



TETRA TECH

August 6, 2013

Mr. Darrell Nitschke
Executive Secretary
North Dakota Public Service Commission
600 E. Boulevard Avenue, Department 408
Bismarck, ND 58505

SUBJECT: Thunder Spirit Wind Energy Project, Adams County, ND (Case No. PU-11-601)

Dear Mr. Nitschke,

On behalf of Global Winds Harvest, please find an original and 10 copies of the Wetlands and Waters of the US Report for the Thunder Spirit Wind Energy Project for filing in Case No. PU-11-601.

Please feel free to contact me at (617) 443-7552 or Tracey.Dubuque@tetratech.com if you have any questions. We look forward to your comments.

Sincerely,

TETRA TECH, INCORPORATED

Tracey M. Dubuque, P.E.
Senior Project Manager

THUNDER SPIRIT WIND ENERGY PROJECT

Wetlands and Other Waters of the United States Delineation Report



August 2013

Prepared for



Thunder Spirit Wind, LLC
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Prepared by



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Introduction

Tetra Tech, Inc. conducted routine wetland delineation for the Thunder Spirit Wind Energy Project (Project) between the dates of April 29 through May 2, 2013. This work was undertaken on behalf of Thunder Spirit Wind Energy, LLC (Thunder Spirit), an affiliate of Global Winds Harvest, Inc.

The Project is located 2 miles north of Hettinger, North Dakota, in Adams County as shown in the topographic map provided as Attachment A. The Project site was selected to include all areas necessary for Thunder Spirit to optimize the wind resource while avoiding and minimizing impacts to environmental resources. The location of the Project area is summarized in Table 1 by township and range.

Table 1: Project Location

County	Civil Township	Township	Range	Sections
Adams County	Duck Creek	130N	95W	1–36
	Holt	130N	96W	13, 14, 23, 24, 25, 26

Project Background

The Project would have a nameplate capacity of approximately 150 megawatts consisting of up to 75 wind turbine generators as shown in the aerial map provided as Attachment B. Additional facilities include access roads, electrical collection systems and cabling, a substation, a construction laydown area, and an approximately 0.85-mile overhead radial transmission line. The Project would interconnect to the Montana-Dakota Utilities (MDU) Hettinger 230-kilovolt (kV) Substation in the southwestern corner of Section 31 in Township 130 North, Range 95 West, and would transmit power into the grid operated by the Midwest Independent Transmission System Operator, Inc. The Project’s collection substation would include a power transformer to step up the voltage from 34.5kV to 230kV, enabling the interconnection to the MDU Substation. The Project substation would be located less than a mile away from the MDU Substation.

Delineation of Wetlands and Other Waters of the United States

Tetra Tech evaluated both wetlands and other waters of the United States (WoUS) using a combination of desktop analysis and routine delineation. The following sections discuss desktop analysis techniques and results, field delineation methods and results, potential impacts to the two types of resources, and mitigation measures.

Wetlands

The U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection jointly define wetlands as those areas “saturated or inundated with ground or surface water, at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas” (USACE 1987).

Desktop Analysis

Desktop analysis of wetland resources for the Project was conducted in March 2013, followed by routine wetland delineation in April and May 2013. The desktop analysis included evaluation of the Project area using National Wetland Inventory (NWI) mapping (USFWS 2013), National Agriculture Imagery Program (NAIP) aerial imagery interpretation (NAIP 2009), Natural Resources Conservation Service (NRCS) web soil survey (NRCS 2013), and topographic maps. A total of 129 wetland polygons were documented in the Project area using the NWI dataset. Most of these features appear to be related to intermittent streams or drainage ways. A smaller percentage (approximately 33%) of the 129 wetland polygons are designated by NWI as palustrine emergent wetlands or palustrine unconsolidated bottom wetlands (i.e., shallow ponds). Both Attachments A and B depict the NWI wetland polygons (many are very small acreages and are not visible at the scale used with these two maps). These maps were utilized during the delineation phase of the Project to focus the field team in the search for potentially jurisdictional wetlands.

Field Delineation Methods

The delineation process is intended to allow for mapping of the transition between wetland and upland ecosystems. This Project followed wetlands delineation method contained in the USACE *Wetland Delineation Manual* (1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region* (Version 2.0) [2010].

The field delineation process documented dominant vegetation, soils, and hydrology in areas of interest (i.e., areas with potential intersections between planned Project infrastructure and potential wetland ecosystems). For a site to be considered wetland there must be positive indication of dominance by hydrophytic vegetation, hydric soils, and characteristic wetland hydrology. In normal conditions, if a sample plot lacks any of these three criteria, it is considered upland. To determine these three characteristics, the field team designated paired sample plots, placed at discrete (typically < 25 feet) distances from one another, one in perceived wetlands, the other in perceived uplands. Each sample plot contained a hand-dug soil pit averaging 20 inches in depth. The sample plot also included nested concentric sampling rings for vegetation cover and species identification, as follows: herbaceous vegetation was identified within a 5-foot radius of the plot center, sapling/shrub vegetation was identified within a 15-foot radius, and trees and vines were documented within a 30-foot radius. The dominant vegetation was keyed to species level and each species was assigned a wetland indicator status using *The National Wetland Plant List* (Lichvar et al. 2012).

Hydrophytic vegetation, or plants that are indicators of wetlands, include those designated obligate (OBL), facultative wetland (FACW), or facultative (FAC) on *The National Wetland Plant List*. 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.

Soil from each soil pit was evaluated for hue, value, and chroma utilizing Munsell Soil Color Charts (Gretag Macbeth 1998). The soil was also checked for texture and for the presence of redoximorphic features, depleted matrix, saturation, and other specific criteria used to document hydric conditions.

Hydrology was analyzed for primary and secondary wetland indicators. Primary wetland indicators could include visible inundation, soil saturation, water marks, drift deposits, sediment deposits,

water-stained leaves, and oxidized root channels associated with living roots (where not tilled), among others. Secondary wetland indicators of hydrology could include oxidized root channels associated with living roots (where tilled), geomorphic position, and drainage patterns. Dug soil pits were left open a sufficient amount of time to allow for the stabilization of the apparent high water table if present. Sample plots that exhibited qualifying characteristics of hydrophytic vegetation, hydric soils, and wetland hydrology were identified as wetlands.

Once vegetation, soils, and hydrology were assessed at each of the paired sample plots, delineation was conducted to identify the outermost boundary of wetland conditions. The field wetland scientist used a Trimble GeoExplorer 6000 Series model XH Global Positioning System (GPS) to map wetland polygons. To generate the map, the wetland scientist walked the boundary line between the paired wetland and upland sample plots using the outermost limit of visibly identifiable wetland vegetation. The Trimble GPS has an average accuracy of 1 to 5 meters, correctable to sub-meter accuracy.

Delineation Results

Wetland delineation was conducted from April 29 to May 2, 2013. Table 2 lists the wetlands that were delineated during the survey. Five potentially jurisdictional wetlands were identified in locations either intersected by planned Project infrastructure or are near planned Project infrastructure. Attachment C is a set of sheet maps that depict delineated wetland resources, as well as other water resources within the overall Project area. Attachment D is a delineation photo log of representative pictures collected during the delineation effort.

Table 2: Wetland Delineation Results

Wetland ID	Cowardin Classification	Latitude-Longitude (Wetland Sample Plot)	Delineated Acreage
TS-WET-1	PEMA (palustrine, emergent, temporarily flooded)	46.033479/-102.604699	1.340
TS-WET-2	PEMA (palustrine, emergent, temporarily flooded)	46.034562/-102.576276	8.373
TS-WET-3	PEMCh (palustrine, emergent, seasonally flooded, diked/impounded)	46.089504/-102630251	0.212
TS-WET-4	PEMC (palustrine, emergent, seasonally flooded)	43.086623/-102.624686	1.741
TS-WET-5	PEMCh (palustrine, emergent, seasonally flooded, diked/impounded)	46.104228/-102.562622	10.988

Potential Impacts

Five potentially jurisdictional wetlands were delineated for this Project in locations either intersected directly by planned Project infrastructure or within conservative buffers (200 feet for turbines, 250 feet for access roads, and 100 feet for collection lines) for planned Project infrastructure. None of the delineated wetlands is planned to have permanent impacts from planned Project infrastructure, although four of the wetlands would have temporary impacts from the current siting (Table 3).

As currently designed, there would be temporary impacts totaling 0.40 acre to four of the wetlands from construction of the electrical collection line system. These temporary impacts would be

cumulatively less than the 0.5-acre threshold for use of a Clean Water Act (CWA) Section 404 nationwide permit (NWP) #12. However, based on field observations at each of the four wetland sites, it appears that use of horizontal directional drilling (HDD) could be used to avoid all impacts.

Table 3: Potentially Jurisdictional Features Identified During Wetland Delineation

Feature ID	Preliminary Jurisdictional Determination ¹	GPS Point ID	Potential Intersect with Project Features		
			Permanent Impacts (Acres) ²	Temporary impacts (Acres) ²	Attachment C, Sheet Map #
TS-WET-1	Potentially jurisdictional	WD-12, WD-13, and WD-14	0.00	0.23 (Collection Lines)	Sheet 3
TS-WET-2	Potentially jurisdictional	WD-11	0.00	0.056 (Collection Lines)	Sheet 4
TS-WET-3	Uncertain	—	0.00	0.069 (Access Road)	Sheet 1
TS-WET-4	Uncertain	WD-1	0.00	0.041 (Collection Lines)	Sheet 1
TS-WET-5	Uncertain	—	0.00	0.00	Sheet 8
Total Temporary Impacts to Wetlands			0.00	0.40	

1. Jurisdictional status of features was based on nexus determination completed during the field evaluation, but would require final decision of significant nexus from USACE.
2. Impact calculations are rounded to two significant digits.

Mitigation Measures

Thunder Spirit has committed to zero permanent wetland impacts. HDD could be used to install the electrical collection lines that cross delineated wetland features on the Project site thereby avoiding permanent impacts. However, if there are still temporary impacts to wetlands from construction of any infrastructure, and if that temporary impact cannot be kept below the 1/10-acre threshold for use of a NWP #12, then a pre-construction notification (PCN) and an application for a NWP #12 will still need to be made to the USACE regulatory office in Bismarck, North Dakota.

Other Waters of the United States

Section 404 of the CWA, Section 328 (CWA 1972) defines “waters of the United States” 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 purpose by industries in interstate commerce;
4. All impoundments of waters otherwise defined as waters of the United States under the definition;
5. Tributaries of waters identified in paragraphs (a)(1)-(4) of this section;
6. The territorial seas;
7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a)(1)-(6) of this section.
8. Waters of the United States 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 Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with the EPA. Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of CWA (other than cooling ponds as defined in 40 CFR 123.11(m) which also meet the criteria of this definition) are not waters of the United States.

Desktop Analysis

WoUS resources were analyzed using U.S. Geological Survey (USGS) topographic maps, Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), the National Hydrography Dataset (NHD 2013), and USFWS NWI data.

The FEMA website was queried for flood insurance rate mapping data. The Project is located in FIRM Map Panel ID # 380333IND0 (FEMA 1987). The Project is located entirely within FEMA Zone D. This is defined as "Areas with possible but undetermined flood hazards. No flood hazard analysis has been conducted. Flood insurance rates are commensurate with the uncertainty of the flood risk."

The Project area lies within the Cedar Creek watershed (HUC 10130303). The NHD dataset documented 33 intermittent stream segments in the Project area and two intermittent ponds (USGS 2013). The only named stream on USGS and NHD mapping within the Project area is Duck Creek. Duck Creek is intermittent, as evidenced not only by USGS mapping, but also from field observations made in April/May 2013. NWI mapping shows parts of Duck Creek as palustrine emergent wetland with temporary flooding (i.e., some portion of the growing season), while other segments of the stream within the Project area are mapped as palustrine, aquatic bed, semipermanently flooded. The water regime "aquatic bed segments" indicates that floating or submerged wetland plants are the dominant features in that location. The water regime "semipermanently flooded" indicates that particular portion of stream is either inundated all growing season, or the water table is at or very near the ground surface for most of the growing season. Duck Creek flows east approximately 20 stream miles from the Project's eastern boundary, eventually joining the perennial stream Cedar Creek. Cedar Creek flows east, joins the Cannonball River, which then flows to the Missouri River. The Missouri River (actually Lake Oahe at this juncture) is a traditional navigable water.

Delineation Methods

The field delineation for WoUS was conducted April 29 through May 2, 2013. This work was limited to those surface water features that exhibited an ordinary high water mark (OHWM) and that intersected either directly or within predetermined buffer distances from planned Project

infrastructure. The USACE defines the term “ordinary high water mark” at 33 CFR 328.3(e) as follows:

The term ordinary high water mark means 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.

Swales and other drainage features that lacked an OHWM or defined beds and banks were not considered WoUS and were not delineated. Attachment C depicts several of the features that were identified by NHD analysis, but upon close observation in the field, were determined to lack an OHWM (e.g., NHD-32, Attachment C, Sheet 5).

A Trimble GeoExplorer XH with sub-meter accuracy was utilized to delineate WoUS features. Both sides of streams were generally mapped using the OHWM as the outer bounds of the stream feature. The only named stream in the Project area (Duck Creek) was not observed to have any flow during field delineation work, nor did any other stream have flowing water. There was standing water in many drainage locations, generally with ponding in deeper segments of the stream channel. Attachment C is a set of sheet maps that depict delineated wetlands and other waters of the United States within the overall project boundary. Attachment D is a delineation photo log of representative pictures from the delineation effort.

Delineation Results

Delineation for WoUS documented a total of five features (Attachment C). Data for these three waters are listed in Table 4. Man-made structures, such as seasonal ponds or stock tanks also exist in the Project area, but they were clearly isolated with no defined channel inflow and were typically dammed on the downgradient ends with no potential for outflow. It was thus reasoned that the seasonal ponds are not likely to be jurisdictional WoUS.

Table 4: WoUS Delineation Results

WoUS ID	Cowardin Classification	Latitude-Longitude	Delineated Acreage (square feet)
TS-WoUS-1	PABFh (palustrine, aquatic bed, semi-permanently flooded, diked/impounded wetland)	46.06253/-102.557	3.651
TS-WoUS-2	PABFh (palustrine, aquatic bed, semi-permanently flooded, diked/impounded wetland) and PUSA (palustrine, unconsolidated shore, temporarily flooded)	46.10414/-102.524	6.501
TS-WoUS-3	PEMA (palustrine, emergent, temporarily flooded)	46.08357/-102.529	1.482

Potential Impacts

Construction of the wind turbines, transformer pads, collection lines, access roads, and a new substation would disturb land within the Project area as defined in Attachment A. All wind turbines, transformer pads, and the substation would be built on uplands to avoid ephemeral and intermittent streams located in the Project area. Collection lines and access roads to the turbines would be carefully sited so as to avoid impacts to the greatest extent practicable. In the event that some impacts from electrical collection lines or access roads cannot be avoided completely, the impacts

would be minimized through mitigation. In those instances where electrical collection lines must cross ephemeral or intermittent drainages, the lines would either be placed using HDD, resulting in no impact to WoUS, or they would be placed using open trenching methods, resulting in temporary impacts to WoUS.

Table 5 lists the WoUS that were delineated during April/May 2013 field work. Three potentially jurisdictional waters were identified within the Project area in locations either intersected directly by planned Project infrastructure or they are in within conservative buffers for planned Project infrastructure. Buffer distances utilized include 200 feet for turbine locations, 250 feet either side of the centerline for access roads, and 100 feet either side of the centerline for collection lines.

Assuming that the proposed wind turbines and associated structures are not placed in potential flooding areas, it is reasonable to assume that floodplains would not be affected and are not a significant issue from a regulatory perspective.

Table 5. Potentially Jurisdictional Features Identified During WoUS Delineation

WoUS ID	Preliminary Jurisdictional Determination	Potential Intersect w/Project Features				
		GPS Point ID	Cause of Temporary Impact	Estimated Temporary Impact Acreage	Estimated Permanent Impact Acreage	Attachment C, Sheet Map #
TS-WoUS-1	Potentially jurisdictional	WD-4 thru WD-9	Collection Lines	0.336	—	Sheet 5
		WD-2	Collection Lines	0.028	—	Sheet 2
		WD-10	Access Road	—	0.006	Sheet 5
		Near WD-2	Turbine	0.063	—	Sheet 2
		Near WD-3 and Near WD-10	Access Road	0.391	—	Sheet 5
Total Impact TS-WoUS-1				0.818	0.006	
TS-WoUS-2	Potentially jurisdictional	WD-16	Collection Lines	0.067	—	Sheet 7
		WD-17 and WD-18	Collection Lines	0.221	—	Sheet 7
		WD-19	Access Road	—	0.062	Sheet 7
		WD-20	Collection Lines	0.497	—	Sheet 7
Total Impact TS-WoUS-2				0.785	0.062	
TS-WoUS-3	Potentially jurisdictional	WD-15	Collection Lines	0.061	—	Sheet 6
Total Temporary Impacts to Wetlands				1.664	0.068	

The USACE has established 0.5 acre of impact as the upper threshold for use of a NWP #12 for utility line projects that impact WoUS. The stream designated TS-WoUS-1 is estimated to have 0.818 acre of cumulative temporary impact due to construction of electrical collection lines. TS-WoUS-1 is a long feature and the USACE may allow the separate crossings of this stream by Project infrastructure to be considered as “single and complete projects,” thereby resulting in no individual crossing with a total estimated impact over the 0.5-acre threshold for use of a NWP. TS-WoUS-1

has two segments that are estimated to each have temporary impacts over the 0.10-acre threshold requiring the completion of a PCN for submittal to USACE.

The stream designated TS-WoUS-2 is estimated to have 0.785 acre of cumulative temporary impact due to construction of electrical collection lines and access roads. One segment of TS-WoUS-2 is predicted to have 0.221-acre of impact from construction of the electrical collection lines. A second segment of TS-WoUS-2 may potentially be impacted by construction of an access road (0.497 acre). Both of these values for impact would exceed the 0.10-acre threshold requiring a PCN be written for the Project. The stream designated TS-WoUS-3 is predicted to have 0.061-acre of impact from construction of electrical collection lines. This impact acreage is below the threshold for completion of a PCN.

It is likely that unless avoidance measures can preclude temporary and permanent impacts to WoUS, the Project would require a Section 404 NWP# 12 from the Bismarck Regulatory office of the USACE. As described previously under wetland impacts, the use of HDD technology to bore underneath the stream segments could greatly minimize or eliminate the need for a PCN and permitting with the USACE.

Mitigation Measures

If WoUS cannot be fully avoided during the construction phase of the Project, impacts should be minimized to the greatest extent practicable. HDD could be used to install the electrical collection lines that cross delineated WoUS in the Project area. Careful placement of culverts would lessen impacts to WoUS from access road construction. Impacts from construction of turbine pads should be carefully controlled to avoid any delineated WoUS. Controls could include pre-construction marking of OHWM for WoUS and fencing to keep construction out of the feature.

Electrical collection lines and access roads constructed adjacent to intermittent streams and drainage ways would be designed in such a manner that runoff from the upper portions of the watershed can flow unrestricted to the lower portion of the watershed. An application (Notice of Intent) to obtain coverage under the National Pollutant Discharge Elimination System general permit for storm water discharges associated with construction activity would be submitted to the North Dakota Department of Health (DOH) prior to construction of the project. If open trenching for collection lines is selected, then the impacted drainage would be returned to the original contour following the trenching, and the upland and embankment areas would be reseeded with native vegetation noted for the area during field reconnaissance. If trenching is the chosen method, the USACE should be consulted to determine appropriate steps to obtain a NWP #12 for the Project.

A stormwater runoff permit would be obtained prior to construction. Compliance with this permit and the associated Surface Water Pollution Prevention Plan would ensure that surface water is not adversely affected by runoff from disturbances and construction areas.

References

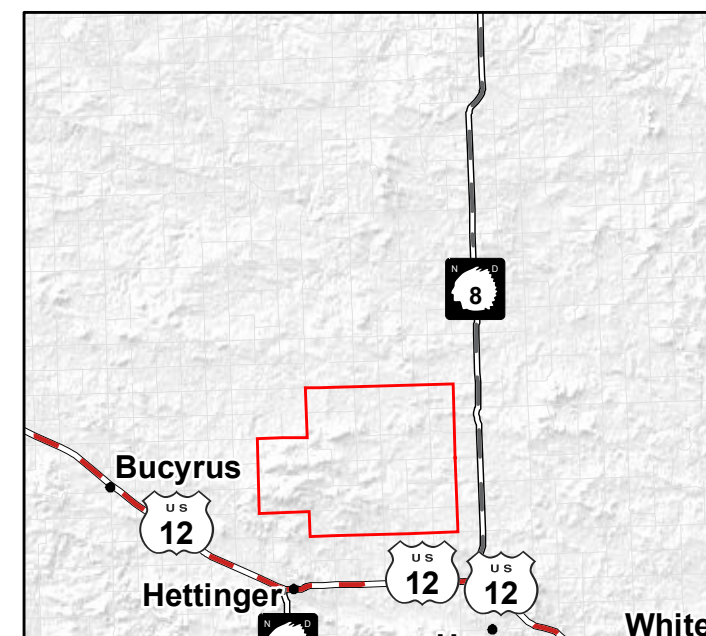
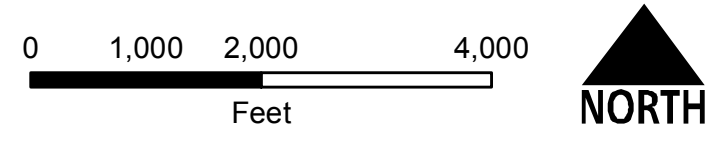
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- . 1987. Wetlands Delineation Manual. Technical Report Y-87-1, Department of the Army, Washington, D.C.
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- USGS (U.S. Geological Survey). 2013. National Hydrography Dataset. Online: <http://nhd.usgs.gov/data.html>.

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Attachment A: Project Area Topographic Map

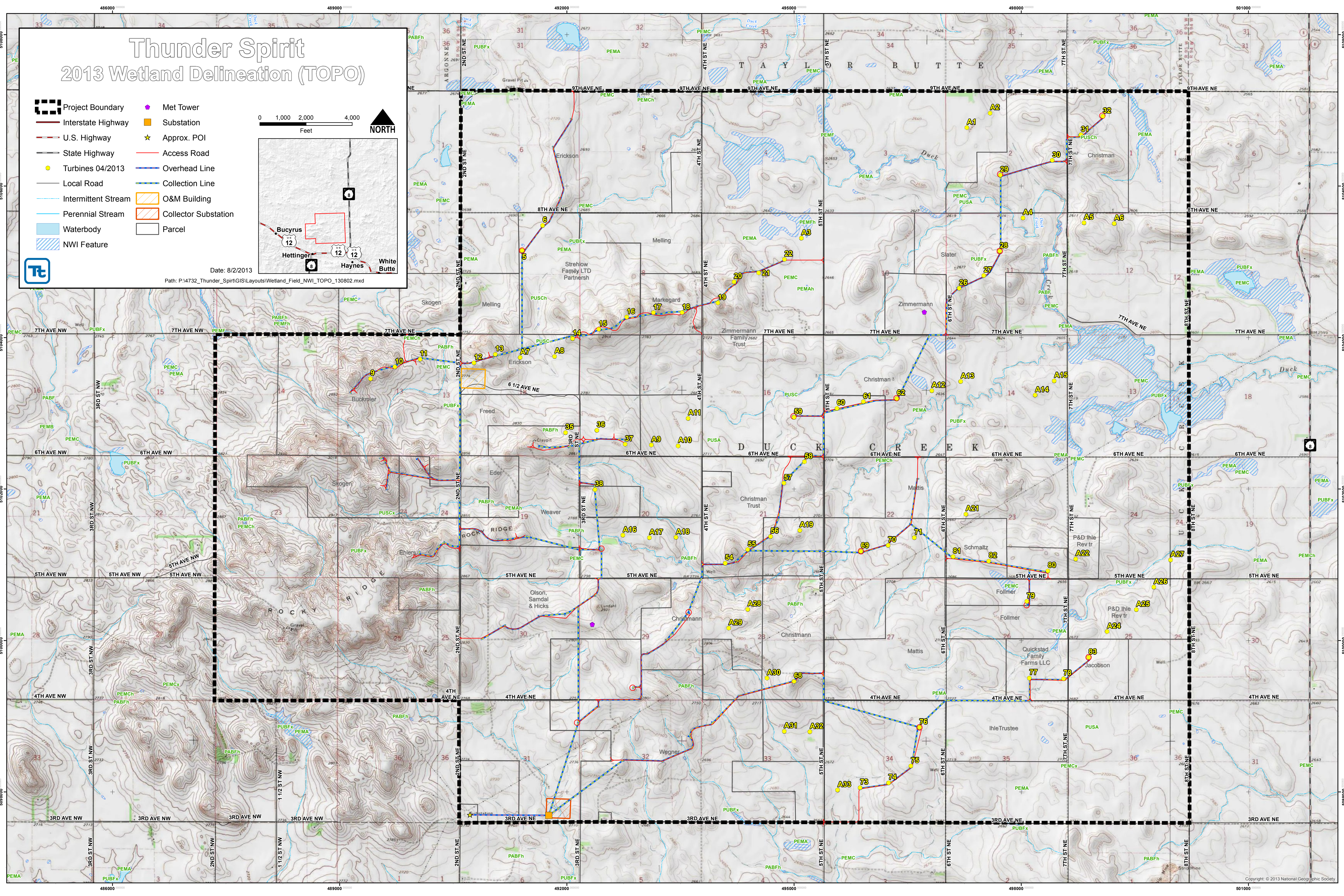
Thunder Spirit 2013 Wetland Delineation (TOPO)

- Project Boundary
- Interstate Highway
- U.S. Highway
- State Highway
- Local Road
- Turbines 04/2013
- Intermittent Stream
- Perennial Stream
- Waterbody
- NWI Feature
- Met Tower
- Substation
- Approx. POI
- Access Road
- Overhead Line
- Collection Line
- O&M Building
- Collector Substation
- Parcel



Date: 8/2/2013

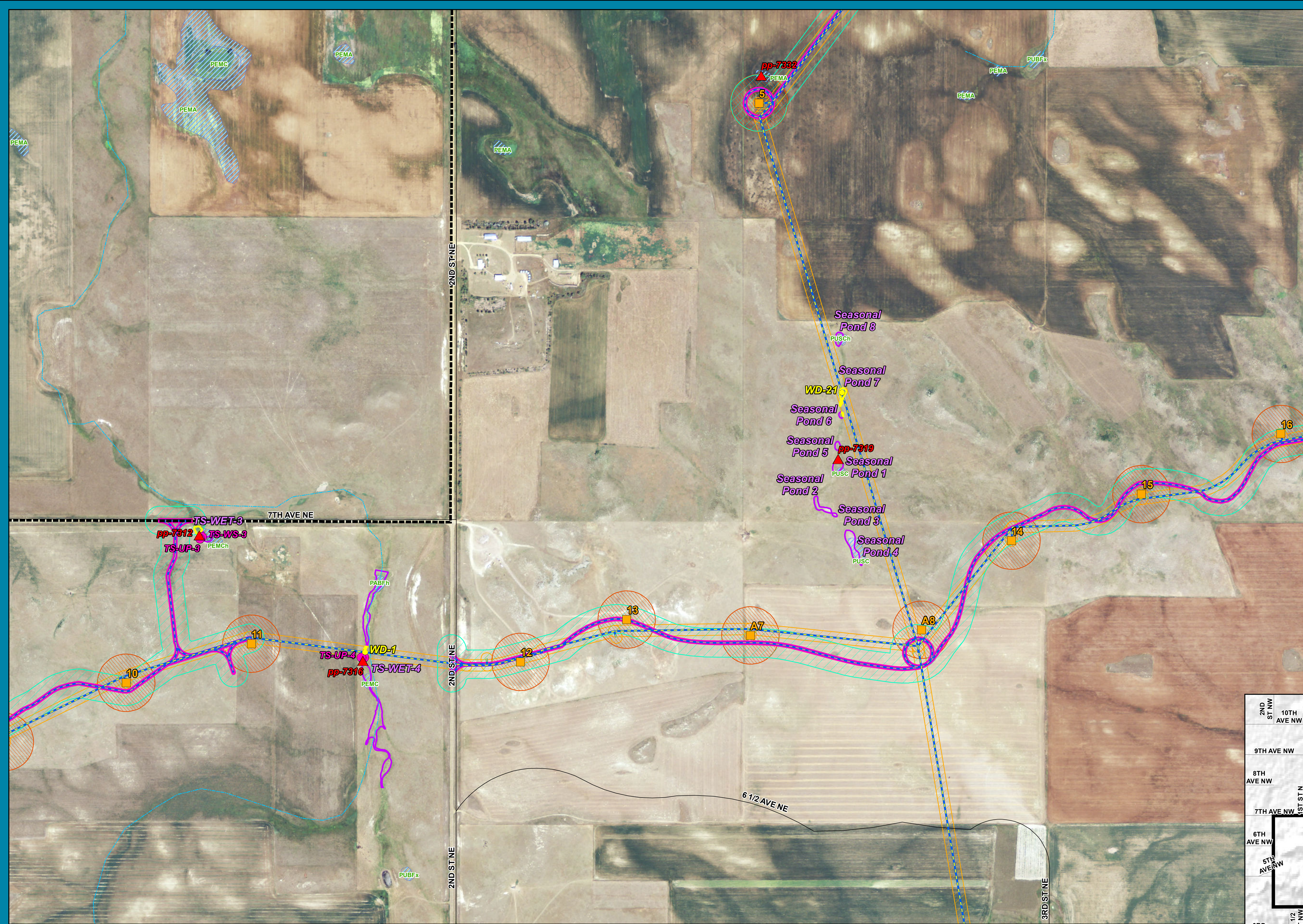
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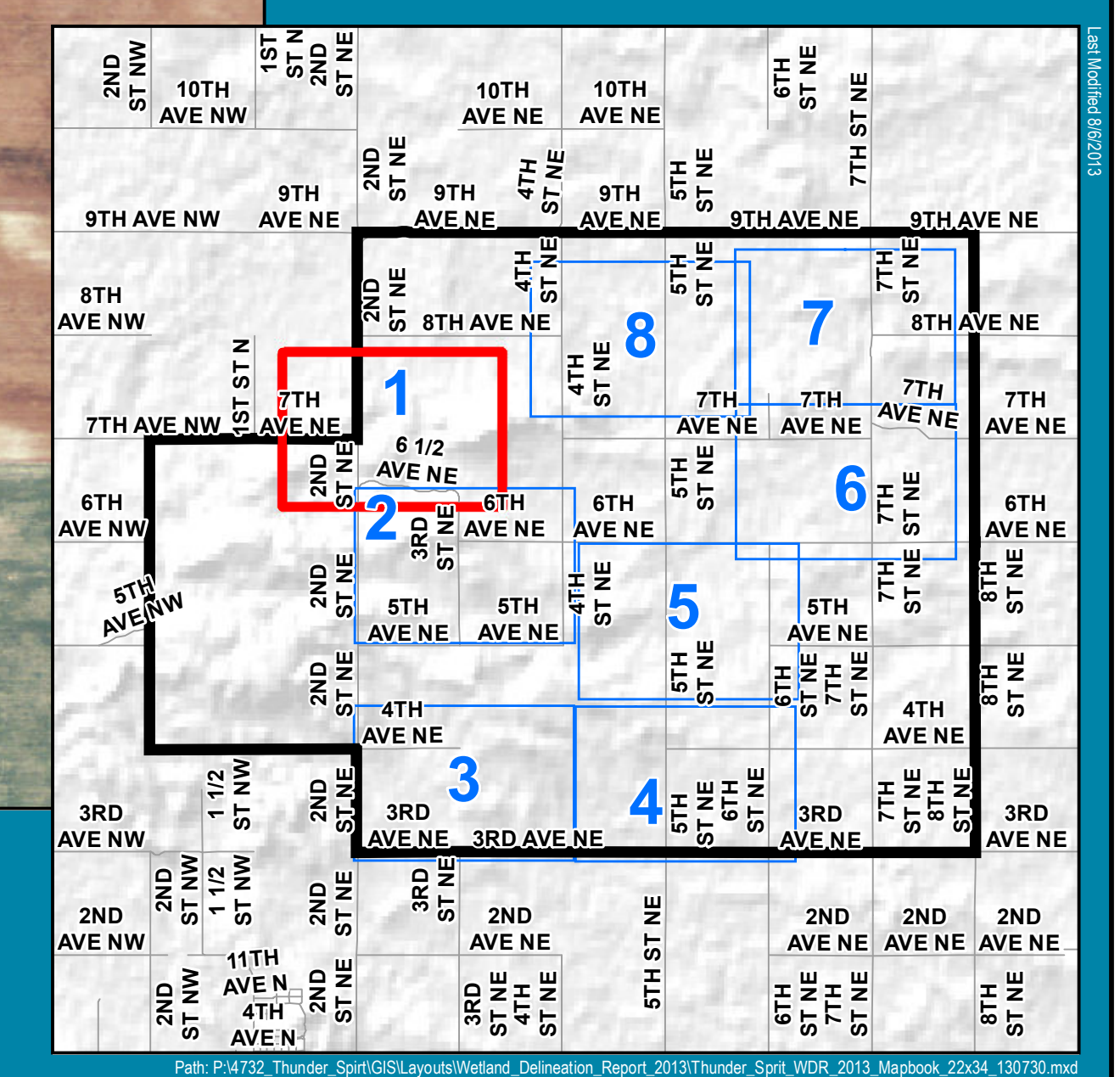
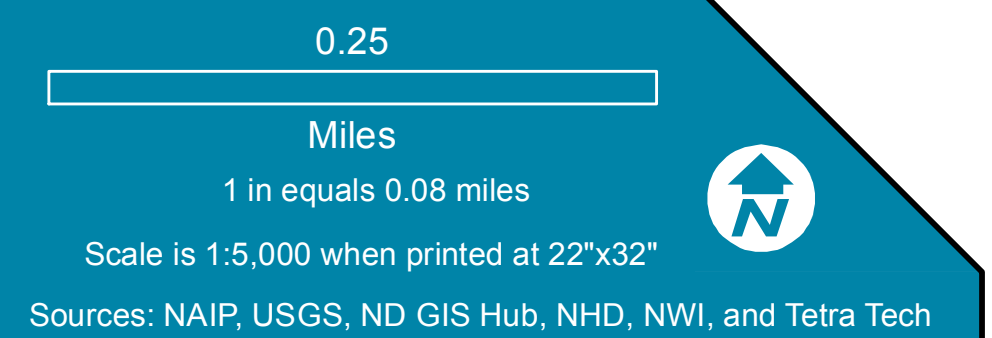
Attachment B: Project Area Aerial Map

Attachment C: Wetland Sheet Maps

WETLAND DELINEATION SHEET 1



- Project Features**
- Project Boundary 04/26/2013
 - Impact Point
 - Wetland or Water Project Impact
 - *WD - Wetland Delineation / NHD - National Hydrology Dataset
 - Proposed Turbine 04/26/2013
 - Met Tower
 - Proposed Substation
 - Collector Line
 - Proposed Access Road
 - 24ft Wide Permanent Road impact Footprint
 - 250ft Wide Temporary Road Impact Footprint
 - 500ft Diameter Temporary Turbine Impact Footprint
 - 100ft Wide Temporary Collector Line Impact Footprint
- Surveyed Feature**
- Photo Point
 - Sample Plot
 - Culvert
 - Water or Wetland
- Hydrology**
- Intermittent Stream
 - Perennial Stream
 - Waterbody
 - National Wetland Inventory Feature
 - Local Road

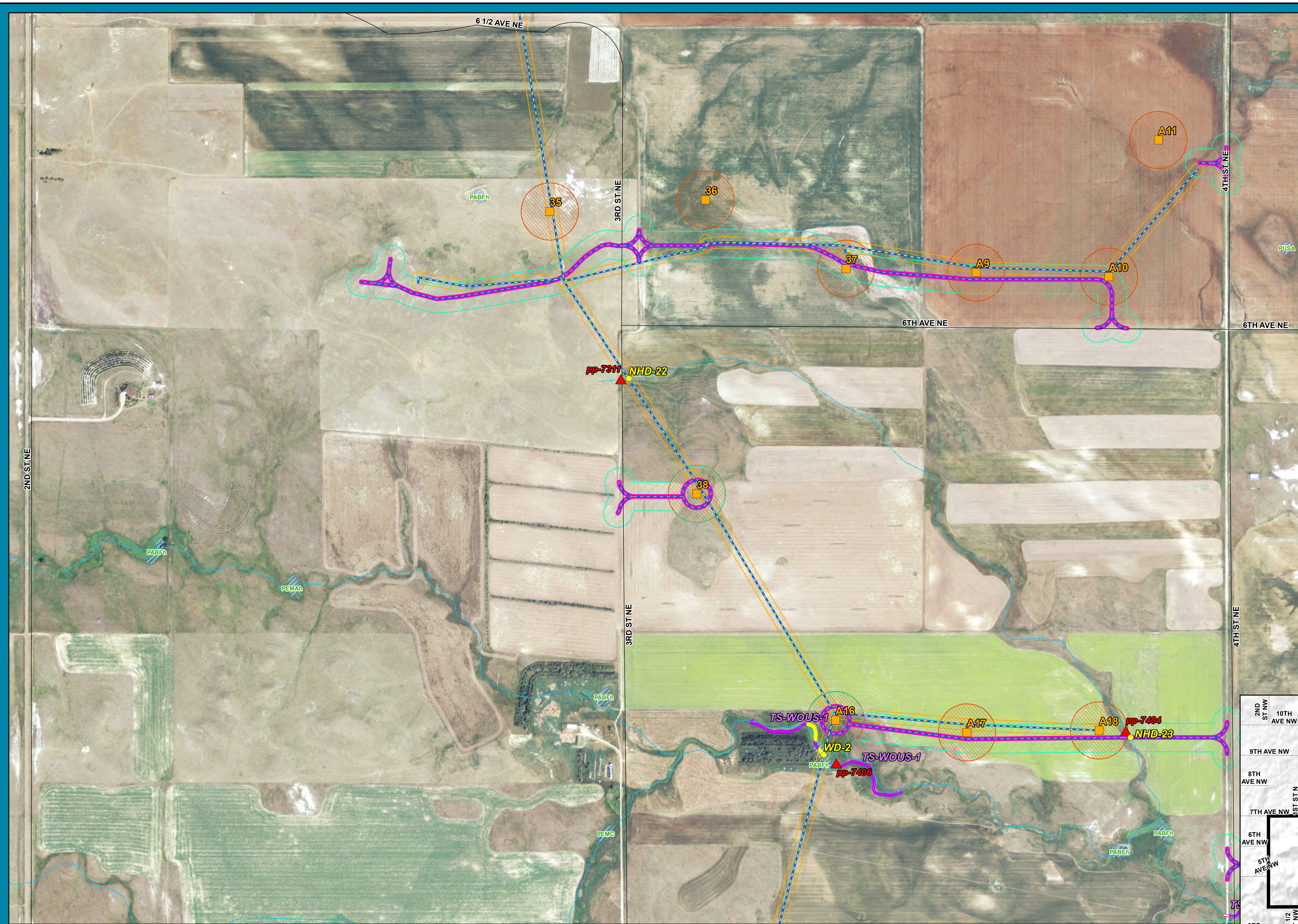


THUNDER SPIRIT WINDFARM PROJECT



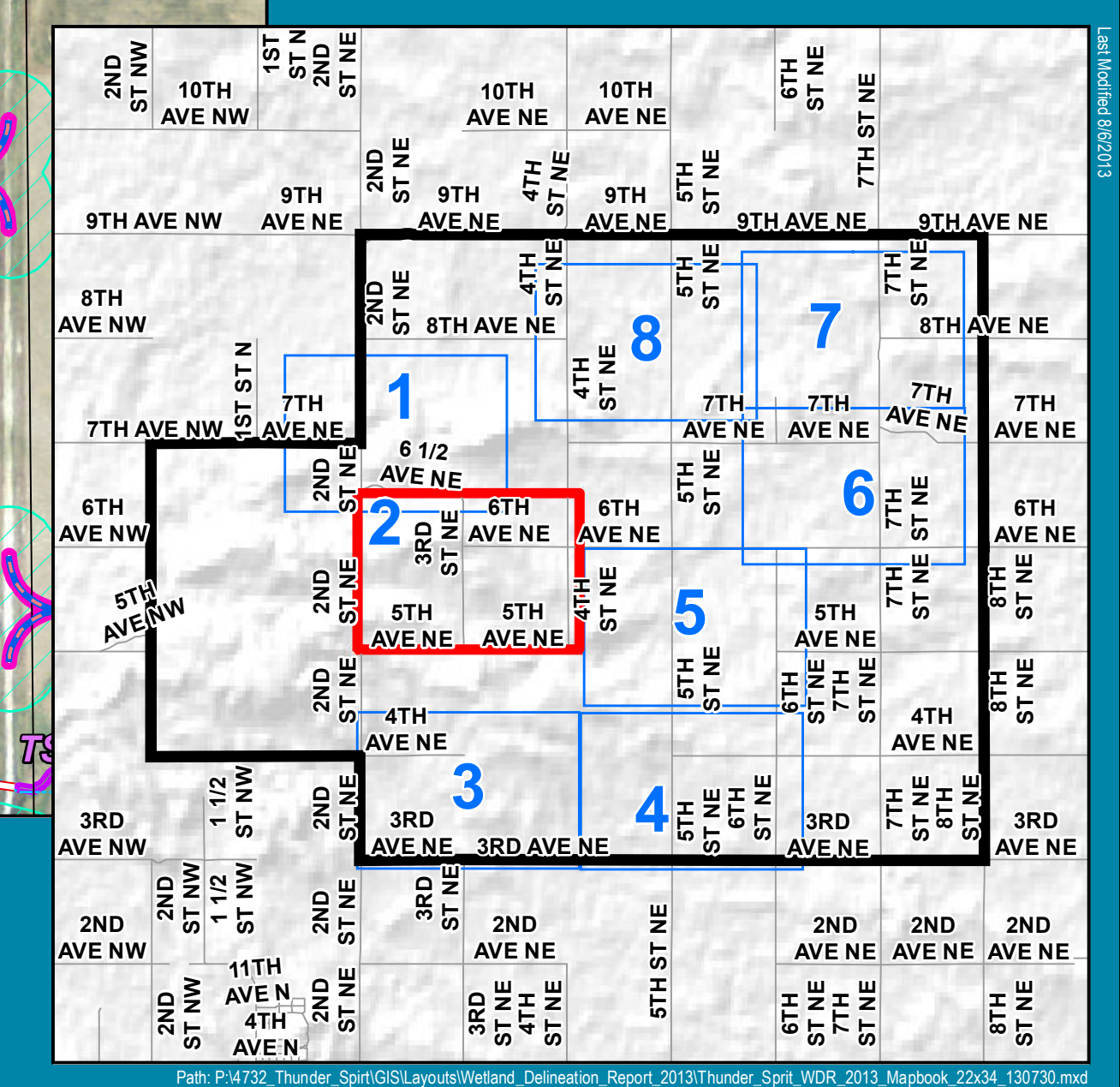
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WETLAND DELINEATION SHEET 2



- Project Features**
- Project Boundary 04/26/2013
 - Impact Point
 - Wetland or Water Project Impact
 - Proposed Turbine 04/26/2013
 - ◆ Met Tower
 - Proposed Substation
 - Collector Line
 - Proposed Access Road
 - 24ft Wide Permanent Road Impact Footprint
 - 250ft Wide Temporary Road Impact Footprint
 - 500ft Diameter Temporary Turbine Impact Footprint
 - 100ft Wide Temporary Collector Line Impact Footprint
- Surveyed Feature**
- ▲ Photo Point
 - Sample Plot
 - Culvert
 - Water or Wetland
- Hydrology**
- Intermittent Stream
 - Perennial Stream
 - Waterbody
 - National Wetland Inventory Feature
 - Local Road

0.25
Miles
1 in equals 0.08 miles
Scale is 1:5,000 when printed at 22"x32"
Sources: NAIP, USGS, ND GIS Hub, NHD, NWI, and Tetra Tech

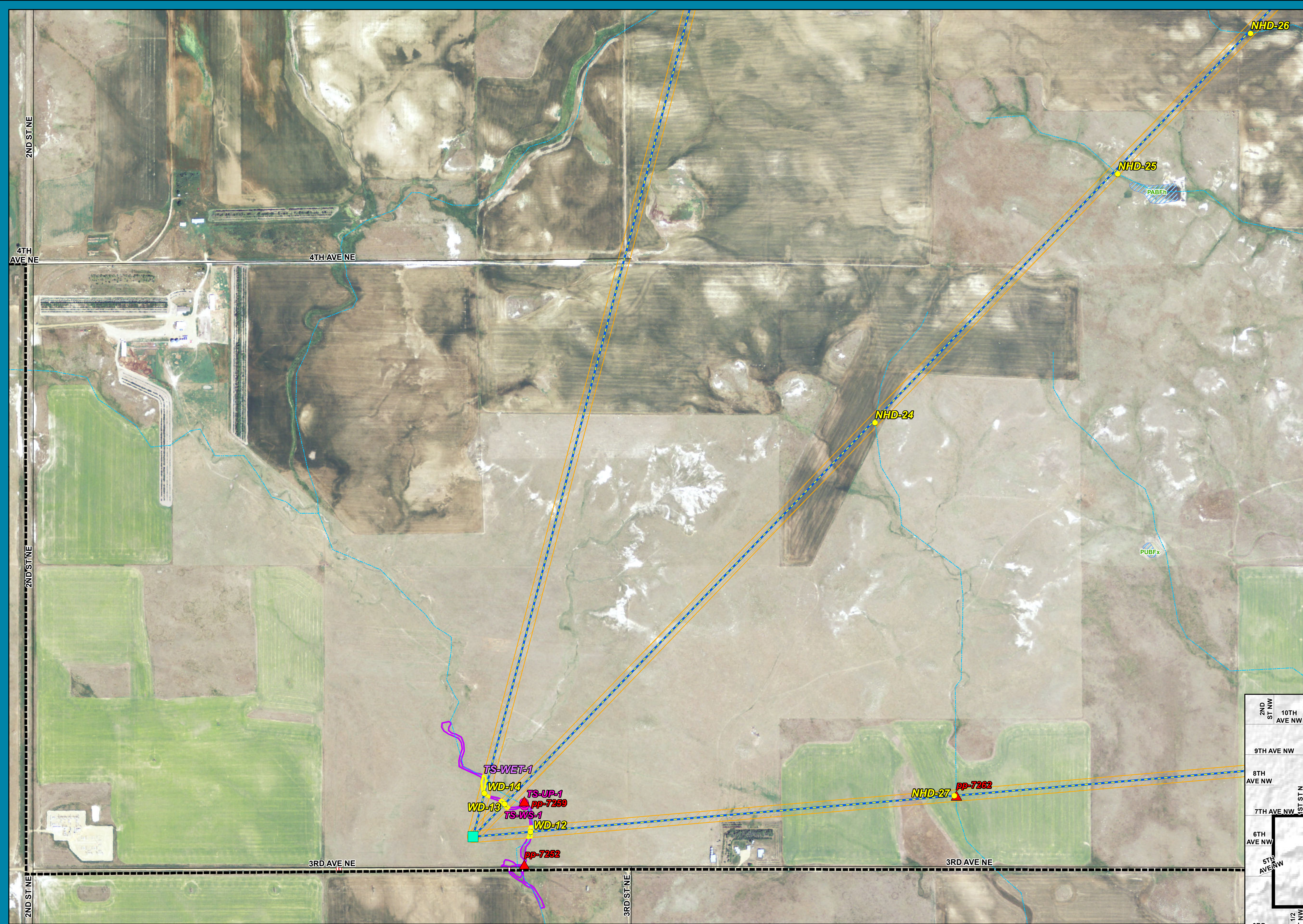


THUNDER SPIRIT WINDFARM PROJECT



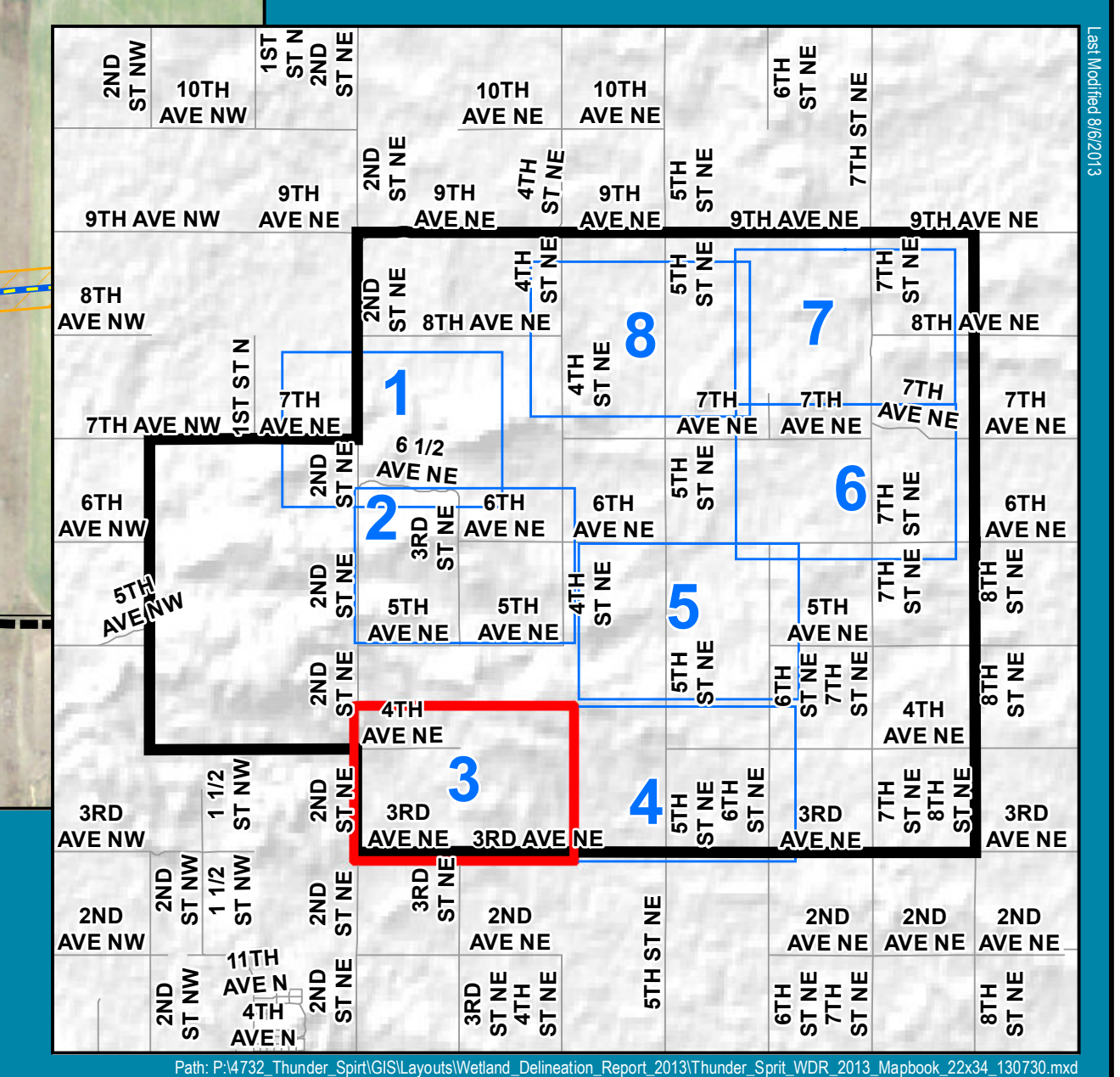
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WETLAND DELINEATION SHEET 3



- Project Features**
- Project Boundary 04/26/2013
 - Impact Point
 - Wetland or Water Project Impact
 - *WD - Wetland Delineation / NHD - National Hydrology Dataset
 - Proposed Turbine 04/26/2013
 - Met Tower
 - Proposed Substation
 - Collector Line
 - Proposed Access Road
 - 24ft Wide Permanent Road impact Footprint
 - 250ft Wide Temporary Road Impact Footprint
 - 500ft Diameter Temporary Turbine Impact Footprint
 - 100ft Wide Temporary Collector Line Impact Footprint
- Surveyed Feature**
- Photo Point
 - Sample Plot
 - Culvert
 - Water or Wetland
- Hydrology**
- Intermittent Stream
 - Perennial Stream
 - Waterbody
 - National Wetland Inventory Feature
 - Local Road

0.25
Miles
1 in equals 0.08 miles
Scale is 1:5,000 when printed at 22"x32"
Sources: NAIP, USGS, ND GIS Hub, NHD, NWI, and Tetra Tech

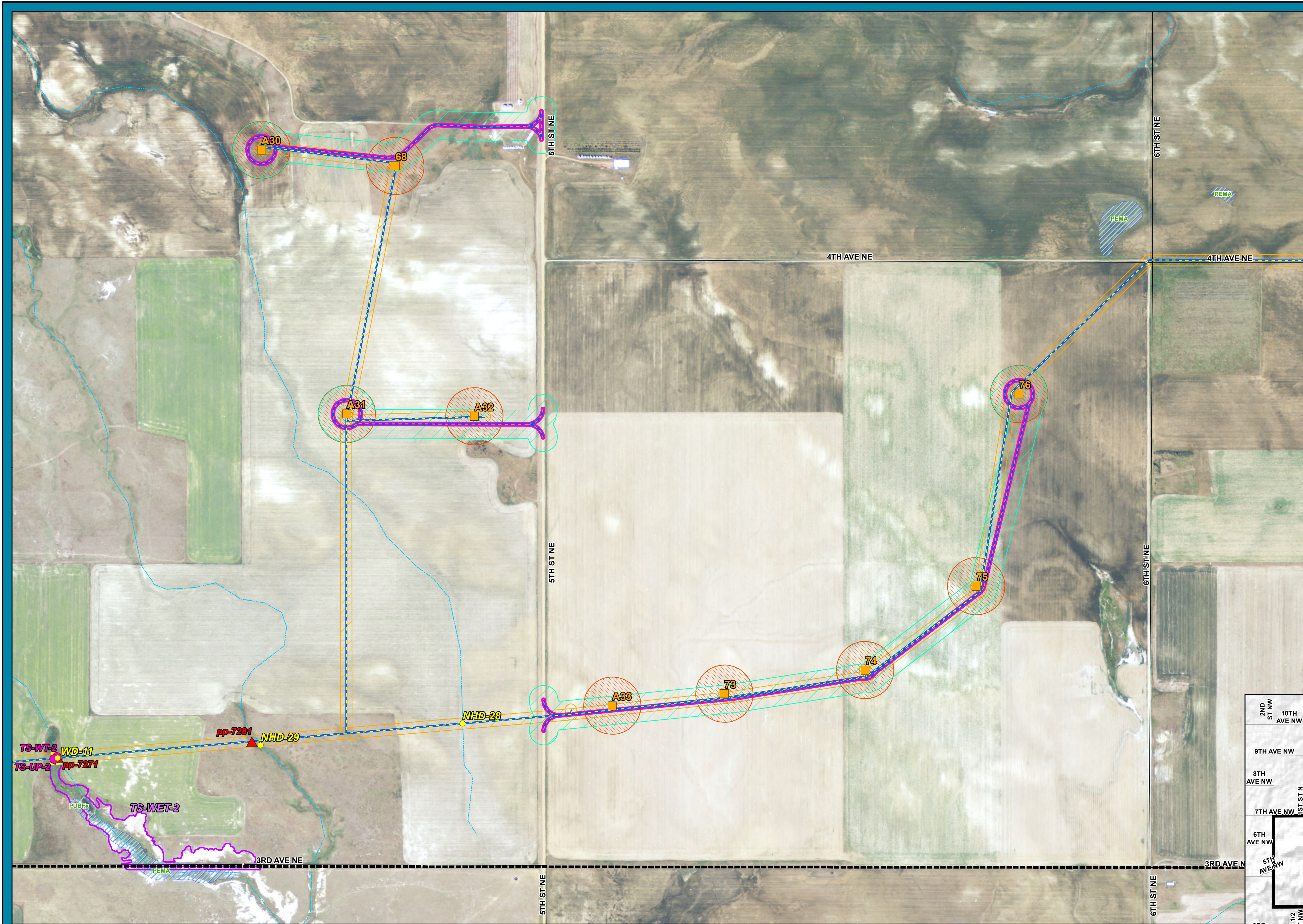


THUNDER SPIRIT WINDFARM PROJECT

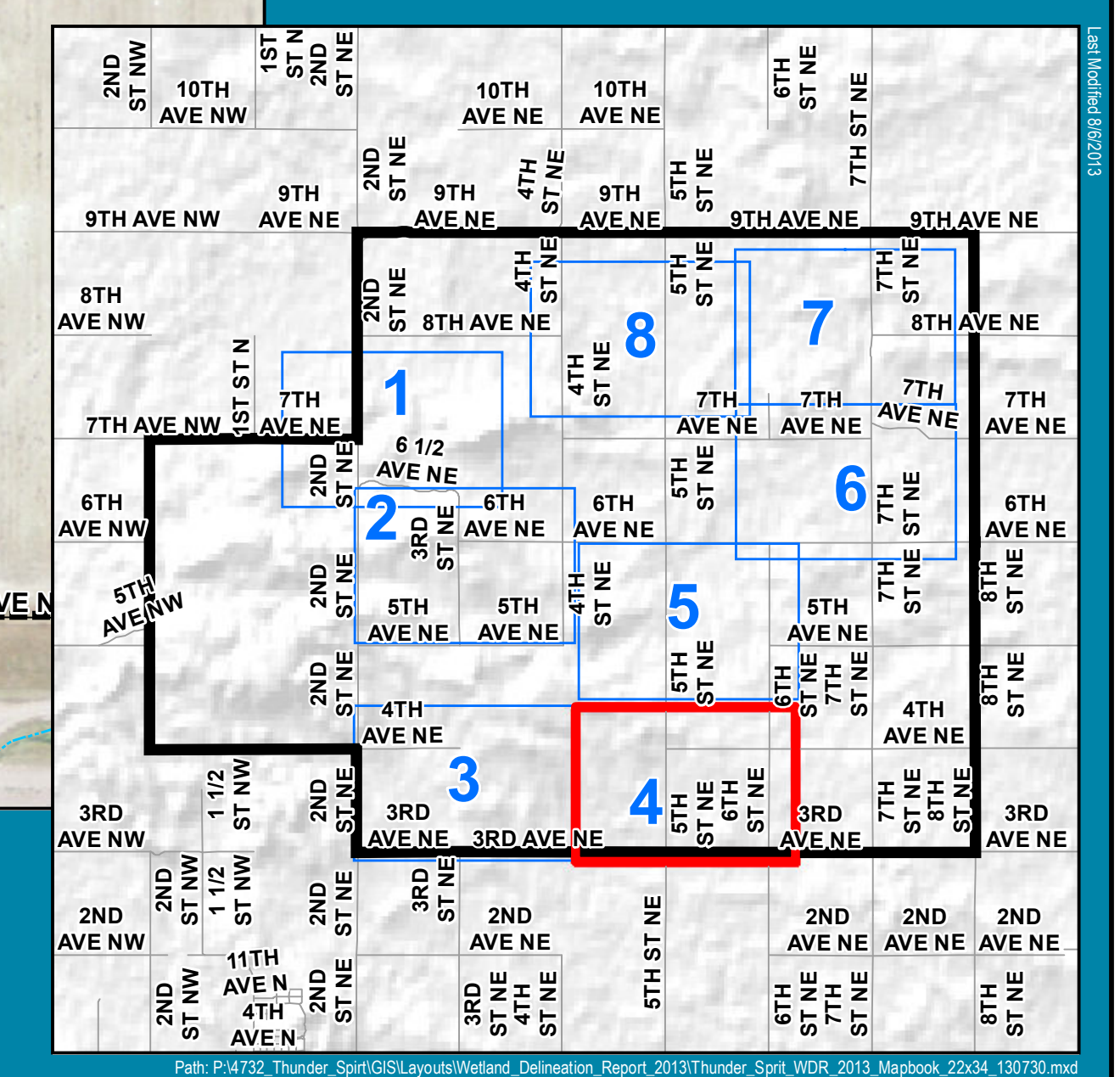
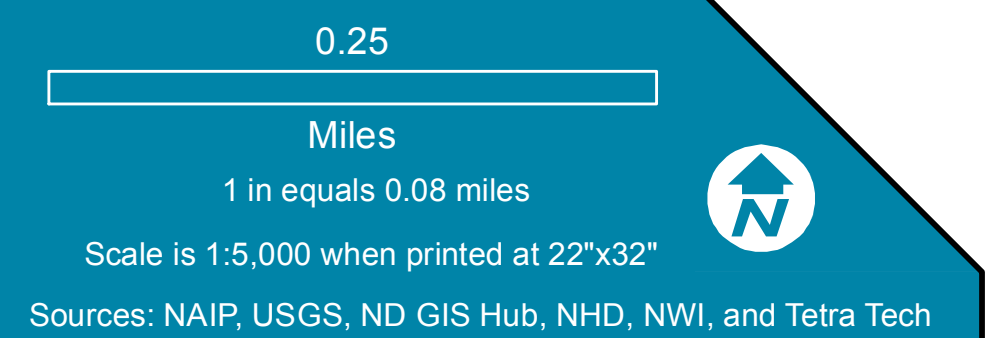


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WETLAND DELINEATION SHEET 4



- Project Features**
- Project Boundary 04/26/2013
 - Impact Point
 - Wetland or Water Project Impact
 - *WD - Wetland Delineation / NHD - National Hydrology Dataset
 - Proposed Turbine 04/26/2013
 - Met Tower
 - Proposed Substation
 - Collector Line
 - Proposed Access Road
 - 24ft Wide Permanent Road impact Footprint
 - 250ft Wide Temporary Road Impact Footprint
 - 500ft Diameter Temporary Turbine Impact Footprint
 - 100ft Wide Temporary Collector Line Impact Footprint
- Surveyed Feature**
- Photo Point
 - Sample Plot
 - Culvert
 - Water or Wetland
- Hydrology**
- Intermittent Stream
 - Perennial Stream
 - Waterbody
 - National Wetland Inventory Feature
 - Local Road

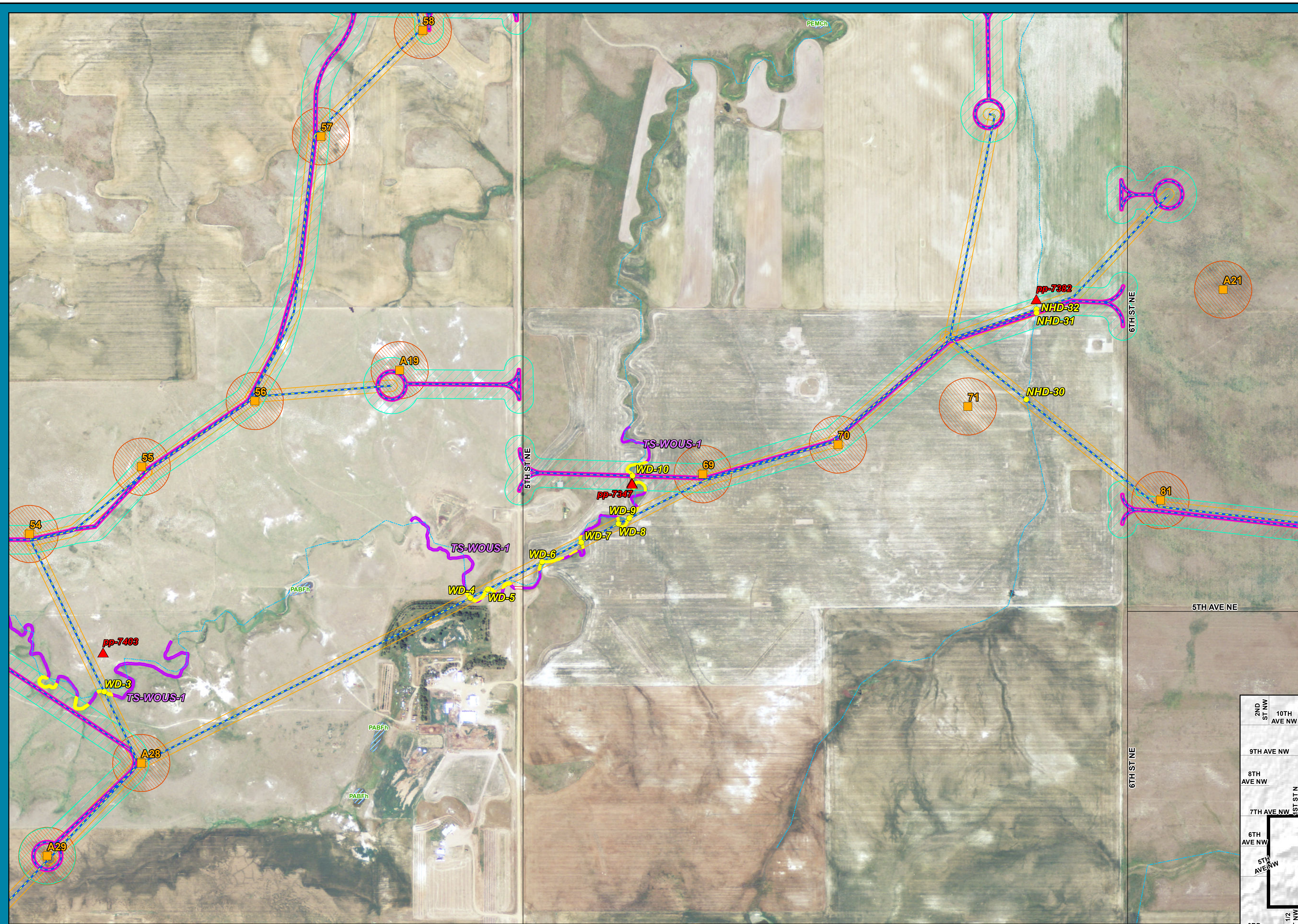


THUNDER SPIRIT WINDFARM PROJECT



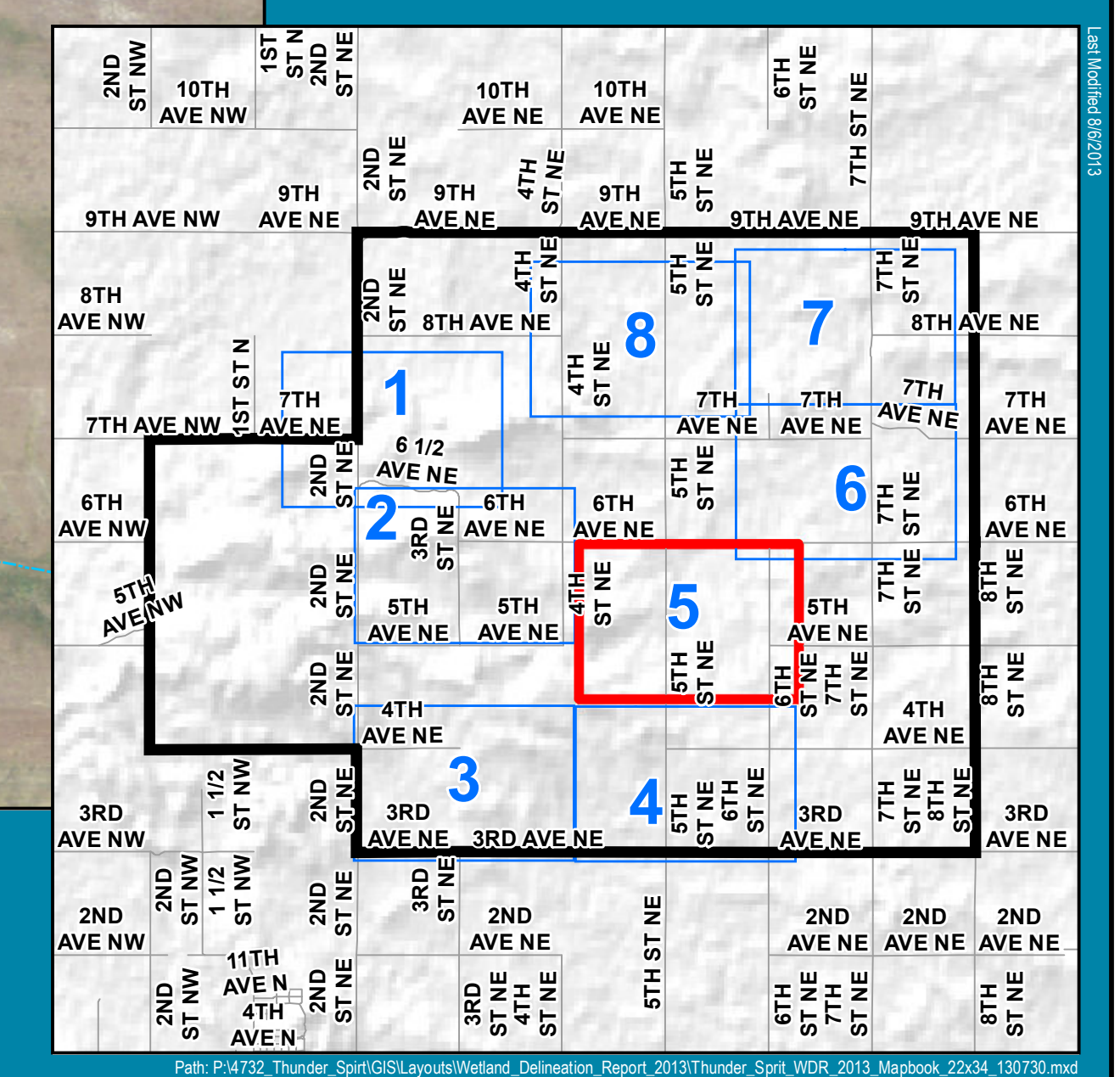
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WETLAND DELINEATION SHEET 5



- Project Features**
- Project Boundary 04/26/2013
 - Impact Point
 - Wetland or Water Project Impact
 - *WD - Wetland Delineation / NHD - National Hydrology Dataset
 - Proposed Turbine 04/26/2013
 - Met Tower
 - Proposed Substation
 - Collector Line
 - Proposed Access Road
 - 24ft Wide Permanent Road impact Footprint
 - 250ft Wide Temporary Road Impact Footprint
 - 500ft Diameter Temporary Turbine Impact Footprint
 - 100ft Wide Temporary Collector Line Impact Footprint
- Surveyed Feature**
- Photo Point
 - Sample Plot
 - Culvert
 - Water or Wetland
- Hydrology**
- Intermittent Stream
 - Perennial Stream
 - Waterbody
 - National Wetland Inventory Feature
 - Local Road

0.25
Miles
1 in equals 0.08 miles
Scale is 1:5,000 when printed at 22"x32"
Sources: NAIP, USGS, ND GIS Hub, NHD, NWI, and Tetra Tech

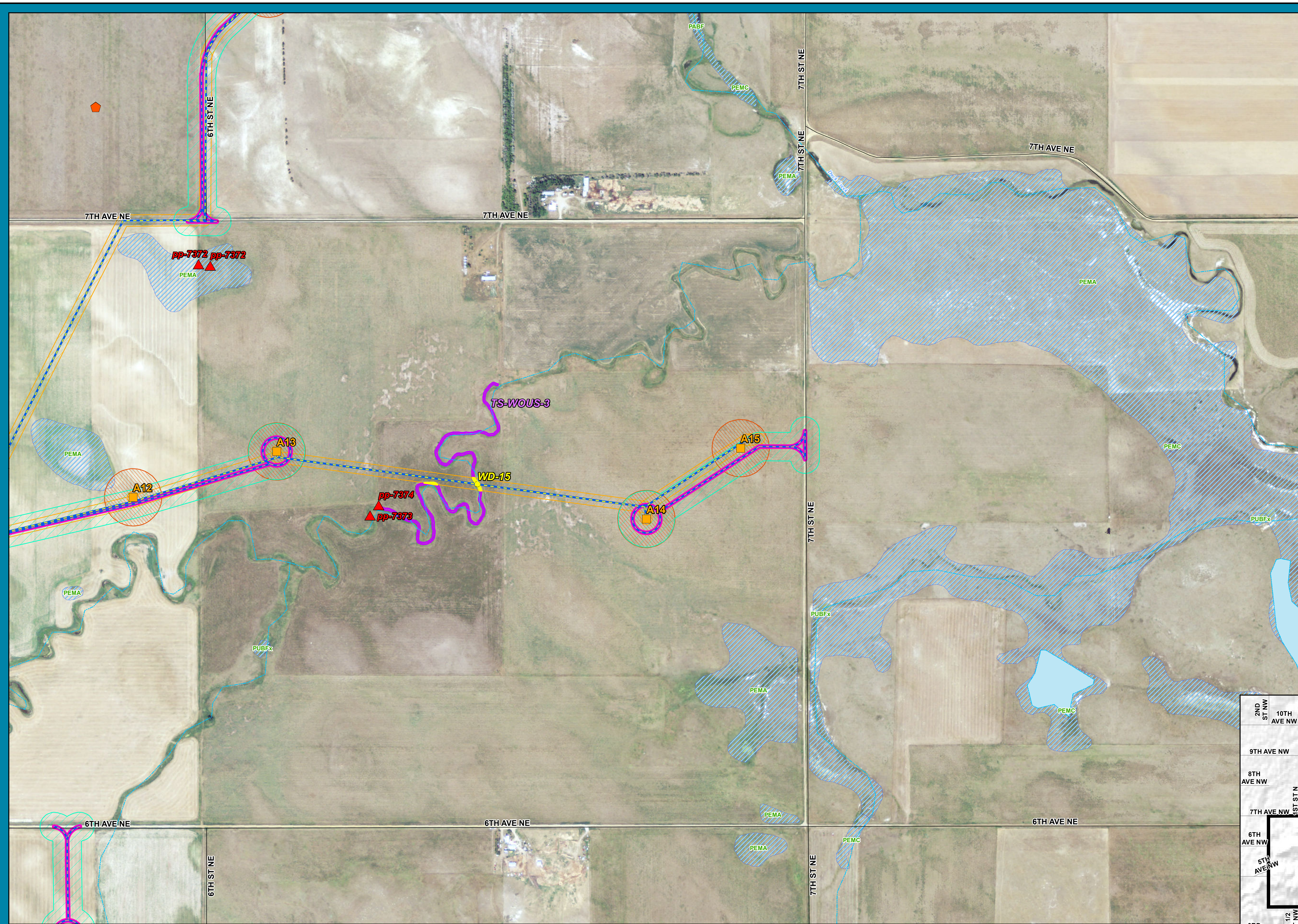


THUNDER SPIRIT WINDFARM PROJECT



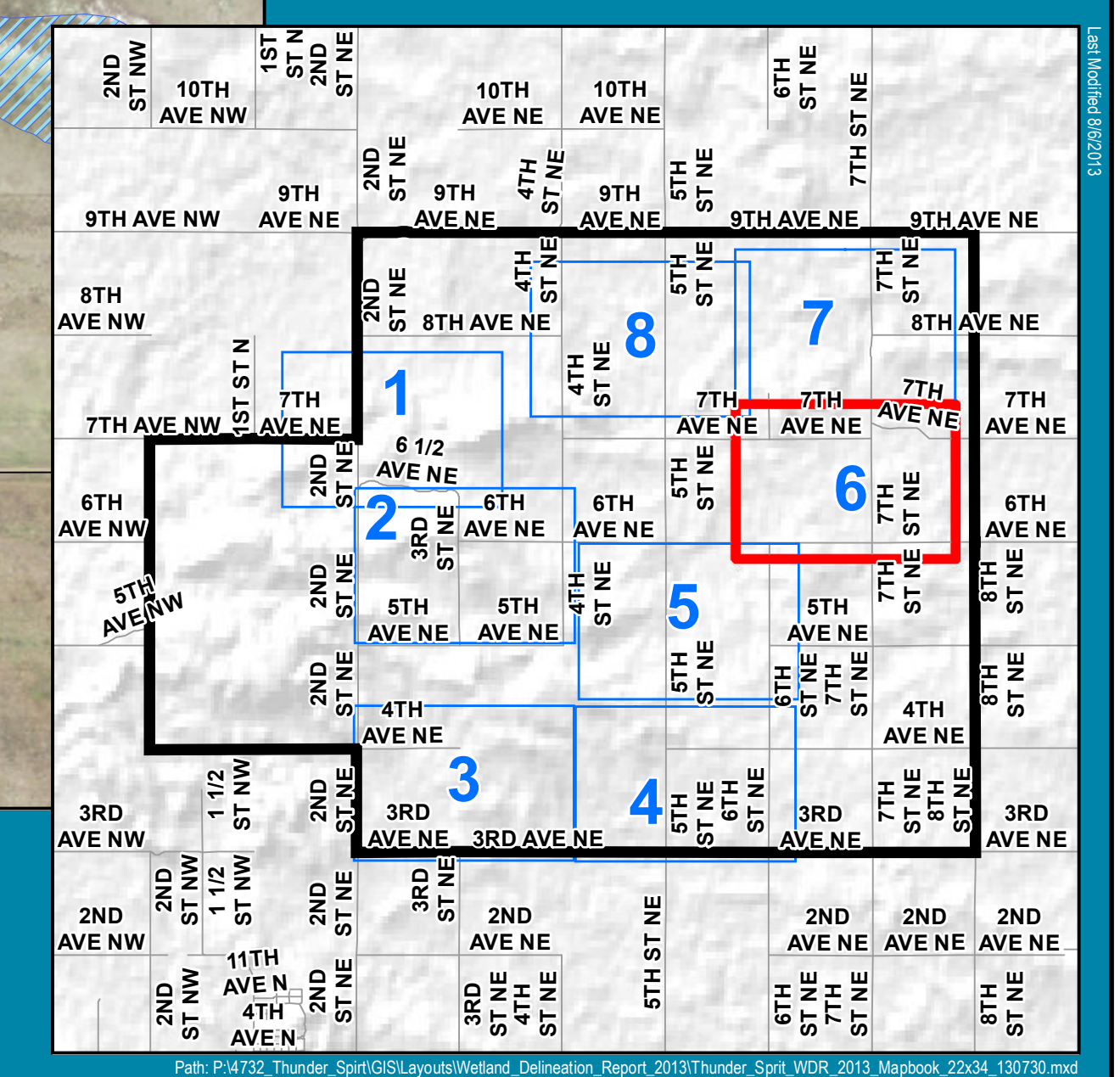
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WETLAND DELINEATION SHEET 6



- Project Features**
- Project Boundary 04/26/2013
 - Impact Point
 - Wetland or Water Project Impact
 - *WD - Wetland Delineation / NHD - National Hydrology Dataset
 - Proposed Turbine 04/26/2013
 - Met Tower
 - Proposed Substation
 - Collector Line
 - Proposed Access Road
 - 24ft Wide Permanent Road impact Footprint
 - 250ft Wide Temporary Road Impact Footprint
 - 500ft Diameter Temporary Turbine Impact Footprint
 - 100ft Wide Temporary Collector Line Impact Footprint
- Surveyed Feature**
- Photo Point
 - Sample Plot
 - Culvert
 - Water or Wetland
- Hydrology**
- Intermittent Stream
 - Perennial Stream
 - Waterbody
 - National Wetland Inventory Feature
 - Local Road

0.25
Miles
1 in equals 0.08 miles
Scale is 1:5,000 when printed at 22"x32"
Sources: NAIP, USGS, ND GIS Hub, NHD, NWI, and Tetra Tech

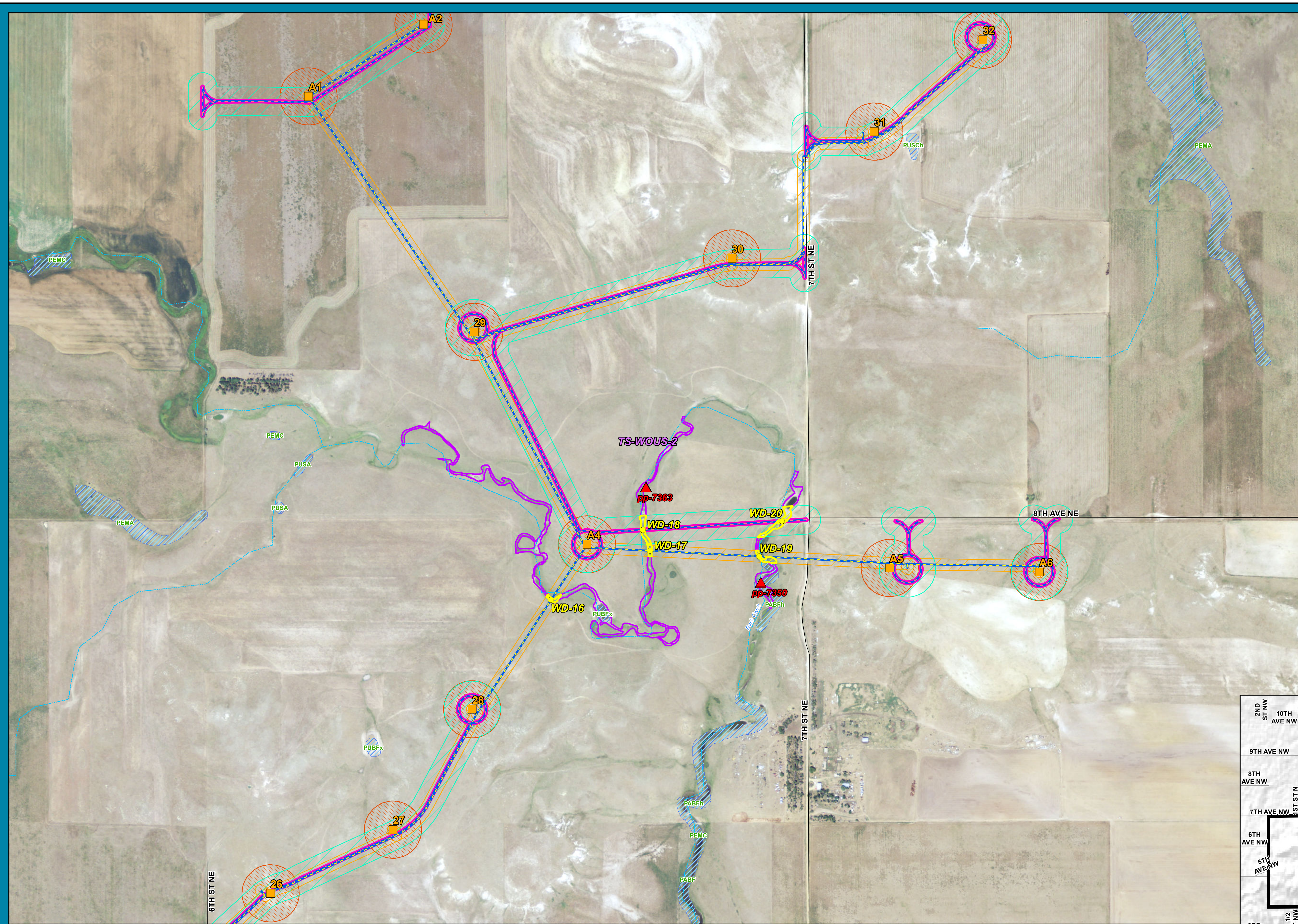


THUNDER SPIRIT WINDFARM PROJECT



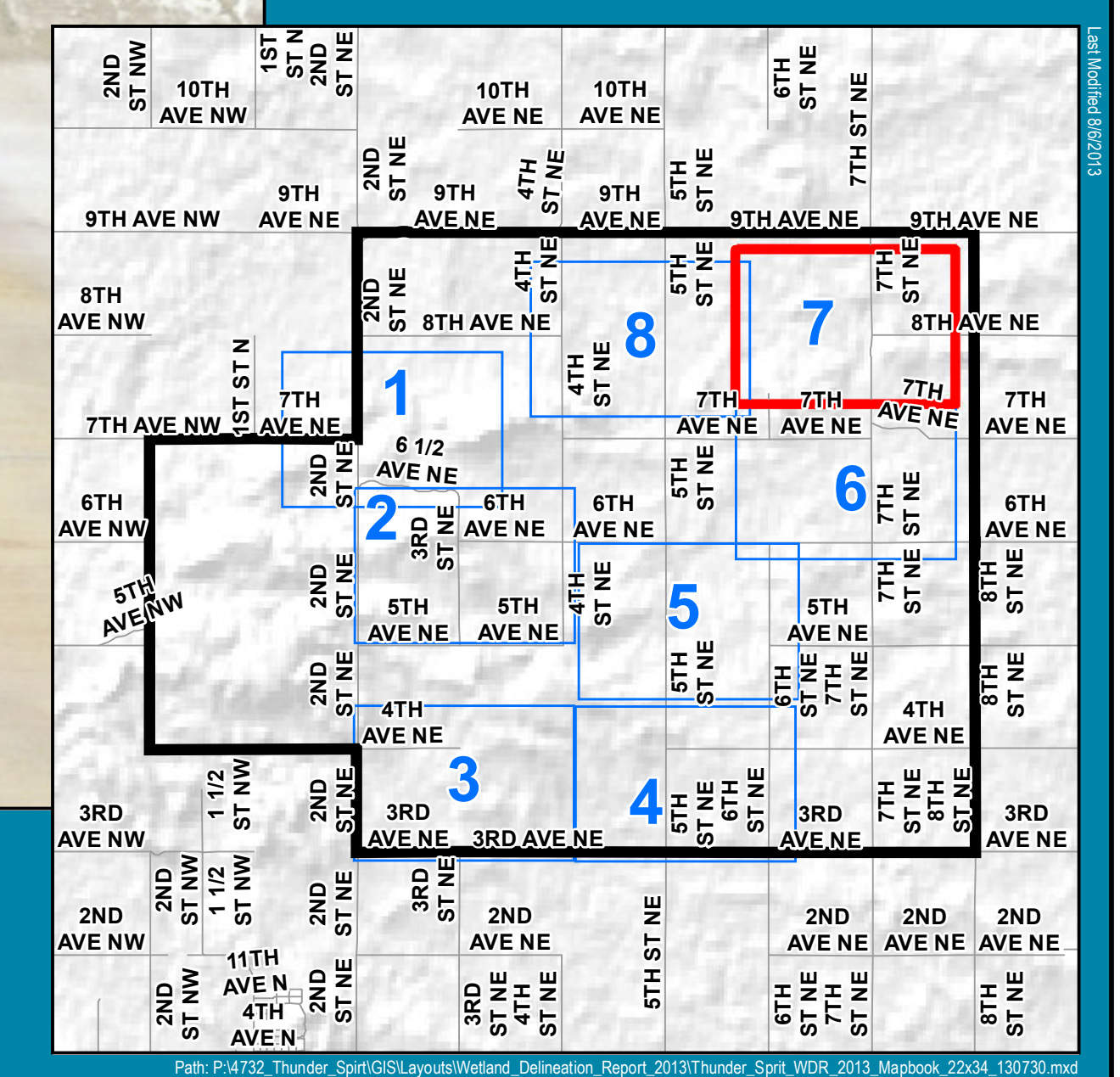
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WETLAND DELINEATION SHEET 7



- Project Features**
- Project Boundary 04/26/2013
 - Impact Point
 - Wetland or Water Project Impact
 - *WD - Wetland Delineation / NHD - National Hydrology Dataset
 - Proposed Turbine 04/26/2013
 - Met Tower
 - Proposed Substation
 - Collector Line
 - Proposed Access Road
 - 24ft Wide Permanent Road Impact Footprint
 - 250ft Wide Temporary Road Impact Footprint
 - 500ft Diameter Temporary Turbine Impact Footprint
 - 100ft Wide Temporary Collector Line Impact Footprint
- Surveyed Feature**
- Photo Point
 - Sample Plot
 - Culvert
 - Water or Wetland
- Hydrology**
- Intermittent Stream
 - Perennial Stream
 - Waterbody
 - National Wetland Inventory Feature
 - Local Road

0.25
Miles
1 in equals 0.08 miles
Scale is 1:5,000 when printed at 22"x32"
Sources: NAIP, USGS, ND GIS Hub, NHD, NWI, and Tetra Tech

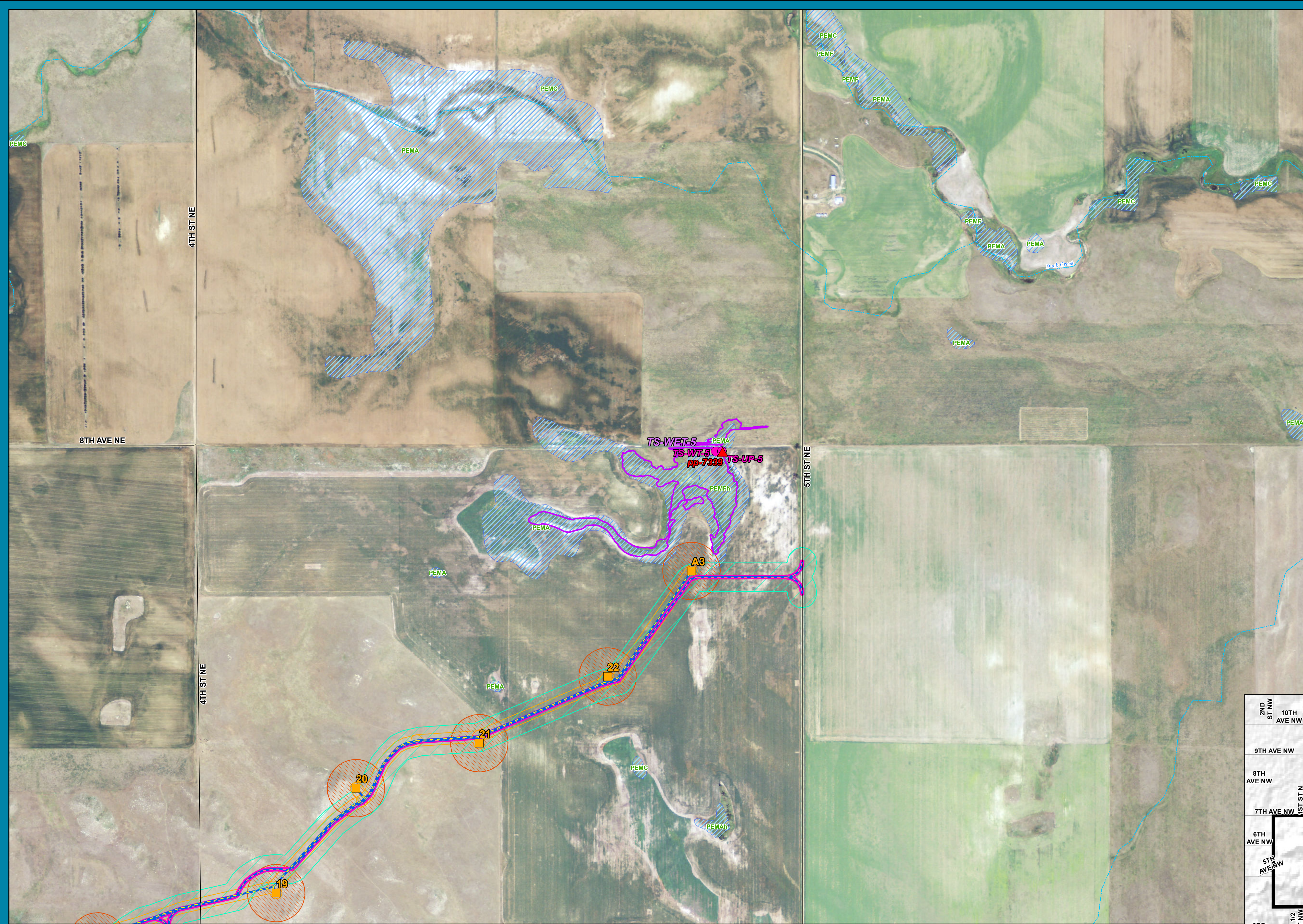


THUNDER SPIRIT WINDFARM PROJECT



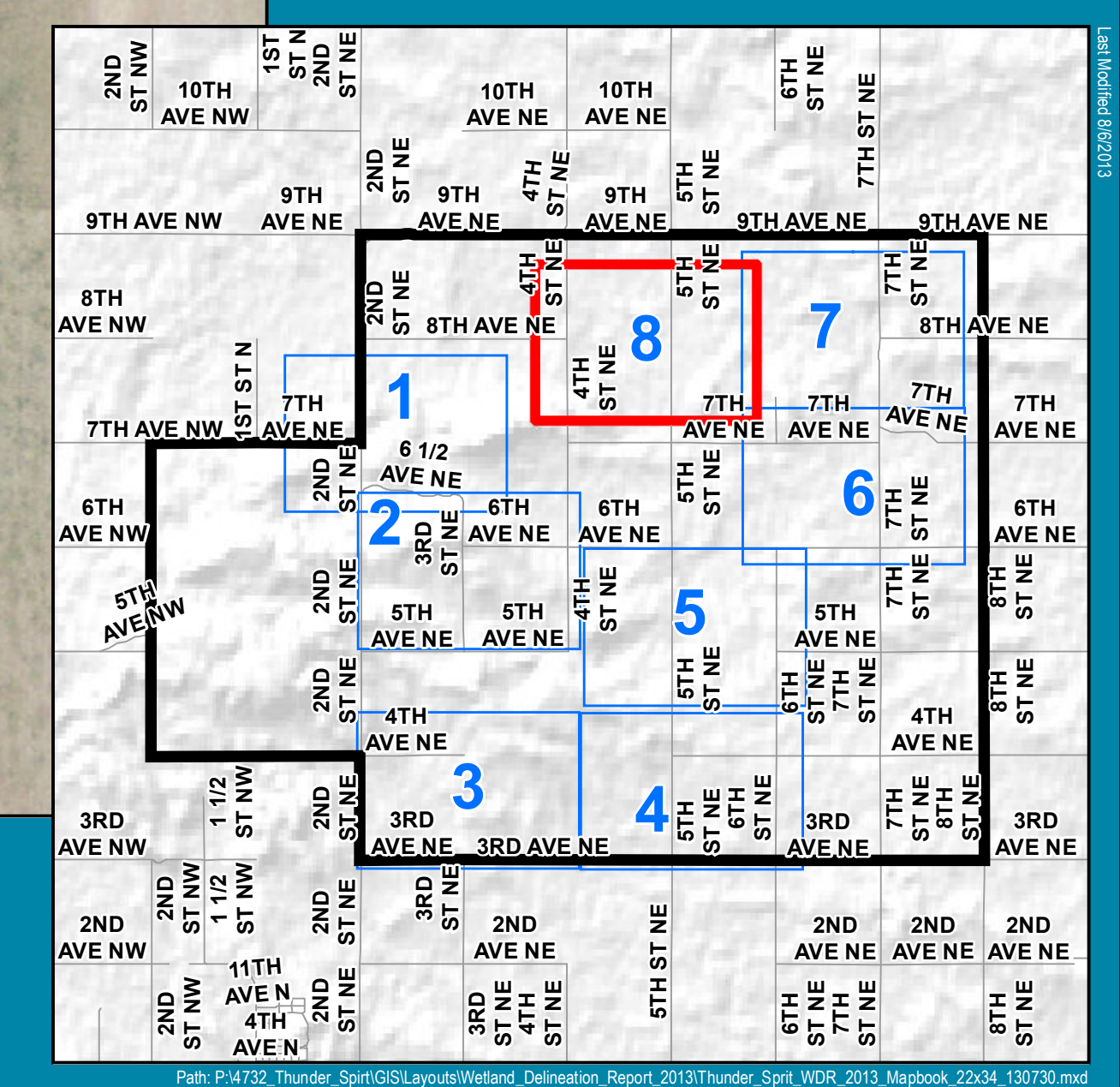
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WETLAND DELINEATION SHEET 8



- Project Features**
- Project Boundary 04/26/2013
 - Impact Point
 - Wetland or Water Project Impact
 - *WD - Wetland Delineation / NHD - National Hydrology Dataset
 - Proposed Turbine 04/26/2013
 - Met Tower
 - Proposed Substation
 - Collector Line
 - Proposed Access Road
 - 24ft Wide Permanent Road impact Footprint
 - 250ft Wide Temporary Road Impact Footprint
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- Surveyed Feature**
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0.25
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THUNDER SPIRIT WINDFARM PROJECT



Path: P:\4732_Thunder_Spirit\GIS\Layouts\Wetland_Delineation_Report_2013\Thunder_Spirit_WDR_2013_Mapbook_22x34_130730.mxd

Attachment D: Delineation Photo Log

Wetland and Other Waters of the United States – Delineation Photo Log]



Photo 1 – View to the south at wetland sample plot TS-WT-1. The wetland vegetation in this location is prairie cordgrass that lines the drainageway.



Photo 2 – View to the northeast from the upland soil plot (TS-UP-2) to the wetland plot (TS-WT-2) at the shovel. Prairie cordgrass is the tall facultative wetland plant growing next to the shovel.



Photo 3 – View to the northeast over wetland TS-WET-2. Alkaline conditions are obvious in this photograph.



Photo 4 – Looking south over wetland TS-WET-3. This was determined to be wetland despite problematic vegetation. Delineation was conducted early in the growing season and dominant vegetation was not hydrophytic, despite positive indication for wetland hydrology and for hydric soils. NWI maps this area as a palustrine emergent, seasonally flooded, diked/impounded wetland.



Photo 5 – View to the north within a drainageway that was mapped as wetland TS-WET-4. The upland sample plot (TS-UP-4) is on the embankment to the left, while the wetland sample plot (TS-WT-4) is evidenced by the dark soil on the right edge of this photograph. The shovel marks the transition line between upland vegetation to the left and wetland vegetation to the right.



Photo 6 – View to the west from upland terrain toward wetland TS-WET-5. The shovel marks the upland sample plot (TS-UP-5). The river bulrush-dominated wetland vegetation lies directly west (away from the photographer). This is a rather large, somewhat diverse palustrine emergent wetland with river bulrush dominating parts of the wetland, cattails growing in other parts, and a combination of rushes, sedges, and curly dock in still other locations.



Photo 7 – Looking southeast and downgradient in drainage mapped as TS-WoUS-1. Uplands in this valley area grazed and there are patches of native prairie.



Photo 8 – Looking west along drainage mapped as TS-WoUS-2. This is Duck Creek on the Slater property. Some deeper portions of this intermittent channel held some surface water at the time of the delineation. Flow is to the south (left) in this location.



Photo 9 - View to the southwest along a drainage mapped as TS-WoUS-3. This view is looking upgradient. Flow is intermittent. This drainage is tributary to Duck Creek.