

Addendum to Helix Wind Power Facility Noise Analysis

TO: Sara Parsons/Iberdrola Renewables, Inc.
Chase Whitney/Iberdrola Renewables, Inc.

FROM: Mark Bastasch, P.E./CH2M HILL

COPIES: Linnea Eng/CH2M HILL

DATE: August 10, 2010

Purpose

The purpose of this memorandum is to provide information about predicted noise levels during the construction and operation of the Helix Wind Power Facility (HWPF), as amended, in accordance with OAR 345-021-0010(1)(x)(A), and analyze Facility compliance with applicable Oregon Department of Environmental Quality (DEQ) noise regulations per OAR 345-021-0010(1)(x)(B). This noise analysis concludes that applicable DEQ noise regulations will be met for the construction and operation of the proposed expanded HWPF.

Definition of Terms

Helix Wind Power Facility, LLC (certificate holder) considers Helix to be one project and intends to construct it as a single facility (referred to as HWPF). However, for ease in differentiating between the approved HWPF and modifications proposed in *Request for Amendment No. 1 to the Site Certificate for the Helix Wind Power Facility* (amendment request; August 2010), HWPF components authorized under the *Site Certificate for the Helix Wind Power Facility* (site certificate; July 31, 2009) are referred to as “previously-approved” and the amended facility and site boundary are referred to collectively as the “proposed expanded HWPF.”

Project Description

The amendment request seeks to increase the maximum generating capacity and maximum number of turbines from what was originally authorized for HWPF in the site certificate. The site certificate authorized up to 60 turbines and a generating capacity of up to 102 MW. The proposed expanded HWPF will not exceed 134 turbines and a generating capacity of 201 MW.

Consistent with the *Application for Site Certificate for the Helix Wind Power Facility* (August 2008), the amendment request analyzes impacts for two turbine types. The turbine types represent a range that encompasses the scale and impacts of the turbines potentially used. Final turbine selection has not yet occurred. The minimum turbine layout for the proposed expanded HWPF is 67 3.0-MW turbines. The maximum turbine layout is 134 1.5-MW turbines. The final layout will have 67 to 134 turbines, with any combination of turbines ranging in size up to 3.0 MW.

Summary of Regulations

OAR Chapter 340, Division 35, specifically addresses noise from wind energy facilities as follows:

- OAR 340-035-0035(1)(b)(B)(iii)(I) establishes the option for a proposed wind energy facility to assume a background L_{50} ambient noise level of 26 decibels (dBA).
- OAR 340-035-0035(1)(b)(B)(iii)(IV) requires a proposed wind energy facility to satisfy the ambient noise standard, where a landowner has not waived the standard, by predicting facility noise levels at the appropriate measurement point, assuming that all of the proposed wind facility's turbines are operating between cut-in speed and the wind speed corresponding to the maximum sound power level established by IEC 61400-11. These predictions must be compared to the assumed ambient noise level of 26 dBA, or to the actual ambient background L_{10} and L_{50} noise levels, if measured. If this comparison shows that the increase in noise is not more than 10 dBA over this entire range of wind speeds, the facility complies with the ambient background standard.
- OAR 340-035-0035(1)(b)(B)(iii)(VI) requires that a proposed wind energy facility predict compliance with the "Table 8" limits set forth in the regulations (summarized below in Table 1). Compliance must occur at the appropriate measurement point, with reference to the turbine's maximum sound power level, following procedures established by IEC 61400-11, and assuming that all of a facility's turbines are operating at the maximum sound power level.

TABLE 1
State of Oregon Statistical Noise Limits for Industrial and Commercial Sources (OAR-340-35-0035)

Statistical Descriptor	Maximum Permissible Statistical Noise Levels (dBA)	
	Daytime (7:00 a.m. – 10:00 p.m.)	Nighttime (10:00 p.m. – 7:00 a.m.)
L_{50}	55	50
L_{10}	60	55
L_1	75	60

Notes:

Based on "Table 8" of OAR-340-0035: New Industrial and Commercial Noise Source. Standards and OAR-340-0035(1)(b)(B)(i).

dBA = decibel (A-weighted scale).

Based on the applicable standards, assuming an ambient level of 26 dBA, the maximum allowable noise level produced by a proposed wind facility, as measured at a sensitive receptor such as a home, is an increase of 10 dBA over the ambient level across the entire range of wind speeds between the cut-in wind speed and the wind speed corresponding to the maximum sound power level, or 36 dBA (26 dBA +10 dBA). In accordance with OAR 340-035-0035(1)(b)(B)(iii)(IV), the 36-dBA level must be complied with when all turbines operate at the maximum sound power level established by IEC 61400-11. At wind speeds corresponding to sound power levels less than the maximum (for example, during cut-in wind speeds), the resulting noise level also will be less. Therefore, it is not necessary

to predict noise levels for each wind speed between cut-in and the maximum sound power level when assuming an ambient level of 26 dBA.¹

If a proposed wind facility complies with the OAR 340-035-0035(1)(b)(B)(iii)(IV) limit of 36 dBA at a receptor, it necessarily also complies with OAR 340-035-0035(1)(b)(B)(iii)(VI), namely the OAR “Table 8” limit of 50 dBA, at that same receptor.

In addition to the foregoing limits, OAR 340-035-0035(1)(f) establishes standards that regulate octave band sound pressure levels and audible discrete tones. Such standards can be applied by DEQ when it believes subsections (1)(a), (b), or (c) (summarized in Table 1 above) do not adequately protect the health, safety, or welfare of the public.

Impulse noise is also regulated in OAR 340-35-0035(1)(d), but wind turbines do not generate impulse noise and therefore OAR 345-035-0035(1)(d) does not apply to wind projects.

The noise limits in OAR 340-035-0035(1)(b) apply at “appropriate measurement points” on “noise sensitive property.” The “appropriate measurement point” is defined as whichever of the following is farther from the noise source:

- 25 feet (7.6 meters) toward the noise source from that point on the noise sensitive building nearest the noise source; or
- That point on the noise-sensitive property line nearest the noise source.

“Noise-sensitive property” is defined as “real property normally used for sleeping, or normally used as schools, churches, hospitals, or public libraries. Property used in industrial or agricultural activities is not noise-sensitive property unless it meets the foregoing criteria in more than an incidental manner.” Residences are the only noise-sensitive property identified within the analysis area.

Noise Analysis

As described in the Final Order (July 31, 2009), the certificate holder seeks micro-siting flexibility for the proposed expanded HWPF with regard to the final layout for turbines. To demonstrate that the certificate holder has a reasonable likelihood of constructing and operating the proposed facility in compliance with the noise standards, noise analyses were conducted for both the maximum turbine layout and the minimum turbine layout for the proposed expanded HWPF. The noise analysis used a maximum turbine layout of 43 turbines within the previously-approved site boundary and 91 turbines within the proposed expanded site boundary for a total of 134 turbines, as shown in Figure 1. For the minimum turbine layout, 28 turbines are located in the previously-approved site boundary and 39 turbines are located in the proposed expanded site boundary, as shown in Figure 2.

The noise results from these two scenarios are presented in this memorandum. After the precise turbine locations and type have been selected and prior to HWPF construction, the certificate holder will submit for the Oregon Department of Energy’s (Department) review an acoustical analysis of the final HWPF design along with evidence, including any noise easements, that demonstrates compliance with OAR 340-035-0035. The certificate holder will

¹At receptors that have not waived the 10-dBA increment, the 26-dBA “assumed ambient” results in a regulatory limit of 36 dBA under all wind speeds. Therefore, it is necessary to model only the loudest scenario that occurs at the wind speed corresponding to the maximum sound power level.

not start construction of major HWPF components until the Department is satisfied that HWPF satisfies the requirements of OAR 340-035-0035.

The same methods used in the original HWPF Application for Site Certificate were used in this noise analysis. The noise model, CADNA/A by Datakustik GmbH of Munich, Germany, utilizes sound propagation factors adopted from ISO 9613 (ISO, 1993) and VDI 2714 (VDI, 1988). Atmospheric absorption for conditions of 10°C and 70 percent relative humidity (conditions that favor propagation) was computed in accordance with ISO 9613-1 and the Simple Ground procedure per ISO 9613-2 as requested by the Department.

Table 2 summarizes the octave band sound power level data, inclusive of the +2 dBA margin consistent with the original HWFP noise analysis.

TABLE 2
Modeled Octave Band Sound Power Levels

	Overall (dBA)	Octave Band Center Frequency, Hz (A-weighted)							
		63	125	250	500	1,000	2,000	4,000	8,000
Maximum Turbine Layout (1.5-MW Turbine)	106	87	96	99	101	100	97	89	80
Minimum Turbine Layout (3.0-MW Turbine)	112	96	100	105	107	106	103	97	87
Substation Transformers ¹	106	83	95	97	103	100	96	91	82

¹ Transformers are expected to have a National Electrical Manufacturers Association (NEMA) sound rating of 87 dBA or less. Each substation was modeled as having an overall sound power level of 106 dBA. For the minimum turbine analysis, a noise wall south of the transformer has been included in the analysis; this or other options will be evaluated during final design consistent with the requirements of Final Order Condition 101.

Table 3 summarizes the predicted noise levels for the 1.5-MW maximum turbine layout (134 turbines). Table 4 summarizes the predicted noise levels for the 3.0-MW minimum turbine layout (67 turbines). Both tables indicate whether a landowner waiver is required. Only those receptors with a dBA greater than or equal to 36 require waivers. Figures 1 and 2 present the noise contours for the maximum and minimum layouts, respectively, including the previously-approved collector substation and proposed additional collector substation.

TABLE 3
 Summary of Predicted Noise Levels for Proposed Expanded HWPf (dBA)
Maximum Turbine Layout—1.5-MW Layout

Map ID	Level	Waiver Required (>36 dBA)
R-73	48	Yes
R-5	47	Yes
R-3	47	Yes
R-81	45	Yes
R-75	45	Yes
R-97	45	Yes
R-95	45	Yes
R-10	44	Yes
R-9	44	Yes
R-83	43	Yes
R-76	42	Yes
R-68	42	Yes
R-82	41	Yes
R-87	40	Yes
R-72	40	Yes
R-96	40	Yes
R-69	40	Yes
R-84	39	Yes
R-86	38	Yes
R-24	37	Yes
R-85	37	Yes
R-15	37	Yes
R-2	37	Yes
R-16	37	Yes
R-17	37	Yes
R-12	36	Yes
R-11	36	Yes
R-13	36	Yes
R-14	35	No
R-92	33	No

Results are summarized for receptors predicted to be greater than 33 dBA.

TABLE 4
 Summary of Predicted Noise Levels for Proposed Expanded HWPf (dBA)
Minimum Turbine Layout—3.0-MW Layout

ID	Level	Waiver (>36 dBA)
R-73	50	Yes
R-3	50	Yes
R-9	49	Yes
R-81	48	Yes
R-10	48	Yes
R-5	48	Yes
R-75	46	Yes
R-68	46	Yes
R-76	46	Yes
R-83	46	Yes
R-69	45	Yes
R-72	45	Yes
R-82	45	Yes
R-87	44	Yes
R-84	42	Yes
R-86	42	Yes
R-11	41	Yes
R-2	41	Yes
R-97	41	Yes
R-15	41	Yes
R-12	41	Yes
R-16	41	Yes
R-85	40	Yes
R-17	40	Yes
R-13	40	Yes
R-14	39	Yes
R-96	37	Yes
R-24	37	Yes
R-92	36	Yes
R-90	35	No
R-1	35	No
R-95	35	No
R-89	34	No
R-91	34	No
R-94	34	No
R-88	33	No
R-93	33	No
R-45	33	No

Results are summarized for receptors predicted to be greater than 33 dBA.

Conclusion

The changes proposed in this amendment request do not affect the certificate holder's ability to comply with the site certificate. This noise analysis demonstrates that the proposed expanded HWPF complies with applicable DEQ noise regulations per OAR 345-021-0010(1)(x)(B). In addition, pursuant to OAR 345-021-0010(1)(x)(C) and (D) and Condition 101 of the Final Order, before beginning construction, the certificate holder will provide to the Department an acoustical analysis of the final HWPF design along with evidence, including any noise easements, that demonstrates compliance with OAR 340-035-0035. For these reasons, OAR 340-035-0035 is met.

Figures

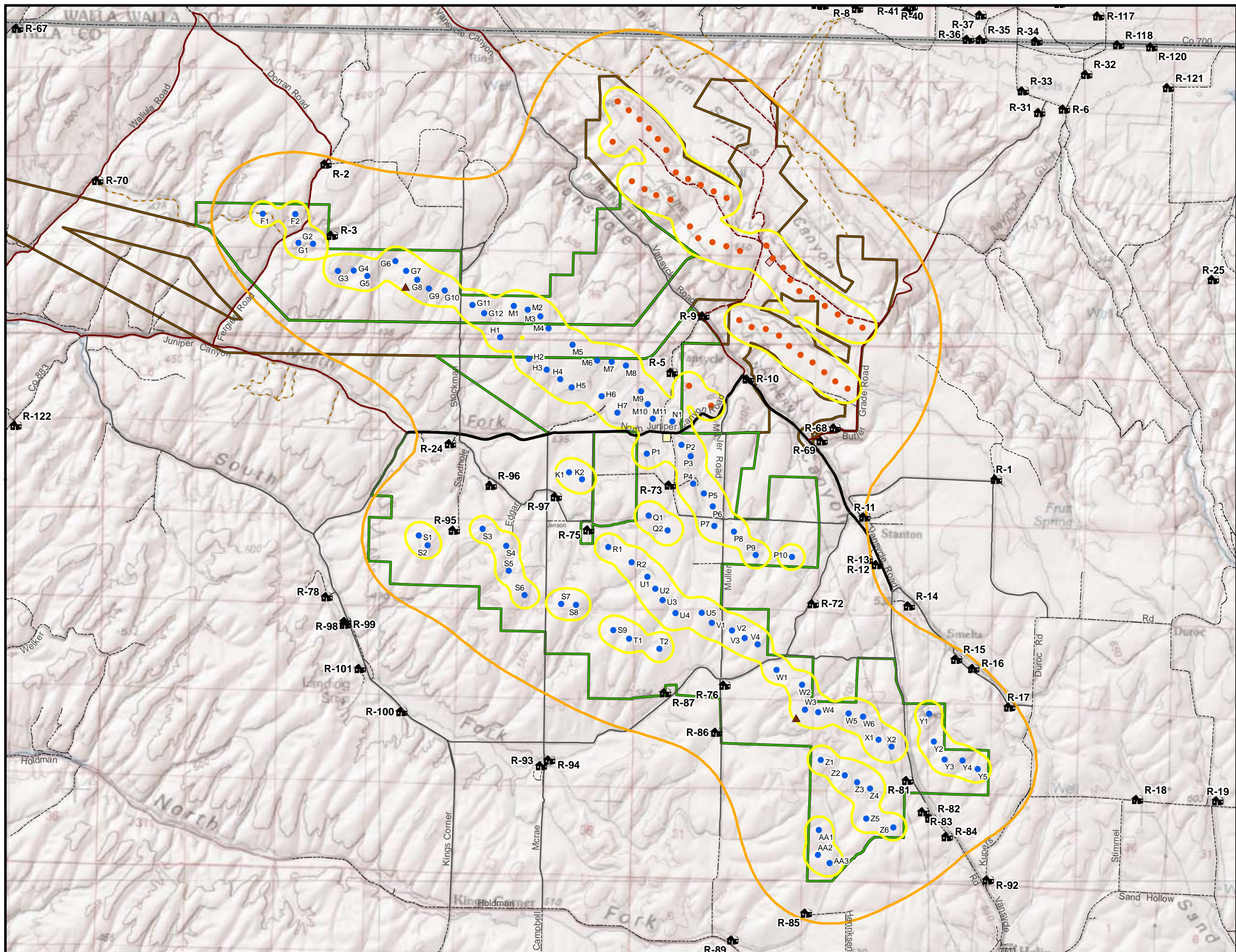
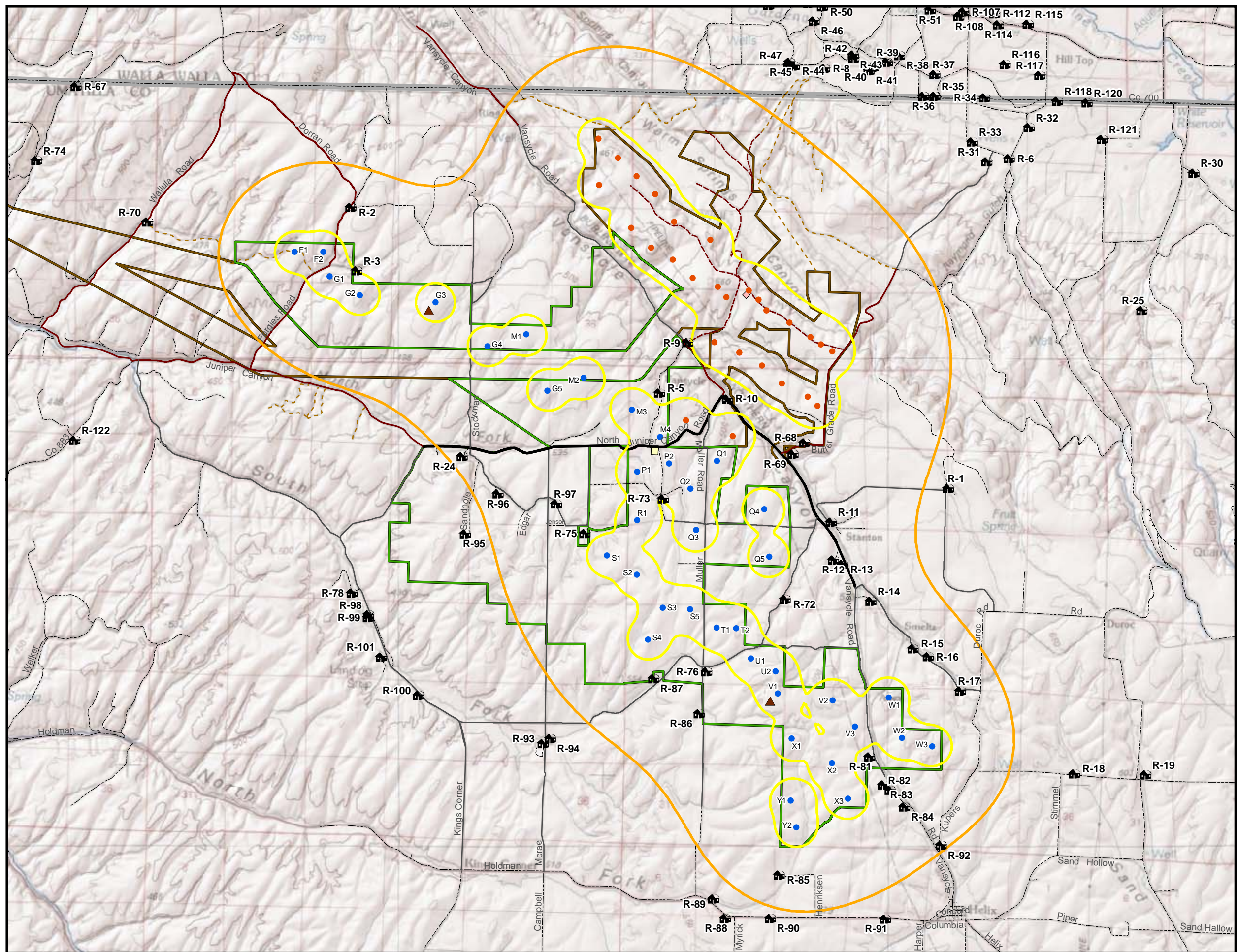


Figure 1 Noise Contours 1.5-MW Turbine Layout (Maximum Turbine Layout) Helix Wind Power Facility Amendment Noise Analysis Addendum

- Proposed Expanded Helix Site Boundary
- Previously-Approved Helix Site Boundary
- Previously-Approved Turbine
- Previously-Approved Substation
- 🏠 House
- 36-dBA Noise Contour
- 50-dBA Noise Contour
- Proposed Permanent Facilities**
- Proposed Turbine
- ▲ Proposed Met Tower
- Proposed Substation
- Existing Facilities**
- Existing Transmission Line
- Railroad
- Public, Paved
- Public, Gravel
- Other Public Road
- Private, Farm Road
- Other Private Road
- Other Road

Miles

Figure 2
Noise Contours
 3.0-MW Turbine Layout
 (Minimum Turbine Layout)
 Helix Wind Power Facility Amendment
 Noise Analysis Addendum



- Proposed Expanded Helix Site Boundary
- Previously-Approved Helix Site Boundary
- Previously-Approved Turbine
- Previously-Approved Substation
- 🏠 House
- ~ 36-dBA Noise Contour
- ~ 50-dBA Noise Contour
- Proposed Permanent Facilities**
- Proposed Turbine
- ▲ Proposed Met Tower
- Proposed Substation
- Existing Facilities**
- Existing Transmission Line
- = Railroad
- = Public, Paved
- = Public, Gravel
- = Other Public Road
- - - Private, Farm Road
- - - Other Private Road
- - - Other Road

