



COLUMBUS | CLEVELAND
CINCINNATI-DAYTON
MARIETTA

BRICKER & ECKLER LLP
100 South Third Street
Columbus, OH 43215-4291
MAIN: 614.227.2300
FAX: 614.227.2390

www.bricker.com
info@bricker.com

Sally W. Bloomfield
614.227.2368
sbloomfield@bricker.com

November 14, 2014

Via Electronic Filing

Ms. Barcy McNeal
Public Utilities Commission of Ohio
Administration/Docketing
180 East Broad Street, 11th Floor
Columbus, OH 43215-3793

**Re: Northwest Ohio Wind Energy, LLC, now Trishe Wind Ohio, LLC,
Case No. 13-0197-EL-BGN**

Dear Ms. McNeal:

On December 16, 2013, the Ohio Power Siting Board ("Board") issued a Certificate of Environmental Compatibility and Public Need subject to a number of conditions to Northwest Ohio Wind Energy, LLC ("NOWE"). On August 19, 2014, an application was filed requesting the Board to approve/recognize that the NOWE certificate is now held by Trishe Wind Ohio, LLC ("Trishe")

Condition No. 24 of the Board's Order requires the following:

The Applicant shall monitor the microwave paths to ensure there are no adverse impacts. At least 30 days prior to the preconstruction conference, the Applicant shall conduct a microwave path study that identifies all existing microwave paths that intersect the selected route, and a worst-case Fresnel zone analysis for each path. A copy of this study shall be provided to the path licensee(s) for review, and to Staff for review and confirmation that the Applicant is complying with this condition.

Attached is a copy of the updated microwave study. Because towers T11, T12, T38 and T56 are identified as having potential interference, Trishe has decided to delete those locations from the final layout of 50 turbines in order to prevent any interference.

We request that the Staff notify Applicant that it has complied with this condition. If you have any questions please call at the number listed above.

Sincerely,

Sally W. Bloomfield

Attachment

cc: Grant Zeto (w/Attachment)

Wind Power GeoPlanner™

Microwave Study

Trishe Wind Ohio LLC



Prepared on Behalf of
Starwood Energy Group
Global, Inc.

October 31, 2014



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: Trishe Wind Ohio LLC

County: Paulding

State: Ohio

Number of Turbines: 60

Blade Diameter: 114 meters

Hub Height: 93 meters

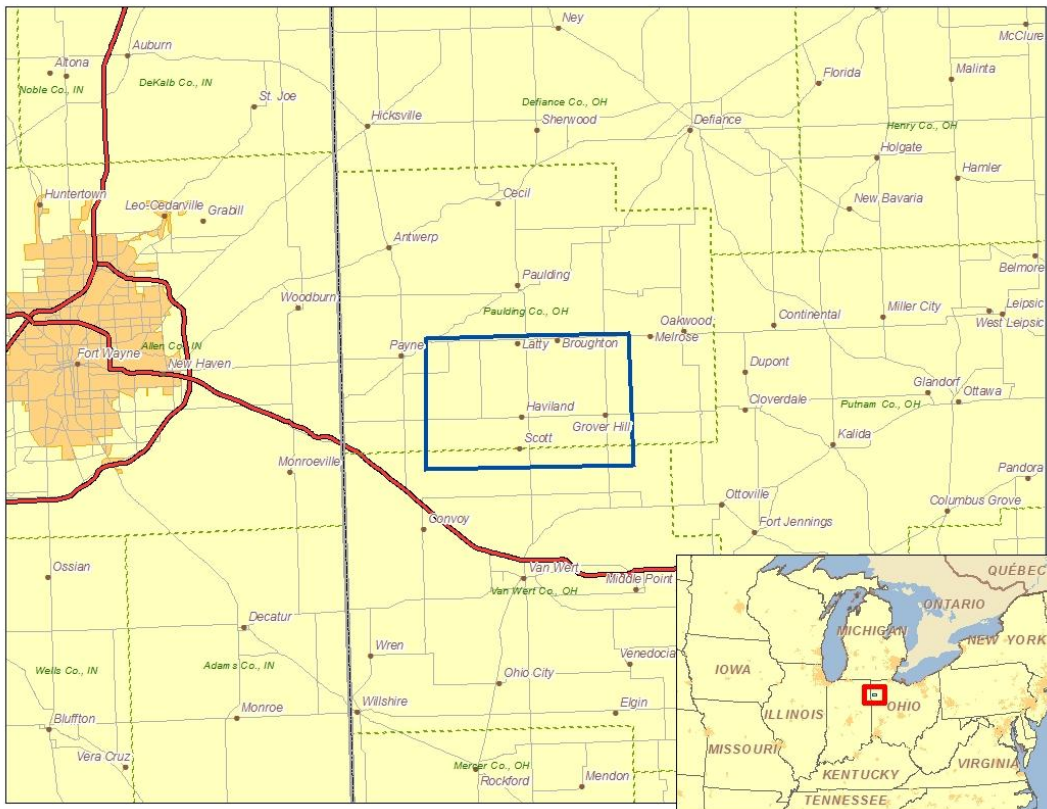


Figure 1: Area of Interest

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 GHz¹. First, we determined all microwave paths that intersect the area of interest² and listed them in Table 1. These paths and the area of interest that encompasses the planned turbine locations are shown in Figure 2.

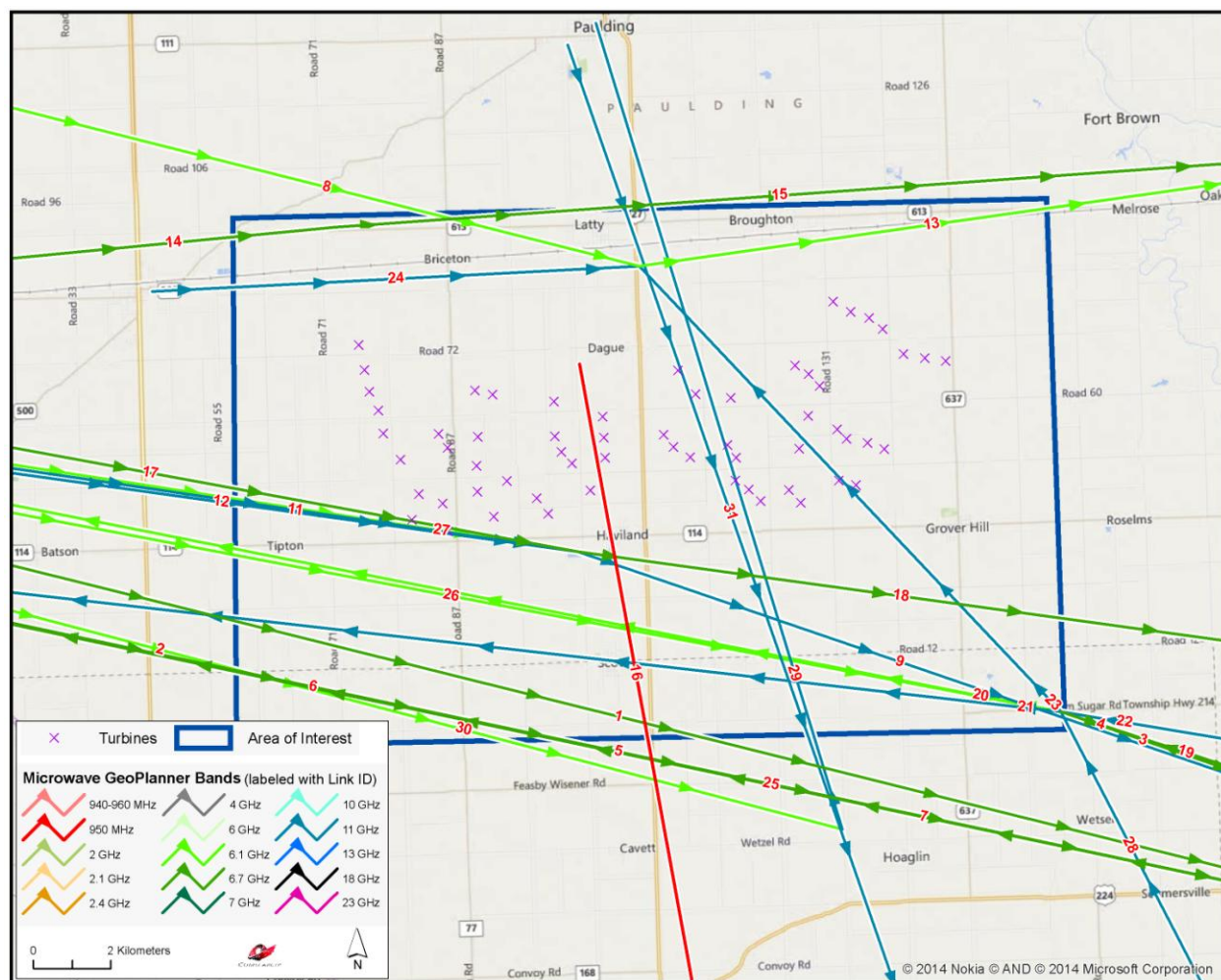


Figure 2: Microwave Paths that Intersect the Area of Interest

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	1029441	1225294	Upper 6 GHz	77.87	Torelco LLC
2	Proposed	1036820	WQUL808	Lower 6 GHz	57.94	Torelco LLC
3	Proposed	1211350	1215371	Upper 6 GHz	43.04	Torelco LLC
4	Proposed	ADA	WETSEL	Upper 6 GHz	60.24	ECW Wireless, LLC
5	Proposed	CCI87269	ATC50782	Lower 6 GHz	49.37	Fundamental Broadcasting LLC
6	Proposed	CCI87269	ATC50782	Upper 6 GHz	49.37	Old Dominion LLC
7	Proposed	FTJENNIN	TOWNLEY	Upper 6 GHz	49.32	ECW Wireless, LLC
8	Proposed	GTPIN-52	OH03415-	Lower 6 GHz	54.80	Wireless Internetwork LLC
9	Proposed	HAVILAND	CAIRO2	11 GHz	44.36	iSignal
11	Proposed	NEWHAVEN	HAVILAND	11 GHz	34.09	iSignal
12	Proposed	NEWHAVEN	HAVILAND	11 GHz	38.12	iSignal
13	Proposed	OH03415-	CCI87204	Lower 6 GHz	56.25	Wireless Internetwork LLC
14	Licensed	WAZ563	WAZ596	Upper 6 GHz	31.41	Norfolk Southern Railway
15	Licensed	WAZ596	WBB735	Upper 6 GHz	38.54	Norfolk Southern Railway
16	Licensed	WLD621	RXONLY	950 MHz	21.00	First Family Broadcasting, Inc.
17	Licensed	WQON426	WQON427	Upper 6 GHz	51.69	Fort Wayne Communications Group Company
18	Licensed	WQON427	WQON424	Upper 6 GHz	39.37	Fort Wayne Communications Group Company
19	Licensed	WQOV246	WQOV248	Upper 6 GHz	60.24	World Class Wireless, LLC
20	Proposed	WQOV248	EDGERTON	Lower 6 GHz	31.09	ECW Wireless, LLC
21	Licensed	WQOV248	WQOS750	11 GHz	35.35	World Class Wireless, LLC
22	Licensed	WQPA629	WQOV248	11 GHz	16.31	World Class Wireless, LLC
23	Licensed	WQRX775	WQRY695	11 GHz	15.85	Sprint Spectrum L.P.
24	Licensed	WQRY696	WQRY695	11 GHz	12.61	Sprintcom, Inc
25	Licensed	WQSA894	WQSA779	Lower 6 GHz	49.37	Blue Ridge Carriers
26	Proposed	WQSD967	1211350	Lower 6 GHz	62.79	Torelco LLC
27	Licensed	WQSD967	WQSD966	Lower 6 GHz	49.79	Torelco LLC
28	Licensed	WQTB516	WQRX775	11 GHz	16.56	Sprint Spectrum L.P.
29	Licensed	WQTX715	WQTX717	11 GHz	21.79	MetaLINK Technologies, Inc.
30	Licensed	WQUL511	WQUL808	Lower 6 GHz	57.94	Torelco LLC
31	Licensed	WQUU748	WQUT739	11 GHz	30.27	Agile Network Builders

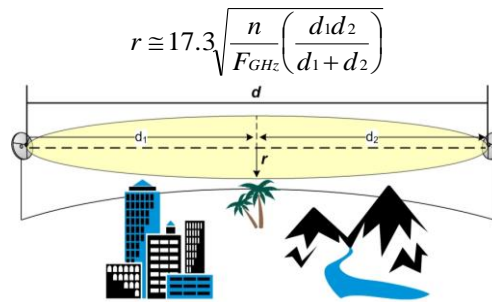
Table 1: Summary of Microwave Paths that Intersect the Area of Interest

(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, path IDs 11-12, 16-17, 23, 27, 29, 31 cross within close proximity of turbines and the tower locations for these paths will have a critical impact on the result. 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:



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
- d₁ = Distance from antenna 1 to a specific point in the microwave path, kilometers
- d₂ = Distance from antenna 2 to a specific point in the microwave path, kilometers

In general, this is the area where the planned wind turbines should be avoided, if possible. A depiction of the Fresnel Zones for each microwave path listed can be found in Figure 3, and is also included in the enclosed shapefiles^{4,5}.

³ See enclosed mw_geopl.shp and mw_geopl_fcc.shp for details.

⁴ The ESRI® shapefiles enclosed are in NAD 83 UTM Zone 16 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.



Total Microwave Paths	Paths with Affected 2D Fresnel Zones	Total Turbines	Turbines intersecting the Fresnel Zones
31	7	60	6

For this project, 60 turbines were considered in the analysis, each with a blade diameter of 114 meters and turbine hub height of 93 meters. Of those turbines, six were found to intersect the Fresnel Zones of seven microwave paths. Figure 4 and Figure 5 contain a detailed depiction of the potential obstruction scenarios and Table 3 contains a summary of the affected turbines. A

cross sectional analysis was performed in Section 4 to determine the diagonal clearance value for these cases.

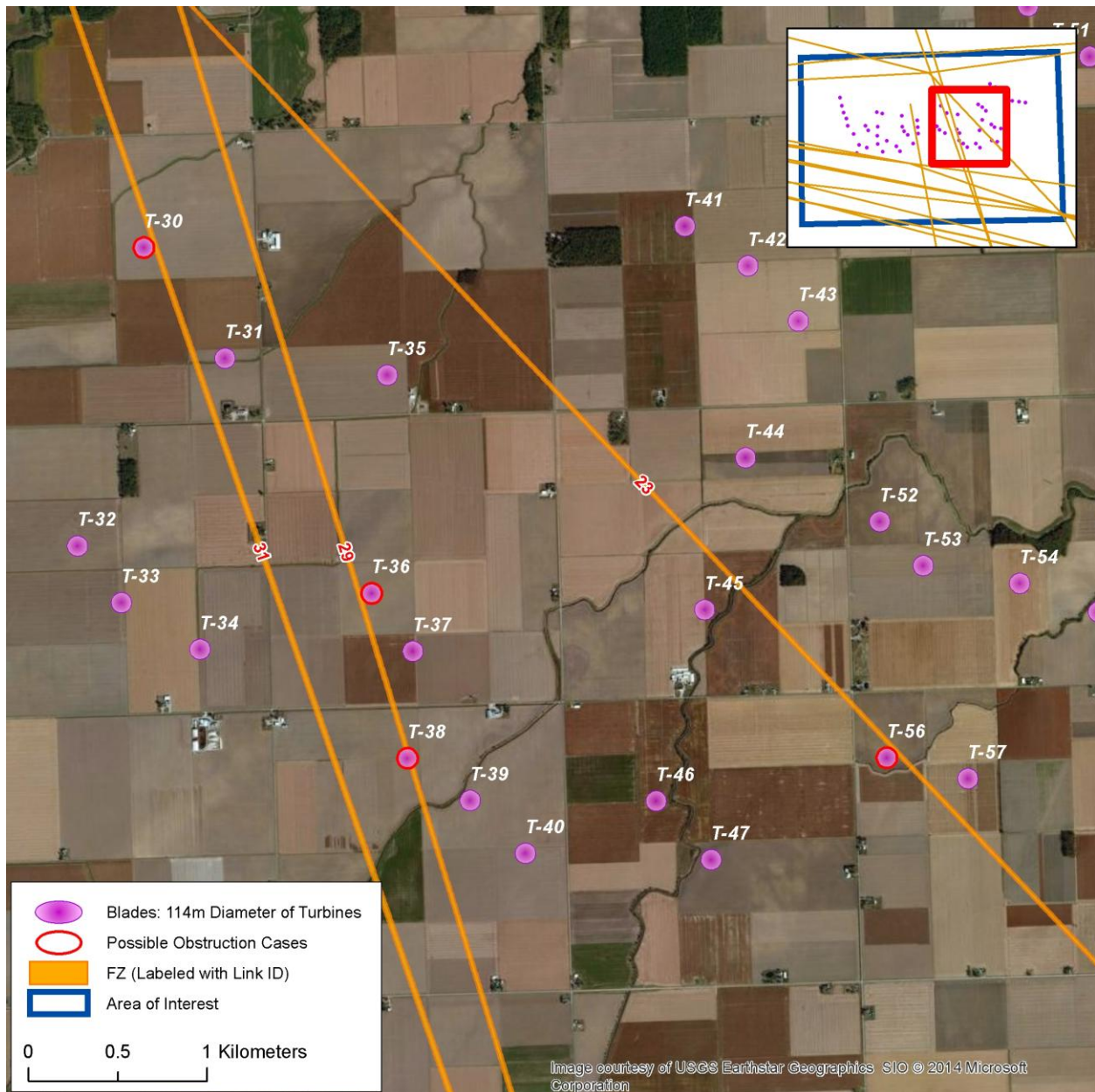


Figure 4: Potential Obstruction Cases
 (Turbine T30, T36, T38 and T56)

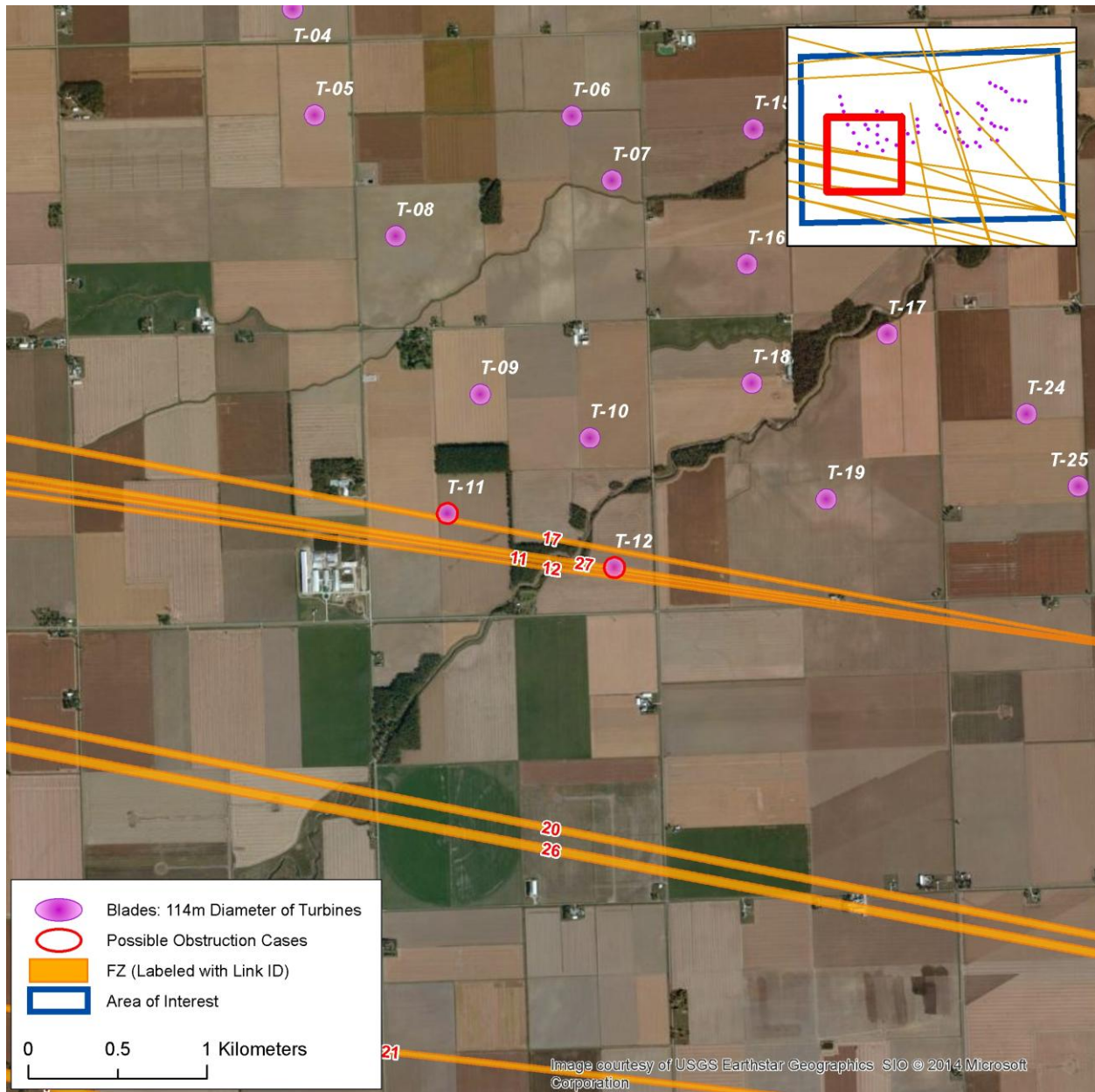


Figure 5: Potential Obstruction Cases
 (Turbine T11 and T12)

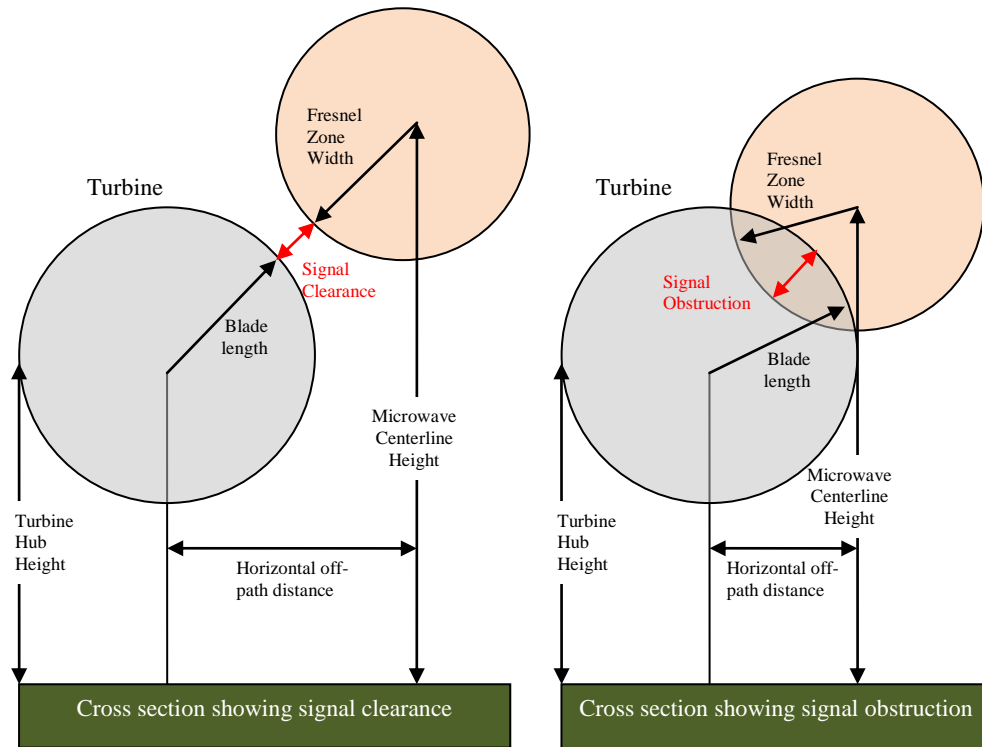
Turbine ID	Latitude (NAD83)	Longitude (NAD83)	Affected Microwave Path ID	Fresnel Zone Width at Turbine Location (m)	Horizontal off-path Distance (m)	Distance along the path from site 1 (km)	Horizontal Clearance (m)
T-11	41.02393325	-84.64444141	17	13.39	33.34	47.31	-37.04
T-12	41.02098480	-84.63343618	11	9.04	25.85	30.70	-40.19
T-12	41.02098480	-84.63343618	12	9.10	53.92	34.72	-12.18
T-12	41.02098480	-84.63343618	27	12.42	5.23	46.37	-64.19
T-30	41.05701400	-84.56129243	31	12.95	63.92	8.89	-6.03
T-36	41.03932252	-84.54679397	29	12.05	68.71	10.36	-0.34
T-38	41.03098042	-84.54472177	29	11.95	9.36	9.42	-59.59
T-56	41.03032337	-84.51288360	23	10.28	64.46	8.28	-2.82

Table 3: Turbines that Intersect Fresnel Zones

4. Cross Sectional Analysis

Our Fresnel Zone analysis in the previous section identified eight potential obstruction cases that need to be further examined from a cross sectional perspective. The cases that will be analyzed in this section can be found in Table 3.

Our cross sectional analysis calculates the precise height and width of 100% of the first Fresnel Zone at the turbine location based on the antenna heights of the two link endpoints and the earth curvature bulge at the specific turbine location. The horizontal off-path distance was calculated in the previous section and the turbine hub height and blade length were provided by the client. The cross sectional analysis uses these values to calculate the clearance between the blades and the microwave Fresnel Zone as shown in the two diagrams below.



The results of the cross sectional calculations can be seen in Table 4 below. Positive clearance values indicate clearance of the Fresnel zone and negative clearance values indicate obstruction of the Fresnel zones.

Microwave Path ID	Fresnel Zone Width at Turbine Location (m)	Microwave Centerline Height at Turbine Location (m)	Turbine ID	Hub Height (m)	Blade Length (m)	Cross Sectional Clearance (m)
17	13.39	63.92	T-11	93	57	-26.14
11	9.04	67.20	T-12	93	57	-29.52
12	9.10	66.71	T-12	93	57	-6.12
27	12.42	63.09	T-12	93	57	-39.05
31	12.95	58.96	T-30	93	57	2.47
29	12.05	47.10	T-36	93	57	13.58
29	11.95	49.88	T-38	93	57	-24.83
23	10.28	74.41	T-56	93	57	-0.20

Table 4: Cross Sectional Analysis Results

5. Conclusion

Total Microwave Paths	Paths with Affected Fresnel Zones	Total Turbines	Turbines intersecting the Fresnel Zones
31	6	60	4

Table 5: Summary of Analysis Result

Our study identified 31 microwave paths intersecting the Trishe Wind Ohio LLC project area. The Fresnel Zones for these microwave paths were calculated and mapped. Six turbines were found to intersect the two dimensional Fresnel Zones of seven microwave paths in the two dimensional analysis. Based on the cross sectional analysis, it was determined that four turbine may obstruct the Fresnel Zone of six microwave paths and potentially cause signal degradation.

6. Contact

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

Contact person: Denise Finney
Title: Account Manager
Company: Comsearch
Address: 19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone: 703-726-5650
Fax: 703-726-5595
Email: dfinney@comsearch.com
Web site: www.comsearch.com

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Case No(s). 13-0197-EL-BGN

Summary: Correspondence of Northwest Ohio Wind Energy, LLC, now Trishe Wind Ohio, LLC in Compliance with Condition No. 24 electronically filed by Teresa Orahod on behalf of Sally Bloomfield