



Executive Summary – Wind Power GeoPlanner™

Licensed Microwave Search & Worst Case Fresnel Zone

Comsearch performed an analysis to evaluate the potential effects of the planned Cohocton wind power project area in Steuben County, New York on existing non-federal government microwave telecom systems.

Microwave Search Results: Comsearch's Wind Power GeoPlanner™ provides a graphical representation of affected microwave paths and provides supporting technical parameters. The microwave path data is overlaid on topographic basemaps. Comsearch identified 6 microwave paths that intersect the project area (see Figure 1 and Table 1 below).

Comsearch then calculated a Worst Case Fresnel Zone (WCFZ) for each microwave path in the project area. The mid-point of a full microwave path is the location where the widest (or worst case) Fresnel zone occurs. Fresnel zones are calculated for each path using the following formula.

$$Rn \cong 17.3 \sqrt{\frac{n}{FGHz} \left(\frac{d1d2}{d1+d2} \right)}$$

The calculated WCFZ radius, giving the linear path an area or swath, buffers each microwave path in the project area. The distance unit is in meters and can be found in the column attribute "WCFZ." In general, this is the XY area where the planned wind turbines should be avoided, if possible. These areas are shown in Figures 2 through Figure 6.

Three microwave paths were identified (see Figures 3 through 6 and Table 2) to have a potential XY conflict with respect to four turbines: 149554, 149569, 149578 and 149590 (see Table 3).

When wind turbines need to be located inside a WCFZ, Comsearch offers and recommends a detailed clearance study, which considers the vertical Z-height clearance objectives. Please contact Denise Finney at (703) 726 – 5650 for assistance.

Turbines: 49 turbines were considered in the analysis, each with a blade diameter of 87 meters. The coordinates provided were in NAD83.

Map Projection: The ESRI® Shapefiles contained in the enclosed GeoPlanner CD are in NAD 83 UTM Zone 18 projected coordinate system.

Comsearch Contact:

Denise Finney, Account Manager
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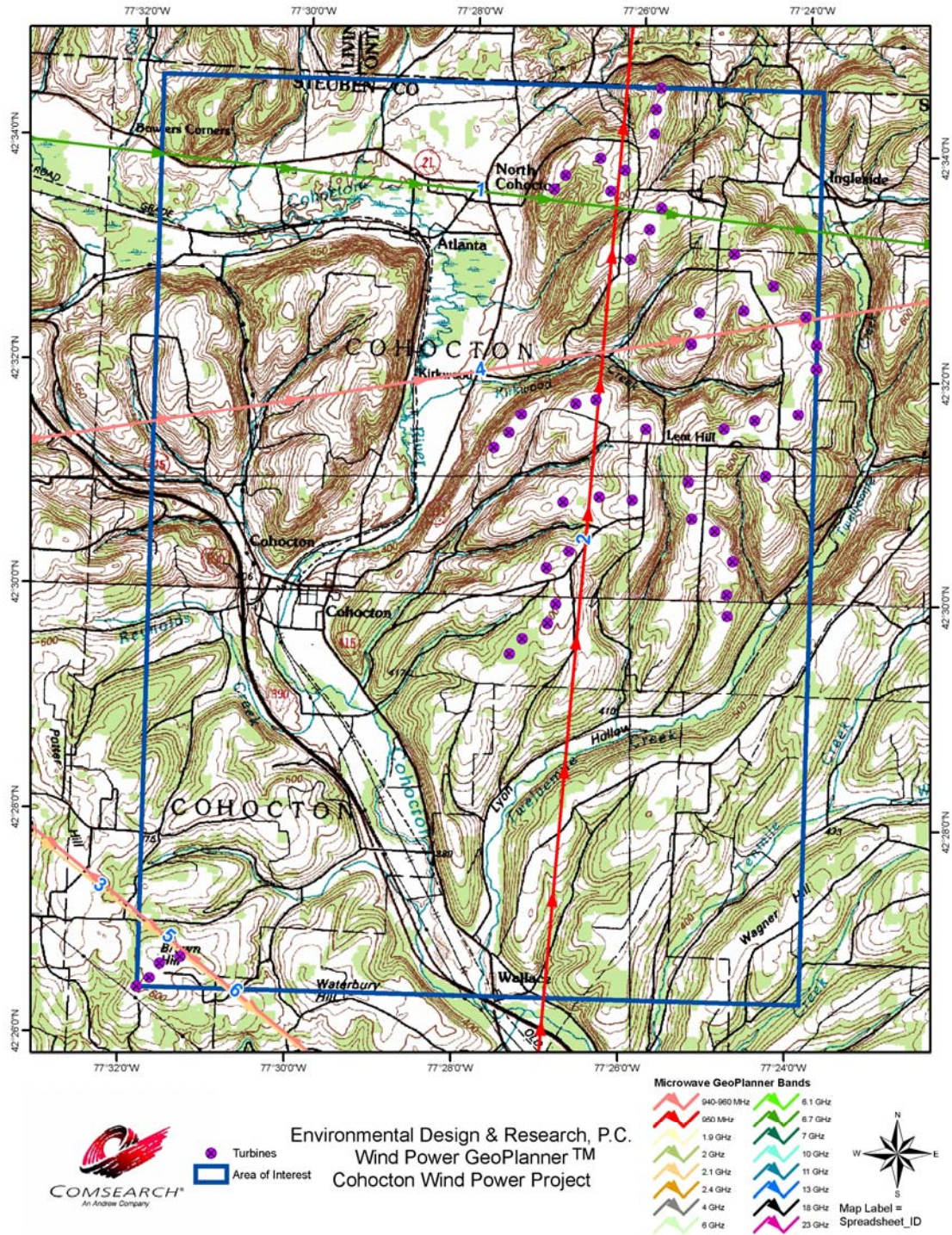
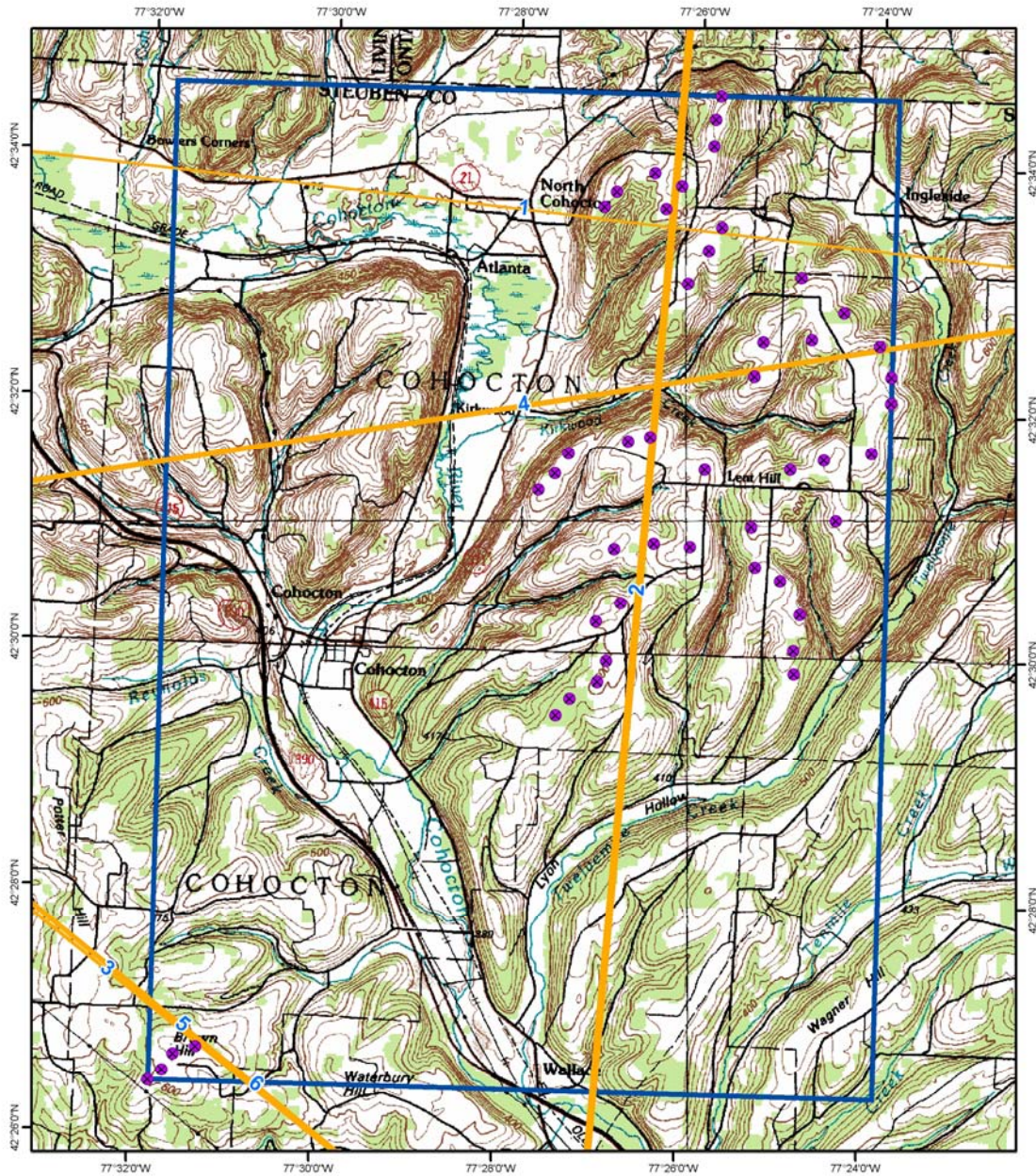


Figure 1 – Wind Power GeoPlanner™

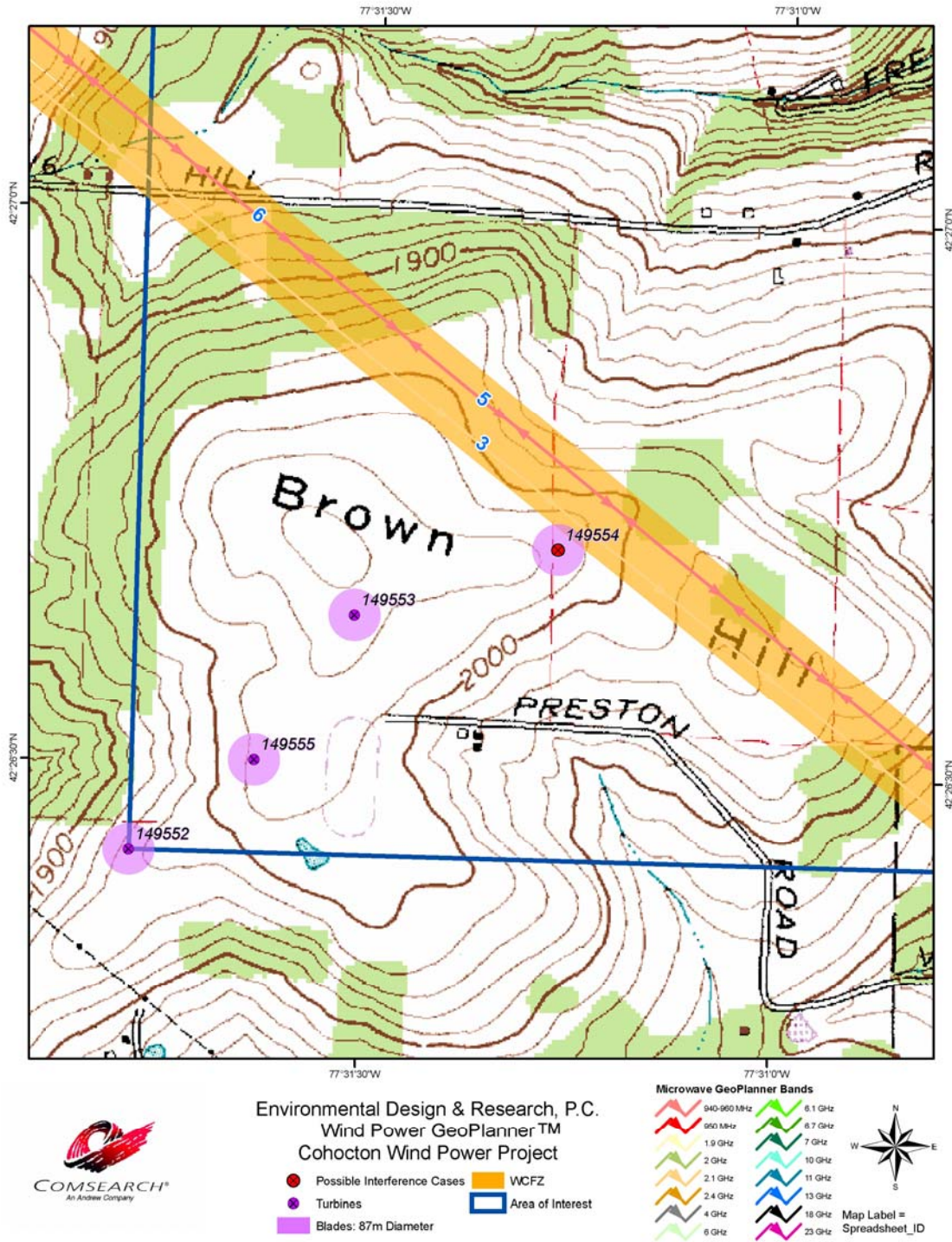


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Cohocton Wind Power Project

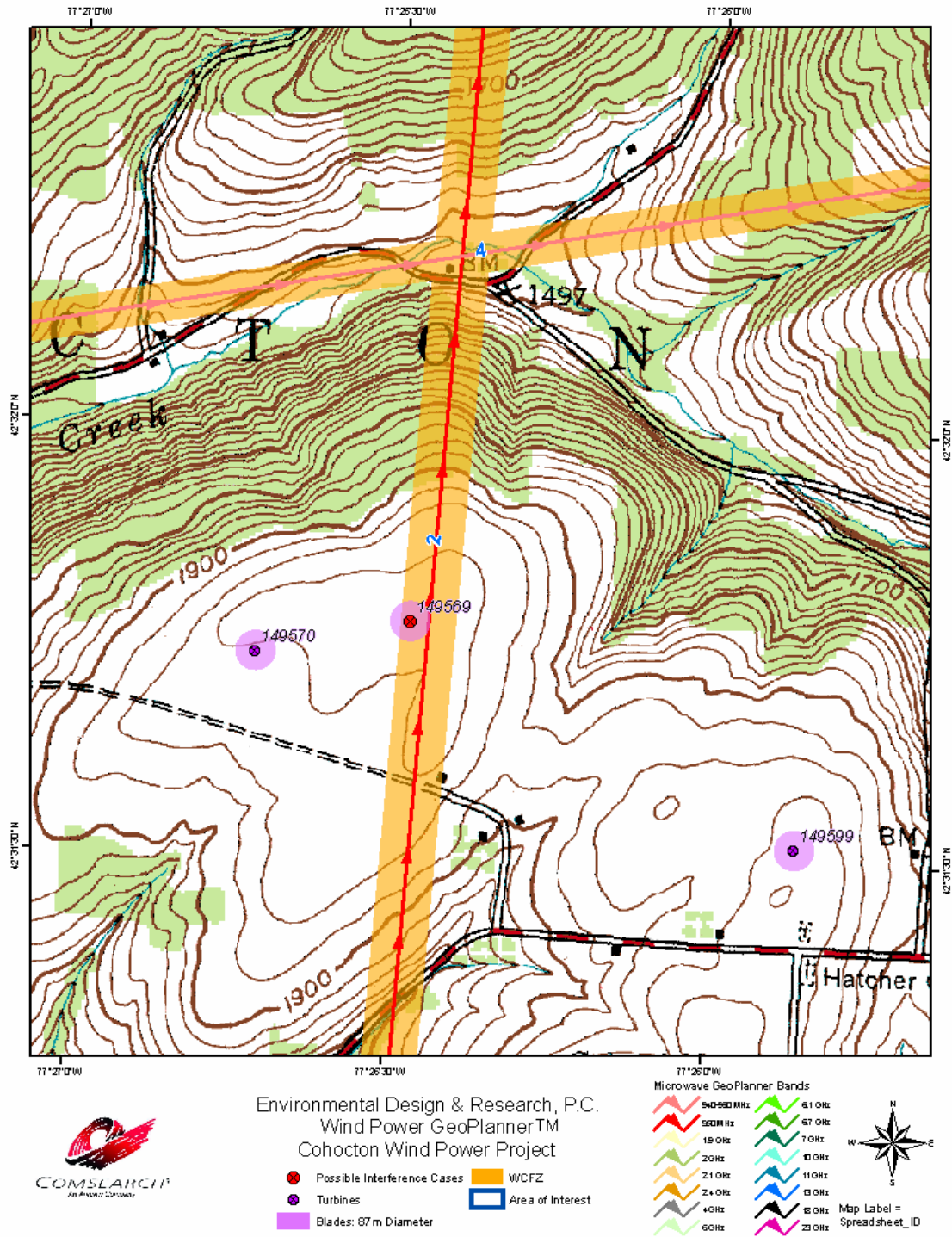
 Turbines
 WCFZ
 Area of Interest
 Map Label = Spreadsheet_ID



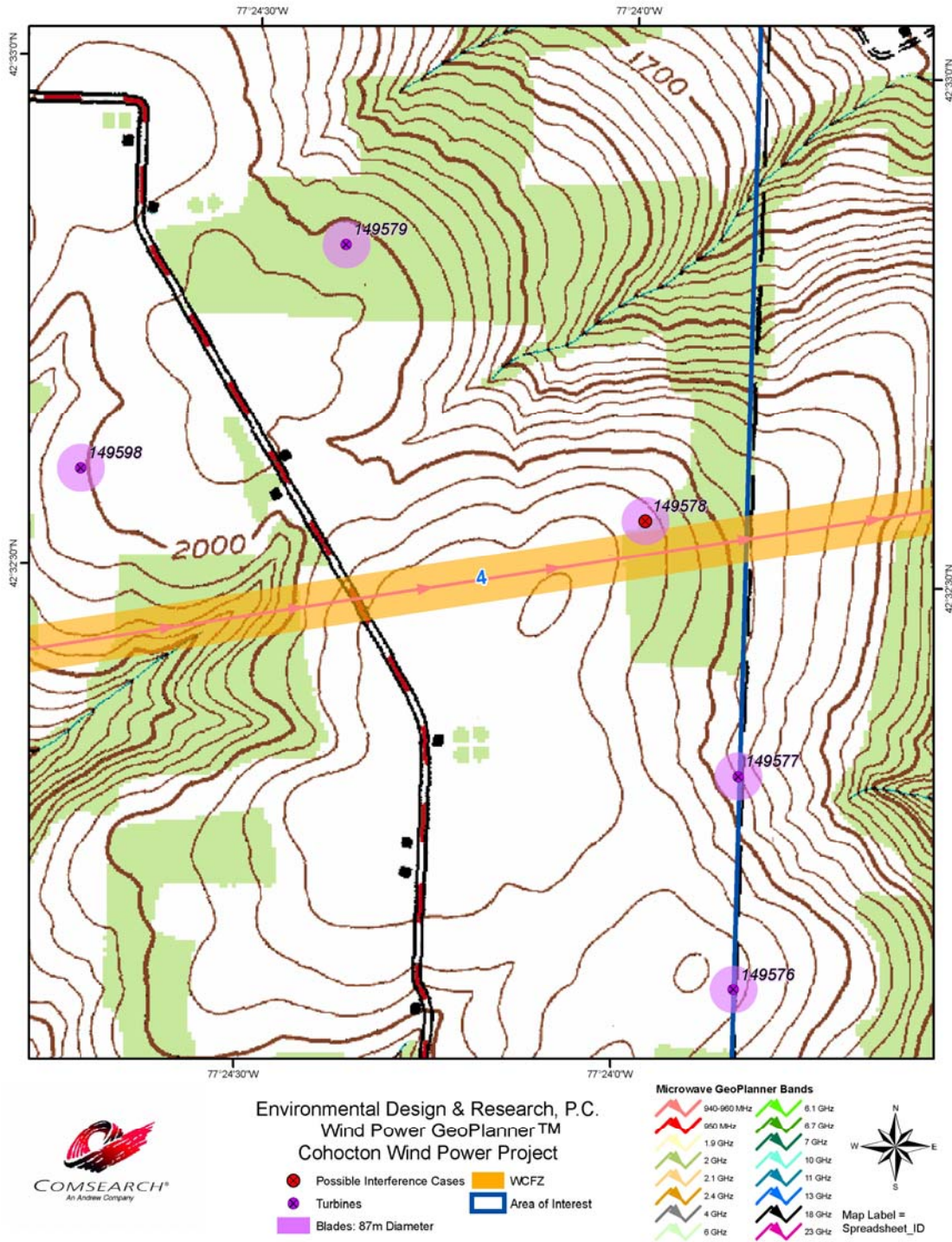
Figure 2 – Wind Power GeoPlanner™ & WCFZ



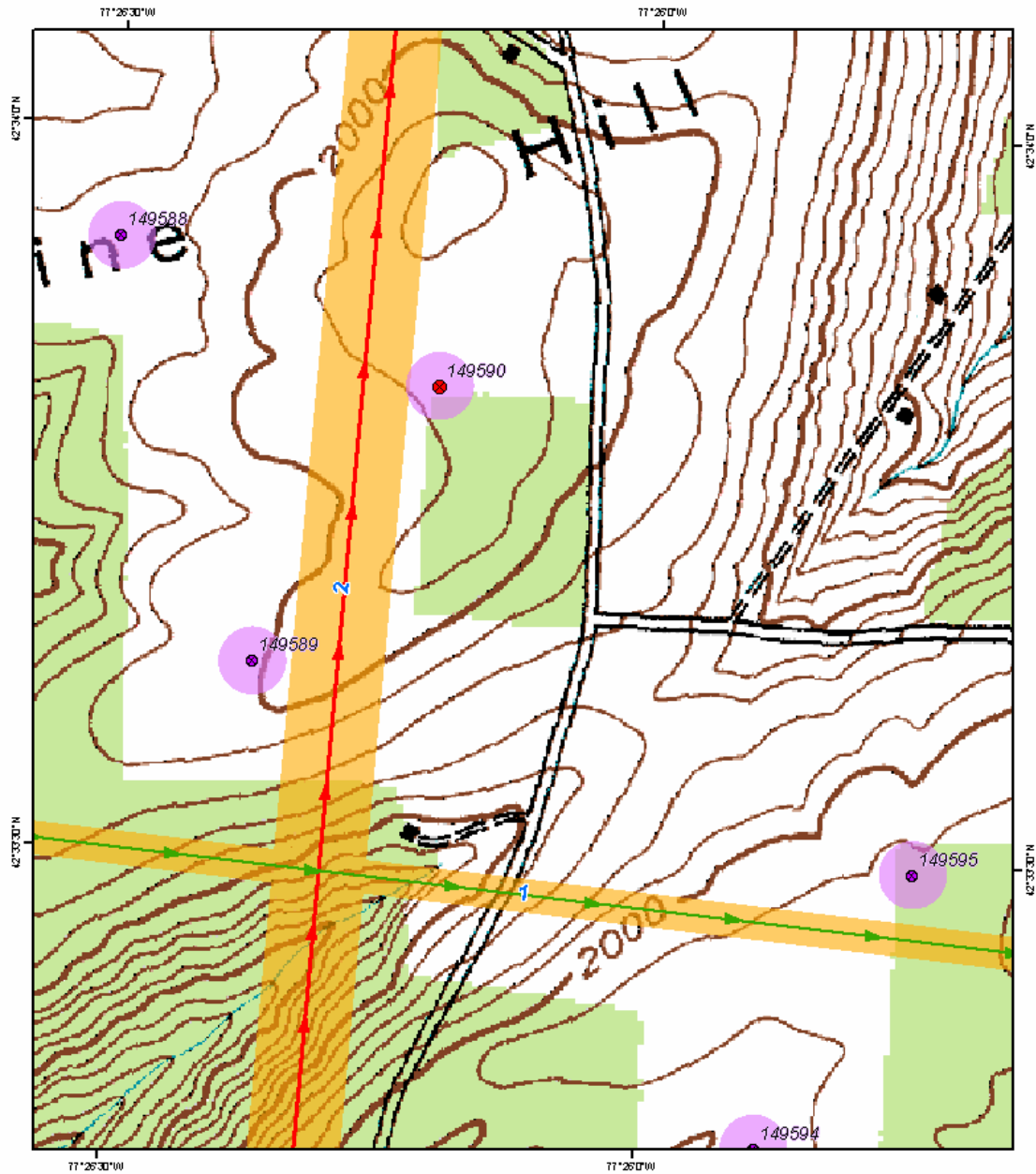
**Figure 3 – Potential Interference Case
(Turbine 149554)**



**Figure 4 – Potential Interference Case
(Turbine 149569)**



**Figure 5 – Potential Interference Case
(Turbine 149578)**

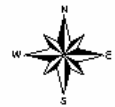


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Wind Power GeoPlanner™
Cohocton Wind Power Project

- Possible Interference Cases
- Turbines
- Blades: 87 m Diameter
- WCFZ
- Area of Interest

Microwave GeoPlanner Bands

- 50-550 MHz
- 5600 MHz
- 15 GHz
- 20 GHz
- Z1 GHz
- Z+ GHz
- + GHz
- 60 GHz
- 6.1 GHz
- 6.7 GHz
- 7 GHz
- 10 GHz
- 11 GHz
- 13 GHz
- 15 GHz
- 23 GHz



Map Label =
Spread sheet_ID

**Figure 6 – Potential Interference Case
(Turbine 149590)**



ID	Site Name 1	Site Name 2	Call Sign 1	Call Sign 2	Band Name	Licensee	WCFZ (m)
1	BYERSVILLE	PRATTSBURG	KDY71	KDT82	Upper 6 GHz	CNG Transmission Corporation	21.70
2	BATH	RECEIVER	WMF964	RXONLY	950 MHz	FAMILY LIFE MINISTRIES INC	59.67
3	SOUTH DANSVL	AVOCA	WMS263	WMS265	2.1 GHz	Dobson Cellular Systems, Inc.	27.15
4	ACOMB RD	PRATTSBURG	WNNT710	WNTZ201	940-960 MHz	Pfeiffer Corporation	42.04
5	AVOCA	DANSVILLE	WPRV808	RXONLY	940-960 MHz	THE PFEIFFER GROUP INC	38.63
6	DANSVILLE	AVOCA	WPRV809	RXONLY	940-960 MHz	THE PFEIFFER GROUP INC	38.63

Table 1 – Microwave GeoPlanner Links Considered in Analysis
(See enclosed mw_geopl.xls for more detailed information)

ID	Name Site 1	Name Site 2	Call Sign 1	Call Sign 2	Band Name	Licensee	WCFZ (m)
2	BATH	RECEIVER	WMF964	RXONLY	950 MHz	FAMILY LIFE MINISTRIES INC	59.67
3	SOUTH DANSVL	AVOCA	WMS263	WMS265	2.1 GHz	Dobson Cellular Systems, Inc.	27.15
4	ACOMB RD	PRATTSBURG	WNNT710	WNTZ201	940-960 MHz	Pfeiffer Corporation	42.04

Table 2 – Microwave GeoPlanner Links with Potential Conflict to Wind Turbines

XMID	Longitude	Latitude
149554	-77.52118778230	42.44502425190
149569	-77.44122207160	42.52955675130
149578	-77.39955210690	42.54264593120
149590	-77.43665862080	42.56371736530

Table 3 – Affected Turbines



Wind Turbine/Microwave Detailed Clearance Calculations

Company: Environmental Design & Research, P.C.
Location: Cohocton Wind Power Project – Steuben County, NY

Introduction

For the proposed wind energy facility, our preliminary clearance calculations showed cases of wind turbines potentially obstructing three microwave paths. The cases specifically involve the possible obstruction of one 2.1 GHz path licensed to Dobson Cellular, one 950 MHz path licensed to Family Life Ministries, and one 940 MHz path licensed to Pfeiffer Corporation by four of the proposed wind turbines. Path data sheets are included for the stations that comprise these microwave paths. The preliminary calculations were based on worst-case (mid-path) horizontal Fresnel radius clearance. The purpose of this study is to perform more detailed calculations, taking into account both horizontal and vertical clearance, to determine if obstruction of the microwave paths could occur.

Discussion

Horizontal Clearance Calculations: The cases in Tables 1 and 2 were identified as requiring further analysis because with respect to clearance in the horizontal direction, the locations of the some of the wind turbines are within the worst-case (mid-path) Fresnel zone radius of the microwave paths. The actual Fresnel zone radius is calculated taking into account the position of the wind turbines along the microwave path and the elliptical shape of the Fresnel zone. Table 1 shows a summary of the results, while Table 2 shows the more detailed calculations. As shown in the tables, none of the cases clear horizontally using the actual Fresnel zone radius.

Vertical Clearance Calculations: A vertical path profile was then constructed for each microwave path involved. These profiles are shown in Figures 1 to 3. On the profile, the wind turbines affecting the path are drawn at the appropriate location along the path in correspondence with the distances shown in Table 2. Based on the turbine height of 121.5 meters above ground level that was provided, the microwave paths do not have sufficient vertical clearance over the

specific wind turbines identified (149554, 149569, 149578, and 149590) as shown in the Figures.

Case	Site 1 Name	Site 1 Call Sign	Site 2 Name	Site 2 Call Sign	Mid-Band Frequency (GHz)	Worst Case (Mid-path) Fresnel Zone Radius (m)	Potentially Obstructed by Turbine #	Actual Fresnel Zone Radius at Turbine Location (m)	Turbine Off-path Distance (m)	Turbine Blade Radius (m)	Horizontal Clearance (m)	Horizontal Clearance?	Vertical Clearance?	Overall Clearance?
1	SOUTH DANSV	WMS263	AVOCA	WMS265	2.150	27.11	149554	26.90	54.64	43.50	-15.76	NO	NO	NO
2	BATH	WMF964	RECEIVER	RXONLY	0.950	59.67	149569	59.61	36.46	43.50	-66.65	NO	NO	NO
3	ACOMBRD	WN1710	PRATTSBUR	WN1201	0.950	42.04	149578	27.32	60.05	43.50	-10.77	NO	NO	NO
4	BATH	WMF964	RECEIVER	RXONLY	0.950	59.67	149590	59.20	100.05	43.50	-2.65	NO	NO	NO

Table 1: Analysis Summary

Conclusion

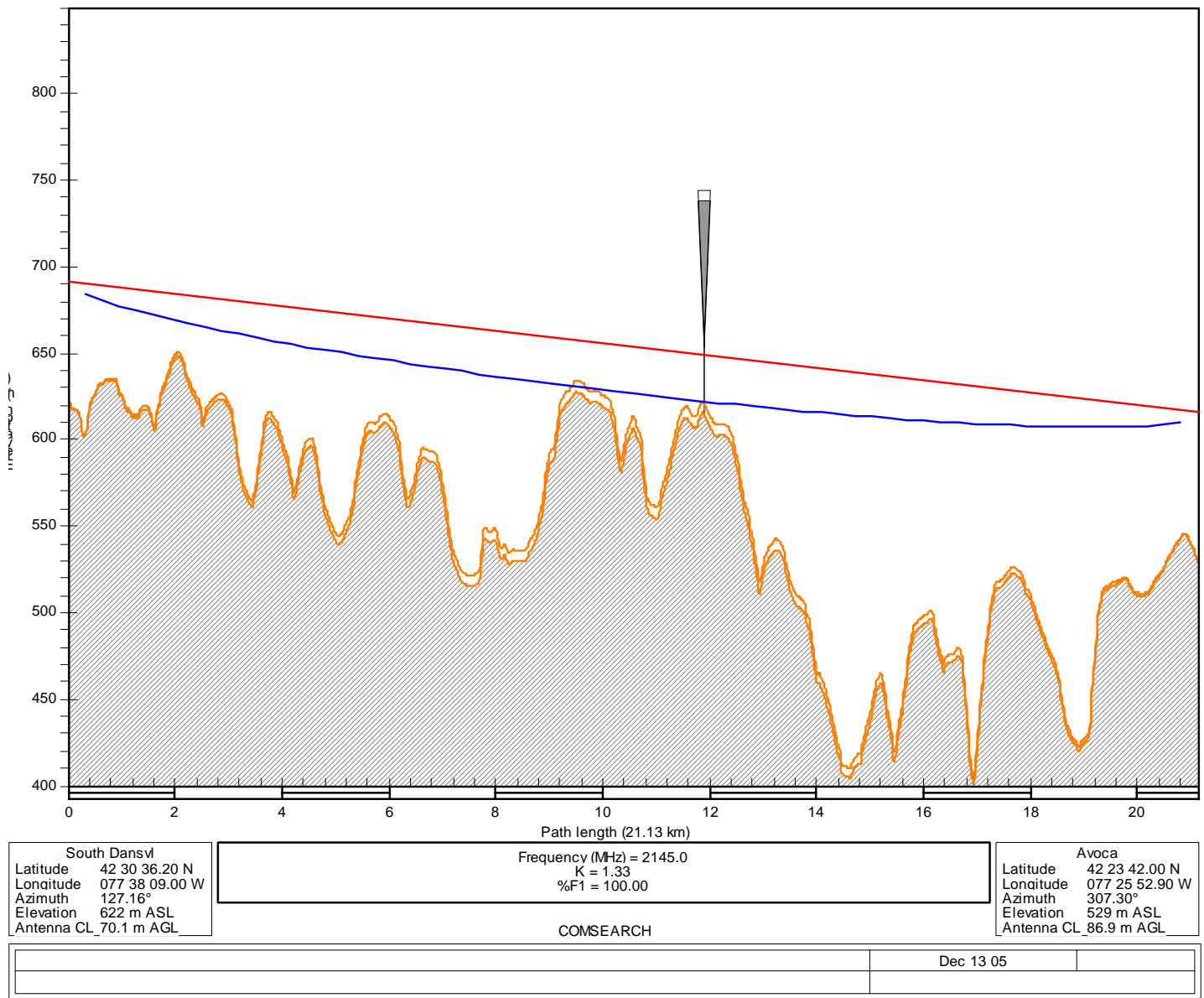
Based on the detailed horizontal and vertical path clearance calculations, cases 1 to 4 do not have sufficient vertical or horizontal clearance for the microwave paths to be clear of the potential obstruction from turbines 149554, 149569, 149578, and 149590. In order to avoid affecting the performance of the existing microwave paths, it is necessary to relocate these wind turbines to locations that meet the recommended clearance criteria.

Comsearch Contact:

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 (703) 726-5642
 jmarzin@comsearch.com

Case	Site 1 Name	Site 1 Call Sign	Site 2 Name	Site 2 Call Sign	Mid-Band Frequency (GHz)	Worst Case (Mid-path) Fresnel Zone Radius (m)	Potentially Obstructed by Turbine #	Turbine Latitude (DD)	Turbine Longitude (DD)	Turbine to Site 1 (km)	Turbine to Site 2 (km)	Actual Fresnel Zone Radius at Turbine Location (m)	Site 1 - Turbine Azimuth (Deg)	Site 2 - Turbine Azimuth (Deg)	Turbine Off-path Distance (m)	Turbine Blade Radius (m)	Horizontal Clearance (m)	Horizontal Clearance?	Vertical Clearance?	Overall Clearance?
1	SOUTH DANSY	WVMS263	AVOCA	WVMS265	2.150	27.11	149554	42.4450242519	77.5211877823	11.88	9.25	26.90	127.42	306.96	54.64	43.50	-15.76	NO	NO	NO
2	BATH	WVWF964	RECEIVER	RXONLY	0.950	59.67	149569	42.5295567513	77.4412220716	21.61	23.59	59.61	3.48	183.69	36.46	43.50	-66.65	NO	NO	NO
3	ACOMB RD	WNIT710	PRATTSBURG	WNITZ201	0.950	42.04	149578	42.5426459312	77.3996521069	19.75	2.69	27.32	79.36	260.99	60.05	43.50	-10.77	NO	NO	NO
4	BATH	WVWF964	RECEIVER	RXONLY	0.950	59.67	149590	42.5637173653	77.43966586208	25.43	19.78	59.20	3.80	183.31	100.05	43.50	-2.65	NO	NO	NO

Table 2: Analysis Details

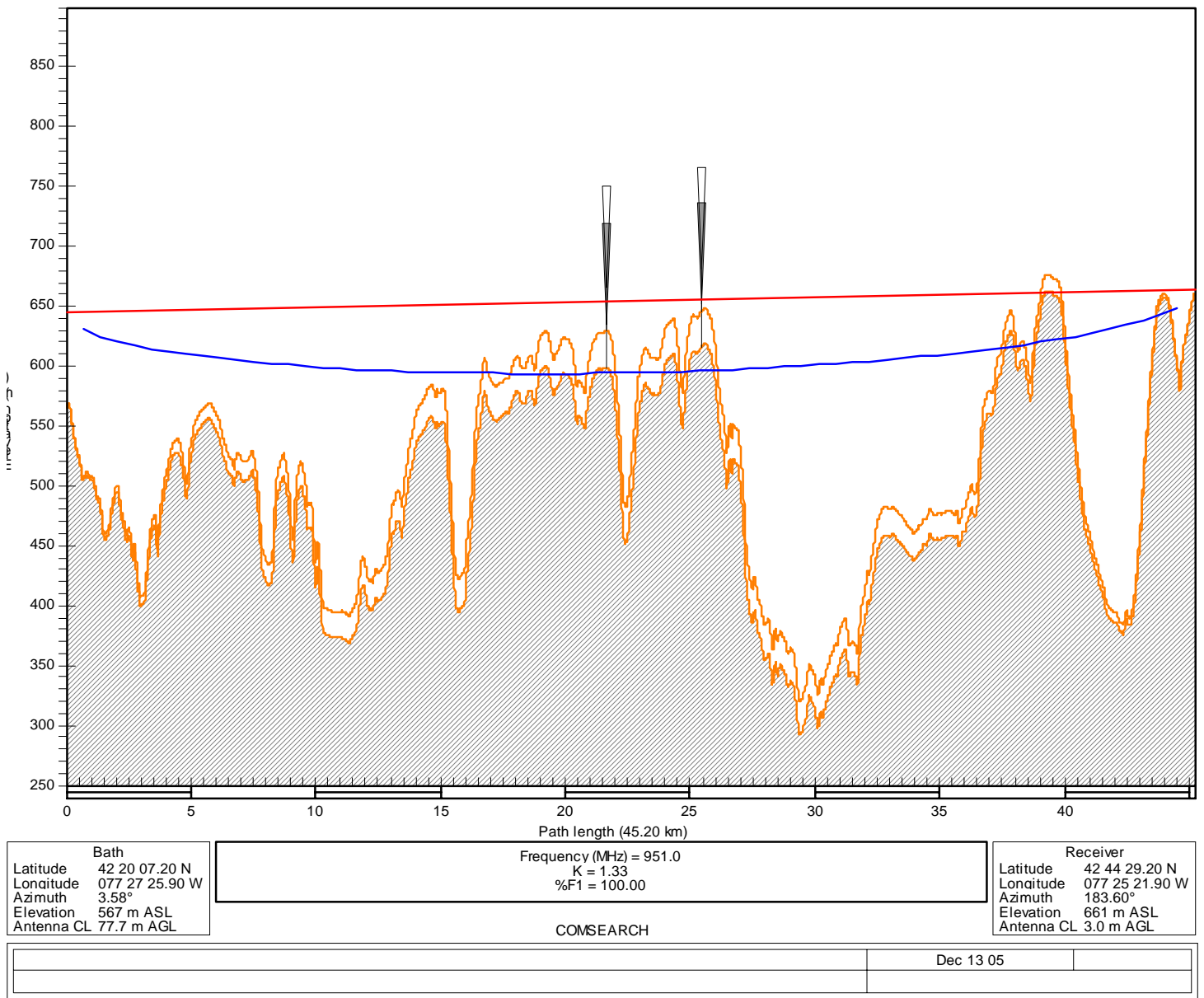


Clearance criteria - Main

1st Criteria - K 1.33
1st Criteria - %F1 100.00

Dist (km)	Elev (m)	Struct (m)	Clear (m)	K (m)	%F1 (m)	FH (m)	Crit
11.88	615.7	122	-121.5	6.5	26.9		1 Turbine 149554

Figure 1: South Dansvl (WMS263) to Avoca (WMS265) Path Profile and Clearance calculations – Case 1 with turbine 149554 is shown at the 11.9 km point on the Figure.



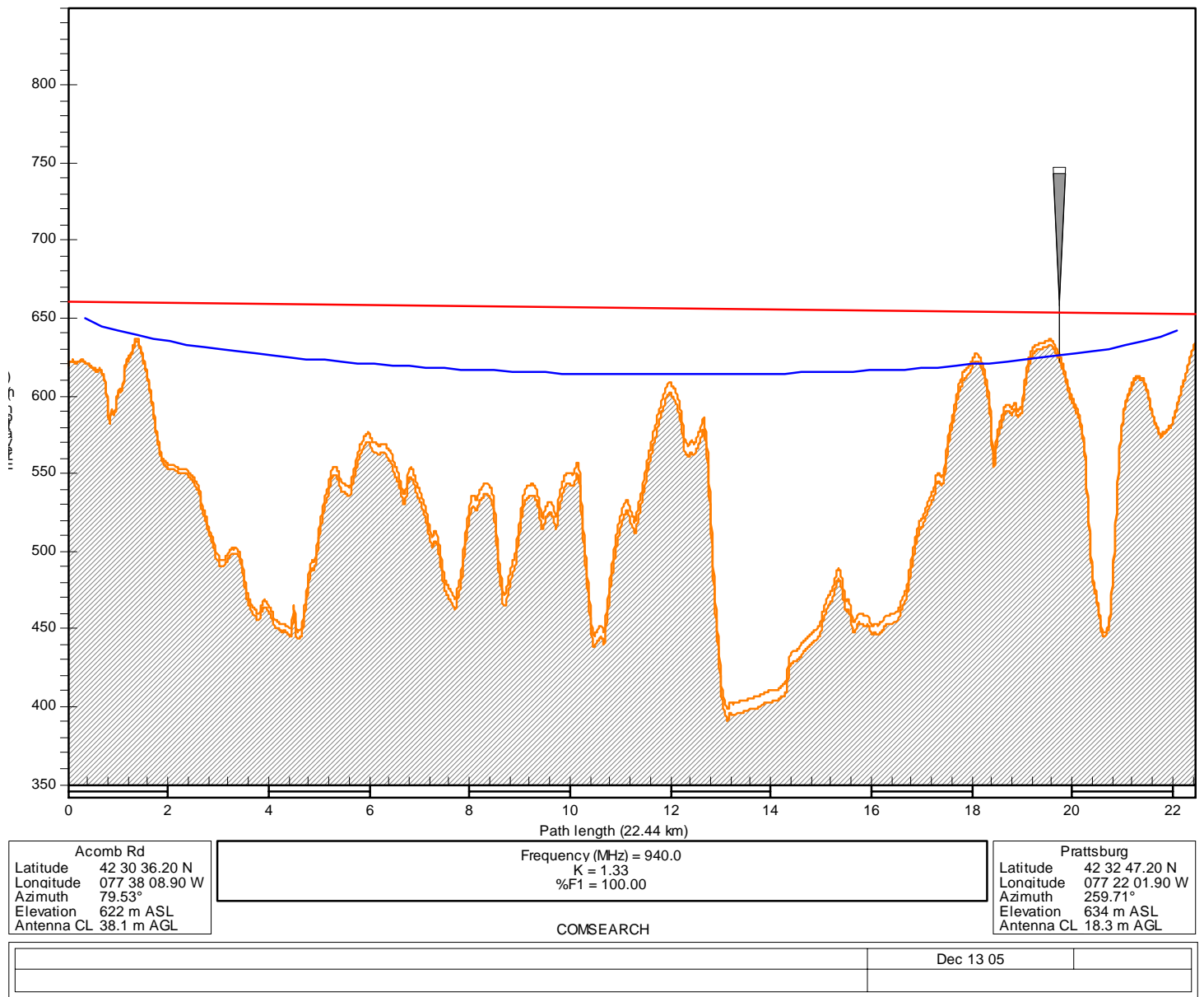
Clearance criteria - Main

1st Criteria - K 1.33

1st Criteria - %F1 100.00

Dist (km)	Elev (m)	Struct (m)	Clear (m)	K (m)	%F1 (m)	FH (m)	Crit	
21.61	599.0	122	-156.3	30.0	59.6		1	Turbine 149569
25.43	615.7	122	-170.5	29.6	59.2		1	Turbine 149590

Figure 2: Bath (WFM964) to Receiver Path Profile and Clearance calculations – Cases 2 and 4 with turbines 149569 and 149590 are shown at the 21.6 and 25.4 km points on the Figure.



Clearance criteria - Main

1st Criteria - K 1.33
 1st Criteria - %F1 100.00

Dist (km) Elev (m) Struct (m) Clear (m) K (m) %F1 (m) FH (m) Crit

19.75 622.6 122 -121.4 3.1 27.4 1 Turbine 149578

Figure 3: Acomb Rd (WNTT710) to Prattsburg (WNTZ201) Path Profile and Clearance calculations – Case 3 with turbine 149578 is shown at the 19.75 km point on the Figure.

Date: 12/13/2005

RCN Number / Job Number: 94081826

Administrative Information	SOUTH DANSVL NY	AVOCA NY
Status / License Basis	License / SECONDARY OPERATION	License / SECONDARY OPERATION
Call Sign	WMS263	WMS265
Licensee Code	DOBCMI	DOBCMI
Licensee Name	Dobson Cellular Systems, Inc.	Dobson Cellular Systems, Inc.
Radio Service / Station Class	CF -- Point-to-Point Microwave, Common Carrier	FXO -- Fixed
File Number / Application Date	0000875727 05/03/2002	0000421618 04/21/1980
Effective / Expiration Date	01/29/1997 02/01/2011	01/29/1997 02/01/2011

Site Information		
Latitude (NAD 83)	42 ° 30' 36.2" N	42 ° 23' 42.0" N
Longitude (NAD 83)	77 ° 38' 9.0" W	77 ° 25' 52.9" W
Ground Elevation (m/ft-AMSL)	621.79 / 2040.0	529.00 / 1735.5
Antenna Structure Registration #		1007542
Path Azimuth (°)	127.159	307.297
Path Length (km / miles)		21.125 / 13.127

Transmit Antenna		
Manufacturer	A21950	A21950
Model	ANDREW CORPORATION	ANDREW CORPORATION
Gain (dBi) / Beamwidth (°) / Tilt (°)	GP6F-21A	GP6F-21A
Centerline (m / ft - AGL)	29.8 / 5.40 / -0.28	29.8 / 5.40 / 0.13
	70.10 / 230.0	86.87 / 285.0

Receive Antenna	Same As Transmit	
Manufacturer		
Model		
Gain (dBi) / Beamwidth (°)		
Centerline (m / ft - AGL)		

Diversity Receive Antenna
Manufacturer
Model
Gain (dBi) / Beamwidth (°)
Centerline (m / ft - AGL)

Radio Information		
Manufacturer	300110	300110
Model	TELESCIENCES TRANSMISSION SYSTEMS INC	TELESCIENCES TRANSMISSION SYSTEMS INC
Model Description	IVO-2G-8DS1	IVO-2G-8DS1
Emission Designator / Modulation	3M50D7W 32 QAM	3M50D7W 32 QAM
Loading	192 CH DIG 12624.0	192 CH DIG 12624.0
Stability (%)	0.001	0.001
	Nominal Coordinated Maximum	Nominal Coordinated Maximum
Power (dBm)		24.0
Received Level (dBm)		-54.0
EIRP (dBm)		47.8
Fixed Loss: Tx / Common (dB)	0.0 / 6.0	0.0 / 6.0
Free Space Loss (dB)		125.6

Transmit Frequencies (MHz)		
	2162.0000H	2112.0000H

RCN Number / Job Number:

Administrative Information

Status / License Basis
Call Sign
Licensee Code
Licensee Name
Radio Service / Station Class
File Number / Application Date
Effective / Expiration Date

BATH NY

License / PRIMARY OPERATION
WMF964
FAMLIF
FAMILY LIFE MINISTRIES INC
AI -- Aural Intercity Relay
04/20/1993 06/01/2006

RECEIVER NY

License / PRIMARY OPERATION

FAMLIF
FAMILY LIFE MINISTRIES INC
FXO -- Fixed

Site Information

Latitude (NAD 83)	42 ° 20' 7.2" N	42 ° 44' 29.2" N
Longitude (NAD 83)	77 ° 27' 25.9" W	77 ° 25' 21.9" W
Ground Elevation (m/ft-AMSL)	566.90 / 1859.9	660.80 / 2168.0
Antenna Structure Registration #		
Path Azimuth (°)	3.578	183.601
Path Length (km / miles)		45.200 / 28.086

Transmit Antenna

S01000
Manufacturer SCALA ELECTRONICS
Model PR-450U (V)
Gain (dBi) / Beamwidth (°) / Tilt (°) 18.1 / 12.00 / -0.13
Centerline (m / ft - AGL) 77.70 / 254.9

Receive Antenna

S01000
Manufacturer SCALA ELECTRONICS
Model PR-450U (V)
Gain (dBi) / Beamwidth (°) 18.1 / 12.00
Centerline (m / ft - AGL) 3.05 / 10.0

Diversity Receive Antenna

Manufacturer
Model
Gain (dBi) / Beamwidth (°)
Centerline (m / ft - AGL)

Radio Information

Manufacturer	AB0063	999999
Model	AB EQUIPMENT	RECEIVE
Model Description	UNKNOWN	ONLY
Emission Designator / Modulation	500KF9W FM	
Loading	1 CH MSG 0.0	1 CH MSG
Stability (%)	0.005	0.005
Power (dBm)	Nominal Coordinated Maximum	Nominal Coordinated Maximum
Received Level (dBm)		-58.9
EIRP (dBm)	48.1	
Fixed Loss: Tx / Common (dB)	0.0 / 0.0	0.0 / 0.0
Free Space Loss (dB)		125.1

Transmit Frequencies (MHz) 951.5000V(10)

RCN Number / Job Number: 950428A1

Administrative Information	ACOMB RD NY	PRATTSBURG NY
Status / License Basis	License / PRIMARY OPERATION	License / PRIMARY OPERATION
Call Sign	WNTT710	WNTZ201
Licensee Code	SPFEEL	SPFEEL
Licensee Name	Pfeiffer Corporation	Pfeiffer Corporation
Radio Service / Station Class	MG -- Microwave Industrial/Business Pool	FXO -- Fixed
File Number / Application Date	0000156426 06/06/2000	0000208422 08/21/2000
Effective / Expiration Date	06/07/2000 06/02/2010	08/26/2000 09/15/2010

Site Information

Latitude (NAD 83)	42 ° 30' 36.2" N	42 ° 32' 47.2" N
Longitude (NAD 83)	77 ° 38' 8.9" W	77 ° 22' 1.9" W
Ground Elevation (m/ft-AMSL)	621.80 / 2040.0	633.98 / 2080.0
Antenna Structure Registration #		
Path Azimuth (°)	79.531	259.712
Path Length (km / miles)		22.437 / 13.942

Transmit Antenna

Manufacturer	S01111	S01111
Model	SCALA ELECTRONICS	SCALA ELECTRONICS
Gain (dBi) / Beamwidth (°) / Tilt (°)	PR-450CU (H)	PR-450CU (H)
Centerline (m / ft - AGL)	18.0 / 24.00 / -0.10	18.0 / 24.00 / -0.06
	38.10 / 125.0	18.29 / 60.0

Receive Antenna

Same As Transmit

Manufacturer	
Model	
Gain (dBi) / Beamwidth (°)	
Centerline (m / ft - AGL)	

Diversity Receive Antenna

Manufacturer	
Model	
Gain (dBi) / Beamwidth (°)	
Centerline (m / ft - AGL)	

Radio Information

	TEMP42	TEMP42
Manufacturer	MICROWAVE DATA SYSTEMS, INC	MICROWAVE DATA SYSTEMS, INC
Model	E5M5LL1460	E5M5LL1460
Model Description	MDS-960A-12 (Analog)	MDS-960A-12 (Analog)
Emission Designator / Modulation	200KF9W FM	200KF9W FM
Loading	12 CH DIG 384.0	12 CH DIG 384.0
Stability (%)	0.00015	0.00015
	Nominal Coordinated Maximum	Nominal Coordinated Maximum
Power (dBm)		37.0
Received Level (dBm)		-53.9
EIRP (dBm)		51.0
Fixed Loss: Tx / Common (dB)	0.0 / 4.0	0.0 / 4.0
Free Space Loss (dB)		118.9

Transmit Frequencies (MHz)

942.7750H(4)	933.7750H(4)
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