APPENDIX K - WETLAND DELINEATION REPORT



February 26, 2019

Mark Wengierski Project Manager Sweetland Wind Farm, LLC 4865 Sterling Drive, Suite 200 Boulder, Colorado 80301

Re: Sweetland Wind Project Wetland Delineation Report

Dear Mr. Wengierski:

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) was retained by Sweetland Wind Farm, LLC (Client) to provide wetland delineation services for the proposed Sweetland Wind Project (Project) in Hand County, South Dakota (Figure A-1, Appendix A). The following sections provide information on the proposed Project and summarize the completed wetland delineation.

INTRODUCTION

The Client plans to construct a new 200-megawatt wind farm and associated overhead transmission line and substation in Hand County, South Dakota. The proposed Project would include construction of a maximum of 71 wind turbines and 15 alternate locations, permanent access roads, operations and maintenance facility, a maximum of 4 meteorological towers, electrical power underground collection lines and communication system, a maximum 7-mile 230-kV overhead transmission line, substation, switchyard, and temporary construction areas, such as crane paths, pull sites, laydown yard, and a batch plant. The Project is located approximately 10 miles southeast of Miller, South Dakota.

The Project has the potential to impact wetlands or other water bodies that may be under the jurisdiction of the U.S. Army Corps of Engineers (USACE) as designated by Section 404 of the Clean Water Act. Burns & McDonnell conducted a wetland delineation for the Project to evaluate the presence of wetlands and other water bodies, including streams, drainages, and ponds. The delineation was conducted based on buffers applied to the proposed Project layout (Survey Area). Specifically, a 250-foot buffer was applied to each turbine, a 200-foot buffer was applied to each facility footprint, and a 100-foot buffer (200 feet wide) was applied to all remaining linear features. The Survey Area included in the wetland delineation totaled approximately 2,385 acres.

METHODS

The following discussions summarize the methods used for the review of existing data and the wetland delineation.



Existing Data Review

Burns & McDonnell reviewed available background information for the proposed Project prior to conducting a site visit. This available background information included the 1981 U.S. Geological Survey (USGS) 7.5-minute topographic maps (Vayland Northwest, Vayland, Vayland Southeast, and Wessington Southwest, ND quadrangles), U.S. Fish & Wildlife Service (USFWS) National Wetlands Inventory (NWI) maps, U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) 2018 Soil Survey Geographic (SSURGO) digital data for Hand County, South Dakota, and 2015 National Agriculture Imagery Program (NAIP) aerial photography. Maps generated from this data are included as Figures A-2 and A-3 in Appendix A. Local climate data for this region was also reviewed to evaluate precipitation conditions.

Wetland presence based only on NWI maps cannot be assumed to be an accurate assessment of potentially occurring jurisdictional wetlands. Wetland identification criteria differ between the USFWS and the USACE. As a result, wetlands shown on an NWI map may not be under the jurisdiction of the USACE, and all USACE-jurisdictional wetlands are not always included on NWI maps. Therefore, a field visit was conducted to identify any wetlands or other water bodies that may be present.

Wetland Delineation Field Survey

A field wetland delineation was completed in June and October 2018, in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual and the 2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region – Version 2.0 (Regional Supplement). Sample plots were established at multiple locations, and Wetland Determination Data Forms from the Regional Supplement were completed to characterize the Survey Area (Appendix B). Vegetation, soil conditions, and hydrologic indicators were recorded at each of these sample plots. Locations of sample plots and other identified features were recorded using a sub-meter accurate global positioning system (GPS) unit. Natural color photographs depicting wetlands, streams, and sample plots were taken onsite and are included in Appendix C. Additional photographs were taken during the delineation effort to document onsite conditions where sample plots were not analyzed. Several of these photograph locations that depict representative features, such as open upland pasturelands, swales, and croplands, are indicated on Figure A-4. Additional photographs not depicted on Figure A-4 or provided in Appendix C can be provided upon request.

Following the October 2018 field survey, portions of the Project layout were altered. Ground conditions were subsequently frozen, restricting field wetland delineations from occurring. Accordingly, approximately 20% of the Survey Area was delineated via offsite wetland determination methods, using the background information previously listed. Specifically, wetlands were identified using NWI maps and hydric soil data in conjunction with topography



and aerial imagery review to identify locations that exhibited wetland signatures such as wetland vegetation or saturated soils. Streams for these areas were identified using NHD data in conjunction with topography and aerial imagery review. Areas that were delineated by desktop should be field verified prior to submitting this report to the USACE.

RESULTS

The following sections describe the results of the existing data review and the completed wetland delineation.

Existing Data Review

The 2015 NAIP aerial photography indicates that the Survey Area consists largely of rangeland, pastureland, and cropland (Figure A-2.1 through Figure A-2.25).

The 2018 USDA NRCS SSURGO digital data indicate that portions of 25 soil map units are located in the Survey Area. (Figure A-2). Of the 25 soil map units, one map until is rated hydric, one map until is rated predominantly hydric, and one map unit is rated partially hydric on local and national hydric soil lists.

The existing USGS topographic maps were reviewed to familiarize Burns & McDonnell wetland personnel with the topography and potential locations of wetlands and other water bodies (Figure A-3). The USGS topographic maps depicts the Survey Area as having large areas of rolling hills and gently sloping to flat topography. Wind turbines for the proposed Project are generally sited on hilltops and ridges, and access roads and underground collection systems connect strings of turbines. Two named streams, Silver Creek and East Pearl Creek, are located within the Survey Area.

The NWI data indicate 151 palustrine emergent (PEM) wetlands, 14 palustrine aquatic bed (PAB) wetlands, and one palustrine forested/palustrine scrub-shrub (PFO/PSS) wetland are located within the Survey Area (Figures A-3).

Wetland Delineation Field Survey

As previously stated, wetland scientists with Burns & McDonnell conducted wetland delineations of the Survey Area in June and October 2018. The second person of each team, a GPS specialist with Burns & McDonnell, recorded the location and extent of features identified within the Survey Area. The land cover and delineated wetlands from the field survey efforts are discussed in detail below.



Vegetation

The Survey Area was largely composed of rangeland and cropland. Typical vegetation in the upland portions of the Survey Area included Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), and field brome (*Bromus arvensis*).

Soils

Typical upland soils ranged from black (10YR 2/1) to very dark grayish brown (10YR 3/2) and ranged in texture from clay loam to silt loam. Redoximorphic features were typically present in wetland soils, but they were less common in upland soils.

Hydrology

Hydrology in the Survey Area has been highly altered to support agricultural practices within croplands. Upland swales are common throughout cropland to aid in draining surface water. Subsurface tiling may be present in many of the croplands, but indicators of such (flagging, inlets, vents, etc.) were not widely observed. Streams have been channelized throughout much of the Survey Area to facilitate farming and ranching practices. The primary source of hydrology for wetlands was precipitation and areas of shallow groundwater. Indicators of hydrology within the wetlands included surface water, high water table, saturation, algal mat or crust, hydrogen sulfide odor, oxidized rhizospheres on living roots, surface soil cracks, drainage patterns, saturation visible on aerial imagery, a concave geomorphic position, and a positive FAC neutral test. Precipitation for the months prior to the field delineations was determined using the Wetland Climate Tables (WETS) analysis. Average precipitation for the Project was obtained from the Miller, SD WETS weather station and used for the WETS analysis. Precipitation levels are provided in Table 1.

Timeframe	Actual Precipitation (inches)	Longterm Average Precipitation (inches)	Actual Relative to Average
June 2018	5.12	6.36	Drier than normal
October 2018	10.13	6.49	Wetter than normal

 Table 1: Precipitation for Three Months Prior to Field Wetland Delineation

Source: Miller, SD Wetland Climate Tables (WETS)

Delineation Areas

During the wetland delineation efforts, 78 wetlands and 28 streams were identified within the Survey Area. The wetlands and streams are generally described below, and their locations are shown on Figure A-4 in Appendix A. Table 2 provides the types and size of each wetland, and Table 3 provides the type and length of each stream delineated. Sample plots were located in the



wetlands and adjacent uplands. Data forms and photographs for these sample plots are included in Appendix B and Appendix C, respectively.

Wetlands

A total of 78 wetlands, comprised of three wetland types: PEM, PFO, and palustrine unconsolidated bottom (PUB), and encompassing a total of 39.84 acres, were identified (Photograph Log, Appendix C).

A total of 68 PEM wetlands, encompassing 38.67 acres, were delineated. Dominant vegetation in the PEM wetlands included reed canary grass (Phalaris arundinacea), fox-tail barley (Hordeum jubatum), common spike-rush (Eleocharis palustris), flat-stem spike-rush (E. compressa), blunt spike-rush (E. obtusa), sedge (Carex sp.), common fox sedge (C. vulpinoidea), river club-rush (Schoenoplectus fluviatilis), rough cocklebur (Xanthium strumarium), rush (Juncus sp.), American water-plantain (Alisma subcordatum), northern water-plantain (A. triviale), curly dock (Rumex crispus), spotted lady's-thumb (Persicaria maculosa), broadleaf cattail (Typha latifolia), field meadow-foxtail (Alopecurus pratensis), large barnyard grass (Echinochloa crus-galli), late goldenrod (Solidago gigantea), and freshwater cord grass (Spartina pectinata). Wetland hydrology was indicated by surface water, high water table, saturation, algal mat or crust, hydrogen sulfide odor, oxidized rhizospheres on living roots, surface soil cracks, drainage patterns, saturation visible on aerial imagery, a concave geomorphic position, and a positive FAC neutral test. Soils ranged from gray (10YR 6/1) to black (10YR 2/1) in color and clay loam, silty clay loam, or silt loam in texture, with redoximorphic concentrations. Hydric soil was mainly indicated by hydrogen sulfide, 1cm muck, loamy mucky mineral, depleted matrix, redox dark surface, and depleted dark surface.

Two PFO wetlands, encompassing 0.15 acre, were delineated. Vegetation in PFO wetlands was dominated by green ash (*Fraxinus pennsylvanica*), eastern cottonwood (*Populus deltoides*), gray willow (*Salix bebbiana*), reed canary grass, and sedge. Wetland hydrology in PFO wetlands included drainage patterns, a concave geomorphic position, and a positive FAC neutral test. Soils were black (10YR 2/1 or 7.5YR 2.5/1) in color and silty clay loam to clay loam in texture, with redoximorphic concentrations. Hydric soil was indicated by a redox dark surface.

A total of eight PUB wetlands, encompassing 1.02 acre, were delineated. Vegetation was largely absent, and upland vegetation typically surrounded these wetlands.



Table 2:Delineated Wetlands within the Survey Area

Wetland Number ^{a, b}	Wetland Type ^c	Acreage in Survey Area	Figure A-4 Page Number
W-001	PEM	0.12	A-4.25
W-002	PFO	0.10	A-4.25
W-003	PEM	0.10	A-4.25
W-004	PEM	1.04	A-4.24
W-005	PEM	1.67	A-4.22, A-4.24
W-016	PEM	0.18	A-4.19
W-501	PEM	0.16	A-4.2
W-507	PEM	0.14	A-4.4
W-508	PEM	0.18	A-4.4
W-510	PEM	0.23	A-4.4
W-515	PEM	0.17	A-4.14
W-516	PUB	0.11	A-4.14
W-517	PEM	1.12	A-4.10
W-518	PEM	0.49	A-4.9
W-520	PEM	0.15	A-4.11, A-4.12
W-521	PEM	0.03	A-4.6
W-522	PUB	0.10	A-4.11
W-523	PEM	0.05	A-4.11
W-524	PEM	1.12	A-4.11
W-526	PEM	1.40	A-4.11
W-527	PEM	0.04	A-4.16
W-533	PEM	0.03	A-4.15
W-537	PEM	1.35	A-4.11
W-539	PEM	0.04	A-4.17
W-540	PEM	0.22	A-4.17
W-546	PEM	1.74	A-4.17
W-547	PEM	0.18	A-4.10



Wetland Number ^{a, b}	Wetland Type ^c	Acreage in Survey Area	Figure A-4 Page Number
W-548	PEM	0.43	A-4.7
W-550	PEM	0.30	A-4.7
W-552	PEM	0.05	A-4.3
W-554	PEM	0.15	A-4.18
W-555	PEM	0.29	A-4.18
W-558	PEM	0.12	A-4.16
W-559	PEM	0.08	A-4.16
W-560	PEM	0.10	A-4.17
W-561	PEM	0.03	A-4.17
W-562	PEM	0.07	A-4.18, A-4.19
W-563	PEM	0.04	A-4.18, A-4.19
W-564	PFO	0.05	A-4.19
W-566	PEM	0.45	A-4.20
W-567	PEM	0.23	A-4.19
W-568	PEM	0.50	A-4.21
W-569	PEM	3.64	A-4.21
W-570	PEM	2.57	A-4.21
W-571	PUB	0.54	A-4.21
W-573	PEM	0.21	A-4.23
W-575	PUB	0.03	A-4.23
W-579	PEM	0.05	A-4.25
W-580	PEM	0.30	A-4.21
W-581	PEM	0.25	A-4.22
W-583	PEM	0.17	A-4.19
W-584	PEM	0.32	A-4.21
W-585	PEM	0.09	A-4.10
W-586	PEM	1.09	A-4.18
W-587	PEM	2.34	A-4.18



Wetland Number ^{a, b}	Wetland Type ^c	Acreage in Survey Area	Figure A-4 Page Number
W-589	PUB	0.03	A-4.14
W-590d	PEM	0.50	A-4.16
W-591d	PEM	0.31	A-4.10
W-592d	PEM	0.17	A-4.21
W-593d	PEM	0.29	A-4.22
W-594d	PEM	1.08	A-4.22
W-595d	PUB	0.01	A-4.17
W-597d	PEM	0.12	A-4.10, A-4.11
W-598d	PEM	0.59	A-4.19
W-599d	PEM	3.37	A-4.21, A-4.23
W-600d	PEM	2.23	A-4.23
W-601d	PEM	1.86	A-4.23, A-4.24
W-701	PEM	0.06	A-4.5
W-702	PEM	0.20	A-4.4
W-703	PEM	0.03	A-4.8
W-705	PUB	0.19	A-4.7
W-707	PEM	0.84	A-4.11
W-708	PEM	0.09	A-4.13
W-709	PUB	0.01	A-4.15
W-710	PEM	0.18	A-4.10
W-711	PEM	0.01	A-4.13
W-712	PEM	0.81	A-4.11
W-713	PEM	0.11	A-4.11
	Total:	39.84	

(a) W = wetland

(b) The letter "d" following a wetland number indicates this wetland was identified using offsite wetland determination methods.

(c) Symbols for wetland type: PEM = palustrine emergent, PFO = palustrine forested, PUB = palustrine unconsolidated bottom



Streams

A total of 28 streams, consisting of two stream types (intermittent and ephemeral) and equaling 12,884 linear feet, were identified (Photographs, Appendix C). The different stream types are summarized below.

A total of three intermittent streams, extending for a total of 1,308 feet, were identified. Intermittent streams were characterized by the presence of a limited volume of flow at the time of the site visit. This is a likely indicator that the stream is partially fed by groundwater, but it may not flow during dry periods. Intermittent streams ranged from approximately 1.5 to 5 feet wide and approximately 0.5 to 1.0-foot deep from the ordinary high-water mark (OHWM). These streams primarily flowed through agricultural fields and pasture where common riparian vegetation included species such as smooth brome, field brome, fox-tail barley, and rough cocklebur.

A total of 25 ephemeral streams, extending for a total of 11,576 feet, were identified. Ephemeral streams were characterized by a defined bed and bank, but they had limited or no flow during the site visit, indicating that these streams largely carry water only during and after precipitation events. Ephemeral streams ranged from approximately 1.5 to 8 feet wide and from 0.5 foot to 3.5 feet deep from the OHWM. These streams flowed through agricultural fields and pasture where common riparian vegetation included species such as smooth brome, red-root (*Amaranthus retroflexus*), yellow bristle grass (*Setaria pumila*), tall false rye grass (*Schedonorus arundinaceus*), clammy ground cherry (*Physalis heterophylla*), rough cocklebur, agricultural soybean (*Glycine max*).

Stream Number ^a	Flow Classification	Length of Stream in Survey Area (feet)	Figure A-4 Page Number
S-001	Ephemeral	795	A-4.25
S-002	Ephemeral	666	A-4.25
S-003	Intermittent	301	A-4.22
S-004	Intermittent	631	A-4.22
S-501	Ephemeral	145	A-4.5
S-502	Ephemeral	457	A-4.5
S-504	Ephemeral	596	A-4.4
S-506	Ephemeral	294	A-4.8
S-508	Ephemeral	420	A-4.13, A-4.14

Table 3:Delineated Streams within the Survey Area



Stream Number ^a	Flow Classification	Length of Stream in Survey Area (feet)	Figure A-4 Page Number
S-510	Ephemeral	273	A-4.11
S-513	Ephemeral	270	A-4.6
S-514	Ephemeral	244	A-4.17
S-516	Ephemeral	549	A-4.7
S-517	Ephemeral	33	A-4.7
S-518	Ephemeral	504	A-4.6, A-4.7
S-519	Ephemeral	548	A-4.3
S-521	Ephemeral	212	A-4.16, A-4.17
S-522	Ephemeral	235	A-4.16, A-4.17
S-523	Intermittent	376	A-4.12, A-4.16
S-526	Ephemeral	587	A-4.20
S-701	Ephemeral	427	A-4.1
S-702	Ephemeral	1741	A-4.11
S-703	Ephemeral	214	A-4.8
S-704	Ephemeral	1061	A-4.13
S-705	Ephemeral	512	A-4.13
S-706	Ephemeral	130	A-4.11
S-707	Ephemeral	278	A-4.8
S-708	Ephemeral	385	A-4.4
	Total	12,884	

(a) S = stream



SUMMARY

Burns & McDonnell conducted a wetland delineation of the Survey Area to identify wetlands and other water bodies. A total of 78 wetlands and 28 stream channels were identified. The wetlands and streams identified for this report are subject to federal regulation under the jurisdiction of USACE. Accordingly, Burns & McDonnell recommend this report be submitted to USACE for final jurisdictional review and concurrence. Following the identification of the final Project components, Burns & McDonnell recommends the Client obtain the necessary permits or regulatory authorization prior to initiating land disturbing Project activities.

Sincerely,

Tyler Beemer, PWS Senior Environmental Scientist

Attachments: Appendix A - Figures Appendix B - Routine Wetland Determination Data Forms, Great Plains Region Appendix C - Photograph Log

cc: Paul Callahan, Burns & McDonnell Carrie Barton, Burns & McDonnell

APPENDIX A -FIGURES



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Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BcA	Prosper-Stickney loams, nearly level	5	6.5	0.3%
CaA	Dudley silt loam, nearly level	5	3.9	0.2%
CnA	Cavo-Glenham loams, nearly level	6	37.0	1.6%
HdA	Durrstein-Bon complex, nearly level	62	0.2	0.0%
HhB	Houdek loam, 2 to 6 percent slopes	4	4.7	0.2%
HkA	Houdek-Prosper loams, 0 to 2 percent slopes	3	68.9	2.9%
HkB	Houdek-Prosper loams, 1 to 6 percent slopes	3	8.8	0.4%
НА	Houdek-Dudley complex, 0 to 2 percent slopes	5	3.5	0.1%
Hv	Hoven silt loam, 0 to 1 percent slopes	100	9.2	0.4%
LIA	Bon loam, channeled, 0 to 2 percent slopes, frequently flooded	9	4.0	0.2%
RcA	Raber-Cavo loams, 0 to 2 percent slopes	2	9.9	0.4%
RcB	Raber-Cavo loams, 2 to 6 percent slopes	2	4.4	0.2%
So	Oahe-Delmont loams, 2 to 6 percent slopes	0	15.9	0.7%
Тр	Tetonka silt loam, 0 to 1 percent slopes	95	40.3	1.7%
W	Water	0	2.4	0.1%
WmB	Glenham loam, undulating	1	285.1	12.0%
WmC	Glenham loam, rolling	1	100.4	4.2%
WnA	Glenham-Prosper loams, 0 to 2 percent slopes	6	164.8	6.9%
WnB	Glenham-Propser loams, 1 to 6 percent slopes	6	947.4	39.7%
WpA	Glenham-Cavo loams, nearly level	10	51.5	2.2%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
WpB	Glenham-Cavo loams, undulating	10	167.5	7.0%
WxC	Glenham-Java loams, rolling	1	5.0	0.2%
WzC	Glenham-Java loams, rolling	1	231.2	9.7%
ZxE	Betts-Java loams, steep	0	4.1	0.2%
ZyD	Java-Glenham Ioams, hilly	0	62.7	2.6%
ZyE	Betts-Java loams, steep	0	146.0	6.1%
Totals for Area of Interest			2,385.3	100.0%

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that 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). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

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Rating Options

Aggregation Method: Percent Present Component Percent Cutoff: None Specified Tie-break Rule: Lower



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