

# **Appendix C**

## **Telecommunications Studies**

# Wind Power GeoPlanner™

## Communication Tower Study

Badger Wind



Prepared on Behalf of  
Orsted Onshore NA

January 20, 2022



**COMSEARCH**  
A CommScope Company

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## 1. Introduction

This Communication Tower Study was performed for the Badger Wind project in Logan and McIntosh Counties, North Dakota to identify the tower structures as well as FCC-licensed communication antennas that exist in the project area. This information is useful in the planning stages of the wind energy facilities to identify turbine setbacks and to prevent disruption to the services provided by the tenants on the towers. This data can be used in support of the wind energy facilities communications needs in addition to avoiding any potential impact to the current communications services provided in the region.

## 2. Summary of Results

The communication towers and antennas in the study area were derived from a variety of sources including the FCC's Antenna Structure Registration (ASR) database, Universal Licensing System (ULS), national and regional tower owner databases, and the local planning and zoning boards. The data<sup>1</sup> was imported into GIS software and the structures mapped in the wind energy area of interest. Each tower location is identified with a unique ID number associated with detailed structure and contact information provided in a spreadsheet attachment.

Six tower structures and twenty-three communication antennas were identified within the Badger Wind project area using the data sources described in our methodology above. All six structures found were registered with the FCC, four of which contain eleven of the twenty-three communication antennas. The remaining antennas may be located on a variety of structure types such as guyed towers, monopoles, silos, rooftops or portable structures. The specific type of structure would normally need to be determined by an on-site visit.

Detailed information about the tower structures and communication antennas is provided in Table 1 and Table 2 including location coordinates, structure height above ground level, and owner-operator name<sup>2</sup>.

A discussion of turbine setback distances is provided in section three.

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<sup>1</sup> Comsearch makes no warranty as to the accuracy of the data included in this report beyond the date of the report. The data provided in this report is governed by Comsearch's data license notification and agreement located at [http://www.comsearch.com/files/data\\_license.pdf](http://www.comsearch.com/files/data_license.pdf).

<sup>2</sup> Please note that this report analyzes all known operators on the towers from data sources available to Comsearch. Unidentified operators may exist on the towers due to unlicensed or federal government systems, mobile phone operators with proprietary locations, erroneous data on the FCC license, and other factors beyond our control.

Tower ID	ASR Number	Owner	Structure Height AGL (m)	Latitude (NAD83)	Longitude (NAD83)	Distance to the Nearest Turbine (km)
Tower001	1291978	SBA Towers V, LLC	76.2	46.236278	-99.566722	1.22
Tower002	1040004	NORTH DAKOTA, STATE OF	60.3	46.255000	-99.739167	5.67
Tower003	1254358	CCATT LLC	58.2	46.255417	-99.587694	0.97
Tower004	1201574	Montana-Dakota Utilities Co	29.0	46.259444	-99.559444	3.18
Tower005	1291890	SBA Towers V, LLC	90.2	46.261472	-99.771500	7.50
Tower006	1039835	BASIN ELECTRIC POWER COOPERATIVE	125.0	46.362500	-99.676389	1.67

Table 1: Summary of Tower Structures

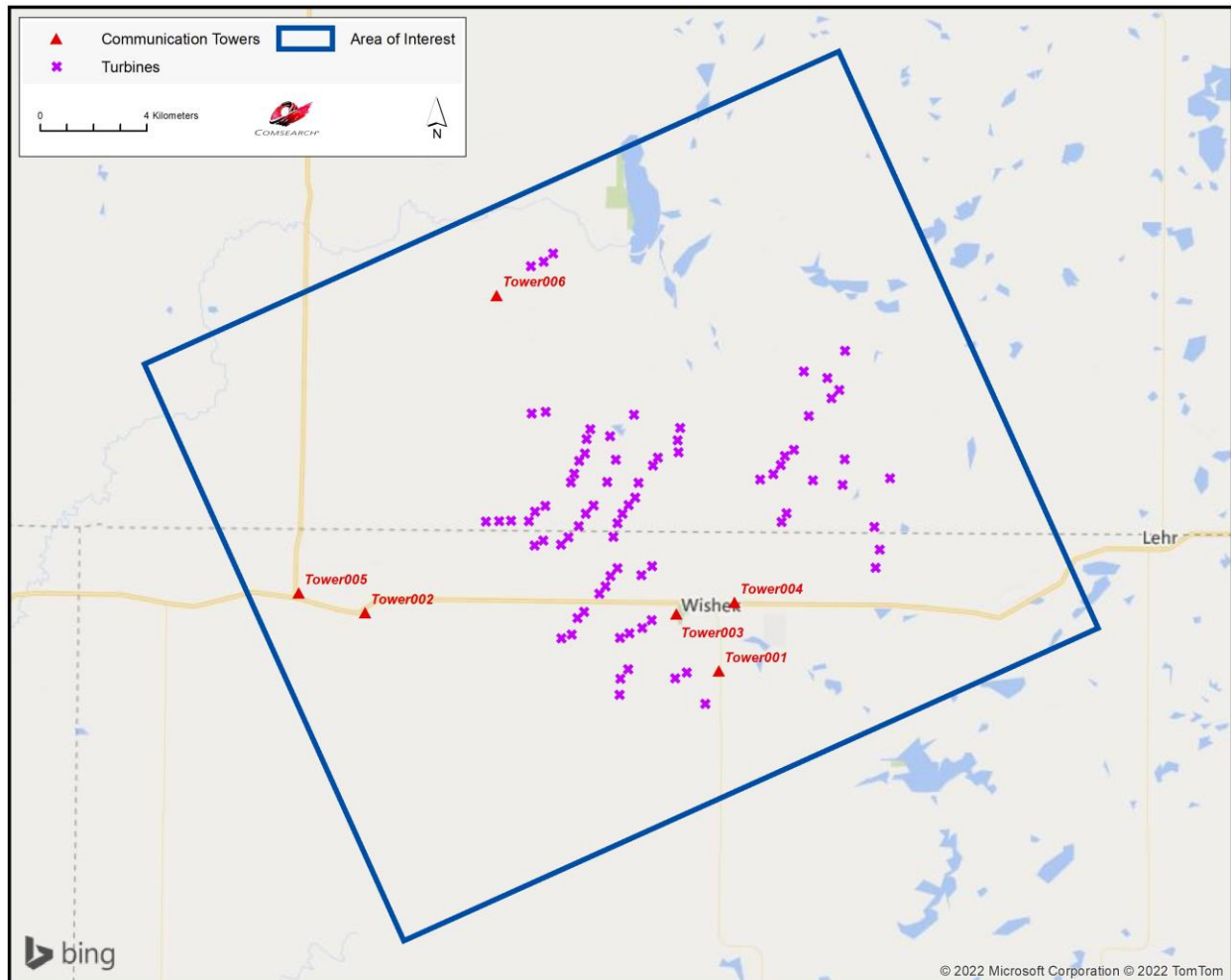


Figure 1: Towers within the Area of Interest

ID	Tower ID	Callsign	Service Type	Licensee	Antenna Height AGL (m)	Latitude (NAD83)	Longitude (NAD83)	Distance to the Nearest Turbine (km)
1		WNZC976	Land Mobile	RAILE, EDWIN	15.0	46.237472	-99.586500	0.36
2		KWI834	Land Mobile	Department of Emergency Services/State Radio	70.0	46.254972	-99.739556	5.70
3		KNFF825	Land Mobile	NORTH DAKOTA, STATE OF	53.0	46.254972	-99.739556	5.70
4	Tower002	WPPF241	Land Mobile	Department of Emergency Services/State Radio	70.0	46.254972	-99.739556	5.70
5	Tower002	KAP981	Land Mobile	State of North Dakota Dept. of Transportation/Telecommunications	60.0	46.254972	-99.739278	5.68
6	Tower002	WRKT635	Land Mobile	MONTANA-DAKOTA UTILITIES CO.	63.4	46.255000	-99.739167	5.67
7	Tower002	WRHZ393	Land Mobile	NORTH DAKOTA INFORMATION TECHNOLOGY DEPT	56.9	46.255000	-99.739167	5.67
8	Tower002	WQDA866	Land Mobile	Department of Emergency Services/State Radio	63.9	46.255000	-99.739167	5.67
9		WQNN362	Land Mobile	WISHEK HOME FOR THE AGED	12.0	46.255139	-99.560694	2.74
10	Tower003	KNKN782	Cellular	AT&T Mobility Spectrum LLC	Unknown	46.255417	-99.587694	0.97
11	Tower003	WPVV301	Cellular	AT&T Mobility Spectrum LLC	Unknown	46.255417	-99.587694	0.97
12		KUZ839	Land Mobile	WISHEK COMMUNITY HOSPITAL	37.0	46.255528	-99.550389	3.32
13	Tower004	KAF607	Land Mobile	Montana-Dakota Utilities Co.	30.0	46.259444	-99.559444	3.18
14		WPJU239	Land Mobile	BEK COMMUNICATIONS COOPERATIVE	55.0	46.259972	-99.664278	2.09
15		KNFY423	Land Mobile	MCINTOSH, COUNTY OF	30.0	46.260528	-99.518167	2.42
16		KNFY423	Land Mobile	MCINTOSH, COUNTY OF	37.0	46.261083	-99.518167	2.39
17		WSR667	Land Mobile	Waste Management Holdings, Inc	13.0	46.266444	-99.714528	3.40
18		KNNT540	Land Mobile	JAMESTOWN COMMUNICATIONS INC	60.0	46.361083	-99.678167	1.88
19		KNNT542	Land Mobile	JAMESTOWN COMMUNICATIONS INC	60.0	46.361083	-99.678167	1.88
20	Tower006	KNKN356	Cellular	North Dakota 5-Kidder Limited Partnership	Unknown	46.362500	-99.676389	1.67

ID	Tower ID	Callsign	Service Type	Licensee	Antenna Height AGL (m)	Latitude (NAD83)	Longitude (NAD83)	Distance to the Nearest Turbine (km)
21	Tower006	WQEK731	Land Mobile	Basin Electric Power Cooperative	102.1	46.362500	-99.676389	1.67
22	Tower006	WBD236	Microwave	Basin Electric Power Cooperative	123.44/11.25	46.362500	-99.676389	1.67
23		KEQ905	Land Mobile	Department of Emergency Services/State Radio	18.0	46.400806	-99.619556	3.51

Table 2: Summary of Communication Antennas

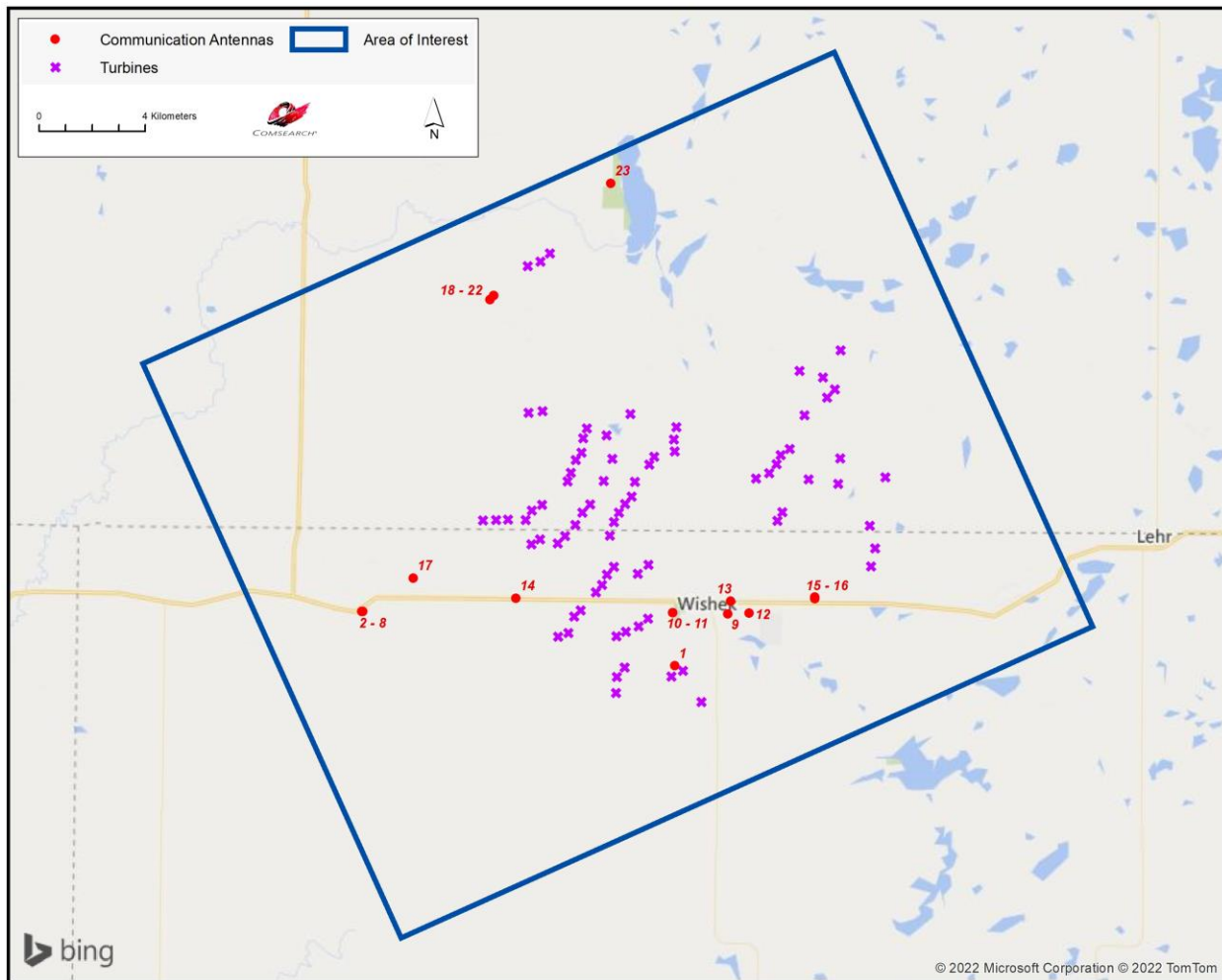


Figure 2: Communication Antennas within the Area of Interest

### **3. Discussion of Separation Distances**

In planning the wind energy turbine locations, a conservative approach would dictate not locating any turbines in close proximity to existing tower structures to avoid any possible impact to the communications services provided by the structures. Reasonable distance between communication towers and wind turbine towers is a function of two things: (1) the physical turning radius of the wind turbine blades and (2) the characteristics of the communication systems on the communication tower.

Since wind turbine blades can rotate 360°, the first consideration of separation distance to other structures is clearance of the blades. If the blade radius is 50 meters, then a separation distance greater than 50 meters is necessary. From a practical standpoint, a setback distance greater than the maximum height of the turbine is necessary to insure a “fall” safety zone in the unlikely event of a turbine tower failure. Setback requirements for “fall” safety are typically specified by the local zoning ordinances.

The required separation distance based on the characteristics of the communication systems will vary depending on the type of communication antennas that are installed on the tower. For example, AM broadcast antennas should be separated by distances that allow for normal coverage which can extend up to 3 kilometers. For land mobile and mobile phone systems, setback distances are based on FCC interference emission limits from electrical devices in the land mobile and mobile phone frequency bands.

Finally, the tower structures identified could be a potential benefit in support of communications network needs for the wind energy facility. An example would be the implementation of a Supervisory Control and Data Acquisition (SCADA) system that monitors and provides communications access to the wind energy facility.

### **4. Conclusions**

Our study identified six tower structures and twenty-three communication antennas within the project area. They are used for microwave, cellular, and land mobile services in the area.



## **5. Contact Us**

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# Wind Power GeoPlanner™

## Off-Air TV Analysis

Badger Wind



Prepared on Behalf of  
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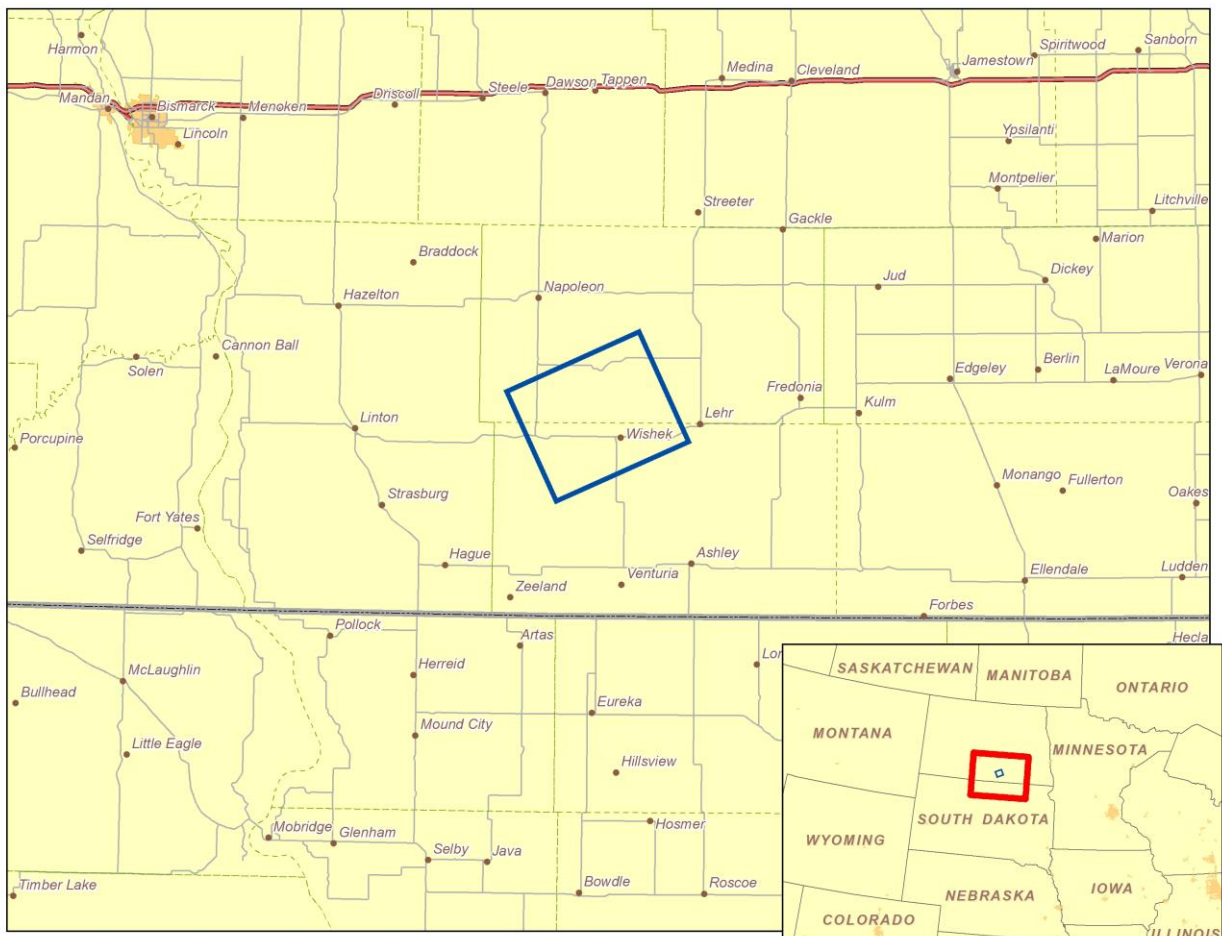
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## 1. Introduction

Off-air television stations broadcast signals from terrestrially-based facilities directly to television receivers. Comsearch identified those off-air stations whose service could potentially be affected by the proposed Badger Wind project in Logan and McIntosh Counties, North Dakota. Comsearch then examined the coverage of the stations and the communities in the area that could potentially have degraded television reception due to the location of the proposed wind turbines.

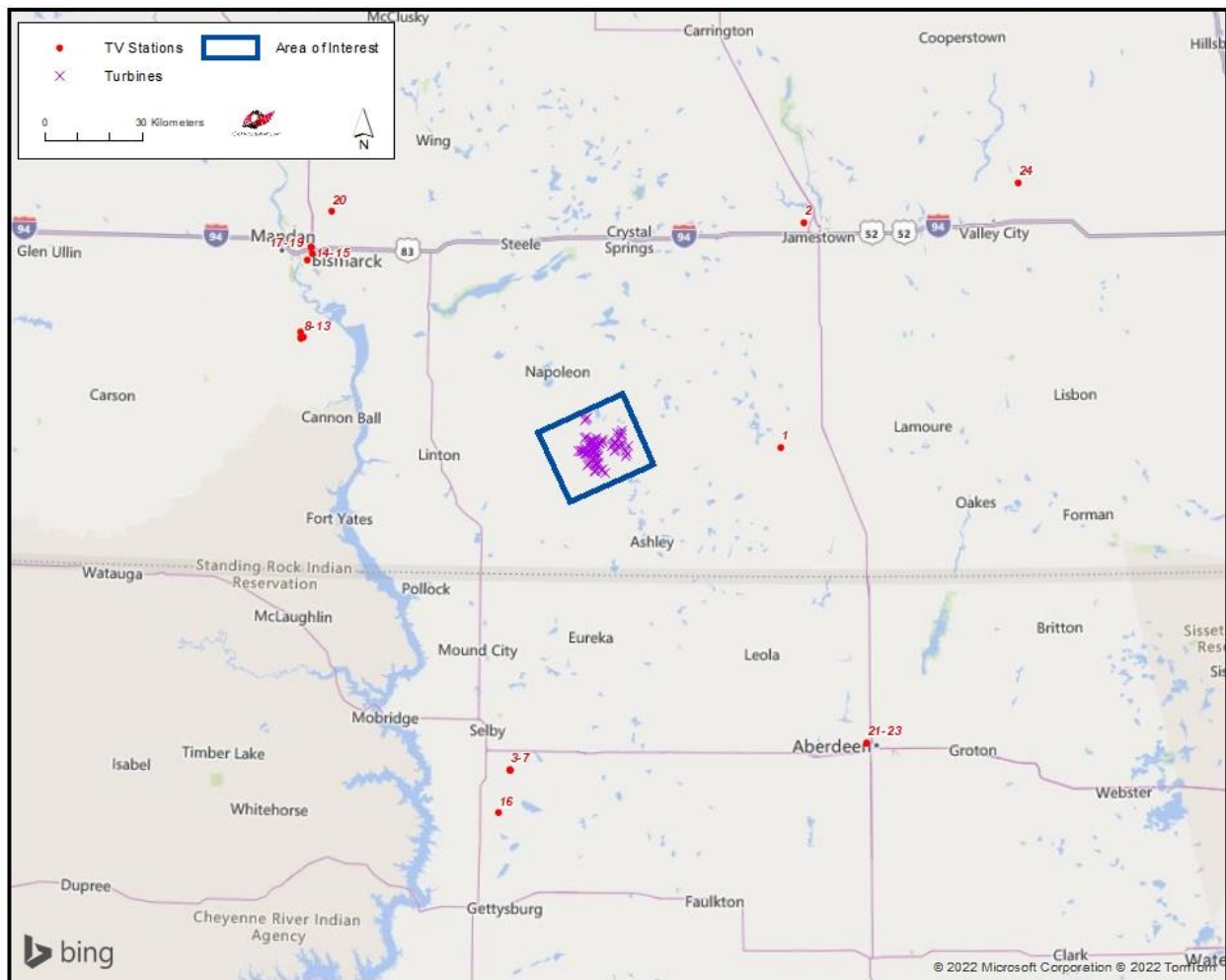
## 2. Summary of Results

The proposed wind energy project area and local communities are depicted in Figure 1, below.



*Figure 1: Wind Farm Project Area and Local Communities*

To begin the analysis, Comsearch compiled all off-air television stations<sup>1</sup> within 150 kilometers of the proposed turbines. TV stations at a distance of 150 kilometers or less are the most likely to provide off-air coverage to the project area and neighboring communities. These stations are listed in Table 1, on the next page, and a plot depicting their locations is provided in Figure 2. There are a total of 24 database records for stations within approximately 150 kilometers of the proposed turbines. Of these stations, only 19 stations are currently licensed and operating, 11 of which are low-power stations or translators. Translator stations are low-power stations that receive signals from distant broadcasters and retransmit the signal to a local audience. These stations serve local audiences and have limited range, which is a function of their transmit power and the height of their transmit antenna.



*Figure 2: Plot of Off-Air TV Stations within 150 Kilometers of Proposed Turbines*

<sup>1</sup> Comsearch makes no warranty as to the accuracy of the data included in this report beyond the date of the report. The data presented in this report is derived from the TV station's FCC license and governed by Comsearch's data license notification and agreement located at [http://www.comsearch.com/files/data\\_license.pdf](http://www.comsearch.com/files/data_license.pdf).

ID	Call Sign	Status	Service <sup>2</sup>	Channel	Transmit ERP <sup>3</sup> (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to the Closest Turbine (km)
1	KJRE	LIC	DTV	20	72.3	46.298889	-98.865833	47.64
2	KJRR	LIC	DTV	7	21.3	46.924167	-98.772222	85.47
3	K17KW-D	LIC	LPD	17	4.0	45.397222	-99.941667	95.73
4	K44ME-D	LIC	LPT	44	4.24	45.397222	-99.941667	95.73
5	K46MX-D	LIC	LPT	46	4.24	45.397222	-99.941667	95.73
6	K48OQ-D	LIC	LPT	48	4.24	45.397222	-99.941667	95.73
7	K50NL-D	LIC	LPT	50	4.24	45.397222	-99.941667	95.73
8	KNDB	LIC	DTV	26	50.0	46.589722	-100.794444	90.37
9	KBME-TV	LIC	DTV	22	97.3	46.589722	-100.800833	90.84
10	KBMY	LIC	DTV	17	75.0	46.587500	-100.805833	91.15
11	KXMB-TV	LIC	DTV	12	19.1	46.589722	-100.806111	91.23
12	KFYR-TV	LIC	DTV	31	500.0	46.605639	-100.807333	91.79
13	K35PO-D	CP	LPD	35	15.0	46.605639	-100.807333	91.79
14	KXBK-LD	LIC	LPD	15	0.85	46.805667	-100.785083	98.73
15	K28MS-D	LIC	LPD	28	2.0	46.825417	-100.767111	98.61
16	KQSD-TV	LIC	DTV	11	33.72	45.277222	-99.986389	109.51
17	K34LO-D	CP	LPD	34	5.0	46.840250	-100.775667	100.02
18	K43JQ-D	LIC	LPD	43	1.6	46.840250	-100.775667	100.02
19	K23OL-D	CP	LPD	23	2.0	46.840250	-100.775694	100.02
20	K16NV-D	CP	LPD	16	9.0	46.941944	-100.694917	101.37
21	K24DT-D	LIC	LPT	24	0.737	45.474722	-98.527222	115.90
22	K33MI-D	LIC	LPT	33	15.0	45.474722	-98.527222	115.90
23	K36NW-D	LIC	LPD	36	3.0	45.474722	-98.527222	115.90
24	K23PR-D	CP	LPD	23	15.0	47.029444	-97.896944	144.70

*Table 1: Off-Air TV Stations within 150 Kilometers of Proposed Turbines*

<sup>2</sup> Definitions of service and status codes:

- ACA - Analog Class A
- DCA - Digital Class A
- DRT - Digital Replacement Translator
- DT - ETL testing
- DTS - Distributed Transmission System
- DTV - Full Service Television
- DTX - Digital TV Auxiliary
- LPA - Low Power Analog TV
- LPD - Low Power Digital TV
- LPT - Digital TV Translator
- LPX - Analog TV Translator
- TS - Legacy Service for Analog TV Auxiliary
- TV - Analog TV legacy

- LIC – Licensed and operational station
- CP – Construction permit granted

<sup>3</sup> ERP = Transmit Effective Radiated Power

### 3. Impact Assessment

Based on a contour analysis of the licensed stations within 150 kilometers of the badger Wind turbines, it was determined that five of the full-power digital stations, identified below in Table 2 below, may have their reception disrupted in and around the project. The areas primarily affected would include TV service locations within 10 kilometers of the turbines that have clear line-of-sight (LOS) to a proposed wind turbine but not to the respective station. After the wind turbines are installed, communities and homes in these locations may have degraded reception of these stations. This is due to multipath interference caused by signal scattering as TV signals are reflected by the rotating wind turbine blades and mast.

ID	Call Sign	Status	Service	Channel	Transmit ERP (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to the Closest Turbine (km)
1	KJRE	LIC	DTV	20	72.3	46.298889	-98.865833	47.64
2	KJRR	LIC	DTV	7	21.3	46.924167	-98.772222	85.47
11	KXMB-TV	LIC	DTV	12	19.1	46.589722	-100.806111	91.23
12	KFYR-TV	LIC	DTV	31	500.0	46.605639	-100.807333	91.79
16	KQSD-TV	LIC	DTV	11	33.72	45.277222	-99.986389	109.51

*Table 2: Licensed Off-Air TV Stations Subject to Degradation*

### 4. Recommendations

While TV signals are reflected by wind turbines, which can cause multipath interference to the TV receiver, modern digital TV receivers have undergone significant improvements to mitigate the effects of signal scattering. When used in combination with a directional antenna, it becomes even less likely that signal scattering from wind farms will cause interference to digital TV reception.

Nevertheless, signal scattering could still impact certain areas currently served by the TV station mentioned above, especially those that would have line-of-sight to at least one wind turbine but not to the station antenna. In the unlikely event that interference is observed in any of the TV service areas, it is recommended that a high-gain directional antenna be used, preferably outdoors, and oriented towards the signal origin in order to mitigate the interference.

Both cable service and direct broadcast satellite service will be unaffected by the presence of the wind turbine facility and may be offered to those residents who can show that their off-air TV reception has been disrupted by the presence of the wind turbines after they are installed.



## **5. Contact**

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