BEFORE THE STATE OF NORTH DAKOTA
PUBLIC SERVICE COMMISSION

BOWMAN WIND, LLC
BOWMAN WIND PROJECT – BOWMAN COUNTY
SITING APPLICATION

CASE NO. PU-21-121

PRE-FILED TESTIMONY OF BRIE ANDERSON
ON BEHALF OF BOWMAN WIND, LLC

August 4, 2021

I. INTRODUCTION AND QUALIFICATIONS

Q. Please state your name, employer, and business address.

A. My name is Brie Anderson. I am employed at Merjent, Inc., 800 Washington Avenue North, Suite 315, Minneapolis, Minnesota.

Q. Briefly describe your background and qualifications.

A. I have a Bachelor of Science degree in ecology and field biology with a wildlife emphasis and a Master of Science degree in Geographic Information Systems for Natural Resources. I have 13 years of experience permitting various infrastructure projects at the federal, state, and local levels. A copy of my resume is attached as **BW Exhibit 21-A**.

Q. What is Merjent's role with respect to the Bowman Wind Project ("Project")?

A. Merjent is providing environmental permitting support for the Project.

Q. What is your familiarity with the Bowman Wind Project ("Project")?

A. I have been working on the Bowman Wind Farm since October 2019. I managed preparation of the Certificate of Site Compatibility Application ("Application) for the Project, including drafting the environmental chapters; reviewed environmental desktop and survey data for the Project; assisted with agency consultation; managed other consultants, including sound and shadow flicker consultants; and assisted with layout development to avoid/minimize impacts to environmental resources and ensure compliance with applicable setbacks and other siting requirements.

Q. What proposed hearing exhibits are you sponsoring in your testimony?

A. I am sponsoring the following proposed hearing exhibits:

- BW Exhibit 1: Certificate of Site Compatibility Application (Sections 6.2, 6.5, 6.6, 6.7, 6.8, 6.10, 6.11, 6.12, 6.13, 6.14, 6.15, 6.16, 6.17, 8.0, 9.0; Appendices C, D, E, F, G, H, I; Figures)

- BW Exhibit 2: Summary of Project Adjustments
- BW Exhibit 3: Updated Figures 1-12 in support of the Bowman Wind Project Certificate of Site Compatibility Application
- BW Exhibit 4: Comparison Figure (comparing preliminary Project layout with current Project layout)
- BW Exhibit 5: Updated Project Receptor Chart
- BW Exhibit 7: Noxious Weed Management and Control Plan
- BW Exhibit 8: Updated Sound Modeling Report
- BW Exhibit 9: Updated Shadow Flicker Report
- BW Exhibit 10: U.S. Department of the Interior, Bureau of Land Management Letter, dated June 8, 2021
- BW Exhibit 11: North Dakota Geological Survey Letter, dated May 12, 2021
- BW Exhibit 12: U.S. Department of Commerce, National Telecommunications and Information Administration Review Response, dated April 5, 2021
- BW Exhibit 13: Bowman Wind Response to 22 June 2021 Request for Information
- BW Exhibit 14: Updated Application Table 7.0-1 Potential Permits and Approvals
- BW Exhibit 21-A: Anderson Resume

Q. What is the purpose of your Direct Testimony?

A. The purpose of my testimony is to identify the reports provided in support of the Application, discuss the results of the sound and shadow flicker analyses conducted for the Project, discuss the Project's compliance with the North Dakota Public Service Commission's ("PSC") siting criteria and the Siting Act (NDCC Ch. 49-22), and to provide an update on the status of permits/approvals and agency consultation.

II. UPDATES TO THE APPLICATION

Q. Is proposed BW Exhibit 1 Bowman Wind's Application for Certificate of Site Compatibility for the Bowman Wind Project ("Application"), which was filed with the PSC on March 30, 2021?

A. Yes.

Q. Have there been any updates to the Application?

A. Yes. As described in the Summary of Project Adjustments (proposed **BW Exhibit 2**) and discussed in the Direct Testimony of Scott Jansen, since filing the Application, Bowman Wind has continued to coordinate with landowners on development of the Project, incorporate additional information, and further refine the Project boundary and layout. As a result, Bowman Wind has made minor adjustments to the Project boundary and Project layout, which are depicted in the Layout Comparison Figure (proposed **BW Exhibit 4**) and updated Application Figures 1-12 (proposed **BW Exhibit 3**).

Q. Did these Project changes affect resource impact estimates?

A. Overall, impact estimates for the current layout are similar to those for the preliminary layout. Notable changes include removal of a potential laydown yard that decreased temporary impacts by 15 acres and the addition of a potential turbine location, which increased temporary impacts by 5.4 acres and permanent impacts by 1.8 acres. However, since impact calculations are based on all 86 proposed turbine locations, and only up to 74 turbines will be constructed, the actual temporary and permanent impacts will be less and remain unchanged between the preliminary and current layouts. The total acreage change between the preliminary layout and the current layout is a decrease of one half of one percent (*see* Table 1 in Summary of Project Adjustments (proposed **BW Exhibit 2**)).

III. ENVIRONMENTAL AND SITE ANALYSIS REPORTS

Q. What environmental and site analysis reports were filed with the Application for the Project?

A. The following environmental and site analysis reports were filed with the Application (proposed **BW Exhibit 1**):

- Appendix C: Telecommunications Studies;
- Appendix E: Sound Analysis Report;
- Appendix F: Shadow Flicker Analysis Report;
- Appendix G: Class I, Class II, and Class III Report for the Bowman Wind Project and Unanticipated Discoveries Plan **[CONFIDENTIAL]**; and
- Appendix I: Bird and Bat Conservation Strategy ("BBCS"), which discusses the following Tier 1, 2, and 3 surveys including:
  - Avian Use Surveys
  - Raptor Nest Surveys and Follow-up Monitoring
  - Prairie Grouse Lek Monitoring Surveys
  - Northern Long-eared Bat Habitat Assessment
  - Bat Acoustic Monitoring Surveys
  - Grassland Assessment
  - Back-tailed Prairie Dog Colony Mapping

Q. Since the Application was filed, have any additional or updated reports been completed?

A. Yes. Since the Application was filed, Bowman Wind completed or updated and filed the following:

- Wetland Delineation Report (titled Jurisdictional Determination Report), filed on June 25, 2021 (proposed **BW Exhibit 16**);
- Updated Sound Analysis Report, filed on July 23, 2021 (proposed **BW Exhibit 8**);
- Updated Shadow Flicker Analysis Report, filed on July 23, 2021 (proposed **BW Exhibit 9**);

- An Updated BBCS, filed on July 23, 2021 (proposed **BW Exhibit 18**);
- Grassland Assessment, filed on July 23, 2021 (proposed **BW Exhibit 17**); and
- Updated Cultural Resources Report, dated July 2021 [**CONFIDENTIAL**] (proposed **BW Exhibit 15**).

Q. In addition to the formal studies you have identified, were any other key site analyses conducted?

A. Yes. As discussed in the Application, Bowman Wind used desktop and site-specific data to identify and analyze potential impacts to a variety of resources in addition to those covered by the formal reports, including: land use; human health and safety; recreational resources; land-based economies; soils; vegetation; and rare and unique natural resources. *See* proposed **BW Exhibit 1**, Sections 6.0 and 8.0.

Q. Were any changes to land use within the Project Area identified after the Application was filed?

A. Yes. As indicated in the Summary of Project Adjustments filed on July 23, 2021, updated information was received regarding North Dakota Game and Fish Department ("NDGFD") Private Lands Open to Sportsmen ("PLOTS") parcels. *See* Summary of Project Adjustments (proposed **BW Exhibit 2**). The current PLOTS acreage is less than previously identified, as are the proposed temporary impacts to PLOTS parcels. Additionally, after the Application was filed, Bowman Wind learned that the BLM Grazing Allotment leases within the Project Area expired on February 28, 2021. As a result, there are no BLM Grazing Allotment leases within the Project Area. These land use changes are reflected in the updated Figure 7 filed on July 23, 2021 (proposed **BW Exhibit 3**).

IV. SOUND ANALYSIS REPORT

Q. What sound may be generated by modern utility-scale wind turbines, such as those that will be used by the Project.

A. The sound commonly associated with a wind turbine is described as a rhythmic "whoosh" caused by aerodynamic processes. This sound is generated by wind turbines due to turbulence at the blade tips, from mechanical systems in the hub or nacelle (which radiates throughout the structure), and from transformers at the base of the turbine mast. Sound increases with wind speed until maximum blade rotational speed is reached, which usually occurs when wind speeds reach 8-10 meters per second at the turbine hub.

Q. Are you aware of any federal or state sound level regulations for wind energy conversion facilities located in North Dakota?

A. There is no federal sound level regulation for wind turbines. The PSC requires that sound produced by wind turbines not exceed 45 A-weighted decibels ("dBA") within 100 feet of an inhabited residence or a community building, unless a waiver is obtained from the owner of the inhabited residence or the community building.

Q. Does Bowman County have a sound requirement for wind energy conversion facilities?

A. Yes. The Bowman County Zoning Ordinance contains the following sound requirement:

> [S]ound levels of wind turbines within one-hundred (100) feet of any non-participating residence will not exceed 45 dBA L_{eq}. Construction noise or reasonable and necessary maintenance activities are allowed to exceed the sound limit except between the hours of 10 PM to 6 AM local time. This sound standard does not apply to participating dwellings.

Q. Was a sound modeling analysis conducted for the Project?

A. Yes. On behalf of Bowman Wind, Merjent retained RSG, an experienced and highly qualified sound modeling consulting firm, to conduct a sound modeling analysis to determine if the Project would comply with the applicable County and PSC requirements. RSG conducted a sound modeling analysis for the preliminary Project

layout, and the associated report was submitted with the Application (*see* Sound Modeling Report, Appendix E). RSG also conducted updated sound modeling for the current Project layout, and that report was filed with the PSC on July 23, 2021 (*see* updated Sound Modeling Report, proposed **BW Exhibit 8**). The methodology used and the modeling results are detailed in each report.

Q. What turbine model was used for the sound modeling analysis?

A. The sound modeling analysis was conducted using GE 2.82 MW turbines with 127-meter rotor diameters, approximately 89-meter hub heights, and fitted with low-noise trailing edges ("LNTE"). Although only up to 74 turbine locations would be constructed, all 86 potential turbine locations were modeled. Additionally, as an industry best practice, Bowman Wind included the Project substation (transformer) and battery storage facility in the sound modeling.

Q. What receptors were included and how were they identified?

A. The receptors in the sound modeling analysis included residences and community buildings, as those are the receptors identified in the applicable sound regulations. As discussed in the direct testimony of Scott Jansen, receptors were identified by Bowman Wind via a combination of publicly available aerial imagery, driving the site and collecting global positioning system ("GPS") locations, getting feedback from members of the community, and using specific planimetric aerial imagery taken in 2020 of the Project Area. Merjent also conducted a review of receptor data as a quality check. As a result, 140 residences and seven community buildings (one church and six schools) were identified and included in the analysis as receptors.

Q. Please summarize the results of the sound modeling analysis.

A. Based on the sound modeling analysis conducted, one residence was modeled at 47 dBA within 100 feet of the residence (referred to as receptor R-148). The owners of that residence are in the process of signing a participation agreement with Bowman Wind that waives the sound requirement. In the event that agreement were not executed, Bowman Wind would not construct Turbine T41 and, if that

turbine is not constructed, the sound level at receptor R-148 is modeled at 44 dBA. For all other residences and community buildings, the modeled sound level within 100 feet of the receptor is below 45 dBA. As a result, with or without a waiver for receptor R-148, the Project will comply with the County's and the PSC's sound requirements.

Q. If a different turbine model were ultimately selected for the Project, would Bowman Wind conduct an updated sound modeling analysis?

A. Yes, if a different turbine model were selected for the Project, Bowman Wind would have an updated sound modeling analysis conducted to ensure continued compliance with the County's and PSC's sound level requirements.

V. SHADOW FLICKER REPORT

Q. What is shadow flicker?

A. Like any tall structure, wind turbines cast a shadow when the sun is visible. When the wind turbine blades rotate and pass in front of the sun, a flickering or flashing effect may occur when the shadows of the rotating blades cause alternating changes in light intensity at a given stationary location, a receptor, such as the window of a home. This recurring change in light intensity is known as shadow flicker.

Shadow flicker occurs only under very specific conditions. For example, shadow flicker can only occur when the sun is shining and the turbine is in operation (i.e., when the turbine blades are rotating). Moreover, shadow flicker is generally most notable when a turbine is facing a receptor, as this results in the widest-possible shadow being cast.

Shadow flicker intensity and frequency at a given receptor are determined by a number of interacting factors, such as sun position, wind direction, turbine locations, receptor locations, terrain, and time of day. The intensity of shadow flicker varies significantly with distance, and as separation between a turbine and receptor

increases, shadow flicker intensity will generally diminish as shadows diffuse and become imperceptible.

Q. Are you aware of any federal, state, or local shadow flicker regulations for the Project?

A. Shadow flicker is not currently regulated in applicable state or federal law. Bowman County has a limit of 30 hours of shadow flicker per year for non-participating occupied residences unless a variance is granted.

Although the PSC does not have a shadow flicker requirement specified in statute or rule, the PSC typically expects applicants to limit shadow flicker at occupied residences to 30 hours per year or less, unless the owner of the residence grants a waiver.

Q. Was a shadow flicker assessment conducted for the Project?

A. Yes. On behalf of Bowman Wind, Merjent retained ReGenerate Consulting ("ReGenerate"), an experienced and highly qualified shadow flicker modeling consulting firm, to conduct a shadow flicker assessment to determine if the Project would comply with the applicable County requirement. ReGenerate conducted a shadow flicker assessment for the preliminary Project layout, and the associated report was submitted with the Application (see Shadow Flicker Assessment Report, Appendix F). Regenerate conducted an updated shadow flicker assessment for the current Project layout, and the report was filed with the PSC on July 23, 2021 (*see* updated Shadow Flicker Assessment Report, proposed **BW Exhibit 9**). The methodology used and the assessment results are detailed in each report.

Q. What turbine model and locations were used for the shadow flicker assessment?

A. The shadow flicker assessment was conducted using the GE 2.82 MW turbines with 127-meter rotor diameters, approximately 89-meter hub heights, and fitted with

LNTE. Although only up to 74 turbine locations would be constructed, all 86 potential turbine locations (including 12 alternates) were modeled.

Q. What receptors were included in the assessment?

A. The receptors in the shadow flicker assessment included the same 140 residences (both participating and non-participating) identified for the sound analysis.

Q. Please summarize the results of the shadow flicker assessment.

A. Based on the shadow flicker assessment conducted, all residences are expected to experience below 30 hours per year of shadow flicker. The maximum modeled shadow flicker (hours per year) is 14.0 for participating residences and 13.9 for non-participating residences. Additionally, 116 of the 119 nonparticipating residences have zero hours of modeled shadow flicker. Accordingly, all receptors are below the maximum limit set forth in the County's ordinance.

Q. If a different turbine model were ultimately selected for the Project, would Bowman Wind conduct an updated shadow flicker assessment?

A. Yes, if a different turbine model were selected for the Project, Bowman Wind would have an updated shadow flicker assessment conducted to ensure compliance with the County's shadow flicker requirement.

Q. Do existing wind farms impact in the sound and shadow flicker modeling analyses for the Project?

A. No. Neighboring projects that are currently operational were identified based upon the U.S. Wind Turbine Database maintained by the U.S. Geological Survey ("USGS"). The nearest wind project, Cedar Hills, is over five miles away. As a result, the Cedar Hills Project does not impact the receptors analyzed for the Project, and does not affect the sound and shadow flicker modeling results for the Project.

VI. MICROWAVE BEAM PATH STUDY

Q. Was a microwave beam path study conducted for the Project Area?

A. Yes. Bowman Wind conducted a study identifying microwave beam paths and towers in the Project Area, and a copy of the study is included in Appendix C to the Application (proposed **BW Exhibit 1**).

Q. Do Project facilities avoid all microwave beam paths?

A. Yes. There is one microwave beam path in the northern portion of the Project Area that extends northeast to another microwave tower several miles northeast of the Project Area. *See* updated Figure 9, proposed **BW Exhibit 3**. Bowman Wind sited the Project's turbines to avoid the identified microwave beam path.

VII. AGENCY COORDINATION

Q. Prior to filing its Project Application, did Bowman Wind send consultation letters to all agencies and entities identified in Section 69-06-01-05 of the North Dakota Administrative Code?

A. Yes. Bowman Wind sent Project notification letters to 34 federal, state, and local agencies, including the agencies and entities identified in NDAC Section 69-06-01-05. The list of recipients and copies of the correspondence sent and received are provided in Appendix D of the Application (proposed **BW Exhibit 1**).

Q. What agencies/entities has Bowman Wind received correspondence from or consulted with?

A. Bowman Wind received comments from or otherwise consulted with the following agencies/entities:

- U.S. Department of Defense ("DOD") and Ellsworth Air Force Base ("Ellsworth AFB")
- U.S. Department of Commers, NTIA
- U.S. Army Corps of Engineers ("USACE")

- U.S. Fish and Wildlife Service ("USFWS")
- NDGFD
- North Dakota Parks & Recreation ("NDPR")
- North Dakota State Water Commission ("NDSWC")
- State Historical Society of North Dakota ("SHSND")
- Bowman County Airport Authority
- Bowman County

Additionally, after the Application was filed, the PSC received comments directly from the U.S. Department of the Interior, Bureau of Land Management ("BLM"), the NDGFD, and the North Dakota Geological Survey ("NDGS"). Additional discussion of Bowman Wind's coordination with the DOD and Ellsworth AFB is provided in the Direct Testimony of Scott Jansen. Also, a detailed discussion of Bowman Wind's coordination with the USFWS and the NDGFD is provided in the Direct Testimony of Ryan Henning.

Q. Please provide an update regarding the results of the coordination with NTIA.

A. On behalf of Bowman Wind, Evans Engineering coordinated with the NTIA to identify potential interference with federal telecommunications. The NTIA's review was underway at the time the Application was filed. In a letter dated April 5, 2021, the NTIA responded that no reviewing agencies had identified concerns regarding turbine placement within the identified build area, which includes the Project Area. *See* proposed **BW Exhibit 12** (NTIA Review Response, dated April 5, 2021).

Q. Does the Project comply with the recommended avoidance distances in the Telecommunication Studies conducted for the Project (proposed BW Exhibit 1, Appendix C)?

A. Yes. Project turbines will not be sited within 150 meters of land mobile fixed-base stations in order to avoid any possible impact to the communications services provided by these stations. Currently, the closest turbine to a communication tower

is 1,239 feet (378 meters). As such, impacts to communication systems are not anticipated.

VIII. PERMITS AND APPROVALS

Q. Are other permits besides the Certificate of Site Compatibility required for this Project?

A. Yes. Potential permits and approvals for the Project were identified in Table 7.0-1 of the Application, and an updated version of that table is provided as proposed **BW Exhibit 14**.

Q. Please discuss the permit and approval updates provided in proposed BW Exhibit 14.

A. The table provided as proposed **BW Exhibit 14** was updated to show that the current Project layout was submitted to the FAA for review in July 2021. Additionally, the table was updated to indicate that the Project submitted its permit and variance applications to Bowman County on June 25, 2021.

Q. Has Bowman Wind committed to obtaining all necessary federal, state, county, and township permits?

A. Yes.

IX. COMPLIANCE WITH PSC SITING RULES

Q. Are you familiar with the exclusion areas, avoidance areas, selection criteria and policy criteria identified in Section 69-06-08-01 of the North Dakota Administrative Code?

A. Yes.

Q. Please discuss whether there are any general exclusion areas located within the Project Area.

A. There are no categories of general exclusion areas within the Project Area.

Q. Please discuss whether any of the exclusion areas specific to wind energy conversion facilities are located within the Project Area.

A. Five exclusion areas specific to wind energy conversion facilities are present within the Project Area:

- Areas less than 1.1 times the height of the turbine from the nearest edge of an interstate or state roadway right of way;
- Areas less than 1.1 times the height of the turbine + 75 feet from the centerline of any county or maintained township roadway;
- Areas less than 1.1 times the height of the turbine from the nearest edge of any railroad right-of-way;
- Areas less than 1.1 times the turbine height from the nearest edge of a 115 kV or higher transmission line right-of-way; and
- Areas less than 1.1 times the turbine height from the property line of a non-participating landowner and 3 times the height of the turbine from an inhabited rural residence of a non-participating landowner, unless a variance is granted.

Although present within the Project Area, the turbines have been sited to avoid these areas. For six of the proposed turbine locations, the turbine model is currently limited to the GE-127 2.82 MW turbine to ensure compliance with all wind energy specific exclusion areas. For all other proposed turbine locations, compliance is based on a turbine model up to 105 meters (345 feet) in hub height, with an up to 158 meter (519 feet) rotor diameter, and with a total tip height of 184 meters (604 feet).

Q. Are there any general avoidance areas present within the Project Area?

A. Yes. The following general avoidance areas are present within the Project Area:

- Historical resources which are not designated as exclusion areas: Cultural resource sites have been avoided with the proposed Project layout.

- Areas within known floodplains as defined by the geographical boundaries of the hundred-year flood: There are 95 acres of 100-year floodplain in the Project Area associated with Spring Creek and an unnamed tributary of Spring Creek in the northern portion and Cold Turkey Creek in the central southeast portion of the Project Area. No Project facilities (turbines, access roads, Project substation, O&M facility, or battery storage facility) are within this floodplain area.
- Woodlands and wetlands: Wetlands are present but all permanent wetland impacts will be avoided to the extent practicable. Temporary impacts may occur due to the installation of collection lines. Trees are sparsely located throughout the Project and the Project has been designed to minimize tree removal to the extent possible and would be limited to locations where crossing tree rows make impacts unavoidable. If impacts to trees occur, Bowman Wind will comply with the PSC's tree and shrub mitigation specifications.

Q. Will the Project comply with the wind energy conversion facility-specific sound avoidance area requirement?

A. Yes. As discussed earlier in my testimony, Bowman Wind has completed a sound assessment for the GE-127 2.82 MW at all 86 proposed turbine locations, which also included anticipated sound output for the substation (transformer) and battery storage. Sound levels do not exceed 44 dBA within 100 feet of non-participating residences or community buildings. One pending participation residence was modeled at 47 dBA within 100 feet of the residence. However, Bowman Wind is in the process of entering into a participation agreement and securing a waiver from the owners of that residence. If Bowman Wind does not obtain the necessary waiver of the sound avoidance requirement, Bowman Wind would not construct proposed Turbine T41. If Turbine T41 is not constructed, the sound level at the pending participation residence is modeled at 44 dBA.

Q. Will any significant adverse effects resulting from the location, construction, and operation of the Project as they relate to the Selection Criteria set forth in

the PSC's rules be at an acceptable minimum or managed and maintained at an acceptable minimum?

A. Yes.

Q. Were the policy criteria set forth in the PSC's siting rules considered and utilized to the extent possible by Bowman Wind when designing the proposed Project?

A. Yes.

Q. Were the factors set forth in NDCC § 49-22-09 considered by Bowman Wind when designing the proposed Project?

A. Yes.

X. CONCLUSION

Q. Based on the analysis conducted by Bowman Wind, as set forth in the proposed hearing exhibits, will construction of the proposed Project produce minimal adverse human and environmental effects?

A. Yes.

Q. Does this conclude your Testimony?

A. Yes.