Cerro Gordo County Planning & Zoning
Staff Report
SPECIAL USE

Case No.: Case No. 19-31	**Date of Application:** May 6, 2019
Use Request: 20.2(J) Public Utility Structures & Accessory Equipment	**Owners:** ; Kevin Sutcliffe and Lyndon Sutcliffe (Sec. 9) ; Gary/Donna Sutcliffe (Sec. 16)
Current Zoning: A-1 Agricultural	**Petitioner:** CED Mason City Wind, LLC
Address: Unassigned	**Size of Special Use:** Less than 5 acres including access **Size of Parcel:** Varies (generally 40 acres each)
Legal: Locations: Sections 9 & 16 Mason Township,	**Hearing Date:** May 28, 2019

BACKGROUND INFORMATION:

1) PURPOSE OF SPECIAL USE REQUEST -

Consolidated Edison Development has submitted an Application for a Special Use Permit (SUP) as CED Mason City Wind, LLC to construct three wind turbines approximately ½-mile east of Mason City, roughly consolidated around 260th Street, south of Iowa Highway 122, in Sections 9 and 16 of Portland Township. Two of the turbines will located in the SW¼ of Section 9 (owned by Kevin Sutcliffe and Lyndon Sutcliffe respectively). (See Figures 1 & 2). The third turbine is located in the NE¼ of the NW¼ of Section 16 (owned by Gary and Donna Sutcliffe) (See Figure 3). Two of the proposed 2.88 MW wind turbines (416-foot rotor diameter and a 292-foot hub height) will have a total height of 499 feet. The third proposed 2.3 MW wind turbine (381-foot rotor diameter and a 262-foot hub height) will have a total height of 453 feet. While the height is noted, there is a note acknowledging the intention that the height of the turbine may be adjusted. I am reviewing this turbine as if it is intended to be as tall as the others and as it was reviewed by the Federal Aviation Administration (FAA) at up to 499 feet tall.

New transmission lines are proposed to extend west to an existing substation within the corporate limits of Mason City, located on 11th Street SE just west of California (Thrush) Avenue. Transmission lines will be underground along the right-of-way of 260th Street. Obtaining the necessary utility and driveway entrance permits from the County Engineers Office should be a condition of approval. Floodplain Development Permits may also be required as a result if there is any boring under any waterbodies.

The Zoning Ordinance permits commercial wind energy conversion systems (wind turbines), which are regulated similarly to a public utility structure or communication tower, on property zoned A-1 with a Special Use Permit under Section 20.2(J).

2) EXISTING LAND USE AND ZONING CLASSIFICATION OF PROPERTY –

The parcels on which the turbines are proposed have been used for agricultural production in the past. The current zoning of the properties on which the turbines will be erected is A-1 Agricultural. Approximate locations of the three turbines are shown on a site plan on Figure 1 of the applicant's application. Additional figures are included to provide more detail.

3) LAND USE AND ZONING CLASSIFICATION OF SURROUNDING PROPERTY -

Agricultural production and rural residences are the predominant uses of land in the surrounding area. All property in the immediate vicinity is zoned A-1 Agricultural.

GENERAL FINDINGS:

1) HARMONY AND ACCORD WITH GENERAL PRINCIPLES AND PROPOSALS OF ZONING ORDINANCE -

The purpose statement of the Zoning Ordinance says that it was "adopted for the purpose of promoting public health, safety, morals, comfort, and general welfare." The proposed use should not have an impact on public health as there are no emissions from wind generating facilities. The use should not adversely affect public safety, morals, comfort, or general welfare. With appropriate conditions applied to the development, any potential impacts will be mitigated.

The ordinance is also intended to "conserve the values of property and encourage the most appropriate use of land." Experience has shown that wind turbines generally do not have an adverse impact on property values. Property values within the area of the windfarm south of Clear Lake did not suffer as a result of that project. The ordinance states that it is intended to "provide the social and economic advantages resulting from an orderly planned use of land resources; and facilitate adequate but economical provisions for public improvements." The wind turbines would be a public improvement that enhances the use of renewable energy in North Iowa.

2) COMPATIBILITY OF USE WITH APPEARANCE AND ESSENTIAL CHARACTER OF AREA -

A minimal amount of farmland will be taken out of production for the tower sites and access roads. Less than 5 acres of land will be consumed by the three tower sites and access roads. Agricultural operations will be continued up to the location of the towers and the roads. The turbines will have significant visual impacts on surrounding residences. A structure of this height will be visible for a significant distance. Using an algebraic formula, and not accounting for visual obstructions such as hills, valleys, and vegetation, a turbine with an overall height of 499 feet may be seen for 27 miles (See Figure 4). There are almost 15 dwellings within a mile of the proposed turbine sites (see Figures 5).

3) IMPACT ON EXISTING AND FUTURE USES, VICINITY, AND COMMUNITY AS A WHOLE -

The proposed turbines should be considered permanent improvements. Eventually, the turbines may be considered obsolete and decommissioned. A decommissioning plan was filed with the application and the operational statement says that decommissioning is budgeted for in the financial model. The proposed wind turbines should have minimal impact on existing and future agricultural operations on this or surrounding property. The use should not have a detrimental impact on the community as a whole with appropriate conditions applied.

4) ADEQUACY OF PUBLIC SERVICES (i.e., highways, streets, police, fire protection, drainage structures, refuse disposal, water and sewage facilities, or schools) -

Two of the turbines will be accessed from paved roads (T-2 from 265th Street; T-3 from 260th Street; See Figures 2 & 3), and one will be accessed from a gravel-surfaced road (T-1 from Ulmus Avenue; See Figure 1). The Board of Adjustment should approve accesses as a condition of the SUP subject to the standards of the County Engineer. Likewise, since these are county roads, access and delivery routes to the sites should be coordinated with the County Engineer's office as a condition of approval.

The construction of turbines usually involves the movement of heavy equipment, extra-long trailers carrying blades, and other vehicles that may cause damage to gravel roads. The narrative states that the company will coordinate with the County Engineer on transportation routes. Furthermore, they say that they will document road conditions prior to construction and work with the Engineer to restore the roads to pre-construction conditions after construction. This should be a condition of the SUP as well. Additionally, Ulmus Avenue, having an access road proposed from it to T-1 (See Figure 1), is a minimum maintenance road (See Figure 6). Minimum maintenance roads, or Level B Roads, do not receive the same level of maintenance as other gravel roads classified as Level A. A condition of any SUP approved should make any upgrade to Ulmus Avenue or any maintenance necessary for the road during construction or after construction of the wind turbines come at the expense of the applicant.

Law enforcement protection is provided by the Cerro Gordo County Sheriff's Department. Fire protection for the turbines is provided by the Nora Springs Fire Department. There should be little, if any, additional demand on either agency as a result of approving the proposed special use.

The two northern-most sites in Section 9 are in Drainage District No. 36. The site in Section 16, Bath Township is not located in a Drainage District. The developer acknowledges in its narrative that it will be responsible for any and all repairs to any drainage structures that are damaged during construction. This should be a condition if the permit is approved. All three turbine sites are located outside of flood hazard areas. The closest floodplain is approximately 100 feet from T3. While no floodplain permit will be required for the turbine structure, it is the applicant's responsibility to obtain any permits required by the state or a local Floodplain Development Permit if any grading work during construction will potentially occur in the FEMA-designated 100-year floodplain or if the applicant needs to bore under a waterbody for collection lines.

The applicant states in their narrative that all onsite refuse will be disposed of at its expense. The use will not require water or wastewater facilities.

The proposed use should not have an impact on schools.

5) PUBLIC COST FOR ADDITIONAL PUBLIC FACILITIES AND SERVICES -

The proposed use should not create any need for additional public facilities or services. The applicant should be required to repair county roads and drainage district tile damaged during construction.

Additionally, Ulmus Avenue, having an access road proposed from it to T-1 (See Figure 1), is a minimum maintenance road (See Figure 6). Minimum maintenance roads, or Level B Roads, do not receive the same level of maintenance as other gravel roads classified as Level A. A condition of any SUP approved should make any upgrade to Ulmus Avenue or any maintenance necessary for the road during construction or after construction of the wind turbines come at the expense of the applicant.

6) POTENTIAL DETRIMENTS TO PERSONS, PROPERTY, OR GENERAL WELFARE (i.e., excessive traffic, noise, smoke, fumes, glare, or odors) -

Detailed site plans filed with the application show that the turbines will be erected at distances that are equal to or greater than the height of the tower (including blades at their highest point of rotation) from existing principal or accessory structures, from road right-of-way lines, or any shared property line with a non-participating landowner.

According to the narrative, estimated decibel levels at its loudest are anticipated to be approximately 50 decibels at the most affected residence, which is owned by a participating landowner This level is about usual bedroom levels and quieter than usual home noises. An acoustical analysis based on documentation for the turbines provided in the application was conducted by a third party with an acoustical map and tables confirming decibel levels ranging from 35-50 decibels for the eight closest residences to the proposed turbines. The closest non-participating residence is located at 21485 260th Street, which is about 1,132 feet from T3 (Alternate site). The acoustical analysis shows potential noise could reach 47.7 decibels. There is significant vegetation along the west property line that will reduce these levels, which the analysis did not account for, so the noise will be significantly less as a result.

The rotor blades will be about 72' from ground level at their lowest point. This should minimize any hazard to persons or livestock. The turbines will be required to be lit by FAA standards. The narrative states that red, synchronized lights will be used. Daytime lighting is not required. The Board may want to consider a condition requiring that the towers be lit with red lights. The visual impacts created by the proposed project vary according to the subjective opinions of any given person.

The proposed use will generate traffic during construction; however, it should generate very few trips once complete. These trips will likely be associated with routine maintenance. 265th Street (Iowa Highway 122) carries 3,120 vehicles per day past the two turbine sites in Section 9 and is paved. 260th Street carries 160 vehicles per past the three turbine sites and is also paved. Ulmus Avenue, which is a minimum maintenance road and gravel-

surfaced, only carries 30 between the two previously mentioned roads. Any additional traffic after construction is complete will be negligible. The Board may want to adopt a condition that dust control be applied during construction at the direction of and in such frequencies as the County Engineer may prescribe, at the applicant's expense.

The proposed turbine will not produce smoke, fumes, or odors. Glare is a possibility. The Board may wish to consider a condition that requires the applicant to mitigate any glare within 30 days of receipt of a complaint.

Additionally, wind turbines can create a shadow flicker effect when the shadow from the moving rotor blades is cast through a constrained opening, such as a window. The acoustical analysis submitted by the applicant also included a shadow flicker analysis conducted by the same third party. The analysis used a "conservative approach," in that no existing building or vegetative buffers were taken into account and that it was assumed that rotor blades were always perpendicular to the line from the turbine to the sun—assuming the largest potential shadow effect. Five of the eight nearest residences could potentially be impacted by a potential shadow flicker effect for up to between 10 and 20 hours per year. Four of those five residences have significant existing vegetation between the proposed turbines, which will drastically limit if not eliminate the potential for any shadow flicker impact. The fifth residence of those five has a large, existing utility directly in line between the closest proposed turbine, T1, and the house, which also will mitigate any potential shadow flicker impact.

The proposed 499-foot turbines range from 1,599 to 1,628 feet above mean sea level. The proposed site is outside of the Conical Overlay Zone of the Mason City Municipal Airport. The Mason City Municipal Airport has been afforded the opportunity to comment on the SUP application.

7) COMPATIBILITY AND CONSISTENCY WITH THE INTENT AND PURPOSE OF THE ZONING DISTRICT -

Variances to the height requirements of the A-1 Agricultural District will be necessary. The towers will be about 499 feet (to the tip of the blade) in height, which far exceeds the 35-foot maximum allowed. All other required A-1 district setbacks will be met.

The stated intent of the A-1 Agricultural District is to "permit the continued use of such land for agricultural purposes." The proposed wind turbines will cause minimal disruption to continued agricultural production on the property once construction is complete.

8) COMPATIBILITY WITH COUNTY COMPREHENSIVE PLAN -

According to the county's Comprehensive Plan, the future land use of the area to be encompassed by this project is designated for agricultural use. The continued agricultural use of the land in the project area will not be compromised significantly by the special use.

COMPLIANCE WITH ADDITIONAL ARTICLE 20 REQUIREMENTS:
Additional requirements for the special use requested are as follows:

20.2 SPECIAL USES

J. Commercial microwave, radio and television towers, public utility structures and accessory equipment, including their transmitting stations and towers, and wireless telecommunications facilities. Any district except residential, provided the following requirements are met:

1. Application. In making application for a Special Use Permit, the applicant shall file the following in addition to the standard application for Special Use Permit:

    a. A site plan, drawn to scale, identifying the site boundary; tower or facility location; height of structure(s); guy wires and anchors; and existing and proposed structures including accessory structures. **Detailed site plans for the three turbines were filed with the application.**

b. If the applicant is not the site owner, written authorization from the site owner. **The application package included copies of the Memorandum of Lease Agreements signed by the property owners. Additionally, a Wind Farm Cooperation Agreement signed by the owner of all of the farm fields to the west and south of T3 was included. The owner is considered a participating landowner as a result.**

c. The applicant shall provide evidence that available public or private sites are unsuitable for operation of the facility under applicable telecommunications regulations and applicant's technical design requirements. A new tower shall not be permitted if co-location can be found upon an existing or alternative tower structure that meets engineering requirements of an applicant's wireless network within a one (1) mile radius of the proposed new tower site. Cost shall not be used as a reason against co-locating of antennas. **The proposed turbines are not a telecommunications facility. Therefore, this requirement does not apply.**

d. Evidence that all permits required by any other governmental entity have been obtained, or, if all such permits cannot practicably be obtained prior to the public hearing, the written acknowledgement by the applicant that any special use permit granted will be contingent upon the applicant obtaining all such permits and providing conclusive evidence thereof to the Administrative Officer, as the latter may require. **The applicant filed copies of the Determination of No Hazard to Air Navigation for the three turbine sites. The determinations are for turbines with overall heights of 499 feet. The Army Corps of Engineers may potentially require review of the project. The applicant also commissioned a Tier 1 and Tier 2 Avian and Bat Assessment using US Fish and Wildlife guidelines for wind energy development The study concluded that the project may have some impact on raptor species and suggests that the applicant "implement a post-development Raptor and Monitoring and Action Plan as well as passive post development fatality monitoring." The study also suggests adequate buffers from wetland areas. It is the responsibility of the applicant to obtain any permits or approvals required by USDA or Iowa DNR. Copies of such permits are required to be submitted to the Planning and Zoning Office once received.**

2. Conditions. Any applicant shall provide documentation that all of the following applicable conditions will be met for all towers:

a. The tower shall be constructed or easily modifiable, within thirty (30) days, to support the equipment of at least three (3) communications companies. **This requirement is usually applied to communications and telecommunications towers and is not applicable to this project.**

b. Towers and telecommunications facilities shall be of camouflage design, if possible. Examples of camouflage facilities include, but are not limited to, architecturally screened roof-mounted antennas, antennas integrated into architectural elements, communications and telecommunications towers designed to blend into the surrounding environment or to look like an object other than a tower. Where camouflage design is impossible or impractical, the tower shall be built of materials that make it nearly invisible. Lighting on the tower shall be of the least conspicuous type and exist only to satisfy Federal Aviation Administration (FAA) requirements. **The application states that red, synchronized lighting satisfying FAA requirements will be used. Blades and towers will be painted white to blend into the environment and meet FAA requirements.**

c. The tower owner and the tower operator shall provide proof of adequate liability insurance in writing to the Administrative Officer of Cerro Gordo County for Planning and Zoning, under such further conditions and in such amounts as the Board of Adjustment or the Administrative Officer may direct, but in no event shall such proof be required more often than annually. **This should be a requirement of the SUP, if approved. The applicant submitted a Certificate of Liability Insurance, which shows the applicant has $10 million in umbrella liability coverage for each occurrence and in the aggregate,**

d. The base of the tower shall be at least the height of the tower from any public right-of-way and any existing principal or accessory structure, other than the base station. Guy wires, guy anchors, and base station structures shall comply with all setbacks for the zoning district in which they are located. No guy

anchors, towers, or base station structures shall be located in an easement located on the property except that held by the applicant. **This requirement will be met. The use will not involve any guy wires, guy anchors, or base stations.**

e. Any signal interference complaints associated with the tower or related equipment shall be addressed within thirty (30) days in accordance with Federal Communications Commission (FCC) rules and procedures. **This should be a condition of the SUP, if approved. The application narrative states that, "CED Mason City Wind, LLC will mitigate any interference with electromagnetic communications, from radio, telephone, or televisions signals caused [by the project] in accordance with county recommendations."**

f. The tower and all appurtenances shall be removed upon the end of its useful life and the site restored to its condition prior to tower placement within one hundred eighty (180) days. **A decommissioning plan was filed with the application package. In addition, the narrative states that all physical material will be removed to a depth of 36 inches and the easement area will be restored to pre-existing conditions. Topsoil will be replaced where necessary.**

g. Access from any public road shall be subject to the standards of the County Engineer. An access permit shall be obtained from the County Engineer prior to construction. Access locations are shown on the site plan. **This requirement should be a condition of the SUP, if approved.**

h. A zoning permit shall be applied for and approved, subject to Article 22 of the Zoning Ordinance, prior to any construction. **This should be a condition of the SUP, if approved.**

i. A sign shall be placed on the base station structure or at the base of the tower that identifies a name and phone number of whom to contact in case of emergency. No advertising device is permitted anywhere on the facility except as permitted by this Ordinance. **There will be no other advertising. Emergency information should be placed on a sign at the access road as a condition of the SUP, if approved.**

3. Exceptions. The Special Use Permit procedure shall not apply where:

   a. An applicant proposes to add an antenna to an existing tower and the addition of such antenna will not increase the total height of the tower.

      In such cases, the applicant shall file an Application for Zoning Certificate for review by the Zoning Administrator, along with evidence that the required FAA and FCC permits have been obtained. **Since this request is not for a communications or telecommunications tower, this requirement does not apply.**

4. Transmission lines. The routing of transmission lines shall be restricted to locations that minimize the disruption of agricultural activity and developed residential areas. **According to the application narrative, collection/distribution lines will be installed, likely trenched west of the site along 260th Street to the existing substation located at 11th Street SE within Mason City corporate limits. One of the conditions of the SUP, if approved, should be that the applicant obtains a permit to conduct work in the county right-of-way for the collection/distribution line installation.**

ZONING DISTRICT REQUIREMENTS:

Requirements of the **A-1** zoning district for which the proposed special use is to be located are as follows. Ordinance provisions are in normal type. Staff comments are in **bold**:

- Minimum parcel size is 10 acres.
- 7.5 Height Regulation. No building hereafter erected or structurally erected shall exceed two and one-half (2 ½) stories or thirty-five (35) feet. **Variances will be necessary.**

- 7.6 Yard Requirements. Each lot shall have front, side and rear yards not less than the depths or widths following:
  A. Front yard depth, fifty (50) feet.
  B. Each side yard width, twenty-five (25) feet.
  C. Rear yard depth, thirty (30) feet.

- **Compliance with district regulations:**
  All yard setback requirements will be met since the towers can be no closer than 499 feet from any right-of-way line, principal or accessory structure, or non-participating property line. All yard setbacks will be complied with.

  Height variances are necessary for the three turbines. The Zoning Ordinance permits structures to be no taller than 2½ stories or 35 feet in the A-1 Agricultural District. Due to the height of the turbine with the blade at its apex, a variance from this requirement will be necessary. The turbines will be 499 feet tall from base to the top of the blade when it is at its apex. In a case like this, the SUP creates the need for the height variance.

  The towers are required to be set back a distance equal to the tower's height from road rights-of-way, and structures. In addition, the turbines will be at least 1,100 feet from occupied residences. I recommend that the height variances be granted by condition.

STATUTORY REQUIREMENTS:
Additional requirements under Iowa Code pertain to the Special Use applied for:

- Archaeological Review by the State Historical Society of Iowa may be required.
- Army Corps of Engineers' approval may be required.
- NPDES Storm Water Discharge Permit for the disturbance of more than 1 acre of land.
- FAA determination of no hazard to air navigation (received).
- County Engineer's route recommendations.
- Access approvals for new maintenance roads through the County Engineer.
- Permit to conduct work in the right-of-way from the County Engineer for collection/distribution line work.
- State review for grading within the floodplain for T3 or boring under creeks for the collection/distribution system and a local Floodplain Development Permit will likely be required, as applicable.

STAFF ANALYSIS AND RECOMMENDED ACTION:
The county, and specifically the Board of Adjustment, has consistently supported the use of "green" energy efforts. This dates back to the original proposal for the Cerro Gordo Windfarm south of Clear Lake back in 1998. Since then, the Board of Adjustment has approved height and yard variances to accommodate private wind turbines and approved a SUP for the capacitor bank related to the Crystal Lake Wind project, and the supervisors have amended the Zoning Ordinance to streamline the approval process for private wind generation facilities.

These three turbines will be very noticeable on the landscape due to their proposed height (499 feet). For comparison purposes, the stacks on the south side of the Alliant generating plant to the west are 200 feet in height. The visual impacts of these turbines should not be underestimated. Due to the size and location of the proposed turbines, I have invited the County Engineer, City of Mason City, and the Mason City Municipal Airport to submit comments on the application. Their comments will be shared with you at the meeting, if received.

While noise and shadow flicker are potential impacts, factors such as distance and existing vegetative buffers should mitigate such potential impacts. The included auditory analysis shows that noise will be about 50 decibels or less measured at the nearest residences, which is quieter than typical household sound.

The largest concern, if any, I have is the classification of Ulmus Avenue as a minimum maintenance road. Minimum maintenance roads, or Level B Roads, do not receive the same level of maintenance as other gravel roads classified

as Level A. A condition of the SUP should make any upgrade to Ulmus Avenue or any maintenance necessary for the road during construction or after construction of the wind development come at the expense of the applicant.

The applicant has done an excellent job of demonstrating compliance with the requirements of the Zoning Ordinance as well as obtaining necessary authorizations from the FAA in advance of submitting the application documents. I believe the Board of Adjustment would be hard-pressed to find a reason to deny the Special Use Permit so long as the below recommended conditions are included at a minimum.

RECOMMENDED CONDITIONS TO BE MET IF POSITIVE VOTE BY BOARD OF ADJUSTMENT:

Note: In granting a Special Use Permit, the Board of Adjustment may attach conditions which it finds are necessary to carry out the purpose of the Zoning Ordinance, in conformance with what is provided in Article 20 of the Zoning Ordinance, and where reasonable and necessary may increase the required lot or yard, control the location and number of vehicular access points to the property, limit the number of signs, limit coverage or height of buildings because of obstruction to view and reduction of light and air to adjacent property, and require screening and landscaping to reduce noise and glare and maintain the property in character in keeping with the surrounding area. Special uses shall ordinarily comply with the standards of the district concerned for principal uses which are permitted therein, except as modified by the Board of Adjustment in granting a Special Use Permit.

The following conditions are recommended:

1. This permit may be reviewed at any time in the future upon the request of the applicants or a majority of the Board of Adjustment members.
2. These provisions and/or regulations as stated shall be minimum requirements and wherever the requirements of any other lawfully adopted rules, regulations, or ordinances are at a variance, the most restrictive shall govern.
3. It is contemplated that from time to time during the operation of a commercial windfarm, that conditions may arise which are not covered by the terms and conditions of this permit and which cannot be anticipated. In the event such conditions do arise, the Board of Adjustment of Cerro Gordo County, Iowa may impose additional regulations to meet any new conditions. In addition, if said facility should, at any time, be operated in any manner which violates the rules and regulations of any federal or state regulatory agency, then the Board of Adjustment may impose such other conditions so as to insure compliance with such rules and regulations.
4. This permit will be subject to revocation for operator's failure to comply with the provisions as herein set forth or such other provisions as may, from time to time, be imposed by the Board of Adjustment of Cerro Gordo County, Iowa, under the terms of this permit.
5. County representatives shall have the right to enter the premises at any time upon notification to the permit holder for the purposes of enforcing the provisions of this Special Use Permit.
6. This Special Use Permit shall be applicable to CED Mason City Wind, LLC, its successors, and assigns as well as any future owner of the turbine.
7. Driveway accesses to the turbine sites are hereby approved. Prior to installation of the driveway, a permit shall be obtained from the County Engineer. Said access shall be constructed to the standards of the County Engineer.
8. Transportation of heavy equipment for construction shall be limited to routes designated by the Cerro Gordo County Engineer. Any road damaged as a result of the construction of the special use shall be restored to its pre-construction condition. Costs of repair of damage to county roads or rights-of-way resulting from the construction phase of this project shall be the responsibility of the applicant.
9. Any upgrade to Ulmus Avenue from a Level-B minimum maintenance road to a Level A classification or any maintenance necessary for Ulmus Avenue during or after construction of wind turbines shall be at the expense of the applicant.
10. Dust control shall be applied during the construction phase at the discretion of and in such amounts and frequencies prescribed by the County Engineer.
11. Necessary permits shall be obtained from the County Engineer to install transmission, collection, or distribution lines in any county rights-of-way.
12. The project shall not adversely impact any duly established drainage district. Damage to drainage structures resulting from the construction of the special use shall be repaired at the applicant's expense.
13. Tower lighting shall comply with FAA requirements, but be the least-intrusive type possible for nearby residents.
14. The applicant shall take appropriate steps to mitigate glare created by the special use within thirty (30) days of receipt of a complaint.

15. A variance from the A-1 district height limitation of 35 feet is hereby granted. The overall height of the special use shall not exceed 499 feet.
16. The applicants shall apply for and obtain a Zoning Permit prior to any placement of any structure on the property. A site plan prepared by a licensed surveyor or engineer showing the exact location of the wind turbine shall be filed along with the application.
17. The tower owner and the tower operator shall provide proof of adequate liability insurance in writing to the Planning and Zoning Administrator of Cerro Gordo County, under such further conditions and in such amounts as the Board of Adjustment or the Planning and Zoning Administrator may direct, but in no event shall such proof be required more often than annually.
18. The base of the tower shall be at least the overall height of the wind turbine from any public right-of-way, any shared, non-participating property line, and any existing principal or accessory structure.
19. Any signal interference complaints associated with the tower or related equipment shall be addressed within thirty (30) days in accordance with Federal Communications Commission (FCC) rules and procedures.
20. The tower and all appurtenances shall be removed upon the end of its useful life and the site restored to its condition prior to tower placement within one hundred eighty (180) days.
21. A sign shall be placed on the base station structure or at the base of the tower that identifies a name and phone number of whom to contact in case of emergency.
22. The special use shall be constructed and operated in accordance with the application.
23. Copies of all permits and licenses issued by other federal, state, or local governmental entities shall be filed in the office of the Cerro Gordo County Zoning Administrator. This includes the NPDES Permit from the Iowa Department of Natural Resources.

QUESTIONS & COMMENTS:

Proposed motion for approval of application: To adopt the staff report as the Board's findings and to grant the application, subject to the conditions recommended by staff and as modified by the Board of Adjustment, for the operation of a commercial wind generator turbine, and further, that the grant of the application be made effective immediately and on the condition that CED Mason City Wind, LLC, shall perform all operations under the application under the specific direction of the Cerro Gordo County Zoning Administrator, consistent with the proposed conditions and recommendations approved by the Board of Adjustment, until such time as a formal resolution is drafted and adopted by the Board of Adjustment, not to exceed 60 days.

Proposed motion for denial of application: To adopt the staff report as the Board's findings and to deny the application for the reasons stated in the staff report as well as for the following reasons: ***[STATE ADDITIONAL REASONS FOR DENIAL, IF ANY]***. Said reasons for denial shall be stated in the official transcript and minutes of the Board of Adjustment, and shall be made in writing to the applicant in letter form by the Board's secretary.

Prepared by:
John Robbins
Planning and Zoning Administrator
Final Draft date – May 17, 2019

PLANNING AND ZONING
Cerro Gordo County Courthouse

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John Robbins, Assistant Administrative Officer
Michelle Rush, Executive Assistant

APPEAL INSTRUCTIONS AND PROCEDURES

Zoning Board of Adjustment ~ Cerro Gordo County

Read the attached **Rules of Procedure** for the Cerro Gordo County Board of Adjustment. These rules will be complied with in all applications or appeals before the Board of Adjustment. Please do not ask for a variance in these rules as none will be given.

Ordinance sections referred to in this document may be found at www.co.cerro-gordo.ia.us under the Planning and Zoning Department. Click on Zoning Ordinance.

All forms must be typewritten or written in black ink and returned to the address listed above.

FORMS OF APPEAL (choose one):

☐ **Variance to a Zoning District requirement where there are unusual conditions or circumstances which cause a hardship when the provisions of Zoning are strictly applied.**

Required items for review:

- Fully completed application/appeal form (pp. 3 & 4) with necessary site plans
- Fully completed Variance Criteria Supplemental information (pp. 5 & 6)
- Six (6) copies of the property plat if the original plat filed with the Application for Zoning Certificate was drawn larger than 8½" x 14"
- $100.00 non-refundable filing fee made payable to *Cerro Gordo County Treasurer*

☒ **Special Uses listed in Article 20.2 of the Zoning Ordinance and upon which the Board is required to act under the Ordinance.**

Required items for review:

- Fully completed application/appeal form (pp. 3 & 4) with necessary site plans
- If the area to be considered is located within a flood plain, attach copy of Iowa Department of Natural Resources approval
- Written letter:
  - ✓ Describing the special use and how such building or use will affect the character of the neighborhood, traffic conditions, public utility facilities and

other matters pertaining to the public safety, public health and general welfare
  - ✓ Addressing the provisions of Section 24.4(A)(2)(a-g) in the Zoning Ordinance, and
  - ✓ Addressing the performance standards in the applicable subsection of Article 20.2
- Seven (7) copies of the schematic drawing
- $175.00 non-refundable filing fee made payable to *Cerro Gordo County Treasurer*

Site plans are required for the following special uses and an additional fee of $100.00 made payable to *Cerro Gordo County Treasurer* is required for an area of one acre or less, and $200.00 for an area of more than one acre. Site plans shall comply with the provisions of Section 18.12(D) of the Zoning Ordinance. This fee is for site plan review only.

- Go-Kart Tracks, Racetracks, Drag strips
- Sewage Treatment Plants and Waste Stabilization Lagoons
- Public or Private Utility service
- Anhydrous Ammonia Pumping and Storage Facilities
- Wholesale Storage of Gasoline, Fuels, Oils, Flammable or Toxic Substances
- Commercial Feedlots and Confinement Operations
- Salvage Yards and/or Junk Yards
- Extraction and Primary Material Processing
- Permanent Asphalt Plants
- Mobile Home Park
- Travel Trailer Park

☐ **Appeal an error in any order, requirement, decision or determination made by the Zoning Administrator in the enforcement of the Zoning Ordinance.**

Required items for review:

- Fully completed application/appeal form (pp. 3 & 4) with necessary site plans
- Written letter describing the reasons or facts you feel the order, requirement, decision or determination was in error.
- $175.00 non-refundable filing fee made payable to *Cerro Gordo County Treasurer*

The Applicant shall, immediately after filing the appeal paperwork, mark all corners of the lot with lath and colored flags. The Applicant shall also mark with a different colored flag the location of the addition/structure being proposed.

APPLICATION/APPEAL FORM

[For Completion by All Applicants]

Date 5/6/2019

TO: ZONING BOARD OF ADJUSTMENT
CERRO GORDO COUNTY, IOWA

I (WE), CED Mason City Wind, LLC
(NAME)

OF 4301 W 57th St. STE 131 Soiux Falls, SD 57108
(MAILING ADDRESS)

respectfully request that a determination be made by the Board of Adjustment on this Application/Appeal based on the letter written by the Zoning Administrator dated _____ for the reason that it was a matter which, in his/her opinion, should come before the Board of Adjustment.

This Application/Appeal is: (Please Check One)

☐ A Variance to a Zoning District requirement where there are unusual conditions or circumstances which cause a hardship when the provisions of Zoning are strictly applied.

☒ A Special Use listed in Article 20.2 of the Zoning Ordinance upon which the Board is required to act under the Ordinance.

☐ An Appeal where it is alleged there is error in any order, requirement, decision or determination made by the Zoning Administrator in the enforcement of the Zoning Ordinance.

The property affected is located in Section 9 & 16 of Portland Township.

The property affected is zoned A-1: Agriculture according to the Cerro Gordo County Zoning District Maps. Legal description of the property is:

Parcel ID: 080930000100
Property Description: NW SW 09-96-19

Parcel ID: 080930000300
Property Description: SW SW 09-96-19

Parcel ID: 080930000200
Property Description: NE SW 09-96-19

Parcel ID: 081610000200
Property Description: NE NW 16-96-19

I am the ☐ Owner ☒ Contract Purchaser ☐ Other (Explain) _____

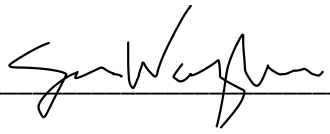
CED Mason City Wind LLC will hold a contract lease for the wind farm of the property affected.

Describe what you are proposing to do on the property affected.

CED Mason City Wind LLC is proposing the construction of 3 industrial scale wind turbines. Wind farm improvements would include gravel access roads, driveway entrances, buried collection lines, cement poured foundations, and white wind turbine towers and blades.

I (We) grant permission to the Planning & Zoning staff and Board of Adjustment members to enter onto the above described property for purposes of review.

I (We) further state that if this request is granted, I (We) will proceed with the actual construction in accordance with the purposes herein stated and any conditions and/or requirements the Board of Adjustment may stipulate.

Signature of Applicant 

OFFICE USE ONLY

Date Filed _____ Case Number _____

Date Set for Hearing _____ Fee Paid _____

Application/Appeal was ☐ Granted ☐ Denied ☐ Tabled

VARIANCE CRITERIA SUPPLEMENTAL INFORMATION

Cerro Gordo County Zoning Board of Adjustment

[For completion by Variance Applicants Only]

This attachment is intended to supplement the Appeal to the Board of Adjustment Application for requests for variances. This attachment shall be submitted as a part of and attached to the Appeal Application and serve to enable the Board to make fair and equitable decisions. Failure to complete this form in its entirety may result in postponing the request until adequate information is submitted.

The Board of Adjustment shall authorize upon appeal, in specific cases, such variance from the terms of the Ordinance as will not be contrary to the public interest, where owing to special conditions a literal enforcement of the provisions of the Ordinance will result in unnecessary hardship, and so that the spirit of the Ordinance shall be observed and substantial justice done.

The Applicant shall be held responsible to provide adequate evidence that the literal enforcement of the Ordinance will result in unnecessary hardship. "Hardship" as used in connection with the granting of a variance means the property in question cannot be put to a reasonable use if used under the conditions allowed by the provisions of the Ordinance, the plight of the landowner is due to circumstances unique to his property not created by the landowner; and the variance, if granted, will not alter the essential character of the locality.

The Board shall ensure that their decision shall not be contrary to the public interest, that the spirit of the Ordinance shall be observed, and substantial justice done.

Applicant(s) _____

Type of Variance Requested _____

1. The land in question cannot yield a reasonable use for the following reasons:

_____

_____

_____

_____

2. What is unique about this property compared to other properties in the vicinity?

_____

_____

_____

_____

3. Explain how the variance will fit in with the character of the area (i.e., size, height, scale, etc.):

4. The need for the variance cannot be attributed to the present or past property owner for the following reasons:

5. The Zoning Ordinance requirements have resulted in a need for a variance for the following reasons:

6. The variance is in accord with the purposes and intent of the Zoning Ordinance and Comprehensive Plan for the following reasons:

7. The variance will not impair the public health, safety and general welfare of the residents of the County for the following reasons:

I, _____ certify that

all of the above statements are true to the best of my knowledge and belief.

CED Mason City Wind LLC
Special Use Permit
Application

May 9, 2019

Project Applicant

Gokhan Andi
Project Developer
Consolidated Edison Development
4301 W 57th ST STE 131
Sioux Falls, SD 57108
Phone: (605) 306-6238
Email: andig@conedceb.com

Project Owner

CED Mason City Wind, LLC
Phone: (605) 306-6220

Table 1: Legal Description of Properties in the Project Area

Parcel ID	Legal Description	Parcel Owner	Net Acres
080930000100	NW SW 09-96-19	Kevin G Sutcliffe	36.53
080930000200	NE SW 09-96-19	Lyndon G Sutcliffe	38.08
080930000300	SW SW 09-96-19	Kevin G Sutcliffe	37.79
080930000400	SE SW 09-96-19	Lyndon G Sutcliffe	38.76
081610000100	NW NW 16-96-19	Darmar, Ltd	38.02
081610000200	NE NW 16-96-19	Gary C Sutcliffe	24.25
081610000300	NE NW 16-96-19	Darmar, Ltd	2.50
081610000600	SE NW 16-96-19	Darmar, Ltd	27.50
081610000500	SW NW 16-96-19	Darmar, Ltd	39.00

Table 2: Legal Description of Properties Adjacent to the Project Area

Parcel ID	Legal Description	Parcel Owner	Address	Adjacent Turbine
080940000100	NW SE 09-96-19	Laura Shanks	1801 20th St. Unit K 15 Ames, IA 50010	Turbine 2
080940000700	SW SE 09-96-19	Laura Shanks	1801 20th St. Unit K 15 Ames, IA 50010	Turbine 2
081610000400	NE NW 16-96-19	Phyllis Krause	21485 260th St. Mason City, IA 50401	Turbine 3, Alternate 3
081720000200	NE NE 17-96-19	Mary Tevis	20793 260th St. Mason City, IA 50401	Turbine 3, Alternate 3
080840000900	SE SE 08-96-19	George S Marty Jr. Trust	1515 Summit Ave. St Paul, MN 55105	Turbine 1
080840000200	NE SE 08-96-19	George S Marty Jr. Trust	1515 Summit Ave. St Paul, MN 55105	Turbine 1

A. Project Description

Consolidated Edison Development (CED), doing business as CED Mason City Wind, LLC, is proposing to build a wind farm in Cerro Gordo County, Iowa, approximately 3 miles east of Mason City. The wind farm will consist of three GE wind turbines, further described below. The proposed site layout is provided in Figure 1.

The project will have a total wind farm area of 215 acres, including approximately 9 acres of land that will be temporarily disturbed during construction. Turbine locations are summarized in Table 3, below. Turbine 1 will be located approximately 590 feet (ft.) east of Ulmus Avenue and more than 1,200 ft. from the nearest residence. Turbine 2 will be located approximately 900 ft. south of 265th Street (U.S. Highway 18) and more than 1,200 ft. from the nearest residence. Turbine 3 will be located approximately 900 ft. south of 11th Street SE and more than 1,200 ft. from the nearest residence. In addition, CED is proposing an alternate location for Turbine 3, or "Alternate 3." Alternate 3 will be located approximately 780 ft. south of 265th Street (U.S. Highway 18) and more than 1,100 ft. from the nearest residence. Although the preferred location for Turbine 3 is farther away from the nearest residence than Alternate 3, it is closer to (but not in) a FEMA 100-year floodplain. CED is working with its construction team to ensure that construction-related activities for Turbine 3 will not encroach upon the floodplain area. Turbine locations and setbacks to public rights-of-way and nearest residences are shown in Figure 1

Service roads will be constructed leading from main roads to turbine locations, as shown in Figure 1. The primary land use of the project area is agricultural and the project is located in an area of minimal flood hazard. The construction of the proposed wind turbines will not significantly impact the land use in the area and will positively contribute to the county's tax base and generation of renewable energy. The project area is located in an A-1 zoning district and therefore can be permitted as an accessory use to a principal permitted use, per Section 6.27 of the Cerro Gordo County Zoning Ordinance.

Copies of landowner lease agreements are included as Appendix A.

Application form 7460 Notice of Proposed Construction was submitted to the Federal Aviation Administration (FAA) and determination letters are attached as Appendix B.

Table 3: Turbine Locations

Locations	Latitude	Longitude	Parcel ID	Legal Description
Turbine 1	43.14457°	-93.10042°	On the border of 080930000100 and 080930000300	NW SW 09-96-19 and SW SW 09-96-19
Turbine 2	43.14556°	-93.09519°	080930000200	NE SW 09-96-19
Turbine 3	43.13842°	-93.09732°	081610000200	NE NW 16-96-19
Alternate 3	43.13874°	-93.09732°	081610000200	NE NW 16-96-19

B. Turbine Description and Performance Standards under the Zoning Ordinance

1. General

The proposed project will use wind turbines designed and manufactured by GE Renewable Energy (or a similar Tier-1 manufacturer). Turbine blades and towers are painted white as per FAA regulations. All three turbines proposed for the wind farm project will be tubular, monopole type towers. The project will consist of two GE 2.82 MW turbines (127 meter rotor diameter and 89 meter hub height) with a total turbine maximum height of 499 ft., and one GE 2.3 MW turbine (116 meter rotor diameter and 80 meter hub height) with a total turbine maximum height of 453 ft.[1] Turbines are certified to the IEC guidelines (61400-22) by a professional engineer based on certification standards recognized by the American Wind Energy Association. Turbine specifications, including Engineers Certification, are included in Appendix C.

2. Zoning Ordinance Section 20.2(J)

Cerro Gordo County Zoning Ordinance Section 20.2(J) applies to Special Uses for "commercial microwave, radio and television towers, public utility structures and accessory equipment, including their transmitting stations and towers, and wireless telecommunications facilities." Although the proposed CED Mason City Wind Project does not include any of the structures or uses that are named in this section of the Ordinance, the County has interpreted this section to apply to Wind Energy Conversion Systems such as that being proposed here. Accordingly, the CED Mason City Wind Project will comply with the provisions of Section 20.2(J) in the following ways:

1. This Application contains the documentation required in the Ordinance, including:
    a. Site Plan, etc. (Figures 1 – 5)
    b. Written authorization from site owners (Appendix A)
    c. Site suitability: the proposed site provides access to a sufficient wind resource, electrical grid interconnect, and participating landowners.
    d. Other permits and approvals will be obtained as required, see Section G.3. below.
2. Conditions:
    a. Towers, communications equipment (not applicable).
    b. Towers, appearance: the turbine towers will be designed in accordance with FAA requirements, see Section B.3. below.
    c. Certificate of Liability Insurance (Appendix E).
    d. Tower height setbacks: see Section B.5. below.
    e. Signal interference see Section E.2. below.
    f. Decommissioning: see Section I below.
    g. Public roads: see Section G.1. below.
    h. Zoning permit: see Section G.3. below.
    i. Signage: see Section B.4. below.
3. Exceptions

[1] Although not anticipated, it is possible that a different wind turbine will be used instead of the GE wind turbines described in this application. If a different wind turbine is selected, it will be substantially similar to the GE wind turbines described herein (i.e., similar blade length, maximum height of 500 ft. or less, capacity, etc.). CED Mason City will notify the permitting authority as soon as possible if such a change occurs.

a. Antenna (not applicable)

4. Transmission lines: The project will include collection and distribution lines but no transmission lines.

3. Lighting

Lighting on turbines used during night time operation will consist of FAA-Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint / synchronized red lights – Chapters 4,12,&13. Daytime lighting of wind turbines is not required.

4. Signage

Standard Department of Transportation signage requirements (wide load, red flags, etc.) will be used for transportation of each wind turbine component for safety precautions. A sign that identifies the name and phone number of an "in case of emergency" contact will be placed at the entrance to each turbine access road and a turbine identification number at the base of each WTG. No advertisements will be placed on wind turbine components.

5. Setbacks

All turbines comply with setback requirements defined in the Cerro Gordo County Zoning Ordinance [20.2(J)(2)(d)], which states that "the base of the tower shall be at least the height of the tower from any public right-of-way and any existing principal or accessory structure, other than the base station." The maximum height of the GE 2.82 MW wind turbine is 499 ft., and the maximum height of the GE 2.3 MW wind turbine is 453 ft. Although not stated in the Ordinance, the language in this section has also been interpreted to require a tip height (maximum turbine height) setback from non-participating landowner's property lines. Figure 1 shows turbine distances from nearest residential structures, project boundary property lines, and road rights-of-way. These figures show that the proposed turbine locations meet the required tip height (499 ft. and 453 ft.) setbacks for all public rights-of-way, principal or accessory structures, and non-participating landowner property boundaries.

C. Power Generation and Interconnection

The CED Mason City Wind Project will be constructed with the purpose of providing power to a local utility for resale. A substation owned by Interstate Power and Light Company (IPL) is located just over 1 mile west of the Project area. CED Mason City Wind LLC will install a collector line and a communication line to connect the Project to this substation. It is expected that the collection system from the turbines to the substation line will be within the Cerro Gordo County right-of-way. The communication and collector lines will be buried 42 inches below the surface to the point of interconnection with the local distribution grid. Pole-mounted interconnection equipment and a control hut will be installed near the substation. Utility and driveway entrance permits will be applied for through the County Engineer's Office. A System Interconnection Agreement has been signed with IPL. CED Mason City Wind LLC will obtain approval for an overhead distribution/underground line as needed and allowed by the county. All required upgrades to the distribution system will be completed at CED Mason City Wind LLC's expense.

D. Safety

Wind turbines will not be climbable up to 15 ft. above ground level. All access doors to the wind turbines and electrical equipment will be locked at all times when not being serviced. Appropriate warning signage will be placed on wind turbine towers, electrical equipment, and wind farm boundary entrances. A qualified engineer will certify the wind turbines showing that the turbine, foundation, and tower design is within acceptable professional standards given local soil and climate conditions.

E. Noise, Flicker and Signal Interference

1. Noise and Shadow Flicker

Third party acoustic and shadow flicker analyses for the proposed turbines are underway and will be provided once completed.

2. Signal Interference

CED Mason City Wind LLC will mitigate any interference with electromagnetic communications from radio, telephone, or television signals caused by the turbines in accordance with county recommendations. Based on proximity to nearest communication towers, signal interference is assumed to be negligible. If signal interference does occur, any complaints associated with the tower or related equipment will be addressed within 30 days in accordance with Federal Communications Commission (FCC) rules and procedures.

F. Waste Disposal

CED Mason City Wind LLC will be responsible for all construction materials brought on site. Materials will be removed after each phase of construction. All construction materials, equipment, and waste materials will be removed from the site at CED Mason City Wind LLC's expense. All hazardous material will be disposed of in accordance with state, local, and federal laws.

G. Avoidance and Mitigation of Damages to Public Infrastructure

1. Roads

CED Mason City Wind LLC will abide by the Cerro Gordo County Engineer's recommendations on required bond amounts for road access. CED Mason City Wind LLC will obtain all applicable permits for the proposed project. Final transportation of turbine components will be decided 30 days prior to turbine component deliveries with coordination from State and Local Officials. Pre-construction surveys will be done by CED Mason City Wind LLC. CED Mason City Wind LLC will coordinate information with Cerro Gordo County Engineer and local authorities for determining existing road conditions. Applicable weight and size permits will be obtained from the impacted authorities prior to construction. CED Mason City Wind LLC will abide by any dust control measures required by the County Engineer. If situations arise where dust control measures are needed they will be addressed in accordance with the Cerro Gordo County Engineer recommendations.

2. Drainage Systems

CED Mason City Wind LLC understands that it is responsible for any public drainage tiles that are damaged through the construction phase of the project. If required, CED Mason

City Wind LLC will notify the Army Corps of Engineers, Iowa Department of Natural Resources, and Iowa Sovereign Lands Section of the proposed Project as necessary.

3. Other Permits and Approvals

CED Mason City Wind LLC will seek the following permits and approvals after or concurrent with issuance of the Special Use Permit and prior to commencing construction of the Project:

- Road use agreement for construction routes
- ROW permit for transmission lines
- Driveway access permit
- Floodplain Development Permit
- Building and Electrical Permits (as applicable)
- Iowa EPA Storm water Permit for Construction Activities

H. Avian and Bat Assessment

CED Mason City Wind LLC commissioned a Tier 1 and 2 Avian and Bat Assessment to be completed for the Project area. The results and recommendations of the assessment have been incorporated into the design and siting process of the Project in order to reduce the potential for impacts to wildlife. The assessment is included as Appendix D.

I. Discontinuation and Decommissioning

Within 12 months from the end of the Wind Farm Option Agreement CED Mason City Wind LLC will remove all physical material related to the wind farm to a depth of 36 inches. Turbines can be removed and transported to a new location or taken apart for scrap metal. For the case in which the wind turbine is scrapped for material, the copper wire associated with the wiring of the turbine components will be removed and sold. Turbine towers will be cut into sections for scrap metal. All valuable components associated with the wind turbine will be sold to cover cost of decommissioning the project. CED Mason City Wind LLC will have full responsibility in clearing all equipment and material associated with the wind farm before restoring easement area to pre-existing conditions. All oils and other hazardous materials will be removed from the site by a qualified transporter.

Landowners will have the option to keep access roads on site. Alternatively, access roads will be removed through the decommissioning process and topsoil will be restored at the end of wind farm easement. Easement payments will continue to landowner until removal is complete.

Costs allocated for the decommissioning of the wind farm project have been included in the financial model of the project.

J. Proof of Insurance

A copy of Certificate of Liability Insurance for CED Mason City Wind LLC is included in Appendix E.

LIST OF FIGURES

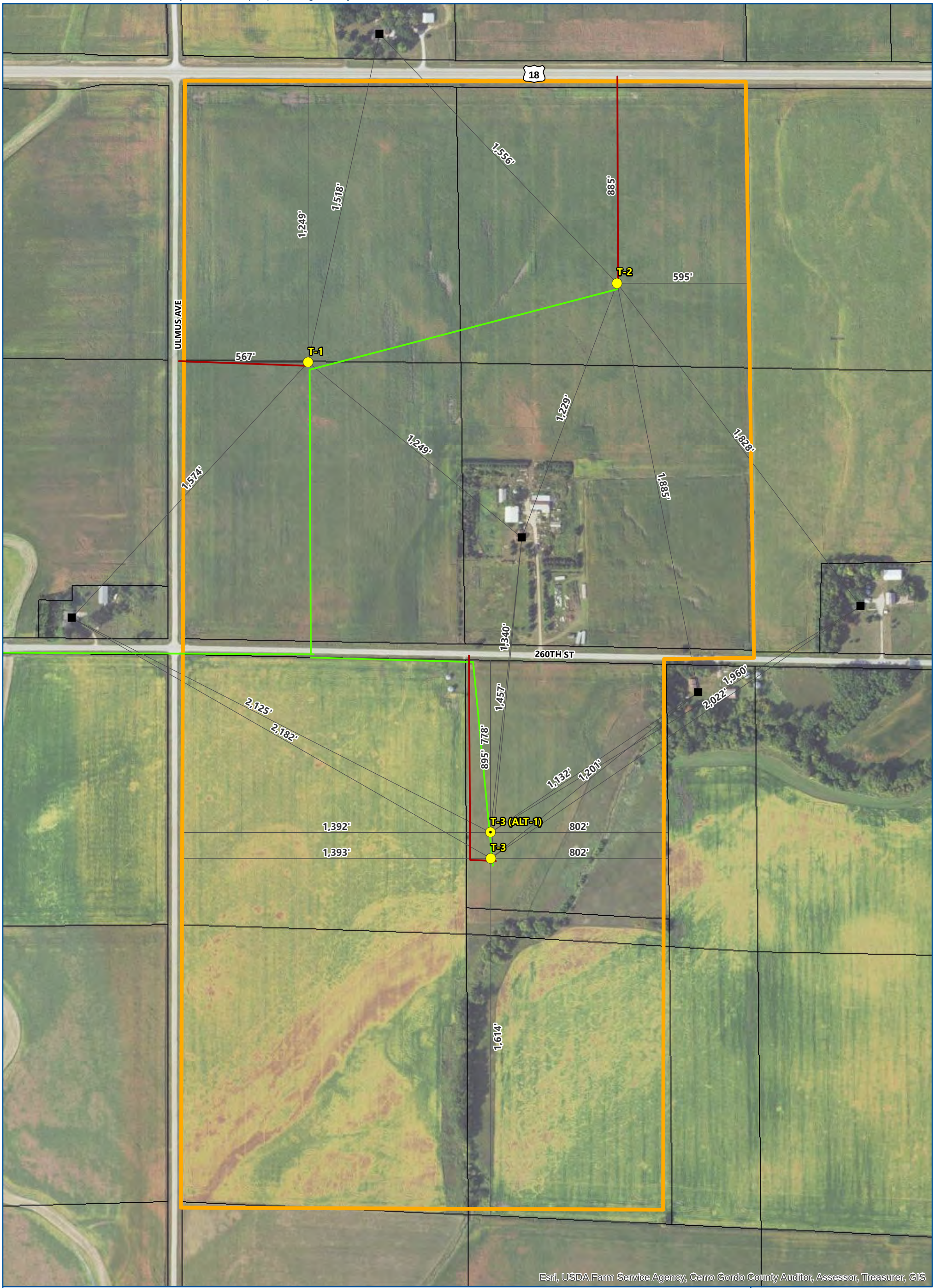
LIST OF APPENDICES

FIGURES

Figure 1

Project Overview

Barr Footer: ArcGIS 10.6.1, 2019-05-08 15:46 File: I:\Projects\15\17\1017\Maps\Reports\CUP\Figure 1 - Project Overview.mxd User: kac2



Project Boundary
Turbine Location (5/7/2019)
Alternate Turbine Location (5/7/2019)
Access Road
Collection System
Residence Location
Parcel Boundary

N

0 400 800
Feet

BARR

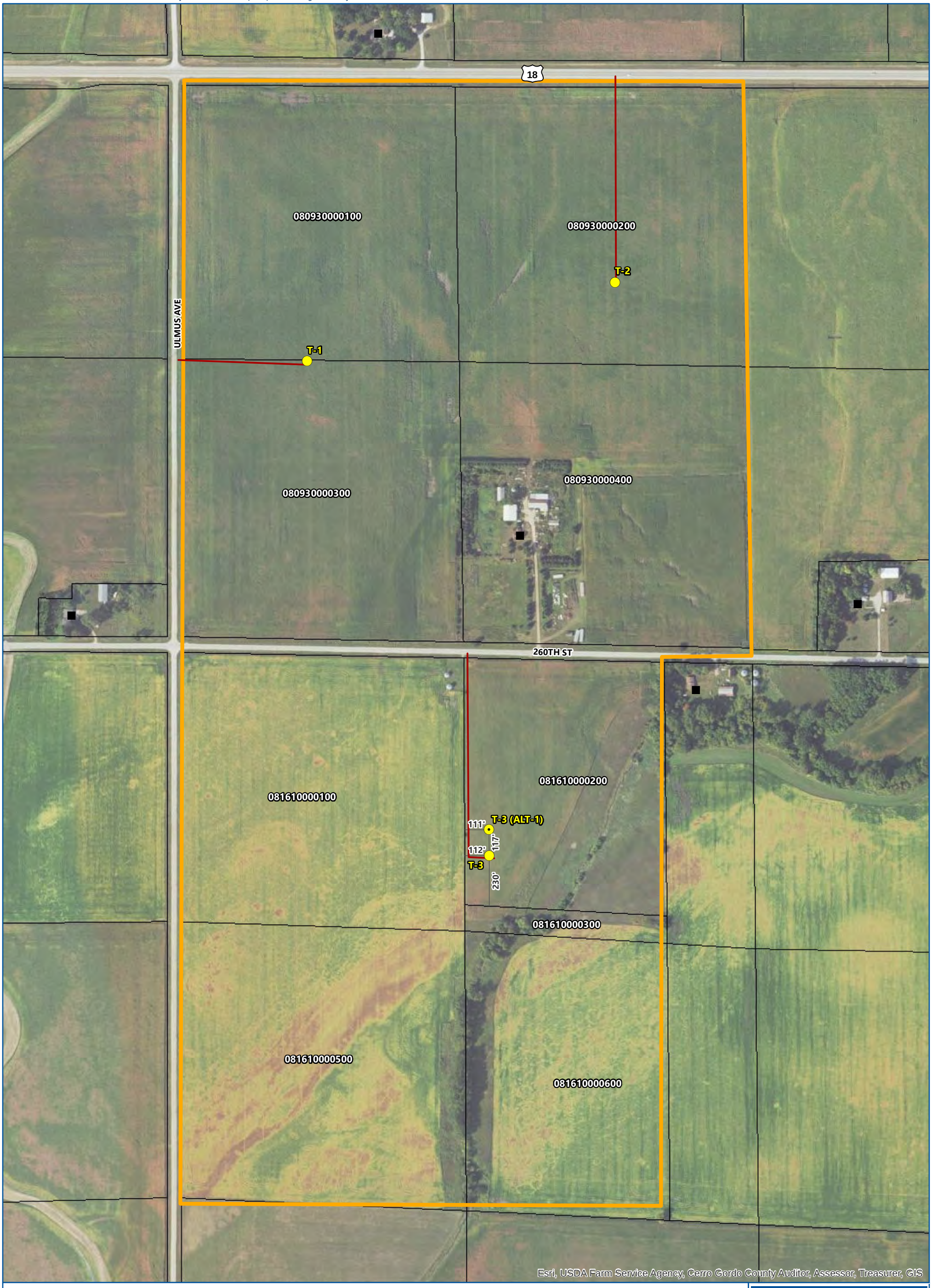
PROJECT OVERVIEW
ConEdison
Cerro Gordo County, IA

FIGURE 1

Figure 2

Project Area Parcels

Barr Footer: ArcGIS 10.6.1, 2019-05-08 10:30 File: I:\Projects\15\17\1017\Maps\Reports\CUP\Figure 2 - Project Area Parcels.mxd User: kac2



Project Boundary

Turbine Location (5/7/2019)

Alternate Turbine Location (5/7/2019)

Access Road

Residence Location

Parcel Boundary

N

0 350 700

Feet

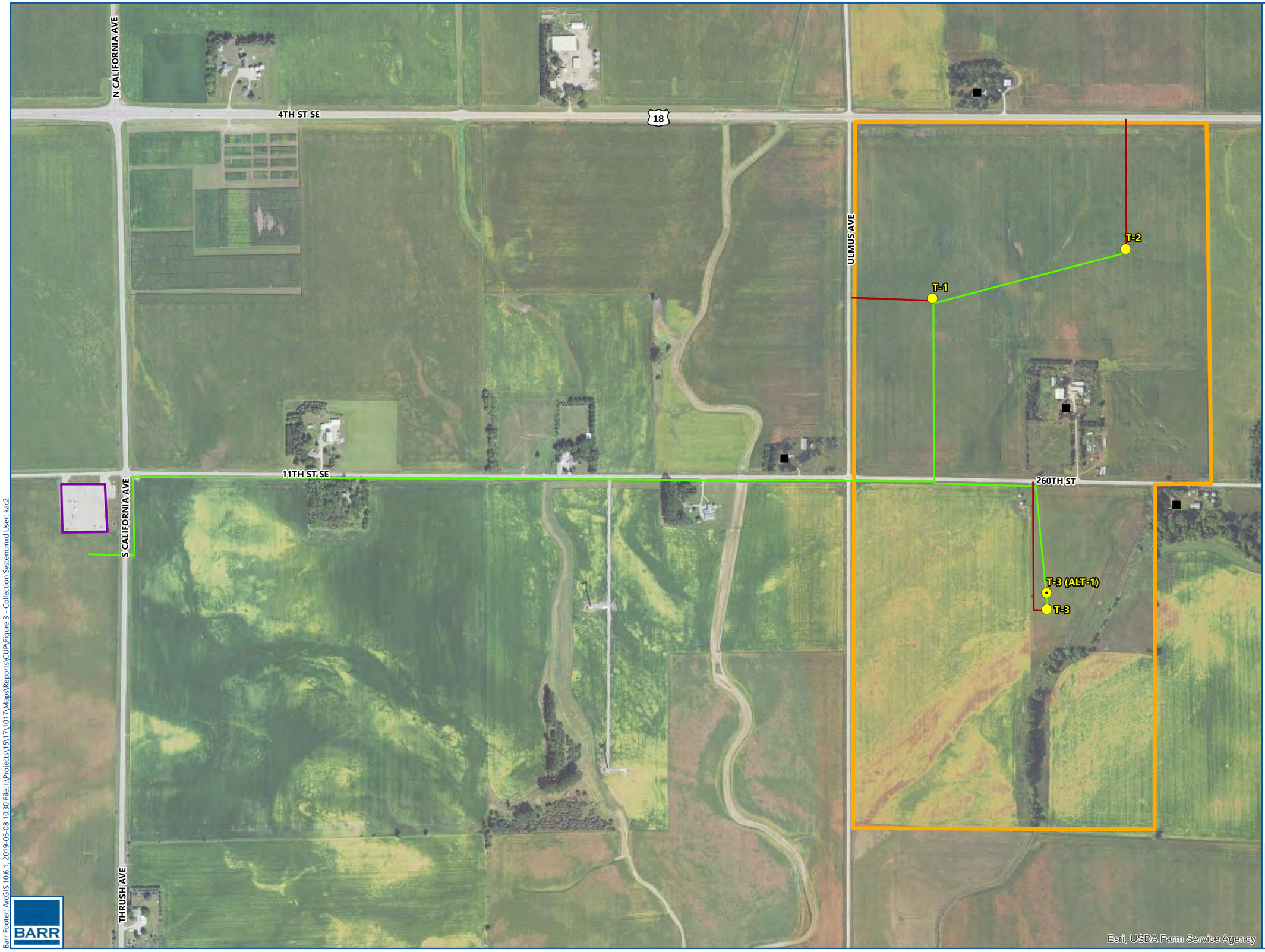
BARR

PROJECT AREA PARCELS
ConEdison
Cerro Gordo County, IA

FIGURE 2

Figure 3

Collection System



Project Boundary

Turbine Location (5/7/2019)

Alternate Turbine Location (5/7/2019)

Access Road

Collection System

Alliant Substation

Residence Location

N

0 650 1,300

Feet

COLLECTION SYSTEM
ConEdison
Cerro Gordo County, IA

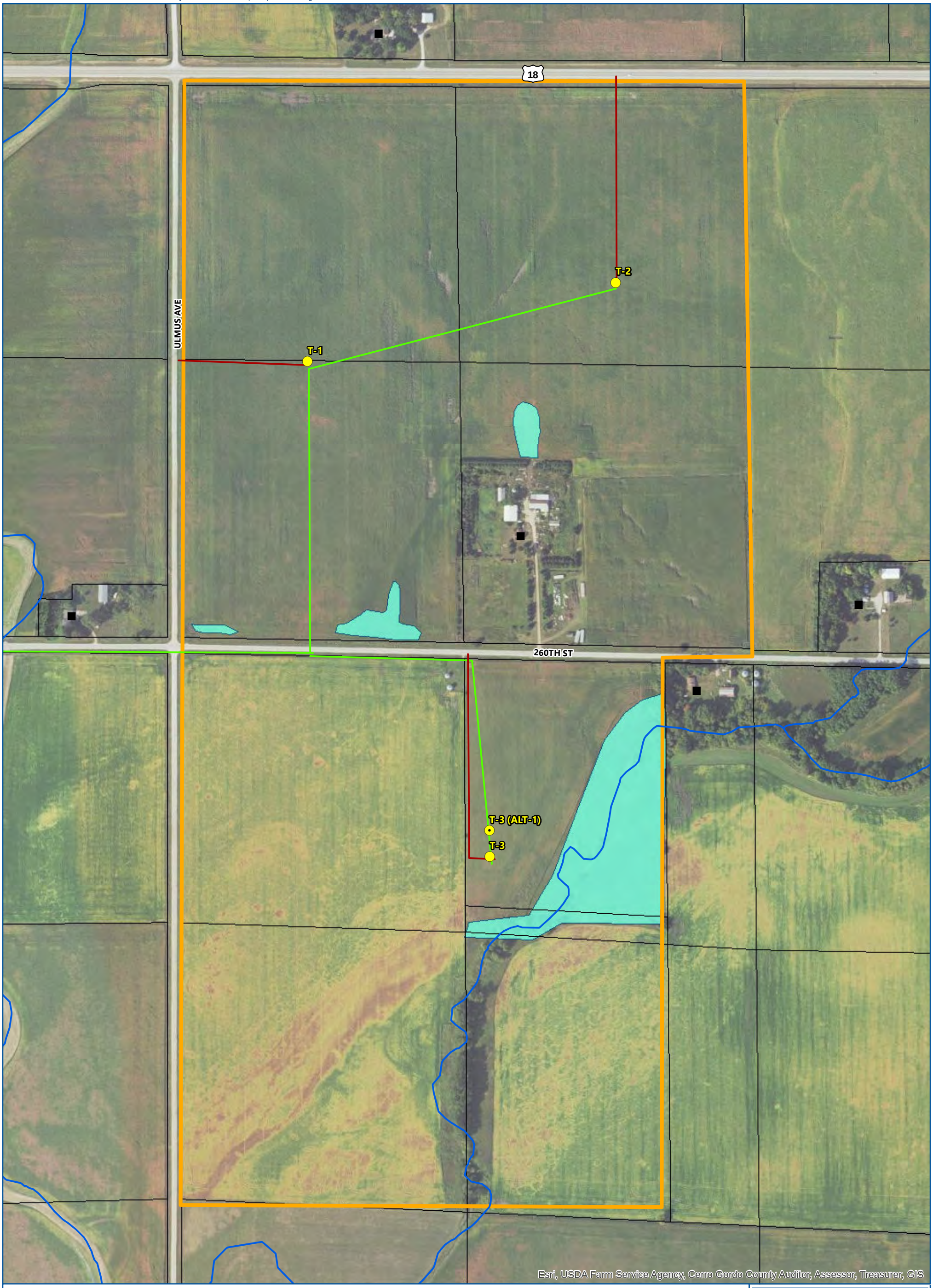
FIGURE 3

BARR

Figure 4

Wetlands and Waterbodies

Barr Footer: ArcGIS 10.6.1, 2019-05-08 10:29 File: I:\Projects\15\17\1017\Maps\Reports\CUP\Figure 4- Wetlands and Waterbodies.mxd User: kac2



Project Boundary
Turbine Location (5/7/2019)
Alternate Turbine Location (5/7/2019)
Access Road
Collection System
Residence Location
Parcel Boundary
Streams (NHD Flowlines)
Wetland Boundary

N

0 400 800
Feet

BARR

Wetlands and Waterbodies
ConEdison
Cerro Gordo County, IA

FIGURE 4

Figure 5

FEMA Floodplains

Project Boundary

Turbine Location (5/7/2019)

Alternate Turbine Location (5/7/2019)

Access Road

Collection System

Alliant Substation

Residence Location

FEMA Floodplain

N

0 650 1,300

Feet

FEMA FLOODPLAINS
ConEdison
Cerro Gordo County, IA

FIGURE 5

Barr Footer: ArcGIS 10.6.1, 2019-05-08 10:02 File:I:\Projects\15\17\1017\Maps\Reports\CUP\Figure 5 - FEMA Floodplains.mxd User: kac2

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APPENDICES

Appendix A

Landowner Lease Agreements

RECORDING REQUSTED BY AND
WHEN RECORDED RETURN TO:

CED Mason City Wind, LLC
4301 W. 57th St., Suite 131
Sioux Falls, SD 57108

MEMORANDUM OF LEASE AGREEMENT

This Memorandum of Lease Agreement ("**Agreement**") is made on _____, 2019 (the "**Effective Date**") between Gary C. and Donna E. Sutcliffe, husband and wife ("**Lessor**"), and CED Mason City Wind, LLC, ("**Lessee**"). Lessor and Lessee (the "**Parties**") agree as follows:

WHEREAS:

A. On the date hereof, the Parties have entered into a Lease Agreement which by grants to Lessee wind rights to develop, construct, and install the Project on certain land described in Exhibit A – Premises attached hereto and incorporated herein by this reference (the "**Premises**").

B. The term of the Agreement commences on the date hereof and continues for a period of twenty-five (25) years in accordance with the terms of the Agreement, unless otherwise terminated as provided in the Agreement.

C. The Parties desire to enter into this Memorandum, which is to be recorded in order that any third parties may have notice of the interests of the Lessee in the Premises and the existence of the Agreement and of certain rights granted to the Lessee in the Premises as part of the Agreement.

NOW, THEREFORE, in consideration of the payments and covenants provided in the Lease Agreement to be paid and performed by the Lessee, Lessor hereby grants to the Lessee a certain rights (as described in the Agreement) to the Premises on the terms and conditions set forth in the Agreement. All of the terms, conditions, provisions and covenants of the Agreement are hereby incorporated into this Memorandum by reference as though fully set forth herein, and the Agreement and this Memorandum shall be deemed to constitute a single instrument or document. Should there be any inconsistency between the terms of this Memorandum and the Agreement; the terms of the Agreement shall prevail.

(The remainder of this page is intentionally blank.)

IN WITNESS WHEREOF, the undersigned have caused this instrument to be executed as of the _____ day of _____, 2019.

LESSOR:

By: Gary C. Sutcliffe
Gary C. Sutcliffe

By: Donna E. Sutcliffe
Donna E. Sutcliffe

STATE OF Iowa)
) ss
COUNTY OF Cerro Gordo)

The foregoing instrument was acknowledged before me this 30 day of April, 2019 by Gary C. Sutcliffe & Donna E. Sutcliffe.

Notary Public

THOMAS NAIRN
Commission Number 814893
My Commission Exp. 1-28-2022

LESSEE:

CED Mason City Wind, LLC
a Delaware limited liability company

By: _____

Its: James J. Dixon
Senior Vice President
and Chief Operating Officer

STATE OF NEW YORK)
) ss
COUNTY OF WESTCHESTER)

The foregoing instrument was acknowledged before this 1st day of May, 2019 by James J. Dixon, the Senior Vice President and COO of CED Mason City Wind, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

PAUL FARRELL MAPELLI
Notary Public, State of New York
No. 02MA4967056
Qualified in Rockland County
Commission Expires May 21, 2022

EXHIBIT A

DESCRIPTION OF THE LESSOR PROPERTY

NORTH 25 ACRES OF THE WEST 55 ACRES OF THE EAST HALF (E1/2) OF THE NORTHWEST QUARTER (NW1/4) OF SECTION 16, TOWNSHIP 96 NORTH, RANGE 19 WEST OF THE 5TH P.M., Parcel Number 081610000200

RECORDING REQUSTED BY AND
WHEN RECORDED RETURN TO:

CED Mason City Wind, LLC
4301 W. 57th St., Suite 131
Sioux Falls, SD 57108

MEMORANDUM OF LEASE AGREEMENT

This Memorandum of Lease Agreement ("**Agreement**") is made on 30 April, 2019 (the "**Effective Date**") between Kevin G. Sutcliffe ("**Lessor**"), and CED Mason City Wind, LLC, ("**Lessee**"). Lessor and Lessee (the "**Parties**") agree as follows:

WHEREAS:

A. On the date hereof, the Parties have entered into a Lease Agreement which by grants to Lessee wind rights to develop, construct, and install the Project on certain land described in Exhibit A – Premises attached hereto and incorporated herein by this reference (the "**Premises**").

B. The term of the Agreement commences on the date hereof and continues for a period of twenty-five (25) years in accordance with the terms of the Agreement, unless otherwise terminated as provided in the Agreement.

C. The Parties desire to enter into this Memorandum, which is to be recorded in order that any third parties may have notice of the interests of the Lessee in the Premises and the existence of the Agreement and of certain rights granted to the Lessee in the Premises as part of the Agreement.

NOW, THEREFORE, in consideration of the payments and covenants provided in the Lease Agreement to be paid and performed by the Lessee, Lessor hereby grants to the Lessee a certain rights (as described in the Agreement) to the Premises on the terms and conditions set forth in the Agreement. All of the terms, conditions, provisions and covenants of the Agreement are hereby incorporated into this Memorandum by reference as though fully set forth herein, and the Agreement and this Memorandum shall be deemed to constitute a single instrument or document. Should there be any inconsistency between the terms of this Memorandum and the Agreement; the terms of the Agreement shall prevail.

(The remainder of this page is intentionally blank.)

IN WITNESS WHEREOF, the undersigned have caused this instrument to be executed as of the 30 day of April, 2019.

LESSOR:

By: Kevin G. Sutcliffe
Kevin G. Sutcliffe

STATE OF Iowa)
) ss
COUNTY OF Cerro Gordo)

The foregoing instrument was acknowledged before me this 30th day of April, 2019 by Kevin G. Sutcliffe.

NOTARIAL SEAL IOWA
JOHN E. UDELHOFEN
COMMISSION NUMBER 168387
My Comm. Exp. 2-11-20

Notary Public

LESSEE:

CED Mason City Wind, LLC
a Delaware limited liability company

By: _____

Its: James J. Dixon
Senior Vice President
and Chief Operating Officer

STATE OF NEW YORK)
) ss
COUNTY OF WESTCHESTER)

The foregoing instrument was acknowledged before this 1st day of May, 2019 by James J. Dixon, the Senior Vice President and COO of CED Mason City Wind, LLC, a Delaware limited liability company, on behalf of the company.

_____
Notary Public

EXHIBIT A

DESCRIPTION OF THE LESSOR PROPERTY

THE WEST HALF (W1/2) OF THE SOUTHWEST QUARTER (SW ¼) OF SECTION NONE (9), TOWNSHIP NINETY-SIX (96) NORTH, RANGE NINETEEN (19) WEST OF THE 5TH P.M., Parcel Number 080930000100 and 080930000300

RECORDING REQUSTED BY AND
WHEN RECORDED RETURN TO:

CED Mason City Wind, LLC
4301 W. 57th St., Suite 131
Sioux Falls, SD 57108

MEMORANDUM OF LEASE AGREEMENT

This Memorandum of Lease Agreement ("**Agreement**") is made on May 1, 2019 (the "**Effective Date**") between Lyndon G. Sutcliffe ("**Lessor**"), and CED Mason City Wind, LLC, ("**Lessee**"). Lessor and Lessee (the "**Parties**") agree as follows:

WHEREAS:

A. On the date hereof, the Parties have entered into a Lease Agreement which by grants to Lessee wind rights to develop, construct, and install the Project on certain land described in Exhibit A – Premises attached hereto and incorporated herein by this reference (the "**Premises**").

B. The term of the Agreement commences on the date hereof and continues for a period of twenty-five (25) years in accordance with the terms of the Agreement, unless otherwise terminated as provided in the Agreement.

C. The Parties desire to enter into this Memorandum, which is to be recorded in order that any third parties may have notice of the interests of the Lessee in the Premises and the existence of the Agreement and of certain rights granted to the Lessee in the Premises as part of the Agreement.

NOW, THEREFORE, in consideration of the payments and covenants provided in the Lease Agreement to be paid and performed by the Lessee, Lessor hereby grants to the Lessee a certain rights (as described in the Agreement) to the Premises on the terms and conditions set forth in the Agreement. All of the terms, conditions, provisions and covenants of the Agreement are hereby incorporated into this Memorandum by reference as though fully set forth herein, and the Agreement and this Memorandum shall be deemed to constitute a single instrument or document. Should there be any inconsistency between the terms of this Memorandum and the Agreement; the terms of the Agreement shall prevail.

(The remainder of this page is intentionally blank.)

IN WITNESS WHEREOF, the undersigned have caused this instrument to be executed as of the 30 day of April, 2019.

LESSOR:

By: _____
Lyndon G. Sutcliffe

STATE OF Iowa)
) ss
COUNTY OF Cerro Gordo)

The foregoing instrument was acknowledged before me this 30 day of April, 2019 by Lyndon G. Sutcliffe.

_____
Notary Public

THOMAS NAIRN
Commission Number 814893
My Commission Exp. 1-26-2022

LESSEE:

CED Mason City Wind, LLC
a Delaware limited liability company

By: _____

Its: James J. Dixon
Senior Vice President
and Chief Operating Officer

STATE OF NEW YORK)
) ss
COUNTY OF WESTCHESTER)

The foregoing instrument was acknowledged before this 1ST day of May, 2019 by James J. Dixon, the Senior Vice President and COO of CED Mason City Wind, LLC, a Delaware limited liability company, on behalf of the company.

Paul Farrell Mapelli
Notary Public

PAUL FARRELL MAPELLI
Notary Public, State of New York
No. 02MA4967056
Qualified in Rockland County
Commission Expires May 21, 2022

EXHIBIT A

DESCRIPTION OF THE LESSOR PROPERTY

THE EAST HALF (E1/2) OF THE SOUTHWEST QUARTER (SW1/4) OF SECTION NINE (9), TOWNSHIP NINETY-SIX (96) NORTH, RANGE NINETEEN (19) WEST OF THE 5TH P.M., Parcel Number 080930000200 and 080930000400

Appendix B

FAA Determinations

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2019-WTE-3289-OE

Issued Date: 04/23/2019

Corey Juhl
ConEd Development, Inc.
1502 17th St SE
Pipestone, MN 56164

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine MCW - 1
Location:	Mason City, IA
Latitude:	43-08-40.49N NAD 83
Longitude:	93-06-01.51W
Heights:	1126 feet site elevation (SE) 499 feet above ground level (AGL) 1625 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
This determination expires on 10/23/2020 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

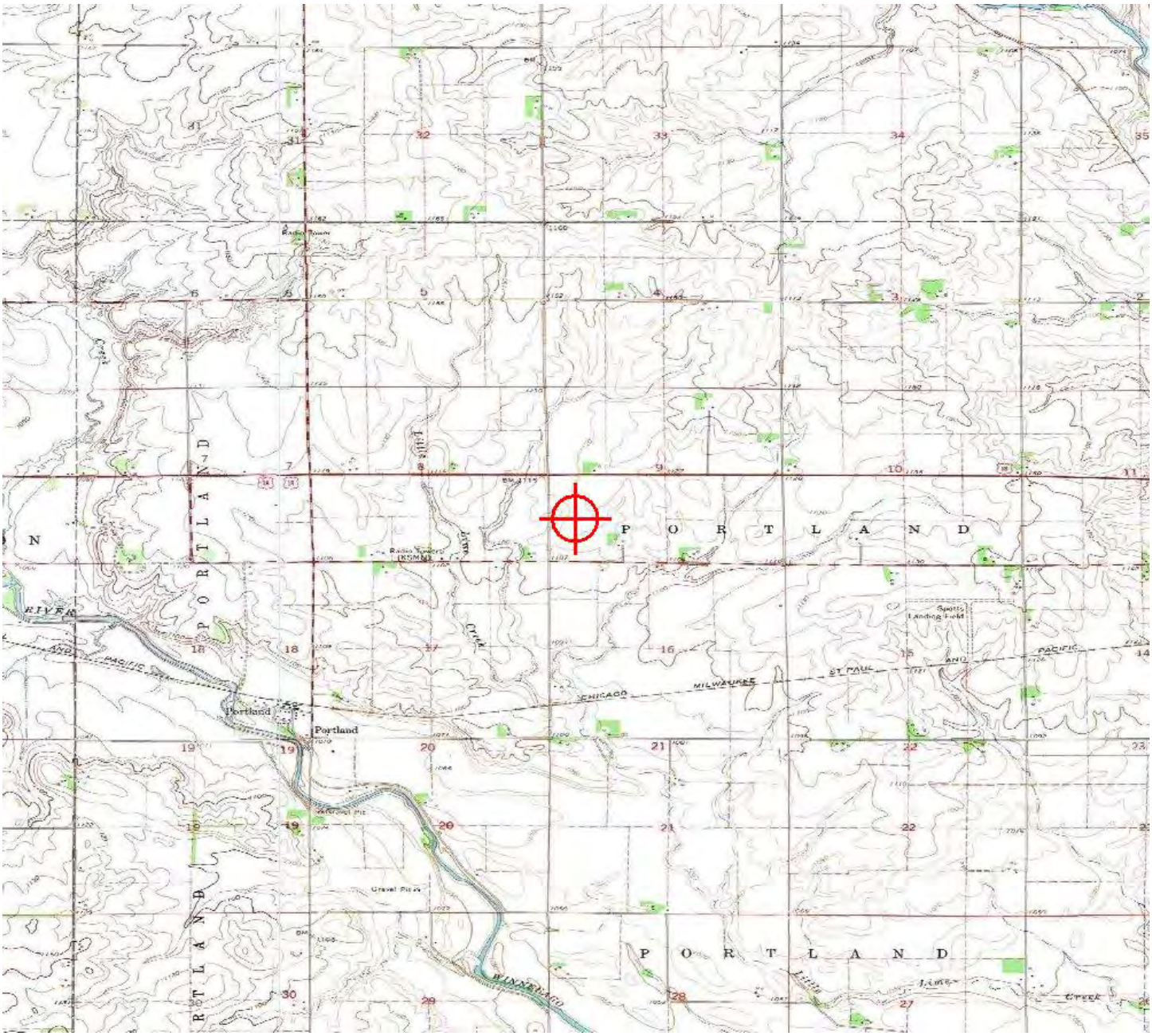
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3289-OE.

Signature Control No: 401450376-403495234 (DNE -WT)
Cindy Whitten
Specialist

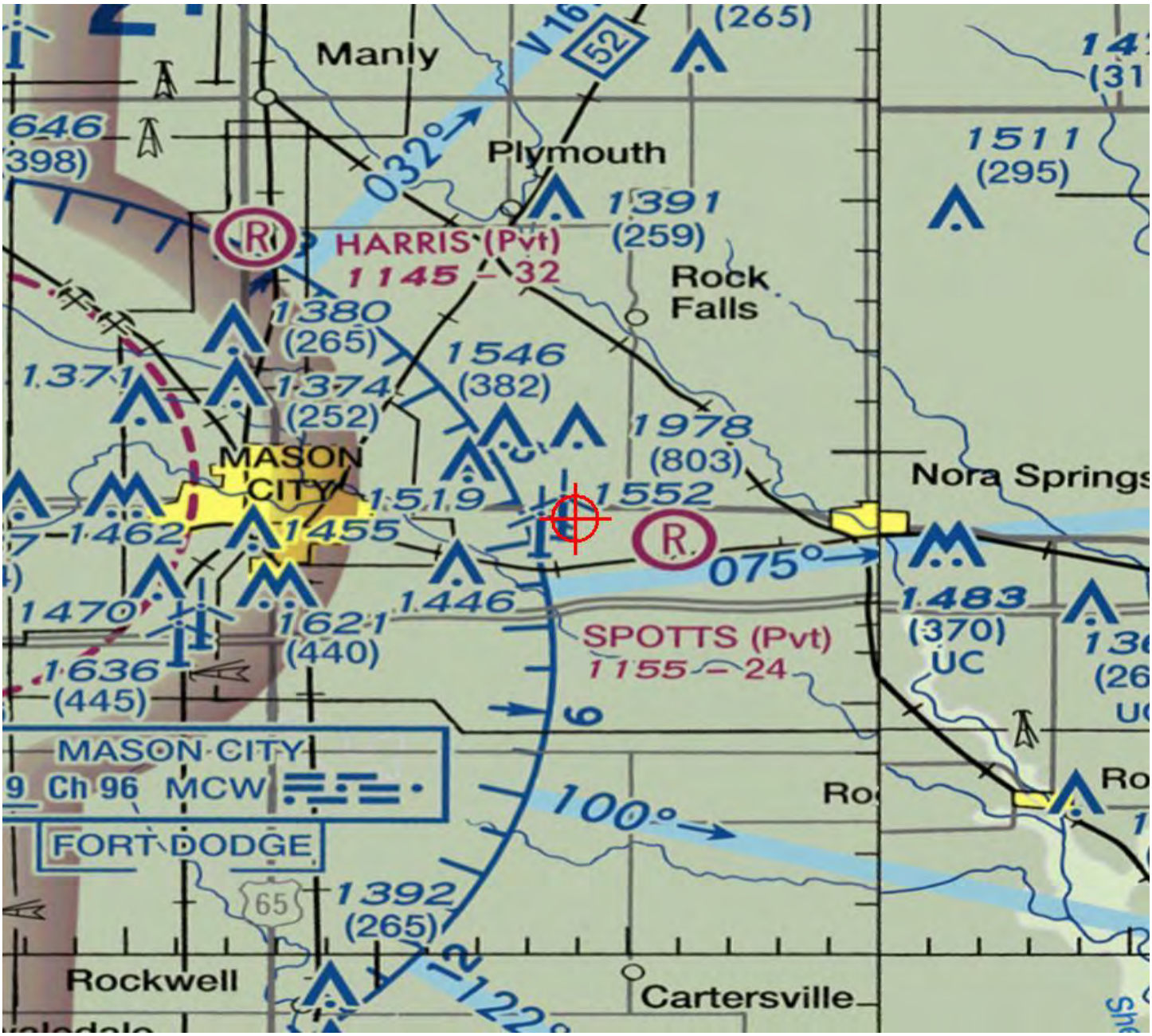
Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3289-OE



Sectional Map for ASN 2019-WTE-3289-OE



Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2019-WTE-3290-OE

Issued Date: 04/23/2019

Corey Juhl
ConEd Development, Inc.
1502 17th St SE
Pipestone, MN 56164

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine MCW - 2
Location:	Mason City, IA
Latitude:	43-08-44.04N NAD 83
Longitude:	93-05-42.68W
Heights:	1129 feet site elevation (SE)
	499 feet above ground level (AGL)
	1628 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
This determination expires on 10/23/2020 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

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This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

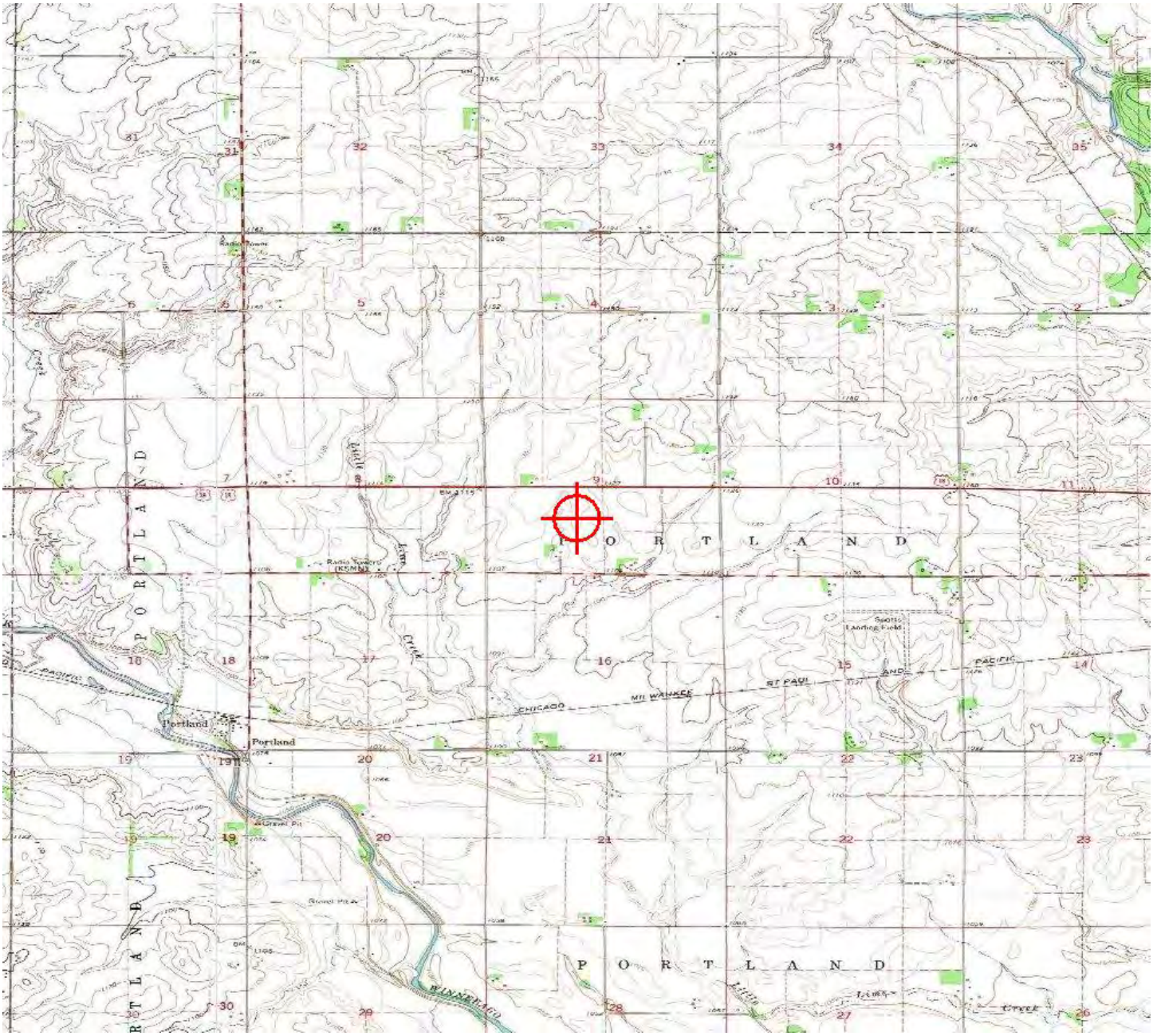
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3290-OE.

Signature Control No: 401450378-403495236 (DNE -WT)
Cindy Whitten
Specialist

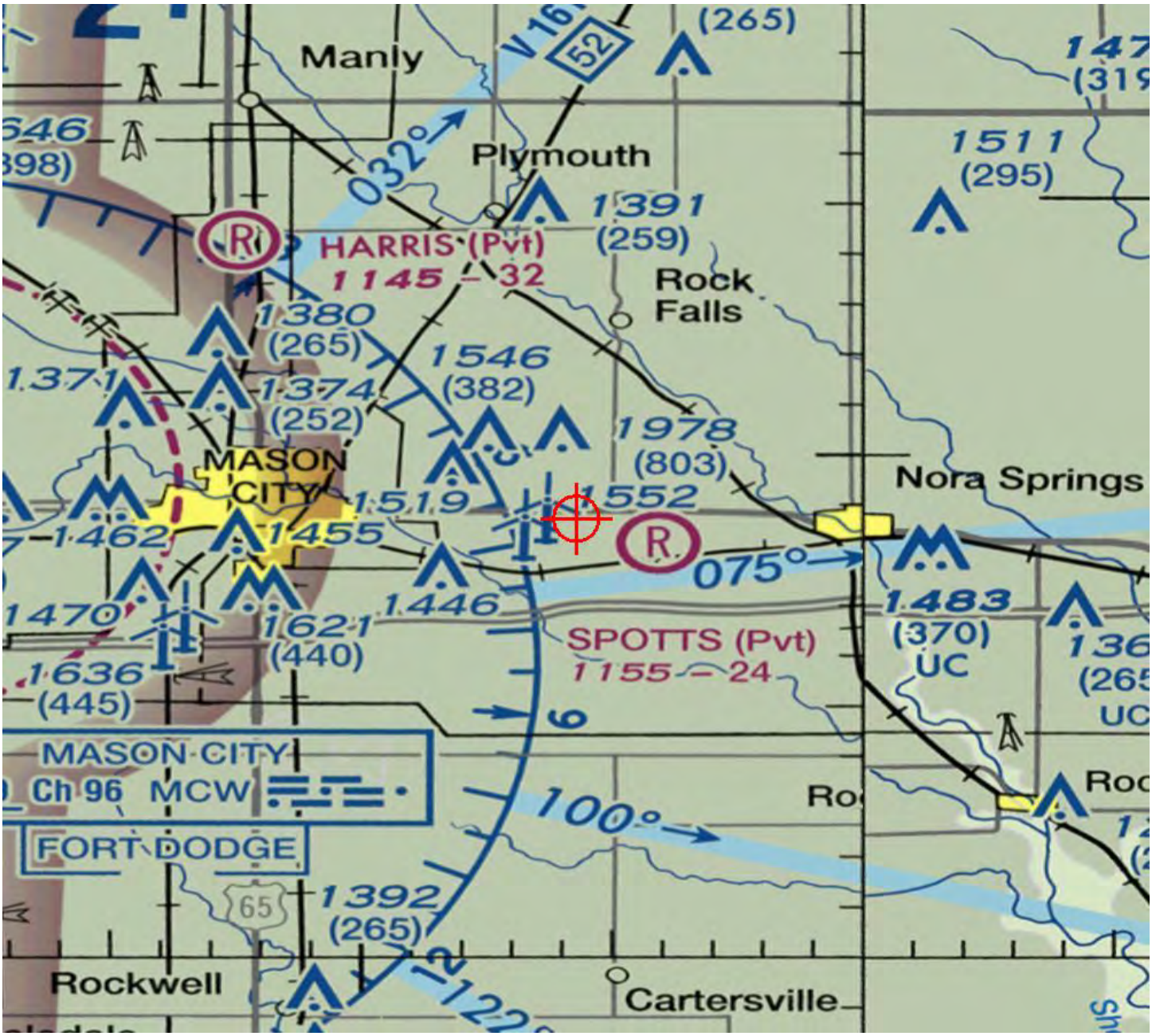
Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3290-OE



Sectional Map for ASN 2019-WTE-3290-OE



Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2019-WTE-3291-OE

Issued Date: 04/23/2019

Corey Juhl
ConEd Development, Inc.
1502 17th St SE
Pipestone, MN 56164

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine MCW - 3
Location:	Mason City, IA
Latitude:	43-08-18.34N NAD 83
Longitude:	93-05-50.35W
Heights:	1100 feet site elevation (SE) 499 feet above ground level (AGL) 1599 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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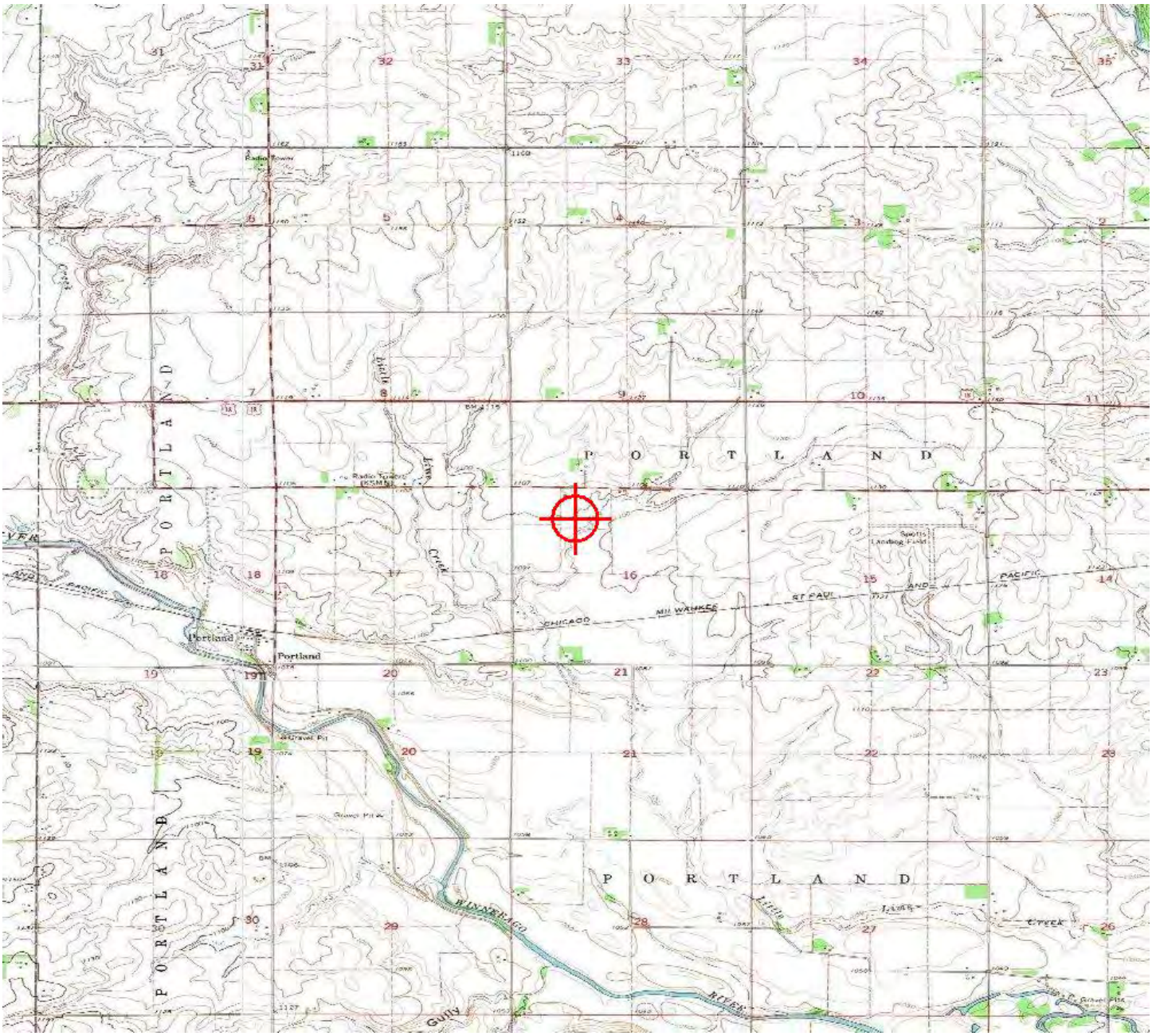
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3291-OE.

Signature Control No: 401450382-403495235 (DNE -WT)
Cindy Whitten
Specialist

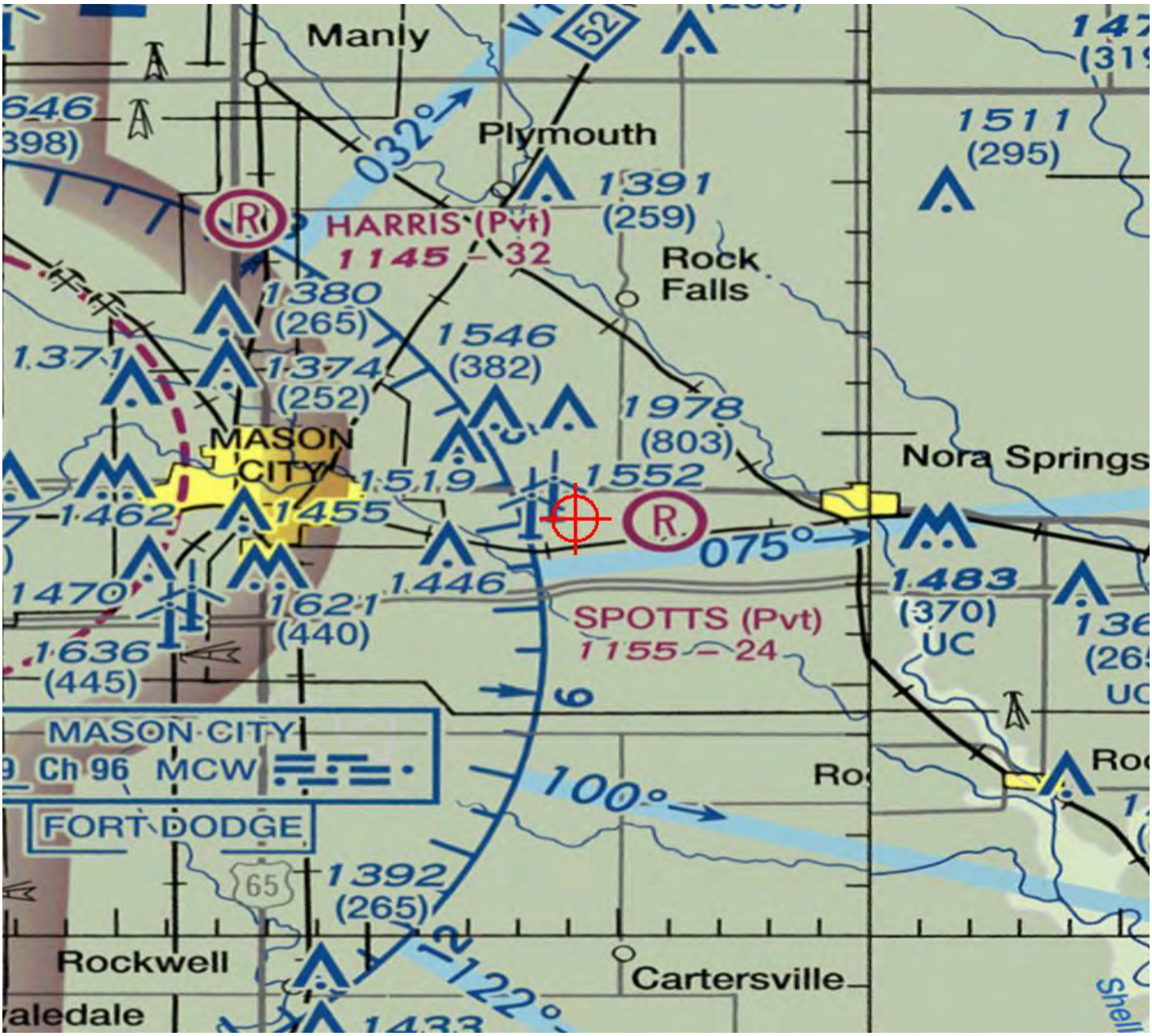
Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3291-OE



Sectional Map for ASN 2019-WTE-3291-OE



Appendix C

GE Wind Turbine Specifications with Engineers Certification

GE Power & Water

– Original –

Technical Documentation Wind Turbine Generator Systems 1&2MW Platform

Technical Description and Data

Applicable for Wind Turbine Generators from 2.0 MW to 2.4 MW

imagination at work

GE Power & Water

www.ge-energy.com

Visit us at
www.ge-renewable-energy.com

All technical data is subject to change in line with ongoing technical development!

Copyright and patent rights

imagination at work

Table of Contents

1 Introduction

This document summarizes the technical description and specifications of the GE Energy (GE) 1&2MW Platform wind turbine generator systems (applicable for systems from 2.0 MW to 2.4 MW).

2 Technical Description of the Wind Turbine and Major Components

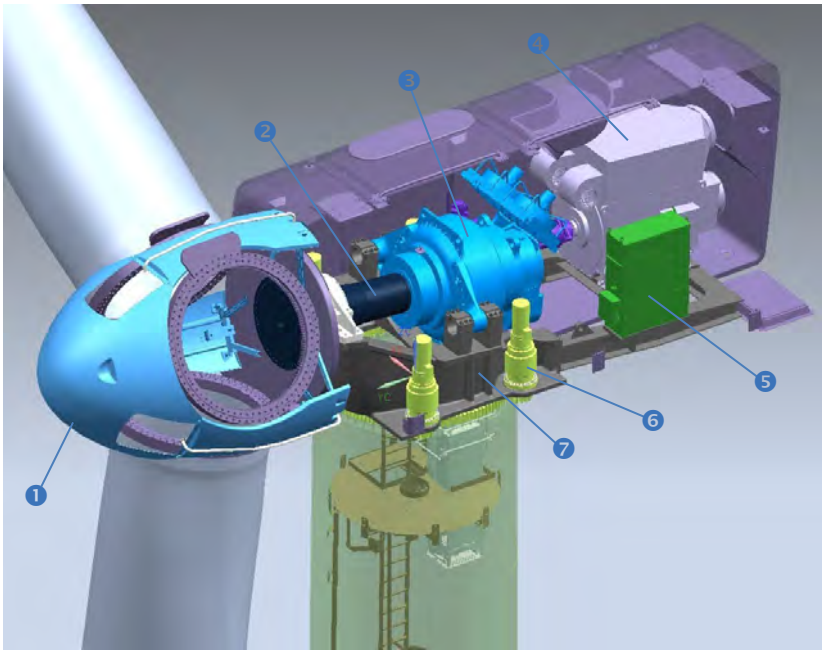
The wind turbine is a three bladed, upwind, horizontal-axis wind turbine with a rotor diameter of 107 or 116m. The turbine rotor and nacelle are mounted on top of a tubular tower with the following hub heights:

	2.2 to 2.4MW,-107m rotor	2.0 to 2.3MW,-116m rotor
50 Hz	80/94 m	80/94 m
60 Hz	80/94 m	80/94 m

Table 1: 1&2MW Platform hub heights for 50/60Hz markets, from 2.0-2.4 MW

The Wind Turbine Generator (WTG) employs active yaw control (designed to steer the machine with respect to the wind direction), active blade pitch control (designed to regulate turbine rotor speed), and a generator/power electronic converter system.

The wind turbine generator features a distributed drive train design consisting of a main shaft bearing, gearbox, and generator. Figure 1 shows these, as well as other major components such as the bedplate, yaw drives and an electrical panel box.



1 – Hub
2 – Main shaft
3 - Gearbox
4 - Generator
5 – Electrical panel box
6 – Yaw drive
7 - Bedplate

Figure 1: GE Energy 1&2MW Platform wind turbine nacelle layout, for generator systems of 2.0-2.4 MW

2.1 Rotor

Two rotor diameter WTGs are offered. The 107 m rotor diameter has a swept area of 8,992 m^2, the 116 m rotor diameter has a swept area of 10,568 m^2. The 107 m rotor is designed to operate between 8 and 16 rpm, while the 116 rotor is designed to operate between 8 and 15.7 rpm. Rotor speed is regulated by a combination of blade pitch angle adjustment and generator/converter torque control. The rotor spins in a clock-wise direction under normal operating conditions when viewed from an upwind location.

Full blade pitch angle range is approximately 90°, with the 0° position being with the airfoil chord line flat to the prevailing wind. The blades being pitched to a full feather pitch angle of approximately 90° accomplishes aerodynamic braking of the rotor; whereby the blades "spill" the wind thus limiting rotor speed.

2.2 Blades

There are three rotor blades for each wind turbine generator. The airfoils transition along the blade span with the thicker airfoils being located in-board towards the blade root (hub) and gradually tapering to thinner cross sections out towards the blade tip.

Vortex Generators (VGs) are attached to the suction side of the blades to increase turbine performance. These are molded plastic vanes that create vortices, attached to the blades in rows in the inner 1/3 of the blades. VGs increase the amount of attached flow over the blade and increase its efficiency.

Low Noise Trailing Edge (LNTE) are an optional feature for sites requiring reduced noise capability.

2.3 Blade Pitch Control System

The rotor utilizes three (one for each blade) independent electric pitch motors and controllers to provide adjustment of the blade pitch angle during operation. Blade pitch angle is adjusted by an electric drive that is mounted inside the rotor hub and is coupled to a ring gear mounted to the inner race of the blade pitch bearing (see Figure 1).

GE's active-pitch controller enables the wind turbine generator rotor to regulate speed, when above rated wind speed, by allowing the blade to "spill" excess aerodynamic lift. Energy from wind gusts below rated wind speed is captured by allowing the rotor to speed up, transforming this gust energy into kinetic energy which may then be extracted from the rotor.

Three independent back-up units are provided to power each individual blade pitch system to feather the blades and shut down the machine in the event of a grid line outage or other fault. By having all three blades outfitted with independent pitch systems, redundancy of individual blade aerodynamic braking capability is provided.

2.4 Hub

The hub is used to connect the three rotor blades to the wind turbine generator main shaft. The hub also houses the three electric blade pitch systems and is mounted directly to the main shaft. Access to the inside of the hub is provided through a hatch.

2.5 Gearbox

The gearbox in the wind turbine generator is designed to transmit power between the low-rpm turbine rotor and high- rpm electric generator. The gearbox is a multi-stage planetary/helical gear design. The gearbox is mounted to the machine bedplate. The gearing is designed to transfer torsional power from the wind turbine rotor to the electric generator. A parking brake is mounted on the high-speed shaft of the gearbox.

2.6 Bearings

The blade pitch bearing is designed to allow the blade to pitch about a span-wise pitch axis. The inner race of the blade pitch bearing is outfitted with a blade drive gear that enables the blade to be driven in pitch by an electric gear-driven motor/controller.

The main shaft bearing is a roller bearing mounted in a bearing cap arrangement.

The bearings used inside the gearbox are of the cylindrical and tapered roller type. These bearings are designed to provide bearing and alignment of the internal gearing shafts and accommodate radial and axial loads.

2.7 Brake System

The electrically actuated individual blade pitch systems act as the main braking system for the wind turbine generator. Braking under normal operating conditions is accomplished by feathering the blades out of the wind. Any single feathered rotor blade is designed to slow the rotor, and each rotor blade has its own back-up to provide power to the electric drive in the event of a grid line loss.

The wind turbine generator is also equipped with a mechanical brake located at the output (high-speed) shaft of the gearbox. This brake is only applied as an auxiliary brake to the main aerodynamic brake and to prevent rotation of the machinery as required by certain service activities.

2.8 Generator

The generator is a doubly-fed induction type. The generator meets protection class requirements of the International Standard IP 34 (duct ventilated). The generator is mounted to the generator frame and the mounting is designed so as to reduce vibration and noise transfer to the bedplate.

2.9 Flexible Coupling

Designed to protect the drive train from excessive torque loads, a flexible coupling is provided between the generator and gearbox output shaft. This coupling is equipped with a torque-limiting device sized to keep the maximum allowable torque below the maximum design limit of the drive train.

2.10 Yaw System

A ball bearing attached between the nacelle and tower facilitates yaw motion. Planetary yaw drives (with brakes that engage when the drive is disabled) mesh with the outside gear of the yaw bearing and steer the machine to track the wind in yaw. The passive yaw brakes prevent the yaw drives from experiencing peak loads from turbulent wind.

The controller activates the yaw drives to align the nacelle to the average wind direction based on the wind vane sensor mounted on top of the nacelle.

A cable twist sensor provides a record of nacelle yaw position and cable twisting. After the sensor detects excessive rotation in one direction, the controller automatically brings the rotor to a complete stop, untwists the cable by counter yawing of the nacelle, and restarts the wind turbine.

2.11 Tower

The wind turbine is mounted on top of a tubular tower. The tubular tower is manufactured in sections from steel plate. Access to the turbine is through a lockable steel door at the base of the tower. Service platforms are provided. Access to the nacelle is provided by a ladder and a fall arresting safety system is included. Interior lights are installed at critical points from the base of the tower to the tower top.

2.12 Nacelle

The nacelle houses the main components of the wind turbine generator. Access from the tower into the nacelle is through the bottom of the nacelle. The nacelle is ventilated. It is illuminated with electric light. A hatch at the front end of the nacelle provides access to the blades and hub. The rotor can be secured in place with a rotor lock.

2.13 Anemometer, Wind Vane and Lightning Rod

An anemometer, wind vane and lightning rod are mounted on top of the nacelle housing. Access to these sensors is accomplished through a hatch in the nacelle roof.

2.14 Lightning Protection

The rotor blades are equipped with lightning receptors mounted in the blade. The turbine is grounded and shielded to protect against lightning, however, lightning is an unpredictable force of nature, and it is possible that a lightning strike could damage various components notwithstanding the lightning protection deployed in the machine.

2.15 Wind Turbine Control System

The wind turbine machine can be controlled automatically or manually from either an interface located inside the nacelle or from a control box at the bottom of the tower. Control signals can also be sent from a remote computer via a Supervisory Control and Data Acquisition System (SCADA), with local lockout capability provided at the turbine controller.

Service switches at the tower top prevent service personnel at the bottom of the tower from operating certain systems of the turbine while service personnel are in the nacelle. To override any machine operation, Emergency-stop buttons located in the tower base and in the nacelle can be activated to stop the turbine in the event of an emergency.

2.16 Power Converter

The wind turbine uses a power converter system that consists of a converter on the rotor side, a DC intermediate circuit, and a power inverter on the grid side.

The converter system consists of a power module and the associated electrical equipment. Variable output frequency of the converter allows operation of the generator.

3 Technical Data

3.1 Rotor

Maximum power output	2.2 to 2.4MW, 107m rotor	2.0 to 2.3MW, 116m rotor
Maximum power output	2200 to 2400 kW	2000 to 2300 kW
Diameter	107 m	116 m
Number of blades	3	3
Swept area	8,992 m^2	10,568 m^2
Rotor speed range	8 to 16 rpm	8 to 15.7 rpm
Rotational direction	Clockwise looking downwind	Clockwise looking downwind
Tip speed @ rated power	80.1 m/s For all nameplate variants.	81.7 m/s to 85.4m/s.
Orientation	Upwind	Upwind
Speed regulation	Pitch control	Pitch control
Aerodynamic brakes	Full feathering	Full feathering

3.2 Pitch System

	2.2 to 2.4MW, 107m rotor	2.0 to 2.3MW,116m rotor
Principle	Independent blade pitch control	Independent blade pitch control
Actuation	Individual electric drive	Individual electric drive

3.3 Yaw System

	2.2 to 2.4MW, 107m rotor	2.0 to 2.3MW, 116m rotor
Yaw rate	0.5 degree/s	0.5 degree/s

3.4 Corrosion Protection

Atmospheric corrosion protection (corrosion categories as defined by ISO 12944-2:1998)				
50 & 60 Hz	Standard		Enhanced (Option)	
Recommended Climate	Dry, arid, inland, non-industrial areas		Humid, coastal, industrial areas	
Component	Internal	External	Internal	External
Blades	C-4	C-5	C-4	C-5
Tower shell coating	C-2	C-3	C-4	C-5M
Tower internal fasteners, tower stair fasteners	C-4	C-4	C-4	C-5
Hub, bedplate, generator frame, mainshaft, pillowblock, gearbox, generator	C-4	C-4	C-4	C-4
Nacelle, hub fasteners	C-4	C-4	C-4	C-5
Automatic lubrication system (option for 1&2MW)	C-3	C-3	C-5	C-5

4 Operational Limit

	2.2 to 2.4MW, 107m rotor	2.0 to 2.3MW, 116m rotor
Height above sea level	Maximum 3000 m. See notes in section maximum standard ambient temperature below.	Maximum 3000 m. See notes in section maximum standard ambient temperature below.
Minimum temperature (standard) operational/survival	Standard weather: -15°C / -20°C Cold weather package (60Hz only): -30 °C/ -40 °C Switching on takes place at a hysteresis of 5K (-10°C resp. -25°C)	Standard weather: -15°C / -20°C Cold weather package (60Hz only): -30 °C/ -40 °C Switching on takes place at a hysteresis of 5K (-10°C resp. -25°C)
Maximum standard ambient temperature (operation / survival)	+40°C / +50°C The turbine has a feature reducing the maximum output, resulting in minimized turbine revolutions once the component temperatures approach predefined thresholds. This feature operates best at higher altitudes, as the heat transfer properties of air diminish with decreasing density. Please note that the units are not de-rated in respect to site conditions. The units' reactions related to this feature are based solely on sensor temperatures.	+40°C / +50°C The turbine has a feature reducing the maximum output, resulting in minimized turbine revolutions once the component temperatures approach predefined thresholds. This feature operates best at higher altitudes, as the heat transfer properties of air diminish with decreasing density. Please note that the units are not de-rated in respect to site conditions. The units' reactions related to this feature are based solely on sensor temperatures.
Wind conditions according to IEC 61400	2.2-107: 50/60Hz (IECs) Vaverage = 8.5m/s TI=14% with Ed3 (16% Ed2) 2.3-107: 50/60Hz (IECs) Vavergae = 8.2m/s TI=14% with Ed3 (16% Ed2) 2.4-107: 50/60Hz (IECs) Vavergae = 8.2m/s TI=14% with Ed3 (16% Ed2)	2.0-116: 50/60Hz (IECs) Vaverage= 8.0m/s TI=13.5% with Ed3 (15%Ed2) 2.1-116: 50/60Hz (IECs) Vaverage= 8.0m/s TI=13.5% with Ed3 (15%Ed2) 2.2-116: 50/60Hz (IECs) Vaverage= 7.5m/s TI=13.5% with Ed3 (15%Ed2) 2.3-116: 50/60Hz (IECs) Vaverage = 7.5m/s TI=13.5% with Ed3 (15%Ed2)
Maximum extreme gust (10 min) according to IEC 61400	50 / 60 Hz: Standard weather package: 40 m/s Cold Weather Package : 40m/s	50 / 60 Hz: Standard weather package: 38 m/s Cold Weather Package: 38m/s

GE Renewable Energy

- Original Document -

Technical Documentation
Wind Turbine Generator Systems
2MW Platform - Onshore

Technical Description and Data

Applicable for Wind Turbine Generators from 2.0 MW to 2.8 MW with 116 m and 127 m Rotor Diameter

Rev. 05 - EN 2018-12-13

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Table of Contents

1 Introduction

This document summarizes the technical description and specifications of the GE Renewable Energy (GE) 2MW Platform wind turbine generator systems (applicable for systems from 2.0 MW to 2.8 MW).

2 Technical Description of the Wind Turbine and Major Components

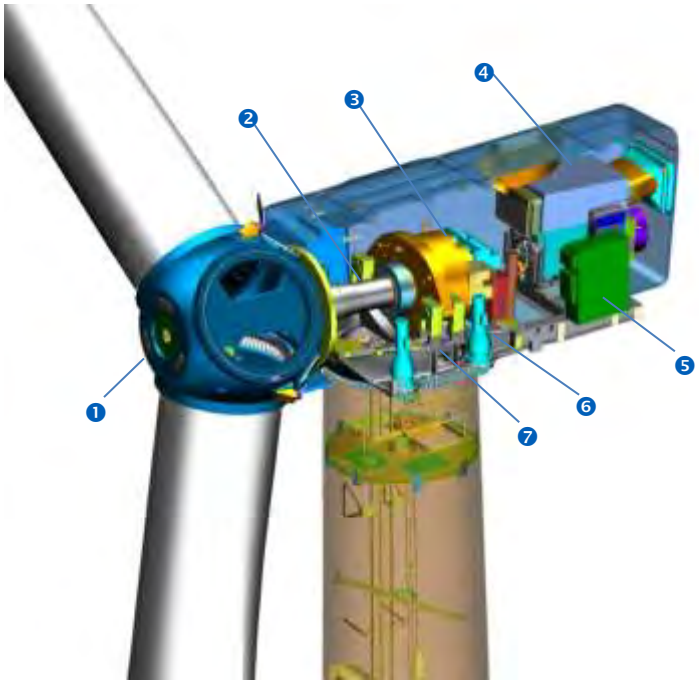
The wind turbine is a three bladed, upwind, horizontal-axis wind turbine with a rotor diameter of 116 or 127m. The turbine rotor and nacelle are mounted on top of a tubular tower with the following hub heights:

	2.0-2.4-116	2.5-116	2.7-116	2.2-2.8-127
50 Hz	80/94 m	N/A	N/A	N/A
60 Hz	80/90/94 m	80/90/94 m	90 m	89/90*/114/134

Table 1: 2MW Platform hub heights for 50/60Hz markets, from 2.0-2.8 MW; *Brazil Only

The Wind Turbine Generator (WTG) employs active yaw control (designed to steer the machine with respect to the wind direction), active blade pitch control (designed to regulate turbine rotor speed), and a generator/power electronic converter system.

The wind turbine generator features a distributed drive train design consisting of a main shaft bearing, gearbox, and generator. Figure 1 shows these, as well as other major components such as the bedplate, yaw drives and an electrical panel box.



1 – Hub

2 – Main shaft

3 - Gearbox

4 - Generator

5 – Electrical panel box

6 – Yaw drive

7 - Bedplate

Figure 1: GE Renewable Energy 2MW Platform wind turbine nacelle layout, for generator systems of 2.0-2.8 MW

2.1 Rotor

Two rotor diameter WTGs are offered: the 116m rotor and the 127m rotor WTGs. Rotor speed on the WTGs is regulated by a combination of blade pitch angle adjustment and generator/converter torque control. The rotor spins in a clock-wise direction under normal operating conditions when viewed from an upwind location.

Full blade pitch angle range is approximately 90°, with the 0° position being with the airfoil chord line flat to the prevailing wind. The blades being pitched to a full feather pitch angle of approximately 90° accomplishes aerodynamic braking of the rotor; whereby the blades “spill” the wind thus limiting rotor speed.

2.2 Blades

There are three rotor blades for each wind turbine generator. The airfoils transition along the blade span with the thicker airfoils being located in-board towards the blade root (hub) and gradually tapering to thinner cross sections out towards the blade tip.

Low Noise Trailing Edge (LNTE) are an optional feature for sites requiring reduced noise capability.

2.3 Blade Pitch Control System

The rotor utilizes three (one for each blade) independent electric pitch motors and controllers to provide adjustment of the blade pitch angle during operation. Blade pitch angle is adjusted by an electric drive that is mounted inside the rotor hub and is coupled to a ring gear mounted to the inner race of the blade pitch bearing (see Figure 1).

GE’s active-pitch controller enables the wind turbine generator rotor to regulate speed, when above rated wind speed, by allowing the blade to “spill” excess aerodynamic lift. Energy from wind gusts below rated wind speed is

captured by allowing the rotor to speed up, transforming this gust energy into kinetic energy which may then be extracted from the rotor.

Three independent back-up units are provided to power each individual blade pitch system to feather the blades and shut down the machine in the event of a grid line outage or other fault. By having all three blades outfitted with independent pitch systems, redundancy of individual blade aerodynamic braking capability is provided.

2.4 Hub

The hub is used to connect the three rotor blades to the wind turbine generator main shaft. The hub also houses the three electric blade pitch systems and is mounted directly to the main shaft. Access to the inside of the hub is provided through a hatch.

2.5 Gearbox

The gearbox in the wind turbine generator is designed to transmit power between the low-rpm turbine rotor and high- rpm electric generator. The gearbox is a multi-stage planetary/helical gear design. The gearbox is mounted to the machine bedplate. The gearing is designed to transfer torsional power from the wind turbine rotor to the electric generator. A parking brake is mounted on the high-speed shaft of the gearbox.

2.6 Bearings

The blade pitch bearing is designed to allow the blade to pitch about a span-wise pitch axis. The inner race of the blade pitch bearing is outfitted with a blade drive gear that enables the blade to be driven in pitch by an electric gear-driven motor/controller.

The main shaft bearing is a roller bearing mounted in a bearing cap arrangement.

The bearings used inside the gearbox are of the cylindrical and tapered roller type. These bearings are designed to provide bearing and alignment of the internal gearing shafts and accommodate radial and axial loads.

2.7 Brake System

The electrically actuated individual blade pitch systems act as the main braking system for the wind turbine generator. Braking under normal operating conditions is accomplished by feathering the blades out of the wind. Any single feathered rotor blade is designed to slow the rotor, and each rotor blade has its own back-up to provide power to the electric drive in the event of a grid line loss.

The wind turbine generator is also equipped with a mechanical brake located at the output (high-speed) shaft of the gearbox. This brake is only applied as an auxiliary brake to the main aerodynamic brake and to prevent rotation of the machinery as required by certain service activities.

2.8 Generator

The generator is a doubly-fed induction type. The generator meets protection class requirements of the International Standard IP 34 (duct ventilated). The generator is mounted to the generator frame and the mounting is designed so as to reduce vibration and noise transfer to the bedplate.

2.9 Flexible Coupling

Designed to protect the drive train from excessive torque loads, a flexible coupling is provided between the generator and gearbox output shaft. This coupling is equipped with a torque-limiting device sized to keep the maximum allowable torque below the maximum design limit of the drive train.

2.10 Yaw System

A ball bearing attached between the nacelle and tower facilitates yaw motion. Planetary yaw drives (with brakes that engage when the drive is disabled) mesh with the outside gear of the yaw bearing and steer the machine to track the wind in yaw. The yaw brakes prevent the yaw drives from experiencing peak loads from turbulent wind.

The controller activates the yaw drives to align the nacelle to the average wind direction based on the wind vane sensor mounted on top of the nacelle.

A cable twist sensor provides a record of nacelle yaw position and cable twisting. After the sensor detects excessive rotation in one direction, the controller automatically brings the rotor to a complete stop, untwists the cable by counter yawing of the nacelle, and restarts the wind turbine.

2.11 Tower

The wind turbine is mounted on top of a tubular tower. The tubular tower is manufactured in sections from steel plate. Access to the turbine is through a lockable steel door at the base of the tower. Service platforms are provided. Access to the nacelle is provided by a ladder and a fall arresting safety system is included. Interior lights are installed at critical points from the base of the tower to the tower top.

2.12 Nacelle

The nacelle houses the main components of the wind turbine generator. Access from the tower into the nacelle is through the bottom of the nacelle. The nacelle is ventilated. It is illuminated with electric light. A hatch at the front end of the nacelle provides access to the blades and hub. The rotor can be secured in place with a rotor lock.

2.13 Anemometer, Wind Vane and Lightning Rod

An anemometer, wind vane and lightning rod are mounted on top of the nacelle housing. Access to these sensors is accomplished through a hatch in the nacelle roof.

2.14 Lightning Protection

The rotor blades are equipped with lightning receptors mounted in the blade. Please refer to GE Renewables Energy Lightning Protection Facility/Lightning Protection Zone Concept document for further details.

2.15 Wind Turbine Control System

The wind turbine machine can be controlled automatically or manually from either an interface located inside the nacelle or from a control box at the bottom of the tower. Control signals can also be sent from a remote computer via a Supervisory Control and Data Acquisition System (SCADA), with local lockout capability provided at the turbine controller.

Service switches at the tower top prevent service personnel at the bottom of the tower from operating certain systems of the turbine while service personnel are in the nacelle. To override any machine operation, Emergency-stop buttons located in the tower base and in the nacelle, can be activated to stop the turbine in the event of an emergency.

2.16 Power Converter

The wind turbine uses a power converter system that consists of a converter on the rotor side, a DC intermediate circuit, and a power inverter on the grid side.

The converter system consists of a power module and the associated electrical equipment. Variable output frequency of the converter allows operation of the generator.

3 Technical Data

3.1 Rotor

	2.0-2.7-116	2.2-2.8-127
Maximum power output	2000 to 2700 kW	2200 to 2820 kW
Diameter	116.5 m	127.2 m
Number of blades	3	3
Swept area	10,660 m^2	12,704 m^2
Rotor speed range	7.4 to 15.7 rpm	7.4 to 15.7 rpm
Rotational direction	Clockwise looking downwind	Clockwise looking downwind
Tip speed @ rated power	81.7 m/s to 85.4 m/s	85.1 m/s to 89.1 m/s
Orientation	Upwind	Upwind
Speed regulation	Pitch control	Pitch control
Aerodynamic brakes	Full feathering	Full feathering

3.2 Pitch System

	2.0-2.7-116	2.2-2.8-127
Principle	Independent blade pitch control	
Actuation	Individual electric drive	

3.3 Yaw System

	2.0-2.7-116	2.2-2.8-127
Yaw rate	0.5 degree/s	

3.4 Corrosion Protection

Atmospheric corrosion protection (corrosion categories as defined by ISO 12944-2:1998)				
50 & 60 Hz	**Standard**		**Enhanced (Option)**	
Recommended Climate	**Dry, arid, inland, non-industrial areas**		**Humid, coastal, industrial areas**	
Component	**Internal**	**External**	**Internal**	**External**
Blades	C-4	C-5	C-4	C-5
Tower shell coating	C-2	C-3	C-4	C-5M
Tower internal fasteners, tower stair fasteners	C-4	C-4	C-4	C-5
Hub, bedplate, generator frame, main shaft, pillow block, gearbox	C-4	C-4	C-4	C-4
Generator	N/A	C-3	N/A	C-5
Nacelle, hub fasteners	C-4	C-4	C-4	C-5
Automatic lubrication system (option for 2MW)	C-3	C-3	C-4	C-5

3.5 Tip Height

	2.0-2.7-116	**2.2-2.8-127**
80 m hub height	138.3 m (Not available on 2.7-116)	Not available
89 m hub height	Not available	152.072 m
90 m hub height	148.3 m	153.3 m (Brazil only offering)
94 m hub height	152.0 m (Not available on 2.7-116)	Not available
114 m hub height	Not available	178.1 m
134 m hub height	Not available	198.5 m

4 Operational Limit

	2.0-2.7-116	2.2-2.8-127
Height above sea level	Maximum 3000 m. See notes in section maximum standard ambient temperature below.	Maximum 3000 m. See notes in section maximum standard ambient temperature below.
Minimum temperature (standard) operational/survival	Standard weather (STW): -15 °C / -20 °C Cold weather (CWE) (60Hz only): -30 °C/ -40 °C	Standard weather (STW): -15 °C / -20 °C Cold weather (CWE) (60Hz only): -30 °C/ -40 °C
Maximum standard ambient temperature (operation / survival)	+40 °C / +50 °C The turbine has a feature reducing the maximum output, resulting in minimized turbine revolutions once the component temperatures approach predefined thresholds. This feature operates best at higher altitudes, as the heat transfer properties of air diminish with decreasing density. Please note that the units are not de-rated in respect to site conditions. The units' reactions related to this feature are based solely on sensor temperatures.	+40 °C / +50 °C The turbine has a feature reducing the maximum output, resulting in minimized turbine revolutions once the component temperatures approach predefined thresholds. This feature operates best at higher altitudes, as the heat transfer properties of air diminish with decreasing density. Please note that the units are not de-rated in respect to site conditions. The units' reactions related to this feature are based solely on sensor temperatures.
Wind conditions according to IEC 61400 **(Design life 20 years)**	2.0-116: 50 / 60 Hz (IECs) Vaverage = 8.0 m/s at 80 m HH Iref = 13.5 % with Ed3 2.1-116: 50 / 60 Hz (IECs) Vaverage = 7.0 m/s at 80 m HH Iref = 12.9 % with Ed3 2.2-116: 50 / 60 Hz (IECs) Vaverage = 7.0 m/s at 80 m HH Iref = 12.9 % with Ed3 2.3-116: 50 / 60 Hz (IECs) Vaverage = 7.0 m/s at 80 m HH Iref = 12.9 % with Ed3 2.5-116: 60 Hz (IECs) Vaverage = 8.0 m/s at 80 m HH Iref = 12.9 % with Ed3 2.7-116: 60 Hz (IECs) Vaverage = 8.0 m/s at 80 m HH Iref = 12.9 % with Ed3	2.2-127: 60 Hz (IECs) Vaverage = 7.85 m/s at 80 m HH Iref = 12.9 % with Ed3 2.5-127: 60 Hz (IECs) Vaverage = 7.85 m/s at 80 m HH Iref = 12.9 % with Ed3 2.8-127: 60 Hz (IECs) Vaverage = 7.85 m/s at 80 m HH Iref = 12.9 % with Ed3
Maximum extreme gust (10 min) according to IEC 61400	50 / 60 Hz: STW and CWE: 38 m/s	60 Hz: STW and CWE: 40 m/s

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Technical Documentation
Wind Turbine Generator Systems
All Turbine Types - Onshore

Codes and Standards

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Table of Contents

1 Introduction

This document describes GE Wind's approach to compliance and certification for 1&2MW/3MW Platform, 50 Hz & 60 Hz wind turbines.

2 Certification

GE wind turbines with ratings less than 2.0MW are certified to the Germanischer Lloyd guideline for the Certification of Wind Turbines (Edition 2003 with supplement 2004) using IEC 61400-1 loads (Editions 2).

All other GE wind turbines currently being offered for sale are certified according to IEC 61400-22 testing and certification scheme in combination with IEC 64100-1 Edition 3 wind turbine design requirements. Each turbine model may have additional certifications as listed in the Operational Limits section of the Technical Description and Data document for that model.

3 Compliance

3.1 50 Hz

The GE 50 Hz wind turbines are designed to meet the following EU directives:

- 2006/42/EC Machinery Safety Directive
- 2014/35/EU (formerly 2006/95/EC) Low Voltage Directive
- 2014/30/EU (formerly 2004/108/EC EMC) directive
- Fixed installations such as wind turbines are not required under the EMC directive to be either CE marked or be provided with a declaration to the EMC directive. However, some subassemblies or components of apparatus may have their own declaration of conformity.

3.2 60 Hz

The GE 60 Hz wind turbines are designed to meet the following North American codes & standards:

- National Electric Code (NEC) - valid for all US States & Territories
  Electrical components are third party listed to appropriate US Standards
- Canadian Electric Code (CEC) – valid for all Canadian Provinces & Territories
  Electrical components are third party listed to appropriate Canadian Standards
- Occupational Safety & Health Administration (OSHA) guidelines
  29 CFR part 1910 – General Industry

4 Quality Assurance

GE manufacturing locations are certified based on the requirements found in ISO 9001: 2008.

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Technical Documentation
Wind Turbine Generator Systems
All Turbine Types - 50 & 60 Hz

Codes and Standards

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Revision history

For the revision history of this document please refer to the corresponding Document Approval Sheet.

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This document describes GE Wind's approach to compliance and certification for 1&2MW / 3MW Platform, 50 Hz & 60 Hz wind turbines.

2 Certification

GE wind turbines with ratings less than 2.0MW are certified to the Germanischer Lloyd guideline for the Certification of Wind Turbines (Edition 2003 with supplement 2004 or Edition 2010) using IEC 61400-1 loads (Editions 2).

The following turbine models are certified to the IEC guideline (61400-22) using IEC 61400-1 loads (Edition 3).

- GE wind turbines with ratings from 2.0MW through 2.4MW with either 107 m or 116 m rotors.
- 2.75-120 with 85 m, 98.3 m, 110 m, 120 m, 139 m (Space Frame Tower only)
- 3.2-100, 3.2-103
- 3.2-130 with 85 m, 110 m and 134 m tubular steel towers
- 3.4-137 with 110 m and 134 m tubular steel towers

3 Compliance

3.1 50 Hz

The GE 50Hz wind turbines are designed to meet the following EU directives:

- 2006/42/EC Machinery Safety Directive
- 2006/95/EC (formerly 73/23/EEC) Low Voltage Directive
- 2004/108/EC EMC directive

  Fixed installations such as wind turbines are not required under the EMC directive to be either CE marked or be provided with a declaration to the EMC directive. However some subassemblies or components of apparatus may have their own declaration of conformity.

3.2 60 Hz

The GE 60 Hz wind turbines are designed to meet the following North American codes & standards:

- National Electric Code (NEC) - valid for all US States & Territories
  Electrical components are third party listed to appropriate US Standards
- Canadian Electric Code (CEC) – valid for all Canadian Provinces & Territories
  Electrical components are third party listed to appropriate Canadian Standards
- Occupational Safety & Health Administration (OSHA) guidelines
  29 CFR part 1910 – General Industry

4 Quality Assurance

GE manufacturing locations are certified based on the requirements found in ISO 9001: 2008.

Appendix D

Avian and Bat Assessment

TIER 1 & 2 AVIAN AND BAT ASSESSMENT

CED MASON CITY WIND, LLC PROJECT

CERRO GORDO COUNTY, IOWA

APRIL 25, 2019

Prepared for:
CED Mason City Wind, LLC.
416 S. Bell Ave
Ames, IA 50010

WSB PROJECT NO. R-013892-000

wsb

CED MASON CITY WIND, LLC PROJECT

MASON CITY, IA

April 25, 2019

Prepared By:

CERTIFICATION

The report was prepared by:

Roxy Franta, Certified Associate Ecologist

Date: April 25, 2019

The report was reviewed by:

Alison Harwood, Senior Environmental Scientist, Associate

Date: April 25, 2019

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I. INTRODUCTION AND PURPOSE

ConEdison Development is planning to construct the CED Mason City Wind, LLC Project (Project, site) in Cerro Gordo County, Iowa. The Project is in Sections 9 and 16 of Township 96N and Range 19W and is located approximately 4 miles east of Mason City and 5 miles west of Nora Springs (**Figure 1**)**.** ConEdison Development has designated approximately 217 acres as the Project area.

The Project involves constructing two GE2.82-127 and one GE2.3-116 wind turbines and associated utilities for a generation capacity of 7.5 megawatts (MW). The objective of this study is to identify the potential impacts the Project may have on avian and bat species, to inform the siting of these facilities, and reduce impacts. Avian and bat use of habitats and airspace make them susceptible to the anthropogenic threats of wind turbines, and avian and bat mortality has the potential to increase in certain geographic areas. Proper siting of wind turbines is important to reduce impacts to wildlife.

WSB solicited and analyzed available information from expert sources, evaluated habitat, analyzed information from past studies of similar wind projects, and incorporated anecdotal information from a site visit. This report is intended to meet the strategies described in Chapters 2-3 of the U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines (USFWS 2012).

II. METHODOLOGY

The U.S. Fish and Wildlife Service's Wind Turbine Advisory Committee Recommendations documented in the USFWS Land-based Wind Energy Guidelines (WEG) were used to conduct preliminary site assessments for the Project. The recommendations consist of a tiered approach. The WEG indicate that adherence with the guidelines and active communication with the USFWS will be viewed by the USFWS as an appropriate means of identifying and implementing reasonable and effective measures to avoid the take of species protected under the Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act (BGEPA), and Endangered Species Act (ESA).

Tier 1 involves a preliminary site evaluation or screening of potential project sites. This was completed by performing a desktop evaluation of the potential Project area to determine if species or habitats of concern were present in the immediate vicinity of the Project. Publicly available information was collected from Federal, State, and local resources regarding wildlife and habitat within the Project area. This data collection effort included requesting and/or obtaining information from the following sources:

- Iowa Department of Natural Resources (DNR)
- United States Fish and Wildlife Service (USFWS)
- United States Environmental Protection Agency (USEPA)
- Breeding Bird Survey (BBS)
- The Nature Conservancy (TNC)
- Audubon Society
- US Geological Survey (USGS) Gap Analysis datasets
- Aerial Imagery

Tier 2 is site characterization, which involves determining if any site-specific risks to wildlife or habitat could occur as a result of wind development at the selected site. This was completed by obtaining a review of the Natural Heritage Program information for the site and reviewing the USFWS Information for Planning and Consultation (IPaC) Database. The purpose of these reviews is to determine if any risks to wildlife and habitat resources exist within the selected Project area. The IPaC Report (Not for Consultation) is available in **Appendix B**. The Iowa DNR Natural Heritage review will be provided upon receipt.

The results of the Tier 1 and 2 assessment will inform whether there is greater than a moderate probability of significant adverse impacts to species of concern and the need for Tier 3 studies. Tier 3 consists of pre/post-construction field studies to document the wildlife conditions on site and predict impacts. To date, Tier 1 and 2 of the USFWS recommendations have been completed with this report. No Tier 3 studies have been completed.

Several studies have been conducted throughout the United States on the mortality rate of birds from collisions with wind turbines as well as on the influence of wind turbines on population densities. We have reviewed past studies that were completed in the site's region to investigate the influence of wind farms on avian and bat mortality rates. These studies were used to augment the results of the desktop review and approximate the potential impacts on birds, bats, and their habitats resulting from the Project.

III. RESULTS

A. Land Cover

The Project consists of approximately 217 acres in Cerro Gordo County in northeast Iowa, approximately 4 miles east of Mason City and 5 miles west of Nora Springs (**Figure 1, Appendix A**). The largest city near the Project area is Mason City. The largest roadway near the Project is US Highway 18, 1.2 miles to the south. The landscape of the Project area is gradually sloping from north to south towards a small stream that flows through the southeast part of the Project area. Site elevations vary from 1136 to 1094 feet.

Ecoregions denote areas of general similarity in ecosystems and in the type of environmental resources. The Project area is located within the Level III Western Corn Belt Plains and Level IV Iowan Surface ecoregion (USEPA 2015). The native vegetation within this ecoregion was historically dominated by bluestem prairie and oak-hickory forest, but much of the ecoregion is used for cropland today (USGS 2016). Most of the Project area is mapped as Cultivated Crops with small areas of Grasslands/Herbaceous immediately surrounding the farmstead, based on the USGS National Land Cover Database (Homer et al 2011). According to the USGS Gap Land Cover Data, the site is mapped Agriculture and Developed Vegetation (USGS 2013).

Data from a site visit on April 25, 2019 verified the land cover mapping results. The majority of the site is currently plowed fields or picked row crops. The ditch in the southeast portion of the Project is channelized and surrounded by a grass buffer and scrubby willows. A few medium to large-sized trees are located within shelter belts in the Project area. No large nests were observed in any of the trees within the Project area or on properties adjacent to the site.

Table 1 summarizes the current land cover present within the Project area based on the 2011 National Land Cover Database. **Figure 2, Appendix A** shows the Iowa DNR 2009 landcover (1 m).

Table 1: CED Mason City Wind, LLC Project Existing Land Cover

Land Cover	Acres	Percent of Project Area
Cultivated Crops	190	88
Grasslands/Herbaceous	14.5	6
Developed	12	6
Open Water	0.5	<1
TOTAL:	**217**	**100%**

B. Sensitive Habitats

Avian species are attracted to areas that provide habitat for resting, cover, foraging, or breeding such as grasslands, woodlands, open water, and wetlands. Bats generally occur in wooded areas often near water resources. Within the Project area, there is one intermittent stream that flows south across the southeast corner of the Project area. A farmstead surrounded by small windrows

of trees is located at the center of the site and a few trees line the intermittent stream, but no other trees are present within the Project area. The majority of the Project area is used for agricultural row crops. The nearest large stands of trees are located approximately 1.3 miles to the southwest along the Winnebago River and 3 miles to the northeast along the Shellrock River within the Shellrock River Greenbelt Wildlife Management Area (WMA). Common tree nesting raptors may be found within the windrows adjacent to the farmstead within the Project, but it is not likely that bald eagles would be found nesting nearby.

According to The Nature Conservancy (TNC) Interactive Conservation Maps, the Hitzhusen Prairie Corridor Priority Conservation Area is located 3 miles to the south along the Winnebago River, but this area is not necessarily comprised of prairie and appears to me dominated by agriculture. The conservation targets for this conservation area include little bluestem bedrock bluff prairie plant community types.

No National Audubon Society Important Bird Areas (IBA) are located within or near the Project. The Iowa Union Hills Bird Conservation Area (BCA) is located 13 miles to the southwest of the Project. This BCA was dedicated to protecting declining grassland and prairie pothole bird species. Species typical of this area includes norther harrier, bobolink, grasshopper sparrow, northern pintail, redhead, American bittern, and sandhill crane.

Five State Wildlife Management Areas and a state preserve are located within five miles of the Project. The Shellrock River Greenbelt WMA is 2.8 miles to the northeast, Grover's Meadow WMA is 3 miles to the southeast, Claybanks Forest WMA is 3.3 miles to the southeast, Limestone Prairie Preserve WMA is 5 miles to the southeast, and Mother's Forest is 4.8 miles to the east. The Claybanks Forest State Preserve is adjacent to the WMA. These protected lands have the potential to have higher quality habitat that may attract migrating and resident avian and bat species, among other types of wildlife. Given the distance between the Project area and these protected lands, it is unlikely that their habitats would affect the number of wildlife attracted to the site.

Open grassy areas attract many species of grassland birds as well as attract raptors which utilize open areas for hunting. Raptors may also be attracted to agricultural open spaces for hunting. During the site visit, grassy areas were observed within the Project area along the intermittent tributary at the southeast corner of the site. Construction activities from this Project are planned to occur on land that is currently plowed for row crops or that has previously been developed. The landcover of these locations was confirmed during the site visit. There are very few contiguous grassland areas within the surrounding landscape. Given the existing site conditions, it is unlikely that there are nesting grassland birds within the Project area.

Natural habitats near the Project area as shown on **Figure 3, Appendix A.**

C. Water, Wetlands and Riparian Areas

Wetlands, waterbodies, and riparian areas serve as habitat for various species of birds and bats. A level 1 wetland delineation was completed for the Project area and one wetland was identified onsite. The Project area appears to have wetlands located along the intermittent stream in the southeast portion of the site, but this wetland area does not appear to have open water.

An intermittent stream flows through the southeast part of the site and is tributary to Little Lime Creek which ultimately flows into the Winnebago River. The Winnebago River is located 1.3 miles to the southwest at its closest point to the Project. The Shell Rock River is located 3 miles to the northeast and has a riparian forested buffer. The river also forms some open water lakes north of Nora Springs which have the potential to provide habitat for bald eagles. No other lakes or open water are located within or near the Project and open water does not provide a large component of available habitat for species that may utilize the Project area. Bats are generally attracted to open water and wetlands when hunting. There is potential that bats will forage within the project area, but it is more likely that they would be concentrated near larger wet areas such as the nearby rivers.

Water resources are shown on **Figure 4, Appendix A**.

D. Wildlife

1. Federally Threatened and Endangered Species

Species that utilize agricultural lands dominated with row crops will most commonly be found within the Project area. No critical habitat is located within the Project area. One federally threatened bat species is listed for Cerro Gordo County, Iowa (USFWS IPaC):

- Northern long-eared bat (*Myotis septentrionalis*) – is a federally-threatened bat species that hibernates in caves and mines in the winter and utilizes cavities or crevices, such as trees, for maternity roosts to raise pups. Pups are generally born from late May to late July. Young bats start flying by 18-21 days after birth. This species emerges at dusk to feed on insects that are caught in flight.

2. USFWS Birds of Conservation Concern and Other Notable Species

The Project area is located within the USFWS Bird Conservation Region (BCR) 22: Eastern Tallgrass Prairie. **Table 2** identifies species listed by the USFWS as Birds of Conservation Concern that may occur within BCR 22 or species that warrant attention. Based on the available habitats found within the Project area and natural history information listed from Cornell Lab of Ornithology (Birds of North America 2017), the potential of species occurrence within the Project area was further evaluated and listed as either unlikely, potential, or likely to occur. Some species listed may not occur at the Project area but could be found flying nearby the Project.

Table 2: Migratory bird species listed as Birds of Conservation Concern (BCR 22 Eastern Tallgrass Prairie) or that warrant attention by the USFWS which may occur within Cerro Gordo County, Iowa.

Common Name	Scientific Name	Season of Occurrence	Likelihood to Occur at Project (Unlikely, Potential, Likely)	Federal Conservation Concern
Bald Eagle	*Haliaeetus leucocephalus*	Breeding	Unlikely to breed on site. Potential to fly through if present in the area.	Protected under BGEPA

Life history information of Birds of Conservation Concern that have the potential to occur within the Project area is as follows (retrieved from the Cornell Lab of Ornithology and MTNHP):

Bald Eagle

Bald eagles are a de-listed raptor species that are typically found near large bodies of water and forested areas. They typically nest in large trees such as white pine or cottonwood and nests are used year after year. They mainly feed on fish but will scavenge for a variety of other species when necessary. Bald eagles are often seen soaring on wing over long distances. This species remains protected under the Bald and Golden Eagle Protection Act (Eagle Act). Under authority of the Eagle Act, 16 U.S.C. 668-668d, bald eagles and golden eagles are afforded additional legal protection. The Eagle Act prohibits the take, sale, purchase, barter, offer for sale, purchase, transport, export, or import at any time or in any manner of any bald or golden eagle, alive or dead, or any part, nest, or egg thereof. The Eagle Act also defines take to include "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb", and includes criminal and civil penalties for violating the statute. The term "disturb" is defined as agitating or bothering an eagle to a degree that causes, or is likely to cause, injury to an eagle, or either a decrease in productivity or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior.

3. State Threatened and Endangered Species

According to the Iowa DNR, seven endangered, two threatened, and four species of concern avian species are listed within Iowa. One bat species is listed as endangered. Of the species listed, the following have the potential to occur within or near the Project area based on the Iowa DNR Natural Areas Inventory interactive mapper and known ranges. An official natural heritage review request was submitted to the DNR on April 9, 2019 and will be provided upon receipt.

Table 3: Iowa State-Listed Endangered, Threatened, or Special Concern Species.

Common Name	Scientific Name	State Status	Season of Occurrence	Likelihood to Occur at Project (Unlikely, Potential, Likely)	Federal Conservation Concern
Birds					
Red-shouldered Hawk	*Buteo lineatus*	Endangered	Year-round	Unlikely, prefer forested areas	Low Concern
Northern Harrier	*Circus cyaneus*	Endangered	Winter	Potential, hunts in open areas such as fields	Low Concern
Piping Plover	*Charadrius melodus*	Endangered	Breeding	Unlikely, range is in western Iowa	Red Watch List. Listed as Near Threatened by the International Union for the Conservation of Nature.
Common Barn Owl	*Tyto alba*	Endangered	Year-round	Potential, hunts in open areas	Low Concern
Least Tern	*Sterna antillarum*	Endangered	Breeding	Unlikely, range is in western Iowa	Declining. Listed on the 2016 State of North America's Birds' Watch List.
King Rail	*Rallus elegans*	Endangered	Breeding	Unlikely, prefers freshwater marshes and rice fields	Declining. Listed on the 2014 State of the Birds' Watch List.

Common Name	Scientific Name	State Status	Season of Occurrence	Likelihood to Occur at Project (Unlikely, Potential, Likely)	Federal Conservation Concern
Short-eared Owl	*Asio flammeus*	Endangered	Year-round	Likely, hunt in large open areas. Sightings have occurred near Mason City (Sullivan 2009).	Common Bird in Steep Decline.
Long-eared Owl	*Asio otus*	Threatened	Winter/Year-round	Unlikely, prefer dense vegetation and open grasslands.	Declining. Listed on 2016 State of North America's Birds' Watch List.
Henslow's Sparrow	*Ammodramus henslowii*	Threatened	Breeding	Unlikely, prefers large open fields with dense grasses. Lack of habitat in Project area.	Restricted Range. Listed on the 2016 State of North America's Birds' Watch List.
Forster's Tern	*Sterna forsteri*	Special Concern	Migration/Breeding	Unlikely, breeds and winters in marshes.	Low Concern
Black Tern	*Chlidonias niger*	Special Concern	Breeding	Unlikely, breeds in marshes.	Common Bird in Steep Decline.
Peregrine Falcon	*Falco peregrinus*	Special Concern	Migration	Unlikely, more common found amongst cliffs or tall buildings.	Low Concern
Bald Eagle	*Haliaeetus leucocephalus*	Special Concern	Non-breeding/Year-round	Unlikely to nest, Potentially flying through.	Low Concern
Bats					
Indiana Bat	*Myotis sodalis*	Endangered	Year-round	Unlikely, range is southern Iowa.	Endangered

Northern Harrier

The northern harrier is a medium-sized raptor species that has owl-like features such as a disc-shaped face. It is often seen gliding low over open fields in search of small mammal prey. This species prefers large tracts of undisturbed wetland or grasslands but will occupy agricultural lands in the winter. Nesting occurs on the ground in a dense clump of vegetation. Typical flight patterns of this species are tree-top height to low over the ground, typically at heights lower than the rotor swept zone of the turbines, 18.6 m (Wulff et al 2016). In winter, this species is often found communally with short-eared owls.

Short-eared Owl

Short-eared owls live in large, open areas with low vegetation including agricultural areas. They generally hunt for small mammals and occasionally small birds. This owl is often seen during the daylight or at dawn and dusk. They nest on the ground in amongst grasses and low plants, constructing a bowl nest scraped out of the ground and lined with feathers.

Common Barn Owl

This owl species is strictly nocturnal and are generally secretive. They hunt on wing over open meadows and fields eating mostly small mammal prey. They nest in cavities and buildings such as in trees, barns, and haystacks. Nest sites are often used year after year.

4. USGS North American Breeding Bird Survey (BBS)

Breeding bird surveys have been conducted on the Burchinal transect (36131) which is 7 miles south of the Project. The most species observed during a survey along this transect was 49 species, recorded in 2012. These surveys include all birds seen or heard for a 30-minute period every half-mile along the transect (USGS 2011). While these lists represent common species that may be present within the Project area, they should not be considered comprehensive as other species could potentially occur. Additionally, because these lists are partially based on observations, some of these sightings include causal or accidental sightings of species which have wandered from their normal range. Based on the data obtained from surveys between 1995 and 2015 along the Burchinal transect (Sauer 2017), the following species have occurred the most often (as defined as being observed during at least 70% of survey years) and would likely utilize the available habitat within the Project area.

Table 4: Most commonly observed native species on the Burchinal Transect of the North American Breeding Bird Survey between 1995 and 2015.

Common Name	Scientific Name
American Crow	*Corvus brachyrhynchos*
American Goldfinch	*Spinus tristis*
American Robin	*Turdus migratorius*
Barn Swallow	*Hirundo rustica*
Bluejay	*Cyanocitta cristata*
Bobolink	*Dolichonyx oryzivorus*
Brown-headed Cowbird	*Molothrus ater*
Brown Thrasher	*Toxostoma rufum*
Chipping Sparrow	*Spizella passerina*
Common Grackle	*Quiscalus quiscula*
Common Yellowthroat	*Geothlypis trichas*
Dickcissel	*Spiza americana*
Eastern Kingbird	*Tyrannus tyrannus*
Gray Catbird	*Dumetella carolinensis*
Horned Lark	*Eremophila alpestris*
House Wren	*Troglodytes aedon*
Killdeer	*Charadrius vociferous*
Mourning Dove	*Zenaida macroura*
Red-tailed Hawk	*Buteo jamaicensis*
Red-winged Blackbird	*Agelaius pheniceus*
Ring-necked Pheasant	*Phasianus colchicus*
Sedge Wren	*Cistothorus platensis*

Common Name	Scientific Name
Song Sparrow	*Melospiza melodia*
Vesper Sparrow	*Pooecetes gramineus*
Western Meadowlark	*Sturnella neglecta*

Based on the BBS transects, and raptors commonly found in Iowa, the diurnal/crepuscular raptor species that have the potential to occur within the Project includes: bald eagle, northern harrier, red-tailed hawk, ferruginous hawk (*Bueto regalis*), American kestrel (*Falco sparverius*), turkey vulture (*Cathartes* aura), short-eared owl, rough-legged hawk (*Buteo lagopus*), and Swainson's hawk (*Buteo swainsoni*).

Nocturnal raptor species that have the potential to occur within the Project area include the great horned owl (*Bubo virginianus*) and the common barn owl.

5. Site Visit

A list of species and approximate number of individuals observed during the April 25, 2019 site visit is provided in **Table 5.**

Table 5: Avian species observed at the CED Mason City Wind, LLC Project during a site visit on April 25, 2019.

Common Name	Scientific Name	Approximate Number of Individuals
Common Grackle	*Quiscalus quyiscula*	40
Red-winged Blackbird	*Agelaius phoeniceus*	20
American Crow	*Corvus brachyrhynchos*	3
Brown-headed Cowbird	*Molothrus ater*	5
Mourning Dove	*Zenaida macroura*	2
Great Blue Heron	*Ardea Herodias*	1

IV. REVIEW OF LITERATURE

Direct impacts to avian species from collisions with turbines has been documented at a range of wind facilities through the United States. Publicly available studies were reviewed to identify the potential impact that wind turbines may have on avian and bat populations in the region. These studies demonstrate that several factors, including surrounding habitat, abundance of avian species, and wind turbine locations play a role in the potential impact of wind projects on birds and bats. Most studies focus on direct mortality from wind turbines because it is more quantifiable, but indirect mortality such as habitat fragmentation or avoidance behaviors should also be considered when evaluating a site or turbine siting. Based on available data, adjusted fatality rates across the United States range from three to six birds per MW per year for all species combined, where fatalities at wind sites in the Great Plains appear to be lower than sites in the rest of the U.S. (Loss et al. 2013). Adjusted bat fatality rates may be substantially higher than bird fatality rates, but bat fatalities appear to be inversely related to the percent of grassland cover (Thompson et al. 2017).

A. Direct Impacts

Direct impacts refer to fatalities resulting from collision with turbine blades or towers. The effect of turbine height and rotor swept area on bird collision fatalities remains uncertain (AWWI 2018). Greater than 80% of nocturnal migrants typically fly above the height of the most common rotor swept zone of 150 m (Mabee and Cooper 2004; Mabee et al 2006). Osborn (1998) observed that more than 82% of birds flew above or below the main rotor swept zone of the wind turbines (22 – 55 m) and most birds flew 31 meters or more from the wind turbines. The rotor swept zone for turbines proposed for this Project is 22-138 meters. There is no evidence to date that nocturnal migrants form a disproportionately high number of collision fatalities during migration (Welcker et al. 2017).

Small passerines account for approximately 60% of fatalities reported in publicly available data (Erickson et al 2014). More than 90% of all land birds are small passerines (Partners in Flight Science Committee 2013). However, collision fatalities at wind facilities is likely several orders of magnitude lower than other leading anthropogenic sources of avian mortality (AWWI 2018). Other more prevalent sources of mortality include feral and domestic cats, power transmission lines, buildings and windows, and communication towers.

Diurnal raptors are relatively frequent fatalities which suggests the potential for relatively high fatality rates, particularly in the western states where raptors are more common. Raptors are known to use natural landscape features to facilitate migration routes, and siting of facilities away from these routes may reduce impacts. Due to flight characteristics, raptors and vultures, and wetland-associated species like waterfowl are at highest risk of collision with turbines (Wulff et al 2016; Osborn 1998). High prey density was presumed to be responsible for high raptor collision at the Altamont Pass wind resource area in northern California (Kingsley and Whittam 2007). Repowering of wind facilities with larger turbines that complete fewer rotor rotations per minute than smaller turbines may be partially responsible for reduced raptor collision rates at repowered facilities (NAS 2007).

Several species of birds have low documented numbers of collisions with wind turbines including the whooping crane and sandhill crane, upland game birds, and some waterfowl (Grodsky et al 2013, Loss et al 2013, Derby et al 2018, and Navarrete and Griffis-Kyle 2014). During a six-year study at five wind farms in North and South Dakota during crane migration, totaling around 92,022 inspections, no individuals were found dead suggesting that cranes do not appear overly susceptible to collisions with turbines (Derby et al 2018). Collision risk has been found low in both greater sage-grouse and greater prairie-chickens and it has been assumed that ring-necked pheasants experience similar low risks (Smith et al 2016, LeBeau et al 2014, Dupuie 2018). Few studies are available which document high collision risks for waterfowl, though Graff (2016) found that 67% of fatalities observed at two wind farms in the Dakotas were waterfowl, including mallard, northern pintail, and redhead. A majority of studies indicate turbine avoidance behaviors of waterfowl (Larsen and Madsen 2000, Desholm and Kahlert 2005, Larsen and Guillemette 2007, Madsen et al 2009, Fijn et al 2012, and Rees 2012), which results in changes to habitat selection for feeding and nesting.

Overall, current turbine-related fatalities of small passerines constitute a very small percentage of their total population (<0.02%) (AWWI 2018). However, demographic modelling does indicate the potential for population-level impacts of some raptor species due to collision fatalities (AWWI 2018). It is unknown whether current or future collision fatality levels represent a significant threat to migratory tree-bat species populations (AWWI 2018), but demographic modeling indicates a potential for population-level impacts at current or projected levels of collision fatalities for hoary bats (Frick et al. 2017).

Migratory tree-roosting bat species, including the hoary bat, are vulnerable to colliding with wind turbines and constitute approximately 70% of the reported fatalities at wind farms (AWWI 2018). Bat fatalities tend to peak during the late summer and early fall coinciding with the migration

season of tree bats (AWWI 2018). Sexually ready hoary bat carcasses have been found during periods of high fatality (Cryan et al. 2012).

B. Indirect Impacts

Indirect impacts include changes to a species' use of habitat resulting from the effects of the construction and operation of a wind facility. A wind energy facility in the Great Plains had little effect on nest site selection and nest survival of greater prairie chickens in a recent study from 2017, and the primary drivers for nest selection and survival were landscape and habitat characteristics (Harrison et al 2017). Another multi-year study of the greater sage-grouse in Wyoming found that nest site selection, brood, and female survival were not influenced by proximity to turbines (LeBeau et al 2017a). Also, negative trends in male lek attendance were not detected (LeBeau 2017b). Another multi-year study in Kansas showed that greater prairie chicken females showed little or no response to turbines while nesting (Winder et al. 2013; Winder et al. 2014). Lek persistence appeared to be lower in proximity to turbines, but there was no detectable effect of turbine proximity on male body mass (Winder et al. 2015). A study of male ring-necked pheasants determined to notable avoidance behavior of wind turbines and suggested that habitat plays a greater role in their abundance (Dupuie 2018). Another study showed that wind farms were an attractant to ring-necked pheasants possibly due to protections from aerial predators and the availability of grit near turbines (Lopucki et al 2017).

In another study, the USGS found that seven of nine grassland bird species studied from 2003 to 2012 were displaced from areas in North and South Dakota after a wind facility was constructed (Shaffer 2015). Species that avoided wind farms included the western meadowlark, the upland sandpiper, the bobolink, the grasshopper sparrow, the clay-colored sparrow, the chestnut-collared longspur, and the savannah sparrow. Many of these species continued to leave their breeding habitat for up to five years after the construction of the wind farm. A study conducted at Buffalo Ridge Wind Resource Area (WRA) in southwestern Minnesota investigated the influence of wind turbines on densities of upland nesting birds in CRP areas. Total bird density was lower in CRP plots with turbines than in CRP plot without turbines and the results suggest that upland nesting birds may avoid using grasslands with turbines within 80 meters (Leddy 1999).

Waterfowl have been known to generally avoid wind developments (Larsen and Guillemette 2007; Masden et al 2009; Larsen and Madsen 2000; Desholm and Kahlert 2005; Fijn et al 2012) which is problematic when they are placed in important waterfowl areas (e.g. prairie pothole region), or across migratory or feeding flight corridors causing a barrier effect. Several studies have shown that waterfowl exclude themselves from areas that are 150 m from turbines and avoid areas within 500 m of a turbine (Larsen and Madsen 2000; Masden et al 2009). Avoidance of important agricultural feeding areas was observed in one study which estimated an effective loss of 68% total field area utilized by waterfowl from the presence of wind turbines. The Project is located at the southern tip of the Prairie Pothole Region (PPR) which provides important habitat for breeding waterfowl and over 50% of North America's ducks are hatched in the PPR (Bellrose 1980, Greenwood et al. 1995). Wetlands and croplands also serve as important stopover habitat for migrating waterfowl. One study found up to a 56% reduction in breeding pairs of waterfowl when compared to sites without turbines (Loesch 2013). Waterfowl avoidance of wind turbine sites may displace them to less desirable breeding habitat which may reduce reproductive success (Bellrose 1980, Loesch 2013). The Project area has few pothole wetlands within or nearby the site and does not likely provide important waterfowl habitat.

Fatality estimates from wind facilities located within the mid-western region of the United States are summarized in **Table 6.**

Table 6: Annual avian fatality estimates from wind facilities located in mid-western states of the U.S. (per megawatt per year).

Wind Project	Years of Monitoring	Estimated Bird Fatalities per MW per Yr	Estimated Raptor Fatalities per MW per Yr	Estimated Bat Fatalities per MW per Yr	Habitat	Location	Reference
Top of Iowa	2003	0.42	0	7.16	Agricultural	IA	Jain 2005
Top of Iowa	2004	0.81	0.17	10.27	Agricultural	IA	Jain 2005
Crystal Lake II	2009	N/A	N/A	7.42	Agricultural	IA	Derby 2010b
Pioneer Prairie I	2011-2012	1.41	0	10.06	Agricultural/Grass	IA	Chodachek 2012
Winnebago	2009-2010	3.88	0.27	4.54	Agricultural/Grass	IA	Derby 2010a
Big Blue	2013	0.60	0	2.04	Agricultural	MN	Fagen Engineering 2014
Big Blue	2014	0.37	0	1.43	Agricultural	MN	Fagen Engineering 2015
Average		**1.25**	**0.07**	**6.13**			

C. Geographically Relevant Studies

Of the direct fatality studies reviewed, Top of Iowa and Crystal Lake II are the closest geographically to the Project and have similar habitat to the CED Mason City, LLC Wind Project.

- **Bird and bat behavior and mortality at a northern Iowa windfarm (Jain 2005).**

The Top of Iowa wind farm in Worth County, Iowa consists of 89 turbines and has a total project capacity of 80.1 MW. The maximum height of the rotors is 97.5 m. The wind farm is located on agricultural lands used primarily for row crops, similar to Mason City Wind, but is in close proximity to three state Wildlife Management Areas. Fatality monitoring was conducted in 2003 and 2004 for a total of 16 months. Over this time period, seven bird fatalities were found resulting in an adjusted bird fatality rate of 0.49 birds/MW in 2003 and 1.07 birds/MW in 2004. Seventy-five bat fatalities were found, and species included the hoary bat, little brown bat, and eastern red bat. Bat fatalities occurred between June and October, which corresponds to the active breeding and migration seasons of bats in the mid-west. These studies resulted in 7.34 bats/MN in 2003 and 9.81 bats/MW in 2004. Bat calls were recorded during these surveys at both the turbine locations and non-turbine sites. Number of calls were similar at turbine and non-turbine sites.

- **Post-Construction Bat and Bird Fatality Study Crystal Lake II Wind Energy Center (Derby 2010).**

WEST conducted post-construction monitoring of operations to verify bat fatality rates at Crystal Lake II Wind Energy Center located in Hancock and Winnebago Counties, Iowa. Wind turbines at this site are located on lands used for agricultural row crops. Four wind projects at this location total 184 turbines. Only bat fatality results have been reported publicly as indicated in **Table 6.**

V. CONCLUSIONS

A. Habitat and Land Cover

In general, the available habitat within the Project area is not unique in the region and provides a similar habitat as the surrounding landscape. Most of the Project area is farmed which alters the quality of habitat and does not resemble historic prairies or grasslands. Few grasslands and forests are located near the Project, with trees only available in riparian areas along nearby ditches and streams. Given the lack of these resources at the site, it is unlikely that habitat fragmentation or loss will occur as a result of this Project. Species typical of disturbed, agricultural areas will likely be most abundant at the site.

B. Migration

The Project is located in the southeastern portion of the Prairie Pothole Region which is within the Mississippi Flyway along a major waterfowl migration route. According the Ducks Unlimited, the Mississippi Flyway is the most heavily used migration corridor for waterfowl. A study published in 2014 tracked spring migrating mallards and found that they pass through the Project's region (Beatty et al 2014). Each year, thousands of waterfowl are reported resting in Clear Lake located 22 miles to the west of the site and at the Rice Lake WMA in Lake Mills Iowa, located along the migration route to the northwest. These large numbers of waterfowl pass through the Project's region biannually. Despite being located within a major migration route, there is very little desirable stop-over habitat within or nearby the site. The placement of a wind facility at this location will not likely disrupt available waterfowl habitat or cause avoidance behaviors of desirable habitat as is typically observed in the literature.

Passerines migrate at night and have the potential to collide with turbines. Most small birds migrate between elevation of 500 to 1,000 feet above the ground (USFWS 1998) which is higher than the 138-foot rotor swept zone for the proposed turbines of this Project. Given the available habitat of the Project, it is unlikely that the Project will attract migratory passerines to the site and the estimated fatalities are likely to resemble those shown in **Table 6.**

C. Breeding

At a wind facility in North Dakota, no evidence was observed that wind turbines directly reduced survival of breeding female mallards and blue-winged teal (Gue et al 2013). There is limited preferred habitat for nesting waterfowl within or near the Project area. Siting of wind energy facilities should be focused outside of important habitat such as grassland or wetlands, in areas that include a higher percentage of agricultural fields. Siting in this manner may reduce overall mortality.

Based on the analysis of natural history data for species, which have the potential to occur within the Project area, the non-raptor breeding birds that have the potential to be found within the Project area generally occur as ground nesters or species which remain low to the ground during foraging and are unlikely to be impacted by the Project. The Project area has no grassland habitat that would provide nesting locations for most ground-nesting species.

Diurnal raptor species such as the Swainson's hawk, red-tailed hawk, and ferruginous hawk nest in medium to large-sized trees. Bald eagles nest in large trees such as eastern cottonwood, aspen, red pine, and white pine. Medium-sized trees are present around the farmstead and ditches near the site. No large trees are available within or adjacent to the Project area and it is unlikely that nests of these species would be encountered.

D. Species of Concern

Wildlife species typical of this area would be those accustomed to disturbance from agriculture and human activity. Most of the Project area and adjacent properties are heavily utilized for agricultural, with a few interspersed wetlands or grasslands. The land in the Project area has been converted to row crops. Small, patchy areas of grassland and wetland areas are present, but the siting of turbines will not result in fragmentation of existing grassland or wetlands. It is unlikely that species which may occur within the Project area will be impacted by this Project. Of the threatened, endangered, and special concern species discussed in Section III, three state-listed endangered species, northern harrier, common barn owl, and short-eared owl, have the greatest potential to be impacted by this Project because they may occur within the Project area, though no sightings of barn owls have been reported near the Mason City area via ebird.

Raptors that may be present on site that commonly hunt in open grassy areas may be at risk due to their common occupancy within the rotor swept zone. In past studies of avian mortality at wind farms, raptor mortality has been disproportionately higher than other species, most likely due to hunting behaviors within the airspace. The Buffalo Ridge Wind Resource area experienced lower raptor mortality than the Altamont Pass WRA in California and the difference was attributed to closed, tubular tower design (rather than lattice design which encourages nesting and perching), lack of rolling topography, and a string layout for turbine formation rather than a grid layout. This Project will use tubular tower design and the regional topography is very flat. It is expected that the raptor mortality would be similar to that of other studies within the Midwest as shown in **Table 6.** The bald eagle, although removed from the Endangered Species List, is continued to be protected by the Federal Bald and Golden Eagle Protection Act (BGEPA). The Project is located within the bald eagle's typical year-round occupancy area. The Project area lacks large trees suitable for perching or nesting and lacks open water for hunting habitat. Bald eagles may pass through the Project area, but it is unlikely that the Project area is utilized by the bald eagle.

E. Recommendations

The purpose of the Tier 1 and Tier 2 studies are to make an initial evaluation of the probability of significant adverse impacts to species of concern and their habitats. The findings of these studies have identified that the CED Mason City Wind, LLC Project has the potential to affect the following species:

- Raptor species, in particular the northern harrier, barn owl, and short-eared owl.

These species are known to utilize the agricultural landscape in this region for hunting but will not likely nest within the site due to the lack of available habitat. To provide suitable protections for raptors that may be present onsite, and to be in conformance with the U.S. Fish and Wildlife Service's voluntary guidance, we recommend that Con Edison implement a post-development Raptor Monitoring and Action Plan as well as passive post-development fatality monitoring. We also suggest siting turbines with adequate buffers from wetland areas.

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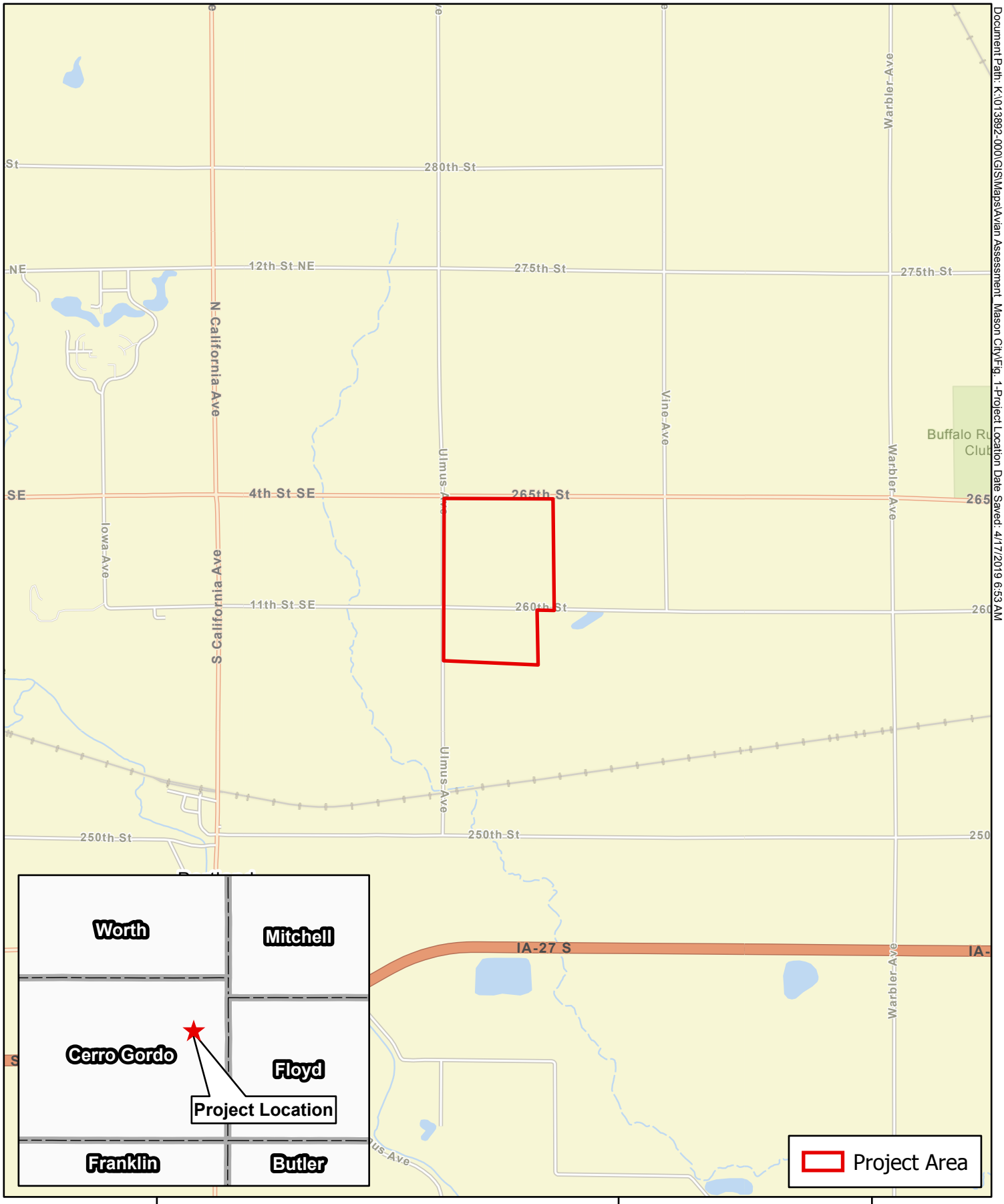
APPENDIX A – Figures



Document Path: K:\013892-000\GIS\Maps\Avian Assessment_Mason City\Fig. 1-Project Location Date Saved: 4/17/2019 6:53 AM

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Figure 1 - Project Location

CED Mason City Wind, LLC
Mason City, IA

N

0 3,000 Feet

1 inch = 3,000 feet

wsb

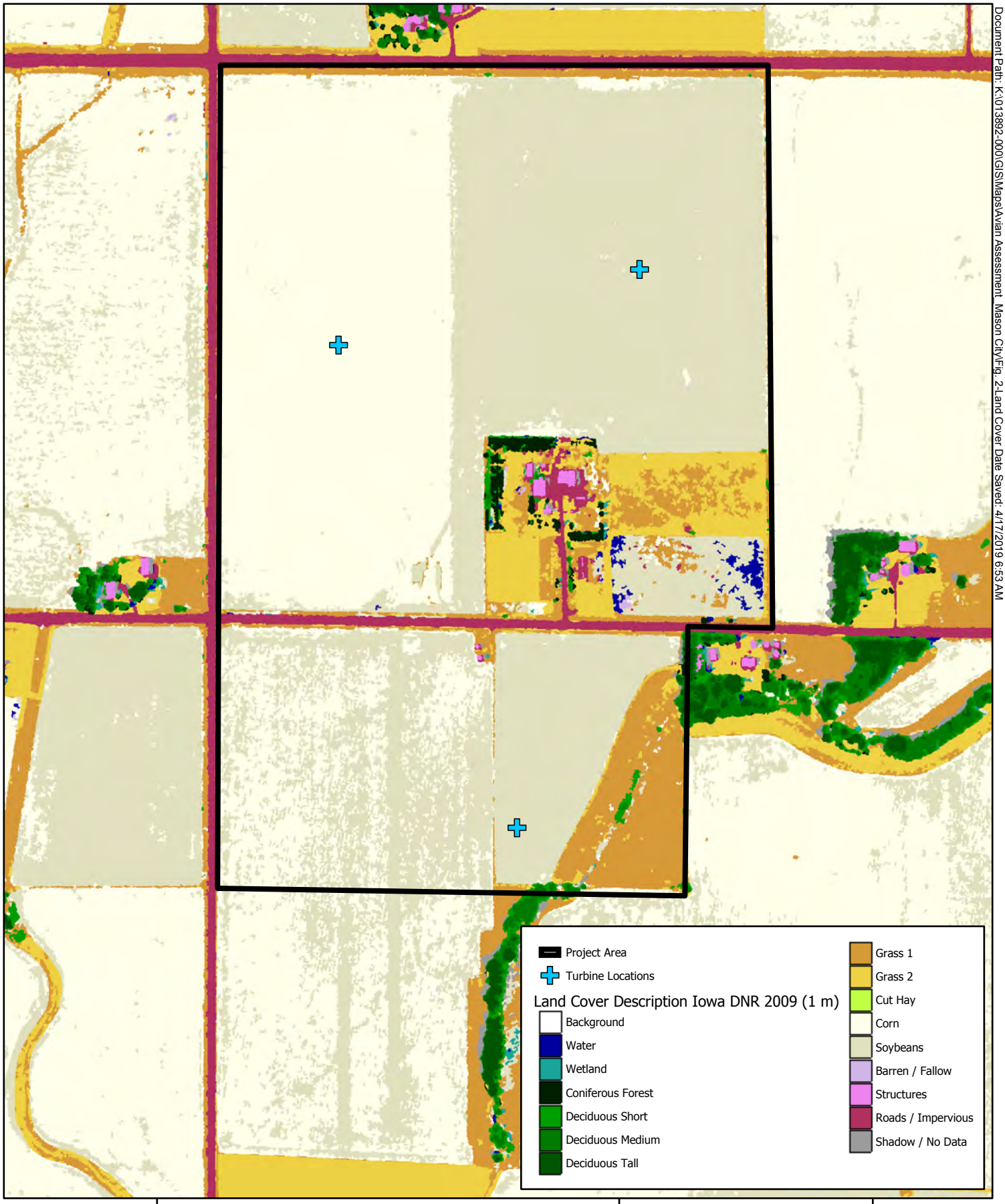

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Figure 2 - Land Cover

CED Mason City Wind, LLC
Mason City, IA

N

0 600 Feet

1 inch = 600 feet

wsb

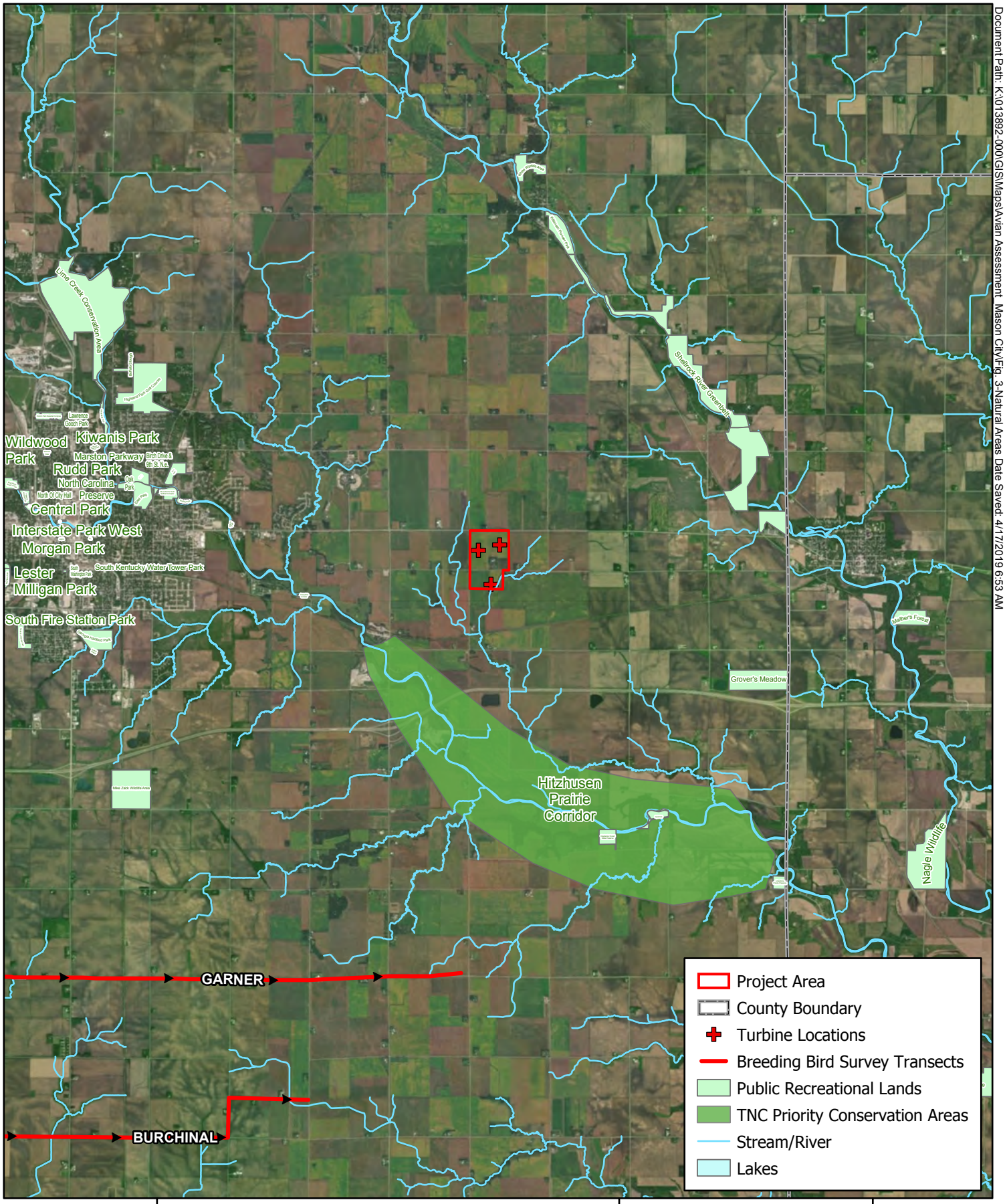

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Figure 3 - Natural Areas

CED Mason City Wind, LLC
Mason City, IA

N

0 8,500 Feet

1 inch = 8,500 feet

wsb

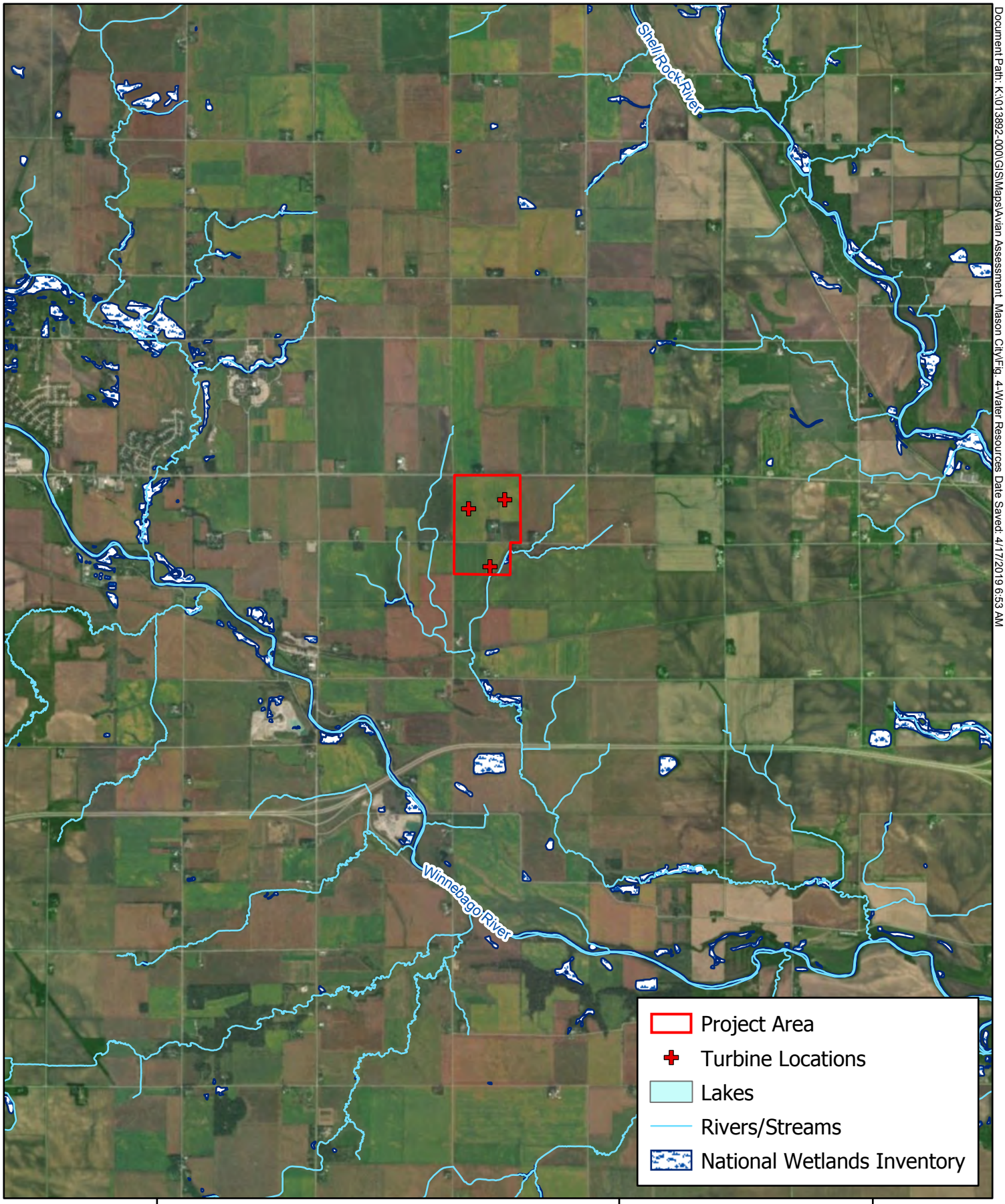

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Figure 4 - Water Resources

CED Mason City Wind, LLC
Mason City, IA

N

0 5,000 Feet

1 inch = 5,000 feet

wsb

APPENDIX B – Federal IPaC Review

IPaC **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Cerro Gordo County, Iowa

Local office

Illinois-Iowa Ecological Services Field Office

(309) 757-5800
(309) 757-5807

Illinois & Iowa Ecological Services Field Office
1511 47th Ave
Moline, IL 61265-7022

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS

NAME	STATUS
Northern Long-eared Bat Myotis septentrionalis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Insects

NAME	STATUS
Poweshiek Skipperling Oarisma poweshiek There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/9161	Endangered

Flowering Plants

NAME	STATUS
Prairie Bush-clover Lespedeza leptostachya No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4458	Threatened
Western Prairie Fringed Orchid Platanthera praeclara No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1669	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle Haliaeetus leucocephalus This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

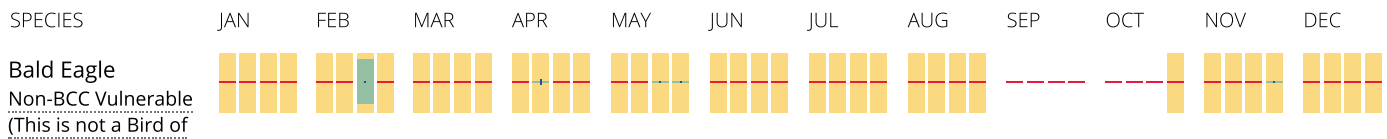
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort – no data



Bald Eagle
Non-BCC Vulnerable (This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.)

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds

guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ “What does IPaC use to generate the migratory birds potentially occurring in my specified location”. Please be aware this report provides the “probability of presence” of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the “no data” indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or

minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND

PEM1A

RIVERINE

R4SBC

A full description for each wetland code can be found at the National Wetlands Inventory website

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Appendix E

Certificate of Liability Insurance

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 05/06/2019

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Marsh USA, Inc.
1166 Avenue of the Americas
New York, NY 10036
Attn: NewYork.Certs@marsh.com Fax: 212-948-0500

CN101545073--XS-18-20

CONTACT NAME:
PHONE (A/C, No, Ext): **FAX (A/C, No):**
E-MAIL ADDRESS:

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : First Liberty Insurance Corp.	33588
INSURER B : N/A	N/A
INSURER C : Liberty Insurance Company	42404
INSURER D : N/A	N/A
INSURER E : N/A	N/A
INSURER F :	

INSURED
CED Mason City Wind, LLC
c/o Con Edison Development
100 Summit Lake Drive, Ste. 210
Valhalla, NY 10595

COVERAGES **CERTIFICATE NUMBER:** NYC-010650866-01 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X **COMMERCIAL GENERAL LIABILITY**			TB6-691-544681-068	09/01/2018	09/01/2019	EACH OCCURRENCE	$ 1,000,000
	CLAIMS-MADE [X] OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 100,000
							MED EXP (Any one person)	$ 10,000
							PERSONAL & ADV INJURY	$ 1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 2,000,000
	X POLICY [ ] PRO-JECT [ ] LOC						PRODUCTS - COMP/OP AGG	$ 2,000,000
	OTHER:							$
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$
	ANY AUTO						BODILY INJURY (Per person)	$
	OWNED AUTOS ONLY / SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	$
								$
C	X **UMBRELLA LIAB** X OCCUR			TH7- 691-544681-168	09/01/2018	09/01/2019	EACH OCCURRENCE	$ 10,000,000
	EXCESS LIAB CLAIMS-MADE						AGGREGATE	$ 10,000,000
	DED RETENTION $							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						PER STATUTE / OTH-ER	
	ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? [ ] **(Mandatory in NH)**	N / A					E.L. EACH ACCIDENT	$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$
							E.L. DISEASE - POLICY LIMIT	$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

Cerro Gordo County
John Robbins
220 N. Washington Ave
Mason City, IA 50401

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE of Marsh USA Inc.

Manashi Mukherjee Manashi Mukherjee

ACOUSTIC AND SHADOW FLICKER STUDY OF MASON CITY WIND FARM

CERRO GORDO COUNTY, IOWA

May 2019

conEdison Development
a conEdison, inc. company

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ACOUSTIC AND SHADOW FLICKER STUDY OF THE MASON CITY WIND FARM CERRO GORDO COUNTY, IOWA

Prepared for:

Con-Edison Development
4301 W. 57th Street, Suite 131
Sioux Falls, SD 57108

Prepared by:

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Waltham, MA 02451

Certified by Peter H. Guldberg, INCE, CCM

May 9, 2019

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

ConEdison Development is developing the 7.94-MW Mason City Wind Farm in Portland Township, Cerro Gordo County, Iowa consisting of one (1) GE 2.3-116 LNTE[1] wind turbine with an 80-meter hub height, and two (6) GE 2.82-127 LNTE wind turbines with an 89-meter hub height. The project is located on a parcel south of 265th Street and east of Umus Avenue; project boundaries are highlighted in blue in Figure 2, which shows the proposed location of the three turbines T-1 through T-3. An alternate layout has T-3 moved 120 feet north of its original location (see Figure 2A). Predicted sound and shadow flicker levels are presented in this study for both the original and alternate turbine layouts.

The eight nearest residences, labeled as receptor locations R1 through R8 in this report, are approximately 1,300 feet to 3,100 feet miles from the nearest wind turbine. R1 is a Participating Property owner, while residences R2 through R8 are Non-Participating. The one Participating residence inside the project area, R1 owned by Lyndon Sutcliffe at 21318 260th Street, is approximately 1,300 feet from each of the three wind turbines.

1.1 Project Sound Levels

A study of the maximum wind turbine sound levels was performed with the Cadna-A acoustic model (International Standard ISO 9613-2). The acoustic modeling results are conservative because:

1. The manufacturer's estimated maximum sound power level was assumed.
2. The acoustic model assumed the most favorable conditions for sound propagation, corresponding to a ground-based temperature inversion that occurs on a calm, clear night or during a moderate (10 mph) downwind condition.
3. No attenuation from trees or other vegetation was assumed, ground conditions were assumed to be a mix of reflective and absorptive conditions for minimal ground absorption.

[1] Low Noise Trailing Edge (LNTE) blade design.

The acoustic study conclusions are:

- For the original turbine layout, the maximum wind turbine sound level at a nearby residence is 50.3 dBA, occurring at Participating Property owner R1, and this maximum sound level is below the Cerro Gordo County sound limit of 60 dBA. For comparison, an auto pass-by produces a sound peak of 75 dBA for someone standing near a roadway.

  Sound levels at the other seven nearest residences (locations R2 through R8 in Figure 2) range from 37.9 to 47.6 dBA. All of these are below the County sound limit of 60 dBA. None of the predicted wind turbine sound levels contain a pure tone, as defined by ANSI Standard S12.9.

- For the alternate turbine layout, the maximum wind turbine sound level at a nearby residence is 50.5 dBA, occurring at Participating Property owner R1, and this maximum sound level is below the Cerro Gordo County sound limit of 60 dBA. For comparison, an auto pass-by produces a sound peak of 75 dBA for someone standing near a roadway.

  Sound levels at the other seven nearest residences (locations R2 through R8 in Figure 2A) range from 38.0 to 47.7 dBA. All of these are below the County sound limit of 60 dBA. None of the predicted wind turbine sound levels contain a pure tone, as defined by ANSI Standard S12.9.

1.2 Project Shadow Flicker

A study of the potential shadow flicker effects was done with the WindPro SHADOW model and local meteorological data. The shadow flicker modeling results are conservative because:

1. No adjustment was made for existing building or vegetative visual shielding.

2. The rotor plane of the turbines was assumed to always be perpendicular to the line from the turbine to the sun, giving the largest shadow effect.

The shadow flicker study conclusions are:

- For the original turbine layout, predicted shadow flicker at the nearest residences R1 through R8 range from 0 hours/0 minutes to 24 hours/26 minutes per year (see Figure 3). All predicted levels are below the project goal of 30 hours per year and should not be annoying to residents.

- For the alternate turbine layout, predicted shadow flicker at the nearest residences R1 through R8 range from 0 hours/0 minutes to 27 hours/8 minutes per year (see Figure 3A). All predicted levels are below the project goal of 30 hours per year and should not be annoying to residents.

2.0 COMMON MEASURES OF COMMUNITY SOUND

All sounds originate with a source – a human voice, vehicles on a roadway, or an airplane overhead. The sound energy moves from the source to a person's ears as sound waves, which are minute variations in air pressure. The loudness of a sound depends on the sound pressure level[2], which has units of decibel (dB). The decibel scale is logarithmic to accommodate the wide range of sound intensities to which the human ear is subjected. On this scale, the quietest sound we can hear is 0 dB, while the loudest is 120 dB. Every 10-dB increase is perceived as a doubling of loudness. Most sounds we hear in our daily lives have sound pressure levels in the range of 30 dB to 90 dB.

A property of the decibel scale is that the numerical values of two separate sounds do not directly add. For example, if a sound of 70 dB is added to another sound of 70 dB, the total is only a 3-decibel increase (or 73 dB) on the decibel scale, not a doubling to 140 dB. In terms of sound perception, 3 dB is the minimum change most people can detect. Table 1 describes the subjective effect of different changes in sound levels.

TABLE 1

SUBJECTIVE EFFECT OF CHANGES IN SOUND PRESSURE LEVELS

Change in Sound Level	Apparent Change in Loudness
3 dB	Just perceptible
5 dB	Noticeable
10 dB	Twice (or half) as loud

[2] The sound pressure level is defined as $20*\log_{10}(P/P_o)$ where P is the sound pressure and P_o is the reference pressure of 20 micro-Pascals (20 μPa), which by definition corresponds to 0 dB.

Sound exposure in a community is commonly expressed in terms of the A-weighted sound level (dBA); A-weighting approximates the frequency response of the human ear. Typical sound levels associated with various activities and environments are presented in Figure 1.

Sound levels change from moment to moment. Some are sharp impulses lasting one second or less, while others rise and fall over much longer periods of time. There are various measures of sound pressure designed for different purposes. To establish the background ambient sound level in an area, the $\mathbf{L_{90}}$ metric, which is the sound level exceeded 90 percent of the time, is sometimes used. The $\mathbf{L_{90}}$ can be thought of as the level representing the quietest 10 percent interval of any time period. The $\mathbf{L_{eq}}$, or equivalent sound level, is the steady-state sound level over a period of time that has the same acoustic energy as the fluctuating sounds that actually occurred during that same period. It is commonly referred to as the average sound level. The $\mathbf{L_{max}}$, or maximum sound level, represents the $1/8^{th}$-second peak level recorded during a given time period.

A sound study typically includes an analysis of the sound spectrum into its various frequency components to determine tonal characteristics. The unit of frequency is Hertz (Hz), measuring the cycles per second of the sound pressure waves, and typically the frequency analysis examines nine octave bands from 32 Hz to 8,000 Hz. A source creates a pure tone, as defined by American National Standards Institute (ANSI) Standard S12.9, if acoustic energy is concentrated in a narrow frequency range and a 1/3-octave band has a sound level 5 to 15 dB greater than both adjacent bands (5 dB for high frequencies, 8 dB for middle frequencies, and 15 dB for low frequencies).

FIGURE 1
Common Outdoor Sound Levels

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3.0 NOISE AND SHADOW FLICKER REGULATIONS AND CRITERIA

Cerro Gordo County has a sound limit of 60 dBA for residences near wind energy projects. While there is no State or local limit on shadow flicker, a guideline applied in the renewable energy field to minimize adverse effects is 30 hours/year at a non-participating residence, and that goal is used in this study.

4.0 CALCULATED FUTURE SOUND LEVELS

4.1 Methodology

The maximum sound power level for the GE 2.3-116 wind turbine with Low Noise Trailing Edge (LNTE) technology is 108.0 dBA (an expected value of 106.0 dBA plus a 2.0 dBA uncertainty factor).[3] The maximum sound power level for the GE 2.82-127 wind turbine with LNTE is 110.5 dBA (an expected value of 108.5 dBA plus a 2.0 dBA uncertainty factor).[4] Both the sound pressure level we hear and the sound power level of machinery (an energy density) are on a decibel scale[5], leading to possible confusion since these measures are not the same. The acoustic model uses the sound power level of a wind turbine along with other assumptions to calculate the sound pressure level heard at a receiver located downwind from a wind turbine.

Future sound levels from the Mason City Wind Farm were calculated with the Cadna A acoustic model. Cadna A is a sophisticated three-dimensional model for sound propagation and attenuation based on International Standard ISO 9613[6]. Atmospheric absorption, the process by which sound energy is absorbed by the air, was calculated using ANSI S1.26-1995.[7] Absorption of sound assumed standard day conditions and is significant at large distances. Ground surfaces were assumed to be mixed ground consisting of both hard and porous surfaces.[8] This is a reasonable worst-case assumption and approximates winter frozen ground conditions in the area between the turbine and the nearest residences.

Digital terrain data for the project areas were analyzed to obtain terrain heights. The model assumes favorable sound propagation, as occurs under downwind conditions or a ground-based temperature

[3] GE Power & Water, Technical Documentation Wind Turbine Generator Systems 2.3-116 with LNTE, Product Acoustic Specifications, 2015.

[4] GE Power & Water, Technical Documentation Wind Turbine Generator Systems 2.x-127 with LNTE, Product Acoustic Specifications, 2018.

[5] The sound power level is defined as $10*\log_{10}(W/W_o)$, where W is the sound power of the source in Watts and W_o is the reference power of 10^{-12} Watts.

[6] International Standard, ISO 9613-2, Acoustics – Attenuation of Sound During Propagation Outdoors, -- Part 2 General Method of Calculation.

[7] American National Standards Institute, ANSI S1.26-1995, "American National Standard Method for the Calculation of the Absorption of Sound by the Atmosphere," 1995.

[8] Ground absorption factor G set equal to 0.5 in Cadna-A.

inversion, such as might occur on a clear night. At other times, atmospheric turbulence and wind shadow effects will reduce sound levels by 5 to 20 dBA from those presented below.

4.2 Results and Conclusions

Figures 2 and 2A present the maximum sound levels in A-weighted decibels (dBA) for the original and alternate layouts, respectively. In these figures, the color-coded decibel contours represent sound levels at a height 5 feet above ground level, and the eight nearest residences to the project are labeled as R1 through R8. R1 is the residence of a Participating Property owner, while R2 through R8 are residences of Non-Participating Property owners and are outside the project boundary, highlighted in blue in the figures. Note that Figures 2 and 2A present a composite worst-case in which all locations are simultaneously downwind of the wind turbines.

The owners and addresses of residences R1 through R8 are as follows:

R1 – Lyndon Sutcliffe, 21318 260th Street
R2 – Phyllis Krause, 21485 260th Street
R3 – Kevin Shanks, 21630 260th Street
R4 – Harold Pippert, 21226 265th Street
R5 – Steven Clemens, 20934 260th Street
R6 – Mary Tevis, 20793 260th Street
R7 – Ronald Esser, 20612 260th Street
R8 – Jason Pippert, 20614 265th Street

Sound levels at the eight nearest residences range from 37.9 to 50.3 dBA for the original layout, and from 38.0 to 50.5 dBA for the alternate layout:

	Original Layout	Alternate Layout
Residence R1	50.3 dBA	50.5 dBA
Residence R2	47.4 dBA	47.7 dBA
Residence R3	45.2 dBA	45.3 dBA
Residence R4	47.6 dBA	47.6 dBA
Residence R5	45.8 dBA	45.9 dBA
Residence R6	42.2 dBA	42.3 dBA
Residence R7	39.8 dBA	39.8 dBA
Residence R8	37.9 dBA	38.0 dBA

All of these levels are below the Cerro Gordo County sound limit of 60 dBA for residences. For comparison to everyday sounds, the pass-by of an automobile produces a sound peak of 75 dBA for someone standing near a roadway. None of the predicted wind turbine sound levels at residences will contain a pure tone, as defined by ANSI Standard S12.9.

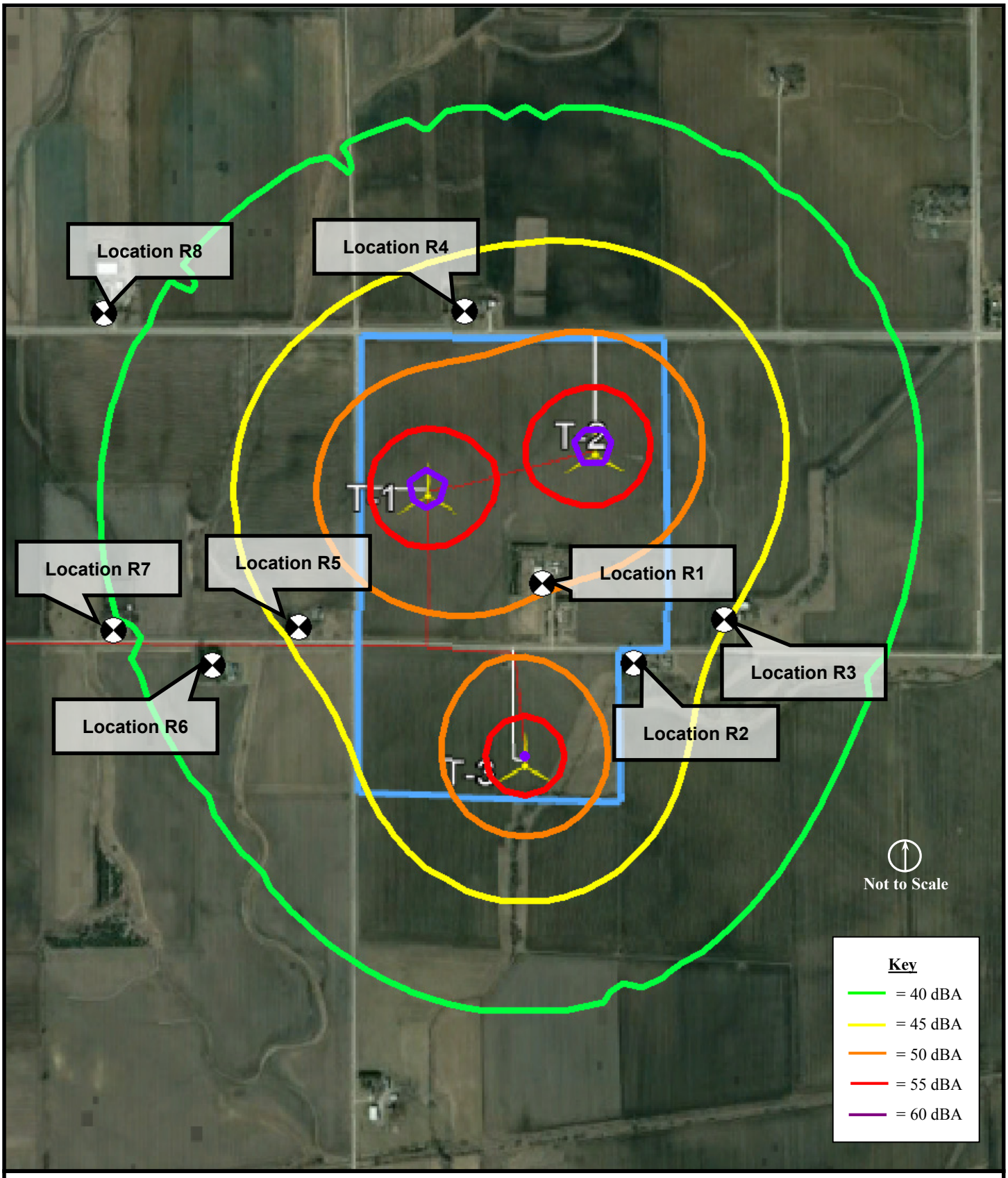

Figure 2
Predicted Sound Levels
Mason City Wind Project

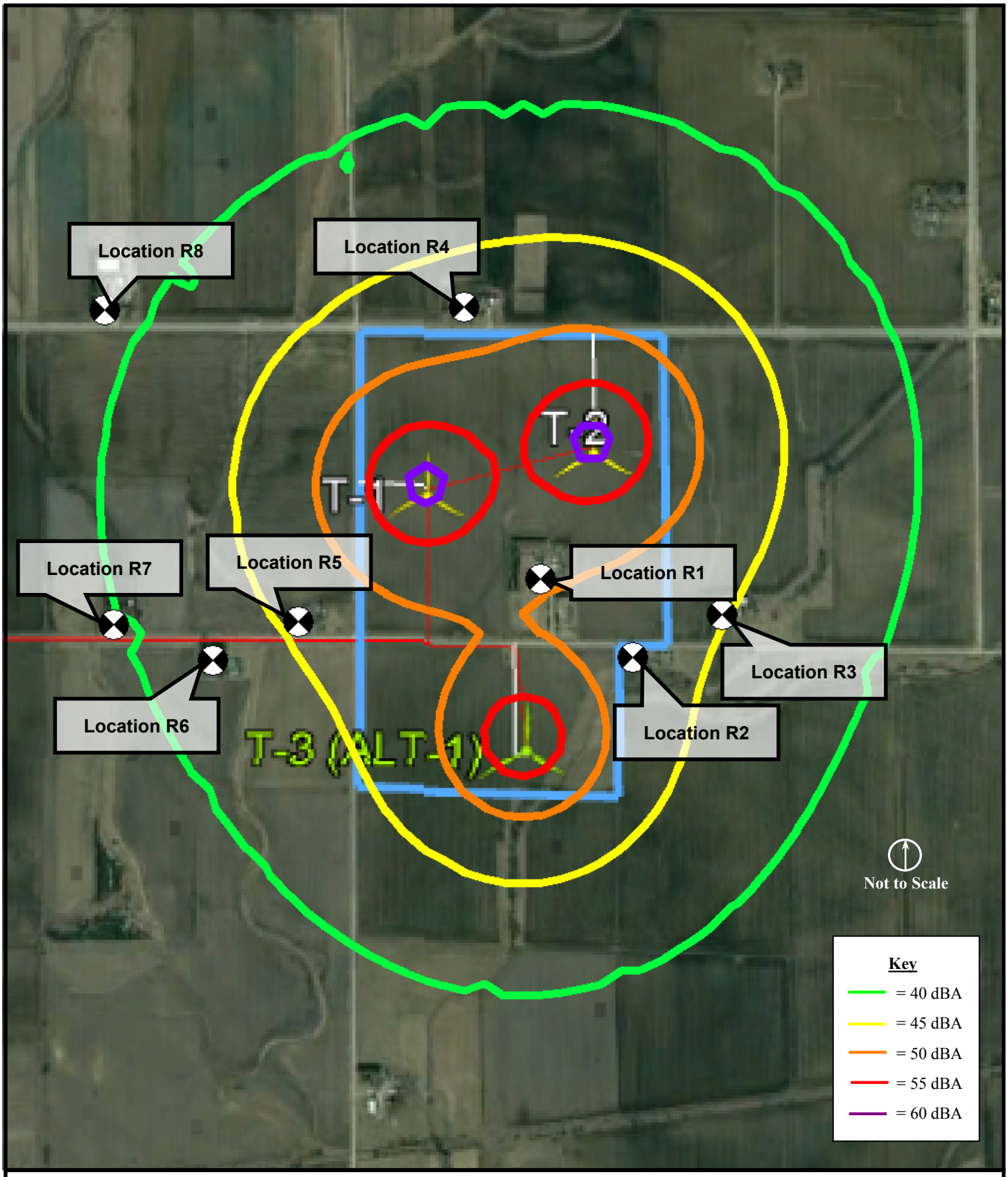

Figure 2A
Predicted Sound Levels
Mason City Wind Project – Alternate Layout

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5.0 CALCULATED FUTURE HOURS OF SHADOW FLICKER

The expected maximum hours of shadow flicker for the Aurora County Wind Farm were calculated using the latest version of the WindPro SHADOW model (version 3.1), and climatological data from the National Weather Service stations in Mason City (wind direction and speed) and Des Moines (sunshine). The calculations consider the average sunshine probability by month and hours of turbine operation by wind direction sector. These calculations are conservative because no adjustment was made for visual shielding by existing buildings or vegetation, and the rotor plane of the turbines was assumed to always be perpendicular to the line from the turbine to the sun, giving the largest shadow effect**.**

Figures 3 and 3A present the expected maximum hours of shadow flicker for the original and alternate layouts, respectively, showing isopleths lines for 10, 20, 30 and 40 hours/year of potential shadow flicker. The butterfly-shaped contours are positioned north of each turbine because the project site is in the Northern Hemisphere. The results at the eight nearest residences are as follows:

	Original Layout	Alternate Layout
Residence R1	0 hours/0 minutes	0 hours/0 minutes
Residence R2	24 hours/26 minutes	27 hours/8 minutes
Residence R3	20 hours/15 minutes	19 hours/3 minutes
Residence R4	20 hours/57 minutes	20 hours/57 minutes
Residence R5	9 hours/34 minutes	9 hours/10 minutes
Residence R6	3 hours/51 minutes	3 hours/46 minutes
Residence R7	7 hours/17 minutes	7 hours/17 minutes
Residence R8	4 hours/55 minutes	4 hours/55 minutes

Predicted shadow flicker at residences R1 through R8 are below the project goal of 30 hours per year for both the original and alternate layouts, and thus flicker should not be annoying to residents.

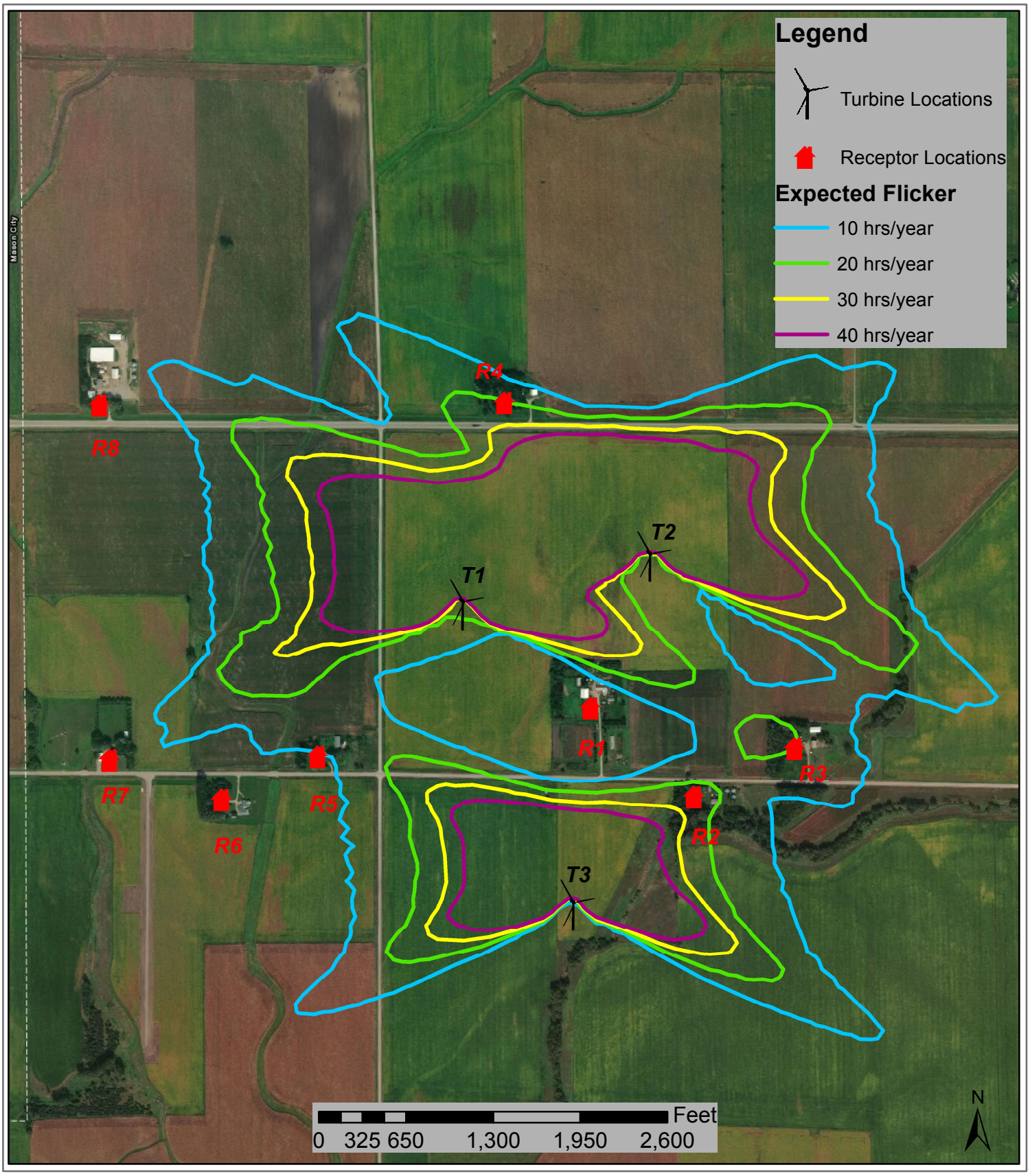


Figure 3
Maximum Expected Shadow Flicker from the Mason City Wind Project
Mason City, Iowa

TECH environmental

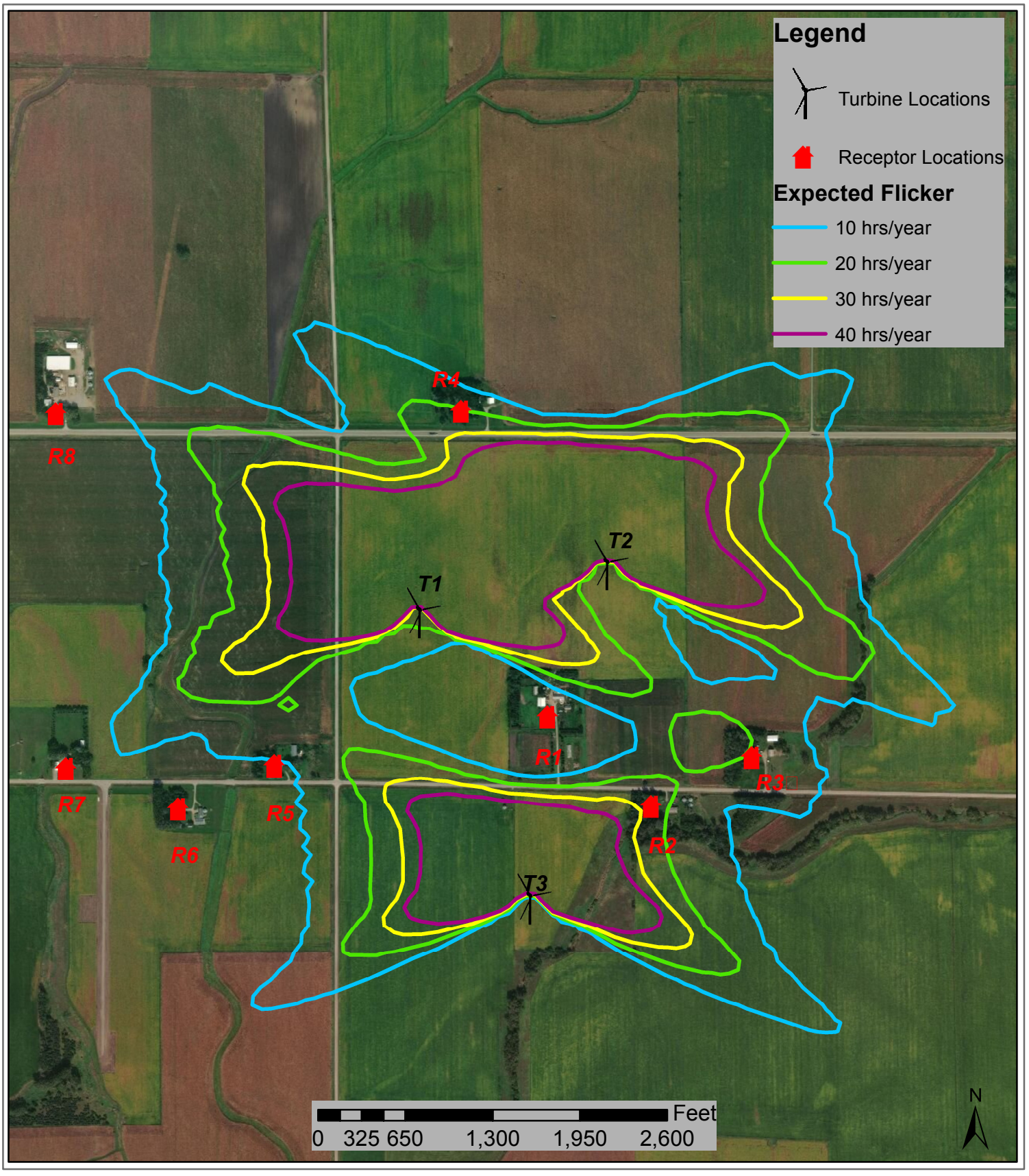


Figure 3A
Maximum Expected Shadow Flicker from the Mason City Wind Project - Alternative Layout
Mason City, Iowa

TECH environmental

Case No. 19-31
CED Mason City Wind, LLC (Section 9 & 16, Portland Township)
Figure 1
Looking east from Ulmus Avenue toward the location of Turbine 1 (T1)

May 15, 2019, J. Robbins

Figure 2
Looking south from 265th Street toward the location of Turbine 2 (T2)

May 15, 2019, J. Robbins

Figure 3

Looking south from 260th Street toward the location of Turbine 3 (T3)

May 15, 2019, J. Robbins

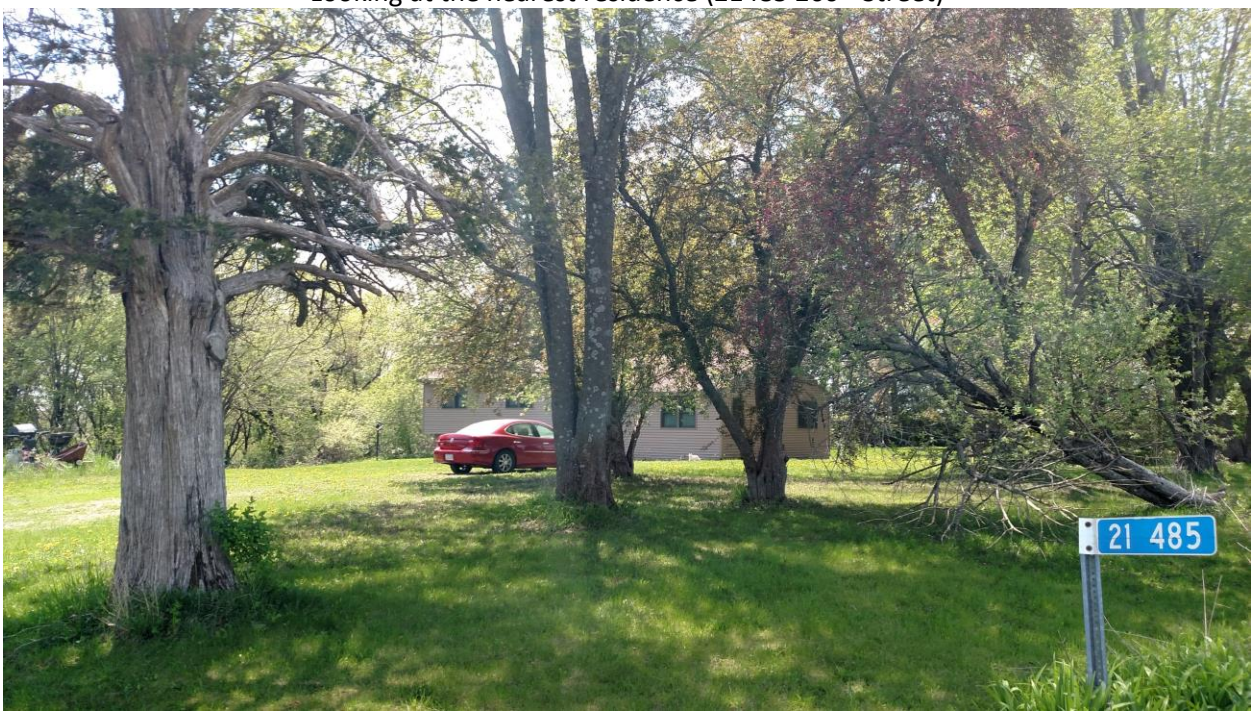
Figure 4

Looking east from Thrush Avenue (approximately ½-mile-mile away) toward two existing wind turbines east of Mason City

May 15, 2019, J. Robbins

Figure 5

Looking at the nearest residence (21485 260th Street)

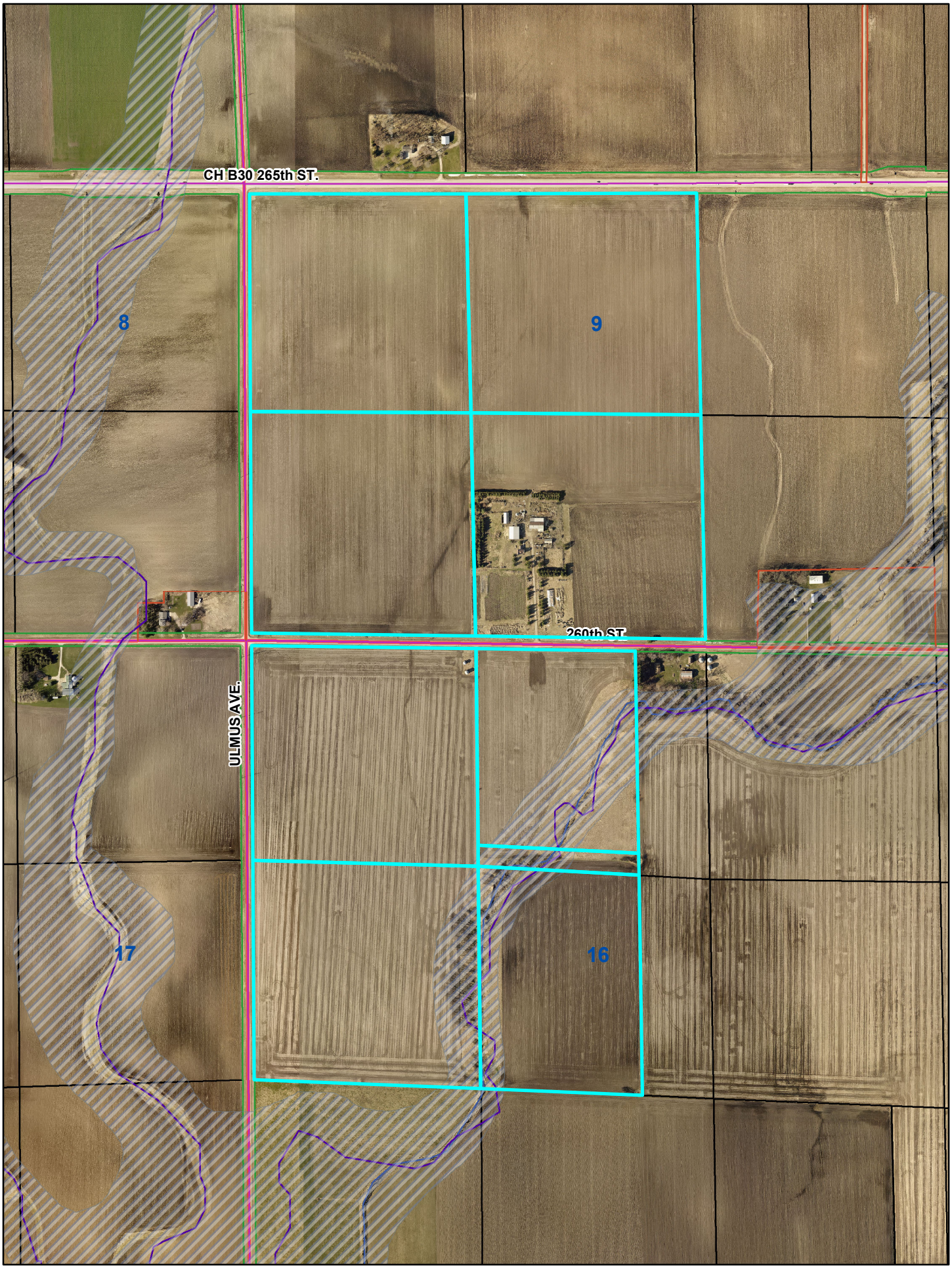


May 15, 2019, J. Robbins

Figure 6

Looking at the road sign indicating Ulmus Avenue as a minimum maintenance road

May 15, 2019, J. Robbins


CH B30 265th ST.
8
9
260th ST
ULMUS AVE.
17
16