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September 28, 2023

Via Hand Delivery & Electronic Mail

Mr. Steve Kahl
North Dakota Public Service Commission
600 E. Boulevard, Dept. 408
Bismarck, ND 58505-0480
ndpsc@nd.gov

In re: Oliver Wind IV, LLC
Oliver Wind IV 345-kV Transmission Line - Oliver & Mercer Counties
Siting Application
Our File No. 035218-000083

Dear Mr. Kahl:

Enclosed for filing please find the following:

1) Oliver Wind IV, LLC's Consolidated Application for a Certificate of Corridor Compatibility and Transmission Facility Route Permit in Oliver and Mercer Counties, North Dakota (5 copies);

2) NextEra Energy Resources Development LLC's check in the amount of $110,000 for the Commission's filing and administrative fees set forth under North Dakota Century Code Sections 49-22-22(1)(b) and 49-22-22(4);

3) Publication Map (5 copies);

4) Affidavit of Service by Mail pertaining to service of the Application upon the Oliver and Mercer County Auditors pursuant to North Dakota Administrative Code Section 69-06-05-01(4); and,

5) Notice of Appearance.

We are also enclosing a USB containing project GIS and an electronic version of the application for your convenience.

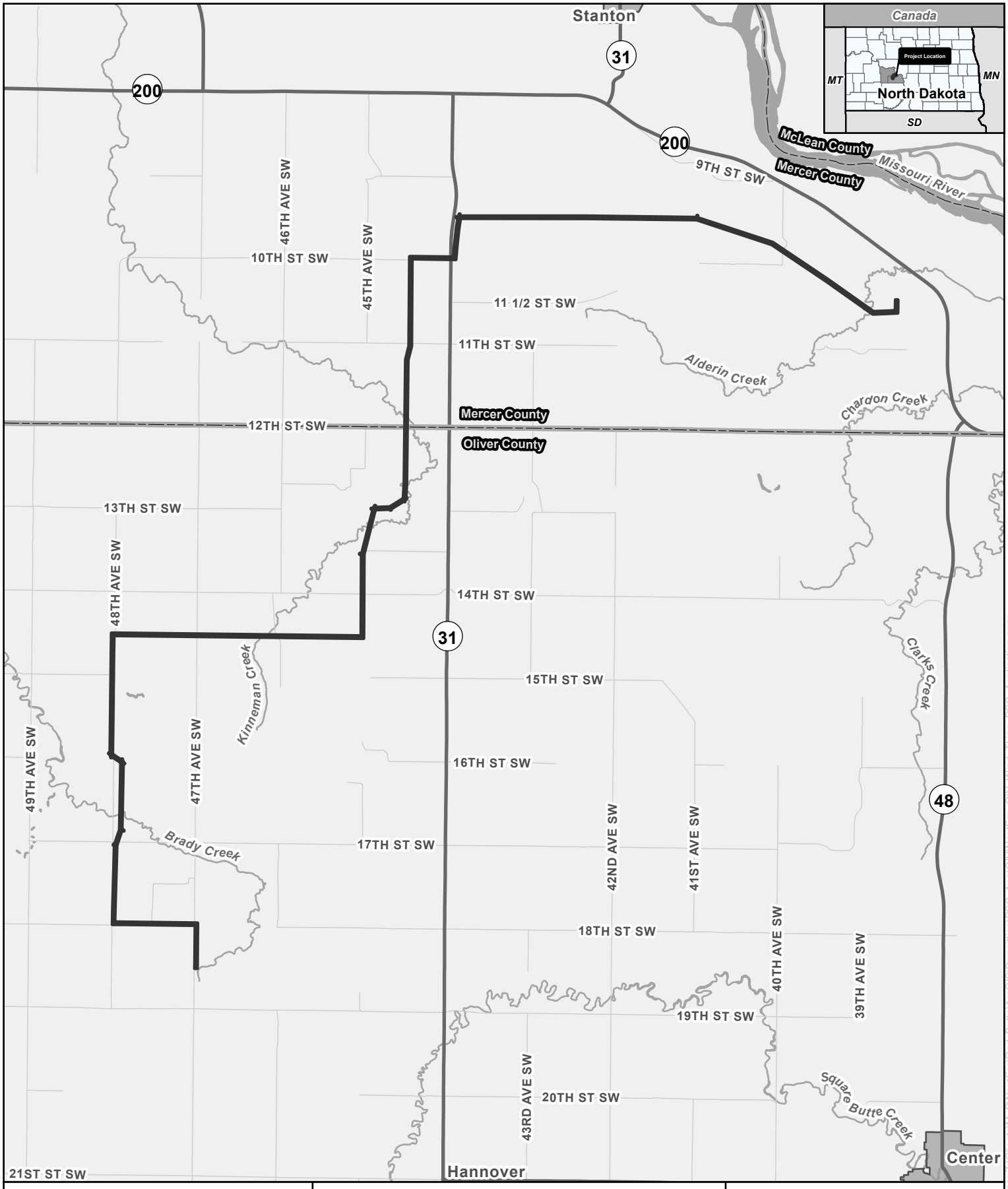
Please feel free to contact me if you have any questions. Thank you.

Sincerely,

Casey A. Furey

CAF/lh
Enc.

cc:	Oliver County Auditor	(via U.S. Mail)
	Mercer County Auditor	(via U.S. Mail)
	Erik Edison	(via email)
	Tracy Davis	(via email)
	Dina Brown	(via email)
	Clay Cameron	(via email)
	Sarah Montone	(via email)



0 4,000 8,000 Feet

1 inch = 8,000 feet

N W E S

Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

Project Corridor

Source: Z:\Clients\M_P\NextEra\Red_Butte\ArcGIS\Permitting\PSC_App\OlivNextEra_OliV_Wind_TLine_PSC_Application.aprx

Date: (9/13/2023)

BEFORE THE STATE OF NORTH DAKOTA

PUBLIC SERVICE COMMISSION

In the Matter of the Application of Oliver Wind IV, LLC for a Certificate of Corridor Compatibility and Transmission Facility Route Permit to construct the approximately 19.5-mile Oliver Wind IV 345-kV Transmission Line in Oliver and Mercer Counties, North Dakota	**Case No. PU-23-___**

NOTICE OF APPEARANCE

Notice is hereby given that Casey A. Furey and Erik J. Edison, Crowley Fleck PLLP, will be appearing in the above-entitled matter on behalf of Oliver Wind IV, LLC. All correspondence, notices, pleadings, and other material relevant to this matter should be served upon the undersigned.

Dated this 28th day of September, 2023.

By: _____

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BEFORE THE STATE OF NORTH DAKOTA

PUBLIC SERVICE COMMISSION

In the Matter of the Application of Oliver Wind IV, LLC for a Certificate of Corridor Compatibility and Transmission Facility Route Permit to construct the approximately 19.5-mile Oliver Wind IV 345-kV Transmission Line in Oliver and Mercer Counties, North Dakota	**Case No. PU-23-___**

AFFIDAVIT OF SERVICE BY MAIL

STATE OF NORTH DAKOTA)
)§
COUNTY OF BURLEIGH)

Lisa Herberholz, being first duly sworn on oath, deposes and says: That she is a citizen of the United States over the age of eighteen years and not a party to, nor interested in, the above entitled action.

That on the 28th day of September, 2023, this affiant did deposit in the United States Post office at Bismarck, North Dakota, a true and correct copy of the following document:

OLIVER WIND IV, LLC'S CONSOLIDATED APPLICATION FOR A CERTIFICATE OF CORRIDOR COMPATIBILITY AND TRANSMISSION FACILITY ROUTE PERMIT

That the document with postage prepaid was mailed, directed to the persons to be served at their last known post office address as follows:

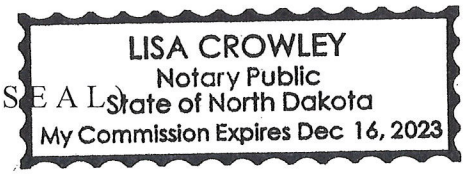
Jaden Schmidt
Oliver County Auditor
PO Box 188
Center, ND 58530-0188

Carmen Reed
Mercer County Auditor
PO Box 39
Stanton, ND 58571-0039

To the best of affiant's knowledge, the addresses above given were the actual post office addresses of the parties intended to be served.

Lisa Herberholz

Subscribed and sworn to before me this 28th day of September, 2023.



(SEAL)

Lisa Crowley

Notary Public
Burleigh County, North Dakota
My Commission Expires: 12.16.23

CONSOLIDATED APPLICATION FOR A CERTIFICATE OF CORRIDOR COMPATIBILITY AND TRANSMISSION FACILITY ROUTE PERMIT

OLIVER WIND IV 345-kV TRANSMISSION LINE

OLIVER AND MERCER COUNTIES, NORTH DAKOTA

SUBMITTED TO:

North Dakota Public Service Commission

SUBMITTED BY:

Oliver Wind IV, LLC
700 Universe Boulevard
Juno Beach, Florida 33408

PREPARED BY:

Merjent, Inc.
1 Main Street SE, Suite 300
Minneapolis, Minnesota 55414

SEPTEMBER 2023

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1.0 INTRODUCTION

Oliver Wind IV, LLC (Oliver Wind IV), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC (NextEra), respectfully submits this consolidated application for a Certificate of Corridor Compatibility (Certificate) and Transmission Facility Route Permit (Route Permit) to the North Dakota Public Service Commission (Commission or PSC) to construct the approximately 19.5-mile Oliver Wind IV 345-kilovolt (kV) Transmission Line (Project) in Oliver and Mercer counties, North Dakota (Figures 1 through 3).

The Project will convey power from the planned Oliver Wind IV Wind Energy Center (Wind Energy Center) to the point of interconnection at the new Basin Electric Power Cooperative (Basin Electric) Leland Olds Station (LOS) 345-kV Substation (Figure 4). The LOS 345-kV Substation was identified as the optimal point of interconnection based on Basin Electric's interconnection studies and the Wind Energy Center's load injection needs. Due to the size of the LOS 345-kV Substation, the Project is required to connect at a capacity of 345-kV.

In July 2023, Oliver Wind IV executed a 15-year power purchase agreement (PPA) with Verizon Communications, Inc that will purchase 150 megawatts (MW) of the Project's electrical output. The Wind Energy Center will have a nameplate capacity of approximately 200 MW, consisting of up to 73 turbines located in Oliver County, North Dakota. Oliver Wind IV is actively marketing the Project's remaining 50 MW electrical output to several potential offtakers. Per Commission regulations, the Wind Energy Center requires a separate application for a Certificate of Site Compatibility, which Oliver Wind IV is filing concurrently with this application.

Interconnection of the Project consists of a single Southwest Power Pool (SPP) interconnection request (GEN-2016-130) for 202 MW into the LOS 345-kV Substation. Oliver Wind IV executed the generator interconnection agreement with SPP in January of 2021. An amended and restated generator interconnection agreement was executed in April 2023 that included an entity name change, updated commercial operation date from 2022 to 2024, and reduction in affected system and network upgrade costs. Interconnection studies performed by SPP and Basin Electric show that the Project will not adversely impact reliability to the transmission system.

Concurrently with this application, Oliver Wind IV is also filing an application for a Certificate of Site Compatibility for the Wind Energy Center. Pursuant to North Dakota Century Code (N.D.C.C.) Section 49-22-13, Oliver Wind IV respectfully requests that the hearing on this application for a Certificate and Route Permit be consolidated and held on the same date and in conjunction with the hearing on its separately filed application for the Wind Energy Center Certificate of Site Compatibility.

NextEra, through its subsidiaries and affiliates, develops renewable projects throughout the United States and Canada. NextEra is one of the world's leading generators of wind energy, operating more than 15,000 MW of emissions-free wind energy in North America. In North Dakota, NextEra affiliates own and/or operate 15 wind facilities (that generate approximately 1,615 MW) and two pipelines, with another up to 900 MW of wind energy currently in development. Since 2003, NextEra's subsidiaries have been helping fuel the state's economic growth and quality of life and moving our country toward energy independence. NextEra designs, constructs, and operates its facilities in an environmentally sound and responsible manner. NextEra's 2022 Environmental, Social and Governance Report in Appendix A describes NextEra's environmental accountability, management, and stewardship policies that are intended to:

- design, construct, operate, and maintain its facilities in an environmentally sound and responsible manner;
- prevent pollution, minimize waste, and conserve natural resources;
- avoid, minimize, and/or mitigate impacts to habitat and wildlife; and
- engage stakeholders to build trust and partner toward common goals for environmental stewardship and protection.

1.1 COMPLIANCE WITH THE ENERGY CONVERSION AND TRANSMISSION FACILITY SITING ACT

The North Dakota Energy Conversion and Transmission Facility Siting Act, N.D.C.C. Chapter 49-22 (Siting Act) requires the proponent of an electric transmission facility with a design in excess of 115-kV to obtain a Certificate and Route Permit from the Commission in order to locate, construct, and operate the facility in the state of North Dakota. An application must meet certain criteria set forth in the Siting Act, as well as in North Dakota Administrative Code (N.D. Admin Code) Article 69-06. A transmission facility is required to be sited in an orderly manner compatible with environmental preservation and the efficient use of resources (N.D.C.C. 49-22-02).

In this application, Oliver Wind IV presents the information required by the Siting Act and the Commission's siting rules. Oliver Wind IV has considered the Exclusion and Avoidance Areas, Selection Criteria, and Policy Criteria in the design of the Project, in accordance with N.D. Admin Code 69-06-05-01, N.D. Admin Code 69-06-08-02, N.D.C.C. 49-22-08, and N.D.C.C. 49-22-09. Information regarding Project design and technical information has been included in this application to allow a thorough understanding of the Project and to aid in review by the Commission, regulatory agencies, and the public. Table 1.1-1 provides a summary of information included in this application and the section of the application in which each siting requirement is addressed, if applicable.

TABLE 1.1-1

Certificate and Route Permit Completion Checklist

State Authority and Description	Section Addressed
North Dakota Administrative Code 69-06-05-01. Application	
2. The application must contain:	
a. A description of:	
(1) The type of facility proposed	1.0, 1.2
(2) Purpose of the facility	1.0, 1.2, 2.1
(3) The technology to be used	4.0, 5.0
(4) The type of product to be transmitted	1.0, 1.2, 4.0
(5) The source of the product to be transmitted	1.0
(6) The final destination of the transmission line	1.0, 1.2, Figure 13
(7) The proposed size and design and any alternate size or design that was considered, including:	
(a) The width of right of way;	1.2
(b) The approximate length of the facility;	1.0, 1.2, 4.1

TABLE 1.1-1

Certificate and Route Permit Completion Checklist

State Authority and Description	Section Addressed
(c) The estimated span length for electric facilities;	4.1
(d) The anticipated type of structure for electric facilities;	1.2, 4.1, Figure 8
(e) The voltage for electric facilities;	1.0, 1.2, 4.1
(f) The requirement for and location of any new associated facilities	1.4, 1.7, 2.1, 3.0, 4.0
b. The anticipated time schedule for accomplishing major events, including:	Appendix B
(1) Obtaining the certification of corridor compatibility;	1.5
(2) Obtaining the route permit;	1.5
(3) Completing right-of-way acquisition;	1.5
(4) Starting construction;	1.5
(5) Completing construction;	1.5
(6) Testing operations; and	1.5
(7) Commencing operations.	1.5
c. A copy of each evaluative study or assessment of the environmental impact of the proposed facility submitted to the agencies listed in section 69-06-01-05 and each response received.	Appendix B, Appendix C
d. An analysis of the need for the proposed facility based on present and projected demand for the product transmitted, including the most recent system studies supporting the analysis of the need.	1.0, 2.1
e. A description of any feasible alternative methods for serving the need	2.2
f. The width of a corridor must be at least ten percent of its length, but not less than one mile [1.61 kilometers] or greater than six miles [9.66 kilometers] unless another appropriate width is determined by the commission.	1.4
g. A study area that includes a proposed corridor of sufficient width to enable the commission to evaluate the factors addressed in North Dakota Century Code section 49-22-09.	1.4
h. A discussion of the factors in North Dakota Century Code section 49-22-09 to aid the commission's evaluation of the proposed route.	3.5
i. A discussion of the applicant's policies and commitments to limit the environmental impact of its facilities, including copies of board resolutions and management directives.	Appendix A
j. Identification and map of the criteria that led to the proposed route location within the designated corridor, including exclusion areas, avoidance areas, selection criteria, policy criteria, design construction limitations, and economic considerations.	3.1, 3.2, 3.3, 3.4, 4.0, 5.0, All figures
k. A discussion of the relative value of each criteria and how the applicant selected the proposed corridor location, giving consideration to all criteria and how the location, construction, and operation of the facility will affect each criteria.	3.1, 3.2, 3.3, 3.4, 4.0, 5.0,
l. A discussion of the general mitigative measures that the applicant will take to minimize adverse impacts that result from a route location in the proposed corridor and the construction and operation of the facility.	
m. The qualifications of each person involved in the corridor location study.	9.0
n. A map identifying the criteria that led to the proposed route location within the designated corridor and the location of any new associated facilities. Several different criteria may be shown on each map depending on the map scale and the density and nature of the criteria.	All figures

TABLE 1.1-1

Certificate and Route Permit Completion Checklist

State Authority and Description	Section Addressed
o. An eight and one-half-inch by eleven-inch black and white map suitable for newspaper publication depicting the site area.	Electronically provided
p. A discussion of present and future natural resource development in the area.	1.7, Figure 6
q. Map and GIS requirements. The applicant shall provide information that is complete, current, presented clearly and concisely, and supported by appropriate references to technical and other written material available to the commission.	All figures, GIS provided
North Dakota Administrative Code 69-06-08-02. Transmission facility corridor and route criteria.	
1. Exclusion areas.	3.1, Figure 7
2. Avoidance areas.	3.2, Figure 7
3. Selection criteria.	3.3
4. Policy criteria.	3.4
North Dakota Century Code 49-22-08. Application for a certificate - Notice of filing - Amendment - Designation of a site or corridor.	
1. An application for a certificate shall be in such form as the commission may prescribe, containing the following information:	
a. A description of the size and type of facility.	1.0, 1.2, 4.1
b. A summary of any studies which have been made of the environmental impact of the facility.	6.4, 6.6, 6.7, 6.8 ,6.9, Appendix B
c. A statement explaining the need for the facility.	1.0, 2.1
d. An identification of the location of the preferred site for any electric conversion facility.	1.0, 1.4, All figures
e. An identification of the location of the preferred corridor for any electric transmission facility.	1.0, 1.4, All figures
f. A description of the merits and detriments of any location identified and a comprehensive analysis with supporting data showing the reasons why the preferred location is best suited for the facility.	1.0, 1.2, 1.3, 1.4, 1.7, 2.1, 2.2, 3.0, 6.0
g. A description of mitigative measures that will be taken to minimize all foreseen adverse impacts resulting from the location, construction, and operation of the proposed facility.	6.1.2, 6.2.2, 6.3.2, 6.4.2, 6.5.2, 6.6.2, 6.7.2, 6.8.2, 6.9.2
h. An evaluation of the proposed site or corridor with regard to the applicable considerations set out in section 49-22-09 and the criteria established pursuant to section 49-22-05.1.	3.5, 3.6
i. Such other information as the applicant may consider relevant or the commission may require.	Appendix B
North Dakota Century Code 49-22-08.1 - Application for a permit - Notice of filing - Amendment - Designation of a route.	
1. An application for a route permit for an electric transmission facility within a designated corridor must be filed no later than two years after the issuance of the certificate and must be in such form as the commission may prescribe, containing the following information:	
a. A description of the type, size, and design of the proposed facility.	1.0, 1.2, 4.1

TABLE 1.1-1

Certificate and Route Permit Completion Checklist

State Authority and Description	Section Addressed
b. A description of the location of the proposed facility.	1.0, 1.4, All figures
c. An evaluation of the proposed route with regard to the applicable considerations set out in section 49-22-09 and the criteria established pursuant to section 49-22-05.1.	3.5, 3.6
d. A description of mitigative measures that will be taken to minimize all foreseen adverse impacts resulting from the location, construction, and operation of the proposed facility	6.1.2, 6.2.2, 6.3.2, 6.4.2, 6.5.2, 6.6.2, 6.7.2, 6.8.2, 6.9.2
e. A description of the right-of-way preparation and construction and reclamation procedures.	1.4, 5.0
f. A statement setting forth the manner in which:	
(1) The utility will inform affected landowners of easement acquisition, and necessary easement conditions and restrictions.	1.2, 1.4, 3.3, 3.5
(2) The utility will compensate landowners for easements, without reference to the actual consideration to be paid.	1.2, 1.4, 3.3, 3.5
g. Such other information as the utility may consider relevant or the commission may require.	Appendix B
North Dakota Century Code 49-22-09. Factors to be considered in evaluating applications and designation of sites, corridors, and routes.	
1. The commission shall be guided by, but is not limited to, the following considerations, where applicable, to aid the evaluation and designation of sites, corridors, and routes:	
a. Available research and investigations relating to the effects of the location, construction, and operation of the proposed facility on public health and welfare, natural resources, and the environment.	1.5, 3.0, 5.0, 6.3, 6.5, 6.7
b. The effects of new energy conversion and transmission technologies and systems designed to minimize adverse environmental effects.	3.5, 4.0, 5.0
c. The potential for beneficial uses of waste energy from a proposed energy conversion facility.	Not applicable
d. Adverse direct and indirect environmental effects which cannot be avoided should the proposed site or route be designated.	3.5, 6.0
e. Alternatives to the proposed site, corridor, or route which are developed during the hearing process and which minimize adverse effects.	3.5
f. Irreversible and irretrievable commitments of natural resources should the proposed site, corridor, or route be designated.	3.5, 6.5, 6.6, 6.7
g. The direct and indirect economic impacts of the proposed facility.	3.5, 6.1
h. Existing plans of the state, local government, and private entities for other developments at or in the vicinity of the proposed site, corridor, or route.	1.7, 3.5, Figure 6
i. The effect of the proposed site or route on existing scenic areas, historic sites and structures, and paleontological or archaeological sites.	3.5, 6.4
j. The effect of the proposed site or route on areas which are unique because of biological wealth or because they are habitats for rare and endangered species.	3.5, 6.8, 6.9
k. Problems raised by federal agencies, other state agencies, and local entities.	3.5, 7.0, Appendix C

1.2 PROJECT SUMMARY

Oliver Wind IV proposes to site, construct, and operate the proposed 345-kV transmission line in Oliver and Mercer counties, North Dakota. The Project is an approximate 19.5-mile long 345-kV transmission line that will convey power from the planned Wind Energy Center collection substation in Oliver County to the point of interconnection at the new LOS 345-kV Substation in Mercer County. The Wind Energy Center collection substation is being developed as part of the Wind Energy Center and is not included within this Project. The LOS 345-kV Substation will be owned and operated by Basin Electric.

The Projects' permanent facilities will include:

- Approximately 121 transmission line structure locations, which includes four locations that have 3-pole dead-end structures for a total of 129 monopoles;
- Weathering steel monopoles; and
- Transmission support anchors (guy wires) at select locations.

The Project's temporary facilities will include:

- Wire stringing, pulling and tensioning sites;
- Temporary construction access between pole locations; and
- Two construction laydown areas for equipment.

Oliver Wind IV will own the entire Project and, as a result, will manage the construction of all equipment and associated facilities. Oliver Wind IV will select a third-party engineering, procurement, and construction (EPC) contractor to manage and complete construction of the Project.

Terms used in this application associated with the Project are defined in Table 1.2-1.

TABLE 1.2-1
Project Terms

Term	Definition/Description
Project Route	In accordance with N.D.C.C. Section 49-22-03(11), "Route" is defined as the location of an electric transmission facility within a designated corridor. The Project Route aligns with the transmission line centerline and is approximately 19.5 miles long.
Project Corridor	The area around the Project Route where easements were acquired (also referred to as the right-of-way). The Project Corridor is the typical easement that will be used during construction and maintained during the life of the Project. The Project Corridor is typically 150 feet wide, with additional width at structures with guy wires, and encompasses approximately 379 acres.
Study Area	The Study Area analyzed for the Project is one-mile wide (0.5 mile on either side of the Project Route) and encompasses approximately 12,731 acres. [1]

[1] N.D. Admin. Code 69-06-05-01(2)(f) states that the "width of the corridor must be at least ten percent of its length, but not less than one mile [1.61 kilometers] or greater than six miles [9.66 kilometers] unless another appropriate width is determined by the Commission." Oliver Wind IV proposes a one-mile-wide Study Area, with a 150-foot-wide Project Corridor, the combination of which is sufficient for the Commission to evaluate the factors addressed in N.D.C.C. Section 49-22-09.

The Study Area encompasses the Project Route and Project Corridor and is centered on the Project Route with 0.5 mile on either side of the Project Route. Upon evaluation of the one-mile Study Area, Oliver Wind IV seeks a Certificate for a corridor typically 150 feet in width with

additional width at structures with guy wires, which is referred to throughout the application as the Project Corridor and defined above.

1.3 PROJECT DEVELOPMENT HISTORY

In 2019, NextEra, through its subsidiary, began development of the Red Butte Wind Energy Center, a 400 MW wind project that overlapped with the current Oliver Wind IV Project Area. In 2023, the Red Butte Wind project was split into two projects that are being developed separately: the Oliver Wind IV 200 MW project and Red Butte Wind 200 MW project. The Oliver Wind IV Wind Energy Center includes the northern 200 MW portion and is the focus of this application, while the southern 200 MW portion remains under development as the Red Butte Wind Energy Center. Both projects are independent but have some overlapping design and development elements. During development of Oliver Wind IV, the point of interconnection was changed from the existing Basin Electric LOS 230-kV Substation (T144N, 84W, S21) to the new Basin Electric LOS 345-kV Substation (T144N, 84W, S27).

Throughout this application, the former Red Butte Wind Project and Red Butte Wind, LLC will be referred to as the Project or Oliver Wind IV. The current, southern 200 MW Red Butte Wind Project under development will be referred to as Red Butte.

1.4 PROJECT LOCATION

The Project is in Oliver and Mercer counties in west-central North Dakota near the towns of Center and Stanton and ND Highway 31 and 200. The Project generally runs in an alternating north-south and east-west alignment in an overall northeast direction and is approximately 19.5 miles long, with 10.8 miles in Oliver County and 8.7 miles in Mercer County. The Project is located in an area where Oliver Wind IV has negotiated or received verbal agreements for easements or is anticipating easements with landowners (Figure 5). Oliver Wind IV is in the process of negotiating the remaining easements with landowners. All facilities are on private land except where the Project crosses public road rights-of-way and land owned by public utilities.

Table 1.4-1 shows the township, range, and sections of the Project Route and Project Corridor.

TABLE 1.4-1
Project Route and Project Corridor Location

County	Township	Range	**Section** [1]
Oliver	142N	85W	5
	143N	85W	3, 9, 10, 16, 17, 18, 19, 30, 31, 32
	143N	86W	13, 24
Mercer	144N	84W	19, 20, 21, 27, 28
	144N	85W	22, 23, 24, 27, 34

[1] Note that the Project Route and Project Corridor may be located within the section but may not encompass the entire section.

Table 1.4-2 shows the township, range, and sections of the Study Area.

TABLE 1.4-2
Study Area Location

County	Township	Range	Section [1]
Oliver	142N	85W	5, 6, 7, 8
	142N	86W	1
	143N	85W	3, 4, 9, 10, 15, 16, 17, 18, 19, 20, 21, 22, 30, 31, 32
	143N	86W	13, 24, 25, 36
Mercer	144N	84W	17, 18, 19, 20, 21, 22, 27, 28, 29, 30, 33, 34
	144N	85W	13, 14, 15, 22, 23, 24, 26, 27, 33, 34, 35

[1] Note that locations within the Study Area may be located within the section but may not encompass the entire section.

The Project Route was designed to parallel existing linear features such as existing transmission lines, section lines, quarter section lines, roadways, and field edges to the greatest extent possible. The existing linear features offer several advantages including reduced environmental impacts and farming and improved compatibility with the surrounding landscape. The Project Route parallels the Basin Electric LOS to Antelope Valley Station 345-kV transmission line for approximately 1.75 miles from approximately structure 109 to the LOS 345-kV Substation and a transmission line near ND Highway 31 for approximately 0.52 miles from approximately structure 79 to 82.

The portion of the Project Route from approximately structure 108 to 116 is the Basin Electric preferred route into the LOS 345-kV Substation. This section of the Project Route parallels the Basin Electric LOS to Antelope Valley Station 345-kV transmission line for approximately 1.75 miles. The Project Route is located on 2.5 miles of Basin Electric-owned land from approximately structure 91 to 97, 107 to 108, 110 to 116, and 120 to the LOS 345-kV Substation. The Project Route is then located on approximately 0.27 miles of Great River Energy-owned land from approximately structure 108 to 110. Oliver Wind IV has negotiated easements with both Basin Electric and Great River Energy.

1.5 SCHEDULE

A summary of the anticipated time schedule for the Project, including obtaining the Certificate and Route Permit and construction and operation are included below in Table 1.5-1.

TABLE 1.5-1
Anticipated Time Schedule

Activity	Anticipated Time
Obtaining the Certificate of Corridor Compatibility	March 2024
Obtaining the Route Permit	March 2024
Completing right-of-way acquisition	October 2023
Starting construction	May 2024
Completing construction	December 2024 with one year for reclamation
Testing operations	November 2024
Commencing commercial operation	December 2024

1.6 EXPANSIONS OR ADDITIONS

Oliver Wind IV does not propose any additions or expansions to the Project at this time. Should Oliver Wind IV seek to develop adjacent areas in the future, all necessary permits and approvals would be obtained to allow such an expansion.

1.7 PRESENT AND FUTURE NATURAL RESOURCE DEVELOPMENT

In Oliver and Mercer counties, publicly known present and future natural resources development projects associated with energy development include surface coal mining, coal fired generation plants, carbon capture facilities, oil exploration, and wind energy development. Publicly known present and future natural resource development projects in Oliver and Mercer counties and within areas near the Study Area are described below and depicted in Figure 6.

Within Oliver and Mercer counties and within areas near the Study Area are two active coal mines, including the Beulah Mine and Center Mine, as well as historic abandoned underground, partially underground, and surface coal mines (Commission 2022). The approximate location of known abandoned coal mines (NDGIS 2023), reclaimed coal mines and areas of mined coal (NDGS 2007, USDA 2023), and active coal mine permit boundaries (BNI 2023, DWC 2020) are shown on Figure 6.

The Beulah Mine is owned and operated by Dakota Westmoreland Corporation and is located east and west of ND Highway 49 and three miles south of Beulah in Mercer and Oliver counties. The Beulah Mine mines approximately 2.9 million tons of coal annually. The Beulah Mine supplies Coyote Station south of Beulah in Mercer County and Heskett Station north of Mandan in Morton County (Commission 2015).

The Center Mine is owned and operated by BNI Coal, Ltd. (BNI) and is located south of Center, North Dakota. The Center Mine mines approximately 4.5 million tons of coal annually and has a reserve of about 600 million tons (Commission 2015). The Center Mine supplies the Milton R. Young Station electric generating station Units I and II south of Nelson Lake in Oliver County.

The Leland Olds Power Station is owned and operated by Basin Electric and is located approximately 0.25 miles north of the Study Area southeast of Stanton along the Missouri River and ND Highway 200. The plant receives coal shipped by rail from the Freedom Mine.

Oil exploration wells are present within the Study Area and throughout Oliver and Mercer counties and North Dakota. In Oliver and Mercer counties, none of the drilled wells have yielded oil, and therefore these wells are considered dry holes (NDOGD 2023). The location of oil exploration wells near the Study Area are shown on Figure 6.

Within Oliver County, Minnkota Power Cooperative is proposing to develop a project to capture and sequester carbon dioxide (CO_2) emissions produced from the electric generating stations at the Milton R. Young Station (Project Tundra 2023). The CO_2 capture project is known as Project Tundra, and the anticipated CO_2 capture rate for the project is estimated at 4 million metric tons per year. Minnkota Power Cooperative is leading Project Tundra, along with research support from the Energy & Environmental Research Center at the University of North Dakota.

Within Oliver County, SCS Carbon Transport LLC is proposing to develop the Summit Carbon Solutions Midwest Carbon Express, a CO_2 pipeline and sequestration project (See Case PU-22-391 Midwest Carbon Express CO_2 Pipeline Project). SCS Carbon Transport LLC is partnering with 32 ethanol plants across a five-state region. The project will transport CO_2 via pipeline from existing ethanol plants to Oliver County where it will be sequestered in subsurface geologic formations. The pipeline will have a maximum design flow rate and deliver 936 million standard cubic feet of CO_2 per day which is approximately equivalent to 18 million metric ton per annum of CO_2.

Within Oliver County, there are a total of 147 existing wind turbines associated with seven different existing wind facilities (Commission 2023 and NDGIS 2023). The wind facilities include all of or portions of the Oliver Wind I, II, and III Wind Projects, which are operated by subsidiaries of NextEra, and all of or portions of the Bison 1 through 4 Wind Projects, which are operated by Minnesota Power. The wind turbines in Oliver County collectively produce approximately 383 MW of generation power. Also within Oliver County are three proposed wind facilities, including this Project, the Red Butte Wind Energy Center, and the Flat Rock Wind Project, LLC proposed by Enel Green Power in Oliver and Morton counties (see Case PU-22-267, Docket No.1 Flat Rock Wind Project, LLC's Ten-Year Plan for 2022-2032 Ten-Year Plan). Existing and proposed wind turbine locations and wind project boundaries are included on Figure 6.

2.0 NEED FOR FACILITY

2.1 NEED ANALYSIS

This section provides an analysis of the need for the Project based on present and projected demand for wind energy, including the most recent studies supporting the analysis of the need. Demand for wind energy and the Project come from a variety of needs, including state energy goals from North Dakota Governor Doug Burgum, the Wind Energy Center's executed PPA, and power forecast demands from the North Dakota Transmission Authority. A more detailed description of each of the needs for the Project is described in detail below.

The need for the Project is driven by the need for the planned Wind Energy Center and the preferred point of interconnection.

On May 12, 2021, North Dakota Governor Doug Burgum announced a goal to get North Dakota to carbon neutrality by 2030 (Office of the Governor 2021). Since electricity generation from wind power does not directly create carbon emissions, this Project supports this goal.

Consistent with these overall state energy goals and needs, in July 2023, Oliver Wind IV executed a 15-year PPA for the Project, which will interconnect to the electrical grid via LOS 345-kV Substation. Interconnection studies determined that the substation was the best point of interconnection based on the Wind Energy Center's proximity and that the interconnection of the Wind Energy Center at this point would not result in transmission congestion or significant network upgrades.

The North Dakota Transmission Authority's (NDTA) updated 2021 Power Forecast Study forecasts that North Dakota will face an electrical power challenge in the coming years due to announcements of a number of large industrial/commercial uses that will require an estimated 2,250 MW of electric generating capacity within the next 15 years. The study states: "There are several options [to achieve the required electric generating capacity], but the options are limited by demand for lower carbon intense resources and a push to use renewable alternatives. Developers have a strong interest in building more wind generation in North Dakota" (NDTA 2022). The Wind Energy Center will provide low-carbon-intense electric generation in North Dakota.

2.2 ALTERNATIVE METHODS TO SERVICE THE NEED

Oliver Wind IV identified the point of interconnection at the new LOS 345-kV Substation based on the Wind Energy Center's load injection needs. There is no existing infrastructure that could connect the Wind Energy Center to existing transmission. The location of the Wind Energy Center was identified as an optimal site from wind resource, transmission, landowner participation, economic, and environmental perspectives. Therefore, there is no feasible alternative method to service the facility need. The Project Route is the most viable alternative based on landowner preferences, paralleling existing public roads and section lines, and it is the most direct route that also minimizes impacts on the exclusion, avoidance, selection, and policy criteria identified in N.D. Admin Code Section 69-06-08-02.

2.3 TEN-YEAR PLAN

In accordance with N.D.C.C. Section 49-22-04 and N.D. Admin. Chapter 69-06-02, Oliver Wind IV will file a Ten-Year Plan for the Wind Energy Center with the Commission.

3.0 SITE SELECTION CRITERIA

The Project Corridor is based on the location of the existing infrastructure, landowner participation, field surveys, known environmentally sensitive areas, review of Oliver and Mercer county and state transmission line requirements, and communications with local, state, and federal agencies. North Dakota has several site selection criteria that are considered by the Commission to determine suitability of the transmission line. Oliver Wind IV has reviewed the criteria in N.D. Admin Code Chapter 69-06-08 and has considered these criteria in the Project design. These criteria are discussed in the sections below.

3.1 EXCLUSION AREAS

In accordance with N.D. Admin Code Section 69-06-08-02(1), which implements N.D.C.C. Section 49-22-05.1, the geographical areas listed in Table 3.1-1 must be excluded in the consideration of a transmission facility route. Exclusion areas may be located within a corridor, but at no given point can such an area or areas encompass more than 50 percent of the corridor width unless there is no reasonable alternative. N.D. Admin Code Section 69-06-08-02 further specifies that a buffer zone of a reasonable width to protect the integrity of the area must be included. Natural screening may be considered in determining the width of the buffer zone. Figure 7 depicts the exclusion areas.

TABLE 3.1-1
Exclusion Areas

Transmission Facility Corridor and Route Criteria		Description if Present in or Applicable to the Project	Proposed Buffer	Section Addressed
1.	**Exclusion areas.**			
a.	Designated or registered national: parks; memorial parks; historic sites and landmarks; natural landmarks; monuments; and wilderness areas.	Not applicable.	No impacts are anticipated, and no buffer is proposed.	6.5
b.	Designated or registered state: parks; historic sites; monuments; historical markers; archaeological sites; and nature preserves.	Archaeological sites, as identified through a Class I Literature Search and a Class III Cultural Resources Inventory are present in the Project Corridor, which the Project will avoid.[1]	No impacts are anticipated, and no buffer is proposed.	6.4, 6.5, Figure 7[1]
c.	County parks and recreational areas; municipal parks; and parks owned or administered by other governmental subdivisions.	Not applicable.	No impacts are anticipated, and no buffer is proposed.	6.5
d.	Areas critical to the life stages of threatened or endangered animal or plant species.	Not applicable.	No impacts are anticipated, and no buffer is proposed.	6.8, 6.9
e.	Areas where animal or plant species that are unique or rare to this state would be irreversibly damaged.	Not applicable.	No impacts are anticipated, and no buffer is proposed.	6.8, 6.9
f.	Areas within one thousand two hundred feet of the geographic center of an intercontinental ballistic missile (ICBM) launch or launch control facility.	Not applicable.	No impacts are anticipated, and no buffer is proposed.	3.6, 6.3
g.	Areas within 30 feet on either side of a direct line between ICBM launch or launch control facilities to avoid microwave interference.	Not applicable.	No impacts are anticipated, and no buffer is proposed.	3.6, 6.3

TABLE 3.1-1 **Exclusion Areas**			
Transmission Facility Corridor and Route Criteria	Description if Present in or Applicable to the Project	Proposed Buffer	Section Addressed
[1] Known archaeological sites are not depicted on Figure 7 due to confidentiality.			

3.2 AVOIDANCE AREAS

In accordance with N.D. Admin Code Section 69-06-08-02(2), the geographical areas listed in Table 3.2-1 may be approved as a site for routing of a transmission facility unless the applicant shows that, under the circumstances, there is no reasonable alternative. Avoidance areas may be located within a corridor, but at no given point can such an area or areas encompass more than 50 percent of the corridor width unless there is no reasonable alternative. N.D. Admin Code Section 69-06-08-02(2) further requires a buffer zone of a reasonable width to protect the integrity of the area. Natural screening may be considered in determining the width of the buffer zone. Figure 7 depicts the avoidance areas.

TABLE 3.2-1 **Avoidance Areas**				
Transmission Facility Corridor and Route Criteria		Description if Present in or Applicable to the Project	Proposed Buffer	Section Addressed
2.	**Avoidance areas.**			
a.	Designated or registered national: historic districts; wildlife areas; wild, scenic, or recreational rivers; wildlife refuges; and grasslands.	Not applicable.	No impacts are anticipated, and no buffer is proposed.	6.5
b.	Designated or registered state: wild, scenic, or recreational rivers; game refuges; game management areas; management areas; forests; forest management lands; and grasslands.	The Normand and Lucille Schaefer and Missouri Breaks Wildlife Management Areas (WMA) are within the Study Area but outside the Project Corridor and therefore the Project will avoid.	No impacts are anticipated, and no buffer is proposed.	6.4, 6.5, Figure 7
c.	Historical resources which are not specifically designated as exclusion or avoidance areas.	Historic farmsteads and cemeteries are present within the Study Area, which the Project will avoid.	No impacts are anticipated, and no buffer is proposed.	6.4, Figure 7[1], Appendix B1
d.	Areas which are geologically unstable.	A geotechnical and geophysical analysis is being performed and areas which are geologically unstable will be avoided and spanned as necessary. No transmission line structure locations will be located within a landslide deposit, as indicated by the North Dakota Geological Survey landslide mapping program.	No impacts are anticipated, and no buffer is proposed.	6.6, Figure 13
e.	Within 500 feet of a residence, school, or place of business.	Not applicable.	No impacts are anticipated, and no buffer is proposed.	3.6, Figure 13
f.	Reservoirs and municipal water supplies.	Not applicable.	No impacts are anticipated, and no buffer is proposed.	Not applicable

Oliver IV T-Line 000018

TABLE 3.2-1
Avoidance Areas

Transmission Facility Corridor and Route Criteria	Description if Present in or Applicable to the Project	Proposed Buffer	Section Addressed
g. Water sources for organized rural water districts.	Not applicable.	No impacts are anticipated, and no buffer is proposed.	6.7
h. Irrigated land.	Not applicable.	No impacts are anticipated, and no buffer is proposed.	Not applicable
i. Areas of recreational significance which are not designated as exclusion areas.	Not applicable.	No impacts are anticipated, and no buffer is proposed.	6.5

[1] Known archaeological sites are not depicted on Figure 7 due to confidentiality.

3.3 SELECTION CRITERIA

In accordance with N.D. Admin Code Section 69-06-08-02(3), a site can be approved in an area only when the applicant demonstrates to the Commission that any significant adverse effects resulting from the location, construction, and operation of the facility in that area, as they relate to the criteria listed in Table 3.3-1, will be at an acceptable minimum, or that those effects will be managed and maintained at an acceptable minimum.

TABLE 3.3-1
Selection Criteria

Transmission Facility Corridor and Route Criteria	Potential Effects	Section Addressed
3. Selection criteria.		
a. The impact upon agriculture:		
(1) Agricultural production.	Negligible/minimal effect anticipated. Only land needed during operations will be permanently affected. Areas within the construction easement may be disturbed during field surveys and construction but will be restored as practicable and landowners will be compensated through an easement payment and for loss of agricultural production.	1.4, 3.7, 4.3
(2) Family farms and ranches.	Negligible/minimal effect anticipated. Transmission lines are a compatible use with existing family farms and ranches, and the Project will not displace any farms or ranches.	6.1
(3) Land which the owner demonstrates has soil, topography, drainage, and an available water supply that cause the land to be economically suitable for irrigation.	No effect anticipated. There is no known irrigation within the Study Area, and, thus, no effects are anticipated. Participating landowners have not expressed concerns related to economically suitable irrigation on their land.	NA
(4) Surface drainage patterns and ground water flow patterns.	No effect anticipated. Project infrastructure will avoid impacts to surface waters and will 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.	6.7, Figure 11, Appendix B2
b. The impact upon:		

TABLE 3.3-1
Selection Criteria

Transmission Facility Corridor and Route Criteria	Potential Effects	Section Addressed
(1) Sound-sensitive land uses.	Negligible/minimal effect anticipated. Following construction, there will be a minimal amount of sound from the Project as a result of corona effects, which occur when air molecules near conducting wire are ionized due to changes in the electric field intensity at the conductor surface. The sound is most noticeable when conductors are wet as a result of precipitation.	6.3
(2) The visual effect on the adjacent area.	Negligible/minimal effect anticipated. The Project will be visible to landowners and travelers along roadways. Existing transmission lines, coal mines, coal fired power plants, and roads are present in the viewshed.	NA
(3) Extractive and storage resources.	No effect anticipated.	NA
(4) Wetlands, woodlands, and wooded areas.	Negligible/minimal effect anticipated. The Project will avoid direct impacts to all wetlands. Trees/shrubs will be replaced consistent with the Commission's Tree and Shrub Mitigation Specifications.	6.7, 6.9.2, Figures 11-13 Appendix B2
(5) Radio and television reception, and other communication or electronic control facilities.	No effect anticipated.	6.2
(6) Human health and safety.	No effect anticipated. The Project will be designed and constructed to meet or exceed the standards of the National Electrical Safety Code (NESC). Regular maintenance and inspections will be performed during the life of the Project to ensure its continued integrity.	4.0, 6.1, 6.2, 6.3
(7) Animal health and safety.	No effect anticipated. Construction work will be coordinated with landowners to avoid impacts to livestock. Oliver Wind IV will implement a Wildlife Response and Reporting System the Project is complete.	6.6, 6.7
(8) Plant life.	Negligible/minimal effect anticipated. The Project will result in less than one acre of permanent ground disturbance, including loss of the existing plant populations. Trees/shrubs will be replaced consistent with the Commission's Tree and Shrub Mitigation Specifications. Temporarily disturbed areas will be restored as practicable.	6.5

3.4 POLICY CRITERIA

In accordance with North Dakota Administrative Code (N.D. Admin. Code) Section 69-06-08-02(4), the Commission may give preference to an applicant who will maximize benefits that result from the adoption of the policies and practices listed in Table 3.4-1 and may require the adoption of such policies and practices as appropriate.

TABLE 3.4-1
Policy Criteria

Energy Conversion Facility Siting Criteria	Description if Present in or Applicable to the Project	Section Addressed
4. Policy Criteria		

TABLE 3.4-1
Policy Criteria

Energy Conversion Facility Siting Criteria	Description if Present in or Applicable to the Project	Section Addressed
a. Location and design.	The Project location is based on landowner participation, field surveys, known environmentally sensitive areas, and review of Oliver County and state transmission line requirements. Project design will meet the requirements of the National Electrical Safety Code requirements and policies, designing the system to efficiently transfer electricity, ensuring worker and public health and safety, and constructing facilities to most effectively and efficiently meet its delivery obligations.	1.0, 1.4, 3.0, 4.0, All figures
b. Training and utilization of available labor in this state for the general and specialized skills required.	Oliver Wind IV has used several local firms in developing the Project and compiling this application and will continue to use local labor to the extent practicable.	Not applicable
c. Economies of construction and operation.	Oliver Wind IV will utilize local contractors to the extent practicable.	6.1
d. Use of citizen coordinating committees.	Not applicable.	Not applicable
e. A commitment of a portion of the transmitted product for use in this state.	The energy produced by the Wind Energy Center will be transmitted along the Project into the Basin Electric LOS 345-kV Substation.	1.0, 2.1
f. Labor relations.	No labor relations would be negatively affected by the Project.	Not applicable
g. The coordination of facilities.	Oliver Wind IV has coordinated with utility operators along the Project Route to avoid conflicts or disruptions. The portion of the Project Route from approximately structure 108 to 116 is the Basin Electric preferred route into the LOS 345-kV Substation which also parallels the Basin Electric LOS to Antelope Valley Station 345-kV transmission line for approximately 1.75 miles.	1.4
h. Monitoring of impacts.	The engineering, procurement, and construction contractor will employ best management practices during construction to monitor soil impacts and segregate topsoil. A storm water pollution prevention plan will be prepared for the Project.	5.0
i Utilization of existing and proposed rights of way and corridors.	The Project's design emphasizes the utilization of existing rights of way and corridors, which encompasses roads, section lines, quarter sections, edges of agricultural fields, and transmission lines.	1.4
j. Other existing or proposed transmission facilities.	The Project was designed, where practicable, to parallel existing transmission facilities. The Project parallels the Basin Electric LOS to Antelope Valley Station 345-kV transmission line for approximately 1.75 miles and a transmission line near ND Highway 31 for approximately 0.52 miles. The Project will interconnect at the existing LOS 345-kV Substation.	1.4

3.5 FACTORS TO BE CONSIDERED

The North Dakota Energy Conversion and Transmission Facility Siting Act, N.D.C.C. Section 49-22-09, lists the factors in Table 3.5-1 to be considered in evaluating applications and designation of sites, corridors, and routes.

TABLE 3.5-1
Factors to be Considered

Factors to be Considered	Evaluation	Section Addressed
I. The commission shall be guided by, but is not limited to, the following considerations, where applicable, to aid the evaluation and designation of sites, corridors, and routes:		

TABLE 3.5-1
Factors to be Considered

Factors to be Considered	Evaluation	Section Addressed
a. Available research and investigations relating to the effects of the location, construction, and operation of the proposed facility on public health and welfare, natural resources, and the environment.	Research and investigations relating to the effects of the location, construction, and operation of the proposed facility on public health and welfare, natural resources, and the environment have been evaluated	1.0, 1.3, 4.0, 5.0, 6.0, Appendix B
b. The effects of new energy conversion and transmission technologies and systems designed to minimize adverse environmental effects.	Oliver Wind IV will utilize best management practices that minimize impacts to the environment. The Project has been designed to minimize adverse environmental effects including utilizing bird flight diverters to avoid and reduce bird mortality.	3.0, 4.0, 5.0, 6.0
c. The potential for beneficial uses of waste energy from a proposed energy conversion facility.	Not applicable.	Not applicable
d. Adverse direct and indirect environmental effects which cannot be avoided should the proposed site be designated.	The Project is expected to impact up to 0.2 acres of land during operation, which will not be available for other uses. An additional 106.1 acres of land will be temporarily affected due to construction.	4.3
e. Alternatives to the proposed site which are developed during the hearing process and which minimize adverse effects.	Oliver Wind IV believes that the Project Route is the most viable route and most direct route where voluntary easements can be acquired with landowners. The Project Route also maximizes conformance with the exclusion, avoidance, selection, and policy criteria identified in N.D. Admin Code Section 69-06-08-02.	1.0, 1.4, 2.2, 3.0
f. Irreversible and irretrievable commitments of natural resources should the proposed site be designated.	There are few commitments of resources associated with this Project that are irreversible and irretrievable, but these include those resources primarily related to construction.	5.0, 6.0
g. The direct and indirect economic impacts of the proposed facility.	Direct and indirect economic impacts of the Project include payments for participating landowners, employment, property tax for the substation parcel, transmission line tax payment to the state of North Dakota based on mileage and voltage, and sales/use tax on materials.	6.1
h. Existing plans of the state, local government, and private entities for other developments at or in the vicinity of the proposed site, corridor, or route.	No conflicts are anticipated with existing state, local government, or private entities' development plans.	1.8. Figure 6
i. The effect of the proposed site on existing scenic areas, historic sites and structures, and paleontological or archaeological sites.	There are no designated recreational or scenic resources that will be affected by the Project. Archaeological sites, as identified through a Class I Literature Search and a Class III Cultural Resources Inventory, and historical sites identified through a Class II Architectural History Inventory are present, and the Project will avoid.	6.4, Appendix B4
j. The effect of the proposed site on areas which are unique because of biological wealth or because they are habitats for rare and endangered species.	No effect anticipated. All rare and endangered species habitats will be avoided.	6.5, 6.6, 6.7, 6.8, 6.9
k. Problems raised by federal agencies, other state agencies, and local entities.	Concerns raised by federal, state, or local entities have been addressed. Oliver Wind IV is in ongoing discussions with National Park Service regarding studies of potential visual impacts to Knife River Indian Villages.	7.0, Appendix C

3.6 SETBACKS

The setbacks used in designing the Project comply with or exceed those required by the Commission per N.D. Admin. Code Section 69-06-08-02(1)-(2), the Oliver County Planning and Zoning Ordinance (Oliver County 2016), and the Mercer County Zoning Ordinance (Mercer County 2012). Setbacks were measured from the outermost portion of the transmission line

facility to the nearest point of the applicable feature. Table 3.6-1 includes the setback distances as designated by the Commission used in designing the Project.

TABLE 3.6-1
Setback Distances as Designated by the Commission

Setback Type	Setback Distance
The geographic center of an intercontinental ballistic missile (ICBM) launch or launch control facility.	1,200 feet [1]
Areas on either side of a direct line between ICBM launch or launch control facilities to avoid microwave interference.	30 feet
Residence, school, or place of business.	500 feet [2]

[1] The nearest ICBM launch or launch control facility is approximately 21.8 nautical miles (132,700 feet).
[2] Per N.D.C.C. 49-22-05.1(2), a residence setback may be waived in writing by the owner of the residence.

The Project has been sited along existing roads and existing infrastructure to the extent possible to minimize impacts to farming and ranching operations and natural resources. Setbacks from existing infrastructure were used in designing the Project.

3.7 COUNTY CRITERIA

Oliver Wind IV has prioritized close coordination with Oliver and Mercer counties throughout the development of the Project and associated Wind Energy Center. As part of Oliver Wind IV's commitment to transparency and community involvement, the project team recently conducted meetings with the county planning and zoning departments, as well as the county commission, to provide comprehensive updates on the Project's progress. Adherence to county setbacks is discussed in Section 3.6.

Oliver Wind IV met with Oliver County Planning & Zoning on July 28, 2022, to provide an update on the Project and associated wind project. On December 9, 2022, Oliver Wind IV presented a Project update to the Mercer County Commission. On March 16, 2023, a Project update was provided to the Mercer County Planning & Zoning.

Oliver Wind IV will continue to meet with county officials as the Project and its associated transmission line moves forward for any necessary local construction permits (*e.g.*, building permits, road use agreements). A conditional use permit application for the Project and Wind Energy Center was submitted to Oliver County in September 2023 and is currently pending before Oliver County. A conditional use permit application for the Project was also submitted to Mercer County in September 2023 and is currently pending before Mercer County. The conditional use permits will be submitted to the Commission after they are issued.

4.0 PROJECT DESIGN

4.1 TRANSMISSION LINE

The Project will consist of an approximately 19.5-mile 345-kV single-circuit transmission line with approximately 121 transmission line structure locations, which includes four locations that have 3-pole dead-end structures for a total of 129 monopoles. The exact quantity and distribution of structure types may change during detailed design and construction.

The monopole structures will range in height from approximately 100 feet to 170 feet with an average of approximately 120 feet, depending on the required span distances between structures and area topography. The span between structures will average approximately 900 feet, depending on topography, with longer spans up to 1,200 feet; taller structures could be used for crossing existing distribution and transmission lines or where unusual terrain exists. The single-pole structures will be designed to support three conductors, an overhead Optical Ground Wire (OPGW), and an Overhead Shield Wire (OHSW). The OPGW and OHSW will provide lightning protection and fiber optic communications between the Wind Energy Center collection substation and the LOS 345-kV Substation for systems control. Multi-pole structures will be used in four locations where the line crosses under an existing 345kV transmission line. On these, the conductors will each be on their own structure. Bird flight diverters will be mounted to the OPGW and OHSW per Avian Power Line Interaction Committee (APLIC) guidelines. Tangent structures will be freestanding and directly embedded into the soil. Angle structures (used where the transmission line changes direction) and dead-end structures (used to provide longitudinal stability along the length of the line) will be constructed with concrete foundations. Guy wires will be used on approximately 10 to 20 structures depending on final design. Figure 8 provides diagrams of the monopole structures.

Project construction and design will meet the requirements of the National Electrical Safety Code (NESC), Oliver Wind IV, and other applicable local or national building codes. Minimum conductor clearance is measured at the point of greatest conductor sag and closest proximity to the ground. The transmission line will be constructed with clearances that exceed standards set by NESC. Final engineering design will determine specific structure heights in order to maintain NESC clearances at the lowest point of conductor sag for all operating conditions. Clearances may be increased to account for site-specific situations. Table 4.1-1 includes a description of various Project design component characteristics.

TABLE 4.1-1
Project Design Components

Description of Design Component	**Values**
Voltage (kV)	345-kV
Length of transmission line	19.5 miles
Approximate total number of structures	129
Conductor size	1.108 inches
Typical minimum and maximum span distances between structures	200 – 1,200 feet
Average span	900 feet
Minimum and maximum structure height	100 – 170 feet
Average height of structures	120 feet
Average number of structures	7 per mile
Minimum conductor-to-ground clearance to agricultural land at 100 degrees Celsius (°C)	31.5 feet
Minimum conductor-to-ground clearance to railroad at 100°C	35.3 feet

TABLE 4.1-1 **Project Design Components**	
Minimum conductor-to-ground clearance to paved highways at 100°C	27.3 feet
Circuit configuration	Vertical and horizontal

4.2 PROJECT ACCESS

Oliver Wind IV will use existing public and private access to the maximum extent possible. Where existing access is unavailable, temporary access roads will be used to access areas where there are environmental constraints between structures limiting access or where structures are not located adjacent to existing roads. All access roads avoid aquatic, biological, cultural, and tribal resource constraints and any changes made to temporary access roads during construction will be surveyed. Temporary access will only be as wide as needed and construction will predominantly take place when the ground is dry and hard enough to support construction equipment with no improvements, but occasionally timber mats may be required to cross aquatic sites. Generally, little to no grading or vegetation clearing will be required.

4.3 PROJECT IMPACT ASSUMPTIONS

Permanent impacts are those required for Project operation, consisting mostly of individual structure locations. Temporary impacts are those impacts that result during construction to accommodate equipment and temporary activities outside of the areas that will remain as the permanent Project footprint during operation (Table 4.3-1).

TABLE 4.3-1
Estimated Project Ground Disturbance Impacts

Project Component	**Disturbance Assumptions**	**Impact Multiplier** [1]	**Temporary Impact (acres)**	**Permanent Impact (acres)**
Transmission pole structures	Temporary: 100 ft x 125 ft area = 12,500 ft^2 = 0.29 acres	129 structures	34.7	None
	Permanent: 8 ft diameter = 50.27 ft^2 = 0.0012 acres		None	0.2
Transmission support anchors (guy wires)	Temporary: 50 ft x 200 ft area = 10,000 ft^2 = 0.23 acre	35 support anchors	8.1	0.0014
	Permanent: 075-ft radius anchor foundation = 314.16 ft^2 = 0.00004 acre			
Pulling and tensioning areas	Temporary: 1.1-to-2.7-acre areas	12 locations	21.6	None
	Permanent: None			
Temporary access	Temporary: Up to 24 feet wide	8.5 miles	24.7	None
	Permanent: None			
Construction laydown area (north location)	Temporary: 8 acres	One location	8	None
	Permanent: None			
Construction laydown area (south location)	Temporary: 9 acres	One location	9	None
	Permanent: None			
		Total (acres) [2]	**106.1**	**0.2**

[1] Impact multipliers are based on preliminary engineering design and could change during final design.

[2] Rounded to the nearest tenth of an acre. Total impact areas may overestimate actual impacts.

5.0 CONSTRUCTION, OPERATION, AND MAINTENANCE

5.1 PRE-CONSTRUCTION SURVEYING AND GEOTECHNICAL ANALYSES

Oliver Wind IV and/or its contractors will perform initial transmission line survey work, consisting of survey control, route centerline location, profile surveys, and access surveys prior to construction. These surveys will likely be conducted concurrently with other pre-construction tasks.

Geotechnical analyses will be conducted at select locations along the transmission line to determine engineering requirements for structures. A truck-mounted auger will be transported to each site to drill a small-diameter borehole. Cuttings from each borehole will be evaluated to determine soil characteristics. An experienced geotechnical testing laboratory will perform the sample analysis. Geotechnical analyses will be confined to a relatively small area needed for site access and equipment operations. Additionally, a geophysics survey was completed where the Project Route crosses mine spoils. The combined geophysics and geotechnical surveys will inform design for structures located in mine spoils.

5.2 PROJECT CONSTRUCTION

Structures will be installed at existing grades. Therefore, structure locations will not be graded or leveled, unless it is necessary to provide a reasonably level area for construction crews and equipment, such as auger trucks, cranes, and other installation vehicles (*e.g.*, bucket trucks, stringing, and clipping trucks). Blading will be confined to the Project Corridor and will be accomplished using bulldozers or front-end loaders. Soil removed during leveling will be stockpiled and replaced following construction; special emphasis will be placed on salvaging topsoil to be used for reclamation. The ground will be re-graded to the approximate original contour and revegetated (rangeland) or tilled (cropland) when the work is completed. Temporary disturbance to soils will be mitigated by returning the sites to grazing and farming unless other arrangements are made with the landowner in order to facilitate the long-term maintenance of the transmission line.

Temporary ground disturbance will occur during the setting of structures and support anchors. These disturbances will occur during the boring of the hole used for setting the structure and support anchor. Support anchors for guyed structures will extend into the subsurface and be approximately 0.75-foot in radius. Boring equipment will be used to facilitate the installation of the transmission foundation. Soil removed during boring activities will be spread around the base of the structure. Boring equipment will be used to facilitate the installation of transmission foundations. The foundations will be constructed of reinforced concrete with prefabricated anchor bolt cases placed in the boreholes. Soil removed during boring activities will be sloped around the structure after installation or in adjacent upland areas. Approximately 60 cubic yards of concrete will be required per drilled shaft foundation with the large majority of the structures directly embedded. The most noticeable impact on the Project Route will be land disturbance in the area of transmission structure construction to allow adequate room for operation of equipment. Following the structure installation, the disturbed area will be groomed and seeded, including replacement of trees and shrubs outside of the Project Corridor. Where practicable, trees and low-growing vegetation will not be removed if future growth will not interfere with the operation or maintenance of the line. There may be limited use of herbicides to remove or control the growth of vegetation in some areas. Herbaceous and smaller woody plants will not be disturbed, except for those that will be crushed unavoidably during structure installation. During operations, vegetation will be monitored regularly and trimmed so that it does not exceed safety

provisions. The Project will be constructed to maintain minimum conductor-to-ground clearance as required by the NESC.

After structures have been erected, conductors will be installed by establishing stringing setup areas. These stringing setup areas will be located approximately every three to four miles along the Project Route. Conductors will be installed between setup areas using a “controlled tension method,” which ensures that the cable comes off the reel at a constant tension without backlashes. Conductor stringing operations will also require brief access to each structure to secure the conductor wires to the insulators or shield wire clamps once final line sag is established.

Stringing equipment generally consists of wire pullers, tensioners, conductor reels, shield wire reels, and stringing blocks. Stringing operations consist of pulling lightweight cables or ropes through the stringing sheaves located at every structure site. This cable or rope will be used to pull the conductors through the sheaves under sufficient tension to keep the conductor from coming into contact with the ground. Temporary guard or clearance poles will be installed over existing distribution or communication lines, streets, roads, highways, railways, or other obstructions after any necessary notifications are made and/or permits are obtained. This ensures that conductors will not obstruct traffic or come into contact with existing energized conductors or other cables and protects the conductors from damage. Once a section of a line has been installed, temporary structures will be removed, holes backfilled, and the area of disturbance reseeded to produce the same cover that was removed.

Debris associated with transmission line construction may include construction materials such as packaging material, insulator crates, conductor reels, and wrapping. This debris may also include excess excavated soil and removed vegetation. Materials with salvage value, including conductor reels, unused conductor and hardware, structures, and other materials, will be removed from the site for reuse. Excess soil and vegetation will be spread across uplands in the Project Corridor. Solid waste will be temporarily stored within the Project Corridor or construction laydown areas and then transported to appropriate disposal facilities. Debris will be disposed of in accordance with local, state, and federal regulations.

Temporary staging areas will be located within the Project Corridor and/or construction laydown areas and will be limited to the structure site areas for structure laydown and framing prior to structure installation. Disturbed areas will be restored to their original condition to the maximum extent practicable.

Construction-related tasks are outlined below.

- Pre-construction: Environmental surveys, geotechnical analysis, cultural resources surveys, avian surveys, micro-siting, engineering, design, land procurement, various utility studies, and long-lead equipment procurement.
- Surveying: Initial line-survey work, consisting of aerial photography, survey control, route centerline location, profile surveys, and access surveys.
- Structures: Vegetation removal (as needed) and drilling for foundations.
- Delivery and Assembly: Flatbed truck deliveries to installation locations, structure assembly with cranes and bucket trucks, backfill foundation footings with rock and tamp into place to prevent structure movement or settling.

- Wire Installation: Wires will be strung, pulled, and tensioned using heavy, truck-mounted winches that also carry reels of conductor and cable.
- Post-construction reclamation activities generally include:
- Cleaning up all construction sites, including removing and properly disposing of debris;
- Removing all temporary facilities, including staging areas;
- Installing appropriate erosion control measures; and
- Reseeding and replacing trees and shrubs as necessary in disturbed areas with vegetation similar to vegetation that was removed and restoring the areas to their original condition to the extent practicable. Trees and shrubs will be replaced consistent with the Commission's Tree and Shrub Mitigation Specifications.

5.3 CONSTRUCTION MANAGEMENT

The EPC contractor will have primary responsibility for construction management, using the services of local contractors where possible and appropriate, and will undertake the following activities:

- Securing building, electrical, grading, road, and utility permits;
- Performing detailed civil, structural and electrical engineering;
- Scheduling execution of construction activities;
- Forecasting Project labor requirements and budgeting;
- Coordinating and managing the work of all Project subcontractors; and
- Providing direct supervision for the installation of all Project components including foundations, structures, insulators and conductors, and interconnection equipment.

Construction activities under the EPC's supervision will generally consist of:

- Project development;
- Foundation excavation;
- Concrete foundation installation;
- Electrical and communications equipment installation;
- Transmission line assembly and erection;
- System testing; and
- Restoration of temporary impact areas.

Throughout the construction phase, ongoing coordination will occur between Oliver Wind IV and the EPC. The EPC's on-site Project construction manager will help to coordinate ongoing communication with local officials and landowners. Oliver Wind IV, the EPC construction manager, and the operations and maintenance (O&M) staff manager will work together to ensure a smooth transition from construction through Project commissioning and operation.

5.4 COMMISSIONING

The Project will be commissioned after completion of the construction phase and detailed inspection and testing. Inspection and testing will occur for each component of the Project.

5.5 OPERATION AND MAINTENANCE

The Project will be operated in conjunction with the Wind Energy Center with five to eight full time employees located locally. The Project will also be monitored through the Supervisory Control and Data Acquisitions (SCADA) system located at the Wind Energy Center O&M building. Project O&M will consist of continuous remote monitoring and regular on-site inspections and maintenance as needed.

6.0 ENVIRONMENTAL ANALYSIS

6.1 LOCAL ECONOMICS

6.1.1 Description Of Resources

Oliver County

According to Job Service North Dakota Labor Market Information Center (NDLMI), Oliver County's 2022 resident population was 1,856, a one-year numeric change of -17 or a change of -0.9 percent (NDLMI 2023). The unemployment rate for Oliver County in May 2023 was 2.7 percent. One year prior, the unemployment rate was 2.3 percent. There were five job openings in Oliver County in June 2023. On average in the fourth quarter 2022, the private industry in Oliver County employing the largest number of workers was utilities. The private industry with the highest average weekly wage in the fourth quarter 2022 was Administrative and Waste Services.

In Oliver County agriculture is an important part of the economy with 234 farms located in the county (USDA, NASS 2017). According to the 2017 Census of Agriculture, the total market value of agricultural products produced in Oliver County was $47,326,000, 46 percent of which was from crops and 54 percent from livestock. The principal crops include corn, wheat, oats, barley, soybeans, forage, and sunflowers and the primary livestock is cattle.

In July 2023, Oliver County had zero homes for sale; however, housing was available in the nearby towns of Stanton, Washburn, Hazen, Beulah, New Salem, Mandan, and Bismarck (Zillow 2023). U.S. Census Bureau data from the 2020 census indicates there are approximately 152 vacant housing units in Oliver County (U.S. Census Bureau 2020a). Lodging facilities including hotels, inns, and motels are available in Washburn, Hazen, Beulah, New Salem, Mandan, and Bismarck.

Mercer County

According to Job Service North Dakota Labor Market Information Center, Mercer County's 2022 resident population was 8,333, a one-year numeric change of +3 or a change of 0.0 percent (NDLMI 2023). The unemployment rate for Mercer County in May 2023 was 2.2 percent. One year prior, the unemployment rate was 2.3 percent. There were 101 job openings in Mercer County in June 2023. On average in the fourth quarter 2022, the private industry in Mercer County employing the largest number of workers was utilities. The private industry with the highest average weekly wage in the fourth quarter 2022 was Administrative and Waste Services.

In Mercer County, agriculture is an important part of the economy with 317 farms located in the county (USDA, NASS 2017). According to the 2017 Census of Agriculture, the total market value of agricultural products produced in Mercer County was $57,168,000, 44 percent of which was from crops and 56 percent from livestock. The principal crops include corn, wheat, oats, barley, soybeans, forage, and sunflowers and the primary livestock is cattle.

In July 2023, Mercer County had 30 homes for sale with the majority in the towns of Beulah and Hazen (Zillow 2023). U.S. Census Bureau data from the 2020 census indicates there are approximately 1,182 vacant housing units in Mercer County (U.S. Census Bureau 2020b). Lodging facilities including hotels, inns, and motels are available in Washburn, Hazen, Beulah, New Salem, Mandan, and Bismarck.

6.1.2 Impacts/Mitigation

The Project and the Wind Energy Center will have positive economic impacts for the local population, including lease and royalty payments for participating landowners, employment, and property and sales tax revenue. Economic losses from farmland that is taken out of production for operation of the Project are anticipated to be minimal in comparison to the additional income provided by the Project.

Oliver Wind IV estimates that the Project and the Wind Energy Center will provide approximately $37 million in tax revenue over 35 years. The Project and the Wind Energy Center also will provide over $30 million in payments to participating landowners for over 30 years, which will not only benefit those landowners, but also the local economy as that money is reinvested in local goods and services. Oliver Wind IV estimates that the total cost for the Project would be $43 million.

The Project and the Wind Energy Center will create approximately five to eight full-time O&M jobs. Most of these employees are expected to reside locally. The full-time positions include one site manager and several technicians. Additionally, the Project and the Wind Energy Center will create approximately 300 temporary construction jobs during the approximately eight-month construction period.

Landowner compensation has been established under individual lease agreements and includes compensation for crop damage during surveys and construction. In an environment of uncertain and often declining agricultural prices and yields, the supplemental income provided to farmers from wind energy leases is expected to provide stability to farm incomes and thus will help assure the continued viability of farming in the Study Area. Project construction will not cause additional impacts to leading industries within the Study Area.

To the extent that local contractors are used for portions of the construction, total wages and salaries paid to contractors and workers in Oliver and Mercer counties will contribute to the total personal income of the region. Additional personal income will be generated for residents in the counties as well as the state by circulation and recirculation of dollars paid out by the applicant as business expenditures and state and local taxes. Expenditures made for equipment, energy, fuel, operating supplies, and other products and services will benefit businesses in the counties and the state.

It is likely that general skilled labor is available either in the county or the state to serve the basic infrastructure and site development needs. Specialized labor will be required for certain components of Project development. It is likely that this labor will be imported from other areas of the state or from other states, as the relatively short duration of construction does not warrant special training of local or regional labor. Balancing the use of local contractors and imported specialized contractors will likely alleviate any labor relations issues.

During construction, out-of-town laborers will likely use lodging facilities in and around the cities of Washburn, Hazen, Beulah, New Salem, Mandan, and Bismarck. It is expected that full-time O&M staff will reside in nearby towns with available housing.

6.2 PUBLIC SERVICES

6.2.1 Description of Resources

Local Government Services

Within the Study Area is a network of established roads and utilities that provide access and necessary services to cities, communities, homesteads, and farms. There are no incorporated or unincorporated cities within the Study Area. The Study Area is located approximately 3.4 miles northwest of the town of Hannover, North Dakota and two miles south of the city of Stanton, North Dakota.

Electrical Service

The local electric co-op provides rural electrical service in the Study Area.

Roads

Public roads within the Study Area are North Dakota Highway 31 and 200, county roads, township roads, section lines, and private roads. The Study Area lies in the North Dakota Department of Transportation (NDDOT) District 1 – Bismarck.

Traffic

Existing daily traffic volumes for state highways, county roads, and township roads that are located within and within proximity to the Study Area are documented in Table 6.2.1-1. In general, the NDDOT indicates that roads with vehicle counts under 100 annual average daily traffic are rarely counted and roads with no count data are likely lower than those with count data.

TABLE 6.2-1
Existing Daily Traffic Levels

Roadway Segment	Average Daily Traffic	Average Daily Truck Traffic	Year
49th Avenue Southwest, north of 17th Street Southwest	60	N/A	2006
14th Street Southwest, west of ND Highway 31	28	N/A	2016
ND Highway 31, north of 14th Street Southwest	540	80	2022
County Road 20, west of	143	15	2020
ND Highway 31, south of ND Highway 200	570	N/A	2020
9th Street Southwest, south of ND Highway 200	30	N/A	1990
ND Highway 200, south of Deapolis Cemetery	1335	N/A	2020
Source: NDDOT's Transportation Information Map (NDDOT 2023)			

Communications

The corona-induced broadband electromagnetic radiation (EMR) from transmission lines can produce interference with some communications signals if there is an overlap in the signal and EMR frequencies. Broadband corona EMR discharge typically occurs in the frequency spectrum from below 100 kilohertz (kHz) to approximately 1,000 megahertz (MHz), which overlaps with the frequencies used for AM and FM radio and some television signals.

6.2.2 Impacts/Mitigation

Local Government Services

No impact to local government services is anticipated, and no mitigation is required.

Electrical Service

No impact on electrical service is anticipated, and no mitigation is required.

Roads

No permanent access roads will be built to construct or maintain the Project. Much of the Project Route is adjacent to existing public roads or section lines and can be accessed with minimal off-road work. In areas where the Project Route is not adjacent to existing roads, Oliver Wind IV will enter into agreements with landowners for temporary construction access.

The capacity of any route and level-of-service to the traveling public will not be affected, and no mitigation is required.

Traffic

There will be a temporary increase in vehicular traffic during construction activities. The maximum construction workforce is expected to generate approximately 1,000 additional vehicle trips per day on each road to support construction of the Project and Wind Energy Center. Up to 20 concrete trucks will be required per transmission structure foundation for the structures that use drilled shaft foundations. While there may be some noticeable increase in heavy vehicle traffic in discrete locations for limited amounts of time, the capacity of route and level-of-service to the traveling public will be negligible as any combination of state and county highways and other township roads will be used. Specific truck routes will be dictated by delivery location. Additional operating permits will be issued by the state or county for over-sized truck movements. Oliver Wind IV will coordinate with Oliver County and Mercer County to obtain necessary road use agreements. The capacity of any route and level of service to the traveling public will not be permanently affected, and as such, no mitigation is required.

Water Supply

Construction will not significantly impact local water supply. Construction will require approximately 12,000 gallons per day of water for foundations, backfill, compaction, and dust control. Construction water estimates are subject to change due to final site investigation and weather. The Project will not require appropriation of surface water or permanent dewatering.

The abandonment of wells is not anticipated. However, in the event wells are abandoned, they will be sealed as required by North Dakota law. Therefore, no mitigation is required.

Communications

With sufficient corona activity, some radio and television interference can be noticeable; however, the radio sound generated by a transmission line is very low in power and interference is generally only experienced in very close proximity to the transmission line. These effects are most pronounced directly underneath the line conductors and decrease with distance from the transmission line. The level of interference with reception of a radio signal also depends on the

relative locations of the radio transmitter, the radio receiver, and the transmission line. A transmission line that is directly between a radio transmitter and a listener's receiver may be more likely to interfere with that listener's reception, whereas a transmission line behind or beside the listener in relation to the transmitter will not necessarily cause interference depending on the radio receiver's antenna.

As digital signal processing has been integrated into television and radio receivers, the potential interference impact of corona-generated radio sound has been further reduced. Moreover, the advent of cable and satellite television service, and the federally mandated conversion to digital television broadcast in June 2009 have greatly reduced the occurrence of corona-generated interference. Newer digital television receivers are equipped with systems to filter out interference.

6.3 PUBLIC HEALTH, WELFARE, AND SAFETY

6.3.1 Description of Resources

Aerospace and Military Operations

Oliver Wind IV and its representatives have notified the following aerospace and military operations agencies/organizations to notify them of the Project and solicit feedback concerning the development of the Project. The aerospace and military operations agencies/organizations include the Federal Aviation Administration (FAA), North Dakota Aeronautics Commission, Grand Forks Air Force Base (AFB), Minot AFB, 91st Missile Maintenance Squadron, U.S. Department of Defense (DoD), and Military Aviation and Installation Assurance Siting Clearinghouse (Clearinghouse). Responses from the aerospace and military operations agencies/organizations are summarized in Section 7.0 and correspondence is included in Appendix C.

The Minot AFB responded to the notification that the 91st Missile Wing does not have any operations in Oliver or Mercer counties, but did state that the 5th Bomb Wing on Minot AFB does have flying routes in this area.

The nearest Project feature to an intercontinental ballistic missile (ICBM) launch or launch control facility is approximately 21.8 nautical miles (132,700 feet).

Sound

Corona from transmission line conductors can generate electromagnetic "noise" at the same frequencies transmitted by radio and television signals. Corona consists of the breakdown or ionization of air within a few centimeters of conductors and hardware. Aeolian vibration is produced when a steady flow of wind interacts with an object such as a transmission line. Wind must blow steadily and perpendicular to the lines to set up oscillating forces.

The Study Area is primarily rural and agricultural. There are no populated towns within the Study Area. The existing acoustic environment is defined primarily by distant traffic sound from the nearby arterial highways and will also include intermittent aircraft overflights and sound from agricultural operations. In addition to anthropogenic sound sources, the windy conditions of this site define a somewhat elevated ambient sound level, which increases with wind speed. Windy conditions can generate sound caused by the rustling of grass and tree leaves.

Electromagnetic Fields

Power frequency electromagnetic fields (EMF) are created wherever electricity flows. Leading U.S. and international scientific organizations, such as the National Cancer Institute and the World Health Organization, have evaluated EMF research. These organizations generally conclude that overall, the body of scientific research does not show that exposure to EMF causes or contributes to any type of cancer or any other disease or illness (NIEHS 1999).

Hazardous Materials/Hazardous Waste

The Project is located in a rural area of North Dakota. Hazardous wastes from large industrial or commercial activities are not likely to be present in the Study Area. Potential hazards may exist in rural areas from farm dumps and agricultural chemicals. A Phase I Environmental Site Assessment (Phase I ESA) was conducted for the Red Butte project in 2018 for an area that contained a large majority of the Study Area. The Phase I ESA was conducted to identify any recognized environmental conditions that may exist. A recognized environmental condition includes the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property. The opinion of the report concluded that there was no evidence of any recognized environmental conditions in connection with the site.

Potentially hazardous materials associated with the Project include fuel, hydraulic fluid, or other hazardous substances may be stored onsite during construction. When more than 1,320 gallons of oil storage is located on-site, a Spill Prevention, Control, and Countermeasures (SPCC) Plan is required to address the safe and secure containment of oil as well as procedures for operations and spill prevention practices.

Security

The Study Area is located in a region characterized by low population density and there are no cities or towns within the Study Area. The Study Area falls within the jurisdiction of Oliver County and Hazen emergency services boundaries and Oliver County and Stanton fire response boundaries. Both boundaries determine the designated ambulance response service and fire department service for incidents reported through the 9-1-1 emergency system. The nearest hospital is Sakakawea Medical Center in Hazen.

6.3.2 Impacts/Mitigation

Aerospace and Military Operations

The maximum expected transmission structure height will be approximately 170 feet in height above ground level, and no part of the Project will exceed 200 feet above ground level. Initial review of the Project Route and structure locations by Capitol Airspace Group identified that the transmission line crosses the instrument approach area of the Mercer County Regional Airport in Hazen. Capitol Airspace Group considered existing and potential future instrument approach areas. Oliver Wind IV submitted a Notice of Construction or Alteration (FAA Form 7460-1) for transmission pole locations 25 through 37, which fall within the existing and potential future instrument approach areas, and the FAA has issued a Determination of No Hazard for transmission pole locations 25 through 37 .

The Project will include bird flight diverters, which can provide visibility during the day for low flying aircraft.

Sound

Project construction and maintenance may cause short-term but unavoidable sound impacts due to construction and equipment. Construction and maintenance activities will also generate traffic that will have potential sound effects, such as trucks travelling to and from the Project on public roads. Sound generated by construction activities is generally exempt from state and local noise regulation. Once the Project has been built, no significant sound impacts are anticipated. Project maintenance will occur periodically but is not expected to result in significant sound generation.

Corona effects occur when air molecules near conducting wire are ionized due to changes in the electric field intensity at the conductor surface. Measures such as carefully handling the conductor during construction to avoid nicking or scraping or otherwise damaging the surface and using hardware with no sharp edges or points are typically adequate to control corona. Corona effects are expected to be low enough that no objectionable audible sound will result outside the Study Area. The sound is most noticeable when conductors are wet as a result of precipitation.

Aeolian vibration is produced when a steady flow of wind interacts with an object such as a transmission line. Wind must blow steadily and perpendicular to the lines to set up oscillating forces. The resulting vibration can produce resonance if the frequency of the vibration matches the natural frequency of the line. However, aeolian vibration is expected to be minimal outside of the Project Corridor.

Electromagnetic Fields

Many studies of EMF have been conducted, but none has identified a cause-and-effect relationship between EMF exposure and health effects or a mechanism by which EMF could cause disease (NIEHS 1999). No impacts from EMF are expected.

Hazardous Materials/Hazardous Waste

Prior to construction, Oliver Wind IV will conduct a new Phase I ESA and the results will be used to avoid and minimize risk associated with potential recognized environmental conditions in the Project Corridor. Significant findings are not anticipated due to the known historic uses of the property. As with any construction activity, there is the possibility of accidentally spilling fuel, hydraulic fluid, or other hazardous substances during construction of the Project. The potential of such events will be minimized through implementation of a SPCC Plan, which will include the following:

- Construction equipment will be equipped with spill cleanup kits.
- Equipment refueling will take place at secure areas, away from wetlands or drainages.
- Workers will be trained in spill clean-up and the use of spill cleanup kits.

These measures will ensure that surface and groundwater quality will not be degraded through inadvertent spillage of contaminants.

6.4 CULTURAL RESOURCES

6.4.1 Description of Resources

Archaeological Resources

Between 2019 to 2020, before the split of the two separate 200 MW wind projects, AECOM coordinated with the State Historical Society of North Dakota (SHSND) on the appropriate scope and level of survey for cultural resources and was assigned North Dakota State Historic Preservation Office (NDSHPO) reference number 19-0332. A Class I: Literature Review was completed for the respective area and a Class III: Intensive Cultural Resources Inventory was completed. The results of these studies are contained in "Red Butte Transmission Line: Class III Cultural Resource Inventory in Mercer and Oliver Counties, North Dakota" (MS No. 19278 [McCarthy et. al 2021]), which is on file with the NDSHPO. The report received NDSHPO concurrence on July 14, 2021 (Appendix C).

After the split of the Red Butte and Oliver Wind IV projects in March 2023, the Project was assigned the new NDSHPO reference number 23-0203. Burns & McDonnell completed a Class I: Literature Review for the Project Area plus a one-mile buffer. Burns & McDonnell also completed further Class III: Intensive Cultural Resources Inventories in 2022 and 2023 for new Project design areas, which had not previously been surveyed. The Class III surveys were completed within a survey corridor for all areas potentially affected by temporary and/or permanent ground disturbance to identify archaeological resources. A Class III Cultural Resource Inventory report is currently underway for these inventories. Once complete, the report will be submitted to the SHSND for review and concurrence. A summary of all the relevant Class III: Cultural Resources Inventory Reports in included in Appendix B4.

The Class I: Literature Review followed the NDSHPO Guidelines Manual for Cultural Resources Inventory Projects (SHSND 2020) and included a file search of the North Dakota Cultural Resources Survey (NDCRS) data files maintained by the SHSND. Review of NDCRS data files included review of archaeological, historical, and architectural resource forms and cultural resources survey reports, as well as Cultural Heritage Forms available at the SHSND in Bismarck, North Dakota. The file search also included a review of the National Register of Historic Places (NRHP) records maintained by the National Park Service (NPS) to identify historic properties listed on the NRHP, historic plat maps, and U.S. Geological Survey (USGS) topographic maps.

The Class I: Literature Review identified 22 previous cultural resource inventories and a total of 163 previously recorded cultural resources. No previously recorded Cultural Heritage Sites or resources currently listed on the NRHP were identified in the Class I: Literature Review.

Cultural resources can be defined as any resource that has cultural character (King 2012). Expanding upon this simple definition, "cultural resources" include all landscapes, buildings, sites, districts, structures, or objects that have been created by or associated with humans and are considered to have historical or cultural value. The term "historic property" includes only those cultural resources that are listed in or eligible for listing on the NRHP, which was established by the National Historic Preservation Act, 1966 (16 U.S. Code 470 *et seq.*, as amended). Finally, "site" refers to any location in which human activities have occurred and where material evidence of those activities remains. Sites are defined as locations of past human activity older than 50 years, containing one or more cultural features, six or more artifacts, intact subsurface cultural materials, or a combination of these qualities, within an area of approximately 60 square meters (645 square feet), and spatially discrete from areas of similar content by approximately 60 meters

(approximately 200 feet) (SHSND 2020). Isolated finds are defined as areas of past human activity older than 50 years, containing five or fewer artifacts with limited potential to possess subsurface cultural materials. Site leads are either a) isolated finds, as defined above, with the potential to possess substantial subsurface deposits, or b) locations reported by non-archaeologists as containing cultural resources that have not been field verified by an archaeologist (SHSND 2020).

Among the 163 previously recorded cultural resources recorded on NDCRS forms, 13 have been previously recommended as eligible for the NRHP. Ten of these sites are Native American cultural material scatters or possible village sites, while the remaining three are Euro-American sites. None of the eligible sites cross into the temporary or permanent construction easement for the Project.

A further 13 cultural resources have been recommended potentially eligible for the NRHP. Twelve of these are Native American sites, while one is a Euro-American site. A total of 61 cultural resources have not been formally evaluated for eligibility for the NRHP. These include nine Native American site leads, 35 Native American sites, four Euro-American site leads, six Euro-American sites, six architectural site leads, and one architectural site. None of the unevaluated sites will be impacted by the Project's temporary or permanent construction easement.

A total of 76 cultural resources have been previously recommended not eligible for the NRHP. These include three Native American site leads, 25 Native American isolated finds, nine Euro-American archaeological sites, 33 architectural sites, and six architectural sites.

Nearly all of the Native American sites or site leads were lithic scatters or stone circle sites. The Euro-American sites include collapsed abandoned farmsteads, foundations, cultural material scatters, or a combination of these feature types.

The current Project utilizes an avoidance strategy design to completely avoid previous and newly documented archaeological sites that are recommended for avoidance by the SHSND and participating Tribal Historic Preservation Officers (THPOs). Avoidance buffers will be delineated prior to construction to avoid impacts to archaeological resources.

Native American Coordination

On June 25, 2019, outreach letters were sent to the following 19 Native American Tribes:

- Cheyenne River Sioux Tribe
- Crow Nation
- Flandreau Santee Sioux Tribe
- Fort Belknap Indian Community
- Fort Peck Assiniboine and Sioux Tribes
- Lower Brule Sioux Tribe
- Lower Sioux Indian Community
- Mandan, Hidatsa, and Arikara Nations
- Northern Arapaho
- Northern Cheyenne Tribe
- Oglala Lakota Nation
- Rosebud Sioux Tribe
- Santee Sioux Nation
- Sisseton-Wahpeton Oyate

- Spirit Lake Sioux Tribe
- Standing Rock Sioux Tribe
- Turtle Mountain Band of Chippewa Indians
- Upper Sioux Community
- Yankton Sioux Tribe

Since that time, numerous discussions have taken place with the following ten interested Native American Tribes to discuss the Project, survey plans, and cultural resource report content and format:

- Cheyenne River Sioux Tribe
- Mandan, Hidatsa, and Arikara Nations
- Northern Arapaho
- Northern Cheyenne Tribe
- Rosebud Sioux Tribe
- Sisseton-Wahpeton Oyate
- Spirit Lake Sioux Tribe
- Standing Rock Sioux Tribe
- Turtle Mountain Band of Chippewa Indians
- Yankton Sioux Tribe

The first stage of tribal participation focused on assisting with micrositing the proposed transmission line route for the Previous Project. During this stage, Traditional Cultural Surveyors (TCS) from the Standing Rock Sioux Tribe and the Rosebud Sioux Tribe visited the proposed right-of-way with representatives from Oliver Wind IV and AECOM to assess the locations for potential cultural resources and Sites of Religious and/or Cultural Significance to Tribes (SRCSTT). After completion of this preliminary stage, the layout was revised prior to the second stage of study.

In August through November 2019 and in October 2020, stage two of the tribal study focused on field surveys. During stage two, TCS from the Rosebud Sioux Tribe, Turtle Mountain Band of Chippewa Indians, Northern Cheyenne Tribe, Northern Arapaho, Standing Rock Sioux Tribe, and the Spirit Lake Sioux Tribe completed a joint field survey together with cultural resources consultants. Results of these field efforts are recorded in “Red Butte Transmission Line: A Class III Cultural Resource Inventory in Mercer and Oliver Counties, North Dakota” (MS No. 19278 [McCarthy et. al 2021]) which is on file with the NDSHPO. As previously noted, this report received NDSHPO concurrence on July 14, 2021.

Further rounds of micrositing were conducted in August 2022 to maintain continued tribal coordination on the Project. A tribal representative from the Rosebud Sioux Tribe and Standing Rock Sioux Tribe participated in this effort. In October 2022 and June 2023, TCS from the Rosebud Sioux Tribe, the Standing Rock Sioux Tribe, Turtle Mountain Band of Chippewa Indians, and the Spirit Lake Sioux Tribe completed field surveys together with cultural resources consultants.

If future location changes in Project infrastructure occur, further fieldwork and tribal coordination will be completed. TCS from the Rosebud Sioux Tribe, Mandan, Hidatsa, and Arikara Nations, Turtle Mountain Band of Chippewa Indians, Northern Arapaho, Yankton Sioux, Northern Cheyenne Tribe, and the Spirit Lake Tribe will be invited to assist in joint tribal and cultural resource consultant field surveys.

Oliver Wind IV, participating THPOs, Burns & McDonnell, and the SHSND are coordinating preparation of reports that include the results of the joint surveys into Class III Cultural Resources Inventory Reports.

6.4.2 Impacts/Mitigation

Archaeological sites, including SRCSTT, will be avoided during construction in accordance with input from the SHSND and participating THPOs. Cultural sites that are recommended for avoidance by the SHSND and participating THPOs that are in close proximity to proposed construction easements will be fenced to reduce the potential for inadvertent disturbance. Therefore, no direct impacts to cultural resources are anticipated.

An Unanticipated Discoveries Plan will be prepared that will outline the procedure utilized to address any unanticipated discoveries of cultural resources, including possible human remains. In the event that unanticipated discoveries are made during construction, the Unanticipated Discoveries Plan will provide direction to on-site personnel and their consultants regarding proper procedures for addressing the discoveries. In the event that burials are discovered during construction, construction activities would stop within 100 feet of the site and the site would be protected until the appropriate county sheriff's office has been contacted. The Sheriff will be responsible for contacting the North Dakota State Forensic Examiner to determine if the remains are associated with a crime scene. If the remains are determined not to be part of an active crime scene or investigation, the North Dakota Chief Archaeologist will be contacted to coordinate how to proceed.

6.5 LAND USE RESOURCES

6.5.1 Description of Resources

The Study Area is located in rural North Dakota in an area predominantly comprised of cultivated land, hayfields, pasturelands, and grasslands. Accordingly, much of the Study Area is used for agricultural purposes supporting both livestock grazing and crops, and most of the Study Area has been converted to commercial crops. Wooded areas within the Study Area are limited to shelterbelts between fields, windbreaks surrounding farmsteads, along drainages, and near wetlands.

Public Lands

The Study Area is not located within any designated or registered national sites, including parks, memorial parks, historic sites and landmarks, natural landmarks, historic districts, monuments, wilderness areas, wildlife areas, wild, scenic, or recreational rivers, wildlife refuges, and grasslands (NDGIS 2023). The Lewis and Clark National Historic Trail which follows the historic routes of the Lewis and Clark expedition and meanders on and off public and private land across 16 states is located approximately 0.5 mile east of the Study Area on private land. The Knife River Indian Villages (KRIV) National Historic Site, which is a unit of the National Park System and administered by the NPS, is located approximately 2.5 miles north of the Study Area along the Missouri River. The Fort Clark State Historic Site is located approximately 1.25 miles southeast of the Study Area. Currently, existing infrastructure is within the viewsheds of both sites including transmission lines, wind turbines, mining operations, and the Leland Olds Power Station. To date, NDSHPO has not expressed concern to Oliver Wind IV regarding viewshed impacts to KRIV or Fort Clark. However, the NPS has requested a viewshed analysis to compare the existing surrounding landscape to the proposed Project and Wind Energy Center

development. Oliver Wind IV has been actively collaborating with NPS on the viewshed analysis and will provide the Commission with the final report and updated correspondence with NPS.

Within the Study Area is the North Dakota Game and Fish Department (NDGFD)-managed Normand and Lucille Schaefer and Missouri Breaks Wildlife Management Areas (WMA), which are dedicated to public use and wildlife habitat management (Figure 9). Both WMAs contain areas of a reclaimed coal mine. The Study Area is not located within any designated or registered state parks, forests, forest management lands, historic sites, monuments, historical markers, archaeological sites, grasslands, wild, scenic, or recreational rivers, game refuges, and nature preserves. School trust land properties, which are managed by the North Dakota Department of Trust Lands (NDDTL), are not located within the Study Area. The NDGFD-managed Stanton UAP Boat Ramp along the Missouri River is located 0.5 miles north of the Study Area (Figure 7).

The Study Area is not located within any county parks and recreational areas, municipal parks, parks administered by other governmental subdivisions, hardwood draws, or enrolled woodlands.

Easements and Agreements

Within the Study Area is the U.S. Bureau of Reclamation (USBR) Fort Clark Unit irrigation canal system. The Fort Clark canals are under the management of USBR, facilitated through easements with individual landowners.

Within the Study Area there are no Private Land Open to Sportsmen (PLOTS) easements (NDGIS 2023) and there are also no lands or waters (wetland or grassland easements) administered by the U.S. Fish and Wildlife Service (USFWS) (USFWS 2023a) (Figure 9).

Conservation Reserve Program (CRP) lands administered by the Farm Service Agency (FSA) through the U.S. Department of Agriculture (USDA) have the potential to occur in the Study Area. In exchange for yearly compensation, CRP lands are removed from agricultural production and planted with species that will improve environmental quality and health, with a long-term goal of establishing valuable land cover to improve water quality, prevent soil erosion, and reduce the loss of wildlife habitat (USDA, FSA 2023). Specific CRP acres are subject to privacy laws between each landowner and the FSA.

Land Cover

Land cover classifications, including acreage and percent within the Study Area, are shown in Table 6.5-1 and Figure 10. The Study Area is comprised primarily of herbaceous grasslands (58.58 percent) and cultivated lands (27.10 percent).

TABLE 6.5-1
Land Cover

Land Cover	Acreage within Study Area	Percentage of Study Area
Barren Land	2.22	0.02%
Cultivated Crops	3449.56	27.10%
Deciduous Forest	160.82	1.26%
Developed, High Intensity	0.44	0.00%
Developed, Low Intensity	31.73	0.25%
Developed, Medium Intensity	5.42	0.04%
Developed, Open Space	282.43	2.22%

TABLE 6.5-1
Land Cover

Land Cover	Acreage within Study Area	Percentage of Study Area
Emergent Herbaceous Wetlands	198.30	1.56%
Hay/Pasture	1076.15	8.45%
Herbaceous	7458.32	58.58%
Mixed Forest	2.00	0.02%
Open Water	8.04	0.06%
Shrub/Scrub	9.08	0.07%
Woody Wetlands	46.28	0.36%
Total	**12,730.80**	**100.00%**

Source: National Land Cover Database (NLCD) (Homer et al. 2015)

There are unbroken grasslands within the Project Corridor. Unbroken grassland is grassland that has not been actively or historically disturbed by tilling, construction, or other mechanical methods. Other disturbance methods such as grazing, haying, fire, or other types of management actions, as well as undesirable species, did not qualify a grassland as broken. The NDGFD defines unbroken grasslands as “grasslands that have not been tilled or otherwise broken” (NDGFD 2021).

An unbroken grassland assessment was completed using desktop assessment and field survey confirmation. The assessment concluded that 48 transmission structures would be located within unbroken grassland, which would result in 0.06 acres of permanent impacts to unbroken grassland. All temporary impacts during construction would be reclaimed with locally sourced native seed mixes.

6.5.2 Impacts/Mitigation

Oliver Wind IV will work with landowners to minimize impacts to their land. Where feasible, the Project was positioned along section lines and field edges to lessen the fragmentation of land. Once construction activities have been completed, temporary construction areas will be able to go back to their previous use.

Oliver Wind IV will protect existing trees and shrubs by avoiding tree removal where possible. However, tree removal will be necessary to accommodate construction of structures and comply with clearance requirements during operations of the Project. Oliver Wind IV will replace consistent with the Commission’s Tree and Shrub Mitigation Specifications. Oliver Wind IV requests a modification to the Commission’s Tree and Shrub Mitigation Specifications which limits clearance up to 50 feet in width. Specifically, Oliver Wind IV requests clearance of up to 150 feet in width, or the width of the Project Corridor, to comply with clearance requirements during operations of the Project.

Oliver Wind IV proposes the following mitigation measures:

- Develop and implement a Noxious Weed Management and Control Plan to eliminate the spread of weeds during construction and to implement prescribed treatments to eliminate, to the maximum extent possible, the invasion of weeds from surrounding lands.
- Provide contractors with static constraint maps and facilitate compliance through onsite environmental construction monitoring.

- Coordinate with local Natural Resources Conservation Service staff to revegetate non-cropland and pasture areas temporarily disturbed during construction or operation of the Project with locally sourced native seed mixes appropriate to the region.
- Reseed temporarily disturbed areas or restore to crop, based on the conditions of the area prior to construction and based on landowner preference.

Public Lands

No public lands will be directly impacted as impacts to public lands will mainly be visual in nature. Additionally, the Project is surrounded by existing infrastructure (Figure 6) and will not create a significant additional visual impact. A visual analysis is underway to demonstrate no significant viewshed impacts to KRIV or Fort Clark State Historic Site. Currently, no mitigation is proposed.

Easements and Agreements

Oliver Wind IV will obtain a letter of consent from both the USBR and the respective landowner to cross the Fort Clark Unit irrigation canal system. No mitigation is required.

Any land taken out of CRP will be negotiated between the individual landowner and the FSA. No mitigation is required.

Land Cover

The development of the Project will not result in a significant change in land use within the Study Area. Construction of the Project will permanently impact approximately 0.2 acres (which is less than one percent of the Project Corridor and includes 0.06 acres of unbroken grassland) and temporarily impact approximately 106.1 acres.

6.6 GEOLOGICAL AND SOIL RESOURCES

6.6.1 Description of Resources

Geology and Soils

The Study Area is in the Missouri Plateau Class IV ecoregion, which is a more detailed ecoregion for state-level applications (Bryce et al. 1996). The Missouri Plateau was largely unaffected by glaciation and retains its original soils and complex stream drainage pattern. The surface geology in the Study Area is dominated by Paleocene sediments made up of silt and sand with an approximate thickness of 650 feet and Quaternary sediments with an approximate thickness of 100 feet (NDGIS 2023).

Soil characteristics within the Study Area were assessed using the Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO). The SSURGO database provides a description of the soils present and information about their unique properties and productivity (USDA 2023). In all, 49 soil types are found within the Project Corridor. The dominant soil map units found within the Project Corridor are classified as mined land and sandy loams or loams and range from well drained to poorly drained.

Landslide areas as indicated by the North Dakota Geological Survey (NDGS) landslide mapping program are present within the Study Area. Landslide deposits within the Project Corridor are located between structures 95 and 96 and 116 and 117.

Mining and Mineral Interests

The Study Area contains one active gravel mine (Anderson 2012; Google Earth 2023); one dry non-active oil and gas exploration well (NDOGD 2023); no active coal mines (Commission 2015); and no active coal leases. The closest permitted coal mine is the Center Mine operated by BNI under permit number BNCR-9702, which is located approximately six miles southeast of the Study Area (BNI 2023). The Study Area and Project Corridor are located within areas previously mined for coal and mine spoils as defined by the NDGS and NRCS Web Soil Survey (NDGS 2007, USDA 2023). The approximate location of known abandoned coal mines, reclaimed coal mines and areas of mined coal, and active coal mine permit boundaries (BNI 2023, DWC 2020) are shown on Figure 6 and Figure 13.

Per coordination with NDDTL, there is one coal lease managed by NDDTL within the area studied per the agency notification letters (Appendix C). However, the coal lease identified by NDDTL is outside of the Study Area.

Geotechnical and Geophysical Investigation

A geophysical investigation to assess potential mine spoils along the north side of the transmission line has been completed. A multi-channel analysis of surface waves geophysics investigation was performed in areas identified as having potential mine spoils and in areas believed to be native soils (Figure 6 and Figure 13, NDGS 2007, USDA 2023). The geophysics survey indicated that the native soils and mine spoils (if present) could not be differentiated as the velocity contrasts were not significantly different. The geophysics survey did indicate it could differentiate between soil (native or spoil) versus bedrock. The estimated depth to bedrock typically ranged from 25 to 40 feet.

As of September 2023, a geotechnical investigation is in progress with 11 out of the planned 35 boring locations surveyed. Two geotechnical investigation borings were performed in areas identified as having potential mine spoils, both of which indicated that mine spoils were not present. Additional borings were performed along the north side of the Project Route near areas identified as having potential mine spoils that indicated mine spoils were not present. Based on the geotechnical investigation at the surveyed locations, the subsurface stratigraphy typically consists of topsoil overlaying clay glacial till, occasionally with sand layers. Underlying the soil, weathered to intact shale is commonly found, sometimes accompanied by a layer of sandstone. Some interbedded lignite (also known as coal) has been observed. To date, no voids have been observed during the geotechnical investigation.

6.6.2 Impacts/Mitigation

Geology and Soils

Impacts to soils will be limited to areas removed from their current use by the occupancy of Project structures. Soil disturbance activities including grading and leveling at structure locations has the potential to contribute to soil erosion through the exposure of soils that were previously vegetated and stable.

Oliver Wind IV proposes the following mitigative measures:

- Use the Project Storm Water Pollution Prevention Plan (SWPPP) during construction to mitigate disturbed soils and prevent erosion.

- Maintain appropriate water and soil conservation practices during construction through the implementation of best management practices (BMPs). These practices include silt fencing, temporary reseeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways and sod stabilization, and separation of topsoil and subsoil.
- Implement a 25-miles per hour (mph) speed limit on Project roads to minimize dust.
- Alleviate compaction of soils if it occurs during construction.

A geotechnical and geophysical analysis is being performed and areas which are geologically unstable will be avoided and spanned as necessary. No transmission line structure locations will be located within mapped landslide deposits, as indicated by the NDGS landslide mapping program.

Mining and Mineral Interests

No mitigation is required.

Geotechnical and Geophysical Investigation

Based on the results of the geotechnical investigation completed as of August 2023, no areas were identified as unstable. In general, low strength layers were not observed. The investigated areas indicate that the site is suitable for construction.

6.7 SURFACE WATER AND GROUNDWATER RESOURCES

6.7.1 Description of Resources

Groundwater

The Study Area is located within the Missouri Slope ecoregion, an unglaciated region of North Dakota that includes minimal natural wetland basins and abundant small creeks and streams (NDGFD 2015).

A portion of the northeast region of the Study Area overlaps with the City of Washburn community source water protection area and Missouri River sensitive groundwater area, both of which are located outside the Project Corridor (NDDWR 2023). Square Butte Creek aquifer sensitive groundwater area overlaps the Project Study Area and Project Corridor from approximately structure 65 to 70.

Water wells that draw water from aquifers or groundwater may be located within the Study Area (NDDWR 2023). These water wells serve various purposes, including domestic and stock uses.

Surface Waters

Within the Study Area there are numerous intermittent, unnamed tributaries and three named creeks: Brady Creek, Kinneman Creek, and Alderin Creek. The majority of the Study Area is drained into the Alderin Creek-Missouri River watershed, Cambridge Cemetery-Knife River watershed, Headwaters Square Butte Creek watershed, Kinneman Creek watershed, and Brady Creek watershed.

Merjent delineated wetlands and other waters in support of the Project (Appendix B6). Other waters can include, but are not limited to, streams, ponds, impoundments, prairie potholes, and

lakes. Field surveys occurred from 2019 to 2023 within the survey corridor. The survey corridor is any location where potential Project infrastructure could be sited within the Study Area. Wetlands and other waters delineations followed methodology from the U.S. Army Corps of Engineers (USACE) Wetlands Delineation Manual (Environmental Laboratory 1987) and Regional Supplement to the USACE Wetland Delineation Manual: Great Plains Region (Version 2.0) (USACE 2010). The USFWS National Wetlands Inventory (NWI) and U.S Geological Survey National Hydrography Dataset (NHD) were used to identify potential surface waters within the Study Area (USFWS 2023b, USGS 2023, Figure 11). This data served as a precursor for field delineations. Wetlands and other waters delineated in support of the Project are shown on Figure 11.

Floodplains

North Dakota Department of Water Resources (NDDWR) Risk Assessment MapService (NDRAM) base level engineering flood data is present along creeks and streams located within the Study Area (NDDWR, NDRAM 2023). Per the 2023 agency response letter received from the NDDWR there are Federal Emergency Management Agency (FEMA)-mapped floodplains identified and/or mapped at the Project location (Zone A). Review of the Flood Insurance Rate Maps showed that Zone A floodplains are present in the Project Corridor in Mercer County (USDHS, FEMA 2023). However, no transmission line structures are within mapped floodplains. Therefore, no floodplain permits are necessary from Oliver or Mercer County relative to the National Flood Insurance Program.

6.7.2 Impacts/Mitigation

Groundwater

If shallow groundwater is disturbed by construction, it is anticipated that it would resume its natural course of flow upon construction completion and would not be significantly impacted. Based on the relatively small amount of permanent infrastructure at each structure location, the Project would not contribute to significant impacts on groundwater flow or recharge.

Surface Waters

The Project will not require appropriation of surface water or permanent dewatering. Temporary dewatering of groundwater (*i.e.*, locally lowering groundwater levels in the vicinity of the excavation) may be required during construction.

The Project has been designed to minimize impacts to wetlands and other waters to the extent practicable. Based on wetlands and other waters delineation surveys, the Project is not expected to impact wetlands or other waters.

If dewatering of excavations is necessary during foundation construction and as long as the water is known to be uncontaminated, all water would be discharged according to items outlined in the SWPPP. If discharge water is suspected to be contaminated, an application for a temporary discharge permit (NDG-070000) will be submitted to the North Dakota Department of Environmental Quality (NDDEQ).

Oliver Wind IV proposes the following measures:

- Minimize impacts to wetlands and other waters to the extent practicable.
- The Project will be built to allow stormwater runoff to flow unrestricted.
- Wetlands will be delineated and flagged prior to construction when in close proximity to Project features.
- Maintain appropriate water and soil conservation practices during construction through the implementation of BMPs outlined in the SWPPP. These practices include silt fencing, temporary reseeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways, and sod stabilization.
- Coverage under the NDDEQ's National Pollutant Discharge Elimination System (NPDES) general construction permit will be obtained prior to the start of construction.
- Provide contractors with static constraint maps and ensure compliance through onsite environmental construction monitoring.

Floodplains

Project facilities will be located and constructed in such a manner that no impacts are anticipated to floodplains based on the FEMA Flood Insurance Rate Maps. No mitigation is required.

6.8 WILDLIFE RESOURCES

6.8.1 Description of Resources

Oliver Wind IV conducted numerous wildlife studies to evaluate, avoid and minimize potential impacts to species of concern from Project development and operation. Wildlife surveys were conducted in coordination with USFWS and NDGFD. The following desktop assessments and field studies were conducted with respect to the voluntary USFWS 2012 Final Land-Based Wind Energy Guidelines (USFWS 2012) to document wildlife habitat and use.

- Sharp-tailed grouse (*Tympanuchus phasianellus*) lek surveys were completed in May 2019 (Appendix B3) and April 2020 (Appendix B4).
- Raptor nest surveys were completed from February to July 2020 (Appendix B5) and February to June 2022 (Appendix B6).
- Desktop whooping crane (*Grus americana*) habitat review was completed in 2023 (Appendix B7).
- Northern long-eared bat (NLEB; *Myotis septentrionalis*) presence/absence surveys completed July 26 to August 16, 2019 (Appendix B8); July 22 to July 28, 2020 (Appendix B9); and August 11 to August 24, 2022 (Appendix B10).
- Dakota skipper (*Hesperia dacotae*) surveys were completed from August 10, 17 to 19, and 22 to 23, 2022; and June 15, June 26 to 27, July 6, and July 17, 2023 (Appendix B11).

Avian Species

The Migratory Bird Treaty Act (MBTA) was enacted in 1918 for the purpose of prohibiting the use of birds and bird parts in the millinery industry. Under the MBTA, it is illegal "to pursue, hunt, take, capture, kill … possess, offer for sale, sell … purchase … ship, export, import …transport or cause to be transported… any migratory bird, any part, nest, or eggs of any such bird …" (16 United States Code 703). The word "take" is defined by regulation as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 Code of Federal Regulation [CFR] 10.12). The USFWS maintains a list of all species protected by the MBTA at 50 CFR 10.13.

Additionally, bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA). The BGEPA protects bald eagles and golden eagles throughout their range in the United States. Although it does not designate critical habitat, BGEPA protects individual eagles and nests from disturbance.

Sharp-tailed Grouse Lek Surveys

Oliver Wind IV completed two years of aerial and ground sharp-tailed grouse lek surveys. Surveys were conducted within a study area that encompassed the Project Corridor and most of the Project Study Area. Two confirmed leks were documented within the Study Area during the 2019 and 2020 surveys. Among these leks, none were located within the Project Corridor.

Raptor Nest Surveys

Oliver Wind IV completed two years of aerial and ground raptor nest surveys. The 2020 survey was conducted within an area that encompassed the Project Corridor and most of the Study Area. The 2022 survey was conducted within an area that encompassed the southern half of the Study Area. Aerial and ground-based surveys were conducted following the timeframes recommended by the USFWS Region 6 protocol (USFWS 2021a) and Eagle Conservation Plan Guidance (USFWS 2013). During the 2020 and 2022 surveys, a total of 19 non-eagle raptor nests were documented within the Study Area, of which 11 were documented as active. Among these nests, one active and one inactive non-eagle raptor nest were located within the Project Corridor. Additionally, there was one active bald eagle nest documented approximately 4.6 miles east of the Study Area.

Bat Species

Eleven bat species are found in North Dakota (Gullickson 1999). Based on the presence of suitable habitat, known distribution ranges, and documented occurrences, five of these species are expected to have a moderate to high potential to occur within the Study Area: little brown bat (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasioncycteris noctivagans*), eastern red bat (*Lasiurus borealis*), and hoary bat (*Lasiurus cinereus*). These bat species are often found roosting in attics, barns, or in trees underneath a canopy of leaves. The remaining six species are expected to have a low potential for occurrence in the Study Area. Additionally, given the lack of caves or other features that could serve as hibernacula, wintering use is not expected in the Study Area.

Suitable natural roosting habitats in the Study Area are limited to individual trees, windrows, wooded drainages, buildings, bridges, and riparian zones. Farmstead buildings (*e.g.,* houses, barns) could also provide potential roosting locations within the Study Area; however, the suitability of these man-made structures has not been evaluated. Bat acoustic and mist net

surveys were completed along the Project Corridor. The survey results related to NLEB are included in Section 6.9.

6.8.2 Impacts/Mitigation

Avian Species

Potential impacts from the Project to avian species include direct impacts, such as collisions with the transmission lines, and indirect impacts, such as displacement or habitat loss and fragmentation. Potential impacts to raptor nests and grouse leks were minimized to the greatest extent practicable through site planning and avoidance of documented nest and lek locations.

Raptor nests will be avoided to the extent practicable and disturbance minimized during nesting season. Vegetative removal will be conducted outside of this March through July period to the extent practicable to avoid impacts to previously undetected nests. Any tree removal needed from March through July will be preceded by a visual check of the trees for any raptor nests. No raptor nests with eggs or chicks will be removed at any time.

Bat Species

Potential impacts from the Project to bat species include indirect impacts, such as displacement or habitat loss and fragmentation. Direct impacts such as collision with the Project are not anticipated.

Highly suitable habitats (*i.e.,* woodlands) for bats are largely absent from the Study Area. Natural roosting habitat (individual trees, windrows, woodlots, and riparian zones) is limited and fragmented. Lower quality habitat in the form of grasslands and agriculture lands compose the majority of the Study Area. Bat species may transit through the Study Area during spring and fall migration; however, identifiable migration and movement corridors for bats are not known in the Study Area. There are no large forested riparian corridors for bat species to follow or use as stopover day roosting sites. Forested areas within the Study Area consist mainly of small, wooded parcels that are disconnected from each other. Given the lack of large, forested riparian corridors and limited roosting habitat within the Study Area, use of the Study Area by migrating bats is likely to be low.

Mitigation

Oliver Wind IV conducted desktop assessments and field studies and consulted with the NDGFD and USFWS on appropriate avoidance, minimization, and offset measures so that the Project would have minimal environmental impacts. Based on the above, the following measures will be used to the extent practicable by Oliver Wind IV:

- Design utility lines, and mark with bird flight diverters, with respect to APLIC guidelines to prevent bird collision, as practicable (APLIC 2012).
- Design utility lines to provide adequate raptor proofing as described in the APLIC Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (APLIC 2006) on the structures in coordination with applicable state and federal agencies.
- Minimize construction activities to the extent practicable within 0.5 mile of known sharp-tailed grouse lek locations during the lekking and breeding season.
- The Project Corridor has been sited at least two miles from known active eagle nests.

- If any raptor nest is discovered during construction, the nest will be monitored to determine if there is a change in the nest activity status in order to avoid impacts that might have the potential to precipitate nest abandonment.
- Provide contractors with static constraint maps and ensure compliance through onsite environmental construction monitoring.
- Implement a 25-mph speed limit on Project roads to minimize wildlife collisions.
- Prepare a voluntary Wildlife Conservation Strategy (WCS) that includes an adaptive management approach, so that information gathered during post-construction monitoring can be used to inform future management decisions at the Project.
- Implement an operational Wildlife Response and Reporting System (WRRS). The WRRS will include reporting protocols to report and document bird and bat mortality during routine maintenance activities. If a dead or injured bird or bat is found, its location will be marked and reported to the Plant Lead/Site Supervisor. The dead or injured bird or bat will not be removed from the location it was found.

6.9 RARE AND UNIQUE NATURAL RESOURCES

6.9.1 Description of Resources

The USFWS administers the Endangered Species Act of 1973 (ESA), which mandates protection of species federally listed as threatened and endangered (T&E) and their associated habitats. An endangered species is a species that is in danger of extinction throughout all or a significant portion of its range. A threatened species is a species that is likely to become endangered in the foreseeable future. Critical habitat for these species can be designated if that habitat includes specific areas that are occupied by a species at the time of listing or unoccupied areas that are considered essential to the conservation of a species. Candidate species receive no statutory protection from the USFWS unless they are formally listed. North Dakota does not have a state T&E species list; however, it recognizes those federally listed under the ESA.

Seven federally listed species are believed or known to occur in North Dakota; however, the USFWS Information for Planning and Conservation (IPaC) tool (USFWS 2023c), indicated that five T&E species could potentially occur within the Study Area. These species include three birds, one mammal, and one insect: piping plover (*Charadrius melodus,* threatened), red knot (*Calidris canutus rufa,* threatened), whooping crane (*Grus Americana,* endangered), NLEB (endangered), and Dakota skipper (*Hesperia dacotae*, threatened). These T&E species are described in greater detail below.

Piping Plover

The preferred habitat of piping plover is generally characterized as exposed, sparsely vegetated shores and islands of shallow, alkali lakes and impoundments for breeding (NDGFD 2015). Piping plovers prefer salt-encrusted, alkali, or sub-saline semi-permanent lakes, ponds, and rivers with wide shorelines of gravel, sand, or pebbles. The piping plover nest in the sand or shoreline, generally near an object such as a clump of grass, rock, or small log but never in heavy vegetation. Piping plover forage on fly larvae, beetles, crustaceans, mollusks, and other small animals near the shoreline, or sometimes by the nest.

Critical habitat has been federally designated for the piping plover in North Dakota, mainly along the shores of the Missouri River and wildlife refuge areas (NDGFD 2015). Key areas and

conditions for piping plover in North Dakota include the Alkali Lakes Core Area, which follows the Missouri Coteau landform from central North Dakota to northeast Montana.

The closest designated critical habitat is along the Missouri River, located approximately 0.7 miles north of the Study Area (USFWS 2023d). The Study Area is located outside of the Alkali Lakes Core Area. The nearest part of the Alkali Lakes Core Area is located approximately 22 miles northeast of the Study Area. The Study Area is located outside the primary range and within the possible range of the piping plover (NDGFD 2015).

During the field surveys in the Study Area, no sandy or gravelly beaches, sandbars, alkaline wetlands, or lakes were delineated or observed. With the absence of preferred nesting habitat, it is unlikely that piping plover may occur within the Study Area. Additionally, no potential piping plover habitat was identified during the field surveys in the Project Corridor.

Red Knot

The red knot is noted for its long-distance migrations of more than 9,000 miles between circumpolar breeding habitats and marine wintering habitats in southern latitudes of South America (USFWS 2022a). Most of the known migration routes for the Rufa subspecies are along coastal regions of Canada and the United States. However, an interior migratory route was identified to and from the Arctic, passing through Saskatchewan and Alberta Canada, through the Great Plains states, to non-breeding areas mostly in Texas and Louisiana along coastal areas of the Gulf of Mexico.

Critical habitat has been federally proposed for the red knot, although there is no proposed critical habitat in North Dakota (USFWS 2021b). In North Dakota during migration, both alkaline and freshwater lakes have been used by red knots (NDGFD 2015). The observations of red knots in North Dakota are scattered throughout the state. Red knots have been observed in the Missouri River system as well as sewage lagoons and large permanent freshwater wetlands. There are no stopover sites consistently used by red knots in North Dakota. The entire state of North Dakota is within the possible range of the red knot.

During the field surveys in the Project Corridor, no sandy or gravelly beaches, sandbars, alkaline wetlands, or lakes were delineated or observed. With the absence of preferred nesting habitat, it is unlikely that red knots may occur within the Study Area. Additionally, no potential red knot stopover sites were identified during the field surveys in the Project Corridor.

Whooping Crane

Whooping cranes typically migrate from their breeding grounds in the Wood Buffalo National Park in Canada, to their wintering areas in the Aransas National Wildlife Refuge in Texas, moving through Oklahoma, Kansas, Nebraska, North Dakota, and South Dakota (USFWS 2022b). A 200-mile-wide migration corridor has been delineated for the whooping crane that contains 95 percent of all verified sightings. Stopover habitat during migration includes a variety of croplands with roosting occurring in shallow, freshwater inland wetlands. This entire migration corridor includes a swath of the central U.S. and extends from southcentral North Dakota along the Missouri River to northwest North Dakota through the Study Area.

A whooping crane habitat review was completed for the Project with a focus on the Wind Energy Center (Appendix B7). The habitat review evaluated whether the habitat review area, which includes the southern half of the Study Area, represents unique or high-quality whooping crane habitat compared to the surrounding landscape. The analysis concluded the habitat review area

is within the whooping crane migratory corridor and that the habitat review area is similar to the surrounding landscape. No USFWS whooping crane sightings have been recorded within the habitat review area. However, one record of a telemetered whooping crane occurrence was recorded within the Study Area. The predicted probability of whooping crane habitat use within the habitat review area ranged from 0.0001-0.1. Given the low probability of use of the habitat review area, similarity of probability of use compared to areas outside of the habitat review area, and lack of whooping crane mortalities to date, impacts to whooping cranes are unlikely.

Northern Long-Eared Bat

NLEB generally roosts in trees under loose bark or within holes, hibernates within caves and mine shafts, and occupies forested habitats between mid-May and mid-August, depending on latitude (NDGFD 2015). The NLEB prefers large, contiguous tracks of upland forested habitat during the summer residency period. Natural roosting habitats in the Study Area are limited to individual trees, trees along drainages, and trees near wetlands. The Study Area and all of North Dakota is within the NLEB range. The closest primary range of the NLEB is along the Missouri River, located approximately 0.75 miles northeast of the Study Area.

Western EcoSystems Technology, Inc. (WEST) conducted NLEB presence/absence acoustic and mist-net surveys in support of the Project (Appendix B8 through B10). The presence of NLEBs was initially assessed with a desktop assessment of potential habitat. Acoustic assessments were conducted at these potential habitat locations using specialized bat detectors that recorded ultrasonic calls made by bats. Data collected over multiple nights were then analyzed to identify and distinguish NLEB calls from other species. Following the acoustic assessment, targeted mist-netting surveys were carried out at the locations where previously identified NLEB calls were detected. The mist-netting method allowed for the safe capture and examination of bats, aiding in the confirmation of NLEB presence near the Study Area. During this process, WEST biologists successfully captured and identified NLEB at several locations.

Dakota Skipper

Dakota skipper is an obligate of high-quality, untilled prairie habitat dominated by native species. Dakota skipper larvae exclusively feed on native bunch grasses, and adults require native forbs that flower during their flight-period as sources of nectar. The species is not likely to be present in cropped or previously cropped areas, non-native hay lands, pasture, grasslands dominated by non-native species, or in areas with significant trees and/or shrub cover.

As of 2022, over the past three decades, Dakota skipper have been documented in three townships within Oliver County (USFWS 2022c). The Study Area is located outside all Dakota skipper township detection locations. The nearest documented Dakota skipper township detection is a 2020 township detection located approximately 0.9 miles south of the northeast portion of the Study Area in Township 143N, Range 84W with the exact location of the Dakota skipper detection location located somewhere within the 36-square-mile township.

WEST completed a Dakota skipper habitat assessment in support of the Project (Appendix B11). The overall purpose of the analysis was to assess unbroken grasslands where potential Project infrastructure could be sited to determine whether the existing vegetative conditions are suitable to support the reproductive needs of Dakota skipper during its larval stage. Within the Project Corridor there is one area of suitable Dakota skipper habitat, totaling approximately 0.1 acres (Figure 11).

6.9.2 Impacts/Mitigation

Oliver Wind IV is developing a voluntary WCS, which includes an adaptive management approach so that information gathered, and experience gained from post-construction monitoring can be used to inform future management decisions at the Project. Per the WRRS protocol, if a dead or injured federally listed species is found, it must be left undisturbed and reported to USFWS. No irreversible damage to rare or unique animal or plant species is anticipated. Individual species are discussed below.

Piping Plover

There were no piping plover observed during the avian use surveys conducted for the Wind Energy Center (Agudelo and Derby 2020, Piorkowski 2023). The closest designated critical habitat is located approximately 0.75 miles northeast of the Study Area, so it is unlikely, although possible, that piping plover will occur within the Study Area.

Red Knot

There were no red knots observed during the avian use surveys conducted for the Wind Energy Center (Agudelo and Derby 2020, Piorkowski 2023). With no red knot observations during avian surveys and since there is no preferred stopover habitat identified within the Project Corridor, it is unlikely that the Project will affect the red knot.

Whooping Crane

Although the Study Area is located within the western half of the 50 percent whooping crane migration corridor (Pearse et al. 2018) the majority of whooping crane sightings have been recorded to the north and east of the Study Area (Appendix B7). The Project is not anticipated to affect whooping cranes.

Northern Long-Eared Bat

To minimize potential impacts on the NLEB and its roosting habitat during the active season, restrictions on tree removal will be in effect within a three-mile conservation buffer around the two NLEB positive locations that intersect the Study Area from April 1 to October 31 (Figure 12). Consequently, trees considered suitable roosting habitat, including both alive and standing dead trees with a diameter of over three inches at breast height and possessing exfoliating bark, cracks, crevices, and/or cavities, will be retained and not removed within the designated conservation buffer during that time. If trees considered suitable roosting habitat require removal for construction between April 1 to October 31, an emergence survey will be completed for each tree to ensure bats are not roosting in trees during removal. This survey protocol will follow standard USFWS survey guidelines (USFWS 2023e).

Dakota Skipper

Project infrastructure was sited and the construction easement was designed to avoid impacts on all suitable Dakota skipper habitat. No Project construction activities will occur within identified suitable Dakota skipper habitat. Avoidance of the suitable Dakota skipper habitat will include spanning structures between the suitable habitat. Suitable Dakota skipper habitat boundaries will be marked during construction to restrict entry by construction equipment. Thus, no impacts to Dakota skipper are anticipated.

Mitigative Measures

Oliver Wind IV conducted environmental studies and consulted with the NDGFD and USFWS on appropriate avoidance, minimization, and offset measures so that the Project would have minimal environmental impacts. Based on the above, including all aforementioned mitigation measures from Section 6.8, Oliver Wind IV will apply the following additional measures, to the extent practicable:

- Provide the appropriate whooping crane identification guide materials to be in all Project maintenance and operations vehicles for reference.
- Implement a tree removal restriction for suitable NLEB habitat within three miles of NLEB positive locations from April 1 to October 31 unless an emergence survey clears trees for clearing.
- Field-verified suitable Dakota skipper habitat has been and will continue to be avoided. High visibility fencing (*e.g.*, snow fence) will be placed around field-verified suitable Dakota skipper habitat areas in close proximity to construction to restrict construction equipment from disturbing these areas.
- Provide contractors with training, spatial data and static constraints maps that identity where field verified suitable Dakota skipper habitat is located and where construction equipment is restricted.
- Educate construction contractors about threatened and endangered species and associated mitigative measures being implemented for each respective species.
- Provide contractors with static constraint maps and ensure compliance through onsite environmental construction monitoring.

7.0 PUBLIC AND AGENCY COORDINATION

As part of development of the Project and Wind Energy Center, Oliver Wind IV and its representatives have maintained close coordination with agencies, as well as other groups and organizations.

Throughout development of the Project, Oliver Wind IV has coordinated with landowner stakeholders through a combination of in-person meetings, mailers, and phone calls. Landowner dinners and open house events were held on October 13, 2022, and August 15, 2023, providing an opportunity for open communication and feedback from landowners. Oliver Wind IV is committed to maintaining coordination with landowner stakeholders throughout the development and lifetime of the Project.

Oliver Wind IV has actively engaged with various stakeholders during the Project's development, including Native American Tribes as described in Section 6.4, Oliver and Mercer counties, as detailed in Section 3.7., and worked in collaboration with NDGFD and USFWS as detailed in Table 7.0-1.

In July and August 2019 and March 2022, Oliver Wind IV distributed Project notification letters to local, state, and federal agencies per Section 69-06-01-05 of the N.D. Admin. Code. The Project notification letters included a description of the Project, a solicitation request for any sensitive resources, current or planned development, or property interests the agency may have in or around the Study Area that Oliver Wind IV should consider, request for applicable permits, and a map of the Study Area.

The table below provides a summary of the correspondence between Oliver Wind IV and agencies, groups, and organizations. Attachment C includes templates of the Project notification letters, and correspondence with agencies and organizations including letters received in response to the Project notification letter, emails, and meeting summaries as of September 2023. Table 7.0-1 below and Appendix C are generally organized in the order in which the agency appears in Section 69-06-01-05 of the N.D. Admin. Code and are generally organized with the earliest correspondence date first, apart from email chains. Some agencies have been grouped together when the correspondence includes more than one agency.

TABLE 7.0-1
Summary of Agency and Organization Correspondence

Agency, Group, or Organization	**Correspondence Date**	**Summary of Correspondence[1]**
North Dakota Aeronautics Commission (NDAC) **(Appendix C2)**	August 23, 2019	The NDAC responded to the agency notification letter that the Project location will not have an impact on the nearest NDAC public airport, Mercer County Regional Airport (Hazen). If the height of the construction equipment is above 200 feet above ground level, then a case needs to be submitted to the Federal Aviation Administration for review.
North Dakota Attorney General	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
North Dakota Department of Agriculture	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
North Dakota Department of Health	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
North Dakota Department of Human Services	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
North Dakota Department of Labor and Human Rights	NA	The agency did not provide a response to the 2019 or 2023 notification letters.

TABLE 7.0-1
Summary of Agency and Organization Correspondence

Agency, Group, or Organization	Correspondence Date	Summary of Correspondence[1]
North Dakota Department of Career and Technical Education	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
North Dakota Department of Commerce	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
Energy Infrastructure and Impact Office	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
North Dakota Industrial Commission (NDIC) **(Appendix C3)**	April 25, 2023	The NDIC responded to the agency notification letter that after reviewing the "Wind Project Study Area" it appears that the only well that exists is: File no. 38701, Summit Carbon Solutions, LLC, Slash Lazy H 5, Section 6-142N-86W. There are no wells within the "Transmission Line Study Area".
Office of Governor Doug Burgum	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
North Dakota Department of Transportation (NDDOT) **(Appendix C4)**	September 4, 2019	The NDDOT responded to the agency notification letter that the Project should have no adverse effects on NDDOT highways. If any work needs to be done on a highway right-of-way, appropriate permits and risk management documents will need to be obtained.
State Historical Society of North Dakota (SHSND) **(Appendix C5)**	August 6, 2019, and April 4, 2023	The SHSND responded to both the 2019 and 2023 agency notification letters and recommended a Class I Literature Review and a Class II Reconnaissance and Class III Cultural Resources Inventory by a permitted architectural historian for standing buildings and structures within a two-mile radius of individual turbine locations.
	September 12, 2023	SHSND provided a letter stating no viewshed analysis is required by SHSND for the Project. SHSND acknowledged that Oliver Wind IV is coordinating with NPS on a viewshed analysis for the Wind Energy Center.
North Dakota Indian Affairs Commission	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
Job Service North Dakota	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
North Dakota Department of Trust Lands (NDDTL) **(Appendix C6)**	August 12, 2019	The NDDTL responded to the agency notification letter that to obtain an easement across School Trust land, an online application form must be completed. Any proposed towers or lines would be subject to review by the surface division staff and approval by the Land Commissioner on behalf of the Board of University and School Lands. There are School Trust surface interests that are managed by the NDDTL on behalf of the Board of University and School Lands located within the Project Area. There are no active Coal Leases on School Trust Lands within the Project Area.
	April and May, 2023	The NDDTL responded stating that any proposed project crossing NDDTL managed property would need to apply for a Right of Way agreement and would be subject to review and approval by the Board of University and School trust Lands. Merjent responded stating that no infrastructure is planned on NDDTL surface lands due to the NDGFD preference for siting turbines on unbroken grasslands.
North Dakota Parks and Recreation Department (NDPRD) **(Appendix C7)**	April and May, 2023	The NDPRD requested shapefiles of the Project areas. Merjent sent over the shapefiles. The NDPRD used the map to draw out the approximate boundary. The NDPRD did not follow up with any additional responses.
Natural Resources Conservation Service (NRCS) **(Appendix C8)**	April 5, 2023	The NRCS responded to the agency notification letter that they have a major responsibility with the Farmland Protection Policy Act (FPPA) in documenting conversion of farmland (*i.e.*, prime, statewide importance and local importance) to non-agriculture use when federal funding is utilized. Since the Project does not have a source of federal funding, therefore, FPPA does not apply, and no further action is needed.
North Dakota Department of Water Resources (NDDWR) **(Appendix C9)**	August 30, 2019	The NDDWR responded to the agency notification letter that the project does not require a conditional or temporary permit for water appropriation, however, if surface water or groundwater will be diverted for construction of the Project, a water permit will be required per N.D.C.C. 61-04-02. If a NDDWR observation well must be removed, the Project is requested to contact the Water Appropriations Division. There are no floodplains identified and/or mapped at the Project location. North Dakota has no formal 'permitting' authority as a state entity in National Flood Insurance Program identified floodplain areas. The permitting is always done by the local entity, please work closely with the County Floodplain Administrator.

TABLE 7.0-1
Summary of Agency and Organization Correspondence

Agency, Group, or Organization	Correspondence Date	Summary of Correspondence[1]
	April 23, 2023	The NDDWR responded to the agency notification letter that there is a Federal Emergency Management Agency National Flood Insurance Program mapped where the project is to take place. The NDDWR requests to be notified regarding any potential impacts to water resources. The NDDWR indicated the project does not require a conditional or temporary permit for water appropriation. The NDDWR states if an observation well must be removed, please contact the Water Appropriation Division.
United States Department of Defense (DoD)	NA	See NTIA response.
United States Army Corps of Engineers (USACE) **(Appendix C10)**	August 19, 2019	The USACE responded to the agency notification letter that a Section 10 permit would be required for work impacting navigable waters. A section 404 permit would be required for discharge of dredge or fill material in waters of the United States. The USACE has determined that the Project may need a Clean Water Act Section 404 permit.
	April 17, 2023	The USACE responded to the agency notification letter that their office has reviewed the information you provided regarding the proposed project and determined that a USACE Section 404 permit may be required for your Project.
Oliver County	July 28, 2022	Oliver Wind IV presented a Project update to Oliver County Planning & Zoning.
Mercer County **(Appendix C11)**	December 9, 2022	Oliver Wind IV presented a Project update to the Mercer County Commission.
	March 16, 2023	Oliver Wind IV presented a Project update to Mercer County Planning & Zoning.
	September 15, 2023	Oliver Wind IV coordinated with Mercer County regarding FEMA floodplain maps.
North Dakota Transmission Authority	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
North Dakota Pipeline Authority	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
North Dakota Department of Environmental Quality (NDDEQ) **(Appendix C12)**	August 20, 2019	The NDDEQ responded to the agency notification letter that environmental impacts from construction of the Project will be minor and can be controlled by proper construction methods. Fugitive dust emissions should be minimized during construction. Aggregate for road construction should not contain erionite. Care is to be taken during construction activity near any water of the state to minimize adverse effects on a water body. The Project may be located over defined glacial aquifers, defined sensitive glacial drift aquifers, or within wellhead or source water protection areas. Noise levels can be minimized by ensuring that construction equipment is equipped with recommended muffler in good working order and ensuring that construction activities are not conducted early morning or late evenings. All solid waste materials must be managed and transported in accordance with the state's solid and hazardous waste rules. The NDDEQ owns no land and does not have projects scheduled in the Project area. The NDDEQ believes that the proposed activities are consistent with the State Implementation Plan for the Control of Air Pollution for the State of North Dakota.
	April 19, 2023	The NDDEQ responded to the agency notification letter that care is to be taken during construction activity near any water of the state to minimize adverse effects on a water body. Disturbing one or more acres requires a permit to discharge stormwater runoff. The Project may be located over defined glacial aquifers, defined sensitive glacial drift aquifers, or within wellhead or source water protection areas. All solid waste materials must be managed and transported in accordance with the state's solid and hazardous waste rules. The NDDEQ owns no land and does not have projects scheduled in the Project area.
North Dakota Geological Survey (NDGS) **(Appendix C13)**	August 21, 2019	The NDGS responded to the agency notification letter that it appears that there are some locations in the northeast portions of the Project that contain areas mapped as landslide or features that suggest slope instability. There are also several areas within the Project boundary that contain mineable coal resources as depicted on the NDGS coal maps. A review of the Public Service Commission's Abandoned Mine Land (AML) locations data also shows several AML locations northeast of Center, ND.

TABLE 7.0-1
Summary of Agency and Organization Correspondence

Agency, Group, or Organization	Correspondence Date	Summary of Correspondence[1]
	April 6, 2023	The NDGS responded to the agency notification letter that the project area is located just south of an area where several sand mining operations are currently located. The project area does contain a few localized landslide features associated with local drainages and the hilly topography in this area. Areas of landslides should be avoided when selecting locations for towers or transmission line support structures.
North Dakota Forest Service	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
Bureau of Land Management	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
Military Aviation and Installation Assurance Siting Clearinghouse (Clearinghouse) **(Appendix C14)**	November 21, 2019	The Military Aviation and Installation Assurance Siting Clearinghouse coordinated within the U.S. DoD an informal review of the Project. The results indicated that the Project will have minimal impact on military operations conducted in the area.
91st Missile Maintenance Squadron	NA	See Minot Air Force Base response.
Minot Air Force Base (AFB) **(Appendix C15)**	April 6, 2023	The Minot AFB responded stating that the 91st Missile Wing does not have any operations in these counties however the 5th Bomb Wing on Minot AFB does have flying routes in this area. The Minot AFB also asked if the Project has been pushed to the DoD Clearing House for a review.
	May 18, 2023	Merjent responded to the Minot AFB stating that the wind turbine locations have undergone a review and have been approved by both the DoD Siting Clearinghouse and the Federal Aviation Administration (FAA). The DoD had no concerns, and the FAA has issued Determinations of No Hazard. Proposed wind turbine and transmission line pole locations were provided.
Grand Forks Air Force Base	NA	The agency did not provide a response to the 2019 or 2023 notification letters.
National Telecommunications and Information Administration (NTIA) **(Appendix C16)**	April 1, 2022	Oliver Wind IV submitted a letter and attachments to the NTIA.
	May 19, 2022	The NTIA had minor issues with turbine placement in this area. The NTIA found the project is within the notification zone of the Bismarck, ND NEXRAD radar. However, there will be low impact and only the lowest elevation angle will be contaminated. The agency requested further contact with the developer only if the project area changes or the turbine heights increase by 10 meters or more.
National Park Service (NPS) - Knife River Indian Villages (KRIV) National Historic Site (NHS) **(Appendix C17)**	October 18, 2019	Oliver Wind IV reengaged with the NPS regarding the Project and stated that once the cultural resources studies are complete and the locations of all of the project facilities are locked in, Oliver Wind IV would like to discuss with the NPS regarding a visual analysis previously requested.
	July 6, 2023	On a telephone call between Oliver Wind IV and the NPS about the Project, NPS staff expressed concerns about potential visual impacts of the Project on the setting of the KRIV National Historic Site (NHS) both from within the KRIV NHS and Fort Clark State Historic Site (SHS). NPS staff mentioned that there is a draft Cultural Landscape Report for the KRIV.
	July 18, 2023	Oliver Wind IV follows up on the call with notes and requests additional information including: a copy of the draft Cultural Landscape Report, a copy of the KRIV management plan or similar type of comprehensive/planning document if there is one, a copy of the KRIV National Historic Landmark (NHL) nomination form with regard to the proposed NHL at the KRIV, and confirmation that Jim Schilling at NPS Midwestern Regional office is the appropriate NPS staff to contact with regard to Fort Clark SHS.
	August 8, 2023	NPS responded by providing a link to the Big Hidatsa Village NHL nomination form and the 1989 National Register nomination form for KRIV. NPS specified that these documents contain sensitive information and are for Oliver Wind IV's reference only. The NPS stated their concern about the proposed energy project is not just specific to impacts to archaeological sites, but to a cultural landscape that is significant to the Mandan Hidatsa and Arikara. The NPS shared important viewsheds from within KRIV.
	August 8, 2023	Oliver Wind IV responded to the NPS that they did reach out to Andrew Clark at North Dakota State Historic Preservation Office about the draft NHL nomination for Fort Clark.

TABLE 7.0-1
Summary of Agency and Organization Correspondence

Agency, Group, or Organization	Correspondence Date	Summary of Correspondence[1]
	September 2023	As of September 2023, Oliver Wind IV is actively coordinating with the NPS regarding visual concerns. Oliver Wind IV is completing a viewshed analysis and photostatic simulations using key viewpoints. Selection of viewpoints was coordinated with NPS staff.
North Dakota Game and Fish Department (NDGFD) and United States Fish and Wildlife Service (USFWS) **(Appendix C18)**	July 18, 2018	Oliver Wind IV initiated a meeting with NDGFD and USFWS that allowed Oliver Wind IV to present an update on the Project. Oliver Wind IV introduced the Project and presented an overview of studies completed by the previous developer and studies to be conducted by Oliver Wind IV. Oliver Wind IV 's intent is to avoid siting infrastructure on unbroken grasslands to the extent possible, considering other exclusion/avoidance areas and constraints. Oliver Wind IV provided a map of the desktop unbroken grassland analysis. NDGFD requested updates to the reports for whooping crane and avian species, intending to use Neal Niemuth's models for these birds. NDGFD also shared a large map of NDGFD lek data and highlighted that the Red Butte Project area is not fully covered by this data due to limitations in lek census blocks. The meeting included a discussion about the feasibility of the transmission line spanning Wildlife Management Areas (WMA) and the presentation of new North Dakota Century Code rules.
	August 28, 2019	Oliver Wind IV initiated a meeting with NDGFD as an opportunity to provide a status update on the Project. Oliver Wind IV shared a map of the latest project layout, highlighting a substantial reduction in project size and potential turbines due to coal lease and grassland issues. Turbine micrositing is complete, and field surveys are underway. All turbines and substation locations are situated outside of unbroken grasslands. The evaluation of transmission routing considers challenges such as coal leases, cultural resources, grouse leks, and landowner preferences. Regarding offsets, Oliver Wind IV is awaiting the post-micrositing array to conduct an initial evaluation, expecting wetlands to be of low concern due to minimal numbers and low use by breeding waterfowl. In general, NDGFD acknowledges avian displacement as the primary ecological service to be offset, although it is used as a proxy for other wildlife effects. NDGFD recognizes certain factors but expresses concerns about the acreages rather than dollar values in the offset ask. NDGFD appreciates Oliver Wind IV's efforts to avoid and minimize impacts and is amenable to having Oliver Wind IV review and structure the NDGFD letter to the Commission addressing these efforts. Overall, NDGFD welcomes the frequent updates from Oliver Wind IV and values the opportunity to discuss project progress.
	September 12, 2019	The NDGFD responded to the agency notification letter that based on initial review, the Project appears to fall within an area with low to moderate risk to our native wildlife; however, valuable habitat for these species does exist within the Project Area and careful consideration should be made when siting turbines, roads, and associated infrastructure. Disturbance, fragmentation, and loss of native prairie have adversely impacted a wide variety of species and these negative impacts will only continue to compound as more development takes place on the landscape. Though the Project Area only includes a small number of wetlands, the resources they provide are still of value to many of our native species. The NDGFD recommends Oliver Wind IV contact USFWS's Habitat and Population Evaluation Team office to request the Local Siting Decision Support Tool to evaluate Project impacts on wetland resources. As Oliver Wind IV moves forward with this Project, the NDGFD requests to remain informed.
	October 17, 2019	The USFWS responded to the agency notification letter that the USFWS primary recommendation on all wind energy facilities in North Dakota is to avoid impacting all grasslands, particularly native prairie, focusing instead on areas that are currently disturbed (*e.g.*, cropland). We recommend seeking an alternate area with less intact habitat for this project. If the Project is to proceed at this location, then we recommend avoidance to the maximum extent possible of grasslands, particularly native prairie. The Project Area is within the whooping crane migration corridor and whooping cranes have been reported near the Project. Preconstruction surveys at Project revealed the presence of NLEB both on-site and in adjacent habitats during summer. Dakota skipper surveys were not conducted despite the presence of suitable reproductive habitat for the species within the Project Area and historic records of the species in Oliver County. At least 11 bald eagle nests have been identified in the Project Area.

TABLE 7.0-1
Summary of Agency and Organization Correspondence

Agency, Group, or Organization	Correspondence Date	Summary of Correspondence[1]
	July 14, 2022	Oliver Wind IV initiated a meeting with NDGFD and USFWS that allowed Oliver Wind IV to present an update on the Project including that the transmission line is now routed north of NDGFD WMA. Oliver Wind IV presented an overview of survey results and ongoing studies encompassing the entire 400 MW study area that was formerly identified as part of the larger, prior Red Butte Wind Project. WEST will follow up with NDGFD for any new nest/lek data, while USFWS requested bat reports. Oliver Wind IV clarified that the bat reports are not yet finalized, and genetic samples are being collected for NLEB. Oliver Wind IV inquired about USFWS obtaining a permit for genetic sampling for the Project, surprising both NDGFD and USFWS with the capture of NLEB. Oliver Wind IV possesses the wind best management practices document as requested by NDGFD. NDGFD asked Oliver Wind IV to share turbine locations and site plans, with NDGFD planning to run the impact analysis internally. Oliver Wind IV agreed to send once finalized.
	March 15, 2023	Oliver Wind IV initiated a meeting with NDGFD on March 15, 2023 with the objective of the meeting to update the proposed development schedule of the original Red Butte Wind Project, providing timelines and expectations for submission to the Commission. Oliver Wind IV presented updated project information, describing that the former Red Butte Wind Project was being split into two parts: Oliver Wind IV (~200 MW) and Red Butte Wind (~200 MW). Oliver Wind IV is on track to submit a Commission application around August 2023, with a commercial operation date in Q4 2024. The turbines proposed for Oliver Wind IV are GE 2.82MW with a tip height of 500 feet. An estimated 18 miles of new overhead transmission line will connect to a new Basin Electric substation near Leland Olds. The layout scenarios have considered numerous constraints, and all unbroken grasslands are being avoided for turbine placement. Oliver Wind IV provided an overview of wildlife survey results. Turbines are also positioned to be 0.5 miles away from sharp-tailed grouse leks. Most field surveys for the entire development area have been completed, and additional Dakota skipper surveys will be done for the finalized construction layout in summer 2023. The development of a WCS is also planned for spring and summer. NDGFD inquired if a two-mile avoidance of nesting habitat was used in turbine layouts and asked about the number of turbines sited within broken grasslands. NDGFD expressed a preference for turbines in croplands and within two miles of leks instead of on grasslands, proposing post-construction monitoring of known leks and construction timing restrictions as alternative options.
	May 11, 2023	The USFWS requested shapefiles of the study area used in the notification letter. Merjent responded with the requested shapefiles.
	June 23, 2023	Oliver Wind IV initiated a meeting with USFWS on June 23, 2023 with the objective of the meeting to update the proposed development schedule of the original Red Butte Wind Project, providing timelines and expectations for submission to the Commission. Oliver Wind IV presented updated project information, describing that the former Red Butte Wind Project was being split into two parts: Oliver Wind IV (~200 MW) and Red Butte Wind (~200 MW). Oliver Wind IV is on track to submit a Commission application around August 2023, with a commercial operation date in Q4 2024. An estimated 18 miles of new overhead transmission line will connect to a new Basin Electric substation near Leland Olds. Oliver Wind IV provided an overview of wildlife survey results. The layout scenarios have considered numerous constraints, and all unbroken grasslands are being avoided for turbine placement. Turbines are also positioned to be 0.5 miles away from sharp-tailed grouse leks and 2 miles from eagle nests. Most field surveys for the entire development area have been completed, and additional Dakota skipper surveys will be done for the finalized construction layout in summer 2023. The development of a Wildlife Conservation Strategy is also planned for spring and summer. The whooping crane habitat model was updated using the requested Niemuth models. USFWS recommended marking the transmission line with bird diverters, which Oliver Wind IV confirmed was already planned. Oliver Wind IV stated that impacts to wetlands are being avoided and if impacts are necessary, will be less than 0.1 acre (non-reporting NWP). Oliver Wind IV confirmed that the project does not fall within the range of the offset model for wetlands. USFWS stated they would like to review the WCS. Oliver Wind IV agreed to the NLEB timing restrictions for tree clearing and will continue coordination if tree clearing cannot occur prior to April 1.

TABLE 7.0-1
Summary of Agency and Organization Correspondence

Agency, Group, or Organization	Correspondence Date	Summary of Correspondence[1]
Federal Aviation Administration (FAA)	June 23, 2022/August 18, 2023	FAA issued Determinations of No Hazard for preliminary turbine array. FAA issued extension of Determinations of No Hazard for preliminary turbine array.
	July 12, 2023	ADLS and meteorological tower locations were submitted for FAA review.
	August 22, 2023	FAA issued Determinations of No Hazard for final turbine array.
	August 30, 2023	A single revised turbine location submitted for FAA review.
	September 18, 2023	FAA issued Determination of No Hazard for transmission line structures 25 through 37.

[1] Wording in response letters may reference Red Butte Wind instead of Oliver Wind IV.

8.0 POTENTIAL PERMITS/APPROVALS

Table 8.0-1 outlines the federal, state, and county permits or approvals that have been identified as potentially required for the construction and operation of the Project. Permits dependent on the final Project layout will be applied for after receiving Commission approval, but prior to construction.

TABLE 8.0-1
Potential Permits and Approvals Required for Construction and Operation

Agency	Type of Approval	Status*	Need
Federal Approvals			
Bureau of Reclamation (USBR) - Fort Clark Unit	Letter of Consent	3	A letter of consent from the USBR and the landowner is required to cross the canal.
Federal Aviation Administration (FAA)	Form 7460-1, Notice of Proposed Construction	2	Transmission structures within instrument approach areas need to be filed for review.
U.S. Environmental Protection Agency	Spill Prevention, Control, and Countermeasure Plan	3	Required if more than 1,320 gallons of oil storage is located on-site.
U.S. Fish and Wildlife Service (USFWS)	Special Use Permit	N/A	Not required as no USFWS easements are present.
United States Army Corps of Engineers	Nationwide Permit 57	N/A	Not required as wetland delineations have been completed so that impacts to wetlands and other surface waters are avoided.
	Section 404 Permit	N/A	
	Section 10 permit	N/A	
State of North Dakota			
North Dakota Department of Environmental Quality	National Pollutant Discharge Elimination System Permit: General Construction Storm Water	3	Required for disturbance of over one acre of land and a stormwater pollution prevention plan must be prepared.
North Dakota Department of Transportation	Road Approach/Access Permit	3	Required for construction of access roads from State Highways.
	Utility Permit/Risk Management Documents	3	Required for utility crossings on State Highway right-of-way.
North Dakota Department of Trust Lands	Rights-of-Way Easement and special access request	N/A	No temporary or permanent rights on school trust land properties is required.
North Dakota Department of Water Resources	Drainage Permit	N/A	Not required as the Project will not be required to drain a pond, slough, lake or sheetwater, or any series thereof, that has a watershed area (*i.e.*, drainage area) of 80 acres or more.
	Conditional or Temporary Permit for water appropriation	N/A	No water appropriation required.
	Water Permit	N/A	No water well will be required.
North Dakota Highway Patrol	Overheight/Overweight Permit	3	Required for hauling construction equipment and materials on State Highways.
North Dakota Public Service Commission	Certificate of Corridor Compatibility and Transmission Facility Route Permit	2	Required for construction of transmission facility over 115-kilvolt.
North Dakota Public Service Commission	Certificate of Site Compatibility	2	Required for construction of generation facility over 0.5 megawatt in size.
State Historical Society of North Dakota (SHSND)	Review of Effect Determinations	3	Reports for the Class III Cultural Resources Inventory will be submitted to SHSND for review when complete.
Local Permits			
Mercer County	Conditional Use Permit	2	Required for construction of the Project.
	Utility Occupancy Permit	3	Required for crossing the county right-of-way.
Oliver County	Conditional Use Permit	2	Required for construction of a wind energy facility and the Project.

TABLE 8.0-1
Potential Permits and Approvals Required for Construction and Operation

Agency	Type of Approval	Status*	Need
	Utility Occupancy Permit	3	Required to place collection lines and telecommunication lines within county right-of-way.
	Road Use Agreement	3	Required for road use, access roads, intersections, road maintenance and repair of county roads.
	Building Permit	3	Required to build aboveground facilities such as the operations and maintenance facility.
Southwest Water Authority	Pipeline Crossing Permit	3	Required for crossing the Southwest Pipeline Project.

* Status Explanation: 1 Completed and approved, 2 Applied and/or decision pending, 3 Will apply for prior to construction as applicable

9.0 QUALIFICATIONS OF CONTRIBUTORS

The qualifications of each significant contributor involved in the facility site location study and this application is provided below in Table 9.0-1.

TABLE 9.0-1
Qualifications of Contributors

Name and Project Role	Education and Professional Experience
Clay Cameron Director Wind Development NextEra	Mr. Cameron has over 25 years of experience in project management, including development, construction, budgeting, financial reporting, and federal, state, and local permitting and compliance. His responsibilities include financial feasibility analysis, cost and schedule management, and coordination of functional project teams and customer relationships. He has 15 years of experience in the utility industry including roles of increasing responsibility in community development, engineering & construction, and project development. He studied business management at Louisiana State University, and holds a State of Florida General Contractor license.
Sarah Montone Wind Development NextEra	Ms. Montone has seven years of experience in project management including development, audit, and vehicle line planning. She has two years of utility industry project development experience. She has a Bachelor of Science and a Master of Business Administration from the University of Detroit Mercy.
Dina Brown Environmental Services Project Manager NextEra	Ms. Brown has over 25 years of environmental experience in the planning, permitting, management and closure of energy industry projects. She has had direct responsibility for permitting and compliance with the Clean Water Act, National Environmental Policy Act, Resource Conservation and Recovery Act, Endangered Species Act, National Historic Preservation Act, Clean Air Act, as well as numerous state regulatory programs. Her primary responsibility is the permitting and licensing of projects on private and public lands in compliance with federal and state environmental laws. She has a Master of Science in Forest Science from Oregon State University and a Bachelor of Science in Civil/Environmental Engineering from Texas A&M University. She is a Certified Professional Soil Scientist.
Ron Burris Tribal Relations Project Manager NextEra	Mr. Burris is the Tribal Relations project manager for NextEra's North Dakota projects with primary responsibility for ensuring proactive outreach, collaboration, and relationship development with Tribes who have ancestral connections to the area of North Dakota. He has 19 years of total project management experience as an officer in the United States Navy, a project engineering manager for NextEra Energy, and has been the Tribal Relations lead for North Dakota for the past five years. Mr. Burris has a B.S. in Systems Engineering from the US Naval Academy and is a designated Naval Aviator.
Tracy Davis Managing Attorney NextEra	Ms. Davis has over 19 years of experience practicing energy regulatory law, and has served as in-house counsel for NextEra for the past ten years. Her responsibilities include representation of NextEra subsidiaries and affiliates before state regulatory commissions, including the North Dakota Public Service Commission. She has a Bachelor of Arts and a Doctor of Jurisprudence from the University of Texas at Austin.
Lindsey Churchill, PhD, PWS Project Manager Merjent, Inc.	Dr. Churchill has 15 years of environmental permitting experience in wetland and natural resources. Her responsibilities included project management, application preparation, and oversight of surveys. She has a PhD in Natural Resources Management from North Dakota State University, a Master of Science in Natural Resources Management from NDSU, and Bachelor of Science in biology and mathematics from University of Jamestown. She is registered as a Professional Wetland Scientist and a USACE certified wetland delineator.
Dirk Churchill Environmental Specialist Merjent, Inc	Mr. Churchill has 11 years of experience in environmental assessment, permitting, and compliance services. His responsibilities included application preparation and leading wetland surveys. He has a Bachelor of Science in Natural Resources from North Dakota State University. He is a USACE-certified wetland delineator.
Jim Heideman GIS Analyst Merjent, Inc.	Jim Heideman is a GIS Specialist with 11 years of experience in environmental consulting, focusing on cultural resource management and environmental permitting. He has been the GIS lead scopes with the role of creating/managing spatial data, publishing and hosting ArcGIS Online services, post-processing and analyzing spatial data, and preparing technical report figures.
Melinda McCarthy, MA, RPA Archaeologist Burns & McDonnell	Ms. McCarthy has 14 years of cultural resources and historic preservation experience. Her responsibilities included leading the cultural resources archaeology and architecture surveys, GIS, and tribal outreach. She has a Bachelor of Arts in Anthropology with an emphasis in Archeology and a Master of Arts in history with a specialization in historic preservation, both from Southeast Missouri State University. She is permitted as a Principal Investigator through the North Dakota State Historic Preservation Office (NDSHPO) in North Dakota.

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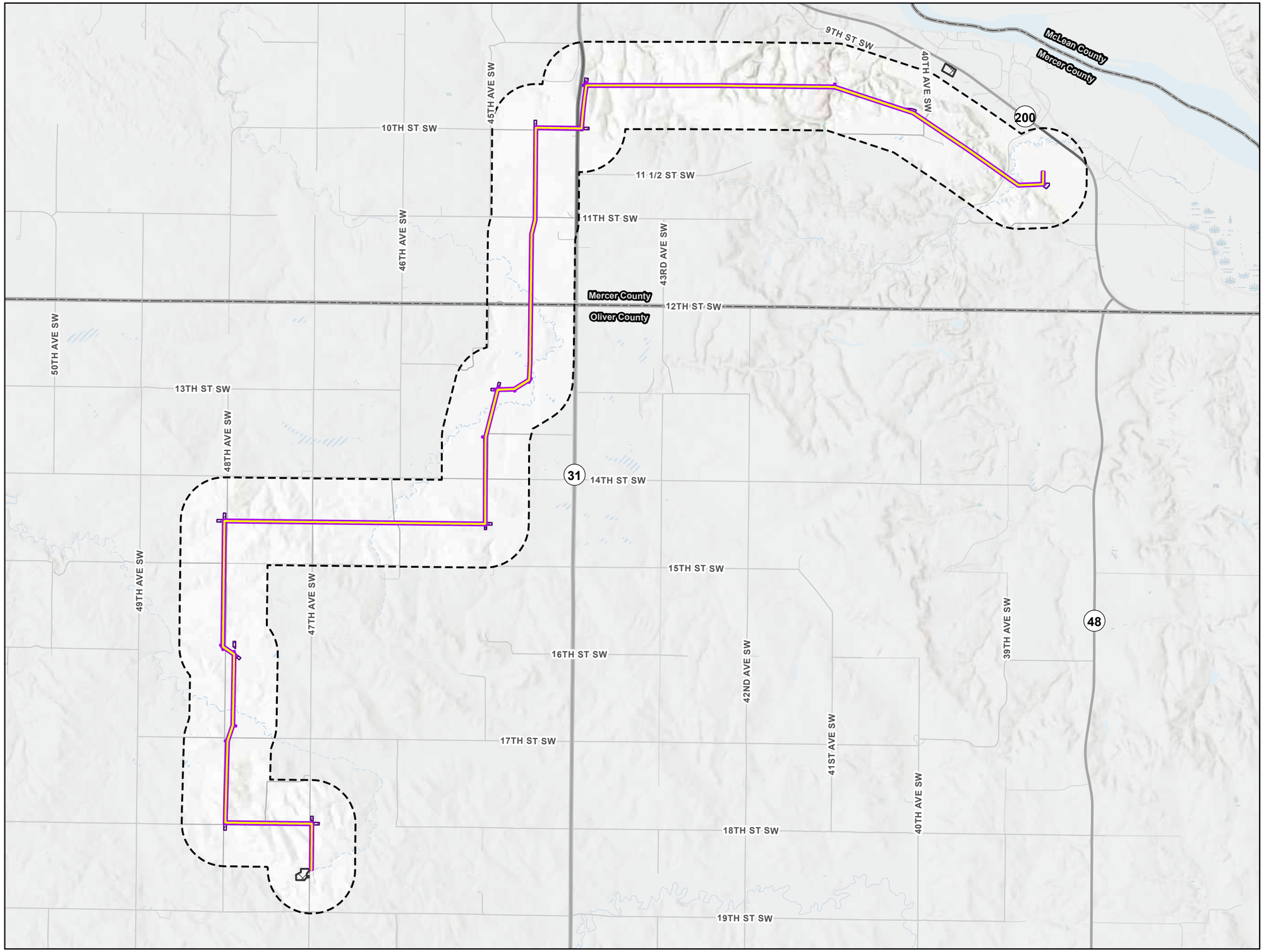
11.0 ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
APLIC	Avian Power Line Interaction Committee
Basin Electric	Basin Electric Cooperative
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
BNI	BNI Coal, Ltd.
CFR	Code of Federal Regulation
Certificate	Certificate of Corridor Compatibility
Clearinghouse	Military Aviation and Installation Assurance Siting Clearinghouse
CO_2	carbon dioxide
Commission or PSC	North Dakota Public Service Commission
CRP	Conservation Reserve Program
DoD	U.S. Department of Defense
DWC	Dakota Westmoreland Corporation
EMF	electromagnetic fields
EMR	electromagnetic radiation
EPC	engineering, procurement, and construction
ESA	Endangered Species Act of 1973
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FPPA	Farmland Protection Policy Act
FSA	Farm Service Agency
ICBM	intercontinental ballistic missile
IPaC	Information for Planning and Conservation
kHz	kilohertz
KRIV	Knife River Indian Villages
kV	kilovolt
LOS	Leland Olds Station
MBTA	Migratory Bird Treaty Act
MHz	Megahertz
mph	miles per hour
MW	megawatt
N.D. Admin. Code	North Dakota Administrative Code
N.D.C.C.	North Dakota Century Code
NASS	National Agricultural Statistics Service
NDAC	North Dakota Aeronautics Commission
NDCRS	North Dakota Cultural Resources Survey
NDDEQ	North Dakota Department of Environmental Quality
NDDOT	North Dakota Department of Transportation
NDDTL	North Dakota Department of Trust Lands
NDDWR	North Dakota Department of Water Resources
NDGFD	North Dakota Game and Fish Department

NDGIS	North Dakota GIS Hub Data Portal
NDGS	North Dakota Geological Survey
NDLMI	Job Service North Dakota Labor Market Information Center
NDOGD	North Dakota Oil and Gas Division
NDRAM	North Dakota Risk Assessment MapService
NDSHPO	North Dakota State Historic Preservation Office
NDTA	North Dakota Transmission Authority
NESC	National Electrical Safety Code
NextEra	NextEra Energy Resources, LLC
NHD	National Hydrography Dataset
NHL	National Historic Landmark
NHS	National Historic Site
NIEHS	National Institute of Environmental Health Sciences
NLEB	northern long-eared bat
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTIA	National Telecommunications and Information Administration
NWI	National Wetlands Inventory
O&M	operations and maintenance
OHSW	Overhead Shield Wire
OPGW	Optical Ground Wire
Oliver Wind IV	Oliver Wind IV, LLC
Phase I ESA	Phase I Environmental Site Assessment
PLOTS	Private Land Open to Sportsmen
PPA	power purchase agreement
Project	Oliver Wind IV 345-kV Transmission Line
Route Permit	Transmission Facility Route Permit
SCADA	Supervisory Control and Data Acquisitions
SHS	State Historic Site
SHSND	State Historical Society of North Dakota
Siting Act	Energy Conversion and Transmission Facility Siting Act
SPCC	Spill Prevention, Control, and Countermeasures
SPP	Southwest Power Pool
SRCSTT	Sites of Religious and/or Cultural Significance to Tribes
SSURGO	Soil Survey Geographic Database
SWPPP	Storm Water Pollution Prevention Plan
T&E	threatened and endangered
TCS	Traditional Cultural Surveyors
THPO	Tribal Historic Preservation Officer
USACE	U.S. Army Corps of Engineers
USBR	U. S. Bureau of Reclamation
USDA	U.S. Department of Agriculture

USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WCS	Wildlife Conservation Strategy
WEST	Western EcoSystems Technology, Inc.
Wind Energy Center	Oliver Wind IV Energy Center
WMA	Wildlife Management Area
WRRS	Wildlife Response and Reporting System

Figures





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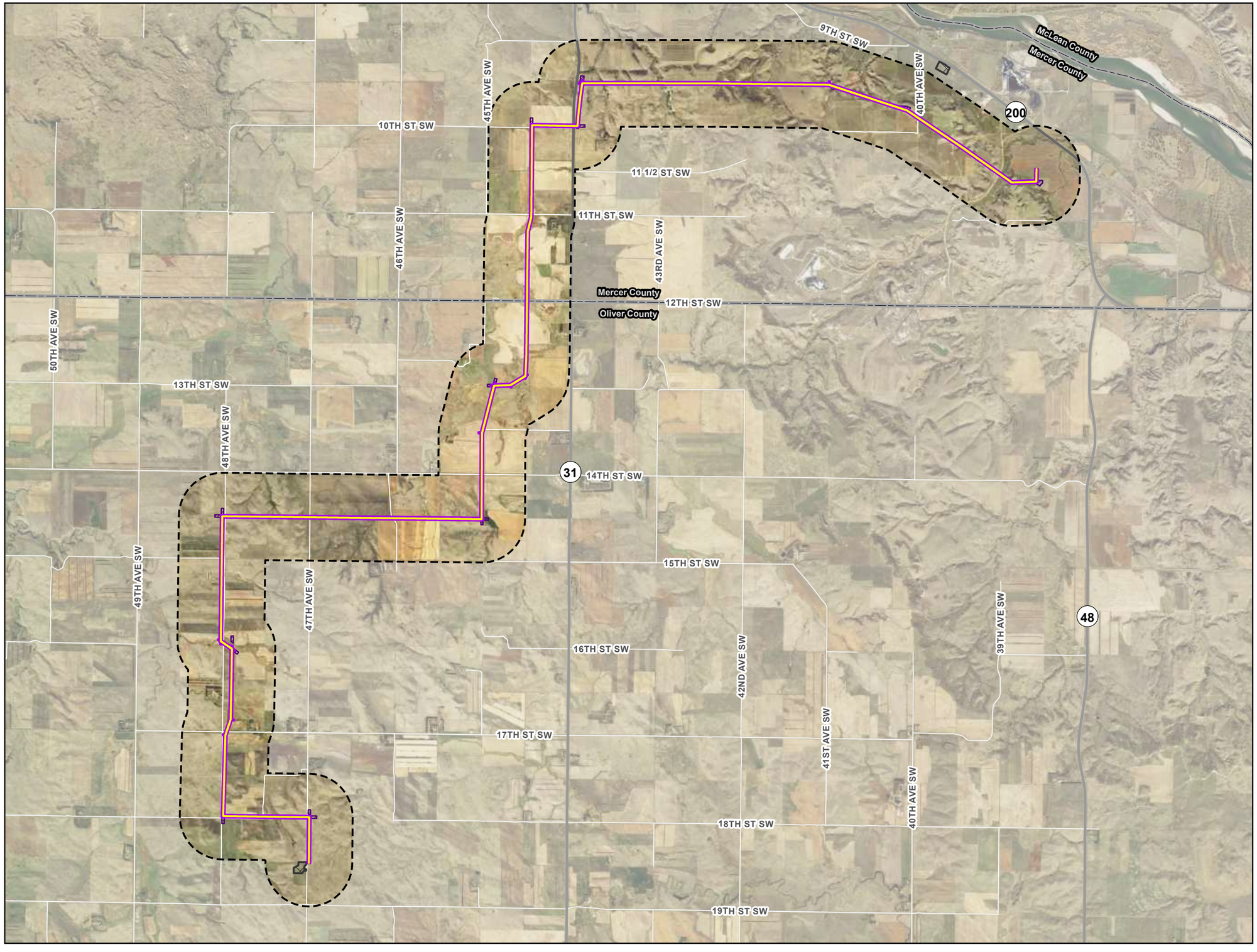
- Project Route
- Project Corridor
- Study Area
- Pulling Location
- Construction Laydown Area
- County Boundary

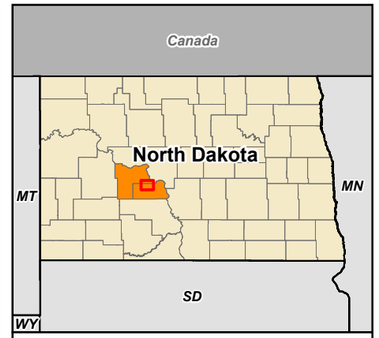
Figure 1:
Project Route and Study Area (Street)
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

merjent

For Environmental Review Purposes Only

Date: (9/15/2023) Source: Z:\Clients\MI_PNA\Enlarged_Routes\ArcGIS\Permitting\PSC_App\OliverIV_Wind_TLine_PSC_Application.aprx





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- Project Route
- Project Corridor
- Study Area
- Pulling Location
- Construction Laydown Area
- County Boundary

Figure 2:
Project Route and Study Area (Aerial)
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

merjent

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Source: ArcGIS Online (2023) Date: (01/05/2023) C:\Users\M_PINNICK\Merjent Box\Projects\Pending\PSC_Applic\NextEra_OIV_Wind_TLine_PSC_Application.aprx

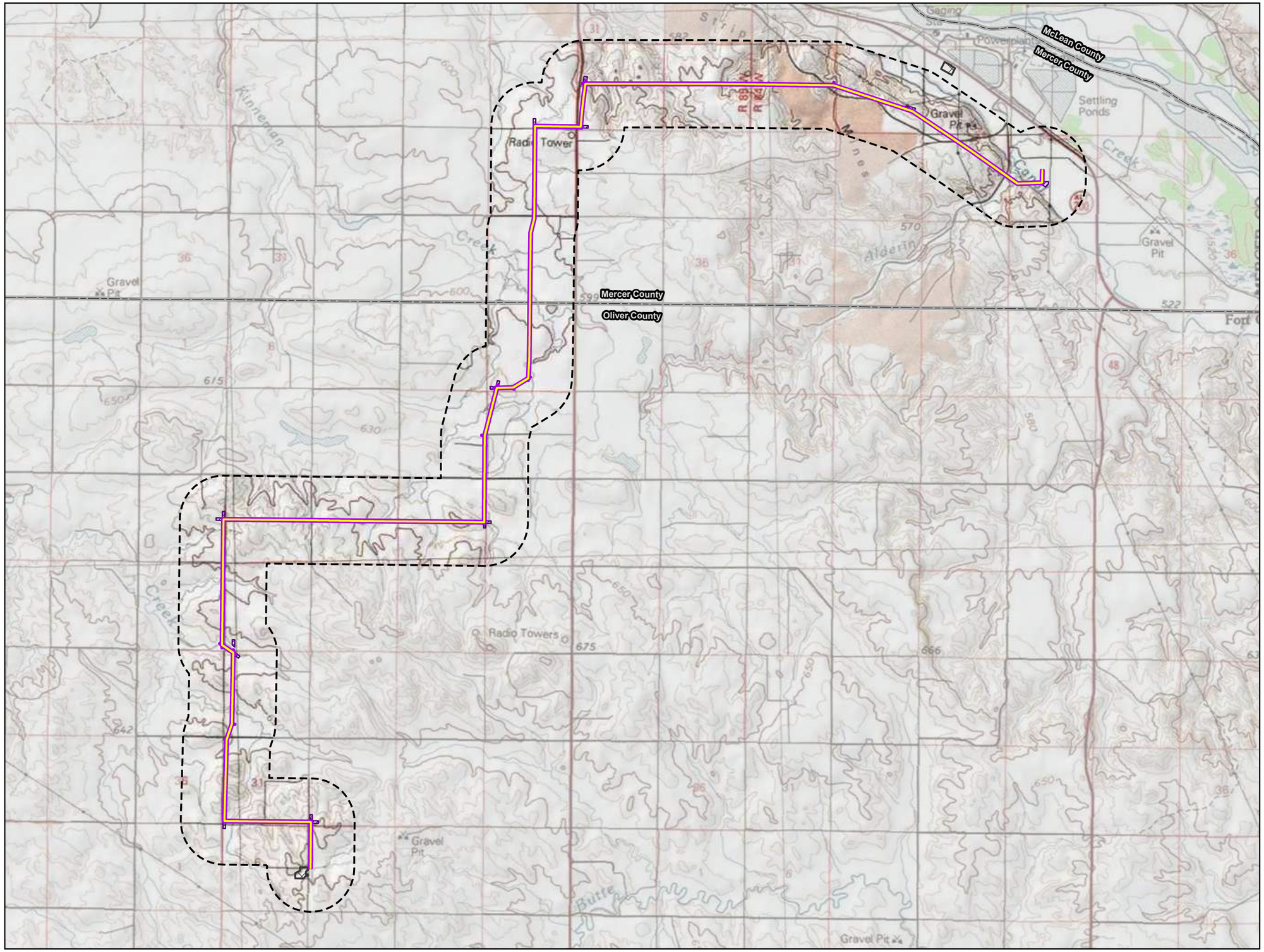
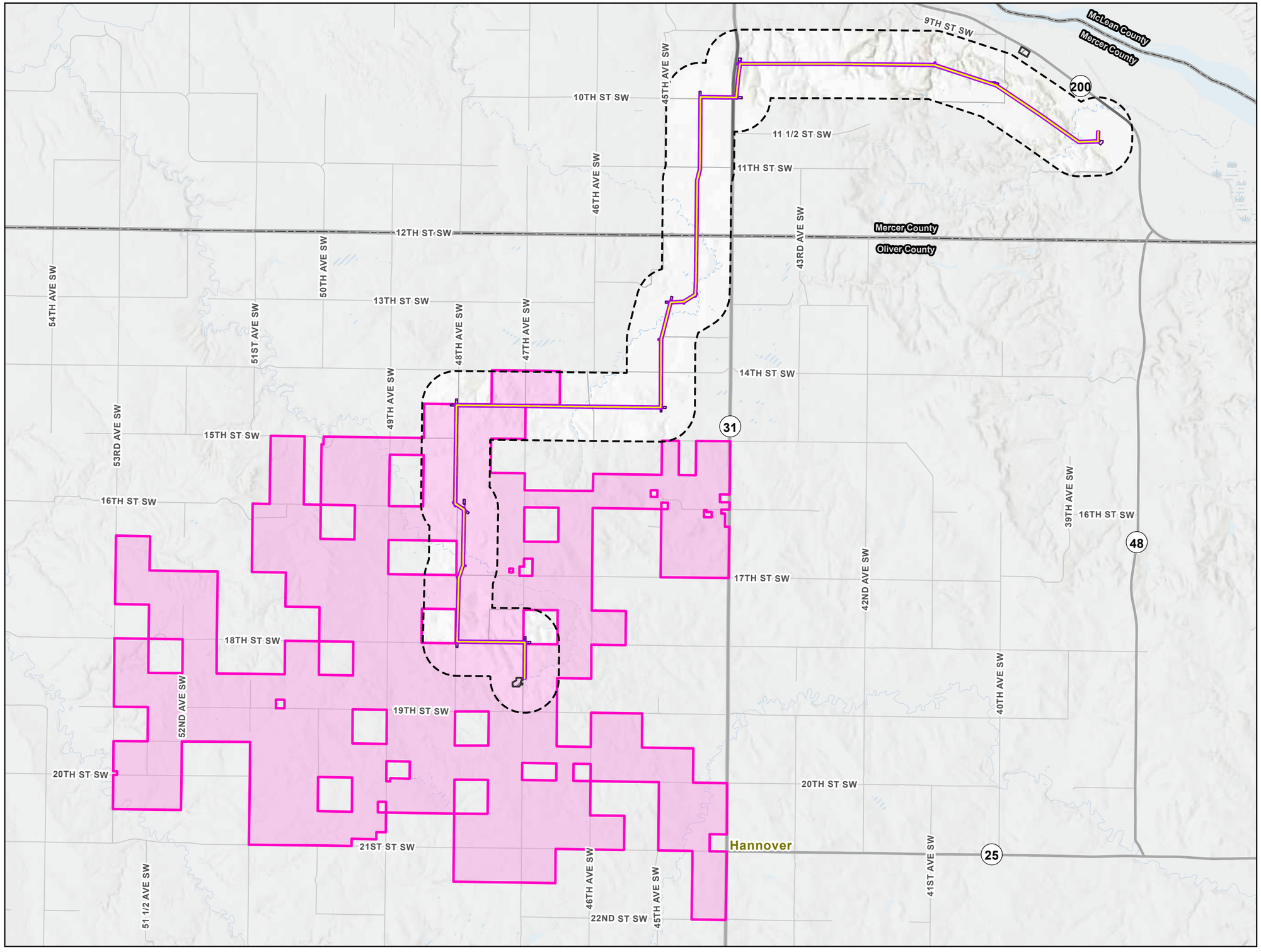
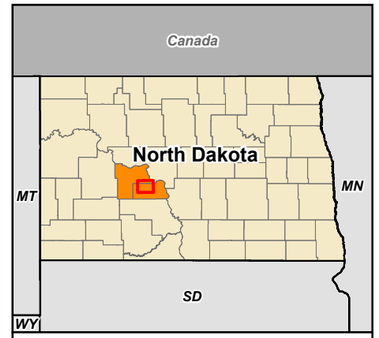


Figure 3:
Project Route and Study Area (Topographic)
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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Contractor Will Bore All Wetlands And Roads

Date: (9/15/2022) Source: J:\Clients\NextEra\Wind_Sites\Oliver\GIS\Permitting\PSC_App\OWNotice_OW_Wind_TLine_PSC_Application.aprx





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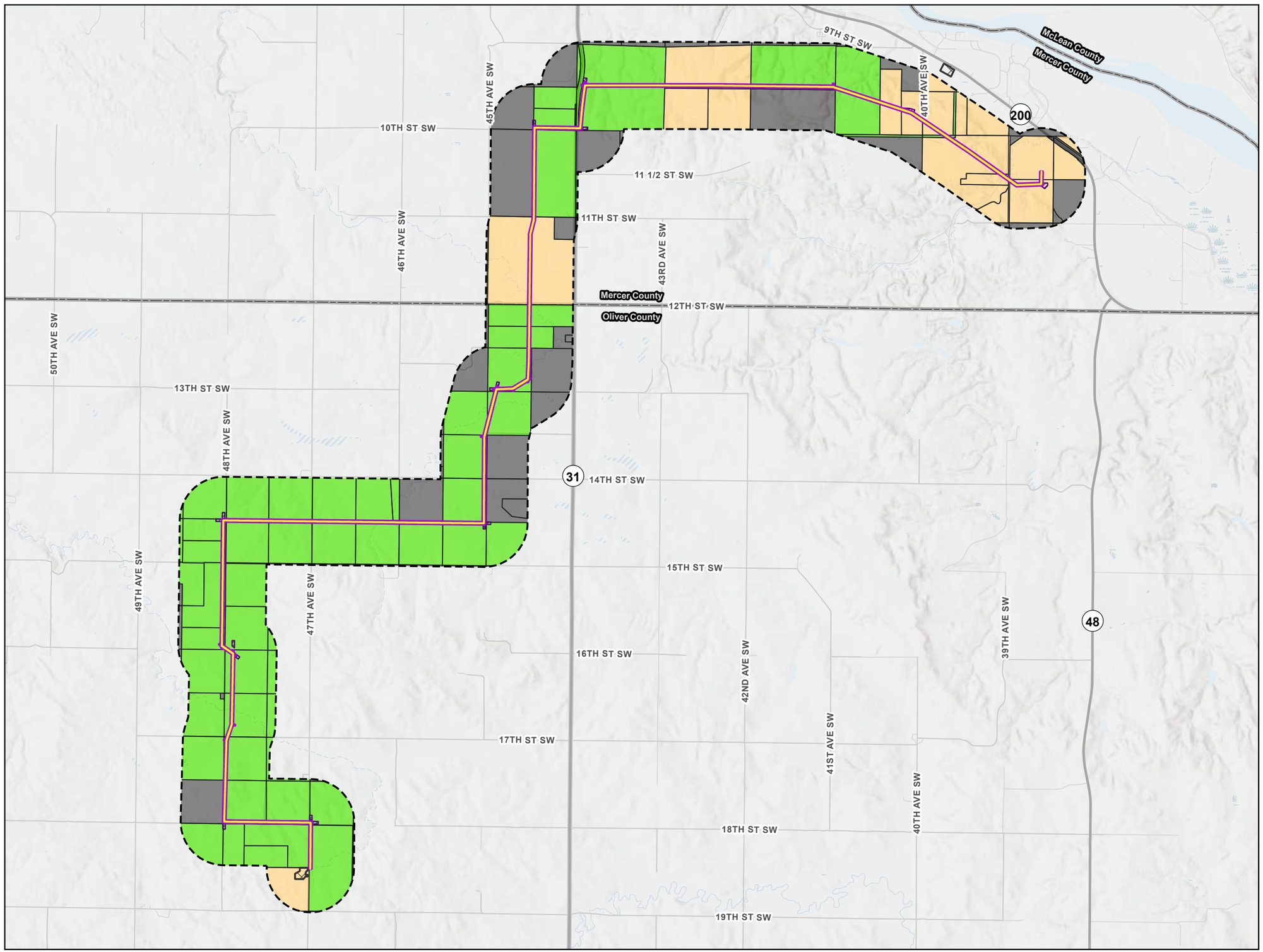
- Project Route
- Project Corridor
- Study Area
- Pulling Location
- Construction Laydown Area
- Wind Energy Center Project Area
- County Boundary

Figure 4:
Project Route, Study Area, and Wind Project
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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Source: Z:\Client\M_P\NextEra\Red_Butte\ArcGIS\Permitting\PSC_App\OliverNextEra_OIV_Wind_Tline_PSC_Application.aprx
Date: (8/19/2025)





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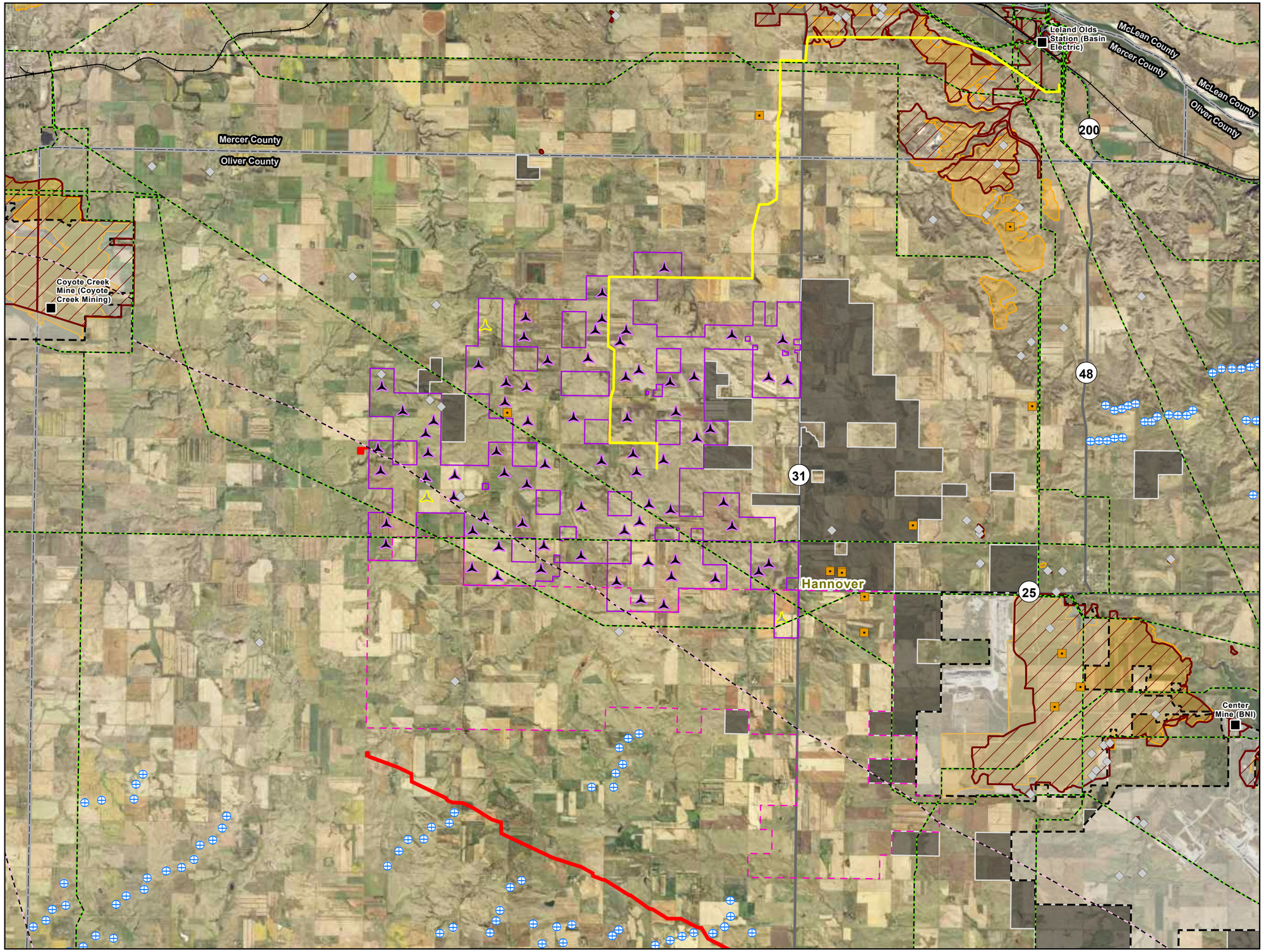
- Project Route
- Project Corridor
- Study Area
- Pulling Location
- Construction Laydown Area
- Participating Landowner
- Landowner Participation Anticipated
- Non-Participating Landowner
- County Boundary

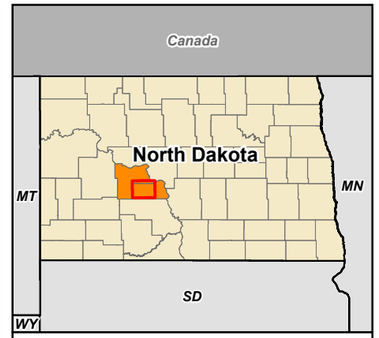
Figure 5: Participating Landowners
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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For Environmental Review Purposes Only

Date: (6/15/2023) Source: Z:\Clients\NextEra\Red_Pines\ArcGIS\Permitting\PSC_App\OWNotice_OW_Wind_TLine_PSC_Application.aprx





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Existing Development
- Wind Turbine
- Energy Facility
- Exploration Well
- Abandoned Mine
- Transmission Line
- Oil & Gas Pipeline
- Railroad
- Coal Mine Permit Boundary
- Coal Lease*
- Previously Mined Land (NDGS 2007)
- Previously Mined Land (USDA 2023)

*Only coal leases adjacent to the Project are displayed on the map

Proposed Development
- Oliver Wind IV Primary Turbine
- Oliver Wind IV Alternative Turbine
- Oliver Wind IV Transmission Line
- Oliver Wind IV Project Area
- Red Butte Study Area
- Proposed Carbon Caputure Infrastructure

Figure 6: Present and Future Natural Resources Development

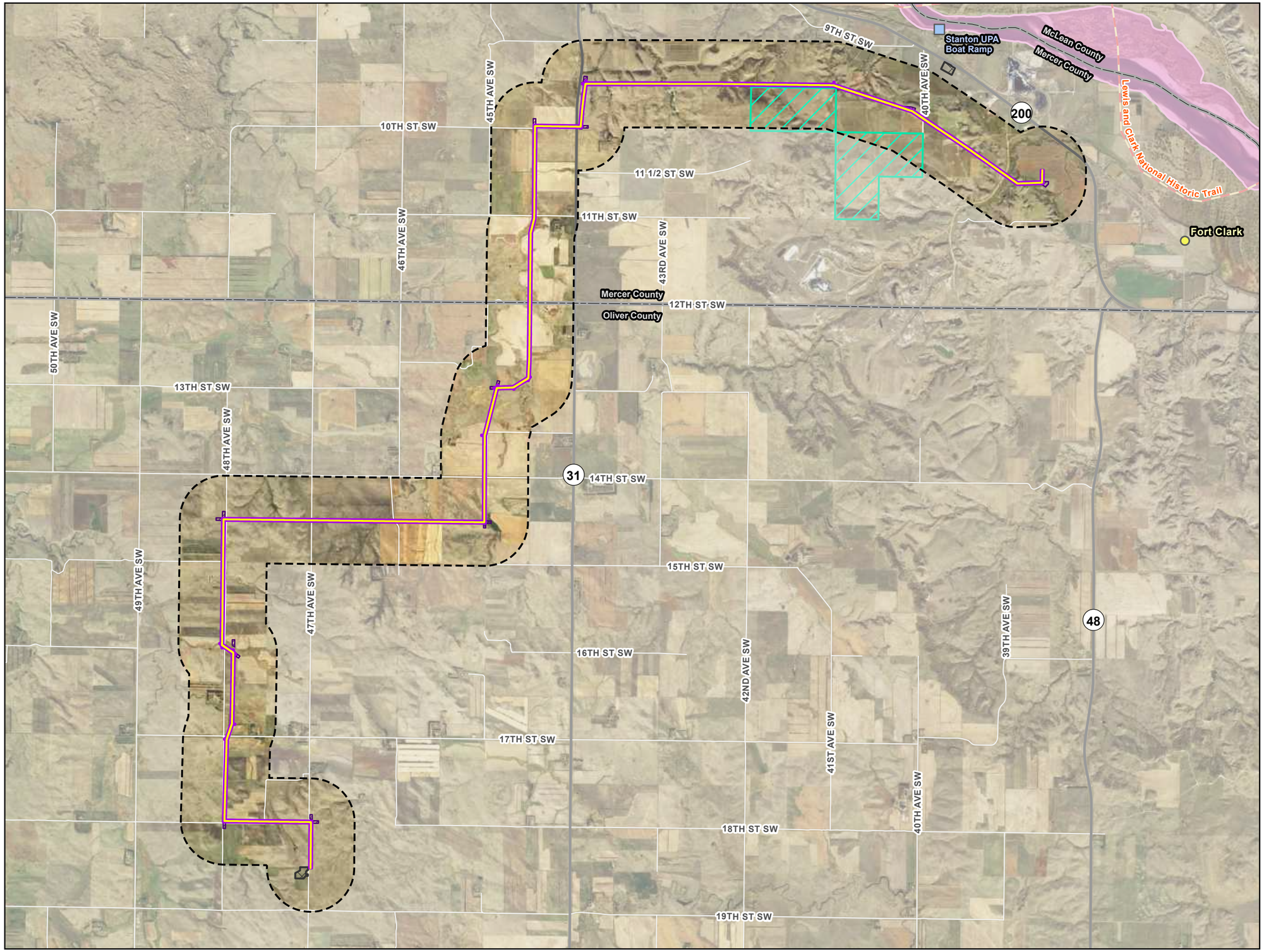
Oliver Wind IV 345-kV Transmission Line

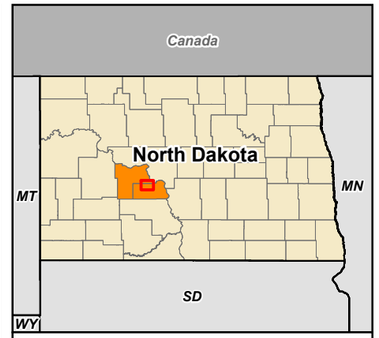
Oliver and Mercer Counties, North Dakota

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For Environmental Review Purposes Only

Source: J:\Client\M_P\Westwind\Red_Butte\GIS\Permitting\PSC_App\OliverIV_Wind_Tline_PSC_Application.aprx
Date: (8/1/2025)





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- Project Route
- Project Corridor
- Study Area
- Pulling Location
- Construction Laydown Area
- County Boundary

Avoidance Area*

- State Historic Site
- Stanton UPA Boat Ramp
- National Historic Trail
- Wildlife Management Area
- Designated Critical Habitat (Piping Plover)

*Known archaeological sites are not depicted due to confidentiality

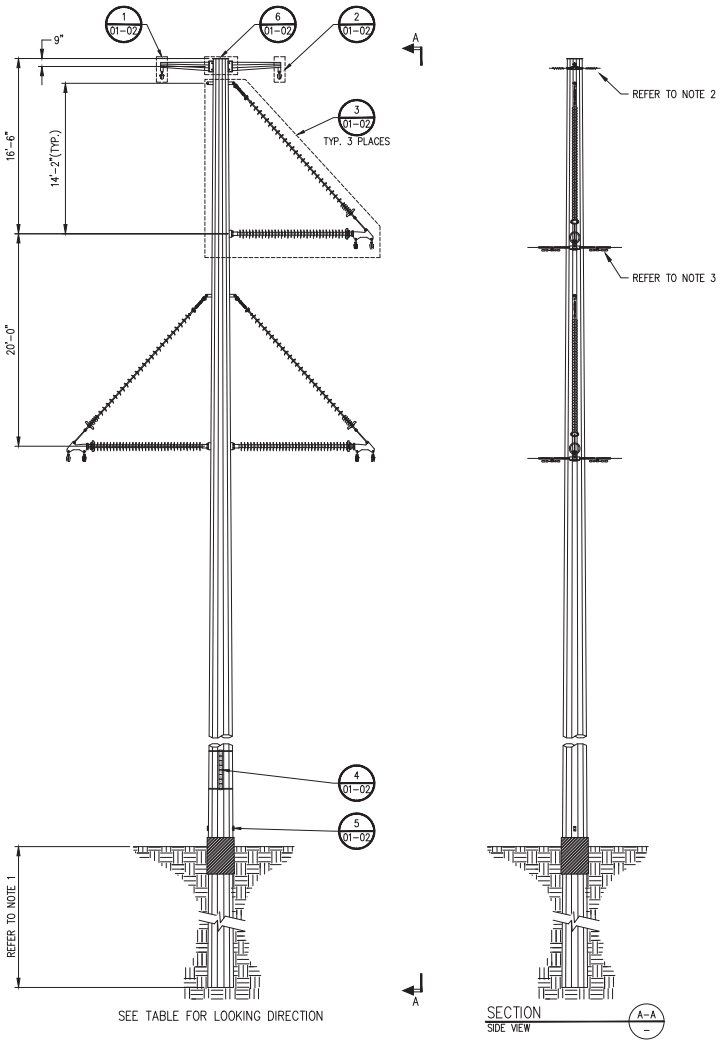
Figure 7: Exclusion and Avoidance Areas

Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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For Environmental Review Purposes Only

Date: (8/1/2025) Source: ArcGIS\Oliver_Wind\Deliverables\Route_Suite\ArcGIS\Permitting\PSC_App\OliverWind_DW_Wind_Tline_PSC_Application.aprx



STRUCTURE LIST

AHEAD ON LINE LOOKING DIRECTION REFERS TO LOOKING ALONG THE LINE TOWARDS NEW LELAND OLDS. LOOKING BACK ON LINE REFERS TO LOOKING ALONG THE LINE TOWARDS OLIVER WIND IV.

STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION
2	22MRO2	AHEAD ON LINE	33	22MRO33	AHEAD ON LINE	62	22MRO62	AHEAD ON LINE	93	22MRO93	AHEAD ON LINE
3	22MRO3	AHEAD ON LINE	34	22MRO34	AHEAD ON LINE	63	22MRO63	AHEAD ON LINE	94	22MRO94	AHEAD ON LINE
5	22MRO5	AHEAD ON LINE	35	22MRO35	AHEAD ON LINE	64	22MRO64	AHEAD ON LINE	95	22MRO95	AHEAD ON LINE
6	22MRO6	AHEAD ON LINE	36	22MRO36	AHEAD ON LINE	65	22MRO65	AHEAD ON LINE	96	22MRO96	AHEAD ON LINE
7	22MRO7	AHEAD ON LINE	37	22MRO37	AHEAD ON LINE	66	22MRO66	AHEAD ON LINE	97	22MRO97	AHEAD ON LINE
8	22MRO8	AHEAD ON LINE	38	22MRO38	AHEAD ON LINE	67	22MRO67	AHEAD ON LINE	98	22MRO98	AHEAD ON LINE
9	22MRO9	AHEAD ON LINE	39	22MRO39	AHEAD ON LINE	68	22MRO68	AHEAD ON LINE	99	22MRO99	AHEAD ON LINE
10	22MRO10	AHEAD ON LINE	40	22MRO40	AHEAD ON LINE	69	22MRO69	AHEAD ON LINE	100	22MRO100	AHEAD ON LINE
12	22MRO12	AHEAD ON LINE	41	22MRO41	AHEAD ON LINE	72	22MRO72	AHEAD ON LINE	101	22MRO101	AHEAD ON LINE
13	22MRO13	AHEAD ON LINE	42	22MRO42	AHEAD ON LINE	73	22MRO73	AHEAD ON LINE	102	22MRO102	AHEAD ON LINE
14	22MRO14	AHEAD ON LINE	43	22MRO43	AHEAD ON LINE	74	22MRO74	AHEAD ON LINE	104	22MRO104	AHEAD ON LINE
15	22MRO15	AHEAD ON LINE	44	22MRO44	AHEAD ON LINE	75	22MRO75	AHEAD ON LINE	105	22MRO105	AHEAD ON LINE
18	22MRO18	AHEAD ON LINE	45	22MRO45	AHEAD ON LINE	78	22MRO78	AHEAD ON LINE	106	22MRO106	AHEAD ON LINE
19	22MRO19	AHEAD ON LINE	46	22MRO46	AHEAD ON LINE	80	22MRO80	AHEAD ON LINE	107	22MRO107	AHEAD ON LINE
20	22MRO20	AHEAD ON LINE	47	22MRO47	AHEAD ON LINE	81	22MRO81	AHEAD ON LINE	108	22MRO108	AHEAD ON LINE
21	22MRO21	AHEAD ON LINE	48	22MRO48	AHEAD ON LINE	83	22MRO83	AHEAD ON LINE	110	22MRO110	AHEAD ON LINE
24	22MRO24	AHEAD ON LINE	50	22MRO50	AHEAD ON LINE	84	22MRO84	AHEAD ON LINE	111	22MRO111	AHEAD ON LINE
25	22MRO25	AHEAD ON LINE	51	22MRO51	AHEAD ON LINE	86	22MRO86	AHEAD ON LINE	112	22MRO112	AHEAD ON LINE
26	22MRO26	AHEAD ON LINE	52	22MRO52	AHEAD ON LINE	87	22MRO87	AHEAD ON LINE	113	22MRO113	AHEAD ON LINE
27	22MRO27	AHEAD ON LINE	53	22MRO53	AHEAD ON LINE	88	22MRO88	AHEAD ON LINE	114	22MRO114	AHEAD ON LINE
28	22MRO28	AHEAD ON LINE	54	22MRO54	AHEAD ON LINE	89	22MRO89	AHEAD ON LINE	115	22MRO115	AHEAD ON LINE
29	22MRO29	AHEAD ON LINE	56	22MRO56	AHEAD ON LINE	90	22MRO90	AHEAD ON LINE	116	22MRO116	AHEAD ON LINE
30	22MRO30	AHEAD ON LINE	57	22MRO57	AHEAD ON LINE	91	22MRO91	AHEAD ON LINE	118	22MRO118	AHEAD ON LINE
32	22MRO32	AHEAD ON LINE	61	22MRO61	AHEAD ON LINE	92	22MRO92	AHEAD ON LINE	-	-	-

GENERAL INSTALLATION NOTES

1. REFER TO DRAWING OW4-B-T008-01 FOR EMBEDMENT INSTALLATION DETAILS.
2. REFER TO DRAWING OW4-D-T003-32-01 FOR OPGW DAMPER INSTALLATION REQUIREMENTS.
3. REFER TO DRAWING OW4-D-T003-33-01 FOR CONDUCTOR DAMPER INSTALLATION REQUIREMENTS.

ENGINEER OF RECORD SEAL

NOT FOR CONSTRUCTION

"Engineering with Distinction"
ELECTRICAL CONSULTANTS, INC.
BILLINGS, MONTANA

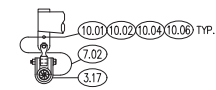
NO	REVISION	DATE	BY	APR
A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

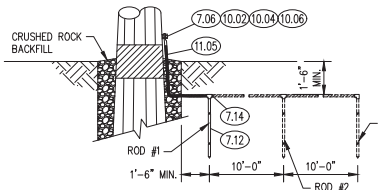
ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	09/08/23
DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL TANGENT DELTA – 1 OF 2
345-M1-SC-T01-G0-C01-F01-S01

DWG. NAME: OW4-D-T003-01-01 REVISION NO : A



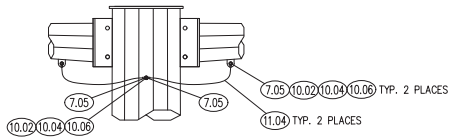
DETAIL
OPGW TANGENT – STEEL
1



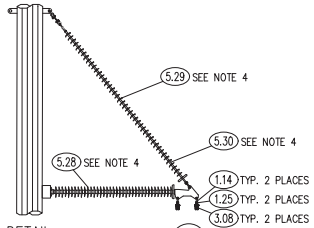
DETAIL
DIRECT EMBED GROUNDING
5



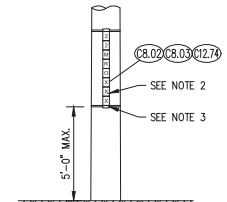
DETAIL
SW TANGENT – STEEL
2



DETAIL
SW ARM GROUNDING
6



DETAIL
BRACED POST – STEEL
3



DETAIL
STRUCTURE SIGN PLACEMENT
4

ASSEMBLY	ITEM #	QTY PER ASSY	QTY PER STR	UNIT	DESCRIPTION	MANUFACTURER 1/PART #	MANUFACTURER 2/PART #
OPGW (1) ASSEMBLY PER STRUCTURE DETAIL 1	3.17	1	1	EA	FIBERLIGN - SUSPENSION CLAMP W/ Y-CLEVIS (0.512in - 0.536in DIA)	PLP-4300109-YC	
	7.02	1	1	EA	OPGW/OHSW GROUNDING S-STRAP WITH TWO TERMINALS	EMC INC. EM02-7S-OPGW-JTL	
	10.01	2	2	EA	1/2" WASHER, GALV	ALL MAKES	
	10.02	2	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	2	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	2	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
SW (1) ASSEMBLY PER STRUCTURE DETAIL 2	3.26	1	1	EA	FIBERLIGN - SUSPENSION CLAMP W/Y-CLEVIS (0.354in - 0.381in DIA)	PLP-4301100-YC	
	7.02	1	1	EA	OPGW/OHSW GROUNDING S-STRAP WITH TWO TERMINALS	EMC INC. EM02-7S-OPGW-JTL	
	10.01	2	2	EA	1/2" WASHER, GALV	ALL MAKES	
	10.02	2	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	2	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	2	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
BRACED POST (3) ASSEMBLIES PER STRUCTURE DETAIL 3	1.14	2	6	EA	Y-CLEVIS BALL - 30K (ANSI 52-3 & 52-5)	HUBBELL YBC30	MACLEAN YCB-65A
	1.25	2	6	EA	SOCKET EYE - 30K (ANSI 52-3 & 52-5) (1-1/16" WIDTH)	LINDSEY 3355	
	3.08	2	6	EA	CUSHION GRIP CLAMP - (0.684in - 1.196in DIA)	PLP CGS-1097	AFL HCS1073
	5.28	1	3	EA	345kV POLYMER POST INSULATOR (FOR LINDSEY 345kV BRACED POST ASSEMBLY)	NGK LA-SN691-M6U-X	ONLY REQUIRED WHEN ORDERING LINDSEY 345kV BRACED POST ASSEMBLY. DO NOT ORDER FOR MACLEAN ASSEMBLIES
	5.29	1	3	EA	345kV POLYMER BRACE INSULATOR - 50K (FOR LINDSEY 345kV BRACED POST ASSEMBLY)	NGK-502-SC1430-YK-43	ONLY REQUIRED WHEN ORDERING LINDSEY 345kV BRACED POST ASSEMBLY. DO NOT ORDER FOR MACLEAN ASSEMBLIES
	5.30	1	3	EA	345kV BRACED POST ASSEMBLY - STEEL POLE (INCLUDES MOUNTING BOLT KIT)	LINDSEY R 248523-CGS-0	MACLEAN B470H132P20170BB
POLE SIGNAGE (1) ASSEMBLY PER STRUCTURE DETAIL 4	C8.02	40	40	FT	3/4 TYPE 201 HEAVY DUTY SS BAND	MARATHON MAR430	USA B12430
	C8.03	2	2	EA	CLAMPS & BOLTS FOR SS BAND	MARATHON MAR500	USA B12500
	C12.36	A/R	A/R	EA	BASE NUMBER - 0 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY010	
	C12.37	A/R	A/R	EA	BASE NUMBER - 1 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY001	
	C12.38	A/R	A/R	EA	BASE NUMBER - 2 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY002	
	C12.39	A/R	A/R	EA	BASE NUMBER - 3 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY003	
	C12.40	A/R	A/R	EA	BASE NUMBER - 4 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY004	
	C12.41	A/R	A/R	EA	BASE NUMBER - 5 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY005	
	C12.42	A/R	A/R	EA	BASE NUMBER - 6 OR 9 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY006	
	C12.43	A/R	A/R	EA	BASE NUMBER - 7 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY007	
	C12.44	A/R	A/R	EA	BASE NUMBER - 8 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY008	
	C12.57	1	1	EA	BASE LETTER - M - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYM	
	C12.59	1	1	EA	BASE LETTER - O - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYO	
	C12.62	1	1	EA	BASE LETTER - R - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYR	
	C12.74	1	1	EA	3" TAG HOLDER, VERTICAL ORIENTATION, 8 TAGS, W/ SLOTS	TECH PRODUCTS AH308VP-S	
GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 5	7.06	1	1	EA	COMPRESSION TERMINAL: 1/2" TO #4	BURNDY YA4CN	
	7.12	A/R	A/R	EA	STRUCTURE GROUND ROD: 5/8" BY 10' LENGTH, COPPER CLAD, PER UL 467U	ERICO 615800	GALVAN 60260
	7.14	A/R	A/R	EA	GROUND ROD CONNECTOR TAP - CADWELD (NO IGNITOR)	ERICO NTI 161L	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.05	A/R	A/R	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	
SW ARM GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 6	7.05	4	4	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	10.02	3	3	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	3	3	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	3	3	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	10	10	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	

NOTES

1. MATERIAL SHOWN HERE FOR ONE STRUCTURE.
2. INSTALL ALL TAGS FACING THE NEAREST ROAD OR INSPECTION PATH.
3. USE BANDING TO SECURE TAG HOLDER TO POLES, MOUNT BOTTOM TAG 5' ABOVE GROUND.
4. IF LINDSEY IS SELECTED FOR INSULATOR ASSEMBLY 5.30, THEN ADDITIONAL PARTS 5.28 AND 5.29 WILL BE REQUIRED. THESE PARTS ARE NOT NEEDED IF MACLEAN IS SELECTED FOR 5.30.
5. INSTALL GROUND RODS USING THE FOLLOWING PROCEDURE. TARGET GROUND RESISTANCE IS 25 OHMS FOR ALL STRUCTURES.
   A. DRIVE ONE (1) 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #1).
   B. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP C.
   C. DRIVE SECOND 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN STEEL POLE GROUNDING DETAIL (ROD #2) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   D. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP E.
   E. DRIVE THIRD 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #3) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   F. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP G.
   G. IF MEASUREMENT EXCEEDS 25 OHMS AT THIS STAGE, CONNECTION TO THE STRUCTURE CAN BE COMPLETED AT THIS TIME. ALL READINGS SHALL BE RECORDED AND PROVIDED TO THE OWNER. AFTER ALL CONNECTIONS ARE MADE TO THE STATIC WIRE, THE STRUCTURE SHALL BE RETESTED AGAIN TO SEE IF IT MEETS THE 25 OHMS. IF AT THIS TIME THE RESISTANCE CAN STILL NOT BE MET, CONTACT THE OWNER.

ENGINEER OF RECORD SEAL

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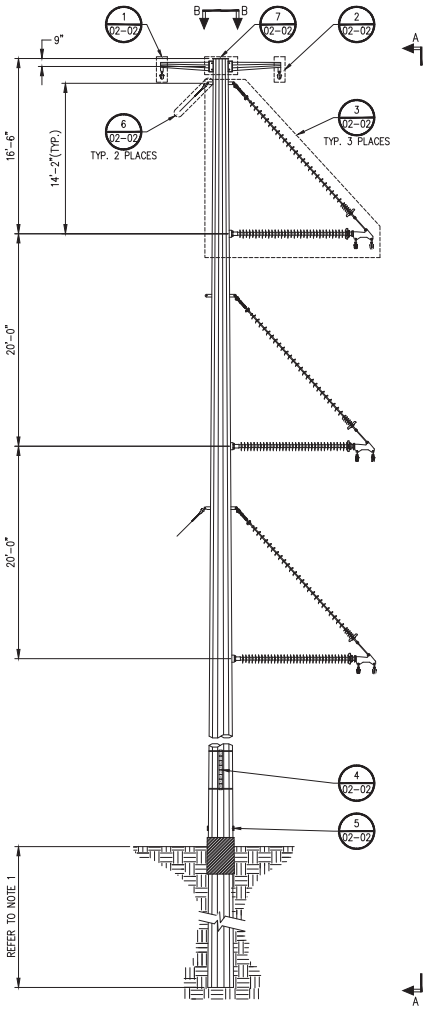
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OLIVER WIND IV, LLC

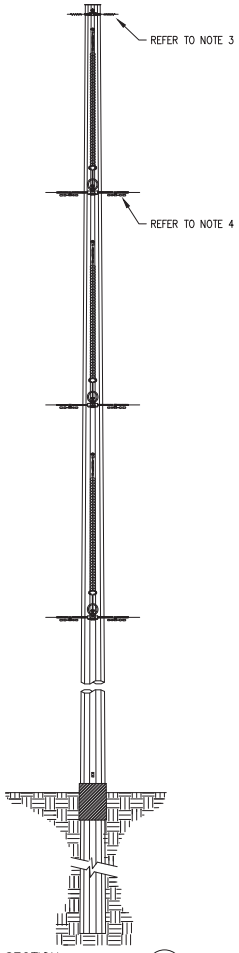
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DRAWN	C. ELLIS	09/08/23
DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL TANGENT DELTA – 2 OF 2
345-M1-SC-T01-G0-C01-F01-S01

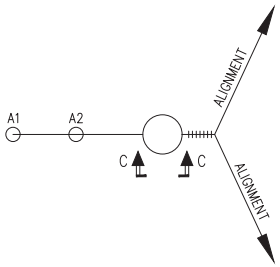
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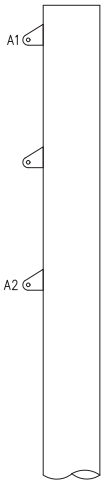
SEE TABLE FOR LOOKING DIRECTION



SECTION
SIDE VIEW
A–A



SECTION
GUY WIRE/ANCHOR PLAN VIEW
(SEE NOTE 5)
B–B



SECTION
GUY WIRE/ANCHOR ELEVATION
(SEE NOTE 5)
C–C

STRUCTURE LIST

AHEAD ON LINE LOOKING DIRECTION REFERS TO LOOKING ALONG THE LINE TOWARDS NEW LELAND OLDS. LOOKING BACK ON LINE REFERS TO LOOKING ALONG THE LINE TOWARDS OLIVER WIND IV.

STR	SIGNAGE	LOOKING DIRECTION	ANCHOR ASSEMBLY	ANCHOR INSTALL	STR	SIGNAGE	LOOKING DIRECTION	ANCHOR ASSEMBLY	ANCHOR INSTALL
55	22MRO55	AHEAD ON LINE	OW4-D-T003-40-01	OW4-D-T008-XX	-	-	-	-	-

GENERAL INSTALLATION NOTES

1. REFER TO DRAWING OW4-B-T008-01 FOR EMBEDMENT INSTALLATION DETAILS.
2. REFER TO TABLE ABOVE FOR ANCHOR DETAILS.
3. REFER TO DRAWING OW4-D-T003-32-01 FOR OPGW DAMPER INSTALLATION REQUIREMENTS.
4. REFER TO DRAWING OW4-D-T003-33-01 FOR CONDUCTOR DAMPER INSTALLATION REQUIREMENTS.
5. LETTERS ON THE POLE ELEVATION SECTION VIEW AND ANCHOR LOCATION PLAN VIEW CORRESPOND TO THE POLE AND ANCHOR ATTACHMENT LOCATIONS FOR THE GUYING ASSEMBLY. FOR EXAMPLE, GUY WIRE WOULD CONNECT THE A1 VANG ON THE POLE ELEVATION TO THE A1 ANCHOR IN THE PLAN VIEW.

ENGINEER OF RECORD SEAL

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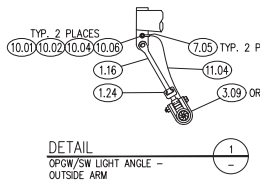
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OLIVER WIND IV, LLC

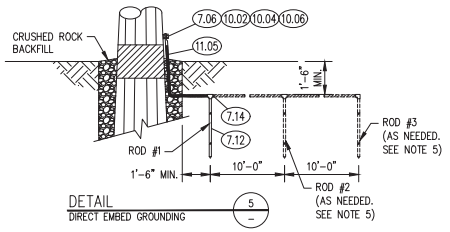
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DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL LIGHT ANGLE GUYED – 1 OF 2
345-M1-SC-T03-G1-C01-F01-S01

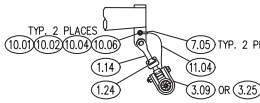
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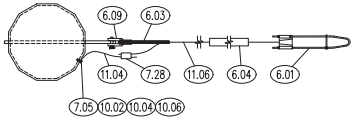
DETAIL
OPGW/SW LIGHT ANGLE – OUTSIDE ARM
1



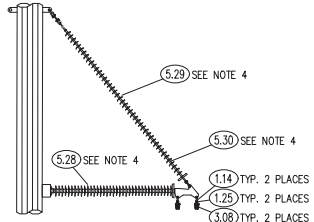
DETAIL
DIRECT EMBED GROUNDING
5



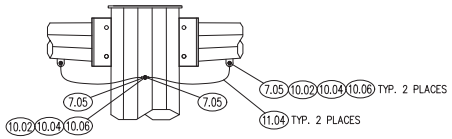
DETAIL
OPGW/SW LIGHT ANGLE – INSIDE ARM
2



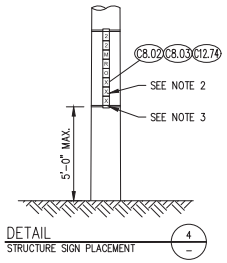
DETAIL
GUY WIRE ASSEMBLY
6



DETAIL
BRACED POST – STEEL
3



DETAIL
SW ARM GROUNDING
7



DETAIL
STRUCTURE SIGN PLACEMENT
4

ASSEMBLY	ITEM #	QTY PER ASSY	QTY PER STR	UNIT	DESCRIPTION	MANUFACTURER 1/PART #	MANUFACTURER 2/PART #
OPGW/SW LIGHT ANGLE - OUTSIDE ARM (1) ASSEMBLY PER STRUCTURE DETAIL 1	1.16	1	1	EA	Y-CLEVIS BALL EXT - 35K (ANSI 52-3 & 52-5)	MACLEAN YCBHL-65A	HUBBELL HYBC30
	1.24	1	1	EA	SOCKET EYE - 20K (ANSI 52-3 & 52-5) (5/8" WIDTH)	MACLEAN SI-625	HUBBELL SA05
	3.09	A/R	A/R	EA	FIBERLIGN - SUSPENSION CLAMP (0.512in - 0.536in DIA)	PLP 4300109	
	3.25	A/R	A/R	EA	FIBERLIGN - SUSPENSION CLAMP (0.354in - 0.381in DIA)	PLP 4300100	
	7.05	2	2	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YAZCN	
	10.01	2	2	EA	1/2" WASHER, GALV	ALL MAKES	
	10.02	2	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	2	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	2	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	10	10	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
OPGW/SW LIGHT ANGLE - INSIDE ARM (1) ASSEMBLY PER STRUCTURE DETAIL 2	1.14	1	1	EA	Y-CLEVIS BALL - 30K (ANSI 52-3 & 52-5)	HUBBELL YBC30	MACLEAN YCB-65A
	1.24	1	1	EA	SOCKET EYE - 20K (ANSI 52-3 & 52-5) (5/8" WIDTH)	MACLEAN SI-625	HUBBELL SA05
	3.09	A/R	A/R	EA	FIBERLIGN - SUSPENSION CLAMP (0.512in - 0.536in DIA)	PLP 4300109	
	3.25	A/R	A/R	EA	FIBERLIGN - SUSPENSION CLAMP (0.354in - 0.381in DIA)	PLP 4300100	
	7.05	2	2	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YAZCN	
	10.01	2	2	EA	1/2" WASHER, GALV	ALL MAKES	
	10.02	2	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	2	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	2	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	10	10	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
BRACED POST (3) ASSEMBLIES PER STRUCTURE DETAIL 3	1.14	2	6	EA	Y-CLEVIS BALL - 30K (ANSI 52-3 & 52-5)	HUBBELL YBC30	MACLEAN YCB-65A
	1.25	2	6	EA	SOCKET EYE - 30K (ANSI 52-3 & 52-5) (1-1/16" WIDTH)	LINDSEY 3355	
	3.08	2	6	EA	CUSHION GRIP CLAMP - (0.884in - 1.196in DIA)	PLP CGS-1097	AFL HCS1073
	5.28	1	3	EA	345kV POLYMER POST INSULATOR (FOR LINDSEY 345KV BRACED POST ASSEMBLY)	NGK L4-SN691-M6U-X	ONLY REQUIRED WHEN ORDERING LINDSEY 345KV BRACED POST ASSEMBLY; DO NOT ORDER FOR MACLEAN ASSEMBLIES
	5.29	1	3	EA	345kV POLYMER BRACE INSULATOR - 50K (FOR LINDSEY 345KV BRACED POST ASSEMBLY)	NGK 502-SC1430-YK-43	ONLY REQUIRED WHEN ORDERING LINDSEY 345KV BRACED POST ASSEMBLY; DO NOT ORDER FOR MACLEAN ASSEMBLIES
	5.30	1	3	EA	345kV BRACED POST ASSEMBLY - STEEL POLE (INCLUDES MOUNTING BOLT KIT)	LINDSEY R-246523-CGS-0	MACLEAN B470H132P26170EB
POLE SIGNAGE (1) ASSEMBLY PER STRUCTURE DETAIL 4	C8.02	40	40	FT	3/4 TYPE 201 HEAVY DUTY SS BAND	MARATHON MAR430	USA B12430
	C8.03	2	2	EA	CLAMPS & BOLTS FOR SS BAND	MARATHON MAR500	USA B12500
	C12.36	A/R	A/R	EA	BASE NUMBER - 0 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY010	
	C12.37	A/R	A/R	EA	BASE NUMBER - 1 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY001	
	C12.38	A/R	A/R	EA	BASE NUMBER - 2 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY002	
	C12.39	A/R	A/R	EA	BASE NUMBER - 3 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY003	
	C12.40	A/R	A/R	EA	BASE NUMBER - 4 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY004	
	C12.41	A/R	A/R	EA	BASE NUMBER - 5 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY005	
	C12.42	A/R	A/R	EA	BASE NUMBER - 6 OR 9 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY006	
	C12.43	A/R	A/R	EA	BASE NUMBER - 7 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY007	
	C12.44	A/R	A/R	EA	BASE NUMBER - 8 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY008	
	C12.57	1	1	EA	BASE LETTER - M - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYM	
	C12.59	1	1	EA	BASE LETTER - O - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYO	
	C12.62	1	1	EA	BASE LETTER - R - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYR	
	C12.74	1	1	EA	3" TAG HOLDER, VERTICAL ORIENTATION, 8 TAGS, W/ SLOTS	TECH PRODUCTS AH308VP-S	
GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 5	7.06	1	1	EA	COMPRESSION TERMINAL: 1/2" TO #4	BURNDY YA4CN	
	7.12	A/R	A/R	EA	STRUCTURE GROUND ROD: 5/8" BY 10' LENGTH, COPPER CLAD, PER UL 467U	ERICO 615800	GALVAN 6260
	7.14	A/R	A/R	EA	GROUND ROD CONNECTOR TAP - CADWELD (NO IGNITOR)	ERICO NT116TL	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.05	A/R	A/R	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	
RUNNING ANGLE GUY ASSEMBLY (2) ASSEMBLIES PER STRUCTURE DETAIL 6	6.01	1	2	EA	GUY DEADEND VAR-GRIP 59k	PLP VG-16-2103	HUBBELL 34GA16
	6.03	1	2	EA	BIG GUY GRIP 3/4"	PLP BG-1112	
	6.04	1	2	EA	GUY GUARD - YELLOW	ELECTRIC MATERIAL 70-7Y-W0C	
	6.09	1	2	EA	CLEVIS THIMBLE - 90K	LINDSEY R-22157	
	7.05	1	2	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YAZCN	
	7.28	1	2	EA	BONDING CLAMP, RUN DIA (0.740"-1.152"), TAP DIA (0.162"-0.464")	AFL 393-6	
	10.02	1	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	2.5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
	11.05	A/R	A/R	FT	3/4" EHS 19 STRAND	ALL MAKES	
SW ARM GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 7	7.05	4	4	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YAZCN	
	10.02	3	3	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	3	3	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	3	3	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	10	10	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	

NOTES

1. MATERIAL SHOWN HERE FOR ONE STRUCTURE.
2. INSTALL ALL TAGS FACING THE NEAREST ROAD OR INSPECTION PATH.
3. USE BANDING TO SECURE TAG HOLDER TO POLES. MOUNT BOTTOM TAG 5' ABOVE GROUND.
4. IF LINDSEY IS SELECTED FOR INSULATOR ASSEMBLY 5.30, THEN ADDITIONAL PARTS 5.28 AND 5.29 WILL BE REQUIRED. THESE PARTS ARE NOT NEEDED IF MACLEAN IS SELECTED FOR 5.30.
5. INSTALL GROUND RODS USING THE FOLLOWING PROCEDURE. TARGET GROUND RESISTANCE IS 25 OHMS FOR ALL STRUCTURES.
   A. DRIVE ONE (1) 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #1).
   B. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP C.
   C. DRIVE SECOND 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN STEEL POLE GROUNDING DETAIL (ROD #2) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   D. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP E.
   E. DRIVE THIRD 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #3) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   F. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP G.
   G. IF MEASUREMENT EXCEEDS 25 OHMS AT THIS STAGE, CONNECTION TO THE STRUCTURE CAN BE COMPLETED AT THIS TIME. ALL READINGS SHALL BE RECORDED AND PROVIDED TO THE OWNER. AFTER ALL CONNECTIONS ARE MADE TO THE STATIC WIRE, THE STRUCTURE SHALL BE RETESTED AGAIN TO SEE IF IT MEETS THE 25 OHMS. IF AT THIS TIME THE RESISTANCE CAN STILL NOT BE MET, CONTACT THE OWNER.
6. REFER TO PHASING DRAWING OW4-D-T006-01 FOR OPGW POSITION ON EACH STRUCTURE.

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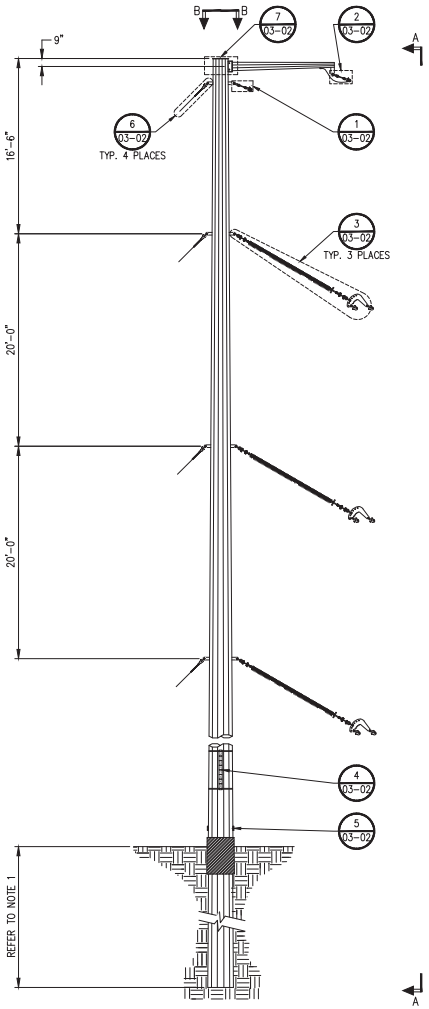
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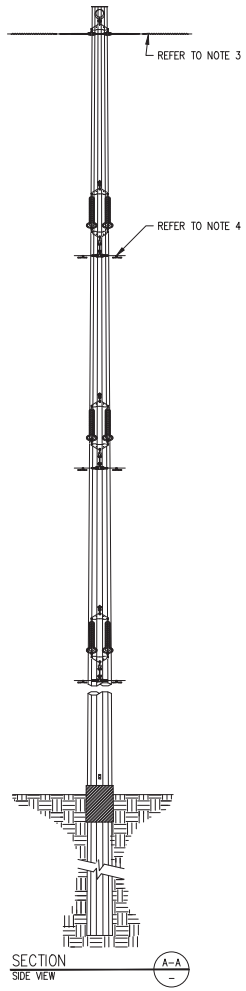
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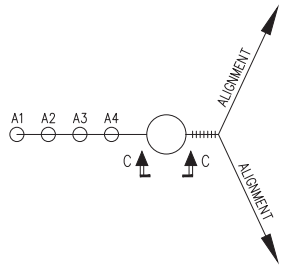
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APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL LIGHT ANGLE GUYED – 2 OF 2
345-M1-SC-T03-G1-C01-F01-S01

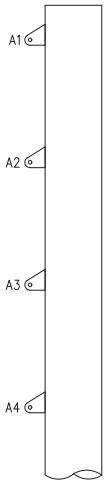
DWG. NAME: OW4-D-T003-02-02 | REVISION NO : A







SECTION
GUY WIRE/ANCHOR PLAN VIEW
(SEE NOTE 5)
B–B



SECTION
GUY WIRE/ANCHOR ELEVATION
(SEE NOTE 5)
C–C

STRUCTURE LIST

AHEAD ON LINE LOOKING DIRECTION REFERS TO LOOKING ALONG THE LINE TOWARDS NEW LELAND OLDS. LOOKING BACK ON LINE REFERS TO LOOKING ALONG THE LINE TOWARDS OLIVER WIND IV.

STR	SIGNAGE	LOOKING DIRECTION	ANCHOR ASSEMBLY	ANCHOR INSTALL	STR	SIGNAGE	LOOKING DIRECTION	ANCHOR ASSEMBLY	ANCHOR INSTALL
16	22MRO16	AHEAD ON LINE	OW4-D-T003-40-01	OW4-D-T008-XX	59	22MRO59	BACK ON LINE	OW4-D-T003-40-01	OW4-D-T008-XX
17	22MRO17	BACK ON LINE	OW4-D-T003-40-01	OW4-D-T008-XX	103	22MRO103	AHEAD ON LINE	OW4-D-T003-40-01	OW4-D-T008-XX

GENERAL INSTALLATION NOTES

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2. REFER TO TABLE ABOVE FOR ANCHOR DETAILS.
3. REFER TO DRAWING OW4-D-T003-32-01 FOR OPGW DAMPER INSTALLATION REQUIREMENTS.
4. REFER TO DRAWING OW4-D-T003-33-01 FOR CONDUCTOR DAMPER INSTALLATION REQUIREMENTS.
5. LETTERS ON THE POLE ELEVATION SECTION VIEW AND ANCHOR LOCATION PLAN VIEW CORRESPOND TO THE POLE AND ANCHOR ATTACHMENT LOCATIONS FOR THE GUYING ASSEMBLY. FOR EXAMPLE, GUY WIRE WOULD CONNECT THE A1 VANG ON THE POLE ELEVATION TO THE A1 ANCHOR IN THE PLAN VIEW.

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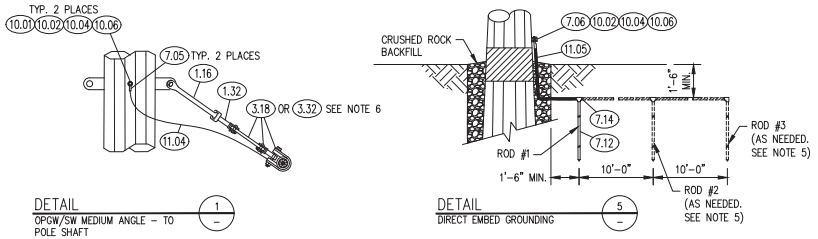
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ENGINEERING RECORD		DATE
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DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

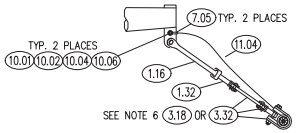
OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL MEDIUM ANGLE GUYED – 1 OF 2
345-M1-SC-T04-G1-C01-F01-S01

DWG. NAME: OW4-D-T003-03-01 REVISION NO : A

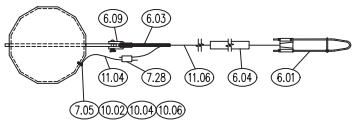


DETAIL 1
OPGW/SW MEDIUM ANGLE – TO POLE SHAFT

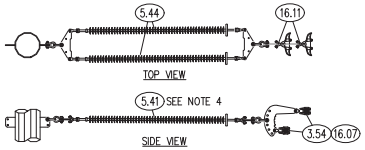
DETAIL 5
DIRECT EMBED GROUNDING



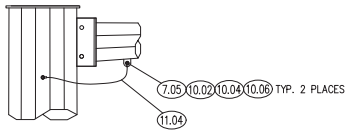
DETAIL 2
OPGW/SW MEDIUM ANGLE – TO ARM



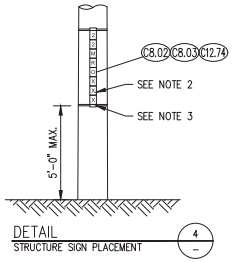
DETAIL 6
GUY WIRE ASSEMBLY



DETAIL 3
I-STRING ASSEMBLY – STEEL



DETAIL 7
SW ARM GROUNDING



DETAIL 4
STRUCTURE SIGN PLACEMENT

ASSEMBLY	ITEM #	QTY PER ASSY	QTY PER STR	UNIT	DESCRIPTION	MANUFACTURER 1/PART #	MANUFACTURER 2/PART #
OPGW/SW TO POLE SHAFT (1) ASSEMBLY PER STRUCTURE DETAIL 1	1.16	1	1	EA	Y-CLEVIS BALL EXT - 35K (ANSI 52-3 & 52-5)	MACLEAN YCBHL-65A	HUBBELL HYBC30
	1.32	1	1	EA	SOCKET CLEVIS - 30K	HUBBELL SC30	
	3.18	A/R	A/R	EA	FIBERLIGN - DOUBLE SUSPENSION CLAMP W/ Y-CLEVIS (0.512in - 0.536in DIA)	PLP 4300220-CEYP	
	3.32	A/R	A/R	EA	FIBERLIGN - DOUBLE SUSPENSION CLAMP W/ Y-CLEVIS (0.354in - 0.381in DIA)	PLP 4300200-CEYP	
	7.05	2	2	EA	COMPRESSION TERMINAL 1/2" TO #2	BURNDY YAZCN	
	10.01	2	2	EA	1/2" WASHER, GALV	ALL MAKES	
	10.02	2	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	2	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	2	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
OPGW/SW TO ARM (1) ASSEMBLY PER STRUCTURE DETAIL 2	1.16	1	1	EA	Y-CLEVIS BALL EXT - 35K (ANSI 52-3 & 52-5)	MACLEAN YCBHL-65A	HUBBELL HYBC30
	1.32	1	1	EA	SOCKET CLEVIS - 30K	HUBBELL SC30	
	3.18	A/R	A/R	EA	FIBERLIGN - DOUBLE SUSPENSION CLAMP W/ Y-CLEVIS (0.512in - 0.536in DIA)	PLP 4300220-CEYP	
	3.32	A/R	A/R	EA	FIBERLIGN - DOUBLE SUSPENSION CLAMP W/ Y-CLEVIS (0.354in - 0.381in DIA)	PLP 4300200-CEYP	
	7.05	2	2	EA	COMPRESSION TERMINAL 1/2" TO #2	BURNDY YAZCN	
	10.01	2	2	EA	1/2" WASHER, GALV	ALL MAKES	
	10.02	2	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	2	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	2	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
I-STRING RUNNING ANGLE (3) ASSEMBLIES PER STRUCTURE DETAIL 3	3.54	2	6	EA	EHV ARMOR ROD - DRAKE	PLP AR-0604	MACLEAN ARA795-26-EHV
	5.41	1	3	EA	345kV RUNNING ANGLE INSULATOR ASSEMBLY (HARDWARE ONLY)	LINDSEY HD-ASY-1189-2-RA-345kV-0	MACLEAN C-8681-RA1-H
	5.44	2	6	EA	345kV POLYMER SUSPENSION INSULATOR - 50K	NGK 502-SS1100-SK-43	MACLEAN S2708013 1VGS8053
	16.07	2	6	EA	ANGLE SUSPENSION CLAMP - "DRAKE	MACLEAN CFA-194-N	LINDSEY 1425-094
	16.11	2	6	EA	Y-CLEVIS EYE, 30K - "DRAKE	MACLEAN RYCI-65-2187	LINDSEY R-15085
POLE SIGNAGE (1) ASSEMBLY PER STRUCTURE DETAIL 4	C8.02	40	40	FT	3/4 TYPE 201 HEAVY DUTY SS BAND	MARATHON MAR430	USA B12430
	C8.03	2	2	EA	CLAMPS & BOLTS FOR SS BAND	MARATHON MAR500	USA B12920
	C12.36	A/R	A/R	EA	BASE NUMBER - 0 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY010	
	C12.37	A/R	A/R	EA	BASE NUMBER - 1 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY001	
	C12.38	A/R	A/R	EA	BASE NUMBER - 2 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY002	
	C12.39	A/R	A/R	EA	BASE NUMBER - 3 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY003	
	C12.40	A/R	A/R	EA	BASE NUMBER - 4 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY004	
	C12.41	A/R	A/R	EA	BASE NUMBER - 5 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY005	
	C12.42	A/R	A/R	EA	BASE NUMBER - 6 OR 9 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY006	
	C12.43	A/R	A/R	EA	BASE NUMBER - 7 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY007	
	C12.44	A/R	A/R	EA	BASE NUMBER - 8 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY008	
	C12.57	1	1	EA	BASE LETTER - M - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYM	
	C12.59	1	1	EA	BASE LETTER - O - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYO	
	C12.62	1	1	EA	BASE LETTER - R - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYR	
	C12.74	1	1	EA	3" TAG HOLDER, VERTICAL ORIENTATION, 8 TAGS, W/ SLOTS	TECH PRODUCTS AH308VP-S	
GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 5	7.06	1	1	EA	COMPRESSION TERMINAL 1/2" TO #4	BURNDY YAKCN	
	7.12	A/R	A/R	EA	STRUCTURE GROUND ROD: 5/8" BY 10' LENGTH, COPPER CLAD, PER UL 467U	ERICO 615800	GALVAN 6260
	7.14	A/R	A/R	EA	GROUND ROD CONNECTOR TAP - CADWELD (NO IGNITOR)	ERICO NTI 161L	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.05	A/R	A/R	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	
RUNNING ANGLE GUY ASSEMBLY (4) ASSEMBLIES PER STRUCTURE DETAIL 6	6.01	1	4	EA	GUY DEADEND VARI-GRIP 5/8in	PLP VG-18-2103	HUBBELL 34GA18
	6.03	1	4	EA	BIG GUY GRIP 3/4"	PLP BG-1112	
	6.04	1	4	EA	GUY GUARD - YELLOW	ELECTRIC MATERIAL 70-7Y-W0C	
	6.09	1	4	EA	CLEVIS THIMBLE - 90K	LINDSEY R-22157	
	7.05	1	4	EA	COMPRESSION TERMINAL 1/2" TO #2	BURNDY YAZCN	
	7.28	1	4	EA	BONDING CLAMP, RUN DIA (0.743"-1.152"), TAP DIA (0.162"-0.464")	AFL 993-6	
	10.02	1	4	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	4	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	4	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	5	20	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
	11.06	A/R	A/R	FT	3/4" EHS 19 STRAND	ALL MAKES	
SW ARM GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 7	7.05	2	2	EA	COMPRESSION TERMINAL 1/2" TO #2	BURNDY YAZCN	
	10.02	2	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	2	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	2	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	

NOTES

1. MATERIAL SHOWN HERE FOR ONE STRUCTURE.
2. INSTALL ALL TAGS FACING THE NEAREST ROAD OR INSPECTION PATH.
3. USE BANDING TO SECURE TAG HOLDER TO POLES. MOUNT BOTTOM TAG 5' ABOVE GROUND.
4. PART 5.41 IS HARDWARE REQUIRED TO CONNECT TO PART 5.44 INSULATORS TO MAKE UP I-STRING ASSEMBLY.
5. INSTALL GROUND RODS USING THE FOLLOWING PROCEDURE. TARGET GROUND RESISTANCE IS 25 OHMS FOR ALL STRUCTURES.
   A. DRIVE ONE (1) 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #1).
   B. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP C.
   C. DRIVE SECOND 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN STEEL POLE GROUNDING DETAIL (ROD #2) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   D. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP E.
   E. DRIVE THIRD 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #3) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   F. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP G.
   G. IF MEASUREMENT EXCEEDS 25 OHMS AT THIS STAGE, CONNECTION TO THE STRUCTURE CAN BE COMPLETED AT THIS TIME. ALL READINGS SHALL BE RECORDED AND PROVIDED TO THE OWNER. AFTER ALL CONNECTIONS ARE MADE TO THE STATIC WIRE, THE STRUCTURE SHALL BE RETESTED AGAIN TO SEE IF IT MEETS THE 25 OHMS. IF AT THIS TIME THE RESISTANCE CAN STILL NOT BE MET, CONTACT THE OWNER.
6. REFER TO PHASING DRAWING OW4-D-T006-01 FOR OPGW POSITION ON EACH STRUCTURE.

ENGINEER OF RECORD SEAL

NOT FOR CONSTRUCTION

"Engineering with Distinction"
ELECTRICAL CONSULTANTS, INC.
BILLINGS, MONTANA

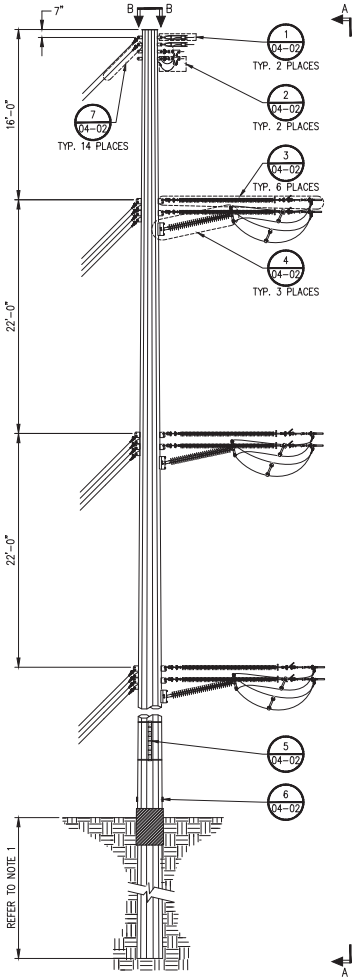
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A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

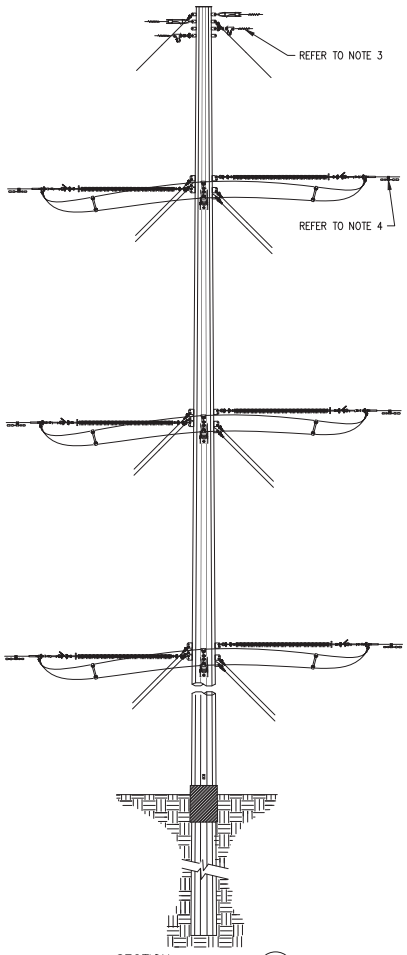
ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	09/08/23
DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL MEDIUM ANGLE GUYED – 2 OF 2
345-M1-SC-T04-G1-C01-F01-S01

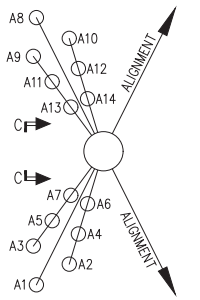
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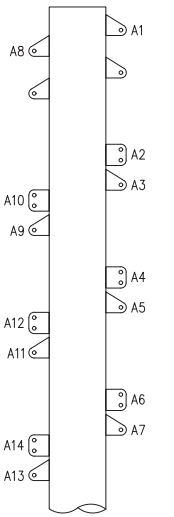
SEE TABLE FOR LOOKING DIRECTION



SECTION
SIDE VIEW
A–A



SECTION
GUY WIRE/ANCHOR PLAN VIEW
(SEE NOTE 5)
B–B



SECTION
GUY WIRE/ANCHOR ELEVATION
(SEE NOTE 5)
C–C

STRUCTURE LIST

AHEAD ON LINE LOOKING DIRECTION REFERS TO LOOKING ALONG THE LINE TOWARDS NEW LELAND OLDS. LOOKING BACK ON LINE REFERS TO LOOKING ALONG THE LINE TOWARDS OLIVER WIND IV.

STR	SIGNAGE	LOOKING DIRECTION	ANCHOR ASSEMBLY	ANCHOR INSTALL	STR	SIGNAGE	LOOKING DIRECTION	ANCHOR ASSEMBLY	ANCHOR INSTALL
22	22MRO22	BACK ON LINE	OW4-D-T003-40-01	OW4-D-T008-XX	58	22MRO58	AHEAD ON LINE	OW4-D-T003-40-01	OW4-D-T008-XX
23	22MRO23	AHEAD ON LINE	OW4-D-T003-40-01	OW4-D-T008-XX	60	22MRO60	BACK ON LINE	OW4-D-T003-40-01	OW4-D-T008-XX

GENERAL INSTALLATION NOTES

1. REFER TO DRAWING OW4-B-T008-01 FOR EMBEDMENT INSTALLATION DETAILS.
2. REFER TO TABLE ABOVE FOR ANCHOR DETAILS.
3. REFER TO DRAWING OW4-D-T003-32-01 FOR OPGW DAMPER INSTALLATION REQUIREMENTS.
4. REFER TO DRAWING OW4-D-T003-33-01 FOR CONDUCTOR DAMPER INSTALLATION REQUIREMENTS.
5. LETTERS ON THE POLE ELEVATION SECTION VIEW AND ANCHOR LOCATION PLAN VIEW CORRESPOND TO THE POLE AND ANCHOR ATTACHMENT LOCATIONS FOR THE GUYING ASSEMBLY. FOR EXAMPLE, GUY WIRE WOULD CONNECT THE A1 VANG ON THE POLE ELEVATION TO THE A1 ANCHOR IN THE PLAN VIEW.

ENGINEER OF RECORD SEAL

NOT FOR CONSTRUCTION

"Engineering with Distinction"
ECI ELECTRICAL CONSULTANTS, INC.
BILLINGS, MONTANA

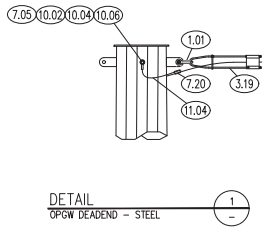
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A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

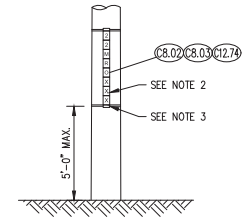
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DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL LIGHT DEADEND GUYED – 1 OF 2
345-M1-SC-T05-G1-C01-F01-S01

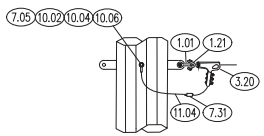
DWG. NAME: OW4-D-T003-04-01 | REVISION NO : A



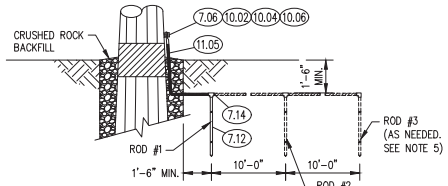
DETAIL
OPGW DEADEND – STEEL
1



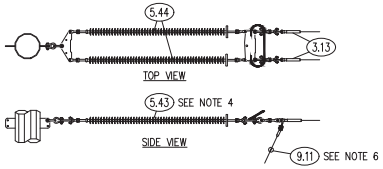
DETAIL
STRUCTURE SIGN PLACEMENT
5



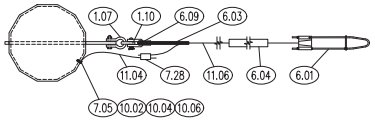
DETAIL
SW DEADEND – STEEL
2



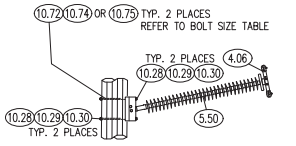
DETAIL
DIRECT EMBED GROUNDING
6



DETAIL
DEADEND – STEEL
3



DETAIL
GUY WIRE ASSEMBLY
7



DETAIL
JUMPER POST – STEEL
4

ASSEMBLY	ITEM #	QTY PER ASSY	QTY PER STR	UNIT	DESCRIPTION	MANUFACTURER 1/PART #	MANUFACTURER 2/PART #
OPGW (2) ASSEMBLIES PER STRUCTURE DETAIL 1	1.01	1	2	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WSNK	
	3.19	1	2	EA	FIBERLIGN - U-BOLT DEADEND CLAMP (0.526in - 0.545in DIA)	PLP 2861309	
	7.05	1	2	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	7.20	1	2	EA	CONNECTOR: OPGW (0.526in - 0.540in DIA) TO #2 PG CLAMP	AFL OBC-E2-N1-1	
	10.02	1	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	2.5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
SW (2) ASSEMBLIES PER STRUCTURE DETAIL 2	1.01	1	2	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WSNK	
	1.21	1	2	EA	ROTATED Y-CLEVIS EYE - 19K	HUBBELL Y530590	MACLEAN RYCE-65-625
	3.20	1	2	EA	QUADRANT CLAMP DEADEND - 3/8 EHS, TMS AW (0.22in - 0.55in DIA)	MACLEAN FCD-58-3	HUBBELL SWDES5N
	7.05	1	2	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	7.31	1	2	EA	CENTER BOLT PARALLEL GROOVE CLAMP (0.252" - 0.502")	AFL 481.1	
	10.02	1	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	2.5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
DEADEND (6) ASSEMBLIES PER STRUCTURE DETAIL 3	3.13	2	12	EA	DEADEND - COMPRESSION - VERTICAL - DRAKE	HUBBELL A0112451SS	
	5.43	1	6	EA	345kV DEAD END INSULATOR ASSEMBLY (HARDWARE ONLY)	LINDSEY HD-ASY-1190-2-DE-345KV	MACLEAN C-8981-DE3-H
	5.44	2	12	EA	345kV POLYMER SUSPENSION INSULATOR - 50K	NGK 502-SS1100-SK-43	MACLEAN S270801311VSS5053
	9.11	1	6	EA	CUSHION GRIP TWIN SPACER, DRAKE	PLP CGTS-0112	
JUMPER POST (3) ASSEMBLIES PER STRUCTURE DETAIL 4	4.06	1	3	EA	18" JUMPER YOKE W/ SIDE CLAMPS - DRAKE	MACLEAN LPHJD-18-140	LINDSEY R-17416I300
	5.50	1	3	EA	345kV POLYMER POST JUMPER - STEEL POLE	MACLEAN-H3101014OCBSS043	NGK L3-SN951-18-X
	10.28	4	12	EA	FLAT WASHER FOR 1" ROD	ALL MAKES	
	10.29	4	12	EA	1" HEAVY HEX NUT, A563 GRADE DH, GALV	ALL MAKES	
	10.30	4	12	EA	1" HEAVY HEX LOCK NUT, A563 GRADE DH, GALV	ALL MAKES	
	10.72	A/R	A/R	EA	1" x 32" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)	ALL MAKES	
	10.74	A/R	A/R	EA	1" x 36" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)	ALL MAKES	
	10.75	A/R	A/R	EA	1" x 38" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)	ALL MAKES	
POLE SIGNAGE (1) ASSEMBLY PER STRUCTURE DETAIL 5	C8.02	40	40	FT	3/4 TYPE 201 HEAVY DUTY SS BAND	MARATHON MAR430	USA 812430
	C8.03	2	2	EA	CLAMPS & BOLTS FOR SS BAND	MARATHON MARS00	USA 812500
	C12.36	A/R	A/R	EA	BASE NUMBER - 0 - (9" BLACK ON YELLOW)	TECH PRODUCTS EL3KY010	
	C12.37	A/R	A/R	EA	BASE NUMBER - 1 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY001	
	C12.38	A/R	A/R	EA	BASE NUMBER - 2 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY002	
	C12.39	A/R	A/R	EA	BASE NUMBER - 3 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY003	
	C12.40	A/R	A/R	EA	BASE NUMBER - 4 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY004	
	C12.41	A/R	A/R	EA	BASE NUMBER - 5 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY005	
	C12.42	A/R	A/R	EA	BASE NUMBER - 6 OR 9 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY006	
	C12.43	A/R	A/R	EA	BASE NUMBER - 7 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY007	
	C12.44	A/R	A/R	EA	BASE NUMBER - 8 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY008	
	C12.57	1	1	EA	BASE LETTER - M - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYM	
	C12.59	1	1	EA	BASE LETTER - O - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYO	
	C12.62	1	1	EA	BASE LETTER - R - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYR	
	C12.74	1	1	EA	3" TAG HOLDER, VERTICAL ORIENTATION, 8 TAGS, W/ SLOTS	TECH PRODUCTS AH308VP-S	
GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 6	7.06	1	1	EA	COMPRESSION TERMINAL: 1/2" TO #4	BURNDY YA4CN	
	7.12	A/R	A/R	EA	STRUCTURE GROUND ROD: 5/8" BY 10' LENGTH, COPPER CLAD, PER UL 467U	ERICO 615800	GALVAN16260
	7.14	A/R	A/R	EA	GROUND ROD CONNECTOR TAP - CADWELD (NO IGNITOR)	ERICO NT116TL	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.05	A/R	A/R	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	
DEADEND GUY (14) ASSEMBLIES PER STRUCTURE DETAIL 7	6.01	1	14	EA	GUY DEADEND VAR.GRIP.5SK	PLP VG-18-2103	HUBBELL 34GA18
	6.03	1	14	EA	BIG GUY GRIP 3/4"	PLP BG-1112	
	6.04	1	14	EA	GUY GUARD - YELLOW	ELECTRIC MATERIAL 70-7Y-W0C	
	6.09	1	14	EA	CLEVIS THIMBLE - 90K	LINDSEY 9.22157	
	1.10	1	14	EA	CHAIN LINK - 110K	LINDSEY 3456	HUBBELL LK120CVN
	1.07	1	14	EA	ANCHOR SHACKLE - 102K	LINDSEY 3256BNC	
	7.05	1	14	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	7.28	1	14	EA	BONDING CLAMP, RUN DIA (0.743"-1.152"), TAP DIA (0.162"-0.464")	AFL 393-6	
	10.02	1	14	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.06	1	14	EA	1/2" HEX NUT, GALV	ALL MAKES	
	10.04	1	14	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	11.04	5	70	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
	11.06	A/R	A/R	FT	3/4" EHS 19 STRAND	ALL MAKES	

NOTES

1. MATERIAL SHOWN HERE FOR ONE STRUCTURE.
2. INSTALL ALL TAGS FACING THE NEAREST ROAD OR INSPECTION PATH.
3. USE BANDING TO SECURE TAG HOLDER TO POLES. MOUNT BOTTOM TAG 5' ABOVE GROUND.
4. PART 5.43 IS HARDWARE REQUIRED TO CONNECT TO PART 5.44 INSULATORS TO MAKE UP STRAIN ASSEMBLY.
5. INSTALL GROUND RODS USING THE FOLLOWING PROCEDURE. TARGET GROUND RESISTANCE IS 25 OHMS FOR ALL STRUCTURES.
   A. DRIVE ONE (1) 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #1).
   B. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP C.
   C. DRIVE SECOND 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN STEEL POLE GROUNDING DETAIL (ROD #2) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   D. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP E.
   E. DRIVE THIRD 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #3) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   F. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP G.
   G. IF MEASUREMENT EXCEEDS 25 OHMS AT THIS STAGE, CONNECTION TO THE STRUCTURE CAN BE COMPLETED AT THIS TIME. ALL READINGS SHALL BE RECORDED AND PROVIDED TO THE OWNER. AFTER ALL CONNECTIONS ARE MADE TO THE STATIC WIRE, THE STRUCTURE SHALL BE RETESTED AGAIN TO SEE IF IT MEETS THE 25 OHMS. IF AT THIS TIME THE RESISTANCE CAN STILL NOT BE MET, CONTACT THE OWNER.
6. SPACERS SHALL BE DISTRIBUTED EVENLY THROUGHOUT JUMPERS, 2 PER PHASE.

BOLT SIZE TABLE

HARDWARE CATEGORY	BOLT LOCATION	ITEM #	DESCRIPTION
TOP JUMPER POST	TOP	10.72	1" x 32" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	10.72	1" x 32" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
MIDDLE JUMPER POST	TOP	10.74	1" x 36" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	10.74	1" x 36" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
BOTTOM JUMPER POST	TOP	10.75	1" x 38" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	10.75	1" x 38" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)

ENGINEER OF RECORD SEAL

NOT FOR CONSTRUCTION

"Engineering with Distinction"
ELECTRICAL CONSULTANTS, INC.
BILLINGS, MONTANA

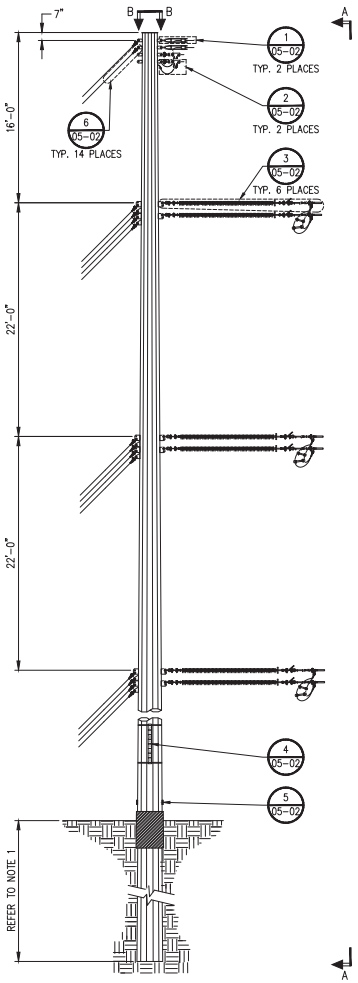
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A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

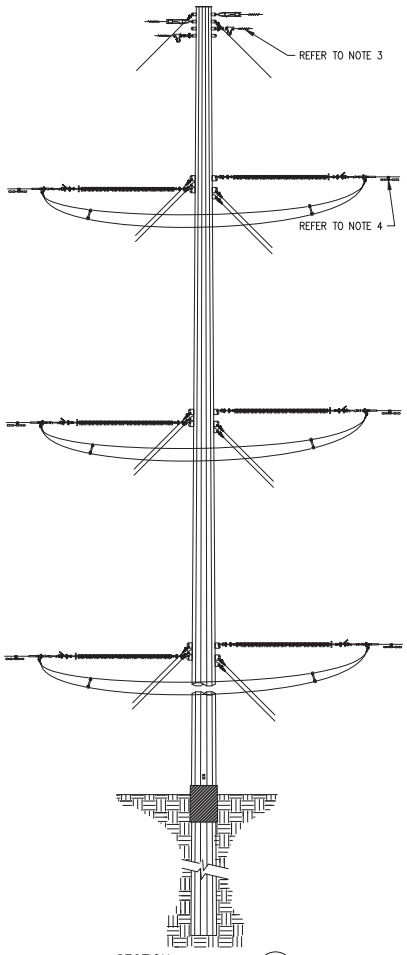
ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	09/08/23
DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL LIGHT DEADEND GUYED – 2 OF 2
345-M1-SC-T05-G1-C01-F01-S01

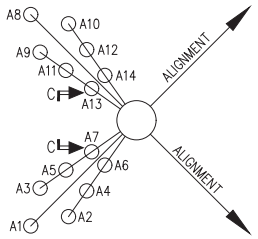
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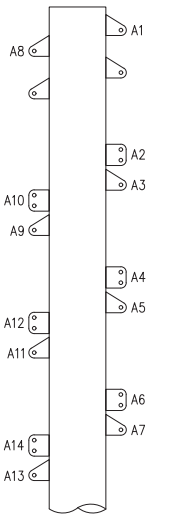
SEE TABLE FOR LOOKING DIRECTION



SECTION
SIDE VIEW
A–A



SECTION
GUY WIRE/ANCHOR PLAN VIEW
(SEE NOTE 5)
B–B



SECTION
GUY WIRE/ANCHOR ELEVATION
(SEE NOTE 5)
C–C

STRUCTURE LIST

AHEAD ON LINE LOOKING DIRECTION REFERS TO LOOKING ALONG THE LINE TOWARDS NEW LELAND OLDS. LOOKING BACK ON LINE REFERS TO LOOKING ALONG THE LINE TOWARDS OLIVER WIND IV.

STR	SIGNAGE	LOOKING DIRECTION	ANCHOR ASSEMBLY	ANCHOR INSTALL	STR	SIGNAGE	LOOKING DIRECTION	ANCHOR ASSEMBLY	ANCHOR INSTALL
85	22MRO85	AHEAD ON LINE	OW4-D-T003-40-01	OW4-D-T008-XX	-	-	-	-	-

GENERAL INSTALLATION NOTES

1. REFER TO DRAWING OW4-B-T008-01 FOR EMBEDMENT INSTALLATION DETAILS.
2. REFER TO TABLE ABOVE FOR ANCHOR DETAILS.
3. REFER TO DRAWING OW4-D-T003-32-01 FOR OPGW DAMPER INSTALLATION REQUIREMENTS.
4. REFER TO DRAWING OW4-D-T003-33-01 FOR CONDUCTOR DAMPER INSTALLATION REQUIREMENTS.
5. LETTERS ON THE POLE ELEVATION SECTION VIEW AND ANCHOR LOCATION PLAN VIEW CORRESPOND TO THE POLE AND ANCHOR ATTACHMENT LOCATIONS FOR THE GUYING ASSEMBLY. FOR EXAMPLE, GUY WIRE WOULD CONNECT THE A1 VANG ON THE POLE ELEVATION TO THE A1 ANCHOR IN THE PLAN VIEW.

ENGINEER OF RECORD SEAL

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BILLINGS, MONTANA

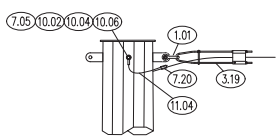
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A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

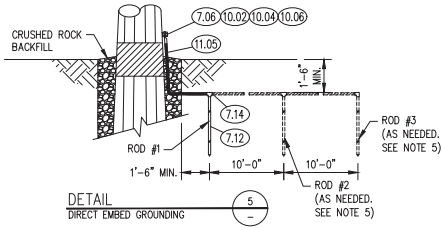
ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	09/08/23
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APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL HEAVY DEADEND GUYED – 1 OF 2
345-M1-SC-T06-G1-C01-F01-S01

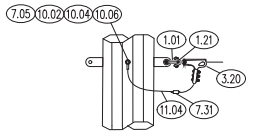
DWG. NAME: OW4-D-T003-05-01 REVISION NO : A



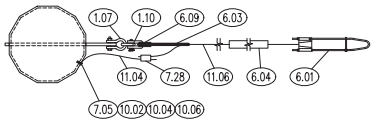
DETAIL
OPGW DEADEND – STEEL
1



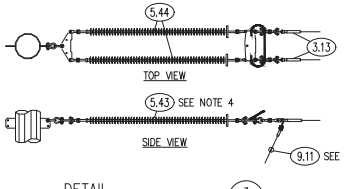
DETAIL
DIRECT EMBED GROUNDING
5



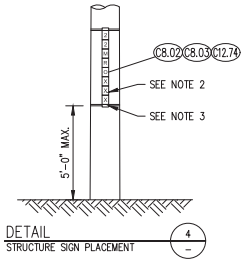
DETAIL
SW DEADEND – STEEL
2



DETAIL
GUY WIRE ASSEMBLY
6



DETAIL
DEADEND – STEEL
3



DETAIL
STRUCTURE SIGN PLACEMENT
4

ASSEMBLY	ITEM #	QTY PER ASSY	QTY PER STR	UNIT	DESCRIPTION	MANUFACTURER 1/PART #	MANUFACTURER 2/PART #
OPGW (2) ASSEMBLIES PER STRUCTURE DETAIL 1	1.01	1	2	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WSNK	
	3.19	1	2	EA	FIBERLIGN - U-BOLT,DEADEND CLAMP (0.529in - 0.545in DIA)	PLP 2801309	
	7.05	1	2	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	7.20	1	2	EA	CONNECTOR: OPGW (0.529in - 0.540in DIA) TO #2 PG CLAMP	AFL OBC-E2-N1-1	
	10.02	1	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	2.5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
SW (2) ASSEMBLIES PER STRUCTURE DETAIL 2	1.01	1	2	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WSNK	
	1.21	1	2	EA	ROTATED Y-CLEVIS EYE - 15K	HUBBELL YCS0590	MACLEAN RYCE-05-625
	3.20	1	2	EA	QUADRANT CLAMP DEADEND - 3/8 Ø HS, TMS AW (0.22in - 0.55in DIA)	MACLEAN PQD-5R-3	HUBBELL SWDE50N
	7.05	1	2	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	7.31	1	2	EA	CENTER BOLT PARALLEL GROOVE CLAMP (0.292" - 0.502")	AFL 481.1	
	10.02	1	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	2.5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
DEADEND (6) ASSEMBLIES PER STRUCTURE DETAIL 3	3.13	2	12	EA	DEADEND - COMPRESSION - VERTICAL - DRAKE	HUBBELL A0112451SS	
	5.43	1	6	EA	345kV DEAD END INSULATOR ASSEMBLY (HARDWARE ONLY)	LINDSEY HD-ASY-1100-2-DE-345KV	MACLEAN C-8981-DE3-H
	5.44	2	12	EA	345kV POLYMER SUSPENSION INSULATOR - 50K	NGK 502-SS1100-5K-43	MACLEAN S2708013110S5053
	9.11	1	6	EA	CUSHION GRIP TWIN SPACER, DRAKE	PLP CGTS-0112	
POLE SIGNAGE (1) ASSEMBLY PER STRUCTURE DETAIL 4	C8.02	40	40	FT	3/4 TYPE 201 HEAVY DUTY SS BAND	MARATHON MAR430	USA B12430
	C8.03	2	2	EA	CLAMPS & BOLTS FOR SS BAND	MARATHON MAR500	USA B12500
	C12.36	A/R	A/R	EA	BASE NUMBER - 0 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY010	
	C12.37	A/R	A/R	EA	BASE NUMBER - 1 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY001	
	C12.38	A/R	A/R	EA	BASE NUMBER - 2 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY002	
	C12.39	A/R	A/R	EA	BASE NUMBER - 3 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY003	
	C12.40	A/R	A/R	EA	BASE NUMBER - 4 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY004	
	C12.41	A/R	A/R	EA	BASE NUMBER - 5 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY005	
	C12.42	A/R	A/R	EA	BASE NUMBER - 6 OR 9 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY006	
	C12.43	A/R	A/R	EA	BASE NUMBER - 7 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY007	
	C12.44	A/R	A/R	EA	BASE NUMBER - 8 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY008	
	C12.57	1	1	EA	BASE LETTER - M - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYM	
	C12.59	1	1	EA	BASE LETTER - O - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYO	
	C12.62	1	1	EA	BASE LETTER - R - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYR	
	C12.74	1	1	EA	3" TAG HOLDER, VERTICAL ORIENTATION, 8 TAGS, W/ SLOTS	TECH PRODUCTS AH308VP-S	
GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 5	7.06	1	1	EA	COMPRESSION TERMINAL: 1/2" TO #4	BURNDY YA4CN	
	7.12	A/R	A/R	EA	STRUCTURE GROUND ROD: 5/8" BY 10' LENGTH, COPPER CLAD, PER UL 467U	ERICO 615800	GALVAN 61250
	7.14	A/R	A/R	EA	GROUND ROD CONNECTOR TAP - CADWELD (NO IGNITOR)	ERICO NTI 151L	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.05	A/R	A/R	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	
DEADEND GUY (14) ASSEMBLIES PER STRUCTURE DETAIL 6	6.01	1	14	EA	GUY DEADEND VAR-GRIP 5/8i	PLP VG-18-2103	HUBBELL 34GA18
	6.03	1	14	EA	BIG GUY GRIP 3/4"	PLP BG-1112	
	6.04	1	14	EA	GUY GUARD - YELLOW	ELECTRIC MATERIAL 70-7Y-W0C	
	6.09	1	14	EA	CLEVIS THIMBLE - 90K	LINDSEY P-22157	
	1.10	1	14	EA	CHAIN LINK - 110K	LINDSEY 3436	HUBBELL LK120CVN
	1.07	1	14	EA	ANCHOR SHACKLE - 102K	LINDSEY 3264BNC	
	7.05	1	14	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	7.28	1	14	EA	BONDING CLAMP; RUN DIA (0.743"-1.152"), TAP DIA (0.162"-0.464")	AFL 393.6	
	10.02	1	14	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.06	1	14	EA	1/2" HEX NUT, GALV	ALL MAKES	
	10.04	1	14	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	11.04	5	70	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
	11.06	A/R	A/R	FT	3/4" EHS 19 STRAND	ALL MAKES	

NOTES

1. MATERIAL SHOWN HERE FOR ONE STRUCTURE.
2. INSTALL ALL TAGS FACING THE NEAREST ROAD OR INSPECTION PATH.
3. USE BANDING TO SECURE TAG HOLDER TO POLES. MOUNT BOTTOM TAG 5' ABOVE GROUND.
4. PART 5.43 IS HARDWARE REQUIRED TO CONNECT TO PART 5.44 INSULATORS TO MAKE UP STRAIN ASSEMBLY.
5. INSTALL GROUND RODS USING THE FOLLOWING PROCEDURE. TARGET GROUND RESISTANCE IS 25 OHMS FOR ALL STRUCTURES.
   A. DRIVE ONE (1) 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #1).
   B. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP C.
   C. DRIVE SECOND 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN STEEL POLE GROUNDING DETAIL (ROD #2) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   D. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP E.
   E. DRIVE THIRD 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #3) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   F. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP G.
   G. IF MEASUREMENT EXCEEDS 25 OHMS AT THIS STAGE, CONNECTION TO THE STRUCTURE CAN BE COMPLETED AT THIS TIME. ALL READINGS SHALL BE RECORDED AND PROVIDED TO THE OWNER. AFTER ALL CONNECTIONS ARE MADE TO THE STATIC WIRE, THE STRUCTURE SHALL BE RETESTED AGAIN TO SEE IF IT MEETS THE 25 OHMS. IF AT THIS TIME THE RESISTANCE CAN STILL NOT BE MET, CONTACT THE OWNER.
6. SPACERS SHALL BE DISTRIBUTED EVENLY THROUGHOUT JUMPERS, 2 PER PHASE.

ENGINEER OF RECORD SEAL

NOT FOR CONSTRUCTION

"Engineering with Distinction"
ELECTRICAL CONSULTANTS, INC.
BILLINGS, MONTANA

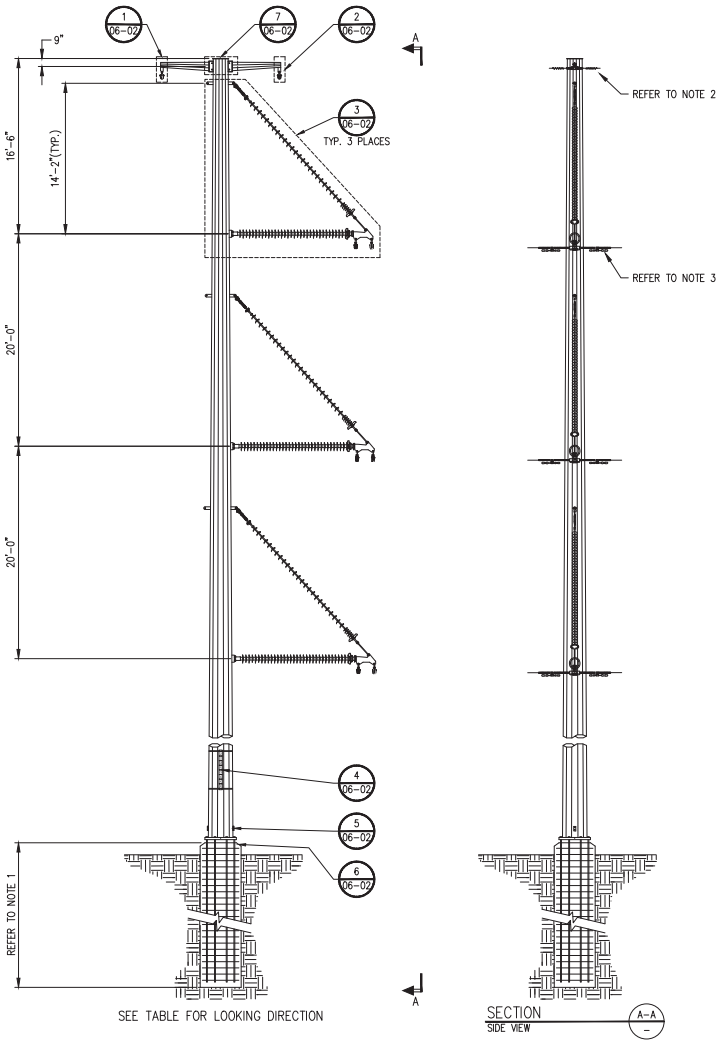
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A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	09/08/23
DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL HEAVY DEADEND GUYED – 2 OF 2
345-M1-SC-T06-G1-C01-F01-S01

DWG. NAME: OW4-D-T003-05-02 | REVISION NO : A



STRUCTURE LIST

AHEAD ON LINE LOOKING DIRECTION REFERS TO LOOKING ALONG THE LINE TOWARDS NEW LELAND OLDS. LOOKING BACK ON LINE REFERS TO LOOKING ALONG THE LINE TOWARDS OLIVER WIND IV.

STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION
70	22MRO70	AHEAD ON LINE	71	22MRO71	BACK ON LINE	109	22MRO109	AHEAD ON LINE	-	-	-

GENERAL INSTALLATION NOTES

1. REFER TO DRAWING OW4-B-T008-02 FOR DRILLED PIER INSTALLATION DETAILS.
2. REFER TO DRAWING OW4-D-T003-32-01 FOR OPGW DAMPER INSTALLATION REQUIREMENTS.
3. REFER TO DRAWING OW4-D-T003-33-01 FOR CONDUCTOR DAMPER INSTALLATION REQUIREMENTS.

ENGINEER OF RECORD SEAL

NOT FOR CONSTRUCTION

"Engineering with Distinction"
ELECTRICAL CONSULTANTS, INC.
BILLINGS, MONTANA

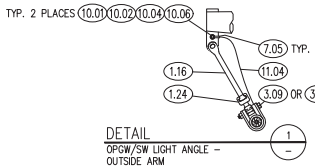
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A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

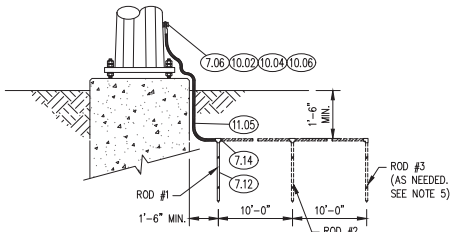
ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	09/08/23
DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL LIGHT ANGLE SS – 1 OF 2
345-M1-SC-T03-G0-C01-F01-S01

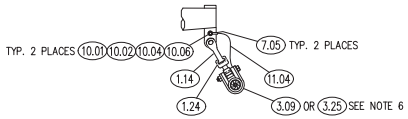
DWG. NAME: OW4-D-T003-06-01 | REVISION NO : A



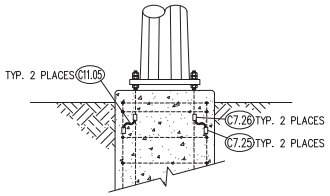
DETAIL 1
OPGW/SW LIGHT ANGLE – OUTSIDE ARM



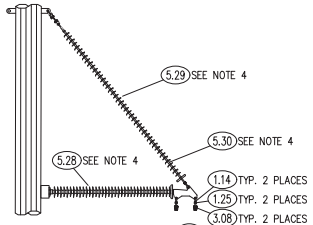
DETAIL 5
STEEL POLE GROUNDING



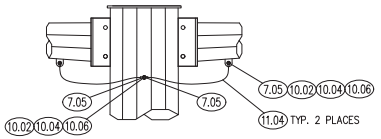
DETAIL 2
OPGW/SW LIGHT ANGLE – INSIDE ARM



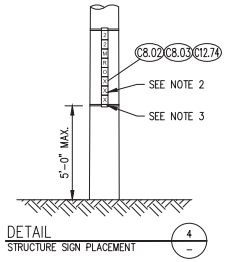
DETAIL 6
CAISSON GROUNDING



DETAIL 3
BRACED POST – STEEL



DETAIL 7
SW ARM GROUNDING



DETAIL 4
STRUCTURE SIGN PLACEMENT

ASSEMBLY	ITEM #	QTY PER ASSY	QTY PER STR	UNIT	DESCRIPTION	MANUFACTURER 1/PART #	MANUFACTURER 2/PART #
OPGW/SW LIGHT ANGLE - OUTSIDE ARM (1) ASSEMBLY PER STRUCTURE DETAIL 1	1.16	1	1	EA	Y-CLEVIS BALL EXT - 35K (ANSI 52-3 & 52-5)	MACLEAN YCBHL-65A	HUBBELL HYBC30
	1.24	1	1	EA	SOCKET EYE - 20K (ANSI 52-3 & 52-5) (5/8" WIDTH)	MACLEAN SI-625	HUBBELL SA05
	3.09	A/R	A/R	EA	FIBERLIGN - SUSPENSION CLAMP (0.512in - 0.536in DIA)	PLP 4300109	
	3.25	A/R	A/R	EA	FIBERLIGN - SUSPENSION CLAMP (0.354in - 0.381in DIA)	PLP 4300100	
	7.05	2	2	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	10.01	2	2	EA	1/2" WASHER, GALV	ALL MAKES	
	10.02	2	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	2	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	2	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	10	10	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
OPGW/SW LIGHT ANGLE - INSIDE ARM (1) ASSEMBLY PER STRUCTURE DETAIL 2	1.14	1	1	EA	Y-CLEVIS BALL - 30K (ANSI 52-3 & 52-5)	HUBBELL YBC30	MACLEAN YCB-65A
	1.24	1	1	EA	SOCKET EYE - 20K (ANSI 52-3 & 52-5) (5/8" WIDTH)	MACLEAN SI-625	HUBBELL SA05
	3.09	A/R	A/R	EA	FIBERLIGN - SUSPENSION CLAMP (0.512in - 0.536in DIA)	PLP 4300109	
	3.25	A/R	A/R	EA	FIBERLIGN - SUSPENSION CLAMP (0.354in - 0.381in DIA)	PLP 4300100	
	7.05	2	2	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	10.01	2	2	EA	1/2" WASHER, GALV	ALL MAKES	
	10.02	2	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	2	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	2	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	10	10	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
BRACED POST (3) ASSEMBLIES PER STRUCTURE DETAIL 3	1.14	2	6	EA	Y-CLEVIS BALL - 30K (ANSI 52-3 & 52-5)	HUBBELL YBC30	MACLEAN YCB-65A
	1.25	2	6	EA	SOCKET EYE - 30K (ANSI 52-3 & 52-5) (1-1/16" WIDTH)	LINDSEY 3355	
	3.08	2	6	EA	CUSHION GRIP CLAMP - (0.884in - 1.196in DIA)	PLP CGS-1097	AFL HCS1073
	5.28	1	3	EA	345kV POLYMER POST INSULATOR (FOR LINDSEY 345kV BRACED POST ASSEMBLY)	NGK L4-SN691-M6U-X	ONLY REQUIRED WHEN ORDERING LINDSEY 345kV BRACED POST ASSEMBLY. DO NOT ORDER FOR MACLEAN ASSEMBLIES
	5.29	1	3	EA	345kV POLYMER BRACE INSULATOR - 50K (FOR LINDSEY 345kV BRACED POST ASSEMBLY)	NGK 502-SC1430-YK-43	ONLY REQUIRED WHEN ORDERING LINDSEY 345kV BRACED POST ASSEMBLY. DO NOT ORDER FOR MACLEAN ASSEMBLIES
	5.30	1	3	EA	345kV BRACED POST ASSEMBLY - STEEL POLE (INCLUDES MOUNTING BOLT KIT)	LINDSEY R-248525-CGS-0	MACLEAN B470H132P26170BB
POLE SIGNAGE (1) ASSEMBLY PER STRUCTURE DETAIL 4	C8.02	40	40	FT	3/4 TYPE 201 HEAVY DUTY SS BAND	MARATHON MAR430	USA B12430
	C8.03	2	2	EA	CLAMPS & BOLTS FOR SS BAND	MARATHON MAR500	USA B12500
	C12.36	A/R	A/R	EA	BASE NUMBER - 0 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY010	
	C12.37	A/R	A/R	EA	BASE NUMBER - 1 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY001	
	C12.38	A/R	A/R	EA	BASE NUMBER - 2 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY002	
	C12.39	A/R	A/R	EA	BASE NUMBER - 3 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY003	
	C12.40	A/R	A/R	EA	BASE NUMBER - 4 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY004	
	C12.41	A/R	A/R	EA	BASE NUMBER - 5 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY005	
	C12.42	A/R	A/R	EA	BASE NUMBER - 6 OR 9 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY006	
	C12.43	A/R	A/R	EA	BASE NUMBER - 7 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY007	
	C12.44	A/R	A/R	EA	BASE NUMBER - 8 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY008	
	C12.57	1	1	EA	BASE LETTER - M - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYM	
	C12.59	1	1	EA	BASE LETTER - O - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYO	
	C12.62	1	1	EA	BASE LETTER - R - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYR	
	C12.74	1	1	EA	3" TAG HOLDER, VERTICAL ORIENTATION, 8 TAGS, W/ SLOTS	TECH PRODUCTS AH308VP-S	
GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 5	7.06	1	1	EA	COMPRESSION TERMINAL: 1/2" TO #4	BURNDY YA4CN	
	7.12	A/R	A/R	EA	STRUCTURE GROUND ROD: 5/8" BY 10' LENGTH, COPPER CLAD, PER UL 467U	ERICO 615800	GALVAN 6260
	7.14	A/R	A/R	EA	GROUND ROD CONNECTOR TAP - CADWELD (NO IGNITOR)	ERICO NT116TL	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.05	A/R	A/R	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	
CAISSON GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 6	C7.25	2	2	EA	GROUNDING CONNECTOR - CABLE TO ROD (1-3/8" - 1-1/2") - TAP (4 - 2/0 AWG)	BURNDY GAR 1626	
	C7.26	2	2	EA	GROUNDING CONNECTOR - CABLE TO ROD (2" - 2-3/8") - TAP (4 - 2/0 AWG)	BURNDY GAR 1826	
	C11.05	10	10	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	
SW ARM GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 7	7.05	4	4	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	10.02	3	3	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	3	3	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	3	3	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	10	10	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	

NOTES

1. MATERIAL SHOWN HERE FOR ONE STRUCTURE.
2. INSTALL ALL TAGS FACING THE NEAREST ROAD OR INSPECTION PATH.
3. USE BANDING TO SECURE TAG HOLDER TO POLES. MOUNT BOTTOM TAG 5' ABOVE GROUND.
4. IF LINDSEY IS SELECTED FOR INSULATOR ASSEMBLY 5.30, THEN ADDITIONAL PARTS 5.28 AND 5.29 WILL BE REQUIRED. THESE PARTS ARE NOT NEEDED IF MACLEAN IS SELECTED FOR 5.30.
5. INSTALL GROUND RODS USING THE FOLLOWING PROCEDURE. TARGET GROUND RESISTANCE IS 25 OHMS FOR ALL STRUCTURES.
   A. DRIVE ONE (1) 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #1).
   B. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP C.
   C. DRIVE SECOND 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN STEEL POLE GROUNDING DETAIL (ROD #2) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   D. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP E.
   E. DRIVE THIRD 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #3) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   F. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP G.
   G. IF MEASUREMENT EXCEEDS 25 OHMS AT THIS STAGE, CONNECTION TO THE STRUCTURE CAN BE COMPLETED AT THIS TIME. ALL READINGS SHALL BE RECORDED AND PROVIDED TO THE OWNER. AFTER ALL CONNECTIONS ARE MADE TO THE STATIC WIRE, THE STRUCTURE SHALL BE RETESTED AGAIN TO SEE IF IT MEETS THE 25 OHMS. IF AT THIS TIME THE RESISTANCE CAN STILL NOT BE MET, CONTACT THE OWNER.
6. REFER TO PHASING DRAWING OW4-D-T006-01 FOR OPGW POSITION ON EACH STRUCTURE.

ENGINEER OF RECORD SEAL

NOT FOR CONSTRUCTION

"Engineering with Distinction"
ELECTRICAL CONSULTANTS, INC.
BILLINGS, MONTANA

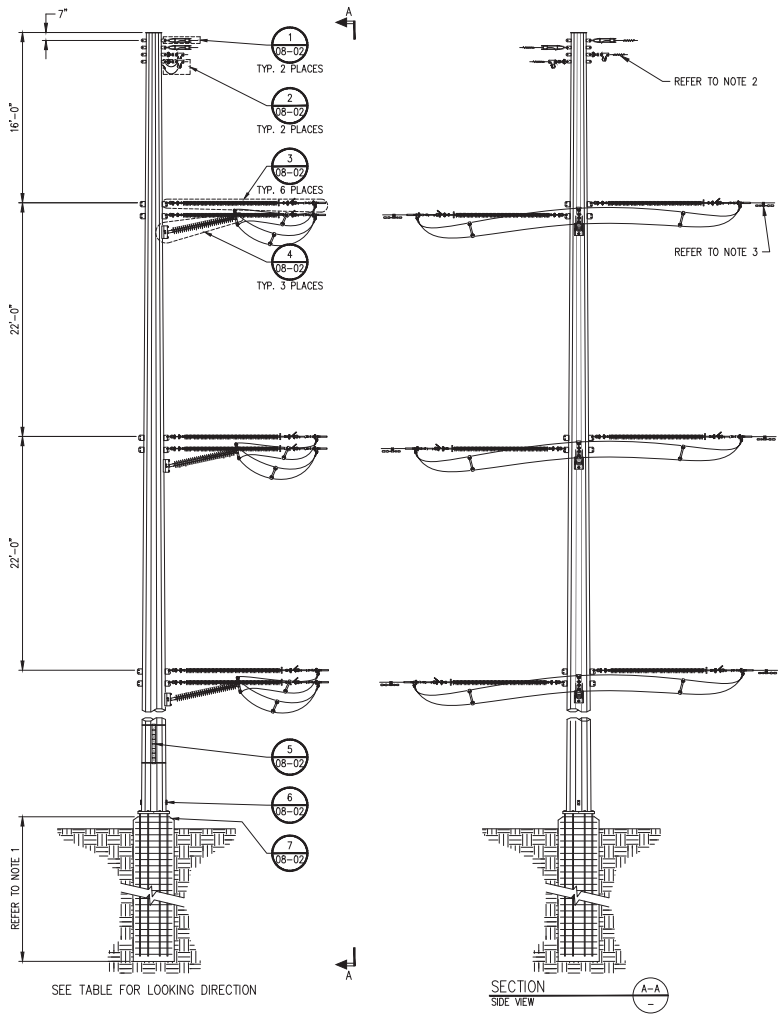
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A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	09/08/23
DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL LIGHT ANGLE SS – 2 OF 2
345-M1-SC-T03-G0-C01-F01-S01

DWG. NAME: OW4-D-T003-06-02 | REVISION NO : A



STRUCTURE LIST

AHEAD ON LINE LOOKING DIRECTION REFERS TO LOOKING ALONG THE LINE TOWARDS NEW LELAND OLDS. LOOKING BACK ON LINE REFERS TO LOOKING ALONG THE LINE TOWARDS OLIVER WIND IV.

STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION
1	22MRO1	BACK ON LINE	117	22MRO117	BACK ON LINE	121	22MRO121	AHEAD ON LINE	-	-	-

GENERAL INSTALLATION NOTES

1. REFER TO DRAWING OW4-B-T008-02 FOR DRILLED PIER INSTALLATION DETAILS.
2. REFER TO DRAWING OW4-D-T003-32-01 FOR OPGW DAMPER INSTALLATION REQUIREMENTS.
3. REFER TO DRAWING OW4-D-T003-33-01 FOR CONDUCTOR DAMPER INSTALLATION REQUIREMENTS.

ENGINEER OF RECORD SEAL

NOT FOR CONSTRUCTION

"Engineering with Distinction"
ECI ELECTRICAL CONSULTANTS, INC.
BILLINGS, MONTANA

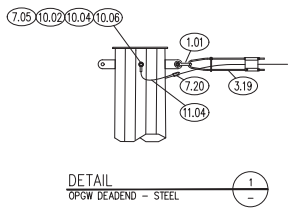
NO	REVISION	DATE	BY	APR
A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

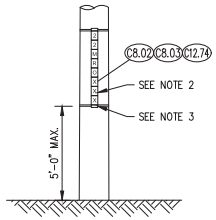
ENGINEERING RECORD		DATE
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DESIGNED	M. SANTANA	09/08/23
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APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL LIGHT DEADEND SS – 1 OF 2
345-M1-SC-T05-G0-C01-F01-S01

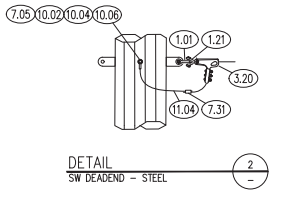
DWG. NAME: OW4-D-T003-08-01 REVISION NO : A



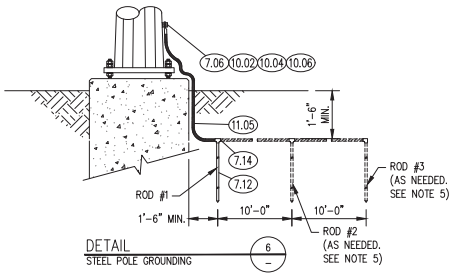
DETAIL
OPGW DEADEND – STEEL
1



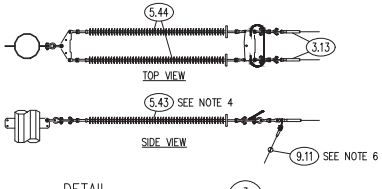
DETAIL
STRUCTURE SIGN PLACEMENT
5



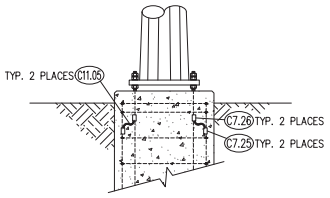
DETAIL
SW DEADEND – STEEL
2



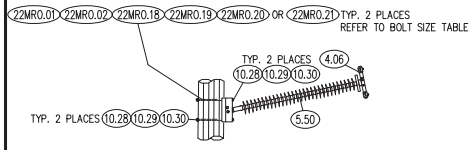
DETAIL
STEEL POLE GROUNDING
6



DETAIL
DEADEND – STEEL
3



DETAIL
CAISSON GROUNDING
7



DETAIL
JUMPER POST – STEEL
4

ASSEMBLY	ITEM #	QTY PER ASSY	QTY PER STR	UNIT	DESCRIPTION	MANUFACTURER 1/PART #	MANUFACTURER 2/PART #
OPGW (2) ASSEMBLIES PER STRUCTURE DETAIL 1	1.01	1	2	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WSNK	
	3.19	1	2	EA	FIBERLIGN - U-BOLT/DEADEND CLAMP (0.526in - 0.545in DIA)	PLP 2861309	
	7.05	1	2	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	7.20	1	2	EA	CONNECTOR: OPGW (0.526in - 0.540in DIA) TO #2 PG CLAMP	AFL OBC-E2-N1-1	
	10.02	1	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	2.5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
SW (2) ASSEMBLIES PER STRUCTURE DETAIL 2	1.01	1	2	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WSNK	
	1.21	1	2	EA	ROTATED Y-CLEVIS EYE - 15K	HUBBELL YCS0590	MACLEAN RYCE-65-625
	3.20	1	2	EA	QUADRANT CLAMP DEADEND - 3/8 Ø HS, TMS AW (0.22in - 0.55in DIA)	MACLEAN PQD-58-3	HUBBELL SWDE50N
	7.05	1	2	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	7.31	1	2	EA	CENTER BOLT PARALLEL GROOVE CLAMP (0.292" - 0.502")	AFL 461.1	
	10.02	1	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	2.5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
DEADEND (6) ASSEMBLIES PER STRUCTURE DETAIL 3	3.13	2	12	EA	DEADEND - COMPRESSION - VERTICAL - DRAKE	HUBBELL A0112451SS	
	5.43	1	6	EA	345kV DEAD END INSULATOR ASSEMBLY (HARDWARE ONLY)	LINDSEY HD-ASY-1100-2-DE-345KV	MACLEAN C-8981-DE3-H
	5.44	2	12	EA	345kV POLYMER SUSPENSION INSULATOR - 50K	NGK 502-SS1100-SK-43	MACLEAN S2708013 1VG65063
	9.11	1	6	EA	CUSHION GRIP TWIN SPACER, DRAKE	PLP CGTS-0112	
JUMPER POST (3) ASSEMBLIES PER STRUCTURE DETAIL 4	4.06	1	3	EA	18" JUMPER YOKE W/ SIDE CLAMPS - DRAKE	MACLEAN LPHD-18-140	LINDSEY R-174161000
	5.50	1	3	EA	345kV POLYMER POST JUMPER - STEEL POLE	MACLEAN H31010140CBS3043	NGK L3-SN951-18-X
	10.28	4	12	EA	FLAT WASHER FOR 1" ROD	ALL MAKES	
	10.29	4	12	EA	1" HEAVY HEX NUT, A563 GRADE DH, GALV	ALL MAKES	
	10.30	4	12	EA	1" HEAVY HEX LOCK NUT, A563 GRADE DH, GALV	ALL MAKES	
	22MR0.01	A/R	A/R	EA	1" x 72" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)	ALL MAKES	
	22MR0.02	A/R	A/R	EA	1" x 80" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)	ALL MAKES	
	22MR0.18	A/R	A/R	EA	1" x 68" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)	ALL MAKES	
	22MR0.19	A/R	A/R	EA	1" x 76" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)	ALL MAKES	
	22MR0.20	A/R	A/R	EA	1" x 82" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)	ALL MAKES	
	22MR0.21	A/R	A/R	EA	1" x 86" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)	ALL MAKES	
POLE SIGNAGE (1) ASSEMBLY PER STRUCTURE DETAIL 5	C8.02	40	40	FT	3/4 TYPE 201 HEAVY DUTY SS BAND	MARATHON MAR430	USA 812430
	C8.03	2	2	EA	CLAMPS & BOLTS FOR SS BAND	MARATHON MAR500	USA 812500
	C12.36	A/R	A/R	EA	BASE NUMBER - 0 - (3" BLACK ON YELLOW)	TECH PRODUCTS ELJKY010	
	C12.37	A/R	A/R	EA	BASE NUMBER - 1 - (3" BLACK ON YELLOW)	TECH PRODUCTS ELJKY001	
	C12.38	A/R	A/R	EA	BASE NUMBER - 2 - (3" BLACK ON YELLOW)	TECH PRODUCTS ELJKY002	
	C12.39	A/R	A/R	EA	BASE NUMBER - 3 - (3" BLACK ON YELLOW)	TECH PRODUCTS ELJKY003	
	C12.40	A/R	A/R	EA	BASE NUMBER - 4 - (3" BLACK ON YELLOW)	TECH PRODUCTS ELJKY004	
	C12.41	A/R	A/R	EA	BASE NUMBER - 5 - (3" BLACK ON YELLOW)	TECH PRODUCTS ELJKY005	
	C12.42	A/R	A/R	EA	BASE NUMBER - 6 OR 9 - (3" BLACK ON YELLOW)	TECH PRODUCTS ELJKY006	
	C12.43	A/R	A/R	EA	BASE NUMBER - 7 - (3" BLACK ON YELLOW)	TECH PRODUCTS ELJKY007	
	C12.44	A/R	A/R	EA	BASE NUMBER - 8 - (3" BLACK ON YELLOW)	TECH PRODUCTS ELJKY008	
	C12.57	1	1	EA	BASE LETTER - M - (3" BLACK ON YELLOW)	TECH PRODUCTS ELJKYM	
	C12.59	1	1	EA	BASE LETTER - O - (3" BLACK ON YELLOW)	TECH PRODUCTS ELJKYO	
	C12.62	1	1	EA	BASE LETTER - R - (3" BLACK ON YELLOW)	TECH PRODUCTS ELJKYR	
	C12.74	1	1	EA	3" TAG HOLDER, VERTICAL ORIENTATION, 6 TAGS, W/ SLOTS	TECH PRODUCTS AH036VP-S	
GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 6	7.06	1	1	EA	COMPRESSION TERMINAL: 1/2" TO #4	BURNDY YA4CN	
	7.12	A/R	A/R	EA	STRUCTURE GROUND ROD: 5/8" BY 10' LENGTH, COPPER CLAD, PER UL 467U	ERICO 615800	GALVAN 6260
	7.14	A/R	A/R	EA	GROUND ROD CONNECTOR TAP - CADWELD (NO IGNITOR)	ERICO NT1161L	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.05	A/R	A/R	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	
CAISSON GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 7	C7.25	2	2	EA	GROUNDING CONNECTOR - CABLE TO ROD (1-3/8" - 1-1/2") - TAP (4 - 2/0 AWG)	BURNDY GAR 1626	
	C7.26	2	2	EA	GROUNDING CONNECTOR - CABLE TO ROD (2" - 2-3/8") - TAP (4 - 2/0 AWG)	BURNDY GAR 1826	
	C11.05	10	10	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	

NOTES

1. MATERIAL SHOWN HERE FOR ONE STRUCTURE.
2. INSTALL ALL TAGS FACING THE NEAREST ROAD OR INSPECTION PATH.
3. USE BANDING TO SECURE TAG HOLDER TO POLES. MOUNT BOTTOM TAG 5' ABOVE GROUND.
4. PART 5.43 IS HARDWARE REQUIRED TO CONNECT TO PART 5.44 INSULATORS TO MAKE UP STRAIN ASSEMBLY.
5. INSTALL GROUND RODS USING THE FOLLOWING PROCEDURE. TARGET GROUND RESISTANCE IS 25 OHMS FOR ALL STRUCTURES.
   A. DRIVE ONE (1) 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #1).
   B. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP C.
   C. DRIVE SECOND 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN STEEL POLE GROUNDING DETAIL (ROD #2) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   D. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP E.
   E. DRIVE THIRD 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #3) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   F. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP G.
   G. IF MEASUREMENT EXCEEDS 25 OHMS AT THIS STAGE, CONNECTION TO THE STRUCTURE CAN BE COMPLETED AT THIS TIME. ALL READINGS SHALL BE RECORDED AND PROVIDED TO THE OWNER. AFTER ALL CONNECTIONS ARE MADE TO THE STATIC WIRE, THE STRUCTURE SHALL BE RETESTED AGAIN TO SEE IF IT MEETS THE 25 OHMS. IF AT THIS TIME THE RESISTANCE CAN STILL NOT BE MET, CONTACT THE OWNER.
6. SPACERS SHALL BE DISTRIBUTED EVENLY THROUGHOUT JUMPERS, 2 PER PHASE.

BOLT SIZE TABLE - STRUCTURES 1 AND 121

HARDWARE CATEGORY	BOLT LOCATION	ITEM #	DESCRIPTION
TOP JUMPER POST	TOP	22MR0.01	1" x 72" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	22MR0.01	1" x 72" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
MIDDLE JUMPER POST	TOP	22MR0.02	1" x 80" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	22MR0.02	1" x 80" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
BOTTOM JUMPER POST	TOP	22MR0.21	1" x 86" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	22MR0.21	1" x 86" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)

BOLT SIZE TABLE - STRUCTURE 117

HARDWARE CATEGORY	BOLT LOCATION	ITEM #	DESCRIPTION
TOP JUMPER POST	TOP	22MR0.18	1" x 68" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	22MR0.18	1" x 68" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
MIDDLE JUMPER POST	TOP	22MR0.19	1" x 76" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	22MR0.19	1" x 76" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
BOTTOM JUMPER POST	TOP	22MR0.20	1" x 82" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	22MR0.20	1" x 82" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)

HOLD FOR VENDOR CALCULATIONS

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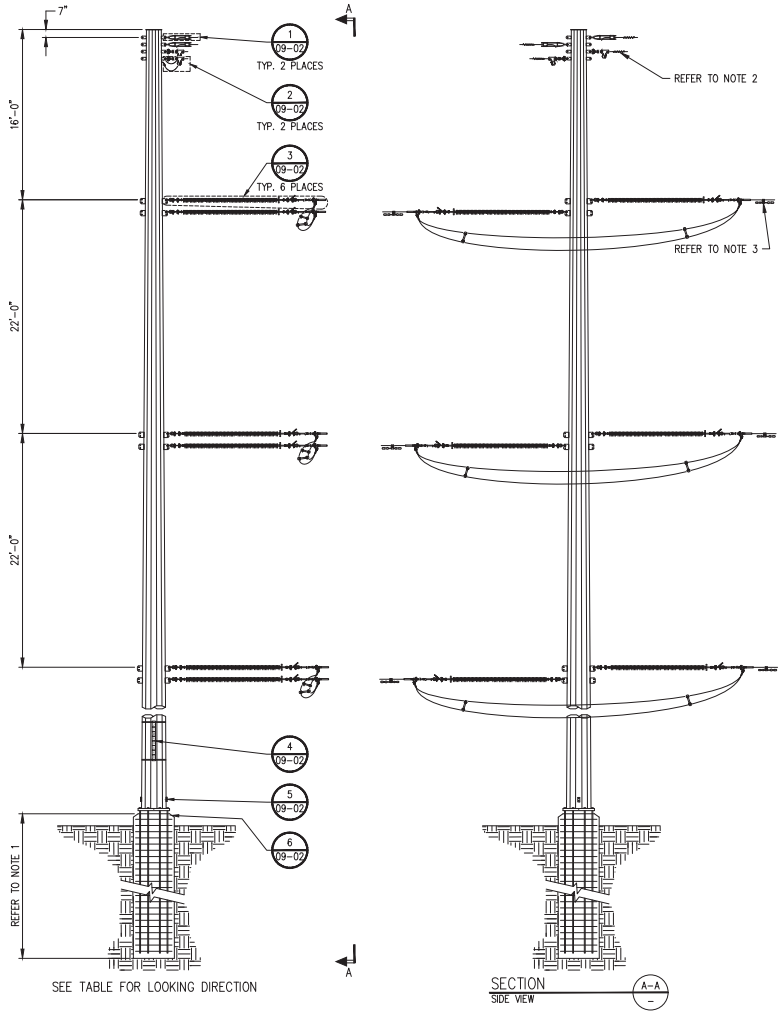
NO	REVISION	DATE	BY	APR
A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	09/08/23
DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL LIGHT DEADEND SS – 2 OF 2
345-M1-SC-T05-G0-C01-F01-S01

DWG. NAME: OW4-D-T003-08-02 | REVISION NO : A



STRUCTURE LIST

AHEAD ON LINE LOOKING DIRECTION REFERS TO LOOKING ALONG THE LINE TOWARDS NEW LELAND OLDS. LOOKING BACK ON LINE REFERS TO LOOKING ALONG THE LINE TOWARDS OLIVER WIND IV.

STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION
4	22MRO4	BACK ON LINE	31	22MRO31	AHEAD ON LINE	79	22MRO79	AHEAD ON LINE	-	-	-
11	22MRO11	AHEAD ON LINE	49	22MRO49	BACK ON LINE	82	22MRO82	BACK ON LINE	-	-	-

GENERAL INSTALLATION NOTES

1. REFER TO DRAWING OW4-B-T008-02 FOR DRILLED PIER INSTALLATION DETAILS.
2. REFER TO DRAWING OW4-D-T003-32-01 FOR OPGW DAMPER INSTALLATION REQUIREMENTS.
3. REFER TO DRAWING OW4-D-T003-33-01 FOR CONDUCTOR DAMPER INSTALLATION REQUIREMENTS.

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BILLINGS, MONTANA

NO	REVISION	DATE	BY	APR
A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

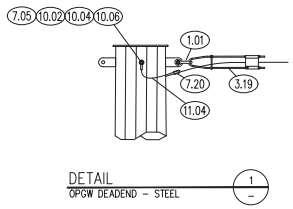
ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	09/08/23
DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE

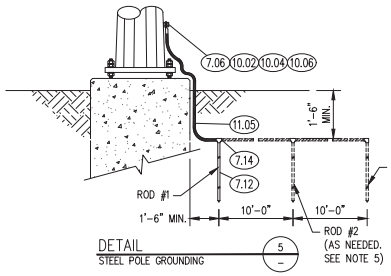
SC STEEL HEAVY DEADEND SS – 1 OF 2

345-M1-SC-T06-G0-C01-F01-S01

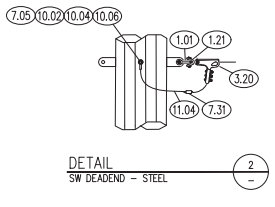
DWG. NAME: OW4-D-T003-09-01 REVISION NO : A



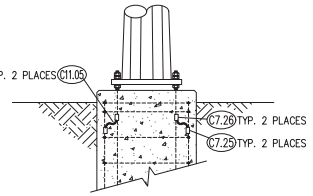
DETAIL
OPGW DEADEND – STEEL
1



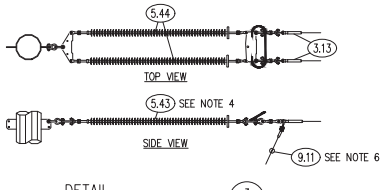
DETAIL
STEEL POLE GROUNDING
5



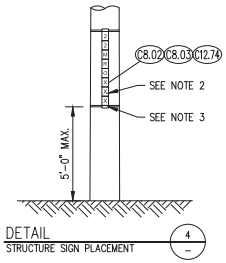
DETAIL
SW DEADEND – STEEL
2



DETAIL
CAISSON GROUNDING
6



DETAIL
DEADEND – STEEL
3



DETAIL
STRUCTURE SIGN PLACEMENT
4

ASSEMBLY	ITEM #	QTY PER ASSY	QTY PER STR	UNIT	DESCRIPTION	MANUFACTURER 1/PART #	MANUFACTURER 2/PART #
OPGW (2) ASSEMBLIES PER STRUCTURE DETAIL 1	1.01	1	2	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WSNK	
	3.19	1	2	EA	FIBERLIGN - U-BOLT,DEADEND CLAMP (0.529in - 0.545in DIA)	PLP 28613309	
	7.05	1	2	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	7.20	1	2	EA	CONNECTOR: OPGW (0.529in - 0.540in DIA) TO #2 PG CLAMP	AFL OBC-E2-N1-1	
	10.02	1	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	2.5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
SW (2) ASSEMBLIES PER STRUCTURE DETAIL 2	1.01	1	2	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WSNK	
	1.21	1	2	EA	ROTATED Y-CLEVIS EYE - 19K	HUBBELL YCS0590	MACLEAN RYCE-65-625
	3.20	1	2	EA	QUADRANT CLAMP DEADEND - 3/4 Ø HS, TMS AW (0.22in - 0.55in DIA)	MACLEAN PCD-58-3	HUBBELL SWD650N
	7.05	1	2	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	7.31	1	2	EA	CENTER BOLT PARALLEL GROOVE CLAMP (0.292" - 0.502")	AFL 481.1	
	10.02	1	2	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	2	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	2	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	2.5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
DEADEND (6) ASSEMBLIES PER STRUCTURE DETAIL 3	3.13	2	12	EA	DEADEND - COMPRESSION - VERTICAL - DRAKE	HUBBELL A0112451SS	
	5.43	1	6	EA	345kV DEAD END INSULATOR ASSEMBLY (HARDWARE ONLY)	LINDSEY HD-ASY-1100-2-DE-345KV	MACLEAN C-6981-DE3-H
	5.44	2	12	EA	345kV POLYMER SUSPENSION INSULATOR - 50K	NGK-502-SS1100-SK-43	MACLEAN S2708013110S55053
	9.11	1	6	EA	CUSHION GRIP TWIN SPACER, DRAKE	PLP CGTS-01112	
POLE SIGNAGE (1) ASSEMBLY PER STRUCTURE DETAIL 4	C8.02	40	40	FT	3/4 TYPE 201 HEAVY DUTY SS BAND	MARATHON MAR430	USA B12430
	C8.03	2	2	EA	CLAMPS & BOLTS FOR SS BAND	MARATHON MAR500	USA B12500
	C12.36	A/R	A/R	EA	BASE NUMBER - 0 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY010	
	C12.37	A/R	A/R	EA	BASE NUMBER - 1 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY001	
	C12.38	A/R	A/R	EA	BASE NUMBER - 2 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY002	
	C12.39	A/R	A/R	EA	BASE NUMBER - 3 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY003	
	C12.40	A/R	A/R	EA	BASE NUMBER - 4 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY004	
	C12.41	A/R	A/R	EA	BASE NUMBER - 5 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY005	
	C12.42	A/R	A/R	EA	BASE NUMBER - 6 OR 9 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY006	
	C12.43	A/R	A/R	EA	BASE NUMBER - 7 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY007	
	C12.44	A/R	A/R	EA	BASE NUMBER - 8 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY008	
	C12.57	1	1	EA	BASE LETTER - M - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYM	
	C12.59	1	1	EA	BASE LETTER - O - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYO	
	C12.62	1	1	EA	BASE LETTER - R - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYR	
	C12.74	1	1	EA	3" TAG HOLDER, VERTICAL ORIENTATION, 8 TAGS, W/ SLOTS	TECH PRODUCTS AH308VP-S	
GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 5	7.06	1	1	EA	COMPRESSION TERMINAL: 1/2" TO #4	BURNDY Y4HCN	
	7.12	A/R	A/R	EA	STRUCTURE GROUND ROD: 5/8" BY 10' LENGTH, COPPER CLAD, PER UL 467U	ERICO 615800	GALVAN 6260
	7.14	A/R	A/R	EA	GROUND ROD CONNECTOR TAP - CADWELD (NO IGNITOR)	ERICO NT1161L	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.05	A/R	A/R	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	
CAISSON GROUNDING (1) ASSEMBLY PER STRUCTURE DETAIL 6	C7.25	2	2	EA	GROUNDING CONNECTOR - CABLE TO ROD (1-3/8" - 1-1/2") - TAP (4 - 2/0 AWG)	BURNDY GAR 1626	
	C7.26	2	2	EA	GROUNDING CONNECTOR - CABLE TO ROD (2" - 2-3/8") - TAP (4 - 2/0 AWG)	BURNDY GAR 1826	
	C11.05	10	10	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	

NOTES

1. MATERIAL SHOWN HERE FOR ONE STRUCTURE.
2. INSTALL ALL TAGS FACING THE NEAREST ROAD OR INSPECTION PATH.
3. USE BANDING TO SECURE TAG HOLDER TO POLES. MOUNT BOTTOM TAG 5' ABOVE GROUND.
4. PART 5.43 IS HARDWARE REQUIRED TO CONNECT TO PART 5.44 INSULATORS TO MAKE UP STRAIN ASSEMBLY.
5. INSTALL GROUND RODS USING THE FOLLOWING PROCEDURE. TARGET GROUND RESISTANCE IS 25 OHMS FOR ALL STRUCTURES.
   A. DRIVE ONE (1) 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #1).
   B. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP C.
   C. DRIVE SECOND 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN STEEL POLE GROUNDING DETAIL (ROD #2) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   D. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP E.
   E. DRIVE THIRD 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #3) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   F. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP G.
   G. IF MEASUREMENT EXCEEDS 25 OHMS AT THIS STAGE, CONNECTION TO THE STRUCTURE CAN BE COMPLETED AT THIS TIME. ALL READINGS SHALL BE RECORDED AND PROVIDED TO THE OWNER. AFTER ALL CONNECTIONS ARE MADE TO THE STATIC WIRE, THE STRUCTURE SHALL BE RETESTED AGAIN TO SEE IF IT MEETS THE 25 OHMS. IF AT THIS TIME THE RESISTANCE CAN STILL NOT BE MET, CONTACT THE OWNER.
6. SPACERS SHALL BE DISTRIBUTED EVENLY THROUGHOUT JUMPERS, 2 PER PHASE.

ENGINEER OF RECORD SEAL

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ECI ELECTRICAL CONSULTANTS, INC.
BILLINGS, MONTANA

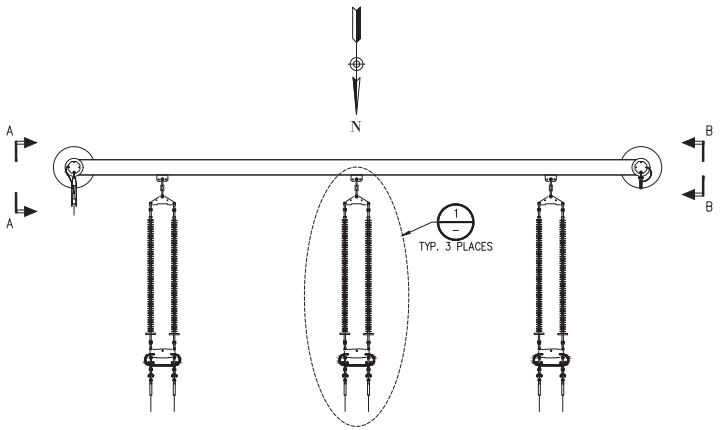
NO	REVISION	DATE	BY	APR
A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	09/08/23
DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL HEAVY DEADEND SS – 2 OF 2
345-M1-SC-T06-G0-C01-F01-S01

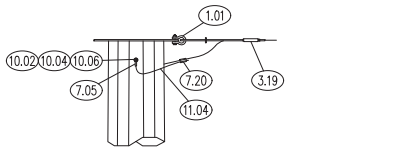
DWG. NAME: OW4-D-T003-09-02 | REVISION NO : A



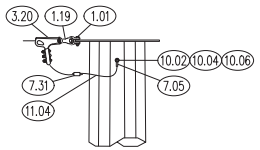
ASSEMBLY	ITEM #	QTY PER ASS'Y	QTY PER STR	UNIT	DESCRIPTION	MANUFACTURER 1/PART #	MANUFACTURER 2/PART #
OPGW (1) ASSEMBLY PER STRUCTURE SECTION A-A	1.01	1	1	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WBNK	
	3.19	1	1	EA	FIBERLIGN - U-BOLT DEADEND CLAMP (0.529in - 0.545in DIA)	PLP 2801309	
	7.20	1	1	EA	CONNECTOR: OPGW (0.525in - 0.540in DIA) TO #2 PG CLAMP	AFL OBC-ST-N1-1	
	11.04	.5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
	7.05	1	1	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	9.18	15	15	EA	DOWNLEAD CLAMP FOR OPGW/AGSS 0.469"-0.562" W/ 1/2-13 HEX HEAD BOLT HARDWARE KIT	PLP 8003042H3	
SW (1) ASSEMBLY PER STRUCTURE SECTION B-B	1.01	1	1	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WBNK	
	1.19	1	1	EA	Y-CLEVIS EYE - 19K	HUBBELL YC26S	MACLEAN YCE-65-635
	3.20	1	1	EA	QUADRANT CLAMP DEADEND - 3/8 EHS, 7#8 AW (0.22in - 0.55in DIA)	MACLEAN PQD-38-3	HUBBELL SWDE50N
	7.31	1	1	EA	CENTER BOLT PARALLEL GROOVE CLAMP (0.292" - 0.502")	AFL 461.1	
	11.04	.5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
	7.05	1	1	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
DEADEND (3) ASSEMBLIES PER STRUCTURE DETAIL 1	1.04	1	3	EA	ANCHOR SHACKLE WIDE - 50K	MACLEAN ASH-66-BC	HUBBELL ASS0WBNK
	1.09	1	3	EA	CHAIN LINK - 80K	HUBBELL LK80	
	3.13	2	6	EA	DEADEND - COMPRESSION - VERTICAL - DRAKE	HUBBELL A011245SS	
	5.43	1	3	EA	345kV DEAD END INSULATOR ASSEMBLY (HARDWARE ONLY)	LINDSEY HD-ASY-1190-2-DE-345KV	MACLEAN C-8681-DE3-H
	5.44	2	6	EA	345kV POLYMER SUSPENSION INSULATOR - 50K	NGK-502-SS1100-SK-43	MACLEAN S270801311VGSS053

NOTES

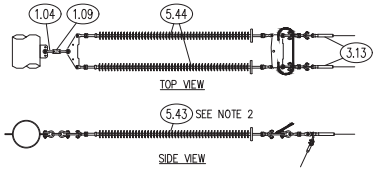
1. MATERIAL SHOWN HERE FOR ONE STRUCTURE.
2. PART 5.43 IS HARDWARE REQUIRED TO CONNECT TO PART 5.44 INSULATORS TO MAKE UP STRAIN ASSEMBLY.
3. SUBSTATION SHALL BE RESPONSIBLE FOR JUMPER MATERIAL AND OPGW SPLICE MATERIAL. OPGW DOWNLEADS HAVE BEEN PROVIDED AS PART OF TRANSMISSION HARDWARE KIT. THIS MAY BE DUPLICATED BETWEEN TRANSMISSION AND SUBSTATION PACKAGES.



SECTION
OPGW DEADEND – STEEL
A–A



SECTION
SW DEADEND – STEEL
B–B



DETAIL
DEADEND – STEEL
1

ENGINEER OF RECORD SEAL

NOT FOR CONSTRUCTION

"Engineering with Distinction"
ECI ELECTRICAL CONSULTANTS, INC.
BILLINGS, MONTANA

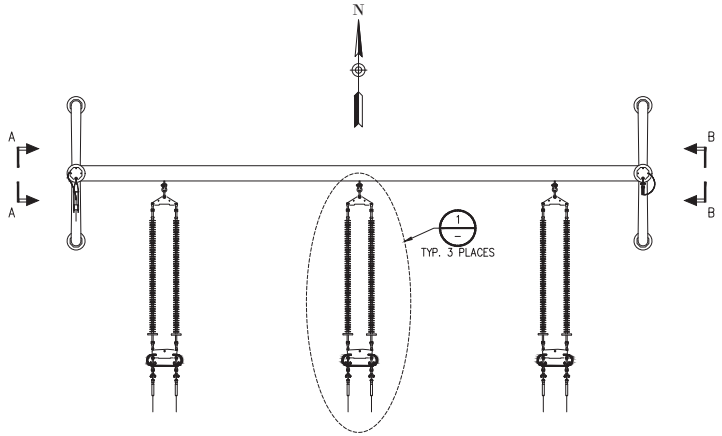
NO	REVISION	DATE	BY	APR
A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

ENGINEERING RECORD		DATE
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DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
OLIVER WIND IV SUBSTATION – 1 OF 1
345-M0-SC-T07-G0-C01-F01-S01

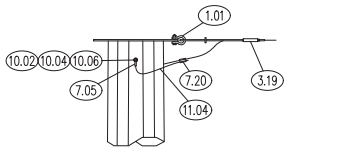
DWG. NAME: OW4-D-T003-10-01 | REVISION NO : A



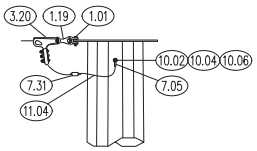
ASSEMBLY	ITEM #	QTY PER ASSY	QTY PER STR	UNIT	DESCRIPTION	MANUFACTURER 1/PART #	MANUFACTURER 2/PART #
OPGW (1) ASSEMBLY PER STRUCTURE SECTION A-A	1.01	1	1	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WBNK	
	3.19	1	1	EA	FIBERLIGN - U-BOLT DEADEND CLAMP (0.529in - 0.545in DIA)	PLP 2801309	
	7.20	1	1	EA	CONNECTOR: OPGW (0.529in - 0.540in DIA) TO #2 PG CLAMP	AFL OBC-ST-NT-1	
	11.04	.5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
	7.05	1	1	EA	COMPRESSION TERMINAL 1/2" TO #2	BURNDY YAZCN	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	9.18	15	15	EA	DOWNLEAD CLAMP FOR OPGW/ADSS 0.469"-0.562" W/ 1/2-13 HEX HEAD BOLT HARDWARE KIT	PLP 8003042H3	
SW (1) ASSEMBLY PER STRUCTURE SECTION B-B	1.01	1	1	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WBNK	
	1.19	1	1	EA	V-CLEVIS EYE - 19K	HUBBELL YC5S5	MACLEAN YCE-65-635
	3.20	1	1	EA	QUADRANT CLAMP DEADEND - 3/8 EHS, 7#8 AW (0.22in - 0.55in DIA)	MACLEAN FQD-58-3	HUBBELL SWDE55N
	7.31	1	1	EA	CENTER BOLT PARALLEL GROOVE CLAMP (0.292" - 0.502")	AFL 481.1	
	11.04	.5	5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
	7.05	1	1	EA	COMPRESSION TERMINAL 1/2" TO #2	BURNDY YAZCN	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
DEADEND (3) ASSEMBLIES PER STRUCTURE DETAIL 1	1.04	1	3	EA	ANCHOR SHACKLE WIDE - 60K	MACLEAN ASH-66-BC	HUBBELL AS60WBNK
	1.09	1	3	EA	CHAIN LINK - 80K	HUBBELL LK80	
	3.13	2	6	EA	DEADEND - COMPRESSION - VERTICAL - DRAKE	HUBBELL A01124SSS	
	5.43	1	3	EA	345kV DEAD END INSULATOR ASSEMBLY (HARDWARE ONLY)	LINDSEY HD-ASY-1190-2-DE-345KV	MACLEAN C-8881-DE3-H
	5.44	2	6	EA	345kV POLYMER SUSPENSION INSULATOR - 50K	NGK 502-SS1100-SK-43	MACLEAN S27080131VGSS053

NOTES

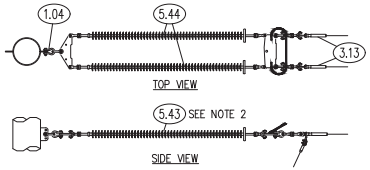
1. MATERIAL SHOWN HERE FOR ONE STRUCTURE.
2. PART 5.43 IS HARDWARE REQUIRED TO CONNECT TO PART 5.44 INSULATORS TO MAKE UP STRAIN ASSEMBLY.
3. SUBSTATION SHALL BE RESPONSIBLE FOR JUMPER MATERIAL AND OPGW SPLICE MATERIAL. OPGW DOWNLEADS HAVE BEEN PROVIDED AS PART OF TRANSMISSION HARDWARE KIT. THIS MAY BE DUPLICATED BETWEEN TRANSMISSION AND SUBSTATION PACKAGES.
4. CONDUCTOR VANGS ARE PROJECTED TO BE VERTICAL. CHAIN LINKS HAVE BEEN PROVIDED AS PART OF TRANSMISSION HARDWARE KIT IN THE CASE THE CONDUCTOR DEADEND ASSEMBLY MUST ROTATE 90°.



SECTION
OPGW DEADEND – STEEL
A–A
–



SECTION
SW DEADEND – STEEL
B–B
–



DETAIL
DEADEND – STEEL
1
–

ENGINEER OF RECORD SEAL

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BILLINGS, MONTANA

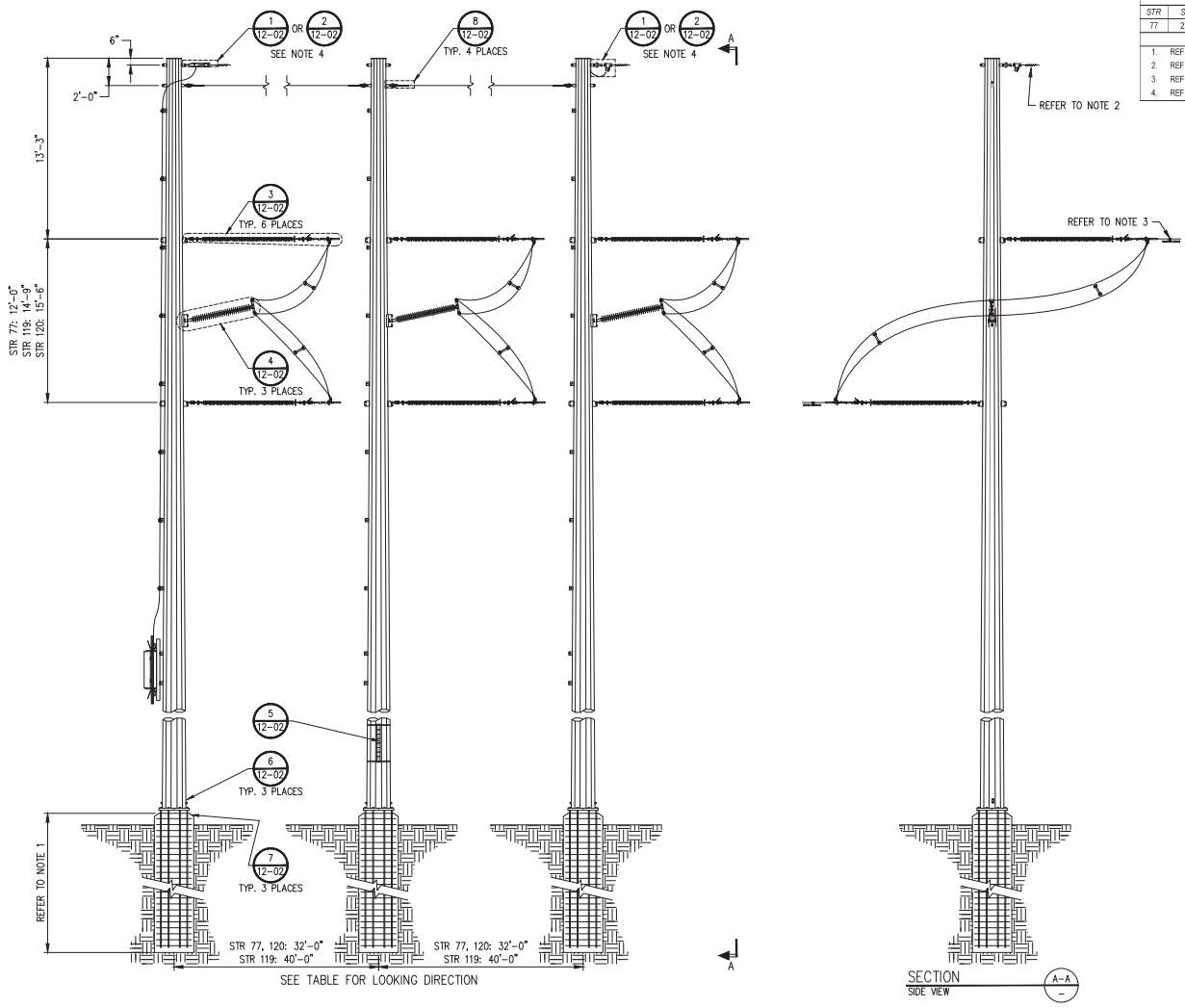
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OLIVER WIND IV, LLC

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APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
NEW LELAND OLDS SWITCHYARD – 1 OF 1
345-MO-SC-T07-GO-C01-F01-S01

DWG. NAME: OW4-D-T003-11-01 | REVISION NO : A



STRUCTURE LIST

AHEAD ON LINE LOOKING DIRECTION REFERS TO LOOKING ALONG THE LINE TOWARDS NEW LELAND OLDS. LOOKING BACK ON LINE REFERS TO LOOKING ALONG THE LINE TOWARDS OLIVER WIND IV.

STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION
77	22MRO77	AHEAD ON LINE	119	22MRO119	BACK ON LINE	120	22MRO120	AHEAD ON LINE	-	-	-

GENERAL INSTALLATION NOTES

1. REFER TO DRAWING OW4-B-T008-02 FOR DRILLED PIER INSTALLATION DETAILS.
2. REFER TO DRAWING OW4-D-T003-32-01 FOR OPGW DAMPER INSTALLATION REQUIREMENTS.
3. REFER TO DRAWING OW4-D-T003-33-01 FOR CONDUCTOR DAMPER INSTALLATION REQUIREMENTS.
4. REFER TO DRAWING OW4-D-T006-01 FOR OPGW POSITION ON EACH STRUCTURE.

ENGINEER OF RECORD SEAL

NOT FOR CONSTRUCTION

"Engineering with Distinction"
ELECTRICAL CONSULTANTS, INC.
BILLINGS, MONTANA

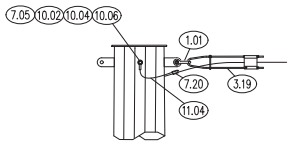
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OLIVER WIND IV, LLC

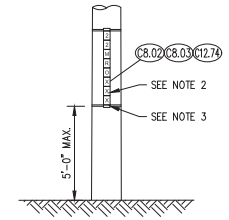
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DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL 3-POLE DEADEND LIGHT SS – 1 OF 2
345-M1-SC-T10-G0-C01-F01-S01

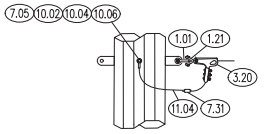
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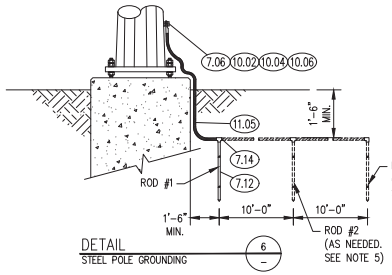
DETAIL
OPGW DEADEND – STEEL
1



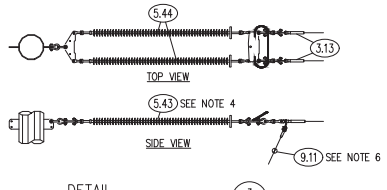
DETAIL
STRUCTURE SIGN PLACEMENT
5



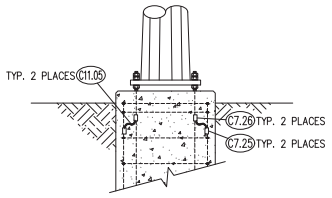
DETAIL
SW DEADEND – STEEL
2



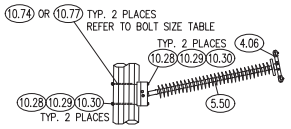
DETAIL
STEEL POLE GROUNDING
6



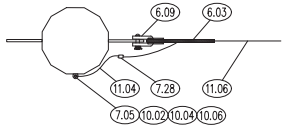
DETAIL
DEADEND – STEEL
3



DETAIL
CAISSON GROUNDING
7



DETAIL
JUMPER POST – STEEL
4



DETAIL
SPAN GUY ATTACHMENT
8

ASSEMBLY	ITEM #	QTY PER ASSY	QTY PER STR	UNIT	DESCRIPTION	MANUFACTURER 1/PART #	MANUFACTURER 2/PART #
OPGW (1) ASSEMBLY PER STRUCTURE DETAIL 1	1.01	1	1	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WSNK	
	3.19	1	1	EA	FIBERLIGN - U-BOLT DEADEND CLAMP (0.529in - 0.545in DIA)	PLP 2861309	
	7.05	1	1	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YAZCN	
	7.20	1	1	EA	CONNECTOR: OPGW (0.529in - 0.540in DIA) TO #2 PG CLAMP	AFL OBC-E2-N1-1	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	2.5	2.5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
SW (1) ASSEMBLY PER STRUCTURE DETAIL 2	1.01	1	1	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WSNK	
	1.21	1	1	EA	ROTATED Y-CLEVIS EYE - 15K	HUBBELL YCS0590	MACLEAN RYCE-65-625
	3.20	1	1	EA	QUADRANT CLAMP DEADEND - 3/8 EHS, 1WB AW (0.22in - 0.55in DIA)	MACLEAN HQD-5B-3	HUBBELL SWD650N
	7.05	1	1	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YAZCN	
	7.31	1	1	EA	CENTER BOLT PARALLEL GROOVE CLAMP (0.292" - 0.502")	AFL 481.1	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	2.5	2.5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
DEADEND (6) ASSEMBLIES PER STRUCTURE DETAIL 3	3.13	2	12	EA	DEADEND - COMPRESSION - VERTICAL - DRAKE	HUBBELL A0112451SS	
	5.43	1	6	EA	345kV DEAD END INSULATOR ASSEMBLY (HARDWARE ONLY)	LINDSEY HD-ASY-1100-2-DE-345KV	MACLEAN C-8981-DE3-H
	5.44	2	12	EA	345kV POLYMER SUSPENSION INSULATOR - 50K	NGK 502-SS1100-5K-43	MACLEAN S2708013110/S65053
	9.11	1	6	EA	CUSHION GRIP TWIN SPACER, DRAKE	PLP CGTS-0112	
JUMPER POST (3) ASSEMBLIES PER STRUCTURE DETAIL 4	4.06	1	3	EA	18" JUMPER YOKE W/ SIDE CLAMPS - DRAKE	MACLEAN LPHD-18-140	LINDSEY R-17416300
	5.50	1	3	EA	345kV POLYMER POST JUMPER - STEEL POLE	MACLEAN H31010140CBS5043	NGK L3-SN951-18-X
	10.28	4	12	EA	FLAT WASHER FOR 1" ROD	ALL MAKES	
	10.29	4	12	EA	1" HEAVY HEX NUT, A563 GRADE DH, GALV	ALL MAKES	
	10.30	4	12	EA	1" HEAVY HEX LOCK NUT, A563 GRADE DH, GALV	ALL MAKES	
	10.74	A/R	A/R	EA	1" x 36" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)	ALL MAKES	
	10.77	A/R	A/R	EA	1" x 44" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)	ALL MAKES	
POLE SIGNAGE (1) ASSEMBLY PER STRUCTURE DETAIL 5	C8.02	40	40	FT	3/4 TYPE 201 HEAVY DUTY SS BAND	MARATHON MAR430	USA 812430
	C8.03	2	2	EA	CLAMPS & BOLTS FOR SS BAND	MARATHON MAR500	USA 812500
	C12.36	A/R	A/R	EA	BASE NUMBER - 0 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY610	
	C12.37	A/R	A/R	EA	BASE NUMBER - 1 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY601	
	C12.38	A/R	A/R	EA	BASE NUMBER - 2 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY602	
	C12.39	A/R	A/R	EA	BASE NUMBER - 3 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY603	
	C12.40	A/R	A/R	EA	BASE NUMBER - 4 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY604	
	C12.41	A/R	A/R	EA	BASE NUMBER - 5 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY605	
	C12.42	A/R	A/R	EA	BASE NUMBER - 6 OR 9 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY606	
	C12.43	A/R	A/R	EA	BASE NUMBER - 7 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY607	
	C12.44	A/R	A/R	EA	BASE NUMBER - 8 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY608	
	C12.57	1	1	EA	BASE LETTER - M - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYM	
	C12.59	1	1	EA	BASE LETTER - O - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYO	
	C12.62	1	1	EA	BASE LETTER - R - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYR	
	C12.74	1	1	EA	3" TAG HOLDER, VERTICAL ORIENTATION, 8 TAGS, W/ SLOTS	TECH PRODUCTS 4A536NVP-S	
GROUNDING (3) ASSEMBLIES PER STRUCTURE DETAIL 6	7.06	1	3	EA	COMPRESSION TERMINAL: 1/2" TO #4	BURNDY YA4CN	
	7.12	A/R	A/R	EA	STRUCTURE GROUND ROD: 5/8" BY 10' LENGTH, COPPER CLAD, PER UL 467U	ERICO 615800	GALVAN 6260
	7.14	A/R	A/R	EA	GROUND ROD CONNECTOR TAP - CADWELD (NO IGNITOR)	ERICO NTI 161L	
	10.02	1	3	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	3	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	3	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.05	A/R	A/R	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	
CAISSON GROUNDING (3) ASSEMBLIES PER STRUCTURE DETAIL 7	C7.25	2	6	EA	GROUNDING CONNECTOR - CABLE TO ROD (1-3/8" - 1-1/2") - TAP (4 - 2/0 AWG)	BURNDY GAR 1626	
	C7.26	2	6	EA	GROUNDING CONNECTOR - CABLE TO ROD (2" - 2-3/8") - TAP (4 - 2/0 AWG)	BURNDY GAR 1826	
	C11.05	10	30	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	
SPAN GUY (4) ASSEMBLIES PER STRUCTURE DETAIL 8	6.09	1	4	EA	CLEVIS THIMBLE - 50K	LINDSEY R 22157	
	6.03	1	4	EA	BIG GUY GRIP 3/4"	PLP BG-1112	
	11.06	A/R	A/R	FT	3/4" EHS 19 STRAND	ALL MAKES	
	7.28	1	4	EA	BONDING CLAMP: RUN DIA (0.743"-1.152"), TAP DIA (0.162"-0.464")	AFL 393.6	
	11.04	5	20	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
	7.05	1	4	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YAZCN	
	10.02	1	4	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.06	1	4	EA	1/2" HEX NUT, GALV	ALL MAKES	
	10.04	1	4	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	

NOTES

1. MATERIAL SHOWN HERE FOR ONE STRUCTURE.
2. INSTALL ALL TAGS FACING THE NEAREST ROAD OR INSPECTION PATH.
3. USE BANDING TO SECURE TAG HOLDER TO POLES. MOUNT BOTTOM TAG 5' ABOVE GROUND.
4. PART 5.43 IS HARDWARE REQUIRED TO CONNECT TO PART 5.44 INSULATORS TO MAKE UP STRAIN ASSEMBLY.
5. INSTALL GROUND RODS USING THE FOLLOWING PROCEDURE. TARGET GROUND RESISTANCE IS 25 OHMS FOR ALL STRUCTURES.
   A. DRIVE ONE (1) 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #1).
   B. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP C.
   C. DRIVE SECOND 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN STEEL POLE GROUNDING DETAIL (ROD #2) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   D. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP E.
   E. DRIVE THIRD 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #3) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   F. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP G.
   G. IF MEASUREMENT EXCEEDS 25 OHMS AT THIS STAGE, CONNECTION TO THE STRUCTURE CAN BE COMPLETED AT THIS TIME. ALL READINGS SHALL BE RECORDED AND PROVIDED TO THE OWNER. AFTER ALL CONNECTIONS ARE MADE TO THE STATIC WIRE, THE STRUCTURE SHALL BE RETESTED AGAIN TO SEE IF IT MEETS THE 25 OHMS. IF AT THIS TIME THE RESISTANCE CAN STILL NOT BE MET, CONTACT THE OWNER.
6. SPACERS SHALL BE DISTRIBUTED EVENLY THROUGHOUT JUMPERS, 2 PER PHASE.

BOLT SIZE TABLE - STRUCTURES 77 & 120

HARDWARE CATEGORY	BOLT LOCATION	ITEM #	DESCRIPTION
LEFT POLE JUMPER POST	TOP	10.74	1" x 36" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	10.74	1" x 36" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
MIDDLE POLE JUMPER POST	TOP	10.74	1" x 36" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	10.74	1" x 36" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
RIGHT POLE JUMPER POST	TOP	10.74	1" x 36" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	10.74	1" x 36" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)

BOLT SIZE TABLE - STRUCTURE 119

HARDWARE CATEGORY	BOLT LOCATION	ITEM #	DESCRIPTION
LEFT POLE JUMPER POST	TOP	10.77	1" x 44" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	10.77	1" x 44" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
MIDDLE POLE JUMPER POST	TOP	10.77	1" x 44" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	10.77	1" x 44" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
RIGHT POLE JUMPER POST	TOP	10.77	1" x 44" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)
	BOTTOM	10.77	1" x 44" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)

HOLD FOR VENDOR CALCULATIONS

ENGINEER OF RECORD SEAL

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BILLINGS, MONTANA

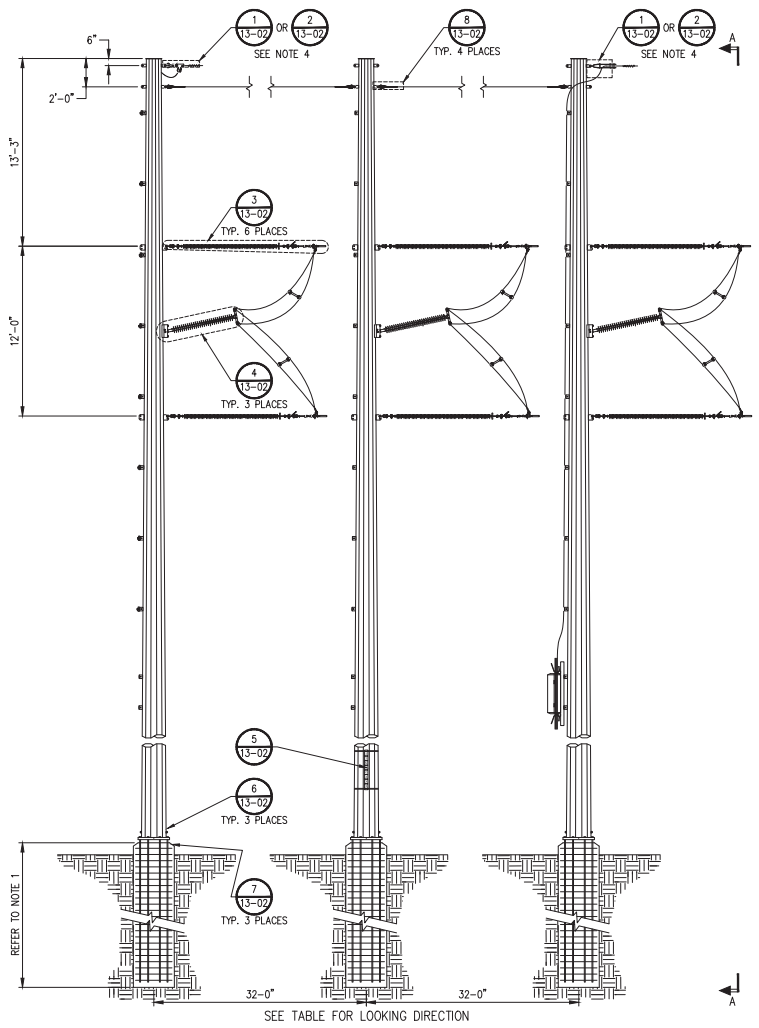
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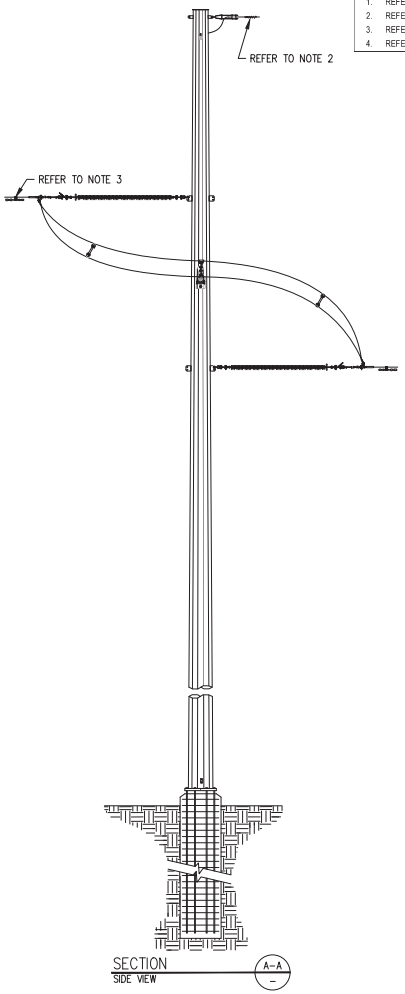
OLIVER WIND IV, LLC

ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	09/08/23
DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL 3-POLE DEADEND LIGHT SS – 2 OF 2
345-M1-SC-T10-G0-C01-F01-S01

DWG. NAME: OW4-D-T003-12-02 | REVISION NO : A





STRUCTURE LIST

AHEAD ON LINE LOOKING DIRECTION REFERS TO LOOKING ALONG THE LINE TOWARDS NEW LELAND OLDS. LOOKING BACK ON LINE REFERS TO LOOKING ALONG THE LINE TOWARDS OLIVER WIND IV.

STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION	STR	SIGNAGE	LOOKING DIRECTION
76	22MRO76	AHEAD ON LINE	-	-	-	-	-	-	-	-	-

GENERAL INSTALLATION NOTES

1. REFER TO DRAWING OW4-B-T008-02 FOR DRILLED PIER INSTALLATION DETAILS.
2. REFER TO DRAWING OW4-D-T003-32-01 FOR OPGW DAMPER INSTALLATION REQUIREMENTS.
3. REFER TO DRAWING OW4-D-T003-33-01 FOR CONDUCTOR DAMPER INSTALLATION REQUIREMENTS.
4. REFER TO DRAWING OW4-D-T006-01 FOR OPGW POSITION ON EACH STRUCTURE.

ENGINEER OF RECORD SEAL

NOT FOR CONSTRUCTION

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BILLINGS, MONTANA

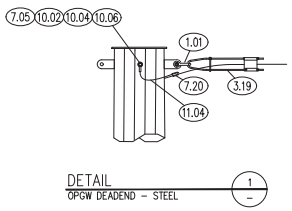
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A	ISSUED FOR BID – 30% REVIEW	09/08/23	CFE	BJM

OLIVER WIND IV, LLC

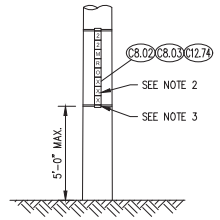
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DRAWN	C. ELLIS	09/08/23
DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL 3-POLE DEADEND LIGHT SS – 1 OF 2
345-M1-SC-T10-G0-C01-F01-S01

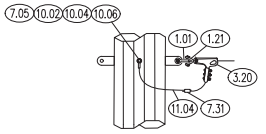
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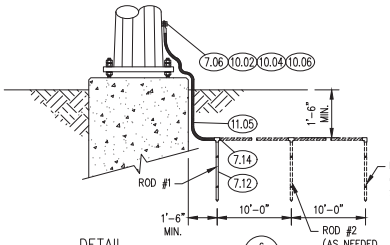
DETAIL
OPGW DEADEND – STEEL
1



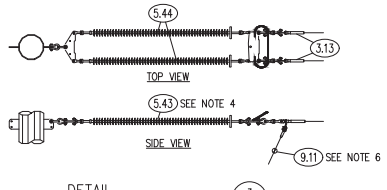
DETAIL
STRUCTURE SIGN PLACEMENT
5



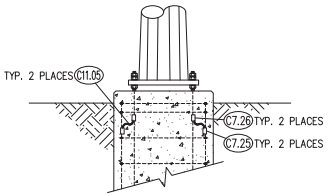
DETAIL
SW DEADEND – STEEL
2



DETAIL
STEEL POLE GROUNDING
6

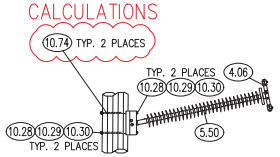


DETAIL
DEADEND – STEEL
3

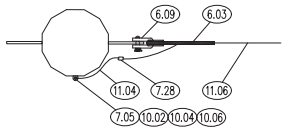


DETAIL
CAISSON GROUNDING
7

HOLD FOR VENDOR CALCULATIONS



DETAIL
JUMPER POST – STEEL
4



DETAIL
SPAN GUY ATTACHMENT
8

ASSEMBLY	ITEM #	QTY PER ASSY	QTY PER STR	UNIT	DESCRIPTION	MANUFACTURER 1/PART #	MANUFACTURER 2/PART #
OPGW (1) ASSEMBLY PER STRUCTURE DETAIL 1	1.01	1	1	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WSNK	
	3.19	1	1	EA	FIBERLIGN - U-BOLT DEADEND CLAMP (0.529in - 0.545in DIA)	PLP 2801309	
	7.05	1	1	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	7.20	1	1	EA	CONNECTOR: OPGW (0.529in - 0.540in DIA) TO #2 PG CLAMP	AFL OBC-E2-N1-1	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	2.5	2.5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
SW (1) ASSEMBLY PER STRUCTURE DETAIL 2	1.01	1	1	EA	ANCHOR SHACKLE WIDE - 25K	HUBBELL AS25WSNK	
	1.21	1	1	EA	ROTATED Y-CLEVIS EYE - 15K	HUBBELL YCS0590	MACLEAN RYCE-05-625
	3.20	1	1	EA	QUADRANT CLAMP DEADEND - 3/8 EHS, TMS AW (0.22in - 0.55in DIA)	MACLEAN FQD-5B-3	HUBBELL SWDE50N
	7.05	1	1	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	7.31	1	1	EA	CENTER BOLT PARALLEL GROOVE CLAMP (0.252" - 0.502")	AFL 481.1	
	10.02	1	1	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	1	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	1	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.04	2.5	2.5	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
DEADEND (6) ASSEMBLIES PER STRUCTURE DETAIL 3	3.13	2	12	EA	DEADEND - COMPRESSION - VERTICAL - DRAKE	HUBBELL A0112451SS	
	5.43	1	6	EA	345kV DEAD END INSULATOR ASSEMBLY (HARDWARE ONLY)	LINDSEY HD-ASY-1100-2-DE-345KV	MACLEAN C-8681-DE3-H
	5.44	2	12	EA	345kV POLYMER SUSPENSION INSULATOR - 50K	NGK 502-SS1100-SK-43	MACLEAN S2706013 1VGSS053
	9.11	1	6	EA	CUSHION GRIP TWIN SPACER, DRAKE	PLP CGTS-0112	
JUMPER POST (3) ASSEMBLIES PER STRUCTURE DETAIL 4	4.06	1	3	EA	18" JUMPER YOKE W/ SIDE CLAMPS - DRAKE	MACLEAN LPH3D-18-140	LINDSEY R-17416300
	5.50	1	3	EA	345kV POLYMER POST JUMPER - STEEL POLE	MACLEAN H31010140CBSS043	NGK L3-SN951-18-X
	10.28	4	12	EA	FLAT WASHER FOR 1" ROD	ALL MAKES	
	10.29	4	12	EA	1" HEAVY HEX NUT, A563 GRADE DH, GALV	ALL MAKES	
	10.30	4	12	EA	1" HEAVY HEX LOCK NUT, A563 GRADE DH, GALV	ALL MAKES	
	10.74	2	6	EA	1" x 30" ALL-THREAD, A449, GALV (NO NUTS INCLUDED)	ALL MAKES	
POLE SIGNAGE (1) ASSEMBLY PER STRUCTURE DETAIL 5	C8.02	40	40	FT	3/4 TYPE 201 HEAVY DUTY SS BAND	MARATHON MAR430	USA B12430
	C8.03	2	2	EA	CLAMPS & BOLTS FOR SS BAND	MARATHON MAR500	USA B12500
	C12.36	A/R	A/R	EA	BASE NUMBER - 0 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY010	
	C12.37	A/R	A/R	EA	BASE NUMBER - 1 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY001	
	C12.38	A/R	A/R	EA	BASE NUMBER - 2 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY002	
	C12.39	A/R	A/R	EA	BASE NUMBER - 3 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY003	
	C12.40	A/R	A/R	EA	BASE NUMBER - 4 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY004	
	C12.41	A/R	A/R	EA	BASE NUMBER - 5 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY005	
	C12.42	A/R	A/R	EA	BASE NUMBER - 6 OR 9 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY006	
	C12.43	A/R	A/R	EA	BASE NUMBER - 7 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY007	
	C12.44	A/R	A/R	EA	BASE NUMBER - 8 - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KY008	
	C12.57	1	1	EA	BASE LETTER - M - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYM	
	C12.59	1	1	EA	BASE LETTER - O - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYO	
	C12.62	1	1	EA	BASE LETTER - R - (3" BLACK ON YELLOW)	TECH PRODUCTS EL3KYR	
	C12.74	1	1	EA	3" TAG HOLDER, VERTICAL ORIENTATION, 8 TAGS, W/ SLOTS	TECH PRODUCTS AH308VP-S	
GROUNDING (3) ASSEMBLIES PER STRUCTURE DETAIL 6	7.06	1	3	EA	COMPRESSION TERMINAL: 1/2" TO #4	BURNDY YA4CN	
	7.12	A/R	A/R	EA	STRUCTURE GROUND ROD: 5/8" BY 10' LENGTH - COPPER CLAD, PER UL 467U	ERICO 615800	GALVAN 6260
	7.14	A/R	A/R	EA	GROUND ROD CONNECTOR TAP - CADWELD (NO IGNITOR)	ERICO NT1161L	
	10.02	1	3	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.04	1	3	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	
	10.06	1	3	EA	1/2" HEX NUT, GALV	ALL MAKES	
	11.05	A/R	A/R	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	
CAISSON GROUNDING (3) ASSEMBLIES PER STRUCTURE DETAIL 7	C7.25	2	6	EA	GROUNDING CONNECTOR - CABLE TO ROD (1-3/8" - 1-1/2") - TAP (4 - 2/0 AWG)	BURNDY GAR 1626	
	C7.26	2	6	EA	GROUNDING CONNECTOR - CABLE TO ROD (2" - 2-3/8") - TAP (4 - 2/0 AWG)	BURNDY GAR 1826	
	C11.05	10	30	FT	#4 - SOLID HARD DRAWN COPPER	ALL MAKES	
SPAN GUY (4) ASSEMBLIES PER STRUCTURE DETAIL 8	6.09	1	4	EA	CLEVIS THIMBLE - 60K	LINDSEY R-22157	
	6.03	1	4	EA	BIG GUY GRIP 3/4"	PLP BG-1112	
	11.06	A/R	A/R	FT	3/4" EHS 19 STRAND	ALL MAKES	
	7.28	1	4	EA	BONDING CLAMP: RUN DIA (0.747-1.152"), TAP DIA (0.162"-0.464")	AFL 393-6	
	11.04	5	20	FT	#2 - 7 STRAND FLEXIBLE COPPER	ALL MAKES	
	7.05	1	4	EA	COMPRESSION TERMINAL: 1/2" TO #2	BURNDY YA2CN	
	10.02	1	4	EA	1/2" LOCK WASHER, GALV	ALL MAKES	
	10.06	1	4	EA	1/2" HEX NUT, GALV	ALL MAKES	
	10.04	1	4	EA	1/2" - 13x2" FULLY THREADED LONG BOLT, GALV	ALL MAKES	

NOTES

1. MATERIAL SHOWN HERE FOR ONE STRUCTURE.
2. INSTALL ALL TAGS FACING THE NEAREST ROAD OR INSPECTION PATH.
3. USE BANDING TO SECURE TAG HOLDER TO POLES, MOUNT BOTTOM TAG 5' ABOVE GROUND.
4. PART C 4.43 IS HARDWARE REQUIRED TO CONNECT TO PART 5.44 INSULATORS TO MAKE UP STRAIN ASSEMBLY.
5. INSTALL GROUND RODS USING THE FOLLOWING PROCEDURE. TARGET GROUND RESISTANCE IS 25 OHMS FOR ALL STRUCTURES.
   A. DRIVE ONE (1) 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #1).
   B. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP C.
   C. DRIVE SECOND 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN STEEL POLE GROUNDING DETAIL (ROD #2) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   D. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP E.
   E. DRIVE THIRD 5/8" X 10' GROUNDING ELECTRODE LOCATED AS SHOWN IN THE STEEL POLE GROUNDING DETAIL (ROD #3) AND CONNECT TO THE FIRST GROUNDING ELECTRODE USING CONNECTOR.
   F. TEST GROUND RESISTANCE PER SPECIFICATION. IF MEASUREMENT IS 25 OHMS OR LESS, CONNECTION TO THE STRUCTURE CAN BE COMPLETED. ALL READINGS SHALL BE RECORDED AND REPORTED TO OWNER. OTHERWISE, PROCEED TO STEP G.
   G. IF MEASUREMENT EXCEEDS 25 OHMS AT THIS STAGE, CONNECTION TO THE STRUCTURE CAN BE COMPLETED AT THIS TIME. ALL READINGS SHALL BE RECORDED AND PROVIDED TO THE OWNER. AFTER ALL CONNECTIONS ARE MADE TO THE STATIC WIRE, THE STRUCTURE SHALL BE RETESTED AGAIN TO SEE IF IT MEETS THE 25 OHMS. IF AT THIS TIME THE RESISTANCE CAN STILL NOT BE MET, CONTACT THE OWNER.
6. SPACERS SHALL BE DISTRIBUTED EVENLY THROUGHOUT JUMPERS, 2 PER PHASE.

ENGINEER OF RECORD SEAL

NOT FOR CONSTRUCTION

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ECI ELECTRICAL CONSULTANTS, INC.
BILLINGS, MONTANA

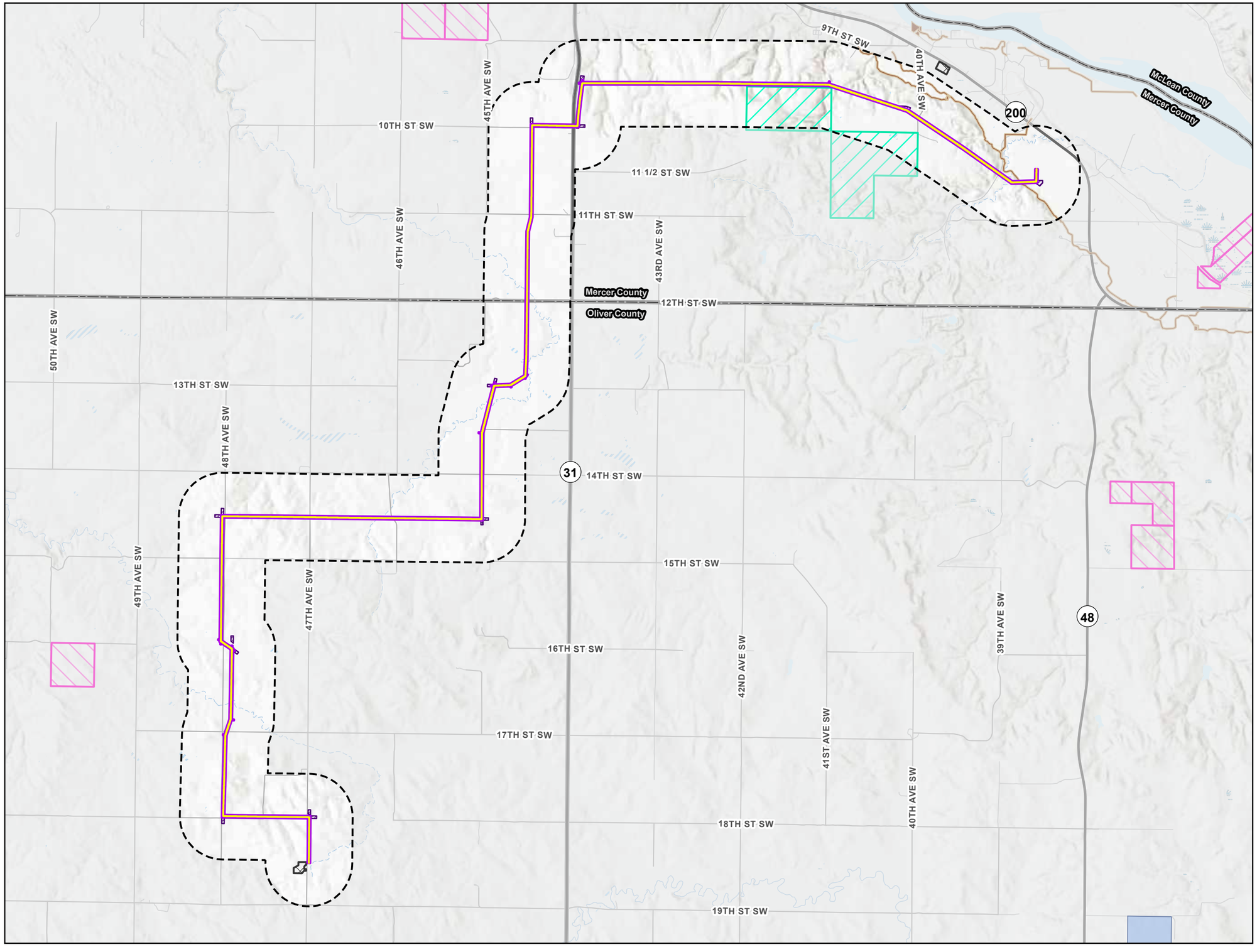
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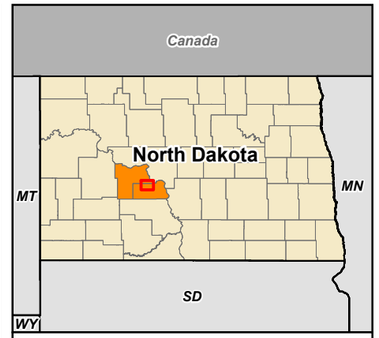
OLIVER WIND IV, LLC

ENGINEERING RECORD		DATE
DRAWN	C. ELLIS	09/08/23
DESIGNED	M. SANTANA	09/08/23
CHECKED	K. SCHULTZ	09/08/23
APPROVED	B. MATTHIES	09/08/23
DWG SCALE: NONE	PLT SCALE: 1:1	

OLIVER WIND IV 345 kV TRANSMISSION LINE
SC STEEL 3–POLE DEADEND LIGHT SS – 2 OF 2
345–M1–SC–T10–G0–C01–F01–S01

DWG. NAME: OW4–D–T003–13–02 | REVISION NO : A





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- Project Route
- Project Corridor
- Study Area
- Pulling Location
- Construction Laydown Area
- Bureau of Reclamation Easement
- State Trust Land
- Wildlife Management Area
- Private Land Open to Sportsmen Agreement
- County Boundary

Figure 9: Public Lands, Easements, and Agreements

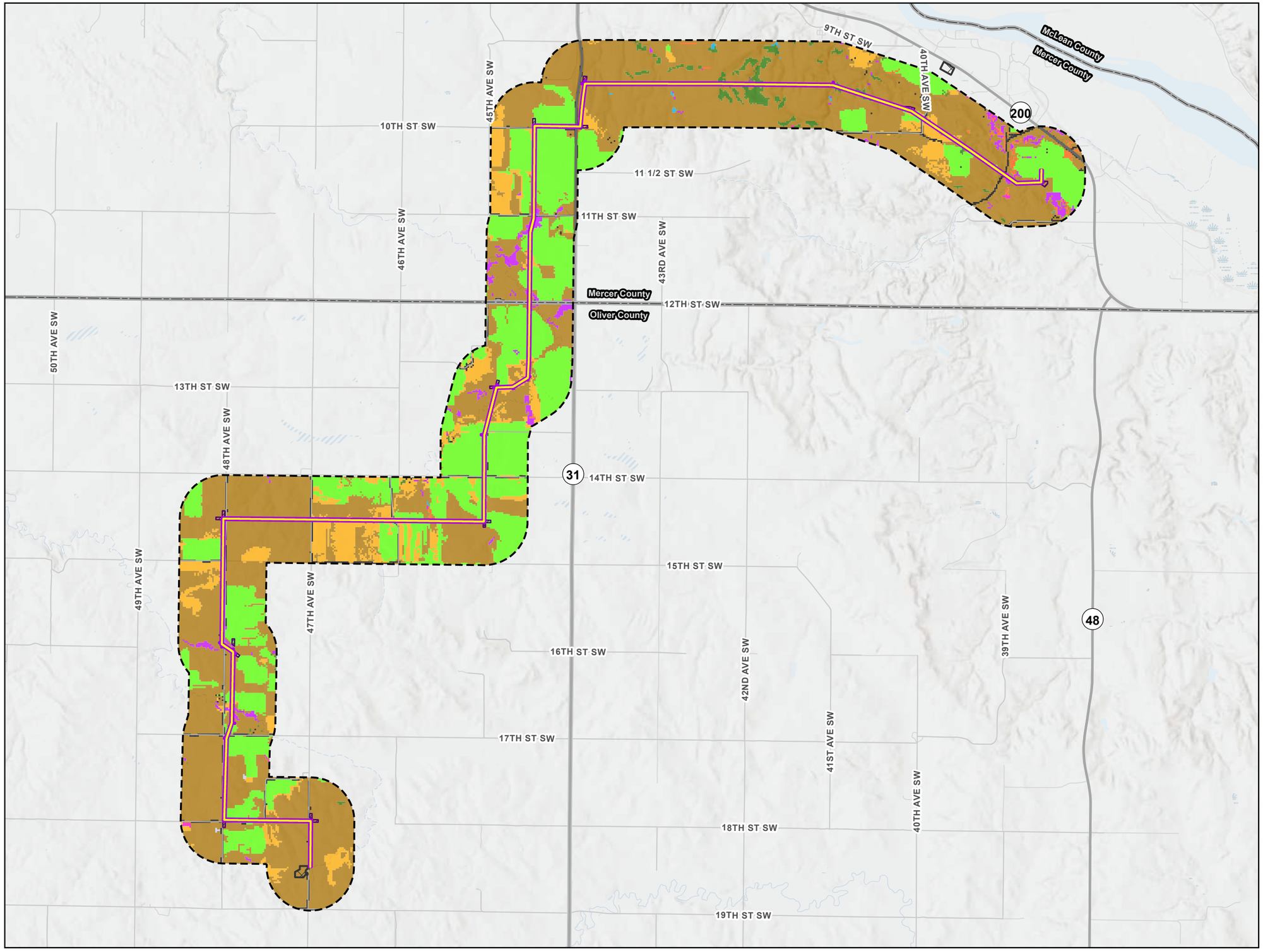
Oliver Wind IV 345-kV Transmission Line

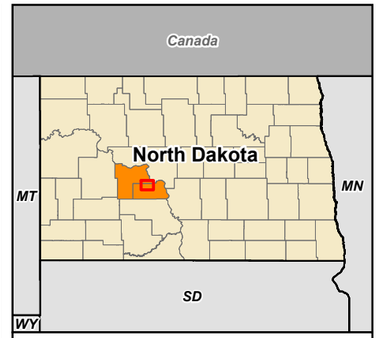
Oliver and Mercer Counties, North Dakota

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For Environmental Review Purposes Only

Date: (01/05/2023) Source: Z:\Clients\M_P\Midcontinent_Butler\Arcs\ISP\permitting\PSC_App\ON\NextEra_ON_Wind_TLine_PSC_Application.aprx





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- Project Route
- Project Corridor
- Study Area
- Pulling Location
- Construction Laydown Area
- County Boundary

National Land Cover Database

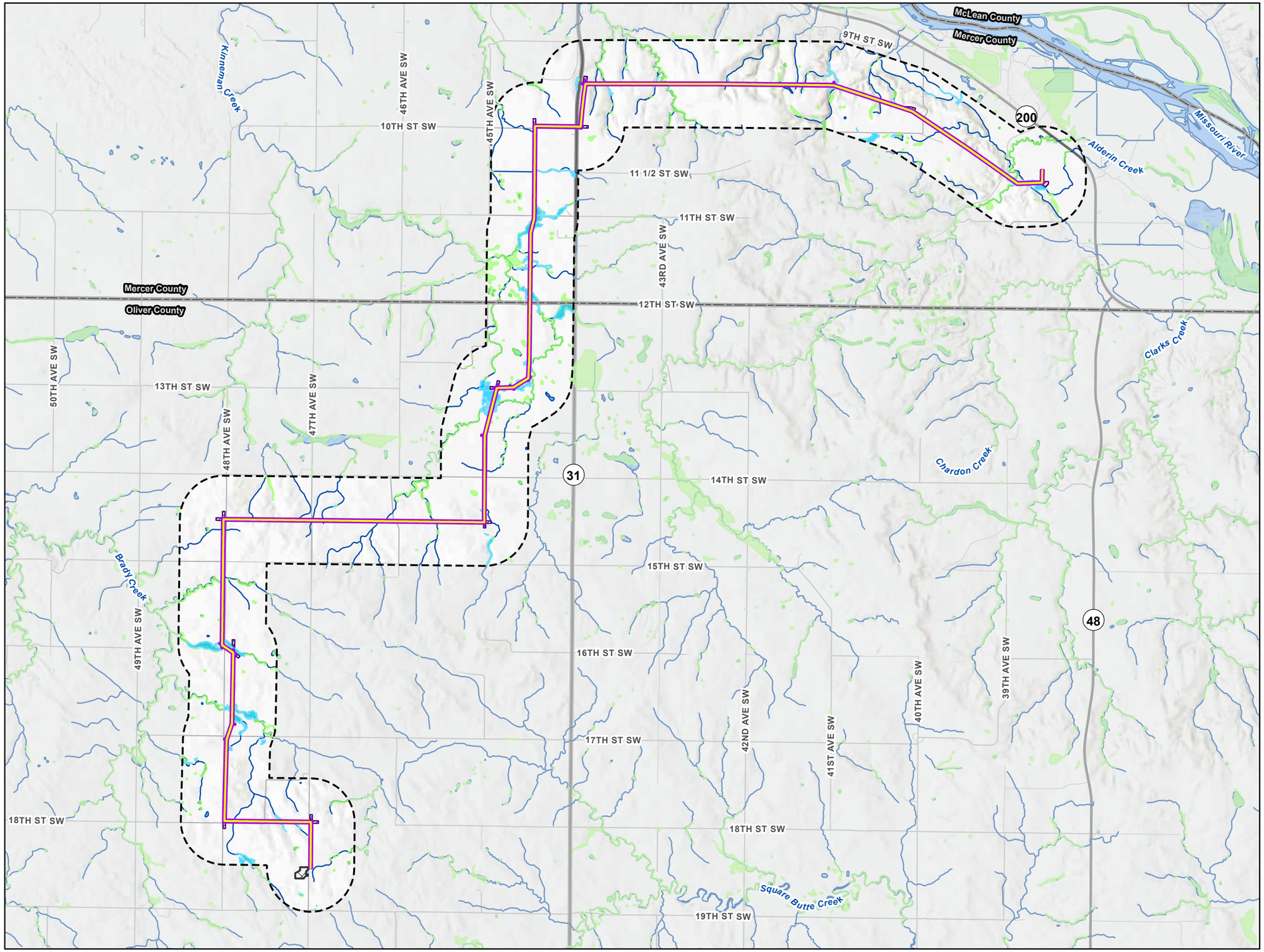
- Barren Land (0.02%)
- Cultivated Crops (27.10%)
- Deciduous Forest (1.26%)
- Developed (2.52%)
- Emergent Herbaceous Wetlands (1.56%)
- Hay/Pasture (8.45%)
- Herbaceous (58.58%)
- Mixed Forest (0.02%)
- Open Water (0.06%)
- Shrub/Scrub (0.07%)
- Woody Wetlands (0.36%)

Figure 10:
Land Cover
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

Source: Z:\Clients\MG_PN\Maps\Project_Updates\Oliver\Permitting\PSC_App\OliverWind_OIV_Wind_Line_PSC_Application.aprx

Date: (9/15/2025)

For Environmental Review Purposes Only





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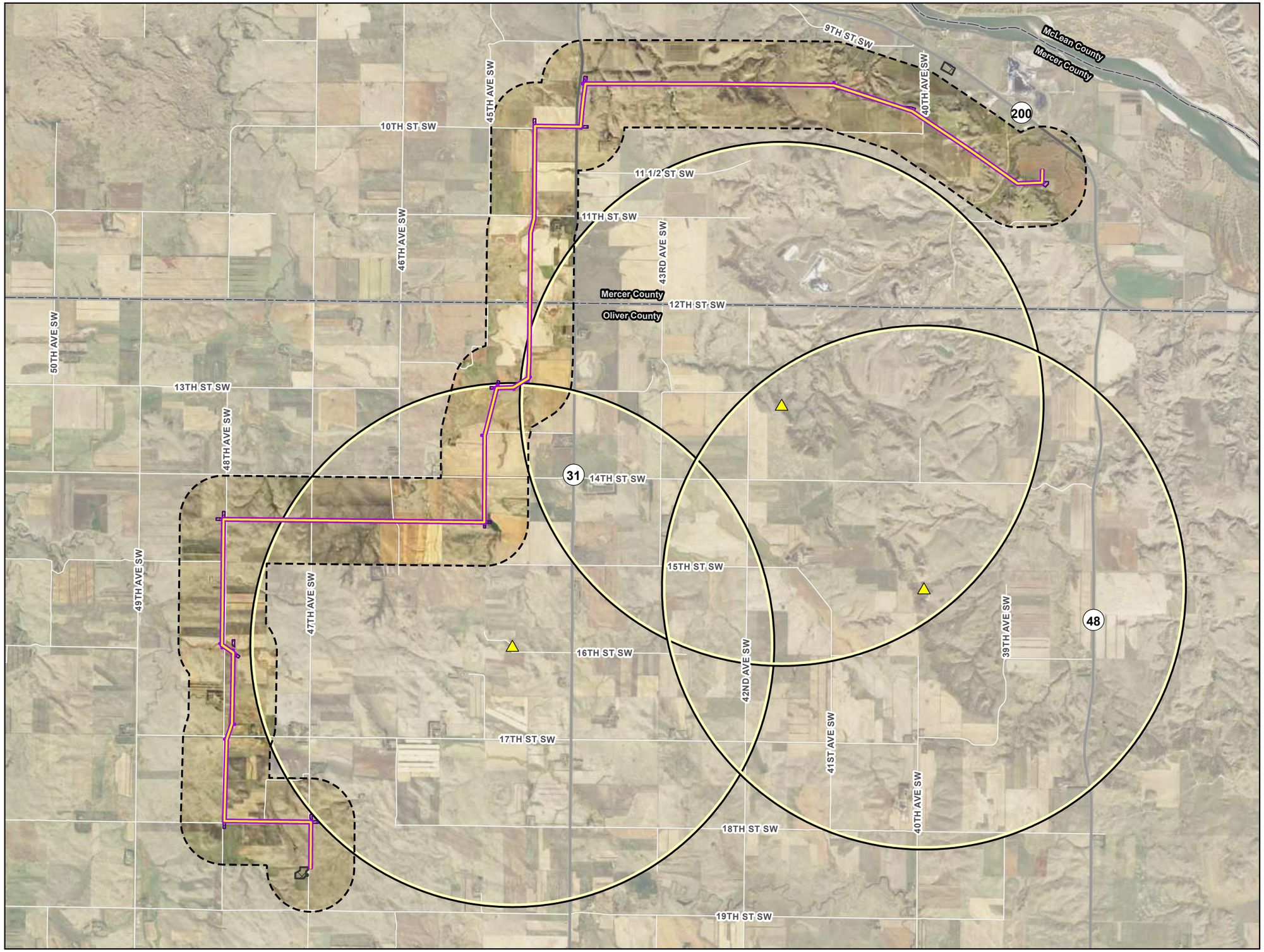
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- Project Route
- Project Corridor
- Study Area
- Pulling Location
- Construction Laydown Area
- County Boundary
- NHD Waterway
- NHD Waterbody
- NWI Wetland
- Delineated Wetland and Other Water

Figure 11:
Surface Water and National Wetlands Inventory
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

Source: 2/24/2023 S:\Client_PIN\Mercer\Red_Butte\ArcGIS\Permitting\PSC_App\OLIVNextEra_OIV_Wind_Turbine_PSC_App.aprx

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- Project Route
- Project Corridor
- Study Area
- Pulling Location
- Construction Laydown Area
- County Boundary
- NLEB Positive Location
- NLEB Conservation Buffer (3 mi)

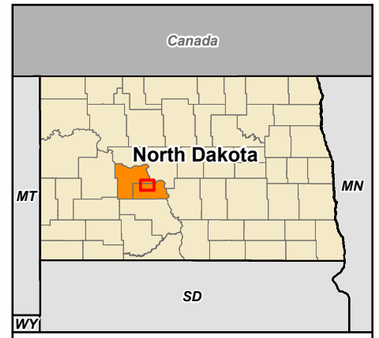
Figure 12:
Northern Long-Eared Bat Conservation Buffer and Tree Removal
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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10TH ST SW
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11TH ST SW
12TH ST SW
13TH ST SW
14TH ST SW
15TH ST SW
16TH ST SW
17TH ST SW
18TH ST SW
19TH ST SW
45TH AVE SW
46TH AVE SW
47TH AVE SW
48TH AVE SW
49TH AVE SW
50TH AVE SW
51ST AVE SW
43RD AVE SW
42ND AVE SW
41ST AVE SW
40TH AVE SW
39TH AVE SW
McLean County
Mercer County
Oliver County
200
31
48



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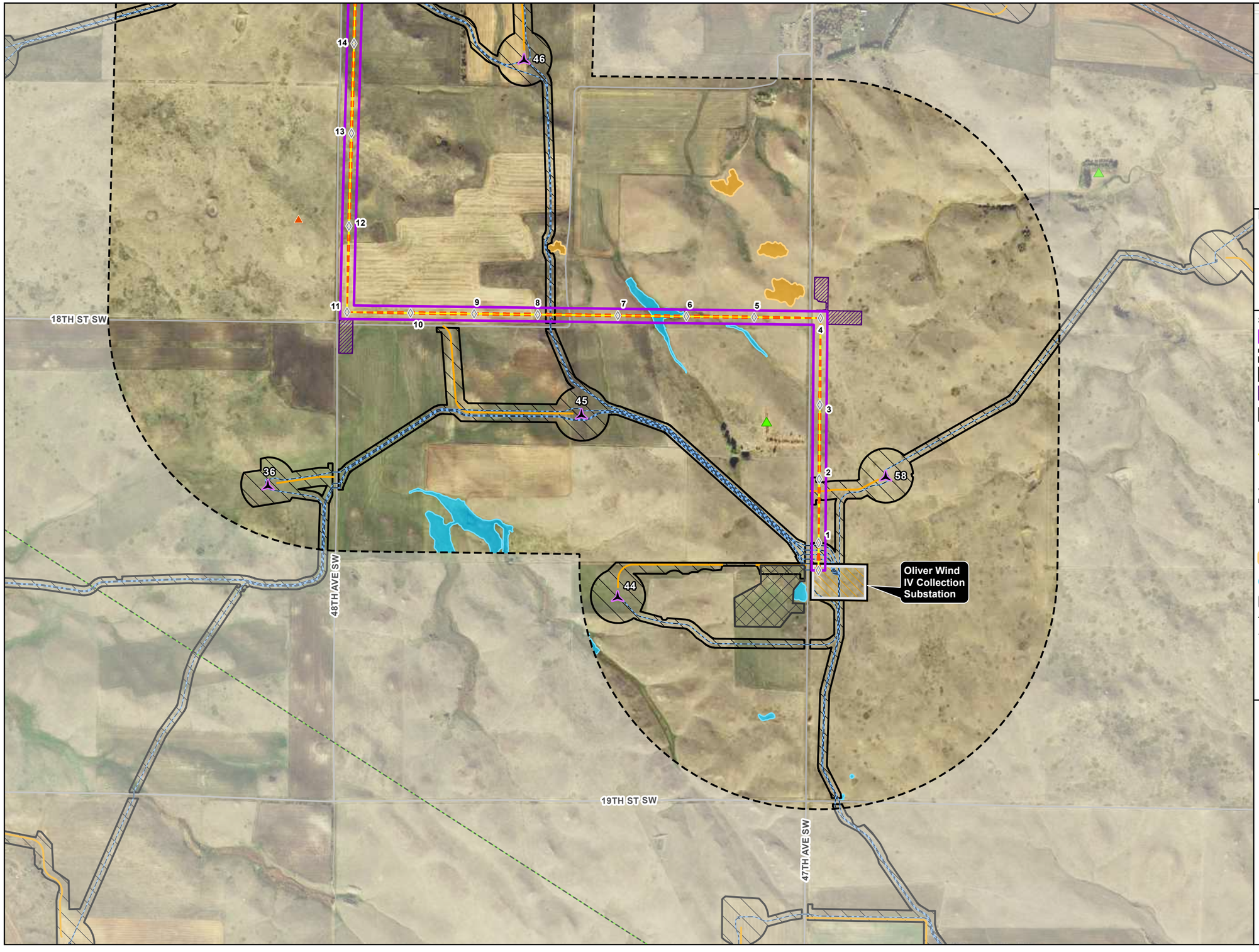
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- Project Corridor
- Study Area
- Pulling Location
- Construction Laydown Area
- County Boundary
- Map Series Page Extent

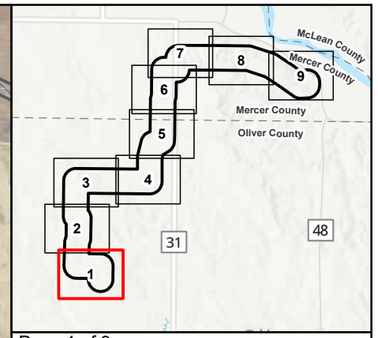
Figure 13:
Site Plan Detail Index Map (Aerial)
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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Date: (9/15/2025) Source: C:\Clients\...\Oliver_Wind_IV\GIS\Permitting\PSC_App\OliverWind_TLine_PSC_Application.aprx





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Site Plan

- Project Corridor
- Study Area
- Substation
- Pulling Location
- Construction Laydown Area
- Project Structure
- Project Route
- Project Conductor
- Primary Turbine
- Access Road
- Collection Line
- Construction Easement
- Collection Substation

*Coal leases displayed on the map are not comprehensive.
Known archaeological sites are not depicted due to confidentiality.

- Raptor Nest
- Confirmed Sharp-tailed Grouse Lek
- Dakota Skipper Larval Habitat
- Delineated Wetland and Other Water
- County Boundary
- Transmission Line
- County Road

Figure 13: Site Plan Detail (Aerial)

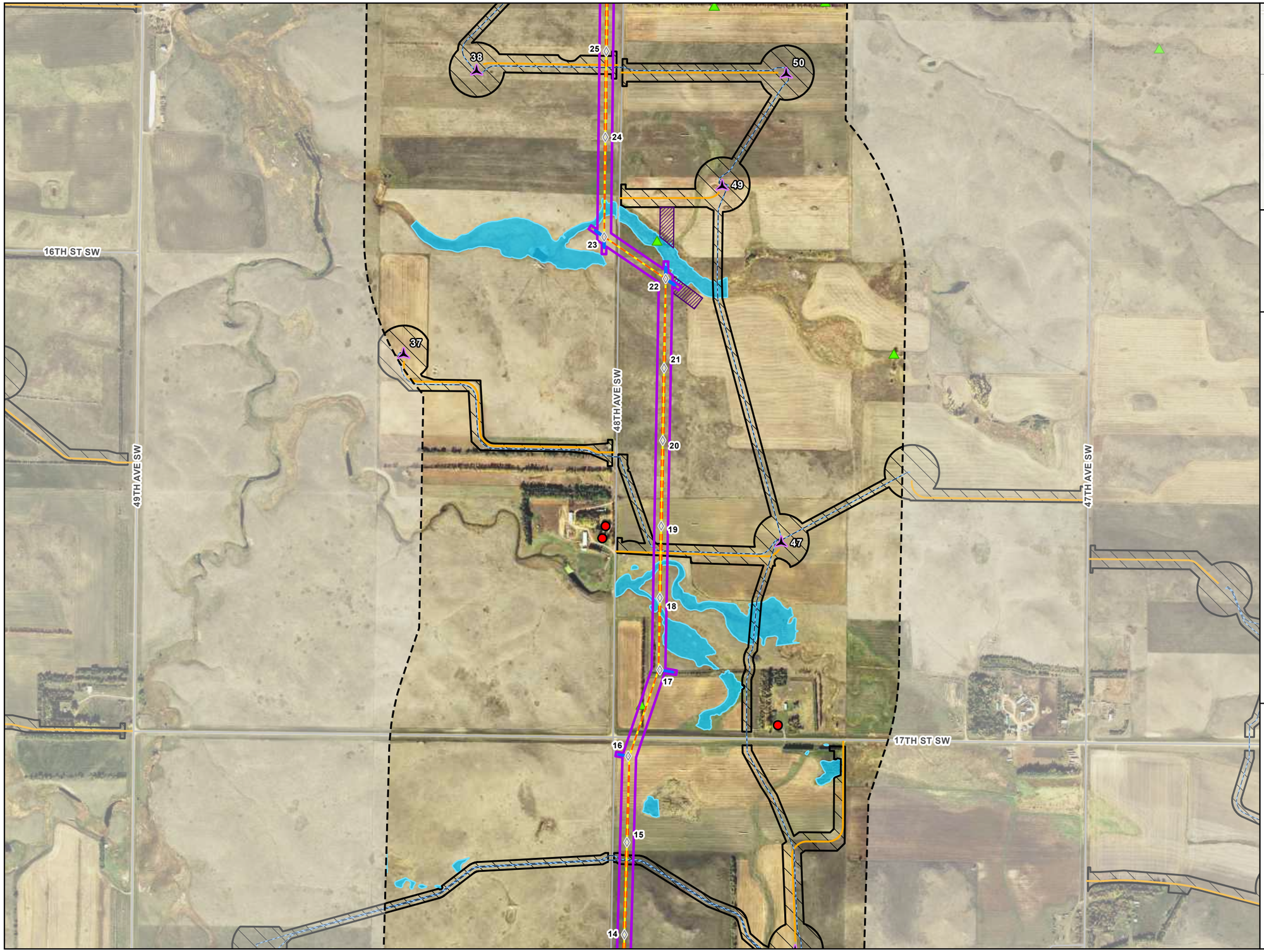
Oliver Wind IV 345-kV Transmission Line

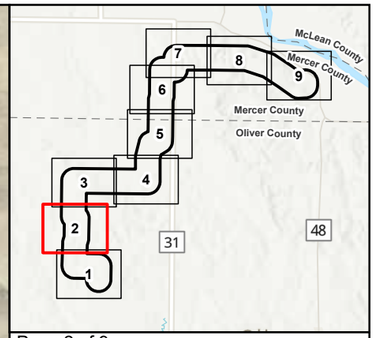
Oliver and Mercer Counties, North Dakota

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Site Plan

- Project Corridor
- Study Area
- Pulling Location
- Project Structure
- Project Route
- Project Conductor
- Project Guy Wire
- Primary Turbine
- Access Road
- Collection Line
- Construction Easement

*Coal leases displayed on the map are not comprehensive.
Known archaeological sites are not depicted due to confidentiality.

- Raptor Nest
- Occupied Residence
- Delineated Wetland and Other Water
- County Boundary
- County Road

Figure 13: Site Plan Detail (Aerial)

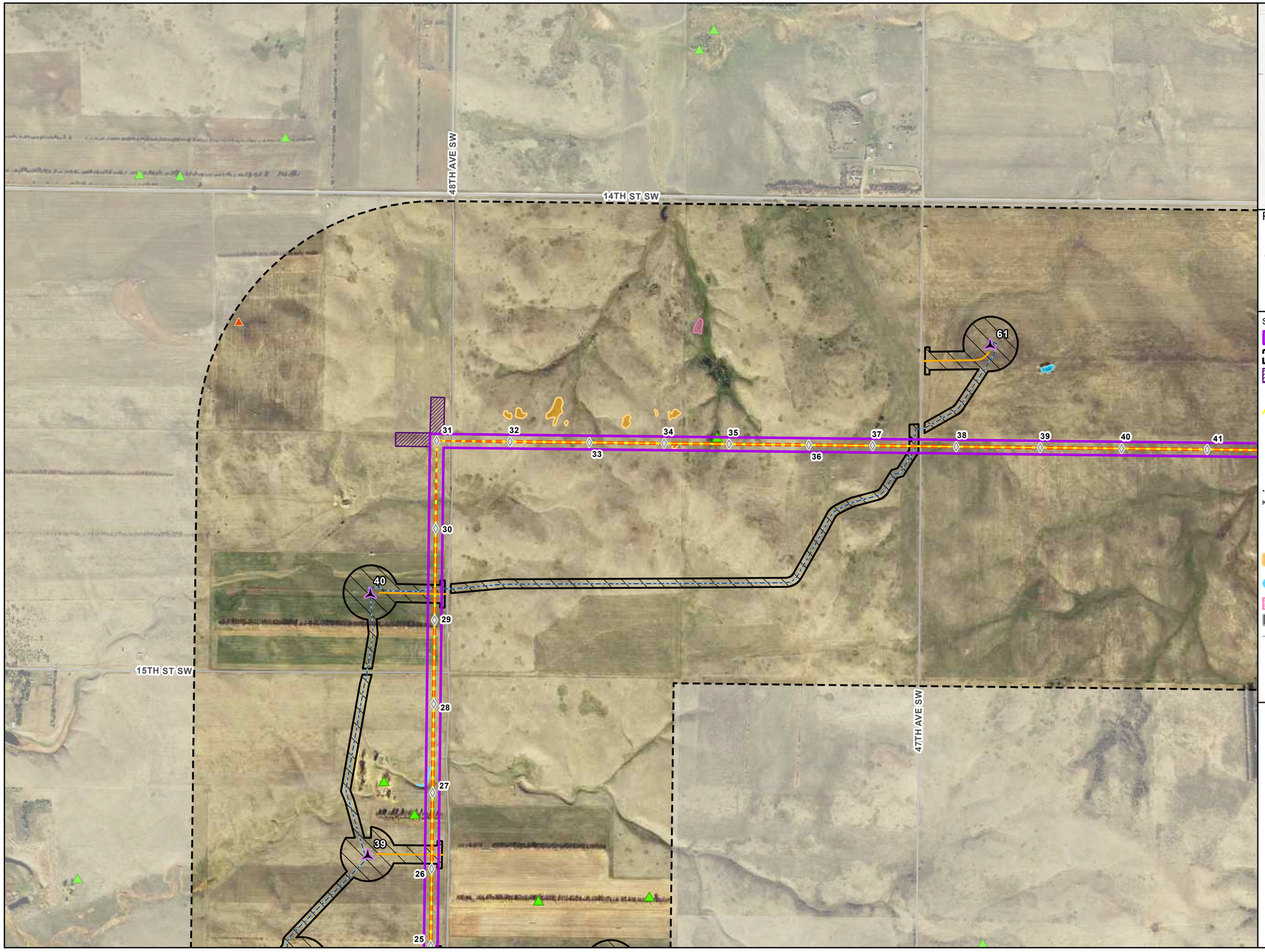
Oliver Wind IV 345-kV Transmission Line

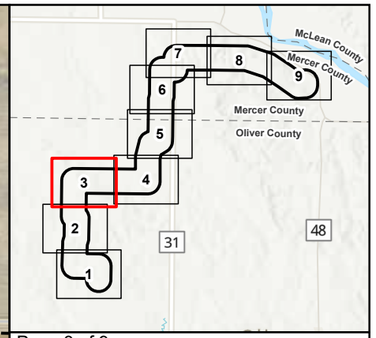
Oliver and Mercer Counties, North Dakota

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Site Plan

- Project Corridor
- Study Area
- Pulling Location
- Project Structure
- Project Route
- Project Conductor
- Primary Turbine
- Access Road
- Collection Line
- Construction Easement

*Coal leases displayed on the map are not comprehensive.
Known archaeological sites are not depicted due to confidentiality.

- Raptor Nest
- Confirmed Sharp-tailed Grouse Lek
- Dakota Skipper Larval Habitat
- Delineated Wetland and Other Water
- Landslide Deposit
- County Boundary
- County Road

Figure 13: Site Plan Detail (Aerial)

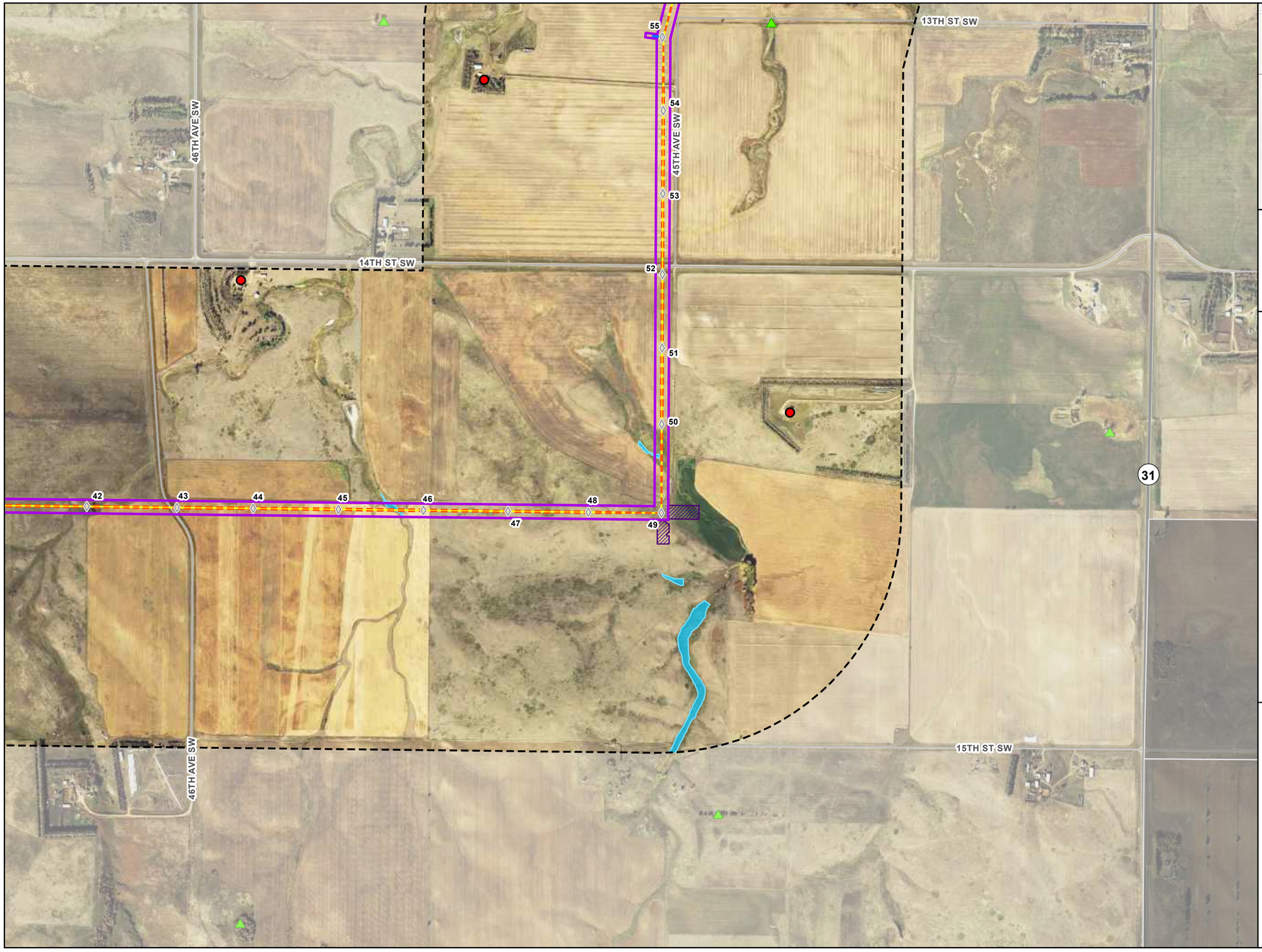
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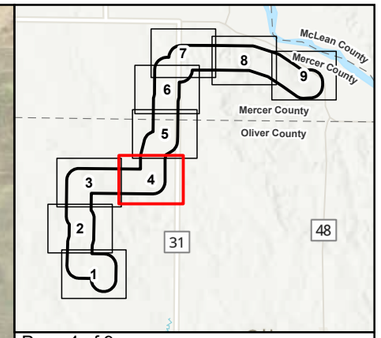
Oliver and Mercer Counties, North Dakota

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Site Plan

- Project Corridor
- Study Area
- Pulling Location
- Project Structure
- Project Route
- Project Conductor
- Project Guy Wire
- Access Road

*Coal leases displayed on the map are not comprehensive.
Known archaeological sites are not depicted due to confidentiality.

- Raptor Nest
- Occupied Residence
- Delineated Wetland and Other Water
- Coal Lease*
- County Boundary
- State/Federal Highway
- County Road

Figure 13: Site Plan Detail (Aerial)

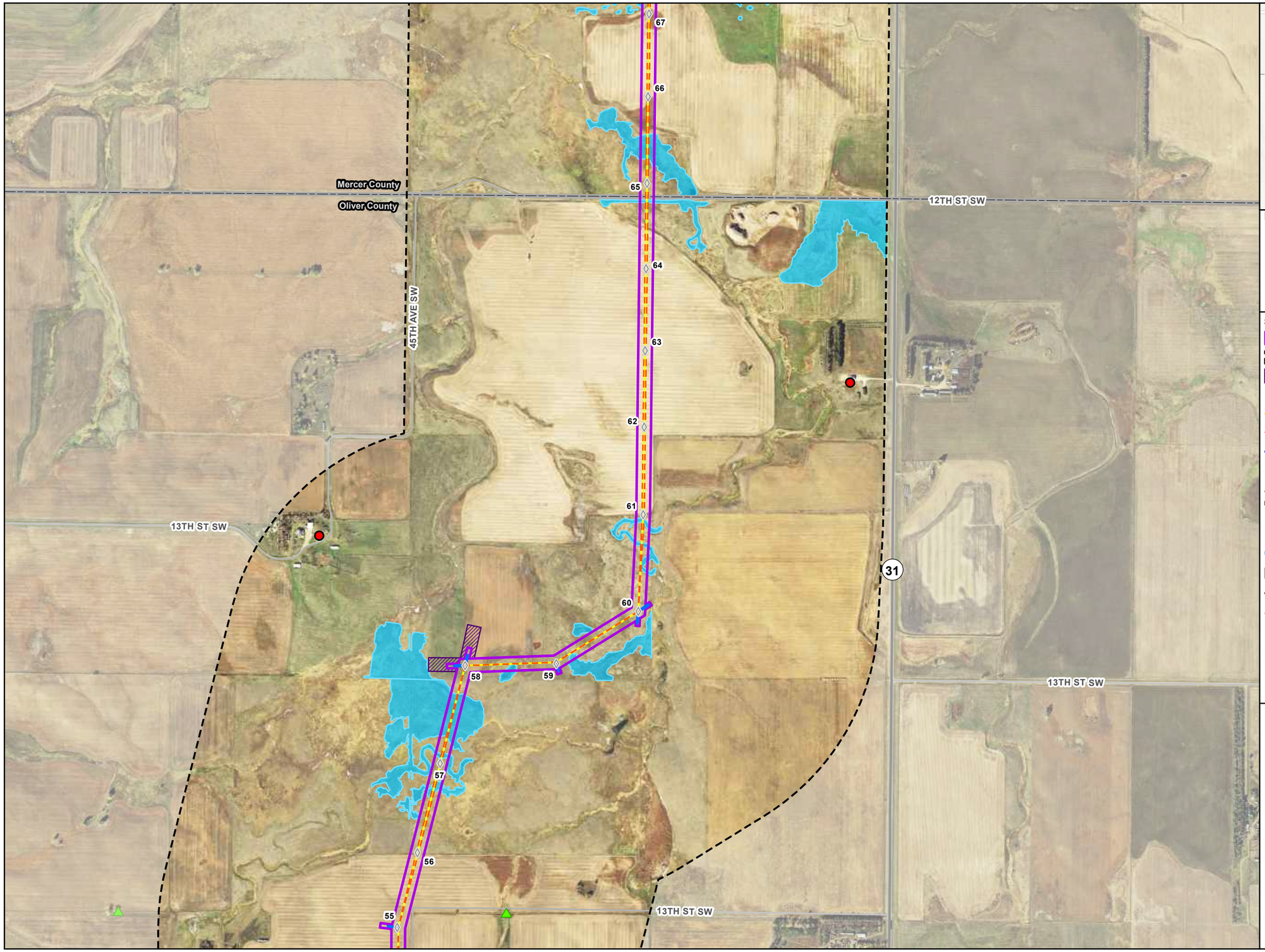
Oliver Wind IV 345-kV Transmission Line

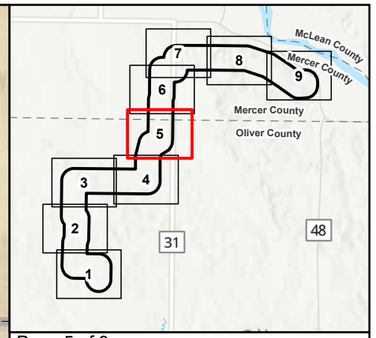
Oliver and Mercer Counties, North Dakota

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Site Plan
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- Study Area
- Pulling Location
- Project Structure
- Project Route
- Project Conductor
- Project Guy Wire

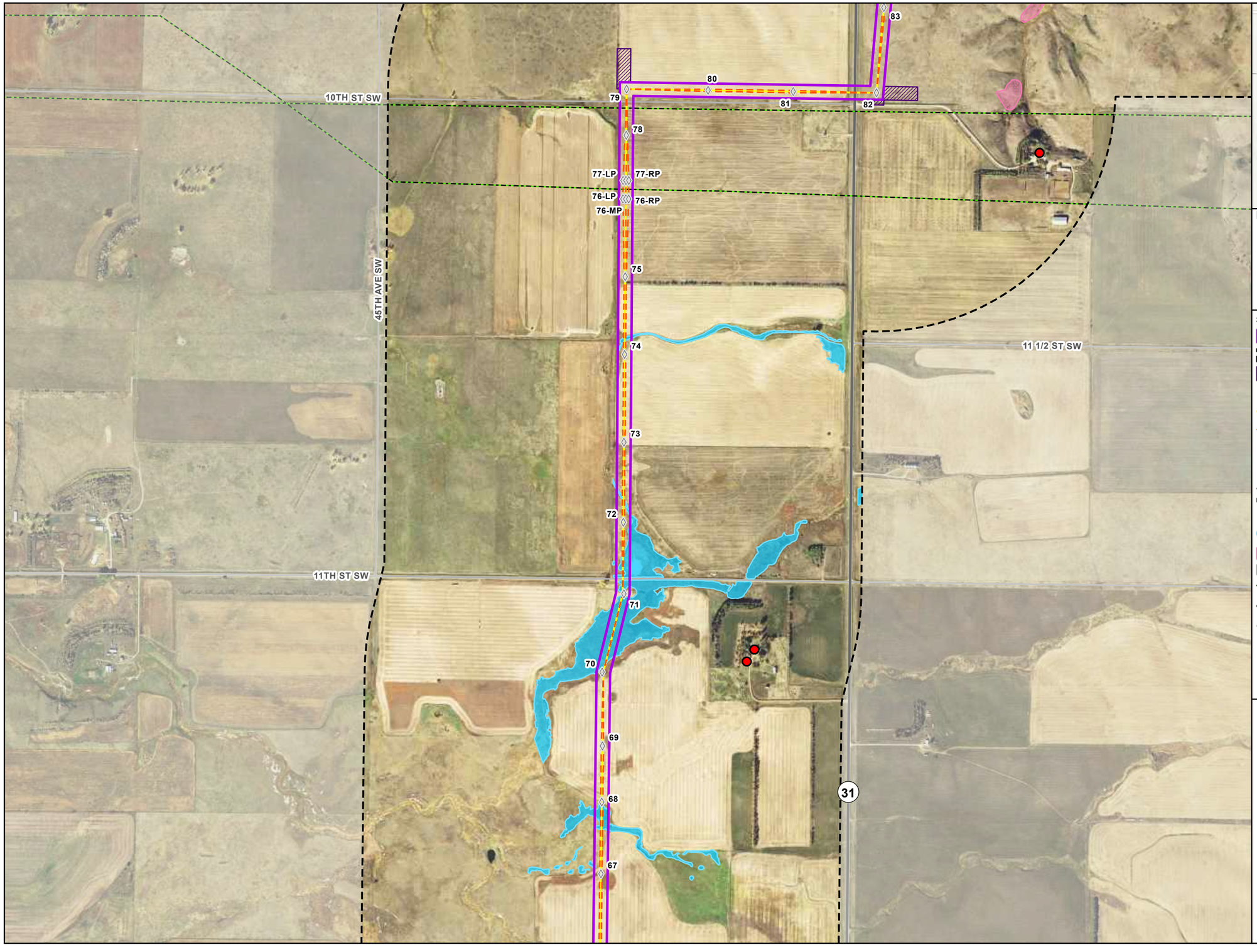
*Coal leases displayed on the map are not comprehensive.
Known archaeological sites are not depicted due to confidentiality.
- Raptor Nest
- Occupied Residence
- Delineated Wetland and Other Water
- County Boundary
- State/Federal Highway
- County Road

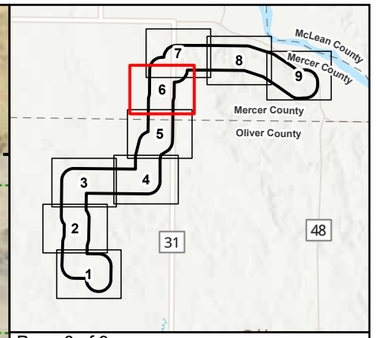
Figure 13:
Site Plan Detail (Aerial)
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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Site Plan
- Project Corridor
- Study Area
- Pulling Location
- Project Structure
- Project Route
- Project Conductor

*Coal leases displayed on the map are not comprehensive.
Known archaeological sites are not depicted due to confidentiality.
- Occupied Residence
- Delineated Wetland and Other Water
- Landslide Deposit
- County Boundary
- Transmission Line
- State/Federal Highway
- County Road

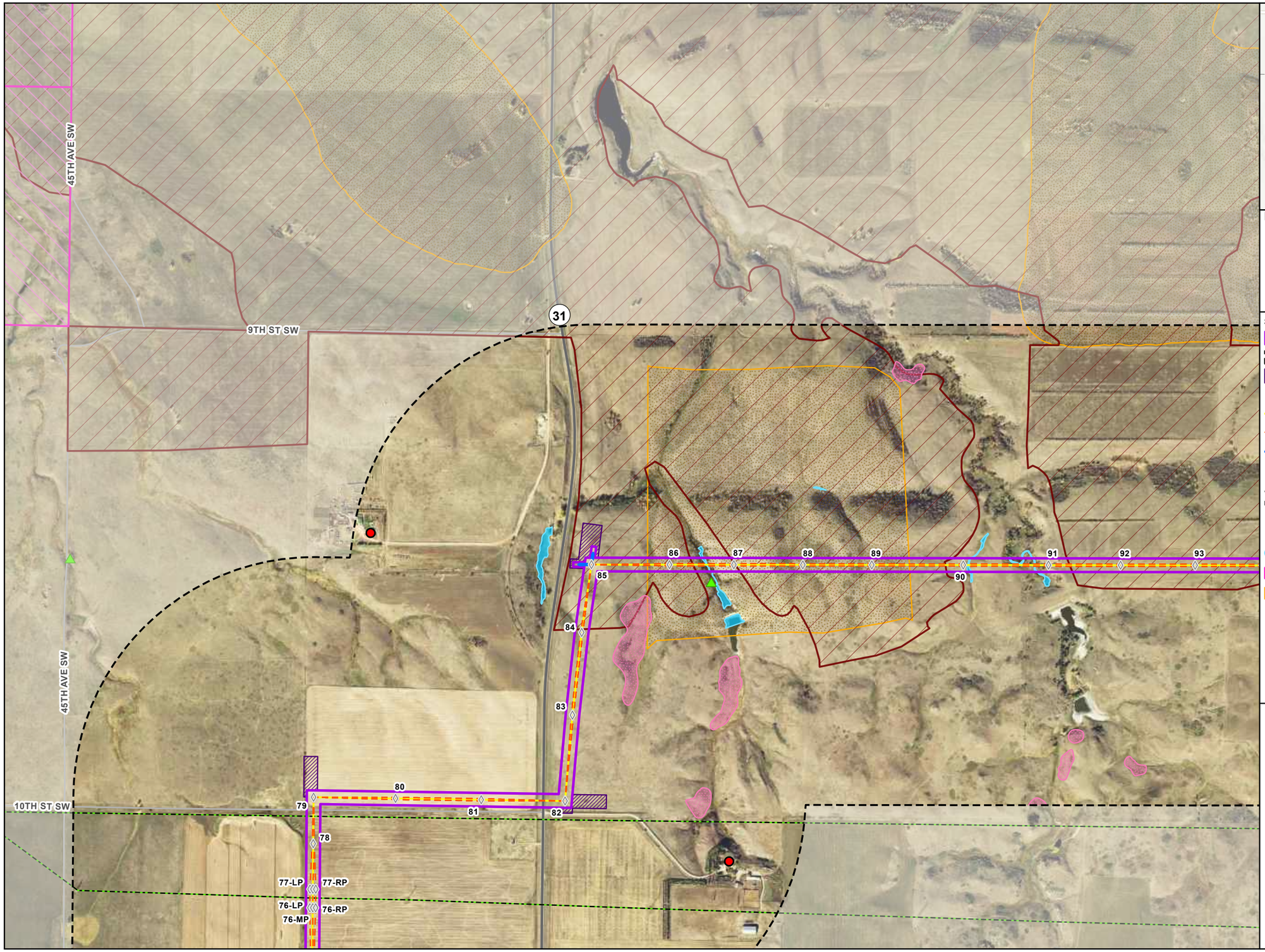
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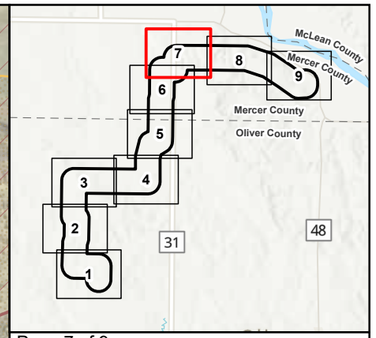
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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Site Plan

- Project Corridor
- Study Area
- Pulling Location
- Project Structure
- Project Route
- Project Conductor
- Project Guy Wire

*Coal leases displayed on the map are not comprehensive.
Known archaeological sites are not depicted due to confidentiality.

- Raptor Nest
- Occupied Residence
- Delineated Wetland and Other Water
- State Trust Land
- Previously Mined Land (NDGS 2007)
- Previously Mined Land (USDA 2023)
- Landslide Deposit
- County Boundary
- Transmission Line
- State/Federal Highway
- County Road

Figure 13: Site Plan Detail (Aerial)

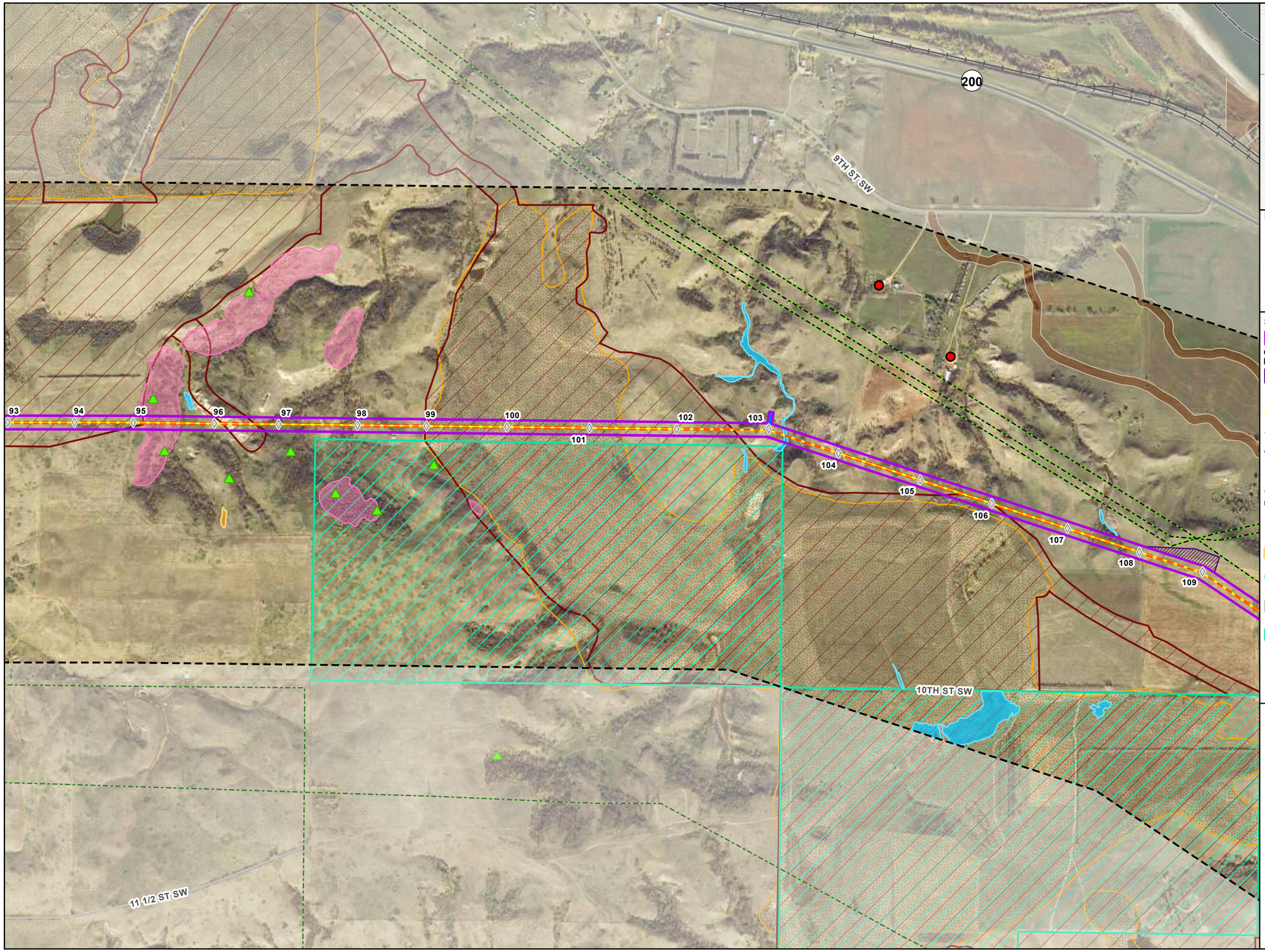
Oliver Wind IV 345-kV Transmission Line

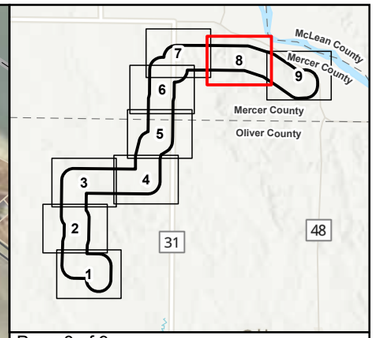
Oliver and Mercer Counties, North Dakota

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Site Plan

- Project Corridor
- Study Area
- Pulling Location
- Project Structure
- Project Route
- Project Conductor
- Project Guy Wire

*Coal leases displayed on the map are not comprehensive.
Known archaeological sites are not depicted due to confidentiality.

- Raptor Nest
- Occupied Residence
- Dakota Skipper Larval Habitat
- Delineated Wetland and Other Water
- Bureau of Reclamation Easement
- Wildlife Management Area
- Previously Mined Land (NDGS 2007)
- Previously Mined Land (USDA 2023)
- Landslide Deposit
- County Boundary
- Transmission Line
- Railroad
- State/Federal Highway
- County Road

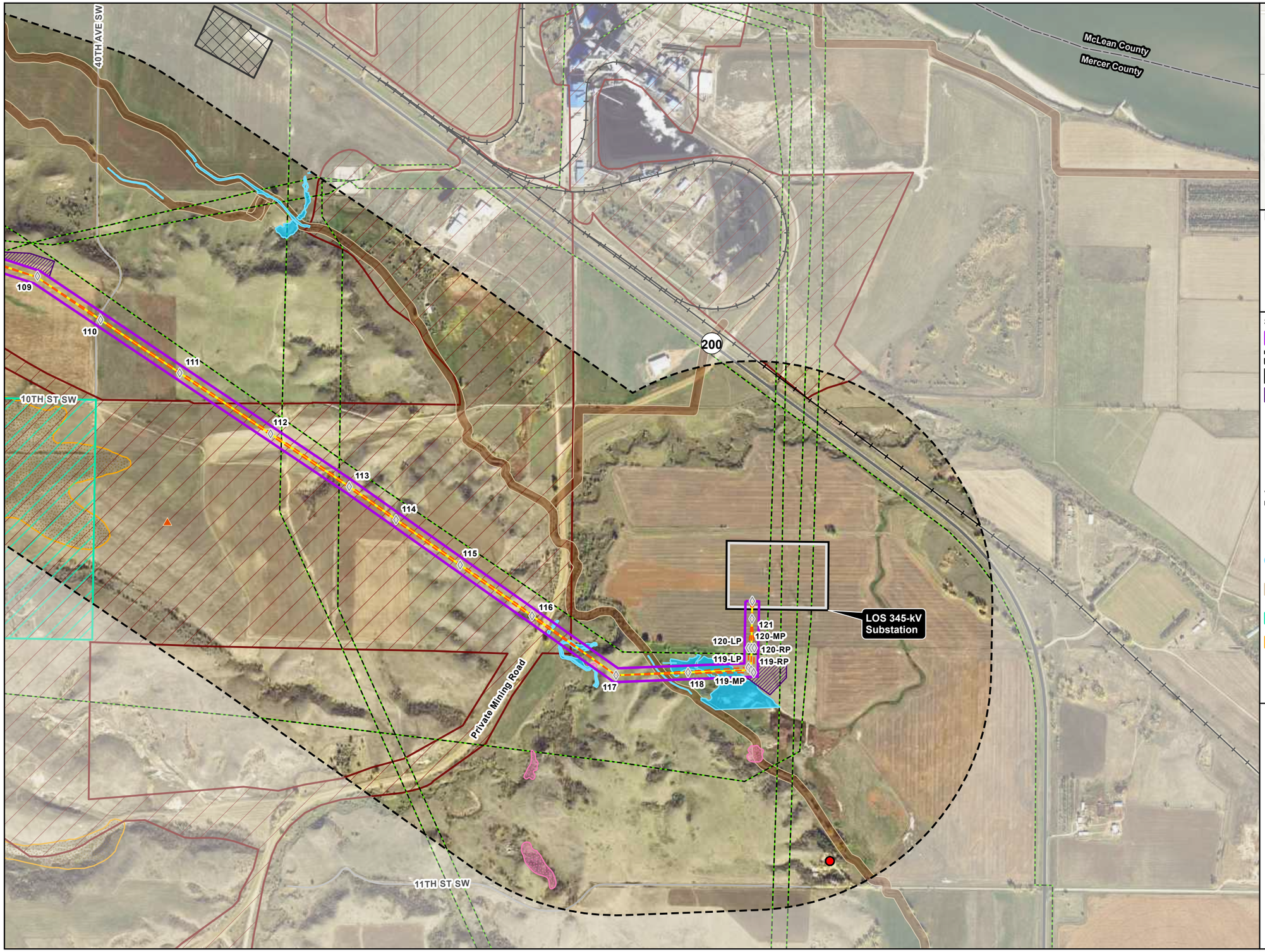
Figure 13:
Site Plan Detail (Aerial)
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

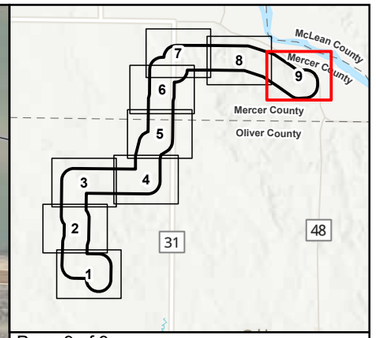
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N W E S

Site Plan

- Project Corridor
- Study Area
- Substation
- Pulling Location
- Construction Laydown Area
- Project Structure
- Project Route
- Project Conductor

*Coal leases displayed on the map are not comprehensive.

Known archaeological sites are not depicted due to confidentiality.

- Confirmed Sharp-tailed Grouse Lek
- Occupied Residence
- Delineated Wetland and Other Water
- Bureau of Reclamation Easement
- Wildlife Management Area
- Previously Mined Land (NDGS 2007)
- Previously Mined Land (USDA 2023)
- Landslide Deposit
- County Boundary
- Transmission Line
- Railroad
- State/Federal Highway
- County Road

Figure 13: Site Plan Detail (Aerial)

Oliver Wind IV 345-kV Transmission Line

Oliver and Mercer Counties, North Dakota

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For Environmental Review Purposes Only

Date (of Map): 2025 | Source: Z:\Clients\MI_PN\Mallard_Path\Work\GIS\Permitting\PSC_App\PN_Mallard_OW_Wind_Line_PSC_Application.aprx

Appendix A

NextEra Energy, Inc.’s 2022 Environmental, Social and Governance Report

NEXTera ENERGY

2022

ENVIRONMENTAL, SOCIAL AND GOVERNANCE REPORT





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Vision and strategy:
A letter from our chairman, president and CEO 3

NextEra Energy's blueprint to reach Real Zero™ 5

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Confronting climate change 9

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United Nations Sustainable Development Goals Metrics

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Cover photo: The Wheatridge Renewable Energy Facility, which went online in Lexington, Ore., in March 2022, combines wind, solar and battery energy storage technology in one location. The wind component encompasses up to 300 megawatts of wind capacity produced by approximately 120 wind turbines.

Photo left: Catch a quick glimpse of employee Jeff Elms as he appears between the solar panels during an equipment check at the Blythe and McCoy Energy Centers in Blythe, Calif.

Oliver IV T-Line 000119

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Vision and strategy: Our chairman, president and CEO

NextEra Energy's blueprint to reach Real Zero

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Confronting climate change

NextEra Energy's ESG journey

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2021-2022 awards and recognitions

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Appendices

VISION AND STRATEGY: A LETTER FROM OUR CHAIRMAN, PRESIDENT AND CEO

To all our stakeholders:

It is the honor of my professional life to lead the best team in our industry at NextEra Energy. Our team has a clear vision: We will help lead the decarbonization of the U.S. economy. This vision is bold – even unprecedented. Yet, it's consistent with our decades-long record of performance for all our stakeholders, including our accomplishments and goals related to environmental, social and governance (ESG) that we share with you in this report.

I joined this company nearly 20 years ago, and right away was given the opportunity to work on a game-changing step we took at that time to move forward to a clean energy future. That transaction was the conversion of a gas turbine contract with General Electric, still one of our largest suppliers today, to a contract for wind turbines. We made that decision because we saw something others didn't see, that renewables would soon become the low-cost generation source of choice.

Our first-mover advantage in wind at what is now NextEra Energy Resources was soon expanded to solar. We started first with solar-thermal technology, but then photovoltaic technology came along and was a game-changer for us and for our entire economy, and our solar business began to take off. Over the years, NextEra Energy Resources became the largest generator of wind and solar energy in the world.

> WE PLAN TO DECARBONIZE OURSELVES, STARTING AT FPL, WITH THE MOST AMBITIOUS GOAL SET BY ANY U.S. UTILITY OR POWER PROVIDER TO DATE, AND THE SECTOR'S ONLY ONE TO NOT REQUIRE CARBON OFFSETS. OUR GOAL IS TO ACHIEVE REAL ZERO™ BY NO LATER THAN 2045 … ZERO CARBON EMISSIONS, 100% CLEAN ENERGY, AT NO INCREMENTAL COST TO OUR CUSTOMERS.

Over this same period, Florida Power & Light Company (FPL) led its own transformation. FPL was already one of the best utilities in the nation. But the FPL team was not satisfied 20 years ago, and still is not satisfied today, and we have chosen to be a first mover in the utility space time and time again. FPL voluntarily reduced our reliance on foreign oil by 99% starting in 2001. We were also one of the very first utilities to fully deploy smart meters across our service area and to launch a comprehensive storm hardening program to help us restore power faster after major storms and to help us improve everyday reliability. And FPL was also the first utility to really go after renewables as a way to reduce customer bills relative to alternatives.



John Ketchum – NextEra Energy's chairman, president and CEO.

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Both FPL and NextEra Energy Resources continue to be industry leaders. Several years ago, both businesses invested in battery storage, which is the holy grail of renewables because it can help make wind and solar energy a nearly firm energy product. Today, our vision is focused on deploying even more renewables and storage, which in the future we expect to be supplemented by green hydrogen as a way to convert gas turbines to generate emissions-free baseload generation. We have built both FPL and NextEra Energy Resources through a series of toe-in-the-water investments that over time have added up to something big, a scalable platform, built from the ground up, and centered on the best opportunity set and team in the industry.

WE PLAN TO BECOME THE PREFERRED U.S. PARTNER FOR RENEWABLE ENERGY INFRASTRUCTURE SOLUTIONS OF FORTUNE 1000 CUSTOMERS THAT ARE TRYING TO ACHIEVE THEIR OWN SUSTAINABILITY GOALS.

Our vision to help decarbonize the U.S. economy is based upon that scalable platform and everything else that has made our company successful over at least the last 20 years. We plan to achieve our vision in four ways, simultaneously:

» We plan to decarbonize ourselves, starting at FPL, and starting with the most ambitious goal set by any U.S. utility or power provider to date, and the sector's only one to not require carbon offsets. Our goal is to achieve Real Zero, meaning we will be carbon emissions free by no later than 2045. Described in our Zero Carbon Blueprint™, Real Zero means exactly that: zero carbon emissions, 100% clean energy, at no incremental cost to our customers.

» We plan to partner with our peer companies to help decarbonize the rest of the U.S. power sector, continuing the work that NextEra Energy Resources has done with investor-owned utilities, municipalities and cooperatives over the last 20 years. We believe that, as we work toward our own Real Zero goal, we will further develop the capabilities that can help other power companies meet their own goals.

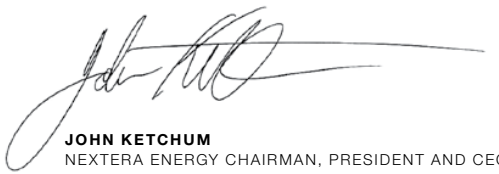
» We plan to partner with companies outside the power sector to help lead the decarbonization of the rest of the U.S. economy. We aim to become the preferred U.S. partner for renewable energy infrastructure solutions of Fortune 1000 customers that are trying to achieve their own sustainability goals, especially in sectors with high electric use or high emissions.

» We plan to continue to build the nation's leading competitive transmission business to help provide the backbone for the significant renewables expansion that we believe is coming.

Many other elements of our ESG strategy are discussed throughout this report, such as the measurable progress we have made on racial equity at our company, especially over the last two years. We have also committed to additional disclosures on various metrics related to diversity, equity and inclusion. I am proud of our team's efforts and am honored to have joined a board of directors that has such a strong commitment to corporate governance and ethics and which provides oversight of every facet of NextEra Energy's strategy that is reflected in this document.

Our company has made many ambitious goals. Some, such as reliable and affordable electric service, date from the founding of our company nearly a century ago. Others, such as our new Real Zero goal, keep us focused on what we can achieve in the decades ahead. Reaching each of our goals is the imperative of the most talented team in our industry. Over the last 20 years, and especially over the last six months, I have become even more grateful for all my colleagues who come to work every day focused on delivering even more value to our customers and who challenge themselves to make our company even better.

On behalf of our more than 15,000-member team, thank you for your interest in learning more about NextEra Energy and all our ESG accomplishments and goals.



JOHN KETCHUM
NEXTERA ENERGY CHAIRMAN, PRESIDENT AND CEO

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NEXTERA ENERGY'S BLUEPRINT TO REACH REAL ZERO BY ELIMINATING CARBON EMISSIONS BY NO LATER THAN 2045

Today, we see a pathway to a completely carbon-emissions-free power sector by no later than 2050, with a combination of zero-carbon-emissions resources and short-term and long-term energy storage. We believe that the transition to affordable renewable energy isn't an option; it's the solution. Years before many Fortune 500 companies considered transitioning away from fossil fuels to renewable energy, we were building solar and wind projects, and closing oil- and coal-fired power plants. We're now poised to build on our decades of innovation, as we work to fulfill our long-standing vision to be the largest and cleanest energy provider in the world.

> OUR GOAL IS TO BE COMPLETELY CARBON EMISSIONS FREE BY NO LATER THAN 2045. OUR GOAL INCLUDES MEANINGFUL MILESTONES IN FIVE-YEAR INCREMENTS.

The road to decarbonizing the U.S. economy requires every industry to assess its role and set goals that will lead to the greatest possible impact. As the largest U.S. utility company, we know our sector can lead the way. Today, we're setting an ambitious goal for our company that should catalyze progress for our sector and for the U.S. economy. Our goal is to be completely carbon emissions free by no later than 2045.* Our goal includes meaningful milestones in five-year increments that would allow us to reach Real Zero emissions by no later than 2045.

NextEra Energy has been working to reduce our carbon dioxide (CO_2)-emissions rate for decades, and as of 2021 has achieved a 58% reduction, compared to a 2005 adjusted baseline. While we've had emissions-rate-reduction goals since 2018 and worked to reduce emissions years before setting goals, we've always said that we did not want to commit to a full decarbonization goal until we could see the full path. That time is now.

*Greenhouse gas (GHG) emissions are reported in our annual GHG inventory as metric tons carbon dioxide equivalent (CO_2e), and include carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O).



Employees from left, Devon Wing, Will Rosenboom and Stefan Hansen are among the first to work at the company's Wheatridge Renewable Energy Facility where solar, wind and battery energy storage merge into a winning combination to reach Real Zero.

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NEXTERA ENERGY'S REAL ZERO GOAL

Our Real Zero goal is the most ambitious target set by an energy producer, and the sector's only one to not require carbon offsets for success. We've been an industry leader for at least 30 years, and our size, scale and expertise position us to lead the energy sector to Real Zero. Our Real Zero goal aligns with our view that our nation must be energy independent and that America's energy can and should be carbon emissions free, and affordable.

NextEra Energy's ability to produce power with zero-carbon emissions means our energy customers can meet their emissions goals. We can help make any such goal achievable, affordable and on a faster pace.

For our current and future customers, whatever your emissions-reduction goals, NextEra Energy would be prepared to be your partner of choice, using our unmatched expertise to accelerate your success.

We're in this to lead our industry and drive change. And we want to bring the U.S. economy with us on this journey.

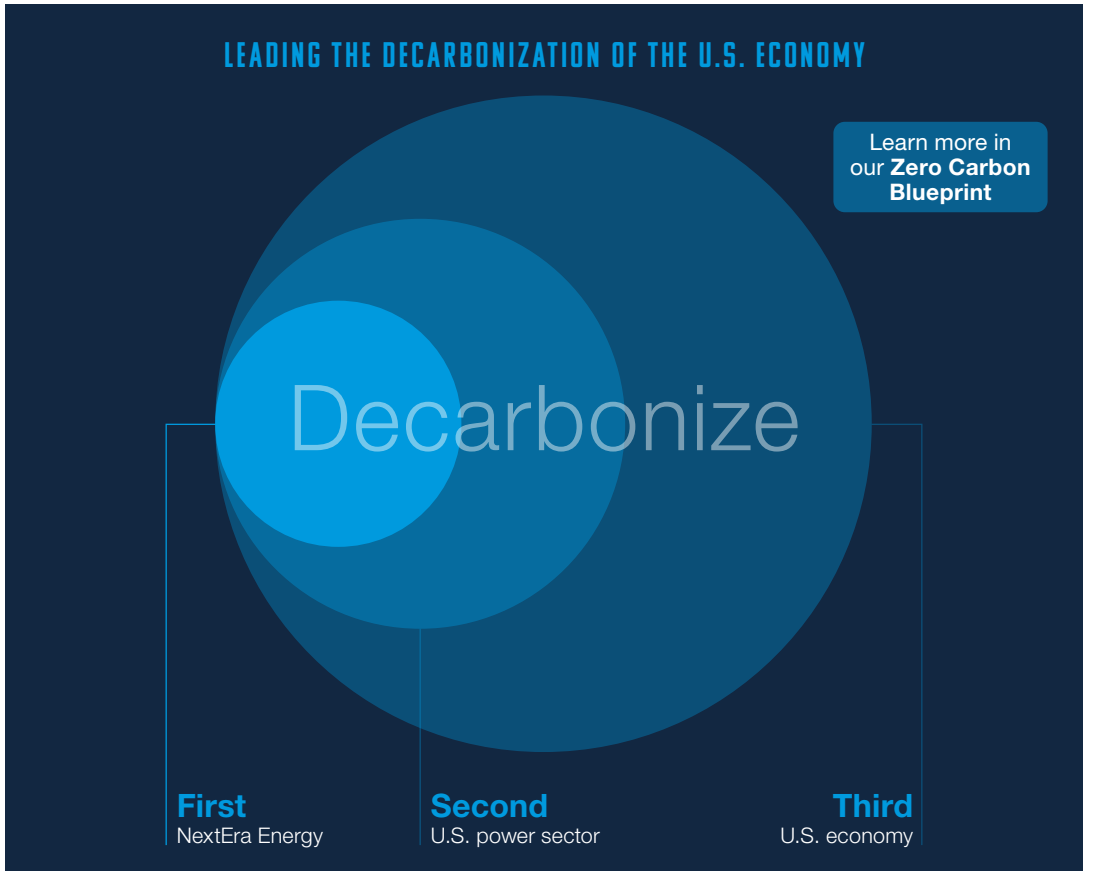
Producing electricity at Real Zero would be a game-changer – for our customers, the U.S. electric power sector and the entire U.S. economy.

NextEra Energy's Real Zero goal would catalyze the decarbonization of the U.S. economy along three parallel paths.

First, we intend to decarbonize our own business, beginning with our goal to reach Real Zero emissions, without the need for carbon offsets, by no later than 2045. We've been prudently investing in decarbonizing our own operations for decades and this is an extension of our core values.

Second, we plan to help decarbonize more of the U.S. power sector – investor-owned utilities (IOUs), municipalities and cooperatives – through continued investments and innovation in wind, solar, storage and green hydrogen projects.

Third, we expect to help lead the decarbonization of the U.S. economy – by working to become the preferred partner for customers to help them reduce or eliminate carbon emissions in their operations. We would also use our experts and data analytics to help our commercial and industrial customers reach their own net zero or strive to achieve Real Zero goals.



Strategy and measurable milestones

We plan to decarbonize our company and achieve our Real Zero goal by doubling down on our core businesses at FPL and NextEra Energy Resources. We would continue to smartly invest capital at FPL, and increase our investments in renewable energy, storage and innovation. We're also setting clear, interim emissions-reduction milestones to hold ourselves accountable and demonstrate measurable progress to our stakeholders. Value, affordability, reliability and resiliency for our customers remain our priority.

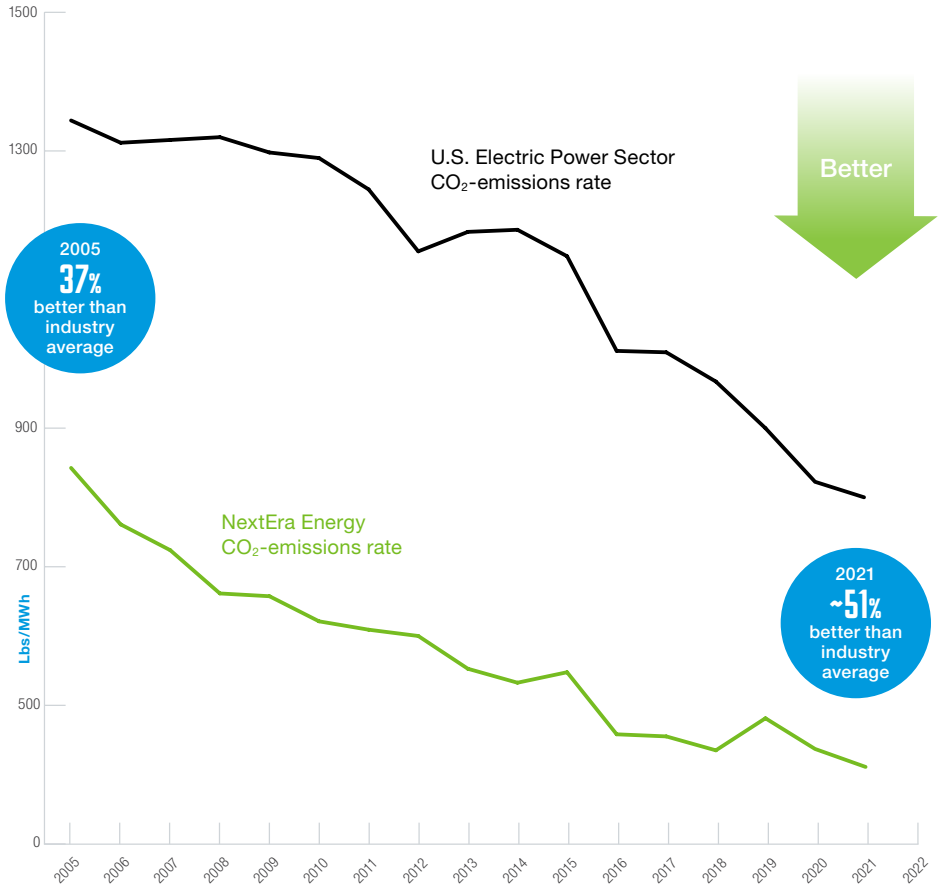
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OUR CO_2-EMISSIONS RATE IS SIGNIFICANTLY BETTER THAN THE INDUSTRY AVERAGE DUE TO OUR CLEAN ENERGY INVESTMENTS AND ACTIONS

Others in our sector are today reaching carbon-emissions-reduction levels we achieved 15 years ago.



2005	Continued the transition away from foreign oil and added 2,214 megawatts (MW) of natural gas and added 434 MW of wind.
2006	Acquired 615 MW of nuclear and added 824 MW of wind.
2007	Acquired 1,024 MW of nuclear, added 1,150 MW of natural gas and 1,060 MW of wind.
2008	Added 25 MW of solar, 2,500 MW of natural gas and 1,061 MW of wind.
2009	Added 1,169 MW of wind.
2010	Added 91 MW of solar and 683 MW of wind.
2011	Completed 176-MW nuclear addition, added 1,250 MW of natural gas, 378 MW of wind, 5 MW of solar.
2012	Completed 514-MW nuclear addition, added 1,523 MW of wind and 40 MW of solar.
2013	Modernized 1,200 MW of natural gas, added 1,364 MW of wind and 20 MW of solar.
2014	Modernized 1,250 MW of natural gas, added 374 MW of wind and 623 MW of solar.
2015	Added 522 MW of wind and 47 MW of solar.
2016	Modernized 1,277 MW of natural gas, divested 3,828 MW of natural gas, added 621 MW of wind and 1,012 MW of solar.
2017	Retired and demolished 250 MW of coal, repowered 1,597 MW of wind, added 354 MW of wind and 497 MW of solar.
2018	Retired and demolished 636 MW of coal and 2,530 MW of natural gas and oil, repowered 928 MW of wind, added 1,405 MW of wind and 924 MW of solar, and completed a 26-MW nuclear addition.
2019	Acquired Gulf Power (which added 1,750 MW of natural gas), repowered 1,091 MW of wind, and added 1,025 MW of wind and 830 MW of solar.
2020	Retired 615 MW of nuclear and 330 MW of coal, converted 924 MW of coal to natural gas, completed a 23-MW nuclear addition, repowered 1,432 MW of wind, and added 1,993 MW of solar, 2,679 MW of wind and 26 MW of energy storage.
2021	Added approximately 2,007 MW of wind, 1,547 MW of solar, 1,017 MW of battery energy storage, and repowered 435 MW of wind generating capacity.

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ABOUT THIS REPORT

We set big goals, deliver measurable results and hold ourselves to high standards. In recent years, investors and other stakeholders have shown increased interest in understanding our goals, results and standards within the framework of environmental, social and governance (ESG) reporting. We're confident that our smart capital investments in renewable energy will be beneficial for our customers, the environment and the U.S. economy, and will support reaching our Real Zero goal.

This report is designed to highlight our core ESG strategy and disclosures, based on feedback from the investment community and other stakeholders.

NextEra Energy reports ESG disclosures through multiple resources, including this report, to provide stakeholders with an understanding of our long-term strategy focused on providing clean, reliable and affordable energy solutions across North America, our track record of delivering results for our customers and shareholders, and our vision for a zero-carbon-emissions future.

This report is aligned with the Sustainability Accounting Standards Board (SASB) framework under the Electric Utilities and Power Generators Standard and the Task Force on Climate-Related Financial Disclosures (TCFD).

We also continue to report ESG disclosures through the Edison Electric Institute (EEI) ESG/Sustainability template and the United Nations Sustainable Development Goals (SDGs), and our report includes a **Third-Party Emissions Statement**. Additional metrics also can be found on the ESG Resources page on our **Investor Relations website.**

A sunset at the Ponderosa Wind Energy Center in Ponderosa, Okla., sends a warm glow over the renewable energy facility.

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CONFRONTING CLIMATE CHANGE

At NextEra Energy, we began our journey to Real Zero in the 1980s when we invested in our first solar and wind projects. Today, we pledge to do what we can to accelerate our journey and lead the decarbonization of the entire U.S. economy.

As highlighted in this report, we envision an ambitious expansion of our existing storage and renewables portfolios and the adoption of emerging technologies to fulfill our goal of achieving Real Zero carbon emissions at NextEra Energy, as well as our endeavor to lead the decarbonization of the U.S. economy. While those technologies and wind will support broader decarbonization, additional solar, battery energy storage, green hydrogen and renewable natural gas, as well as continued use of our existing nuclear fleet, represent key steps in the drive toward decarbonization of our own operations.

Serving customers while tackling today's challenges comes with the fundamental responsibility to also look beyond the horizon to ensure we're ready to serve customers tomorrow. This is especially true in Florida, where FPL serves a rapidly growing state on the front lines of climate change and frequent severe weather. Our approach to climate change, which is in line with the TCFD framework, is summarized below and discussed throughout this report. A TCFD reference index is also included as **Appendix B** to this report.

Governance

NextEra Energy, as a renewable energy leader, has made climate-related issues core to our overall business strategy. The entire NextEra Energy board of directors, led by our executive chairman has oversight of climate-related risks and opportunities, including their impacts on our strategy. The board understands the impacts of climate change on our future growth, as well as how we prepare our business to adapt to the effects of climate change.

At every scheduled board of directors meeting, the board performs a review of our performance against business objectives and key risks and opportunities for the company.

The board also holds an annual strategy session devoted to discussing, debating and validating management's overall strategy. Oversight of climate-related issues includes discussion of physical risks from climate change, such as hurricanes, climate- and emissions-related government policies, incentives and regulations, emissions-reduction initiatives, renewable energy, trends and business plans, and emerging clean energy technologies, among others.

Our executive management team is responsible for day-to-day management of climate-related risks and opportunities, as well as their potential effects on the management and operations of individual business units.



Crew members team up to install new wind generating equipment during construction of the Borderlands Wind Energy Center in Quemado, N.M.

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The Cotton Creek Solar Energy Center was commissioned in Northwest Florida in March 2022.

Through the board's oversight and management's execution of our strategy, our carbon-emissions rate in 2005 was already 37% better than the U.S. electric power sector and, in 2021, was nearly 51% better than the U.S. electric power sector. Over the same period, our total generating capacity increased 72% to meet growing customer demand. These results demonstrate that, even with dramatic growth in our core business, we've reduced our already industry-leading, carbon-emissions rate much faster than the industry average – leading the way to Real Zero, we believe.

Strategy

Climate-related risks and opportunities influence our strategy across all of our businesses over the short term (less than five years), medium term (five to 10 years) and long term (greater than 10 years). As we respond to our customers' demands for emissions-free and renewable energy, climate-related risks and opportunities have influenced our financial plan for capital expenditures, acquisitions and revenues.

Customer demands also have influenced our capital plan in executing our significant renewable energy deployment and transmission line development business plans, including our grid hardening initiatives. At FPL, climate-related risks and opportunities have influenced our operational strategy, including our short- and medium-term strategy for daily operations and infrastructure planning in our integrated resource plan. This strategy is reflected in our modernization of FPL's generation fleet by first replacing old, inefficient oil, natural gas and coal plants with state-of-the-art natural gas units. We reduced our use of oil to generate electricity from 41 million barrels in 2001, the most in the country, to only 100,000 barrels of low-sulphur diesel, a fuel used as emergency backup, in 2021. In 2020, we converted the Gulf Clean Energy Center, formerly Plant Crist, to natural gas, cutting its CO_2-emissions rate by 40%. With the 2020 retirement of FPL's Indiantown Cogeneration facility, 2021 was the first time in nearly 70 years that there were no coal-fired power plants in our Florida system. The phase-out of these coal facilities is expected to generate hundreds of millions of dollars of savings for customers, while eliminating millions of tons of CO_2 emissions annually.

CLIMATE-RELATED RISKS AND OPPORTUNITIES INFLUENCE OUR STRATEGY ACROSS ALL OF OUR BUSINESSES OVER THE SHORT TERM, MEDIUM TERM AND LONG TERM.

The next leg of FPL's generation modernization efforts is focused on deploying solar, which is now the most cost-effective generation resource in most parts of our service area. At the end of 2021, FPL had approximately 3,164 MW of solar generation capacity on its system, making it the largest producer of solar energy-generated electricity in Florida. By the end of 2031, FPL projects that it will have approximately 12,626 MW of photovoltaic (PV) solar generation. Company projections show that the cleanest energy sources, such as low-emissions natural gas, zero-carbon-emissions nuclear and solar, will provide approximately 99% of all energy produced in FPL's system in 2031, putting the company well on its way to attaining Real Zero. Our decarbonization goals also includes converting current natural gas generation to green hydrogen or renewable natural gas in the future.

NextEra Energy has built and operates more solar power facilities than any other utility in the nation, and we have even more on the way as we work to reach our Real Zero goal and continue to build a more resilient and sustainable energy future. We believe all forms of solar play a role in a zero-carbon-emissions future and we support customers who choose to put solar panels on their roofs. In Florida, we are concerned about the growing and unnecessary state-mandated, subsidized bill credit for the very small fraction of customers who choose to buy or lease expensive rooftop solar systems, yet the credit is funded by all FPL customers, including those who can't or choose not to place solar systems on their homes.

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Climate-related opportunities influence our strategy over the short-, medium- and long-term horizons. NextEra Energy Resources, our diversified, clean energy business, emphasizes the development, construction and operation of long-term contracted assets. We continue to tailor solutions for commercial, utility and public power customers who want to access their own clean, reliable, renewable energy. We offer a combination of energy solutions that cannot be found elsewhere in the marketplace from one company. These solutions include universal and small-scale solar energy, wind energy and energy storage behind and in front of the meter.

Our focus at NextEra Energy Resources is to develop long-term contracted, low-cost wind and solar generation assets, increasingly paired with battery energy storage. We have been in the renewable development business for decades. From these early beginnings, we have become the world's largest generator of renewable energy from the wind and the sun and a world leader in battery energy storage.

An example is the Wheatridge Renewable Energy Facility, which went online in March 2022. This innovative project combines wind, solar and battery energy storage technology in one location. The wind component encompasses up to 300 MW of wind capacity produced by approximately 120 wind turbines. Along with the broader public shift toward calls for action to fight climate change, over the past few years there has been an increased focus on sustainability on the part of many of our stakeholders. While we expect this trend to amplify demand among our traditional customers and in our core renewable energy business, we also believe that it is opening significant new markets and business opportunities for NextEra Energy Resources. With NextEra Energy's leadership and Real Zero goal, NextEra Energy Resources plans to help customers achieve their emissions-reduction goals and eventually attain Real Zero themselves. We anticipate our development program to be further enhanced by an ability to attract new, non-traditional customers, particularly in the commercial and industrial sector, as improving renewable economics are increasingly aligned with corporate objectives to procure energy from clean generation sources.



Employee Jana Lehn surveys solar panels at the Wheatridge Renewable Energy Facility in Lexington, Ore. The operation combines solar with wind and battery storage.

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CLIMATE-RELATED RISKS THAT MAY IMPACT OUR BUSINESS

Climate change risk type	Application to our businesses
Current/emerging regulation	Our operations are subject to complex and comprehensive federal, state and other regulations. Current and emerging regulations are addressed in risk management and business planning. As an example, under a Florida law enacted in 2019, FPL must file a long-term Storm Protection Plan that details how it plans to continue to build a stronger, smarter and more storm-resilient grid in the years ahead. The Storm Protection Plan and subsequent Florida Public Service Commission (FPSC) rules regarding cost recovery mechanism are examples of current regulation that address risks related to climate change and severe weather events and impact how FPL receives cost recovery for its storm hardening activities.
Technology	Technology developments are reviewed as part of our corporate risk assessment and strategic planning processes. We are always focused on innovation and exploring new technologies. Being innovative and having a strong commitment to continuous improvement is at the heart of who we are as a company. From state-of-the-art renewable energy solutions and leading-edge battery storage systems to smart grid technology and drones equipped with artificial intelligence, we're making significant investments in innovative, advanced technologies to do what's right on behalf of our customers, shareholders and other stakeholders. Transition risks related to changes in the price and availability of technology are some of the risks related to climate change that we consider in our analyses. Based on our ongoing analysis of the long-term potential of low-cost renewables, we remain confident that wind, solar and battery storage will help reduce costs for customers and help achieve future CO_2-emissions reductions on our path to Real Zero by no later than 2045.
Legal	While FPL's generation portfolio emits greenhouse gases at a lower rate than most of the U.S. electric generation sector, its results of operations could be impacted to the extent that new federal or state laws or regulations impose any new greenhouse gas emissions limits or a price on CO_2 emissions. To address this potential risk, FPL's integrated resource planning and annual Ten-Year Site Plan filing with the FPSC have included CO_2 cost projections since 2007. On the other hand, we believe that any such new laws or regulations likely would increase the demand for NextEra Energy Resources' clean energy products and services.
Market	Investments by FPL are guided by a well-established integrated resource planning process to determine the amount and timing of future generation needed to meet projected growth in energy load and demand. Market climate-related risks are incorporated into this planning process and different options are evaluated taking into account system economics, forecasted electric power demand, demand-side management, fuel prices, potential future climate policies and the integration of low-cost, clean and reliable generation, including solar and energy storage solutions. We also look at the impact of federal and state energy efficiency codes and standards. To the extent market forces drive demand for renewable energy, we believe that should only increase the opportunities available for NextEra Energy Resources.
Acute/chronic physical	Physical risks tied to climate change are reviewed as part of our risk management process. Changes in global climate could produce unusual variations in temperature and weather patterns, resulting in more intense, frequent and extreme weather events, abnormal levels of precipitation and, particularly relevant to FPL, changes in sea level. FPL operates in the east and lower west coasts of Florida and in Northwest Florida, areas that historically have been prone to severe weather events, such as hurricanes. Throughout our history of managing the impacts of hurricanes and natural disasters in Florida, we have remained focused on safety, execution and the importance of providing an essential service to our customers during these events. Our continued investments and preparation at FPL have resulted in building a stronger, smarter and more resilient energy grid that has improved reliability in good weather and bad and enables faster power restoration following extreme weather events. Since 2006, FPL has made significant investments in strengthening the energy grid to make it more resilient to severe weather. The deployment of innovative technology to help prevent outages and shorten restoration times when outages occur has enabled FPL to lower operating costs and improve reliability and resiliency.

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Risk management

As discussed in more detail in the risks and opportunities section of this report, our approach to risk management starts with a strategic focus on preparedness and a disciplined capital allocation process. Preparedness, crisis planning and risk management are part of our culture. Our president and CEO, who also serves as our chief risk officer, and executive management are responsible for executing our long-term strategy, while also monitoring climate-change opportunities and risks related to our strategy. Our corporate risk management committee provides oversight and support for our risk management activities.

For the purposes of our risk management process, we do not view climate change as a discrete risk, but rather a potential stress multiplier to existing risks and opportunities that we monitor very closely and have worked to mitigate for a very long time. For example, system disruption from a weather event is a long-standing risk that we have integrated into our risk assessment process, and potential climate change projections for more frequent storms would be a multiplier for this risk category but not necessarily broken out as an incremental impact being added separately. We also recognize that climate change may affect different parts of our business in different ways.

Metrics and targets

The business metrics we use to assess climate-related risks and opportunities include our progress against each business unit's goals. At FPL, these include our service reliability metrics, our power plant availability metrics and our progress toward our goal to install 30 million solar panels by 2030. We now expect to reach our solar panel installation goal by 2025. One of the main climate-change related risks facing FPL is more frequent storms, and our reliability metrics help us measure our progress in providing a stronger and more resilient energy grid. At NextEra Energy Resources, this includes our progress on completing the development of our wind, solar and storage projects on schedule and on budget, as well as adding significant new wind and solar opportunities to our backlog to support future growth. Implementing our renewables development strategy has led to significant carbon-emission reductions for our company and our customers. Our smart, long-term investments, including in wind and solar, have helped us achieve a laudable reduction in our CO_2-emissions rate, achieving a 58% reduction from an adjusted 2005 baseline. As we implement Real Zero, our goal is to eliminate scope 1 and scope 2 carbon emissions from our operations by no later than 2045, beginning with a 70% reduction in our CO_2 rate by 2025.* Read more about our Real Zero goal and our plan to achieve it in our **Zero Carbon Blueprint**.

Our scope 1, 2 and 3 emissions data is verified by an independent third party and available in **Appendix E** (Emissions Data and Third-Party Emissions Assurance Statement) of this report. We also participate in the CDP (formerly known as the Carbon Disclosure Project) survey. Our 2021 response is available on our **Investor Relations website**.



Crews construct what today is the FPL Miami-Dade Solar Center in Florida.

* We are striving to achieve our goal of Real Zero emissions by no later than 2045 so long as there is no incremental cost to customers relative to alternatives, our efforts to do so are supported by cost-effective technology advancements and constructive government policies and incentives and our investments are acceptable to our regulators Throughout this report, we reference our adjusted 2005 baseline for our emissions-reduction goal. The 2005 baseline is adjusted to account for acquisitions and divestitures during the goal period. Certain facilities within the NextEra Energy wind and solar generation portfolio produce Renewable Energy Credits and other environmental attributes which are typically sold along with the energy from the plants under long-term contracts, or may be sold separately from wind and solar generation not sold under long-term contracts. The purchasing party is solely entitled to the reporting rights and ownership of the environmental attributes. Visit "Reports and Filings" on the investor page of NextEraEnergy.com for more information.

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NEXTERA ENERGY'S ESG JOURNEY

1952: FPL holds its first storm drill.

1978: FPL begins demand-side management program.

1979: FPL starts exploring alternative fuels, including solar power.

1984: FPL Group (renamed NextEra Energy in 2010) incorporated; appoints first female director; we have had at least one female director on our board continuously since our incorporation.

1984: FPL Group provides the right for a majority of shareholders to call a special meeting; in 2015, the threshold was lowered to 20%.

1984: FPL Group invests in our first Florida solar project in Miami.

1989: FPL Group is the first non-Japanese company to win Deming Prize recognizing outstanding performance in quality control.

1989: FPL Group invests in our first wind project outside of Florida.

1994: FPL launches Care to Share program, providing crisis assistance to customers who are unable to pay their electric bills.

1997: FPL Energy (renamed NextEra Energy Resources in 2010) is formed to focus on clean energy technologies and fuels.

1998: FPL Energy builds our first wind farm in Oregon.

2001: FPL Group incorporates sustainability metrics into executive officer compensation goals.

2001: FPL begins fleet modernization by switching from oil to natural gas and increasing fuel efficiency.

2006: FPL begins hardening program to strengthen the energy grid.

2007: FPL Group commits to more than $2 billion investment in clean energy to reduce CO_2 emissions at the Clinton Global Initiative Forum.

2008: FPL builds the nation's largest PV solar project.

2008: FPL Group begins ZeroToday! employee safety campaign.

2009: FPL Group becomes the largest producer of wind and solar power in the U.S.

2010: FPL builds the world's first solar hybrid facility.

2010: FPL Group, Inc., is renamed NextEra Energy, Inc. and FPL Energy renamed NextEra Energy Resources.

2012: NextEra Energy Resources celebrates commissioning 10,000th MW of wind energy.

2012: NextEra Energy Resources launches first battery storage demonstration project.

2016: FPL launches innovative energy storage pilot project related to scaling renewable energy and storage.

2018: NextEra Energy announces goal to reduce CO_2-emissions rate 65% by 2021 from a 2001 adjusted baseline.

2018: FPL launches Storm Secure Underground Program, a pilot to place neighborhood overhead power lines underground to improve resiliency during severe weather and enhance day-to-day reliability.

2019: NextEra Energy acquires Gulf Power Company and begins plans to reduce emissions, increase clean energy and lower costs.

2019: FPL announces plan to install 30 million solar panels by 2030.

2019: NextEra Energy announces updated goal to reduce CO_2-emissions rate by 67% by 2025 from a 2005 adjusted baseline.

2020: FPL launches FPL SolarTogether, the largest community solar program in the U.S.

2020: FPL announces plan for first green hydrogen pilot project.

2020: FPL and Gulf Power Company end coal-fired power generation in Florida.

2021: FPL and Gulf Power Company legally combine.

2021: NextEra Energy Resources announces plan for first green hydrogen pilot project.

2021: FPL completes and commissions the world's largest integrated solar-powered battery.

2022: FPL installs 50% of 30 million solar panels ahead of schedule. Completion is now expected by 2025.

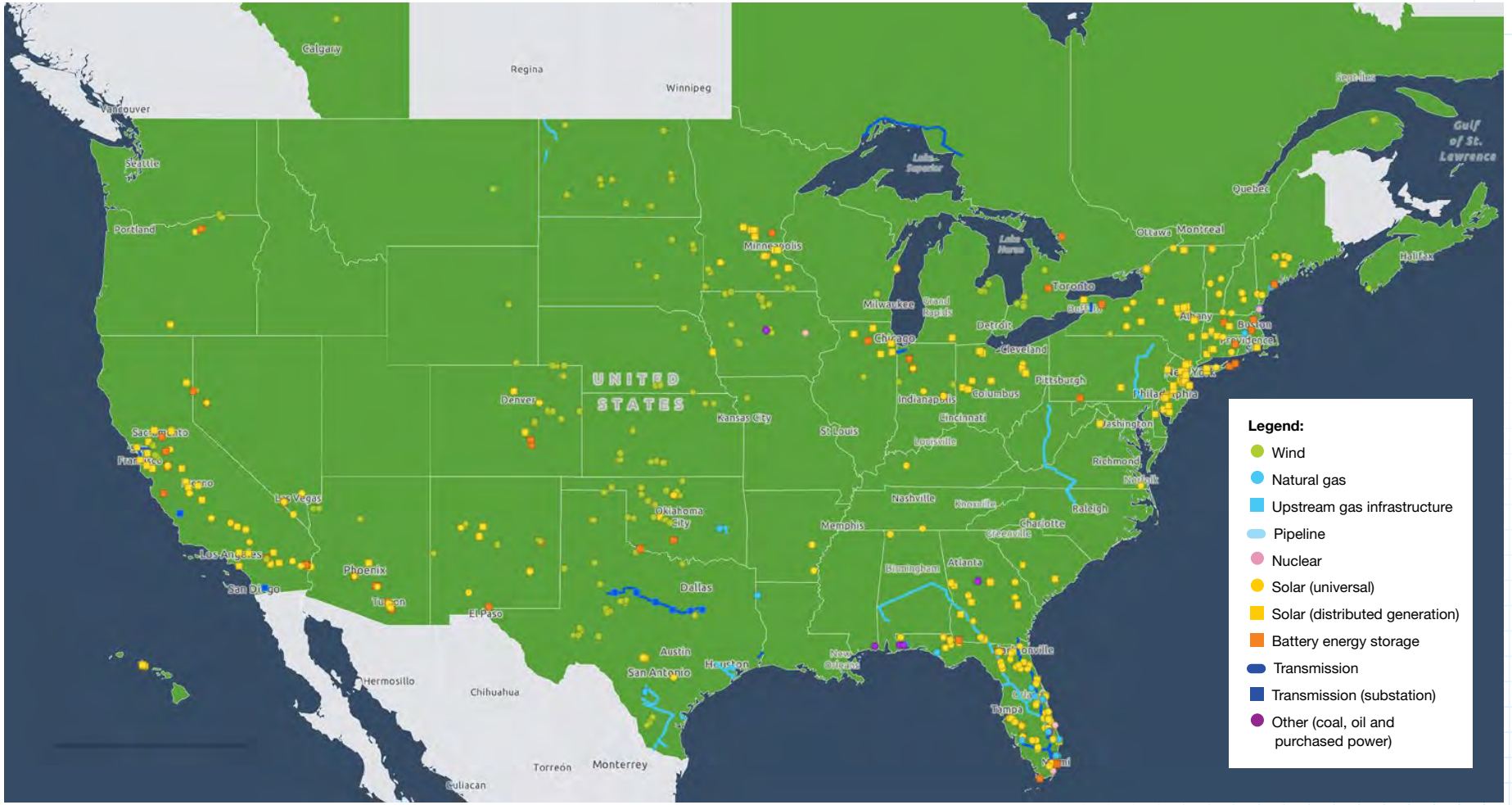
2022: NextEra Energy sets goal to achieve Real Zero carbon emissions by no later than 2045.

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OUR PORTFOLIO



Map represents areas where NextEra Energy has a presence, operations or development projects. Locations with more than one facility are illustrated with a single dot. Data as of December 2021.

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COMPANY SNAPSHOT*

~61,800 MW
net generating capacity

~$110 B
infrastructure capital deployed since 2012

~15,000
employees

~$141 B
in total assets

~89,180 MILES
of transmission and distribution

$17.1 B
operating revenues



49 STATES AND 4 CANADIAN PROVINCES
with a presence, operations or development projects

~51%
below the national average CO_2-emissions rate

85%
improvement in NextEra Energy overall company safety performance since 2003

~$16 B
invested in American energy infrastructure

23%
total shareholder return, outperforming the S&P 500 Utilities Index

45%
improvement in FPL's reliability over the last decade

*Data as of year-end 2021 if not otherwise shown.

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BUILDING THE WORLD'S LEADING CLEAN ENERGY PROVIDER

NextEra Energy is shaping the future of energy through innovation and investments in clean energy for the benefit of our customers throughout the U.S. and Canada. Through FPL and NextEra Energy Resources, we are investing in North America's energy infrastructure sustainably and responsibly.

Solar panels and batteries work together at the Manatee Solar Energy Center in Parrish, Fla., to form one of the world's biggest solar-charged battery storage systems.

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FLORIDA POWER & LIGHT COMPANY

FPL is the largest energy company in the U.S. as measured by retail electricity produced and sold, serving approximately 5.8 million customer accounts or more than 12 million people across Florida – from Miami to Pensacola.

Our core philosophy, known as the virtuous circle, starts with providing customers a best-in-class value proposition of low bills, high reliability, clean energy solutions and excellent customer service. By delivering on these key commitments, we can drive high customer satisfaction, which leads to a constructive regulatory environment and the ability to have important conversations with regulators and elected officials at all levels about investments in new technologies. A constructive regulatory environment, in turn, attracts investment, which enables us to invest in projects that grow clean energy capacity, keep costs low for customers and improve reliability. From 2012 to 2021, FPL deployed approximately $51 billion in smart capital investments in Florida to continue to improve its customer value proposition.

FPL'S GENERATION FLEET IS NOW ONE OF THE CLEANEST AND MOST EFFICIENT IN THE COUNTRY, SAVING CUSTOMERS MORE THAN $12 BILLION IN FUEL COSTS AND AVOIDING MORE THAN 175 MILLION TONS OF CO_2 EMISSIONS SINCE 2001.

To help pay for these investments with minimal impact to customer bills, FPL has focused on lowering its operating costs for more than 30 years. FPL has improved its operating costs from almost 10% worse than the industry average in 1988 to 65% better than the industry average by 2020. Relative to an average utility's operation and maintenance (O&M) costs per retail megawatt hour (MWh), FPL saves its customers nearly $2.6 billion a year through its best-in-class cost profile. The result of these smart capital investments and continued focus on cost reduction is a typical 1,000-kilowatt hour (kWh) FPL residential customer bill that was approximately 28% lower than the national average as of year-end 2021 and among the lowest in the U.S.* Additionally, based on the 20 largest investor-owned utilities in the country ranked by number of customers, FPL has the lowest residential bill, which is well below the average.*

Efficient generation and clean energy solutions

FPL has been making smart, consistent, long-term investments in cleaner, state-of-the-art energy centers and replacing old inefficient oil, natural gas and coal plants with modern natural gas units, reducing its oil use to nearly zero since 2001.

*Data does not include Gulf Power.



The Blue Springs Solar Energy Center is one of the newer solar installations in the FPL fleet. The facility, located in Northwest Florida's Jackson County, was commissioned in 2022.

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LEADING COAL PHASE-OUT STRATEGY

Coal plant retirements by FPL in Florida:

2016
Cedar Bay
250 MW

2018
St. John's River Power Park
254 MW (Units 1 and 2 ownership portion)

375 MW (Units 1 and 2 bought purchased power agreement portion)

2020
Indiantown Cogen
330 MW

Plant Crist
924 MW (Units 4-7)

FPL has closed all of its coal plants in Florida.

Coal plant retirements outside of Florida:

2021
Plant Scherer
634 MW
(Unit 4 ownership share)

2024
Plant Daniel
502 MW
(Units 1 and 2 ownership share scheduled to retire by January 2024)

2028
Plant Scherer
215 MW
(Unit 3 ownership share scheduled to retire by 2028)

FPL's generation fleet is now one of the cleanest and most efficient in the country, saving customers more than $12 billion in fuel costs and avoiding more than 175 million tons of CO_2 emissions since 2001.

In recent years, FPL acquired coal plants from which we were previously contractually obligated to purchase power and subsequently began to close and demolish these plants. FPL has permanently closed approximately 2,133 MW of coal generation, including joint ownership interests, since 2015. The Indiantown Cogeneration Plant was closed at the end of 2020, and the Gulf Clean Energy Center, formerly Plant Crist, was converted to natural gas, cutting its CO_2-emissions-rate by 40%. With the conversion of the Gulf Clean Energy Center and the retirement of Indiantown Cogeneration Plant, 2021 marked the first time in nearly 70 years that FPL had no coal-fired power plants in Florida. At the end of 2021, FPL formally retired its portion of a coal unit located in Georgia. FPL has announced plans for retirements of two of its three remaining coal units outside of Florida by January 2024. FPL also owns a 25% interest in an 860-MW coal unit at a multi-unit power plant in Georgia. This unit in which we own an interest is slated to close around or before 2028.



The distinct red and white stacks of FPL's Cape Canaveral Power Plant in Florida are demolished to make way for a more modern, efficient, less-carbon emitting facility to serve Florida customers.

FPL has invested in natural gas generation to reduce dependence on oil and coal. Its highly efficient natural gas power generation fleet has helped drive these coal retirements, reduced costs for its customers and lowered its CO_2-emissions rate. Its natural gas units emit approximately one-third the CO_2 of similarly sized coal units, while maintaining affordability and reliability. In the future, we plan to adapt FPL's natural gas power generation fleet to use zero-carbon-emissions green hydrogen. In fact, FPL received approval to develop Florida's first green hydrogen plant, which is expected to come online in 2023 at our Okeechobee Clean Energy Center. Early investments in modernizations, such as green hydrogen, are an important part of our Real Zero journey and pave the way for cost-effective conversion of our existing natural gas-fired plants to green hydrogen.

In addition, we are bringing the benefits of solar energy to the Sunshine State. Solar is now the most cost-effective generation resource in most parts of FPL's service area. FPL leads all utilities in the nation with the most universal solar capacity and is currently Florida's largest generator of solar power. In 2019, FPL announced its groundbreaking 30-by-30 plan, representing one of the largest solar expansions in the world. By April 2022, FPL passed the 50% mark toward completing the plan with 50 solar energy centers in operation. FPL now expects to install 30 million solar panels across the state of Florida by 2025 – five years ahead of schedule.

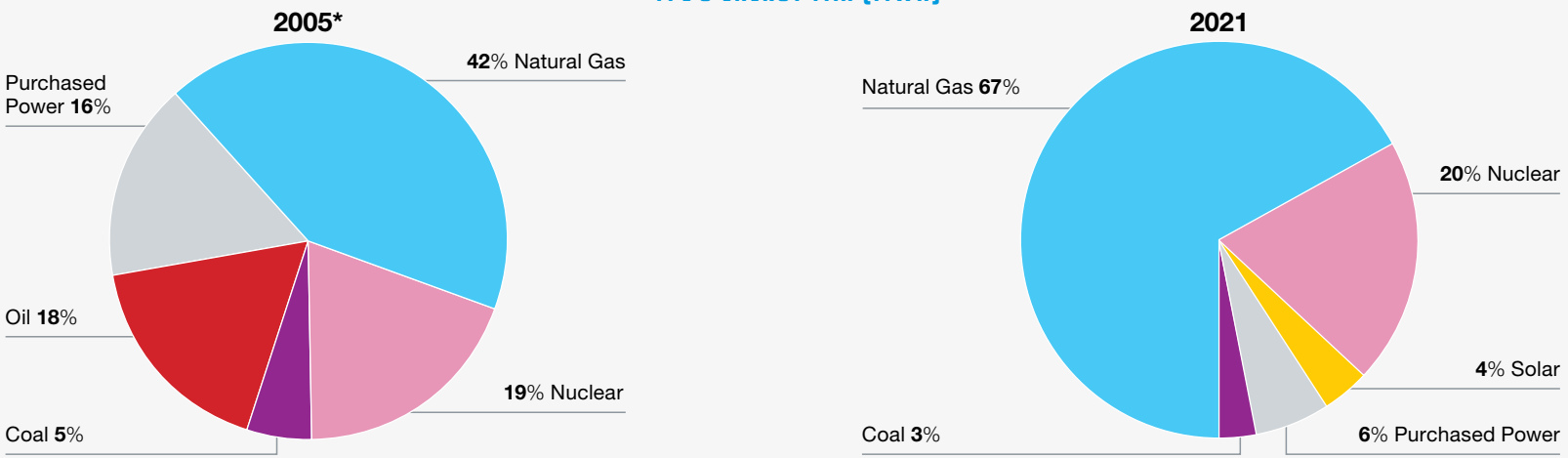
FPL is giving customers additional opportunities to invest in solar through the FPL SolarTogether™ program – the largest community solar program in the U.S. The program was initially launched in 2020 to provide customers the opportunity to offset their energy capacity with power from 20 universal solar energy centers totaling nearly 1,500 MW of capacity.

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FPL'S ENERGY MIX (MWH)



Due to the overwhelming popularity of SolarTogether, a program extension – which would include 24 more solar energy centers and 1,788 MW of additional capacity – was approved in 2021. SolarTogether also includes an allocated portion of solar capacity for low-income customers, which is the largest low-income solar offering in the country.

We are increasingly combining solar with low-cost battery energy storage. At the end of 2021, FPL commissioned the world's largest solar-powered battery – a 409-MW project adjacent to our Manatee solar facility in Manatee County, Florida. FPL's **Ten-Year Site Plan**, filed in April 2022, includes a significant increase in battery energy storage deployment with approximately 1,800 MW of new battery energy storage by 2031.

We are excited about green hydrogen technology, which will be key to unlocking 100% carbon-free electricity through long battery energy storage created with solar power. Green hydrogen is a versatile clean fuel and important to NextEra Energy's Real Zero goal. Green hydrogen is made by using zero-carbon-emissions electricity to run an electrolyzer, which splits water into hydrogen and oxygen, while producing no greenhouse gas emissions. Green hydrogen holds the promise of addressing hard-to-decarbonize sectors that are important drivers of economic growth in the U.S., such as manufacturing and heavy-duty transportation.

*Data does not include Gulf Power.

FPL is in the midst of executing on an approved pilot program to assess how our combustion turbines operate with a hydrogen fuel mix and learn how a hydrogen fuel production and battery energy storage facility can be effectively used on site with combustion turbine units.

The pilot program is the latest example of how FPL always looks beyond the horizon and eagerly makes disciplined, long-term investments to build a more modern, stronger and cleaner energy grid that all of us – including future generations – can depend on.

The future FPL Cavendish NextGen Hydrogen Hub will leverage solar energy to power the electrolysis process that produces green, or zero-carbon-emissions, hydrogen from water. Once produced, the green hydrogen will be blended with natural gas and used to power an existing combustion turbine at the co-located FPL Okeechobee Clean Energy Center – creating cleaner energy that will help power FPL customers across the grid. Expected learning from this pilot include lessons from design, procurement, construction, commissioning, operations and maintenance during a variety of operational scenarios on the grid. As we execute our Real Zero goal, we project that FPL's CO_2-emissions rate will be approximately 64% lower in 2030 than the industry average was in 2005.

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These electric vehicle fast chargers located at the Turnpike Plaza in Pompano, Fla., are among those available in FPL's EVolution program.

We believe in the future of electric vehicles (EVs). Beyond our generation transformation, we are excited about the potential for the electrification of transportation. In 2019, FPL launched an innovative program designed to boost Florida's electric vehicle charging infrastructure, support EV adoption and increase range confidence. FPL EVolution will bring more than 1,000 charging ports to more than 200 locations across the FPL service area by the end of 2025, and is positioned to be one of the largest fast-charging networks in the state. The program includes more than 800 miles of strategically located, fast-charging stations, where EV drivers will be able to plug in every 25 miles along major highways, such as I-95, the Florida Turnpike and east-west corridors. With the addition of FPL EVolution Fleet and FPL EVolution Home, we also are meeting EV drivers' needs at home, at work and on the road.

On top of investments in EV charging, we partnered with the city of West Palm Beach to purchase five electric school buses for use by the city's parks and recreation department. This project is the first of its kind in Florida – and it's just the beginning. FPL also is leading by example when it comes to driving EVs. We are committed to converting 60% of our light-duty vehicle fleet to electric or plug-in hybrid by 2030, demonstrating our pledge to help Florida become a leader in sustainable transportation and our Real Zero goal to be zero-emitting by no later than 2045.

Building America's smartest and strongest energy grid – reliability and customer service

Another example of FPL's strategy is our extensive effort to harden the energy grid and deploy smart grid technology. In 2004-2005, FPL's service area was hit by seven major hurricanes over 18 months, including Hurricane Wilma, which caused extensive damage throughout FPL's service area, requiring a total restoration time of more than two weeks. Since 2006, we have made significant investments to strengthen the energy grid to improve reliability for customers. By the end of 2021, we had hardened or undergrounded more than 65% of all main distribution power lines. We also have replaced wood transmission structures so that 94% of these are now concrete or steel.

FPL was one of the early adopters of smart grid devices and today has approximately 6 million smart meters and intelligent devices on our grid. Each day we collect about 1 billion data points from these devices and use predictive analytics and algorithms that we developed and patented to identify potential problems so we can fix them before our customers are interrupted and crews are dispatched. Not having to dispatch a vehicle helps reduce our carbon footprint and reduces O&M costs. These intelligent devices can automatically redirect power, self-heal and eliminate or minimize customers affected, resulting in more than 10 million outages avoided over the last decade.

We delivered our best-ever service reliability performance in 2021, continuing a trend in which we've improved reliability by nearly 45% since 2011. Customers in Northwest Florida have seen an improvement of nearly 60% in reliability since becoming part of the FPL family in 2019. For the sixth time in seven years, FPL in 2021 was awarded the ReliabilityOne® National Reliability Award, presented by PA Consulting, to the award recipient that has demonstrated sustained leadership, innovation and achievement in the area of electric reliability.

FPL expects to continue to invest in building the nation's strongest and smartest energy grid. Under a Florida law enacted in 2019, we have filed a long-term Storm Protection Plan that details how we will continue to build a stronger, smarter and more storm-resilient grid in the years ahead. The plan is a continuation of our successful storm hardening and preparedness program and includes additional hardening of overhead transmission and distribution facilities, as well as significant undergrounding of distribution lines. The undergrounding of neighborhood lines, or distribution laterals, will further enhance the network's overall reliability and resiliency.

In addition, we intend to make further smart grid investments over the coming years and will continue to use emerging technology to find new, innovative ways to deliver cleaner, more reliable energy to customers. FPL also focuses on providing best-in-class customer service. The company received the top ranking in the southern U.S. among large electric providers, according to J.D. Power's 2021 Electric Utility Residential Customer Satisfaction Study℠ and 2021 Electric Utility Business Customer Satisfaction Study℠. All our capital investments have improved our customer value proposition, and we have the team and technology to respond to customer concerns quickly and transparently through several communication channels and web-based applications.

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Our focus on enhancing the customer value proposition has helped reduce customer complaints and earn award-winning customer satisfaction. Our survey data indicates that three-quarters of residential customers rate their overall experience with us as excellent. Complaints recorded as logged in the FPSC Consumer Activity Report have dropped from 346 in 2010 to 102 in 2021 – a 71% reduction. During the same period, the number of customers we serve increased by 15%.

Modernizing Northwest Florida with innovative infrastructure and first-class reliability

We are committed to giving our customers in Northwest Florida the best electric service they have ever had. In the three years since welcoming Gulf Power into the NextEra Energy family, we have realized outstanding results toward this goal. On Jan. 1, 2021, Gulf Power merged into FPL with separate retail rates. Following unanimous regulatory approval of a comprehensive four-year-rate agreement, FPL began serving Northwest Florida under unified rates in 2022.

FPL EXPECTS TO CONTINUE TO INVEST IN BUILDING THE NATION'S STRONGEST AND SMARTEST ENERGY GRID.

NextEra Energy acquired Gulf Power in January 2019 and immediately began identifying investments to improve reliability and expand clean energy, while working to reduce costs for customers. Currently, FPL has 19 solar farms in operation or in development across Northwest Florida (not including solar on military installations) – and even more in the works. We completed the Gulf Clean Energy Center coal-to-natural gas conversion and accelerated shut down of its coal units. We also are constructing the North Florida Resiliency Connection (NFRC), a new transmission line that will connect the Northwest Florida and FPL systems. It is expected to be completed in 2022.

The results of the work of our dedicated team and smart investments over the past years have been remarkable compared to industry standards. Due to our smart capital investments, Northwest Florida customers achieved a 24% improvement in CO_2-emissions rate over the last three years. Under our Real Zero goal we will continue to reduce carbon emissions. The investments we are making in Northwest Florida are the same types of investments that have made FPL's energy grid the strongest and most reliable in the nation.

Our service reliability in Northwest Florida has improved by nearly 60% since 2019. The improvements include a pilot program to replace select overhead power lines with underground lines in neighborhoods chosen based on past hurricane outages, vegetation-related service interruptions and other reliability data.

A STRONGER AND SMARTER ENERGY GRID HELPS PREVENT OUTAGES AND RESTORE POWER QUICKER*



deployed
~6 MILLION SMART METERS



installed more than
200,000 INTELLIGENT DEVICES**



collect daily
~1 BILLION DATA POINTS



perform annually
26,000 MILES
of vegetation management



hardened
94%
of transmission structures which are now concrete or steel

* Data as of year-end 2021 unless otherwise shown.
**Milestone reached May 20, 2022.

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NEXTERA ENERGY RESOURCES

NextEra Energy Resources, LLC (together with its subsidiaries) is a clean energy leader, with approximately 24,600 MW of total net generating capacity in the U.S. and Canada, as of year-end 2021, and a total generating capacity of approximately 30,000 MW for the facilities it operates and in which it has ownership interests as of year-end 2021. NextEra Energy Resources has invested capital in nearly every part of the energy and electricity value chain. Yet, the heart of the business is building and growing the world's leading portfolio of wind, solar and battery energy storage assets. Our strategy is focused on developing low-cost and long-term contracted wind and solar generation assets, which are increasingly paired with battery energy storage. NextEra Energy Resources invested in our first wind and solar projects in the 1980s.

From these early beginnings, NextEra Energy Resources has become the world's largest generator of renewable energy from the wind and sun and a world leader in battery energy storage. Since 2012, NextEra Energy Resources has invested nearly $40 billion in wind, solar and battery energy storage to advance our industry-leading position.

With renewable operations in 38 states as of year-end 2021, we are helping states and companies across the U.S. meet renewable portfolio standards and carbon-emissions-reduction goals through the development of zero-emissions renewable energy solutions, while lowering customer bills and creating value for NextEra Energy shareholders. With approximately 50% of U.S. origination market share for wind, 15% of U.S. origination market share for universal solar and 35% of U.S. universal storage origination market share in 2021, NextEra Energy Resources has been a driving force in emissions reductions across the U.S. power sector for three decades.*

FROM 2022 THROUGH 2025, NEXTERA ENERGY RESOURCES EXPECTS TO CONSTRUCT APPROXIMATELY 28 TO 37 GIGAWATTS OF LONG-TERM CONTRACTED RENEWABLES PROJECTS, REPRESENTING ONE OF THE LARGEST-EVER DEPLOYMENTS OF WIND, SOLAR AND BATTERY PROJECTS OVER A FOUR-YEAR PERIOD.

To grow the world's largest competitive clean energy company, we are focused on leveraging our competitive advantages to capitalize on what we believe is the best renewables environment in our history. By executing our strategy, we will lead and partner with the rest of the energy industry to continue to drive North America's clean energy future forward.

* Universal solar means utility-scale projects having at least 10 MW in nameplate generating capacity.

~$40 B
Invested nearly $40 billion in wind, solar and battery energy storage since 2012

~25 GW
Owned or operated about 25 gigawatts (GW) of wind and solar as of year-end 2021

~3,800 MW
Commissioned ~3,800 MW of renewable energy projects and storage in 2021



Employee Chris Farmer heads out to check the turbines at the Golden West Wind Energy Center in Callahan, Colo.

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Wind turbines are visible as the sun shines through the clouds at sunset at the Heartland Divide Wind Energy Center in Audubon, Iowa.

Executing our strategy

NextEra Energy Resources' renewable energy business has been built almost entirely from the ground up, and along the way we have honed several competitive advantages. These start with our development skills – outstanding customer relationships, regulatory and permitting knowledge, the ability to design integrated renewable products, and our history of construction execution and brand recognition.

Another key competitive advantage is scale. NextEra Energy Resources is among the leaders in bringing new renewable energy projects online every year. Our scale allows us to leverage long-term, strategic relationships with our suppliers and lenders to realize sustained cost advantages. With the largest portfolio of development sites and interconnection queue positions in the industry, we believe we are uniquely positioned to execute better than any other company in our sector even in challenging market conditions. Our team's skill set includes a deep understanding of our data and the ability to leverage that data to improve our offerings to customers.

NextEra Energy Resources collects billions of data points every day from its operating wind and solar portfolio and uses that data to make smart decisions to optimize project development, maximize revenues and reduce operational costs. Using advanced analytics, we developed the first-of-its-kind intelligent wind and solar site-design optimization tool.

By processing large proprietary data sets – from weather and resource data, land constraints and equipment characteristics – this tool evaluates thousands of potential layouts to find the optimal design that maximizes value for each site. With digital work plans and the ability to view real-time performance of the fleet, we leverage digital tools to streamline, simplify and automate labor-intensive processes, while optimizing work planning across our portfolio. These efforts have allowed NextEra Energy Resources to reduce our wind O&M costs per MWh by approximately 34% since 2016, with the expectation of another 10% reduction by 2023. For solar, we aim to reduce NextEra Energy Resources' O&M costs per MWh by approximately 44% from 2016 to 2023.

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Renewables' market potential

Over the past 10 years, renewable energy has shifted from a business solely driven by compliance to one that is driven by both compliance and economics. Today, new renewable energy resources are cheaper than the operating costs of many older, inefficient fossil generation units. With continued technology improvements and cost declines, we believe that by the latter part of this decade, after U.S. federal tax credits phase down, new near-firm (with battery energy storage) wind will be a $25 to $32 per MWh product and new near-firm (with battery energy storage) solar will be a $30 to $37 per MWh product, continuing to be the low-cost generation alternatives.

NEXTERA ENERGY RESOURCES IS KEY TO NEXTERA ENERGY'S LEADERSHIP IN THE DECARBONIZATION OF THE POWER SECTOR AND OTHER PARTS OF THE U.S. ECONOMY.

Market estimates now anticipate the renewable energy market to grow at roughly 15% per year through the next decade and that the wind and solar share of the nation's generation mix could grow from less than 13% in 2021 to about 60% in 2035. We have conducted a scenario analysis to model the U.S. energy grid to determine how the U.S. electric sector can achieve a 100% carbon-free electricity grid on a long-term horizon by 2050. Based on our analysis, we believe there is an opportunity to build approximately 3,600 GW, or more than 100 GW per year, of renewable energy and storage through 2050. Additionally, decarbonizing the electricity sector of the economy results in excess carbon-free energy that may be converted to green hydrogen to decarbonize other sectors of the economy. This creates an estimated $4 trillion investment opportunity in renewable energy plus storage through 2050.

Positioned to decarbonize the U.S. economy

NextEra Energy Resources is key to NextEra Energy's leadership in the decarbonization of the power sector and other parts of the U.S. economy. With our meaningful competitive advantages, we are well positioned to capitalize on this opportunity through better development and operational and customer solutions.

NextEra Energy Resources' focus on leading the power sector's transition to low-cost renewables is reflected in our development expectations. From 2022 through 2025, NextEra Energy Resources expects to construct approximately 28 to 37 GW of long-term contracted renewables projects, representing one of the largest-ever deployments of wind, solar and battery projects over a four-year period. In 2021, we had a record year of success, commissioning approximately 3,800 MW of renewable energy projects during the year and adding about 7,200 net MW of renewables and storage to our backlog.



Employee Francisco Castellanos checks on the battery energy storage facilities Blythe and McCoy Energy Centers in Blythe, Calif.

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An artist's rendering of the Okeechobee Clean Energy Center in Florida includes the Cavendish NextGen Hydrogen Hub.

Our renewables backlog, as of year-end 2021, was approximately 16,600 MW, which is roughly the size our entire renewables generation portfolio was at the end of 2017 and nearly 25% larger than our backlog at year-end 2020. In 2021, we added approximately 2,008 MW of new wind generating capacity and 728 MW of solar generating capacity, repowered 435 MW of wind generating capacity and increased our backlog of contracted renewable development projects. We are well on our way to meeting our current development expectations for new signed contracts.

Green hydrogen presents a particularly compelling new market for NextEra Energy Resources, where we have explored a number of pilot programs. A clean energy technology company with which we have partnered has developed proprietary processes to decarbonize industrial production of hydrogen at economic prices and recently won conditional approval for an approximately $1 billion Department of Energy loan to expand its methane pyrolysis process facilities in Nebraska that produce clean hydrogen and low-emissions carbon black, which is primarily used in manufacturing tires, plastics, inks and toners, and other products. Our agreement with this company provides NextEra Energy Resources the opportunity to be its preferred renewable energy supplier for the manufacturing facility. Similarly, we also have partnered with a liquid fuels company with a proprietary process to produce zero-emissions synthetic fuels by combining green hydrogen with concentrated CO_2 streams captured from industrial processes. Our strategic partnership with this company includes the opportunity for NextEra Energy Resources to provide up to 3,000 MW of renewable energy under a preferential energy supply agreement.

In addition to assisting customers with the transition to sustainable and zero-carbon-emissions transportation, we are helping our customers optimize their energy use and reach their own carbon-reduction goals. Our NextEra 360 software platform leverages data from NextEra Energy Resources' world-leading renewable fleet. The software is part of our broader suite of sustainability solutions that help our customers navigate the sustainability journey to achieve their own Real Zero.

In addition, we are helping to change the landscape of water resource management through NextEra Distributed Water's on-site reclamation and reuse services. The company's ecologically engineered, district-scale water recycling systems, called Water Hubs, reduce water supply risk, have the potential to save millions of dollars in utility costs and improve environmental stewardship.

As we execute our Real Zero goal and develop additional renewable energy opportunities over the coming years, we expect to deliver benefits for customers and many other stakeholders. Older, inefficient and higher-cost generation units will be replaced with clean low-cost wind and solar, reducing customer costs, emissions, water use and waste. The billions of dollars of investments we plan to make will support local communities and create attractive construction and operations job opportunities. Finally, shareholders will benefit through execution of a sustainable business strategy that also delivers attractive long-term growth.

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Being a good steward of the environment means making the right choices. NextEra Energy has been an industry leader in protecting the environment for many decades, and we continue to demonstrate that commitment with our Real Zero goal. We invest in low- and zero-carbon-emissions generation. We support environmental conservation and research. We conserve and enhance biodiversity on land for which we are responsible. We engage with environmental and government agencies and local stakeholders. We follow our environmental policy that includes our strategies to prevent pollution, minimize waste, and conserve natural resources and habitats where we operate.

FPL has a long history of protecting sea turtles, not only at our generating facilities like the St. Lucie Nuclear Power Plant, but also through our sea turtle lighting program in the coastal areas within our service territory.

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Managing and mitigating environmental risk

Environmental risk identification, mitigation and management are key drivers for ensuring safe and sustainable operations. More than 150 corporate environmental professionals and numerous others embedded in our operating business units keep these environmental drivers top of mind, all of whom are key members of the teams that develop and operate our projects over the long term. These include experts in air emissions, water use and quality, remediation, wildlife and habitat, oil and hazardous substances, archaeology and cultural resources, and environmental policy, all critical to the responsible development and ongoing operation and compliance of our facilities. Whether it is a modernization of an existing generation facility, a clean energy development project, a transmission or distribution infrastructure project or development of corporate facilities, our environmental services team is part of the entire life cycle of the project to ensure that we identify, mitigate and manage any potential impacts to the environment.

We also work closely with a wide range of environmental organizations to ensure responsible development and operations and to complete environmental stewardship projects that go beyond compliance. We also invest philanthropic dollars for environmental education, conservation and research. We employ a multifaceted, proactive approach to managing environmental protection and stewardship and achieving our goal of zero significant environmental events every year. Our programs include employee and contractor training, daily site inspections, remote satellite and drone monitoring, routine self-assessments, compliance tracking systems, environmental construction monitoring, environmental audits, quarterly business unit reviews with our Corporate Environmental Governance Council and quarterly due diligence reporting to executive management and the NextEra Energy board of directors.

Climate change, decarbonization and Real Zero carbon emissions reductions

We believe our industry can best confront climate change by investing in clean power generation that produces zero or low emissions. This has been part of the strategy across all of our businesses for a long period of time and is a key element of our Real Zero goal. Our portfolio has one of the lowest emissions profiles of any utility in North America. In 2021, sulfur dioxide (SO_2), nitrogen oxides (NOx) and CO_2 rates were 98%, 74% and 51% lower, respectively, than the U.S. electric power sector average. We have also set a clear goal to reduce carbon emissions further with Real Zero and are making excellent progress toward that achievement. Our near-term goal is to reduce our CO_2-emissions rate 70% by 2025 from an adjusted 2005 baseline, while our long-term goal is to achieve Real Zero carbon emissions by no later than 2045. From 2005 to 2021, NextEra Energy reduced its CO_2-emissions rate by 58%.*



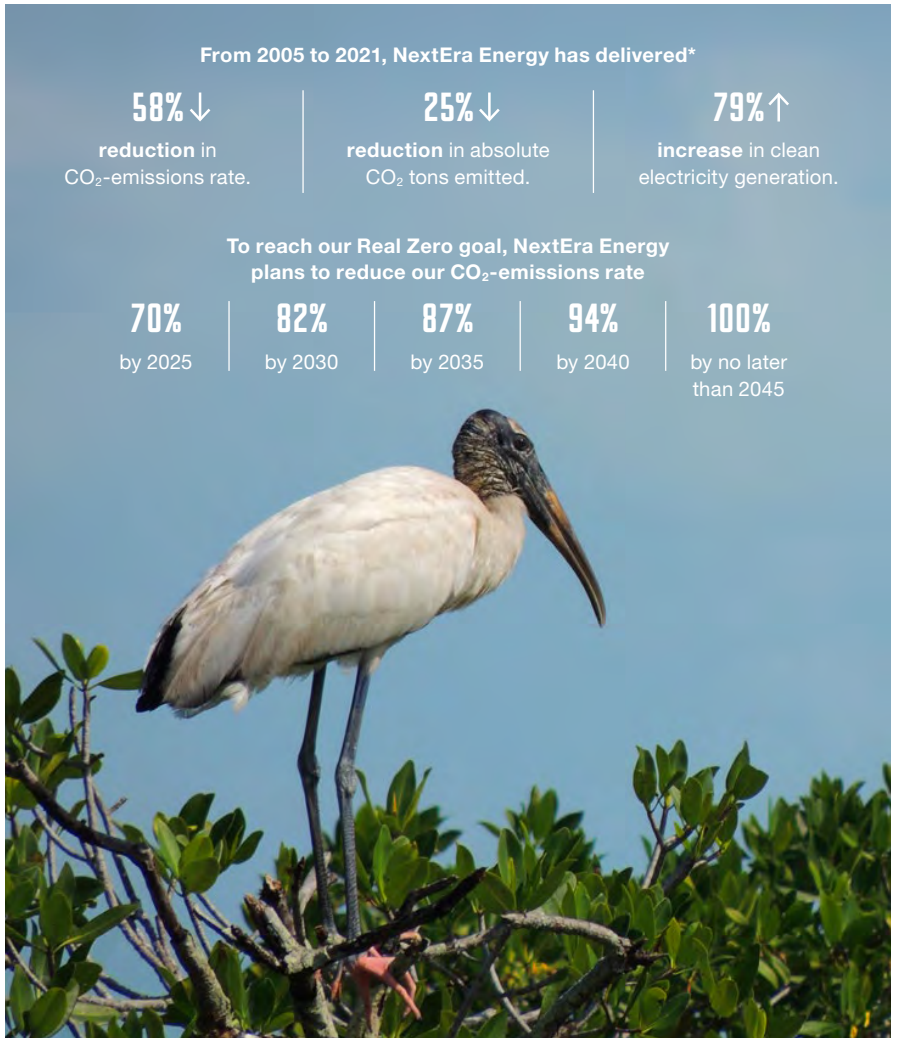
FPL biologist Mary Jo Hernandez uses a test strip to measure water pH as part of routine monitoring around the Turkey Point Clean Energy Center in Florida.

*We are striving to achieve our goal of Real Zero emissions by no later than 2045 so long as there is no incremental cost to customers relative to alternatives, our efforts to do so are supported by cost-effective technology advancements and constructive government policies and incentives and our investments are acceptable to our regulators. Throughout this report, we reference our adjusted 2005 baseline for our emissions reduction goal. The 2005 baseline is adjusted to account for acquisitions and divestitures during the goal period. Certain facilities within the NextEra Energy wind and solar generation portfolio produce Renewable Energy Credits and other environmental attributes which are typically sold along with the energy from the plants under long-term contracts, or may be sold separately from wind and solar generation not sold under long-term contracts. The purchasing party is solely entitled to the reporting rights and ownership of the environmental attributes. Visit "Reports and Filings" on the investor page of NextEraEnergy.com for more information. Throughout this report, we reference our adjusted 2005 baseline for our emissions reduction goal. The 2005 baseline is adjusted to account for acquisitions and divestitures during the goal period.

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This wood stork is one of many birds that frequent the natural areas surrounding the Turkey Point Clean Energy Center in Florida.

Through Real Zero, our goal is to expand our innovative solutions, such as FPL SolarTogether, energy efficiency programs, NextEra Energy Resources' wind and solar projects, and other offerings, to help customers, states and businesses across the country reduce their emissions and meet their clean energy goals. Real Zero also includes the continued safe operation of our nuclear fleet to generate zero-carbon-emissions electricity, a core component of our environmental strategy.

Verifying our emissions data

Our 2021 scope 1, scope 2 and partial scope 3 emissions inventory received independent third-party verification. The verification activities were conducted in alignment with the principles of ISO 14064-3:2006(E) Specifications with Guidance for the Validation and Verification of Greenhouse Gas Assertions. Our verified scope 1, 2 and 3 emissions data and additional information can be found in Appendix E (Emissions data and third-party emissions assurance statement) of this report.

> WE ALSO WORK CLOSELY WITH A WIDE RANGE OF ENVIRONMENTAL ORGANIZATIONS TO ENSURE RESPONSIBLE DEVELOPMENT AND OPERATIONS AND TO COMPLETE ENVIRONMENTAL STEWARDSHIP PROJECTS THAT GO BEYOND COMPLIANCE. WE ALSO INVEST PHILANTHROPIC DOLLARS FOR ENVIRONMENTAL EDUCATION, CONSERVATION AND RESEARCH.

Water availability

Water is a vital natural resource. We continue to take measures to reduce our water consumption, including investing in both water-free power generation from wind and PV solar, and in more efficient generation at our facilities that use steam turbines. To ensure sustainable access to water, we are active stewards of sourcing, using and managing this critical resource in the communities in which we operate. We embed water conservation management strategies into our business planning and operational practices to lower costs and mitigate risks posed by water availability. We reduce consumption through efficiency, technology and operational improvements.

Our investments in water-free wind and PV solar energy, which currently comprise more than a third of our company's generating capacity, avoided the use of more than 20 billion gallons of water in 2021. Nearly 74% of the water NextEra Energy generating facilities withdrew in 2021 came from saltwater sources, which are non-potable and not subject to drought.

*Based on a 2005 baseline adjusted for acquisitions and divestitures during the emissions-reduction goal period.

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Importantly, 98% of water withdrawn for use at our natural gas plants is withdrawn via a once-through cooling system and then returned to its original source. The remainder is reused or consumed through evaporation or deep-well injection.

Only one of 25 of our generation facilities that use water is located in a region of high or extremely high water stress in the U.S. In 2021, we used 7.1 billion gallons of reclaimed water for cooling purposes. Doing so offsets the demand for higher-quality water and reduces water supply risk. We continue to find innovative ways at our generation facilities to use the lowest-quality water sources, including reclaimed water, which reduce impacts to higher-quality sources like groundwater. At FPL's Sanford Plant, we are transitioning from using groundwater to surface water, which assists the St. Johns River Water Management District in protecting the Volusia Blue Spring. Additionally, at FPL's Okeechobee Clean Energy Center, we are deepening a groundwater well to use lesser quality water from the Avion Park Production Zone, instead of sourcing water from the Upper Floridan Aquifer.

In June 2020, the Miami-Dade County Commission approved FPL's proposed development of an advanced reclaimed water project to reuse treated wastewater from the county at FPL's Turkey Point Clean Energy Center. The state-of-the-art FPL Miami-Dade Clean Water Recovery Center (CWRC) will further treat and reuse up to 15 million gallons of reclaimed water per day from the South District Wastewater Treatment Plant in Miami-Dade County. FPL will use 100% of that reclaimed water to cool a natural gas plant at Turkey Point.

A win-win for FPL customers, Miami-Dade County and the Sunshine State, the CWRC will increase resiliency at the Turkey Point Clean Energy Center, provide a cost-effective way to reuse and recycle treated wastewater that would otherwise be discarded, and conserve Floridan Aquifer groundwater at the Turkey Point site. The CWRC also will help Miami-Dade County meet regulations of the Ocean Outfall Act, which set a state requirement for Miami-Dade County to reuse 60% of its wastewater.

Reducing waste

We believe the best way to deliver environmental value by minimizing our waste footprint begins with reducing the amount of waste we generate in the first place. Then, we look for opportunities to reuse and recycle materials to minimize the waste that we send to local landfills.

From modernizing many of our facilities and reducing the amount of oil-ash generated to banning the use of chlorinated solvents at all facilities and continuing to phase out polychlorinated biphenyl (PCB) equipment, we are reducing the amount of waste generated.



Environmental water conservation measures are underway at the Okeechobee Clean Energy Center in Florida to deepen a groundwater well which will allow the company to reduce its potable ground water use at this site.

We have greatly reduced the amount of hazardous waste we generate to maintain the status of a Very Small Quantity Generator, the lowest possible federal regulatory classification. NextEra Energy provides documented training to employees to ensure that hazardous waste, when generated, is properly identified, stored, disposed or recycled. All aspects of waste management are validated through facility environmental audits that include records review, site inspection and personnel interviews. In addition, all waste management vendors receive an environmental audit from either internal audit personnel or through CHWMEG, a nonprofit trade association, and its global Facility Review Program. Active engagement with industry groups, like Cross-Cutting Issues Group and the Electric Power Research Institute, also helps ensure understanding of evolving standards and compliance obligations.

We also seek opportunities to identify and implement reuse and recycling programs that result in environmental and economic benefits. In 2021, our corporate recycling and services facility reconditioned and redirected $4.7 million worth of equipment back into inventory. In addition, our investment recovery team engages a seven-step process for asset disposition when assets reach the end-of-use stage: reuse, recondition, return, resell, reclaim, recycle and remove. In 2021, FPL was awarded the Trailblazer Award from the Florida Recycling Partnership Foundation for the investment recovery operation.

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Another example of how NextEra Energy is working to reduce waste and streamline costs comes from our supply chain business unit. FPL replaces poles as needed due to aging, storms and grid hardening efforts. These poles include both wood and reinforced concrete. Historically, wood poles were cut into manageable pieces and collected for landfill disposal. Concrete poles would be transported to a crusher, with FPL covering transit costs. The team identified a source to recycle wood and concrete poles and reduce landfill costs, saving $400,000 in cost avoidance and keeping 20.5 million pounds of debris out of the landfill. Our partner provides one-stop support for all poles. About 75% of the wood poles are now redeployed to landscapers or other end re-users so only 25% go to landfill, while all concrete poles are crushed and used as aggregate.

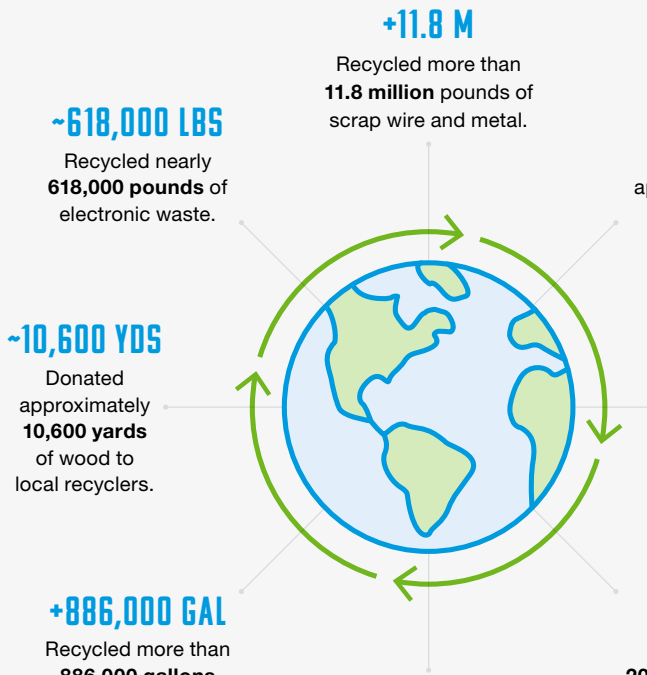
WE EMPLOY A MULTIFACETED, PROACTIVE APPROACH TO MANAGING ENVIRONMENTAL PROTECTION AND STEWARDSHIP AND ACHIEVING OUR GOAL OF ZERO SIGNIFICANT ENVIRONMENTAL EVENTS EVERY YEAR.

While our solar and wind fleet are still early in their operating lives, we are working with our vendors on recycling plans. We have proactively worked with solar vendors on plans to first reuse solar infrastructure components when a site is decommissioned and, in the event they cannot be reused, to recycle them. We have recently employed the same collaboration with wind vendors for waste management as we decommission or repower wind sites. Many of our wind vendors have made significant strides in recycling.

This was recently demonstrated by GE Renewable Energy's announcement that it has entered into long-term contracts to recycle blades removed from its U.S.-based turbines during upgrades or repowering. The recycled blades are used as a raw material for cement. In 2021, 580 blades from five projects were identified for recycling, including 393 that were removed in 2020 and recycled in 2021 and an additional 287 blades that were removed in 2021 to be recycled in 2022.

Preserving and protecting habitat and wildlife

Environmental stewardship includes habitat and wildlife protection. Before we build any operating facility, we study the local ecosystem so that we can better understand what it takes to be a partner in its preservation and to be a good neighbor to all the species that live there. We carefully consider the presence of any threatened or endangered species, as well as significant wildlife corridors, wetlands or other ecologically important areas.



Data from year-end 2021.

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We seek to minimize and mitigate the impact of our development before we begin a project and, once a project is operating, we continue to monitor potential impacts to biodiversity. The Land-Based Wind Energy Guidelines, Avian Protection Plan Guidelines and Manatee Protection Plans are among numerous policies and programs aimed at protecting threatened and endangered species that we follow across our operations. In addition to following all federal and state regulations, we make important contributions to scientific research to protect numerous vulnerable species and habitats and to better understand how to reduce impacts. Several examples of our wildlife and habitat restoration projects are featured below.

Solar stewardship

At our Florida solar energy centers, we work with Audubon Florida and other local organizations to craft site-specific enhancement and preservation plans focused on providing habitat opportunities for birds, pollinators and other wildlife. This is accomplished through a variety of prescriptive methodologies, including but not limited to: restoring hydrology to wetlands, increasing biodiversity through the use of appropriate native plant species, applying integrated approaches to minimize the prevalence of invasive species, incorporating pollinator species into ground covers and installing of artificial perches, nest boxes and platforms for wildlife use.

For example, to avoid disrupting the delicate Florida ecosystem, sites within panther habitat include wildlife-friendly fencing. This special fencing is designed so that both panther prey species and panthers themselves can pass through or over the fence. At our FPL Hammock Solar Energy Center, which has been operating since 2018, we conducted a study with 20 cameras set along the perimeter fence and throughout the site to ensure that animals were able to access and use the site successfully and safely. In 2021, the company standardized the use of wildlife-friendly fencing at all future solar sites in Florida to further allow for wildlife use.

Outside of Florida, we follow a similar process. NextEra Energy Resources evaluates opportunities to implement additional voluntary stewardship actions on a project-by-project basis. Voluntary stewardship supplements the development process and takes further steps to preserve and enhance existing natural resources.



Two caracara and a red-shouldered hawk scout for prey at our Blue Heron Solar Energy Center in Hendry County, Fla.

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These additional actions can work to address local stakeholder concerns, build upon required regulatory actions and the stewardship components of the project development process, and address stewardship goals, such as preserving or enhancing biodiversity.

Monarch butterfly and pollinators

To demonstrate our commitment to protect pollinators and their habitats, FPL is one of the first electric utilities to have enrolled in the voluntary Monarch Candidate Conservation Agreement with Assurances. By enrolling, FPL has committed to implement measures to create conservation benefits for the monarch butterfly. These measures can also benefit other pollinators.

In addition to direct habitat conservation measures, it is also important to contribute to our scientific understanding of pollinator preservation. NextEra Energy is engaged in a research partnership with the University of Illinois Chicago's Energy Resources Center (UIC-ERC) to answer key questions at the intersection of insect pollinator conservation and solar power. The study, entitled "Evaluation of Economic, Ecological, and Performance Impacts of Co-Located Pollinator Plantings at Large-Scale Solar Installations," will examine the economic, ecological and performance impacts of pollinator habitats co-located at five large-scale solar PV facilities in the Midwest and Mid-Atlantic regions, one of which is a subsidiary of NextEra Energy.

Wildlife and habitat research

NextEra Energy Resources participates in the Renewable Energy Wildlife Research Fund (REWRF), which is housed within the Renewable Energy Wildlife Institute, an independent, nonprofit organization that works to solve renewable energy, wildlife, and related natural resource challenges through sound science and collaboration. The REWRF is currently funding innovative research projects related to bats, eagles and grouse, and will be expanding into solar research topics to better understand the potential impacts on species and habitat. REWRF will also explore potential benefits to ecosystem services that solar energy can provide (pollination, soil preservation, water quality, etc.). All research is conducted by independent third parties and will be peer reviewed and publicly released.

Manatees

For decades, FPL has worked closely with state and federal agencies to ensure manatees are protected. In 2016, FPL opened Manatee Lagoon, an eco-discovery center, to help educate the public and inspire communities to preserve and protect Florida's environment and wildlife for future generations. At FPL's Cape Canaveral Clean Energy Center, the U.S. Fish and Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FWC) created



Manatees munch on romaine lettuce at FPL's Cape Canaveral Clean Energy Center in Florida. The supplements were provided for manatees in response to the 2021 Unusual Mortality Event. Photo courtesy of the Florida Fish and Wildlife Conservation Commission.

a temporary field response station to support the Florida manatee in response to the 2021 Unusual Mortality Event (UME) declared following an abnormal number of manatee deaths in Florida. The energy center, located in the northern Indian River Lagoon, is a critical stop-off point, where manatees congregate as they migrate south during the winter. We eagerly worked with the FWC to assist in the effort and pledged to contribute more than $700,000 over the next three years to help with manatee rescue and rehabilitation, education and habitat restoration.

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Mike Lloret, a wildlife biologist with FPL, holds several American crocodile hatchlings. The reptiles have found an ideal home in the habitat surrounding FPL's Turkey Point Clean Energy Center in Florida.

Researchers determined the cause of the manatee UME is starvation attributed to a lack of seagrass, a primary food source, in the Indian River Lagoon. Supporting research to restore and recover seagrass can positively benefit the health of Florida manatees. With this knowledge, the NextEra Energy Foundation provided grants to the Florida Atlantic University (FAU) Foundation for the FAU Harbor Branch Experimental Seagrass Nursery and to the Florida Oceanographic Society to support seagrass research and on-site seagrass nursery operations.

Additionally, in partnership with the Fish & Wildlife Foundation of Florida, FPL funded a new manatee rescue transport truck for FWC. This truck was added to the FWC fleet to expand rescue efforts and transport sick or injured manatees to rehabilitation facilities throughout Florida.

American crocodiles

On the brink of extirpation from the U.S. in the late 1970s due to habitat loss, the American crocodile has made a dramatic comeback in the habitat surrounding FPL's Turkey Point Clean Energy Center. In the 1980s, FPL initiated a crocodile management program at the plant.

This plant has a 5,900-acre, manmade cooling canal system and surrounding land that offers ideal nesting conditions for the American crocodile. Our crocodile management program includes protecting these nesting areas, completing population surveys, conducting capture and spatial distribution surveys, and regulating plant activity at night and during nesting season. In 2021, FPL biologists captured, tagged and released a record setting 565 hatchlings. Our strategy to prepare historical nesting locations before the season and improve the water quality of the cooling canal system led to 27 successful nests in 2021, the second-highest year on record, behind 28 successful nests in 2008.

Avian protection programs

We have taken the initiative to protect bird species through several innovative programs. When siting projects, we are dedicated to avoiding and minimizing impacts to both terrestrial and avian species and their habitat. For NextEra Energy Resources' wind facilities, we follow industry and agency guidelines, which include voluntarily collecting and providing eagle nesting and avian point count survey data results, as well as post-construction mortality monitoring results, to the USFWS. Our practice also is to site our turbines at least 2 miles away from every known eagle nest, unless otherwise approved by USFWS. In addition to our siting practices, we use IdentiFlight®, a developing automated technology used to detect, identify and protect eagles at wind farms by using high performance optical systems paired with machine vision software. Golden Hills Wind, LLC has been conducting a pilot project using this technology to minimize effects to golden eagles at the site.

By detecting an eagle as far as 1 kilometer out from an operating wind turbine, in real time, the IdentiFlight system maximizes the protection for eagles compared to other non-automated systems. The pilot project, at the two-year mark, is demonstrating very promising results. In addition to our project specific work, we have funded several research projects related to eagle population assessments and eagle conservation. NextEra Energy Resources also has recently reached a voluntary agreement with the federal government pursuant to which it will spend up to approximately $27 million to minimize additional eagle deaths and injuries at approximately 50 of its existing wind facilities. NextEra Energy Resources continues to minimize our interactions with bald and golden eagles through our siting practices, research and conservation. See our **statement** for additional details.

Since 2007, FPL has invested more than $130 million to construct and retrofit more than 150,000 poles to make them more bird-friendly, reducing avian risk and improving service reliability to our customers. To identify and proactively address high-risk distribution structures, FPL created the energy industry's first avian risk assessment model. In 2014, FPL updated the avian risk assessment model to further enhance avian assessment for eagles and wood storks and protection processes.

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Sierra Franco is a two-time participant in the NextEra Energy Internship Program. This year, Franco is interning with environmental services after being an intern with power delivery in 2021.

SOCIAL

Our three core values are at the forefront of everything we do:
We are committed to excellence.
We do the right thing.
We treat people with respect.

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SOCIAL

Our culture and people

Our culture and people are our most important resource and a key competitive advantage. We have a culture that is centered on our people, setting big goals and focusing on execution, and continuous improvement and accountability in everything we do. Integrity and ethical behavior are at the very foundation of who we are, what we do and how we do it. We expect all employees and contractors of our company to act with the highest standards of personal and professional integrity and to comply with all applicable laws, regulations and company policies.

At NextEra Energy, we have three principal codes of conduct that embody these values and help ensure they are upheld: our Code of Business Conduct and Ethics, our Code of Ethics for Senior Executive and Financial Officers and our Supplier Code of Conduct and Ethics. Each year, all non-bargaining employees are required to review our Code of Business Conduct and Ethics and certify compliance via a required annual code of conduct training session. Every year NextEra Energy hosts several events for employees to showcase innovation and advances in technology. Our annual NextEra Energy Quality, Safety and Innovation Expo provides an opportunity for employees to learn about the latest innovations in technology, safety and practices that power our company.

Human rights

We are committed to maintaining a culture that supports human rights. This commitment to human rights is consistent with our company's core values and cuts across all operations. Our Code of Business Conduct and Ethics reminds our employees and those doing business on our behalf of their moral, ethical and legal responsibility to protect the rights of all people. Further, one of our core values is "Treat People with Respect." This means all people. We are subject to federal and state labor laws, which address freedom of association and collective bargaining, child labor, and forced and compulsory labor.

Our commitment to human rights extends to our international suppliers. We work closely with our solar panel and energy storage suppliers to protect that our equipment, including components, are produced without forced labor. First, our new contracts require that our solar supplies, including components, be manufactured outside of the Xinjiang Uyghur Autonomous Region of China and without the use of forced labor. Second, our new contracts include a commitment from our suppliers' to maintain a strict forced labor compliance program that documents the supply chain from raw materials to finished products. Finally, we hired an independent third party to review our solar suppliers' manufacturing and supply chain traceability documents to help confirm that our products were being manufactured outside of Xinjiang and without forced labor.



Employees Phuong Geer and Ray Lozano participate in Power to Care week by sprucing up the Citrus Health Center in Pembroke Pines, Fla. Volunteers cleaned, painted and planted flowers and gave back to the community.

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Arlo Smith works on a storm hardening project in Northwest Florida.

Company operations do not interfere with employees' freedom of association and collective bargaining. We are committed to continued compliance with those laws and the rights of Indigenous people. We support compliance with federal and state laws by continuous monitoring and auditing of our internal processes, such as hiring and promotion practices.

Additionally, we actively encourage all employees to speak up if they believe our Code of Business Conduct and Ethics or labor laws have been violated. All such reports are taken seriously and investigated. We expect the same standards from our suppliers and all other entities with whom we conduct business.

Safety

There is nothing more important in our company than the safety of our employees and our customers. Our commitment to safety is a hallmark of our culture and a reflection of our focus on execution. Our vision for corporate safety is to establish and promote a safety culture based on the principle that zero injuries is the only acceptable target. We've made safety a part of every employee's annual goals to reach this target. We're proud of our decades-long record of safe operations. Since 2003, we have seen an 85% improvement in safety performance as of year-end 2021. Our safety performance ranks in the top decile for our industry.

To ensure we maintain a safe working environment, we leverage safety committees, as well as an Executive Safety Council that reviews and addresses our work-related injury risks. Numerous NextEra Energy locations participate in the Voluntary Protection Program (VPP) of the Occupational Safety and Health Administration (OSHA). Currently, 28 of our work locations have received an inspection from OSHA and recognition as a VPP Star Site. We are also committed to using suppliers with a demonstrated commitment to safety. In general, suppliers who have a presence on company premises of 30 or more cumulative person-days within 12 months are required to comply with the requirements of NextEra Energy's Supplier Safe and Secure Workplace Policy. We maintain specific guidelines for the implementation of safety goals and invoke them as requirements within contractual agreements with our suppliers.

The safety of our customers is equally important. We provide resources and continue to leverage our Safety 6 program to educate the public on how to prevent safety incidents near power lines. We encourage anyone working outdoors to follow these rules:

1. **Work at a safe distance.**
2. **Stay calm, stay away.**
3. **Don't mix ladders and lines.**
4. **Call 811 before you dig.**
5. **Look up and live.**
6. **Respect that downed lines can be deadly.**

Attracting and retaining talent

We believe that achieving success begins with people. We are focused on attracting and retaining a diverse, highly skilled and multi-generational workforce that can help us drive innovative and creative solutions to meet the continually evolving needs of our customers. We are focused on attracting and retaining the talent needed to support our culture of innovation and continuous improvement. As a world leader in clean energy, we attract highly skilled talent from across different specializations, including engineering, computer, math and data science, finance, legal and technology professionals, such as cyber security, biologists, chemists, and countless field and technical industry specialists, who are eager to be a part of providing a more safe and sustainable energy future for the U.S. In 2021, our talent acquisition team attended career fairs and college recruiting events across the country to identify top candidates and partner with key organizations, such as Women in Technology International, the National Black MBA Association, the American Indian Science and Engineering Society, Society of Hispanic Professional Engineers, MBA Vets and several other professional diversity recruiting organizations with a focus on attracting a diverse talent pool. We recruit from universities across the country, including Historically Black Colleges and Universities, to identify candidates for our summer intern program and early-career rotational programs.

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From left, employees Catalina Arango and Lissette Carrasco share an award received during the 2022 Women in Data Science (WiDS) South Florida conference, hosted and sponsored by NextEra Energy. Arango served as co-ambassador for the event with Lissette Carrasco as WiDS ambassador. Hosting the event was one of many ways the company supports employee professional development.

In 2021, our NEXT summer intern program welcomed 163 interns from universities across the country, of which more than 78% were women and minority interns. Beginning in 2020, we adapted this important program to include virtual and in-person options to ensure it would continue during the coronavirus (COVID-19) pandemic.

We have a robust talent management process that includes an annual performance review with two check-ins throughout the year and an employee development and goal-setting plan that focuses equally on employee and leader feedback to develop skills, opportunities and further advancement within the organization.

Our senior management team hosts talent meetings across business units to identify, assess and position employees to further develop skills needed to become future leaders. We also regularly conduct employee engagement surveys to identify ways to improve our business and increase employee engagement. We take these survey results seriously and use them to create action plans, facilitated by our corporate engagement team, to address top focus areas. In 2022, 90% of NextEra Energy employees, excluding FPL bargaining employees, completed the survey, matching both the 2018 and 2020 participation rate. Our overall engagement score for 2022 was 62%. Employees ranked their immediate supervisor, safety, performance, and diversity and inclusion among their most positive work experiences.

Critical to our success is the health and well-being of our employees. We support them with programs that drive high performance, development and engagement, while also providing work-life balance. Some of the programs we offer employees include on-site fitness centers and medical services, paid parental leave, mental health services, financial well-being programs, career development programs and tuition reimbursement for higher education. We offer more than 1,500 courses through NextEra University, an internal continuous education platform available to all employees, that includes training related to leadership, technical and commercial skills, Six Sigma and project management. In 2021, our employees completed more than 1.2 million hours of continuing education.

Diversity, equity and inclusion

We highly value diversity of thought, style, technical and functional capabilities and leadership. When talented employees from varied backgrounds are engaged and contributing to our business success, we all benefit. NextEra Energy is committed to maintaining an inclusive work environment that is free from discrimination and harassment on the basis of race, color, age, sex, pregnancy (including lactation, childbirth or related medical conditions), national origin, religion, marital status, sexual orientation, gender identity, gender expression, genetic informations, citizenship status, physical or mental disability or protected veteran status, or any other characteristic protected by applicable federal, state or local law.

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From left, Justice Rowe, Emmanuel Francois, Nicholas Braswell, David Cohen and Malcom Richardson joined NextEra Energy in 2021, through the summer intern program, which is part of the company's diversity and inclusion strategy. Rowe, Francois, Cohn and Richardson remain part of the NextEra Energy family.

Our Executive Diversity & Inclusion (D&I) Council advises and drives our corporate D&I strategy and partners with business units to promote diversity talent development and recruiting. We also have a Corporate D&I Council, whose members are business unit champions, who help drive their respective unit's D&I strategies. The Corporate D&I Council shares best practices, sponsors our annual D&I Summit, and advises and mentors our employee resource groups (ERGs).

D&I metrics are reviewed quarterly by the Executive D&I Council, as well as by all senior leaders who are members of the company's operating committee. The Corporate D&I Council meets monthly and reviews organizational diversity metrics on a quarterly basis. Business unit leaders review a diversity scorecard quarterly to develop annual D&I plans, track progress and implement strategies. In 2022, we established a diversity and inclusion goal for leaders to promote diversity and foster an inclusive culture.

Our board of directors reviews our D&I and talent management strategy at least annually, including human capital and diversity metrics. The board also focuses on diversity in our talent pipeline and reviews the diversity metrics of our internship program. Our diverse board members also speak to employee resource groups and other employee forums.

As of year-end 2021, women represented 24% of our workforce and minorities represented 39% of our workforce. We also actively focus on increasing diversity of company management. Women represented 26% of our management team and minorities represented 28% of our management team, as of year-end 2021.

2021 WORKFORCE AND MANAGEMENT DEMOGRAPHICS

Women and minorities in the workforce	
Women	24%
Minorities	39%
Minority and women interns	78%

Women and minorities in management	
Women	26%
Minorities	28%

Ethnic diversity in the workforce	
White	61%
Hispanic/Latino	22%
Black or African American	10%
Asian	5%
All other minorities*	2%

Ethnic diversity in management	
White	72%
Hispanic/Latino	14%
Asian	7%
Black or African American	5%
All other minorities*	2%

*All other minorities include: Native Hawaiian or Other Pacific Islander, two or more races, and Native American or Alaskan Native.

RACIAL EQUITY PILLARS

» Hiring, retention and promotion of Black employees:
  – Partner with 50+ professional organizations to increase pipeline of Black talent, including Management Leadership for Tomorrow, National Black MBA Association, National Association of Black Accountants, HBCU Connect, etc.
  – Implement rotational development program and mentoring/sponsorship program for Black employees.
» Programs that make a difference in Black communities:
  – Support 30+ community and youth outreach organizations over a period of one to 10 years.
  – Increase total funding by $6 million annually.
  – Funded $30 million to the NextEra Energy Foundation to support these efforts.
  – Contributed more than $3.1 million in 2021.
» Supplier diversity and venture investment:
  – Staff company-wide supplier diversity program to triple our spending with Black-owned businesses by 2022.
  – Committed more than $145 million in 2021 to venture capital, private and real estate to advance diversity, equity and inclusion.

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Asian Professionals in Energy Exchange (APEX) is one of NextEra Energy's employee resource groups. Each year APEX hosts Diwali to give their colleagues the opportunity to learn about traditional Indian music, dance, cuisine and creative crafts.

Our past three years of recently filed EEO-1 reports are posted beginning this year on the investor relations section of our website under **ESG Resources**. In 2021, NextEra Energy was named to Forbes magazine's list of "America's Best Employers for Diversity." In addition, the company was selected by Winds of Change magazine as one of the "Top 50 Workplaces for Indigenous STEM Professionals" for our strong support of diversity and an inclusive work climate.

Programs that make a difference

As part of our commitment to advancing social justice, racial equity and related issues, our racial equity working team of nearly 100 employees continues to develop specific actions our company can take to make a positive contribution toward racial equity, including supporting programs that make a difference in Black communities in STEM education, workforce development, equitable justice, community development and economic mobility for Black communities nationwide. With strategic partners like the American Association of Blacks in Energy, 100 Black Men of America, United Negro College Fund, and Center for Policing Equity, our outcomes included:

- **3,200 lives directly affected.**
- **11 new workforce development programs.**
- **10 new scholarship programs.**
- **Seven new permanent endowments.**
- **53 strategic alignments with organizations advancing racial equity for the Black community.**

We have embedded this focus on racial equity into our business practices and implemented platforms that deliver conscious, intentional and transformational change.

Employee resource groups (ERGs)

Our 12 ERGs are at the heart of our D&I and engagement efforts. These voluntary, employee-led groups are made up of employees and allies who partner together to develop personal and professional skills, drive cultural competency and demonstrate advocacy.

Additionally, the ERGs help influence our D&I strategy and serve as key advisers to help evolve and grow our inclusive culture. Our ERGs are active throughout the year hosting events to help employees learn and discover the uniqueness we all bring to the workplace. Our ERGs celebrate Black History Month, Women's History Month, Asian Pacific Heritage Month, Pride Month, Hispanic Heritage Month, Disability Employment Awareness Month and Veterans Day.

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Employees participate in NextEra Energy's Power to Care Day by planting sea oats near Pompano Beach, Fla. The annual event allows employees to volunteer their time together to give back to the community.

Supplier diversity

For more than 40 years, our company has promoted the use of diverse suppliers through our supplier diversity program. We actively pursue opportunities and cultivate relationships with small, disadvantaged, women-owned, HUBZone, veteran- and service-disabled veteran-owned, and minority-owned business enterprises. We define diverse suppliers as companies that are certified as owned, operated and controlled by minorities or women, and those designated by U.S. government agencies as small and disadvantaged businesses. The integrated supply chain group and supplier diversity team work with our business units, as well as with other internal and external stakeholders to strengthen relationships with the suppliers and grow our spend with them. These businesses continue to provide innovative and cost-effective solutions that deliver value to our company and customers.

In 2021, we sourced more than $750 million with small businesses, $500 million with minority-owned businesses and $200 million with women-owned businesses. Given the important role diverse businesses play in positively impacting our communities, NextEra Energy is committed to supplier diversity and economic inclusion. While COVID-19 challenged us last year, we centered on innovative ways to reach out and engage diverse suppliers from across the nation. We supported virtual conferences, networking, community, and development events with our advocacy partners like the Florida State Minority Supplier Development Council and others.

As a founding member of the council, we proudly support its mission to link corporations and government with minority business enterprises to foster business development and expansion. We stand committed to advancing supplier diversity, growing small and diverse businesses, and favorably impacting communities where we work, live and serve.

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Our Communities

With operations across North America, we recognize the importance of building relationships and are passionate about supporting the communities where we live and work. Since the founding of our company in 1925, we have striven to improve community engagement and foster strong ties to the communities we serve. As part of the Power to Care volunteer program, NextEra Energy employees contributed more than 39,000 hours in 2021 to their local communities through company-sponsored projects and personal volunteer time.

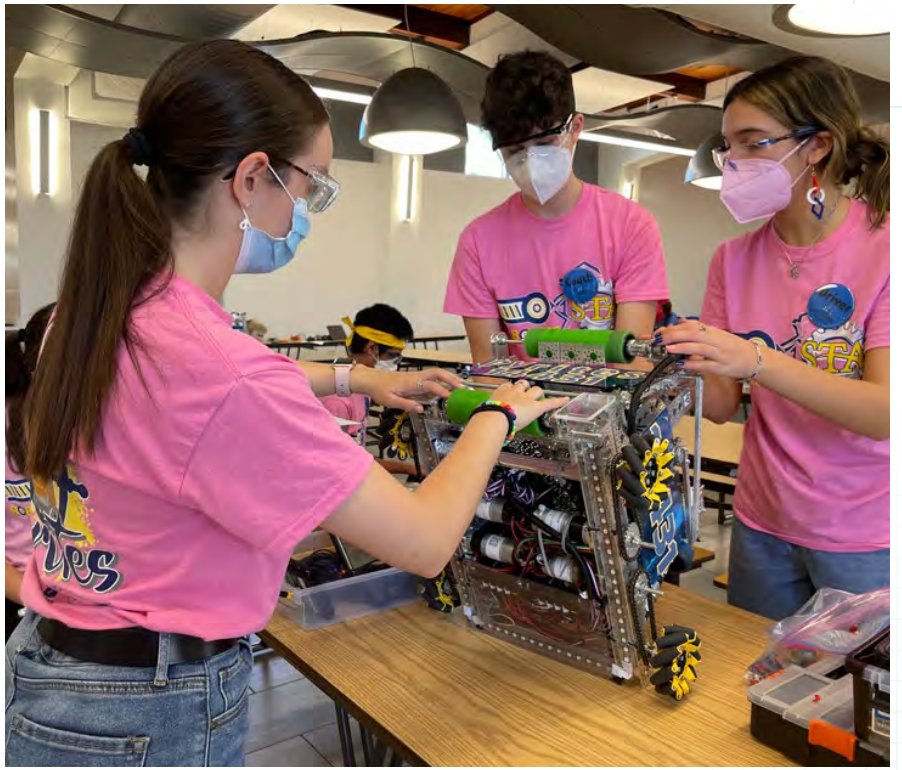
Some of the impacts our employees made in 2021 include:

- The 2021 Power to Care campaign was reimagined due to COVID-19, featuring service projects that could be done safely and remotely at any time during the two-week campaign, and employees enterprise-wide were invited to participate.
- More than 680 volunteers across 10 states participated in over 1,070 different service projects, all to give back to the communities we serve.
- In partnership with Operation Gratitude, more than 2,400 paracord survival bracelets were made and more than 1,000 letters of appreciation and encouragement were written to military service members and frontline workers.
- More than 500 employees and their families honored Earth Day by picking up litter in their local communities.
- More than 180 volunteers recorded themselves reading a book in partnership with Reading Is Fundamental's "Until Every Child Reads" initiative. These are featured on the organization's virtual library for children to access.

In 2021, our company and our employees also contributed more than $20 million to support wide-ranging initiatives and causes that benefit the well-being of our communities. Our 2021 giving included NextEra Energy employees raising more than $4.75 million for the United Way and other nonprofit organizations. And through the company's Dollars for Doers program, which awards grants in recognition of employee volunteer time, nearly $100,000 in grants were distributed to nonprofit organizations in 2021.

Academic support

NextEra Energy recognizes that building a culturally diverse and inclusive workplace is the right thing to do. Different perspectives help us serve our customers better and grow our business. The diversity of thought and experience offered by an employee base that reflects all the communities we serve gives us a competitive advantage – internationally, nationally and directly within the communities in which we live, work and raise a family. We have devoted a significant level of resources to ensure that our efforts within the education arena support students from all demographics and income strata because the energy needs of today's world lead to a need



Students on St. Thomas Aquinas High School's robotics team, the Pyrites, work on building their robot at their school in Fort Lauderdale, Fla. The team competes with their robot in challenges and is sponsored by FPL.

for a broader skill base and creativity. Our support of hundreds of education programs spans national, state and local organizations, nonprofits and 43 counties and 35 school districts in Florida alone. Our education and programs that make a difference teams focus on efforts that serve diverse and underserved communities, with a particular focus on science, technology, engineering and math (STEM). STEM programs help to develop students for future success while building a highly skilled workforce for NextEra Energy and other companies. Students are introduced to a world of possibilities and set on an educational track to acquire the capabilities to pursue careers in science and engineering. And we believe that, in many cases, these programs break down barriers and provide more opportunities.

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Amite High Magnet School Principal Dr. Travis Ford is all smiles after receiving a $50,000 classroom makeover grant. The magnet school in Amite City, La., is one of the schools to receive the grant, which is part of a $2 million commitment from the NextEra Energy Foundation to advance STEM curriculum.

NextEra Energy has long been committed to supporting and promoting robotics teams across its service area, offering financial support to fund teams and to help exceptional students who plan to take their STEM skills, as well as leadership and communication talents, to the college level. FPL has sponsored the South Florida FIRST Robotics competition and supported more than 500 teams over the past decade. Each year a $20,000 college scholarship is awarded to an outstanding alumnus of the FIRST robotics program.

Through the NextEra Energy Foundation, NextEra Energy Resources and FPL recently awarded their inaugural Classroom Makeover Grants. Each year through 2024, 10 schools – 40 in all – will be selected to receive a $50,000 grant. The grants are intended to provide transformational learning experiences for Black students in classroom settings. All recipient schools are comprised of 25% or more Black students, bringing potential together with opportunity so all children can succeed. The Classroom Makeover Grant program directly addresses needs in infrastructure, technology and resources like software, equipment and books.

NEXTERA ENERGY OFFERS SCHOLARSHIPS FOR BLACK STUDENTS IN THE SOUTHEASTERN CONSORTIUM OF MINORITIES IN ENGINEERING AND HAS COMMITTED $1.8 MILLION OVER THE NEXT FOUR YEARS TO MAKE SURE OUR FUTURE WORKFORCE IS REPRESENTATIVE OF THE COMMUNITIES WE SERVE.

Educators everywhere faced challenges at the highest levels due to COVID-19. Among the many lessons learned, leveraging technology and looking for innovative ways to reach and teach students at all ages topped the list. FPL's energy curriculum portal provides a robust virtual curriculum for fourth, fifth and sixth grades that covers energy standards in science, English language arts and math. The free, open-source online curriculum is designed to ensure that students have a deeper understanding about the importance of energy and all of its forms and is available at energycurriculum.com.

As early as 22 years ago, FPL incorporated experiential learning and has offered a traveling science show at no charge to elementary schools offering important energy conservation lessons. Since 2000, the show has reached more than 1 million students and more than 80% of those students attend Title 1 schools. NextEra Energy offers scholarships for Black students in the Southeastern Consortium of Minorities in Engineering (SECME) and has committed $1.8 million over the next four years to make sure our future workforce is representative of the communities we serve.

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FPL Chairman, President and CEO Eric Silagy chats with Girl Scout entrepreneurs about cookies and more during the commissioning of the Cotton Creek Solar Energy Center in Escambia County in Northwest Florida.

FPL also partners with scout troops for badge work, workshops and virtual programming in support of STEM, including the NextEra Energy Renewable Energy Patch and the FPL Florida Solar Patch. We partner with Girl Scouts by funding a STEM program manager and providing STEM scholarships. Through the Urban League, FPL sponsors a STEM progression program that begins in eighth grade and guides youth through their high school years. Our partnership with the Student ACES program gives students a chance to work in the growing solar industry field and receive mentorship to help them begin a promising career.

We believe supporting education is the key to a brighter future and it is a cornerstone of our commitment to our customers, our employees and our children in the communities we serve. We strive to help develop our next generation of leaders and create opportunities for all students so they can dream of a brighter future and achieve it.

NextEra Energy also works with universities, community colleges and school districts both in and outside of Florida. Some of NextEra Energy academic partners are researching which vegetation, including pollinators, are optimal within and outside the controlled, fenced area of a solar facility.

Agrivoltaic/Solar Energy Research & Training Centers offer multidisciplinary approach to advancing coexistence of agriculture and renewable energy. Disciplines include but are not limited to, engineering, agricultural science, entomology, horticulture, renewable energy, biology and craft/technical. This effort will result in renewable energy development that is environmentally prudent, sustainable and commercially practical.

To ensure safe and accessible laboratories, NextEra Energy supports development of solar research fields. The facilities are collaborative with universities, community colleges and area school districts. As part of comprehensive training programs, students, with mentoring from NextEra Energy experts, install the PV panels. The solar energy labs advance training and research in electrical engineering, mechanical engineering, civil engineering, environmental science, agricultural science, computer science, networking/cybersecurity, artificial intelligence, meteorological studies, supervisory controls and data acquisition, cybersecurity, photovoltaic panel installation and numerous other craft/technical disciplines. On of our collaborations is with the University of Arizona and Diné College, the oldest tribal college & university in the country, NextEra Energy is supporting the development of a solar training and research lab.

At the University of Nevada, Reno, students in 2021 received a firsthand look at what it takes to operate their own solar energy center. In addition, we awarded a $75,000 grant to the university's Nevada Institute for Sustainability to teach the next generation of renewables engineers. Thanks to the donation, the university now offers a minor in sustainability, online graduate certificate programs for working professionals, and new programs for current and future students who are interested in becoming part of the growing renewable industry.

Affordable energy

Providing affordable electricity for customers is critical to supporting local economies. The typical FPL residential customer bill is significantly below the national average and among the lowest in Florida.* For many years, we have worked closely with our customers experiencing hardship regarding any issues about their service or paying their bill, offering several programs designed to support customers.

FPL's Care to Share program has provided payment support to customers in time of crisis, raising about $26 million since 1994 to help nearly 100,000 Florida families in need pay their electric bills. For decades, FPL has worked with hundreds of agencies to facilitate payment assistance for qualified customers. In Northwest Florida, we support our neighbors in need of assistance with their energy bills through Project SHARE, which is administered by the Salvation Army.

FPL also has developed programs and tools designed to educate our customers about energy efficiency and help them reduce electricity use. Programs like our FPL Energy Analyzer on our mobile app and the FPL Business Energy Manager empower customers and enable them to analyze, track and better understand their energy usage, in addition to providing customers a personalized plan with energy-saving tips and recommendations, including programs and rebates that may be available.

*Data does not include Gulf Power.

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NextEra Energy Resources in 2021 broke ground on the Grand Casino Hinckley 3-MW Solar Facility, the company's first solar project developed in collaboration with the Mille Lacs Band of Ojibwe and its tribal government body. Solar energy generated at the site will power the Band's Grand Casino in Hinckley, Minn., and other customers served by the local utility.

FPL's demand-side management efforts through 2021 have resulted in a cumulative summer peak reduction of nearly 5,500 MW and an estimated cumulative energy savings of approximately 95,489 gigawatt hour (GWh). This has eliminated the need to construct the equivalent of approximately 66 new 100-MW generating units.

We also support our customers during major disruptive events. In 2017, FPL voluntarily suspended electrical disconnections for several months following Hurricane Irma. In addition, we support our customers during major disruptive events, such as the COVID-19 pandemic. During the height of the pandemic, FPL's Main Street Recovery Credit Program offered eligible small businesses a monthly 10% credit on the energy charge portion of their bill. For low-income residential customers, NextEra Energy committed $15 million to fund a discount program, where eligible customers who received federal assistance through the Low-Income Discount Program (LIHEAP) or the Emergency Home Energy Assistance for the Elderly Program (EHEAP) received a $20 credit on their monthly bill from December 2020 through December 2021.

COVID-19

Since early 2020, the NextEra Energy team has constantly risen to meet the challenges of the COVID-19 global pandemic. We feel great compassion for those who have lost loved ones to this disease, those who have contracted the COVID-19 virus and those who have experienced economic hardship. We've worked tirelessly to demonstrate our commitment to the communities where we live, work and play by providing innovative solutions to help our customers, while keeping our employees safe during this unprecedented time. Our corporate pandemic team continues to prioritize the safety of our team and our communities, while we continue to deliver on our commitments to customers during this pandemic and beyond. Electricity is critical to responding to the virus so first responders can help those in need, businesses can continue to operate, governments can continue to function and our customers can go about their daily lives to the greatest extent possible during this challenging time.

Tribal/Indigenous relations

Our communities include Native American tribes and Canadian Indigenous communities that may have an interest in our projects. That interest may be due to tribal lands in proximity to the project location or because the tribe historically resided in the region. Our tribal/Indigenous relations staff supports all NextEra Energy Resources and FPL projects, including wind, solar, battery energy storage, electric transmission and natural gas infrastructure. We work proactively with tribes to avoid and resolve issues, support tribal economic and community needs, educate internal personnel and consultants, and help support tribes' energy development interests.

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Issue avoidance and resolution is achieved by early, direct tribal outreach on all projects under development, both for projects on private land where tribal outreach is voluntary and on projects with a regulatory requirement for tribal outreach. Multiple opportunities for project participation are available to tribes throughout a project's development, including site visits, cultural surveys, construction monitoring and special studies. Staff coordination is conducted with respect and sensitivity to each tribe's cultural concerns or needs.

Tribal community support is provided by working with tribes to identify national, regional and local tribal community needs. For example, in 2021, NextEra Energy created a scholarship program for Native American youth, administered by the American Indian Graduate Center. Fifteen scholarships are awarded annually to qualified students in energy, environmental and cultural resource disciplines.

Internal education for our development, environmental and construction teams is vital to our efforts to build strong collaborative relationships with tribes. By learning about Native American and Indigenous practices, traditions, cultural awareness and sensitivities, our tribal/Indigenous relations staff provide training for developers, subject matter experts/support staff and construction personnel. This helps ensure that all members of our project teams act in a responsible, respectful manner on every project. Strong relationships with tribes also open lines of communication that may identify opportunities and support business development on tribal lands. In 2021, NextEra Energy broke ground on the Grand Casino Hinckley 3-MW Solar Facility, the company's first project developed in collaboration with the Mille Lacs Band of Ojibwe and its tribal government body. Solar energy generated at the site will power the Band's Grand Casino in Hinckley, Minn., and other customers served by the local utility.

Veterans and military members

We are proud that nearly 2,000 NextEra Energy employees – 13% of our workforce – are veterans of our nation's armed forces. The Veterans at NextEra Energy (VETNEXT) is one of the company's largest and most engaged employee resource groups. In 2021, NextEra Energy received the U.S. Department of Labor's HIRE Vets Platinum Medallion award for the third year in a row for our excellence in hiring and retaining veterans.

Additionally, we are honored to be named for the second year by Forbes and Statista to the 2021 list of America's Best Employers for Veterans. This award was chosen based on an independent survey from a sample of 5,000 U.S. veterans and awarded to 150 companies for their efforts to recruit, employ and retain veterans. For more than a decade, FPL has been celebrating local heroes, with holiday hero surprises. Employee volunteers decorate the hero's homes' exterior with thousands of LED lights, solar-powered decorations and energy-efficient décor as a thank you for service to our community and nation.



Volunteer Air Force personnel stationed at Vance Airforce Base in Enid, Okla. offer their thanks to NextEra Energy Resources for our support of their Thanksgiving meal program, which served 200 meals to officers and enlisted personnel and their families in 2021.

In 2021, two veterans and three healthcare workers and their families were surprised in Miami, Melbourne, St. Augustine, Gulf Breeze and Panama City. NextEra Energy Resources also supports our military during the holidays. At Vance Airforce Base in Oklahoma, the company sponsored a Thanksgiving meal project. The programs are among many ways NextEra Energy supports veterans and our armed forces in areas we serve, such as Northwest Florida, a key area for the U.S. Navy and Air Force. We are committed to being the best partner we can be by focusing on communication, cooperation and collaboration to form consensus.

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Economic development

NextEra Energy is one of the largest infrastructure companies and among the largest capital investors in the U.S., and our investments create significant economic benefits. In 2021, NextEra Energy paid $2.6 billion in various state and local taxes and business fees that support local governments, police, fire, schools and other local organizations within the communities where we operate. In Florida, we were one of the top taxpayers in 2021, paying $1.9 billion in various taxes and fees, including property taxes, sales and use taxes, gross receipts taxes and franchise fees. In property taxes alone, FPL paid more than $628 million to Florida governments in 2021, up from $607 million in 2020.

Economic analysis indicates that NextEra Energy's capital investments in 2020 have created more than 84,000 jobs across the nation when including both direct and indirect economic activity. Florida's low-tax, pro-business policies, combined with a variety of incentives designed to spur economic growth, make it an attractive place to do business.

NEXTERA ENERGY PAID $1.9 BILLION IN VARIOUS STATE AND LOCAL TAXES AND BUSINESS FEES THAT SUPPORT LOCAL GOVERNMENTS, POLICE, FIRE, SCHOOLS AND OTHER LOCAL ORGANIZATIONS WITHIN THE COMMUNITIES WHERE WE OPERATE.

We are doing our part to energize economic opportunity across FPL's service area through FPL's Office of Economic Development. Created in 2011, this one-stop resource for new and expanding businesses that are considering expansion in Florida has brought in dozens of new businesses from out of state, promoting Florida's economic growth. We're also committed to supporting local suppliers. In 2021, we spent more than $2.7 billion with suppliers in Florida, where our headquarters are located.

Powering Florida Resource Center

Launched in 2012, the Powering Florida Resource Center provides site selection experts with direct access to information about the state's workforce, real estate, utility rates, and potential discounts and incentives. In addition, it provides local economic development organizations in Florida with tailored data about their communities to help them better market their strengths and target potential businesses. Powering Florida works hand-in-hand with state and local organizations to keep Florida high on the list for growing businesses. A new resource center will re-launch later this year.



NextEra Energy welcomes entrepreneurs to its 35 Mules innovation hub, where they have the opportunity to develop their business ideas that support the energy and water industries. The inaugural class celebrated graduation in December 2021.

35 Mules innovation hub

Our 35 Mules in-house innovation hub helps entrepreneurs develop their game-changing ideas in energy, water and energy-adjacent industries into Florida-based businesses, further supporting the state's economic growth and stimulating the business environment. FPL launched the hub in February 2020 and received 70 applications from around the world. FPL chose six companies to join 35 Mules for its first cohort. The 13 founders had a dedicated workspace on FPL's Juno Beach campus for 15 months. During their time in the program, the startups raised $15 million in grant funding and venture capital, met with more than 150 NextEra Energy subject-matter experts, and received more than 200 hours of formal training in legal, marketing, human resources, customer discovery and more.

In March 2022, FPL welcomed its second cohort – 14 entrepreneurs in seven startup companies – into its program. These startups are in various industries, including maritime, industrial professional services, raw materials, asset and vegetation risk management, consumer electronics, cleantech, aviation and aerospace, and information technology. The program's unique name comes from FPL's humble beginnings in 1925, when a very unlikely patchwork of enterprises combined to form the precursor to NextEra Energy, including an ice plant, a sponge boat and 35 mules.

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GOVERNANCE

Our proven track record of delivering strong financial and operational performance begins with our foundation of sound corporate governance and oversight. Our board of directors is led both by our executive chairman and a lead independent director. The board has a broad range of skills and industry knowledge, as well as diversity with respect to age, gender, race, ethnicity and specialized experience.

Together, the board has brought diverse perspectives to lead NextEra Energy to successful results and create long-term value for our shareholders and stakeholders. For more details, please refer to the NextEra Energy 2022 Proxy Statement on the investor relations section of NextEra Energy's website. Page 8 of the proxy statement includes a summary of director qualifications and experience.

NextEra Energy Chairman, President and CEO John Ketchum and NextEra Energy Resources President and CEO Rebecca Kujawa talk with employees during a 2022 quarterly meeting.

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GOVERNANCE

Sustainability governance

Our approach to sustainability engages all levels of the company from the board of directors to our employees. Sustainable business practices are embedded throughout the company as we execute our long-term strategy.

Board of directors – With sustainability core to our business, the board's oversight of the development and execution of NextEra Energy's strategy includes providing oversight of issues which could impact the long-term sustainability of our company. Additionally, through annual in-depth strategy sessions and regular updates on each business, the board effectively oversees opportunities and risks, including those related to our ESG responsibilities.

Board committees – Each board committee oversees different areas of opportunities and risks related to sustainability and communicates key findings to the full board.

Chief executive officer – Our chairman, president and CEO has ultimate responsibility for the company's sustainability performance and long-term success.

Executive leadership – As our leaders execute our long-term growth plan and key initiatives, they implement our sustainability vision. Leaders are responsible for achieving specific goals tied to sustainability as we deliver long-term value.

Sustainability executive steering committee and sustainability council – Composed of key business unit representatives across the organization, the council focuses on proactively addressing sustainability issues and policies and driving strategic initiatives across the company. The council reports to, and receives feedback from, the executive steering committee quarterly. In 2021, we updated the executive steering committee charter by adding another layer of senior executive oversight. Twice a year, the executive steering committee chair reports to the sustainability lead team, made up of the executive vice president of finance and CFO, executive vice president and general counsel and the executive vice president of human resources and corporate services.

Employees – By delivering on their goals and objectives, our employees are key to driving our company's sustainability efforts and delivering value to all stakeholders.

GOVERNANCE HIGHLIGHTS*

- **11 of 12 directors** are independent.
- Balance of new and experienced directors, with **tenure of current directors averaging nine years**.
- **Two of the four** new independent directors added since 2018 **were women or ethnically diverse**.
- **Added nine new independent directors** in the last 10 years and have a **specified retirement age** for directors.
- **Four of 12 directors are women or ethnically diverse** and average age of directors is 65.

COMPENSATION ALIGNED WITH SUSTAINABILITY

Senior executive compensation is tied directly to performance that drives long-term shareholder value. Our senior executive compensation program includes goals tied to sustainability, a variety of which have been included as compensation metrics since 2001. Current senior executive compensation metrics include:

Environment	Social	Governance / Operations
Renewable energy – To maintain our position as the world's leading renewables developer, compensation is tied to completing the development and construction of our wind, solar and storage projects on schedule and on budget, as well as adding significant new wind, solar and storage opportunities to our backlog to support future growth. Implementing our renewables development strategy has led to significant emissions reductions for our company and our customers.	**Customer value proposition** – To emphasize the delivery of a sustainable outstanding customer value proposition, compensation metrics include O&M costs per retail MWh, capital expenditures, service reliability and customer satisfaction scores. These metrics are intended to drive the delivery of low bills, high reliability, clean energy solutions and outstanding customer service.	**Operational performance** – Intended to support efficient and reliable delivery of clean energy to our customers, these metrics include availability metrics across the generation fleets and reliability metrics for the transmission and distribution grid.
Environmental events – To support our commitment to the environment, metrics include achieving zero significant environmental violations across all of our businesses.	**Safety** – Safety is a company priority. We include the number of OSHA recordable incidents in our compensation metrics to emphasize our focus on a zero accident workplace.	**Nuclear safety and reliability** – To prioritize the highest levels of nuclear safety and reliability, compensation metrics include the nuclear fleet's performance against industry-wide operating performance measures, as measured by a third party.

*As of August 2022.

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BOARD OF DIRECTORS' ESG OVERSIGHT

Audit Committee
- Oversees compliance with legal and regulatory requirements and Code of Business Conduct and Ethics.
- Oversees external and internal auditors.
- Oversees preparation of financial statements in accordance with Generally accepted accounting principles (GAAP) standards.
- Reviews and discusses with management the company's major financial risk exposures.
- Ensures that major risks identified are reviewed by the board or a board committee.

Governance and Nominating Committee
- Oversees board composition, refreshment and diversity.
- Political engagement oversight.
- Makes recommendations to the board on the business of the Annual Meeting of Shareholders.
- Oversees evaluation of the board.

Finance and Investment Committee
- Oversees capital spending and financing plans.
- Reviews financing strategies, financial policies and the use of financial instruments, including derivatives.
- Reviews energy trading and marketing operations.
- Recommends annual dividend policy.

Nuclear Committee
- Oversees safety, reliability and quality of nuclear operations.
- Reviews long-term strategies and plans related to nuclear operations.

Compensation Committee
- Approves compensation program, including incentive compensation goals tied to sustainability and other ESG-related goals.
- Approves selection of corporate peer group for compensation benchmarking.
- Assesses risks related to employee compensation programs.



NextEra Energy board of directors, as of August 2022, row 1, from left: Sherry Barrat, lead director, James Camaren, Kenneth Dunn, and Naren Gursahaney. Row 2, from left: Kirk Hachigian, John Ketchum, Amy Lane and David Porges. Row 3, from left: Rudy Schupp, John Skolds, John A. Stall and Darryl Wilson.

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Public policy advocacy

Since every aspect of our business is impacted by policy decisions at every level of government, it is particularly important for us to be involved in the political process. Our political engagement strategy helps support constructive political and regulatory environments throughout the U.S., which, in turn, should create long-term shareholder value. In Florida, a constructive regulatory environment is a key foundation to our regulated utility strategy of further improving our best-in-class customer value proposition through smart capital investments. At NextEra Energy Resources, local, state and federal regulations govern every aspect of our renewable energy development business.

Sound political engagement has supported NextEra Energy in becoming the world's leading generator of energy from the wind and sun. Without active political engagement, we believe that overall renewable development within the U.S. would have been significantly lower than current levels. Additionally, we believe that without active political engagement, we would be less successful in advancing our corporate strategies and creating long-term shareholder value.

The company believes our lobbying efforts are consistent with its corporate objective of being the world's leading clean energy company, which necessarily involves an evolving balance of considerations, including achieving our emissions-reduction targets. To the extent consistent with our objective, we aim for our lobbying and participation in trade associations to align with pursuing strategies that are consistent with the goal to keep global warming to less than 1.5 degrees Celsius over pre-industrial levels.

Our board's governance and nominating committee, composed entirely of independent directors, oversees our Political Engagement Policy. Among other requirements, the policy establishes clear accountability for all political engagement and for governance and nominating committee review, and public website disclosure, of all federal and state lobbying expenditures, significant trade association dues, and contributions made by the NextEra Energy PAC, among other pertinent information.

The policy also requires our general counsel to receive, and to report to the governance and nominating committee the status of, annual compliance certifications from our leaders having political engagement accountabilities. It also requires the vice president, government affairs – federal, annually to review significant trade association memberships to ensure that participation aligns with our strategy. Any policy positions taken by a trade association that may be in conflict with our core strategy and objectives will be reviewed with the chairman, president and CEO. For more information, please access our **Corporate Political Engagement Policy** on the investor relations section of our website.

Engaging our shareholders

We engage with shareholders on a regular basis and provide information through multiple channels. Our shareholder engagement efforts allow us to better understand our shareholders' priorities and perspectives and enable us to effectively address the issues that matter the most to our shareholders.

In 2021, we reached out to our 50 largest shareholders and offered to engage on ESG-related topics as well as any other topics of interest. We also reached out to shareholders not among our 50 largest who expressed an interest in engagement with us. We received positive feedback from and held engagements with shareholders representing over 35% of our shares outstanding. Our 2021 ESG report, diversity and inclusion strategy, emissions-reduction initiatives and renewable energy strategy were the main topics of these engagements.

Engaging our stakeholders

A stakeholder can be defined as an individual, group or institution that has a vested interest in how our company operates and manages economic, environmental and/or social issues and risks. At NextEra Energy, our stakeholders include employees, customers, government/agency officials, investors, shareholders, suppliers, consultants, environmental groups, members of the media, our business partners and nonprofit organizations that help the communities we serve.

We engage our stakeholders through various methods, including:

- Outreach meetings.
- Web, FPL Mobile App and email.
- Speaking engagements.
- Executive contact program.
- Social media.
- Customer care center.
- Open houses.
- Employee and customer surveys.
- Customer account satisfaction tracking.
- Materiality analysis.
- ESG reporting analysis.
- Direct mail.
- Government relations.
- Analyst meetings.
- Shareholder meetings.

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RISKS AND OPPORTUNITIES

Our approach to risk management starts with a strategic focus on preparedness and a disciplined capital allocation process. Preparedness, crisis planning and risk management are part of our culture. Our chairman, president and CEO, who also serves as our chief risk officer, and executive management are responsible for executing our long-term strategy while also monitoring opportunities and risks related to our strategy.

NextEra Energy's GridLiance West Transmission operates transmission assets in Clark County, Nev.

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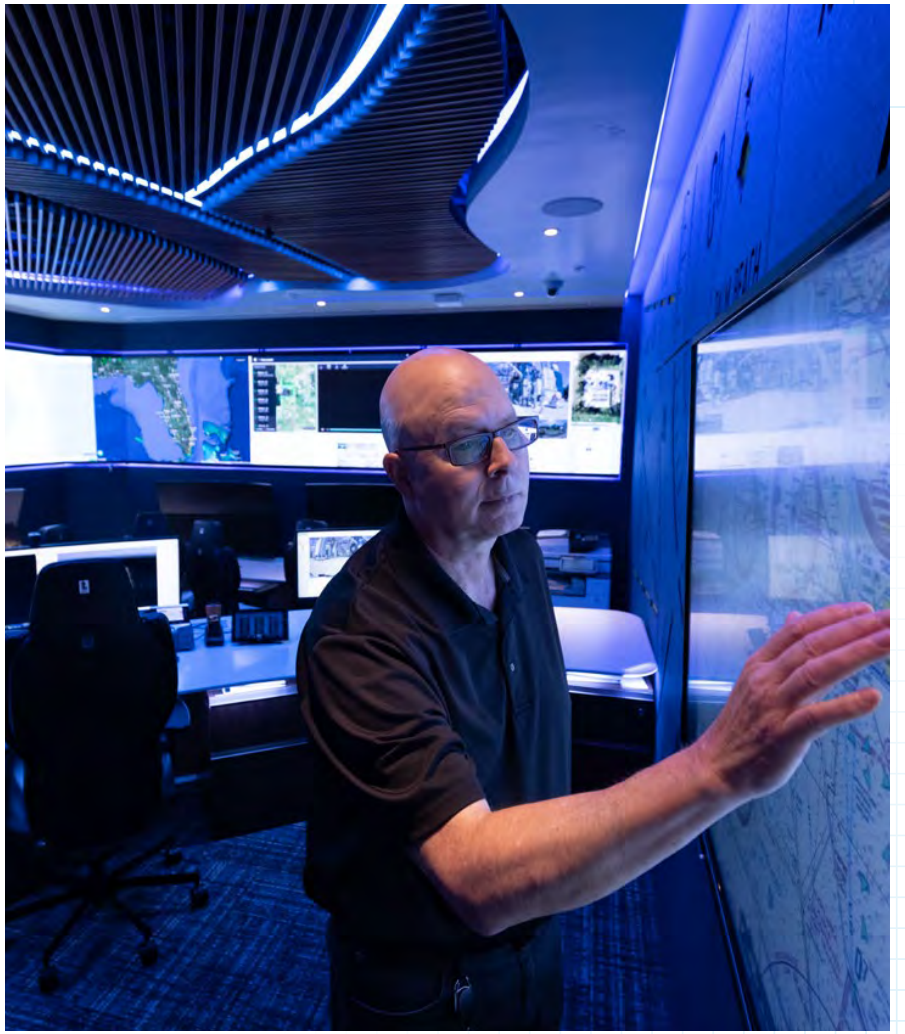
RISKS AND OPPORTUNITIES

Our corporate risk management committee provides oversight and support for our risk management activities. The committee consists of officers and key personnel from across the company. The committee meets four times per year and discusses risks and related mitigation activities, and performs detailed reviews of risks, as appropriate. Risks are assessed based on impact, probability and speed of onset. Representatives of the committee then meet twice a year with the risk lead team, which is comprised of the chairman, president and CEO, CFO and general counsel, to review and provide feedback on the results of the committee's work. The risk assessment activities and results are reported to the audit committee of the board of directors annually.

The corporate risk management committee has established relationships within the risk community and continuously works to ensure our risk program stays current and relevant. In 2021, the committee participated in enterprise risk management roundtables with companies both within and outside the utility industry. We also have an exposure management committee, which has policy oversight of the risk profiles of our energy marketing and trading and power marketing businesses. This committee meets monthly and is chaired by the CFO. The exposure management committee reviews all market, credit and operational issues associated with energy trading and reports to the finance and investment committee of the board of directors at least annually. It also reports to the audit committee on all matters of internal control and financial reporting associated with this business.

FPL IS BUILDING A STRONGER, SMARTER AND MORE RESILIENT ENERGY GRID THAT IMPROVES RELIABILITY IN GOOD WEATHER AND BAD, AND ENABLES FASTER POWER RESTORATION FOLLOWING EXTREME WEATHER EVENTS.

We employ a robust risk management process to all of our investment decisions. Our investment decisions are rooted in realistic assumptions, with appropriate sensitivity analyses, as needed, to ensure a data-driven decision-making process. Across all of our businesses there is a robust due diligence and project approval process intended to ensure that all significant risks have been identified and mitigated to the greatest extent possible. All significant investment decisions are reviewed and approved by NextEra Energy's operating committee, which is comprised of all senior executives and other executives from the various functional departments of each of our businesses. Investments of greater dollar value require additional authorizations, up to and including approval by the board's finance and investment committee and the full NextEra Energy board of directors, depending on the nature and amount of the investment.



Employee Phil Langworthy monitors our operating systems from the Power Delivery Diagnostic Center, which we do around the clock to keep the lights on for customers. The smartgrid technology allows for increased reliability for customers.

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Investments at our regulated utilities are guided through a well-established integrated resource planning process to determine the amount and timing of future generation needed to meet projected growth in energy load and demand. Our carbon footprint and potential climate-related risks are incorporated into this planning process. Different options are evaluated taking into account system economics, forecasted electric power demand, demand-side management, fuel prices, potential future climate policies, and the integration of low-cost, clean and reliable generation, including solar and battery energy storage solutions. Our capital allocation process at FPL is centered on enhancing the overall customer value proposition to deliver long-term customer benefits and the support of regulators for our investment decisions.

Review of NextEra Energy Resources' investment decisions begins with thorough due diligence by subject matter experts from nearly 20 key functional areas. These subject matter experts, who bring deep experience and expertise, help identify and assess the commercial, financial and operational feasibility of new project investment opportunities. We also have processes in place to ensure we are continuously learning from unforeseen challenges to improve future capital allocation decisions.

FPL and NextEra Energy Resources hold annual strategy sessions with business unit leadership across each organization to identify and review long-term goals, risks and opportunities. The results of these annual strategy sessions are reviewed with the board of directors to ensure key risks are identified and managed, and opportunities to enhance customer and shareholder value creation are pursued.

For the purposes of our risk management process, we do not view climate change as a discrete risk, but rather a potential stress multiplier to existing risks and opportunities already under consideration. For example, system disruption from a weather event is a long-standing risk that we have integrated into our risk-assessment process, and potential climate change projections for more frequent storms would be a multiplier for this risk category but not necessarily broken out as an incremental, separate impact. We also recognize that climate change may affect different parts of our business in different ways. We provide more details on our approach to managing environmental risks and our strategy under **Environment** in this report.

Preparing for storms, flooding and sea-level rise

Physical risks are reviewed as part of our corporate risk management process, including the risks of more frequent and severe storms, flooding and sea-level rise as a result of climate change. Our experience and history of managing hurricanes and natural disasters in Florida provides us with the skills and capabilities to remain focused on safety, execution and the importance of providing an essential service to our customers during these events.

FPL is building a stronger, smarter and more resilient energy grid that improves reliability in good weather and bad, and enables faster power restoration following extreme weather events. Since 2006, FPL has made significant investments in strengthening the energy grid to make it more resilient to severe weather. The deployment of innovative technology to help prevent outages and shorten restoration times when outages occur has enabled FPL to lower operating costs and improve reliability and resiliency. Specific investments in the FPL system include:

- Hardening or undergrounding power lines to better withstand higher winds to enhance service reliability and resiliency.
- Upgrading transmission line structures, replacing wood structures with concrete or steel, maintaining vegetation along more than 26,000 miles of power lines each year and inspecting all 1.4 million power poles within an eight-year cycle.
- Installing more than 200,000 intelligent devices that prevent power outages and shorten restoration times by automatically redirecting power, self-healing and minimizing customers affected, resulting in more than 10 million outages avoided over the last decade.
- Using drones equipped with artificial intelligence, machine learning and geospatial data so flights are fully autonomous, as well as developing in-house image recognition software to spot faulty equipment and prevent outages.

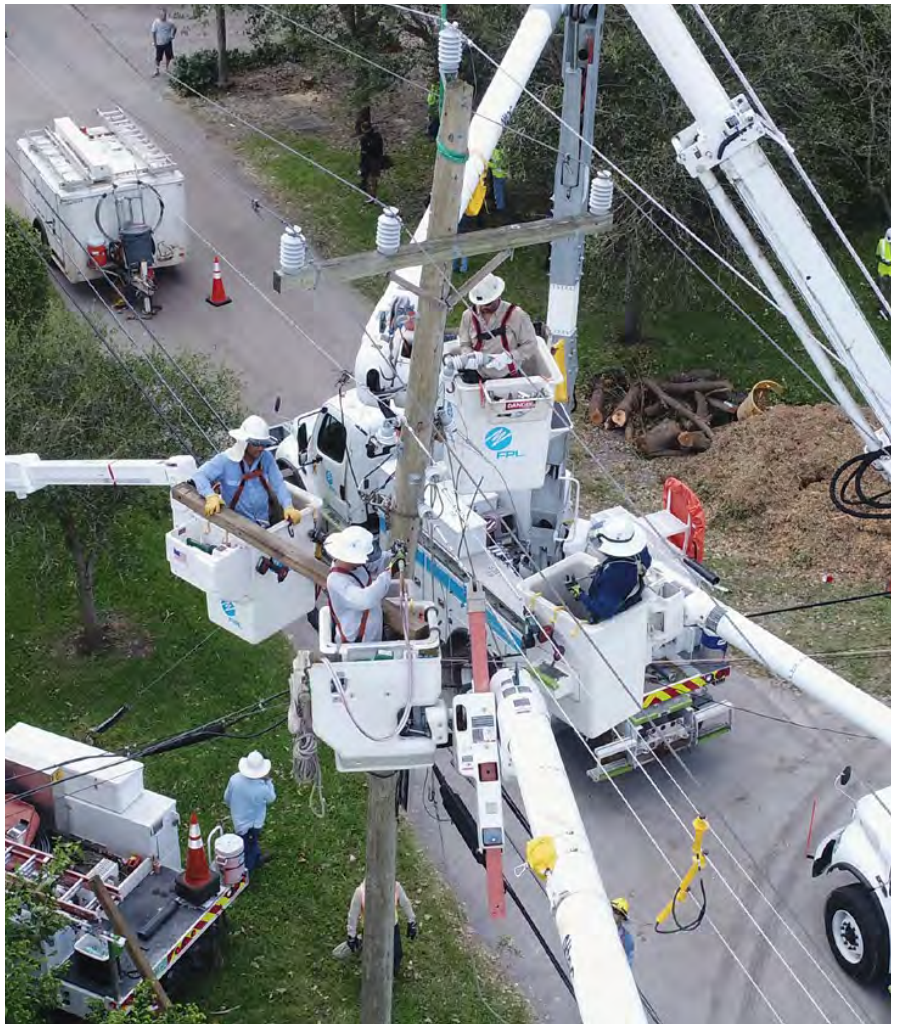


FPL crews work to restore power following a storm in West Palm Beach, Fla. Our emergency preparation efforts to strengthen the grid against storms and train for quick storm response increases reliability for our customers.

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FPL line workers work to repair damaged power lines in South Miami-Dade County, Fla., after Hurricane Irma, one of the Atlantic's strongest and costliest hurricanes.

Based on analysis of sea-level rise and flooding that FPL has completed in collaboration with many different government organizations, we have determined that near-term risk to our operations and facilities is low. Our Florida nuclear facilities are elevated 20 feet above sea level to protect against flooding and extreme storm surge. We expect to continue to make additional resiliency and reliability investments over the coming decades to mitigate any potential impacts to our system. Mitigation actions taken to date include:

» Installing pumps, flood control structures, monitoring sensors and raised equipment in high-risk flood zones.

» Designing our substation yards to meet the Federal Emergency Management Agency (FEMA) 100-year flood elevations.

» Deploying mobile substations and transformers, along with other equipment, that can be used to respond to flood or storm events.

» Hardening underground structures and using above-ground equipment in high-risk flood zones.

» Deploying innovative technology at locations more susceptible to storm surge, such as a temporary AquaDam we installed at one of FPL's coastal substations in North Florida.

OUR EXPERIENCE AND HISTORY OF MANAGING HURRICANES AND NATURAL DISASTERS IN FLORIDA PROVIDES US WITH THE SKILLS AND CAPABILITIES TO REMAIN FOCUSED ON SAFETY, EXECUTION AND THE IMPORTANCE OF PROVIDING AN ESSENTIAL SERVICE TO OUR CUSTOMERS DURING EXTREME WEATHER EVENTS.

A good example of how our storm hardening investments have created value for our customers is to compare the last two major hurricanes that hit FPL's service area: Hurricane Wilma in 2005 and Hurricane Irma in 2017. Although Irma was a more powerful storm, with nearly 50% greater damage potential than Wilma, FPL was able to reduce the average number of outage days per customer by 60%. Hurricane Irma was the largest hurricane event FPL has ever faced with more than 4.4 million, or nearly 90% of customers, losing power compared to roughly 3.2 million, or 75% of customers, due to Hurricane Wilma. As a result of our storm hardening investments, FPL improved restoration times, sustained less equipment damage, lost fewer poles and brought our generation facilities back faster than ever. These investments also avoided significant economic loss in FPL's service area and across Florida.

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Employee Sophia Eccleston joins other FPL team members participating in the company's annual storm drill in advance of the 2022 hurricane season.

Emergency preparedness

Preparedness and crisis management are part of what we do as a company. For nearly 70 years, we have conducted annual drills to prepare for all types of emergencies. It is this type of preparation to handle the unexpected that we believe will enable us to continue to deliver for our customers over the long-term, no matter what may come our way.

We are continuously monitoring and preparing for the unexpected and have teams in place that regularly test our systems, operations and people to ensure they are prepared to manage any emergency – whether it's a storm, cyber event, oil spill, capacity shortfall or even a global pandemic.

FPL conducts an annual week-long storm drill, which tests the response of employees to a hypothetical hurricane. These drills, which traditionally include local first responders, as well as state and federal officials, provide opportunities to demonstrate how we continuously improve and are ready to respond together with local and state partners to return life to normal for millions of Floridians in their greatest time of need. Every year, our drills are a commitment to push ourselves and improve upon our procedures when responding to a natural disaster. During the simulated exercises, FPL employees are evaluated on response and restoration efforts related to operations, logistics, communications and customer service, among other areas.

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The FPL Distribution Control Center is a state-of-the-art, Category 5-rated building that enhances FPL's ability to respond to natural disasters, as well as efficiently monitor thousands of smart devices and other equipment around the clock to prevent outages before they occur and to quickly respond and restore power when they do occur. FPL has improved its storm preparation and response capabilities by:

» Hardening, or strengthening, nearly all main power lines serving critical community facilities and services, such as police and fire stations, hospitals and 911 centers. In addition to being more storm-resilient, main power lines that have been hardened perform 50% better in day-to-day operations than those that are not hardened, which means fewer outages.

» Improving communication systems and capitalizing on smart grid technology to ensure efficient and accurate restoration information delivered to customers.

» Providing customers the ability to directly report a downed power line using smartphone technology, which speeds efforts to restore power.

We also participate in mutual assistance programs with other electric companies from across the nation, which allows us to bring in additional resources to quickly support our crews responding to major outage events. EEI honored FPL in 2021 with its Emergency Response Award for the company's efforts to help other utilities and customers recover after Hurricane Ida.

NUCLEAR SAFETY IS PARAMOUNT TO OUR BUSINESS OPERATIONS AND WE HAVE ROBUST SAFETY MEASURES ACROSS OUR NUCLEAR FLEET.

Nuclear safety

Our nuclear fleet is a critical part of our generation mix and one of the most cost-effective fleets in the industry, driven by a focus on innovation, lowering costs and commitment to excellence. Our nuclear fleet is a source of safe, reliable, clean and cost-effective baseload energy for customers and a key component of our Real Zero goal to provide emissions-free generation. Our operating nuclear units avoided the generation of more than 23.5 million tons of CO_2 in 2021, equivalent to removing about 4.6 million cars from the road annually. Nuclear safety is paramount to our business operations and we have robust safety measures across our nuclear fleet. The U.S. Nuclear Regulatory Commission (NRC) maintains and tracks a set of performance indicators as objective measures of nuclear safety performance for commercial U.S. nuclear plants.



Employee Andrew Watry is a nuclear chemist at Point Beach Nuclear Power Plant in Two Rivers, Wis.

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These indicators monitor the performance of initiating events, safety systems, fission product barrier integrity, emergency preparedness, occupational and public radiation safety and physical protection (security).

Our plants are designed to withstand physical attacks, as well as earthquakes and other natural events stronger than ever recorded in their respective regions. Site design at all of our nuclear sites provides extra protection against flooding and extreme storm surge, including all sites being elevated at least 20 feet above sea level. In collaboration with the nuclear industry, we created regional response centers that house pre-built equipment, located away from nuclear sites, that can be brought into any of our nuclear plants in response to a natural disaster at a site. We have made significant upgrades to our nuclear facilities, including:

» Installed high-capacity pumps to provide additional backup cooling water for safety systems.

» Pre-staged additional backup equipment in reinforced buildings on-site.

» Confirmed the ability of our plants to withstand extreme natural events, such as earthquakes, flooding and fires.

» Empowered our plant operators to shut down the plant within a matter of seconds, if necessary.

» Require one full week of training every six weeks for plant operators to prove their ability to safely operate the plant in a variety of worst-case scenarios that include earthquakes, severe storms, flooding, loss of power and loss of reactor core cooling.

Cybersecurity

We take security seriously at NextEra Energy – both at our facilities and online. We have a comprehensive cybersecurity monitoring program for all of our computer and data networks and are actively involved in cybersecurity-related matters, including establishing a cybersecurity culture at NextEra Energy and educating our employees about the importance of being cyber aware.

In 2021, all employees were required to complete a cybersecurity and data privacy training course focused on building techniques for maintaining cyber awareness at work, at home and while traveling.

We have made it a priority to protect our power networks and customer data from all forms of intrusion, including cyber incidents, that could threaten to disrupt operations or cause harm to customers. The safe, secure delivery of electrical service is paramount. Our comprehensive, defense-in-depth approach imposes security at every layer and our standards for cybersecurity exceed those set by the industry.



Ben Miron, who oversees the company's cybersecurity efforts, addresses employees during an annual cybersecurity summit.

NextEra Energy's audit committee receives regular reports on the key risks facing the company from a representative of the corporate risk committee and also receives frequent reports from the company's internal auditor about the results of reviews of cybersecurity and information security governance. The board of directors of the company annually receives a cybersecurity report from the company's chief information officer and its vice president, IT infrastructure and cybersecurity.

Various leading third parties periodically assess the company's alignment with the U.S. Department of Energy's Cyber Capability Maturity Model (C2M2) standard, which is the predominate cybersecurity framework for the U.S. electric utility industry. NextEra Energy has a comprehensive cybersecurity training program in which all employees receive education and training on prevention of cybersecurity problems and on privacy and data protection.

FPL performs annual internal cybersecurity drills with the participation of federal agencies (the U.S. Department of Homeland Security, U.S. Secret Service and the Federal Bureau of Investigation) to ensure readiness of the organization. FPL also participates with other electric utilities across the country in the North American Electric Reliability Corporation's (NERC) biennial GridEx exercise and in industry forums, such as Electricity Subsector Coordinating Council and NERC activities, to ensure lessons learned are applied.

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AWARDS AND RECOGNITIONS

» In 2022, NextEra Energy was again ranked No. 1 in the electric and gas utilities industry on Fortune's list of "Most Admired Companies" for the 15th time in 16 years. NextEra Energy is one of only two Florida-based companies to rank No. 1 in its industry across all sectors. NextEra Energy ranked No. 1 for eight of the nine rated attributes, including innovation, people management, use of corporate assets, quality of management, financial soundness, long-term investment value, quality of products/services and global competitiveness.

» In 2022 and 2021, NextEra Energy was named to Newsweek's list of America's Most Responsible Companies. NextEra Energy is the only Florida-based energy company on the list two years in a row. The award recognizes companies for their ESG efforts, among other attributes.

» In 2022, NextEra Energy was recognized by Forbes magazine as one of America's Best Employers for the sixth year.

» In 2022, NextEra Energy received the Business Group on Health's Best Employers Award for Excellence in Health & Well-Being for advancing employee well-being through comprehensive, innovative benefits and initiatives. NextEra Energy was specifically recognized for its focus on diversity and inclusion.

» In 2021, NextEra Energy received the U.S. Department of Labor's HIRE Vets Platinum Medallion award for our excellence in hiring and retaining veterans. The company has received the award every year since 2018.

» In 2021, NextEra Energy was recognized on Fortune's list of companies that "Change the World." NextEra Energy is the only U.S. gas and electric utility to be recognized. This is the second time that NextEra Energy has been recognized on Fortune's "Change the World" list. The annual list recognizes companies that have had a positive social impact through activities that are part of their core business strategy.

» In 2021, NextEra Energy was named to the first-ever list of TIME's 100 Most Influential Companies. The list highlights 100 businesses making an extraordinary impact around the world.

» In 2021, NextEra Energy was recognized by Institutional Investor for the best CEO and the best investor relations team in the utilities industry for the last six years in a row and the best CFO for the last three years.

» In 2021, FPL won the ReliabilityOne® National Reliability Excellence Award for the sixth time in the last seven years, presented by PA Consulting to the award recipient that has demonstrated sustained leadership, innovation and achievement in the area of electric reliability.

» FPL received the top ranking in the Southern U.S. among large electric providers, according to J.D. Power's 2021 Electric Utility Residential Customer Satisfaction Study℠ and 2021 Electric Utility Business Customer Satisfaction Study℠.

» NextEra Energy was assessed in 2021 as having best-in-class preparedness, according to S&P Global Ratings' ESG evaluation, reflecting our ability to identify long-term risks and develop and implement plans to transform these challenges into new opportunities, distinguishing the company from its peers amid the disruptive forces facing the industry. NextEra Energy's final ESG evaluation score, 86, is one of the highest rankings to be given by S&P Global Ratings to any corporate entity within the electric power industry.

» NextEra Energy received the third annual S&P Global Platts Energy Transition Award, for our leadership in environmental, social and governance, in 2020, the last year the special award was given by the organization.

» FPL was named a 2021 Business Customer Champion by Escalent, a top human behavior and analytics firm. FPL Escalent also named FPL among the 2021 Most Trusted Utility Brands. FPL ranked as the second most trusted electric provider in Florida. This is the eighth consecutive year the company was recognized by Escalent as being one of the nation's top-performing utilities.

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CONCLUSION

We have been making long-term strategic investments to build a business that is resilient and able to deliver for customers and shareholders. NextEra Energy's Real Zero goal is the next step in this journey and it lays out a clear path to reach zero-carbon emissions by no later than 2045. We believe that our ambition to reach Real Zero can and will be a game-changer, not only for customers, but also for the U.S. electric power sector and the entire U.S. economy.

We are committed to a carbon-free-emissions future and delivering outstanding value for our customers, supporting our communities and empowering our teams, all while generating significant shareholder value creation and doing the right thing for the environment.

The Cool Springs Solar Energy Center was commissioned at Bainbridge, Ga., in 2021.

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Sustainability Accounting Standards Board (SASB) Metrics

SASB topic	SASB accounting metric	2020	2021	Comments
Greenhouse Gas Emissions and Energy Resource Planning	1. Gross global scope 1 emissions 2. Percentage covered under emissions-limiting regulations and 3. Percentage covered under emissions-reporting regulations	1. 43,247,571 metric tons CO_2e 2. 0.07% 3. 100%	1. 42,353,376 metric tons CO_2e 2. 0.15% 3. 100%	NextEra Energy conducts business under regulatory regimes that require CO_2 rather than CO_2e reporting. The SASB metric reported here is CO_2e which includes emissions from power generation.
	GHG emissions associated with power deliveries	2,172,160 metric tons CO_2e	1,736, 579 metric tons CO_2e	The 2020 and 2021 numbers represent additional CO_2e for power purchased for customer load in Northwest Florida.
	Discussion of long-term and short-term strategy or plan to manage scope 1 emissions, emissions reduction target, and analysis of performance against those targets	Discussion within report	Discussion within report	See discussion in the following sections of this report: NextEra Energy's blueprint to reach Real Zero no later than 2045 and Confronting Climate Change Our strategy: A letter from our chairman, president and CEO Building the world's leading clean energy solutions provider Environment-Climate Change, decarbonization and Real Zero carbon-emissions reductions
	1. Number of customers served in markets with renewable portfolio standards and 2. Percentage fulfillment of RPS target by market	See comments	See comments	FPL serves approximately 5.8 million customer accounts in Florida. Florida does not have a state-level renewable portfolio standard (RPS) requirement. NextEra Energy Resources is a wholesale power generator for customers across the U.S. that includes utilities, retail electricity providers, power cooperatives, municipal electric providers and large industrial companies. NextEra Energy Resources operates in 38 states with mandatory renewable portfolio standards and an additional five states with voluntary renewable energy standards or targets.
Air Quality	Air emissions of the following pollutants: 1. NOx (excluding N_2O) 2. SOx 3. particulate matter (PM 10) 4. lead (Pb) 5. mercury (Hg) Percentage of each in or near areas of dense population	1. 8,453 metric tons 2. 1,183 metric tons 3. 959 metric tons 4. 0.36 metric tons 5. 0.03 metric tons	1. 10,525 metric tons 2. 840 metric tons 3. 964 metric tons 4. 0.61 metric tons 5. 0.05 metric tons	2021 SASB data set includes emissions from power generation. With the exception of cooling towers, auxiliary equipment is not included in the 2021 data set, as this represents less than 0.1% of emissions and is considered de minimis. All power plants are near areas of dense population based on the definitions of "near" and "dense." SOx is reported as SO_2. NOx and SO_2 numbers differ from other reported areas due reporting in metric tons versus short tons.

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Sustainability Accounting Standards Board (SASB) Metrics

SASB topic	SASB accounting metric	2020	2021	Comments
Water Management	1. Total water withdrawn 2. Total water consumed, percentage of each in regions of high or extremely high baseline water stress	1. 7,681,333, thousand cubic meters; 0.001% 2. 118,814 thousand cubic meters; 0.07%	1. 7,339,262 thousand cubic meters; 0.001% 2. 117,079 thousand cubic meters; 0.08%	In 2021, NextEra Energy operated or had ownership share of 25 power generating sites across the U.S. that use water, but only one site is located in regions of high or extremely high water stress. Nearly 74% of the water we withdrew in 2021 came from saltwater sources. Water metrics reported reflect use for plant operations and use associated with decommissioning or closure of generating facilities. Water numbers differ from other reported areas due to the use of thousand cubic meters vs. billions gallons.
	Number of incidents of non-compliance associated with water quality and/ or quantity permits, standards, and regulations	0	1	In 2021, the Cape Canaveral Energy Center exceeded its permitted allowable *Once Through Cooling Water Chlorine Dioxide Injection* limit, resulting in an Environmental Reportable Event. Procedures were put into place after the event to ensure future compliance.
	Description of water management risks and discussion of strategy and practices to mitigate those risks	Description within report and on the sustainability website	Description within report and on the sustainability website	See discussion in the following sections of this report: Environment - Water Availability
Coal Ash Management	Amount of coal combustion residuals (CCR) generated, percentage recycled	169,771 metric tons; 93% recycled	144,706 metric tons 91% recycled	In 2021, NextEra Energy did not operate any facilities that generated CCR but has a co-owner share of two that do.
	Total number of CCR impoundments, broken down by hazard potential classification and structural integrity assessment	4	4	NextEra Energy has interest in four CCR impoundments, with two of these impoundments undergoing closure. While there are three surface impoundments that are regulated under the federal CCR regulation found at 40 CFR 257.50-107, there are four impoundments that meet the broader definition in 40 CFR 257.2 referenced within the SASB standards. Each has been ranked using the EPA hazard potential classification. There are one Low Hazard, two Significant Hazard and one High Hazard. All four had the highest structural integrity assessment rating of Satisfactory in 2021.

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Sustainability Accounting Standards Board (SASB) Metrics

SASB topic	SASB accounting metric	2020	2021	Comments
Energy Affordability	Average retail electric rate for 1. residential, 2. commercial and 3. industrial customers	FPL Retail electric rates: 1. Residential $0.1044/kWh 2. Commercial $0.0805/kWh 3. Industrial $0.0569/kWh Gulf Power Retail electric rates: 1. Residential $0.1357/kWh 2. Commercial $0.1057/kWh 3. Industrial $0.0722/kWh	FPL Retail electric rates: 1. Residential $0.1122/kWh 2. Commercial $0.0880/kWh 3. Industrial $0.0636/kWh Gulf Power Retail electric rates: 1. Residential $0.1395/kWh 2. Commercial $0.1085/kWh 3. Industrial $0.0831/kWh	
	Typical monthly electric bill for residential customers for 1. 500 kWh and 2. 1,000 kWh of electricity delivered per month	FPL: 1. 500 kWh $52.50 2. 1,000 kWh $94.38 Gulf Power: 1. 500 kWh $80.06 2. 1,000 kWh $140.43	FPL: 1. 500 kWh $55.79 2. 1,000 kWh $101.70 Gulf Power: 1. 500 kWh $79.81 2. 1,000 kWh $139.89	
	Discussion of impact of external factors on customer affordability of electricity, including the economic conditions of the service territory	Discussion within report	Discussion within report	See discussion in the following sections of this report and the sustainability website: Florida Power & Light Company Affordable Energy Economic Development

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Sustainability Accounting Standards Board (SASB) Metrics

SASB topic	SASB accounting metric	2020	2021	Comments
Workforce Health and Safety	1. Total recordable incident rate (TRIR), 2. fatality rate and 3. near miss frequency rate (NMFR)	1. 0.39 2. 0.00 3. N/A	1. 0.33 2. 0.00 3. N/A	NextEra Energy does not track NMFR in a comparable manner as SASB guidelines. OSHA recordable rate (TRIR) is the metric used in senior leadership compensation goals; goal for senior leadership is top decile performance.
End-Use Efficiency and Demand	Percentage of electric utility revenues from rate structures that 1. are decoupled and 2. contain a lost revenue adjustment mechanism (LRAM)	Not applicable	Not applicable	
	Percentage of electric load served by smart grid technology	99%	99%	
	Customer electricity savings from efficiency measures, by market	Discussion within report	Discussion within report	See discussion in the following sections of this report: Florida Power & Light Company Affordable Energy
Nuclear Safety and Emergency Management	Total number of nuclear power units, broken down by U.S. Nuclear Regulatory Commission (NRC) Action	All eight nuclear power units are 'licensee response' classification under U.S. Nuclear Regulatory Commission Action	All eight nuclear power units are 'licensee response' classification under U.S. Nuclear Regulatory Commission Action	U.S. Nuclear Regulatory Commission Action Matrix Includes Duane Arnold nuclear power unit, which is in the process of decommissioning
	Description of efforts to manage nuclear safety and emergency preparedness	Description within report	Discussion within report	See discussion in the following section of this report: Nuclear safety
	Number of incidents of non-compliance with physical and/or cybersecurity standards or regulations	Description within report	Description within report	See discussion in the following section of this report: Cybersecurity

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Sustainability Accounting Standards Board (SASB) Metrics

SASB topic	SASB accounting metric	2020	2021	Comments
Grid Resiliency	1. System Average Interruption Duration Index (SAIDI) 2. System Average Interruption Frequency Index (SAIFI) 3. Customer Average Interruption Duration Index (CAIDI), inclusive of major event days	FPL: 1. SAIDI: 48.5 2. SAIFI: 0.87 3. CAIDI: 56.26 Gulf Power: 1. SAIDI: 50.26 2. SAIFI: 0.81 3. CAIDI: 61.71	FPL: 1. SAIDI: 45.6 2. SAIFI: 0.82 3. CAIDI: 55.29 Gulf Power: 1. SAIDI: 42.8 2. SAIFI: 0.63 3. CAIDI: 94.34	Metric is exclusive of major event days and is based on how reported to Florida Public Service Commission for all of power delivery (transmission and distribution).

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APPENDIX B

Task Force on Climate-Related Financial Disclosures

Section	Recommended Disclosure	NextEra Energy Response
Governance	Describe the board's oversight of climate-related risks and opportunities.	Confronting climate change - Governance Sustainability governance Our approach to risk management
	Describe management's role in assessing and managing climate-related risks and opportunities.	Confronting climate change - Governance Sustainability governance Our approach to risk management
Strategy	Describe the climate-related risks and opportunities identified over the short, medium and long term.	Confronting climate change - Strategy Risks and opportunities Florida Power & Light Company NextEra Energy Resources
	Describe the impact of climate-related risks and opportunities on the businesses, strategy and financial planning.	Confronting climate change - Strategy Our approach to risk management
	Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2 degree Celsius or lower scenario.	Confronting climate change - Strategy Our approach to risk management 2022 FPL Ten-Year Site Plan
Risk Management	Describe the processes for identifying and assessing climate-related risks.	Confronting climate change - Risk management Risks and opportunities
	Describe the processes for managing climate-related risks.	Confronting climate change - Risk management Risks and opportunities
	Describe how processes for identifying, assessing and managing climate-related risks are integrated into the overall risk management process.	Confronting climate change - Risk management Risks and opportunities
Metrics and Targets	Disclose the metrics used to assess climate-related risks and opportunities in line with strategy and risk management processes.	Confronting climate change - Metrics and targets Environment Environment - Climate change and reducing emissions
	Disclose scope 1, 2 and, if appropriate, 3 GHG emissions and related risks.	Sustainability Accounting Standards Board (SASB) Metrics 3rd-Party Verification Statement
	Describe the targets used to manage climate-related risks and opportunities and performance against targets.	Environment - Climate change and reducing emissions

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APPENDIX C

EEI ESG/Sustainability Quantitative Metrics

Parent Company: NextEra Energy, Inc. (NextEra Energy)

Principal Operating Companies: Florida Power & Light Company (FPL) and NextEra Energy Resources, LLC and Gulf Power Company (2019 - 2021 data only)

	2005	2019	2020	2021
Owned Net Generation Capacity (MW)[1]				
Coal	915	2,554	1,351	717
Natural gas[2]	22,515	23,973	24,533	26,030
Nuclear	4,015	6,202	5,794	5,795
Oil	1,316	944	1,473	964
Renewable Energy Resources:	4,069	18,007	21,581	23,068
Hydroelectric	361	0	0	0
Landfill gas	0	3	3	3
Solar	148	3,894	5,505	6,548
Wind	3,192	14,110	16,073	16,517
Other	368	0	0	0
Owned Net Generation (MWh)				
Coal	6,065,258	6,923,744	4,417,826	4,439,180
Natural gas	59,752,003	99,230,129	103,070,751	99,680,103
Nuclear	29,745,644	51,118,396	49,869,793	46,943,053
Oil	23,828,305	222,347	160,427	293,419
Renewable Energy Resources:	9,385,224	49,890,065	58,688,356	69,932,925
Hydroelectric	1,811,409	0	0	0
Landfill gas	0	22,547	21,615	21,259
Solar	275,393	7,059,936	9,417,857	15,232,598
Wind	7,298,422	42,807,582	49,248,884	54,679,068
Capital Expenditures and Energy Efficiency (EE)[3]				
Annual Capital Expenditures (billions)[4]	$2.5	$12.3	$14.6	$15.9
Incremental Annual Electricity Savings from EE Measures (MWh)	Form EIA-861	Form EIA-861	Form EIA-861	Form EIA-861
Incremental Annual Investment in Electric EE Programs (thousands)	Form EIA-861	Form EIA-861	Form EIA-861	Form EIA-861
Retail Electric Customers				
Commercial	469,973	571,3812	576,672	641,831
Industrial	20,392	12,084	11,990	13,368
Residential	3,828,374	4,501,472	4,567,743	5,065,615

1) Solar capacity numbers for 2019, 2020 and 2021 include 75 MW of non-incremental thermal solar. 2019 coal and landfill capacity and generation increased due to the acquisition of Gulf Power. 2019 Natural Gas capacity increased due to the addition of Okeechobee Clean Energy Center (state-of-the art natural gas combined cycle power plant). This plant addition, along with NextEra Energy's acquisition of ownership share in natural gas power plants Oleander & Stanton, attributed to the increase in natural gas generation.
2) Some natural gas plants have the ability to use oil for additional fuel flexibility. In 2019, approximately 65% of NextEra Energy's natural gas capacity was dual-fuel capable. In 2020, approximately 68% of NextEra Energy's natural gas capacity was dual-fuel capable. In 2021, approximately 71% had dual fuel capability.
3) Per NextEra Energy 10K filings.
4) 2019 capital expenditures exclude capital expenditures related to the Gulf Power acquisition.

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EEI ESG/Sustainability Quantitative Metrics

Parent Company: NextEra Energy, Inc. (NextEra Energy)

Principal Operating Companies: Florida Power & Light Company (FPL), NextEra Energy Resources, LLC and Gulf Power Company (2019 - 2021 data only)

Emissions[5]	2005	2019	2020	2021
Carbon Dioxide (CO_2)[6]				
Owned Generation CO_2 Emissions (tons)	54,270,781	49,953,427	47,328,818	46,614,994
Owned Generation CO_2 Emissions Intensity (lbs/Net MWh)	843	482	438	422
Total Owned Generation CO_2 Emissions (MT)	49,233,638	45,317,000	42,935,994	42,288,462
Total Owned Generation CO_2 Emissions Intensity (MT/Net MWh)	0.260	0.219	0.199	0.191
Non-Generation CO_2e Emissions of Sulfur Hexafluoride (SF6)[7]				
Total CO_2e emissions of SF6 (MT)	--	--	43,731	19,579
Leak rate of CO_2e emissions of SF6 (MT/Net MWh)	--	--	0.000202	0.000088
Nitrogen Oxide (NOx)				
NOx Emissions (tons)	55,275	12,039	9,288	11,601
NOx Emissions Intensity (lbs/Net MWh)	0.86	0.12	0.09	0.11
Total NOx Emissions (MT)	50,145	10,922	8,426	10,525
Total NOx Emissions Intensity (MT/Net MWh)	0.0002651	0.0000527	0.0000390	0.0000476
Sulfur Dioxide (SO_2)				
SO_2 Emissions (tons)	121,480	2,482	1,142	926
SO_2 Emissions Intensity (lbs/Net MWh)	1.89	0.02	0.011	.008
Total SO_2 Emissions (MT)	110,205	2,252	1,036	840
Total SO_2 Emissions Intensity (MT/Net MWh)	0.000583	0.000011	0.000005	0.000004
Mercury (Hg)				
Hg Emissions (kg)	281	22	31	44
Hg Emissions Intensity (kg/Net MWh)	0.0000022	0.0000001	0.0000001	0.0000002

5) NextEra Energy conducts business under regulatory regimes that require CO_2 rather than CO_2e reporting. As a result, metrics may differ throughout the report in areas that report CO_2 from power generation only. This data includes emissions data for NextEra Energy-owned power plant sites, as well as joint ownership sites. Data for the joint ownership sites were adjusted to account for the company's ownership share only.
6) Purchased power is considered minimal, as this would make up less than 1% of emissions profile and is excluded from the EEI template.
7) As reported to the EPA in accordance with EPA's GHG Reporting Program (40 CFR Part 98, Subpart DD).

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EEI ESG/Sustainability Quantitative Metrics

Parent Company: NextEra Energy, Inc. (NextEra Energy)

Principal Operating Companies: Florida Power & Light Company (FPL), NextEra Energy Resources, LLC and Gulf Power Company (2019 - 2021 data only)

Resources	2005	2019	2020	2021
Human Resources				
Total Number of Employees	12,400	14,800	14,900	15,017
Percentage of Women in Total Workforce	Not reported	23%	24%	24%
Percentage of Minorities in Total Workforce	Not reported	36%	37%	39%
Total Number on Board of Directors	11	13	13	13[9]
Percentage of Women on Board of Directors	9%	23%	23%	15%
Percentage of Minorities on Board of Directors	18%	23%	15%	15%
Employee Safety - Recordable Incident Rate	2.40	0.62	0.39	0.33
Employee Safety - Work-related Fatalities	0	0	0	0
Fresh Water Resources used in Thermal Power Generation Activities[8]				
Water Withdrawals - Consumptive (Millions of Gallons)	21,061	26,960	22,178	21,112
Water Withdrawals - Non-Consumptive (Millions of Gallons)	341,107	476,694	475,507	481,040
Water Withdrawals - Consumptive Rate (Millions of Gallons/Net MWh)	0.0001385	0.0001298	0.0001024	0.0000942
Water Withdrawals - Non-Consumptive Rate (Millions of Gallons/Net MWh)	0.0022429	0.0022373	0.0021446	0.0021371
Waste Products				
Amount of Hazardous Waste Manifested for Disposal (tons)	Not tracked	1.1	0.8	1.3
Percent of Coal Combustion Products Beneficially Used	Not tracked	69%	93%	91%

8) Water metrics reported reflect use for plant operations and use associated with decommissioning or closure of generating facilities, except the rate metric. The rate metric only reflects water use for power generation per MWh. Water data may be periodically updated to incorporate improvements to our water data management system. With the development of our improved water data management system, the baseline for water data was adjusted to 2007.
9) Number of Board of Directors members reduced to 12, as of August 2022, following leadership transition.

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United Nations Sustainable Development Goals Metrics

Our business is aligned with global sustainability initiatives, particularly the United Nations Sustainable Development Goals (SDGs). The 17 goals and 169 targets provide a framework for governments, businesses and organizations to advance sustainable development. In 2021, we mapped our alignment with the SDGs to determine where our business most aligns with and contributes to supporting the goals. While nearly all of the SDGs are indirectly aligned with various aspects of our corporate strategies, we identified that our business strategy directly aligns with three priority SDGs (7, 9 and 13) and two additional SDGs (14 and 15) where our operations may make a significant contribution.

SDG	Our Approach	Section of Report
	Our investment in emissions-free and clean generation has reduced the impact on the air we breathe and demonstrates our commitment to environmental protection and stewardship. Our strategy is based on generating and delivering clean energy and building energy infrastructure that's reliable and affordable. We expect that our investments in emissions-free wind and solar generation, innovative battery storage technology, low-emissions natural gas generation, safe and emissions-free nuclear power, industry-leading energy efficiency programs and transmission lines designed to deliver energy where it's needed when it's needed will enable us to continue providing a wide range of benefits to our many valued stakeholders. » **FPL plans to install 12,626 MW of solar in Florida by 2031, expanding upon its earlier plan to install 30 million solar panels across the state of Florida. The company is on schedule to complete the installation of all 30 million by 2025 – five years ahead of schedule.** » **From 2022-2025, NextEra Energy Resources expects to bring online an additional 28-37 GW of clean, carbon-emissions-free renewable energy.** » **Our capital investments also will help us meet our near-term goal of reducing our CO_2 emissions rate 82% by 2030 from a 2005 baseline.** » **In 2022, NextEra Energy announced a commitment to achieve Real Zero carbon emissions by no later than 2045. This goal represents the most ambitious target set by any U.S. utility or power provider to-date.**	NextEra Energy's blueprint to reach Real Zero Florida Power & Light Company - Efficient generation and clean energy solutions NextEra Energy Resources - Positioned to decarbonize the U.S. economy Social - Affordable energy
	As one of the largest electric power and energy infrastructure companies in North America and a leader in the renewable energy industry, NextEra Energy is committed to building a sustainable energy future that is affordable, reliable and clean. NextEra Energy's Real Zero goal and ability to produce power with zero-carbon emissions will mean the customers we provide power to can meet their Net Zero goals faster, cheaper and easier. By investing in smart infrastructure and innovative clean energy solutions, we are helping to build a sustainable energy future that is affordable, reliable and clean. » **Over the past decade, we have invested ~$110 billion in infrastructure capital deployment, making us the largest U.S. infrastructure investor in the energy industry and one of the largest capital investors across any industry in the U.S. over this period.**	Florida Power & Light Company - Building America's smartest and strongest energy grid Florida Power & Light Company - Efficient generation and clean energy solutions NextEra Energy Resources - Positioned to decarbonize the U.S. economy Environment - Climate change, decarbonization and Real Zero carbon emissions reductions Social - Economic development

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SDG	Our Approach	Section of Report
	We believe that no company in any industry has done more to reduce carbon emissions and to confront climate change than NextEra Energy. Climate-related risks and opportunities have influenced our financial plan for capital expenditures, acquisitions and revenues, to respond to our customers' demands for clean and renewable energy. This has influenced our capital plan in executing our significant renewable energy deployment and grid hardening initiatives. » **NextEra Energy's Real Zero goal calls for a significant investment that strives to eliminate all scope 1 and scope 2 carbon emissions across its operations by no later than 2045.** » **NextEra Energy's plan would generate only carbon emissions-free energy from a diverse mixture of wind, solar, battery storage, nuclear, green hydrogen and other renewable sources.**	NextEra Energy's blueprint to reach Real Zero Florida Power & Light Company - Building America's smartest and strongest energy grid Environment - Climate change, decarbonization and Real Zero carbon emissions reductions Risks and Opportunities - Emergency preparedness Risks and Opportunities - Our approach to risk management Risks and Opportunities - Preparing for storms, flooding and sea-level rise
	Before we build any operating facility, we study the local ecosystem so that we can better understand what it takes to be a partner in its preservation and to be a good neighbor to all the species that live there. We carefully consider the presence of any threatened or endangered species, as well as significant wildlife corridors, wetlands or other ecologically important areas. We seek to minimize and mitigate the impact of our development before we begin a project, and once a project is operating, we continue to monitor potential impacts to biodiversity. » **In the 1980s, FPL initiated a crocodile management program at the Turkey Point Clean Energy Center. Our crocodile management program includes protecting these nesting areas, completing population surveys, conducting capture and spatial distribution surveys and regulating plant activity at night and during nesting season. In 2021, FPL biologists captured, tagged and released a record setting 565 hatchlings.** » **In an effort to positively benefit the health of Florida manatees, the NextEra Energy Foundation provided grants to the Florida Atlantic University (FAU) Foundation for the FAU Harbor Branch Experimental Seagrass Nursery and to the Florida Oceanographic Society to support seagrass research and onsite seagrass nursery operations.** » **At our Florida solar energy centers, we work with Audubon Florida and other local organizations to craft site-specific enhancement and preservation plans focused on providing habitat opportunities for birds, pollinators and other wildlife.**	Environment - Wildlife

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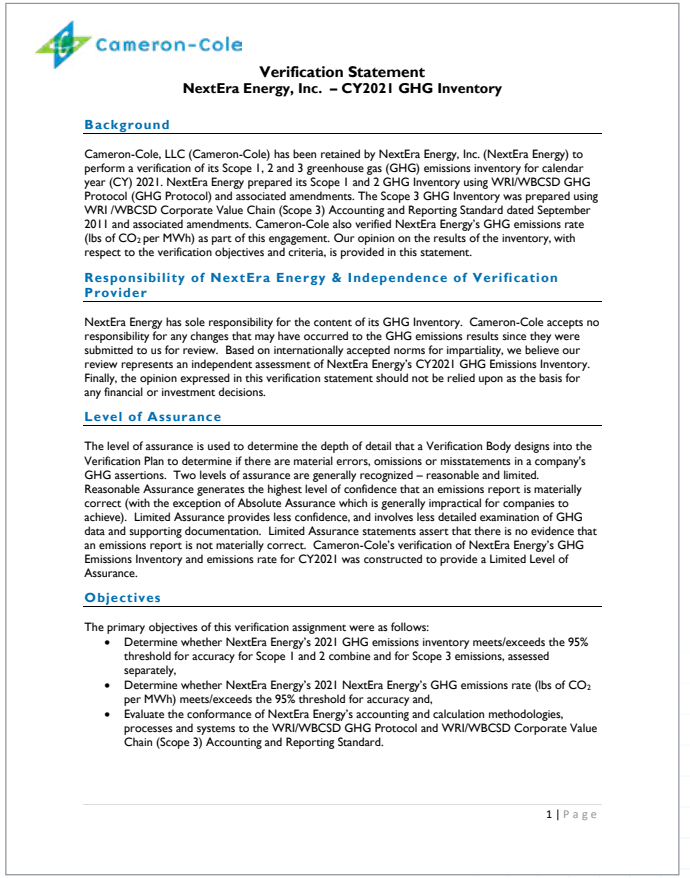
APPENDIX E

Emissions Data and Third-party Emissions Assurance Statements

2021 scope 1, scope 2 and scope 3 emissions inventory received independent third-party verification. The verification activities were conducted in alignment with the principles of ISO-14064-3:2006(E) specifications with Guidance for the Validation and Verification of Greenhouse Gas Assertions. Our GHG emissions rate (lbs of CO_2 per MWh) was also verified as part of this process.

Scope 1 emissions were reported for Stationary, Mobile, and Fugitive sources. Scope 2 (location-based) emissions were reported for office facilities (owned or leased), not served by FPL or Gulf Power. Emissions were estimated using actual kWh purchases (when available), sq. footage and a national average CO_2 emissions factor derived from electric sector emissions and generation data. Scope 2 (market-based) emissions were reported for office facilities (owned or leased) not served by FPL or Gulf Power. Emissions were estimated using actual kWh purchases (when available), sq. footage and Green-e Energy Residual Mix Emissions Rates (2018). Scope 3 emissions were reported as per GHG Protocol Scope 3 Standards for Category 3 (Fuel- and energy-related activities not included in scope 1 or scope 2), Category 6 (Business Travel) and Category 11 (Use of Sold Products).

	2021
Scope 1 emissions	43,027,155 metric tons CO_2e
Scope 2 emissions (location-based)	17,201 metric tons CO_2e
Scope 2 emissions (market-based)	17,872 metric tons CO_2e
Scope 3 emissions (fuel- and energy-related activities [not included in scope 1 or scope 2], business travel and use of sold products)	2,392,318 metric tons CO_2e
Emissions rate	422 lbs CO_2 per MWh



Cameron-Cole

Verification Statement
NextEra Energy, Inc. – CY2021 GHG Inventory

Background

Cameron-Cole, LLC (Cameron-Cole) has been retained by NextEra Energy, Inc. (NextEra Energy) to perform a verification of its Scope 1, 2 and 3 greenhouse gas (GHG) emissions inventory for calendar year (CY) 2021. NextEra Energy prepared its Scope 1 and 2 GHG Inventory using WRI/WBCSD GHG Protocol (GHG Protocol) and associated amendments. The Scope 3 GHG Inventory was prepared using WRI /WBCSD Corporate Value Chain (Scope 3) Accounting and Reporting Standard dated September 2011 and associated amendments. Cameron-Cole also verified NextEra Energy's GHG emissions rate (lbs of CO_2 per MWh) as part of this engagement. Our opinion on the results of the inventory, with respect to the verification objectives and criteria, is provided in this statement.

Responsibility of NextEra Energy & Independence of Verification Provider

NextEra Energy has sole responsibility for the content of its GHG Inventory. Cameron-Cole accepts no responsibility for any changes that may have occurred to the GHG emissions results since they were submitted to us for review. Based on internationally accepted norms for impartiality, we believe our review represents an independent assessment of NextEra Energy's CY2021 GHG Emissions Inventory. Finally, the opinion expressed in this verification statement should not be relied upon as the basis for any financial or investment decisions.

Level of Assurance

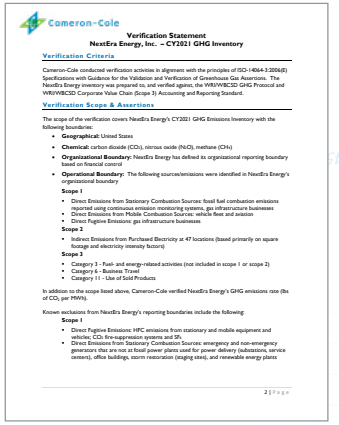
The level of assurance is used to determine the depth of detail that a Verification Body designs into the Verification Plan to determine if there are material errors, omissions or misstatements in a company's GHG assertions. Two levels of assurance are generally recognized – reasonable and limited. Reasonable Assurance generates the highest level of confidence that an emissions report is materially correct (with the exception of Absolute Assurance which is generally impractical for companies to achieve). Limited Assurance provides less confidence, and involves less detailed examination of GHG data and supporting documentation. Limited Assurance statements assert that there is no evidence that an emissions report is not materially correct. Cameron-Cole's verification of NextEra Energy's GHG Emissions Inventory and emissions rate for CY2021 was constructed to provide a Limited Level of Assurance.

Objectives

The primary objectives of this verification assignment were as follows:

- Determine whether NextEra Energy's 2021 GHG emissions inventory meets/exceeds the 95% threshold for accuracy for Scope 1 and 2 combine and for Scope 3 emissions, assessed separately,
- Determine whether NextEra Energy's 2021 NextEra Energy's GHG emissions rate (lbs of CO_2 per MWh) meets/exceeds the 95% threshold for accuracy and,
- Evaluate the conformance of NextEra Energy's accounting and calculation methodologies, processes and systems to the WRI/WBCSD GHG Protocol and WRI/WBCSD Corporate Value Chain (Scope 3) Accounting and Reporting Standard.

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Cameron-Cole

Verification Statement
NextEra Energy, Inc. – CY2021 GHG Inventory

Verification Criteria

Cameron-Cole conducted verification activities in alignment with the principles of ISO-14064-3:2006(E) Specifications with Guidance for the Validation and Verification of Greenhouse Gas Assertions. The NextEra Energy inventory was prepared to, and verified against, the WRI/WBCSD GHG Protocol and WRI/WBCSD Corporate Value Chain (Scope 3) Accounting and Reporting Standard.

Verification Scope & Assertions

The scope of the verification covers NextEra Energy's CY2021 GHG Emissions Inventory with the following boundaries:

- **Geographical:** United States
- **Chemical:** carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4)
- **Organizational Boundary:** NextEra Energy has defined its organizational reporting boundary based on financial control
- **Operational Boundary:** The following sources/emissions were identified in NextEra Energy's organizational boundary

Scope 1

- Direct Emissions from Stationary Combustion Sources: fossil fuel combustion emissions reported using continuous emission monitoring systems, gas infrastructure businesses
- Direct Emissions from Mobile Combustion Sources: vehicle fleet and aviation
- Direct Fugitive Emissions: gas infrastructure businesses

Scope 2

- Indirect Emissions from Purchased Electricity at 47 locations (based primarily on square footage and electricity intensity factors)

Scope 3

- Category 3 - Fuel- and energy-related activities (not included in scope 1 or scope 2)
- Category 6 - Business Travel
- Category 11 – Use of Sold Products

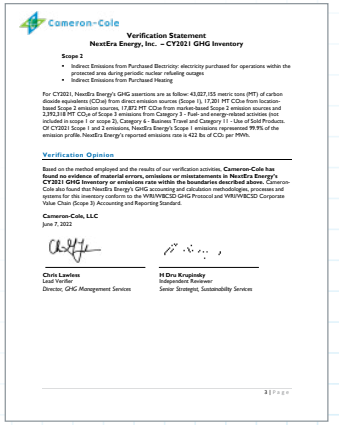
In addition to the scope listed above, Cameron-Cole verified NextEra Energy's GHG emissions rate (lbs of CO_2 per MWh).

Known exclusions from NextEra Energy's reporting boundaries include the following:

Scope 1

- Direct Fugitive Emissions: HFC emissions from stationary and mobile equipment and vehicles; CO_2 fire-suppression systems and SF6
- Direct Emissions from Stationary Combustion Sources: emergency and non-emergency generators that are not at fossil power plants used for power delivery (substations, service centers), office buildings, storm restoration (staging sites), and renewable energy plants

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Cameron-Cole

Verification Statement
NextEra Energy, Inc. – CY2021 GHG Inventory

Scope 2

- Indirect Emissions from Purchased Electricity: electricity purchased for operations within the protected area during periodic nuclear refueling outages
- Indirect Emissions from Purchased Heating

For CY2021, NextEra Energy's GHG assertions are as follow: 43,027,155 metric tons (MT) of carbon dioxide equivalents (CO_2e) from direct emission sources (Scope 1), 17,201 MT CO_2e from location-based Scope 2 emission sources, 17,872 MT CO_2e from market-based Scope 2 emission sources and 2,392,318 MT CO_2e of Scope 3 emissions from Category 3 - Fuel- and energy-related activities (not included in scope 1 or scope 2), Category 6 – Business Travel and Category 11 – Use of Sold Products. Of CY2021 Scope 1 and 2 emissions, NextEra Energy's Scope 1 emissions represented 99.9% of the emission profile. NextEra Energy's reported emissions rate is 422 lbs of CO_2 per MWh.

Verification Opinion

Based on the method employed and the results of our verification activities, **Cameron-Cole has found no evidence of material errors, omissions or misstatements in NextEra Energy's CY2021 GHG inventory or emissions rate within the boundaries described above.** Cameron-Cole also found that NextEra Energy's GHG accounting and calculation methodologies, processes and systems for this inventory conform to the WRI/WBCSD GHG Protocol and WRI/WBCSD Corporate Value Chain (Scope 3) Accounting and Reporting Standard.

Cameron-Cole, LLC
June 7, 2022

Chris Lawless
Lead Verifier
Director, GHG Management Services

M Dru Krupinsky
Independent Reviewer
Senior Strategist, Sustainability Services

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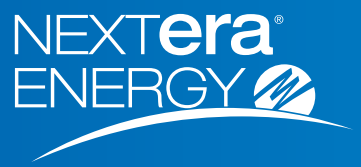
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FORWARD-LOOKING STATEMENTS

This report contains "forward-looking statements" within the meaning of the safe harbor provisions of the Private Securities Litigation Reform Act of 1995. Forward-looking statements are not statements of historical facts, but instead represent the current expectations of NextEra Energy, Inc. (together with its subsidiaries, NextEra Energy) regarding future operating results and other future events, many of which, by their nature, are inherently uncertain and outside of NextEra Energy's control. Forward-looking statements in this report include, among others, statements concerning adjusted earnings per share expectations and future operating performance, statements concerning future dividends, results of acquisitions, statements concerning the Real ZeroTM carbon emissions reduction goals and associated expectations, and statements regarding any impacts of, and the ability to arrive at acceptable mitigation measures in response to, trade-related laws and regulations including the U.S. Department of Commerce's decision to initiate an anti-circumvention investigation into the importation of solar panels from Malaysia, Vietnam, Thailand and Cambodia. In some cases, you can identify the forward-looking statements by words or phrases such as "will," "may result," "expect," "anticipate," "believe," "intend," "plan," "seek," "potential," "projection," "forecast," "predict," "goals," "target," "outlook," "should," "would" or similar words or expressions. You should not place undue reliance on these forward-looking statements, which are not a guarantee of future performance. The future results of NextEra Energy and its business and financial condition are subject to risks and uncertainties that could cause actual results to differ materially from those expressed or implied in the forward-looking statements, or may require it to limit or eliminate certain operations. These risks and uncertainties include, but are not limited to, those discussed in this report and the following: effects of extensive regulation of NextEra Energy's business operations; inability of NextEra Energy to recover in a timely manner any significant amount of costs, a return on certain assets or a reasonable return on invested capital through base rates, cost recovery clauses, other regulatory mechanisms or otherwise; impact of political, regulatory, operational and economic factors on regulatory decisions important to NextEra Energy; disallowance of cost recovery based on a finding of imprudent use of derivative instruments; effect of any reductions or modifications to, or elimination of, governmental incentives or policies that support utility scale renewable energy projects or the imposition of additional tax laws, tariffs, duties, policies or assessments on renewable energy or equipment necessary to generate it or deliver it; impact of new or revised laws, regulations, interpretations or constitutional ballot and regulatory initiatives on NextEra Energy; capital expenditures, increased operating costs and various liabilities attributable to environmental laws, regulations and other standards applicable to NextEra Energy; effects on NextEra Energy of federal or state laws or regulations mandating new or additional limits on the production of greenhouse gas emissions; exposure of NextEra Energy to significant and increasing compliance costs and substantial monetary penalties and other sanctions as a result of extensive federal regulation of its operations and businesses; effect on NextEra Energy of changes in tax laws, guidance or policies as well as in judgments and estimates used to determine tax-related asset and liability amounts; impact on NextEra Energy of adverse results of litigation; effect on NextEra Energy of failure to proceed with projects under development or inability to complete the construction of (or capital improvements to) electric generation, transmission and distribution facilities, gas infrastructure facilities or other facilities on schedule or within budget; impact on development and operating activities of NextEra Energy resulting from risks related to project siting, planning, financing, construction, permitting, governmental approvals and the negotiation of project development agreements, as well as supply chain disruptions; risks involved in the operation and maintenance of electric generation, transmission and distribution facilities, gas infrastructure facilities, retail gas distribution system in Florida and other facilities; effect on NextEra Energy of a lack of growth or slower growth in the number of customers or in customer usage; impact on NextEra Energy of severe weather and other weather conditions; threats of terrorism and catastrophic events that could result from terrorism, cyberattacks or other attempts to disrupt NextEra Energy's business or the businesses of third parties; inability to obtain adequate insurance coverage for protection of NextEra Energy against significant losses and risk that insurance coverage does not provide protection against all significant losses; a prolonged period of low gas and oil prices could impact NextEra Energy's gas infrastructure business and cause NextEra Energy to delay or cancel certain gas infrastructure projects and could result in certain projects becoming impaired; risk of increased operating costs resulting from unfavorable supply costs necessary to provide full energy and capacity requirement services; inability or failure to manage properly or hedge effectively the commodity risk within its portfolio; effect of reductions in the liquidity of energy markets on NextEra Energy's ability to manage operational risks; effectiveness of NextEra Energy's risk management tools associated with its hedging and trading procedures to protect against significant losses, including the effect of unforeseen price variances from historical behavior; impact of unavailability or disruption of power transmission or commodity transportation facilities on sale and delivery of power or natural gas; exposure of NextEra Energy to credit and performance risk from customers, hedging counterparties and vendors; failure of counterparties to perform under derivative contracts or of requirement for NextEra Energy to post margin cash collateral under derivative contracts; failure or breach of NextEra Energy's information technology systems; risks to NextEra Energy's retail businesses from compromise of sensitive customer data; losses from volatility in the market values of derivative instruments and limited liquidity in over-the-counter markets; impact of negative publicity; inability to maintain, negotiate or renegotiate acceptable franchise agreements; occurrence of work strikes or stoppages and increasing personnel costs; NextEra Energy's ability to successfully identify, complete and integrate acquisitions, including the effect of increased competition for acquisitions; environmental, health and financial risks associated with ownership and operation of nuclear generation facilities; liability of NextEra Energy for significant retrospective assessments and/or retrospective insurance premiums in the event of an incident at certain nuclear generation facilities; increased operating and capital expenditures and/or reduced revenues at nuclear generation facilities resulting from orders or new regulations of the Nuclear Regulatory Commission; inability to operate any of NextEra Energy's owned nuclear generation units through the end of their respective operating licenses; effect of disruptions, uncertainty or volatility in the credit and capital markets or actions by third parties in connection with project-specific or other financing arrangements on NextEra Energy's ability to fund its liquidity and capital needs and meet its growth objectives; inability to maintain current credit ratings; impairment of liquidity from inability of credit providers to fund their credit commitments or to maintain their current credit ratings; poor market performance and other economic factors that could affect NextEra Energy's defined benefit pension plan's funded status; poor market performance and other risks to the asset values of nuclear decommissioning funds; changes in market value and other risks to certain of NextEra Energy's investments; effect of inability of NextEra Energy subsidiaries to pay upstream dividends or repay funds to NextEra Energy or of NextEra Energy's performance under guarantees of subsidiary obligations on NextEra Energy's ability to meet its financial obligations and to pay dividends on its common stock; the fact that the amount and timing of dividends payable on NextEra Energy's common stock, as well as the dividend policy approved by NextEra Energy's board of directors from time to time, and changes to that policy, are within the sole discretion of NextEra Energy's board of directors and, if declared and paid, dividends may be in amounts that are less than might be expected by shareholders; NextEra Energy Partners, LP's inability to access sources of capital on commercially reasonable terms could have an effect on its ability to consummate future acquisitions and on the value of NextEra Energy's limited partner interest in NextEra Energy Operating Partners, LP; effects of disruptions, uncertainty or volatility in the credit and capital markets on the market price of NextEra Energy's common stock; and the ultimate severity and duration of public health crises, epidemics and pandemics, and its effects on NextEra Energy's business. NextEra Energy discusses these and other risks and uncertainties in its annual report on Form 10-K for the year ended December 31, 2021 and other Securities and Exchange Commission (SEC) filings, and this report should be read in conjunction with such SEC filings. The forward-looking statements made in this report are made only as of the date of this report and NextEra Energy undertakes no obligation to update any forward-looking statements.

Oliver IV T-Line 000190



NextEra Energy, Inc.
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For more information:
NextEraEnergy.com
FPL.com
NextEraEnergyResources.com

AUGUST 2022

Appendix B

Studies and Assessments

Appendix B1. Cultural Resources Summary

Burns & McDonnell
3255 Greensboro Dr.
Suite 104
Bismarck, ND 58503

Archaeology Survey Report Summary

To	Oliver Wind IV, LLC
Subject	Oliver Wind IV 345-kV Transmission Line Class III: Intensive Archaeological Resource Inventory Summary Oliver and Mercer Counties, North Dakota
From	Burns & McDonnell Engineering Company, Inc.
Date	September 13, 2023

Introduction and Purpose

Oliver Wind IV, LLC (Oliver Wind IV), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC, proposes to construct the Oliver Wind IV Transmission Line (Project). The Project consists of approximately 19.5 miles (mi) of new 345-kilovolt (kV) overhead transmission line on leased private property in Oliver and Mercer Counties, North Dakota. The Project will convey power from the Oliver Wind IV Energy Center (Wind Energy Center) substation in Oliver County to the interconnection point at the new Basin Electric Power Cooperative Leland Olds 345-kV Substation in Mercer County.

The Project will require a Certificate of Corridor Compatibility and Transmission Facility Route Permit from the North Dakota Public Service Commission; therefore, the Project is subject to the review of the State Historical Society of North Dakota (SHSND) under North Dakota Century Code Section 49-22-09. The purpose of this investigation is to provide the necessary information for SHSND review by confirming the presence or absence of archaeological sites within the survey corridor, which included a 200 foot (ft) or 60.96 meter (m) wide corridor around the proposed transmission line route, an 8.5 ac (3.44 ha) and a 10 ac (4.05 ha) area for construction laydown yards, and a number of 30 ft (9.14 m) wide off right-of-way access roads (Survey Corridor, see Figures 1 and 2).

In 2019 and 2020, AECOM completed a Class III: Intensive Cultural Resource Inventory for approximately 811.87 ac (328.55 ha) (see North Dakota State Historic Preservation Office [NDSHPO] manuscript number 019278 for details). The report for these inventories received SHSND concurrence on July 14, 2021 (Attachment A). Further Class III inventories were completed by Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) for an approximately 2 mi reroute, small route shifts, the inclusion of pulling and tensioning and guy wire easements, and for altered off right-of-way access roads. The additional inventories occurred between April 2022 and August 2023 and the additional Survey Corridor totaled 188.9 ac (76.45 ha).

Results

A Class I: Literature Review was performed by AECOM in May 2019 and January 2020, and updated reviews were completed by Burns & McDonnell in November 2021 and March 2023. The literature reviews identified one Native American site lead, two Euro-American site leads, 12 Native American sites, and one architectural site partially within the Project Survey Corridor.

During the additional Class III: Intensive Cultural Resource Inventory, Burns & McDonnell documented three Native American isolated finds and seven Native American sites. A total of 93 shovel test probes were

completed in medium to high probability areas of the Survey Corridor with low ground visibility or at isolated finds to determine presence or absence of subsurface artifacts.

A survey for Sites of Religious and Cultural Significance to Tribes (SRCSTT) was also undertaken for the updated Project by Traditional Cultural Surveyors (TCS) from Rosebud Sioux Tribe, Turtle Mountain Band of Chippewa Indians, Northern Cheyenne Tribe, Northern Arapaho, Standing Rock Sioux Tribe, and the Spirit Lake Sioux Tribe. Thirteen SRCSTT were documented and recorded on NDSHPO Cultural Heritage Forms by Burns & McDonnell on behalf of the participating tribes.

Recommendations

A total of 17 Native American isolated finds, 12 Native American sites, one Euro-American site, two sites of unknown association, one multicomponent site with both a Native American and a Euro-American component, and 18 SRCSTT documented by AECOM and TCS in 2019 and 2020 remain within the planned Project Right-of-Way (ROW). Additionally, one Native American site and two SRCSTT documented by Burns & McDonnell and TCS in 2022 and 2023 remain within the planned Project ROW. Burns & McDonnell or AECOM also updated 13 previously recorded Native American sites identified during the Class I: Literature Review.

Burns & McDonnell recommends avoidance of all cultural resources that are potentially eligible for listing on the NRHP, sites deemed culturally sensitive, or sites that have not been evaluated for eligibility following the guidelines outlined by the NDSHPO. For this investigation, Oliver Wind IV has committed to avoiding effects to archaeological resources that could be considered archaeologically or culturally significant. In the absence of a formal evaluation of the significance of the identified archaeological resource, Burns & McDonnell recommends that resources, with the exception of isolated finds, be avoided. It is Burns & McDonnell's understanding that the current proposed infrastructure incorporates all recommended avoidance buffers. If the Project is redesigned in such a way that a resource cannot be avoided, Burns & McDonnell recommends additional investigations that would constitute formal evaluation of site significance.

Burns & McDonnell is not recommending avoidance for all 17 isolated finds, as it was determined through pedestrian survey and shovel test probes that the areas contained low artifact density with little to no potential to produce intact subsurface deposits or important information.

Recommended avoidance buffers for resources within the Project ROW vary and have been determined based on two primary factors: the probability, based on the nature of the resource, the topography, and the extent of shovel test probes in the surrounding area, that the resource retains a subsurface component that extends beyond the identified boundary of the resource, and the predicted likelihood, based on the surrounding topography, that earthmoving near the resource would have the potential to indirectly contribute to damage to the resource through erosion.

Burns & McDonnell is recommending avoidance but no further buffer of one previously documented Native American site and one previously documented Euro-American site, as well as for one newly recorded Native American site and one newly recorded Euro-American site.

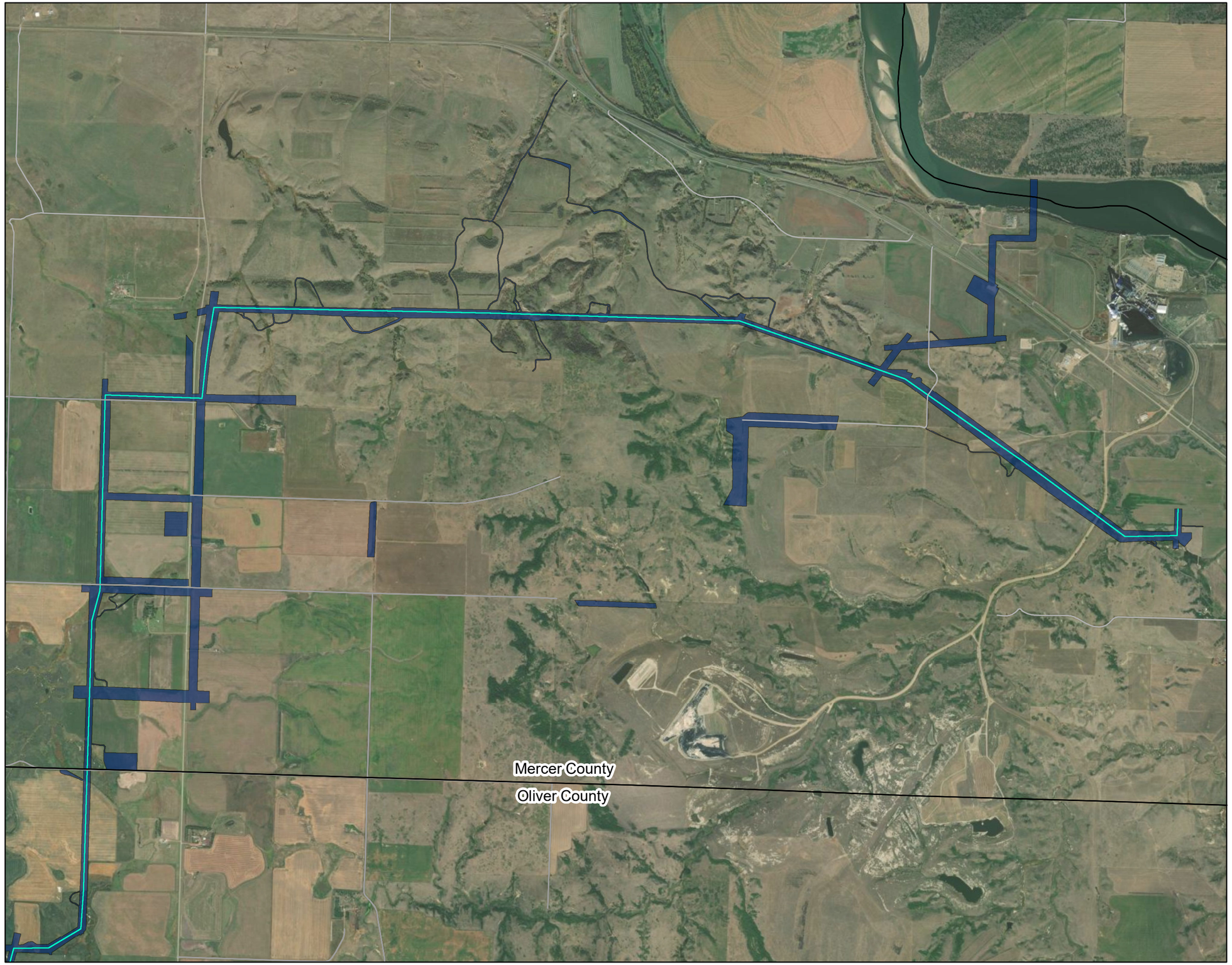
Burns & McDonnell is recommending a 10 ft avoidance buffer for two previously recorded Native American sites and two newly documented Native American sites, and a 25 ft avoidance buffer for five of the previously recorded Native American sites, seven of the newly recorded Native American sites, and the two sites of unknown cultural association.

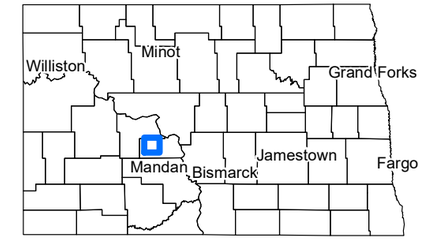
Burns & McDonnell is recommending a 50 ft avoidance buffer for two previously recorded Native American sites, one newly documented Native American site, and one newly documented multi-component site, as well as a 150 ft avoidance buffer for one previously documented Native American site.

Per the recommendation of the participating tribes, all SRCSTT should be considered eligible for the NRHP, and avoidance is recommended.

If these sites and their associated avoidance buffers can be avoided during construction, then Burns & McDonnell recommends a determination of No Significant Sites Affected, as documented and mapped in the current Class III: Intensive Cultural Resource Inventory report. If areas beyond the combined Survey Corridor are to be used during construction, Burns & McDonnell recommends completion of an addendum Class III: Intensive Cultural Resource Inventory to determine the presence or absence of cultural resources within these areas. The Class III 2022/2023 report will be submitted to NDSHPO once complete, and concurrence will be obtained prior to construction of the Project. Once the NDSHPO concurrence letter is received it will be submitted to the Commission.

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Legend

- County Road
- Transmission Centerline
- County Boundary
- Survey Corridor

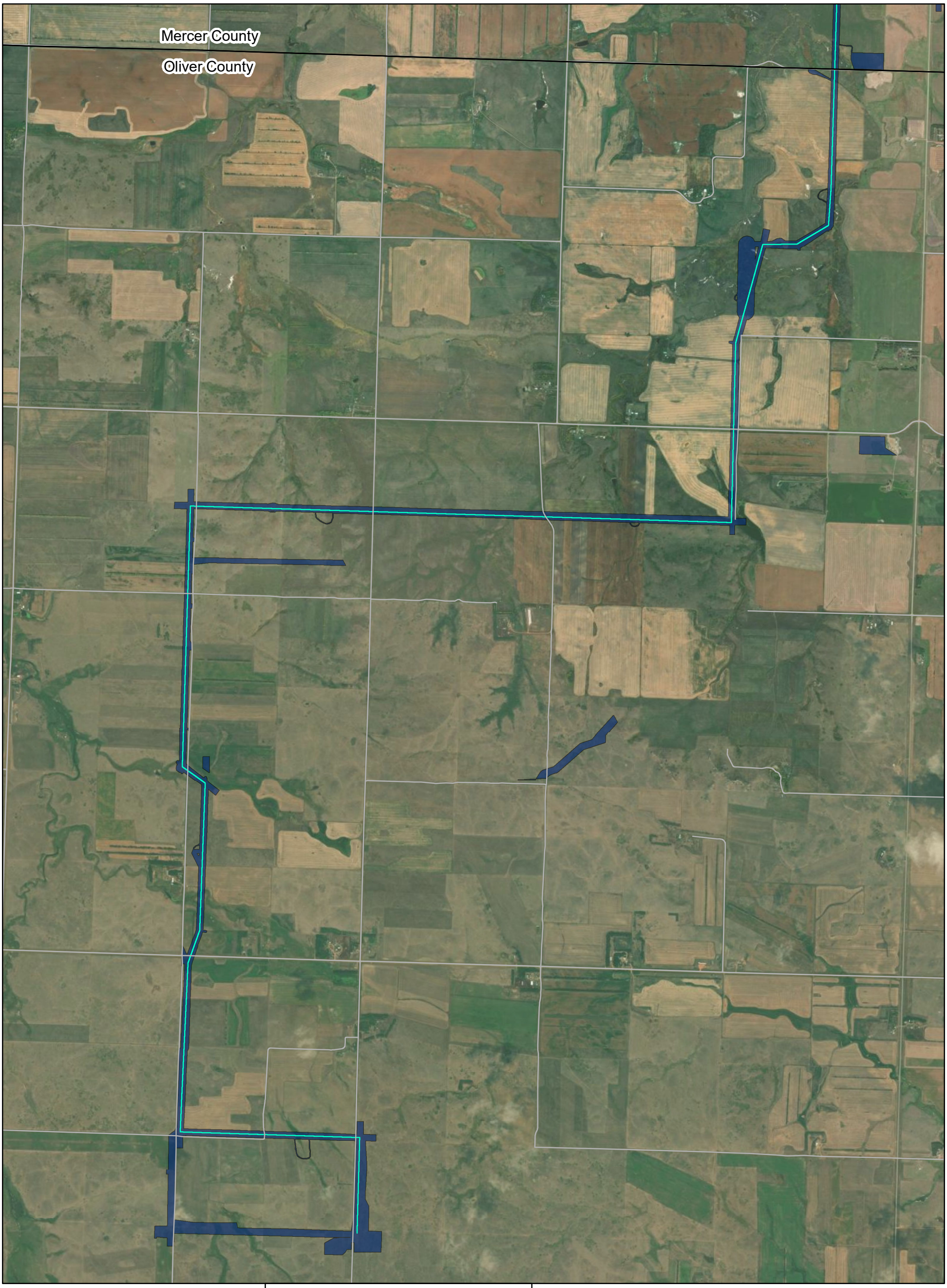
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0 0.3 0.6 1.2 Miles

Figure 1

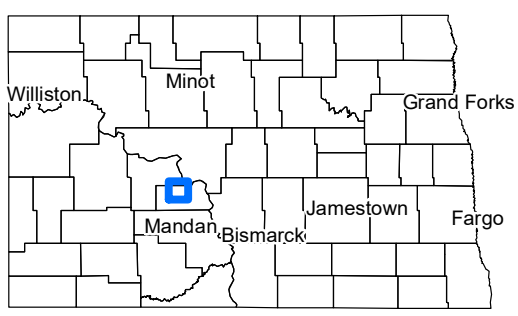
Cultural Survey Corridor

Oliver Wind IV
Cultural Resource Inventory
Mercer & Oliver County, ND



Legend

- County Road
- Transmission Centerline
- County Boundary
- Survey Corridor



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Figure 2
Cultural Survey Corridor
Oliver Wind IV
Cultural Resource Inventory
Mercer & Oliver Counties, ND

0 0.4 0.8 1.6
Miles

Attachment A:
NDSHPO Concurrence Letter

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June 21, 2021

Melinda McCarthy
AECOM
1000 East Calgary Ave, Ste 1
Bismarck, ND 58503

ND SHPO Ref.: 19-0332 Red Butte Wind Energy Center transmission line NextEra in portions of 33 Sections in Mercer and Oliver Counties, North Dakota

Dear Melinda McCarthy,

We reviewed the report for ND SHPO Ref: 19-0332 Red Butte Wind Energy Center transmission line NextEra in portions of 33 Sections in Mercer and Oliver Counties, titled "Red Butte Transmission Line: A Class III Cultural Resource Inventory in Mercer and Oliver Counties, North Dakota" and find this AECOM report by Christina M. Huling, Melinda M. McCarthy, Marcia L. Bender, Rebecca N. Pace, Alexander D. Cassidy-Neumiller, and Robin M. Roberts acceptable. We will add it to our Manuscript Collection. We also concur with no significant archeological sites directly affected for this portion of the project.

If you have any questions, please contact either Andrew Clark, Chief Archeologist at (701) 328-3574 or andrewclark@nd.gov or Lorna Meidinger, Historic Preservation Specialist at (701) 328-2089 or lbmeidinger@nd.gov.

Sincerely,

for William D. Peterson PhD
State Historic Preservation Officer
(North Dakota)

19-0332

Appendix B2. Wetlands and Other Waters Delineation Report

WETLANDS AND OTHER WATERS DELINEATION REPORT

OLIVER WIND IV 345-kV TRANSMISSION LINE

OLIVER AND MERCER COUNTIES, NORTH DAKOTA

PREPARED FOR:

Oliver Wind IV, LLC
700 Universe Boulevard
Juno Beach, Florida 33408

PREPARED BY:

Merjent, Inc.
1 Main Street SE, Suite 300
Minneapolis, Minnesota 55414

SEPTEMBER 2023

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1.0 INTRODUCTION

Oliver Wind IV, LLC (Oliver Wind IV), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC (NextEra), is proposing to construct the approximately 19.5-mile Oliver Wind IV 345-kilovolt (kV) Transmission Line (Project) in Oliver and Mercer Counties, North Dakota.

This Wetland and Other Waters Delineation Report is in support of the Project's application to the North Dakota Public Service Commission for a Certificate of Corridor Compatibility and Transmission Facility Route Permit.

Merjent Inc. (Merjent) delineated wetlands and other waters in support of the Project. Other waters can include, but are not limited to streams, ponds, and impoundments. The field surveys occurred from 2020 through 2023 within the Project Corridor and any additional areas where temporary construction impacts may occur, such as laydown yards and pulling locations. Desktop review was completed for a Study Area. Terms used in this report are applicable to North Dakota Administrative Code (N.D. Admin Code) Article 69-06 and North Dakota Century Code (N.D.C.C.) Section 49-22 and are defined in Table 1.0-1 below. The Project location is shown on Figure 1. Presented in this report are the methods, results, and a summary of the wetland and other waters delineations.

TABLE 1.0-1
Project Terms

Term	Definition/Description
Project Route	In accordance with N.D.C.C. Section 49-22-03(11), "Route" is defined as the location of an electric transmission facility within a designated corridor. The Project Route aligns with the transmission line centerline and is approximately 19.5 miles long.
Project Corridor	The area around the Project Route where easements were acquired (also referred to as the right-of-way). The Project Corridor is the typical easement that will be used during construction and maintained during the life of the Project. The Project Corridor is typically 150 feet wide, with additional width at structures with guy wires, and encompasses approximately 379 acres.
Study Area	The Study Area analyzed for the Project is one-mile wide (0.5 mile on either side of the Project Route) and encompasses approximately 12,731 acres.[a]

[a] N.D. Admin. Code 69-06-05-01(2)(f) states that the "width of the corridor must be at least ten percent of its length, but not less than one mile [1.61 kilometers] or greater than six miles [9.66 kilometers] unless another appropriate width is determined by the Commission." Oliver Wind IV proposes a one-mile-wide Study Area, with a 150-foot-wide Project Corridor, the combination of which is sufficient for the Commission to evaluate the factors addressed in N.D.C.C. Section 49-22-09.

2.0 METHODS

2.1 DESKTOP REVIEW

Prior to the field surveys, Merjent conducted a review of desktop resources to establish the potential location of wetlands and other waters within the Study Area. The desktop review was conducted using a variety of publicly available online mapping tools and resources, including:

- Environmental Systems Research Institute (ESRI) World Imagery aerial imagery (ESRI 2023)
- Google Earth aerial imagery (Google Earth 2023)

- United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey Database (Soil Survey Staff, NRCS, USDA 2023; Figure 2)
- United States Geological Survey (USGS) National Hydrography Dataset (NHD) (USGS 2023; Figure 3)
- United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) (USFWS 2023a 2023; Figure 3)

A desktop review was also conducted for lands and waters administered by the USFWS, including wetland easements within the Study Area.

2.2 FIELD SURVEY

2.2.1 Wetlands

Merjent conducted wetland field surveys within the Project Corridor, laydown yards, and pulling sites from 2020 through 2023. Wetland field survey delineations followed methodology from the United States Army Corps of Engineers (USACE) Wetlands Delineation Manual (Environmental Laboratory 1987) and the Regional Supplement to the USACE Wetland Delineation Manual: Great Plains Region (Version 2.0) (USACE 2010). The wetland delineation process was used to document dominant vegetation, soils, and hydrology during surveys. For a site to be considered a wetland, there must be dominance by hydrophytic vegetation, presence of hydric soils, and characteristic wetland hydrology. Under normal conditions, if a sample plot lacks any of these three criteria, it is considered upland. To determine these three variables, the field team designated paired sample plots, placed at discrete (typically less than 20 feet) distances from one another, for each wetland. One sample plot represented wetland conditions; the other sample plot represented upland conditions. Each sample plot featured a hand-dug soil pit averaging 16 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 sample plot center;
- Sapling/shrub vegetation was identified within a 15-foot radius of the sample plot center; and,
- Trees and woody vines were documented within a 30-foot radius of the sample plot center.

A Wetland Determination Data Form, specific to the Great Plains Region, was completed for each paired wetland and upland sample plot. In cases where wetlands were assessed outside of the growing season, assessed during drought conditions, or when a wetland boundary was difficult to assess, Merjent conservatively mapped the wetland boundaries.

2.2.1.1 Hydrophytic Vegetation Indicators

The dominant vegetation at each sample plot was identified to species level, and each species was assigned a wetland indicator status according to the Cowardin classification system, using the Great

Plains National Wetland Plant List (USACE 2020). The wetland scientist used Wetland and Aquatic Plants of the Northern Great Plains (Chadde 2019) and Weeds of the West (Whitson et al. 2009) as field references for identifying unknown plant species.

Hydrophytic vegetation, or plants likely to occur in wetlands, include those species indicated as obligate, facultative wetland, or facultative. Upland plants include all other indicators, including unlisted plants. As a general rule, for a sample plot to meet the wetland vegetation criteria, greater than 50 percent of the plants must be hydrophytes.

2.2.1.2 Hydric Soils Indicators

Soil from each soil pit was evaluated for hue, value, and chroma in each observable horizon, using Munsell Soil Color Charts (Gretag/Macbeth 2009). Each soil horizon was also checked for texture and for the presence of redoximorphic features, depleted matrix, saturation, and other specific criteria used to document hydric conditions.

2.2.1.3 Hydrology Indicators

Each sample plot was evaluated for the presence of hydrology indicators. One primary indicator is sufficient to conclude that wetland hydrology is present. In the absence of a primary indicator, two or more secondary indicators are required to conclude that wetland hydrology is present. For each wetland, hydrology was analyzed for all primary and secondary wetland indicators. Once established, the soil pits were left open a sufficient amount of time to allow the apparent high-water table, if present, to stabilize. Depth to surface water, water table, and saturation were recorded when present.

2.2.1.4 Mapping

The wetland scientist mapped wetland boundaries with a Global Positioning System (GPS) by walking the outer limit of visibly identifiable wetland vegetation between the paired wetland and upland sample plots. The field-collected data were plotted as a map layer using geographic information system (GIS) software. Additionally, the GPS was used to record the locations of the wetland and upland soil pits.

2.2.1.5 Photographs

Photographs were taken by the wetland scientist throughout the survey area during the field survey. Photographs of select wetlands that represent the wetlands throughout the survey area are provided in the photographic log in Appendix A.

2.2.2 Other Waters

Since the USACE does not have a data form for other waters for the Great Plains Region, data were collected using GPS technology and included data point locations and boundary delineations, including the ordinary high-water mark (OHWM), flow characteristics, substrate, and vegetation features.

2.2.2.1 Mapping

The wetland scientist mapped other waters with a GPS. The field-collected data were plotted as a map layer using GIS software.

2.2.2.2 Photographs

Photographs were taken by the wetland scientist throughout the survey area during the field survey. Photographs of select other waters that represent the other waters throughout the survey area are provided in the photographic log in Appendix A.

3.0 RESULTS

3.1 DESKTOP REVIEW

3.1.1 Geography and Topography

The Study Area is located in the Missouri Plateau Class IV ecoregion, which is a more detailed ecoregion for state-level applications (Bryce et al. 1996). The Missouri Plateau was largely unaffected by glaciation and retains its original soils and complex stream drainage pattern. The landscape within the Study Area is gently rolling to flat, with elevations ranging from approximately 1,690 to 2,350 feet above sea level (Google Earth 2023).

3.1.2 Hydric Soils

Merjent acquired soils data from a USDA NRCS Web Soil Survey site-specific soil report (Soil Survey Staff, NRCS, USDA 2023; Figure 2). There are seven different soil map units classified as hydric soils within the Study Area, consisting primarily of loams, silt loams, silty clay, and silty clay loams. Table 3.1-1 below describes the mapped hydric soil map units within the Study Area.

TABLE 3.1-1
Hydric Soil Map Units within the Study Area

Soil Map Unit Name	Area (acres)	Percent of Study Area	Drainage Class
Dimmick silty clay, 0 to 1 percent slopes	3.47	0.03%	Very poorly drained
Harriet loam, 0 to 2 percent slopes, occasionally flooded	407.60	3.20%	Poorly drained
Heil silty clay loam, 0 to 1 percent slopes	8.07	0.06%	Poorly drained
Regan silt loam, 0 to 2 percent slopes, occasionally flooded	143.79	1.13%	Poorly drained
Regan silt loam, strongly saline, 0 to 1 percent slopes, occasionally flooded	26.06	0.20%	Poorly drained
Regan silt loam, very poorly drained, 0 to 1 percent slopes	25.59	0.20%	Very poorly drained
Tonka silt loam, 0 to 1 percent slopes	7.30	0.06%	Poorly drained
Source Soil Survey Staff, NRCS, USDA 2023			

3.1.3 Hydrology and Surface Waters

The USFWS NWI and USGS NHD were used to identify potential hydrology and surface waters within the Study Area (USFWS 2023a; USGS 2023; Figure 2). The Study Area is located within the sub-watersheds of Alderin Creek-Missouri River, Cambridge Cemetery-Knife River, Kinneman Creek, Brady Creek, and Headwaters Square Butte Creek (USGS 2023; Figure 2).

The USFWS online Wetlands Mapper tool depicts wetlands mapped as part of the NWI Program. Within the Study Area, the NWI dataset identified approximately 190.26 acres, as depicted in Figure 3 and in Table 3.1-2 below (USFWS 2023a).

The desktop review resulted in no USFWS administered lands or waters, including wetland easements, within the Study Area (USFWS 2023b).

The NHD was used to identify perennial and intermittent streams, ponds, and lakes. The online database NHD Viewer tool was queried and found intermittent and perennial streams, canals/ditches, and lakes/ponds that crossed the Study Area, as depicted in Figure 3 (USGS 2023). Three of the features are named creeks: Brady Creek, Kinneman Creek, and Alderin Creek.

TABLE 3.1-2
NWI Wetlands within the Study Area

NWI Type	Total Area (acres)	Percentage of Study Area
Freshwater Emergent Wetland	166.13	1.30%
Freshwater Pond	23.82	0.19%
Freshwater Forested/Shrub Wetland	0.31	>0.01%
Source USFWS 2023a		

3.2 FIELD SURVEY

3.2.1 Wetlands

Merjent delineated 70 wetlands, totaling approximately 159.33 acres within the survey area. Summaries of the wetlands are provided below in Table 3.2-1. Maps depicting the delineated wetlands are included on Figure 4.

TABLE 3.2-1
Summary of Delineated Wetlands within Study Area

Wetland ID	Latitude	Longitude	Figure 4, Map Page	Size (acres)
RB-A01-WETLAND	-101.484749	47.207402	6	0.17
RB-A04-WETLAND	-101.42771	47.262916	10, 11	1.16
RB-A05-WETLAND	-101.430483	47.256823	10	2.73
RB-A06-WETLAND	-101.436199	47.256719	10	4.93
RB-A07-WETLAND	-101.432526	47.263434	10, 11	1.71
RB-A08-WETLAND	-101.43745	47.25646	10	0.02
RB-A09-Wetland	-101.437385	47.254129	10	17.68
RB-A10-WETLAND	-101.437391	47.248402	10	3.07
RB-A11-WETLAND	-101.437908	47.242807	9	7.25
RB-A12-WETLAND	-101.436594	47.240978	9	2.00
RB-A13-WETLAND	-101.429492	47.240336	9	12.32
RB-A14-WETLAND	-101.447211	47.223379	8	1.70
RB-A15-WETLAND	-101.447663	47.226109	8	24.46
RB-A16-WETLAND	-101.439124	47.227646	8	3.81
RB-A17-WETLAND	-101.443735	47.227105	8	0.48
RB-A26-WETLAND	-101.334176	47.275527	14	0.64
RB-A27-WETLAND	-101.333409	47.276377	14	0.38
RB-A27-WETLAND	-101.333191	47.277246	14	0.01
RB-A28-WETLAND	-101.349661	47.269887	14	0.48

TABLE 3.2-1
Summary of Delineated Wetlands within Study Area

Wetland ID	Latitude	Longitude	Figure 4, Map Page	Size (acres)
RB-A29-WETLAND	-101.355246	47.269459	13, 14	6.38
RB-A30-WETLAND	-101.35859	47.270709	13	0.12
RB-C01-WETLAND	-101.512005	47.194876	4	0.08
RB-C02-WETLAND	-101.515272	47.184005	3	13.42
RB-C11-WETLAND	-101.426522	47.258578	10	0.20
RB-C12-WETLAND	-101.508647	47.18353	3	5.49
RB-C14-WETLAND	-101.50664	47.172667	3	14.96
RB-D02-WETLAND	-101.50528	47.148557	1	6.33
RB-D03-WETLAND	-101.499437	47.144945	1	0.16
RB-D04-WETLAND	-101.490316	47.146663	1	0.53
RB-D06-WETLAND	-101.447676	47.20302	7	0.24
RB-D07-WETLAND	-101.520992	47.165185	2	0.06
RB-D08-WETLAND	-101.510203	47.174195	3	0.07
RB-D09-WETLAND	-101.446922	47.200446	7	3.67
RB-D10-WETLAND	-101.438024	47.231134	8, 9	1.70
RB-D11-WETLAND	-101.460237	47.205136	7	0.26
RB-D12-WETLAND	-101.438266	47.247307	9, 10	0.07
RB-D13-WETLAND	-101.448971	47.206937	7	0.15
RB-E05-WETLAND	-101.506262	47.170211	2, 3	2.13
RB-E06-WETLAND	-101.503905	47.171891	3	0.00
RB-F04-WETLAND	-101.487927	47.141121	1	0.03
RB-F05-WETLAND	-101.488329	47.140499	1	0.04
RB-F06-WETLAND	-101.49173	47.142889	1	0.21
RB-H01-WETLAND	-101.365535	47.277213	13	0.15
RB-J01-WETLAND	-101.509312	47.166977	2	0.68
RB-J02-WETLAND	-101.440545	47.228453	8	0.47
RB-J03-WETLAND	-101.427077	47.278136	11	1.13
RB-K21-WETLAND	-101.414905	47.280328	12	0.04
RB-K22-WETLAND	-101.364922	47.279905	13	1.94
RB-K23-WETLAND	-101.390188	47.278835	12	0.21
RB-K25-WETLAND	-101.49273	47.154332	1,2	0.37
RB-K26-WETLAND	-101.496907	47.155101	1,2	2.30
RB-P02-WETLAND	-101.433823	47.24694	9, 10	0.03
RB-P02-WETLAND	-101.433088	47.247652	9, 10	0.36
RB-P02-WETLAND	-101.4334	47.247253	10	0.05
RB-P03-WETLAND	-101.439215	47.247083	9, 10	0.04
RB-P03-WETLAND	-101.438707	47.247148	10	0.12
RB-P03-WETLAND	-101.439807	47.247222	10	0.04
RB-P03-WETLAND	-101.439364	47.247345	10	0.03
RB-P03-WETLAND	-101.438987	47.247608	10	0.06
RB-P04-WETLAND	-101.440637	47.247116	10	0.21
RB-Q02-WETLAND	-101.501635	47.16892	2	0.02
RB-Q03-WETLAND	-101.501452	47.168131	2	1.10
RB-Q04-WETLAND	-101.502474	47.168673	2	0.02
RB-Q36-WETLAND	-101.517794	47.165158	2	0.26
RB-Q37-WETLAND	-101.51868	47.164487	2	0.04
RB-Q38-WETLAND	-101.520191	47.164588	2	0.28

TABLE 3.2-1
Summary of Delineated Wetlands within Study Area

Wetland ID	Latitude	Longitude	Figure 4, Map Page	Size (acres)
RB-Q39-WETLAND	-101.519407	47.164498	2	0.06
RB-Q60-WETLAND	-101.322246	47.263626	15	0.10
RB-Q62-WETLAND	-101.32105	47.26274	15	1.10
RB-Q64-WETLAND	-101.314516	47.261922	15	6.79
			Total:	**159.33**

3.2.2 Other Waters

Merjent delineated 12 other waters, totaling approximately 2.90 acres within the survey area. Summaries of the other waters are provided below in Table 3.2-2. Maps depicting the delineated other waters are included on Figure 4.

TABLE 3.2-2
Summary of Delineated Other Waters within Study Area

Other Water ID	Feature Name	Figure 4, Map Page	Size (acres)
RB-A01-STREAM	Unnamed	13	0.07
RB-A01-STREAM	Unnamed	13	0.67
RB-J01-STREAM	Unnamed	10	0.48
RB-J02-STREAM	Unnamed	10	0.25
RB-J03-STREAM	Unnamed	11	0.31
RB-J05-STREAM	Unnamed	12	0.16
RB-K01-POND	Unnamed	10	0.43
RB-K01-STREAM	Unnamed	12,13	0.16
RB-Q59-STREAM	Alderin Creek	14	0.01
RB-Q61-STREAM	Alderin Creek	14	0.25
RB-Q63-STREAM	Unnamed	14	0.12
RB-Q65-STREAM	Unnamed	14	0.01
		Total:	**2.90**

4.0 SUMMARY

Merjent delineated wetlands and other waters in support of the Project in 2020 through 2023 within the survey area, which is defined as the Project Corridor, laydown yards, and pulling locations. Based on the field survey and desktop review, it is our professional opinion that 70 wetlands, totaling approximately 159.33 acres, and 12 other waters, totaling approximately 2.90 acres, exist within the survey area.

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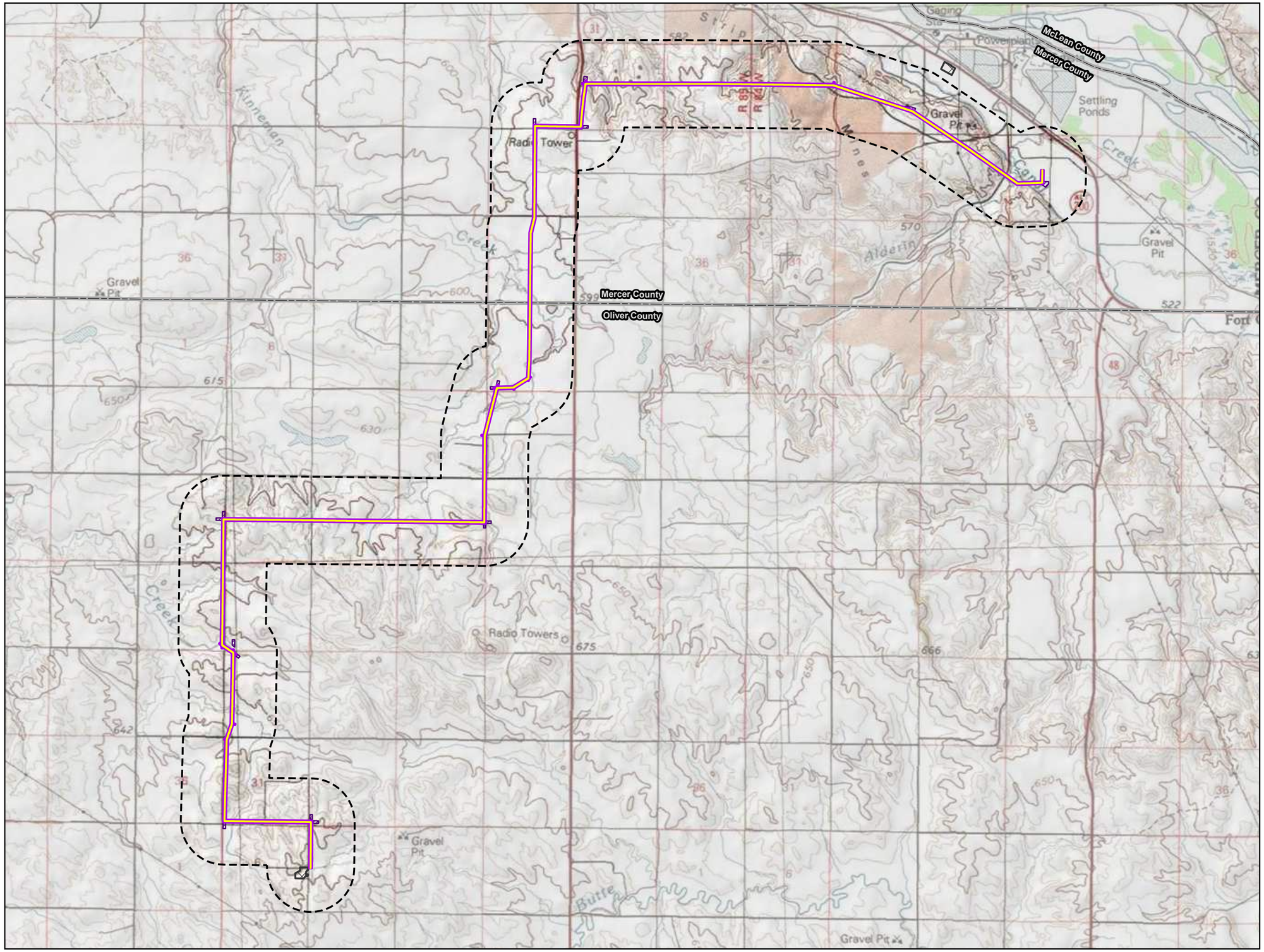
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cooperation with the Western United States Land Grant Universities Cooperative Extension Services.

6.0 ACRONYMS AND ABBREVIATIONS

ESRI	Environmental Systems Research Institute
GIS	Geographic Information System
GPS	Global Positioning System
kV	kilovolt
Merjent	Merjent, Inc.
N.D. Admin. Code	North Dakota Administrative Code
N.D.C.C.	North Dakota Century Code
NextEra	NextEra Energy Resources, LLC
NHD	National Hydrography Dataset
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OHWM	ordinary high-water mark
Oliver Wind IV	Oliver Wind IV, LLC
Project	Oliver Wind IV 345-kilovolt Transmission Line
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

Figures





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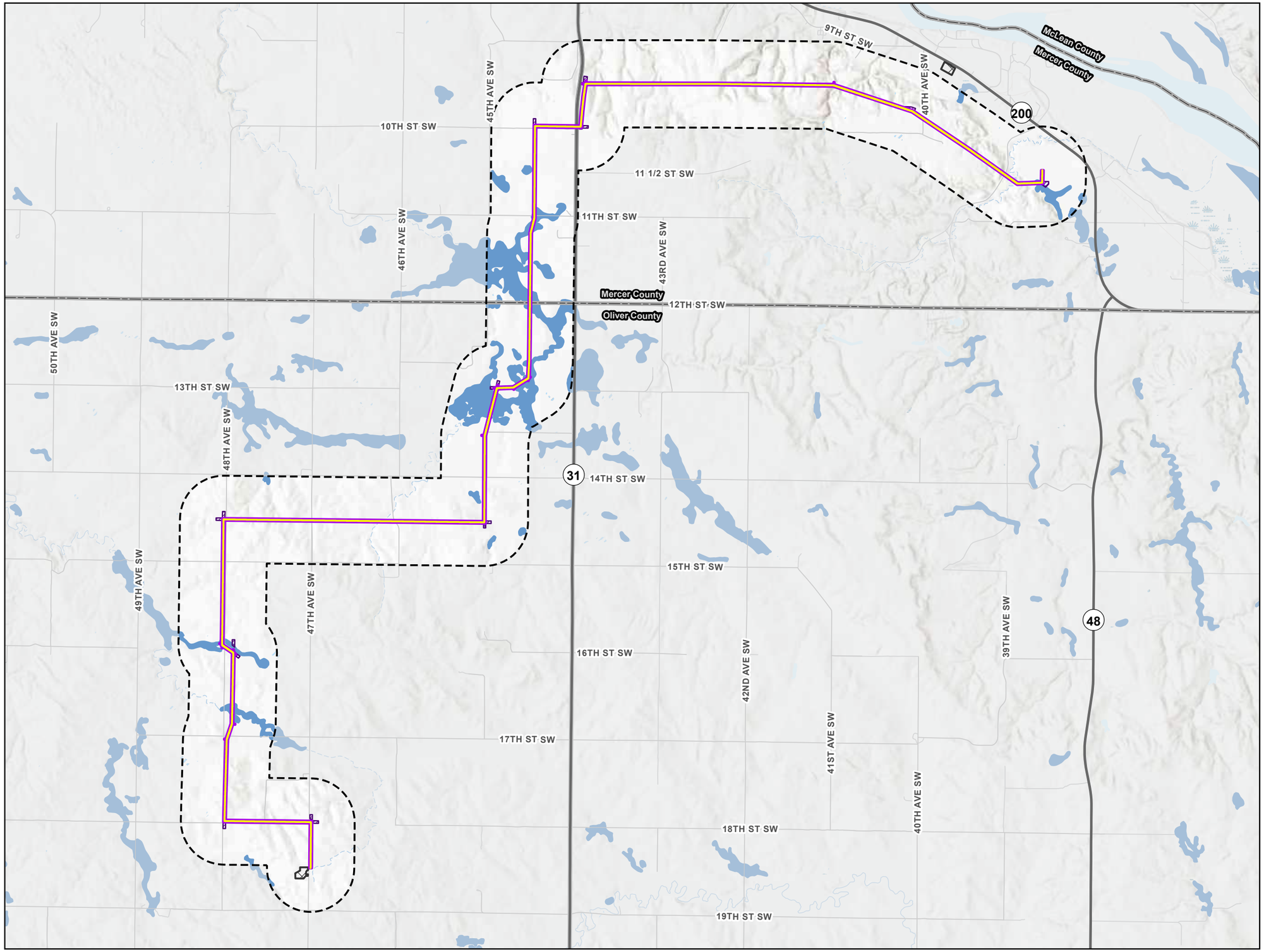
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- Study Area
- Pulling Location
- Construction Laydown Area

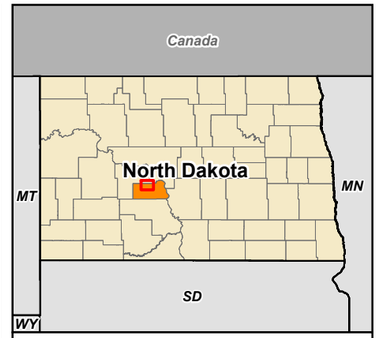
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Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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Date: (9/7/2023) Source: Z:\Clients\M_P\NorthernNet_But\Maps\Final_Data\OVWindgenTie_Arc\PrjMxd\Fig_OVI_Wind_TLine_Bio.aprx





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- Study Area
- Pulling Location
- Construction Laydown Area
- Hydric Soil

Figure 2:
SSURGO Soils
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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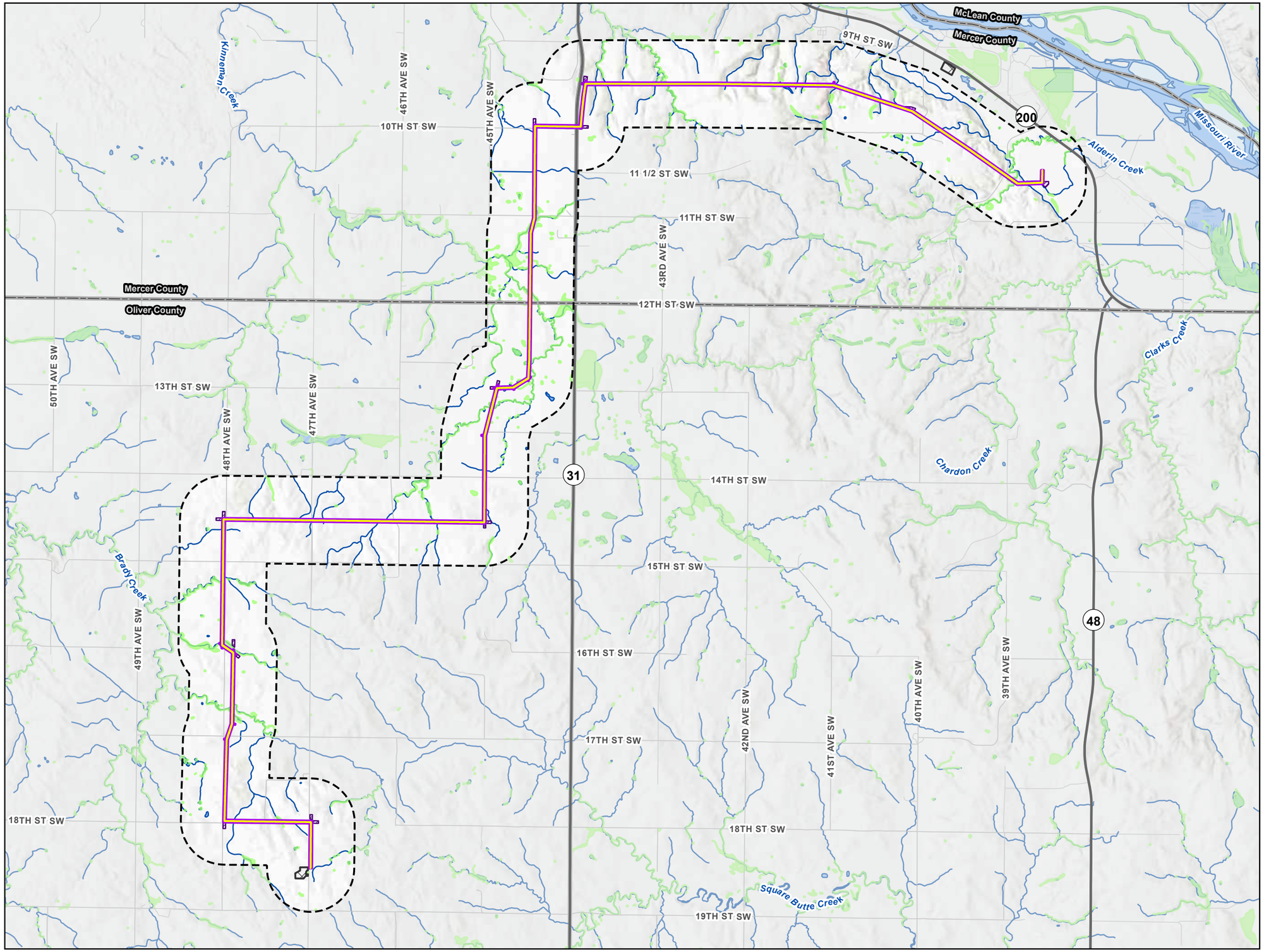
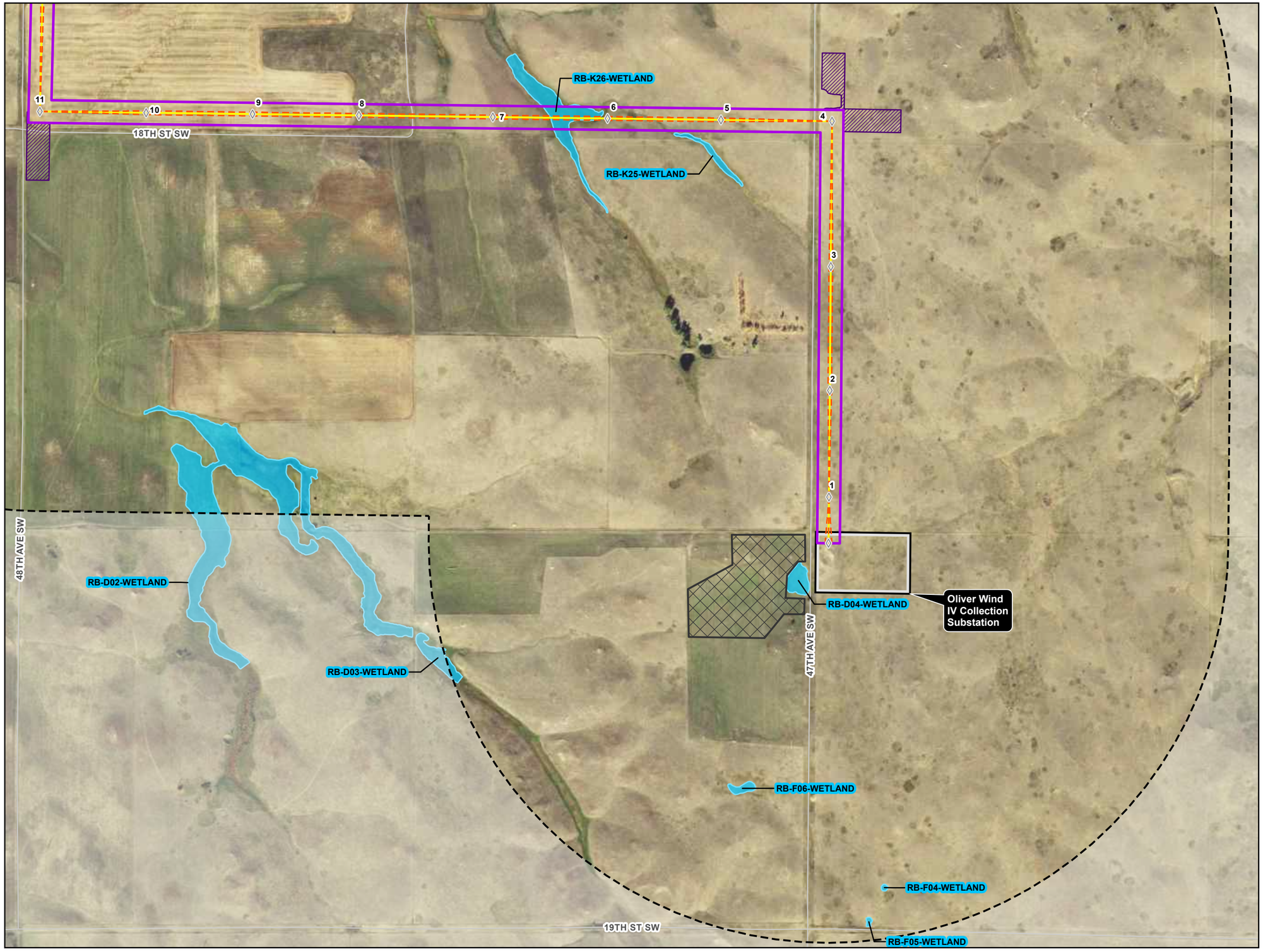


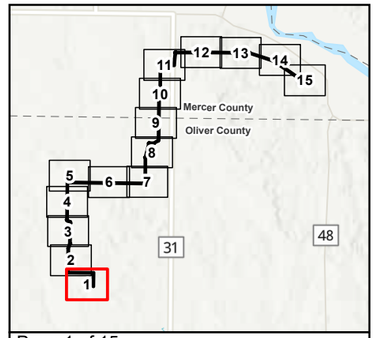
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345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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- Project Guy Wire
- Project Corridor
- Study Area
- Substation
- Pulling Location
- Construction Laydown Area
- Delineated Wetland and Other Water

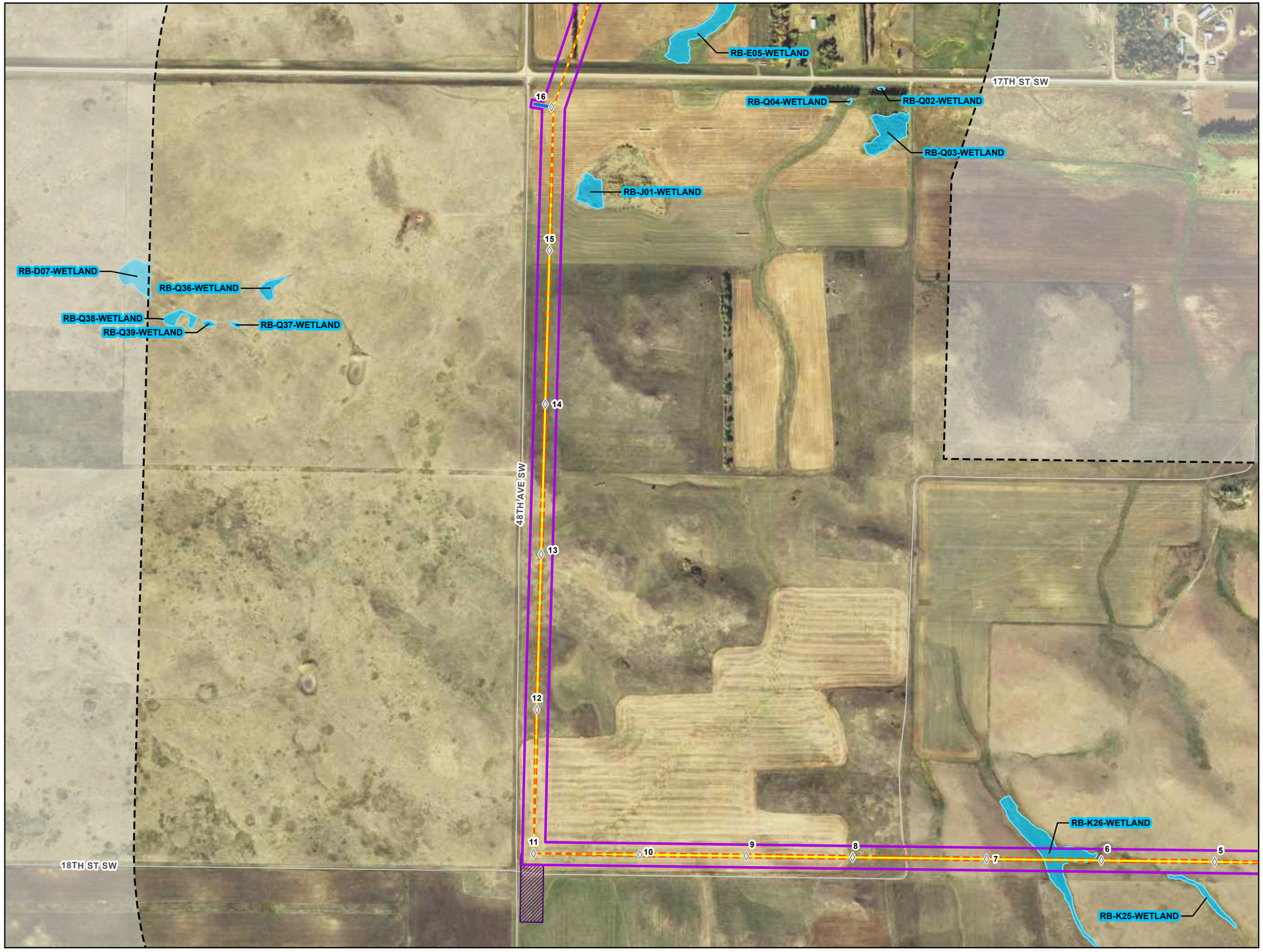
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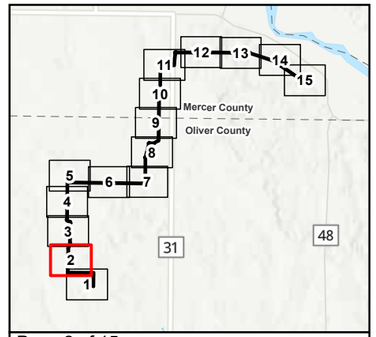
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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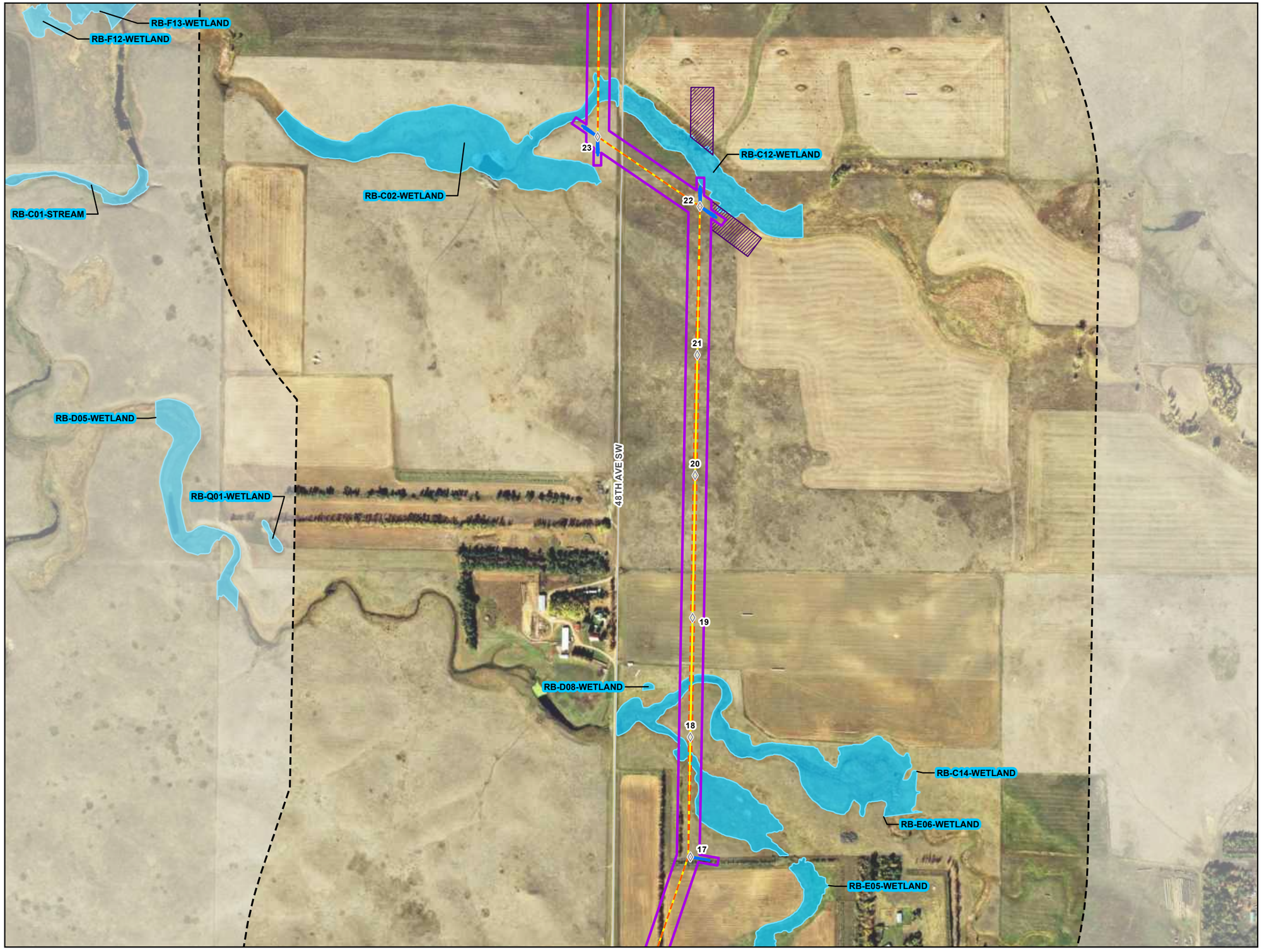
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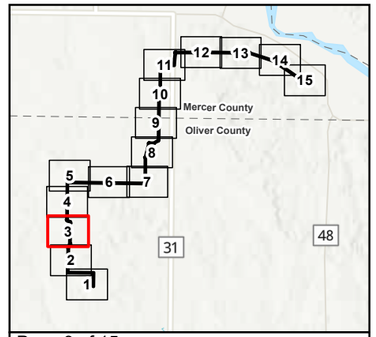
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345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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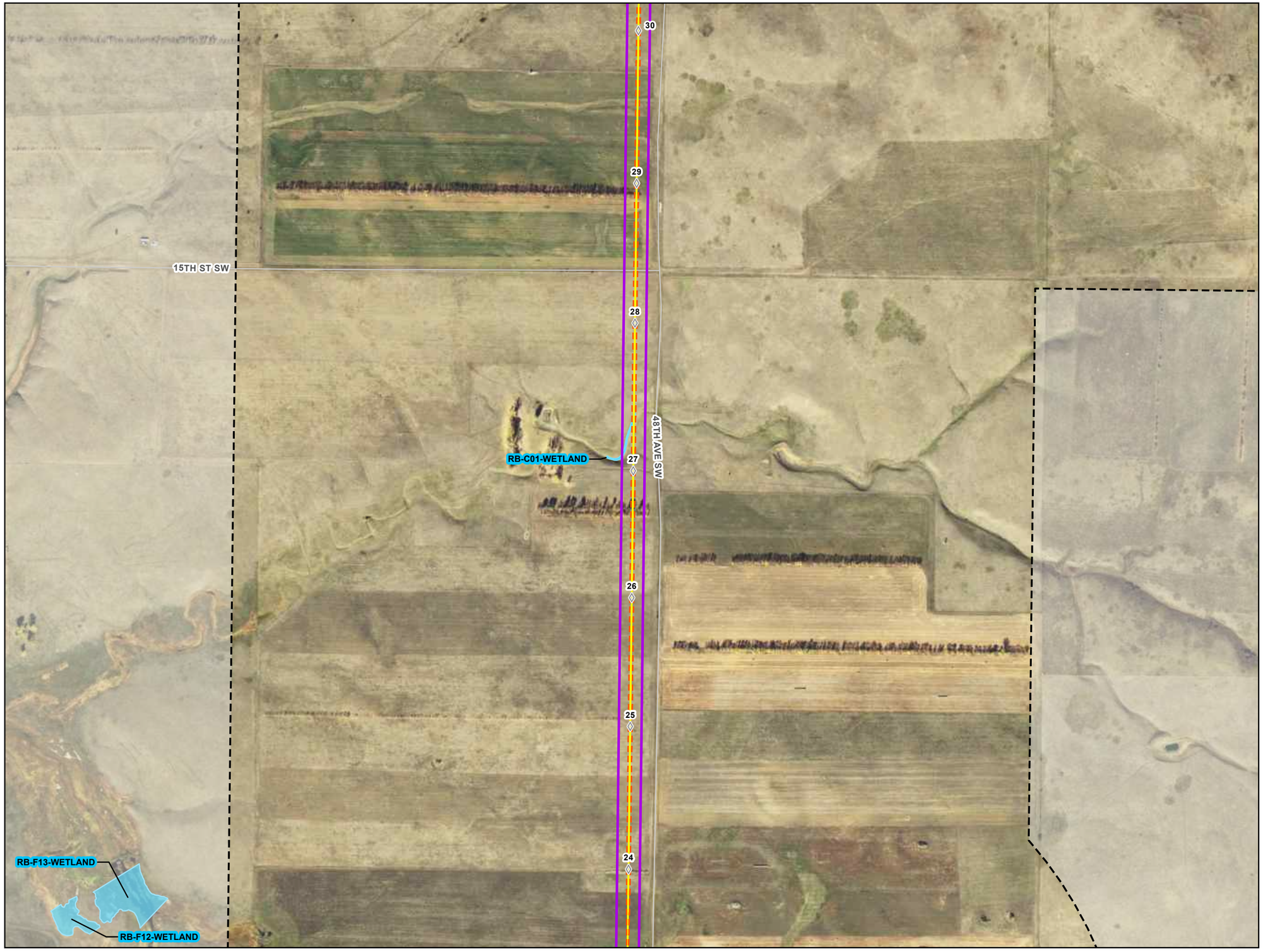
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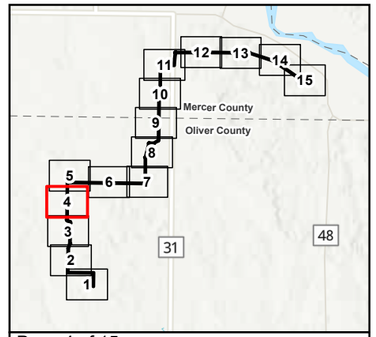
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Oliver and Mercer Counties, North Dakota

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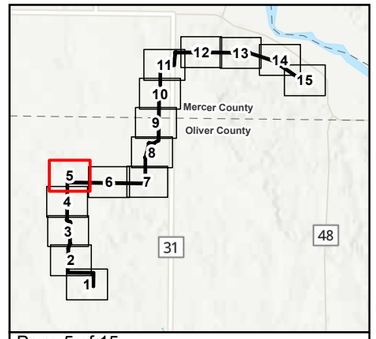
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Delineated Wetlands and Other Waters
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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Source: ArcGIS Online World Imagery Map (10/7/2025)





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- Delineated Wetland and Other Water

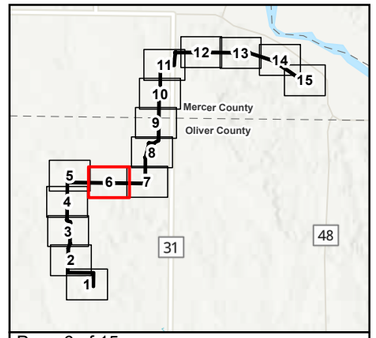
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Oliver and Mercer Counties, North Dakota

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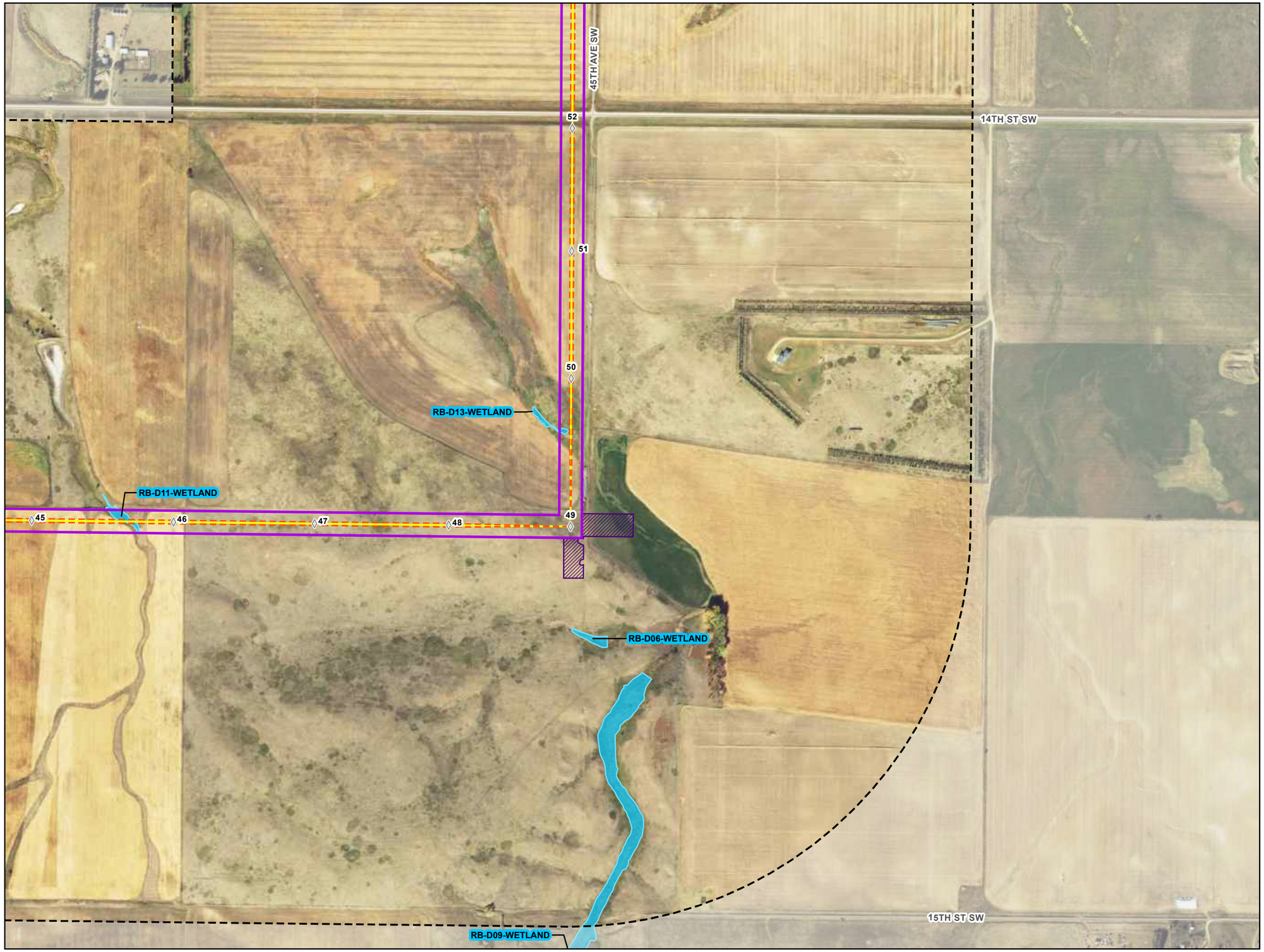
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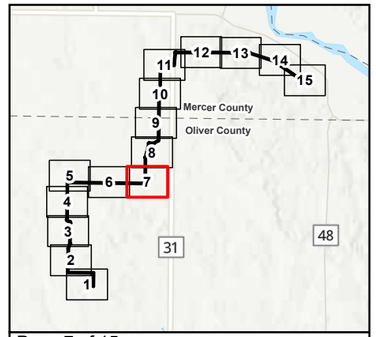
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345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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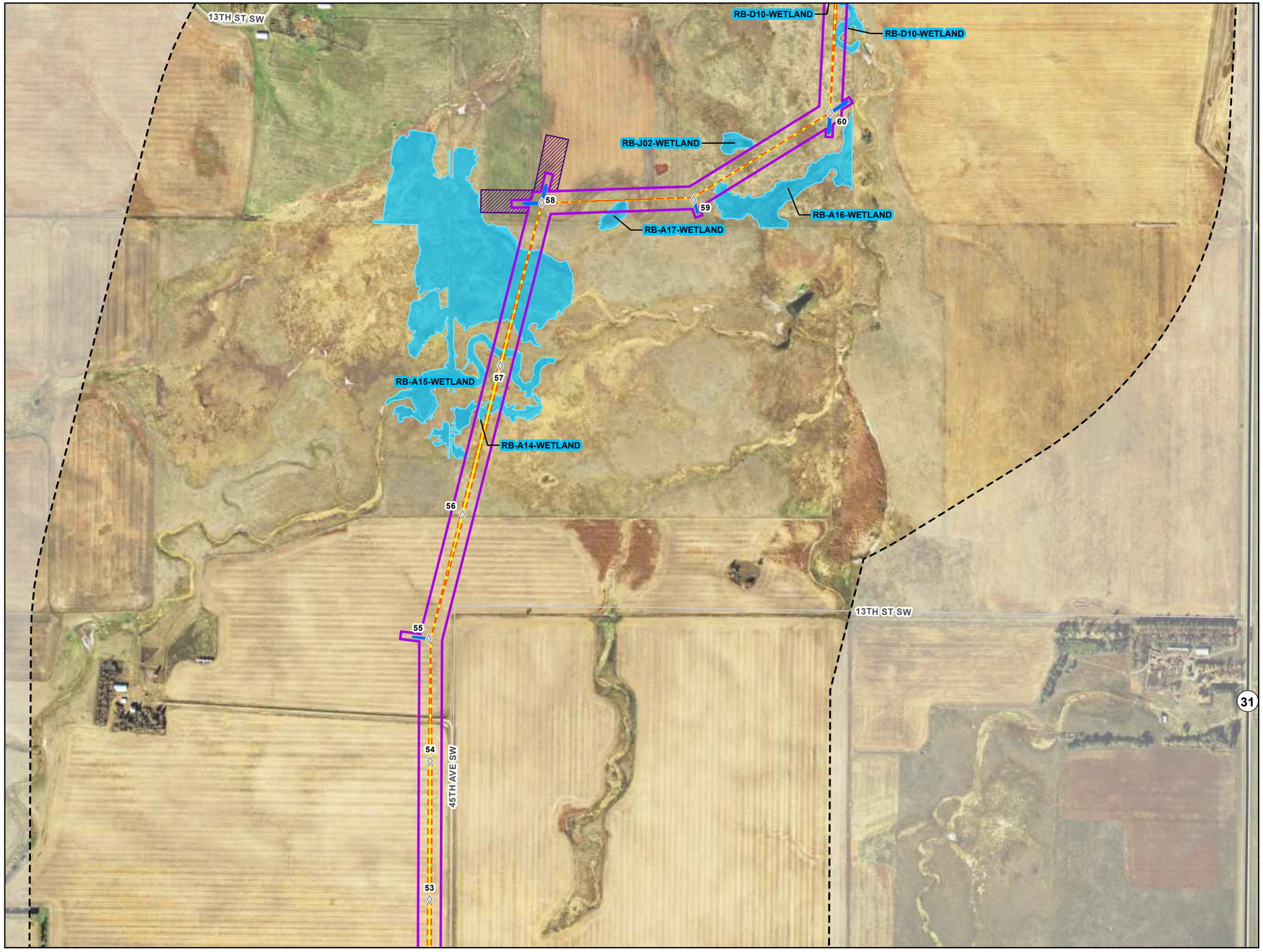
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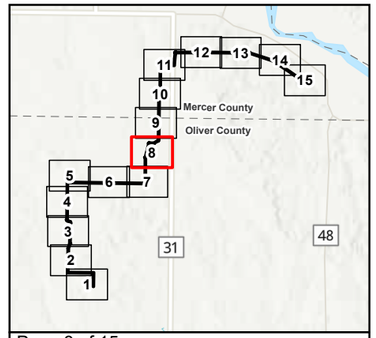
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Oliver and Mercer Counties, North Dakota

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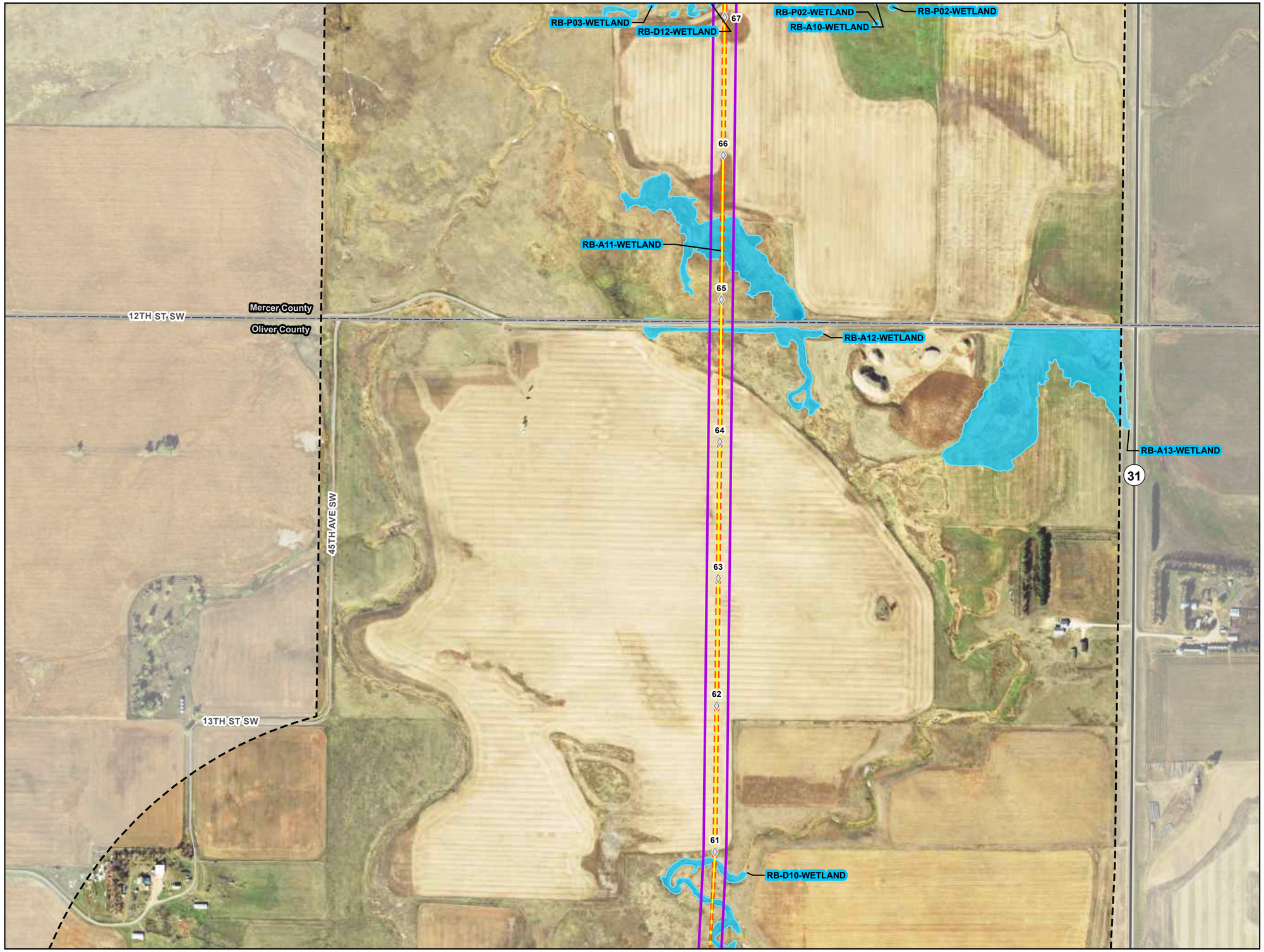
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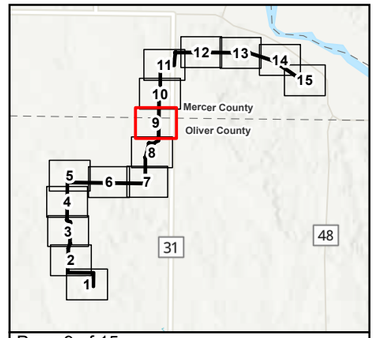
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Oliver and Mercer Counties, North Dakota

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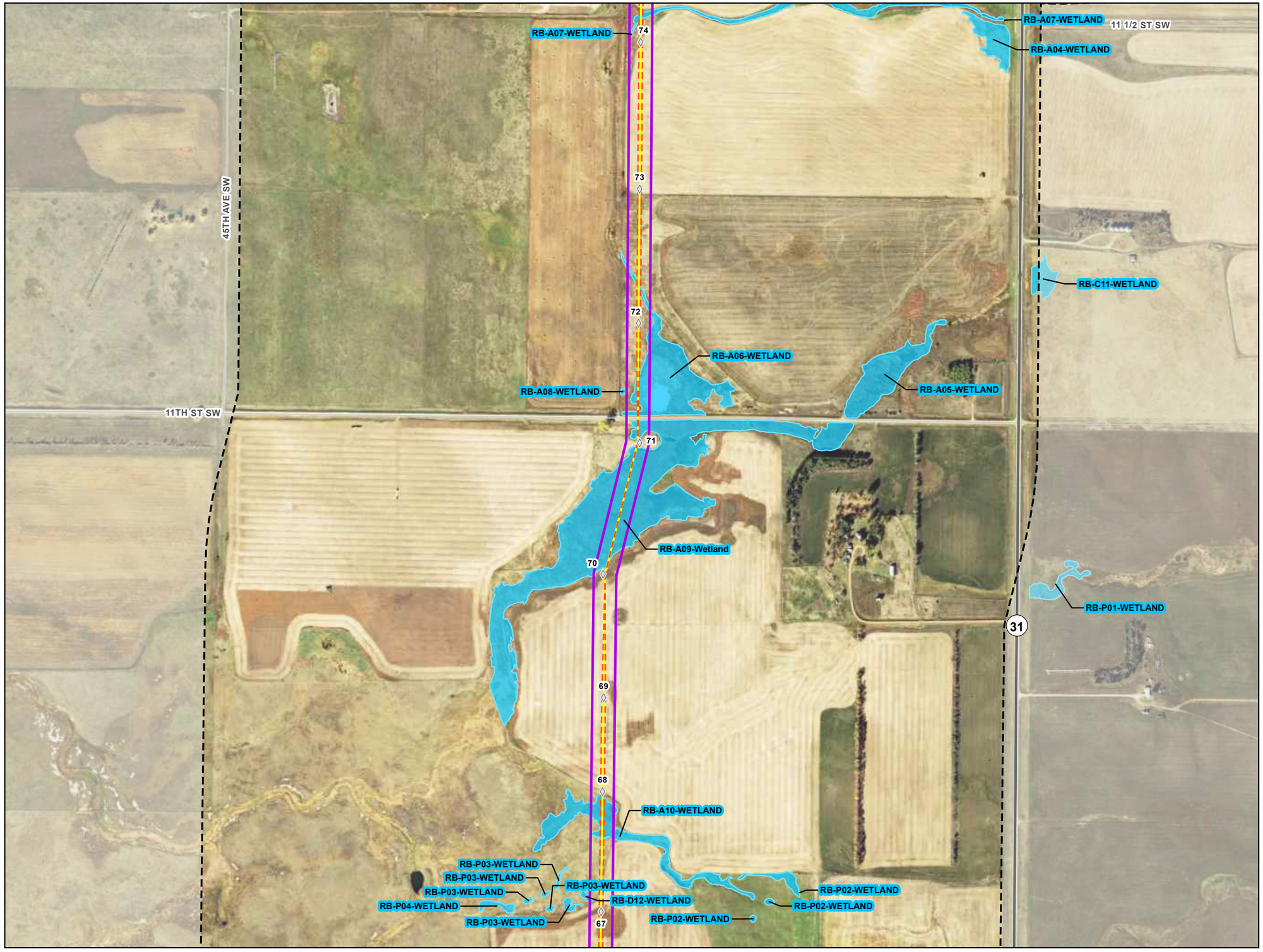
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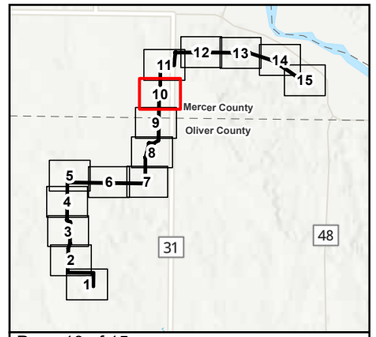
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Delineated Wetlands and Other Waters
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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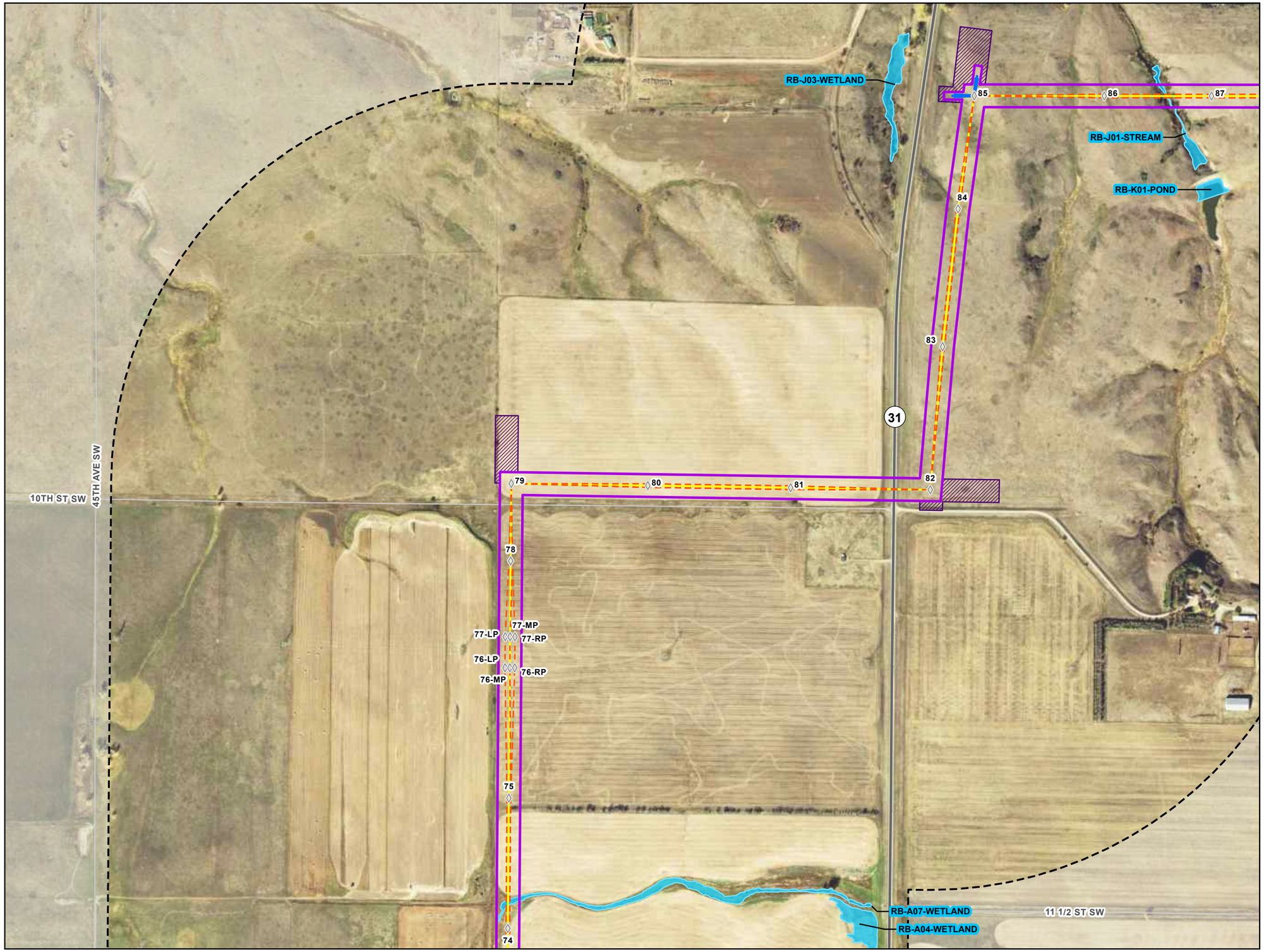
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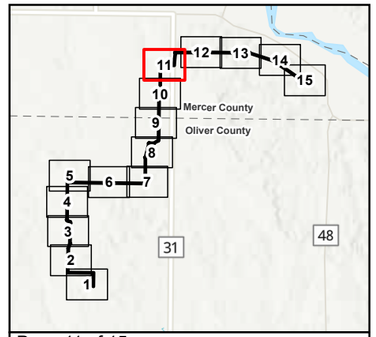
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Delineated Wetlands and Other Waters
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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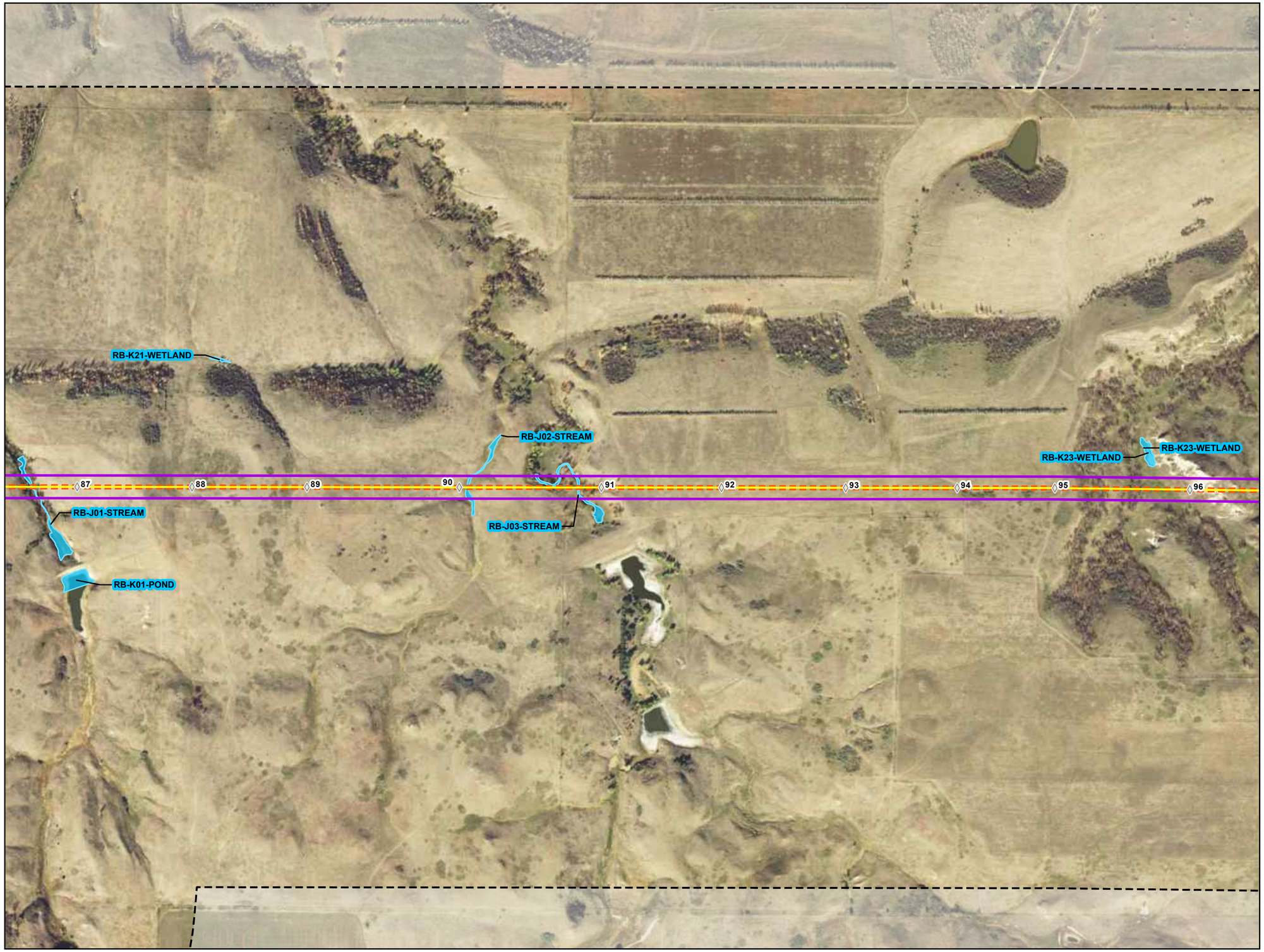
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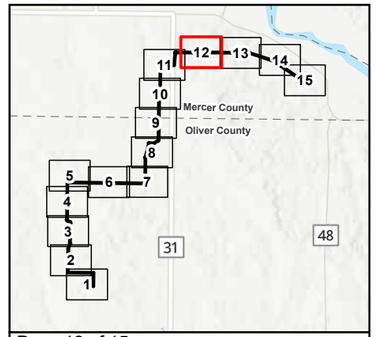
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Oliver and Mercer Counties, North Dakota

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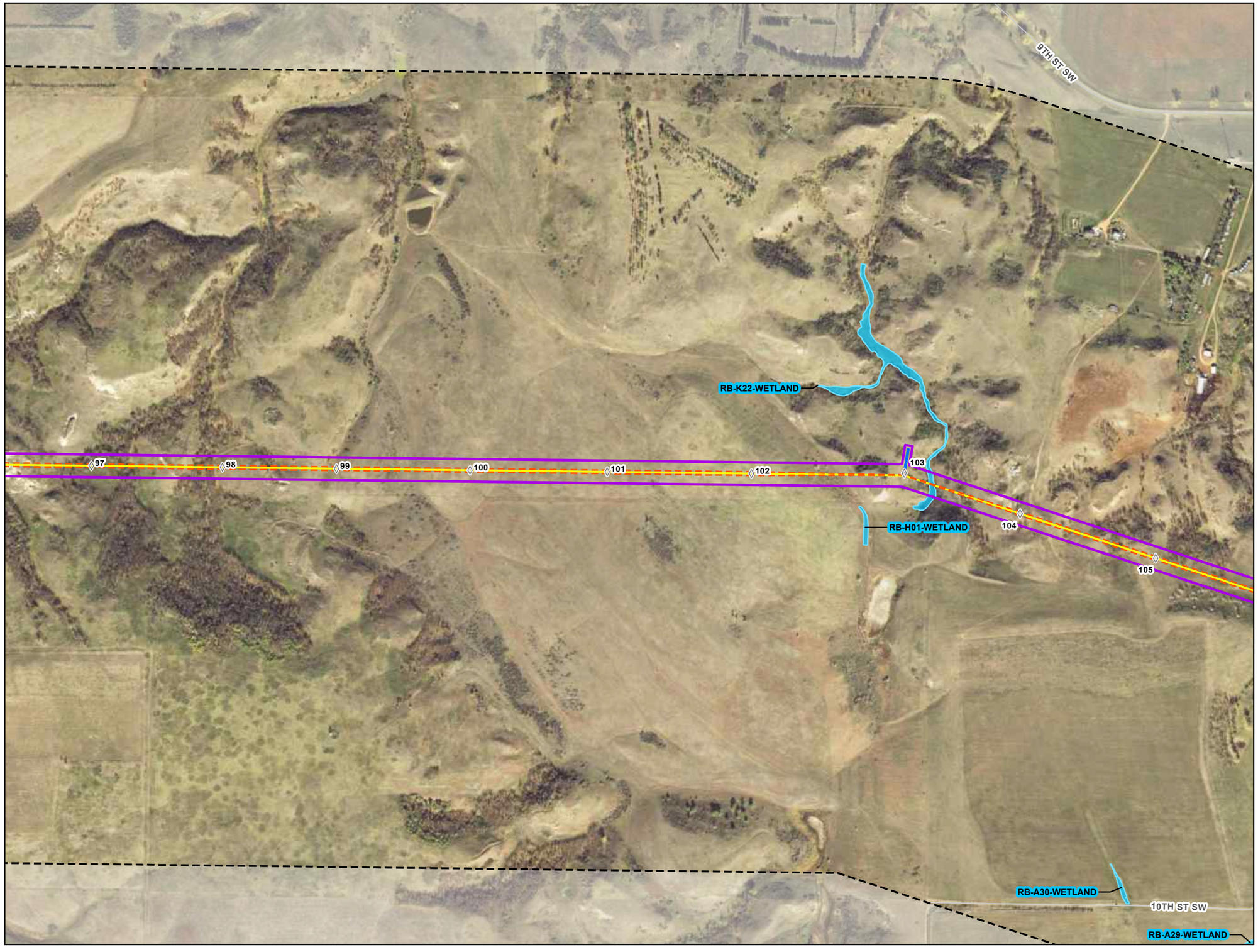
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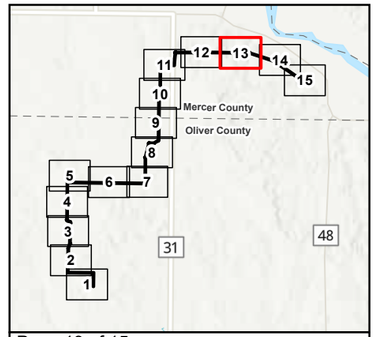
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Figure 4:
Delineated Wetlands and Other Waters
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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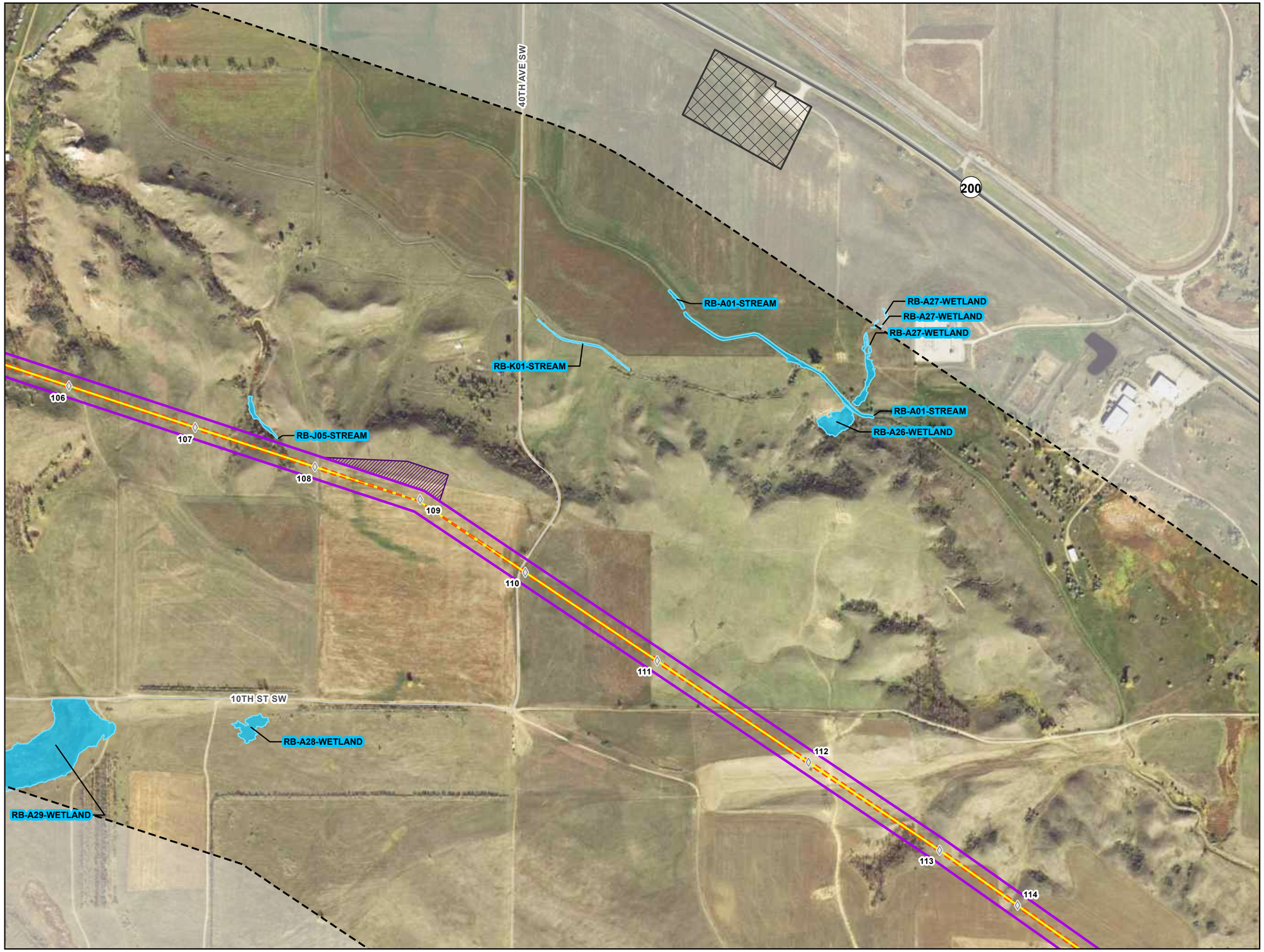
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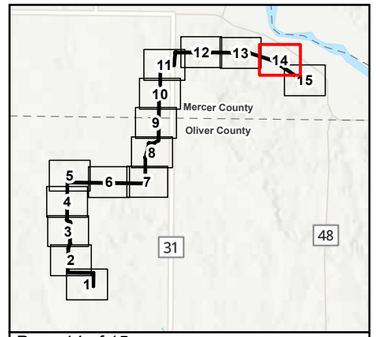
Figure 4:
Delineated Wetlands and Other Waters
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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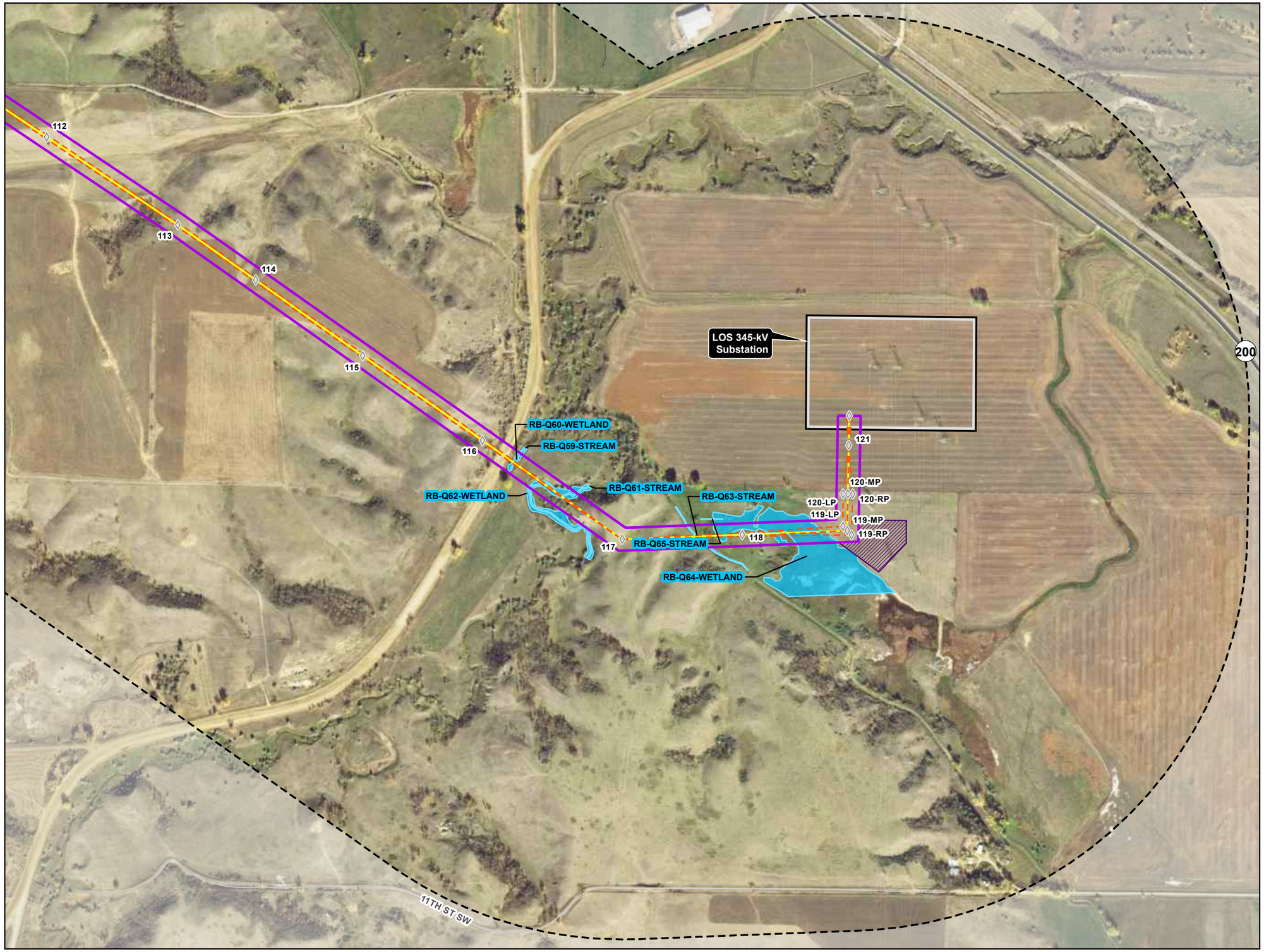
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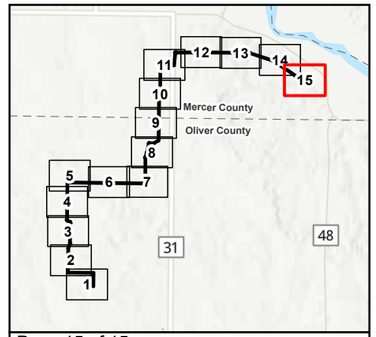
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Oliver and Mercer Counties, North Dakota

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For Environmental Review Purposes Only

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- Project Structure
- Project Route
- Project Conductor
- Project Guy Wire
- Project Corridor
- Study Area
- Substation
- Pulling Location
- Construction Laydown Area
- Delineated Wetland and Other Water

Figure 4:
Delineated Wetlands and Other Waters
Oliver Wind IV
345-kV Transmission Line
Oliver and Mercer Counties, North Dakota

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For Environmental Review Purposes Only

Source: ArcGIS Online World Imagery; Date: (9/7/2023) Z:\Clients\MI_P\NextEra\Red_Butte\MXD\Final_Data\OW\Biological\001_AVOP\NextEra_OW_Wind_Line_Bio.aprx

Appendix A

Photographic Log

Date Taken: May 17, 2023 **Description:** Photo of RB-Q64-WETLAND facing east. Photo shows a wetland with salt crust.	
Date Taken: May 17, 2023 **Description:** Photo of RB-Q61-STREAM facing south. Photo shows Alderin Creek flowing south to north.	

Date Taken: May 17, 2023 **Description:** Overview photo of RB-Q60-WETLAND facing north. Photo shows a PFO wetland with a drainage stream in the center.	
Date Taken: August 17, 2023 **Description:** Overview photo of wetland RB-A11-WETLAND facing north. Photo shows Kinneman Creek.	

Date Taken: August 17, 2023 **Description:** Overview photo of wetland RB-A06-WETLAND facing south. Photo shows a large wetland dominated by cattails, and other wetland vegetation marking the edge.	
Date Taken: August 17, 2023 **Description:** Photo of RB-C02-WETLAND facing west. Photo shows a large depressional wetland with diverse wetland vegetation.	

Appendix B3. Sharp-tailed Grouse Lek Surveys (May 2019)

Sharp-tailed Grouse Lek Surveys
Completed May 2019

Oliver Wind IV Project
Oliver and Mercer Counties, North Dakota

Final Report

Prepared for:

Oliver Wind IV, LLC

Prepared by:

Kevin Shelley, Terri Thorn, and Clayton Derby

4007 State Street, Suite 109
Bismarck, North Dakota 58503

Report Date: August 24, 2023



Privileged and Confidential – Contains Sensitive Biological Information

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Kevin Shelley	Senior Ecologist, Writer
Dr. Sofia Agudelo	Reviewer, Technical Editor
Ashley Tanner	Field Biologist

REPORT REFERENCE

Shelley, K., T. Thorn, and C. Derby. 2023. May 2019 Sharp-tailed Grouse Lek Surveys, Oliver Wind IV Project, Oliver and Mercer counties, North Dakota. Final Repor. Prepared for Oliver Wind IV, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 24, 2023. 8 pp.

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Figure 2. Location and activity status of sharp-tailed grouse (STGR) leks within the Study Area of the proposed Oliver Wind IV Project in Oliver and Mercer counties, North Dakota (surveys conducted from May 2 – 12, 2019). 7

INTRODUCTION

Oliver Wind IV, LLC (Company) is evaluating the potential for wind energy development at the proposed Oliver Wind IV Project and Transmission Line (referred to as the Project) in Oliver and Mercer counties, North Dakota (Figure 1). The Company contracted Western EcoSystems Technology, Inc. (WEST) to conduct sharp-tailed grouse (*Tympanuchus phasianellus*; STGR) lek surveys in the Study Area. The primary objective of these surveys was to document the status of sharp-tailed grouse leks including the search for previously undocumented STGR leks, as well as determine the number of STGR present at each lek in the Study Area. This report presents the results of the lek surveys conducted in May of 2019.

STUDY AREA

The Study Area is located approximately 3.7 miles (mi; 6.0 kilometers [km]) west of the town of Center, in central North Dakota, within both Oliver and Mercer counties (Figure 1). The Study Area (54,358-acre [ac]; 21,998-hectare [ha]) was established with a 1.0-mi (1.6-km) buffer encompassing the anticipated Project footprint associated with the 2019 turbine layout and Transmission Line rather than the Project Area (Figure 1).

The Study Area is within the Northwestern Glaciated Plains Level III Ecoregion, in an area historically dominated by grasslands but extensively converted to agricultural use (e.g., row crops and livestock grazing; Bryce et al. 1996, US Environmental Protection Agency 2017). The terrain within the Study Area is gently rolling with interspersed level areas, and elevations of 1,663–2,385 feet (ft; 507– 727 meters [m]) above sea level (US Geological Survey 2019).

METHODS

Two rounds of surveys (one ground and one aerial) were conducted in May of 2019 ,during the North Dakota peak lekking period for STGR (March 15 – May 15; North Dakota Game and Fish Department 2021). Aerial surveys were deployed to address weather-caused limited road access that reduced survey coverage in the Study Area. Surveys began 30 minutes (min) prior to sunrise when winds were less than 20 mi (32 km) per hour and there was little or no rain. Surveys ended approximately two hours after sunrise.

The ground-based survey design was modeled after the South Dakota Department of Game, Fish and Parks (SDGFP) *Wildlife Survey Manual 2009 – 2015* (SDGFP 2009) because a written methodology specifically for North Dakota was not publicly available. During the ground-based survey, observers visited survey points from public roads or section lines for a minimum of five min to listen and look for displaying STGR. If a lek was located, the observer would then map the location, to the best of their ability, from the road. Observers also assessed the status of previously known lek locations (identified in prior years) within the Study Area.

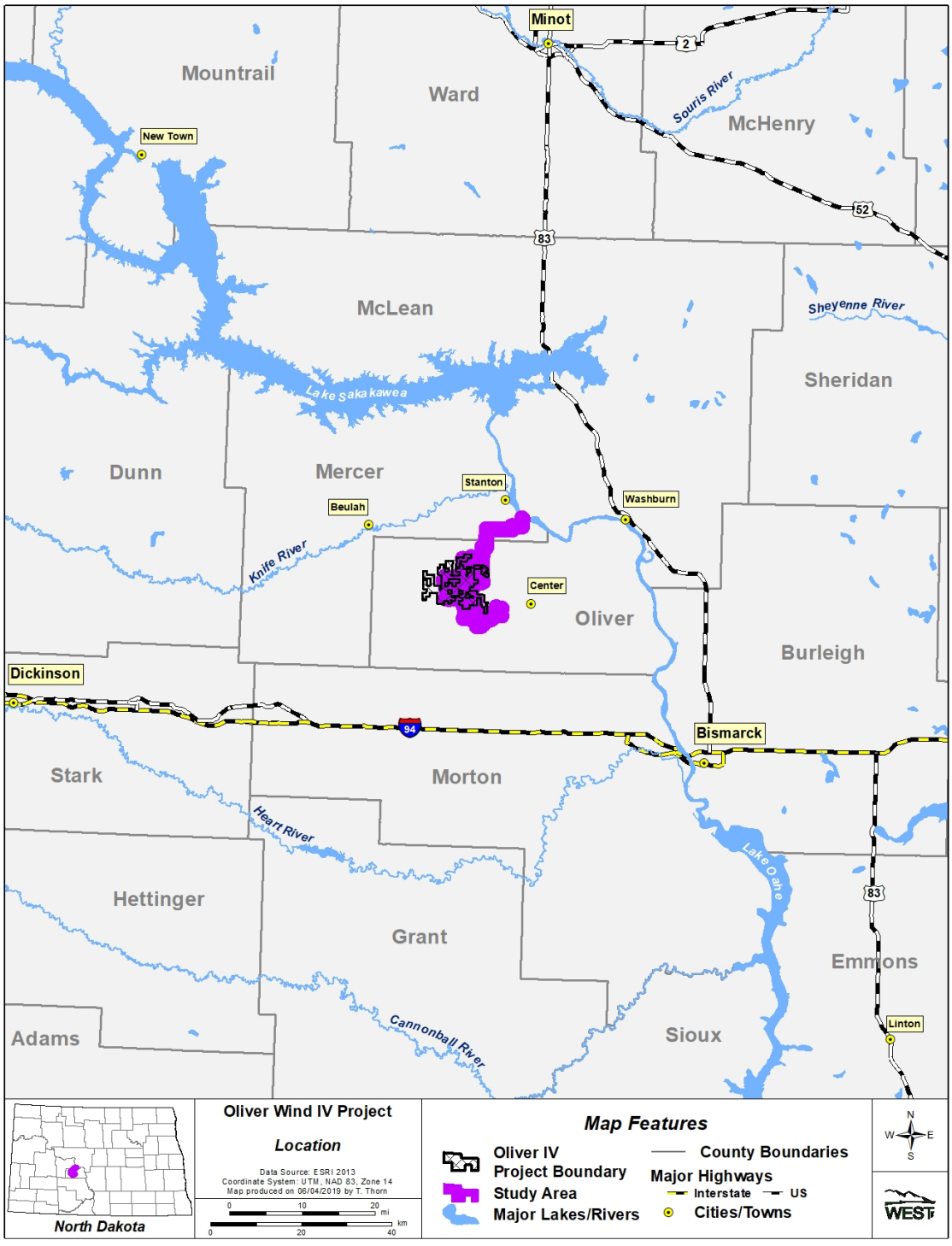


Figure 1. Location of the proposed Oliver Wind IV Project Area and Study Area in Oliver and Mercer counties, North Dakota.

Given limited road access and potential snow cover conditions, aerial surveys were conducted to complement the ground-based survey, to achieve full spatial coverage of the Study Area. Aerial surveys were conducted following guidelines of Martin and Knopf (1981). Pre-flight planning included identifying the locations of previously known lek locations, a review of topographic maps and aerial photographs, and building mobile Geographic Information Systems files. Aerial line-transects, spaced approximately every 1,312 ft (400 m; Figure 2), were flown at approximately 164–328 ft (50–100 m) above ground level using a fixed-wing aircraft (e.g., Cessna 172). The selected spacing of aerial transects provided for complete visual survey coverage of the areas where construction impacts from the Project may occur. An onboard flight Global Positioning System (GPS) unit was used to assist the pilot in navigating transects; lek locations (i.e., approximate center point) were recorded using a hand-held GPS unit.

For the purposes of this survey, a lek was defined as a location where two or more male STGR were detected (visually or aurally). Leks were classified according to their activity status. "Confirmed" leks were those where two or more STGR males were seen or heard displaying courtship behavior at the same location during more than one survey round. Leks were classified as "probable" when visual and/or auditory observations of two or more STGR males were detected during just one survey round. All leks located during ground-based and aerial surveys, regardless of their activity status, were assigned a unique identification number (Lek ID). The date, time, estimated number of STGR (males, females, and unknown), and any relevant comments were also recorded for each lek.

RESULTS

Round 1 (ground-based) was conducted May 2 – 6, 2019, and Round 2 (aerial) was conducted May 9 – 12, 2019. During the 2019 surveys, STGR were observed displaying at one previously known and four previously unknown lek locations within the Study Area (Figure 2). One lek (Lek ID 5) was classified as "confirmed" and the remaining four leks were classified as "probable" (Table 1, Figure 2). All five leks were located within grassland/herbaceous habitat (Figure 2).

Separate counts of males and females were not possible during the aerial survey (Round 2) due to the speed and distance of the aircraft. The only previously documented lek (Lek ID 1), located in the northeastern portion of the Study Area within the Transmission Line buffer (Figure 2), had the highest number (38) of STGR, followed by Lek ID 5, in the central portion of the Study Area, with 28 STGR (Table 1, Figure 2). The total number of STGR recorded at other leks ranged from two (Lek ID 4) to 12 (Lek ID 3; Table 1).

Table 1. Number[1] of sharp-tailed grouse and activity status of leks within the Study Area of the proposed Oliver Wind IV Project in Oliver and Mercer counties, North Dakota, during lek surveys conducted from May 2 – 12, 2019.

	Survey Round 1 - Ground (May 2 – 6)				Survey Round 2 - Aerial (May 9 – 12)					
Lek ID	M	F	U	T	M	F	U	T	Survey Total	Activity Status
1*	0	0	16	16	0	0	22	22	38	Probable
2	NA	NA	NA	NA	0	0	6	6	6	Probable
3	NA	NA	NA	NA	0	0	12	12	12	Probable
4	0	0	2	2	0	0	0	0	2	Probable
5	12	0	1	13	0	0	15	15	28	Confirmed

[1.] Number of males (M), females (F), unknown (U), and total (T) sharp-tailed grouse from each survey round.

* Previously known lek location.

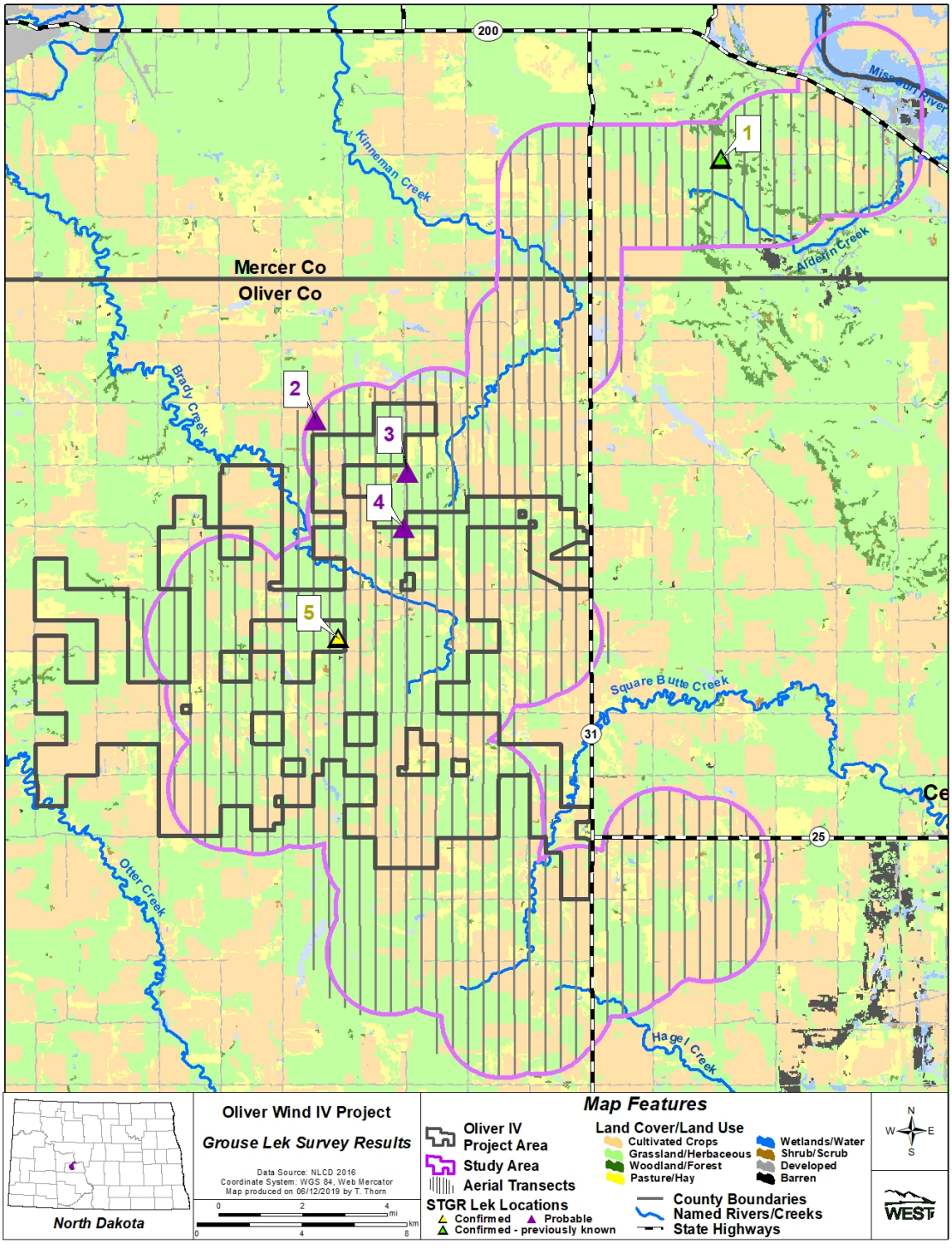


Figure 2. Location and activity status of sharp-tailed grouse (STGR) leks within the Study Area of the proposed Oliver Wind IV Project in Oliver and Mercer counties, North Dakota (surveys conducted from May 2 – 12, 2019).

SUMMARY

The survey results indicate STGR occur in the north-central portion of the Study Area during the breeding season. The number and location of STRG leks, as well as the relative abundance of STGR attending the leks, provides baseline information for STGR occurrence in the Study Area which can be an aid in siting Project infrastructure and operation.

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Appendix B4. Sharp-tailed Grouse Lek Surveys (April 2020)

Sharp-tailed Grouse Lek Surveys
Completed April 2020

Oliver Wind IV Project
Oliver and Mercer Counties, North Dakota

Final Report

Prepared for:

Oliver Wind IV, LLC

Prepared by:

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Privileged and Confidential – Contains Sensitive Biological Information

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Dr. Sofia Agudelo	Reviewer, Technical Editor
Ashley Tanner	Field Biologist

REPORT REFERENCE

Shelley, K., T. Thorn, and C. Derby. 2023. Sharp-tailed Grouse Lek Surveys, Completed April 2020, Oliver Wind IV Project, Oliver and Mercer counties, North Dakota. Final Report. Prepared for Oliver Wind IV, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 24, 2023. 9 pp.

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Figure 2. Location and activity status of sharp-tailed grouse leks within the Study Area of the Oliver Wind IV Project in Oliver and Mercer counties, North Dakota (surveys conducted from April 7 – 30, 2020). 7

INTRODUCTION

Oliver Wind IV, LLC (Company) is evaluating the potential for wind energy development at the proposed Oliver Wind IV Project and Transmission Line (referred to as the Project) in Oliver and Mercer counties, North Dakota (Figure 1). The Company contracted Western EcoSystems Technology, Inc. (WEST) to conduct sharp-tailed grouse (*Tympanuchus phasianellus*; STGR) lek surveys to collect baseline environmental information. The objectives of these surveys were to document the status of sharp-tailed grouse leks in the 2020 Study Area, including the search for previously unknown STGR leks, as well as determine the number of individual STGR present at each lek in the vicinity of the Project. This report presents the results of the lek surveys conducted in April of 2020.

STUDY AREA

The Project is located approximately 3.7 miles (mi; 6.0 kilometers [km]) west of the town of Center, in central North Dakota, within both Oliver and Mercer counties (Figure 1). The 2020 Study Area (127,607-acre [ac]; 51,640-hectare [ha]) more than doubled in size compared to the 2019 Study Area to encompass the entire Project Area and additional lands to the east (Figure 1).

The Study Area is within the Northwestern Glaciated Plains Level III Ecoregion, in an area historically dominated by grasslands but extensively converted to agricultural use (e.g., row crops and livestock grazing; Bryce et al. 1996, US Environmental Protection Agency 2017). The terrain within the Study Area is gently rolling with interspersed level areas, and elevations of 1,663–2,385 feet (ft; 507– 727 meters [m]) above sea level (US Geological Survey 2019).

METHODS

Three rounds of aerial surveys were conducted in April of 2020 within the Study Area, during the North Dakota peak lekking period for STGR (March 15 – May 15; North Dakota Game and Fish Department 2021). Surveys began 30 minutes (min) prior to sunrise when winds were less than 20 mi [32 km] per hour and there was little or no rain. Surveys ended approximately two hours after sunrise.

Due to limited road access and potential snow cover conditions, aerial surveys were conducted to achieve full spatial coverage of the Study Area, following guidelines of Martin and Knopf (1981). Pre-flight planning included identifying the locations of previously known lek locations, a review of topographic maps and aerial photographs, and building mobile Geographic Information Systems files. Aerial line-transects, spaced approximately every 1,312 ft (400 m; Figure 2), were flown at approximately 164–328 ft (50–100 m) above ground level using a fixed-wing aircraft (e.g., Cessna 172). The selected spacing of aerial transects provided for complete visual survey coverage of the areas where construction impacts from the Project may occur. An onboard flight Global Positioning System (GPS) unit was used to assist the pilot in navigating transects; lek locations (i.e., approximate center point) were recorded using a hand-held GPS unit.

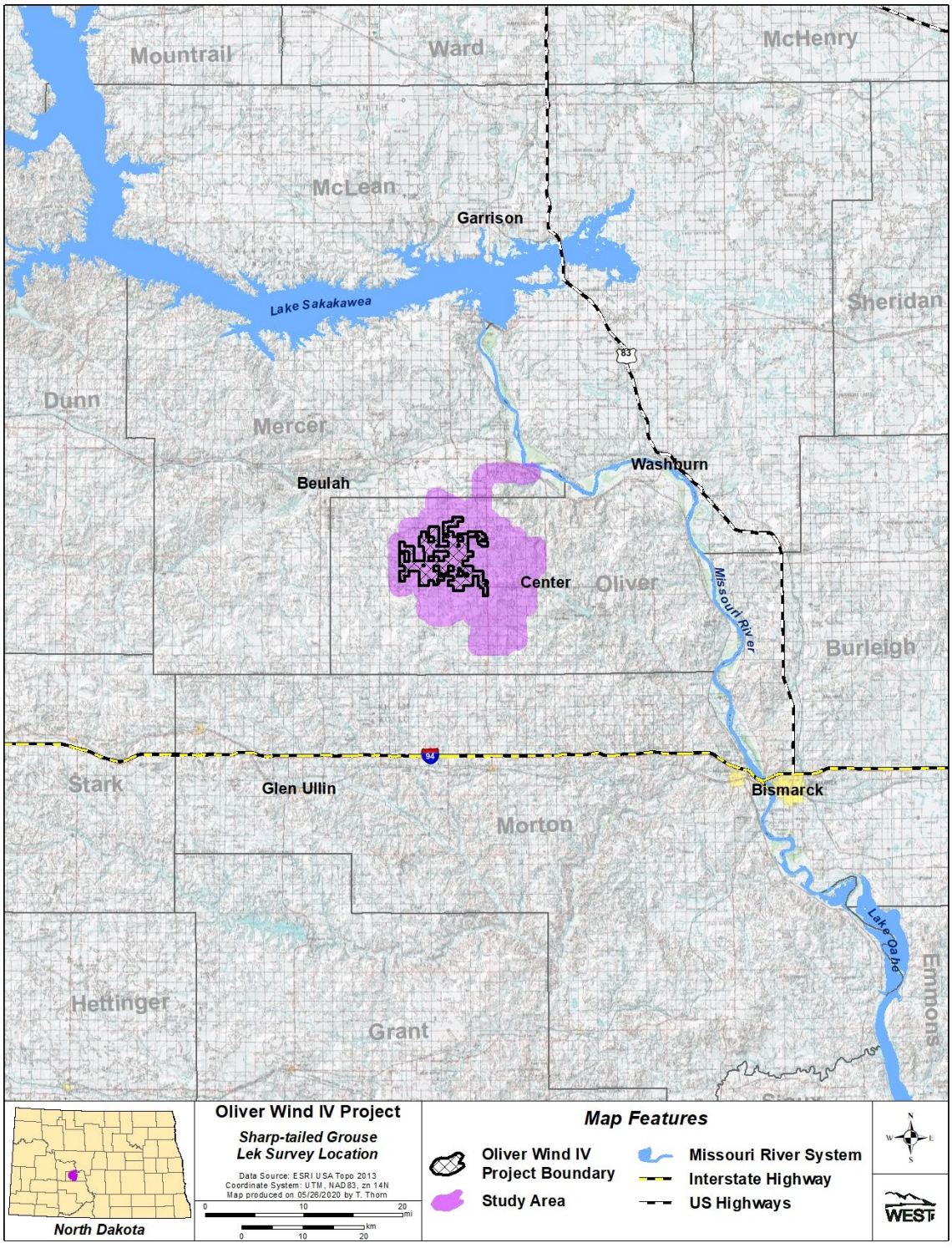


Figure 1. Location of the proposed Oliver Wind IV Project Area and Study Area in Oliver and Mercer counties, North Dakota.

For the purposes of this survey, a lek was defined as a location where two or more male STGR were observed lekking, either visually or aurally. Leks were categorized based on their activity status. Leks that had two or more STGR males displaying courtship behavior at the same location during multiple survey rounds were classified as "confirmed" leks. Leks where visual and/or auditory observations of two or more STGR males were detected during only one survey round were classified as "probable" leks.

All leks located, regardless of their activity status, were assigned a unique identification number (Lek ID). The date, time, estimated number of STGR (males, females, and unknown), and any relevant comments were also recorded for each lek.

RESULTS

Survey Round 1 was conducted on April 7, 2020; Round 2 was conducted April 17 – 19, 2020, and Round 3 was conducted April 26 – 30, 2020 (Table 1). During the 2020 surveys, STGR were observed lekking at five previously unknown locations (Lek IDs 6–10) and five previously known locations (Lek IDs 1 – 5; Figure 2) documented during surveys conducted in 2019 (Shelley et al. 2023). Separate counts of males and females were not always possible during the aerial surveys due to the speed and distance of the aircraft.

Two of the previously unknown leks (Lek ID 9 and Lek ID 10; Figure 2, Table 1) were classified as “confirmed” and the remaining three (Lek IDs 6 – 8) were classified as “probable.” Lek IDs 6 and 7 were located within cultivated lands and Lek IDs 8, 9, and 10 were in grassland/herbaceous habitat (Figure 2). Lek IDs 9 and 10, located in the eastern portion of the Study Area, had the highest peak number of STGR observed in 2020, with 16 STGR in Round 3 (Table 1). Lek IDs 6, 7, and 8 had peak numbers of nine, two, and nine STGR, respectively (Table 1).

The five previously known STGR leks documented within the 2019 Study Area (Shelley et al. 2023) were revisited in 2020 and classified as follows: Lek IDs 1, 2 and 3 were classified as “probable” and Lek IDs 4 and 5 were “confirmed.” Of these previously known leks, Lek IDs 4 and 5 both were observed with the most STGR (16; Table 2), and all five previously known leks were located in grasslands/herbaceous habitat (Figure 2).

Table 1. Number[1] of sharp-tailed grouse and activity status of previously unknown leks within the 2020 Study Area of the proposed Oliver Wind IV Project in Mercer and Oliver counties, North Dakota during lek surveys conducted from April 7 – 30, 2020.

	Survey Round 1 (April 7)				Survey Round 2 (April 17 – 19)				Survey Round 3 (April 26 – 30)				Survey	Activity
Lek ID	M	F	U	T	M	F	U	T	M	F	U	T	Total	Status
6	0	0	0	0	0	0	0	0	1	0	8	9	9	Probable
7	0	0	6	6	0	0	0	0	1	0	1	2	8	Probable
8	0	0	0	0	0	0	0	0	6	0	3	9	9	Probable
9	0	0	0	0	2	0	11	13	4	0	12	16	29	Confirmed
10	0	0	0	0	5	2	4	11	8	0	8	16	27	Confirmed

[1.] Number of males (M), females (F), unknown (U), and total (T) sharp-tailed grouse from each survey round.

Table 2. Summary[1] of sharp-tailed grouse lek surveys conducted in 2019 and 2020 within the Study Area of the proposed Oliver Wind IV Project in Oliver and Mercer counties, North Dakota.

	2019					2020				
Lek ID	M	F	U	T	Status	M	F	U	T	Status
1*	0	0	38	38	Probable	1	0	8	9	Probable
2*	0	0	6	6	Probable	1	0	1	2	Probable
3*	0	0	12	12	Probable	6	0	3	9	Probable
4*	0	0	2	2	Probable	6	0	25	31	Confirmed
5*	12	0	16	28	Confirmed	13	2	12	27	Confirmed
6	-	-	-	-	-	1	0	8	9	Probable
7	-	-	-	-	-	1	0	7	7	Probable
8	-	-	-	-	-	6	0	3	3	Probable
9	-	-	-	-	-	6	0	23	23	Confirmed
10	-	-	-	-	-	13	2	12	12	Confirmed

[1.] Overall number of males (M), females (F), unknown (U), and total (T) sharp-tailed grouse from all the survey rounds.

* Previously known leks documented during the 2019 lek surveys within the Study Area (Shelley et al. 2023).

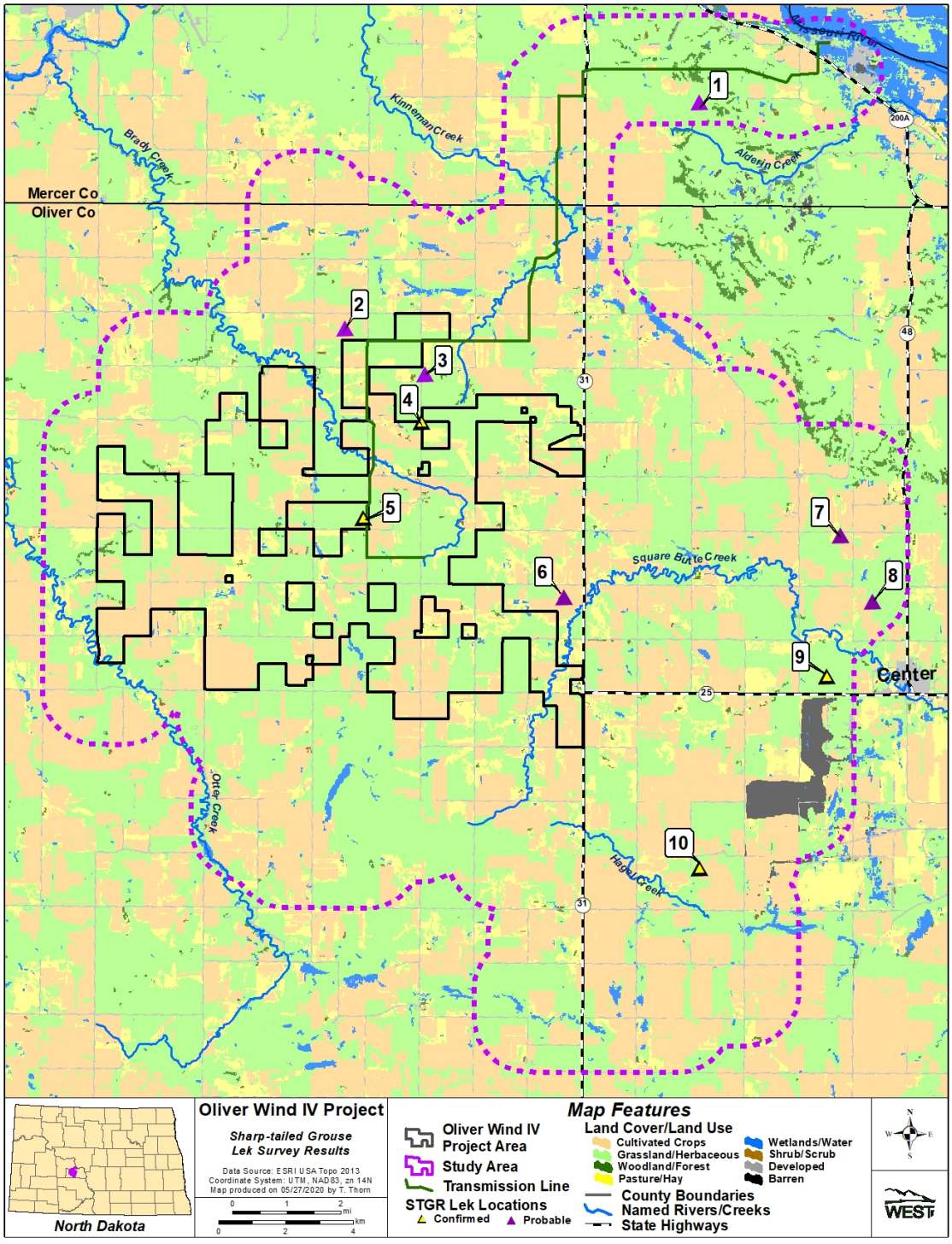


Figure 2. Location and activity status of sharp-tailed grouse leks within the Study Area of the Oliver Wind IV Project in Oliver and Mercer counties, North Dakota (surveys conducted from April 7 – 30, 2020).

Oliver IV T-Line 000258

SUMMARY

The documentation of previously unknown leks in 2020 and the change in activity status between 2019 and 2020 suggest lek locations and STGR abundance at each lek vary year to year. These results provide an overall understanding of the spatial extent of breeding STGR within the landscape of the Study Area, which can aid in Project development.

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Appendix B5. Raptor Nest Survey (2020)

Raptor Nest Surveys

Completed February – July 2020

Oliver Wind IV Project
Oliver and Mercer Counties, North Dakota

Final Report

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Prepared by:

Sofía Agudelo and Clayton Derby

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REPORT REFERENCE

Agudelo, S and C. Derby. 2023. Raptor Nest Surveys, Completed February – July 2020. Oliver IV Wind Project. Oliver and Mercer Counties, North Dakota. Final Draft Report. Prepared for Oliver IV Wind, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 23, 2023. 16pp.

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INTRODUCTION

Oliver Wind IV, LLC (Company) is evaluating the potential for wind energy development at the Oliver Wind IV Project and Transmission Line (referred to as the Project) in Oliver and Mercer Counties, North Dakota. The Company contracted Western EcoSystems Technology, Inc. (WEST) to conduct raptor nest surveys, with a focus on bald (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) the Project and associated Study Area (Figure 1).

Raptor nest surveys were conducted following guidance provided in the US Fish and Wildlife Service's (USFWS) *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013), *Interim Golden Eagle Inventory and Monitoring Protocols* (Pagel et al. 2010), and Region 6 *Recommended Protocol for Conducting Pre-construction Eagle Nest Surveys at Wind Energy Projects* published in January of 2020 (USFWS 2020a). Although the surveys were conducted prior to the issuance of the *Updated Eagle Nest Protocol* issued on April 21, 2020 (USFWS 2020b), the surveys were consistent with the protocol.

The overall objective of the raptor nest surveys was to provide a comprehensive assessment of nest occupancy as well as to track nest success and productivity within the Study Area. Results from this survey provide information on the nesting status of eagles and other raptor species within the Study Area.

STUDY AREA

The Study Area is located approximately 3.7 miles (mi; 6.0 kilometers [km]) west of the town of Center, in central North Dakota (Figure 1). The Study Area occurs within the Northwestern Glaciated Plains Level III Ecoregion - an area historically dominated by grasslands but extensively converted to agricultural use, with crop production and livestock grazing the primary uses (Griffith 2010, Sayler 2016). Topography is gently rolling to flat, with elevations ranging from 1,663–2,385 feet (ft; 507–727 meters [m]) above sea level (USGS 2019).

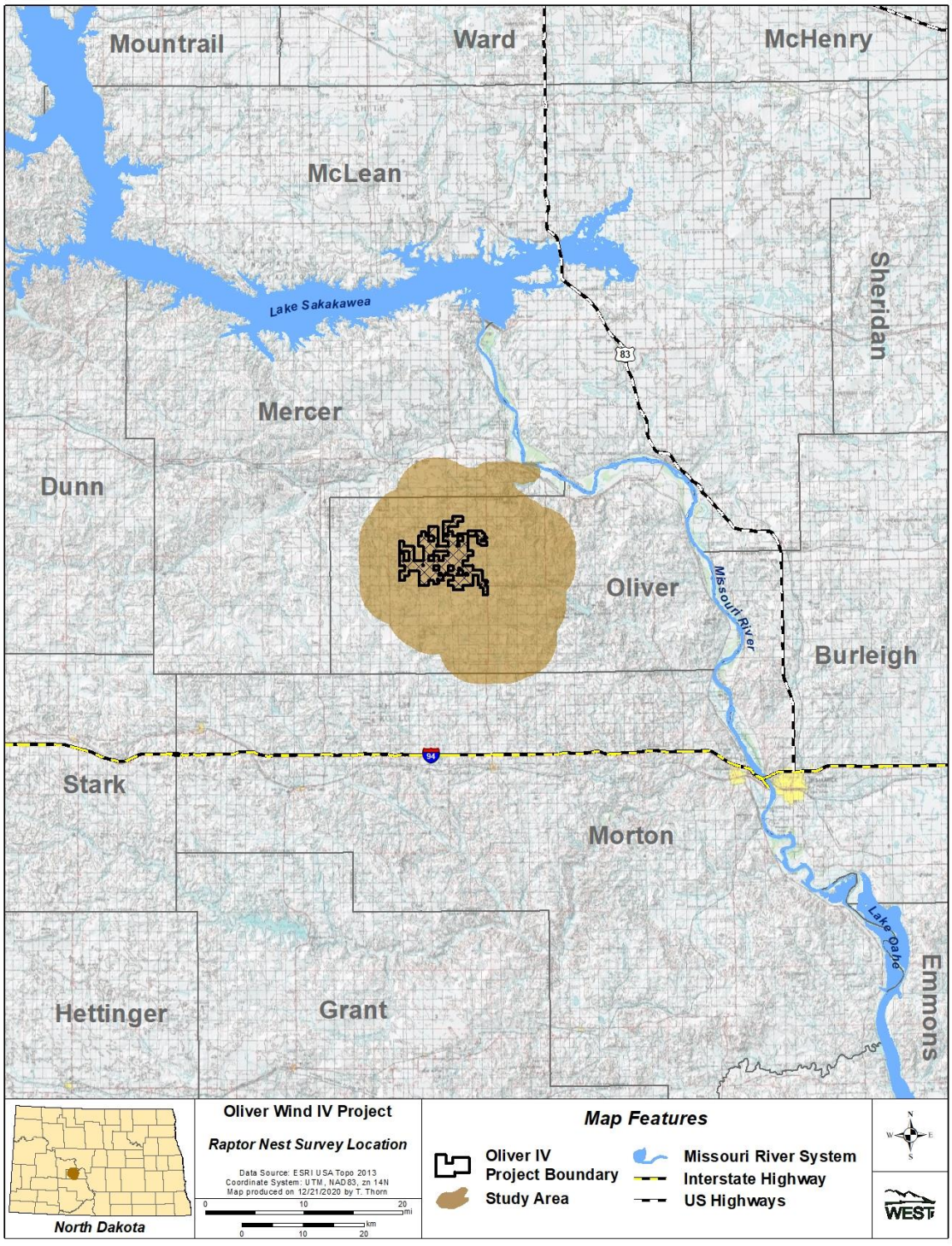


Figure 1. Location of the Oliver Wind IV Project and raptor nest Study Area in Oliver and Mercer Counties, North Dakota.

METHODS

Pre-survey planning included the creation of field maps and mobile Geographic Information System (commonly, GIS) files, and the review of relevant background information such as topographic maps and aerial photographs to identify suitable eagle and raptor nesting habitat within Study Area. Raptor nest locations identified in prior surveys or provided by the North Dakota Game and Fish Department (NDGFD) were also mapped prior to the onset of surveys.

Aerial and ground-based surveys were conducted following the timeframes recommended by the USFWS Region 6 protocol (USFWS 2020a). The general schedule suggested for this effort, per direction from the USFWS Region 6 office on application of the ECPG, is outlined below.

- Visit 1: Ground-based survey to check known eagle nest locations between January 1 – February 21.
- Visit 2: Aerial survey to check known eagle nest locations and to search for new eagle and non-eagle raptor nests between February 22 – March 21.
- Visit 3: Ground-based survey to check known eagle nest locations, including new eagle nests found during Survey 2 between March 22 – April 30.
- Visit 4: Aerial survey to check known eagle nest locations, including new eagle nests found during Survey 2, and to search for new eagle and non-eagle raptor nests between April 21 – May 31.
- Visit 5: Ground-based survey to check known eagle nest locations, including those found during Surveys 2 and 4 between June 1 – July 7.
- Visit 6: Ground-based survey to check known eagle nest locations between July 8 – August 31.

Aerial Surveys

Aerial surveys were used to locate eagle and non-eagle raptor nests within the Study Area as they allowed for a quick and thorough visual inspection of suitable nesting habitat. Suitable nesting habitat included riparian corridors, woodlands and forested areas, large trees, cliffs or rocky outcrops, and anthropogenic structures such as power poles. Pre-flight planning included a desktop review of aerial imagery and land cover data to develop a survey route and to identify potential eagle and other raptor nesting habitats within the Study Area. These potential nesting habitats for eagles and other raptors were included in surveys.

Aerial surveys occurred before trees/vegetation produced leaves and when eagles and raptors would be actively tending to a nest or incubating eggs (USFWS 2007). Aerial surveys were conducted to check known eagle nests and to search for new nests. All potential eagle and raptor nest habitat was surveyed by flying meandering transects at speeds of 60–75 mi (97–121 km) per hour throughout the Study Area and associated buffers. Surveys were concentrated over likely eagle and other raptor nesting habitat (e.g., large trees, human structures such as power poles,

wooded areas, riparian corridors, forested margins of waterbodies, and any cliffs or rocky outcrops).

Aerial raptor nest surveys were conducted by an experienced WEST biologist in a Robinson R44 helicopter (Pagel et al. 2010, USFWS 2013). The first aerial survey was conducted on March 13 - 14, 2020. A second round of aerial raptor nest surveys were completed on April 26 – 28, 2020.

During the second aerial survey, each nest detected during the first round of aerial surveys was rechecked to confirm/update the nest status. This survey also included a comprehensive search of the Study Area for new nests and was used to record information on raptors that initiate nesting later in the breeding season. The same methods used during the first survey were repeated during the second aerial survey.

During the survey, the pilot positioned the helicopter to allow a thorough visual inspection of stick nest structures. The survey team took great care to minimize disturbance to breeding eagles and raptors. When nests were located, the pilot reduced speed and adjusted the flight track such that the biologist could clearly see the nest to document the nest accurately. The pilot approached the nest slowly and maintained the greatest possible distance at which the nest status could be documented. The survey flight path was recorded using a hand-held Global Positioning System (GPS)-enabled tablet running Gaia GPS software to ensure the Study Area was covered adequately.

Ground Based Surveys

The ground-based survey methods allowed for a determination of occupancy status of any known/historic eagle nests (ground surveys one and two) and visitation of any occupied active nests to determine nest success/productivity (ground surveys three and four). The first two ground surveys were conducted to provide additional information on the occupancy status of known/historic eagle nests. Ground surveys were no longer conducted once a nest was determined to be unoccupied or if an occupied nest was determined to be inactive or failed.

Ground-based surveys were conducted from public roads and lands where permission was granted by the landowner prior to surveys. The biologist used the closest location and/or best vantage point to observe the nest; in some cases, nest locations were inaccessible and could not be surveyed.

One experienced WEST biologist conducted the ground-based raptor nest surveys on February 21, March 31, June 26, and July 17, 2020. Conducting the survey early in the season ensured the search effort coincided with the period when eagles were likely incubating eggs or tending young and was based on chronology for nesting eagles in the region (Pagel et al. 2010, Isaacs and Anthony 2011, USFWS 2013).

After locating each nest, the biologist completed a thorough visual inspection of the habitat to provide views of the nest from several different angles. Known/historic eagle nests were observed for four hours per survey, or until occupancy was confirmed. The biologist took great care to

minimize disturbance to breeding eagles and raptors. The survey was conducted between 07:00 hours and 16:00 hours. Ground surveys were conducted in areas where access was available to view the nest.

Data Collection Methods and Terminology

Biologists searched for stick nests with a large bowl or flat platform-shape, made of intertwined large sticks; known locations of nests were also surveyed for current nest status and condition. Data on raptor species, nest status, nest condition and substrate, nest type, nest coordinates, whether or not the nest was consistent with an eagle nest, and any other additional relevant information about the nest were recorded at each nest location to the extent possible. Raptor sightings and behavior nearby nests were also recorded. All occupied eagle nests and unoccupied nests potentially used by eagles were photographed.

Each nest was assigned a unique nest identification (ID) number, location was recorded with a GPS and attribute data including species, substrate, status, condition, and relative nest size and nest characteristics were documented. Below are detailed descriptions of nest attributes and applicable definitions and terms. A table detailing information about raptor nests recorded during the raptor nest survey is presented in Appendix A.

Nest Condition – Nest condition was categorized using descriptions ranging from poor to good, which provided a general sense of when a nest or nest site may have been last used.

- Poor (P): a nest appearing dilapidated (e.g., in disrepair, sloughing, or sagging heavily) and required major repair to be suitable for successful nesting
- Fair (F): a nest in generally good condition with fairly well-defined bowl, minor sagging, may require some repair in order to be used
- Good (G): a nest in excellent condition with a well-defined bowl, no sagging or sloughing, and was considered suitable for nesting
- Unknown (UNK): nest condition is unknown

Nest Characteristics – Each nest was recorded according to two general categories: 1) large stick nests (potentially suitable for eagle use) and 2) non-eagle size nests.

Nest Location – Coordinates for all the raptor nests located during surveys were recorded using a hand-held Global Positioning System (GPS); coordinates were set at Universal Transverse Mercator North American Datum 83 unit (UTM NAD 83).

Nest Status – Nest status was categorized using definitions originally proposed by Postupalsky (1974) and these definitions are still largely followed today in the ECPG (USFWS 2013).

- Occupied (O): a nest was classified as occupied if any of the following were observed at the nest structure: 1) an adult in an incubating position; 2) eggs; 3) nestlings or fledglings; 4) presence of an adult (sometimes sub-adults); 5) a newly constructed or refurbished stick nest in the area where territorial behavior of a raptor had been observed earlier in

the breeding season; or 6) a recently repaired nest with fresh sticks (clean breaks) or fresh boughs on top, and/or droppings and/or molted feathers on the nest rim or underneath.

- Occupied active (OA): nest had eggs, nestlings, and/or an adult in incubating/brooding position at the time of the survey
- Occupied inactive (OI): nest had evidence of recent tending of the nest or presence by an adult, but there were no eggs, nestlings, or adult in incubating/brooding position
- Unoccupied (U): nest with no evidence of occupancy for at least two consecutive surveys
- Undetermined (UND): nest with no evidence of occupancy during only one survey
- Missing (M): nest is completely missing or couldn't be found
- Unknown (UNK): nest may or may not be present; status could not be determined

*Nest S*ubstrate – Nest substrate included anthropogenic structures (e.g., power line poles and nest platforms), cliffs and rock outcrops, and trees.

Nest Success – Nesting success is defined as the proportion of OA nests resulting in at least one young fledged, or the minimum acceptable age for determining success. Nest success for eagles means at least one nestling survived to greater than 56 days for golden eagles and greater than 67 days for bald eagles (Steenhof and Newton 2007, USFWS 2013). Nest success was only documented if subsequent surveys were completed to evaluate the nests.

Productivity – Nest productivity is defined as the average number of young that reached fledging age (or minimum age for success, as described above) per Occupied Active nest in a particular breeding period.

Raptor Nest – Raptor and eagle nests were defined as structures made or locations used by raptors, for laying their eggs and sheltering their young (Steenhof and Newton 2007).

All raptor nests (including eagle nests) detected within the Study Area and a 4.0-mi (6.4-km) buffer of the Study Area were recorded (Figure 1) during the first aerial survey (Visit 2) and within a 2.0-mi (3.2-km) buffer of the Study Area during the second aerial survey (Visit 4). The reduction of the Study Area from a 4.0-mi (Visit 2) to a 2.0-mi aerial survey buffer (Visit 4) was implemented due to updated guidance from the USFWS in 2020. The Study Area with a 4.0-mi buffer extended slightly into Morton County but the Study Area with a 2.0-mi buffer was fully contained in Oliver County (Figure 1). Raptors were defined as kites, accipiters, buteos, harriers, falcons, owls, and eagles. Two aerial and four ground-based surveys were completed in 2020, pursuant to USFWS Region 6 protocol (USFWS 2020a), as summarized in Table 1.

For all occupied eagle nests detected during Visits 1–4, ground-based follow-up visits were conducted during Visits 5 and 6. Follow-up visits were limited to only occupied eagle nests to determine eagle nest success per USFWS Region 6 recommendations. The following eagle nest status definitions were used: (1) successful nests were defined as nests where chicks were observed and were at least 70% feathered at the time of observation (Steenhof 1987, 2007 as

Table 1. Survey effort for eagle and raptor nest surveys conducted within the Project, 2.0-mile (mi), and 4.0-mi survey areas of the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota, from February 21 – July 17, 2020.

Visit Number	Type of Survey	Survey Objective	Survey Dates
1	Ground	Visit known eagle nests within 4.0-mi survey area	February 21, 2020
2	Aerial	Revisit known eagle nests and search for new eagle nests within 4.0-mi survey area; search for all raptor nests within 1.0-mi survey area	March 13 – 14, 2020
3	Ground	Revisit known eagle nests and new eagle nests observed in Survey 2 within 4.0-mi survey area	March 31, 2020
4	Aerial	Revisit known eagle nests and search for new eagle nests within 2.0-mi survey area; revisit all previously recorded raptor nests and search for new raptor nests within 1.0-mi survey area	April 26 – 28, 2020
5	Ground	Check status of occupied eagle nests	June 26, 2020
6	Ground	Check status of occupied eagle nests	July 17, 2020

cited in USFWS 2013); (2) unsuccessful nests were defined as nests where it was clearly determined that no chicks had survived; and (3) undetermined nests were defined as nests that were not visited, nests that could not be adequately viewed, or nests in which the chicks were less than 70% feathered during the ground visit.

Data Management

Quality Assurance and Quality Control

WEST implemented quality assurance and quality control (QA/QC) measures at all stages of the surveys, including in the field, during data entry and analysis, and report writing. All WEST field biologists were trained in proper survey techniques and all data collected were recorded on paper. Data were reviewed before they were submitted for data entry and after data were entered. If errors or anomalies were found, follow-up measures were implemented including discussions and review of field data with the biologist and/or Project manager.

Data Compilation and Storage

WEST data entry staff were trained on proper data entry procedures, which included an independent review of the field data. System controls were implemented to ensure correct data were entered; however, if any errors, omissions, or problems were identified in later stages of analysis, they were traced back to the raw data where appropriate changes and measures were implemented.

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Reporting and Review Process

WEST's reporting and review process included technical editing and content review, senior technical review, senior management review, and a final review by the Project manager before delivery to the client.

RESULTS

One hundred thirty-five stick nest structures were detected (Table 2, Figure 2) and 85 nests were classified as active (occupied) within the Study Area and associated buffers in 2020. The number and associated species of active nests included: two occupied/active Swianson's hawk (*Buteo swainsoni*) nests (Nest 94 and Nest 121), 21 occupied/active great horned owl (*Bubo virginianus*) nests, and 57 occupied/active red-tailed hawk (*Buteo jamaicensis*) nests. There were two (non-eagle) raptor nests that were active (Nest 91 and Nest 114) where the species could not be confirmed and 51 raptor nests that were inactive. Additionally, there was one stick nest occupied by Canada geese (*Branta canadensis*; Table 2, Figure 2).

One known bald eagle nest (BE397; location provided by the NDGFD) was included in the 2020 survey effort but was not detected during Visit 1 (February 21, 2020) or Visit 2 (March 13-14, 2020; Table 2; Figure 2), and therefore was removed from the follow-up Visits 3-6. One active bald eagle nest (Nest 85), located in the east-central portion of the Study Area, was recorded for the first time during aerial surveys conducted in 2020 (Table 2; Figure 2). Nest 85 was revisited during Visits 5 and 6, and adult eagle activity was observed in the vicinity of the nest location. However, nest ID 85 was obscured by vegetative cover during Visit 5 and no adult or juvenile eagle activity was subsequently recorded in the vicinity during Visit 6. Thus, nest ID 85 success was "undetermined" according to the definitions used in this report. No additional eagle nests or large stick nest structures consistent with an eagle nest were recorded within the Study Area during the 2020 survey period (Table 2; Figure 2). Appendix A includes photos for the eagle nest documented in 2020.

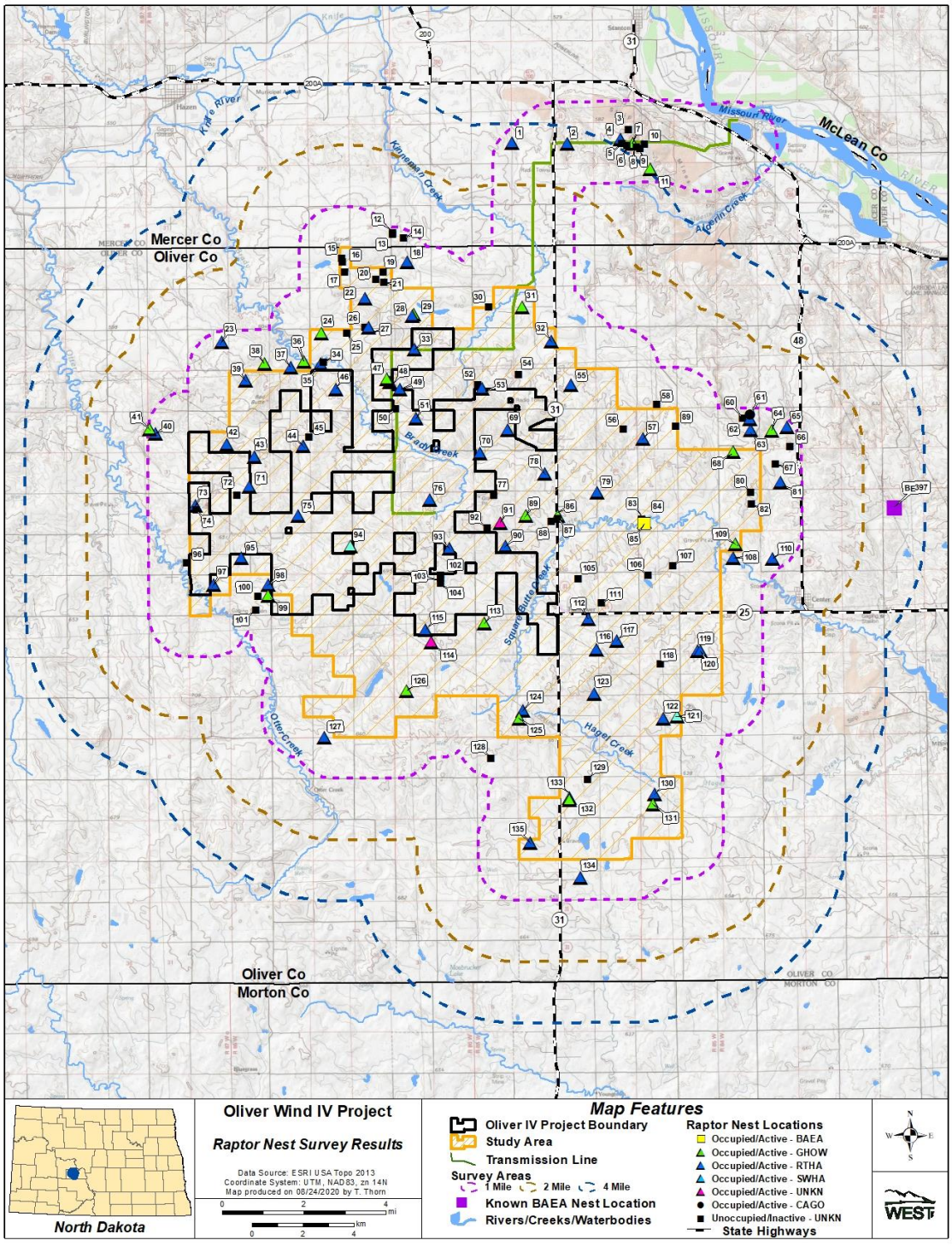


Figure 2. Status of nest structures located during eagle and general raptor nest surveys conducted in 2020 within the Oliver Wind IV Project Oliver and Mercer Counties, North Dakota, and associated buffers.

Table 2. Summary of features associated with nest structures located during raptor nest surveys conducted in 2020 within the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota, and associated buffers.

Nest ID[1]	Species[2]	Easting[3]	Northing[3]	Nest Status	Nest Condition	Comments
BE397	BAEA	329343	5224069	Not detected	Unknown	Known nest
1	RTHA	314857	5238959	Occupied/Active	Fair	1 adult
2	RTHA	317004	5238839	Occupied/Active	Good	1 adult
3	UNKN	319443	5239286	Unoccupied/Inactive	Fair	
4	RTHA	319115	5238934	Occupied/Active	Fair	1 adult; 2 eggs
5	UNKN	319149	5238758	Unoccupied/Inactive	Fair	
6	UNKN	319365	5238662	Unoccupied/Inactive	Fair	
7	GHOW	319572	5238748	Occupied/Active	Good	1 adult
8	UNKN	319720	5238605	Unoccupied/Inactive	Good	
9	UNKN	319858	5238545	Unoccupied/Inactive	Good	
10	UNKN	320051	5238694	Unoccupied/Inactive	Good	
11	GHOW	320244	5237717	Occupied/Active	Good	1 adult
12	UNKN	310015	5235608	Unoccupied/Inactive	Fair	
13	UNKN	310008	5235550	Unoccupied/Inactive	Fair	
14	UNKN	310447	5235388	Unoccupied/Inactive	Fair	
15	UNKN	307980	5234678	Unoccupied/Inactive	Fair	
16	UNKN	308022	5234526	Unoccupied/Inactive	Good	
17	UNKN	308084	5234118	Unoccupied/Inactive	Good	
18	RTHA	310538	5234441	Occupied/Active	Good	1 adult
19	UNKN	309605	5234060	Unoccupied/Inactive	Good	
20	UNKN	309290	5233784	Unoccupied/Inactive	Good	
21	UNKN	309593	5233683	Unoccupied/Inactive	Good	
22	RTHA	308828	5233064	Occupied/Active	Good	1 adult
23	RTHA	303152	5231570	Occupied/Active	Good	1 adult
24	GHOW	307082	5231762	Occupied/Active	Good	1 adult
25	UNKN	308067	5231730	Unoccupied/Inactive	Good	
26	UNKN	308797	5231920	Unoccupied/Inactive	Good	
27	RTHA	308933	5231912	Occupied/Active	Good	1 adult
28	RTHA	310683	5232302	Occupied/Active	Good	1 adult
29	GHOW	310734	5232368	Occupied/Active	Good	1 adult
30	UNKN	313683	5232528	Unoccupied/Inactive	Good	
31	GHOW	314983	5232497	Occupied/Active	Good	1 adult; 2 nestlings
32	RTHA	316092	5231102	Occupied/Active	Good	1 adult
33	RTHA	310718	5231000	Occupied/Active	Good	1 adult
34	UNKN	307126	5230612	Unoccupied/Inactive	Fair	
35	RTHA	307012	5230567	Occupied/Active	Good	1 adult
36	GHOW	306341	5230682	Occupied/Active	Good	1 adult
37	RTHA	305832	5230457	Occupied/Active	Good	1 adult

Table 2. Summary of features associated with nest structures located during raptor nest surveys conducted in 2020 within the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota, and associated buffers.

Nest ID[1]	Species[2]	Easting[3]	Northing[3]	Nest Status	Nest Condition	Comments
38	GHOW	304789	5230657	Occupied/Active	Good	1 adult
39	RTHA	304030	5230017	Occupied/Active	Good	1 adult
40	RTHA	300407	5228068	Occupied/Active	Good	1 adult
41	GHOW	300198	5228266	Occupied/Active	Good	1 adult
42	RTHA	303202	5227529	Occupied/Active	Good	1 adult
43	RTHA	304261	5227018	Occupied/Active	Good	1 adult
44	RTHA	306196	5227362	Occupied/Active	Good	1 adult
45	UNKN	306423	5227701	Unoccupied/Inactive	Good	
46	RTHA	307555	5229551	Occupied/Active	Good	1 adult
47	GHOW	309578	5229867	Occupied/Active	Good	1 adult
48	RTHA	309678	5229754	Occupied/Active	Good	1 adult
49	RTHA	310088	5229457	Occupied/Active	Good	1 adult
50	UNKN	309882	5228673	Unoccupied/Inactive	Good	
51	RTHA	310668	5228279	Occupied/Active	Good	1 adult
52	UNKN	313143	5229510	Unoccupied/Inactive	Fair	
53	RTHA	313292	5229343	Occupied/Active	Good	1 adult
54	UNKN	314753	5229845	Unoccupied/Inactive	Fair	
55	RTHA	316788	5229367	Occupied/Active	Good	
56	UNKN	318791	5227550	Unoccupied/Inactive	Fair	
57	RTHA	319552	5227124	Occupied/Active	Good	1 adult
58	UNKN	320122	5228448	Unoccupied/Inactive	Good	
60	UNKN	323481	5227800	Unoccupied/Inactive	Fair	
61	CAGO	323790	5227919	Occupied/Active	Good	1 adult
62	RTHA	323764	5227750	Occupied/Active	Good	1 adult
63	RTHA	323779	5227316	Occupied/Active	Good	Actively building nest
64	GHOW	324597	5227254	Occupied/Active	Good	1 adult; 3 nestlings
65	RTHA	325217	5227375	Occupied/Active	Good	1 adult
66	UNKN	325308	5226615	Unoccupied/Inactive	Good	
67	UNKN	324694	5225939	Unoccupied/Inactive	Fair	
68	GHOW	323061	5226488	Occupied/Active	Good	1 adult
69	RTHA	314249	5227675	Occupied/Active	Good	1 adult
70	RTHA	313132	5226810	Occupied/Active	Good	1 adult
71	RTHA	304026	5225833	Occupied/Active	Good	1 adult
72	UNKN	303524	5225523	Unoccupied/Inactive	Fair	
73	RTHA	301864	5225182	Occupied/Active	Good	1 adult
74	UNKN	301892	5225012	Unoccupied/Inactive	Fair	
75	RTHA	305894	5224626	Occupied/Active	Good	1 adult
76	RTHA	311092	5225050	Occupied/Active	Good	1 adult
77	UNKN	313601	5225147	Unoccupied/Inactive	Good	

Table 2. Summary of features associated with nest structures located during raptor nest surveys conducted in 2020 within the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota, and associated buffers.

Nest ID[1]	Species[2]	Easting[3]	Northing[3]	Nest Status	Nest Condition	Comments
78	RTHA	315645	5225927	Occupied/Active	Good	1 adult
79	RTHA	317665	5225081	Occupied/Active	Good	1 adult
80	UNKN	323700	5224863	Unoccupied/Inactive	Fair	
81	RTHA	324885	5225221	Occupied/Active	Good	
82	UNKN	323687	5224411	Unoccupied/Inactive	Good	
83	UNKN	319366	5223982	Unoccupied/Inactive	Good	
84	GHOW	319484	5223892	Occupied/Active	Good	1 adult
85*	BAEA	319469	5223806	Occupied/Active	Good	2 adults
86	GHOW	316074	5224252	Occupied/Active	Good	1 adult; 2 nestlings
87	UNKN	316074	5224136	Unoccupied/Inactive	Good	
88	UNKN	315827	5224007	Unoccupied/Inactive	Fair	
89	GHOW	314835	5224278	Occupied/Active	Good	1 adult
89	UNKN	320835	5227582	Unoccupied/Inactive	Poor	Nest deteriorated
90	RTHA	313970	5223130	Occupied/Active	Good	1 adult
91	UNKN	313801	5224050	Occupied/Active	Good	2 nestlings
92	UNKN	313281	5223868	Unoccupied/Inactive	Good	
93	RTHA	311780	5223109	Occupied/Active	Good	1 adult
94	SWHA	307891	5223346	Occupied/Active	Good	1 adult
95	RTHA	303591	5223056	Occupied/Active	Good	1 adult
96	UNKN	301437	5222931	Unoccupied/Inactive	Fair	
97	RTHA	302466	5222058	Occupied/Active	Good	1 adult
98	RTHA	304608	5221948	Occupied/Active	Good	1 adult
99	GHOW	304579	5221533	Occupied/Active	Good	1 adult
100	UNKN	304183	5221534	Unoccupied/Inactive	Fair	
101	UNKN	304071	5220968	Unoccupied/Inactive	Fair	
102	UNKN	311387	5222085	Unoccupied/Inactive	Good	
103	UNKN	311383	5221951	Unoccupied/Inactive	Good	
104	UNKN	311381	5221769	Unoccupied/Inactive	Good	
105	UNKN	316798	5221709	Unoccupied/Inactive	Fair	
106	UNKN	319520	5221747	Unoccupied/Inactive	Fair	
107	UNKN	320512	5222081	Unoccupied/Inactive	Fair	
108	RTHA	322896	5222325	Occupied/Active	Good	1 adult
109	GHOW	322999	5222849	Occupied/Active	Good	1 adult; 2 nestlings
110	RTHA	324440	5222225	Occupied/Active	Good	
111	UNKN	317671	5220734	Unoccupied/Inactive	Fair	
112	RTHA	317126	5220138	Occupied/Active	Good	
113	GHOW	313046	5220126	Occupied/Active	Good	
114	UNKN	310922	5219454	Occupied/Active	Good	2 nestlings
115	RTHA	310722	5219965	Occupied/Active	Good	

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Table 2. Summary of features associated with nest structures located during raptor nest surveys conducted in 2020 within the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota, and associated buffers.

Nest ID[1]	Species[2]	Easting[3]	Northing[3]	Nest Status	Nest Condition	Comments
116	RTHA	317402	5218935	Occupied/Active	Good	1 adult
117	RTHA	318198	5219240	Occupied/Active	Good	1 adult
118	UNKN	319877	5218262	Unoccupied/Inactive	Good	
119	RTHA	321364	5218719	Occupied/Active	Good	1 adult
120	RTHA	321472	5218711	Occupied/Active	Good	1 adult
121	SWHA	320458	5216184	Occupied/Active	Good	2 adults
122	RTHA	319927	5216095	Occupied/Active	Good	1 adult
123	RTHA	317255	5217190	Occupied/Active	Good	1 adult
124	RTHA	314418	5216645	Occupied/Active	Good	1 adult
125	GHOW	314254	5216325	Occupied/Active	Good	1 adult
126	GHOW	309880	5217571	Occupied/Active	Good	1 adult
127	RTHA	306574	5215871	Occupied/Active	Good	1 adult
128	UNKN	313096	5214795	Unoccupied/Inactive	Good	
129	UNKN	316850	5213821	Unoccupied/Inactive	Good	
130	RTHA	319451	5213156	Occupied/Active	Good	1 adult
131	GHOW	319380	5212744	Occupied/Active	Good	1 adult
132	GHOW	316118	5213062	Occupied/Active	Good	1 adult
133	RTHA	316115	5213145	Occupied/Active	Good	2 adults
134	RTHA	316432	5209985	Occupied/Active	Good	1 adult
135	RTHA	314502	5211424	Occupied/Active	Good	1 adult

[1.] Nest consistent with an eagle nest denoted by asterisk (*).

[2.] BAEA = bald eagle; CAGO = Canada goose; GHOW = great horned owl; RTHA = red-tailed hawk; SWHA = Swainson's hawk; UNKN = unknown species.

[3.] Easting and Northing coordinates given in UTM NAD 83, Zone 14N.

All nests were located on deciduous/coniferous trees.

Oliver IV T-Line 000277

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Appendix A. Photographs of Eagle Nests Located during the Raptor Nest Surveys Conducted in 2020 for the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota, and associated buffers



Nest ID 85. Survey 2 conducted March 12, 2020: Bald eagle occupied/active.



Nest ID 85. Survey 4 conducted April 27, 2020: Bald eagle occupied/active.



Nest ID 85. Survey 5 conducted June 26, 2020: Bald eagle occupied/active.



Nest ID 85. Survey 6 conducted July 17, 2020: inactive.

Appendix B6. Raptor Nest Survey (2022)

Raptor Nest Surveys

Completed February – June 2022

Oliver Wind IV Project

Oliver County, North Dakota

Final Report

Prepared for:

Oliver Wind IV, LLC

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INTRODUCTION

Oliver Wind IV, LLC. (Company) is developing the Oliver Wind IV Project (Project) in Oliver County, North Dakota (Figure 1). The Company contracted Western EcoSystems Technology, Inc. (WEST) to conduct a Tier 3 raptor nest survey within the proposed Project and Study Area and an associated 3.2-kilometer (km; 2.0-mile [mi]) buffer. All surveys were conducted following recommendations from the US Fish and Wildlife Service (USFWS) *Land-Based Wind Energy Guidelines* (USFWS 2012), the USFWS *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013), the USFWS Region 6 *Recommended Eagle Nest Survey Protocol* (USFWS 2020a) and the updated protocol (USFWS 2020b).

The overall objective of the raptor nest surveys was to provide a comprehensive assessment of nest occupancy as well as to track nest success and productivity within the Study Area. Results from this survey provide information on the nesting status of eagles and other raptor species within the Study Area.

STUDY AREA

The 45,861-hectare (113,325-acre) Study Area is located 17.7 kilometers (11 miles) north of the city of New Salem in Oliver County, North Dakota (Figure 1). The Study Area is primarily composed of herbaceous grassland (47.8%), followed by cultivated crops (37.7%), hay/pasture (10.0%), developed open space (2.6%), and less than 1% of the other land categories (National Land Cover Database (NLCD) 2019; Figure 2, Table 1). The Study Area is in the Level IV Missouri Plateau and River Breaks of the Level III Northwestern Great Plains ecoregion (US Environmental Protection Agency 2013). The Northwestern Great Plains ecoregion is a large ecoregion that covers northeastern Wyoming, eastern Montana, western North Dakota, western South Dakota, and northern Nebraska. This ecoregion consists of semiarid rolling plains, punctuated by buttes and badlands, and primarily used as rangeland or cultivated cropland.

METHODS

In accordance with recommendations from the USFWS Region 6 guidance (USFWS 2020a), eagle and non-eagle raptor nest surveys were conducted within the Study Area Minimum Convex Polygon (MCP) and a 3.2-km buffer of the MCP at the time of survey. Surveys included two aerial surveys for all raptor nests, including eagles and four ground-based surveys for eagle nests with the first survey being ground-based and conducted at known/historic eagle nest locations.

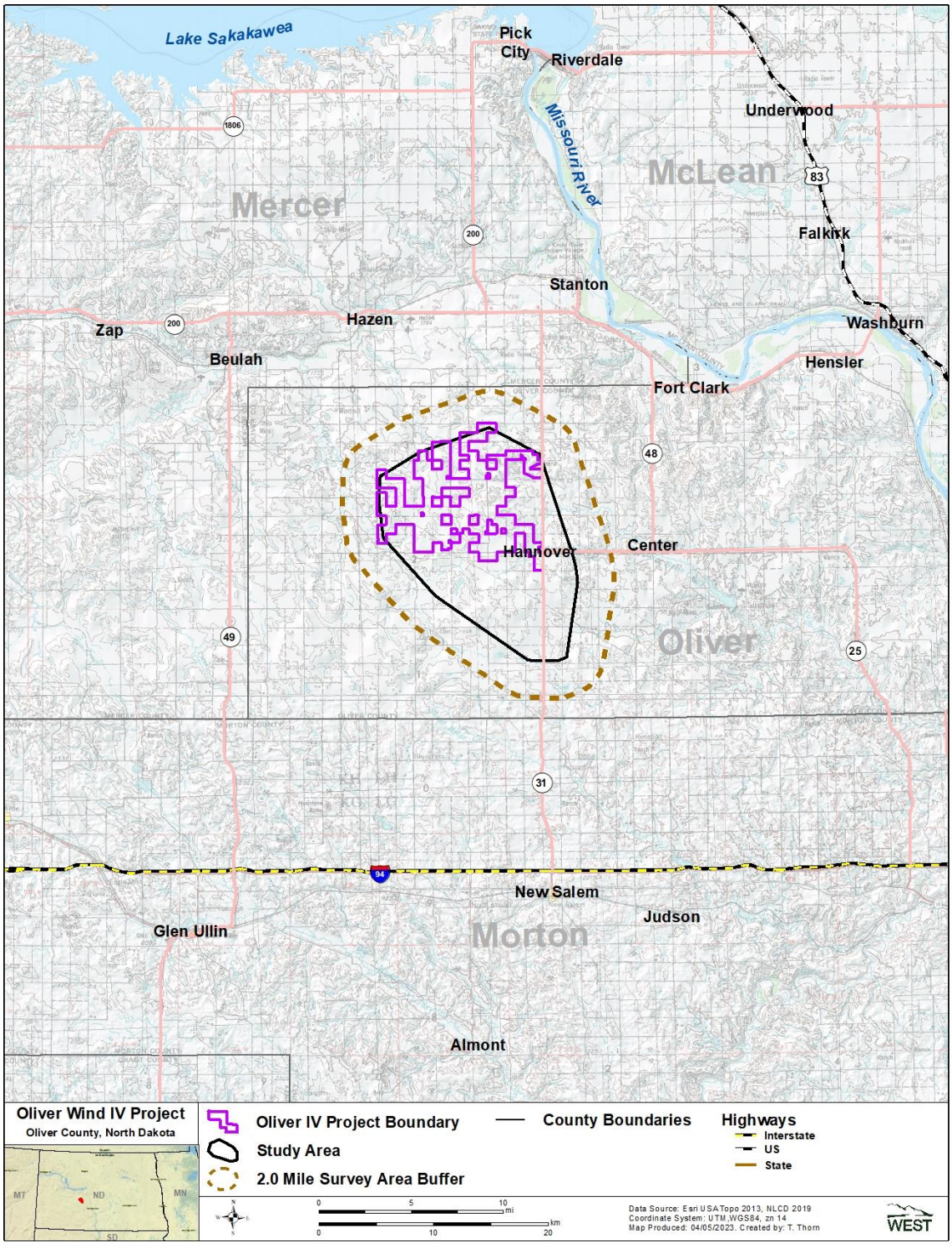


Figure 1. Location of the Oliver Wind IV Project Study Area and associated 3.2-kilometer (2.0-mile) buffer, Oliver County, North Dakota.

Table 1. Land cover types, coverage, and percent (%) composition within the Oliver Wind IV Project Study Area and 2-mi buffer , Oliver County, North Dakota.

Land Cover Type	Coverage (Hectares)	Coverage (Acres)	% Composition
Herbaceous	21,903.3	54,124.1	47.8%
Cultivated Crops	17,280.8	42,701.9	37.7%
Hay/Pasture	4,595.1	11,354.7	10.0%
Developed, Open Space	1,207.6	2,984.0	2.6%
Emergent Herbaceous Wetlands	409.0	1,010.7	0.9%
Deciduous Forest	178.8	441.8	0.4%
Woody Wetlands	70.2	173.4	0.2%
Barren Land	70.0	173.1	0.2%
Shrub/Scrub	67.8	167.5	0.1%
Open Water	40.5	100.0	0.1%
Developed, Low Intensity	31.0	76.5	0.1%
Mixed Forest	5.9	14.6	<0.1%
Developed, Medium Intensity	0.7	1.8	<0.1%
Evergreen Forest	0.5	1.3	<0.1%
Total[1]	**45,861.1**	**113,325.3**	**100**

Sources: National Land Cover Database 2019.

1. Sums of values may not add to the total value shown, due to rounding.

Aerial and ground-based surveys were conducted following the timeframes recommended by the USFWS Region 6 protocol (USFWS 2020a). The general schedule suggested for this effort, per direction from the USFWS Region 6 office on application of the ECPG, is outlined below.

- Visit 1: Ground-based survey to check known eagle nest locations between January 1 – February 21.
- Visit 2: Aerial survey to check known eagle nest locations and to search for new eagle and non-eagle raptor nests between February 22 – March 21.
- Visit 3: Ground-based survey to check known eagle nest locations, including new eagle nests found during Survey 2 between March 22 – April 30.
- Visit 4: Aerial survey to check known eagle nest locations, including new eagle nests found during Survey 2, and to search for new eagle and non-eagle raptor nests between April 21 – May 31.
- Visit 5: Ground-based survey to check known eagle nest locations, including those found during Surveys 2 and 4 between June 1 – July 7.
- Visit 6: Ground-based survey to check known eagle nest locations between July 8 – August 31.

Study Design for Aerial Surveys

Aerial surveys were used to locate eagle and non-eagle raptor nests within the Study Area and associated buffer as they allowed for a thorough visual inspection of suitable nesting habitat, including but not limited to riparian corridors, woodlands and forested areas, large trees, cliffs or

rocky outcrops, and anthropogenic structures such as power poles. Pre-flight planning included a desktop review of aerial imagery and land cover data to develop a survey route and to identify potential eagle and other raptor nesting habitats within the Study Area and associated buffer. These potential nesting habitats for eagles and other raptors were included in surveys.

The first round of aerial raptor nest surveys was conducted by an experienced WEST biologist and piloted by an experienced wildlife pilot using a Robinson R44 helicopter (Pagel et al. 2010, USFWS 2013). The first survey was conducted on March 3, 4, and 6, 2022. The survey period occurred when local raptor species were likely nesting; however, late-nesting species may not yet have been present.

The helicopter was flown at approximately 46–61 meters (151–200 feet) above ground level at an air speed of approximately 80 km per hour (50 mi per hour). During the survey, the pilot positioned the helicopter to allow a thorough visual inspection of stick nest structures. The survey team took great care to minimize disturbance to breeding eagles and raptors. When nests were located, the pilot reduced speed and adjusted the flight track such that the biologist could clearly see the nest to document the nest accurately. The pilot approached the nest slowly and maintained the greatest possible distance at which the nest status could be documented. The survey flight path was recorded using a hand-held Global Positioning System (GPS)-enabled tablet running Gaia GPS software to ensure the Study Area was covered adequately.

To determine the status of a nest, the biologist evaluated behavior of adults on or near the nest, and the presence of eggs, young, whitewash, or fresh building materials. Species, nest type, nest status, nest condition, and nest substrate were recorded at each nest location to the extent possible.

A second round of aerial raptor nest surveys was completed on May 11 and 15, 2022. During this survey, each nest observed during the first round of aerial surveys was rechecked to confirm/update the nest status. This survey also included a comprehensive search of the Study Area and associated buffer for new nests and was used to record information on raptors that initiate nesting later in the breeding season. The same methods used during the first survey were repeated during the second aerial survey.

Study Design for Ground Based Surveys

The ground-based survey methods allowed for a determination of occupancy status of any known/historic eagle nests (ground surveys one and two) and visitation of any occupied active nests to determine nest success/productivity (ground surveys three and four). The first two ground surveys were conducted to provide additional information on the occupancy status of known/historic eagle nests. Ground surveys were no longer conducted once a nest was determined to be unoccupied or if an occupied nest was determined to be inactive or failed.

One experienced WEST biologist conducted the ground-based raptor nest surveys on February 16, April 27, and June 30, 2022. Conducting the survey early in the season ensured the search effort coincided with the period when eagles were likely incubating eggs or tending young and

was based on chronology for nesting eagles in the region (Pagel et al. 2010, Isaacs and Anthony 2011, USFWS 2013).

The biologist focused on locating the nest and allowing for a thorough visual inspection of the habitat to provide views of the nest from several different angles. Known/historic eagle nests were observed for four hours per survey, or until occupancy was confirmed. The biologist took great care to minimize disturbance to breeding eagles and raptors. The survey was conducted between 07:00 hours and 16:00 hours. Ground surveys were conducted in areas where access was available to view the nest.

To determine the status of a nest, the biologist evaluated behavior of adults on or near the nest, and the presence of eggs, young, whitewash, or fresh building materials. Species, nest type, nest status, nest condition, and nest substrate were recorded at each nest location to the extent possible.

Data Collection Methods and Terminology

Each nest was assigned a unique nest identification (ID) number, location was recorded with a GPS and attribute data including species, substrate, status, condition, and relative nest size and nest characteristics were documented. Below are detailed descriptions of nest attributes and applicable definitions and terms. A table detailing information about raptor nests recorded during the 2022 raptor nest surveys is presented in Appendix A.

Nest Condition – Nest condition was categorized using descriptions ranging from poor to good, which provided a general sense of when a nest or nest site may have been last used.

- Poor (P): a nest appearing dilapidated (e.g., in disrepair, sloughing, or sagging heavily) and required major repair to be suitable for successful nesting
- Fair (F): a nest in generally good condition with fairly well-defined bowl, minor sagging, may require some repair in order to be used
- Good (G): a nest in excellent condition with a well-defined bowl, no sagging or sloughing, and was considered suitable for nesting
- Unknown (UNK): nest condition is unknown

Nest Characteristics – Each nest was recorded according to two general categories: 1) large stick nests (potentially suitable for eagle use) and 2) non-eagle size.

Nest Location – Coordinates for all the raptor nests located during surveys were recorded using a hand-held Global Positioning System (GPS); coordinates were set at Universal Transverse Mercator North American Datum 83 unit (UTM NAD 83).

Nest Status – Nest status was categorized using definitions originally proposed by Postupalsky (1974) and these definitions are still largely followed today in the ECPG (USFWS 2013).

- Occupied (O): a nest was classified as occupied if any of the following were observed at the nest structure: 1) an adult in an incubating position; 2) eggs; 3) nestlings or fledglings; 4) presence of an adult (sometimes sub-adults); 5) a newly constructed or refurbished stick nest in the area where territorial behavior of a raptor had been observed earlier in the breeding season; or 6) a recently repaired nest with fresh sticks (clean breaks) or fresh boughs on top, and/or droppings and/or molted feathers on the nest rim or underneath;
- Occupied active (OA): nest had eggs, nestlings, and/or an adult in incubating/brooding position at the time of the survey;
- Occupied inactive (OI): nest had evidence of recent tending of the nest or presence by an adult, but there were no eggs, nestlings, or adult in incubating/brooding position;
- Unoccupied (U): nest with no evidence of occupancy for at least two consecutive surveys;
- Undetermined (UND): nest with no evidence of occupancy during only one survey;
- Missing (M): nest is completely missing or couldn't be found;
- Unknown (UNK): nest may or may not be present; status could not be determined.

*Nest S*ubstrate – Nest substrate included anthropogenic structures (e.g., power line poles and nest platforms), cliffs and rock outcrops, and trees.

Nest Success – Nesting success is defined as the proportion of OA nests resulting in at least one young fledged, or the minimum acceptable age for determining success. Nest success for eagles means at least one nestling survived to greater than 56 days for golden eagles (*Aquila chrysaetos*) and greater than 67 days for bald eagles (*Haliaeetus leucocephalus*; Steenhof and Newton 2007, USFWS 2013). Nest success was only documented if subsequent surveys were completed to evaluate the nests.

Productivity – Nest productivity is defined as the average number of young that reached fledging age (or minimum age for success, as described above) per OA nest in a particular breeding period.

Raptor Nest–Raptor nests were defined as structures made or the place used by raptors, for laying their eggs and sheltering their young (Steenhof and Newton 2007).

Data Management

Quality Assurance and Quality Control

WEST implemented quality assurance and quality control (QA/QC) measures at all stages of the surveys, including in the field, during data entry and analysis, and report writing. All WEST field biologists were trained in proper survey techniques and all data collected were recorded on paper. Data were reviewed before they were submitted for data entry and after data were entered. If errors or anomalies were found, follow-up measures were implemented including discussions and review of field data with the biologist and/or Project manager.

Data Compilation and Storage

WEST data entry staff were trained on proper data entry procedures, which included an independent review of the field data. System controls were implemented to ensure correct data were entered; however, if any errors, omissions, or problems were identified in later stages of analysis, they were traced back to the raw data where appropriate changes and measures were implemented.

Reporting and Review Process

WEST's reporting and review process included technical editing and content review, senior technical review, senior management review, and a final review by the Project manager before delivery to the client.

RESULTS

Seventy-three nests were recorded during surveys, including 38 occupied/active nests and 35 unoccupied (Figure 3, Table 2; Appendix A). Of the occupied active nests there was one bald eagle nest, one Canada goose (*Branta canadensis*) nest, 14 great horned owl (*Bubo virginianus*) nests, 16 red-tailed hawk (*Buteo jamaicensis*) nests, three Swainson's hawk (*B. swainsoni*) nests, and two unidentified raptor nests. One nest (Nest ID 18) was occupied by two difference species great horned owl during the first aerial survey and then red-tailed hawk during the second aerial survey (Appendix A).

One known/historic eagle nest location (Nest ID 73) was classified as unoccupied after two aerial surveys and two ground checks and showed no evidence of occupancy (Figure 2). A new occupied active bald eagle nest (nest ID 39), and a large stick nest (Nest ID 59) were documented (Figure 2). Nest ID 39 was successful and fledged two young bald eagles and nest ID 59 was occupied by a great horned owl (*Bubo virginanus*).

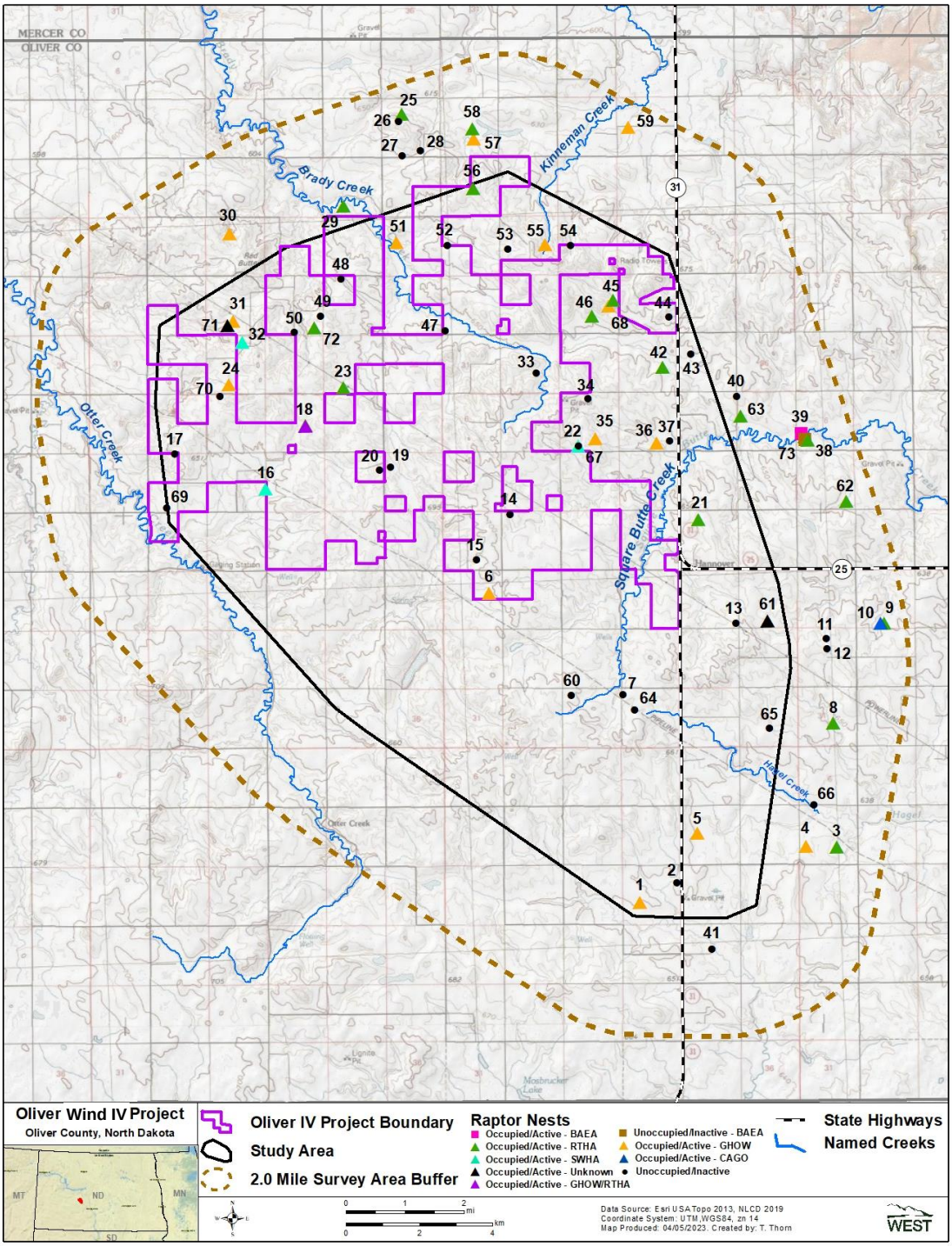


Figure 2. Location of eagle and non-eagle raptor nests documented during raptor nest surveys in 2022 within the Oliver Wind IV Project Study Area, Oliver County, North Dakota.

Table 2. Nest status, species, and location of eagle and non-eagle raptor nests documented during raptor nest surveys in 2022 within the Oliver Wind IV Project Study Area, Oliver County, North Dakota.

	Nest Location		
Nest Status	**Study Area**	**Two-mile buffer**	**Total**
O/A			
Bald Eagle	0	1	1
Canada Goose	0	1	1
Great Horned Owl	10	4	14
Red-tailed Hawk	7	9	16
Swainson's Hawk	3	0	3
Great Horned Owl/Red-tailed Hawk*	1	0	1
Unidentified Raptor	2	0	2
U			
Unidentified Raptor	25	10	35
Total	**48**	**25**	**73**

OA = Occupied/Active nests had eggs, nestlings, and/or an adult in incubating/brooding position at the time of the survey.

U = nest with no evidence of occupancy for at least two consecutive surveys.

MCP = minimum convex polygon

* Nest ID 18 is counted as one nest, but had occupancy of two different species.

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Appendix A. Raptor Nests Documented During 2022 Raptor Nest Surveys within the Oliver Wind IV IV Project Study Area and associated 3.2-kilometer (2.0-mile) buffer, Oliver County, North Dakota.

Appendix A. Eagle and non-eagle raptor nests documented during 2022 nest surveys within the Oliver Wind IV Project Study Area and 3.2-kilometer (2.0-mile) buffer, Oliver County, North Dakota.

Nest ID	Species	Status	Substrate	Condition	Class	Two-mile Buffer
1	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
2	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	
3	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	X
4	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	X
5	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
6	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
7	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	
8	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	X
9	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	X
10	CAGO	Occupied/Active	Deciduous Tree	Good	Non-Eagle	X
11	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	X
12	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	X
13	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	
14	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	
15	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	
16	SWHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
17	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	
18	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
18	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
19	UNKN	Unoccupied/Inactive	Deciduous Tree	Poor	Non-Eagle	
20	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	
21	RTHA	Occupied/Active	Deciduous Tree	Fair	Non-Eagle	
22	SWHA	Occupied/Active	Deciduous Tree	Fair	Non-Eagle	
23	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
24	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
25	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	X
26	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	X
27	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	X
28	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	X
29	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	X
30	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	X
31	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
32	SWHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
33	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	
34	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	
35	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
36	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
37	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	

Appendix A. Eagle and non-eagle raptor nests documented during 2022 nest surveys within the Oliver Wind IV Project Study Area and 3.2-kilometer (2.0-mile) buffer, Oliver County, North Dakota.

Nest ID	Species	Status	Substrate	Condition	Class	Two-mile Buffer
38	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	X
39	BAEA	Occupied/Active	Deciduous Tree	Good	Large Stick Nest	X
40	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	X
41	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	X
42	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
43	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	
44	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	
45	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
46	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
47	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	
48	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	
49	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	
50	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	
51	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
52	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	
53	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	
54	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	
55	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
56	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
57	GHOW	Occupied/Active	Deciduous Tree	Good	Non-Eagle	X
58	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	X
59	GHOW	Occupied/Active	Deciduous Tree	Good	Large Stick Nest	X
60	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	
61	UNKN	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
62	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	X
63	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	X
64	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	
65	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	
66	UNKN	Unoccupied/Inactive	Deciduous Tree	Good	Non-Eagle	X
67	UNKN	Unoccupied/Inactive	Deciduous Tree	Poor	Non-Eagle	
68	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
69	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	X
70	UNKN	Unoccupied/Inactive	Deciduous Tree	Fair	Non-Eagle	
71	UNKN	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
72	RTHA	Occupied/Active	Deciduous Tree	Good	Non-Eagle	
73	BAEA	Unoccupied/Inactive	Deciduous Tree	Good	Large Stick Nest	X

Appendix B7. Whooping Crane Habitat Review

Whooping Crane Habitat Review
Oliver Wind IV Project
Oliver and Mercer Counties, North Dakota

Final Report

Prepared for:

Oliver Wind IV, LLC

Prepared by:

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Report Date: August 17, 2023



Privileged and Confidential – Contains Sensitive Biological Information

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Figure 3. Whooping crane relative probability of use[1], sightings, and telemetry locations associated with the proposed Oliver Wind IV Project Whooping Crane Study Area in Oliver County, North Dakota, and four reference areas. 8

Oliver IV T-Line 000305

INTRODUCTION

Oliver Wind IV, LLC (Company) is evaluating the potential for wind energy development at the proposed Oliver Wind IV Project and Transmission Line (referred to as the Project) in Oliver and Mercer counties, North Dakota. The Company requested Western EcoSystems Technology, Inc. (WEST) to conduct a desktop review and analysis of potential whooping crane (*Grus americana*; WHCR) habitat use in the vicinity of the Project, in an area referred to in this report as the WHCR Study Area.

As part of the Transmission Line design, the Company has planned for the installation of bird flight diverters along the entire transmission line. This practice aligns with the recommendations by wildlife agencies to reduce the risk of WHCR collision. It is also a practice contained in the Avian Power Line Interaction Committee (APLIC) guidance in "*Reducing Avian Collisions with Power Lines*" (APLIC 2012). With installation of the bird flight diverters, WHCR collision risk with the Transmission Line is extremely unlikely to occur.

Considering the unlikely event of powerline collision with the installation of bird flight diverters, the objective of this analysis was to assess WHCR relative habitat suitability and likelihood of WHCR habitat use in the Project Area. compared to the surrounding landscape, with a focus on the WHCR Study Area as a proxy for the Project Area. The remainder of this report therefore focuses on addressing the objectives solely in Oliver County.

Whooping crane habitat reviews have typically involved both a qualitative and quantitative analyses of potential roosting and foraging habitats (i.e., wetlands, croplands, and grasslands), wetland types and densities, disturbance features, and other factors known or believed to affect use by WHCR. These reviews often included an analysis of a proposed project area and comparative adjacent areas. However, based on recommendations from the North Dakota Game and Fish Department and the US Fish and Wildlife Service (USFWS), the objective of this review was to evaluate the relative probability of WHCR habitat use within the WHCR Study Area using a regionally developed spatial model (Niemuth et al. 2018).

STUDY AREA

The 24,138-acre (ac; 9,768-hectare [ha]) WHCR Study Area was established to encompass the Project Area (i.e., excluding the Transmission Line) and immediately adjacent lands. The WHCR Study Area is located in Oliver County, North Dakota, within the 50% whooping crane migration corridor (USFWS CWCTP 2023, Figure 1).

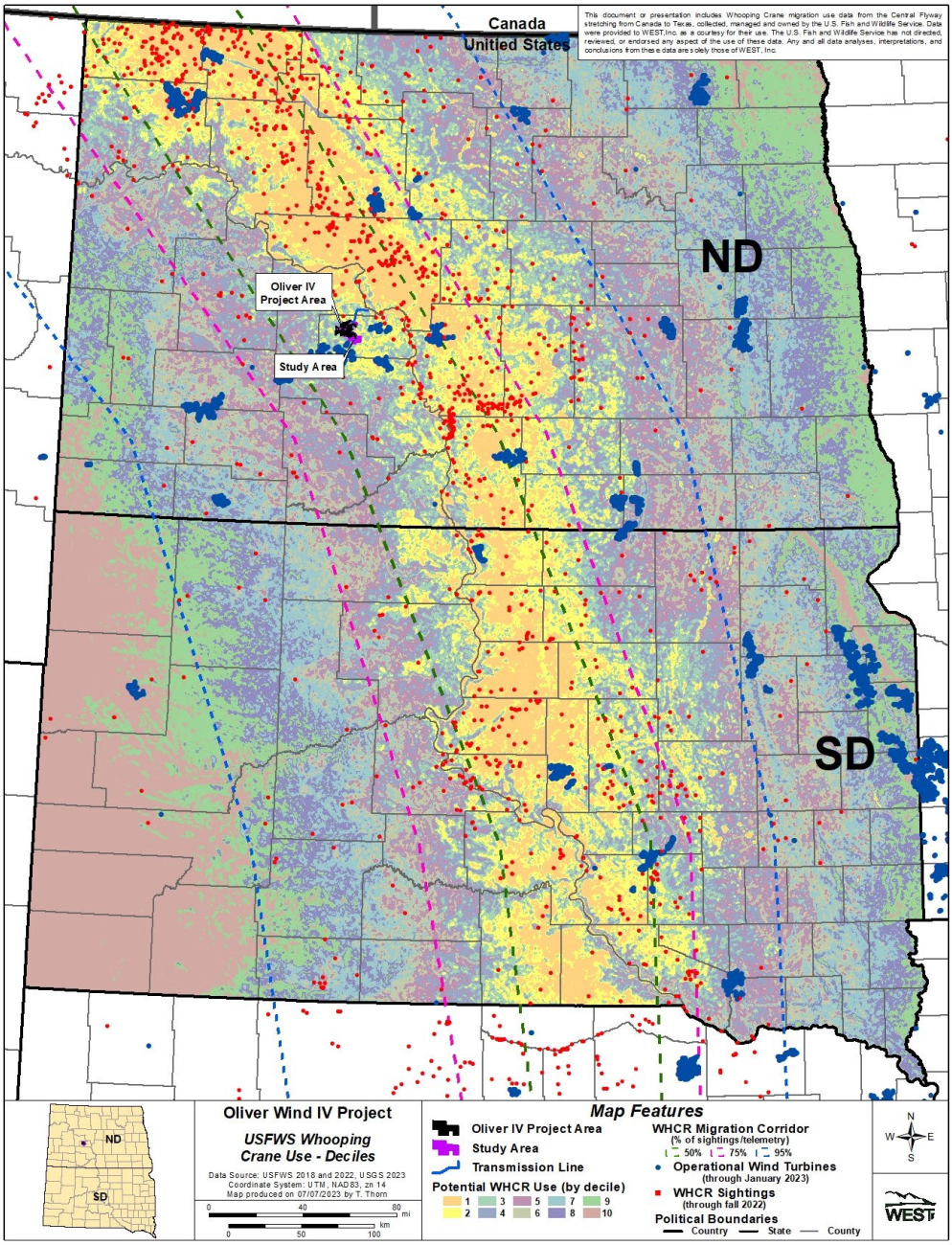


Figure 1. Location of the proposed Oliver Wind IV Project and Whooping Crane Study Areas in Oliver County, North Dakota, in relation to other operating wind energy projects within the whooping crane migration corridor, confirmed sightings through spring 2022[1], and potential whooping crane use deciles.[2]

[1] USFWS CWCTP 2023
[2] Niemuth et al. 2018

The WHCR Study Area is within the Northwestern Glaciated Plains Level III Ecoregion, in an area historically dominated by grasslands but extensively converted to agricultural use (e.g., row crops and livestock grazing; Bryce et al. 1996, US Environmental Protection Agency 2012; 2013). The terrain within the Study Area is gently rolling with interspersed level areas, and elevations of 1,663–2,385 feet (ft; 507– 727 meters [m]) above sea level (US Geological Survey 2019).

Based on National Land Cover Database (NLCD; 2016) spatial data, the WHCR Study Area is comprised of approximately 62.5% grassland/herbaceous lands (including 49.7% grasslands and 12.8% pasture/hay lands) and 33.3% cultivated croplands. Developed represents 2.7% and the remaining land cover types represent 0.9% (wetlands/open water) or less of the WHCR Study Area (Table 1).

Table 1. Area (acres) and percent (%) total cover of 2016 National Land Cover Database land cover types in the proposed Oliver Wind IV Project Whooping Crane Study Area in Oliver County, North Dakota.

Land Cover Types	Acres	Total Cover (%)
Grasslands	12,007	49.7
Cultivated crops	8,046	33.3
Pasture/Hay	3,079	12.8
Developed	651	2.7
Wetland/Open water	210	0.9
Forest/Trees	98	0.4
Shrub/Scrub	42	0.2
Barren land	6	<0.1
Total[1]	**24,138**	**100**

[1] Values do not add up to totals due to rounding.

METHODS

WEST completed the desktop review and analysis of the WHCR Study Area using ArcGIS, ArcMap 10.5.1 software (ArcMap 2017) and several spatial data layers including NLCD (2016), National Wetland Inventory (NWI) data (USFWS NWI 2018), and model outputs from Niemuth et al. (2018). The desktop analysis included a summary of land cover types to help describe conditions specific to the WHCR Study Area, as well as an assessment of the suitability of WHCR habitat within the WHCR Study Area and at four reference areas of the same dimensions located adjacent to the WHCR Study Area in the four cardinal directions. The analyses used two models developed by Niemuth et al. (2018) for comparison: the Predicted Habitat Use Model and the Decile Model.

Predicted Habitat Use Model

Niemuth et al. (2018) developed a predicted habitat use model for WHCR stopover habitat within North and South Dakota. This model (hereafter, Niemuth Model) provides a numerically continuous (0–1.0) prediction of the relative probability of habitat use by WHCR. The Niemuth Model was developed specifically for North and South Dakota. The Niemuth model considered 12 predictor variables that were analyzed and validated using Geographic Position System (GPS)

location data from WHCR equipped with radio-telemetry transmitters (Niemuth et al. 2018). This output is useful in evaluating potential WHCR use within a project or study area and comparing it with similar adjacent areas.

Decile Model

To aid in conservation planning, Niemuth et al. (2018) also developed a Decile Model by partitioning the Model outputs into 10 same-sized areas, referred as deciles, to provide a spatial probability gradient of high use areas (Decile 1) to low-use areas (Decile 10. (Figure 1). This output is useful for evaluating potential use across broad geographic areas, aiding in project planning.

Whooping Crane Public Sightings Records

A Federal/State effort to report migrating whooping cranes was organized in 1975 (Lewis 1992, USFWS 2009) to provide a mechanism for the public to report whooping cranes opportunistically sighted during the spring and fall migration periods. The effort continues to the present day and has yielded a long-term dataset that has documented that 75% of the whooping cranes sighted by the public occur within 40 miles of the migration corridor centerline (USFWS 2006; 2022). The sighting records adjacent to the Study Area were plotted as an additional information source to inform project planning (Figure 1).

RESULTS

The WHCR Study Area is located within the western half of the 50% WHCR migration corridor (Pearse et al. 2018) with a higher density of WHCR sightings (USFWS 2022) occurring north and east of the WHCR Study Area adjacent to the west side of Missouri River and within the prairie pothole region (Coteau), (Figure 1 and Figure 2).

Predicted Habitat Use Model

Predicted probability WHCR habitat use within the WHCR Study Area ranged from less than 0.0001–0.1. As expected, the higher probability of use was predicted in the North and East reference areas due to their closer proximity to the Missouri River and prairie pothole landscape. The highest predicted probability WHCR habitat use was the North reference area which ranged from less than 0.0001–0.3, while the East reference area had approximately 1.4 % (343 ac) of the area classified with a WHCR use-probability of 0.1 – 0.2. The West and South reference areas were classified with the same probability range as the WHCR Study Area (Table 2). The similarity in predicted probability of WHCR habitat use between the WHCR Study Area and among the four reference areas suggests the suitability of habitat in the Study Area is generally similar in the surrounding landscape, but tends to improve to the North and East of the Study Area (Table 2, Figure 2).

Table 2. Predicted probability of use for whooping cranes within the proposed Oliver Wind IV Project Whooping Crane Study Area in Oliver County[1], North Dakota, and the North, East, South, and West reference areas[1].

Relative Probability Ranges	Study Area		North		East		South		West	
	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
0-0.1	24,138	100	22,157	91.8	23,796	98.6	24,138	100	24,138	100
0.1-0.2	0	0	1,895	7.9	343	1.4	0	0	0	0
0.2-0.3	0	0	86	0.4	0	0	0	0	0	0
0.3-0.4	0	0	0	0	0	0	0	0	0	0
0.4-0.5	0	0	0	0	0	0	0	0	0	0
0.5-0.6	0	0	0	0	0	0	0	0	0	0
0.6-0.7	0	0	0	0	0	0	0	0	0	0
0.7-0.8	0	0	0	0	0	0	0	0	0	0
0.8-0.9	0	0	0	0	0	0	0	0	0	0
0.9-1	0	0	0	0	0	0	0	0	0	0
Total[2]	**24,138**	**100**	**24,138**	**100**	**24,138**	**100**	**24,138**	**100**	**24,138**	**100**

[1] A portion of the North, South, and West reference areas intersected Morton and Mercer counties.

[2] Acres and percent (%) total area within each relative probability range are shown.

[3] Sums may not total values shown due to rounding.

Source: Niemuth et al.2018.

Decile Model

Deciles 2 through 5 are represented within the WHCR Study Area (Table 3, Figure 1). The highest use decile (Decile 1), as depicted in Figure 2, appears within the WHCR Study Area but no Decile 1 habitat was contained in the modeled output (Table 3). The highest acreage of WHCR habitat occurred in Decile 3 (66.1%) and Decile 4 (21.9%; Figure 2 and Table 3).

Table 3. Number of acres for each decile within the proposed Oliver Wind IV Project Whooping Crane Study Area in Oliver County, North Dakota.

Decile	Acres	Percent (%)
1	0	0
2	2,894	12.0
3	15,950	66.1
4	5,275	21.9
5	20	<0.1
6	0	0
7	0	0
8	0	0
9	0	0
10	0	0
Total[1]	**24,138**	**100**

[1.] Sums may not total values shown due to rounding.

Source: Niemuth et al. 2018.

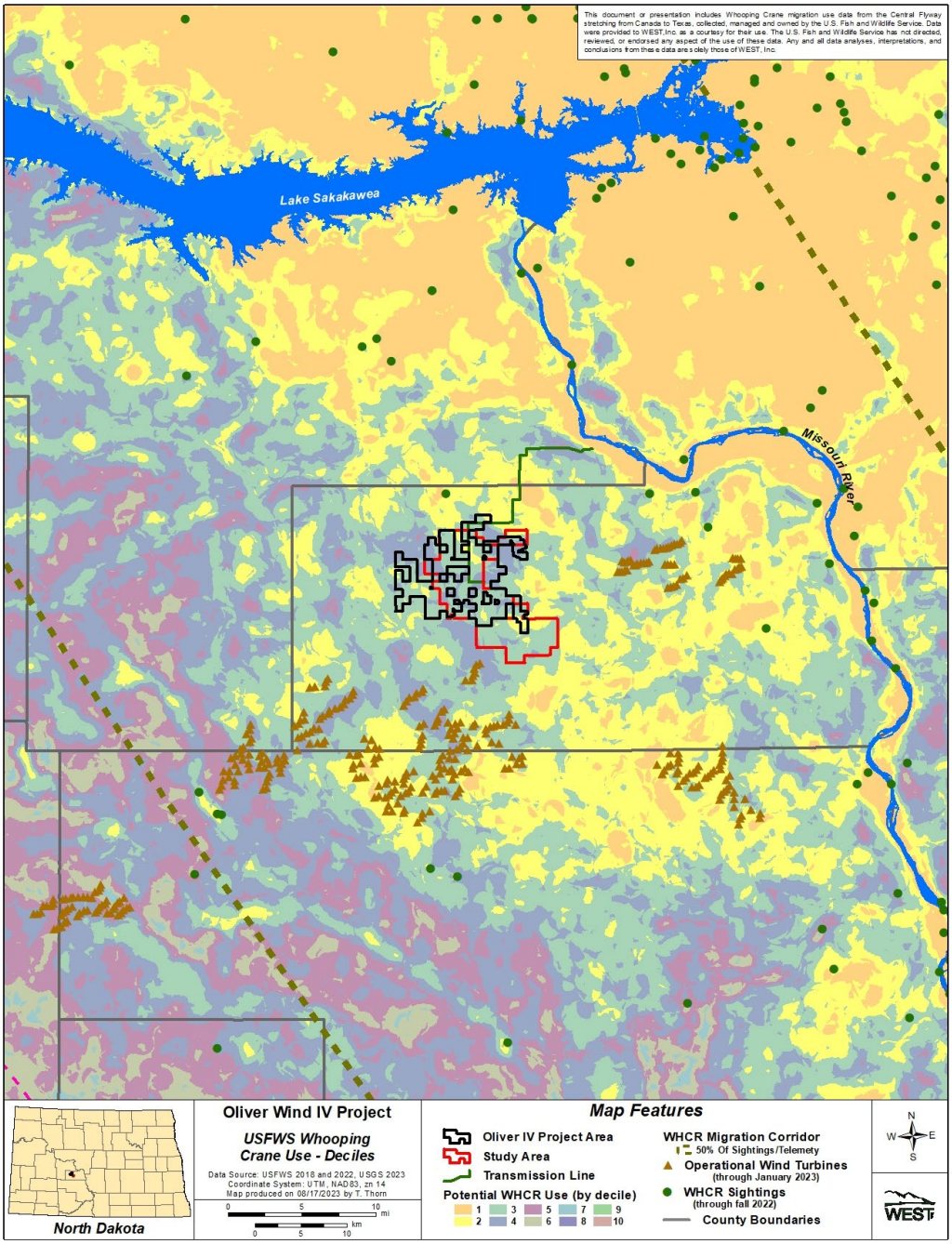


Figure 2. Location of the proposed Oliver Wind IV Project and Whooping Crane Study Areas in Oliver County, North Dakota, in the whooping crane migration corridor, including confirmed sightings through spring 2022[3] and potential whooping crane use deciles.[4]

[3] USFWS CWCTP 2023
[4] Niemuth et al. 2018

Whooping Crane Public Sightings Records

WEST plotted the USFWS WHCR sightings (through spring of 2022; USFWS CWCPT 2023) and telemetry data (2009 – 2018; Pearse et al. 2020) and found one record of a telemetered WHCR occurring within both the WHCR Study Area and the Oliver Wind IV Project Area, and additional records in or near the reference areas (Figure 2 and Figure 3).

DISCUSSION

The objective of this analysis was to assess WHCR relative habitat suitability and the overall likelihood of WHCR habitat use in the Study Area. Results indicate that both habitat suitability and probability of WHCR use increases to the north and east of the WHCR Study Area. In contrast, the WHCR Study Area is representative to the habitat suitability and lower probability of use associated with the landscapes to the south and west of the WHCR Study Area.

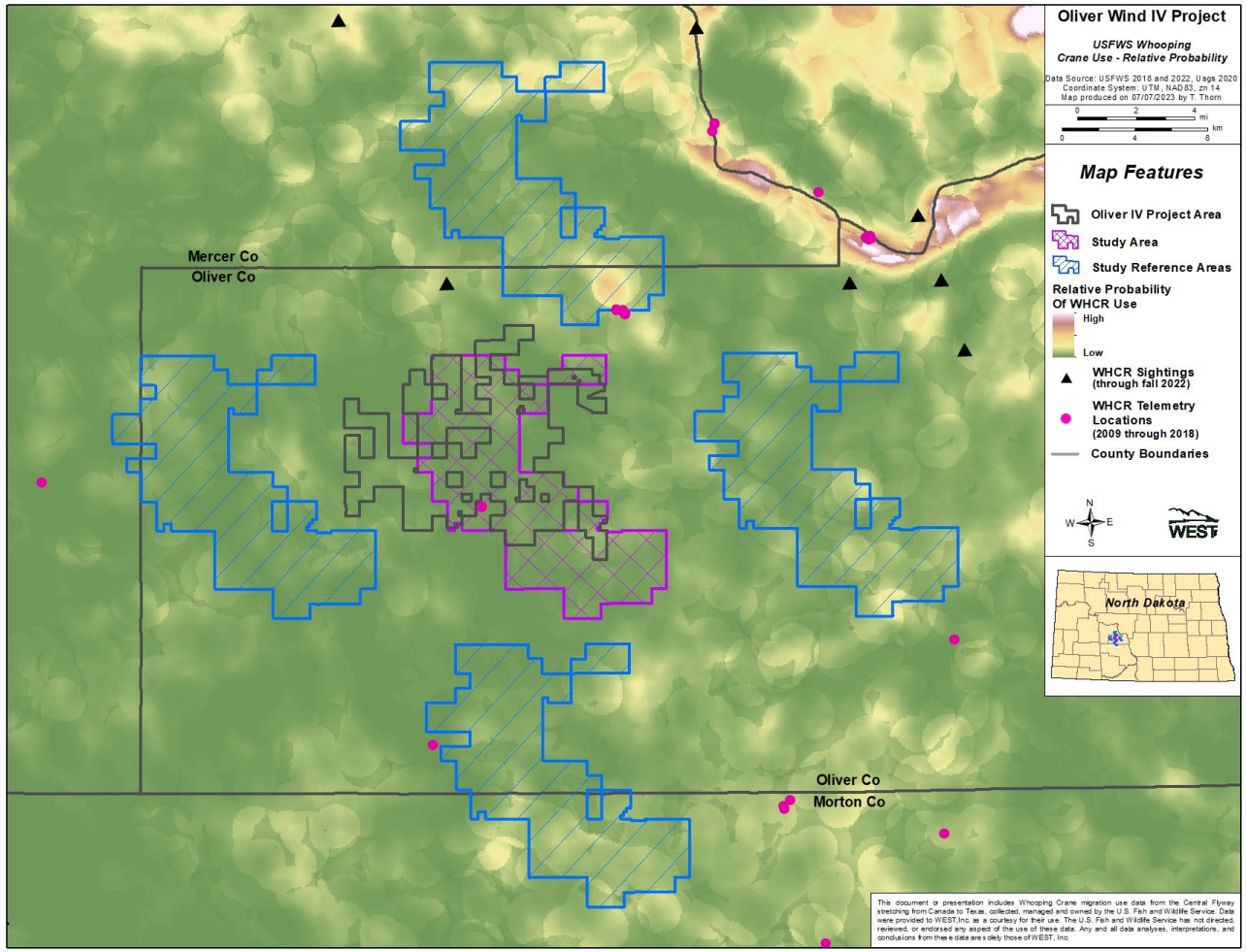


Figure 3. Whooping crane relative probability of use[1], sightings, and telemetry locations associated with the proposed Oliver Wind IV Project Whooping Crane Study Area in Oliver County, North Dakota, and four reference areas.

1. Relative probability of use ranges from 0–1 (low–high); probability of use within the Study Area ranges from 0–0.1 (Table 2).
Sources: Niemuth et al. 2018, USFWS CWCPT 2023

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Appendix B8. Bat Summer Presence/Absence Surveys (2019)

Northern Long Eared-Bat Presence/Absence Surveys

Oliver Wind IV Project

Oliver County, North Dakota

Surveys Conducted July 26 – August 16, 2019



Prepared for:

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Report Date: August 29, 2023

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EXECUTIVE SUMMARY

Oliver Wind IV, LLC (Company) is developing the Oliver Wind IV Energy Center (Project) in Oliver County, North Dakota. The Company contracted Western EcoSystems Technology, Inc. (WEST) to conduct presence/absence surveys for the federally threatened northern long-eared bat (*Myotis septentrionalis;* NLEB) which has the potential to occur within the Project Study Area (Figure 1). WEST employed a combination of survey methods including acoustic and mist-net surveys to determine if the NLEB is present or absent within the Study Area during the summer maternity season.

Survey methods followed the US Fish and Wildlife Service (USFWS) 2019 *Range-Wide Indiana Bat Summer Survey Guidelines* (Guidelines) and were reviewed and approved by the South Dakota USFWS Field Office A total of 342.0 ha (845.1 ac) of potentially suitable NLEB summer habitat were identified through desktop analysis within the Study Area. This led to establishing 14 detector locations (corresponding to seven sites) within the Study Area to align with the 2019 Guidelines. Acoustic surveys were conducted at the seven sites (with two detector locations each) from July 26 to August 1, for a total of 82 detector-nights. Weather conditions or detector malfunctions resulted in conditions which did not meet the Guidelines survey criteria on 20 detector-nights; additional nights were surveyed to ensure the Guideline required effort of four valid detector-nights per station were completed, resulting in a total of 62 valid detector-nights.

All data were analyzed, including calls recorded on invalid nights, to determine whether NLEB were present or absent. Kaleidoscope identified 55 call files as potential NLEB calls, 44 calls on valid nights and 11 calls on invalid nights. Seven NLEB calls at two survey locations (4b, 5b) were confirmed by qualitative review, suggesting the presence of NLEB at these sites.

Presence/absence mist-net surveys were conducted at three survey locations from July 28 – August 3, 2019. WEST biologists captured a total of 20 bats, including 14 silver-haired bats (*Lasionycteris noctivagans*), three eastern red bats (*Lasiurus borealis*), and three hoary bats (*L. cinereus*). No NLEB were captured during the first (July 28 – Aug 3)mist-net survey effort in 2019.

WEST conducted follow-up mist netting from August 13 – 15, 2019, at the two acoustic survey sites (4b and 5b) to verify NLEB presence or probably absence where qualitative acoustic data indicated NLEB presence. Mist-netting at the acoustic survey sites resulted in the capture of eight bats captured, including four NLEB, two little brown bats (*Myotis lucifugus*), one silver-haired bat, and one eastern red bat. All captured NLEB were males (two juveniles and two adults). DNA analysis from one NLEB bat collection bag was inconclusive due to lack of genetic material in the bag.

STUDY PARTICIPANTS

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Kevin Murray	Qualitative Acoustic Analyst; Bat Biologist
Julia Wilson	Permitted Bat Biologist; Report Writer
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REPORT REFERENCE

Wilson, J., K. Murray, and C. Derby. 2019. Bat Summer Presence/Absence Surveys, Oliver Wind IV Project, Oliver County, North Dakota: Surveys Conducted July 26 – August 19, 2019. Prepared for Oliver Wind IV, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Bloomington, Indiana. Report Revised August 29, 2023. 18pp.

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[1] The Appendices include documents referring to the Red Butte Wind Farm. The Project name was changed to Oliver Wind IV Project in 2022, making the information in the Appendices applicable to the Oliver Wind IV Project despite references to the Red Butt Wind Farm.

BACKGROUND AND PROJECT OVERVIEW

Oliver Wind IV, LLC (Company) contracted Western EcoSystems Technology, Inc. (WEST) to conduct presence/absence surveys for the federally threatened northern long-eared bat (*Myotis septentrionalis*; NLEB) which has the potential to occur within the Oliver Wind IV Project Study Area (Figure 1). The objectives of the 2019 summer bat surveys were to: 1) determine the presence or probable absence of NLEB within the Study Area during the summer maternity season, 2) determine sites where follow-up mist-net surveys for NLEB should be conducted if warranted, and 3) confirm sex, age, and reproductive status of individual NLEB if present.

Based on the US Fish and Wildlife Service (USFWS) and North Dakota Game and Fish Department (NDGFD) records for North Dakota, NLEB is considered rare in North Dakota. Recent research by North Dakota State University found that presence is unlikely throughout the state except potentially in badlands areas in the extreme western part of the state (Dr. E. Gillam, North Dakota State University, pers. com.). The Study Area is not in the badlands of western North Dakota, but acoustic monitoring by Dr. Gillam indicated potential for NLEB to occur within the Study Area. The objective of the acoustic and mist-net surveys was to determine if NLEB are present or absent in the Study Area during the summer maternity season.

The following report summarizes the results of acoustic and mist-net surveys conducted during the summer of 2019.

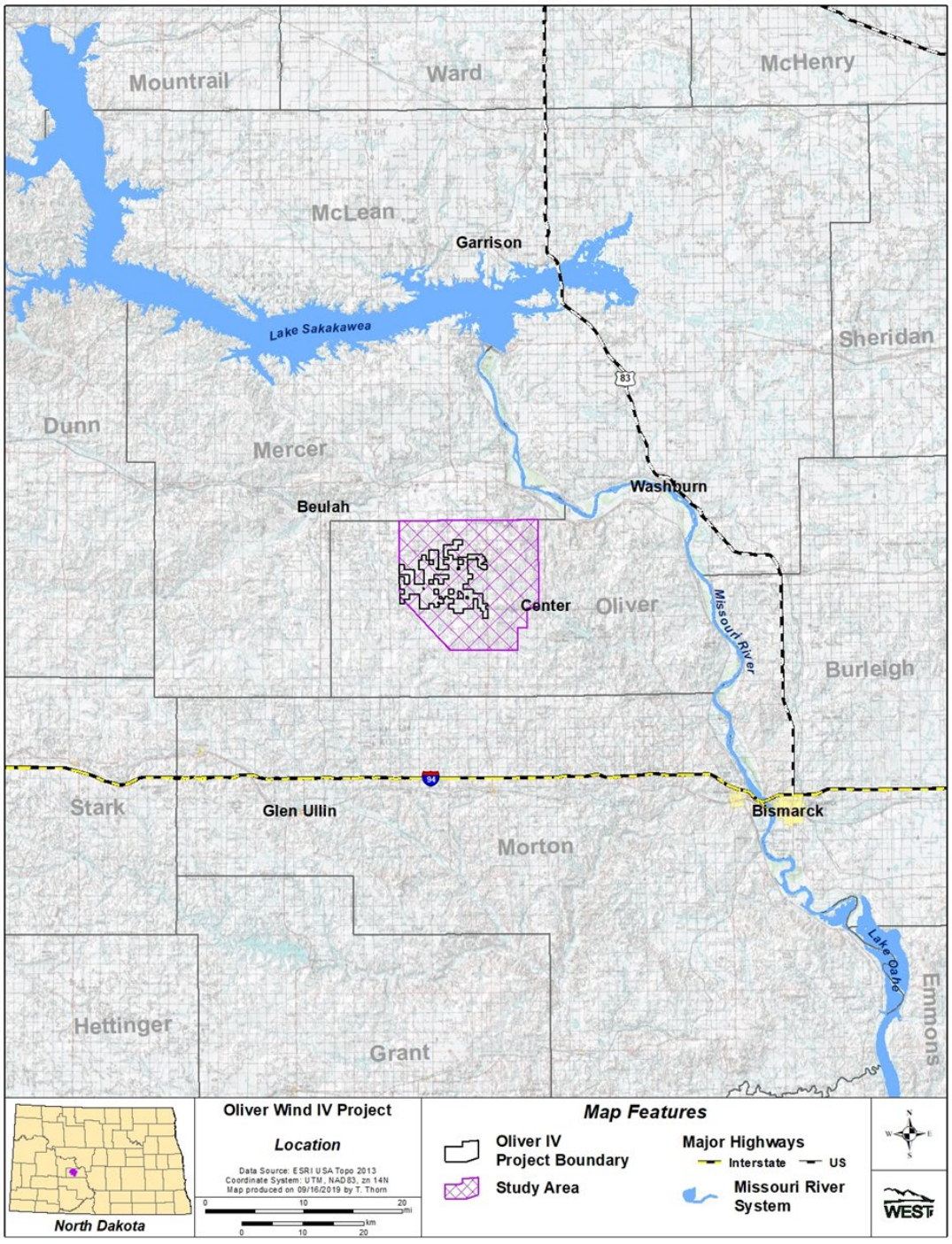


Figure 1. Location of the Oliver Wind IV Project and 2019 Study Area in Oliver County, North Dakota.

METHODS

All acoustic and mist-net surveys followed the current USFWS *Range-Wide Indiana Bat Summer Survey Guidelines* (Guidelines), which also apply to NLEB (USFWS 2019). The USFWS Guidelines (2019) for Indiana bat and NLEB surveys recommend: 1) desktop habitat assessment, 2) presence/probable absence acoustic surveys, and 3) follow-up mist-net and telemetry surveys. A study plan for the Project was provided to the USFWS on July 8, 2019, and site-specific authorization was provided by Scott Larson (USFWS South Dakota Field Office) in a letter dated July 11, 2019 (Appendix D).

Habitat Assessment and Survey Effort

The desktop habitat assessment indicated approximately 1,200 acres of potentially suitable habitat (USFWS 2019) within the 2019 Study Area. The USFWS (2019) defines suitable NLEB habitat as any forest (i.e., deciduous, coniferous, mixed) or forested landscape feature (e.g., woody wetlands, forested riparian areas, shelterbelts). The USFWS Guidelines (2019) recommend a minimum of one acoustic survey site per 123 acres of suitable bat habitat for non-linear projects. WEST initially surveyed ten sites using a mix of acoustic and mist-net surveys, and completed follow-up mist-net surveys at two of the prior acoustic survey sites where NLEB calls were qualitatively identified via acoustic signatures.

Acoustic Surveys

Acoustic survey sites were sampled using two detectors deployed at each site for a minimum of four nights, resulting in a total of eight detector nights per site. Bats were surveyed using Song Meter full-spectrum ultrasonic detectors (SM3 and SM4; Wildlife Acoustics, Inc.; http://www.wildlifeacoustics.com).

Acoustic surveys were conducted from July 26 – August 1. Two detectors were redeployed from August 13 – 16 to make up for incomplete nights during the initial survey period. Acoustic monitoring began before sunset and continued for the entire night. If weather conditions such as persistent rain (for 30 or more minutes [min]), strong sustained winds (greater than nine miles per hour [mph] for 30 or more min), or cold temperature (below 10 degrees Celsius [°C; 50 degrees Fahrenheit (°F)] for 30 or more min) occurred, then the site was surveyed for an additional night if any of these conditions occurred. Weather conditions were monitored with Weather Underground's Wundermap (http://www.wunderground.com/wundermap/: Rural Oliver County, KNDNEWSA2).

Omnidirectional detector microphones were positioned at least 3.0 meters (m; 9.8 feet [ft].) above ground, oriented horizontally. For each acoustic detector, the date, start and end time, site description, detector orientation, site coordinates, tree species composition, stand age, vegetation community type, and weather data were recorded. Representative photographs of each site were also taken. Standard settings used for each SM4 detector are shown in Figure 2. Field technicians verified that detectors were functioning properly by using internal SM3/SM4 microphone (mic) calibration and checking the status diagnostic screens. These tools allowed technicians to verify

that the mic was connected and functioning, that data cards were installed, that battery voltage was sufficient, and that the unit was programmed properly. In addition, the .sm4dump diagnostic file was saved at each station and used to verify proper functioning of detectors.

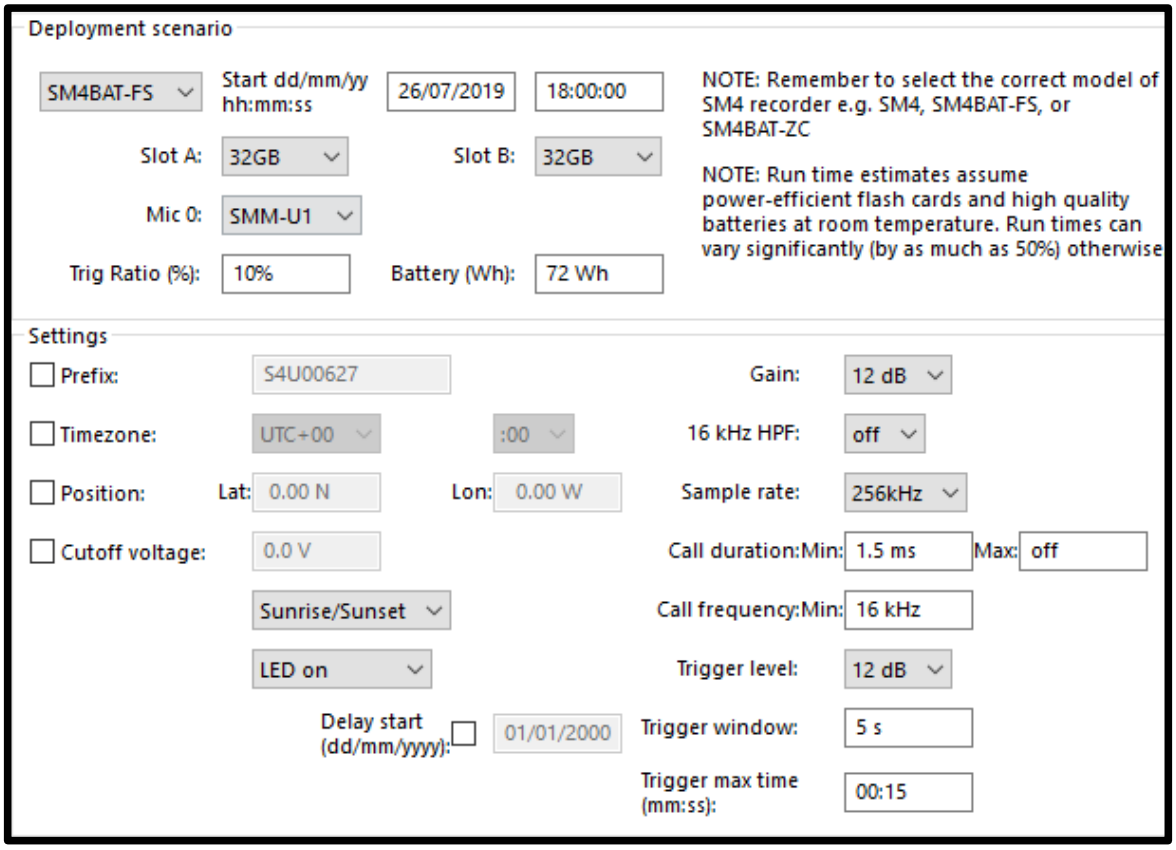


Figure 2. Standard settings for Song Meter 4 full-spectrum ultrasonic detectors used on the Oliver Wind IV Project in Oliver County, North Dakota.

Bat calls were identified using USFWS-approved quantitative identification methods (Kaleidoscope Pro© version 4.2.0; Wildlife Acoustics Inc.) from all nights, including nights considered invalid due to weather. The Bats of North America classifier 4.2.0 was used within Kaleidoscope. Kaleidoscope generated a list of species identified and a list of nightly maximum likelihood estimator (MLE) p-values for each species with the potential to occur in the Study Area. The following species were included in the Kaleidoscope model: big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), little brown bat (*Myotis lucifugus*), and NLEB. Minimum number of pulses was set to "2" and the bat classifier setting was set to "0 Balanced (Neutral)". Defaults were used for all other software settings. The only filter applied to the data set was a noise filter within Kaleidoscope that moved sound files with noise into a noise subfolder.

All calls identified as NLEB by automated identification software were examined and verified by a qualified biologist with extensive acoustic identification experience (Dr. K. Murray). All calls identified as NLEB and all calls from nights that the Kaleidoscope Pro considered NLEB presence likely per the Guidelines (MLE p-value < 0.05) were reviewed. Bat calls were identified using a known call library and published echolocation call parameters for bat species in the eastern US (Murray et al. 2001 [pg. 732], Britzke et al. 2011 [Table S1]). If call sequences were not characteristic of NLEB, contained distinct calls produced by species other than NLEB, or were of insufficient quality, they were reclassified.

Mist-Net Surveys

Mist-net surveys were conducted under federal endangered species recovery permit (TE03495B-2 [K. Hammond]; TE26854C-0 [B. Hyzy]; TE13580D-0 [J. Wilson]) and North Dakota Scientific Collection Licenses (GNF05044690 [K. Hammond-Rendon]; GNF05044694 [B. Hyzy]; GNF05044693 [J. Wilson]). A study plan for the Project was provided to the USFWS on July 8, 2019, and site-specific authorization was provided by Scott Larson (USFWS South Dakota Field Office) in a letter dated July 11, 2019 (Appendix D).

WEST conducted mist-net surveys at three sites from July 28 – August 3 and follow-up mist-net surveys from August 13 – 15 at two sites where NLEB calls were acoustically verified per the Guidelines (Figure 4). Initial mist-net surveys were conducted for nine net-nights at each site over the course of two calendar nights, and follow-up surveys were conducted for six net-nights at each site over the course of two calendar nights. Standard 2-ply, 50 denier, nylon mist-nets with a mesh size of 38.0 millimeters (mm; 1.3 inches [in]) were used at all mist-net sites. Mist-nets were placed in suitable bat habitat and positioned perpendicularly across flight corridors to fill the corridor from side-to-side and extended from ground-level up to the overhanging canopy, when possible. When forested corridors were unavailable, some nets were placed on forested field edges.

Mist-netting began at sunset and continued for at least five hours, and nets were checked every 10 minutes. Disturbance in the form of noise and movement was minimized at all net locations. If weather conditions, such as persistent rain, drizzle, or fog (more than 30 min in duration), strong winds (greater than nine mph for more than 30 min), or cold temperatures (below 50 °F [10 °C] for 30 or more min) occurred, then those net locations were resurveyed another night. An exception occurred for sites 4b and 5b, when rain persisted for 60 minutes. However, these were follow-up mist-net sites and NLEB had already been detected and captured and determined to be present.

For each mist-net night, the date, start and end times, site description, site coordinates, mist-net specifics, and weather data (temperature, cloud cover, wind speed, precipitation, and moon phase) were recorded. All captured bats were identified to species. In addition, sex, age, reproductive condition, body mass (grams), forearm length (mm), and capture status (recapture/new) were recorded.

To assess exposure to White-Nose Syndrome (WNS), a Reichard Index score (0-3) was recorded for all captured bats (Reichard 2009). USFWS WNS decontamination protocols were followed (USFWS 2016) to prevent cross-contamination of captured bats with *Pseudogymnoascus destructans*, the fungus that causes WNS. Captured bats were measured and processed immediately and released within 15 min. Forearm bands were attached to all captured *Myotis* species. Voucher photographs of each captured bat species were taken.

RESULTS

Acoustic Surveys

Locations and descriptions of acoustic survey sites within the Study Area are provided in Figure 3 and Table 1. Maps, photographs, and datasheets of acoustic survey sites are included in Appendices A, B, and C, respectively.

Acoustic surveys were conducted at seven acoustic survey sites (2 acoustic survey locations at each survey site for a total of 14 survey locations) within the Study Area from July 26 to August 1 (Figure 3). Cattle knocked over two acoustic detectors at two survey sites resulting in incomplete nights, so two detectors were redeployed from August 13 to August 16 resulting in a total of 82 detector-nights across all locations. Weather conditions and cattle disruptions resulted in a failure to meet 2019 Guideline criteria of 20 detector-nights. Additional nights were surveyed to ensure all survey locations were surveyed for a minimum of four valid detector nights per Guideline requirements, resulting in a total of 62 valid detector-nights (see weather logs in Appendix L).

Kaleidoscope detected a total of 8,721 bat calls and identified 7,193 of all calls to species, including all data from valid and invalid nights (82.5%; Table 1). Little brown bats were the most common species (2,490 calls [28.6%]), followed by silver-haired bats (1,720 calls [19.7%]), eastern red bats (1,103 calls [12.6%]), big brown bats (922 calls [10.6%]), hoary bats (903 calls [10.4%]), and NLEBs (55 calls [0.6%]; Table 2). Bat echolocation calls have a high level of variation within species causing overlap in call traits among species. Therefore, call identification is imperfect, and each identification has an associated error rate (USFWS 2013). In addition, the error rates associated with Kaleidoscope identifications of *unknown* bat calls have not been characterized. For these reasons, the results of the Kaleidoscope analysis can be misleading and should be viewed with caution.

Kaleidoscope identified 55 call files as potential NLEB calls at six sites, 10 survey locations, and on 23 survey nights, including valid and invalid nights. MLE p-values for NLEB presence met Guideline criteria ($p < 0.05$) on eight of these nights. A total of seven calls at two survey locations (4b, 5b) were confirmed as NLEB by a subsequent qualitative call analysis (Figure 3; Table 2; Appendix F). The remaining 48 potential NLEB calls identified by Kaleidoscope were reclassified as high-frequency unknowns, unknown *Myotis* species, little brown bats, and big brown bats by the qualitative call analysis. The Kaleidoscope analysis output is in Appendix E; a summary of the qualitative analysis is in Appendix F; and sonograms of representative bat calls have been archived but are upon request.

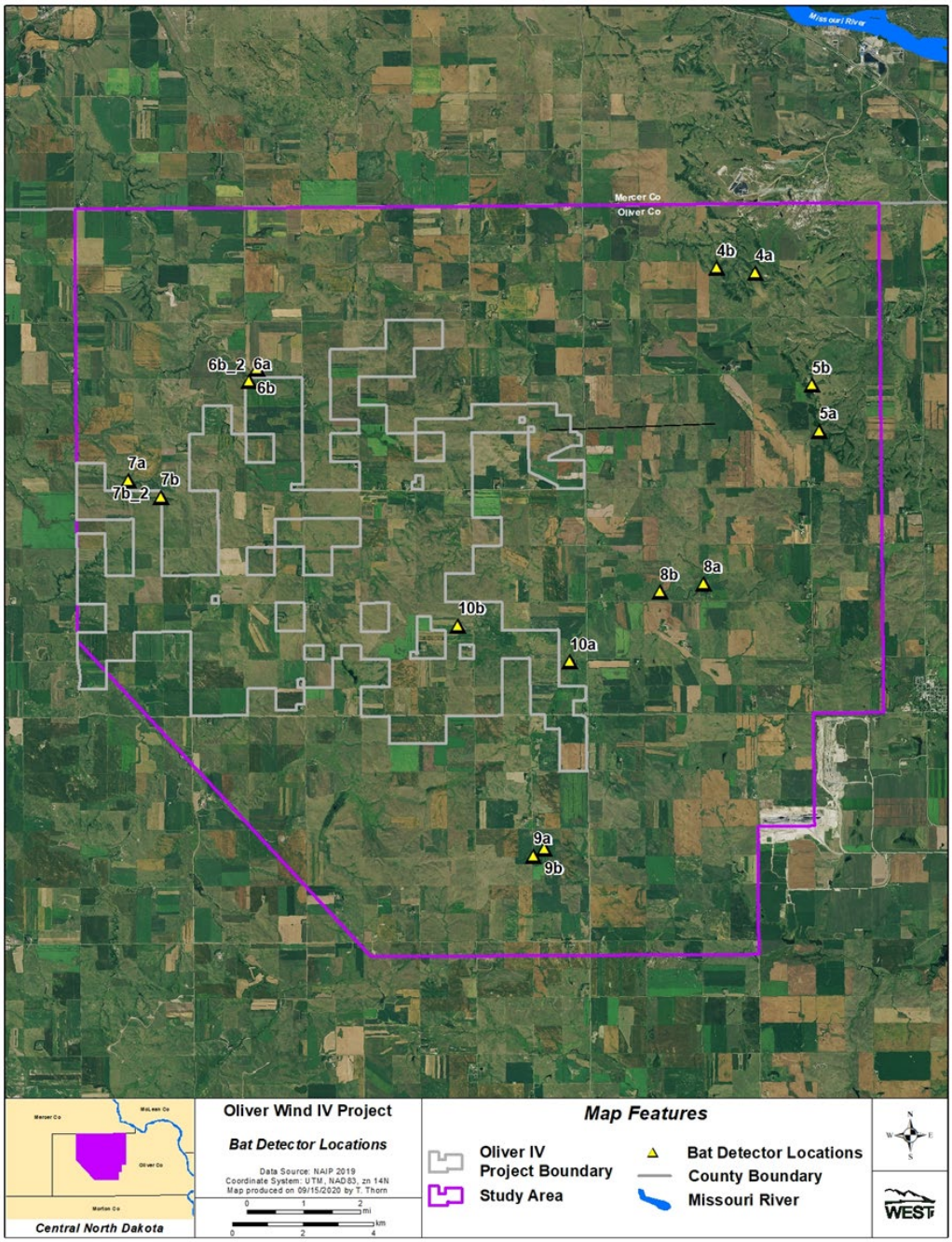


Figure 3. Location of acoustic survey sites for the summer 2019 bat presence/absence surveys within the Oliver Wind IV Project Study Area in Oliver County, North Dakota. ***(Note: Four male northern long-eared bats (Myotis septentrionalis*****; NLEB)** ***were captured in mist-nets at survey sites 4b (2 NLEB) and 5b (2 NLEB) in July/August 2019).***

Oliver IV T-Line 000328

Table 1. Acoustic survey site coordinates, descriptions, and results of Kaleidoscope* identification software from valid and invalid survey nights within the Oliver Wind IV Project Study Area in Oliver County, North Dakota.

Site ID	Easting**	Northing**	Site Description	Bat Calls Identified	Total Bat Calls	Valid Detector Nights	Invalid Detector Nights	Detector Type	Bat Calls per Detector Night
4a	321180	5232750	Forest Edge	835	1,061	4	1	SM3	212.2
4b	320105	5232934	Forest Edge	452	612	4	1	SM3	122.4
5a	322831	5228187	Upland Forest	851	1,025	4	1	SM3	205.0
5b	322664	5229499	Forest Edge	1,300	1,530	4	1	SM3	306.0
6a	306708	5230235	Forest Edge	92	123	4	1	SM3	24.6
6b	306952	5230564	Riparian Forest	513	654	3	3	SM3	109.0
6b_2‡	306948	5230573	Riparian Forest	352	444	3	1	SM4	111.0
7a	303186	5227539	Riparian Forest	307	395	4	1	SM3	79.0
7b	304090	5227029	Riparian Forest	217	289	3	3	SM3	48.2
7b_2‡	304079	5227022	Riparian Forest	271	313	3	1	SM4	78.3
8a	319382	5223965	Upland Forest	512	564	4	1	SM3	112.8
8b	318131	5223792	Riparian Forest	174	194	4	1	SM3	38.8
9a	314263	5216424	Forest Edge	87	105	5	1	SM3	17.5
9b	314566	5216617	Shelterbelt	88	108	5	1	SM3	18.0
10a	315502	5221911	Riparian Forest	999	1,114	4	1	SM3	222.8
10b	312366	5223046	Forest Edge	143	190	4	1	SM3	38.0
Totals				**7,193**	**8,721**	**62**	**20**		**106.4**

*Number of calls that were identified to species by Kaleidoscope Pro software.

**Coordinate system and datum: Universal Transverse Mercator North American Datum (NAD) 1983, Zone 14

‡6b and 7b were redeployed (6b_2 and 7b_2) to achieve 4 valid detector nights.

Table 2. Bat calls identified by Kaleidoscope Pro® Version 4.2.0 on valid and invalid nights within the Oliver Wind IV Project Study Area in Oliver County, North Dakota. Numbers in parentheses indicate number confirmed as northern long-eared bat (MYSE) calls by subsequent qualitative analysis.

Site ID	EPFU	LABO	LACI	LANO	MYLU	MYSE	NOID
4a	232	48	87	422	45	1 (0)	226
4b	57	49	152	120	53	21 (6)	160
5a	139	266	68	220	154	4 (0)	174
5b	106	53	198	834	101	8 (1)	230
6a	18	24	13	4	27	6 (0)	31
6b	43	60	72	23	313	2 (0)	141
6b_2	14	97	17	6	214	4 (0)	92
7a	49	81	27	25	121	4 (0)	88
7b	72	30	23	6	85	1 (0)	72
7b_2	8	42	13	17	190	1 (0)	42
8a	142	106	13	11	239	1 (0)	52
8b	8	13	17	10	126		20
9a	6	60	1	2	18		18
9b	4	56		1	27		20
10a	14	88	123	12	760	2 (0)	115
10b	10	30	79	7	17		47
Totals	**922**	**1,103**	**903**	**1,720**	**2,490**	**55 (7)**	**1,528**
	10.6%	**12.6%**	**10.4%**	**19.7%**	**28.6%**	**0.6%**	**17.5%**

EPFU = big brown bat (*Eptesicus fuscus*); LABO = eastern red bat (*Lasiurus borealis*); LACI = hoary bat (*Lasiurus cinereus*); LANO = silver-haired bat (*Lasionycteris noctivagans*); MYLU = little brown bat (*Myotis lucifugus*); MYSE = northern long-eared bat (*Myotis septentrionalis*); NOID = unknown or no identification.

Oliver IV T-Line 000330

Mist-Net Surveys

Mist-nest survey site locations, descriptions and results are provided in Tables 3-5. Appendices G, H, I, J, and K contain maps of mist-net survey sites, photographs of mist-net sites, bat capture details, representative photographs of bats captured, and datasheets, respectively.

Mist-net surveys were conducted at three survey locations from July 28 to August 3, 2019, including the two acoustic survey locations (4b and 5b) where NLEB were qualitatively confirmed during acoustic surveys (August 13 to August 15, 2019, Figure 4). During the first round of mist-net surveys, WEST biologists captured a total of 20 bats, including 14 silver-haired bats, three eastern red bats, and three hoary bats. Eight more bats were captured during the second round of mist-net surveys, including four NLEB, two little brown bats, one silver-haired bat, and one eastern red bat. All captured NLEB were males (two were juveniles and two were adults; Table 5).

WEST notified the USFWS South Dakota Field Office and North Dakota Game and Fish of the first three NLEB captured on August 15, 2019. USFWS biologist Natalie Gates requested that DNA be collected from any additional NLEB captured to verify the species identify. WEST biologists collected the processing bag that held the NLEB at site 4b on August 15, 2019, and sent it to Northern Arizona University for DNA extraction and analysis. Results of the analysis indicated insufficient DNA was in the collection bag to confirm species.

Table 3. Locations and site descriptions of mist-net surveys within the Oliver Wind IV Project Study Area in Oliver County, North Dakota.

Site ID	Net	Easting*	Northing*	Site Description
1 (presence/absence)	A	320949	5232216	Forest Edge
	B	320923	5232229	Forested Corridor
	C	320917	5232290	Forested Corridor
	D	320940	5232295	Forest Edge
	E	320962	5232311	Forest Edge
2 (presence/absence)	A	323129	5227701	Forested Corridor
	B	323134	5227736	Forested Corridor
	C	323098	5227765	Forested Corridor
	D	323035	5227776	Forest Edge
	E	323163	5227674	Forest Edge
3 (presence/absence)	A	301833	5225070	Forest Edge
	B	301876	5225025	Forested Corridor
	C	301793	5225012	Forest Edge
	D	301775	5225043	Forest Edge
	E	301809	5225097	Forested Corridor
4b (follow-up)	A	320093	5232912	Forested Corridor
	B	320095	5232925	Forested Corridor
	C	320071	5232943	Forested Corridor
5b (follow-up)	A	322775	5229511	Forested Corridor
	B	322609	5229472	Forested Corridor
	C	322670	5229409	Forest Edge

*Universal Transverse Mercator [UTM] Zone 14, NAD 1983

Table 4. Summary of bat mist-net captures within the Oliver Wind IV Project Study Area in Oliver County, North Dakota.

Site ID	LABO	LACI	LANO	MYLU	MYSE	Total
1		3	12			15
2	1		2			3
3	2					2
4b‡	1		1		2	4
5b‡				2	2	4
Total	**4**	**3**	**15**	**2**	**2**	**28**

LABO = eastern red bat (*Lasiurus borealis*); LACI = hoary bat (*Lasiurus cinereus*); LANO = silver-haired bat (*Lasionycteris noctivagans*); MYLU = little brown bat (*Myotis lucifugus*); MYSE = northern long-eared bat (*Myotis septentrionalis*).

‡Follow-up mist-net sites following call analysis and confirmation of NLEB (MYSE) at these locations.

Table 5. Details of *Myotis* species captured during summer bat mist-net surveys within the Oliver Wind IV Project Study Area in Oliver County, North Dakota.

Site ID	Species[4]	Capture Date	Capture Time	Band ID	Sex[1]	Age[2]	Reproductive Condition[3]	Forearm Length (mm)	Weight (g)
4b	MYSE	August 14	21:44	WEST B0315	M	A	N	35.5	6.00
4b	MYSE	August 15	01:20	WEST B0350	M	J	N	34.8	6.25
5b	MYSE	August 13	22:30	WEST A0214	M	J	N	36.2	6.50
5b	MYSE	August 13	22:30	WEST A0213	M	A	N	37.0	6.75
5b	MYLU	August 13	23:20	WEST A0212	F	A	PL	39.2	11.50
5b	MYLU	August 14	02:27	WEST A0211	M	A	N	39.2	11.25

[1]F=female; M=male.

[2]A=adult; J=juvenile.

[3]PL=post-lactating; N=non-reproductive.

4 MYSE = Northern long-eared bat (*Myotis septentrionalis*); MYLU = little brown bat (*Myotis lucifugus*).

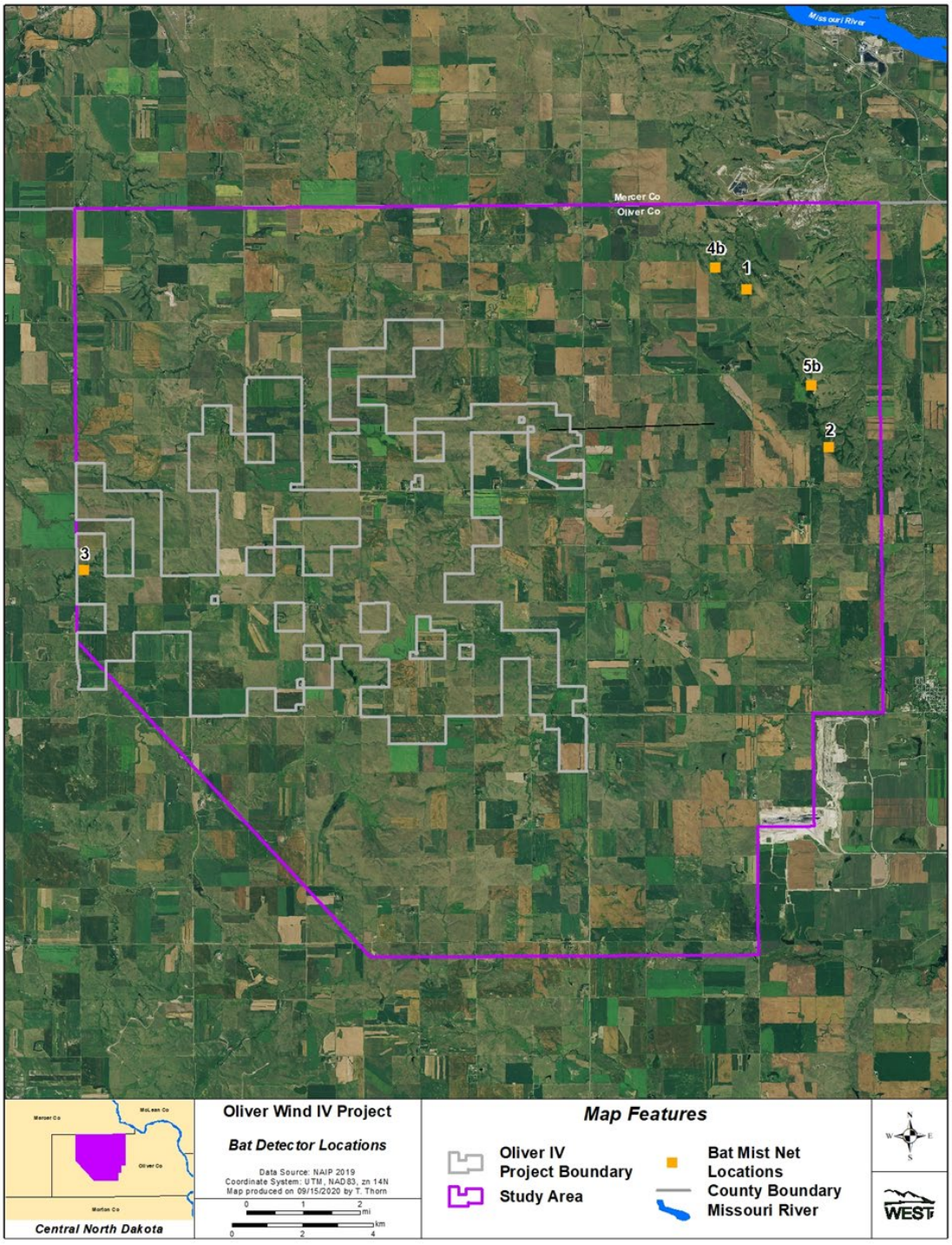


Figure 4. Location of 2019 summer bat mist-net survey sites within the Oliver Wind IV Project Study Area in Oliver County, North Dakota.

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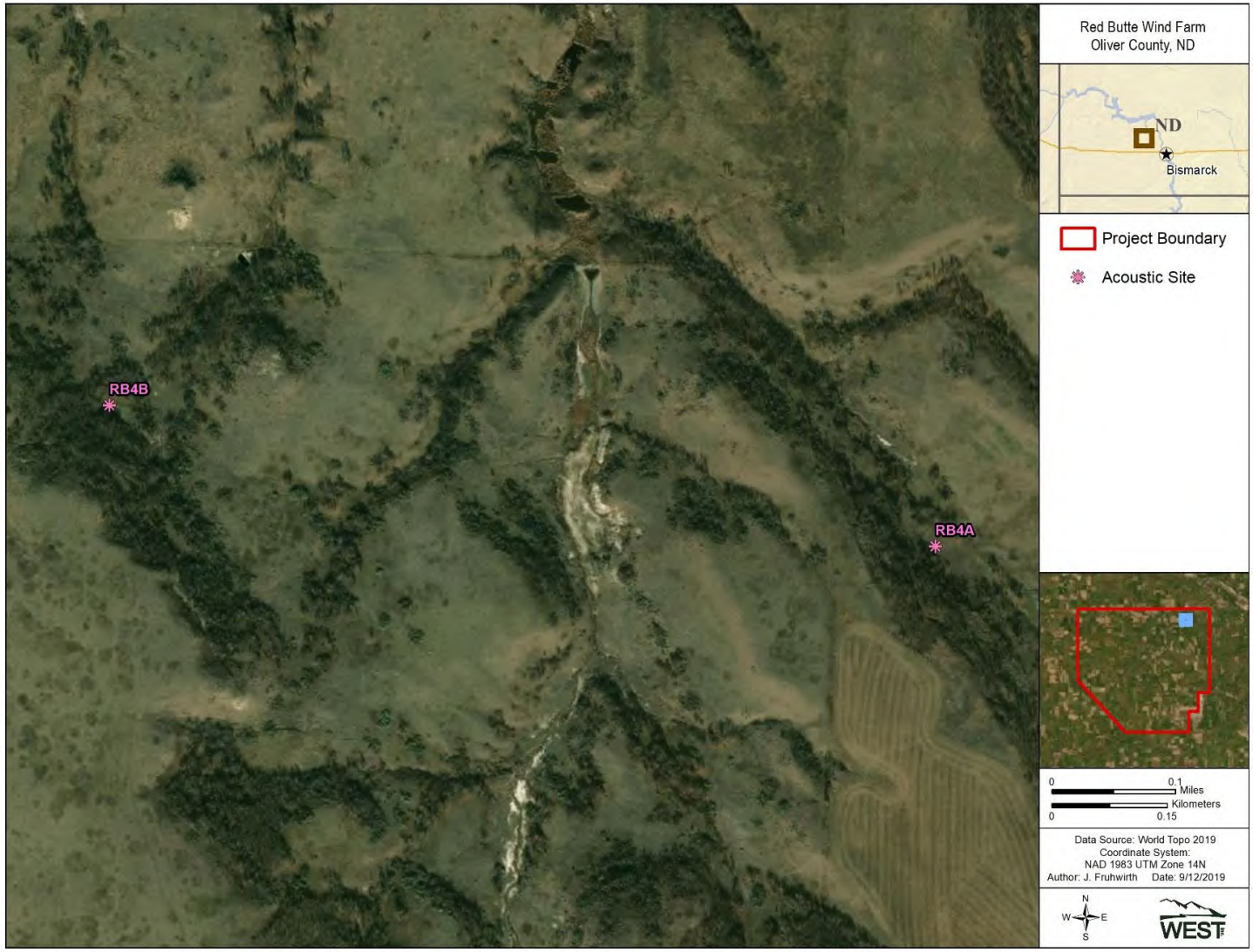
Reichard, J. E. 2009. Wing-Damage Index Used for Characterizing Wing Condition of Bats Affected by White-Nose Syndrome. Center for Ecology and Conservation, Boston University, Boston, Massachusetts.

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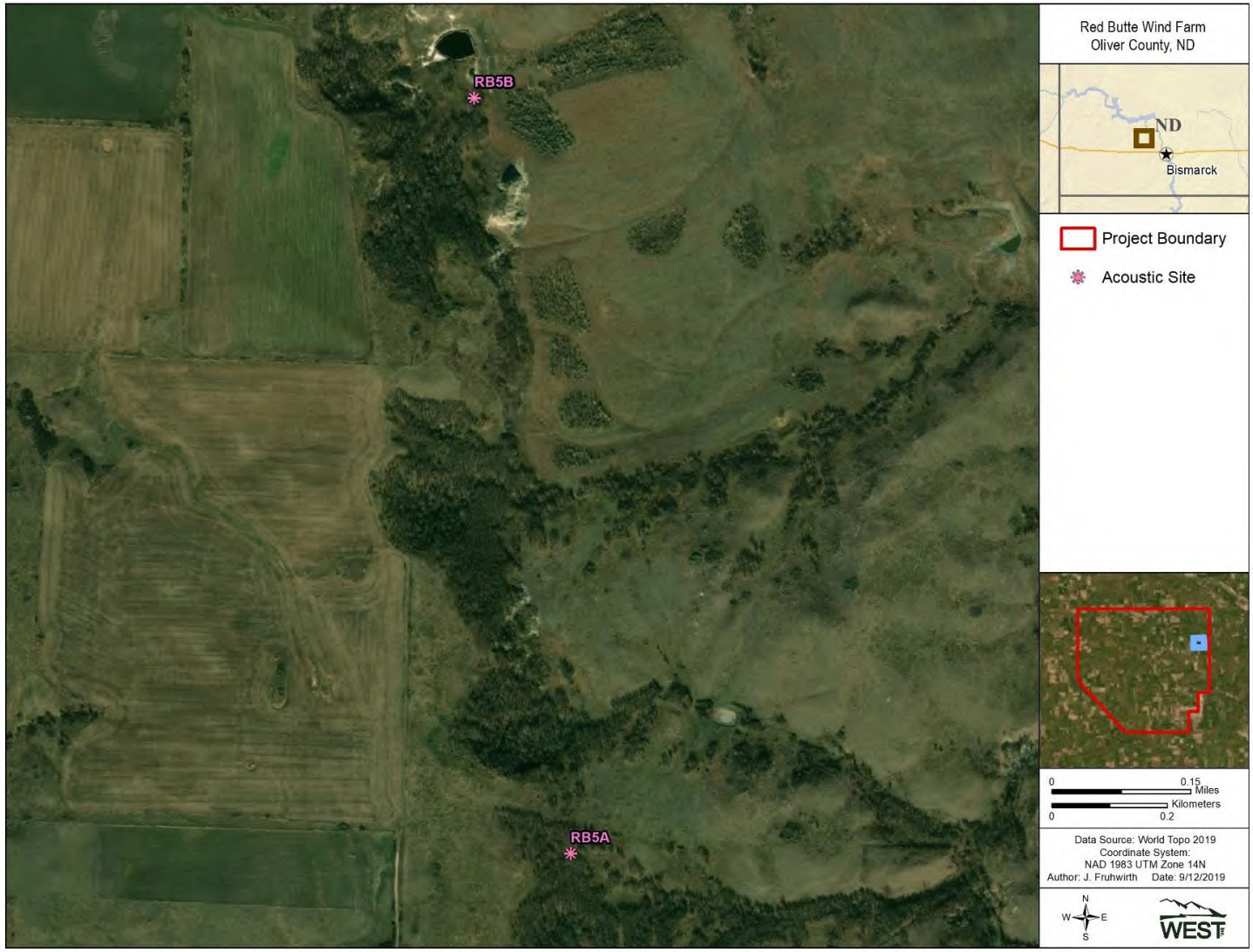
US Fish and Wildlife Service (USFWS). 2016. National White-Nose Syndrome Decontamination Protocol - Version 04.12.2016. White-Nose Syndrome.org, a partnership of federal, local, and state governmental agencies, non-governmental agencies, and universities.

US Fish and Wildlife Service (USFWS). 2019. Range-Wide Indiana Bat Summer Survey Guidelines. USFWS Region 3, Bloomington, Indiana. April 2019. 63 pp., including appendices. Available online: https://www.fws.gov/midwest/endangered/mammals/MYSO/surveys/pdf/2019_Rangewide_IBat_Survey_Guidelines.pdf

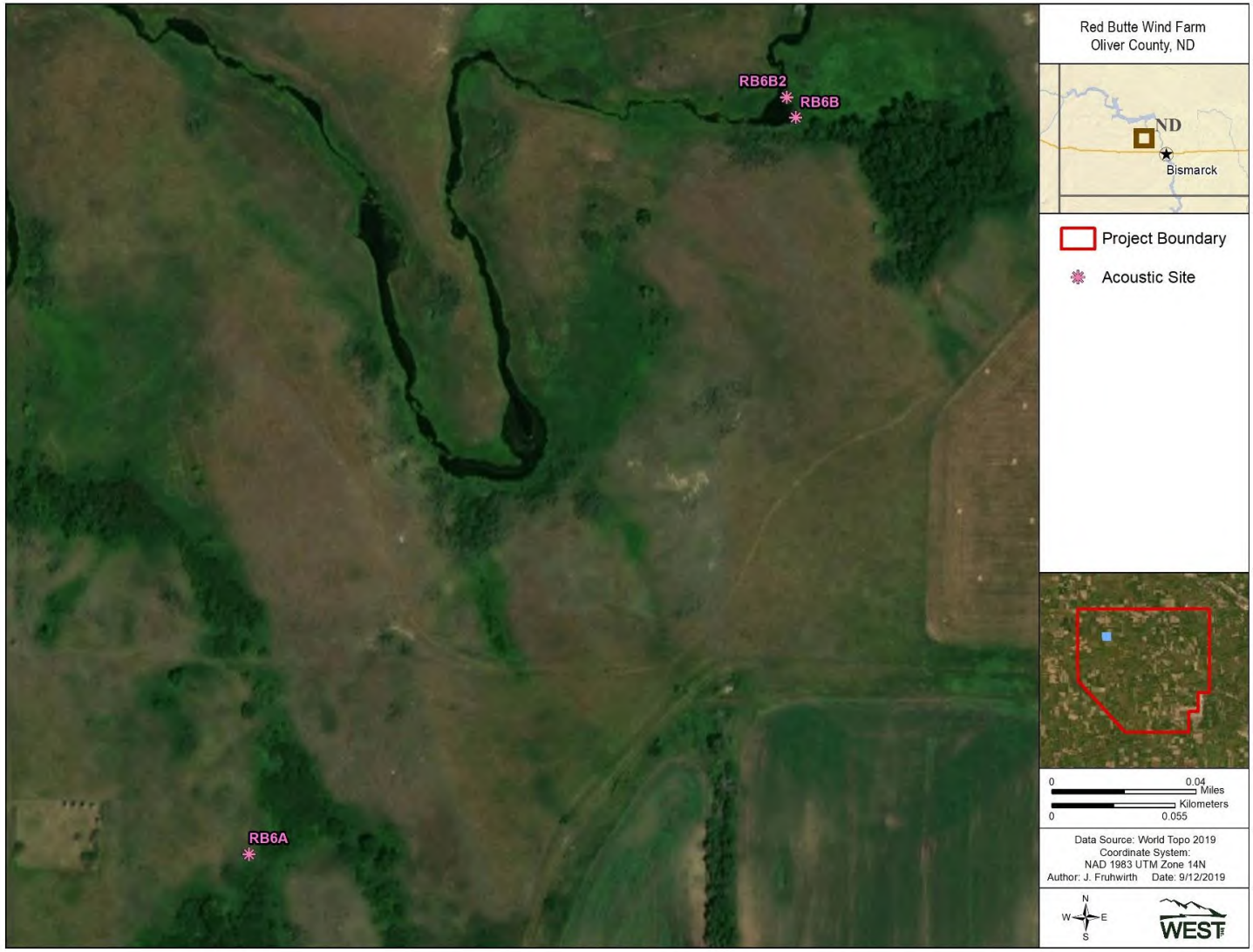
Appendix A. Maps of Acoustic Survey Sites



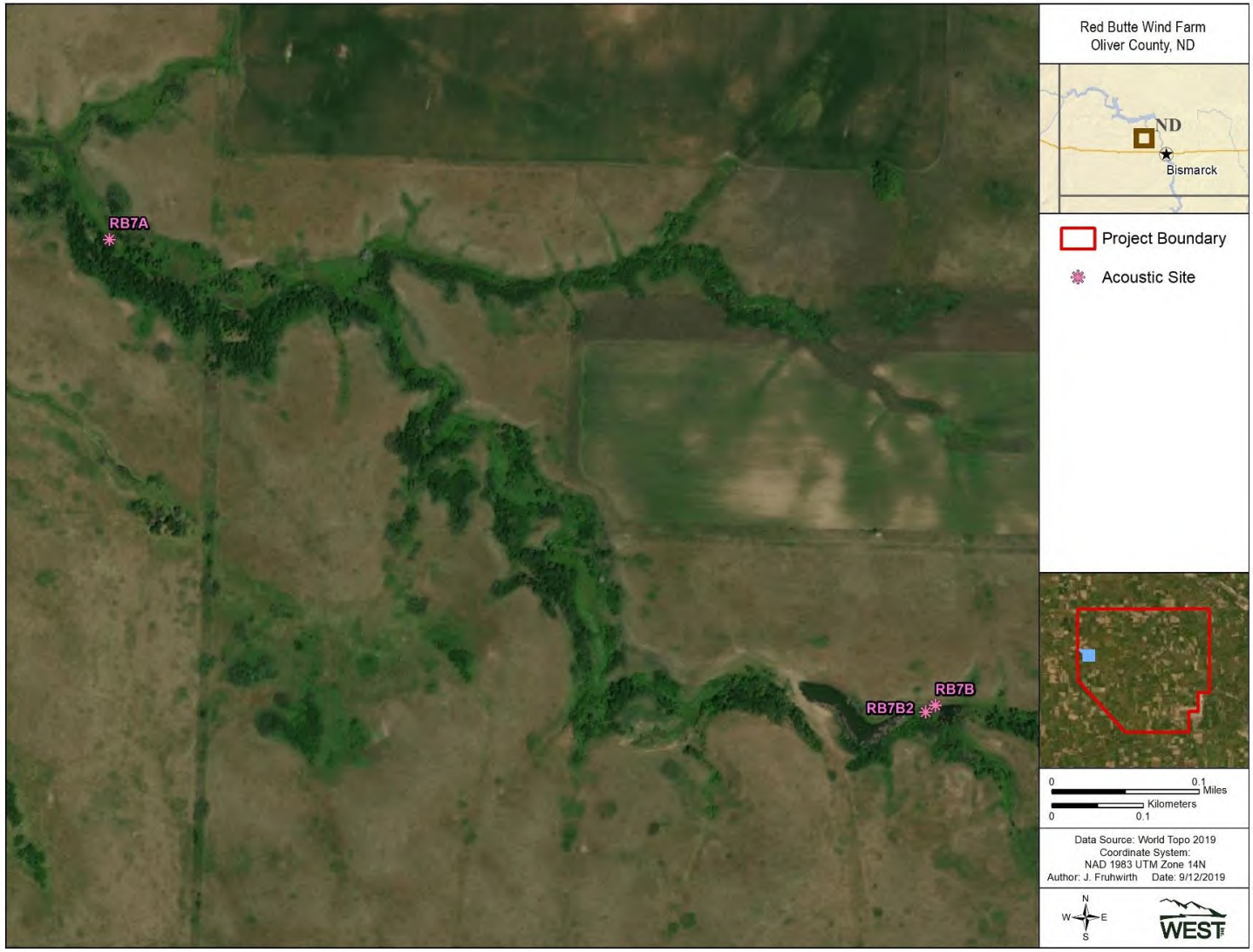
Appendix A1. Map of acoustic sites 4a and 4b at the Red Butte Wind Project.



Appendix A2. Map of acoustic sites 5a and 5b at the Red Butte Wind Project..



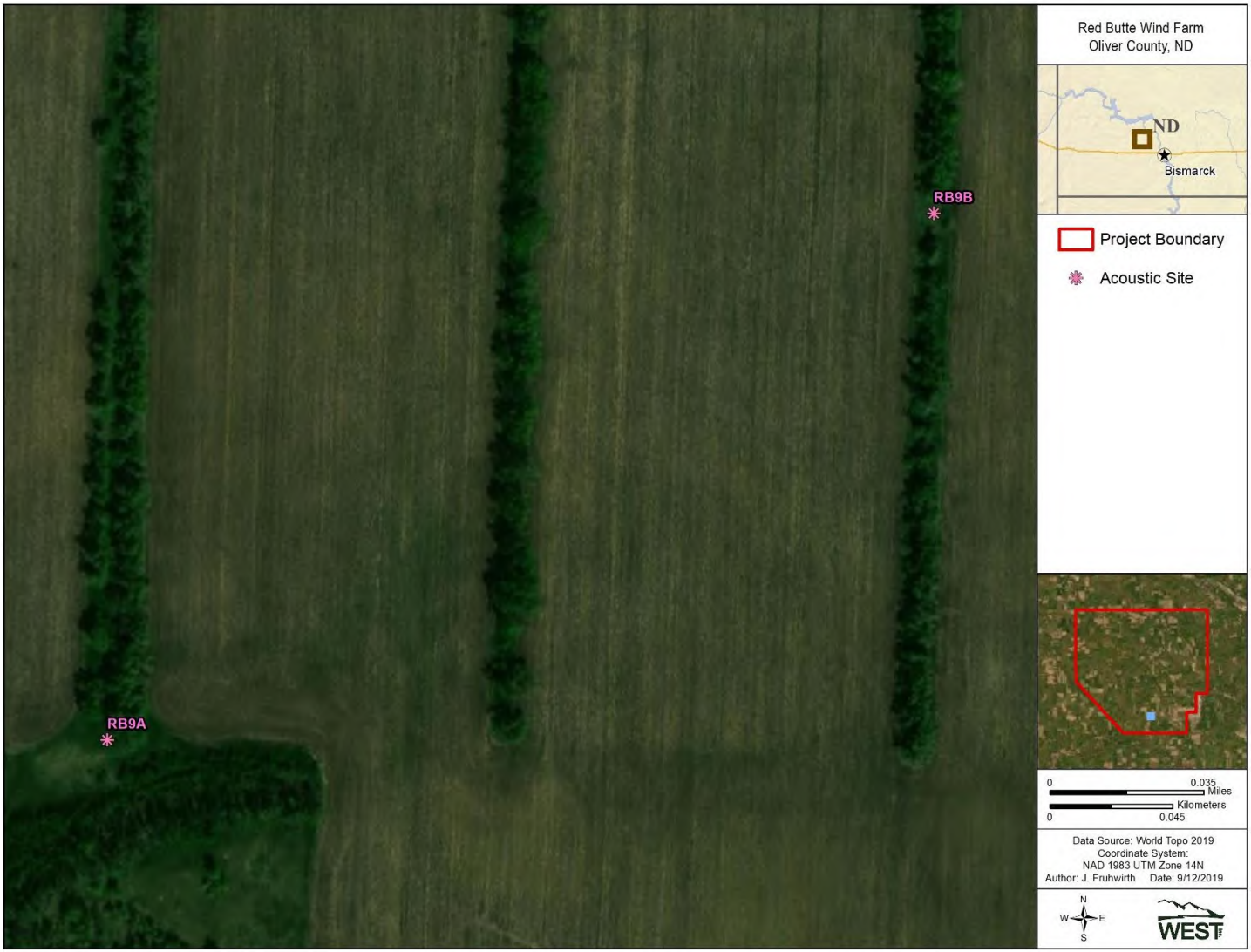
Appendix A3. Map of acoustic sites 6a, 6b, and 6b-2 at the Red Butte Wind Project..



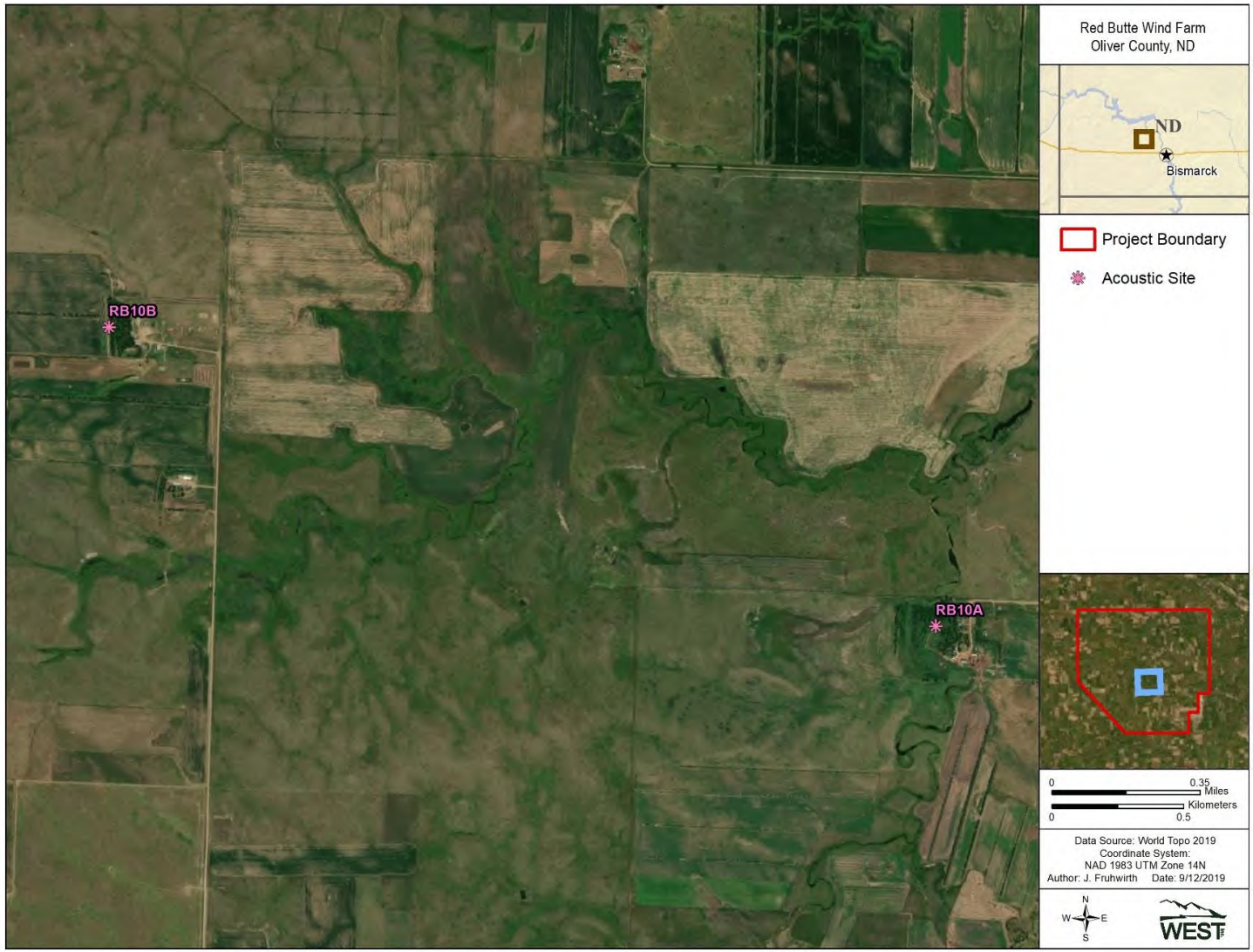
Appendix A4. Map of acoustic sites 7a, 7b, and 7b-2 at the Red Butte Wind Project..



Appendix A5. Map of acoustic sites 8a and 8b at the Red Butte Wind Project..



Appendix A6. Map of acoustic sites 9a and 9b at the Red Butte Wind Project..



Appendix A7. Map of acoustic sites 10a and 10b at the Red Butte Wind Project..

Appendix B. Photographs of Acoustic Survey Sites







Appendix B1. Acoustic survey site 4a.







Appendix B1. Acoustic survey site 4b.



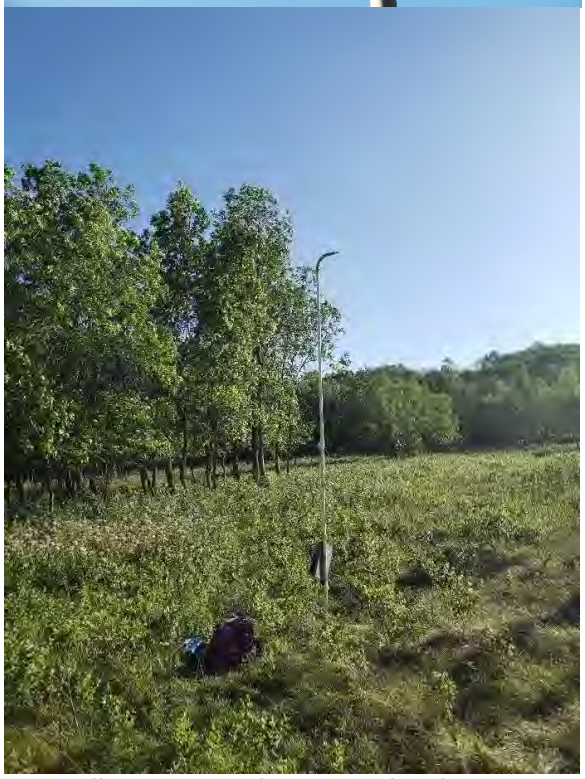




Appendix B1. Acoustic survey site 5a.







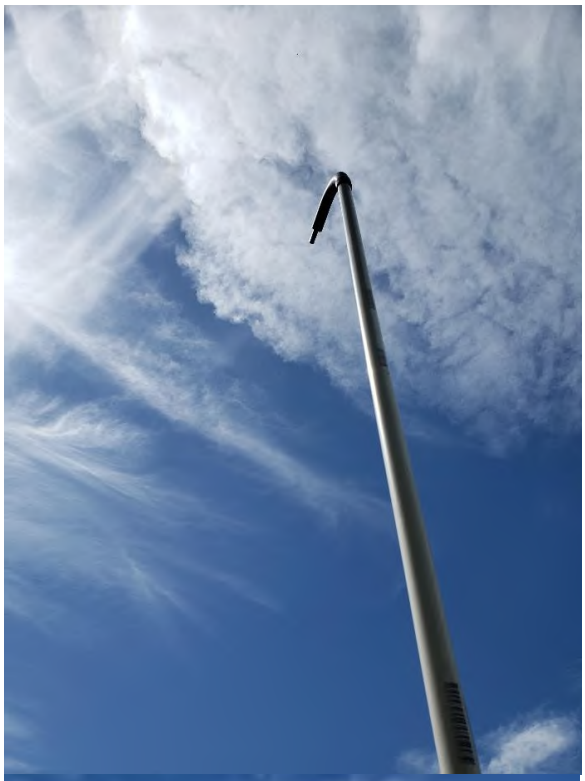
Appendix B1. Acoustic survey site 5b.







Appendix B1. Acoustic survey site 6a.







Appendix B1. Acoustic survey site 6b.





Appendix B1. Acoustic survey site 6b-2 (redeployment).







Appendix B1. Acoustic survey site 7a.







Appendix B1. Acoustic survey site 7b.







Appendix B1. Acoustic survey site 7b-2 (redeployment).







Appendix B1. Acoustic survey site 8a.







Appendix B1. Acoustic survey site 8b.







Appendix B1. Acoustic survey site 9a.







Appendix B1. Acoustic survey site 9b.



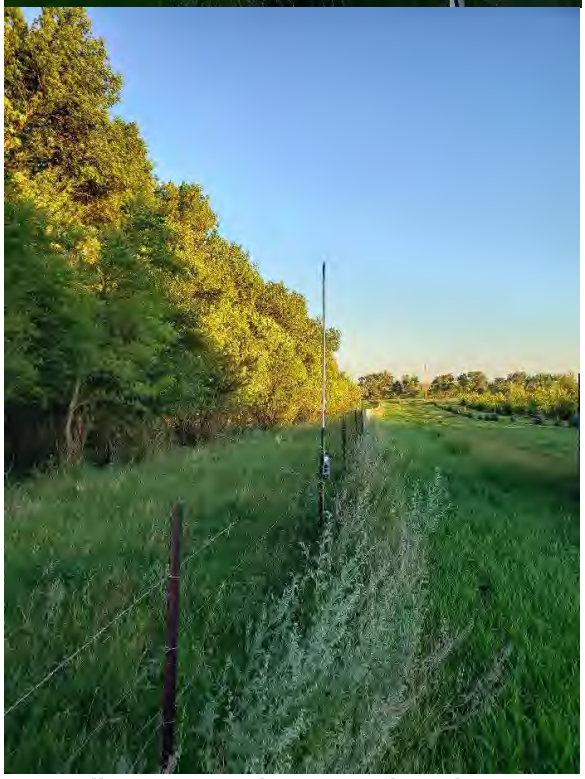




Appendix B1. Acoustic survey site 10a.







Appendix B1. Acoustic survey site 10b.

Appendix C. Acoustic Datasheets

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): RB4 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-27	**End Date:** 2019-08-01	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1235	**End Time:** 1250	**Easting:** 321180	**Northing:** 5232750
*Use 24 hour time format	*Use yyyy-mm-dd date format	*Easting should be 6 digits	*Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 306307			
Detector Housing: None	**Mic Serial:** 706308	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 100		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-27	1235	6.4	✓	✓	✓	✓	setup				Record Status Data / Standby Error
2019-07-29	1215	5.7	✓	✓			check				Record Status Data / Standby Error
2019-08-01	1250	5.3		✓			pickup				Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 50
Forest Type: Deciduous	**% Open/Ag:** 50
Dominant Tree Species: Fraxinus pennsylvanica, Acer negundo	**% Water:** 0
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present: Fraxinus pennsylvanica (snag)	
Topography: Flat	

[3]Habitat Description within 100m (i.e. the sketched area)

Prairie edge, Fraxinus snags



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): RB4 B	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-27	**End Date:** 2019-08-01	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1405	**End Time:** 1325	**Easting:** 320105	**Northing:** 5232934

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 304764			
Detector Housing: None	**Mic Serial:** 106415	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 92		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-27	1405	6.4	✓	✓	✓	✓	setup				Record Status Data / Standby Error
2019-07-29	1310	5.6	✓	✓			check				Record Status Data / Standby Error
2019-08-01	1325	5.3	✓	✓			pickup				Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 70
Forest Type: Deciduous	**% Open/Ag:** 30
Dominant Tree Species: Fraxinus pennsylvanica, Ulmus americana	**% Water:** 0
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present: Fraxinus pennsylvanica (snag)	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

In a valley, moved detector 15m from desktop selection to better capture potential flyway

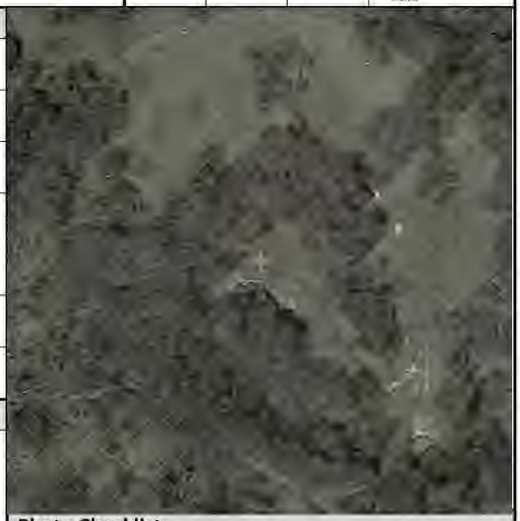


Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB5 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-26	**End Date:** 2019-07-31	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1750	**End Time:** 1517	**Easting:** 322831	**Northing:** 5228187

[4] Use 24 hour time format *[4] Use yyyy-mm-dd date format* *[4] Easting should be 6 digits* *[4] Northing should be 7 digits*

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: 302827			
Detector Housing: None	**Mic Serial:** 102794	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 96		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-26	1750	6.4	✓	✓	✓	✓	setup				Record Standby Status Error Data
2019-07-28	1715	5.8	✓	✓			check				Record Standby Status Error Data
2019-07-31	1517	4.8		✓			pickup				Record Standby Status Error Data
											Record Standby Status Error Data

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Upland Forest	**% Forest:** 55
Forest Type: Deciduous	**% Open/Ag:** 45
Dominant Tree Species: Acer negundo, Fraxinus pennsylvanica	**% Water:** 0
Stand Age (DBH): Early-successional (0 - 12 cm)	
Preferred Roost Tree Species Present:	
Topography: Slope	

[3] Habitat Description within 100m (i.e. the sketched area)

Forest patch in pasture, all A. negundo and F. pennsylvanica. Detector set to MDT, datasheet in CDT.



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] *Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)*
[2] *Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).*
[3] *Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).*

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB5 B	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-26	**End Date:** 2019-07-31	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1750	**End Time:** 1605	**Easting:** 322664	**Northing:** 5229499

[4] Use 24 hour time format *[4] Use yyyy-mm-dd date format* *[4] Easting should be 6 digits* *[4] Northing should be 7 digits*

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: 306451			
Detector Housing: None	**Mic Serial:** 100365	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 324		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-26	1750	6.4	✓	✓	✓	✓	setup				Record Status Data / Standby Error
2019-07-28	1745	5.4	✓	✓	✓		check, replaced after downed by cows				Record Status Data / Standby Error
2019-07-31	1605	5.2		✓			pickup				Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)	
[1] **Primary Habitat:** Field Edge	**% Forest:** 35
Forest Type: Deciduous	**% Open/Ag:** 55
Dominant Tree Species: Fraxinus pennsylvanica	**% Water:** 10
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present:	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

Near pond in pasture edge. Reset on 7/28 after cows destroyed. Detector set to MDT, datasheet on CDT

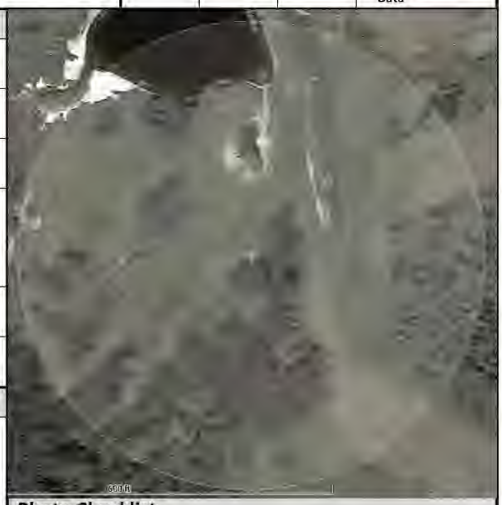


Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB6 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-27	**End Date:** 2019-08-01	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1615	**End Time:** 1450	**Easting:** 306708	**Northing:** 5230235

[4] Use 24 hour time format *[5] Use yyyy-mm-dd date format* *[6] Easting should be 6 digits* *[7] Northing should be 7 digits*

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: 304900			
Detector Housing: None	**Mic Serial:** 110294	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 348		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-27	1615	6.4	✓	✓	✓	✓	setup				Record Status Data / Standby Error
2019-07-28	1545	5.8	✓	✓	✓		data check				Record Status Data / Standby Error
2019-08-01	1450	5.3		✓			pickup				Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 20
Forest Type: Deciduous	**% Open/Ag:** 80
Dominant Tree Species: Fraxinus pennsylvanica	**% Water:** 0
Stand Age (DBH): Early-successional (0 - 12 cm)	
Preferred Roost Tree Species Present:	
Topography: Low Point	

[3] Habitat Description within 100m (i.e. the sketched area)

Shrubby valley bottom with a few Fraxinus, original point was in tall shrubs so moved 15m. Swapped card 7/28



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB6 B	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-27	**End Date:** 2019-08-04	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1530	**End Time:** 1200	**Easting:** 306952	**Northing:** 5230564

[a] Use 24 hour time format [b] Use yyyy-mm-dd date format [c] Easting should be 6 digits [c] Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: 305616			
Detector Housing: None	**Mic Serial:** 109981	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 276		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-27	1530	6.4	✓	✓	✓	✓	setup				Record Status Data / Standby Error
2019-07-28	1525	5.8	✓	✓			data check				Record Status Data / Standby Error
2019-08-01	1530			✓			detector did not turn on, knocked over, redeployed				Record Status Data / Standby Error
2019-08-04	1200						pickup				Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 20
Forest Type: Deciduous	**% Open/Ag:** 75
Dominant Tree Species: Fraxinus pennsylvanica	**% Water:** 5
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present:	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

Tiny pond edge in cow pasture. Detector did not turn on, had data for all nights but need to check it, was knocked over by cows. Redeployed 8/1



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB- 6b	**Project:** Red Butte		**State:** North Dakota
	Surveyors: K. Hammond, K. Lutsch		**County:** Oliver
Start Date: 2019-08-13	**End Date:** 2019-08-14	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1800	**End Time:** 0800	**Easting:** 0306948	**Northing:** 5230573

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: s4u02834			
Detector Housing: None	**Mic Serial:** 110410	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 232		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-08-13	1230	6.2	✓	✓	✓	✓	Redeployed				Record Status Data / Standby Error
2019-08-17	1200						Picked up				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Creek/Riparian	**% Forest:** 20
Forest Type: Deciduous/Shrub	**% Open/Ag:** 75
Dominant Tree Species: Fraxinus pennsylvanica	**% Water:** 5
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present: none	
Topography: Low Point	

[3] Habitat Description within 100m (i.e. the sketched area)

Riparian area with shrub/forest and open cow pasture



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat) | Detector Orientation: ✓ (Detector + Bat Feature Sampled) | Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

WEST

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB7 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-27	**End Date:** 2019-08-01	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1952	**End Time:** 1755	**Easting:** 303186	**Northing:** 5227539

[4] Use 24 hour time format *[4] Use yyyy-mm-dd date format* *[5] Easting should be 6 digits* *[5] Northing should be 7 digits*

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: 303624			
Detector Housing: None	**Mic Serial:** 108213	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 340		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-27	1952	6.4	✓	✓	✓	✓	setup				Record Status Data / Standby Error
2019-07-28	1415	5.8	✓	✓	✓		check				Record Status Data / Standby Error
2019-08-01	1755	-		✓			picked up, would not turn on but recorded full night of data				Record Status Data / Standby Error
									✓		Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Creek/Riparian	**% Forest:** 30
Forest Type: Deciduous	**% Open/Ag:** 69
Dominant Tree Species: Ulmus americana, Fraxinus pennsylvanica	**% Water:** 1
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present:	
Topography: Low Point	

[3] Habitat Description within 100m (i.e. the sketched area)

Small forested creek area surrounded by cow pasture. Moved further NW down creek bed as close as possible to desktop-selected location, desktop-selected location was too wet/swampy for detector placement. Swapped card 7/28



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB7 B	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-27	**End Date:** 2019-08-04	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1810	**End Time:** 1200	**Easting:** 304090	**Northing:** 5227029

[4] Use 24 hour time format *[4] Use yyyy-mm-dd date format* *[5] Easting should be 6 digits* *[5] Northing should be 7 digits*

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: 304729 / 304882			
Detector Housing: None	**Mic Serial:** 110091	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 175		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-27	1810	6.4	✓	✓	✓	✓	setup				Record Standby Status Error Data
2019-07-28	1250	5.8	✓	✓	✓		swapped out detectors				Record Standby Status Error Data
2019-08-01	2045	6.4	✓	✓	✓	✓	knocked over by cows, reset				Record Standby Status Error Data
2019-08-04	1200						pickup				Record Standby Status Error Data

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Creek/Riparian — **% Forest:** 25

Forest Type: Deciduous — **% Open/Ag:** 65

Dominant Tree Species: Populus deltoides, Fraxinus pennsylvanica — **% Water:** 10

Stand Age (DBH): Early-successional (0 - 12 cm)

Preferred Roost Tree Species Present:

Topography: Low Point

[3] **Habitat Description** within 100m (i.e. the sketched area)

Mostly shrubby wetland/ephemeral creek. Detector replaced 7/28 because programmed start/end times were inconsistent with the rest of them in project. Downed by cows 8/1 and reset. Checked 8/2 and swapped card



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] *Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)*
[2] *Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).*
[3] *Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).*

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB- 7b	**Project:** Red Butte		**State:** North Dakota
	Surveyors: K. Hammond		**County:** Oliver
Start Date: 2019-08-13	**End Date:** 2019-08-14	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1800	**End Time:** 0800	**Easting:** 0304079	**Northing:** 5227022

[4]Use 24 hour time format *[4]Use yyyy-mm-dd date format* *[4]Easting should be 6 digits* *[4]Northing should be 7 digits*

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: s4u02775			
Detector Housing: None	**Mic Serial:**	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 133		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-08-13	1051	6.3	✓	✓	✓	✓	redeployed				Record Status Data / Standby Error
2019-08-17	1200						picked up				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Creek/Riparian	**% Forest:** 40
Forest Type: Shrub/hardwood forest	**% Open/Ag:** 40
Dominant Tree Species: Populus deltoides, Fraxinus pennsylvanica	**% Water:** 20
Stand Age (DBH): Early-successional (0 - 12 cm)	
Preferred Roost Tree Species Present: none	
Topography: Low Point	

[3]Habitat Description within 100m (i.e. the sketched area)

riparian creek area surrounded by shrub forest and open cow pasture



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB8 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-26	**End Date:** 2019-07-31	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1445	**End Time:** 1701	**Easting:** 319382	**Northing:** 5223965

[4] Use 24 hour time format *[5] Use yyyy-mm-dd date format* *[6] Easting should be 6 digits* *[7] Northing should be 7 digits*

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: 302841			
Detector Housing: None	**Mic Serial:** 104116	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 17		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-26	1445	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2019-07-28	1840	5.7	✓	✓			check				Record Status Data / Standby Error
2019-07-31	1701	5.3		✓			pickup				Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Upland Forest	**% Forest:** 20
Forest Type: Deciduous	**% Open/Ag:** 75
Dominant Tree Species: Platanus occidentalis	**% Water:** 5
Stand Age (DBH): Mature (38 cm or greater)	
Preferred Roost Tree Species Present:	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

Mostly hayfield with mature cottonwoods. Adjacent to small creek. Detector set to MDT, datasheet in CDT



Photo Checklist

Detector Location: ✓ *(Detector + All Surrounding Habitat)* Detector Orientation: ✓ *(Detector + Bat Feature Sampled)* Detection Cone: ✓ *(Air Space Sampled)*

[1] *Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)*
[2] *Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).*
[3] *Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).*

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB8 B	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-26	**End Date:** 2019-07-31	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1540	**End Time:** 1740	**Easting:** 318131	**Northing:** 5223792

*Use 24 hour time format *Use yyyy-mm-dd date format *Easting should be 6 digits *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: 304914			
Detector Housing: None	**Mic Serial:** 106739	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 80		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-26	1540	6.4	✓	✓	✓	✓	setup				Record Status Data / Standby Error
2019-07-28	1910	5.8	✓	✓			check				Record Status Data / Standby Error
2019-07-31	1740	5.1		✓			pickup				Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Creek/Riparian	**% Forest:** 35
Forest Type: Deciduous	**% Open/Ag:** 62
Dominant Tree Species: Acer negundo, Crataegus mollis	**% Water:** 3
Stand Age (DBH): Early-successional (0 - 12 cm)	
Preferred Roost Tree Species Present:	
Topography: Slope	

[3] Habitat Description within 100m (i.e. the sketched area)

Boxelder and thorny shrubbed edge of creek, more shrub than forest. Trees under 20ft in height. Detector set to MDT, datasheet in CDT



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat) | Detector Orientation: ✓ (Detector + Bat Feature Sampled) | Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB9 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-27	**End Date:** 2019-08-02	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 2050	**End Time:** 1500	**Easting:** 314263	**Northing:** 5216424

[4] Use 24 hour time format *[4] Use yyyy-mm-dd date format* *[4] Easting should be 6 digits* *[4] Northing should be 7 digits*

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: 302803			
Detector Housing: None	**Mic Serial:** 106188	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 210		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-27	2050	6.4	✓	✓	✓	✓	setup				Record Status Data / Standby Error
2019-07-28	1730	5.5		✓	✓		check, swapped card				Record Status Data / Standby Error
2019-08-02	1500	-	✓	✓			pickup, see notes				Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 25
Forest Type: Deciduous	**% Open/Ag:** 75
Dominant Tree Species: Ulmus parvifolia, Fraxinus pennsylvanica	**% Water:** 0
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present:	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

Edge of soy field. Picked up a day late because thunderstorms on 8/1, batteries dead on pickup.



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB9 B	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-27	**End Date:** 2019-08-02	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 2120	**End Time:** 1440	**Easting:** 314566	**Northing:** 5216617

[a] Use 24 hour time format *[b] Use yyyy-mm-dd date format* *[c] Easting should be 6 digits* *[d] Northing should be 7 digits*

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: 306316			
Detector Housing: None	**Mic Serial:** 103614	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 270		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-27	2120	6.4	✓	✓	✓	✓	setup				Record Status Data / Standby Error
2019-07-29	1640	5.7	✓	✓	✓		check, card swap				Record Status Data / Standby Error
2019-08-02	1440	-		✓			pickup				Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 10
Forest Type: Deciduous	**% Open/Ag:** 90
Dominant Tree Species: Ulmus parvifolia	**% Water:** 0
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present: Unknown snag(s) with exfol. bark	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

Treeline in soy field. Picked up a day late because thunderstorms on 8/1, batteries dead on pickup



Photo Checklist

Detector Location: ✓ *(Detector + All Surrounding Habitat)* Detector Orientation: ✓ *(Detector + Bat Feature Sampled)* Detection Cone: ✓ *(Air Space Sampled)*

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB10 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-26	**End Date:** 2019-07-31	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1900	**End Time:** 1820	**Easting:** 315502	**Northing:** 5221911

[4] Use 24 hour time format *[4] Use yyyy-mm-dd date format* *[4] Easting should be 6 digits* *[4] Northing should be 7 digits*

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: 303530			
Detector Housing: None	**Mic Serial:** 102507	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 182		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-26	1900	6.4	✓	✓	✓	✓	setup				Record Status Data / Standby Error
2019-07-29	1845	5.4	✓	✓			check				Record Status Data / Standby Error
2019-07-31	1820	5.1		✓			pickup				Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Creek/Riparian	**% Forest:** 30
Forest Type: Deciduous	**% Open/Ag:** 65
Dominant Tree Species: Platanus occidentalis, Salix nigra	**% Water:** 5
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present: Unknown snag(s) with exfol. bark, Fraxinus pennsylvanica (snag)	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

Pasture with creek and trees in backyard. Detector set to MDT, datasheet in CDT.



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] *Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)*
[2] *Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).*
[3] *Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).*

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): RB10 B	**Project:** Red Butte		**State:** North Dakota
	Surveyors: J. Wilson, A. Green		**County:** Oliver
Start Date: 2019-07-26	**End Date:** 2019-07-31	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1955	**End Time:** 1855	**Easting:** 312366	**Northing:** 5223046

[4] Use 24 hour time format *[4] Use yyyy-mm-dd date format* *[4] Easting should be 6 digits* *[4] Northing should be 7 digits*

Detector Information	Microphone Information		Anabat Only
Detector Model: SM3	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: 306252			
Detector Housing: None	**Mic Serial:** 106727	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 275		
Battery Source: Internal	**Mic Vertical Orientation (°):** 90		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2019-07-26	1955	6.4	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2019-07-28	1933	5.5	✓	✓			check				Record Status Data / Standby Error
2019-07-31	1855	5.2		✓			picked up				Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 45
Forest Type: Deciduous	**% Open/Ag:** 55
Dominant Tree Species: Acer negundo	**% Water:** 0
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present:	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

In forest edge adjacent to planted baby tree rows. Detector set to MDT, datasheet in CDT



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Appendix D. Site-Specific Authorization and Resume of Acoustic Analyst

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Dakota Ecological Services

420 South Garfield Avenue, Suite 400
Pierre, South Dakota 57501-5408

IN REPLY REFER TO:
WEST Site Specific
Authorization # 2
NLEB Permit

July 11, 2019

Mr. Kevin Lager Murray
Research Biologist
Western Ecosystems Technology, Inc.
408 West Sixth Street
Bloomington, Indiana 47404

Dear Mr. Murray:

This letter provides your site specific authorization per condition I.1 of the following Federal Endangered Species Permits:

TE26854C-0 Brenna Hyzy
TE81968B-0 Curtis Hart
TE75774C-0 Wesley Conway
TE21829B-2 Larisa Bishop-Boros
TE03495B-2 Kristina Hammond
TE99051B-1 Goniela Iskali
TE19208C-0 Ashley Matteson
TE13580D Julia Wilson
TE234121-9 Wester Ecosystems Technology (includes Kevin Murray, T. Travis Brown, Tim Sichmeller, Donald Solick, Jason Ritzert)

Under this condition you are to notify the U.S. Fish and Wildlife Service (Service) Field Supervisor for the state in which activities are proposed to occur at least 30 days prior to conducting any activities.

The information required under condition I and H6 was provided to the Service in an email dated July 8, 2019. In summary, bats, including northern long-eared bats (NLEB), will be captured in mist nests and harp traps at the Red Butte Wind Project in Oliver County, North Dakota. The objective of the survey is to determine presence/probable absence of the NLEB. Captured bats will be placed in clean cloth bags and assessed for morphometric data (mass, length of forearm, and other metrics need for identification if necessary). Once processed, bats will be released at the site of capture. As a reminder, bats cannot be held for more than 30 minutes.

A North Dakota Scientific Collectors permit from the North Dakota Game and Fish Department is also required for this type of work.

All activities will take place as part of a presence/absence survey for the Red Butte Wind Project. All survey activities should conform to the conditions of your Service permit.

Please report your data from this survey to the USFWS South Dakota Field Office utilizing the 2016 Bat Reporting spreadsheets for Region 6, to fulfill condition L of your permit. The spreadsheet and instructions can be found on the Service's website http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html.

As stated in your permit, your concurrence letter must be carried with this permit to authorize site-specific activities. If you have any questions, please feel free to call Charlene Bessken at 605-224-8693 x 231.

Sincerely,

Scott V. Larson
Field Supervisor
South Dakota Field Office

Cc: Kathy Konishi, USFWS, Denver
Jerry Reinisch, USFWS, North Dakota Field Office

Kevin Murray, Ph.D., *Consulting Ecologist*

PROFESSIONAL EXPERIENCE

2010-Present	*Consulting Ecologist and Project Manager,* WEST, Inc., Bloomington, Indiana
2009	*Lead Biological Science Technician,* National Park Service, Ozark Scenic Riverways
2006-2008	*Research Assistant*, University of Miami, Coral Gables, FL
2002-2006	*Doctoral Fellow,* University of Miami, Coral Gables, FL
2001-2002	*Lead Biological Science Technician,* Missouri State University, Springfield, Missouri
2000	*Biological Science Technician,* Oregon State University, Corvallis, Oregon
1998-2000	*Biological Science Technician,* Missouri State University, Springfield, Missouri

SPECIALTY AREAS

Dr. Murray has extensive research experience in bat ecology. He has experience in capture and identification of over fifteen species of bats in North America, including work with endangered species (*Myotis sodalis*, *Myotis grisescens*, *Myotis septentrionalis* [proposed]). He has managed projects and conducted bat surveys all over the eastern U.S. including numerous Missouri projects.

Dr. Murray has 18 years of experience in acoustic identification of bat echolocation calls in North America, Central America, and the Caribbean, including extensive experience with *M. septentrionalis*, *M. sodalis* and *M. grisescens*.

Dr. Murray has conducted 5 acoustic ID workshops (1998 to present) training individuals from federal and state agencies, universities, and consulting companies.

Dr. Murray has 19 publications, including 17 on bat research and 10 on bat echolocation, and numerous presentations on bat research at scientific conferences.

SELECTED PROFESSIONAL PUBLICATIONS

Clement, M.J., **K.L. Murray**, D.I. Solick, and J.C. Gruver. 2014. The effect of call libraries and acoustic filters on the identification of bat echolocation. Ecology and Evolution 4:3482-3493.

Britzke, E.R., E.H. Gillam and **K.L. Murray**. 2013. Current state of understanding of ultrasonic detectors for the study of bat ecology. Acta Theriologica 58:109-117.

Britzke, E.R., J.E. Duchamp, **K.L. Murray**, R.K. Swihart, and L.W. Robbins. 2011. Acoustic identification of bats in the eastern United States: a comparison of parametric and nonparametric methods. Journal of Wildlife Management 75:660-667.

Murray, K.L., E. Fraser, C. Davy, T.H. Fleming, and M.B. Fenton. 2009. Characterization of the echolocation calls of bats from Exuma, Bahamas. Acta Chiropterologica 11:415-424.

Robbins, L.W., **K.L. Murray**, and P. McKenzie. 2008. Evaluating the effectiveness of the standard mist netting protocol for the endangered Indiana bat (*Myotis sodalis*). Northeastern Naturalist.

Britzke, E.R., K.L. Murray, J.S. Heywood and L. W. Robbins. 2002. Acoustic identification. Pg. 221-225 *in* The Indiana Bat: Biology and Management of an Endangered Species (A. Kurta and J. Kennedy eds.). Bat Conservation International. Austin, TX.

Murray, K.L., E.R. Britzke, and L.W. Robbins. 2001. Variation in search-phase calls of bats. Journal of Mammalogy 82:728-737.

Murray, K.L., E.R. Britzke, B.M. Hadley, and L.W. Robbins. 1999. Surveying bat communities: a comparison between mist nets and the Anabat II bat detector system. Acta Chiropterologica 1:105-112.

HONORS AND AWARDS

National Science Foundation Education Fellowship, University of Miami, 2008

National Geographic Society Committee for Research and Exploration Grant (Biology), 2006

University Doctoral Fellowship, University of Miami, 2002-2005

Distinguished Thesis Award, Midwestern Association of Graduate Schools, 2002

Basil and Joann Boritzki Award for Outstanding Graduate Work, Missouri State University, 2000.

EDUCATION

Ph.D.
University of Miami
Coral Gables, Florida
2008
Biology

M.S.
Missouri State University
Springfield, Missouri
2001
Biology

B.S.
Missouri State University
Springfield, Missouri
1998
Biology

SCIENTIFIC ORGANIZATION MEMBERSHIPS

American Society of Mammalogists

North American Society for Bat Research

Midwest Bat Working Group

Appendix E. Kaleidoscope (version 4.2.0) Output

Appendix E1. Kaleidoscope (version 4.2.0) analysis output (26 July – 1 August).

		Number of Files							P-Values					
Site	**Night**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYLU**	**MYSE**	**NOID**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYLU**	**MYSE**
4a	20190727	7	11	23	79	7		35	1.000	0.000	0.000	0.000	0.011	1.000
4a	20190728	100	11	18	125	12		89	0.000	0.000	0.104	0.000	0.000	1.000
4a	20190729	13	5	21	25	7	1	21	0.005	0.000	0.000	0.000	0.000	0.175
4a	20190730	46	7	11	94	5		51	0.000	0.000	0.334	0.000	0.030	1.000
4a	20190731	66	14	14	99	14		30	0.000	0.000	0.137	0.000	0.000	1.000
4a	**4a**	**232**	**48**	**87**	**422**	**45**	**1**	**226**						
4b	20190727	3	7	25	17	5	4	24	1.000	0.000	0.000	0.004	0.031	0.000
4b	20190728	25	15	33	23	30	14	50	0.000	0.000	0.000	0.007	0.000	0.000
4b	20190729	12	13	38	20	4	2	28	0.019	0.000	0.000	0.030	0.374	0.002
4b	20190730	4	8	24	28	9	1	15	1.000	0.000	0.000	0.000	0.000	0.215
4b	20190731	13	6	32	32	5		43	0.043	0.000	0.000	0.000	0.019	1.000
4b	**4b**	**57**	**49**	**152**	**120**	**53**	**21**	**160**						
5a	20190726	23	115	7	24	26		21	0.000	0.000	0.037	0.000	0.053	1.000
5a	20190727	31	41	21	60	29	1	36	0.000	0.000	0.000	0.000	0.000	0.516
5a	20190728	46	50	25	23	66	3	53	0.000	0.000	0.000	0.008	0.000	0.094
5a	20190729	18	33	2	11	13		33	0.000	0.000	0.821	0.002	0.008	1.000
5a	20190730	21	27	13	102	20		31	0.176	0.000	0.075	0.000	0.000	1.000
5a	**5a**	**139**	**266**	**68**	**220**	**154**	**4**	**174**						
5b	20190726	24	15	39	59	23	5	29	0.001	0.000	0.000	0.000	0.000	0.000
5b	20190727	18	9	61	340	18		66	1.000	0.000	0.000	0.000	0.000	1.000
5b	20190728	8	12	36	141	17	2	40	1.000	0.000	0.000	0.000	0.000	0.045
5b	20190729	35	5	28	62	23		54	0.000	0.012	0.000	0.000	0.000	1.000
5b	20190730	21	12	34	232	20	1	41	1.000	0.000	0.000	0.000	0.000	0.440
5b	**5b**	**106**	**53**	**198**	**834**	**101**	**8**	**230**						
6a	20190727	2	7	1		4		3	0.031	0.000	0.267	1.000	0.099	1.000
6a	20190728	12	7	8	1	9	3	9	0.000	0.000	0.000	1.000	0.000	0.001
6a	20190729		2	1	1	5	2	3	1.000	0.069	0.197	0.622	0.001	0.006
6a	20190730	2	3	3	1	6	1	13	0.158	0.011	0.004	0.991	0.000	0.158
6a	20190731	2	5		1	3		3	0.072	0.000	1.000	0.594	0.162	1.000
6a	**6a**	**18**	**24**	**13**	**4**	**27**	**6**	**31**						
6b	20190727	1	13	1		157	2	24	0.284	0.044	0.149	1.000	0.000	0.950
6b	20190728	12	6	37	12	16		28	0.003	0.000	0.000	0.746	0.000	1.000
6b	20190729	4	12	10		33		17	0.047	0.000	0.000	1.000	0.000	1.000
6b	20190730	6	6	6	3	41		30	0.002	0.027	0.000	0.826	0.000	1.000
6b	20190731	4	9	13	3	28		19	0.122	0.000	0.000	1.000	0.000	1.000
6b	20190801	16	14	5	5	38		23	0.000	0.000	0.012	0.591	0.000	1.000
6b	**6b**	**43**	**60**	**72**	**23**	**313**	**2**	**141**						
7a	20190727	1	5	5	4	8	3	9	0.966	0.000	0.000	0.214	0.000	0.000
7a	20190728	15	5	12	7	13		14	0.000	0.001	0.000	0.552	0.000	1.000
7a	20190729	16	16	5	1	18		16	0.000	0.000	0.007	1.000	0.000	1.000
7a	20190730	4	28		3	43		19	0.013	0.000	1.000	0.102	0.000	1.000
7a	20190731	13	27	5	10	39	1	30	0.000	0.000	0.021	0.006	0.000	0.685
7a	**7a**	**49**	**81**	**27**	**25**	**121**	**4**	**88**						

Appendix E1. Kaleidoscope (version 4.2.0) analysis output (26 July – 1 August).

		Number of Files							P-Values					
Site	**Night**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYLU**	**MYSE**	**NOID**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYLU**	**MYSE**
7b	20190727	1	4			9		13	0.126	0.003	1.000	1.000	0.000	1.000
7b	20190728	9	3	3	2	23		16	0.000	0.209	0.048	0.974	0.000	1.000
7b	20190729	16	1	6	1	27		11	0.000	1.000	0.001	1.000	0.000	1.000
7b	20190730	4	9			1		9	0.000	0.000	1.000	1.000	1.000	1.000
7b	20190731	18	6	14	3	8		20	0.000	0.000	0.000	1.000	0.000	1.000
7b	20190801	24	7			17	1	3	0.000	0.000	1.000	1.000	0.000	0.386
7b	**7b**	**72**	**30**	**23**	**6**	**85**	**1**	**72**						
8a	20190726		43	11	5	14		14	1.000	0.000	0.000	0.521	0.022	1.000
8a	20190727	98	11		1	177	1	13	0.000	0.292	1.000	1.000	0.000	1.000
8a	20190728	5	14		2	14		6	0.001	0.000	1.000	0.453	0.000	1.000
8a	20190729	4	20	2	2	23		12	0.009	0.000	0.112	0.656	0.000	1.000
8a	20190730	35	18		1	11		7	0.000	0.000	1.000	1.000	0.001	1.000
8a	**8a**	**142**	**106**	**13**	**11**	**239**	**1**	**52**						
8b	20190726	7	3	6	5	14		5	0.001	0.073	0.000	0.311	0.000	1.000
8b	20190727		5	1	1	72		10	1.000	0.446	0.197	0.622	0.000	1.000
8b	20190728	1	1	6	4	12		4	0.980	0.778	0.000	0.295	0.000	1.000
8b	20190729		2	4		5		0	1.000	0.068	0.000	1.000	0.001	1.000
8b	20190730		2			23		1	1.000	0.578	1.000	1.000	0.000	1.000
8b	**8b**	**8**	**13**	**17**	**10**	**126**		**20**						
9a	20190727		4			1		1	1.000	0.000	1.000	1.000	0.859	1.000
9a	20190728	1	9		1			3	0.390	0.000	1.000	0.396	1.000	1.000
9a	20190729		38	1		4		7	1.000	0.000	0.064	1.000	1.000	1.000
9a	20190730		4			3		2	1.000	0.000	1.000	1.000	0.110	1.000
9a	20190731					4		2	1.000	1.000	1.000	1.000	0.000	1.000
9a	20190801	5	5		1	6		3	0.000	0.000	1.000	0.922	0.002	1.000
9a	**9a**	**6**	**60**	**1**	**2**	**18**		**18**						
9b	20190727		1			3		1	1.000	0.300	1.000	1.000	0.013	1.000
9b	20190728		1			3		1	1.000	0.300	1.000	1.000	0.013	1.000
9b	20190729	2	44		1	7		9	0.072	0.000	1.000	0.594	0.883	1.000
9b	20190730		6			5		3	1.000	0.000	1.000	1.000	0.019	1.000
9b	20190731		3			3		3	1.000	0.003	1.000	1.000	0.067	1.000
9b	20190801	2	1			6		3	0.015	0.501	1.000	1.000	0.000	1.000
9b	**9b**	**4**	**56**		**1**	**27**		**20**						
10a	20190726		34	76	3	25		20	1.000	0.000	0.000	1.000	0.000	1.000
10a	20190727	1	2	1	3	24		3	0.785	0.605	0.474	0.066	0.000	1.000
10a	20190728	6	26	30	4	606	1	60	0.200	0.739	0.000	1.000	0.000	1.000
10a	20190729	2	12	14	1	78	1	17	0.742	0.001	0.000	1.000	0.000	0.971
10a	20190730	5	14	2	1	27		15	0.000	0.000	0.097	1.000	0.000	1.000
10a	**10a**	**14**	**88**	**123**	**12**	**760**	**2**	**115**						
10b	20190726	4	8	18	1	5		13	0.214	0.000	0.000	1.000	0.043	1.000
10b	20190727	2	2	23	4			12	0.989	0.002	0.000	1.000	1.000	1.000
10b	20190728		6	10		3		7	1.000	0.000	0.000	1.000	0.222	1.000
10b	20190729	4	3	22	2	3		5	0.343	0.003	0.000	1.000	0.067	1.000
10b	20190730		11	6		6		10	1.000	0.000	0.000	1.000	0.037	1.000

Appendix E1. Kaleidoscope (version 4.2.0) analysis output (26 July – 1 August).

	Number of Files								P-Values					
Site	**Night**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYLU**	**MYSE**	**NOID**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYLU**	**MYSE**
10b	**10b**	**10**	**30**	**79**	**7**	**17**		**47**						

Appendix E1. Kaleidoscope (version 4.2.0) analysis output for redeployed detectors (13 – 16 August).

	Number of Files								P-Values					
Site	**Night**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYLU**	**MYSE**	**NOID**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYLU**	**MYSE**
6b	20190813		23	4	1	23	1	14	1.000	0.000	0.000	0.999	0.000	0.459
6b	20190814	1	8			18		10	0.129	0.000	1.000	1.000	0.000	1.000
6b	20190815	11	35	7		113	1	41	0.000	0.000	0.000	1.000	0.000	1.000
6b	20190816	2	31	6	5	60	2	27	0.670	0.000	0.000	0.149	0.000	0.341
6b	**6b**	**14**	**97**	**17**	**6**	**214**	**4**	**92**						
7b	20190813	4	23	4	4	61		10	0.050	0.000	0.005	0.251	0.000	1.000
7b	20190814	3	3		4	95		11	0.107	1.000	1.000	0.013	0.000	1.000
7b	20190815		6	1	1	24	1	9	1.000	0.003	0.197	0.622	0.000	0.513
7b	20190816	1	10	8	8	10		12	1.000	0.000	0.000	0.017	0.000	1.000
7b	**7b**	**8**	**42**	**13**	**17**	**190**	**1**	**42**						

Appendix F. Qualitative Analysis Summary

Appendix F1. Summary of qualitative acoustic analysis of call identified as Indiana bats (MYSO) and northern long-eared bats (MYSE) by Kaleidoscope Pro (version 4.2.0) at Red Butte Wind Project in Oliver County, North Dakota.

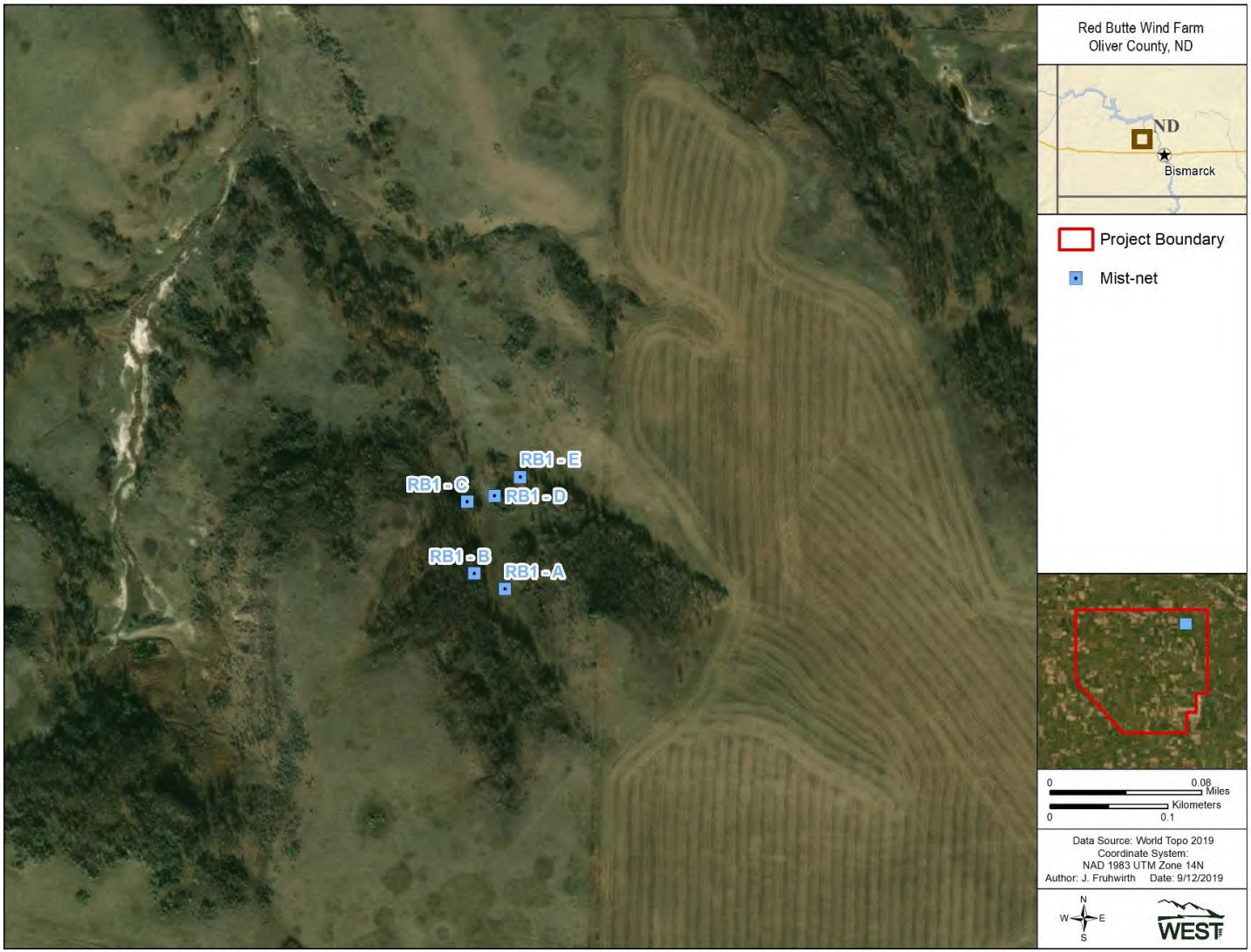
Station	Night	Filename	Kaleidoscope ID	Qualitative ID	Justification
4a	7/29/2019	T7292237.48#	MYOSEP	HF	LABO or MYLU; slope, bandwidth and Fmax all too low for MYSE
4b	7/27/2019	T7272242.39#	MYOSEP	MYSP	approach-phase calls; slope low for MYSE
4b	7/27/2019	T7272323.49#	MYOSEP	MYSE	some approach-phase calls
4b	7/27/2019	T7280119.45#	NoID	MYSP	approach-phase calls; slope low for MYSE
4b	7/27/2019	T7280307.03#	MYOSEP	LF	big brown or silver-haired bat harmonics misidentified as MYSE calls
4b	7/27/2019	T7280352.14#	NoID	MYSE	none
4b	7/27/2019	T7280402.41#	MYOSEP	MYSP	Myotis species approach-phase calls
4b	7/28/2019	T7282305.54#	MYOSEP	MYSE	none
4b	7/28/2019	T7290002.25#	MYOSEP	MYLU	MYLU approach-phase calls; low slope; curvilinear
4b	7/28/2019	T7290025.04#	MYOSEP	MYSP	unknown Myotis species; slope low for MYSE
4b	7/28/2019	T7290122.25#	NoID	MYSP	unknown Myotis species; slope low for MYSE
4b	7/28/2019	T7290131.09#	MYOSEP	HF	call fragments; cannot ID to species; bandwidth, Fmax, slope all too low for MYSE
4b	7/28/2019	T7290131.25#	MYOSEP	HF	call fragments; cannot ID to species; bandwidth, Fmax, slope all too low for MYSE
4b	7/28/2019	T7290132.29#	MYOSEP	HF	3 pulses; cannot ID to species
4b	7/28/2019	T7290142.50#	MYOSEP	MYLU	MYLU approach-phase calls; low slope; curvilinear
4b	7/28/2019	T7290149.56#	MYOSEP	MYLU	FM MYLU calls
4b	7/28/2019	T7290203.06#	MYOSEP	MYLU	FM MYLU calls
4b	7/28/2019	T7290216.38#	MYOSEP	HF	call fragments; cannot ID to species; bandwidth, Fmax, slope all too low for MYSE
4b	7/28/2019	T7290239.50#	MYOSEP	HF	3 pulses; cannot ID to species
4b	7/28/2019	T7290245.13#	MYOSEP	MYSP	low bandwidth and Fmax
4b	7/28/2019	T7290309.06#	NoID	MYSE	two bats (+ LACI)
4b	7/28/2019	T7290404.46#	MYOSEP	MYSE	none
4b	7/28/2019	T7290506.25#	MYOSEP	MYLU	low slope, slightly curvilinear
4b	7/29/2019	T7292357.48#	MYOSEP	HF	call fragments; cannot ID to species; bandwidth, Fmax, slope all too low for MYSE
4b	7/29/2019	T7300029.14#	MYOSEP	MYSP	unknown Myotis species; slope low for MYSE
4b	7/30/2019	T7310539.36#	MYOSEP	MYSE	none
5a	7/27/2019	T7280245.17#	MYOSEP	HF	only 2 pulses; cannot ID to species; bandwidth and Fmax too low for MYSE
5a	7/28/2019	T7282300.11#	MYOSEP	MYSP	slope too low
5a	7/28/2019	T7290230.01#	MYOSEP	MYSP	low bandwidth and Fmax

5a	7/28/2019	T7290230.25#	MYOSEP	MYSP	low slope, bandwidth, Fmax
5b	7/26/2019	T7262145.21#	MYOSEP	MYLU	low slope, bandwidth, Fmax
5b	7/26/2019	T7262319.15#	MYOSEP	MYLU	little brown approach-phase calls; low slope and Fmax
5b	7/26/2019	T7270153.11#	MYOSEP	MYSP	low slope; approach-phase calls
5b	7/26/2019	T7270155.48#	MYOSEP	HF	fragmentary calls; cannot ID to species; Fmax, Fmin and slope too low for MYSE
5b	7/26/2019	T7270156.18#	MYOSEP	MYLU	little brown approach-phase calls; low slope and Fmax
5b	7/28/2019	T7282205.04#	MYOSEP	HF	low slope, bandwidth, Fmax and Fmin to low for MYSE; EPFU or MYLU
5b	7/28/2019	T7290134.13#	MYOSEP	MYSE	none
5b	7/30/2019	T7302140.00#	MYOSEP	MYSP	approach-phase calls; unknown Myotis species
6a	7/28/2019	T7282239.12#	MYOSEP	HF	fragmentary and poor-quality calls; slope, bandwidth, Fmin and Fmax too low
6a	7/28/2019	T7282317.29#	MYOSEP	MYSP	unknown Myotis species; slope low for MYSE
6a	7/28/2019	T7290547.43#	MYOSEP	MYSP	unknown Myotis species; slope low for MYSE
6a	7/29/2019	T7292243.13#	MYOSEP	EPFU	low slope and Fmin
6a	7/29/2019	T7292246.16#	MYOSEP	EPFU	low slope and Fmin
6a	7/30/2019	T7302326.53#	MYOSEP	HF	fragmentary calls; cannot ID to species; slope, bandwidth, Fmin and Fmax all too low for MYSE
6b	7/27/2019	T7280047.31#	MYOSEP	MYSP	lots of MYLU foraging calls at the site; slope and Fmin too low for MYSE
6b	7/27/2019	T7280101.10#	MYOSEP	MYSP	lots of MYLU foraging calls at the site; bandwidth and Fmax too low for MYSE
6b (redeploy)	8/13/2019	T8132341.57#	MYOSEP	MYLU	MYLU approach-phase calls; low slope; curvilinear
6b (redeploy)	8/15/2019	T8160117.52#	MYOSEP	MYLU	low slope, bandwidth, and Fmax
6b (redeploy)	8/16/2019	T8170204.22#	MYOSEP	MYLU	MYLU approach-phase calls; low slope; curvilinear
6b (redeploy)	8/16/2019	T8170234.29#	MYOSEP	HF	fragmentary calls; cannot ID to species; bandwidth, Fmax, and slope too low for MYSE
7a	7/27/2019	T7272321.05#	MYOSEP	HF	low slope, bandwidth, Fmax
7a	7/27/2019	T7280458.00#	MYOSEP	HF	approach-phase calls; low slope; MYLU with low Fmin or EPFU with high Fmin
7a	7/27/2019	T7280458.54#	MYOSEP	HF	fragmentary and poor-quality calls; low slope; MYLU with low Fmin or EPFU with high Fmin
7a (redeploy)	7/31/2019	T7312324.34#	MYOSEP	MYSP	unknown Myotis species; slope low for MYSE
7b	8/1/2019	T8020419.49#	MYOSEP	HF	low slope, bandwidth and Fmax
7b (redeploy)	8/15/2019	T8160156.34#	MYOSEP	MYLU	MYLU approach-phase calls; low slope; curvilinear
8a	7/27/2019	T7272229.19#	MYOSEP	HF	Fmin too low; approach-phase calls
10a	7/28/2019	T7290414.26#	MYOSEP	HF	fragmentary calls; cannot ID to species; bandwidth, Fmax, and slope too low for MYSE
10a	7/29/2019	T7292258.21#	MYOSEP	HF	fragmentary calls; cannot ID to species; bandwidth, Fmax, and slope too low for MYSE

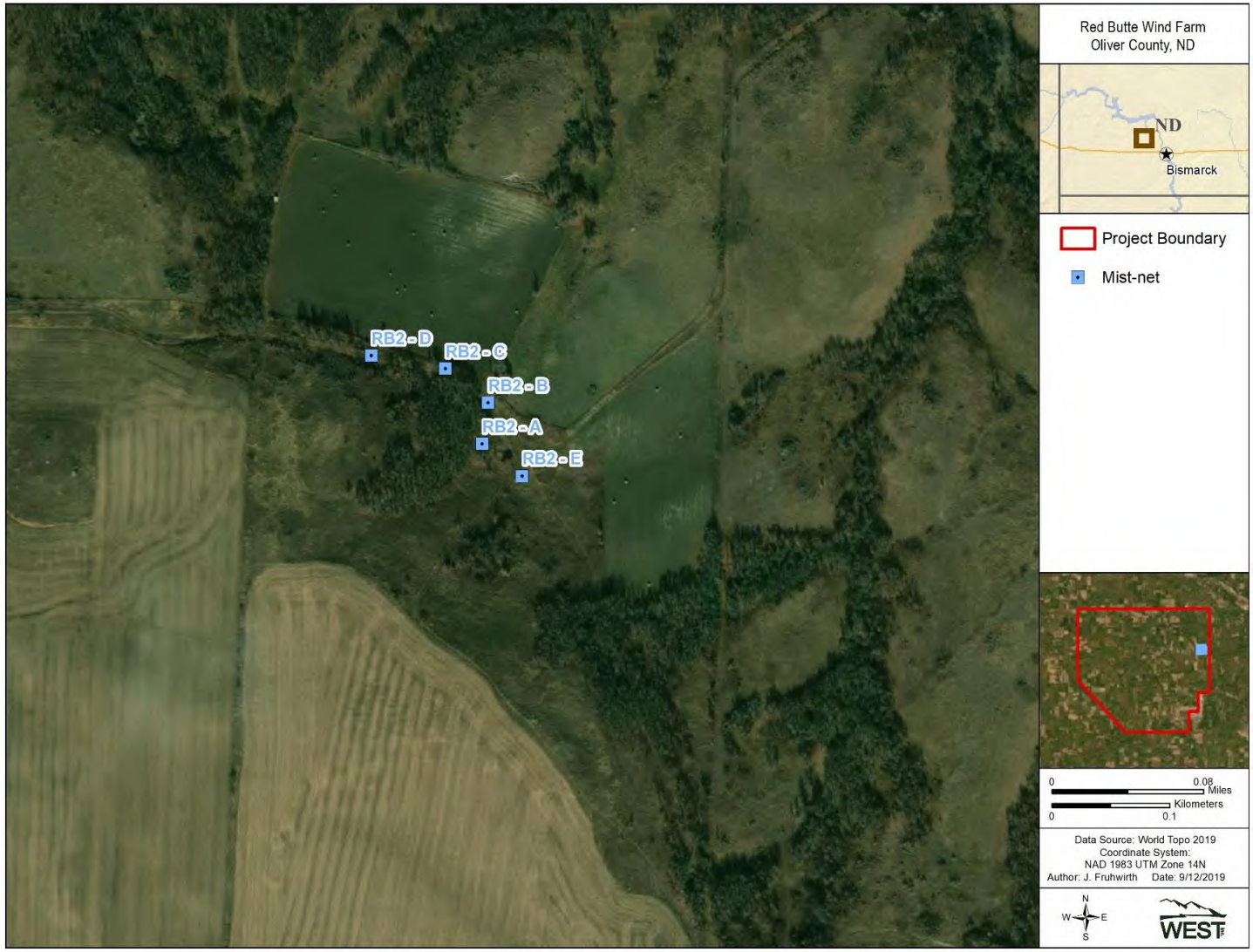
LABO = eastern red bat (*Lasiurus borealis*); MYLU = little brown bat (*Myotis lucifugus*); MYSE = northern long-eared bat (*Myotis septentrionalis*); MYSO = Indiana bat (*Myotis sodalis*); HF Unknown = high frequency unknown; Myotis Sp. = unknown Myotis species; No ID = no identification

Fmin = minimum call frequency; Fmax = maximum call frequency; slope = minimum call slope; bandwidth = call frequency range

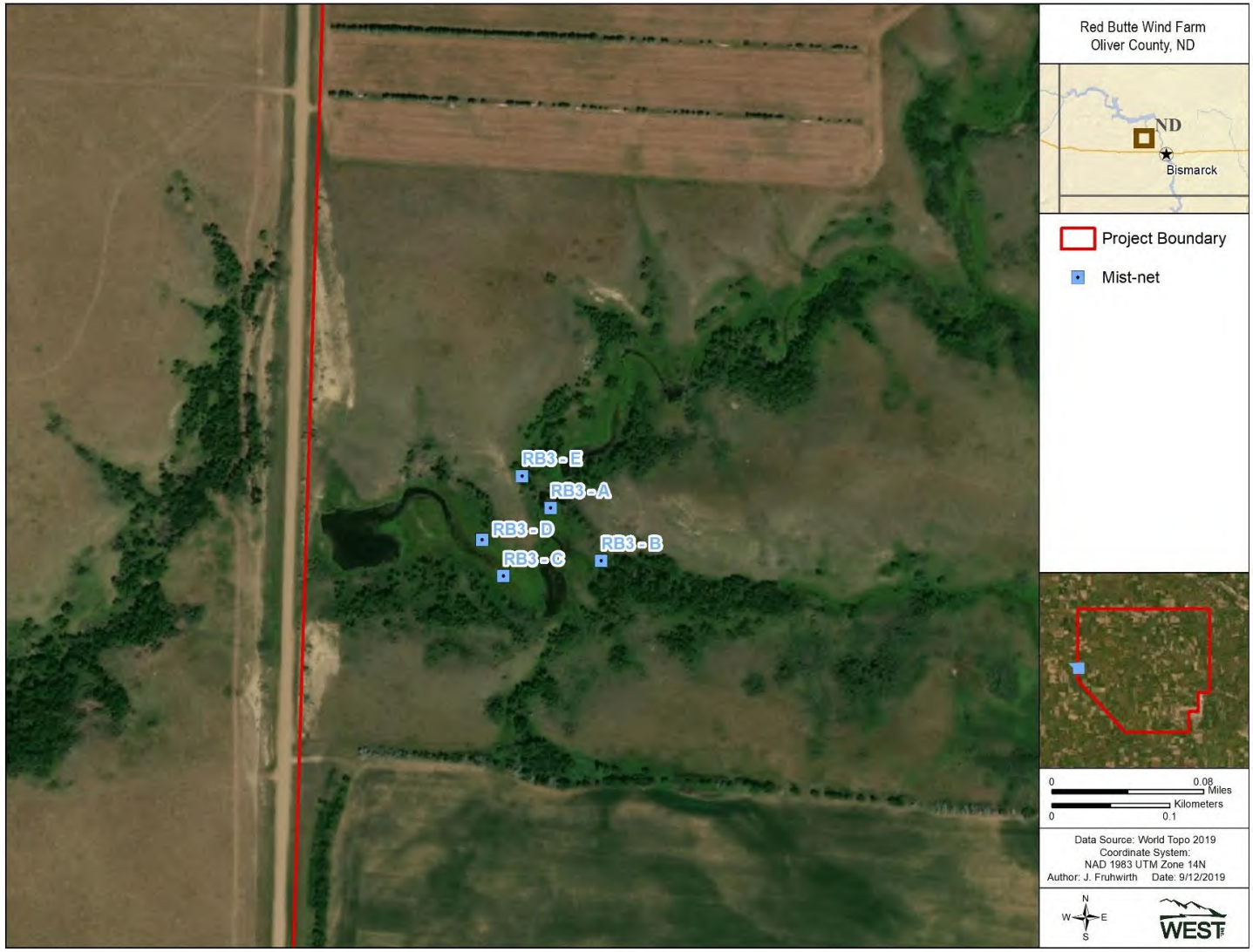
Appendix G. Maps of Mist-Net Survey Sites



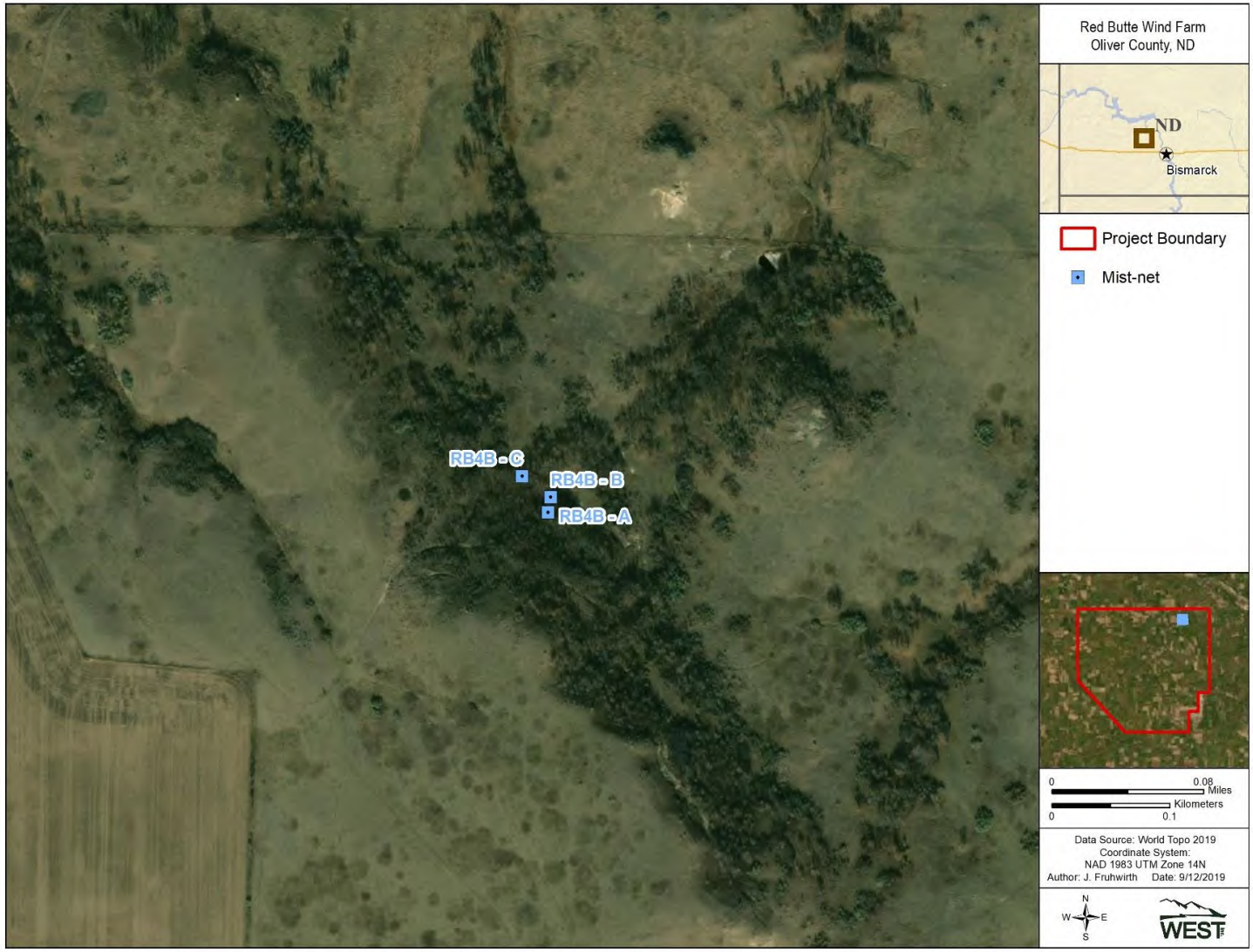
Appendix G1. Map of mist-net site RB-1 at the Red Butte Wind Project.



Appendix G2. Map of mist-net site RB-2 at the Red Butte Wind Project.



Appendix G3. Map of mist-net site RB-3 at the Red Butte Wind Project.

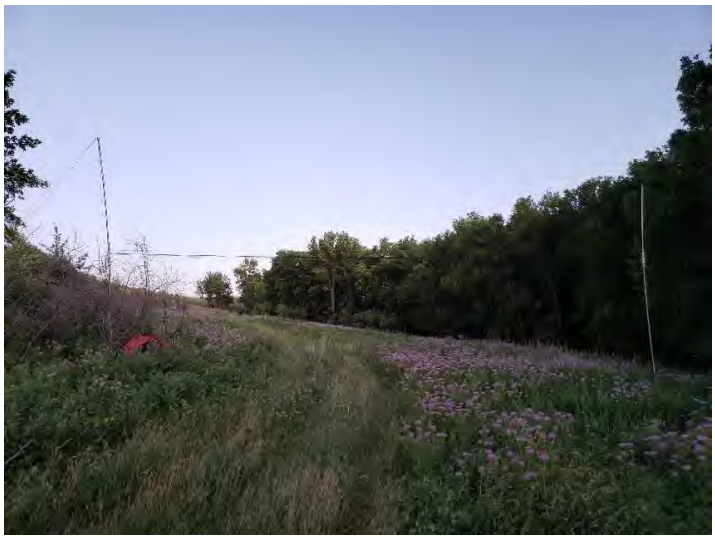


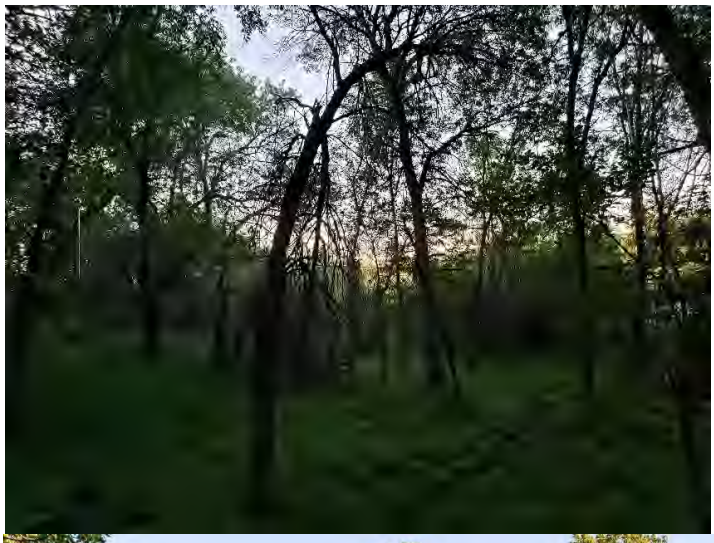
Appendix G4. Map of follow-up mist-net site RB-4b at the Red Butte Wind Project.



Appendix G5. Map of follow-up mist-net site RB-5b at the Red Butte Wind Project.

Appendix H. Photographs of Mist-Net Survey Sites





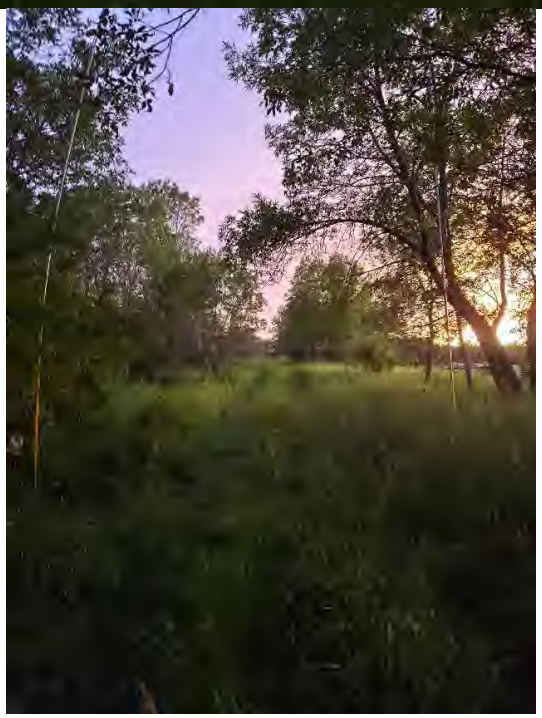


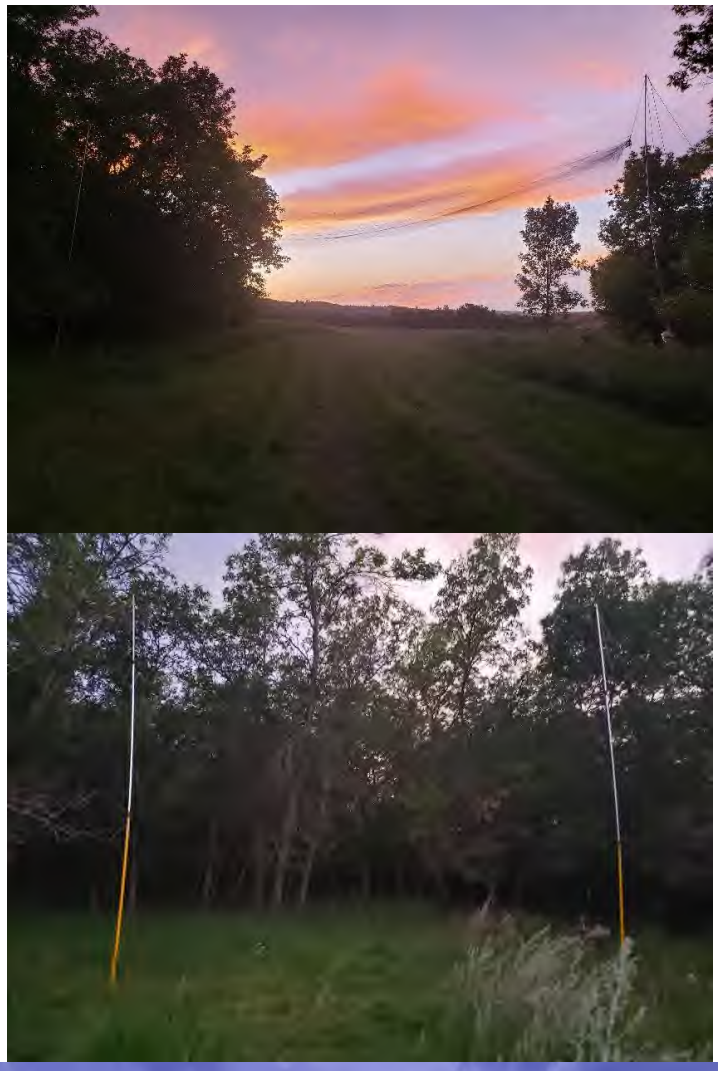




Appendix H1. Mist-net site 1, nets A – E (top to bottom).







Appendix H2. Mist-net site 2, nets A – E (top to bottom).









Appendix H3. Mist-net site 3, nets A – E (top to bottom).



Appendix H4. Mist-net site 4b, nets A – E (top to bottom).



Appendix H5. Mist-net site 5b, nets A – E (top to bottom).

Appendix I. Details of All Bat Captures

Appendix I1. Details of bats captured at Site RB1 (July 28 – 30) at the Red Butte Wind Project.

Site	Survey Night	Time	Species[1]	Sex[2]	Age[3]	Reproductive Status[4]	Reichard Score	Forearm Length (mm)	Weight (g)
1	7/29/2019	22:15	LANO	F	J	N	0	41.3	11
1	7/29/2019	22:18	LANO	F	J	N	0	41.3	11
1	7/29/2019	0:35	LACI	M	J	N	0	50.5	20
1	7/29/2019	0:40	LANO	F	A	N	0	41.2	13.25
1	7/30/2019	23:25	LANO	M	J	N	0	41	10.3
1	7/30/2019	23:25	LANO	M	J	N	0	42.3	12.3
1	7/30/2019	0:15	LANO	M	J	N	0	41.9	11.8
1	7/30/2019	0:40	LANO	F	J	N	0	41	12.5
1	7/30/2019	1:00	LANO	F	J	N	0	41.7	12.8
1	7/30/2019	1:00	LANO	M	J	N	0	42.8	12.3
1	7/30/2019	1:30	LANO	F	J	N	0	42.3	11.5
1	7/30/2019	1:30	LANO	M	J	N	0	40.9	11.5
1	7/30/2019	2:45	LACI	M	J	N	0	52.3	20
1	7/30/2019	3:00	LANO	F	J	N	0	41.9	12.5
1	7/30/2019	3:00	LACI	F	J	N	0	23	19.8

[1]LANO = silver-haired bat (*Lasionycteris noctivagans*); LACI = hoary bat (*Lasiurus cinereus*)
[2]F = female; M = male.
[3]J = juvenile; A = adult.
[4]N = non-reproductive.

Appendix I2. Details of bats captured at Site RB2 (July 31 – August 1) at the Red Butte Wind Project.

Site	Survey Night	Time	Species[1]	Sex[2]	Age[3]	Reproductive Status[4]	Reichard Score	Forearm Length (mm)	Weight (g)
2	7/31/2019	0:30	LANO	F	J	N	0	43.3	11.5
2	8/1/2019	0:54	LANO	M	J	N	0	40.1	12.2
2	8/1/2019	1:00	LABO	U	U	U	U	U	U

[1]LANO = silver-haired bat (*Lasionycteris noctivagans*); LABO = red bat (*Lasiurus borealis*).
[2]F = female; M = male; U = unknown (bat escaped net).
[3]J = juvenile; U = unknown (bat escaped net).
[4]N = non-reproductive; U = unknown (bat escaped net).

Appendix I3. Details of bats captured at Site RB3 (August 2 – 3) at the Red Butte Wind Project.

Site	Survey Night	Time	Species[1]	Sex[2]	Age[3]	Reproductive Status[4]	Reichard Score	Forearm Length (mm)	Weight (g)
3	8/2/2019	23:40	LABO	F	J	N	0	39.3	10.8
3	8/2/2019	2:00	LABO	F	J	N	0	41.3	12.1

[1]LABO = red bat (*Lasiurus borealis*).
[2]F = female.
[3]J = juvenile.
[4]N = non-reproductive.

Appendix I4. Details of bats captured at follow-up mist-net Site 4b (August 14 – 15) at the Red Butte Wind Project.

Site	Survey Night	Time	Species[1]	Sex[2]	Age[3]	Reproductive Status[4]	Reichard Score	Forearm Length (mm)	Weight (g)
4b	8/14/2019	21:44	MYSE	M	A	N	0	35.5	6
4b	8/15/2019	0:21	LANO	M	J	N	0	39.4	10
4b	8/15/2019	1:20	MYSE	M	J	N	0	34.8	6.25
4b	8/15/2019	1:56	LABO	F	J	N	0	38.8	14

[1]MYSE = northern long-eared bat (*Myotis septentrionalis*); LANO = silver-haired bat (*Lasionycteris noctivagans*); LABO (*Lasiurus borealis*) = red bat.
[2]M = male; F= female.
[3]A = adult; J = juvenile.
[4]N = non-reproductive.

Appendix I5. Details of bats captured at follow-up mist-net Site 5b (August 13 – 14) at the Red Butte Wind Project

Site	Survey Night	Time	Species[1]	Sex[2]	Age[3]	Reproductive Status[4]	Reichard Score	Forearm Length (mm)	Weight (g)
5b	8/13/2019	22:30	MYSE	M	J	N	0	36.2	6.5
5b	8/13/2019	22:30	MYSE	M	A	N	0	37	6.75
5b	8/13/2019	23:20	MYLU	F	A	PL	0	39.2	11.5
5b	8/14/2019	2:27	MYLU	M	A	N	0	39.2	11.25

[1]MYSE = northern long-eared bat (*Myotis septentrionalis*); MYLU = little brown bat (*Myotis lucifugus*).
[2]M = male; F= female.
[3]A = adult; J = juvenile.
[4]N = non-reproductive; PL = post-lactating.

Appendix J. Representative Photographs of Bat Species Captured during Mist-Net Surveys









Appendix J1. Representative photos of bat species captured at the Red Butte Wind Project. From top: LANO, LABO, LACI, MYLU, and MYSE.

Appendix K. Mist-Net Site Description Datasheets

Site Description and Weather Data Form

Location Information

Site ID:	Project:	State:
RB1	Red Butte	North Dakota
	Datum: NAD 83	County: Oliver

Net Locations – Take pictures of each net set and distinguishing characteristics

Net ID (A,B,...)	Net Size (e.g. 3x9)	UTM Zone	Easting	Northing	Net Nights Used (1,2,...)	Canopy Cover (%)
A	3 x 18	14	320949	5232216	1, 2	0
B	2 x 12	14	320923	5232229	1, 2	90
C	3 x 4	14	320917	5232290	2	25
D	2 x 9	14	320940	5232295	1, 2	10
E	3 x 6	14	320962	5232311	1, 2	0

Site Sketch

Should be drawn in a top-down view using map to assist with accuracy. Include all streams, roads, trails, and structures. Note all net locations using Net ID.



Net Night	Date (yyyy-mm-dd)	Biologists Present	Total Nets Open (#)	Sunset Time (24 Hour)	Moonrise Time	Moonset Time	[1] Moon Phase	Start Time	Start Temp (°F)	Start Wind Speed (mph)	Start Sky Code	Stop Time	Stop Temp	Stop Wind Speed	Stop Sky Code	Precip. During Survey (Yes/No)	Precip. Duration (min)	Night Complete (Yes/No)
1	2019-07-28	Brenna Hyzy, Pallavi Sirajuddin	5	2127	0309	0502	C	2125	70	16	0	2200	70	16	0	No	0	No
2	2019-07-29	Brenna Hyzy, Pallavi Sirajuddin	4	2128	0401	0604	N	2130	61	3	0	0230	53	3	0	No	0	Yes
3	2019-07-30	Brenna Hyzy, Pallavi Sirajuddin	5	2124	0459	0705	N	2120	78	15	2	0220	63	7	2	No	0	Yes
4																		
5																		

Habitat Information

[2] Primary Habitat Surveyed:	Dominant Canopy Species:	Estimated Canopy Tree Age (DBH):	Additional Comments:
Upland Forest	Acer negundo	Late-successional (25-38 cm)	Winded out 7/28
Forest Type: Deciduous	**Preferred Roost Trees Present:**		

[1] *New (N), Crescent (C), Half (H), Gibbous (G), Full (F)* [2] *Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Briefly Describe)*

Site Description and Weather Data Form

Location Information

Site ID:	Project:	State:
RB2	Red Butte	North Dakota
	Datum: NAD 83	County: Oliver

Net Locations – Take pictures of each net set and distinguishing characteristics

Net ID (A,B,...)	Net Size (e.g. 3x9)	UTM Zone	Easting	Northing	Net Nights Used (1,2,...)	Canopy Cover (%)
A	3 x 6	14	323129	5227701	1, 2	15
B	3 x 12	14	323134	5227736	1, 2	0
C	3 x 4	14	323098	5227765	1, 2	20
D	3 x 9	14	323035	5227776	1, 2	15
E	3 x 18	14	323163	5227674	2	0

Site Sketch Should be drawn in a top-down view using map to assist with accuracy. Include all streams, roads, trails, and structures. Note all net locations using Net ID.



Net Night	Date (yyyy-mm-dd)	Biologists Present	Total Nets Open (#)	Sunset Time (24 Hour)	Moonrise Time	Moonset Time	[1] Moon Phase	Start Time	Start Temp (°F)	Start Wind Speed (mph)	Start Sky Code	Stop Time	Stop Temp	Stop Wind Speed	Stop Sky Code	Precip. During Survey (Yes/No)	Precip. Duration (min)	Night Complete (Yes/No)
1	2019-07-31	Brenna Hyzy, Pallavi Sirajuddin	4	2119	0603	0802	C	2119	79	0	1	0220	68	0	0	No	0	Yes
2	2019-08-01	Brenna Hyzy, Pallavi Sirajuddin	5	2119	0648	2001	C	2119	70	6	1	0220	63	4	0	No	0	Yes
3																		
4																		
5																		

Habitat Information

[2] Primary Habitat Surveyed:	Dominant Canopy Species:	Estimated Canopy Tree Age (DBH):	Additional Comments:
Upland Forest	Unknown	Mid-successional (13-24 cm)	
Forest Type: Deciduous	**Preferred Roost Trees Present:**		

[1] New (N), Crescent (C), Half (H), Gibbous (G), Full (F) [2] Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Briefly Describe)

Site Description and Weather Data Form

Location Information

Site ID:	Project:	State:
RB3	Red Butte	North Dakota
	Datum: NAD 83	County: Oliver

Net Locations – Take pictures of each net set and distinguishing characteristics

Net ID (A,B,...)	Net Size (e.g. 3x9)	UTM Zone	Easting	Northing	Net Nights Used (1,2,...)	Canopy Cover (%)
A	3 x 18	14	0301833	5225070	1, 2	0
B	3 x 4	14	0301876	5225025	1, 2	20
C	2 x 9	14	0301793	5225012	1, 2	0
D	2 x 12	14	0301775	5225043	1, 2	0
E	2 x 2.6	14	0301809	5225097	2	20

Site Sketch Should be drawn in a top-down view using map to assist with accuracy. Include all streams, roads, trails, and structures. Note all net locations using Net ID.



Net Night	Date (yyyy-mm-dd)	Biologists Present	Total Nets Open (#)	Sunset Time (24 Hour)	Moonrise Time	Moonset Time	[1] Moon Phase	Start Time	Start Temp (°F)	Start Wind Speed (mph)	Start Sky Code	Stop Time	Stop Temp	Stop Wind Speed	Stop Sky Code	Precip. During Survey (Yes/No)	Precip. Duration (min)	Night Complete (Yes/No)
1	2019-08-02	Brenna Hyzy, Pallavi Sirajuddin	4	2115	808	2237	C	2115	80	2	0	0215	75	0	0	No	0	Yes
2	2019-08-03	Brenna Hyzy, Pallavi Sirajuddin	5	2115	929	2307	C	2115	77	14	1	0215	69	8	0	No	0	Yes
3																		
4																		
5																		

Habitat Information

[2] Primary Habitat Surveyed:	Dominant Canopy Species:	Estimated Canopy Tree Age (DBH):	Additional Comments:
Bottomland Forest	Unknown	Mid-successional (13-24 cm)	
Forest Type: Deciduous	**Preferred Roost Trees Present:**		

[1] *New (N), Crescent (C), Half (H), Gibbous (G), Full (F)* [2] *Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Briefly Describe)*

Site Description and Weather Data Form

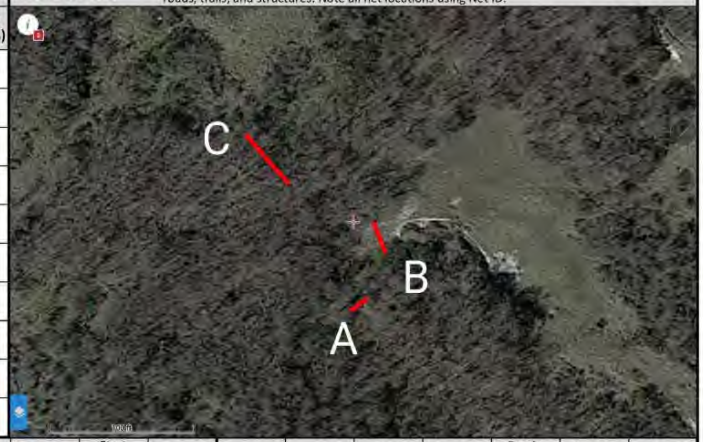
Location Information

Site ID:	Project:	State:
RB-4b	Red Butte	North Dakota
	Datum: NAD 83	County: Oliver

Net Locations – Take pictures of each net set and distinguishing characteristics

Net ID (A,B,...)	Net Size (e.g. 3x9)	UTM Zone	Easting	Northing	Net Nights Used (1,2,...)	Canopy Cover (%)
A	2 x 4	14	320093	5232912	1, 2	90
B	3 x 6	14	320095	5232925	1, 2	80
C	2 x 12	14	320071	5232943	1, 2	95

Site Sketch Should be drawn in a top-down view using map to assist with accuracy. Include all streams, roads, trails, and structures. Note all net locations using Net ID.



Net Night	Date (yyyy-mm-dd)	Biologists Present	Total Nets Open (#)	Sunset Time (24 Hour)	Moonrise Time	Moonset Time	[1] Moon Phase	Start Time	Start Temp (°F)	Start Wind Speed (mph)	Start Sky Code	Stop Time	Stop Temp	Stop Wind Speed	Stop Sky Code	Precip. During Survey (Yes/No)	Precip. Duration (min)	Night Complete (Yes/No)
1	2019-08-14	Julia Wilson, Kelly Lutsch	3	2057	2057	0553	F	2057	63.4	0.0	2	0230	59.2	0.9	1	Yes	55	Yes
2	2019-08-15	Julia Wilson, Kelly Lutsch	3	2056	2127	0633	F	2056	67.8	0.0	0	0156	54.0	0.0	0	No		Yes
3																		
4																		
5																		

Habitat Information

[2] Primary Habitat Surveyed:	Dominant Canopy Species:	Estimated Canopy Tree Age (DBH):	Additional Comments:
Upland Forest	Fraxinus pennsylvanica Ulmus americana	Mid-successional (13-24 cm)	Habitat around acoustic site sampled. Nets placed in forest corridors opening to field and shrub area.
Forest Type: Mixed	**Preferred Roost Trees Present:** Fraxinus pennsylvanica (snag) Unknown snag(s) with exfol. bark		

[1] New (N), Crescent (C), Half (H), Gibbous (G), Full (F) *[2] Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Briefly Describe)*

Site Description and Weather Data Form

Location Information

Site ID:	Project:	State:
RB-5b	Red Butte	North Dakota
	Datum: NAD 83	County: Oliver

Net Locations – Take pictures of each net set and distinguishing characteristics

Net ID (A,B,...)	Net Size (e.g. 3x9)	UTM Zone	Easting	Northing	Net Nights Used (1,2,...)	Canopy Cover (%)
A	3 x 12	14	0322775	5229511	1	33
B	3 x 6	14	0322609	5229472	1	50
C	2 x 6	14	0322670	5229409	1	75

Site Sketch Should be drawn in a top-down view using map to assist with accuracy. Include all streams, roads, trails, and structures. Note all net locations using Net ID.



Net Night	Date (yyyy-mm-dd)	Biologists Present	Total Nets Open (#)	Sunset Time (24 Hour)	Moonrise Time	Moonset Time	[1] Moon Phase	Start Time	Start Temp (°F)	Start Wind Speed (mph)	Start Sky Code	Stop Time	Stop Temp	Stop Wind Speed	Stop Sky Code	Precip. During Survey (Yes/No)	Precip. Duration (min)	Night Complete (Yes/No)
1	2019-08-13	Kristina Hammond, Kelly Lutsch	3	2059	2023	0434	G	2105	61	0	1	0205	55	1	0	No	0	Yes
2	2019-08-14	Kristina Hammond	3	2058	2053	0544	F	2055	65	2	2	0225	59	7	1	Yes	80	No
3																		
4																		
5																		

Habitat Information

[2] Primary Habitat Surveyed:	Dominant Canopy Species:	Estimated Canopy Tree Age (DBH):	Additional Comments:
Field Edge	Populus deltoides Fraxinus pennsylvanica	Mid-successional (13-24 cm)	Nets placed around acoustic detector site covering forested corridor habitat, and field/forest edge habitat. 8/14 closed nets from 2255 to 0015 due to weather
Forest Type: Mixed	**Preferred Roost Trees Present:**		

[1] *New (N), Crescent (C), Half (H), Gibbous (G), Full (F)* [2] *Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Briefly Describe)*

Appendix L. Daily Weather Log for Acoustic Detector Nights

STATION:	KNDNEWSA2	Sunset Time:	21:26	Survey Start:	21:26	Determination:	*Valid*
SITES:	5, 8, 10	Sunrise Time:	6:18	End Time:	2:26	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/26/2019	9:23 PM	69.4F	53.6F	0.57	NNW	2.0mph	3.0mph	29.9in	0.0in	0.0in
7/26/2019	9:29 PM	69.1F	53.6F	0.58	NNW	2.9mph	3.0mph	29.9in	0.0in	0.0in
7/26/2019	9:34 PM	68.5F	53.2F	0.58	NW	5.0mph	5.0mph	29.9in	0.0in	0.0in
7/26/2019	9:39 PM	68.2F	53.2F	0.59	NNW	4.9mph	6.0mph	29.9in	0.0in	0.0in
7/26/2019	9:44 PM	68.2F	53.2F	0.59	NNW	4.9mph	6.0mph	29.9in	0.0in	0.0in
7/26/2019	9:49 PM	68.0F	52.7F	0.58	NNW	4.0mph	6.0mph	29.9in	0.0in	0.0in
7/26/2019	9:55 PM	68.2F	52.9F	0.58	NW	4.0mph	7.0mph	29.9in	0.0in	0.0in
7/26/2019	10:00 PM	68.5F	52.7F	0.57	NNW	4.0mph	5.0mph	29.9in	0.0in	0.0in
7/26/2019	10:05 PM	68.5F	52.7F	0.57	NW	4.0mph	4.0mph	29.9in	0.0in	0.0in
7/26/2019	10:10 PM	68.2F	52.9F	0.58	NNW	0.9mph	2.0mph	29.9in	0.0in	0.0in
7/26/2019	10:15 PM	67.1F	52.7F	0.6	NNW	0.0mph	1.0mph	29.9in	0.0in	0.0in
7/26/2019	10:20 PM	65.7F	52.7F	0.63	NNW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	10:26 PM	63.9F	53.1F	0.68	NNW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	10:31 PM	62.1F	52.9F	0.72	NNW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	10:36 PM	60.3F	52.3F	0.75	NNW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	10:41 PM	59.2F	51.6F	0.76	NW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	10:46 PM	59.2F	51.6F	0.76	NW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	10:51 PM	58.3F	51.4F	0.78	NW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	10:57 PM	57.6F	51.1F	0.79	NNW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	11:02 PM	57.4F	51.3F	0.8	NW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	11:07 PM	57.4F	51.3F	0.8	NNW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	11:12 PM	57.4F	51.3F	0.8	NW	0.0mph	1.0mph	29.9in	0.0in	0.0in
7/26/2019	11:17 PM	57.4F	51.3F	0.8	NW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	11:22 PM	57.0F	50.9F	0.8	NW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	11:28 PM	56.7F	50.5F	0.8	NNW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	11:33 PM	56.5F	50.7F	0.81	NW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	11:38 PM	56.5F	51.1F	0.82	NW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	11:43 PM	57.0F	51.3F	0.81	SE	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	11:48 PM	57.9F	51.8F	0.8	SE	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	11:53 PM	58.5F	51.6F	0.78	SE	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/26/2019	11:59 PM	57.4F	50.9F	0.79	SE	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/27/2019	12:04 AM	55.9F	49.8F	0.8	SE	0.0mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	12:09 AM	55.0F	50.0F	0.83	SE	0.0mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	12:14 AM	55.6F	50.9F	0.84	SE	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/27/2019	12:20 AM	55.8F	50.4F	0.82	SE	0.0mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	12:25 AM	55.4F	50.0F	0.82	SE	0.0mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	12:30 AM	55.2F	50.2F	0.83	SE	0.0mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	12:35 AM	54.9F	50.2F	0.84	SE	0.0mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	12:40 AM	54.9F	50.2F	0.84	SE	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/27/2019	12:45 AM	54.7F	50.0F	0.84	SE	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/27/2019	12:51 AM	54.3F	49.8F	0.85	SE	0.0mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	12:56 AM	54.7F	50.2F	0.85	SE	0.0mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	1:01 AM	55.0F	50.4F	0.84	SE	0.0mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	1:06 AM	55.6F	50.2F	0.82	SE	0.0mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	1:11 AM	54.9F	50.2F	0.84	SE	0.9mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	1:17 AM	54.3F	49.6F	0.84	SE	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/27/2019	1:22 AM	53.2F	49.1F	0.86	SE	0.0mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	1:27 AM	53.2F	49.1F	0.86	SSW	0.9mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	1:32 AM	53.4F	49.3F	0.86	SSW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/27/2019	1:37 AM	54.0F	49.8F	0.86	SSW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	1:43 AM	54.7F	50.5F	0.86	SSW	0.0mph	0.0mph	29.9in	0.0in	0.0in
7/27/2019	1:48 AM	55.6F	50.5F	0.83	SW	0.9mph	1.0mph	29.9in	0.0in	0.0in
7/27/2019	1:53 AM	55.8F	50.7F	0.83	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	1:58 AM	55.9F	50.9F	0.83	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	2:03 AM	55.2F	50.2F	0.83	SW	0.0mph	3.0mph	30.0in	0.0in	0.0in
7/27/2019	2:08 AM	54.3F	49.8F	0.85	NNW	2.9mph	3.0mph	30.0in	0.0in	0.0in
7/27/2019	2:13 AM	54.9F	50.7F	0.86	West	0.9mph	1.0mph	30.0in	0.0in	0.0in

7/27/2019	2:19 AM	55.9F	51.4F	0.85	SW	0.9mph	2.0mph	30.0in	0.0in	0.0in
7/27/2019	2:24 AM	55.9F	51.4F	0.85	West	0.9mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	2:29 AM	56.1F	51.4F	0.84	WSW	0.0mph	2.0mph	30.0in	0.0in	0.0in
7/27/2019	2:34 AM	55.8F	51.1F	0.84	SSW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	2:39 AM	55.6F	50.9F	0.84	SW	0.9mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	2:44 AM	55.2F	50.5F	0.84	SW	0.0mph	2.0mph	30.0in	0.0in	0.0in
7/27/2019	2:49 AM	55.6F	50.9F	0.84	SW	0.0mph	2.0mph	30.0in	0.0in	0.0in
7/27/2019	2:54 AM	55.9F	50.9F	0.83	WSW	0.9mph	2.0mph	30.0in	0.0in	0.0in
7/27/2019	3:00 AM	55.4F	50.0F	0.82	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	3:05 AM	54.7F	50.0F	0.84	SW	0.9mph	2.0mph	30.0in	0.0in	0.0in
7/27/2019	3:10 AM	54.7F	50.0F	0.84	WSW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	3:15 AM	53.8F	49.1F	0.84	WSW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	3:20 AM	54.1F	49.5F	0.84	WSW	0.9mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	3:25 AM	54.0F	49.3F	0.84	WSW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	3:30 AM	53.2F	48.9F	0.85	WSW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	3:35 AM	52.9F	48.7F	0.86	WSW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	3:41 AM	52.5F	48.7F	0.87	WSW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	3:46 AM	52.5F	49.1F	0.88	WSW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	3:51 AM	52.5F	49.1F	0.88	WSW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	3:56 AM	52.5F	49.1F	0.88	WSW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	4:01 AM	52.7F	49.3F	0.88	WSW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	4:06 AM	52.3F	48.6F	0.87	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	4:11 AM	52.0F	48.6F	0.88	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	4:17 AM	51.6F	48.6F	0.89	WSW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	4:22 AM	52.0F	49.1F	0.9	West	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	4:27 AM	52.0F	48.9F	0.89	SW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	4:32 AM	51.6F	48.6F	0.89	SW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	4:37 AM	51.4F	48.6F	0.9	SW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	4:42 AM	51.4F	48.9F	0.91	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	4:47 AM	51.6F	49.1F	0.91	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	4:52 AM	51.6F	48.7F	0.9	SSW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	4:57 AM	51.8F	48.9F	0.9	SW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	5:02 AM	52.0F	49.1F	0.9	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	5:08 AM	52.0F	49.1F	0.9	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	5:13 AM	51.8F	48.9F	0.9	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	5:18 AM	51.8F	48.9F	0.9	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	5:23 AM	52.0F	48.9F	0.89	WSW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	5:28 AM	51.6F	48.7F	0.9	WSW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	5:33 AM	51.3F	48.2F	0.89	WSW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	5:38 AM	50.7F	48.2F	0.91	WSW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	5:43 AM	51.1F	48.6F	0.91	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	5:48 AM	51.1F	48.6F	0.91	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	5:53 AM	51.1F	48.6F	0.91	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	5:58 AM	51.1F	48.6F	0.91	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	6:03 AM	51.1F	48.6F	0.91	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	6:08 AM	51.1F	48.6F	0.91	SW	0.0mph	0.0mph	30.0in	0.0in	0.0in
7/27/2019	6:14 AM	51.1F	48.9F	0.92	SW	0.0mph	1.0mph	30.0in	0.0in	0.0in
7/27/2019	6:19 AM	51.6F	49.1F	0.91	SW	0.0mph	0.0mph	30.0in	0.0in	0.0in

STATION:	KNDNEWSA2	Sunset Time:	21:24	Survey Start:	21:24	Determination:	*Not valid*
SITES:	4 - 10	Sunrise Time:	6:19	End Time:	2:24	Reason:	Sustained winds over 9 mph for 40 mins, then gusty for several more hours

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/27/19	9:26 PM	74.5F	61.9F	65.00%	SW	4.0mph	5.0mph	29.8in	0.0in	0.0in
7/27/19	9:31 PM	74.5F	61.9F	65.00%	South	4.9mph	7.0mph	29.8in	0.0in	0.0in
7/27/19	9:36 PM	74.5F	61.5F	64.00%	SSE	4.0mph	7.0mph	29.8in	0.0in	0.0in
7/27/19	9:41 PM	74.5F	61.5F	64.00%	South	4.9mph	6.0mph	29.8in	0.0in	0.0in
7/27/19	9:46 PM	74.5F	61.5F	64.00%	South	4.9mph	6.0mph	29.8in	0.0in	0.0in
7/27/19	9:51 PM	74.1F	62.1F	66.00%	SSE	2.9mph	6.0mph	29.8in	0.0in	0.0in
7/27/19	9:57 PM	73.6F	62.4F	68.00%	South	2.9mph	4.0mph	29.8in	0.0in	0.0in
7/27/19	10:02 PM	73.0F	61.9F	68.00%	South	4.0mph	6.0mph	29.8in	0.0in	0.0in
7/27/19	10:07 PM	73.0F	61.9F	68.00%	South	2.9mph	5.0mph	29.8in	0.0in	0.0in
7/27/19	10:12 PM	73.0F	62.2F	69.00%	SSE	2.9mph	5.0mph	29.8in	0.0in	0.0in
7/27/19	10:17 PM	72.5F	62.2F	70.00%	South	4.0mph	6.0mph	29.8in	0.0in	0.0in
7/27/19	10:23 PM	72.1F	62.2F	71.00%	SSW	2.9mph	4.0mph	29.8in	0.0in	0.0in
7/27/19	10:28 PM	72.1F	61.9F	70.00%	SSW	2.0mph	5.0mph	29.8in	0.0in	0.0in
7/27/19	10:33 PM	72.5F	61.7F	69.00%	SSW	2.0mph	5.0mph	29.8in	0.0in	0.0in
7/27/19	10:38 PM	72.7F	61.5F	68.00%	SSW	2.9mph	5.0mph	29.8in	0.0in	0.0in
7/27/19	10:43 PM	72.3F	61.5F	69.00%	South	0.9mph	2.0mph	29.8in	0.0in	0.0in
7/27/19	10:48 PM	72.0F	61.7F	70.00%	SSE	0.9mph	2.0mph	29.8in	0.0in	0.0in
7/27/19	10:53 PM	71.6F	61.7F	71.00%	SSE	2.9mph	3.0mph	29.8in	0.0in	0.0in
7/27/19	10:59 PM	71.4F	61.2F	70.00%	SSW	2.9mph	4.0mph	29.8in	0.0in	0.0in
7/27/19	11:04 PM	72.0F	61.2F	69.00%	SW	4.0mph	9.0mph	29.8in	0.0in	0.0in
7/27/19	11:09 PM	72.1F	61.3F	69.00%	SW	4.0mph	6.0mph	29.8in	0.0in	0.0in
7/27/19	11:14 PM	72.1F	61.3F	69.00%	SSE	2.0mph	7.0mph	29.8in	0.0in	0.0in
7/27/19	11:19 PM	72.3F	61.2F	68.00%	SSE	4.0mph	5.0mph	29.8in	0.0in	0.0in
7/27/19	11:24 PM	72.5F	61.3F	68.00%	South	2.9mph	6.0mph	29.8in	0.0in	0.0in
7/27/19	11:30 PM	72.5F	61.3F	68.00%	SW	6.0mph	6.0mph	29.8in	0.0in	0.0in
7/27/19	11:35 PM	72.7F	61.5F	68.00%	SSW	2.9mph	6.0mph	29.8in	0.0in	0.0in
7/27/19	11:40 PM	72.7F	61.5F	68.00%	SSE	2.9mph	7.0mph	29.8in	0.0in	0.0in
7/27/19	11:45 PM	72.5F	61.3F	68.00%	SSW	6.0mph	7.0mph	29.8in	0.0in	0.0in
7/27/19	11:50 PM	72.5F	61.3F	68.00%	SSW	4.9mph	6.0mph	29.8in	0.0in	0.0in
7/27/19	11:55 PM	72.5F	61.7F	69.00%	South	4.9mph	7.0mph	29.8in	0.0in	0.0in
7/28/19	12:01 AM	72.3F	61.5F	69.00%	SSW	6.9mph	7.0mph	29.8in	0.0in	0.0in
7/28/19	12:06 AM	72.3F	61.5F	69.00%	SSW	8.1mph	8.0mph	29.8in	0.0in	0.0in
7/28/19	12:11 AM	72.3F	61.5F	69.00%	SSW	2.9mph	6.0mph	29.8in	0.0in	0.0in
7/28/19	12:16 AM	72.1F	61.9F	70.00%	SW	4.0mph	9.0mph	29.8in	0.0in	0.0in
7/28/19	12:21 AM	72.1F	62.2F	71.00%	SSW	4.0mph	8.0mph	29.8in	0.0in	0.0in
7/28/19	12:26 AM	72.0F	62.1F	71.00%	SW	8.1mph	12.0mph	29.8in	0.0in	0.0in
7/28/19	12:32 AM	71.8F	62.2F	72.00%	SSW	8.1mph	10.0mph	29.8in	0.0in	0.0in
7/28/19	12:37 AM	71.8F	62.2F	72.00%	SSW	4.9mph	13.0mph	29.8in	0.0in	0.0in
7/28/19	12:42 AM	71.8F	62.6F	73.00%	SSW	6.9mph	10.0mph	29.8in	0.0in	0.0in
7/28/19	12:47 AM	72.0F	62.8F	73.00%	SSW	6.9mph	11.0mph	29.8in	0.0in	0.0in
7/28/19	12:52 AM	72.3F	62.8F	72.00%	SW	6.9mph	14.0mph	29.8in	0.0in	0.0in
7/28/19	12:57 AM	72.9F	63.3F	72.00%	SW	11.0mph	18.0mph	29.8in	0.0in	0.0in
7/28/19	1:03 AM	72.9F	63.3F	72.00%	SW	15.0mph	18.0mph	29.8in	0.0in	0.0in
7/28/19	1:08 AM	72.3F	63.1F	73.00%	SW	12.1mph	13.0mph	29.8in	0.0in	0.0in
7/28/19	1:13 AM	72.0F	63.7F	75.00%	SSW	17.9mph	26.0mph	29.8in	0.0in	0.0in
7/28/19	1:18 AM	72.0F	63.7F	75.00%	SSW	13.0mph	21.0mph	29.8in	0.0in	0.0in
7/28/19	1:23 AM	71.8F	63.9F	76.00%	SSW	14.1mph	18.0mph	29.8in	0.0in	0.0in
7/28/19	1:28 AM	71.2F	63.7F	77.00%	SSW	13.0mph	19.0mph	29.8in	0.0in	0.0in
7/28/19	1:34 AM	70.9F	63.7F	78.00%	SW	11.0mph	13.0mph	29.8in	0.0in	0.0in
7/28/19	1:39 AM	70.5F	63.7F	79.00%	SW	12.1mph	16.0mph	29.8in	0.0in	0.0in
7/28/19	1:44 AM	70.2F	63.7F	80.00%	SW	4.9mph	15.0mph	29.8in	0.0in	0.0in
7/28/19	1:49 AM	69.6F	63.5F	81.00%	SSW	4.9mph	11.0mph	29.8in	0.0in	0.0in
7/28/19	1:54 AM	69.1F	63.7F	83.00%	SW	8.1mph	15.0mph	29.8in	0.0in	0.0in
7/28/19	2:00 AM	68.5F	63.5F	84.00%	SW	12.1mph	14.0mph	29.7in	0.0in	0.0in
7/28/19	2:05 AM	68.5F	63.1F	83.00%	South	4.9mph	9.0mph	29.7in	0.0in	0.0in

7/28/19	2:10 AM	68.5F	62.4F	81.00%	SW	10.1mph	11.0mph	29.7in	0.0in	0.0in
7/28/19	2:15 AM	68.7F	62.6F	81.00%	South	6.9mph	12.0mph	29.7in	0.0in	0.0in
7/28/19	2:20 AM	68.7F	63.0F	82.00%	SSW	14.1mph	14.0mph	29.7in	0.0in	0.0in
7/28/19	2:25 AM	68.5F	63.5F	84.00%	South	6.9mph	14.0mph	29.7in	0.0in	0.0in
7/28/19	2:31 AM	68.2F	63.9F	86.00%	South	6.9mph	11.0mph	29.8in	0.0in	0.0in
7/28/19	2:36 AM	68.2F	64.2F	87.00%	SSE	8.1mph	12.0mph	29.8in	0.0in	0.0in
7/28/19	2:41 AM	68.0F	64.4F	88.00%	ESE	10.1mph	10.0mph	29.8in	0.0in	0.0in
7/28/19	2:46 AM	68.0F	64.0F	87.00%	South	6.0mph	13.0mph	29.8in	0.0in	0.0in
7/28/19	2:51 AM	68.2F	63.5F	85.00%	South	11.0mph	18.0mph	29.8in	0.0in	0.0in
7/28/19	2:56 AM	68.2F	63.5F	85.00%	South	4.0mph	12.0mph	29.8in	0.0in	0.0in
7/28/19	3:02 AM	67.8F	63.1F	85.00%	SSW	12.1mph	12.0mph	29.7in	0.0in	0.0in
7/28/19	3:07 AM	67.6F	63.0F	85.00%	SSW	6.9mph	11.0mph	29.7in	0.0in	0.0in
7/28/19	3:12 AM	68.2F	62.4F	82.00%	South	8.9mph	12.0mph	29.7in	0.0in	0.0in
7/28/19	3:17 AM	68.5F	62.4F	81.00%	South	12.1mph	12.0mph	29.7in	0.0in	0.0in
7/28/19	3:22 AM	68.4F	62.6F	82.00%	SW	8.1mph	9.0mph	29.7in	0.0in	0.0in
7/28/19	3:28 AM	68.4F	62.6F	82.00%	South	6.0mph	10.0mph	29.7in	0.0in	0.0in
7/28/19	3:33 AM	68.0F	62.6F	83.00%	SW	8.1mph	9.0mph	29.7in	0.0in	0.0in
7/28/19	3:38 AM	67.8F	62.1F	82.00%	South	6.0mph	9.0mph	29.7in	0.0in	0.0in
7/28/19	3:43 AM	67.8F	61.7F	81.00%	SSE	6.0mph	8.0mph	29.7in	0.0in	0.0in
7/28/19	3:48 AM	68.2F	61.3F	79.00%	South	4.0mph	8.0mph	29.7in	0.0in	0.0in
7/28/19	3:53 AM	68.7F	60.4F	75.00%	South	4.9mph	9.0mph	29.7in	0.0in	0.0in
7/28/19	3:59 AM	69.4F	60.4F	73.00%	South	6.0mph	7.0mph	29.7in	0.0in	0.0in
7/28/19	4:04 AM	69.6F	60.3F	72.00%	SSE	2.0mph	5.0mph	29.7in	0.0in	0.0in
7/28/19	4:09 AM	70.0F	60.1F	71.00%	SSE	0.9mph	2.0mph	29.7in	0.0in	0.0in
7/28/19	4:14 AM	69.8F	59.9F	71.00%	West	2.9mph	3.0mph	29.7in	0.0in	0.0in
7/28/19	4:19 AM	69.4F	60.4F	73.00%	SW	2.0mph	2.0mph	29.7in	0.0in	0.0in
7/28/19	4:24 AM	68.7F	60.8F	76.00%	South	2.0mph	3.0mph	29.7in	0.0in	0.0in
7/28/19	4:29 AM	69.1F	60.8F	75.00%	SSE	0.9mph	2.0mph	29.7in	0.0in	0.0in
7/28/19	4:35 AM	68.9F	60.6F	75.00%	SW	0.0mph	0.0mph	29.7in	0.0in	0.0in
7/28/19	4:40 AM	68.4F	61.5F	79.00%	West	10.1mph	11.0mph	29.7in	0.0in	0.0in
7/28/19	4:45 AM	67.6F	62.2F	83.00%	WSW	2.9mph	8.0mph	29.7in	0.0in	0.0in
7/28/19	4:50 AM	67.1F	62.8F	86.00%	WSW	6.0mph	9.0mph	29.7in	0.0in	0.0in
7/28/19	4:55 AM	66.7F	62.8F	87.00%	WSW	6.0mph	7.0mph	29.7in	0.0in	0.0in
7/28/19	5:00 AM	66.6F	62.6F	87.00%	West	4.9mph	5.0mph	29.7in	0.0in	0.0in
7/28/19	5:05 AM	66.4F	62.4F	87.00%	SW	0.0mph	2.0mph	29.7in	0.0in	0.0in
7/28/19	5:11 AM	66.2F	62.2F	87.00%	SSW	0.9mph	1.0mph	29.7in	0.0in	0.0in
7/28/19	5:16 AM	66.4F	62.4F	87.00%	SSE	0.9mph	2.0mph	29.7in	0.0in	0.0in
7/28/19	5:21 AM	66.7F	62.1F	85.00%	SSW	0.0mph	3.0mph	29.7in	0.0in	0.0in
7/28/19	5:26 AM	66.7F	62.1F	85.00%	SSW	0.0mph	0.0mph	29.7in	0.0in	0.0in
7/28/19	5:31 AM	66.4F	62.1F	86.00%	SSW	0.9mph	4.0mph	29.7in	0.0in	0.0in
7/28/19	5:36 AM	66.4F	62.1F	86.00%	SSE	2.9mph	4.0mph	29.7in	0.0in	0.0in
7/28/19	5:41 AM	66.4F	62.1F	86.00%	SSE	2.9mph	6.0mph	29.7in	0.0in	0.0in
7/28/19	5:46 AM	66.2F	62.2F	87.00%	South	2.0mph	5.0mph	29.7in	0.0in	0.0in
7/28/19	5:51 AM	65.8F	62.2F	88.00%	SW	2.0mph	4.0mph	29.7in	0.0in	0.0in
7/28/19	5:57 AM	65.7F	62.2F	89.00%	South	4.0mph	6.0mph	29.7in	0.0in	0.0in
7/28/19	6:02 AM	65.7F	62.2F	89.00%	South	2.9mph	6.0mph	29.7in	0.0in	0.0in
7/28/19	6:07 AM	65.7F	62.6F	90.00%	SSE	4.0mph	7.0mph	29.7in	0.0in	0.0in
7/28/19	6:12 AM	65.7F	62.2F	89.00%	South	2.9mph	5.0mph	29.7in	0.0in	0.0in
7/28/19	6:17 AM	65.7F	62.2F	89.00%	SSE	2.0mph	4.0mph	29.7in	0.0in	0.0in
7/28/19	6:22 AM	65.7F	62.2F	89.00%	SSE	2.9mph	4.0mph	29.7in	0.0in	0.0in

STATION:	KNDNEWSA2	Sunset Time:	21:23	Survey Start:	21:23	Determination:	*Valid*
SITES:	4 - 10	Sunrise Time:	6:20	End Time:	2:23	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/28/19	9:22 PM	70.2F	52.7F	54%	NW	8.9mph	20.0mph	29.83in	0.00in	0.00in
7/28/19	9:27 PM	69.8F	52.9F	55%	NNW	10.1mph	13.0mph	29.83in	0.00in	0.00in
7/28/19	9:33 PM	69.4F	53.1F	56%		10.1mph	18.0mph	29.84in	0.00in	0.00in
7/28/19	9:38 PM	69.3F	52.9F	56%	NNW	8.9mph	12.0mph	29.84in	0.00in	0.00in
7/28/19	9:43 PM	69.1F	53.2F	57%	NW	6.9mph	14.0mph	29.84in	0.00in	0.00in
7/28/19	9:48 PM	68.5F	53.2F	58%	NW	6.0mph	11.0mph	29.84in	0.00in	0.00in
7/28/19	9:53 PM	68.2F	52.9F	58%	NNW	8.9mph	15.0mph	29.84in	0.00in	0.00in
7/28/19	9:59 PM	68.2F	53.2F	59%	NW	8.1mph	12.0mph	29.85in	0.00in	0.00in
7/28/19	10:04 PM	68.0F	53.1F	59%	NNW	8.9mph	9.0mph	29.85in	0.00in	0.00in
7/28/19	10:09 PM	67.5F	53.1F	60%	NNW	4.9mph	8.0mph	29.85in	0.00in	0.00in
7/28/19	10:14 PM	67.3F	53.4F	61%	NNW	8.1mph	9.0mph	29.85in	0.00in	0.00in
7/28/19	10:19 PM	66.7F	53.2F	62%	NNW	6.0mph	9.0mph	29.85in	0.00in	0.00in
7/28/19	10:24 PM	66.4F	53.4F	63%	NNW	4.9mph	10.0mph	29.85in	0.00in	0.00in
7/28/19	10:30 PM	66.2F	53.2F	63%	NNW	6.0mph	8.0mph	29.86in	0.00in	0.00in
7/28/19	10:35 PM	65.8F	53.2F	64%	NNW	2.0mph	10.0mph	29.86in	0.00in	0.00in
7/28/19	10:40 PM	65.5F	53.4F	65%	NNW	2.0mph	5.0mph	29.86in	0.00in	0.00in
7/28/19	10:45 PM	65.1F	53.4F	66%	NNW	2.9mph	6.0mph	29.86in	0.00in	0.00in
7/28/19	10:50 PM	64.8F	53.6F	67%	NW	0.0mph	2.0mph	29.86in	0.00in	0.00in
7/28/19	10:55 PM	64.4F	53.2F	67%	WNW	0.9mph	2.0mph	29.86in	0.00in	0.00in
7/28/19	11:00 PM	64.0F	53.2F	68%	NW	0.0mph	2.0mph	29.86in	0.00in	0.00in
7/28/19	11:06 PM	63.7F	53.2F	69%	WNW	0.9mph	2.0mph	29.86in	0.00in	0.00in
7/28/19	11:11 PM	63.0F	53.1F	70%	WNW	0.9mph	2.0mph	29.87in	0.00in	0.00in
7/28/19	11:16 PM	62.2F	53.1F	72%	WNW	0.9mph	2.0mph	29.87in	0.00in	0.00in
7/28/19	11:21 PM	61.9F	53.1F	73%	WNW	2.0mph	2.0mph	29.87in	0.00in	0.00in
7/28/19	11:26 PM	61.5F	53.2F	74%	WNW	0.0mph	0.0mph	29.87in	0.00in	0.00in
7/28/19	11:31 PM	61.0F	53.1F	75%	WNW	0.0mph	1.0mph	29.87in	0.00in	0.00in
7/28/19	11:37 PM	60.4F	52.9F	76%	NW	0.0mph	1.0mph	29.87in	0.00in	0.00in
7/28/19	11:42 PM	60.1F	52.9F	77%	WNW	0.0mph	0.0mph	29.87in	0.00in	0.00in
7/28/19	11:47 PM	59.7F	52.9F	78%	WNW	0.0mph	0.0mph	29.87in	0.00in	0.00in
7/28/19	11:52 PM	59.4F	52.9F	79%	West	0.9mph	1.0mph	29.87in	0.00in	0.00in
7/28/19	11:57 PM	59.2F	52.7F	79%	West	0.0mph	1.0mph	29.88in	0.00in	0.00in
7/29/19	12:02 AM	59.2F	53.1F	80%	West	0.0mph	1.0mph	29.88in	0.00in	0.00in
7/29/19	12:08 AM	59.0F	52.5F	79%	WNW	0.0mph	2.0mph	29.88in	0.00in	0.00in
7/29/19	12:13 AM	59.0F	52.5F	79%	West	0.0mph	1.0mph	29.88in	0.00in	0.00in
7/29/19	12:18 AM	59.0F	52.2F	78%	WNW	0.0mph	1.0mph	29.88in	0.00in	0.00in
7/29/19	12:23 AM	59.2F	52.0F	77%	West	3.0mph	3.0mph	29.88in	0.00in	0.00in
7/29/19	12:28 AM	59.4F	52.2F	77%	NNW	0.9mph	2.0mph	29.88in	0.00in	0.00in
7/29/19	12:33 AM	59.4F	52.2F	77%	NNW	0.0mph	3.0mph	29.88in	0.00in	0.00in
7/29/19	12:39 AM	59.4F	52.2F	77%	NNW	2.9mph	4.0mph	29.89in	0.00in	0.00in
7/29/19	12:44 AM	59.5F	52.0F	76%	NNW	2.9mph	4.0mph	29.88in	0.00in	0.00in
7/29/19	12:49 AM	59.5F	52.3F	77%	NNW	2.0mph	5.0mph	29.89in	0.00in	0.00in
7/29/19	12:54 AM	59.5F	52.3F	77%		2.9mph	4.0mph	29.89in	0.00in	0.00in
7/29/19	12:59 AM	59.5F	52.3F	77%	NNW	6.0mph	6.0mph	29.89in	0.00in	0.00in
7/29/19	1:05 AM	59.9F	52.7F	77%	NNW	8.1mph	10.0mph	29.89in	0.00in	0.00in
7/29/19	1:10 AM	60.3F	53.1F	77%	NNW	10.1mph	10.0mph	29.90in	0.00in	0.00in
7/29/19	1:15 AM	60.4F	53.2F	77%	NW	6.0mph	10.0mph	29.90in	0.00in	0.00in
7/29/19	1:20 AM	60.1F	53.2F	78%	NNW	6.0mph	9.0mph	29.90in	0.00in	0.00in
7/29/19	1:25 AM	59.7F	53.2F	79%	NNW	8.1mph	9.0mph	29.90in	0.00in	0.00in
7/29/19	1:30 AM	59.7F	53.2F	79%	NNW	6.0mph	8.0mph	29.90in	0.00in	0.00in
7/29/19	1:36 AM	59.5F	53.1F	79%	NW	6.0mph	8.0mph	29.90in	0.00in	0.00in
7/29/19	1:41 AM	59.4F	53.2F	80%	NNW	8.1mph	9.0mph	29.90in	0.00in	0.00in
7/29/19	1:46 AM	59.4F	53.2F	80%	NW	6.0mph	9.0mph	29.90in	0.00in	0.00in
7/29/19	1:51 AM	59.4F	53.2F	80%	NW	6.0mph	10.0mph	29.90in	0.00in	0.00in
7/29/19	1:56 AM	59.4F	53.2F	80%	NNW	6.0mph	9.0mph	29.91in	0.00in	0.00in
7/29/19	2:01 AM	59.4F	53.2F	80%	NNW	6.0mph	8.0mph	29.91in	0.00in	0.00in
7/29/19	2:06 AM	59.4F	53.2F	80%	NNW	4.9mph	11.0mph	29.91in	0.00in	0.00in
7/29/19	2:11 AM	59.2F	53.4F	81%	NNW	6.0mph	8.0mph	29.91in	0.00in	0.00in

7/29/19	2:16 AM	58.6F	52.9F	81%	NNW	4.9mph	7.0mph	29.91in	0.00in	0.00in
7/29/19	2:21 AM	58.5F	53.1F	82%	NW	4.9mph	9.0mph	29.91in	0.00in	0.00in
7/29/19	2:26 AM	58.3F	52.9F	82%	NNW	4.0mph	6.0mph	29.92in	0.00in	0.00in
7/29/19	2:32 AM	58.3F	52.9F	82%	NNW	4.0mph	9.0mph	29.92in	0.00in	0.00in
7/29/19	2:37 AM	58.1F	52.7F	82%	NNW	8.1mph	9.0mph	29.92in	0.00in	0.00in
7/29/19	2:42 AM	58.3F	52.9F	82%	NNW	6.9mph	9.0mph	29.92in	0.00in	0.00in
7/29/19	2:47 AM	58.1F	52.7F	82%	NNW	6.9mph	10.0mph	29.93in	0.00in	0.00in
7/29/19	2:52 AM	57.6F	52.5F	83%	NNW	2.0mph	6.0mph	29.93in	0.00in	0.00in
7/29/19	2:58 AM	56.7F	51.8F	84%	NW	0.9mph	2.0mph	29.93in	0.00in	0.00in
7/29/19	3:03 AM	55.9F	51.4F	85%	NW	0.0mph	1.0mph	29.93in	0.00in	0.00in
7/29/19	3:08 AM	55.6F	51.8F	87%	NNW	2.9mph	4.0mph	29.93in	0.00in	0.00in
7/29/19	3:13 AM	55.6F	51.8F	87%	NW	2.9mph	6.0mph	29.93in	0.00in	0.00in
7/29/19	3:18 AM	55.8F	52.0F	87%	NNW	6.9mph	9.0mph	29.93in	0.00in	0.00in
7/29/19	3:23 AM	55.6F	51.8F	87%	NNW	2.9mph	5.0mph	29.93in	0.00in	0.00in
7/29/19	3:29 AM	55.2F	51.8F	88%	NNW	4.9mph	5.0mph	29.93in	0.00in	0.00in
7/29/19	3:34 AM	55.6F	52.2F	88%	NNW	6.0mph	9.0mph	29.93in	0.00in	0.00in
7/29/19	3:39 AM	55.8F	52.0F	87%	NNW	6.0mph	8.0mph	29.93in	0.00in	0.00in
7/29/19	3:44 AM	55.8F	52.0F	87%	NW	6.0mph	9.0mph	29.93in	0.00in	0.00in
7/29/19	3:49 AM	55.8F	52.0F	87%	NNW	4.0mph	6.0mph	29.93in	0.00in	0.00in
7/29/19	3:54 AM	55.2F	51.4F	87%		2.9mph	4.0mph	29.94in	0.00in	0.00in
7/29/19	4:00 AM	55.0F	51.3F	87%	NNW	6.0mph	8.0mph	29.94in	0.00in	0.00in
7/29/19	4:05 AM	55.0F	51.3F	87%	NNW	2.9mph	6.0mph	29.95in	0.00in	0.00in
7/29/19	4:10 AM	54.9F	51.1F	87%	NNW	2.9mph	6.0mph	29.95in	0.00in	0.00in
7/29/19	4:15 AM	54.3F	50.5F	87%	NNW	0.9mph	3.0mph	29.95in	0.00in	0.00in
7/29/19	4:20 AM	54.1F	50.9F	89%	NW	4.0mph	6.0mph	29.95in	0.00in	0.00in
7/29/19	4:25 AM	54.3F	51.1F	89%	NNW	6.9mph	8.0mph	29.96in	0.00in	0.00in
7/29/19	4:31 AM	54.5F	51.3F	89%	NNW	4.9mph	9.0mph	29.96in	0.00in	0.00in
7/29/19	4:36 AM	54.3F	51.1F	89%	NW	6.0mph	6.0mph	29.96in	0.00in	0.00in
7/29/19	4:41 AM	54.1F	50.9F	89%	NNW	4.0mph	6.0mph	29.96in	0.00in	0.00in
7/29/19	4:46 AM	54.0F	51.1F	90%	NNW	4.9mph	8.0mph	29.96in	0.00in	0.00in
7/29/19	4:51 AM	53.8F	50.9F	90%	NW	6.0mph	6.0mph	29.96in	0.00in	0.00in
7/29/19	4:56 AM	53.4F	50.5F	90%	NNW	2.9mph	5.0mph	29.97in	0.00in	0.00in
7/29/19	5:02 AM	53.2F	50.7F	91%	NW	2.9mph	5.0mph	29.97in	0.00in	0.00in
7/29/19	5:07 AM	53.2F	50.7F	91%	NNW	4.0mph	5.0mph	29.97in	0.00in	0.00in
7/29/19	5:12 AM	53.4F	50.5F	90%	NW	2.9mph	6.0mph	29.97in	0.00in	0.00in
7/29/19	5:17 AM	53.2F	50.4F	90%	NNW	2.9mph	5.0mph	29.97in	0.00in	0.00in
7/29/19	5:22 AM	53.1F	50.2F	90%	NNW	4.0mph	6.0mph	29.97in	0.00in	0.00in
7/29/19	5:27 AM	52.9F	50.4F	91%	NNW	4.9mph	7.0mph	29.97in	0.00in	0.00in
7/29/19	5:32 AM	52.9F	50.4F	91%	NNW	6.0mph	7.0mph	29.97in	0.00in	0.00in
7/29/19	5:37 AM	52.9F	50.4F	91%	NNW	4.0mph	6.0mph	29.97in	0.00in	0.00in
7/29/19	5:43 AM	52.9F	50.4F	91%	NW	2.9mph	4.0mph	29.98in	0.00in	0.00in
7/29/19	5:48 AM	52.5F	50.0F	91%	NNW	0.0mph	1.0mph	29.97in	0.00in	0.00in
7/29/19	5:53 AM	52.2F	49.6F	91%	NNW	2.0mph	4.0mph	29.98in	0.00in	0.00in
7/29/19	5:58 AM	52.0F	49.6F	92%	NNW	2.0mph	4.0mph	29.97in	0.00in	0.00in
7/29/19	6:03 AM	51.8F	49.3F	91%	NNW	0.0mph	2.0mph	29.98in	0.00in	0.00in
7/29/19	6:08 AM	51.4F	48.9F	91%	NNW	0.0mph	0.0mph	29.98in	0.00in	0.00in
7/29/19	6:13 AM	50.9F	48.7F	92%	WNW	0.0mph	0.0mph	29.98in	0.00in	0.00in
7/29/19	6:18 AM	50.5F	48.4F	92%	WNW	0.0mph	1.0mph	29.98in	0.00in	0.00in

STATION:	KNDNEWSA2	Sunset Time:	21:22	Survey Start:	21:23	Determination:	*Not valid*
SITES:	4 - 10	Sunrise Time:	6:21	End Time:	2:22	Reason:	Low temps over an hour during survey period

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/29/19	9:24 PM	62.4F	48.4F	60%	East	0.0mph	1.0mph	29.98in	0.00in	0.00in
7/29/19	9:29 PM	61.5F	48.0F	61%	East	0.9mph	1.0mph	29.98in	0.00in	0.00in
7/29/19	9:34 PM	61.3F	50.7F	68%	East	0.0mph	0.0mph	29.98in	0.00in	0.00in
7/29/19	9:39 PM	60.3F	50.4F	70%	East	0.0mph	0.0mph	29.98in	0.00in	0.00in
7/29/19	9:44 PM	59.4F	49.6F	70%	East	0.0mph	0.0mph	29.99in	0.00in	0.00in
7/29/19	9:50 PM	58.8F	47.5F	66%	East	0.0mph	1.0mph	29.99in	0.00in	0.00in
7/29/19	9:55 PM	58.6F	47.3F	66%	East	0.0mph	1.0mph	29.99in	0.00in	0.00in
7/29/19	10:00 PM	59.2F	47.5F	65%	East	0.0mph	1.0mph	30.00in	0.00in	0.00in
7/29/19	10:05 PM	59.4F	47.7F	65%	East	0.0mph	1.0mph	30.00in	0.00in	0.00in
7/29/19	10:10 PM	59.2F	47.8F	66%	East	0.0mph	1.0mph	30.00in	0.00in	0.00in
7/29/19	10:15 PM	58.8F	47.8F	67%	ESE	3.0mph	3.0mph	30.00in	0.00in	0.00in
7/29/19	10:21 PM	58.8F	47.8F	67%	ESE	2.0mph	2.0mph	30.00in	0.00in	0.00in
7/29/19	10:26 PM	58.8F	48.2F	68%	ESE	0.9mph	2.0mph	30.01in	0.00in	0.00in
7/29/19	10:31 PM	58.6F	48.6F	69%	ESE	0.9mph	3.0mph	30.01in	0.00in	0.00in
7/29/19	10:36 PM	58.1F	48.4F	70%	ESE	0.9mph	2.0mph	30.01in	0.00in	0.00in
7/29/19	10:41 PM	57.4F	48.4F	72%	ESE	2.0mph	3.0mph	30.01in	0.00in	0.00in
7/29/19	10:46 PM	57.2F	48.6F	73%	ESE	2.0mph	2.0mph	30.01in	0.00in	0.00in
7/29/19	10:52 PM	57.4F	48.4F	72%	East	0.9mph	2.0mph	30.01in	0.00in	0.00in
7/29/19	10:57 PM	57.4F	48.4F	72%	ESE	0.9mph	2.0mph	30.01in	0.00in	0.00in
7/29/19	11:02 PM	57.6F	48.6F	72%	East	2.0mph	4.0mph	30.01in	0.00in	0.00in
7/29/19	11:07 PM	57.7F	48.4F	71%	East	2.0mph	2.0mph	30.01in	0.00in	0.00in
7/29/19	11:13 PM	57.6F	48.6F	72%	ESE	2.0mph	4.0mph	30.01in	0.00in	0.00in
7/29/19	11:18 PM	57.4F	48.4F	72%	ESE	2.0mph	3.0mph	30.02in	0.00in	0.00in
7/29/19	11:23 PM	57.0F	48.4F	73%	ESE	2.0mph	2.0mph	30.01in	0.00in	0.00in
7/29/19	11:28 PM	56.7F	48.4F	74%	East	2.0mph	3.0mph	30.01in	0.00in	0.00in
7/29/19	11:33 PM	56.3F	48.2F	74%	ESE	2.0mph	2.0mph	30.02in	0.00in	0.00in
7/29/19	11:39 PM	56.1F	48.0F	74%	ESE	2.0mph	3.0mph	30.02in	0.00in	0.00in
7/29/19	11:44 PM	56.7F	48.0F	73%	SE	0.9mph	2.0mph	30.02in	0.00in	0.00in
7/29/19	11:49 PM	57.0F	48.4F	73%	SE	0.9mph	3.0mph	30.02in	0.00in	0.00in
7/29/19	11:54 PM	56.8F	48.6F	74%	SE	2.0mph	2.0mph	30.02in	0.00in	0.00in
7/29/19	11:59 PM	56.7F	48.4F	74%	ESE	0.9mph	2.0mph	30.02in	0.00in	0.00in
7/30/19	12:05 AM	56.3F	48.6F	75%	ESE	0.9mph	2.0mph	30.02in	0.00in	0.00in
7/30/19	12:10 AM	56.3F	48.9F	76%	ESE	0.9mph	4.0mph	30.02in	0.00in	0.00in
7/30/19	12:15 AM	56.1F	48.7F	76%	SE	0.9mph	2.0mph	30.02in	0.00in	0.00in
7/30/19	12:20 AM	55.8F	48.7F	77%	SE	0.0mph	1.0mph	30.02in	0.00in	0.00in
7/30/19	12:26 AM	55.8F	48.7F	77%	SE	0.9mph	1.0mph	30.02in	0.00in	0.00in
7/30/19	12:31 AM	55.4F	48.4F	77%	ESE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	12:36 AM	53.8F	47.1F	78%	ESE	0.0mph	1.0mph	30.02in	0.00in	0.00in
7/30/19	12:41 AM	52.3F	46.8F	81%	ESE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	12:46 AM	51.4F	46.4F	83%	ESE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	12:51 AM	50.5F	46.2F	85%	ESE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	12:56 AM	50.4F	46.6F	87%	ESE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	1:01 AM	49.8F	46.0F	87%	ESE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	1:06 AM	49.6F	46.2F	88%	East	0.0mph	1.0mph	30.02in	0.00in	0.00in
7/30/19	1:11 AM	50.0F	46.6F	88%	East	0.0mph	0.0mph	30.03in	0.00in	0.00in
7/30/19	1:16 AM	49.6F	45.7F	86%	East	0.0mph	0.0mph	30.03in	0.00in	0.00in
7/30/19	1:22 AM	49.1F	45.3F	87%	East	0.0mph	0.0mph	30.03in	0.00in	0.00in
7/30/19	1:27 AM	48.6F	45.1F	88%	East	0.0mph	0.0mph	30.03in	0.00in	0.00in
7/30/19	1:32 AM	48.0F	44.6F	88%	East	0.0mph	0.0mph	30.03in	0.00in	0.00in
7/30/19	1:37 AM	48.0F	45.0F	89%	East	0.0mph	0.0mph	30.03in	0.00in	0.00in
7/30/19	1:42 AM	47.8F	45.0F	90%	East	0.0mph	0.0mph	30.03in	0.00in	0.00in
7/30/19	1:48 AM	48.0F	45.9F	92%	SSW	0.0mph	1.0mph	30.03in	0.00in	0.00in
7/30/19	1:53 AM	48.4F	45.5F	90%	SSE	0.0mph	0.0mph	30.03in	0.00in	0.00in
7/30/19	1:58 AM	48.4F	45.5F	90%	SSE	0.0mph	0.0mph	30.03in	0.00in	0.00in
7/30/19	2:03 AM	48.0F	45.1F	90%	SW	0.0mph	1.0mph	30.03in	0.00in	0.00in
7/30/19	2:08 AM	47.8F	45.0F	90%	SW	0.0mph	1.0mph	30.03in	0.00in	0.00in
7/30/19	2:13 AM	47.1F	44.1F	89%	SW	0.0mph	0.0mph	30.03in	0.00in	0.00in

7/30/19	2:19 AM	46.6F	43.9F	90%	SW	0.0mph	0.0mph	30.03in	0.00in	0.00in
7/30/19	2:24 AM	46.0F	43.5F	91%	SW	0.0mph	0.0mph	30.03in	0.00in	0.00in
7/30/19	2:29 AM	46.6F	44.4F	92%	SW	0.0mph	1.0mph	30.03in	0.00in	0.00in
7/30/19	2:34 AM	46.9F	45.0F	93%	SW	0.0mph	1.0mph	30.03in	0.00in	0.00in
7/30/19	2:39 AM	47.1F	45.0F	92%	SW	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	2:45 AM	46.9F	44.8F	92%	SW	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	2:50 AM	46.2F	43.5F	90%	WSW	0.0mph	1.0mph	30.02in	0.00in	0.00in
7/30/19	2:55 AM	46.2F	44.1F	92%	WSW	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	3:00 AM	46.8F	44.8F	93%	WSW	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	3:05 AM	47.1F	45.1F	93%	WSW	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	3:10 AM	47.3F	45.3F	93%	WSW	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	3:16 AM	47.1F	45.1F	93%	WSW	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	3:21 AM	46.9F	45.0F	93%	WSW	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	3:26 AM	46.9F	45.3F	94%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	3:31 AM	47.1F	45.1F	93%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	3:36 AM	47.1F	45.1F	93%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	3:41 AM	47.1F	45.1F	93%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	3:47 AM	47.5F	45.9F	94%	SE	0.0mph	1.0mph	30.02in	0.00in	0.00in
7/30/19	3:52 AM	47.3F	45.3F	93%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	3:57 AM	46.9F	45.0F	93%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	4:02 AM	46.9F	45.3F	94%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	4:07 AM	46.9F	45.0F	93%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	4:12 AM	47.1F	45.5F	94%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	4:18 AM	47.1F	45.1F	93%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	4:23 AM	47.3F	45.3F	93%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	4:28 AM	46.9F	45.0F	93%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	4:33 AM	46.8F	44.8F	93%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	4:38 AM	46.8F	45.1F	94%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	4:43 AM	46.9F	45.3F	94%	SE	0.0mph	1.0mph	30.03in	0.00in	0.00in
7/30/19	4:48 AM	47.1F	45.7F	95%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	4:54 AM	47.1F	45.5F	94%	SE	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	4:59 AM	47.7F	46.2F	95%	South	0.0mph	1.0mph	30.02in	0.00in	0.00in
7/30/19	5:04 AM	47.8F	46.4F	95%	South	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	5:09 AM	47.8F	46.2F	94%	South	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	5:14 AM	48.2F	46.8F	95%	SSE	0.0mph	2.0mph	30.02in	0.00in	0.00in
7/30/19	5:19 AM	48.4F	46.8F	94%	West	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	5:25 AM	48.4F	46.8F	94%	SSW	0.0mph	0.0mph	30.02in	0.00in	0.00in
7/30/19	5:30 AM	48.7F	47.3F	95%	SSE	0.9mph	4.0mph	30.02in	0.00in	0.00in
7/30/19	5:35 AM	49.6F	48.2F	95%	SSE	2.0mph	4.0mph	30.02in	0.00in	0.00in
7/30/19	5:40 AM	50.0F	48.0F	93%	SSE	4.9mph	5.0mph	30.01in	0.00in	0.00in
7/30/19	5:45 AM	50.5F	48.6F	93%	SSE	2.9mph	3.0mph	30.01in	0.00in	0.00in
7/30/19	5:50 AM	50.7F	48.6F	92%	South	2.9mph	3.0mph	30.01in	0.00in	0.00in
7/30/19	5:55 AM	50.7F	48.6F	92%	South	2.0mph	3.0mph	30.02in	0.00in	0.00in
7/30/19	6:01 AM	50.7F	48.2F	91%	South	2.0mph	5.0mph	30.02in	0.00in	0.00in
7/30/19	6:06 AM	51.1F	48.6F	91%	SSE	2.9mph	6.0mph	30.01in	0.00in	0.00in
7/30/19	6:11 AM	51.4F	48.9F	91%	ESE	2.9mph	5.0mph	30.01in	0.00in	0.00in
7/30/19	6:16 AM	51.6F	48.7F	90%	SSE	4.9mph	7.0mph	30.01in	0.00in	0.00in
7/30/19	6:21 AM	51.6F	48.7F	90%	SSE	4.9mph	6.0mph	30.01in	0.00in	0.00in

STATION:	KNDNEWSA2	Sunset Time:	21:21	Survey Start:	21:21	Determination:	*Valid*
SITES:	4 - 10	Sunrise Time:	6:23	End Time:	2:21	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/30/19	9:19 PM	68.2F	60.3F	76%	East	2.0mph	5.0mph	29.91in	0.00in	0.00in
7/30/19	9:24 PM	68.0F	60.4F	77%	ESE	2.9mph	4.0mph	29.91in	0.00in	0.00in
7/30/19	9:29 PM	67.8F	60.3F	77%	ESE	2.0mph	4.0mph	29.91in	0.00in	0.00in
7/30/19	9:35 PM	67.8F	60.3F	77%	SE	2.9mph	5.0mph	29.91in	0.00in	0.00in
7/30/19	9:40 PM	67.8F	60.3F	77%	SE	4.9mph	7.0mph	29.91in	0.00in	0.00in
7/30/19	9:45 PM	67.8F	60.3F	77%	SE	6.9mph	8.0mph	29.91in	0.00in	0.00in
7/30/19	9:50 PM	67.8F	60.3F	77%	SSE	2.9mph	6.0mph	29.91in	0.00in	0.00in
7/30/19	9:55 PM	67.6F	60.6F	78%	SE	4.9mph	8.0mph	29.91in	0.00in	0.00in
7/30/19	10:00 PM	67.6F	60.6F	78%	SSE	4.0mph	7.0mph	29.91in	0.00in	0.00in
7/30/19	10:06 PM	67.6F	60.6F	78%	ESE	4.0mph	7.0mph	29.91in	0.00in	0.00in
7/30/19	10:11 PM	67.5F	60.4F	78%	SE	4.9mph	6.0mph	29.91in	0.00in	0.00in
7/30/19	10:16 PM	67.5F	60.8F	79%	ESE	4.0mph	5.0mph	29.92in	0.00in	0.00in
7/30/19	10:21 PM	67.3F	60.6F	79%	SE	2.9mph	5.0mph	29.92in	0.00in	0.00in
7/30/19	10:26 PM	67.1F	60.8F	80%	SE	2.0mph	5.0mph	29.92in	0.00in	0.00in
7/30/19	10:31 PM	66.9F	60.6F	80%	SE	2.9mph	6.0mph	29.92in	0.00in	0.00in
7/30/19	10:37 PM	66.9F	60.6F	80%	SE	4.0mph	5.0mph	29.92in	0.00in	0.00in
7/30/19	10:42 PM	66.9F	60.6F	80%	SE	4.0mph	6.0mph	29.92in	0.00in	0.00in
7/30/19	10:47 PM	66.7F	60.8F	81%	SSE	2.9mph	4.0mph	29.92in	0.00in	0.00in
7/30/19	10:52 PM	66.7F	60.8F	81%	SE	2.9mph	4.0mph	29.92in	0.00in	0.00in
7/30/19	10:57 PM	66.6F	60.6F	81%	SE	2.9mph	5.0mph	29.92in	0.00in	0.00in
7/30/19	11:02 PM	66.4F	60.8F	82%	SE	2.9mph	5.0mph	29.93in	0.00in	0.00in
7/30/19	11:07 PM	66.4F	60.8F	82%	SE	2.9mph	8.0mph	29.93in	0.00in	0.00in
7/30/19	11:13 PM	66.2F	60.6F	82%	SE	2.9mph	4.0mph	29.93in	0.00in	0.00in
7/30/19	11:18 PM	66.0F	60.6F	83%	SE	0.9mph	5.0mph	29.93in	0.00in	0.00in
7/30/19	11:23 PM	66.0F	60.6F	83%	SSE	4.0mph	4.0mph	29.93in	0.00in	0.00in
7/30/19	11:28 PM	66.2F	60.8F	83%	SE	2.9mph	6.0mph	29.94in	0.00in	0.00in
7/30/19	11:33 PM	66.0F	60.6F	83%	SE	0.9mph	5.0mph	29.94in	0.00in	0.00in
7/30/19	11:38 PM	66.0F	61.0F	84%	SE	2.0mph	6.0mph	29.94in	0.00in	0.00in
7/30/19	11:44 PM	66.0F	61.0F	84%	SSE	2.9mph	5.0mph	29.94in	0.00in	0.00in
7/30/19	11:49 PM	65.8F	60.8F	84%	SSE	6.0mph	8.0mph	29.94in	0.00in	0.00in
7/30/19	11:54 PM	65.8F	60.8F	84%	SE	4.9mph	7.0mph	29.93in	0.00in	0.00in
7/30/19	11:59 PM	65.8F	60.8F	84%	SSE	4.9mph	7.0mph	29.94in	0.00in	0.00in
7/31/19	12:04 AM	65.8F	60.8F	84%	SE	4.0mph	7.0mph	29.94in	0.00in	0.00in
7/31/19	12:09 AM	65.7F	60.6F	84%	SSE	4.9mph	8.0mph	29.93in	0.00in	0.00in
7/31/19	12:14 AM	65.7F	61.0F	85%	ESE	2.9mph	6.0mph	29.93in	0.00in	0.00in
7/31/19	12:19 AM	65.7F	61.0F	85%	SSE	6.9mph	10.0mph	29.93in	0.00in	0.00in
7/31/19	12:24 AM	65.7F	61.0F	85%	SSE	6.0mph	9.0mph	29.93in	0.00in	0.00in
7/31/19	12:29 AM	65.7F	61.0F	85%	SSE	4.9mph	10.0mph	29.93in	0.00in	0.00in
7/31/19	12:34 AM	65.7F	61.0F	85%	SE	4.0mph	8.0mph	29.92in	0.00in	0.00in
7/31/19	12:40 AM	65.7F	61.3F	86%	SSE	6.0mph	10.0mph	29.92in	0.00in	0.00in
7/31/19	12:45 AM	65.7F	61.3F	86%	SE	8.9mph	9.0mph	29.92in	0.00in	0.00in
7/31/19	12:50 AM	65.7F	61.3F	86%	South	8.1mph	10.0mph	29.92in	0.00in	0.00in
7/31/19	12:55 AM	65.5F	61.2F	86%	SSW	4.9mph	9.0mph	29.92in	0.00in	0.00in
7/31/19	1:00 AM	65.5F	61.2F	86%	SSE	4.9mph	7.0mph	29.91in	0.00in	0.00in
7/31/19	1:05 AM	65.1F	61.2F	87%	SSE	4.0mph	7.0mph	29.91in	0.00in	0.00in
7/31/19	1:11 AM	64.9F	61.0F	87%	SE	2.9mph	7.0mph	29.91in	0.00in	0.00in
7/31/19	1:16 AM	64.8F	60.8F	87%	SE	2.9mph	4.0mph	29.91in	0.00in	0.00in
7/31/19	1:21 AM	64.4F	60.8F	88%	SE	4.0mph	6.0mph	29.91in	0.00in	0.00in
7/31/19	1:26 AM	64.0F	60.4F	88%	SE	6.0mph	9.0mph	29.91in	0.00in	0.00in
7/31/19	1:31 AM	63.7F	60.4F	89%	South	2.0mph	6.0mph	29.91in	0.00in	0.00in
7/31/19	1:36 AM	63.5F	60.3F	89%	SE	2.0mph	5.0mph	29.91in	0.00in	0.00in
7/31/19	1:42 AM	63.3F	60.3F	90%	SSE	2.9mph	6.0mph	29.91in	0.00in	0.00in
7/31/19	1:47 AM	63.1F	60.1F	90%	SSE	4.0mph	6.0mph	29.90in	0.00in	0.00in
7/31/19	1:52 AM	63.0F	60.3F	91%	SSE	4.9mph	8.0mph	29.91in	0.00in	0.00in
7/31/19	1:57 AM	63.0F	60.3F	91%	SSE	4.9mph	7.0mph	29.90in	0.00in	0.00in
7/31/19	2:02 AM	63.0F	60.3F	91%	SSE	4.9mph	7.0mph	29.89in	0.00in	0.00in
7/31/19	2:07 AM	62.8F	60.1F	91%	SE	8.1mph	9.0mph	29.89in	0.00in	0.00in

7/31/19	2:12 AM	62.8F	60.1F	91%	SSE	4.9mph	8.0mph	29.89in	0.00in	0.00in
7/31/19	2:18 AM	62.6F	60.3F	92%	SSE	8.9mph	10.0mph	29.89in	0.00in	0.00in
7/31/19	2:23 AM	62.6F	60.3F	92%	SE	6.9mph	11.0mph	29.88in	0.00in	0.00in
7/31/19	2:28 AM	62.4F	60.1F	92%	South	4.0mph	10.0mph	29.88in	0.00in	0.00in
7/31/19	2:33 AM	62.4F	60.1F	92%	SSE	4.0mph	10.0mph	29.88in	0.00in	0.00in
7/31/19	2:38 AM	62.2F	59.9F	92%	SE	6.0mph	10.0mph	29.88in	0.00in	0.00in
7/31/19	2:44 AM	62.1F	60.1F	93%	ESE	4.0mph	10.0mph	29.88in	0.00in	0.00in
7/31/19	2:49 AM	62.1F	60.1F	93%	SSE	6.0mph	8.0mph	29.88in	0.00in	0.00in
7/31/19	2:54 AM	61.9F	59.9F	93%	SSE	4.9mph	9.0mph	29.88in	0.00in	0.00in
7/31/19	2:59 AM	61.9F	59.9F	93%	South	8.1mph	8.0mph	29.88in	0.00in	0.00in
7/31/19	3:04 AM	61.7F	59.9F	94%	SSE	2.9mph	10.0mph	29.88in	0.00in	0.00in
7/31/19	3:09 AM	61.5F	59.7F	94%	SSE	4.0mph	9.0mph	29.88in	0.00in	0.00in
7/31/19	3:14 AM	61.5F	59.7F	94%	SE	8.9mph	10.0mph	29.88in	0.00in	0.00in
7/31/19	3:20 AM	61.3F	59.5F	94%	SE	2.9mph	9.0mph	29.88in	0.00in	0.00in
7/31/19	3:25 AM	61.3F	59.5F	94%	SE	4.9mph	8.0mph	29.88in	0.00in	0.00in
7/31/19	3:30 AM	61.3F	59.5F	94%	SW	8.1mph	8.0mph	29.88in	0.00in	0.00in
7/31/19	3:35 AM	61.2F	59.4F	94%	SSE	8.9mph	9.0mph	29.88in	0.00in	0.00in
7/31/19	3:41 AM	61.2F	59.7F	95%	South	8.1mph	9.0mph	29.88in	0.00in	0.00in
7/31/19	3:46 AM	61.2F	59.7F	95%	SE	6.9mph	10.0mph	29.88in	0.00in	0.00in
7/31/19	3:51 AM	61.0F	59.5F	95%	SSE	6.0mph	9.0mph	29.88in	0.00in	0.00in
7/31/19	3:56 AM	61.0F	59.5F	95%	SSW	6.0mph	9.0mph	29.88in	0.00in	0.00in
7/31/19	4:01 AM	61.0F	59.5F	95%	South	4.9mph	7.0mph	29.88in	0.00in	0.00in
7/31/19	4:06 AM	60.8F	59.4F	95%	SSE	6.9mph	9.0mph	29.88in	0.00in	0.00in
7/31/19	4:12 AM	60.8F	59.4F	95%	South	4.0mph	7.0mph	29.88in	0.00in	0.00in
7/31/19	4:17 AM	61.0F	59.5F	95%	SSE	6.0mph	9.0mph	29.88in	0.00in	0.00in
7/31/19	4:22 AM	61.0F	59.9F	96%	SSE	4.9mph	7.0mph	29.88in	0.00in	0.00in
7/31/19	4:27 AM	61.2F	60.1F	96%	South	4.9mph	8.0mph	29.88in	0.00in	0.00in
7/31/19	4:32 AM	61.2F	60.1F	96%	SE	6.0mph	8.0mph	29.88in	0.00in	0.00in
7/31/19	4:38 AM	61.2F	60.1F	96%	South	2.0mph	7.0mph	29.88in	0.00in	0.00in
7/31/19	4:43 AM	61.3F	60.3F	96%	SSW	4.0mph	6.0mph	29.88in	0.00in	0.00in
7/31/19	4:48 AM	61.3F	60.3F	96%	SW	0.0mph	3.0mph	29.88in	0.00in	0.00in
7/31/19	4:53 AM	61.3F	60.3F	96%	SSW	0.0mph	1.0mph	29.88in	0.00in	0.00in
7/31/19	4:58 AM	61.5F	60.4F	96%	SE	2.0mph	3.0mph	29.87in	0.00in	0.00in
7/31/19	5:03 AM	61.5F	60.4F	96%	SSE	2.0mph	3.0mph	29.87in	0.00in	0.00in
7/31/19	5:09 AM	61.5F	60.4F	96%	SSE	0.9mph	3.0mph	29.87in	0.00in	0.00in
7/31/19	5:14 AM	61.7F	60.6F	96%	SE	0.9mph	4.0mph	29.87in	0.00in	0.00in
7/31/19	5:19 AM	61.9F	60.8F	96%	SSE	2.9mph	3.0mph	29.87in	0.00in	0.00in
7/31/19	5:24 AM	61.9F	60.8F	96%	South	2.0mph	3.0mph	29.87in	0.00in	0.00in
7/31/19	5:29 AM	61.9F	60.8F	96%	SE	2.0mph	4.0mph	29.87in	0.00in	0.00in
7/31/19	5:34 AM	61.9F	60.8F	96%	SSE	4.0mph	4.0mph	29.87in	0.00in	0.00in
7/31/19	5:40 AM	62.1F	61.0F	96%	SSE	2.9mph	3.0mph	29.87in	0.00in	0.00in
7/31/19	5:45 AM	62.1F	61.0F	96%	SSE	4.9mph	5.0mph	29.87in	0.00in	0.00in
7/31/19	5:50 AM	62.1F	61.0F	96%	SE	2.9mph	6.0mph	29.87in	0.00in	0.00in
7/31/19	5:55 AM	62.1F	61.0F	96%	ESE	4.9mph	7.0mph	29.87in	0.00in	0.00in
7/31/19	6:00 AM	62.1F	61.0F	96%	SSE	4.0mph	8.0mph	29.87in	0.00in	0.00in
7/31/19	6:05 AM	62.2F	61.2F	96%	SE	4.0mph	8.0mph	29.87in	0.00in	0.00in
7/31/19	6:11 AM	62.2F	61.2F	96%	SSE	6.9mph	10.0mph	29.87in	0.00in	0.00in
7/31/19	6:16 AM	62.2F	61.2F	96%	SSE	6.9mph	9.0mph	29.87in	0.00in	0.00in
7/31/19	6:21 AM	62.2F	61.2F	96%	SSE	6.9mph	11.0mph	29.86in	0.00in	0.00in
7/31/19	6:26 AM	62.2F	61.2F	96%	SSW	10.1mph	12.0mph	29.87in	0.00in	0.00in

STATION:	KNDNEWSA2	Sunset Time:	21:18	Survey Start:	21:18	Determination:	*Valid*
SITES:	4, 6, 7, 9	Sunrise Time:	6:25	End Time:	2:18	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/31/19	9:19 PM	74.5F	68.5F	82%	ESE	2.0mph	2.0mph	29.87in	0.00in	0.00in
7/31/19	9:24 PM	74.1F	68.5F	83%	NE	4.0mph	5.0mph	29.86in	0.00in	0.00in
7/31/19	9:30 PM	73.9F	68.4F	83%	NE	0.0mph	3.0mph	29.87in	0.00in	0.00in
7/31/19	9:35 PM	73.8F	68.4F	83%	ESE	2.0mph	3.0mph	29.88in	0.00in	0.00in
7/31/19	9:40 PM	73.2F	68.2F	84%	SSE	0.9mph	2.0mph	29.89in	0.00in	0.00in
7/31/19	9:45 PM	73.0F	68.0F	84%	SSE	2.0mph	5.0mph	29.88in	0.00in	0.00in
7/31/19	9:50 PM	72.9F	68.0F	85%	SE	4.0mph	4.0mph	29.88in	0.00in	0.00in
7/31/19	9:55 PM	73.0F	68.0F	84%	NE	2.0mph	4.0mph	29.89in	0.00in	0.00in
7/31/19	10:00 PM	73.0F	68.0F	84%	ENE	8.9mph	11.0mph	29.89in	0.00in	0.00in
7/31/19	10:06 PM	73.0F	68.0F	84%	SSE	2.9mph	4.0mph	29.90in	0.00in	0.00in
7/31/19	10:11 PM	73.2F	68.2F	84%	South	4.0mph	6.0mph	29.89in	0.00in	0.00in
7/31/19	10:16 PM	72.9F	68.0F	85%	SE	0.9mph	2.0mph	29.89in	0.00in	0.00in
7/31/19	10:21 PM	72.5F	68.0F	86%	NE	0.0mph	4.0mph	29.90in	0.00in	0.00in
7/31/19	10:26 PM	72.3F	67.8F	86%	North	0.0mph	1.0mph	29.91in	0.00in	0.00in
7/31/19	10:31 PM	72.1F	67.6F	86%	SSE	2.9mph	4.0mph	29.91in	0.00in	0.00in
7/31/19	10:37 PM	72.1F	67.6F	86%	SW	4.9mph	6.0mph	29.91in	0.00in	0.00in
7/31/19	10:42 PM	72.1F	68.0F	87%	SSE	6.0mph	10.0mph	29.90in	0.00in	0.00in
7/31/19	10:47 PM	72.0F	67.8F	87%	SSE	2.0mph	7.0mph	29.91in	0.00in	0.00in
7/31/19	10:52 PM	72.0F	67.8F	87%	NE	2.9mph	4.0mph	29.92in	0.00in	0.00in
7/31/19	10:57 PM	72.0F	67.8F	87%	NE	0.9mph	5.0mph	29.92in	0.00in	0.00in
7/31/19	11:02 PM	72.0F	68.2F	88%	ESE	0.9mph	5.0mph	29.92in	0.00in	0.00in
7/31/19	11:08 PM	71.8F	67.6F	87%	SSE	2.9mph	4.0mph	29.92in	0.00in	0.00in
7/31/19	11:13 PM	71.2F	67.5F	88%	ESE	0.9mph	3.0mph	29.91in	0.00in	0.00in
7/31/19	11:18 PM	71.1F	67.3F	88%	NNW	0.9mph	2.0mph	29.92in	0.00in	0.00in
7/31/19	11:23 PM	70.7F	66.9F	88%	ESE	0.9mph	1.0mph	29.92in	0.00in	0.00in
7/31/19	11:28 PM	70.2F	66.7F	89%	ESE	0.0mph	1.0mph	29.92in	0.00in	0.00in
7/31/19	11:34 PM	69.6F	66.6F	90%	ESE	0.0mph	0.0mph	29.92in	0.00in	0.00in
7/31/19	11:39 PM	69.4F	66.4F	90%	ESE	0.9mph	1.0mph	29.92in	0.00in	0.00in
7/31/19	11:44 PM	68.7F	66.0F	91%	SW	0.9mph	2.0mph	29.92in	0.00in	0.00in
7/31/19	11:49 PM	68.5F	66.2F	92%	WSW	0.9mph	3.0mph	29.91in	0.00in	0.00in
7/31/19	11:54 PM	68.7F	66.6F	93%	SSE	4.9mph	6.0mph	29.91in	0.00in	0.00in
7/31/19	11:59 PM	68.9F	66.7F	93%	South	2.0mph	7.0mph	29.91in	0.00in	0.00in
8/1/19	12:04 AM	69.1F	66.7F	92%	SSW	2.0mph	5.0mph	29.91in	0.00in	0.00in
8/1/19	12:10 AM	69.1F	66.7F	92%	SSW	4.0mph	5.0mph	29.91in	0.00in	0.00in
8/1/19	12:15 AM	69.1F	66.7F	92%	South	0.9mph	5.0mph	29.91in	0.00in	0.00in
8/1/19	12:20 AM	68.7F	66.4F	92%	South	4.0mph	5.0mph	29.91in	0.00in	0.00in
8/1/19	12:25 AM	68.7F	66.4F	92%	South	2.9mph	5.0mph	29.91in	0.00in	0.00in
8/1/19	12:30 AM	68.5F	66.4F	93%	SSE	4.0mph	6.0mph	29.91in	0.00in	0.00in
8/1/19	12:35 AM	68.5F	66.4F	93%	SSE	4.9mph	6.0mph	29.91in	0.00in	0.00in
8/1/19	12:41 AM	68.7F	66.6F	93%	SSE	4.0mph	5.0mph	29.91in	0.00in	0.00in
8/1/19	12:46 AM	68.7F	66.6F	93%	SE	4.0mph	6.0mph	29.91in	0.00in	0.00in
8/1/19	12:51 AM	68.9F	66.7F	93%	SSE	4.9mph	6.0mph	29.91in	0.00in	0.00in
8/1/19	12:56 AM	68.7F	66.4F	92%	SE	0.9mph	4.0mph	29.92in	0.00in	0.00in
8/1/19	1:01 AM	68.5F	66.4F	93%	ESE	2.9mph	6.0mph	29.92in	0.00in	0.00in
8/1/19	1:06 AM	68.4F	66.2F	93%	ESE	2.0mph	5.0mph	29.92in	0.00in	0.00in
8/1/19	1:12 AM	68.4F	66.2F	93%	SE	4.0mph	7.0mph	29.92in	0.00in	0.00in
8/1/19	1:17 AM	68.4F	66.2F	93%	SE	4.9mph	9.0mph	29.92in	0.00in	0.00in
8/1/19	1:22 AM	68.4F	66.2F	93%	SE	6.0mph	9.0mph	29.91in	0.00in	0.00in
8/1/19	1:27 AM	68.4F	66.2F	93%	ESE	4.9mph	6.0mph	29.92in	0.00in	0.00in
8/1/19	1:32 AM	68.2F	66.0F	93%	SE	4.9mph	8.0mph	29.92in	0.00in	0.00in
8/1/19	1:37 AM	68.2F	66.4F	94%	SSW	4.9mph	9.0mph	29.91in	0.00in	0.00in
8/1/19	1:43 AM	68.2F	66.4F	94%	ESE	6.0mph	8.0mph	29.91in	0.00in	0.00in
8/1/19	1:48 AM	68.0F	66.2F	94%	ESE	4.0mph	7.0mph	29.91in	0.00in	0.00in
8/1/19	1:53 AM	67.8F	66.0F	94%	SSE	0.0mph	6.0mph	29.92in	0.00in	0.00in
8/1/19	1:58 AM	67.8F	66.0F	94%	ESE	4.0mph	5.0mph	29.92in	0.00in	0.00in
8/1/19	2:03 AM	67.6F	65.8F	94%	ESE	0.9mph	3.0mph	29.92in	0.00in	0.00in
8/1/19	2:08 AM	67.5F	65.7F	94%	East	0.0mph	4.0mph	29.93in	0.00in	0.00in

8/1/19	2:14 AM	67.1F	65.3F	94%	SW	0.9mph	1.0mph	29.92in	0.00in	0.00in
8/1/19	2:19 AM	66.6F	64.8F	94%	WSW	0.0mph	3.0mph	29.92in	0.00in	0.00in
8/1/19	2:24 AM	66.4F	64.9F	95%	WSW	0.9mph	1.0mph	29.92in	0.00in	0.00in
8/1/19	2:29 AM	66.4F	64.9F	95%	SSW	3.0mph	3.0mph	29.92in	0.00in	0.00in
8/1/19	2:34 AM	66.4F	64.9F	95%	SSW	2.9mph	3.0mph	29.92in	0.00in	0.00in
8/1/19	2:40 AM	66.4F	65.1F	96%	SSE	0.9mph	3.0mph	29.92in	0.00in	0.00in
8/1/19	2:45 AM	66.2F	64.9F	96%	SSE	0.0mph	2.0mph	29.92in	0.00in	0.00in
8/1/19	2:50 AM	66.6F	65.3F	96%	SSW	2.0mph	4.0mph	29.92in	0.00in	0.00in
8/1/19	2:55 AM	66.7F	65.5F	96%	SW	0.0mph	2.0mph	29.92in	0.00in	0.00in
8/1/19	3:00 AM	66.7F	65.5F	96%	ESE	0.0mph	4.0mph	29.92in	0.00in	0.00in
8/1/19	3:05 AM	66.7F	65.5F	96%	South	0.0mph	1.0mph	29.92in	0.00in	0.00in
8/1/19	3:11 AM	66.9F	65.7F	96%	South	2.9mph	4.0mph	29.91in	0.00in	0.00in
8/1/19	3:16 AM	66.7F	65.5F	96%	SE	2.9mph	3.0mph	29.91in	0.00in	0.00in
8/1/19	3:21 AM	66.7F	65.5F	96%	SE	0.0mph	1.0mph	29.91in	0.00in	0.00in
8/1/19	3:26 AM	66.7F	65.5F	96%	South	2.0mph	3.0mph	29.91in	0.00in	0.00in
8/1/19	3:31 AM	66.9F	66.0F	97%	SSW	0.9mph	2.0mph	29.91in	0.00in	0.00in
8/1/19	3:36 AM	66.9F	66.0F	97%	SSE	0.0mph	0.0mph	29.91in	0.00in	0.00in
8/1/19	3:41 AM	66.7F	65.5F	96%	SSE	0.0mph	0.0mph	29.91in	0.00in	0.00in
8/1/19	3:46 AM	66.0F	64.8F	96%	WSW	0.0mph	1.0mph	29.91in	0.00in	0.00in
8/1/19	3:51 AM	65.8F	64.6F	96%	SW	0.0mph	1.0mph	29.91in	0.00in	0.00in
8/1/19	3:56 AM	65.8F	64.6F	96%	SW	0.0mph	0.0mph	29.91in	0.00in	0.00in
8/1/19	4:02 AM	65.3F	64.0F	96%	SW	2.0mph	3.0mph	29.91in	0.00in	0.00in
8/1/19	4:07 AM	65.5F	64.6F	97%	SW	2.9mph	4.0mph	29.91in	0.00in	0.00in
8/1/19	4:12 AM	65.7F	64.8F	97%	SSE	2.0mph	4.0mph	29.91in	0.00in	0.00in
8/1/19	4:17 AM	65.8F	64.9F	97%	South	2.0mph	3.0mph	29.91in	0.00in	0.00in
8/1/19	4:22 AM	66.0F	65.1F	97%	SW	2.0mph	4.0mph	29.91in	0.00in	0.00in
8/1/19	4:27 AM	66.2F	65.3F	97%	South	4.0mph	6.0mph	29.91in	0.00in	0.00in
8/1/19	4:33 AM	66.4F	65.5F	97%	SSE	2.0mph	4.0mph	29.91in	0.00in	0.00in
8/1/19	4:38 AM	66.6F	65.7F	97%	SW	0.9mph	1.0mph	29.91in	0.00in	0.00in
8/1/19	4:43 AM	66.4F	65.5F	97%	South	0.9mph	2.0mph	29.91in	0.00in	0.00in
8/1/19	4:48 AM	66.0F	65.1F	97%	South	0.0mph	1.0mph	29.91in	0.00in	0.00in
8/1/19	4:53 AM	66.0F	65.1F	97%	SSE	2.0mph	5.0mph	29.91in	0.00in	0.00in
8/1/19	4:59 AM	66.4F	65.5F	97%	SW	2.0mph	4.0mph	29.91in	0.00in	0.00in
8/1/19	5:04 AM	66.2F	65.3F	97%	South	2.0mph	3.0mph	29.91in	0.00in	0.00in
8/1/19	5:09 AM	66.2F	65.3F	97%	SSE	2.9mph	4.0mph	29.91in	0.00in	0.00in
8/1/19	5:14 AM	66.0F	65.1F	97%	SE	0.0mph	1.0mph	29.92in	0.00in	0.00in
8/1/19	5:19 AM	66.0F	65.1F	97%	ESE	0.0mph	0.0mph	29.92in	0.00in	0.00in
8/1/19	5:24 AM	66.0F	65.1F	97%	SE	0.0mph	0.0mph	29.92in	0.00in	0.00in
8/1/19	5:30 AM	65.8F	64.9F	97%	SE	0.0mph	0.0mph	29.92in	0.00in	0.00in
8/1/19	5:35 AM	65.8F	64.9F	97%	SE	0.0mph	0.0mph	29.92in	0.00in	0.00in
8/1/19	5:40 AM	65.8F	64.9F	97%	SSW	0.0mph	0.0mph	29.92in	0.00in	0.00in
8/1/19	5:45 AM	65.7F	64.8F	97%	SSW	0.0mph	0.0mph	29.92in	0.00in	0.00in
8/1/19	5:50 AM	65.7F	64.8F	97%	SSW	0.0mph	0.0mph	29.92in	0.00in	0.00in
8/1/19	5:56 AM	65.7F	64.8F	97%	SSW	0.0mph	0.0mph	29.92in	0.00in	0.00in
8/1/19	6:01 AM	65.5F	64.6F	97%	SSW	0.0mph	0.0mph	29.92in	0.00in	0.00in
8/1/19	6:06 AM	65.5F	64.6F	97%	SSW	0.0mph	0.0mph	29.92in	0.00in	0.00in
8/1/19	6:11 AM	65.5F	64.6F	97%	SSW	0.0mph	0.0mph	29.92in	0.00in	0.00in
8/1/19	6:16 AM	65.3F	64.4F	97%	SSW	0.0mph	0.0mph	29.91in	0.00in	0.00in
8/1/19	6:21 AM	65.3F	64.4F	97%	SSW	0.0mph	0.0mph	29.91in	0.00in	0.00in

STATION:	KNDNEWSA2	Sunset Time:	21:17	Survey Start:	21:17	Determination:	*Valid*
SITES:	6b, 7b; 9a and 9b	Sunrise Time:	6:25	End Time:	2:17	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
8/1/19	9:15 PM	66.0F	63.7F	92%	SE	4.9mph	6.0mph	29.93in	0.00in	0.63in
8/1/19	9:20 PM	66.0F	63.7F	92%	ESE	0.9mph	2.0mph	29.93in	0.00in	0.63in
8/1/19	9:25 PM	65.8F	63.7F	93%	SSE	2.0mph	2.0mph	29.94in	0.00in	0.63in
8/1/19	9:31 PM	65.7F	63.5F	93%	SE	0.9mph	2.0mph	29.94in	0.00in	0.63in
8/1/19	9:36 PM	65.7F	63.3F	92%	ESE	2.0mph	3.0mph	29.94in	0.00in	0.63in
8/1/19	9:41 PM	65.5F	63.1F	92%	South	2.0mph	2.0mph	29.94in	0.00in	0.63in
8/1/19	9:46 PM	65.1F	63.0F	93%	SSE	0.9mph	3.0mph	29.95in	0.00in	0.63in
8/1/19	9:51 PM	65.1F	63.0F	93%	SSW	2.9mph	3.0mph	29.94in	0.00in	0.63in
8/1/19	9:57 PM	65.1F	63.0F	93%	South	2.0mph	4.0mph	29.94in	0.00in	0.63in
8/1/19	10:02 PM	65.1F	63.3F	94%	SE	4.0mph	5.0mph	29.95in	0.00in	0.63in
8/1/19	10:07 PM	65.1F	63.3F	94%	SSW	2.0mph	4.0mph	29.95in	0.00in	0.63in
8/1/19	10:12 PM	65.1F	63.3F	94%	South	2.9mph	3.0mph	29.95in	0.00in	0.63in
8/1/19	10:17 PM	65.1F	63.0F	93%	SSW	2.0mph	5.0mph	29.95in	0.00in	0.63in
8/1/19	10:23 PM	65.1F	63.0F	93%	South	4.0mph	4.0mph	29.95in	0.00in	0.63in
8/1/19	10:28 PM	65.3F	63.0F	92%	SSW	2.9mph	5.0mph	29.95in	0.00in	0.63in
8/1/19	10:33 PM	65.3F	63.0F	92%	SSE	4.9mph	5.0mph	29.95in	0.00in	0.63in
8/1/19	10:38 PM	65.1F	62.8F	92%	South	6.0mph	6.0mph	29.96in	0.00in	0.63in
8/1/19	10:43 PM	64.9F	62.6F	92%	SSE	2.9mph	6.0mph	29.96in	0.00in	0.63in
8/1/19	10:48 PM	64.9F	62.6F	92%	SSE	6.0mph	8.0mph	29.96in	0.00in	0.63in
8/1/19	10:54 PM	64.8F	62.4F	92%	SSE	4.9mph	10.0mph	29.95in	0.00in	0.63in
8/1/19	10:59 PM	64.6F	62.2F	92%	SE	6.0mph	9.0mph	29.95in	0.00in	0.63in
8/1/19	11:04 PM	64.6F	62.2F	92%	SE	8.9mph	9.0mph	29.95in	0.00in	0.63in
8/1/19	11:09 PM	64.4F	62.1F	92%	SSE	4.9mph	6.0mph	29.96in	0.00in	0.63in
8/1/19	11:14 PM	64.2F	62.2F	93%	SE	4.9mph	6.0mph	29.96in	0.00in	0.63in
8/1/19	11:19 PM	64.2F	62.2F	93%	SSE	0.9mph	4.0mph	29.96in	0.00in	0.63in
8/1/19	11:25 PM	64.0F	62.1F	93%	ESE	0.0mph	1.0mph	29.96in	0.00in	0.63in
8/1/19	11:30 PM	64.0F	62.1F	93%	SE	2.0mph	4.0mph	29.97in	0.00in	0.63in
8/1/19	11:35 PM	63.9F	62.1F	94%	ESE	0.0mph	0.0mph	29.97in	0.00in	0.63in
8/1/19	11:40 PM	63.7F	61.9F	94%	ESE	0.0mph	4.0mph	29.97in	0.00in	0.63in
8/1/19	11:45 PM	63.7F	61.9F	94%	ESE	0.0mph	0.0mph	29.97in	0.00in	0.63in
8/1/19	11:50 PM	63.3F	61.5F	94%	ESE	0.0mph	1.0mph	29.97in	0.00in	0.63in
8/1/19	11:56 PM	63.1F	61.3F	94%	ESE	0.0mph	1.0mph	29.97in	0.00in	0.63in
8/2/19	12:01 AM	62.4F	60.6F	94%	ESE	0.0mph	1.0mph	29.97in	0.00in	0.00in
8/2/19	12:06 AM	62.1F	60.3F	94%	ESE	0.0mph	1.0mph	29.97in	0.00in	0.00in
8/2/19	12:11 AM	61.9F	60.4F	95%	ESE	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	12:16 AM	61.9F	60.8F	96%	ESE	0.0mph	1.0mph	29.98in	0.00in	0.00in
8/2/19	12:22 AM	62.1F	61.0F	96%	ESE	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	12:27 AM	62.2F	61.2F	96%	ESE	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	12:32 AM	62.2F	61.2F	96%	ESE	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	12:37 AM	62.2F	61.2F	96%	ESE	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	12:42 AM	62.4F	61.3F	96%	ESE	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	12:47 AM	62.2F	61.2F	96%	ESE	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	12:53 AM	61.9F	60.8F	96%	ESE	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	12:58 AM	61.9F	60.8F	96%	ESE	0.0mph	0.0mph	29.98in	0.00in	0.00in
8/2/19	1:03 AM	61.5F	60.4F	96%	ESE	0.0mph	1.0mph	29.97in	0.00in	0.00in
8/2/19	1:08 AM	61.5F	60.4F	96%	ESE	0.0mph	0.0mph	29.98in	0.00in	0.00in
8/2/19	1:13 AM	61.5F	60.4F	96%	ESE	0.0mph	0.0mph	29.98in	0.00in	0.00in
8/2/19	1:18 AM	61.3F	60.3F	96%	ESE	0.0mph	0.0mph	29.98in	0.00in	0.00in
8/2/19	1:23 AM	61.3F	60.3F	96%	ESE	0.0mph	0.0mph	29.98in	0.00in	0.00in
8/2/19	1:28 AM	61.2F	60.1F	96%	SSE	0.0mph	1.0mph	29.98in	0.00in	0.00in
8/2/19	1:34 AM	61.3F	60.4F	97%	South	0.9mph	2.0mph	29.97in	0.00in	0.00in
8/2/19	1:39 AM	61.2F	60.1F	96%	SSE	0.9mph	2.0mph	29.97in	0.00in	0.00in
8/2/19	1:44 AM	61.2F	60.1F	96%	SSE	0.9mph	2.0mph	29.97in	0.00in	0.00in
8/2/19	1:49 AM	61.5F	60.6F	97%	SSW	2.9mph	5.0mph	29.97in	0.00in	0.00in
8/2/19	1:54 AM	61.9F	61.0F	97%	SE	2.0mph	3.0mph	29.96in	0.00in	0.00in
8/2/19	1:59 AM	61.9F	60.8F	96%	SSE	2.9mph	4.0mph	29.97in	0.00in	0.00in

8/2/19	2:04 AM	62.1F	61.0F	96%	SSE	0.9mph	2.0mph	29.97in	0.00in	0.00in
8/2/19	2:10 AM	62.1F	61.0F	96%	SSE	0.9mph	3.0mph	29.96in	0.00in	0.00in
8/2/19	2:15 AM	62.1F	61.0F	96%	SSW	2.0mph	3.0mph	29.96in	0.00in	0.00in
8/2/19	2:20 AM	62.2F	61.2F	96%	South	2.0mph	5.0mph	29.96in	0.00in	0.00in
8/2/19	2:25 AM	62.1F	60.6F	95%	SSE	0.9mph	3.0mph	29.97in	0.00in	0.00in
8/2/19	2:30 AM	61.5F	60.1F	95%	SE	0.0mph	2.0mph	29.97in	0.00in	0.00in
8/2/19	2:35 AM	61.5F	60.4F	96%	SE	0.0mph	3.0mph	29.97in	0.00in	0.00in
8/2/19	2:41 AM	62.1F	61.0F	96%	ESE	4.0mph	4.0mph	29.96in	0.00in	0.00in
8/2/19	2:46 AM	62.8F	61.7F	96%	ESE	6.0mph	6.0mph	29.96in	0.00in	0.00in
8/2/19	2:51 AM	63.1F	61.7F	95%	SE	4.0mph	9.0mph	29.97in	0.00in	0.00in
8/2/19	2:56 AM	63.3F	61.5F	94%	SE	2.0mph	4.0mph	29.97in	0.00in	0.00in
8/2/19	3:01 AM	63.3F	61.5F	94%	SE	2.9mph	4.0mph	29.97in	0.00in	0.00in
8/2/19	3:06 AM	63.3F	61.5F	94%	SSE	4.9mph	5.0mph	29.97in	0.00in	0.00in
8/2/19	3:11 AM	63.3F	61.3F	93%	SSE	2.9mph	4.0mph	29.96in	0.00in	0.00in
8/2/19	3:16 AM	63.1F	61.2F	93%	SSE	2.0mph	2.0mph	29.96in	0.00in	0.00in
8/2/19	3:21 AM	62.8F	60.8F	93%	SSW	0.0mph	1.0mph	29.96in	0.00in	0.00in
8/2/19	3:26 AM	62.2F	60.3F	93%	South	0.0mph	1.0mph	29.97in	0.00in	0.00in
8/2/19	3:31 AM	62.1F	60.3F	94%	SW	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	3:36 AM	61.5F	59.7F	94%	SW	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	3:42 AM	61.3F	59.5F	94%	SW	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	3:47 AM	61.2F	59.7F	95%	ESE	0.0mph	1.0mph	29.97in	0.00in	0.00in
8/2/19	3:52 AM	61.2F	59.7F	95%	ESE	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	3:57 AM	61.0F	59.5F	95%	ESE	0.0mph	1.0mph	29.96in	0.00in	0.00in
8/2/19	4:02 AM	61.3F	60.3F	96%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	4:07 AM	61.0F	59.5F	95%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	4:13 AM	60.3F	58.8F	95%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	4:18 AM	60.3F	58.8F	95%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	4:23 AM	59.9F	58.5F	95%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	4:28 AM	59.2F	57.4F	94%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	4:33 AM	58.5F	57.0F	95%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	4:39 AM	58.6F	57.6F	96%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	4:44 AM	58.8F	57.7F	96%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	4:49 AM	58.8F	57.7F	96%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	4:54 AM	58.6F	57.6F	96%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	4:59 AM	59.0F	58.1F	97%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	5:04 AM	58.6F	57.6F	96%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	5:09 AM	57.9F	56.8F	96%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	5:15 AM	57.9F	57.0F	97%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	5:20 AM	58.3F	57.4F	97%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	5:25 AM	57.7F	56.7F	96%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	5:30 AM	56.8F	55.4F	95%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	5:35 AM	56.7F	55.6F	96%	ESE	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	5:40 AM	56.8F	55.9F	97%	South	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	5:46 AM	56.8F	55.9F	97%	SSW	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	5:51 AM	57.0F	56.1F	97%	SSW	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	5:56 AM	57.6F	56.7F	97%	SSW	0.0mph	0.0mph	29.96in	0.00in	0.00in
8/2/19	6:01 AM	57.9F	57.4F	98%	SSW	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	6:06 AM	58.6F	58.1F	98%	NE	0.0mph	0.0mph	29.97in	0.00in	0.00in
8/2/19	6:11 AM	58.6F	58.1F	98%	ENE	2.0mph	2.0mph	29.97in	0.00in	0.00in
8/2/19	6:16 AM	58.8F	58.3F	98%	ENE	0.9mph	3.0mph	29.98in	0.00in	0.00in
8/2/19	6:22 AM	59.4F	58.8F	98%	NE	0.0mph	0.0mph	29.98in	0.00in	0.00in
8/2/19	6:27 AM	59.5F	59.0F	98%	NE	0.0mph	2.0mph	29.98in	0.00in	0.00in

STATION:	KNDNEWSA2	Sunset Time:	20:59	Survey Start:	20:59	Determination:	*Valid*
SITES:	6b and 7b (redeployment)	Sunrise Time:	6:42	End Time:	1:59	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
8/13/19	8:57 PM	59.2 F	54.0 F	83 %	NNW	0.9 mph	1.0 mph	30.10 in	0.00 in	0.00 in
8/13/19	9:03 PM	59.2 F	54.0 F	83 %	NNW	2.0 mph	2.0 mph	30.10 in	0.00 in	0.00 in
8/13/19	9:08 PM	59.2 F	54.0 F	83 %	NW	0.9 mph	3.0 mph	30.10 in	0.00 in	0.00 in
8/13/19	9:13 PM	59.4 F	53.8 F	82 %	NW	0.9 mph	3.0 mph	30.10 in	0.00 in	0.00 in
8/13/19	9:18 PM	59.4 F	54.1 F	83 %	NNW	0.0 mph	1.0 mph	30.10 in	0.00 in	0.00 in
8/13/19	9:23 PM	58.8 F	54.0 F	84 %	NNW	0.0 mph	0.0 mph	30.10 in	0.00 in	0.00 in
8/13/19	9:28 PM	58.5 F	54.0 F	85 %	NNW	0.0 mph	0.0 mph	30.11 in	0.00 in	0.00 in
8/13/19	9:33 PM	58.5 F	53.6 F	84 %	NNW	0.0 mph	1.0 mph	30.11 in	0.00 in	0.00 in
8/13/19	9:38 PM	58.5 F	53.6 F	84 %	North	0.0 mph	0.0 mph	30.11 in	0.00 in	0.00 in
8/13/19	9:44 PM	58.5 F	53.2 F	83 %	NNW	0.0 mph	1.0 mph	30.11 in	0.00 in	0.00 in
8/13/19	9:49 PM	58.1 F	52.9 F	83 %	NNW	0.0 mph	0.0 mph	30.12 in	0.00 in	0.00 in
8/13/19	9:54 PM	57.7 F	52.9 F	84 %	NE	0.0 mph	1.0 mph	30.12 in	0.00 in	0.00 in
8/13/19	9:59 PM	57.7 F	52.9 F	84 %	ENE	0.0 mph	1.0 mph	30.12 in	0.00 in	0.00 in
8/13/19	10:04 PM	57.6 F	53.1 F	85 %	ENE	0.0 mph	0.0 mph	30.12 in	0.00 in	0.00 in
8/13/19	10:09 PM	57.4 F	53.2 F	86 %	ENE	0.0 mph	0.0 mph	30.12 in	0.00 in	0.00 in
8/13/19	10:14 PM	57.0 F	52.9 F	86 %	ENE	0.0 mph	0.0 mph	30.12 in	0.00 in	0.00 in
8/13/19	10:19 PM	56.7 F	53.1 F	88 %	ENE	0.0 mph	0.0 mph	30.12 in	0.00 in	0.00 in
8/13/19	10:25 PM	55.9 F	52.7 F	89 %	ENE	0.0 mph	0.0 mph	30.12 in	0.00 in	0.00 in
8/13/19	10:30 PM	55.2 F	52.3 F	90 %	ENE	0.0 mph	0.0 mph	30.12 in	0.00 in	0.00 in
8/13/19	10:35 PM	54.9 F	52.0 F	90 %	ENE	0.0 mph	0.0 mph	30.12 in	0.00 in	0.00 in
8/13/19	10:40 PM	54.3 F	51.4 F	90 %	ENE	0.0 mph	0.0 mph	30.12 in	0.00 in	0.00 in
8/13/19	10:45 PM	53.6 F	51.1 F	91 %	ENE	0.0 mph	0.0 mph	30.12 in	0.00 in	0.00 in
8/13/19	10:50 PM	52.9 F	50.4 F	91 %	ENE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/13/19	10:55 PM	52.2 F	49.8 F	92 %	ENE	0.0 mph	0.0 mph	30.12 in	0.00 in	0.00 in
8/13/19	11:00 PM	51.6 F	49.5 F	92 %	ENE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/13/19	11:05 PM	51.3 F	49.3 F	93 %	ENE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/13/19	11:11 PM	50.7 F	48.7 F	93 %	ENE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/13/19	11:16 PM	50.4 F	48.4 F	93 %	SSE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/13/19	11:21 PM	50.0 F	48.0 F	93 %	SSE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/13/19	11:26 PM	49.8 F	48.2 F	94 %	SSE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/13/19	11:31 PM	49.5 F	47.5 F	93 %	SSE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/13/19	11:36 PM	48.6 F	46.9 F	94 %	SSE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/13/19	11:41 PM	48.6 F	46.9 F	94 %	SSE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/13/19	11:46 PM	48.4 F	46.9 F	95 %	SSE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/13/19	11:51 PM	48.7 F	47.7 F	96 %	SSE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/13/19	11:56 PM	48.7 F	47.7 F	96 %	SSE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/14/19	12:01 AM	48.9 F	47.8 F	96 %	SSE	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	12:06 AM	48.6 F	47.1 F	95 %	SSE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/14/19	12:11 AM	48.4 F	46.9 F	95 %	SSE	0.0 mph	0.0 mph	30.13 in	0.00 in	0.00 in
8/14/19	12:17 AM	48.4 F	47.3 F	96 %	SSE	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	12:22 AM	48.4 F	47.3 F	96 %	SSE	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	12:27 AM	48.4 F	47.3 F	96 %	SSE	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	12:32 AM	48.6 F	47.5 F	96 %	SSE	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	12:37 AM	48.6 F	47.5 F	96 %	SSE	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	12:42 AM	48.4 F	47.3 F	96 %	SSW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	12:47 AM	48.6 F	47.5 F	96 %	SSW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	12:52 AM	48.7 F	47.7 F	96 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	12:57 AM	48.6 F	47.5 F	96 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	1:02 AM	48.7 F	47.7 F	96 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	1:07 AM	48.0 F	46.6 F	95 %	SW	0.0 mph	0.0 mph	30.15 in	0.00 in	0.00 in
8/14/19	1:12 AM	47.7 F	46.6 F	96 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	1:18 AM	47.8 F	46.8 F	96 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	1:23 AM	47.8 F	46.8 F	96 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	1:28 AM	47.8 F	46.8 F	96 %	South	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	1:33 AM	47.3 F	45.9 F	95 %	South	0.0 mph	0.0 mph	30.15 in	0.00 in	0.00 in
8/14/19	1:38 AM	46.6 F	45.1 F	95 %	SSW	0.0 mph	0.0 mph	30.15 in	0.00 in	0.00 in

8/14/19	1:43 AM	46.0 F	44.6 F	95 %	SSW	0.0 mph	0.0 mph	30.15 in	0.00 in	0.00 in
8/14/19	1:48 AM	45.7 F	44.4 F	95 %	SSW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	1:53 AM	45.9 F	44.8 F	96 %	SSW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	1:58 AM	46.6 F	45.9 F	97 %	SSW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	2:03 AM	46.9 F	46.2 F	97 %	SSW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	2:08 AM	46.9 F	46.2 F	97 %	SSW	0.0 mph	0.0 mph	30.15 in	0.00 in	0.00 in
8/14/19	2:14 AM	46.9 F	46.2 F	97 %	SSW	0.0 mph	0.0 mph	30.15 in	0.00 in	0.00 in
8/14/19	2:19 AM	46.9 F	46.2 F	97 %	SSW	0.0 mph	0.0 mph	30.15 in	0.00 in	0.00 in
8/14/19	2:24 AM	46.8 F	46.0 F	97 %	SSW	0.0 mph	0.0 mph	30.15 in	0.00 in	0.00 in
8/14/19	2:29 AM	47.5 F	46.8 F	97 %	SSW	0.0 mph	0.0 mph	30.15 in	0.00 in	0.00 in
8/14/19	2:34 AM	47.7 F	46.9 F	97 %	SSW	0.0 mph	0.0 mph	30.15 in	0.00 in	0.00 in
8/14/19	2:39 AM	47.8 F	46.9 F	97 %	SSW	0.0 mph	0.0 mph	30.15 in	0.00 in	0.00 in
8/14/19	2:44 AM	48.4 F	47.5 F	97 %	SSW	0.0 mph	0.0 mph	30.15 in	0.00 in	0.00 in
8/14/19	2:49 AM	48.7 F	48.2 F	98 %	SSW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	2:54 AM	48.9 F	48.4 F	98 %	SSW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	2:59 AM	48.7 F	48.2 F	98 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	3:04 AM	48.9 F	48.0 F	97 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	3:10 AM	48.9 F	48.0 F	97 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	3:15 AM	49.3 F	48.4 F	97 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	3:20 AM	49.3 F	48.4 F	97 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	3:25 AM	49.3 F	48.4 F	97 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	3:30 AM	49.1 F	48.0 F	96 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	3:35 AM	48.9 F	47.8 F	96 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	3:40 AM	48.6 F	47.1 F	95 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	3:45 AM	48.2 F	46.8 F	95 %	WSW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	3:50 AM	47.7 F	46.2 F	95 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	3:55 AM	47.5 F	46.4 F	96 %	SW	0.0 mph	2.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	4:00 AM	47.5 F	46.4 F	96 %	WSW	0.0 mph	2.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	4:05 AM	47.7 F	46.6 F	96 %	WSW	2.0 mph	3.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	4:10 AM	47.7 F	46.6 F	96 %	WSW	2.9 mph	3.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	4:16 AM	47.8 F	46.9 F	97 %	SW	2.0 mph	3.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	4:21 AM	47.8 F	46.9 F	97 %	SW	2.0 mph	3.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	4:26 AM	47.5 F	46.4 F	96 %	SW	0.9 mph	1.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	4:31 AM	47.1 F	46.0 F	96 %	SW	0.0 mph	1.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	4:36 AM	47.7 F	46.9 F	97 %	WSW	0.0 mph	1.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	4:41 AM	47.8 F	46.9 F	97 %	WSW	0.0 mph	1.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	4:46 AM	47.7 F	46.9 F	97 %	SW	0.0 mph	1.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	4:51 AM	47.7 F	46.9 F	97 %	SW	0.0 mph	1.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	4:56 AM	47.7 F	46.9 F	97 %	SW	0.9 mph	1.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	5:01 AM	47.7 F	46.9 F	97 %	WSW	0.0 mph	2.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	5:06 AM	47.7 F	46.9 F	97 %	WSW	0.9 mph	1.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	5:11 AM	47.5 F	46.8 F	97 %	SW	0.0 mph	1.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	5:17 AM	47.5 F	46.8 F	97 %	SW	0.9 mph	2.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	5:22 AM	47.5 F	46.8 F	97 %	WSW	0.0 mph	2.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	5:27 AM	47.5 F	46.8 F	97 %	WSW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	5:32 AM	47.5 F	46.8 F	97 %	West	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	5:37 AM	47.1 F	46.4 F	97 %	West	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	5:42 AM	47.1 F	46.4 F	97 %	West	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	5:47 AM	47.5 F	46.8 F	97 %	West	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	5:52 AM	47.7 F	46.9 F	97 %	SSW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	5:57 AM	47.7 F	46.9 F	97 %	SSW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	6:03 AM	47.5 F	46.8 F	97 %	SSW	0.0 mph	1.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	6:08 AM	47.5 F	46.8 F	97 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	6:13 AM	47.7 F	46.9 F	97 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	6:18 AM	47.5 F	46.8 F	97 %	SW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	6:23 AM	47.1 F	46.4 F	97 %	WSW	0.0 mph	0.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	6:28 AM	46.8 F	46.0 F	97 %	SW	0.0 mph	1.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	6:33 AM	46.6 F	45.9 F	97 %	West	0.9 mph	2.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	6:38 AM	46.8 F	46.0 F	97 %	WSW	0.9 mph	2.0 mph	30.14 in	0.00 in	0.00 in
8/14/19	6:44 AM	46.8 F	46.0 F	97 %	West	0.9 mph	1.0 mph	30.14 in	0.00 in	0.00 in

STATION:	KNDNEWSA2	Sunset Time:	20:57	Survey Start:	20:57	Determination:	*Invalid*
SITES:	6b and 7b (redeployment)	Sunrise Time:	6:43	End Time:	1:57	Reason:	Rain persisting more than 30 mins

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
8/14/19	8:53 PM	63.0 F	57.4 F	82 %	SSW	0.0 mph	1.0 mph	29.95 in	0.00 in	0.01 in
8/14/19	8:58 PM	62.8 F	56.8 F	81 %	SW	0.0 mph	1.0 mph	29.95 in	0.00 in	0.01 in
8/14/19	9:03 PM	62.4 F	56.8 F	82 %	SW	0.0 mph	0.0 mph	29.95 in	0.00 in	0.01 in
8/14/19	9:08 PM	62.1 F	56.8 F	83 %	SW	0.0 mph	1.0 mph	29.95 in	0.00 in	0.01 in
8/14/19	9:13 PM	61.5 F	56.3 F	83 %	SW	0.0 mph	1.0 mph	29.95 in	0.00 in	0.01 in
8/14/19	9:18 PM	61.3 F	56.1 F	83 %	SSW	0.0 mph	3.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	9:24 PM	61.3 F	56.1 F	83 %	South	0.0 mph	0.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	9:29 PM	61.2 F	55.9 F	83 %	South	0.0 mph	0.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	9:34 PM	60.6 F	55.8 F	84 %	South	0.0 mph	0.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	9:39 PM	60.4 F	55.6 F	84 %	South	0.0 mph	0.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	9:44 PM	60.4 F	55.6 F	84 %	South	0.0 mph	0.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	9:49 PM	60.3 F	55.4 F	84 %	South	0.0 mph	0.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	9:55 PM	60.3 F	55.4 F	84 %	South	0.0 mph	1.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	10:00 PM	60.1 F	55.6 F	85 %	SSE	0.0 mph	0.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	10:05 PM	60.3 F	55.8 F	85 %	SSE	0.0 mph	0.0 mph	29.97 in	0.00 in	0.01 in
8/14/19	10:10 PM	60.4 F	55.9 F	85 %	South	0.0 mph	1.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	10:15 PM	60.4 F	55.9 F	85 %	South	0.0 mph	0.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	10:20 PM	60.4 F	55.9 F	85 %	South	0.0 mph	1.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	10:25 PM	60.4 F	55.9 F	85 %	SE	2.0 mph	3.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	10:30 PM	60.4 F	55.9 F	85 %	SSE	2.0 mph	5.0 mph	29.96 in	0.00 in	0.01 in
8/14/19	10:35 PM	60.8 F	56.3 F	85 %	SE	4.0 mph	4.0 mph	29.97 in	0.00 in	0.01 in
8/14/19	10:40 PM	61.0 F	56.1 F	84 %	SSE	0.9 mph	3.0 mph	29.97 in	0.00 in	0.01 in
8/14/19	10:45 PM	61.2 F	56.3 F	84 %	South	0.9 mph	3.0 mph	29.97 in	0.00 in	0.01 in
8/14/19	10:51 PM	61.3 F	56.1 F	83 %	South	2.9 mph	3.0 mph	29.97 in	0.00 in	0.01 in
8/14/19	10:56 PM	61.5 F	56.3 F	83 %	WSW	2.0 mph	2.0 mph	29.98 in	0.00 in	0.01 in
8/14/19	11:01 PM	61.7 F	56.8 F	84 %	NNW	2.9 mph	13.0 mph	30.01 in	0.00 in	0.01 in
8/14/19	11:06 PM	62.4 F	57.2 F	83 %	NW	11.0 mph	11.0 mph	30.02 in	0.00 in	0.01 in
8/14/19	11:11 PM	61.3 F	57.2 F	86 %	NNW	10.1 mph	19.0 mph	30.02 in	0.01 in	0.02 in
8/14/19	11:16 PM	60.4 F	57.2 F	89 %	NNW	11.0 mph	13.0 mph	30.01 in	0.02 in	0.03 in
8/14/19	11:21 PM	60.1 F	57.4 F	91 %	NNW	6.9 mph	13.0 mph	30.01 in	0.04 in	0.05 in
8/14/19	11:27 PM	59.7 F	57.4 F	92 %		6.0 mph	8.0 mph	29.99 in	0.07 in	0.08 in
8/14/19	11:32 PM	59.5 F	57.6 F	93 %	NNE	4.0 mph	8.0 mph	29.98 in	0.09 in	0.10 in
8/14/19	11:37 PM	59.5 F	57.7 F	94 %	ESE	0.9 mph	3.0 mph	29.97 in	0.11 in	0.12 in
8/14/19	11:42 PM	59.4 F	57.6 F	94 %	ESE	2.9 mph	6.0 mph	29.95 in	0.12 in	0.13 in
8/14/19	11:47 PM	59.2 F	57.4 F	94 %	ESE	2.0 mph	3.0 mph	29.96 in	0.12 in	0.13 in
8/14/19	11:52 PM	58.8 F	57.0 F	94 %	South	0.0 mph	0.0 mph	29.95 in	0.12 in	0.13 in
8/14/19	11:57 PM	58.6 F	56.8 F	94 %	South	0.0 mph	1.0 mph	29.95 in	0.12 in	0.13 in
8/15/19	12:02 AM	58.5 F	56.7 F	94 %	SW	0.9 mph	2.0 mph	29.95 in	0.12 in	0.00 in
8/15/19	12:07 AM	58.3 F	56.5 F	94 %	WSW	0.9 mph	2.0 mph	29.95 in	0.12 in	0.00 in
8/15/19	12:13 AM	58.3 F	56.5 F	94 %	South	0.9 mph	2.0 mph	29.95 in	0.11 in	0.00 in
8/15/19	12:18 AM	58.1 F	56.3 F	94 %	South	2.9 mph	3.0 mph	29.95 in	0.10 in	0.00 in
8/15/19	12:23 AM	57.9 F	56.1 F	94 %	SSE	2.0 mph	3.0 mph	29.94 in	0.07 in	0.00 in
8/15/19	12:28 AM	57.7 F	56.3 F	95 %	SSE	0.9 mph	3.0 mph	29.94 in	0.04 in	0.00 in
8/15/19	12:33 AM	57.6 F	56.1 F	95 %	South	0.9 mph	4.0 mph	29.94 in	0.03 in	0.00 in
8/15/19	12:38 AM	57.6 F	56.1 F	95 %	South	0.9 mph	2.0 mph	29.94 in	0.01 in	0.00 in
8/15/19	12:43 AM	57.4 F	55.9 F	95 %	SSW	0.0 mph	2.0 mph	29.94 in	0.00 in	0.00 in
8/15/19	12:48 AM	57.0 F	55.6 F	95 %	SSW	0.9 mph	2.0 mph	29.93 in	0.00 in	0.00 in
8/15/19	12:53 AM	56.8 F	55.4 F	95 %	SSW	0.9 mph	1.0 mph	29.93 in	0.00 in	0.00 in
8/15/19	12:58 AM	56.8 F	55.4 F	95 %	SSW	0.0 mph	1.0 mph	29.93 in	0.00 in	0.00 in
8/15/19	1:04 AM	56.8 F	55.4 F	95 %	SSW	0.9 mph	1.0 mph	29.93 in	0.00 in	0.00 in
8/15/19	1:09 AM	57.0 F	55.6 F	95 %	South	2.0 mph	2.0 mph	29.93 in	0.00 in	0.00 in
8/15/19	1:14 AM	57.2 F	55.8 F	95 %	South	2.0 mph	4.0 mph	29.92 in	0.00 in	0.00 in
8/15/19	1:19 AM	57.4 F	55.9 F	95 %	South	2.0 mph	3.0 mph	29.92 in	0.00 in	0.00 in
8/15/19	1:24 AM	57.7 F	56.3 F	95 %	South	2.0 mph	5.0 mph	29.92 in	0.00 in	0.00 in
8/15/19	1:29 AM	57.7 F	56.3 F	95 %	SSE	2.0 mph	4.0 mph	29.92 in	0.00 in	0.00 in
8/15/19	1:35 AM	57.7 F	55.9 F	94 %	South	2.0 mph	5.0 mph	29.92 in	0.00 in	0.00 in
8/15/19	1:40 AM	57.6 F	55.8 F	94 %	South	2.0 mph	7.0 mph	29.92 in	0.00 in	0.00 in

8/15/19	1:45 AM	57.7 F	55.9 F	94 %	SSW	2.0 mph	5.0 mph	29.92 in	0.00 in	0.00 in
8/15/19	1:50 AM	57.7 F	55.9 F	94 %	South	2.0 mph	5.0 mph	29.92 in	0.00 in	0.00 in
8/15/19	1:55 AM	57.6 F	55.8 F	94 %	SSW	2.0 mph	3.0 mph	29.91 in	0.00 in	0.00 in
8/15/19	2:00 AM	57.7 F	55.9 F	94 %	South	2.9 mph	3.0 mph	29.91 in	0.00 in	0.00 in
8/15/19	2:05 AM	57.7 F	55.9 F	94 %	SSE	2.9 mph	4.0 mph	29.91 in	0.00 in	0.00 in
8/15/19	2:10 AM	57.6 F	55.6 F	93 %	South	0.9 mph	2.0 mph	29.91 in	0.00 in	0.00 in
8/15/19	2:15 AM	57.6 F	55.6 F	93 %	SSW	2.0 mph	3.0 mph	29.91 in	0.00 in	0.00 in
8/15/19	2:21 AM	57.7 F	55.8 F	93 %	SSW	2.0 mph	3.0 mph	29.91 in	0.00 in	0.00 in
8/15/19	2:26 AM	57.9 F	55.9 F	93 %	SSW	2.0 mph	3.0 mph	29.91 in	0.00 in	0.00 in
8/15/19	2:31 AM	57.9 F	55.6 F	92 %	South	2.0 mph	5.0 mph	29.91 in	0.00 in	0.00 in
8/15/19	2:36 AM	58.3 F	55.9 F	92 %	South	4.0 mph	5.0 mph	29.90 in	0.00 in	0.00 in
8/15/19	2:41 AM	58.3 F	55.9 F	92 %	SSW	4.0 mph	4.0 mph	29.90 in	0.00 in	0.00 in
8/15/19	2:46 AM	58.3 F	55.9 F	92 %	SSW	2.0 mph	2.0 mph	29.90 in	0.00 in	0.00 in
8/15/19	2:51 AM	58.3 F	55.9 F	92 %	SSW	0.9 mph	5.0 mph	29.90 in	0.00 in	0.00 in
8/15/19	2:56 AM	58.5 F	56.1 F	92 %	SSW	2.0 mph	4.0 mph	29.90 in	0.00 in	0.00 in
8/15/19	3:01 AM	58.6 F	55.9 F	91 %	SW	0.9 mph	3.0 mph	29.89 in	0.00 in	0.00 in
8/15/19	3:07 AM	58.8 F	56.1 F	91 %	SW	0.9 mph	3.0 mph	29.89 in	0.00 in	0.00 in
8/15/19	3:12 AM	59.4 F	56.7 F	91 %	SW	2.0 mph	5.0 mph	29.89 in	0.00 in	0.00 in
8/15/19	3:17 AM	59.5 F	56.7 F	90 %	SSW	2.9 mph	6.0 mph	29.89 in	0.00 in	0.00 in
8/15/19	3:22 AM	59.7 F	56.8 F	90 %	SSW	2.9 mph	4.0 mph	29.89 in	0.00 in	0.00 in
8/15/19	3:27 AM	59.7 F	56.8 F	90 %	SW	2.0 mph	5.0 mph	29.89 in	0.00 in	0.00 in
8/15/19	3:32 AM	59.7 F	56.8 F	90 %	SW	2.0 mph	3.0 mph	29.89 in	0.00 in	0.00 in
8/15/19	3:37 AM	59.5 F	56.7 F	90 %	SW	0.9 mph	2.0 mph	29.89 in	0.00 in	0.00 in
8/15/19	3:42 AM	59.5 F	56.8 F	91 %	NNW	8.1 mph	13.0 mph	29.92 in	0.00 in	0.00 in
8/15/19	3:47 AM	60.3 F	57.6 F	91 %	NW	2.0 mph	3.0 mph	29.91 in	0.00 in	0.00 in
8/15/19	3:52 AM	60.6 F	57.7 F	90 %	West	0.0 mph	7.0 mph	29.92 in	0.00 in	0.00 in
8/15/19	3:57 AM	60.6 F	57.4 F	89 %	WSW	0.9 mph	1.0 mph	29.91 in	0.00 in	0.00 in
8/15/19	4:02 AM	60.8 F	57.6 F	89 %	NW	4.9 mph	7.0 mph	29.91 in	0.00 in	0.00 in
8/15/19	4:08 AM	61.0 F	57.7 F	89 %	NNW	2.0 mph	3.0 mph	29.91 in	0.01 in	0.01 in
8/15/19	4:13 AM	60.6 F	57.7 F	90 %	NNW	2.0 mph	2.0 mph	29.91 in	0.01 in	0.01 in
8/15/19	4:18 AM	60.4 F	57.6 F	90 %	NNE	0.0 mph	1.0 mph	29.90 in	0.01 in	0.01 in
8/15/19	4:23 AM	60.3 F	57.6 F	91 %	NNE	0.0 mph	0.0 mph	29.90 in	0.01 in	0.01 in
8/15/19	4:28 AM	59.9 F	57.2 F	91 %	NNW	0.0 mph	0.0 mph	29.90 in	0.01 in	0.01 in
8/15/19	4:33 AM	59.5 F	56.8 F	91 %	NNW	0.0 mph	0.0 mph	29.90 in	0.01 in	0.01 in
8/15/19	4:38 AM	59.2 F	56.8 F	92 %	North	0.0 mph	2.0 mph	29.90 in	0.01 in	0.01 in
8/15/19	4:43 AM	59.0 F	56.7 F	92 %	North	0.0 mph	0.0 mph	29.90 in	0.01 in	0.01 in
8/15/19	4:48 AM	58.6 F	56.7 F	93 %	ENE	0.0 mph	0.0 mph	29.90 in	0.01 in	0.01 in
8/15/19	4:54 AM	58.6 F	56.7 F	93 %	NE	0.0 mph	0.0 mph	29.90 in	0.01 in	0.01 in
8/15/19	4:59 AM	58.5 F	56.7 F	94 %	NE	0.0 mph	1.0 mph	29.90 in	0.01 in	0.01 in
8/15/19	5:04 AM	58.5 F	56.7 F	94 %	NE	0.0 mph	2.0 mph	29.90 in	0.01 in	0.01 in
8/15/19	5:09 AM	58.3 F	56.5 F	94 %	ENE	0.0 mph	1.0 mph	29.89 in	0.00 in	0.01 in
8/15/19	5:14 AM	58.1 F	56.3 F	94 %	NE	0.0 mph	1.0 mph	29.89 in	0.00 in	0.01 in
8/15/19	5:19 AM	57.9 F	56.1 F	94 %	NE	0.0 mph	0.0 mph	29.89 in	0.00 in	0.01 in
8/15/19	5:24 AM	57.6 F	55.8 F	94 %	ENE	0.0 mph	0.0 mph	29.89 in	0.00 in	0.01 in
8/15/19	5:30 AM	57.4 F	55.6 F	94 %	ENE	0.0 mph	0.0 mph	29.89 in	0.00 in	0.01 in
8/15/19	5:35 AM	57.0 F	55.2 F	94 %	NE	0.0 mph	0.0 mph	29.89 in	0.00 in	0.01 in
8/15/19	5:40 AM	56.8 F	55.2 F	94 %	ENE	0.0 mph	0.0 mph	29.88 in	0.00 in	0.01 in
8/15/19	5:45 AM	56.7 F	55.2 F	95 %	ENE	0.0 mph	0.0 mph	29.88 in	0.00 in	0.01 in
8/15/19	5:50 AM	56.7 F	55.2 F	95 %	ENE	0.0 mph	1.0 mph	29.88 in	0.00 in	0.01 in
8/15/19	5:55 AM	56.8 F	55.4 F	95 %	NE	0.0 mph	0.0 mph	29.88 in	0.00 in	0.01 in
8/15/19	6:00 AM	56.8 F	55.4 F	95 %	NW	0.0 mph	1.0 mph	29.88 in	0.00 in	0.01 in
8/15/19	6:06 AM	56.7 F	55.2 F	95 %	NW	0.0 mph	0.0 mph	29.88 in	0.00 in	0.01 in
8/15/19	6:11 AM	56.5 F	55.0 F	95 %	NW	0.0 mph	0.0 mph	29.88 in	0.00 in	0.01 in
8/15/19	6:16 AM	56.5 F	55.0 F	95 %	NW	0.0 mph	0.0 mph	29.88 in	0.00 in	0.01 in
8/15/19	6:21 AM	56.5 F	55.4 F	96 %	NW	0.0 mph	0.0 mph	29.87 in	0.00 in	0.01 in
8/15/19	6:26 AM	56.5 F	55.0 F	95 %	NW	0.0 mph	0.0 mph	29.88 in	0.00 in	0.01 in
8/15/19	6:31 AM	56.3 F	55.2 F	96 %	NW	0.0 mph	0.0 mph	29.88 in	0.00 in	0.01 in
8/15/19	6:36 AM	56.3 F	55.2 F	96 %	NW	0.0 mph	0.0 mph	29.88 in	0.00 in	0.01 in
8/15/19	6:41 AM	56.5 F	55.4 F	96 %	NW	0.0 mph	0.0 mph	29.88 in	0.00 in	0.01 in

STATION:	KNDNEWSA2	Sunset Time:	20:56	Survey Start:	20:56	Determination:	*Valid*
SITES:	6b and 7b (redeployment)	Sunrise Time:	6:44	End Time:	1:56	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
8/15/19	8:54 PM	63.9 F	59.0 F	84 %	ESE	0.0 mph	1.0 mph	29.79 in	0.00 in	0.54 in
8/15/19	8:59 PM	63.3 F	58.5 F	84 %	SW	0.0 mph	0.0 mph	29.79 in	0.00 in	0.54 in
8/15/19	9:04 PM	62.4 F	57.9 F	85 %	SW	0.0 mph	0.0 mph	29.79 in	0.00 in	0.54 in
8/15/19	9:09 PM	61.3 F	57.2 F	86 %	SW	0.0 mph	1.0 mph	29.79 in	0.00 in	0.54 in
8/15/19	9:14 PM	60.4 F	56.5 F	87 %	SW	0.0 mph	0.0 mph	29.80 in	0.00 in	0.54 in
8/15/19	9:20 PM	59.7 F	56.1 F	88 %	SW	0.0 mph	0.0 mph	29.80 in	0.00 in	0.54 in
8/15/19	9:25 PM	59.4 F	55.8 F	88 %	SW	0.0 mph	0.0 mph	29.80 in	0.00 in	0.54 in
8/15/19	9:30 PM	59.0 F	55.8 F	89 %	SW	0.0 mph	0.0 mph	29.80 in	0.00 in	0.54 in
8/15/19	9:35 PM	58.6 F	55.4 F	89 %	SW	0.0 mph	0.0 mph	29.80 in	0.00 in	0.54 in
8/15/19	9:40 PM	58.3 F	55.0 F	89 %	SW	0.0 mph	0.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	9:45 PM	57.9 F	54.7 F	89 %	SE	0.0 mph	0.0 mph	29.80 in	0.00 in	0.54 in
8/15/19	9:51 PM	57.2 F	54.0 F	89 %	SE	0.0 mph	0.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	9:56 PM	56.8 F	54.3 F	91 %	West	0.0 mph	1.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	10:01 PM	56.3 F	53.4 F	90 %	SSW	0.0 mph	0.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	10:06 PM	56.5 F	54.5 F	93 %	SSW	0.0 mph	0.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	10:11 PM	56.8 F	54.9 F	93 %	SSW	0.0 mph	0.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	10:16 PM	56.7 F	54.3 F	92 %	SSW	0.0 mph	0.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	10:22 PM	56.5 F	54.1 F	92 %	SSW	0.0 mph	0.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	10:27 PM	56.5 F	54.1 F	92 %	South	0.0 mph	1.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	10:32 PM	55.6 F	53.1 F	91 %	South	0.0 mph	0.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	10:37 PM	55.6 F	53.6 F	93 %	SSW	0.0 mph	0.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	10:42 PM	55.8 F	53.8 F	93 %	SW	0.0 mph	1.0 mph	29.82 in	0.00 in	0.54 in
8/15/19	10:47 PM	56.1 F	54.1 F	93 %	South	0.0 mph	0.0 mph	29.82 in	0.00 in	0.54 in
8/15/19	10:52 PM	56.3 F	54.3 F	93 %	SSE	0.9 mph	2.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	10:58 PM	56.7 F	54.7 F	93 %	SSE	4.0 mph	4.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	11:03 PM	57.0 F	54.7 F	92 %	SSE	0.9 mph	2.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	11:08 PM	57.0 F	54.7 F	92 %	SSE	0.9 mph	2.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	11:13 PM	56.8 F	54.0 F	90 %	South	0.0 mph	0.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	11:18 PM	56.1 F	53.6 F	91 %	SW	0.0 mph	1.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	11:23 PM	55.8 F	53.4 F	92 %	South	0.0 mph	1.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	11:28 PM	55.9 F	54.0 F	93 %	SSE	0.0 mph	1.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	11:34 PM	55.9 F	54.0 F	93 %	South	0.0 mph	1.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	11:39 PM	55.9 F	53.6 F	92 %	SW	0.0 mph	0.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	11:44 PM	55.9 F	53.6 F	92 %	SSE	0.0 mph	1.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	11:49 PM	55.8 F	53.4 F	92 %	South	0.0 mph	0.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	11:54 PM	55.6 F	53.2 F	92 %	South	0.0 mph	0.0 mph	29.81 in	0.00 in	0.54 in
8/15/19	11:59 PM	55.4 F	53.4 F	93 %	South	0.0 mph	0.0 mph	29.80 in	0.00 in	0.54 in
8/16/19	12:05 AM	55.6 F	54.0 F	94 %	South	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	12:10 AM	55.9 F	54.0 F	93 %	SSE	0.0 mph	1.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	12:15 AM	55.9 F	54.0 F	93 %	SSE	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	12:20 AM	55.8 F	53.8 F	93 %	SSE	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	12:25 AM	55.9 F	54.0 F	93 %	SSE	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	12:30 AM	55.4 F	53.4 F	93 %	SSE	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	12:35 AM	55.2 F	53.2 F	93 %	SSE	0.0 mph	1.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	12:40 AM	55.0 F	53.1 F	93 %	SSE	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	12:46 AM	55.0 F	53.4 F	94 %	SSE	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	12:51 AM	55.0 F	53.4 F	94 %	SSE	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	12:56 AM	54.9 F	53.2 F	94 %	SSE	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	1:01 AM	55.0 F	53.4 F	94 %	SSE	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	1:06 AM	54.5 F	52.5 F	93 %	SSE	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	1:11 AM	54.1 F	52.5 F	94 %	SSE	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	1:16 AM	54.1 F	52.5 F	94 %	SSE	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	1:21 AM	54.1 F	52.5 F	94 %	South	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	1:27 AM	54.1 F	52.5 F	94 %	West	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	1:32 AM	54.1 F	52.2 F	93 %	West	0.0 mph	0.0 mph	29.79 in	0.00 in	0.00 in
8/16/19	1:37 AM	54.1 F	52.2 F	93 %	West	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	1:42 AM	54.0 F	52.0 F	93 %	West	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in

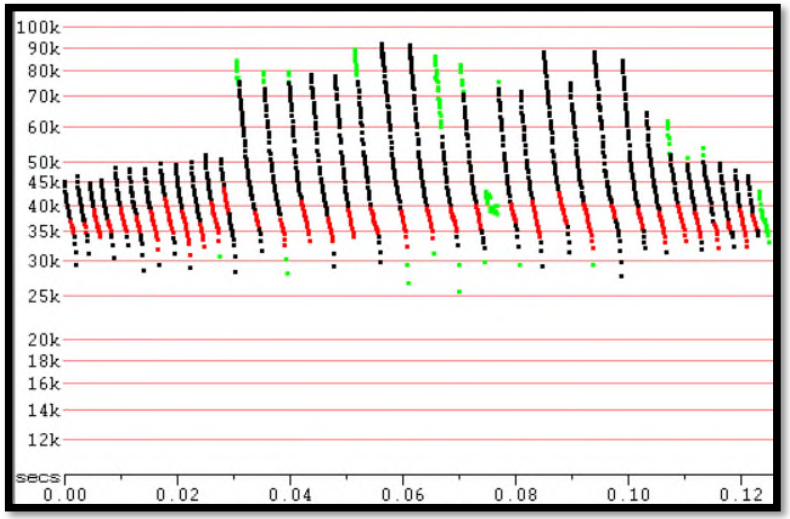
8/16/19	1:47 AM	54.1 F	52.2 F	93 %	West	0.0 mph	0.0 mph	29.79 in	0.00 in	0.00 in
8/16/19	1:52 AM	54.1 F	52.2 F	93 %	West	0.0 mph	0.0 mph	29.80 in	0.00 in	0.00 in
8/16/19	1:57 AM	54.0 F	52.0 F	93 %	SSW	0.0 mph	0.0 mph	29.79 in	0.00 in	0.00 in
8/16/19	2:02 AM	54.0 F	51.6 F	92 %	SSW	0.0 mph	0.0 mph	29.79 in	0.00 in	0.00 in
8/16/19	2:07 AM	54.0 F	52.0 F	93 %	SE	0.0 mph	1.0 mph	29.79 in	0.00 in	0.00 in
8/16/19	2:13 AM	54.5 F	52.5 F	93 %	SE	0.0 mph	0.0 mph	29.79 in	0.00 in	0.00 in
8/16/19	2:18 AM	54.3 F	51.8 F	91 %	SE	0.0 mph	0.0 mph	29.79 in	0.00 in	0.00 in
8/16/19	2:23 AM	54.0 F	51.6 F	92 %	SSE	0.0 mph	0.0 mph	29.79 in	0.00 in	0.00 in
8/16/19	2:28 AM	54.0 F	52.0 F	93 %	SSE	0.0 mph	0.0 mph	29.79 in	0.00 in	0.00 in
8/16/19	2:33 AM	54.1 F	51.8 F	92 %	SSE	0.0 mph	0.0 mph	29.79 in	0.00 in	0.00 in
8/16/19	2:38 AM	53.8 F	51.4 F	92 %	SE	0.0 mph	0.0 mph	29.78 in	0.00 in	0.00 in
8/16/19	2:43 AM	53.4 F	51.1 F	92 %	SE	0.0 mph	1.0 mph	29.79 in	0.00 in	0.00 in
8/16/19	2:48 AM	53.2 F	51.3 F	93 %	SW	0.9 mph	3.0 mph	29.78 in	0.00 in	0.00 in
8/16/19	2:53 AM	53.4 F	51.4 F	93 %	SW	0.9 mph	2.0 mph	29.78 in	0.00 in	0.00 in
8/16/19	2:58 AM	53.2 F	51.3 F	93 %	WSW	0.0 mph	0.0 mph	29.78 in	0.00 in	0.00 in
8/16/19	3:03 AM	53.1 F	51.1 F	93 %	WSW	0.0 mph	0.0 mph	29.78 in	0.00 in	0.00 in
8/16/19	3:08 AM	52.9 F	50.9 F	93 %	West	0.0 mph	0.0 mph	29.78 in	0.00 in	0.00 in
8/16/19	3:13 AM	52.7 F	50.7 F	93 %	WSW	0.0 mph	1.0 mph	29.78 in	0.00 in	0.00 in
8/16/19	3:19 AM	52.9 F	50.9 F	93 %	West	0.0 mph	1.0 mph	29.78 in	0.00 in	0.00 in
8/16/19	3:24 AM	52.9 F	51.3 F	94 %	WSW	0.9 mph	2.0 mph	29.78 in	0.00 in	0.00 in
8/16/19	3:29 AM	53.2 F	51.3 F	93 %	West	0.9 mph	2.0 mph	29.78 in	0.00 in	0.00 in
8/16/19	3:34 AM	53.2 F	51.3 F	93 %	WSW	0.9 mph	1.0 mph	29.78 in	0.00 in	0.00 in
8/16/19	3:39 AM	53.1 F	51.1 F	93 %	SW	0.0 mph	1.0 mph	29.78 in	0.00 in	0.00 in
8/16/19	3:44 AM	53.1 F	51.1 F	93 %	West	0.9 mph	2.0 mph	29.78 in	0.00 in	0.00 in
8/16/19	3:49 AM	53.4 F	51.8 F	94 %	WSW	2.0 mph	4.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	3:54 AM	53.8 F	51.8 F	93 %	SW	2.0 mph	3.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	3:59 AM	53.8 F	51.8 F	93 %	West	2.0 mph	4.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	4:04 AM	54.0 F	52.0 F	93 %	WSW	2.9 mph	4.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	4:09 AM	54.0 F	52.0 F	93 %	WSW	2.0 mph	3.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	4:14 AM	54.1 F	52.2 F	93 %	WSW	2.0 mph	5.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	4:20 AM	54.5 F	52.2 F	92 %	WSW	2.0 mph	3.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	4:25 AM	54.7 F	52.2 F	91 %	WSW	2.9 mph	3.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	4:30 AM	54.3 F	51.8 F	91 %	WSW	2.0 mph	2.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	4:35 AM	54.0 F	51.4 F	91 %	WSW	0.9 mph	2.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	4:40 AM	53.8 F	51.4 F	92 %	West	0.0 mph	1.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	4:45 AM	53.4 F	51.1 F	92 %	West	0.9 mph	1.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	4:50 AM	53.1 F	51.1 F	93 %	West	0.9 mph	1.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	4:55 AM	52.5 F	50.5 F	93 %	West	0.0 mph	0.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	5:00 AM	52.5 F	50.5 F	93 %	West	0.9 mph	1.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	5:05 AM	52.3 F	50.4 F	93 %	West	0.9 mph	1.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	5:10 AM	52.2 F	50.2 F	93 %	West	0.9 mph	1.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	5:15 AM	52.2 F	50.5 F	94 %	West	0.9 mph	2.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	5:20 AM	52.2 F	50.2 F	93 %	West	0.9 mph	2.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	5:25 AM	52.0 F	50.0 F	93 %	West	0.9 mph	2.0 mph	29.77 in	0.00 in	0.00 in
8/16/19	5:30 AM	52.0 F	50.0 F	93 %	West	0.9 mph	1.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	5:35 AM	52.0 F	50.0 F	93 %	WSW	0.9 mph	2.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	5:40 AM	51.4 F	49.5 F	93 %	WSW	0.9 mph	1.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	5:46 AM	51.3 F	49.3 F	93 %	WSW	0.9 mph	2.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	5:51 AM	51.3 F	49.6 F	94 %	WSW	2.0 mph	2.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	5:56 AM	51.1 F	49.1 F	93 %	WSW	0.9 mph	2.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	6:01 AM	51.1 F	49.5 F	94 %	WNW	0.9 mph	2.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	6:06 AM	51.4 F	49.8 F	94 %	WSW	2.0 mph	2.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	6:11 AM	51.8 F	49.8 F	93 %	WSW	2.0 mph	3.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	6:16 AM	51.8 F	49.8 F	93 %	WSW	0.9 mph	2.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	6:21 AM	51.8 F	49.8 F	93 %	SW	0.9 mph	2.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	6:27 AM	51.6 F	49.5 F	92 %	West	0.9 mph	2.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	6:32 AM	51.6 F	49.6 F	93 %	WNW	0.9 mph	2.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	6:37 AM	51.6 F	49.6 F	93 %	West	0.0 mph	1.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	6:42 AM	51.6 F	49.6 F	93 %	West	0.9 mph	1.0 mph	29.76 in	0.00 in	0.00 in
8/16/19	6:47 AM	51.4 F	49.5 F	93 %	WSW	0.0 mph	1.0 mph	29.76 in	0.00 in	0.00 in

STATION:	KNDNEWSA2	Sunset Time:	20:54	Survey Start:	20:54	Determination:	*Valid*
SITES:	6b and 7b (redeployment)	Sunrise Time:	6:46	End Time:	1:54	Reason:	No adverse weather

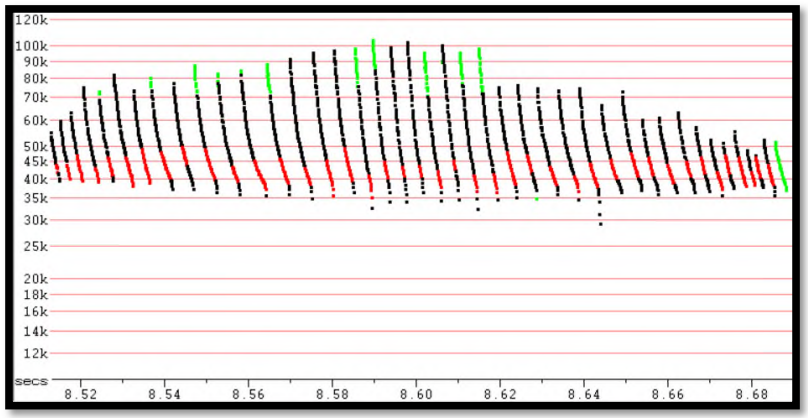
Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
8/16/19	8:54 PM	67.8 F	58.8 F	73 %	South	0.9 mph	2.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	8:59 PM	67.6 F	59.0 F	74 %	SW	0.9 mph	2.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	9:04 PM	67.3 F	58.6 F	74 %	South	0.9 mph	3.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	9:09 PM	66.7 F	58.6 F	75 %	SW	0.9 mph	1.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	9:15 PM	66.6 F	58.8 F	76 %	South	0.9 mph	2.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	9:20 PM	66.4 F	59.0 F	77 %	SE	2.0 mph	3.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	9:25 PM	66.0 F	58.6 F	77 %	SW	2.9 mph	3.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	9:30 PM	65.7 F	58.6 F	78 %	SSW	2.0 mph	3.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	9:35 PM	65.3 F	58.6 F	79 %	SSW	0.9 mph	4.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	9:41 PM	64.9 F	58.6 F	80 %	SSW	2.0 mph	2.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	9:46 PM	64.8 F	58.5 F	80 %	South	2.0 mph	4.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	9:51 PM	64.6 F	58.3 F	80 %	SSW	2.0 mph	3.0 mph	29.62 in	0.00 in	0.00 in
8/16/19	9:56 PM	64.6 F	58.6 F	81 %	South	2.0 mph	3.0 mph	29.62 in	0.00 in	0.00 in
8/16/19	10:01 PM	64.2 F	58.3 F	81 %	South	0.9 mph	4.0 mph	29.62 in	0.00 in	0.00 in
8/16/19	10:06 PM	64.0 F	58.1 F	81 %	South	0.9 mph	2.0 mph	29.62 in	0.00 in	0.00 in
8/16/19	10:12 PM	64.0 F	57.7 F	80 %	South	2.9 mph	3.0 mph	29.62 in	0.00 in	0.00 in
8/16/19	10:17 PM	64.2 F	57.6 F	79 %	SSE	4.0 mph	4.0 mph	29.62 in	0.00 in	0.00 in
8/16/19	10:22 PM	64.6 F	57.9 F	79 %	South	2.0 mph	5.0 mph	29.62 in	0.00 in	0.00 in
8/16/19	10:27 PM	65.1 F	58.1 F	78 %	South	6.0 mph	6.0 mph	29.62 in	0.00 in	0.00 in
8/16/19	10:32 PM	65.5 F	58.5 F	78 %	South	2.9 mph	4.0 mph	29.62 in	0.00 in	0.00 in
8/16/19	10:38 PM	66.0 F	58.6 F	77 %	South	2.0 mph	7.0 mph	29.62 in	0.00 in	0.00 in
8/16/19	10:43 PM	66.7 F	59.0 F	76 %	SSW	2.0 mph	5.0 mph	29.62 in	0.00 in	0.00 in
8/16/19	10:48 PM	66.9 F	59.2 F	76 %	SSW	2.9 mph	6.0 mph	29.62 in	0.00 in	0.00 in
8/16/19	10:53 PM	66.9 F	59.2 F	76 %	South	6.0 mph	6.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	10:58 PM	66.9 F	59.2 F	76 %	South	2.9 mph	5.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	11:03 PM	67.1 F	58.8 F	75 %	SW	4.9 mph	6.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	11:08 PM	67.3 F	59.0 F	75 %	SE	2.9 mph	7.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	11:13 PM	67.3 F	59.0 F	75 %	SSW	2.0 mph	7.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	11:18 PM	67.3 F	58.6 F	74 %	SSW	4.0 mph	6.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	11:23 PM	67.3 F	58.6 F	74 %	SW	6.9 mph	8.0 mph	29.61 in	0.00 in	0.00 in
8/16/19	11:29 PM	67.3 F	58.6 F	74 %	West	8.1 mph	16.0 mph	29.62 in	0.00 in	0.00 in
8/16/19	11:34 PM	67.8 F	58.8 F	73 %	WSW	8.1 mph	9.0 mph	29.63 in	0.00 in	0.00 in
8/16/19	11:39 PM	67.8 F	58.8 F	73 %	SW	6.0 mph	10.0 mph	29.63 in	0.00 in	0.00 in
8/16/19	11:44 PM	68.4 F	58.6 F	71 %	West	8.9 mph	9.0 mph	29.63 in	0.00 in	0.00 in
8/16/19	11:49 PM	68.5 F	59.5 F	73 %	WSW	4.0 mph	7.0 mph	29.64 in	0.00 in	0.00 in
8/16/19	11:54 PM	68.0 F	59.4 F	74 %	West	2.0 mph	3.0 mph	29.63 in	0.00 in	0.00 in
8/16/19	11:59 PM	67.6 F	59.0 F	74 %	West	0.0 mph	2.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	12:05 AM	67.3 F	59.0 F	75 %	West	0.0 mph	1.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	12:10 AM	66.7 F	59.0 F	76 %	West	0.0 mph	1.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	12:15 AM	66.4 F	59.0 F	77 %	West	0.9 mph	2.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	12:20 AM	66.0 F	59.4 F	79 %	West	0.0 mph	0.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	12:25 AM	65.5 F	58.8 F	79 %	West	0.0 mph	0.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	12:31 AM	65.1 F	58.8 F	80 %	SSE	2.0 mph	3.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	12:36 AM	65.1 F	58.1 F	78 %	SSE	0.9 mph	2.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	12:41 AM	65.5 F	58.1 F	77 %	South	2.0 mph	2.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	12:46 AM	65.7 F	58.3 F	77 %	SSE	2.0 mph	3.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	12:51 AM	65.7 F	58.3 F	77 %	SSW	2.0 mph	4.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	12:56 AM	66.2 F	58.1 F	75 %	South	4.9 mph	6.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	1:01 AM	66.4 F	57.9 F	74 %	South	2.9 mph	6.0 mph	29.61 in	0.00 in	0.00 in
8/17/19	1:07 AM	66.4 F	57.9 F	74 %	South	2.0 mph	5.0 mph	29.61 in	0.00 in	0.00 in
8/17/19	1:12 AM	65.8 F	57.7 F	75 %	SSE	2.9 mph	5.0 mph	29.61 in	0.00 in	0.00 in
8/17/19	1:17 AM	65.5 F	57.7 F	76 %	South	4.0 mph	4.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	1:22 AM	65.1 F	57.4 F	76 %	South	0.9 mph	4.0 mph	29.61 in	0.00 in	0.00 in
8/17/19	1:27 AM	64.2 F	57.6 F	79 %	SW	0.9 mph	2.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	1:32 AM	63.7 F	57.4 F	80 %	SW	0.9 mph	2.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	1:37 AM	63.1 F	57.2 F	81 %	SW	0.9 mph	2.0 mph	29.61 in	0.00 in	0.00 in
8/17/19	1:43 AM	62.6 F	57.0 F	82 %	WSW	0.0 mph	1.0 mph	29.61 in	0.00 in	0.00 in

8/17/19	1:48 AM	62.6 F	57.0 F	82 %	South	0.9 mph	1.0 mph	29.61 in	0.00 in	0.00 in
8/17/19	1:53 AM	62.2 F	56.7 F	82 %	SSE	0.9 mph	2.0 mph	29.61 in	0.00 in	0.00 in
8/17/19	1:58 AM	62.4 F	56.8 F	82 %	South	0.9 mph	2.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	2:03 AM	62.4 F	56.8 F	82 %	West	2.0 mph	2.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	2:08 AM	62.6 F	57.0 F	82 %	West	2.0 mph	3.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	2:14 AM	62.6 F	57.0 F	82 %	West	2.0 mph	3.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	2:19 AM	62.6 F	57.0 F	82 %	SW	0.9 mph	2.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	2:24 AM	62.4 F	56.8 F	82 %	WSW	2.0 mph	2.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	2:29 AM	62.1 F	56.8 F	83 %	WSW	0.0 mph	1.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	2:34 AM	61.5 F	56.7 F	84 %	West	0.0 mph	1.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	2:39 AM	61.5 F	57.0 F	85 %	WSW	2.0 mph	3.0 mph	29.61 in	0.00 in	0.00 in
8/17/19	2:44 AM	62.2 F	57.4 F	84 %	WSW	0.0 mph	1.0 mph	29.61 in	0.00 in	0.00 in
8/17/19	2:49 AM	62.6 F	57.0 F	82 %	NW	4.9 mph	6.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	2:55 AM	63.1 F	57.2 F	81 %	NW	4.9 mph	10.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	3:00 AM	63.0 F	57.0 F	81 %	NW	12.1 mph	12.0 mph	29.61 in	0.00 in	0.00 in
8/17/19	3:05 AM	62.8 F	57.2 F	82 %	NNW	11.0 mph	12.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	3:10 AM	62.2 F	57.4 F	84 %	NW	8.1 mph	12.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	3:15 AM	61.9 F	57.4 F	85 %	NNW	12.1 mph	13.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	3:20 AM	61.7 F	57.4 F	86 %	North	10.1 mph	10.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	3:25 AM	61.5 F	57.6 F	87 %	NNW	6.9 mph	10.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	3:30 AM	61.2 F	57.2 F	87 %	NNE	8.1 mph	10.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	3:35 AM	61.2 F	57.6 F	88 %	NNW	6.9 mph	9.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	3:41 AM	61.0 F	57.4 F	88 %	NNW	4.9 mph	9.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	3:46 AM	60.4 F	56.8 F	88 %		4.9 mph	6.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	3:51 AM	60.3 F	57.0 F	89 %		4.0 mph	6.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	3:56 AM	60.1 F	56.8 F	89 %	NNW	4.0 mph	7.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	4:01 AM	59.9 F	56.7 F	89 %	North	6.0 mph	9.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	4:06 AM	59.5 F	56.3 F	89 %	NNE	6.0 mph	7.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	4:11 AM	59.4 F	56.5 F	90 %		4.9 mph	7.0 mph	29.62 in	0.00 in	0.00 in
8/17/19	4:16 AM	59.2 F	56.3 F	90 %	NNW	4.9 mph	9.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	4:21 AM	59.2 F	56.3 F	90 %	NNW	6.9 mph	9.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	4:26 AM	59.2 F	56.3 F	90 %	North	6.0 mph	9.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	4:32 AM	59.2 F	56.3 F	90 %	NW	4.9 mph	7.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	4:37 AM	59.2 F	55.9 F	89 %	NNW	4.9 mph	8.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	4:42 AM	58.8 F	55.9 F	90 %	NNW	6.0 mph	9.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	4:47 AM	58.6 F	55.8 F	90 %	NW	8.1 mph	10.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	4:52 AM	58.6 F	55.8 F	90 %	NNW	6.0 mph	12.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	4:57 AM	58.6 F	55.8 F	90 %	NNW	8.1 mph	9.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	5:02 AM	58.5 F	55.6 F	90 %	NW	6.9 mph	9.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	5:07 AM	58.3 F	55.4 F	90 %	NNW	4.9 mph	8.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	5:12 AM	58.1 F	55.2 F	90 %	NNW	6.0 mph	9.0 mph	29.64 in	0.00 in	0.00 in
8/17/19	5:17 AM	57.9 F	55.0 F	90 %	NNW	8.1 mph	9.0 mph	29.64 in	0.00 in	0.00 in
8/17/19	5:22 AM	57.9 F	55.0 F	90 %		6.9 mph	9.0 mph	29.64 in	0.00 in	0.00 in
8/17/19	5:27 AM	57.9 F	55.0 F	90 %	NNW	6.0 mph	7.0 mph	29.64 in	0.00 in	0.00 in
8/17/19	5:33 AM	57.7 F	54.9 F	90 %	NNW	4.0 mph	7.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	5:38 AM	57.6 F	54.7 F	90 %	NNW	4.0 mph	8.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	5:43 AM	57.6 F	54.7 F	90 %	NW	4.0 mph	7.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	5:48 AM	57.4 F	54.9 F	91 %	NNW	6.0 mph	8.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	5:53 AM	57.2 F	54.7 F	91 %	NNW	4.0 mph	6.0 mph	29.64 in	0.00 in	0.00 in
8/17/19	5:58 AM	57.0 F	54.5 F	91 %	North	4.0 mph	7.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	6:03 AM	57.2 F	54.7 F	91 %	NNW	2.9 mph	7.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	6:08 AM	57.6 F	55.0 F	91 %	NNW	2.0 mph	6.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	6:13 AM	57.6 F	55.0 F	91 %	NE	0.0 mph	3.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	6:18 AM	57.7 F	55.2 F	91 %	NNE	0.0 mph	6.0 mph	29.63 in	0.00 in	0.00 in
8/17/19	6:23 AM	57.6 F	55.0 F	91 %	NNE	2.0 mph	2.0 mph	29.64 in	0.00 in	0.00 in
8/17/19	6:29 AM	57.6 F	55.0 F	91 %	NNW	0.9 mph	3.0 mph	29.64 in	0.00 in	0.00 in
8/17/19	6:34 AM	57.6 F	55.0 F	91 %	North	2.9 mph	5.0 mph	29.64 in	0.00 in	0.00 in
8/17/19	6:39 AM	57.6 F	55.0 F	91 %	NNW	2.0 mph	5.0 mph	29.64 in	0.00 in	0.00 in
8/17/19	6:44 AM	57.6 F	55.0 F	91 %	NNW	2.0 mph	7.0 mph	29.64 in	0.00 in	0.00 in
8/17/19	6:49 AM	57.6 F	55.0 F	91 %	North	0.9 mph	5.0 mph	29.64 in	0.00 in	0.00 in

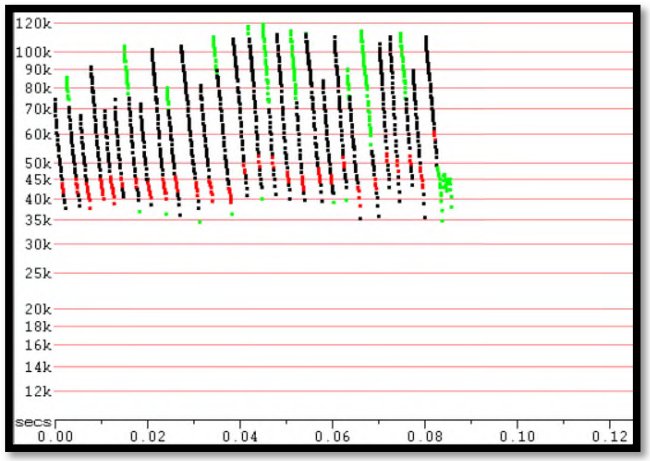
Appendix M. Representative Bat Species Calls



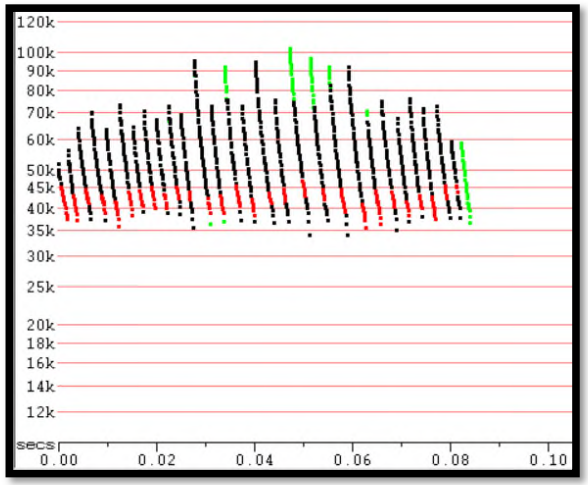
Appendix M1. Call screen of potential northern long-eared bat call from site 6a reclassified as a big brown bat by qualitative analysis.



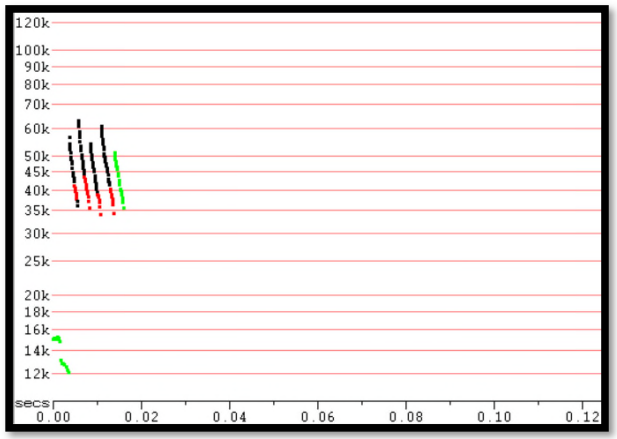
Appendix M2. Call screen of potential northern long-eared bat call from site 5b reclassified as a little brown bat by qualitative analysis.



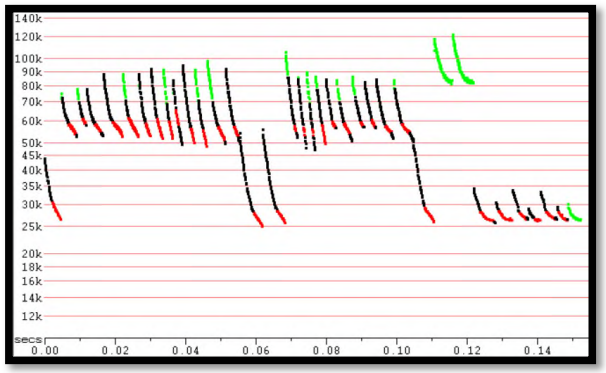
Appendix M3. Call screen of potential northern long-eared bat call from site 4b confirmed as a northern long-eared bat by qualitative analysis.



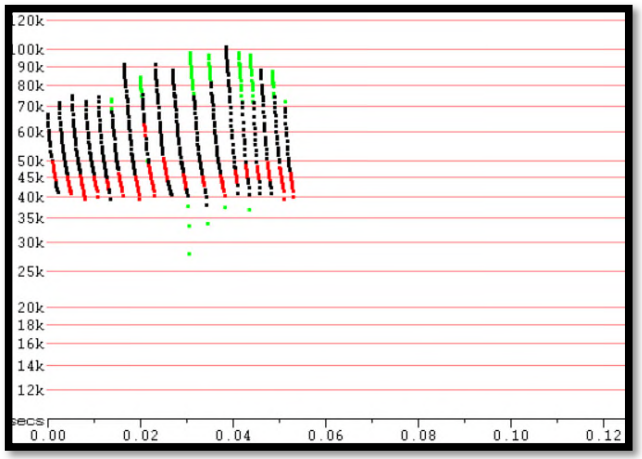
Appendix M4. Call screen of potential northern long-eared bat call from site 5b confirmed as a northern long-eared bat by qualitative analysis.



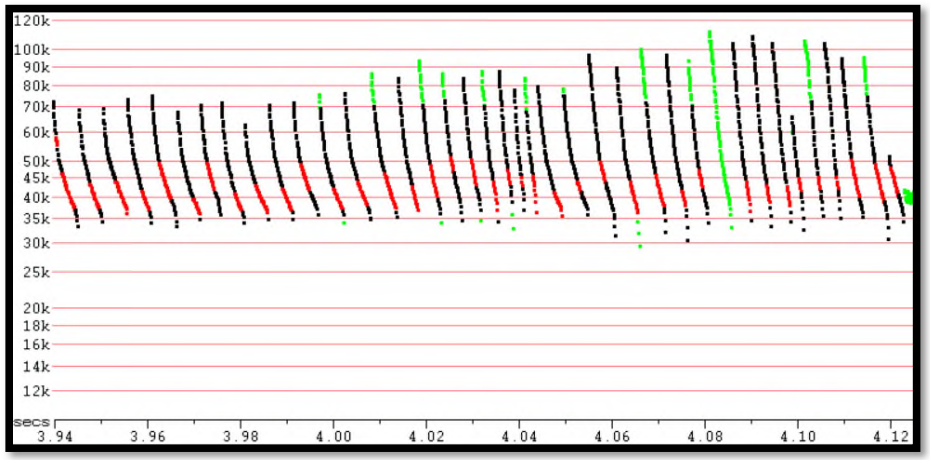
Appendix M5. Call screen of potential northern long-eared bat call from site 4b reclassified as a high frequency unknown by qualitative analysis.



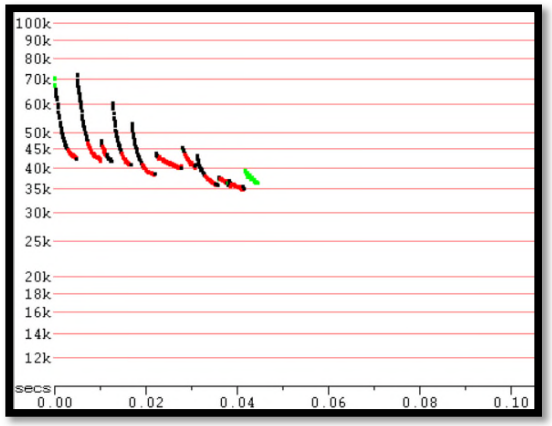
Appendix M6. Call screen of potential northern long-eared bat call from site 4b reclassified as a low frequency unknown by qualitative analysis. The detector is recording the second and third harmonics of the fundamental frequency and Kaleidoscope is identifying those harmonic calls as northern long-eared bats because of the high frequency components. The gaps in the sequence of lower frequency calls are instances when the second and third harmonics are more inten se and the detector is recording those calls instead of the fundamental frequency.



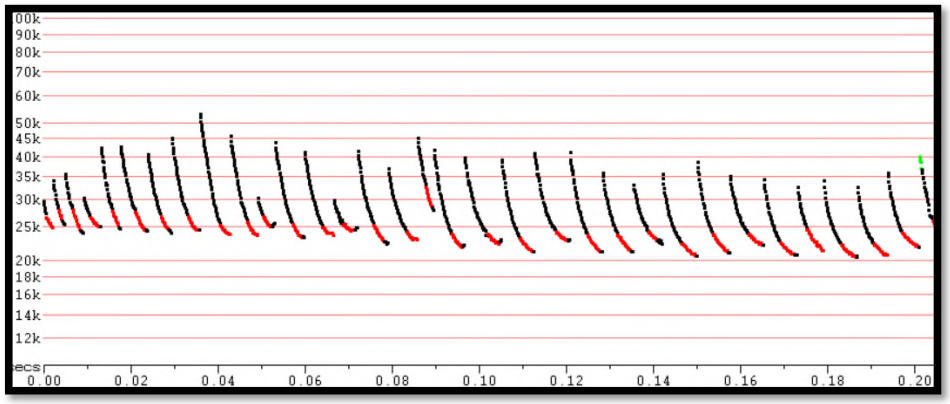
Appendix M7. Call screen of potential northern long-eared bat call from site 6a reclassified as an unknown *Myotis* species call by qualitative analysis.



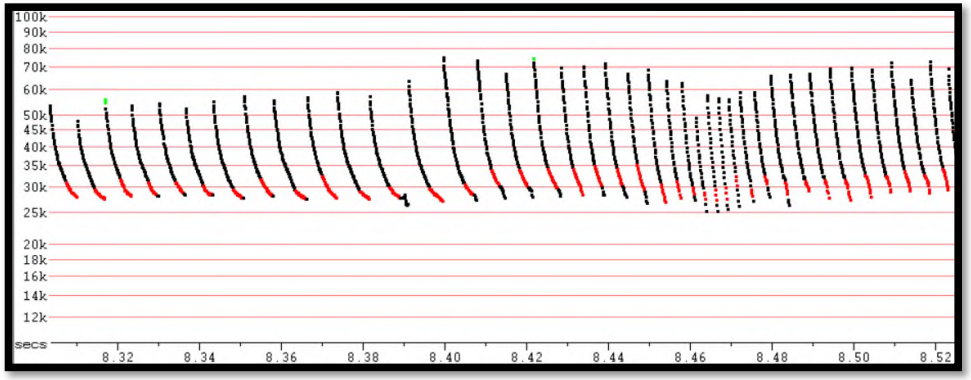
Appendix M8. Call screen of little brown bat call from site 6a identified by qualitative analysis.



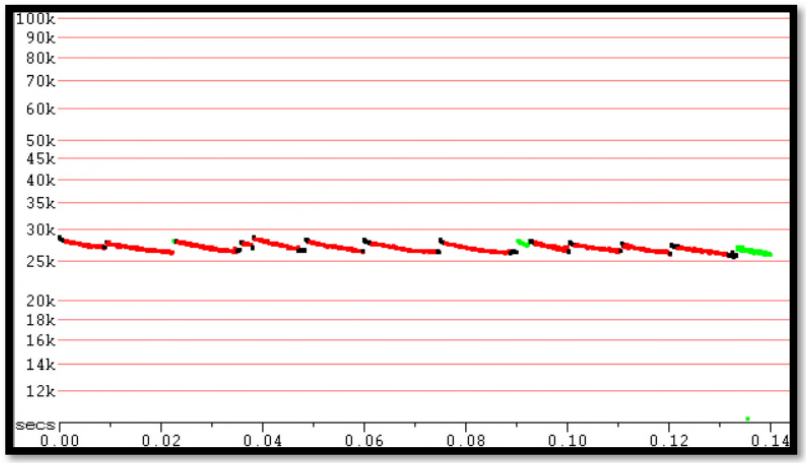
Appendix M9. Call screen of an eastern red bat call from site 5b identified by qualitative analysis.



Appendix M10. Call screen of a hoary bat call from site 6a identified by qualitative analysis.



Appendix M11. Call screen of a big brown bat call from site 5b identified by qualitative analysis.



Appendix M12. Call screen of a silver-haired bat call from site 5b identified by qualitative analysis.

Appendix B9. Northern Long-Eared Bat Presence/Absence Acoustic Surveys (2020)

Northern Long-Eared Bat Presence/Absence Surveys

Oliver Wind IV Project

Oliver and Mercer Counties, North Dakota

Surveys Conducted July 22 – July 28, 2020



Prepared for:

Oliver Wind IV, LLC

Prepared by:

Julia Wilson, Kristina Hammond, Kevin Murray, and Clayton Derby

Western EcoSystems Technology, Inc.
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Bismarck, North Dakota

Report Revised: August 29, 2023

WEST

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EXECUTIVE SUMMARY

Oliver Wind IV, LLC (Company), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC, is developing the Oliver Wind IV Project (Project) located in Oliver County with the associated transmission line extending into Mercer County. The Company contracted Western EcoSystems Technology, Inc. (WEST) to conduct summer presence/absence acoustic surveys for the federally threatened northern long-eared bat (*Myotis septentrionalis*; NLEB) at the Project. WEST employed acoustic surveys to determine whether NLEB is present or absent within the Study Area during the summer maternity season (May 15 – August 15).

The US Fish and Wildlife Service (USFWS) 2020 *Range-Wide Indiana Bat Survey Guidelines* (Guidelines), which also apply to the NLEB, recommends a minimum of one acoustic survey site (site) consisting of two acoustic detector locations (detector locations) for every 49.8 hectares (ha; 123.0 acres [ac]) of suitable summer habitat for non-linear projects, with each detector location deployed for four nights to total eight detector nights per site. For linear projects, the Guidelines recommend a minimum of two detector nights for each 1.0-kilometer (km; 0.6-miles [mi]) segment of suitable summer habitat. For the purposes of this NLEB presence/absence survey, the transmission portion of the Project was treated as a linear "project" and the power generating portion of the project was treated as a "non-linear" project (Study Area, Figure 1).

Sites and detector locations within the Study Area were selected by creating 1.0-km buffers around the turbine layout and the portion of the T-Line encompassed therein. The linear portion of the Project where surveys were conducted (i.e., T-Line route) is defined as the 20.0-km (12.4-mi) long T-Line and a 30.5-meters (m; 100.0-feet [ft]) buffer on each side (60.9 m [200.0 ft] total) of the centerline. A total of 342.0 ha (845.1 ac) of potentially suitable NLEB summer habitat were identified through desktop analysis within the Study Area, resulting in 14 detector locations (corresponding to seven sites) proposed within the Study Area as per the 2020 Guidelines. Five 1.0-km segments with potential NLEB summer habitat were identified along the T-Line route, resulting in five detector locations (corresponding to five survey sites) proposed along the T-Line route as per the Guidelines.

A federally permitted bat biologist conducted acoustic surveys July 22 – July 28, 2020, for a total of 59 detector-nights within the Study Area and 14 detector-nights along the T-Line route, following methods described in the current Guidelines. Kaleidoscope identified 27 call files as potential NLEB calls. Upon qualitative review, four call files at one detector location 7B were confirmed as NLEB calls. However, little brown bats (*Myotis lucifugus*) and western long-eared bats (*Myotis evotis*), which have similar calls to NLEB, were also present at detector location 7B and it is possible that the calls identified as NLEB were false positives. No follow-up mist-net or telemetry surveys were conducted but acquiring capture data (using mist-net surveys) are recommended in order to reduce the uncertainty associated with the 2020 acoustic data.

STUDY PARTICIPANTS

Clayton Derby	Project Manager; Senior Reviewer
Kevin Murray	Qualitative Acoustic Analyst; Senior Bat Biologist Review
Julia Wilson	Permitted Bat Biologist; Report Writer
Kristina Hammond-Rendon	Permitted Bat Biologist
Alex Brazeal	Acoustic Technician
Terri Thorn	GIS Specialist
Jolie Blevins	Bat Project Coordinator; Data Manager
Carissa Goodman	Technical Editor
Sofía Agudelo	Senior Technical Editor; Reviewer

REPORT REFERENCE

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[1] The Appendices include documents referring to the Red Butte Wind Farm. The Project name was changed to Oliver Wind IV Project in 2022, making the information in the Appendices applicable to the Oliver Wind IV Project despite references to the Red Butt Wind Farm.

BACKGROUND AND PROJECT OVERVIEW

Oliver Wind IV, LLC (Oliver Wind IV), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC (NextEra), is developing the Oliver Wind IV Energy Center (WEC) and Transmission Line (T-Line), collectively known as the Oliver Wind IV Project (Project), in Oliver and Mercer Counties, North Dakota (Figure 1). Oliver Wind IV contracted Western EcoSystems Technology, Inc. (WEST) to conduct presence/absence surveys for the federally threatened northern long-eared bat (*Myotis septentrionalis*; NLEB; US Fish and Wildlife Service [USFWS] 2015) during the summer maternity season (May 15 – August 15) within the Study Area.

Based on North Dakota Game and Fish Department (NDGFD) records for North Dakota, NLEB is considered rare in the state (Dyke et al. 2015, NDGFD 2019). Recent research by North Dakota State University found that presence is unlikely throughout North Dakota except potentially in Badlands areas in the extreme western part of the state (Nelson et al. 2015; Dr. E. Gillam, North Dakota State University, pers. com. May 16, 2019). The Project is approximately 85 miles east the Badlands area. However, four NLEB were captured in August 2019 within the Study Area for the Project Study Area (Wilson et al. 2023). The objective of the 2020 surveys was to determine if NLEB are present within the new 2020 Study Area (Figure 1) located to the north and west of the sites where the four NLEB's were captured in 2019.

METHODS

All surveys followed methods described within the USFWS *Range-Wide Indiana Bat Summer Survey Guidelines* (Guidelines), which also apply to the NLEB (USFWS 2020). The Guidelines for surveys recommend: 1) desktop habitat assessment, 2) presence/probable absence acoustic or mist-net surveys, and 3) telemetry surveys (if needed). A study plan for the Project was provided to the USFWS on June 12, 2020, and no response was received.

Habitat Assessment and Survey Effort

For non-linear projects, the Guidelines specify a minimum survey effort of one acoustic survey site (site) consisting of two acoustic detector locations (detector locations) for every 49.8 hectares (ha; 123.0 acres [ac]) of suitable summer habitat. Each detector location should be deployed for four nights to total eight detector nights per site (USFWS 2020). For linear projects, the Guidelines recommend a minimum of two detector nights for each 1.0-kilometer (km; 0.6-mile [mi]) segment that contains suitable summer NLEB habitat. The Guidelines define suitable NLEB habitat as any forest (i.e., deciduous, coniferous, mixed) or forested landscape feature (e.g., woody wetlands, forested riparian areas, shelterbelts). For the purposes of this NLEB presence/absence survey, the transmission portion of the Project was treated as a linear "project" and the power generating portion of the project was treated as a "non-linear" project (Study Area; Figure 1).

Sites and detector locations within the Study Area were selected by creating 1.0-km buffers around the current turbine layout and the portion of the T-Line encompassed therein. A federally

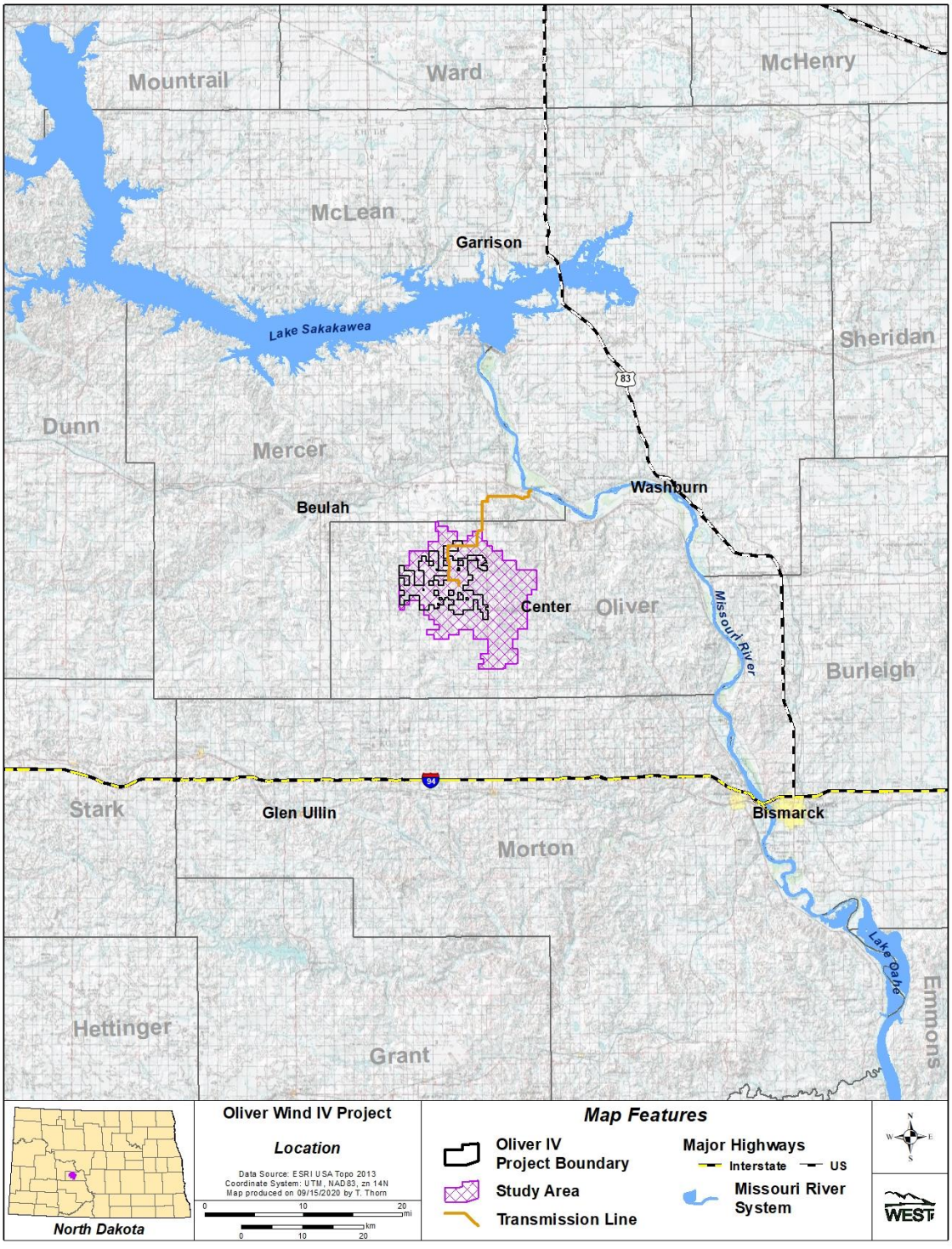


Figure 1. Location of the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota.

permitted bat biologist (K. Hammond-Rendon) conducted a desktop analysis using a combination of manually digitized forest areas and land cover data (National Land Cover Database 2016). A total of 342.0 ha (845.1 ac) of potentially suitable NLEB summer habitat were identified within the Study Area, resulting in 14 detector locations (corresponding to seven sites) proposed for acoustic surveys within the Study Area as per the Guidelines. Two alternative detector locations were identified if the aforementioned sites were deemed undesirable due to site-specific conditions within the Study Area. Another federally permitted bat biologist (J. Wilson) micro-sited these detector locations in the field based on available habitat and landscape features, and deployed acoustic detectors within the Study Area from July 22 – July 27, 2020. All detectors within the Study Area functioned for at least four nights.

The T-Line runs 20.0 km (12.4 mi) to the Stanton Station near the Missouri River; the linear portion of the Project where surveys were conducted (i.e., T-Line route) is defined as the T-Line and a 30.5-meters (m; 100.0-feet [ft]) buffer on each side (60.9 m [200.0 ft] total) of the centerline. A federally permitted bat biologist (K. Hammond-Rendon) identified five 1.0-km segments along the T-Line route that contained suitable forested habitat, resulting in five detector locations (corresponding to five sites) proposed along the T-Line route as per the Guidelines. Another federally permitted bat biologist (J. Wilson) deployed five acoustic detectors within the T-Line route, based on available habitat and landscape features, from July 24 – July 28, 2020. All detectors within the T-Line route functioned for at least two nights.

Detectors were deployed in an efficient order, with the detectors in the Study Area (minimum of four detector nights) deployed first, followed by deployment of the T-Line route detectors (minimum of two detector nights). This meant the minimum required survey nights were completed simultaneously at some locations, such that it was not possible to pick up every detector immediately following the last valid detector-night. As a result, three detectors were deployed for five nights and 11 detectors were deployed for four nights in the Study Area, totaling 59 detector-nights. This level of effort exceeded the minimum required survey effort recommended for non-linear projects (USFWS 2020). Upon completion of the minimum required two detector nights for the T-Line route, it was not possible to pick up all detectors within the following day. As a result, four detectors were deployed for three nights, and one detector was deployed for the minimum of two nights, resulting in a total of 14 detector-nights for the T-Line route. This level of effort exceeded the minimum survey effort recommended for linear projects (USFWS 2020).

Acoustic Surveys

Acoustic surveys were conducted for the Project from July 22 – July 28, 2020, using Song Meter full-spectrum ultrasonic detectors (SM4; Wildlife Acoustics, Inc., Maynard, Massachusetts). Acoustic monitoring began before sunset and continued for the entire night (1800 – 0800 hours). If weather conditions such as persistent rain (for 30 or more minutes [min]), strong sustained winds (greater than 14.5 km [9.0 mi] per hour for 30 or more min), or cold temperatures (below 10 degrees Celsius [50 degrees Fahrenheit] for 30 or more min) occurred, then the location subjected to those conditions was surveyed for an additional night. Weather conditions were

checked with KNDHAZEN8 weather station, and weather data are available on Weather Underground's Wundermap (Weather Underground 2020).

Omnidirectional SMM-U2 detector microphones were positioned at least 3.0 m (9.8 ft) off the ground, oriented perpendicularly to the ground. Detectors were set up at least 6.0 m (19.7 ft) away from tall vegetation. No weatherproofing was used. For each acoustic detector, the following data were recorded: date, start and end time; weather; detector orientation; site and detector location description, coordinates, tree species composition, stand age, and vegetation community type. Representative photographs of each detector location were catalogued, and coordinates were recorded with a Global Position System unit with an accuracy of less than 6.0 m (19.7 ft).

Standard settings used for each SM4 detector are shown in Figure 2. The biologist verified that detectors were functioning properly by using internal SM4 microphone (mic) calibration and checking the status diagnostic screens. These tools allowed the field crew to verify that the mic was connected and functioning, that data cards were installed, that battery voltage was sufficient, and that the unit was programmed properly. In addition, the detector summary and diagnostic files were saved and used to verify proper functioning of detectors.

Full-spectrum bat call files from all nights were converted to zero-crossing files and identified using a USFWS-approved automated bat call identification program (Kaleidoscope Pro® [Kaleidoscope], version 5.1.0; Wildlife Acoustics, Inc. 2020). The Bats of North America classifier 5.1.0 was used to generate a list of species identified and a list of nightly maximum likelihood estimator (MLE) p-values for each species with the potential to occur at the Project. The following species were included in the Kaleidoscope model: big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), western small-footed bat (*Myotis ciliolabrum*), western long-eared bat, little brown bat, NLEB, and long-legged bat (*Myotis volans*). The minimum number of pulses was set to "2", and the bat classifier setting was set to "0 Balanced (Neutral)". Defaults were used for all other software settings and no filters were applied to the data set.

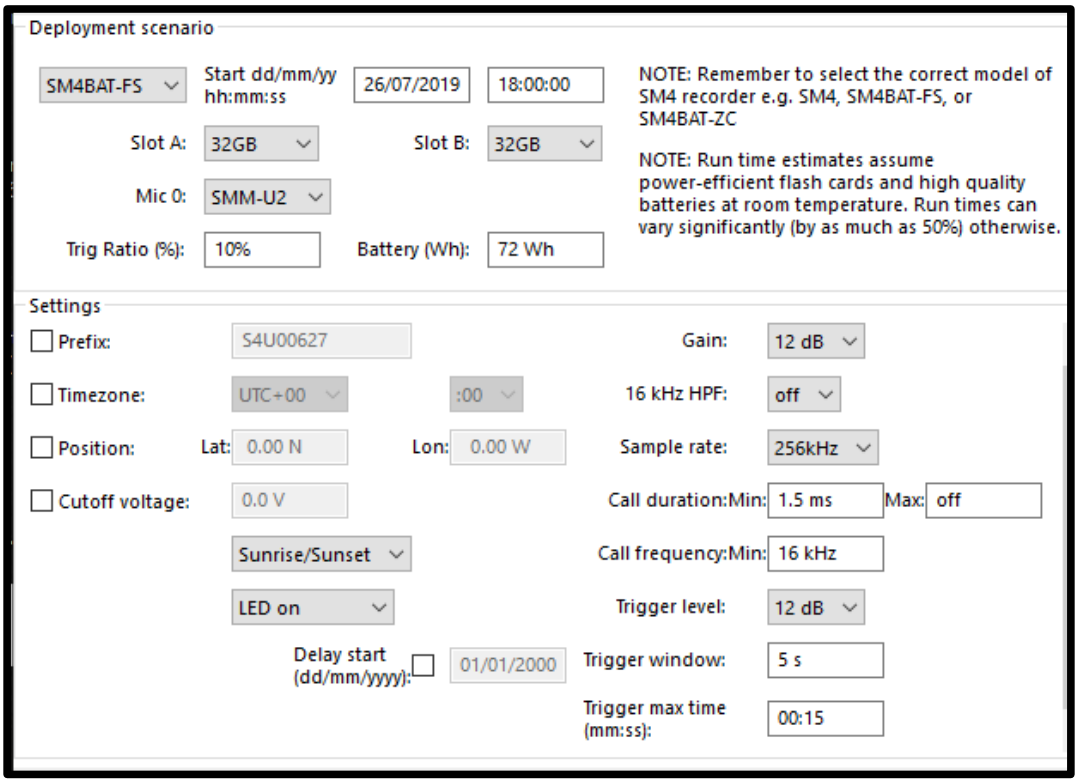


Figure 2. Standard settings for Song Meter 4 full-spectrum ultrasonic detectors used on the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota.

Per the Guidelines, all calls from each night that Kaleidoscope considered as likely to be NLEB (MLE p-value less than 0.05) were qualitatively reviewed by a qualified biologist (Dr. K. Murray) with extensive acoustic identification experience (Appendix A). All calls Kaleidoscope identified as NLEB, regardless of the MLE p-value, were also examined and verified by the qualified biologist. Bat calls were identified by comparing the call characteristics to calls from a known library and published echolocation call parameters for bat species in the eastern US (Murray et al. 2001 [p. 732], Britzke et al. 2011 [Table S1]). All call sequences not characteristic of NLEB, or sequences produced by species other bat species, or of insufficient quality, were reclassified.

RESULTS

Fourteen detector locations (seven sites) within the Study Area and five detector locations (five sites) along the T-Line route were surveyed during NLEB presence/absence acoustic surveys conducted at the Project in the summer of 2020. Due to limited available habitat observed at detector location 3B during micro-siting, one of the alternate detector locations (alt2) was used as a replacement. Detector locations and site descriptions are in Figure 3 and Table 1. Maps, photographs, datasheets, and weather verification tables are included in Appendices B, C, D, and E, respectively. The weather during all nights was considered valid (Appendix E) and the acoustic detectors functioned properly for the entire survey period, totaling 73 valid detector-nights across

the Project. Kaleidoscope outputs are in Appendix F; summaries of the qualitative analyses are in Appendix G; and spectrograms of representative bat calls are in Appendix H.

Kaleidoscope recognized a total of 9,464 bat calls and identified 6,881 of all calls to species (72.7%; Table 1) during acoustic surveys conducted at the Project. Hoary bats were the most commonly identified species (1,820 calls [19.2%]), followed by silver-haired bats (1,395 calls [14.7%]), little brown bats (1,159 calls [12.2%]), eastern red bats (1,137 calls [12.0%]), big brown bats (1,021 calls [10.8%]), western small-footed bat (187 calls [2.0%]), long-legged bat (79 calls [0.8%]), western long-eared bat (56 calls [0.6%]), and NLEB (27 calls [0.3%]; Table 2). The remaining 2,583 calls (27.3%) were not identifiable to species by Kaleidoscope. Bat echolocation calls have a high level of variation, causing overlap in call traits among species. Therefore, call identification is imperfect, and each identification has an associated error rate (USFWS 2013). In addition, the error rates associated with Kaleidoscope identifications of unknown bat calls have not been characterized. For these reasons, the results of the Kaleidoscope analysis can be misleading and should be viewed with caution.

Kaleidoscope identified 26 call files as potential NLEB at three detector locations within the Study Area (2B, 4A, and 7B) and one call file at one detector location (T5) along the T-Line route (Table 2; Appendix F). The MLE p-values for NLEB presence met Guideline criteria ($p < 0.05$) on one night at detector location 7B (Appendix F). A total of four calls at detector location 7B were confirmed as NLEB by the qualitative review of the calls, of which three occurred on July 22 and one on July 23, 2020 (Appendix G). Other potential NLEB calls identified by Kaleidoscope within the Study Area were reclassified as little brown bats, western long-eared bats, hoary bats, and big brown bats by qualitative call analyses. The potential NLEB call identified by Kaleidoscope at detector location T5 along the T-Line route was reclassified as an unknown *Myotis* sp. Thus, no NLEB calls were confirmed in the T-Line route, which is located 5.8 km (3.6 mi) north of where NLEB were captured in mist-nets in 2019 (Wilson et al. 2019).

Although four NLEB calls were confirmed at detector location 7B, there was a higher than normal potential for NLEB false positives at this location due to a barn in the vicinity that was likely being used as a roost by little brown bats and western long-eared bats. Both species can emit calls that resemble NLEB and may do so more often when near a roost or when flying in the presence of conspecifics, making call attributes (slope and duration) difficult to differentially distinguish to species level. These situations are best addressed with mist-net surveys or telemetry studies to resolve the uncertainty, but mist-net or telemetry surveys were not conducted as part of the 2020 surveys.

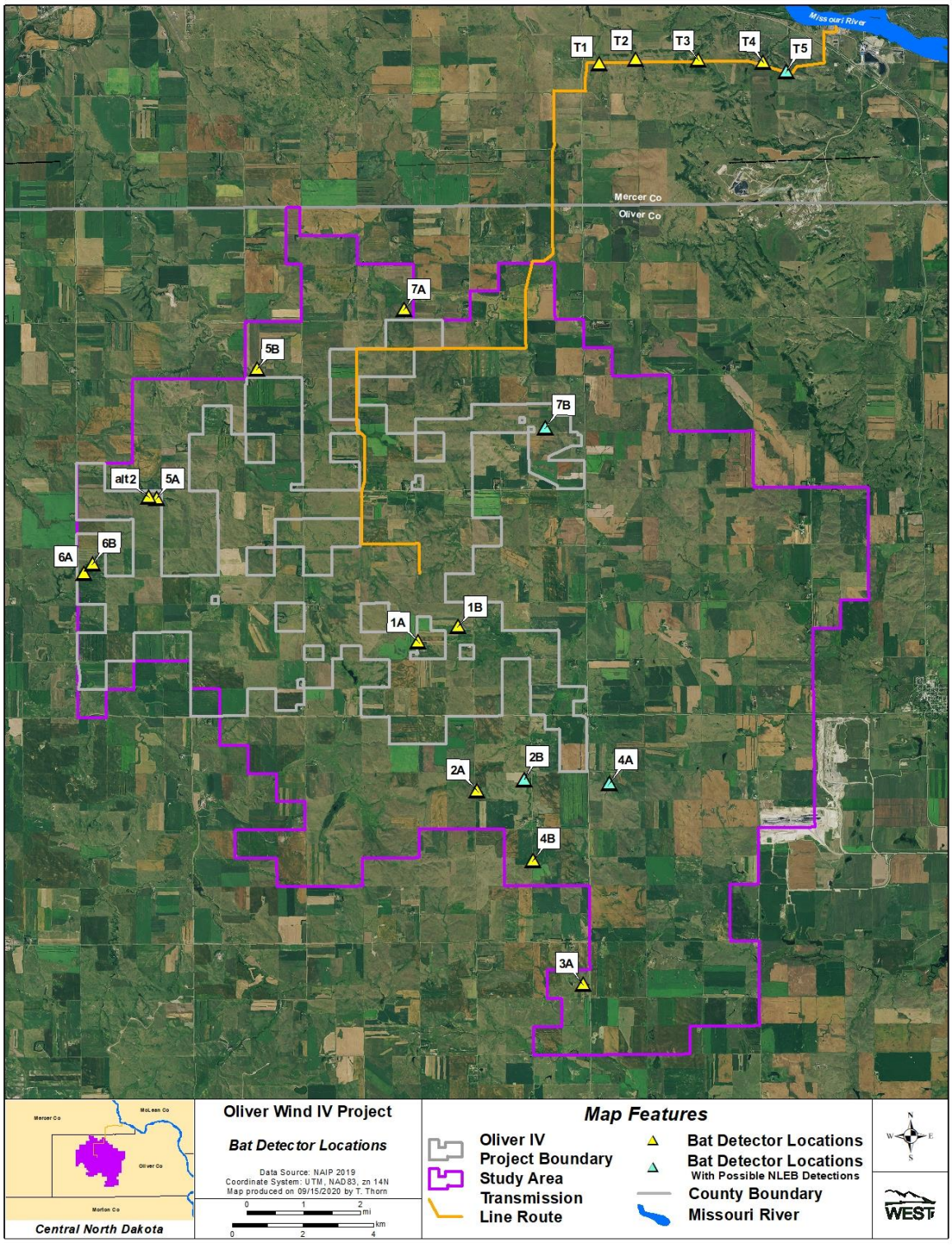


Figure 3. Detector locations for the northern long-eared (NLEB) bat presence/absence acoustic surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020.

Table 1. Detector location coordinates, descriptions, and results of Kaleidoscope[1] identification software from valid and invalid survey nights at the Oliver Wind IV Project and Study Area Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020.

Detector Location ID	Latitude[2]	Longitude[2]	Description	Bat Calls Identified	Total Bat Calls	Valid Detector Nights	Invalid Detector Nights	Bat Calls per Detector Night
1A	47.1304	-101.4892	Forest edge	62	85	4	0	21.3
1B	47.1342	-101.4743	Forest edge	122	167	4	0	41.8
2A	47.0922	-101.4676	Forest edge	1,180	1,461	4	0	365.3
2B	47.0949	-101.4500	Forest edge	86	145	5	0	29.0
3A	47.0426	-101.4286	Forest edge	185	296	5	0	59.2
alt2	47.1677	-101.5897	Creek/riparian	272	385	4	0	96.3
4A	47.0938	-101.4181	Bottomland forest	294	506	5	0	101.2
4B	47.0741	-101.4468	Forest edge	19	32	4	0	8.0
5A	47.1674	-101.5867	Pond and Forest	608	816	4	0	204.0
5B	47.2002	-101.5488	Pond and Forest	306	403	4	0	100.8
6A	47.1482	-101.6140	Creek/riparian	551	688	4	0	172.0
6B	47.1507	-101.6109	Creek/riparian	60	104	4	0	26.0
7A	47.2153	-101.4936	Forest edge	198	280	4	0	70.0
7B	47.1847	-101.4411	Upland forest	957	1,697	4	0	424.3
T1	47.2777	-101.4200	Creek/riparian	221	287	3	0	95.7
T2	47.2786	-101.4062	Pond and Forest	993	1,184	3	0	394.7
T3	47.2783	-101.3829	Bottomland forest	304	373	2	0	186.5
T4	47.2776	-101.3586	Bottomland forest	226	274	3	0	91.3
T5	47.2752	-101.3499	Forest edge	237	281	3	0	93.7
Totals				**6,881**	**9,464**	**73**	**0**	**129.6**

1. Number of calls that were identified to species by Kaleidoscope Pro® software.

2. Coordinate system and datum: Universal Transverse Mercator North American Datum 1983, Zone 14.

Table 2. Bat calls identified by Kaleidoscope[1] at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020. Numbers in parentheses indicate number of northern long-eared bat calls confirmed by qualitative analysis.

Detector Location ID	EPFU	LABO	LACI	LANO	MYCI	MYEV	MYLU	MYSE	MYVO	NOID
1A	17	19	2	3	7	0	10	0	4	23
1B	20	23	55	15	2	1	6	0	0	45
2A	40	150	901	29	16	0	40	0	4	281
2B	19	12	8	14	4	0	22	1 (0)	6	59
3A	22	55	11	11	11	0	56	0	19	111
alt2	102	69	32	20	4	1	40	0	4	113
4A	27	45	100	37	26	0	54	1 (0)	4	212
4B	7	3	0	2	1	0	6	0	0	13
5A	113	149	123	31	24	0	161	0	7	208
5B	31	33	10	19	11	1	200	0	1	97
6A	12	432	29	20	29	2	26	0	1	137
6B	10	14	24	4	2	0	5	0	1	44
7A	23	24	104	14	5	0	12	0	16	82
7B	82	14	296	59	30	44	398	24 (4)	10	740
T1	60	26	22	94	3	0	14	0	2	66
T2	220	31	60	599	4	2	77	0	0	191
T3	78	11	19	179	5	2	10	0	0	69
T4	61	16	13	127	1	3	5	0	0	48
T5	77	11	11	118	2	0	17	1 (0)	0	44
Totals	**1,021**	**1,137**	**1,820**	**1,395**	**187**	**56**	**1,159**	**27**	**79**	**2,583**
	10.8%	**12.0%**	**19.2%**	**14.7%**	**2.0%**	**0.6%**	**12.2%**	**0.3%**	**0.8%**	**27.3%**

[1.] Kaleidoskope Pro® Version 5.1.0

EPFU = big brown bat (*Eptesicus fuscus*); LABO = eastern red bat (*Lasiurus borealis*); LACI = hoary bat (*Lasiurus cinereus*); LANO = silver-haired bat (*Lasionycteris noctivagans*); MYCI = western small-footed bat (*Myotis ciliolabrum*); MYEV = western long-eared bat (*Myotis evotis*); MYLU = little brown bat (*Myotis lucifugus*); MYSE = NLEB, northern long-eared bat (*Myotis septentrionalis*); MYVO = long-legged bat (*Myotis volans*); NOID = unknown or no identification.

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Appendix A. Resume of Acoustic Analyst for the Northern Long-Eared Bat Presence/Absence Acoustic Surveys at the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020

Kevin Murray, Ph.D., *Consulting Ecologist*

PROFESSIONAL EXPERIENCE

2010-Present	*Consulting Ecologist and Project Manager,* WEST, Inc., Bloomington, Indiana
2009	*Lead Biological Science Technician,* National Park Service, Ozark Scenic Riverways
2006-2008	*Research Assistant*, University of Miami, Coral Gables, FL
2002-2006	*Doctoral Fellow,* University of Miami, Coral Gables, FL
2001-2002	*Lead Biological Science Technician,* Missouri State University, Springfield, Missouri
2000	*Biological Science Technician,* Oregon State University, Corvallis, Oregon
1998-2000	*Biological Science Technician,* Missouri State University, Springfield, Missouri

EDUCATION

Ph.D.
University of Miami
Coral Gables, Florida
2008
Biology

M.S.
Missouri State University
Springfield, Missouri
2001
Biology

B.S.
Missouri State University
Springfield, Missouri
1998
Biology

SCIENTIFIC ORGANIZATION MEMBERSHIPS

American Society of Mammalogists

North American Society for Bat Research

Midwest Bat Working Group

SPECIALTY AREAS

Dr. Murray has extensive research experience in bat ecology. He has experience in capture and identification of over fifteen species of bats in North America, including work with endangered species (*Myotis sodalis*, *Myotis grisescens*, *Myotis septentrionalis* [proposed]). He has managed projects and conducted bat surveys all over the eastern U.S. including numerous Missouri projects.

Dr. Murray has 18 years of experience in acoustic identification of bat echolocation calls in North America, Central America, and the Caribbean, including extensive experience with *M. septentrionalis*, *M. sodalis* and *M. grisescens*.

Dr. Murray has conducted 5 acoustic ID workshops (1998 to present) training individuals from federal and state agencies, universities, and consulting companies.

Dr. Murray has 19 publications, including 17 on bat research and 10 on bat echolocation, and numerous presentations on bat research at scientific conferences.

SELECTED PROFESSIONAL PUBLICATIONS

Clement, M.J., **K.L. Murray**, D.I. Solick, and J.C. Gruver. 2014. The effect of call libraries and acoustic filters on the identification of bat echolocation. Ecology and Evolution 4:3482-3493.

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Robbins, L.W., **K.L. Murray**, and P. McKenzie. 2008. Evaluating the effectiveness of the standard mist netting protocol for the endangered Indiana bat (*Myotis sodalis*). Northeastern Naturalist.

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HONORS AND AWARDS

National Science Foundation Education Fellowship, University of Miami, 2008

National Geographic Society Committee for Research and Exploration Grant (Biology), 2006

University Doctoral Fellowship, University of Miami, 2002-2005

Distinguished Thesis Award, Midwestern Association of Graduate Schools, 2002

Basil and Joann Boritzki Award for Outstanding Graduate Work, Missouri State University, 2000.

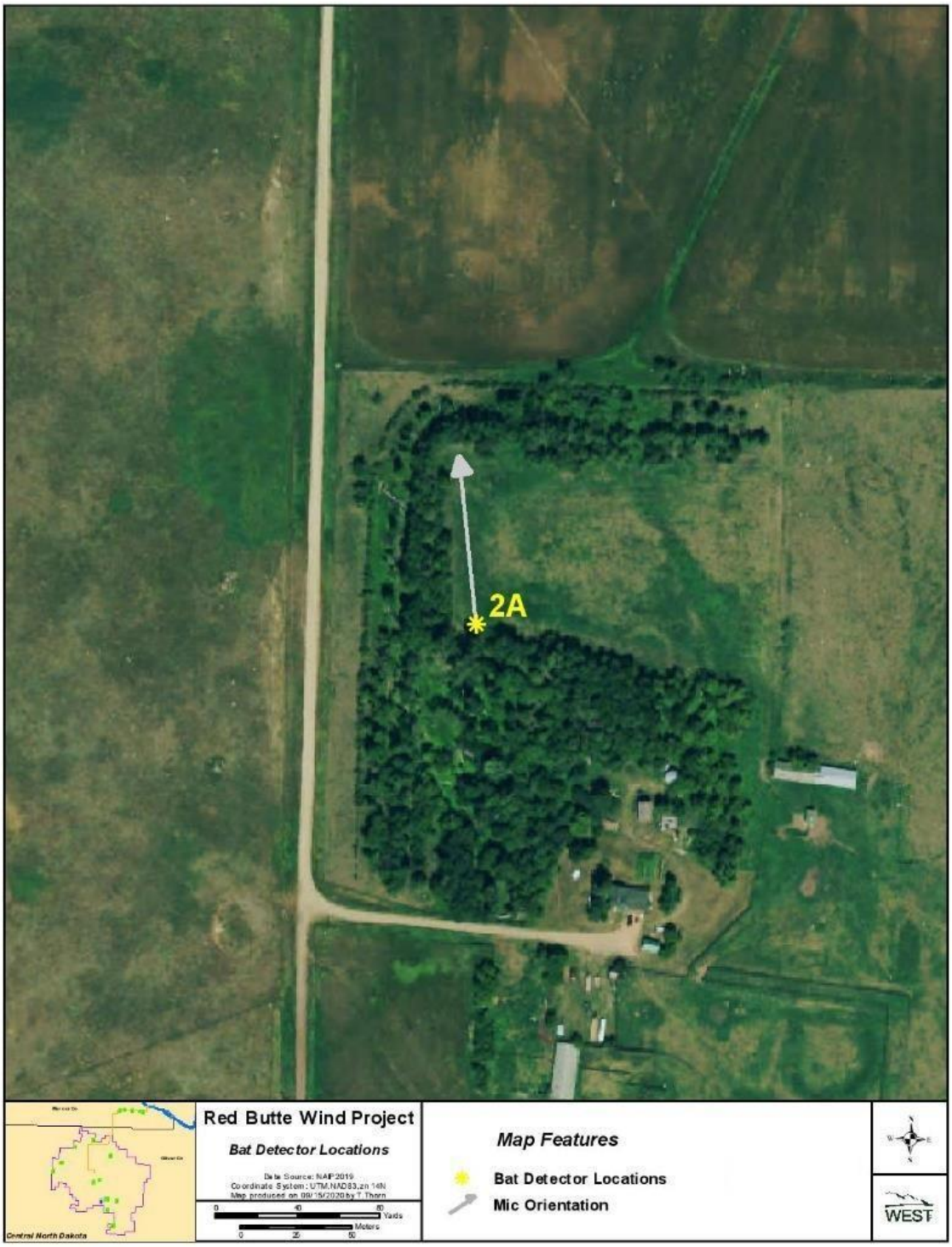
Appendix B. Maps of Detector Locations for the Northern Long-Eared Bat Presence/Absence Acoustic Surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020



Appendix B1. Map of acoustic detector location 1A at the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota.



Appendix B2. Map of acoustic detector location 1B at the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota.



Appendix B3. Map of acoustic detector location 2A at the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota.



Appendix B4. Map of acoustic detector location 2B at the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota.



Appendix B5. Map of acoustic detector location 3A at the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota.



Appendix B6. Map of acoustic detector location 4A at the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota.



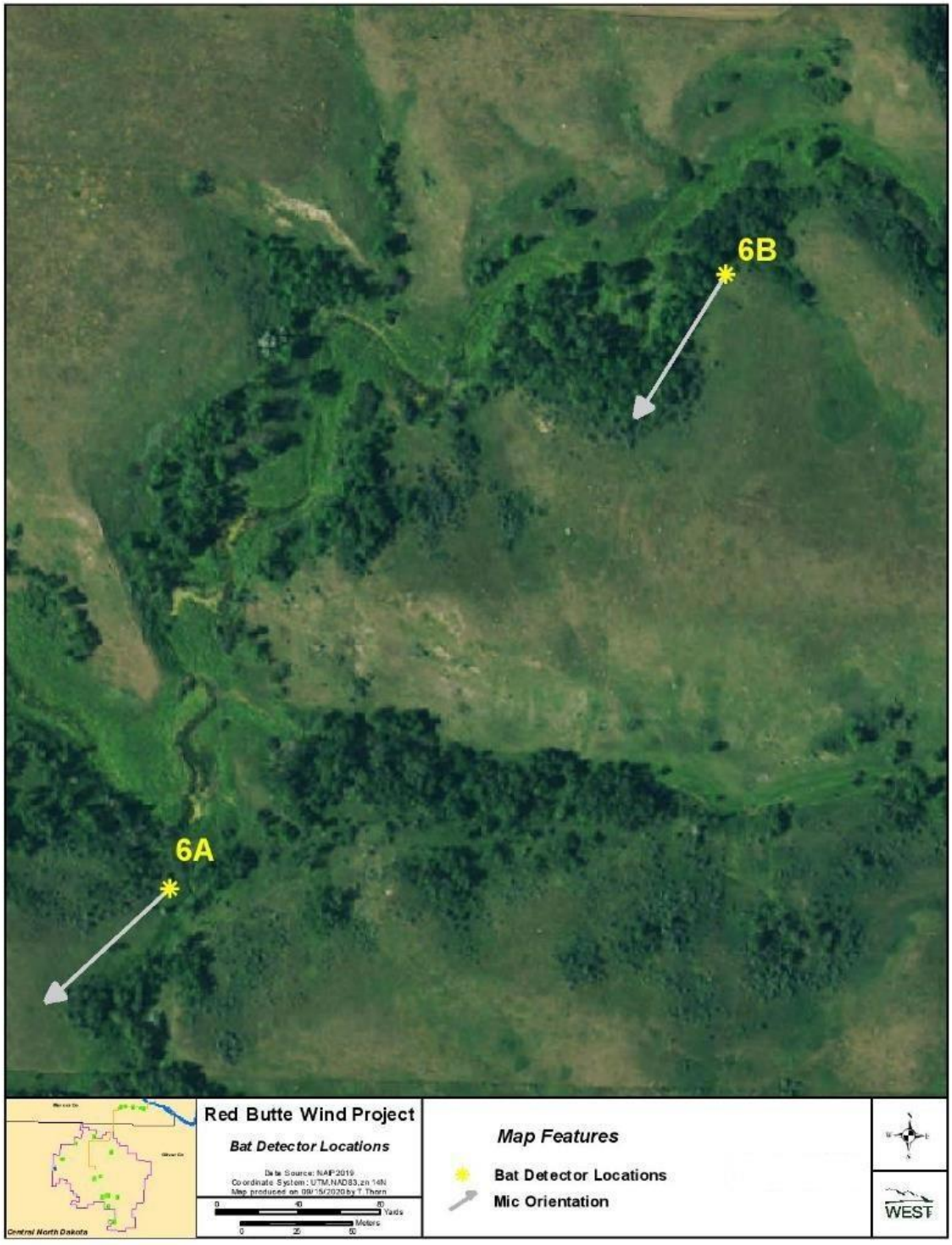
Appendix B7. Map of acoustic detector location 4B at the Oliver Wind IV Project in Oliver and Counties, North Dakota.



Appendix B8. Map of acoustic detector locations alt2 and 5A at the Oliver Wind IV Project in Oliver and Counties, North Dakota.



Appendix B9. Map of acoustic detector location 5B at the Oliver Wind IV Project in Oliver and Counties, North Dakota.



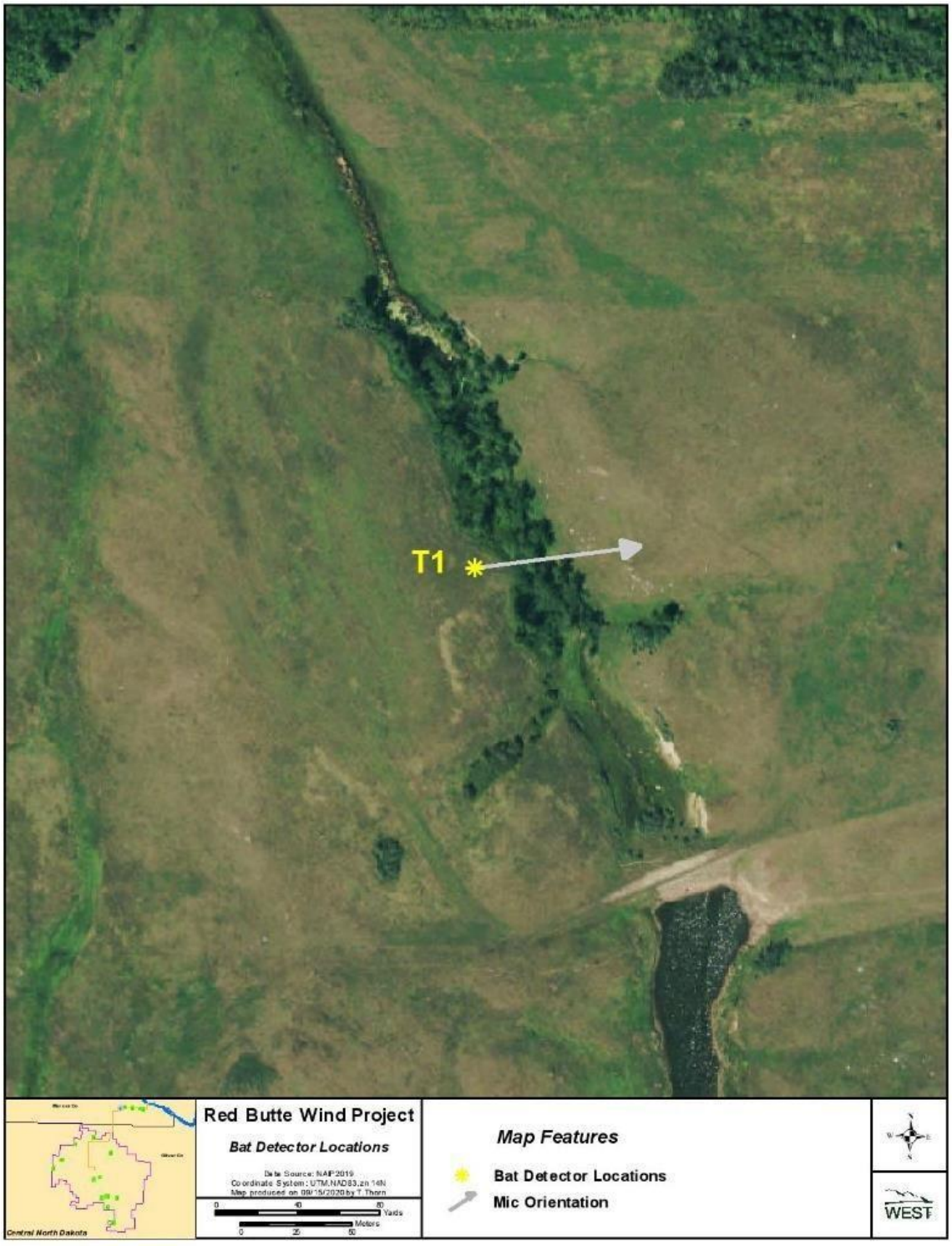
Appendix B10. Map of acoustic detector locations 6A and 6B at the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota.



Appendix B11. Map of acoustic detector location 7A at the Oliver Wind IV Project in Oliver and Counties, North Dakota.



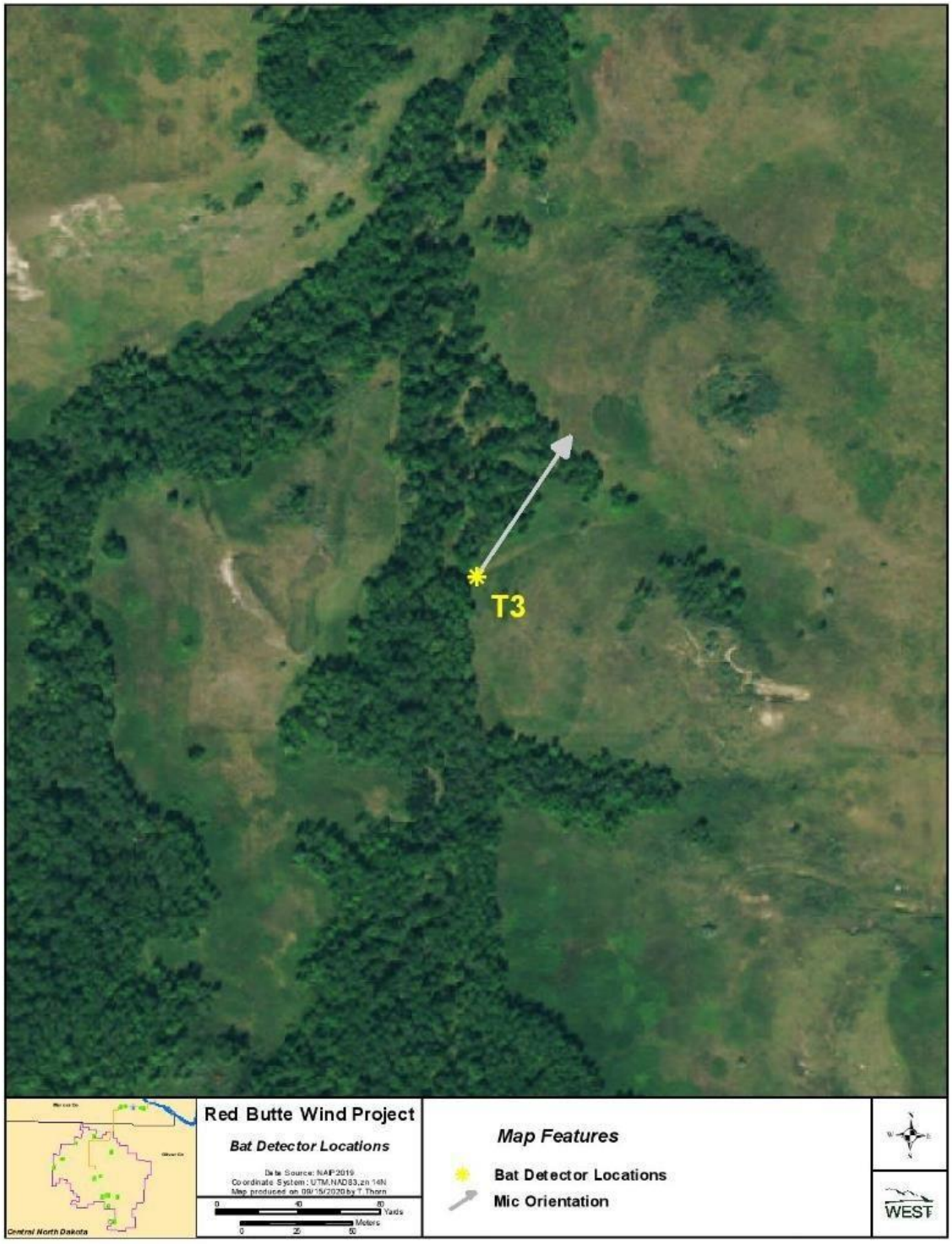
Appendix B12. Map of acoustic detector location 7B at the Oliver Wind IV Project in Oliver and Counties, North Dakota.



Appendix B13. Map of acoustic detector location T1 at the Oliver Wind IV Project in Oliver and Counties, North Dakota.



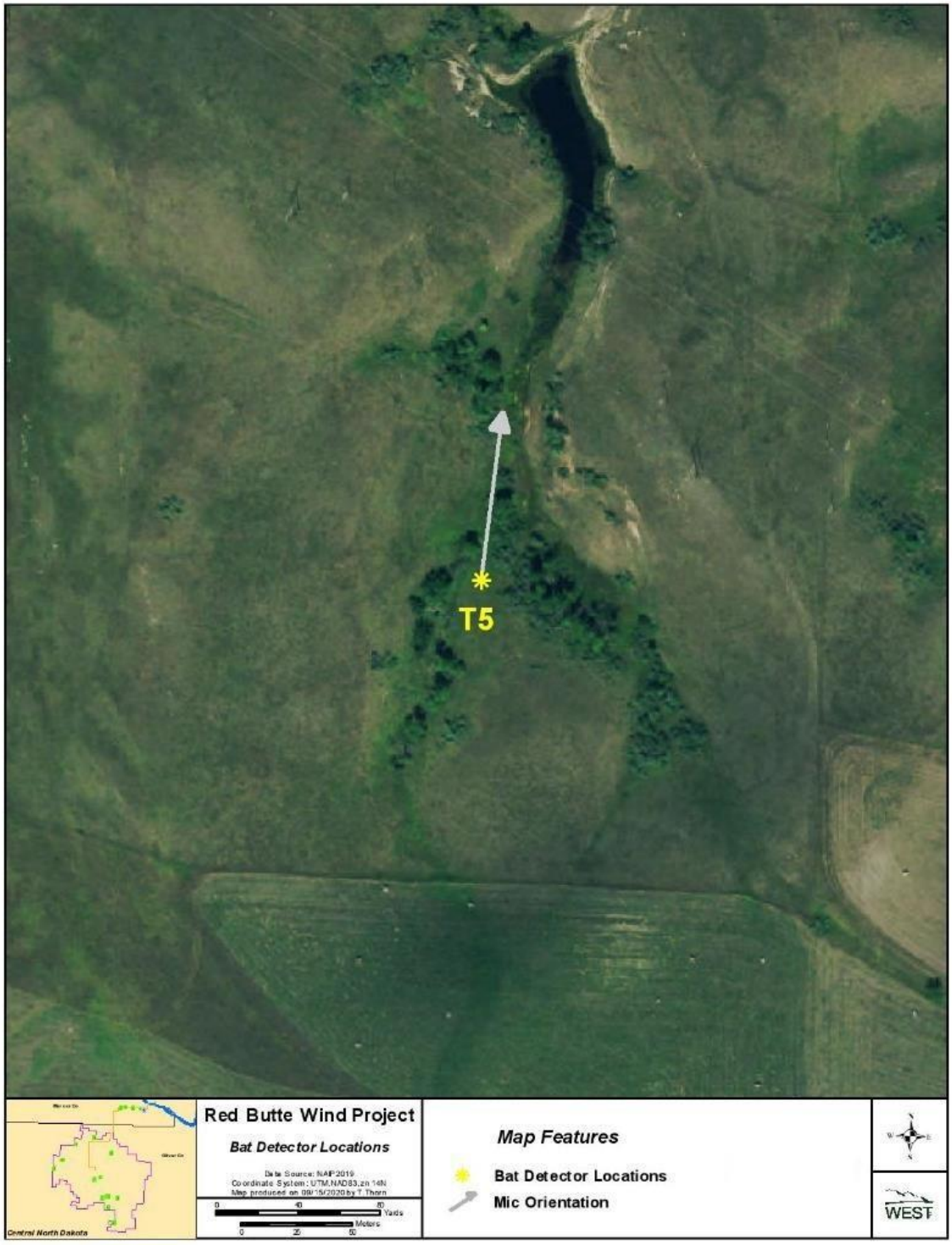
Appendix B14. Map of acoustic detector location T2 at the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota.



Appendix B15. Map of acoustic detector location T3 at the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota.



Appendix B16. Map of acoustic detector location T4 at the Oliver Wind IV Project in Oliver and Counties, North Dakota.



Appendix B17. Map of acoustic detector location T5 at the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota.

Appendix C. Photographs of Detector Locations for the Northern Long-Eared Bat Presence/Absence Acoustic Surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020







Appendix C1. Acoustic detector location 1A.







Appendix C2. Acoustic detector location 1B.







Appendix C3. Acoustic detector location 2A.







Appendix C4. Acoustic detector location 2B.

Note: Photos are representative only; original deployment photos were lost. Orientation and location are consistent with deployment; microphone type differed.







Appendix C5. Acoustic detector location 3A.







Appendix C6. Acoustic detector location alt2.







Appendix C7. Acoustic detector location 4A.

Note: Photos are representative only; original deployment photos were lost. Orientation and location are consistent with deployment; microphone type differed.







Appendix C8. Acoustic detector location 4B.







Appendix C9. Acoustic detector location 5A.







Appendix C10. Acoustic detector location 5B.







Appendix C11. Acoustic detector location 6A.







Appendix C12. Acoustic detector location 6B.

Note: Photos are representative only; original deployment photos were lost. Orientation and location are consistent with deployment; microphone type differed.







Appendix C13. Acoustic detector location 7A.







Appendix C14. Acoustic detector location 7B.







Appendix C15. Acoustic detector location T1.

Note: Photos are representative only; original deployment photos were lost. Orientation and location are consistent with deployment; microphone type differed.



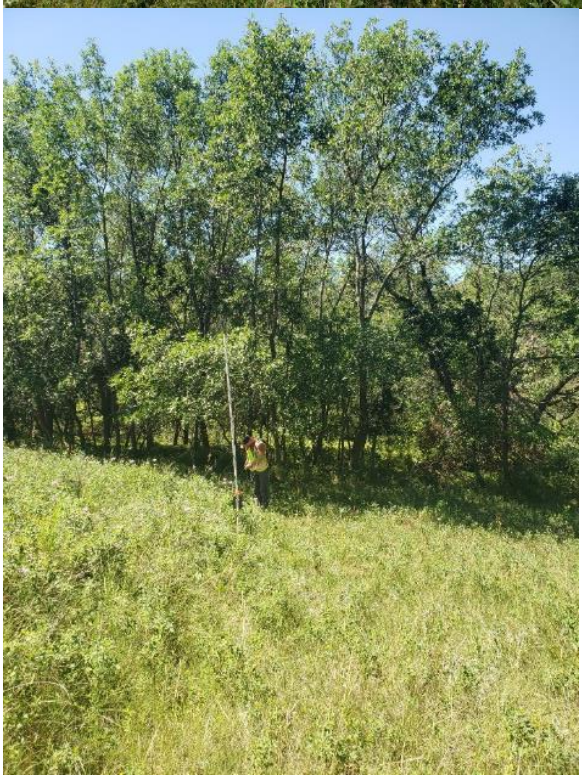




Appendix C16. Acoustic detector location T2.







Appendix C17. Acoustic detector location T3.







Appendix C18. Acoustic detector location T4.







Appendix C19. Acoustic detector location T5.

Note: Photos are representative only; original deployment photos were lost. Orientation and location are consistent with deployment; microphone type differed.

Appendix D. Acoustic Datasheets for the Northern Long-Eared Bat Presence/Absence Acoustic Surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MNSA): 1 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-23	**End Date:** 2020-07-27	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1523	**End Time:** 1707	**Easting:** 311219	**Northing:** 5222658

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 02778			
Detector Housing: None	**Mic Serial:** 205029	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 80		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Anabat Only: Test Indicators ("Data" lit and static heard)	Anabat Only: Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-23	1523	6.3	✓	✓	✓	✓	setup				Record Status Data / Standby Error
2020-07-27	1707	5.7	✓	✓			pickup, 1 gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 35
Forest Type: Deciduous	**% Open/Ag:** 65
Dominant Tree Species: Fraxinus pennsylvanica	**% Water:** 0
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present:	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

Moved to north of forested area along field edge due to land ownership (spoke with neighboring unsigned LO)



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): 1 B	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-23	**End Date:** 2020-07-27	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1427	**End Time:** 1728	**Easting:** 312366	**Northing:** 5223046

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 00602			
Detector Housing: None	**Mic Serial:** 202636	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 165		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-23	1427	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-27	1728	5.6	✓	✓			pick up, 1 gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 60
Forest Type: Deciduous	**% Open/Ag:** 40
Dominant Tree Species: Acer negundo	**% Water:** 0
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present:	
Topography: Flat	

[3]Habitat Description within 100m (i.e. the sketched area)

Between forest and immature tree rows



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): 2 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-23	**End Date:** 2020-07-27	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1018	**End Time:** 1805	**Easting:** 312726	**Northing:** 5218369

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 02867			
Detector Housing: None	**Mic Serial:** 204909	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 352		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-23	1018	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-27	1805	5.7	✓	✓			pickup, 10gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 65
Forest Type: Deciduous	**% Open/Ag:** 35
Dominant Tree Species: Platanus occidentalis, Acer negundo	**% Water:** 0
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present: Unknown snag(s) with exfol. bark	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

Field edge, barn nearby, close to pasture



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): 2 B	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-23	**End Date:** 2020-07-28	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1045	**End Time:** 1300	**Easting:** 314070	**Northing:** 5218625
*Use 24 hour time format	*Use yyyy-mm-dd date format	*Easting should be 6 digits	*Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 05114			
Detector Housing: None	**Mic Serial:** 204857	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 182		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-23	1045	6.3	✓	✓	✓	✓	setup				Record Status Data / Standby Error
2020-07-28	1300	5.7	✓	✓			pickup, 1 gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 15
Forest Type: Mixed	**% Open/Ag:** 85
Dominant Tree Species: Pinus sylvestris, Fraxinus pennsylvanica	**% Water:** 0
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present: Fraxinus pennsylvanica (snag)	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

Field edge with snags



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): 3 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-23	**End Date:** 2020-07-28	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1155	**End Time:** 1355	**Easting:** 315515	**Northing:** 5212755
*Use 24 hour time format	*Use yyyy-mm-dd date format	*Easting should be 6 digits	*Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 05063			
Detector Housing: None	**Mic Serial:** 204904	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 85		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-23	1155	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-28	1355	5.4	✓	✓			pickup,4 gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 25
Forest Type: Deciduous	**% Open/Ag:** 75
Dominant Tree Species: Fraxinus pennsylvanica, Acer negundo	**% Water:** 0
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present: Unknown snag(s) with exfol. bark	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

Edge of shelterbelt with dead trees and expansive pasture



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): alt 2	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-23	**End Date:** 2020-07-27	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1621	**End Time:** 1620	**Easting:** 303735	**Northing:** 5227057

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 04801			
Detector Housing: None	**Mic Serial:** 204837	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 132		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-23	1621	6.3	✓	✓	✓	✓	set up				Record Status Data Standby Error
2020-07-27	1620	5.7	✓	✓			pick up, 3 gb				Record Status Data Standby Error
											Record Status Data Standby Error
											Record Status Data Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Creek/Riparian	**% Forest:** 40
Forest Type: Deciduous	**% Open/Ag:** 57
Dominant Tree Species: Acer negundo, Fraxinus pennsylvanica	**% Water:** 3
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present: Unknown snag(s) with exfol. bark	
Topography: Slope	

[3] Habitat Description within 100m (i.e. the sketched area)

Near forested riparian area, adjacent to emergent wetland and creek bed (dry at present)



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): 4 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-23	**End Date:** 2020-07-28	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1305	**End Time:** 1338	**Easting:** 316490	**Northing:** 5218429

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 02834			
Detector Housing: None	**Mic Serial:** 204858	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 342		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-23	1305	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-28	1338	5.7	✓	✓			pickup, 3gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Bottomland Forest	**% Forest:** 20
Forest Type: Deciduous	**% Open/Ag:** 70
Dominant Tree Species: Salix sandbar, Platanus occidentalis	**% Water:** 10
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present: Platanus occidentalis (snag)	
Topography: Low Point	

[3] Habitat Description within 100m (i.e. the sketched area)

Emergent wetland, forested wetland



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): 4 B	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-23	**End Date:** 2020-07-27	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1109	**End Time:** 1812	**Easting:** 314239	**Northing:** 5216309
*Use 24 hour time format	*Use yyyy-mm-dd date format	*Easting should be 6 digits	*Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 02775			
Detector Housing: None	**Mic Serial:** 204968	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 100		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-23	1109	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-27	1812	5.7	✓	✓			pickup, 1 gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 20
Forest Type: Deciduous	**% Open/Ag:** 80
Dominant Tree Species: Ulmus parvifolia, Fraxinus pennsylvanica	**% Water:** 0
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present: Unknown snag(s) with exfol. bark	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

Field and shelterbelt edge



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): 5 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-22	**End Date:** 2020-07-26	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1438	**End Time:** 1335	**Easting:** 303968	**Northing:** 5227012

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 02782			
Detector Housing: None	**Mic Serial:** 204905	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 20		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-22	1438	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-26	1335	5.7	✓	✓			pickup, 6 gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Pond	**% Forest:** 20
Forest Type: Deciduous	**% Open/Ag:** 65
Dominant Tree Species: Fraxinus pennsylvanica	**% Water:** 15
Stand Age (DBH): Early-successional (0 - 12 cm)	
Preferred Roost Tree Species Present: Unknown snag(s) with exfol. bark	
Topography: High Point	

[3] Habitat Description within 100m (i.e. the sketched area)

Heavily cow trampled pond edge; tried to pick a spot where cows couldn't trample detector.



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): 5 B	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson		**County:** Oliver
Start Date: 2020-07-22	**End Date:** 2020-07-26	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1538	**End Time:** 1436	**Easting:** 306957	**Northing:** 5230561

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 05113			
Detector Housing: None	**Mic Serial:** 204886	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 292		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-22	1538	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-26	1436	5.6	✓	✓			pick up, 2 gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Pond	**% Forest:** 25
Forest Type: Deciduous	**% Open/Ag:** 65
Dominant Tree Species: Fraxinus pennsylvanica, Acer negundo	**% Water:** 10
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present: Unknown snag(s) with exfol. bark	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

Base of ridge adjacent to forest patch and creek with cattle pond



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat) | Detector Orientation: ✓ (Detector + Bat Feature Sampled) | Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): 6 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-22	**End Date:** 2020-07-26	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1045	**End Time:** 1205	**Easting:** 301824	**Northing:** 5224947

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 02896			
Detector Housing: None	**Mic Serial:** 204844	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 225		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-22	1045	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-26	1205	5.7	✓	✓			pickup, 4 gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Creek/Riparian	**% Forest:** 30
Forest Type: Deciduous	**% Open/Ag:** 60
Dominant Tree Species: Fraxinus pennsylvanica, Acer negundo	**% Water:** 10
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present:	
Topography: Slope	

[3] Habitat Description within 100m (i.e. the sketched area)

Field slope near creek and pond



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): 6 B	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazael		**County:** Oliver
Start Date: 2020-07-22	**End Date:** 2020-07-26	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1012	**End Time:** 1205	**Easting:** 302071	**Northing:** 5225219

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 02888			
Detector Housing: None	**Mic Serial:** 204906	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 210		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-22	1012	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-26	1232	5.8	✓	✓			pick up, 3 gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Creek/Riparian	**% Forest:** 25
Forest Type: Deciduous	**% Open/Ag:** 70
Dominant Tree Species: Fraxinus pennsylvanica, Acer negundo	**% Water:** 5
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present: Unknown snag(s) with exfol. bark	
Topography: Slope	

[3] Habitat Description within 100m (i.e. the sketched area)

Field slope adjacent to small creek, pond nearby



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): 7 A	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-22	**End Date:** 2020-07-26	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1228	**End Time:** 1510	**Easting:** 311191	**Northing:** 5232102

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 02836			
Detector Housing: None	**Mic Serial:** 204946	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 38		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-22	1230	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-26	1510	5.6	✓	✓			pick up, 2 gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 10
Forest Type: Deciduous	**% Open/Ag:** 75
Dominant Tree Species: Fraxinus pennsylvanica	**% Water:** 15
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present: Fraxinus pennsylvanica (snag)	
Topography: Slope	

[3]Habitat Description within 100m (i.e. the sketched area)

Flat grazing field, near snags and small pond. Moved away from original spot due to sewage hazard.



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): 7 B	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-22	**End Date:** 2020-07-26	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1305	**End Time:** 1548	**Easting:** 315057	**Northing:** 5228585
*Use 24 hour time format	*Use yyyy-mm-dd date format	*Easting should be 6 digits	*Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 02599			
Detector Housing: None	**Mic Serial:** 204810	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 295		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-22	1305	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-26	1548	5.6	✓	✓			pickup, 12gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Upland Forest	**% Forest:** 25
Forest Type: Deciduous	**% Open/Ag:** 75
Dominant Tree Species: Fraxinus pennsylvanica, Acer negundo	**% Water:** 0
Stand Age (DBH): Mid-successional (13 - 24 cm)	
Preferred Roost Tree Species Present:	
Topography: Flat	

[3] **Habitat Description** within 100m (i.e. the sketched area)

Forest in junkyard, field adjacent. Old barn with openings also adjacent



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): T 1	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Mercer
Start Date: 2020-07-24	**End Date:** 2020-07-27	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1129	**End Time:** 1010	**Easting:** 316980	**Northing:** 5238861

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 00530			
Detector Housing: None	**Mic Serial:** 204838	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 80		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-24	1129	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-27	1010	5.7	✓	✓			pick up, 2 gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Creek/Riparian	**% Forest:** 20
Forest Type: Deciduous	**% Open/Ag:** 75
Dominant Tree Species: Acer negundo	**% Water:** 5
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present: Unknown snag(s) with exfol. bark	
Topography: Slope	

[3]Habitat Description within 100m (i.e. the sketched area)

Slippe adjacent to forested riparian area, creek nearby

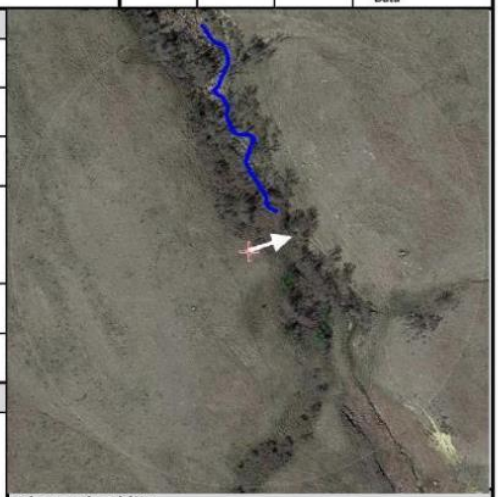


Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector , including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): T 2	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Mercer
Start Date: 2020-07-24	**End Date:** 2020-07-27	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1152	**End Time:** 1027	**Easting:** 318021	**Northing:** 5238937

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 02886			
Detector Housing: None	**Mic Serial:** 205021	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 15		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-24	1152	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-27	1027	5.7	✓	✓			pickup 8 gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Pond	**% Forest:** 23
Forest Type: Deciduous	**% Open/Ag:** 60
Dominant Tree Species: Populus tremuloides, Acer negundo	**% Water:** 7
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present: Unknown snag(s) with exfol. bark	
Topography: Flat	

[3] Habitat Description within 100m (i.e. the sketched area)

Little valley with open area for foraging, some mature trees, Salix spp. and large snags adjacent to pond.

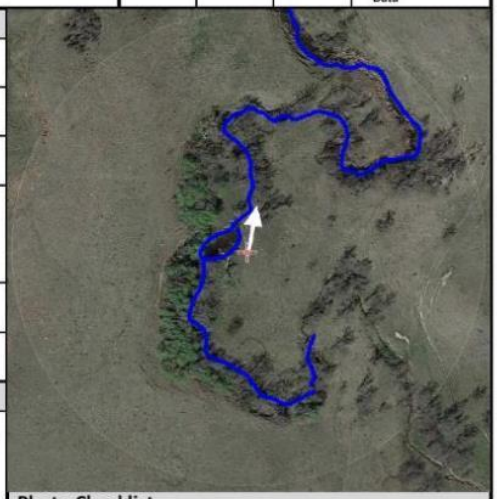


Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): T 3	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-27	**End Date:** 2020-07-29	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1250	**End Time:** 1300	**Easting:** 319788	**Northing:** 5238848
*Use 24 hour time format	*Use yyyy-mm-dd date format	*Easting should be 6 digits	*Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 05060			
Detector Housing: None	**Mic Serial:** 204870	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 32		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-27	1250	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-29	1300	5.8	✓	✓			pickup, 5 gb				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Bottomland Forest	**% Forest:** 50
Forest Type: Deciduous	**% Open/Ag:** 50
Dominant Tree Species: Acer negundo, Fraxinus pennsylvanica	**% Water:** 0
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present: Fraxinus pennsylvanica (snag), Unknown snag(s) with exfol. bark	
Topography: Slope	

[3] Habitat Description within 100m (i.e. the sketched area)

Adjacent to lowland forested corridor, and perpendicular flyway; riparian but dry at present (see green line)

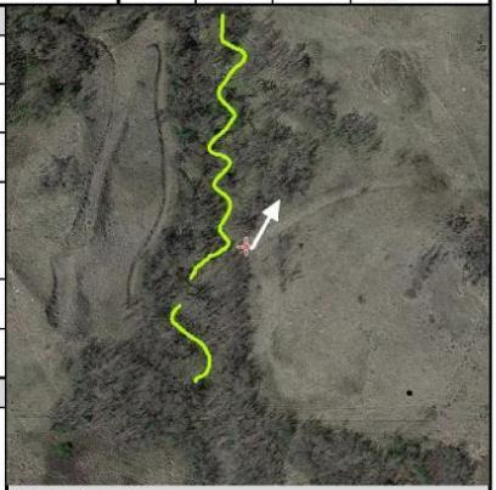


Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): T 4	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Oliver
Start Date: 2020-07-24	**End Date:** 2020-07-27	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1515	**End Time:** 1405	**Easting:** 321624	**Northing:** 5238711
*Use 24 hour time format	*Use yyyy-mm-dd date format	*Easting should be 6 digits	*Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** *(Should be 16)*
Detector Serial: 02786			
Detector Housing: None	**Mic Serial:** 207484	**Mic Height (m):** 3	**Data Div** *(Should be 16)*
	Mic Horizontal Orientation (0-360°): 275		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-24	1515	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-27	1405	5.8	✓	✓			pick up, 2 GB				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Bottomland Forest	**% Forest:** 30
Forest Type: Deciduous	**% Open/Ag:** 68
Dominant Tree Species: Fraxinus pennsylvanica, Acer negundo	**% Water:** 2
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present:	
Topography: Low Point	

[3] Habitat Description within 100m (i.e. the sketched area)

Forested wetland in low valley, little standing water at present



Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Acoustic Presence/Probable Absence Data Form

Site Information			
Site ID (SiteID + DetectorID, e.g MN5A): T 5	**Project:** Red Butte		**State:** North Dakota
	Surveyors: Julia Wilson, Alex Brazeal		**County:** Mercer
Start Date: 2020-07-24	**End Date:** 2020-07-27	**Datum:** NAD83	**UTM Zone:** 14
Start Time: 1436	**End Time:** 1352	**Easting:** 322269	**Northing:** 5238429

*Use 24 hour time format | *Use yyyy-mm-dd date format | *Easting should be 6 digits | *Northing should be 7 digits

Detector Information	Microphone Information		Anabat Only
Detector Model: SM4	**Sound Reception:** None		**Audio Div** (Should be 16)
Detector Serial: 04733			
Detector Housing: None	**Mic Serial:** 205023	**Mic Height (m):** 3	**Data Div** (Should be 16)
	Mic Horizontal Orientation (0-360°): 5		
Battery Source: Internal	**Mic Vertical Orientation (°):** 0		

All Detector Checklist

Date (yyyy-mm-dd)	Time (24 Hour)	Battery Voltage (V)	Perform Mic Check	Inspect Cables; Mic Holder; Housing	Replace Data Card(s)	Change Battery	Comments (Detector set up, picked up, moved, knocked over, vandalized, etc.)	Anabat Only: Sensitivity Setting (Normally 6)	Test Indicators ("Data" lit and static heard)	Set Volume (Lowest Setting)	LED Indicator Lights (Should be Standby, unless between 18:00 and 8:00)
2020-07-24	1436	6.3	✓	✓	✓	✓	set up				Record Status Data / Standby Error
2020-07-27	1352	5.7	✓	✓			pick up 2 GB				Record Status Data / Standby Error
											Record Status Data / Standby Error
											Record Status Data / Standby Error

Habitat Composition within 100m (i.e. the sketched area)

[1] **Primary Habitat:** Field Edge	**% Forest:** 25
Forest Type: Deciduous	**% Open/Ag:** 75
Dominant Tree Species: Fraxinus pennsylvanica	**% Water:** 0
Stand Age (DBH): Late-successional (25 - 38 cm)	
Preferred Roost Tree Species Present: Fraxinus pennsylvanica (snag)	
Topography: Slope	

[3]Habitat Description within 100m (i.e. the sketched area)

Drainage with trees and snags, leading to pond to north

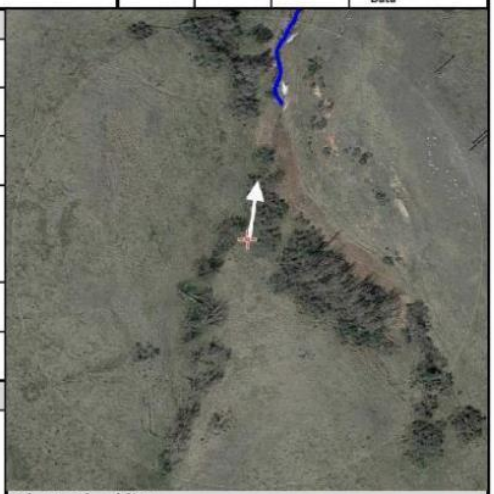


Photo Checklist

Detector Location: ✓ (Detector + All Surrounding Habitat)	Detector Orientation: ✓ (Detector + Bat Feature Sampled)	Detection Cone: ✓ (Air Space Sampled)

[1] Choices: Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Give Brief Description)
[2] Map out habitat features within a 100 m radius of the detector (x). Indicate direction of microphone using an arrow. Include any features of interest (water, buildings, rocky outcrops, etc.).
[3] Provide a written description of the surrounding habitat within a 100m radius of the detector, including details on width of the road/trail/cutline, size of pond/lake, distance to nearest water, etc.).

Appendix E. Daily Weather Log for Acoustic Detector Nights for the Northern Long-Eared Bat Presence/Absence Acoustic Surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020

STATION:	KNDHAZEN5	Sunset Time:	21:29	Survey Start:	21:29	Determination:	*Valid*
SITES:	5A, 5B, 6A, 6B, 7A, 7B	Sunrise Time:	6:14	End Time:	2:29	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/22/2020	9:24 PM	79.3 F	66.6 F	65 %	SSE	4.7 mph	6.5 mph	29.92 in	0.00 in	0.00 in
7/22/2020	9:29 PM	79.1 F	66.6 F	66 %	SE	5.9 mph	8.1 mph	29.92 in	0.00 in	0.00 in
7/22/2020	9:34 PM	78.9 F	66.7 F	66 %	SE	4.6 mph	6.4 mph	29.92 in	0.00 in	0.00 in
7/22/2020	9:39 PM	78.6 F	66.6 F	67 %	SE	6.0 mph	8.7 mph	29.92 in	0.00 in	0.00 in
7/22/2020	9:44 PM	78.6 F	66.4 F	66 %	SE	6.8 mph	9.1 mph	29.92 in	0.00 in	0.00 in
7/22/2020	9:49 PM	78.1 F	66.5 F	68 %	SE	5.1 mph	6.8 mph	29.91 in	0.00 in	0.00 in
7/22/2020	9:54 PM	77.7 F	66.3 F	68 %	SE	7.4 mph	9.9 mph	29.92 in	0.00 in	0.00 in
7/22/2020	9:59 PM	77.6 F	66.2 F	68 %	ESE	7.3 mph	9.9 mph	29.91 in	0.00 in	0.00 in
7/22/2020	10:04 PM	77.2 F	66.2 F	69 %	SE	5.9 mph	8.3 mph	29.91 in	0.00 in	0.00 in
7/22/2020	10:09 PM	76.7 F	65.7 F	69 %	SE	7.3 mph	9.4 mph	29.91 in	0.00 in	0.00 in
7/22/2020	10:14 PM	76.7 F	66.0 F	70 %	SE	6.2 mph	8.2 mph	29.91 in	0.00 in	0.00 in
7/22/2020	10:19 PM	76.5 F	65.8 F	70 %	SE	6.7 mph	8.9 mph	29.91 in	0.00 in	0.00 in
7/22/2020	10:24 PM	76.1 F	65.9 F	71 %	SE	5.7 mph	7.1 mph	29.91 in	0.00 in	0.00 in
7/22/2020	10:29 PM	75.7 F	65.8 F	71 %	ESE	6.0 mph	7.3 mph	29.92 in	0.00 in	0.00 in
7/22/2020	10:34 PM	75.4 F	65.9 F	72 %	ESE	4.5 mph	5.7 mph	29.92 in	0.00 in	0.00 in
7/22/2020	10:39 PM	74.7 F	65.7 F	74 %	ESE	4.5 mph	5.4 mph	29.92 in	0.00 in	0.00 in
7/22/2020	10:44 PM	74.5 F	65.5 F	74 %	ESE	4.3 mph	5.4 mph	29.92 in	0.00 in	0.00 in
7/22/2020	10:49 PM	74.5 F	65.6 F	74 %	ESE	3.8 mph	4.7 mph	29.92 in	0.00 in	0.00 in
7/22/2020	10:54 PM	73.9 F	65.5 F	75 %	East	3.8 mph	4.4 mph	29.92 in	0.00 in	0.00 in
7/22/2020	10:59 PM	73.9 F	65.3 F	75 %	East	4.0 mph	4.8 mph	29.92 in	0.00 in	0.00 in
7/22/2020	11:04 PM	73.6 F	65.3 F	75 %	ESE	5.3 mph	6.7 mph	29.93 in	0.00 in	0.00 in
7/22/2020	11:09 PM	73.8 F	65.4 F	75 %	East	4.8 mph	5.8 mph	29.92 in	0.00 in	0.00 in
7/22/2020	11:14 PM	73.4 F	65.2 F	76 %	ESE	4.4 mph	5.1 mph	29.93 in	0.00 in	0.00 in
7/22/2020	11:19 PM	73.4 F	65.1 F	75 %	ESE	4.5 mph	5.7 mph	29.93 in	0.00 in	0.00 in
7/22/2020	11:24 PM	73.4 F	65.1 F	75 %	East	4.6 mph	5.6 mph	29.93 in	0.00 in	0.00 in
7/22/2020	11:29 PM	73.2 F	64.9 F	75 %	ESE	4.8 mph	6.0 mph	29.93 in	0.00 in	0.00 in
7/22/2020	11:34 PM	73.5 F	65.0 F	75 %	ESE	4.2 mph	5.0 mph	29.93 in	0.00 in	0.00 in
7/22/2020	11:39 PM	73.0 F	64.9 F	75 %	East	5.2 mph	6.5 mph	29.93 in	0.00 in	0.00 in
7/22/2020	11:44 PM	72.4 F	64.8 F	77 %	ESE	4.2 mph	5.4 mph	29.93 in	0.00 in	0.00 in
7/22/2020	11:49 PM	72.1 F	64.6 F	77 %	ESE	4.8 mph	6.0 mph	29.93 in	0.00 in	0.00 in
7/22/2020	11:54 PM	72.3 F	64.3 F	76 %	ESE	7.0 mph	8.9 mph	29.93 in	0.00 in	0.00 in
7/22/2020	11:59 PM	72.8 F	64.6 F	75 %	ESE	6.6 mph	8.7 mph	29.93 in	0.00 in	0.00 in
7/23/2020	12:04 AM	72.3 F	64.2 F	76 %	East	7.0 mph	8.8 mph	29.93 in	0.00 in	0.00 in
7/23/2020	12:09 AM	72.3 F	64.2 F	76 %	East	6.2 mph	7.6 mph	29.93 in	0.00 in	0.00 in
7/23/2020	12:14 AM	72.1 F	64.0 F	76 %	East	5.9 mph	7.4 mph	29.93 in	0.00 in	0.00 in
7/23/2020	12:19 AM	72.0 F	64.0 F	76 %	East	5.2 mph	6.9 mph	29.93 in	0.00 in	0.00 in
7/23/2020	12:24 AM	72.2 F	63.8 F	75 %	East	6.5 mph	8.3 mph	29.93 in	0.00 in	0.00 in
7/23/2020	12:29 AM	72.2 F	63.8 F	75 %	East	5.4 mph	6.9 mph	29.93 in	0.00 in	0.00 in
7/23/2020	12:34 AM	72.1 F	63.6 F	74 %	East	5.3 mph	6.7 mph	29.93 in	0.00 in	0.00 in
7/23/2020	12:39 AM	72.1 F	63.5 F	74 %	East	5.0 mph	6.2 mph	29.93 in	0.00 in	0.00 in
7/23/2020	12:44 AM	72.0 F	63.6 F	75 %	East	3.8 mph	4.8 mph	29.93 in	0.00 in	0.00 in
7/23/2020	12:49 AM	71.8 F	63.6 F	75 %	East	4.4 mph	5.8 mph	29.93 in	0.00 in	0.00 in
7/23/2020	12:54 AM	71.7 F	63.5 F	75 %	ENE	3.7 mph	4.8 mph	29.94 in	0.00 in	0.00 in
7/23/2020	12:59 AM	71.6 F	63.6 F	76 %	East	3.5 mph	4.8 mph	29.94 in	0.00 in	0.00 in
7/23/2020	1:04 AM	71.4 F	63.3 F	75 %	East	3.4 mph	4.4 mph	29.93 in	0.00 in	0.00 in
7/23/2020	1:09 AM	71.4 F	63.4 F	76 %	East	5.1 mph	6.4 mph	29.93 in	0.00 in	0.00 in
7/23/2020	1:14 AM	71.0 F	63.3 F	77 %	ESE	2.9 mph	3.6 mph	29.93 in	0.00 in	0.00 in
7/23/2020	1:19 AM	70.8 F	63.1 F	77 %	East	3.6 mph	4.3 mph	29.94 in	0.00 in	0.00 in
7/23/2020	1:24 AM	71.0 F	63.1 F	76 %	East	3.5 mph	4.1 mph	29.93 in	0.00 in	0.00 in
7/23/2020	1:29 AM	71.0 F	63.1 F	76 %	ENE	1.8 mph	2.9 mph	29.93 in	0.00 in	0.00 in
7/23/2020	1:34 AM	70.6 F	63.1 F	77 %	East	2.3 mph	3.5 mph	29.93 in	0.00 in	0.00 in
7/23/2020	1:39 AM	70.5 F	63.0 F	77 %	East	2.5 mph	3.7 mph	29.93 in	0.00 in	0.00 in
7/23/2020	1:44 AM	70.6 F	62.9 F	77 %	ENE	3.7 mph	4.6 mph	29.93 in	0.00 in	0.00 in
7/23/2020	1:49 AM	70.7 F	63.1 F	77 %	East	3.0 mph	4.1 mph	29.93 in	0.00 in	0.00 in
7/23/2020	1:54 AM	70.3 F	63.0 F	78 %	ESE	2.3 mph	3.0 mph	29.93 in	0.00 in	0.00 in
7/23/2020	1:59 AM	70.1 F	62.7 F	78 %	ESE	2.1 mph	2.9 mph	29.93 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:29	Survey Start:	21:29	Determination:	*Valid*
SITES:	5A, 5B, 6A, 6B, 7A, 7B	Sunrise Time:	6:14	End Time:	2:29	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/23/2020	2:04 AM	70.3 F	62.8 F	77 %	East	3.4 mph	4.3 mph	29.93 in	0.00 in	0.00 in
7/23/2020	2:09 AM	70.3 F	62.7 F	77 %	ESE	5.2 mph	6.9 mph	29.93 in	0.00 in	0.00 in
7/23/2020	2:14 AM	70.2 F	62.8 F	77 %	East	4.1 mph	5.4 mph	29.92 in	0.00 in	0.00 in
7/23/2020	2:19 AM	70.1 F	62.7 F	78 %	East	3.9 mph	4.9 mph	29.92 in	0.00 in	0.00 in
7/23/2020	2:24 AM	70.0 F	62.6 F	78 %	East	3.1 mph	4.6 mph	29.92 in	0.00 in	0.00 in
7/23/2020	2:29 AM	69.9 F	62.6 F	78 %	ESE	3.1 mph	4.2 mph	29.92 in	0.00 in	0.00 in
7/23/2020	2:34 AM	69.7 F	62.5 F	78 %	ESE	3.2 mph	4.8 mph	29.92 in	0.00 in	0.00 in
7/23/2020	2:39 AM	69.7 F	62.5 F	78 %	ESE	1.3 mph	2.1 mph	29.92 in	0.00 in	0.00 in
7/23/2020	2:44 AM	69.6 F	62.4 F	78 %	ESE	3.9 mph	5.2 mph	29.92 in	0.00 in	0.00 in
7/23/2020	2:49 AM	69.6 F	62.4 F	78 %	ESE	4.1 mph	5.5 mph	29.91 in	0.00 in	0.00 in
7/23/2020	2:54 AM	69.8 F	62.5 F	78 %	East	3.3 mph	4.4 mph	29.92 in	0.00 in	0.00 in
7/23/2020	2:59 AM	69.4 F	62.5 F	78 %	ESE	3.5 mph	4.5 mph	29.92 in	0.00 in	0.00 in
7/23/2020	3:04 AM	69.4 F	62.6 F	79 %	East	3.2 mph	4.3 mph	29.91 in	0.00 in	0.00 in
7/23/2020	3:09 AM	69.3 F	62.3 F	78 %	East	2.8 mph	3.8 mph	29.91 in	0.00 in	0.00 in
7/23/2020	3:14 AM	69.4 F	62.5 F	79 %	East	2.7 mph	3.8 mph	29.91 in	0.00 in	0.00 in
7/23/2020	3:19 AM	69.3 F	62.6 F	79 %	ESE	3.9 mph	5.7 mph	29.91 in	0.00 in	0.00 in
7/23/2020	3:24 AM	69.3 F	62.6 F	79 %	ESE	3.0 mph	4.4 mph	29.91 in	0.00 in	0.00 in
7/23/2020	3:29 AM	69.1 F	62.5 F	79 %	ENE	1.6 mph	2.5 mph	29.91 in	0.00 in	0.00 in
7/23/2020	3:34 AM	68.9 F	62.4 F	80 %	East	1.6 mph	2.1 mph	29.90 in	0.00 in	0.00 in
7/23/2020	3:39 AM	68.8 F	62.3 F	80 %	East	1.9 mph	2.8 mph	29.91 in	0.00 in	0.00 in
7/23/2020	3:44 AM	68.9 F	62.4 F	80 %	ESE	2.1 mph	2.8 mph	29.91 in	0.00 in	0.00 in
7/23/2020	3:49 AM	68.9 F	62.5 F	80 %	East	2.7 mph	3.7 mph	29.90 in	0.00 in	0.00 in
7/23/2020	3:54 AM	68.6 F	62.5 F	81 %	East	1.3 mph	1.8 mph	29.91 in	0.00 in	0.00 in
7/23/2020	3:59 AM	68.6 F	62.5 F	81 %	ENE	1.5 mph	2.0 mph	29.90 in	0.00 in	0.00 in
7/23/2020	4:04 AM	68.5 F	62.6 F	82 %	East	1.6 mph	2.1 mph	29.90 in	0.00 in	0.00 in
7/23/2020	4:09 AM	68.4 F	62.6 F	82 %	East	2.0 mph	2.8 mph	29.90 in	0.00 in	0.00 in
7/23/2020	4:14 AM	68.5 F	62.6 F	82 %	East	2.6 mph	3.4 mph	29.90 in	0.00 in	0.00 in
7/23/2020	4:19 AM	68.4 F	62.6 F	82 %	East	2.2 mph	2.8 mph	29.90 in	0.00 in	0.00 in
7/23/2020	4:24 AM	68.4 F	62.7 F	82 %	ESE	1.4 mph	1.9 mph	29.91 in	0.00 in	0.00 in
7/23/2020	4:29 AM	68.6 F	62.9 F	82 %	ESE	2.6 mph	3.8 mph	29.90 in	0.00 in	0.00 in
7/23/2020	4:34 AM	68.4 F	63.0 F	83 %	ESE	2.3 mph	3.0 mph	29.90 in	0.00 in	0.00 in
7/23/2020	4:39 AM	68.2 F	62.9 F	83 %	SE	2.8 mph	3.8 mph	29.90 in	0.00 in	0.00 in
7/23/2020	4:44 AM	68.4 F	63.0 F	83 %	SE	1.9 mph	2.7 mph	29.90 in	0.00 in	0.00 in
7/23/2020	4:49 AM	68.6 F	63.1 F	83 %	ESE	2.4 mph	2.7 mph	29.90 in	0.00 in	0.00 in
7/23/2020	4:54 AM	68.5 F	63.1 F	83 %	East	2.6 mph	3.5 mph	29.90 in	0.00 in	0.00 in
7/23/2020	4:59 AM	68.5 F	63.3 F	84 %	SE	2.2 mph	2.7 mph	29.89 in	0.00 in	0.00 in
7/23/2020	5:04 AM	68.4 F	63.3 F	84 %	East	2.3 mph	2.9 mph	29.89 in	0.00 in	0.00 in
7/23/2020	5:09 AM	68.5 F	63.5 F	84 %	ESE	3.6 mph	4.8 mph	29.89 in	0.00 in	0.00 in
7/23/2020	5:14 AM	68.5 F	63.4 F	84 %	ESE	2.9 mph	3.9 mph	29.89 in	0.00 in	0.00 in
7/23/2020	5:19 AM	68.4 F	63.4 F	84 %	ESE	3.5 mph	4.7 mph	29.89 in	0.00 in	0.00 in
7/23/2020	5:24 AM	68.1 F	63.5 F	85 %	SE	2.8 mph	3.9 mph	29.89 in	0.00 in	0.00 in
7/23/2020	5:29 AM	68.3 F	63.6 F	85 %	SE	2.2 mph	2.7 mph	29.89 in	0.00 in	0.00 in
7/23/2020	5:34 AM	68.4 F	63.8 F	85 %	SE	3.0 mph	3.9 mph	29.89 in	0.00 in	0.00 in
7/23/2020	5:39 AM	68.4 F	63.8 F	85 %	ESE	3.9 mph	4.9 mph	29.89 in	0.00 in	0.00 in
7/23/2020	5:44 AM	68.2 F	63.9 F	86 %	ESE	3.7 mph	4.5 mph	29.89 in	0.00 in	0.00 in
7/23/2020	5:49 AM	68.2 F	63.9 F	86 %	ESE	2.7 mph	3.5 mph	29.89 in	0.00 in	0.00 in
7/23/2020	5:54 AM	68.4 F	64.0 F	86 %	ESE	2.0 mph	3.3 mph	29.89 in	0.00 in	0.00 in
7/23/2020	5:59 AM	68.5 F	64.2 F	86 %	ESE	3.8 mph	5.1 mph	29.89 in	0.00 in	0.00 in
7/23/2020	6:04 AM	68.5 F	64.3 F	86 %	ESE	4.8 mph	6.6 mph	29.89 in	0.00 in	0.00 in
7/23/2020	6:09 AM	68.4 F	64.3 F	87 %	East	4.2 mph	5.3 mph	29.89 in	0.00 in	0.00 in
7/23/2020	6:14 AM	68.0 F	64.1 F	87 %	East	3.1 mph	4.2 mph	29.89 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:28	Survey Start:	21:28	Determination:	*Valid*
SITES:	1A, 1B, 2A, 2B, 3A, alt2, 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B	Sunrise Time:	6:15	End Time:	2:28	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/23/2020	9:24 PM	80.3 F	72.8 F	78 %	ESE	8.1 mph	10.2 mph	29.77 in	0.00 in	0.00 in
7/23/2020	9:29 PM	80.2 F	72.9 F	78 %	ESE	8.3 mph	10.6 mph	29.77 in	0.00 in	0.00 in
7/23/2020	9:34 PM	80.2 F	72.9 F	78 %	ESE	7.0 mph	9.1 mph	29.77 in	0.00 in	0.00 in
7/23/2020	9:39 PM	80.2 F	72.9 F	78 %	SE	5.3 mph	7.0 mph	29.78 in	0.00 in	0.00 in
7/23/2020	9:44 PM	80.1 F	72.9 F	79 %	SE	4.2 mph	5.8 mph	29.78 in	0.00 in	0.00 in
7/23/2020	9:49 PM	80.1 F	73.0 F	79 %	ESE	6.5 mph	8.3 mph	29.78 in	0.00 in	0.00 in
7/23/2020	9:54 PM	79.9 F	73.1 F	80 %	ESE	7.1 mph	8.6 mph	29.77 in	0.00 in	0.00 in
7/23/2020	9:59 PM	79.5 F	72.9 F	80 %	ESE	6.4 mph	8.1 mph	29.77 in	0.00 in	0.00 in
7/23/2020	10:04 PM	79.7 F	73.1 F	80 %	ESE	8.5 mph	10.5 mph	29.77 in	0.00 in	0.00 in
7/23/2020	10:09 PM	79.6 F	73.2 F	81 %	ESE	8.1 mph	10.8 mph	29.76 in	0.00 in	0.00 in
7/23/2020	10:14 PM	79.3 F	73.1 F	81 %	ESE	8.3 mph	10.0 mph	29.76 in	0.00 in	0.00 in
7/23/2020	10:19 PM	79.3 F	73.0 F	81 %	ESE	7.2 mph	8.7 mph	29.76 in	0.00 in	0.00 in
7/23/2020	10:24 PM	79.4 F	73.2 F	81 %	ESE	6.0 mph	7.4 mph	29.77 in	0.00 in	0.00 in
7/23/2020	10:29 PM	79.3 F	73.2 F	81 %	East	5.1 mph	6.3 mph	29.77 in	0.00 in	0.00 in
7/23/2020	10:34 PM	79.0 F	73.2 F	82 %	East	5.5 mph	6.7 mph	29.78 in	0.00 in	0.00 in
7/23/2020	10:39 PM	78.7 F	73.1 F	83 %	East	4.5 mph	5.5 mph	29.78 in	0.00 in	0.00 in
7/23/2020	10:44 PM	78.9 F	73.0 F	82 %	East	4.8 mph	6.0 mph	29.78 in	0.00 in	0.00 in
7/23/2020	10:49 PM	79.0 F	73.0 F	82 %	ESE	5.2 mph	6.6 mph	29.78 in	0.00 in	0.00 in
7/23/2020	10:59 PM	78.6 F	73.0 F	83 %	East	5.6 mph	7.0 mph	29.78 in	0.00 in	0.00 in
7/23/2020	11:04 PM	78.7 F	73.2 F	83 %	ESE	6.6 mph	8.1 mph	29.78 in	0.00 in	0.00 in
7/23/2020	11:09 PM	78.4 F	73.2 F	84 %	ESE	6.3 mph	8.3 mph	29.78 in	0.00 in	0.00 in
7/23/2020	11:14 PM	78.4 F	73.1 F	84 %	ESE	5.9 mph	7.2 mph	29.77 in	0.00 in	0.00 in
7/23/2020	11:19 PM	78.3 F	73.2 F	84 %	ESE	6.5 mph	8.0 mph	29.77 in	0.00 in	0.00 in
7/23/2020	11:24 PM	78.2 F	73.3 F	85 %	ESE	5.6 mph	7.1 mph	29.77 in	0.00 in	0.00 in
7/23/2020	11:29 PM	78.1 F	73.2 F	85 %	East	4.1 mph	5.5 mph	29.78 in	0.00 in	0.00 in
7/23/2020	11:34 PM	77.7 F	73.2 F	86 %	East	4.1 mph	4.8 mph	29.77 in	0.00 in	0.00 in
7/23/2020	11:39 PM	77.8 F	73.1 F	85 %	East	4.9 mph	6.5 mph	29.77 in	0.00 in	0.00 in
7/23/2020	11:44 PM	77.9 F	73.1 F	85 %	East	5.2 mph	6.7 mph	29.76 in	0.00 in	0.00 in
7/23/2020	11:49 PM	78.0 F	73.1 F	85 %	East	5.7 mph	7.2 mph	29.76 in	0.00 in	0.00 in
7/23/2020	11:54 PM	78.0 F	73.1 F	85 %	East	6.1 mph	7.4 mph	29.76 in	0.00 in	0.00 in
7/23/2020	11:59 PM	78.0 F	73.1 F	85 %	East	6.9 mph	8.2 mph	29.76 in	0.00 in	0.00 in
7/24/2020	12:04 AM	78.1 F	73.2 F	85 %	East	7.0 mph	8.4 mph	29.75 in	0.00 in	0.00 in
7/24/2020	12:09 AM	78.1 F	73.2 F	85 %	East	7.9 mph	9.7 mph	29.76 in	0.00 in	0.00 in
7/24/2020	12:14 AM	78.1 F	73.4 F	86 %	East	5.8 mph	7.1 mph	29.75 in	0.00 in	0.00 in
7/24/2020	12:19 AM	77.9 F	73.4 F	86 %	ENE	4.9 mph	6.3 mph	29.76 in	0.00 in	0.00 in
7/24/2020	12:24 AM	77.9 F	73.4 F	86 %	East	4.8 mph	6.2 mph	29.76 in	0.00 in	0.00 in
7/24/2020	12:29 AM	77.9 F	73.4 F	86 %	East	4.0 mph	5.5 mph	29.76 in	0.00 in	0.00 in
7/24/2020	12:34 AM	77.9 F	73.4 F	86 %	ENE	4.1 mph	5.7 mph	29.75 in	0.00 in	0.00 in
7/24/2020	12:39 AM	77.8 F	73.4 F	86 %	ENE	2.7 mph	4.1 mph	29.75 in	0.00 in	0.00 in
7/24/2020	12:44 AM	77.4 F	73.2 F	87 %	ENE	4.5 mph	6.1 mph	29.74 in	0.00 in	0.00 in
7/24/2020	12:49 AM	77.5 F	73.3 F	87 %	East	4.9 mph	6.7 mph	29.74 in	0.00 in	0.00 in
7/24/2020	12:54 AM	77.7 F	73.6 F	87 %	East	5.3 mph	6.3 mph	29.74 in	0.00 in	0.00 in
7/24/2020	12:59 AM	77.9 F	73.6 F	87 %	East	7.0 mph	8.8 mph	29.74 in	0.00 in	0.00 in
7/24/2020	1:04 AM	78.1 F	73.8 F	87 %	East	5.9 mph	7.3 mph	29.74 in	0.00 in	0.00 in
7/24/2020	1:09 AM	77.7 F	73.7 F	87 %	East	4.8 mph	6.1 mph	29.73 in	0.00 in	0.00 in
7/24/2020	1:14 AM	77.8 F	73.7 F	87 %	East	6.3 mph	7.7 mph	29.73 in	0.00 in	0.00 in
7/24/2020	1:19 AM	78.1 F	73.8 F	87 %	East	5.2 mph	6.7 mph	29.73 in	0.00 in	0.00 in
7/24/2020	1:24 AM	78.0 F	73.9 F	87 %	ESE	4.5 mph	5.6 mph	29.73 in	0.00 in	0.00 in
7/24/2020	1:29 AM	78.0 F	73.8 F	87 %	East	3.7 mph	4.6 mph	29.73 in	0.00 in	0.00 in
7/24/2020	1:34 AM	78.1 F	73.9 F	87 %	ESE	3.4 mph	4.8 mph	29.73 in	0.00 in	0.00 in
7/24/2020	1:39 AM	78.3 F	74.1 F	87 %	ESE	2.0 mph	2.8 mph	29.73 in	0.00 in	0.00 in
7/24/2020	1:44 AM	78.4 F	74.1 F	87 %	SE	2.1 mph	2.7 mph	29.73 in	0.00 in	0.00 in
7/24/2020	1:49 AM	78.4 F	74.0 F	86 %	East	1.9 mph	2.6 mph	29.73 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:28	Survey Start:	21:28	Determination:	*Valid*
SITES:	1A, 1B, 2A, 2B, 3A, alt2, 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B	Sunrise Time:	6:15	End Time:	2:28	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/24/2020	1:54 AM	78.4 F	74.1 F	87 %	East	1.5 mph	2.0 mph	29.73 in	0.00 in	0.00 in
7/24/2020	1:59 AM	78.3 F	74.1 F	87 %	SSE	0.4 mph	0.9 mph	29.73 in	0.00 in	0.00 in
7/24/2020	2:04 AM	78.1 F	74.0 F	87 %	South	1.0 mph	1.2 mph	29.74 in	0.00 in	0.00 in
7/24/2020	2:09 AM	77.7 F	73.9 F	88 %	SW	2.7 mph	3.0 mph	29.74 in	0.00 in	0.00 in
7/24/2020	2:14 AM	77.4 F	73.8 F	89 %	SW	4.2 mph	5.0 mph	29.74 in	0.00 in	0.00 in
7/24/2020	2:19 AM	77.2 F	73.6 F	89 %	SW	2.5 mph	3.6 mph	29.74 in	0.00 in	0.00 in
7/24/2020	2:24 AM	76.9 F	73.7 F	90 %	SSW	1.3 mph	2.0 mph	29.74 in	0.00 in	0.00 in
7/24/2020	2:29 AM	76.8 F	73.7 F	90 %	SW	3.5 mph	4.3 mph	29.73 in	0.00 in	0.00 in
7/24/2020	2:34 AM	76.7 F	73.8 F	91 %	SW	3.8 mph	4.7 mph	29.73 in	0.00 in	0.00 in
7/24/2020	2:39 AM	76.6 F	73.8 F	91 %	SW	3.4 mph	3.8 mph	29.73 in	0.00 in	0.00 in
7/24/2020	2:44 AM	76.5 F	73.8 F	91 %	SW	3.9 mph	4.5 mph	29.73 in	0.00 in	0.00 in
7/24/2020	2:49 AM	76.4 F	73.7 F	91 %	SSW	2.6 mph	3.0 mph	29.73 in	0.00 in	0.00 in
7/24/2020	2:54 AM	75.9 F	73.3 F	91 %	South	1.2 mph	1.4 mph	29.72 in	0.00 in	0.00 in
7/24/2020	2:59 AM	75.7 F	73.3 F	92 %	South	1.3 mph	1.5 mph	29.72 in	0.00 in	0.00 in
7/24/2020	3:04 AM	75.6 F	73.4 F	92 %	South	1.0 mph	1.3 mph	29.72 in	0.00 in	0.00 in
7/24/2020	3:09 AM	75.6 F	73.4 F	93 %	SSW	1.3 mph	1.5 mph	29.72 in	0.00 in	0.00 in
7/24/2020	3:14 AM	75.4 F	73.2 F	93 %	SSW	0.0 mph	0.0 mph	29.72 in	0.00 in	0.00 in
7/24/2020	3:19 AM	75.3 F	73.1 F	93 %	SSW	0.0 mph	0.0 mph	29.72 in	0.00 in	0.00 in
7/24/2020	3:24 AM	75.2 F	73.0 F	93 %	SSW	0.0 mph	0.0 mph	29.72 in	0.00 in	0.00 in
7/24/2020	3:29 AM	75.1 F	73.0 F	94 %	SSW	0.0 mph	0.0 mph	29.72 in	0.00 in	0.00 in
7/24/2020	3:34 AM	74.8 F	72.8 F	94 %	SSW	0.1 mph	0.1 mph	29.72 in	0.00 in	0.00 in
7/24/2020	3:39 AM	74.7 F	72.7 F	94 %	SSW	1.5 mph	1.8 mph	29.72 in	0.00 in	0.00 in
7/24/2020	3:44 AM	74.4 F	72.7 F	95 %	SSW	2.0 mph	2.3 mph	29.72 in	0.00 in	0.00 in
7/24/2020	3:49 AM	73.9 F	72.3 F	95 %	SSW	0.5 mph	0.6 mph	29.73 in	0.00 in	0.00 in
7/24/2020	3:54 AM	73.8 F	72.6 F	96 %	East	0.8 mph	0.9 mph	29.73 in	0.00 in	0.00 in
7/24/2020	3:59 AM	73.6 F	72.4 F	96 %	ENE	1.5 mph	1.9 mph	29.73 in	0.00 in	0.00 in
7/24/2020	4:04 AM	73.4 F	72.3 F	96 %	ENE	1.0 mph	1.3 mph	29.73 in	0.00 in	0.00 in
7/24/2020	4:09 AM	73.6 F	72.5 F	96 %	SSE	0.0 mph	0.0 mph	29.74 in	0.00 in	0.00 in
7/24/2020	4:14 AM	73.8 F	72.7 F	96 %	South	0.1 mph	0.2 mph	29.74 in	0.00 in	0.00 in
7/24/2020	4:19 AM	73.6 F	72.4 F	96 %	SSW	1.1 mph	1.3 mph	29.74 in	0.00 in	0.00 in
7/24/2020	4:24 AM	73.2 F	72.1 F	96 %	SSW	1.2 mph	1.6 mph	29.75 in	0.00 in	0.00 in
7/24/2020	4:29 AM	72.8 F	71.7 F	96 %	SSW	0.1 mph	0.2 mph	29.75 in	0.00 in	0.00 in
7/24/2020	4:34 AM	73.2 F	72.1 F	96 %	SSW	2.4 mph	2.8 mph	29.75 in	0.00 in	0.00 in
7/24/2020	4:39 AM	73.3 F	72.2 F	96 %	SW	3.7 mph	4.2 mph	29.76 in	0.00 in	0.00 in
7/24/2020	4:44 AM	73.3 F	72.2 F	96 %	SW	3.5 mph	3.7 mph	29.76 in	0.00 in	0.00 in
7/24/2020	4:49 AM	72.7 F	71.6 F	96 %	SW	3.8 mph	4.3 mph	29.76 in	0.00 in	0.00 in
7/24/2020	4:54 AM	72.2 F	71.1 F	96 %	SSW	3.6 mph	4.1 mph	29.76 in	0.00 in	0.00 in
7/24/2020	4:59 AM	72.0 F	71.2 F	97 %	SW	3.4 mph	3.7 mph	29.76 in	0.00 in	0.00 in
7/24/2020	5:04 AM	71.7 F	71.0 F	97 %	SW	4.5 mph	4.8 mph	29.77 in	0.00 in	0.00 in
7/24/2020	5:09 AM	71.2 F	70.4 F	97 %	SSW	4.5 mph	4.9 mph	29.77 in	0.00 in	0.00 in
7/24/2020	5:14 AM	71.9 F	71.1 F	97 %	SW	3.4 mph	3.9 mph	29.77 in	0.00 in	0.00 in
7/24/2020	5:19 AM	71.9 F	71.2 F	97 %	SSW	3.4 mph	4.0 mph	29.78 in	0.00 in	0.00 in
7/24/2020	5:24 AM	71.6 F	70.9 F	97 %	South	1.5 mph	1.9 mph	29.78 in	0.00 in	0.00 in
7/24/2020	5:29 AM	71.6 F	70.9 F	97 %	SE	0.2 mph	0.3 mph	29.78 in	0.00 in	0.00 in
7/24/2020	5:34 AM	71.4 F	70.7 F	97 %	SE	0.0 mph	0.1 mph	29.78 in	0.00 in	0.00 in
7/24/2020	5:39 AM	71.5 F	70.8 F	97 %	South	1.3 mph	1.9 mph	29.78 in	0.00 in	0.00 in
7/24/2020	5:44 AM	72.1 F	71.4 F	97 %	South	0.7 mph	1.1 mph	29.78 in	0.00 in	0.00 in
7/24/2020	5:49 AM	72.0 F	71.2 F	97 %	ESE	1.0 mph	1.4 mph	29.78 in	0.00 in	0.00 in
7/24/2020	5:54 AM	72.0 F	71.2 F	97 %	East	1.3 mph	1.7 mph	29.78 in	0.00 in	0.00 in
7/24/2020	5:59 AM	72.1 F	71.3 F	97 %	East	0.2 mph	0.3 mph	29.78 in	0.00 in	0.00 in
7/24/2020	6:04 AM	71.9 F	71.1 F	97 %	SSE	0.0 mph	0.0 mph	29.79 in	0.00 in	0.00 in
7/24/2020	6:09 AM	71.6 F	70.9 F	97 %	SSE	0.6 mph	1.1 mph	29.78 in	0.00 in	0.00 in
7/24/2020	6:14 AM	71.4 F	70.7 F	97 %	SE	0.2 mph	0.4 mph	29.78 in	0.00 in	0.00 in
7/24/2020	6:19 AM	71.3 F	70.6 F	97 %	South	1.7 mph	2.5 mph	29.79 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:27	Survey Start:	21:27	Determination:	Valid
SITES:	1A, 1B, 2A, 2B, 3A, alt2, 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B, T1, T2, T4, T5	Sunrise Time:	6:16	End Time:	2:27	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/24/2020	9:29 PM	73.8 F	63.5 F	70 %	ESE	9.4 mph	11.2 mph	29.76 in	0.00 in	0.00 in
7/24/2020	9:34 PM	73.5 F	62.6 F	69 %	ESE	7.1 mph	8.6 mph	29.76 in	0.00 in	0.00 in
7/24/2020	9:39 PM	74.0 F	63.7 F	70 %	SW	7.1 mph	8.6 mph	29.78 in	0.00 in	0.00 in
7/24/2020	9:44 PM	73.9 F	62.6 F	68 %	WSW	5.2 mph	6.7 mph	29.78 in	0.00 in	0.00 in
7/24/2020	9:49 PM	74.8 F	63.4 F	68 %	South	4.1 mph	5.1 mph	29.78 in	0.00 in	0.00 in
7/24/2020	9:54 PM	73.9 F	63.2 F	70 %	South	5.9 mph	6.8 mph	29.78 in	0.00 in	0.00 in
7/24/2020	9:59 PM	73.5 F	63.9 F	72 %	SSW	3.7 mph	4.9 mph	29.78 in	0.00 in	0.00 in
7/24/2020	10:04 PM	72.2 F	63.3 F	74 %	South	3.7 mph	4.7 mph	29.78 in	0.00 in	0.00 in
7/24/2020	10:09 PM	73.4 F	63.2 F	70 %	South	5.7 mph	6.9 mph	29.78 in	0.00 in	0.00 in
7/24/2020	10:14 PM	72.7 F	63.7 F	73 %	SSW	4.7 mph	5.7 mph	29.78 in	0.00 in	0.00 in
7/24/2020	10:19 PM	71.1 F	63.1 F	76 %	South	3.6 mph	4.4 mph	29.78 in	0.00 in	0.00 in
7/24/2020	10:24 PM	71.0 F	62.9 F	75 %	SSW	3.0 mph	3.6 mph	29.78 in	0.00 in	0.00 in
7/24/2020	10:29 PM	70.0 F	62.7 F	78 %	SSW	1.4 mph	1.8 mph	29.78 in	0.00 in	0.00 in
7/24/2020	10:34 PM	69.6 F	62.4 F	78 %	SSE	0.2 mph	0.4 mph	29.78 in	0.00 in	0.00 in
7/24/2020	10:39 PM	69.5 F	62.1 F	77 %	SW	1.7 mph	2.1 mph	29.77 in	0.00 in	0.00 in
7/24/2020	10:44 PM	69.8 F	62.2 F	77 %	SW	1.8 mph	2.1 mph	29.77 in	0.00 in	0.00 in
7/24/2020	10:49 PM	70.0 F	62.2 F	76 %	SW	1.6 mph	1.8 mph	29.77 in	0.00 in	0.00 in
7/24/2020	10:54 PM	69.0 F	62.4 F	80 %	WSW	3.0 mph	3.4 mph	29.78 in	0.00 in	0.00 in
7/24/2020	10:59 PM	69.8 F	61.5 F	75 %	South	2.4 mph	2.7 mph	29.78 in	0.00 in	0.00 in
7/24/2020	11:04 PM	70.3 F	62.3 F	76 %	SE	2.0 mph	2.1 mph	29.77 in	0.00 in	0.00 in
7/24/2020	11:09 PM	68.9 F	62.2 F	79 %	SE	1.5 mph	1.9 mph	29.78 in	0.00 in	0.00 in
7/24/2020	11:14 PM	67.9 F	61.8 F	81 %	SSE	1.1 mph	1.1 mph	29.78 in	0.00 in	0.00 in
7/24/2020	11:24 PM	66.7 F	62.1 F	85 %	East	2.8 mph	3.0 mph	29.78 in	0.00 in	0.00 in
7/24/2020	11:29 PM	65.5 F	61.3 F	87 %	SE	1.9 mph	2.2 mph	29.78 in	0.00 in	0.00 in
7/24/2020	11:34 PM	65.8 F	61.4 F	86 %	SSE	3.1 mph	3.6 mph	29.78 in	0.00 in	0.00 in
7/24/2020	11:39 PM	66.8 F	61.8 F	84 %	South	4.3 mph	4.9 mph	29.78 in	0.00 in	0.00 in
7/24/2020	11:44 PM	67.3 F	62.2 F	84 %	South	2.9 mph	3.2 mph	29.78 in	0.00 in	0.00 in
7/24/2020	11:49 PM	68.9 F	62.9 F	81 %	SSW	2.2 mph	2.4 mph	29.78 in	0.00 in	0.00 in
7/24/2020	11:54 PM	69.0 F	63.3 F	82 %	SSW	2.1 mph	2.2 mph	29.78 in	0.00 in	0.00 in
7/24/2020	11:59 PM	69.1 F	63.3 F	82 %	SSW	1.4 mph	1.9 mph	29.78 in	0.00 in	0.00 in
7/25/2020	12:04 AM	69.7 F	63.8 F	82 %	SSW	2.7 mph	2.9 mph	29.77 in	0.00 in	0.00 in
7/25/2020	12:09 AM	69.9 F	63.2 F	79 %	SW	3.6 mph	4.2 mph	29.78 in	0.00 in	0.00 in
7/25/2020	12:14 AM	69.6 F	63.6 F	81 %	SSW	3.5 mph	4.1 mph	29.77 in	0.00 in	0.00 in
7/25/2020	12:19 AM	69.3 F	63.5 F	82 %	SW	2.8 mph	3.5 mph	29.78 in	0.00 in	0.00 in
7/25/2020	12:24 AM	69.0 F	63.2 F	82 %	WSW	5.5 mph	6.7 mph	29.78 in	0.00 in	0.00 in
7/25/2020	12:29 AM	69.7 F	63.8 F	82 %	SW	4.3 mph	4.9 mph	29.78 in	0.00 in	0.00 in
7/25/2020	12:34 AM	69.4 F	63.9 F	83 %	SW	2.3 mph	2.8 mph	29.78 in	0.00 in	0.00 in
7/25/2020	12:39 AM	67.9 F	63.1 F	84 %	SW	1.7 mph	2.1 mph	29.78 in	0.00 in	0.00 in
7/25/2020	12:44 AM	68.2 F	63.4 F	85 %	SSW	3.4 mph	4.2 mph	29.78 in	0.00 in	0.00 in
7/25/2020	12:49 AM	68.5 F	63.7 F	85 %	SSW	2.9 mph	3.5 mph	29.78 in	0.00 in	0.00 in
7/25/2020	12:54 AM	68.0 F	63.6 F	86 %	SSW	3.4 mph	3.6 mph	29.78 in	0.00 in	0.00 in
7/25/2020	12:59 AM	68.1 F	63.4 F	85 %	South	4.1 mph	4.7 mph	29.78 in	0.00 in	0.00 in
7/25/2020	1:04 AM	69.2 F	63.9 F	83 %	SSW	2.7 mph	3.4 mph	29.78 in	0.00 in	0.00 in
7/25/2020	1:09 AM	68.8 F	63.9 F	84 %	SE	2.4 mph	3.1 mph	29.78 in	0.00 in	0.00 in
7/25/2020	1:14 AM	66.7 F	62.8 F	88 %	ESE	0.7 mph	1.0 mph	29.78 in	0.00 in	0.00 in
7/25/2020	1:19 AM	65.4 F	62.1 F	89 %	ESE	0.9 mph	1.3 mph	29.78 in	0.00 in	0.00 in
7/25/2020	1:24 AM	65.3 F	62.0 F	90 %	SSW	1.7 mph	2.2 mph	29.78 in	0.00 in	0.00 in
7/25/2020	1:29 AM	66.7 F	62.9 F	88 %	SSW	3.2 mph	4.0 mph	29.79 in	0.00 in	0.00 in
7/25/2020	1:34 AM	67.0 F	63.1 F	87 %	South	4.4 mph	5.4 mph	29.79 in	0.00 in	0.00 in
7/25/2020	1:39 AM	67.4 F	63.4 F	87 %	SSE	4.1 mph	4.9 mph	29.78 in	0.00 in	0.00 in
7/25/2020	1:44 AM	68.2 F	63.4 F	85 %	South	4.3 mph	5.3 mph	29.78 in	0.00 in	0.00 in
7/25/2020	1:49 AM	69.0 F	64.0 F	84 %	South	6.3 mph	7.5 mph	29.78 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:27	Survey Start:	21:27	Determination:	Valid
SITES:	1A, 1B, 2A, 2B, 3A, alt2, 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B, T1, T2, T4, T5	Sunrise Time:	6:16	End Time:	2:27	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/25/2020	1:54 AM	69.1 F	64.0 F	84 %	SSW	6.8 mph	8.2 mph	29.78 in	0.00 in	0.00 in
7/25/2020	1:59 AM	68.9 F	64.0 F	84 %	South	5.5 mph	7.0 mph	29.78 in	0.00 in	0.00 in
7/25/2020	2:04 AM	69.3 F	63.9 F	83 %	South	5.6 mph	7.0 mph	29.78 in	0.00 in	0.00 in
7/25/2020	2:09 AM	69.9 F	64.1 F	82 %	South	6.0 mph	7.4 mph	29.78 in	0.00 in	0.00 in
7/25/2020	2:14 AM	70.1 F	63.9 F	81 %	South	6.6 mph	7.7 mph	29.78 in	0.00 in	0.00 in
7/25/2020	2:19 AM	70.2 F	64.2 F	81 %	South	5.9 mph	7.2 mph	29.78 in	0.00 in	0.00 in
7/25/2020	2:24 AM	69.7 F	64.1 F	82 %	South	6.8 mph	8.4 mph	29.78 in	0.00 in	0.00 in
7/25/2020	2:29 AM	69.3 F	64.4 F	85 %	South	6.3 mph	7.4 mph	29.78 in	0.00 in	0.00 in
7/25/2020	2:34 AM	67.9 F	64.0 F	87 %	SSE	6.9 mph	7.8 mph	29.78 in	0.00 in	0.00 in
7/25/2020	2:39 AM	67.4 F	63.6 F	88 %	South	6.8 mph	7.9 mph	29.78 in	0.00 in	0.00 in
7/25/2020	2:44 AM	67.8 F	63.9 F	88 %	South	7.7 mph	9.1 mph	29.78 in	0.00 in	0.00 in
7/25/2020	2:49 AM	68.4 F	64.4 F	87 %	South	7.6 mph	9.0 mph	29.78 in	0.00 in	0.00 in
7/25/2020	2:54 AM	67.8 F	64.1 F	88 %	South	7.3 mph	8.4 mph	29.78 in	0.00 in	0.00 in
7/25/2020	2:59 AM	67.6 F	64.1 F	89 %	SSE	7.0 mph	8.1 mph	29.78 in	0.00 in	0.00 in
7/25/2020	3:04 AM	67.4 F	64.0 F	89 %	South	6.6 mph	7.6 mph	29.78 in	0.00 in	0.00 in
7/25/2020	3:09 AM	67.3 F	64.0 F	89 %	South	6.4 mph	7.5 mph	29.78 in	0.00 in	0.00 in
7/25/2020	3:14 AM	67.8 F	64.4 F	89 %	South	6.4 mph	7.5 mph	29.78 in	0.00 in	0.00 in
7/25/2020	3:19 AM	67.9 F	64.2 F	88 %	South	6.3 mph	7.6 mph	29.78 in	0.00 in	0.00 in
7/25/2020	3:24 AM	68.5 F	64.4 F	87 %	South	4.2 mph	5.3 mph	29.78 in	0.00 in	0.00 in
7/25/2020	3:29 AM	67.3 F	63.9 F	89 %	SSW	3.7 mph	4.5 mph	29.78 in	0.00 in	0.00 in
7/25/2020	3:34 AM	66.9 F	63.4 F	89 %	South	4.3 mph	5.3 mph	29.78 in	0.00 in	0.00 in
7/25/2020	3:39 AM	68.1 F	63.7 F	86 %	South	4.9 mph	6.2 mph	29.78 in	0.00 in	0.00 in
7/25/2020	3:44 AM	69.0 F	64.0 F	84 %	South	5.3 mph	6.5 mph	29.77 in	0.00 in	0.00 in
7/25/2020	3:49 AM	69.3 F	63.9 F	83 %	South	5.5 mph	6.8 mph	29.77 in	0.00 in	0.00 in
7/25/2020	3:54 AM	69.2 F	63.8 F	83 %	South	5.1 mph	6.2 mph	29.77 in	0.00 in	0.00 in
7/25/2020	3:59 AM	69.3 F	64.0 F	83 %	South	6.0 mph	7.0 mph	29.77 in	0.00 in	0.00 in
7/25/2020	4:04 AM	68.2 F	63.9 F	86 %	South	6.0 mph	6.9 mph	29.77 in	0.00 in	0.00 in
7/25/2020	4:09 AM	67.5 F	63.4 F	87 %	South	4.7 mph	5.6 mph	29.77 in	0.00 in	0.00 in
7/25/2020	4:14 AM	67.5 F	63.0 F	85 %	South	4.4 mph	5.1 mph	29.77 in	0.00 in	0.00 in
7/25/2020	4:19 AM	68.2 F	63.2 F	84 %	South	5.2 mph	6.3 mph	29.77 in	0.00 in	0.00 in
7/25/2020	4:24 AM	68.5 F	63.7 F	85 %	South	5.7 mph	6.8 mph	29.77 in	0.00 in	0.00 in
7/25/2020	4:29 AM	67.6 F	63.5 F	87 %	SSW	4.8 mph	5.9 mph	29.77 in	0.00 in	0.00 in
7/25/2020	4:34 AM	67.0 F	63.0 F	87 %	South	5.0 mph	6.6 mph	29.77 in	0.00 in	0.00 in
7/25/2020	4:39 AM	67.3 F	63.0 F	86 %	South	3.9 mph	5.2 mph	29.77 in	0.00 in	0.00 in
7/25/2020	4:44 AM	66.4 F	62.5 F	88 %	South	2.3 mph	3.1 mph	29.77 in	0.00 in	0.00 in
7/25/2020	4:49 AM	66.4 F	62.6 F	88 %	South	3.3 mph	4.3 mph	29.77 in	0.00 in	0.00 in
7/25/2020	4:54 AM	66.7 F	62.9 F	88 %	South	2.7 mph	3.4 mph	29.77 in	0.00 in	0.00 in
7/25/2020	4:59 AM	67.2 F	63.1 F	87 %	South	4.8 mph	5.8 mph	29.77 in	0.00 in	0.00 in
7/25/2020	5:04 AM	67.6 F	63.5 F	87 %	South	4.0 mph	4.8 mph	29.78 in	0.00 in	0.00 in
7/25/2020	5:09 AM	67.2 F	63.2 F	87 %	South	4.2 mph	5.5 mph	29.77 in	0.00 in	0.00 in
7/25/2020	5:14 AM	67.2 F	63.4 F	88 %	SSE	3.4 mph	4.3 mph	29.77 in	0.00 in	0.00 in
7/25/2020	5:19 AM	66.0 F	62.7 F	89 %	South	3.9 mph	4.6 mph	29.78 in	0.00 in	0.00 in
7/25/2020	5:24 AM	67.1 F	63.2 F	88 %	South	4.7 mph	5.6 mph	29.78 in	0.00 in	0.00 in
7/25/2020	5:29 AM	67.1 F	63.3 F	88 %	South	5.7 mph	6.8 mph	29.78 in	0.00 in	0.00 in
7/25/2020	5:34 AM	67.4 F	63.3 F	87 %	South	7.6 mph	9.4 mph	29.78 in	0.00 in	0.00 in
7/25/2020	5:39 AM	67.8 F	63.5 F	86 %	South	7.0 mph	8.6 mph	29.78 in	0.00 in	0.00 in
7/25/2020	5:44 AM	67.8 F	63.5 F	86 %	South	6.5 mph	8.2 mph	29.78 in	0.00 in	0.00 in
7/25/2020	5:49 AM	67.5 F	63.6 F	87 %	South	5.3 mph	6.7 mph	29.78 in	0.00 in	0.00 in
7/25/2020	5:54 AM	67.5 F	63.5 F	87 %	South	5.0 mph	6.2 mph	29.78 in	0.00 in	0.00 in
7/25/2020	5:59 AM	67.7 F	63.5 F	86 %	South	4.3 mph	5.5 mph	29.79 in	0.00 in	0.00 in
7/25/2020	6:04 AM	68.4 F	63.8 F	85 %	SSE	5.0 mph	6.0 mph	29.78 in	0.00 in	0.00 in
7/25/2020	6:09 AM	67.9 F	63.9 F	87 %	SSE	4.7 mph	5.5 mph	29.78 in	0.00 in	0.00 in
7/25/2020	6:14 AM	67.6 F	63.6 F	87 %	SSE	5.8 mph	6.9 mph	29.78 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:27	Survey Start:	21:27	Determination:	Valid
SITES:	1A, 1B, 2A, 2B, 3A, alt2, 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B, T1, T2, T4, T5	Sunrise Time:	6:16	End Time:	2:27	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/25/2020	6:19 AM	67.9 F	63.6 F	86 %	South	5.6 mph	6.7 mph	29.78 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:26	Survey Start:	21:26	Determination:	Valid
SITES:	1A, 1B, 2A, 2B, 3A, alt2, 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B, T1, T2, T4, T5	Sunrise Time:	6:18	End Time:	2:26	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/25/2020	9:24 PM	67.3 F	54.2 F	63 %	NW	4.7 mph	5.8 mph	29.94 in	0.00 in	0.00 in
7/25/2020	9:29 PM	67.1 F	54.3 F	64 %	NW	4.8 mph	5.7 mph	29.94 in	0.00 in	0.00 in
7/25/2020	9:34 PM	66.4 F	54.6 F	66 %	WNW	4.4 mph	5.4 mph	29.94 in	0.00 in	0.00 in
7/25/2020	9:39 PM	65.9 F	54.7 F	67 %	NW	4.1 mph	4.8 mph	29.94 in	0.00 in	0.00 in
7/25/2020	9:44 PM	64.9 F	55.0 F	70 %	WNW	4.4 mph	5.2 mph	29.95 in	0.00 in	0.00 in
7/25/2020	9:49 PM	64.5 F	54.3 F	70 %	WNW	5.3 mph	6.2 mph	29.95 in	0.00 in	0.00 in
7/25/2020	9:54 PM	64.2 F	53.8 F	69 %	WNW	4.8 mph	5.9 mph	29.95 in	0.00 in	0.00 in
7/25/2020	9:59 PM	64.1 F	53.8 F	69 %	WNW	4.4 mph	5.4 mph	29.96 in	0.00 in	0.00 in
7/25/2020	10:04 PM	64.0 F	53.7 F	69 %	NW	4.5 mph	5.5 mph	29.96 in	0.00 in	0.00 in
7/25/2020	10:09 PM	63.8 F	53.6 F	69 %	WNW	4.2 mph	5.1 mph	29.96 in	0.00 in	0.00 in
7/25/2020	10:14 PM	63.4 F	53.5 F	70 %	NW	3.4 mph	4.0 mph	29.96 in	0.00 in	0.00 in
7/25/2020	10:19 PM	62.9 F	53.6 F	72 %	NW	2.7 mph	3.3 mph	29.96 in	0.00 in	0.00 in
7/25/2020	10:24 PM	62.3 F	53.5 F	73 %	WNW	2.2 mph	2.5 mph	29.97 in	0.00 in	0.00 in
7/25/2020	10:29 PM	62.2 F	53.2 F	72 %	WNW	2.5 mph	3.0 mph	29.97 in	0.00 in	0.00 in
7/25/2020	10:34 PM	62.3 F	53.5 F	73 %	WNW	2.4 mph	2.8 mph	29.97 in	0.00 in	0.00 in
7/25/2020	10:39 PM	62.2 F	53.4 F	73 %	West	2.4 mph	2.8 mph	29.97 in	0.00 in	0.00 in
7/25/2020	10:44 PM	62.1 F	53.5 F	73 %	WNW	2.6 mph	3.0 mph	29.97 in	0.00 in	0.00 in
7/25/2020	10:49 PM	62.7 F	53.7 F	73 %	WNW	2.9 mph	3.5 mph	29.98 in	0.00 in	0.00 in
7/25/2020	10:54 PM	62.6 F	53.6 F	72 %	WNW	3.4 mph	3.6 mph	29.98 in	0.00 in	0.00 in
7/25/2020	10:59 PM	62.9 F	53.7 F	72 %	West	3.7 mph	4.1 mph	29.98 in	0.00 in	0.00 in
7/25/2020	11:04 PM	63.2 F	53.8 F	71 %	WNW	4.4 mph	5.1 mph	29.98 in	0.00 in	0.00 in
7/25/2020	11:09 PM	63.6 F	54.0 F	71 %	WNW	3.8 mph	4.2 mph	29.98 in	0.00 in	0.00 in
7/25/2020	11:14 PM	63.2 F	54.2 F	73 %	West	3.1 mph	3.4 mph	29.98 in	0.00 in	0.00 in
7/25/2020	11:19 PM	62.6 F	54.1 F	74 %	West	2.7 mph	3.2 mph	29.98 in	0.00 in	0.00 in
7/25/2020	11:24 PM	62.6 F	53.9 F	73 %	WNW	3.3 mph	3.7 mph	29.98 in	0.00 in	0.00 in
7/25/2020	11:29 PM	62.9 F	54.2 F	73 %	West	3.0 mph	3.4 mph	29.98 in	0.00 in	0.00 in
7/25/2020	11:34 PM	62.8 F	54.4 F	74 %	West	3.1 mph	3.4 mph	29.98 in	0.00 in	0.00 in
7/25/2020	11:39 PM	62.6 F	54.3 F	74 %	West	3.4 mph	3.5 mph	29.98 in	0.00 in	0.00 in
7/25/2020	11:44 PM	62.6 F	54.3 F	74 %	West	2.6 mph	2.9 mph	29.98 in	0.00 in	0.00 in
7/25/2020	11:49 PM	62.6 F	54.6 F	75 %	West	2.2 mph	2.6 mph	29.98 in	0.00 in	0.00 in
7/25/2020	11:54 PM	62.3 F	54.6 F	76 %	West	2.2 mph	2.6 mph	29.99 in	0.00 in	0.00 in
7/25/2020	11:59 PM	61.7 F	54.5 F	77 %	West	2.3 mph	2.7 mph	29.99 in	0.00 in	0.00 in
7/26/2020	12:04 AM	61.5 F	54.7 F	78 %	West	2.7 mph	3.4 mph	29.99 in	0.00 in	0.00 in
7/26/2020	12:09 AM	61.5 F	55.1 F	79 %	West	3.0 mph	3.4 mph	29.99 in	0.00 in	0.00 in
7/26/2020	12:14 AM	61.3 F	54.7 F	79 %	West	3.0 mph	3.6 mph	29.99 in	0.00 in	0.00 in
7/26/2020	12:19 AM	61.3 F	54.8 F	79 %	WSW	2.6 mph	3.2 mph	29.99 in	0.00 in	0.00 in
7/26/2020	12:24 AM	61.2 F	54.8 F	79 %	West	3.6 mph	4.3 mph	30.00 in	0.00 in	0.00 in
7/26/2020	12:29 AM	61.5 F	55.0 F	79 %	West	4.1 mph	4.7 mph	30.00 in	0.00 in	0.00 in
7/26/2020	12:34 AM	61.6 F	55.2 F	79 %	West	4.2 mph	4.8 mph	30.00 in	0.00 in	0.00 in
7/26/2020	12:39 AM	61.2 F	55.0 F	80 %	West	4.6 mph	5.1 mph	30.00 in	0.00 in	0.00 in
7/26/2020	12:44 AM	61.3 F	55.0 F	80 %	West	4.6 mph	5.3 mph	30.00 in	0.00 in	0.00 in
7/26/2020	12:49 AM	61.6 F	55.3 F	80 %	West	4.8 mph	5.5 mph	30.00 in	0.00 in	0.00 in
7/26/2020	12:54 AM	61.1 F	55.1 F	81 %	West	3.6 mph	4.3 mph	30.00 in	0.00 in	0.00 in
7/26/2020	12:59 AM	60.8 F	55.1 F	82 %	West	1.4 mph	1.9 mph	30.00 in	0.00 in	0.00 in
7/26/2020	1:04 AM	60.0 F	54.6 F	83 %	SE	0.3 mph	0.5 mph	30.00 in	0.00 in	0.00 in
7/26/2020	1:09 AM	58.7 F	54.0 F	85 %	West	1.4 mph	1.8 mph	30.01 in	0.00 in	0.00 in
7/26/2020	1:14 AM	59.8 F	54.7 F	83 %	WNW	2.7 mph	3.2 mph	30.01 in	0.00 in	0.00 in
7/26/2020	1:19 AM	60.2 F	54.9 F	83 %	West	2.2 mph	2.6 mph	30.01 in	0.00 in	0.00 in
7/26/2020	1:24 AM	59.6 F	54.7 F	84 %	West	1.6 mph	2.1 mph	30.01 in	0.00 in	0.00 in
7/26/2020	1:29 AM	59.5 F	54.6 F	84 %	West	1.9 mph	2.2 mph	30.01 in	0.00 in	0.00 in
7/26/2020	1:34 AM	59.3 F	54.6 F	84 %	West	2.1 mph	2.2 mph	30.01 in	0.00 in	0.00 in
7/26/2020	1:39 AM	59.4 F	54.7 F	85 %	West	2.5 mph	2.8 mph	30.01 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:26	Survey Start:	21:26	Determination:	Valid
SITES:	1A, 1B, 2A, 2B, 3A, alt2, 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B, T1, T2, T4, T5	Sunrise Time:	6:18	End Time:	2:26	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/26/2020	1:44 AM	59.3 F	54.8 F	85 %	WNW	2.3 mph	2.5 mph	30.02 in	0.00 in	0.00 in
7/26/2020	1:49 AM	59.2 F	54.7 F	85 %	WNW	2.5 mph	2.9 mph	30.02 in	0.00 in	0.00 in
7/26/2020	1:54 AM	59.4 F	54.9 F	85 %	WNW	2.4 mph	2.9 mph	30.02 in	0.00 in	0.00 in
7/26/2020	1:59 AM	59.3 F	55.1 F	86 %	WNW	2.2 mph	2.4 mph	30.02 in	0.00 in	0.00 in
7/26/2020	2:04 AM	59.0 F	54.9 F	86 %	West	2.7 mph	3.0 mph	30.02 in	0.00 in	0.00 in
7/26/2020	2:09 AM	59.2 F	54.7 F	85 %	West	3.1 mph	3.3 mph	30.02 in	0.00 in	0.00 in
7/26/2020	2:14 AM	59.2 F	54.7 F	85 %	West	2.3 mph	2.5 mph	30.03 in	0.00 in	0.00 in
7/26/2020	2:19 AM	59.1 F	54.5 F	85 %	West	2.4 mph	2.8 mph	30.03 in	0.00 in	0.00 in
7/26/2020	2:24 AM	59.2 F	54.7 F	85 %	WSW	1.3 mph	1.7 mph	30.03 in	0.00 in	0.00 in
7/26/2020	2:29 AM	58.6 F	54.3 F	86 %	SSE	0.1 mph	0.2 mph	30.03 in	0.00 in	0.00 in
7/26/2020	2:34 AM	57.4 F	53.8 F	88 %	SSE	1.0 mph	1.3 mph	30.03 in	0.00 in	0.00 in
7/26/2020	2:39 AM	58.0 F	54.2 F	87 %	SSE	1.0 mph	1.1 mph	30.03 in	0.00 in	0.00 in
7/26/2020	2:44 AM	58.9 F	54.6 F	86 %	SSE	0.8 mph	0.8 mph	30.03 in	0.00 in	0.00 in
7/26/2020	2:49 AM	59.1 F	54.8 F	86 %	SSE	0.0 mph	0.0 mph	30.03 in	0.00 in	0.00 in
7/26/2020	2:54 AM	58.6 F	54.6 F	87 %	SSE	0.0 mph	0.0 mph	30.03 in	0.00 in	0.00 in
7/26/2020	2:59 AM	58.2 F	54.4 F	87 %	SSE	0.0 mph	0.0 mph	30.03 in	0.00 in	0.00 in
7/26/2020	3:04 AM	58.4 F	54.5 F	87 %	SSE	0.0 mph	0.0 mph	30.03 in	0.00 in	0.00 in
7/26/2020	3:09 AM	59.1 F	54.5 F	85 %	SW	0.1 mph	0.1 mph	30.03 in	0.00 in	0.00 in
7/26/2020	3:14 AM	59.9 F	54.5 F	82 %	WSW	1.2 mph	1.4 mph	30.02 in	0.00 in	0.00 in
7/26/2020	3:19 AM	60.2 F	54.3 F	81 %	WNW	2.0 mph	2.3 mph	30.03 in	0.00 in	0.00 in
7/26/2020	3:24 AM	60.2 F	54.2 F	81 %	West	1.8 mph	2.2 mph	30.03 in	0.00 in	0.00 in
7/26/2020	3:29 AM	60.2 F	54.1 F	81 %	West	1.8 mph	2.1 mph	30.02 in	0.00 in	0.00 in
7/26/2020	3:34 AM	60.5 F	54.4 F	80 %	SW	1.0 mph	1.3 mph	30.03 in	0.00 in	0.00 in
7/26/2020	3:39 AM	60.4 F	54.3 F	80 %	South	0.1 mph	0.1 mph	30.03 in	0.00 in	0.00 in
7/26/2020	3:44 AM	59.2 F	54.1 F	83 %	South	1.5 mph	1.8 mph	30.03 in	0.00 in	0.00 in
7/26/2020	3:49 AM	58.5 F	53.6 F	84 %	South	0.6 mph	0.7 mph	30.03 in	0.00 in	0.00 in
7/26/2020	3:54 AM	57.9 F	53.7 F	86 %	SSE	0.0 mph	0.0 mph	30.02 in	0.00 in	0.00 in
7/26/2020	3:59 AM	57.2 F	53.4 F	87 %	SSE	0.0 mph	0.0 mph	30.02 in	0.00 in	0.00 in
7/26/2020	4:04 AM	56.5 F	52.9 F	88 %	SSE	0.0 mph	0.0 mph	30.02 in	0.00 in	0.00 in
7/26/2020	4:09 AM	56.3 F	52.7 F	88 %	SSE	0.2 mph	0.3 mph	30.02 in	0.00 in	0.00 in
7/26/2020	4:14 AM	56.6 F	52.8 F	87 %	South	1.8 mph	2.2 mph	30.02 in	0.00 in	0.00 in
7/26/2020	4:19 AM	56.1 F	52.7 F	88 %	South	2.3 mph	2.4 mph	30.02 in	0.00 in	0.00 in
7/26/2020	4:24 AM	56.1 F	52.6 F	88 %	SSW	2.4 mph	2.8 mph	30.03 in	0.00 in	0.00 in
7/26/2020	4:29 AM	57.3 F	53.1 F	86 %	SSW	2.4 mph	3.0 mph	30.03 in	0.00 in	0.00 in
7/26/2020	4:34 AM	58.3 F	53.2 F	83 %	South	0.8 mph	1.2 mph	30.02 in	0.00 in	0.00 in
7/26/2020	4:39 AM	58.7 F	53.5 F	83 %	South	0.0 mph	0.0 mph	30.02 in	0.00 in	0.00 in
7/26/2020	4:44 AM	58.6 F	53.4 F	83 %	South	1.2 mph	1.3 mph	30.02 in	0.00 in	0.00 in
7/26/2020	4:49 AM	58.3 F	53.0 F	83 %	SSW	2.2 mph	2.2 mph	30.02 in	0.00 in	0.00 in
7/26/2020	4:54 AM	58.6 F	53.2 F	82 %	SSW	2.6 mph	3.1 mph	30.02 in	0.00 in	0.00 in
7/26/2020	4:59 AM	59.0 F	52.9 F	80 %	South	1.1 mph	1.3 mph	30.02 in	0.00 in	0.00 in
7/26/2020	5:04 AM	59.6 F	52.7 F	78 %	South	0.2 mph	1.0 mph	30.02 in	0.00 in	0.00 in
7/26/2020	5:09 AM	60.0 F	52.6 F	77 %	South	0.0 mph	0.1 mph	30.02 in	0.00 in	0.00 in
7/26/2020	5:14 AM	59.7 F	52.4 F	77 %	South	0.0 mph	0.0 mph	30.02 in	0.00 in	0.00 in
7/26/2020	5:19 AM	59.4 F	52.2 F	77 %	South	0.3 mph	0.4 mph	30.02 in	0.00 in	0.00 in
7/26/2020	5:24 AM	59.8 F	52.6 F	77 %	South	1.7 mph	1.9 mph	30.02 in	0.00 in	0.00 in
7/26/2020	5:29 AM	60.0 F	52.6 F	76 %	SSW	2.2 mph	2.2 mph	30.02 in	0.00 in	0.00 in
7/26/2020	5:34 AM	60.1 F	52.5 F	76 %	SSW	2.8 mph	3.1 mph	30.02 in	0.00 in	0.00 in
7/26/2020	5:39 AM	59.3 F	52.2 F	78 %	SSW	3.3 mph	3.4 mph	30.03 in	0.00 in	0.00 in
7/26/2020	5:44 AM	59.8 F	51.7 F	74 %	SSW	2.4 mph	2.8 mph	30.03 in	0.00 in	0.00 in
7/26/2020	5:49 AM	61.0 F	51.5 F	71 %	SSW	1.6 mph	1.8 mph	30.04 in	0.00 in	0.00 in
7/26/2020	5:54 AM	60.9 F	51.6 F	72 %	SSW	0.1 mph	0.1 mph	30.03 in	0.00 in	0.00 in
7/26/2020	5:59 AM	60.5 F	51.3 F	72 %	SSW	0.3 mph	0.4 mph	30.03 in	0.00 in	0.00 in
7/26/2020	6:04 AM	59.3 F	51.6 F	76 %	SW	0.2 mph	0.3 mph	30.02 in	0.00 in	0.00 in
7/26/2020	6:09 AM	58.6 F	51.0 F	76 %	WSW	2.1 mph	2.2 mph	30.02 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	**Sunset Time:**	21:26	**Survey Start:**	21:26	**Determination:**	Valid
SITES:	1A, 1B, 2A, 2B, 3A, alt2, 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B, T1, T2, T4, T5	**Sunrise Time:**	6:18	**End Time:**	2:26	**Reason:**	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/26/2020	6:14 AM	59.6 F	51.7 F	75 %	WSW	1.8 mph	2.2 mph	30.02 in	0.00 in	0.00 in
7/26/2020	6:19 AM	59.5 F	51.6 F	75 %	WSW	1.6 mph	2.1 mph	30.03 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:25	Survey Start:	21:25	Determination:	Valid
SITES:	1A, 1B, 2A, 2B, 3A, alt2, 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B, T1, T2, T4, T5	Sunrise Time:	6:19	End Time:	2:25	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/26/2020	9:24 PM	68.4 F	53.4 F	59 %	West	3.9 mph	4.5 mph	30.07 in	0.00 in	0.00 in
7/26/2020	9:29 PM	68.0 F	53.3 F	59 %	West	4.3 mph	4.8 mph	30.07 in	0.00 in	0.00 in
7/26/2020	9:34 PM	67.4 F	53.0 F	60 %	West	4.5 mph	4.8 mph	30.06 in	0.00 in	0.00 in
7/26/2020	9:39 PM	66.8 F	52.6 F	60 %	West	4.4 mph	5.0 mph	30.07 in	0.00 in	0.00 in
7/26/2020	9:44 PM	66.7 F	52.6 F	60 %	West	4.6 mph	5.2 mph	30.07 in	0.00 in	0.00 in
7/26/2020	9:49 PM	66.3 F	52.4 F	61 %	West	3.9 mph	4.6 mph	30.07 in	0.00 in	0.00 in
7/26/2020	9:54 PM	66.3 F	52.2 F	60 %	WSW	3.3 mph	4.0 mph	30.07 in	0.00 in	0.00 in
7/26/2020	9:59 PM	66.7 F	52.2 F	60 %	WSW	3.6 mph	4.2 mph	30.08 in	0.00 in	0.00 in
7/26/2020	10:04 PM	66.5 F	52.3 F	60 %	WSW	3.2 mph	3.6 mph	30.08 in	0.00 in	0.00 in
7/26/2020	10:09 PM	66.4 F	52.2 F	60 %	WSW	3.6 mph	4.2 mph	30.08 in	0.00 in	0.00 in
7/26/2020	10:14 PM	66.5 F	52.1 F	60 %	WSW	3.5 mph	4.3 mph	30.08 in	0.00 in	0.00 in
7/26/2020	10:19 PM	66.6 F	52.3 F	60 %	WSW	3.8 mph	4.5 mph	30.07 in	0.00 in	0.00 in
7/26/2020	10:24 PM	66.4 F	52.2 F	60 %	West	3.7 mph	4.5 mph	30.08 in	0.00 in	0.00 in
7/26/2020	10:29 PM	66.2 F	52.1 F	60 %	WSW	3.6 mph	4.3 mph	30.08 in	0.00 in	0.00 in
7/26/2020	10:34 PM	66.3 F	52.3 F	61 %	West	4.0 mph	4.5 mph	30.09 in	0.00 in	0.00 in
7/26/2020	10:39 PM	65.8 F	52.2 F	61 %	West	4.3 mph	4.9 mph	30.09 in	0.00 in	0.00 in
7/26/2020	10:44 PM	65.5 F	52.3 F	63 %	West	3.8 mph	4.3 mph	30.09 in	0.00 in	0.00 in
7/26/2020	10:49 PM	64.9 F	52.3 F	64 %	WSW	3.1 mph	3.8 mph	30.09 in	0.00 in	0.00 in
7/26/2020	10:54 PM	64.5 F	52.2 F	64 %	SW	2.9 mph	3.7 mph	30.09 in	0.00 in	0.00 in
7/26/2020	10:59 PM	64.4 F	52.1 F	64 %	WSW	3.0 mph	4.0 mph	30.09 in	0.00 in	0.00 in
7/26/2020	11:04 PM	64.7 F	52.2 F	64 %	WSW	2.5 mph	3.1 mph	30.09 in	0.00 in	0.00 in
7/26/2020	11:09 PM	64.7 F	52.2 F	64 %	WSW	2.5 mph	3.2 mph	30.08 in	0.00 in	0.00 in
7/26/2020	11:14 PM	64.7 F	52.4 F	65 %	WSW	2.4 mph	3.2 mph	30.08 in	0.00 in	0.00 in
7/26/2020	11:19 PM	64.7 F	52.3 F	64 %	WSW	2.4 mph	2.9 mph	30.09 in	0.00 in	0.00 in
7/26/2020	11:24 PM	64.8 F	52.4 F	64 %	WSW	2.1 mph	2.6 mph	30.09 in	0.00 in	0.00 in
7/26/2020	11:29 PM	64.5 F	52.4 F	65 %	WSW	1.9 mph	2.3 mph	30.09 in	0.00 in	0.00 in
7/26/2020	11:34 PM	64.6 F	52.5 F	65 %	SW	2.3 mph	3.3 mph	30.09 in	0.00 in	0.00 in
7/26/2020	11:39 PM	64.7 F	52.6 F	65 %	SW	2.0 mph	2.6 mph	30.09 in	0.00 in	0.00 in
7/26/2020	11:44 PM	64.7 F	52.4 F	65 %	SW	1.8 mph	2.2 mph	30.09 in	0.00 in	0.00 in
7/26/2020	11:49 PM	65.1 F	52.7 F	64 %	SW	2.0 mph	2.3 mph	30.09 in	0.00 in	0.00 in
7/26/2020	11:54 PM	65.1 F	52.9 F	65 %	SW	1.6 mph	2.0 mph	30.09 in	0.00 in	0.00 in
7/26/2020	11:59 PM	64.8 F	52.7 F	65 %	WSW	2.3 mph	2.6 mph	30.09 in	0.00 in	0.00 in
7/27/2020	12:04 AM	64.8 F	52.7 F	65 %	WSW	2.2 mph	2.5 mph	30.09 in	0.00 in	0.00 in
7/27/2020	12:09 AM	64.8 F	52.7 F	65 %	SW	1.7 mph	2.1 mph	30.09 in	0.00 in	0.00 in
7/27/2020	12:14 AM	64.8 F	52.7 F	65 %	SSW	1.2 mph	1.6 mph	30.08 in	0.00 in	0.00 in
7/27/2020	12:19 AM	64.6 F	52.8 F	66 %	SSW	1.3 mph	1.7 mph	30.08 in	0.00 in	0.00 in
7/27/2020	12:24 AM	64.7 F	52.6 F	65 %	SW	1.5 mph	1.9 mph	30.08 in	0.00 in	0.00 in
7/27/2020	12:29 AM	65.2 F	52.8 F	64 %	SW	1.6 mph	2.1 mph	30.09 in	0.00 in	0.00 in
7/27/2020	12:34 AM	65.3 F	52.9 F	64 %	SW	1.3 mph	1.8 mph	30.09 in	0.00 in	0.00 in
7/27/2020	12:39 AM	64.9 F	52.9 F	65 %	WSW	1.8 mph	2.0 mph	30.09 in	0.00 in	0.00 in
7/27/2020	12:44 AM	64.7 F	53.0 F	66 %	West	2.2 mph	2.3 mph	30.08 in	0.00 in	0.00 in
7/27/2020	12:49 AM	64.0 F	52.9 F	67 %	WSW	1.9 mph	2.0 mph	30.08 in	0.00 in	0.00 in
7/27/2020	12:54 AM	64.1 F	52.7 F	66 %	SW	1.9 mph	2.3 mph	30.08 in	0.00 in	0.00 in
7/27/2020	12:59 AM	64.7 F	52.8 F	65 %	SSW	3.1 mph	3.4 mph	30.08 in	0.00 in	0.00 in
7/27/2020	1:04 AM	65.2 F	52.9 F	64 %	SSW	1.7 mph	2.0 mph	30.08 in	0.00 in	0.00 in
7/27/2020	1:09 AM	65.0 F	53.0 F	65 %	SSW	1.1 mph	1.4 mph	30.08 in	0.00 in	0.00 in
7/27/2020	1:14 AM	64.9 F	52.9 F	65 %	WSW	1.7 mph	2.1 mph	30.08 in	0.00 in	0.00 in
7/27/2020	1:19 AM	64.7 F	52.9 F	66 %	West	1.8 mph	2.2 mph	30.08 in	0.00 in	0.00 in
7/27/2020	1:24 AM	64.8 F	52.8 F	65 %	West	2.2 mph	2.5 mph	30.09 in	0.00 in	0.00 in
7/27/2020	1:29 AM	64.5 F	53.0 F	66 %	WSW	1.5 mph	2.1 mph	30.08 in	0.00 in	0.00 in
7/27/2020	1:34 AM	64.1 F	52.9 F	67 %	SSW	1.1 mph	1.2 mph	30.08 in	0.00 in	0.00 in
7/27/2020	1:39 AM	63.9 F	52.7 F	67 %	SSW	0.6 mph	1.1 mph	30.08 in	0.00 in	0.00 in
7/27/2020	1:44 AM	64.0 F	52.9 F	67 %	South	0.1 mph	0.4 mph	30.08 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:25	Survey Start:	21:25	Determination:	Valid
SITES:	1A, 1B, 2A, 2B, 3A, alt2, 4A, 4B, 5A, 5B, 6A, 6B, 7A, 7B, T1, T2, T4, T5	Sunrise Time:	6:19	End Time:	2:25	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/27/2020	1:49 AM	64.0 F	52.9 F	67 %	South	0.0 mph	0.0 mph	30.08 in	0.00 in	0.00 in
7/27/2020	1:54 AM	63.7 F	52.9 F	68 %	South	1.4 mph	1.6 mph	30.08 in	0.00 in	0.00 in
7/27/2020	1:59 AM	62.8 F	52.7 F	70 %	South	2.2 mph	2.3 mph	30.08 in	0.00 in	0.00 in
7/27/2020	2:04 AM	61.7 F	52.7 F	72 %	SSW	4.3 mph	4.7 mph	30.08 in	0.00 in	0.00 in
7/27/2020	2:09 AM	59.4 F	51.5 F	75 %	SW	5.2 mph	5.8 mph	30.08 in	0.00 in	0.00 in
7/27/2020	2:14 AM	60.9 F	51.9 F	72 %	SW	2.8 mph	3.1 mph	30.08 in	0.00 in	0.00 in
7/27/2020	2:19 AM	61.8 F	52.0 F	70 %	SW	4.4 mph	4.8 mph	30.08 in	0.00 in	0.00 in
7/27/2020	2:24 AM	62.4 F	52.5 F	70 %	SW	4.1 mph	5.0 mph	30.07 in	0.00 in	0.00 in
7/27/2020	2:29 AM	59.9 F	52.7 F	77 %	SSW	3.6 mph	4.1 mph	30.07 in	0.00 in	0.00 in
7/27/2020	2:34 AM	59.0 F	52.2 F	78 %	SSW	4.7 mph	5.4 mph	30.08 in	0.00 in	0.00 in
7/27/2020	2:39 AM	59.0 F	52.3 F	79 %	SSW	2.9 mph	3.5 mph	30.08 in	0.00 in	0.00 in
7/27/2020	2:44 AM	59.0 F	51.9 F	77 %	SW	3.8 mph	4.8 mph	30.07 in	0.00 in	0.00 in
7/27/2020	2:49 AM	60.3 F	52.1 F	74 %	SW	5.2 mph	6.4 mph	30.08 in	0.00 in	0.00 in
7/27/2020	2:54 AM	60.9 F	52.4 F	73 %	SW	5.5 mph	6.6 mph	30.08 in	0.00 in	0.00 in
7/27/2020	2:59 AM	60.9 F	52.4 F	74 %	SW	5.2 mph	6.2 mph	30.08 in	0.00 in	0.00 in
7/27/2020	3:04 AM	60.6 F	52.3 F	74 %	SW	4.4 mph	5.3 mph	30.08 in	0.00 in	0.00 in
7/27/2020	3:09 AM	60.4 F	52.2 F	74 %	SW	3.8 mph	4.9 mph	30.07 in	0.00 in	0.00 in
7/27/2020	3:14 AM	60.6 F	51.8 F	73 %	SW	4.0 mph	5.1 mph	30.07 in	0.00 in	0.00 in
7/27/2020	3:19 AM	61.2 F	52.3 F	73 %	SW	3.9 mph	4.5 mph	30.08 in	0.00 in	0.00 in
7/27/2020	3:24 AM	61.0 F	52.2 F	73 %	SW	3.9 mph	4.7 mph	30.08 in	0.00 in	0.00 in
7/27/2020	3:29 AM	60.8 F	52.0 F	73 %	SW	3.8 mph	4.9 mph	30.07 in	0.00 in	0.00 in
7/27/2020	3:34 AM	61.1 F	51.5 F	71 %	SW	4.7 mph	5.9 mph	30.07 in	0.00 in	0.00 in
7/27/2020	3:39 AM	61.9 F	51.7 F	69 %	SW	4.4 mph	5.3 mph	30.07 in	0.00 in	0.00 in
7/27/2020	3:44 AM	61.8 F	52.1 F	70 %	SW	3.9 mph	4.7 mph	30.07 in	0.00 in	0.00 in
7/27/2020	3:49 AM	61.2 F	51.6 F	71 %	SW	3.5 mph	4.0 mph	30.07 in	0.00 in	0.00 in
7/27/2020	3:54 AM	61.5 F	51.7 F	70 %	SW	3.0 mph	3.5 mph	30.07 in	0.00 in	0.00 in
7/27/2020	3:59 AM	61.1 F	51.4 F	71 %	SSW	3.0 mph	3.5 mph	30.07 in	0.00 in	0.00 in
7/27/2020	4:04 AM	61.0 F	51.1 F	70 %	SW	3.5 mph	4.1 mph	30.07 in	0.00 in	0.00 in
7/27/2020	4:09 AM	61.4 F	51.7 F	71 %	SSW	1.9 mph	2.3 mph	30.07 in	0.00 in	0.00 in
7/27/2020	4:14 AM	60.8 F	51.3 F	71 %	SSW	1.6 mph	2.3 mph	30.07 in	0.00 in	0.00 in
7/27/2020	4:19 AM	61.0 F	51.4 F	71 %	SSW	2.1 mph	2.6 mph	30.07 in	0.00 in	0.00 in
7/27/2020	4:24 AM	60.7 F	51.2 F	71 %	SSW	1.8 mph	2.2 mph	30.07 in	0.00 in	0.00 in
7/27/2020	4:29 AM	61.6 F	50.5 F	67 %	SW	3.0 mph	3.5 mph	30.07 in	0.00 in	0.00 in
7/27/2020	4:34 AM	63.8 F	51.3 F	64 %	SSW	3.2 mph	3.5 mph	30.07 in	0.00 in	0.00 in
7/27/2020	4:39 AM	63.0 F	51.4 F	66 %	SSW	3.2 mph	3.6 mph	30.07 in	0.00 in	0.00 in
7/27/2020	4:44 AM	62.0 F	51.2 F	68 %	SSW	3.1 mph	3.5 mph	30.06 in	0.00 in	0.00 in
7/27/2020	4:49 AM	62.7 F	50.6 F	65 %	SW	3.6 mph	4.1 mph	30.07 in	0.00 in	0.00 in
7/27/2020	4:54 AM	63.7 F	50.9 F	63 %	SW	3.6 mph	4.2 mph	30.07 in	0.00 in	0.00 in
7/27/2020	4:59 AM	63.5 F	51.1 F	64 %	SSW	3.3 mph	3.7 mph	30.07 in	0.00 in	0.00 in
7/27/2020	5:04 AM	62.5 F	51.3 F	67 %	SW	3.5 mph	4.0 mph	30.07 in	0.00 in	0.00 in
7/27/2020	5:09 AM	60.8 F	50.9 F	70 %	SSW	3.3 mph	3.6 mph	30.06 in	0.00 in	0.00 in
7/27/2020	5:14 AM	60.0 F	51.0 F	72 %	SSW	2.6 mph	3.2 mph	30.07 in	0.00 in	0.00 in
7/27/2020	5:19 AM	58.9 F	50.8 F	74 %	SSW	2.6 mph	3.2 mph	30.06 in	0.00 in	0.00 in
7/27/2020	5:24 AM	58.6 F	50.9 F	75 %	South	2.4 mph	2.9 mph	30.06 in	0.00 in	0.00 in
7/27/2020	5:29 AM	59.0 F	50.9 F	74 %	SSW	3.3 mph	4.0 mph	30.06 in	0.00 in	0.00 in
7/27/2020	5:34 AM	59.0 F	51.1 F	75 %	SSW	3.2 mph	3.9 mph	30.06 in	0.00 in	0.00 in
7/27/2020	5:39 AM	59.0 F	51.1 F	75 %	SSW	2.7 mph	3.6 mph	30.06 in	0.00 in	0.00 in
7/27/2020	5:44 AM	59.2 F	51.3 F	75 %	SSW	2.6 mph	3.2 mph	30.06 in	0.00 in	0.00 in
7/27/2020	5:49 AM	59.1 F	51.2 F	75 %	South	2.4 mph	2.8 mph	30.06 in	0.00 in	0.00 in
7/27/2020	5:54 AM	58.9 F	51.3 F	76 %	South	1.8 mph	2.0 mph	30.07 in	0.00 in	0.00 in
7/27/2020	5:59 AM	58.6 F	51.0 F	76 %	South	1.7 mph	2.2 mph	30.06 in	0.00 in	0.00 in
7/27/2020	6:04 AM	58.7 F	51.2 F	76 %	South	1.6 mph	2.0 mph	30.06 in	0.00 in	0.00 in
7/27/2020	6:09 AM	58.3 F	51.0 F	77 %	South	1.1 mph	1.5 mph	30.06 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:24	Survey Start:	21:24	Determination :	*Valid*
SITES:	2A, 3A, 4A, T3	Sunrise Time:	6:20	End Time:	2:24	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/27/20	9:24 PM	68.4 F	57.2 F	67 %	NNE	1.3 mph	1.6 mph	29.96 in	0.00 in	0.00 in
7/27/20	9:29 PM	67.7 F	57.3 F	69 %	SE	0.0 mph	0.1 mph	29.96 in	0.00 in	0.00 in
7/27/20	9:34 PM	67.0 F	56.9 F	70 %	SSE	0.0 mph	0.0 mph	29.96 in	0.00 in	0.00 in
7/27/20	9:39 PM	66.8 F	56.4 F	69 %	ESE	0.0 mph	0.1 mph	29.96 in	0.00 in	0.00 in
7/27/20	9:44 PM	66.8 F	56.4 F	69 %	SE	0.1 mph	0.1 mph	29.96 in	0.00 in	0.00 in
7/27/20	9:49 PM	66.6 F	56.1 F	69 %	SE	0.0 mph	0.0 mph	29.96 in	0.00 in	0.00 in
7/27/20	9:54 PM	66.4 F	55.3 F	67 %	ESE	0.2 mph	0.4 mph	29.96 in	0.00 in	0.00 in
7/27/20	9:59 PM	67.6 F	55.1 F	64 %	East	1.0 mph	1.2 mph	29.96 in	0.00 in	0.00 in
7/27/20	10:04 PM	68.2 F	55.0 F	63 %	ESE	0.8 mph	1.0 mph	29.97 in	0.00 in	0.00 in
7/27/20	10:09 PM	67.9 F	55.1 F	64 %	SE	0.0 mph	0.0 mph	29.97 in	0.00 in	0.00 in
7/27/20	10:14 PM	66.9 F	54.9 F	65 %	SE	0.0 mph	0.0 mph	29.97 in	0.00 in	0.00 in
7/27/20	10:19 PM	66.6 F	54.6 F	65 %	SE	0.0 mph	0.0 mph	29.97 in	0.00 in	0.00 in
7/27/20	10:24 PM	65.8 F	54.0 F	66 %	SE	0.0 mph	0.0 mph	29.96 in	0.00 in	0.00 in
7/27/20	10:29 PM	65.6 F	53.3 F	64 %	SE	0.0 mph	0.0 mph	29.96 in	0.00 in	0.00 in
7/27/20	10:34 PM	66.3 F	53.1 F	63 %	ESE	0.0 mph	0.1 mph	29.96 in	0.00 in	0.00 in
7/27/20	10:39 PM	66.8 F	53.3 F	62 %	SE	0.0 mph	0.0 mph	29.97 in	0.00 in	0.00 in
7/27/20	10:44 PM	66.1 F	53.5 F	64 %	SE	0.0 mph	0.0 mph	29.97 in	0.00 in	0.00 in
7/27/20	10:49 PM	65.1 F	52.9 F	65 %	SE	0.0 mph	0.0 mph	29.97 in	0.00 in	0.00 in
7/27/20	10:54 PM	65.7 F	53.3 F	64 %	South	1.1 mph	1.5 mph	29.97 in	0.00 in	0.00 in
7/27/20	10:59 PM	65.8 F	53.2 F	64 %	South	1.6 mph	2.0 mph	29.97 in	0.00 in	0.00 in
7/27/20	11:04 PM	66.1 F	53.1 F	63 %	South	1.1 mph	1.2 mph	29.97 in	0.00 in	0.00 in
7/27/20	11:09 PM	66.2 F	53.2 F	63 %	South	1.0 mph	1.1 mph	29.97 in	0.00 in	0.00 in
7/27/20	11:14 PM	66.1 F	53.1 F	63 %	SSE	0.5 mph	1.1 mph	29.97 in	0.00 in	0.00 in
7/27/20	11:19 PM	65.8 F	52.8 F	63 %	SSE	0.1 mph	0.3 mph	29.97 in	0.00 in	0.00 in
7/27/20	11:24 PM	65.8 F	53.2 F	64 %	South	0.0 mph	0.0 mph	29.96 in	0.00 in	0.00 in
7/27/20	11:29 PM	65.4 F	53.3 F	65 %	SSW	2.3 mph	2.5 mph	29.97 in	0.00 in	0.00 in
7/27/20	11:34 PM	63.9 F	52.8 F	67 %	SSW	3.1 mph	3.5 mph	29.97 in	0.00 in	0.00 in
7/27/20	11:39 PM	64.7 F	52.7 F	65 %	SSW	2.1 mph	2.4 mph	29.97 in	0.00 in	0.00 in
7/27/20	11:44 PM	65.4 F	52.6 F	63 %	South	1.7 mph	1.9 mph	29.97 in	0.00 in	0.00 in
7/27/20	11:49 PM	65.9 F	52.9 F	63 %	SSW	1.5 mph	2.0 mph	29.98 in	0.00 in	0.00 in
7/27/20	11:54 PM	65.9 F	52.7 F	62 %	South	2.0 mph	2.3 mph	29.97 in	0.00 in	0.00 in
7/27/20	11:59 PM	65.9 F	52.6 F	62 %	South	1.7 mph	2.2 mph	29.97 in	0.00 in	0.00 in
7/28/20	12:04 AM	66.0 F	52.8 F	62 %	SSW	2.4 mph	2.9 mph	29.97 in	0.00 in	0.00 in
7/28/20	12:09 AM	65.2 F	52.6 F	64 %	SSW	3.2 mph	3.3 mph	29.97 in	0.00 in	0.00 in
7/28/20	12:14 AM	64.7 F	52.3 F	64 %	SSW	2.7 mph	3.1 mph	29.98 in	0.00 in	0.00 in
7/28/20	12:19 AM	64.9 F	52.1 F	63 %	South	2.2 mph	2.2 mph	29.98 in	0.00 in	0.00 in
7/28/20	12:24 AM	65.3 F	52.3 F	63 %	South	1.6 mph	1.9 mph	29.97 in	0.00 in	0.00 in
7/28/20	12:29 AM	64.9 F	52.4 F	64 %	SSE	1.1 mph	1.1 mph	29.97 in	0.00 in	0.00 in
7/28/20	12:34 AM	64.0 F	52.3 F	66 %	SSE	1.1 mph	1.2 mph	29.98 in	0.00 in	0.00 in
7/28/20	12:39 AM	63.5 F	52.2 F	67 %	SSE	1.8 mph	2.2 mph	29.98 in	0.00 in	0.00 in
7/28/20	12:44 AM	63.2 F	52.1 F	67 %	SSE	1.7 mph	2.2 mph	29.97 in	0.00 in	0.00 in
7/28/20	12:49 AM	62.9 F	52.0 F	68 %	South	2.0 mph	2.2 mph	29.98 in	0.00 in	0.00 in
7/28/20	12:54 AM	63.0 F	51.9 F	67 %	SSE	1.2 mph	1.4 mph	29.97 in	0.00 in	0.00 in
7/28/20	12:59 AM	63.2 F	52.1 F	67 %	SSE	0.9 mph	1.1 mph	29.97 in	0.00 in	0.00 in
7/28/20	1:04 AM	63.4 F	52.0 F	66 %	South	1.3 mph	1.5 mph	29.97 in	0.00 in	0.00 in
7/28/20	1:09 AM	63.5 F	52.1 F	66 %	South	2.5 mph	3.0 mph	29.97 in	0.00 in	0.00 in
7/28/20	1:14 AM	62.9 F	51.8 F	67 %	South	2.6 mph	3.0 mph	29.97 in	0.00 in	0.00 in
7/28/20	1:19 AM	63.1 F	51.8 F	66 %	South	2.2 mph	2.2 mph	29.97 in	0.00 in	0.00 in
7/28/20	1:24 AM	63.4 F	51.9 F	66 %	South	2.4 mph	3.1 mph	29.98 in	0.00 in	0.00 in
7/28/20	1:29 AM	63.2 F	52.0 F	67 %	South	2.8 mph	3.2 mph	29.98 in	0.00 in	0.00 in
7/28/20	1:34 AM	61.9 F	51.8 F	70 %	South	3.5 mph	3.8 mph	29.98 in	0.00 in	0.00 in
7/28/20	1:39 AM	61.4 F	51.3 F	70 %	South	3.5 mph	3.9 mph	29.98 in	0.00 in	0.00 in
7/28/20	1:44 AM	62.0 F	51.4 F	68 %	South	3.5 mph	3.6 mph	29.98 in	0.00 in	0.00 in
7/28/20	1:49 AM	62.6 F	51.4 F	67 %	South	3.5 mph	3.7 mph	29.97 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:24	Survey Start:	21:24	Determination :	*Valid*
SITES:	2A, 3A, 4A, T3	Sunrise Time:	6:20	End Time:	2:24	Reason:	No adverse weather

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/28/20	1:54 AM	62.9 F	51.3 F	66 %	South	3.4 mph	3.7 mph	29.97 in	0.00 in	0.00 in
7/28/20	1:59 AM	63.0 F	51.3 F	66 %	South	3.4 mph	3.5 mph	29.97 in	0.00 in	0.00 in
7/28/20	2:04 AM	63.1 F	51.5 F	66 %	South	2.9 mph	3.2 mph	29.98 in	0.00 in	0.00 in
7/28/20	2:09 AM	62.3 F	51.3 F	67 %	South	3.2 mph	3.4 mph	29.98 in	0.00 in	0.00 in
7/28/20	2:14 AM	62.8 F	51.3 F	66 %	South	2.6 mph	3.1 mph	29.97 in	0.00 in	0.00 in
7/28/20	2:19 AM	63.0 F	51.7 F	67 %	South	2.2 mph	2.3 mph	29.97 in	0.00 in	0.00 in
7/28/20	2:24 AM	62.0 F	51.6 F	69 %	South	3.1 mph	3.3 mph	29.97 in	0.00 in	0.00 in
7/28/20	2:29 AM	61.7 F	51.2 F	69 %	South	3.5 mph	3.7 mph	29.97 in	0.00 in	0.00 in
7/28/20	2:34 AM	62.3 F	51.1 F	67 %	South	3.1 mph	3.4 mph	29.97 in	0.00 in	0.00 in
7/28/20	2:39 AM	63.1 F	51.3 F	65 %	South	3.2 mph	3.4 mph	29.97 in	0.00 in	0.00 in
7/28/20	2:44 AM	63.6 F	51.6 F	65 %	South	3.0 mph	3.4 mph	29.97 in	0.00 in	0.00 in
7/28/20	2:49 AM	63.4 F	51.6 F	65 %	South	2.4 mph	2.9 mph	29.97 in	0.00 in	0.00 in
7/28/20	2:54 AM	62.7 F	51.5 F	67 %	South	2.6 mph	2.7 mph	29.97 in	0.00 in	0.00 in
7/28/20	2:59 AM	62.2 F	51.1 F	67 %	South	3.4 mph	3.4 mph	29.97 in	0.00 in	0.00 in
7/28/20	3:04 AM	62.6 F	51.3 F	66 %	South	3.5 mph	3.8 mph	29.96 in	0.00 in	0.00 in
7/28/20	3:09 AM	62.8 F	51.3 F	66 %	South	3.6 mph	4.1 mph	29.96 in	0.00 in	0.00 in
7/28/20	3:14 AM	62.7 F	51.1 F	66 %	South	2.9 mph	3.4 mph	29.96 in	0.00 in	0.00 in
7/28/20	3:19 AM	63.2 F	51.4 F	65 %	South	2.9 mph	3.4 mph	29.96 in	0.00 in	0.00 in
7/28/20	3:24 AM	63.1 F	51.5 F	66 %	South	2.8 mph	3.4 mph	29.96 in	0.00 in	0.00 in
7/28/20	3:29 AM	62.5 F	51.3 F	67 %	South	2.4 mph	2.6 mph	29.96 in	0.00 in	0.00 in
7/28/20	3:34 AM	62.8 F	51.0 F	65 %	SSW	2.7 mph	3.2 mph	29.96 in	0.00 in	0.00 in
7/28/20	3:39 AM	63.4 F	51.4 F	65 %	SSW	3.3 mph	3.5 mph	29.96 in	0.00 in	0.00 in
7/28/20	3:44 AM	63.1 F	51.3 F	65 %	SSW	3.7 mph	4.3 mph	29.96 in	0.00 in	0.00 in
7/28/20	3:49 AM	63.1 F	51.3 F	65 %	SSW	3.4 mph	3.5 mph	29.96 in	0.00 in	0.00 in
7/28/20	3:54 AM	62.9 F	51.4 F	66 %	SSW	3.5 mph	3.8 mph	29.96 in	0.00 in	0.00 in
7/28/20	3:59 AM	62.6 F	51.2 F	66 %	SSW	2.8 mph	3.4 mph	29.96 in	0.00 in	0.00 in
7/28/20	4:04 AM	62.6 F	51.6 F	67 %	SSW	3.4 mph	3.5 mph	29.96 in	0.00 in	0.00 in
7/28/20	4:09 AM	61.7 F	51.0 F	68 %	SSW	3.8 mph	4.4 mph	29.96 in	0.00 in	0.00 in
7/28/20	4:14 AM	62.9 F	51.1 F	65 %	SSW	3.4 mph	3.5 mph	29.96 in	0.00 in	0.00 in
7/28/20	4:19 AM	63.6 F	51.2 F	64 %	SSW	3.4 mph	3.4 mph	29.96 in	0.00 in	0.00 in
7/28/20	4:24 AM	63.8 F	51.6 F	65 %	SSW	2.1 mph	2.3 mph	29.96 in	0.00 in	0.00 in
7/28/20	4:29 AM	60.7 F	51.5 F	72 %	NW	1.5 mph	1.7 mph	29.97 in	0.00 in	0.00 in
7/28/20	4:34 AM	58.0 F	50.5 F	76 %	SW	1.3 mph	1.5 mph	29.96 in	0.00 in	0.00 in
7/28/20	4:39 AM	57.7 F	50.3 F	77 %	SSW	1.0 mph	1.1 mph	29.96 in	0.00 in	0.00 in
7/28/20	4:44 AM	57.0 F	50.4 F	79 %	South	0.0 mph	0.0 mph	29.96 in	0.00 in	0.00 in
7/28/20	4:49 AM	56.7 F	50.2 F	79 %	South	0.0 mph	0.0 mph	29.96 in	0.00 in	0.00 in
7/28/20	4:54 AM	57.0 F	50.3 F	78 %	South	0.3 mph	0.6 mph	29.96 in	0.00 in	0.00 in
7/28/20	4:59 AM	58.0 F	49.9 F	75 %	South	1.8 mph	2.1 mph	29.96 in	0.00 in	0.00 in
7/28/20	5:04 AM	59.9 F	50.9 F	72 %	South	2.2 mph	2.3 mph	29.96 in	0.00 in	0.00 in
7/28/20	5:09 AM	58.8 F	50.9 F	75 %	South	0.7 mph	1.1 mph	29.96 in	0.00 in	0.00 in
7/28/20	5:14 AM	58.5 F	50.3 F	74 %	SSW	0.8 mph	1.1 mph	29.96 in	0.00 in	0.00 in
7/28/20	5:19 AM	58.5 F	50.7 F	75 %	West	1.8 mph	2.2 mph	29.96 in	0.00 in	0.00 in
7/28/20	5:24 AM	57.3 F	50.3 F	78 %	WSW	1.3 mph	1.5 mph	29.96 in	0.00 in	0.00 in
7/28/20	5:29 AM	56.8 F	50.3 F	79 %	SSW	1.0 mph	1.1 mph	29.97 in	0.00 in	0.00 in
7/28/20	5:34 AM	56.9 F	50.3 F	78 %	SSW	0.8 mph	1.1 mph	29.96 in	0.00 in	0.00 in
7/28/20	5:39 AM	57.3 F	50.5 F	78 %	SSW	0.9 mph	1.1 mph	29.96 in	0.00 in	0.00 in
7/28/20	5:44 AM	56.7 F	50.4 F	80 %	SSW	0.9 mph	1.1 mph	29.97 in	0.00 in	0.00 in
7/28/20	5:49 AM	56.4 F	50.2 F	80 %	South	0.5 mph	1.1 mph	29.96 in	0.00 in	0.00 in
7/28/20	5:54 AM	56.9 F	50.4 F	78 %	SSW	1.0 mph	1.1 mph	29.96 in	0.00 in	0.00 in
7/28/20	5:59 AM	56.8 F	50.4 F	79 %	SSW	0.6 mph	0.9 mph	29.96 in	0.00 in	0.00 in
7/28/20	6:04 AM	56.6 F	50.4 F	80 %	SSW	0.0 mph	0.0 mph	29.96 in	0.00 in	0.00 in
7/28/20	6:09 AM	56.3 F	50.2 F	80 %	SSW	0.1 mph	0.5 mph	29.97 in	0.00 in	0.00 in
7/28/20	6:14 AM	56.5 F	50.1 F	79 %	SSW	1.1 mph	1.5 mph	29.97 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:23	Survey Start:	21:23	Determination:	*Valid*			
SITES:	T3	Sunrise Time:	6:21	End Time:	2:23	Reason:	No adverse weather			

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/28/20	9:19 PM	70.4 F	57.7 F	64 %	SSE	4.5 mph	5.0 mph	29.91 in	0.00 in	0.00 in
7/28/20	9:24 PM	69.6 F	58.0 F	67 %	SSE	4.9 mph	5.8 mph	29.91 in	0.00 in	0.00 in
7/28/20	9:29 PM	69.2 F	57.5 F	66 %	SE	5.2 mph	5.9 mph	29.91 in	0.00 in	0.00 in
7/28/20	9:34 PM	69.3 F	57.9 F	67 %	SE	5.5 mph	6.5 mph	29.91 in	0.00 in	0.00 in
7/28/20	9:39 PM	69.0 F	58.0 F	68 %	SE	5.3 mph	6.2 mph	29.91 in	0.00 in	0.00 in
7/28/20	9:44 PM	68.6 F	57.9 F	69 %	SE	5.4 mph	6.1 mph	29.91 in	0.00 in	0.00 in
7/28/20	9:49 PM	68.5 F	58.1 F	70 %	SE	5.1 mph	6.1 mph	29.91 in	0.00 in	0.00 in
7/28/20	9:54 PM	68.3 F	57.8 F	69 %	SE	6.1 mph	7.2 mph	29.92 in	0.00 in	0.00 in
7/28/20	9:59 PM	68.7 F	57.8 F	68 %	SE	6.6 mph	7.5 mph	29.92 in	0.00 in	0.00 in
7/28/20	10:04 PM	69.5 F	57.8 F	66 %	SE	6.7 mph	7.8 mph	29.92 in	0.00 in	0.00 in
7/28/20	10:09 PM	69.5 F	57.8 F	66 %	SE	6.2 mph	7.3 mph	29.91 in	0.00 in	0.00 in
7/28/20	10:14 PM	69.2 F	57.9 F	67 %	SE	5.6 mph	6.6 mph	29.92 in	0.00 in	0.00 in
7/28/20	10:19 PM	68.7 F	57.8 F	68 %	SE	5.0 mph	5.7 mph	29.92 in	0.00 in	0.00 in
7/28/20	10:24 PM	67.9 F	58.1 F	71 %	SSE	4.5 mph	5.1 mph	29.92 in	0.00 in	0.00 in
7/28/20	10:29 PM	66.5 F	57.6 F	73 %	SSE	4.8 mph	5.4 mph	29.91 in	0.00 in	0.00 in
7/28/20	10:34 PM	65.8 F	57.6 F	75 %	SSE	4.8 mph	5.4 mph	29.92 in	0.00 in	0.00 in
7/28/20	10:39 PM	65.3 F	57.4 F	76 %	SSE	4.8 mph	5.5 mph	29.92 in	0.00 in	0.00 in
7/28/20	10:44 PM	64.8 F	57.1 F	76 %	SSE	4.5 mph	5.1 mph	29.91 in	0.00 in	0.00 in
7/28/20	10:49 PM	64.8 F	56.9 F	76 %	SE	4.6 mph	5.0 mph	29.92 in	0.00 in	0.00 in
7/28/20	10:54 PM	65.8 F	56.7 F	73 %	SE	5.2 mph	6.1 mph	29.92 in	0.00 in	0.00 in
7/28/20	10:59 PM	66.3 F	56.9 F	72 %	SE	4.8 mph	5.5 mph	29.92 in	0.00 in	0.00 in
7/28/20	11:04 PM	65.9 F	57.1 F	73 %	SSE	4.7 mph	5.2 mph	29.92 in	0.00 in	0.00 in
7/28/20	11:09 PM	65.6 F	56.9 F	73 %	SSE	4.8 mph	5.6 mph	29.92 in	0.00 in	0.00 in
7/28/20	11:14 PM	64.8 F	56.9 F	76 %	South	4.7 mph	5.4 mph	29.92 in	0.00 in	0.00 in
7/28/20	11:19 PM	63.8 F	56.5 F	77 %	South	5.2 mph	5.8 mph	29.92 in	0.00 in	0.00 in
7/28/20	11:24 PM	63.4 F	56.1 F	77 %	SSE	5.0 mph	5.7 mph	29.92 in	0.00 in	0.00 in
7/28/20	11:29 PM	63.4 F	56.0 F	77 %	South	4.8 mph	5.3 mph	29.92 in	0.00 in	0.00 in
7/28/20	11:34 PM	63.3 F	56.5 F	78 %	South	5.5 mph	6.1 mph	29.92 in	0.00 in	0.00 in
7/28/20	11:39 PM	63.0 F	56.6 F	80 %	SSE	5.4 mph	5.9 mph	29.92 in	0.00 in	0.00 in
7/28/20	11:44 PM	62.5 F	56.3 F	80 %	South	5.4 mph	6.0 mph	29.92 in	0.00 in	0.00 in
7/28/20	11:49 PM	62.4 F	56.5 F	81 %	South	4.9 mph	5.7 mph	29.92 in	0.00 in	0.00 in
7/28/20	11:54 PM	62.2 F	56.7 F	82 %	South	5.3 mph	5.9 mph	29.92 in	0.00 in	0.00 in
7/28/20	11:59 PM	61.8 F	56.7 F	84 %	SSE	5.0 mph	5.6 mph	29.92 in	0.00 in	0.00 in
7/29/20	12:04 AM	62.0 F	56.8 F	83 %	SSE	5.0 mph	5.8 mph	29.93 in	0.00 in	0.00 in
7/29/20	12:09 AM	62.2 F	56.9 F	83 %	SSE	5.1 mph	5.9 mph	29.93 in	0.00 in	0.00 in
7/29/20	12:14 AM	62.4 F	56.7 F	82 %	SSE	5.2 mph	5.9 mph	29.93 in	0.00 in	0.00 in
7/29/20	12:19 AM	62.9 F	56.2 F	79 %	SSE	4.6 mph	5.2 mph	29.92 in	0.00 in	0.00 in
7/29/20	12:24 AM	63.6 F	56.4 F	78 %	SSE	4.7 mph	5.6 mph	29.92 in	0.00 in	0.00 in
7/29/20	12:29 AM	63.7 F	56.3 F	77 %	SSE	4.9 mph	5.6 mph	29.92 in	0.00 in	0.00 in
7/29/20	12:34 AM	63.0 F	56.4 F	79 %	South	5.1 mph	5.6 mph	29.92 in	0.00 in	0.00 in
7/29/20	12:39 AM	62.7 F	56.1 F	79 %	SSE	4.3 mph	4.8 mph	29.92 in	0.00 in	0.00 in
7/29/20	12:44 AM	63.0 F	56.2 F	78 %	SE	4.3 mph	4.6 mph	29.92 in	0.00 in	0.00 in
7/29/20	12:49 AM	63.2 F	56.4 F	78 %	SSE	4.4 mph	5.1 mph	29.92 in	0.00 in	0.00 in
7/29/20	12:54 AM	63.2 F	56.4 F	78 %	SSE	4.8 mph	5.4 mph	29.92 in	0.00 in	0.00 in
7/29/20	12:59 AM	62.8 F	56.5 F	80 %	SSE	5.0 mph	5.8 mph	29.92 in	0.00 in	0.00 in
7/29/20	1:04 AM	62.4 F	56.2 F	80 %	SSE	5.5 mph	6.1 mph	29.92 in	0.00 in	0.00 in
7/29/20	1:09 AM	61.9 F	56.2 F	82 %	SSE	5.1 mph	5.8 mph	29.92 in	0.00 in	0.00 in
7/29/20	1:14 AM	61.6 F	56.0 F	82 %	SSE	5.3 mph	5.9 mph	29.92 in	0.00 in	0.00 in
7/29/20	1:19 AM	61.4 F	55.9 F	82 %	SSE	5.5 mph	6.1 mph	29.92 in	0.00 in	0.00 in
7/29/20	1:24 AM	61.4 F	55.8 F	82 %	SSE	5.3 mph	6.0 mph	29.92 in	0.00 in	0.00 in
7/29/20	1:29 AM	62.1 F	55.6 F	79 %	SSE	5.8 mph	6.7 mph	29.93 in	0.00 in	0.00 in
7/29/20	1:34 AM	63.1 F	55.7 F	77 %	SE	6.1 mph	7.1 mph	29.93 in	0.00 in	0.00 in
7/29/20	1:39 AM	63.3 F	56.1 F	77 %	SE	5.7 mph	6.8 mph	29.93 in	0.00 in	0.00 in
7/29/20	1:44 AM	62.7 F	55.8 F	78 %	SSE	5.5 mph	6.5 mph	29.93 in	0.00 in	0.00 in
7/29/20	1:49 AM	62.9 F	55.9 F	78 %	SSE	5.8 mph	6.8 mph	29.93 in	0.00 in	0.00 in

STATION:	KNDHAZEN5	Sunset Time:	21:23	Survey Start:	21:23	Determination:	*Valid*			
SITES:	T3	Sunrise Time:	6:21	End Time:	2:23	Reason:	No adverse weather			

Date	Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.
7/29/20	1:54 AM	61.4 F	55.6 F	82 %	SSE	4.9 mph	5.6 mph	29.93 in	0.00 in	0.00 in
7/29/20	1:59 AM	61.2 F	55.0 F	80 %	SSE	5.2 mph	6.0 mph	29.92 in	0.00 in	0.00 in
7/29/20	2:04 AM	62.3 F	55.5 F	78 %	SE	6.5 mph	7.7 mph	29.92 in	0.00 in	0.00 in
7/29/20	2:09 AM	63.0 F	55.6 F	77 %	SE	6.4 mph	7.8 mph	29.92 in	0.00 in	0.00 in
7/29/20	2:14 AM	63.3 F	55.5 F	76 %	SE	7.6 mph	8.8 mph	29.93 in	0.00 in	0.00 in
7/29/20	2:19 AM	63.4 F	55.7 F	76 %	SE	7.2 mph	8.3 mph	29.93 in	0.00 in	0.00 in
7/29/20	2:24 AM	63.1 F	55.5 F	76 %	SE	7.2 mph	8.6 mph	29.92 in	0.00 in	0.00 in
7/29/20	2:29 AM	62.9 F	55.6 F	77 %	SE	6.7 mph	7.9 mph	29.92 in	0.00 in	0.00 in
7/29/20	2:34 AM	62.3 F	55.5 F	78 %	SE	6.8 mph	7.9 mph	29.92 in	0.00 in	0.00 in
7/29/20	2:39 AM	62.1 F	55.7 F	79 %	SSE	5.8 mph	7.0 mph	29.91 in	0.00 in	0.00 in
7/29/20	2:44 AM	61.8 F	55.3 F	79 %	SE	6.4 mph	7.7 mph	29.91 in	0.00 in	0.00 in
7/29/20	2:49 AM	62.0 F	55.5 F	79 %	SE	6.1 mph	7.4 mph	29.91 in	0.00 in	0.00 in
7/29/20	2:54 AM	62.1 F	55.8 F	80 %	SE	6.6 mph	7.7 mph	29.91 in	0.00 in	0.00 in
7/29/20	2:59 AM	62.0 F	55.6 F	80 %	SE	5.8 mph	6.8 mph	29.91 in	0.00 in	0.00 in
7/29/20	3:04 AM	62.4 F	56.0 F	79 %	SE	6.6 mph	7.9 mph	29.91 in	0.00 in	0.00 in
7/29/20	3:09 AM	62.6 F	56.1 F	79 %	SE	7.0 mph	8.1 mph	29.91 in	0.00 in	0.00 in
7/29/20	3:14 AM	62.9 F	56.2 F	79 %	SE	6.5 mph	7.5 mph	29.91 in	0.00 in	0.00 in
7/29/20	3:19 AM	62.1 F	55.7 F	80 %	SE	6.7 mph	7.9 mph	29.91 in	0.00 in	0.00 in
7/29/20	3:24 AM	62.6 F	55.4 F	77 %	SE	7.7 mph	9.5 mph	29.91 in	0.00 in	0.00 in
7/29/20	3:29 AM	63.0 F	55.6 F	77 %	SE	6.6 mph	7.8 mph	29.91 in	0.00 in	0.00 in
7/29/20	3:34 AM	63.1 F	55.7 F	77 %	SE	6.6 mph	7.8 mph	29.91 in	0.00 in	0.00 in
7/29/20	3:39 AM	63.1 F	55.9 F	77 %	SE	6.2 mph	7.6 mph	29.91 in	0.00 in	0.00 in
7/29/20	3:44 AM	63.4 F	55.9 F	77 %	SE	8.5 mph	10.1 mph	29.91 in	0.00 in	0.00 in
7/29/20	3:49 AM	64.3 F	56.4 F	76 %	SE	9.4 mph	10.8 mph	29.91 in	0.00 in	0.00 in
7/29/20	3:54 AM	63.4 F	56.5 F	78 %	SE	8.6 mph	9.8 mph	29.91 in	0.00 in	0.00 in
7/29/20	3:59 AM	62.7 F	56.1 F	79 %	SE	8.6 mph	9.9 mph	29.91 in	0.00 in	0.00 in
7/29/20	4:04 AM	62.7 F	56.1 F	79 %	SE	8.7 mph	10.3 mph	29.91 in	0.00 in	0.00 in
7/29/20	4:09 AM	62.6 F	56.1 F	79 %	SE	8.4 mph	9.8 mph	29.91 in	0.00 in	0.00 in
7/29/20	4:14 AM	62.4 F	56.1 F	80 %	SE	8.8 mph	10.0 mph	29.91 in	0.00 in	0.00 in
7/29/20	4:19 AM	62.1 F	56.0 F	81 %	SE	8.8 mph	10.2 mph	29.91 in	0.00 in	0.00 in
7/29/20	4:24 AM	62.2 F	55.9 F	80 %	SE	9.5 mph	11.3 mph	29.91 in	0.00 in	0.00 in
7/29/20	4:29 AM	62.4 F	55.9 F	79 %	SE	9.6 mph	11.6 mph	29.91 in	0.00 in	0.00 in
7/29/20	4:34 AM	62.6 F	56.0 F	79 %	SE	8.4 mph	9.9 mph	29.91 in	0.00 in	0.00 in
7/29/20	4:39 AM	62.6 F	56.1 F	79 %	SE	9.2 mph	10.6 mph	29.91 in	0.00 in	0.00 in
7/29/20	4:44 AM	62.7 F	56.0 F	79 %	SE	9.8 mph	11.9 mph	29.91 in	0.00 in	0.00 in
7/29/20	4:49 AM	63.0 F	56.1 F	78 %	SE	8.8 mph	10.7 mph	29.91 in	0.00 in	0.00 in
7/29/20	4:54 AM	62.9 F	56.1 F	78 %	SE	8.5 mph	9.9 mph	29.91 in	0.00 in	0.00 in
7/29/20	4:59 AM	62.7 F	56.1 F	79 %	SE	8.4 mph	9.6 mph	29.91 in	0.00 in	0.00 in
7/29/20	5:04 AM	62.0 F	55.9 F	81 %	SE	8.4 mph	9.8 mph	29.91 in	0.00 in	0.00 in
7/29/20	5:09 AM	61.8 F	56.0 F	81 %	SE	8.2 mph	9.6 mph	29.92 in	0.00 in	0.00 in
7/29/20	5:14 AM	60.9 F	55.7 F	83 %	SSE	8.2 mph	9.6 mph	29.91 in	0.00 in	0.00 in
7/29/20	5:19 AM	59.8 F	55.2 F	85 %	SSE	8.1 mph	9.1 mph	29.92 in	0.00 in	0.00 in
7/29/20	5:24 AM	59.2 F	54.8 F	85 %	SSE	8.0 mph	9.1 mph	29.92 in	0.00 in	0.00 in
7/29/20	5:29 AM	58.6 F	54.6 F	86 %	SSE	8.3 mph	9.7 mph	29.92 in	0.00 in	0.00 in
7/29/20	5:34 AM	58.2 F	54.4 F	87 %	SSE	8.0 mph	9.3 mph	29.92 in	0.00 in	0.00 in
7/29/20	5:39 AM	57.9 F	54.2 F	87 %	SSE	7.3 mph	8.6 mph	29.92 in	0.00 in	0.00 in
7/29/20	5:44 AM	57.9 F	54.2 F	88 %	South	7.1 mph	8.4 mph	29.93 in	0.00 in	0.00 in
7/29/20	5:49 AM	58.7 F	54.4 F	86 %	SSE	7.8 mph	9.0 mph	29.93 in	0.00 in	0.00 in
7/29/20	5:54 AM	59.2 F	54.7 F	85 %	SSE	7.3 mph	8.4 mph	29.93 in	0.00 in	0.00 in
7/29/20	5:59 AM	59.5 F	55.0 F	85 %	SSE	6.9 mph	8.1 mph	29.93 in	0.00 in	0.00 in
7/29/20	6:04 AM	59.5 F	55.0 F	85 %	South	7.4 mph	8.5 mph	29.94 in	0.00 in	0.00 in
7/29/20	6:09 AM	59.5 F	55.0 F	85 %	South	7.6 mph	9.0 mph	29.94 in	0.00 in	0.00 in
7/29/20	6:14 AM	59.4 F	54.9 F	85 %	South	7.2 mph	8.4 mph	29.94 in	0.00 in	0.00 in
7/29/20	6:19 AM	59.0 F	54.8 F	86 %	South	6.7 mph	7.7 mph	29.93 in	0.00 in	0.00 in

Appendix F. Kaleidoscope Output for the Northern Long-Eared Bat Presence/Absence Acoustic Surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020

Appendix F1. Kaleidoscope[1] analysis output number of files for the northern long-eared bat presence/absence acoustic surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020.

	Number of Files										
Detector Location ID	**Night**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYCI**	**MYEV**	**MYLU**	**NLEB**	**MYVO**	**NOID**
1A	20200723	5	5			2				3	8
1B	20200724	8	7	2	1	5		6			15
1A	20200725	4	3		2			1			0
1B	20200726		4					3		1	0
1A	**1A**	**17**	**19**	**2**	**3**	**7**		**10**		**4**	**23**
1B	20200723	8	8	36	4			3			21
1B	20200724	7	5	8	4	1		1			10
1B	20200725	4	7	7	5	1					11
1B	20200726	1	3	4	2		1	2			3
1B	**1B**	**20**	**23**	**55**	**15**	**2**	**1**	**6**			**45**
2A	20200723	8	65	165	13	6		5		2	98
2A	20200724	23	29	450	6	6		20		1	129
2A	20200725	9	3	102	6	1		3		1	21
2A	20200726		53	184	4	3		12			33
2A	**2A**	**40**	**150**	**901**	**30**	**16**		**40**		**4**	**281**
2B	20200723		3		2			6		1	15
2B	20200724	9	4	1	3					1	9
2B	20200725	7			4	1		7	1	3	17
2B	20200726	2	5	3		1		5			9
2B	20200727	1		4	5	2		4		1	9
2B	**2B**	**19**	**12**	**8**	**14**	**4**		**22**	**1**	**6**	**59**
3A	20200723	9	17		5	4		6		1	27
3A	20200724	1	14	2	4	6		24		16	51
3A	20200725	5	3	4				8			12
3A	20200726	5	11	2		1		6		1	15
3A	20200727	2	10	3	2			12		1	6

Appendix F1. Kaleidoscope[1] analysis output number of files for the northern long-eared bat presence/absence acoustic surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020.

	Number of Files										
Detector Location ID	**Night**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYCI**	**MYEV**	**MYLU**	**NLEB**	**MYVO**	**NOID**
3A	**3A**	**22**	**55**	**11**	**11**	**11**		**56**		**19**	**111**
4A	20200723	11	8	12	2	3		8			44
4A	20200724	6	9	20	6	8		41	1	3	59
4A	20200725	5	10	26	21	11		4			44
4A	20200726	3	11	22	7	2				1	40
4A	20200727	2	7	20	1	2		1			25
4A	**4A**	**27**	**45**	**100**	**37**	**26**		**54**	**1**	**4**	**212**
4B	20200723		2					1			2
4B	20200724	4			1			2			4
4B	20200725	2	1		1	1		2			5
4B	20200726	1						1			2
4B	**4B**	**7**	**3**		**2**	**1**		**6**			**13**
5A	20200722	20	5	8				11		1	19
5A	20200723	3	36	54	3	2		32			38
5A	20200724	62	56	38	3	14		76		5	81
5A	20200725	28	52	23	25	8		42		1	70
5A	**5A**	**113**	**149**	**123**	**31**	**24**		**161**		**7**	**208**
5B	20200722	2	8		1	6	1	168		1	45
5B	20200723	4	15		5	2		9			18
5B	20200724	14	8	3	6	3		19			28
5B	20200725	11	2	7	7			4			6
5B	**5B**	**31**	**33**	**10**	**19**	**11**	**1**	**200**		**1**	**97**
6A	20200722	3	44	2	1	20	2	12		1	42
6A	20200723	7	102		5	6		8			41
6A	20200724	1	272	12	12	2		3			40
6A	20200725	1	14	15	2	1		3			14
6A	**6A**	**12**	**432**	**29**	**20**	**29**	**2**	**26**		**1**	**137**

Appendix F1. Kaleidoscope[1] analysis output number of files for the northern long-eared bat presence/absence acoustic surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020.

	Number of Files										
Detector Location ID	**Night**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYCI**	**MYEV**	**MYLU**	**NLEB**	**MYVO**	**NOID**
6B	20200722		8	1				1			4
6B	20200723	3	4	2	2	1				1	10
6B	20200724	2	1	10	1			3			6
6B	20200725	5	1	11	1	1		1			24
6B	**6B**	**10**	**14**	**24**	**4**	**2**		**5**		**1**	**44**
7A	20200722		5	8				1		2	12
7A	20200723	2	3	25	2	4		3		12	21
7A	20200724	18	11	60	6	1		2		1	33
7A	20200725	3	5	11	6			6		1	16
7A	**7A**	**23**	**24**	**104**	**14**	**5**		**12**		**16**	**82**
7B	20200722	16	2	85	16	5	37	188	20	2	354
7B	20200723	26	2	104	27	3	5	115	4	6	283
7B	20200724	23	5	90	6	16		55		1	68
7B	20200725	17	5	17	10	6	2	40		1	35
7B	**7B**	**82**	**14**	**296**	**59**	**30**	**44**	**398**	**24**	**10**	**740**
alt2	20200723	14	10	4	11	2		17			36
alt2	20200724	56	30	4	3	1	1	19		1	36
alt2	20200725	18	15	16	4	1		4			23
alt2	20200726	14	14	8	2					3	18
alt2	**alt2**	**102**	**69**	**32**	**20**	**4**	**1**	**40**		**4**	**113**
T1	20200724	21	8	8	34	2		5		2	24
T1	20200725	23	9	5	38			2			23
T1	20200726	16	9	9	22	1		7			19
T1	**T1**	**60**	**26**	**22**	**94**	**3**		**14**		**2**	**66**

Appendix F1. Kaleidoscope[1] analysis output number of files for the northern long-eared bat presence/absence acoustic surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020.

	Number of Files										
Detector Location ID	**Night**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYCI**	**MYEV**	**MYLU**	**NLEB**	**MYVO**	**NOID**
T2	20200724	137	15	19	193	1	1	52			104
T2	20200725	12	3	18	165			2			16
T2	20200726	71	13	23	241	3	1	23			71
T2	**T2**	**220**	**31**	**60**	**599**	**4**	**2**	**77**			**191**
T3	20200727	10	8	16	43	1	1	3			24
T3	20200728	68	3	3	136	4	1	7			45
T3	**T3**	**78**	**11**	**19**	**179**	**5**	**2**	**10**			**69**
T4	20200724	26	5	4	27		1	3			17
T4	20200725	17	6	3	56		1				19
T4	20200726	18	5	6	44	1	1	2			12
T4	**T4**	**61**	**16**	**13**	**127**	**1**	**3**	**5**			**48**
T5	20200724	41	7		27	2		1			24
T5	20200725	22	2	5	61			7	1		13
T5	20200726	14	2	6	30			9			7
T5	**T5**	**77**	**11**	**11**	**118**	**2**		**17**	**1**		**44**

[1.] Kaleidoscope Pro® Version 5.1.0

EPFU = big brown bat (*Eptesicus fuscus*); LABO = eastern red bat (*Lasiurus borealis*); LACI = hoary bat (*Lasiurus cinereus*); LANO = silver-haired bat (*Lasionycteris noctivagans*); MYCI = western small-footed bat (*Myotis ciliolabrum*); MYEV = western long-eared bat (*Myotis evotis*); MYLU = little brown bat (*Myotis lucifugus*); NLEB = northern long-eared bat (*Myotis septentrionalis*); MYVO = long-legged bat (*Myotis volans*); NOID = unknown or no identification.

Appendix F2. Kaleidoscope[1] analysis output p-values for the northern long-eared bat presence/absence acoustic surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020.

	P-Values									
Detector Location ID	**Night**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYCI**	**MYEV**	**MYLU**	**NLEB**	**MYVO**
1A	20200723	0	0	1	1	0.23	1	1	1	0
1A	20200724	0	0	0.18	1	0	1	0.01	1	1
1A	20200725	0.01	0	1	0.35	1	1	0.78	1	1
1A	20200726	1	0	1	1	1	1	0.16	1	0.29
1A	**1A**	**0**	**0**	**0.51**	**0.93**	**0**	**1**	**0.02**	**1**	**0**
1B	20200723	0.05	0	0	1	1	1	0.39	1	1
1B	20200724	0	0	0	0.74	0.29	1	0.95	1	1
1B	20200725	0.11	0	0	0.27	0.32	1	1	1	1
1B	20200726	0.8	0	0	0.72	1	0.07	0.28	1	1
1B	**1B**	**0**	**0**	**0**	**0.98**	**0.34**	**0.08**	**0.41**	**1**	**1**
2A	20200723	1	0	0	1	0.02	1	1	1	0.04
2A	20200724	1	0	0	1	0.01	1	0	1	1
2A	20200725	0.89	0	0	1	0.54	1	0.11	1	0.29
2A	20200726	1	0	0	1	0.42	1	0.31	1	1
2A	**2A**	**1**	**0**	**0**	**1**	**0**	**1**	**0**	**1**	**0.12**
2B	20200723	1	0.01	1	0.04	1	1	0	1	0.51
2B	20200724	0	0	0.81	0.47	1	1	1	1	0.11
2B	20200725	0	1	1	0.09	0.85	1	0	0.45	0.03
2B	20200726	0.11	0	0	1	0.51	1	0.01	1	1
2B	20200727	0.98	1	0	0.05	0.1	1	0	1	0.37
2B	**2B**	**0**	**0**	**0**	**0**	**0.25**	**1**	**0**	**0.78**	**0**

Appendix F2. Kaleidoscope[1] analysis output p-values for the northern long-eared bat presence/absence acoustic surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020.

	P-Values									
Detector Location ID	**Night**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYCI**	**MYEV**	**MYLU**	**NLEB**	**MYVO**
3A	20200723	0	0	1	0.05	0.02	1	0.2	1	0.45
3A	20200724	0.91	0	0.12	0.04	0.22	1	0	1	0
3A	20200725	0	0.02	0	1	1	1	0	1	1
3A	20200726	0	0	0.1	1	0.79	1	0.05	1	0.45
3A	20200727	0.26	0	0.01	0.65	1	1	0	1	0.77
3A	**3A**	**0**	**0**	**0**	**0.10**	**0.04**	**1**	**0**	**1**	**0**
4A	20200723	0	0	0	1	0.03	1	0	1	1
4A	20200724	0.07	0	0	0.92	0	1	0	0.83	0.56
4A	20200725	0.88	0	0	0	0	1	0.32	1	1
4A	20200726	0.82	0	0	0.76	0.15	1	1	1	0.13
4A	20200727	0.93	0	0	1	0.04	1	1	1	1
4A	**4A**	**0**	**0**	**0**	**0.08**	**0**	**1**	**0**	**0.92**	**0.43**
4B	20200723	1	0.01	1	1	1	1	0.63	1	1
4B	20200724	0	1	1	0.85	1	1	0.02	1	1
4B	20200725	0.07	0.2	1	0.59	0.22	1	0.09	1	1
4B	20200726	0.12	1	1	1	1	1	0.12	1	1
4B	**4B**	**0**	**0.01**	**1**	**0.64**	**0.51**	**1**	**0**	**1**	**1**
5A	20200722	0	0	0	1	1	1	0	1	0.75
5A	20200723	1	0	0	1	0.94	1	0	1	1
5A	20200724	0	0	0	1	0	1	0	1	0.44
5A	20200725	0	0	0	0	0.01	1	0	1	1
5A	**5A**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**1**	**0.82**
5B	20200722	0.1	0.67	1	0.59	0.94	0.64	0	1	1
5B	20200723	0.04	0	1	0.01	0.31	1	0.01	1	1
5B	20200724	0	0	0.2	0.17	0.14	1	0	1	1
5B	20200725	0	0.04	0	0.16	1	1	0.01	1	1
5B	**5B**	**0**	**0**	**0**	**0**	**0.31**	**0.78**	**0**	**1**	**1**

Appendix F2. Kaleidoscope[1] analysis output p-values for the northern long-eared bat presence/absence acoustic surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020.

	P-Values									
Detector Location ID	**Night**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYCI**	**MYEV**	**MYLU**	**NLEB**	**MYVO**
6A	20200722	0.02	0	0.06	0.97	0	0.01	0.16	1	0.74
6A	20200723	0	0	1	0.03	0.08	1	1	1	1
6A	20200724	1	0	0	0	1	1	1	1	1
6A	20200725	1	0	0	1	0.64	1	0.79	1	1
6A	**6A**	**0.01**	**0**	**0**	**0**	**0**	**0.01**	**1**	**1**	**1**
6B	20200722	1	0	0.06	1	1	1	1	1	1
6B	20200723	0.05	0	0.09	0.58	0.44	1	1	1	0.1
6B	20200724	0.53	0.28	0	1	1	1	0.01	1	1
6B	20200725	0.02	0.12	0	1	0.16	1	0.45	1	1
6B	**6B**	**0**	**0**	**0**	**1**	**0.28**	**1**	**0.25**	**1**	**0.38**
7A	20200722	1	0	0	1	1	1	0.99	1	0.01
7A	20200723	1	0	0	1	0.24	1	0.82	1	0
7A	20200724	0	0	0	1	0.68	1	0.95	1	0.17
7A	20200725	0.49	0	0	0.31	1	1	0	1	0.5
7A	**7A**	**0**	**0**	**0**	**1**	**0.37**	**1**	**0.06**	**1**	**0**
7B	20200722	0.02	1	0	1	1	0	0	0	1
7B	20200723	0	1	0	0.95	1	0	0	0.15	0.72
7B	20200724	0	0.18	0	1	0	1	0	1	1
7B	20200725	0	0.07	0	0.32	0.01	0.01	0	1	1
7B	**7B**	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**1**
alt2	20200723	0	0	0.12	0	0.44	1	0	1	1
alt2	20200724	0	0	0.67	1	1	0.13	0	1	0.9
alt2	20200725	0	0	0	1	0.7	1	0.53	1	1
alt2	20200726	0	0	0	1	1	1	1	1	0
alt2	**alt2**	**0**	**0**	**0**	**0.94**	**0.75**	**0.26**	**0**	**1**	**0.15**

Appendix F2. Kaleidoscope[1] analysis output p-values for the northern long-eared bat presence/absence acoustic surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020.

	P-Values									
Detector Location ID	**Night**	**EPFU**	**LABO**	**LACI**	**LANO**	**MYCI**	**MYEV**	**MYLU**	**NLEB**	**MYVO**
T1	20200724	0	0	0.03	0	0.3	1	0.09	1	0.06
T1	20200725	0	0	0.54	0	1	1	0.84	1	1
T1	20200726	0	0	0	0	0.69	1	0.01	1	1
T1	**T1**	**0**	**0**	**0**	**0**	**0.31**	**1**	**0**	**1**	**0.26**
T2	20200724	0	0	0.63	0	1	0.33	0	1	1
T2	20200725	1	0	0.06	0	1	1	0.28	1	1
T2	20200726	0	0	0.22	0	0.23	0.14	0	1	1
T2	**T2**	**0**	**0**	**0.02**	**0**	**0.84**	**0.05**	**0**	**1**	**1**
T3	20200727	0.4	0	0	0	0.5	0.07	0.39	1	1
T3	20200728	0	0.01	1	0	0	0.07	0	1	1
T3	**T3**	**0**	**0**	**0.24**	**0**	**0**	**0.01**	**0**	**1**	**1**
T4	20200724	0	0	0.64	0	1	0.08	0.18	1	1
T4	20200725	0.01	0	1	0	1	0.07	1	1	1
T4	20200726	0	0	0.34	0	0.35	0.07	0.51	1	1
T4	**T4**	**0**	**0**	**0.48**	**0**	**0.75**	**0**	**0.32**	**1**	**1**
T5	20200724	0	0	1	0	0.04	1	1	1	1
T5	20200725	0	0.1	0.91	0	1	1	0	0.2	1
T5	20200726	0	0.14	0.11	0	1	1	0	1	1
T5	**T5**	**0**	**0**	**0.83**	**0**	**0.46**	**1**	**0**	**0.42**	**1**

[1] Kaleidoscope Pro® Version 5.1.0

EPFU = big brown bat (*Eptesicus fuscus*); LABO = eastern red bat (*Lasiurus borealis*); LACI = hoary bat (*Lasiurus cinereus*); LANO = silver-haired bat (*Lasionycteris noctivagans*); MYCI = western small-footed bat (*Myotis ciliolabrum*); MYEV = western long-eared bat (*Myotis evotis*); MYLU = little brown bat (*Myotis lucifugus*); NLEB = northern long-eared bat (*Myotis septentrionalis*); MYVO = long-legged bat (*Myotis volans*).

Appendix G. Qualitative Analysis Summary for the Northern Long-Eared Bat Presence/Absence Acoustic Surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020

Appendix G. Summary of qualitative acoustic analysis of calls identified as northern long-eared bats by Kaleidoscope[1] for the northern long-eared bat presence/absence acoustic surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020.

Detector Location ID	Night	File Name	Kaleidoscope ID[2]	Qualitative ID[2]	Justification[3]
2B	7/25/2020	U7260157.29#	NLEB	HF Unknown	low bandwidth and Fmax; not characteristic of NLEB
4A	7/24/2020	U7250319.34#	NLEB	MYLU	slope too low for NLEB
7B	7/22/2020	U7222213.27#	NLEB	HF Unknown	approach-phase calls; calls that resemble NLEB have TBC < 65 ms indicative of approach-phase
7B	7/22/2020	U7222300.55#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
7B	7/22/2020	U7222308.48#	NLEB	HF Unknown	fragmentary call; cannot ID to species; low bandwidth and Fmax; not characteristic of NLEB
7B	7/22/2020	U7222317.01#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
7B	7/22/2020	U7222319.32#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
7B	7/22/2020	U7222342.43#	NLEB	HF Unknown	fragmentary call; cannot ID to species; low bandwidth, Fmax, and slope; not characteristic of NLEB
7B	7/22/2020	U7230011.53#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
7B	7/22/2020	U7230024.09#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
7B	7/22/2020	U7230027.53#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
7B	7/22/2020	U7230035.05#	NLEB	NLEB	none
7B	7/22/2020	U7230035.59#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
7B	7/22/2020	U7230102.24#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
7B	7/22/2020	U7230103.03#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
7B	7/22/2020	U7230124.23#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
7B	7/22/2020	U7230126.26#	NLEB	HF Unknown	approach-phase calls; calls that resemble NLEB have TBC < 65 ms indicative of approach-phase; low slope
7B	7/22/2020	U7230127.48#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB

Appendix G. Summary of qualitative acoustic analysis of calls identified as northern long-eared bats by Kaleidoscope[1] for the northern long-eared bat presence/absence acoustic surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020.

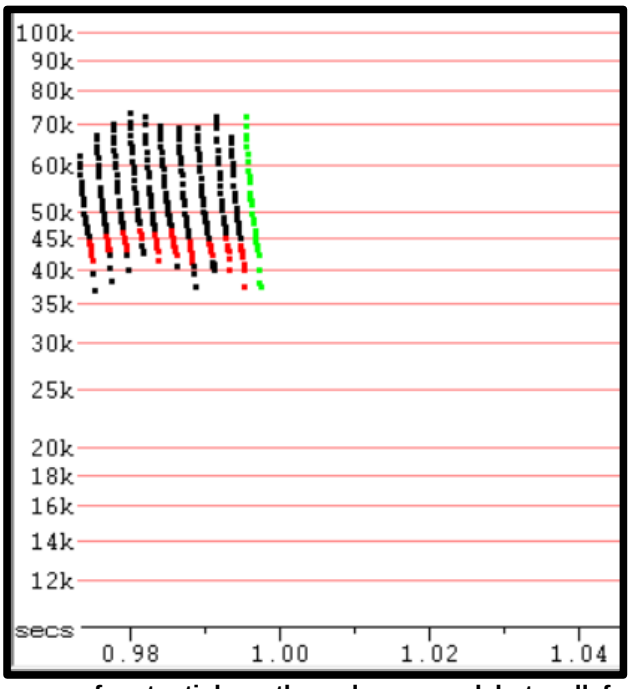
Detector Location ID	Night	File Name	Kaleidoscope ID[2]	Qualitative ID[2]	Justification[3]
7B	7/22/2020	U7230128.15#	NoID	NLEB	none
7B	7/22/2020	U7230130.32#	NLEB	HF Unknown	fragmentary calls; cannot ID to species
7B	7/22/2020	U7230201.59#	MYEV	NLEB	none
7B	7/22/2020	U7230213.51#	NLEB	HF Unknown	approach-phase calls; variable Fmin
7B	7/22/2020	U7230221.19#	NLEB	HF Unknown	approach-phase calls; calls that resemble NLEB have TBC < 65 ms indicative of approach-phase; low slope
7B	7/22/2020	U7230225.31#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
7B	7/23/2020	U7232304.47#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
7B	7/23/2020	U7240003.53#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
7B	7/23/2020	U7240116.23#	NLEB	NLEB	none
7B	7/23/2020	U7240116.40#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB
T5	7/25/2020	U7252248.41#	NLEB	HF Unknown	unknown Myotis; slope too low for NLEB

1. Kaleidoscope Pro® Version 5.1.0.

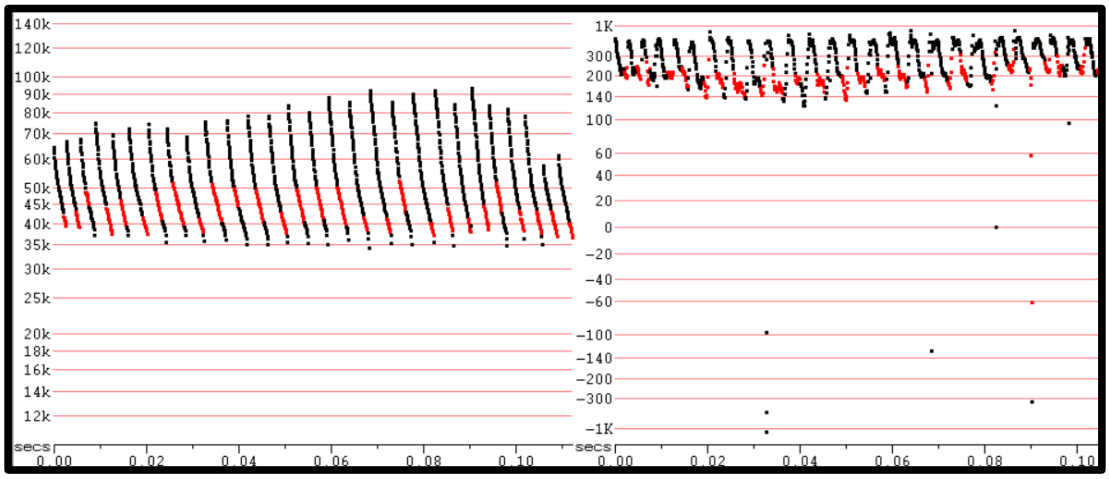
2. MYLU = little brown bat (*Myotis lucifugus*); NLEB = northern long-eared bat (*Myotis septentrionalis*); MYEV = long-eared myotis (*Myotis evotis*); HF Unknown = high frequency unknown; NoID = no identification; HF = high frequency.

3. Fmin = minimum call frequency; Fmax = maximum call frequency; TBC = time between calls; ms = milliseconds; slope = minimum call slope; bandwidth = call frequency range

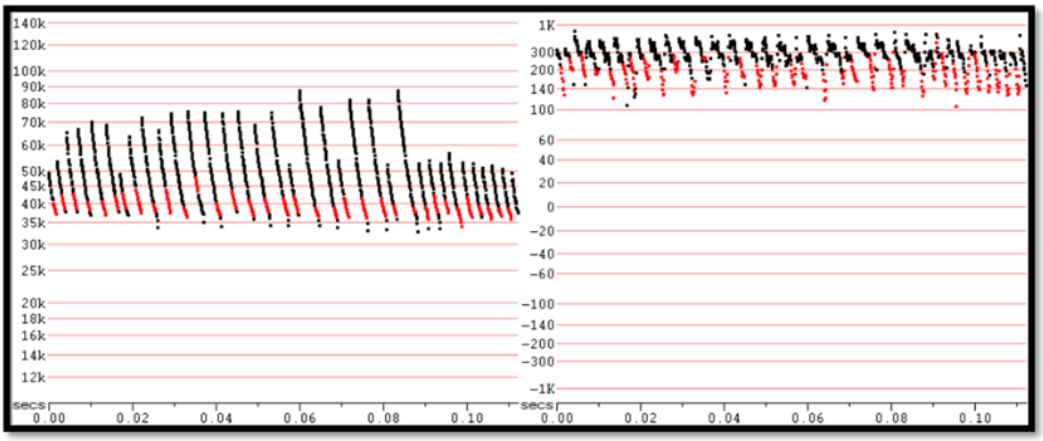
Appendix H. Representative Bat Species Calls for the Northern Long-Eared Bat Presence/Absence Acoustic Surveys at the Oliver Wind IV Project and Study Area in Oliver and Mercer Counties, North Dakota, from July 22 – July 28, 2020



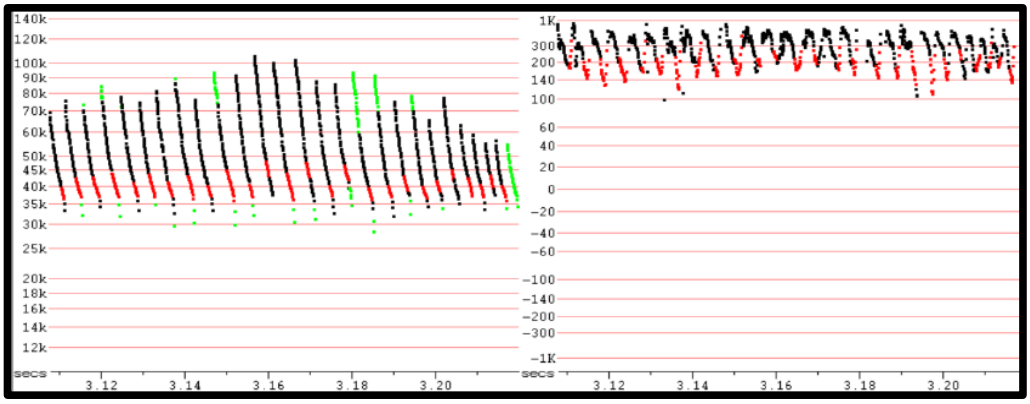
Appendix H1. Call screen of potential northern long-eared bat call from detector location 2B reclassified as high-frequency unknown by qualitative analysis.



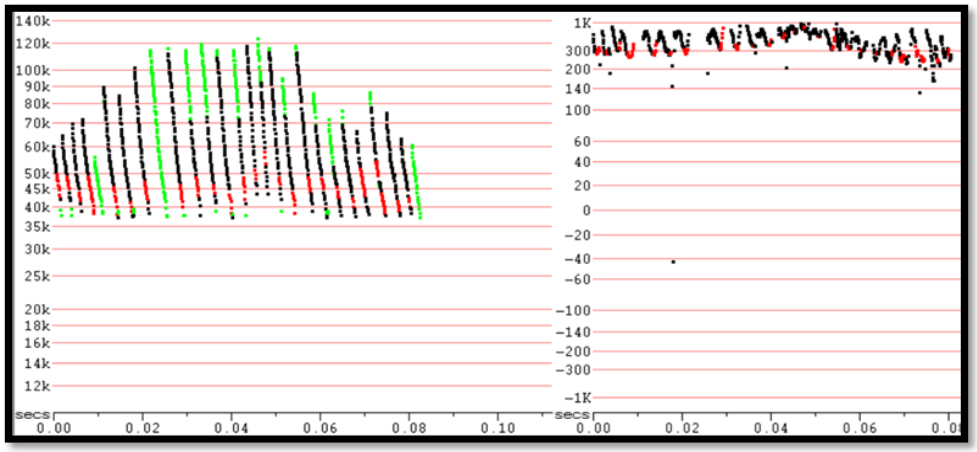
Appendix H2. Call screen (left) and slope plot (right) of potential northern long-eared bat call from detector location 4A reclassified as little brown bat by qualitative analysis.



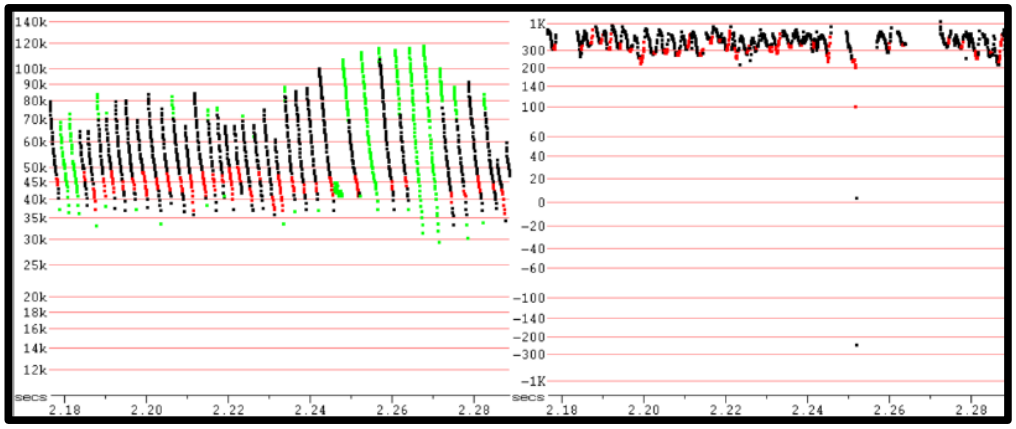
Appendix H3. Call screen (left) and slope plot (right) of potential northern long-eared bat call from detector location T5 reclassified as high-frequency unknown by qualitative analysis.



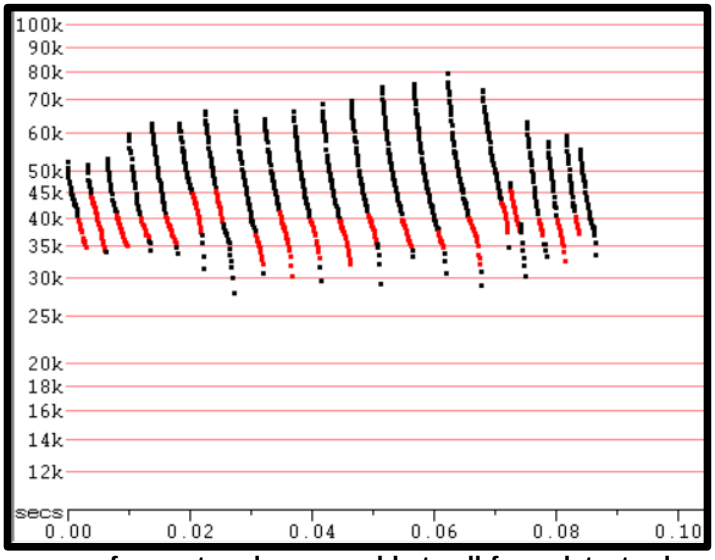
Appendix H4. Call screen (left) and slope plot (right) of potential northern long-eared bat call from detector location 7B reclassified as high-frequency unknown by qualitative analysis.



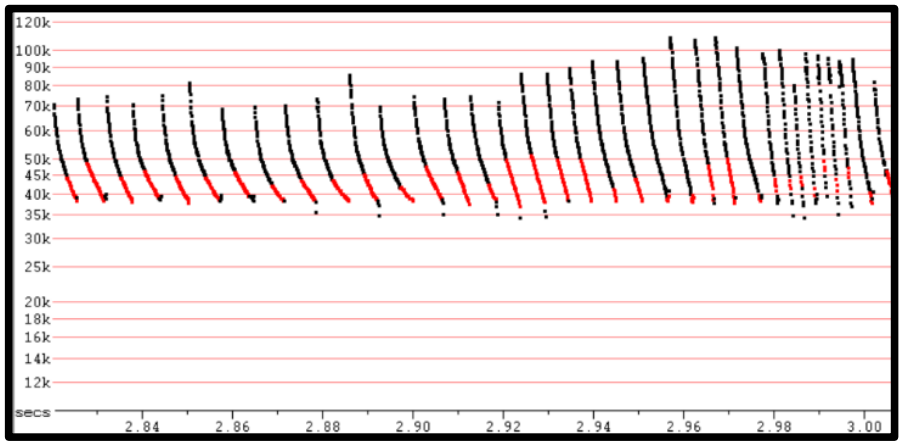
Appendix H5. Call screen (left) and slope plot (right) of a northern long-eared bat call from detector location 7B identified by Kaleidoscope Pro and qualitative analysis.



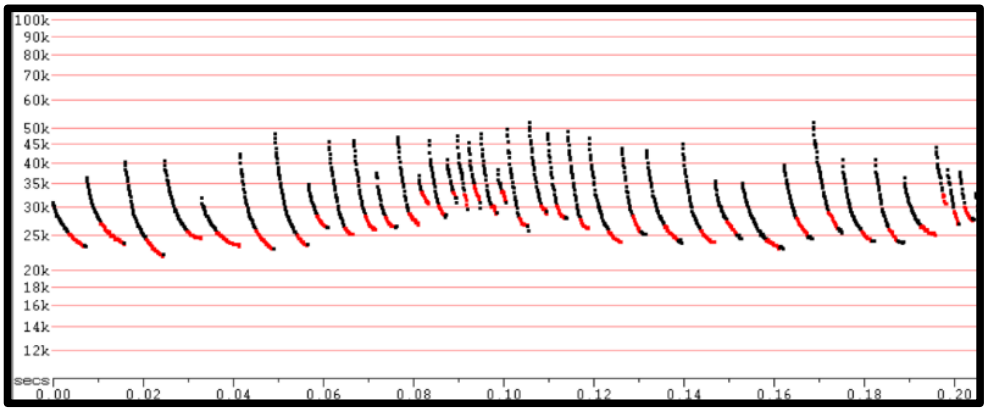
Appendix H6. Call screen (left) and slope plot (right) of a northern long-eared bat call from detector location 7B identified by Kaleidoscope Pro and qualitative analysis.



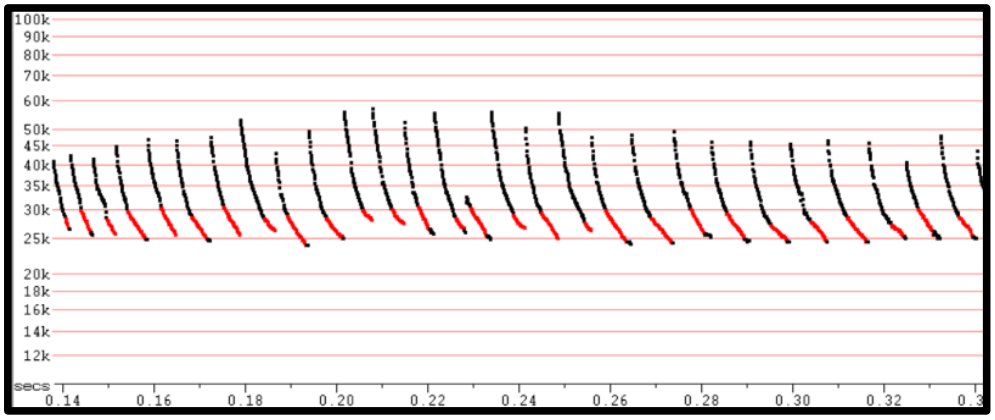
Appendix H7. Call screen of a western long-eared bat call from detector location 7B identified by Kaleidoscope Pro and qualitative analysis.



Appendix H8. Call screen of little brown bat call identified by Kaleidoscope Pro and qualitative analysis. The call screen includes approach-phase and feeding buzz calls (at the end).



Appendix H9. Call screen of a hoary bat call identified by qualitative analysis.



Appendix H10. Call screen of a big brown bat call identified by Kaleidoscope Pro and qualitative analysis.

Appendix B10. Summer Bat Presence/Absence Surveys (2022)

Northern Long-Eared Bat Presence/Absence Surveys

Oliver Wind IV Energy Center

Oliver and Mercer Counties, North Dakota

Surveys Conducted August 11 – August 24, 2022



Prepared for:

Oliver Wind IV, LLC

Prepared by:

Hannah Hayes and Martin Piorkowski

Western EcoSystems Technology, Inc.
4007 State Street Suite 109
Bismarck, North Dakota 58503

Report Date: August 29, 2023

WEST

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EXECUTIVE SUMMARY

Oliver Wind IV, LLC (Oliver Wind IV), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC (NextEra), is developing the Oliver Wind IV Energy Center (WEC) and Transmission Line (T-Line), collectively known as the Oliver Wind IV Project (Project), in Oliver and Mercer Counties, North Dakota. Western EcoSystems Technology, Inc. (WEST) was contracted to conduct follow-up mist-netting surveys at two sites that had either probable northern long-eared bat (*Myotis septentrionalis*; NLEB) acoustic detections or unknown *Myotis* ssp. detections in 2019 and 2020. The main objective of the 2022 summer bat survey was to attempt capture of NLEB during the summer maternity season (May 15 – August 15) at two sites where acoustic detections indicated the presence of the species.

Survey methods followed the U.S. Fish and Wildlife Service (USFWS) *Range-Wide Indiana Bat & Northern Long-Eared Bat Survey Guidelines* (USFWS 2022) and were approved by the USFWS North Dakota Ecological Services Field Office on August 4, 2022. The study plan was also provided to the North Dakota Game and Fish Department.

Mist-netting was conducted at two sites from August 11 to August 24, 2022, and. one bat was captured during the entire survey period: a silver-haired bat (*Lasionycteris noctivagans*). No NLEB were captured.

STUDY PARTICIPANTS

Martin Piorkowski	Project Manager
Kristina Hammond-Rendon	Senior Reviewer
Brenna Hyzy	Bat Biologist
Renea Wilson	Report Compiler
Hannah Hayes	Permitted Bat Biologist/ Report Compiler
Michelle Cavalieri	Bat Technician
Terri Thorn	GIS Specialist
Lucas Voorhees	Bat Project Coordinator
Carissa Goodman	Technical Editor

REPORT REFERENCE

H. Hayes and M. Piorkowski. 2022. Summer Bat Presence/Absence Surveys, Oliver Wind IV Energy Center, Oliver and Mercer Counties, North Dakota: Surveys Conducted August 11 – August 24, 2022. Prepared for Oliver Wind IV, LLC. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. Report Revised August 29, 2023.

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Appendix B. Maps of Mist-Net Survey Sites
Appendix C. Photographs of Mist-Net Survey Sites
Appendix D. Photographs of Captured Bats
Appendix E. Summary of Mist-Net Captures
Appendix F. Mist-Net Survey Datasheets

[1]The Appendices include maps referring to the Red Butte Wind Farm. The Project name was changed to Oliver Wind IV Project in 2022, making the information in the Appendices applicable to the Oliver Wind IV Project despite references to the Red Butt Wind Farm.

INTRODUCTION

Oliver Wind IV, LLC (Oliver Wind IV), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC (NextEra), is developing the Oliver Wind IV Energy Center (WEC) and Transmission Line (T-Line), collectively known as the Oliver Wind IV Project (Project), in Oliver and Mercer Counties, North Dakota (Figure 1). During the summers of 2019 and 2020, Western EcoSystems Technology, Inc. (WEST) conducted Presence/Probable Absence (P/A) surveys at the Project (Murray and Wilson 2020; Wilson et al. 2019) following U.S. Fish and Wildlife Service (USFWS) guidance as described in the *Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2019, USFWS 2020).

Previous efforts included: desktop habitat mapping, acoustic P/A surveys, and P/A mist-netting surveys. From these previous efforts in 2020, two acoustic locations (T5 along the transmission line and 7B within the Project Area; Figure 2) had either probable northern long-eared bats or calls of an unknown *Myotis* spp. (Murray and Wilson 2020) but no follow-up mist-netting efforts were deployed in 2020. Therefore, the main objective of this 2022 summer bat survey was to attempt confirm the presence or probable absence of NLEB by conducting mist-net surveys during the summer maternity season (May 15 – August 15) at the sites where 2020 acoustic detections suggested probable presence of the species.

METHODS

All surveys followed methods described in the current *Range-Wide Indiana Bat & Northern Long-Eared Bat Survey Guidelines* (Guidelines; USFWS 2022). A Study Plan for the Project was provided to USFWS North Dakota Ecological Services Field Office on July 20, 2022 (Piorkowski 2022) with approval from USFWS on August 4, 2022 (Appendix A). All surveys were completed by a federally permitted bat biologist (H. Hayes; TE00101D-0, NDGF Scientific Collection License [Permit # 15568]).

Mist-Net Surveys

WEST conducted follow-up mist-netting surveys at two sites (T5 and 7B; Figure 2) that had either probable NLEB acoustic detections or unknown *Myotis* ssp. detections in 2019 and 2020. Mist-net surveys were conducted for six valid net-nights at each site for two calendar nights, for a total of 12 net nights. Three nights were invalid due to weather and additional nights were conducted and nets were moved. Standard 2-ply, 5-denier, nylon mist-nets with a mesh size of 38.0 millimeters (mm; 1.3 inches) were used at all mist-net sites. Mist-nets were placed in suitable bat habitat and positioned perpendicularly across flight corridors to fill the corridor from side-to-side and extended from ground level up to the overhanging canopy, when possible, or in forested habitat to specifically target NLEB. This required use of single-, double-, and triple-stacked mist-nets, depending on the canopy height at each mist-net location.

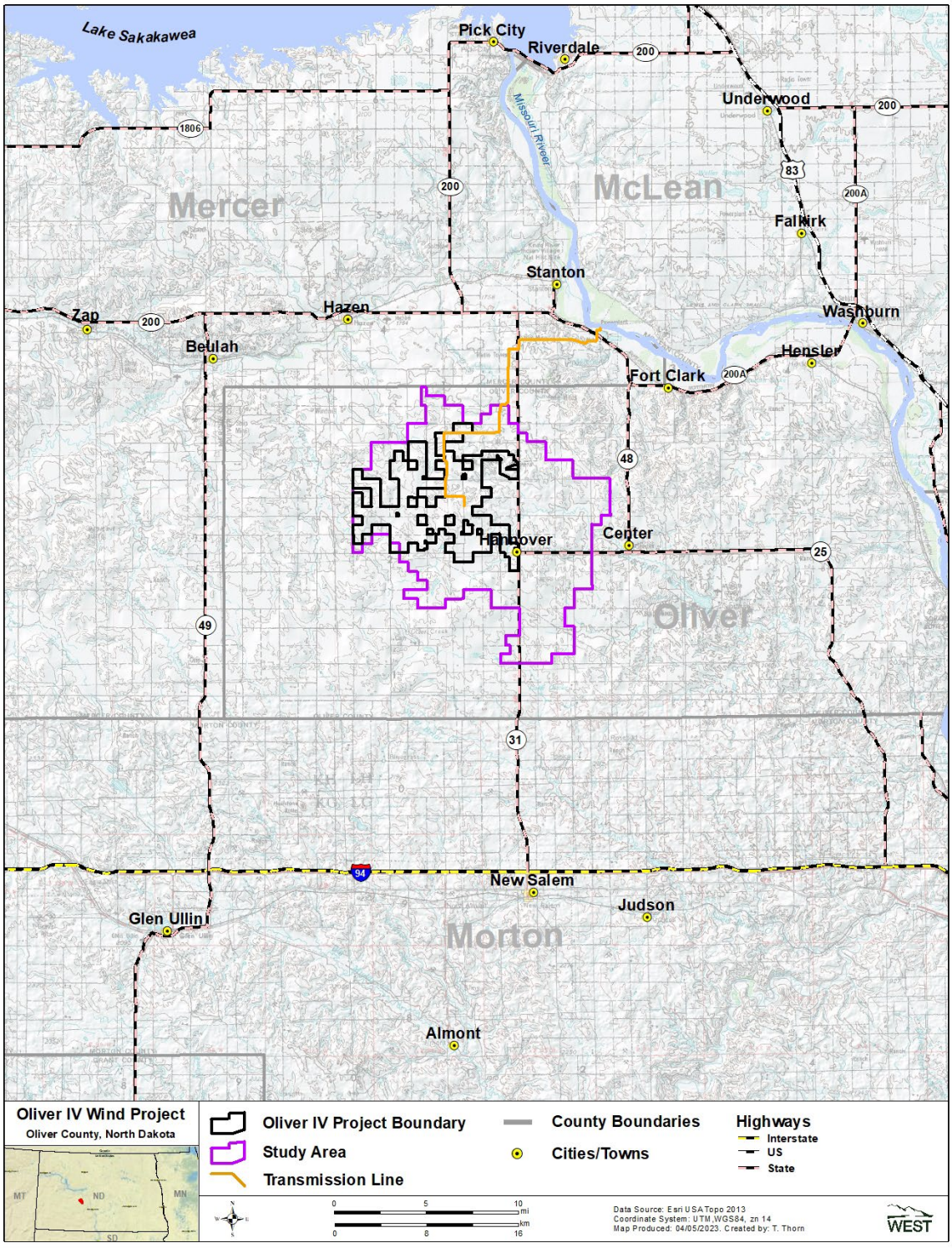


Figure 1. Location of the proposed Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota.

Mist-netting began at sunset and continued for at least five hours, and nets were checked every 10 minutes (min). Net locations were established at least 98 feet (30 meter) apart within each mist-net location. Disturbance in the form of noise and movement was minimized at all net locations. If weather conditions, such as persistent rain or heavy fog (more than 30 min in duration), strong winds (greater than nine miles [mi; 14 kilometers] per hour for more than 30 min), or cold temperatures (below 50 degrees [°] Fahrenheit [F; 10° Celsius] for 30 min or more) occurred, then those mist-net locations were resurveyed another night.

For each mist-net night, the date, start and end times, site description, site coordinates, mist-net specifics, and weather data (temperature, cloud cover, wind speed, precipitation, and moon phase) were recorded. All captured bats were identified to species. In addition, sex, age, reproductive condition, body mass (grams), forearm length (millimeters), and capture status (recapture/new capture) were recorded.

To assess exposure to white-nose syndrome (WNS), a Reichard Index score (0-3) was recorded for all captured bats (Reichard 2009). USFWS WNS decontamination protocols were followed (White-nose Syndrome Disease Management Group 2020, USFWS 2022) to prevent cross-contamination of captured bats with *Pseudogymnoascus destructans*, the fungus that causes WNS. Captured bats were measured and processed immediately and released within 15 min of capture. Voucher photographs of each bat species captured were taken. Photographs showing species' diagnostic characteristics were taken of every individual *Myotis* bat captured.

RESULTS

Appendices B, C, D, E and F contain maps of mist-net sites, photographs of mist-net sites, photographs of captured bats, a summary of mist-net captures, and mist-net survey datasheets, respectively.

Follow-up mist-net surveys were conducted at two sites (T5 and 7B, Figure 2) from August 11 to August 24, 2022 (Appendix B). Mist-netting was extended past the summer maternity season due to inclement weather (USFWS approval; pers. comm. H. Riddle, USFWS). Site 7B had seven net locations and site T5 had four net locations, for a total of 21 net-nights (Appendices B, C, and F). Mist-netting occurred within upland forest habitat, over prairie potholes, and edge habitat (Table 1). No NLEB were captured at either site; one juvenile male silver-haired bat (*Lasionycteris noctivagans*; SHBA) was captured at site 7B, and no bats were captured at site T5.

SUMMARY

Although no NLEB were captured at either site 7B or T5 during the 2022 summer maternity season, site 7B is still considered as a site where NLEB have probable presence due to the confirmed occurrence NLEB calls at 7B in 2020 (Wilson et al. 2020).

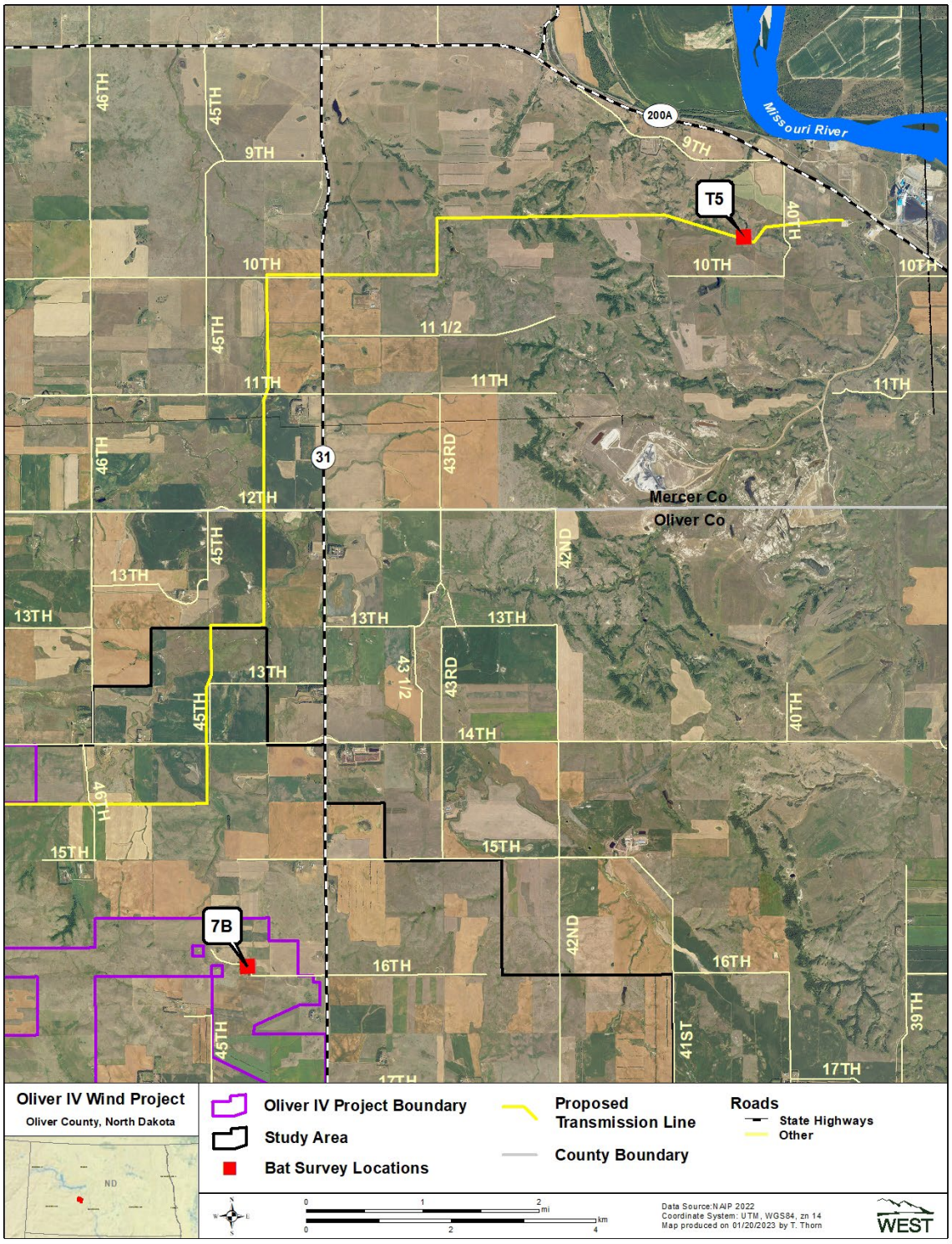


Figure 2. Location of mist-net survey sites for the proposed Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota.

Table 1. Locations and habitat descriptions of mist-net surveys at the Oliver Wind IV Project in Oliver and Mercer Counties, North Dakota on valid and invalid nights.

Mist-Net Site ID	Net	Easting*	Northing*	Site Description
7B	A	315034	5228579	Upland forest, interior
	B	315001	5228592	Upland forest, interior
	C	314946	5228635	Upland forest, across trail
	D	315034	5228598	Upland forest, across trail
	E	315079	5228605	Upland forest, edge
	F	315080	5228521	Upland forest, across trail
	G	314955	5228633	Upland forest, interior
T5	A	322288	5238471	Upland forest, edge
	B	322320	5238425	Upland forest, edge
	C	322323	5238400	Upland forest, draw
	D	322301	5238561	Across prairie pothole

* Coordinate system and datum: Universal Transverse Mercator, North American Datum 83.

ID = Identification.

Oliver IV T-Line 000569

REFERENCES

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World Geodetic System (WGS) Sphere Mercator. 1984. WGS 84/Pseudo Mercator. Mercator variation projection data.

Appendix A. Site-Specific Authorization

Note: These Appendices include maps referring to the Red Butte Wind Farm. The Project name was changed to Oliver Wind IV Project in 2022, making the information in the Appendices applicable to the Oliver Wind IV Project despite references to the Red Butt Wind Farm.

Red Butte NLEB Study Plan and SSA request

Becker, Drew N <Drew_Becker@fws.gov> Thu, Aug 4, 2022 at 8:49 AM
To: Martin Piorkowski <mpiorkowski@west-inc.com>
Cc: "Riddle, Heidi L" <heidi_riddle@fws.gov>

Hi Martin,

Study design looks good from our perspective, we approve. Heidi will reach out soon.

Drew

Drew Becker
North Dakota Ecological Services Supervisor
U.S. Fish and Wildlife Service
3425 Miriam Avenue
Bismarck, North Dakota 58501
Office 701-355-8512
Cell 701-319-0127
drew_becker@fws.gov

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NOTE: This email correspondence and any attachments to and from this sender is subject to the Freedom of Information Act (FOIA) and may be disclosed to third parties.

From: Martin Piorkowski <mpiorkowski@west-inc.com>
Sent: Wednesday, August 3, 2022 2:59 PM
To: Becker, Drew N <Drew_Becker@fws.gov>
Subject: [EXTERNAL] Re: Red Butte NLEB Study Plan and SSA request

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Hello Mr. Becker,

I was following up on this as the season is quickly closing. I was looking to see if you had any additional questions.

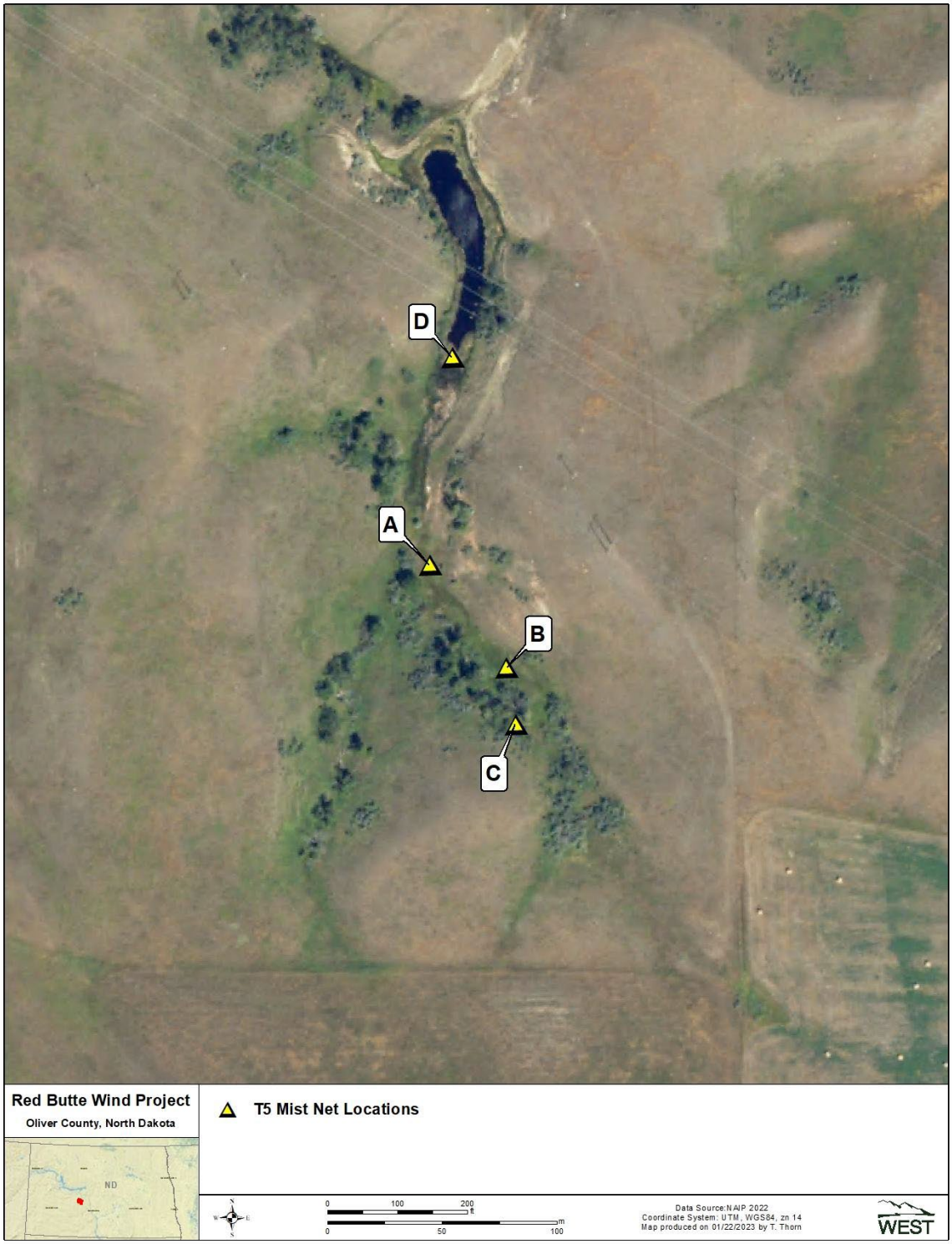
Thanks,
Marty

Martin Piorkowski
Wildlife Biologist/ Project Manager

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Apendix A. U.S. Fish and Wildlife Service approval of northern long-eared bat mist-netting surveys for the Oliver Wind IV Project, Mercer and Oliver counties, North Dakota.

Appendix B. Maps of Mist-Net Survey Sites



Appendix B1. Location of mist-nets (A – D) at site T5 at the Oliver Wind IV Project in Mercer and Oliver counties, North Dakota.



Appendix B2. Location of mist-nets (A – G) at site 7B at the Oliver Wind IV Project in Mercer and Oliver counties, North Dakota.

Appendix C. Photographs of Mist-Net Survey Sites



Appendix C1a. Photographs of mist-nets (A – D; left to right, top to bottom) at site 7B at the Oliver Wind IV Project in Mercer and Oliver counties, North Dakota.







Appendix C1b. (cont.) Photographs of mist-nets (E – G; left to right, top to bottom) at site 7B at the Oliver Wind IV Project in Mercer and Oliver counties, North Dakota.



Appendix C2. Location of mist-nets (A – D; left to right, top to bottom) at site T5 at the Oliver Wind IV Project in Mercer and Oliver counties, North Dakota.

Appendix D. Photographs of Captured Bats



Appendix D. Juvenile male silver-haired bat captured at site 7B on August 24, 2022, at the Oliver Wind IV Project in Mercer and Oliver counties, North Dakota.

Appendix E. Summary of Mist-Net Captures

Appendix E. Summary of mist-net captures at the Oliver Wind IV Project in Mercer and Oliver counties, North Dakota.

Survey Site	Survey Night	Time	Species	Sex	Age	Reproductive Status	Reichard Score	Forearm Length (mm)	Weight (g)	Re-Captured (Yes/No)
7B	8/24/2022	02:02	LANO	M	J	N	0	40.6	11.25	No

LANO = *Lasionycteris noctivagans* (silver-haired bat; SHBA); M = male; J = juvenile; N = non-reproductive; mm = millimeter; g = grams.

Appendix F. Mist-Net Survey Datasheets

Site Description and Weather Data Form

Location Information

Site ID:	Project: Red Butte	State: North Dakota
7B	Datum: NAD 83	County: Oliver

Net Locations – Take pictures of each net set and distinguishing characteristics

Net ID (A,B,...)	Net Size (e.g. 3x9)	UTM Zone	Easting	Northing	Net Nights Used (1,2,...)	Canopy Cover (%)
A	3 x 6	14	315034	5228579	1, 2, 3	10
B	2 x 4	14	315001	5228592	1, 4	100
C	1 x 4	14	314946	5228635	1	40
D	1 x 4	14	315034	5228598	2, 3	100
E	2 x 6	14	315079	5228605	2, 3	5
F	2 x 9	14	315080	5228521	4	100
G	3 x 6	14	314955	5228633	4	90

Site Sketch

Should be drawn in a top-down view using map to assist with accuracy. Include all streams, roads, trails, and structures. Note all net locations using Net ID.



Net Night	Date (yyyy-mm-dd)	Biologists Present	Total Nets Open (#)	Sunset Time (24 Hour)	Moonrise Time	Moonset Time	Moon Phase [1]	Start Time	Start Temp (°F)	Start Wind Speed (mph)	Start Sky Code	Stop Time	Stop Temp	Stop Wind Speed	Stop Sky Code	Precip. During Survey (Yes/No)	Precip. Duration (min)	Night Complete (Yes/No)
1	2022-08-11	H. Hayes, M. Cavalieri	3	2104	2127	0533	F	2100	69	12	2	2130	61	13	2	No	0	No
2	2022-08-16	H. Hayes, M. Cavalieri	3	2058	2316	1216	G	2053	78	0	0	0203	60	1	0	No	0	Yes
3	2022-08-17	H. Hayes, M. Cavalieri	3	2056	2336	1328	G	2050	75	2	1	2127	72	2	2	No	0	No
4	2022-08-24	H. Hayes, M . Piorkowski	3	1841	0337	2003	C	2041	68	0	0	0141	56	0	2	No	0	Yes
5																		

Habitat Information

[2] Primary Habitat Surveyed:	Dominant Canopy Species:	Estimated Canopy Tree Age (DBH):	Additional Comments:
Upland Forest	Acer negundo Acer saccharum	Late-successional (25-38 cm)	Night 1 wind out/livestock interference. Net A 4x6 on night 2 only. Net D changed to 1x6 on night 3.
Forest Type: Mixed	**Preferred Roost Trees Present:** Unknown snag(s) with exfol. bark		

[1] *New (N), Crescent (C), Half (H), Gibbous (G), Full (F)* [2] *Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Briefly Describe)*

Bat Capture Data Form

Project: Red Butte
Site ID: 7B
Date: 2022-08-11
Biologist(s): H. Hayes, M. Cavalieri

State: North Dakota
County: Oliver
Net Night: 1
Night Complete: Yes (No)

Survey Comments:
Wind out/livestock interference at 2130

#	Species (4 Letter Code)	Time (24 Hour)	Sex (M, F, U)	Age (A, J, U)	[A] Repro. Status	Reichard Score (0 - 3)	Right Forearm (mm)	Weight (g)	Net ID (A, B,...)	Capture Height in Net (m)	Recapture (Yes / No)	[B] Band #	[C] Original Transmitter Frequency	Drifted Transmitter Frequency	[D] Bat ID (Site-Species #)	[E] Photos (None, Face, Calcar, Toes)	Comments
1	No bats																
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	

[A] Male: (N) - non-reproductive, (TD) - testes-descended, (U) - unknown. Female: (N) - non-reproductive, (L) - lactating, (P) - pregnant, (PL) - post-lactating, (U) - unknown.
[B] Band RIGHT forearm on males, LEFT on females AND include letters.
[C] Original frequency: pre-assigned by manufacturer; Drifted frequency: final frequency prior to bat release.
[D] Bat ID: write Site ID – Species Code (with the sequential number of individuals of species captured; e.g. MN5-MYSO2). Only Myotis and target species are given a Bat ID.
[E] Take photos of 1) *ALL* MYSO/MYSE/MYLE/MYGR captured, 2) First several MYLU from each site, 3) One representative photo of each species captured.
[*] (U) – unknown is used exclusively when a bat escapes before the determination can be made.

Bat Capture Data Form

Project: Red Butte
Site ID: 7B
Date: 2022-08-16
Biologist(s): H. Hayes, M. Cavalieri

State: North Dakota
County: Oliver
Net Night: 2
Night Complete: (Yes) No

Survey Comments:

#	Species (4 Letter Code)	Time (24 Hour)	Sex (M, F, U)	Age (A, J, U)	[A] Repro. Status	Reichard Score (0 - 3)	Right Forearm (mm)	Weight (g)	Net ID (A, B,...)	Capture Height in Net (m)	Recapture (Yes / No)	[B] Band #	[C] Original Transmitter Frequency	Drifted Transmitter Frequency	[D] Bat ID (Site-Species #)	[E] Photos (None, Face, Calcar, Toes)	Comments
1	No bats																
2																	
3																	
4																	
5																	
6																	
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8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	

[A] Male: (N) - non-reproductive, (TD) - testes-descended, (U) - unknown. Female: (N) - non-reproductive, (L) - lactating, (P) - pregnant, (PL) - post-lactating, (U) - unknown.
[B] Band RIGHT forearm on males, LEFT on females AND include letters.
[C] Original frequency: pre-assigned by manufacturer; Drifted frequency: final frequency prior to bat release.
[D] Bat ID: write Site ID – Species Code (with the sequential number of individuals of species captured; e.g. MN5-MYSO2). Only Myotis and target species are given a Bat ID.
[E] Take photos of 1) *ALL* MYSO/MYSE/MYLE/MYGR captured, 2) First several MYLU from each site, 3) One representative photo of each species captured.
[*] (U) – unknown is used exclusively when a bat escapes before the determination can be made.

Bat Capture Data Form

Project: Red Butte
Site ID: 7B
Date: 2022-08-17
Biologist(s): H. Hayes, M. Cavalieri

State: North Dakota
County: Oliver
Net Night: 3
Night Complete: Yes (No)

Survey Comments:
Lightning weather out @ 2127

#	Species (6 Letter Code)	Time (24 Hour)	Sex (M, F, U)	Age (A, J, U)	[A] Repro. Status	Reichard Score (0 - 3)	Right Forearm (mm)	Weight (g)	Net ID (A, B,...)	Capture Height in Net (m)	Recapture (Yes / No)	[B] Band #	[C] Original Transmitter Frequency	Drifted Transmitter Frequency	[D] Bat ID (Site-Species #)	[E] Photos (None, Face, Calcar, Toes)	Comments
1	No bats																
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	

[A] Male: (N) - non-reproductive, (TD) - testes-descended, (U) - unknown. Female: (N) - non-reproductive, (L) - lactating, (P) - pregnant, (PL) - post-lactating, (U) - unknown.
[B] Band RIGHT forearm on males, LEFT on females AND include letters.
[C] Original frequency: pre-assigned by manufacturer; Drifted frequency: final frequency prior to bat release.
[D] Bat ID: write Site ID – Species Code (with the sequential number of individuals of species captured; e.g. MN5-MYSO2). Only Myotis and target species are given a Bat ID.
[E] Take photos of 1) *ALL* MYSO/MYSE/MYLE/MYGR captured, 2) First several MYLU from each site, 3) One representative photo of each species captured.
[*] (U) – unknown is used exclusively when a bat escapes before the determination can be made.

Bat Capture Data Form

Project: Red Butte
Site ID: 7B
Date: 2022-08-24
Biologist(s): H. Hayes, M. Piorowski
State: North Dakota
County: Oliver
Net Night: 4
Night Complete: (Yes) No
Survey Comments:

#	Species (4 Letter Code)	Time (24 Hour)	Sex (M, F, U)	Age (A, J, U)	[A] Repro. Status	Reichard Score (0 - 3)	Right Forearm (mm)	Weight (g)	Net ID (A, B,...)	Capture Height in Net (m)	Recapture (Yes / No)	[B] Band #	[C] Original Transmitter Frequency	Drifted Transmitter Frequency	[D] Bat ID (Site-Species #)	[E] Photos (None, Face, Calcar, Toes)	Comments
1	LANO	0202	M	J	N	0	40.6	11.25	F	1.5	No				7B - LANO1	Face / Calcar	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	

[A] Male: (N) - non-reproductive, (TD) - testes-descended, (U) - unknown. Female: (N) - non-reproductive, (L) - lactating, (P) - pregnant, (PL) - post-lactating, (U) - unknown.
[B] Band RIGHT forearm on males, LEFT on females AND include letters.
[C] Original frequency: pre-assigned by manufacturer; Drifted frequency: final frequency prior to bat release.
[D] Bat ID: write Site ID – Species Code (with the sequential number of individuals of species captured; e.g. MN5-MYSO2). Only Myotis and target species are given a Bat ID.
[E] Take photos of 1) *ALL* MYSO/MYSE/MYLE/MYGR captured, 2) First several MYLU from each site, 3) One representative photo of each species captured.
[*] (U) – unknown is used exclusively when a bat escapes before the determination can be made.

Site Description and Weather Data Form

Location Information

Site ID:	Project:	State:
T5	Red Butte	North Dakota
	Datum: NAD 83	County: Mercer

Net Locations – Take pictures of each net set and distinguishing characteristics

Net ID (A,B,...)	Net Size (e.g. 3x9)	UTM Zone	Easting	Northing	Net Nights Used (1,2,...)	Canopy Cover (%)
A	3 x 12	14	322288	5238471	1, 2, 3	0
B	3 x 12	14	322320	5238425	1	0
C	2 x 6	14	322323	5238400	1, 2, 3	40
D	3 x 12	14	322301	5238561	2, 3	0

Site Sketch



Net Night	Date (yyyy-mm-dd)	Biologists Present	Total Nets Open (#)	Sunset Time (24 Hour)	Moonrise Time	Moonset Time	Moon Phase[1]	Start Time	Start Temp (°F)	Start Wind Speed (mph)	Start Sky Code	Stop Time	Stop Temp	Stop Wind Speed	Stop Sky Code	Precip. During Survey (Yes/No)	Precip. Duration (min)	Night Complete (Yes/No)
1	2022-08-12	H. Hayes, M. Cavalieri	3	2104	2155	0659	G	2100	74	7	1	0204	65	0	3	No	0	Yes
2	2022-08-13	H. Hayes, M. Cavalieri	3	2102	2217	0822	G	2057	76	2	0	2350	71	10	1	No	0	No
3	2022-08-14	H. Hayes, M. Cavalieri	3	2100	2239	0945	G	2058	81	1	0	0200	73	5	0	No	0	Yes
4																		
5																		

Habitat Information

[2]Primary Habitat Surveyed:	Dominant Canopy Species:	Estimated Canopy Tree Age (DBH):	Additional Comments:
Pond	Fraxinus pennsylvanica Salix spp.	Mid-successional (13-24 cm)	Night 1 fog rolled in at 10 to 2. Night 2 lightning out.
Forest Type:	**Preferred Roost Trees Present:**		
Deciduous	Unknown snag(s) with exfol. bark		

[1] *New (N), Crescent (C), Half (H), Gibbous (G), Full (F)* [2] *Bridge, Bottomland Forest, Cave Entrance, Creek/Riparian, Field Edge, Mine Portal, Open Field, Pond, Structure, Upland Forest, or Other (Briefly Describe)*

Bat Capture Data Form

Project: Red Butte
Site ID: T5
Date: 2022-08-12
Biologist(s): H. Hayes, M. Cavalieri

State: North Dakota
County: Mercer
Net Night: 1
Night Complete: (Yes) No

Survey Comments:
Fog rolled in 10 minutes before close

#	Species (4 Letter Code)	Time (24 Hour)	Sex (M, F, U)	Age (A, J, U)	[A] Repro. Status	Reichard Score (0 - 3)	Right Forearm (mm)	Weight (g)	Net ID (A, B,...)	Capture Height in Net (m)	Recapture (Yes / No)	[B] Band #	[C] Original Transmitter Frequency	Drifted Transmitter Frequency	[D] Bat ID (Site-Species #)	[E] Photos (None, Face, Calcar, Toes)	Comments
1	No bats																
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
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12																	
13																	
14																	
15																	

[A] Male: (N) - non-reproductive, (TD) - testes-descended, (U) - unknown. Female: (N) - non-reproductive, (L) - lactating, (P) - pregnant, (PL) - post-lactating, (U) - unknown.
[B] Band RIGHT forearm on males, LEFT on females AND include letters.
[C] Original frequency: pre-assigned by manufacturer; Drifted frequency: final frequency prior to bat release.
[D] Bat ID: write Site ID – Species Code (with the sequential number of individuals of species captured; e.g. MN5-MYSO2). Only Myotis and target species are given a Bat ID.
[E] Take photos of 1) *ALL* MYSO/MYSE/MYLE/MYGR captured, 2) First several MYLU from each site, 3) One representative photo of each species captured.
[*] (U) – unknown is used exclusively when a bat escapes before the determination can be made.

Bat Capture Data Form

Project: Red Butte
Site ID: T5
Date: 2022-08-13
Biologist(s): H. Hayes, M. Cavalieri

State: North Dakota
County: Mercer
Net Night: 2
Night Complete: Yes (No)

Survey Comments:
Lightning weather out @ 2350

#	Species (4 Letter Code)	Time (24 Hour)	Sex (M, F, U)	Age (A, J, U)	Repro. Status [A]	Reichard Score (0 - 3)	Right Forearm (mm)	Weight (g)	Net ID (A, B,...)	Capture Height in Net (m)	Recapture (Yes / No)	Band # [B]	Original Transmitter Frequency [C]	Drifted Transmitter Frequency [C]	Bat ID (Site-Species #) [D]	Photos (None, Face, Calcar, Toes) [E]	Comments
1	No bats																
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	

[A] Male: (N) - non-reproductive, (TD) - testes-descended, (U) - unknown. Female: (N) - non-reproductive, (L) - lactating, (P) - pregnant, (PL) - post-lactating, (U) - unknown.
[B] Band RIGHT forearm on males, LEFT on females AND include letters.
[C] Original frequency: pre-assigned by manufacturer; Drifted frequency: final frequency prior to bat release.
[D] Bat ID: write Site ID – Species Code (with the sequential number of individuals of species captured; e.g. MN5-MYSO2). Only Myotis and target species are given a Bat ID.
[E] Take photos of 1) *ALL* MYSO/MYSE/MYLE/MYGR captured, 2) First several MYLU from each site, 3) One representative photo of each species captured.
[*] (U) – unknown is used exclusively when a bat escapes before the determination can be made.

Bat Capture Data Form

Project: Red Butte
Site ID: T5
Date: 2022-08-14
Biologist(s): H. Hayes, M. Cavalieri

State: North Dakota
County: Mercer
Net Night: 3
Night Complete: (Yes) No

Survey Comments:

#	Species (4 Letter Code)	Time (24 Hour)	Sex (M, F, U)	Age (A, J, U)	[A] Repro. Status	Reichard Score (0 - 3)	Right Forearm (mm)	Weight (g)	Net ID (A, B,...)	Capture Height in Net (m)	Recapture (Yes / No)	[B] Band #	[C] Original Transmitter Frequency	Drifted Transmitter Frequency	[D] Bat ID (Site-Species #)	[E] Photos (None, Face, Calcar, Toes)	Comments
1	No bats																
2																	
3																	
4																	
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9																	
10																	
11																	
12																	
13																	
14																	
15																	

[A] Male: (N) - non-reproductive, (TD) - testes-descended, (U) - unknown. Female: (N) - non-reproductive, (L) - lactating, (P) - pregnant, (PL) - post-lactating, (U) - unknown.
[B] Band RIGHT forearm on males, LEFT on females AND include letters.
[C] Original frequency: pre-assigned by manufacturer; Drifted frequency: final frequency prior to bat release.
[D] Bat ID: write Site ID – Species Code (with the sequential number of individuals of species captured; e.g. MN5-MYSO2). Only Myotis and target species are given a Bat ID.
[E] Take photos of 1) *ALL* MYSO/MYSE/MYLE/MYGR captured, 2) First several MYLU from each site, 3) One representative photo of each species captured.
[*] (U) – unknown is used exclusively when a bat escapes before the determination can be made.

Appendix B11. Dakota Skipper Habitat Assessment

ENVIRONMENTAL & STATISTICAL CONSULTANTS

901 Lamberton Pl NE, South Suite
Albuquerque, NM 87107

TECHNICAL MEMORANDUM

Date: August 23, 2023

To: Dina Brown, Oliver Wind IV, LLC

From: Kevin Shelley, Western EcoSystems Technology, Inc.

Subject: Dakota Skipper (*Hesperia dakotae*) Habitat Assessment for the Oliver Wind IV Energy Project, Oliver and Mercer Counties, North Dakota.

INTRODUCTION

Oliver Wind IV, LLC (Company) is pursuing development of the Oliver Wind IV Energy Center (Project) and associated transmission line in Oliver and Morton counties, North Dakota (Figure 1). The Company contracted Western EcoSystems Technology, Inc. (WEST) to conduct a Dakota skipper (DASK; *Hesperia dakotae*) habitat assessment in support of the Project.

Over the past three decades, the species has been documented in three townships within Oliver County but not within Mercer County. (USFWS 2022). Thus, the overall purpose of this study was to assess native (unbroken) prairie grasslands where potential Project infrastructure could be sited within the Project Area and transmission line route to determine whether the existing vegetative conditions are suitable to support the reproductive needs of DASK during its larval stage. Identifying the location, size, and juxtaposition of DASK suitable habitat will aid the Company in project planning by identifying the location of 1) high quality native prairie grasslands and 2) DASK larval habitat within the Project Area and transmission line. Therefore, the survey objective was to locate, map, and estimate the total area (ac) of potential DASK larval habitat within the Project Area.

PROJECT LOCATION

The Project Area and transmission line route are generally located approximately 3.7 miles (mi; 6.0 kilometers [km]) west of the town of Center, within Oliver and Mercer counties in central North Dakota (Figure 1). The Project Area and transmission line route occur within the Northwestern Glaciated Plains Level III Ecoregion, in an area historically dominated by grasslands but extensively converted to agricultural use (e.g., row crops and livestock grazing; Bryce et al. 1996, US Environmental Protection Agency 2012; 2013). The terrain within the Project Area and

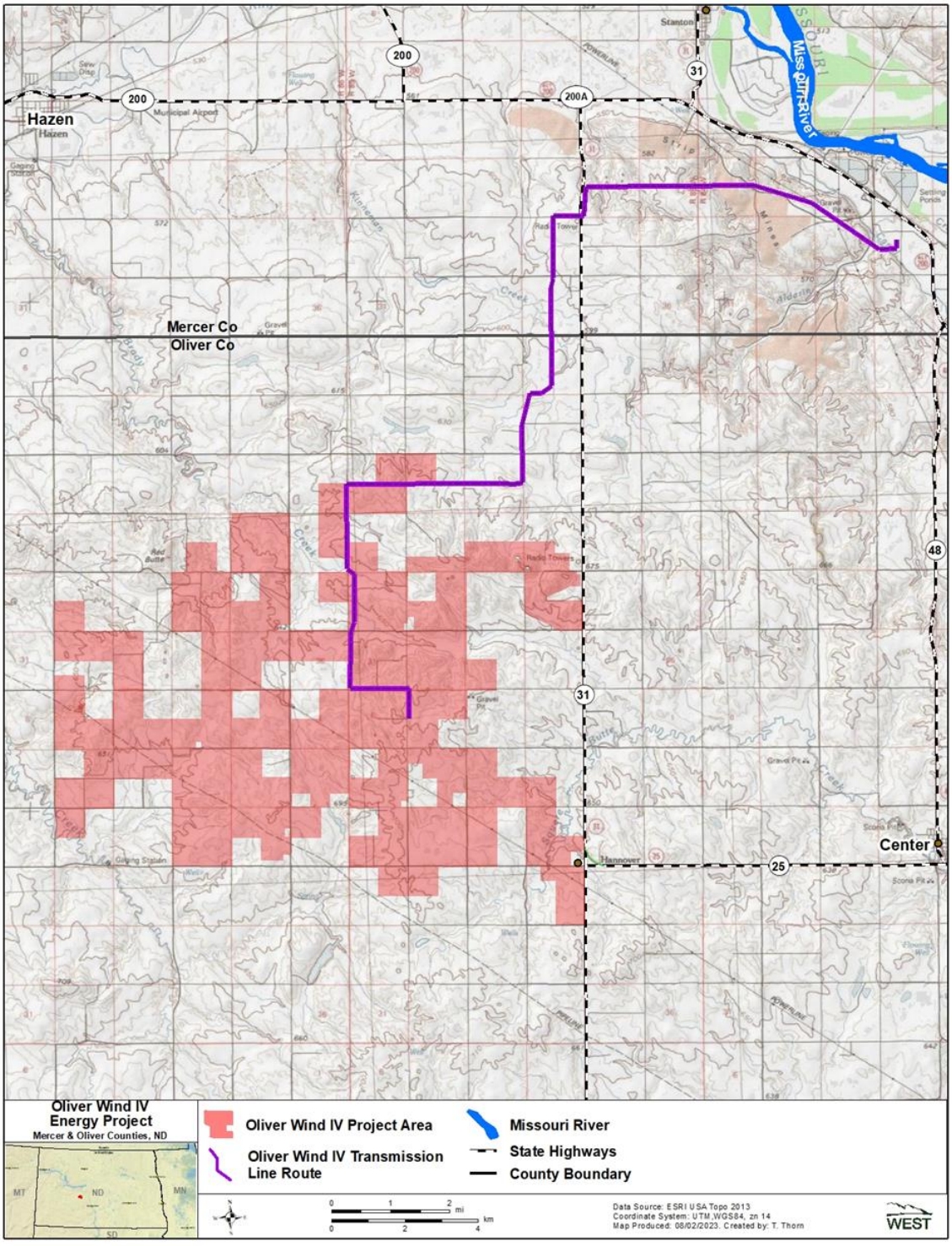


Figure 1. Location of the Oliver Wind IV Energy Project, Oliver and Mercer counties, North Dakota.

transmission line route is gently rolling with interspersed level areas, and elevations of 1,663–2,385 feet (ft; 507– 727 meters [m]) above sea level (US Geological Survey 2023).

Dakota Skipper

The DASK inhabits tallgrass prairie and mixed-grass prairie in the north-central US and north into Canada (southern Saskatchewan and Manitoba Provinces). The species has been documented to occur in numerous counties in North Dakota. The optimum habitat conditions for DASK larval life stage typically occurs in grassland patches nested within larger patches of native (unbroken) grasslands. The sites where the species tends to reside are among the most diverse native grassland plant (grass and forb) communities, have minimal soil disturbance, and minimal non-native plant species.

METHODS

The DASK habitat assessment was conducted during the summers of 2022 and 2023, and encompassed the Project footprint associated with proposed locations of anticipated infrastructure (collection lines [dated July 19, 2022], and updated transmission line [May 12, 2023]). WEST was provided spatial data by the Company in 2022 and 2023 that depicted the location and size of native prairie (unbroken) grasslands that needed additional surveys to determine whether DASK larval habitat was present.

Pedestrian field surveys were conducted by a WEST Senior Ecologist with over five years of experience assessing and classifying DASK larval habitat. Native unbroken grasslands within the Project Area that coincided with collection or transmission line corridors (150-ft survey corridors) were surveyed to determine the presence or absence of potential DASK larval habitat. Sites determined to be suitable DASK larval habitat (polygons) were delineated using a handheld GPS location device loaded with ArcGIS imagery (Esri 2023).

RESULTS

Pedestrian field surveys were completed by a DASK habitat expert on August 10, 17 – 19, and 22 – 23, 2022 and on June 15, June 26 – 27, July 6, and July 17, 2023. Twenty-eight sites (habitat patches) totaling 13.10 acres were found with the requisite plant species diversity and richness and classified as DASK larval habitat (Figure 2; Table 1). No additional sites were found with the requisite plant species diversity and richness necessary to be classified as DASK larval habitat.

Table 1. Identified Dakota Skipper larval habitat patches delineated during field surveys in 2022 and 2023 at the Oliver Wind IV Energy Project and associated transmission line, Oliver and Mercer counties, North Dakota.

Site ID	acres	Site ID	acres
1	1.41	15	0.38
2	0.52	16	0.11
3	0.32	17	0.28
4	1.20	18	0.13
5	0.13	19	0.28
6	0.21	20	0.10
7	0.62	21	0.18
8	0.04	22	0.15
9	0.23	23	0.13
10	0.04	24	0.89
11	0.21	25	0.05
12	1.86	26	1.22
13	0.97	27	0.06†
14	1.17	28	0.21†
		Total:	**13.10 acres**

†Sites (ID 27 and ID 28) classified in 2023. The remaining 26 sites were classified in 2022.

Oliver IV T-Line 000598

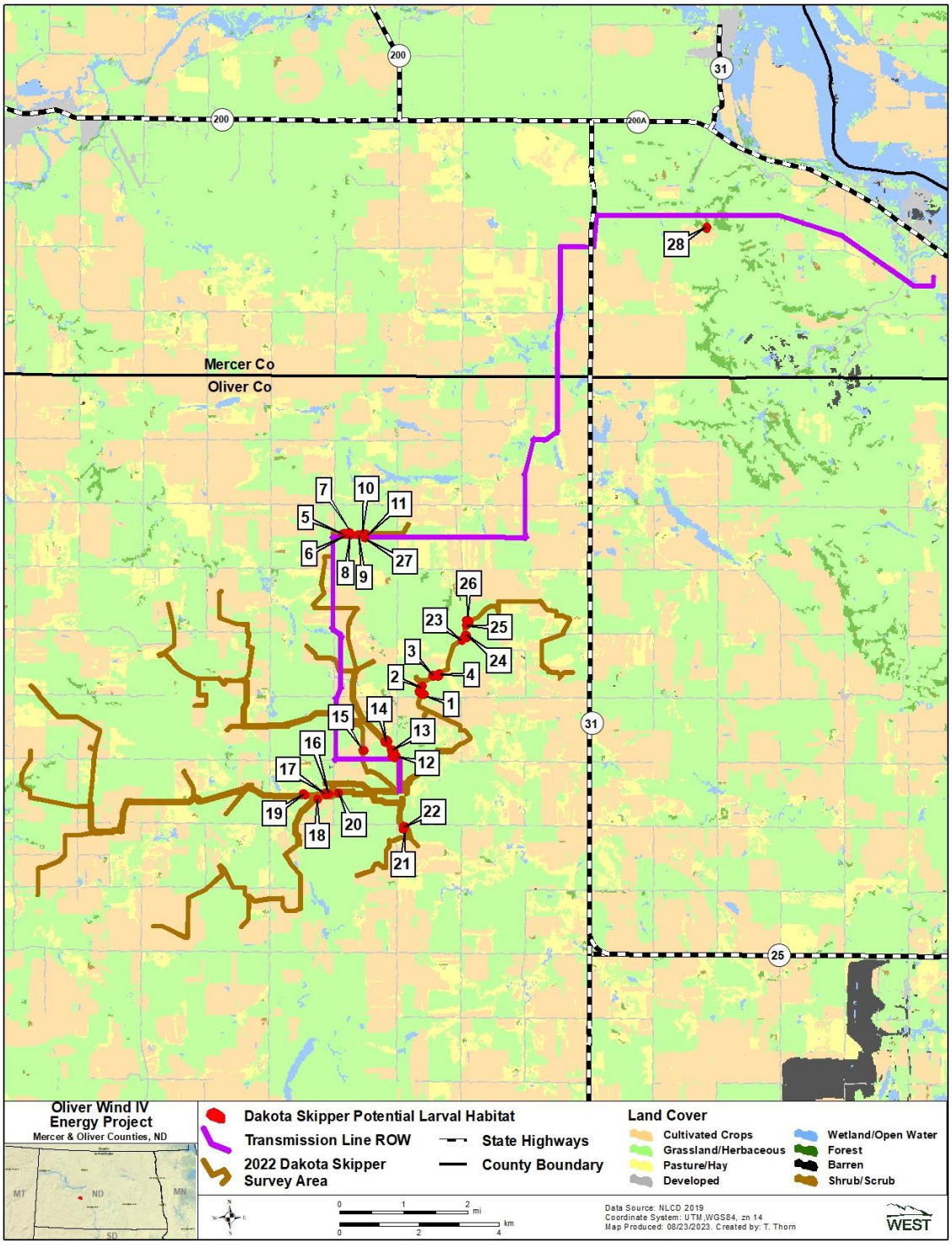


Figure 2. The location of 28 Dakota skipper larval habitat patches associated with the Oliver Wind IV Energy Center and transmission line, Oliver and Mercer counties, North Dakota (surveys conducted in 2022 and 2023).

Oliver IV T-Line 000599

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and

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Appendix C

Agency Notification Letters and Correspondence

Appendix C1
Agency Notification Letter Templates

AECOM
1000 East Calgary Ave
Bismarck, ND 58503
aecom.com

(701) 221-4148 tel
(701) 221-4155 fax

Subject: Red Butte Wind Energy Center and 230 kV Transmission Line Project Oliver and Mercer Counties, ND

Red Butte Wind, LLC (Red Butte Wind), a wholly-owned, indirect subsidiary of NextEra Energy Resources, LLC, is proposing to develop the Red Butte Wind Energy Center (Wind Energy Center) and the approximately 15-mile, 230 kV transmission line (Transmission Line, and collectively with the Wind Energy Center, the "Project") in Oliver and Mercer Counties, ND. Red Butte Wind plans to complete North Dakota Public Service Commission permitting and construction in 2020. An agency information request letter was originally sent by PRC Wind in 2016 when the Project began development. Due to the three-year timespan, this letter serves as a new information request.

The Wind Energy Center will have a nameplate capacity of approximately 200 megawatts, consisting of wind turbines and associated infrastructure. The Wind Energy Center will be located entirely within Oliver County, ND. The Transmission Line will connect the Wind Energy Center to the electrical grid at the Basin Electric Leland Substation in southeast Mercer County. The Transmission Line will be located in Oliver and Mercer Counties, ND. Red Butte Wind requests the consideration of the Project shown on the attached map (Figure 1). The Wind Energy Center Project Area and 2-mile wide Transmission Line Corridor encompass the following legal locations:

County	Township	Range	Sections
Oliver	141 N	84 W	6, 7, 18
	141 N	85 W	1, 2, 10 - 15
	142 N	84 W	4 – 9, 17 - 20, 29 - 31
	142 N	85 W	1 - 31, 33 - 36
	142 N	86 W	1 - 5, 8 - 15, 17, 22 – 26, 34 - 36
	143 N	84 W	30 - 33
	143 N	85 W	7, 9, 10, 14 - 36
	143 N	86 W	1, 2, 12 – 14, 21 – 29, 32 - 36
Mercer	144 N	84 W	15 -17, 19 – 23, 27 - 33
	144 N	85 W	21 – 28, 33 - 36

To ensure that all social, economic, and environmental effects are considered and per Section 69-06-01-05 of the North Dakota Administrative Code, we are soliciting your views and comments on the Project. We are particularly interested in any property which your agency may own or have an interest in and which would be adjacent to the Project. We would also appreciate being made aware of any proposed developments your agency may be contemplating in the areas under consideration for the Project. Any information that might help us in our siting studies and permit applications would be appreciated. We would appreciate a response within 30 days of receipt of this letter. If no reply is received by this date, it will be assumed that you have no comment on this Project.

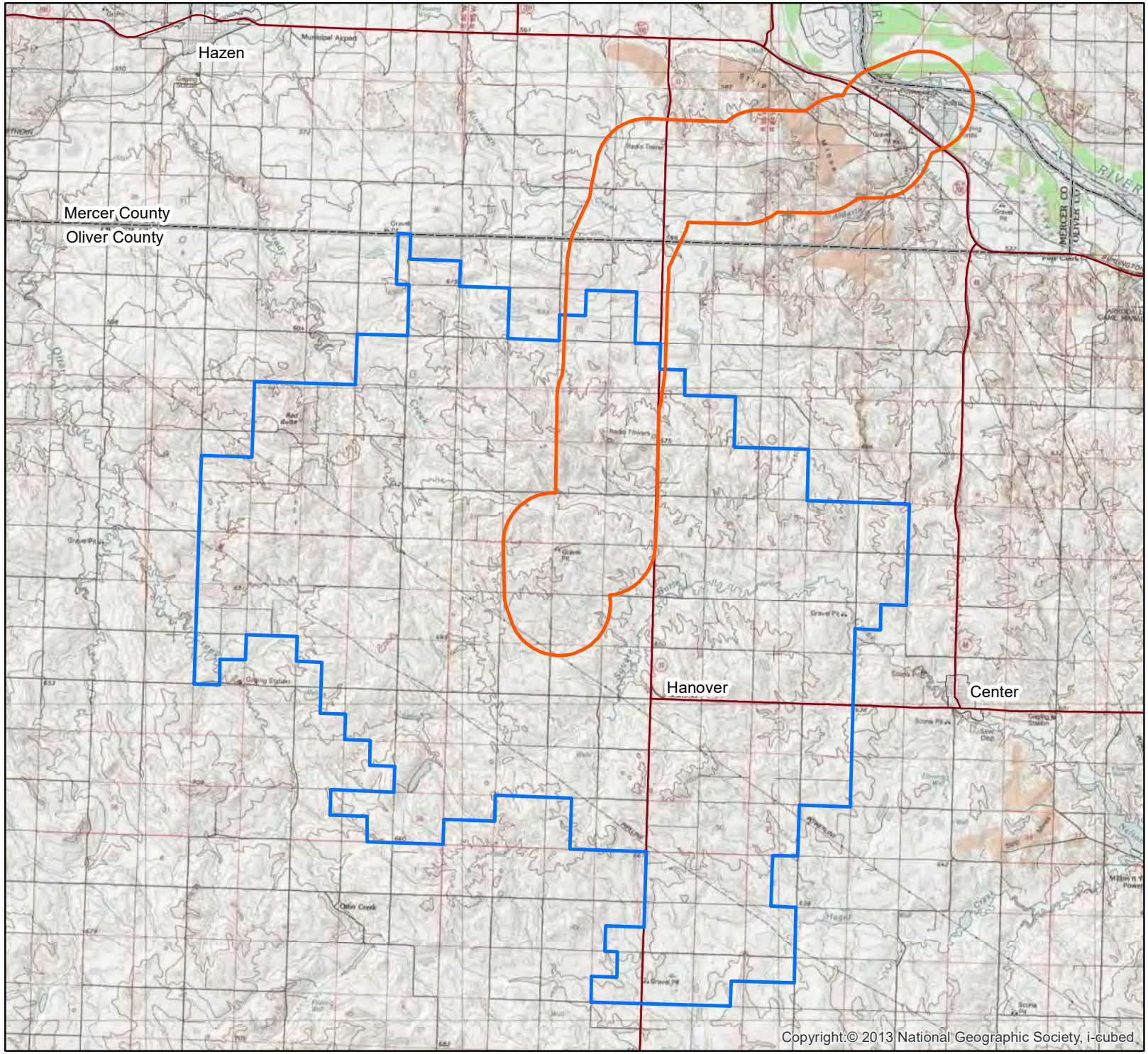
If further information is desired regarding the proposed Project, please contact Lindsey Churchill at (701) 221-4148 in Bismarck, ND, or at the email and address below.

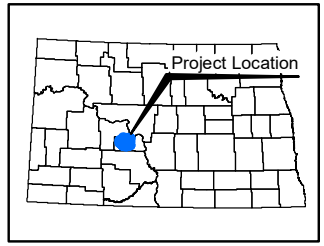
Sincerely,



Lindsey Churchill, PhD, PWS
AECOM
Environmental Project Manager
1000 East Calgary Avenue Suite 1
Bismarck, ND 58503
lindsey.churchill@aecom.com

Enclosure:
Figure 1 - Project Location Map





Legend

- City Boundary
- County Boundary
- Red Butte Project Area
- Transmission Line Corridor

0 0.75 1.5 3 Miles

Figure 1
Project Location
Red Butte
Wind Energy Center and
230 kV Transmission Line
Mercer and Oliver Counties,
North Dakota

N W E S

AECOM

merjent

p 612.746.3660 ▪ f 612.746.3679 ▪ www.merjent.com

1 Main Street SE ▪ Suite 300 ▪ Minneapolis, Minnesota ▪ 55414

March 31, 2023

Subject: Notification of the Proposed Oliver Wind IV Energy Center in Oliver County, North Dakota and Associated 345-kV Transmission Line in Oliver and Mercer Counties, North Dakota

Oliver Wind IV, LLC (Oliver Wind IV), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC, is proposing to develop the Oliver Wind IV Energy Center (Wind Project; formerly known as the Red Butte Wind Energy Center [Red Butte]) in Oliver County, North Dakota and its associated 345-kilovolt (kV) transmission line (Transmission Line) in Oliver and Mercer counties, North Dakota. The purpose of this letter is to provide notification of the Project per North Dakota Administrative Code Section 69-06-01-05. A previous notification letter was sent to your agency or entity for the Red Butte project in 2019. Due to the four-year timespan and modifications to the Project including refined Study Areas, change in name, updated construction timeline, and updated interconnection, this letter serves as a new information request.

Oliver Wind IV plans to submit to the North Dakota Public Service Commission an application for a Certificate of Site Compatibility for the Wind Project and a consolidated application for a Certificate of Corridor Compatibility and Route Permit for the Transmission Line and complete construction in the fourth quarter of 2024. The Wind Project will have a nameplate capacity of approximately 200-megawatts and will consist of 71 wind turbines, access roads, underground electrical collection lines and communication systems, a collection substation, an aircraft detection lighting system, an operations and maintenance facility, and meteorological towers. The Wind Project's generated power will interconnect to the electrical grid at the new Basin Electric 345-kV Substation through an approximately 20-mile-long 345-kV transmission line.

We are solicitating input from your agency or entity regarding any sensitive resources, current or planned development, or property interests your agency or entity may have in or around the Study Areas that should be considered as it moves forward with development. In addition, we ask that you provide information regarding any applicable permits that may be required from your office. Oliver Wind IV respectfully requests your response within 30 days of receipt of this letter. Copies of all correspondence received in response to this letter will be included with the North Dakota Public Service Commission applications. Oliver Wind IV requests the consideration of the Study Areas shown within the legal descriptions provided in the tables below and on the attached map.

Wind Project Study Area			
County	**Township**	**Range**	**Section**
Oliver	142 N	85 W	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 28, 29, 30
	142 N	86 W	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25
	142 N	87 W	1, 12, 13
	143 N	85 W	7, 8, 9, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35
	143 N	86 W	10, 11, 12, 13, 14, 15, 16, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36
	143 N	87 W	25, 36

Transmission Line Study Area			
County	**Township**	**Range**	**Section**
Oliver	142 N	85 W	4, 5, 6, 7, 8
	142 N	86 W	1
	143 N	85 W	2, 3, 4, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19, 20, 21, 22, 29, 30, 31, 32, 33
	143 N	86 W	12, 13, 14, 23, 24, 25, 26, 36
Mercer	144 N	84 W	16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 29, 30, 32, 33, 34, 35
	144 N	85 W	13, 14, 15, 21, 22, 23, 24, 25, 26, 27, 28, 33, 34, 35

We sincerely appreciate your cooperation in this matter. Oliver Wind IV has contracted with Merjent on this Project. If further information is desired or if you have comments regarding the Project, please contact me at the address provided below, by e-mail at lindsey.churchill@merjent.com, or by phone at 701-526-4848.

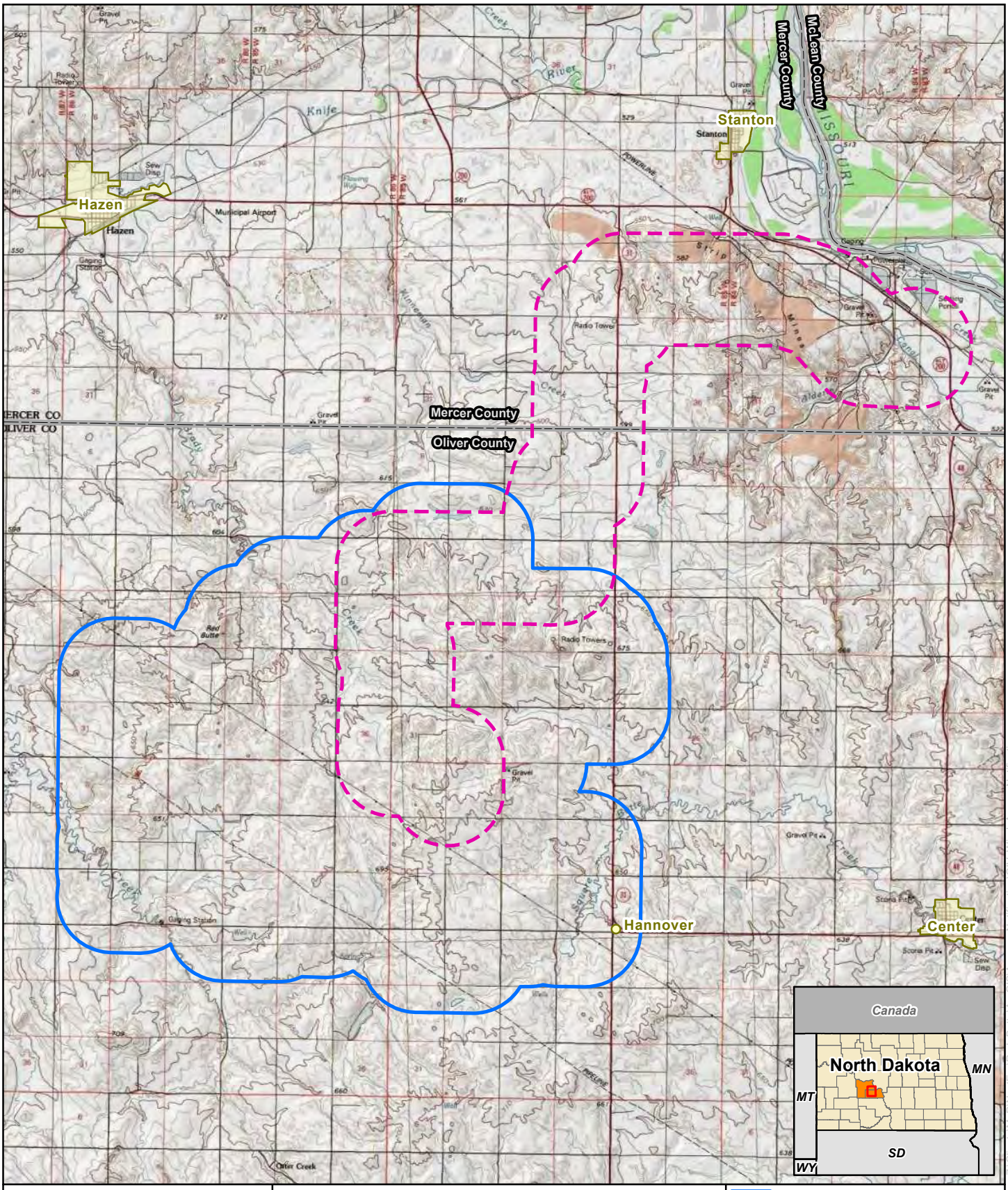
Sincerely,



Lindsey Churchill, PhD, PWS
Senior Project Manager

Merjent, Inc.
1 Main Street SE, Suite 300
Minneapolis, Minnesota 55414

Enclosure: Study Area Map



Study Area Map

Oliver Wind IV Energy Center and Transmission Line

Mercer and Oliver Counties, North Dakota

For Environmental Review Purposes Only

Source: Z:\Clients\M_P\NextEra\Red_Butte\ArcGIS\Agency_Notification\OIV_Wind_AgencyNotification.aprx

Date: (3/22/2023)

Appendix C2
North Dakota Aeronautics Commission

Good morning Lindsey,

We received your letter on the Red Butte and Transmission Line project. It does not appear the location will have an impact on our nearest public airport, Mercer County Regional Airport (Hazen). However, I do not see a proposed height of transmission line or construction equipment on the letter you sent. If the height is above 200' AGL then you need to submit a case to the FAA for review. You can do so on this website https://oeaaa.faa.gov/oeaaa/external/portal.jsp

Below are the rules in determining whether a case needs to be filed or not. You can file a case on the above website and also find instructions on how to do so. Please let me know if you have any questions.

Who Needs to File

The requirements for filing with the Federal Aviation Administration for proposed structures vary based on a number of factors: height, proximity to an airport, location, and frequencies emitted from the structure, etc. For more details, please reference 14 CFR Part 77.9.

Please click here to use the FAA's Notice Criteria Tool to determine if you meet the requirements to file notice of your construction or alteration

OR

In accordance with 14 CFR Part 77.9, if you propose any of the following types of construction or alteration, you must file notice with the FAA at least 45 days prior to beginning construction:

- any construction or alteration that exceeds an imaginary surface extending outward and upward at any of the following slopes:
  - 100 to 1 for a horizontal distance of 20,000 ft. from the nearest point of the nearest runway of each airport described in 14 CFR 77.9(d) with its longest runway more than 3,200 ft. in actual length, excluding heliports
  - 50 to 1 for a horizontal distance of 10,000 ft. from the nearest point of the nearest runway of each airport described in 14 CFR 77.9(d) with its longest runway no more than 3,200 ft. in actual length, excluding heliports
  - 25 to 1 for a horizontal distance of 5,000 ft. from the nearest point of the nearest landing and takeoff area of each heliport described in 14 CFR 77.9(d);
- OR any highway, railroad, waterway or other traverse way for mobile objects, of a height which, if adjusted upward as defined in 14 CFR 77.9(c) would exceed a standard of 14 CFR 77.9 (a) or (b);
- OR your structure will emit frequencies, and does not meet the conditions of the FAA Co-location Policy;
- OR your proposed structure will be in proximity to a navigation facility and may impact the assurance of navigation signal reception;
- OR any construction or alteration exceeding 200 feet above ground level, regardless of location;
- OR any construction or alteration located on an airport described in 14 CFR 77.9(d);
- OR filing has been requested by the FAA.

Thank you!

Nels Lund
Airport Planner
North Dakota Aeronautics Commission
PO Box 5020
Bismarck, ND 58502-5020
701-328-9655 (Office)
701-955-8280 (Cell)
https://aero.nd.gov



Appendix C3
North Dakota Industrial Commission

From: Holweger, Todd L.
To: Lindsey Churchill
Subject: EXTERNAL: Proposed Oliver Wind IV Energy Center
Date: Tuesday, April 25, 2023 3:13:22 PM
Attachments: image001.png
Proposed Oliver Wind IV Energy center letter.pdf

CAUTION: This email originated from outside of Merjent.

Lindsey,

After reviewing the "Wind Project Study Area" it appears that the only well that exists is:
File no. 38701, Summit Carbon Solutions, LLC, Slash Lazy H 5, Section 6-142N-86W.

There are no wells within the "Transmission Line Study Area".

Thank you,

Todd L. Holweger
Permit Manager/Geophysical Supervisor, Oil & Gas Division

701.328.8024 (o) • tholweger@nd.gov • https://www.dmr.nd.gov/oilgas/



Appendix C4
North Dakota Department of Transportation

NORTH Dakota | Transportation
Be Legendary.™

September 4, 2019

Lindsey Churchill, PHD, PWS
AECOM
Environmental Project Manager
1000 East Calgary Avenue, Suite1
Bismarck ND 58503

RED BUTTE WIND ENERGY CENTER AND 230 kV TRANSMISSION LINE PROJECT, OLIVER AND MERCER COUNTIES, NORTH DAKOTA

We have reviewed your July 31, 2019, letter.

This project should have no adverse effect on the North Dakota Department of Transportation highways.

However, if because of this project any work needs to be done on highway right of way, appropriate permits and risk management documents will need to be obtained from the Department of Transportation District Engineers, Rob Rayhorn at 701-227-6510.

CHAD M. ORN, P.E., DIRECTOR – OFFICE OF PROJECT DEVELOPMENT

57/cmo/js
c: Rob Rayhorn, Dickinson District Engineer

Appendix C5
State Historical Society of North Dakota

August 6, 2019

Ms. Lindsey Churchill, Ph.D.
Environmental Project Manager
AECOM
1000 East Calgary Avenue Suite 1
Bismarck, ND 58503

ND SHPO Ref: 19-0538 PSC Red Butte Wind Energy Center and 230 kV Transmission Line Project in Oliver and Mercer Counties, North Dakota

Dear Ms. Churchill,

We reviewed your preliminary information on ND SHPO Ref: 19-0538 PSC Red Butte Wind Energy Center and 230 kV Transmission Line Project in Oliver and Mercer Counties, North Dakota. We recommend survey for cultural resources as follows:

- A current Class I (file search) to determine any additional recorded cultural resources in the project area.

- A Class II (reconnaissance) and Class III (pedestrian) survey by a permitted architectural historian for standing buildings and structures (including cemeteries) over 50 years old in the visual Area of Potential Effect (APE). This is within a two-mile radius of individual turbine locations. The purpose is to evaluate any architectural or structural features that may be eligible for nomination to the National Register of Historic Places. At least three out of the seven aspects of integrity used to evaluate historic properties could be impacted by the proposed project: the setting, feeling, and association of historic sites. We also may have concerns regarding the visitor's experience and the line of site of a tall transmission line in the vicinity of Knife River Indian Villages National Historic Site (KNRI) and Fort Clark State Historic Site. You may want to consider consultation with the Site Superintendent of KNRI.

- A Class III archaeological survey of all areas of direct impact including crane paths, met towers, access roads, turbine locations and staging areas, unless the footprint has been recently surveyed for cultural resources.

Thank you for the opportunity to review this project to date. We look forward to review of the Class I/Class III surveys. Please include the ND SHPO reference number listed above in any further correspondence for this specific project. If you have any questions, please contact Andrew Clark at (701)-328-3574 or Susan Quinnell at (701) 328-3576 or squinnell@nd.gov.

Sincerely,

Claudia J. Berg
Director, State Historical Society of North Dakota

June 21, 2021

Melinda McCarthy
AECOM
1000 East Calgary Ave, Ste 1
Bismarck, ND 58503

ND SHPO Ref.: 19-0332 Red Butte Wind Energy Center transmission line NextEra in portions of 33 Sections in Mercer and Oliver Counties, North Dakota

Dear Melinda McCarthy,

We reviewed the report for ND SHPO Ref: 19-0332 Red Butte Wind Energy Center transmission line NextEra in portions of 33 Sections in Mercer and Oliver Counties, titled "Red Butte Transmission Line: A Class III Cultural Resource Inventory in Mercer and Oliver Counties, North Dakota" and find this AECOM report by Christina M. Huling, Melinda M. McCarthy, Marcia L. Bender, Rebecca N. Pace, Alexander D. Cassidy-Neumiller, and Robin M. Roberts acceptable. We will add it to our Manuscript Collection. We also concur with no significant archeological sites directly affected for this portion of the project.

If you have any questions, please contact either Andrew Clark, Chief Archeologist at (701) 328-3574 or andrewclark@nd.gov or Lorna Meidinger, Historic Preservation Specialist at (701) 328-2089 or lbmeidinger@nd.gov.

Sincerely,

for William D. Peterson PhD
State Historic Preservation Officer
(North Dakota)

19-0332

June 23, 2021

Melinda McCarthy
AECOM
1000 East Calgary Ave, Ste 1
Bismarck, ND 58503

ND SHPO Ref.: 19-0332 Red Butte Wind Energy Center transmission line NextEra in portions of 33 Sections in Mercer and Oliver Counties, North Dakota

Dear Melinda McCarthy,

We reviewed the report for ND SHPO Ref: 19-0332 Red Butte Wind Energy Center transmission line NextEra in portions of 33 Sections in Mercer and Oliver Counties, titled "A Class II/III Architectural Survey – Red Butte Wind Energy Center in Oliver County, North Dakota" and find this AECOM report by Melinda M. McCarthy acceptable. We will add it to our Manuscript Collection. We also concur with the eligibility recommendations within the report.

If you have any questions, please contact Lorna Meidinger, Historic Preservation Specialist at (701) 328-2089 or lbmeidinger@nd.gov.

Sincerely,

for William D. Peterson PhD
State Historic Preservation Officer
(North Dakota)

19-0332

July 14, 2021

Christina Huling
AECOM
1000 E Calgary Ave, Ste 1
Bismarck, ND 58503

ND SHPO Ref: 19-0332 Red Butte Wind Energy Center transmission line NextEra in portions of 33 Sections in Mercer and Oliver Counties, North Dakota

Dear Ms. Huling,

We received ND SHPO Ref: 19-0332 "Red Butte Wind Energy Center: Class III Cultural Resource Inventory Results for the 2019 and 2020 Field Seasons in Oliver County, North Dakota" in portions of [T141N R85W Sections 2, 11, & 14, T142N R85W Sections 5-9, 15-30, & 33-36, T142N R86W Sections 1-5, 8-15, 17, 25, 26, 35, & 36, T143N R85W Sections 7, 17, 19-22, 27, & 29-33 and T143N R86W Section 1, 12-14, 22-27, & 32-36] and find this AECOM report by Christina Huling, Melinda McCarthy, Kaleigh Perry, Rebecca Pace, Lucy Harrington, Robin Roberts, Max Bieber, Marcia Bender, and Alexander Cassidy-Neumiller acceptable. We will add it to our Manuscript Collection. We also concur with no significant sites affected.

If you have any questions, please contact either Andrew Clark, Chief Archeologist at (701) 328-3574 or andrewclark@nd.gov or Lorna Meidinger, Historic Preservation Specialist at (701) 328-2089 or lbmeidinger@nd.gov.

Sincerely,

for William D. Peterson PhD
State Historic Preservation Officer
(North Dakota)

19-0332

April 4, 2023

Dr. Lindsey Churchill
Merjent, Inc.
1 Main Street SE, Ste 300
Minneapolis, MN 55414

ND SHPO Ref: 23-0203 Oliver Wind IV Energy Center and Transmission Line in Oliver and Mercer Counties, North Dakota

Dear Dr. Churchill,

We reviewed your preliminary information on ND SHPO Ref: 23-0203 Oliver Wind IV Energy Center and Transmission Line in Oliver and Mercer Counties, North Dakota. We recommend survey for cultural resources as follows:

- A current Class I: Literature Search to determine any previously recorded cultural resources in the project area.

- A Class II (reconnaissance) and Class III (intensive) survey by a permitted architectural historian for standing buildings and structures (including cemeteries) over 45 years old in the visual Area of Potential Effect (APE). This is within a two-mile radius of individual turbine locations. The purpose is to evaluate any architectural or structural features that may be eligible for nomination to the National Register of Historic Places or the State Historic Sites Registry. At least three out of the seven aspects of integrity used to evaluate historic properties could be impacted by the proposed project: the setting, feeling, and association of historic sites.

- A Class III intensive archaeological survey of all areas of direct impact including crane paths, met towers, access roads, turbine locations and staging areas, unless the footprint has been recently surveyed for cultural resources.

Thank you for the opportunity to review this project to date. We look forward to review of the Class II/Class III surveys. Please include the ND SHPO reference number listed above in any further correspondence for this specific project. If you have any questions, please contact Lorna Meidinger, Lead Historic Preservationist, at (701) 328-2089 or lbmeidinger@nd.gov.

Sincerely,

for William D. Peterson, PhD
Director, State Historical Society of North Dakota

23-0203

September 12, 2023

Melinda McCarthy
Burns and McDonnell Engineering Company
3255 Greensboro Drive
Suite 104
Bismarck, ND 58503

SHSND Ref.: 23-0203 Oliver Wind IV Energy Center and Transmission Line in portions of 137 sections in Mercer and Oliver Counties, North Dakota

Dear Melinda,

Pursuant to our conversation today, this letter is to acknowledge that the State Historical Society of North Dakota does not currently require a viewshed analysis for the transmission line portion of the proposed project for SHSND Ref.: 23-0203 Oliver Wind IV Energy Center and Transmission Line provided it takes place in the location and manner described in the documentation.

The Knife River Indian Villages National Historic Site has voiced concern for the visual and auditory effects on their park unit as well as the Fort Clark State Historic Site, which is currently in-process of being nominated for a National Historic Landmark. It is our understanding that NextEra is communicating directly with that National Park Service unit regarding this concern.

Please include the SHSND Reference number listed above in further correspondence for this specific project. If you have any questions please contact Lorna Meidinger, Historic Preservation Specialist at (701) 328-2089 or lbmeidinger@nd.gov.

Sincerely,

for William D. Peterson, PhD
Director, State Historical Society of North Dakota

23-0203

Appendix C6
North Dakota Department of Trust Lands

1707 North 9th Street
PO Box 5523
Bismarck, ND 58506-5523
Phone: (701) 328 – 2800
Fax: (701) 328 – 3650

https://land.nd.gov

DEPARTMENT OF
ND TRUST LANDS
INVESTING FOR EDUCATION

Jodi A. Smith, Commissioner

August 12, 2019

LINDSEY (MEYERS) CHURCHILL
ENVIRONMENTAL PROJECT MANAGER
AECOM
1000 EAST CALGARY AVE, SUITE 1
BISMARCK, ND 58503

RE: Red Butte Wind Energy Center and 230 kV Transmission Line Project; Oliver and Mercer Counties, ND

Dear Ms. Churchill:

We received your letter dated July 31, 2019, regarding a request for information on the proposed Red Butte Wind Energy Center and 230 kV Transmission Line Project in Oliver and Mercer Counties.

To obtain an easement across trust Lands, an on-line application form must be completed. This application can be found at: https://www.land.nd.gov/SurfaceROW/RowApplicationForm . Any proposed towers or lines would be subject to review by the surface division staff and approval by the Land Commissioner on behalf of the Board of University and School Lands.

The following items may be considered in the review of an easement application:

1. Financial benefit to the trusts;
2. Availability of alternate encumbrance site or route;
3. The least environmentally damaging site or route regardless of property ownership;
4. Physical stability of the landscape;
5. Other potential future uses for the trust lands, including urban development;
6. Potential mineral and other material development including oil, gas, coal, cement materials, sodium sulfate, sand and gravel, road material, building stone, chemical substances, metallic ores, uranium ores, or colloidal or other clays;
7. Feasibility for reclamation;
8. Maintenance of existing wetlands and water flows;
9. Any cultural, historical, archeological, and paleontological resources;
10. Federally listed threatened and endangered species;
11. Location of the proposed route or site in relation to section lines, quarter section lines and corridors;
12. Potential liability to the trusts;
13. Applicant's past encumbrances on trust lands;
14. Applicant's financial stability; and
15. Any other information relevant to the application which would assist in the determination.

There are school trust surface interests that are managed by the North Dakota Department of Trust Lands on behalf of the Board of University and School Lands which are located within or near the proposed project area. These surface interests are as follows:

County	Township	Range	Section	Subdivision
Oliver	142	85	16	E2
Oliver	142	85	30	NW4
Oliver	142	86	36	E2
Oliver	143	86	26	NW4

There are no active Coal Leases on school trust lands within the project area. Attached for your information is a spreadsheet of state mineral interests within the project area.

Please be advised the Board of University and School Lands will not move forward on Wind Projects until site inspection and review have been completed and all local and state approvals have been obtained.

If you have any questions, feel free to contact our office at 701-328-2800.

Sincerely,

Michael Humann
Surface Division Manager

enc: State Mineral Interest spreadsheet

No.	County	Oil Lease	Legal	Subdv	Mineral Interest	Net Acres	Trust	Status	Acquisition
3300870	OLI	0000000	141-85-13-NW	NW4	0.05	8	L	A	L
3300880	OLI	0000000	141-85-14-NE	NE4	0.5	80	L	A	L
3300890	OLI	0000000	141-85-14-SE	SE4	0.5	80	L	A	L
3300900	OLI	0000000	141-85-15-NW	NW4	0.5	80	A	A	A
3302010	OLI	0000000	142-84-4-NE	SW4NE4, LOT 2	0.5	40.08	A	A	A
3302020	OLI	0000000	142-84-4-NW	S2NW4, LOTS 3,4	0.5	80.05	A	A	A
3302030	OLI	0000000	142-84-4-SE	S2SE4	0.5	40	L	A	L
3302040	OLI	0000000	142-84-4-SW	SW4	0.5	80	L	A	L
3302100	OLI	0000000	142-84-16-NE	NE4	0.5	80	A	A	G
3302110	OLI	0000000	142-84-16-NW	NW4	0.5	80	A	A	G
3302120	OLI	0000000	142-84-16-SE	SE4	0.5	80	A	A	G
3302130	OLI	0000000	142-84-16-SW	SW4	0.5	80	A	A	G
3302200	OLI	0000000	142-84-29-SE	SE4	0.5	80	L	A	L
3302210	OLI	0000000	142-84-29-SW	SW4	0.5	80	A	A	A
3302220	OLI	0000000	142-84-30-NW	E2NW4, LOTS 1,2	0.5	78.39	L	A	L
3302270	OLI	0000000	142-85-10-NE	N2NE4	0.5	40	B	A	A
3302280	OLI	0000000	142-85-11-NW	NW4	0.5	80	B	A	A
3302290	OLI	0000000	142-85-11-SW	SW4	0.5	80	B	A	A
3302300	OLI	0000000	142-85-16-NE	NE4	1	160	A	A	G
3302310	OLI	0000000	142-85-16-NW	NW4	1	160	A	A	G
3302320	OLI	0000000	142-85-16-SE	SE4	1	160	A	A	G
3302330	OLI	0000000	142-85-16-SW	SW4	0.5	80	A	A	G
3302340	OLI	0000000	142-85-20-NE	NE4	0.5	80	A	A	A
3302350	OLI	0000000	142-85-20-SE	SE4	0.5	80	A	A	A
3302360	OLI	0000000	142-85-22-SE	SE4 LESS 2.11 AC DEEDED TO CO	0.05	7.89	L	A	L
3302370	OLI	0000000	142-85-30-NW	E2NW4, LOTS 1,2	1	158.49	A	A	A
3302380	OLI	0000000	142-85-36-NE	NE4	0.5	80	A	A	G

3302390	OLI	0000000	142-85-36-NW	NW4	0.5	80	A	A	G
3302400	OLI	0000000	142-85-36-SE	SE4	0.5	80	A	A	G
3302410	OLI	0000000	142-85-36-SW	SW4	0.5	80	A	A	G
3302420	OLI	0000000	142-86-3-NW	SW4NW4, LOT 4	0.5	39.48	L	A	L
3302430	OLI	0000000	142-86-3-SW	SW4	0.5	80	L	A	L
3302440	OLI	0000000	142-86-4-NW	S2NW4, LOTS 3,4	0.5	79.52	L	A	L
3302460	OLI	0000000	142-86-12-SE	S2SE4	0.5	40	U	A	A
3304710	OLI	0000000	142-86-12-SW	S2SW4	0.5	40	U	A	A
3302510	OLI	0000000	142-86-24-SE	NW4SE4	0.05	2	L	A	L
3304720	OLI	0000000	142-86-24-SW	NE4SW4, S2SW4	0.05	6	L	A	L
3302520	OLI	0000000	142-86-25-NE	NE4	0.05	8	L	A	L
3302590	OLI	0000000	142-86-36-NE	NE4	1	160	A	A	G
3302600	OLI	0000000	142-86-36-NW	NW4	0.5	80	A	A	G
3302610	OLI	0000000	142-86-36-SE	SE4	1	160	A	A	G
3302620	OLI	0000000	142-86-36-SW	SW4	0.5	80	A	A	G
3303410	OLI	0000000	143-84-33-NW	NW4	0.5	80	N	A	A
3303420	OLI	0000000	143-84-36-NE	NE4	1	160	A	A	G
3303430	OLI	0000000	143-84-36-NW	NW4	1	160	A	A	G
3303440	OLI	0000000	143-84-36-SE	SE4	1	160	A	A	G
3303450	OLI	0000000	143-84-36-SW	SW4	1	160	A	A	G
3303470	OLI	0000000	143-85-10-NE	NE4	0.5	80	A	A	A
3303500	OLI	0000000	143-85-15-NE	NE4	0.05	8	L	A	L
3303510	OLI	0000000	143-85-15-SE	SE4	0.05	8	L	A	L
3303520	OLI	0000000	143-85-16-NE	NE4	0.5	80	A	A	G
3303530	OLI	0000000	143-85-16-NW	NW4	0.5	80	A	A	G
3303540	OLI	0000000	143-85-16-SE	SE4	1	160	A	A	G
3303550	OLI	0000000	143-85-16-SW	SW4	1	160	A	A	G
3303560	OLI	0000000	143-85-22-NE	NE4	0.05	8	L	A	L
3303570	OLI	0000000	143-85-22-SE	SE4	0.05	7.93	L	A	L
3303580	OLI	0000000	143-85-23-SE	S2SE4	0.5	40	U	A	A

3303590	OLI	0000000	143-85-26-NE	N2NE4, SW4NE4	0.5	60	U	A	A
3304820	OLI	0000000	143-85-26-NW	NE4NW4	0.5	20	U	A	A
3303600	OLI	0000000	143-85-35-SE	SE4	0.5	80	A	A	A
3303610	OLI	0000000	143-85-36-NE	NE4	0.5	80	A	A	G
3303620	OLI	0000000	143-85-36-NW	NW4	0.5	80	A	A	G
3303630	OLI	0000000	143-85-36-SE	SE4	0.5	80	A	A	G
3303640	OLI	0000000	143-85-36-SW	SW4	0.5	80	A	A	G
3303770	OLI	0000000	143-86-14-NE	N2NE4	0.5	40	L	A	L
3304840	OLI	0000000	143-86-14-NW	NE4NW4	0.5	20	L	A	L
3303850	OLI	0000000	143-86-22-SE	W2SE4	0.5	40	L	A	L
3304850	OLI	0000000	143-86-22-SW	E2SW4	0.5	40	L	A	L
3303860	OLI	0000000	143-86-26-NE	NE4	0.5	80	L	A	L
3303870	OLI	0000000	143-86-26-NW	NW4	1	160	D	A	A
3303900	OLI	0000000	143-86-36-NE	NE4	1	160	A	A	G
3303910	OLI	0000000	143-86-36-NW	NW4	1	160	A	A	G
3303920	OLI	0000000	143-86-36-SE	SE4	1	160	A	A	G
3303930	OLI	0000000	143-86-36-SW	SW4	1	160	A	A	G
2801220	MCL	0000000	144-84-16-NE	NE4	0.5	80	A	A	G
2801230	MCL	0000000	144-84-16-NW	NW4	0.5	80	A	A	G
2801240	MCL	0000000	144-84-16-SE	LOTS 1,2	0.5	52.15	A	A	G
2801250	MCL	0000000	144-84-16-SW	LOTS 3,4	0.5	42.65	A	A	G
2903020	MER	0000000	144-84-22-NE	NE4	0.05	8	L	A	L
2907450	MER	0000000	144-84-22-NW	NW4	0.05	8	L	A	L
2817070	MCL	0000000	144-84-23-NE	THAT PART OF NE4 RECEIVED AS ACCRETIONS TO 13: SW4	0.5	5.5	A	A	A
2903040	MER	0000000	144-84-28-NW	NW4	0.5	80	L	A	L
2903050	MER	0000000	144-84-29-NE	NE4	0.5	80	L	A	L
2903060	MER	0000000	144-84-29-NW	NW4	0.5	80	L	A	L
2903070	MER	0000000	144-84-30-NE	NE4	0.05	8	L	A	L
2903270	MER	0000000	144-85-20-SW	SW4	0.5	80	A	A	A

2903280	MER	0000000	144-85-26-NE	NE4	0.05	8	L	A	L
2903290	MER	0000000	144-85-26-NW	NW4	0.5	80	L	A	L
2903370	MER	0000000	144-85-36-NE	NE4	0.5	80	A	A	G
2903380	MER	0000000	144-85-36-NW	NW4	0.5	80	A	A	G
2903390	MER	0000000	144-85-36-SE	SE4	0.5	80	A	A	G
2903400	MER	0000000	144-85-36-SW	SW4	0.5	80	A	A	G

Legend: **Coal Ownership**

%	Trust	Acq Code	Ownership
5 & 50	L	L	Coal ownership unknown
50	A	A	Coal ownership unknown
50	A	G	Coal ownership dependent on year sold
100	A	G	State owns all coal
50	B	A	Coal ownership unknown
100	D	A	Coal ownership unknown
50	N	A	Coal ownership unknown
50	U	A	Coal ownership unknown

From:	Lindsey Churchill
To:	Spangelo, Kayla M.
Cc:	Dirk Churchill
Subject:	RE: EXTERNAL: RE: Proposed Oliver Wind IV Energy Center & 345-kV Transmission Line - Oliver and Mercer Counties.
Date:	Thursday, May 11, 2023 4:15:33 PM
Attachments:	image002.png image003.png

Received, thank you.

Lindsey Churchill, PhD, PWS
Bismarck, North Dakota
651.428.7398 mobile
lindsey.churchill@merjent.com

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1 Main Street SE, Suite 300
Minneapolis, MN 55414
612.746.3660 main
www.merjent.com

From: Spangelo, Kayla M. <kspangelo@nd.gov>
Sent: Thursday, May 11, 2023 4:11 PM
To: Lindsey Churchill <lindsey.churchill@merjent.com>
Subject: RE: EXTERNAL: RE: Proposed Oliver Wind IV Energy Center & 345-kV Transmission Line - Oliver and Mercer Counties.
Importance: High

Lindsey,

Please add the below information received from NDDTL's Mineral division regarding Coal Leases present in the specific provided Tract List(s) in the received comment letter.

Township Range	Section	Coal Lease Comment
143-85	35	Coal Lease CO1400038 covers 143-85-35 SE. The primary term of this lease has been extended to 4/30/2029.

Please let me know if you have any questions.

Thank you,

Kayla Spangelo
Natural Resources Professional - Rights of Ways

701.328.1916 • kspangelo@nd.gov • land.nd.gov • 1707 N 9th St • Bismarck, ND 58501

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From:	Lindsey Churchill
To:	Spangelo, Kayla M.
Cc:	Brown, Dina; Dirk Churchill
Subject:	RE: EXTERNAL: RE: Proposed Oliver Wind IV Energy Center & 345-kV Transmission Line - Oliver and Mercer Counties.
Date:	Monday, May 8, 2023 10:43:33 AM
Attachments:	image001.png image002.png

Kayla,

Thank you for the comment letter. To address your previous question below, the driving factor was that the ND Game and Fish Department has discouraged siting turbines on grasslands, with an emphasis on unbroken grasslands and restored native prairie. When we initially evaluated the land cover of the NDDTL parcels via desktop aerial imagery and windshield surveys, the parcels mostly or wholly contained unbroken grasslands and/or native prairie. The same land cover considerations were also given to private lands.

Thanks,

Lindsey Churchill, PhD, PWS
Bismarck, North Dakota
651.428.7398 mobile
lindsey.churchill@merjent.com

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From: Spangelo, Kayla M. <kspangelo@nd.gov>
Sent: Thursday, May 4, 2023 11:53 AM
To: Lindsey Churchill <lindsey.churchill@merjent.com>
Subject: RE: EXTERNAL: RE: Proposed Oliver Wind IV Energy Center & 345-kV Transmission Line - Oliver and Mercer Counties.

Hello,

Comment letter is attached.

Thank you,

Kayla Spangelo
Natural Resources Professional - Rights of Ways

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From: Spangelo, Kayla M.
Sent: Thursday, April 27, 2023 8:27 AM
To: 'Lindsey Churchill' <lindsey.churchill@merjent.com>
Subject: RE: EXTERNAL: RE: Proposed Oliver Wind IV Energy Center & 345-kV Transmission Line - Oliver and Mercer Counties.

Nothing? There were several tracts within the project area identified on the received letter? Is there a reason no turbines were proposed on Trust Lands?

Thank you,

Kayla Spangelo

From: Lindsey Churchill <lindsey.churchill@merjent.com>
Sent: Wednesday, April 26, 2023 4:18 PM
To: Spangelo, Kayla M. <kspangelo@nd.gov>
Subject: RE: EXTERNAL: RE: Proposed Oliver Wind IV Energy Center & 345-kV Transmission Line - Oliver and Mercer Counties.

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Kayla,

At this time, infrastructure is not planned on NDDTL surface lands. If that changes, we will let you know as soon as possible.

Thanks,

Lindsey Churchill, PhD, PWS
Bismarck, North Dakota
651.428.7398 mobile
lindsey.churchill@merjent.com

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From: Spangelo, Kayla M. <kspangelo@nd.gov>

Sent: Wednesday, April 26, 2023 12:02 PM
To: Lindsey Churchill <lindsey.churchill@merjent.com>
Subject: RE: EXTERNAL: RE: Proposed Oliver Wind IV Energy Center & 345-kV Transmission Line - Oliver and Mercer Counties.

Yes, that should be fine, thank you. We are hopeful to still meet the requested time frame but as you can imagine, things are picking up for the spring.

If it is very likely that Trust lands are going to be included, can you please direct Oliver Wind to apply for a wind farm and a transmission line as soon as possible? Especially since they are already working towards PSC approval. NDDTL has nothing so we have no reviews and/or onsites planned to site so the timeline is not looking very encouraging.

Kayla Spangelo

From: Lindsey Churchill <lindsey.churchill@merjent.com>
Sent: Wednesday, April 26, 2023 11:07 AM
To: Spangelo, Kayla M. <kspangelo@nd.gov>
Subject: RE: EXTERNAL: RE: Proposed Oliver Wind IV Energy Center & 345-kV Transmission Line - Oliver and Mercer Counties.

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Kayla,

Yes, however, we are currently in the process of writing the PSC applications. Would you be able to respond by May 19?

Thanks,

Lindsey Churchill, PhD, PWS
Bismarck, North Dakota
651.428.7398 mobile
lindsey.churchill@merjent.com

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From: Spangelo, Kayla M. <kspangelo@nd.gov>
Sent: Wednesday, April 26, 2023 10:46 AM
To: Lindsey Churchill <lindsey.churchill@merjent.com>
Subject: EXTERNAL: RE: Proposed Oliver Wind IV Energy Center & 345-kV Transmission Line - Oliver

and Mercer Counties.
Importance: High

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Lindsey,

The Department has been reviewing the proposed project(s) and area(s) listed in the letter received on April 3, 2023 regarding the proposed Oliver Wind IV Energy Center & 345-kV Transmission Line - Oliver and Mercer Counties. Is it possible to extend the timeframe for responses?

Thank you,

Kayla Spangelo
Natural Resources Professional - Rights of Ways

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May 4, 2023

MERJENT, INC.
ATTN: LINDSEY CHURCHILL
1 MAIN STREET SE, SUITE 300
MINNEAPOLIS, MN 55414

Hello,

The North Dakota Department of Trust Lands (NDDTL) has received your request for comment RE: NOTIFICATION OF THE PROPOSED OLIVER WIND IV ENERGY CENTER IN OLIVER COUNTY, NORTH DAKOTA AND ASSOCIATED 345-KV TRANSMISSION LINE IN OLIVER AND MERCER COUNTIES, ND.

NDDTL manages the below surface tracts on behalf of the Board of University and School Lands located within the proposed project boundary area(s). NDDTL has various existing agreements and ongoing negotiations within the proposed area for various types of activities and agreements.

DTL managed Surface Tracts within proposed project area:		
County	**Township-Range-Section**	**Subdivision**
Oliver	142-85-16	NE4
Oliver	142-85-16	SE4
Oliver	142-85-30	E2NW4, Lots 1,2
Oliver	143-86-26	NW4
Oliver	143-87-36	SW4

NDDTL has not received an application from Oliver Wind IV for this project (wind farm nor transmission line) at the time of this letter. Any proposed projects crossing NDDTL managed property would need to apply for a Rights of Way agreement and would be subject to review and approval by the Board of University and School Lands. NDDTL ROW applications can be completed by navigating to the NDDTL webpage, selecting Divisions, then selecting Surface & Minerals Management, and then selecting the Rights-of-Way and Special Access option on the left side of the screen OR by navigating to the following webpage: https://www.land.nd.gov/rightsofway. The Application can be found under the Form section.

NDDTL reviews the financial benefit to the trusts; availability of alternate encumbrance site or route; least environmentally damaging site or route regardless of property ownership; physical stability of the landscape; other potential future uses for the trust lands, including urban

Joseph A. Heringer COMMISSIONER
1707 North 9th Street | P.O. Box 5523 | Bismarck, ND 58506-5523
PHONE: 701-328-2800 | FAX: 701-328-3650 | https://land.nd.gov

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development; potential mineral and other material development including oil, gas, coal, construction aggregate, sodium sulfate, chemical substances, metallic ore, or uranium ore; feasibility for reclamation; maintenance of existing wetlands and water flows; any cultural, historical, archeological, and paleontological resources; habitat for federally listed threatened and endangered species; location of the proposed route or site in relation to section lines, quarter section lines and corridors; potential liability to the trusts; applicant's past encumbrances on trust lands; applicant's financial stability; and any other information relevant to the application which would assist in the determination.

Surveying/engineering companies completing surveys on Trust property must possess a valid planning and preconstruction survey permit and the entity requesting the right of way must have applied for a right of way and received a ROW tracking number from NDDTL prior to surveying on Trust property. Any survey or construction activities cannot begin on NDDTL managed property until the Commissioner has signed the appropriate documents.

If you have any questions, feel free to contact NDDTL via phone at 701-328-2800 or email to landrow@nd.gov.

Sincerely,

Kayla Spangelo

Kayla Spangelo
Natural Resources Professional

North Dakota Department of Trust Lands

Joseph A. Heringer COMMISSIONER
1707 North 9th Street | P.O. Box 5523 | Bismarck, ND 58506-5523
PHONE: 701-328-2800 | FAX: 701-328-3650 | https://land.nd.gov

Appendix C7
North Dakota Parks and Recreation Department

From: Lindsey Churchill
To: Dirk, Christine
Cc: Dirk Churchill; Brown, Dina
Subject: RE: EXTERNAL: Oliver Wind IV Energy Center and transmission line request
Date: Thursday, June 8, 2023 2:04:00 PM
Attachments: image001.png

Christine,

I wanted to follow up and see if you need anything additional from me or if you have a response for the Oliver IV project.

Thanks,

Lindsey Churchill, PhD, PWS
Bismarck, North Dakota
651.428.7398 mobile
lindsey.churchill@merjent.com

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From: Lindsey Churchill
Sent: Wednesday, May 3, 2023 3:53 PM
To: Dirk, Christine <cdirk@nd.gov>
Subject: RE: EXTERNAL: Oliver Wind IV Energy Center and transmission line request

Ok, thanks Christine.

Lindsey Churchill, PhD, PWS
Bismarck, North Dakota
651.428.7398 mobile
lindsey.churchill@merjent.com

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From: Dirk, Christine <cdirk@nd.gov>
Sent: Wednesday, May 3, 2023 2:09 PM
To: Lindsey Churchill <lindsey.churchill@merjent.com>

Subject: RE: EXTERNAL: Oliver Wind IV Energy Center and transmission line request

Hi Lindsey,

I should have mentioned that my email won't accept zip files. No worries. I used the map to draw out the approximate boundary. Have a great day.

Chris

Christine Dirk
GIS Specialist

701.328.5368 • parkrec.nd.gov

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From: Lindsey Churchill <lindsey.churchill@merjent.com>
Sent: Monday, May 1, 2023 3:58 PM
To: Dirk, Christine <cdirk@nd.gov>
Cc: Brown, Dina <Dina.Brown@nexteraenergy.com>
Subject: RE: EXTERNAL: Oliver Wind IV Energy Center and transmission line request

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Christine,

The email I sent below containing the shapefiles was returned as undeliverable. Is there a preferred method for sending shapefiles? The attachment was only 125 KB, so I don't think it was due to size.

Thanks,

Lindsey Churchill, PhD, PWS
Bismarck, North Dakota
651.428.7398 mobile
lindsey.churchill@merjent.com

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From: Lindsey Churchill
Sent: Monday, May 1, 2023 3:54 PM
To: Dirk, Christine <cdirk@nd.gov>
Cc: Brown, Dina <Dina.Brown@nexteraenergy.com>
Subject: RE: EXTERNAL: Oliver Wind IV Energy Center and transmission line request

Christine,

Please see attached for the shapefiles of the wind and transmission project study areas. Let me know if you have any other questions.

Regards,

Lindsey Churchill, PhD, PWS
Bismarck, North Dakota
651.428.7398 mobile
lindsey.churchill@merjent.com

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From: Dirk, Christine <cdirk@nd.gov>
Sent: Wednesday, April 26, 2023 2:29 PM
To: Lindsey Churchill <lindsey.churchill@merjent.com>
Subject: EXTERNAL: Oliver Wind IV Energy Center and transmission line request

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Hello,

I am working on a response to the Oliver Wind IV Energy Center and transmission line project. Do you happen to have a shapefile of the project areas that you could share with me? Thanks.

Christine Dirk
GIS Specialist

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Appendix C8
Natural Resources Conservation Service

USDA
United States Department of Agriculture

Natural Resources
Conservation Service

Bismarck State Office
PO Box 1458
Bismarck, ND
58502-1458

Voice 701.530.2000
Fax 855-813-7556

April 5, 2023

Lindsey Churchill, PhD, PWS
Merjent, Inc.
1 Main Street SE, Suite 300
Minneapolis, MN 55414

Dear Dr. Churchill:

The Natural Resources Conservation Service (NRCS) has reviewed your letter dated March 31, 2023 concerning the Proposed Oliver Wind IV (Wind Project) and associated infrastructure in Oliver and Mercer Counties, North Dakota.

NRCS has a major responsibility with the Farmland Protection Policy Act (FPPA) in documenting conversion of farmland (i.e., prime, statewide importance and local importance) to non-agriculture use when federal funding is utilized. Your solicitation letter does not mention a source of federal funding, therefore, FPPA does not apply, and no further action is needed.

The Wetland Conservation Provisions of the 1985 Food Security Act, as amended, provide that if a USDA participant converts a wetland for the purpose or to have the effect of making agricultural production possible, loss of USDA benefits could occur. The NRCS has developed the following guidelines for the installation of permanent structures where wetlands occur. If these guidelines are followed the impacts to the wetland will be considered minimal allowing USDA participants to continue to receive USDA benefits. Following are the requirements:

- Disturbance to the wetland must be temporary.
- No drainage of wetland is allowed (temporary or permanent).
- Mechanized landscaping necessary for installation is kept to a minimum and preconstruction contours are maintained.
- Temporary side cast material must be placed in such a manner not to be dispersed in the wetland.
- All trenches must be backfilled to the original wetland bottom elevation.

Potentially impacted USDA participants that wish to request a certified wetland determination can be directed to the USDA Farm Service Agency (FSA) to a Highly Erodible Land Conservation (HELC) and Wetland Conservation request (WC) Certification (AD-1026) or they may contact Casey Guetter, Designated Conservationist, NRCS, Bismarck, North Dakota at (701) 989-6160 for information about conservation compliance provisions related to the project.

NRCS recommends that impacts to wetlands be avoided.

If you have additional questions pertaining to FPPA, please contact Wade Bott, State Soil Scientist, NRCS, Bismarck, North Dakota, at (701) 530-2021.

Sincerely,

WADE BOTT Digitally signed by WADE BOTT
Date: 2023.04.05 08:19:12 -05'00'

WADE D. BOTT
State Soil Scientist

Appendix C9
North Dakota Department of Water Resources

NORTH Dakota | Water Commission
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August 30, 2019

Lindsey Churchill
AECOM
1000 East Calgary Avenue
Bismarck, ND 58503

Dear Ms. Churchill:

This is in response to your request for a review of the environmental impacts associated with the Red Butte Wind Energy center and 230 kV Transmission Line Project located in Oliver and Mercer Counties, ND.

The proposed project has been reviewed by State Water Commission staff, and the following comments are provided:

- Initial review indicates the project does not require a conditional or temporary permit for water appropriation. However, if surface water or groundwater will be diverted for construction of the project, a water permit will be required per North Dakota Century Code § 61-04-02. Please consult with the Water Appropriations Division of the Office of the State Engineer if you have any questions at (701) 328-2754 or waterpermits@nd.gov.

- The State Water Commission maintains a network of observation wells across the state for monitoring the water levels and quality in glacial and bedrock aquifers. These wells are often installed in road and highway rights-of-way to limit inconvenience to the adjacent landowners. State Water Commission observation wells have a yellow protective casing extending between 1 and 3 feet above ground surface, and their locations are marked with a stake. If an observation well is encountered during project activities and must be removed, please contact the Water Appropriations Division. The State Water Commission hopes to keep all observation wells, but otherwise will ensure the well is properly abandoned.

- There are floodplains identified and/or mapped where this proposed project is to take place. Areas are designated to be in Zone A. North Dakota has no formal 'permitting' authority as a state entity in NFIP identified floodplain areas. The permitting is always done by the local entity, which has jurisdiction in the area in question. Please work closely with the County Floodplain Administrator.

Thank you for the opportunity to provide review comments. Should you have further questions, please contact me at 701-328-4970 or stevebest@nd.gov.

Sincerely,

Steven Best
Planner III

SB:dm/1570

NORTH Dakota | Water Resources

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April 25, 2023

Lindsey Churchill, PhD, PWS
Senior Project Manager
1 Main Street SE, STE 300
Minneapolis, MN 55414

Dear Ms. Churchill:

This is in response to your request for a review of the environmental impacts associated the Oliver Wind IV Energy Center in Oliver County ND & Associated 345-kV Transmission Line in Oliver & Mercer Counties, ND.

The proposed project has been reviewed by Department of Water Resources, and the following comments are provided:

- There is a FEMA National Flood Insurance Program (NFIP) regulatory floodplain identified or mapped where this proposed project is to take place. Impacted areas are designated to be in NFIP Zone A. The State of North Dakota has no formal NFIP permitting authority, as all NFIP permitting decisions are considered by impacted NFIP participating communities, which is the community with zoning authority for the area in question. Please work directly with the local floodplain administrator of the zoning authority impacted to achieve NFIP and community compliance.

- The Department of Water Resources (DWR) and Water Resource Districts are responsible for regulating drainage and water management in North Dakota. The DWR is also responsible for regulating the construction and modification of any dike, levee, or other device. Consequently, the DWR requests to be notified regarding a proposed project's impacts, if any, to water resources, such as watercourses (i.e. streams or rivers), agricultural drains, and wetlands (i.e. ponds, sloughs, lakes, or any series thereof), and dikes, levees, and other water control devices, as any alterations, modifications, improvements, or impacts to those may require a drainage permit(s) or a construction permit(s) from the DWR.

- Initial review indicates the project does not require a conditional or temporary permit for water appropriation. However, if surface water or groundwater will be diverted for construction of the project, a water permit will be required per North Dakota Century Code § 61-04-02. Please consult with the Department of Water Resources Water Appropriation Division if you have any questions at 701-328-2754 or appropinfo@nd.gov.

- The Department of Water Resources maintains a network of observation wells across the state for monitoring the water levels and quality in glacial and bedrock aquifers. These wells are often installed in road and highway rights-of-way to limit inconvenience to the adjacent landowners. Department of Water Resources observation wells have a yellow protective casing extending between 1 and 3 feet above ground surface, and their

locations are marked with a stake. If an observation well is encountered during project activities and must be removed, please contact the Water Appropriation Division. The Department of Water Resources hopes to keep all observation wells, but otherwise will ensure the well is properly abandoned.

Thank you for the opportunity to provide review comments. Should you have further questions, please contact me at 701-328-4970 or stevebest@nd.gov.

Sincerely,

Steven Best
Planner III

SB:dm/1570

Appendix C10
United States Army Corps of Engineers

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
NORTH DAKOTA REGULATORY OFFICE
3319 UNIVERSITY DRIVE
BISMARCK, NORTH DAKOTA 58504-7565

August 19, 2019

NWO-2016-01443-BIS

AECOM
Attn: Ms. Lindsey Churchill
1000 East Calgary Avenue Suite 1
Bismarck, North Dakota 58503

Dear Ms. Churchill:

This is in response to your letter dated July 31, 2019, requesting comments on the proposed Red Butte Wind LLC; Red Butte Wind Energy Center and 230 kV Transmission Line project. The project is located throughout Oliver and Mercer Counties, North Dakota.

U. S. Army Corps of Engineers Regulatory Offices administer Section 10 of the Rivers and Harbors Act (Section 10) and Section 404 of the Clean Water Act (Section 404). A Section 10 permit would be required for work impacting navigable waters, this includes work over, through, or under Section 10 waters. Section 10 waters in North Dakota are the Missouri River (including Lake Sakakawea and Lake Oahe), Yellowstone River, James River (south of the railroad tracks in Jamestown, North Dakota), Bois de Sioux River, Red River of the North, and Upper Des Lacs Lake. A Section 404 permit would be required for the discharge of dredge or fill material (temporarily or permanently) in waters of the United States. Waters of the United States may include, but are not limited to, rivers, streams, ditches, coulees, lakes, ponds, and their adjacent wetlands. Fill material includes, but is not limited to, rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mines or other excavation activities and materials used to create any structure or infrastructure in waters of the United States.

Based on the information contained in your letter, the Corps has determined that your proposed project may need a Clean Water Act Section 404 permit. The permit application and instructions for completing the application may be found at: http://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/Obtain-a-Permit. Be sure to accurately describe all proposed work and construction methodology. Once the application is complete, mail it to the letterhead address or to the email address below.

The North Dakota Regulatory office can accept (and prefers) electronic submissions to the following email: CENWO-OD-RND@usace.army.mil.

Printed on Recycled Paper

Please refer to identification number NWO-2016-01443-BIS in any correspondence concerning this project. If you have any questions, please contact Jeremy Nygard at U.S. Army Corps of Engineers, North Dakota Regulatory Office, 3319 University Drive, Bismarck, North Dakota 58504-7565, by email at *Jeremy.S.Nygard@usace.army.mil*, or telephone at (701) 255-0015 X 2006. For more information regarding our program, please visit our website at *http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/NorthDakota.aspx*.

Sincerely,

Patricia L. McQueary
State Program Manager
North Dakota

From: Nygard, Jeremy S CIV USARMY CENWO (USA)
To: Lindsey Churchill
Subject: EXTERNAL: NWO-2023-00553-BIS, Merjent; Oliver Wind IV, LLC; Oliver Wind IV Energy Center
Date: Monday, April 17, 2023 1:50:34 PM
Attachments: NWO-2023-00553_20230414_SOV Response.pdf
Eng_Form_6082_Sep 2022.pdf

Hi Lindsey,

Our office has reviewed the information you provided regarding the proposed project and determined that a U.S. Army Corps of Engineers Section 404 permit may be required for your project. Please see attached letter and blank application form. Thank you,

v/r

Jeremy Nygard
Regulatory Permit Assistant
U.S. Army Corps of Engineers
North Dakota Regulatory Office
3319 University Drive
Bismarck, ND 58504
701-255-0015 ext. 2006

The North Dakota Regulatory office prefers that all submissions are sent electronically to the following email address: CENWO-OD-RND@usace.army.mil instead of a hard copy by mail. Please split large attachments (>25 MB) into multiple emails if needed.

Appendix C11
Mercer County

From: Lindsey Churchill
Sent: Friday, September 15, 2023 1:12 PM
To: 'Zueger, Cyndi L.'
Subject: RE: EXTERNAL: FW: Thank you - Missouri River CCO Meeting for McLean, Mercer, and Oliver County

Thank you, Cyndi. We will use the FEMA maps for floodplain review. I appreciate the follow up.

Lindsey Churchill, PhD, PWS
Bismarck, North Dakota
651.428.7398 mobile
lindsey.churchill@merjent.com

merjent
1 Main Street SE, Suite 300
Minneapolis, MN 55414
612.746.3660 main
www.merjent.com

From: Zueger, Cyndi L. <czueger@nd.gov>
Sent: Friday, September 15, 2023 11:53 AM
To: Lindsey Churchill <lindsey.churchill@merjent.com>
Subject: EXTERNAL: FW: Thank you - Missouri River CCO Meeting for McLean, Mercer, and Oliver County

CAUTION: This email originated from outside of Merjent.

Lindsey,

I hope these are what you are asking for. I don't have copies of the actual maps.

Cyndi

Cyndi Zueger
Mercer County
Tax Director/Land Use Administrator
701-745-3294
410 Van Slyck Ave
Stanton ND 58571

From: Horner, Laura M. <lmhorner@nd.gov>
Sent: Tuesday, June 6, 2023 5:43 PM
To: Kroll, Noelle <nkroll@nd.gov>; Schreiner, Todd A. <tschreiner@nd.gov>; Zueger, Cyndi L. <czueger@nd.gov>; washaud@westriv.com; stanton@westriv.com; Neumiller, Jennifer L. <jlneumiller@nd.gov>; Reed, Carmen

<creed@nd.gov>
Cc: Pluss, Madeleine <madeleine.pluss@fema.dhs.gov>; Spomer, Tyler <tlspomer@nd.gov>; Gregg Thielman <cgthielman@houstoneng.com>; Nic Cullen <ncullen@houstoneng.com>; kgronsky@dewberry.com; Sutley, David <dsutley@Dewberry.com>; Adam Nies <anies@houstoneng.com>
Subject: Thank you - Missouri River CCO Meeting for McLean, Mercer, and Oliver County

Good evening Everyone,

Thank you for joining us for the **Missouri River (Mercer, McLean and Oliver County) CCO Meeting** on Wednesday, May 31, 2023. We enjoyed visiting with you all to help ensure a safer, stronger future.

As discussed during the meeting, we have plenty of follow-up resources available to you to help facilitate outreach and ensure stakeholders within your communities are aware of the upcoming map changes:

- **To view the preliminary maps, please visit the following online resources or contact the City, County or other jurisdictional authority:** We encourage you to review the mapping information with all of your community leaders and anyone that might have an interest.
    - FEMA Map Service Center
    - FEMA Preliminary/Changes Since Last FIRM Viewer

- PDFs of the **CCO Presentation slide deck**, **Sign-In Sheets, Meeting Minutes and additional Flood Insurance Material** have been posted to the State's .ftp site for download using the following link. I strongly encourage you to share this information with all of the elected officials and staff who were unable to attend the meeting hosted on May 31st regarding the Flood Insurance Rate Map (FIRM) update taking place in Mercer, McLean and Oliver County.
    - http://ftp.swc.nd.gov/_1gV8F0NkJYw5kR

- Please reach out if any residents located in the updated project area are in need of any additional material or an 1-on-1 conversation regarding any impacts of the updated flood risk information.

Thanks again for joining us – and as always, please feel free to reach out to me directly with any next steps, questions or concerns.

Sincerely,

Laura Horner
Risk MAP Program Manager

701.328.2759(m) • 701.328.3696 (f) • lmhorner@nd.gov • www.dwr.nd.gov

NORTH Dakota | Water Resources
Be Legendary.

701.328.2750 • dwr@nd.gov • 1200 Memorial Hwy • Bismarck, ND 58504

Appendix C12
North Dakota Department of Environmental Quality

NORTH Dakota | Environmental Quality
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August 20, 2019

Lindsey Churchill, PhD
Environmental Project Manager
AECOM
1000 East Calgary Avenue Suite 1
Bismarck, ND 58503

Re: Red Butte Wind Energy Center & 230 kV Transmission Line in Mercer, Oliver Counties

Dear Ms. Churchill:

The North Dakota Department of Environmental Quality has reviewed the information concerning the above-referenced project received at the department on August 05, 2019, with respect to possible environmental impacts.

This department believes that environmental impacts from the proposed construction will be minor and can be controlled by proper construction methods. With respect to construction, we have the following comments:

1. All necessary measures must be taken to minimize fugitive dust emissions created during construction activities. Any complaints that may arise are to be dealt with in an efficient and effective manner.

2. Care is to be taken during construction activity near any water of the state to minimize adverse effects on a water body. This includes minimal disturbance of stream beds and banks to prevent excess siltation, and the replacement and revegetation of any disturbed area as soon as possible after work has been completed. Caution must also be taken to prevent spills of oil and grease that may reach the receiving water from equipment maintenance, and/or the handling of fuels on the site. Guidelines for minimizing degradation to waterways during construction are attached.

3. Projects disturbing one or more acres are required to have a permit to discharge storm water runoff until the site is stabilized by the reestablishment of vegetation or other permanent cover. Further information on the storm water permit may be obtained from the department's website or by calling the Division of Water Quality (701-328-5210). Also, cities may impose additional requirements and/or specific best management practices for construction affecting their storm drainage system. Check with the local officials to be sure any local storm water management considerations are addressed.

4. The proposed construction project includes many individual projects located within Mercer and Oliver counties. It is possible that some projects may be located over defined glacial drift aquifers, defined sensitive glacial drift aquifers, or within wellhead or source water

protection areas. Care should be taken to avoid spills of any materials that may have an adverse effect on groundwater quality. All spills must be immediately reported to this department and appropriate remedial actions performed.

5. Noise from construction activities may have adverse effects on persons who live near the construction area. Noise levels can be minimized by ensuring that construction equipment is equipped with a recommended muffler in good working order. Noise effects can also be minimized by ensuring that construction activities are not conducted during early morning or late evening hours.

6. All solid waste materials must be managed and transported in accordance with the state's solid and hazardous waste rules. Appropriate efforts to reduce, reuse and/or recycle waste materials are strongly encouraged. As appropriate, segregation of inert waste from non-inert waste can generally reduce the cost of waste management. Further information on waste management and recycling is available from the department's Division of Waste Management at (701) 328-5166.

These comments are based on the information provided about the project in the above-referenced submittal. The U.S. Army Corps of Engineers may require a water quality certification from this department for the project if the project is subject to their Section 404 permitting process. Any additional information which may be required by the U.S. Army Corps of Engineers under the process will be considered by this department in our determination regarding the issuance of such a certification.

The department owns no land in or adjacent to the proposed improvements, nor does it have any projects scheduled in the area. In addition, we believe the proposed activities are consistent with the State Implementation Plan for the Control of Air Pollution for the State of North Dakota.

If you have any questions regarding our comments, please feel free to contact this office.

Sincerely,

L. David Glatt, P.E., Director
North Dakota Department of Environmental Quality

LDG:dlp
Attach.

NORTH Dakota | Environmental Quality
Be Legendary.

Construction and Environmental Disturbance Requirements

The following are the minimum requirements of the North Dakota Department of Environmental Quality for projects that involve construction or environmental disturbance in or near waters of the State of North Dakota. They ensure that minimal environmental degradation occurs as a result of construction or related work which has the potential to affect waters of the state. All projects must be constructed to minimize the loss of soil, vegetative cover, and pollutants (chemical or biological) from a site.

Soils

Prevent the erosion of soil and sediment loss using erosion and sediment controls. Fragile and sensitive areas such as wetlands, riparian zones, delicate flora, and land resources must be protected against compaction, vegetation loss, and unnecessary damage.

Surface Waters

All construction must be managed to minimize impacts to aquatic systems. Follow safe storage and handling procedures to prevent the contamination of water from fuel spills, lubricants, and chemicals. Stream bank and stream bed disturbances must be controlled to minimize slit movement, nutrient upsurges, plant dislocations, and any physical, chemicals, or biological disruption. The use of pesticides or herbicides in or near surface waters is allowed under the department's pesticide application permit with notification to the department.

Fill Material

Any fill material placed below the ordinary high-water mark must be free of topsoil, decomposable materials, and persistent synthetic organic compounds; including, but not limited to, asphalt, tires, treated lumber, and construction debris. The department may require testing of fill materials. All temporary fill must be removed. Debris and solid wastes must be properly disposed or recycled. Impacted areas must be restored to near original condition.

918 East Divide Avenue | Bismarck ND 58501-1947 | Fax 701-328-5200 | deq.nd.gov

Director's Office 701-328-5150
Division of Air Quality 701-328-5188
Division of Municipal Facilities 701-328-5211
Division of Waste Management 701-328-5166
Division of Water Quality 701-328-5210
Division of Chemistry 701-328-6140 2635 East Main Ave Bismarck ND 58501

NORTH Dakota | Environmental Quality

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April 19, 2023

Lindsey Churchill, PhD
Merjent
1 Main Street SW, Ste 300
Minneapolis, MN 55414

Re: Oliver Wind IV Energy Center & Associated 345 kV Transmission Line in Mercer, Oliver Counties

Dear Ms. Churchill:

The North Dakota Department of Environmental Quality has reviewed the information concerning the above-referenced project received at the department on April 10, 2023 with respect to possible environmental impacts.

This department believes that environmental impacts from the proposed construction will be minor and can be controlled by proper construction methods. With respect to construction, we have the following comments:

1. Care is to be taken during construction activity near any water of the state to minimize adverse effects on a water body. This includes minimal disturbance of stream beds and banks to prevent excess siltation, and the replacement and revegetation of any disturbed area as soon as possible after work has been completed. Caution must also be taken to prevent spills of oil and grease that may reach the receiving water from equipment maintenance, and/or the handling of fuels on the site. Guidelines for minimizing degradation to waterways during construction are attached.

2. Projects disturbing one or more acres are required to have a permit to discharge stormwater runoff until the site is stabilized by the reestablishment of vegetation or other permanent cover. Further information on the stormwater permit may be obtained from the department's website or by calling the Division of Water Quality (701-328-5210). Also, cities may impose additional requirements and/or specific best management practices for construction affecting their storm drainage system. Check with the local officials to be sure any local stormwater management considerations are addressed.

3. The proposed construction project may include individual projects located within Mercer and Oliver Counties. It is possible that some projects may be located over defined glacial drift aquifers, defined sensitive groundwater areas, or within wellhead or source water protection areas. Care should be taken to avoid spills of any materials that may have an adverse effect on groundwater quality. All spills must be immediately reported to this Department and appropriate remedial actions performed.

4. All solid waste materials must be managed and transported in accordance with the state's solid and hazardous waste rules. Appropriate efforts to reduce, reuse and/or recycle waste materials are strongly encouraged. As appropriate, segregation of inert waste from non-inert waste can generally reduce the cost of waste management. Further information on waste management and recycling is available from the department's Division of Waste Management at (701) 328-5166.

The department owns no land in or adjacent to the proposed improvements, nor does it have any projects scheduled in the area. In addition, we believe the proposed activities are consistent with the State Implementation Plan for the Control of Air Pollution for the State of North Dakota.

If you have any questions regarding our comments, please feel free to contact this office.

Sincerely,

L. David Glatt, P.E., Director
North Dakota Department of Environmental Quality

LDG:csc
Attach.

Construction and Environmental Disturbance Requirements

The following are the minimum requirements of the North Dakota Department of Environmental Quality for projects that involve construction and environmental disturbance in or near waters of the State of North Dakota. They ensure that minimal environmental degradation occurs as a result of construction or related work which has the potential to affect waters of the state. All projects must be constructed to minimize the loss of soil, vegetative cover, and pollutants (chemical or biological) from a site.

Soils

Prevent the erosion and sediment loss using erosion and sediment controls. Fragile and sensitive areas such as wetlands, riparian zones, delicate flora, and land resources must be prohibited against compaction, vegetation loss and unnecessary damage.

Surface Waters

All construction must be managed to minimize impacts to aquatic systems. Follow safe storage and handling procedures to prevent the contamination of water from fuel spills, lubricants, and chemicals. Stream bank and stream bed disturbances must be contained to minimize silt movement, nutrient upsurges, plant dislocations, and any physical chemicals, or biological disruption. The use of pesticides or herbicides in or near surface waters is allowed under the department's pesticide application permit with notification to the department.

Fill Material

Any fill material place below the ordinary high-water mark must be free of topsoil, decomposable materials, and persistent synthetic organic compounds; including, but not limited to, asphalt, tires, treated lumber, and construction debris. The department may require testing of fill material. All temporary fills must be removed. Debris and solid waste must be properly disposed or recycled. Impacted areas must be restored to near original condition.

Appendix C13
North Dakota Geological Survey

North Dakota Geological Survey

Edward C. Murphy - State Geologist

Department of Mineral Resources

Lynn D. Helms - Director

North Dakota Industrial Commission

www.state.nd.us/ndgs

August 21, 2019

Lindsey Churchill, PhD
AECOM
1000 East Calgary Ave, Suite 1
Bismarck, ND 58503

Re: Red Butte Wind Energy Center and 230 kV Transmission Line Project: Oliver & Mercer Counties, ND

The North Dakota Geological Survey appreciates the notification and opportunity to review and provide comment on the proposed wind energy development project. Your comment solicitation letter of July 31, 2019 was reviewed by our office on August 21, 2019.

Based on the extent of the proposed project areas, it appears that there are some locations in the northeast portions of the wind energy center and transmission line corridor boundaries that contain areas mapped as landslides or features that suggest slope instability. These areas can be found depicted on our 1:24,000 scale landslide maps that have been completed for the Stanton, Hannover NW, and Hannover NE quadrangles and should be included in your project area evaluations.

Also, there appears to be several areas within the proposed project area boundaries that contain mineable coal resources as depicted on our detailed coal maps for this area. A review of the PSC's Abandoned Mine Land (AML) locations data also shows several AML locations just northeast of Center, N.D.

Our current Areas of Landslides maps, LiDAR elevation mapping and data products, and coal maps for the 1:24,000 and 1:100,000 scale quadrangles that encompass the proposed project area can be found on our website at:

https://www.dmr.nd.gov/ndgs/landslides/

You may also contact our offices directly, with any additional questions or comments, at (701) 328-8000.

Sincerely,

North Dakota Geological Survey:

Fred Anderson
Geologist
fjanderson@nd.gov

FJA\

Lindsey Churchill

From: Anderson, Fred J. <fjanderson@nd.gov>
Sent: Thursday, April 6, 2023 10:00 AM
To: Lindsey Churchill
Subject: EXTERNAL: N.D. Geological Survey: Geologic Review and Comments on the Proposed Oliver Wind IV Energy Center and Associated 345-kV Transmission Line in Oliver and Mercer Counties, North Dakota

CAUTION: This email originated from outside of Merjent.

Dr. Churchill,

The NDGS appreciates the opportunity to review and provide comments on your proposed energy infrastructure development project.

I have reviewed the project comment solicitation letter of March 31, 2023 and would offer the following comments:

- The project area is located just south of an area (i.e. the Hazen and Stanton Dunes) where several sand mining operations are currently located. The corridor for the proposed transmission line may pass through some of these current or planned future operations.
- The footprint of the proposed wind farm area does contain a few localized landslide features constrained to local drainages particularly in the northwestern portion of the project area that should be noted.
- The proposed transmission line corridor does pass through an area south of Stanton where several landslide features have been mapped, again associated with local drainages and the hilly topography in this area.
- Areas of landslides should be avoided when selecting locations for towers or transmission line support structures. Steep slopes in areas where mapped landslide density is high should also be evaluated with respect to the proximity of these areas to final site selections.

Landslide mapping and data products for this project area can be found on our website for site specific review at: https://www.dmr.nd.gov/ndgs/landslides/

Please feel free to contact our offices at any time if there are any additional questions or concerns.

Regards,

Fred J. Anderson
Geologist, North Dakota Geological Survey

701.328.8000 (Survey Main Office) • 701.328.8037 (Office Direct) • fjanderson@nd.gov • www.dmr.nd.gov/ndgs

NORTH Dakota | Mineral Resources
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701.328.8020 (Front Office) • oilandgasinfo@nd.gov • www.dmr.nd.gov • 600 E Boulevard Ave, Dept. 405 • Bismarck, ND 58505

Appendix C14
Military Aviation and Installation Assurance Siting Clearinghouse

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3500 DEFENSE PENTAGON
WASHINGTON, DC 20301-3500

SUSTAINMENT

November 21, 2019

Lindsey Churchill
Environmental Project Manager, Environment
AECOM

Dear Dr. Churchill,

As requested, the Military Aviation and Installation Assurance Siting Clearinghouse coordinated within DoD an informal review of the Red Butte Wind Energy Center and Transmission Line Project. The results of our review indicated that the dual wind and transmission project, located in Oliver County, North Dakota, as proposed, will have minimal impact on military operations conducted in the area.

Please note that this informal review by the DoD Military Aviation and Installation Assurance Siting Clearinghouse does not constitute an action under 49 United States Code Section 44718 and that the DoD is not bound by the conclusion arrived at under this informal review. To expedite our review in the Obstruction Evaluation Airport Airspace Analysis (OE/AAA) process, please add the project number 2019-09-D-DEV-11 in the comments section of the filing. If you have any questions, please contact me at steven.j.sample4.civ@mail.mil or at 703-571-0076.

Sincerely,

Steven J. Sample
Deputy Director
Military Aviation and Installation
Assurance Siting Clearinghouse

Appendix C15
Minot Air Force Base

From: Lindsey Churchill
Sent: Thursday, May 18, 2023 3:30 PM
To: WARREN, SAMUELE M CIV USAF AFGSC 5 CES/CENP
Cc: Brown, Dina; Dirk Churchill
Subject: RE: EXTERNAL: Oliver Wind IV Project
Attachments: 20230517_OIV_Wind_Project_Alignment_Shapefiles.zip

Sam,

I hope this email finds you well. I wanted to provide you with an update on the proposed Oliver Wind IV Energy Center and associate 345-kV Transmission Line project in Oliver and Mercer counties, North Dakota.

The wind turbine locations have undergone a review and have been approved by both the DoD Siting Clearinghouse and the FAA. The DoD had no concerns, and the FAA has issued a Determination of No Hazard. The transmission line has not been filed with the FAA or reviewed by the DoD Siting Clearinghouse. We are actively working on completing these tasks and will keep you updated on the progress. For your reference, I have attached the approved wind turbine locations as well as the proposed transmission line pole locations.

The information presented in this email is also being shared with the Minot Air Force Base. If you have any questions or require further information, please do not hesitate to reach out to me.

Thank you for your attention to this matter.

Sincerely,

Lindsey Churchill, PhD, PWS
Bismarck, North Dakota
651.428.7398 mobile
lindsey.churchill@merjent.com

1 Main Street SE, Suite 300
Minneapolis, MN 55414
612.746.3660 main
https://nam12.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.merjent.com%2F&data=05%7C01%7Cdirk.churchill%40merjent.com%7C3a17a00b4684401c960e08db57deb102%7C1cc8bd10ce8b4c0ab3f7bcd338132bc0%7C0%7C0%7C638200387537824306%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=ZlBu3tZ2k%2FybXSQwXc1wA8LInOtKtNdaD%2BiCIEhF8q4%3D&reserved=0

-----Original Message-----
From: WARREN, SAMUELE M CIV USAF AFGSC 5 CES/CENP <samuele.warren.1@us.af.mil>
Sent: Thursday, April 6, 2023 3:24 PM
To: Lindsey Churchill <lindsey.churchill@merjent.com>
Subject: EXTERNAL: Oliver Wind IV Project

CAUTION: This email originated from outside of Merjent.

Ms. Churchill,

Received the following letter from 91 MW in regards to the Oliver Wind IV project within Mercer and Oliver Counties North Dakota. The 91 MW do not have any operations is these counties however the 5 BW on Minot AFB does have flying routes in this area. Have you pushed this project to the DoD Clearing House for them to do a review? (https://nam12.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.acq.osd.mil%2Fdodsc%2Fcontact%2Fdod-review-process.html&data=05%7C01%7Cdirk.churchill%40merjent.com%7C3a17a00b4684401c960e08db57deb102%7C1cc8bd10ce8b4c0ab3f7bcd338132bc0%7C0%7C0%7C638200387537824306%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=McexXJKtjUu4Vhy%2B7n4FF5yNem79ZAzmXxfoaLH3Vas%3D&reserved=0)

Along with DoD Clearing House, Minot AFB cannot really evaluate the project at this time without specific details of the project.

sam

Sam Warren
Community Planner
5 CES/CENP
445 Peacekeeper Place
Minot AFB, ND 58705
DSN: 312-453-1969
Comm:701-723-1969

Appendix C16
National Telecommunications and Information Administration

From: Brownlee, James
To: JHenry@ntia.gov
Cc: Labate, Daniel; Plyler, Angela
Subject: Wind Farm NTIA Notification - Red Butte Wind Energy Project Area in Oliver and Mercer Counties, ND
Attachments: Red Butte ND Wind Project NTIA Letter 2022-04-01.pdf

---

Dear Mrs. Henry,

Please find the attached letter serving as notification to the government that NextEra Energy Resources plans to install a wind energy facility in Oliver and Mercer Counties in North Dakota called the Red Butte Wind Energy Project. Included in the letter are maps showing the project location, project boundary coordinates, and turbine details. Please let me know if anything further is required or of any questions that may arise.

Regards,
James

James Brownlee
Sr. Resource Modeling Analyst
NextEra Analytics, Inc.
700 Universe Blvd
Juno Beach, FL 33408
(561) 694-4973 | James.Brownlee@fpl.com

April 1, 2022

Type of Notification: Update

Project: Red Butte

Counties: Oliver and Mercer

State: North Dakota

Project Sponsor: NextEra Energy Resources

Contact: James Brownlee
Email: James.Brownlee@fpl.com
Phone: 561-694-4973

To Whom It May Concern:

This letter and its attachments will serve as notification to the government that NextEra Energy Resources plans to install a wind energy facility in Oliver and Mercer Counties in North Dakota called the Red Butte Wind Energy Project. Enclosed are maps and tables that describe the location of this wind energy project.

- Table 1 contains boundary points (NAD83) of the Red Butte Wind Energy Project Area
- Figure 1 is a state level map showing the area where the Red Butte Wind Energy Project is located.
- Figure 2 is a local USGS topographical map of the Red Butte Wind Energy Project Area

The approximate dimensions of the wind turbines to be installed at this facility are as follows:

- Turbine Hub Height AGL: 117 meters
- Turbine Blade Diameter: 140 meters
- Maximum Blade Tip Height AGL: 187 meters
- Estimated Number of Turbines to be Installed: 140

Please review the attached information and contact me if any further information is required.

Sincerely,

James Brownlee
Senior Resource Modeling Analyst
NEXTEra Analytics Inc.
700 Universe Blvd
Juno Beach, FL 33408

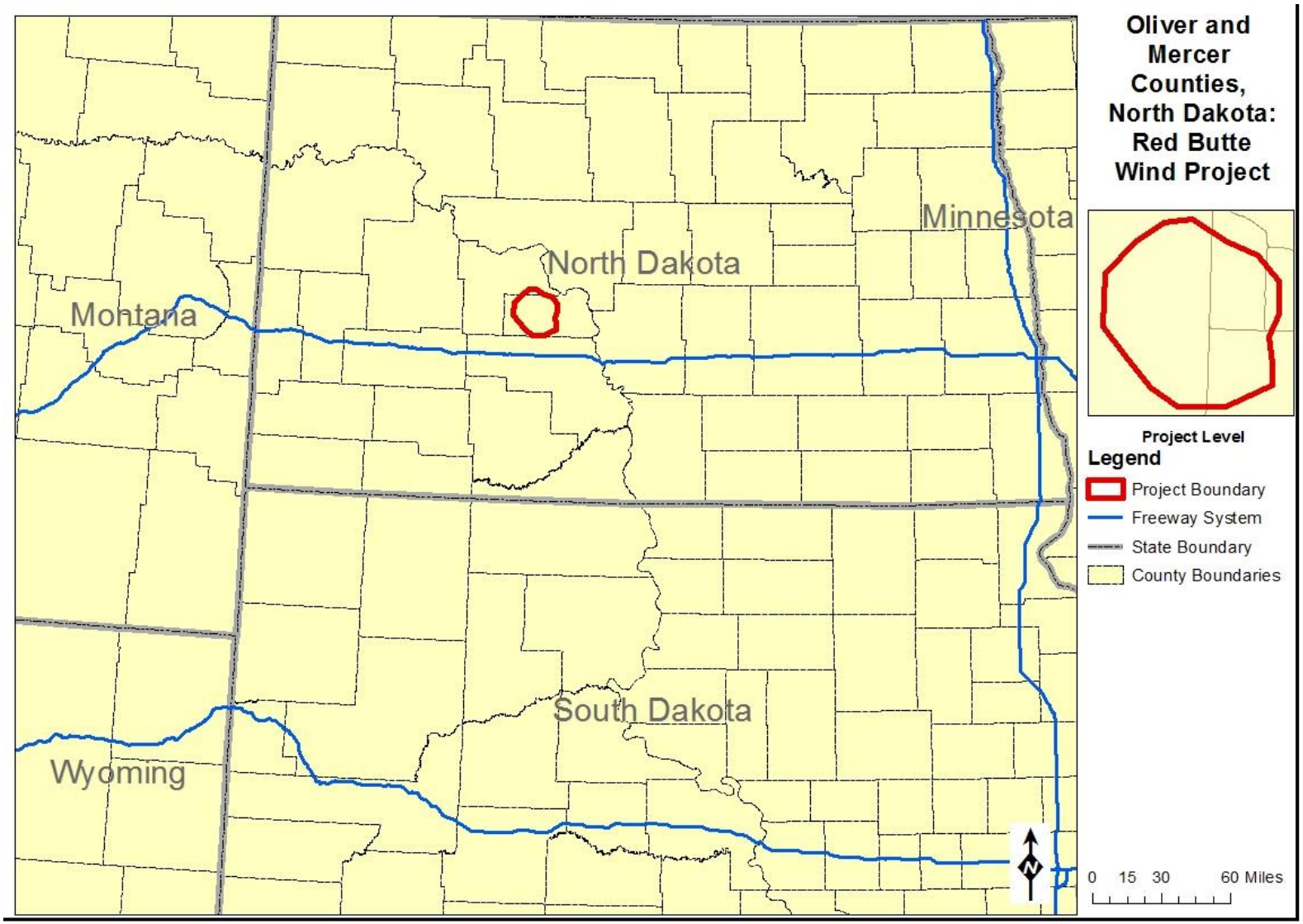


Figure 1: Location of the Red Butte Wind Energy Project

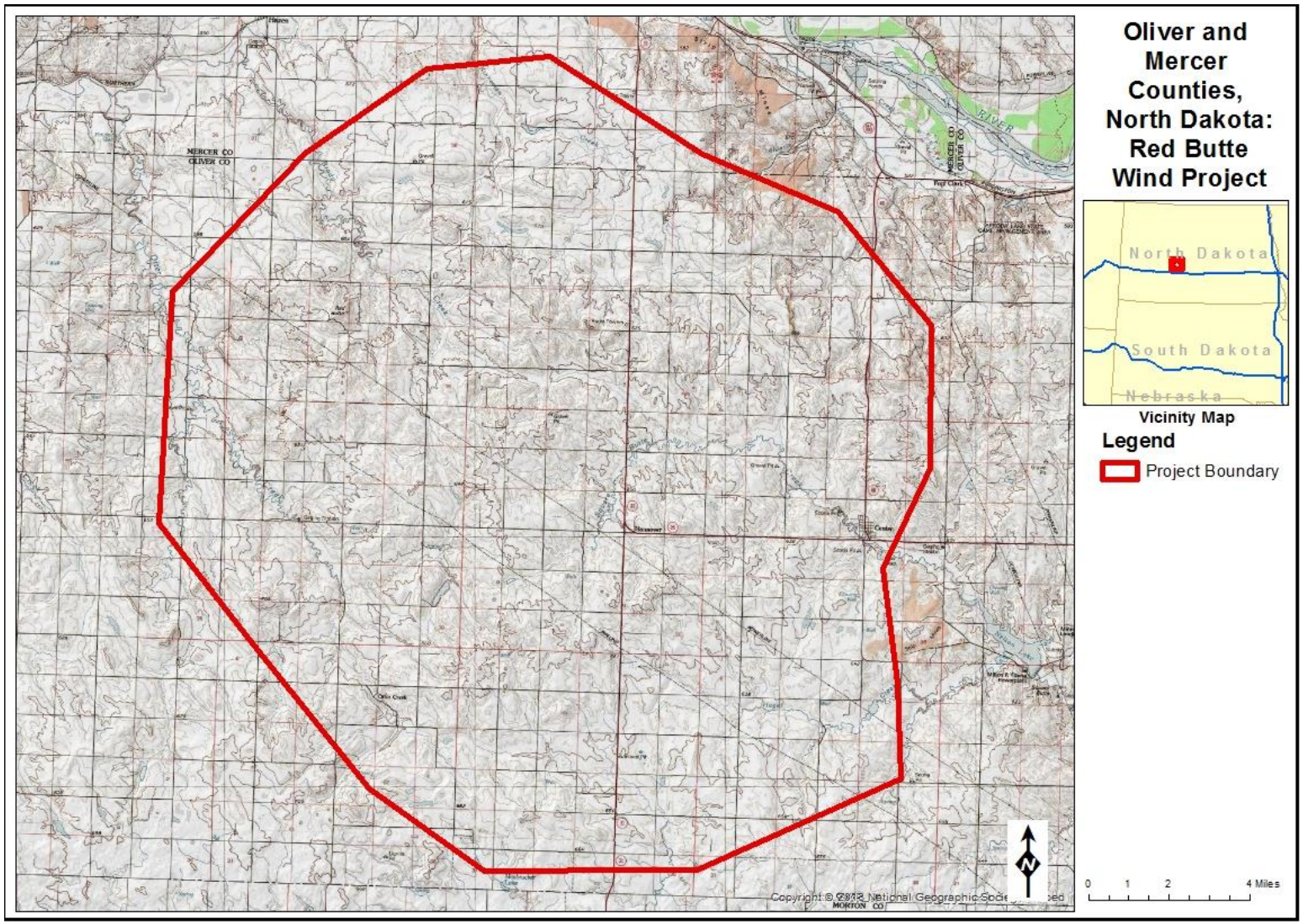


Figure 2: USGS map of the Red Butte Wind Energy Project

Identifier	Longitude	Latitude
1	101:28:25.75772W	47:16:53.61757N
2	101:23:27.50957W	47:14:53.95033N
3	101:19:09.57841W	47:13:44.68234N
4	101:16:04.38383W	47:11:20.63843N
5	101:15:59.02102W	47:08:15.59822N
6	101:17:22.97699W	47:06:05.24685N
7	101:16:48.39284W	47:03:36.78948N
8	101:16:37.50097W	47:01:33.57310N
9	101:20:40.28498W	47:00:13.08462N
10	101:22:57.35869W	46:59:27.54944N
11	101:24:23.71621W	46:59:25.74250N
12	101:29:39.02910W	46:59:17.70520N
13	101:33:21.85268W	47:00:59.50880N
14	101:37:10.62647W	47:03:59.48865N
15	101:40:17.09014W	47:06:33.32968N
16	101:40:05.73019W	47:11:33.17910N
17	101:36:02.05099W	47:14:38.79151N
18	101:32:17.42097W	47:16:32.79708N
19	101:28:25.75772W	47:16:53.61757N

Table 1: Project Boundary Coordinates (NAD83) of the Red Butte Wind Project Site

UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, D.C. 20230

May 19, 2022

James Brownlee
Senior Resource Modeling Analyst
NextEra Analytics, Inc.

Re: Red Butte Project, Revision 1: Oliver & Mercer Counties, ND

Dear Mr. Brownlee:

In response to your request on April 1, 2022, the National Telecommunications and Information Administration provided to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC) the plans for the Red Butte Wind Project, Revision 1, located in Oliver and Mercer Counties, North Dakota.

After a 45+ day period of review, one agency, the Department of Commerce, had minor issues with turbine placement in this area. Their comments are noted below:

Commerce has completed our review of the subject wind farm proposal and found the project area is over 48 km NW of the Bismarck, ND NEXRAD. It is within the notification zone of that radar. However, there will be low impact and only the lowest elevation angle will be contaminated. Further contact with the developer is requested only if the project area changes or the turbine heights increase by 10 meters or more.

While the other IRAC agencies did not identify any concerns regarding radio frequency blockage, this does not eliminate the need for the wind energy facilities to meet any other requirements specified by law related to these agencies. For example, this review by the IRAC does not eliminate any need that may exist to coordinate with the Federal Aviation Administration concerning flight obstruction.

Thank you for the opportunity to review this proposal.

Sincerely,

John R. McFall
Deputy Chief, Spectrum Services Division
Office of Spectrum Management

Appendix C17
National Park Service - Knife River Indian Villages National Historic Site

From: Todd, Brenda
To: Bender, Marcia
Cc: Adam Yarina
Subject: Re: [EXTERNAL] Red Butte Wind - Knife River Indian Villages NHS
Date: Monday, November 04, 2019 5:05:56 PM

Dear Marcia,

I am the Superintendent of Knife River Indian Villages NHS. I would be very happy to re-engage in consultation about this project.

How would you like to proceed? You are always welcome at our offices in Stanton.

I look forward to hearing more.

Thank you,
Brenda

On Wed, Oct 30, 2019 at 11:22 AM Yarina, Adam <adam_yarina@nps.gov> wrote:

> Here's what I received from the consultant at AECOM re Red Butte Wind. I'm around all this week to chat; my cube is on the second floor in the northeast corner of the building, near Bob Bryson and Carmen Thompson's offices.
>
> Best,
>
> Adam Yarina
> Regional Energy Specialist
> National Parks Service, Interior Region 3, 4, & 5
> Office: 402-661-1528
> adam_yarina@nps.gov
>
> ---------- Forwarded message ---------
> From: **Bender, Marcia** <marcia.bender@aecom.com>
> Date: Fri, Oct 18, 2019 at 1:03 PM
> Subject: [EXTERNAL] Red Butte Wind - Knife River Indian Villages NHS
> To: adam_yarina@nps.gov <adam_yarina@nps.gov>
>
> Hello Mr. Yarina,
>
> I received your contact information from the staff at Knife River Indian Villages (KRIV) near Stanton, North Dakota. I called and left you a voicemail regarding Red Butte Wind Energy Center (project). I'm Marcia Bender and I work for AECOM Technical Services (AECOM) in Bismarck. AECOM has been contracted by Red Butte Wind, LLC (Red Butte Wind) to continue the environmental studies needed to prepare an application for a Certificate of Site Compatibility for the proposed Red Butte Wind Energy Center in Olive County, North Dakota. The project is located approximately 5 miles west of the town of Center and approximately 5 miles south of the town of Stanton, in Oliver County. Red Butte Wind purchased this project from the original developer and is working toward finalizing the design for a new

application. AECOM completed a Class I: Literature Review for the project study area and are currently finishing our Class III: Intensive Cultural Resources Inventory and Traditional Cultural Properties (TCP) surveys, with interested tribes, among other environmental studies, in order to site the locations of wind turbines, access roads, a transmission line, and ancillary facilities for the project while minimizing impacts to natural and cultural resources.

On behalf of Red Butte Wind, AECOM would like to reengage the NPS regarding the project, due to its proximity to the Knife River Indian Villages (KRIV), near Stanton, North Dakota. In 2016, the North Dakota State Historic Preservation Office (SHPO) Chief Archaeologist had advised Red Butte Wind's consultants to confer with NPS about the project and KRIV once the project design was complete. Heidi Riddle was working with the previous consultant about getting the spatial data for the project that would be needed to conduct the visual analysis to at least determine if the project would be visible from the KRIV. It appears a meeting with NPS at Stanton to discuss the project was the last interaction. That is where my paper trail ends. At that time, NPS had requested that the consultant conduct a visual analysis from the KRIV toward the project, once the cultural resources studies were complete and the locations of all of the project facilities were locked in. AECOM would like to reengage NPS regarding this matter so we can continue these discussions. I can be reached at this email address or any of the phone numbers below. Thank you and I look forward to talking to you.

Best regards,

Marcia

Marcia L. Bender, MA, RPA
Principal Investigator

Archaeologist

Design and Consulting Services Group
M: 303-524-5121

D: 701-255-5501

O: 701-221-4140

marcia.bender@aecom.com

AECOM

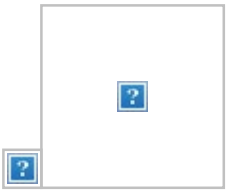
1000 E. Calgary Ave

Suite 1

Bismarck, ND 58503, United States

aecom.com

--
Brenda K. Todd, PhD
Superintendent, Knife River Indian Villages National Historic Site
564 County Road 37
Stanton, ND 58571
(office) (701) 745-3300
(cell) (701) 301-0166



From: Brown, Dina <Dina.Brown@nexteraenergy.com>
Sent: Saturday, September 2, 2023 4:14 PM
To: Lindsey Churchill
Cc: Dirk Churchill
Subject: EXTERNAL: FW: [EXTERNAL] RE: NextEra Oliver Wind IV follow up

CAUTION: This email originated from outside of Merjent.

From: Snyder, Natasha <Natasha.Snyder@nexteraenergy.com>
Sent: Tuesday, August 8, 2023 11:35 AM
To: Deegan, Alisha M. <alisha_deegan@nps.gov>
Cc: Brown, Dina <Dina.Brown@nexteraenergy.com>; Bender, Marcia L <mlbender@burnsmcd.com>; McCarthy, Melinda M <mmmccarthy@burnsmcd.com>; McEnaney, Marla J. <Marla_McEnaney@nps.gov>; Sanford, Dena L. <Dena_Sanford@nps.gov>; Schilling, Timothy M <Tim_Schilling@nps.gov>
Subject: RE: [EXTERNAL] RE: NextEra Oliver Wind IV follow up

Alisha – thank you so much for all this information!
(I was just thinking I needed to follow up on all this with you, so you read my mind.)

I did reach out to Andrew Clark at SHPO about the draft NHL nomination for Fort Clark.

Very kind regards,

N.

Natasha B. Snyder
Environmental Specialist
NextEra Energy Resources, LLC
Environmental Services (JES/JB)
700 Universe Boulevard
Juno Beach, Florida 33408
Mobile: (561) 427-9059
Natasha.Snyder@nexteraenergy.com

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From: Deegan, Alisha M. <alisha_deegan@nps.gov>
Sent: Tuesday, August 8, 2023 1:02 PM

To: Snyder, Natasha <Natasha.Snyder@nexteraenergy.com>
Cc: Brown, Dina <Dina.Brown@nexteraenergy.com>; Bender, Marcia L <mlbender@burnsmcd.com>; McCarthy, Melinda M <mmmccarthy@burnsmcd.com>; McEnaney, Marla J. <Marla_McEnaney@nps.gov>; Sanford, Dena L. <Dena_Sanford@nps.gov>; Schilling, Timothy M <Tim_Schilling@nps.gov>
Subject: Re: [EXTERNAL] RE: NextEra Oliver Wind IV follow up

Good Morning, Natasha,

In response to your request, we provide the following information and additional explanation.

The Big Hidatsa Village National Historic Landmark (NHL) and the 1989 National Register nominations are available online at National Archives NextGen Catalog.

The documents contain sensitive information; the NPS provides this for your reference. Please do not distribute the documents beyond staff participating in this project. The focus of both of these nominations is archeological. The NHL revision will propose an expanded boundary to include the collection of village sites in the KNRI area, and the cultural landscape. As we have discussed during our conference calls, the NPS concern about the proposed energy project is not just impacts to archeological sites, but to a cultural landscape that is significant to the Mandan Hidatsa and Arikara.

The Cultural Landscape Report is in draft form and has not been reviewed by all relevant parties nor approved. Because the document contains sensitive information, it is inappropriate to share the draft at this time. I am, however, providing an excerpt that addresses the significance of the site:

> "The landscape at Knife River Indian Villages is significant and sacred to the Hidatsa, Mandan, and Arikara peoples... "Landscape significance and periods of significance are derived from the significance statements listed in the Foundation Document for the NHS, completed in 2013. These significance statements encompass the themes and areas of significance established in the 1964 NHL nomination and a National Register of Historic Places nomination prepared in 1987 ...In addition to the significance identified in the Foundation Document, research conducted for this CLR has identified the cultural landscape at Knife River Indian

Villages as potentially eligible for listing in the National Register of Historic Places

as a Traditional Cultural Place (TCP)."

I am also summarizing important excerpts from the draft CLR, pages 3-37 and 3-61 that identify important viewsheds from within KNRI.

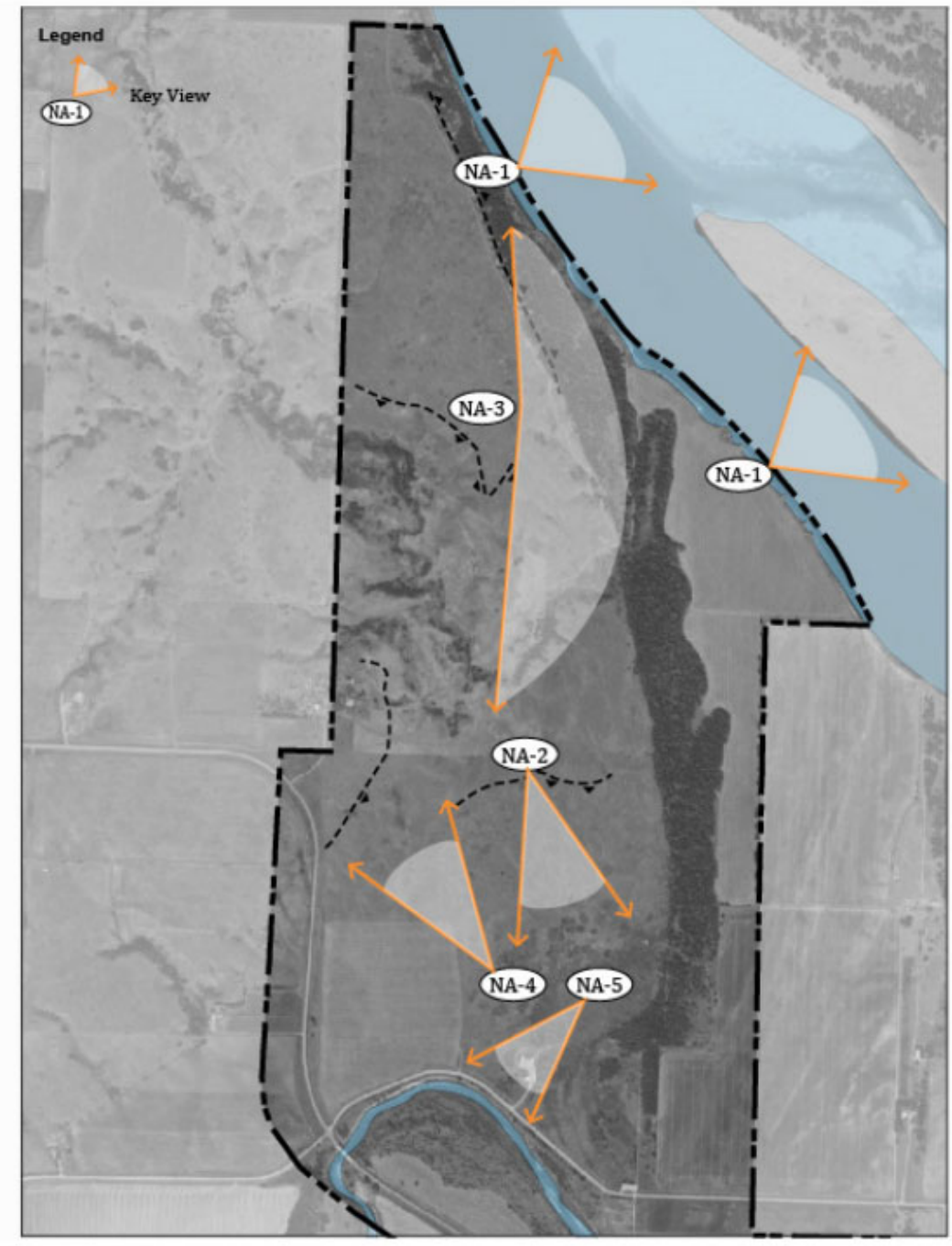


Figure 3-67. North
Views Diagram (QE, 2

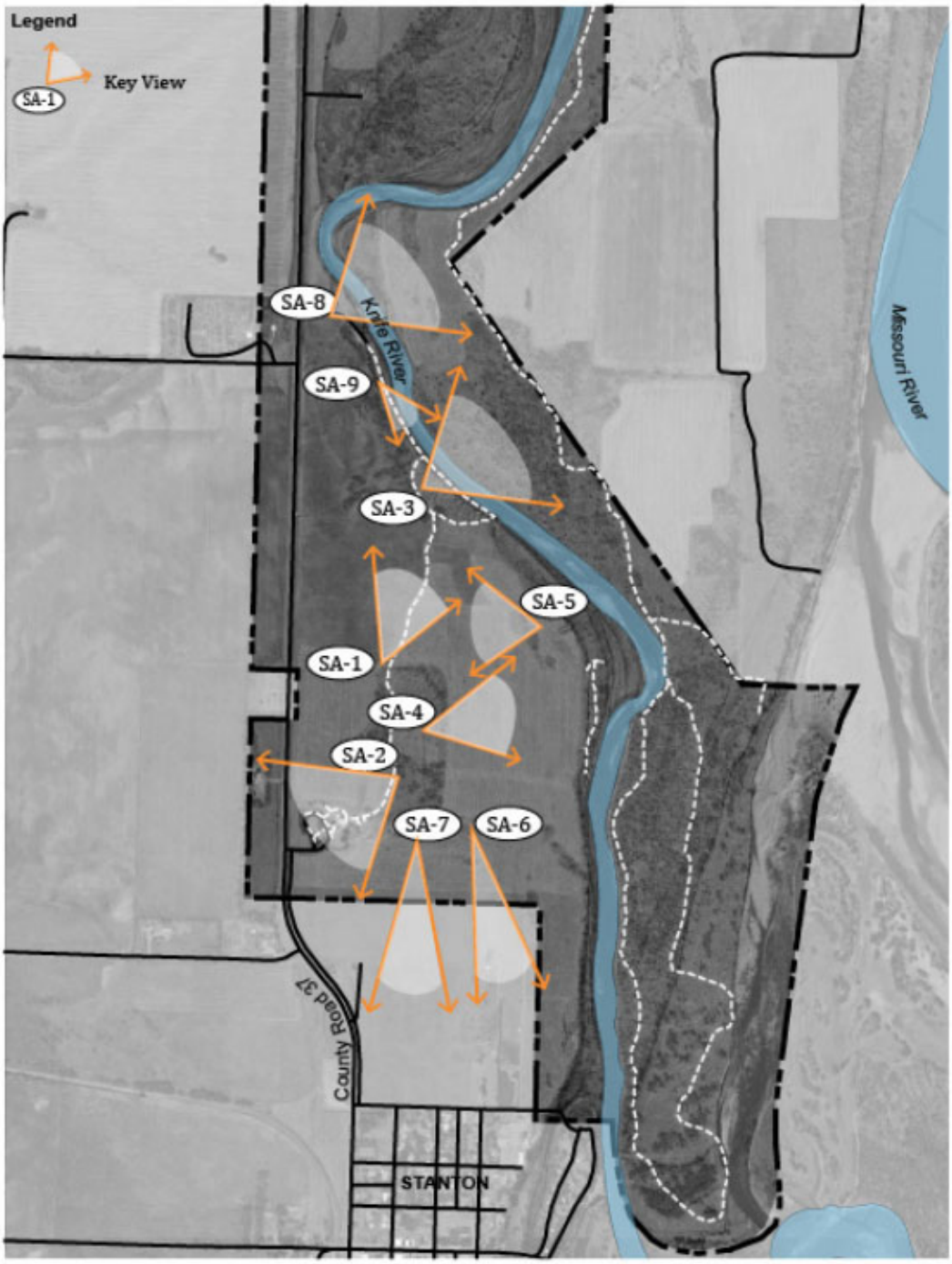


Figure 3-29. South
Views Diagram (QE, 2

As noted in the draft document, views are an important part of landscape character both within the park and from the park to external locations. Views of the natural landscape surrounding the villages within the NPS park boundary contribute to understanding the historic landscape. The draft CLR notes that views throughout the park are threatened by resource extraction and other types of development within the park's viewshed. Maintaining the integrity

of the viewshed as it currently exists, to the maximum extent possible, is therefore important to our organization.

While I cannot share the draft CLR at this time, the overarching significance of KNRI and its resources, and management and treatment needs are addressed in the June 2013 Foundation Document, which is attached for your reference.

The Fort Clark NHL nomination is in draft stage and is undergoing edits with the North Dakota State Historic Preservation Office. Please contact Andrew Clark with the North Dakota SHPO to determine if the draft document can be made available for your information.

Thank you,
Alisha

Alisha Deegan
Superintendent (Park Manager)
Knife River Indian Villages National Historic Site

Chair of Council of Indigenous Relevance Communication Leadership and Excellence (CIRCLE)

Hidatsa/Sahnish
She/Her

PO Box 9
564 County Road 37
Stanton, ND 58571

P:701-745-3300 ext 1202
C:701-301-0467

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From: Snyder, Natasha <Natasha.Snyder@nexteraenergy.com>
Sent: Tuesday, July 18, 2023 3:31 PM
To: Deegan, Alisha M. <alisha_deegan@nps.gov>; dena_sanford@nps.com <dena_sanford@nps.com>
Cc: Brown, Dina <Dina.Brown@nexteraenergy.com>; Bender, Marcia L <mlbender@burnsmcd.com>; McCarthy, Melinda M <mmmccarthy@burnsmcd.com>
Subject: [EXTERNAL] RE: NextEra Oliver Wind IV follow up

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Good afternoon, Superintendent Deegan.

I am following up on our call on Thursday, July 6, 2023 about the NextEra Oliver Wind IV project with National Park Service (NPS) staff, the NextEra project team, and our cultural resources contractor staff from Burns & McDonnell. NextEra greatly appreciates the time and expertise of all the NPS staff participating in the call and looks forward to addressing NPS' comments.
(I know that in addition to Ms Sanford, Mary Kreuger, Jim Schilling, and Brian Curran [sp?] were also on the call, but I do not have their emails – please forward as appropriate.]

On the call, NPS staff expressed concerns about potential visual impacts of the project on the setting of three specific resources:

- the Knife River Indian Villages National Historic Site (KRIV);
- the National Historic Landmark (NHL) within the KRIV; and.
- Fort Clark, a State Park with associated TCPs that is being considered for designation as an NHL.

When discussing concerns for the KRIV, NPS staff mentioned that there is a draft Cultural Landscape for the KRIV.

- I am respectfully asking if a copy of the draft report could be made available to us so that we could understand the significance of the cultural landscape to the KRIV NHS?
- If there is a KRIV management plan or similar type of comprehensive/planning document that addresses cultural resources in general that would be helpful as well.

With regard to the NHL at the KRIV, I am unable to find a copy of the KRIV NHL nomination form in the NPS' NHL database (possibly because of its archaeological associations?).

- I am respectfully asking if a copy of the KRIV NHL nomination form could also be made available to us so that we could understand the significance of setting to this NHL.

With regard to Fort Clark, there is information online for the state park and we will be able to contact ND SHPO for as much information for TCPs that can be disclosed, but the draft NHL nomination would not be available in the NPS' NHL database and I do not know who is preparing it (e.g., NPS Midwestern Regional Office, ND SHPO, etc.).

- I am not sure that KRIV is involved in the preparation of the draft NHL nomination for Fort Clark, so I am respectfully requesting confirmation that Jim Schilling at NPS Midwestern Regional office is the appropriate NPS staff to contact.

I understand from KRIV staff that you are on vacation this week.
I will be in the field or on vacation next week myself (including 3 days in a remote setting with no internet/cell phone access).

Hopefully we can coordinate via email.
In the event that I am not immediately available, Dina Brown (my Dina; the NextEra Environmental Permitting Lead) and Marcia Bender and Melinda McCarthy (Burns & McDonnell, our cultural resources contractors) are cc'd to facilitate receiving the information and/or following up with anyone else.

Thank you very much in advance for your assistance with my inquiries.
I look forward to hearing from you as soon as you are available.

Kindest regards,

N.

P.S., In the event that there are concerns for access to confidential information, I have attached my CV for your records.

Natasha B. Snyder
Environmental Specialist
NextEra Energy Resources, LLC
Environmental Services (JES/JB)
700 Universe Boulevard
Juno Beach, Florida 33408
Mobile: (561) 427-9059
Natasha.Snyder@nexteraenergy.com



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Appendix C18
North Dakota Game and Fish Department and United States Fish and Wildlife Service

Red Butte Wind Energy Center
Wildlife Agency Meeting

Date: 18 July 2018
Time: 13:00 – 15:00h
Location: North Dakota Game and Fish Department, 100 N. Bismarck Expressway, Bismarck, ND 58501. Call in number for USFWS: (305) 552-3001 access number 49701129.

AGENDA

1) Sign-in sheet
2) Introductions
3) Red Butte Wind Energy Center (Project) information
   a. Project originally developed by PRC Wind starting in 2016. Further developments conducted by Tenaska in 2018. NextEra purchased and will complete development and permitting.
   b. Wind project area to be determined
   c. Planned for 200 MW, approximately 75 turbines
   d. PSC application anticipated submission November 2019
   e. Anticipated construction start date in Q2 2020 with Commercial Operation by December 2020
4) Discussion items
   a. Previous meetings with USFWS and NDGFD
      i. Study plan development/review and data sharing in 2016
      ii. Meetings in 2017 to review Tier 2 and 3 study results
      iii. Meeting in 2018 to discuss additional Dakota skipper habitat surveys
   b. Studies completed prior to and discussed with agency by previous Project proponents
      i. WEG Tier 1 and 2 Studies: Critical Issue Analyses and Desktop Studies – desktop review of existing data from North Dakota Parks and Recreation Department (NDPRD) Natural Heritage Inventory (NHI) GIS data, U.S. Fish and Wildlife Service (USFWS) Information, Planning, and Conservation System (IPaC) federally listed species, North Dakota Game and Fish (NDGF) Wildlife Management Areas (WMAs), NDGF Private Land Open to Sportsman (PLOTS) land, USFWS Natural Wildlife Refuges and Waterfowl Production Areas (WPAs), Audubon Society Important Bird Areas (IBAs), North American Breeding Bird Survey (BBS) data, National Wetland Inventory (NWI) maps, and other readily available databases, public records, GIS data, and websites.

         Conclusion based on layout in 2016 was that additional information was needed to better define potential impacts for avoidance and minimization. Moved to conducting Tier 3 studies.

      ii. WEG Tier 3 Wildlife Surveys Previously Conducted and Discussed with Agencies

         1. 2016 Spring/Summer/Fall avian point-count surveys
            a. 35 points in spring within larger survey area, 26 points in summer and fall. Each point surveyed for 5 minutes.
            b. 45.5 survey hours. Most common were red-winged blackbirds, cowbirds, Canada geese, western meadowlark, and cliff swallow. Species of concern identified included marbled godwit, upland sandpiper, western meadowlark, chestnut collared longspur, bobolink, grasshopper sparrow, Swainson's hawk, and northern harrier.
            c. Use rates variable across Project but generally higher in southern portion.

2. 2016 Spring/Summer/Fall Eagle point-count surveys
    a. 24 points surveyed in spring within larger survey area then reduced to 16 points. Each point surveyed for 1-2 hours once per month. 224 hours of survey.
    b. 2 adult bald eagles observed during surveys, both flying > 200 m above ground.
3. 2016-2017 Aerial raptor nest surveys (including bald and eagle nests)
    a. Conducted from helicopter, out to 10 miles for eagle nests.
    b. Limited number of non-eagle nests found within survey area.
    c. 10+ active bald eagle nests within 10 mile survey area.
    d. Most bald eagle nests to the east along the Missouri River, more than 7 miles from the survey area.
4. 2016 Grassland breeding bird surveys
    a. 247 point count locations along transects spaced more than 200 m apart. Surveys conducted 4 times in May/June.
    b. 75 species recorded. Most common species included western meadowlark, brown headed cowbird, red-winged blackbird, bobolink, horned lark, savannah sparrow, and clay-colored sparrow. Special status species observed included dickcissel, chestnut-collared longspur, lark bunting, bobolink, Sprague's pipit, Baird's sparrow, grasshopper sparrow, golden eagle, northern harrier, Swainson's hawk, sharp-tailed grouse, marbled godwit, upland sandpiper, and Franklin's gull.
5. General bat acoustic study
    a. Three paired stations, one microphone at 5 m and other approximately 45 m AGL. Surveys completed from May to November.
    b. Generally low bat use at all three stations and at both heights, passage rates varied from 0.66 ± 0.16 to 2.57 ± 0.54 bat passes/night. Activity was highest from late July to September.
    c. Most calls were from low frequency species (e.g., hoary bat, silver haired bat). Calls from three species of conservation priority were potentially identified: big brown, little brown, and northern long-eared bat. As only two calls were identified as northern long-eared bat, it is questionable as to if these were actually NLEB given difficulty in distinguishing from eastern red bats in open landscapes.
6. Native prairie evaluation
    a. A native prairie evaluation was conducted to identify potential native prairie areas. Four levels of vegetation quality were assigned to each parcel: poor, fair, good, and excellent. A total of approximately 43.2% of the Study Area classified as poor-excellent native prairie.
7. Whooping crane likelihood of occurrence report
    a. Project is within overall whooping crane migration corridor.
    b. Given Project characteristics (e.g., generally dry) determined that whooping cranes had a low likelihood of occurrence.
8. Sharp-tailed grouse lek survey
    a. One survey conducted concurrently with aerial raptor nesting surveys. Additional ground surveys were conducted by vehicle along all accessible roads.
    b. Six leks were documented.

c. Agency Comments Received

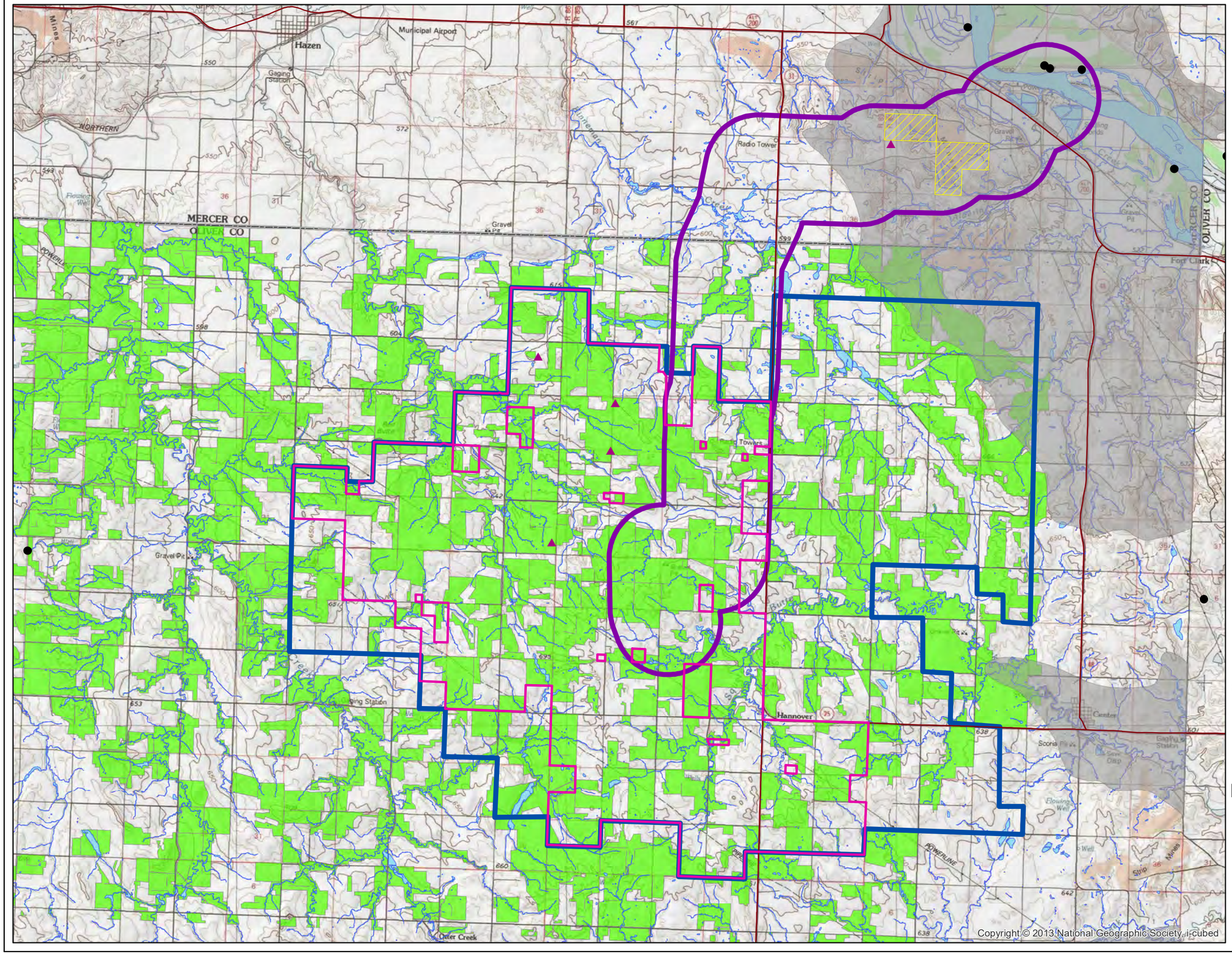
i. Concern regarding impacts to native grasslands and wetlands, attempt to avoid impacts was recommended.
ii. Discussion of voluntary offsets for direct and indirect impacts to grasslands and wetlands where avoidance was not possible.
iii. Request for additional Dakota skipper habitat evaluations.

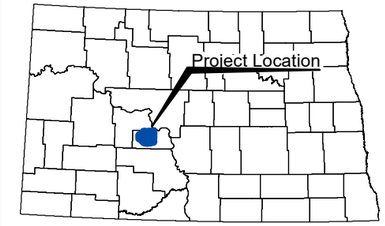
d. Additional Studies Completed or Planned Since 2018
   i. Dakota skipper habitat evaluation
      1. One historic observation of DASK in county from 1990's, 10+ miles to east along Missouri River.
      2. USFWS indicated considers species extirpated from county.
      3. Additional habitat evaluation within high quality native prairie conducted for potential DASK habitat. One area found to contain prairie constituent elements for reproductive habitat of needed grasses and forbs.
      4. Was the DASK report provided?
   ii. 2019 sharp-tailed grouse lek survey
      1. Partial survey due to timing and weather. One ground survey of accessible roads plus check of leks found previously. One aerial survey completed.
      2. Two confirmed leks and three probable leks located.
   iii. Eagle/Avian use surveys
      1. Large Project area being surveyed. 64 points, surveyed for one hour per month, for one year planned.
      2. Surveys started in June 2019.
   iv. Wetland and waterbody delineations – Field surveys planned for 2019.
   v. Grassland/DASK habitat assessment – Desktop and field verification for unbroken grassland and potential DASK habitat, ongoing in 2019.
   vi. NLEB presence/absence surveys – Combination of acoustic and mist-netting planned, as approved by USFWS survey protocols. Surveys planned for late July/early August 2019.
   vii. Whooping crane habitat assessment – Desktop comparison of current Project area and reference areas to evaluate relative habitat quality of Project to region.
   viii. 2020 eagle nest survey
   ix. 2020 sharp-tailed grouse lek survey – Full aerial survey planned.
   x. Wildlife Conservation Strategy – To be developed following USFWS WEG.

5) Agency Input
   a. Leks
   b. WMAs
   c. Consideration and process for voluntary offsetting measures
6) Action Items / Next Steps

ATTACHMENTS

- Overview Map





Legend

- County Boundary
- 2017 Project Area
- Preliminary Project Boundary
- Preliminary Transmission Line Corridor

Environmental Constraints:

- Bald Eage Nest
- 2019 Lek
- National Wetlands Inventory
- SWAP Focus Area
- Unbroken Grassland*
- Wildlife Management Area

* Unbroken grassland analysis not completed for Transmission line corridor

0 1 2 4 Miles

Red Butte Wind Energy Center Mercer and Oliver Counties, North Dakota

N W E S

AECOM

Red Butte Wind Energy Center
Wildlife Agency Meeting Notes

Date: 18 July 2018
Time: 13:00 – 15:00h
Location: North Dakota Game and Fish Department, 100 N. Bismarck Expressway, Bismarck, ND 58501.

Attendees (in person):
Steve Dyke (NDGF)
Sandy Johnson (NDGF)
Dustin Jones (NEER)
Clay Cameron (NEER)
Clayton Derby (WEST)
Lindsey Churchill (AECOM)

Attendees (via phone):
Natalie Gates (USFWS)
Jeffrey Bryce (NEER)
Trey Hadley (NEER)

1) Dustin introduced Project and gave an overview of studies completed by previous developer and studies to be completed by NEER.
2) NEER discussed intent to avoid siting infrastructure on unbroken grasslands to the extent possible by other exclusion/avoidance areas and constraints.
    a. Map provided of desktop unbroken grassland analysis completed by AECOM.
3) Sandy requested Whooping Crane and avian reports be updated using Neal Niemuth's models for whooping cranes and breeding birds.
    a. Sandy provided example model maps for chestnut-collared longspur, Baird's sparrow, Sprague's pipit, upland sandpiper, and grasshopper sparrow.
4) Sandy provided large map of NDGF lek data.
    a. NDGF stressed that the Red Butte Project area is not entirely covered by NDGF lek data due to limits of lek census blocks. NEER expressed their understanding of the data limitations and would ensure data is accurately presented if NDGF chooses to share.
    b. Additional surveys will still need to be completed for leks to supplement data.
    c. Currently in low cycle for grouse populations; avoiding unbroken grassland is best way to avoid lek impacts.
    d. Sandy provided lek survey methods from Jesse Kolar and NDGF Draft Guidelines.
5) Discussed if transmission line can span Wildlife Management Areas (WMAs)
    a. NDGF – unknown, will depend on how the WMA is owned/purchased.
6) Discussed new North Dakota Century Code rules
    a. Comments from Agencies required 30 days before the scheduled PSC hearing date
    b. Agencies would like to receive reports and other documents for which they are expected to review or comment 75 or more days before this date
7) Action Items / Next Steps
    a. NEER to provide previous reports and summary of prior agency correspondence
    b. WEST to integrate Neal Niemuth's models into updated reports
    c. NDGF to investigate WMA restrictions and ownership type for the transmission line

d. NEER to schedule follow-up meeting following turbine micrositing and survey and provide post-microsited turbine array; NEER will share new/updated wildlife reports as they are available for agency review

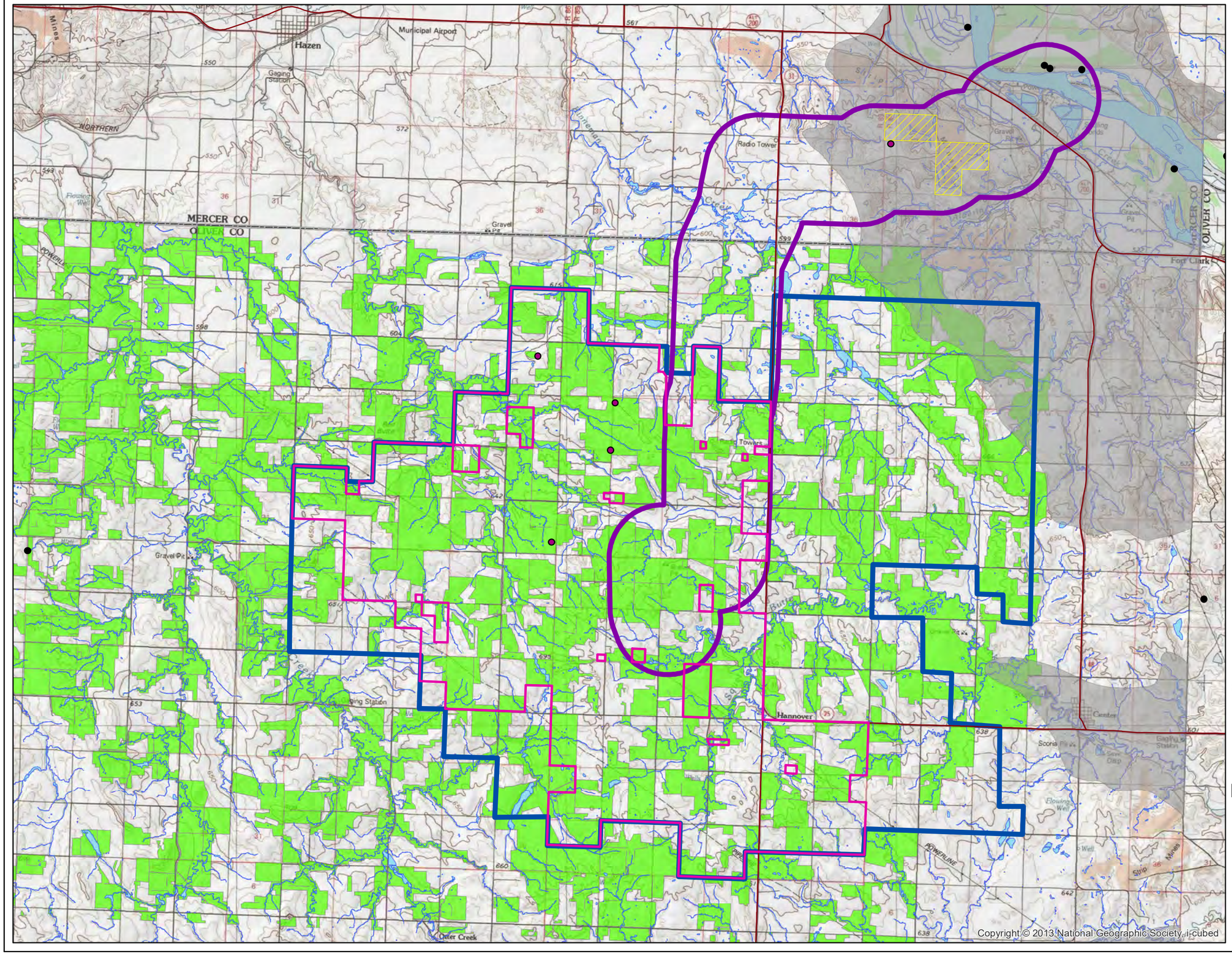
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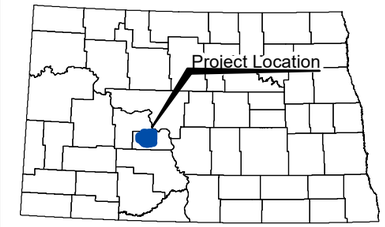
NEER Unbroken Grassland Map

Grassland Breeding Bird Model Maps

NDGF Lek Map

NDGF Lek Survey Methods





Legend

- County Boundary
- 2017 Project Area
- Preliminary Project Boundary
- Preliminary Transmission Line Corridor

Environmental Constraints:

- Bald Eage Nest
- 2019 Lek
- National Wetlands Inventory
- SWAP Focus Area
- Unbroken Grassland*
- Wildlife Management Area

* Unbroken grassland analysis not completed for Transmission line corridor

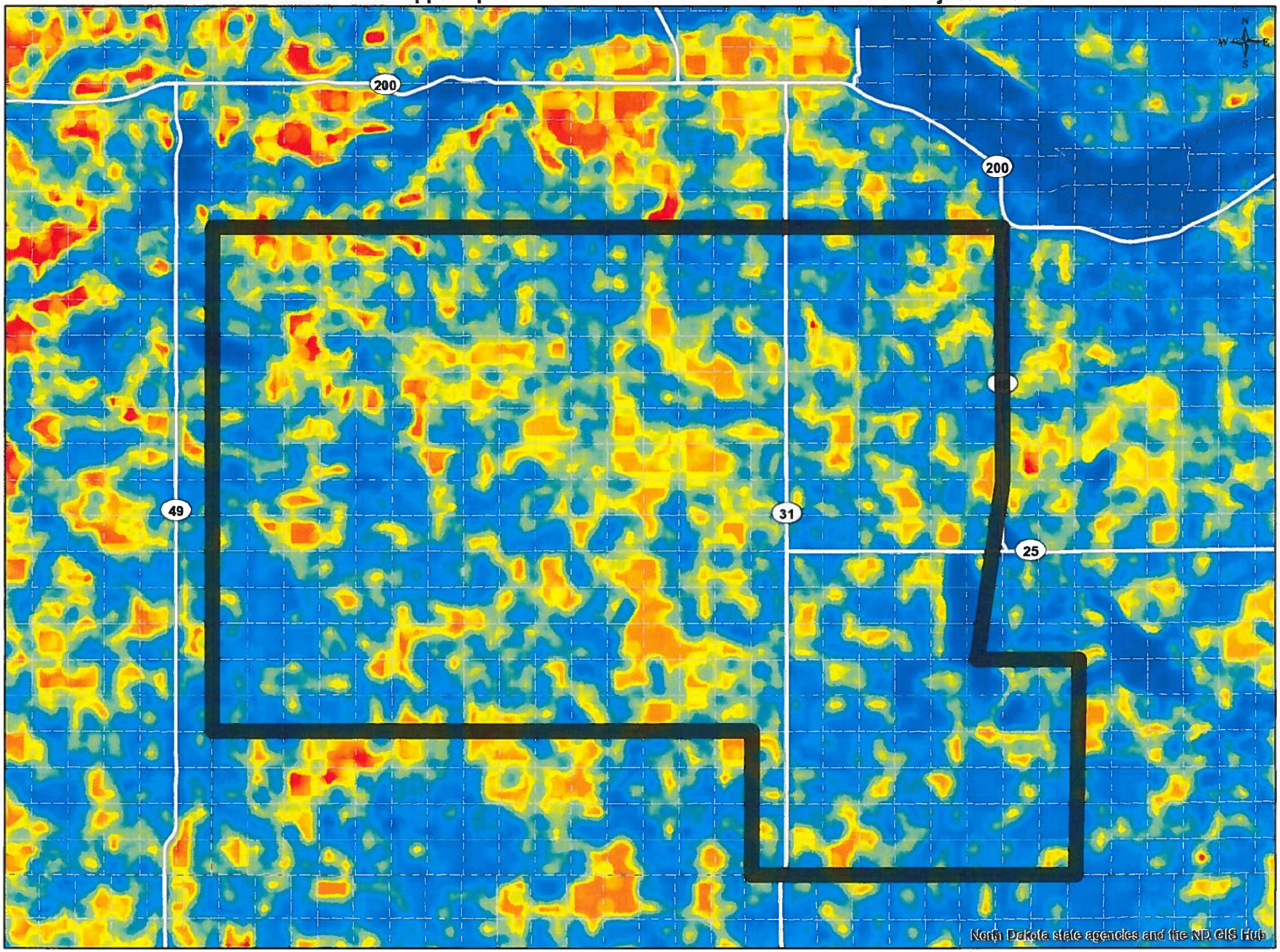
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Red Butte Wind Energy Center Mercer and Oliver Counties, North Dakota

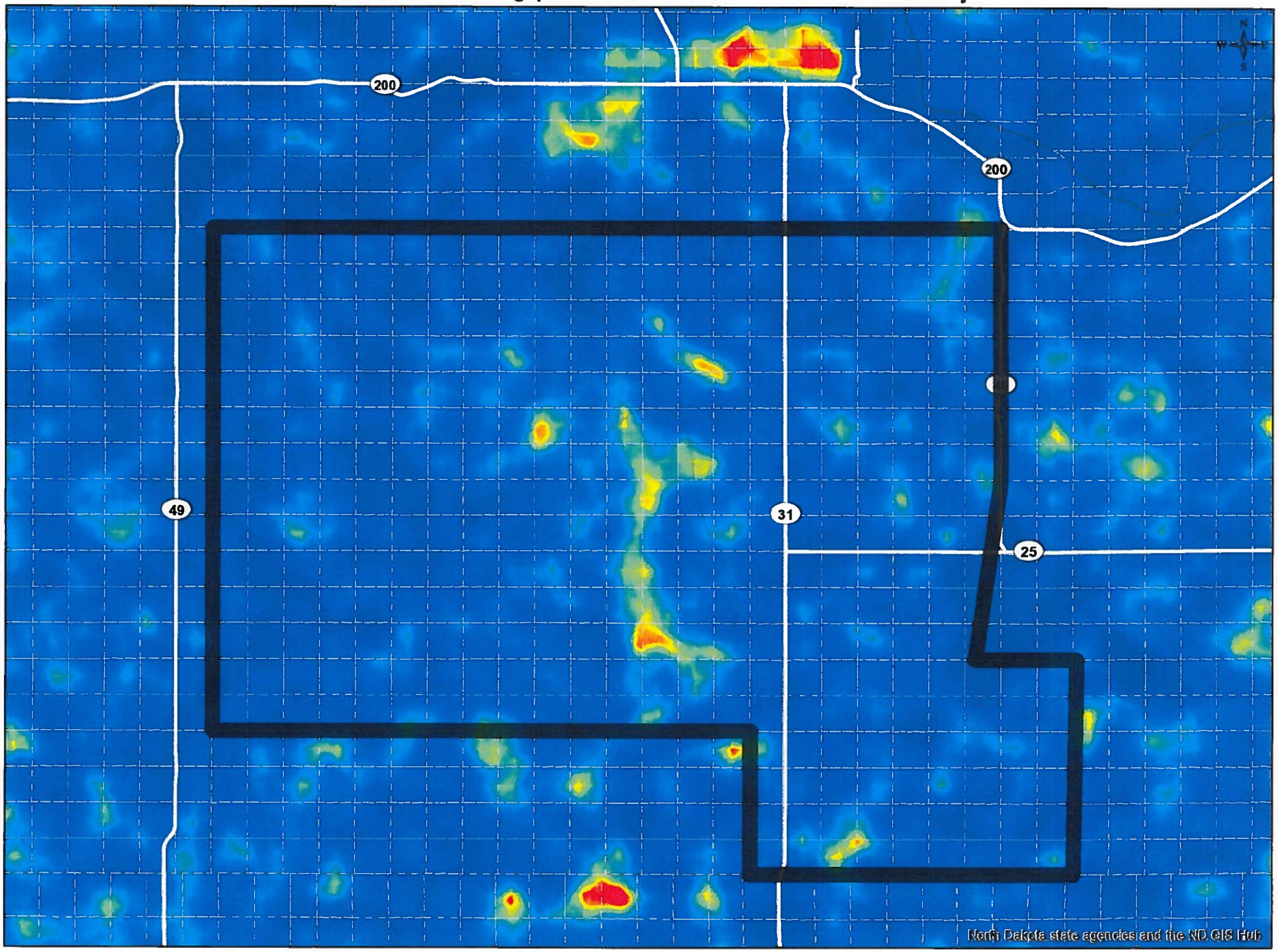
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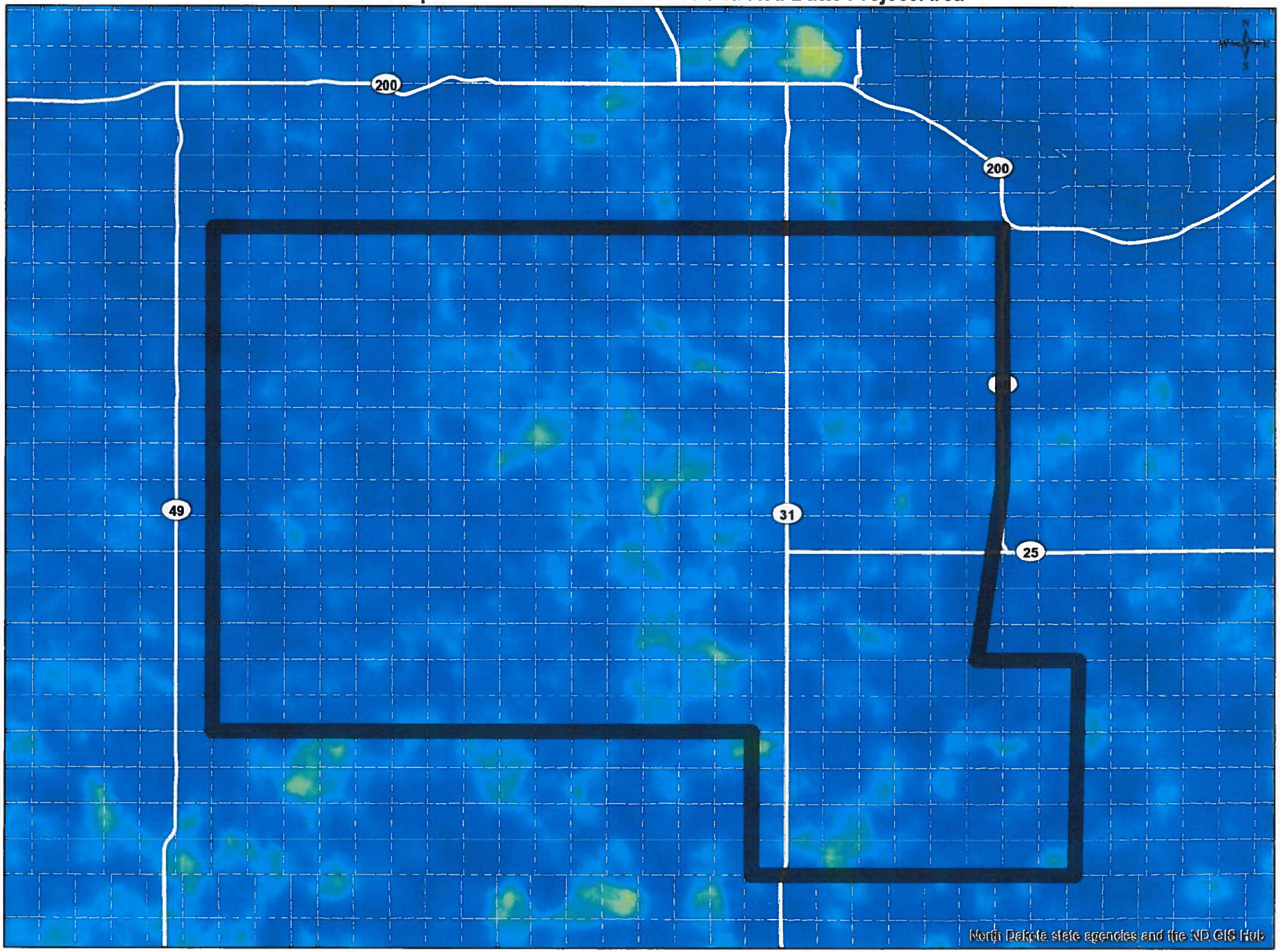
Grasshopper Sparrow Predicted Occurrence and Red Butte Project Area



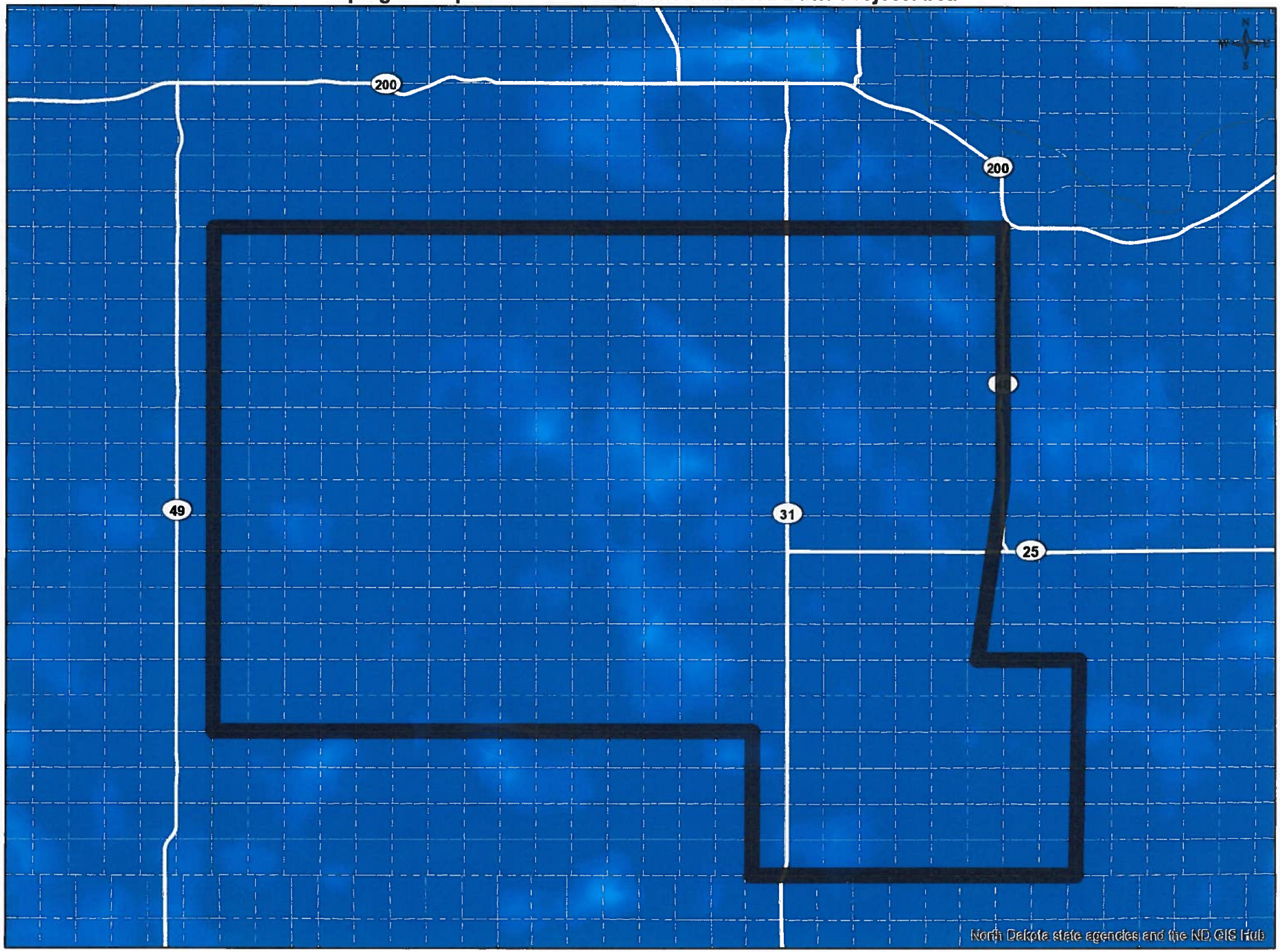
Chestnut-collared Longspur Predicted Occurrence and Red Butte Project Area



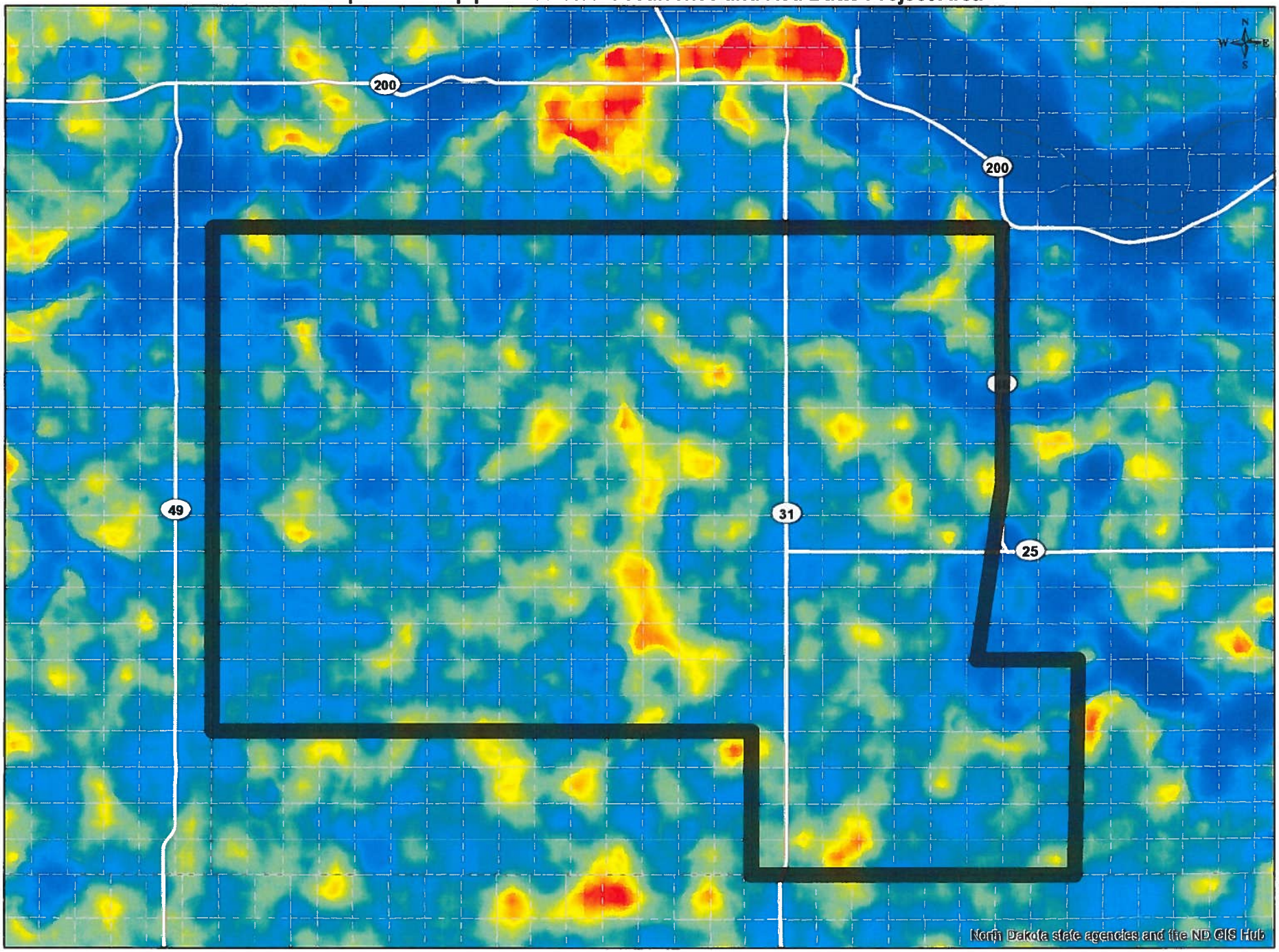
Baird's Sparrow Predicted Occurrence and Red Butte Project Area

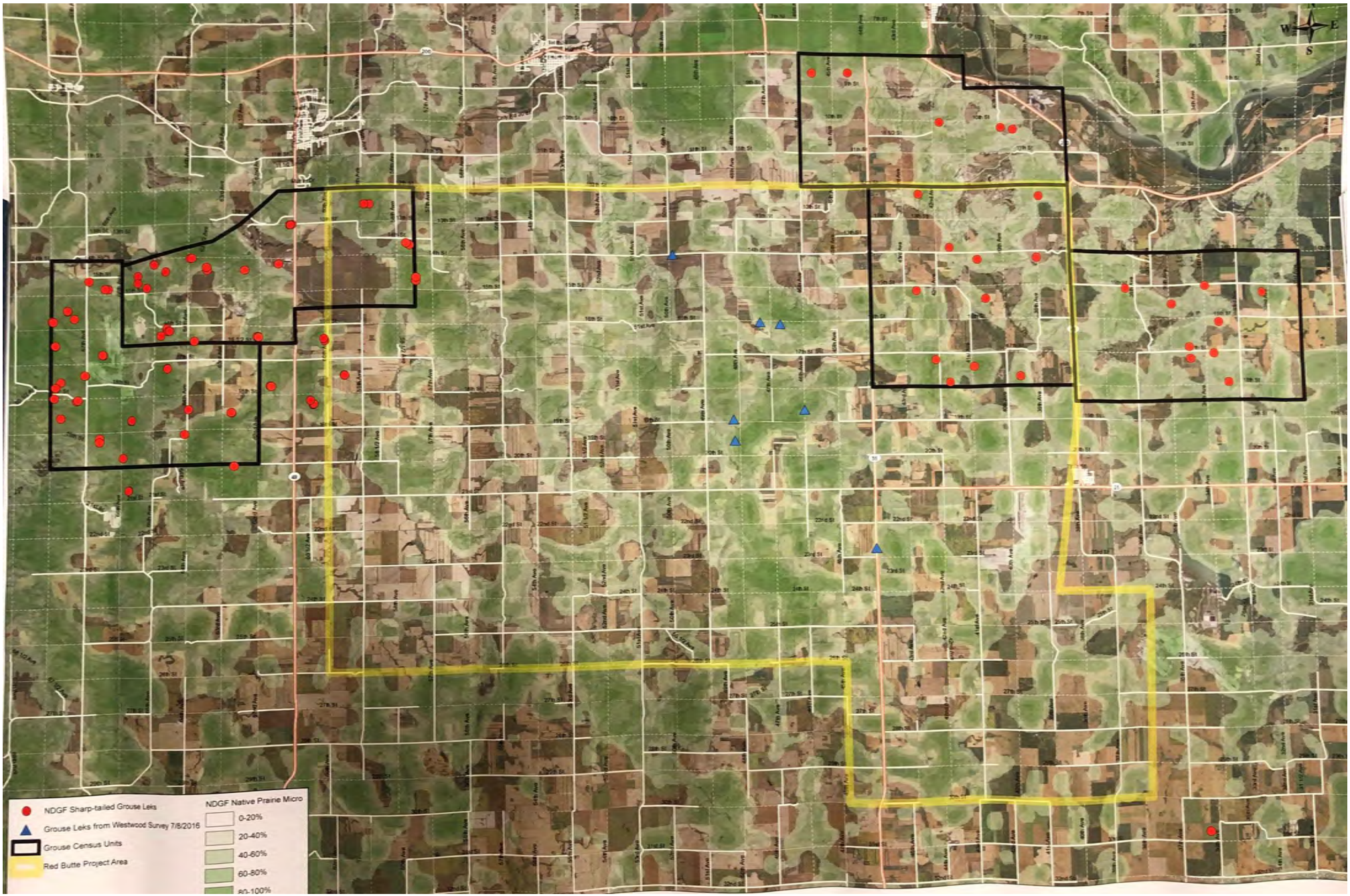


Sprague's Pipit Predicted Occurrence and Red Butte Project Area



Upland Sandpiper Predicted Occurrence and Red Butte Project Area




NDGF Sharp-tailed Grouse Leks
Grouse Leks from Westwood Survey 7/8/2016
Grouse Census Units
Red Butte Project Area
NDGF Native Prairie Micro
0-20%
20-40%
40-60%
60-80%
80-100%
W
E
S

Message from Jesse Kolar, NDGF Upland Game Supervisor

We've attached our protocols; however, these might not be appropriate for detecting presence/absence of sharptail grouse leks. The North Dakota Game and Fish Department conducts surveys on established survey blocks to monitor population trends. (Also, we extrapolate our population trends from small survey blocks; we do not survey the entire state.) Note the grouse census protocol were written for NDGF internal guidance, not for consultants. They're not written to search new areas for leks, but to monitor existing survey blocks. They work for us because we have a good idea where the leks have been historically.

Leks are variable over time (in size and location), so to survey for lek presence/absence, it would take multiple years. We do not use data from our surveys until they have been conducted for a minimum of 5 years. A more thorough protocol would be required to determine presence/absence of a lek for a given land parcel (e.g. 2-3 years with repeated (at least 3x) listening runs per parcel (the protocols for listening runs are in the first section of our survey protocol (attached).

Currently the sharptail grouse population is in a low cycle, so many historic leks might not be active, or have few, hardly-displaying males (and hence be hard to detect). However, even if leks disappear for a few years during low population cycles, the grouse often reappear at the same spot when the population rebounds. Thus, even a thorough search of an area during a low cycle in the population should carry the caveat that leks may be present when the population is higher.

North Dakota Game & Fish Department Prairie Grouse Census Protocols

I. Listening runs/locating grounds

Dates: 15 Mar - 30 Apr (extend up to 15 May during years with late spring).
Listening runs can begin in spring as soon as travel conditions permit. There are a limited number of "good" mornings so start as early as possible. ("Good" is defined in Conditions below.)

Peak of attendance by females on grounds in North Dakota is usually 15-25 April but may vary up to a week depending on weather.

Time: 30 minutes before sunrise to 1 hour after sunrise. Use a sunrise table to determine local sunrise times. Grouse activity begins about 45 minutes before sunrise and continues for up to 2 hours after sunrise. Monitoring can continue to 2 hours after sunrise, but routes should be run so that no area is repeatedly monitored >1 hour after sunrise.

Conditions:

Wind - Low wind speeds (<10 mph). Wind (<10 mph) normally does not affect counts, but winds > 5 mph limit the ability to hear grouse. If the winds are less than 5 mph, please do not spend time counting, and instead try to make as many listening stops as possible to locate grounds. (Counts can be completed on poorer mornings—winds up to 20 mph—or up to 2 hours after sunrise.)

Precipitation - no precipitation. Grouse are often inactive while it is raining or snowing.

Sky - Visibility > 5 miles. Cloud cover does not affect counts, but fog limits the ability to detect grouse.

Temperature - Temperature does not affect counts.

Ground - Use care to avoid muddy conditions, particularly if your travel is on private land.

Protocol:

1. Stop within ½ mile of every point in a census block. Plot your travel and listening stops on a map each day to see that the census area is monitored thoroughly.
2. Turn off engine and walk at least 30 feet from your vehicle to avoid interference of cooling noises, etc., from the vehicle.
3. Listen for 3-5 minutes per stop. Grouse activity is not continuous and sometimes wind or interference necessitates longer listening periods.
4. While listening, use binoculars to glass surrounding terrain. When prairie grouse are dancing their white tails are often visible and easily seen from a distance, providing the vegetation is not too tall. Even in tall vegetation grouse often "flutter jump" about 5 feet into the air which can help locate grounds.
5. Knolls and flats are likely areas to search for grounds but grounds can be anywhere (even summer fallow), so do not neglect areas simply because they are not "grouse habitat."
6. Grouse ordinarily use the same courtship grounds each year but move on occasion. Listening runs are necessary *EVERY* year (both to locate grounds that moved or are newly established).
7. Listening runs may be supplemented by monitoring during the last 2 hours before sunset. Grouse are occasionally active then, but attendance is generally lower (counts must only be made during mornings).
8. Aerial surveys can also help locate grounds but are not recommended for thoroughly locating grounds, nor for counts.

II. Counts

Dates: 01 Apr - 30 Apr (may extend to 15 May during years with late spring).

Peak of attendance by females on grounds in North Dakota is usually 15-25 April but may vary up to a week depending on weather.

Time: 30 minutes before sunrise to 2 hours after sunrise. Additional counts can be made as long as grouse are active on grounds. Use a sunrise table to determine local sunrise times. Grouse activity begins about 45 minutes before sunrise and continues for up to 2 hours after sunrise. Counts can continue to 2 hours after sunrise, but routes should be run so that no area is repeatedly monitored >1 hour after sunrise.

Conditions:

Wind - Wind speeds <20 mph).
If the winds are less than 5 mph, please do not spend time counting, and instead try to make as many listening stops as possible to locate grounds. (Counts can be completed on poorer mornings—winds up to 20 mph—or up to 2 hours after sunrise.)

Precipitation - no precipitation. Grouse are often inactive while it is raining or snowing.

Sky - Visibility > 5 miles. Cloud cover does not affect counts, but fog limits the ability to detect grouse.

Temperature - Temperature does not affect counts.

Ground - Use care to avoid muddy conditions, particularly if your travel is on private land.

Protocol:

1. Approach the ground slowly with your vehicle. Grouse will flush when approached on foot but normally will allow a close approach with a vehicle. Use the closest vantage point to the ground to count from, which normally means a spot higher than the breeding ground. This may not always be possible but certainly is the ideal and preferred situation.
2. Use binoculars (or a spotting scope); they are essential for a good count.
3. Classify and count all males and females on each ground. Our census was designed around accurate counts of males. The main objective is to get an accurate count of males. Count of females is desired but not critical. We use the number of females on grounds to determine when peak of breeding is, but not for population estimates. If you do not get an accurate count of females that is ok.
    a. If the ground has birds actively displaying, those actively displaying birds are males. Display activity is sporadic, but males frequently display and stop as a group. It is easier to count males while they are actively dancing, not while the ground is at a halt.
    b. Pan across the ground and count males while they are dancing, when they stop, you stop but hold your place and when activity resumes your count can resume also. Continue until you have covered the entire ground and you have a count of all males.
    c. *Classification tips.* If dancing activity is vigorous but not all are dancing, then you have to determine which non-dancers are male and female. This may take some time and involve several counts.
        i. *Males.* Only males have yellow eye combs (usually evident in spring and a spotting scope will help notice this). Only males display. If the bird attempts to enter the ground and is chased out, it is likely a male. Males occupy the grounds later in the morning after females move off. If the ground has grouse present, you

see no dancing activity for several minutes, birds are feeding, squared off, or preening, chances are they are all males. If a female were present, or one arrives, dancing immediately begins and usually continues until the female leaves. If a few birds dance, square off and stop, and wait long periods between dancing, all birds are probably males, even those around the perimeter of the ground.

ii. *Females.* If it enters the ground and is not chased by a known male, it is a female. Females will occasionally chase each other but not as vigorously or as far as males. If no yellow eye spot is present, the bird never displays, and is ignored when close to a known male, the bird is a female.

iii. *Both.* If you arrive at a ground and some birds are dancing and some are not it may take a little longer to sex the birds. Non-dancers around the perimeter of a ground are the most difficult to sex. Again, if the bird seems to be loafing on the perimeter, you can usually spot the yellow eyespot if it is a male.

iv. Experience is the best teacher for identifying sex of birds and it will come much easier with each count you make. It helps to make a few counts with an experienced observer.

d. Each morning you visit a ground you should make several counts to be sure you have counted all birds present. Do not leave until you feel you have made an accurate count. Spend as much time as necessary at each ground to locate all birds. Tall vegetation, dips, and mounds may hide some birds so take enough time to be sure all birds have been seen. If grouse are still arriving at the ground you may have to remain at the ground longer to get an accurate count.

4. Do not neglect the area around a ground. Even though activity seems to be centered in one area, isolated males or small groups may be several yards or several hundred yards from the center of activity. Glass all surrounding terrain for these "satellite grounds". Occasionally if a hen or group of hens leave a ground, some males may follow and display at locations other than the ground proper.

5. If the birds flush upon your arrival, park and wait. If the time period is mid-April and you are at the ground early in the morning the males should return to the ground. However, if it is late in the morning and they fly a long distance, chances are they will not return.

6. *If* you have a ground that is impossible to count from a vehicle (it is on the highest knoll around and there are always birds on the other side; no ready access due to land ownership; poor road conditions; fences; etc.) you might have to make a flush count.

a. To decrease the chance of counting females: flush birds late in the morning after most dancing activity is done. Males remain on the ground long after females leave. If you can tell the birds are not active (listen for a while or glass a portion of the ground to check activity) all birds on the ground are probably males and a flush count can be made.

b. Use flush counts later in the census period (in late April or early May) since few females are present then, even during the peak activity period of the morning. Keep in mind that attendance by males begins to decline later in the season so late morning counts are a better option than late season counts.

c. Flush difficult grounds at least 3 times. If counts do not vary over a bird or two, the count will be ok.

7. On your first visit to a ground, if no birds are present but you feel the ground should be active you can check the site for evidence of activity. If birds have been using the ground there will be feathers, droppings, and flattened vegetation present. If so, additional visits are necessary.

8. If you feel a ground has moved, most times you can hear birds at the new ground by listening at the old location.

9. Count each ground at least three times (three different days). Vary your counts so that you have

at least one early count (before sunrise) on each ground near the peak of breeding activity. Do not use the same route for counts each day but vary the route so count times vary on each ground.

10. Fill in your census form *COMPLETELY!* Include all weather data, and be sure to record time for each ground counted. Make a note of unusual circumstances (as raptor or coyote on ground) that may have influenced the count. Be sure to record if the count was a flush count.
11. After your survey each day, please send a copy of that morning's survey to the biologist in charge of the survey. They will be able to summarize the data and contact you if additional counts or coverage are needed. At the conclusion of the seasonal survey, include a map of the area showing dancing ground locations.
12. If you find grouse dancing in a new location, this could be either a new ground or simply a ground that has moved. The biologist and observer will decide whether to assign a new number to the ground or to use a number from a former ground.

APPENDIX E. RECOMMENDED WILDLIFE SURVEY METHODS

Raptor Surveys

Grouse Surveys

These instructions are intended to aid personnel in obtaining distribution data for prairie grouse display grounds. The collection of this data will help developers understand the risk of a project to prairie grouse.

Survey Efforts

1. Approximately a dozen mornings are needed to census a township (36 square miles).
2. Secure permission to access area by vehicle.
    - It is recommended that the surveyor be able to drive within 1/2 mile of any spot in the area to listen for displaying grouse and be able to count each ground from a vehicle. Displaying grouse will allow a much closer approach by a vehicle than a person on foot. If grouse are spooked, detection of leks is very unlikely unless the birds flush.
3. Increased effort is required to survey grouse near highways, power plants, or other sources of noise pollution. Most grounds should be located by sound so any interference should be avoided to the extent possible.
    - Wetland areas are also a source of interference due to large numbers of waterfowl, blackbirds and other noisy critters.

Survey Methods

1. Set up a 0.5 x 0.5 mile grid of points that area accessible by vehicle or ATV.
2. Drive to each point, shut off vehicle, and walk at least 20 m from the vehicle (to avoid vehicular noises, such as engine cooling.)
3. Listen for 3-5 minutes during peak activity time.
    - 45 minutes before to 45 minutes after sunrise.
4. Listen for 5-10 minutes during decreased activity time.
    - 45 minutes after sunrise to 2 hours after sunrise.
5. While listening, use binoculars to glass surrounding terrain.

Oliver IV T-Line 000709

- When grouse are dancing their white tails are very visible and easily seen from a distance, providing the vegetation is not too tall.
- In tall vegetation grouse often "flutter jump" about 5 feet into the air which can help locate grounds.
- Knolls and flats are likely areas to search for grounds but grounds can be anywhere (even summer fallow) so do not neglect areas that may initially appear unsuitable.

6. Plot travel and listening stops on a map each day. This will help determine areas of missed coverage and aid in covering the entire area.

   Note: Aerial surveys can be made to locate grounds but are not sufficient to declare an area free of grouse display grounds (e.g. they are prone to false negatives). Grouse tend to hunker down when aerial threats are perceived, and grouse are very difficult to detect from the air when they are hunkered down.

Survey Conditions

- Surveys should occur between 15 March and 15 May.
  - Peak of attendance by females on grounds in North Dakota is usually 15-25 April but may vary depending on weather.
- Each area should be surveyed entirely 3 times wi h at least 2 weeks between survey efforts.
- Survey effort should only take place 45 minutes before sunrise to 2 hours after sunset.
- Conditions should be clear (no precipitation) and calm (wind < 10mph).
  - Do not attempt surveys during any sort of precipitation; grouse are not active at that time.

Bat Surveys

Bats are long-lived (up to 30 years), reproduce at slow rates (as low as one young per year) and can move long distances during spring and fall, making them particularly susceptible to population declines. High bat fatalities at some Eastern wind facilities (4,000 annual deaths at one facility in West Virginia) have brought recent attention to the potential negative impacts to these species posed by wind facilities (Arnett 2005).

Acoustic monitoring is the most cost effective and common method to determine bat activity in the proposed area. Bats use echolocation calls to navigate and forage for prey during

Oliver IV T-Line 000710

Meeting

Dustin Jones initiated a meeting with North Dakota Game and Fish Department (NDGFD) as an opportunity to provide a status update on the subject projects and generally discuss offset expectations.

Subject

Northern Divide Wind (NDW) and Red Butte Wind (RBW)

Attendees

NDGFD: Greg Link and Elisha Mueller
Nextera (NEER): Dustin Jones and Clay Cameron

Date

Wednesday, 28 August 2019

Notes

1. NDW
    a. Updates:
        i. Shared a map of the latest "preliminary, not for distribution" project layout.
        ii. Turbine micrositing complete and field surveys in progress. Explained array is very similar to the last one NEER recently provided to NDGFD, but that some turbines have shifted slightly to accommodate local and state setbacks and/or landowner requests.
        iii. All turbines and the substation remain sited outside of unbroken grassland and areas where pintail duck density is ≤20 pairs/sq.mi.
        iv. No direct impacts to wetlands.
        v. Transmission line modification required to accommodate the shift in turbines, and that the route considers landowner participation and preferences (e.g. follow property lines) and environmental.
        vi. Offsets
            1. Explained we are currently reviewing proposals from Ducks Unlimited (DU) and Magnolia. Each proposal is based on the same baseline; e.g., 80 acres of grassland, 100 2-acre wetlands, 30-year term. The proposals have differences, but each offer ways to deliver the offsets, and that NEER may evaluate using both providers in some capacity to take advantage of select components from each proposal.
            2. Explained DU is considering having NDGFD hold and manage the "conservation agreement" with the landowners. NDGFD said they have had these conversations with DU and are considering the possibility of being the agreement holder.
2. RBW
    a. Updates:
        i. Shared a map of the latest "preliminary, not for distribution" project layout.
        ii. Substantial reduction in project area size and number of potential turbines since last meeting (mainly due to coal lease and grassland issues).
        iii. Turbine micrositing complete and field surveys in progress.
        iv. All turbines and proposed substation locations sited outside of unbroken grassland.

v. Transmission routing is currently evaluating various alternatives and that coal leases, cultural resources, grouse leks, and landowner preferences are presenting the most challenges to-date.

b. Offsets:
    i. Awaiting post-micrositing array to perform initial evaluation.
    ii. Expect wetlands to be of low concern due to minimal number of wetlands and low use by breeding waterfowl.

3. Offsets (general discussion)
    a. NDGFD stated the following:
        i. Avian displacement is the primary ecological service that is being offset, but that it is used as a proxy for other potential wildlife effects. Thus, they feel the displacement model results are equitable, irregardless
            1. If sited in low habitat value areas,
            2. Of avoidance and minimization efforts,
            3. If the indirect effects (acreage) are relatively large compared to the direct effects, and
            4. Of the fact that many of the functions the avoided grasslands and wetlands offer are still intact (e.g., sedimentation and runoff control, groundwater recharge, carbon sequestration, etc.).
        ii. They may recognize the aforementioned, but there is no reduction in the offset ask.
        iii. The acreages are their primary concern, not the dollar values.
        iv. The science that is currently available regarding avian displacement was based on studies that took place in fragmented landscapes with existing impacts, thus those “discounts” are inapplicable to the offset calculations.
4. Agency Letters
    a. NDGFD commented they were amenable to having NEER review and structure NDGFD’s letter to the PSC, including language addressing NEER’s efforts to avoid and minimize impacts.
5. NDGFD appreciated the meeting and the opportunity to discuss how the projects are progressing, re-acknowledged the significant commitment to avoid and minimize impacts, and welcomed the frequent updates (email, calls, in-person) NEER has provided.

GOVERNOR, Doug Burgum
DIRECTOR, Terry Steinwand
DEPUTY, Scott A. Peterson

"VARIETY IN HUNTING AND FISHING"

NORTH DAKOTA GAME AND FISH DEPARTMENT
100 NORTH BISMARCK EXPRESSWAY BISMARCK, NORTH DAKOTA 58501-5095 PHONE 701-328-6300 FAX 701-328-6352

September 12, 2019

Lindsey Churchill, PhD, PWS
Environmental Project Manager
1000 East Calgary Avenue Suite 1
Bismarck, ND 58503

Dear Ms. Churchill:

RE: Red Butte Wind Energy Center and 230 kV Transmission Line Project Oliver and Mercer Counties, ND

The North Dakota Game and Fish Department has been in discussion with developers of the Red Butte Wind Energy Center since June but will use this opportunity to provide official comments as requested in a letter dated 8/16/2019. Based on our initial review, the project appears to fall within an area with low to moderate risk to our native wildlife; however, valuable habitat for these species does exist within the project area and careful consideration should be made when siting turbines, roads, and associated infrastructure.

Though portions of the project landscape have been significantly altered, there is still a noteworthy amount of relatively undisturbed native habitats. Native prairie is the most endangered ecosystem in North Dakota and, as we are a grassland state, the majority of our native species are linked to prairie. Disturbance, fragmentation, and loss of native prairie have adversely impacted a wide variety of species and these negative impacts will only continue to compound as more development takes place on the landscape. The remaining tracts of unbroken prairie are becoming more and more vital to many declining bird and pollinator species. This habitat supports 30 or more of the 115 Species of Conservation Priority identified in the North Dakota State Wildlife Action Plan (Dyke et. al 2015) and for species of conservation priority, such as the Chestnut-collared Longspur which has declined -86% or the Loggerhead Shrike which has declined -74% since 1974 (Rosenberg et. al 2016) the loss and fragmentation of native prairie in the project area may further negatively impact these rapidly declining species.

Wetlands are another productive wildlife habitat in North Dakota, supporting 54 Species of Conservation Priority, as well as a considerable number of waterfowl, shorebirds and cranes throughout the year. Though the project area only includes a small number of wetlands, the resources they provide are still of value to many of our native species. The USFWS's Habitat and Population Evaluation Team (HAPET) has developed a Local Siting Decision Support Tool

(DST) to estimate the number of duck pairs that are displaced based on research conducted in the Dakotas (Loesch et al. 2013, Loesch 2016). We highly recommend NextEra contact HAPET office to request the DST to evaluate project impacts on wetland resources.

Finally, though the Department believes the best way to protect our species of conservation priority is by taking a habitat-focused approach, we would also like to reiterate the following species-specific concerns.

- Nearly 31% of the entire Sharp-tailed Grouse population falls within North Dakota and declines to the state's population will likely lead to range-wide population declines. Sharp-tailed Grouse are a high-valued upland game bird, and because research indicated that prairie grouse may be adversely affected by energy development, it is vital that lek surveys be conducted to understand the risk associated with development.

- Bats are long-lived, reproduce slowly, and migrate long distances, making them particularly susceptible to wind development. Acoustic surveys should begin at a minimum two years pre-construction to assess the risk the project poses to local bat populations.

- The Whooping Crane's migration corridor enters North Dakota in the northwest corner of the state, angling through Burke County and directly through the proposed project area. The migration corridor then proceeds south to just north of the Van Hook Arm on Lake Sakakawea and follows just east of the Missouri River and its reservoirs until it exits the southern portion of the state. This federally listed endangered species uses a wide variety of shallow wetlands for roosting and foraging. While no fatalities have been documented of Whooping Cranes from collision with wind turbines in the United States, collisions with transmission lines are the leading known cause of death in the wild for whooping cranes. We suggest that NextEra contact HAPET in Bismarck to request the Whooping Crane model of predicted use of landscapes.

- The Bald Eagle population and number of nest sites is increasing significantly in North Dakota. The number of nest sites has increased from 10 known sites in the year 2000 to more than 300 in the year 2017. Due to the continual increase and selection of non-traditional nest sites, it is possible that Bald Eagle nests may be found anywhere across the state where large trees are present. Therefore, it is recommended that NextEra conduct searches for raptor nests during the breeding season to understand the risk associated with development.

The Department has a number of resources available for the benefit of the developer and consultant, including maps and information on native habitats, priority areas, and sensitive species. Core native habitat layers are available via Esri REST Services https://gf.nd.gov/maps/data then selecting North Dakota Game and Fish Department Species Range and Habitats. The Department also recommends working with the U.S. Fish and Wildlife Service, as any state guidelines do not relieve the developer of its obligations to comply with any applicable federal regulations.

As we continue to address the challenges of stemming the decline of our state's most sensitive species, we cannot endorse or consent to the disturbance, fragmentation, and loss of the remaining high value habitats essential to Species of Conservation Priority without recommending that suitable replacement or offsets be applied back onto the landscape. Ensuring these habitats remain on the landscape is the only way to stem the decline of these species and prevent listings through the Endangered Species Act, which could impact both the state and its citizens by limiting further construction of infrastructure, energy development, recreational activities, grazing, vegetation control, and land-use changes or conversion on both public and private land. The Department has stressed the importance of following the best available science in determining impacts and voluntary offsets. The best science addressing North Dakota resources are Loesch et al. 2013 and Shaffer and Buhl 2016 and these papers should be used to help guide NextEra in developing a voluntary offset package.

As NextEra moves forward with this project, the Department requests to remain informed. To accurately analyze the project and provide valuable feedback to the PSC, it is important that the Department receives all documents, including wildlife surveys, spatial data, and any voluntary offsets being proposed 100 days prior to the hearing date.

Sincerely,

Greg Link
Chief, Conservation and Communications Division

Cc: Scott Larson, US Fish and Wildlife Service
ND Public Service Commission

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Dakota Ecological Services
420 South Garfield Avenue, Suite 400
Pierre, South Dakota 57501-5408
(605) 224-8693, southdakotafieldoffice@fws.gov

IN REPLY REFER TO
RED BUTTE WIND
ENERGY CENTER

October 17, 2019

Ms. Lindsey Churchill
AECOM
Environmental Project Manager
1000 East Calgary Avenue, Suite 1
Bismarck, North Dakota 58503

Dear Ms. Churchill:

This letter is in response to your request dated August 16, 2019, for environmental comments regarding the above referenced Red Butte Wind Energy Center (WEC). This proposed wind energy facility, purchased by NextEra in 2019, is a 200 MW wind energy facility with a 15-mile 230kV transmission line in Oliver and Mercer Counties, North Dakota. It is our understanding that the turbine layout is still undergoing modifications (per a September 19, 2019, email exchange with NextEra's Dustin Jones), and that additional wildlife surveys are occurring on this project (per a July 18, 2019, call/meeting on this project introducing NextEra as new owners). Staffing limitations in our agency's Ecological Services office in Bismarck, North Dakota, precluded significant U.S. Fish and Wildlife Service (Service) coordination on this project to date; our office appreciates the opportunity to provide input.

In this letter and attachment we provide information and recommendations regarding important wildlife habitats and Service trust resources including federally listed species, eagles, birds of conservation concern, and other migratory birds that may occur in the project area and vicinity. We have included guidelines and methods to apply to various components of a wind farm including turbines, meteorological towers, and power lines in order to avoid, minimize and/or compensate for impacts to trust resources and assist the developer in achieving compliance with Federal laws. Much of this information applies to most, if not all, wind energy facilities in North Dakota, but comments and considerations specific to this project based on information received to date, including study reports, are provided as well.

Our foremost concerns regarding the proposed Red Butte WEC and associated transmission line are:

- Grasslands/Avian Impacts. Per Red Butte WEC reports, the project area is comprised of about 68% grasslands. Unbroken prairie represents about 43% of the project area, and the transmission line corridor is comprised of 18% native prairie as well. The original

native prairie of North Dakota has been, and continues to be, lost to such an extent that it is considered the most endangered ecosystem in the state. Our primary recommendation on all wind energy facilities in North Dakota is to avoid impacting all grasslands, particularly native prairie, focusing instead on areas that are currently disturbed (e.g. cropland). This recommendation applies both at the large scale (choosing project areas dominated by disturbed lands), as well as turbine siting/micro-siting scale (placing structures within the project area on disturbed lands).

Projects in areas that are primarily grasslands are more likely to incur impacts to wildlife than those in disturbed areas due to the resulting loss and degradation of habitat. Grassland nesting birds in particular are known to be displaced by wind turbines. Population declines among this group of birds is greater than for any avian groups reliant on any other biomes in North America (Rosenberg et al. 2019). Population level impacts begin with, and are exacerbated by, local impacts to individuals. Development of the Red Butte WEC in this grassland dominated project site will impact local nesting grassland birds and contribute to their continued decline.

We recommend seeking an alternate area with less intact habitat for this project. Previously disturbed areas do overlap with suitable wind energy resources – see Fargione et al. 2012. If the Red Butte WEC is to proceed at this location, then we recommend avoidance to the maximum extent possible of grasslands, particularly native prairie. If such areas cannot be avoided, it is imperative to analyze the anticipated impacts of the project and develop plans to adequately compensate for the expected lost value of this area for wildlife. To date, we are unaware of development of such a plan. Tools to quantify these impacts are described in the attachment.

- Whooping Crane. The project area is within the whooping crane migration corridor and whooping cranes have been reported near the proposed Red Butte WEC. Wind turbines may pose a collision risk to these birds, or cause displacement if the cranes avoid otherwise suitable habitat. Overhead transmission lines are a known source of mortality for this species. If the project cannot be moved from the whooping crane migration corridor, measures to reduce the collision mortality risks to this species (e.g. active monitoring, turbine shutdowns, line marking devices) should be applied to reduce the risk of unauthorized take of this species under section 9 of the Endangered Species Act (ESA). Without a federal nexus to this project, development of a Habitat Conservation Plan (HCP) is the means by which to ensure ESA compliance (see: https://www.fws.gov/endangered/what-we-do/hcp-overview.html).

- Northern long-eared bat. Preconstruction surveys at Red Butte WEC revealed the presence of northern long-eared bats both on-site and in adjacent habitats during summer The latter is currently pending genetic verification; we request the results of that testing when available. Proposed Red Butte WEC bat survey plans indicated telemetry studies would be performed to determine potential location of maternity roosts; we request results of that effort if/when those studies are conducted.

The current ESA 4(d) rule for this species does not prohibit incidental take of the northern long-eared bat at wind facilities that are not located near hibernacula or maternal roosts. However, since the bat has been detected in/near the proposed facility in the summer, roosts may exist nearby. At this point, we recommend proactive measures be taken to protect individual bats, i.e. feather blades below cut-in speeds and increase cut-in speeds to at least 5.0 m/s when bats may be present. This is in support of conservation of this federally listed species, as well as other bat species known to be susceptible to wind turbine collision mortality.

- Dakota skipper. Dakota skipper surveys were not conducted despite the presence of suitable reproductive habitat for the species within the Red Butte WEC project area and historic records of the species in Oliver County. The commitment by NextEra in current documents regarding the Dakota skipper is to avoid such areas to the extent "practicable". Since this is not a commitment of complete avoidance, it appears the potential exists for this suitable Dakota skipper habitat to be impacted by the project and without survey information to indicate otherwise, the species may be present. This small butterfly species spends the majority of its annual life cycle on the ground in the egg, larval, or pupal stage. Ground-disturbing activities in suitable habitat could harm individuals. We recommend complete avoidance of impacts to these areas to ensure Dakota skipper unauthorized take under section 9 of the ESA does not occur, or as noted above, development of a HCP to ensure ESA compliance.

- Eagles. Bald and golden eagles are protected via the Bald and Golden Eagle Protection Act (BGEPA). The Red Butte WEC is relatively near the Missouri River which is known to attract bald eagles for both nesting and roosting. At least 11 bald eagle nests have been identified in the project area per the *Spring, Summer & Fall Pre-Construction Avian Survey Report, Red Butte Wind Project, Oliver and Mercer Counties, North Dakota, November 18, 2016*. The presence of golden eagles, whether nesting or migratory, is also a concern as this species was also documented during preconstruction surveys. If prey base, such as prairie dogs, exist within/near the project area, placement of project infrastructure in/near these areas would increase risks to golden eagles; such areas should be avoided. We recommend adhering closely to the recommended eagle guidance herein.

The attachment provides additional information pertaining to the above concerns as well as other issues and species related to the Red Butte Wind Energy Center. If changes are made in the project plans or operating criteria, or if additional information becomes available, the Service should be informed so that the determinations herein can be reconsidered.

The Service appreciates the opportunity to provide comments. If you have any questions on these comments, please contact Natalie Gates of this office at (605) 224-8693, Extension 227.

Sincerely,

Scott Larson

Scott Larson
Field Supervisor
North and South Dakota Field Offices

Attachment/Enclosures

cc: NDGF, Greg Link, Bismarck, ND

Attachment: U.S. Fish and Wildlife Service Additional Information Regarding the Red Butte Wind Energy Center and Transmission Line, Oliver and Mercer Counties, North Dakota.
October 17, 2019

2012 Land-Based Wind Energy Guidelines

We recognize that NextEra is aware of and has been using the voluntary 2012 *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines* (WEG) (available online at: http://www.fws.gov/windenergy/) which were developed in consultation with wind industry companies. We recommend close adherence to these guidelines, using the information gathered to first determine whether the project should be placed in the area of interest at all. The WEG invokes a tiered approach in which information is collected with increasing levels of detail in order to evaluate risk posed to habitats and wildlife at potential wind energy sites. Tiers 1-3 each represent a preconstruction decision point to either move forward to development, gather more information and move to the next tier, or to abandon project plans at a given site, thereby avoiding areas where development is precluded or where wildlife impacts are likely to be high and difficult or costly to remedy or mitigate at a later stage. Sites dominated by grasslands with a high component of native prairie, as is the case for the Red Butte WEC, may fit that description. If the project is to proceed at the chosen location, then the information gathered per the WEG is used to guide project specifics, such as turbine locations, and any needed mitigation measures. Wind energy facility impacts are incurred to both habitat and wildlife, typically including wildlife collision mortality, loss of habitat due to the footprint of the turbines/roads/other facilities, habitat fragmentation, wildlife displacement, encroachment of invasive weeds, and more. Currently, the best strategy to reduce impacts to wildlife is to develop wind energy facilities within areas dominated by cropland wherever possible to preclude direct impacts to valuable wildlife habitats, and siting turbines away from adjacent wildlife habitat as much as possible to reduce indirect effects.

Eagle Guidance

Golden eagles (*Aquila chrysaetos*) are year-round residents in western North Dakota and may be found throughout the state in winter or during migration. Bald eagles (*Haliaeetus leucocephalus*) occur throughout North Dakota in all seasons. These species are protected from a variety of harmful actions via take prohibitions in both the Migratory Bird Treaty Act[1] (MBTA;

[1] On December 22, 2017, the Department of the Interior's (DOI) Office of the Solicitor Memorandum M-37050 titled The Migratory Bird Treaty Act Does Not Prohibit Incidental Take (https://www.doi.gov/sites/doi.gov/files/uploads/m-37050.pdf) concludes that the MBTA's prohibitions on pursuing, hunting, taking, capturing, killing, or attempting to do the same apply only to affirmative actions that have as their purpose the taking or killing of migratory birds, their nests, or their eggs. The MBTA list of protected species includes bald and golden eagles, and the law has been an effective tool to pursue incidental take cases involving eagles. However, the primary law protecting eagles is the Bald and Golden Eagle Protection Act (BGEPA) (16 U.S. Code § 668), since the bald eagle was delisted under the Endangered Species Act in 2007. Memorandum-37050 does not affect the ability of the Service to refer entities for prosecution that have violated the take prohibitions for eagles established by the BGEPA.

16 U.S.C. 703-712) and the Bald and Golden Eagle Protection Act (BGEPA; 16 U.S.C. 668–668d). The BGEPA, enacted in 1940 and amended several times, prohibits take of bald eagles and golden eagles, including their parts, nests, young, or eggs, except where otherwise permitted pursuant to federal regulations. Incidental take of eagles from actions such as electrocutions from power lines or wind turbine strikes are prohibited unless specifically authorized via an eagle incidental take permit from US Fish and Wildlife Service (Service). BGEPA provides penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." BGEPA defines take to include the following actions: "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." The Service expanded this definition by regulation to include the term "destroy" to ensure that "take" also encompasses destruction of eagle nests. Also the Service defined the term disturb which means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

The Service has developed guidance for the public regarding means to avoid take of bald and golden eagles:

- The 2007 *National Bald Eagle Management Guidelines* serve to advise landowners, land managers, and others who share public and private lands with bald eagles when and under what circumstances the protective provisions of BGEPA may apply. They provide conservation recommendations to help people avoid and/or minimize such impacts to bald eagles, particularly where they may constitute "disturbance," which is prohibited by the BGEPA. https://www.fws.gov/northeast/ecologicalservices/pdf/NationalBaldEagleManagementGuidelines.pdf
- The 2013 *Eagle Conservation Plan Guidance, Module 1- Land-based Wind Energy, Version 2* is specific to wind energy development and provides in-depth guidance for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities. Development of an Eagle Conservation Plan per these guidelines may serve as the basis for applying for an eagle incidental take permit for wind energy facilities. Applications for such eagle incidental take permits must include an Eagle Conservation Plan. https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf

The Service also has promulgated new permit regulations under BGEPA:

- Eagle permit regulations, as allowed under BGEPA, were promulgated by the Service in 2009 (74 FR 46836; Sept. 11, 2009) and revised in 2016 (81 FR 91494; Dec. 16, 2016). The regulations authorize the limited take of bald and golden eagles where the take to be authorized is associated with otherwise lawful activities. These regulations also establish permit provisions for intentional take of eagle nests where necessary to ensure public health and safety, in addition to other limited circumstances.

The revisions in 2016 included changes to permit issuance criteria and duration, definitions, compensatory mitigation standards, criteria for eagle nest removal permits, permit application requirements, and fees in order to clarify, improve implementation and increase compliance while still protecting eagles. https://www.gpo.gov/fdsys/pkg/ FR-2016-12-16/pdf/2016-29908.pdf

The Service's Office of Law Enforcement carries out its mission to protect eagles through investigations and enforcement, as well as by fostering relationships with individuals, companies, industries and agencies that have taken effective steps to avoid take, including incidental take of these species, and encouraging others to implement measures to avoid take. The Office of Law Enforcement focuses its resources on investigating individuals and entities that take eagles without identifying and implementing all reasonable, prudent, and effective measures to avoid that take. Those individuals and entities are encouraged to work closely with Service biologists to identify available protective measures, and to implement those measures during all activities or situations where their action or inaction may result in the take of an eagle(s).

Note that the Service has also developed recommendations for wind developers specific to the Mountain-Prairie Region (Region 6):

- *Region 6 Recommendations for Avoidance and Minimization of Impacts to Golden Eagles at Wind Energy Facilities* –The goal of this document is to contribute to maintaining stable or increasing breeding populations of eagles by recommending conservation measures that will maintain breeding territories and minimize impacts to other important eagle use areas (e.g., eagle nests, foraging areas, and communal roosts). https://www.fws.gov/coloradoes/documents/Final_GOEA_Buffer_Recommendations_AvoidanceMinimization_WindFacilities_April_10_2013.pdf.

- *U.S. Fish and Wildlife Service, Region 6, Recommended Approach for Development and Submission of Eagle Conservation Plans submitted to Region 6, Migratory Management Office in support of an Eagle Incidental Take Permit Application for Wind Energy Projects* – finalized in July 2019, this guidance replaces an earlier outline version of ECP recommendations by the Service's Mountain-Prairie Region (Region 6) entitled "Final Outline and Components of an Eagle Conservation Plan (ECP) for Wind Development: Recommendations from USFWS, Region 6". The purpose of the new guidance is to eliminate unnecessary work and expense by permit applicants and shorten/streamline the process of applying for an eagle incidental take permit (EITP). The guidance will reduce the ECP process to only those items necessary for the USFWS to conclude that the ECP is sufficient to support the EITP application, and ensure that we have what we need both for our review of the application and our required NEPA compliance.

We recommend close adherence to the guidelines above, including modeling of eagle data to determine the level of risk posed by the project and possible need for an eagle take permit. As noted earlier, we are aware that both species of eagle have been observed at the Red Butte WEC; we request results of all eagle data collected for this project.

Threatened/Endangered Species

In accordance with section 7(c) of the Endangered Species Act (ESA), as amended, 16 U.S.C. 1531 et seq., we have determined that the following federally listed species may occur in the project area (this list is considered valid for 90 days):

Species	Status	Expected Occurrence
Dakota Skipper (*Hesperia dacotae*)	Threatened	Resident in native prairie
Least Tern (*Sterna antillarum*)	Endangered	Migrant or nesting
Northern Long-eared Bat (*Myotis septentrionalis*)	Threatened	Summer resident, seasonal migrant
Piping Plover (*Charadrius melodus*)	Threatened	Migrant or nesting
Rufa Red Knot (*Calidris canutus rufa*)	Threatened	Rare migrant
Whooping Crane (*Grus Americana*)	Endangered	Spring and fall migrant

Dakota Skipper

The Dakota skipper is a small prairie butterfly listed federally as a threatened species. Dakota skippers are obligate residents of high quality prairie ranging from wet-mesic tallgrass prairie to dry-mesic mixed grass prairie. Their dispersal ability is very limited due in part to their short adult life span and single annual flight. Extirpation from a site may be permanent unless it occurs within about 0.6 miles of an inhabited site that generates a sufficient number of emigrants. Avoidance of impacts to native prairie habitat is recommended to reduce the risk of adverse effects to this species. Critical habitat has been designated for this species; for details and locations see: http://www.fws.gov/Midwest/endangered/insects/dask/index.html. Survey protocols have been developed for North Dakota; the *2018 Dakota Skipper (Hesperia dacotae) North Dakota Survey Protocol* is available online at: https://www.fws.gov/mountain-phttps//www.fws.gov/mountain-prairie/es/protocols/2018_FINAL%20Dakota%20Skipper%20Survey%20Protocol_4202018.pdf. The species is difficult to detect and identify; only experienced, qualified personnel can accurately conduct surveys for this species. Our primary recommendation to avoid impacting this species when survey data is lacking is to avoid development in native prairie within the species' range.

Least Tern and Piping Plover

Least terns and piping plovers occur along the Missouri River and use alkaline wetlands/lakes in in North Dakota. Their habitats include sparsely vegetated interchannel sandbars, islands, and shorelines used for nesting, foraging and brood-rearing. They are sensitive to human

disturbances which can limit reproduction. No construction should take place within 1/4 mile of any known piping plover or least tern nest. The specific migration habits of the least tern and piping plover in North Dakota are not known, but it may be possible for the birds to nest in the project area, or occur there as they move to/from nesting areas while foraging, dispersing from natal areas and migrating. Both species typically occur in North Dakota May through August.

Northern Long-eared Bat:
The northern long-eared bat is a medium-sized brown bat that roosts singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees in the summer and migrates to hibernacula (often caves) in the winter. White nose syndrome - a fungus affecting hibernating bats - is considered a significant threat to this species, but individuals may be harmed by other activities such as modifications to hibernacula, timber harvest, human disturbance, and collisions with wind turbines. As indicated earlier, a 4(d) rule has been published that exempts take of Northern long-eared bats at wind facilities that are not located near maternity roosts or hibernacula (see: https://www.fws.gov/Midwest/Endangered/mammals/nleb/index.html). At this time, we have not located maternity roosts or hibernacula in North Dakota. However, since bat acoustic surveys conducted within the Red Butte WEC project site and mist-net surveys conducted adjacent to the site have revealed the species' presence in the summer, maternity roosts may be nearby. The project site is not heavily forested, but riparian corridors within the project area may serve as habitat for the species, particularly since they are connected to the Missouri River corridor. We recommend proactive measures to protect individual bats that may be at risk from this development including feathering turbine blades and increasing cut-in speeds to 5 m/s or more to reduce the risk of bat mortality at wind generation facilities. Post-construction mortality studies per the WEG are recommended to determine impacts to bats and inform the need for additional adaptive management strategies.

Rufa Red Knot:
The rufa red knot is a robin-sized shorebird that migrates annually between its breeding grounds in the Canadian Arctic and several wintering regions, including the Southeast United States, the Northeast Gulf of Mexico, northern Brazil, and Tierra del Fuego at the southern tip of South America. Although it is primarily a coastal species, small numbers of rufa red knots are reported annually across the interior United States (i.e., greater than 25 miles from the Gulf or Atlantic Coasts) during spring and fall migration. These reported sightings are concentrated along the Great Lakes, but multiple reports have been made from nearly every interior state, including North Dakota. The species does not breed in this state.

Whooping Crane:
The proposed Red Butte WEC location is within the documented migration corridor of the Aransas/Wood Buffalo population of whooping cranes - the only self-sustaining migratory population of whooping cranes in existence. Whooping cranes migrate through North Dakota twice annually on their way to northern breeding grounds and southern wintering areas, occupying numerous habitats such as cropland and pastures; wet meadows; shallow marshes; shallow portions of rivers, lakes, reservoirs, and stock ponds; and both freshwater and alkaline basins for feeding and loafing. Overnight roosting sites frequently require shallow water in which to stand and rest. Use of the proposed project area by sandhill cranes may be indicative of the potential presence of whooping cranes since the two species are often observed utilizing the

same habitats and migrating together. Sightings of whooping cranes should be reported to this office. These are large birds with low maneuverability. Line strike mortality is the greatest known threat to fledged whooping cranes and the Red Butte WEC includes a new overhead transmission line perpendicular to the whooper corridor. More information on this topic is provided herein (see enclosure: *Region 6 Guidance for Minimizing Effects from Power Line Projects within the Whooping Crane Migration Corridor*, and Power Lines section below). Mortality via turbine strikes may also pose a risk if the birds utilize habitat at/near wind farm sites and loss of stopover habitat in the migration corridor is a concern that may be realized if whooping cranes tend to avoid wind farms. Additionally, should construction occur during spring or fall migration, the potential for whooping crane disturbances (flushing the birds) exists. Disturbance stresses them at critical times of the year and should be avoided.

These issues should be addressed prior to wind farm development. According to the *Whooping Crane Likelihood of Occurrence Report, Red Butte Project, Oliver and Mercer Counties, North Dakota, November 11, 2016,* the risk to whooping cranes at this project site is deemed low, despite the project location being within the 75% band of the corridor (encompassing 75% of documented sightings). As noted in the report, however, the nature of whooping crane stopovers is opportunistic, the birds use a variety of habitats, and only 4% of stopovers are estimated to be reported. Additionally the existence of a stopover report within 2 miles of the project is indicative that the birds can and do use the general area. Potential whooping crane habitat in North Dakota has been modeled by the Service's Habitat and Population Evaluation Team in Bismarck (Neimuth et al. 2018) and was recommended to NextEra during our July 18, 2019 call/meeting as an additional source of information helpful in assessing risks to whooping cranes. The most effective means to reduce the risks posed to this species is to locate the project outside the whooping crane migration corridor.

If a federal nexus exists for this project (i.e. a federal agency is funding, permitting or otherwise authorizing the project), and the federal action agency, or their designated representative determines that the project "may adversely affect" listed species in North Dakota, they should request formal consultation from this office. If a "may affect - not likely to adversely affect" determination is made for this project, they should submit it to us for concurrence. If a "no effect" determination is made, further consultation may not be necessary; however, a copy of the determination should be sent to this office. If no federal agency is involved with the proposed project and take of federally listed species may occur, ESA compliance may be achieved by private entities via coordination with this office and development of a Habitat Conservation Plan (HCP). Our website provides more information on HCPs at: http://www.fws.gov/endangered/what-we-do/hcp-overview.html.

Wetlands

According to National Wetlands Inventory maps, available online at: https://www.fws.gov/wetlands/, numerous wetlands exist within the proposed project area. If a project may impact wetlands or other important fish and wildlife habitats, the Service, in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321-4347) and other environmental laws and rules, recommends complete avoidance of these areas, if possible; then minimization of any adverse impacts; and finally, replacement of any lost acres; in that order.

Alternatives should be examined and the least damaging practical alternative selected. If wetland impacts are unavoidable, a mitigation plan addressing the number and types of wetland acres to be impacted and the methods of replacement should be prepared and submitted to the resource agencies for review.

Native Grasslands and Grassland Dependent Birds

Native prairie is a particularly important and imperiled habitat in North Dakota. In addition to the intrinsic value of diverse native prairie plant communities, these areas represent a fraction of the prairie acres that once existed in the state and remaining tracts have become increasingly critical to many declining bird and pollinator species. These habitats harbor numerous native wildlife species, some of which cannot survive outside the native plant community. The North Dakota Game and Fish Department's September 12, 2019, letter regarding this project highlighted that native prairie supports more than 30 of the 115 Species of Conservation Priority (SCP) identified by the state, some of which have experienced population declines of 74% or more.

Some of the State's SCP species are also identified by the Service as Birds of Conservation Concern (BCC) (see below) due to their declining numbers. Further overlap occurs between the list of BCC species and Service-identified avian Species of Habitat Fragmentation Concern in North Dakota. The majority of North American bird species are known to be in decline, incurring a 29% reduction in abundance since 1970, equating to a loss of 2.9 billion birds across almost all biomes (Rosenberg et al. 2019). Among those, grassland birds have experienced the largest magnitude of total population loss: 53%, or more than 700 million breeding individuals across 31 species (Rosenberg et al. 2019). Population level declines begin with local impacts to individuals and/or habitats; development of the Red Butte WEC will impact local nesting grassland birds. Birds are important components of the prairie ecosystem and their loss has cascading effects. Our overarching recommendation to wind energy developers is to avoid grassland habitats to the maximum extent possible by seeking out areas dominated by previously disturbed lands (e.g. cropland) for developments in order to reduce or eliminate impacts to these grassland dependent species.

Also note that while native prairie is considered a conservation priority in the state, lesser-quality grasslands (e.g. grasslands with a high non-native plant component, overgrazed grasslands) can still provide some habitat for wildlife, and we recommend avoidance of these plant communities whenever possible as well. Project impacts should instead be directed toward previously disturbed land (e.g. cropland).

Birds of Conservation Concern

The Migratory Birds Division of the Service has published *Birds of Conservation Concern* [BCC] *2008*, which may be found online at: https://www.fws.gov/migratorybirds/pdf/grants/BirdsofConservationConcern2008.pdf. This document is intended to identify species in need of coordinated and proactive conservation efforts among State, Federal, and private entities, with the goals of precluding future evaluation of these species for ESA protections and promoting/conserving long-term avian diversity. There are 28 species listed in the BCC

document that occur within Bird Conservation Region 17 (Badlands and Prairies) where the Red Butte WEC project area is proposed. Direct and indirect effects to these species will occur with establishment of this wind facility. Primary threats impacting grassland species that occur in North Dakota are habitat loss and fragmentation. In accordance with Executive Order 13186 regarding migratory bird protection, we recommend avoidance, minimization, and finally compensation to reduce the impacts to species protected by the MBTA, including BCC species. Compliance with this law may be partially addressed in a Bird and Bat Conservation Strategy (BBCS) (identified within the WEG and explained further below).

Avian Avoidance of Wind Turbines

As indicated in the WEG, wind turbines are known to impact migratory birds directly via collision with turbines, thus post-construction mortality surveys are typically recommended for 1-2 years (or more) to quantify that mortality and compare it with pre-construction risk assessments. Importantly, the WEG also identify other effects of wind energy facilities such as habitat fragmentation and wildlife avoidance of turbines. While direct mortality can readily be observed and quantified, displacement impacts are more difficult to document/quantify and require more time and effort. The Before-After-Control-Impact (BACI) method for avian studies is recommended in the WEG. This study design is particularly useful in determining indirect effects of wind projects on wildlife, but such studies are rarely conducted typically due to those time/effort constraints. In the absence of robust project-specific research at every wind farm, two relatively recent studies are of particular importance to this issue of quantifying avoidance/displacement: Loesch et al. (2013) and Shaffer and Buhl (2016).

Loesch et al. (2013) evaluated breeding waterfowl pairs on wetlands at existing wind farms and reference sites in the Prairie Pothole Region. Displacement of 18% of pairs, among five waterfowl species was detected within 805 meters (0.5 mile) of wind turbines (C. Loesch, USFWS, pers. comm., 2019).

Similarly, Shaffer and Buhl (2016) evaluated wind farms and reference sites in the Prairie Pothole Region, but their research was on grassland nesting birds and also included pre-construction data, thus this study applied the BACI method. Their results detected avoidance of turbines by seven species. The average rate of displacement out to 300 meters (0.19 mile) from wind turbines was 53% by the 5th year post construction (J. Shaffer, USGS, pers. comm., 2019). This research also detected a trend: displacement rates of grassland nesting birds continued to increase over time during that 5 years post-construction (J. Shaffer, USGS, pers. comm. 2019).

Both of these peer-reviewed/published studies occurred in North and South Dakota over multiple years, on multiple wind farms, and involved large sample sizes and reference sites that were used for comparison with impacted sites. Many of the species found to be displaced during these studies occur at Red Butte WEC.

In addition to the above recent research, an older study of shorter duration was conducted at a wind facility in Minnesota and also documented avoidance of wind turbines by birds, this time on Conservation Reserve Program (CRP) lands: Leddy et al. (1999). CRP grasslands are areas typically planted with grass species after being cropped. CRP grasslands without turbines and

areas located 180 m from turbines supported higher densities (261.0-312.5 males/100 ha) of grassland birds than areas within 80 m of turbines (58.2-128.0 males/100 ha) (Leddy et al. 1999).

If the Red Butte WEC proceeds, we recommend using C. Loesch's 18% displacement of waterfowl pairs within ½ mile of turbines to quantify the number of wetlands needed to compensate for waterfowl displacement at the site and develop a plan to achieve those offsets. We also recommend quantifying grasslands within 300 m of turbines and applying the 53% displacement value via Shaffer and Buhl (2016) to determine and disclose anticipated indirect impacts to grassland nesting birds, and adding this to the offset plan. Methods used to obtain appropriate grassland and wetland offsets are described in Shaffer et al. 2019. Finally, if CRP or other non-native grassland habitats will be affected by the Red Butte WEC, we recommend using the displacement information in Leddy et al. (1999) to develop appropriate offsets for this impact in the plan as well. This information is needed to adequately develop appropriate compensation for this form of habitat loss and its associated effect on grassland nesting birds and we encourage project developers to provide that plan as part of the project.

Mitigation

The Service's mitigation policy, available online at: https://www.fws.gov/policy/a1npi89_02.pdf, was established in 1981 to help assure consistent and effective mitigation recommendations that help federal action agencies and developers plan for mitigation measures early, avoid delays, and assure equal consideration of fish and wildlife resources with other project features and purposes. Our policy adopts the definition of the term "mitigation" as stated in the NEPA regulations which includes:

> ***"(a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation;*** *(c) rectifying the impact by restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (e) compensating for the impact by replacing or providing substitute resources or environments."*

As noted above, loss/degradation of habitats and mortality/displacement of wildlife are known to occur at wind energy facilities. We recommend analysis and quantification of these impacts, followed by application of the above mitigation methods during each step of project development - but particularly during early planning stages - to help ensure full implementation of any necessary mitigation measures.

Bird and Bat Conservation Strategy

Bird and bat conservation strategies are recommended in the WEG. We have developed a regional document to further assist companies in following our established national guidance on BBCSs: *U.S. Fish and Wildlife Service, Region 6, Mountain-Prairie Region Outline for a Bird and Bat Conservation Strategy: Wind Energy Projects,* available online at: https://www.fws.gov/coloradoes/documents/Final%20R6%20BBCS%20Outline%20with%20annotation.pdf. As stated in the introduction of that document: a BBCS "…is a life-of-a-project framework for

identifying and implementing actions to conserve birds and bats during wind energy project planning, construction, operation, maintenance, and decommissioning. It is the responsibility of wind energy project developers and operators to effectively assess project-related impacts to birds, bats and their habitats, and to work to avoid and minimize those impacts." A BBCS explains the actions taken by developers as they progress through the tiers of the WEG, describing the analyses, studies, and reasoning implemented with the purpose of mitigating for potential avian and bat impacts. It also addresses post-construction monitoring and habitat impacts. We recommend completion of a BBCS for this proposed energy wind facility.

Meteorological Towers

Meteorological towers associated with Red Butte WEC are similar to other communication towers in that they are a known mortality hazard to wildlife, particularly birds. Of primary concern is the risk of avian collision mortality. Communication towers are currently estimated to kill 6.8 million birds per year in the United States and Canada (Longcore et al. 2012). To assist developers in establishing communications towers that are more compatible with wildlife, we have developed our 2018 *Recommended Best Practices for Communication Tower Design, Siting, Construction, Operation, Maintenance, and Decommissioning*, available online at: https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds/collisions/communication-towers.php. These recommendations incorporate the state of the science and the 2015 Federal Aviation Administration's *Obstruction Marking and Lighting Advisory Circular AC 70/7460-1L*, online at: https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_70_7460-1L_with_chg_1.pdf. Among the primary concerns addressed within our guidelines are the establishment of new towers on the landscape, the heights of these towers, their lighting scheme, and means of structural support. Collocation of new tower facilities on an existing structure is strongly recommended to avoid any additional impacts to migratory birds. If a new tower is necessary, placement of the new tower near other existing structures is recommended to concentrate the risk posed by the towers to relatively small areas. Minimization of tower height (below 200 feet to preclude the need for Federal Aviation Administration lighting requirements), use of only strobe or flashing lights (avoid steady-burning lights), and avoidance of guy wires (a great deal of avian mortality is a result of collisions with supporting guy wires) are important components intended to minimize potential impacts to migratory birds. The habitat at a tower location and surrounding area can also affect its level of risk to wildlife. Tower placement should occur in degraded sites avoiding ridgelines, coastal areas, wetlands or other bird concentration areas such as staging areas, rookeries, leks, and state or federal refuges. Please see the website provided above for additional information.

Overhead Power Lines

The construction of additional overhead power lines associated with wind farms creates the threat of avian electrocution, particularly for raptors. Thousands of these birds, including endangered species, are killed annually as they attempt to utilize overhead power lines as nesting, hunting, resting, feeding, and sunning sites. The Service recommends the installation of underground, rather than overhead, power lines whenever possible/appropriate to minimize environmental disturbances. For all new overhead lines or modernization of old overhead lines, we recommend incorporating measures to prevent avian electrocutions. The publication entitled

Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 includes many measures to reduce risk to birds including pole extensions, modified positioning of live phase conductors and ground wires, placement of perch guards and elevated perches, elimination of cross arms, use of wood (not metal) braces, and installation of various insulating covers. You may obtain this publication by contacting the Edison Electric Institute via their website at: http://www.eei.org/resourcesandmedia/products/Pages/products.aspx, or by calling 202-508-5000.

Please note that utilizing just one of the "*Suggested Practices . . .*" methods may not entirely remove the threat of electrocution to raptors. In fact, improper use of some methods may increase electrocution mortality. Perch guards, for example, may be only partially effective as some birds may still attempt to perch on structures with misplaced or small-sized guards and suffer electrocution as they approach too close to conducting materials. Among the most dangerous structures to raptors are poles that are located at a crossing of two or more lines, exposed above-ground transformers, or dead end poles. Numerous hot and neutral lines at these sites, combined with inadequate spacing between conductors, increase the threat of raptor electrocutions. Perch guards placed on other poles has, in some cases, served to actually shift birds to these more dangerous sites, increasing the number of mortalities. Thus, it may be necessary to utilize other methods or combine methods to achieve the best results. The same principles may be applied to substation structures.

Please also note that the spacing recommendation within the "*Suggested Practices . . .*" publication of at least 60 inches between conductors or features that cause grounding may not be protective of larger raptors such as eagles. This measure was based on the fact that the skin-to-skin contact distance on these birds (i.e., talon to beak, wrist to wrist, etc.) is less than 60 inches. However, an adult eagle's wingspan (distance between feather tips) may vary from 66 to 96 inches depending on the species (golden or bald) and gender of the bird, and unfortunately, wet feathers in contact with conductors and/or grounding connections can result in a lethal electrical surge. Thus, the focus of the above precautionary measures should be: a) provide more than 96 inches of spacing between conductors or grounding features, b) insulate exposed conducting features so that contact will not cause raptor electrocution, and/or c) prevent raptors from perching on the poles in the first place.

Additional information regarding simple, effective ways to prevent raptor electrocutions on power lines is available in video form. *Raptors at Risk* may be obtained by contacting EDM International, Inc. at 4001 Automation Way, Fort Collins, Colorado 80525-3479, Telephone No. (970) 204-4001, or by visiting their website at: https://www.edmlink.com/component/zoo/item/video-raptors-at-risk.

In addition to electrocution, overhead power lines also present the threat of avian line strike mortality. Particularly in situations where these lines are adjacent to wetlands or where waters exist on opposite sides of the lines, we recommend marking them in order to make them more visible to birds. For more information on bird strikes, please see *Reducing Avian Collisions with Power Lines: The State of the Art in 2012* which, again, may be obtained by contacting the Edison Electric Institute via their website at: http://www.eei.org/resourcesandmedia/products/Pages/products.aspx, or by calling 202-508-5000.

While marking of power lines reduces line strike mortality, it does not preclude it entirely. Thus, marking of additional, existing, overhead lines is recommended to further offset the potential for avian line strike mortality. As noted above, the whooping crane is particularly susceptible to this type of mortality, and your project occurs within the whooping crane migratory corridor. Marking of existing lines elsewhere in the species' corridor is recommended.

Summary

Below we reiterate items above that are pertinent to the proposed project:

- Wind energy guidelines:
  - *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines* http://www.fws.gov/windenergy/

- Eagle guidance:
  - Bald and Golden Eagle Protection Act (BGEPA)
  - *National Bald Eagle Management Guidelines* https://www.fws.gov/northeast/ecologicalservices/pdf/NationalBaldEagleManagementGuidelines.pdf
  - *Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy Version 2* https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf
  - Eagle take permit https://www.gpo.gov/fdsys/pkg/FR-2016-12-16/pdf/2016-29908.pdf
  - *Region 6 Recommendations for Avoidance and Minimization of Impacts to Golden Eagles at Wind Energy Facilities* https://www.fws.gov/coloradoes/documents/Final_GOEA_Buffer_Recommendations_AvoidanceMinimization_WindFacilities_April_10_2013.pdf
  - *U.S. Fish and Wildlife Service, Region 6, Recommended Approach for Development and Submission of Eagle Conservation Plans submitted to Region 6, Migratory Management Office in support of an Eagle Incidental Take Permit Application for Wind Energy Projects* (enclosed)

- Threatened/endangered species - Endangered Species Act (ESA):
  - Dakota skipper
  - Least tern
  - Northern long-eared bat
  - Piping plover
  - Rufa red knot
  - Whooping crane

- Wetlands – avoid, minimize, compensate for unavoidable impacts,
  - National Wetlands Inventory: https://www.fws.gov/wetlands/

- Native Grasslands and Grassland Dependent Birds – identify, avoid, minimize:

- Birds of Conservation Concern:
  - *Birds of Conservation Concern 2008:* https://www.fws.gov/migratorybirds/pdf/grants/BirdsofConservationConcern2008.pdf

- Avian Avoidance of Wind Turbines - compensate for unavoidable indirect impacts:
  - Loesch et al. (2013) – displacement of waterfowl
  - Shaffer and Buhl (2016) – displacement of grassland nesting birds
  - Shaffer et al. (2019) – methods to determine displacement compensation
  - Leddy et al. (1999) – displacement of grassland nesting birds in CRP

- Mitigation:
  - 1981 Service Mitigation Policy: https://www.fws.gov/policy/a1npi89_02.pdf

- Bird and Bat Conservation Strategy:
  - *U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines*
  - *U.S. Fish and Wildlife Service, Region 6, Mountain-Prairie Region Outline for a Bird and Bat Conservation Strategy: Wind Energy Projects:* https://www.fws.gov/coloradoes/documents/Final%20R6%20BBCS%20Outline%20with%20annotation.pdf

- Meteorological Towers:
  - *2018 Recommended Best Practices for Communication Tower Design, Siting, Construction, Operation, Maintenance, and Decommissioning* https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds/collisions/communication-towers.php
  - 2015 Federal Aviation Administration Obstruction Marking and Lighting Advisory Circular AC70/7460-1L, https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_70_7460-1L_with_chg_1.pdf

- Overhead Power Lines:
  - *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006,* http://www.eei.org/resourcesandmedia/products/Pages/products.aspx
  - *Raptors at Risk* video, https://www.edmlink.com/component/zoo/item/video-raptors-at-risk
  - *Reducing Avian Collisions with Power Lines: The State of the Art in 2012,* http://www.eei.org/resourcesandmedia/products/Pages/products.aspx

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Mountain-Prairie Region

IN REPLY REFER TO
FWS/R6
ES

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FEB 04 2010

Memorandum

To: Field Office Project Leaders, Ecological Services, Region 6
Montana, North Dakota, South Dakota, Nebraska, Kansas

From: Assistant Regional Director, Ecological Services, Region 6

Subject: Region 6 Guidance for Minimizing Effects from Power Line Projects Within the Whooping Crane Migration Corridor

This document is intended to assist Region 6 Ecological Services (ES) biologists in power line (including generation lines, transmission lines, distribution lines, etc.) project evaluation within the whooping crane migration corridor. The guidance contained herein also may be useful in planning by Federal action agencies, consultants, companies, and organizations concerned with impacts to avian resources, such as the Avian Power Line Interaction Committee (APLIC). We encourage action agencies and project proponents to coordinate with their local ES field office early in project development to implement this guidance.

The guidance includes general considerations that may apply to most, but not every, situation within the whooping crane migratory corridor. Additional conservation measures may be considered and/or discretion may be applied by the appropriate ES field office, as applicable. We believe that in most cases the following measures, if implemented and maintained, could reduce the potential effects to the whooping crane to an insignificant and/or discountable level. Where a Federal nexus is lacking, we believe that following these recommendations would reduce the likelihood of a whooping crane being taken and resulting in a violation of Endangered Species Act (ESA) section 9. If non-Federal actions cannot avoid the potential for incidental take, the local ES field office should encourage project proponents to develop a Habitat Conservation Plan and apply for a permit pursuant to ESA section 10(a)(1)(B).

Finally, although this guidance is specific to impacts of power line projects to the whooping crane within the migration corridor, we acknowledge that these guidelines also may benefit other listed and migratory birds.

If you have any questions, please contact Sarena Selbo, Section 7 Coordinator, at (303) 236-4046.

Region 6 Guidance for Minimizing Effects from Power Line Projects Within the Whooping Crane Migration Corridor

1) Project proponents should avoid construction of overhead power lines within 5.0 miles of designated critical habitat and documented high use areas (these locations can be obtained from the local ES field office).

2) To the greatest extent possible, project proponents should bury all new power lines, especially those within 1.0 mile of potentially suitable habitat[1].

3) If it is not economically or technically feasible to bury lines, then we recommend the following conservation measures be implemented:

   a) Within the 95-percent sighting corridor (see attached map)

      i) Project proponents should mark[2] new lines within 1.0 mile of potentially suitable habitat and an equal amount of existing line within 1.0 mile of potentially suitable habitat (preferably within the 75-percent corridor, but at a minimum within the 95-percent corridor) according to the U.S. Fish and Wildlife Service (USFWS) recommendations described in APLIC 1994 (or newer version as updated).

      ii) Project proponents should mark replacement or upgraded lines within 1.0 mile of potentially suitable habitat according to the USFWS recommendations described in APLIC 1994 (or newer version as updated).

   b) Outside the 95-percent sighting corridor within a State's borders

      Project proponents should mark new lines within 1.0 mile of potentially suitable habitat at the discretion of the local ES field office, based on the biological needs of the whooping crane.

   c) Develop compliance monitoring plans

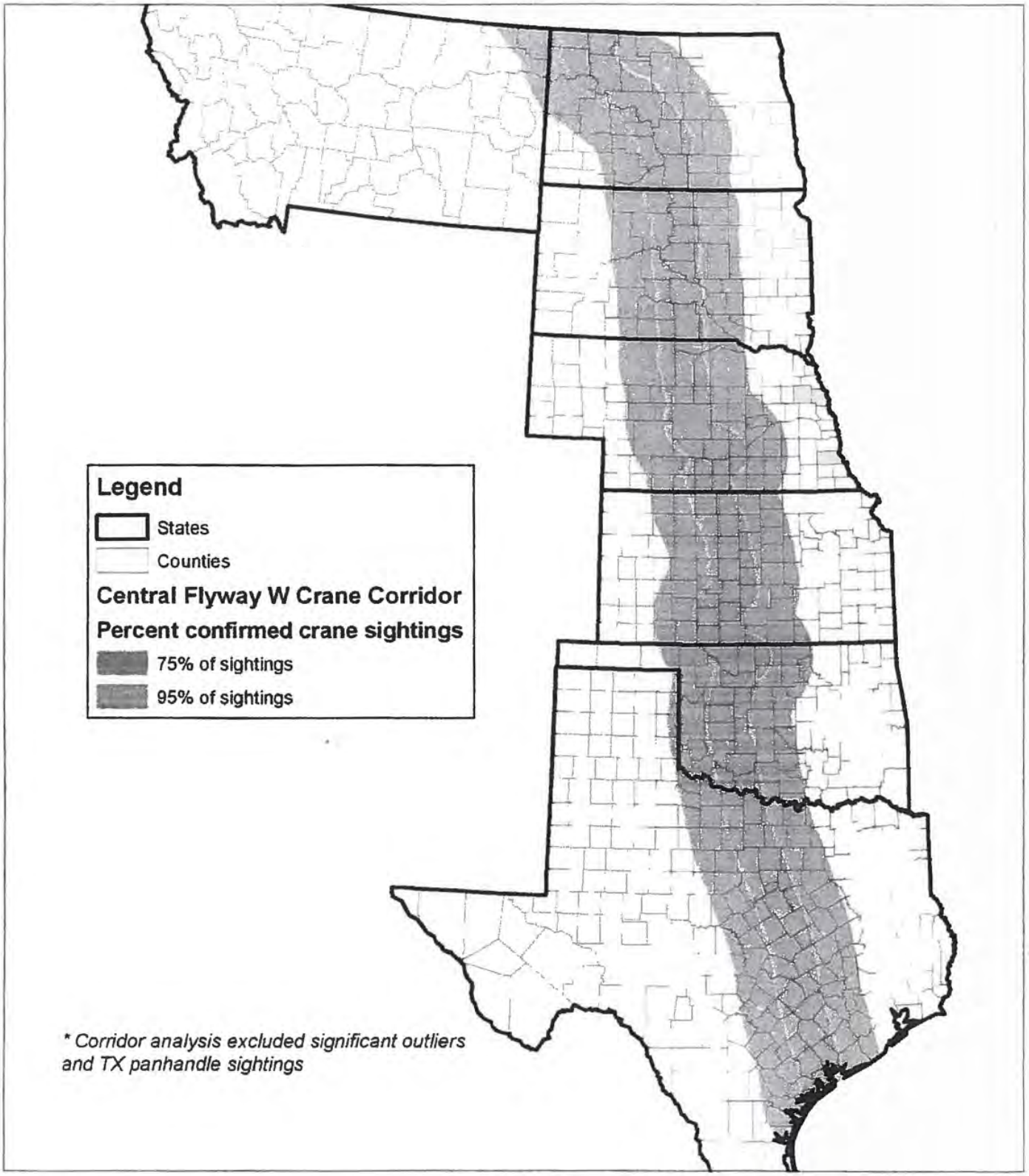
      Field offices should request written confirmation from the project proponent that power lines have been or will be marked and maintained (i.e., did the lines recommended for marking actually get marked? Are the markers being maintained in working condition?)

[1] Potentially suitable migratory stop over habitat for whooping cranes includes wetlands with areas of shallow water without visual obstructions (i.e., high or dense vegetation) (Austin & Richert 2001; Johns et al. 1997; Lingle et al. 1991; Howe 1987) and submerged sandbars in wide, unobstructed river channels that are isolated from human disturbance (Armbruster 1990). Roosting wetlands are often located within 1 mile of grain fields. As this is a broad definition, ES field office biologists should assist action agencies/applicants/companies in determining what constitutes potentially suitable habitat at the local level.

[2] Power lines are cited as the single greatest threat of mortality to fledged whooping cranes. Studies have shown that marking power lines reduces the risk of a line strike by 50 to 80 percent (Yee 2008; Brown & Drewien 1995; Morkill & Anderson 1991). Marking new lines and an equal length of existing line in the migration corridor maintains the baseline condition from this threat.

U.S. Fish & Wildlife Service

United States Central Flyway Whooping Crane Migration Corridor *



Produced for Ecological Services
Grand Island, NE
Current to: 2008
Basemap (Date): U.S. Counties
Meridian:
File:

0 70 140 280 420 560 Miles

N W E S

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23 July, 2019

U.S. Fish and Wildlife Service, Region 6, Migratory Bird Management Office

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Introduction: U.S. Fish and Wildlife Service (USFWS), Region 6, Migratory Bird Management Office (MBMO) and USFWS Ecological Services Field Offices (ESFO) in Region 6, have been jointly reviewing Eagle Conservation Plans (ECPs) submitted to USFWS in support of Eagle Incidental Take Permits (EITPs) for eagle take authorization at wind energy facilities that are already operational, or that are being constructed, in Region 6 states. These applicants are seeking EITPs for their wind energy projects pursuant to the Bald and Golden Eagle Protection Act (BGEPA) and its implementing regulations (CFR Title 50, Part 22). This ECP review process has been ongoing in Region 6 for at least five years. Based on this collective experience we present a new recommended and preferred approach to development of ECPs written and submitted by wind energy companies applying to USFWS, Region 6 for EITPs. Our intent in developing this new ECP guidance, is to make the ECP development and EITP application submission process go more quickly and efficiently, and to eliminate unnecessary work and expense by our EITP applicants. Also, adopting this new approach to ECPs will allow USFWS to get to our National Environmental Policy Act (NEPA) compliance work on these EITP applications much more quickly, another benefit for the applicant. **A key caveat with this new ECP process is that the EITP applicant must engage USFWS, and work with us to develop and apply avoidance and minimizations measures for the wind energy project, to the maximum extent practicable, as early on in the project development process as possible, and prior to submission of the ECP.** The BGEPA 22.26 permit regulations (CFR Title 50, Part 22) for EITPs do not specify what the contents of an ECP should be. Hence, there is latitude for USFWS Regions responsible for administering EITPs in terms of how this process occurs. The major purpose of this USFWS, Region 6, MBMO guidance memo is to reduce the ECP process to only those items necessary for USFWS: 1) to conclude that the ECP is sufficient to support the EITP application; 2) that we have what we need for our review of the application; 3) and that we have what we need to complete our required NEPA compliance, relative to any USFWS decision about whether or not to issue an EITP to a wind energy facility in Region 6. Last, this guidance and recommended process replaces and supersedes our previous USFWS, Region 6, Mountain-Prairie Region ECP guidance memo issued in 2013 entitled "*Final Outline and Components of an Eagle Conservation Plan (ECP) for Wind Development: Recommendations from USFWS, Region 6*".

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A. The following are all the items USFWS, Region 6, MBMO recommends that entities applying for EITPs for wind energy facilities include in an ECP, or submit to USFWS, as part of the permit application process:

1. Provide a statement that the ECP was prepared to support an application for an EITP for a wind energy facility, the name of the facility, and relevant company/subsidiary names of the applicant/owner/operator.

2. Provide a map showing the location of the wind energy facility that USFWS can use for our NEPA document.

3. Provide a statement indicating how many years the applicant is requesting eagle take for. Note that per the USFWS 2016 Revised Eagle Rule (FRN Vol 81, 91494) all applications for EITPs submitted after July 14, 2017 will be processed under the 2016 BGEPA regulations.

4. Endangered Species Act Compliance:
   Before Region 6, MBMO can process an EITP, we need documentation which demonstrates that compliance with the Endangered Species Act (ESA), for federally listed species and critical habitat (designated or proposed), has already been completed for the wind energy project. If the wind energy project will not result in take of listed wildlife, fish, or plants, or adversely modify critical habitat for listed species (designated or proposed), pursuant to the ESA, provide a statement with the ECP submission documenting this. Alternately, if the wind project will result in adverse effects to federally listed species (wildlife, fish, and plants) and/or critical habitat (designated or proposed), provide written documentation which demonstrates that compliance with section 7 or section 10 of the ESA has already been completed for the project. Also, include a copy of the final USFWS document which demonstrates this. The USFWS ESFO in the state the wind project is located in will assist the EITP applicant with meeting any required section 7 or section 10 compliance under the ESA.

5. Department of Defense and Federal Aviation Administration:
   The Department of Defense (DoD) may have concerns about a wind energy project in relation to wind turbines creating interference with DoD radar systems at DoD installations. DoD concerns about wind turbine interference with DoD radar systems includes DoD installations such as Air Force Bases, U.S. Army Bases, missile sites, etc. Similarly, the Federal Aviation Administration may have concerns about wind turbine interference with radar systems at civil or commercial airports. If the wind energy project that an EITP is being submitted for occurs in proximity to a DoD defense installation, or a civil or commercial airport, or both, include a statement that the permit applicant is coordinating with these entities regarding the wind project. Also in such cases the EITP applicant must provide documentation that DoD, FAA, or both have reviewed the wind project and that they do not have any issues with the project design and layout relative to their radar systems and other infrastructure.

6. Project Description:
   The project description should include a list of all infrastructure for the project (i.e., wind

turbines, roads, power lines, met towers, substations, O&M building, etc.). Quantify how much of each project component will be built. For wind turbines: how many are there, what is the rotor diameter(s), total megawatts of the project, tower height, and total height with tower? For roads and power lines: how many miles of each will be constructed? The power line description also should include the voltage of the lines and whether the lines will be constructed above or below ground. Also, for any new power line construction include a statement that indicates whether or not they will be constructed following the Avian Power Line Interaction Committee (APLIC) 2006 Suggested Practices for Avian Protection on Power Lines and the 2012 Reducing Avian Collisions with Power Lines APLIC manuals. Provide map(s) that clearly shows the location of all of the project infrastructure. All maps should be provided as both PDF versions and as GIS shape files. Note that any changes in this information as the project moves forward will necessitate a delay in USFWS action on the application.

7. Eagle Data for the Project:
Submit copies of all eagle data collected for the project. If there were both bald and golden eagles documented at the project break out the responsive results and data by eagle species. This includes eagle use surveys, eagle roost surveys, eagle nest surveys, eagle migration surveys, eagle prey base surveys, eagle mortality monitoring, etc. If there was no eagle roosting habitat, or the project was not located in an eagle migration corridor, such that these surveys were not needed, then note this in the submission. At a minimum, provide a listing of the types of pre-construction monitoring conducted as well as the start and end dates for each type of survey, how many total surveys of each type were conducted, when surveys were conducted (specific dates), a written description of the protocols used to conduct each survey type (this can be in a consultants monitoring report, etc.), and figures that clearly show the sample points or the survey area used for the surveys. If the wind project is already operational include all the same items listed above for all post-construction surveys that were conducted.

   - For pre-construction eagle use surveys: Submit a spreadsheet with a record of all the surveys conducted (following USFWS Region 6-provided spreadsheet that provides required fields), and the results from all the surveys including the flight paths (on a project area base map) or perch locations for all eagles recorded. Provide an estimate of the project area (percentage) surveyed by eagle use survey efforts. Provide a written protocol describing how the pre-construction eagle use surveys were conducted (this can be in a consultants monitoring report, etc.). All maps should be provided as both PDF versions and as GIS shape files. If a report was prepared that included the eagle use survey work include a copy of this with the ECP submission.
   - For eagle nest surveys: Include a map showing the buffer around the project where surveys were conducted and the location of all eagle nests found (both in-use and alternate nests). In regard to survey results for all eagle nests documented as in-use, provide information on occupancy, productivity, and nest success to the extent this information was recorded. An in-use eagle nest means a bald or golden eagle nest characterized by the presence of one or more eggs, dependent young, or adult eagles on the nest in the past 10 days during the breeding season per the definition provided in the USFWS 2016 Revised Eagle Rule (FRN Vol 81, 91494). This information should be

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summarized in a data table to be included with the submission. If a mean inter-nest distance was calculated for the project, provide this by eagle species and clearly indicate what nests were used to do the calculation and which year(s) of survey effort was used for the calculation (per USFWS 2013, Eagle Conservation Plan Guidance, Appendix H). Also, indicate whether or not the eagle nest surveys conducted for the wind project complied with the USFWS, Region 6, MBMO recommended protocol for conducting these surveys. All maps should be provided as both PDF versions and as GIS shape files. If a report was prepared that included the eagle nest survey work include a copy of this with the ECP submission.

- For eagle roosts include a map of the project area showing the locations of all documented roosts. If surveys were conducted to locate suitable eagle roosting habitat and then subsequently to determine whether or not this habitat was used for roosting, or to determine if a known documented eagle roost in the project area was used by eagles, provide the written protocols for how these surveys were conducted, a listing of all the surveys conducted by date, and the survey results. All maps should be provided as both PDF versions and as GIS shape files. If a report was prepared that included the eagle roost survey work include a copy of this with the ECP submission.

- For concentrated areas or sources of eagle prey base such as prairie dog colonies and sage or sharp-tailed grouse or prairie chicken leks, include a map of the project area showing all such locations. If surveys were conducted for prairie dog colonies and sage or sharp-tailed grouse or prairie chicken leks, provide the written protocols for how these surveys were conducted, a listing of all the surveys conducted by date, and the survey results. Indicate the specific species the surveys were conducted for. If there are big game parturition (birthing) areas located within the project area provide a map that shows where these were located. For domestic livestock, clearly indicate which type of livestock are present (i.e. cattle, sheep, horses or some combination thereof). Also, if there are lambing or calving areas within the project area, provide the location of each, and how many such lambing or calving areas there are. All maps should be provided as both PDF versions and as GIS shape files. If a report was prepared that included the eagle prey base assessment work include a copy of this with the ECP submission.

- For post-construction eagle mortality monitoring surveys: If the project is already operational, provide a written protocol describing how the surveys were conducted (this can be in a consultants monitoring report, etc.). Also submit a spreadsheet (USFWS, Region 6, MBMO will provide an Excel spreadsheet that includes the required data fields to be included in the submission) that includes all the records of all the mortality monitoring surveys conducted, including date of each survey and survey results. This spreadsheet should include all the data fields shown on page 97 of Appendix H of the USFWS Eagle Conservation Plan Guidance (USFWS 2013). Provide the total number of surveys conducted. Include full documentation of all bias trials (searcher efficiency and carcass persistence) conducted as part of the eagle mortality monitoring, including methods used, dates the trials were conducted, results, and the total number of such

trials by season. Include definitions for the survey seasons used to complete the eagle mortality monitoring. Provide a map that shows where the surveys were conducted. If the wind energy project has killed or injured eagles, provide a table listing all these mortalities/injuries. This table should include the eagle species, number of eagles, and the date each incident was documented. For each documented eagle mortality/injury, include all the fields shown on page 97 of Appendix H of the USFWS Eagle Conservation Plan Guidance (USFWS 2013) to the extent possible. Also provide a map of the project wind turbine layout showing the wind turbine identification number and the location of all eagle mortalities or injuries. For all incidental finds of dead or injured eagles, provide full documentation of each record separate from those documented during protocol carcass searches. Also, for incidental eagle mortality finds provide documentation of how these were handled relative to the bias trials. All maps should be provided as both PDF versions and as GIS shape files. If a report was prepared for that included the post-construction mortality monitoring work include a copy of this with the ECP submission.

8. Avoidance and Minimization Measures Implemented for the Project:
   There needs to be avoidance and minimization discussions between the EITP applicant and USFWS, Region 6. These discussions are a very important step in the permit process. This step should be completed well in advance of the submission of an EITP application by a wind company to USFWS, Region 6, MBMO. Typically these discussions should occur after the eagle data collection for the project is completed, although in some cases they could occur before the eagle survey work is completed. Information provided by eagle surveys for the project are highly important in informing the number and types of avoidance and minimization measures that USFWS, Region 6 will recommend for the wind project. These avoidance and minimization discussions are especially important for wind projects that are still in the planning stages and that have not yet been constructed. From the USFWS, Region 6 perspective, our best opportunity to achieve eagle risk reduction for a wind energy project is in the stages where we can provide input on project siting, micrositing of wind turbines, etc. Our USFWS, Region 6 recommendations to a company for a wind project may include moving the project to a different location, eliminating specific wind turbines, relocating wind turbines, seasonal curtailment of specific turbines, etc. For wind energy projects that are already constructed and operational there will be fewer opportunities to implement avoidance and minimization recommendations, hence these discussions are more constrained. Nevertheless, even for online wind facilities these avoidance and minimization discussions should still occur. With the ECP submission, provide documentation of all avoidance and minimization measures provided by the USFWS, Region 6 for the wind project. State which of these avoidance and minimization measures were implemented for the project. For those avoidance and minimization measures provided by USFWS that could not be implemented for the wind project, list these items and provide documentation as to the reason(s) why they could not be implemented.

9. Eagle Conservation Measures for the Project:
   Provide a list of all conservation measures (pre-construction, construction, and post-construction) that were or will be specifically implemented to reduce risk to eagles associated with the project. The Best Management Practices (BMPs) included in Chapter 7 of the USFWS,

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Land-based Wind Energy Guidelines (USFWS, 2012) should be implemented at wind energy projects to benefit wildlife and wildlife habitat generally. However, many of these BMPs, such as using appropriate erosion control in project construction and operation to control or minimize runoff into water bodies, do not provide any direct conservation benefit to eagles. Hence, they should not be included with the ECP submission. If the EITP applicants elects to also develop a separate Bird and Bat Conservation Strategy for their wind facility this information should be included in this document. Include in the ECP only those measures that provide a direct conservation benefit to eagles, such as a measure establishing that all big game and livestock carcasses will be removed (or at least covered until they can be removed to prevent eagle access) from the wind facility within 24 hours of their discovery.

10. Compensatory Mitigation:
For wind projects that will include take of golden eagles, provide a statement indicating that all predicted golden eagle takes for the initial phase of the project will be offset through compensatory mitigation. In such cases the statement needs to clearly state a commitment from the applicant to completing all required compensatory mitigation. At present the only compensatory mitigation method for which the USFWS has developed a Resource Equivalency Analysis (REA) to establish mitigation credits is power pole retrofits. USFWS does not have the resources to develop other REAs for other mitigation methods at this time. However, should other credible REAs be developed for other types of mitigation alternatives (roadside carcass removal, lead abatement, conservation easements, etc.) in the future, USFWS would accept these other methods for the compensatory mitigation requirement. In these cases the EITP applicant would need to first submit the REA for the alternative compensatory mitigation method to USFWS. Then the REA associated with the alternative compensatory mitigation method would need to be reviewed by USFWS, a Department of the Interior (DOI) economist, and DOI Solicitors. If following this review the USFWS finds that the REA provides the necessary documentation that the alternative compensatory mitigation method is credible, then we will accept this alternate mitigation method for the required compensatory mitigation under an EITP to offset take of eagles. Include a statement with the ECP submission indicating that a power pole retrofit plan will be developed for the project to meet the compensatory mitigation requirements, and provide all necessary data that USFWS would need as input to the USFWS REA spreadsheet to calculate the required number of power pole retrofits for the project (see Appendix G of the USFWS Eagle Conservation Plan Guidance (USFWS 2013)). However, if the EITP applicant chooses to use the In Lieu Fee program provided by Eagle Electrocution Solutions, LLC (or another USFWS endorsed in lieu fee mitigation bank) for the required compensatory mitigation to offset the take of golden eagles, then a fully detailed power pole retrofit plan is not required. In these cases, the project proponent need only provide USFWS with a memo documenting the intent to use an in lieu fee mitigation provider, the name of the mitigation banker, and key information USFWS would need to complete an REA analysis for the project. Relative to bald eagles, applicants should work with USFWS to determine whether or not compensatory mitigation will be required for their wind project – this is rarely necessary.

11. Adaptive Management:
Adaptive management is a component of every EITP issued by USFWS, Region 6 to companies

for wind energy facilities. If a wind company negotiated with USFWS, Region 6 and reached agreement on an adaptive management table for the wind project, with various eagle take thresholds and the corresponding actions or conservation measures that will be implemented once that threshold is reached, then include this in the ECP submission. At a minimum the applicant and USFWS need to discuss what actions will be taken if eagle take approaches or reaches the amount authorized by an EITP issued by USFWS, Region 6 to the company. The ECP submission should include the outcomes from these discussions.

12. Other USFWS Permits:
    If an applicant intends to apply for any other permits to USFWS, Region 6, MBMO, for other authorizations needed for their wind project, either under the Migratory Bird Treaty Act (MBTA) or BGEPA, include a statement indicating which permits are needed and clearly indicating that they will apply for them. For example many wind energy companies apply for MBTA 21.27 Special Purpose Utility permits so that they can legally collect migratory birds and hold them at their facility for use in post-construction mortality monitoring work. In some cases construction of a wind project may occur in close proximity to an in-use eagle nest such that a BGEPA 22.26 permit is necessary, so that there is legal coverage under a permit, if this construction work were to cause disturbance take of eagles at the nest.

B. The following are things that should <u>not</u> be included in the ECP submission to USFWS, Region 6, MBMO to support an application for an EITP for a wind energy facility:

1. Do not submit the longer, more extensive type of ECPs previously submitted to USFWS, Region 6, MBMO to support applications for EITPs for wind energy facilities. With the process outlined above in Part A of this guidance memo, we are trying to substantially reduce the time required for ECP development and submission to USFWS, as well as the volume of material. Following our new recommended process reduces the ECP development work to providing responses to the specific questions above, plus submission of all of the project-specific eagle survey information (e.g. survey methods, maps of survey areas, survey results on maps or in data tables, etc. as described under Eagle Data for the Project section in Part A above). There is no need for back and forth review and editing efforts on individual chapters or lengthy ECP documents. Instead, if a company submits all of the requested information per the Part A of this guidance memo above, then they are done with the process. There may still be instances with the new ECP process where something that was requested was not provided. In these cases we will only ask for the missing data, or map, or other information, etc. If a company does submit longer ECP documents vs. following the streamlined approach outlined in this memo, their EITP application will receive a lower priority for processing by USFWS, Region 6, MBMO. Also for these types of submissions USFWS, Region 6, MBMO will put a note to the official EITP application file that we did not review the full document and that we only reviewed the ECP to see if it provided the specific information requested above under Part A of this memo.

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Applicants for EITPs for wind energy projects that follow the new recommended approach provided by USFWS, Region 6, will find that the ECP process is shorter, more efficient, and less costly. Also, their EITP application reviews will be prioritized by USFWS, Region 6, MBMO for processing over and above those permit applicants who do not follow the recommended approach.

2. Do not provide overall risk categorization for the wind energy project per USFWS, Eagle Conservation Plan Guidance (USFWS, 2013).

3. Do not include descriptions of federal laws such as BGEPA, MBTA, ESA, and NEPA, or state laws applicable to the project.

4. An applicant may well choose to take the eagle use data collected for their wind energy project and run the USFWS Collision Risk Model (CRM) to determine predictions of eagle take associated with their wind project. We understand that many companies will want to conduct such analyses. However, do not submit any of these model runs, or related interpretations, or explanations of these CRM runs to USFWS, Region 6, MBMO. The USFWS, 2016 Revised Eagle Rule (FRN Vol 81, 91494) is clear that the USFWS will be the party using the eagle survey data provided by the applicant to run the CRM to determine a predicted level of eagle take for a project, and the related take authorization level in a EITP, if a permit is issued for the project. USFWS, will complete the CRM runs to determine a predicted level of eagle take as part of the NEPA process, and the outcomes of this analysis will be shared with the applicant.

5. Do not include any Local Area Population (LAP) analysis for the wind project. USFWS, Region 6, is responsible for completing this analysis using USFWS eagle density information for Eagle Management Units, information on other eagle take that USFWS has previously authorized within the LAP associated with the wind project, and information USFWS has on unpermitted eagle take in this same LAP. It is not the responsibility of any EITP applicant to complete this analysis. USFWS will complete the LAP analysis as part of our NEPA compliance work on an EITP application and share outcomes of that analysis with the applicant.

6. Wind energy companies developing projects that will have associated golden eagle take will need to provide compensatory mitigation to offset this take as discussed in the Compensatory Mitigation section under Part A, above. In such cases the EITP applicant may choose to use a copy of the REA provided by USFWS to conduct their own REA analysis, which is fine. However, results from applicant conducted REA analysis should not be included with the ECP submission, nor should written interpretations of these same results. USFWS will complete an REA analysis using input from the EITP applicant as part of the NEPA process and share the results with them.

7. Some wind energy companies applying to USFWS, Region 6 for EITPs will be seeking take authorization for wind projects that are already operating. And the company may already be conducting post-construction mortality monitoring specific to eagles. In these cases EITP applicants may want to use the post-construction mortality monitoring data they have collected to run analyses with the Evidence of Absence tool, or other tools, and this is fine. However, do

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not submit results of these types of analyses, or interpretations of these results with the ECP submission to USFWS. USFWS will conduct an analysis using post-construction mortality monitoring data provided by the EITP applicant as part of the NEPA process and share results with them.

Literature Cited:

16 U.S.C. §§ 668–668d Bald and Golden Eagle Protection Act

Avian Power Line Interaction Committee, 2006. Suggested Practices for Avian Protection on Power Lines: the State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission, Washington, D.C., and Sacramento, CA.

Avian Power Line Interaction Committee, 2012. Reducing Avian Collisions with Power Lines: the State of the Art in 2012. Edison Electric Institute and APLIC, Washington, D.C.

Code of Federal Regulations, Title 50: Fisheries and Wildlife, Part 22- Eagle Permits, March 13, 2019 version.

Federal Register. Vol 81, 91494, December 16, 2016.

U.S. Fish and Wildlife Service. 2012. U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines, March 23, 2012.

U.S. Fish and Wildlife Service. 2013. Eagle Conservation Plan Guidance, Module 1-Land-based Wind Energy, Version 2, April, 2013.

U.S. Fish and Wildlife Region, Region 6, Mountain-Prairie Region. 2013 Final Outline and Components of an Eagle Conservation Plan (ECP) for Wind Development: Recommendations from USFWS, Region 6.

Oliver IV T-Line 000746

Red Butte Wind Energy Center
Wildlife Agency Meeting

Date: 14 July 2022
Time: 14:00 – 16:00h
Location: North Dakota Game and Fish Department, 100 N. Bismarck Expressway, Bismarck, ND 58501. Call in number for USFWS: (469) 480-4154 access number 15171238#.

AGENDA

1) Introductions
2) Red Butte Wind Energy Center (Project) information
   a. Project originally developed by PRC Wind starting in 2016. Further developments conducted by Tenaska in 2018. NextEra purchased and will complete development and permitting.
   b. Planned for 400 MW (split into two 200 MW phases).
      i. Anticipate filing PSC application for first phase in Q1/Q2 2023 with interconnection to Leland Olds for 2024 COD.
      ii. Anticipate filing PSC application for second phase in late 2023 with interconnection to Square Butte for 2024 or 2025 COD.
3) Discussion items
   a. Previous meetings with USFWS and NDGFD
      i. Study plan development/review and data sharing in 2016.
      ii. Meetings in 2017 to review Tier 2 and 3 study results.
      iii. Meeting in 2018 to discuss additional Dakota skipper habitat surveys.
      iv. Meeting in 2019 to discuss prior studies and proposed studies for 2019 and 2020.
   b. Project Development Review (2016 – 2022)
      i. Since original layout in 2016, the project has adapted to avoid and minimize potential impact to wildlife and their habitats (Map 1).
      ii. Newest layouts include avoidance of unbroken grasslands for permanent disturbance (Map 2) and associated buffers for eagles and leks (Map 3). Additionally, this layout focusses development on cultivated croplands while avoiding coal lease land (Map 4), and avoids most high impact lands as described in NDGFD Key Wildlife Habitat (Map 5).
   c. WEG Tier 3 Wildlife Surveys Previously Conducted (since 2018) and Discussed with Agencies
      i. Table 1 lists the wildlife and habitat surveys conducted since the 2019 agency meeting and future surveys and analyses to be conducted.

Table 1*. List of wildlife and habitat surveys

Study	Survey Effort and Analysis
Lek Surveys 2019	April 2019 - July 2020
Avian Use Surveys 2019-2020	May 2019 - September 2020
Bat Summer Presence/Absence Surveys 2019	July 2019 - September 2019
Whooping Crane Habitat Assessment 2019	August 2019 - October 2019
Raptor nest surveys 2020	February 2020 - September 2020
Lek Surveys 2020	March 2020 - August 2020

Table 1*. List of wildlife and habitat surveys

Study	Survey Effort and Analysis
Bat Summer Presence/Absence Surveys 2020	July 2020 - March 2021
Northern Long-eared Bat Presence/Absence Surveys 2020 - 2022	June 2020 - October 2022
Eagle and Raptor Nest Surveys 2022	March 2022 - September 2022
Eagle/Large Bird Surveys 2022	March 2022 - February 2023
Dakota Skipper Habitat Assessment	June 2022 - August 2022
Whooping Crane Habitat Assessment (Revised)	June 2022 – September 2022
Wildlife Conservation Strategy	June 2022 – Pre-COD
Raptor Nest Surveys	February 2023 – August 2023
Lek Surveys	March 2023 – May 2023

* Shaded cells indicated those survey efforts that are completed through analysis and draft reporting.

1. Lek Surveys (Map 3)
    a. In 2019 a total of 5 Leks identified: 2 Confirmed and 3 Probable.
    b. In 2020 a total of 5 Leks identified: 2 Confirmed and 3 Probable.
2. Raptor Nest Surveys (Map 3)
    a. 135 nest structures identified/searched.
    b. 1 bald eagle nest; 1 historic bald eagle nest could not be located during multiple efforts.
    c. 2 occupied active Swainson's hawk nests.
    d. 21 occupied active great horned owl nests.
    e. 57 occupied active red-tailed hawk nests.
    f. 2 occupied active unidentified raptor nests.
    g. 51 inactive unidentified raptor nests.
3. 2019-2020 Avian Use Surveys (Map 6)
    a. 64 avian and eagle use survey points (800-m survey radius) surveyed for 12 months.
    b. Completed 745 hours of surveys.
    c. Eagles resulted in 28 observations.
        i. 2 observations for GOEA for 3 minutes (2 "exposure" minutes; within 800m and below 200m).
        ii. 26 observations for BAEA for 150 minutes (47 "exposure" minutes).
    d. No federally-listed species identified.
4. Northern-long Eared Bat Acoustics and P/A Surveys
    a. 2019 P/A surveys.
        i. 7 acoustic survey sites resulted in potential NLEB calls at 2 sites.
            1. 2 follow-up mist-nest surveys captured a total of 4 NLEB.
        ii. 3 mist-netting locations.
            1. No NLEB captured.
    b. 2020 P/A acoustic surveys.

i. 7 acoustic survey sites within the Study Area and 5 survey sites along the T-line.
    1. 2 locations had possible NLEB calls (1 within the study area and 1 along the T-line).
    2. No follow up mist-netting efforts were conducted in 2020.

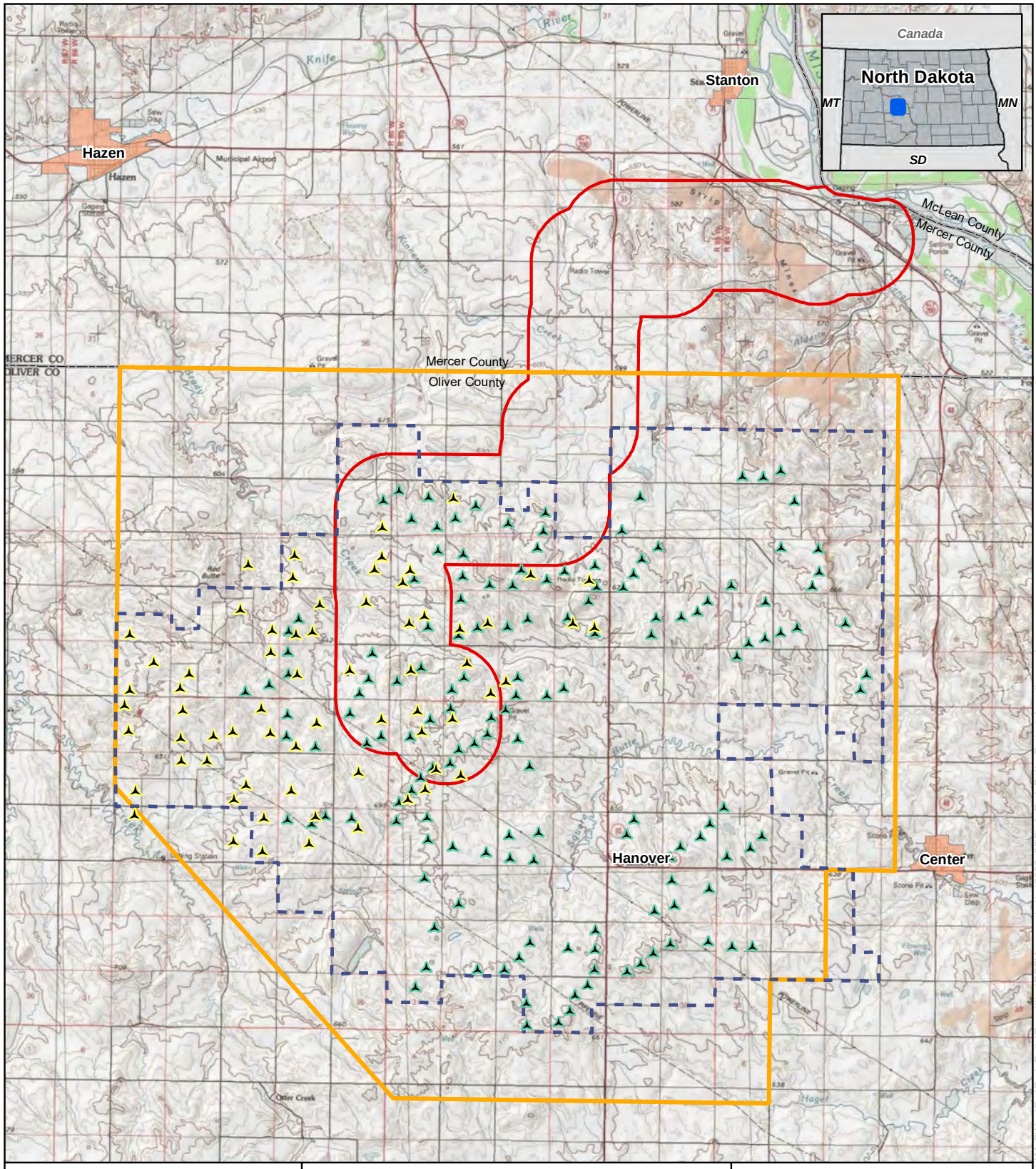
d. Current Studies (2022)
    1. NLEB P/A mist-netting.
        a. 2 survey locations (1 t-line and 1 within project).
        b. Locations based on previous potential NLEB calls, where no follow-up surveys could be conducted at the time.
    2. Eagle and Raptor Nest Surveys (no new eagle nests).
    3. Large Bird/ Eagle Use surveys (March 2022 – February 2023).
    4. Whooping Crane Likelihood of Occurrence Report.
        a. Project is within whooping crane migration corridor.
        b. Niemuth et al. (2018) predicted whooping crane use model suggests relatively low use as compared to other areas to the north and east of the proposed Project area. This is being updated based on revised Project areas.
        c. No documented sightings within the Project area; however, there are several recorded in vicinity.
    5. Additional DASK Habitat Surveys.

e. Proposed Survey Efforts for 2023
    1. Raptor Nest Surveys.
    2. Sharp-tailed Grouse Lek Surveys.
    3. Wildlife Conservation Strategy.

4) Action Items / Next Steps

ATTACHMENTS

- Map 1 - Overview Map
- Map 2 – Unbroken Grasslands
- Map 3 – Lek and Raptor Efforts
- Map 4 – Land Cover (crop and coal lease)
- Map 5 – Key Wildlife Habitats
- Map 6 – 2019 - 2020 Avian and Eagle Use Survey Efforts



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For Environmental Review Purposes Only

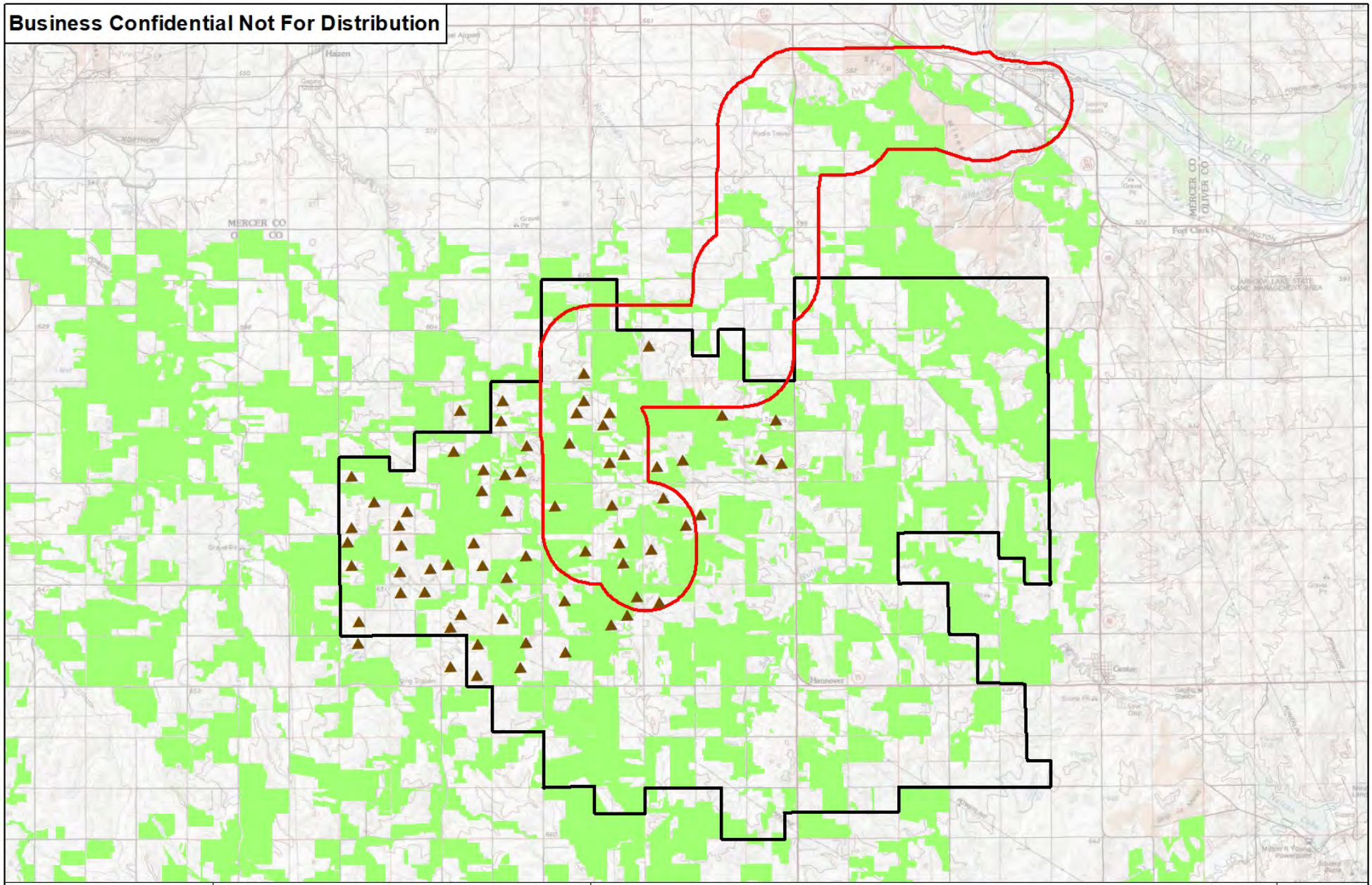
Figure 1
Study Area
Red Butte Wind Energy Center and Transmission Line
Mercer and Oliver Counties, North Dakota

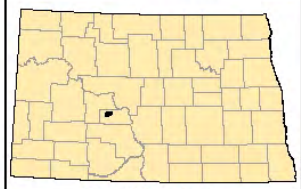
- 400 MW Array (2019)
- 200 MW Array (2022)
- Transmission Line Study Area
- PRC Study Area (2016)
- Wind Project Study Area (2019)
- County Boundary
- City Boundary

Source: Z:\Clients\M_P\NextEra\Red_Butte\Permitting\PSC\Agency_Letter\2022_06\Fig1_Red_Butte_Project_Location.mxd

Date: (7/12/2022)

Business Confidential Not For Distribution





North Dakota

Red Butte Wind Energy Center

Grasslands

Data Source: ESRI USA Topo 2013
Coordinate System: UTM, NAD83, zn 14N
Map produced on 07/11/2022 by T. Thorn

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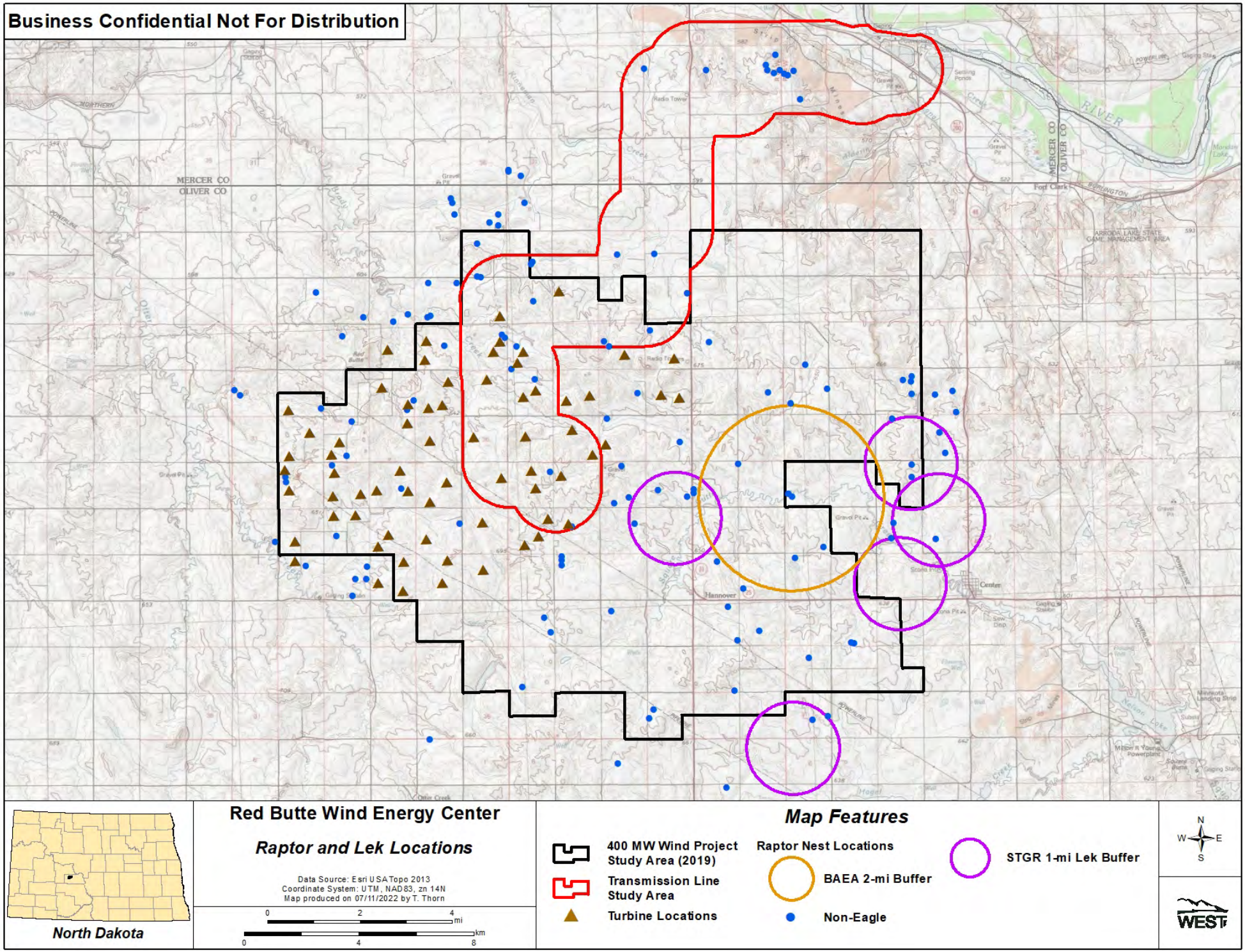
Map Features

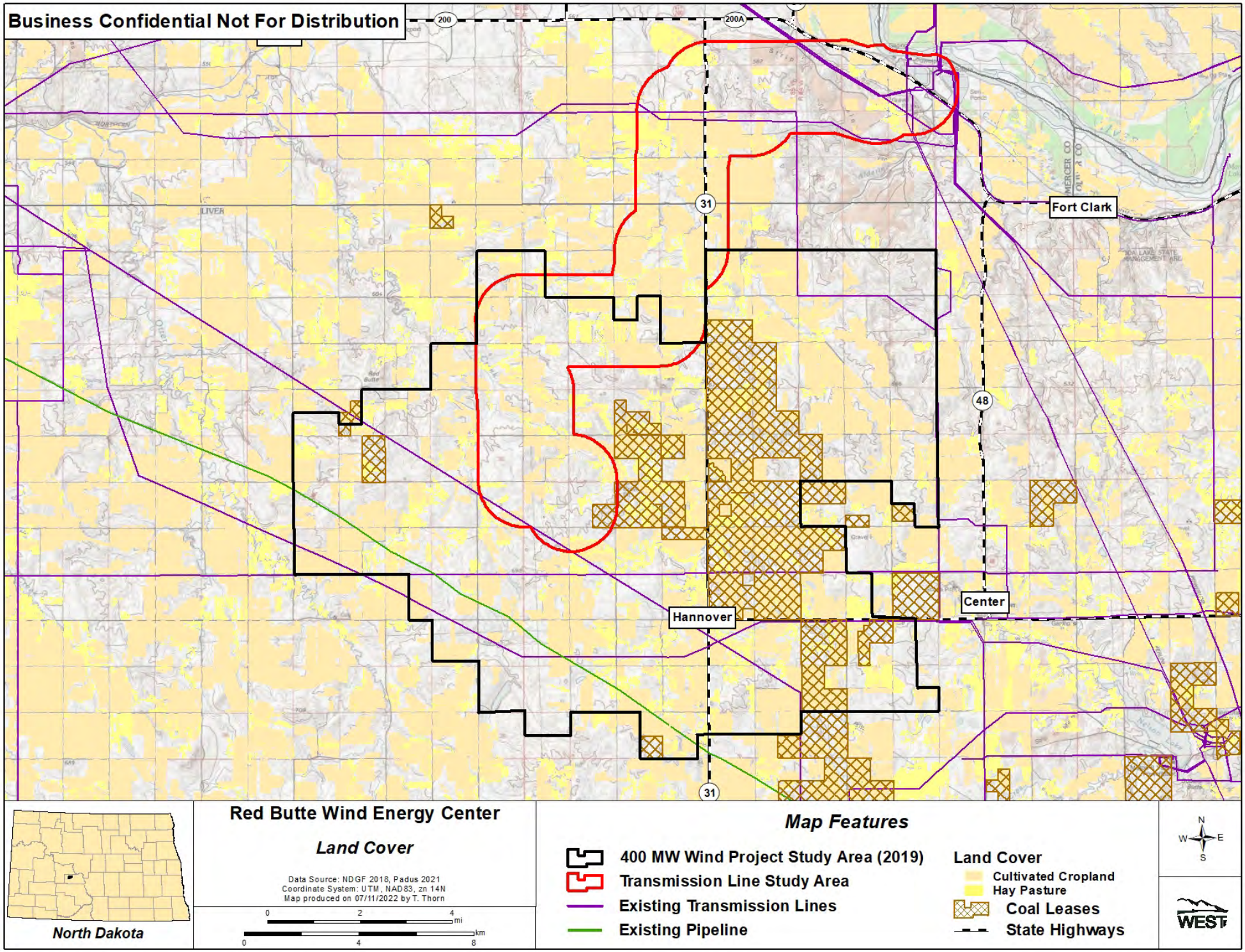
- 400 MW Wind Project Study Area (2019)
- Transmission Line Study Area
- Unbroken Grassland
- Turbine Locations

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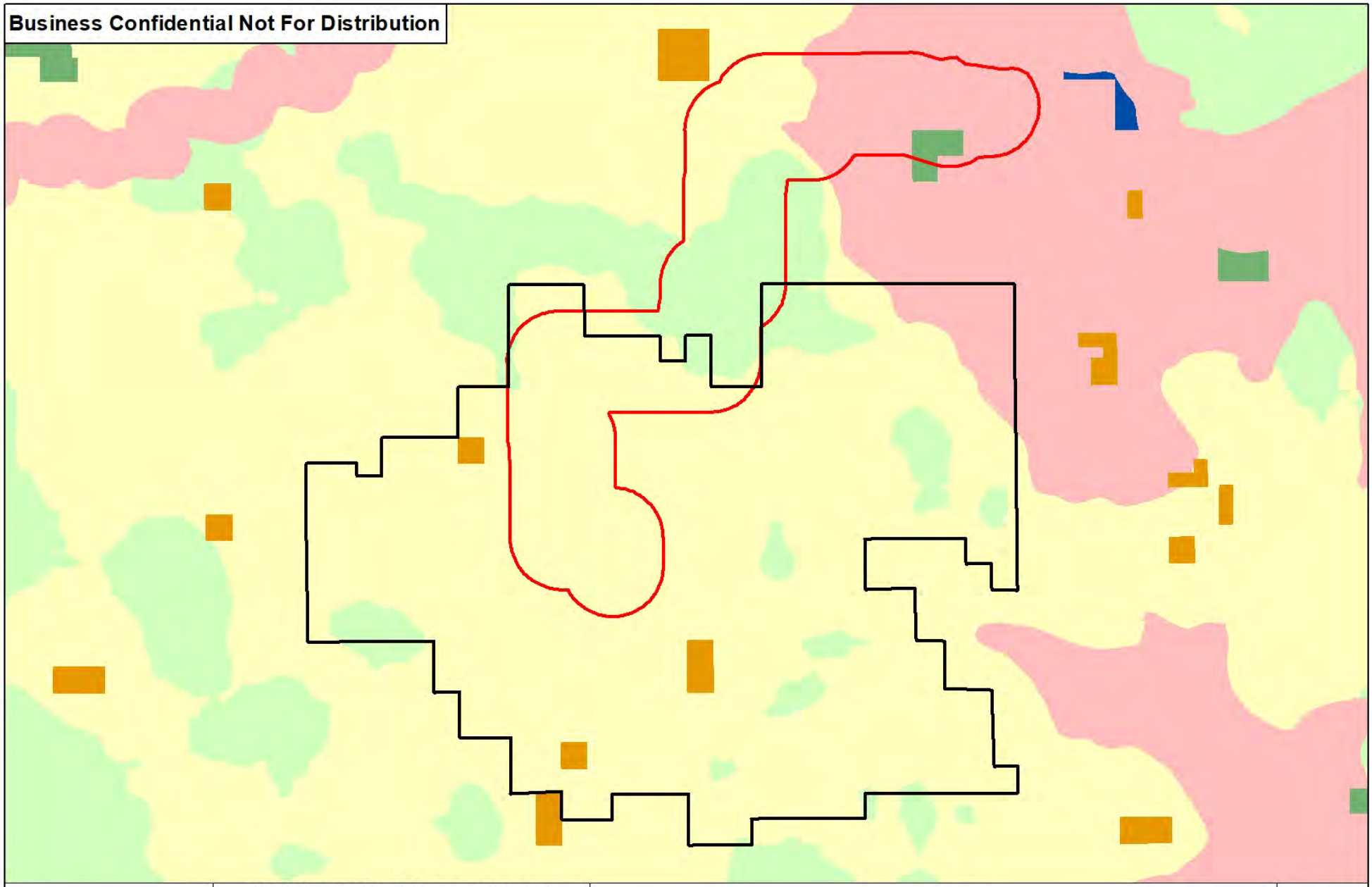
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MERCER CO
OLIVER CO
Red Butte Wind Energy Center
Raptor and Lek Locations
Data Source: Esri USA Topo 2013
Coordinate System: UTM, NAD83, zn 14N
Map produced on 07/11/2022 by T. Thorn
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North Dakota
Map Features
400 MW Wind Project Study Area (2019)
Transmission Line Study Area
Turbine Locations
Raptor Nest Locations
BAEA 2-mi Buffer
Non-Eagle
STGR 1-mi Lek Buffer
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200
200A
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Fort Clark
Hannover
Center
31
North Dakota
Red Butte Wind Energy Center
Land Cover
Data Source: NDGF 2018, Padus 2021
Coordinate System: UTM, NAD83, zn 14N
Map produced on 07/11/2022 by T. Thorn
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Map Features
400 MW Wind Project Study Area (2019)
Transmission Line Study Area
Existing Transmission Lines
Existing Pipeline
Land Cover
Cultivated Cropland
Hay Pasture
Coal Leases
State Highways
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WEST

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North Dakota

Red Butte Wind Energy Center

NDGF Key Wildlife Habitat/Ownership

Data Source: NDGF 2018, Padus 2021
Coordinate System: UTM, NAD83, zn 14N
Map produced on 07/11/2022 by T. Thorn

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0 4 8 km

Map Features

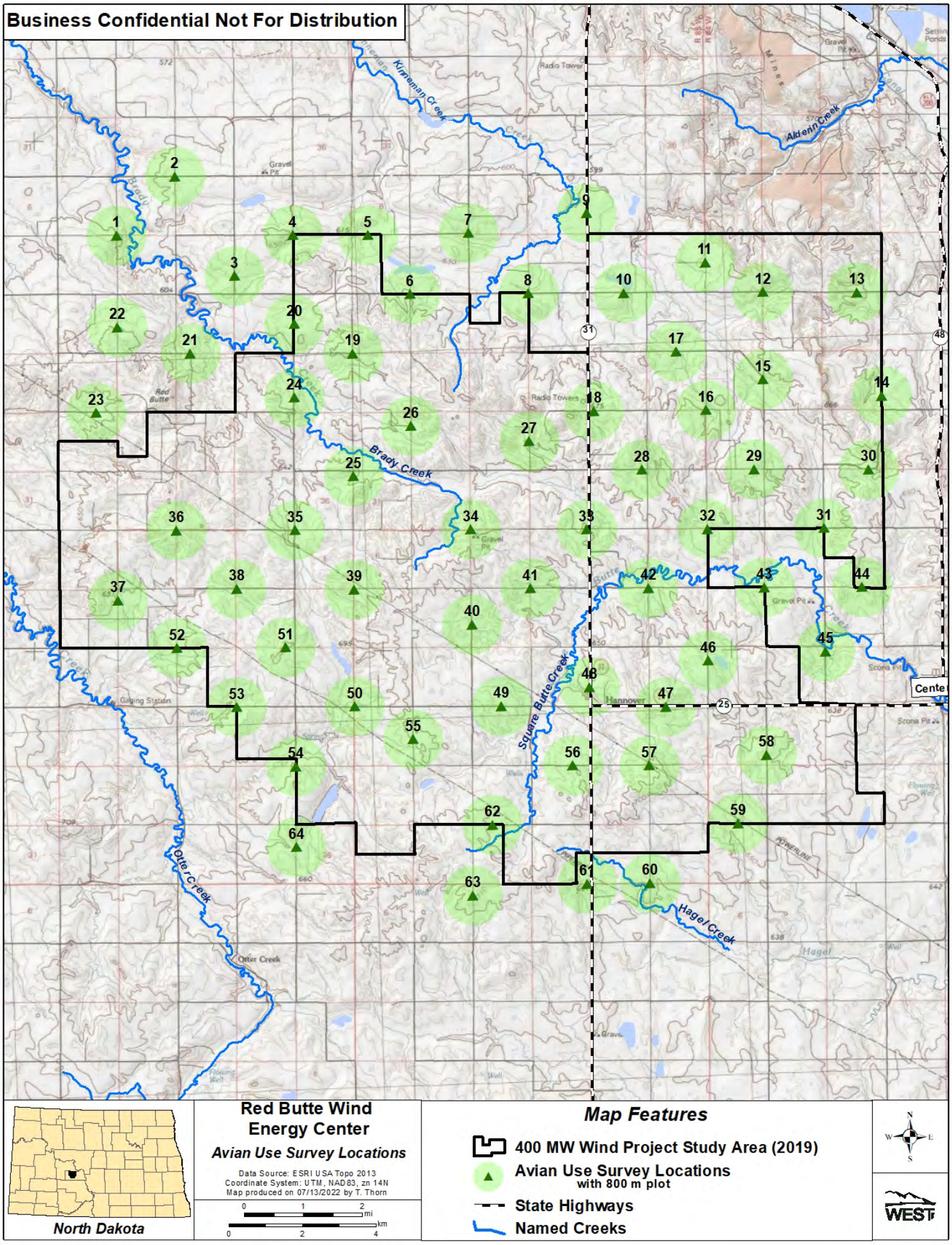
400 MW Wind Project Study Area (2019)
Transmission Line Study Area

Ownership
ND State Trust Lands
NDGF WMAs
BLM

NDGF Key Wildlife Habitat
High Impact
Medium Impact
Low Impact

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WEST


Business Confidential Not For Distribution
Kirkeman Creek
Alderin Creek
Brady Creek
Square Butte Creek
Otter Creek
Hagel Creek
Red Butte
Radio Towers
Gaging Station
Hannover
Gravel Pit
Scona Pit
Flowing Well
POWERLINE
Hagel
Otter Creek
North Dakota
Red Butte Wind Energy Center
Avian Use Survey Locations
Data Source: ESRI USA Topo 2013
Coordinate System: UTM, NAD83, zn 14N
Map produced on 07/13/2022 by T. Thorn
0 1 2 mi
0 2 4 km
Map Features
400 MW Wind Project Study Area (2019)
Avian Use Survey Locations
with 800 m plot
State Highways
Named Creeks
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WEST

NextEra Energy Resources
North Dakota Projects
Wildlife Agency Meeting Notes

Date: 14 July 2022
Time: 14:00 – 16:00h
Location: North Dakota Game and Fish Department, 100 N. Bismarck Expressway, Bismarck, ND 58501 and via Teams.

Meeting Notes

1) Introductions
2) NextEra presented updated Red Butte Wind Energy Center (Project) information
    a. Transmission line is routed north of NDGFD WMA
        i. Exact distance is to be determined
    b. NextEra/WEST provided overview of the survey results to date and current studies
        i. Surveys cover the full 400 MW study area
        ii. WEST to follow up with NDGFD regarding any new nest/lek data
            1. Make request from Elisha and Sandy
        iii. USFWS (Drew) requested the bat reports
            1. Reports not finalized – WEST will look at what is available to share
            2. Genetic samples to provide bats are NLEB
                a. WEST asked if Drew can get a permit to do genetic sampling on this Project
                b. Agencies are surprised that NLEB were captured
        iv. NDGFD asked about post-construction surveys along the t-line
            1. NextEra does not plan to do post-construction surveys along the t-line
    c. NDGFD (Elisha) asked if NextEra has wind BMP document
        i. NextEra has the document
        ii. NDGFD suggests doing an impact analysis and including in the WCS
        iii. NDGFD requests NextEra share turbine locations, site plan
            1. NDGFD will run the impact analysis internally
3) NextEra mentioned upcoming projects, showed locations
    a. New Salem – 200 MW, t-line to Square Butte substation
    b. Prairie – 200 MW, direct tap

Summary of Action Items

Request updated nest/lek data from NDGFD

Send USFWS additional information on NLEB captures

NLEB genetic sampling permit

Send array, site plan to NDGFD

Attendee List

Elisha Mueller (NDGFD)

Steve Dyke (NDGFD)

Clay Cameron (NextEra)

Dustin Jones (NextEra)

Jill Kotwasinski (NextEra)

Sarah Montone (NextEra)

Clayton Derby (WEST)

Martin Piorkowski (WEST)

Lindsey Churchill (Merjent)

Drew Becker (USFWS)

Heidi Riddle (USFWS)

*Attendees in italics attended via Teams

NextEra Energy Resources - North Dakota Projects
Wildlife Agency Meeting

Date: 15 March 2023
Time: 13:30 – 15:30h
Location: North Dakota Game and Fish Department, 100 N. Bismarck Expressway, Bismarck, ND 58501.
Call in number for remote access: (469) 480-4154 access number 15171238#.

AGENDA

1) Sign-in Sheet
2) Introductions and Meeting Overview
3) Oliver Wind IV Project Information
   a. Project originally developed by PRC Wind starting in 2016. Further development conducted by Tenaska in 2018. NextEra purchased and will complete development and permitting.
   b. Planned for 400 MW (split into two 200 MW units): Oliver Wind IV and Red Butte Wind (Map 1)
   c. Anticipated PSC application submission date: Oliver Wind IV Q3 2023 / Red Butte Wind Q3 2024
   d. Anticipated construction start date: Oliver Wind IV Q2 2024 / Red Butte Wind Q2 2025
   e. Anticipated Commercial Operation Date (COD): Oliver Wind IV Q4 2024 / Red Butte Wind Q4 2025
4) Discussion Items
   a. Previous Project Meetings with USFWS and NDGFD
      i. Study plan development/review and data sharing in 2016
      ii. Meetings in 2017 to review Tier 2 and 3 study results
      iii. Meeting in 2018 to discuss additional Dakota skipper habitat surveys
      iv. Meeting in 2019 to discuss prior studies and proposed studies for 2019 and 2020
      v. Meeting in 2022 to review Tier 3 study results
   b. Project Development Review (2016 – 2023)
      i. The Project has been continually developed to avoid and minimize potential impacts to wildlife and their habitats.
      ii. The Project turbines currently avoid unbroken grasslands (Map 2) and associated buffers for eagles and leks (Map 3). Additionally, the wind Projects avoid coal lease land and existing infrastructure (Map 4) and most high impact lands per NDGFD Key Wildlife Habitat (Map 5).
   c. WEG Tier 3 Wildlife Surveys Previously Conducted (since 2019) and Discussed with USFWS and NDGFD
      i. Table 1 lists the wildlife and habitat surveys conducted since 2019 and surveys and analyses in progress.

Table 1*. List of Wildlife and Habitat Surveys

Study	Survey Effort and Analysis
Sharp-tailed Grouse Lek Surveys 2019	April 2019 - July 2020
Avian Use Surveys 2019 - 2020	May 2019 - September 2020
Bat Summer Presence/Absence Surveys 2019	July 2019 - September 2019
Whooping Crane Habitat Assessment 2019	August 2019 - October 2019
Raptor Nest Surveys 2020	February 2020 - September 2020
Sharp-tailed Grouse Lek Surveys 2020	March 2020 - August 2020

Table 1*. List of Wildlife and Habitat Surveys

Study	Survey Effort and Analysis
Bat Summer Presence/Absence Surveys 2020	July 2020 - March 2021
Northern Long-eared Bat Presence/Absence Surveys 2020 - 2022	June 2020 - October 2022
Eagle and Raptor Nest Surveys 2022	March 2022 - September 2022
Eagle/Large Bird Surveys 2022	March 2022 - February 2023
Dakota Skipper Habitat Assessment	June 2022 - August 2022
Whooping Crane Habitat Assessment (Revised)	June 2022 – September 2022
Wildlife Conservation Strategy	June 2023 – Pre-COD
Raptor Nest Surveys	February 2023 – August 2023
Lek Surveys	March 2023 – May 2023

* Shaded cells indicated those survey efforts that are completed through analysis and draft reporting.

1. Eagle and Raptor Nest Surveys (no new eagle nests) (Map 3)
2. Large Bird/ Eagle Use Surveys (March 2022 – February 2023) (Map 6)
3. NLEB Presence/Absence Mist-netting
    a. 2 survey locations (1 t-line and 1 within project)
    b. Locations based on previous potential NLEB calls, where no follow-up surveys could be conducted at the time.
4. Whooping Crane Likelihood of Occurrence Report
    a. The Project is within whooping crane migration corridor
    b. Niemuth et al. (2018) predicted whooping crane use model suggests relatively low use as compared to other areas to the north and east of the proposed Project area. This is being updated based on revised Project areas
    c. No documented sightings within the Project area; however, there are several recorded in vicinity
5. Additional DASK Habitat Surveys

d. Current/Final Studies for 2023

5) Brief Update on Other NextEra Projects in Development (Map 7)

New Salem Wind, Prairie Wind, Emmons-Logan Storage, Northern Divide Storage

Attachments

- Map 1 – Overview Map
- Map 2 – Unbroken Grasslands
- Map 3 – Lek and Eagle Results
- Map 4 – Existing Infrastructure
- Map 5 – Key Wildlife Habitats
- Map 6 – Avian Use Survey
- Map 7 – Project Development Map

Hazen
Beulah
McLean County
Mercer County
State Hwy 200 Alt
McLean County
Oliver County
Mercer County
Oliver County
12th St SW
State Hwy 31
38th Ave SW
21st St SW
Center
State Hwy 25
44th Ave SW



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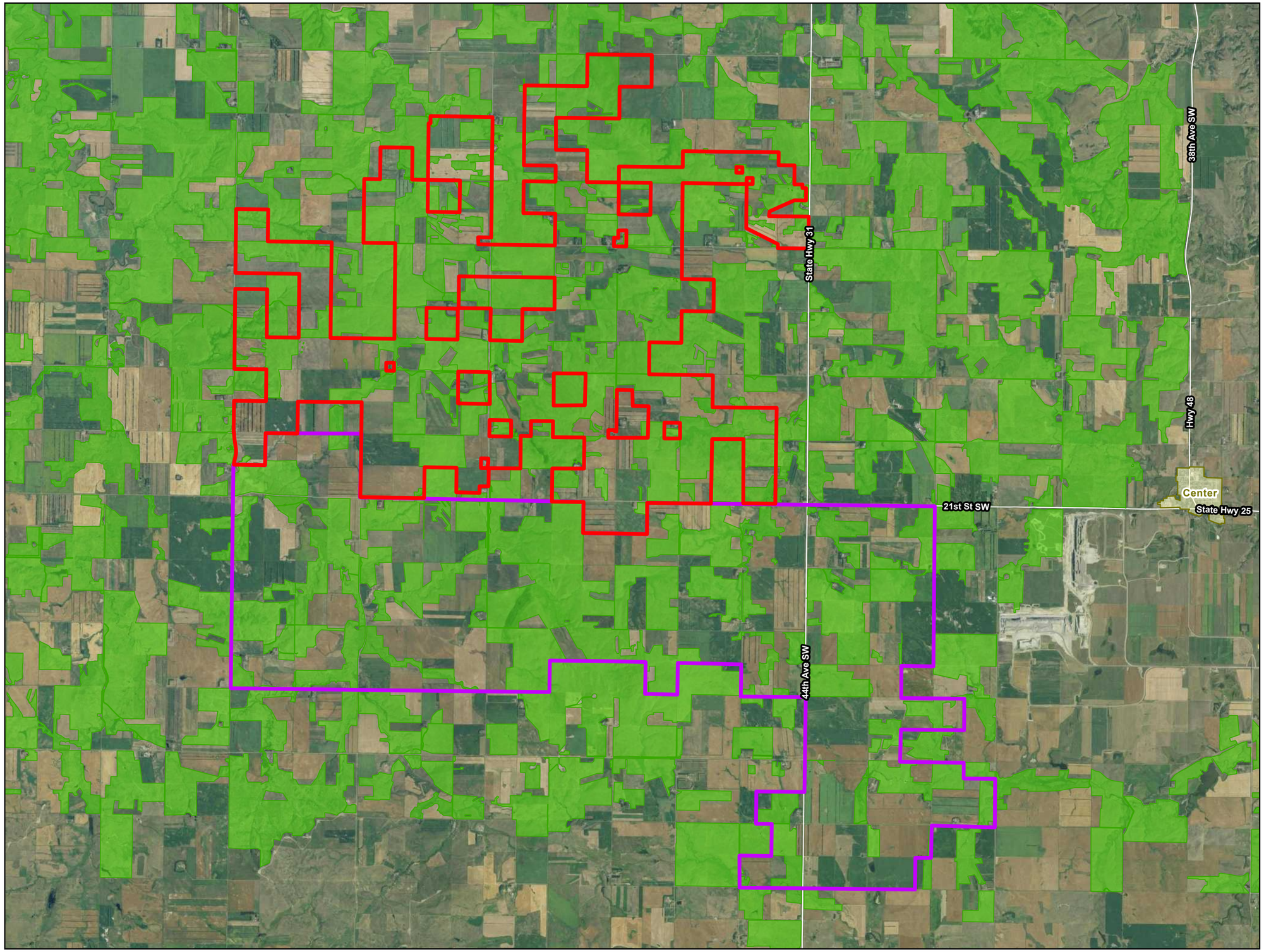
N
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- Project Transmission Line
- Oliver Wind IV
- Red Butte Wind
- County Boundary
- Municipal Boundary

Map 1:
Project Overview
Oliver Wind IV and Red Butte Wind
Mercer and Oliver Counties, North Dakota

Confidential
For Environmental Review Purposes Only

Source: Z:\Clients\M_P\NextEra\Red_Butte\ArcGIS\Client_Meeting\OIV_RBW_ClientMeeting.aprx
Date: (5/14/2022)





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- Oliver Wind IV
- Red Butte Wind
- Municipal Boundary
- Unbroken Grassland

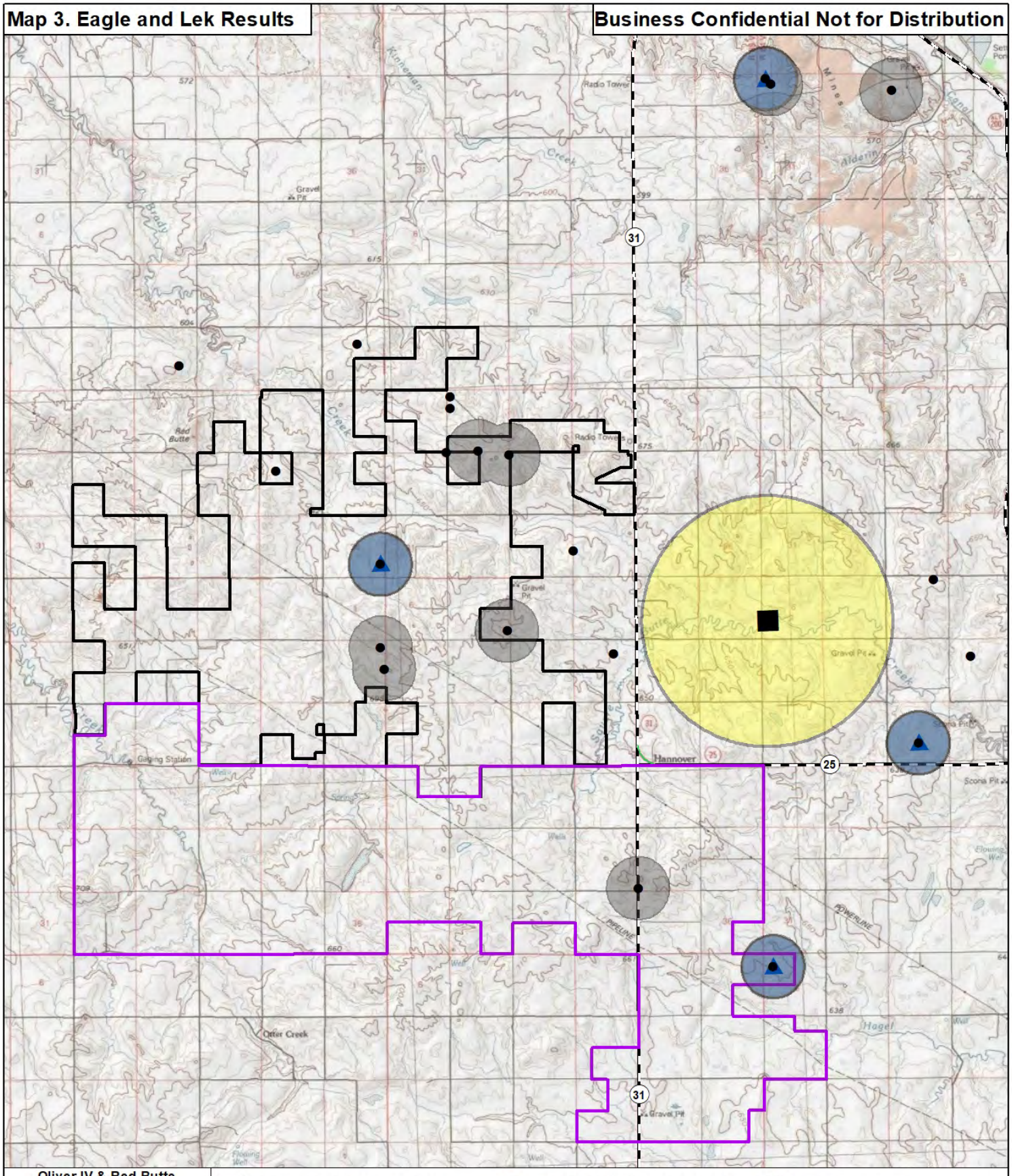
Map 2:
Unbroken Grassland
Oliver Wind IV and Red Butte Wind
Oliver County North Dakota

Confidential
For Environmental Review Purposes Only

Source: Z:\Clients\M_P\Nextera\Red_Butte\ArcGIS\Client_Meeting\OIV_RBW_ClientMeeting.aprx
Date: (5/14/2025)

Map 3. Eagle and Lek Results

Business Confidential Not for Distribution



Oliver IV & Red Butte Wind Projects
Oliver County, ND



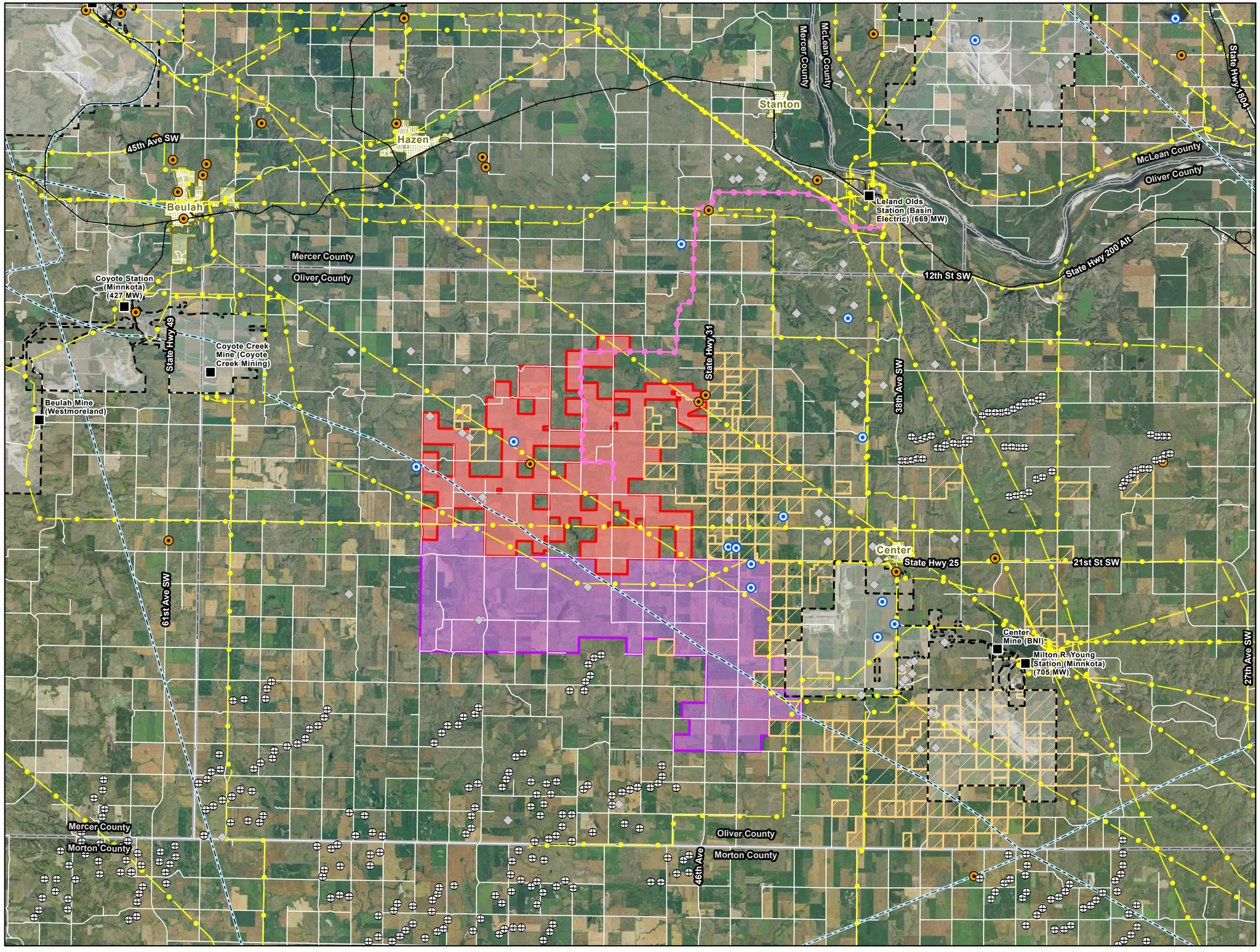
- Oliver IV Wind Project Area
- Red Butte Wind Project Area
- State Highways
- Sharp-tailed Grouse Leks With 0.5-Mile Buffer
- Historic Sharp-tailed Grouse Leks With 0.5-Mile Buffer
- Bald Eagle Nest With 2-Mile Buffer

N W E S

0 1 2 mi
0 2 4 km

Data Source: Esri USA Topo 2013
Coordinate System: UTM,WGS84, zn 14
Map Produced: 03/14/2023. Created by: T. Thorn

WEST





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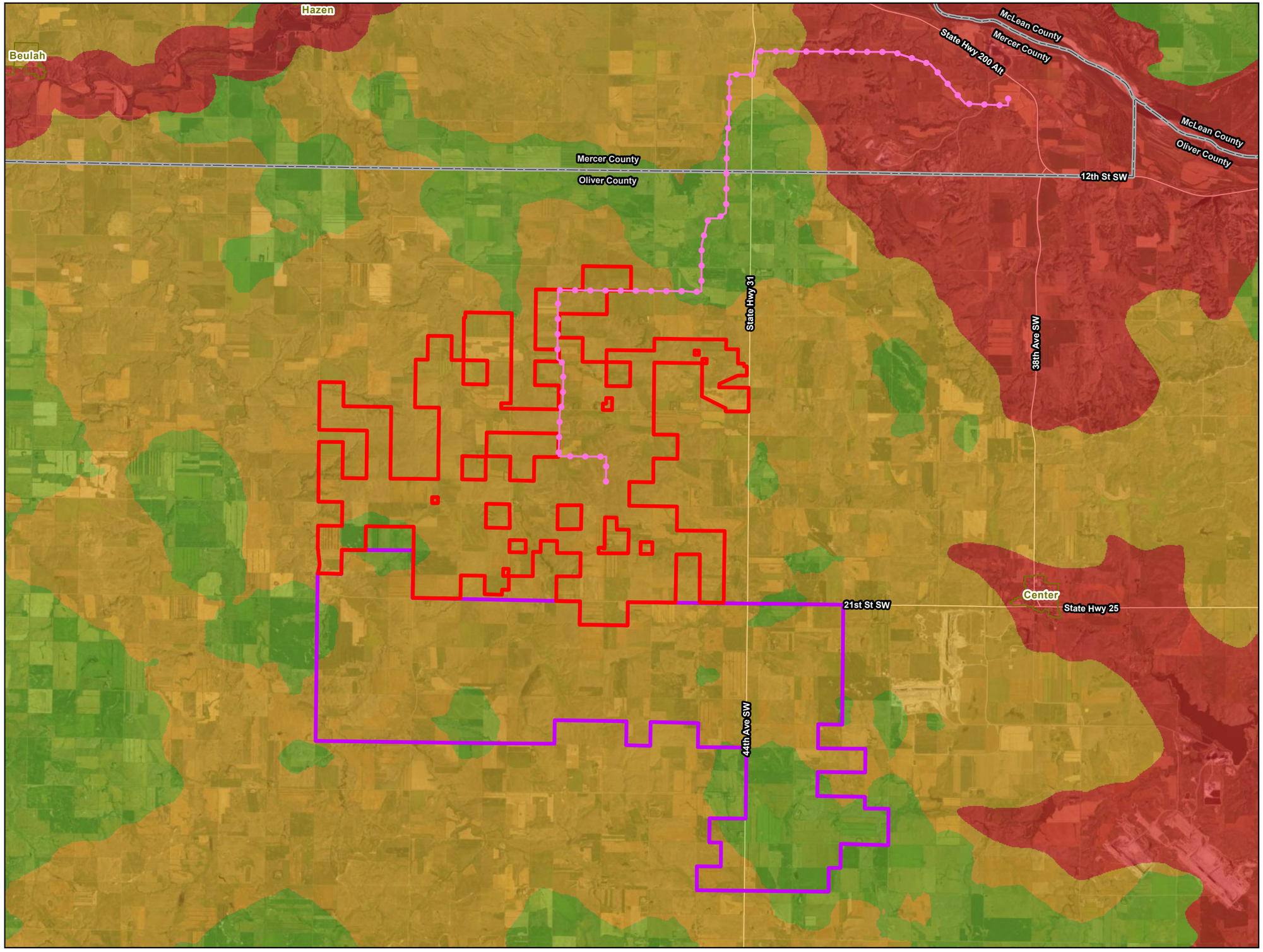
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- Project Transmission Line
- Oliver Wind IV
- Red Butte Wind
- County Boundary
- Municipal Boundary
- Coal Lease
- Coal Mine Permit Boundary
- Wind Turbine
- Energy Facility
- Antenna Structure
- Abandoned Mine
- Oil & Gas Well
- Oil & Gas Pipeline
- Transmission Line
- Railroad

Map 4:
Existing Infrastructure
Oliver Wind IV and Red Butte Wind
Mercer and Oliver Counties, North Dakota

Confidential
For Environmental Review Purposes Only

Date: 04/14/2021 Source: Z:\Clients\M_P\NextEra\Red_Butte\GIS\Client_Meeting\OIV_RBW_ClientMeeting.aprx





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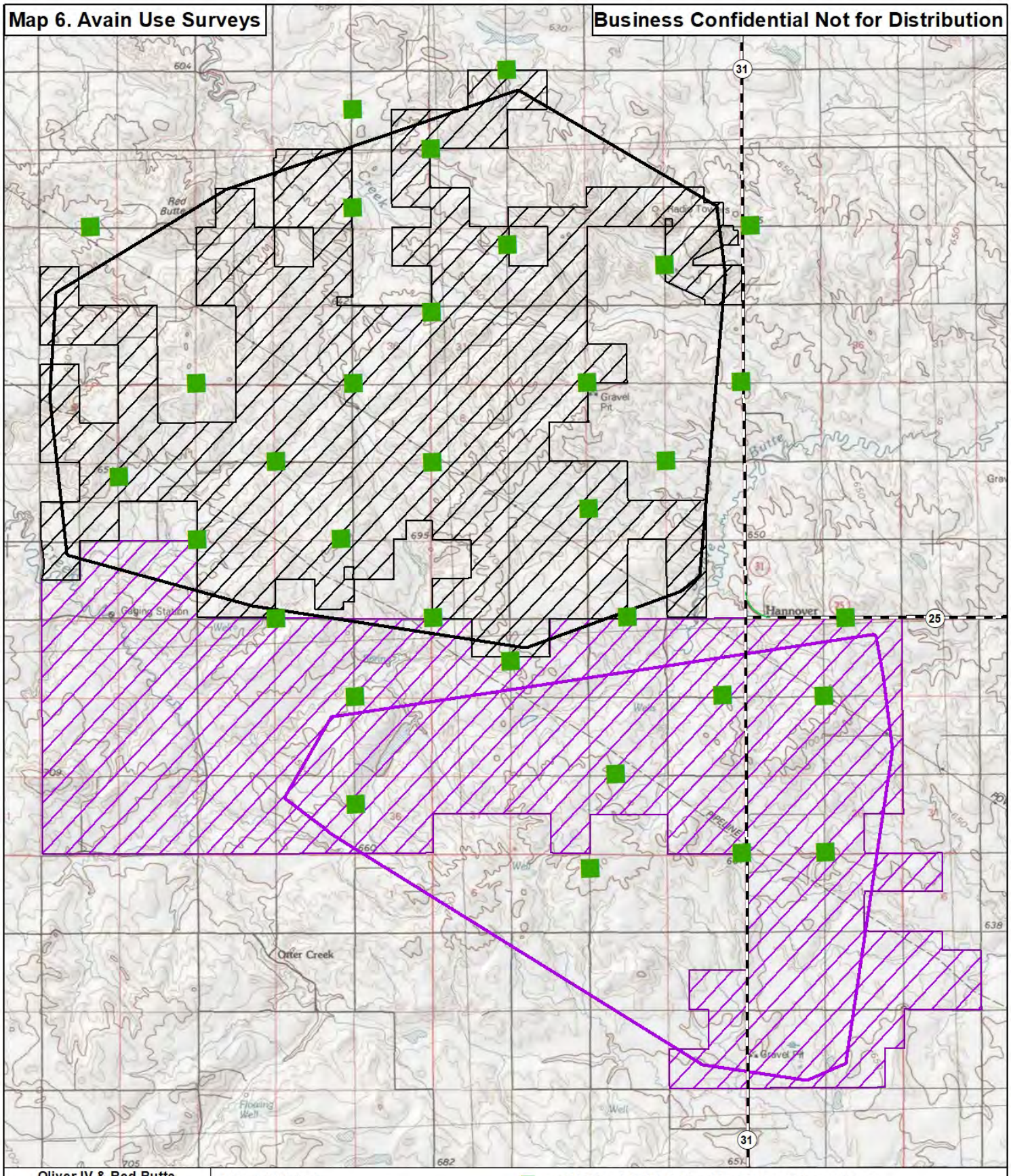
Project Transmission Line
Oliver Wind IV
Red Butte Wind
County Boundary
Municipal Boundary

Key Wildlife Habitat Area
High Impact
Medium Impact
Low Impact

Map 5:
Key Wildlife Habitats
Oliver Wind IV and Red Butte Wind
Mercer and Oliver Counties, North Dakota

Confidential
For Environmental Review Purposes Only

Date (2/14/2025) Source: Z:\Clients\MI_P\Nextera\Red_Butte\MXDs\Client_Meeting\OIV_RBW_ClientMeeting.aprx


Map 6. Avain Use Surveys
Business Confidential Not for Distribution
Red Butte Creek
Gravel Pit
Butte
Hannover
Gaging Station
Well
Otter Creek
Flowing Well
PIPELINE
31
25
Oliver IV & Red Butte Wind Projects
Oliver County, ND
MT
ND
MN
SD
Oliver IV Wind
MCP and Project Area
Project Area
Red Butte Wind
MCP and Project Area
Project Area
2019 And 2022 Avian Use Survey Locations
State Highways
N
W
E
S
0 1 2 mi
0 2 4 km
Data Source: Esri USA Topo 2013
Coordinate System: UTM,WGS84, zn 14
Map Produced: 03/14/2023. Created by: T. Thorn
WEST

From:	Brown, Dina
To:	Mueller, Elisha K. (ekmueller@nd.gov); Martin Piorkowski; Clayton Derby (cderby@west-inc.com); Lindsey Churchill; Cameron, Clay; Montone, Sarah
Cc:	Riddle, Heidi L (heidi_riddle@fws.gov); Jones, Dustin
Subject:	EXTERNAL: NextEra Red Butte Wind Update Meeting with NDGFD
Date:	Tuesday, April 4, 2023 8:30:06 AM
Attachments:	Red_Butte_Oliver_IV_NDGFD__NEER_March_2023_MeetingNotes_04032023.pdf

CAUTION: This email originated from outside of Merjent.

All,

Please find attached notes from the NextEra Energy and NDGFD meeting that occurred on March 15, 2023. The meeting allowed NextEra to provide an update on our Oliver Wind IV and Red Butte Wind energy projects as well as an overview of other current North Dakota projects. Let me know if you have any questions.

Thanks,
Dina

Dina E. Brown | Project Manager
Environmental Services | Central Region | NextEra Energy Resources, LLC
C: 281-570-7108 | Dina.Brown@nexteraenergy.com
We Are Committed to Excellence | We Do the Right Thing | We Treat People With Respect

NextEra Energy Resources
North Dakota Projects
Wildlife Agency Meeting Notes

Date: 15 March 2023
Time: 13:30 – 15:00h
Location: North Dakota Game and Fish Department, 100 N. Bismarck Expressway, Bismarck, ND 58501

Meeting Notes

Objective: Provide an update on the proposed development schedule of the original Red Butte Wind Project with timelines and PSC submission expectations. Additionally, NextEra wanted to provide brief updates on other Projects in North Dakota being proposed including: New Salem, Prairie Winds, Emmons-Logan Battery Storage, and Northern Divide Battery Storage.

1) Introductions
2) NextEra presented updated Red Butte Wind Energy Center (Project) information
    a. Original project was split into two: Oliver Wind IV (~200MW) and Red Butte Wind (~200MW)
    b. Oliver Wind IV is on track to submit a PSC application approximately August 2023 with a COD in Q4 2024
        i. Proposed GE 2.82MW turbines with <500 ft tip height.
        ii. An estimated 18 miles of new overhead transmission line to a new Basin Electric substation near Leland Olds.
        iii. Numerous constraints have been examined and included in layout scenarios.
        iv. All unbroken grassland are being avoided for turbine placement.
        v. Turbines are sited to avoid sharp-tailed grouse leks by 0.5-mile.
    c. Red Butte Wind is proposed approximately one year behind Oliver Wind IV with COD in Q4 2025
    d. NextEra/WEST provided reference to previous meeting (July 15, 2022) for survey results.
        i. Oliver Wind IV (updates)
            1. Most field surveys have been completed for the full area of development and have been discussed previously.
            2. Additional DASK surveys will need to be completed for the finalized construction layout this summer (2023).
            3. Development of a Wildlife Conservation Strategy will be developed over the spring and summer.
        ii. Red Butte Wind (updates)
            1. This project is following approximately one year behind Oliver Wind IV.
            2. Additional studies are being evaluated based on project design and potential gaps in information.
    e. NDGFD Comments
        i. Sharp-tailed Grouse Leks
            1. E. Mueller asked if 2-mi avoidance of nesting habitat was used in turbine layouts and how many turbines might be sited within broken grasslands. She stated that she was encouraged to see that all unbroken grasslands were being avoided for turbine placement. She stated she would rather see turbines in croplands and within 2-mi of leks than see turbines on grasslands. She also stated that there were other options that could be considered including post construction monitoring of known leks and timing restrictions for construction.
            2. C. Cameron reiterated that based on previous discussion with NDGFD that all unbroken grasslands are avoided in the latest turbine arrays.
        ii. WHCR and DASK Habitat

1. E. Mueller expressed concern for DASK across unbroken grasslands for the Oliver Wind IV t-line. She suggested to follow-up with H. Riddle (FWS) to discuss further.
2. A similar concern was made for WHCR and E. Mueller suggested to reach out to H. Riddle on the topic of WHCR and the t-line.

iii. PSC Application

1. E. Mueller reiterated that NDGFD would need to get a letter to the PSC 30 days prior to the hearing. She suggested to get all data to NDGFD at about the time of the PSC application submission for review. She commented on the good relationship that NDGFD and NextEra has had to date with these projects and looks forward to providing a strong supportive letter. She added that NextEra should conduct an impact analysis on their own, as NDGFD will be doing the same, and she would need to report any remaining impacts (even if it is only five acres) to the PSC in their letter.

f. Additional North Dakota Projects

i. New Salem – C. Cameron described New Salem as a 375 MW Project. However, this could be split into two projects (New Salem I and New Salem II) depending on project development. M. Piorkowski described current planned sharp-tailed grouse lek survey strategy (one aerial survey for larger study area and two ground surveys in the smaller project area; Appendix A).

ii. Prairie Wind – C. Cameron provided a high-level description of the project to be approximately 200 MW in size with a COD late in 2025. There would be no t-line associated with this project and would be a direct tap to the existing line that runs through the proposed project.

iii. Emmons-Logan Battery Storage – C. Cameron explained battery storage for the project as storage containers with batteries inside, each with their own heating and cooling systems. This effort requires a PSC application, but has been scaled back from 200 MW to 100 MW. This is to help provide efficiencies for the wind project and more stable energy generation. This storage would impact approximately 20 ac adjacent to the existing Emmons-Logan substation.

iv. Northern Divide Battery Storage – Similar to the Emmons-Logan battery storage, this project would also include an approximately 20 ac location adjacent to the existing Northern Divide substation that would house storage for up to 100 MW.

Summary of Action Items

- NextEra will send along finalized report for Oliver Wind IV to NDGFD prior to/at time of the PSC application submission.
- NextEra will continue to provide NDGFD updates on project status and summarize field survey results as project development continues for other projects.

Attendee List

Elisha Mueller (NDGFD)

Dina Brown (NextEra)

Clay Cameron (NextEra)

Sarah Montone (NextEra)

Clayton Derby (WEST)

Martin Piorkowski (WEST)

Lindsey Churchill (Merjent)

Appendix A

Meeting Notes

Objective: To provide NDGFD a proposed survey strategy for sharp-tailed grouse leks at the New Salem Wind Project to meet their expectations for survey efforts.

3) WEST/NextEra presented a proposed survey strategy for New Salem Wind for 2023
   a. NextEra will be considering grasslands (broken and unbroken) when developing turbine layout designs for the New Salem Wind Project (Project). Priority will be to avoid unbroken grasslands followed by broken grasslands for turbine placement and maximize placement in croplands and other disturbed landscapes.
   b. The Project may be split into two (New Salem Wind I & II) with more certainty of development in the eastern portion of the Study Area (see Focus Area; Figure 1).
   c. Due to uncertainty of turbine locations at this early stage of development, WEST/NextEra proposes to conduct lek surveys at the proposed Project.
   d. M. Piorkowski described current planned sharp-tailed grouse lek survey strategy to include one aerial survey effort across the larger extent of the Study Area (Figure 1) and two ground survey efforts along publically accessible roads within the Focus Area (Figure 1). Surveys will be completed by stopping approximately every 0.5 – 1.0 mi apart depending on topography and habitat types with wider spacing between stopping points in flatter, cropland landscapes.

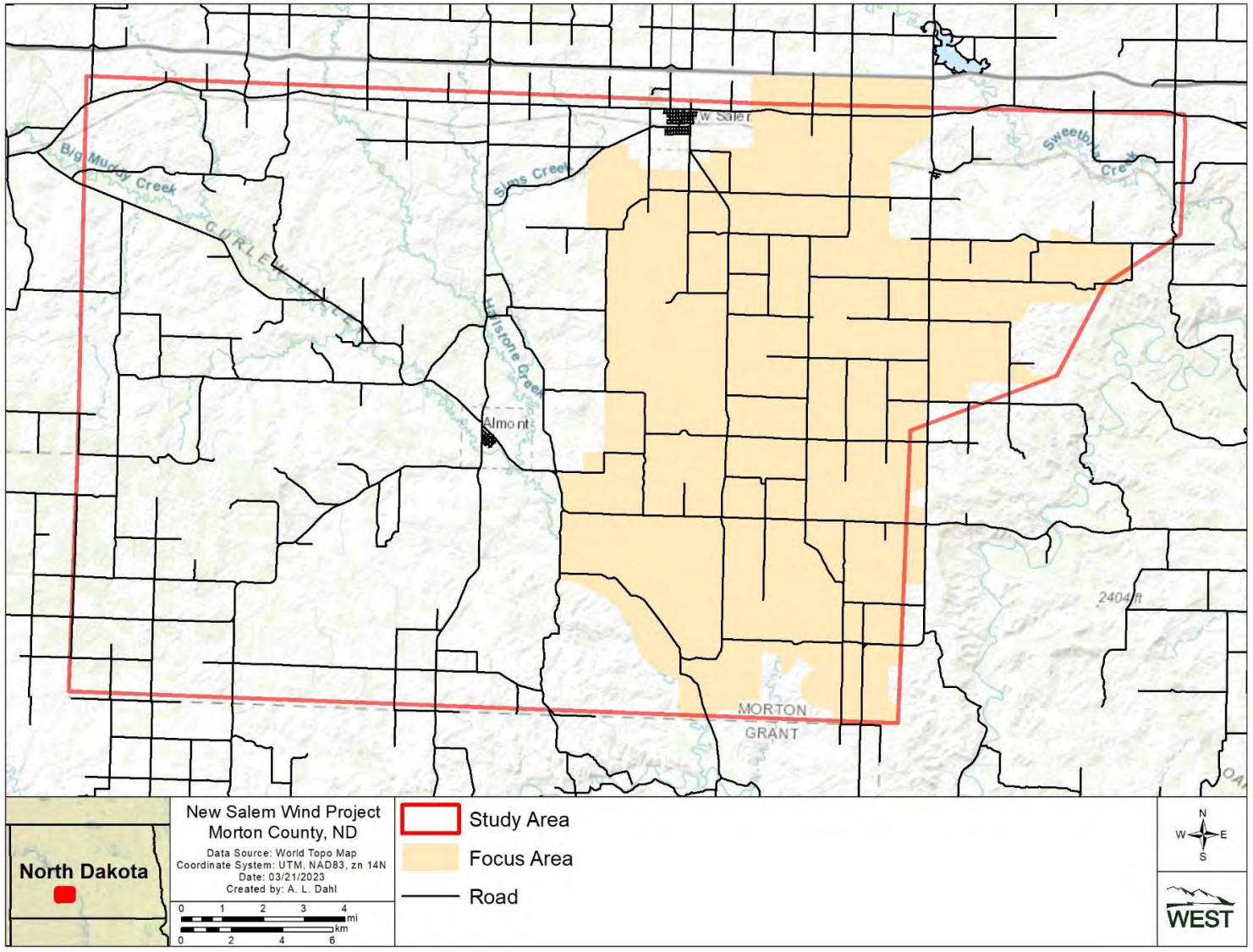


Figure 1. Boundaries of the New Salem Wind Project for proposed 2023 lek surveys, Morton County, North Dakota.

From: Lindsey Churchill
Sent: Thursday, May 11, 2023 4:19 PM
To: Riddle, Heidi L
Cc: Brown, Dina; Dirk Churchill
Subject: RE: EXTERNAL: Red Butte - Oliver IV
Attachments: 20230501_StudyArea_OIV.zip

Heidi,

Please see attached for the study areas shared in the outreach letter. Our final project areas will be smaller footprints.

Thank you,

Lindsey Churchill, PhD, PWS
Bismarck, North Dakota
651.428.7398 mobile
lindsey.churchill@merjent.com



1 Main Street SE, Suite 300
Minneapolis, MN 55414
612.746.3660 main
www.merjent.com

From: Riddle, Heidi L <heidi_riddle@fws.gov>
Sent: Tuesday, May 9, 2023 5:32 PM
To: Lindsey Churchill <lindsey.churchill@merjent.com>
Cc: Brown, Dina <Dina.Brown@nexteraenergy.com>
Subject: EXTERNAL: Red Butte - Oliver IV

CAUTION: This email originated from outside of Merjent.

Hello Lindsey,

I received your request for comments on the subject-mentioned project last week. Can you please share the shapefiles for the project area? I am cc'ing Dina Brown on this email as well, as I believe we are planning to discuss the project overall.

Thank you,
Heidi

Heidi Riddle, CWB®
Fish and Wildlife Biologist
USFWS North Dakota Ecological Services Field Office
3425 Miriam Ave
Bismarck, ND 58501
(701) 319-6708