	Expected noise level of 38-turbine layout (dBA)
R-217-NP	456,087	4,847,814	376.5	34.9	37.0
R-253-NP	461,112	4,849,989	382.1	37.7	39.8
R-254-NP	460,873	4,849,909	388.2	37.7	39.8
R-255-NP	460,873	4,849,951	388.3	37.6	39.7
R-256-NP	460,824	4,849,954	387.7	37.6	39.7
R-257-NP	460,717	4,849,948	387.4	37.5	39.7
R-258-NP	460,675	4,849,947	387.1	37.5	39.7
R-259-NP	460,689	4,850,008	386.5	37.4	39.6
R-260-NP	460,724	4,850,007	387.1	37.4	39.6
R-261-NP	460,753	4,850,006	387.3	37.5	39.6
R-262-NP	460,784	4,850,006	387.3	37.5	39.6
R-263-NP	460,807	4,850,006	387.4	37.5	39.6
R-264-NP	460,877	4,850,022	386.6	37.5	39.6
R-265-NP	460,903	4,850,009	386.2	37.5	39.6
R-266-NP	460,937	4,850,015	384.7	37.5	39.6
R-267-NP	460,957	4,850,014	384.2	37.6	39.7
R-268-NP	460,977	4,850,014	383.7	37.6	39.7
R-269-NP	461,012	4,849,997	383.8	37.6	39.7
R-270-NP	460,634	4,850,014	386.7	37.4	39.5
R-271-NP	460,639	4,850,059	384.5	37.3	39.5
R-272-NP	460,552	4,850,058	382.3	37.3	39.5
R-273-NP	460,554	4,850,036	383.2	37.4	39.5
R-274-NP	460,593	4,850,084	381.7	37.3	39.4
R-275-NP	460,594	4,850,059	383.3	37.3	39.5
R-276-NP	460,640	4,850,105	381.9	37.3	39.4
R-277-NP	460,642	4,850,126	381.4	37.2	39.4
R-278-NP	460,553	4,850,112	380.4	37.3	39.4
R-279-NP	460,552	4,850,157	379.6	37.2	39.3
R-280-NP	460,592	4,850,130	380.2	37.2	39.4
R-281-NP	460,592	4,850,166	379.8	37.2	39.3
R-282-NP	460,641	4,850,172	380.8	37.2	39.3
R-283-NP	460,639	4,850,152	381.0	37.2	39.3
R-284-NP	460,684	4,850,177	381.3	37.2	39.3
R-285-NP	460,721	4,850,172	382.2	37.2	39.3
R-286-NP	460,737	4,850,172	382.8	37.2	39.3
R-287-NP	460,782	4,850,112	386.4	37.3	39.4
R-288-NP	460,728	4,850,114	384.8	37.3	39.4
R-289-NP	460,713	4,850,112	384.1	37.3	39.4
R-290-NP	460,697	4,850,112	383.5	37.3	39.4
R-291-NP	460,683	4,850,112	382.9	37.3	39.4
R-292-NP	460,690	4,850,071	384.5	37.3	39.5
R-293-NP	460,723	4,850,073	385.6	37.3	39.5
R-294-NP	460,762	4,850,073	386.4	37.3	39.5
R-295-NP	460,572	4,850,217	378.0	37.1	39.3
R-296-NP	460,606	4,850,217	378.8	37.1	39.3

Receptor ID	Easting (m)	Northing (m)	Elevation AMSL (m)	Expected noise level of 34-turbine layout (dBA)	Expected noise level of 38-turbine layout (dBA)
R-297-NP	460,694	4,850,222	380.6	37.1	39.3
R-298-NP	460,731	4,850,219	381.3	37.1	39.3
R-299-NP	460,758	4,850,218	382.0	37.1	39.3
R-300-NP	460,645	4,850,283	379.8	37.0	39.2
R-301-NP	460,645	4,850,317	380.5	37.0	39.2
R-302-NP	460,693	4,850,312	381.6	37.0	39.2
R-303-NP	460,701	4,850,286	381.5	37.0	39.2
R-304-NP	460,700	4,850,274	381.4	37.0	39.2
R-305-NP	460,646	4,850,349	381.0	37.0	39.1
R-306-NP	460,645	4,850,377	381.3	36.9	39.1
R-307-NP	460,686	4,850,379	381.1	36.9	39.1
R-308-NP	460,692	4,850,342	381.3	37.0	39.1
R-309-NP	460,729	4,850,385	380.2	36.9	39.1
R-310-NP	460,759	4,850,383	379.9	37.0	39.1
R-311-NP	460,787	4,850,383	379.7	37.0	39.1
R-312-NP	460,638	4,850,440	381.7	36.9	39.1
R-313-NP	460,829	4,850,390	379.6	37.0	39.1
R-314-NP	460,825	4,850,350	379.8	37.0	39.2
R-315-NP	460,823	4,850,330	380.4	37.0	39.2
R-316-NP	460,819	4,850,291	380.8	37.1	39.2
R-317-NP	460,826	4,850,244	382.6	37.1	39.3
R-318-NP	460,873	4,850,216	384.8	37.2	39.3
R-319-NP	460,872	4,850,251	383.5	37.2	39.3
R-320-NP	460,869	4,850,266	382.8	37.1	39.3
R-321-NP	460,865	4,850,278	382.1	37.1	39.2
R-322-NP	460,872	4,850,291	381.3	37.1	39.2
R-323-NP	460,871	4,850,323	380.9	37.1	39.2
R-324-NP	460,872	4,850,348	380.5	37.1	39.2
R-325-NP	460,870	4,850,372	380.3	37.0	39.2
R-326-NP	460,871	4,850,386	380.1	37.0	39.2
R-327-NP	460,822	4,850,430	379.2	37.0	39.1
R-328-NP	460,868	4,850,426	379.8	37.0	39.1
R-329-NP	460,911	4,850,379	380.7	37.1	39.2
R-330-NP	460,936	4,850,386	380.9	37.1	39.2
R-331-NP	460,957	4,850,386	381.2	37.1	39.2
R-332-NP	460,968	4,850,386	381.3	37.1	39.2
R-333-NP	460,886	4,850,428	379.9	37.0	39.1
R-334-NP	460,914	4,850,428	380.2	37.0	39.2
R-335-NP	460,929	4,850,427	380.6	37.0	39.2
R-336-NP	460,950	4,850,430	380.9	37.1	39.2
R-337-NP	461,005	4,850,422	381.6	37.1	39.2
R-338-NP	460,968	4,850,283	381.6	37.2	39.3
R-339-NP	460,969	4,850,254	381.9	37.2	39.3
R-340-NP	460,954	4,850,213	382.7	37.3	39.4
R-341-NP	460,919	4,850,213	384.3	37.2	39.3

Receptor ID	Easting (m)	Northing (m)	Elevation AMSL (m)	Expected noise level of 34-turbine layout (dBA)	Expected noise level of 38-turbine layout (dBA)
R-342-NP	460,959	4,850,178	382.9	37.3	39.4
R-343-NP	460,945	4,850,171	383.3	37.3	39.4
R-344-NP	460,930	4,850,173	383.9	37.3	39.4
R-345-NP	460,914	4,850,174	384.6	37.3	39.4
R-346-NP	460,692	4,850,528	379.0	36.8	39.0
R-347-NP	460,694	4,850,573	378.4	36.8	39.0
R-348-NP	460,749	4,850,528	378.2	36.9	39.0
R-349-NP	460,788	4,850,579	378.5	36.9	39.0
R-350-NP	460,789	4,850,528	378.4	36.9	39.0
R-351-NP	460,820	4,850,578	378.6	36.9	39.0
R-352-NP	460,820	4,850,529	378.5	36.9	39.0
R-353-NP	460,875	4,850,528	379.3	36.9	39.1
R-354-NP	460,912	4,850,527	379.7	37.0	39.1
R-355-NP	460,942	4,850,574	379.2	37.0	39.1
R-356-NP	460,966	4,850,578	379.5	37.0	39.2
R-357-NP	460,959	4,850,528	379.9	37.0	39.2
R-358-NP	460,922	4,850,477	380.0	37.0	39.1
R-359-NP	460,906	4,850,477	379.9	37.0	39.1
R-360-NP	460,959	4,850,475	380.1	37.1	39.2
R-361-NP	461,080	4,850,367	382.5	37.3	39.4
R-362-NP	461,240	4,850,431	383.7	37.5	39.6
R-363-NP	461,262	4,850,431	382.8	37.5	39.6
R-364-NP	461,218	4,850,378	385.7	37.4	39.5
R-365-NP	461,254	4,850,379	383.9	37.5	39.6
R-366-NP	461,222	4,850,325	384.0	37.5	39.6
R-367-NP	461,172	4,850,336	384.9	37.4	39.5
R-368-NP	461,183	4,850,285	383.0	37.4	39.5
R-369-NP	461,138	4,850,287	382.2	37.4	39.5
R-370-NP	461,153	4,850,163	381.3	37.5	39.6
R-371-NP	461,196	4,850,166	381.6	37.6	39.7
R-372-NP	461,222	4,850,158	381.7	37.6	39.7
R-373-NP	460,510	4,855,205	377.1	36.4	38.4
R-374-NP	458,120	4,847,906	380.6	38.7	40.8

Schedule 3: Shadow Results for Proposed Nordex Turbines

Realistic Shadow Flicker (hrs/year)	# Receptors	
	34-turbine layout	38-turbine layout
0	162	161
0 to 5	36	31
5 to 10	21	19
10 to 15	9	9
15 to 20	7	8
20 to 25	8	7
25 to 30	7	7
30 +	0	8

Receptor ID	Easting (m)	Northing (m)	Elevation AMSL (m)	Realistic shadow of 34-turbine layout (hrs/yr)	Realistic shadow of 38-turbine layout (hrs/yr)
R-003-NP	467,274	4,856,654	385.7	0:00	0:00
R-007-NP	470,686	4,856,546	384.2	0:00	0:00
R-008-NP	468,615	4,856,533	383.8	0:00	0:00
R-009-NP	467,261	4,856,529	392.3	0:00	0:00
R-010-NP	459,366	4,856,513	364.0	0:00	0:00
R-012-NP	465,479	4,856,414	383.2	0:00	0:00
R-013-NP	465,801	4,856,409	392.2	0:00	0:00
R-014-NP	464,044	4,856,316	378.7	0:00	0:00
R-015-NP	464,831	4,856,128	384.3	0:00	0:00
R-016-NP	470,382	4,856,046	390.0	0:00	0:00
R-018-NP	458,303	4,856,025	365.9	0:00	0:00
R-021-NP	470,436	4,855,904	389.8	0:00	0:00
R-022-NP	458,136	4,855,890	367.3	0:00	0:00
R-024-NP	459,562	4,855,803	369.2	0:00	0:00
R-026-NP	472,224	4,855,750	396.8	0:00	0:00
R-028-NP	466,119	4,855,651	392.0	2:56	2:56
R-030-NP	458,858	4,855,493	365.6	0:17	0:17
R-031-NP	465,273	4,855,428	389.0	0:00	0:00
R-032-NP	461,210	4,855,170	372.1	1:55	1:55
R-033-NP	463,607	4,855,169	384.4	2:05	2:05
R-034-P	467,901	4,855,164	388.1	21:41	23:45
R-035-P	468,978	4,855,134	387.2	3:21	18:38
R-037-P	470,970	4,855,116	389.8	11:54	13:05
R-038-NP	472,905	4,855,109	399.3	0:00	0:00
R-043-NP	469,792	4,854,953	389.2	14:10	34:26

Receptor ID	Easting (m)	Northing (m)	Elevation AMSL (m)	Realistic shadow of 34-turbine layout (hrs/yr)	Realistic shadow of 38-turbine layout (hrs/yr)
R-044-P	465,621	4,854,894	390.9	28:27	28:27
R-045-NP	464,648	4,854,805	386.3	27:40	27:40
R-047-NP	461,221	4,854,699	373.1	2:19	2:19
R-048-NP	471,926	4,854,660	400.6	7:07	7:07
R-050-NP	471,932	4,854,594	401.0	7:57	7:57
R-051-NP	468,832	4,854,440	393.5	6:19	42:38
R-052-NP	471,847	4,854,412	396.0	17:24	17:24
R-054-NP	467,437	4,854,383	384.1	5:36	5:36
R-055-P	464,833	4,854,320	392.5	26:29	26:29
R-056-NP	458,131	4,854,313	370.2	4:09	4:09
R-057-NP	456,985	4,854,289	369.5	0:00	0:00
R-058-NP	456,672	4,854,281	366.8	0:00	0:00
R-059-NP	471,921	4,854,255	389.0	22:37	22:37
R-061-P	470,149	4,854,226	390.5	18:38	41:48
R-062-P	470,448	4,854,216	386.4	2:49	16:42
R-063-P	467,432	4,854,167	387.2	7:51	7:51
R-064-NP	458,757	4,854,132	369.2	19:42	19:42
R-066-P	470,022	4,854,132	391.9	16:30	36:50
R-067-P	460,705	4,854,056	371.6	14:54	14:54
R-068-NP	456,154	4,853,961	368.4	0:00	0:00
R-070-P	457,582	4,853,945	370.0	4:48	4:48
R-071-NP	457,476	4,853,936	369.2	3:49	3:49
R-072-NP	459,419	4,853,877	378.6	9:31	9:31
R-073-NP	471,866	4,853,848	387.1	4:30	4:30
R-078-P	468,577	4,853,582	387.8	28:40	31:03
R-081-NP	461,525	4,853,440	380.1	1:25	1:25
R-082-NP	471,958	4,853,383	396.8	0:00	0:00
R-083-NP	456,156	4,853,362	366.5	1:47	1:47
R-085-P	461,339	4,853,316	376.1	2:18	2:18
R-086-NP	461,915	4,853,205	386.5	0:00	0:00
R-087-NP	467,469	4,853,048	393.5	0:00	0:00
R-089-NP	472,047	4,852,992	388.7	0:00	0:00
R-090-NP	463,792	4,852,966	389.7	0:00	0:00
R-093-NP	457,077	4,852,799	368.7	18:42	18:42
R-094-NP	458,827	4,852,757	378.0	22:44	22:44
R-099-NP	466,640	4,852,665	396.1	6:36	6:36
R-100-NP	461,310	4,852,664	378.0	5:41	5:41
R-101-P	460,401	4,852,660	378.5	11:18	11:18
R-102-P	463,440	4,852,660	389.7	5:59	5:59
R-103-P	464,877	4,852,658	395.7	0:57	0:57
R-104-P	469,709	4,852,649	388.7	2:38	2:38

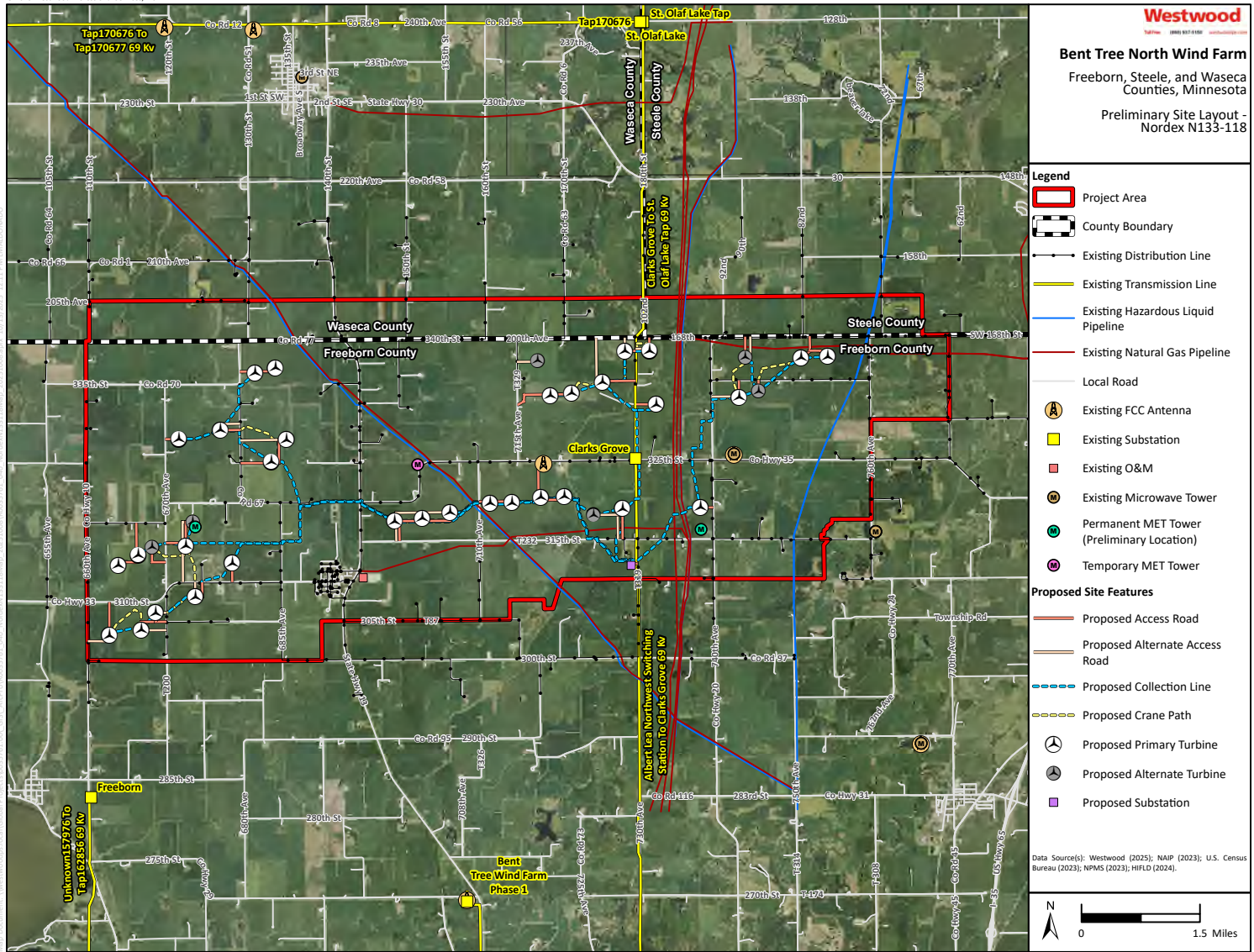
Receptor ID	Easting (m)	Northing (m)	Elevation AMSL (m)	Realistic shadow of 34-turbine layout (hrs/yr)	Realistic shadow of 38-turbine layout (hrs/yr)
R-105-NP	465,496	4,852,635	396.5	7:07	7:07
R-106-NP	461,571	4,852,634	383.6	2:03	2:03
R-107-NP	466,357	4,852,633	395.8	3:05	3:05
R-108-NP	465,576	4,852,625	394.7	8:47	8:47
R-110-P	467,417	4,852,545	386.8	1:45	1:45
R-111-NP	468,587	4,852,537	388.8	0:00	0:00
R-112-P	465,534	4,852,533	395.6	11:38	11:38
R-113-P	464,671	4,852,529	391.4	9:23	9:23
R-114-P	467,369	4,852,501	387.9	5:25	5:25
R-118-P	463,468	4,852,275	389.2	22:57	22:57
R-121-P	469,132	4,852,136	390.4	10:22	10:22
R-122-NP	461,728	4,852,030	386.3	7:35	7:35
R-123-P	462,539	4,851,924	382.9	23:45	23:45
R-124-NP	458,413	4,851,871	380.5	0:25	19:03
R-125-P	460,414	4,851,838	375.9	0:00	0:00
R-127-NP	455,838	4,851,738	369.5	3:42	6:06
R-128-P	457,770	4,851,719	379.9	0:00	48:10
R-129-P	468,812	4,851,696	389.3	28:33	28:33
R-132-NP	461,655	4,851,552	387.1	25:54	25:54
R-135-P	458,763	4,851,467	377.4	6:07	19:26
R-136-NP	455,158	4,851,466	368.5	2:42	2:42
R-138-NP	469,680	4,851,397	391.1	3:43	3:43
R-139-NP	457,328	4,851,362	368.4	18:49	36:36
R-140-NP	456,794	4,851,323	369.2	4:24	35:42
R-141-NP	460,061	4,851,210	380.9	2:31	2:31
R-142-P	463,872	4,851,131	394.6	10:52	10:52
R-143-P	469,064	4,851,086	399.9	0:00	0:00
R-144-NP	467,096	4,851,057	394.5	23:17	23:17
R-145-P	467,924	4,851,048	391.0	12:22	12:22
R-146-NP	467,422	4,851,034	393.7	9:50	9:50
R-147-NP	464,005	4,851,034	395.5	4:38	4:38
R-148-NP	470,171	4,851,002	394.6	0:00	0:00
R-149-NP	469,898	4,850,989	389.9	3:47	3:47
R-152-NP	462,328	4,850,948	385.8	0:00	0:00
R-153-P	464,923	4,850,931	393.3	5:13	5:13
R-154-NP	469,239	4,850,862	393.0	0:00	0:00
R-155-P	459,614	4,850,833	381.4	9:17	12:30
R-156-NP	465,542	4,850,820	395.7	0:19	0:19
R-157-NP	460,425	4,850,811	380.8	1:30	1:30
R-158-P	468,022	4,850,804	390.5	0:00	0:00
R-159-P	466,167	4,850,796	396.8	0:00	0:00

Receptor ID	Easting (m)	Northing (m)	Elevation AMSL (m)	Realistic shadow of 34-turbine layout (hrs/yr)	Realistic shadow of 38-turbine layout (hrs/yr)
R-160-P	468,541	4,850,773	391.2	0:00	0:00
R-161-P	461,395	4,850,748	384.9	5:41	5:41
R-162-P	464,614	4,850,738	395.8	0:00	0:00
R-163-NP	470,092	4,850,723	393.4	0:00	0:00
R-164-NP	458,335	4,850,683	378.2	22:57	28:32
R-165-NP	466,889	4,850,658	390.6	0:00	0:00
R-167-NP	455,863	4,850,559	372.5	22:03	24:13
R-170-NP	457,455	4,850,250	381.1	27:35	27:35
R-173-P	459,306	4,850,090	378.2	4:16	4:16
R-174-NP	467,682	4,850,042	393.3	0:00	0:00
R-175-NP	455,144	4,849,978	370.0	9:23	9:23
R-177-NP	456,729	4,849,881	379.0	19:34	19:34
R-178-NP	460,164	4,849,828	385.2	3:47	3:47
R-179-P	463,116	4,849,825	394.3	0:00	0:00
R-180-P	461,841	4,849,796	392.4	0:00	0:00
R-181-NP	462,563	4,849,723	396.0	0:00	0:00
R-182-NP	468,475	4,849,669	397.1	0:00	0:00
R-188-NP	458,746	4,849,447	384.2	2:16	2:16
R-196-NP	457,456	4,848,776	378.7	7:20	7:20
R-199-NP	456,062	4,848,677	379.2	0:35	0:35
R-217-NP	456,087	4,847,814	376.5	0:00	0:00
R-253-NP	461,112	4,849,989	382.1	0:00	0:00
R-254-NP	460,873	4,849,909	388.2	0:00	0:00
R-255-NP	460,873	4,849,951	388.3	0:00	0:00
R-256-NP	460,824	4,849,954	387.7	0:00	0:00
R-257-NP	460,717	4,849,948	387.4	0:00	0:00
R-258-NP	460,675	4,849,947	387.1	0:00	0:00
R-259-NP	460,689	4,850,008	386.5	0:00	0:00
R-260-NP	460,724	4,850,007	387.1	0:00	0:00
R-261-NP	460,753	4,850,006	387.3	0:00	0:00
R-262-NP	460,784	4,850,006	387.3	0:00	0:00
R-263-NP	460,807	4,850,006	387.4	0:00	0:00
R-264-NP	460,877	4,850,022	386.6	0:00	0:00
R-265-NP	460,903	4,850,009	386.2	0:00	0:00
R-266-NP	460,937	4,850,015	384.7	0:00	0:00
R-267-NP	460,957	4,850,014	384.2	0:00	0:00
R-268-NP	460,977	4,850,014	383.7	0:00	0:00
R-269-NP	461,012	4,849,997	383.8	0:00	0:00
R-270-NP	460,634	4,850,014	386.7	0:00	0:00
R-271-NP	460,639	4,850,059	384.5	0:00	0:00
R-272-NP	460,552	4,850,058	382.3	0:00	0:00

Receptor ID	Easting (m)	Northing (m)	Elevation AMSL (m)	Realistic shadow of 34-turbine layout (hrs/yr)	Realistic shadow of 38-turbine layout (hrs/yr)
R-273-NP	460,554	4,850,036	383.2	0:00	0:00
R-274-NP	460,593	4,850,084	381.7	0:00	0:00
R-275-NP	460,594	4,850,059	383.3	0:00	0:00
R-276-NP	460,640	4,850,105	381.9	0:00	0:00
R-277-NP	460,642	4,850,126	381.4	0:00	0:00
R-278-NP	460,553	4,850,112	380.4	0:00	0:00
R-279-NP	460,552	4,850,157	379.6	0:00	0:00
R-280-NP	460,592	4,850,130	380.2	0:00	0:00
R-281-NP	460,592	4,850,166	379.8	0:00	0:00
R-282-NP	460,641	4,850,172	380.8	0:00	0:00
R-283-NP	460,639	4,850,152	381.0	0:00	0:00
R-284-NP	460,684	4,850,177	381.3	0:00	0:00
R-285-NP	460,721	4,850,172	382.2	0:00	0:00
R-286-NP	460,737	4,850,172	382.8	0:00	0:00
R-287-NP	460,782	4,850,112	386.4	0:00	0:00
R-288-NP	460,728	4,850,114	384.8	0:00	0:00
R-289-NP	460,713	4,850,112	384.1	0:00	0:00
R-290-NP	460,697	4,850,112	383.5	0:00	0:00
R-291-NP	460,683	4,850,112	382.9	0:00	0:00
R-292-NP	460,690	4,850,071	384.5	0:00	0:00
R-293-NP	460,723	4,850,073	385.6	0:00	0:00
R-294-NP	460,762	4,850,073	386.4	0:00	0:00
R-295-NP	460,572	4,850,217	378.0	0:00	0:00
R-296-NP	460,606	4,850,217	378.8	0:00	0:00
R-297-NP	460,694	4,850,222	380.6	0:00	0:00
R-298-NP	460,731	4,850,219	381.3	0:00	0:00
R-299-NP	460,758	4,850,218	382.0	0:00	0:00
R-300-NP	460,645	4,850,283	379.8	0:00	0:00
R-301-NP	460,645	4,850,317	380.5	0:00	0:00
R-302-NP	460,693	4,850,312	381.6	0:00	0:00
R-303-NP	460,701	4,850,286	381.5	0:00	0:00
R-304-NP	460,700	4,850,274	381.4	0:00	0:00
R-305-NP	460,646	4,850,349	381.0	0:00	0:00
R-306-NP	460,645	4,850,377	381.3	0:00	0:00
R-307-NP	460,686	4,850,379	381.1	0:00	0:00
R-308-NP	460,692	4,850,342	381.3	0:00	0:00
R-309-NP	460,729	4,850,385	380.2	0:00	0:00
R-310-NP	460,759	4,850,383	379.9	0:00	0:00
R-311-NP	460,787	4,850,383	379.7	0:00	0:00
R-312-NP	460,638	4,850,440	381.7	0:00	0:00
R-313-NP	460,829	4,850,390	379.6	0:00	0:00

Receptor ID	Easting (m)	Northing (m)	Elevation AMSL (m)	Realistic shadow of 34-turbine layout (hrs/yr)	Realistic shadow of 38-turbine layout (hrs/yr)
R-314-NP	460,825	4,850,350	379.8	0:00	0:00
R-315-NP	460,823	4,850,330	380.4	0:00	0:00
R-316-NP	460,819	4,850,291	380.8	0:00	0:00
R-317-NP	460,826	4,850,244	382.6	0:00	0:00
R-318-NP	460,873	4,850,216	384.8	0:00	0:00
R-319-NP	460,872	4,850,251	383.5	0:00	0:00
R-320-NP	460,869	4,850,266	382.8	0:00	0:00
R-321-NP	460,865	4,850,278	382.1	0:00	0:00
R-322-NP	460,872	4,850,291	381.3	0:00	0:00
R-323-NP	460,871	4,850,323	380.9	0:00	0:00
R-324-NP	460,872	4,850,348	380.5	0:00	0:00
R-325-NP	460,870	4,850,372	380.3	0:00	0:00
R-326-NP	460,871	4,850,386	380.1	0:00	0:00
R-327-NP	460,822	4,850,430	379.2	0:00	0:00
R-328-NP	460,868	4,850,426	379.8	0:00	0:00
R-329-NP	460,911	4,850,379	380.7	0:00	0:00
R-330-NP	460,936	4,850,386	380.9	0:00	0:00
R-331-NP	460,957	4,850,386	381.2	0:00	0:00
R-332-NP	460,968	4,850,386	381.3	0:00	0:00
R-333-NP	460,886	4,850,428	379.9	0:00	0:00
R-334-NP	460,914	4,850,428	380.2	0:00	0:00
R-335-NP	460,929	4,850,427	380.6	0:00	0:00
R-336-NP	460,950	4,850,430	380.9	0:00	0:00
R-337-NP	461,005	4,850,422	381.6	0:00	0:00
R-338-NP	460,968	4,850,283	381.6	0:00	0:00
R-339-NP	460,969	4,850,254	381.9	0:00	0:00
R-340-NP	460,954	4,850,213	382.7	0:00	0:00
R-341-NP	460,919	4,850,213	384.3	0:00	0:00
R-342-NP	460,959	4,850,178	382.9	0:00	0:00
R-343-NP	460,945	4,850,171	383.3	0:00	0:00
R-344-NP	460,930	4,850,173	383.9	0:00	0:00
R-345-NP	460,914	4,850,174	384.6	0:00	0:00
R-346-NP	460,692	4,850,528	379.0	0:00	0:00
R-347-NP	460,694	4,850,573	378.4	2:54	2:54
R-348-NP	460,749	4,850,528	378.2	0:00	0:00
R-349-NP	460,788	4,850,579	378.5	0:56	0:56
R-350-NP	460,789	4,850,528	378.4	0:00	0:00
R-351-NP	460,820	4,850,578	378.6	0:10	0:10
R-352-NP	460,820	4,850,529	378.5	0:00	0:00
R-353-NP	460,875	4,850,528	379.3	0:00	0:00
R-354-NP	460,912	4,850,527	379.7	0:00	0:00

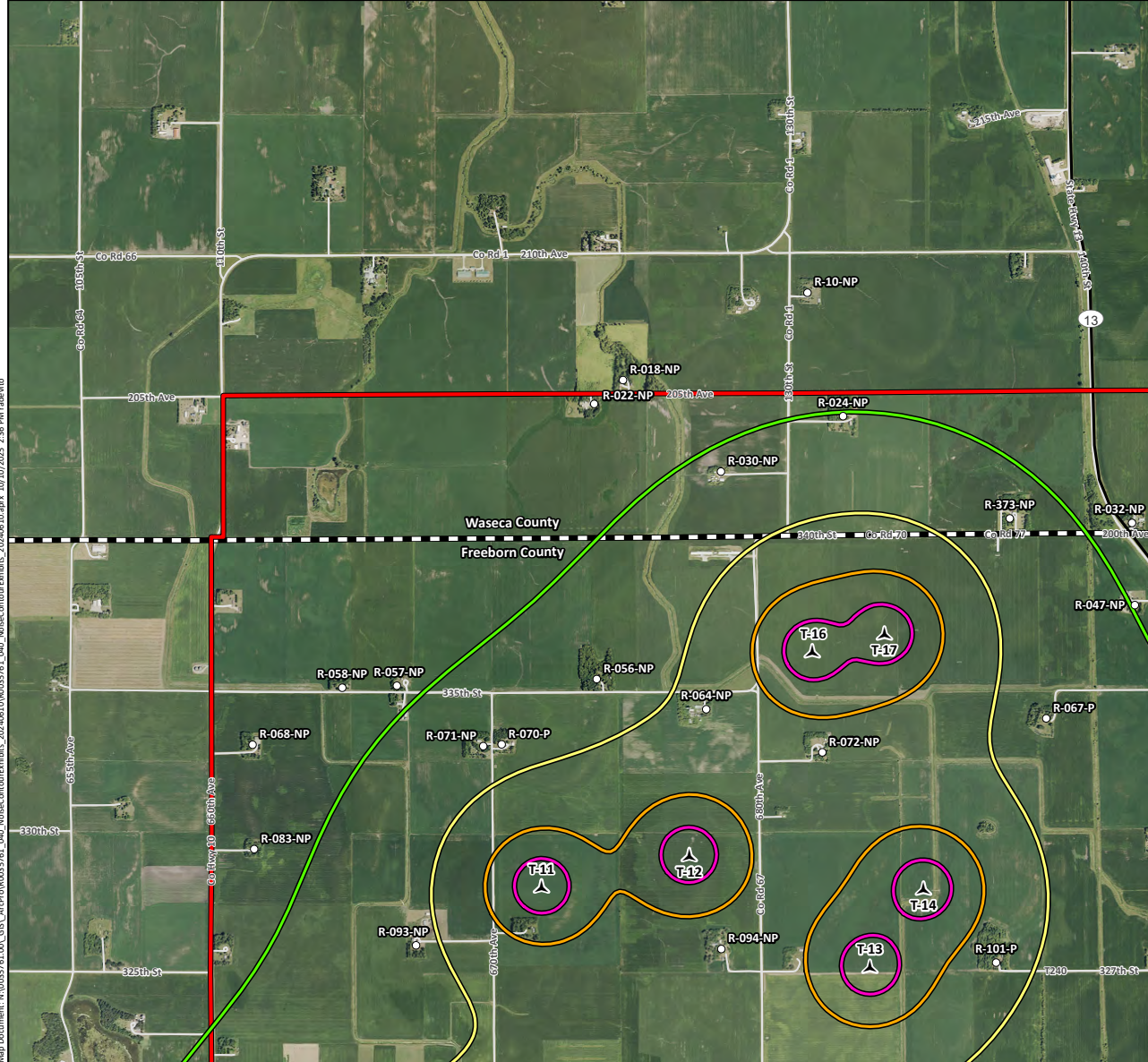
Receptor ID	Easting (m)	Northing (m)	Elevation AMSL (m)	Realistic shadow of 34-turbine layout (hrs/yr)	Realistic shadow of 38-turbine layout (hrs/yr)
R-355-NP	460,942	4,850,574	379.2	0:00	0:00
R-356-NP	460,966	4,850,578	379.5	0:00	0:00
R-357-NP	460,959	4,850,528	379.9	0:00	0:00
R-358-NP	460,922	4,850,477	380.0	0:00	0:00
R-359-NP	460,906	4,850,477	379.9	0:00	0:00
R-360-NP	460,959	4,850,475	380.1	0:00	0:00
R-361-NP	461,080	4,850,367	382.5	0:00	0:00
R-362-NP	461,240	4,850,431	383.7	0:00	0:00
R-363-NP	461,262	4,850,431	382.8	0:00	0:00
R-364-NP	461,218	4,850,378	385.7	0:00	0:00
R-365-NP	461,254	4,850,379	383.9	0:00	0:00
R-366-NP	461,222	4,850,325	384.0	0:00	0:00
R-367-NP	461,172	4,850,336	384.9	0:00	0:00
R-368-NP	461,183	4,850,285	383.0	0:00	0:00
R-369-NP	461,138	4,850,287	382.2	0:00	0:00
R-370-NP	461,153	4,850,163	381.3	0:00	0:00
R-371-NP	461,196	4,850,166	381.6	0:00	0:00
R-372-NP	461,222	4,850,158	381.7	0:00	0:00
R-373-NP	460,510	4,855,205	377.1	10:18	10:18
R-374-NP	458,120	4,847,906	380.6	0:00	0:00



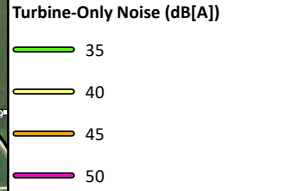
**Bent Tree North
 Wind Project**

Freeborn, Steele, & Waseca
 Counties, Minnesota

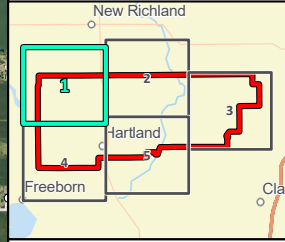
Nordex N133-118 Noise Contour



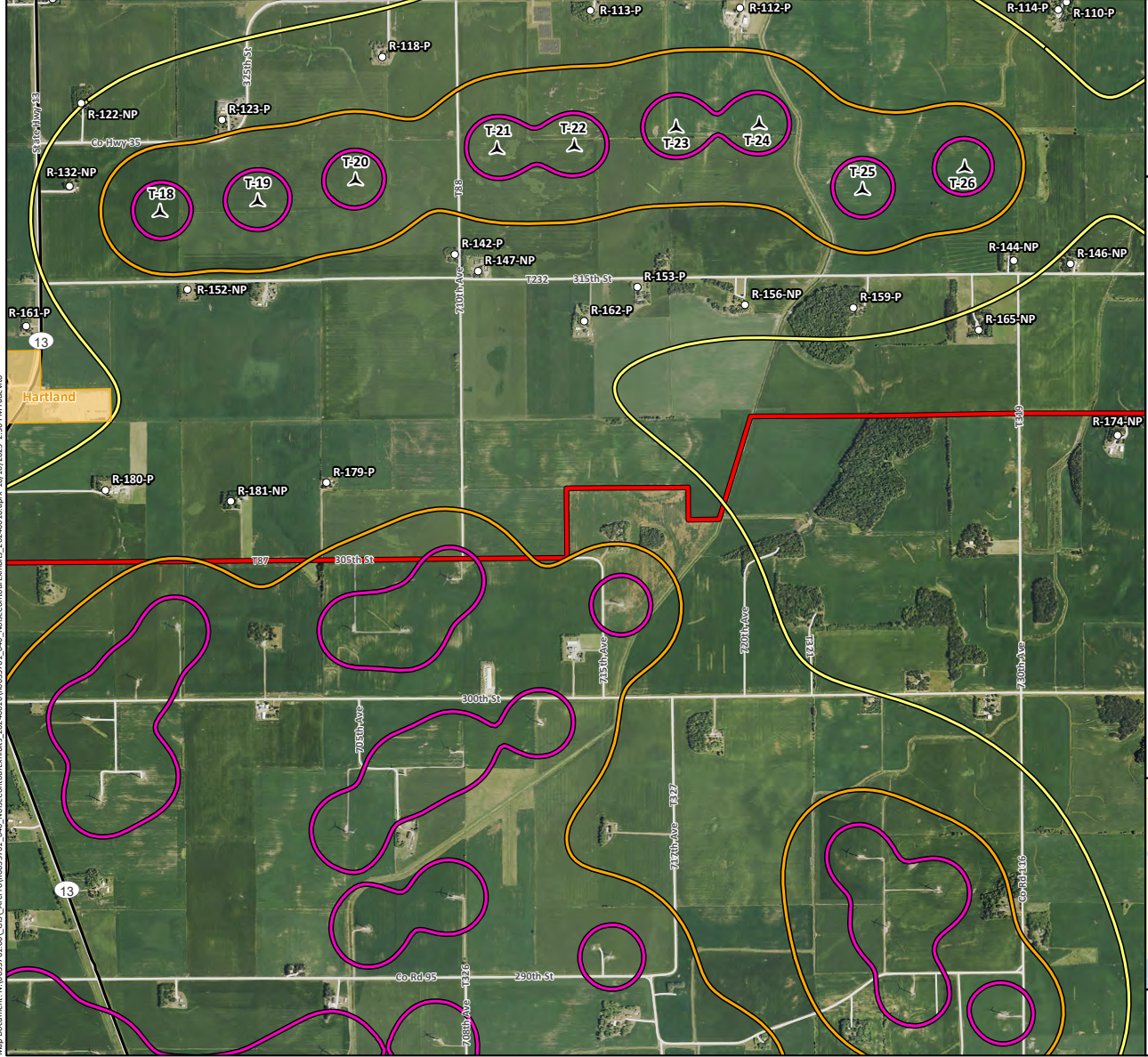
- Legend**
- Project Boundary
 - County Boundary
 - Major Road
 - Local Road
 - ▲ Proposed Primary Turbine
 - Noise Receptor



Data Source(s): Westwood (2025); NAIP (2023); U.S. Census Bureau (2024); MN Geospatial Commons (2023).



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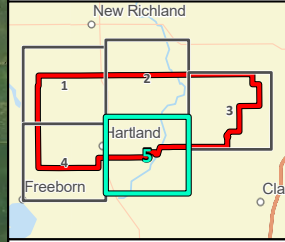
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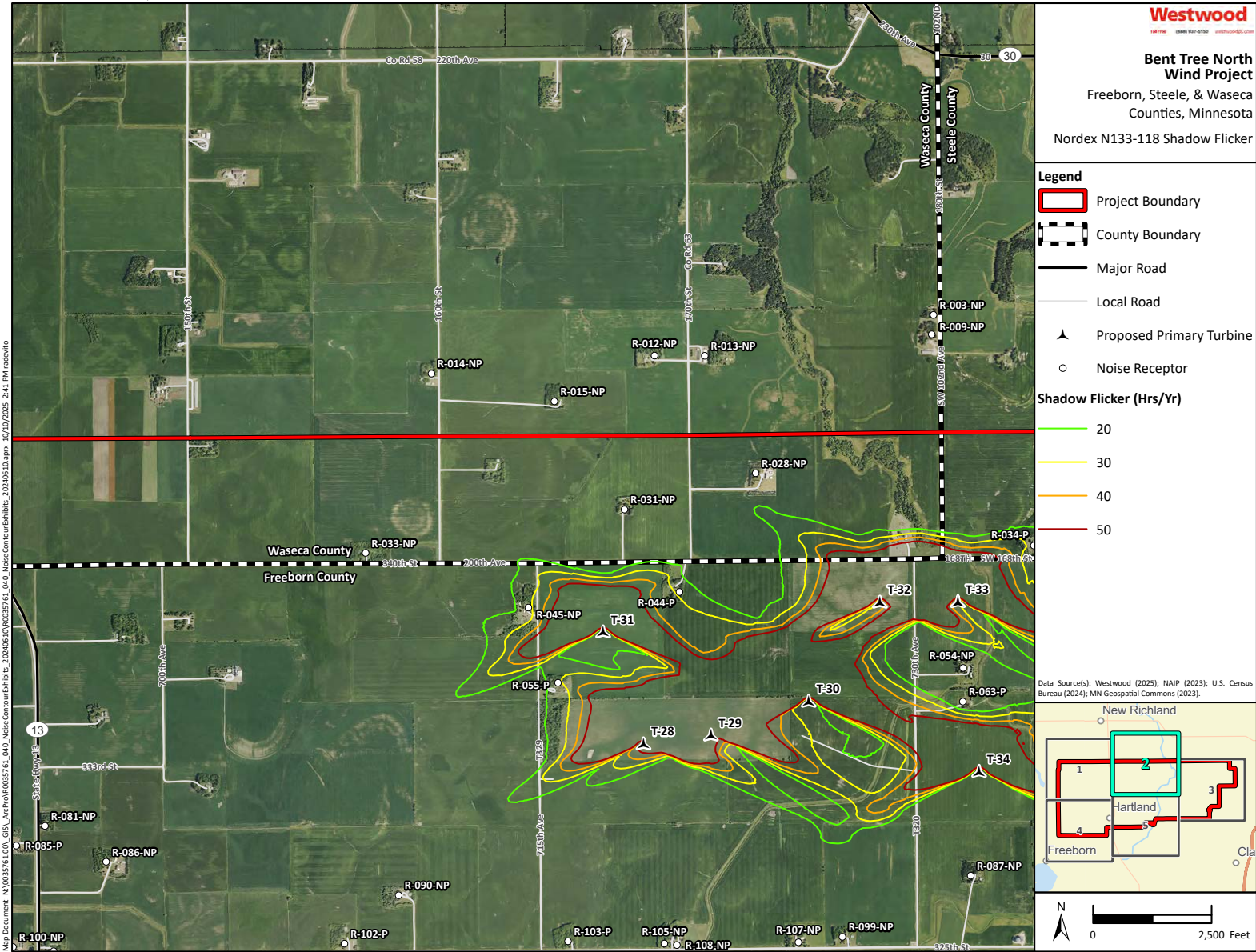


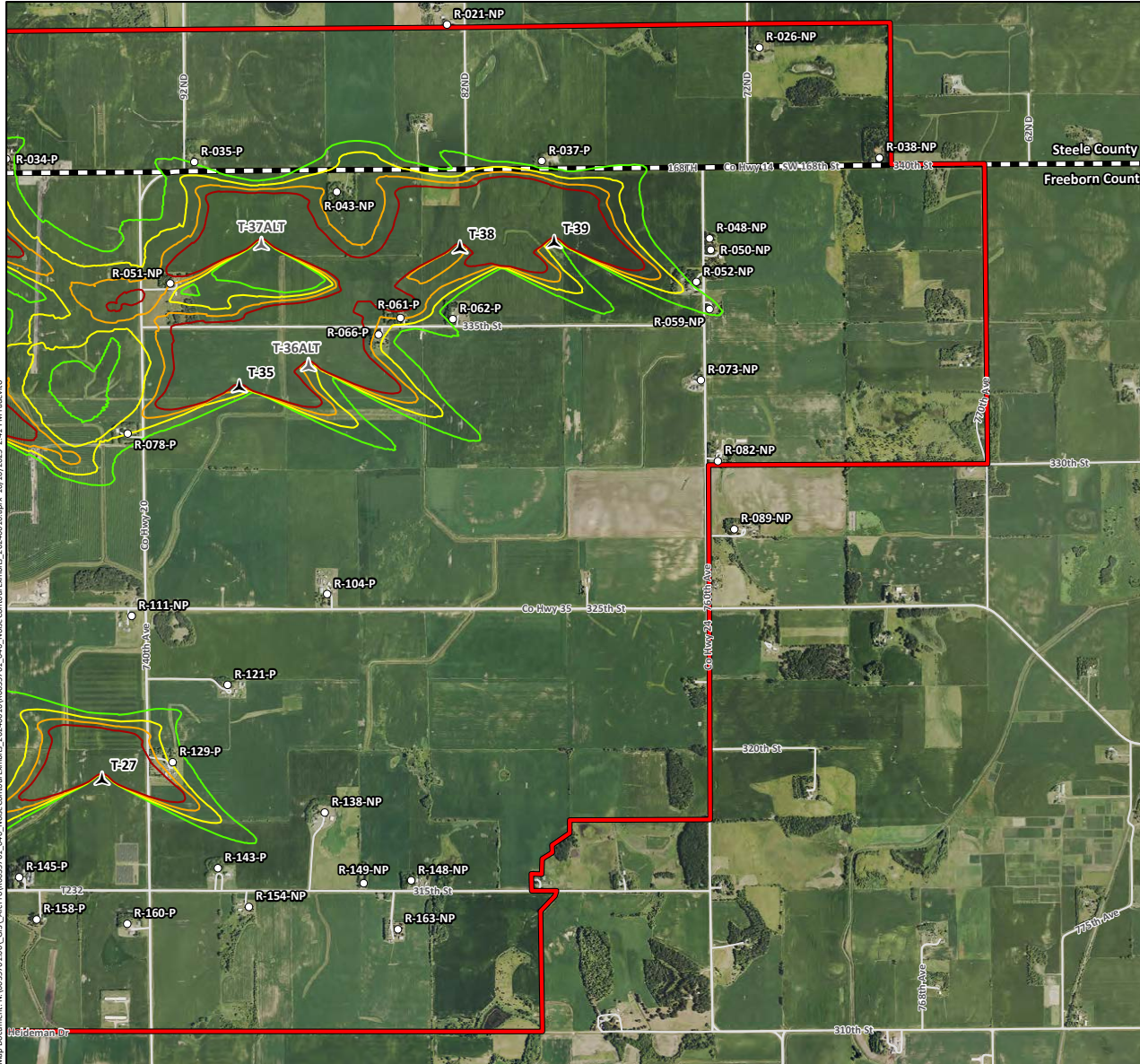
Bent Tree North Wind Project
 Freeborn, Steele, & Waseca Counties, Minnesota
 Nordex N133-118 Noise Contour

- Legend**
- Project Boundary
 - County Boundary
 - Town of Hartland
 - Major Road
 - Local Road
 - Proposed Primary Turbine
 - Noise Receptor
- Turbine-Only Noise (dB[A])**
- 40
 - 45
 - 50

Data Source(s): Westwood (2025); NAIP (2023); U.S. Census Bureau (2024); MN Geospatial Commons (2023).







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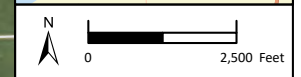
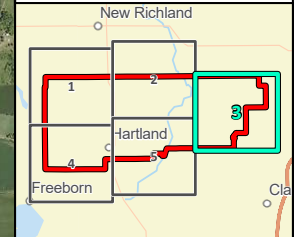


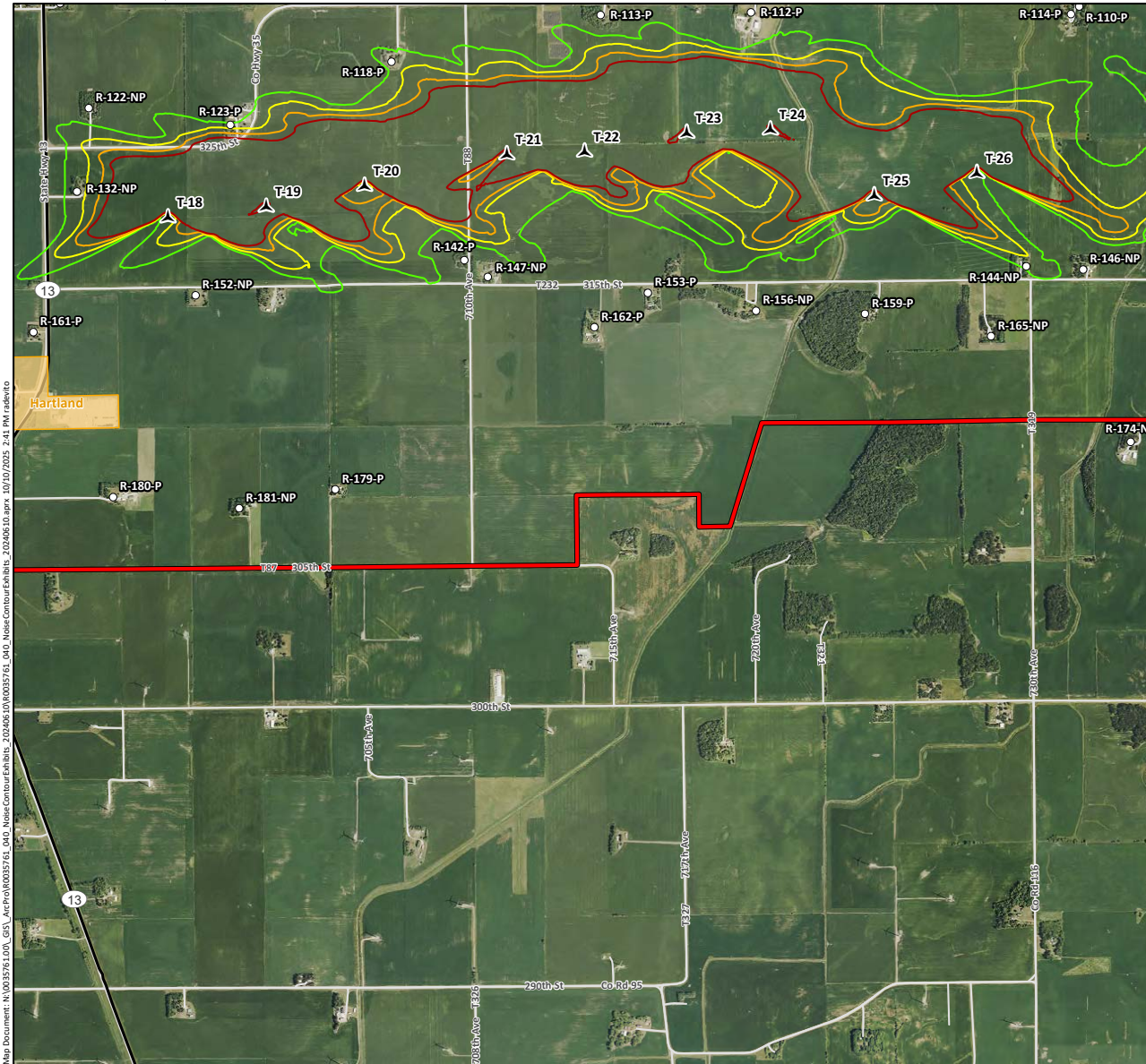
**Bent Tree North
Wind Project**
Freeborn, Steele, & Waseca
Counties, Minnesota

Nordex N133-118 Shadow Flicker

- Legend**
- Project Boundary
 - County Boundary
 - Local Road
 - Proposed Primary Turbine
 - Proposed Alternate Turbine
 - Noise Receptor
- Shadow Flicker (Hrs/Yr)**
- 20
 - 30
 - 40
 - 50

Data Source(s): Westwood (2025); NAIP (2023); U.S. Census Bureau (2024); MN Geospatial Commons (2023).





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Bent Tree North Wind Project

Freeborn, Steele, & Waseca Counties, Minnesota

Nordex N133-118 Shadow Flicker

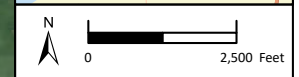
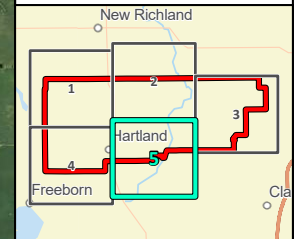
Legend

- Project Boundary
- County Boundary
- Town of Hartland
- Major Road
- Local Road
- ▲ Proposed Primary Turbine
- Noise Receptor

Shadow Flicker (Hrs/Yr)

- 20
- 30
- 40
- 50

Data Source(s): Westwood (2025); NAIP (2023); U.S. Census Bureau (2024); MN Geospatial Commons (2023).



Westwood

DATE: 10/8/2025
 PROJECT: Bent Tree North
 TURBINE MODEL: N133-4.8 118m HH
 NO. OF TURBINES: 32
 PROJECT SIZE: 153.6 MW

ESTIMATED ANNUAL ENERGY PRODUCTION				
Rated Power	153.6	MW		
Roughness-Based Energy Output	678,005.2	MWh/yr.	Theoretical (WindPRO/WASP)	
Topographic effects	0.0	MWh/yr.	0.00%	Not applicable for time-varying
Obstacles	0.0	MWh/yr.	0.00%	Not applicable for time-varying
Gross Annual Energy Output	678,005.2	MWh/yr.		
Bias	Loss %	Efficiency	MWh/yr.	Comments
Wind data correction	0.00%	100.00%	0.0	
RIX correction	0.00%	100.00%	0.0	
Model problems for large wind farms	0.00%	100.00%	0.0	
Power curve correction	0.00%	100.00%	0.0	
Other bias	-0.55%	99.45%	-3,729.5	WASP Elevation model bias - Site Specific
Total Bias	-0.55%	99.45%	-3,729.5	
Permanent Losses	Loss %	Efficiency	MWh/yr.	Comments
Wake Effects / Turbine interaction effects	-6.52%	93.48%	-43,934.5	
Internal wake effects / blockage	-4.32%	95.68%	-29,155.2	Calculated internal with blockage
External wake effects	-2.29%	97.71%	-15,447.2	Calculated External BT1
Future wake effects	0.00%	100.00%	0.0	Calculated Future
Availability	-4.98%	95.02%	-33,563.8	
Turbine (contractual)	-3.05%	96.95%	-20,568.6	Standard assumption
Turbine (other)	-1.00%	99.00%	-6,742.8	Client provided assumption
Balance of Plant	-0.70%	99.30%	-4,719.9	Client provided assumption
Grid	-0.30%	99.70%	-2,022.8	Standard assumption
Other	0.00%	100.00%	0.0	Standard assumption
Turbine Performance	-2.49%	97.51%	-16,764.3	
Generic power curve adjustment	0.00%	100.00%	0.0	Standard assumption
High wind hysteresis	0.00%	100.00%	-8.7	Project specific
Site specific power curve adjustment	-1.50%	98.50%	-10,114.1	Standard assumption
Sub-optimal performance	-1.00%	99.00%	-6,742.8	Standard assumption
Other	0.00%	100.00%	0.0	Standard assumption
Electrical losses	-2.50%	97.50%	-16,850.3	
Electrical losses	-2.46%	97.54%	-16,587.2	Client provided assumption
Parasitic losses	-0.04%	99.96%	-269.7	Project specific Estimate
Environmental	-3.81%	96.19%	-25,695.3	
Performance degradation not due to icing	-1.00%	99.00%	-6,746.1	Standard assumption
Performance degradation due to icing	-1.00%	99.00%	-6,742.8	Client provided assumption
Shutdown due to icing, lightning, hail, etc.	-1.70%	98.30%	-11,462.7	Client provided assumption
Temperature shutdown/de-rating	-0.16%	99.84%	-1,078.8	Client provided assumption
Site access and other force majeure events	0.00%	100.00%	0.0	Standard assumption
Tree growth or felling	0.00%	100.00%	0.0	Standard assumption
Curtailment	-0.27%	99.73%	-1,849.8	
Wind sector management	0.00%	100.00%	0.0	Standard assumption
Grid curtailment and ramp-rate	0.00%	100.00%	0.0	Project specific
Power purchase agreement curtailment	0.00%	100.00%	0.0	Standard assumption
Noise	0.00%	100.00%	0.0	Standard assumption
Flicker	0.00%	100.00%	0.0	Standard assumption
Birds	0.00%	100.00%	0.0	Standard assumption
Bats	-0.25%	99.73%	-1,661.2	Project specific
Other	0.00%	100.00%	0.0	Standard assumption
Total Losses and adjustments	-19.43%	80.57%	-131,008.5	
Losses and adjustments not including array losses	-13.81%	86.19%	-93,143.0	
Gross AEP with topo effects and array losses	630,341.1	MWh/yr.	First 10 Years	First 20 Years
Net Annual Energy Output (P50) (One-Year)	546,274.7	MWh/yr.	548,750.7	546,274.7
Net Capacity Factor	40.60%		40.78%	40.60%

Note: The net annual energy production estimate represents the P50 value of the long-term mean, which has a probability of exceedance of 50%. This represents the best estimate of the long-term mean value for the wind farm. There is a 50% chance that in any given year, even over very long periods, that the mean annual energy production will be less than the Net Annual Energy Output value shown above. There is also a 50% chance that the production will be higher.

Table 5-3: Wind Turbine Characteristics

Characteristic	Vesta V136 - 112	Vesta V136 - 120	Nordex N133-118
Nameplate Capacity (megawatts)	4.5	4.5	4.8
Hub Height ¹	112 m (368 ft)	120 m (394 ft)	118 m (387 ft)
Blade Length	66.7 m (219 ft)	66.7 m (219 ft)	65.5 m (215 ft)
Total Height ²	180 m (591 ft)	188 m (617 ft)	184.6 m (606 ft)
Rotor Diameter	136 m (446 ft)	136 m (446 ft)	133.2 m (437 ft)
Cut-in Wind Speed ³ (m/s)	3	3	3
Cut-out Wind Speed ⁴ (m/s)	32	32	28
Rated Capacity Wind Speed ⁵ (m/s)	14.5	14.5	13.5
Wind Swept Area (square meters)	14,527	14,527	13,893
Rotor Speed (revolutions per minute)	Variable (5.6-14.0)	Variable (5.6-14.0)	Variable (6.5-13)
Wind Class ⁶ (m/s)	8.5	8.5	Unknown
Standard Operating Temperature ⁷	-30°C to 45°C -22°F to 113°F	-30°C to 45°C -22°F to 113°F	Unknown

¹ Hub height = the turbine height from the ground to the middle of the hub.
² Total height = the total turbine height from the ground to the tip of the blade in an upright position.
³ Cut-in wind speed = wind speed at which turbine begins operation.
⁴ Cut-out wind speed = wind speed above which turbine shuts down operation.
⁵ Rated capacity wind speed = wind speed at which turbine reaches its rated capacity based on average site air density.
⁶ Based on the International Electrotechnical Commission (IEC) Class II (Medium Wind) annual average wind speed (maximum).
⁷ WPL proposes using the Low Temperature Turbine Package.

WPL Proposed Changes to Draft Site Permit

Topic	Reference	Current Text	Requested Change
Project Name	p. i	BENT TREE WIND FARM	BENT TREE NORTH WIND FARM
Turbine Count	Section 1, p. 1	consisting of 34	consisting of <u>up to</u> 34
Nordex Turbine	Section 1, p. 1	4.5 MW Vestas V136-112 or V136-120 wind turbines	4.5 MW Vestas V136 <u>or</u> 4.8 MW Nordex N133 <u>wind turbines</u> 112 or V136-120 wind turbines
Nordex Turbine	Section 1, p. 1	4.5 MW, Vestas V136-112 or Vestas V136-120 turbines	4.5 MW; Vestas V136 <u>or</u> 4.8 MW Nordex N133 <u>wind turbines</u> 112 or Vestas V136-120 turbines
O&M Building	Section 2.1, p. 1	n/a	<u>Additional O&M building</u>
Typo	Section 2.1, p. 2	bath plant	batch plant
Laydown Area	Section 2.1, p. 2	Laydown Area (15 acres)	Laydown Area (<u>approximately 15 acres</u>) <u>and other staging areas as necessary</u> 15 acres
Project Area	Section 3, p. 3	no more than 50 acres	no more than <u>63.3</u> 50 acres
Native Prairie	Section 4.7, p. 5	is identified within the Designated Site	is identified within the Designated Site <u>and wind turbines or associated facilities are located in a native prairie or construction activities impact native prairie</u>
Tower Height	Section 4.9, p. 5	The towers may be up to 120 meters (394 feet) above grade measured at hub height.	The towers may be up to 120 meters (394 feet) <u>from the top of the pedestal</u> above grade measured at hub height.
Nordex Turbine	Section 4.9, p. 5	n/a	<i>[Add to the table the Nordex column listed in Table 1 from the direct testimony]</i>
Biological and Natural Resources Inventories	Section 7.1, p. 18	conduct preconstruction desktop and field inventories	conduct preconstruction desktop <u>and field</u> inventories

Topic	Reference	Current Text	Requested Change
Biological and Natural Resources Inventories	Section 7.1, p. 18	within the Designated Site and assess the presence of state- or federally-listed or threatened species	within the Designated Site. <u>The Permittee shall design and conduct pre-construction field inventories of wetlands identified in the desktop inventory and shall assess such areas for the presence and assess the presence</u> of state- or federally-listed or threatened species
Labor Statistic Reporting	Section 10.5, p. 25	ii. the gross number of hours worked by or full-time equivalent workers who are residents of other states, but maintain a permanent residence within 150 miles of the Project;	ii. the gross number of hours worked by or full-time equivalent workers who are residents of other states, but maintain a permanent residence within 150 miles of the Project;
GPS Data	Section 10.9, p. 26	Within 90 days	Within 90 <u>120</u> days