

Solar Power GeoPlanner™

Microwave Study

Posey Solar



Prepared on Behalf of
Posey Solar LLC

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1. Introduction

Microwave bands that may be affected by the solar farms 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 a proposed solar farm on licensed, proposed, and applied non-federal government microwave systems.

2. Project Overview

The proposed Posey Solar project is located in Posey County, Indiana. The facility will generate electricity using silicon photovoltaic (PV) modules fixed to single axis solar trackers. It will have an installed capacity of up to 300 MW ac (380 MW dc).

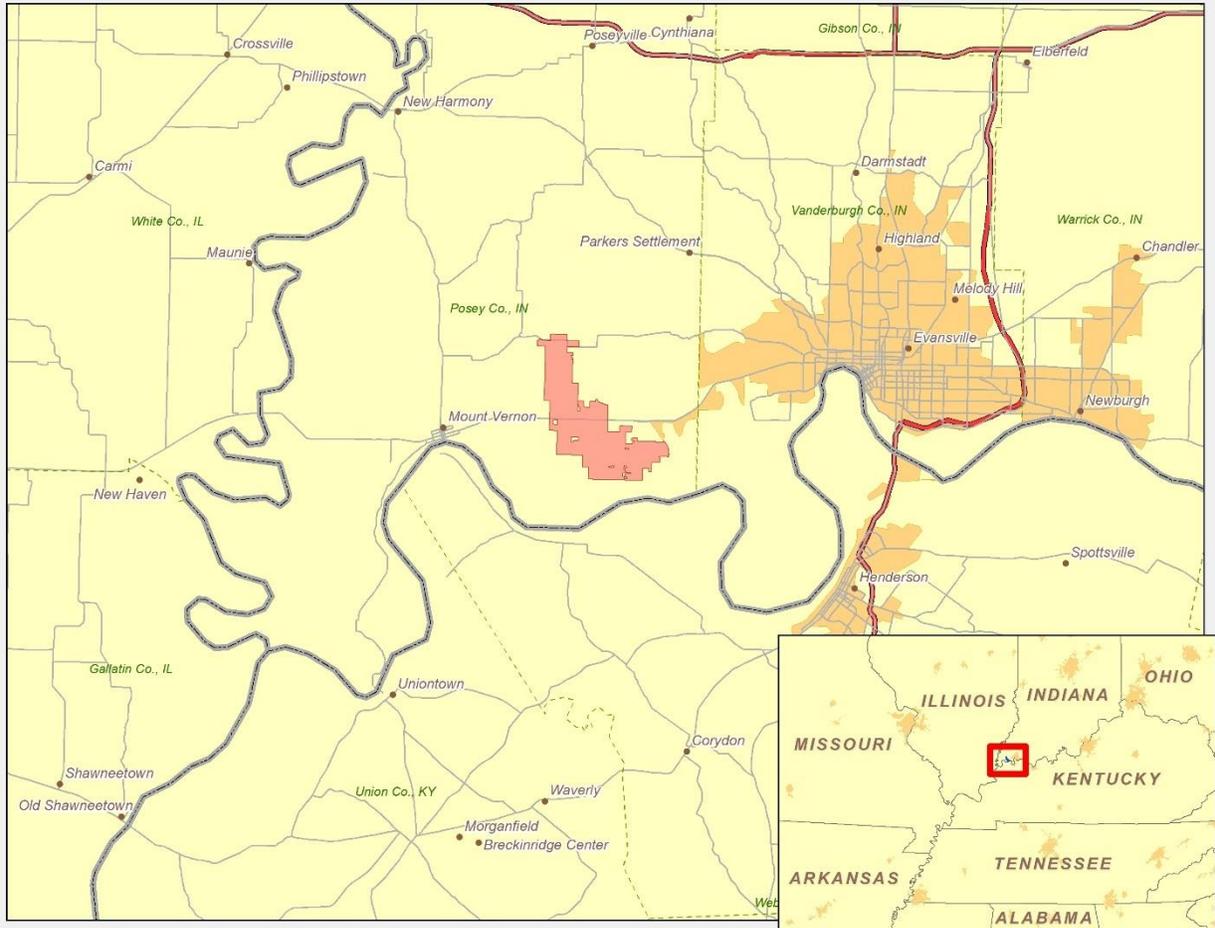


Figure 1: Area of Interest

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 fall within two miles the proposed solar farm² and listed them in Table 1. These paths and the solar farm area of interests are shown in Figure 2 below.

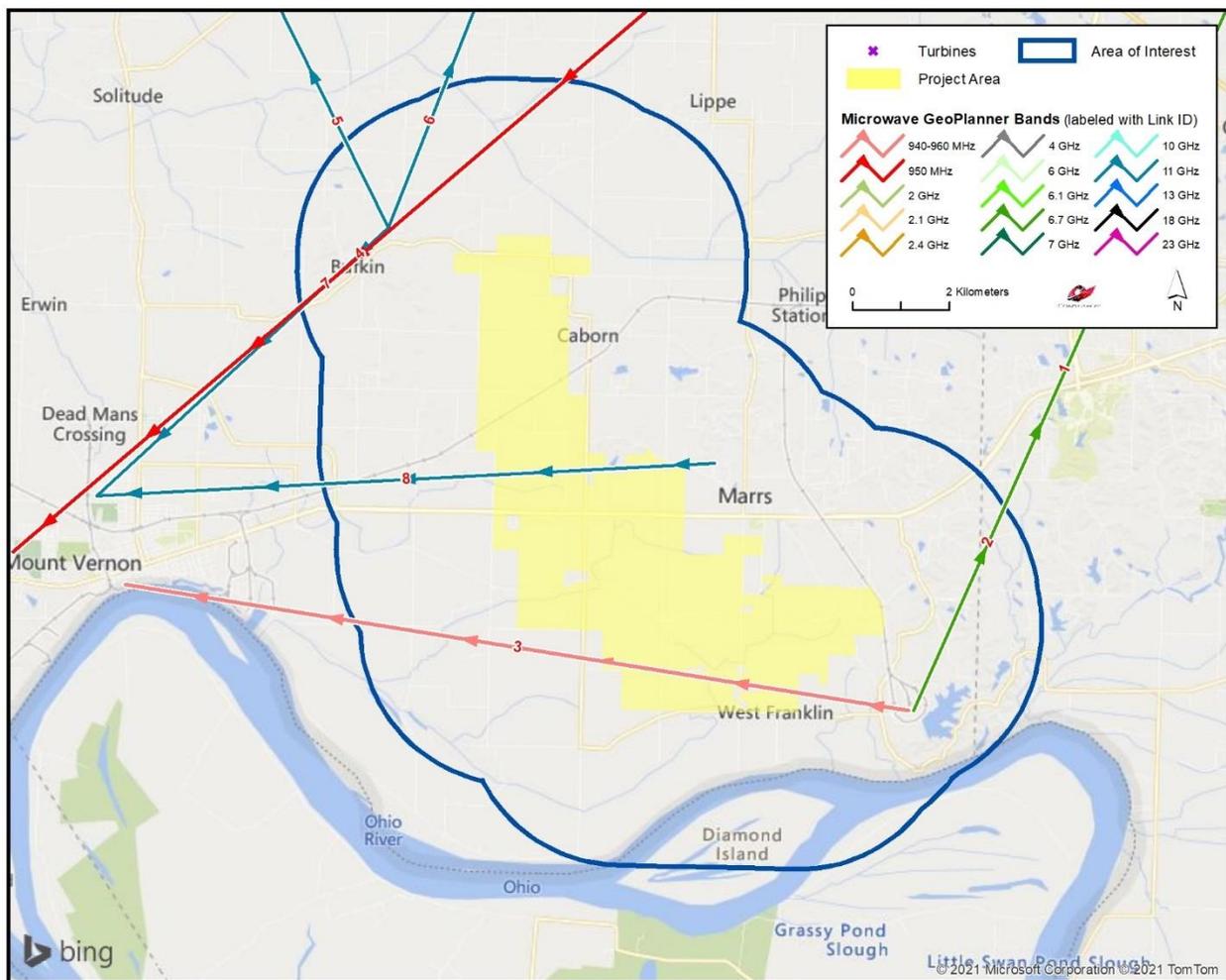


Figure 2: Microwave Paths that Intersect the Area of Interest

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

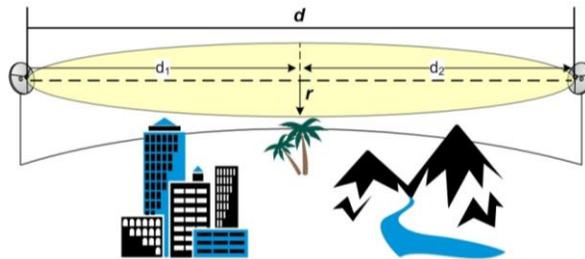
² We use FCC-licensed coordinates to determine which paths intersect the area of interest. It is possible that as-built coordinates may differ slightly from those on the FCC license.

ID	Status	Callsign 1	Callsign 2	Band	Path Length (km)	Licensee
1, 2	Licensed	WNTB853	WNTB856	6.1 GHz	21.09	Southern Indiana Gas and Electric
3	Licensed	WNTB854	WNTB855	940-960 MHz	16.36	Southern Indiana Gas and Electric
4	Licensed	WQPE789	WQPA696	11 GHz	8.18	Zayo Group, LLC
5	Licensed	WQPE789	WQPE816	11 GHz	14.13	Zayo Group, LLC
6	Licensed	WQPE789	WQQM440	11 GHz	12.76	Zayo Group, LLC
7	Licensed	WQWH449	RXONLY	950 MHz	27.04	The Original Company, Inc.
8	Licensed	WRKD397	WRKD370	11 GHz	12.75	W.A.T.C.H. TV Company 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)

Next, we calculated the 1st 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
- 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, the 1st Fresnel zone (i.e., n = 1) is the area where the planned structures should be avoided in order to maintain clear line-of-sight (LOS) between the two endpoints of the microwave beam path. 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 enclosed shapefiles^{3,4}.

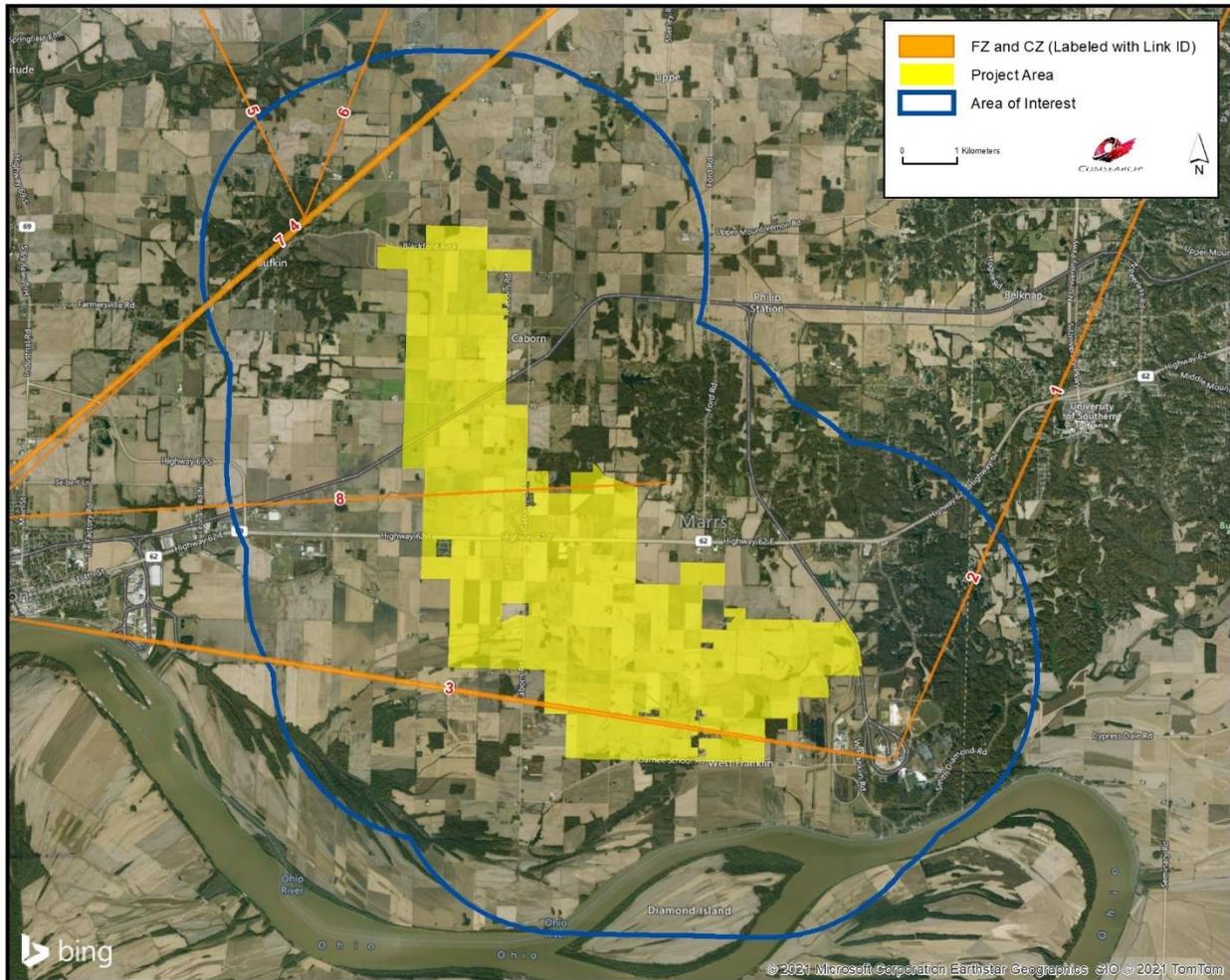


Figure 3: Fresnel Zones and Consultation Zones in the Area of Interest

³ The ESRI® shapefiles enclosed are in NAD 83 UTM Zone 16 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.

4. Three-Dimensional Fresnel Zone Analysis

Our two-dimensional analysis in the previous section identified eight microwave paths within two miles of the proposed solar farm, two of those paths, ID 3 and 8, pass over the proposed project area. This section further analyzes those paths with respect to their Fresnel zones in the vertical dimension within the project area. We determine whether they would achieve three-dimensional clearance by taking into consideration the terrain elevation profile between the two endpoints of each affected microwave beam path inside the project area of interest.

To do this calculation we used USGS 1/3rd arcsecond terrain elevation data to get elevation measurements along each path at 10-meter intervals. For each of these locations we also calculated the height of the top and bottom of the Fresnel Zone bounds. This is the height in which obstructions should be avoided at the particular location. Figure 4 below shows the lowest Fresnel Zone heights in meters for each measuring point along the path centerlines. The lowest measured Fresnel zone was determined to be 17.5 meters above ground level on the western portion of path 3.

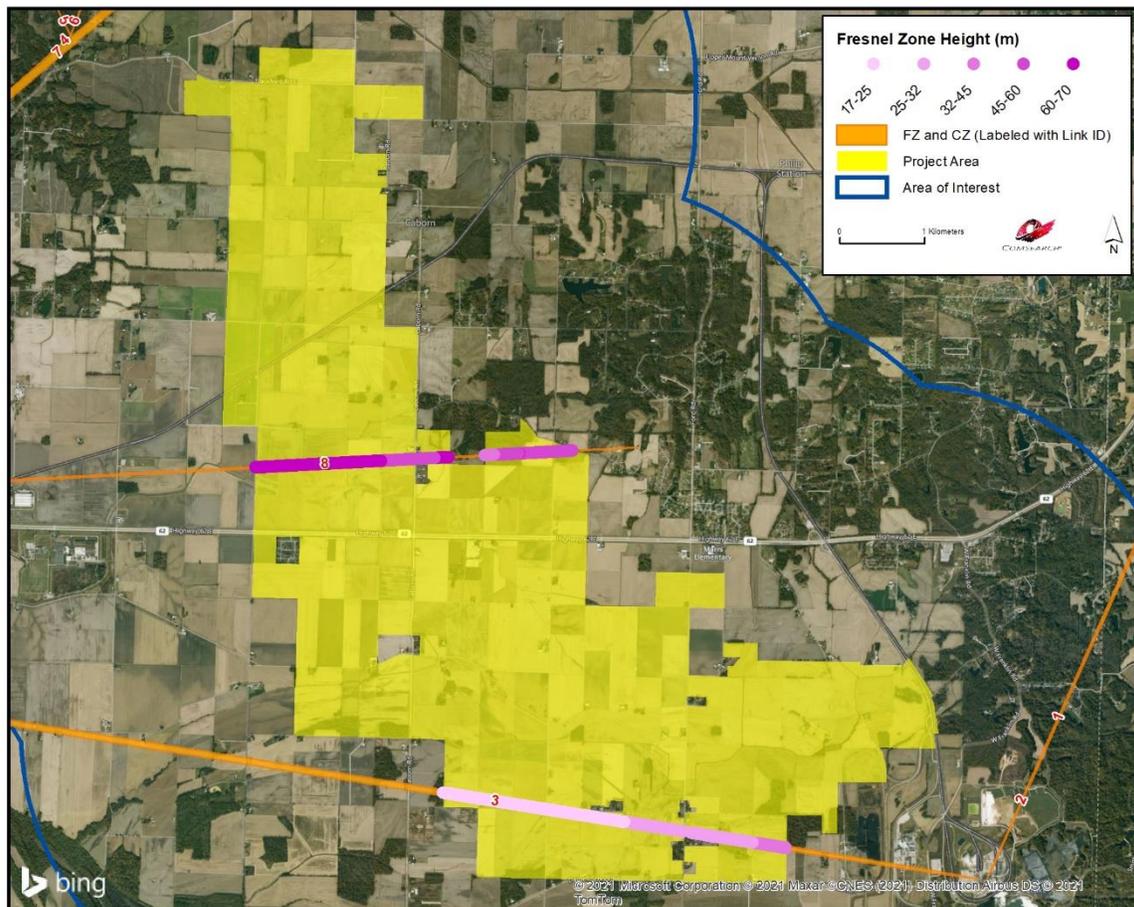


Figure 4: Terrain Elevation Points along Paths in Project Area

5. Conclusion

Our study identified eight microwave paths within two miles of the Posey Solar project area. The Fresnel Zones and Consultation Zones for these microwave paths were calculated and mapped. The lower edge of the zones was found to be at least 17 meters (55.7 feet) above ground level throughout the project area. The solar panels have a maximum height of 12 feet. Therefore, all proposed solar array structures within the defined project area (AOI) have sufficient vertical clearance and avoid the risk of obstructing or causing harmful interference to the microwave paths in and around the project area.

6. Contact

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

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