



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

September 10, 2013

Via Electronic Filing

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

**Re: Northwest Ohio Wind Energy, LLC
OPSB Case No. 13-197-EL-BGN**

Dear Ms. McCauly:

On August 30, 2013, Northwest Ohio Wind Energy, LLC ("NOWE") filed its responses to Staff's Data Requests Nos. 1 – 26 issued August 23, 2013. As part of the OPSB Data Request No. 13, attached is a copy of the updated Microwave Study (Amended Application Appendix T).

This Amended Application Appendix T is the older study which has been refreshed. The new study notes that one new microwave beam path is now operational since the original study. Turbine locations have been adjusted following the micrositing and compliance with sound, shadow flicker and voluntary setbacks. Comsearch concluded that T-12 seems to require a horizontal clearance of 63.17 meters (207.2 feet) in order to clear the potential interference with the nearby microwave beam paths. It is worth noting that T-12 is also among the turbines that would be most impacted by noise reduction operations and the loss of this location would not materially impact the overall viability of the Facility.

While more in-depth and detailed engineering studies using the appropriate dimensions of the to-be selected turbine model would be required to positively rule whether or not T-12 would interfere with the nearby microwave beam paths, Applicant is voluntarily allocating this location as the least desirable turbine location from the array of 60 locations presented in the Amended Application, but keeping it and as a potential location for the permanent hub-height meteorological tower.

In the same conclusions, T-11 seems to require a small adjustment of 37.4 meters (122.7 feet) to the north, and T-56 a mere adjustment of 2.18 meters (7.2 feet) to the southwest. These adjustments are not significant to other studies, are within the FAA de minimis distance for re-filing, and maintain the location in previously evaluated corridors. No figures require updates as the print scale will not reflect these small adjustments.

Bricker & Eckler
ATTORNEYS AT LAW

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Please do not hesitate to contact me if you have any questions.

Sincerely,

A handwritten signature in cursive script, reading "Sally W. Bloomfield".

Sally W. Bloomfield

Attachment

Cc: Chris Cunningham (w/Attachment)

Wind Power GeoPlanner™

Microwave Study

Northwest Ohio Wind



Prepared on Behalf of
Northwest Ohio Wind
Energy, LLC

September 3, 2013



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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: Northwest Ohio Wind

County: Paulding

State: Ohio

Number of Turbines: 60

Blade Diameter: 114 meters

Hub Height: 96 meters

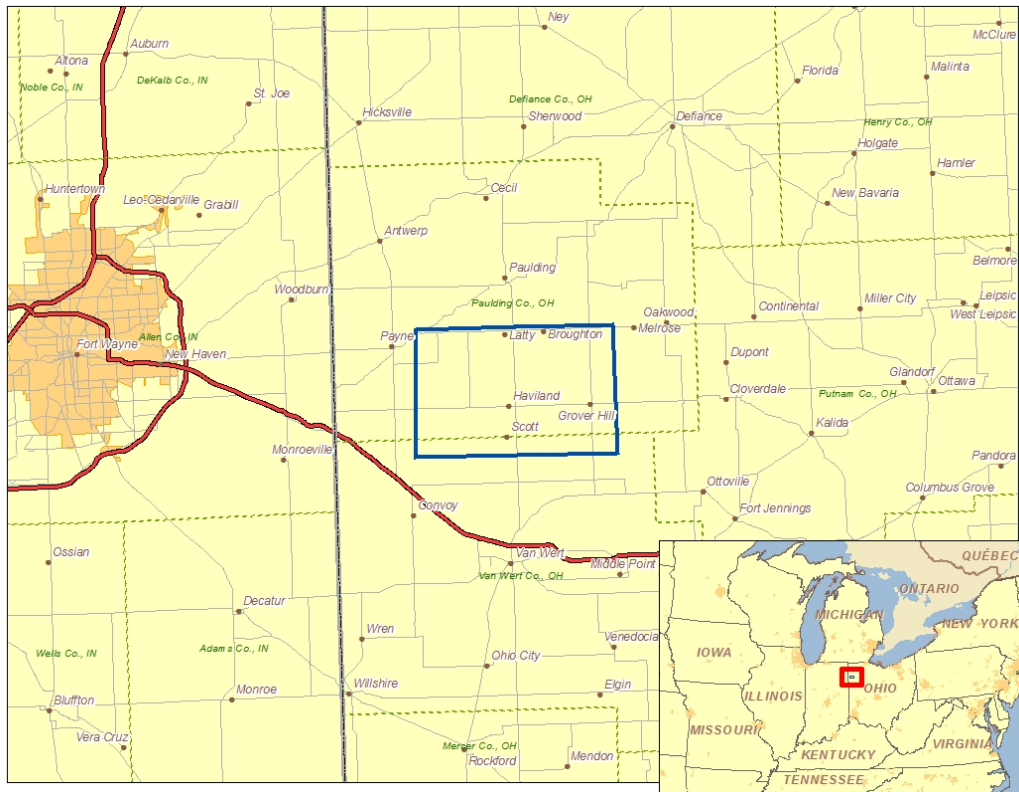


Figure 1: Area of Interest

ID	Status	Callsign 1	Callsign 2	Band	Path Length (km)	Licensee
1	Proposed	1029441	1225294	6.7 GHz	77.87	Torellco LLC
2	Proposed	1036820	1211350	6.1 GHz	62.79	Torellco LLC
3	Applied	1036820	1224934	6.1 GHz	49.79	Torellco LLC
4	Proposed	1211350	1215371	6.7 GHz	43.04	Torellco LLC
5	Proposed	1224934	1225294	6.1 GHz	27.68	Torellco LLC
6	Proposed	1238203	1225294	6.1 GHz	78.84	Torellco LLC
7	Proposed	ADA	WETSEL	6.7 GHz	60.24	ECW Wireless, LLC
8	Licensed	WQSA894	WQSA779	6.1 GHz	49.37	Blue Ridge Carriers
9	Proposed	CCI87269	ATC50782	6.7 GHz	49.37	Old Dominion LLC
10	Licensed	WQRX775	WQRY695	11 GHz	15.85	Sprintcom, Inc
11	Proposed	FORTWAYN	HAVILAND	11 GHz	51.62	iSignal
12	Proposed	FTJENNIN	WETSEL	11 GHz	16.31	ECW Wireless, LLC
13	Proposed	GTPIN-52	OH03415-	6.1 GHz	54.80	Wireless Internet Work II.
14, 15	Proposed	HAVILAND	CAIRO2	11 GHz	44.36	iSignal
16	Proposed	HAVILAND	CARIO1	11 GHz	46.87	iSignal
17, 18	Proposed	NEWHAVEN	HAVILAND	11 GHz	34.09	iSignal
19	Proposed	NEWHAVEN	HAVILAND	11 GHz	38.12	iSignal
20	Proposed	OH03415-	CCI87204	6.1 GHz	56.25	Wireless Internet Work II.
21	Licensed	WAZ563	WAZ596	6.7 GHz	31.41	Norfolk Southern Railway
22	Licensed	WAZ596	WBB735	6.7 GHz	38.54	Norfolk Southern Railway
23	Proposed	WETSEL	TOWNLEY	11 GHz	35.35	ECW Wireless, LLC
24	Licensed	WLD621	RXONLY	950 MHz	21.00	First Family Broadcasting, Inc.
25	Licensed	WQON426	WQON427	6.7 GHz	51.69	Fort Wayne Communications Group Company
26	Licensed	WQON427	WQON424	6.7 GHz	39.37	Fort Wayne Communications Group Company
27	Granted	WQOV246	WQOV248	6.1 GHz	60.24	World Class Wireless LLC
28	Licensed	WQOV246	WQOV248	6.7 GHz	60.24	World Class Wireless LLC
29-31	Licensed	WQOV248	WQOS750	11 GHz	35.35	World Class Wireless LLC
32	Licensed	WQOV248	WQPD934	6.1 GHz	31.09	World Class Wireless LLC
33	Granted	WQOV248	WQPD934	6.1 GHz	31.09	World Class Wireless LLC
34	Licensed	WQPA629	WQOV248	11 GHz	16.31	World Class Wireless LLC
35	Licensed	WQRY696	WQRY695	11 GHz	12.61	Sprintcom, Inc

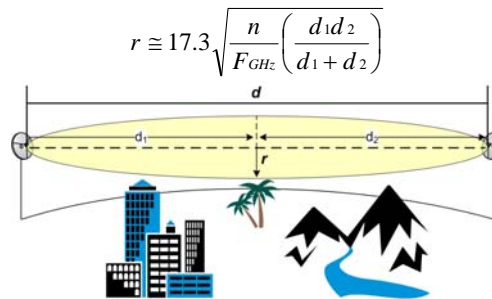
Table 1: Summary of Microwave Paths that Intersect the Area of Interest

(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, 7 out of 35 paths cross within close proximity of 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:



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.

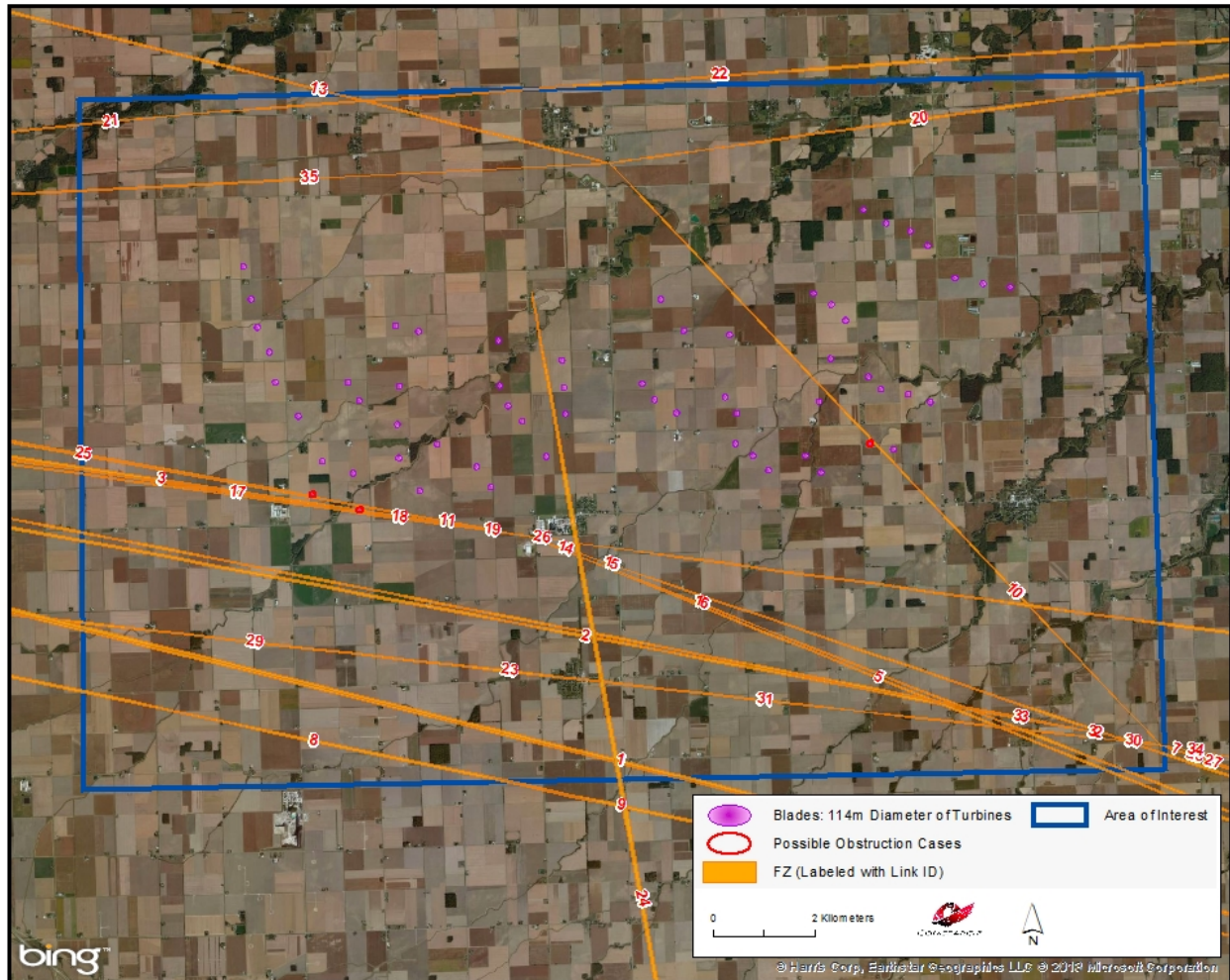


Figure 3: Fresnel Zones in the Area of Interest

Discussion of Potential Two Dimensional Obstructions

Total Microwave Paths	Paths with Affected Fresnel Zones	Total Turbines	Turbines intersecting the Fresnel Zones
35	7	60	3

Table 2: Fresnel Zone Analysis Result

For this project, 60 turbines were considered in the analysis, each with a blade diameter of 114 meters and turbine hub height of 96 meters. Of those turbines, 3 were found to intersect the Fresnel Zones of 7 microwave paths. Figures 4 and 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.

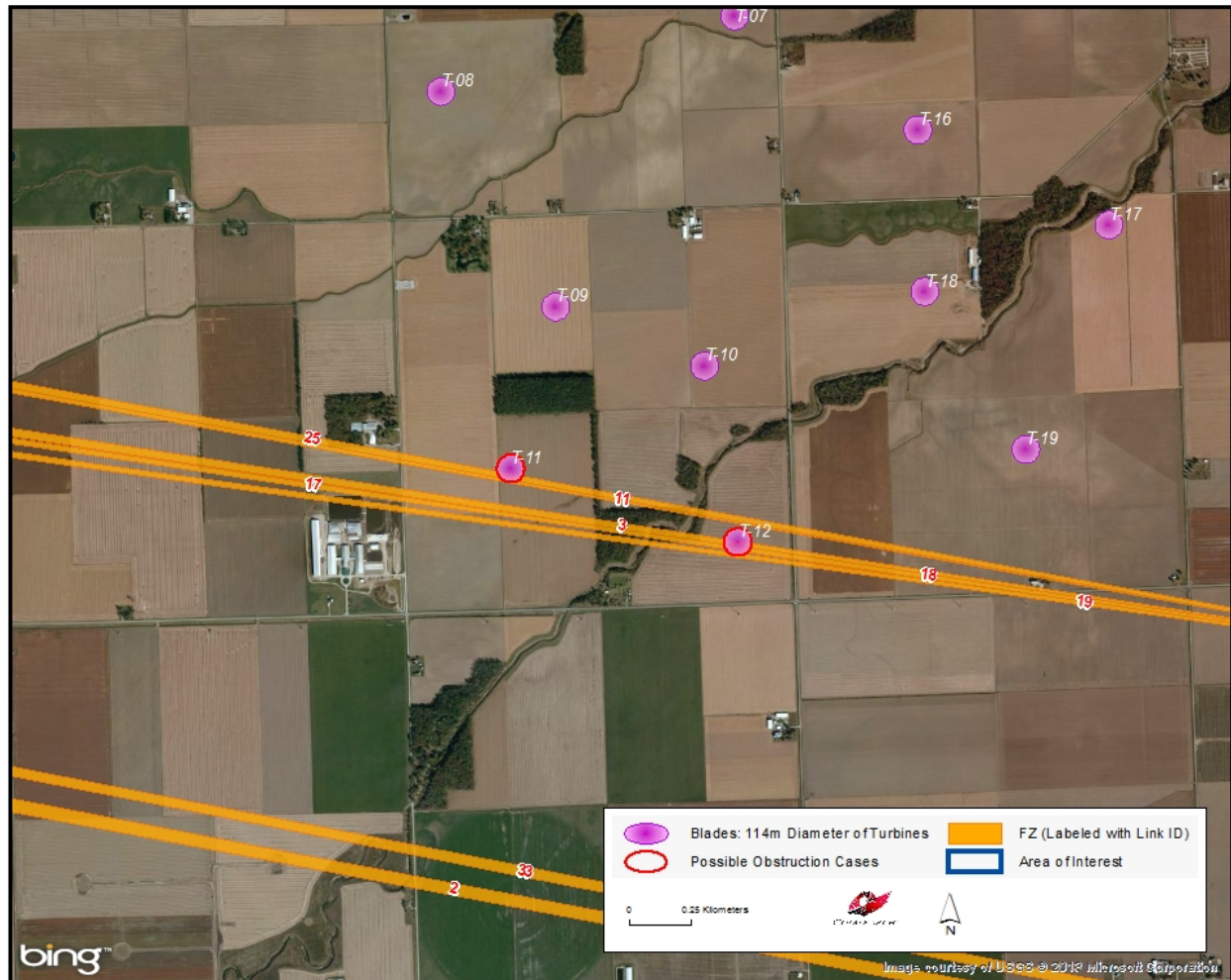


Figure 4: Potential Obstruction Cases (Turbines 11 and 12)

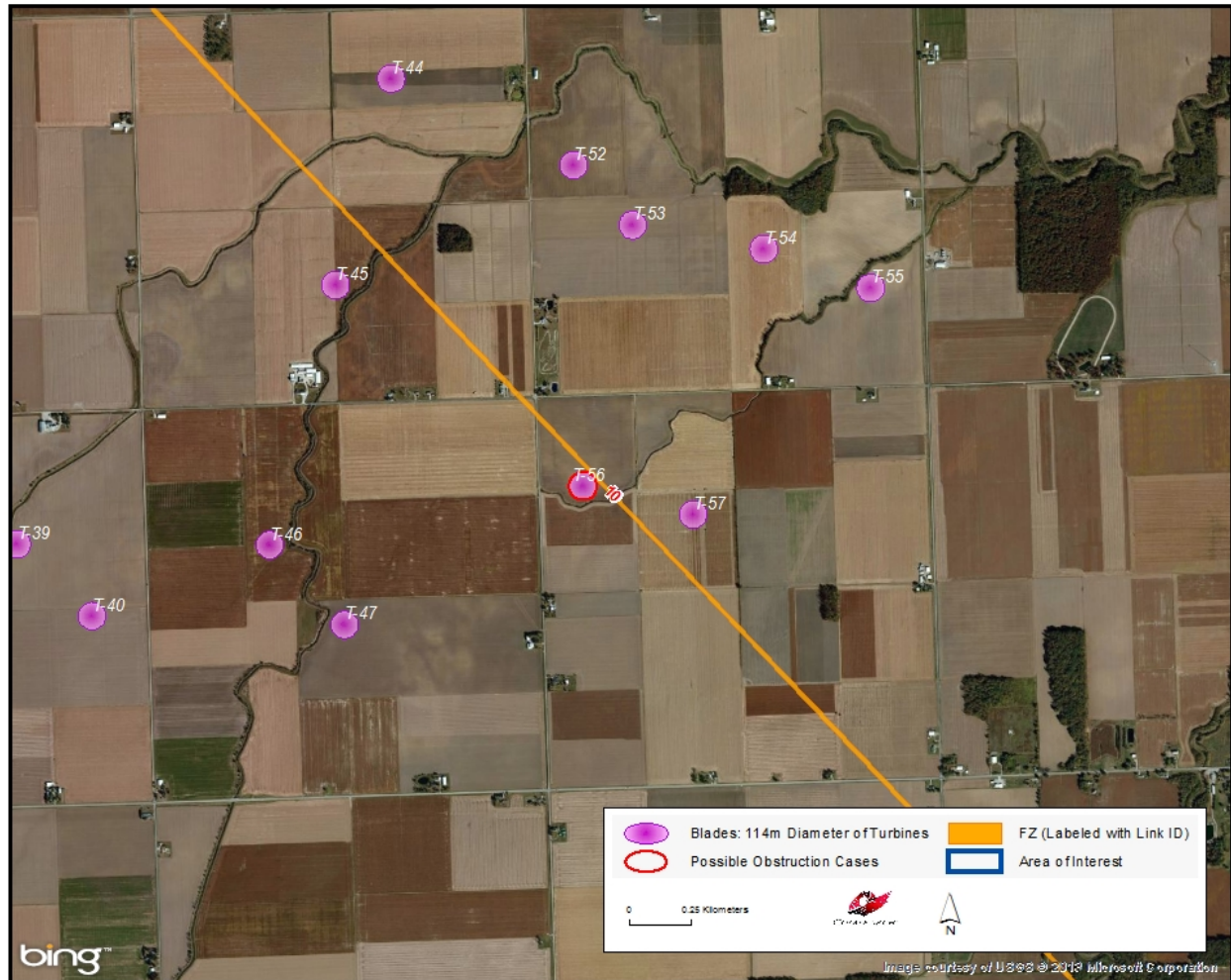


Figure 5: Potential Obstruction Cases (Turbine 56)

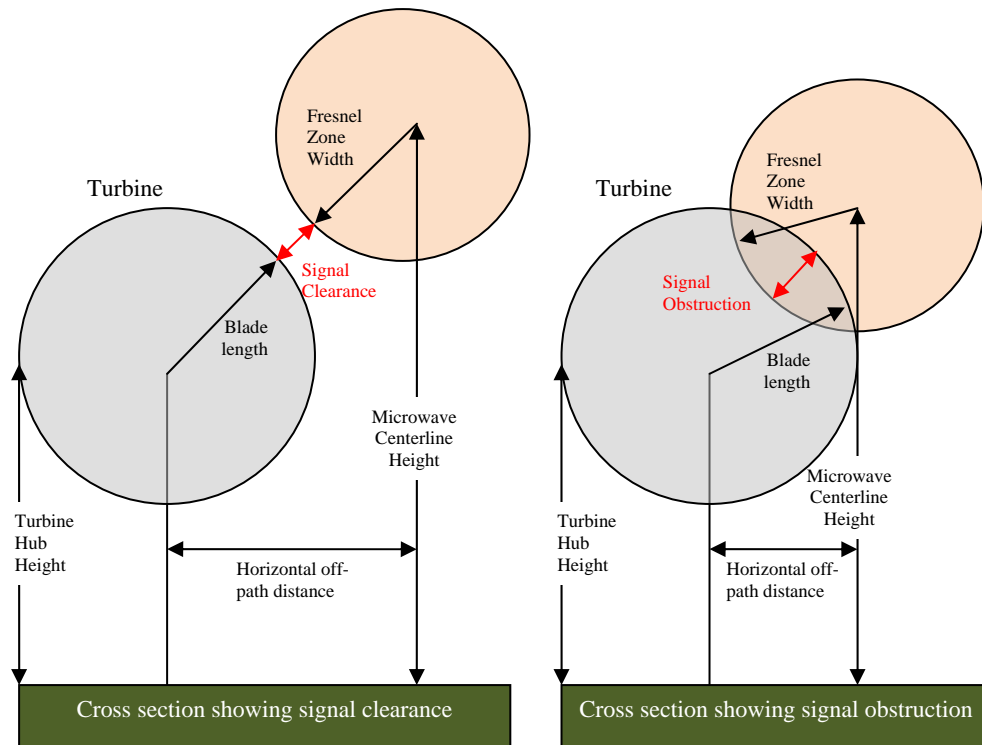
Turbine ID	Latitude (NAD83)	Longitude (NAD83)	Affected Microwave Link ID	Fresnel Zone Width at Turbine Location (m)	Horizontal off-path Distance (m)	Distance along the path from site 1 (km)	Horizontal Clearance (m)
11	41.023933	-84.644442	25	13.40	33	47.3	-37.40
11	41.023933	-84.644442	11	10.39	46.6	47.2	-20.79
12	41.020986	-84.633436	3	12.37	6.2	46.4	-63.17
12	41.020986	-84.633436	17,18	9.04	25.7	30.7	-40.34
12	41.020986	-84.633436	19	9.12	54.3	34.7	-11.82
56	41.030322	-84.512883	10	10.28	65.1	8.3	-2.18

Table 3: Turbines that Intersect Fresnel Zones

4. Cross Sectional Analysis

Our Fresnel Zone analysis in the previous section identified 7 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. Six cases have a negative clearance values indicating obstruction of the Fresnel zones and one shows a positive value indicating clearance.

Microwave Link 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)
25	13.40	63.91	11	96	57	-24.37
11	10.39	69.12	11	96	57	-13.59
3	12.37	62.97	12	96	57	-35.76
17, 18	9.04	67.10	12	96	57	-27.36
19	9.12	66.57	12	96	57	-4.36
10	10.28	74.79	56	96	57	1.19

Table 4: Cross Sectional Analysis Results

5. Conclusion

Total Microwave Paths	Paths with Affected Fresnel Zones	Total Turbines	Turbines intersecting the Fresnel Zones
35	6	60	2

Table 5: Final Analysis Result

Our study identified 35 microwave paths intersecting the Northwest Ohio Wind project area. The Fresnel Zones for these microwave paths were calculated and mapped. Three turbines were found to intersect the two dimensional Fresnel Zones of 7 microwave paths. Based on the cross sectional analysis, it was determined that turbines 11 and 12 may obstruct 6 microwave paths and potentially cause signal degradation to these paths. The case involving turbine 56 and link 10 clears by a just over a meter so caution should be taken if adjusting this turbine location.

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 Transmitting Updated Response to Staff Data Request No. 13 electronically filed by Teresa Orahod on behalf of Sally Bloomfield