

Wind Power GeoPlanner™

Microwave Study

Agricola Wind



Prepared on Behalf of
Liberty Renewables Inc.

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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: Agricola Wind

County: Cayuga

State: New York

Number of Turbines: 24

Blade Diameter: 162 meters

Hub Height: 119 meters

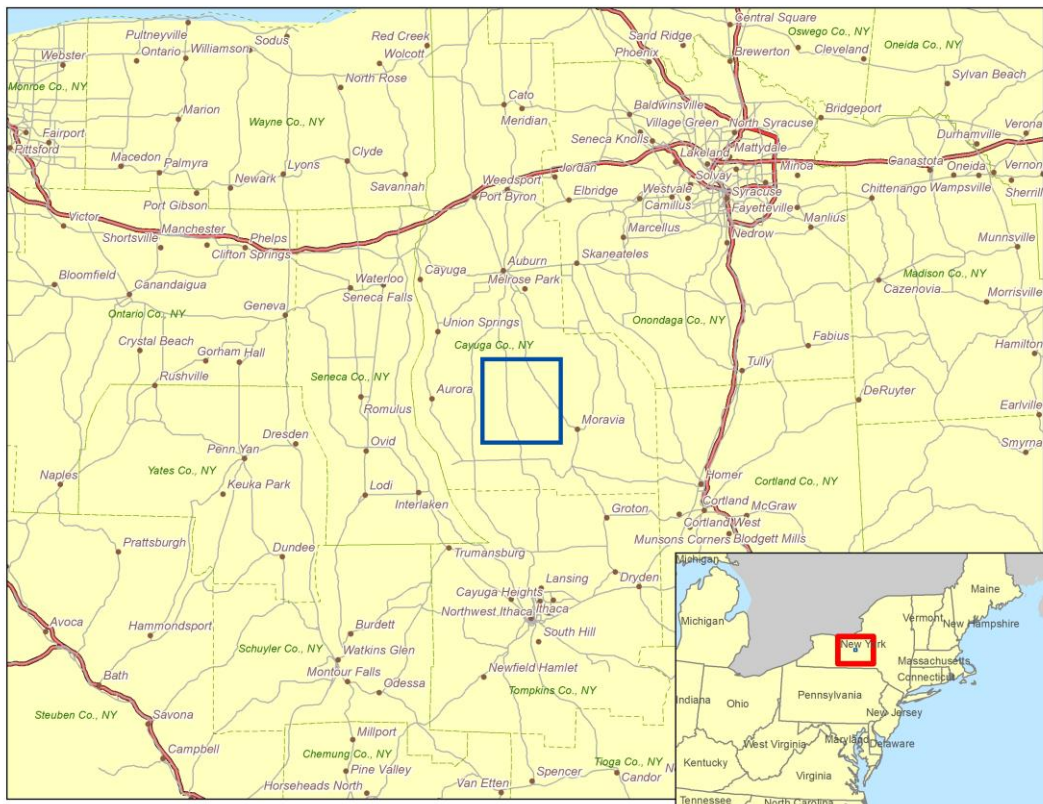


Figure 1: Area of Interest

3. Two-Dimensional 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 GHz¹. First, we determined all microwave paths that intersect the area of interest² defined as a rectangular area with a minimum of a 2-mile buffer from all turbine locations and listed them in Table 1. These paths and the area of interest that encompasses the planned turbine locations with a minimum 2-mile buffer are shown in Figures 2, 3 and 4.

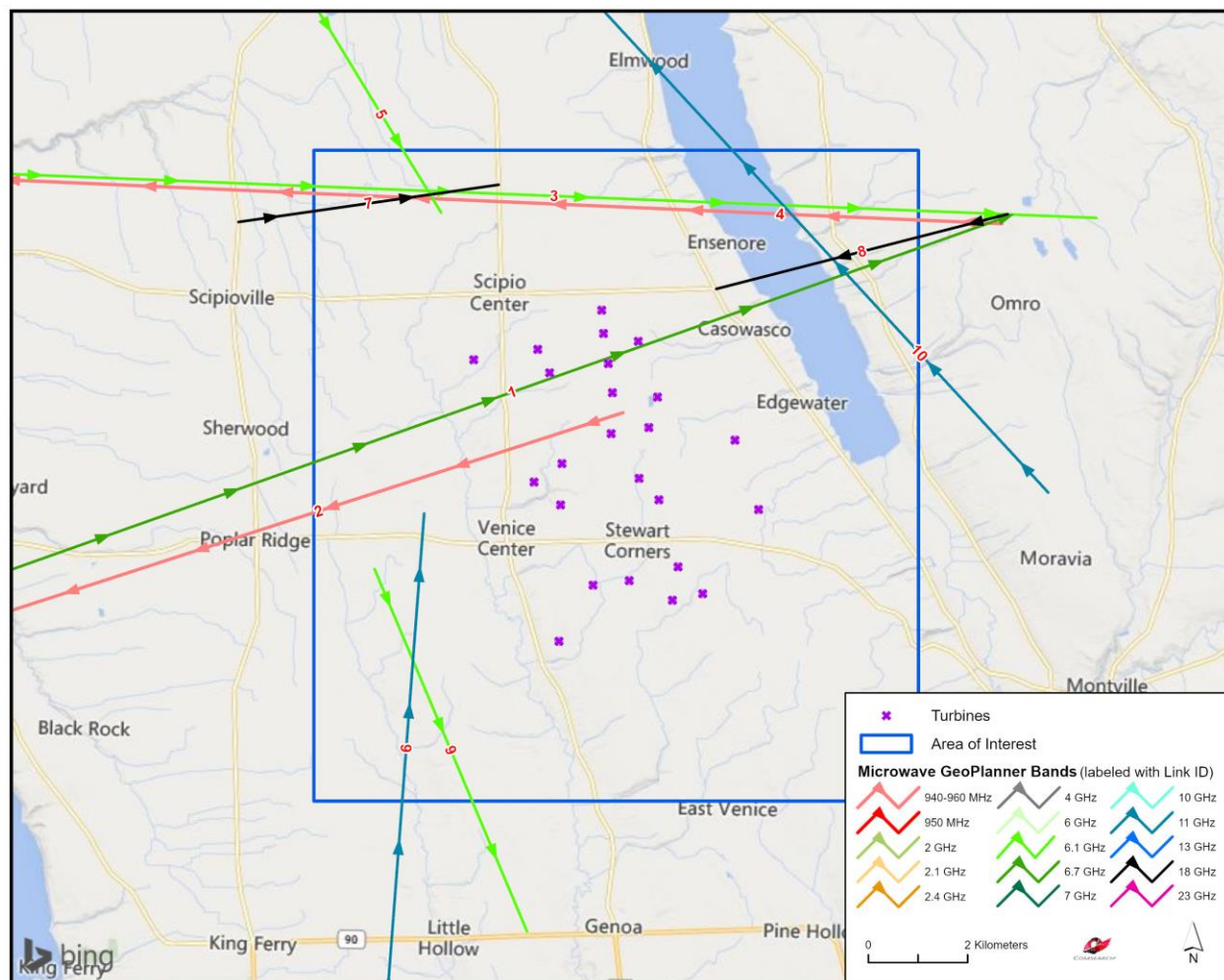


Figure 2: Microwave Paths that Intersect the Area of Interest

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	Licensed	KDT82	KDD97	6.7 GHz	77.89	Eastern Gas Transmission and Storage, In
2	Questionable	WPJA611	WNTZ201	940-960 MHz	72.91	Pfeiffer, Terry L
3	Licensed	WPOV470	WQUL772	6.1 GHz	55.13	Pfeiffer, Terry L
4	Questionable	WPOV473	WPOV470	940-960 MHz	53.23	Pfeiffer, Terry L
5	Licensed	WQQU634	WQQU640	6.1 GHz	18.86	New Cingular Wireless PCS, LLC (NY)
6	Licensed	WQTQ474	WQWY200	11 GHz	32.21	Clarity Connect, Inc.
7	Questionable	WQWX654	WQWX655	18 GHz	5.30	Clarity Connect, Inc.
8	Licensed	WQWX767	WQWX598	18 GHz	6.08	Clarity Connect, Inc.
9	Licensed	WQYU906	WQYU905	6.1 GHz	7.92	Transwave Communication Systems, Inc.
10	Licensed	WRED472	WRED471	11 GHz	17.10	Sprintcom, Inc

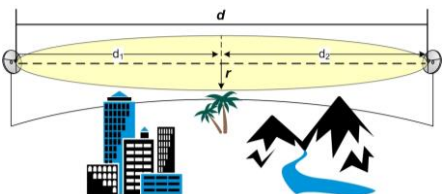
Table 1: Summary of Microwave Paths that Intersect the Area of Interest

(See enclosed mw_geopl.xlsx for more information and
GP_dict_matrix_description.xls for detailed field descriptions)

Verification of Coordinate Accuracy

It is possible that as-built coordinates may differ from those on the FCC license. For this project, two of these paths cross within close proximity of the proposed turbines and the tower locations for these paths will have a critical impact on the result. Therefore, we verified these locations using aerial photography. Some of the towers were found to be slightly off and were moved to their locations based on the aerial photos³.

Next, we calculated a Fresnel Zone for each 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

³ See enclosed mw_geopl.shp (adjusted locations based on aerial photography/basis for report images and results) and mw_geopl_fcc.shp (locations solely based on FCC licensed information) for details.

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 Fresnel Zones and Consultation Zones for each microwave path listed can be found in Figure 3, and is also included in the enclosed shapefiles^{4,5}.

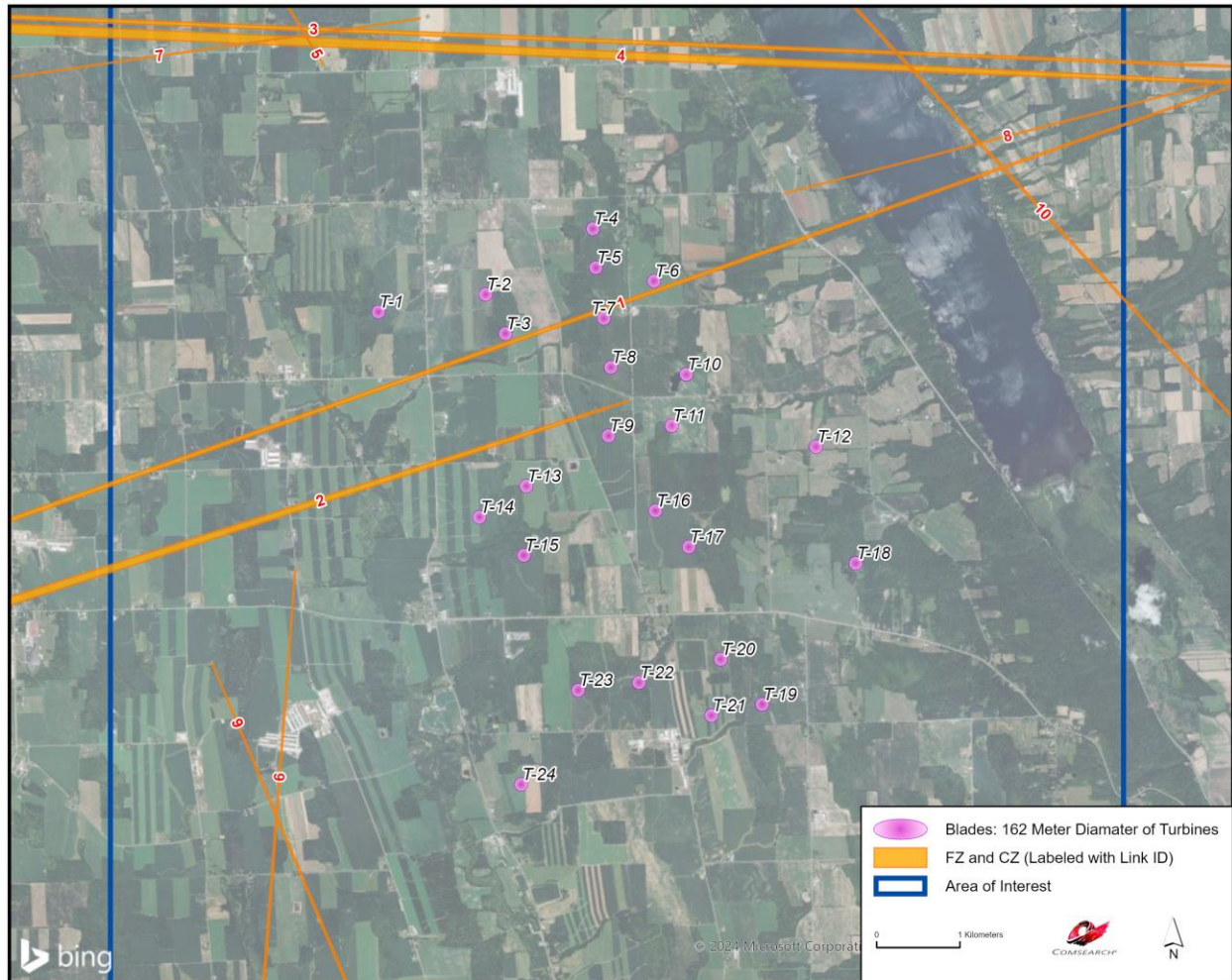


Figure 3: Microwave Paths with Fresnel Zones

⁴ The ESRI® shapefiles enclosed are in NAD 83 UTM Zone 18 projected coordinate system.

⁵ 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.

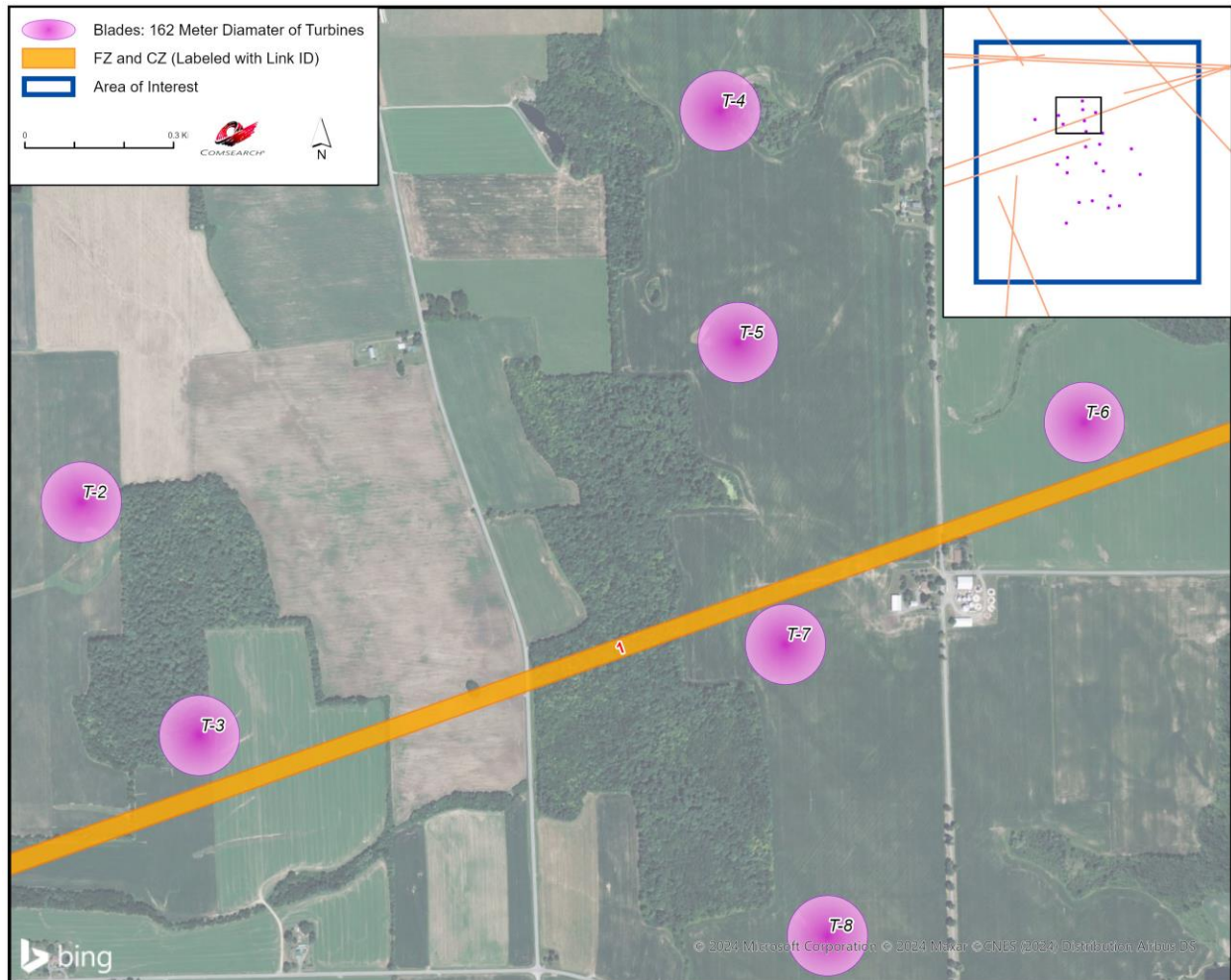


Figure 4: Microwave Paths with Fresnel Zones

4. Conclusion

Total Microwave Paths	Paths with Affected Fresnel Zones	Total Turbines	Turbines intersecting the Fresnel Zones
10	0	24	0

Table 2: Fresnel Zone Analysis Result

Our study identified ten microwave paths intersecting the Agricola Wind area of interest. The Fresnel and Consultation Zones for these microwave paths were calculated and mapped in order to assess the potential impact from the turbines. A total of twenty-four turbines were considered in the analysis with a blade diameter of 162 meters and turbine hub height of 119 meters. Of those turbines, none were found to have potential obstruction with the microwave systems in the area.

5. Contact

For questions or information regarding the Microwave Study, please contact:

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Web site: www.comsearch.com

Appendix: Turbine Locations

New ID	Latitude	Longitude	Elevation (m)	Hub Height (m)	Blade Diameter (m)
T-1	42.77148695	-76.56518110	331.915	119	162
T-2	42.77352734	-76.55138254	378.118	119	162
T-3	42.76939464	-76.54646110	380.659	119	162
T-4	42.78089774	-76.53390128	392.321	119	162
T-5	42.77670238	-76.53335934	397.146	119	162
T-6	42.77536884	-76.52478575	394.694	119	162
T-7	42.77124190	-76.53205525	404.296	119	162
T-8	42.76597068	-76.53088898	402.295	119	162
T-9	42.75856534	-76.53105019	403.789	119	162
T-10	42.76534903	-76.51980318	404.365	119	162
T-11	42.75977835	-76.52181171	412.06	119	162
T-12	42.75779212	-76.50056164	385.395	119	162
T-13	42.75296415	-76.54298281	360.929	119	162
T-14	42.74951972	-76.54980057	352.262	119	162
T-15	42.74548994	-76.54316298	355.953	119	162
T-16	42.75054996	-76.52396454	408.729	119	162
T-17	42.74671517	-76.51897594	414.391	119	162
T-18	42.74526960	-76.49442742	405.733	119	162
T-19	42.72980650	-76.50778340	409.951	119	162
T-20	42.73464360	-76.51400469	408.612	119	162
T-21	42.72855334	-76.51521219	392.563	119	162
T-22	42.73196366	-76.52592079	371.229	119	162
T-23	42.73102696	-76.53482064	366.04	119	162
T-24	42.72073819	-76.54294595	324.297	119	162