Whooping Crane Likelihood of Occurrence Report

Courtenay Wind Farm

Stutsman County, North Dakota

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Executive Summary

The likelihood of whooping cranes occurring in the Courtenay Wind Farm (Project) is low. The major factor that contributed to this assessment was the Project area's location outside of the whooping crane migration corridor. The Project area has a slightly higher proportion of suitable wetland habitat within the Project area than the surrounding area. There are no recorded historical observations of whooping cranes within the Project area. A total of 13 observations occurred within the 35-mile buffer area around the Project area. The majority of these observations occurred west of the James River. The two most likely impacts of wind development on whooping cranes are: 1) direct mortality of whooping cranes due to collisions with transmission lines, turbines, or other facilities; or 2) whooping cranes' avoidance of the area around the facility. Each project site is unique with respect to the relationship of the facilities with potential whooping crane habitat. The whooping crane observations should be used for general inference regarding use of an area and cannot be used for micrositing features away from whooping crane sightings because some of the observations may lack precise locations and not all whooping crane locations are reported.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1

1.0 INTRODUCTION 1

2.0 LEGAL STATUS OF THE WHOOPING CRANE IN THE UNITED STATES 1

3.0 ENVIRONMENTAL SETTING AND PROJECT AREA DESCRIPTION 2
- 3.1 Environmental Setting 2
- 3.2 Project Area Description 2

4.0 WHOOPING CRANE BIOLOGY 3
- 4.1 Reasons for the Population Decline 3
- 4.2 Threats to Whooping Cranes 3

5.0 WHOOPING CRANE MIGRATION 4
- 5.1 Fall Migration 4
- 5.2 Spring Migration 5
- 5.3 Migration Flight Behavior 5
- 5.4 Stop-over Habitat Characteristics 5

6.0 ASSESSMENT OF WHOOPING CRANES LIKELIHOOD OF OCCURENCE 6
- 6.1 Location of a Project Area in the Migration Corridor (L) 6
  - 6.1.1 Biological Justification 6
  - 6.1.2 Scoring 7
  - 6.1.3 Assumptions 7
- 6.2 Attractiveness on the Landscape (A) 7
  - 6.2.1 Biological Justification 7
  - 6.2.2 Scoring 7
  - 6.2.3 Assumptions 8
- 6.3 Presence of Foraging and Roosting Sites (W) 8
  - 6.3.1 Biological Justification 8
  - 6.3.2 Scoring 8
  - 6.3.3 Assumptions 9
- 6.4 Likelihood Index Formula (LI) 9

7.0 COURTENAY WIND ENERGY PROJECT ASSESSMENT AND SUMMARY 9

8.0 LITERATURE CITED 11

9.0 APPENDIX 13

Tables

Table 1. Parameters used in the likelihood index calculation. 6
Table 2. Likelihood index scores for the Courtenay Wind Energy Project. 10

Figures

Figure 1. Courtenay Wind Farm Project Area Vicinity Map
Figure 2. Whooping Crane Migration Corridor: United States
Figure 3. Whooping Crane Migration Corridor: North Dakota
Figure 4. Courtenay Wind Farm Project Whooping Crane Habitat Map

1.0 INTRODUCTION

Geronimo Energy (Geronimo) is proposing to develop the Courtenay Wind Farm (Project) a wind energy facility in Stutsman County, North Dakota (Figure 1). The current layout boundary used in this report is January 21, 2013. One concern when developing wind energy facilities in parts of the Great Plains is the federally endangered whooping crane (*Grus americana*). The whooping crane migrates through portions of North Dakota during the spring and fall. Whooping cranes have been killed by collisions with power lines, and the whooping crane recovery plan lists construction of power lines, fences, and other structures in the migration corridor as a threat to the species (Canadian Wildlife Service [CWS] and United States Fish and Wildlife Service [USFWS] 2007). Thus, the construction and operation of wind turbines may pose a risk to whooping cranes through direct mortality or avoidance of areas where turbines are located.

To continue their efforts to identify areas where they can minimize impacts, Geronimo contracted Tetra Tech, Inc. (Tetra Tech) to conduct a landscape-scale analysis to assess the potential occurrence of whooping cranes for the Project. The objective of this likelihood of occurrence analysis is to evaluate the biological and landscape features within the Project area to determine the potential for whooping cranes to occur. Despite the small population size of whooping cranes, certain landscape features may increase the likelihood of whooping crane occurrence during migration. Thus, Tetra Tech developed a likelihood index to evaluate the Project area based on its location in the migration corridor, the locations of historical observations of whooping cranes, the presence of feeding and roosting sites, and the availability of habitat within the Project area compared to the surrounding landscape. The likelihood index does not predict how many whooping cranes will occur in the Project area; rather, it scores the site based on a suite of variables that are related to whooping crane occurrence. Higher scores denote higher potential likelihood of occurrence. This assessment tool is not intended to replace field surveys. However, given the low probability of detecting a whooping crane during field surveys thereby minimizing the utility to document presence or absence from a given area, this assessment tool was designed to take advantage of available data.

2.0 LEGAL STATUS OF THE WHOOPING CRANE IN THE UNITED STATES

The whooping crane is protected by both federal and state laws in the United States. It was considered endangered in the United States in 1970 and the endangered listing was 'grandfathered' into the Endangered Species Act (ESA) of 1973, which prohibits "take" (CWS and USFWS 2007). "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (16 U.S.C. §1532(19)). "Incidental take" occurs when a fatality of an ESA-listed species occurs as an unintended consequence of an otherwise legal activity, as would the case in the unlikely event of a fatality occurring at a wind farm. To Tetra Tech's knowledge, no whooping crane fatality has occurred at a wind energy facility and no utility has been prosecuted for crane collisions with transmission lines, despite at least 46 known fatalities or serious injuries. The whooping crane is also considered a level III Species of Conservation Priority by the North Dakota Game and Fish Department (Hagen et al. 2005). Under the North Dakota comprehensive wildlife conservation

strategy guide, a level three species of conservation priority is a species of moderate priority but are believed to be peripheral or non-breeding in North Dakota (Hagen et al. 2005).

The whooping crane population in North America has experienced sharp declines and disappearance from most of its historic range (CWS and USFWS 2007). The number of whooping cranes in North America prior to 1870 is estimated to have been between 500 and 1,400 individuals (Allen 1952; Banks 1978), but some biologists suggest that the population may have numbered as many as 10,000 individuals (CWS and USFWS 2007). Activities such as habitat destruction, hunting, and displacement due to anthropogenic activities likely lead to widespread population declines (CWS and USFWS 2007). One self-sustaining wild population of whooping cranes currently exists in the world. Members of this population breed primarily within the boundaries of Wood Buffalo National Park in Canada and migrate through the central United States in route to the wintering grounds at Aransas National Wildlife Refuge along the Gulf Coast of Texas. This flock is referred to as the Aransas-Wood Buffalo National Park Population. Due to intensive management, this population has increased from 15 birds in 1941 to an estimated 257 birds (with a 95% probability of actual flock size being between 178 – 362 birds) as of the 2013 winter whooping crane survey conducted by USFWS (WCCA 2013).

3.0 ENVIRONMENTAL SETTING AND PROJECT AREA DESCRIPTION

3.1 Environmental Setting

The Project area is located within the Drift and End Moraines Complex of the Northern Glaciated Plains Ecoregion (Bryce et al. 1996). The Northern Glaciated Plains ecoregion is characterized by a flat to gently rolling landscape composed of glacial drift (Bryce et al. 1996). This landscape includes a mixed-grass prairie (both tall and short grasses) and composed of blocks of surficial material scraped off and thrust up by the continental glacier at the south end of the Devils Lake (north of the Project area) Basin (Bryce et al. 1996). A greater proportion of semi-permanent and seasonal wetlands are found on the Drift Plains. Because of the productive soil and level topography, the region is almost entirely cultivated, with many wetlands drained via very complex ditch systems or tilled and planted. However, valuable waterfowl habitat still remains concentrated in state and federally and non-governmental organization sponsored duck production areas. The prairie grasses have been largely replaced by fields of spring wheat, barley, sunflowers, and alfalfa.

3.2 Project Area Description

The Project area is 24,206 acres located on privately owned lands in east-central North Dakota. The Project is located near the town of Courtenay in Stutsman County (Figure 1). The Project area is characteristic of the upland portion of this region, with the majority of the land surface currently covered by agriculture and rangelands with patches of grassland that might include native prairie. The area contains numerous small wetlands that vary from shallow vegetated depressions, fens, and intermittent creeks. Residences and abandoned farmsteads are scattered throughout the Project area. Patches of trees and shrubs exist throughout the Project area, and are found primarily between agricultural fields, in drainages, and as shelter belts around homesteads.

4.0 WHOOPING CRANE BIOLOGY

The whooping crane is a long-lived species that may reach 28 years old in the wild (Binkley and Miller 1983). Individuals reach sexual maturity at 3 to 5 years of age and form life-long breeding pairs while on the wintering grounds or during spring migration (Stehn 1997; CWS and USFWS 2007). Whooping cranes have low annual reproductive output. Females typically lay 2 eggs, but only 10 percent of families arrive on the winter grounds with 2 chicks because the smaller chick usually dies within the first two weeks after hatching (CWS and USFWS 2007). The juveniles become independent of the parents on the wintering ground prior to spring migration. Sexually immature individuals (i.e., sub-adults) return to the breeding grounds where they may remain solitary or congregate in small groups on the periphery of breeding pairs (CWS and USFWS 2007).

4.1 Reasons for the Population Decline

Populations of long-lived species with low annual reproductive output such as the whooping crane are sensitive to changes in adult survival (Stahl and Oli 2006). Hunting, especially during spring migration, from 1870 to 1930 resulted in 274 documented whooping crane fatalities (Allen 1952). In addition, Hahn (1963) tallied 309 mounts and 9 skeletons in museum collections throughout the world. Because many of these specimens do not contain information regarding the date and location of collection, it is unlikely that the majority were collected by museum personnel. It is possible that mortality from shooting exceed annual production of juveniles during the early 1900s (CWS and USFWS 2007).

Degradation and loss of breeding habitat eliminated the whooping crane from much of its core breeding range in North America. Whooping cranes once bred from the southern edge of Lake Michigan north through southern Minnesota to northeastern North Dakota through Manitoba, Saskatchewan, and Alberta (Allen 1952). Conversion of prairie ecosystems to agriculture and ranching made much of the breeding habitat unsuitable (CWS and USFWS 2007). Due to their high degree of site fidelity, members of the Aransas-Wood Buffalo Population are unlikely to naturally recolonize the historic whooping crane range in North America.

4.2 Threats to Whooping Cranes

Several factors threaten the whooping crane because of its small population size and concentration of all members of the Aransas-Wood Buffalo National Park population at breeding and wintering locations. Threats to the whooping crane identified in the recovery plan that are related to wind power development include collision with power lines, fences, and other structures, and loss and degradation of stop-over and wintering habitat (CWS and USFWS 2007; USFWS 2009).

Power lines pose a major threat to whooping cranes when they are located in the vicinity of foraging or roosting habitat because individuals often fly at low altitudes (33 to 49 feet above the ground) when moving among sites (CWS and USFWS 2007; Stehn and Wassenich 2008). The majority of documented fatalities during migration are due to collision with power lines. Since 1956, 46 whooping cranes have been killed or seriously injured as a result of collisions with

power lines (Stehn and Wassenich 2008). Collisions with power lines have resulted in fatalities of whooping cranes in other experimental populations that are maintained by the introduction of captive-reared young. Fourteen individuals from the Florida non-migratory population and 1 individual in the migratory Wisconsin population have died from colliding with power lines. The USFWS recommends marking overhead power lines to reduce collision risk, and marked lines can reduce collision risk by 53 to 89 percent (USFWS 2009).

Although whooping crane mortality has not been attributed to wind turbines, the whooping crane recovery plan considers wind power development within the whooping crane migration corridor a threat because of the construction of power lines and associated structures (CWS and USFWS 2007). It is unknown how whooping cranes will respond to the presence of wind turbines. The USFWS (2009) holds the opinion that whooping cranes will avoid stopping at areas with operational wind turbines. Thus, behavioral avoidance of wind farms by whooping cranes may reduce the probability of collision, but may amount to loss of stop-over habitat.

5.0 WHOOPING CRANE MIGRATION

Whooping cranes undertake a 5,000-mile round-trip migration from the breeding area in Canada to the wintering area in Texas every year. Individuals depart the breeding ground in Canada and travel south through Alberta, Canada, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and reach the wintering ground on the Texas coast. The migration route is well defined and 94 percent of all observations occur within a 200-mile wide corridor during spring and fall migration (CWS and USFWS 2007, Figure 2). Whooping cranes may occasionally travel with sandhill cranes during migration, and stop-over sites used by sandhill cranes may indicate potential whooping crane stop-over areas (CWS and USFWS 2007).

During migration, whooping cranes can occur where suitable habitat is available. Some sites in the migration corridor are used consistently and have high annual use. Four traditional stop-over sites are found in Nebraska (Platte River), Kansas (Cheyenne Bottoms Wildlife Management Area, Quivira National Wildlife Refuge), and Oklahoma (Salt Plains National Wildlife Refuge). These sites are designated as critical habitat under the Endangered Species Act (CWS and USFWS 2007).

5.1 Fall Migration

Whooping cranes depart the breeding grounds at Wood Buffalo National Park in mid-September and parents with young are usually the last to depart. Birds may travel alone, in pairs, in family groups, or in small flocks (Johns 1992). Individuals travel southeast about 300 miles to the major staging area in Saskatchewan, where they may remain for 2 to 4 weeks before resuming migration. During fall migration, birds may stay at traditional stop-over sites for 7 to 10 days, but stays as long as 6 weeks have been documented at Quivira National Wildlife Refuge (CWS and USFWS 2007). The majority of whooping cranes reach the wintering grounds by mid-November. In North Dakota most sightings occur from early October to early November; peak migration occurs around October 18 (Austin and Richert 2001).

5.2 Spring Migration

Whooping cranes depart the wintering ground at Aransas National Wildlife Refuge in late March; the last birds depart in May. Breeding pairs are typically first to depart and migration is facilitated by winds from the southeast. There is no known staging area in spring as there is in fall, and migration is completed in 2 to 4 weeks. Traditional stop-over sites that are used in fall are also used in spring. However, individuals spend fewer days at stop-over sites during spring migration. Whooping cranes travel through North Dakota from early April to late April; peak migration occurs around April 19 (Austin and Richert 2001).

5.3 Migration Flight Behavior

Whooping cranes are diurnal migrants and primarily fly by using static soaring, but low-level flapping flight may be used when conditions dictate. Migration is initiated after the air has warmed and thermal updrafts are present. Individuals spiral upwards on thermals of warm air to heights of 1,000 to 6,000 feet (Kyut 1992), then enter into long, descending glides. This process is repeated throughout the day until suitable habitat is reached. Static soaring is energy efficient as birds seldom flap after they are airborne. Whooping cranes may travel up to 500 miles per day in ideal conditions; during average conditions they may travel 250 miles per day (Stehn and Wassenich 2008). During the end of the migration flight, individuals will enter long descending glides and use flapping flight at lower altitudes until they reach suitable roosting and feeding habitat. Whooping cranes do not regularly migrate during unfavorable weather conditions such as a strong headwind, rain or other precipitation, or overcast conditions. When visibility is poor, individuals use flapping flight at lower altitudes until they reach suitable roosting or feeding habitat.

5.4 Stop-over Habitat Characteristics

Whooping cranes require roosting habitat when they stop during migration. They often select sites with unobstructed visibility (Austin and Richert 2001). Palustrine wetlands (freshwater wetlands characterized by emergent vegetation) are used most often used as roosting sites, but individuals have been found roosting at lacustrine wetlands (wetlands around a lake), and riverine wetlands (wetlands along a river). Size of wetlands used during spring and fall migration ranges from 0.4 hectare (ha) to over 500 ha, and no seasonal use patterns are evident (Austin and Richert 2001); 75 percent of recorded roost wetlands were smaller than 4 ha (10 acres). Although size of the wetlands used for roosting varies, water depth ranges 18 to 20 inches and little variability is found among sites.

Whooping cranes forage in wetlands and agricultural fields during migration and may commute between roosting and feeding areas. Palustrine wetlands are used most often when whooping cranes forage in wetlands, but lacustrine and riverine have also been used as feeding sites (Austin and Richert 2001). Among agricultural crops used as feeding sites, use of winter wheat was higher than other crop types in fall and use of row-crop stubble (comprised mostly of corn) was higher in spring than other crop types (Austin and Richert 2001). Whooping cranes have also been observed feeding in sorghum, sunflower, and soybean stubble (Austin and Richert 2001). Feeding sites are often found adjacent to roosting sites. For example, 94.9 and 72.9

percent of roosting sites were within 0.62 mile of feeding sites in spring and fall, respectively (Johns et al. 1997, USFWS 2009).

6.0 ASSESSMENT OF WHOOPING CRANES LIKELIHOOD OF OCCURENCE

The primary threats of wind energy development to whooping cranes are mortality due to collision with transmission lines and associated structures and loss of habitat. Because of the high levels of concern regarding whooping cranes, the ability to evaluate the risk to whooping cranes at individual Project area is a critical component to understanding the environmental impacts of a proposed wind project. Here, Tetra Tech presents a method used to evaluate the likelihood of whooping cranes to occur at a Project area located in east-central North Dakota. This evaluation method incorporates the location of the Project area in the migration corridor, the presences of feeding and roosting sites, and the availability of habitat within the Project area compared to the surrounding landscape (Table 1). Tetra Tech expects whooping cranes to be more likely to occur over the life of a project area at projects with high scores. For the purposes of this report, the scores calculated for each parameter were totaled and the likelihood of occurrence for whooping cranes in the Project area was ranked accordingly: Low (0-4); Moderate (5-10); High (10+). This assessment tool is not intended to replace field surveys. However, given the low probability of detecting a whooping crane during field surveys thereby minimizing their utility to document presence or absence from a given area, this assessment tool was designed to take advantage of available data.

Table 1. Parameters used in the likelihood index calculation.

Parameter	Score	Justification
Location in the Migration Corridor (L)		
Within the 75-percent buffer	7.5	75% of all whooping crane observations occur within the 75-percent buffer
Between the 75-percent and 95-percent buffers	2.0	20% of all observations occur between 75-percent and 95-percent buffers
Outside the 95-percent buffer	0.5	5% of observations occurred outside the 95-percent buffer
Attractiveness on the Landscape (A)		
Ratio of wetlands per total acreage for Project Area / wetland per total acreage for 35-mile area not including Project Area	Actual ratio	Indicates if the Project Area is similar (=), less (<), or more (>) attractive than the surrounding landscape to migrating cranes searching for roosting habitat
Presence of Foraging and Roosting Habitat (W)		
Proportion of the Project that is a wetland-agricultural matrix	Actual Proportion	Indicates the proportion of the Project area that is favored by cranes for foraging and roosting habitat

6.1 Location of a Project Area in the Migration Corridor (L)

6.1.1 Biological Justification

The location of any potential wind project can influence the likelihood of whooping crane occurrence due to the well-defined migratory pattern of the cranes. The median location of all

crane observations was statistically derived and was used to describe the migration route from the breeding grounds to the wintering grounds (CWS and USFWS 2007). Buffers were then calculated based on the percentage of observations (Figure 3). For example, 75 percent of all observations occurred within the 75-percent buffer. If two sites are compared, whooping cranes are more likely to stop over at a site within the 75-percent buffer than at a site outside the 95-percent buffer.

6.1.2 Scoring

Tetra Tech developed scores for the location of a project based on the percent of observations within each buffer. If a project location fell within the 75-percent buffer, it was scored 7.5. If a project location fell between the 75-percent and 95-percent buffers, it was scored 2.0 because 20 percent of all observations occur between these buffers. If a project location fell outside of the 95-percent buffer, it was scored 0.5 because 5 percent of all observations occur outside the 95-percent buffer.

6.1.3 Assumptions

- The likelihood of whooping crane occurrence in the future will not deviate from the patterns observed through 2010 which is the most current available data.
- If a portion of a project area fell on the boundary of a buffer or in two buffers, the project area was assumed to be within the buffer closer to the middle of the migratory corridor.

6.2 Attractiveness on the Landscape (A)

6.2.1 Biological Justification

Wetlands are used by whooping cranes for feeding and roosting and the amount of wetlands within a given area compared to the surrounding landscape may influence whooping crane use of a site during migration. After whooping cranes have descended from migration flight altitudes, they may travel up to 35 miles in search of suitable roosting habitat (T. Stehn, pers. comm). Therefore, Tetra Tech determined if a project area contained a higher proportion of wetlands than was found within the 35-miles surrounding the project area to determine if the project area is more attractive than the surrounding area.

6.2.2 Scoring

Tetra Tech used GAP data for North American (Strong et al. 2005) in conjunction with National Wetlands Inventory (NWI) data (USFWS 2013) and National Land Cover Database data (NLCD; Fry et al. 2011) to determine the total acreage of wetlands within a project area and within 35-miles of the project area. The use of multiple data sources will help avoid the limitations of any one data source (e.g., Stahlecker 1992). Tetra Tech then calculated the proportion of the total acreage of the project area that was comprised of wetlands and the proportion of the total acreage of a 35-mile area around the project boundary that was wetlands (excluding the project area). Tetra Tech divided the proportion of the project area that was wetlands by the proportion of the 35-mile buffer that was wetlands to determine if the project area contained more wetlands

than the surrounding area. Tetra Tech used the ratio as the score in the likelihood index equation. If the ratio was greater than 1, the project area contained more wetlands and is considered more attractive than the surrounding 35-mile buffer. If the ratio was equal to 1, the project area contained a similar proportion of wetlands and is as attractive as the surrounding 35-mile buffer. If the ratio was less than 1, the project area contained less wetlands and is less attractive than the surrounding 35-mile buffer.

6.2.3 Assumptions

- The distribution of wetlands in the Geographic Information System (GIS) data is an accurate representation of the location of wetlands in the project area.
- 35-miles is an appropriate scale to examine whooping crane habitat use.

6.3 Presence of Foraging and Roosting Sites (W)

6.3.1 Biological Justification

Whooping cranes often make low altitude flights between roosting and foraging habitat and are thus at risk of collision with power lines and other structures (CWS and USFWS 2007; Stehn and Wassenich 2008; USFWS 2009). Austin and Richert (2001) found that agricultural crops, especially corn, sorghum, and winter wheat were the habitat most often contiguous to roosting areas and that most cranes traveled 0.62 miles from a roosting site to a foraging site. Therefore, wetlands located within 0.62 mile of agricultural crops form a wetland-habitat matrix that is often used by whooping cranes during migration (Austin and Richert 2001). Tetra Tech determined the proportion of any project area that was comprised of wetland-agricultural matrix. This matrix included water bodies of any type (hereafter wetlands) but restricted the analysis to wetlands greater than 1 acre to eliminate inclusion of unusable wetland (e.g., borrow pits). Tetra Tech limited the analysis to crop agriculture because it is most often used for foraging habitat. Crop agriculture was restricted to agriculture greater than 1 acre in the analysis because most observations of cranes occurred in agriculture greater than 1.0 acre (Austin and Richert 2001).

6.3.2 Scoring

To quantify the amount of roosting and foraging habitat in any project area, geographic information system (GIS) land cover data (GAP data) was obtained for the appropriate state (i.e. North Dakota). Water features and the spatial extent of waters were verified with NWI data (Fry et al. 2011). The GIS analysis was designed to calculate the total area of wetland-agricultural matrix, which may include other habitat types between patches of wetlands and agriculture. Thus, based on the size restrictions and spatial configuration, the total acres of wetland-agricultural matrix could be greater or less than the sum of the acres of wetland and agriculture. Tetra Tech calculated the proportion of a project area that was wetland-agricultural matrix by dividing the total acres of wetland-agricultural matrix by the total acres of the project area. Tetra Tech used the proportion as the score in the likelihood index; therefore, scores may range from 0 to 1.

6.3.3 Assumptions

- The optimal distance of foraging habitat from roosting habitat is 0.62 mile.
- Habitats not classified as wetlands or agriculture are of neutral value and do not influence the availability of wetlands or agriculture on the landscape.

6.4 Likelihood Index Formula (LI)

The likelihood index of whooping cranes occurring at a project area was calculated by evaluating the landscape features in and around the project area. Tetra Tech used the following formula to calculate the likelihood index:

$$LI_i = (L_i \times A_i) + W_i$$

Where L_i is the score of a project location in relation to the migration corridor, A_i is the attractiveness score, or the ratio of wetlands in a project area to the wetlands in the 35-mile area around the project area, H_i is the historical observation score, and W_i is the wetland-agricultural matrix score. The equation places the most weight on the project area location in the migration corridor because of the wide range of scores. Thus, a project area within the 75-percent corridor will tend to score higher than a project area within the 95-percent corridor unless the attractiveness score for the project area within the 75-percent corridor is low (e.g., <0.50) or the attractiveness score for the project area within the 95-percent corridor is high (>4.0), when the other values are equal. A project area located outside of the 95-percent corridor will tend to score low unless the attractiveness score is high because the location score is less than 1.0.

7.0 COURTENAY WIND ENERGY PROJECT ASSESSMENT AND SUMMARY

For the Courtenay Wind Farm, the likelihood index score was 1.47 for the current Project area (Table 2) implying low likelihood of occurrence. The Project area contains suitable habitat for whooping cranes in the form of suitable wetland-agriculture matrix habitat (85-percent of the Project area), making the Presence of Feeding and Roosting Sites (*W*) value 0.85 (Table 2 and Figure 4). The percentage of available wetlands within the Project area is slightly higher than the surrounding 35-mile buffer area, with a calculated Attractiveness on the Landscape (*A*) value of 1.23. Although the Project contains suitable habitat and is more attractive on the landscape, the Project area is located outside of the migration corridor; therefore, the Location (*L*) parameter value was 0.5. Thus, even though the habitat is suitable for cranes, it is unlikely that whooping cranes will be in the area. There were no recorded historical observations of whooping cranes documented within the proposed Project area and one observation documented within 10-miles of the proposed Project area (Figure 4). A total of 13 observations occurred within the 35-mile buffer around the proposed Project area (see Appendix). The majority of these observations occurred west of the James River. The whooping crane observations should be used for general inference regarding use of an area and cannot be used for micrositing features away from whooping crane sightings because some of the observations may lack precise locations and not all whooping crane observations are recorded. Additionally,

the absence of a sighting in a specific area should not be construed as a whooping crane having never occurred in that area.

Table 2. Likelihood index scores for the Courtenay Wind Energy Project.

Location in the Migration Corridor (*L*)	Attractiveness on the Landscape (*A*)	Presence of Foraging and Roosting Habitat (*W*)	Likelihood Index Score (*LI*)
0.5	1.23	0.85	1.47 (**Low**)

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9.0 APPENDIX

Whooping Crane Sightings in the Project area and 35-mile Buffer area.

Obs. #	Adults	Juvenile	Date	Season	County	Location Description
Project area						
None	-	-	-	-	-	-
35-mile Buffer area						
62B-2	2	0	10/04/1962	FALL	STUTSMAN	ELDRIDGE
71B-6	3	1	10/17/1971	FALL	BARNES	
84B-6	4	0	09/15/1984	FALL	STUTSMAN	3E CHASE LAKE NWR
97A-21	0	1	04/19/1997	SPRING	STUTSMAN	1W PINGREE
98A-27	6	0	04/21/1998	SPRING	STUTSMAN	3E,11N WOODWORTH
00B-7	1	0	10/08/2000	FALL	STUTSMAN	4S,1W KENSAL
05B-30	2	0	11/03/2005	FALL	WELLS	9S, 1E SYKESTON
06A-15	2	1	04/15/2006	SPRING	FOSTER	3N, 4W CARRINGTON
06B-01	4	0	09/12/2006	FALL	STUTSMAN	2E HWYS 281&44; 0.2 N, 1.75E EDMUNDS
07B-03	3	0	10/16/2007	FALL	STUTSMAN	5N WOODWORTH
09B-91	12	2	11/08/2009	FALL	STUTSMAN	7 E, 3 S OF PETTIBONE
10B-03	3	0	10/19/2010	FALL	BURLEIGH	1S, 1.7 W OF MCKENZIE
10B-50	5	0	11/03/2010	FALL	WELLS	8 W OF CARRINGTON
TOTAL	**47**	**5**				

Source: USFWS data (through fall 2010)

Tetra Tech personnel who prepared/reviewed this report:

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Senior Biologist Peer Review	Date
Kimberely Gorman	March 19, 2013
PM Review	Date
Kristina Dick	February 22, 2013
GIS Technician	Date

Kensal

Courtenay

Wimbledon

Spiritwood Lake

9

20

13th St Se

94th Ave Se

Ave

Cord 62

Figure 1	1:90,000 WGS84 Zone 14N	0 0.5 1 2 3 4 Miles

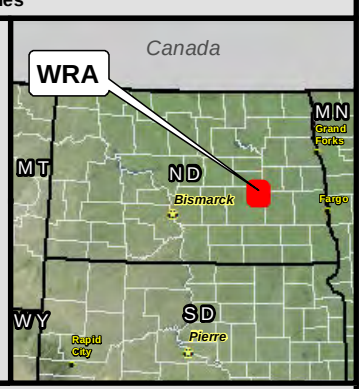
Geronimo Energy

Courtenay Wind Farm

Vicinity Map

Stutsman County, ND
March 19, 2013

Project Boundary
State Highway
Local Road
City
County Boundary



Data Sources Roads-ESRI; Project Infacstrucutre-Geronimo Energy

TETRA TECH

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Figure 2

1:8,100,000 WGS84 Zone 14N

0 25 50 100 150 200 Miles

Geronimo Energy

Courtenay Wind Farm

Whooping Crane Migration Corridor

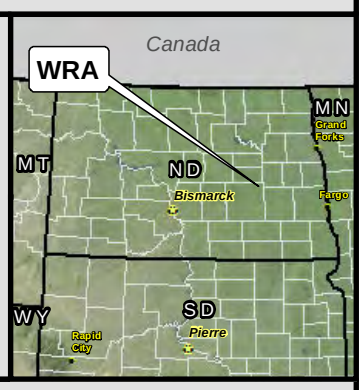
Stutsman County, ND
March 19, 2013

Whooping Crane Sighting
April 1942 - January 2011

Percentage of Sightings
- 75.08%
- 79.44%
- 85.04%
- 89.83%
- 94.83%

State Boundary

County Boundary



Data Sources Roads-ESRI; Project Infacstrucutre-FPL; USFWS-Whooping Crane Data

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North Dakota

Minnesota

South Dakota

Figure 3	1:1,250,000 WGS84 Zone 14N	0 5 10 20 30 40 Miles

Geronimo Energy

Courtenay Wind Farm

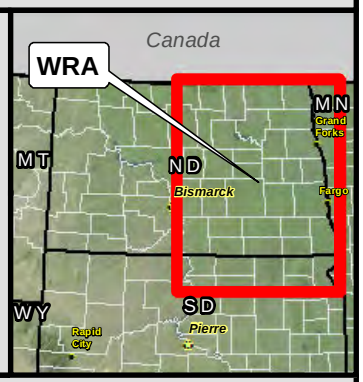
Whooping Crane Migration Corridor

Stutsman County, ND
March 19, 2013

Project Boundary
35-mile Buffer
Whooping Crane Sighting
April 1942 - January 2011

Percentage of Sightings
75.08%
79.44%
85.04%
89.83%
94.83%

State Boundary
County Boundary



Data Sources Roads-ESRI; Project Infacstrucutre-FPL; USFWS-Whooping Crane Data

TETRA TECH

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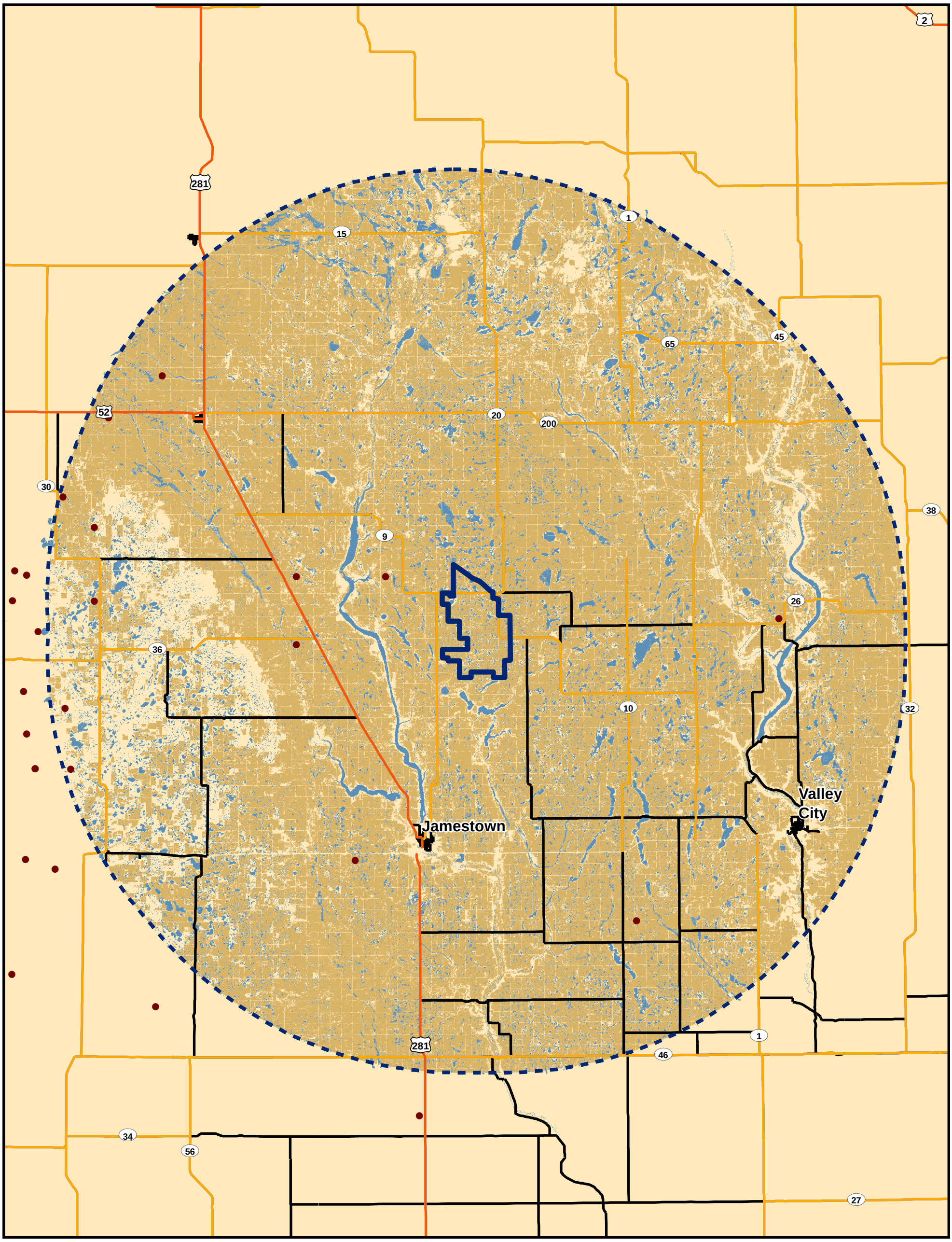


Figure 4

1:520,000 WGS84 Zone 14N

0 2.5 5 10 15 20 Miles

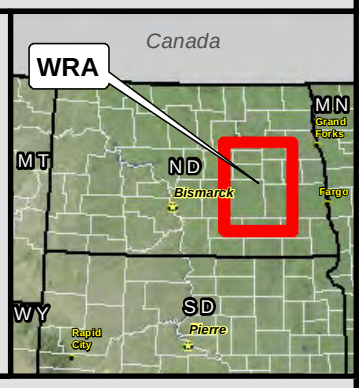
Geronimo Energy

Courtenay Wind Farm

Whooping Crane Habitat Map

Stutsman County, ND
March 19, 2013

- Project Boundary
- 35-mile Buffer
- Whooping Crane Sighting April 1942 - January 2011
- Wetland
- Wetland/Agricultural Matrix
- Federal Highway
- State Highway
- Local Road
- City



Data Sources Roads-ESRI; Project Infacstrucutre-FPL; USFWS-Whooping Crane Data; Wetland-NWI; Agricultural-NLCD 2006

TETRA TECH

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Tier 2 – Site Characterization Report

Courtenay Wind Farm

Stutsman County, North Dakota



Prepared for

GERONIMO ENERGY

COURTENAY WIND FARM
Stutsman County, ND

Prepared by

TETRA TECH

EXECUTIVE SUMMARY

Geronimo Energy (Geronimo) is proposing to develop the Courtenay Wind Farm project (the Project) in Stutsman County, North Dakota. The proposed site for the Courtenay Wind Farm is approximately 15 miles north of the Jamestown, North Dakota in northeast Stutsman County. The Project Area is approximately 24,200 acres.

Geronimo is committed to environmental due diligence and has tasked Tetra Tech with conducting a Tier 2 Site Characterization to assess the Project Area for potential impacts to wildlife according to Tier 2 of the recommendations of the United States Fish and Wildlife Service's (USFWS) Land Based Wind Energy Guidelines. Tier 2 entails broad characterization of one or more potential project sites.

Tetra Tech carried out Tier 2 analysis of the Project Area by thoroughly addressing questions recommended for consideration in the Guidelines. These questions were addressed using credible, publicly available information including published studies, technical reports, databases, and information from agencies, local conservation organizations, and/or local experts. In addition, a qualified Tetra Tech biologist conducted a reconnaissance-level site visit to evaluate current vegetation/habitat coverage and land management/use.

The primary issues identified in Tetra Tech's Tier 2 Site Characterization included the presence of wetlands within the Project Area and the potential for migration stopover and breeding habitat for avian species. Whooping crane stopover habitat may be present within the Project Area. Results of the whooping crane likelihood of occurrence assessment for the Project are pending and will be presented under separate cover. Although significant adverse impacts to species of concern are not anticipated, Geronimo is committed to environmental due diligence and has initiated Tier 3 avian and bat surveys of the Project Area.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1
1.0 INTRODUCTION 1
2.0 METHODS 1
3.0 RESULTS OF TIER 2 ANALYSIS 2
3.1 Agency Consultation 2
3.2 Land Use/Available Habitat 4
3.3 Rare and Unique Resources 5
3.4 Species of Habitat Fragmentation Concern 8
3.5 Avian and Bat Species 9
3.6 Ecologically Significant Areas 11
4.0 SUMMARY 12
4.1 Conclusions 15
5.0 REFERENCES 16

LIST OF TABLES

Table 1. NLCD data for the Project Area 4
Table 2: Items of concern within the Project Area as revealed by Tier 2 analysis 12

APPENDICES

Appendix A Figures
Figure 1: Site Vicinity
Figure 2: Project Location
Figure 3: NLCD Land Cover
Figure 4: Whooping Crane and Piping Plover
Appendix B Agency Consultation
Appendix C Photographic Documentation of Project Area

1.0 INTRODUCTION

Geronimo Energy (Geronimo) is proposing to develop the Courtenay Wind Farm project (Project) in Stutsman County, North Dakota. The proposed site for the Courtenay Wind Farm is approximately 15 miles north of the Jamestown, North Dakota in northeast Stutsman County (Appendix A; Figure 1). The area where Project facilities will be developed (including turbines, electrical collection lines, project substation, etc.) will hereafter be referred to as the Project Area. The Project Area is approximately 24,200 acres (Appendix A; Figure 2). This assessment also includes discussion of the proposed transmission line.

Geronimo is committed to environmental due diligence and has tasked Tetra Tech with conducting a Tier 2 Site Characterization to assess the Project Area for potential impacts to wildlife according to Tier 2 of the recommendations of the United States Fish and Wildlife Service's (USFWS) Land Based Wind Energy Guidelines (Guidelines) (USFWS 2012a). The Guidelines describe information typically needed to identify, assess, and monitor the potential adverse impacts of wind energy projects on wildlife and their habitat, especially migratory birds and bats. The information presented in the Guidelines is intended as a guide to the wind industry to make the best possible choices on the location, design, and operation of projects and to avoid or minimize the risks to wildlife and their habitats.

The Guidelines provide a tiered approach to assist in providing the appropriate types and amount of baseline information required for adequate review of a project and to ensure the amount of investigation is in proportion to the anticipated level of risk to wildlife and their habitats. Risk is defined in the Guidelines as the likelihood that adverse impacts will occur to individuals or populations of species as a result of wind energy development and operation. Tier 2 entails broad characterization of one or more potential project sites. Subsequent tiers refine and build upon issues raised and efforts undertaken at previous tiers. Based on the results of Tier 2 analysis, it may be necessary to collect empirical data in Tier 3 studies.

2.0 METHODS

At each tier of the Guidelines, potential issues associated with developing or operating a project are identified and questions are formulated to guide the decision process. Tetra Tech carried out its Tier 2 analysis of the Project by thoroughly addressing the following questions:

1. Are there known species of concern present on the proposed site, or is habitat (including designated critical habitat) present for these species?

2. Does the landscape contain areas where development is precluded by law or designated as sensitive according to scientifically credible information? Examples of designated areas include, but are not limited to: "areas of scientific importance;" "areas of significant value;" federally-designated critical habitat; high-priority conservation areas for Non-governmental organizations (NGOs); or other local, state, regional, federal, tribal, or international categorizations.

3. Are there plant communities of concern present or likely to be present at the site(s)?

4. Are there known critical areas of congregation of species of concern, including, but not limited to: maternity roosts, hibernacula, staging areas, winter ranges, nesting sites, migration stopovers or corridors, leks, or other areas of seasonal importance?

5. Using best available scientific information has the developer or relevant federal, state, tribal, and/or local agency identified the potential presence of a population of a species of habitat fragmentation concern?

6. Which species of birds and bats, especially those known to be at risk by wind energy facilities, are likely to use the proposed site based on an assessment of site attributes?

7. Is there a potential for significant adverse impacts to species of concern based on the answers to the questions above, and considering the design of the proposed project?

Questions suggested for Tier 2 were addressed using credible, publicly available information including published studies, technical reports, databases, and information from agencies, local conservation organizations, and/or local experts. In addition, a qualified Tetra Tech biologist conducted a reconnaissance level site visit of the Project Area and the proposed transmission line to evaluate current vegetation/habitat coverage and land management/use.

3.0 RESULTS OF TIER 2 ANALYSIS

3.1 Agency Consultation

3.1.1 USFWS

Geronimo contacted the USFWS Ecological Services office in Bismarck, North Dakota on October 28, 2010 to request environmental information in relation to the Project. In a March 18, 2011 response, the USFWS offered comments under the authority of the Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act (BGEPA), the Endangered Species Act (ESA), and the National Wildlife Refuge System Improvement Act of 1997. A copy of the USFWS response is included in Appendix B.

The USFWS recommended that Geronimo follow siting guidance available in the Draft Land-Based Wind Energy Guidelines. These interim guidelines were replaced in March 2012 by the Final Land-Based Wind Energy Guidelines, which provide the framework for this Tier 2 Site Characterization. The USFWS also recommended that Geronimo take a landscape-scale view of development and compare several potential alternative sites. Geronimo has since followed this recommendation by completing a Tier 1 Preliminary Site Evaluation in accordance with the Guidelines.

Specific to potential risks to avian and bat species, the USFWS suggested consultation of guidance materials available from the Avian Power Line Interaction Committee (APLIC), and Rural Utilities Service to avoid or reduce impacts to avian species. The USFWS also recommended that construction should be scheduled, to the extent practicable, for late summer or fall/early winter to not to disrupt

waterfowl or other wildlife during the breeding season. The USFWS recommended that an Avian and Bat Protection Plan (ABPP) be developed for the Project that includes a statement of company policy confirming the company's commitment to work cooperatively towards the protection of migratory birds and bats; identification of the process under which the company will obtain and comply with all necessary permits; discussion of the company's plan for monitoring and reporting all incidents of avian or bat injury or mortality; a commitment to make all reasonable efforts to construct and modify infrastructure to reduce the incidence of avian and bat mortality; a mechanism to review existing practices, ensuring quality control and allowing for adaptive management; and a plan for providing adequate training for all appropriate utility personnel. The Guidelines have since introduced the concept of Bird and Bat Conservation Strategies (BBCS), a distinct plan specific to wind energy projects. A BBCS is prepared by the developer and is intended to provide analysis, reasoning, and studies that support the conclusions reached in each tier of the Guidelines. A BBCS will be developed over time as studies and analyses are completed for each tier.

To avoid unintentional take of bald or golden eagles, the USFWS recommended that a buffer of at least ½ mile be maintained for all bald and golden eagle nests. In order to identify eagle nests, the USFWS recommended that Geronimo survey the Project Area in the spring, March 1-May 15, prior to leaf-out when nests are more visible.

The USFWS included a list of federal threatened, endangered, and candidate species and designated critical habitat found in Stutsman County, North Dakota. Species known to occur within Stutsman County include: whooping crane (endangered), gray wolf (endangered), piping plover (threatened), Sprague's pipit (candidate), and Dakota skipper (candidate). Additionally, piping plover critical habitat is present within Stutsman County. These species and critical habitat are discussed further in Section 3.3.

The USFWS stated that their property interests for the area may include Waterfowl Production Areas (WPAs), wetland easements, and grassland easements. The USFWS recommended that Geronimo coordinate with the Bismarck office prior to final site selection to obtain easement information and maps. If USFWS easements are present within the Project Area, cultural resource compliance requires coordination with the Zone Archaeologist early in the National Environmental Policy Act (NEPA) process. In response, Tetra Tech obtained a map of FWS easements and found that there were some wetland easements in the project area. No grassland easements or WPAs were found in the Project Area.

Finally, the USFWS recommended avoidance of high quality habitat, including native prairie, wetlands, wooded draws, and riparian forests. NWI maps indicated that wetlands are located within the Project Area. The USFWS provided a list of best management practices to help minimize impacts to wildlife and existing habitat in the area. To minimize risk to wildlife and habitat, the USFWS also recommended detailed agency coordination prior to monitoring activities and pre-construction surveys.

3.1.2 North Dakota Parks and Recreation Department

Tetra Tech requested a review of the Project Area from the North Dakota Parks and Recreation Department (NDPR) on January 28, 2013. A review of the transmission line was requested under separate cover on January 29, 2013. As a part of the review, Tetra Tech requested that the NDPR query

the Natural Heritage Inventory (NHI) to determine if any current or historical plant or animal species of concern or other significant ecological communities are known to occur within one mile of the Project Area. Tetra Tech received the results of the NHI query in the form of GIS shapefiles on January 31, 2013 (see Section 3.3.2 for a discussion of the NHI query results). Letters summarizing the results of the NDPR's environmental review for the Project Area and transmission line route were received from Ms. Jesse Hanson, Manager of the Planning and Natural Resources Division, on February 8, 2013. The NDPR recommended that pre and post construction avian and bat monitoring studies be conducted for the Project and that all efforts be made to ensure that critical habitats not be disturbed in the Project Area to help secure rare species conservation in North Dakota. The NDPR also recommended that any impacted areas be revegetated with species native to the Project Area. Copies of the NDPR review letters are included in Appendix B.

3.1.3 North Dakota Game and Fish Department

Tetra Tech requested a review of the Project Area from the North Dakota Game and Fish Department (NDGF) on January 28, 2013. A review of the transmission line was requested under separate cover. Responses have not been received from the NDFG as of the date of this report.

3.2 Land Use/Available Habitat

The Project Area is approximately 24,200 acres (Appendix A; Figure 2) and is located in the Northern Glaciated Plains ecoregion. Soil and weather conditions in this region promote a transition zone between short and tallgrass prairie species. Although historically the ecoregion was dominated by grasslands, it has been primarily converted to farmland. Drift plains, large glacial lake basins, and shallow river valleys, with level to undulating surfaces and deep soils, provide the basis for crop agriculture. Where the glaciers left heavy deposits of rock, gravel, and sand, grasslands remained generally more intact and have been used primarily for grazing land for livestock. The geologic youth of the ecoregion has left an immature drainage system, and the ecoregion is dotted with substantial numbers of wetland depressions, ranging in size and permanence. There are also sub-regional concentrations of glacial formed permanent lakes. Agriculture, grasslands, wetlands, and water from the general mosaic of land cover for the ecoregion (USGS 2013).

According to National Land Cover Dataset (NLCD), the Project Area is dominated by cultivated crops (Appendix A; Figure 3). Pasture/hay land, emergent herbaceous wetlands, open water, and developed, open space represent smaller proportions of the total Project Area (Table 1) (Fry et al. 2011).

Table 1. NLCD Land Cover of the Project Area

NLCD Class	Acres	Percentage
Cultivated Crops	16,034.4	66.2%
Pasture/Hay	2,723.3	11.3%
Emergent Herbaceous Wetlands	2,126.7	8.8%
Open Water	1,719.7	7.1%
Developed, Open Space	1,034.8	4.3%

NLCD Class	Acres	Percentage
Grassland/Herbaceous	475.2	2.0%
Developed, Low Intensity	40.2	0.2%
Deciduous Forest	35.9	0.1%
Woody Wetlands	14.7	0.1%
Evergreen Forest	1.0	0.0%

A Tetra Tech biologist visited the Project Area and the proposed transmission line on November 1 and 2, 2012, to assess habitat coverage and land cover. The biologist observed the Project Area from the public right-of-way and did not access private lands. The land cover of the Project Area was consistent with the land cover described by the NLCD and for the ecoregion as a whole and was observed to consist of a mix of agricultural lands used for grain crops, wetlands, developed land (farmsteads), and small tracts of grasslands. A mix of deciduous and coniferous trees planted for windbreaks surround most farmsteads within the Project Area. The topography in the vicinity of the Project is generally flat to gently rolling and the vegetation cover is uniformly low. Identification of native prairie within the Project Area was not feasible due to the timing of the site visit outside of the normal growing season. Representative photographs of the Project Area and the proposed transmission line route are included in Appendix C.

3.3 Rare and Unique Resources

3.3.1 Federal Listed Species

In their March 2011 review of the Project, the USFWS included a list of federally threatened, endangered, and candidate species and designated critical habitat found in Stutsman County, North Dakota. Species known to occur within Stutsman County includes: whooping crane (endangered), piping plover (threatened), Sprague's pipit (candidate), and Dakota skipper (candidate). Additionally, piping plover critical habitat is present within Stutsman County. Tetra Tech also consulted February 2012 county occurrence information available on the USFWS North Dakota Field Office website (USFWS 2012b). In addition to threatened, endangered, and candidate species, the bald eagle is protected by the Bald and Golden Eagle Protection Act (BGEPA) and the majority of avian species potentially occurring within the Project Area are protected by the Migratory Bird Treaty Act (MBTA).

3.3.1.1 Whooping Crane

The whooping crane (*Grus americana*), a federally endangered species, is a regular spring and fall migrant in North Dakota. Due to intensive management, the wild migratory population (referred to as the Aransas-Wood Buffalo population) has increased from 15 birds in 1941 to 253 birds as of the start of fall migration in 2012 (WCCA 2012). There are several factors which may threaten the whooping crane. These include human settlement and development, habitat loss, shooting, disturbance, disease, and predation. Threats to the whooping crane that are related to wind power development include collision with power lines, fences, and other structures, and loss and degradation of stopover and wintering habitat (CWS and USFWS 2007; USFWS 2009).

Areas characterized by wetland mosaics appear to provide the most suitable migration stopover habitat for whooping cranes (CWS and USFWS 2007). Palustrine wetlands (freshwater wetlands characterized by emergent vegetation) and riverine wetlands (wetlands along a river) are most often used as roosting sites, but individuals have also been found roosting at lacustrine wetlands (wetlands around a lake) (Howe 1989; Austin and Richert 2001). The size of wetlands used by whooping cranes for roosting habitat during spring and fall range greatly in size, from less than 0.4 hectare (ha) to over 500 ha (1 to 1,200 acres) (Howe 1989; Austin and Richert 2001; CWS and USFWS 2007). Cranes generally restrict their usage of wetlands to areas where the water depth is less than 2 feet regardless of overall depth (Austin and Richert 2001).

Roosting sites are usually in close proximity to suitable feeding sites (Johns et al.1997; USFWS 2009), and foraging sites most commonly occur on non-wetland (upland sites) (Austin and Richert 2001). Whooping cranes have been most frequently observed foraging on row-crop stubble (corn, soybean, sunflower, and mile stubble) in spring and green crops (alfalfa, green rye, winter wheat, barley, and spring wheat), small-grain stubble (oat, barley, wheat, and rye stubble), and row-crop stubble in fall (Austin and Richert 2001). Wetlands are overall less commonly used for foraging sites; however, they may be more commonly used for forage sites by families (CWS and USFWS 2007). Palustrine wetlands are used most often when whooping cranes forage in wetlands, but lacustrine and riverine wetlands have also been used as feeding sites.

In North Dakota, whooping cranes have the potential to occur anywhere suitable feeding and roosting habitat is found; however, 94 percent of all documented whooping crane occurrences have been within a 200-mile corridor adjacent to the Missouri River (CWS and USFWS 2007). The Project Area is located on the eastern edge of the whooping crane migration corridor. According to the Whooping Crane Tracking Project Database, there have been no records of whooping crane sightings within the Project Area, eight individuals (seven adults and one juvenile) have been observed within 20 miles of the Project Area between 1962 and 2010. Users of the Database are urged, however, to consider that absence of documented whooping crane use of a given area in the Central Flyway does not mean that whooping cranes do not use that area (CWCTP 2010). Based on the observations made during the site visit, suitable roosting and foraging habitat is present within the Project Area. A whooping crane likelihood of occurrence assessment is being conducted for the Project Area and the results of this assessment will be presented under separate cover.

3.3.1.2 Piping Plover

The piping plover (*Charadrius melodus*), a federally threatened species, is a small migratory member of the shorebird family. Reasons for decline of the piping plover include habitat loss and nest depredation in the wetlands. The main reason for decline of the species along the Missouri River is habitat loss due to water development projects (e.g., Fort Peck Dam, Garrison Dam, and Oahe Dam) and loss of wetlands due to agriculture and other developments. As with most migratory birds, piping plovers could collide with power lines and other structures while in migration.

Breeding individuals in the Great Plains population nest along the shores of alkali wetlands and on riverine shores and sandbars, preferably in areas with minimal vegetation (USFWS 1988). Plovers avoid

dense vegetation. Nearly all natural lakes used by plovers in North Dakota are alkaline in nature and have salt-encrusted, white beaches that are generally are 10-40 yards wide. In North Dakota, this habitat is found on the Missouri and Yellowstone Rivers (USFWS 2012c). The Project Area is located within the range of the piping plover and this species has been recorded in Stutsman County and critical habitat for the species is located at the Arrowwood National Wildlife Refuge approximately 5.5 miles west of the Project Area (Appendix A; Figure 4).

During the site visit, the majority of the wetlands observed within the Project Area were surrounded by dense emergent vegetation and would not provide adequate piping plover breeding habitat. Several wetlands observed from the public road right-of-way were observed to have lowered water levels, resulting in narrow mud beaches with some salt accumulation. These wetlands lack the beach width and substrate associated with high quality piping plover breeding habitat.

3.3.1.3 Sprague's Pipit

The Sprague's pipit (*Anthus spraguii*) is a small songbird that is endemic to the Northern Great Plains. This species was recently listed as a candidate species under the ESA. During the breeding season (late April to early September), Sprague's pipits are more likely to be found in large (> 358 acres) patches of native prairie although they will utilize areas with non-native grasses if the vegetation structure is suitable (e.g., dense cover) and also will breed in lightly grazed rangeland. They are rarely observed in cropland or land in the Conservation Reserve Program (CRP). The loss and fragmentation of native prairie habitat is listed as the primary cause of Sprague's pipit population declines (USFWS 2010).

Based on observations made during the site visit and land cover data, the Project Area is dominated by cultivated land, with some small grassland areas. These areas appear to be less than 40 acres in size and are unlikely to provide suitable Sprague's pipit habitat. According to the NLCD data, the grassland areas within the Project Area range from less than 10 acres to 24 acres (Fry et al. 2011).

3.3.1.4 Dakota Skipper

High quality native prairie serves as vital habitat for the Dakota skipper (*Hesperia dacotae*), a federal candidate species. The Dakota skipper is classified as a candidate species because, although its historic range once consisted of vast unbroken native prairies in north-central United States and south-central Canada, its current range is now limited to scattered remnants of high quality native prairies in Minnesota, North and South Dakota, and southern Manitoba (USFWS 2012d). The Dakota skipper population has declined due to sensitivity to disturbances, such as grazing and fire, and the loss of native prairie habitat.

Based on observations made during the site visit and land cover data, the Project Area is dominated by cultivated land, with some small grassland areas that could potentially provide Dakota skipper habitat.

3.3.1.5 Bald Eagle

Although no longer protected under the federal Endangered Species Act (ESA), the bald eagle (*Haliaeetus leucocephalus*) is still protected by the BGEPA and the MBTA. In 2009, North Dakota Game and Fish Department biologists estimated that 66 nests were occupied by bald eagles, and bald

eagle nests were reported in 29 of 53 counties within the state. Additionally, bald eagle nests have been recorded in single trees or shelterbelts surrounded by cropland (Johnson 2010). Typically, bald eagles prefer forested habitats near bodies of water (USGS 2013). Although a formal nest survey has yet to be completed for the Project, no bald eagle nests were observed within the Project Area during the November 2012 site visit.

3.3.2 State Listed Species

At the state level, North Dakota does not have a list defined by statute for threatened or endangered species comparable to the federal ESA. North Dakota has instead identified 100 Species of Conservation Priority under the North Dakota Comprehensive Wildlife Conservation Strategy. This list includes 45 avian species, 2 amphibian species, 9 reptile species, 15 mammal species, 22 fish species, and 7 freshwater mussel species. The designation of Species of Conservation Priority describes a species identified as in decline at the national, regional, or state level, or a species whose population status is not well known, but is thought to be in decline in North Dakota (Hagen et al. 2005). Species of Conservation Priority receive special attention from state agencies, but do not require take permits or have other regulatory implications. All of the federally listed species discussed above, with the exception of Dakota skipper, are also Species of Conservation Priority.

Tetra Tech received the results of the NHI query in the form of GIS shapefiles on January 31, 2013. Only two records of Species of Conservation Priority exist within a one-mile radius of the Project Area: common loon (observed in 1961) and pugnose shiner (observed in 1964). Both species were recorded at Spiritwood Lake, which is located to the east of the proposed transmission line route. The common loon occurs at freshwater lakes and rivers and may use the larger wetlands present within the Project Area. The pugnose shiner (a minnow) occurs in clear, moderately flowing waters with aquatic vegetation (Dirk 2012). The pugnose shiner is unlikely to occur within the Project Area. The lack of NHI data for the Project Area cannot be construed to mean that no significant features are present. The absence of data may indicate that the Project Area has not been surveyed, rather than confirm that the area lacks natural heritage resources.

The mosaic of wetlands present within the Project Area likely provides migration stopover and breeding habitat for waterfowl. Several waterfowl and shorebird species are considered Species of Conservation Priority by the NDFG and may occur within the Project Area. Other Species of Conservation Priority that may occur within the Project Area are those that have adapted to use disturbed habitats like the row crop fields and shelterbelts present within the Project Area.

3.4 Species of Habitat Fragmentation Concern

The USFWS North Dakota Ecological Services Field Office has identified eleven Species of Habitat Fragmentation Concern for the state: Baird's sparrow (*Ammodramus bairdii*), bobolink (*Dolichonyx oryzivorus*), chestnut-collared longspur (*Calcarius ornatus*), grasshopper sparrow (*Ammodramus savannarum*), greater prairie chicken (*Tympanuchus cupido*), greater sage grouse (*Centrocercus urophasianus*), northern harrier (*Circus cyaneus*), sedge wren (*Cistothorus platensis*), sharp-tailed grouse (*Tympanuchus phasianellus*), Sprague's pipit, and upland sandpiper (*Bartramia longicauda*) (USFWS

2012e). With the exception of the greater sage-grouse (range does not include Stutsman County) the Species of Habitat Fragmentation Concern are associated with grassland habitats or wetland habitats. According to the NLCD data, the grassland areas within the Project Area range from less than 10 acres to 24 acres (Fry et al. 2011). No large tracts of grasslands were observed within the Project Area during the November 2012 site visit. Several small areas of grassland were observed within the Project Area; however, identification of native prairie was not possible due to the timing of the site visit outside of the normal growing season.

The Project Area was observed to consist of a mosaic of wetlands and farmland. Species of Habitat Fragmentation Concern likely to occur within the Project Area include those species, such as northern harrier and sedge wren, which are known to use a mix of these habitat types. Geronimo has initiated Tier 3 avian surveys within the Project Area to characterize avian use of the Project Area. The results of the Tier 3 surveys will be presented under separate cover.

3.5 Avian and Bat Species

3.4.1 Avian Species

North Dakota has 365 documented bird species (Faanes and Stewart 1982) and is situated within the Central Flyway, one of the main bird migratory routes. Most birds that move along the Central Flyway travel from Canada through the central states, eventually reaching the tropics of South America via the Gulf of Mexico (USFWS 2013). The Project Area also lies within North American Bird Conservation Region (BCR) 11 (Prairie Potholes). According to the North American Bird Conservation Initiative (NABCI), this BCR is the most important waterfowl producing region on the North American continent despite extensive wetland drainage and tillage of native grasslands. The region comprises the core of the breeding range of most dabbling duck and several diving duck species and provides critical breeding and migration habitat for over 200 other birds (American Bird Conservancy 2013).

Birds have been identified as a group particularly at risk at wind generation facilities because of the potential for collisions with turbines and power lines (Drewitt and Langston 2006, Arnett et al. 2007). Early wind generation facilities had high levels of avian mortality and raptors were found to be particularly at risk (Barclay et al. 2007). Studies conducted at newer wind generation facilities have shown that high levels of collision mortality do not routinely occur, partially due to improved turbine design (Drewitt and Langston 2006; National Wind Coordinating Collaborative [NWCC] 2001). However, several factors such as abundance, composition, presence of migration corridors, landscape features, and prey abundance can still contribute to avian mortality at wind farm facilities.

In addition to collision mortality, birds may also be at risk of displacement due to habitat loss or change associated with the presence of the facility structures. A decrease in songbird abundance closer to turbines has been demonstrated in two studies, but the causal mechanisms have not been investigated (Leddy 1999 and Johnson et al. 2000). Research at two sites in North and South Dakota (Shaffer and Johnson 2008) suggests that certain grassland songbird species (2 of 4 studied) may avoid turbines by as much as 200 m, but these results have not been finalized nor verified at additional sites. None of these studies have addressed whether these avoidance effects are temporary (i.e., the birds may habituate to the

presence of turbines over time) or permanent. Pearce-Higgins et al. (2012) found little evidence for a post-construction decline for ten species of birds at 18 wind projects in upland habitats in the UK based on data from 1 to 10 years post-construction (more than half of the data was between 1 and 3 years post-construction). However, disturbance related effects were detected during construction.

During the November 2012 site visit, the land cover of the Project Area and proposed transmission line route was consistent with the land cover described for the ecoregion as a whole and was observed to consist of a mix of agricultural lands used for grain crops, wetlands, developed land (farmsteads), and small tracts of grasslands. Avian species expected to use the Project Area are those associated with the habitat types observed. Geronimo has initiated Tier 3 avian surveys at the Project Area to characterize avian use of the Project Area. The results of the Tier 3 surveys will be presented under separate cover.

3.4.2 Bat Species

Bat collision mortality at wind farms is a widespread phenomenon, often exceeding avian collision mortality (Kunz et al. 2007). Of the 46 species of bats in North America, 11 species have been identified among fatalities at wind farms in the United States (Arnett et al. 2008). Recent research has demonstrated that tree and tree-crevasse roosting migratory bats (Lasiurine) have been the species predominantly found during post-construction mortality studies at operational wind farms in North America (Arnett et al. 2008). Results from these mortality studies indicate that the species most commonly encountered during ground searches are: hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), and eastern red bat (*Lasiurus borealis*) (Kunz et. al 2007, Arnett et al. 2008).

Of the 46 bat species in the United States, 10 occur in North Dakota (ASM 2007); three of these are listed by the NDGF as Species of Conservation Priority: western small-footed myotis (*Myotis ciliolabrum*), long-eared myotis (*M. evotis*), and long-legged myotis (*M. volans*) (Hagen et al. 2005). Western small-footed myotis is associated with rocky habitats, dissected breaks and badlands, ridges, cliffs, or major outcroppings. Long-eared myotis is associated with wooded areas, principally coniferous or oak forests, near rocky bluffs or cliffs. Long-legged myotis is associated with open forested lands and badlands (Dirk 2012). Based on observations made during the November 2012 site visit, The Project Area likely does not contain suitable habitat for these three species.

Additionally, two bat species (little brown bat [*Myotis lucifugus*] and northern long-eared bat [*Myotis septentrionalis*]) that are likely to occur in Stutsman County are under review as candidates for listing under the federal Endangered Species Act (Matteson 2010, Kunz and Reichard 2011). Both species are associated with forested habitats and are unlikely to occur within the Project Area (BCI 2013).

Overall, due to the low number of trees or other structures in the Project Area available for roosting habitat, bat use of the Project Area is expected to be low.

3.6 Ecologically Significant Areas

Public Lands

One parcel of Private Land Open to Sportsmen (PLOTS) land is present within the Project Area (Figure 2). The Project Area does not contain any Wildlife Management Areas (WMAs), Waterfowl Production Areas (WPAs), or other public lands. The NHI query for the Project Area returned no records of significant ecological communities within the Project Area or vicinity. Information regarding locations of Conservation Reserve Program land was not requested as a part of this assessment.

Conservation PLOTS land is land that is open to hunting through agreements between the NDFG and private landowners. Conservation PLOTS may be enrolled in other programs, such as CRP, Habitat Plot Program, or Wetlands Reserve Program (WRP). The PLOTS parcel that is present within the Project Area is enrolled in the Habitat Plot Program, which entails multi-year rental contracts to protect, enhance, and create habitat and improve public access. Six PLOTS parcels are also located outside the Project Area boundary, but within one mile of the Project Area (Appendix A; Figure 2).

Six WPAs are located outside the Project Area boundary, but within one mile of the Project Area (Appendix A; Figure 2). These include: Siebert, Horton, Walsh, Durham, Nutt, and Blue Lake WPAs. WPAs are part of the USFWS's National Wildlife Refuge System and are either acquired as public land, or protected through perpetual easement. WPAs provide habitat for a variety of waterfowl, shorebirds, grassland birds, plants, insects, and other wildlife. They also help prevent erosion, clean and protect groundwater, and reduce flooding. WPAs owned by the USFWS also provide opportunities for public access and wildlife-dependent recreation such as hunting, wildlife viewing, and photography (USFWS 2012f).

The Edward M. Brigham III Alkali Lake Sanctuary is located within one mile of the proposed transmission line route (Appendix A; Figure 2). This sanctuary is 2,300-acres in size and consists of a mosaic of interspersed grasslands and wetlands. The sanctuary grasslands encircle 700-acre Alkali Lake, which provides feeding grounds for American white pelicans and a diversity of water and shorebirds (Audubon 2013).

4.0 SUMMARY

Using credible, publicly available information as well as information gathered during a reconnaissance level site visit, Tetra Tech was able to answer the suggested Tier 2 questions. Table 3 highlights items of concern raised by these questions.

Table 2: Items of concern within the Project Area as revealed by Tier 2 analysis

Item of Concern	Results of Tier 2 Analysis	Details
Are known species of concern present on the proposed site, or is habitat (including designated critical habitat) present for these species?	Yes	• Bald eagles (protected by BGEPA) were observed within the Project Area (see Section 3.3.1.5). • Whooping crane stopover habitat may be present within the Project Area. Results of the likelihood of occurrence assessment for the Project are pending (see Section 3.3.1.1). • Piping plover, Sprague's pipit, and Dakota skipper are less likely to occur within the Project Area due to habitat availability (see Sections 3.3.1.2, 3.3.1.3, and 3.3.1.4). • North Dakota does not have a list defined by statute for threatened or endangered species comparable to the federal ESA. Species of Conservation Priority defined by the North Dakota Comprehensive Wildlife Conservation Strategy. A NHI query of the Project Area returned two records of Species of Conservation Priority within one mile of the Project Area: common loon and pugnose shiner. The pugnose shiner is unlikely to occur within the Project Area. Larger wetlands within the Project Area may provide common loon habitat (see Section 3.3.2). • All federal listed species potentially occurring in the Project Area are also Species of Conservation Priority.
Does the Project Area contain areas where development is precluded by law or designated as sensitive?	Yes	• The Project Area contains one PLOTS parcel (see Section 3.6).

Item of Concern	Results of Tier 2 Analysis	Details
Are plant communities of concern present of likely to present?	No	• Based on information from the site visit and land cover data, the Project Area is dominated by agricultural land. Small areas of grassland were observed; however, identification of native prairie was not possible due to the timing of the site visit outside the normal growing season (see Section 3.2). • The NHI query found no records of plant species of concern or significant ecological communities for the Project Area or vicinity (see Section 3.3.2).
Are there known critical areas of congregation of species of concern, including but not limited to: maternity roosts, hibernacula, staging areas, winter ranges, nesting sites, migration stopovers or corridors, leks, or other areas of seasonal importance?	Yes	• Whooping crane stopover habitat may be present within the Project Area. Results of the likelihood of occurrence assessment for the Project are pending (see Section 3.3.1.1). • The mosaic of wetlands present within the Project Area likely provides migration stopover and breeding habitat for waterfowl. Several waterfowl and shorebird species are considered Species of Conservation Priority by the NDFG and may occur within the Project Area (see Section 3.3.2).
Using best available scientific information has the developer or relevant federal, state, tribal, and/or local agency identified the potential presence of a population of a species of habitat fragmentation concern.	No	• The USFWS North Dakota Ecological Services Field Office has identified eleven Species of Habitat Fragmentation Concern for the state. These species were identified after the March 18, 2011 USFWS review of the Project and as such, were not included in the review. • The Project Area was observed to consist of a mosaic of wetlands and farmland. Species of Habitat Fragmentation Concern likely to occur within the Project Area include those species, such as northern harrier and sedge wren, which are known to use a mix of these habitat types (see Section 3.6).

Item of Concern	Results of Tier 2 Analysis	Details
Which species of birds, especially those known to be at risk by wind energy facilities, are likely to use the Project Area?	--	• Avian species expected to use the Project Area are those associated with the habitat types observed (farmland, wetlands, and small tracts of grassland). Geronimo has initiated Tier 3 avian surveys at the Project Area to characterize avian use of the Project Area. The results of the Tier 3 surveys will be presented under separate cover (see Section 3.4.1). • Overall, due to the low number of trees or other structures in the Project Area available for roosting habitat, bat use of the Project Area is expected to be low. Geronimo plans to conduct Tier 3 bat surveys of the Project Area in 2013 to further characterize bat use of the Project Area (see Section 3.4.2).
Is there a potential for significant adverse impacts to species of concern based on the answers to the questions above, and considering the design of the proposed project?	No	• Although significant adverse impacts to species of concern are not anticipated, Geronimo is committed to environmental due diligence and has initiated Tier 3 avian and bat surveys of the Project Area.

4.1 Conclusion and Recommendation

The primary concern raised in Tetra Tech's Tier 2 Site Characterization included the presence of wetlands within the Project Area and the potential for migration stopover and breeding habitat for avian species. Whooping crane stopover habitat may be present within the Project Area. Results of the likelihood of occurrence assessment for the Project are pending and will be presented under separate cover. Although significant adverse impacts to species of concern are not anticipated, Geronimo is committed to environmental due diligence and has initiated Tier 3 surveys of the Project Area.

Based on the Tier 2 assessment the following surveys are recommended to be included in the Tier 3 assessment: wetland and native prairie surveys of the Project disturbance area; stick nest surveys of the Project Area and buffer; and avian point count surveys, crane surveys, and bat acoustic surveys of the Project Area.

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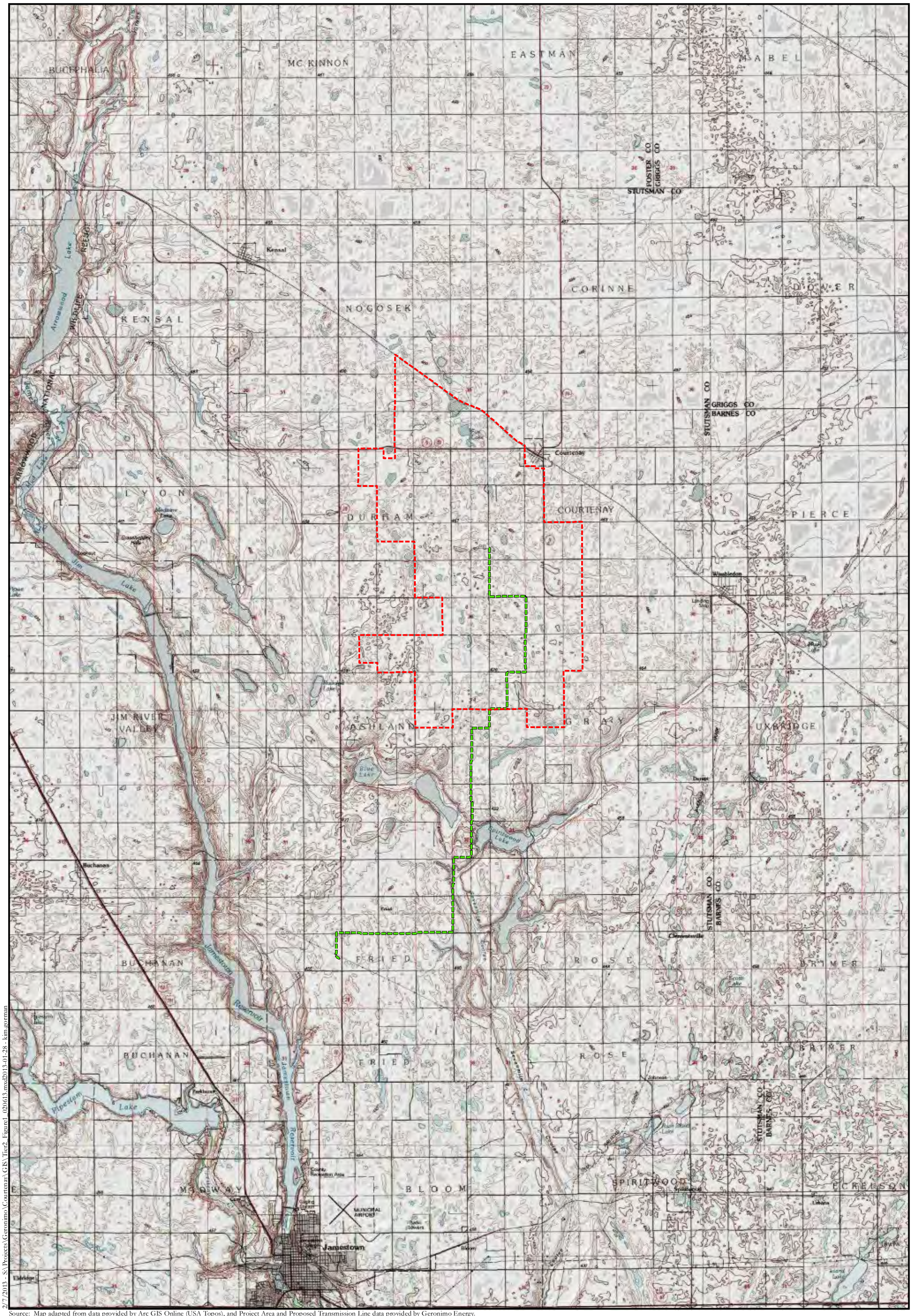
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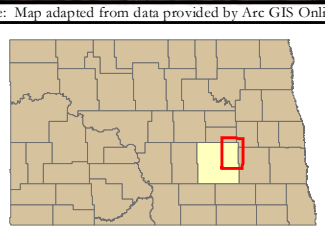
APPENDIX A

Figures



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Source: Map adapted from data provided by Arc GIS Online (USA Topos), and Project Area and Proposed Transmission Line data provided by Geronimo Energy.



Proposed Transmission Line

Project Area

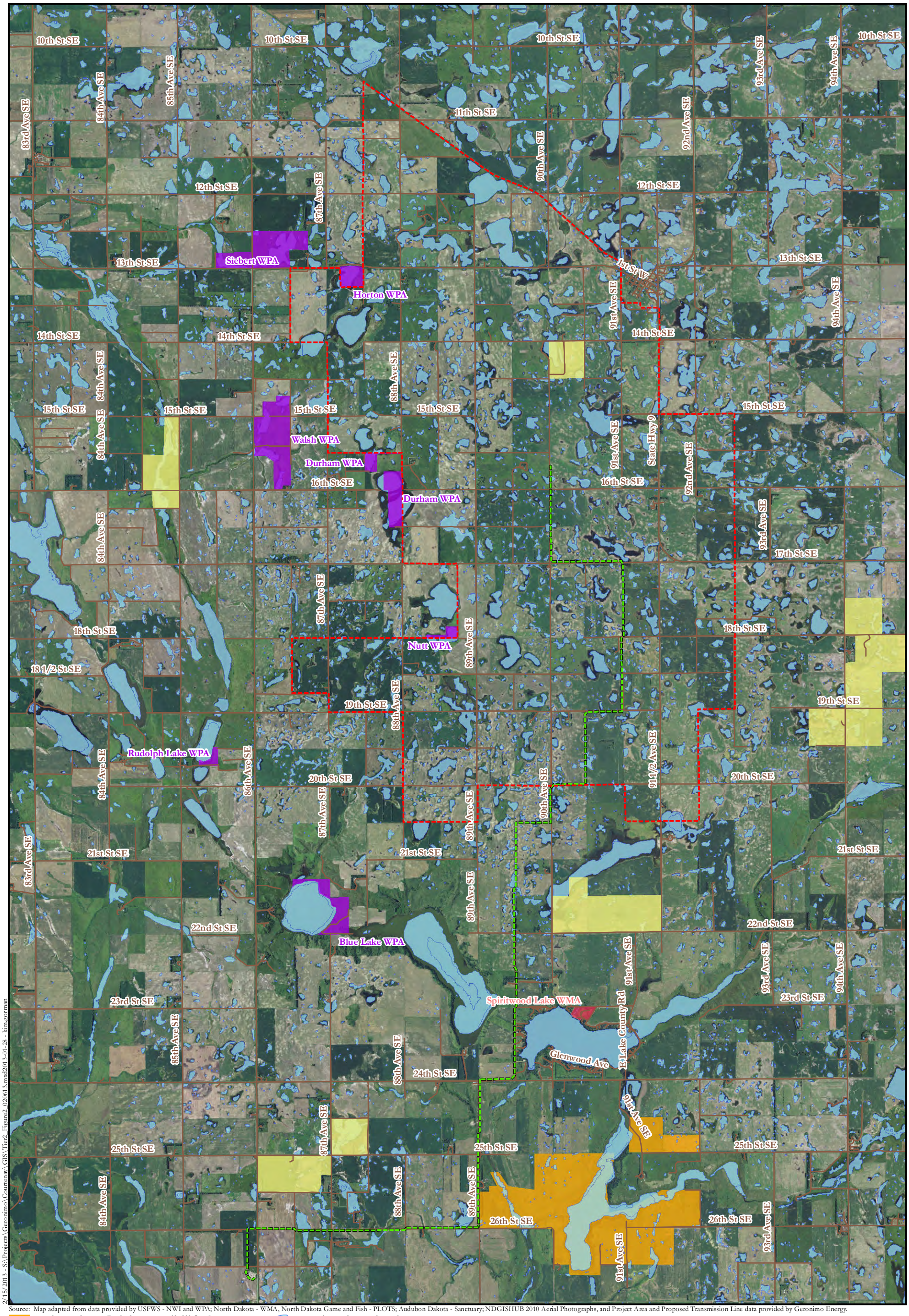
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Figure 1 - Site Vicinity
Courtenay Wind Farm Project
Stutsman County, North Dakota

COURTENAY WIND FARM
Stutsman County, ND

TETRA TECH



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Source: Map adapted from data provided by USFWS - NWI and WPA; North Dakota - WMA, North Dakota Game and Fish - PLOTS; Audubon Dakota - Sanctuary; NDGISHUB 2010 Aerial Photographs, and Project Area and Proposed Transmission Line data provided by Geronimo Energy.

- Edward M. Brigham Wildlife Sanctuary
- Wildlife Management Area
- Conservation PLOTS
- Waterfowl Production Area (WPA)
- National Wildlife Refuge
- National Wetland Inventory
- Project Area
- Proposed Transmission Line
- Road

0 1 2 3 Miles N

Figure 2 - Project Location
Courtenay Wind Farm Project
Stutsman County, North Dakota

COURTENAY WIND FARM
Stutsman County, ND

TETRA TECH

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Source: Map adapted from data provided by MRLC - NLCD (2006) and Project Area and Proposed Transmission Line data provided by Geronimo Energy.

- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Deciduous Forest
- Evergreen Forest
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands
- Proposed Transmission Line
- Project Area

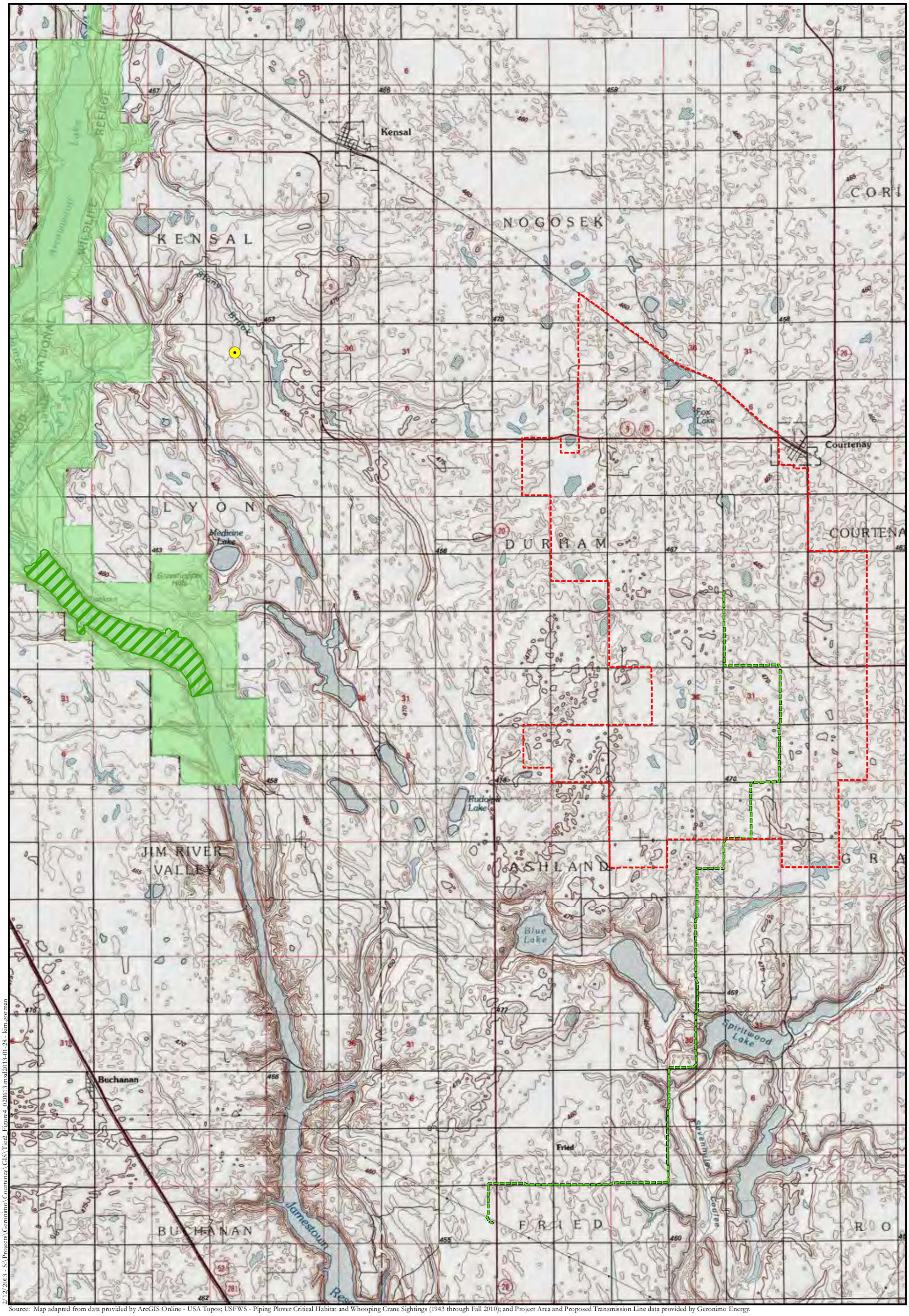
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Figure 3 - NLCD Land Cover
Courtenay Wind Farm Project
Stutsman County, North Dakota

COURTENAY WIND FARM
Stutsman County, ND

TETRA TECH



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Source: Map adapted from data provided by ArcGIS Online - USA Topos; USFWS - Piping Plover Critical Habitat and Whooping Crane Sightings (1943 through Fall 2010); and Project Area and Proposed Transmission Line data provided by Geronimo Energy.

- Confirmed Whooping Crane Sighting
- Piping Plover Critical Habitat
- National Wildlife Refuge
- Project Area
- Proposed Transmission Line

0 1 2 3 Miles N

Figure 4 - Whooping Crane and Piping Plover
Courtenay Wind Farm Project
Stutsman County, North Dakota

COURTENAY WIND FARM
Stutsman County, ND

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APPENDIX B
Agency Consultation

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
3425 Miriam Avenue
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MAR 18 2011

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Edina, Minnesota 55435

Re: Proposed Courtenay Wind Project, Stutsman County, North Dakota

Dear Ms. O'Brien:

This is in response to your October 28, 2010, request for environmental information in relation to a wind energy development project in Stutsman County, North Dakota, which is being proposed by Geronimo Wind Energy, LLC (Geronimo). The project would consist of typical wind project construction, including erecting wind turbines and constructing associated facilities such as gravel access roads, an underground electrical collector system, electrical collector substation, and overhead transmission lines. The final locations of the turbines, access roads, and the electrical collector system have not yet been identified.

The following areas may be affected by the project:

Stutsman County: T. 144 N., R. 63 W., Sections 26, 27, 34-36
T. 143 N., R. 63 W., Sections 1-3, 9-15, 22-26, 35, 36
T. 143 N., R. 62 W., Sections 6-8, 16-20, 29-32
T. 142 N., R. 63 W., Sections 1-4, 11, 12, 14
T. 142 N., R. 62 W., Sections 5-7

We offer the following comments under the authority of and in accordance with the Migratory Bird Treaty Act (16 U.S.C. 703 et seq.) (MBTA), Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d, 54 Stat. 250), the Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.), and the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57).

The U.S. Fish and Wildlife Service (Service) holds certain resources in trust and manages them for the benefit of the American people. These resources include migratory birds, inter-jurisdictional fish, federally-listed threatened and endangered species of plants and animals and their habitats, and units of the National Wildlife Refuge system. One goal of Service policy is that conservation of fish and wildlife resources receive equal consideration with other features of

resource development, and that conservation actions are coordinated with those other forms of development. Another goal is to conserve, protect, and enhance fish and wildlife and their habitats to facilitate the balanced development of the Nation's natural resources. We encourage you to carefully consider the following comments, and to coordinate your plans with the Service early and often in your planning process, in order to comply with the authorities above to the extent possible.

Migratory Birds

The MBTA prohibits the taking, killing, possession, and transportation, (among other actions) of migratory birds, their eggs, parts, and nests, except when specifically permitted. While the MBTA has no provision for allowing unintentional take, the Service realizes that some birds may be killed during wind project construction and operation even if all known reasonable and effective measures to protect birds are used. The Service's Office of Law Enforcement (OLE) carries out its mission to protect migratory birds through investigations and enforcement, as well as by fostering relationships with individuals, companies, and industries that have taken effective steps to avoid take of migratory birds and by encouraging others to implement measures to avoid take of migratory birds. It is not possible to absolve individuals, companies, or agencies from liability even if they implement bird mortality avoidance or other similar protective measures. However, OLE focuses its resources on investigating and prosecuting individuals and companies that take migratory birds without identifying and implementing all reasonable, prudent, and effective measures to avoid that take. Companies are encouraged to work closely with Service biologists to identify available protective measures, including site selection, when developing project plans and/or avian protection plans, and to implement those measures prior to/during project construction and operation.

Adequate consideration for avian and other wildlife resources early in the site evaluation process can help to minimize impacts and facilitate project review. Although current wind turbine technology and proper siting can help to minimize the incidence of avian and bat deaths due to blade, aerial line, and turbine strikes, the potential for direct mortality of some migratory birds will remain. Wind power developers, in concert with the Service, can help to ensure that projects proceed with as little impact to migratory birds as possible. This can be accomplished by gathering information on avian resources as they relate to project siting and by implementing measures to minimize impacts to migratory birds from the construction and operation of the wind facility. The Service's Interim Wind Turbine Siting Guidelines are enclosed to assist in project planning (enclosure 1). We encourage the project proponents to conduct a Potential Impact Index (PII) analysis on several potential sites within wind resource areas to assist in the selection of a wind power site that minimizes the potential to impact migratory birds. Please inform this office whether or not you plan to use the Service's interim guidelines in selecting your site and if not, whether you intend to use a different method to assess potential impacts to avian and other wildlife resources.

In addition, the Service recently issued Draft Land-Based Wind Energy Guidelines and Draft Eagle Conservation Plan Guidance, both available at www.fws.gov/windenergy. Although these are now in draft for public comment, and if finalized, will be voluntary, we encourage wind energy developers to follow these guidelines and guidance to the maximum extent practicable.

Your letter and accompanying aerial photograph indicate that you may have already selected a site for the project. The Service recommends taking a landscape-scale view and comparing several alternative sites before selecting a site that avoids and minimizes impacts to wildlife. We recommend comparing alternative sites within your study area, and analyzing potential sites for wildlife impacts. Our initial cursory review indicates that portions of the study area may be problematic in terms of avoidance of impacts to migratory birds. We recommend that you schedule a meeting with our office before proceeding with development of plans for the site you have indicated. There are numerous Service easements in the townships you indicated. We can share with you the requirements for avoiding or requesting permission to impact easements as part of our coordination on the project.

The Service has coordinated with the Avian Power Line Interaction Committee (APLIC) to develop guidelines to assist companies in formulating Avian Protection Plans (APP). The guidelines can be accessed from APLIC's website at http://www.aplic.org/. These plans are utility specific and designed to reduce operational risks that result from avian interactions with electric utility facilities, but we suggest they may be adapted to wind energy facilities. Wind energy projects have the potential to negatively affect bats as well as avian species. Therefore, we encourage project developers to formulate an Avian and Bat Protection Plan (ABPP) if bats migrate through or may be present in the project area. The Service has issued an August 03, 2010, white paper with Service guidance related to the development of project specific ABPPs (enclosure 2) for renewable energy facilities. Some of the things that the Service looks for in an APP or ABPP are typically a statement of company policy confirming the company's commitment to work cooperatively towards the protection of migratory birds and bats; identification of the process under which the company will obtain and comply with all necessary permits, including, but not limited to, nest relocation, temporary possession, depredation, salvage/disposal, and scientific collection; discussion of the company's plan for monitoring and reporting all incidents of avian or bat injury or mortality; a commitment to make all reasonable efforts to construct and modify infrastructure to reduce the incidence of avian and bat mortality; a mechanism to review existing practices, ensuring quality control and allowing for adaptive management; and a plan for providing adequate training for all appropriate utility personnel. An APP or ABPP reporting system is important to help the company pinpoint areas of concern by tracking both the specific locations where mortalities may be occurring, as well as the extent of such mortalities and the remedial actions taken/planned to address identified problem areas.

To minimize the electrocution hazard to birds, the Service, with support from the Rural Utilities Service, recommends that new or updated overhead power lines be constructed in accordance with the current guidelines for preventing raptor electrocutions. The recommended guidelines can be found in "2006 Suggested Practices for Avian Protection on Power Lines". To increase power line visibility and reduce bird fatalities resulting from collisions with power lines, the Service recommends all new power lines that cross or run adjacent to rivers or large wetlands be modified according to "Mitigating Bird Collisions with Power Lines: The State of the Art in 1994". Both publications can be obtained by writing or calling the Edison Electric Institute, P.O.

Box 266, Waldorf, Maryland 20604-0266, (1-800-334-5453) or visiting their website at www.eci.org.

To the extent practicable, construction should be scheduled for late summer or fall/early winter so as not to disrupt waterfowl or other wildlife during the breeding season (February 1 to July 15). If work is proposed to take place during the breeding season or at any other time which may result in the take of migratory birds, their eggs, or active nests, the Service recommends that the project proponent take all practicable measures to avoid and minimize take, such as maintaining adequate buffers, to protect the birds until the young have fledged. The Service further recommends that if field surveys for nesting birds are conducted with the intent of avoiding take, that any documentation of the presence of migratory birds, eggs, and active nests, along with information regarding the qualifications of the biologist(s) performing the surveys, and any avoidance measures implemented at the project site be maintained. Should surveys or other available information indicate a significant impact to migratory birds, the Service requests that this office be contacted for further consultation on the extent of the impact and the long-term implications of the intended use of the project on migratory bird populations.

Bald and Golden Eagles

The BGEPA prohibits anyone, without a permit issued by the Secretary of the Interior, from taking bald or golden eagles, including their parts, nests, or eggs. The Act provides criminal and civil penalties for persons who take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof. The Act defines take as pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb. "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagles return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment.

The Service recommends Geronimo survey the planning area for bald and golden eagle nests in the spring, March 1 – May 15, prior to leaf-out, when nests are more visible. While the bald eagle tends to be more closely associated with forested areas near water (Buehler 2000), they have been found nesting in single trees several miles from the nearest water body. Especially early in the nesting season, eagles can be very sensitive to disturbance near the nest site and may abandon their nest as a result of low disturbance levels, even from foot traffic. A buffer of at least 1/2 mile should be maintained for all bald and golden eagle nests. A permit is required for any take of bald or golden eagles or their nests. Permits to take golden eagles or their nests are available only for legitimate emergencies or as part of a program to protect golden eagles.

Threatened and Endangered Species

A list of federally threatened and endangered species that may occur within the proposed project's area of influence is enclosed (enclosure 3). This list fulfills requirements of the Service under the ESA.

If a Federal agency authorizes, funds, or carries out a proposed action, the responsible Federal agency, or its delegated agent, is required to evaluate whether the action "may affect" listed species or critical habitat. If the Federal agency or its designated agent determines the action "may affect, is likely to adversely affect" listed species or result in destruction or adverse modification of critical habitat, the responsible Federal agency shall request formal section 7 consultation with this office. If the evaluation shows a "no effect" determination for listed species or critical habitat, further consultation is not necessary. If a private entity receives Federal funding for a construction project, or if any Federal permit or license is required, the Federal agency may designate the fund recipient or permittee as its agent for purposes of informal section 7 consultation. The funding, permitting, or licensing Federal agency is responsible to ensure that it's actions comply with the ESA, including obtaining concurrence from the Service for any action that may affect a threatened or endangered species or result in the destruction or adverse modification of designated critical habitat. The Service recommends that Geronimo and their consultants coordinate with the Federal action agency(ies), as applicable, on this project. Until such time as a Federal action agency designates Geronimo and/or its consultants as its agent for purposes of informal Section 7 consultation, these comments should be considered as preliminary to assist in project planning. If one or more Federal action agencies are involved with this project, that agency has the responsibility under Section 7 of the ESA to conduct consultation with the Service. The Service expects to consult with the Federal action agency or their designated agent on actions that may affect any listed species.

The Federal government recently passed the Tax Relief, Unemployment Insurance Reauthorization and Job Creation Act of 2010, which authorized funds to the U.S. Treasury Department for grants to private entities for construction of renewable energy projects. If the Courtenay Wind Project or a subsequent owner intends to apply for such a Treasury grant, please inform us, as we consider this to be a Federal nexus requiring Section 7 consultation.

The Aransas Wood Buffalo Population (AWBP) of whooping cranes is the only self sustaining migratory population of whooping cranes remaining in the wild. These birds breed in the wetlands of Wood Buffalo National Park in Alberta and the Northwest Territories of northern Canada, and overwinter on the Texas coast. Whooping cranes in the AWBP annually migrate through North Dakota during their spring and fall migrations.

The project area appears to be located outside of the whooping crane migration corridor that includes 95 percent of all confirmed whooping crane sightings in North Dakota (enclosure). However, the presence of suitable roosting and feeding habitat for whooping cranes document the potential for whooping crane presence in the proposed project area. A wind energy project in

this wind resource area has the potential to affect whooping cranes during their annual spring and fall migrations through North Dakota. Potential effects may be direct (e.g. collision mortality) or indirect (e.g. avoidance of the site resulting in cranes seeking alternate habitat). The best available information indicates that whooping cranes avoid stopover habitat that is developed with wind energy appurtenances, particularly wind turbines. This avoidance may deny them the use of important habitat, and thus may result in an adverse effect in the form of harm by habitat modification. Whooping cranes use migration stopover habitat opportunistically and may not use the same stopovers annually. Whooping cranes often stop wherever they happen to be late in the day when they find conditions no longer suitable for migration. This tendency can make for a very unpredictable pattern of stopover use, depending on daily weather conditions. The Service recommends mapping wetlands at the project site within 0.5 mile of all turbines, identifying potentially suitable whooping crane stopover habitat, and analyzing the potential effects to migrating whooping cranes from loss of use of this habitat for migration stopovers.

The interactions of whooping cranes with wind turbines and wind farms are currently not fully known, although it is expected that these large birds with relatively low maneuverability are susceptible to mortality via collisions with turbines. The highest known source of mortality to fledged whooping cranes is from striking power lines. Currently, collisions with power lines have accounted for the death or serious injury of at least 46 whooping cranes since 1956. If power lines will be constructed in association with this project, the Service recommends they be placed underground to avoid collision mortality. If underground construction is not practicable, we recommend installation and maintenance of visual marking devices on all new power lines within one mile of potentially suitable whooping crane stopover habitat.

Piping plovers have been documented nesting in Stutsman County. This area also contains designated critical habitat for piping plovers, which includes certain alkali wetlands. Piping plovers are protected on private land, as well as land in Federal ownership. In North Dakota, piping plovers begin arriving on their breeding grounds in early to mid-April and are typically gone by September 1. Disturbance from construction activities during this timeframe is possible depending on proximity to birds. The Service recommends that construction activities in these areas take place from September 1 – April 1. You may request shapefiles from our office for designated critical habitat; however, there are also other suitable wetlands in the project area where plovers may be nesting. Piping plovers nesting on one wetland could be feeding on another. The alkali soils on the alkali wetlands are soft, and tracks are easily left behind. Piping plover chicks have been documented to be trapped and/or drowned in depressions as shallow as a few inches. Compaction of soil in dry or frozen conditions has the potential to impact piping plovers for many years after the activity.

In order to avoid disturbing these birds and their habitat, we recommend the following precautions when working in potential or known piping plover habitat:

- Total avoidance of the documented and potential nesting wetlands from April 1 – September 1;
- A 600-yard buffer should be maintained on wetlands with potential or documented plover nesting; no work should take place within this buffer zone;

- All vehicle use should be avoided on any wetland shoreline in the project area.

If you are unable to positively identify piping plover nesting areas, or to maintain a 600 yard no-entry buffer on all nesting wetlands, we recommend that you retain the services of a qualified biologist to survey your project area for these resources. If there is no Federal funding or permit involved in the project, the project proponent is still required to ensure that their activities do not result in take of piping plovers, their eggs or chicks, and do not destroy and/or adversely modify designated critical habitat.

Section 10(a)(1)(B) of the ESA allows non-Federal parties planning activities that have no Federal nexus, but which could result in the incidental taking of listed animals, to apply for an incidental take permit. (A Federal nexus exists whenever an activity is conducted, funded, or licensed or permitted by a Federal agency). The application must include a habitat conservation plan (HCP) laying out the proposed actions, determining the effects of those actions on federally-listed plant and wildlife species and their habitats (and may include proposed or candidate species), and defining measures to minimize and mitigate adverse effects. If Geronimo believes that take of listed species is likely to occur at any point in the life of the Courtenay wind project, the options available for ESA coverage of anticipated take include the development of a project specific HCP and application for an incidental take permit (ITP) prior to project construction. If Geronimo believes that take of any listed species in the action area is not likely to occur as a result of the proposed project, and therefore no take authorization is needed, we recommend that this be clearly stated in an analysis of effects for each affected species, and that you share this analysis with the Service.

The Dakota skipper is a small to medium-sized hesperiine butterfly associated with high quality prairie ranging from wet-mesic tallgrass prairie to dry-mesic mixed grass prairie. The first type of habitat is relatively flat and moist native bluestem prairie. Three species of wildflowers are usually present: wood lily (*Lilium philadelphicum*), harebell (*Campanula rotundifolia*), and smooth camas (*Zygadenus elegans*). The second habitat type is upland (dry) prairie that is often on ridges and hillsides. Bluestem grasses and needlegrasses dominate these habitats. On this habitat type, three wildflowers are typically present in high quality sites that are suitable for Dakota skipper: pale purple (*Echinacea pallida*) and upright (*E. angustifolia*) coneflowers and blanketflower (*Gaillardia sp.*). Because of the difficulty of surveying for Dakota skippers and a short survey window, we recommend that the project avoid any impacts to potential Dakota skipper habitat. If Dakota skipper habitat is present near the proposed project, and you intend to take precautions to avoid impacts to skipper habitat, please notify the Service for further direction.

In 2010, the Sprague's pipit was added to the candidate species list. Migratory bird species, such as the Sprague's pipit, that are candidates are still protected under the MBTA. Sprague's pipits require large patches of grassland habitat for breeding, with preferred grass height between 4 and 12 inches. The species prefers to breed in well-drained, open grasslands and avoids grasslands with excessive shrubs. They can be found in lightly to heavily grazed areas. They avoid intrusive human features on the landscape, so the impact of a development can be much larger

than the actual footprint of the feature. If Sprague's pipit habitat is present within or adjacent to the proposed project area, the Service requests that you document any steps taken to avoid and minimize disturbance of this habitat.

The Dakota skipper and Sprague's pipit are candidate species for listing under the ESA. For candidate species, such as the Dakota skipper and Sprague's pipit, there is additional management flexibility available which entails developing a Candidate Conservation Agreements with Assurances (CCAA). CCAAs are formal, voluntary agreements between the Service and one or more parties to address the conservation needs of one or more candidate species. Participants voluntarily commit to implement specific actions designed to remove or reduce threats to the covered species. CCAAs can involve both Federal and non-Federal lands. In some cases, these agreements have been so successful that listing the species proved to be unnecessary. If you would like more information on these programs, please notify the Service for further coordination.

Fish and Wildlife Service Property Interests

The Service administers Waterfowl Production Areas owned in fee title as well as wetland and grassland easements throughout North Dakota. We recommend coordinating with our office prior to final site selection so that we may provide easement information and maps.

Wetland easements are legal agreements with private landowners that permanently protect wetland basins from being drained, burned, leveled, or filled. Grassland easements are legal agreements with landowners that permanently protect grassland vegetation, primarily native prairie, from being destroyed or developed. Grassland easements prevent these grasslands from being converted to cropland. Mowing, haying, and grass seed harvesting must be delayed on grassland easements until after July 15 each year to protect grassland nesting birds. The primary responsibility in protecting these interests is to review all proposed uses to ensure that the requests are compatible with Service easement regulations and various laws and policies. These comments and suggestions are made in an attempt to accomplish three goals: 1) avoid impacts to Service grassland and wetland easements in the project area as much as possible; 2) if unavoidable, ensure that any proposed turbine and associated infrastructure impacts (roads, buried collection lines, transmission lines, sub-stations, etc.) on any Service easement areas are kept to an absolute minimum; and 3) investigate all potential alternatives to eliminate or reduce impacts to easement areas to protect the integrity of the easement.

If Service easements are present in the project area, cultural resource compliance requires coordination with the Zone Archeologist early in the NEPA process. Cultural Resource field investigations on Service easements and fee lands require a permit issued by the Zone Archeologist. Contact Barry G. Williams, USFWS Dakotas Zone Archeologist (barry_williams@fws.gov, 701-355-8577).

High Value Habitat Avoidance

High value wildlife habitat types in North Dakota include native prairies, wetlands, wooded draws, and riparian forests. We recommend that construction of wind towers and appurtenant facilities in the above habitat types be avoided whenever possible.

Our review of NWI maps indicates that wetland areas are located within the project area. NWI data can be accessed directly by visiting their website at (wetlands.fws.gov). Section 404 of the Clean Water Act regulates placement of fill materials in certain wetlands. A Corps of Engineers' 404 permit may be required if fill material will be placed in aquatic sites, including wetlands. The project proponent should contact Mr. Dan Cimarosti, Regulatory Office, Corps of Engineers, 1513 South 12th Street, Bismarck, North Dakota 58504 (701-255-0015), to determine their permit requirements. If a 404 permit is required, the Service will also provide recommendations on this project to the Corps.

Construction activities should be conducted in a manner that will minimize impacts to the wildlife and the existing habitat in the project area. To help avoid impacts, we recommend the project proponent:

- Reseed disturbed native prairie with a diverse native grass/forb seed mixture. Obtain seed stock from nurseries within 250 miles of the project area to insure the particular cultivars are well adapted to the local climate.
- Minimize grassland disturbance by using fewer, larger turbines, and limiting new road construction.
- Design meteorological towers to be self standing (no guywires). If towers must be guyed, install and maintain appropriate visual line marking devices to reduce the potential for avian collision mortality
- Locate appurtenant facilities to avoid placement of fill in wetlands along the route.
- Install and maintain appropriate erosion control measures to reduce sedimentation and water quality degradation of wetlands and streams near the project area.
- Replace unavoidable wetland losses with functionally equivalent wetlands.

Research, Monitoring, and Assessment

We recommend that you discuss with us in detail the type and duration of potential pre-construction literature reviews and wildlife surveys to quantify bird and bat use of the project area, and assist in assessment of risk to wildlife. Monitoring studies are also recommended post-construction to determine the effect of several factors, such as site selection, turbine designs, the layout of wind plants, wind plant operations, habitat alteration, and changes in available perching and nesting sites, on bird and bat impacts. We recommend these studies also be designed in coordination with our office, and that annual reports of the results of these monitoring studies be submitted to this office. The Avian Subcommittee of the National Wind Coordinating Committee (NWCC) has developed a guidance document to assist wind energy developers in designing studies that will produce credible and comparable results of avian interaction with

wind power plants. The NWCC document, "Studying Wind Energy/Bird Interactions: A Guidance Document. Metrics and methods for determining or monitoring potential impacts on birds at existing and proposed wind energy sites," can be obtained by contacting the National Wind Coordination Committee, c/o RESOLVE, 1255 23rd Street, Suite 275, Washington, D.C. 20037, or by visiting their website at (www.nationalwind.org).

We wish to stress the importance of implementing the recommendations contained in this letter, and of coordinating in a substantive and ongoing way with this office as your project planning proceeds. The way in which your company implements the Service's recommendations will determine whether or not the Service can agree that the project has included all available, feasible measures to comply with Federal wildlife law.

Thank you for the opportunity to provide comments. If you require further information as project planning proceeds, please contact Heidi Riddle of my staff, or contact me directly, at (701) 250-4481, or at the letterhead address.

Sincerely,

Jeffrey K. Towner

Jeffrey K. Towner
Field Supervisor
North Dakota Field Office

Enclosures

cc: Dakotas Zone Archeologist, Bismarck
(Attn: B. Williams)
Corps of Engineers, Bismarck Regulatory Office

Jack Dalrymple, Governor
Mark A. Zimmerman, Director

1600 East Century Avenue, Suite 3
Bismarck, ND 58503-0649
Phone 701-328-5357
Fax 701-328-5363
E-mail parkrec@nd.gov
www.parkrec.nd.gov

February 8, 2013

Ms. Kate Schindler
Tetra Tech
Suite 141
2001 Killebrew Drive
Bloomington, MN 55425

Re: Courtenay Wind Farm – Stutsman County

Dear Ms. Schindler,

The North Dakota Parks and Recreation Department (the Department) has reviewed the above referenced proposal for the construction of Courtenay Wind Farm near Jamestown, North Dakota.

Our agency scope of authority and expertise covers recreation and biological resources (in particular rare plants and ecological communities). The project as defined does not affect state park lands that we manage but may affect state Land and Water Conservation Fund (LWCF) project sites that we manage. A map with LWCF project locations has been attached. All LWCF sites received assistance from the federal LWCF program and are under protection of section 6(f) of the LWCF Act. Any property taken from within the 6f boundary of these sites must be replaced with property of equal market value. Should any public or private utilities need to be added or relocated on the LWCF recreational lands, the NDPRD must be consulted prior to any action taken. Please contact Kevin Stankiewicz (701-328-5364 or kstankiewicz@nd.gov) if additional LWCF information is needed.

The North Dakota Natural Heritage biological conservation database has been reviewed to determine if any current or historical plant or animal species of concern or other significant ecological communities are known to occur within an approximate one-mile radius of the project area. Based on this review, no plants, animal and significant ecological community occurrences have been identified within or adjacent to the project areas.

Because this information is not based on a comprehensive inventory, there may be species of concern or otherwise significant ecological communities in the area that are not represented in the database. The lack of data for any project area cannot be construed to mean that no significant features are present. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources.

Given the potential for not only habitat disturbance and disruption but the threat to nesting, feeding and migratory bird and bats in the area we suggest that all efforts be made to avoid impacts to wildlife species and their habitats. In an effort to avoid or minimize impacts to wildlife and their habitats we encourage proper evaluation of all potential wind energy sites. To identify and assess adverse impacts to wildlife we suggest pre and post construction avian and bat monitoring studies be conducted.

The Department recommends that the project be accomplished with minimal impacts and that all efforts be made to ensure that critical habitats not be disturbed in the project area to help secure rare species conservation in North Dakota. Regarding any reclamation efforts, we recommend that any impacted areas be revegetated with species native to the project area.

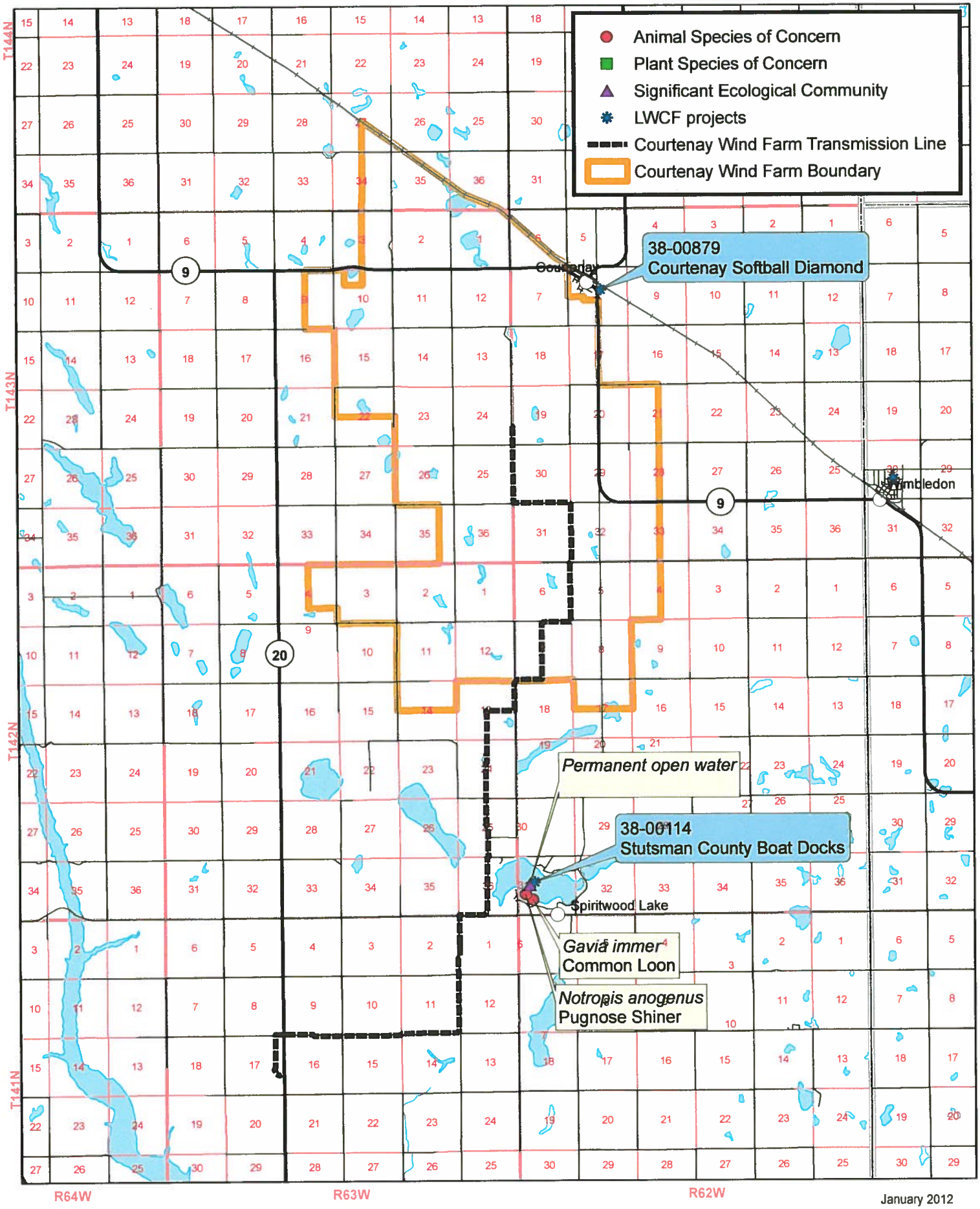
We appreciate your commitment to rare plant, animal and ecological community conservation, management and inter-agency cooperation to date. For additional information please contact Kathy Duttenhefner (701-328-5370 or kgduttenhefner@nd.gov) of our staff. Thank you for the opportunity to comment on this proposed project.

Sincerely,

Jesse Hanson, Manager
Planning and Natural Resources Division

R.USNDNHI*2013_018KD2/4/2013DL2.3.2013

North Dakota Parks and Recreation Department
North Dakota Natural Heritage Inventory



North Dakota Natural Heritage Inventory

Rare Animal and Plant Species and Significant Ecological Communities

State Scientific Name	State Common Name	State Rank	Global Rank	Federal Status	Township Range Section	County	Last Observation	Estimated Representation Accuracy	Precision
Gavia immer	Common Loon	S4	G5		142N062W - 31; 141N062W - 21; 142N062W - 29; 141N062W - 11; 141N062W - 20; 142N062W - 19; 142N063W - 23; 141N062W - 10; 142N062W - 30; 142N063W - 13; 142N062W - 27; 141N063W - 01; 142N062W - 17; 142N063W - 25; 141N062W - 30; 141N063W - 26; 142N063W - 15;	Stutsman	22450		G
Notropis anogenus	Pugnose Shiner	S1	G3		142N062W - 31; 142N063W - 36; 142N063W - 25; 142N062W - 32; 141N063W - 02; 141N062W - 05; 142N062W - 29; 141N063W - 01; 141N062W - 06; 141N063W - 12; 142N062W - 30; 141N062W - 07; 142N063W - 35	Stutsman	23491		M
Permanent open water		S2	GNR		142N062W - 31	Stutsman	1977		S

North Dakota Natural Heritage Inventory Biological and Conservation Data Disclaimer

The quantity and quality of data collected by the North Dakota Natural Heritage Inventory are dependent on the research and observations of many individuals and organizations. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in North Dakota have never been thoroughly surveyed, and new species are still being discovered. For these reasons, the Natural Heritage Inventory cannot provide a definite statement on the presence, absence, or condition of biological elements in any part of North Dakota. Natural Heritage data summarize the existing information known at the time of the request. Our data are continually upgraded and information is continually being added to the database. This data should never be regarded as final statements on the elements or areas that are being considered, nor should they be substituted for on-site surveys.

Estimated Representation Accuracy

Value that indicates the approximate percentage of the Element Occurrence Representation (EO Rep) that was observed to be occupied by the species or community (versus buffer area added for locational uncertainty). Use of estimated representation accuracy provides a common index for the consistent comparison of EO reps, thus helping to ensure that aggregated data are correctly analyzed and interpreted.

Very high (>95%)
High (>80%, <= 95%)
Medium (>20%, <= 80%)
Low (>0%, <= 20%)
Unknown
(null) - Not assessed

Precision

A single-letter code for the precision used to map the Element Occurrence (EO) on a U.S. Geological Survey (USGS) 7.5' (or 15') topographic quadrangle map, based on the previous Heritage methodology in which EOs were located on paper maps using dots.

S - Seconds: accuracy of locality mappable within a three-second radius; 100 meters from the centerpoint
M - Minute: accuracy of locality mappable within a one-minute radius; 2 km from the centerpoint
G - General: accuracy of locality mappalbe to map or place name precision only; 8 km from centerpoint
U - Unmappable

Jack Dalrymple, Governor
Mark A. Zimmerman, Director

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Dear Ms. Schindler,

The North Dakota Parks and Recreation Department (the Department) has reviewed the above referenced proposal for the construction of Courtenay Wind Farm near Jamestown, North Dakota.

Our agency scope of authority and expertise covers recreation and biological resources (in particular rare plants and ecological communities). The project as defined does not affect state park lands that we manage but may affect state Land and Water Conservation Fund (LWCF) project sites that we manage. A map with LWCF project locations has been attached. All LWCF sites received assistance from the federal LWCF program and are under protection of section 6(f) of the LWCF Act. Any property taken from within the 6f boundary of these sites must be replaced with property of equal market value. Should any public or private utilities need to be added or relocated on the LWCF recreational lands, the NDPRD must be consulted prior to any action taken. Please contact Kevin Stankiewicz (701-328-5364 or kstankiewicz@nd.gov) if additional LWCF information is needed.

The North Dakota Natural Heritage biological conservation database has been reviewed to determine if any current or historical plant or animal species of concern or other significant ecological communities are known to occur within an approximate one-mile radius of the project area. Based on this review, several plants, animal and significant ecological community occurrences have been identified within or adjacent to the project areas. Please see the attached spreadsheet and maps for more specific information on these species.

We defer further comments regarding animal species to the North Dakota Game and Fish Department and the United States Fish and Wildlife Service. Because this information is not based on a comprehensive inventory, there may be species of concern or otherwise significant ecological communities in the area that are not represented in the database. The lack of data for any project area cannot be construed to mean that no significant features are present. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources.

Given the potential for not only habitat disturbance and disruption but the threat to nesting, feeding and migratory bird and bats in the area we suggest that all efforts be made to avoid impacts to wildlife species and their habitats. In an effort to avoid or minimize impacts to wildlife and their habitats we encourage proper evaluation of all potential wind energy sites. To identify and assess adverse impacts to wildlife we suggest pre and post construction avian and bat monitoring studies be conducted.

The Department recommends that the project be accomplished with minimal impacts and that all efforts be made to ensure that critical habitats not be disturbed in the project area to help secure rare species conservation in North Dakota. Regarding any reclamation efforts, we recommend that any impacted areas be revegetated with species native to the project area.

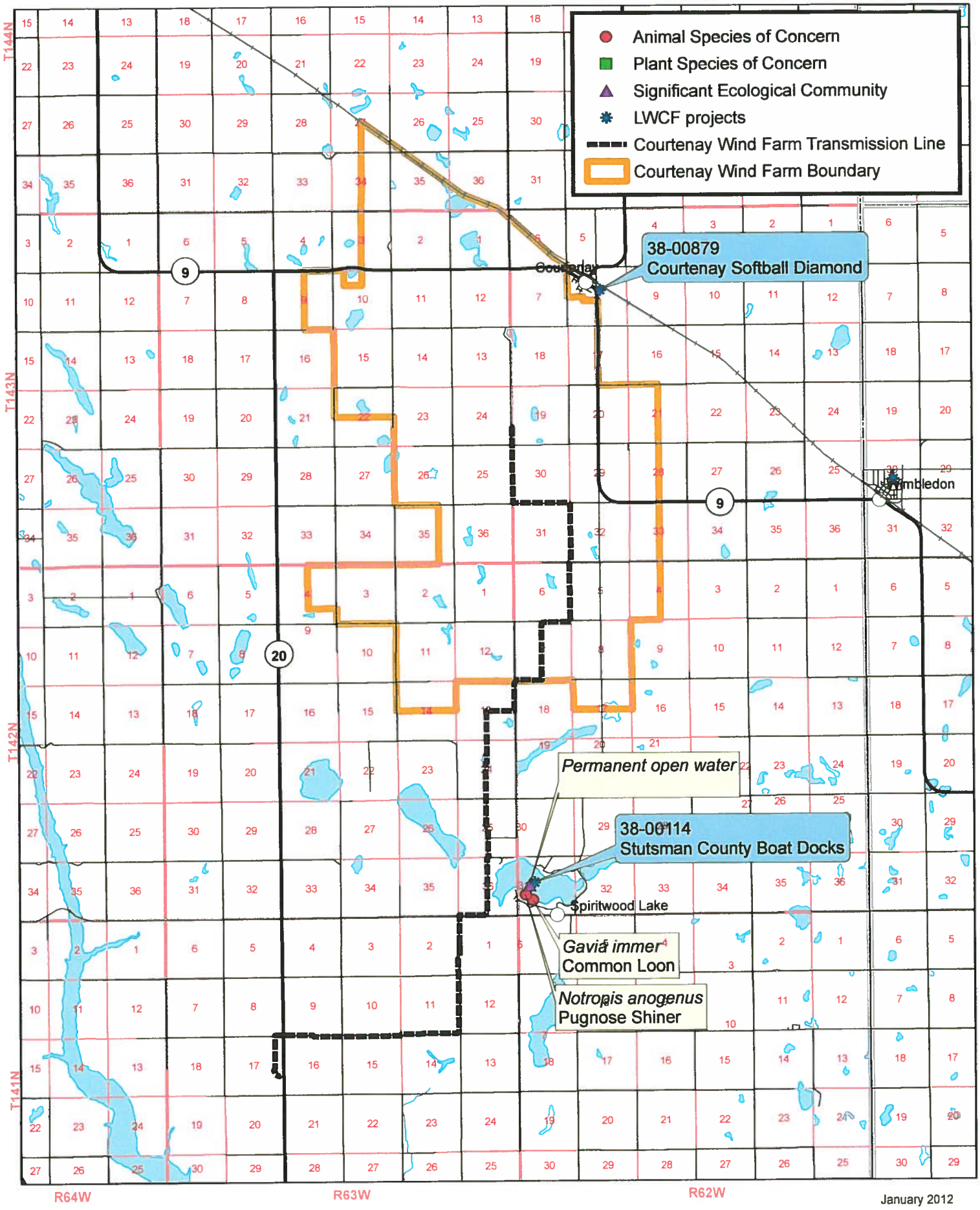
We appreciate your commitment to rare plant, animal and ecological community conservation, management and inter-agency cooperation to date. For additional information please contact Kathy Duttenhefner (701-328-5370 or kgduttenhefner@nd.gov) of our staff. Thank you for the opportunity to comment on this proposed project.

Sincerely,

Jesse Hanson, Manager
Planning and Natural Resources Division

R.USNDNHI*2013_018KD2/4/2013DL2.3.2013

North Dakota Parks and Recreation Department
North Dakota Natural Heritage Inventory



January 2012

North Dakota Natural Heritage Inventory

Rare Animal and Plant Species and Significant Ecological Communities

State Scientific Name	State Common Name	State Rank	Global Rank	Federal Status	Township Range Section	County	Last Observation	Estimated Representation Accuracy	Precision
Gavia immer	Common Loon	S4	G5		142N062W - 31; 141N062W - 21; 142N062W - 29; 141N062W - 11; 141N062W - 20; 142N062W - 19; 142N063W - 23; 141N062W - 10; 142N062W - 30; 142N063W - 13; 142N062W - 27; 141N063W - 01; 142N062W - 17; 142N063W - 25; 141N062W - 30; 141N063W - 26; 142N063W - 15;	Stutsman	22450		G
Notropis anogenus	Pugnose Shiner	S1	G3		142N062W - 31; 142N063W - 36; 142N063W - 25; 142N062W - 32; 141N063W - 02; 141N062W - 05; 142N062W - 29; 141N063W - 01; 141N062W - 06; 141N063W - 12; 142N062W - 30; 141N062W - 07; 142N063W - 35	Stutsman	23491		M
Permanent open water		S2	GNR		142N062W - 31	Stutsman	1977		S

APPENDIX C

Representative Photographs



Photograph 1 (East): A view of the town of Courtenay, located near the northeast corner of the Project Area outside the Project Area boundaries.



Photograph 2 (North): A view of a wetland located in the northeast corner of the Project Area from State Highway 9.



Photograph 3 (North): A view of agricultural land within the Project Area from 90th Avenue SE.



Photograph 5 (Northwest): A view of the railroad that runs along the northern Project Area boundary.



Photograph 5 (Northwest): A view of Siebert WPA, located near the western Project Area boundary.



Photograph 6 (Northeast): A view of a wetland located in the northern half of the Project Area along 88th Avenue SE.



Photograph 7 (Southeast): A view of a wetland located in the northern half of the Project Area along State Highway 9. American coots are visible on the wetland.



Photograph 8 (Southwest): A view of agricultural Conservation PLOTS land located in the northern half of the Project Area along 14th Street SE.



Photograph 9 (Southwest): A view of a wetland and surrounding agricultural land located in the northern half of the Project Area near the intersection of 14th Street SE and 89th Avenue SE.



Photograph 10 (Southwest): A view of a small woodlot and surrounding agricultural land located in the northern half of the Project Area along 14th Street SE.



Photograph 11 (West): A view of agricultural land and wetlands located within the Project Area near the western Project Area boundary.



Photograph 12 (Northwest): A view of St. Mary's Cemetery located within the Project Area near the western Project Area boundary.



Photograph 13 (Northeast): A view of a wetland and surrounding agricultural land located in the northern half of the Project Area near the intersection of State Highway 9 and 16th Street SE.



Photograph 14 (Southwest): A view of an abandoned farmstead and surrounding agricultural land located near the intersection of 17th Street SE and 89th Avenue SE.



Photograph 15 (Northwest): A view of agricultural land located near the intersection of 17th Street SE and 89th Avenue SE.



Photograph 16 (South): A view of a tree line and agricultural land. A potential red-tailed hawk nest is visible near the center of the photograph.



Photograph 17 (Northeast): A view of the Audubon Society's Edward M. Brigham III Alkali Lake Sanctuary located along the proposed transmission line route near the intersection of 26th Street SE and 89th Avenue SE.



Photograph 18 (Northeast): A view of agricultural lands and grasslands located along the proposed transmission line route near the intersection of 24th Street SE and 89th Avenue SE.



Photograph 19 (North): A view along the proposed transmission line route and Camp Rokiwan Road near Spiritwood Lake.



Photograph 20 (Northeast): A view of Spiritwood Lake from Camp Rokiwan Road along the proposed transmission line route.



Photograph 21 (Northwest): A view of agricultural land to the west of Spiritwood Lake and Camp Rokiwan Road. Blue Lake is visible beyond.



Photograph 22 (Northwest): A view of agricultural land located along the proposed transmission line route and Camp Rokiwan Road.

2012 Fall Avian and Crane Surveys

Courtenay Wind Farm
Stutsman County, North Dakota



Prepared for

GERONIMO ENERGY

Prepared by

TETRA TECH

February 2013

EXECUTIVE SUMMARY

Tetra Tech was contracted by Geronimo Energy (Geronimo) to undertake fall avian surveys for the proposed Courtenay Wind Farm project (Project) in Stutsman County, North Dakota. The Courtenay Wind Farm project area (Project Area) is approximately 24,200 acres and is located in the Northern Glaciated Plains ecoregion. A qualified field biologist conducted the surveys to identify potential avian impacts associated with building and operating the Project. The biologist performed weekly surveys at the Project Area from September 27 to November 16, 2012 at nine point count locations distributed throughout the Project Area.

A majority of the Project Area is agricultural and is utilized primarily for cultivated crops (corn and soybeans). The remaining land within the Project Area is made up of wetlands, developed areas (farmsteads), and grasslands. A mix of deciduous and coniferous trees planted for windbreaks surround most farmsteads within the Project Area. The topography in the vicinity of the Project is generally flat to gently rolling and the vegetation cover is uniformly low.

Weekly avian surveys were conducted during the fall migration period in 2012 at nine locations distributed throughout the Project Area. A total of 72 20-minute surveys were conducted from September 27, 2012 to November 16, 2012. During the study period, a total of 11,002 birds from 42 species (plus an additional 700 unidentified birds) were observed within the Project Area. Overall avian mean use at the observation points was 153 birds per 20-minute survey (birds/20 min).

The majority of the birds observed within the Project during the fall avian survey were primarily waterfowl, songbird, and waterbird species. The most commonly observed species include Canada goose, mallard, red-winged blackbird, common grackle, and American coot. With the exception of American coot, which was rarely observed in flight, these species were observed flying within the rotor swept area (RSA) at varying rates. Based on high mean use of the Project Area and observed flight behavior, some turbine-related mortality of these species may occur. However, these species have low observed mortality at operating wind farms and population level impacts are not anticipated given these species' large, stable populations.

Raptor Species

Four raptor species were observed within the Project Area during the avian surveys: American kestrel, bald eagle, northern harrier, and red-tailed hawk. Special consideration is often given to raptor species at wind farms because diurnal raptors are generally at higher risk for collision with turbines than are many other avian species. High raptor use has been associated with high raptor mortality at new generation wind farms. Conversely, raptor mortality appears to be low when raptor use is low. Based on mean use, the Project would be considered a low risk site for raptor mortality. Additionally, the observed flight behavior for raptors did not indicate high risk of collision mortality.

Listed and Sensitive Species

The biologist did not detect any species listed as candidate, threatened, or endangered under the Endangered Species Act (ESA) during the fall avian surveys or the fall crane surveys.

Two bald eagles were observed within the Project Area during the fall point count surveys, and one was observed flying within the RSA. The presence of bald eagles within the Project Area will require compliance with the Bald and Golden Eagle Protection Act (BGEPA). The very limited number of collision mortality records for bald eagles at other wind farms indicates that bald eagles will likely be at low risk of collision mortality at the Project Area (Manville 2005, Pearce 2010). The numbers of bald eagles in North Dakota have been steadily increasing since the 1980s (USFWS 2011), and an evaluation of the effect of the Project on local eagle populations can be completed if additional information is obtained.

The United States Fish and Wildlife Service (USFWS) North Dakota Ecological Services Field Office has identified eleven Species of Habitat Fragmentation Concern for the state. Species of Habitat Fragmentation concern are defined as species of concern for which a relevant federal, state, tribal, and/or local agency has found that separation of their habitats into smaller blocks reduces connectivity such that the individuals in the remaining habitat segments may suffer from effects such as decreased survival, reproduction, distribution, or use of the area. Habitat fragmentation from a wind energy project may create significant barriers for such species (USFWS 2012). The only Species of Habitat Fragmentation Concern observed during the fall avian surveys was the northern harrier, which exhibited relatively low mean use (0.14 birds/20 min) of the Project Area and did not exhibit high risk flight behavior.

At the state level, North Dakota does not have a list defined by statute for threatened or endangered species comparable to the federal ESA. North Dakota has instead identified 100 Species of Conservation Priority under the State Wildlife Action Plan. Six Species of Conservation Priority were observed during fall avian surveys: American white pelican, bald eagle, canvasback, Le Conte's sparrow, northern harrier, and northern pintail. Overall, these species exhibited relatively low mean use of the Project Area and did not exhibit high risk flight behavior.

Crane Surveys

In addition to general avian surveys, crane surveys were conducted weekly from September 27 to October 19, 2012 for two hours before sunset and for two hours after sunrise on consecutive days. No sandhill cranes or whooping cranes were observed within the Project Area during the crane surveys or incidentally outside of survey hours.

TABLE OF CONTENTS

EXECUTIVE SUMMARY 1
1.0 INTRODUCTION 1
2.0 STUDY AREA 1
3.1 Fixed-Point Surveys 2
3.1.1 Survey Design 2
3.1.1 Analysis 3
3.1.2 Crane Surveys 3
4.0 RESULTS AND DISCUSSION 4
4.1 Observed Habitat 4
4.2 Avian Use of the Project Area 4
4.2.1 Federal and State Listed Species 6
4.2.2 Raptors 7
4.4 Flight Behavior 7
4.3 Crane Surveys 8
5.0 DISCUSSION AND CONCLUSIONS 8
5.1 Risk to Non-raptor Species 8
5.2 Risk to Raptor Species 9
5.3 Risk to Listed and Sensitive Species 9
6.0 REFERENCES 11

LIST OF TABLES

Table 1. Avian species, by species grouping, observed during the Fall 2012 surveys 4
Table 2. Avian Flight Height Characteristics in Relation to the RSA 7

APPENDICES

Appendix A Figures
Figure 1: Project Area Vicinity
Figure 2: Project Area and Point Count Locations
Appendix B Avian Survey Protocol
Appendix C Sample Avian Survey Data Sheet
Appendix D Project Area Photographs

1.0 INTRODUCTION

Research and monitoring completed to date has revealed the following impacts to avian species as a result of wind energy development: 1) direct impacts to habitat from the footprint of the facilities and infrastructure, 2) impacts through displacement through mechanisms not yet determined, and 3) direct mortality from turbine collision (Kuvlesky et al. 2007, Stewart et al. 2007, Johnson et al. 2002, Leddy et al. 1999). However, because potential avian impacts depend on a number of factors (project size, turbine models used, geographic location, etc.), assessment of risks to avian species on a project-by-project basis is important.

Geronimo Energy (Geronimo) is proposing to construct the Courtenay Wind Farm (Project) in Stutsman County, North Dakota. The Project is located approximately 15 miles north of the Jamestown, North Dakota in northeast Stutsman County and will consist of approximately 66 to 133 turbines. Geronimo is committed to environmental due diligence and contracted Tetra Tech to conduct fall avian surveys at the Project Area. The following report contains the results of the avian baseline study for the period September 27 to November 16, 2012. This baseline study provides data for characterizing the avian use at the Project during fall migration to quantify potential avian impacts associated with building and/or operating the proposed Project. Information and results from this baseline study will be used in the overall environmental impact assessment for the Project.

2.0 STUDY AREA

The Project Area is approximately 24,200 acres and is located in the Northern Glaciated Plains ecoregion (Figure 1), which is characterized by a flat to gently rolling landscape composed of glacial drift. Soil and weather conditions in this region promote a transition zone between short and tallgrass prairie species. High concentrations of seasonal and temporal wetlands are interspersed throughout the landscape. Grain farming is the major land use of this region (USGS 2013).

The Project Area is located within the Central Flyway, one of the main migratory bird routes. Most birds that move along the Central Flyway travel from Canada through the central states, eventually reaching the tropics of South America via the Gulf of Mexico (USFWS 2013). The Project area also lies within North American Bird Conservation Region (BCR) 11 (Prairie Potholes). According to the North American Bird Conservation Initiative (NABCI), this BCR is the most important waterfowl producing region on the North American continent despite extensive wetland drainage and tillage of native grasslands. The region comprises the core of the breeding range of most dabbling duck and several diving duck species and provides critical breeding and migration habitat for over 200 other birds (American Bird Conservancy 2013).

3.0 METHODS

Standardized protocols for pre-construction point counts have been established and were used in this study. Data collected from these counts are used to identify species or species groups that may be at risk from project development and may provide additional information for siting facilities to minimize impacts to birds. Results in this report are presented in terms of species groups, and highlight federal listed species and North Dakota Species of Conservation Priority. Additionally, because the Project Area is located on the eastern edge of the 95% whooping crane migration corridor, dawn and dusk crane surveys were conducted to understand how cranes use and move through the area.

3.1 Fixed-Point Surveys

The primary objective of the fixed-point surveys was to estimate use of the Project Area by raptors and other birds during fall migration. Point counts (circular plots) were conducted within the Project Area using standardized protocol (Appendix A). Tetra Tech distributed nine point count locations within the Project Area boundaries (Figure 2). Point count locations were chosen to provide a representative coverage of the habitat types present within the Project Area and were sited to give the greatest possible viewshed at each location.

3.1.1 Survey Design

Surveys at each point count location lasted for 20 minutes, during which time the biologist continuously scanned for birds and recorded any visual or auditory observations. The biologist collected data for all birds seen or heard within an 800-meter radius of each of the nine point count locations. Rangefinders and reference points were used to identify flight height and the distance of birds from each point count location. Data recorded during each survey included: date, start and end time of the observation period, species or best possible identification of species, number of individuals, behavior, distance from observer, flight height, flight direction, and weather (temperature, wind speed, wind direction, precipitation, and cloud cover). Tetra Tech selected survey dates to within the fall migration period. Biologists conducted weekly surveys from September 27 to November 16, 2012.

The survey protocol used in this study is designed to collect data on all bird specimens and to provide results that are comparable with other studies of avian use at wind farms rather than to target specific taxa. The benefit of using this method is that it captures activity by a variety of bird species. The survey method used in this study encompasses all daylight hours and is therefore appropriate for the bird community using the Project Area.

Tetra Tech chose 20-min survey periods because they provide adequate time to detect both raptors and non-raptors. However, time periods of 20 min may lead to double-counting of songbirds (i.e., counting the same individual more than once) because individuals may appear and disappear from view. For example, if a horned lark is detected perched on a fence then disappears from view and, 6 minutes later, a horned lark is seen flying, these birds are recorded as separate observations because it is not possible to distinguish individuals. Double-counting of birds is not problematic for this type of survey because the objective is to document use in terms of number of birds noted per 20-min survey, not number of distinct individual birds.

Detectability varies among species and potentially not all individuals within the 800-m radius were counted. This variation in detectability results in an overestimate of mean use for conspicuous species and an underestimate of mean use for reclusive species (Thompson 2002). Birds not easily identifiable, such as those seen under low light conditions or small birds seen at a distance were identified to the lowest taxonomic level possible. Hence, unidentified birds are included in the results.

3.1.1 Analysis

Tetra Tech derived avian use (mean use) of the Project Area by calculating the average number of birds observed per 20-min survey at each point. To evaluate the diversity and composition of avian species using the Project, Tetra Tech first summarized the number of individuals (birds/20 min) and species. In addition, the number of observations is also presented, where an observation can be either an individual bird or a discrete flock of birds. This information helps evaluate whether high mean use is driven by a single event (e.g., a large flock of birds moving through the Project on migration). Because individual birds are not uniquely marked and identified, actual population size or abundance cannot be determined. One individual may be counted multiple times during a survey period or across survey periods. Therefore, avian mean use does not equate to abundance.

Flight behavior was evaluated by calculating the proportion of flying birds that were observed below, within, or above the turbine rotor swept area (RSA). The RSA is considered to be the height interval through which turbine blades are expected to pass. Geronimo is currently considering several turbine models with a variety of hub height options. For the purposes of estimating risk to avian species, Tetra Tech used an overly conservative RSA of 23. 5 meters to 150.5 meters above ground surface based on the lowest and highest possible rotor swept heights of the turbine models and hub heights being considered (GE 1.6-87, Siemens SWT-3.0, and Goldwind models). A bird was considered to have flown within the RSA if any of its recorded heights overlapped the RSA.

3.1.2 Crane Surveys

The purpose of the crane surveys was to determine if whooping cranes occur, or have the potential to occur, within the Project Area based on direct observation and available stopover habitat. Although the primary objective was to document occurrence of whooping cranes (*Grus americana*), observations of whooping cranes are rare events due to the small number of whooping cranes in the wild. In contrast, sandhill cranes (*Grus canadensis*) are numerous in the wild and utilize similar stopover habitat as whooping cranes. Therefore, a secondary objective of the survey was to identify use of the Project and surrounding areas by sandhill cranes to identify areas that may be suitable for whooping crane stopover.

The biologist conducted weekly crane surveys from approximately September 27 through October 19, 2012. The biologist conducted crane surveys for 2 hours before sunset and for 2 hours after sunrise on consecutive days to encompass potential movements to and from roosting areas. The biologist visited areas in and around the Project Area that could serve as potential crane habitat. After potential habitat was visited, the biologist will then travel through the rest of the Project Area looking for cranes in flight or on the ground. The field biologist collected data on all cranes observed and recorded the following data: number of individuals, time of observation, flight height aboveground, behavior, flight direction and habitat. The biologist estimated flight heights using existing structures, local transmission lines, and topographic maps for reference.

4.0 RESULTS

4.1 Observed Habitat

The land cover of the Project Area was consistent with the land cover described for the ecoregion as a whole and was observed to consist of a mix of agricultural lands used for grain crops, wetlands, developed land (farmsteads), and small tracts of grasslands. A mix of deciduous and coniferous trees planted for windbreaks surround most farmsteads within the Project Area. The topography in the vicinity of the Project is generally flat to gently rolling and the vegetation cover is uniformly low. Photographs of the Project Area taken from the point count locations are included in Appendix D.

4.2 Avian Use of the Project Area

The nine point count locations were surveyed eight times, resulting in a total of 72 20-minute surveys. During the study period, a total of 11,002 birds from 42 species (plus an additional 700 unidentified birds) were observed within the Project Area. Overall avian mean use at the observation points was 153 birds birds/20 min (Table 3). Of the species groups observed, waterfowl exhibited the highest mean use (84.81 birds/20 min), and approximately 55 percent of the total birds observed were waterfowl species. The waterfowl species with the highest mean use were Canada goose (*Branta canadensis*) at 50.21 birds/20 min, mallard (*Anas platyrhynchos*) at 50.21 birds/20 min, and tundra swan (*Cygnus columbianus*) at 1.64 birds/20 min. The remainder of the waterfowl species observed exhibited mean use less than 1 bird/min.

Among songbirds (the species group with the second highest mean use [43.28 birds/20 min]), the species with the highest mean use were red-winged blackbird (*Agelaius phoeniceus*) at 23.19 birds/20 min, common grackle (*Quiscalus quiscula*) at 6.93 birds/60 min, and tree swallow (*Tachycineta bicolor*) at 1.89 birds/20 min. Additionally, 700 blackbirds that were unable to be identified to species level were observed. These blackbirds were likely either red-winged blackbird or common grackle (Table 1).

Waterbirds exhibited the third highest mean use of the Project Area of any species group (23.75 birds/20 min), a value largely driven by American coot mean use (19.28 birds/20 min). The remainder of waterbird species exhibited much lower mean use at less than 2 birds/20 min each (Table 1).

Table 1. Avian species, by species grouping, observed during the Fall 2012 avian surveys

Species Grouping	**Number of Birds**	**Number of Observations**	**Mean Use** # birds per 20 min	**Percent Composition** # birds/grand total
Waterfowl	**6106**	**205**	**84.81**	**55.5%**
Canada goose	3615	75	50.21	32.9%
Mallard	2215	93	30.76	20.1%
Tundra swan	118	7	1.64	1.1%
Northern shoveler	56	8	0.78	0.5%
Bufflehead	24	5	0.33	0.2%
Common goldeneye	20	3	0.28	0.2%

Species Grouping	Number of Birds	Number of Observations	Mean Use # birds per 20 min	Percent Composition # birds/grand total
Northern pintail*	15	3	0.21	0.1%
American white pelican*	12	2	0.17	0.1%
Canvasback*	6	2	0.08	0.1%
Lesser scaup	6	1	0.08	0.1%
Ring-necked duck	6	2	0.08	0.1%
Blue-winged teal	5	1	0.07	0.0%
Gadwall	5	1	0.07	0.0%
Green-winged teal	2	1	0.03	0.0%
American wigeon	1	1	0.01	0.0%
Songbirds	**3116**	**55**	**43.28**	**28.3%**
Red-winged blackbird	1670	21	23.19	15.2%
Unidentified blackbird	700	3	9.72	6.4%
Common grackle	499	12	6.93	4.5%
Tree swallow	136	4	1.89	1.2%
Brown-headed cowbird	61	4	0.85	0.6%
House sparrow	25	3	0.35	0.2%
Vesper sparrow	9	3	0.13	0.1%
American goldfinch	5	1	0.07	0.0%
American pipit	5	1	0.07	0.0%
European starling	4	1	0.06	0.0%
American robin	1	1	0.01	0.0%
Le Conte's sparrow*	1	1	0.01	0.0%
Waterbirds	**1710**	**80**	**23.75**	**15.5%**
American coot	1388	28	19.28	12.6%
Ring-billed gull	133	11	1.85	1.2%
Western grebe	80	3	1.11	0.7%
Double-crested cormorant	50	1	0.69	0.5%
Killdeer	25	17	0.35	0.2%
Greater yellowlegs	14	8	0.19	0.1%
Great egret	8	3	0.11	0.1%
Common snipe	7	4	0.10	0.1%
Great blue heron	5	5	0.07	0.0%
Pigeons/Doves	**38**	**4**	**0.53**	**0.3%**
Rock dove	36	3	0.50	0.3%

Species Grouping	Number of Birds	Number of Observations	Mean Use # birds per 20 min	Percent Composition # birds/grand total
Mourning dove	2	1	0.03	0.0%
Raptors	**31**	**29**	**0.43**	**0.3%**
Red-tailed hawk	18	16	0.25	0.2%
Northern harrier*	10	10	0.14	0.1%
Bald eagle*	2	2	0.03	0.0%
American kestrel	1	1	0.01	0.0%
Crows and Allies	**1**	**1**	**0.01**	**0.0%**
American crow	1	1	0.01	0.0%
Grand Total	**11002**	**374**	**152.81**	**100%**

* North Dakota Species of Conservation Priority

4.2.1 Federal and State Listed Species

No federally endangered, threatened, or candidate species were observed during the fall avian surveys.

Two bald eagles (*Haliaeetus leucocephalus*) were observed within the Project Area during the fall point count surveys (Table 1). Although no longer protected under the Endangered Species Act (ESA), the bald eagle (*Haliaeetus leucocephalus*) is still protected by the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA).

The United States Fish and Wildlife Service (USFWS) North Dakota Ecological Services Field Office has identified eleven Species of Habitat Fragmentation Concern for the state: Baird's sparrow (*Ammodramus bairdii*), bobolink (*Dolichonyx oryzivorus*), chestnut-collared longspur (*Calcarius ornatus*), grasshopper sparrow (*Ammodramus savannarum*), greater prairie-chicken (*Tympanuchus cupido*), greater sage-grouse (*Centrocercus urophasianus*), northern harrier (*Circus cyaneus*), sedge wren (*Cistothorus platensis*), sharp-tailed grouse (*Tympanuchus phasianellus*), Sprague's pipit, and upland sandpiper (*Bartramia longicauda*) (USFWS 2012). Species of Habitat Fragmentation concern are defined as species of concern for which a relevant federal, state, tribal, and/or local agency has found that separation of their habitats into smaller blocks reduces connectivity such that the individuals in the remaining habitat segments may suffer from effects such as decreased survival, reproduction, distribution, or use of the area. The USFWS states that habitat fragmentation from a wind energy project may create significant barriers for such species (USFWS 2012). The only Species of Habitat Fragmentation Concern observed during the fall avian surveys was the northern harrier, which exhibited relatively low mean use (0.14 birds/20 min) of the Project Area (Table 1).

At the state level, North Dakota does not have a list defined by statute for threatened or endangered species comparable to the ESA. North Dakota has instead identified 100 Species of Conservation Priority under the North Dakota Comprehensive Wildlife Conservation Strategy. This list includes 45 avian species. The designation of Species of Conservation Priority describes a species identified as in decline at the national, regional, or state level, or a species whose population status is not well known, but is thought

to be in decline in North Dakota. Species of Conservation Priority receive special attention from state agencies, but do not require take permits or have other regulatory implications (Hagen et al. 2005). The following state-designated Species of Conservation Priority were observed during the fall avian surveys: American white pelican (*Pelecanus erythrorhynchos*), bald eagle, canvasback (*Aythya valisineria*), Le Conte's sparrow (*Ammodramus leconteii*), northern harrier, and northern pintail (*Anas acuta*). Overall, these species exhibited relatively low mean use of the Project Area (Table 1).

4.2.2 Raptors

Raptors are a group of special interest when considering impacts from wind energy development due to their propensity to fly at heights similar to turbine RSAs. Four raptor species were observed within the Project Area during the avian surveys: American kestrel (*Falco sparverius*), bald eagle, northern harrier, and red-tailed hawk (*Buteo jamaicensis).* Overall mean use for raptors was 0.43 birds/20 min, and the raptor species with the highest mean use was red-tailed hawk (0.25 birds/20 min) (Table 1).

4.4 Flight Behavior

During fall avian use surveys, the biologist collected behavioral data for all avian species observed visually. Of the total number of birds observed, the biologist observed approximately 51% of birds exhibiting some form of flight behavior. Of the 23 species observed in flight during the fall avian surveys, 15 were observed only in low altitude flight below the RSA. The two species most frequently observed flying at RSA height were Canada goose and mallard. Seventy-one percent of unidentified blackbirds were observed flying within the RSA (Table 2). These blackbirds were likely red-winged blackbirds or common grackle, two other species observed flying at RSA height.

Table 2. Avian Flight Height Characteristics in Relation to the RSA

Species Grouping	Total Number of Birds	No. Observed in Flight	Percent Flying Below RSA	Percent Flying within RSA
Waterfowl	**6106**	**3045**	**34%**	**66%**
Canada goose	3615	1628	32%	68%
Mallard	2215	1390	36%	64%
Tundra swan	118	22	91%	9%
American wigeon	1	1	100%	0%
Blue-winged teal	5	2	100%	0%
Northern shoveler	56	2	100%	0%
Songbirds	**3116**	**2363**	**67%**	**33%**
Unidentified blackbird	700	700	29%	71%
Common grackle	499	499	74%	26%
Red-winged blackbird	1670	937	83%	17%
American goldfinch	5	5	100%	0%
Brown-headed cowbird	61	61	100%	0%

Species Grouping	Total Number of Birds	No. Observed in Flight	Percent Flying Below RSA	Percent Flying within RSA
House sparrow	25	25	100%	0%
Tree swallow	136	136	100%	0%
Waterbirds	**1710**	**126**	**96%**	**4%**
Ring-billed gull	133	63	92%	8%
American coot	1388	51	100%	0%
Great blue heron	5	3	100%	0%
Great egret	8	1	100%	0%
Greater yellowlegs	14	1	100%	0%
Killdeer	25	7	100%	0%
Pigeons/Doves	**36**	**36**	**100%**	**0%**
Rock dove	36	36	100%	0%
Raptors	**31**	**22**	**82%**	**18%**
Bald eagle	2	2	50%	50%
Red-tailed hawk	18	10	70%	30%
American kestrel	1	1	100%	0%
Northern harrier	10	9	100%	0%
Grand Total	**11002**	**5592**	**50%**	**50%**

Notes
[1] Only birds observed in flight were included in Table 2.

No birds were observed flying above RSA height

* North Dakota Species of Conservation Priority

4.3 Crane Surveys

No visual or auditory observations of sandhill cranes or whooping cranes were made during the fall 2012 crane surveys.

5.0 DISCUSSION AND CONCLUSIONS

5.1 Risk to Non-raptor Species

The prairie region of the northern Great Plains is one of the most important areas for duck reproduction in North America (Samson et al. 1998, Jones-Farrand et al. 2007). This region is also a major migration corridor during and spring for ducks, geese, shorebirds, and other waterbirds (Skagen and Knopf 1994, Samson et al. 1998, Jones-Farrand et al. 2007). A large number of wetlands providing migratory stopover habitat are present within the Project Area. Accordingly, waterfowl exhibited the highest mean use of the species groups observed, and approximately 55 percent of the total birds observed were waterfowl species. Studies of these taxa found low fatalities rates even with high mean use (Erickson et al. 2002, Kerns and Kerlinger 2004, Jain 2005). This discrepancy may occur because these species often fly within

flocks during daylight hours, which increases their ability to detect the turbines. Based on a review of mean use and estimated fatality rates of goose species at operating wind facilities, a collision model was created that estimated the average turbine collision avoidance rate for geese (Canada and snow geese) was high (99.93 percent; Fernley et al. 2006). Additionally, the two most commonly observed waterfowl species (Canada goose and mallard) have stable to increasing populations, largely due to their adaptability to changing habitats and human disturbance (Drilling et al. 2002; Mowbray et al. 2002). Given their wide-spread status, high numbers, and stable to increasing populations, population-level impacts are unlikely as a result of any turbine-related mortality that may occur.

Songbirds exhibited the second highest mean use of the Project Area. Red-winged blackbird, common grackle, and unidentified blackbirds were the most commonly observed songbird species. Unidentified blackbirds were likely either red-winged blackbird or common grackle. Given the high mean use of the Project Area by these two species, turbine-related fatalities may occur. However, any fatalities that do occur are unlikely to have population-level impacts due to the species large, stable populations (Rich et al. 2004; Sauer et al. 2008).

Waterbirds exhibited the third highest mean use of the Project Area, a value largely driven by American coot mean use. The biologist observed the majority (96%) of coots swimming or standing on the edge of wetlands. The few coots observed in flight were flying at low altitudes below the RSA. American coot mortality has been recorded at other wind energy facilities but at low numbers (Johnson et al. 2002, Anderson et al. 2005, Kerlinger et al. 2006). Given the high number of coots using the Project Area, some turbine-related mortality may occur; however, any fatalities are not expected to have population level impacts due to the species large, stable population (Sauer et al. 2008).

5.2 Risk to Raptor Species

Special consideration is often given to raptor species at wind farms because diurnal raptors are generally at higher risk for collision with turbines than are many other avian species (National Wind Coordinating Collaborative [NWCC], 2010). High raptor use has been associated with high raptor mortality at new generation wind farms (Erickson 2007). Conversely, raptor mortality appears to be low when raptor use is low, as defined by Erickson (2007) as less than 1.0 birds/20 min. Based on mean use, the Project would be considered a low risk site for raptor mortality with a group mean use of 0.43 birds/20 min. Additionally, the observed flight behavior or raptors did not indicate high risk of collision mortality.

5.3 Risk to Listed and Sensitive Species

The biologist did not detect any species listed as candidate, threatened, or endangered under the ESA during the fall avian point count surveys or the fall crane surveys.

Two bald eagles were observed within the Project Area during the fall point count surveys, and one was observed flying within the RSA. The presence of bald eagles within the Project Area will require compliance with the BGEPA. The very limited number of collision mortality records for bald eagles at other wind farms indicates that bald eagles will likely be at low risk of collision mortality at the Project Area (Manville 2005, Pearce 2010). The numbers of bald eagles in North Dakota have been steadily increasing since the 1980s (USFWS 2011), and an evaluation of the effect of the Project on local eagle populations can be completed if additional information is obtained..

The USFWS North Dakota Ecological Services Field Office has identified eleven Species of Habitat Fragmentation Concern for the state (USFWS 2012). The only Species of Habitat Fragmentation Concern observed during the fall avian surveys was the northern harrier, which exhibited relatively low mean use (0.14 birds/20 min) of the Project Area and did not exhibit high risk flight behavior.

At the state level, North Dakota does not have a list defined by statute for threatened or endangered species comparable to the ESA. North Dakota has instead identified 100 Species of Conservation Priority under the State Wildlife Action Plan. Six Species of Conservation Priority were observed during fall avian surveys: American white pelican, bald eagle, canvasback, Le Conte's sparrow, northern harrier, and northern pintail. Overall, these species exhibited relatively low mean use of the Project Area and did not exhibit high risk flight behavior.

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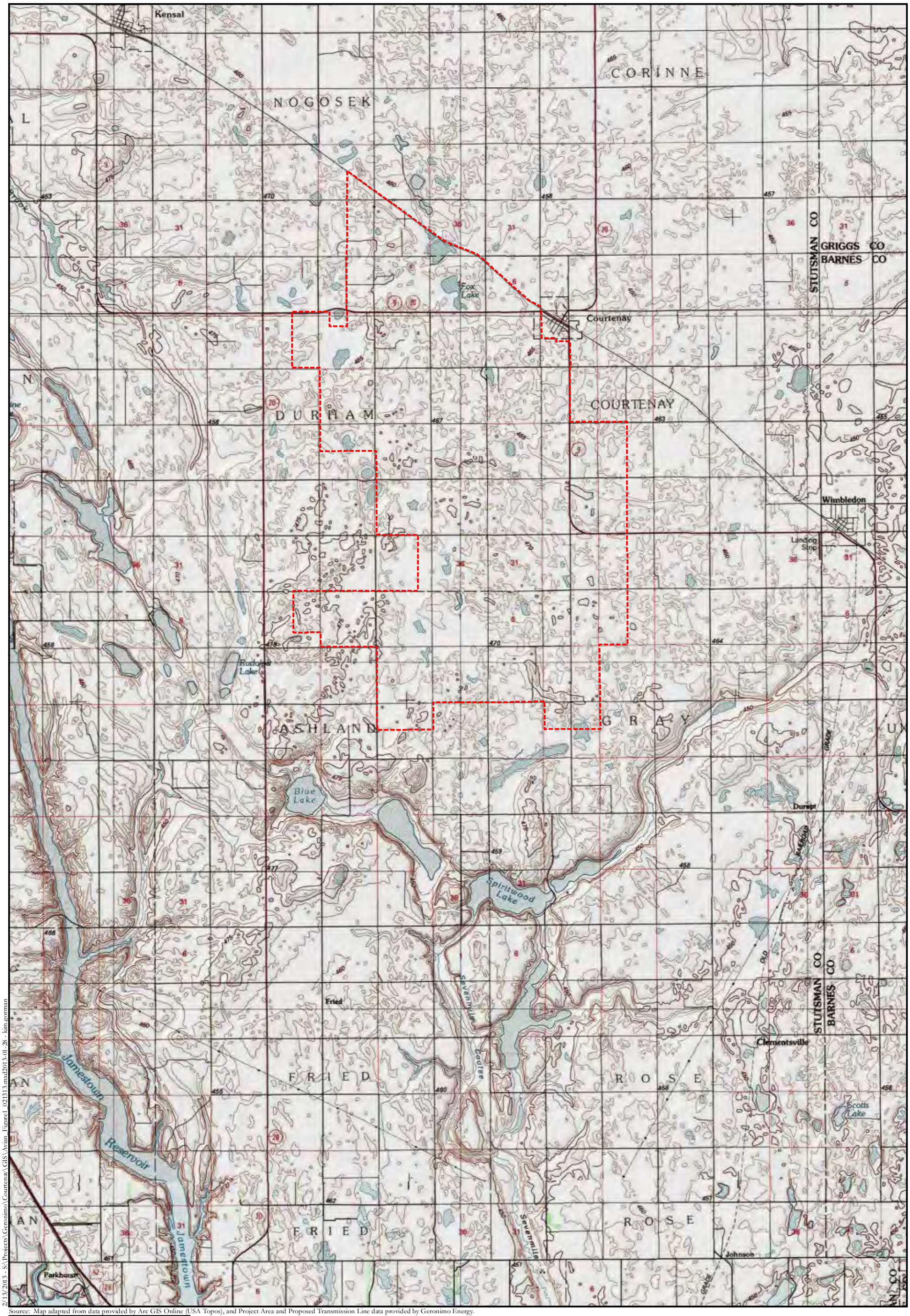
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APPENDIX A
Figures



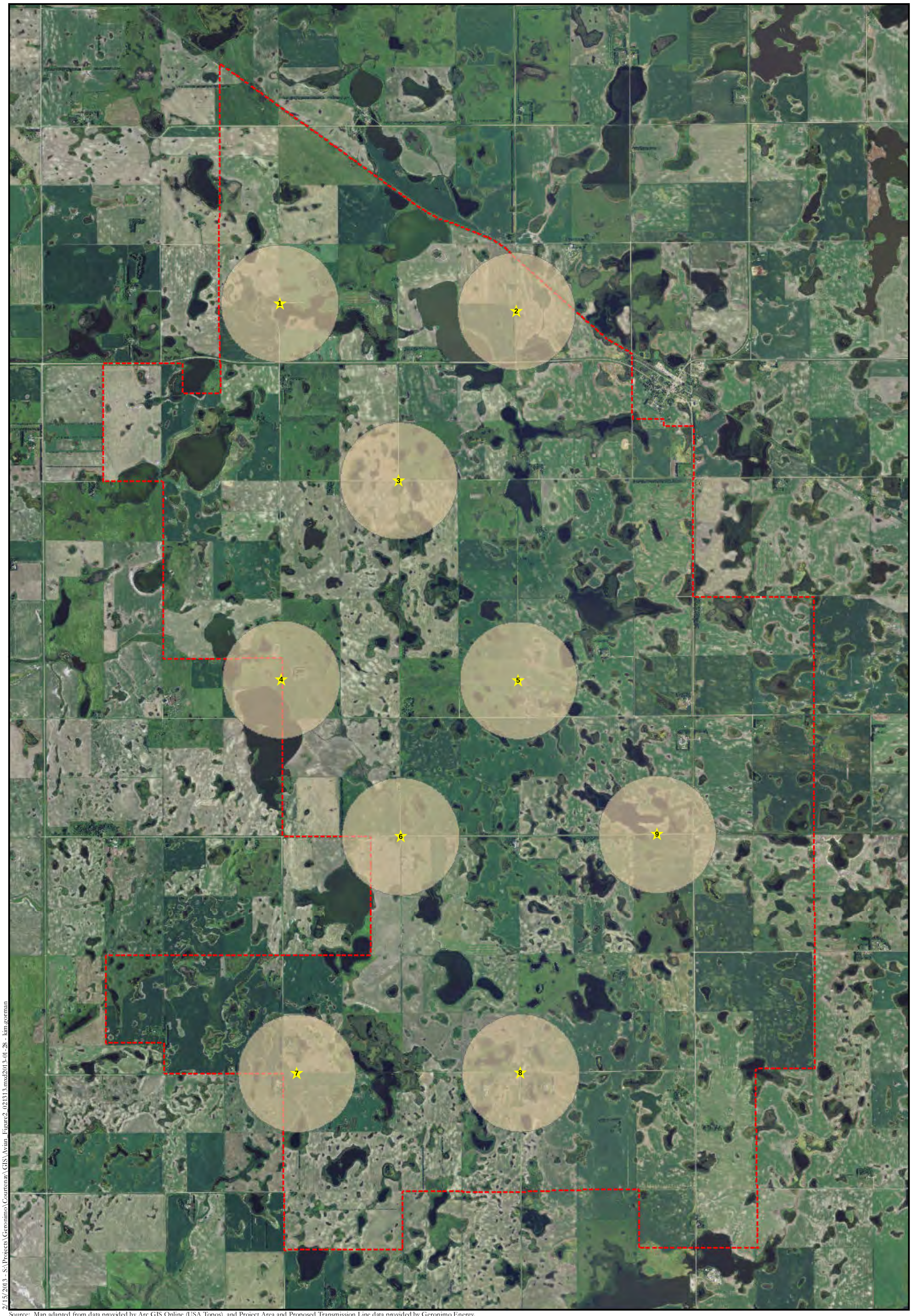
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Source: Map adapted from data provided by Arc GIS Online (USA Topos), and Project Area and Proposed Transmission Line data provided by Geronimo Energy.

Figure 1 - Project Area Vicinity
Courtenay Wind Farm Project
Stutsman County, North Dakota

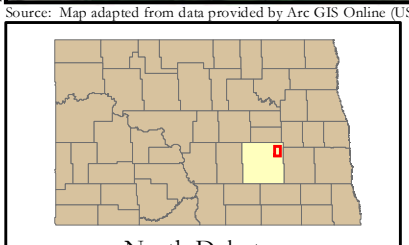
COURTENAY WIND FARM
Stutsman County, ND

TETRA TECH



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Source: Map adapted from data provided by Arc GIS Online (USA Topos), and Project Area and Proposed Transmission Line data provided by Geronimo Energy.



★ Point Count Location

800-meter Radius of Point Count Location

Project Area

0 0.5 1 1.5 Miles N

Figure 2 - Project Area and Point Count Locations
Courtenay Wind Farm Project
Stutsman County, North Dakota

COURTENAY WIND FARM
Stutsman County, ND

TETRA TECH

APPENDIX B
Avian Survey Protocol

Point Count Survey Protocol

1.0 Methods

The methodology employed here is a wind industry standard avian point count survey designed to determine the overall avian use of the area. To this end, 20-minute (min) point counts within an 800-meter (m) radius over the course of 1-2 days (depending on number of points) are utilized.

1.1. Prior to Conducting Surveys

Land Owner Contact

In many cases, projects will have a lease agent which will provide you with information. If you are asked to contact landowners directly, ask the following:

- Are there any locked gates? If so, what is the combination?
- Are there any places that I should not go?
- Are there hunters on the property?
- Are there any time restrictions as to when I can be on the property?
- Is there anything else that I should know (e.g., road conditions, fences, cattle,lambing season)?

Equipment List

- Binoculars
- Watch that displays in 24-hour time
- GPS unit
- Compass
- Field map with turbine strings if available
- Field notebook
- Digital camera
- Pens/Pencils
- Flagging tape
- Clip board (preferably with weather protection)
- Bird book
- Range finder that registers both horizontal and vertical (for example, OPTi-LOGIC 1000 LH Rangefinder Hypsometer)
- Anemometer (Kph)
- Thermometer
- Data sheets (point count, incidental, point count schedule, distance/height
- calibration worksheet)
- List of 4-letter species codes/List of unknown bird codes

1.2. Conducting Surveys

Key Points

- Your safety is the highest priority. If there is a situation that feels unsafe (e.g., lightening storm, confrontational person, washed-out road), do not survey that point and remove yourself to a safe location.
- Documenting bird use of the area is the goal of the point count survey. Thus, the priority is to identify "Species", "Number of individuals" and "Activity." Individual birds' characteristics are secondary.
- Surveys are meant to capture avian use throughout the day and, therefore, are conducted during all weather (except when visibility is reduced (see section 1.2.2) or the situation is unsafe) and during all daylight hours. *Keep track of when during the day points are surveyed using the Time Tracker Data Table.*
- For any weekly survey all points must be surveyed within 7 days and there shall be no less than 4 days from the date of the last survey to the beginning of next survey week.
- Legible handwriting is key; please make every effort to write legibly, preferably using a dark pencil or waterproof pen.
- If you observe any federal or state-listed Threatened & Endangered species, take detailed notes of observations on the appropriate data sheet.

1.2.1. Point Count Datasheets

All fields

- All blanks on the datasheet should be filled in. If you are unable to determine a value (e.g., sex or age) then draw a dash in the box so that it is clear that the information was not available and not that the observer forgot to write it down. <u>You must check the data sheet for errors and omitted information from top to bottom following the survey before moving on to the next point location.</u>

Point data (top of the datasheet):

Date:

- Date survey was conducted.

Observer:

- Initials of the surveyor of record.
- NOTE: If there are two people at a point, one person is the official observer and the other person should act only as the recorder.

Start time and End time:

- Time survey begins and ends. If at anytime during the survey period you are interrupted for less than 1 minute you may suspend the survey and continue when the interruption has ended. Record the time that the interruption occurred and the time it ended. However, if an interruption lasts more than 1 minute you will need to stop the survey and restart the 20- (or 30-) min survey clock. The data you collected prior to the interruption are no longer valid.

Visibility:

- Distance in meters you are able to see.
- If you are able to see the entire 800-m circle during your survey, mark "Clear"
- If you did not mark "Clear":
    - As overall visibility may change within a survey period, we ask you to record both the minimum (Min) and maximum (Max) visibility you had during the survey period.
        - Example: If you can see 1000m to the north, but only 200m to the south , write "Min: 200m and Max: 1000m".
        - Example: If you can see 400m in the beginning of the survey and 700m by the end write "Min:400m and Max: 700m".
- If at any time you are unable to see less than 50% of the 800-m radius circle and/or the cloud ceiling drops below 100m, you either need to postpone or stop the survey. When you are able to see at least 50% of the circle and the cloud ceiling is higher than 100m you may resume the survey. However, if the break was greater than 1min you will need to start the survey over again. The data you collected prior to the reduction in visibility are no longer valid.

Wind Direction:

- Record the direction the wind is originating from (not the direction it is traveling).

Wind Speed (km/h):

- Record the range of wind speeds that occur during the survey period. Fill in both a minimum and maximum wind speed. All wind speed data must be recorded in kilometers per hour (km/h).

Precipitation:

- Circle the appropriate precipitation. If "other" please define in the Notes section.
    - Do not conduct survey if the precipitation limits your visibility to less than 50% of the 800-m circle.

Temp (°F):

- Temperature during survey period. Please record all temperatures in degrees Fahrenheit.

Cloud Cover (%):

- Record the percentage of clouds covering the 800-m circle.
    - Do not conduct survey if the cloud cover is 100% and the cloud ceilingis lower than 150 m.
    -

Observation data(bottom section of datasheet):

Species codes:

- A state-specific species list with the codes we use will be provided to you at the beginning of the field season. We use the 4-letter codes from Pyle's
- *Identification guide to North American Birds*". Most of these codes are the
- same as BBL codes; however, there are some differences. Please check your codes the first time out to ensure that you use the correct code.
- If you are unable to identify the species, a separate list for unknown birds is provided.
- If you are unsure of the species code, write the full name of the bird you saw in the Notes section and fill in the appropriate code when you are able tocheck the code list we sent you.
- If a mixed species flock is observed, please note the observation by recording each species on a separate line and estimating the number of individuals for each species. You should write in the notes column that the species was part of a mixed species flock (see example datasheet).
- For unidentified species please write out any additional information that might refine the possibilities in the notes column. For example, if you record UNSW, in the Notes column, you might write "tree swallow or violet-green swallow".

Time:

- Time is the time you first saw the bird.
- Time is recorded using a 24-hour clock (to avoid am/pm time confusion).

Sex:

- Field should be filled in as male (M), female (F), or both (B).
- If you know the number of males and females, write in the Notes.
- If unknown, draw a line through the box.

Age:

- Field should be filled in as adult (A) or juvenile (J) or both (B).

- If you know the number of adults and/or juveniles, write in the notes column.
- If unknown, draw a line through the box.

Number of individuals:
- Always fill in this field, even in "auditory-only" detections.
- Estimate this number when uncertain.
- Estimates are most accurate at time of observation and do not need any numerical symbols (e.g., ~ or ±) to accompany them.

Activity:
- Circle the first activity observed.
- Put a check mark over the second activity.
    - Walking: bird was on the ground (height is 0).
    - Perching: bird was perched above ground (e.g., tree, fence).
    - Flying: bird was in the air.
    - Other: only select if the activity could not be categorized as an activity listed (e.g., swimming). Please explain any "OT" selection in the Notes..
        - e.g., "mobbing" is a flying activity so select "FL" and write in Notes "mobbing").
- Additional, relevant behavioral information should be included in Notes.

Height data:
- Use a range finder to measure reference heights within the point count circle.
    - When driving by tall structures not on point counts (e.g., telephone poles, met towers, barns) use the range finder to test your ability to estimate heights.
- Two heights are recorded: lowest and highest.
- Heights should be filled in for all birds observed.
- If a bird's height does not change while observed (e.g., a perched bird), simply write the same height in each column.
- Heights should be recorded in meters (m).
- If you cannot see a bird and, therefore, cannot estimate its height, draw lines through the blanks.

Flight direction:
- This applies only to birds that do not land within the 800-m circle.
    - Example: If you see a flock of sandhill cranes flying through or above the count circle.
    - Example: You see a TUVU circle soaring and moving with thermals.

- If a bird is making localized flight movements (e.g., tree to tree) or if a bird is not flying, simply put a line through this space on the data sheet.
    - Example: If a robin changed perches by flying from one tree to another.
    - Example: A flock of blackbirds gets flushed by a passing car and settles nearby.
- Flight direction is the direction to which the bird is flying.
    - If the bird is flying from the north to the south, then the flight direction would be south.
    - The overall directionality of a circle soaring bird should be filled out (as opposed to recording "variable").

Flight Paths:

- Draw flight paths of raptors, large birds and significant observations (such as large flocks or sensitive species) on the data sheet map.

Horizontal distance:

- This is a key piece of information!
- Distance is recorded as first distance and closest distance.
- If first and closest distance are the same, use ditto marks (") in the blank.
- Record all distances in meters (m).
- Use a rangefinder and topographic map to identify the distances of distinctive features in the landscape to help with distance estimation.

Habitat types:

- Circle the primary habitat type in which birds were seen.
- Check second habitat type in which birds where seen.
- Other: only select if the habitat could not be categorized as a habitat listed (e.g., agriculture). Please explain any "OT" selection in the Notes.
- NOTE: Habitat types and codes should be identified prior to first survey. Use Habitat Codes Table for code selection. Point count description sheets should be illed out and sent in to Tetra Tech office with first survey.

Aud?/Vis? Columns:

- Check the auditory box if the bird(s) were heard.
- Check the visual box if the bird(s) was seen.
- Check both if the bird(s) was seen and heard.

Notes:

- Use the Notes column for any additional details you consider important.
- This may include, but is not limited to:
    - Behavior of the bird (e.g., male displaying to female).
    - Location of the bird (e.g., kestrel sitting on wire).
    - Taxonomic grouping of bird if species is unknown (e.g., *Buteo*).
    - If species is unknown, any characters you observed or hunches about what it was (e.g., light head, dark body, song a descending trill; or likely a HOLA or LALO).
    - Full species name, if uncertain about 4-letter code (e.g., ring-necked pheasant, unknown *Buteo*).

Additional Notes:

- Use this section at the bottom of the page for any notes that relate to the survey in general (e.g., "Snowing on and off").
- Additionally, use this section if you run out of room in the notes column for a specific observation. If you use it for this reason, write the observation number in the Obs #/Time column.

NOTE: The following two columns may only be used at projects/points where there is a ridge within the survey circle.

Maximum distance flown in from cliff edge:

- This is designed to capture how far over the ridgeline the birds move and can be useful in determining setbacks needed to minimize mortality to birds, particularly raptors.
- Data should be recorded in meters.
- Use rangefinder to check distances of reference objects at site.

Crosses Ridge (only for projects/points with ridges):

- For points that have ridges lets us know if/how birds are utilizing it.
- CR-Crosses Ridge the bird flies over the ridge.
- ON-On Ridge the bird is flying exclusively over the ridge.
- OF-Off the bird is does not fly over the ridge at any time.

1.2.2. Pausing and/or Halting a Point Count

There may be times while conducting your point count surveys that you will need to pause or halt a point count survey(s). Some example circumstances are:

- Weather/Visibility
    - If you are unable to see at least 50% of the point count circle and/or the cloud ceiling has dropped below 100m.
    - If you are unable to reach a point due to road conditions.

- Interruptions
    - If someone approaches you to speak to you while you are conducting a survey and the interruption last more than 1 min.
    - Some activity (e.g., equipment moving through the area, field within the circle is being actively plowed) interferes with your ability to conduct the survey.
    - You get a flat tire and are unable to delay getting help until after you have finished your surveys.

Depending on the particular circumstances there are several options as to how to proceed.

- If the situation is temporary (e.g., fog rapidly moving through the area), then either wait for the situation to clear or proceed surveying other unaffected points and return to the affected point(s). Note: If you already started to survey a point and the interruption lasts more than 1 minute, you must restart the 20- (or 30-) min survey clock. The data you collected prior to the interruption are no longer valid.
- If this situation is likely to persist for the weekly survey (the number of days it ypically takes you to completely survey all points) simply send a blank datasheet(s) for this point(s) with the other data you collected with an explanationwritten in the Notes as to why you skipped the point(s).

1.2.3. Examples of Common Problems During Surveys and What to do

Someone stops and talks to you during a survey

- If survey is stopped for greater than 1 minute, the survey must start over. The data collected prior to the interruption are no longer valid.
- Talk to the person. Be polite, respectful and discrete. Remember that wind farmsmcan be controversial and the all information you have, including survey data, is confidential.
- • Tell the person, “I am in the middle of a bird survey right now and I have fivemminutes left. I can talk to you when I am finished if you would like to wait?”.
- Record in your notes the name the person you spoke with.
- Refer the person to the development company’s (client) contact.
- As maps contain confidential information, keep them out of view.

You are unsure if you have counted a bird

- Try to keep track of each bird.
- If you lose track, assume they are new individuals.
- Each unique bird should only have one line of data; therefore, if the

- activity/behaviors or habitat use changes during the survey, check or add in the appropriate information on the original line of data. Do not create a new line for this existing bird.
- QUICK TIP: To help keep track of birds, in the Notes box write the direction the bird was observed in.
- Example: You have 1 singing male 200 m away to the north and 2 singing
- males 30 m away to the south. In 15 minutes when you hear a singing
- male 100 m away to the northeast, you can assume it is a new male.

You are unsure how many individuals are present

- The "number of individuals" field always MUST be filled in.
- Exact numbers are better, but if exact numbers are not possible, make a reasonable estimate.
- Using orders of magnitude (e.g., 1, 10, 50, 100) is an appropriate tool for estimating. Remember, without a number, we cannot count a record.
- "At least 1" is acceptable.
- QUICK TIP: To estimate large flocks of birds, count a group of birds (e.g., 50 individuals) and get an idea of what a group of 50 looks like. Then begin counting in groups of 50.
- QUICK TIP: To estimate singing males when there is an abundance of singing occurring, imagine dividing the circle into a pie. Concentrate on listening to one slice of that pie or one quadrant. Estimate the number of males in that quadrant only and put those male as one line item on the data sheet (noting the direction you were listening in the Comments box, so you don't lose track). Then continue in the next quadrant until you have covered the entire circle.

You are unsure of the species

- Record the species to the most specific taxonomic level possible (e.g., unidentified warbler is more specific than unidentified passerine, unidentified *Buteo* is more specific than unidentified hawk).
- Examples of possible choices, from broadest to most specific:
    - Unknown hawk
    - Unknown *Buteo*
    - Red-tailed hawk
- Check the species list to look for the appropriate unknown code.
- If an appropriate code is not listed, leave the code blank and put your species determination in the Notes field.

How do you record a perching bird?

- Perched birds should be recorded at the height they are perched.
    - Example: a bird is perched on a fence post at 1.5 m height. It flies to 4 m and lands on the ground.
        - First behavior = perching (circled)
        - Second behavior = flying (checked)
        - Third behavior = walking (checked)
        - Low height = 0 m (landed on the ground)
        - High height = 4 m
    - Example: a bird is perched on a fence post at 1.5 m height. It flies to 4 m and returns to the same fence post.
        - First behavior = perching (circled)
        - Second behavior = flying (checked)
        - Low height = 1.5 m
        - High height = 4 m

How do you record flight heights over variable topography?

- Record the height above the ground over which the bird is directly located.
- No negative height values should be recorded.

The weather changes during the survey

- If the change is dramatic then note the time and continue the survey unless the situation is dangerous or visibility is obscured in greater than 50% of the survey circle.
- If the situation is dangerous, 50% of the 800-m circle is obscured, or there is 100% cloud cover with a cloud ceiling of less than 100 m, cancel survey and return later.

Common problems with data we receive from field biologists

- Number of individuals is missing.
- Species codes are incorrect.
- Species are missing.
- Low height is higher then the maximum height observed.
- Activity or habitat is “Other”, but is not explained in the Notes.
- Activity or habitat has been left blank.

1.2.4. Incidental Observation Datasheets

Not all birds need to be recorded! Only record observations of state or federal threatened and endangered species, novel species not seen during point counts, raptors or other large birds, grouse species, common birds behaving in a way that puts them at higher risk of being affected by a turbine or large flocks (25+ individuals). Do not record unidentified birds!

- Record birds viewed outside of survey time, outside of 800-m radius of survey circle and those seen while traveling between points.
    - These observations should be made in transit. Do not stop to go birding.
- If you see a threatened or endangered species, provide detailed notes on the data sheet.
- You may also include observations of non-bird species that are of particular interest (e.g., the observation of a carcass near a point as it may draw in birds). We do not have 4-letter codes for non-bird species so if a non-bird observation is important, write the species in the Notes column and record all pertinent info.
- Familiarize yourself with general habitats outside the project area, and think about how they may be affecting the bird activity within the site (e.g., large reservoir within a mile of the site likely drawing in the water fowl flocks you are seeing). Include any information such as this you deem helpful in understanding the big picture of the site on incidental forms.

1.2.5. Time Tracker Data Table

To ensure that all points are being visited at different times of the day and that all daylight hours are being covered, record the hour in which each point was visited in the Time Tracker data table. Include this table with your last data set for the survey season.

- Record the survey date above the appropriate survey number.
- Sunrise and sunset times can be found on-line (http://www.srrb.noaa.gov/highlights/sunrise/sunrise.html). Obtain before going into the field.
- At the time the point is surveyed, write the HOUR in the given cell. If the survey covers two hours, then write the hour that is in the majority.
    - Example: If you start the survey at 6:10am, write 6.
    - Example: If you start the survey at 2:30pm, write 14.
    - Example: If you start the survey at 2:55pm, write 15.
- All points should be visited in the first hour after sunrise at least once during the season.
- Surveys can begin approximately 15 minutes before sunrise, depending on
- weather and lighting conditions.
- IMPORTANT: If you are driving to the field in the morning and it is already light, you are starting surveys too late!
- IMPORTANT: If unforeseen events prevent a survey from being conducted at the normal scheduled time, two consecutive surveys must be at least 4 days apart.

- Example: Snow prevented you to go to the field on week 1. Therefore you needed to do survey 1 on week 2. Then survey 2 must not occur until 4 days have elapsed. Survey 2 can be conducted on the 5th day.

2. Quality Assurance/Quality Control (QA/QC)

In order to produce the highest quality data Tetra Tech asks surveyors to carefully adhere to the following QA/QC standards.

- Data should **NEVER** be transcribed from one datasheet to another or from a notebook to a datasheet. We recognize the nature of fieldwork and expect sheets with cross outs, dirt. etc. If for some unavoidable reason you transcribed data, you **MUST** send both the datasheet you transcribed the data to and the original sheet the data were originally collected on (even if it is a napkin)!
- DO NOT ERASE DATA ON DATASHEETS- If you make an error simply put a line through it.
- Check your data sheets at the end of each point before moving on to the next point in order to catch any missing information while you still remember what happened.
- If data are unavailable, then please place a dash the appropriate space on the datasheet so that it is clear that this piece of data was not forgotten during the data collection.
- Each week prior to surveys, calibrate yourself for height measurements using your range finder to determine accuracy. Because we use height data to determine bird activity within the rotor swept area, it is imperative that height information is accurate. Whenever possible, determine the height of known objects within the point count circle for reference and familiarize yourself with these heights each time that point is surveyed. Additionally, practice on objects outside of the point count circle to verify your accuracy.

Note: Do not be surprised if you get an email from the person entering the data from your project asking for data clarifications.

APPENDIX C
Sample Avian Survey Data Sheet

Courtenay Wind Project
Stutsman County, ND

Avian Fixed Point Observation Data Sheet

Date (mmddyy) _____ Observer (init.) _____ Start Time _____ End Time _____ Obs Pt.

Visibility: Clear or Min _____ Max_____ (m) Page ____ of _____

Wind Direction from (circle one): Calm N NE E SE S SW W NW Variable **Speed**: Low____ High _____ (km/h)

Precipitation (circle one): none light rain rain snow sleet hail fog other **Temp:** _____ (ºF) **Cloud Cover**: _____%

Obs #	Species Code	Time	Sex	Age	# of ind.	Activity (circle 1st, X others)		Height (m) Low	Height (m) High	Flight Dir (to)	Horizontal Distance (m) 1st	Horizontal Distance (m) closest	Habitat Type (circle 1st, X others)			Aud?	Vis?	Notes
1						WA	PE											
						FL	OT											
2						WA	PE											
						FL	OT											
3						WA	PE											
						FL	OT											
4						WA	PE											
						FL	OT											
5						WA	PE											
						FL	OT											
6						WA	PE											
						FL	OT											
7						WA	PE											
						FL	OT											
8						WA	PE											
						FL	OT											
9						WA	PE											
						FL	OT											
10						WA	PE											
						FL	OT											
11						WA	PE											
						FL	OT											
12						WA	PE											
						FL	OT											
13						WA	PE											
						FL	OT											
14						WA	PE											
						FL	OT											
15						WA	PE											
						FL	OT											
16						WA	PE											
						FL	OT											
17						WA	PE											
						FL	OT											
18						WA	PE											
						FL	OT											

Activity Codes: WA-walking on ground, PE-perched above ground, FL-flying, OT-other (please specify)
Habitat Codes:

OBS. # (Time)	ADDITIONAL NOTES

APPENDIX D
Representative Photographs



Photograph 1: A view from point count location 1 to the north.



Photograph 2: A view from point count location 1 to the east.



Photograph 3: A view from point count location 1 to the south.



Photograph 4: A view from point count location 1 to the west.



Photograph 5: A view from point count location 2 to the north.



Photograph 6: A view from point count location 2 to the east.



Photograph 7: A view from point count location 2 to the south.



Photograph 8: A view from point count location 2 to the west.



Photograph 9: A view from point count location 3 to the north.



Photograph 10: A view from point count location 3 to the east.



Photograph 11: A view from point count location 3 to the south.



Photograph 12: A view from point count location 3 to the west.



Photograph 13: A view from point count location 4 to the north.



Photograph 14: A view from point count location 4 to the east.



Photograph 15: A view from point count location 4 to the south.



Photograph 16: A view from point count location 4 to the west.



Photograph 17: A view from point count location 5 to the north.



Photograph 18: A view from point count location 5 to the east.



Photograph 19: A view from point count location 5 to the south.



Photograph 20: A view from point count location 5 to the west.



Photograph 21: A view from point count location 6 to the north.



Photograph 22: A view from point count location 6 to the east.



Photograph 23: A view from point count location 6 to the south.



Photograph 24: A view from point count location 6 to the west.



Photograph 25: A view from point count location 7 to the north.



Photograph 26: A view from point count location 7 to the east.



Photograph 27: A view from point count location 7 to the south.



Photograph 28: A view from point count location 7 to the west.



Photograph 29: A view from point count location 8 to the north.



Photograph 30: A view from point count location 8 to the east.



Photograph 31: A view from point count location 8 to the south.



Photograph 32: A view from point count location 8 to the west.



Photograph 33: A view from point count location 9 to the north.



Photograph 34: A view from point count location 9 to the east.



Photograph 35: A view from point count location 9 to the south.



Photograph 36: A view from point count location 9 to the west.