

Licensed Microwave Search & Worst Case Fresnel Zone



Executive Summary – Wind Power GeoPlanner™

Licensed Microwave Search & Worst Case Fresnel Zone

Comsearch performed an analysis to evaluate the potential effects of the planned Hatchet Ridge Wind Farm in Shasta County, California 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 62 microwave paths that intersect the project area.

Several of these paths were found to have coordinate inaccuracies on the FCC license. To correct these inaccuracies, an onsite field analysis was performed to measure the actual coordinates of all Bear Springs and Hatchet Mountain towers with a GPS unit. A summary of the located towers and coordinates appears below in Table 1.

Tower ID	Area	Latitude (WGS84)	Longitude (WGS84)
1	Bear Springs	40-54-22.5 N	121-49-43.5 W
2	Bear Springs	40-54-22.2 N	121-49-44.7 W
KRRX	Bear Springs	40-54-20.6 N	121-49-42.0 W
A	Hatchet Mountain	40-52-28.1 N	121-46-20.6 W
B	Hatchet Mountain	40-52-29.6 N	121-46-19.0 W
C	Hatchet Mountain	40-52-29.6 N	121-46-18.5 W
D	Hatchet Mountain	40-52-29.5 N	121-46-17.0 W
E	Hatchet Mountain	40-52-28.9 N	121-46-17.9 W
F	Hatchet Mountain	40-52-29.0 N	121-46-19.0 W

Table 1 – Hatchet Ridge Towers

Next Comsearch identified the microwave antennas on these towers and attempted to correlate this to the original microwave path data. Where possible, Comsearch updated the microwave dataset with the correct coordinates for each path. However, a few of the original 62 microwave path antennas were not located on any tower; thus the status on these paths was updated to questionable, and the licensee was contacted to resolve the issue. Of the towers listed in Table 1, Tower F is the only one that remains partially unresolved. An overview of all original paths appears in Figure 1 and Table 2.

For this final study, resolved paths were removed from the analysis if the licensee indicated they had been dismantled, and our field study confirmed they were no longer there. Questionable and unresolved paths were included in the analysis. Multiple attempts to contact the licensees of the questionable and unresolved paths have been



made, and all claim to be operating, although there is no correlation between physical site data and licensed data. The final set of paths included in the analysis appears in Figure 2.

Comsearch then calculated a Worst Case Fresnel Zone (WCFZ) for each remaining 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.

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

Where,

Rn = First Fresnel Zone Radius, meters

n = The Number 1

FGHz = Frequency of Microwave Link, GHz

d1 = Distance to Wind Turbine from Microwave Station 1, km

d2 = Distance to Wind Turbine from Microwave Station 2, km

note: For WCFZ calculation d1 = d2

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 3 through 5.

Please note that because the turbine locations were not provided, we could not determine if any potential obstruction cases exist between the planned wind turbines and the microwave systems. If the latitude and longitude values for turbine locations are provided, Comsearch can identify specific microwave telecom paths and turbines where a potential XY conflict exists. Additionally, when wind turbines need to be located inside a WCFZ, Comsearch can provide a detailed clearance study, which considers the vertical Z-height clearance objectives.

Map Projection: The ESRI® Shapefiles contained in the enclosed GeoPlanner CD are in NAD 83 UTM Zone 10 projected coordinate system.

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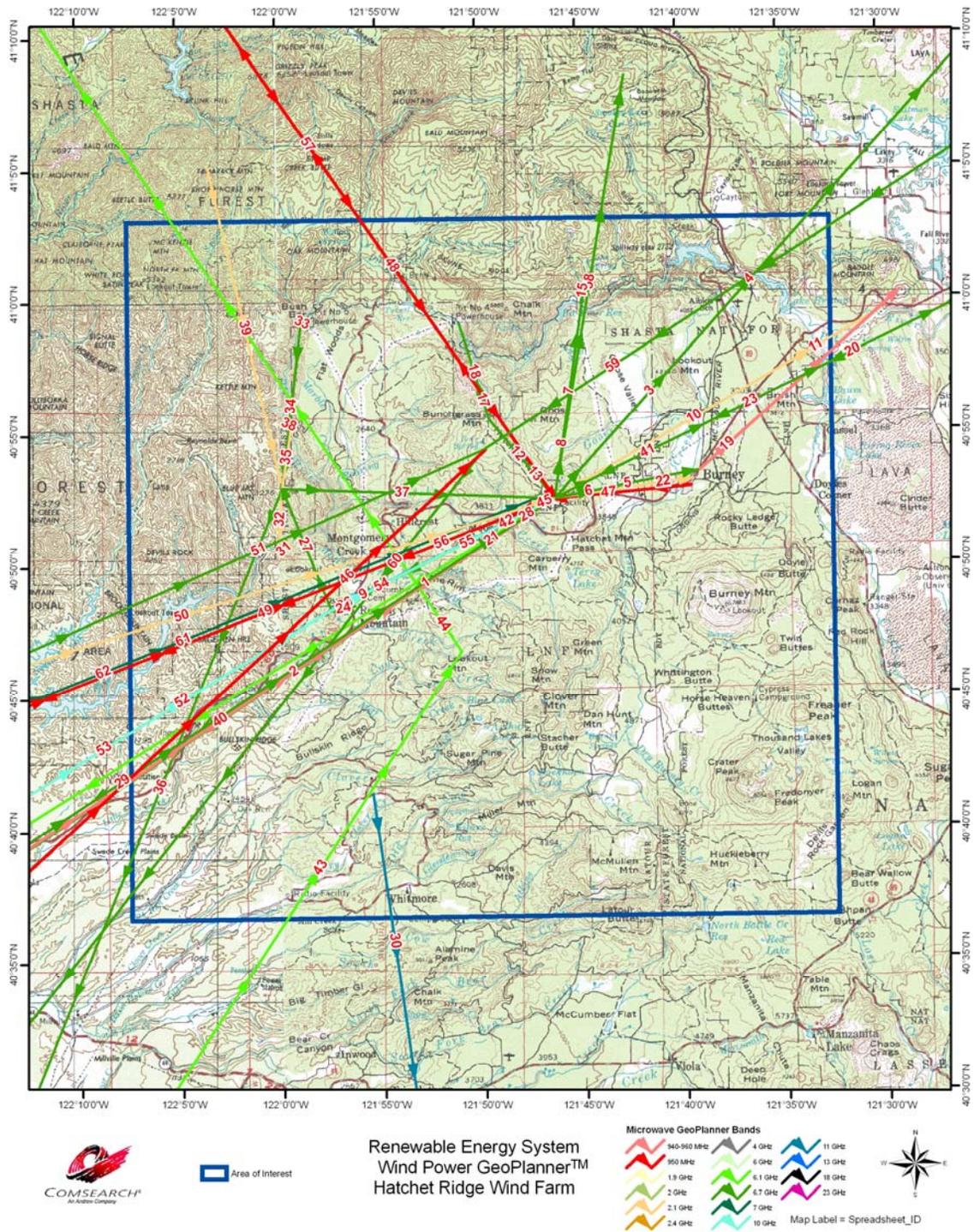


Figure 1 – Wind Power GeoPlanner™ - All Paths

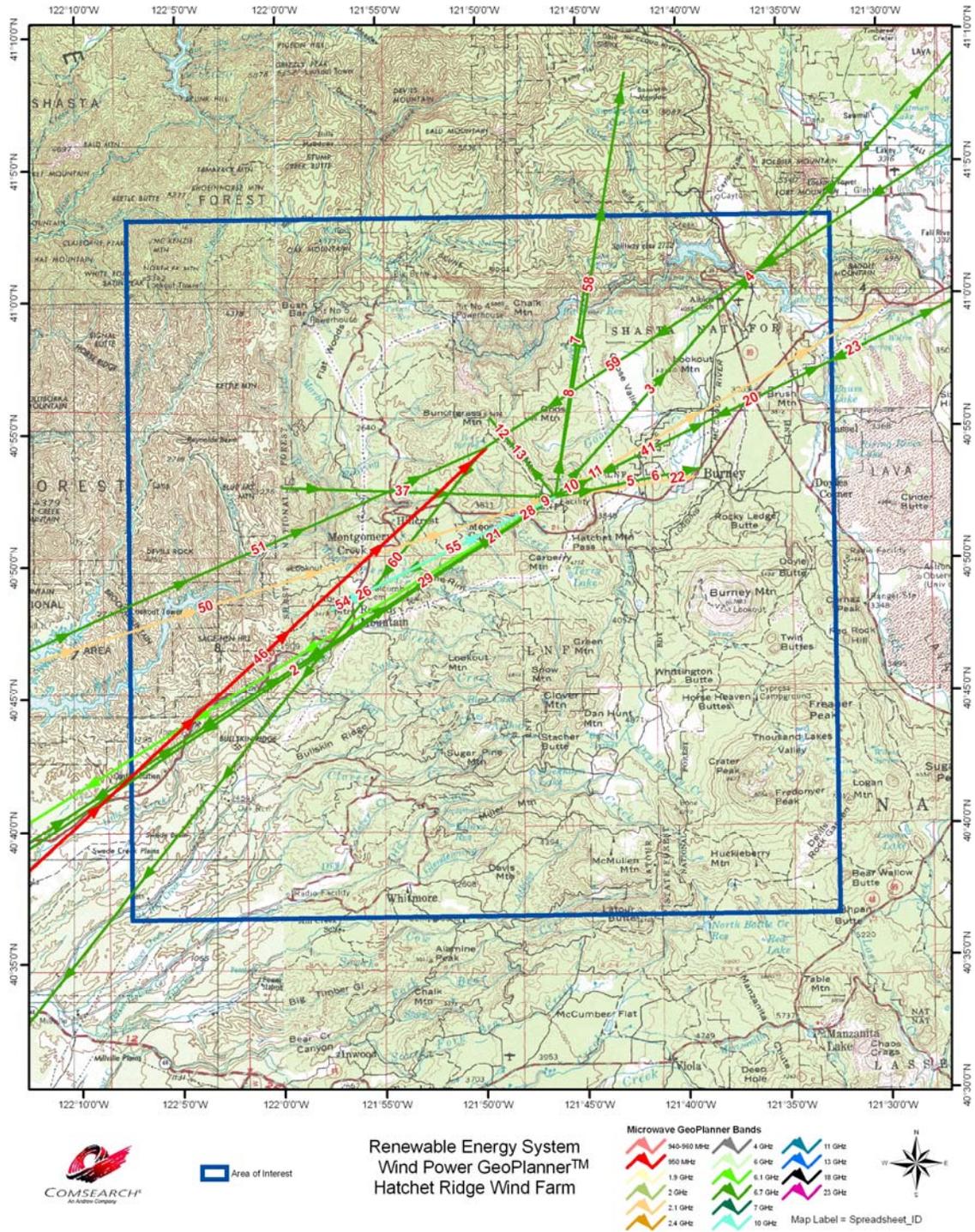


Figure 2 – Wind Power GeoPlanner™ - Remaining Paths

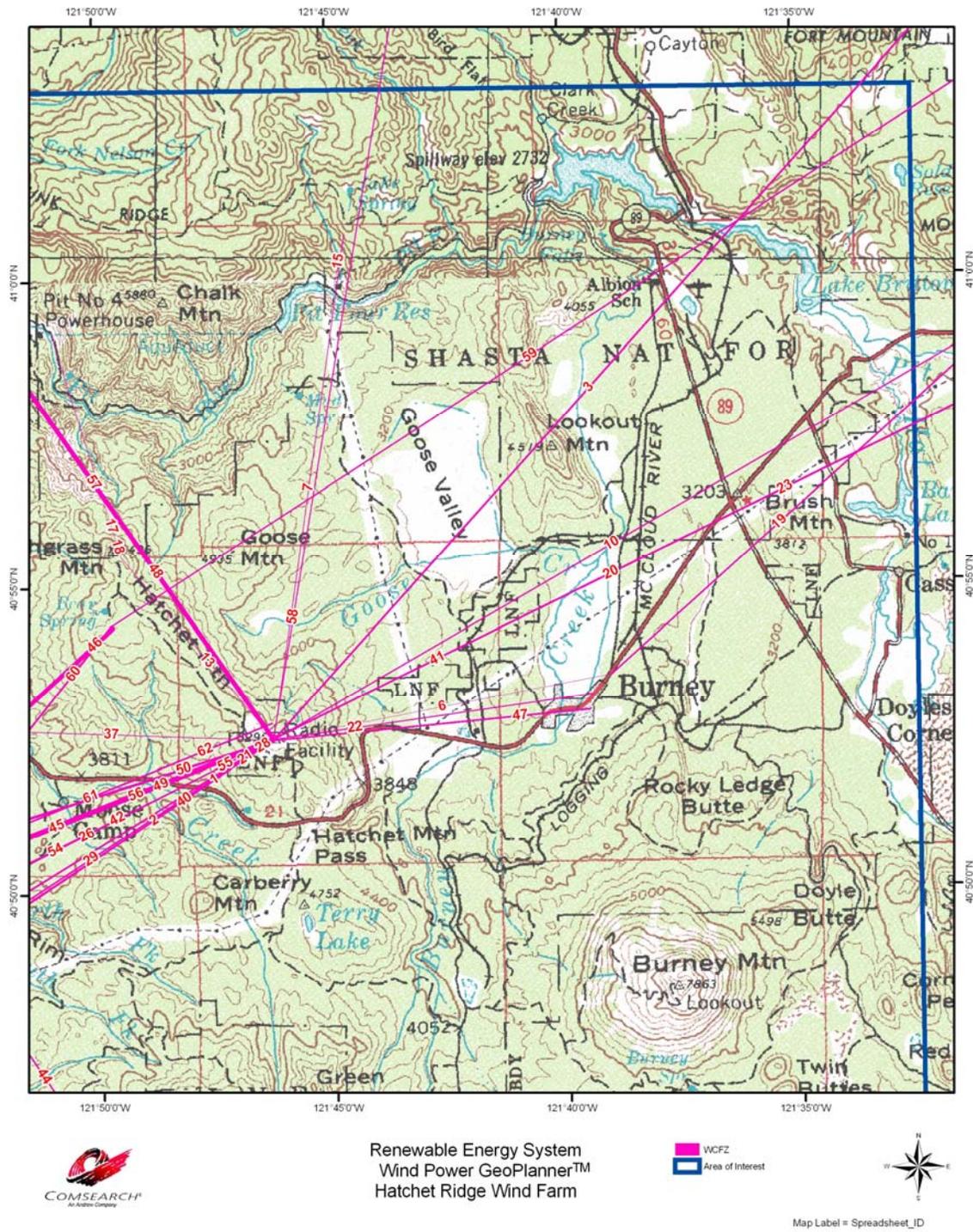
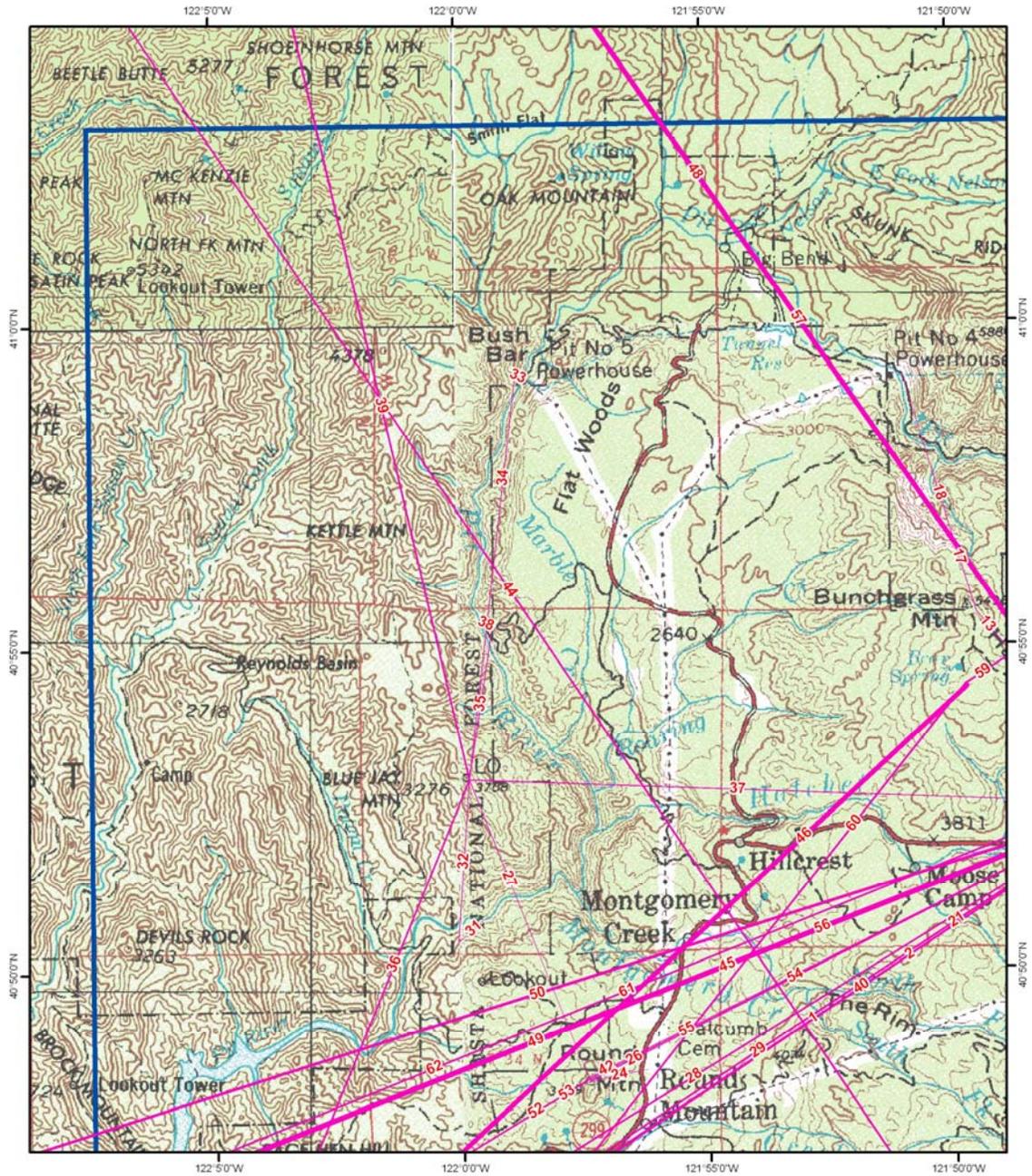


Figure 3 – Wind Power GeoPlanner™ & WCFZ (NE)



Renewable Energy System
Wind Power GeoPlanner™
Hatchet Ridge Wind Farm



Map Label = Spreadsheet_ID

Figure 4 – Wind Power GeoPlanner™ & WCFZ (NW)

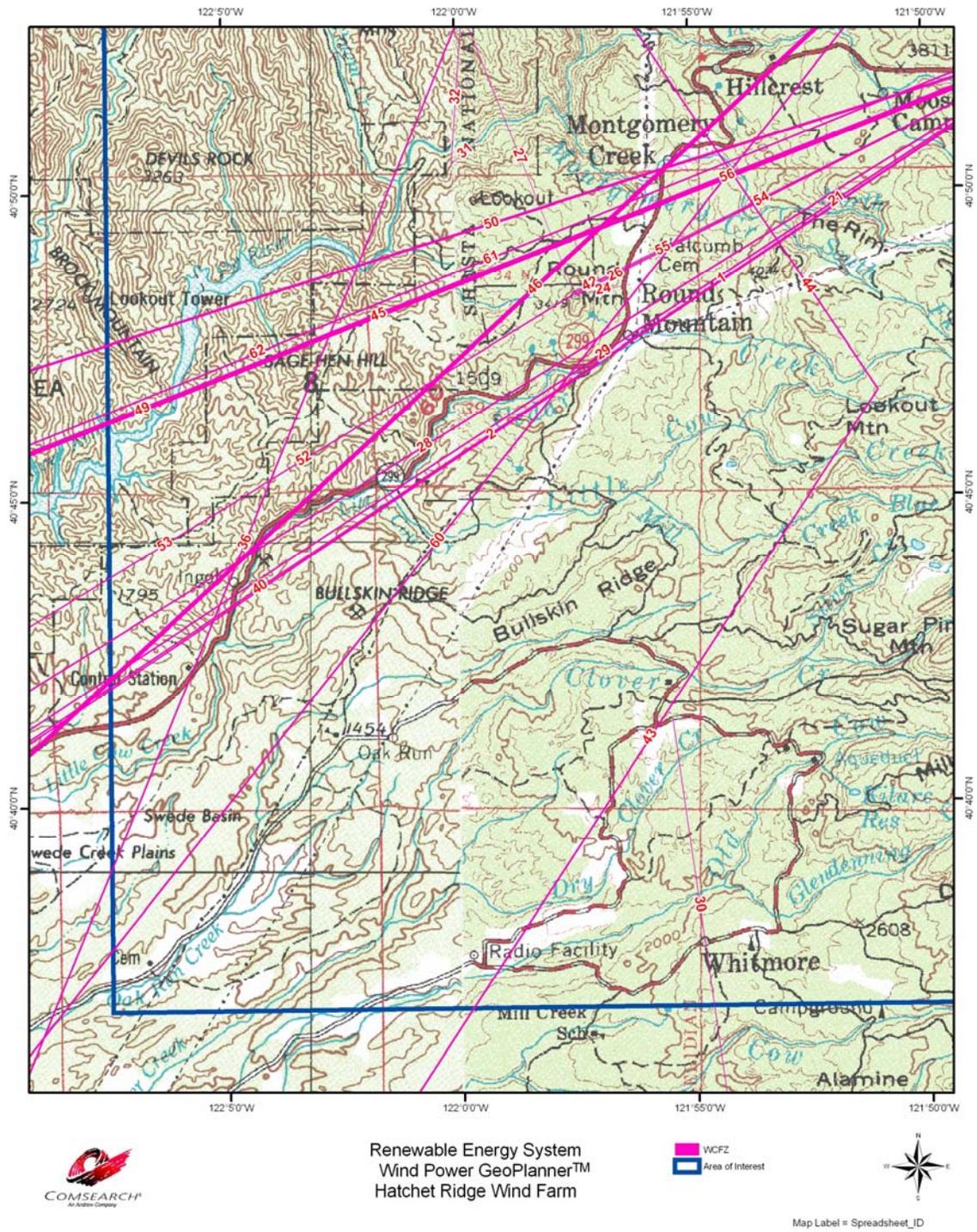


Figure 5 – Wind Power GeoPlanner™ & WCFZ (SW)



Renewable Energy Systems Hatchet Ridge Wind Farm

ID	Category	Tower ID	Name Site 1	Name Site 2	Call Sign Site 1	Call Sign Site 2	BAND NAME	Licensee	WCFZ (m)
1	Unresolved*		HATCHET MTN	REDDING	HATCHE	REDDIN	940-960 MHz	FEDERAL GOVERNMENT	69.29
2	Resolved	D	HATCHET MTN	BENTON SUB	KBK63	KBK68	Upper 6 GHz	Pacific Gas and Electric Company	26.55
3	Resolved	D	HATCHET MTN	HAPPY CAMP	KBK63	KBK69	Lower 6 GHz	Pacific Gas and Electric Company	31.50
4	Resolved	Dis-mantled	HATCHET MTN	HAPPY CAMP	KBK63	KBK69	Upper 6 GHz	Pacific Gas and Electric Company	30.24
5-6	Resolved	D	HATCHET MTN	BURNEY SUE	KBK63	KBY24	Upper 6 GHz	Pacific Gas and Electric Company	10.75
7	Resolved	D	HATCHET MTN	PIT3 PR	KBK63	KEU38P	Lower 6 GHz	Pacific Gas and Electric Company	13.68
8	Resolved	Dis-mantled	HATCHET MTN	PIT 3 PR	KBK63	KEU38P	Upper 6 GHz	Pacific Gas and Electric Company	13.13
9	Resolved	Dis-mantled	HATCHET MTN	ROUND MTN PR	KBK63	KJI72P	Upper 6 GHz	Pacific Gas and Electric Company	13.99
10	Resolved	D	HATCHET MTN	PIT 1 POWER	KBK63	WNEJ875	Lower 6 GHz	Pacific Gas and Electric Company	17.86
11	Resolved	Dis-mantled	HATCHET MTN	PIT 1 POWER	KBK63	WNEJ875	2.1 GHz	Pacific Gas and Electric Company	30.30
12	Resolved	Dis-mantled	HATCHET MTN	BUNCH GRASS	KBK63	WNTA972P	Upper 6 GHz	Pacific Gas and Electric Company	8.94
13	Resolved	D	HATCHET MTN	BUNCH GRASS	KBK63	WQEN887P	Upper 6 GHz	Pacific Gas and Electric Company	8.94
14	Not measured		PIT3 PR	PIT 3 POWER	KBK63P	KEU38	Lower 6 GHz	Pacific Gas and Electric Company	4.49
15	Not measured		PIT 3 PR	PIT 3 POWER	KBK63P	KEU38	Upper 6 GHz	Pacific Gas and Electric Company	4.32
16	Not measured		ROUND MTN PR	ROUND MT SU	KBK63P	KJI72	Upper 6 GHz	Pacific Gas and Electric Company	4.35
17	Not measured		BUNCH GRASS	PIT 4 PH	KBK63P	WNTA972	Upper 6 GHz	Pacific Gas and Electric Company	8.89
18	Not measured		BUNCH GRASS	PIT 4 PH	KBK63P	WQEN887	Upper 6 GHz	Pacific Gas and Electric Company	8.89
19	Not measured		BURNEY SUE	HANEY MTN	KBY24	WNTC676	940-960 MHz	Pacific Gas and Electric Company	38.50
20	Resolved	B	HATCHET MTN	BIG VLY MTN	KCI60	KCI61	Upper 6 GHz	California, State of	23.90
21	Resolved	B	HATCHET MTN	REDDING CDF	KCI60	KNI78	Upper 6 GHz	California, State of	26.22
22	Resolved	B	HATCHET MTN	BURNEY	KCI60	WPP72	2.1 GHz	California, State of	18.47
23	Resolved	B	BIG VLY MTN	HATCHET MTN	KCI61	KCI60	Upper 6 GHz	California, State of	23.90
24	Not measured		ROUND MT SU	ROUND MTN PR	KJI72	KBK63P	Lower 6 GHz	Pacific Gas and Electric Company	4.53
25	Not measured		ROUND MT SU	ROUND MT PR	KJI72	KSR40P	Upper 6 GHz	Pacific Gas and Electric Company	4.36
26	Resolved	D	ROUND MTN PR	HATCHET MTN	KJI72P	KBK63	Lower 6 GHz	Pacific Gas and Electric Company	14.57
27	Not measured		ROUND MT PR	HOGBACK MTN	KJI72P	KSR40	Upper 6 GHz	Pacific Gas and Electric Company	10.19



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ID	Category	Tower ID	Name Site 1	Name Site 2	Call Sign Site 1	Call Sign Site 2	BAND NAME	Licensee	WCFZ (m)
28	Resolved	C	HATCHET MTN	REDDING	KMH74	KME51	Lower 6 GHz	Citizens Telecommunications of CA	27.67
29	Resolved	B	REDDING CDF	HATCHET MTN	KN178	KCI60	Upper 6 GHz	California, State of	26.22
30	Not measured		OAK RUN	SHINGLETOWN	KNL92	KNL91	11 GHz	Citizens Telecommunications of Tuolumne	11.96
31	Not measured		PIT 7 POWER	PIT 7 PR	KSR37	KSR40P	2.1 GHz	Pacific Gas and Electric Company	6.31
32	Not measured		PIT 7 PR	HOGBACK MTN	KSR37P	KSR40	2.1 GHz	Pacific Gas and Electric Company	12.72
33	Not measured		PIT 5 POWER	PIT 5 PR	KSR38	KSR40P	Upper 6 GHz	Pacific Gas and Electric Company	1.53
34	Not measured		PIT 5 PR	HOGBACK MTN	KSR38P	KSR40	Upper 6 GHz	Pacific Gas and Electric Company	11.42
35	Not measured		HOGBACK MTN	PIT 6 PR	KSR40	KSR39P	2.1 GHz	Pacific Gas and Electric Company	12.44
36	Not measured		HOGBACK MTN	COTTONWOOD	KSR40	KSR41	Upper 6 GHz	Pacific Gas and Electric Company	25.53
37	Resolved	E	HOGBACK MTN	HATCHET MTN	KSR40	WNEV258	Upper 6 GHz	Pacific Gas and Electric Company	14.57
38	Not measured		PIT 6 PR	PIT 6 POWER	KSR40P	KSR39	2.1 GHz	Pacific Gas and Electric Company	3.66
39	Not measured		MCCLOUD PR	HOGBACK MTN	KTP98P	KSR40	2.1 GHz	Pacific Gas and Electric Company	28.39
40	Unresolved*		REDDING	HATCHET MTN	REDDIN	HATCHE	940-960 MHz	FEDERAL GOVERNMENT	69.29
41	Resolved	C	BIG VALLEY	HATCHET MTN	WAH462	KMH74	Lower 6 GHz	Citizens Telecommunications of CA	24.89
42	Resolved	F	ROUND MT	HATCHETT MT	WHZ765	HATCHETT	13 GHz	Time Warner NY Cable, Inc.	10.11
43	Not measured		HOOKER	CEDAR CREEK	WLC227	WLC228	Lower 6 GHz	BorderComm Partners LP (XC)	28.27
44	Not measured		CEDAR CREEK	SODA CREEK	WLC228	WLC229	Lower 6 GHz	BorderComm Partners LP (XC)	26.89
45	Unresolved**		HATCHET MTN	S FORK MTN	WLE341	RXONLY	950 MHz	ST OF OR ACTING B/T OR ST BRD OF H ED	73.13
46	Resolved	KRRX	STUDIO	KRRX XMTR	WLG966	RXONLY	950 MHz	MAPLETON COMMUNICATIONS LLC	67.19
47	Unresolved**		BURNEY	HATCHET MTN	WLJ731	RXONLY	950 MHz	BURNEY EDUCATIONAL B/C FOUNDATION	27.55
48	Unresolved**		HATCHET MTN	GRAY BUTTE	WLP267	RXONLY	950 MHz	OR ST BOARD OF HIGHER EDUCATION	70.62
49	Unresolved**		S FORK MTN	HATCHET MTN	WLP270	RXONLY	950 MHz	OR ST BOARD OF HIGHER EDUCATION	73.13
50	Resolved	E	GRAY ROCKS	HATCHET MTN	WML723	WMR383	2.1 GHz	Redding MSA Limited Partnership	40.43
51	Resolved	Dis-mantled	GRAY ROCKS	BUNCHGRASS	WMN741	WMN742	Upper 6 GHz	New Cingular Wireless PCS LLC - N CAL	22.01
52	Not measured		REDDING	ROUND MTN	WMS862	WMS863	10 GHz	New Cingular Wireless PCS LLC - N CAL	17.18
53	Not measured		REDDING	ROUND MTN	WMN208	WMS863	10 GHz	New Cingular Wireless PCS LLC - N CAL	17.17
54	Resolved	A	ROUND MTN	BURNEY	WMS863	WMS864	10 GHz	New Cingular Wireless PCS LLC - N CAL	11.11



**Renewable Energy Systems
Hatchet Ridge Wind Farm**

ID	Category	Tower ID	Name Site 1	Name Site 2	Call Sign Site 1	Call Sign Site 2	BAND NAME	Licensee	WCFZ (m)
55	Resolved	A	ROUND MTN	BURNEY	WMS863	WMS864	10 GHz	New Cingular Wireless PCS LLC - N CAL	11.10
56	Unresolved**		HATCHET MTN	S FORK MTN	WMU584	RXONLY	950 MHz	ST OF OR ACTING B/T OR ST BRD OF H ED	73.12
57	Unresolved**		GRAY BUTTE	HATCHET MT	WMU610	RXONLY	950 MHz	OR ST BOARD OF HIGHER EDUCATION	70.62
58	Resolved	E	HATCHET MTN	HARLOW MTN	WNEV258	WNEV259	Upper 6 GHz	Pacific Gas and Electric Company	18.33
59	Resolved	2	WIDOW MTN	BEAR SPRING	WNTP590	WNTP591	Upper 6 GHz	Transmission Agency of Northern California	24.28
60	Resolved	2	BEAR SPRING	OLINDA	WNTP591	WNTP592	Upper 6 GHz	Transmission Agency of Northern California	28.80
61	Questionable***		S FORK MTN	HATCHETT MTN	WPOR985	RXONLY	7 GHz	SAINTE PARTNERS II, L P	26.97
62	Questionable***		S FORK MTN	HATCHETT MTN	WPOR986	RXONLY	7 GHz	SAINTE PARTNERS II, L P	26.97

*Federal Government paths are analyzed in Comsearch's separate NTIA Study.

**Unresolved status: Licensee claims still active – waiting on more feedback from licensee.

***Questionable status: Licensee claims still active – site possibly outside of measured range.

**Table 2 – Microwave GeoPlanner Links Considered in Analysis
(See enclosed mw_geopl.xls for more detailed information and
GP_dict_matrix_description.xls for field description)**