

APPENDIX C

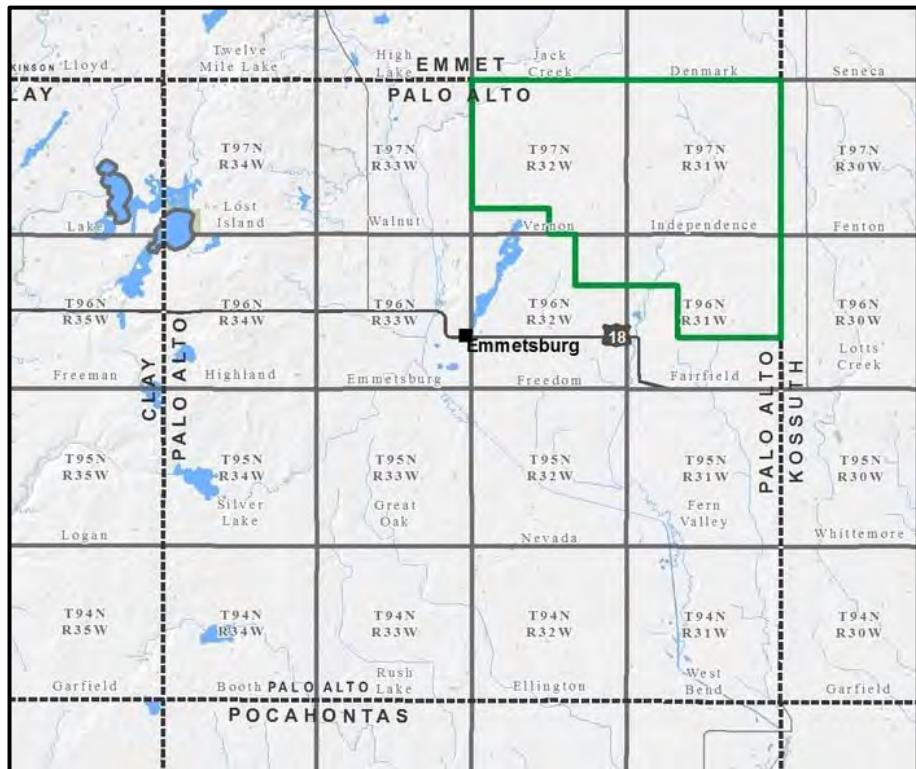
SOUND STUDY

Pre-Construction Noise Analysis

for the proposed

Palo Alto Wind Energy Project

August 2017



Prepared for

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1. Introduction

This report describes the results of a noise analysis conducted for the proposed Palo Alto Wind Energy Project (Project). The Project is located in a primarily agricultural area in the northeast portion of Palo Alto County, Iowa, as shown in Figure 1. The Project will consist of 170 turbines, with 28 alternates, and 2 electrical transformers. It will use 2.0 megawatt (MW) Vestas V110-2.0 model turbines with a hub height of 95 meters. The Project will have a total nameplate generation capacity of 340 MW. The noise level analysis results described herein include the noise generated by all 198 Vestas V110-2.0 wind turbines, as well as the Project's main electrical transformers.

Noise from the proposed wind turbines and transformers must comply with applicable sections of the Wind Energy Conversion Systems Ordinance for Palo Alto County, Iowa. Compliance with the County noise standard is demonstrated herein by the results of a detailed and conservative mathematical model of noise from the turbines and transformers and the propagation of this noise to residences in the area. This report describes the applicable noise standard, the Project site, the noise modeling method, the predicted noise level results, and a demonstration of compliance with the County's ordinance.

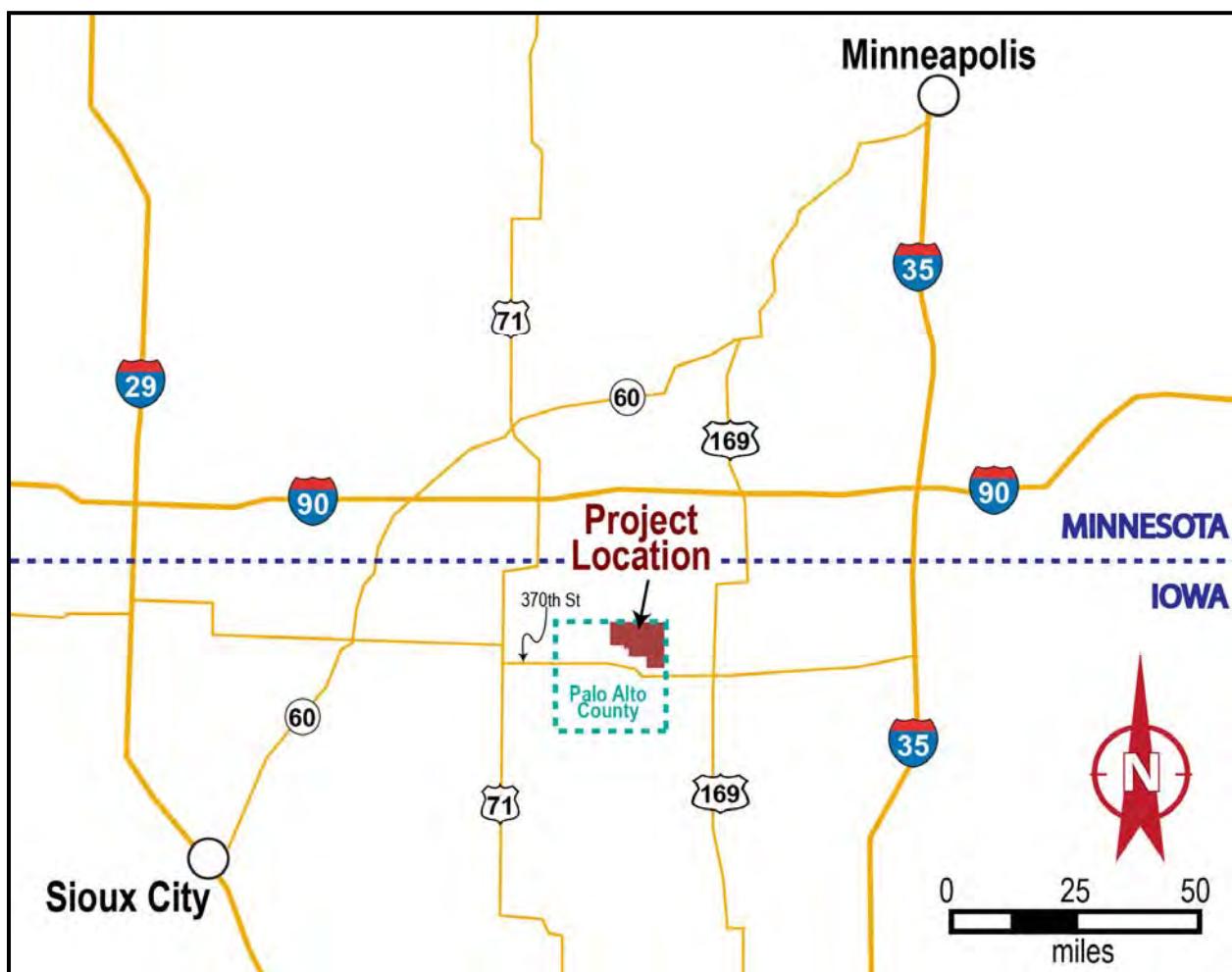


Figure 1. General Location of the Proposed Palo Alto Wind Energy Project

2. Applicable Noise Standard

Noise emissions from the Project must adhere to the sound-related provisions of the Wind Energy Conversion Systems Ordinance for Palo Alto County, Iowa (Ordinance No. 9-27-16). Appendix A contains the full text of the ordinance. The applicable portion, Section 6.d Sound, states:

Sound produced by any Wind Energy Device(s) under normal operating conditions as measured at the exterior wall of a Permanent Residential Dwelling existing as of the date of the issuance of the Site Plan Review and Approval Permit shall not exceed 50 dBA. Sound levels, however, may be exceeded during short term events out of the Owner/Developer's control, such as utility outages and/or severe wind or weather conditions.

To demonstrate compliance with this standard, noise levels from the Project were predicted at each Permanent Residential Dwelling using a method that has been field-verified on other similar wind turbine projects to represent the loudest operating conditions.

3. Project Site Plan

The layout of the proposed Palo Alto Wind Energy Project is shown below in Figures 2 through 4 (Layout L027, August 2017). The figures show the location of each of the Project's 198 Vestas V110-2.0 turbines, as well as the Project's substation, which consists of two 180 megavolt-ampere (MVA) step-up transformers. Also shown are the locations of the 268 receptor points where noise levels were predicted. These locations include all residences within approximately 10,000 feet of any Project wind turbine or main step-up transformer. Noise levels at more distant residences will be below those described herein, and will be well below the applicable limit. Appendix B lists the geographic coordinates and Project participation status of each receptor point where noise levels were predicted. The coordinates of each turbine and transformer are provided in Appendix C. Note that if the Project Applicant changes the layout or turbine type, or uses alternative turbine sites, this noise analysis should be updated accordingly and compliance again demonstrated.

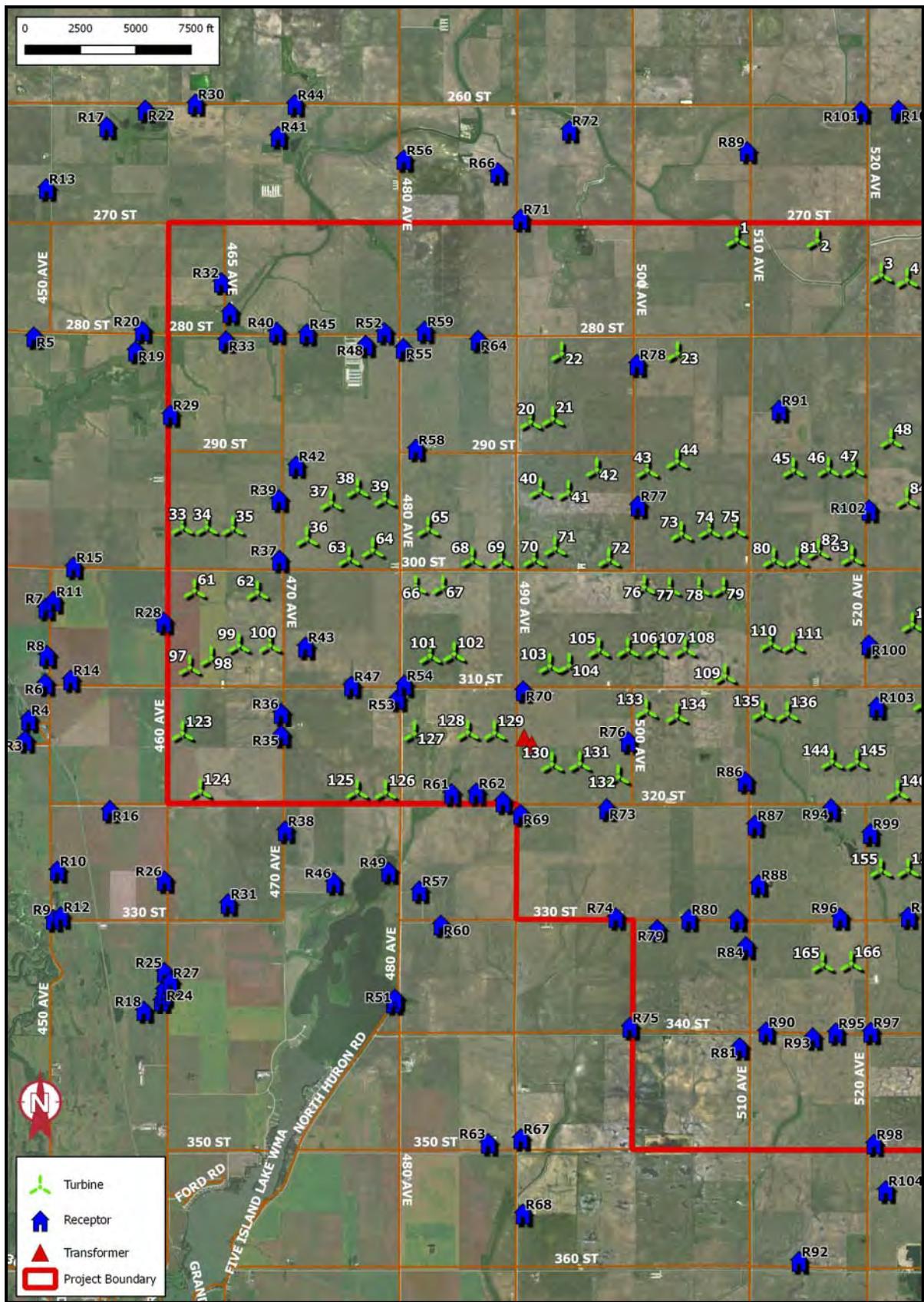


Figure 2. Noise Analysis Site Plan (West)

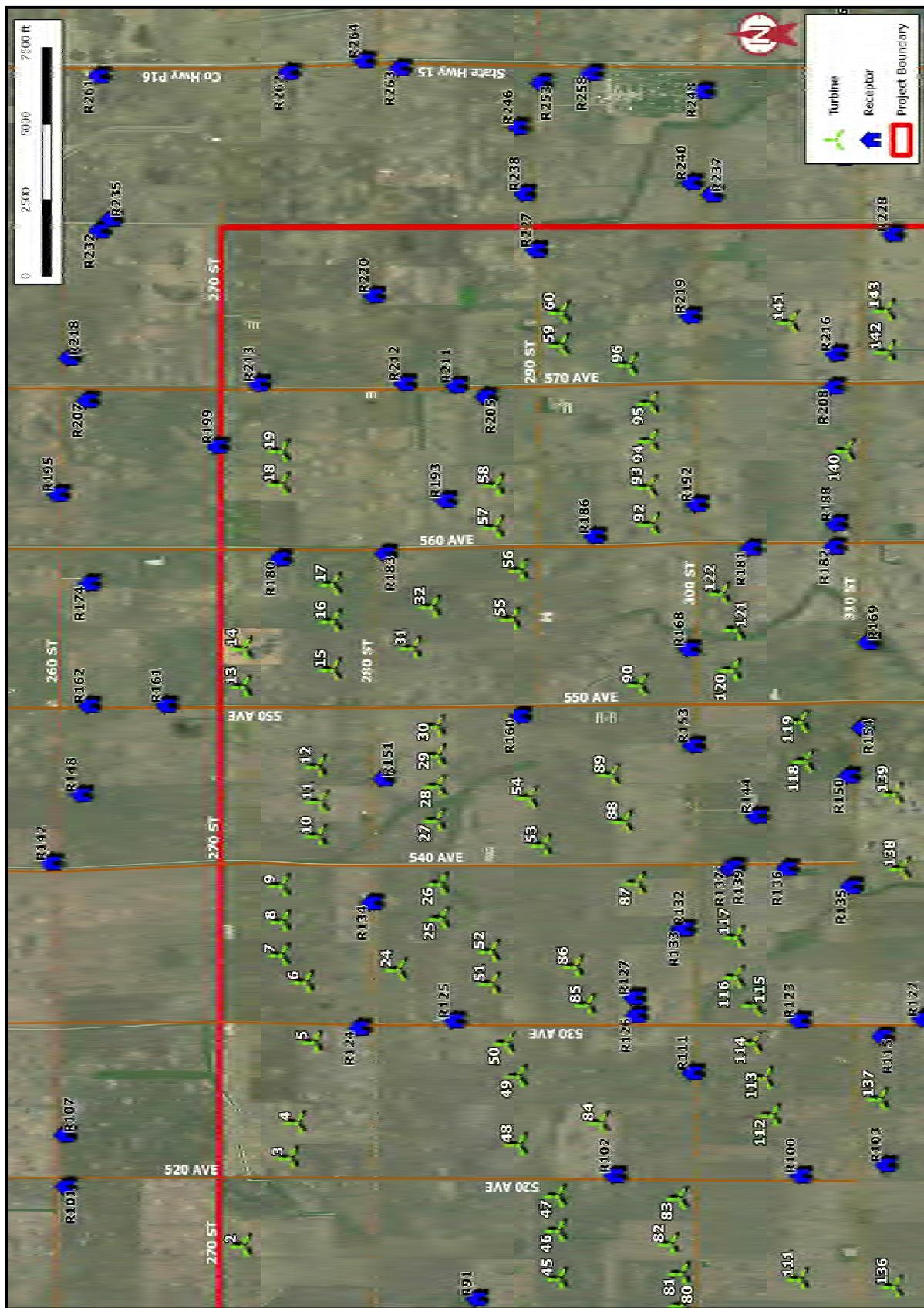


Figure 3. Noise Analysis Site Plan (Northeast)

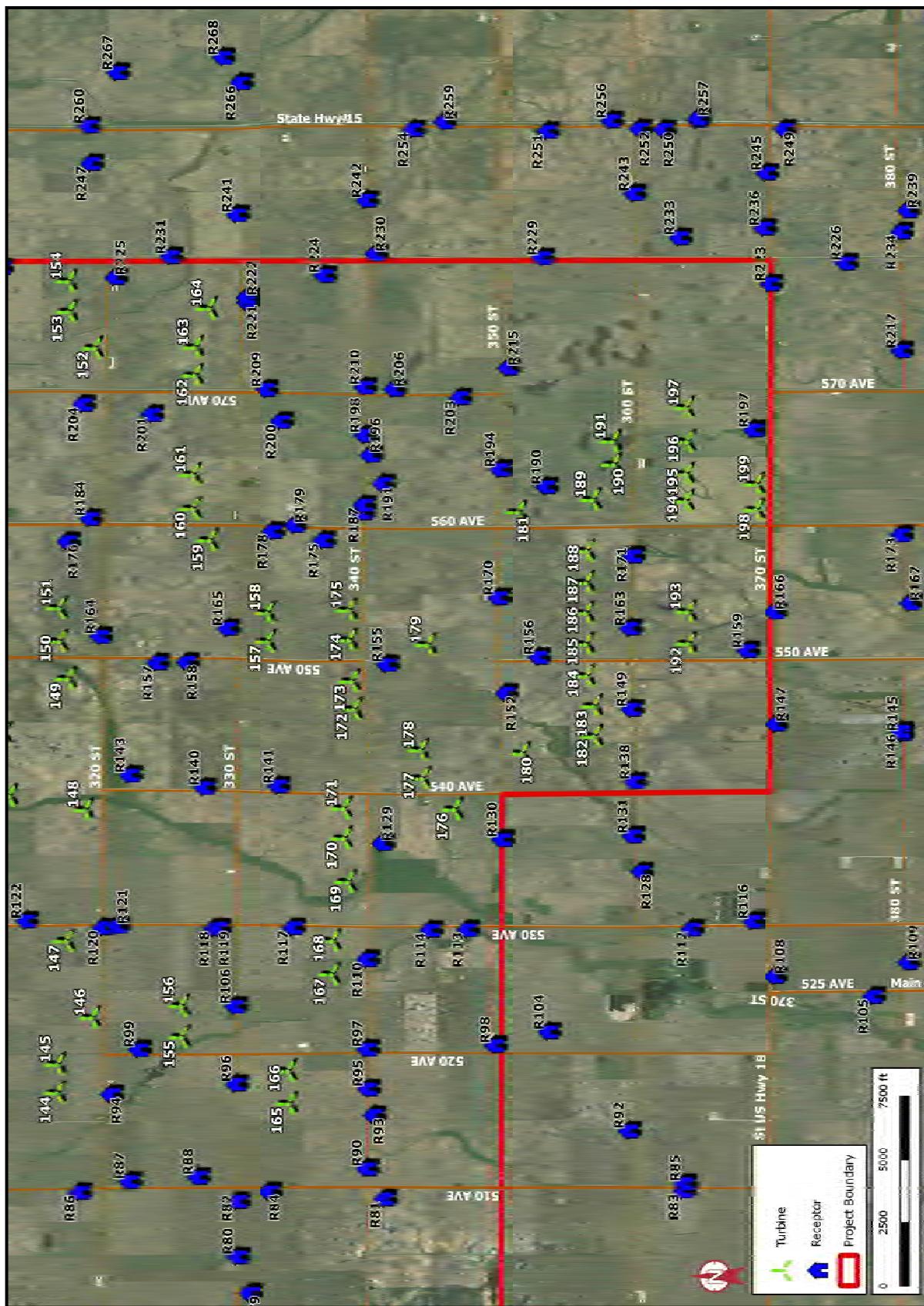


Figure 4. Noise Analysis Site Plan (Southeast)

4. Noise Modeling Method

Noise levels from the proposed Palo Alto Wind Energy Project were predicted using the method prescribed by International Organization for Standardization (ISO) Standard 9613-2:1996, Attenuation of Sound During Propagation Outdoors. The method was implemented using the SoundPLAN 7.4 acoustical modeling software program, and checked using spreadsheet calculations. Figure 5 shows a sample view of the SoundPLAN acoustical model of the Project.

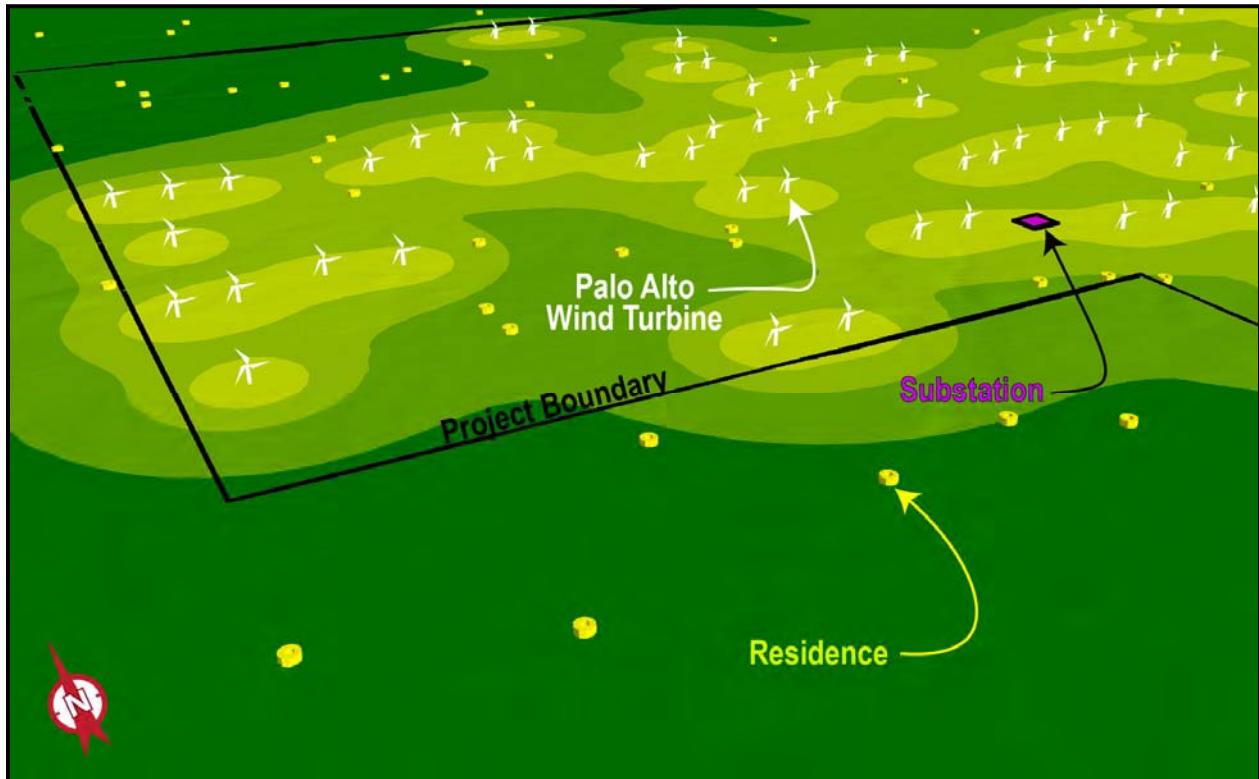


Figure 5. View of the SoundPLAN Noise Model

Ground Effect

The acoustical effect of the ground was modeled using the ISO 9613-2 General Method. This method requires the selection of "ground factors" for the ground near the source, near the receiver, and between the two. Ground factors range from 0.0 to 1.0, and affect how much sound is absorbed or reflected. A ground factor of 0.0 represents a completely reflective surface such as pavement, which would result in a higher level of sound reaching the receiver. A ground factor of 1.0 represents absorptive ground such as thick grass or crops, resulting in a lower level of sound reaching the receiver. For this project, a ground factor of 0.0 (completely reflective) was used in order to make a conservative prediction. Actual ground conditions could, at rare times, be 0.0 when the ground is completely frozen, but would generally be closer to 0.5 when the ground is covered with vegetation or crops, or when the ground is bare and unfrozen.

Atmospheric Conditions

The air temperature, relative humidity, and atmospheric pressure were set to 10°C, 70%, and 1 atmosphere, respectively. These conditions result in the lowest degree of atmospheric absorption per ISO 9613-2.

Receptor Points

In the model, receptors (prediction points) were placed at each of the 268 residences located within approximately 10,000 feet of the proposed Project. The geographic coordinates of each receptor are provided in Appendix B. Consistent with standard professional practice, the height above the ground for each receptor was set to 1.5 meters (5 feet).

Noise Sources

Noise levels were predicted assuming the full operation of all 198 turbines that make up the 340 MW Project, as well as the Project's two main step-up transformers. As currently designed, the Project will use Vestas V110-2.0 turbines. In the model, each turbine was represented as an acoustical point source located at its hub height (95 meters above the ground), and each transformer was modeled as an acoustical point source located three meters above the ground. No directivity was applied to the noise sources, thus assuming maximum sound emission in all directions. Table 1 sound power level data used in this analysis for the wind turbines and transformers. Turbine sound power levels were obtained from Vestas data sheets, and were determined according to International Electrotechnical Commission (IEC) Standard 61400-11. In general, wind turbine noise emissions increase with increasing wind speeds up to approximately 10 to 12 meters per second (as measured at hub height). Noise levels do not increase above this wind speed because turbine noise is primarily driven by the blade rotational speed, and the rotational speed reaches a maximum at this wind speed. This analysis used the maximum noise emission values provided by Vestas. Transformer sound power levels were estimated using the procedures outlined in NEMA TR 1-1993 and IEEE C57.12.90-1993 (34.5 to 345 kV, 180 MVA).

Table 1. Source Sound Power Spectra

Noise Source	Octave Band Sound Power Level (dB)									Overall Sound Power Level (dBA)
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	
Vestas V110-2.0 Turbine*	116.2	113.3	109.5	105.1	103.3	102.9	101.0	94.5	78.3	107.6
180 MVA Transformer**	95.0	100.8	102.7	97.2	97.8	91.6	86.4	81.6	72.5	98.0

* Vestas V110-2.0 MW (T05 0509-4340 Ver 01, 2017-06-16), 12 m/s at hub height

** Estimated using NEMA TR 1-1993 and IEEE C57.12.90-1993

Validation of Noise Prediction Method

The noise level prediction method employed on this project has been validated by Hankard Environmental by comparing predicted noise levels to those measured at operating wind farms. Hankard Environmental compared noise levels measured over the course of five weeks near a wind farm employing similar turbines to the noise levels predicted by an acoustical model of that project using the same methods as described above. The results of that validation analysis showed that the acoustical model generally either precisely predicts the maximum measured turbine-only noise levels, or over-predicts noise levels by approximately 1 dBA. Again, the validation analysis compares predicted levels to the very highest measured turbine-only noise levels. A majority of the time, turbine noise levels will be less than those predicted. This is because the method employed conservatively assumes (1) completely reflective ground, (2) full operation and full acoustic output of all turbines in all directions, and (3) optimal atmospheric conditions for sound propagation. Not all of these factors will be present at all times.

5. Predicted Noise Levels

Noise levels from the full and continuous operation of all 198 wind turbines of the Palo Alto Wind Energy Project, as well as the Project's two step-up transformers, were predicted at each of the 268 residences located in the Project study area (within 10,000 feet of any turbine or transformer). The predicted overall noise levels at each receptor are listed in Appendix D. The levels range from 27.4 dBA to 49.9 dBA. None of the predicted noise levels exceeds the 50 dBA Palo Alto County limit.

Table 2 summarizes the distribution of predicted levels for participating and non-participating receptors. The predicted noise level does not exceed the County's 50 dBA limit at any residence in the study area. Approximately 80% of non-participating residences have predicted levels below 45 dBA, and over 55% of non-participating residences have predicted levels below 40 dBA.

Table 2. Predicted Level Summary

Predicted Noise Level (dBA)	Number of Receptors		
	Non- Participating	Participating	All
≥ 50	0	0	0
47-50	27	8	35
45-47	25	6	31
40-45	54	5	59
< 40	138	5	143
Any Level	244	24	268

Given the conservative nature of this analysis, it can be confidently concluded that turbine noise emissions from the Palo Alto Wind Energy Center will not exceed the Palo Alto County, Iowa noise limit, and that turbine noise levels will be well below the limit a majority of the time.

APPENDIX A

Palo Alto County Wind Energy Ordinance

WIND ENERGY CONVERSION SYSTEMS

ORDINANCE FOR PALO ALTO COUNTY, IOWA

Supervisor Keith Wirtz introduced the following Ordinance No.9-21-16 and asked that it be placed on file and read for the first time on 9-13-2016.

Furthermore, Supervisor Ed Noonan requested that the second reading of Ordinance No. 9-21-16 be set on 9-20-2016.

Furthermore, Supervisor Ed Noonan requested that the third reading of Ordinance No. 9-21-16 be set on 9-27-2016.

AN ORDINANCE ADDRESSING THE STANDARDS, CONDITIONS, AND APPLICATION, SITE PLAN REVIEW AND APPROVAL FOR THE CONSTRUCTION AND MAINTENANCE OF WIND ENERGY CONVERSION SYSTEMS (WECS) AND INDIVIDUAL WIND ENERGY DEVICES (WEDs) WITHIN PALO ALTO COUNTY, IOWA.

WHEREAS, it is deemed advisable and recommended by the Palo Alto County Board of Supervisors to create and enforce an ordinance in Palo Alto County addressing the site Plan Review and Approval for the construction and ongoing maintenance of WECS proposed to be erected within Palo Alto County.

WHEREAS, the Palo Alto County Board of Supervisors wish to adopt and enforce the following Wind Energy Conversion Systems Ordinance to better promote the health, safety, and welfare of the County's residents and businesses.

WHEREAS, the Wind Energy Conversion Systems Ordinance is a separate county ordinance and shall be considered to be a "stand alone" enactment authorized under County Home Rule under Iowa Code Section 331.302(1). The Board of Supervisors move to repeal the provisions of the existing Palo Alto County Zoning Ordinance Article 5, Section 2.1.10 and Section 2.1.11 except as those provisions relate to the application for a Wind Energy Conversion Systems of less than 100, kW in total nameplate generating capacity.

NOW, THEREFORE, BE IT ORDAINED, that the Wind Energy Conversion Systems Ordinance is hereby adopted within Palo Alto County, Iowa and includes the following provisions:

Section 1. Purpose. The purpose of this Ordinance is to provide for the regulation of Owners/Developers engaged in the construction, erection, placement, location, operation, and maintenance of WECS in Palo Alto County; and to preserve and protect public health and safety

without significantly increasing the cost or decreasing the efficiency of these systems and associated structures.

Section 2. Jurisdiction. This Ordinance is adopted by the Palo Alto County Board of Supervisors and governs all lands within the unincorporated areas of Palo Alto County, Iowa. This Ordinance and its provisions shall not apply to those properties or projects occurring within the incorporated cities of Palo Alto County.

Section 3. Definitions.

- a. *"Administrator"* – Any person or firm appointed by the Palo Alto County Board of Supervisors to oversee the Site Plan Review and Approval of WECS and compliance with the Wind Energy Conversion Systems Ordinance.
- b. *"Commercial Grade Wind Energy Conversion System" or "Commercial Grade WECS"* – Means a Wind Energy Conversion System of equal to or greater than 100 kW in total nameplate generating capacity.
- c. *"Decommission" or "Decommissioning"* – means the complete removal of all wind turbines and related devices and equipment and distribution and transmission facilities comprising a Wind Energy Conversion System, including, but not limited to, all rotors, nacelles, and towers; all collection step-up transformers; all Wind Energy Device foundations, pads, underground electrical wires and any and all other underground wind energy structures and improvements and all access road (unless the relevant landowner requests that such access road remain), all in accordance with Section 7 herein.
- d. *"Meteorological Tower" or "MET Tower"* – Means any meteorological, measuring or surveying equipment or devices erected on or attached to any tower, monopole, or guyed structure to verify the wind and weather resources found within a certain area.
- e. *"Owner/Developer"* – Shall mean the individual, firm, business or entity that intends to own and operate a Wind Energy Conversion System in accordance with this Ordinance.
- f. *"Rotor Diameter"* – Means the cross sectional dimension of the circle swept by the rotating blades of the Wind Energy Device.
- g. *"Permanent"* – For purposes of this Ordinance, permanent shall mean any building or structure continuing or existing without fundamental or identifiable change for a continuous period of at least one (1) year. This definition shall not include those temporary or non-permanent buildings and structures utilized during the construction of a WECS.
- h. *"Permanent Residential Dwelling"* – Means any occupied or unoccupied buildings or structures intended for human occupancy of which physical construction of the building has commenced, and which shall be placed upon and securely attached to a permanent foundation. Buildings or structures containing a home occupation which is part of a residence shall be considered a permanent residential dwelling. Mobile, manufactured or factory built housing that is permanently attached to a foundation is also defined as a

permanent residential dwelling. Recreational vehicles, campers, or other temporary forms of housing are not considered a permanent residential dwelling.

- i. "*Total Height*" – Means the vertical distance from ground level to the tip of the blade on a Wind Energy Device when such blade is at its highest point. The County reserves the right to deny applications for Wind Energy Conversion Systems which include Wind Energy Devices which would exceed 550 feet in total height.
- j. "*Tower*" – Means any monopole, freestanding, or guyed structure that supports a Wind Energy Device.
- k. "*Unoccupied Non-Human Dwelling Structure*" – Means any occupied or unoccupied non-human dwelling buildings or structures that are not capable of being occupied for residential purposes.
- l. "*Wind Energy Conversion System*" or "*WECS*" – Means an electrical generating facility comprised of one or more Wind Energy Devices and accessory facilities, including, but not limited, to: power lines, transformers, substations and meteorological towers that operate by converting the kinetic energy of wind into electrical energy. The energy may be used on-site or distributed into the electrical grid.
- m. "*Wind Energy Device*" or "*WED*" – Means any equipment that transforms energy from the wind into usable forms of energy not intended for residential or personal use. This equipment includes any base, blade, foundation, generator, nacelle, rotor or tower that is integrated as part of a single device. The term wind energy device often refers to and includes wind towers, wind turbines, wind generators, windmills, or other wind energy conversion systems. This definition shall not include any buried wires or other sub-surface electrical transmission equipment or ancillary above ground electrical structures such as junction boxes and step-up transformers.
- n. "*Wind Energy Device Accessory Building or Structure*" – Means any permanent building or structure located within the same defined boundaries of a permitted Wind Energy Conversion System or on the same lot, parcel, or tract of land of a single Wind Energy Device; and is clearly considered customarily and incidental and subordinate to the principal Wind Energy Device(s). Any Wind Energy Device Accessory Building or Structure may contribute to the successful operation, convenience and necessity of the principal Wind Energy Device(s). Examples of Wind Energy Device Accessory Buildings or Structures may include, but not be limited to, electrical substations, switching stations or any other permanent structures used in a capacity similar to electrical substations and associated with Wind Energy Conversion Systems. This definition shall not include any above ground or buried transmission lines, wires, or other electrical equipment in addition to any above ground junction boxes, step-up transformers, operations and maintenance buildings or any temporary or non-permanent buildings or structures used during the construction of a Wind Energy Device or Wind Energy Conversion System. For the avoidance of doubt, junction boxes are small pieces of electrical equipment that are typically no larger than approximately 3' tall above the surface and approximately 4' in width and 3' in depth. Step-up transformers are pieces of electrical equipment

approximately 6' tall above the surface and approximately 6' in width and 6' in depth and are usually located in close proximity to the base of the Wind Energy Device.

Section 4. Site Plan Review and Approval Permit Application. A request for a Site Plan Review and Approval Permit may be initiated by an Owner/Developer by filing an application with the Administrator upon forms prescribed for these purposes and available upon request from the Administrator or as a download from Palo Alto County's website. The Zoning Administrator shall immediately present the Site Plan Review and Approval Permit Application to the Palo Alto County Board of Supervisors which is charged with reviewing all applications for Site Plan Review and Approval Application Permits only upon full compliance with the following procedures:

- a. Pre-Application Meeting. Whenever a WECS is proposed in the jurisdiction of Palo Alto County, the Owner/Developer is required to hold a public informational meeting on the proposed development within 90 days prior to submitting an application for a Site Plan Review and Approval Permit. Public notice of the meeting shall be published in a newspaper of general circulation within the vicinity of the proposed project site as well as published within the official publication(s) of Palo Alto County no less than four (4) and no more than 20 days prior to the meeting. The public notice shall include at a minimum the name of the proposed project, a contact person for the project, the location of the project, the time and place of the meeting, and a description of the project activities. The Owner/Developer shall also give notice by ordinary U.S. mail to all property owners within 5,280 feet (one mile) from the Wind Energy Devices. Written notice of that pre-application meeting shall be postmarked not less than four (4) days prior to the pre-application meeting. The Owner/Developer is responsible for meeting all of these requirements and shall provide documentation to the Administrator that these public notice requirements have been satisfied prior to submitting an application for a Site Plan Review and Approval Permit.
- b. Notice. The Owner/Developer shall be responsible for obtaining and submitting to the Administrator an abstractor's or attorney's certificate, at the time the Site Plan Review and Approval Permit application is made, showing the names and last known addresses of the owners of all property within 5,280 feet (one mile) of each proposed Wind Energy Device for which the Site Plan Review and Approval permit is requested.
- c. Agency Notice/Review. Prior to submitting an application for a Site Plan Review and Approval Permit for a WECS, the Owner/Developer shall be responsible for notifying applicable governmental and community agencies of the planned project and allowing each agency 60 days advance notice to do a preliminary review. Documentation of notification of these agencies, and any reports from the agencies, are to be provided to the Administrator when the application is submitted. If any agency does not act within 60 days, the plan may be deemed, for the County's purposes, approved by the agency

that failed to act upon proof of notice. It is recommended that any issues be addressed prior to the public hearing. The Administrator and the Site Plan Review and Approval Permit applicant will establish and agree to a list of applicable agencies (listed below) to which the applicant will submit notice and from whom the applicant will solicit comment from prior to Palo Alto County Board of Supervisors considering an application for a Site Plan Review and Approval Permit.

- Federal Aviation Administration
 - U.S. Fish and Wildlife Service
 - U.S. Department of Agriculture (Local NRCS)
 - Environmental Protection Agency
 - Federal Communications Commission
 - Iowa Department of Transportation
 - Iowa Department of Natural Resources
 - Iowa Utilities Board
 - Office of State Archaeologist
 - Palo Alto County Engineer's Office
 - Palo Alto County Conservation Board
 - Palo Alto County Board of Health
 - Palo Alto County Emergency Management Coordinator
 - Palo Alto County Planning and Zoning Commission
 - All municipalities in Palo Alto County within two (2) miles of any proposed WECS facilities
- d. Site Plan. The application for a Site Plan Review and Approval Permit shall be accompanied by a detailed site plan for the W.E.C.S. A site plan and other such plans and manufacturer's specifications shall show the dimensions, arrangements, descriptive data, site layout and other information essential to an understanding of the use and construction of the proposed WECS. The Site Plan Review and Approval Permit application shall also be accompanied by an application fee of \$1,000.00 plus \$100 per Wind Energy Device.

A site plan shall include the following at a minimum:

- Approximate location and total number of the proposed Wind Energy Device(s)
- Approximate access points to roads showing construction details typical of all entrances proposed to be built in the public right of way
- Approximate distance to any inhabited or uninhabited buildings reflecting compliance with the setback requirements of this ordinance
- Approximate distance to the nearest wind energy or other tower structures of similar purpose or size

- Proposed aerial application accommodation plan, including contact information and conditions to allow applicators to request shut-down and rotation or to notify workers of anticipated aerial operations on a given date in a particular area
 - Leaseholder or ownership details of the building site
 - Dimensions of the building site showing approximate distances to surrounding properties
 - Construction details of the Wind Energy Device(s), including any experimental or prototype Wind Energy Device(s) (including manufacturer and model, tower height, tower type, and rotor diameter)
 - Tower foundation blueprints or drawings and tower blueprints or drawings
 - Schematic site layout, including location of electrical wires, connection points with the electrical grid and related accessory structures
 - The site plan shall be drawn to scale
 - Documentation of land ownership or legal control of the property
 - FAA Request for No Hazard Determination
 - Proposed FAA obstruction and marking plan
 - Publicly available documentation of public surface open drainage ditches and Public subsurface drainage tiles.
- e. Public Hearing. Within 60 days of receiving a Site Plan Review and Approval Permit application for a Wind Energy Conversion System, the Palo Alto County Board of Supervisors shall schedule a public hearing regarding the Site Plan Review and Approval Permit. Notice shall be given to the public no less than four (4) and no more than 20 days prior to the public hearing by publication in the official newspaper(s) of Palo Alto County as well as publication in a newspaper within the general vicinity of the proposed project site. Prior to the public hearing, notice shall also be given by ordinary mail to all property owners located within 5,280 feet (one mile) of each proposed Wind Energy Device for which the Site Plan Review and Approval Permit is requested
- f. Review and Approval or Rejection of the Application for a Site Plan Review and Approval Permit by the County Board of Supervisors. The Board of Supervisors shall vote to approve, with or without conditions, or reject the Site Plan Review and Approval Permit application within 30 days after the public hearing referenced in subparagraph "e" above. A Site Plan Review and Approval Permit shall not be granted by the Palo Alto County Board of Supervisors unless and until the procedures set forth in this Ordinance have been fulfilled. If the application is approved, the Board of Supervisors may prescribe additional appropriate conditions and safeguards as part of the Site Plan Review and Approval Permit, in conformity with this Ordinance and other ordinances of the County. If the application is rejected, the Board of Supervisors shall set forth the reasons for such rejection in its records and shall provide the applicant with a copy of such records.

- g. Term. Approval of the Site Plan Review and Approval Permit for a WECS shall be valid for a period of two (2) years from the date such permit is granted, unless construction has commenced or the Board of Supervisors specifically grants a longer period of time for the Site Plan Review and Approval Permit.
- h. Legal Requirements. The approval and issuance of a Site Plan Review and Approval Permit for the construction or installation of a WECS under this Ordinance shall not relieve any permittee, applicant or Owner/Developer from compliance with all legal requirements, nor shall it relieve the permittee, applicant or Owner/Developer of any liability for damage or loss resulting from the placement, construction or maintenance of such WECS. Palo Alto County assumes no liability whatsoever by virtue of the issuance of a Site Plan Review and Approval Permit for a WECS.

Section 5. Wind Energy Conversion System Requirements.

- a. Setbacks from Public Roads , Public Right of Ways, and Overhead Utility Lines. Wind Energy Devices and Meteorological Towers shall be set back no less than a distance equal to one hundred twenty percent (120%) of its total height from any public street, public right of way or overhead utility line.
- b. Setbacks from Permanent Residential Dwellings. Wind Energy Devices shall be setback a distance of no less than 1,500 feet from any Permanent Residential Dwelling unless a waiver in the form of written permission is granted by the affected property owner. The measurement between the Permanent Residential Dwelling and the W.E.D. is to be taken from the nearest point of the Permanent Residential Dwelling to the center of the Wind Energy Device structure's base. At no time shall any part of the Wind Energy Device or Meteorological Tower overhang any adjoining property without securing appropriate agreements from the affected adjoining property owners.
- c. Setbacks from Property Lines. Wind Energy Devices shall be set back no less than a distance equal to one hundred twenty percent (120%) of its total height from any existing property line unless a waiver in the form of a written permission is granted by the affected property owner. The measurement for the set back from property lines shall be between the center of the base of the Wind Energy Device and the closest point along the adjacent property line.
- d. Setbacks from Unoccupied Non-Human Dwelling Structures. Wind Energy Devices and Meteorological Towers shall be setback no less than a distance equal to one hundred twenty percent (120%) of its total height from any Unoccupied Non-Human Dwelling Structure.

- e. Setbacks from Cemeteries. Wind Energy Devices and Meteorological Towers shall be setback a distance of no less than 1,500 feet from any cemeteries.
- f. Setbacks from City Limits. Wind Energy Devices shall be setback a distance of no less than 1,500 feet from the city limits of all incorporated municipalities within Palo Alto County. The Cities may waive the 1,500 setback.
- g. Shadow Flicker. The Owner/Developer shall use shadow flicker computer modeling to estimate the amount of shadow flicker anticipated to be caused by the WEC S so that computer modeling indicates that no non-participating permanent residential dwelling will experience more than 30 hours per year of shadow flicker under planned operating conditions. If an owner of a non-participating Permanent Residential Dwelling experiences more than 30 hours of shadow flicker per year under WECS normal operating conditions, then the Owner /Developer shall be obligated to mitigate such shadow flicker to comply with the terms of this Ordinance.
- h. Public Lands or Waterways. WECS shall be setback a distance of 1,500 foot setback from any public lands and public waterways whether they are owned by the County, State or Federal government. The Owner/ Developer will have a preliminary review with the Iowa Department of Natural Resources (IDNR) and the Palo Alto County Conservation Board early in the planning stages of all WECS in Palo Alto County. This review will allow the IDNR and the Palo Alto County Conservation Board to identify sensitive environmental and wildlife habitat concerns near such public lands and waterways. Upon consultation with, and after written consent from the public entity owning the public land and /or waterways, the Board of Supervisors may waive the 1,500 foot setback on behalf of the public entity.
- i. Density or Spacing. Wind Energy Device spacing will vary depending on common industry practice and manufacturer specifications. The Owner/Developer shall consider the public interest and the natural environment, and maintain the intent and purpose of this Ordinance.
- j. Access. All ground mounted electrical and control equipment shall be labeled and secured to prevent unauthorized access.
- k. Electrical Wires. All electrical wires associated with a WECS, other than wires necessary to the operation of the Wind Energy Device itself, shall be located underground. Transmission lines or high capacity electrical lines from substations transferring cumulative energy resources from a W. E.C.S. shall not be required to be placed underground.

- I. **Lighting.** Wind Energy Devices shall not be artificially lighted from the ground upward. The only lighting permitted is that which is recommended by the Federal Aviation Administration or other governmental entities. All temporary or permanent Meteorological Towers (regardless of their height) shall display a flashing red light at the top of the tower and be painted conspicuously. Where feasible to do so, aircraft detection lighting systems (ADLS) shall be used to reduce the impact of nighttime lighting on nearby residents, communities and migratory birds and to extend the life expectancy of obstruction lighting, all in accordance with FAA Advisory Circular: 70/7460-1L, section 14.1 *et. seq.* (12/04/15).
- m. **Appearance, Color, and Finish.** Wind Energy Devices shall remain painted or finished the color or finish that was originally applied by the manufacturer, unless approved otherwise by the Palo Alto County Board of Supervisors.
- n. **Signs.** All signs visible from any public roadway, street, or highway other than the manufacturer's or installer's identification and appropriate warning signs shall be prohibited. Documentation showing any signage shall be submitted with the application for a Site Plan Review and Approval Permit.
- o. **Code Compliance.** All WECS shall comply with all applicable State of Iowa construction and electrical codes, and the National Electrical Code.
- p. **Utility Notification and Interconnection.** WECS that connect to an electric utility shall comply with all local, State of Iowa and Federal regulations regarding the connection of energy generation facilities.
- q. **Wind Energy Accessory Buildings or Structures.** Above ground Wind Energy Accessory Buildings or Structures shall be set back a distance of no less than 1,000 feet from any Permanent Residential Dwelling. The measurement between the Wind Energy Accessory Building or Structure is to be taken from the nearest point of the Permanent Residential Dwelling to the visually apparent perimeter of the above ground Wind Energy Accessory Building or Structure, or the boundary of an area containing such above ground Wind Energy Accessory Building or Structure (as may be evidenced by a fence, edge of parking lot, or other visible surface or above ground element of the building or structure; provided, however, that a sign or natural vegetation shall not be considered a perimeter or boundary). Such setback distance of 1,000 feet shall be enforced unless the property owner of such Permanent Residential Dwelling provides written consent or approval to the location of such Wind Energy Accessory Building or Structure.

Above ground Wind Energy Accessory Buildings or Structures shall be setback a distance of no less than 45 feet from any road right of way, public right of way, railroad right of way, or public utility facility, unless the owner of such facilities or such right of way or the applicable public utility facility owner provides written consent or approval to the location of such above ground Wind Energy Accessory Building or Structure. Any such setback distances shall be indicated and specified in the Site Plan Review and Approval Permit application.

- r. Meteorological towers shall be removed within one year of the commencement of operation of any WECS. Any MET tower that will be left in place on a more permanent basis shall have a continuous strobe light of sufficient wattage to be visible horizontally for 360° and overhead 180° from a distance of one (1) mile affixed at the top and be painted in equal vertical bands of alternating colors of red and white, which bands shall be no less than 24" and not more than 48" wide.

Section 6. Mitigation of Damages. In the event there are any damages that occur during the construction or maintenance of a WECS, the Owner/Developer shall be fully responsible for mitigating and correcting any such damages to public or private infrastructure.

- a. Drainage System. The Owner/Developer shall be required to obtain a separate permit prior to commencing construction of the WECS's underground electrical collection cable system if such construction activity is planned to span across organized drainage districts tile systems within the unincorporated areas of Palo Alto County. A request for an underground construction permit may be initiated by filing an application with the Palo Alto County Auditor upon forms prescribed for these purposes and available upon request from the County Auditor or as a download from the Palo Alto County website. Within 45 days of receiving an application for an underground construction permit, the Palo Alto County Board of Supervisors shall vote on the application at a special meeting or one of their regularly scheduled meetings. An underground construction permit shall be subject to the following criterion at a minimum:
 - i. All underground electrical collection cable systems planned to be installed in organized drainage districts or in areas with private tile systems shall be installed by trenching (and not plowing).
 - ii. All underground electrical collection cable systems shall be installed at a cover depth of no less than five feet (60") below grade and eight feet (96") below established drainage ditches and other open waterways.
 - iii. All underground electrical collection cable systems shall be installed so as to maintain a two (2) foot separation distance in all directions, i.e.: horizontal and

vertical and diagonal from existing public drainage tile and public drainage structures.

- iv. The applicant shall remedy any adverse effect on any organized drainage tile districts or private tile systems caused by the construction or repair of the WECS. To complete such repairs, the applicant shall hire appropriate drain tile contractor(s) that are familiar with the organized drainage tile districts and private tile systems within Palo Alto County. The applicant shall obtain written approval from the Palo Alto County Board of Supervisors of the contractor(s) selected prior to commencing the construction of the underground electrical collection cable system.

The Board of Supervisors may prescribe additional appropriate conditions and safeguards as part of the underground construction permit, in conformity with this Ordinance and the ordinances of Palo Alto County. Approval of the underground construction permit shall be valid for a period of two (2) years from the date such permit is granted, unless construction has commenced or the Board of Supervisors specifically grants a longer period of time for the underground construction permit.

- b. Roads. Costs of repair from damage or maintenance of County roads, rights of way, or any County infrastructure resulting from the construction or repair of a W. E.C.S. shall be the responsibility of the Owner/Developer of such WECS. A separate road agreement which clearly lays out the rights and obligations of the County and the Owner/Developer with respect to the construction, maintenance, and use of County roads in connection with the development of the WECS will be required prior to the start of construction and may be made a condition to the Site Plan Review and Approval permit.
- c. Electronic Interference. Any electronic devices that existed in the vicinity of the WECS prior to the submittal of an application for a Site Plan Review and Approval Permit by Owner/Developer and which experience substantial interference as a result of the WECS shall be remedied or compensated for such interference by the Owner/Developer of the WECS . This shall include, but not be limited to, interference with local broadcasts and radio waves, or other personal communication systems.
- d. Sound. Sound produced by any Wind Energy Device(s) under normal operating conditions as measured at the exterior wall of a Permanent Residential Dwelling existing as of the date of issuance of the Site Plan Review and Approval Permit shall not exceed 50 dBA. Sound levels, however, may be exceeded during short term events out of the Owner/Developer's control, such as utility outages and/or severe wind or weather conditions.

Section 7. Decommissioning at End of Serviceable Life or Discontinuance or Abandonment.

Each application for a Site Plan Review and Approval Permit for a WECS shall include a decommissioning plan outlining the anticipated means and cost of removing each Wind Energy Device at the end of its serviceable life or upon becoming a discontinued use. Such cost estimates shall be made by a professional engineer licensed in the State of Iowa, agreeable to the County. The decommissioning plan shall also outline proposed financing methods adequate for the decommissioning of the WECS. Prior to the issuance of a Site Plan Review and Approval Permit, the County and the Owner/Developer shall enter into a separate decommissioning agreement, which shall clearly lay out the rights and obligations of the County and the Owner/Developer with respect to the management and potential decommissioning and removal of the Wind Energy Devices either at the end of their serviceable life or upon becoming a discontinued use.

A Wind Energy Device shall be considered discontinued or abandoned after one (1) year without energy production, unless a timely plan is developed and submitted within such one (1) year period to the Administrator outlining the steps and schedule for returning the Wind Energy Device to active service.

All Wind Energy Devices and accessory facilities shall be removed to a depth of four (4) feet below grade within 180 days of becoming a discontinued use.

Section 8. Penalty. It shall be unlawful for any person, firm or corporation to construct, install, or operate any Commercial Grade WECS that is not in compliance with this Ordinance or with any special conditions contained in the Site Plan Review and Approval Permit. Wind Energy Devices installed prior to the adoption of this Ordinance are exempt. Administrator or other representative of Palo Alto County may enter upon or into any property for which a permit has been issued under this Ordinance to conduct an inspection to determine whether the conditions stated in the permit have been satisfied.

Any person who fails to comply with any provision of this ordinance shall be deemed subject to a county infraction and punishable by a civil penalty of not less than \$65.00 but not to exceed \$625.00 plus court costs for the first offense and not less than \$100.00 but not to exceed \$1,000.00 plus court costs for each repeat offense. Palo Alto County may seek all relief prescribed by State law for county infractions. The County Auditor and the Palo Alto County Attorney and his or her assistances are the officers authorized to enforce this ordinance by issuance of civil citations for county infractions. Each Wind Energy Device determined to be in violation will be considered a separate infraction. Each day that a violation occurs or continues to exist constitutes a separate offense.

The failure to comply with any of the conditions or restrictions imposed on the building permit issued for the WECS shall be deemed a violation of the Palo Alto County Wind Energy Conversion Ordinance and subject to the penalties described herein.

Section 9. Change of Ownership. The Owner/Developer shall submit notification to the Administrator upon change of ownership of all or part of any WECS. The ownership of a WECS shall not be assigned without the written consent of the Palo Alto County Board of Supervisors and such consent shall not be unreasonably withheld.

INTERPRETATION AND REGULATIONS.

In their interpretation and application, the provisions of this Ordinance shall be held to be minimum requirements. Where this Ordinance imposes a greater restriction than is imposed or required by other provisions of law, other rules, regulations, or ordinances, the provisions of this Ordinance shall govern. This Ordinance is not intended to abrogate or annul any easement covenant or other private agreement provided that where any provision of this Ordinance is more restrictive or imposes a higher standard requirement than such easement, covenant or other private agreement, the provisions of this Ordinance shall govern.

REPEAL AND SAVINGS CLAUSE.

Effective on the applicable date of this Ordinance, all ordinances or parts of ordinances previously adopted by Palo Alto County which are in conflict with the provisions of this Ordinance, or amendments thereto, are hereby repealed. The repeal of said ordinance shall not have the effect to release or relinquish any penalty, forfeiture or liability incurred under said ordinance or any part thereof, and such ordinance and all parts thereof shall be treated as still remaining in force for the purpose of instituting or sustaining any proper action or prosecution for the enforcement of such penalty, forfeiture, or liability.

VALIDITY & SEVERABILITY CLAUSE.

Should any section, provision or any part of this Ordinance, or amendments thereto, be declared by a court of competent jurisdiction to be invalid or unconstitutional, such ruling shall not affect the validity of the Ordinance as a whole or provision or part thereof not specifically included in said ruling.

EFFECTIVE DATE.

This Ordinance shall be in full force and effect from and after its adoption and publication as required by law and provided for in the Code of Iowa or amendments thereto.

ADOPTION

Supervisor Keith Wirtz introduced the above Ordinance No. 9-27-16 and it was placed on file and read for the first time on 9-13-2016.

Furthermore, the second reading of Ordinance No. 9-27-16 was held on 9-20-16.

Furthermore, the third readings of Ordinance No. 9-27-16 was held on 9-27-2016.

Supervisor Keith Wirtz therefore moves for the approval and passing of the ordinance.

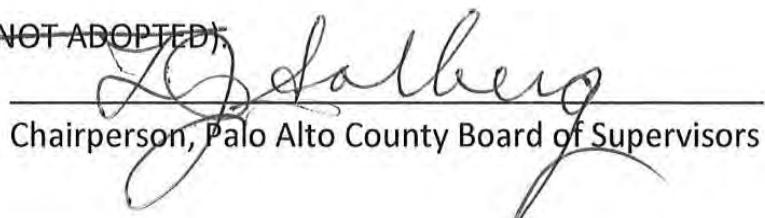
Supervisor Craig Merrill seconded the motion to adopt the ordinance.

THE RECORDED VOICE VOTE WAS MADE:

Keith Wirtz ✓
Ron Graettinger ✓
Ed Noonan ✓
Craig Merrill ✓
Linus Solberg ✓

Passed and approved this 27th day of September, 2016.

MOTION CARRIED RESOLUTION ADOPTED (NOT ADOPTED)


Chairperson, Palo Alto County Board of Supervisors

Attest: Can Mow

Palo Alto County Auditor

I hereby certify that on the following dates the foregoing was published as Ordinance 9-27-2016 in
Palo Alto County, Iowa.

9-6-2016 Emmetsburg Reporter
9-7-2016 Graettinger Times/Ruthven ZipCode
9-8-2016 West Bend Journal

APPENDIX B

Receptor Locations

Receptor ID	UTM Zone 15		Ground Elevation (m ASL)	Participation Status	Receptor ID	UTM Zone 15		Ground Elevation (m ASL)	Participation Status
	Easting (m)	Northing (m)				Easting (m)	Northing (m)		
R-1	361185	4787179	392.0	NP	R-41	365275	4791712	391.7	NP
R-2	361306	4788230	393.0	NP	R-42	365434	4787185	404.4	NP
R-3	361630	4783504	374.8	NP	R-43	365512	4784700	394.8	NP
R-4	361686	4783782	374.8	NP	R-44	365515	4792143	391.3	NP
R-5	361864	4789026	395.4	NP	R-45	365617	4788995	398.0	NP
R-6	361924	4784271	376.5	NP	R-46	365838	4781467	379.6	NP
R-7	361952	4785301	385.9	NP	R-47	366134	4784156	393.0	NP
R-8	361955	4784653	379.5	NP	R-48	366422	4788821	400.7	NP
R-9	361969	4781039	371.2	NP	R-49	366596	4781605	377.2	NP
R-10	362038	4781711	374.4	NP	R-50	366625	4779805	374.5	NP
R-11	362061	4785396	388.9	NP	R-51	366650	4779860	374.1	NP
R-12	362073	4781075	373.0	NP	R-52	366682	4788990	400.5	P
R-13	362077	4791055	402.3	NP	R-53	366761	4783961	395.2	NP
R-14	362274	4784317	378.8	NP	R-54	366860	4784154	400.1	P
R-15	362346	4785865	392.4	NP	R-55	366937	4788766	401.7	NP
R-16	362777	4782524	375.0	NP	R-56	366996	4791355	388.4	NP
R-17	362924	4791890	402.8	NP	R-57	367014	4781331	381.2	NP
R-18	363190	4779762	378.5	NP	R-58	367083	4787380	402.9	NP
R-19	363257	4788804	387.7	NP	R-59	367235	4788998	400.7	NP
R-20	363357	4789074	392.1	NP	R-60	367301	4780856	379.6	NP
R-21	363432	4779894	382.8	NP	R-61	367483	4782657	391.5	NP
R-22	363458	4792108	401.1	NP	R-62	367822	4782660	393.0	NP
R-23	363470	4779975	382.5	NP	R-63	367893	4777852	373.8	NP
R-24	363471	4780044	383.3	NP	R-64	367968	4788858	400.9	NP
R-25	363483	4780289	383.8	NP	R-65	368187	4782533	394.4	NP
R-26	363508	4781539	379.9	NP	R-66	368283	4791151	394.1	NP
R-27	363563	4780149	382.7	NP	R-67	368343	4777909	373.9	NP
R-28	363572	4785077	388.4	NP	R-68	368352	4776869	373.2	NP
R-29	363718	4787927	393.5	NP	R-69	368426	4782362	393.0	NP
R-30	364147	4792178	400.2	NP	R-70	368494	4784045	400.6	NP
R-31	364377	4781208	377.9	NP	R-71	368585	4790510	393.9	NP
R-32	364456	4789727	393.0	NP	R-72	369279	4791716	389.6	NP
R-33	364504	4788920	390.1	NP	R-73	369613	4782412	397.8	NP
R-34	364564	4789304	382.5	P	R-74	369709	4780910	388.2	NP
R-35	365157	4783504	385.3	NP	R-75	369873	4779401	376.8	NP
R-36	365160	4783798	387.3	NP	R-76	369927	4783323	400.6	NP
R-37	365179	4785901	404.2	NP	R-77	370122	4786547	400.6	P
R-38	365185	4782199	377.9	NP	R-78	370146	4788487	397.4	NP
R-39	365188	4786726	405.7	NP	R-79	370276	4780735	388.5	NP
R-40	365201	4789024	393.8	NP	R-80	370714	4780870	391.4	NP

Receptor ID	UTM Zone 15		Ground Elevation (m ASL)	Participation Status	Receptor ID	UTM Zone 15		Ground Elevation (m ASL)	Participation Status
	Easting (m)	Northing (m)				Easting (m)	Northing (m)		
R-81	371379	4779094	385.3	P	R-121	374721	4782239	392.5	NP
R-82	371381	4780857	391.7	NP	R-122	374807	4783328	394.0	NP
R-83	371407	4775513	371.1	NP	R-123	374813	4784564	390.2	NP
R-84	371492	4780480	391.3	NP	R-124	374821	4788945	390.1	NP
R-85	371495	4775497	371.3	NP	R-125	374875	4788002	390.1	P
R-86	371526	4782747	396.5	NP	R-126	374896	4786188	392.1	NP
R-87	371647	4782151	396.7	NP	R-127	375076	4786205	392.0	NP
R-88	371681	4781327	396.1	NP	R-128	375266	4775949	374.5	NP
R-89	371715	4791379	392.1	NP	R-129	375662	4779048	381.4	P
R-90	371747	4779304	382.3	NP	R-130	375683	4777611	384.5	NP
R-91	372087	4787827	391.9	NP	R-131	375699	4776046	374.7	NP
R-92	372142	4776155	369.2	NP	R-132	375753	4785723	388.8	P
R-93	372389	4779211	383.8	NP	R-133	375755	4785696	388.3	P
R-94	372698	4782352	391.6	NP	R-134	376071	4788798	390.1	P
R-95	372708	4779272	387.1	NP	R-135	376147	4784021	384.0	NP
R-96	372795	4780851	390.8	NP	R-136	376341	4784657	389.1	NP
R-97	373187	4779272	386.2	NP	R-137	376347	4785230	388.7	NP
R-98	373203	4777741	385.0	NP	R-138	376350	4776008	375.7	P
R-99	373232	4782006	389.7	NP	R-139	376365	4785191	389.1	NP
R-100	373260	4784579	398.7	NP	R-140	376373	4781167	388.4	NP
R-101	373289	4791900	389.2	NP	R-141	376377	4780280	390.4	NP
R-102	373297	4786431	391.2	NP	R-142	376528	4791983	392.4	NP
R-103	373353	4783728	397.3	NP	R-143	376541	4782054	382.6	NP
R-104	373354	4777095	379.4	NP	R-144	376871	4784950	391.6	NP
R-105	373711	4773196	365.6	NP	R-145	376872	4772789	364.1	NP
R-106	373734	4780845	386.1	NP	R-146	376902	4772801	363.7	NP
R-107	373804	4791903	389.2	NP	R-147	377014	4774303	367.9	P
R-108	373972	4774372	367.9	NP	R-148	377206	4791673	390.4	NP
R-109	374112	4772770	365.2	NP	R-149	377225	4776031	382.5	NP
R-110	374266	4779254	379.6	NP	R-150	377256	4784022	390.5	NP
R-111	374311	4785636	390.7	NP	R-151	377310	4788665	389.1	NP
R-112	374563	4775356	369.2	NP	R-152	377445	4777533	389.7	NP
R-113	374605	4778044	374.1	NP	R-153	377589	4785567	390.4	P
R-114	374606	4778489	376.9	NP	R-154	377735	4783882	390.7	NP
R-115	374640	4783738	394.1	P	R-155	377817	4778954	393.5	NP
R-116	374640	4774621	368.6	NP	R-156	377872	4777130	391.3	NP
R-117	374667	4780134	382.9	NP	R-157	377886	4781702	392.1	NP
R-118	374672	4781078	387.7	NP	R-158	377888	4781346	395.8	NP
R-119	374677	4781021	387.1	NP	R-159	377907	4774629	374.1	NP
R-120	374708	4782410	393.6	NP	R-160	377916	4787291	389.4	P

Receptor ID	UTM Zone 15		Ground Elevation (m ASL)	Participation Status	Receptor ID	UTM Zone 15		Ground Elevation (m ASL)	Participation Status
	Easting (m)	Northing (m)				Easting (m)	Northing (m)		
R-161	378086	4790811	391.3	NP	R-201	380879	4781715	391.6	NP
R-162	378096	4791578	390.2	NP	R-202	380924	4771628	370.8	NP
R-163	378201	4776030	388.4	NP	R-203	381015	4778019	402.7	NP
R-164	378218	4782377	385.7	NP	R-204	381015	4782535	391.8	NP
R-165	378286	4780851	396.1	NP	R-205	381119	4787574	388.4	NP
R-166	378367	4774294	373.9	NP	R-206	381132	4778808	396.8	NP
R-167	378444	4772669	367.3	NP	R-207	381150	4791539	379.2	NP
R-168	378555	4785592	387.5	NP	R-208	381155	4784108	383.5	P
R-169	378590	4783809	385.9	P	R-209	381157	4780339	392.2	NP
R-170	378597	4777602	394.8	NP	R-210	381164	4779159	396.0	NP
R-171	379075	4775983	393.7	NP	R-211	381233	4787868	387.3	NP
R-172	379139	4771784	366.9	NP	R-212	381265	4788380	381.5	NP
R-173	379272	4772760	370.4	NP	R-213	381285	4789832	381.6	NP
R-174	379320	4791552	387.8	NP	R-214	381315	4771601	370.4	NP
R-175	379324	4779687	403.0	NP	R-215	381364	4777437	403.4	P
R-176	379367	4782748	390.5	NP	R-216	381487	4784076	387.5	NP
R-177	379409	4771623	370.0	NP	R-217	381489	4772720	378.6	NP
R-178	379445	4780295	398.7	NP	R-218	381579	4791715	382.2	NP
R-179	379514	4780028	400.8	NP	R-219	381890	4785522	388.9	P
R-180	379533	4789647	388.8	P	R-220	382149	4788670	380.8	NP
R-181	379553	4784958	389.5	NP	R-221	382210	4780552	390.2	NP
R-182	379554	4784128	390.8	NP	R-222	382266	4780553	389.9	NP
R-183	379567	4788600	388.6	NP	R-223	382323	4774278	398.5	NP
R-184	379639	4782476	390.5	NP	R-224	382519	4779621	392.6	NP
R-185	379651	4779213	403.1	P	R-225	382534	4782123	388.4	P
R-186	379703	4786515	392.0	NP	R-226	382560	4773366	393.4	NP
R-187	379744	4779198	402.4	P	R-227	382577	4787046	382.7	NP
R-188	379783	4784104	389.2	NP	R-228	382677	4783491	388.2	NP
R-189	379880	4772154	372.5	NP	R-229	382687	4777003	401.1	NP
R-190	379925	4777006	400.1	NP	R-230	382766	4779003	389.8	NP
R-191	379997	4778963	401.9	NP	R-231	382776	4781455	386.6	NP
R-192	380001	4785492	389.4	NP	R-232	382844	4791393	378.8	NP
R-193	380086	4787994	389.2	P	R-233	382898	4775355	400.5	NP
R-194	380143	4777554	399.9	NP	R-234	382923	4772696	390.5	NP
R-195	380216	4791847	381.9	NP	R-235	382961	4791273	377.4	NP
R-196	380342	4779106	400.2	NP	R-236	382996	4774337	398.8	NP
R-197	380568	4774509	387.4	NP	R-237	383103	4785287	385.8	NP
R-198	380584	4779167	398.2	NP	R-238	383144	4787153	383.1	NP
R-199	380667	4790255	382.4	NP	R-239	383179	4772615	391.1	NP
R-200	380768	4780170	395.8	NP	R-240	383226	4785489	383.9	NP

Receptor ID	UTM Zone 15		Ground Elevation (m ASL)	Participation Status	Receptor ID	UTM Zone 15		Ground Elevation (m ASL)	Participation Status
	Easting (m)	Northing (m)				Easting (m)	Northing (m)		
R-241	383267	4780655	388.4	NP	R-255	384311	4775115	398.5	NP
R-242	383414	4779099	384.7	NP	R-256	384322	4776151	393.4	NP
R-243	383439	4775891	401.2	NP	R-257	384333	4775106	397.7	NP
R-244	383446	4783980	385.8	NP	R-258	384337	4786460	377.5	NP
R-245	383660	4774301	397.8	NP	R-259	384341	4778153	380.8	NP
R-246	383810	4787207	380.3	NP	R-260	384365	4782407	380.7	NP
R-247	383914	4782388	383.4	NP	R-261	384393	4791372	380.4	NP
R-248	384138	4785361	381.9	NP	R-262	384397	4789480	375.2	NP
R-249	384188	4774077	396.5	NP	R-263	384420	4788372	376.9	NP
R-250	384207	4775525	397.9	NP	R-264	384503	4788729	375.4	NP
R-251	384209	4776916	389.5	NP	R-265	384661	4783853	378.9	NP
R-252	384221	4775812	394.0	NP	R-266	384856	4780583	377.5	NP
R-253	384250	4786970	378.3	NP	R-267	385004	4782056	383.6	NP
R-254	384256	4778523	383.3	NP	R-268	385164	4780787	378.6	NP

APPENDIX C

Turbine and Transformer Locations

Source ID	Source Type	UTM Zone 15		Ground Elevation (m ASL)	Source ID	Source Type	UTM Zone 15		Ground Elevation (m ASL)
		Easting (m)	Northing (m)				Easting (m)	Northing (m)	
1	Turbine	371550	4790196	385.9	41	Turbine	369167	4786772	398.8
2	Turbine	372657	4790159	388.0	42	Turbine	369565	4787067	400.6
3	Turbine	373526	4789674	388.2	43	Turbine	370259	4787048	400.2
4	Turbine	373877	4789598	389.0	44	Turbine	370672	4787164	398.5
5	Turbine	374682	4789413	387.2	45	Turbine	372267	4787015	392.0
6	Turbine	375284	4789488	388.7	46	Turbine	372749	4787018	389.5
7	Turbine	375560	4789723	387.1	47	Turbine	373096	4787016	388.3
8	Turbine	375894	4789705	386.7	48	Turbine	373617	4787397	388.6
9	Turbine	376251	4789709	385.3	49	Turbine	374302	4787386	388.5
10	Turbine	376740	4789333	387.8	50	Turbine	374633	4787500	391.9
11	Turbine	377085	4789313	389.3	51	Turbine	375231	4787633	386.5
12	Turbine	377440	4789325	389.7	52	Turbine	375556	4787631	386.6
13	Turbine	378251	4790054	388.4	53	Turbine	376607	4787095	388.5
14	Turbine	378633	4790042	385.7	54	Turbine	377091	4787228	386.3
15	Turbine	378406	4789162	391.2	55	Turbine	378882	4787365	388.2
16	Turbine	378890	4789150	388.7	56	Turbine	379366	4787274	391.9
17	Turbine	379259	4789144	390.8	57	Turbine	379800	4787516	389.1
18	Turbine	380272	4789639	381.2	58	Turbine	380221	4787503	386.4
19	Turbine	380602	4789633	379.1	59	Turbine	381616	4786830	383.2
20	Turbine	368666	4787750	397.8	60	Turbine	381942	4786819	383.3
21	Turbine	368973	4787788	400.0	61	Turbine	364003	4785517	394.3
22	Turbine	369114	4788669	398.3	62	Turbine	364866	4785480	398.1
23	Turbine	370705	4788644	392.5	63	Turbine	366135	4785923	404.2
24	Turbine	375390	4788558	389.0	64	Turbine	366463	4786034	401.9
25	Turbine	375896	4788125	387.6	65	Turbine	367228	4786312	401.9
26	Turbine	376243	4788132	386.1	66	Turbine	367044	4785513	402.1
27	Turbine	376876	4788151	387.7	67	Turbine	367417	4785503	402.4
28	Turbine	377221	4788136	386.7	68	Turbine	367829	4785883	400.4
29	Turbine	377524	4788135	386.2	69	Turbine	368219	4785868	399.3
30	Turbine	377818	4788137	389.5	70	Turbine	368678	4785864	399.1
31	Turbine	378607	4788357	391.8	71	Turbine	368968	4786011	399.4
32	Turbine	379018	4788160	387.0	72	Turbine	369706	4785842	398.0
33	Turbine	363848	4786400	400.6	73	Turbine	370710	4786179	398.8
34	Turbine	364188	4786390	401.7	74	Turbine	371098	4786214	398.0
35	Turbine	364545	4786375	402.3	75	Turbine	371450	4786219	396.0
36	Turbine	365560	4786210	405.3	76	Turbine	370186	4785447	396.1
37	Turbine	365903	4786688	405.0	77	Turbine	370533	4785420	398.1
38	Turbine	366271	4786859	401.4	78	Turbine	370940	4785412	397.3
39	Turbine	366640	4786725	401.6	79	Turbine	371277	4785403	396.0
40	Turbine	368784	4786805	399.6	80	Turbine	371973	4785795	397.9

Source ID	Source Type	UTM Zone 15		Ground Elevation (m ASL)	Source ID	Source Type	UTM Zone 15		Ground Elevation (m ASL)
		Easting (m)	Northing (m)				Easting (m)	Northing (m)	
81	Turbine	372296	4785797	396.6	122	Turbine	379099	4785271	387.4
82	Turbine	372590	4785898	395.8	123	Turbine	363798	4783575	378.5
83	Turbine	373049	4785806	394.9	124	Turbine	364027	4782780	378.1
84	Turbine	373818	4786576	388.0	125	Turbine	366183	4782729	380.9
85	Turbine	375003	4786684	389.5	126	Turbine	366573	4782715	381.2
86	Turbine	375388	4786799	389.6	127	Turbine	366987	4783509	388.3
87	Turbine	376210	4786167	390.9	128	Turbine	367721	4783512	397.3
88	Turbine	376830	4786284	387.9	129	Turbine	368087	4783498	397.6
89	Turbine	377300	4786401	388.9	130	Turbine	368871	4783052	396.7
90	Turbine	378197	4786105	388.4	131	Turbine	369254	4783054	398.3
92	Turbine	379806	4785960	389.0	132	Turbine	369779	4782861	398.6
93	Turbine	380178	4785980	389.3	133	Turbine	370182	4783758	398.0
94	Turbine	380640	4785955	384.8	134	Turbine	370598	4783682	395.6
95	Turbine	381019	4785949	384.6	135	Turbine	371782	4783702	395.4
96	Turbine	381405	4786155	382.6	136	Turbine	372122	4783681	395.3
97	Turbine	363915	4784472	386.8	137	Turbine	374006	4783786	395.1
98	Turbine	364214	4784593	389.2	138	Turbine	376309	4783526	383.3
99	Turbine	364595	4784755	391.3	139	Turbine	377059	4783583	390.6
100	Turbine	365021	4784749	389.8	140	Turbine	380508	4784006	382.7
101	Turbine	367223	4784564	400.4	141	Turbine	381804	4784539	388.8
102	Turbine	367555	4784579	400.6	142	Turbine	381490	4783576	381.6
103	Turbine	368865	4784397	401.5	143	Turbine	381905	4783580	385.2
104	Turbine	369134	4784396	400.3	144	Turbine	372725	4783013	393.5
105	Turbine	369543	4784599	398.2	145	Turbine	373064	4783006	393.3
106	Turbine	369944	4784595	398.7	146	Turbine	373619	4782579	391.9
107	Turbine	370324	4784588	396.0	147	Turbine	374549	4782872	393.8
108	Turbine	370731	4784586	395.1	148	Turbine	376125	4782617	381.8
109	Turbine	371273	4784214	394.4	149	Turbine	377705	4782796	381.4
110	Turbine	371904	4784642	396.1	150	Turbine	378161	4782893	385.3
111	Turbine	372218	4784616	398.0	151	Turbine	378560	4782890	385.0
112	Turbine	373864	4784864	393.8	152	Turbine	381685	4782404	384.7
113	Turbine	374240	4784931	391.3	153	Turbine	382128	4782701	385.5
114	Turbine	374592	4785032	389.5	154	Turbine	382492	4782702	384.9
115	Turbine	374971	4785018	386.7	155	Turbine	373367	4781515	386.2
116	Turbine	375254	4785202	385.2	156	Turbine	373743	4781511	388.4
117	Turbine	375655	4785188	385.5	157	Turbine	378114	4780399	395.8
118	Turbine	377405	4784466	388.5	158	Turbine	378460	4780395	397.0
119	Turbine	377802	4784504	388.8	159	Turbine	379344	4781069	395.5
120	Turbine	378332	4785175	387.3	160	Turbine	379731	4781263	389.2
121	Turbine	378734	4785133	385.1	161	Turbine	380140	4781255	388.9

Source ID	Source Type	UTM Zone 15		Ground Elevation (m ASL)	Source ID	Source Type	UTM Zone 15		Ground Elevation (m ASL)
		Easting (m)	Northing (m)				Easting (m)	Northing (m)	
162	Turbine	381335	4781211	384.5	182	Turbine	376902	4776501	384.0
163	Turbine	381671	4781199	388.2	183	Turbine	377262	4776499	383.5
164	Turbine	382137	4781028	387.1	184	Turbine	377627	4776580	385.4
165	Turbine	372543	4780241	389.3	185	Turbine	378014	4776583	388.2
166	Turbine	372935	4780245	386.9	186	Turbine	378391	4776576	390.1
167	Turbine	374089	4779702	380.2	187	Turbine	378753	4776566	388.2
168	Turbine	374490	4779685	379.9	188	Turbine	379137	4776552	395.0
169	Turbine	375200	4779488	376.9	189	Turbine	379751	4776469	397.0
170	Turbine	375728	4779525	381.4	190	Turbine	380171	4776209	399.2
171	Turbine	376084	4779521	382.4	191	Turbine	380450	4776217	394.8
172	Turbine	377274	4779377	391.7	192	Turbine	377999	4775353	378.7
173	Turbine	377617	4779393	392.3	193	Turbine	378382	4775351	379.3
174	Turbine	378114	4779419	394.2	194	Turbine	379715	4775354	393.4
175	Turbine	378473	4779415	395.5	195	Turbine	380040	4775346	395.7
176	Turbine	376050	4778194	385.2	196	Turbine	380431	4775330	394.6
177	Turbine	376432	4778574	385.1	197	Turbine	380839	4775334	398.6
178	Turbine	376770	4778585	386.6	198	Turbine	379595	4774513	379.6
179	Turbine	378037	4778476	389.8	199	Turbine	379903	4774508	381.2
180	Turbine	376708	4777370	386.1	Trans01	Transformer	368451	4783382	395.6
181	Turbine	379619	4777363	396.0	Trans02	Transformer	368548	4783382	397.4

APPENDIX D

Predicted Noise Levels at Receptors

Receptor ID	Predicted Level (dBA)	Participation Status	Receptor ID	Predicted Level (dBA)	Participation Status
R-1	32.1	NP	R-41	30.3	NP
R-2	31.0	NP	R-42	45.1	NP
R-3	34.1	NP	R-43	46.7	NP
R-4	34.5	NP	R-44	29.7	NP
R-5	30.9	NP	R-45	36.5	NP
R-6	35.8	NP	R-46	38.4	NP
R-7	36.0	NP	R-47	43.8	NP
R-8	36.0	NP	R-48	37.8	NP
R-9	31.0	NP	R-49	40.0	NP
R-10	32.6	NP	R-50	33.5	NP
R-11	36.5	NP	R-51	33.6	NP
R-12	31.3	NP	R-52	37.5	P
R-13	27.7	NP	R-53	47.0	NP
R-14	37.4	NP	R-54	47.3	P
R-15	37.7	NP	R-55	38.5	NP
R-16	37.5	NP	R-56	32.5	NP
R-17	27.4	NP	R-57	38.4	NP
R-18	30.3	NP	R-58	44.5	NP
R-19	34.0	NP	R-59	38.3	NP
R-20	33.5	NP	R-60	36.6	NP
R-21	30.9	NP	R-61	44.5	NP
R-22	27.6	NP	R-62	44.6	NP
R-23	31.1	NP	R-63	30.5	NP
R-24	31.3	NP	R-64	40.6	NP
R-25	31.9	NP	R-65	44.4	NP
R-26	36.2	NP	R-66	34.0	NP
R-27	31.7	NP	R-67	30.9	NP
R-28	46.2	NP	R-68	29.1	NP
R-29	37.9	NP	R-69	43.8	NP
R-30	28.2	NP	R-70	48.6	NP
R-31	35.7	NP	R-71	35.9	NP
R-32	33.4	NP	R-72	33.7	NP
R-33	35.4	NP	R-73	46.6	NP
R-34	34.5	P	R-74	37.7	NP
R-35	42.5	NP	R-75	34.7	NP
R-36	43.4	NP	R-76	49.1	NP
R-37	48.7	NP	R-77	49.0	P
R-38	40.1	NP	R-78	45.0	NP
R-39	46.8	NP	R-79	37.5	NP
R-40	35.9	NP	R-80	38.2	NP

Receptor ID	Predicted Level (dBA)	Participation Status	Receptor ID	Predicted Level (dBA)	Participation Status
R-81	36.6	P	R-121	44.4	NP
R-82	39.4	NP	R-122	46.0	NP
R-83	29.8	NP	R-123	49.0	NP
R-84	39.8	NP	R-124	48.1	NP
R-85	29.9	NP	R-125	49.0	P
R-86	43.9	NP	R-126	47.8	NP
R-87	41.8	NP	R-127	48.2	NP
R-88	40.4	NP	R-128	37.2	NP
R-89	38.2	NP	R-129	48.1	P
R-90	38.4	NP	R-130	43.7	NP
R-91	44.3	NP	R-131	39.2	NP
R-92	31.7	NP	R-132	48.0	P
R-93	40.1	NP	R-133	48.1	P
R-94	45.8	NP	R-134	48.5	P
R-95	41.2	NP	R-135	46.1	NP
R-96	45.7	NP	R-136	44.9	NP
R-97	42.0	NP	R-137	45.8	NP
R-98	36.1	NP	R-138	43.0	P
R-99	47.3	NP	R-139	45.7	NP
R-100	46.4	NP	R-140	41.2	NP
R-101	36.5	NP	R-141	43.9	NP
R-102	48.8	NP	R-142	36.9	NP
R-103	46.5	NP	R-143	43.4	NP
R-104	35.0	NP	R-144	45.3	NP
R-105	29.1	NP	R-145	32.8	NP
R-106	45.2	NP	R-146	32.9	NP
R-107	36.5	NP	R-147	37.9	P
R-108	31.4	NP	R-148	37.9	NP
R-109	28.9	NP	R-149	48.1	NP
R-110	47.5	NP	R-150	48.6	NP
R-111	47.4	NP	R-151	49.9	NP
R-112	34.2	NP	R-152	45.6	NP
R-113	40.0	NP	R-153	46.2	P
R-114	41.6	NP	R-154	46.9	NP
R-115	45.7	P	R-155	49.3	NP
R-116	33.0	NP	R-156	47.8	NP
R-117	46.7	NP	R-157	42.8	NP
R-118	42.4	NP	R-158	43.0	NP
R-119	42.4	NP	R-159	43.2	NP
R-120	45.9	NP	R-160	46.9	P

Receptor ID	Predicted Level (dBA)	Participation Status	Receptor ID	Predicted Level (dBA)	Participation Status
R-161	43.1	NP	R-201	45.2	NP
R-162	38.4	NP	R-202	30.8	NP
R-163	48.7	NP	R-203	38.7	NP
R-164	47.2	NP	R-204	44.5	NP
R-165	47.7	NP	R-205	43.9	NP
R-166	41.6	NP	R-206	37.7	NP
R-167	34.4	NP	R-207	35.0	NP
R-168	49.3	NP	R-208	46.3	P
R-169	44.4	P	R-209	42.5	NP
R-170	44.7	NP	R-210	38.0	NP
R-171	48.0	NP	R-211	42.4	NP
R-172	31.9	NP	R-212	40.9	NP
R-173	35.6	NP	R-213	42.1	NP
R-174	37.6	NP	R-214	30.4	NP
R-175	43.3	NP	R-215	38.8	P
R-176	43.1	NP	R-216	47.7	NP
R-177	31.5	NP	R-217	33.2	NP
R-178	44.3	NP	R-218	33.7	NP
R-179	43.1	NP	R-219	44.1	P
R-180	46.7	P	R-220	37.8	NP
R-181	46.3	NP	R-221	45.5	NP
R-182	43.2	NP	R-222	45.2	NP
R-183	47.0	NP	R-223	35.3	NP
R-184	42.5	NP	R-224	37.3	NP
R-185	41.2	P	R-225	45.8	P
R-186	47.4	NP	R-226	32.4	NP
R-187	40.9	P	R-227	42.9	NP
R-188	43.7	NP	R-228	44.1	NP
R-189	33.2	NP	R-229	34.9	NP
R-190	48.1	NP	R-230	35.3	NP
R-191	40.0	NP	R-231	42.7	NP
R-192	48.2	NP	R-232	31.8	NP
R-193	47.5	P	R-233	34.4	NP
R-194	44.7	NP	R-234	30.3	NP
R-195	35.4	NP	R-235	31.8	NP
R-196	39.3	NP	R-236	33.0	NP
R-197	45.5	NP	R-237	38.4	NP
R-198	38.8	NP	R-238	38.2	NP
R-199	44.0	NP	R-239	29.7	NP
R-200	41.3	NP	R-240	37.9	NP

Receptor ID	Predicted Level (dBA)	Participation Status	Receptor ID	Predicted Level (dBA)	Participation Status
R-241	38.2	NP	R-255	30.2	NP
R-242	34.1	NP	R-256	30.7	NP
R-243	32.8	NP	R-257	30.2	NP
R-244	38.4	NP	R-258	33.9	NP
R-245	31.1	NP	R-259	31.5	NP
R-246	35.2	NP	R-260	35.3	NP
R-247	37.2	NP	R-261	28.9	NP
R-248	34.8	NP	R-262	31.2	NP
R-249	29.6	NP	R-263	32.3	NP
R-250	30.7	NP	R-264	31.8	NP
R-251	31.2	NP	R-265	34.0	NP
R-252	30.8	NP	R-266	32.4	NP
R-253	33.9	NP	R-267	33.0	NP
R-254	31.8	NP	R-268	31.8	NP