

Appendix G

Telecommunications Studies

Wind Power GeoPlanner™

Communication Tower Study

Grand Meadow Repower Project



Prepared on Behalf of
Xcel Energy

January 13, 2021



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1. Introduction

This Communication Tower Study was performed for the Grand Meadow Repower Project in Mower County, Minnesota to identify the tower structures as well as FCC-licensed communication antennas that exist in and around 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 data¹ 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.

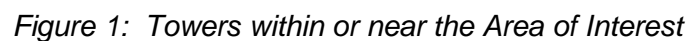
Five tower structures and twenty-five communication antennas were identified within or near the Grand Meadow Repower Project area using the data sources described in our methodology above. All the structures found were registered with the FCC, four of which contain fifteen of the twenty-five communication 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 name².

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.

Table 1: Summary of Tower Structures

ID	Tower ID	Callsign	Service Type	Licensee	Antenna Height AGL (m)	Latitude (NAD83)	Longitude (NAD83)	Distance to the Nearest Turbine (km)
1	Tower001	WQGV819	Microwave	Mower, County of	71.63 - 114.3	43.658361	-92.688694	1.81
2	Tower001	WQIL437	Microwave	Minnesota, State of (DOT)	38.1 - 67.1	43.658361	-92.688694	1.81
3	Tower001	WPMJ464	Land Mobile	MOWER, COUNTY OF	91.4	43.658361	-92.688694	1.81
4	Tower001	WNQZ567	Land Mobile	MOWER, COUNTY OF	97.5	43.658361	-92.688694	1.81
5	Tower001	WQNG466	Land Mobile	MINNESOTA, STATE OF	125.6	43.658361	-92.688694	1.81
6	Tower001	WQHE600	Land Mobile	MINNESOTA, STATE OF	125.6	43.658361	-92.688694	1.81
7	Tower001	WPMX953	Land Mobile	MOWER, COUNTY OF	125.6	43.658361	-92.688694	1.81
8	Tower001	WQHH552	Land Mobile	MOWER, COUNTY OF	125.6	43.658361	-92.688694	1.81
9	Tower001	WQGM683	Land Mobile	MOWER, COUNTY OF	96.0	43.658361	-92.688694	1.81
10		WNVR420	Land Mobile	HARVEST STATES COOPERATIVES	37.0	43.661361	-92.709083	1.81
11	Tower002	RXONLY	Microwave	Townsquare Media Rochester License, LLC	80	43.672944	-92.698417	0.52
12	Tower002	KYBA	FM	TOWNSQUARE MEDIA ROCHESTER LICENSE, LLC	137.0	43.673000	-92.698500	0.51
13		WRBL370	Land Mobile	Angell, Gary	38.1	43.677694	-92.724167	1.51
14		WQVQ405	Land Mobile	HILTON, BILL	28.4	43.685056	-92.687611	0.37
15		WQVM230	Land Mobile	H-FARMS, INC.	32.0	43.685639	-92.688472	0.33
16		WQTX624	Land Mobile	SEMA Equipment Inc.	29.0	43.688278	-92.641083	0.41
17	Tower003	WPSJ612	Cellular	ALLTEL Corporation	Unknown	43.709528	-92.688500	0.53
18		WQUZ350	Land Mobile	Ancom Communications, Inc.	28.9	43.720194	-92.704639	1.62
19		WPMJ464	Land Mobile	MOWER, COUNTY OF	36.3	43.720528	-92.703528	1.54
20		WSH917	Land Mobile	SCOTT, ALLEN	45.0	43.720528	-92.703528	1.54
21	Tower005	WPRR543	Microwave	Dairyland Power Cooperative	50.29 - 74.68	43.732778	-92.675556	0.83
22	Tower005	WRBV603	Land Mobile	DAIRYLAND POWER COOPERATIVE	68.6	43.732778	-92.675556	0.83
23	Tower005	KNHK972	Land Mobile	DAIRYLAND POWER COOPERATIVE	53.0	43.732778	-92.675556	0.83
24		KNGL791	Land Mobile	DAVIS, JIM	37.0	43.736361	-92.629333	0.44
25		KNGC466	Land Mobile	JONES, RICHARD E	18.0	43.746083	-92.667111	0.83

Table 2: Summary of Communication Antennas

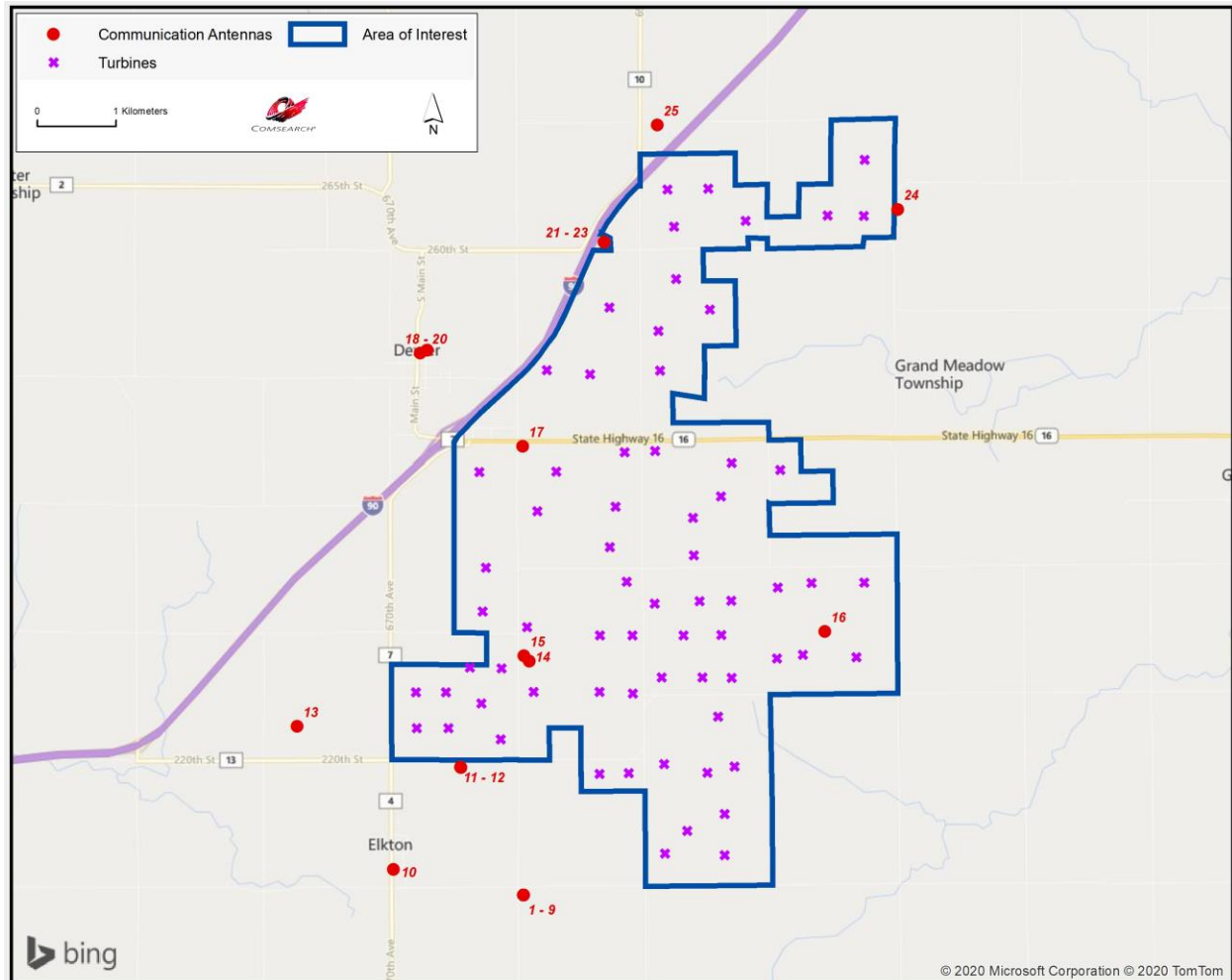


Figure 2: Communication Antennas within or near the Area of Interest

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 five structures and twenty-five communication antennas within or near the project area. They are used for microwave, cellular, FM, 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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Grand Meadow Wind Project

Xcel Energy

Mower County, Minnesota

Microwave Path Analysis

January 15, 2021



Capitol Airspace Group

capitolairspace.com

(703) 256 - 2485



Summary

Capitol Airspace conducted a microwave path analysis for the Grand Meadow wind project in Mower County, Minnesota. The purpose for this analysis was to identify licensed and applied coordinated non-federal microwave paths that could limit increasing existing 80-meter hub height wind turbine rotor diameters to a maximum of 97 meters. At the time of this analysis, 67 wind turbine locations had been identified (black points, [Figure 1](#)). This analysis assessed each location (including its rotor-swept area) to determine if it could obstruct Fresnel zones associated with microwave paths in proximity to the Grand Meadow 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.

Six microwave links (blue, [Figure 1](#)) overlie the Grand Meadow wind project. One wind turbine rotor-swept volume intersects Fresnel zones and could cause signal blockage that degrades link performance. As a result, direct coordination with the link owner may be necessary to ensure that increasing the rotor diameter to 97 meters would not degrade signal reliability.

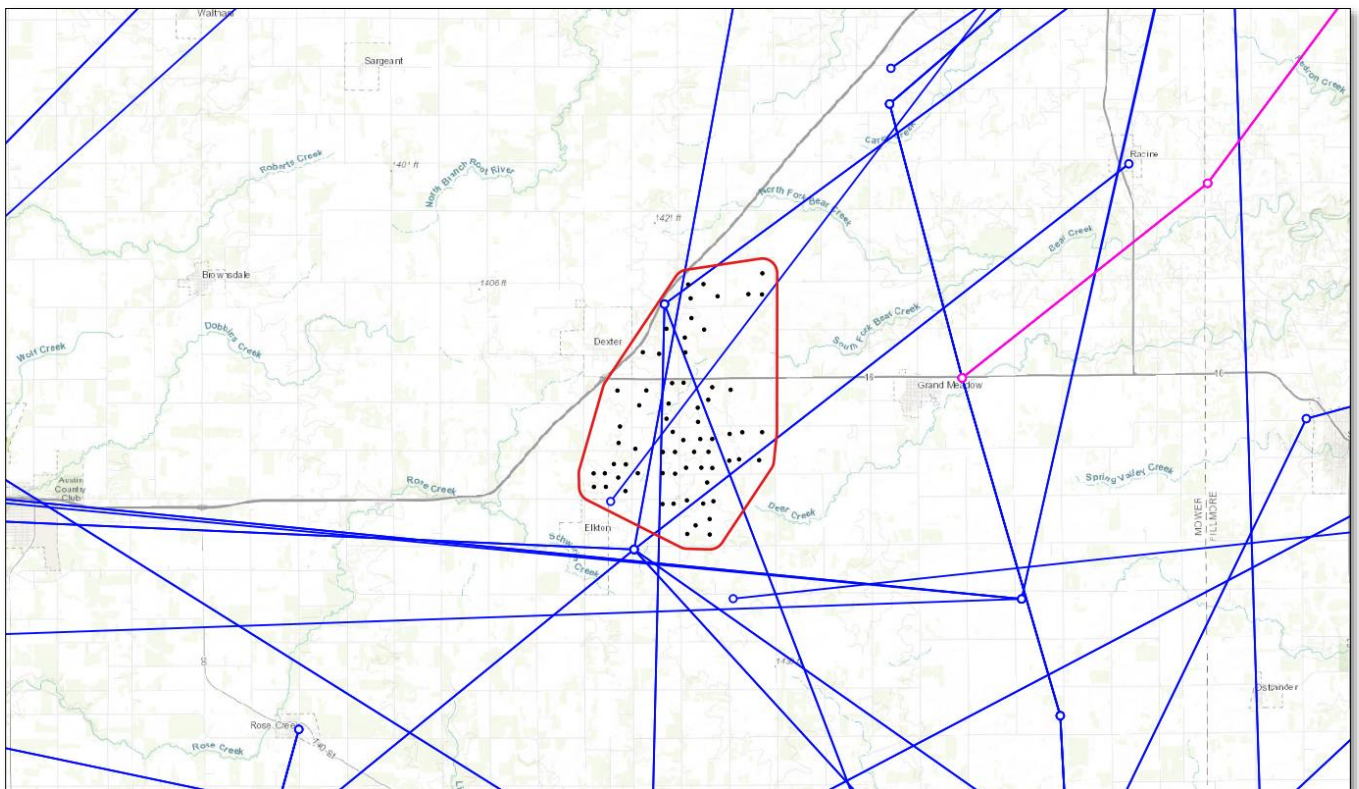


Figure 1: Licensed (blue) and applied (pink) microwave paths in proximity to the Grand Meadow wind project



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.

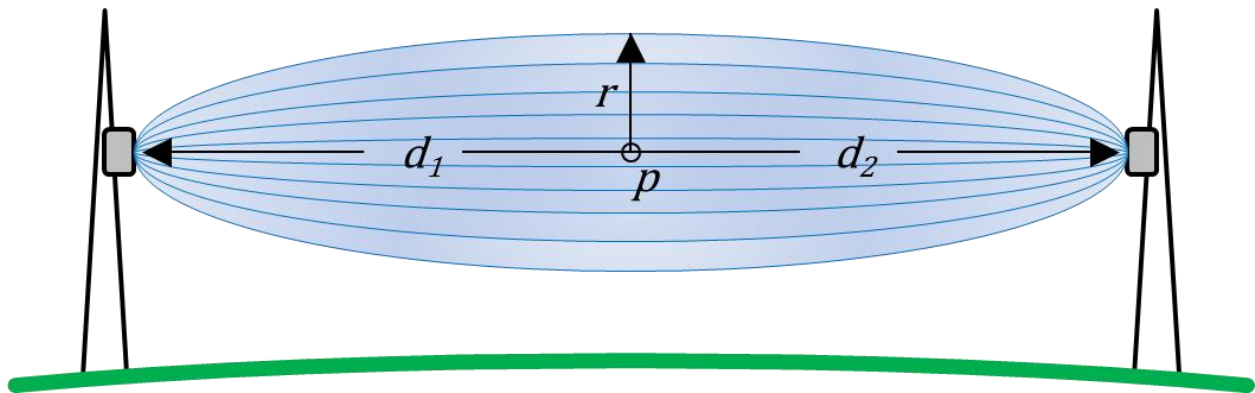


Figure 2: Fresnel zone example

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

11 paths associated with six microwave links overlie the Grand Meadow wind project ([Table 1](#) & [Figure 6](#)).

Table 1: Microwave paths with Fresnel zones overlying the Grand Meadow wind project

Licensee	Call Sign	Path	Status	Transmitter	Receiver	Frequency (MHz) ¹
Dairyland Power Cooperative	WPRR532	Licensed	2	EYOTA MN	DEXTER MN	6315.84
	WPRR543	Licensed	1	DEXTER MN	EYOTA MN	6063.80
		Licensed	2	DEXTER MN	LEROY IA	6004.50
		Licensed	3	DEXTER MN	ADAMS, MN	6034.15
	WPRR544	Licensed	1	LEROY IA	DEXTER MN	6256.54
	WQKD951	Licensed	1	ADAMS, MN	DEXTER, MN	6286.19
Minnesota, State of	WQIL437	Licensed	2	Elkton	Rock Dell	6745.00
	WQIL441	Licensed	2	Rock Dell	Elkton	6585.00
Mower, County of	WQGV819	Licensed	2	Elkton Tower	Racine	934.18
	WQHF631	Licensed	1	Racine	Elkton	943.18
TOWNSQUARE MEDIA ROCHESTER LICENSE, LLC	WMG480	Licensed	1	STL Relay Site	220th Street Site	949.50

Dairyland Power Cooperative

DEXTER MN to EYOTA MN

At an 80-meter hub height and an increased 97-meter rotor diameter, the T102 rotor-swept area (red, [Figure 6](#)) overlaps the WPRR543/WPRR532 link's two-dimensional Fresnel zones. Using the FCC ULS database antenna heights, three-dimensional analysis indicates that this wind turbine would intersect this link's Fresnel zones ([Figure 4](#)). As a result, direct coordination with the Dairyland Power Cooperative may be necessary to ensure that increasing the T102 rotor diameter would not degrade signal reliability.

DEXTER MN to ADAMS, MN

At an 80-meter hub height and an increased 97-meter rotor diameter, the T137 rotor-swept area (orange, [Figure 6](#)) overlaps the WPRR543/WQKD951 link's two-dimensional Fresnel zones. Using the FCC ULS database antenna heights, three-dimensional analysis indicates that the Fresnel zone passes below the rotor-swept volume ([Figure 5](#)). However, coordination with the Dairyland Power Cooperative may be necessary to validate the FCC ULS database antenna heights for this link. This will ensure that the rotor-swept volume does not obstruct the three-dimensional Fresnel zone as a result of potentially inaccurate FCC ULS database antenna heights.

Capitol Airspace has made multiple attempts to contact Dairyland Power Cooperative regarding the potential for impact on these links. However, as of February 23, 2021, these attempts have gone unanswered by Dairyland Power Cooperative.

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.

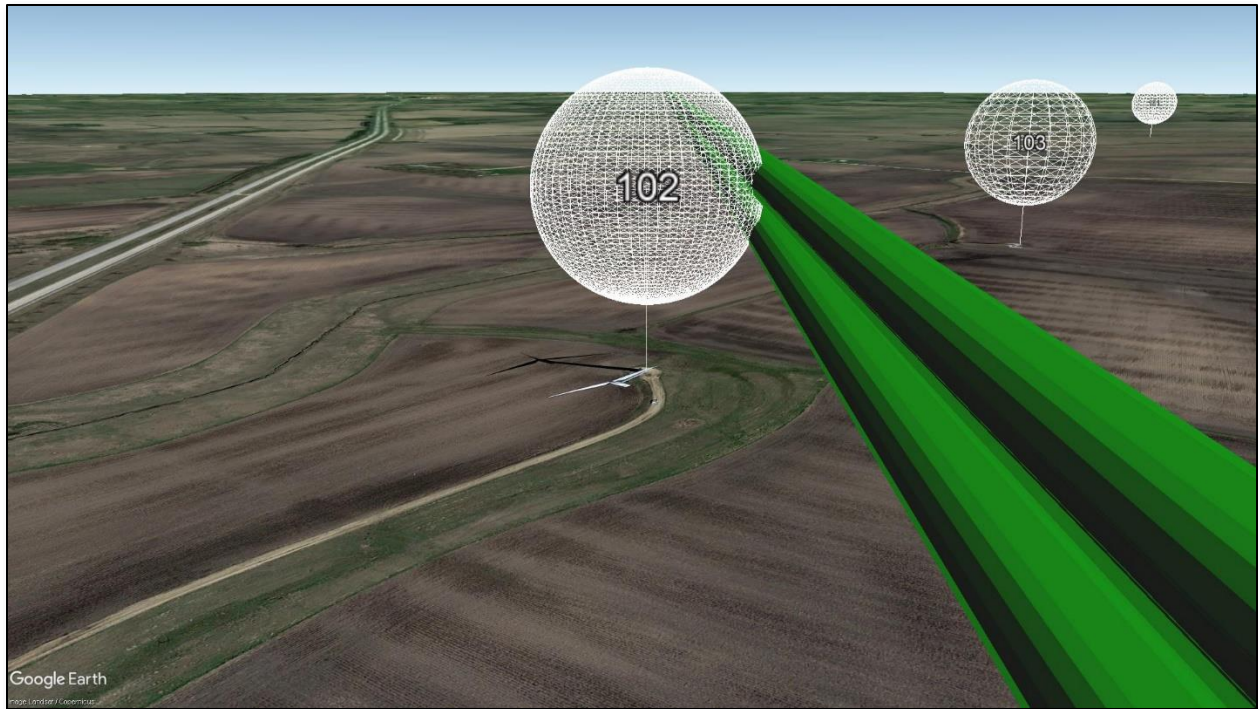


Figure 4: WPRR543/WPRR532 Fresnel zone (green) intersecting the T102 rotor-swept volume (white)

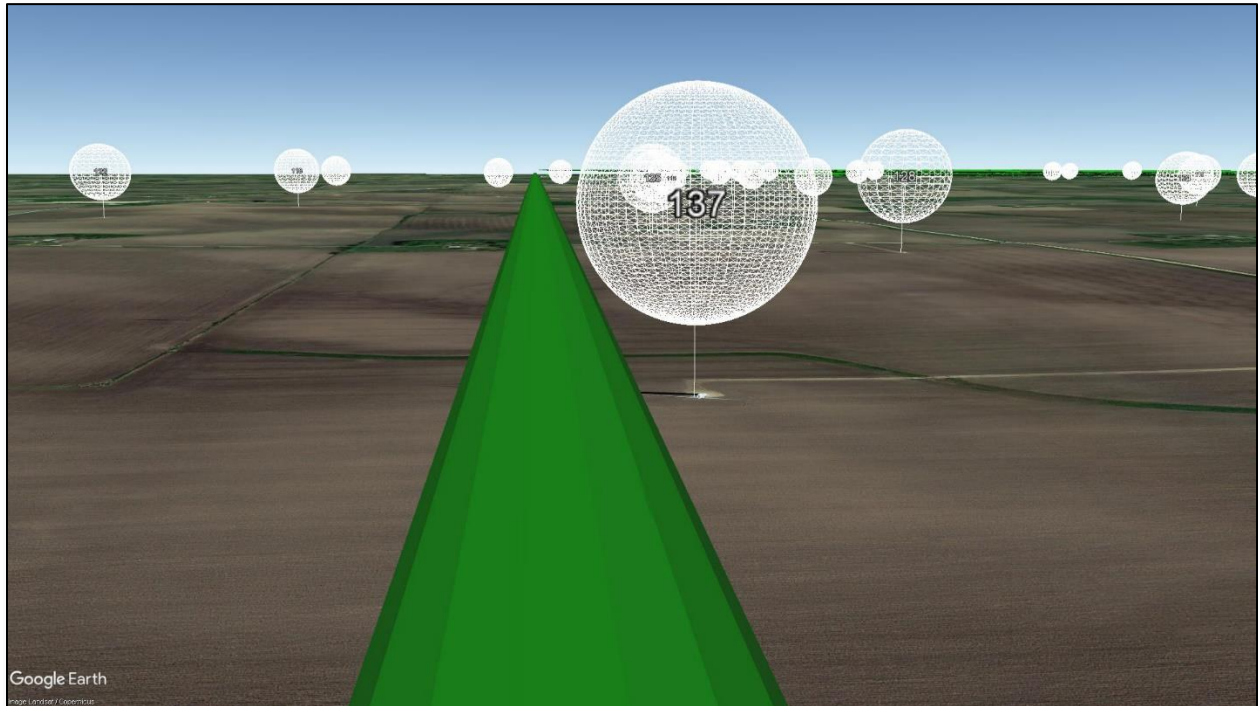


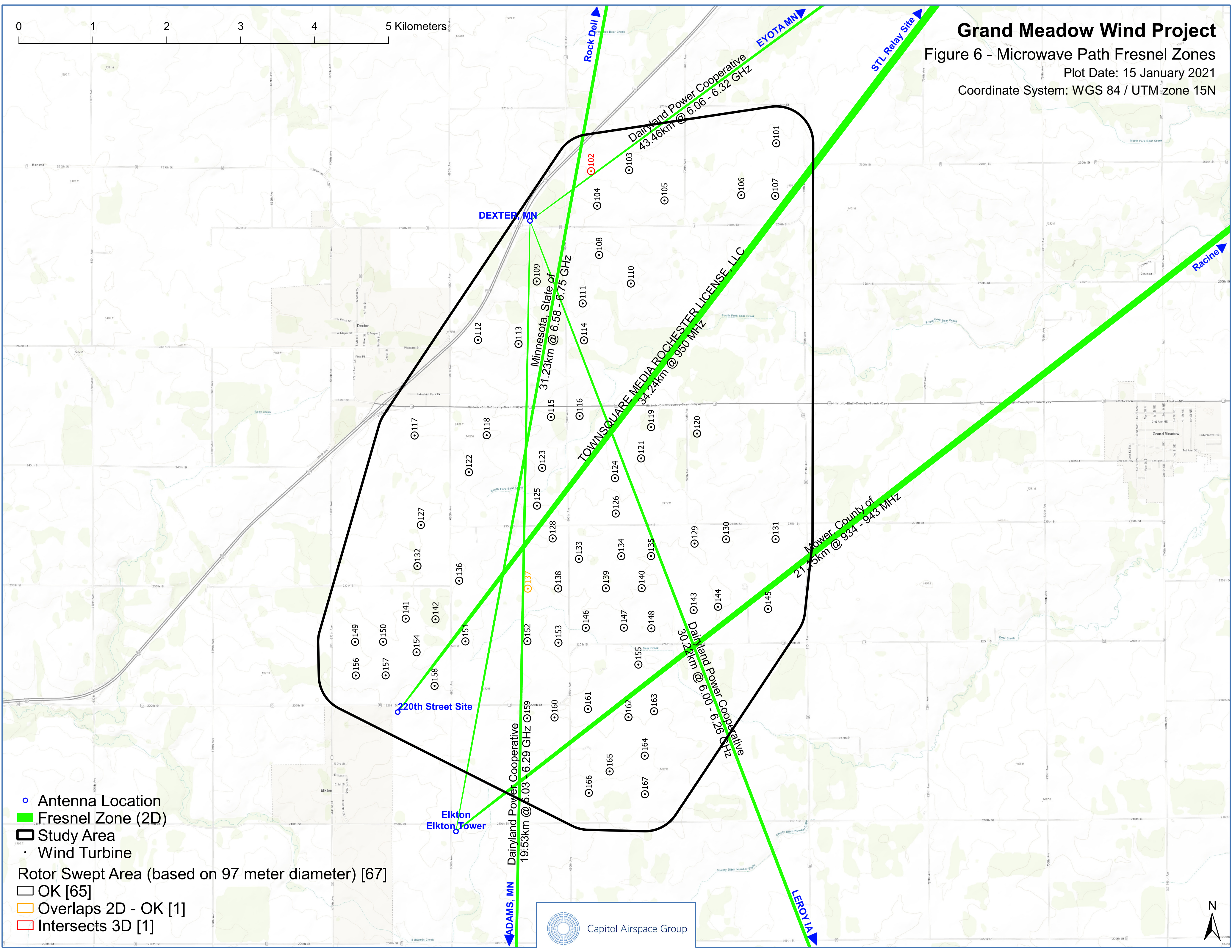
Figure 5: WPRR543/WQKD951 Fresnel zone (green) passing below the T137 rotor-swept volume (white)



Conclusion

The results of this analysis indicate that 11 paths associated with six microwave links overlie the Grand Meadow wind project. At an 80-meter hub height and an increased 97-meter rotor diameter, the T102 (red, [Figure 6](#)) and T137 (orange, [Figure 6](#)) rotor-swept areas would overlap two-dimensional Fresnel zones (green, [Figure 6](#)) and could obstruct Dairyland Power Cooperative microwave links. Using FCC ULS database antenna heights, three-dimensional analysis indicates that the T102 rotor-sphere would intersect the *DEXTER MN* to *EYOTA MN* link Fresnel zones. As a result, direct coordination with Dairyland Power Cooperative may be necessary to ensure that increasing the T102 rotor diameter to 97 meters would not degrade signal reliability. Additionally, three-dimensional analysis indicates that the *DEXTER MN* to *ADAMS, MN* link Fresnel zone passes below the T137 rotor-swept area. However, coordination with the Dairyland Power Cooperative may be necessary to validate the FCC ULS database antenna heights for this link. This will ensure that the rotor-swept volume does not obstruct the three-dimensional Fresnel zone as a result of potentially inaccurate FCC ULS database antenna heights.

If you have any questions regarding the findings of this study, please contact [James Scott](#) or [Candace Childress](#) at (703) 256-2485.



Grand Meadow Wind Project

Figure 6 - Microwave Path Fresnel Zones

Plot Date: 15 January 2021

Coordinate System: WGS 84 / UTM zone 15N

0 1 2 3 4 5 Kilometers

Antenna Location

Fresnel Zone (2D)

Study Area

Wind Turbine

Rotor Swept Area (based on 97 meter diameter) [67]

OK [65]

Overlaps 2D - OK [1]

Intersects 3D [1]



Capitol Airspace Group

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Wind Power GeoPlanner™

AM and FM Radio Report

Grand Meadow Repower Project



Prepared on Behalf of
Xcel Energy

January 18, 2021



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1. Introduction

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

2. Summary of Results

AM Radio Analysis

Comsearch found six database records¹ for AM stations within approximately 30 kilometers of the project, as shown in Table 1 and Figure 1. The closest station to the area of interest (AOI) is KQAQ, which broadcasts out of Austin, MN, is located 19.6 km to the west of the nearest proposed turbine location.

ID	Call Sign	Status ²	Frequency (kHz)	Transmit ERP ³ (kW)	Operation Time	Latitude (NAD 83)	Longitude (NAD 83)	Distance to the nearest turbine (km)
1	KQAQ	LIC	970	5	Daytime	43.707463	-92.946024	19.60
2	KQAQ	LIC	970	0.5	Nighttime	43.707463	-92.946024	19.60
3	KAUS	LIC	1480	1	Daytime	43.622185	-92.990749	23.81
4	KAUS	LIC	1480	1	Nighttime	43.622185	-92.990749	23.81
5	KFAN	LIC	1270	1	Nighttime	43.979686	-92.447675	30.37
6	KFAN	LIC	1270	5	Daytime	43.979686	-92.447675	30.37

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.

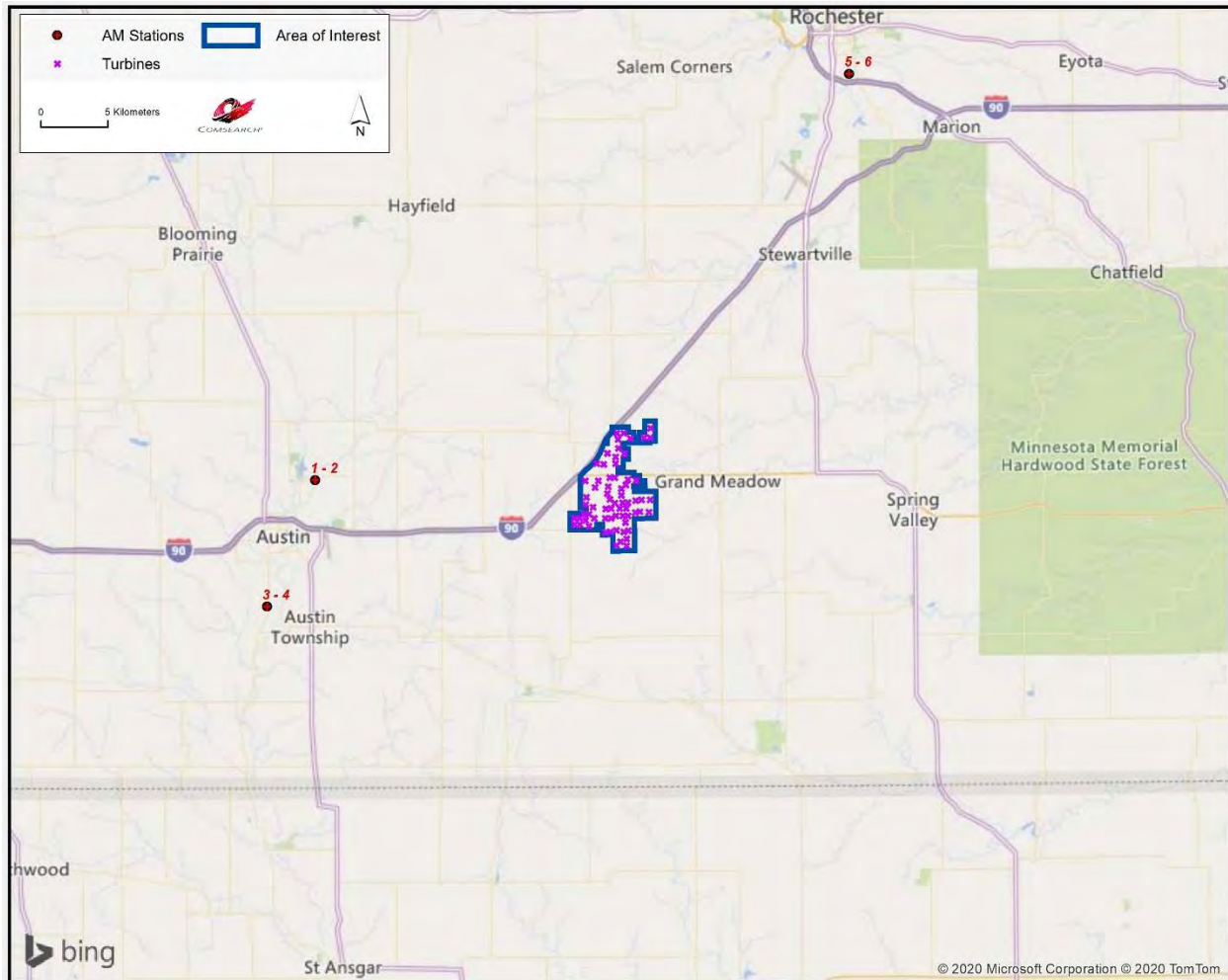


Figure 1: AM Radio Stations within 30 Kilometers of Project Area

FM Radio Analysis

Comsearch determined that there were nine database records for FM stations within a 30-kilometer radius of the Grand Meadow Repower Project, as shown in Table 2 and Figure 2. Eight of the stations are currently licensed and operating, four of which are translator stations that operate with limited range. The closest station is KYBA, which is currently licensed in Stewartville, Minnesota, located 0.51 km to the south of the nearest proposed turbine.

ID	Call Sign	Status ⁴	Service ⁵	Frequency (MHz)	Transmit ERP ⁶ (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to the nearest turbine (km)
1	KYBA	LIC	FM	105.3	50.0	43.673000	-92.698500	0.51
2	KFNL-FM	LIC	FM	104.3	10.0	43.643306	-92.647389	2.30
3	KVCS	LIC	FM	89.1	12.0	43.642750	-92.526556	10.02
4	K232FY	CP	FX	94.3	0.25	43.788000	-92.908222	19.37
5	KROC-FM	LIC	FM	106.9	100.0	43.570806	-92.427111	21.12
6	K277AD	LIC	FX	103.3	0.1	43.670222	-92.977111	21.92
7	K280EF	LIC	FX	103.9	0.009	43.670222	-92.977111	21.92
8	K255AN	LIC	FX	98.9		43.887056	-92.849139	22.12
9	KMSK	LIC	FM	91.3	0.135	43.677444	-93.001278	23.85

Table 2: FM Radio Stations within 30 km

ID	Call Sign	Status ⁷	Frequency (MHz)	Antenna Make	Antenna Model	Antenna Size (m)	Far Field Distance (km)	Recommended Minimum Separation Distance ⁸ Including Turbine Blades (km)
1	KYBA	LIC	105.3	ERI	FMH-6AC	17.1	0.205	0.254

Table 3: FM Radio Stations within 2 km of the Project Area with Separation Distances

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.

⁷ LIC = Licensed and operational station; APP = Application for construction permit; CP=Construction permit granted; CP MOD = Modification of construction permit.

⁸ Recommended minimum separation distance is based on the far field distance of the antenna or 1.5 km if no antenna information is available and includes separation from both the turbine towers and blades. Repower turbines were noted with a blade diameter of 97 meters.

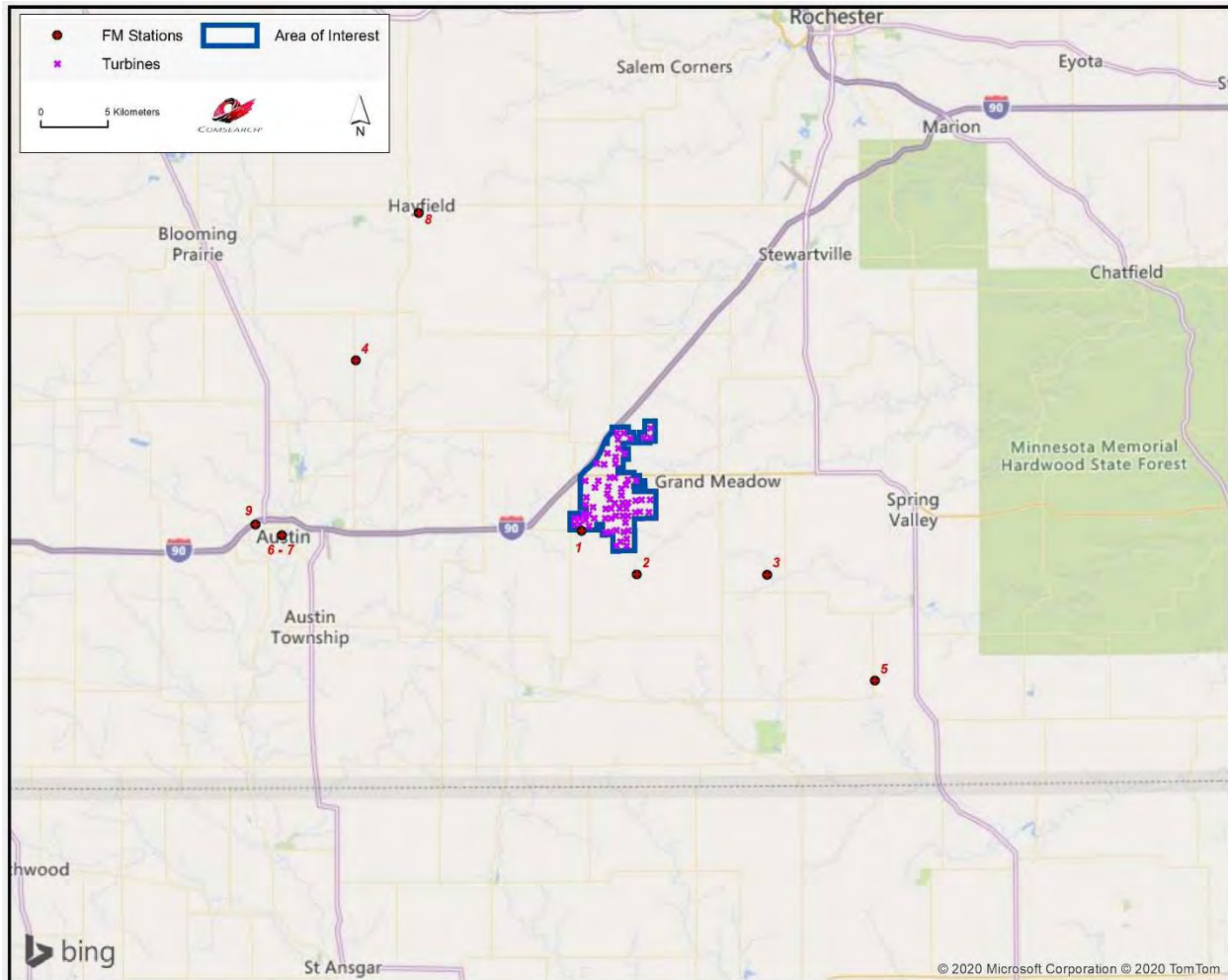


Figure 2: FM Radio Stations within 30 km

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 (KQAQ) is located 19.6 km from the nearest proposed turbine. 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. Station KYBA is the nearest FM station to the turbine locations at 0.51 km away. Based on the licensed antenna information and turbine blade diameter, KYBA requires a minimum separation distance of 0.254 km, which is easily met with the calculated distance of 0.51 km to the nearest turbine. At this distance there should be adequate separation to avoid radiation pattern distortion. All other FM stations are located 2.3 km or further from the nearest turbine and would not be impacted by the wind project.

4. Recommendations

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

5. Contact

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

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Wind Power GeoPlanner™

Off-Air TV Analysis

Grand Meadow Repower Project



Prepared on Behalf of
Xcel Energy

January 14, 2021



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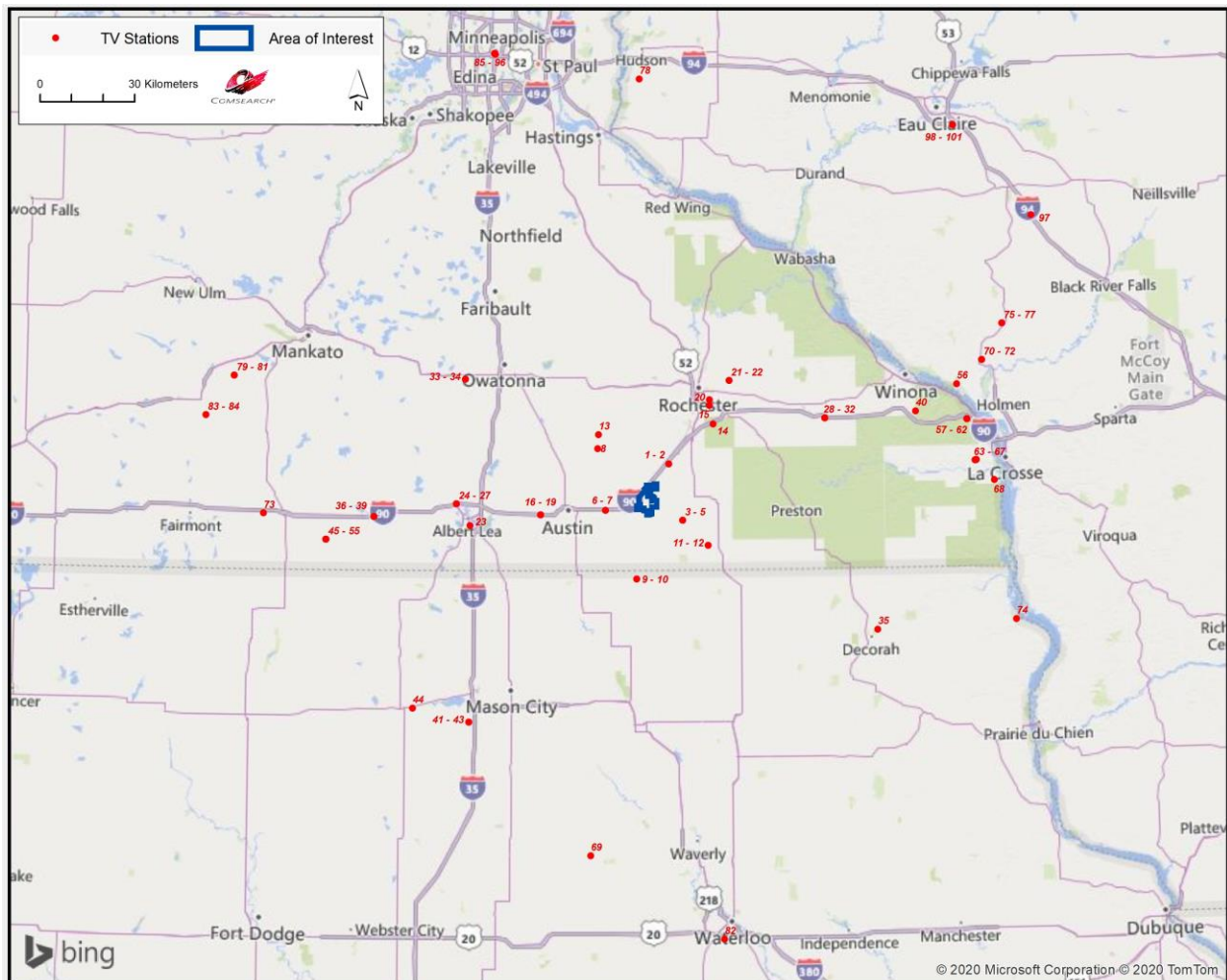
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Off-air television stations broadcast signals from terrestrially-based facilities directly to television receivers. Comsearch identified those off-air stations whose service could potentially be affected by the proposed Grand Meadow Repower Project wind project in Mower 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 proposed wind turbines.

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



To begin the analysis, Comsearch compiled all off-air television stations¹ 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, below, and a plot depicting their locations is provided in Figure 2. There are a total of 101 database records for stations within approximately 150 kilometers of the proposed turbines. Of these stations, only 43 stations are currently licensed and operating, 28 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.



ID	Call Sign	Status	Service ²	Channel	Transmit ERP ³ (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to the Closest Turbine (km)
1	K43OH-D	CP	LPD	43	1.0	43.804028	-92.580222	8.16
2	K45MO-D	CP	LPD	45	1.0	43.804028	-92.580222	8.16
3	KSMQ-TV	LIC	DTV	20	319.2	43.642778	-92.526667	10.01
4	KXLT-TV	LIC	DTV	26	108.0	43.642778	-92.526667	10.01
5	KAAL	LIC	DTV	36	620.0	43.642778	-92.526667	10.01
6	K27OW-D	APP	LPT	27	5.62	43.672556	-92.830306	10.08
7	K27OW-D	CP	LPT	27	5.62	43.672556	-92.830306	10.08
8	K40JT	CP	LPD	40	15.0	43.848111	-92.861722	19.92
9	KYIN	LIC	DTV	18	533.0	43.475556	-92.708333	21.09
10	KIMT	LIC	DTV	24	472.0	43.475556	-92.708333	21.09
11	KTTC	CP	DTV	10	80.0	43.570833	-92.427222	21.12
12	KTTC	LIC	DTV	10	43.1	43.570833	-92.427222	21.12
13	W22FD-D	CP	LPD	22	15.0	43.888056	-92.857833	22.68
14	K41MP-D	CP	LPD	41	1.0	43.917444	-92.404333	26.87
15	K35PC-D	CP	LPD	35	15.0	43.970278	-92.418333	30.74
16	K14PU-D	CP	LPD	14	1.0	43.659639	-93.086750	30.81
17	K19KB-D	CP	LPD	19	1.0	43.659639	-93.086750	30.81
18	K34MP-D	CP	LPD	34	1.0	43.659639	-93.086750	30.81
19	K47OF-D	CP	LPD	47	1.0	43.659639	-93.086750	30.81
20	K31LN-D	CP	LPD	31	4.0	43.986139	-92.417667	32.23
21	K25NK-D	LIC	LPD	25	15.0	44.041111	-92.340556	40.76
22	K25NK-D	CP	LPD	25	15.0	44.041139	-92.340417	40.77
23	K40JT	LIC	LPX	40	10.7	43.627778	-93.363889	53.39

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
TS - Legacy Service for Analog TV Auxiliary
TV - Analog TV legacy

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)
24	K30NI-D	CP	LPD	30	1.0	43.690333	-93.417778	57.42
25	K32LB-D	CP	LPD	32	1.0	43.690333	-93.417778	57.42
26	K38OU-D	CP	LPD	38	1.0	43.690333	-93.417778	57.42
27	K44LT-D	CP	LPD	44	1.0	43.690333	-93.417778	57.42
28	K19IT-D	CP	LPD	19	1.0	43.932167	-91.962333	58.02
29	K27KL-D	CP	LPD	27	1.0	43.932167	-91.962333	58.02
30	K29JH-D	CP	LPD	29	1.0	43.932167	-91.962333	58.02
31	K31KX-D	CP	LPD	31	1.0	43.932167	-91.962333	58.02
32	K40NI-D	CP	LPD	40	1.0	43.932167	-91.962333	58.02
33	K21NU-D	CP	LPD	21	5.0	44.045528	-93.384083	66.92
34	K48KJ-D	LIC	LPD	48	4.92	44.045528	-93.384083	66.92
35	K25PE-D	LIC	LPT	25	15.0	43.326667	-91.765833	80.85
36	K22LG-D	CP	LPD	22	1.0	43.652528	-93.742222	83.64
37	K26MG-D	CP	LPD	26	1.0	43.652528	-93.742222	83.64
38	K28MU-D	CP	LPD	28	1.0	43.652528	-93.742222	83.64
39	K50NB-D	CP	LPD	50	1.0	43.652528	-93.742222	83.64
40	K24JA-D	CP	LPD	24	0.05	43.947806	-91.604028	85.93
41	K22LJ-D	CP	LPD	22	5.0	43.066639	-93.365250	86.36
42	K27MI-D	CP	LPD	27	3.0	43.066639	-93.365250	86.36
43	K35PA-D	CP	LPD	35	15.0	43.066639	-93.365250	86.36
44	KAAL	LIC	DRT	33	8.3	43.105917	-93.585361	95.43
45	K14KD-D	LIC	LPD	14	3.0	43.585833	-93.929722	99.29
46	K16MA-D	LIC	LPT	16	3.0	43.585833	-93.929722	99.29
47	K17MX-D	LIC	LPD	17	3.0	43.585833	-93.929722	99.29
48	K19LJ-D	LIC	LPT	19	3.0	43.585833	-93.929722	99.29
49	K21KF-D	LIC	LPD	21	3.0	43.585833	-93.929722	99.29
50	K23FY-D	LIC	LPT	23	3.0	43.585833	-93.929722	99.29
51	K27FI-D	LIC	LPT	27	3.0	43.585833	-93.929722	99.29
52	K29IF-D	LIC	LPD	29	3.1	43.585833	-93.929722	99.29
53	K31EF-D	LIC	LPT	31	3.0	43.585833	-93.929722	99.29
54	K34NV-D	LIC	LPT	34	3.0	43.585833	-93.929722	99.29
55	K35IU-D	LIC	LPT	35	3.0	43.585833	-93.929722	99.29
56	W26FD-D	CP	LPD	26	15.0	44.023389	-91.439222	100.98
57	K28MV-D	CP	LPD	28	2.0	43.923306	-91.400389	101.25
58	W32DW-D	CP	LPD	32	1.0	43.923306	-91.400389	101.25
59	W34EB-D	CP	LPD	34	1.0	43.923306	-91.400389	101.25
60	K36MW-D	CP	LPD	36	2.0	43.923306	-91.400389	101.25
61	W45DM-D	CP	LPD	45	1.0	43.923306	-91.400389	101.25
62	W46EP-D	CP	LPD	46	1.0	43.923306	-91.400389	101.25
63	WEAU	LIC	DRT	30	15.0	43.804444	-91.372167	101.84
64	WLAX	LIC	DTV	33	1000.0	43.804444	-91.372167	101.84
65	WHLA-TV	LIC	DTV	15	400.0	43.805083	-91.368083	102.17

ID	Call Sign	Status	Service ²	Channel	Transmit ERP ³ (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to the Closest Turbine (km)
66	WXOW	LIC	DTV	28	251.0	43.806389	-91.367500	102.22
67	W34FC-D	LIC	LPT	34	15.0	43.806389	-91.367500	102.22
68	KQEG-CA	LIC	DCA	23	15.0	43.748056	-91.297500	107.66
69	K17MH-D	CP	LPD	17	6.0	42.685861	-92.889917	110.02
70	WKBT-DT	LIC	DTV	8	25.7	44.091111	-91.338056	111.08
71	WKBT-DT	CP	DTV	8	38.7	44.091111	-91.338056	111.08
72	W19DP-D	CP	LPD	19	15.0	44.091111	-91.338056	111.08
73	K45MN-D	CP	LPD	45	1.0	43.658556	-94.176750	118.64
74	K31NJ-D	LIC	LPT	31	15.0	43.349722	-91.221111	120.30
75	W28DT-D	CP	LPD	28	1.0	44.194694	-91.255611	121.51
76	W21DC-D	CP	LPD	21	1.0	44.194667	-91.255417	121.52
77	W22DT-D	CP	LPD	22	0.5	44.194667	-91.255417	121.52
78	W19EN-D	LIC	LPT	19	6.0	44.902778	-92.691111	129.01
79	K25QC-D	CP	LPD	25	7.5	44.051500	-94.299972	134.48
80	K43JE-D	AMD	LPD	25	7.5	44.051500	-94.299972	134.48
81	K43JE-D	LIC	LPD	43	10.82	44.051500	-94.299972	134.48
82	K44FK	LIC	LPX	44	9.1	42.445833	-92.375000	137.08
83	KMNF-LD	LIC	LPT	7	3.0	43.936750	-94.410833	140.06
84	KEYC-TV	LIC	DTV	12	52.7	43.936944	-94.410833	140.07
85	WUMN-LD	LIC	LPD	21	15.0	44.973583	-93.270500	145.39
86	K14RB-D	LIC	LPD	14	15.0	44.976111	-93.272500	145.71
87	KWJM-LD	LIC	LPD	15	15.0	44.976111	-93.272500	145.71
88	KMBD-LD	APP	LPD	20	3.0	44.976111	-93.272500	145.71
89	KMBD-LD	CP	LPD	20	3.0	44.976111	-93.272500	145.71
90	KJNK-LD	LIC	LPD	25	15.0	44.976111	-93.272500	145.71
91	KJNK-LD	STA	LPT	25	1.0	44.976111	-93.272500	145.71
92	KJNK-LD	STA	LPT	25	1.0	44.976111	-93.272500	145.71
93	KJNK-LD	LIC	LPT	25	15.0	44.976111	-93.272500	145.71
94	K33LN-D	LIC	DCA	33	15.0	44.976111	-93.272500	145.71
95	KMQV-LD	LIC	LPD	36	15.0	44.976111	-93.272500	145.71
96	KMBD-LD	LIC	LPD	43	15.0	44.976111	-93.272500	145.71
97	W46EQ-D	CP	LPD	46	1.0	44.501222	-91.128806	147.06
98	W19DJ-D	CP	LPD	19	1.0	44.762806	-91.435444	148.40
99	W29DQ-D	CP	LPD	29	1.0	44.762806	-91.435444	148.40
100	W30EN-D	CP	LPD	30	1.0	44.762806	-91.435444	148.40
101	W31DN-D	CP	LPD	31	1.0	44.762806	-91.435444	148.40

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 Grand Meadow Repower Project, it was determined that eight of the full-power digital stations, identified below in Table 2, along with low-power digital station K25NK-D, 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)
3	KSMQ-TV	LIC	DTV	20	319.2	43.642778	-92.526667	10.01
4	KXLT-TV	LIC	DTV	26	108.0	43.642778	-92.526667	10.01
5	KAAL	LIC	DTV	36	620.0	43.642778	-92.526667	10.01
9	KYIN	LIC	DTV	18	533.0	43.475556	-92.708333	21.09
10	KIMT	LIC	DTV	24	472.0	43.475556	-92.708333	21.09
12	KTTC	LIC	DTV	10	43.1	43.570833	-92.427222	21.12
21	K25NK-D	LIC	LPD	25	15.0	44.041111	-92.340556	40.76
64	WLAX	LIC	DTV	33	1000.0	43.804444	-91.372167	101.84
70	WKBT-DT	LIC	DTV	8	25.7	44.091111	-91.338056	111.08

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

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

Contact person:	David Meyer
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Wind Power GeoPlanner™

Land Mobile & Emergency Services Report

Grand Meadow Repower Project



Prepared on Behalf of
Xcel Energy

January 12, 2021



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1. Introduction

An assessment of the emergency services in the Grand Meadow Repower Project area was performed by Comsearch to identify potential impact from the planned 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 Mower County, Minnesota, appears below in Figure 1.

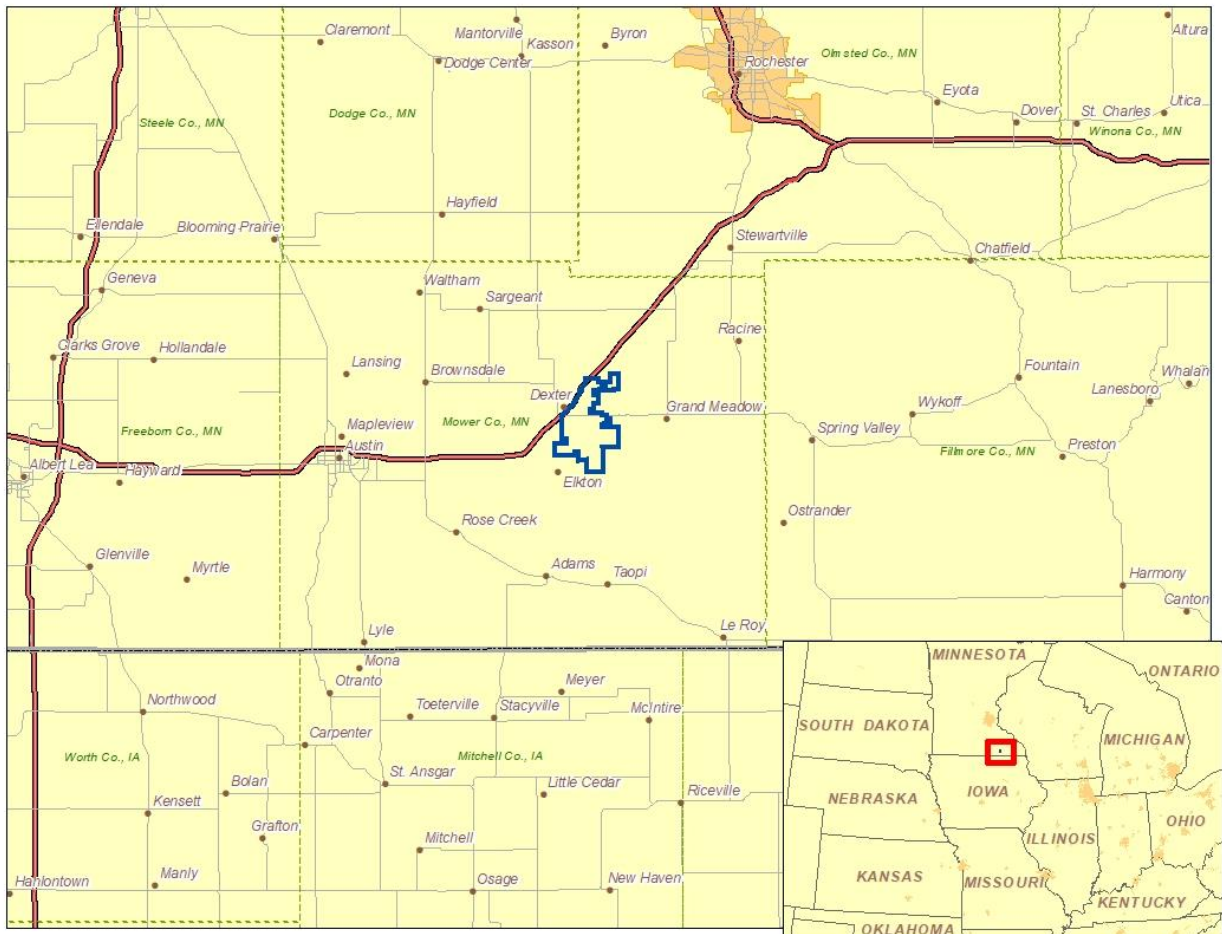


Figure 1: Area of Interest (AOI)

2. Summary of Results

Our land mobile and emergency services incumbent data¹ 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.

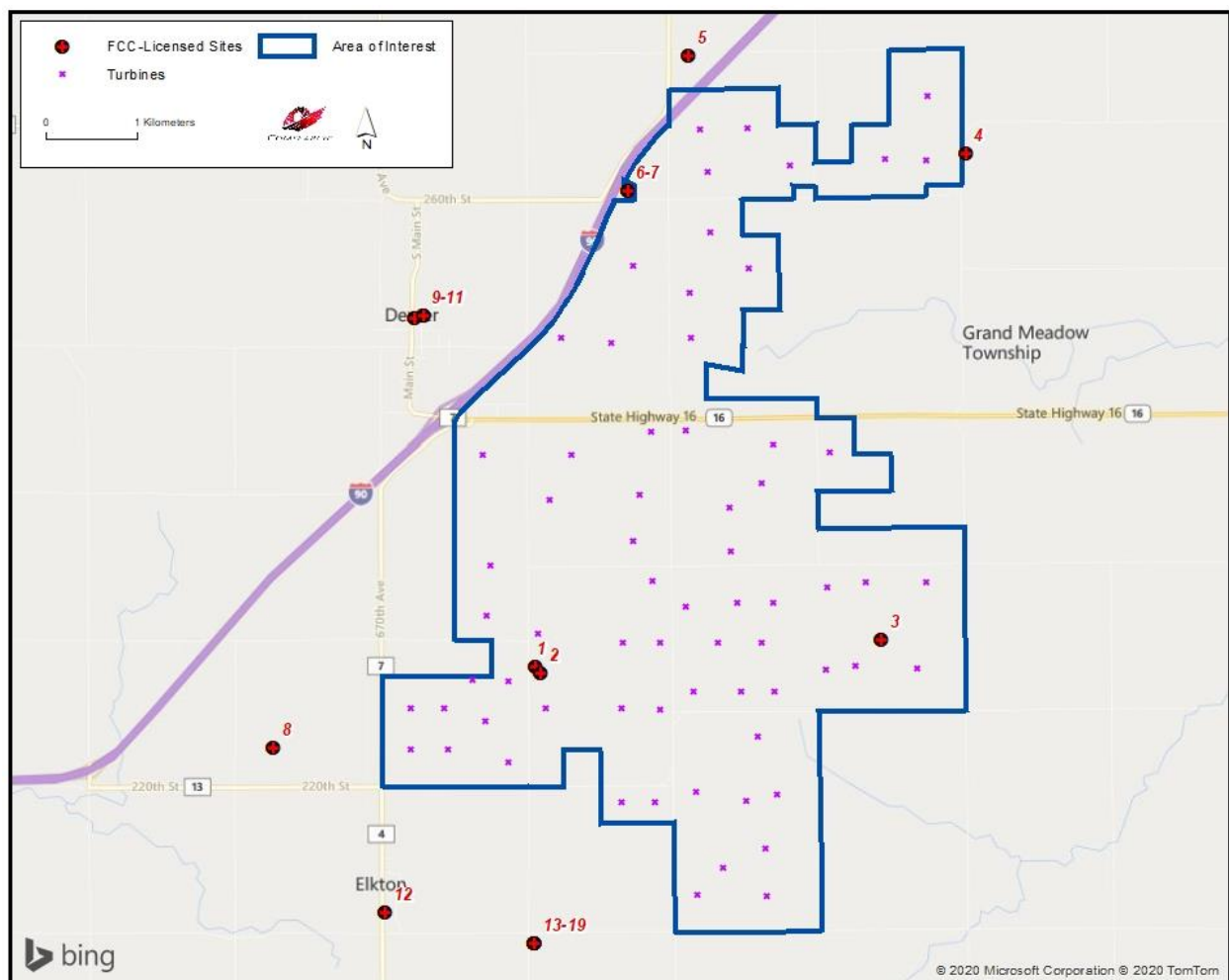


Figure 2: Land Mobile & Emergency Service Sites in and around the Area of Interest

Figure 2 identifies nineteen site-based licenses in and around the Grand Meadow 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	WQVM230	450-470	H-FARMS, INC.	32	43.685639	-92.688472	0.33
2	WQVQ405	450-470	HILTON, BILL	28.4	43.685056	-92.687611	0.37
3	WQTX624	450-470	SEMA Equipment Inc.	29	43.688278	-92.641083	0.41
4	KNGL791	450-470	DAVIS, JIM	37	43.736361	-92.629333	0.44
5	KNGC466	150-174	JONES, RICHARD E	18	43.746083	-92.667111	0.83
6	KNHK972	150-174	DAIRYLAND POWER COOPERATIVE	53	43.732778	-92.675556	0.83
7	WRBV603	450-470	DAIRYLAND POWER COOPERATIVE	68.6	43.732778	-92.675556	0.83
8	WRBL370	450-470	Angell, Gary	38.1	43.677694	-92.724167	1.51
9	WPMJ464	450-470	MOWER, COUNTY OF	36.3	43.720528	-92.703528	1.54
10	WSH917	450-470	SCOTT, ALLEN	45	43.720528	-92.703528	1.54
11	WQUZ350	450-470	Ancom Communications, Inc.	28.9	43.720194	-92.704639	1.62
12	WNVR420	450-470	HARVEST STATES COOPERATIVES	37	43.661361	-92.709083	1.81
13	WNQZ567	150-174	MOWER, COUNTY OF	97.5	43.658361	-92.688694	1.81
14	WPMJ464	150-174, 450-470	MOWER, COUNTY OF	91.4	43.658361	-92.688694	1.81
15	WPMX953	800/900	MOWER, COUNTY OF	125.6	43.658361	-92.688694	1.81
16	WQGM683	450-470	MOWER, COUNTY OF	96	43.658361	-92.688694	1.81
17	WQHE600	800/900	MINNESOTA, STATE OF	125.6	43.658361	-92.688694	1.81
18	WQHH552	800/900	MOWER, COUNTY OF	125.6	43.658361	-92.688694	1.81
19	WQNG466	150-174	MINNESOTA, STATE OF	125.6	43.658361	-92.688694	1.81

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

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

Mobile Licenses

In addition to the fixed-site licenses above, 417 mobile licenses defined by center point and radius were found to intersect the Grand Meadow 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 Grand Meadow Repower Project is located in Mower 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, Public Safety Region #22
Office of Statewide Radio Communications,
Minnesota Department of Transportation
1500 W CR B2, Roseville, MN 55113
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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 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 one for the County of Mower (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

ID	Licensee	Area of Operation	Frequency Band (MHz)
9	MOWER, COUNTY OF	Countywide: Mower	150-174
10	NATIONAL SKI PATROL SYSTEM INC	Statewide: Minnesota	150-174
11	Nevada Division of Forestry	Statewide: Minnesota	150-174
12	NORTHSTAR SEARCH AND RESCUE	Statewide: Minnesota	150-174
13	ROCHESTER CITY OF	Statewide: Minnesota	150-174
14	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 Mower County, Minnesota, in Table 3.

Mobile Phone Carrier	Service ²
AT&T	700 MHz, AWS, PCS, WCS
Blue Ridge Wireless II	AWS
Bug Tussel Wireless	AWS
DISH Network	700 MHz, AWS
Orion Wireless	AWS
Sprint	PCS
Standing Rock Telecommunications	PCS
T-Mobile	AWS, PCS
US Cellular	700 MHz

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 Grand Meadow Repower Project area. 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 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

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

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 the 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 installed.

When planning 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 land mobile frequency bands. As long as the turbines are located 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.

4. Recommendations

In the event that a public safety entity believes its coverage has been compromised by the presence 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:

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Web site:	www.comsearch.com

Appendix A

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
1	KAA306	150-174, 450-470	Rochester Public Utilities	32.0	43.967472	-92.478222
2	KAB264	150-174	HOWARD, COUNTY OF	40.0	43.367472	-92.405722
3	KAB816	150-174	ROCHESTER, CITY OF	48.0	44.022472	-92.362944
4	KAE754	150-174	GOODHUE COUNTY COOPERATIVE ELECTRIC ASSOC	64.0	44.286639	-92.654361
5	KAH922	450-470	LAKESIDE FOODS INC	97.0	44.155250	-92.175167
6	KC7907	150-174	KSTP-TV, LLC	161.0	44.947194	-93.086611
7	KD50657	150-174	WISCONSIN POWER AND LIGHT COMPANY	241.0	43.776389	-90.443333
8	KDG651	450-470	Clement, Tracy	20.0	43.642778	-92.526667
9	KDG651	450-470	Clement, Tracy	32.0	43.642833	-92.526472
10	KDR729	150-174	MAYO FOUNDATION	56.3	44.029417	-92.461833
11	KDR729	150-174	MAYO FOUNDATION	56.3	44.042194	-92.471000
12	KDW967	150-174	HOWARD, COUNTY OF	40.0	43.367472	-92.405722
13	KJZ653	150-174	AUSTIN, CITY OF	40.0	43.697750	-92.963528
14	KKW205	150-174	KASSON, CITY OF	40.0	44.024694	-92.748250
15	KLO481	150-174	KASSON, CITY OF	40.0	44.031639	-92.753528
16	KNAO871	150-174	SONBERG FARMS LLC	80.0	43.313028	-92.870472
17	KNAQ813	150-174	DAHL, DENNIS	64.0	43.314389	-93.272417
18	KNAR750	450-470	GOLDBECK TOWING SERVICE	129.0	43.865528	-91.321528
19	KNBA595	25-50	GM CONTRACTING INC	161.0	44.114694	-94.211639
20	KNBE918	450-470	TROM, LOWELL I	40.0	43.932472	-92.996583
21	KNBG837	450-470	FREEBORN MOWER COOPERATIVE SERVICES	56.0	43.640806	-93.147694
22	KNBW268	450-470	PEOPLES ENERGY COOPERATIVE	56.0	44.042194	-92.340722
23	KNCC310	150-174	TOQUAM, ORLO N	40.0	43.956917	-93.006583

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
24	KNEP328	150-174	KOENIGS, JEROME A	40.0	43.457472	-92.638806
25	KNFG989	150-174	D&H STARK FARMS LTD	56.0	43.370528	-92.456556
26	KNFU686	150-174	LA VALLE, TOWN OF	232.0	43.584417	-90.134583
27	KNFZ492	150-174	ROSE CREEK, CITY OF	24.0	43.601361	-92.832694
28	KNGL791	450-470	DAVIS, JIM	32.0	43.736361	-92.629333
29	KNHH478	800/900	Electronic Specialties, Inc.	113.0	43.357444	-93.308250
30	KNHQ355	450-470	SOBOLIK, JAMES R	80.0	43.356917	-92.162667
31	KNHX289	150-174	FIRST STUDENT INC	40.0	44.024444	-92.545000
32	KNHX289	150-174	FIRST STUDENT INC	56.0	44.024444	-92.545000
33	KNIC679	150-174	SPRING VALLEY, CITY OF	72.0	43.686917	-92.390167
34	KNIF242	450-470	DAVISON, BRUCE:DAVISON, JACK DBA DAVISON FARMS	64.0	43.184139	-93.046028
35	KNIG840	450-470	DOUGAN, SUE	32.0	43.667306	-92.509000
36	KNJX373	150-174	HOUSE CHEVROLET COMPANY	48.0	43.850806	-92.488500
37	KNNF382	150-174	HEMANN, JOHN	39.0	43.451639	-92.797417
38	KOK429	450-470	DAIRYLAND POWER COOPERATIVE	116.0	43.556917	-92.682139
39	KPF364	25-50	KSTP-TV, LLC	241.0	44.968583	-93.207722
40	KSI896	150-174	NORTHWAY COMMUNICATIONS INC.	322.0	44.888028	-89.652056
41	KSV530	150-174	LARSON PRODUCTS INC	19.0	43.834694	-92.767694
42	KWJ508	25-50	INDEPENDENCE READY MIXED CONCRETE	121.0	44.285278	-91.361111
43	KXH817	150-174, 450-470	SCHMELING, ROBERT	32.0	43.864972	-93.000194
44	KZP477	150-174	PURFEERST, JAMES M	72.0	44.239139	-93.149111
45	WNAK403	450-470	SAINT ANSGAR COMMUNITY SCHOOLS	80.0	43.382472	-92.919639
46	WNAK990	450-470	2-WAY RADIO OF MINNESOTA INC	64.0	43.791056	-93.440222
47	WNAW956	450-470	CHARLSON EXCAVATING INC	80.0	43.132472	-93.216583
48	WNBA817	150-174	MAY, GABRIEL	48.0	43.457194	-92.713250

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
49	WNBB792	150-174	TERPSTRA, ALLAN	64.0	44.080250	-93.282722
50	WNBY880	450-470	FRANKS, G RONALD	80.0	43.226333	-93.382972
51	WNFA507	150-174	ADAMS, CITY OF	32.0	43.568139	-92.718361
52	WNFS292	150-174	FRITCHER, DAVID	64.0	43.409972	-92.377111
53	WNGC334	800/900	Electronic Specialties, Inc	112.0	43.102194	-93.597722
54	WNGC397	800/900	HDH Leasing Inc.	113.0	44.524167	-92.576389
55	WNGX885	800/900	ELECTRONIC ENGINEERING COMPANY	113.0	43.120833	-93.193611
56	WNHT247	450-470	ROCHESTER GOLF & COUNTRY CLUB	64.0	44.053306	-92.405167
57	WNIC728	450-470	RADIO COMMUNICATIONS CO INC	121.0	42.751361	-92.796028
58	WNII614	450-470	GRAIN MILLERS INC	48.0	43.385056	-92.922417
59	WNIU517	450-470	RESSLER, JOHN	48.0	43.627472	-92.626000
60	WNIV229	450-470	ROE, RUSSELL:ROE, MILO:ROE, RICK:ROE, BRIAN DBA ROE FARMS	40.0	43.515250	-92.579611
61	WNJQ766	450-470	MARTIN, RODGER	64.0	43.196639	-92.732417
62	WNJZ554	450-470	KEOKUK CO AMBULANCE	322.0	41.333333	-92.204639
63	WNJZ902	150-174	GRISIM, CURT	48.0	43.848861	-92.487944
64	WNKB246	450-470	DONLEY, FARMS, INC	32.0	43.955806	-92.656861
65	WNKW871	450-470	OPFER, JOHN E	32.0	44.020806	-92.645472
66	WNLG922	450-470	NESS, STERLING	48.0	43.965528	-92.699917
67	WNLJ839	450-470	MR SAM COMMUNICATIONS	56.0	43.547472	-92.714639
68	WNLK592	450-470	ROSENBERG RICHARD ROSENBERG JEFF DBA ROSENBERG F	64.0	43.372194	-93.011306
69	WNLY834	450-470	American National Red Cross	121.0	43.811639	-91.187639
70	WNMH253	800/900	Twin City Concrete Products, Inc.	113.0	44.581639	-91.916278
71	WNMS697	150-174	MC COLLEY, WAYNE	40.0	43.938583	-92.852694
72	WNMX401	150-174	REGIONAL HEALTH SERVICES OF HOWARD COUNTY	56.0	43.371639	-92.109889

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73	WNNB993	450-470	NUTRIEN AG SOLUTIONS INC	121.0	42.972194	-93.796056
74	WNNM962	450-470	KRAUSHAAR, STEVEN	64.0	43.583306	-93.151583
75	WNNO413	450-470	HAARSTAD, ODEAN:HAARSTAD, ANDREW:HAARSTAD, KENNETH:HAARSTAD,	48.0	43.781083	-92.706861
76	WNNU894	450-470	MR SAM COMMUNICATIONS	64.0	43.645222	-93.468000
77	WNNY447	150-174	LADWIG, MARVIN	40.0	43.494417	-92.384333
78	WNPC334	150-174	LEWIS, MICHAEL	48.0	43.432472	-92.400722
79	WNPO812	450-470	KRUEGELS INC	32.0	43.682750	-92.383778
80	WNQG647	450-470	Cole Farms	121.0	43.269972	-93.041583
81	WNQO287	150-174	Owatonna Concrete Products, LLC	80.0	44.074972	-93.206056
82	WNQO287	150-174	Owatonna Concrete Products, LLC	80.0	44.272194	-92.989083
83	WNQZ567	150-174	MOWER, COUNTY OF	48.0	43.658361	-92.688694
84	WNRK620	450-470	GEBHARDT, MICHAEL:GEBHARDT, ROBERT:GEBHARDT, JAMES DBA GEBHA	48.0	43.815806	-92.868528
85	WNRV825	450-470	LECY, DELBERT	32.0	43.791639	-92.671000
86	WNRW374	450-470	Hilltop Communications, Inc.	80.0	44.325250	-92.652972
87	WNSE844	450-470	STEVENSON JR, RUSSELL	48.0	43.463861	-92.211833
88	WNSR429	450-470	CUSTOM COMMUNICATIONS INC	80.0	44.008306	-92.471000
89	WNSV528	450-470	AGRIMSON, ARNE	121.0	43.854139	-91.908500
90	WNUA855	150-174	SPRING VALLEY, CITY OF	24.0	43.684139	-92.387389
91	WNUS633	450-470	TRITON SCHOOLS	48.0	44.030250	-92.855750
92	WNUZ853	450-470	ALBERTS, DON	48.0	44.091083	-92.757139
93	WNVB930	450-470	Eickhoff, Jeff N	40.0	43.681917	-92.254056
94	WNV420	450-470	HARVEST STATES COOPERATIVES	32.0	43.661361	-92.709083
95	WNV429	450-470	FASBENDER, DON:FASBENDER, MARK DBA FASBENDER FARMS	40.0	43.529694	-92.687139
96	WNV439	450-470	ALPHA WIRELESS COMMUNICATIONS CO.	121.0	44.148583	-93.979389

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97	WNVV722	450-470	ELECTRONIC ENGINEERING COMPANY	48.0	43.279139	-92.821028
98	WNWA349	150-174	RAUSCH BROTHERS TRUCKING INC	121.0	43.034139	-92.451028
99	WNWK644	450-470	Electronic Specialties, Inc.	80.0	43.365250	-93.133806
100	WNYK609	450-470	LUTHERAN HOSPITAL LA CROSSE	121.0	43.794417	-91.249583
101	WNYV328	150-174	PUBLIC UTILITIES COMMISSION	40.0	43.687194	-92.389611
102	WNY719	450-470	Hilltop Communications, Inc.	80.0	44.006083	-92.423778
103	WPAP494	450-470	TORRENS, LOREN A	113.0	43.949972	-92.700194
104	WPAU761	450-470	BAGLEY, JAMES	56.0	43.719417	-93.215472
105	WPAW465	150-174	LYLE, CITY OF	32.0	43.505806	-92.943806
106	WPAW992	450-470	MASCHING, RICHARD	40.0	43.923583	-92.833528
107	WPBB549	450-470	Latham Hi-Tech Hybrids, Inc.	121.0	42.796917	-93.496583
108	WPBD259	450-470	MEYERHOFER, LE VERNE	40.0	43.679139	-92.596000
109	WPBF383	450-470	DAHLBY, DALE	56.0	43.477444	-93.221028
110	WPBI316	800/900	Interstate Power and Light Company	113.0	43.850278	-92.175278
111	WPBI317	800/900	Interstate Power and Light Company	113.0	42.849056	-92.415889
112	WPBI317	800/900	Interstate Power and Light Company	113.0	43.315778	-91.788972
113	WPBI318	800/900	Interstate Power and Light Company	113.0	43.098028	-93.289889
114	WPBI318	800/900	Interstate Power and Light Company	113.0	43.188056	-92.358333
115	WPBI318	800/900	Interstate Power and Light Company	113.0	43.240667	-92.973639
116	WPBI318	800/900	Interstate Power and Light Company	113.0	43.556917	-92.682139
117	WPBI319	800/900	Interstate Power and Light Company	113.0	43.094167	-93.294167
118	WPBI319	800/900	Interstate Power and Light Company	113.0	43.557167	-93.661056
119	WPBI319	800/900	Interstate Power and Light Company	113.0	43.745306	-93.452639
120	WPBK227	150-174	CHATFIELD, CITY OF	40.0	43.847139	-92.162278
121	WPBU497	450-470	A & K FEED AND GRAIN CO INC	64.0	43.440250	-92.284889

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
122	WPBZ649	450-470	SCHWIZER, MERLYN D	64.0	43.134417	-92.892139
123	WPCQ731	450-470	SCHAEFER, MARK	48.0	43.501639	-92.658806
124	WPCS262	150-174	SLAICHERT, HARLAN W	56.0	43.377194	-92.937694
125	WPDF296	450-470	IBM Research and Development Inc.	56.0	44.066639	-92.504611
126	WPEG465	150-174	HALVORSON, CURTIS	56.0	43.477194	-92.944083
127	WPEG804	450-470	RIVERLAND COMMUNITY COLLEGE	32.0	43.676083	-93.002694
128	WPEN706	450-470	Electronic Specialties, Inc.	97.0	43.423278	-93.533556
129	WPEU410	450-470	FINSETH FAMILY FARMS	56.0	43.762472	-92.097944
130	WPEX927	450-470	GLS AGRONOMY A MINNESOTA PARTNERSHIP	48.0	43.969139	-92.227389
131	WPGS831	150-174	BLOOMING PRAIRIE INDEPENDENT SCHOOL DISTRICT 756	40.0	43.867750	-93.063806
132	WPGY568	450-470	Hilltop Communications, Inc.	80.0	44.412472	-92.272667
133	WPGZ256	450-470	Electronic Specialties, Inc.	80.0	43.118583	-93.239639
134	WPGZ803	450-470	Hilltop Communications, Inc.	80.0	44.325250	-92.652972
135	WPHA250	450-470	Hilltop Communications, Inc.	80.0	44.398583	-92.817417
136	WPHA251	450-470	Hilltop Communications, Inc.	80.0	44.398583	-92.817417
137	WPHB812	150-174	Helena Agri-Enterprises, LLC	48.0	43.282750	-92.791861
138	WPHD723	450-470	Hilltop Communications, Inc.	80.0	44.081639	-93.191333
139	WPHM349	450-470	HARMONY AGRI SERVICES, INC.	80.0	43.554583	-92.002194
140	WPIC271	450-470	Hilltop Communications, Inc.	121.0	44.303306	-93.240500
141	WPIE272	450-470	Hilltop Communications, Inc.	121.0	44.006083	-92.423778
142	WPIF622	450-470	Hilltop Communications, Inc.	121.0	44.236639	-92.558806
143	WPIF624	450-470	Hilltop Communications, Inc.	121.0	44.081639	-93.191333
144	WPIF625	450-470	Hilltop Communications, Inc.	121.0	44.303306	-93.240500
145	WPIF626	450-470	Hilltop Communications, Inc.	121.0	44.303306	-93.240500
146	WPIU349	450-470	ZIEGLER INC	143.0	44.849972	-93.300222

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147	WPJU243	450-470	SCHULTZ FARMS INC	32.0	43.833028	-92.370722
148	WPJU667	450-470	Allnet Wireless LLC	121.0	43.983306	-92.208222
149	WPJZ485	150-174	MAYO FOUNDATION	24.0	43.674139	-92.977694
150	WPKV380	450-470	ROCHESTER PUBLIC SCHOOLS	120.0	44.046361	-92.449333
151	WPLQ539	450-470	KAAL-TV, LLC	32.0	43.675806	-92.951861
152	WPLY304	800/900	MAYO FOUNDATION	40.0	44.021639	-92.467111
153	WPMA361	800/900	MAYO FOUNDATION	113.0	44.021639	-92.467111
154	WPMA366	800/900	MAYO FOUNDATION	113.0	44.021639	-92.467111
155	WPMB807	450-470	KLOCKE BROTHERS FARMS INC	32.0	43.862472	-92.931306
156	WPMF559	150-174	Dakota Minnesota & Eastern Railroad Corporation	30.0	43.668306	-92.960194
157	WPMJ464	450-470	MOWER, COUNTY OF	32.0	43.658361	-92.688694
158	WPML679	450-470	HEYDT, CURTIS W	32.0	43.891639	-92.849972
159	WPMX953	800/900	MOWER, COUNTY OF	40.0	43.658361	-92.688694
160	WPNR583	150-174	MOWER, COUNTY OF	32.0	43.670389	-92.969389
161	WPNW319	450-470	BROADWATER, GARY	32.0	43.595528	-92.263222
162	WPNZ226	150-174	Croell Redi-Mix, Inc.	40.0	43.509694	-92.501833
163	WPNZ226	150-174	Croell Redi-Mix, Inc.	40.0	43.669972	-92.386556
164	WPOZ203	150-174	BLUMENTHAL LANSING COMPANY	121.0	43.360250	-91.244583
165	WPPB574	450-470	JAX DAIRY FARMS INC	30.0	43.519972	-92.809361
166	WPPD445	150-174	GUNDERSEN LUTHERAN MEDICAL CENTER	600.0	43.794417	-91.249583
167	WPPH987	450-470	NORTHERN COUNTRY COOP	30.0	43.880806	-92.714361
168	WPPN854	450-470	MR SAM COMMUNICATIONS	30.0	43.438028	-92.783806
169	WPPN880	450-470	CENTRAL CO-OP	32.0	43.890250	-92.849972
170	WPPT600	450-470	WELLIK, KEVIN	32.0	43.838028	-92.474056
171	WPPV679	150-174	BBRH INC.	100.0	44.291083	-93.294111

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172	WPQD717	450-470	Ancom Communications, Inc.	32.0	43.676389	-93.003611
173	WPQE372	450-470	TWOHEY, EDWARD	32.0	43.886361	-92.597667
174	WPQH731	450-470	BOE, WILLIAM D	32.0	43.561083	-92.630167
175	WPQJ977	450-470	MOBILE RADIO ENGINEERING INC	121.0	44.559972	-93.321056
176	WPRI228	150-174	DAKOTA MINNESOTA & EASTERN RAILROAD CORPORATION	62.0	44.081639	-93.228000
177	WPSF861	150-174	FIRST STUDENT INC	40.0	44.024444	-92.545000
178	WPSF967	450-470	Great River Energy	32.0	43.802500	-92.683889
179	WPTI620	800/900	Upper Iowa Communications	113.0	43.381639	-92.107417
180	WPTW664	150-174	COLOFF MEDIA, LLC	70.0	43.148583	-93.147139
181	WPUF832	450-470	International Paper	32.0	43.681333	-92.964667
182	WPWI617	450-470	Loose, Daniel	250.0	44.335000	-95.288611
183	WPWJ805	450-470	Baudoin Oil Co Inc	30.0	43.706639	-92.589056
184	WPXQ433	800/900	Olmsted County Sheriff's Office	32.0	43.967472	-92.478222
185	WPXS635	800/900	Interstate Power and Light Company	113.0	42.980278	-93.608611
186	WPYB749	800/900	RACOM Corporation	113.0	43.098056	-93.289722
187	WPYE254	150-174	MITCHELL, COUNTY OF	40.0	43.427750	-92.782750
188	WPYY361	800/900	Interstate Power and Light Company	113.0	43.090222	-91.854833
189	WPZH549	800/900	New Hampton Red Power, Inc.	113.0	43.008889	-92.316667
190	WPZR702	150-174	DODGE, COUNTY OF	40.0	44.025556	-92.848056
191	WPZR841	216-220	Mayo Foundation	80.0	44.021667	-92.466944
192	WQAM765	800/900	Ancom Communications, Inc.	113.0	44.044722	-92.400278
193	WQAR953	800/900	Interstate Power and Light Company	113.0	43.315722	-91.438139
194	WQAR953	800/900	Interstate Power and Light Company	113.0	43.316500	-91.455000
195	WQAU830	150-174	AUSTIN MEDICAL CENTER	40.0	43.674417	-92.977972
196	WQAW860	150-174	AUSTIN, CITY OF	40.0	43.666639	-92.966861

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197	WQBK882	150-174	Arens Heating and Cooling	40.0	43.666639	-92.971306
198	WQBR912	800/900	Interstate Power and Light Company	113.0	43.120833	-93.193611
199	WQCR764	150-174	AUSTIN, CITY OF	32.0	43.670417	-92.969389
200	WQCS284	800/900	Interstate Power and Light Company	113.0	42.955833	-91.816111
201	WQCT231	800/900	INTERSTATE POWER & LIGHT COMPANY	113.0	43.372028	-92.100194
202	WQDB755	150-174	Rochester Bus Service, Inc.	40.0	44.036611	-92.489167
203	WQDD260	150-174	TWO-WAY COMMUNICATIONS INC	160.0	44.600000	-91.216667
204	WQDI812	800/900	MINNESOTA, STATE OF	40.0	43.854917	-92.336278
205	WQDI812	800/900	MINNESOTA, STATE OF	40.0	43.934694	-92.617361
206	WQDI812	800/900	MINNESOTA, STATE OF	40.0	44.020694	-92.467056
207	WQDJ729	800/900	MINNESOTA, STATE OF	113.0	44.048111	-92.962389
208	WQDJ729	800/900	MINNESOTA, STATE OF	113.0	44.093611	-93.253889
209	WQDJ729	800/900	MINNESOTA, STATE OF	113.0	44.291111	-93.211389
210	WQDJ729	800/900	MINNESOTA, STATE OF	113.0	44.342806	-92.642389
211	WQDJ729	800/900	MINNESOTA, STATE OF	113.0	44.416556	-92.874306
212	WQDJ729	800/900	MINNESOTA, STATE OF	113.0	44.524167	-92.576389
213	WQDJ729	800/900	MINNESOTA, STATE OF	113.0	44.529167	-93.408056
214	WQDV323	150-174	Interstate Power & and Light Company	290.0	42.686944	-91.826389
215	WQDV323	150-174	Interstate Power & and Light Company	290.0	43.557167	-93.661056
216	WQED612	450-470	STEINKAMP, ALAN	24.0	43.566000	-92.719194
217	WQEI908	450-470	AMERICAN TIME & SIGNAL CO.	20.0	43.662389	-92.949194
218	WQEI908	450-470	AMERICAN TIME & SIGNAL CO.	20.0	43.666250	-92.945472
219	WQEI908	450-470	AMERICAN TIME & SIGNAL CO.	20.0	43.696861	-92.388306
220	WQEI908	450-470	AMERICAN TIME & SIGNAL CO.	20.0	43.855111	-92.490861
221	WQEL823	150-174	FERRIER, THOMAS	40.0	43.943583	-92.273778

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222	WQET917	150-174	STUSSY CONSTRUCTION INC.	40.0	44.077972	-92.755639
223	WQFW336	450-470	AMERICAN TIME	20.0	43.852444	-92.493917
224	WQGB846	450-470	AUSTIN INDEPENDENT SCHOOL DISTRICT #492	32.0	43.662556	-92.949583
225	WQGB846	450-470	AUSTIN INDEPENDENT SCHOOL DISTRICT #492	25.0	43.668333	-92.978333
226	WQGB846	450-470	AUSTIN INDEPENDENT SCHOOL DISTRICT #492	25.0	43.668611	-92.978333
227	WQGM683	450-470	MOWER, COUNTY OF	32.0	43.658361	-92.688694
228	WQGX590	150-174	GRAND MEADOW, CITY OF	24.0	43.702750	-92.574889
229	WQGX781	150-174	AUSTIN, CITY OF	40.0	43.666639	-92.972417
230	WQHE600	800/900	MINNESOTA, STATE OF	40.0	43.658361	-92.688694
231	WQHE600	800/900	MINNESOTA, STATE OF	40.0	43.659306	-92.299667
232	WQHE600	800/900	MINNESOTA, STATE OF	40.0	43.848111	-92.861722
233	WQHF415	800/900	MINNESOTA, STATE OF	113.0	43.550583	-91.361472
234	WQHF415	800/900	MINNESOTA, STATE OF	113.0	43.668750	-91.404194
235	WQHF415	800/900	MINNESOTA, STATE OF	113.0	43.810889	-91.644750
236	WQHH552	800/900	MOWER, COUNTY OF	40.0	43.501083	-92.992694
237	WQHH552	800/900	MOWER, COUNTY OF	40.0	43.658361	-92.688694
238	WQHK257	450-470	CUSTOM COMMUNICATIONS, INC.	80.0	44.001139	-92.487972
239	WQHK535	800/900	MINNESOTA, STATE OF	113.0	43.652028	-93.547556
240	WQHK535	800/900	MINNESOTA, STATE OF	113.0	43.662000	-93.114389
241	WQHK535	800/900	MINNESOTA, STATE OF	113.0	43.817500	-93.292778
242	WQJI420	450-470	SIGNATURE FLIGHT SUPPORT	32.0	43.916861	-92.493528
243	WQJI438	450-470	MIDAMERICAN ENERGY COMPANY	80.0	43.054417	-92.673806
244	WQJR520	450-470	Northern Iowa Windpower II, LLC	80.0	43.364528	-93.269389
245	WQJZ882	450-470	enXco	32.0	43.741889	-92.705361
246	WQKD865	800/900	RACOM Corporation	113.0	43.279722	-91.787778

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
247	WQKD880	800/900	RACOM Corporation	113.0	43.121389	-93.194444
248	WQKD884	800/900	RACOM Corporation	113.0	43.038056	-92.390556
249	WQKD897	800/900	RACOM Corporation	113.0	44.689167	-93.072778
250	WQKD916	800/900	RACOM Corporation	113.0	42.694167	-92.782778
251	WQKD925	800/900	RACOM Corporation	113.0	43.754722	-91.296389
252	WQKD926	800/900	RACOM Corporation	113.0	43.970278	-92.418333
253	WQKM777	450-470	JONES, TERRY	32.0	43.710833	-92.596944
254	WQLJ962	450-470	DIAMOND FARMS INC.	32.0	43.691750	-92.867361
255	WQLV443	450-470	FPL Energy Mower County, LLC	32.0	43.616722	-92.598833
256	WQMM943	450-470	ITC MIDWEST	80.0	43.801111	-92.189889
257	WQMM943	450-470	ITC MIDWEST	80.0	43.959056	-93.466639
258	WQNB673	450-470	IFP, INC.	32.0	43.903056	-92.738639
259	WQNE408	450-470	BIO APPLICATION LLC	32.0	43.436944	-92.593333
260	WQNG466	150-174	MINNESOTA, STATE OF	40.0	43.658361	-92.688694
261	WQNG466	150-174	MINNESOTA, STATE OF	40.0	43.662000	-93.114389
262	WQNG466	150-174	MINNESOTA, STATE OF	40.0	44.052278	-92.901028
263	WQNK299	450-470	KINGSLAND PUBLIC SCHOOL DISTRICT #2137	32.0	43.697444	-92.387167
264	WQNP927	450-470	ABSOLUTE ENERGY	32.0	43.496944	-92.954722
265	WQNR476	450-470	HAARSTADS HOME IMPROVEMENTS LLC	80.0	43.676167	-92.869222
266	WQNS579	150-174	BROWNSDALE FIRE DEPARTMENT	40.0	43.741083	-92.870611
267	WQNS799	450-470	BIRDS EYE FOODS, LLC	80.0	44.075778	-93.512056
268	WQNS915	800/900	DAKOTA, COUNTY OF	241.0	44.714833	-93.124778
269	WQNT540	150-174	ST ANSGAR MILLS INC	40.0	43.378056	-92.917500
270	WQOC975	450-470	HAFNER FARMS	32.0	43.620556	-92.348611
271	WQOJ599	450-470	HURST, ABE	32.0	43.392778	-92.613889

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
272	WQOM569	450-470	BOYSEN FARMS	32.0	43.821778	-92.877472
273	WQOM602	450-470	HAYFIELD PUBLIC SCHOOLS	32.0	43.881333	-92.841167
274	WQOS636	450-470	VIKING AUTOMATIC SPRINKLER COMPANY	80.0	44.043306	-92.528361
275	WQPA482	150-174	LUECK, STEVE	72.0	44.070278	-91.939722
276	WQPC975	450-470	SPRUNG, LEVI	32.0	43.407778	-92.661111
277	WQPI707	150-174	HENDERSON, DAVE	30.0	43.653028	-92.389056
278	WQPM436	450-470	M J MERTEN P T S P	32.0	43.629972	-93.016306
279	WQPT587	800/900	MINNESOTA, STATE OF	40.0	43.545611	-92.470000
280	WQPY464	72-76, 150-174, 450-470, 470-512	ENTERCOM LICENSE, LLC	200.0	44.976472	-93.276139
281	WQQ590	150-174	HINKLE, GREG	40.0	43.839139	-92.386833
282	WQQB224	450-470	SOMINN MACHINERY SALES	40.0	44.023083	-92.851944
283	WQQH265	150-174	HI YIELD PRODUCTS INC	40.0	43.760444	-93.177889
284	WQQT329	450-470	START FARMS INC	32.0	43.573278	-92.445500
285	WQQU249	450-470	ALLI ROLLOFF, INC.	32.0	44.011472	-92.699250
286	WQR701	25-50	STUSSY CONSTRUCTION INC	48.0	44.068306	-92.755194
287	WQRH271	450-470	INDEPENDENT SCHOOL DISTRICT 495	32.0	43.709056	-92.561778
288	WQRI683	25-50	SCHMITTY & SONS BUS COMPANY	113.0	44.620361	-93.296056
289	WQRM434	450-470	DAMEL CORPORATION INC	32.0	43.701611	-92.982167
290	WQRR650	150-174	PATTERSON, CHRISTOPHER L	32.0	43.490278	-92.877778
291	WQRV582	450-470	SHEELY FARMS	32.0	43.756417	-92.820528
292	WQRV886	450-470	SISKOW FARMS	42.0	43.575611	-92.510139
293	WQRX968	450-470	AKKERMAN FARMS	32.0	43.716694	-92.870806
294	WQRZ612	450-470	CARMAN, MARK	32.0	43.656139	-92.513972
295	WQRZ991	150-174	Spring Valley Street Department	40.0	43.692194	-92.374333

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
296	WQSA439	150-174	WISPERING PINES FARMS LLC	40.0	43.925833	-93.004111
297	WQSB986	450-470	WALERAK BROTHERS FARM	32.0	43.861583	-92.757000
298	WQSC810	150-174	RUNDE, RONNIE	40.0	43.486944	-92.611111
299	WQSD395	150-174	FRITCHER, RUSSELL A	40.0	43.370028	-92.401667
300	WQSF987	800/900	LNS SPECTRUM, LLC	113.0	44.006722	-92.718611
301	WQSF992	800/900	VERTICAL VENTURES V, LLC	113.0	44.044722	-92.400278
302	WQSF994	800/900	WIGGINS, WESLEY	113.0	44.006722	-92.718611
303	WQSF996	800/900	GOUAUX, SUE M	113.0	44.006722	-92.718611
304	WQSF998	800/900	Iota Spectrum Partners, LP	113.0	44.006722	-92.718611
305	WQSF999	800/900	Iota Spectrum Partners, LP	113.0	44.006722	-92.718611
306	WQSG200	800/900	RAZI, LLC	113.0	44.006722	-92.718611
307	WQSG201	800/900	WILLSON SPECTRUM, LLC	113.0	44.006722	-92.718611
308	WQSG202	800/900	Iota Spectrum Partners, LP	113.0	44.006722	-92.718611
309	WQSG203	800/900	CARBAJAL, RUDOLPH J	113.0	44.006722	-92.718611
310	WQSG211	800/900	VERTICAL VENTURES V, LLC	113.0	44.044722	-92.400278
311	WQSJ709	450-470	NORTHERN COUNTRY CO-OP	32.0	43.439167	-92.780833
312	WQSK907	800/900	MINNESOTA, STATE OF	40.0	43.848111	-92.861722
313	WQSK907	800/900	MINNESOTA, STATE OF	40.0	43.875083	-93.049583
314	WQSK907	800/900	MINNESOTA, STATE OF	40.0	44.052278	-92.901028
315	WQSV435	450-470	LARSON, DUKE R	32.0	43.466528	-92.416028
316	WQSW614	450-470	Lickteig & Bastyr Farms, LLC.	32.0	43.641389	-93.018056
317	WQSY894	450-470	Dahl, Thomas	56.0	43.712500	-93.248333
318	WQSY954	150-174	XCEL ENERGY SERVICES INC.	80.0	44.299139	-93.249111
319	WQTD982	450-470	XCEL ENERGY SERVICES INC.	80.0	44.299139	-93.249111
320	WQTH200	150-174, 450-470	Minnesota Freezer Warehouse Company	40.0	43.685000	-92.955278

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321	WQTI695	800/900	Iota Spectrum Partners, LP	113.0	44.006722	-92.718611
322	WQTI696	800/900	Iota Spectrum Partners, LP	113.0	44.006722	-92.718611
323	WQTM684	150-174	Nelson, Joel	40.0	43.501528	-92.901472
324	WQTN282	800/900	Iota Spectrum Partners, LP	50.0	44.006722	-92.718611
325	WQTN743	450-470	Vorwerk, Adam	32.0	43.680556	-92.273611
326	WQTS820	450-470	Schlicter Farms	32.0	43.593972	-92.780444
327	WQTT427	450-470	Ancom Communications, Inc.	32.0	43.613139	-92.430556
328	WQTT782	450-470	Hemingway, Eric	97.0	44.412500	-92.594417
329	WQTU931	450-470	J & S Repair Precision Inc	32.0	43.714611	-92.378083
330	WQTY287	450-470	FOWLER CORPORATION	32.0	43.714611	-92.378139
331	WQTY473	450-470	RUEHLOW, BLAKE	50.0	43.298611	-92.760278
332	WQTZ807	450-470	BESKAU, PAUL J	32.0	43.949472	-92.862472
333	WQUB919	450-470	STANTON FARMS	32.0	43.891750	-92.873028
334	WQUD932	450-470	M & L FARMS	32.0	43.821806	-92.883778
335	WQUD957	450-470	Simplified Technology Solutions, LLC	32.0	43.667167	-92.972889
336	WQUR381	450-470	Pacelli Catholic Schools	24.0	43.669222	-92.980417
337	WQUS500	450-470	Flying S Farm	40.0	43.851028	-92.866611
338	WQUT609	150-174	KRUGER, ROGER	40.0	43.918472	-92.875306
339	WQUW918	800/900	Xcel Energy Services, Inc	113.0	44.623889	-92.636944
340	WQUX493	450-470	AG POWER ENTERPRISES	32.0	43.505083	-92.944722
341	WQUZ350	450-470	Ancom Communications, Inc.	32.0	43.720194	-92.704639
342	WQUZ925	450-470	ALL AMERICAN CO OP	32.0	43.853028	-92.486000
343	WQVA247	450-470	SCOTCH PRAIRIE FARMS LLC	80.4	44.338056	-92.211389
344	WQVE884	450-470	HSRE-WSL ON MAYOWOOD II TRS, LLC	32.0	43.998361	-92.475722
345	WQVL496	800/900	MOWER, COUNTY OF	40.0	43.668528	-92.992583

ID	Call Sign	Frequency Band (MHz)	Licensee	Mobile Area Radius (km)	Latitude (NAD83)	Longitude (NAD83)
346	WQVM230	450-470	H-FARMS, INC.	32.0	43.685639	-92.688472
347	WQVN419	450-470	AMERICAN TIME & SIGNAL CO.	20.0	43.708944	-92.562139
348	WQVN419	450-470	AMERICAN TIME & SIGNAL CO.	20.0	43.848861	-92.479528
349	WQVN419	450-470	AMERICAN TIME & SIGNAL CO.	20.0	43.861556	-92.499778
350	WQVN549	450-470	Goslee, Larry	32.0	43.558056	-93.048056
351	WQVN590	150-174	NEIA Pump Service Inc	96.0	43.221111	-91.835028
352	WQVP550	150-174	Wigham, Duane	32.0	43.629222	-92.710722
353	WQVP932	150-174	Krell, Justin	80.0	43.864417	-93.061944
354	WQVQ405	450-470	HILTON, BILL	32.0	43.685056	-92.687611
355	WQWG231	450-470	Boulders of Rochester LLC	32.0	44.004194	-92.554222
356	WQWM718	450-470	Century Farms	40.0	43.620444	-92.708194
357	WQWN580	450-470	Hahn, Brian	40.0	43.848972	-92.749750
358	WQWP689	450-470	Thunder Farms	40.0	43.514167	-92.269917
359	WQWR291	450-470	Autumn Ridge Church	80.0	44.005528	-92.518972
360	WQWT339	450-470	Vestas American Wind Technology	32.0	43.436556	-92.783583
361	WQWT339	450-470	Vestas American Wind Technology	40.0	43.720361	-92.704972
362	WQWZ877	150-174	HIGH PRAIRIE 2 WIND FARM, LLC DBA	32.0	43.496250	-92.579306
363	WQXB359	450-470	Lagerstedt, David L	32.0	43.563889	-92.733333
364	WQXB751	450-470	Powers, Chris	121.0	44.021278	-92.495806
365	WQXE387	150-174	CRANE CREEK ELECTRIC	32.0	43.394778	-92.632472
366	WQXN436	150-174	XCEL ENERGY SERVICES INC.	80.0	44.299139	-93.249111
367	WQXR614	450-470	HUNT, JASON	80.0	43.993611	-92.448167
368	WQYC577	450-470	Twin Creek Farms	80.0	44.071083	-92.897500
369	WQYD339	150-174	BUNNE, DOMINICK	40.0	43.536611	-92.510139
370	WQYD346	450-470	OEHLKE FARMS	32.0	43.756139	-92.553778

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371	WQYD441	450-470	Jensen, Michael D	80.0	43.703111	-93.568222
372	WQYD785	450-470	BROADWATER, BEN	48.0	43.558333	-92.231083
373	WQYF728	450-470	HEMANN, KURT	32.0	43.466667	-92.777500
374	WQYI475	450-470	RUSSELL AND JORDAN NELSON	32.0	43.444444	-92.870556
375	WQYJ371	450-470	ABSOLUTE ENERGY LLC	32.0	43.497806	-92.954361
376	WQYM200	450-470	Carpenter Farms	32.0	43.655972	-92.690639
377	WQYR274	450-470	WEST UNION TRENCHING LLC	160.0	42.963556	-91.799028
378	WQYT901	450-470	Hilltop Communications, Inc	30.0	43.894417	-92.852139
379	WQYU647	450-470	Ziegler Inc	32.0	43.929528	-92.469722
380	WQYV525	150-174	VICKERMAN, SHELBY	80.0	43.536833	-91.744556
381	WQZA414	450-470	MIENERGY COOPERATIVE	80.0	43.772222	-91.985000
382	WQZF388	450-470	J & K CONSTRUCTION	80.0	43.283611	-92.790556
383	WRAR597	450-470	DECOOK EXCAVATING INC.	32.0	44.028028	-92.636278
384	WRAX937	450-470	Gerlach, Larry	32.0	43.630056	-92.928694
385	WRBL370	450-470	Angell, Gary	32.0	43.677694	-92.724167
386	WRBV603	450-470	DAIRYLAND POWER COOPERATIVE	32.0	43.680000	-92.355083
387	WRBV603	450-470	DAIRYLAND POWER COOPERATIVE	32.0	43.732778	-92.675556
388	WRCB432	150-174	Ellingson Trenchless LLC	80.0	44.138417	-92.900417
389	WRCD294	450-470	ROTTINGHAUS GRAIN INC.	64.0	43.123194	-92.795417
390	WRCH993	450-470	Krahn X, LLC	32.0	43.730139	-92.350889
391	WRCI945	450-470	ROONEY TRUCKING, INC.	152.0	42.643139	-92.912417
392	WRCL625	150-174	INDEPENDENT SCHOOL DISTRICT 497	32.0	43.508806	-92.943194
393	WRCL894	450-470	RINDELS, SCOTT	32.0	43.563389	-92.348917
394	WRCN231	450-470	BEHR, RONALD	159.0	43.026306	-93.330222
395	WRCQ237	150-174	Howe Farms	32.0	43.746750	-92.690139

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396	WRCQ820	450-470	HINDT FAMILY FARMS	32.0	43.674250	-92.395750
397	WRCR679	450-470	Bishop, Adam	32.0	43.850611	-93.010361
398	WRCX660	450-470	DECOOK, BRYAN	32.0	43.904472	-92.620667
399	WRCX876	150-174	KUPER, DALLAS	40.0	43.359972	-92.811389
400	WRDI677	450-470	Southland School District 500	32.0	43.568139	-92.718222
401	WRDL268	450-470	AMERICAN TIME & SIGNAL CO.	20.0	43.568639	-92.716833
402	WRDS659	450-470	SHOWALTER, DANIEL	80.0	43.485000	-92.870278
403	WRDT637	450-470	Schams Heifer Express	121.0	44.278333	-91.843889
404	WRFE865	450-470	HAM, JAMIE	80.0	43.242222	-92.865556
405	WRFS985	450-470	EDF Renewables Services, Inc.	32.0	43.772694	-92.680694
406	WRJA435	450-470	KEIM, ROBERT	32.0	43.553611	-92.309167
407	WRJL608	450-470	REICHERTS, GARY	50.0	43.373889	-92.672778
408	WRJQ424	450-470	AUSTIN UTILITIES	24.0	43.692750	-92.952222
409	WRJT635	150-174	Hanegraaf Farms	40.0	43.623750	-92.896500
410	WRO409	450-470	KNAPP, CARL	80.0	43.196083	-92.595750
411	WRP910	150-174	STACYVILLE COOPERATIVE CO	70.0	43.436361	-92.781306
412	WRT797	450-470	LOREN & HANSON FARM	32.0	43.734139	-92.504583
413	WSE810	150-174	Palmer Bus Co.	40.0	43.686833	-92.980694
414	WSH917	450-470	SCOTT, ALLEN	64.0	43.720528	-92.703528
415	WSS343	450-470	Hilltop Communications, Inc	80.0	44.006083	-92.423778
416	WYY356	450-470	SAMPSON, GERALD	72.0	43.508028	-92.877139
417	WZC677	150-174	FILLMORE, COUNTY OF	48.0	43.681083	-92.091278

Table A: Mobile Licenses Intersecting Project Area