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Appendix A

to

Comprehensive Renewable Energy Feasibility Study for Sealaska Corporation

Final Meteorological Report for Hoonah

WIND DATA REPORT
FOR THE
HOONAH WHITE ALICE SITE
APRIL 2005 – SEPTEMBER 2005

Prepared on

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For

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INTRODUCTION

This report summarizes new data taken from late April 2005 through early September 2005 at the White Alice communication tower on a ridge above Hoonah. The report contains a description of the site, instruments installed, data collection and equipment performance. The report will also discuss site climatology based on analysis of a nearby long-term reference location at Juneau (40 miles ENE). The purpose of this climatology is to put the validation period into context as to the degree of normality of the climatic conditions during the study period.

DESCRIPTION OF THE AREA

Hoonah is on Chichigof Island with Icy Strait to the north and Chatham Strait to the east in Southeast Alaska's Inside Passage (see Figure 1). The islands in the Inside Passage are tree covered and have very complex terrain. While Hoonah is only 45 miles east of the Gulf of Alaska, it is sheltered from storms in the Gulf by mountains to the west and southwest that are up to 3,000 feet high. The proximity to the ocean moderates the temperatures and results in a mean annual temperature of about 45 degrees Fahrenheit with a range from the mid 20's to the high 50's. This area receives over 60 inches of rain per year but despite the latitude only about 90 inches of snow, with most of that falling in December and January.

Winds statistics for Juneau are shown in Table 1 and indicate very little seasonal variation being equally weak in every month. Strongest gusts occur in the winter months.

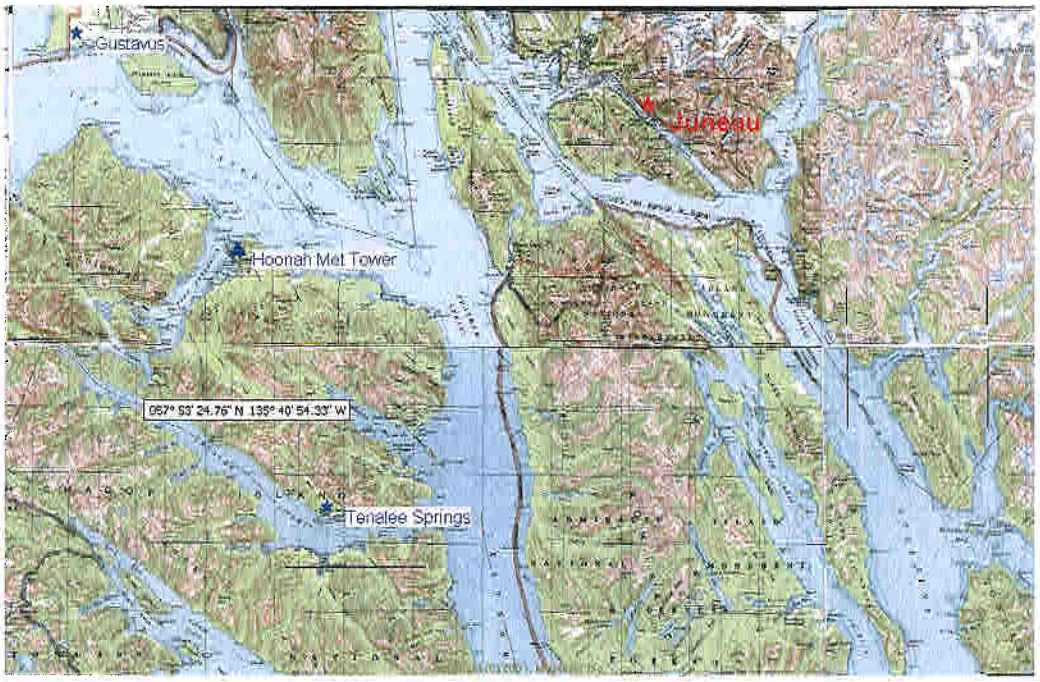

Figure 1 The Hoonah area.

Table 1 Wind Statistics for the Juneau Airport.

Month	Climo Avg V	2005	Departure	Comments
Jan	7.7			
Feb	8			
Mar	8.1			
Apr	8.4	6.5	-23%	9 days only
May	8.1	6	-26%	
Jun	7.8	5.9	-24%	
Jul	7.5	7.3	-3%	
Aug	7.3	6.9	-5%	
Sep	7.9	8	1%	7 days only
Oct	9.2			
Nov	8.5			
Dec	8.8			
Ann	**8.1**	**7.8**	**-13%**	
% of Annual		**96.7%**		

The annual air density for this area assuming a 60 meter hub height turbine, an average elevation of 430 meters and an annual temperature of 6 degrees Centigrade is 1.19 kg/m^3.

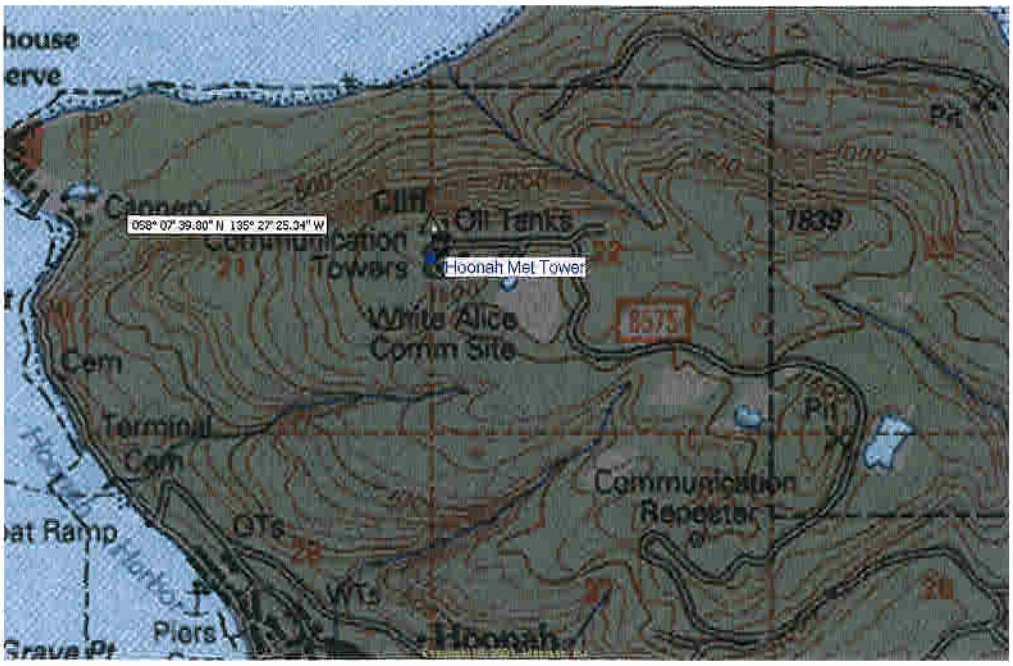

Figure 2 A close-up view of the Hoonah site topography

Figure 3 A three dimensional view of the Hoonah area.

DESCRIPTION OF THE DATA AND METEOROLOGICAL EQUIPMENT

The meteorological tower is instrumented at 20 and 30 meters. Sensors used for measuring wind speed are Maximum 40 cup anemometers with protective terminal boots. Wind direction is measured with a 200P-wind direction sensor. The tower is grounded with a lightening spike, 35 meters of copper grounding wire, and ground rod. All sensors are connected to the logger with shielded 20-gauge cable.

The Maximum cup anemometer on each revolution generates two sine wave cycles that are linearly proportional to the wind speed. Anemometer voltage varies between 0.5 and 6 volts VAC. The transfer constant to convert the Maximum 40P output to wind speed is a multiplier of 1.711 with a 0.78 mph offset.

The site is equipped with a NRG Symphonie Data Logger with a non-volatile industry standard FLASH Multi Media Card (MMC). The card is mailed to this consultant to be read from a USB port. A 5-watt photovoltaic panel powers the sensors and loggers. A terminal reader is supplied to program the logger on-site and view data. NRG supplies software for converting data on the FLASH cards to engineering units, QA/QC programs, and standard statistical summaries included in the back of this report.

Table 2. Site Description for the Hoonah White Alice Site.

Site Name: White Alice Site 5074 **Latitude**: 58° 7' 37.61'' N **Longitude:** 135° 25' 55.16" W **Map Datum:** WGS 84 **Elevation**: 1417 feet. **Terrain:** East-west ridgeline on island; **Roughness**: Sitka Spruce and Western Red Cedar. **Prevailing Wind Direction:** NE **Magnetic Declination**: 26.5 degrees East **Tower Height**: 30 meters **Sensor Levels**: 30 and 21 meters **Logger**: 5074

DATA COLLECTION

Data is sent by email to this consultant office in Portland, Oregon. The Portland Oregon office is equipped with NRG data collection software and stores binary and ASCI data files for further analysis. The averaging interval of the data logger is 10-minutes, but the data analysis uses hourly data. The raw data remains in 10-minute intervals.

DATA RECOVERY

Data recovery was over 100% for the entire period of record from late April 2005 through late September 2005 for the three sites.

CLIMATOLOGY

A climatological analysis is an important part of the wind resource validation study. Typically, a wind resource assessment is conducted for a period of only one to two years prior to installing wind turbines. A general rule is that a year of data is sufficient to estimate the mean annual wind speed to within ±10% at the 90% confidence level. This means that the annual energy output may be off by 20 to 25%. To increase the confidence in the relatively short record of data at the candidate site, data at a nearby long-term reference site can be analyzed.

The approach in the climatological analysis is to select a nearby reference station with a long-term record that would provide information on annual and seasonal variation in the wind resource. Table 1 shows that the winds during the sampling period at Juneau were generally lower (13%) than normal and the average for six month period sampled is about 97% of the annual wind speed.

DATA ANALYSIS

Table 3 and Figures 4 and 5 summarize the important statistics measured to date. In addition to measured average speed, wind direction, temperature and extreme wind speed other statistics derived measurements such as shear, turbulence, and 60 meter wind speeds. The data was corrected for departures from normal for each month and the six month period was normalized to a year.

Table 3 shows that even winds extrapolated to 60 meters using the incredibly high shear values measured at this site are not strong. The high shear and turbulence intensity do not mean this site is one of the most turbulent sites on earth, they merely reflect the low wind speeds and the large impact that tree induced friction has at low wind speeds. The higher winds at night show a mountain to sea wind flow phenomena.

Based on the data collected so far, a modern wind turbine like a GE 1500 kW machine would achieve a gross Capacity Factor (CF) of less than 10% at this site, which means there is no wind power potential here.

Table 3 Statistics for the first six months at Hoonah site.

month	100' v	99'v	70' V	Max 100'	TI	Shear	V60	CF	Count	Data Recovery
Apr	4.3	3.2	2.3	26.4	0.43	0.67	3.6	0.05	223	100%
May	4.8	4.6	3.0	29	0.40	0.66	4.1	0.09	744	100%
Jun	4.2	3.5	2.3	29	0.42	0.67	3.6	0.07	720	100%
Jul	4.6	4.7	2.6	25.6	0.41	0.68	3.3	0.05	744	100%
Aug	5.0	4.6	2.5	36.7	0.41	0.66	3.5	0.08	744	100%
Sep	6.5	6.9	3.8	31.6	0.40	0.74	4.9	0.17	181	100%
Mean	4.9	4.6	2.8	36.7	0.41	0.68	3.9	0.08	3356	100%

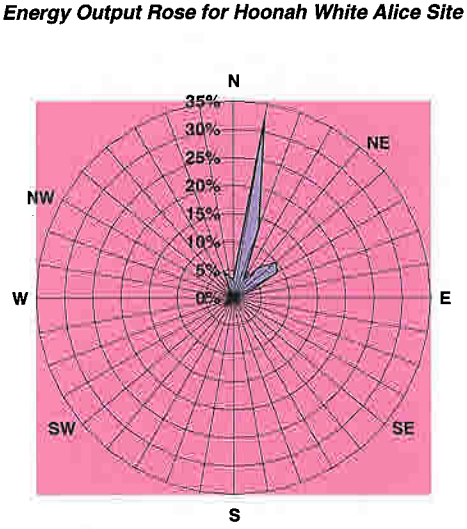

Figure 4 Energy Output Rose for the Hoonah Site.

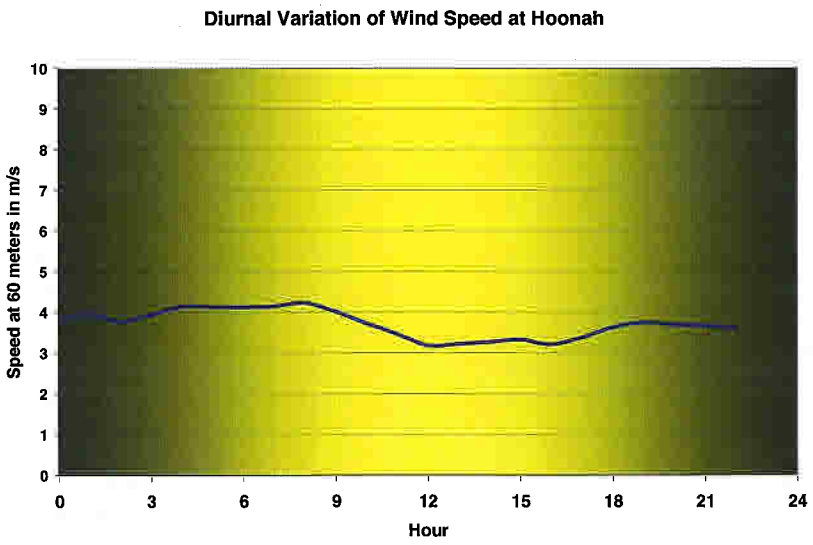

Figure 5 Diurnal Variation of Wind Speed at Hoonah.

Conclusions and Recommendations

Although less than a year of data has been collected, the mean annual wind speed has been corrected to an annual value using a nearby long-term site. Based on the data collected so far, a modern wind turbine like a GE 1500 kW machine would achieve a gross Capacity Factor (CF) of less than 10%, which makes cost effective wind energy development in this area very unlikely.