# Appendix F
# Wind Power GeoPlanner™ Microwave Study
# Wind Power GeoPlanner™ AM and FM Radio Report
# for the North Bend Wind Project

# Wind Power GeoPlanner™

# Microwave Study

## North Bend Wind Project

Prepared on Behalf of
North Bend Wind
Project, LLC

September 25, 2020

COMSEARCH®
A CommScope Company

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# 1. Introduction

Microwave bands that may be affected by the installation of wind turbine facilities operate over a wide frequency range (900 MHz – 23 GHz). Comsearch has developed and maintains comprehensive technical databases containing information on licensed microwave networks throughout the United States. These systems are the telecommunication backbone of the country, providing long-distance and local telephone service, backhaul for cellular and personal communication service, data interconnects for mainframe computers and the Internet, network controls for utilities and railroads, and various video services. This report focuses on the potential impact of wind turbines on licensed, proposed and applied non-federal government microwave systems.

# 2. Project Overview

**Project Information**

**Name**: North Bend Wind Project

**County**: Hughes and Hyde Counties

**State**: South Dakota

**Number of Turbines**: TBD

**Blade Diameter:** TBD

**Hub Height**: TBD

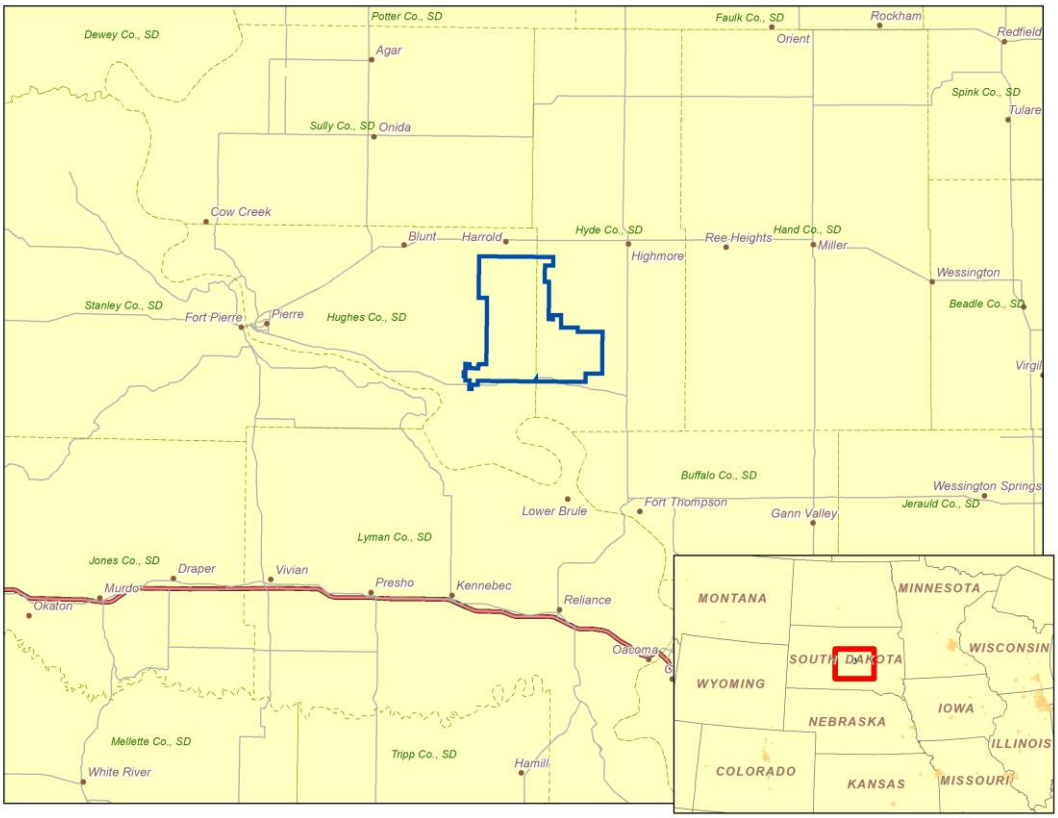



*Figure 1: Area of Interest*

# 3. Fresnel Zone Analysis

## Methodology

Our obstruction analysis was performed using Comsearch's proprietary microwave database, which contains all non-government licensed, proposed and applied paths from 0.9 - 23 GHz[1]. First, we determined all microwave paths that intersect the area of interest[2] and listed them in Table 1. This path and the area of interest that encompasses the planned turbine locations are shown in Figure 2.

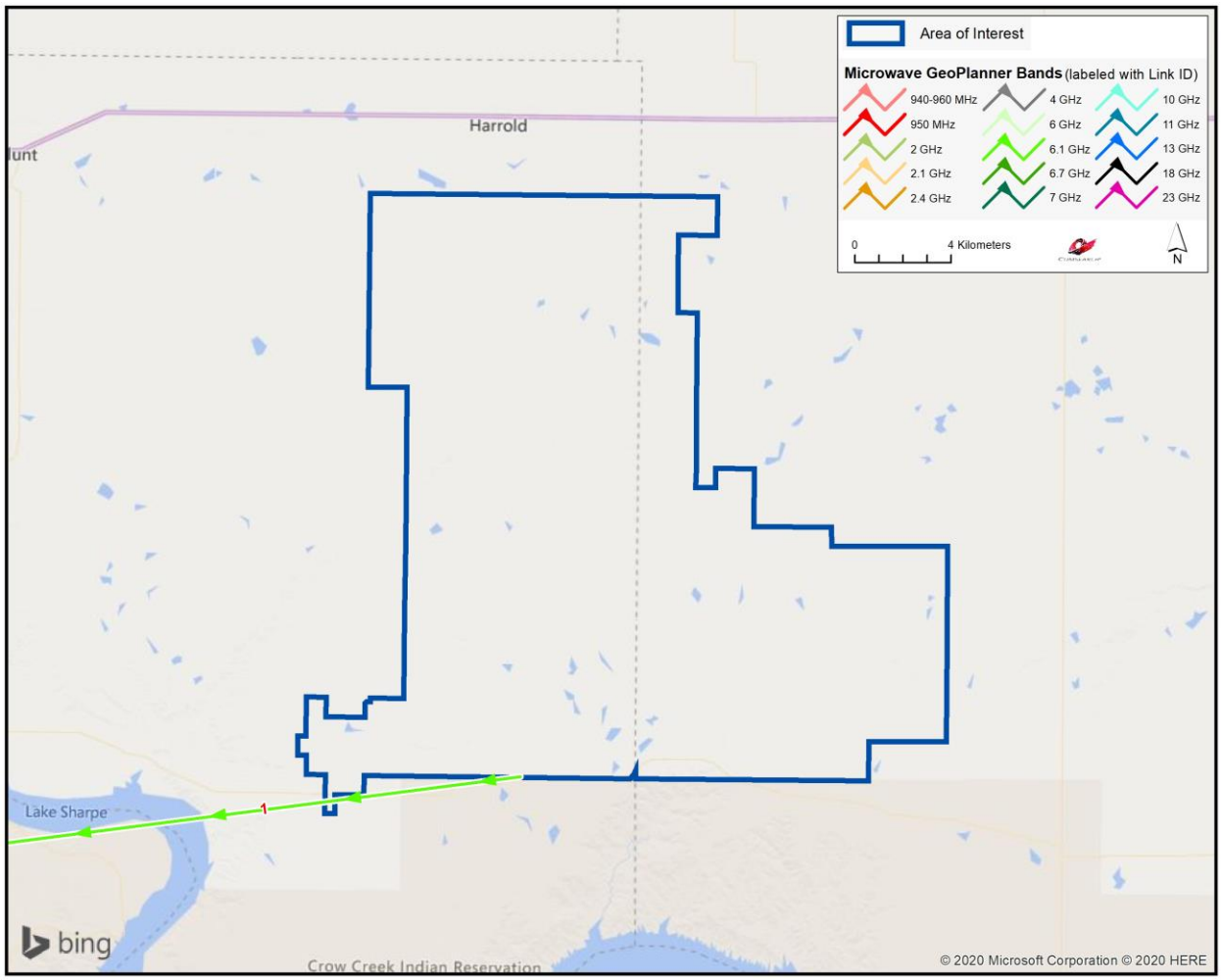



*Figure 2: Microwave Paths that Intersect the Area of Interest*

[1] Please note that this analysis does not include unlicensed microwave paths or federal government paths that are not registered with the FCC.

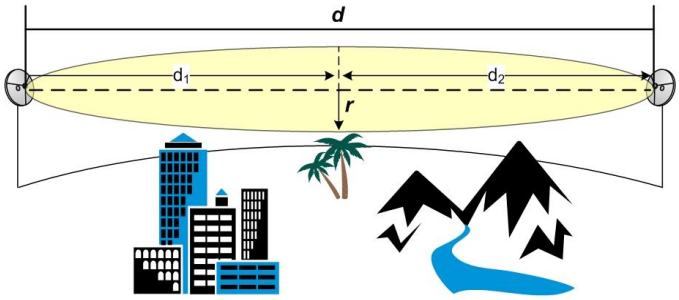
[2] We use FCC-licensed coordinates to determine which paths intersect the area of interest. It is possible that as-built coordinates may differ slightly from those on the FCC license.

| ID | Status | Callsign 1 | Callsign 2 | Band | Path Length (km) | Licensee |
|---|---|---|---|---|---|---|
| 1 | Proposed | CROWCREE | LOWERBRU | Lower 6 GHz | 24.02 | New Cingular Wireless PCS-ND,SD,NE,IA,MT |

*Table 1: Summary of Microwave Paths that Intersect the Area of Interest*
*(See enclosed mw_geopl.xlsx for more information and*
*GP_dict_matrix_description.xls for detailed field descriptions)*

Next, we calculated a Fresnel Zone for this path based on the following formula:

$$r \cong 17.3\sqrt{\frac{n}{F_{GHz}}\left(\frac{d_1 d_2}{d_1 + d_2}\right)}$$




Where,

| | | |
|---|---|---|
| r | = | Fresnel Zone radius at a specific point in the microwave path, meters |
| n | = | Fresnel Zone number, 1 |
| $F_{GHz}$ | = | Frequency of microwave system, GHz |
| $d_1$ | = | Distance from antenna 1 to a specific point in the microwave path, kilometers |
| $d_2$ | = | Distance from antenna 2 to a specific point in the microwave path, kilometers |

The calculated Fresnel Zone shows the narrow area of signal swath and is calculated for the microwave path in the project area. In general, this is the area where the planned wind turbines should be avoided, if possible. Likewise, Comsearch recommends that an area directly in front of each microwave antenna should be avoided. This corresponds to the Consultation Zone which measures 1 kilometer along the main beam of the antenna and 24 ft (7.3 meters) wide. A depiction of the individual Fresnel and Consultation Zones is shown in Figure 3, and is also included in the shapefiles[3,4].

[3] The ESRI® shapefiles enclosed are in NAD 83 UTM Zone 14 projected coordinate system.

[4] 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.

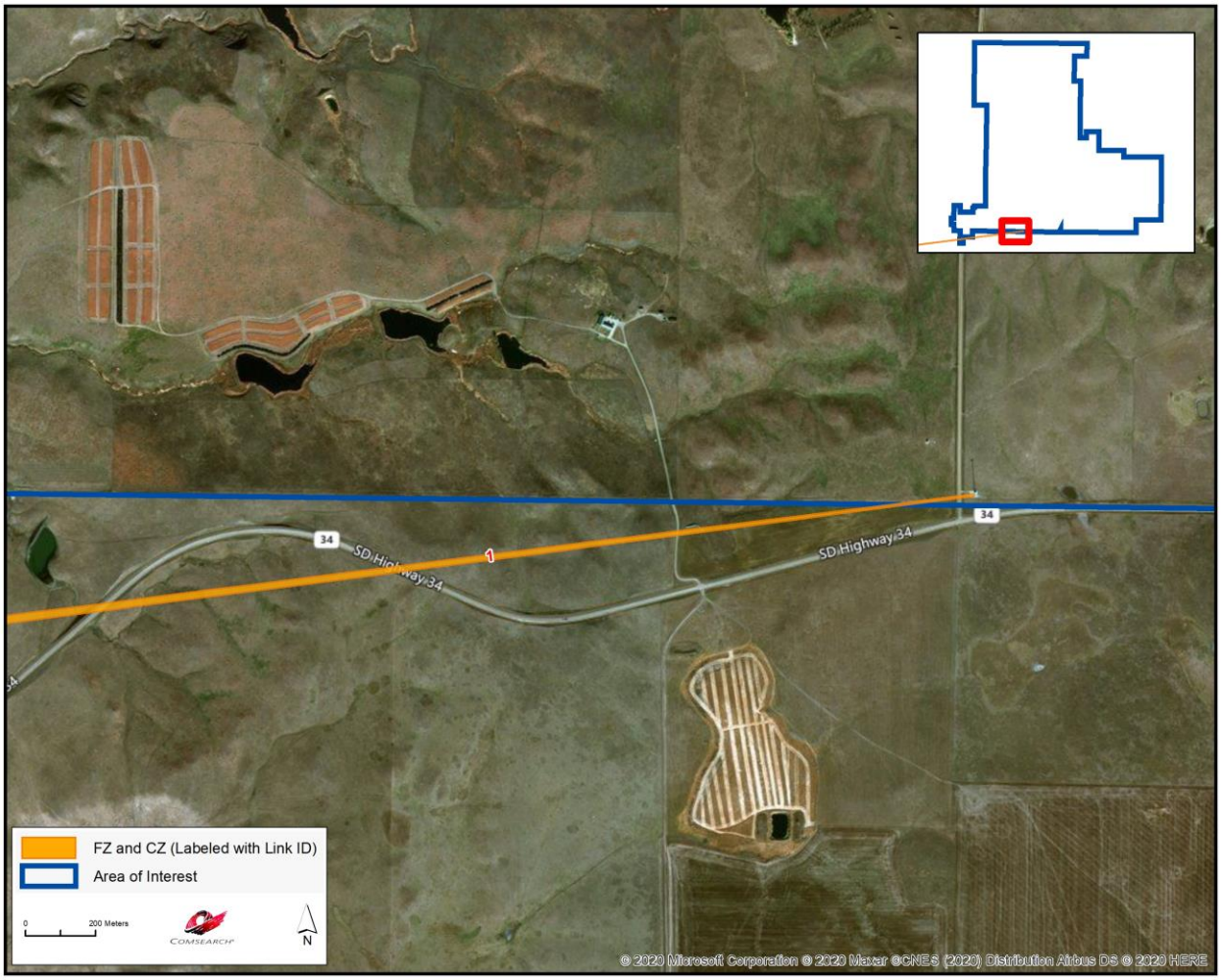



*Figure 3: Fresnel and Consultation Zones in the Area of Interest*

## Discussion of Potential Obstructions

| Total Microwave Paths | Paths with Affected Fresnel Zones | Total Turbines | Turbines intersecting Fresnel Zones |
|---|---|---|---|
| 1 | N/A | N/A | N/A |

For this project, turbine locations were not provided; thus we could not determine if any potential obstructions exist between the planned wind turbines and the incumbent microwave paths. If the latitude and longitude values for turbine locations are provided, Comsearch can identify where a potential conflict might exist.

## 4. Conclusion

Our study identified one microwave path intersecting the North Bend Wind Project area. The Fresnel and Consultation Zones for this microwave path were calculated and mapped. We recommend that all turbines be sited in locations that will not encroach on these exclusion zones.

## 5. Contact

For questions or information regarding the Microwave Study, 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

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# AM and FM Radio Report

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# Table of Contents

# 1. Introduction

Comsearch analyzed AM and FM radio broadcast stations whose service could potentially be affected by the proposed North Bend Wind Project in Hughes and Hyde Counties, South Dakota.

# 2. Summary of Results

**Project Information**

**Name**: North Bend Wind Project

**County**: Hughes and Hyde

**State**: South Dakota

**Blade Diameter**: TBD

**Hub Height**: TBD

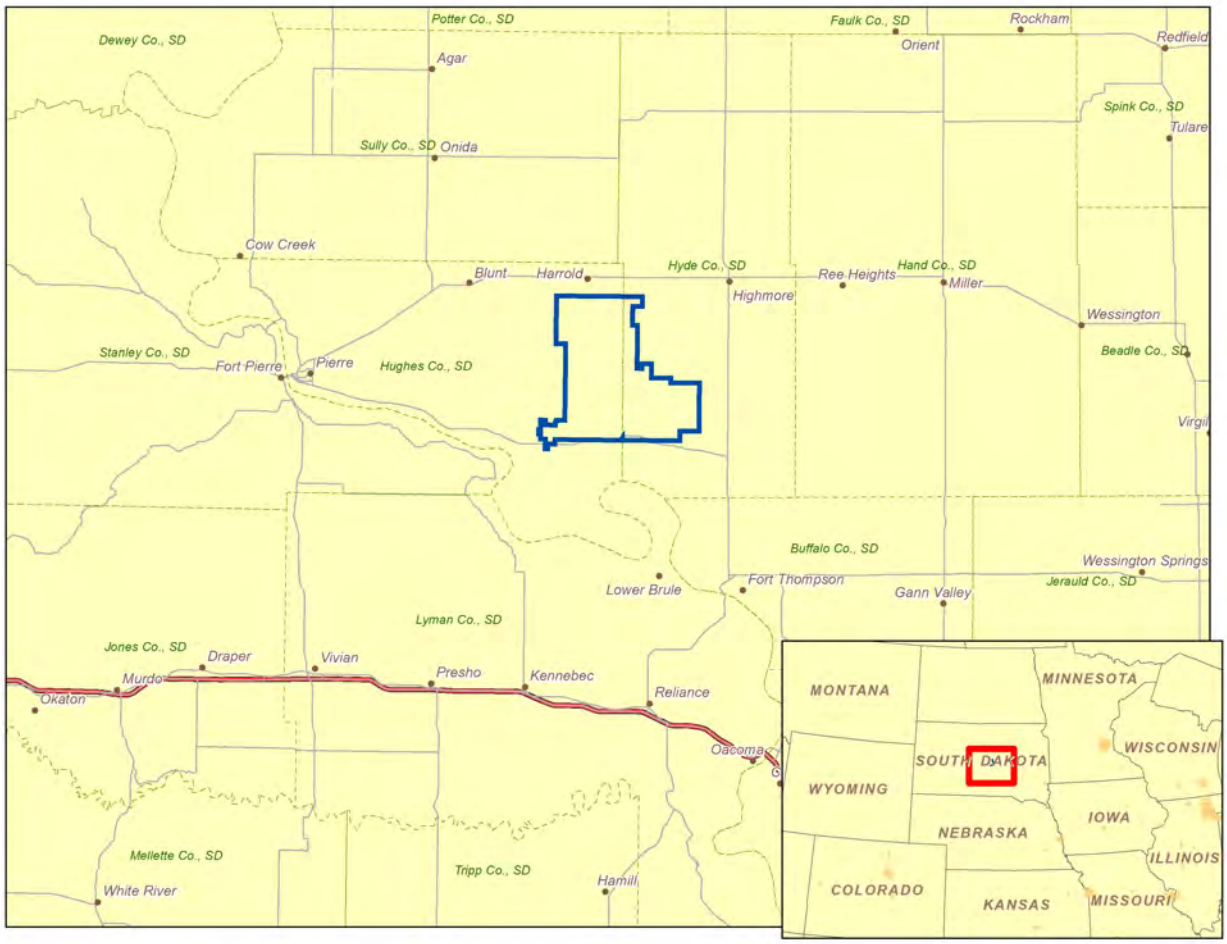


*Figure 1: Area of Interest*

## AM Radio Analysis

Comsearch found no database records[1] for AM stations within approximately 30 kilometers of the project area of interest (AOI).

## FM Radio Analysis

Comsearch determined that there was one FM database record for stations within a 30-kilometer radius of the North Bend Wind project, as shown in Table 2 and Figure 2. The station, KZZE-LP, is currently licensed and operating in Fort Thompson, South Dakota, to the south of the project area, 24.36 km from the AOI.

| ID | Call Sign | Status[2] | Service[3] | Frequency (MHz) | Transmit ERP[4] (kW) | Latitude (NAD 83) | Longitude (NAD 83) | Distance to the Project Area (km) |
|---|---|---|---|---|---|---|---|---|
| 1 | KZZE-LP | LIC | FL | 96.5 | 0.1 | 44.073434 | -99.439718 | 24.36 |

*Table 2: FM Radio Stations within 30 km*

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

[4] ERP = Transmit Effective Radiated Power.

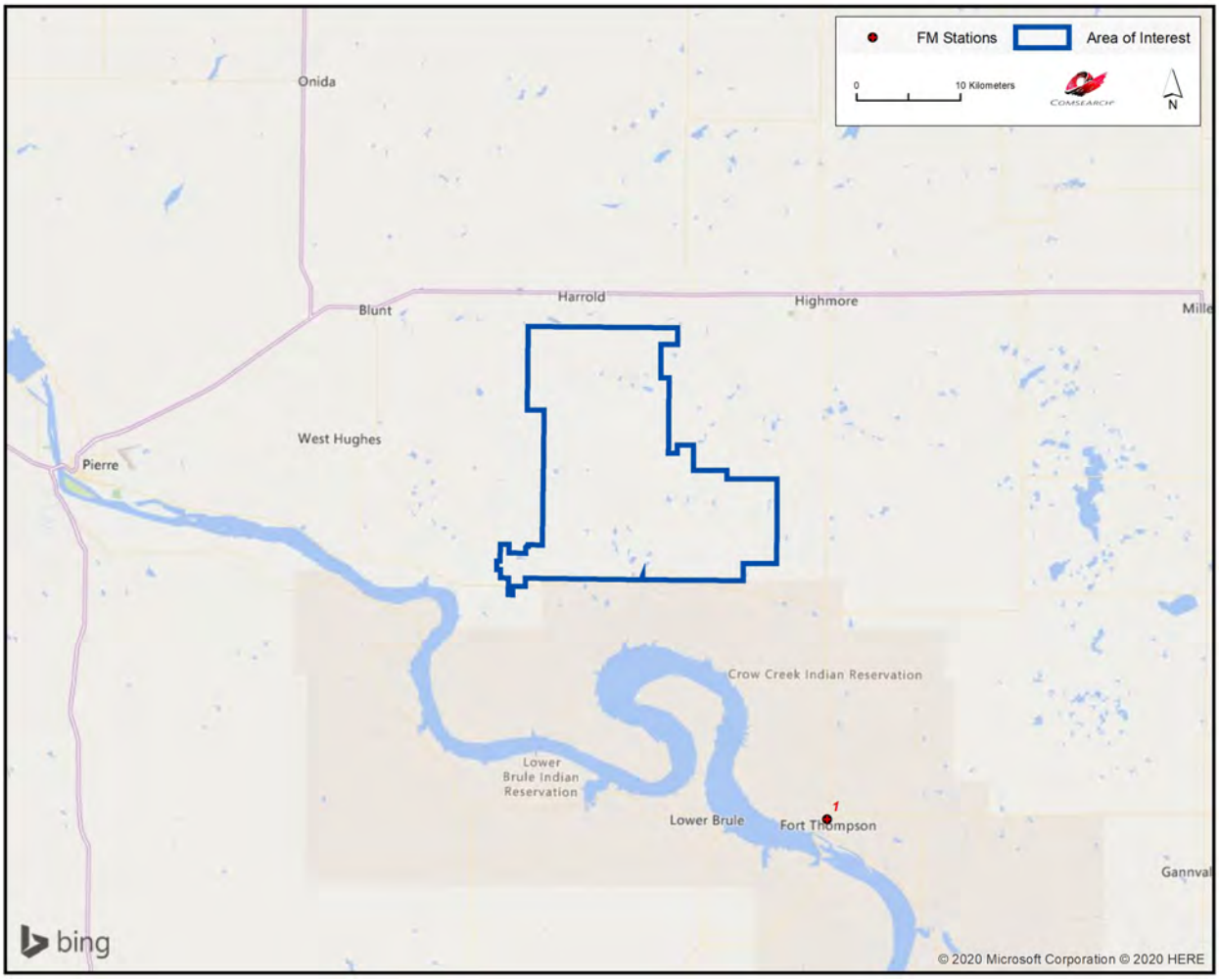


*Figure 2: FM Radio Stations within 30 km*

## 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. A search radius of 30 km found no AM station records. 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, towers) are located in the far field region of the radiating antenna to avoid the risk of distorting its radiation pattern. Station KZZE-LP is the nearest FM station to the proposed turbine locations at 24.36 km away. At this distance there should be adequate separation to avoid radiation pattern distortion.

## 4. Recommendations

Since no impact on 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
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