Appendix G

Telecommunication Studies

Northern States Power Company
Nobles Wind Farm Repower Project
Docket No. IP-6646/WS-09-584
February 2021

Wind Power GeoPlanner™

Communication Tower Study

Nobles Wind Farm Repower Project

Prepared on Behalf of
Xcel Energy

November 9, 2020

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1. Introduction

This Communication Tower Study was performed for the Nobles Wind Farm Repower Project in Nobles County, Minnesota 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[1] 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.

Two tower structures and eight communication antennas were identified within the Nobles Wind Farm Repower Project area using the data sources described in our methodology above. Both structures found were registered with the FCC, which contains six of the eight 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[2].

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

[1] 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.

[2] 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)
Tower001	1295727	Xcel Energy Services Inc.	79.9	43.639444	-95.751083
Tower002	1244139	STATE OF MINNESOTA., MN/DOT	100.6	43.703861	-95.851250

Table 1: Summary of Tower Structures

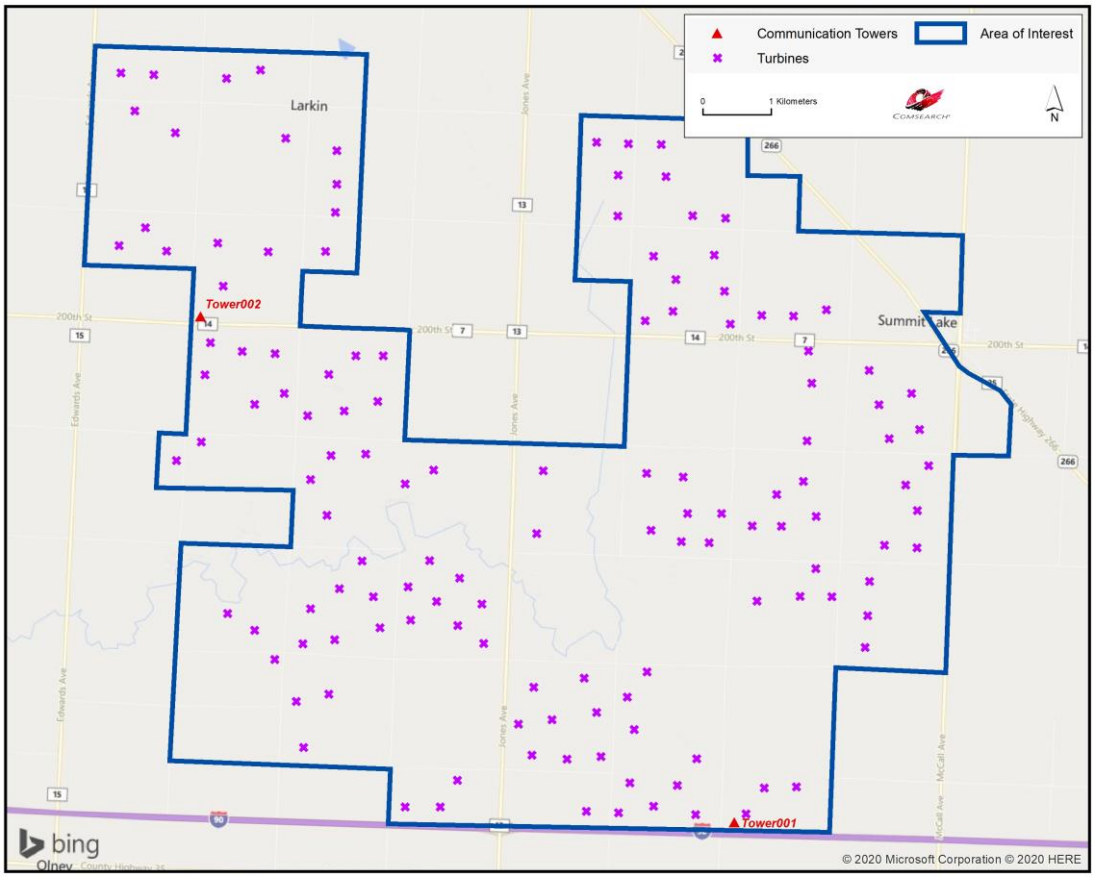

Figure 1: Towers within the Area of Interest

ID	Tower ID	Callsign	Service Type	Licensee	Antenna Height AGL (m)	Latitude (NAD83)	Longitude (NAD83)
1	Tower001	WQVX322	Land Mobile	Vestas	56.4	43.639444	-95.751083
2		WNYT837	Land Mobile	LINCOLN PIPESTONE RURAL WATER SYSTEM	15.0	43.654694	-95.838083
3		WQRG291	Land Mobile	KUHL, BURDELL	9.0	43.663861	-95.733028
4	Tower002	WQAU442	Microwave	Minnesota, State of (DOT)	55.8 - 97.5	43.703861	-95.851250
5	Tower002	WQXT661	Microwave	Minnesota Valley TV Improvement	30.48 - 53.3	43.703861	-95.851250
6	Tower002	WQKH680	CBRS*	Minnesota Valley TV Improvement Corporation	62.0	43.703861	-95.851250
7	Tower002	WQOH267	Land Mobile	MINNESOTA, STATE OF	106.7	43.703861	-95.851250
8	Tower002	WQKZ788	Land Mobile	MINNESOTA, STATE OF	104.3	43.703861	-95.851250

*Point-to-Multi-Point Citizen Band Radio Service (3650-3700 MHz)

Table 2: Summary of Communication Antennas

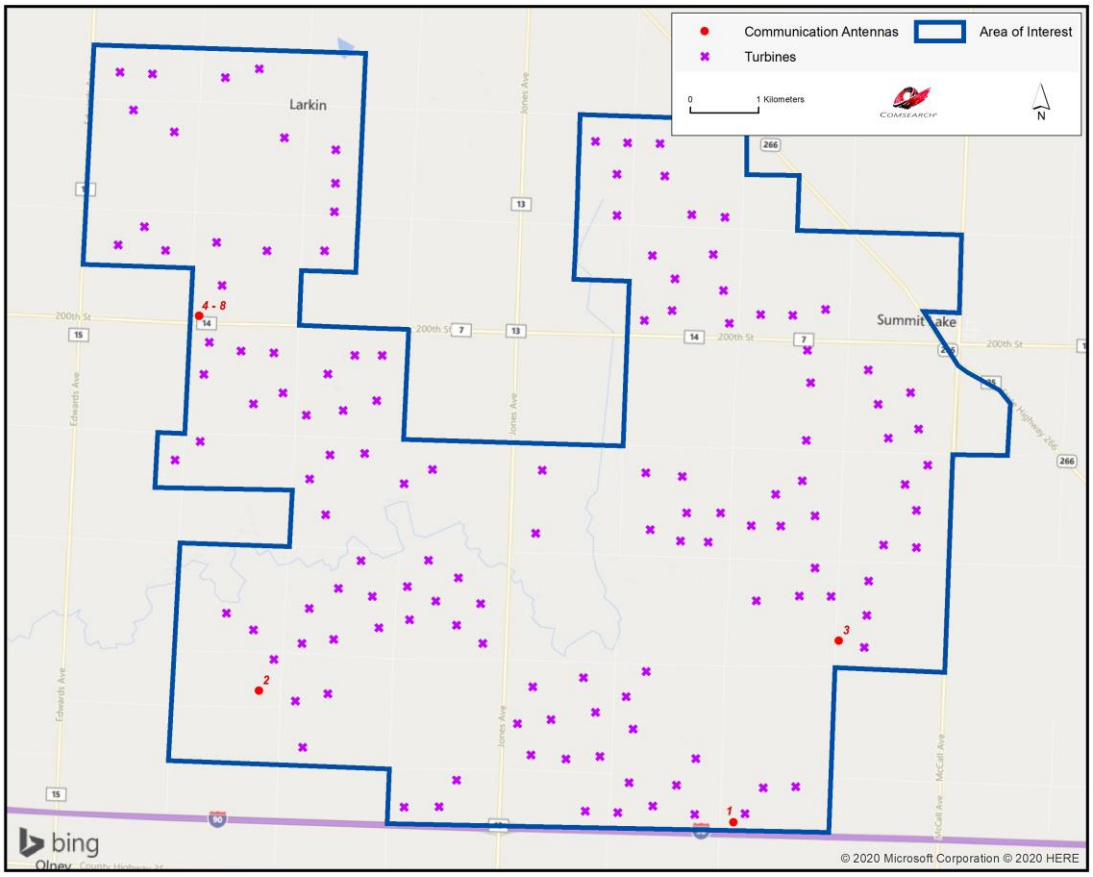

Figure 2: Communication Antennas within the Area of Interest

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 360º, 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 two tower structures and eight communication antennas within the project area. They are used for microwave, CBRS, and land mobile services in the area.

5. Contact Us

For questions or information regarding the Communication Tower Study, please contact:

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Company: Comsearch
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Web site: www.comsearch.com

Nobles Wind Project

Xcel Energy

Nobles County, Minnesota

Microwave Path Analysis

January 27, 2021

Capitol Airspace Group

capitolairspace.com

(703) 256 - 2485

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Alexandria, VA 22312
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Summary

Capitol Airspace conducted a microwave path analysis for the Nobles wind project in Nobles County, Minnesota. The purpose for this analysis was to identify licensed and applied coordinated non-federal microwave paths that could limit increasing the rotor diameter of existing 80-meter hub-height wind turbines from 77 to 97 meters. At the time of this analysis, 134 existing wind turbine locations (black points, ***Figure 1***) had been identified for repowering. This analysis assessed each location (including its rotor-swept volume) to determine if it could obstruct Fresnel zones associated with microwave paths in proximity to the Nobles wind project.

Point-to-point microwave transmission is a critical component of the national communications infrastructure. Microwave paths enable broadband data transmission that supports telephone, cellular, and personal communication service (PCS) networks, wireless internet providers, audio and video transmission from television studios to transmitter sites, as well as many other industry and utility applications. In order to ensure signal reliability, these paths are sited to avoid any line-of-sight obstructions. Proposed structures that create a line-of-sight obstruction can degrade signal reliability and could require revisions to the microwave system.

Seven microwave links overlie the Nobles Wind project (***Figure 1***). At both the existing 77 meter and increased 97-meter rotor diameters, up to eight wind turbines intersect Fresnel zones and could cause signal blockage that degrades link performance. As a result, direct coordination with the link owners may be necessary to ensure that increasing the rotor diameter to 97 meters would not further degrade signal reliability.

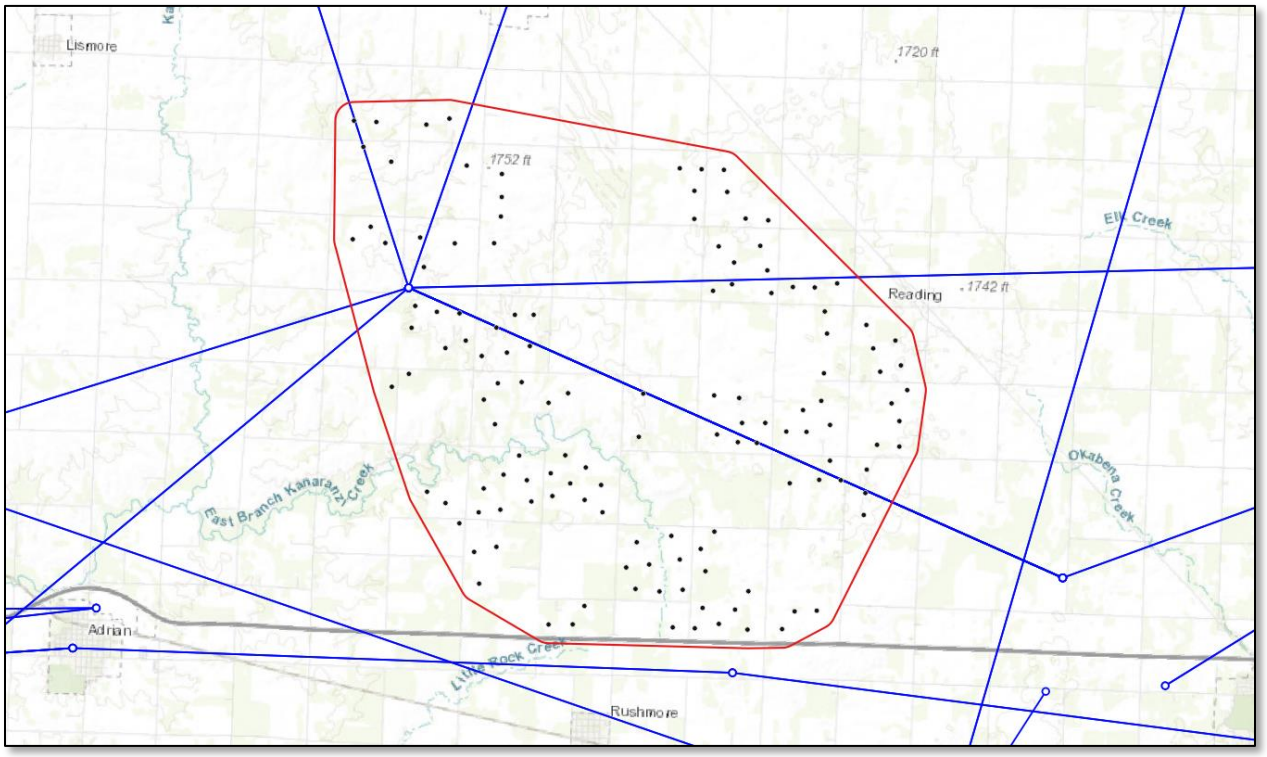

Figure 1: Licensed (blue) microwave paths in proximity to the Nobles wind project

Capitol Airspace maintains a database obtained from the FCC which is updated daily. The results of this analysis are based on FCC data available as of the date of this report.

Methodology

Capitol Airspace studied the proposed project based upon location information provided by Xcel Energy. Using this information, Capitol Airspace used a Geographic Information System (GIS) to determine proximity to both licensed and applied coordinated non-federal microwave paths contained in the Federal Communication Commission (FCC) Universal Licensing System (ULS) database.

This analysis considers impact on microwave paths resulting from the physical blockage of the first Fresnel zone (***Figure 2***). The first Fresnel zone is a three-dimensional volume whose radius at a given point is calculated using the path frequency and distance from the transmitting and receiving antennas. The Fresnel zone radius is largest at the path midpoint (where $d_1 = d_2$). Lower frequencies result in larger Fresnel zone radii for a given path and are typically associated with longer paths. Higher frequencies result in smaller Fresnel zone radii for a given path and are typically associated with shorter paths.

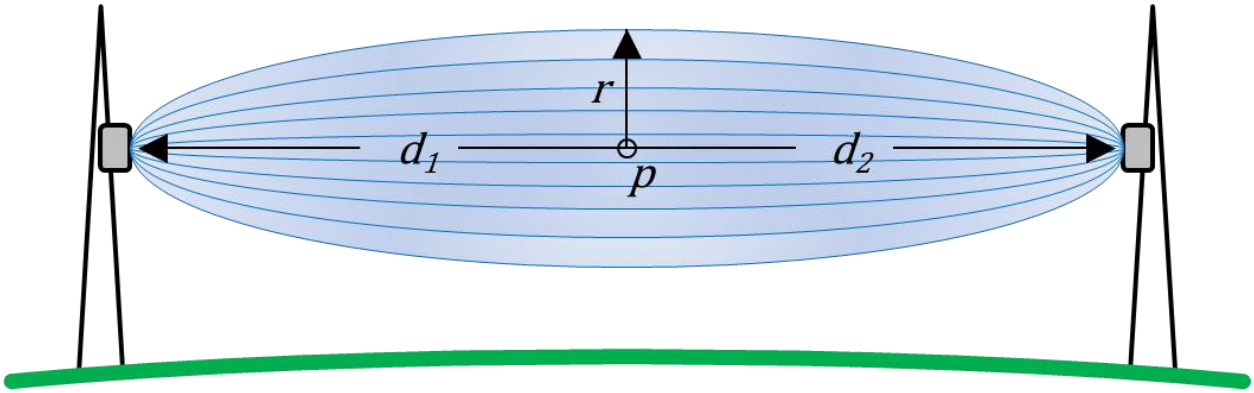

Figure 2: Fresnel zone example

In many cases, ULS database microwave transmitter and receiver antenna locations are inaccurate (e.g. ***Figure 3***). Available satellite and aerial imagery were used to improve the coordinates for locations associated with microwave paths in proximity to the defined study area.

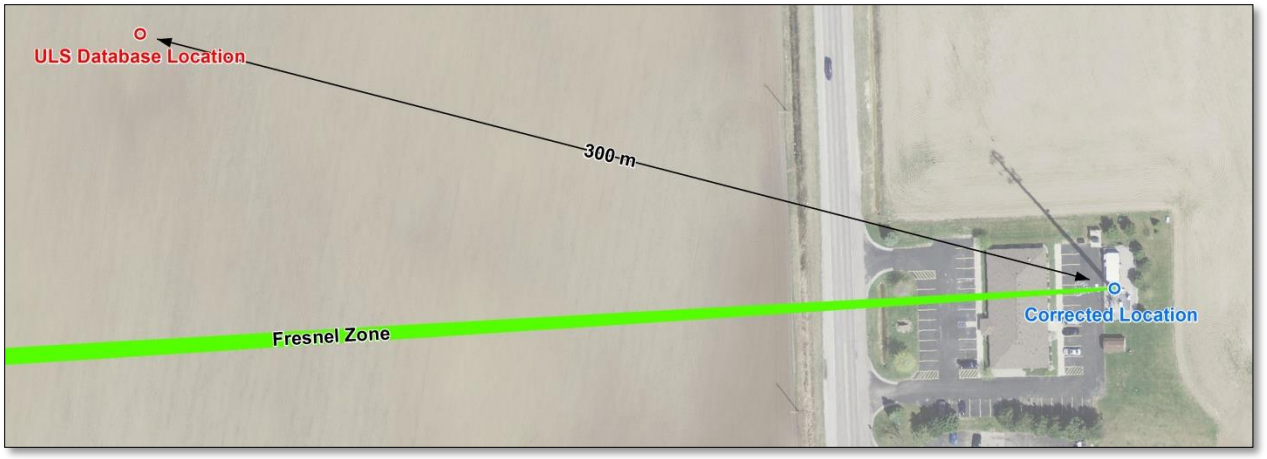

Figure 3: Example of using aerial imagery to correct erroneous ULS database antenna location

Findings

22 paths associated with seven microwave links overlie the Nobles Wind project (***Table 1*** & ***Figure 10***).

Licensee	Call Sign	Path	Status	Transmitter	Receiver	Frequency (MHz)[1]
MINNESOTA VALLEY TELEVISION IMPROVEMENT CORPORATION	WQXT311	2	Licensed	MAGNOLIA WT	RUSHMORE TWR	10755
	WQXT655	1	Licensed	CHANDLER TWR	RUSHMORE TWR	10915
	WQXT661	1	Licensed	RUSHMORE TWR	MAGNOLIA WT	11245
		2	Licensed	RUSHMORE TWR	CHANDLER TWR	11405
		3	Licensed	RUSHMORE TWR	Worthington	11075
		4	Licensed	RUSHMORE TWR	Worthington	11565
		5	Licensed	RUSHMORE TWR	Worthington	11075
		6	Licensed	RUSHMORE TWR	Worthington	11565
	WRCK732	1	Licensed	Worthington	RUSHMORE TWR	11565
		2	Licensed	Worthington	RUSHMORE TWR	11075
		3	Licensed	Worthington	RUSHMORE TWR	11565
		4	Licensed	Worthington	RUSHMORE TWR	11075
STATE OF MINNESOTA, MN/DOT	WPYH767	3	Licensed	Brewster	RUSHMORE TWR	5945
	WQAU442	3	Licensed	RUSHMORE TWR	Brewster	6197
		4	Licensed	RUSHMORE TWR	Slayton	6257
		5	Licensed	RUSHMORE TWR	Kanaranzi	6755
		6	Licensed	RUSHMORE TWR	Worthington	6816
		7	Licensed	RUSHMORE TWR	Worthington	6816
	WQAW725	4	Licensed	Slayton	RUSHMORE TWR	6005
	WQMI469	1	Licensed	Kanaranzi	RUSHMORE TWR	6595
	WQOZ385	2	Licensed	Worthington	RUSHMORE TWR	6656
		3	Licensed	Worthington	RUSHMORE TWR	6656

Table 1: Microwave paths with Fresnel zones overlying the Nobles study area

[1] Microwave paths may be licensed to operate using more than one frequency. For the purposes of calculating Fresnel zone radii, the lowest frequency was used to create the largest Fresnel zone.

Minnesota Valley Television Improvement Corporation

RUSHMORE TWR to CHANDLER TWR

The T1 and T3 rotor-swept areas overlap the *WQXT655/WQXT661* link's two-dimensional Fresnel zone. Three-dimensional analysis confirms that these wind turbines would intersect this link's Fresnel zones (***Figure 4***).

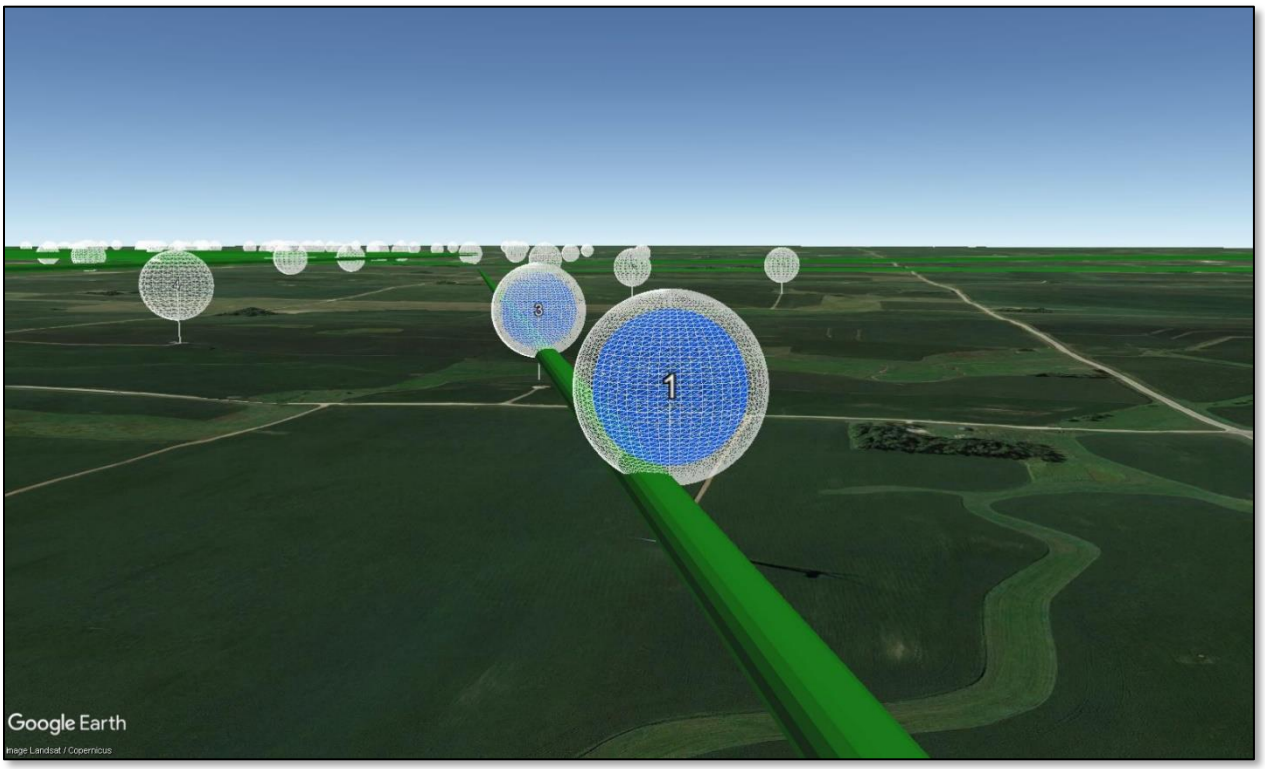

Figure 4: T1 and T3 existing rotor diameter (blue) and increased rotor diameter (white) rotor-swept spheres intersecting the WQXT655/WQXT661 Fresnel zone

RUSHMORE TWR to Worthington

The T24, T108, T117, and T131 rotor-swept areas overlap the *WQXT661/WRCK732* link's two-dimensional Fresnel zone. Three-dimensional analysis confirms that these wind turbines would intersect this link's Fresnel zones (***Figure 5*** & ***Figure 6***).

Discussions with the Minnesota Valley Television Improvement Corporation indicate that they were unaware of the proximity of existing wind turbines to the RUSHMORE TWR to Worthington and RUSHMORE TWR to CHANDLER TWR links. However, they did not indicate experiencing signal degradation associated with these links. The Minnesota Valley Television Improvement Corporation has not yet responded to a request to assess the potential impact of repowering the wind turbines intersecting three-dimensional Fresnel zones.

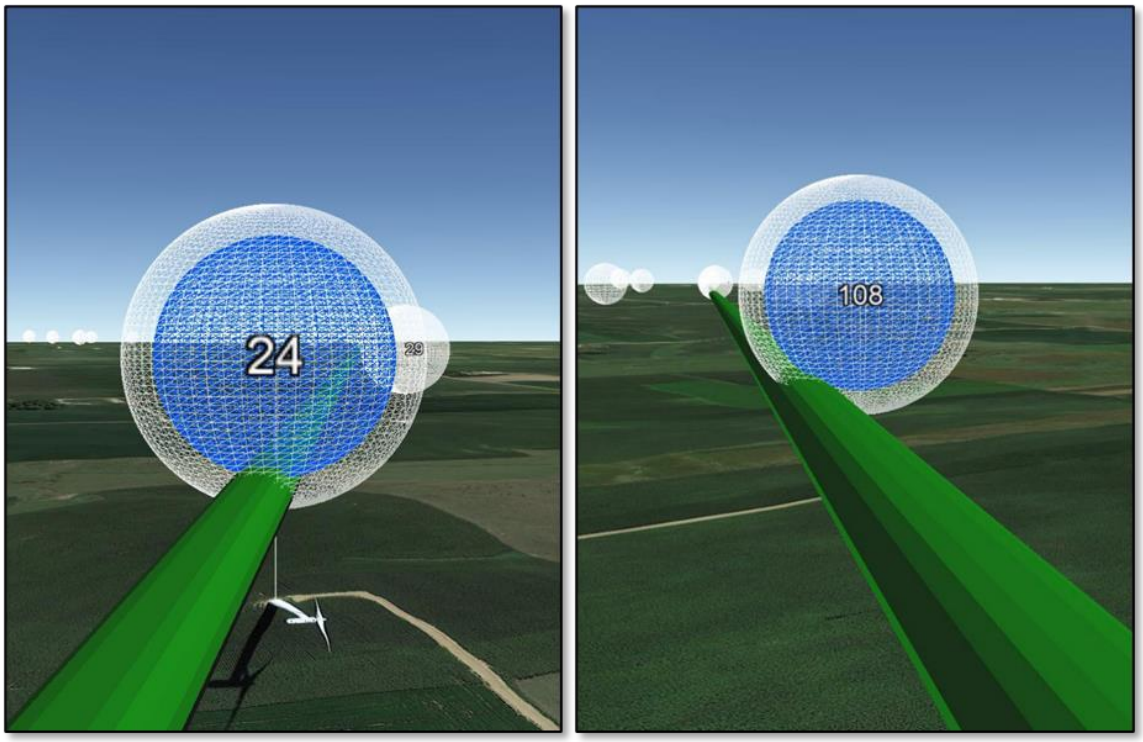

Figure 5: T24 (left) and T108 (right) existing rotor diameter (blue) and increased rotor diameter (white) rotor-swept spheres intersecting the WQXT661/WRCK732 Fresnel zone

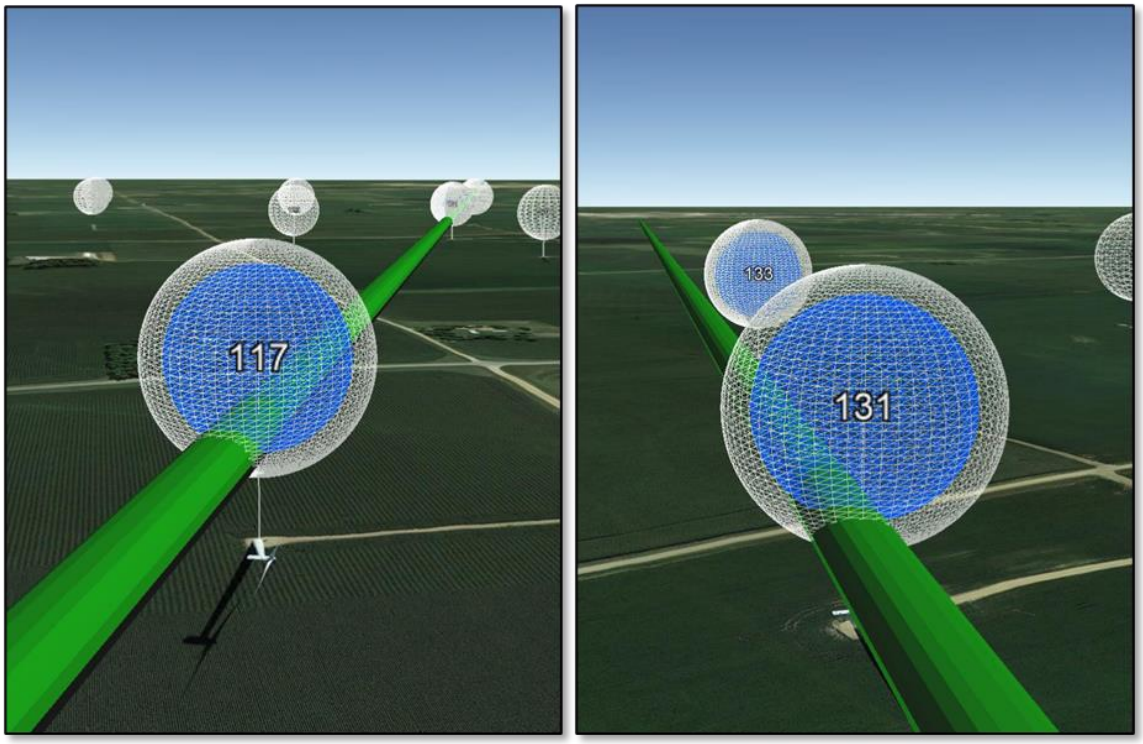

Figure 6: T117 (left) and T131 (right) existing rotor diameter (blue) and increased rotor diameter (white) rotor-swept spheres intersecting the WQXT661/WRCK732 Fresnel zone

State of Minnesota, MN/DOT

RUSHMORE TWR to Worthington

This link employs antenna diversity to increase link reliability. Each link endpoint consists of two antennas mounted at different heights resulting in two propagation paths. The T21, T24, T108, T117, T131, and T133 rotor-swept areas overlap the *WQAU442/WQOZ385* link's two-dimensional Fresnel zone. Additionally, T24, T108, T117, T131, and T133 rotor-swept areas overlap the *WQXT661/WRCK732* link's two-dimensional Fresnel zone. Three-dimensional analysis confirms that these wind turbines would intersect these links' Fresnel zones (***Figure 7***, ***Figure 8***, & ***Figure 9***). As a result, direct coordination with State of Minnesota, MN/DOT may be necessary to ensure that increasing the T21, T24, T108, T117, T131, and T133 rotor diameters to 97 meters would not further degrade signal reliability.

Discussions with MN/DOT indicate that the RUSHMORE TWR to Worthington link is operational despite the known presence of the existing wind turbines. During these discussions, MN/DOT indicated that increasing the rotor-diameter of the existing wind turbines may cause minor signal degradation but is not anticipated to affect the operability of the link. Continued discussion with MN/DOT may be necessary to ensure that the link remains functional as wind turbines intersecting the three-dimensional Fresnel zones are repowered.

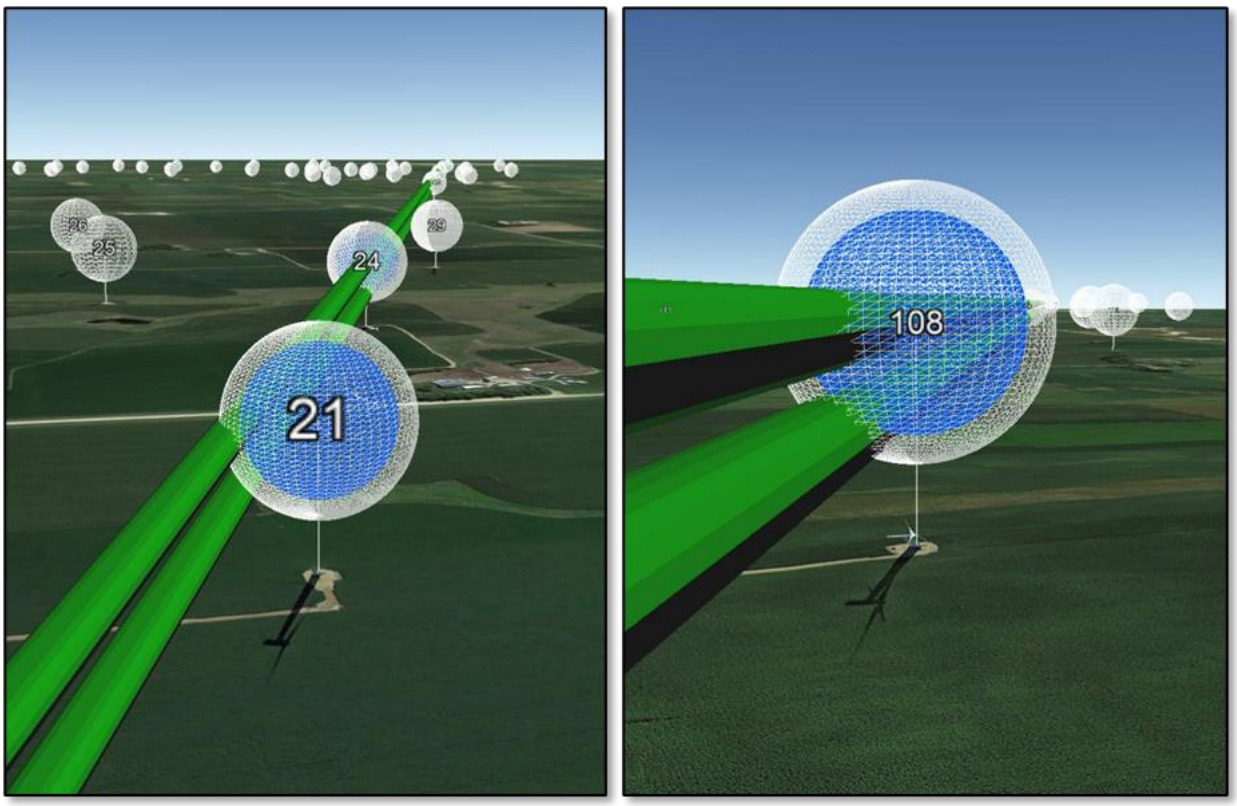

Figure 7: T21, T24 (left), and T108 (right) existing rotor diameter (blue) and increased rotor diameter (white) rotor-swept spheres intersecting the WQAU442/WQOZ385 Fresnel zones

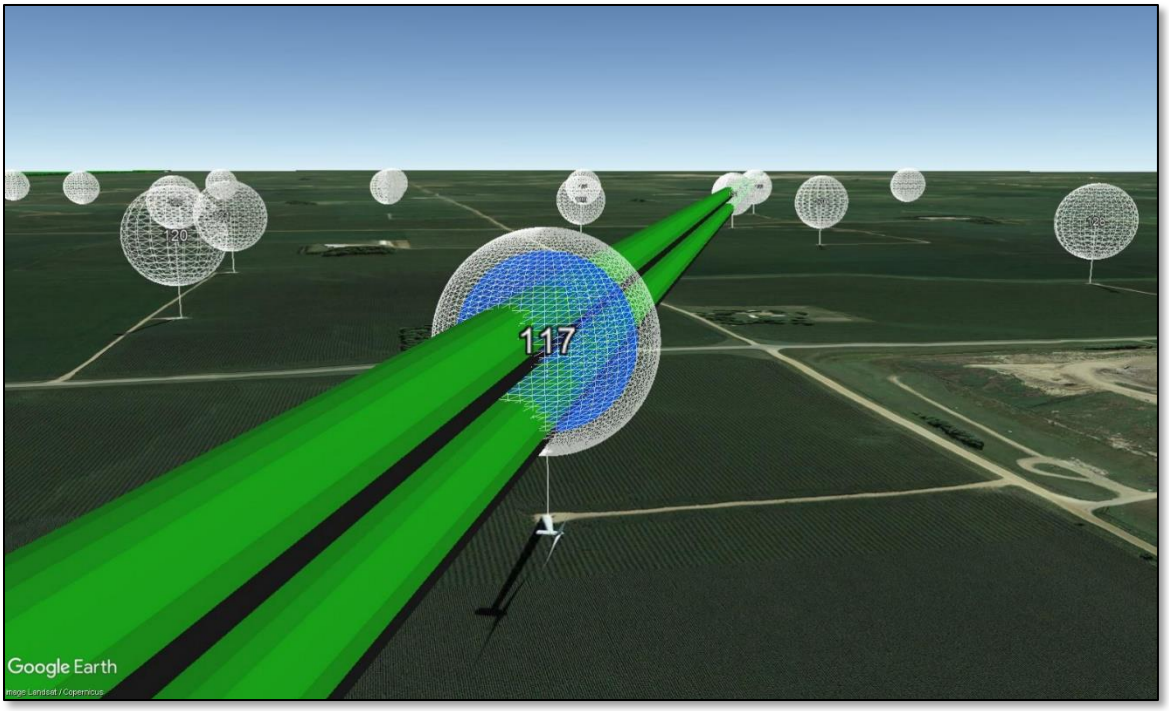

Figure 8: T117 existing rotor diameter (blue) and increased rotor diameter (white) rotor-swept spheres intersecting the WQAU442/WQOZ385 Fresnel zones

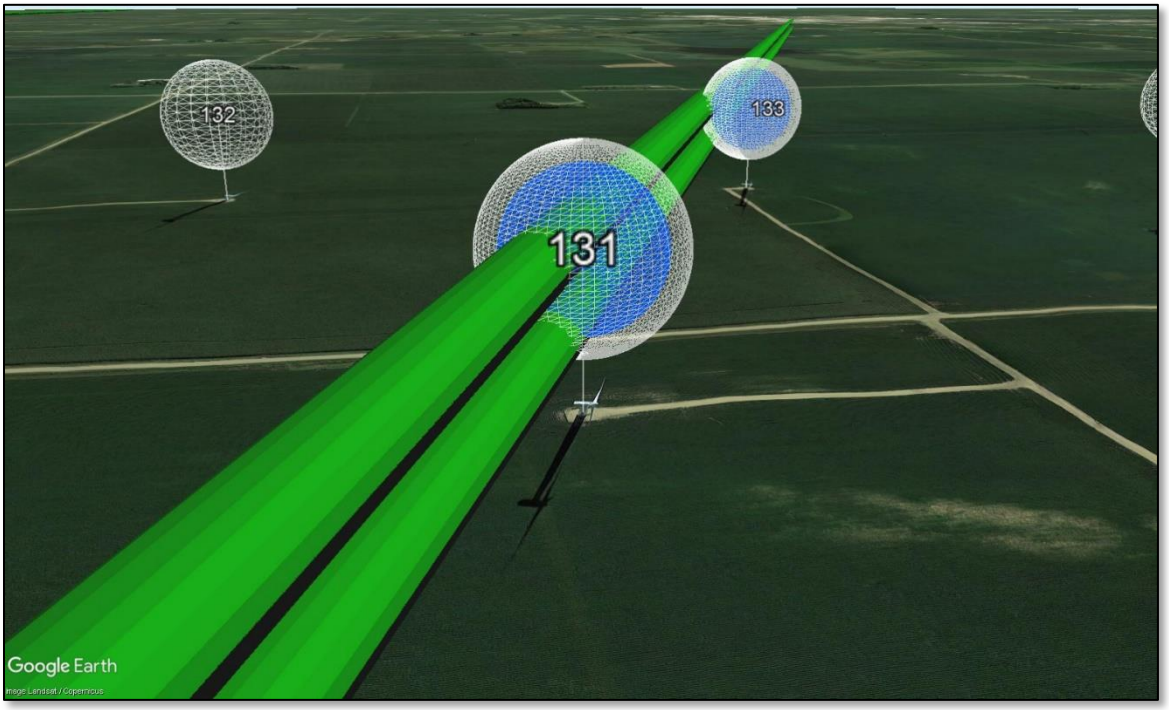

Figure 9: T131 and T133 existing rotor diameter (blue) and increased rotor diameter (white) rotor-swept spheres intersecting the WQAU442/WQOZ385 Fresnel zones

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Conclusion

The results of this analysis indicate that 22 paths associated with seven microwave links overlie the Nobles wind project. At the existing 80-meter hub height and increased 97-meter rotor diameter, wind turbines T1, T3, T21, T24, T108, T117, T131, and T133 (red, ***Figure 10***) overlap two-dimensional Fresnel zones (green, ***Figure 10***). Three-dimensional analysis confirms that these wind turbines would intersect the three-dimensional Fresnel zones and could affect the State of Minnesota MN/DOT's *RUSHMORE TWR* to *Worthington* link as well as the Minnesota Valley Television Improvement Corporation's *RUSHMORE TWR* to *Worthington* and *RUSHMORE TWR* to *CHANDLER TWR* links. As a result, continued discussion with the link owners may be necessary to ensure that increasing the T1, T3, T21, T24, T108, T117, T131, and T133 rotor diameters to 97 meters would not further degrade signal reliability.

If you have any questions regarding the findings of this study, please contact ***James Scott*** or ***Nick Lee*** at (703) 256-2485.

Nobles Wind Project

Figure 10 - Microwave Path Fresnel Zones

Plot Date: 19 June 2020

Coordinate System: WGS 84 / UTM zone 15N

0 1 2 3 4 Kilometers

CHANDLER TWR

MINNESOTA VALLEY TELEVISION IMPROVEMENT CORPORATION
24.09km @ 10.92 - 11.41 GHz

Slayton

STATE OF MINNESOTA, MN/DOT
33.19km @ 6 - 6.26 GHz

RUSHMORE TWR

Brewster

STATE OF MINNESOTA, MN/DOT
45.85km @ 5.95 - 6.2 GHz

MAGNOLIA WT

MINNESOTA VALLEY TELEVISION IMPROVEMENT CORPORATION
26.78km @ 10.76 - 11.25 GHz

STATE OF MINNESOTA, MN/DOT
20.44km @ 6.66 - 6.82 GHz

STATE OF MINNESOTA, MN/DOT
32.2km @ 6.6 - 6.76 GHz

MINNESOTA VALLEY TELEVISION IMPROVEMENT CORPORATION
20.44km @ 11.08 - 11.57 GHz

Worthington

Kanaranzi

Antenna Location
Fresnel Zone (2D)
Study Area

Wind Turbine Rotor Swept Area
(Based on 97 meter rotor diameter)
OK
Overlaps 2D
Intersects 3D

Capitol Airspace Group

N

Wind Power GeoPlanner™

AM and FM Radio Report

Nobles Wind Farm Repower Project

Prepared on Behalf of
Xcel Energy

November 5, 2020

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1. Introduction

Comsearch analyzed AM and FM radio broadcast stations whose service could potentially be affected by the proposed Nobles Wind Farm Repower Project in Nobles County, Minnesota.

2. Summary of Results

AM Radio Analysis

Comsearch found four database records[1] for AM stations within approximately 30 kilometers of the project, as shown in Table 1 and Figure 1. The closest record is station KWOA, which broadcasts out of Worthington, MN, 5.23 km to the southeast of the project area of interest (AOI).

ID	Call Sign	Status[2]	Frequency (kHz)	Transmit ERP[3] (kW)	Operation Time	Latitude (NAD 83)	Longitude (NAD 83)	Distance to Nearest Turbine (km)
1	KWOA	LIC	730	1.0	Daytime	43.629964	-95.678345	5.23
2	KWOA	LIC	730	0.159	Nighttime	43.629964	-95.678345	5.23
3	KQAD	LIC	800	0.5	Daytime	43.650247	-96.172250	25.62
4	KQAD	LIC	800	0.08	Nighttime	43.650247	-96.172250	25.62

Table 1: AM Radio Stations within 30 Kilometers of Project Area

[1] 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 AM/FM station's FCC license and governed by Comsearch's data license notification and agreement located at http://www.comsearch.com/files/data_license.pdf.

[2] LIC = Licensed and operational station; APP = Application for construction permit; CP=Construction permit granted; CP MOD = Modification of construction permit.

[3] ERP = Transmit Effective Radiated Power.

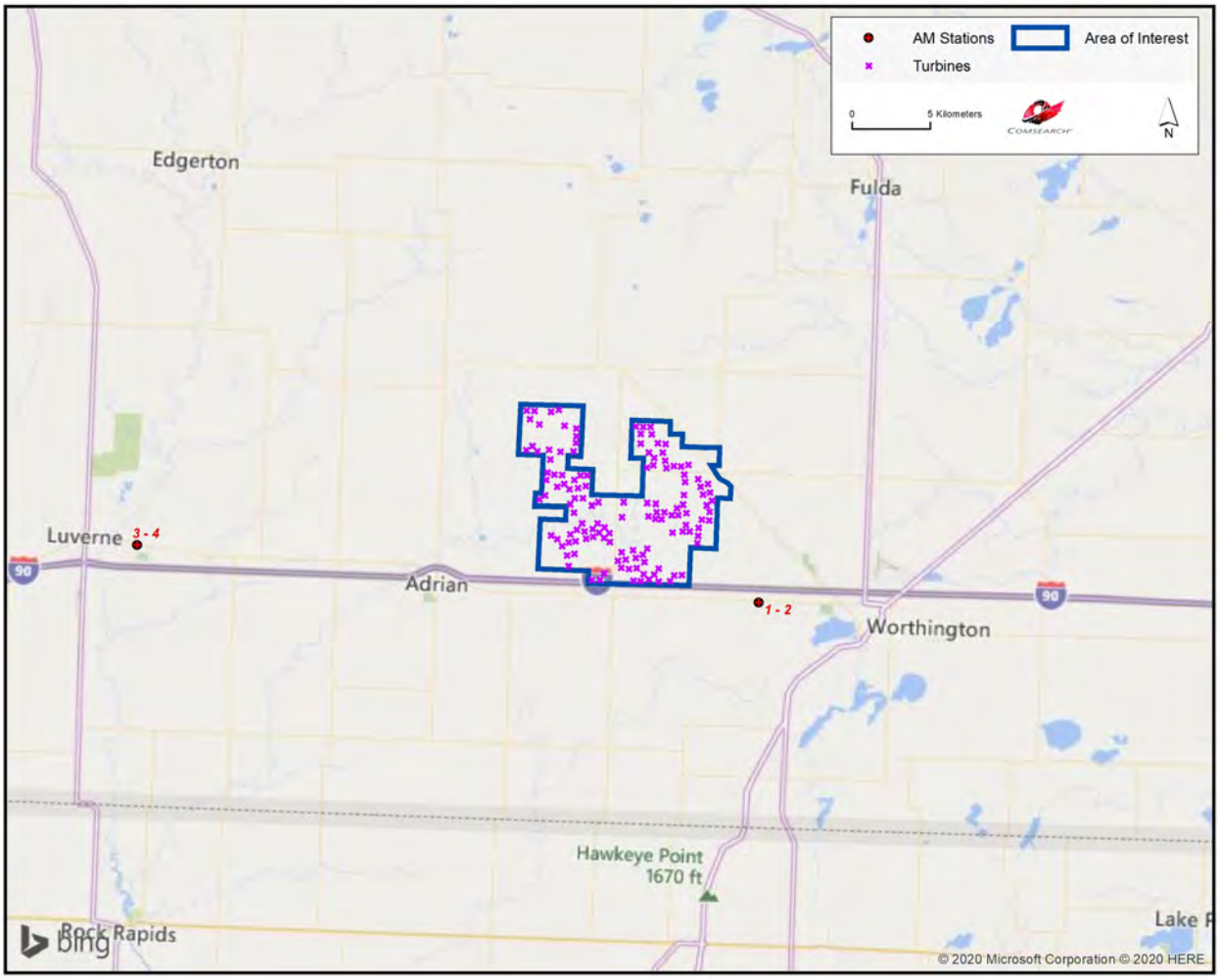

Figure 1: AM Radio Stations within 30 Kilometers of Project Area

FM Radio Analysis

Comsearch determined that there were eleven database records for FM stations within a 30-kilometer radius of the Nobles Wind Farm Repower Project, as shown in Table 2 and Figure 2. All eleven of these stations are currently licensed and operating, three of which are translator stations that operate with limited range. The closest stations (KUSQ and K262AR) are currently licensed in Worthington, MN, and located to the southeast of the project area, 5.23 km from the nearest proposed turbine location.

ID	Call Sign	Status[4]	Service[5]	Frequency (MHz)	Transmit ERP[6] (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to Nearest Turbine (km)
1	KUSQ	LIC	FM	95.1	100.0	43.629972	-95.678333	5.23
2	K262AR	LIC	FX	100.3	0.25	43.629972	-95.678333	5.23
3	KZTP	LIC	FM	104.3	3.4	43.541639	-95.751694	10.97
4	KRSW	LIC	FM	89.3	100.0	43.883583	-95.929194	17.18
5	KNSW	LIC	FM	91.7	99.0	43.883583	-95.929194	17.18
6	K231DG	LIC	FX	94.1	0.25	43.897750	-95.947528	19.14
7	KISD	LIC	FM	98.7	100.0	43.897750	-95.947528	19.14
8	K257FP	LIC	FX	99.3	0.25	43.897750	-95.947528	19.14
9	KJOE	LIC	FM	106.1	10.0	43.897750	-95.947528	19.14
10	KLQL	LIC	FM	101.1	100.0	43.806611	-96.206694	28.45
11	KITN	LIC	FM	93.5	50.0	43.525222	-95.413333	29.52

Table 2: FM Radio Stations within 30 km

[4] LIC = Licensed and operational station; APP = Application for construction permit; CP=Construction permit granted; CP MOD = Modification of construction permit.

[5] FM = FM broadcast station; FX = FM translator station; FS = FM auxiliary (backup) station; FB = FM booster station.

[6] ERP = Transmit Effective Radiated Power.

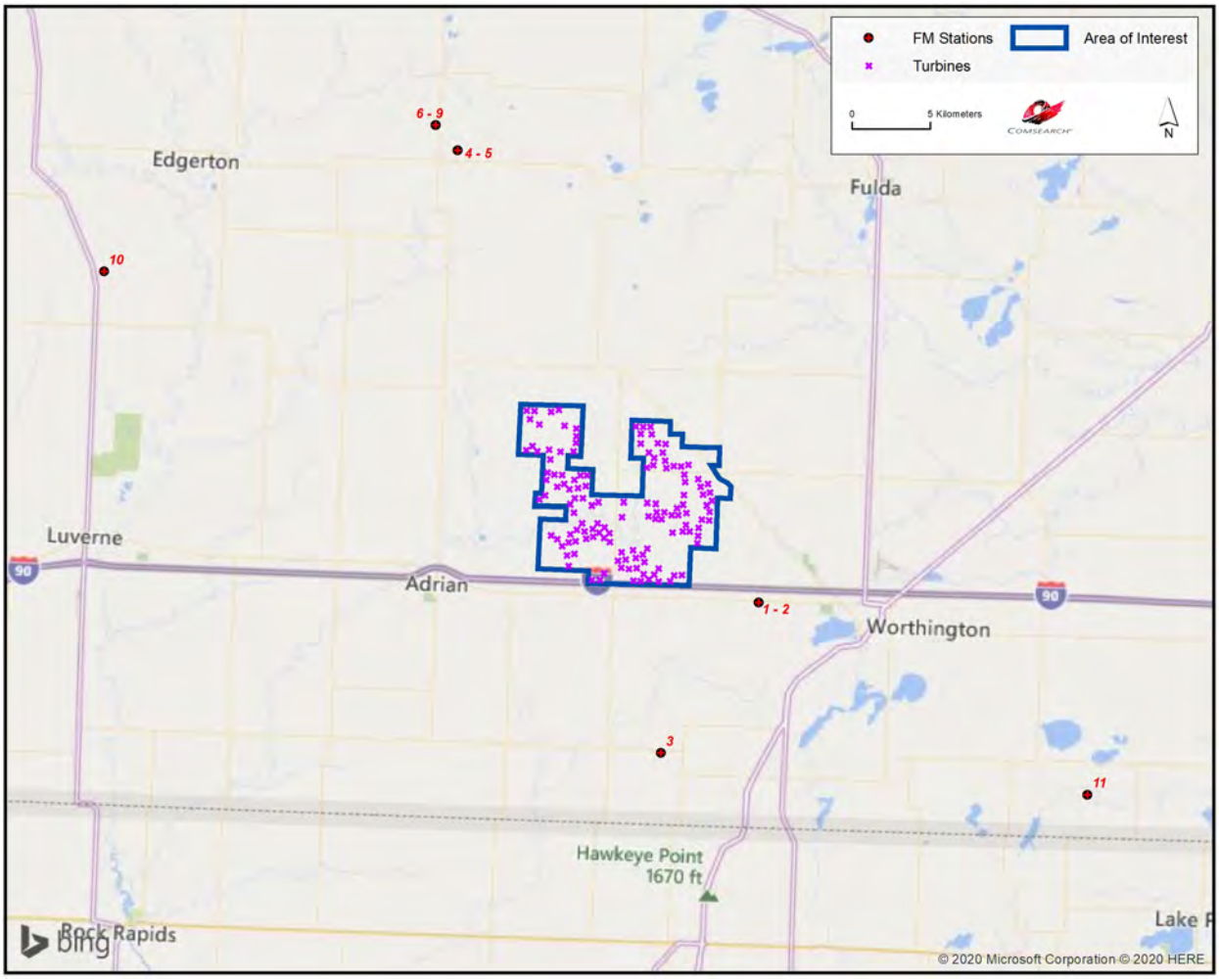

Figure 2: FM Radio Stations within 30 km

3. Impact Assessment

The exclusion distance for AM broadcast stations varies as a function of the antenna type and broadcast frequency. For directional antennas, the exclusion distance is calculated by taking the lesser of 10 wavelengths or 3 kilometers. For non-directional antennas, the exclusion distance is simply equal to 1 wavelength. Potential problems with AM broadcast coverage are only anticipated when AM broadcast stations are located within their respective exclusion distance limit from wind turbine towers. The closest AM station (KWOA) is located 5.23 km from the project. As there were no stations found within 3 kilometers of the project, which is the maximum possible exclusion distance based on a directional AM antenna broadcasting at 1000 KHz or less, the project should not impact the coverage of local AM stations.

The coverage of FM stations is generally not sensitive to interference due to wind turbines, especially when large objects (e.g., wind turbines) are located in the far field region of the radiating antenna to avoid the risk of distorting its radiation pattern. Stations KUSQ and K262AR are the nearest FM stations to any given turbine at 5.23 km away. At this distance there should be adequate separation to avoid radiation pattern distortion.

4. Recommendations

Since no impact on the licensed and operational AM or FM broadcast stations was identified in our analysis, no recommendations or mitigation techniques are required for this project.

5. Contact

For questions or information regarding the AM and FM Radio Report, please contact:

Contact person:	David Meyer
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Company:	Comsearch
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Fax:	703-726-5595
Email:	dmeyer@comsearch.com
Web site:	www.comsearch.com

Wind Power GeoPlanner™

Off-Air TV Analysis

Nobles Wind Farm Repower Project

Prepared on Behalf of
Xcel Energy

November 5, 2020

COMSEARCH®
A CommScope Company

Table of Contents

1. Introduction

Off-air television stations broadcast signals from terrestrial-based facilities directly to television receivers. Comsearch identified those off-air stations whose service could potentially be affected by the proposed Nobles Wind Farm Repower Project in Nobles County, Minnesota. 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 repowered wind turbines.

2. Summary of Results

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

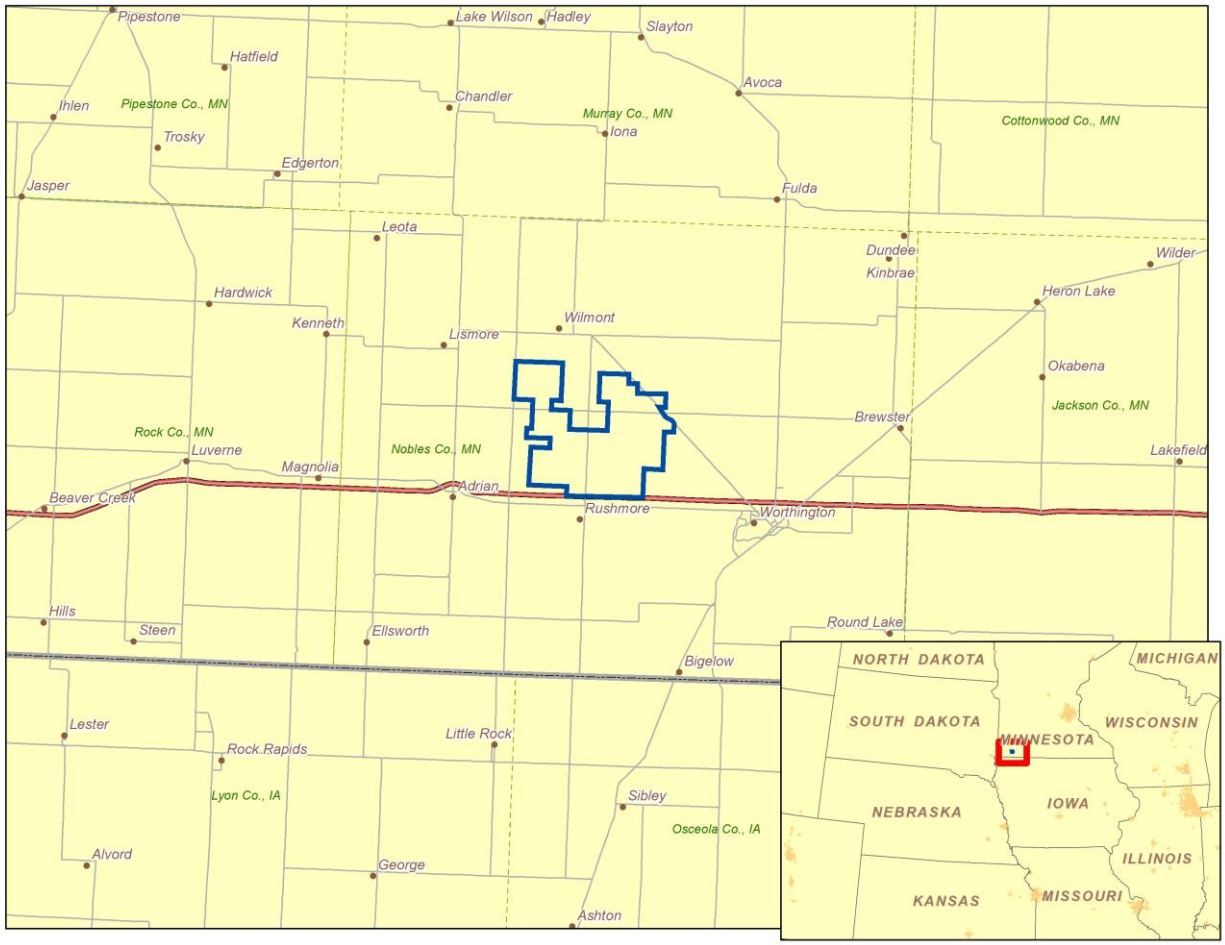

Figure 1: Wind Farm Project Area and Local Communities

To begin the analysis, Comsearch compiled all off-air television stations[1] within 150 kilometers of the repower 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, below, and a plot depicting their locations is provided in Figure 2. There are a total of 157 database records for stations within approximately 150 kilometers of the repower turbines. Of these stations, only 107 stations are currently licensed and operating, 90 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.

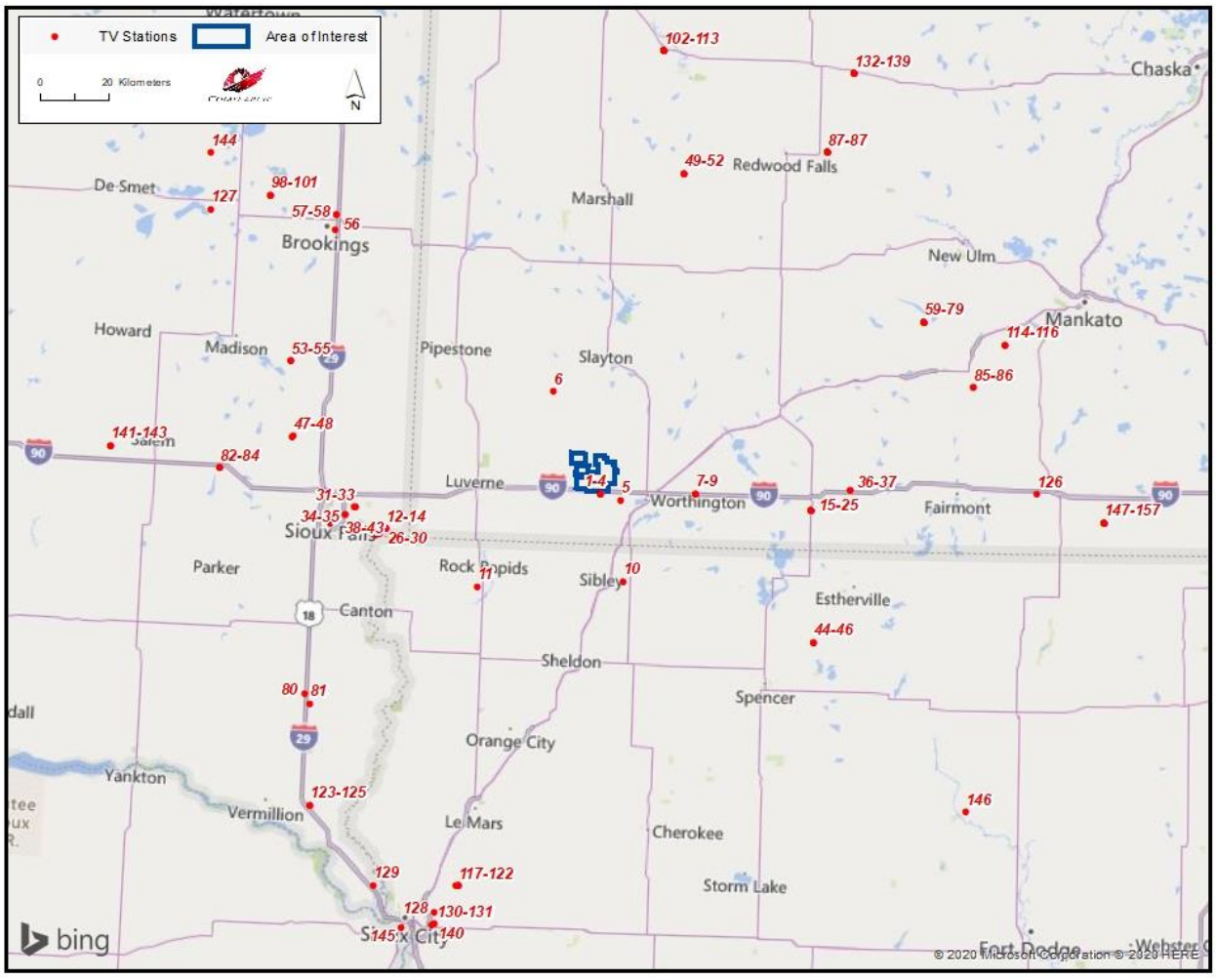

Figure 2: Plot of Off-Air TV Stations within 150 Kilometers of Repower Turbines

[1] 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.

ID	Call Sign	Status	Service[2]	Channel	Transmit ERP[3] (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to the Closest Turbine (km)
1	K17MA-D	CP	LPD	17	1	43.631861	-95.761861	0.98
2	K27ML-D	CP	LPD	27	1	43.631861	-95.761861	0.98
3	K42LR-D	CP	LPD	42	1	43.631861	-95.761861	0.98
4	K50NJ-D	CP	LPD	50	1	43.631861	-95.761861	0.98
5	K18MO-D	LIC	LPD	18	2.5	43.617111	-95.689056	5.11
6	KSMN	LIC	DTV	15	200	43.897778	-95.947500	19.14
7	K20LV-D	CP	LPD	20	1	43.639556	-95.414028	24.99
8	K24KZ-D	CP	LPD	24	1	43.639556	-95.414028	24.99
9	K44LS-D	CP	LPD	44	1	43.639556	-95.414028	24.99
10	K26JI-D	LIC	LPT	26	14	43.403333	-95.668611	27.16
11	K33PV-D	LIC	LPT	33	15	43.376583	-96.196833	42.27
12	K20MB-D	LIC	LPD	20	13.2	43.518611	-96.535000	57.96
13	KELO-TV	LIC	DTV	11	30	43.518611	-96.535000	57.96
14	KSFY-TV	LIC	DTV	13	22.7	43.518611	-96.535000	57.96
15	K17MY-D	LIC	LPD	17	2	43.603333	-94.992778	59.21
16	K19HZ-D	LIC	LPT	19	3.1	43.603333	-94.992778	59.21
17	K22MY-D	LIC	LPD	22	1.9	43.603333	-94.992778	59.21
18	K23FO-D	LIC	LPT	23	3.1	43.603333	-94.992778	59.21
19	K27NF-D	LIC	LPD	27	3.1	43.603333	-94.992778	59.21
20	K28OI-D	LIC	LPD	28	3.1	43.603333	-94.992778	59.21
21	K29LV-D	LIC	LPT	29	3.1	43.603333	-94.992778	59.21
22	K30KQ-D	LIC	LPD	30	2.1	43.603333	-94.992778	59.21
23	K31NT-D	LIC	LPT	31	3.1	43.603333	-94.992778	59.21
24	K34NU-D	LIC	LPD	34	3.1	43.603333	-94.992778	59.21
25	K35IZ-D	LIC	LPT	35	3.1	43.603333	-94.992778	59.21

[2] 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

LIC – Licensed and operational station
CP – Construction permit granted
CP MOD – Modification of construction permit
APP – Application for construction permit, not yet operational
STA – Special transmit authorization, usually granted by FCC for temporary operation
AMD - Amendment

[3] ERP = Transmit Effective Radiated Power

ID	Call Sign	Status	Service[2]	Channel	Transmit ERP[3] (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to the Closest Turbine (km)
26	KDLT-TV	LIC	DTV	21	589	43.505000	-96.556389	60.09
27	KWSD	APP	DTV	36	1000	43.505278	-96.572222	61.29
28	KWSD	LIC	DTV	36	36.9	43.505278	-96.572222	61.29
29	KWSD	STA	DTV	36	18.45	43.505278	-96.572222	61.29
30	KTTW	LIC	DTV	7	7.5	43.503889	-96.571889	61.32
31	K23PM-D	CP	LPD	23	2	43.573861	-96.648639	65.00
32	K56GF	APP	LPD	23	2	43.573861	-96.648639	65.00
33	KCSD-TV	LIC	DTV	24	80.9	43.574417	-96.655583	65.53
34	K22KD-D	CP	LPD	22	3	43.553889	-96.685000	68.40
35	K56GF	LIC	LPX	56	10.1	43.553889	-96.685000	68.40
36	K33MW-D	CP	LPD	33	2	43.661222	-94.853472	69.78
37	K39MD-D	CP	LPD	39	2	43.661222	-94.853472	69.78
38	K04RR-D	CP	LPD	4	3	43.538083	-96.714306	71.16
39	K06QJ-D	CP	LPD	6	3	43.538083	-96.714306	71.16
40	KCPO-LD	CP	LPD	26	2.79	43.532222	-96.739167	73.27
41	KCPO-LP	LIC	LPA	26	7.57	43.526750	-96.738167	73.37
42	KAUN-LP	LIC	LPA	25	0.88	43.535556	-96.743056	73.47
43	KCWS-LP	LIC	LPA	27	0.68	43.535556	-96.743056	73.47
44	K18KG-D	LIC	LPD	18	6.9	43.255556	-94.976667	75.40
45	KBVK-LP	LIC	LPD	21	6.8	43.255556	-94.976667	75.40
46	KBVK-LP	STA	LPD	20	6.8	43.255556	-94.976667	75.40
47	K32JG-D	LIC	LPD	32	3	43.752278	-96.885389	82.07
48	K32JG-D	CP	LPD	32	3	43.751389	-96.889444	82.40
49	K34QF-D	CP	LPD	34	5	44.484167	-95.491111	86.86
50	K43MH-D	LIC	LPD	43	5.5	44.484167	-95.491111	86.86
51	K43MH-D	STA	LPD	34	5	44.484167	-95.491111	86.86
52	KRWF	LIC	DTV	27	58	44.484167	-95.491111	86.86
53	K21LK-D	CP	LPD	21	2	43.949417	-96.909833	87.18
54	K30LV-D	CP	LPD	30	2	43.949417	-96.909833	87.18
55	K33LR-D	CP	LPD	33	2	43.949417	-96.909833	87.18
56	K25OU-D	LIC	LPD	25	4.5	44.300833	-96.766667	95.67
57	K17NF-D	CP	LPD	17	4.27	44.339444	-96.768889	98.66
58	K17NF-D	LIC	LPD	17	7.014	44.339444	-96.768889	98.66
59	K16CG-D	LIC	LPD	16	1.8	44.107778	-94.598889	101.09
60	K17MW-D	LIC	LPD	17	0.5	44.107778	-94.598889	101.09
61	K18NE-D	LIC	LPT	18	0.6	44.107778	-94.598889	101.09
62	K19LI-D	LIC	LPD	19	0.5	44.107778	-94.598889	101.09
63	K20LP-D	LIC	LPD	20	1.3	44.107778	-94.598889	101.09
64	K21DG-D	CP	LPD	21	0.35	44.107778	-94.598889	101.09
65	K22MQ-D	LIC	LPD	22	0.5	44.107778	-94.598889	101.09
66	K23MF-D	LIC	LPD	23	1.8	44.107778	-94.598889	101.09
67	K24JV-D	CP	LPD	24	0.35	44.107778	-94.598889	101.09

ID	Call Sign	Status	Service[2]	Channel	Transmit ERP[3] (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to the Closest Turbine (km)
68	K24JV-D	LIC	LPD	24	1.8	44.107778	-94.598889	101.09
69	K29IE-D	LIC	LPT	29	3	44.107778	-94.598889	101.09
70	K31KV-D	LIC	LPD	31	1.8	44.107778	-94.598889	101.09
71	K35KI-D	LIC	LPD	35	1.8	44.107778	-94.598889	101.09
72	K14KE-D	CP	LPD	14	2	44.106944	-94.595833	101.26
73	K14KE-D	LIC	LPD	14	1.5	44.106944	-94.595833	101.26
74	K21DG-D	LIC	LPD	21	2	44.106944	-94.595833	101.26
75	K26CS-D	LIC	LPT	26	1.7	44.106944	-94.595833	101.26
76	K28OH-D	LIC	LPD	28	0.5	44.106944	-94.595833	101.26
77	K30FN-D	LIC	LPD	30	2	44.106944	-94.595833	101.26
78	K32GX-D	LIC	LPD	32	1.2	44.106944	-94.595833	101.26
79	K34JX-D	LIC	LPD	34	2	44.106944	-94.595833	101.26
80	K38NJ-D	CP	LPD	38	2	43.077000	-96.804861	101.35
81	KUSD-TV	LIC	DTV	34	277	43.050278	-96.783889	101.95
82	K33NF-D	CP	LPD	33	1	43.659861	-97.147444	103.51
83	K35LZ-D	CP	LPD	35	1	43.659861	-97.147444	103.51
84	K38OZ-D	CP	LPD	38	1	43.659861	-97.147444	103.51
85	KMNF-LD	LIC	LPT	7	3	43.936750	-94.410833	108.75
86	KEYC-TV	LIC	DTV	12	52.7	43.936944	-94.410833	108.76
87	K15LS-D	LIC	LPT	15	0.37	44.549694	-94.966944	111.53
88	K16MV-D	LIC	LPT	16	0.5	44.549694	-94.966944	111.53
89	K17BV-D	LIC	LPT	17	0.398	44.549694	-94.966944	111.53
90	K19CV-D	LIC	LPT	19	0.395	44.549694	-94.966944	111.53
91	K22KU-D	LIC	LPT	22	0.39	44.549694	-94.966944	111.53
92	K25II-D	LIC	LPT	25	0.387	44.549694	-94.966944	111.53
93	K28LL-D	LIC	LPT	28	0.382	44.549694	-94.966944	111.53
94	K29MQ-D	LIC	LPT	29	0.5	44.549694	-94.966944	111.53
95	K33LB-D	LIC	LPT	33	0.375	44.549694	-94.966944	111.53
96	K35NY-D	LIC	LPT	35	0.5	44.549694	-94.966944	111.53
97	K36KW-D	LIC	LPT	36	0.373	44.549694	-94.966944	111.53
98	K27LB-D	CP	LPD	27	2	44.383222	-97.010500	116.54
99	K38NI-D	CP	LPD	38	2	44.383222	-97.010500	116.54
100	K42KO-D	CP	LPD	42	2	44.383222	-97.010500	116.54
101	K45LV-D	CP	LPD	45	2	44.383222	-97.010500	116.54
102	K14OL-D	LIC	LPD	14	1.8	44.804722	-95.580556	120.52
103	K16CP-D	LIC	LPD	16	1.8	44.804722	-95.580556	120.52
104	K19LX-D	LIC	LPD	19	1.8	44.804722	-95.580556	120.52
105	K22DO-D	LIC	LPD	22	1.7	44.804722	-95.580556	120.52
106	K24CS-D	LIC	LPD	24	1.8	44.804722	-95.580556	120.52
107	K26NT-D	LIC	LPD	26	1.8	44.804722	-95.580556	120.52
108	K29JW-D	LIC	LPT	29	1.8	44.804722	-95.580556	120.52
109	K31PG-D	LIC	LPT	31	1.8	44.804722	-95.580556	120.52

ID	Call Sign	Status	Service[2]	Channel	Transmit ERP[3] (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to the Closest Turbine (km)
110	K32DR-D	LIC	LPD	32	1.8	44.804722	-95.580556	120.52
111	K33OS-D	LIC	LPT	33	1.8	44.804722	-95.580556	120.52
112	K35DK-D	LIC	LPD	35	1.8	44.804722	-95.580556	120.52
113	K36OK-D	LIC	LPD	36	1.8	44.804722	-95.580556	120.52
114	K25QC-D	CP	LPD	25	7.5	44.051500	-94.299972	120.85
115	K43JE-D	AMD	LPD	25	7.5	44.051500	-94.299972	120.85
116	K43JE-D	LIC	LPD	43	10.82	44.051500	-94.299972	120.85
117	KMEG	LIC	DTV	32	1000	42.586667	-96.221944	121.74
118	KPTH	LIC	DTV	30	871	42.586667	-96.221944	121.74
119	KTIV	LIC	DTV	14	1000	42.586667	-96.221944	121.74
120	K03IS-D	CP	LPD	3	0.3	42.586667	-96.222222	121.75
121	K06QG-D	CP	LPD	6	0.3	42.586667	-96.222222	121.75
122	KCAU-TV	LIC	DTV	9	43.9	42.586389	-96.232500	122.01
123	K33LS-D	CP	LPD	33	1	42.782056	-96.767111	122.70
124	K35KT-D	CP	LPD	35	1	42.782056	-96.767111	122.70
125	K44KV-D	CP	LPD	44	1	42.782056	-96.767111	122.70
126	K45MN-D	CP	LPD	45	1	43.658556	-94.176750	124.32
127	KESD-TV	LIC	DTV	8	15	44.337778	-97.228611	128.07
128	KSIN-TV	LIC	DTV	28	400	42.514722	-96.304444	131.35
129	K22KJ-D	CP	LPD	22	1	42.579694	-96.527917	131.50
130	KSXC-LD	LIC	LPD	26	15	42.484861	-96.305556	134.55
131	KSXC-LP	LIC	LPA	5	3	42.484861	-96.305556	134.55
132	K15LT-D	CP	LPD	15	1	44.759139	-94.873333	135.01
133	K18IR-D	LIC	LPT	18	0.79	44.759139	-94.873333	135.01
134	K20JY-D	LIC	LPT	20	0.79	44.759139	-94.873333	135.01
135	K21NS-D	LIC	LPT	21	0.79	44.759139	-94.873333	135.01
136	K23FP-D	LIC	LPT	23	0.79	44.759139	-94.873333	135.01
137	K31OR-D	LIC	LPT	31	0.79	44.759139	-94.873333	135.01
138	K34OZ-D	LIC	LPT	34	0.79	44.759139	-94.873333	135.01
139	K47JE-D	LIC	LPD	47	0.62	44.759139	-94.873333	135.01
140	K31PP-D	CP	LPD	31	15	42.482056	-96.314194	135.06
141	K14QR-D	CP	LPD	14	1	43.703333	-97.548250	135.60
142	K30NS-D	CP	LPD	30	1	43.703333	-97.548250	135.60
143	K40NS-D	CP	LPD	40	1	43.703333	-97.548250	135.60
144	K35GR-D	LIC	LPT	35	6.76	44.487500	-97.239167	138.07
145	KBWF-LD	LIC	LPD	29	15	42.472500	-96.422500	138.99
146	KTIN	LIC	DTV	25	600	42.817417	-94.411639	141.71
147	K14KD-D	LIC	LPD	14	3	43.585833	-93.929722	144.72
148	K16MA-D	LIC	LPT	16	3	43.585833	-93.929722	144.72
149	K17MX-D	LIC	LPD	17	3	43.585833	-93.929722	144.72
150	K19LJ-D	LIC	LPT	19	3	43.585833	-93.929722	144.72
151	K21KF-D	LIC	LPD	21	3	43.585833	-93.929722	144.72

ID	Call Sign	Status	Service[2]	Channel	Transmit ERP[3] (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to the Closest Turbine (km)
152	K23FY-D	LIC	LPT	23	3	43.585833	-93.929722	144.72
153	K27FI-D	LIC	LPT	27	3	43.585833	-93.929722	144.72
154	K29IF-D	LIC	LPD	29	3.1	43.585833	-93.929722	144.72
155	K31EF-D	LIC	LPT	31	3	43.585833	-93.929722	144.72
156	K34NV-D	LIC	LPT	34	3	43.585833	-93.929722	144.72
157	K35IU-D	LIC	LPT	35	3	43.585833	-93.929722	144.72

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

3. Impact Assessment

Based on a contour analysis of the licensed stations within 150 kilometers of the Nobles Wind Farm Repower Project, it was determined that twelve of the full-power digital stations, identified below in Table 2, along with four low-power stations, have the potential for reception disruption 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 repowered wind turbine but not to the respective station. After the wind turbines are repowered, 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. However, since this project is for a repower of an existing wind farm at the same tower locations with marginal height increases[4], it is expected that the impact due to the changes will be minimal.

ID	Call Sign	Status	Service	Channel	Transmit ERP (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to the Closest Turbine (km)
5	K18MO-D	LIC	LPD	18	2.5	43.617111	-95.689056	5.11
6	KSMN	LIC	DTV	15	200	43.897778	-95.947500	19.14
10	K26JI-D	LIC	LPT	26	14	43.403333	-95.668611	27.16
11	K33PV-D	LIC	LPT	33	15	43.376583	-96.196833	42.27
12	K20MB-D	LIC	LPD	20	13.2	43.518611	-96.535000	57.96
13	KELO-TV	LIC	DTV	11	30	43.518611	-96.535000	57.96
14	KSFY-TV	LIC	DTV	13	22.7	43.518611	-96.535000	57.96
26	KDLT-TV	LIC	DTV	21	589	43.505000	-96.556389	60.09
28	KWSD	LIC	DTV	36	36.9	43.505278	-96.572222	61.29
30	KTTW	LIC	DTV	7	7.5	43.503889	-96.571889	61.32
33	KCSD-TV	LIC	DTV	24	80.9	43.574417	-96.655583	65.53
86	KEYC-TV	LIC	DTV	12	52.7	43.936944	-94.410833	108.76

[4] The repowered turbines will have a hub height of 80 meters and rotor diameter of 97 meters. The overall height increase of the repowered turbines will be a marginal 10 meters based on the existing hub height of 80 meters and rotor diameter of 77 meters.

ID	Call Sign	Status	Service	Channel	Transmit ERP (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to the Closest Turbine (km)
117	KMEG	LIC	DTV	32	1000	42.586667	-96.221944	121.74
118	KPTH	LIC	DTV	30	871	42.586667	-96.221944	121.74
119	KTIV	LIC	DTV	14	1000	42.586667	-96.221944	121.74
122	KCAU-TV	LIC	DTV	9	43.9	42.586389	-96.232500	122.01

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 repowered. However, since this project is for a repower of an existing wind farm at the same tower locations with a marginal increase in turbine size, it is expected that the impact due to the changes will be minimal.

5. Contact

For questions or information regarding the Off-Air TV Analysis, please contact:

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Email: dmeyer@comsearch.com
Web site: www.comsearch.com

Wind Power GeoPlanner™

Land Mobile & Emergency Services Report

Nobles Wind Farm Repower Project

Prepared on Behalf of
Xcel Energy

November 9, 2020

COMSEARCH®
A CommScope Company

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1. Introduction

An assessment of the emergency services in the Nobles Wind Farm Repower Project area was performed by Comsearch to identify potential impact from the repowered turbines. We evaluated the registered frequencies for the following types of first responder entities: police, fire, emergency medical services, emergency management, hospitals, public works, transportation and other state, county, and municipal agencies. We also identified all industrial and business land mobile radio (LMR) systems and commercial E911 operators within the proposed wind energy facility boundaries. This information is useful in the planning stages of the wind energy facility because the data can be used in support of facility communications needs and to evaluate any potential impact on the emergency services provided in that region. An overview of the project area, which is located in Nobles County, Minnesota, appears below in Figure 1.

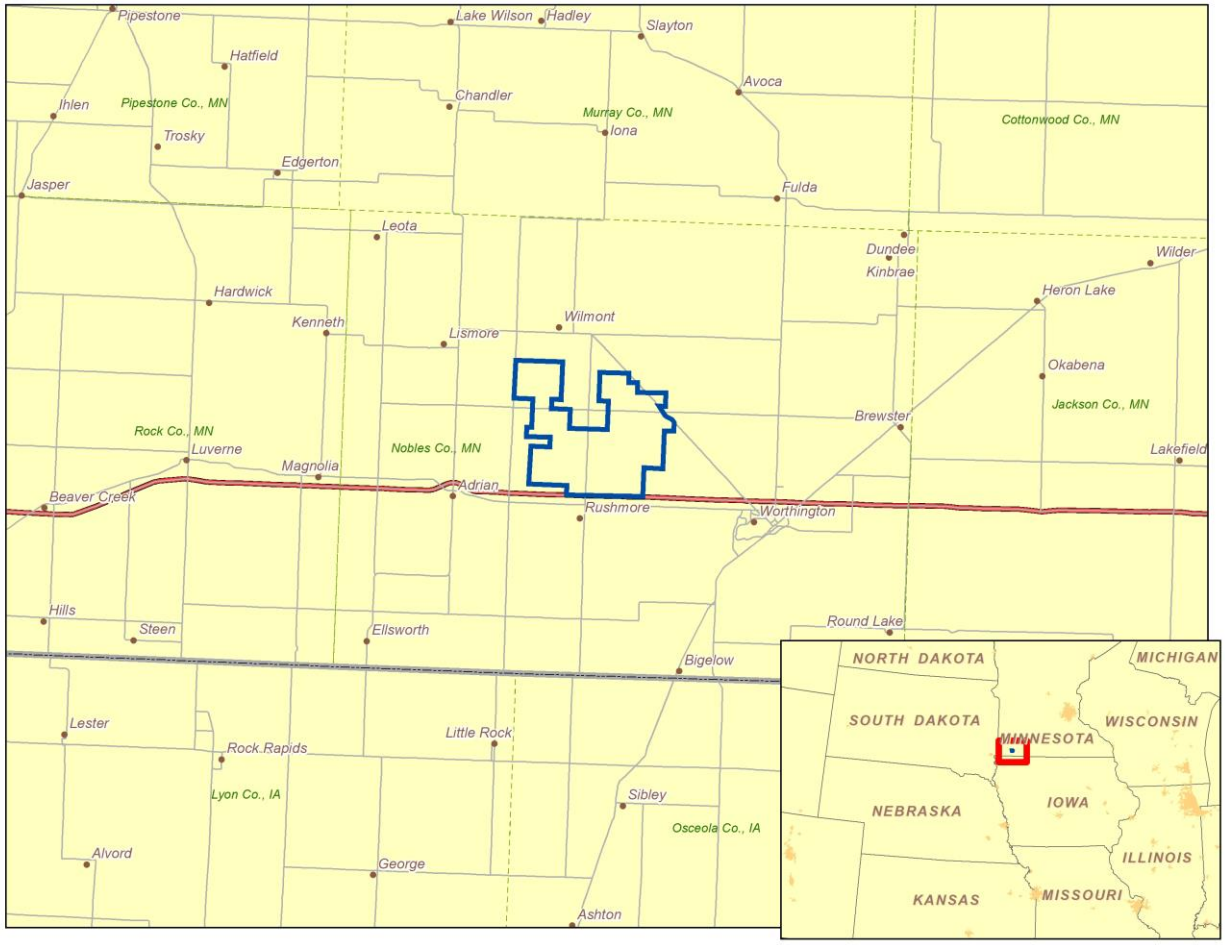

Figure 1: Area of Interest (AOI)

2. Summary of Results

Our land mobile and emergency services incumbent data[1] was derived from the FCC's Universal Licensing System (ULS) and the FCC's Public Safety & Homeland Security bureau. We identified both site-based licenses as well as regional area-wide licenses designated for public safety use.

Site-Based Licenses

The site-based licenses were imported into GIS software and geographically mapped relative to the wind energy project area of interest as defined by the customer. Each site on the map was given an ID number and associated with site information in a data table. A depiction of the fixed-site licenses in and around the project area appears in Figure 2.

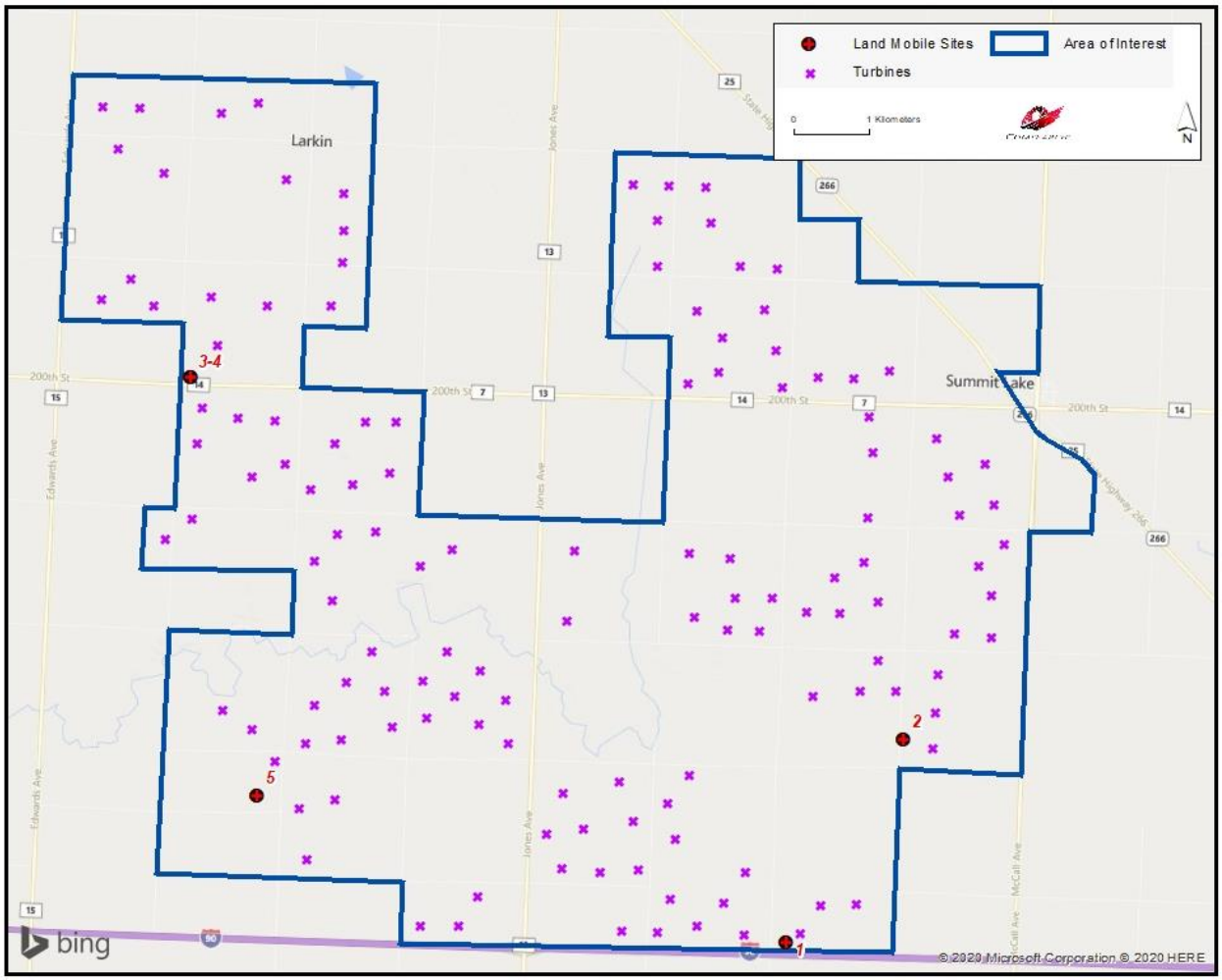

Figure 2: Land Mobile & Emergency Service Sites in Area of Interest

Figure 2 identifies five site-based licenses within the Nobles Wind Farm Repower Project area of interest. Specific information about these sites is provided in Table 1.

ID	Call Sign	Frequency Band (MHz)	Licensee	Antenna Height AGL (m)	Latitude (NAD83)	Longitude (NAD83)	Distance to Nearest Turbine (km)
1	WQRG291	150-174	KUHL, BURDELL	9	43.663861	-95.733028	0.38
2	WQVX322	450-470	Vestas	56.4	43.639444	-95.751083	0.20
3	WNYT837	150-174	LINCOLN PIPESTONE RURAL WATER SYSTEM	15	43.654694	-95.838083	0.50
4	WQKZ788	800/900	MINNESOTA, STATE OF	104.3	43.703861	-95.851250	0.41
5	WQOH267	150-174	MINNESOTA, STATE OF	106.7	43.703861	-95.851250	0.41

Table 1: Land Mobile & Emergency Service Sites in Area of Interest

Mobile Licenses

In addition to the fixed-site licenses above, 390 mobile licenses defined by center point and radius were found to intersect the Nobles Wind Farm Repower Project area. Appendix A contains a tabular summary of these stations.

Area-Wide Licenses

The regional area-wide licenses were compiled from FCC data sources and identified for each county intersected by the wind energy project area. The Nobles Wind Farm Repower Project is located in Nobles County, Minnesota, part of Public Safety Region #22, which contains all the counties in Minnesota. The regional public safety operations are overseen by the entity listed below.

James Mohn
Chairperson
Office of Statewide Radio Communications, Minnesota Department of Transportation
1500 W CR B2, Roseville, MN 55113
Phone: 651-234-7969
Email: james.mohn@state.mn.us

The chairperson for Region #22 serves as the representative for all public safety entities in the area and is responsible for coordinating current and future public safety use in the wireless spectrum. In the bands licensed by the FCC for area-wide first responders, which include 220

[1] 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 land mobile station's FCC license and governed by Comsearch's data license notification and agreement located at http://www.comsearch.com/files/data_license.pdf

MHz, 700 MHz, 800 MHz and 4.9 GHz, as well as the traditional Part 90 public safety pool of frequencies, thirteen licenses were found for the State of Minnesota and none for the County of Nobles (see Table 2). These area-wide licenses are designated for mobile use only.

ID	Licensee	Area of Operation	Frequency Band (MHz)
1	AMERICAN NATIONAL RED CROSS	Statewide: Minnesota	25-50
2	CART INC	Statewide: Minnesota	150-174
3	City of Minneapolis, MN	Statewide: Minnesota	2450-2500
4	GREATER NORTHWEST EMERGENCY MEDICAL SERVICES	Statewide: Minnesota	450-470
5	HENNEPIN, COUNTY OF	Statewide: Minnesota	25-50, 150-174, 406-413, 450-470, 800/900
6	Minnesota Canine Search Rescue and Tracking	Statewide: Minnesota	150-174
7	MINNESOTA DEPARTMENT OF PUBLIC SAFETY	Statewide: Minnesota	150-174
8	MINNESOTA, STATE OF	Statewide: Minnesota	0-10, 150-174, 450-470, 769-775/799-805, 769-775/799-805, 800/900, 2450-2500, 4940-4990
9	NATIONAL SKI PATROL SYSTEM INC	Statewide: Minnesota	150-174
10	Nevada Division of Forestry	Statewide: Minnesota	150-174
11	NORTHSTAR SEARCH AND RESCUE	Statewide: Minnesota	150-174
12	ROCHESTER CITY OF	Statewide: Minnesota	150-174
13	SAINT LOUIS, COUNTY OF	Statewide: Minnesota	150-174, 450-470, 800/900

Table 2: Regional Licenses

E911 Operators

Wireless operators are granted area-wide licenses from the FCC to deploy their cellular networks, which often include handsets with E911 capabilities. Since mobile phone market boundaries differ from service to service, we disaggregated the carriers' licensed areas down to the county level. We have identified the type of service for each carrier in Nobles County, Minnesota, in Table 3.

Mobile Phone Carrier	Service[2]
AT&T	700 MHz, AWS, Cellular, WCS
DISH Network	700 MHz, AWS
Sprint	PCS
Standing Rock Telecommunications	PCS
TerreStar	AWS
T-Mobile	700 MHz, AWS, PCS
Verizon	700 MHz, AWS, Cellular, PCS

Table 3: Mobile Phone Carriers in Area of Interest with E911 Service

3. Impact Assessment

The first responder, industrial/business land mobile sites, area-wide public safety, and commercial E-911 communications as described in this report are typically unaffected by the presence of wind turbines, and we do not anticipate any significant harmful effect to these services in the Nobles Wind Farm Repower Project area as a result of the repower. Although each of these services operates in different frequency ranges and provides different types of service including voice, video and data applications, there is commonality among these different networks with regard to the impact of operating wind turbines on their service. Each of these networks is designed to operate reliably in a non-line-of-sight (NLOS) environment. Many land mobile systems are designed with multiple base transmitter stations covering a large geographic area with overlap between adjacent transmitter sites in order to provide handoff between cells. Therefore, any signal blockage caused by repowering wind turbines does not materially degrade the reception because the end user is likely receiving signals from multiple transmitter locations. Additionally, the frequencies of operation for these services have characteristics that allow the signal to propagate through wind turbines. As a result, very little, if any, change in their coverage should occur when the wind turbines are repowered.

When repowering the wind energy turbine locations in the area of interest, a conservative approach would dictate not locating any turbines within 77.5 meters of land mobile fixed-base stations to avoid any possible impact to the communications services provided by these stations. This distance is based on FCC interference emissions from electrical devices in the

[2] AWS: Advanced Wireless Service at 1.7/2.1 GHz
CELL: Cellular Service at 800 MHz
PCS: Personal Communication Service at 1.9 GHz
WCS: Wireless Communications Service at 2.3 GHz
700 MHz: Lower 700 MHz Service

land mobile frequency bands. As long as the turbines are more than 77.5 meters from the land mobile stations, they will meet the setback distance criteria for FCC interference emissions in the land mobile bands. Based on the distance calculations, the closest land mobile fixed-base station is 0.53 km from the repowered turbine locations, well beyond the recommended separation distance. Therefore, we do not anticipate any impact on these communications services.

4. Conclusions

Since the project is a repower of an existing project and the required separation distances are met, no impact is anticipated. In the event that a public safety entity believes its coverage has been compromised by the repower efforts of the wind energy facility, it has many options to improve its signal coverage to the area through optimization of a nearby base station or even adding a repeater site. Utility towers, meteorological towers or even the turbine towers within the wind project area can serve as the platform for a base station or repeater site.

5. Contact

For questions or information regarding the Land Mobile & Emergency Services Report, please contact:

Contact person:	David Meyer
Title:	Senior Manager
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5656
Fax:	703-726-5595
Email:	dmeyer@comsearch.com
Web site:	www.comsearch.com

Appendix A

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
1	WPIF619	450-470	21ST CENTURY WIRELESS GROUP INC	121	43.638833	-94.615806
2	WRP695	150-174	A C STENGEL & SONS INC	80	43.239694	-96.585306
3	KC25235	450-470	ABSOLUTE COMMUNICATIONS II, L.L.C.	97	43.619694	-95.598333
4	WPPE488	150-174	ABSOLUTE COMMUNICATIONS II, L.L.C.	91	43.619694	-95.598333
5	WPPE491	150-174	ABSOLUTE COMMUNICATIONS II, L.L.C.	91	43.619694	-95.598333
6	WQPD485	450-470	AGRI-ENERGY LLC	32	43.647611	-96.224694
7	WRCZ478	450-470	AHLERS, JARED	32	43.614972	-95.501278
8	WPXP467	450-470	AHRENDT BROTHERS	32	43.710000	-96.214722
9	WPJU667	450-470	Allnet Wireless LLC	121	43.999972	-96.308361
10	WPQB451	450-470	ALPHA WIRELESS COMMUNICATIONS	32	43.417750	-95.528056
11	WNZD427	450-470	ALPHA WIRELESS COMMUNICATIONS CO	40	43.386361	-96.093083
12	WNZD427	450-470	ALPHA WIRELESS COMMUNICATIONS CO	75	43.414417	-94.875278
13	WPPW631	800/900	ALPHA WIRELESS COMMUNICATIONS CO	112	43.227750	-95.134722
14	WPKJ500	450-470	ALPHA WIRELESS COMMUNICATIONS CO DBA COMMUNICATIONS SPECIALI	32	43.417750	-95.528056
15	WNNM935	800/900	ALPHA WIRELESS COMMUNICATIONS CO.	113	43.884167	-95.182500
16	WPEY485	800/900	ALPHA WIRELESS COMMUNICATIONS CO.	113	43.968833	-94.646361
17	WQTW218	450-470	ALTMAN, CLIFF	40	43.749944	-95.953361
18	WQOH613	450-470	AMERICAN STUDENT TRANSPORTATION OF WORTHINGTON, INC.	32	43.629972	-95.675833
19	WQTM214	450-470	ARENDS FARMS INC.	32	43.644972	-96.143917
20	WRCN924	450-470	ASPENALL ENERGY SERVICES LLC	34	43.541167	-95.468639
21	WNGG479	450-470	AVERA MC KENNAN HOSPITAL	322	43.530528	-96.713667
22	WQEK972	450-470	Basin Electric Power Cooperative	80	43.375806	-96.449472

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
23	WPTZ321	450-470	BEDFORD TECHNOLOGY	32	43.633889	-95.570833
24	WNBR804	450-470	BENSON, DERRY L	121	43.649972	-96.917000
25	WQML326	150-174	BERGMAN, BRIAN	80	43.748889	-96.072778
26	WQVL970	150-174	BERGMAN, NICK	40	43.895917	-95.683861
27	WQRL262	450-470	BINFORD FARMS	32	43.686167	-96.134333
28	KNFW958	450-470	BLANKENFELD, ALAN	64	43.858583	-96.553389
29	WQYH845	150-174	BLB Enterprises LLC	40	43.460167	-95.418972
30	WQWM205	150-174	BLOCK, DAN	24	43.566500	-95.953000
31	WQSR520	800/900	BOBKIN WIRELESS, LLC	113	42.720000	-95.434250
32	WNUY922	450-470	BOEVE, ALLEN:BOEVE, MYRON	56	43.526083	-96.170861
33	WPQA615	150-174	BOSE, JEFF	40	44.000806	-95.815306
34	WNRV466	450-470	BOUSEMA FARMS INC.	32	43.632583	-95.719806
35	KNAP966	450-470	BRAKE, DOUGLAS	64	43.801639	-95.875861
36	WPPV893	450-470	Brandon Communications Inc.	32	43.646639	-95.525028
37	WPZT739	450-470	BREWSTER PUBLIC SCHOOLS	32	43.697444	-95.471833
38	WQFD337	150-174	BROCKBERG, TOM	32	43.771111	-96.186111
39	KNCQ826	150-174	BRUEGGEMAN, AL	40	43.474972	-95.450278
40	WPDQ236	450-470	BRUNK BROS	32	43.706361	-95.436111
41	WNWU368	450-470	BUDS CUSTOM 2 WAY	64	44.056611	-95.196389
42	WPDZ343	150-174	BUESING FARMS INC	121	44.789667	-95.660028
43	WQNS645	450-470	BUFFALO RIDGE CONCRETE INC.	32	43.897778	-95.947500
44	WQNR706	150-174	BUILDING PRODUCTS	80	43.565833	-96.748889
45	WNCA530	450-470	BULLERMAN FARMS	32	43.630528	-95.911139
46	WRCK588	450-470	BULLERMAN LIVESTOCK LLC	34	43.714889	-95.950778

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
47	WQTF624	450-470	BULLERMAN, CODY	34	43.573056	-95.913333
48	WQSM486	450-470	BULLERMAN, MARK	32	43.666083	-95.925028
49	WNZL366	450-470	BURESCH, KEITH	48	43.726361	-95.169722
50	WQKF985	150-174	BURKE, GARY	121	44.113333	-96.333056
51	WNNQ585	450-470	BUSCH, TOM	48	43.769417	-95.473333
52	KNIJ684	150-174	BUSMAN, JOHN	64	43.848583	-95.915583
53	WPFE358	25-50	BUTTE FARM SUPPLY INC	113	42.910278	-96.808389
54	WNZD463	450-470	C S AGROW SERVICE COMPANY	80	42.946083	-95.543889
55	WNZN424	450-470	CARLBLOM, TIMOTHY	56	44.041611	-95.250278
56	WQNN366	150-174	CARLSON, GARY W	40	43.959722	-95.901389
57	WQXP478	450-470	Cemstone Concrete Materials, LLC	30	43.616972	-95.595333
58	WPBJ384	800/900	CenterPoint Energy	48	43.806639	-96.206694
59	WQSH269	800/900	CENTRAL VALLEY COMMUNICATIONS, LLC	113	43.510444	-96.738778
60	WPKQ438	450-470	CHRISTOFFER FARMS INC	32	43.616361	-95.469444
61	WNWS216	450-470	CHRISTOPHEL FARMS	80	43.749389	-94.830806
62	WPKS367	450-470	CITY OF WINDOM	60	43.883833	-95.100278
63	WQOK610	150-174	CLIPPER'S HAULING INC.	80	43.966611	-96.403583
64	KPK807	150-174	COMMUNITY FIRST BROADCASTING, LLC	64	43.405528	-95.083889
65	WNNG910	150-174	COOPER, WALLY J	40	43.730250	-95.694722
66	KNIR593	450-470	COOPERATIVE ELEVATOR ASSOCIATION	32	43.417750	-95.537500
67	WQTK920	450-470	CRISP, KEVIN R	79	43.809806	-96.576861
68	WQNS915	800/900	DAKOTA, COUNTY OF	241	44.714833	-93.124778
69	WNIJ877	800/900	DAMMAN, ROBERT:DAMMAN, GLENN DBA DAMMAN CO	80	43.179167	-95.654167
70	WQTI325	450-470	DEBEER, DANIEL	34	43.541111	-95.954667

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
71	WQBD899	450-470	DEE JAY'S SQR, INC.	121	43.515722	-96.770889
72	KNIV751	800/900	DEL MONTE CORPORATION	113	44.299972	-94.741639
73	WNBS409	450-470	DEUTZ, GARY	80	44.403028	-95.751694
74	WPMX409	450-470	DIEKMANN, TOM	32	43.767194	-95.953639
75	WQQJ926	450-470	DIETER, DAVID	32	43.692583	-95.533639
76	WSH223	150-174	DILLEHAY, MARK	40	43.374972	-95.408333
77	WQSJ508	450-470	DOEDEN, KELLY	32	43.395806	-95.752528
78	WQOW614	450-470	DOEDEN, THOMAS	40	43.433222	-95.751917
79	WQNQ556	150-174	Duininck, Inc	40	43.606722	-95.533750
80	WQTM323	450-470	DYKSTRA, DORWARD	32	43.515083	-95.647833
81	WQXF943	800/900	EAST RIVER ELECTRIC POWER COOP	113	44.004528	-97.113250
82	WQXM222	800/900	EAST RIVER ELECTRIC POWER COOPERATIVE	113	43.776750	-96.322583
83	WNIE705	450-470	EIGENBERG FARMS	48	43.866361	-95.342222
84	WQLB774	450-470	ELECTRO WATCHMAN, INC.	75	43.507972	-96.746000
85	WPHF742	450-470	ELECTRONIC ENGINEERING CO.	64	43.116639	-95.741944
86	WPHF742	450-470	ELECTRONIC ENGINEERING CO.	64	43.417750	-95.537500
87	WPHS573	800/900	Electronic Specialties, Inc	113	42.757194	-95.623611
88	WNDX386	800/900	Electronic Specialties, Inc.	113	42.673861	-95.309722
89	WNQN254	450-470	Electronic Specialties, Inc.	80	43.413028	-94.846389
90	WNRI504	800/900	Electronic Specialties, Inc.	113	42.941111	-94.733889
91	WPEJ851	450-470	Electronic Specialties, Inc.	97	43.163306	-95.146111
92	WPIM542	800/900	Electronic Specialties, Inc.	113	43.292194	-94.513028
93	WRCK403	450-470	ELIAS BROTHERS	34	43.649667	-95.955722
94	WQAL327	150-174	ELLIS & EASTERN COMPANY	40	43.699972	-96.000306

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
95	WNQR999	450-470	ENGELKES, ALAN	48	43.600806	-95.736972
96	WQGY731	450-470	ENXCO SERVICE	32	43.956528	-95.890111
97	WQVF994	150-174	ERICKSON FARM INC	79	43.617306	-96.513028
98	WQTN496	450-470	EVERS, MARK	80	44.112028	-94.899667
99	WQTS635	450-470	EXPRESS AG	32	43.646278	-96.219250
100	WQRV592	450-470	FARMERS ELEVATOR COOP	80	43.187361	-96.131278
101	WRBP985	450-470	FASTERT, JUSTIN	32	43.472778	-96.096694
102	WPMC997	150-174	FEIKEMA, CHUCK	30	43.754417	-96.233639
103	WNWS729	450-470	FELDKAMP FARMS	72	43.404694	-95.731694
104	WQKZ362	450-470	FERGUSON'S GARDEN CENTER	80	43.433611	-95.062222
105	WPNX599	150-174	FICK, LOWELL	32	43.653583	-96.233639
106	WQUS965	450-470	FICK, MORRIS	79	43.587333	-96.269361
107	WQUY831	150-174	FIIHR, DENNIS	79	43.199417	-96.011972
108	WPDX603	450-470	FISCHER, DANIEL L	32	43.818611	-95.604000
109	WQVP639	150-174	FLUIT FARMS INC.	80	43.431861	-96.175444
110	WQVP639	150-174	FLUIT FARMS INC.	80	43.684611	-96.232528
111	WPZP383	450-470	FREESE, MARC A	32	43.933500	-95.652583
112	WQNU858	450-470	Froggy Bottom	161	42.740500	-96.415972
113	WQJF408	150-174	FULDA, CITY OF	32	43.869694	-95.601722
114	WRY270	150-174, 450-470	FULDA, CITY OF	105	43.876361	-95.595278
115	WPPU947	450-470	FULLERTON BUILDING SYSTEMS INC	32	43.620806	-95.589722
116	KNEW845	450-470	FULTZ FARMS INC	80	44.230778	-95.573611
117	WNWV732	150-174	GABRIELSON, GREG	40	43.616639	-96.207806
118	WQOW985	450-470	GARLOFF TRUCKING	40	43.538389	-95.375833

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
119	WQPD491	150-174	GATOR BROTHERS BORING INC.	113	43.195833	-96.301111
120	KNJK352	450-470	GCC Alliance Concrete Inc.	97	42.991667	-96.059750
121	WPQJ581	800/900	GCC Alliance Concrete Inc.	32	43.450806	-95.955861
122	KNBA595	25-50	GM CONTRACTING INC	161	44.114694	-94.211639
123	WPGV231	150-174	GMC FARMS LTD	56	43.490528	-96.320306
124	WYL786	450-470	GOHR, HARLAN:GOHR, MARVAN K DBA GOHR BROTHERS	121	43.829111	-94.937500
125	WQOB738	450-470	GRADERT GRAIN FARMS	32	43.431889	-95.749083
126	WNYN608	450-470	GRADERT, KEVIN	32	43.433306	-95.750583
127	WQME946	450-470	GRANUM, COREY	121	44.203889	-96.907778
128	KNEC904	150-174	GREAT LAKES CONCRETE INC	97	43.416917	-95.106667
129	WNBG496	800/900	GREAT LAKES COOPERATIVE	64	43.163306	-95.325556
130	WNBG496	800/900	GREAT LAKES COOPERATIVE	113	43.431889	-94.946639
131	WPCG836	800/900	GREAT LAKES COOPERATIVE	64	43.326361	-95.230833
132	WPQK435	450-470	GREAT RIVER ENERGY	32	43.781917	-95.873639
133	WPSK730	450-470	Great River Energy	32	43.999556	-95.747139
134	WNBF723	150-174	GREENFIELD, KENNETH	80	44.266083	-95.895583
135	WNJZ650	150-174	GRIESSE, LEROY	48	43.433306	-96.186972
136	WPPD445	150-174	GUNDERSEN LUTHERAN MEDICAL CENTER	600	43.794417	-91.249583
137	WPEW480	450-470	HAACK, JERRY J	56	43.374972	-96.399194
138	WNWM567	150-174	HABERMAN, DENNIS	40	43.730528	-95.466389
139	WNGJ572	450-470	HALBUR, RALPH	48	43.888028	-96.388639
140	WQPF472	450-470	HAMANN, MICHAEL	40	43.660000	-96.262222
141	WNVK807	450-470	HANSMANN DENNIS HANSMANN ELLEN HANSMANN CHAD	56	43.348028	-95.938083
142	WNPU584	150-174	HARRIS, CITY OF	64	43.445806	-95.434444

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
143	WPFK854	450-470	HAYENGA, MARK	56	43.449694	-95.703639
144	WQNY783	450-470	HEMMER, JEFF	80	43.826889	-96.719861
145	WNUW617	150-174	HERON LAKE OKABENA INDEPENDENT SCHOOL DISTRICT 330	80	43.741083	-95.316389
146	WNUW617	150-174	HERON LAKE OKABENA INDEPENDENT SCHOOL DISTRICT 330	80	43.793306	-95.313056
147	WQRW262	150-174	Hibma Family Farms	32	43.474361	-95.423361
148	WQKP465	150-174	HOKENESS, DEAN	40	43.558694	-95.826833
149	WNLQ667	450-470	HOOGENDOORN BROS INC	56	43.263861	-96.003083
150	WPEI291	150-174	HOSPERS, CITY OF	64	43.069972	-95.908639
151	WPLS660	450-470	Hubbard Feeds Inc. dba Ridley Block Operation	24	43.635528	-95.573611
152	WNUW618	150-174	INDEPENDENT SCHOOL DISTRICT 2895	80	43.679889	-95.173111
153	WQGY407	450-470	Indpendent School District #2169	32	43.984361	-95.756361
154	WQDV323	150-174	Interstate Power & and Light Company	290	43.557167	-93.661056
155	WNNH904	800/900	Interstate Power and Light Company	113	42.880528	-95.221389
156	WNNH904	800/900	Interstate Power and Light Company	113	43.159167	-95.255278
157	WNNH904	800/900	Interstate Power and Light Company	113	43.198722	-94.493389
158	WNNH904	800/900	Interstate Power and Light Company	113	43.404500	-95.644417
159	WNNH904	800/900	Interstate Power and Light Company	113	43.429167	-95.013056
160	WNNH907	800/900	Interstate Power and Light Company	113	42.690556	-95.509444
161	WQMN422	800/900	INTERSTATE POWER AND LIGHT COMPANY	113	42.767500	-95.584722
162	WQMN422	800/900	INTERSTATE POWER AND LIGHT COMPANY	113	43.188000	-95.365194
163	WQVJ691	800/900	INTERSTATE POWER AND LIGHT COMPANY	113	43.529667	-96.365056
164	WPCH802	450-470	INWOOD HATCHERY & FEED STORE INC.	64	43.307750	-96.432250
165	WPMF469	150-174	IOWA, STATE OF, DOT	40	43.433306	-96.147806

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
166	WQMM943	450-470	ITC MIDWEST	80	43.807972	-95.603056
167	WQMM943	450-470	ITC MIDWEST	80	44.013972	-95.113667
168	WNIJ435	450-470	J.R. Simplot Company	48	43.790250	-96.268361
169	WNQO218	150-174	JARMER, GERALD	48	43.948306	-95.404167
170	KAL211	150-174	JASPER, MERLE	48	43.883306	-96.246139
171	WQYL461	450-470	JENNIGES, ADAM	32	43.522222	-96.015778
172	WQRV621	450-470	JMD FARMS INC.	32	43.403056	-95.813333
173	WQTC657	150-174	JOHNSON, BRADY	40	43.998444	-95.948778
174	WNCA625	450-470	K & K CUSTOM & REPAIR	80	43.087472	-96.297528
175	WNWH287	150-174	KAR MAR FARMS LTD	64	43.527750	-96.383639
176	WQSZ779	450-470	KAZEMBA, JAMES A	32	43.589361	-95.367194
177	WQWM841	150-174	KELLENBERGER CUSTOM FARMING	75	43.438361	-96.328750
178	WQPL293	450-470	KIRCHNER, JACOB	32	43.849417	-95.457583
179	WPFK898	150-174	KLAASSEN, KEITH	40	43.442750	-95.433056
180	WNWH318	450-470	KLAASSEN, Kevin T	40	43.286917	-95.919194
181	KNAW486	450-470	KLASSEN, LOUIS	105	43.863278	-94.994722
182	WQSB630	450-470	KLAY, JOSH	32	43.643833	-96.052667
183	WQFT464	450-470	KNIPS, KEVIN	32	43.688000	-96.013611
184	WNNZ352	450-470	KNIPS, RICK	72	43.760528	-95.952250
185	WQZJ726	450-470	KNUTSON, RUSSELL	32	43.630889	-96.213083
186	WNPL995	450-470	KOOIKER, LE ROY	64	43.433861	-96.033639
187	WQMY719	450-470	KOPPLOW, JARED	32	43.563750	-95.817000
188	WQWS980	150-174	KRACHT, KYLE	79	43.865667	-96.171361
189	WQYD305	450-470	KREMER FARMS	32	43.892250	-95.779944
190	WQSI906	150-174	KRUGER, TODD E	32	43.626861	-95.602083

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
191	WQUA211	150-174	KRUISSELBRINK, ALEANOR	40	44.015694	-96.105250
192	WQRG291	150-174	KUHL, BURDELL	32	43.663861	-95.733028
193	WQAD248	450-470	KUHL, WENDELL	32	43.649972	-95.675278
194	WNZF434	150-174	KUNZE, BRIAN C	40	43.737472	-95.611389
195	WQPZ404	450-470	LANGSTRAAT, ARNIE	32	43.412861	-95.663583
196	WQTX555	450-470	LANNERS, DEAN	32	43.887944	-95.797722
197	WQPM938	450-470	Lenz, Mark	32	43.709972	-95.991972
198	WQLY996	150-174	LINCOLN PIPESTONE RURAL WATER SYSTEM	40	43.631000	-95.748000
199	WQWK461	450-470	LOGER, TJ	32	43.526556	-96.171000
200	WQQK853	450-470	LONNEMAN, ANTHONY	32	43.537528	-95.928667
201	WPWI617	450-470	Loose, Daniel	250	44.335000	-95.288611
202	WQUA234	450-470	LOOSEBROCK DIGGING SERVICE	50	43.745917	-95.951139
203	WQRQ366	450-470	LORCH, BRUCE	40	43.375972	-95.447583
204	WPDX608	150-174	LUBBEN, BRUCE	56	43.630806	-95.371111
205	WQRH977	150-174	LUITJENS, RON	32	43.683139	-95.454083
206	WNSG237	450-470	LUNSTRA, ROGER	113	43.626361	-96.664778
207	KCT629	150-174	LUVERNE, CITY OF	32	43.656639	-96.207250
208	WQEY253	150-174	LUVERNE, CITY OF	32	43.656806	-96.208611
209	WQWN363	450-470	LYNN, BRAD	50	43.732611	-95.999250
210	WQZX266	450-470	LYNN, BRAD	32	43.732639	-95.999083
211	WNED714	450-470	M & H COMMUNICATIONS	80	43.899972	-95.937806
212	WNHJ252	450-470	M & H COMMUNICATIONS	80	43.790250	-96.268361
213	WNSA964	450-470	M & H COMMUNICATIONS	80	43.999972	-96.321139
214	WNKA385	450-470	MADSEN, ROBERT	48	43.763583	-95.315833
215	KES979	25-50	MATHIOWETZ CONSTRUCTION CO	121	44.221639	-94.808583

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
216	WRAD773	450-470	MATUS, TODD	79	43.641583	-96.408500
217	WNVT846	450-470	MC CLELLAN, GENE	40	44.051361	-95.536944
218	KNAQ463	150-174	MCBETH FARMS	40	44.028472	-95.981139
219	WQLD454	450-470	Merten, Dallas	80	43.176278	-95.131694
220	WQPD946	450-470	METZ WASTE APPLICATORS	113	43.732222	-95.892500
221	WQWR979	150-174	METZGER, RAY C	50	43.490917	-96.408806
222	WQJJ583	450-470	MEULEBROECK, DENNIS	80	44.306389	-95.836111
223	WQUI613	450-470	MEYER FARMS, LLC	32	43.551361	-95.348639
224	WQNI323	450-470	MIDWEST ALARM COMPANY, INC.	80	43.524083	-96.729917
225	WRDU892	450-470	Midwest Dry Cast LLC	32	43.630889	-96.213889
226	WNZR540	150-174	MILLER, KENNETH L	56	44.108306	-95.879750
227	WPYI905	450-470	Minnesota Soybean Processors	32	43.695833	-95.454444
228	WNZV528	450-470	MINNESOTA WEST COMMUNITY AND TECHNICAL COLLEGE	32	43.621944	-95.627917
229	WQKR260	800/900	MINNESOTA, STATE OF	40	43.720667	-95.439722
230	WQKZ777	800/900	MINNESOTA, STATE OF	40	43.907306	-96.254944
231	WQKZ777	800/900	MINNESOTA, STATE OF	40	43.943333	-95.982222
232	WQKZ777	800/900	MINNESOTA, STATE OF	40	43.977556	-95.733694
233	WQKZ788	800/900	MINNESOTA, STATE OF	40	43.546083	-96.093917
234	WQKZ788	800/900	MINNESOTA, STATE OF	40	43.652222	-95.675083
235	WQKZ788	800/900	MINNESOTA, STATE OF	40	43.703861	-95.851250
236	WQKZ788	800/900	MINNESOTA, STATE OF	40	43.776750	-96.322583
237	WQOH265	150-174	MINNESOTA, STATE OF	40	43.720667	-95.439722
238	WQOH267	150-174	MINNESOTA, STATE OF	40	43.703861	-95.851250
239	WQOH267	150-174	MINNESOTA, STATE OF	40	43.776750	-96.322583
240	WQOH267	150-174	MINNESOTA, STATE OF	40	43.943333	-95.982222

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
241	WQLW753	450-470	MONOGRAM MEAT SNACKS LLC	32	43.936083	-95.953083
242	WPZZ828	450-470	MOUW'S FEED & GRAIN, INC.	30	43.835056	-96.013167
243	WPIX486	450-470	NACHTICAL, DENNIS	25	43.476639	-95.882250
244	WPFZ761	150-174	NELSON, MARK	80	43.633306	-95.611944
245	WQVY637	450-470	NEPP SALES AND SERIVCE	40	44.026000	-95.750861
246	WQIQ793	150-174	NEUMAN, KEVIN	80	44.429444	-95.649167
247	WNQE795	150-174	New Vision Coop	56	43.529139	-96.357250
248	WPNP634	800/900	NEW VISION COOPERATIVE	32	43.697750	-95.471111
249	WNWD859	450-470	NEWDALE HUTTERIAN BRETHREN INC	121	44.299139	-96.525611
250	WQMX968	470-512	NEXSTAR BROADCASTING, INC.	100	43.541944	-96.727500
251	WPPE485	450-470	NOBLES BROADCASTING COMPANY LTD	91	43.619694	-95.598333
252	WPPF635	800/900	NOBLES COOPERATIVE ELECTRIC	40	43.781917	-95.873639
253	KAC379	150-174	NOBLES, COUNTY OF	40	43.676639	-95.751667
254	WNIR501	150-174	NOBLES, COUNTY OF	48	43.676639	-95.751667
255	WNIR501	150-174	NOBLES, COUNTY OF	40	43.835056	-96.013167
256	WQER211	150-174	NOBLES, COUNTY OF	40	43.517500	-96.018056
257	WQER211	150-174	NOBLES, COUNTY OF	40	43.697500	-95.471944
258	WQCE712	450-470	Northwest Iowa Community College	79	43.186528	-95.880972
259	KKI439	25-50, 150-174	Northwest Ready Mix Concrete Inc	64	43.457194	-95.317778
260	WQTE595	450-470	NUSTAR FARMS	32	43.361306	-95.749917
261	WQCE445	150-174	NUTRIEN AG SOLUTIONS INC	40	43.993806	-95.769694
262	WPXR215	150-174	NYKAMP, RONALD	40	43.861667	-96.112222
263	WQOL696	450-470	OBERMOLLER, RUSSELL	32	43.629417	-95.575833
264	WQTU991	450-470	OCHEDA DAIRY INC.	32	43.557361	-95.601056
265	WNMZ255	450-470	OKOBOJI COMMUNITY SCHOOLS	56	43.342194	-95.206389

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266	WNUQ319	450-470	OLSEM, NICHOLAS	48	43.924972	-95.401389
267	KZJ672	150-174	OSBORNE, BRUCE	121	43.144694	-94.541083
268	KAB590	450-470	OSCEOLA ELECTRIC COOP INC.	32	43.402750	-95.671111
269	WQIE760	450-470	Osceola Windpower, LLC	32	43.474778	-95.534444
270	WQLP692	450-470	Paplow Farms	32	43.894639	-95.417528
271	WPMB352	450-470	PAUL HIBMA FARMS INC	32	43.418306	-95.526389
272	WQRR641	150-174	PAULZINE, ANTHONY	32	43.825917	-95.812361
273	WNDR369	150-174	PELTOLA, ALAN L:PELTOLA, CHARLES D DBA PELTOLA BROTHERS	48	44.044417	-95.645833
274	WYP715	450-470	Penning Bros.	56	43.744139	-95.761667
275	WPFK814	450-470	PETERSEN, RONALD	56	43.399972	-95.446667
276	KAA826	150-174	PIPESTONE, COUNTY OF	48	43.991083	-96.329472
277	WPDP851	450-470	PLENDL BROS	121	42.585278	-96.068361
278	WQBF965	450-470	POST, JOHN	32	43.630778	-95.371944
279	WRCZ479	450-470	PRO CONRETE INC.	79	43.690500	-96.825028
280	WQTC745	450-470	PUTNAM, RUTH	40	43.615333	-95.452639
281	KNAL685	450-470	RAAK, IRWIN	80	43.790250	-96.268361
282	WQKD856	800/900	RACOM Corporation	113	42.636667	-95.669167
283	WQKD900	800/900	RACOM Corporation	113	43.092778	-96.156944
284	WQKD903	800/900	RACOM Corporation	113	43.545083	-96.763722
285	WQKD910	800/900	RACOM Corporation	113	43.656944	-94.612222
286	WQKD920	800/900	RACOM Corporation	113	44.324722	-96.799444
287	WQKD927	800/900	RACOM Corporation	113	43.157250	-95.082472
288	WQKD928	800/900	RACOM Corporation	113	43.603056	-95.703056
289	WPDC645	450-470	RIGHTWAY FARM INC	64	43.159972	-95.463611

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290	WNIP929	450-470	RIKANSRUD, KIRK	80	43.310528	-96.574750
291	WQNC459	450-470	RILEY, DAN	32	43.581278	-95.411083
292	WQRW523	150-174	RILEY, TOM D	32	43.613861	-95.477500
293	WQPK577	150-174	RISACHER FARMS	40	43.993056	-95.880556
294	KAJ643	150-174	ROCK, COUNTY OF	72	43.718861	-96.227528
295	WQBD644	150-174	ROCK, COUNTY OF	40	43.656083	-96.213361
296	WNRX906	450-470	ROGERS, MIKE R	89	43.624972	-95.578611
297	WRAL478	450-470	ROOZING, KEVIN	50	43.271167	-96.116222
298	WPEN768	150-174	ROUND LAKE, CITY OF	40	43.538861	-95.469444
299	WNIU966	450-470	Rowe, Allen E: Rowe, Randy A	32	43.499417	-95.415556
300	WQTF887	150-174	ROZEMA FARMS INC.	40	43.394694	-95.487750
301	WPKT805	150-174	RUSHMORE, CITY OF	32	43.619417	-95.799194
302	WQRY370	450-470	RUSSELL TILING, LLC.	32	43.504000	-95.692722
303	KNAC902	450-470	RYSWYK, LARRY	48	43.865806	-96.023361
304	KAH642	450-470	SAGA COMMUNICATIONS OF IOWA, LLC	97	43.165806	-95.146389
305	WQYZ223	150-174	SANDBULTE TANK SERVICE INC.	32	43.662361	-96.212694
306	WQWW377	150-174	SANDBULTE, AARON	40	43.765389	-96.092694
307	WQOZ947	150-174	SANDBULTE, CURT	40	43.649444	-96.230917
308	KNHX328	150-174, 450-470	SANFORD HEALTH NETWORK-SANFORD LUVERNE	64	43.677194	-96.202083
309	WNGG480	450-470	SANFORD USD MEDICAL CENTER	322	43.524972	-96.739222
310	KNGC963	450-470	SAS, MARK	32	43.846083	-96.046694
311	WQSR518	800/900	SBH SPECTRUM, LLC	113	42.720000	-95.434250
312	WQWL329	450-470	SCHMIDT, RONALD	79	43.527472	-96.727472
313	WRAE444	450-470	SCHNIEDERS, BRANDON	79	43.872917	-96.568444
314	WNVJ315	150-174	SCHULD, DALE	32	43.928861	-96.100306

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315	WQTE665	450-470	SCHUTTE, JACOB	32	43.487667	-95.760139
316	WQNS895	150-174	SCHUTTE, NEIL	80	43.479139	-95.759528
317	KNEN631	150-174	SIBLEY OCHEYEDAN COMMUNITY SCHOOL	40	43.396778	-95.753250
318	KGP623	150-174	SIBLEY, CITY OF	32	43.394056	-95.735528
319	WQNN230	450-470	Siemens Gamesa Renewable Energy, Inc.	32	43.906111	-96.031944
320	WNRR235	150-174	SIEMERS, LONNY	48	43.409694	-95.383611
321	WPGZ252	450-470	Sioux Center Community Schools	80	43.076361	-96.175306
322	WQPD414	450-470	SMITH TRUCKING INC.	32	43.649972	-95.675278
323	WQTI331	450-470	SODERHOLM, TOM	40	43.730306	-95.633306
324	WNBT779	450-470	Soehl Electronics Inc	80	43.532194	-96.739222
325	WNST485	450-470	Soehl Electronics Inc	121	43.567472	-97.078389
326	WPCI689	450-470	Soehl Electronics Inc	56	43.453861	-96.433361
327	WPEY579	450-470	Soehl Electronics Inc	121	43.082500	-96.774500
328	WPHI802	450-470	Soehl Electronics Inc	121	43.550806	-97.095056
329	WPHP734	450-470	Soehl Electronics Inc	121	43.733056	-97.080278
330	WPQK819	800/900	Soehl Electronics Inc	113	43.733028	-97.080333
331	WQMM944	150-174	ST. MICHAELS CEMETARY ASSOCIATION	80	43.579167	-96.711111
332	WRED723	450-470	STAN KRAMER INC.	34	43.900944	-95.643611
333	WQCS661	450-470	STEVE HARRIS CONSTRUCTION	240	42.316667	-96.500000
334	WPBA875	450-470	STOTERAU, TERRY	64	43.780528	-96.550056
335	WQIM211	450-470	Sunrise Farms	32	43.417750	-95.537500
336	WQST315	150-174	SWAN, GORDON	34	44.015667	-95.862972
337	WPMR240	800/900	Sweetman Const. Co.	113	43.550250	-96.767000
338	KNFE356	450-470	SYBESMA, STUART E	48	43.783861	-96.266972
339	WQNV383	450-470	Terpstra, Jim	32	43.411278	-95.762444

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340	WNGH820	450-470	TERRAFACT INC	64	43.491083	-95.273889
341	WQPJ664	450-470	THOMPSON, TROY	40	43.702306	-95.462722
342	KNBG448	450-470	Tilstra, Arlyn	48	43.571083	-96.253639
343	WPCT564	150-174	TIMMONS INC	48	43.288861	-95.522500
344	WQOJ719	450-470	TKC FARMS INC.	32	43.484639	-95.821306
345	WNWY815	150-174	TRAUTMAN, SCOTT	80	44.274972	-96.343639
346	WPCW944	800/900	TRI STATE COMMUNICATIONS INC	113	42.840278	-96.250556
347	WQNE561	450-470	TRI STATE TRUCK WASH OF WORTHINGTON, INC.	20	43.624694	-95.578889
348	WQTZ336	150-174	TUINSTRA, DEAN	48	43.935389	-96.301222
349	KFJ657	150-174, 450-470	TWO WAY SOLUTIONS INC	121	43.554139	-96.718944
350	WNYP706	450-470	TWO WAY SOLUTIONS INC.	32	43.632556	-95.569806
351	WNGG528	150-174	UNION PACIFIC RAILROAD COMPANY	13	43.618889	-95.593417
352	WQQR526	450-470	United Farmers Coop	32	43.412750	-95.641944
353	WQQR526	450-470	United Farmers Coop	32	43.504000	-95.692694
354	WQQR526	450-470	United Farmers Coop	32	43.618250	-95.801472
355	WQQZ892	800/900	VAN GELDER, JASON	30	43.476944	-95.599722
356	WPFC481	150-174	VAN HOECKE, JERRY	64	44.058306	-96.372528
357	KYQ779	150-174	VAN HULZEN FARMS	80	43.849694	-96.109194
358	WQMY793	450-470	VAN STELTEN, COREY	32	43.885500	-96.104028
359	WQVT953	150-174	VANDEKAMP, ARLYN	40	43.833611	-96.238583
360	WQRT805	450-470	VAUPEL, RANDY	32	43.367611	-95.840306
361	WQQX256	150-174	VEENKER, SCOTT	60	43.949056	-95.152528
362	KNAW578	150-174	VELDKAMP, LEROY	56	43.599972	-96.425306
363	WPHH506	450-470	VER HOEF, CLARENCE	48	43.255528	-95.636389
364	WQSG949	800/900	VERTICAL VENTURES II, LLC	113	43.555444	-96.718306

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365	WQVX322	450-470	Vestas	32	43.639444	-95.751083
366	WQYD960	150-174	VT MANURE HANDLING, LLC	48	43.460028	-95.501278
367	WQOJ582	450-470	W & N CONSTRUCTION	32	43.590944	-96.190528
368	WQWQ286	450-470	WAGNER, MICHAEL	40	43.674611	-95.838028
369	WQZW372	450-470	WALTON, ZACHERY D	50	43.903667	-95.259278
370	WRCM928	450-470	WASSENAAR, DUSTIN	80	43.714917	-95.137944
371	WNYW893	450-470	WEGS BLUE & WHITE DAIRY	40	43.548861	-95.713361
372	WPAG721	450-470	WEILAND, NATHAN	80	43.782472	-96.670611
373	WQSX350	150-174	WENDELL, STEVE	79	43.906472	-96.622750
374	KNNU904	450-470	WIENEKE, DALE	25	43.682194	-95.934194
375	WQTE666	450-470	WIENEKE, JOE	32	43.702056	-95.973472
376	WQTH331	150-174	WILL SMITH TRUCKING	100	42.996194	-94.967000
377	WQYV781	150-174	WILLERS, MARK	40	43.584556	-96.337944
378	WZK487	150-174	WILLIAMS, CHARLES E	64	43.824417	-95.502500
379	WQUX455	450-470	WINSEL, KEN	79	44.061417	-96.124444
380	WPJQ692	450-470	WORTHINGTON COUNTRY CLUB	32	43.632194	-95.628056
381	WPOX221	450-470	WORTHINGTON TAXI SERVICE	32	43.626694	-95.606389
382	KCW722	150-174, 450-470	WORTHINGTON, CITY OF	32	43.620250	-95.600000
383	WPFN876	150-174	Xcel Energy Services Inc.	40	43.781944	-95.873611
384	WQSY954	150-174	XCEL ENERGY SERVICES INC.	80	43.782222	-95.873333
385	WQXN436	150-174	XCEL ENERGY SERVICES INC.	80	43.782222	-95.873333
386	WQLL894	150-174	YORK, BRIAN	40	43.996667	-95.926389
387	WPLF903	450-470	ZINS, JEFFERY D	30	43.877750	-95.648056
388	WQYN234	450-470	ZWAAN, MONTE	34	43.572222	-96.153861
389	WQUG987	150-174	ZYLSTRA FEEDLOT	32	43.360194	-95.841333

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
390	WQWR978	450-470	ZYLSTRA, KEVIN	34	43.891611	-96.162306

Table A: Mobile Licenses Intersecting Project Area