Appendix B – Delineation of Wetlands and Waters of the United States

DELINEATION OF WETLANDS AND WATERS OF THE UNITED STATES

ASHLEY WIND ENERGY PROJECT
MCINTOSH COUNTY, NORTH DAKOTA

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September 2010

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ACRONYMS AND ABBREVIATIONS

BGEPA	Bald and Golden Eagle Protection Act
CFR	Code of Federal Regulations
CPV	CPV Ashley Renewable Energy Company, LLC
CWA	Clean Water Act
DWQ	North Dakota Division of Water Quality
EO	Executive Order
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FAC	facultative
FACU	facultative upland
FACW	facultative wetland
GIS	geographic information system
GPS	global positioning system
kV	kilovolt
met tower	meteorological tower
MBTA	Migratory Bird Treaty Act
MDU	Montana-Dakota Utilities Co.
MISO	Midwest Independent Transmission System Operator
MW	megawatt
NDAC	North Dakota Administrative Code
NHD	National Hydrography Dataset
NI	no indicator
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
NWP	nationwide permit
NDDOH	North Dakota Department of Health
NDGFD	North Dakota Game and Fish Department
OBL	obligate wetland
O&M	operations and maintenance
OHWM	ordinary high water mark
PEM	palustrine emergent
PFO	palustrine forested
Project	Ashley Wind Energy Project
PSS	palustrine scrub-shrub
RPW	relatively permanent waters
TVA	Tennessee Valley Authority
Tetra Tech	Tetra Tech EC, Inc.

TNW	traditional navigable waters
UPL	obligate upland
U.S.	United States
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WPA	Waterfowl Production Areas

1.0 INTRODUCTION

CPV Ashley Renewable Energy Company, LLC (CPV) is developing plans to build the Ashley Wind Energy Project (Project) approximately 6 miles north of the City of Ashley in McIntosh County, North Dakota (Figure 1).

Tetra Tech EC, Inc. (Tetra Tech) was contracted by CPV to conduct a preliminary desktop analysis for the Project, followed by a field verification and delineation. The purpose of the desktop analysis was to map and evaluate existing datasets for the presence of wetlands and water resources within the Project Area and to use that information to aid in Project design. Following the desktop analysis, Tetra Tech wetland ecologists performed field verification and delineation of wetlands and other "waters of the United States [U.S.]," within the Project footprint and adjacent study area buffer (defined as the Project study corridor). Field work was performed from June 21 through July 1, 2010 and July 8-11, 2010. Through this identification of wetlands and water resources, CPV's engineers were able to avoid or minimize impacts on these resources through micrositing of the Project layout. This report documents the results of the field work.

1.1 Project Description

The proposed Project will consist of up to approximately 200.1 megawatts (MW) of renewable wind energy capacity. The Project Area is defined as approximately 17,400 acres of private land under easement agreement with CPV for the construction and operation of the Project (Figure 2). Of the 17,400 acres, only 0.4 percent is expected to be permanently affected by the Project footprint. Project facilities will likely include:

- up to 87 wind turbines;
- new gravel access roads and improvements to existing county roads;
- underground electrical collection lines;
- an operation and maintenance (O&M) building;
- interconnection substation facility;
- up to four permanent meteorological towers (met towers); and
- a temporary batch plant area and staging/laydown area for the construction phase of the Project.

The Project will interconnect to the Midwest Independent Transmission System Operator (MISO) electric grid via a 230-kilovolt (kV) Montana-Dakota Utilities Co. (MDU) transmission line that passes through the Project Area. The proposed Project and supporting facilities will be sited, constructed, and operated entirely within the 17,400-acre Project Area.

1.2 Purpose and Regulatory Framework

The purpose of this report is to document formally the wetlands and other waters present in the Project study corridor and provide a characterization of these resources. This assessment was conducted for use in designing development plans that comply with federal regulations concerning water quality as set forth under the Clean Water Act (CWA) of 1972. The United States Army Corps of Engineers (USACE) enforces Section 10 and Section 404 of the CWA, which regulates the discharge of dredged or fill material into all "waters of the U.S." including wetlands. Such waters are known as jurisdictional "waters of the U.S." and include not only obvious water bodies such as rivers, lakes, harbors, and bays, but also less obvious bodies of water such as intermittent streams and wetlands. If impacts on wetlands are expected to exceed the nationwide permit 12 threshold of 0.5 acre, CPV will submit the results of the wetlands delineation survey to the USACE for its review and concurrence with the findings prior to Project construction.

Pursuant to Section 404 of the CWA, USACE defines wetlands in 33 Code of Federal Regulations (CFR) 328.3b in general terms as those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and which under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The 1987 USACE Wetland Delineation Manual (USACE 1987) defines technical criteria to establish whether or not a wetland meets the definition presented in 33 CFR 328.3b. Three essential characteristics form the technical criteria: (1) prevalence of hydrophytic vegetation; (2) hydric soils; and (3) wetland hydrology. For an area to be classified as a jurisdictional wetland under the federal guidelines, all of the above criteria must be met and the wetland must have a significant nexus with a water of the U.S.

"Waters of the U.S." are defined in 40 CFR 230.3(s) as follows:

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters including interstate wetlands;
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce including any such waters:
    i. Which are or could be used by interstate or foreign travelers for recreational or other purposes; or
    ii. From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
    iii. Which are used or could be used for industrial purposes by industries in interstate commerce;
4. All impoundments of waters otherwise defined as waters of the United States under this definition;
5. Tributaries of waters identified in paragraphs (s)(1) through (4) of this section;
6. The territorial sea;
7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (s)(1) through (6) of this section; waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 423.11(m) which also meet the criteria of this definition) are not waters of the United States.

"Waters of the U.S." do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other federal agency for the purposes of the CWA, the final authority regarding CWA jurisdiction remains with the United States Environmental Protection Agency (EPA).

1.2.1 Federal Jurisdiction

1.2.1.1 Clean Water Act

Under Section 404 of the CWA, the USACE and the EPA regulate the discharge of dredge and fill material into "waters of the U.S." The jurisdictional status of wetlands and other waters is generally based on the USACE Jurisdictional Determination Form Instructional Guidebook (USACE 2007b) and USACE guidance resulting from Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States & Carabell v. United States (USACE 2008a). In order for an aquatic feature to be considered a "water of the U.S.," it must be at least one of the following:

- A traditional navigable water (TNW)
- A wetland adjacent to a TNW
- A relatively permanent water (RPW), including tributaries that typically flow year-round or have a continuous flow at least seasonally (typically three consecutive months depending on the region)
- A wetland that directly abuts a RPW
- A wetland adjacent (proximal but not abutting) to a RPW, but only if it can be shown that the feature has a "significant nexus" with a TNW
- A non-RPW or wetland adjacent to a non-RPW if the feature has a "significant nexus" with a TNW (USACE 2007b)

Adjacent is defined as "bordering, contiguous, or neighboring." Wetlands separated from other waters of the U.S. by barriers such as natural river berms, man-made dikes, and beach dunes may be considered adjacent wetlands. The 2008 ruling also requires that the agencies not generally assert jurisdiction over the following features:

- Swales or erosional features (e.g., gullies or small washes characterized by low volume, infrequent, or short duration flow); and
- Ditches (including roadside ditches) excavated wholly in and draining only uplands and that do not carry a relatively permanent flow of water.

Recent agency guidance states that the agencies will apply the significant nexus standard as follows (USACE 2007a):

- A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by all wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical and biological integrity of downstream traditional navigable waters; and
- Significant nexus includes consideration of hydrologic and ecologic factors.

In the absence of adjacent wetlands, lateral jurisdiction over nontidal waters extends to the ordinary high water mark (OHWM). The definition of the OHWM is "that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas" (65 Federal Register 12823, 2000).

1.2.1.2 Executive Order 11990 Protection of Wetlands

The purpose of Executive Order (EO) 11990, Protection of Wetlands, is to "minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands." To meet these objectives, the EO requires federal agencies, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided. Tennessee Valley Authority (TVA), a federal agency, is buying up to 200 MW of power from the Project. This federal action requires TVA to comply with EO 11990. In compliance with EO 11990 and to support TVA's role as lead federal agency, all wetlands present in the Project study corridor were delineated in the field to determine the types and extent of wetlands present, followed by micrositing to avoid impacts to wetlands when possible.

1.2.2 State Jurisdiction

State-regulated wetlands in North Dakota are primarily regulated through Section 401 of the CWA water quality certification program. The North Dakota Department of Health's (NDDOH) Division of Water Quality (DWQ) is the primary permitting agency for wetlands in North Dakota under Section 401. The North Dakota Game and Fish Department (NDGFD) acts as a commenting agency on wetland permitting through the Section 404 process when protected species are potentially involved.

Wetlands in North Dakota are defined according to North Dakota Administrative Code (NDAC) 33-16-02.1-09 as "water bodies, including isolated ponds, sloughs, and marshes, [that] are to be considered waters of the state and will be protected under [general water quality standards]." "Waters of the state" are defined according to NDAC Section 61-28-02(11) as:

> all waters within the jurisdiction of [the] state including all streams, lakes, ponds, impounding reservoirs, marshes, watercourses, waterways, and all other bodies or accumulation of water on or under the surface of the earth, natural or artificial, public or private, situated wholly or partly within or bordering upon the state, except those private waters that do not combine or effect a junction with natural surface or underground water just defined.

The North Dakota State Engineer's Office oversees the consultation process for impacts to "waters of the state," however permits are issued through various state offices depending on the type of impact. Pursuant to North Dakota Century Code 61-32-03, a Drain Permit is required from the State Engineer's Office before draining (or filling) "a pong, slough, lake, or sheetwater, or any series thereof, which has a watershed area comprising 80 acres or more."

2.0 SITE DESCRIPTION AND LOCATION

The proposed Project is located in McIntosh County in southeastern North Dakota in the Central Dark Brown Glaciated Plains (Major Land Resource Area 53B). The entirety of McIntosh County lies within the Northern Great Plains Spring Wheat Region (USDA-SCS 1981) and Central Lowland and Great Plains Physiographic Regions (Bluemle 1991). The regional topography is defined by rolling hills with many shallow isolated lakes and prairie potholes ranging in elevation from about 1,900 to 2,250 feet; the Project Area elevation is consistent with that of the region, ranging between 2,000 and 2,200 feet above sea level. The Project Area spans 34 separate sections of land, as summarized in Table 1.

Table 1. Townships, Ranges, and Sections within the Project Area

Township	Range	Sections
131N	69W	5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30
131N	70W	1, 2, 11, 12, 13, 14, 23, 24
132N	69W	31, 32
132N	70W	35, 36

Of the various soil types occurring in the Project study corridor, the majority are variations of loams, silty loams, clay loams, and silty clay loams. The underlying soil parent material is mostly of glacial origin with deposits of glaciolacustrine, till, and glaciofluvial deposits. No major streams are present in the immediate vicinity of the Project Area. The South Branch of Beaver Creek is approximately 12 miles to the west of the Project and Spring Creek is approximately 18 miles to the south in South Dakota.

Land use in the Project Area is characterized by farming and ranching. The Project Area is rural with a low population density and scattered residential areas. A few existing vertical structures are present, including the 230-kV transmission line owned by MDU, the 345-kV transmission line owned by Basin Electric, overhead distribution lines, and five temporary met towers associated with this Project.

2.1 Project Area Climate

Precipitation data from the National Weather Service (NWS 2010) Center for Bismarck, North Dakota (the closest center with archived data, located about 80 miles northwest of the Project) was examined. These data characterize the climate-sourced hydrology for the water resources examined during the survey period. The Water Year in North Dakota is the period measured from January 1 to December 31. Recent climate information is contrasted with normal, or average, climate information, based on records from the years 1971 to 2000. Recent climate data available on-line for Bismarck are summarized as follows:

- Normal Water-Year-to-Date: 9.06 inches
- Observed Water-Year-to-Date as of July 11, 2010: 11.15 inches
- Water-Year-to-Date departure from normal: 2.09 inches above normal(or 23 percent above normal)
- Normal monthly precipitation for June: 2.59 inches
- Monthly rainfall for June 2010: 2.48 inches
- Departure from normal June precipitation: 0.11 inches below normal
- Normal average monthly temperature for June: 64.6

- Observed average monthly temperature for June: 65.2
- Departure from normal average monthly temperature for June: 0.6 (or about 1 percent above normal)

Wetland hydrology observed in the Project Area during the survey period (June and a portion of July) was typical for the region. Daily temperature and precipitation amounts for the field investigation period are provided in Table 2. Average monthly precipitation and average monthly temperatures for McIntosh County, as listed by the NRCS (2010a), are presented in Table 3. While daily temperature and precipitation amounts deviated slightly from normal during the investigation period, precipitation year-to-date was 23 percent above normal. Most of the contributing precipitation occurred in April and May, during which 1.62 inches (111 percent) and 0.83 inches (37 percent) of rainfall above monthly normal occurred, respectively (NWS 2010).

Table 2. Daily Precipitation Summary for the Project Area[1]

Date	Temperature (°F)				Precipitation (in)
	Maximum	Minimum	Average	Departure from Normal Average	
Jun-1	65	45	55	-6	0.00
Jun-2	71	39	55	-6	0.00
Jun-3	73	54	64	2	0.10
Jun-4	79	50	65	3	0.00
Jun-5	80	53	67	5	0.02
Jun-6	77	52	65	3	0.00
Jun-7	77	45	61	-2	0.16
Jun-8	79	58	69	6	Trace
Jun-9	72	55	64	1	0.00
Jun-10	67	57	62	-1	Trace
Jun-11	66	56	61	-3	0.01
Jun-12	65	54	60	-4	Trace
Jun-13	71	49	60	-4	0.00
Jun-14	71	39	55	-9	0.00
Jun-15	78	42	60	-5	0.00
Jun-16	83	45	64	-1	Trace
Jun-17	81	58	70	5	0.53
Jun-18	70	52	61	-4	Trace
Jun-19	75	51	63	-3	0.01
Jun-20	82	53	68	2	0.00
Jun-21	**81**	**60**	**71**	**5**	**0.00**
Jun-22	**82**	**58**	**70**	**4**	**0.79**
Jun-23	**80**	**59**	**70**	**3**	**0.00**
Jun-24	**86**	**56**	**71**	**4**	**0.00**
Jun-25	**86**	**63**	**75**	**8**	**0.39**
Jun-26	**85**	**63**	**74**	**7**	**0.47**
Jun-27	**79**	**56**	**68**	**1**	**0.00**
Jun-28	**77**	**57**	**67**	**-1**	**0.00**
Jun-29	**82**	**54**	**68**	**0**	**0.00**
Jun-30	**97**	**65**	**81**	**13**	**0.00**
Jul-1	**95**	**66**	**81**	**13**	**0.00**
Jul-2	**94**	**70**	**82**	**13**	**0.00**

Table 2. Daily Precipitation Summary for the Project Area[1]

Date	Temperature (°F)				Precipitation (in)
	Maximum	Minimum	Average	Departure from Normal Average	
Jul-3	**83**	**65**	**74**	**5**	**0.00**
Jul-4	**81**	**59**	**70**	**1**	**0.00**
Jul-5	**78**	**53**	**66**	**-3**	**0.00**
Jul-6	**73**	**49**	**61**	**-8**	**0.02**
Jul-7	**80**	**52**	**66**	**-3**	**Trace**
Jul-8	**84**	**51**	**68**	**-2**	**0.00**
Jul-9	**88**	**52**	**70**	**0**	**0.00**
Jul-10	**95**	**54**	**75**	**5**	**0.13**
Jul-11	**74**	**56**	**65**	**-5**	**Trace**

Source: http://www.weather.gov/climate/index.php?wfo=bis

[1] Bolded text indicates dates in which wetlands were delineated in the Ashley Wind Project.

Table 3. Average Precipitation and Temperature for the Project Area

Month	Average Precipitation (Inches)	Average Monthly Temperatures
January	0.41	9°F
February	0.39	17°F
March	0.92	28°F
April	1.49	42°F
May	2.73	56°F
June	3.53	65°F
July	2.55	70°F
August	2.30	69°F
September	1.59	58°F
October	1.59	45°F
November	0.61	28°F
December	0.28	15°F

Source: http://www.wcc.nrcs.usda.gov/ftpref/support/climate/wetlands/nd/38051.txt

2.2 Regional Wetland Ecosystems

The North American Prairie Pothole Region extends from the Canadian provinces of Alberta, Saskatchewan and Manitoba, down into the United States within the states of Montana, North Dakota Minnesota, South Dakota, and Iowa. The prairie pothole region covers a large portion of northern, central and eastern North Dakota. McIntosh County, North Dakota is situated within the prairie pothole region.

Prairie potholes are depressional wetlands formed as a result of the Wisconsin glaciation during the Pleistocene Epoch ending approximately 10,000 years ago. In addition to prairie potholes, kettle lakes also formed in this region when partially buried glacial ice blocks melted, leaving behind water-filled depressions. In current times, these depressional wetlands fill with water in the spring following snowmelt and spring rains. Depths of surface water varies dependent upon current climatic trends.

Stewart and Kantrud (1972) describe nine classes or types of prairie pothole vegetation in North Dakota. These systems include wetland low prairies, wet meadows, shallow-marsh emergent, deep-marsh emergent, fen emergent, submerged and floating aquatic, natural drawdown vegetation, cropland drawdown vegetation, and cropland tillage vegetation. These prairie pothole vegetation types will be discussed in more detail in the results section of this document as they pertain to plant communities documented by the field assessment.

3.0 METHODS

3.1 Information Review

Prior to conducting on-site field surveys, desktop analysis for the Project study corridor was conducted using data sets such as 2009 aerial imagery (NAIP 2009), National Wetlands Inventory (NWI) maps (USFWS 2009a), the National Hydrography Dataset (NHD) (USGS 2010), and the Natural Resources Conservation Service (NRCS) soil survey (SSURGO 2009). Immediately prior to field work, aerial photography for the Project Area was studied and a conservative estimate was made of those wetlands and water resources that should be delineated. This estimate was based on either the clear placement of a buffered Project feature within a likely wetland or water of the U.S., or the siting of a buffered Project feature in close proximity to wetlands or other waters of the U.S.

3.2 Field Analysis

The Project study corridor was surveyed for the location and extent of wetlands. The Project study corridor was defined as the Project footprint plus an adjacent study area buffer as follows: 250-foot radius study area around turbines; 75-foot study corridor across crane paths and new access roads; 50-foot wide study corridor across existing county roads to be improved; 60-foot-wide study corridor across new spur roads to the permanent meteorological towers; and 30-foot-wide study corridor across buried electrical collection line locations. Additional Project facilities covered in the field analysis included the O&M building and equipment staging area (7.5 acres); four proposed permanent meteorological towers (1 acre each); the interconnection substation facility (9 acres); and the temporary batch plant (2.5 acres).

Wetlands numbered 1-25 were delineated according to the routine methodology set forth in the USACE *Wetland Delineation Manual* (USACE 1987) and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region* (USACE 2010a). Wetlands numbered 26-100 were assessed for the presence of dominant hydrophytic vegetation and characteristic wetland hydrology per these standards, but no soil pits were dug. This methodology for assessing Wetlands 26-100 was chosen because it was determined after the first 25 wetlands were delineated that these wetlands were of very similar type and function in the landscape. These characteristics are described in more detail later in this document.

Vegetation analysis involved evaluation of each vegetation stratum (herbaceous, shrub, tree, and vine). The percent cover by species was determined using a 5-foot radius for the herbaceous layer, a 15-foot radius for the shrub layer, and 30-foot radii for tree and vine strata. The wetland indicator status was determined for each dominant plant species based on the *Region 4: North Plains* addendum to Reed's *1988 National List of Plant Species that Occur in Wetlands* (USACE 2010b). Hydrophytic vegetation, or plants that are indicators of wetlands, include those designated obligate (OBL), facultative wetland (FACW), or facultative (FAC). As a general rule, hydrophytes dominate a sample plot when greater than 50 percent of the evaluated species are OBL, FACW, or FAC. Upland plants include those listed with facultative upland (FACU) or no indicator (NI) status.

Pairs of soil pits were dug at each of the first 25 sample plots to a maximum depth of 20 inches. One soil pit was placed in areas of readily discernable wetland plant communities, and a companion soil pit was placed nearby in upland sites. This allowed for the establishment of a conservative polygon to be mapped between wet and dry areas of any given site under evaluation. Soils were inspected for the presence of hydric soil indicators as described in the new Great Plains Regional Supplement. The soil hue, value, and chroma were examined and defined using the *Munsell Soil Color Charts* (Macbeth 1994).

Hydrology was analyzed for primary and secondary wetland indicators at each wetland. Primary wetland indicators include visible inundation, soil saturation, water marks, drift lines, sediment deposits, and drainage patterns in wetlands. Secondary wetland indicators of hydrology include oxidized root channels associated with living roots, water-stained leaves, and local soil survey data. The soil pits were left open a sufficient amount of time to allow for the stabilization of the apparent high water table, if present. All data were recorded on the Wetland Determination Data Forms (Appendix A). Sample plots that exhibited qualifying characteristics of hydrophytic vegetation, hydric soils, and wetland hydrology were identified as wetlands.

The Cowardin classification system categorizes wetlands by vegetative community and hydrologic regime (Cowardin et al. 1979). The Cowardin classification of the wetlands within the Project study corridor are palustrine (i.e., freshwater) emergent (non-woody plants rooted in soils that are saturated at least part of the time with most of the plant emerged above the surface) (PEM), palustrine scrub-shrub (PSS), and palustrine forested (PFO) types. The vast majority of wetlands in the Project Area were documented as PEM wetlands.

The field investigation also included an examination of NWI- and United States Geological Survey (USGS)-mapped streams ("blue lines"), as well as other drainages that were not mapped by the NWI or USGS. The USACE regulates streams that have a surface water connection with navigable waters.

Tetra Tech evaluated wetlands and surface waters in the Project following guidance provided in the USACE Jurisdictional Determination Form Instruction Guidebook and joint EPA and USACE guidance regarding CWA jurisdiction after Rapanos (EPA/USACE 2007b, 2008).

3.3 Mapping

The boundaries of wetlands within the Project study corridor as well as some of these features that were visible just outside of the Project study corridor but within the Project Area were recorded using a Geo® XH™ Global Positioning System (GPS) in the field. The Geo®XH™ unit provides an estimated 3-foot (1 meter) survey accuracy (post-processing) for open areas with little or no canopy cover, such as the open areas characterizing most of the Project Area. The field-collected data were plotted as a map layer using geographic information system (GIS) software and are displayed in Figure 2 (Sheets 1-13). Some wetlands extended well beyond the Project study corridor and were therefore not mapped in the field in their entirety. However, where these wetland boundaries were clearly visible on current aerial photography, these boundaries were digitized from that source using ArcInfo.

Supporting information for the delineation—wetland forms and site photographs—are presented in Appendices A and B, respectively.

4.0 RESULTS AND DISCUSSION

4.1 Vegetation

4.1.1 Regional

The majority of land in the region is used for crop cultivation (spring wheat, barley, oats, sunflower, and hay) or ranching, with patches of native grassland. This region of North Dakota is mixed grass prairie. The commonly observed native grassland species include western wheatgrass (*Agropyron smithii*), needleandthread (*Stipa comata*), green needlegrass (*Stipa viridula*), Kentucky bluegrass (*Poa pratensis*), Sandberg's bluegrass (*Poa secunda*), and blue grama (*Bouteloua gracilis*). Introduced grasses include smooth brome (*Bromus inermis*) and crested wheatgrass (*Agropyron cristatum*) (NRCS 2006). A wide variety of forbs are also present in the region, including common sunflower (*Helianthus annuus*), prairie coneflower (*Ratibida columnifera*), purple coneflower (*Echinacea angustifolia*), western wallflower (*Erysimum asperum*), silverleaf scurf pea (*Psoralea argophylla*), and yarrow (*Achillea millefolium*), among many others.

4.1.2 Project Area

The regional plants listed in the previous section are all dominants on the Project Area. Table 4 provides a more complete listing of wetland plant species observed.

Table 4. Common Dominant and Subdominant Wetland Plant Species Observed within the Project Study Corridor

Scientific Name	Common Name (USDA, NRCS 2010)	Indicator Status*
Agrostis gigantea	Redtop	NI
Agrostis stolonifera	Creeping bentgrass	FAC+
Alisma plantago-aquatica	Water plantain	OBL
Alopecurus aequalis	Short-awned foxtail	OBL
Anenome canadensis	Meadow anemone	FACW
Apocynum sibiricum	Claspingleaf dogbane	FAC
Beckmannia syzigachne	American slough grass	OBL
Bidens cernua	Beggarticks	OBL
Calamagrostis inexpansa	Northern reedgrass	FACW
Carex atherodes	Slough sedge	OBL
Carex lanuginosa	Woolly sedge	OBL
Carex oligosperma	Bog sedge	NI
Carex sartwellii	Sartwell's sedge	FACW
Carex vulpinoidea	Fox sedge	OBL
Distichlis stricta	Saltgrass	NI
Eleocharis acicularis	Needle spikerush	OBL
Eleocharis palustris	Creeping spikerush	OBL
Equisetum arvense	Common horsetail	FAC
Glyceria grandis	Giant mannagrass	NI
Glyceria striata	Fowl mannagrass	OBL
Hierochloe odorata	Sweetgrass	FACW
Hordeum jubatum	Foxtail barley	FACW
Juncus balticus	Baltic rush	OBL
Juncus canadensis	Canada rush	NI

Table 4. Common Dominant and Subdominant Wetland Plant Species Observed within the Project Study Corridor

Scientific Name	Common Name (USDA, NRCS 2010)	Indicator Status*
Juncus dudleyi	Dudley's rush	NI
Lemna minor	Lesser duckweed	OBL
Mentha arvensis	Wild mint	FACW
Montia howellii	Howell's montia	NI
Panicum capillare	Witchgrass	FAC
Panicum virgatum	Switchgrass	FAC
Phalaris arundinacea	Reed canary grass	FACW+
Phragmites australis	Giant reed grass	FACW
Poa palustris	Fowl bluegrass	FACW
Polygonum amphibium	Water smartweed	OBL
Potamogeton pectinatus	Sago pondweed	OBL
Ranunculus aquatilis	Water crowfoot	OBL
Rumex crispus	Curly dock	FACW
Rumex mexicanus	Willow dock	FACW
Sagittaria latifolia	Broadleaf arrowhead	OBL
Salix amygdaloides	Peach-leaved willow	FACW
Salix exigua	Coyote willow	FACW+
Scirpus acutus	Hardstem bulrush	OBL
Scirpus americanus	Three-square bulrush	OBL
Scirpus atrovirens	Green bulrush	OBL
Scirpus fluviatilis	River bulrush	OBL
Scripus validus	Softstem bulrush	OBL
Scolochloa festucacea	Whitetop	OBL
Scutellaria galericulata	Marsh skullcap	OBL
Sparganium eurycarpum	Giant bur-reed	OBL
Spartina pectinata	Prairie cordgrass	FACW
Teucrium occidentale	American germander	FACW
Typha angustifolia	Narrow-leaved cattail	OBL
Typha latifolia	Broad-leaved cattail	OBL
Utricularia macrorhiza	Bladderwort	OBL

USDA = United States Department of Agriculture

* Indicator Status is defined as follows (USACE 2010b):

Code	Indicator Status	Occurrence
OBL	Obligate Wetland	Occurs almost always (estimated probability 99%) under natural conditions in wetlands.
FACW	Facultative Wetland	Usually occurs in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
FAC	Facultative	Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
FACU	Facultative Upland	Usually occurs in non-wetlands (estimated probability 67%-99%), but occasionally found on wetlands (estimated probability 1%-33%).
UPL	Obligate Upland	May occur in wetlands in another region, but occurs almost always (estimated probability 99%) under natural conditions in non-wetlands in the regions specified.
NI	No indicator	Insufficient information available to determine an indicator status.

An indicator status code may be further qualified with a plus (+) or (-) sign. The plus (+) sign indicates a frequency of occurrence towards the wetter end of the category and the negative (-) sign indicates a frequency towards the drier end of the category.

Table 5 provides a listing of the upland plants commonly observed in the Project study corridor.

Table 5. Common Dominant and Subdominant Upland Plant Species Observed within the Project Study Corridor

Scientific Name	Common Name (USDA, NRCS 2010)	Indicator Status*
Achillea millefolium	Common yarrow	FACU
Agoseris sp. (glauca?)	--- (Pale false-dandelion)	--- (FAC)
Agropyron cristatum	Crested wheatgrass	NI
Agropyron smithii	Western wheatgrass	FACU
Alyssum sp.	Alyssum	NI
Ambrosia psilostachya	Perennial ragweed	FAC
Amorpha canescens	Leadplant	NI
Antennaria sp.	Pussytoes	NI
Artemisia absinthium	Absinth wormwood	NI
Artemisia frigida	Fringed sagewort	NI
Artemisia ludoviciana	White sage	FACU
Asclepias pumila	Plains milkweed	NI
Asclepias speciosa	Showy milkweed	FAC
Asclepias viridiflora	Green milkweed	NI
Astragalus crassicarpus	Groundplum milkvetch	NI
Bouteloua gracilis	Blue grama	NI
Bromus inermis	Smooth brome	NI
Calylophus serrulatus	Yellow evening primrose	NI
Carex brevior	Fescue sedge	FACU
Carex praegracilis	Clustered field sedge	FACW
Chenopodium sp.	Lambsquarters	---
Cirsium arvensis	Canada thistle	FACU
Cirsium flodmanii	Flodman's thistle	NI
Cirsium vulgare	Bull thistle	UPL
Convolvulus arvensis	Field bindweed	NI
Dactylis glomerata	Orchard grass	FACU
Dalea purpurea	Purple prairie clover	NI
Echinacea angustifolia	Purple coneflower	NI
Elymus canadensis	Canada wildrye	FACU
Erigeron strigosus	Daisy fleabane	FACU
Erysimum asperum	Western wallflower	NI
Euphorbia esula	Leafy spurge	NI
Frasera speciosa	Green gentian	NI
Gaillardia aristata	Blanket flower	NI
Galium boreale	Northern bedstraw	FACU
Gaura coccinea	Scarlet gaura	NI
Geum triflorum	Prairie smoke	FACU

Table 5. Common Dominant and Subdominant Upland Plant Species Observed within the Project Study Corridor

Scientific Name	Common Name (USDA, NRCS 2010)	Indicator Status*
Glycyrrhiza lepidota	American licorice	FACU
Guiterrezia sarothrae	Broom snakeweed	NI
Koeleria macrantha	Prairie junegrass	NI
Lactuca serriola	Prickly lettuce	FACU
Lotus purshianus	American deervetch	NI
Medicago falcata	Yellow-flowered alfalfa	NI
Medicago lupilina	Black medic	FACU
Medicago sativa	Alfalfa	NI
Melilotus alba	White sweetclover	FACU-
Melilotus officinalis	Yellow sweetclover	FACU-
Nasturtium officinale	Watercress	OBL
Onosmodium molle	False gromwell	NI
Oxytropis lambertii	Lambert crazyweed	UPL
Penstemon angustifolius	Narrowleaf beardtongue	NI
Petasites sp.	Coltsfoot	---
Poa compressa	Canada bluegrass	FACU
Poa pratensis	Kentucky bluegrass	FACU
Poa secunda	Sandberg's bluegrass	NI
Polygala alba	White milkwort	NI
Populus deltoides	Plains cottonwood	FAC
Potentilla sp.	Potentilla	---
Prunus americana	Wild plum	UPL
Prunus virginiana	Chokecherry	FACU-
Psoralea argophylla	Silverleaf scurfpea	NI
Psoralea esculenta	Breadfruit scurfpea	NI
Ranunculus sp.	Buttercup	---
Ratibida columnifera	Prairie coneflower	NI
Rosa arkansana	Prairie rose	NI
Sisyrinchi montanum	Mountain blue-eyed grass	FAC
Solidago canadensis	Canada goldenrod	FACU
Solidago mollis	Soft goldenrod	NI
Solidago rigida	Stiff goldenrod	FACU-
Sonchus arvensis	Perennial sow thistle	FAC
Stipa comata	Needleandthread	NI
Stipa virdula	Green needlegrass	NI
Symphoricarpos occidentalis	Western snowberry	NI
Thlaspi arvense	Field pennycress	NI
Tradescantia occidentalis	Prairie spiderwort	UPL
Tragopogon dubius	Goatsbeard	NI

Table 5. Common Dominant and Subdominant Upland Plant Species Observed within the Project Study Corridor

Scientific Name	Common Name (USDA, NRCS 2010)	Indicator Status*
Triticum aestivum	Wheat	NI
Ulmus pumila	Chinese elm	NI
Urtica dioca	Stinging nettle	FACW
Vernonia fasciculata	Ironweed	FACW
Xanthium strumarium	Cocklebur	FAC
Zea mays	Corn	NI
Zigadenus elegans	Showy deathcamas	FACU

* Indicator Status is defined as follows (USACE 2010):

Code	Indicator Status	Occurrence
OBL	Obligate Wetland	Occurs almost always (estimated probability 99%) under natural conditions in wetlands.
FACW	Facultative Wetland	Usually occurs in wetlands (estimated probability 67%-99%), but occasionally found in non-wetlands.
FAC	Facultative	Equally likely to occur in wetlands or non-wetlands (estimated probability 34%-66%).
FACU	Facultative Upland	Usually occurs in non-wetlands (estimated probability 67%-99%), but occasionally found on wetlands (estimated probability 1%-33%).
UPL	Obligate Upland	May occur in wetlands in another region, but occurs almost always (estimated probability 99%) under natural conditions in non-wetlands in the regions specified.
NI	No indicator	Insufficient information available to determine an indicator status.

An indicator status code may be further qualified with a plus (+) or (-) sign. The plus (+) sign indicates a frequency of occurrence towards the wetter end of the category and the negative (-) sign indicates a frequency towards the drier end of the category.

4.2 Soils

A total of 15 soil units mapped by the NRCS occur within the Project study corridor and are described in Table 6. Eight of these soil units are designated by the NRCS as hydric (NRCS 2010b). Hydric soils are defined as soils that are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register 1994). The hydric criteria for soils in the Great Plains Region have been updated in the Great Plains Supplement (USACE 2010). Some soil characteristics previously defining upland soils are now considered by the USACE to be hydric soil characteristics. Although hydrophytic vegetation and wetland hydrology indicators must be confirmed before a wetland determination can be made, hydric soils information is useful in determining the potential presence of wetlands. In particular, if vegetation is removed by farming and wetlands are delineated in the drier seasons, soil characteristics become especially important indicators of the wetland-upland boundary. Detailed information from NRCS descriptions of each mapped soil unit within the Project study corridor is presented in Table 6.

Overall, the soils within the Project study corridor matched the loams, clay loams, silty clay loams, and loamy clay soils mapped by the NRCS for the area. The soils were generally dark brown to black (10YR 2/1) or very dark grayish brown (10YR 5/1). Soils across the Project are typically Mollisols, a productive agricultural soil common to grasslands and savannas characterized by a dark surface layer of mineral soil high in organic matter with a low chroma (1 or 2) matrix in both upland and wetland soils. Often, soils with low value and low chroma are considered hydric; nearly all the soils that supported upland plants within the Project study corridor exhibited low value and low chroma. This soil type can have any moisture regime. Wetland soils frequently met the criteria for hydric soil indicator A11: Depleted Below Dark Surface or indicator A12: Thick Dark Surface. Its important to note that although hydric soils were prevalent throughout the Project study corridor, the presence of hydric soils alone is not enough to qualify an area as a wetland.

Table 6. NRCS Mapped Soil Units within the Project Study Corridor

NRCS Map Unit	NRCS Soil Series Description
2235 – Arnegard loam, 0 to 6 percent slopes	Well drained, very deep soils located, with moderate permeability on terraces and in swales on uplands. Parent material is alluvium. NRCS listed as hydric when in depressions and with a Parnell component. Major uses include cropland, pasture, and hayland. Listed as farmland of statewide importance.
873 – Hamerly-Parnell complex, 0 to 3 percent slopes	Somewhat poorly to very poorly drained soils on flats and depressions on till plains. NRCS listed as hydric when in depressions, flats, or drainageways with Marysland, Tonka, Vallers, or Parnell components. Major uses include cropland, pasture, and hayland.
2249 – Makoti silty clay loam, 0 to 3 percent slopes	Well drained soils on flats on lake plains. Not listed as hydric by NRCS. Major uses include cropland, pasture, and hayland. Listed as farmland of statewide importance.
2252 – Max-Zahl-Arnegard loams, 9 to 35 percent slopes, very stony	Well drained soils that occur on till plains and moraines. Max soils occur on knolls, ridges, backslopes, and summits. Zahl soils occur on shoulder slopes, knolls, and ridges. Arnegard soils occur on footslopes of knolls and ridges and in swales. Not listed as hydric by NRCS. Major uses include cropland, pasture, and hayland.
1372 – Noonan-Williams loams, 0 to 6 percent slopes	Moderately well drained to well drained soils that occur in swales and rises on till plains. NRCS listed as hydric when in depressions with Harriet or Tonka components. Major uses include cropland, pasture, and hayland.
1427 – Parnell silty clay loam	Very poorly drained soils with frequent ponding that occur on till plains. NRCS listed as hydric when in depressions, flats, or outwash plains with Marysland, Colvin, Parnell, Vallers, Tonka, or Southam components. Major uses include cropland, pasture, and hayland.
1710 – Southam silty clay loam	Very poorly drained soils with frequent ponding that occur on till plains. NRCS listed as hydric when in depressions, flats, beaches, or outwash plains with Marysland, Arveson, Vallers, Southam, Minnewaukan, or Lallie components. Major uses include cropland, pasture, and hayland.
2265 – Wabek-Appam sandy loams, 0 to 6 percent slopes	Excessively drained to somewhat excessively drained soils that occur on ridges and swales in outwash plains. Not listed as hydric by NRCS. Major uses include cropland, pasture, and hayland.
2266 – Wabek-Appam sandy loams, 6 to 25 percent slopes	Excessively drained to somewhat excessively drained soils that occur on ridges and swales in outwash plains. Not listed as hydric by NRCS. Major uses include cropland, pasture, and hayland.
2188 – Wabek-Lehr complex, 2 to 6 percent slopes	Excessively drained to somewhat excessively drained soils that occur on ridges and rises on outwash plains and collapsed outwash plains. Not listed as hydric by NRCS. Major uses include cropland, pasture, and hayland.

Table 6. NRCS Mapped Soil Units within the Project Study Corridor

NRCS Map Unit	NRCS Soil Series Description
2015 – Williams-Bowbells loams, 3 to 6 percent slopes	Well drained to moderately well drained soils that occur on rises and swales on till plains. Not listed as hydric by NRCS. Major uses include cropland, pasture, and hayland. Listed as farmland of statewide importance.
2031 – Williams-Zahl loams, 3 to 6 percent slopes	Well drained soils that occur on knolls, ridges, summits, backslopes, and shoulder slopes on till plains and moraines. NRCS listed as hydric when in depressions with Parnell components. Major uses include cropland, pasture, and hayland.
2073 – Zahl-Max loams, 15 to 60 percent slopes	Well drained soils that occur on knolls, ridges, shoulder slopes, and backslopes on till plains and moraines. Not listed as hydric by NRCS. Major uses include cropland, pasture, and hayland.
2175 – Zahl-Williams loams, 6 to 9 percent slopes	Well drained soils that occur on shoulder slopes and backslopes of knolls and ridges. NRCS listed as hydric when in depressions with Parnell components. Major uses include cropland, pasture, and hayland.
2081 – Zahl-Williams loams, 9 to 15 percent slopes	Well drained soils that occur on knolls, ridges, shoulder slopes, backslopes, and summits. NRCS listed as hydric when in depressions with Parnell or Tonka components. Major uses include cropland, pasture, and hayland.

4.3 Hydrology

Review of topographic maps, hydrography data, and the NRCS Soil Survey indicates that within the Project study corridor there are no linear water courses carrying surface water off the Project Area. The entirety of McIntosh County is located within the Missouri River drainage basin, most of the drainage is internal and does not flow out of the area (USDA-SCS 1981). The Project Area is located in the West Missouri Coteau Hydrologic Unit10130106; this hydrologic unit drains to Lake Oahe River Basin in South Dakota (NRCS 2009). No defined streams occur within or immediately adjacent to the Project Area, but three large, named lakes occur just outside of the Project Area. Salt Lake is near the southeast boundary of the Project Area and both Green Lake and Pudwill Lake occur to the west. Overland surface flow from precipitation recharges the prairie pothole wetlands and lakes in the Project Area.

4.4 Wetlands

The Cowardin classification system categorizes wetlands by vegetative community and hydrologic regime (Cowardin et al. 1979). The Cowardin classification of the wetlands within the Project study corridor are predominantly palustrine (i.e., freshwater) emergent (non-woody plants rooted in soils that are saturated at least part of the time with most of the plant emerged above the surface) types (see Table 6). These palustrine emergent wetlands are all situated within prairie pothole or kettle lake. According to the Cowardin classification system, lakes with surface acreage of 8 hectares (20 acres) or more, and that lack trees, shrubs or persistent emergent vegetation are lacustrine ("lake") systems. Furthermore, lakes that are less than 8 hectares in area, but that are more than 6.6 feet deep at low water, may be considered lacustrine systems. Tetra Tech evaluated all surfaces waters that would be crossed by the Project; however, due to the large number of lake systems that had to be evaluated, only the palustrine classification system was used to characterize those resources. Measurements of lake depth or surficial acreage were not conducted as part of the wetlands delineation.

As described in Section 2.2, the vegetation in the prairie pothole wetlands may also be classified in one of nine systems per Stewart and Kantrud (1972). These systems include wetland low prairies, wet meadows, shallow-marsh emergent, deep-marsh emergent, fen emergent, submerged and floating aquatic, natural drawdown vegetation, cropland drawdown vegetation, and cropland tillage vegetation. No fen emergent systems were observed onsite. All of the other eight classes were observed in the Project Area.

Table 7 lists the 100 wetlands identified in or proximate to the Project study corridor.

Table 7. Wetlands Identified within or Proximate to the Project Study Corridor

ID	Sheet-map No.	Cowardin Class	Size within Study Corridor (acre)	NRCS Mapped Soil Type (majority of polygon)	Hydric Soil Type Present
WET1	1	PEM	0.380	Parnell silty clay loam	Parnell silty clay loam
WET2	1	PEM	0.0	Zahl-Max loams, 15 to 60 percent slopes	
WET3	1, 2	PEM	0.124	Zahl-Max loams, 15 to 60 percent slopes	
WET4	1, 2	PEM	0.174	Parnell silty clay loam	Parnell silty clay loam
WET5	2	PEM	0.215	Zahl-Williams loams, 6 to 9 percent slopes	
WET6	2	PEM	0.0	Zahl-Williams loams, 6 to 9 percent slopes	
WET7	1, 2	PEM	0.285	Noonan-Williams loams, 0 to 6 percent slopes	
WET8	2	PEM	0.059	Williams-Zahl loams, 3 to 6 percent slopes	
WET9	2	PEM	0.862	Zahl-Williams loams, 6 to 9 percent slopes	
WET10	2	PEM	0.150	Zahl-Williams loams, 9 to 15 percent slopes	
WET11	4	PEM	0.052	Zahl-Williams loams, 6 to 9 percent slopes	
WET12	3	PEM	0.0	Zahl-Max loams, 15 to 60 percent slopes	
WET13	3	PEM	0.216	Zahl-Williams loams, 6 to 9 percent slopes	
WET14	3	PEM	0.009	Wabek-Appam sandy loams, 6 to 25 percent slopes	
WET15	4	PSS	0.220	Zahl-Max loams, 15 to 60 percent slopes	
WET16	8	PEM	0.024	Williams-Zahl loams, 3 to 6 percent slopes	
WET17	8	PEM	0.147	Zahl-Max loams, 15 to 60 percent slopes	
WET18	8	PEM	0.149	Zahl-Williams loams, 9 to 15 percent slopes	Parnell silty clay loam
WET19	8	PEM	0.347	Parnell silty clay loam	Parnell silty clay loam
WET20	4	PEM	0.392	Zahl-Williams loams, 9 to 15 percent slopes	
WET21	4	PEM	0.178	Zahl-Williams loams, 9 to 15 percent slopes	
WET22	4	PEM	0.574	Zahl-Williams loams, 9 to 15 percent slopes	
WET23	4	PEM	0.908	Zahl-Williams loams, 6 to 9 percent slopes	
WET24	4	PEM	0.058	Zahl-Williams loams, 6 to 9 percent slopes	
WET25	4, 5	PEM	0.0	Zahl-Williams loams, 6 to 9 percent slopes	
WET26	4, 5	PEM	0.0	Zahl-Williams loams, 6 to 9 percent slopes	
WET27	5	PEM	0.683	Zahl-Williams loams, 6 to 9 percent slopes	Southam silty clay loam
WET28	5	PEM	0.0	Zahl-Williams loams, 6 to 9 percent slopes	
WET29	5	PEM	0.388	Zahl-Williams loams, 9 to 15 percent slopes	
WET30	5, 9	PEM	0.225	Zahl-Williams loams, 9 to 15 percent slopes	
WET31	9	PEM	0.047	Zahl-Williams loams, 6 to 9 percent slopes	
WET32	9	PEM	0.052	Zahl-Williams loams, 6 to 9 percent slopes	
WET33	9	PEM	0.147	Zahl-Max loams, 15 to 60 percent slopes	
WET34	9	PEM	0.0	Zahl-Max loams, 15 to 60 percent slopes	

Table 7. Wetlands Identified within or Proximate to the Project Study Corridor

ID	Sheet-map No.	Cowardin Class	Size within Study Corridor (acre)	NRCS Mapped Soil Type (majority of polygon)	Hydric Soil Type Present
WET35	8, 9	PEM	0.104	Zahl-Max loams, 15 to 60 percent slopes	
WET36	8, 9	PEM	0.347	Zahl-Williams loams, 9 to 15 percent slopes	Southam silty clay loam
WET37	8	PEM	0.103	Zahl-Williams loams, 9 to 15 percent slopes	
WET38	6	PEM	1.964	Southam silty clay loam	Southam silty clay loam
WET39	6	PEM	0.114	Zahl-Williams loams, 6 to 9 percent slopes	
WET40	6	PEM	0.450	Zahl-Williams loams, 6 to 9 percent slopes	
WET41	6	PEM	0.245	Zahl-Williams loams, 6 to 9 percent slopes	
WET42	6	PEM	0.564	Southam silty clay loam	Southam silty clay loam / Parnell silty clay loam
WET43	6	PEM	0.213	Zahl-Williams loams, 6 to 9 percent slopes	
WET44	6	PEM	0.015	Williams-Zahl loams, 3 to 6 percent slopes	
WET45	6	PEM	0.905	Zahl-Williams loams, 9 to 15 percent slopes	
WET46	6	PEM	0.066	Max-Zahl-Arnegard loams, 9 to 35 percent slopes, very stony	
WET47	10	PEM	0.087	Max-Zahl-Arnegard loams, 9 to 35 percent slopes, very stony	
WET48	9, 10	PEM	0.082	Zahl-Williams loams, 9 to 15 percent slopes	
WET49	9, 10	PEM	0.927	Zahl-Williams loams, 6 to 9 percent slopes	
WET50	9	PEM	0.157	Williams-Zahl loams, 3 to 6 percent slopes	
WET51	9, 10	PEM	0.024	Zahl-Williams loams, 9 to 15 percent slopes	
WET52	9	PEM	0.127	Arnegard loam, 0 to 6 percent slopes	
WET53	12	PEM	0.063	Williams-Zahl loams, 3 to 6 percent slopes	
WET54	12	PEM	0.240	Zahl-Williams loams, 9 to 15 percent slopes	
WET55	12	PEM	0.0	Parnell silty clay loam	Parnell silty clay loam
WET56	12	PEM	0.285	Zahl-Williams loams, 6 to 9 percent slopes	
WET57	12	PEM	0.001	Zahl-Max loams, 15 to 60 percent slopes	
WET58	12	PEM	0.021	Zahl-Williams loams, 9 to 15 percent slopes	
WET59	12	PEM	0.0	Zahl-Max loams, 15 to 60 percent slopes	
WET60	12	PEM	0.0	Zahl-Max loams, 15 to 60 percent slopes	
WET61	12	PEM	0.477	Parnell silty clay loam	Parnell silty clay loam
WET62	13	PEM	0.010	Zahl-Williams loams, 9 to 15 percent slopes	
WET63	13	PEM	0.214	Zahl-Williams loams, 6 to 9 percent slopes	
WET64	9	PEM	0.261	Zahl-Williams loams, 6 to 9 percent slopes	
WET65	5	PEM	0.003	Zahl-Max loams, 15 to 60 percent slopes	
WET66	5	PEM	0.203	Zahl-Williams loams, 9 to 15 percent slopes	
WET67	5, 6	PEM	0.717	Southam silty clay loam	Southam silty clay loam
WET68	1	PEM	0.0	Zahl-Williams loams, 6 to 9 percent slopes	
WET69	3	PEM	0.0	Zahl-Williams loams, 9 to 15 percent slopes	
WET70	3	PEM	0.0	Zahl-Williams loams, 9 to 15 percent slopes	
WET71	2	PEM	0.468	Southam silty clay loam	Southam silty clay loam
WET72	2	PEM	0.300	Parnell silty clay loam	Parnell silty clay loam
WET73	4	PEM	0.043	Zahl-Williams loams, 9 to 15 percent slopes	

Table 7. Wetlands Identified within or Proximate to the Project Study Corridor

ID	Sheet-map No.	Cowardin Class	Size within Study Corridor (acre)	NRCS Mapped Soil Type (majority of polygon)	Hydric Soil Type Present
WET74	4	PEM	0.0	Southam silty clay loam	Southam silty clay loam
WET75	4	PEM	0.126	Wabek-Appam sandy loams, 6 to 25 percent slopes	
WET76	4	PEM	0.010	Hamerly-Parnell complex, 0 to 3 percent slopes	
WET77	4	PEM	0.080	Williams-Zahl loams, 3 to 6 percent slopes	
WET78	5	PFO	0.327	Southam silty clay loam	
WET79	5	PFO	0.001	Southam silty clay loam	
WET80	4	PEM	0.115	Zahl-Williams loams, 6 to 9 percent slopes	
WET81	4, 5	PEM	0.357	Zahl-Williams loams, 6 to 9 percent slopes	
WET82	5, 6	PEM	0.282	Southam silty clay loam	
WET83	5, 6	PEM	0.069	Zahl-Williams loams, 6 to 9 percent slopes	
WET84	6	PEM	0.0	Zahl-Williams loams, 6 to 9 percent slopes	
WET85	6	PEM	0.165	Zahl-Williams loams, 6 to 9 percent slopes	
WET86	6	PEM	0.255	Southam silty clay loam	Southam silty clay loam
WET87	6	PEM	0.0	Zahl-Williams loams, 6 to 9 percent slopes	
WET88	5, 6	PEM	0.067	Zahl-Williams loams, 9 to 15 percent slopes	
WET89	5, 9	PEM	0.029	Zahl-Williams loams, 6 to 9 percent slopes	
WET90	5, 9	PEM	0.006	Zahl-Williams loams, 6 to 9 percent slopes	
WET91	9	PEM	0.0	Zahl-Williams loams, 9 to 15 percent slopes	
WET92	9, 10, 13	PEM	0.451	Parnell silty clay loam	Parnell silty clay loam
WET93	13	PEM	0.248	Williams-Zahl loams, 3 to 6 percent slopes	
WET94	9, 10	PEM	0.027	Zahl-Williams loams, 9 to 15 percent slopes	
WET95	6	PEM	0.123	Max-Zahl-Arnegard loams, 9 to 35 percent slopes, very stony	
WET96	11, 12	PEM	0.155	Zahl-Williams loams, 9 to 15 percent slopes	
WET97	12	PEM	0.185	Zahl-Williams loams, 6 to 9 percent slopes	
WET98	12	PEM	0.0	Williams-Zahl loams, 3 to 6 percent slopes	
WET99	8	PEM	0.016	Zahl-Williams loams, 6 to 9 percent slopes	
WET 100	8	PEM	0.056	Zahl-Williams loams, 6 to 9 percent slopes	

Note that Appendix B provides photographs of the following wetlands: WET2-Photos 1, 2; WET10-Photos 8-10; WET15-Photos 4-6; WET36-Photo 16; WET42-Photo 14; WET72-Photo 3; WET79-Photo 7; WET83-Photo11; WET84-Photo 15; WET88-Photo 13; and WET95-Photo 12.

All wetland boundaries within the Project study corridor were delineated in the field with a GPS. Some portions of wetlands that extended well beyond the boundaries of the Project study corridor were delineated based on aerial maps using ArcGIS software to allow for micrositing of Project features while keeping on-the-ground field surveys within the rights-of-way approved by landowners for site access. Desktop efforts conducted in this manner were consistent with the offsite methods described in USACE 1987.

4.5 Streams

All mapped "blue lines" on the USGS NHD (USGS 2010) and the NWI were examined during the June-July 2010 field effort within the Project study corridor. Upon examination, none of the blue line streams intersecting the Project study corridor lacked bed, bank and channel features and would not qualify as a "waters of the U.S." under the definitions provided by the USACE. The typical "non-stream" feature shown as a blue line was a relict stream, the stream features of which had been lost by decades of plowing, cropping, and contour-smoothing. These relict drainages typically lacked any indication that flow is concentrated for more than a few yards; rather precipitation directly infiltrates or is conveyed to lower areas by sheet flow. Some of the relict drainages exhibit swale-like morphology but lack a surface water connection with other waters.

5.0 WETLAND FUNCTIONS AND VALUES

All wetlands identified from the Project survey corridor were prairie potholes. Murkin (1998) describes several hydrologic functions that prairie pothole wetlands provide, and which are generally assumed to be true for the wetlands evaluated at the Project, including:

- *Control and storage of surface water* – This function is especially important during spring runoff and rainfall events when wetlands store excess precipitation and reduce the intensity of downstream flooding and soil erosion.
- *Recharge of groundwater supplies* – Wetlands that discharge groundwater may serve as local or regional groundwater sources.
- *Sinks for excess nutrients* – Through complex nutrient cycling and foodweb dynamics, wetlands reduce nutrient concentrations from waters.
- *Vascular plant production and carbon storage* – Wetland plants in the prairie potholes produce large amounts of carbon compared with most upland plant communities. This carbon is typically retained in the characteristic closed basins of these wetland systems.
- *Filters for sediments and chemicals* – Wetlands, especially shallow vegetated wetlands, reduce water flow and allow sediments and chemicals to settle out; waters that are discharged to the receiving watershed (e.g., overflow or groundwater) are likely to have reduced chemical and sediment concentrations.
- *Other hydrologic functions* – Wetlands may contribute to local rainfall; removal of wetlands may affect rainfall inputs and groundwater recharge.
- *Fish and Amphibian production* – Site-specific potholes may support healthy fisheries and amphibian production.

The presence of United States Fish and Wildlife Service (USFWS) conservation easements and Waterfowl Production Areas (WPA) that occur near the Project Area demonstrate functions and values that prairie potholes provide to wildlife. According to the USFWS, nearly 95 percent of WPAs occur in the prairie pothole region; a third of these areas occur in North Dakota alone (USFWS undated). These wetlands provide habitat and forage for a wide variety of waterfowl, shorebirds, grassland birds, plants, insects and other wildlife (USFWS 2009b), including species protected by the Endangered Species Act (ESA), the Migratory Bird Treaty Act (MBTA), and the Bald and Golden Eagle Protection Act (BGEPA). WPAs also offer societal values; these areas are generally open to the public and used for a variety of recreation purposes such as hunting, fishing, boating, and bird watching among many others. During wetland surveys, numerous incidental wildlife observations were made including nesting waterfowl such as blue-winged teal (*Anas discors*), northern shoveler (*Anas clypeata*), and mallard (*Anas platyrhynchos*); shorebirds such as willet (*Catoptrophorus semipamatus*), marbled godwit (*Limosa fedoa*), and American bittern (*Botaurus lentiginosus*); passerines such as common yellowthroat (*Geothlypis trichas*), red-winged blackbird (*Agelaius phoeniceus*), and black tern (*Chlidonias niger*); and herpetiles such as northern leopard frogs (*Rana pipiens*) and smooth green snakes (*Liochlorophis vernalis*).

6.0 CONCLUSIONS AND RECOMMENDATIONS

One hundred wetlands were observed and evaluated during the field assessment. A total of 82 wetlands were delineated within a designated Project study corridor, which includes the Project construction footprint. An additional 18 wetlands were delineated in areas proximal to, but outside of, the Project study corridor and within the Project Area.

Based on careful examination in the field, none of the delineated wetlands appear to have a hydrologic connection (i.e., significant nexus) to TNW. For this reason, Tetra Tech has concluded that none of the 82 wetlands in the Project study corridor are jurisdictional. Informal discussions with the USACE in the Bismarck, North Dakota office would clarify the need for a formal jurisdictional determination for these Project wetlands ~~in the event that permanent impacts (i.e., the conversion of wetland covertype from forested to emergent or scrub shrub, or conversion to a non wetland use), are anticipated due to Project construction~~.

Following USACE guidance documents, Tetra Tech concludes that no USACE-jurisdictional wetlands or waters of the U.S are present in the Project study corridor and therefore no permit from the USACE is required. Furthermore, Tetra Tech has reviewed the USACE regional permit conditions on its Nationwide Permits (NWPs) and does not believe that any would be prohibitive to construction or operation of the Project. Regional conditions apply to wetlands classified as fens; to waters adjacent to natural springs; to Missouri River, including Lake Sakakawea and Lake Oahe; to historic properties; and to regulated activities in high quality (class III) waters during specific seasons. No fens were identified during the delineation, nor were any of the other conditions that could prevent a NWP from being obtained for the Project, if necessary.

Tetra Tech concludes that all delineated wetlands should be considered "waters of the state" and therefore under the jurisdiction of the state of North Dakota. After the final Project layout has been determined and permanent impacts on waters of the state calculated, formal consultation with the State Engineer's Office should occur in order to confirm that no state permits, such a drain permit, are required.

In keeping with the ~~spirit~~ of EO 11990, CPV has committed to avoiding and minimizing impacts on all wetlands to the extent practicable. This is also consistent with the North Dakota Public Service Commission's recommended avoidance areas which include "woodlands and wetlands" as listed in the NDAC. Tetra Tech recommends that prior to construction, a wetlands scientist familiar with the Project should accompany the Project engineer in a site visit and walkover of the final layout to ~~ensure~~ that additional wetland impacts would not be caused by ~~changes in~~ the Project layout.

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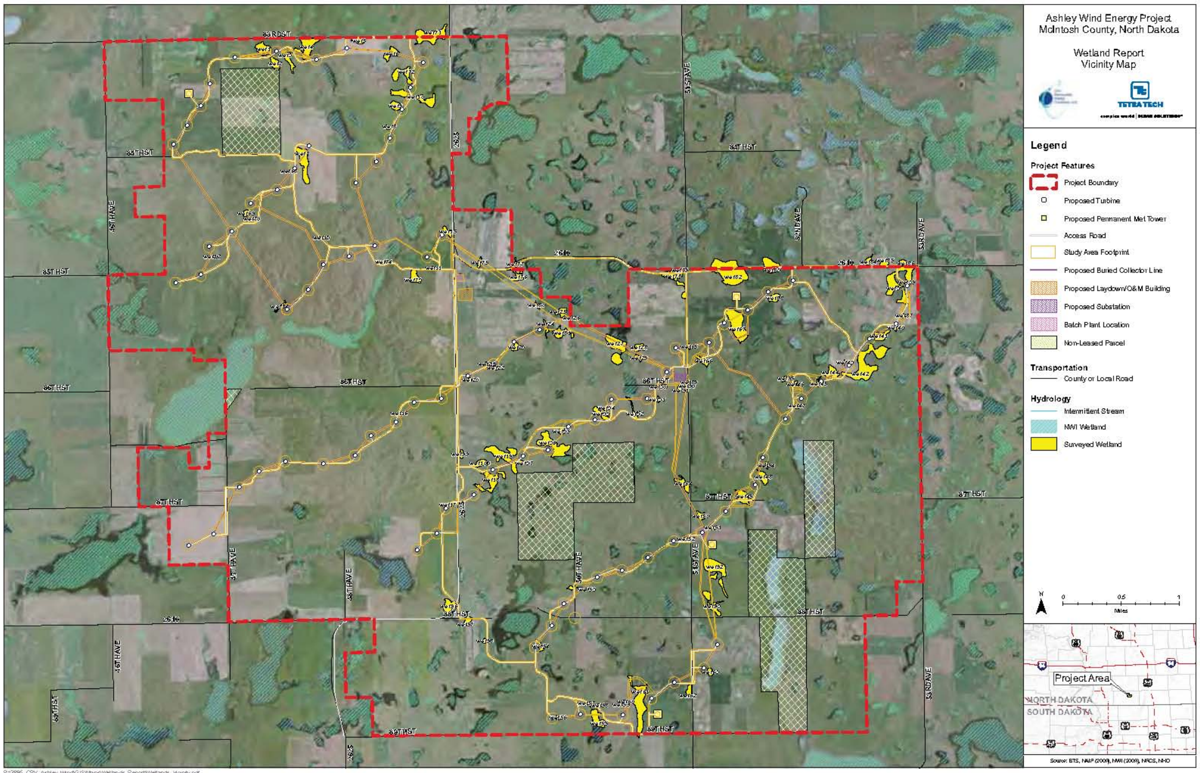
FIGURES

FIGURE 1

Vicinity Map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Proposed Permanent Met Tower
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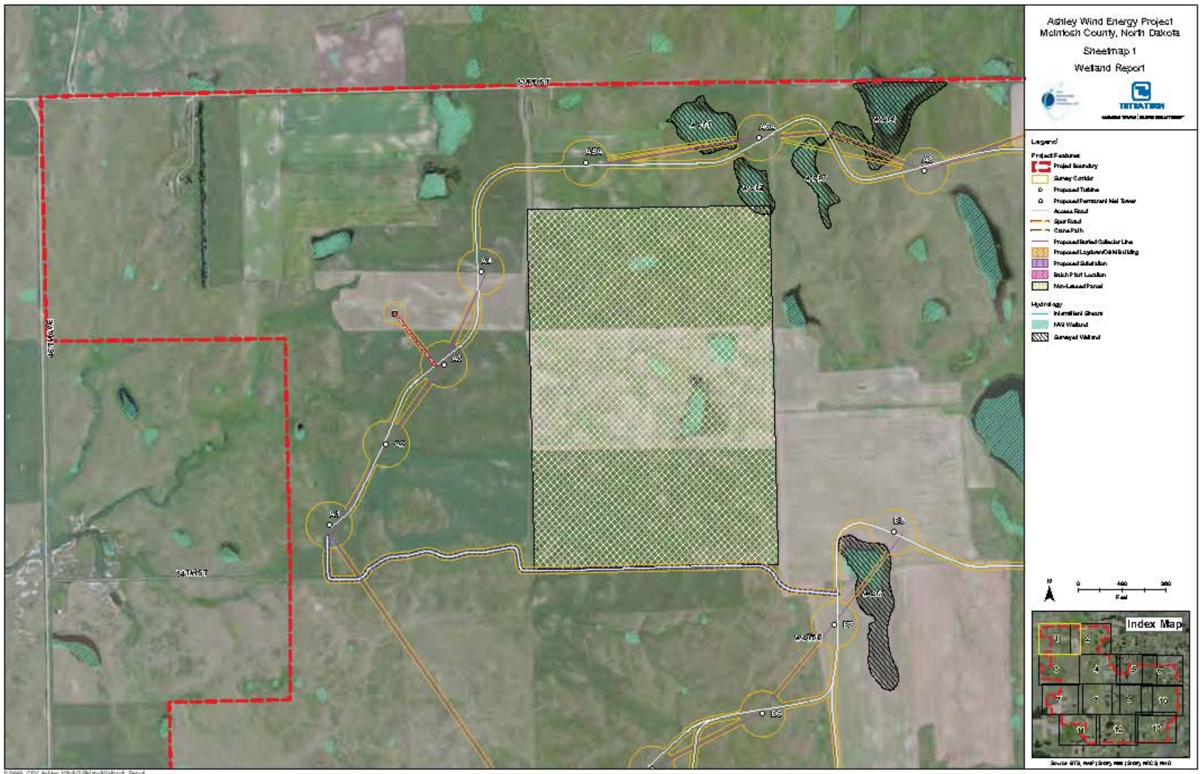
SOUTH DAKOTA

FIGURE 2

Wetland Delineation Results (Sheetmaps 1-13)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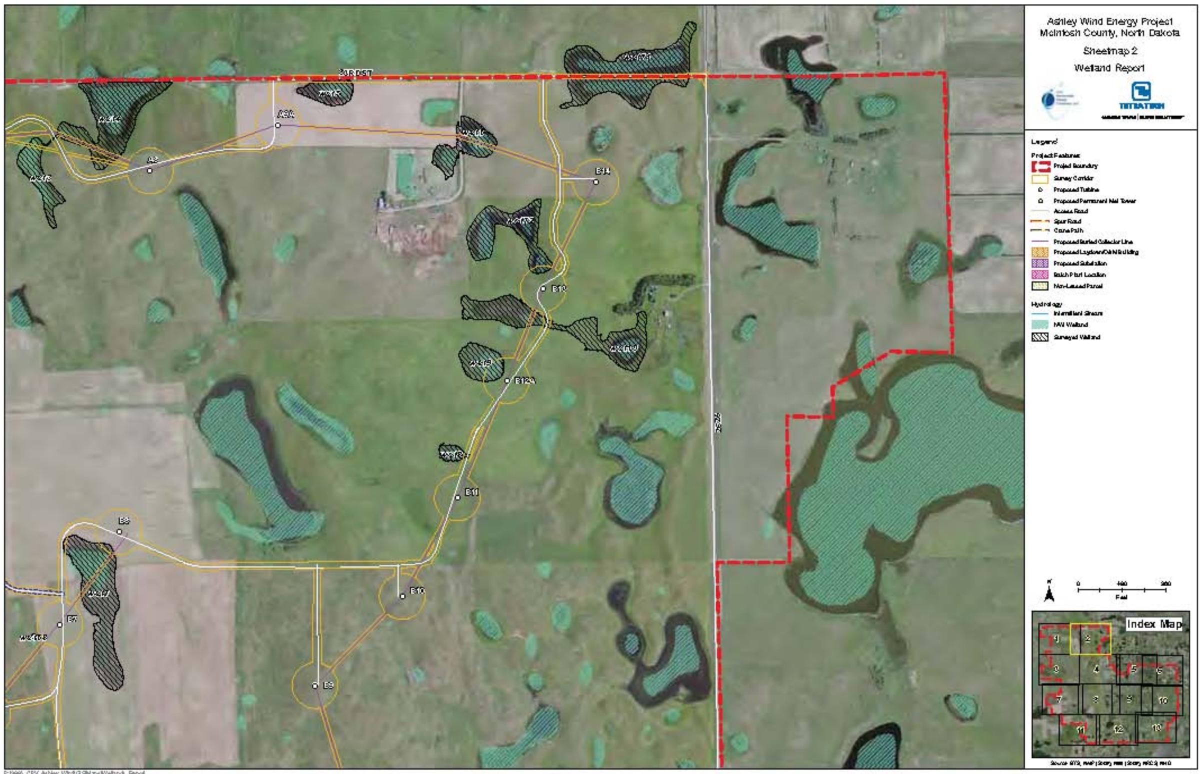
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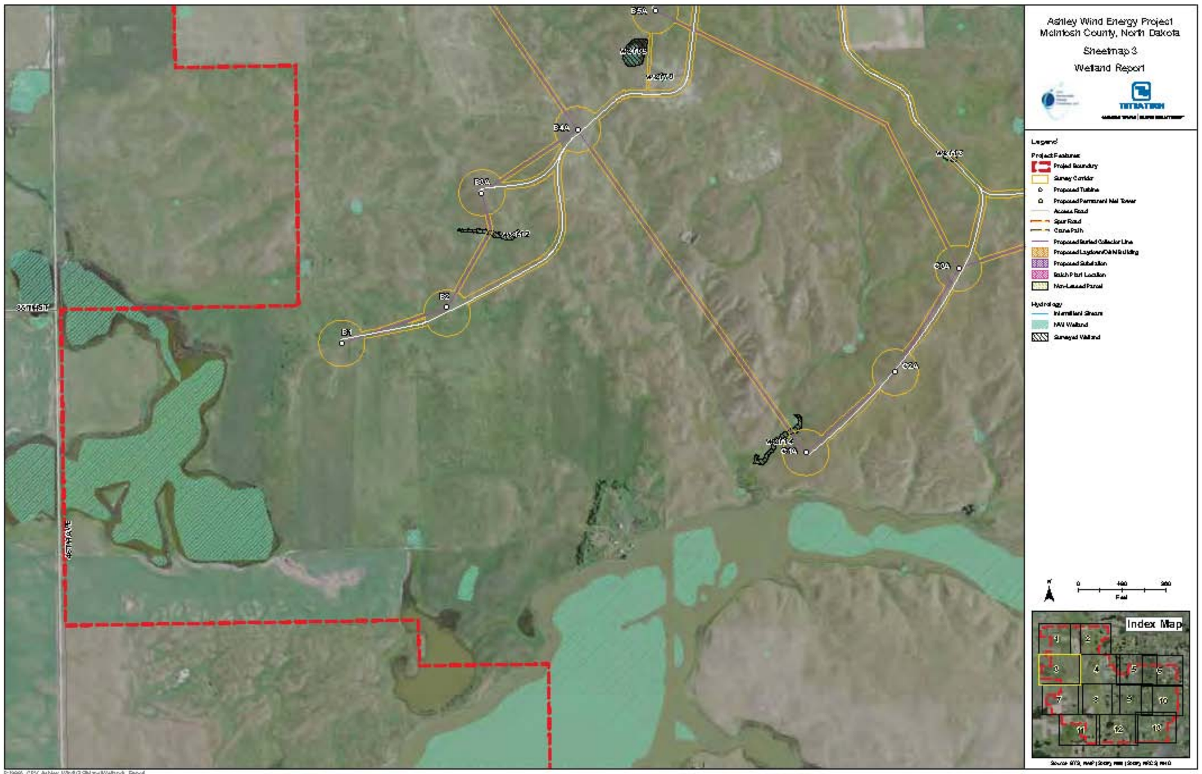
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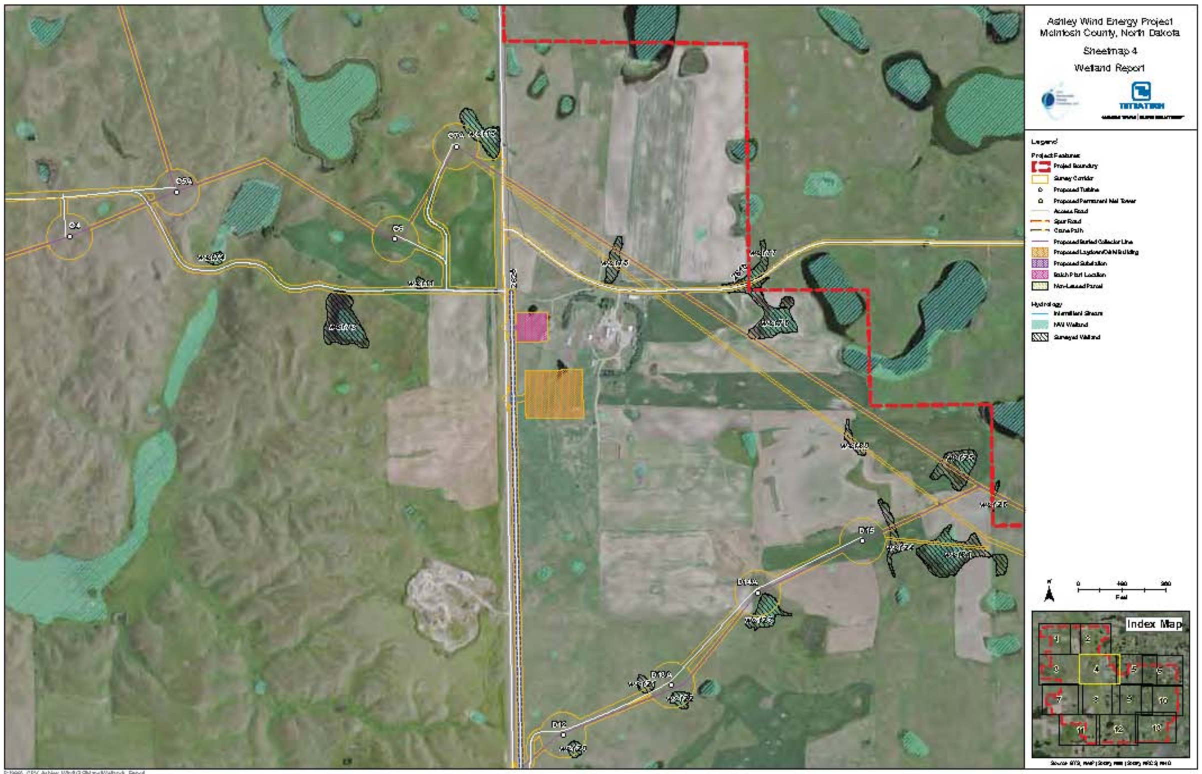
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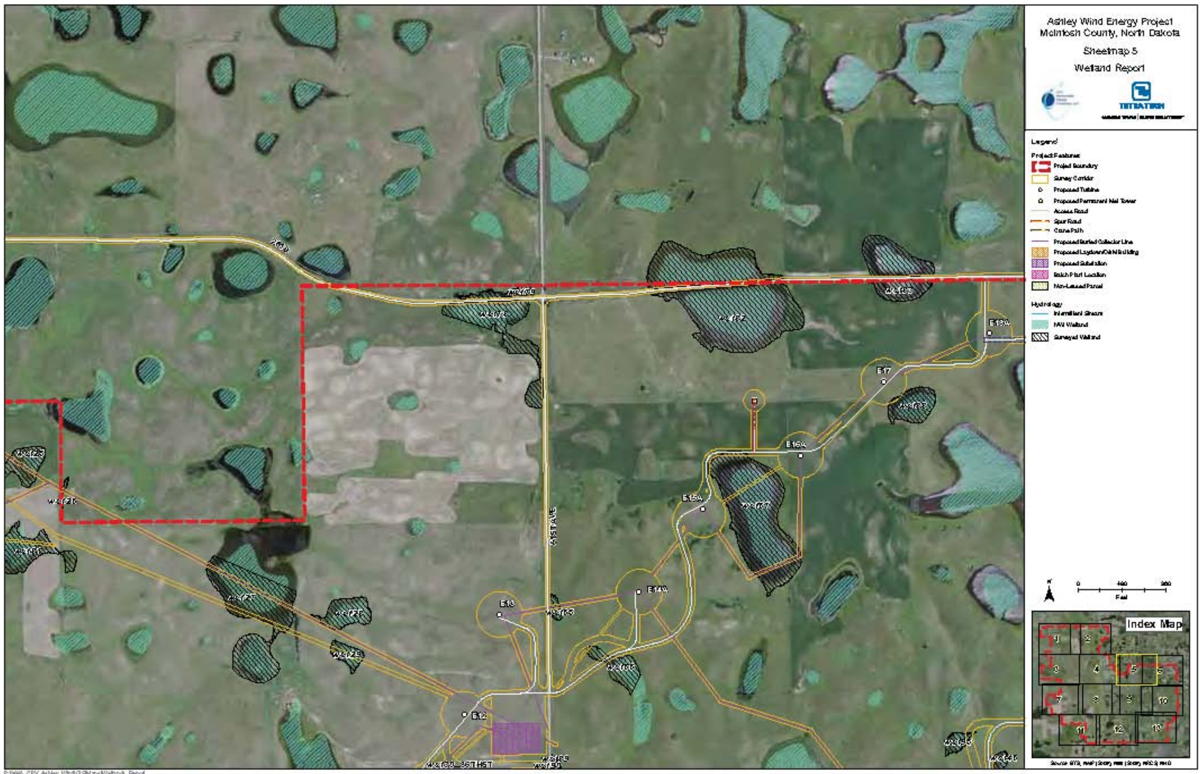
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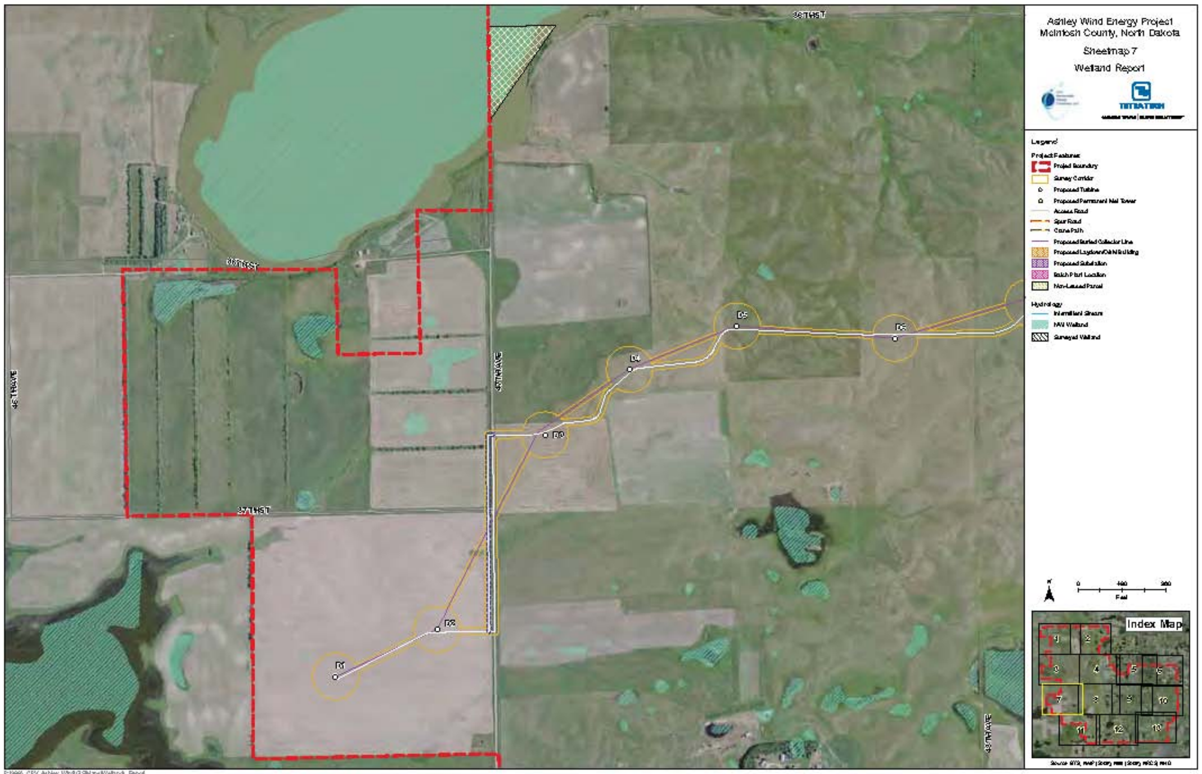
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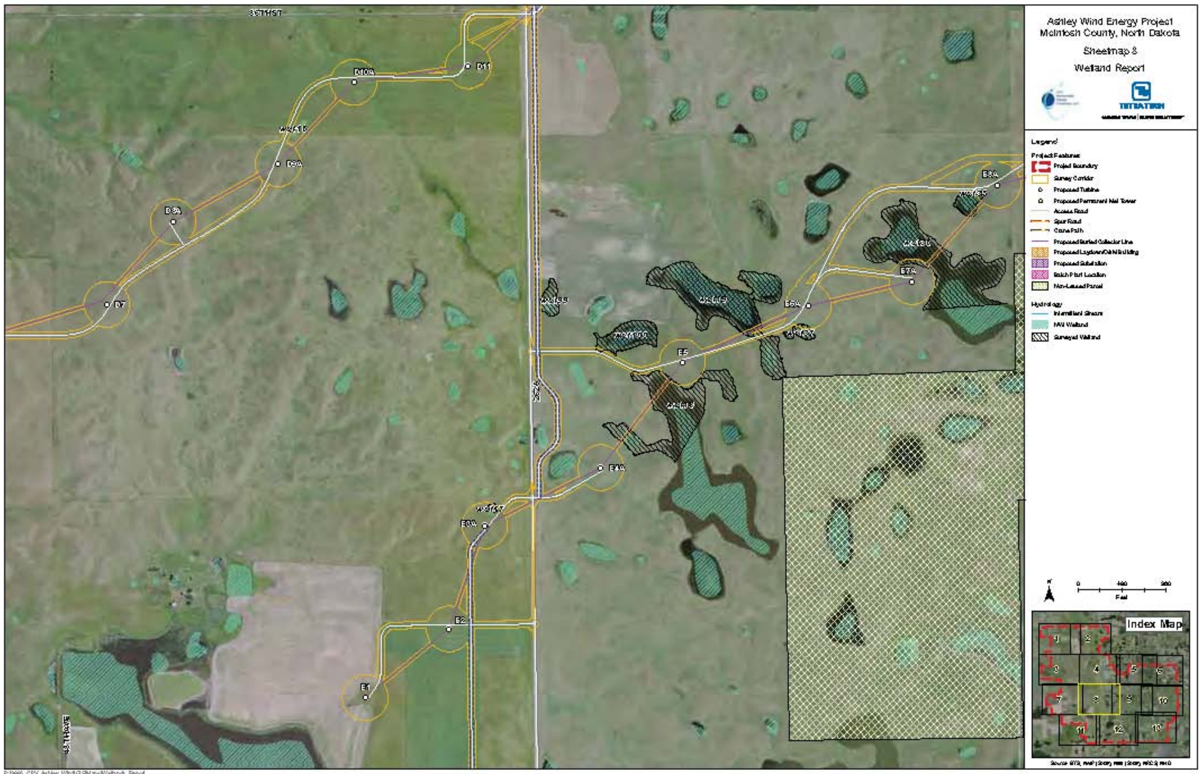
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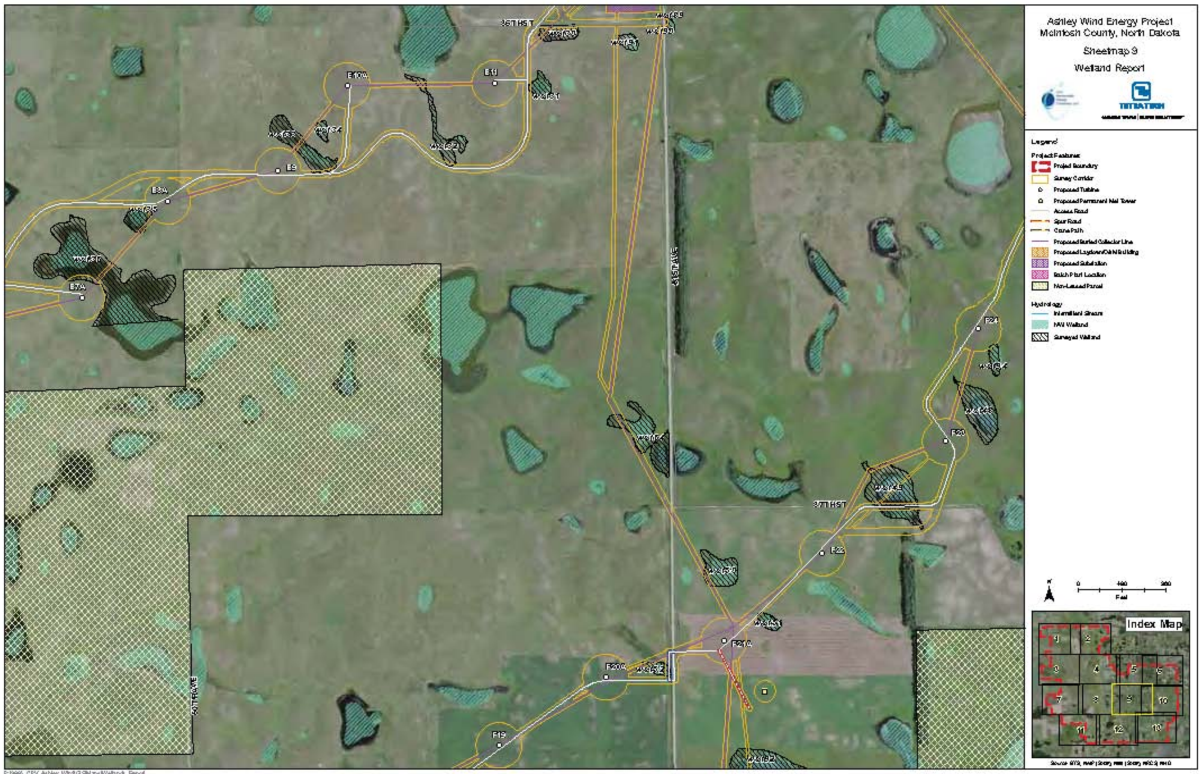
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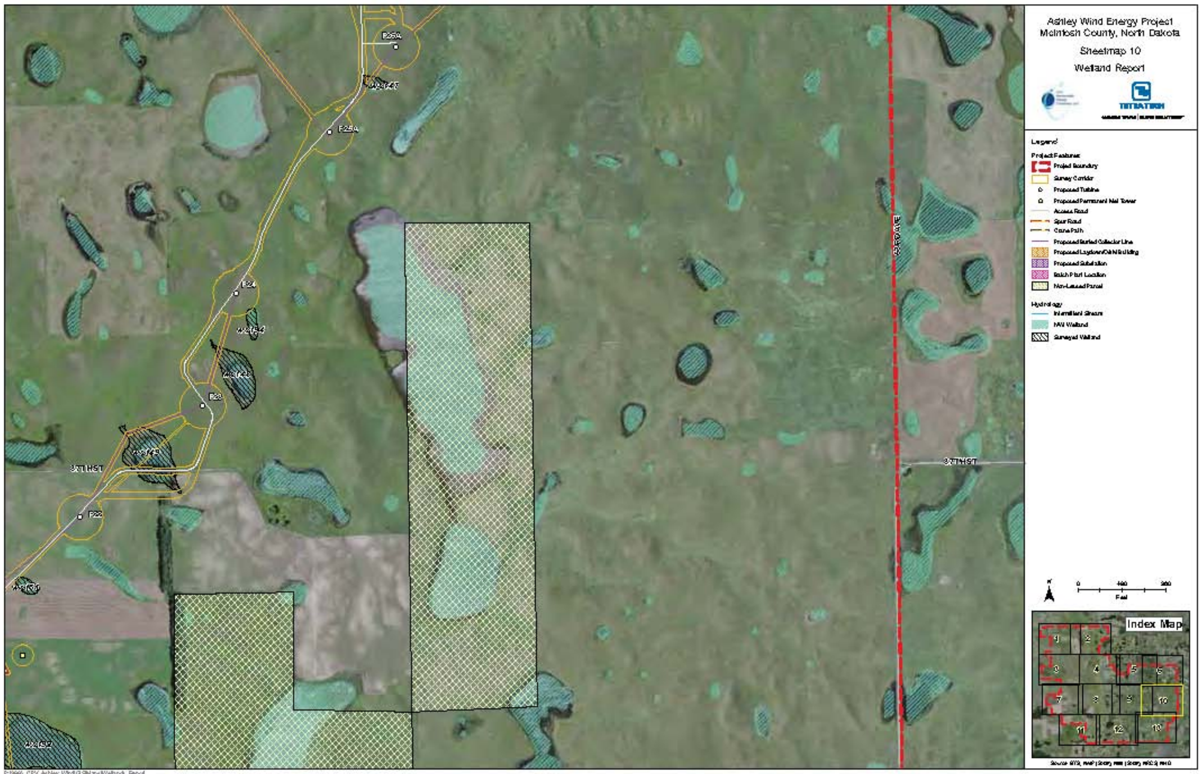
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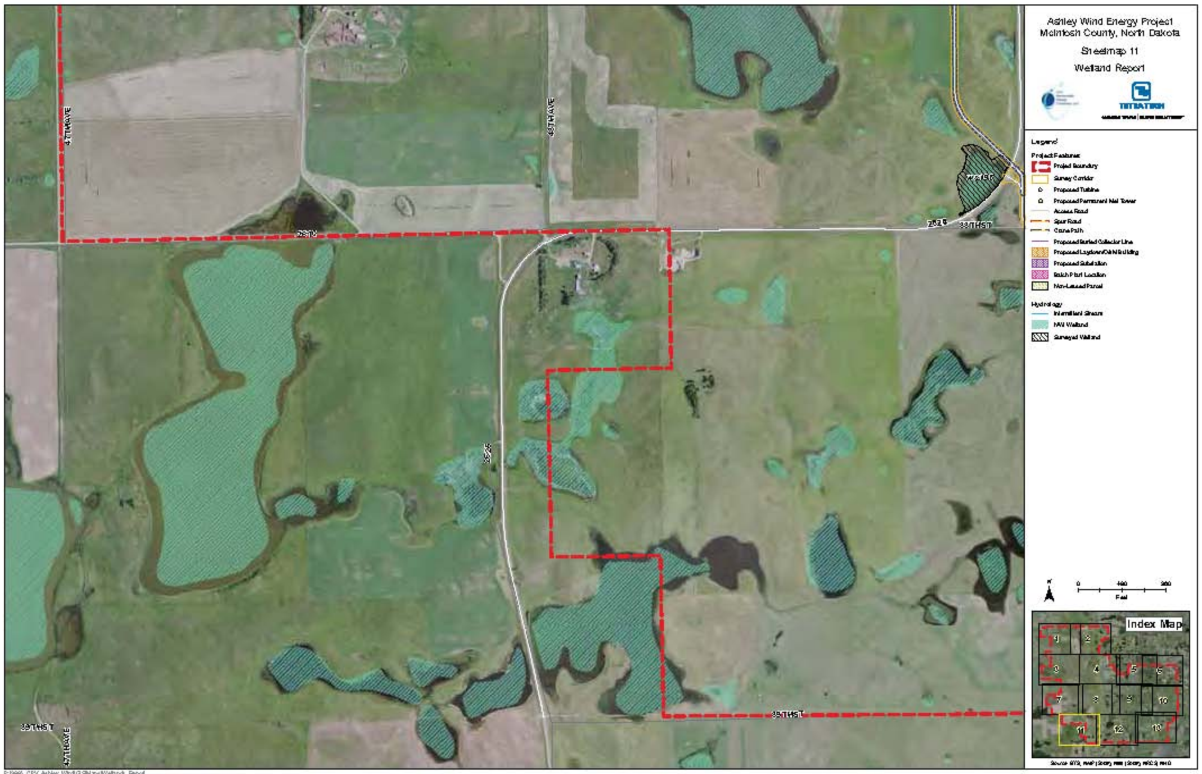
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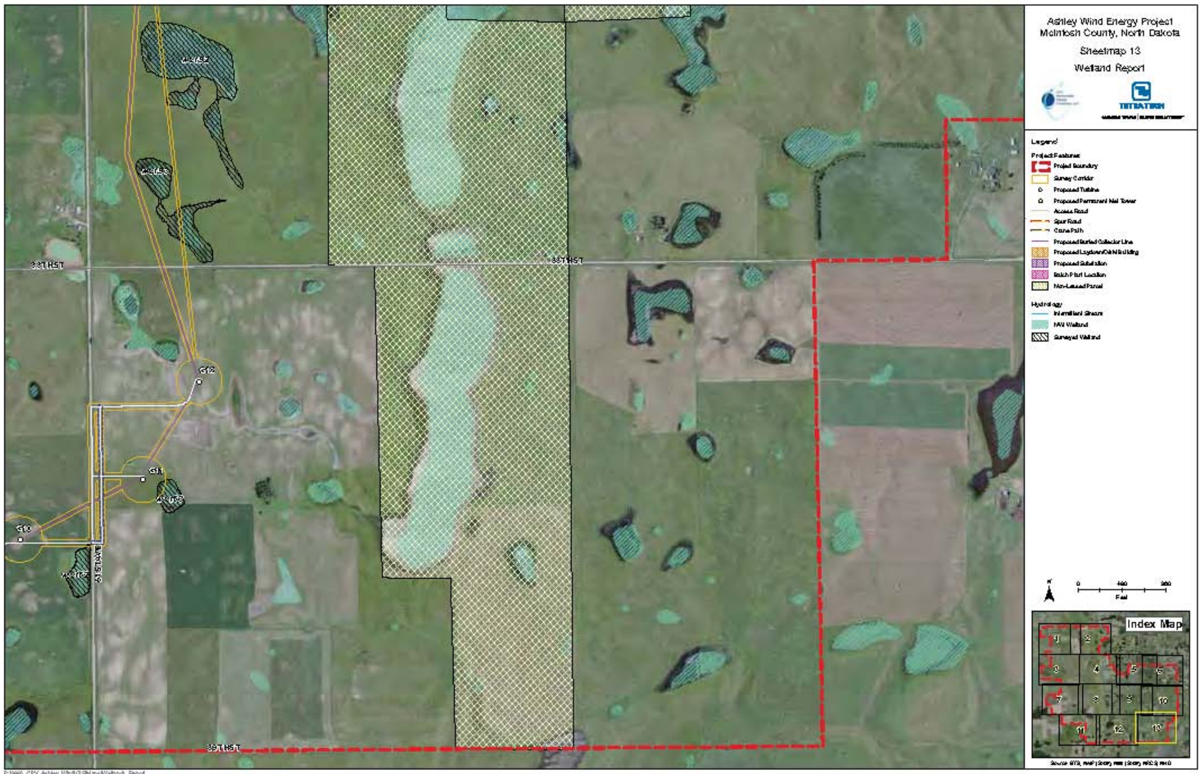
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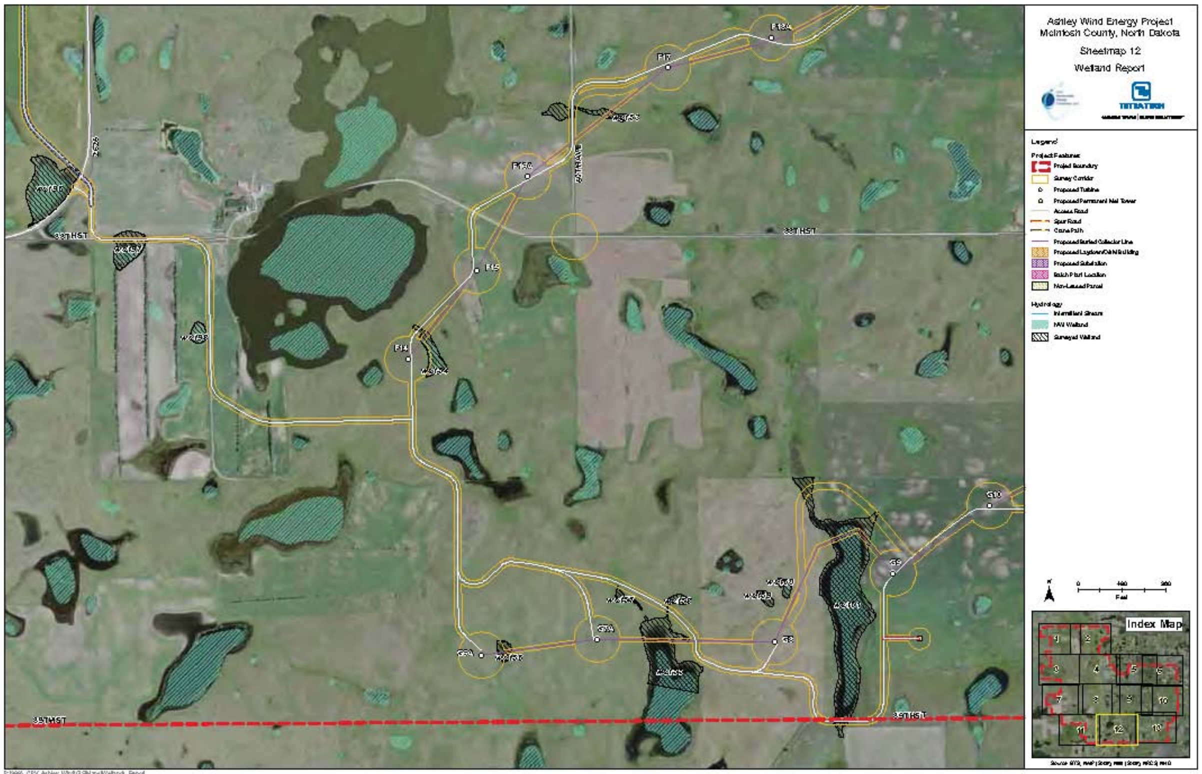
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