Tribal Renewable Energy
Final Technical Report

Final Report

Project Title: Flathead Reservation Renewable Energy Feasibility Study

Date of Report: September 2006

Recipient Organization: Salish & Kootenai Holding Company, Inc.

Award Number: DE-FG36-04GO14024

Partners:

Salish & Kootenai Holding Company, Inc.
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Tab 1

Executive Summary

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Executive Summary

Background

The Confederated Salish and Kootenai Tribes of the Flathead Nation (Tribe) is a Federally Recognized Sovereign Nation, whose Tribal Lands are located in western Montana, and including portions of Flathead, Lake and Sanders counties. The Tribe, by and through its wholly owned enterprise, S & K Holding Company (SKHC) is pleased to report its findings to the Department of Energy's Solicitation on Renewable Energy Development on Tribal Lands. SKHC has selected Distributed Generation Systems, Inc. (Disgen), of Lakewood, Colorado as its contractor to aid in the preparation of this report and to manage and conduct the study.

Core Objective

The study shall assess the feasibility of a commercial wind facility on lands selected and owned by the Tribe and shall examine the potential for the development of solar and biomass resources located on Tribal Lands.

Summary Results

1. Wind resource assessment sufficient to obtain financing

SKHC in conjunction with Disgen selected a tribally-owned parcel of land as the subject of the commercial wind facility feasibility assessment in the Salish Mountain Range. SKHC and Disgen erected a 35-meter tower on the selected site. The 35-meter meteorological tower was use for this site since the topography did not meet the safety standard for a 50 meter meteorological tower. An environmental assessment report was written for the installation of the meteorological tower dated, August 2004 (Document # 208-36204).

Evidence of a good wind resource was found in tree "flagging" in the Salish Mountain region, near Oliver Point, indicating solid winds from the west and northwest. The northern portion, approximately 2 miles of the ridge and the southern 5 miles are not heavily forested and thus represent the best opportunity for installing wind turbines. Other sites were evaluated such as the Camas prairie area but a continuous large tract of trust land is not available as required for wind farm.

The average wind speed for the site was found to be 11.2 mph (m/s) at the height of 35 meters, a Class 1 Wind Resource. This low wind resource resulted in a low capacity factor ranged from 16% to 20% for different manufacturers of wind turbines. The analysis was completed by a meteorologist, Ed McCarthy in Martinez, CA after collecting over 12 months of wind data. The final report and data can be found in Tab 2. The average annual wind speed of 11.2 mph or Class 1 wind resource is not feasible for a commercial wind project for the project area.

2. Phase I Avian resource assessment

Disgen, upon approval of the SKHC, contracted with Western EcoSystems Technology, Inc (West) of Cheyenne, Wyoming to conduct the Phase One Screening Report for the possible wind farm area, Salish Mountain. The final report was completed on May 2005. West is the leading biological research firm with special skills in avian assessments as they related to wind turbines.

The Phase One research focused on identifying any potential environmental impediments to proceeding with the development of a wind energy project, a "show stopper analysis". The research is guided by the Endangered Species Act, the Eagle Protection Act and the Migratory Bird Treat Act. The biological resources are evaluated through a search of existing data, including communications with local scientist in the state of Montana. A site visitation to evaluate habitat, loom for raptor nests, prey populations and other biological resources was conducted

The Phase One screening reported that the proposed project area has a number of issues to mitigate prior to development of an industrial infrastructure such as a wind farm. These issues included: a bald eagle population, a possible reintroduction of sage grouse, and trumpeter swans.

A detailed report is enclosed Tab 3 for further review and discussion.

3. Preliminary cultural assessment

Class I Cultural Resource Records and Literature Survey

The Class I Cultural Resource Records and Literature Survey was conducted by the Confederate Salish and Kootenai Tribal Historical Preservation Department. The final report was submitted in February, 2006.

This survey screened existing literature for the presence of culturally sensitive resources with in the prospective project area. The survey found no mitigating circumstances for a possible development project.

A detailed report is enclosed in Tab 4 for further review and discussion.

4. Review of local Transmission Capabilities and Market Assessment.

Disgen performed a preliminary evaluation of the transmission capabilities using a wind project size of 70 MW to determine the potential points of interconnection to the nearest transmission system. Disgen has identified a 115kV transmission line owed by Northwestern Energy at Kerr-Thompson Falls as the most feasible interconnection for a possible wind farm.

SKHC was made aware that the interconnection procedure is a three tier process that could take 165 days to complete and require deposits made to the connecting utility of approximately $160,000.
Disgen identified the most likely buyer for the wind energy would be People Power and Light with a market price beginning at $31 MWh (3.1 cents/kWh)

A more detailed explanation is located in Tab 5.

5. Preliminary set of economic projections;

Disgen has provided a set of preliminary project economics for a 30MW facility to be interconnected to the Northwestern Energy 115kV Transmission Line as a baseline to the economic viability of this proposed project. This model assumed a Tribally-owned project on Tribal trust lands, without using the existing production tax credit, and using no loans. It also assumed no property taxes being paid to the state Montana and Federal Government and no landowner payments to the Confederate Tribes of Salish & Kootenai. Given the low capacity of 19.3% for a Suzlon 88 Wind Turbine 2100kW, the breakeven energy sales price is 10.0 cents per kWh to make this propose wind project to deliver a rate of return of 9.0%. If the Tribe chooses to partner with a private investment partner who needs to utilize the existing Production Tax Credit, and negotiates a landowner payment, the rate of return and price per kWh can only improve to 8.5 cents per kWh.

A large component in delivering a competitive price is the amount of energy produced from the wind turbine. If the Salish Mountains had the wind resource of an annual average wind speed of more than 16 mph and at least a 35% capacity factor, the energy prices to be sold could go as low as 3.5 cents per kWh.

Tab 6 shows the preliminary economic values.

6. Biomass and solar resources on tribal lands.

The Confederate Tribes of Salish & Kootenai has a tremendous amount of forestry products and have established an economic entity in selling forestry products to the lumber mills in the area. Unfortunately, the mills are operated by non-tribal entities, so tribal involvement is very limited.
The waste from the initial log cutting was reviewed but overcoming the handling and transportation issue is expensive and not feasible for an economic opportunity.

7. Preliminary assessment wind/pumped storage hybrid systems

The wind resource on Salish Mountain proved not to be economically feasible which made it more difficult in economically justifying a hydro pumped storage system. The pumped storage system would have been used to deliver power when the wind resources were low. The recharging of storage reservoir would have used the wind power during low power consumptions.

Recommendations

Disgen at the sole direction of SKHC reviewed other energy opportunities during this study.

1. Salish & Kootenai small-scale hydro power plan. This was a study conducted in 1984 to identify and inventory possible small scale hydro facility on the Flathead Reservation. It identified and accumulated over 70 MW of possible hydro sites. Since the release of the report two sites have been developed and are operating.
2. A geothermal heat source was also reviewed but the temperature of the source was not sufficient to produce steam. The location of the source was also a lengthy distance from a heat load to justify a hot water distribution system. If a heating load is identified then the Tribes should review this geothermal option again.

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Tab 2

Wind Assessment

Project Title: Flathead Reservation Renewable Energy Feasibility Study

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Partners: S & K Holding Company, Inc
Distributed Generation Systems, Inc. (cost sharing partner)

TO: Belvin Pete, Project Manager
Native American Programs and Resources
Distributed Generation Systems, Inc (Disgen)

FROM: Ed McCarthy

DATE: March 31, 2006

SUBJ: Preliminary Wind Resource Assessment, Flathead Indian Reservation

Summary: One year of wind speed and wind direction measurements are completed on the Flathead Indian Reservation in northwestern Montana. The wind measurements are obtained from state-of-the-art monitoring equipment installed at Irvine Hill on the Reservation. In addition, some supplemental wind measurements are obtained from an existing communications tower at Oliver Point, south of the Irvine Hill Site. The wind measurements over this 1-year period imply that this area has a Class 1 Wind Resource. The measurements generally confirm the classification of the region by the Montana Wind Map.

Site Location: The meteorological monitoring equipment is installed on a 35-meter NRG Systems TallTower. This tower is located on Irvin Hill at 47^{o} 41.65' N and 114^{o} 27.46' W at an elevation of 4410 feet msl. The existing communications tower is located on Oliver Point at 47.5758^{o} N and 114.3921^{o} W at an elevation of 4782 feet msl. The location of the Flathead Indian Reservation south of Kalispell, Montana is shown in Figure 2.

Meteorological Equipment: Wind speed data are collected by use of the Maximum #40 wind speed cups and the NRG #200P wind direction vane. Two wind speed sensors are mounted at 35 meters agl; two wind speed sensors are mounted at 25 meters agl; and one wind speed sensor are mounted at 15 meters agl. One wind direction sensor is mounted at 35 meters agl and one wind direction sensor is mounted at 25 meters agl. Ambient temperature is measured at a height of 3-meters agl using an NRG Systems 110S temperature probe mounted in a self –aspirated shield. Solar radiation measurements are made with a Licor Pyranometer mounted at the 10-meter level of the tower. An NRG Systems Symphonie Data Loggers is used to record and average (10-minute intervals) the wind speed and wind direction measurements. The meteorological equipment was installed on November 2004.

Montana Wind Map: The wind power classification for the State of Montana based on the 1976 edition of the *Wind Atlas of the United States* is presented in Figure 1. The wind map of the State of Montana was updated by staff at the National Renewable Energy Laboratory (NREL) in 2002 and is presented in Figure 2. The map represents the estimated annual average wind speeds at a height of 50 meters (164 feet) above ground level. For central Montana, the average annual wind speeds are estimated to be less than 5.6 mps (12.5 mph) at 50 meters above ground level.

Wind Power and Wind Speed Classifications: The standard wind power and wind speed classifications for wind resource assessment are presented in Table 1. The classifications range from Class 1 (lowest wind power density) to Class 7 (highest wind power density). Typical economically developable wind power classifications are Class 3 and higher.

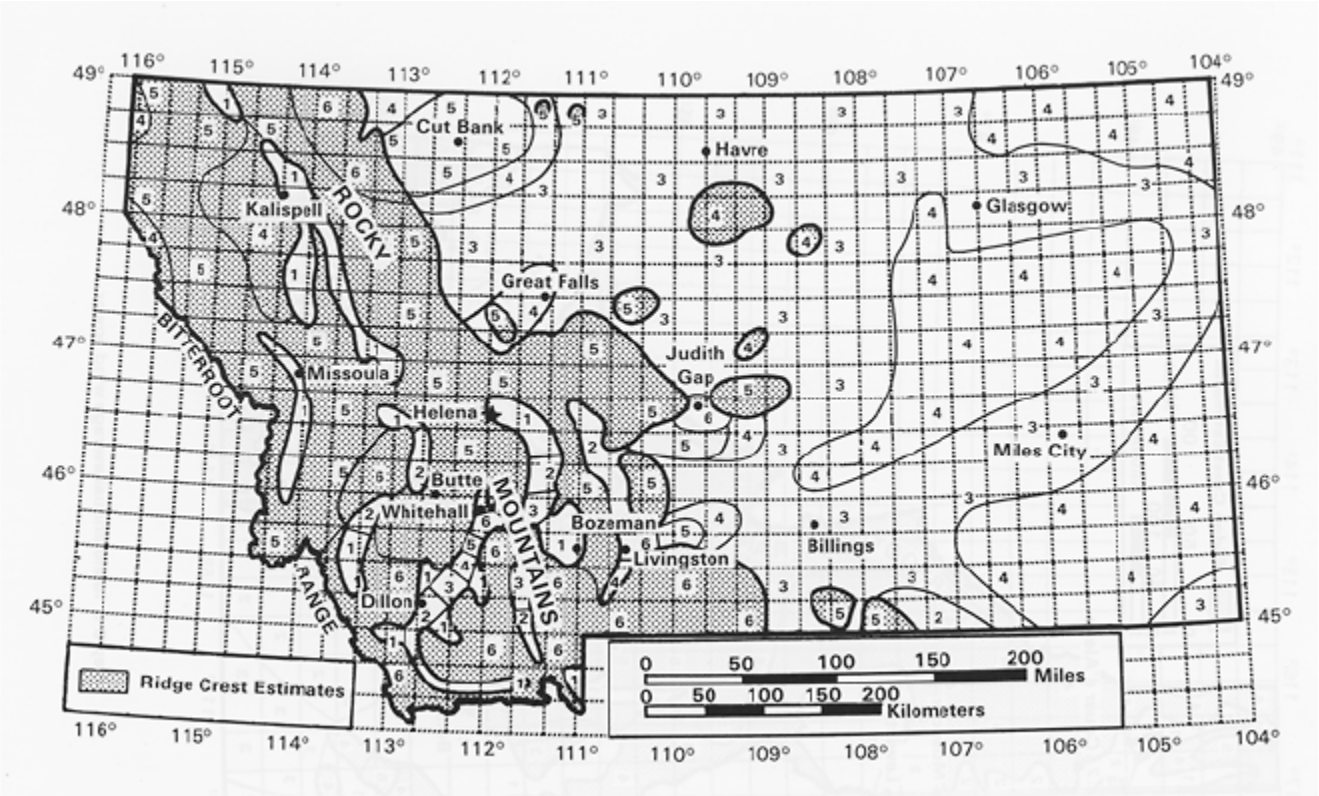


Figure 1 – Wind Power Classification for the State of Montana (NREL, 1976)

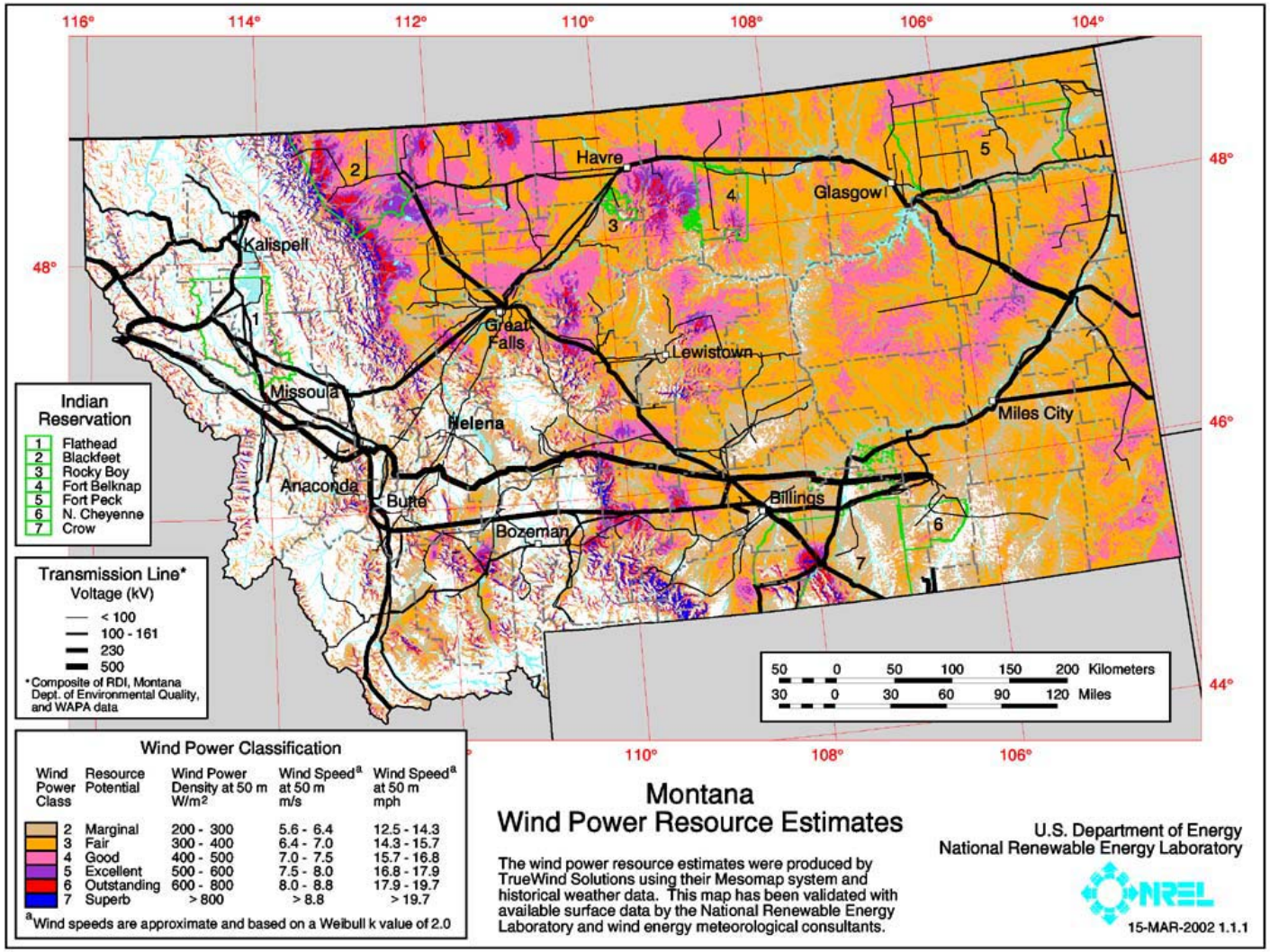


Figure 2 – Montana Wind Map

Table 1 - Classes of Annual Wind Power Density and Annual Wind Speed at 10 m and 50 meters[a]								
Wind Power Class	10 m (33 ft)				50 m (164 ft)			
	Power Density, Watts per square meter		Speed[b], meters per second (miles per hour)		Power Density, Watts per square meter		Speed[b], meters per second (miles per hour)	
	lower limit	upper limit	lower limit	upper limit	lower limit	upper limit	lower limit	upper limit
1	0	100	0	4.4 (9.8)	0	200	0	5.6 (12.5)
2	100	150	4.4 (9.8)	5.1 (11.5)	200	300	5.6 (12.5)	6.4 (14.3)
3	150	200	5.1 (11.5)	5.6 (12.5)	300	400	6.4 (14.3)	7.0 (15.7)
4	200	250	5.6 (12.5)	6.0 (13.4)	400	500	7.0 (15.7)	7.5 (16.8)
5	250	300	6.0 (13.4)	6.4 (14.3)	500	600	7.5 (16.8)	8.0 (17.9)
6	300	400	6.4 (14.3)	7.0 (15.7)	600	800	8.0 (17.9)	8.8 (19.7)
7	400	1000	7.0 (15.7)	9.4 (21.1)	800	2000	8.8 (19.7)	11.9 (26.6)

(a) Vertical extrapolation of wind speed based on the 1/7 power law: (mean wind speed at desired height) = (known mean wind speed at other height) x [(desired height ÷ known height)^(1/7)

(b) Mean wind speed is based on Rayleigh speed distribution of equivalent mean wind power density. Wind speed is for standard sea-level conditions. To maintain the same power density, speed increases 3%/1000 m (5%/5000 ft) elevation.

Wind Speeds: The average wind speeds measured on the meteorological towers are presented in Table 2. The designation "west" and "south" refers to the orientation of the sensor mounting booms. A mean hourly summary of the wind speed measurements are presented in the Attachment.

Table 2 – Average Wind Speeds at 35m, 25m, and 15 m

Location	Level	Period of Record	Average Wind Speed (mph)	Data Recovery
Irvine Hill	35 meters (West)	November 2004 – January 2006	11.1	90.4%
	35 meters (South)	November 2004 – January 2006	11.0	90.4%
	25 meters (West)	November 2004 – January 2006	10.6	90.3%
	25 meters (South)	November 2004 – January 2006	11.0	89.9%
	15 meters (South)	November 2004 – January 2006	10.4	89,4%
Oliver Point	23 meters (#1)	January 2005 – September 2005	10.9	90.0%
	23 meters (#2)	January 2005 – September 2005	10.7	90.4%

Wind Direction: Wind direction measurements are obtained at the 35-meter and 25-meter levels on the tower. A joint frequency distribution of the 35-meter wind speed and the 35-meter wind direction are presented in the Attachment. These data are also used to construct a wind rose which is presented in Figure 3. The wind rose indicates a predominant southwesterly wind direction at the site.

Turbulence: The Turbulence Intensity (TI) is defined as the standard deviation of the wind speed divided by the mean of the wind speed. The turbulence intensity table derived from the hourly average wind speed data at the 35-meter level is presented in the Attachment. The TI values for the site are less than 10%, implying very low turbulence at this site.

Wind Shear: Wind shear is the change or increase in wind speed above ground level. The simple wind power law is expressed as:

$$U_2 = U1\,(Z_2/Z_1)^{\text{alpha}}$$

Where U_2 and U_1 are the wind speeds at the upper and lower levels, Z_2 and Z_1 are the upper and lower elevations, and alpha is the wind speed power law exponent. The typical value for the wind speed power law exponent is 0.14 (1/7 power law). Depending on terrain and surface roughness, the value may vary between 0.05 and 0.35. The calculated value based on the 15-meter and 35 meter hourly average wind speeds is 0.12.

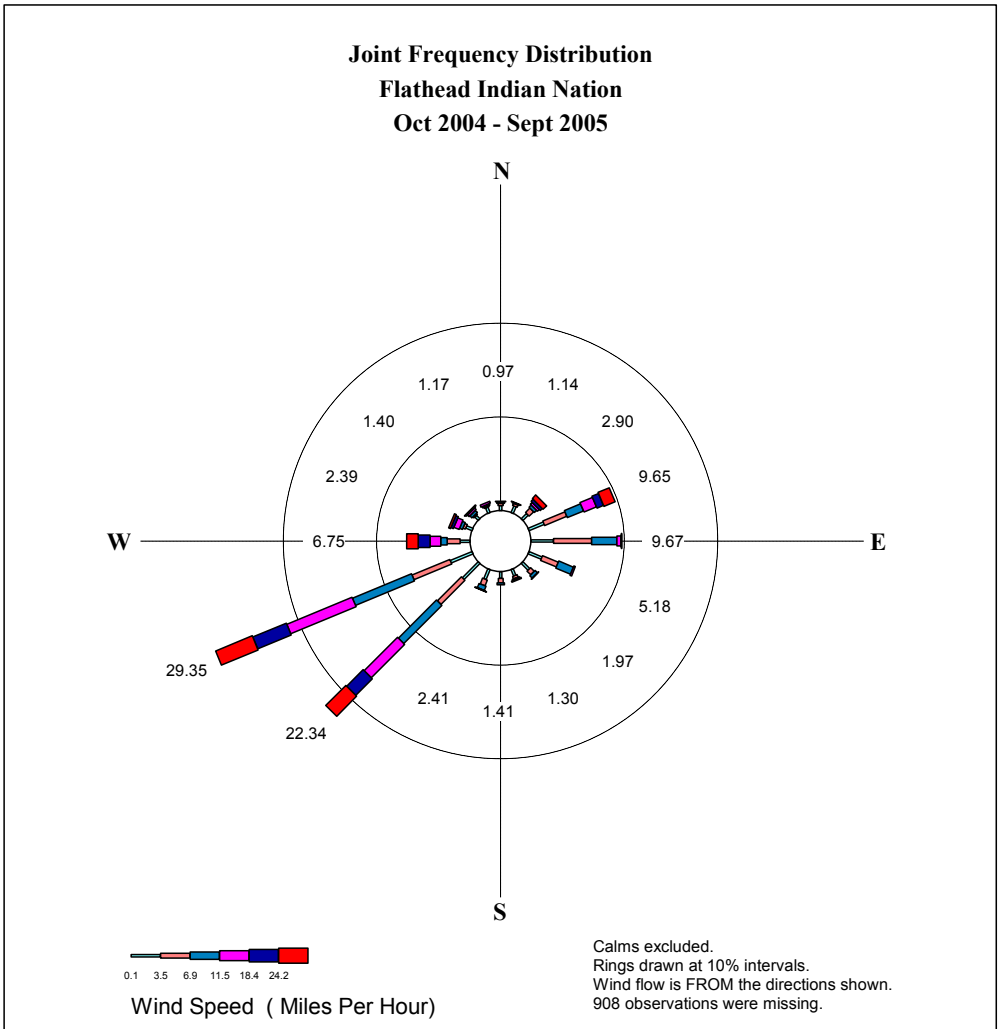
Energy Output

The wind speed data collected at 35-meters above ground level at the Flathead Site is adjusted upwards using the wind speed power law to estimate the wind speed at a wind turbine hub height of 80-meters. The wind speed frequency distribution generated at 80-meters at each site is combined with a sea level power curve for six commercially available wind turbines – GE 70.5m (1500kW) GE 77m (1500kW), Suzlon S88 (2100kW) Vestas V82 (1650kW), Vestas V90 (3000kW), and Gamesa G87 (2000kW) - to create the annual theoretical energy estimate for a single turbine.

The gross annual theoretical energy output is presented in Table 3. The gross annual theoretical energy output is adjusted by various loss factors to estimate the actual or net energy delivered to the substation. These losses take into account the wind turbine out-of-service time associated with scheduled and unscheduled downtime (-3%), electrical line losses from the turbine to the substation (-2%), control system losses (-1%), array losses due to wake effects between adjoining turbines (-5%), and lost power associated with blade icing and blade soiling (-1%). The net energy output, the net turbine capacity factor, and the annual average wind speed are also presented in Table 3.

Table 1 – Energy Output Projection Summary for the Flathead Indian Reservation

Turbine	Rotor Diameter (m)	Rating (kW)	Hub Height (m)	Gross Theoretical Energy (kWh)	Net Theoretical Energy (kWh)	Turbine Capacity Factor (Net) (%)	Annual Wind Speed (mps)
Suzlon	**88**	2100	80	4,025,483	3,542,425	19.3%	5.4
Vestas V-82	**82**	1650	80	3,277,191	2,883,928	20.0%	5.4
Vestas V-90	**90**	3000	80	4,903,634	4,315,198	16.4%	5.4
Gamesa G87	**87**	2000	80	3,927,923	3,456,572	19.7%	5.4
GE	**70.5**	1500	80	2,794,333	2,459,013	18.7%	5.4
GE	**71**	1500	80	2,964,180	2,608,478	19.9%	5.4



PERCENT OCCURRENCE: Wind Speed (Miles Per Hour)
LOWER BOUND OF CATEGORY

DIR	0.1	3.5	6.9	11.5	18.4	24.2
N	0.52	0.24	0.16	0.05	0.00	0.00
NNE	0.76	0.24	0.08	0.05	0.01	0.00
NE	0.78	0.69	0.33	0.28	0.29	0.52
ENE	1.73	2.54	1.88	1.45	0.76	1.29
E	2.38	4.07	2.70	0.45	0.04	0.03
ESE	1.49	1.81	1.69	0.19	0.00	0.00
SE	1.02	0.53	0.36	0.05	0.00	0.00
SSE	0.73	0.27	0.15	0.15	0.01	0.00

TOTAL OBS = 7516 MISSING OBS = 908

PERCENT OCCURRENCE: Wind Speed (Miles Per Hour)
LOWER BOUND OF CATEGORY

DIR	0.1	3.5	6.9	11.5	18.4	24.2
S	0.71	0.48	0.20	0.01	0.01	0.00
SSW	1.14	0.67	0.49	0.07	0.04	0.00
SW	2.42	3.62	5.77	5.03	2.49	3.01
WSW	2.53	4.34	6.81	7.56	3.87	4.24
W	1.05	1.38	0.69	1.14	1.26	1.21
WNW	0.73	0.27	0.32	0.60	0.27	0.21
NW	0.51	0.17	0.31	0.25	0.08	0.08
NNW	0.64	0.12	0.17	0.23	0.00	0.01

CALM OBS = 0

Figure 3 – Wind Rose for the Flathead Site

Attachments

MEAN HOURLY WIND SPEEDS

FLATHEAD INDIAN NATION
15M WIND SPEED (MPH)

11/01/04 - 01/31/06

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	10.1	8.5	12.5	10.9	7.8	6.8	7.2	7.1	7.9	8.2	10.4	10.8	9.2
02	11.2	8.8	11.9	10.0	7.7	6.6	7.4	6.6	7.9	7.7	8.9	11.2	9.0
03	12.5	8.2	11.7	10.1	7.5	6.1	8.1	5.9	7.7	7.9	9.3	11.1	9.0
04	12.1	8.6	10.2	9.3	7.6	5.9	7.2	5.8	7.3	7.4	10.2	10.6	8.8
05	10.6	7.9	10.7	8.4	7.7	5.9	7.3	5.6	6.9	7.2	10.8	10.7	8.6
06	11.3	8.1	11.0	8.6	8.1	6.6	7.3	6.1	6.8	7.4	10.5	9.6	8.7
07	11.2	6.9	9.3	9.3	7.1	7.1	7.0	5.9	7.9	7.9	10.7	9.1	8.5
08	11.5	6.3	9.2	9.5	8.3	6.3	7.7	6.5	8.1	8.6	10.1	9.0	8.6
09	10.9	6.8	10.0	11.0	8.6	7.2	8.3	6.9	7.4	8.8	9.3	8.9	8.8
10	11.1	7.1	10.5	12.3	8.9	9.0	9.2	8.0	8.4	9.8	9.5	8.5	9.3
11	11.8	7.4	12.2	12.8	9.6	10.4	10.9	9.6	9.3	9.6	10.6	9.5	10.3
12	13.6	8.8	13.3	14.6	10.4	11.2	12.9	10.7	12.2	10.5	10.4	9.6	11.4
13	12.8	9.2	14.1	15.3	10.9	11.6	14.0	11.2	13.3	10.5	11.2	10.9	12.0
14	12.4	10.3	15.7	15.6	12.4	14.0	16.5	13.1	14.4	11.1	12.6	10.8	13.1
15	12.2	10.2	16.4	17.0	13.3	12.5	17.7	13.1	16.0	10.9	11.8	10.9	13.3
16	12.3	10.3	16.9	17.5	13.0	13.0	18.3	14.3	17.2	10.8	12.0	10.7	13.6
17	12.2	10.4	16.4	18.8	13.3	13.3	18.5	14.0	15.2	10.3	11.2	10.9	13.4
18	11.5	9.0	15.5	16.1	13.0	11.6	19.6	13.8	13.3	9.5	11.0	10.6	12.7
19	10.2	9.0	12.5	14.1	12.8	10.5	18.0	12.8	11.5	9.5	10.8	9.7	11.6
20	11.1	9.6	12.6	13.0	12.0	11.0	13.7	12.1	10.2	8.9	10.6	9.8	11.1
21	10.0	9.4	11.9	13.3	9.9	9.3	10.8	10.1	8.8	8.0	10.1	9.4	10.0
22	10.9	8.6	11.9	12.5	9.8	8.8	9.7	9.2	8.3	8.0	9.5	9.0	9.7
23	11.3	8.4	10.5	11.5	9.0	8.6	8.2	7.6	7.8	8.0	9.9	10.5	9.4
24	10.2	8.1	10.7	10.8	7.8	8.1	7.0	7.2	7.3	8.9	10.6	10.4	9.1
Mean	11.5	8.6	12.4	12.6	9.9	9.2	11.4	9.3	10.1	9.0	10.5	10.1	10.4

Good Hours												
879	672	744	706	744	720	744	744	720	744	1095	1296	

Missing Hours												
609	0	0	14	0	0	0	0	0	0	345	192	

9,808 Hours of Good Data 1,160 Hours Missing 89.4% Data Recovery

MEAN HOURLY WIND SPEEDS

FLATHEAD INDIAN NATION
25M WIND SPEED (W) (MPH)

11/01/04 - 01/31/06

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	10.1	8.1	12.7	11.5	8.2	6.8	7.5	7.1	8.1	8.7	10.6	11.1	9.4
02	11.0	8.4	12.2	10.4	8.1	6.6	7.7	6.7	8.0	8.1	9.0	11.3	9.1
03	12.3	8.1	12.1	10.6	7.8	6.0	8.5	6.0	8.0	8.0	9.4	11.3	9.2
04	11.9	8.5	10.5	9.7	7.7	6.0	7.5	5.8	7.4	8.0	10.4	10.8	8.9
05	11.0	7.7	10.9	8.5	7.7	5.7	7.5	5.7	7.2	7.7	11.1	10.8	8.7
06	11.1	7.9	11.2	8.5	8.4	6.7	7.7	6.3	7.0	7.7	10.9	9.9	8.8
07	11.1	6.7	9.6	9.6	7.4	7.1	7.1	5.9	8.1	8.3	11.0	9.4	8.7
08	11.2	6.0	9.5	9.9	8.4	6.3	7.8	6.5	8.3	9.0	10.5	9.4	8.8
09	10.6	6.5	10.2	11.2	8.8	7.2	8.4	6.8	7.3	9.1	9.9	9.2	8.9
10	10.8	6.8	10.6	12.5	9.0	9.0	9.2	7.9	8.3	10.2	10.1	8.8	9.5
11	11.6	7.1	12.2	13.3	9.8	10.5	11.1	9.6	9.3	10.0	11.1	9.8	10.5
12	13.1	8.2	13.3	15.1	10.6	11.3	13.1	10.7	12.2	10.7	10.9	9.8	11.5
13	12.5	8.7	14.2	15.6	11.2	11.7	14.0	11.1	13.3	10.7	11.7	11.0	12.1
14	12.1	9.9	15.8	15.8	12.6	14.0	16.6	13.1	14.4	11.3	13.1	10.9	13.2
15	11.7	9.7	16.5	17.6	13.7	12.5	17.7	12.9	16.1	11.2	12.3	11.1	13.4
16	11.8	9.9	17.1	18.3	13.4	13.0	18.3	14.2	17.4	11.0	12.5	11.1	13.8
17	11.8	10.1	16.5	19.9	13.9	13.1	18.5	13.8	15.3	10.6	11.5	11.3	13.6
18	11.3	8.8	15.6	17.2	13.5	11.4	19.7	13.9	13.4	9.9	11.6	10.9	12.9
19	10.1	9.1	12.9	14.7	13.4	10.7	18.1	13.0	11.7	9.8	11.2	9.9	11.9
20	10.9	9.4	12.9	13.6	12.8	11.1	14.2	12.3	10.5	9.3	10.8	10.2	11.4
21	10.0	9.5	12.1	13.8	10.6	9.5	11.2	10.4	9.1	8.3	10.4	10.0	10.4
22	10.8	8.6	12.0	13.0	10.5	9.0	10.2	9.7	8.8	8.6	9.7	9.3	10.0
23	11.1	8.2	10.7	12.0	9.4	8.8	8.6	7.8	8.1	8.5	10.2	10.9	9.7
24	10.2	8.0	10.8	11.4	8.3	8.2	7.3	7.1	7.5	9.5	10.9	10.9	9.4
Mean	11.3	8.3	12.6	13.1	10.2	9.3	11.6	9.3	10.2	9.3	10.9	10.4	10.6

Good Hours												
953	672	744	706	744	720	744	744	720	744	1113	1303	

Missing Hours												
535	0	0	14	0	0	0	0	0	0	327	185	

9,907 Hours of Good Data 1,061 Hours Missing 90.3% Data Recovery

MEAN HOURLY WIND SPEEDS

FLATHEAD INDIAN NATION
25M WIND SPEED (S) (MPH)

11/01/04 - 01/31/06

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	10.8	8.7	13.0	11.7	8.5	7.4	7.8	7.7	8.5	9.1	10.8	11.3	9.8
02	11.7	9.2	12.5	10.6	8.5	7.1	8.1	7.3	8.4	8.3	9.1	11.7	9.6
03	12.9	8.5	12.3	10.9	8.3	6.6	8.8	6.5	8.3	8.3	9.7	11.6	9.6
04	12.4	9.0	10.8	10.0	8.2	6.5	7.9	6.4	7.8	8.2	10.6	11.0	9.3
05	11.1	8.2	11.1	8.8	8.3	6.3	8.0	6.3	7.6	7.9	11.3	11.1	9.1
06	11.7	8.4	11.4	9.1	8.8	7.2	8.2	6.8	7.4	7.9	11.1	10.1	9.2
07	11.7	7.3	9.8	9.9	7.8	7.7	7.5	6.4	8.5	8.5	11.2	9.6	9.0
08	11.9	6.5	9.7	10.3	8.9	6.8	8.2	7.0	8.7	9.1	10.6	9.5	9.1
09	11.2	7.0	10.4	11.5	9.3	7.8	8.8	7.3	7.7	9.3	9.8	9.4	9.2
10	11.4	7.3	10.7	12.7	9.6	9.4	9.7	8.5	8.8	10.4	10.0	9.0	9.8
11	12.2	7.6	12.4	13.5	10.3	10.9	11.5	10.2	9.7	10.2	10.8	10.1	10.8
12	13.9	8.9	13.7	15.5	11.0	11.8	13.6	11.4	12.7	10.9	11.2	10.0	11.9
13	13.1	9.4	14.6	16.2	11.6	12.2	14.4	11.7	13.8	11.0	12.0	11.3	12.5
14	12.7	10.6	16.2	16.3	13.2	14.7	17.2	13.7	14.9	11.7	13.4	11.3	13.7
15	12.4	10.4	17.0	18.0	14.1	13.2	18.4	13.6	16.6	11.4	12.6	11.4	13.9
16	12.6	10.6	17.5	18.8	13.9	13.6	19.0	14.9	17.8	11.3	12.8	11.3	14.2
17	12.4	10.7	16.9	20.3	14.5	13.9	19.3	14.8	15.9	10.8	12.0	11.5	14.1
18	11.8	9.3	16.0	17.5	14.2	12.2	20.5	14.7	14.2	10.1	11.8	11.1	13.4
19	10.7	9.4	13.2	15.2	14.1	11.2	18.8	13.6	12.4	10.2	11.4	10.0	12.3
20	11.4	9.8	13.2	13.8	13.2	11.7	14.8	12.7	10.9	9.5	11.1	10.3	11.7
21	10.5	9.8	12.4	14.2	10.9	9.9	11.6	10.9	9.5	8.5	10.7	10.0	10.7
22	11.3	9.0	12.3	13.2	10.7	9.4	10.6	10.0	9.0	8.8	10.1	9.4	10.3
23	11.8	8.7	10.9	12.4	9.8	9.2	9.0	8.3	8.4	8.7	10.5	11.0	10.0
24	10.7	8.4	11.2	11.7	8.6	8.8	7.7	7.8	7.9	9.8	11.2	11.0	9.7
Mean	11.8	8.9	12.9	13.4	10.7	9.8	12.1	9.9	10.6	9.6	11.1	10.6	11.0

Good Hours												
903	672	744	706	744	720	744	744	720	744	1103	1309	

Missing Hours												
585	0	0	14	0	0	0	0	0	0	337	179	

9,853 Hours of Good Data 1,115 Hours Missing 89.8% Data Recovery

MEAN HOURLY WIND SPEEDS

FLATHEAD INDIAN NATION
35M WIND SPEED (W) (MPH)

11/01/04 - 01/31/06

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	10.5	8.7	13.2	12.1	8.7	7.3	8.1	7.9	8.7	9.4	11.1	11.6	10.0
02	11.7	9.3	12.8	10.9	8.6	7.0	8.4	7.5	8.5	8.6	9.4	11.9	9.7
03	12.6	8.5	12.6	11.3	8.5	6.5	9.1	6.8	8.5	8.4	10.0	11.9	9.8
04	12.3	9.1	11.1	10.2	8.4	6.5	8.3	6.5	8.0	8.3	10.8	11.3	9.5
05	11.4	8.2	11.3	9.0	8.4	6.2	8.2	6.5	7.8	8.2	11.6	11.2	9.3
06	11.5	8.4	11.8	9.2	9.0	7.2	8.6	7.1	7.5	8.1	11.4	10.3	9.4
07	11.4	7.3	10.1	9.9	7.8	7.5	7.7	6.4	8.8	8.7	11.5	9.8	9.1
08	11.5	6.3	9.9	10.2	8.7	6.4	8.3	7.2	9.0	9.3	10.9	9.8	9.1
09	11.0	7.0	10.5	11.4	9.0	7.5	8.8	7.3	7.8	9.3	10.1	9.7	9.2
10	11.2	7.2	10.7	12.7	9.3	9.2	9.8	8.5	8.7	10.4	10.3	9.3	9.8
11	12.0	7.4	12.6	13.5	10.3	10.8	11.6	10.3	9.7	10.3	11.2	10.4	10.9
12	13.6	8.7	13.6	15.4	11.0	11.8	13.8	11.6	12.7	10.9	11.0	10.2	11.9
13	13.0	9.0	14.7	16.1	11.7	12.2	14.6	12.0	14.0	11.0	12.3	11.5	12.6
14	12.6	10.3	16.3	16.4	13.2	14.7	17.3	13.9	15.1	11.8	13.5	11.6	13.7
15	12.2	10.1	17.1	18.0	14.1	13.2	18.5	13.9	16.8	11.6	12.8	11.5	13.9
16	12.3	10.4	17.6	18.9	14.2	13.6	19.3	15.2	18.0	11.4	13.1	11.5	14.4
17	12.2	10.5	16.8	20.5	14.6	13.9	19.5	15.0	16.1	11.1	12.2	11.8	14.2
18	11.8	9.3	16.1	17.8	14.4	12.2	20.7	14.9	14.5	10.3	12.1	11.2	13.5
19	10.5	9.4	13.5	15.6	14.3	11.2	19.0	13.8	12.9	10.4	11.7	10.2	12.5
20	11.3	9.7	13.6	14.1	13.5	11.7	15.3	13.1	11.2	9.6	11.4	10.4	11.9
21	10.4	9.9	12.8	14.5	11.2	10.0	12.0	11.2	9.9	8.7	10.9	10.3	10.9
22	11.3	9.1	12.5	13.6	10.9	9.5	10.9	10.4	9.4	9.0	10.4	9.6	10.5
23	11.5	8.7	11.3	12.6	9.9	9.3	9.2	8.5	8.6	8.8	10.9	11.1	10.2
24	10.7	8.5	11.4	12.1	8.8	8.8	7.8	7.9	8.1	10.1	11.5	11.3	9.9
Mean	11.7	8.8	13.1	13.6	10.8	9.8	12.3	10.1	10.8	9.7	11.3	10.8	11.1
Good Hours	965	672	744	706	744	720	744	744	720	744	1101	1309	
Missing Hours	523	0	0	14	0	0	0	0	0	0	339	179	

9,913 Hours of Good Data 1,055 Hours Missing 90.4% Data Recovery

MEAN HOURLY WIND SPEEDS

FLATHEAD INDIAN NATION
35M WIND SPEED (S) (MPH)

11/01/04 - 01/31/06

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	10.4	8.7	13.2	12.2	8.7	7.3	8.0	7.8	8.6	9.3	11.0	11.5	9.9
02	11.7	9.3	12.8	10.9	8.6	7.1	8.3	7.4	8.5	8.6	9.4	11.8	9.7
03	12.7	8.6	12.6	11.4	8.5	6.6	9.1	6.7	8.5	8.4	9.9	11.7	9.8
04	12.2	9.2	11.1	10.4	8.4	6.7	8.3	6.4	8.0	8.3	10.7	11.2	9.5
05	11.4	8.3	11.4	9.1	8.3	6.3	8.2	6.4	7.8	8.1	11.5	11.1	9.3
06	11.5	8.5	11.8	9.2	8.9	7.2	8.3	7.0	7.5	8.1	11.3	10.3	9.3
07	11.3	7.5	10.2	9.9	7.8	7.6	7.6	6.3	8.7	8.6	11.4	9.8	9.1
08	11.4	6.5	10.1	10.4	8.7	6.5	8.1	7.0	8.9	9.2	10.8	9.8	9.1
09	10.9	7.0	10.6	11.5	9.0	7.5	8.7	7.1	7.8	9.2	10.0	9.7	9.2
10	11.2	7.3	10.8	12.8	9.2	9.1	9.6	8.2	8.6	10.3	10.1	9.2	9.7
11	12.1	7.5	12.5	13.6	10.1	10.6	11.4	10.0	9.6	10.2	11.1	10.2	10.8
12	13.6	8.7	13.5	15.5	10.9	11.6	13.5	11.2	12.5	10.8	10.9	10.0	11.8
13	12.9	9.0	14.6	16.0	11.5	12.0	14.3	11.5	13.6	10.8	11.8	11.3	12.4
14	12.5	10.3	16.1	16.3	13.0	14.3	16.9	13.5	14.7	11.5	13.1	11.5	13.5
15	12.1	10.1	16.8	17.9	14.0	12.8	18.0	13.4	16.4	11.4	12.4	11.5	13.7
16	12.2	10.4	17.4	18.8	13.8	13.2	18.7	14.7	17.7	11.2	12.9	11.5	14.1
17	12.2	10.5	16.6	20.4	14.3	13.4	18.9	14.3	15.8	10.9	12.0	11.7	14.0
18	11.7	9.5	15.9	17.7	14.2	11.7	20.2	14.4	14.0	10.2	11.9	11.1	13.3
19	10.6	9.5	13.4	15.3	14.0	11.0	18.5	13.4	12.6	10.3	11.6	10.1	12.3
20	11.3	9.9	13.4	14.1	13.5	11.5	15.0	12.9	11.1	9.5	11.3	10.4	11.9
21	10.4	10.0	12.7	14.4	11.2	9.9	11.9	11.0	9.9	8.7	10.8	10.3	10.9
22	11.3	9.2	12.5	13.6	11.0	9.5	10.8	10.3	9.4	9.0	10.3	9.6	10.5
23	11.5	8.8	11.3	12.6	10.0	9.3	9.2	8.4	8.7	8.8	10.7	11.0	10.1
24	10.6	8.6	11.4	12.1	8.9	8.7	7.8	7.7	8.1	10.0	11.4	11.3	9.9
Mean	11.6	8.9	13.0	13.6	10.7	9.6	12.1	9.9	10.7	9.6	11.2	10.7	11.0
Good Hours	965	672	744	708	744	720	744	744	720	744	1098	1313	
Missing Hours	523	0	0	12	0	0	0	0	0	0	342	175	

9,916 Hours of Good Data 1,052 Hours Missing 90.4% Data Recovery

MEAN HOURLY VALUES

FLATHEAD INDIAN NATION
35M WIND DIRECTION (DEG)

11/01/04 - 01/31/06

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	193	172	196	164	166	210	226	185	201	174	201	204	192
02	184	173	193	169	180	204	234	182	199	189	205	199	194
03	181	188	199	149	148	196	219	173	210	195	199	198	189
04	192	184	192	147	140	187	212	168	209	205	205	207	189
05	191	185	177	144	138	181	200	199	205	178	203	183	183
06	205	175	197	153	139	183	195	168	206	177	202	183	183
07	212	189	191	135	156	195	160	168	217	198	203	190	186
08	192	182	176	158	157	191	163	160	201	175	191	204	181
09	212	168	169	149	146	202	154	161	189	174	203	190	179
10	202	172	157	129	136	172	183	148	211	170	199	196	176
11	200	172	161	145	156	182	173	151	186	157	207	194	177
12	211	165	169	149	164	177	201	151	197	175	205	180	181
13	208	170	181	157	161	206	216	181	195	186	222	178	190
14	212	145	196	169	166	200	207	171	195	185	214	190	190
15	209	181	204	170	156	190	211	188	205	183	216	193	194
16	201	168	221	178	162	188	210	184	196	194	203	178	190
17	215	203	191	159	161	189	213	182	198	190	204	200	194
18	205	185	208	148	157	170	214	179	203	192	225	204	194
19	219	191	193	155	164	174	225	191	186	195	214	183	192
20	216	208	200	171	158	194	194	180	193	174	201	177	189
21	209	213	196	168	154	204	213	187	184	199	201	195	194
22	205	223	189	171	158	219	227	215	204	197	204	201	201
23	207	217	199	160	179	221	223	207	204	174	204	197	200
24	204	198	185	175	167	192	223	189	210	185	207	192	195
Mean	203	184	189	157	157	193	204	178	200	184	206	192	189

Good Hours												
939	672	744	705	744	720	744	744	720	744	1132	1358	

Missing Hours												
549	0	0	15	0	0	0	0	0	0	308	130	

9,966 Hours of Good Data 1,002 Hours Missing 90.9% Data Recovery

MEAN HOURLY VALUES

FLATHEAD INDIAN NATION
TEMPERATURE (DEG)

11/01/04 - 01/31/06

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	27.6	30.4	34.3	38.9	48.4	51.9	64.6	64.3	52.8	42.8	31.0	25.4	40.3
02	26.9	29.9	33.6	38.4	47.9	51.1	63.6	63.2	52.3	42.4	30.8	25.4	39.7
03	27.0	29.3	33.2	37.9	47.3	50.6	62.7	62.3	51.5	42.1	30.5	25.4	39.3
04	26.8	28.9	32.7	37.3	46.8	49.9	62.0	61.5	51.0	41.9	30.1	25.2	38.9
05	26.9	28.4	32.5	36.7	46.0	49.6	61.1	60.4	50.4	41.7	30.0	25.4	38.6
06	26.7	27.9	31.9	37.0	46.7	50.0	62.0	60.1	49.8	41.3	29.8	25.0	38.5
07	26.7	27.4	31.9	37.7	48.0	51.1	63.2	61.7	50.1	41.1	29.5	25.0	38.8
08	26.5	27.8	32.7	38.7	48.7	52.5	64.7	63.0	51.7	41.4	29.5	24.8	39.4
09	26.5	30.1	34.1	39.8	49.7	53.9	66.3	65.0	53.1	41.9	30.4	25.4	40.5
10	27.8	31.1	35.4	42.0	51.4	55.6	68.7	67.1	54.9	42.7	31.2	26.0	41.8
11	29.4	32.1	36.7	43.5	53.1	57.3	71.0	69.0	56.9	43.8	31.9	26.9	43.2
12	29.8	33.0	38.2	44.7	54.5	58.6	73.0	71.0	58.3	45.1	32.5	27.6	44.4
13	30.8	34.3	40.0	46.3	55.4	59.1	74.3	72.4	59.8	46.0	33.3	27.7	45.4
14	31.1	35.3	41.1	46.9	56.3	59.8	75.5	73.8	60.6	46.9	33.9	28.1	46.1
15	30.8	36.5	41.6	47.8	56.6	59.6	76.4	74.8	61.5	47.6	34.0	28.3	46.6
16	30.3	36.8	41.1	47.7	56.6	59.6	76.6	74.9	61.1	48.0	33.4	27.9	46.4
17	29.2	35.9	40.2	47.0	56.2	59.1	76.1	74.7	60.4	46.7	32.6	26.8	45.6
18	28.6	33.7	38.7	46.3	54.9	58.6	75.2	73.4	58.8	45.4	32.1	26.6	44.6
19	28.1	32.8	37.3	44.2	53.7	57.9	73.4	71.4	56.3	44.9	31.8	26.2	43.6
20	28.2	32.6	36.6	42.2	52.2	56.0	70.4	68.5	55.3	44.4	31.7	26.2	42.6
21	28.0	32.3	35.9	41.3	51.0	54.7	67.8	67.2	54.8	44.1	31.4	25.7	41.9
22	28.3	32.0	35.6	40.2	50.5	54.4	67.0	66.7	54.2	44.1	31.3	25.7	41.6
23	27.8	31.4	35.0	40.0	49.9	54.0	66.3	65.8	53.9	43.2	31.1	25.7	41.1
24	27.9	31.1	34.6	39.4	49.3	53.3	65.8	64.9	53.0	43.0	30.9	25.5	40.7
Mean	28.2	31.7	36.0	41.7	51.3	54.9	68.6	67.4	55.1	43.9	31.5	26.2	42.1

Good Hours												
1140	672	744	720	744	720	744	744	720	744	1355	1488	

Missing Hours												
348	0	0	0	0	0	0	0	0	0	85	0	

10,535 Hours of Good Data 433 Hours Missing 96.1% Data Recovery

MEAN HOURLY VALUES

FLATHEAD INDIAN NATION
SOLAR RADIATION (LY)

02/01/05 - 05/31/05

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01		.0	.0	.0	.0								.0
02		.0	.0	.0	.0								.0
03		.0	.0	.0	.0								.0
04		.0	.0	.0	.0								.0
05		.0	.0	.0	2.7								.7
06		.0	.0	11.0	53.4								16.2
07		.0	8.6	80.9	151.0								60.7
08		24.4	68.8	169.9	266.1								133.6
09		133.3	168.8	279.1	360.6								236.6
10		243.0	250.7	444.4	453.3								348.8
11		332.6	311.7	501.0	503.7								412.8
12		378.6	392.6	501.5	519.4								446.9
13		382.4	392.7	525.8	519.5								455.3
14		345.3	353.7	429.1	509.0								409.9
15		276.0	290.9	422.6	398.5								347.7
16		180.5	192.9	286.4	324.6								246.7
17		79.9	94.7	188.8	235.1								150.3
18		3.5	22.4	99.6	133.9								65.5
19		.0	.2	10.3	22.8								8.4
20		.0	.0	.0	3.0								.8
21		.0	.0	.0	.0								.0
22		.0	.0	.0	.0								.0
23		.0	.0	.0	.0								.0
24		.0	.0	.0	.0								.0
Mean		99.1	106.2	164.6	182.8								138.6

Good Hours

672	744	720	720

Missing Hours

0	0	0	24

2,856 Hours of Good Data 24 Hours Missing 99.2% Data Recovery

MEAN HOURLY WIND SPEEDS

FLATHEAD INDIAN NATION
OLIVER PT - 77 FT WIND SPEED (MPH)

01/01/05 - 09/30/05

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	11.9	11.0	13.5	12.5	10.2	10.6	10.1	8.0	8.5				10.8
02	12.7	10.6	12.6	12.8	9.9	10.6	9.9	7.7	7.2				10.5
03	12.3	10.6	12.3	12.5	10.1	10.6	9.9	7.5	7.1				10.4
04	11.4	10.2	12.1	12.0	9.3	10.2	10.2	7.2	7.2				10.1
05	11.0	10.4	11.7	11.8	9.3	10.2	10.0	7.6	8.4				10.1
06	11.4	10.4	11.8	11.4	9.6	10.8	9.0	8.1	7.9				10.1
07	10.9	9.7	11.3	10.3	9.0	10.2	7.8	7.5	8.8				9.5
08	10.8	8.9	11.3	10.1	8.4	8.9	7.7	6.4	9.0				9.0
09	10.7	8.5	11.1	10.2	8.0	8.1	7.8	6.8	9.1				8.8
10	10.6	8.2	10.6	10.3	7.9	8.3	8.7	7.4	9.0				8.9
11	9.9	8.3	11.3	10.3	8.6	9.4	9.2	8.4	9.3				9.4
12	9.4	8.4	11.6	10.6	9.5	9.7	10.7	9.5	9.3				9.9
13	9.3	8.6	12.7	11.8	10.2	10.5	11.5	10.7	8.8				10.7
14	10.1	9.4	14.1	13.0	10.7	11.7	12.9	11.5	10.1				11.7
15	9.8	9.7	14.1	12.3	11.7	11.3	14.0	12.6	11.5				12.0
16	10.7	9.6	13.2	14.0	12.2	11.7	16.2	13.0	10.1				12.5
17	12.0	9.8	13.5	13.8	12.2	11.3	16.2	12.5	10.0				12.6
18	12.6	10.3	12.5	13.2	12.7	10.9	16.8	13.0	9.4				12.6
19	13.2	10.9	12.7	13.3	12.8	11.3	16.3	12.9	10.9				12.8
20	12.8	11.0	13.5	14.5	12.6	11.8	15.5	12.0	10.0				12.8
21	12.9	9.9	12.5	15.3	12.2	12.1	13.7	11.8	9.2				12.4
22	13.5	9.7	12.0	14.3	11.6	12.4	12.6	10.7	8.2				11.9
23	13.5	10.2	12.6	13.0	11.0	12.1	11.2	9.1	8.4				11.3
24	12.7	10.5	13.0	12.1	10.5	12.0	10.6	8.3	9.0				11.0
Mean	11.5	9.8	12.4	12.3	10.4	10.7	11.6	9.6	9.0				10.9
Good Hours	515	672	744	689	744	720	744	744	324				
Missing Hours	229	0	0	31	0	0	0	0	396				

5,896 Hours of Good Data 656 Hours Missing 90.0% Data Recovery

MEAN HOURLY WIND SPEEDS

FLATHEAD INDIAN NATION
OLIVER PT - 77 FT WIND SPEED (2) (MPH)

01/01/05 - 09/30/05

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	11.4	10.7	13.3	12.3	10.2	10.4	9.9	7.7	8.2				10.5
02	12.3	10.3	12.5	12.6	9.9	10.4	9.7	7.6	7.0				10.4
03	11.8	10.4	12.3	12.4	10.3	10.4	9.7	7.4	6.8				10.3
04	10.9	9.9	12.1	11.9	9.4	10.0	9.9	7.1	6.8				9.9
05	10.6	10.2	11.8	11.8	9.3	10.0	9.9	7.4	8.1				10.0
06	10.9	10.2	11.8	11.3	9.5	10.5	8.9	7.9	7.6				10.0
07	10.5	9.5	11.4	10.2	8.8	9.9	7.6	7.3	8.5				9.3
08	10.4	8.7	11.3	10.1	8.2	8.6	7.7	6.2	8.7				8.8
09	10.4	8.2	11.2	9.9	7.9	7.9	7.7	6.6	8.8				8.7
10	10.4	8.0	10.6	9.9	7.6	8.1	8.6	7.2	8.8				8.7
11	9.6	7.9	11.3	10.3	8.4	9.2	9.1	8.2	9.0				9.2
12	9.2	8.0	11.6	10.4	9.3	9.5	10.6	9.2	8.9				9.7
13	9.2	8.2	12.6	11.1	10.1	10.3	11.3	10.4	8.4				10.4
14	10.0	9.0	13.8	12.6	10.6	11.4	12.6	11.1	9.6				11.4
15	9.7	9.3	13.9	12.0	11.5	11.1	13.5	12.2	10.8				11.7
16	10.7	9.2	12.9	13.7	11.9	11.4	15.5	12.6	9.7				12.2
17	12.0	9.5	13.3	13.7	12.0	11.0	15.5	12.0	9.6				12.3
18	12.6	10.1	12.2	13.0	12.5	10.6	16.0	12.5	8.7				12.3
19	13.2	10.7	12.5	13.0	12.7	11.1	15.4	12.5	10.3				12.5
20	12.9	10.7	13.4	14.0	12.5	11.7	14.7	11.5	9.6				12.5
21	12.8	9.7	12.4	14.8	12.0	12.1	13.1	11.3	8.9				12.1
22	13.3	9.4	12.1	13.8	11.6	12.2	12.1	10.3	7.9				11.6
23	12.8	9.8	12.7	12.7	11.0	11.9	10.8	8.9	8.2				11.1
24	12.1	10.1	12.8	11.8	10.7	11.7	10.3	8.0	8.7				10.8
Mean	11.3	9.5	12.3	12.1	10.3	10.5	11.3	9.3	8.6				10.7

Good Hours									
538	672	744	690	744	720	744	744	324	

Missing Hours									
206	0	0	30	0	0	0	0	396	

5,920 Hours of Good Data 632 Hours Missing 90.4% Data Recovery

MEAN HOURLY VALUES

FLATHEAD INDIAN NATION
OLIVER PT - 63 FT WIND DIRECTION (DEG)

01/01/05 - 09/30/05

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
01	219	219	220	181	189	214	245	199	212				211
02	218	212	220	169	196	207	243	176	221				206
03	216	213	207	158	202	220	238	188	229				206
04	209	207	210	188	187	218	237	196	245				209
05	211	221	205	171	185	215	233	203	249				208
06	208	208	208	170	186	213	222	192	247				203
07	198	205	207	150	175	206	217	195	244				197
08	193	194	203	152	186	209	209	189	236				194
09	197	182	205	151	192	213	207	189	230				194
10	199	190	192	148	185	218	208	201	232				195
11	194	196	207	152	179	217	213	191	222				196
12	197	206	194	176	190	203	207	183	236				197
13	207	211	208	177	189	236	220	209	237				209
14	209	198	216	185	186	207	219	209	224				205
15	218	205	221	191	183	205	221	198	223				206
16	211	204	212	185	177	196	217	187	207				199
17	215	196	225	187	182	184	230	179	189				199
18	208	197	223	179	179	191	225	187	217				199
19	213	204	223	174	173	191	233	204	195				201
20	211	204	226	182	170	199	246	227	196				208
21	216	219	213	181	179	208	279	204	204				212
22	222	215	206	177	176	214	262	224	229				213
23	218	212	204	186	195	220	256	221	229				215
24	220	219	208	167	183	224	252	210	216				211
Mean	210	206	211	172	184	209	231	198	224				204

Good Hours	462	672	744	686	744	720	744	744	324
Missing Hours	282	0	0	34	0	0	0	0	396

5,840 Hours of Good Data 712 Hours Missing 89.1% Data Recovery

FREQUENCY DISTRIBUTION - Hours of Occurrence 11/15/04 - 01/15/06

Parameter
1: FLATHEAD INDIAN NATION
35M WIND SPEED (W) (MPH)

2: FLATHEAD INDIAN NATION
35M WIND DIRECTION (DEG)

	Parameter 1: MPH							
Parm 2 - DEG	0.0 to 10.0	10.1 to 15.0	15.1 to 20.0	20.1 to 25.0	25.1 to 30.0	30.1 to 35.0	35.1 to 50.0	Total
0.0 to 22.5	114	5	1	0	0	0	0	120
22.6 to 45.0	168	9	8	10	4	3	0	202
45.1 to 67.5	527	98	74	56	48	45	27	875
67.6 to 90.0	864	65	15	5	2	0	0	951
90.1 to 112.5	465	48	1	0	0	0	0	514
112.6 to 135.0	155	18	0	0	0	0	0	173
135.1 to 157.5	119	14	4	1	0	0	0	138
157.6 to 180.0	134	12	2	0	0	0	0	148
180.1 to 202.5	198	8	4	0	0	0	0	210
202.6 to 225.0	646	200	117	112	66	34	12	1187
225.1 to 247.5	1212	827	511	362	248	168	99	3427
247.6 to 270.0	514	128	142	137	99	57	23	1100
270.1 to 292.5	153	34	40	24	15	5	3	274
292.6 to 315.0	84	21	9	11	4	1	1	131
315.1 to 337.5	74	20	3	0	1	0	0	98
337.6 to 360.1	74	6	1	0	0	0	0	81
Total	5501	1513	932	718	487	313	165	9629

9,631 Good Hours 617 Hours Missing 94.0% Net Data Recovery

FREQUENCY DISTRIBUTION - Percent Occurrence 11/15/04 - 01/15/06

Parameter
1: FLATHEAD INDIAN NATION
35M WIND SPEED (W) (MPH)

2: FLATHEAD INDIAN NATION
35M WIND DIRECTION (DEG)

	Parameter 1: MPH							
Parm 2 - DEG	0.0 to 10.0	10.1 to 15.0	15.1 to 20.0	20.1 to 25.0	25.1 to 30.0	30.1 to 35.0	35.1 to 50.0	Total
0.0 to 22.5	1.2	.1	.0	.0	.0	.0	.0	1.2
22.6 to 45.0	1.7	.1	.1	.1	.0	.0	.0	2.1
45.1 to 67.5	5.5	1.0	.8	.6	.5	.5	.3	9.1
67.6 to 90.0	9.0	.7	.2	.1	.0	.0	.0	9.9
90.1 to 112.5	4.8	.5	.0	.0	.0	.0	.0	5.3
112.6 to 135.0	1.6	.2	.0	.0	.0	.0	.0	1.8
135.1 to 157.5	1.2	.1	.0	.0	.0	.0	.0	1.4
157.6 to 180.0	1.4	.1	.0	.0	.0	.0	.0	1.5
180.1 to 202.5	2.1	.1	.0	.0	.0	.0	.0	2.2
202.6 to 225.0	6.7	2.1	1.2	1.2	.7	.4	.1	12.3
225.1 to 247.5	12.6	8.6	5.3	3.8	2.6	1.7	1.0	35.6
247.6 to 270.0	5.3	1.3	1.5	1.4	1.0	.6	.2	11.4
270.1 to 292.5	1.6	.4	.4	.2	.2	.1	.0	2.8
292.6 to 315.0	.9	.2	.1	.1	.0	.0	.0	1.4
315.1 to 337.5	.8	.2	.0	.0	.0	.0	.0	1.0
337.6 to 360.1	.8	.1	.0	.0	.0	.0	.0	.8
Total	57.1	15.7	9.7	7.5	5.1	3.3	1.7	100.0

9,631 Good Hours 617 Hours Missing 94.0% Net Data Recovery

FLATHEAD INDIAN NATION
35M WIND SPEED (S)

01/01/05 to 12/31/05

Wind Speed Frequency and Concurrent TI

Wind Speed (mps)	Frequency of Occurrence Hrs	%	Mean Turbulence Intensity
0-2	2910	34.8	0.331
3	1229	14.7	0.177
4	871	10.4	0.151
5	648	7.8	0.128
6	502	6.0	0.120
7	404	4.8	0.114
8	336	4.0	0.102
9	301	3.6	0.096
10	260	3.1	0.096
11	231	2.8	0.086
12	184	2.2	0.083
13	151	1.8	0.080
14	133	1.6	0.076
15	73	.9	0.076
16	56	.7	0.070
17	31	.4	0.066
18	20	.2	0.084
19	10	.1	0.075
20	2	.0	0.061
21	3	.0	0.072
22	1	.0	0.084
23	0	0.0	*****
24	1	.0	0.035
25	0	0.0	*****
26	0	0.0	*****
27	0	0.0	*****
28	0	0.0	*****
29	0	0.0	*****
30	0	0.0	*****
Total Hrs	8357		8357

2004

S and K Holding

Proposed Meteorological Tower
To Assess Wind Resources

ENVIRONMENTAL ASSESSMENT CHECKLIST

Bureau of Indian Affairs
Flathead Agency
P.O. Box A
Pablo, Mt 59855

And

Confederated Salish and Kootenai Tribes
Natural Resources Department
NEPA Program
P.O. Box 278
Pablo Mt. 59855

TABLE OF CONTENTS

CHECKLIST ENVIRONMENTAL ASSESSMENT

I. Purpose of and Need for the Proposal

1.1.1. Proponent: S&K Holding and Distributed Generation Systems, Inc. (Disgen)
1.1.2. Name of Project: Proposed Meteorological (Met) Tower to Assess Wind Resources
1.1.3. Type of Action: Building a temporary meteorological tower with various anemometers and gauges to assess weather, particularly wind resources in the Oliver Point area of the Reservation
1.1.4. Proposed Implementation Date: August 2004
1.1.5. Location: T 22 N/R 22 W/ Sec. 6. 1.1.6. County: Lake
1.2. Need for Action (related to current conditions): The purpose of S and K Holding is to "promote economic independence by maximizing economic opportunities for the Tribe and Tribal members in a culturally appropriate manner". As part of that mission, S and K Holding has pursued and received a grant from the Department of Energy to assess wind resources on the Reservation. This EA is for a proposal for one test wind tower, to collect information on wind resources, and to evaluate the potential for power generation from wind turbines.
1.3. Purpose (objectives): To provide information to the Tribes relative to business opportunities, per the mission statement of S and K Holding. Tribal Council gave support to pursuing the NEPA process and issue a permit for this use through the Tribal Lands Department on 27 July 2004.
1.4. Pertinent EISs/EAs: no NEPA documents. S and K Holding has a Comprehensive Economic Development Strategy, January 2002, from which they operate.
1.5. Decisions to be made: The decision for the Superintendent and the Tribes is, is more analysis needed or should the action go forward with this level of analysis.
1.6. Other agencies involved: The Tribal Wildlife Program has determined that there would be no measurable effects to threatened or endangered species from the proposal. Therefore, consultation with the USFWS, in compliance with Section 7 of the Endangered Species Act, would not be necessary. No water would be affected, so no other agencies would need to be consulted.

1.7. SUMMARIZE SCOPING, EXPLAIN RELEVANT ISSUES: Provide a brief chronology of the scoping and ongoing involvement for this project.	The IDT was formed in late June 2004. Resource specialists provided input (see attached reports). Because there is no programmatic NEPA documentation for projects of this sort, an EA was produced for the current proposal.
1.8. LIST OF PERMITS NEEDED:	--Tribal Aquatic Lands Conservation Ordinance (ALCO, Tribal Ordinance 87A). No water would be affected, so no permit is needed. --Cultural Clearance permit (Tribal Ordinance 95). The proposal received a clearance, RP # 04-174, attached.
Cumulative Effects Analysis Area (CEAA)	The CEAA includes the surrounding ~ ½ to 1 mile, along the north-to-south ridge top (photo/map attached). This area is relatively similar to and connected with the project area.

2.0. Alternatives Considered: Alternative A, No Action; Alternative B, Proposed Action.	**Alternative A: No Action.** No met tower would be placed at the proposal area at this time. Other management activities may occur such as driving to the site on established dirt roads, weed treatment, fire suppression, etc. Choosing the No Action Alternative at this time would not preclude proposing some similar action in the future. **Alternative B: Proposed Action**: Build a met tower ~ 50 m tall, according to the specifications in Appendix 1. Mitigation measures from the IDT staff are listed below: *Mitigation Measures*: ▪ Use existing towers or erect towers near existing towers, to avoid building additional towers in new locations. ▪ Attach bird deflectors to guy wires at 30-foot intervals (see Wildlife Program for details) ▪ Do not use lights on the tower ▪ Remove tower within 6 months of the end of the study. ▪ Weed spraying may be needed, if weeds increase due to increased vehicle use at the site. ▪ Implement avian monitoring, per specifications in the Wildlife Program report. ▪ Close all pasture gates ▪ Obey all fire closures ▪ Install hog wire to protect wires from livestock (per Appendix 1)

II. Effects to the Physical Environment

Resource	[Y/N] **Potential Effects** N = Not present or No impact would occur Y or Low = Impacts may occur (explain below)
3.1 GEOLOGY AND SOIL QUALITY, STABILITY AND MOISTURE: Are fragile, compactible or unstable soils present? Are there unusual geologic features? Are there special reclamation considerations?	[N] No permanent structures would be built. The tower would simply sit on top of the ground for 1-3 years. Therefore, there would be no effects.
3.2. WATER QUALITY, QUANTITY AND DISTRIBUTION: Are important surface or groundwater resources present? Is there potential for violation of ambient water quality standards, drinking water maximum contaminant levels, or degradation of water quality?	[N] The proposal area is on a ridge top, situated well away from any water resources. Also, no excavation would occur. Therefore, there would be no effects.
3.3. AIR QUALITY: Will pollutants or particulate be produced? Is the project influenced by air quality regulations or zones (Class I airshed)?	[N] No excavation would occur. Therefore, there would be no effects.

Resource	Potential Effects
3.4. VEGETATION COVER, QUANTITY AND QUALITY: Will vegetative communities be permanently altered? Are any rare plants or cover types present?	[N] No excavation would occur. No permenent structures would be installed. Therefore, there would be no effects.
3.5. TERRESTRIAL, AVIAN AND AQUATIC LIFE AND HABITATS: Is there substantial use of the area by important wildlife, birds or fish?	[Y] See attached wildlife report (B. Gullett, 28 July 2004).
3.6. UNIQUE, ENDANGERED, FRAGILE OR LIMITED ENVIRONMENTAL RESOURCES: Are any federally listed threatened or endangered species or identified habitat present? Any wetlands? Sensitive Species or Species of special concern?	[N] No threatened, endangered, or sensitive species occupy the site. Therefore, there would be no measurable effects (B. Gullett, 28 July 2004).
3.7. HISTORICAL AND ARCHAEOLOGICAL SITES: Are any historical, archaeological or paleontological resources present?	[N] A cultural clearance was received (RP #04-174)
3.8. AESTHETICS: Is the project on a prominent topographic feature? Will it be visible from populated or scenic areas? Will there be excessive noise or light?	[N] No permanent structures would be built. Also, the tower would not be lighted, so it would have low visibility.
3.9. DEMANDS ON ENVIRONMENTAL RESOURCES OF LAND, WATER, AIR, OR ENERGY: Will the project use resources that are limited in the area? Are there other activities nearby that will affect the project?	[N] However, if wind resources are sufficient, the project may lead to a wind farm proposal in the future.
3.10. OTHER ENVIRONMENTAL DOCUMENTS PERTINENT TO THE AREA: Are there other studies, plans or projects on this tract?	[N]

III. Effects on the Human Population	
Resource	**Potential Effects**
3.11. HUMAN HEALTH AND SAFETY: Will this project add to health and safety risks in the area?	[N]
3.12. INDUSTRIAL, COMMERCIAL AND AGRICULTURAL ACTIVITIES AND PRODUCTION: Will the project add to or alter these activities?	[N]

Resource	Potential Effects
3.13. QUANTITY AND DISTRIBUTION OF EMPLOYMENT: Will the project create, move, or eliminate jobs? If so estimated number.	[N] Existing staff would collect the data cards.
3.14. LOCAL AND STATE TAX BASE AND TAX REVENUES: Will the project create or eliminate tax revenue?	[N]
3.15. DEMAND FOR GOVERNMENT SERVICES: Will substantial traffic be added to existing roads? Will other services (fire protection, police, schools, etc) be needed?	[N] An access road is already in place. The road would not need to be widened or improved.
3.16. LOCALLY ADOPTED ENVIRONMENTAL PLANS AND GOALS: Are there State, County, City, USFS, BLM, Tribal, etc. zoning or management plans in effect?	[N]
3.17. ACCESS TO AND QUALITY OF RECREATIONAL AND WILDERNESS ACTIVITIES: Are wilderness or recreational areas nearby or accessed through this tract? Is there recreational potential within the tract?	[N] The site is fairly remote, located on a ridge top. Uses include timber management and livestock grazing. It is far removed from the Tribal Wilderness, which provides more spectacular scenery.
3.18. DENSITY AND DISTRIBUTION OF POPULATION AND HOUSING: Will the project add to the population and require additional housing?	[N]
3.19. SOCIAL STRUCTURES AND MORES: Is some disruption of native or traditional lifestyles or communities possible?	[N]
3.20. CULTURAL UNIQUENESS AND DIVERSITY: Will the action cause a shift in some unique quality of the area?	[N] A cultural clearance was received (RP #04-174)
3.21. OTHER APPROPRIATE SOCIAL AND ECONOMIC CIRCUMSTANCES: Is there a potential for other future uses for the area other than for the proposed type of management? Is future use hypothetical?	[N]
3.22. LIST UNAVOIDABLE ADVERSE EFFECTS	The tower may result in bird mortality, if birds fly into the guy wires.
3.23. RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY	Productivity—timber and range resources—at the site would not be changed.

3.24. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES	There are no irreversible commitments of resources, because the tower would be temporary, and no permanent structures would be built. No excavation would occur. Also, roads are already in place. Irretrievable commitments of resources would include the loss of open space during the time the tower would be visible (1-3 years). However, the area does not currently appear pristine or unmanaged.
3.25. ANY OTHER DISCLOSURES	[N]
4.0 LIST OF PREPARES	CSKT natural resource staff (NEPA, GIS, wildlife), Tribal Preservation Office, S and K Holding, Disgen staff, and Tribal Lands Department staff.
5.0 LIST OF AGENCIES AND PERSONS CONSULTED	See section 1.6.

Prepared by:

Rosemary H. Leach — NEPA Program Manager

Name — Title

Signature — Date

FINDING

ALTERNATIVE SELECTED:	Alternative B, the Proposed Action
Level of Potential Effects:	Finding of no significant impact, with design features and mitigation measures in place.

Need for Further Environmental Analysis:

[ ] EIS [ ] More Detailed EA [√] No Further Analysis Needed

EA Checklist Approved By:

Ernest T. Moran — Superintendent, Flathead Agency

Name — Title

Signature — Date

APPENDIX A

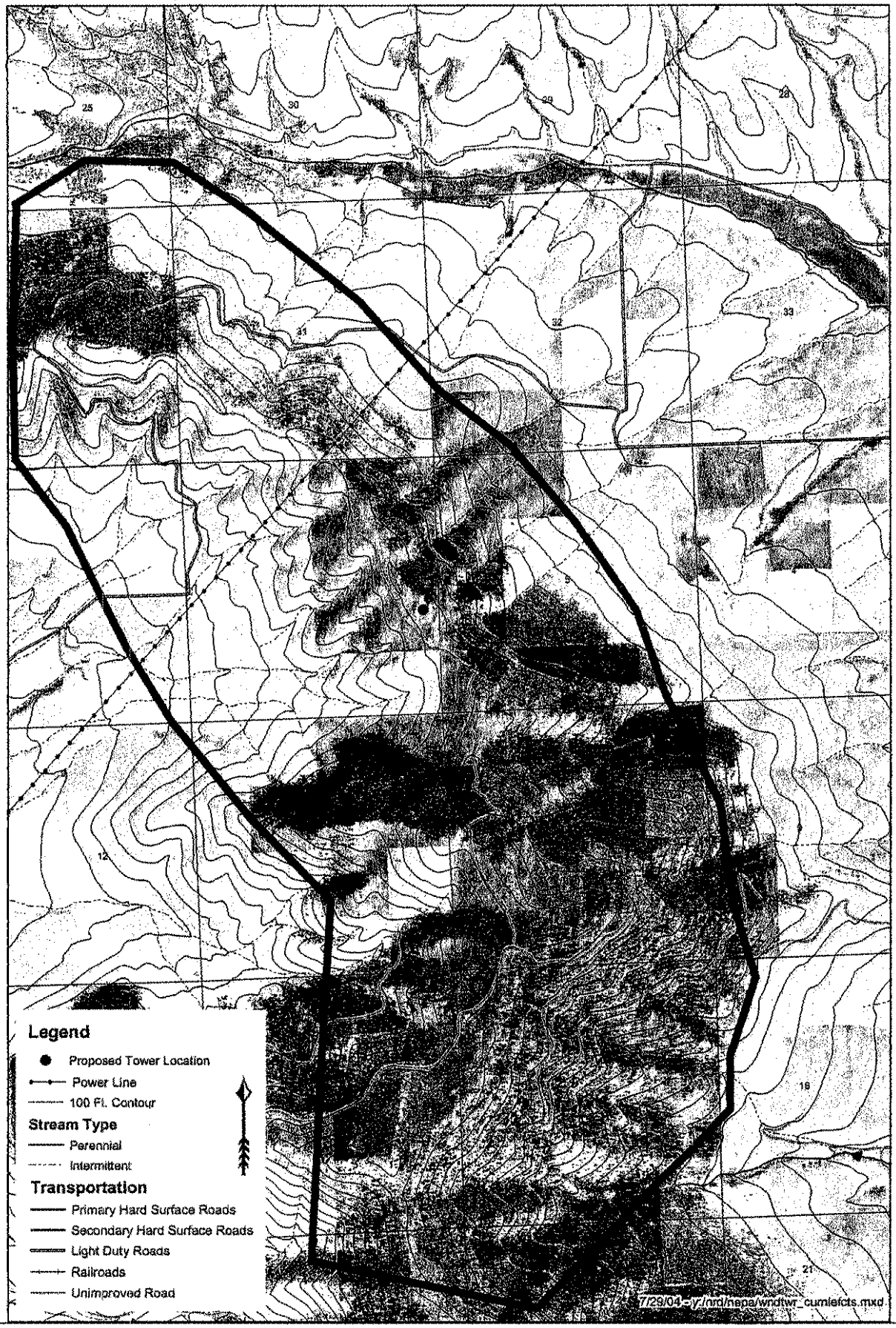
Map and photos

APPENDIX B

Clearances and Reports

- Cultural Clearance RP # 04-174
- Wildlife—Brett Gullett, 28 July 2004
- Lands Department—Doug Dupuis, 29 July 2004

Fig 1-2. Cumulative Effects Analysis Area For
Proposed Wind Tower Location T22N., R22W., Sec. 6



MEMORANDUM

Date: 7/28/2004

To: Rose Leach, NEPA Coordinator
Cc: Dale Becker, Wildlife Management Program Manager

From: Brett Gullett, Wildlife Mitigation Biologist

Subject: Proposed Met Tower

With the lack of large buildings, towerkills become the second leading unregulated human caused mortality to birds on the Flathead Indian Reservation (behind feral cats). Young et al. (2003) provides avian mortality information for met towers and wind turbines. New towers need to be constructed with mitigations to prevent mortalities as much as possible. The proposed site is beyond the home range of any Bald Eagle nest in the area, although migratory eagles and non-breeding individuals may still use the area. The proposed site is located along areas with the highest density (unpublished data USFS Landbird Monitoring Program) of Cordilleran Flycatchers (Level II MTPIF Watchlist, Casey 2000) found on the Flathead Indian Reservation. The narrow ridges of the Salish Hills also provide wind updrafts, foraging, and nesting habitat for many raptor species.

Mitigation Measures for tower construction to address Wildlife concerns

- Use existing towers or erect towers near existing towers, to avoid building additional towers in new locations.
- Self-supporting towers are preferred. Towers with guy wires will need to be outfitted with guyed bird deflectors (GBD) at 30ft. intervals.
- Tower will be removed within 6 months after use or mechanical failure.
- No lights are preferred, if a lighting system is needed, white strobes with the minimum number, minimum intensity, and minimum number of flashes per minute (longest duration between flashes) allowable by the FAA.
- Weed mitigation may be needed for increased use of road system.
- Implement Avian monitoring. This would consist of carcass searches (Young et al. 2003) at the met tower site after construction, and fixed-radius point surveys (Young et al. 2002) at the met tower site and proposed wind turbine locations.

Direct and Indirect Effects, Proposed Action
The proposed tower would have negative direct and indirect effects to migratory birds that use the area. Effects would be ameliorated to the extent possible by implementing the above-listed mitigation measures. Although adverse to individuals, effects from a single tower would not be measurable to bird populations.

Cumulative Effects, Proposed Action
With no other towers in the area, there would be no measurable cumulative effects to bird populations from the proposal.

Casey, D. 2000. Montana bird conservation plan. Montana Partner's in Flight. Kalispell, MT. 280p.

Young, D.P., W.P. Erickson, R.E. Good, M.D. Strickland and G.D. Johnson. 2003. Avian and bat mortality associated with the initial phase of the Foote Creek Rim windpower project, Carbon County, Wyoming. Technical Report to Pacificorp, Inc., Portland Oregon. Pp. 35.

Young, D.P., W.P. Erickson, K, Bay, R, Good and K, Kronner. 2002. Baseline avian studies for the proposed Maiden wind farm, Yakima and Benton counties, Washington. Technical Report to Booneville Power Administration, Portland Oregon. Pp. 61.

Appendix 1. Tower Specifications

- Met (meteorological) Tower
  - 50 m tall (~175 feet tall) including a lightning rod on top
  - 9 square-foot metallic base plate
  - Base plate rests on the ground, so no ground is disturbed by digging or any material such as concrete.
  - Total area affected by base plate: 0.87 acres
  - 4 sets of 6 guy wires, attached at 6 different elevations distributed ~fairly evenly throughout the tower. Guy wires may each affect ~ 1 square-foot of ground.
  - wires go out from the base to 110 feet
  - Tower is 6 inches in diameter
  - No heavy equipment is needed to erect the tower.
  - no lighting, because it's not 200 feet tall
  - Guy wires are put in the ground with rebar rods done with a compressor, so no pouring of concrete. Rebar is removed at end and reused.
  - Nothing permanent is constructed; all would be removed.
  - Hog guard is placed underneath the guy wires.
  - Diameter of guy wires ~ 1/4 inch
  - Grounded with copper wire on the side of the tower
  - At 50 m there is are 2 anemometers and a wind vane
  - At 40 m: same thing
  - At 30 m: 1 vane and 1 anemometer
  - They stick out a bit, but not enough to be a bird perch (C Bergen)

General Operation

- Collect 2 years of data, or preferably 3 years of wind data, and then decide if they want to try a wind farm

Wildlife Diverters:

-
- Diverters similar to the Swan Diverters would be [redacted] These consist of small plastic coils that sit on the wire, maybe 1 or 2 on each wire, so not particularly heavy.

Location:

- T22N/R22W NW of Sec 6.
- The site is treeless, so that no overstory vegetation would be disturbed.
- Grassland burning could occur with no effect to the tower or guy wires (Disgen memos, NEPA files).

Other potential sites:

- A communication tower (already in place), probably operated by Ronan Telephone Co. They might be interested in putting a data collector on that existing tower.
- There is a taller tower at Oliver Point (probably used by Tribal Fire Control). If it is taller than 30 m, then they would like to put an anemometer on it, too.

Access

- Access would be via roads in place. Roads would not need to be upgraded.
- The proponent would need to access the tower several times per year.
    - If they use a cellular data logger (collector), then they just need to go and swap out the cards 2-3 times per year.
    - The cellular type is solar powered, so no electricity needed
    - If they can't use that, then they use D cell batteries and need to go change the batteries 1/month

Note: for comparison,

- Wind turbine towers are ~ 1.5mw turbines, 65 to 80 m tall, max turbine blade = 77 m rotor

Tribal Renewable Energy
Final Technical Report

Tab 3

Environmental Review
Phase One Avian Screening

Project Title: Flathead Reservation Renewable Energy Feasibility Study

Date of Report: September 2006

Recipient Organization: Salish & Kootenai Holding Company, Inc.
Award Number: DE-FG36-04GO14024

Partners: Salish & Kootenai Holding Company, Inc.
Distributed Generation Systems, Inc. (cost sharing partner)

Phase One Screening Report: Flathead Indian Reservation

Salish Mountains, Lake and Sanders Counties, Montana

May, 2005

Prepared For:

Distributed Generation Systems, Inc. (DISGEN)
200 Union Boulevard, Suite 304
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Prepared By:

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Western EcoSystems Technology, Inc. (WEST, Inc.)
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WEST, Inc.
Specializing in Ecological Field Studies

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION AND METHODS:

Distributed Generation Systems, Inc. (DISGEN) is evaluating the feasibility of wind energy development in the Salish Mountains of the Flathead Indian Reservation ("reservation" hereafter), Montana. The reservation is governed by the sovereign Confederated Salish and Kootenai Tribes (CSKT). Western EcoSystems Technology, Inc. (WEST) was contracted to provide an initial screening and assessment of the biological resources for a proposed wind plant development on the reservation in western Lake and southeastern Sanders Counties. When evaluating potential windpower sites, knowledge of wildlife and other biological resource issues helps the wind industry identify and avoid potential ecological problems early in the development process. The purpose of this report is not to definitively describe impacts of the proposed windpower project, rather, the purpose is to alert project proponents early in the development process to potential conflicts with wildlife and habitat.

Although generally considered environmentally friendly, windpower, at most locations, has been associated with a low level of avian fatalities caused by collisions with turbines and other wind plant structures (e.g., Orloff 1992, Higgins *et al.* 1996, Erickson *et al.* 2000, Erickson *et al.* 2001, Johnson *et al.* 2002a, Young *et al.* 2002). Studies conducted at wind plants in the U.S. indicate that raptors and passerines appear to be the most susceptible to turbine collisions (AWEA 1995). In California, high raptor mortality has been documented at both an old and modern wind power project (Smallwood and Thelander 2004, Kerlinger *et al.* 2005). The older Altamont wind project was sited in an area with high densities of raptors, and the newer project was sited in an area with raptor use 2-3 times higher than Altamont; most fatalities at the newer project were American kestrels. An extensive post-construction study of two wind plants on Buffalo Ridge in Minnesota with 350 total turbines was conducted from 1996 through 1999. Total annual mortality was estimated to average approximately 2.8 birds per turbine (bpt). Most of the mortality documented involved nocturnal migrant passerines (Johnson *et al.* 2000a). At the Foote Creek Rim wind plant in Wyoming, the total annual mortality associated with 69 turbines was estimated to be approximately 1.7 bpt based on a two-year study. Many of the fatalities at this location were also believed to be nocturnal migrants (Young *et al.* 2002). At the Stateline Wind Plant, in Oregon and Washington, total annual mortality associated with 454 turbines was estimated to be approximately 1.9 bpt based upon a two and a half-year study (Erickson *et al.* 2004; data and report currently under review). Passerines comprised 75% of the fatalities, and approximately 25% were considered nocturnal migrants. Horned larks comprised almost 39% of all fatalities. However, percent composition of fatalities should be considered in conjunction with relative abundance for an individual species, i.e., a species commonly observed as a fatality may also be commonly observed during avian use surveys. For example, at the Stateline Wind Plant over half of the bird observations from point counts were horned larks. This suggests that horned lark mortality is in proportion to their abundance. Approximately 10-20 million horned larks are estimated to exist within the Columbia Plateau where the Stateline project is located. The annual fatality estimate for raptors was 0.06 bpt; most of which were red-tailed hawks and American kestrels. At the Vansycle Wind Plant,

Oregon, total annual mortality was estimated at only 0.6 bpt for one year of monitoring of 28 turbines; 58% were passerines (Erickson *et al.* 2000). All these wind plant sites experience high levels of fog, with the possible exception of the Wyoming site.

In addition to avian fatalities, bat fatalities associated with wind plants have been documented worldwide (Jeffrey and Johnson 2004). In the Pacific Northwest, Rocky Mountains, and upper Midwest regions, bat fatality levels have been low (1.2-1.7 bats/turbine/year). Almost all fatalities occur during the late summer and early fall period, coinciding with the migratory period of hoary and silver-haired bats; these two species makeup over 90% of the fatalities in the west and upper Midwest U.S. These two species are widely distributed throughout North America. However, high numbers of bat fatalities have been documented at wind energy sites on ridge tops in the eastern U.S. (Arnett *et al.* 2004, Kerns and Kerlinger 2004, Nicholson 2003).

Other impacts associated with wind plants include direct terrestrial, aquatic, and riparian habitat loss from the construction phase of development, as well as the potential indirect watershed degradation due to sediment deposition from erosion associated with pre- and post-construction development and infrastructure maintenance. Additionally, there are the potential long-term displacement effects from wildlife avoiding the developed facility area.

The U.S. Fish and Wildlife Service (USFWS) is the primary agency responsible for compliance with federal wildlife laws including the Endangered Species Act (ESA), Bald Eagle Protection Act, and Migratory Bird Treaty Act (MBTA). Section 9 of the Endangered Species Act prohibits "take" of endangered species of fish or wildlife, where take is defined as "harass, harm, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct." Subsequent amendments to the law have extended the prohibition of take to include threatened species. It is also unlawful to jeopardize the continued existence of species proposed for listing as threatened or endangered. Federal candidate species receive no protection under the ESA, but their status is periodically reviewed by the USFWS to determine the need for listing. The Bald Eagle Protection Act (which protects both bald and golden eagles) and Migratory Bird Treaty Act prohibit take of eagles and migratory birds.

The area evaluated for potential biological resources includes proposed project facilities (project area) and approximately a two-mile buffer (evaluation area). This report focuses on the following potential areas of concern:

- Candidate, Proposed, Threatened, Endangered, and USFWS Birds of Conservation Concern
  1. Identify the potential occurrence of federally listed or state protected species through existing literature and database searches
  2. Evaluate the suitability of habitat at the wind plant site for protected species
- Unique Habitat

1. Evaluate the uniqueness of the site relative to the surrounding area. For example: wildlife might be attracted to a habitat desirable for wind power development surrounded by less desirable areas

- Tribal & State Wildlife Issues (using existing wildlife agency information)
  1. Determine if site is considered a critical winter or parturition area or other highly valuable habitat for game and non-game wildlife (e.g., birds and bats)
  2. Determine if area is considered a migratory route for game species
  3. Examine habitat during site visits to determine the potential for use by state protected species
- Wetlands
  1. Determine the potential for wetlands at the site through a cursory site visit and examination of available data, such as National Wetland Inventory data and aerial photographs, as available
- Raptors
  1. Identify areas of potentially high nesting density
  2. Identify areas of potentially high prey density
  3. Examine topography to determine the potential for high use and potential nest locations
  4. Determine the species likely to occur in the area
  5. Determine the potential for migratory pathways
- Bats
  1. Determine the proximity to potential feeding sites and hibernacula
  2. Determine species likely to occur in the area
- Avian Migratory Pathways of Passerines, Waterfowl and Shorebirds

Biological resources within the vicinity of the project were evaluated through a search of existing data and a site visit. The project area was examined from public roads and range roads where possible on June 29 and 30, 2004. On June 29, the site visit was accompanied by Shannon Clairmont, Wildlife Biologist of the CSKT Natural Resources Department (NRD) Wildlife Management Program. Ron Hazelwood of the U.S. Fish and Wildlife Service (USFWS) was unable to attend. Open dialog occurred during the site visit, addressing species occurrence, biological features and potential wildlife habitat including plant communities, topographic features, and the potential for raptor use of the area. Presence of raptor nests were noted and observations of all wildlife species and habitats were recorded.

Several sources were used to identify biological resources within the project area, including the Montana Natural Heritage Program (MNHP) database, Montana Bird Distribution Database (MBDD), CSKT NRD species checklist, Montana Bird Conservation Plan, USFWS threatened and endangered species lists and birds of conservation concern, Montana animal species of concern list, and other sources where noted. Additionally, personal communications occurred with the following professionals:

Name	Agency	Position	Date of Contact
Shannon Clairmont	CSKT, NRD Wildlife Management Program	Wildlife Biologist	6/29/04
Brett Gullett	CSKT, NRD Wildlife Management Program	Wildlife Biologist - Ornithologist	7/06/04 10/7/04
Stacy Courville	CSKT, NRD Wildlife Management Program	Wildlife Biologist – Big game & Furbearers	10/28/04
Janene Lichtenberg	CSKT, NRD Wildlife Management Program	Wildlife Biologist – Non-game	10/29/04
Marilyn Hemker	USFWS Idaho Office	Threatened & Endangered Species; query re: plants	9/20/04
Gina Glenne	USFWS Snake River Basin Office	Botanist	10/12/04
On-line Service	USFWS Ecological Services, Montana Field Office	Threatened, Endangered and Candidate Species – Flathead Indian Reservation	6/22/04 & 9/14/04 update

After biological resources within the project area were identified, we addressed the potential for conflicts with the proposed windpower project based upon studies conducted at other wind plants throughout the U.S., and concerns expressed through communications with the listed professional experts.

2.0 PROJECT AREA AND DESCRIPTION:

The Northern Rockies physiogeographic province of western Montana contains a variety of coniferous forest habitats, intermountain valleys dominated by grassland and sagebrush habitats, and riparian zones along streams and rivers. The Salish Mountain range of the project area is comprised of dry forest and grassland steppe, with some sagebrush/shrub steppe in areas such as to the northwest in the Garceau Gulch region and also to the southeast adjacent to the riparian habitat zone along the Flathead River (Figure 1). Forest sites here are composed predominantly of Douglas-fir and some ponderosa pine, with an understory of shrubs and/or herbaceous vegetation. Dominant vegetation of the intermountain grasslands includes Idaho and rough fescues, and bluebunch wheatgrass. Major land use in this region is livestock grazing. The proposed project area consists of two regions, the northern proposed development area, or "project", 4728 acres, and a southern reference area, 1760 acres, that is topographically more diverse and closer to the Flathead River and associated avian resources (i.e., raptors and water birds) (Figure 2). The entire evaluation area already contains powerline infrastructure necessary for electricity transmission; crossing through Garceau and Oliver Gulches (Figure 1).

3.0 RESULTS:

3.1 *Federal and State Protected Species*

According to the U.S. Fish & Wildlife Service, 8 species listed under the Endangered Species Act occur or likely occur on the Flathead Indian Reservation: bald eagle, bull trout, gray wolf, grizzly bear, Canada lynx, Spalding's catchfly, water howellia, and linearleaf moonwort. In addition, 6 other state listed species are addressed, including piping plover, least tern, whooping crane, black-footed ferret, pallid sturgeon, and white sturgeon.

3.1.1 Bald eagle (*Haliaeetus leucocephalus*; State Threatened, USFWS Threatened)

In 1978, the USFWS listed bald eagle throughout the lower 48 States as endangered except in Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was listed as threatened (USFWS 1978). In 1995, bald eagle was reclassified from endangered to threatened in all of the lower 48 states (USFWS 1995). The Bush administration is planning to remove bald eagle from the federal threatened species list by the end of 2004.

Since the late 1970's, bald eagle has been doubling its breeding population every 6-7 years in the lower 48 states (USFWS 1995). In 1963, a National Audubon Society survey reported 417 active nests in the lower 48 states, which produced an average of 0.59 young per nest. In 1994, about 4,450 occupied breeding areas were reported with an estimated average young per occupied territory (for 4,110 territories) of 1.17 (USFWS 1995).

The bald eagle is a resident species on the Flathead Reservation, with other individuals from more northerly latitudes wintering here or migrating through to more southerly locations. Two bald eagle nests are documented within 10 miles south of Buffalo bridge on the Flathead River, within the project evaluation area for the reference site (2-mile buffer) (Brett Gullett, pers. comm.). However, these nests would be two miles or greater from the ridgeline of the reference site. Nest production for this species is usually between 1-3 young per year. Little is known of post-fledging behavior; however, bald eagles do not reach sexual maturity until 4-5 years and may live up to 20-30 years (Buehler 2000). Three adult bald eagles were observed along this stretch of river during the site visit, and one subadult bald eagle was also observed at this time along the reference site ridgeline near the radio tower north of Oliver Point (Figure 2). When Canada and Alaska have harsh winters, densities of wintering eagles in the Flathead valley can be high, especially during late winter and early spring when domestic livestock calving occurs. Winter surveys average 70 bald eagles (11 year average) with a high of 125 and a low of 34 (Brett Gullett, pers. comm.). Calving occurs in the main valley and not in the foothills or forests of the project area. No communal roosts have been identified. To date, there have been no reported bald eagle fatalities associated with wind plants (Erickson et al. 2002).

3.1.2. Bull Trout (*Salvelinus confluentus*; State Threatened, USFWS Threatened)

Bull trout are a sensitive species that are adversely affected by high sediment loads in their spawning streams. They occur in Flathead Lake and adults can migrate over 100 miles in rivers seeking suitable tributary streams for spawning, young fish may stay in smaller tributary streams for up to three years while growing. This species is also a resident species of large river systems independent of Flathead Lake (MNHP 2004). No impacts to bull trout of the Flathead River or tributaries are expected.

3.1.3. Gray Wolf (*Canis lupus*; State Threatened, USFWS Threatened)

This species is not migratory but moves seasonally within its territory, and can disperse widely before establishing new territories (e.g., males average 70 miles from natal territory in northwestern Montana). Pack territories are dynamic and change from year to year depending on prey availability, wolf populations, and relationships with neighboring packs (MNHP 2004). A transient wolf pack, the "Hog Heaven Pack" has been documented to make forays from the north to the south along the Salish range (Shannon Clairmont & Stacy Courville pers. comm.). It is unknown to what extent they utilize big game within the project area, if at all.

3.1.4 Canada Lynx (*Lynx canadensis*; State Threatened, USFWS Threatened)

Lynx are adapted to cold temperatures and deep snows of boreal forest environments. A key characteristic of lynx habitat is the presence of adequate numbers of snowshoe hares. Home ranges for this species usually resides at elevations between 4,000 and 7,000 feet. Contiguous forest with elevation peaks at just over 5,000 feet exist in the northern region of the project area (south east of Garceau Gulch), however the spatial area at this elevation is very limited due to the steep topography on either side of the ridgeline. No suitable habitat exists (Stacy Courville pers. comm.).

3.1.5 Grizzly Bear (*Ursus arctos horribilis*; State Threatened, USFWS Threatened)

Grizzlies have large home ranges (768 square kilometers for males in Swan Mountain Range, MT) and exhibit seasonal elevational movements following food availability. In Montana, this species uses meadows, seeps, riparian zones, mixed shrub fields, closed and open timber, snow chutes, and alpine slabrock habitats (MNHP 2004). Grizzly bears are opportunistic omnivores utilizing a diverse suite of plants, bark, roots, insects, fishes, small and large mammals, carrion, mushrooms, and garbage. Unverified reports have been made of grizzlies to the west of the Salish range, but no grizzlies have been documented in the evaluation area (Stacy Courville pers comm.).

3.1.6 Black-footed Ferret (*Mustela nigripes*; State Endangered, USFWS Endangered)

Black-footed ferrets have been extirpated from most of their former range, no wild populations exist. All know populations are a result of the reintroduction of captive bred ferrets. Reintroductions have occurred annually in Montana on federal and/or tribal land since 1994 with varying success. No reintroductions have been conducted on the Flathead Reservation and no populations exist.

3.1.7 Least Tern (*Sterna antillarum*; State Endangered, USFWS Endangered)

Interior least terns nest on unvegetated san-pebble beaches and islands of large reservoirs and rivers in northeastern and southeastern Montana, specifically the Yellowstone and Missouri river systems (MNHP 2004). Most Montana observations for this species involve breeding pairs, with few sightings of transient/migrating individuals. All observations are restricted to the eastern region of the state (MBDD 2004).

3.1.8 Piping Plover (*Charadrius melodus*; State Threatened, USFWS Threatened)

This species is limited to open shorelines of freshwater or alkaline lakes, reservoirs, rivers, or wetlands. Piping plovers typically occur in northern and northeastern Montana. Reports of this species during migration are uncommon, but observations have been made east of the Rocky Mountains (MNHP 2004). Nesting records have been made east of the project area in Pondera County (MBDD 2004). However, no records of this species have been made at the Flathead Reservation during migration or the breeding season (CSKT NRD checklist).

3.1.9 Whooping Crane (*Grus Americana*; State Endangered, USFWS Endangered)

Whooping cranes are known to fly through Montana during both spring and fall migration. Historic records exist of transient individuals in Gallatin and Broadwater counties of central Montana (1967 and 1979 respectively). The current estimate of the entire whooping crane population is around 194 individuals (Wally Jobman, USFWS, pers. comm.). For the past 20 years, observations have been restricted to the northeast corner of Montana. It is unlikely that this species would migrate through the Flathead Reservation.

3.1.10 Pallid Sturgeon (*Scaphirhynchus albus*; State Endangered, USFWS Endangered)

This species is native in major rivers in eastern Montana including the Missouri and Yellowstone Rivers. Pallid Sturgeon use large, turbid rivers over sand and gravel bottoms. Therefore, habitat and distribution of this species are not found to occur on the Flathead Reservation.

3.1.11 White Sturgeon – Kootenai River Population (*Acipenser transmontanus*; State Endangered, USFWS Endangered)

The Kootenai River population of this species is isolated from other Columbia River populations because of a natural barrier formed during the last ice age. However, the river system where this population resides is landlocked from any interconnectivity with the Flathead River system.

3.1.12 Spalding's Catchfly (*Silene spaldingii*; State 'at high risk' species of concern, USFWS Threatened)

This species occurs in open grasslands with rough fescue or bluebunch wheatgrass associations, occasionally with scattered conifers, on deep soils in the valley and foothill zones (MNHP 2004). Seven observations have been made of this species on the Flathead Reservation. Notable regions of occurrence include the upper Flathead River/Fisher

River drainages and Tobacco Valley (USFWS 2004). It is unknown if this species exists along the foothills of the Salish Mountains.

3.1.13 Water Howellia (*Howellia aquatilis*; State 'at risk' species of concern, USFWS Threatened)

This species is restricted in Montana to clusters of wetlands, especially in the Swan Valley, occupying ephemeral wetlands that are small and typically dry by fall. Other habitat characteristics are described as small, vernal, freshwater glacial ponds and oxbow sloughs in the valley zone. Occurrences of this species are primarily from the Flathead National Forest and Swan Lake Ranger District. Suitable habitat likely doesn't occur within the project evaluation area.

3.1.14 Linearleaf Moonwort (*Botrychium lineare*; State 'at high risk' species of concern, USFWS Candidate)

This species has been found in a variety of habitats including mid-height grasslands, limestone shelf of steep slope, woodland trails, roadside gravels, and in grass under conifers. One occurrence is known to come for the Flathead Reservation. However, it appears that the majority of observations for this species were associated with gravelly shoulders created during road or trail construction (MNHP 2004). It is unknown is this species exists in the project evaluation area.

3.1.15 USFWS Birds of Conservation Concern, site visit species, and MNHP & MFWP species of concern lists:

The USFWS lists 28 birds as species of concern within the Northern Rockies Bird Conservation Region (USFWS 2002) (Table 1). Of these 28 species, 12 species may breed within the evaluation area and 20 either occur or may fly through the evaluation area during migration (Table 1). Forty-five bird species were observed during the two-day site visit (Table 2). In addition to the USFWS list, 20 additional bird species are state listed species of concern, 14 of which breed on the reservation (Table 3). One amphibian, one reptile, and three mammals are state listed as species of concern (Table 3). However, they are not likely to frequent the project area.

Table 1. USFWS Birds of Conservation Concern (BCC) within the Northern Rockies (U.S. portion only) Bird Conservation Region (USFWS 2002). Notes on occurrence are based upon MNHP (2004), MBDD (2004), CSKT NRD, and other sources as noted.

SPECIES	NOTES ON OCCURRENCE
Swainson's Hawk (*Buteo swainsoni*)	Uncommon spring through fall, breeding records exist. Grassland/Farmland/Shrubsteppe.
Ferruginous Hawk (*Buteo regalis*)	Uncommon spring through fall, no breeding records exist. Grassland/Farmland/Shrubsteppe .
Golden Eagle (*Aquila chrysaetos*)	Uncommon year round, breeding records exist. Grassland/Farmland/Shrubsteppe.

Peregrine Falcon (*Falco peregrinus*)	Rare year round, breeding records exist; successful recorvery program, no nests near evaluation area. Lakes/Rivers/Ponds/Reservoirs.
Prairie Falcon (*Falco mexicanus*)	Rare spring and winter, uncommon during summer and fall, breeding records exist. Closest nests south on Flathead River. Grassland/Farmland/Shrubsteppe.
Yellow Rail (*Coturnicops noveboracensis*)	No records exist. May rarely fly through project area, observation made at East Bay, Flathead Lake.
American Golden-Plover (*Pluvialis dominica*)	Rare in fall, no breeding records exist. Lakes/Rivers/Ponds/Reservoirs.
Snowy Plover (*Charadrius alexandrinus*)	Five or fewer recorded sightings.
Mountain Plover (*Charadrius montanus*)	No records exist.
Solitary Sandpiper (*Tringa solitaria*)	Rare spring and summer, no breeding records exist. Lakes/Rivers/Ponds/Reservoirs.
Upland Sandpiper (*Bartramia longicauda*)	Uncommon spring though fall, breeding records exist. Grassland/Farmland/Shrubsteppe.
Whimbrel (*Numenius phaeopus*)	Five or fewer recorded sightings.
Long-billed Curlew (*Numenius americanus*)	Uncommon spring through fall, breeding records exist. Grassland/Farmland/Shrubsteppe.
Marbled Godwit (*Limosa dedoa*)	Uncommon spring through fall, no breeding records exist. Lakes/Rivers/Ponds/Reservoirs
Sanderling (*Calidris alba*)	Rare spring through fall, no breeding records exist. Lakes/Rivers/Ponds/Reservoirs.
Wilson's Phalarope (*Phalaropus tricolor*)	Common spring through fall, breeding records exist. Lakes/Rivers/Ponds/Reservoirs.
Yellow-billed Cuckoo (*Coccyzus americanus*)	Rare spring and summer, no breeding records exist. Riparian.
Flammulated Owl (*Lotus flammeolus*)	Five or fewer recorded sightings. May occur in project dry forest.
Black Swift (*Crypseloides niger*)	Uncommon spring and summer, breeding records exist. Lakes/Rivers/Ponds/Reservoirs.
Lewis's Woodpecker (*Melanerpes lewis*)	Uncommon year round, breeding records exist. Riparian.
Williamson's Sapsucker (*Sphyrapicus thyroideus*)	Uncommon spring through fall, breeding records exist. Open Pine/Fir Forest.
Red-naped Sapsucker (*Sphyrapicus nuchalis*)	Common spring and summer, uncommon in fall, breeding records exist. Riparian.
White-headed Woodpecker (*Picoides albolarvatus*)	No records exist.
Loggerhead Shrike (*Lanius ludovicianus*)	Uncommon spring through fall, no breeding records exist. Grassland/Farmland/Shrubsteppe.
Pygmy Nuthatch (*Sitta*	Uncommon year round, breeding records exist. Open

pygmaea)	Pine/Fir Forest.
Virginia's Warbler (*Vermivora virginiae*)	No records exist.
Brewer's Sparrow (*Spizella breweri*)	Uncommon spring and summer, rare in fall, breeding records exist. Grassland/Farmland/Shrubsteppe.
McCown's Longspur (*Calcarius mccownii*)	No records exist.

Table 2. Species lists for observations made during the June 29 and 30, 2004 site visit.

Bird Species	
Swainson's Thrush (*Catharus ustulatus*)	House Wren (*Troglodytes aedon*)
Black-headed Grosbeak (*Pheucticus melanocephalus*)	Mourning Dove (*Zenaida macroura*)
Blue Grouse (*Dendragapus obscurus*)	Mountain Bluebird (*Sialia currucoides*)
Western Meadowlark (*Sturnella neglecta*)	American Robin (*Turdus migratorius*)
Chipping Sparrow (*Spizella passerine*)	Bald Eagle (*Haliaeetus leucocephalus*)
Brewer's Sparrow (*Spizella breweri*)	Osprey (*Pandion haliaetus*)
Savannah Sparrow (*Passerculus sandwichensis*)	Turkey Vulture (*Cathartes aura*)
Dark-eyed Junco (*Junco hyemalis*)	Northern Harrier (*Circus cyaneus*)
Vesper Sparrow (*Pooecetes gramineus*)	Red-tailed Hawk (*Buteo jamaicensis*)
Black-capped Chickadee (*Poecile atricapillus*)	Northern Goshawk (*Accipiter gentilis*)
Clark's Nutcracker (*Nucifraga columbiana*)	Common Nighthawk (*Chordeiles minor*)
Northern Flicker (*Colaptes auratus*)	Eastern Kingbird (*Tyrannus tyrannus*)
Downy Woodpecker (*Picoides pubescens*)	American Kestrel (*Falco sparverius*)
Red-breasted Nuthatch (*Sitta canadensis*)	Western Tanager (*Piranga ludoviciana*)
Western Wood-Pewee (*Contopus sordidulus*)	Killdeer (*Charadrius vociferous*)
Canada Goose (*Branta canadensis*)	Cliff Swallow (*Hirundo pyrrhonota*)
Red-winged Blackbird (*Agelaius phoeniceus*)	Violet-green Swallow (*Tachycineta thalassina*)
Brown-headed Cowbird (*Molothrus ater*)	Barn Swallow (*Hirundo rustica*)
Common Raven (*Corvus corax*)	Pine Siskin (*Carduelis pinus*)
Black-billed Magpie (*Pica pica*)	Cedar Waxwing (*Bombycilla cedrorum*)
Say's Phoebe (*Sayornis saya*)	Belted Kingfisher (*Ceryle alcyon*)
Spotted Sandpiper (*Actitis macularia*)	Common Merganser (*Mergus merganser*)
Double-crested Cormorant (*Phalacrocorax auritus*)	

Table 3. Montana species of concern documented on the Flathead Indian Reservation, not including previously addressed species (MNHP and CSKT NRD species checklist reviewed).

Species	Notes on Occurrence
Boreal Toad (*Bufo borealis*)	Suitable habitat lacking in project area. Suitable habitat in reference area.
Northern Alligator Lizard (*Elgaria coerulea*)	Rare, even in suitable habitat. Unknown.
American Bison (*Bos bison*)	Not present.
Fisher (*Martes pennanti*)	Project forest/understory, rock possible.
Wolverine (*Gulo gulo luscus*)	Unlikely, transient status unknown.
American White Pelican	No breeding, Lakes/Rivers/Ponds/Reservoirs
Black Tern	Breeding, Lakes/Rivers/Ponds/Reservoirs
Black-backed Woodpecker	No breeding, Open Pine/Fir Forest
Black-crowned Night-heron	No breeding, Lakes/Rivers/Ponds/Reservoirs
Bobolink	Breeding, Grassland/Farmland/Shrubsteppe
Burrowing Owl	Breeding, Grassland/Farmland/Shrubsteppe
Caspian Tern	Breeding, Lakes/Rivers/Ponds/Reservoirs
Columbian Sharp-tailed Grouse	Not present – Recovery Program Initiated.
Common Loon	Breeding, Lakes/Rivers/Ponds/Reservoirs
Common Tern	Breeding, Lakes/Rivers/Ponds/Reservoirs
Forster's Tern	Breeding, Lakes/Rivers/Ponds/Reservoirs
Franklin's Gull	No breeding, Lakes/Rivers/Ponds/Reservoirs
Grasshopper Sparrow	Breeding, Grassland/Farmland/Shrubsteppe
Gray-crowned Rosy-finch	Breeding, Alpine Meadow/Hi-elev Forest
Great Gray Owl	Breeding, Alpine Meadow/Hi-elev Forest
Harlequin Duck	Breeding, Lakes/Rivers/Ponds/Reservoirs
Northern Goshawk	Breeding, Dense Spruce/Fir Forest
Olive-sided Flycatcher	Breeding, Open Pine/Fir Forest
Trumpeter Swan	Breeding, recov program, Lake/Wetland/Pond
White-faced Ibis	No breeding, Lakes/Rivers/Ponds/Reservoirs

3.2 *Unique Habitat and Wildlife Agency Issues*

3.2.1. Douglas-Fir/Ponderosa Pine Dry Forest

The northern project area contains a large tract of dry forest, composed predominantly of Douglas-fir and some ponderosa pine, with an understory of shrubs and/or herbaceous vegetation (Appendix A – photo examples). A mix of early and late successional forest stages exist, providing new and old growth trees, broken-topped trees, and old soft snags. Snag density and size diversity will likely increase due to a recent pine beetle infestation

in this region (Brett Gullett pers. comm.). This forest is used by a resident herd of elk and mule deer, black bear, and consistently by a transient gray wolf pack. Potential issues to these species from wind power development are addressed in the 'Big Game' section below. Coniferous forest and associated dead snags can also harbor resident bats and may also be used by migrating bats such as tree-roosting species. Potential issues regarding bats from wind power development are addressed in section 3.5.

Mature dry forest is important to neotropical migrants for nesting and foraging (e.g., Hammond's flycatcher, cordilleran flycatcher, western tanager, flammulated owl). Forests with mixed horizontal and vertical structure are also important as migratory layover sites. Snag nesters and foragers, such as Lewis's woodpecker and flammulated owls, have a strong affinity to mature dry forests because of their reliance upon old growth snags. Development of a windpower facility with roads, turbines, and turbine pads, will result in the loss of some dry forest habitat. Displacement of interior forest nesting species would likely occur, but to what extent is unknown. Installing a string of wind turbines along a forested ridge would create forest edge, which may provide new foraging grounds for bird species that utilize forest edge habitats for gleaning or hawking insects. If this is the case, it is unknown if foraging birds would be at higher risk to collision with turbines. Nocturnal migrants do show up as fatalities at many existing wind plants nationwide, however it is unknown if forest edge associated with wind turbines along ridgetops would result in higher mortality rates. Lastly, the CSKT NRD suggested that it may be worthwhile surveying rock outcrops (Appendix B – photo examples) for denning snakes along the ridgeline where road and turbine development would occur (J. Lichtenberg, pers. comm.).

3.2.2. Sagebrush Steppe and Intermountain Grasslands

Sagebrush shrubland occurs in the dry lower elevation mountain valleys to the east and west of the Salish ridgeline within the evaluation area (Appendix C – photo examples). This shrubland is interspersed with intermountain grasslands, which becomes more prevalent as you gain elevation on the Salish foothills, toeslopes, and non-forested ridgelines (Appendix D – photo examples). These grasslands consist of a mix of native grasses such as Idaho and rough fescues, bluebunch wheatgrass, and blue gramma grass. Depending on the slope aspect, these native grasses are intermixed with various forbes and/or deciduous shrubs (Appendix E – photo examples). These habitats are important to grassland and shrubland nesting birds and also for wintering and post-winter big game herds (see Big Game section below).

We anticipate displacement of grassland nesting birds from wind turbines to be at a small-scale. Small-scale displacement impacts (e.g., less than 100 meters) have been documented in the Midwest by Leddy *et al.* (1999) and Johnson *et al.* (2000). Preliminary findings from a large-scale Pacific Northwest study (i.e., twenty 300-meter transects perpendicular to turbine-strings surveyed three times during breeding season pre-construction and post-construction) also suggest a small-scale impact of a wind facility on grassland nesting passerines (Erickson *et al.* 2004). Impacts appear to be due

Unnecessary energy expenditures may increase the rate at which body condition declines, and the energy balance determining whether a deer will survive the winter is thought to be relatively narrow, especially for fawns (Wood 1988). Overwinter fawn survival may decrease in response to human activity or other disturbances (Stephenson *et al.* 1996). Roads and energy development may also fragment otherwise continuous patches of suitable habitat, effectively decreasing the amount of winter range available for big game. Fragmentation of habitat may also limit the ability of big game populations to move throughout the winter range as conditions change, causing big game to utilize less suitable habitat (Brown 1992). Construction related disturbance and displacement is expected to be limited to the construction period time frame, which likely will take place during the summer months, minimizing construction disturbance to wintering big game. Afterward, primary disturbances to big game will be associated with operations and maintenance activities involving vehicular traffic and the presence of wind turbines and substation facilities.

Indirect impacts associated with human activity or development has been documented with elk (e.g., Lyon 1983, Wisdom et al. 1986, Czech 1991, Morrison et al. 1995, Rowland et al. 2000) and mule deer (e.g., Rost and Bailey 1979, Easterly et al. 1992, Merrill et al. 1994, Sawyer et al. 2004). In south-central Montana, Van Dyke and Klein (1996) documented elk movements through the use of radio telemetry before, during, and after the installation of a single oil well within an area used year round by elk. Drilling activities during their study ceased by November 15, however, maintenance activities continued throughout the year. Elk showed no shifts in home range between the pre and post drilling periods, however, elk shifted core use areas out of view from the drill pad during the drilling and post drilling periods. Elk also increased the intensity of use in core areas after drilling and slightly reduced the total amount of range used. It was not clear if the avoidance of the well site during the post-drilling period was related to maintenance activities or to the use of a new road by hunters and recreationists. The authors concluded that if drilling activities occupy a relatively small amount of elk home ranges, that elk are able to compensate by shifting areas of use within home ranges.

A study by Rost and Bailey (1979) found that wintering mule deer and elk avoided areas within 656 ft (200m) of roads in eastern portions of their Colorado study area, where presumably greater amounts of winter habitat were present. Road avoidance was greater where roads were more traveled. Only mule deer showed a clear avoidance of roads in the western portion of their study area, where winter range was assumed to be more limiting. Mule deer also showed greater avoidance of roads in shrub habitats versus more forested areas. The authors concluded that impacts of roads depended on the availability of suitable winter range away from roads, as well as the amount of traffic associated with roads.

Oregon radio-telemetry studies of elk and mule deer have been conducted in a large fenced experimental research area. Results of spring studies (April – early June) suggest that elk habitat selection may be negatively related to traffic and other human disturbance

(Johnson et al. 2000). Mule deer habitat selection appeared to be related to elk distribution, with mule deer avoiding areas used by elk. Traffic and roads did not appear to be an important factor in spring distribution of mule deer (Wisdom et al. 2002). Distances moved by elk tended to increase as a function of increased use by humans, including ATV use, hiking, and horseback riding. The same was true for mule deer, but the response was less than that of elk (Wisdom et al. 2002).

In western Wyoming, a multi-year GPS/radio-telemetry study suggests that winter mule deer habitat selection and distribution patterns have been affected by natural gas development, specifically road networks and well pads (Sawyer 2004). There is little information regarding wind project effects on big game. At the Foote Creek Rim wind project in Wyoming, observational data on pronghorn indicate no reduction in use of the immediate area. Mule deer and elk also occurred at Foote Creek Rim, but their numbers were so low that meaningful data on wind plant avoidance could not be collected (Johnson *et al.* 2000b).

Turbines and roads in the Project area will be primarily located on ridges and will be visible to grassland slopes over a fairly large area. While human related activity at wind turbines during regular maintenance will be less than during the construction period, it is not known if human activity associated with regular maintenance activity will exceed tolerance thresholds for wintering elk and mule deer. If tolerance thresholds during regular maintenance activities are exceeded, these species are likely to permanently utilize areas away from the wind development. Affects of wind power development on bears are unknown.

3.4 *Raptor Issues*

Raptor species observed during the site visit included bald eagle (*Haliaeetus leucocephalus*), osprey (*Pandion haliaetus*), turkey vulture (*Cathartes aura*), American kestrel (*Falco sparverius*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), and northern goshawk (*Accipiter gentilis*). The CSKT (NRD checklist) identifies the following raptor species as nesting on the Flathead Indian Reservation:

SPECIES	BREEDING HABITAT NOTES
Barred Owl (Strix varia)	Dense conifer, mixed, or deciduous
Great Horned Owl (*Bubo virginianus*)	Conifer or deciduous (abandoned nest use)
Western Screech Owl	Deciduous, especially oak & riparian
Northern Pygmy Owl	Dense conifer or deciduous
Northern Saw-whet Owl	Dense conifer or deciduous
Burrowing Owl	Open grassland, savannah.
Great Gray Owl	Dense boreal and coniferous
Long-eared Owl	Conifer or mixed, esp near water.

Short-eared Owl	Prairie, marsh, savannah, tundra.
Boreal Owl	Dense conifer or mixed.
American Kestrel (*Falco sparverius*)	Open/partial open trees, farmland, urban.
Prairie Falcon	Open mountain, shortgrass prairie, tundra
Merlin	Open deciduous/savannah woodlands
Osprey	Coasts, rivers, lakes.
Bald Eagle	Open areas of coasts, rivers, lakes.
Golden Eagle	Open mountains/hills
Red-tailed Hawk (*Buteo jamaicensis*)	Open country trees
Swainson's Hawk (*Buteo swainsoni*)	Open country trees
Northern Goshawk	Conifer or mixed forest
Cooper's Hawk (*Accipiter cooperii*)	Deciduous/Riparian deciduous
Northern Harrier (*Circus cyaneus*)	Prairie, savannah, marsh.
Turkey Vulture (*Cathartes aura*)	Lowland and mountain habitats

3.4.1. Nesting Density

Many of the owls listed above, including the flammulated owl (not known to breed on reservation, but may), may nest in the dry forest area of the project. The same is true for American kestrels, northern goshawks, and potentially golden eagles. The remaining species likely nest at lower-elevation valley areas and riparian areas of the Flathead or Little Bitterroot Rivers. Raptor density in these areas is likely much higher than within the project boundary, however approximately 7-8 river miles of the Flathead River are within the project's reference evaluation area. Three adult bald eagles were observed along this river stretch, and three large stick nests were noted as well; one occupied by an osprey (Figure 2). The CSKT NRD conducts bald eagle nest surveys and maintains a database with nest locations. Two bald eagle nests are known to exist in the project's reference evaluation area. At least one osprey nest occurs here as well, and three were observed during the site visit within 5 miles south of the evaluation area. Both the bald eagle and osprey are culturally significant to the tribe.

3.4.2. Prey Density

Potential raptor prey in the development area includes small passerine birds, blue grouse, gray partridge, squirrels, rodents, rabbits, and snakes. The same is true for the reference area, with the addition of fishes of the Flathead River. Short-eared owls (*Asio flammeus*) and rough-legged hawks (*Buteo lagopus*) are known to congregate during winter in loose flocks in grasslands and cropland with good rodent feeding (Thompson and Ely 1989). Short-eared owls are apparently more common on the reservation during spring and summer, and uncommon during fall and winter. Rough-legged hawks are common in winter and early spring, and a large communal roost exists east of the Flathead Valley (S. Clairmont, pers. comm.). Hunting in winter by rough-legged hawks is restricted mostly to the lower-elevation valley where rodent populations are likely dense due to agriculture practices, rural roadsides, wetland and savannah zones, and warmer temperatures. The same holds true for wintering bald eagles, where the birds focus on valley livestock calving operations. Densities of other prey species are likely low to moderate, or at least not concentrated within a small area of the Salish range (e.g., prairie dog town).

However, gyrfalcons winter along the Flathead River and hunt the foothills of the Salish range for prey such as gray partridge (B. Gullett, pers. comm.).

3.4.3. Topographic Affinity

The topography for much of the development area is prominent ridgeline with a north/northwest orientation. Western slopes are slightly more gradual than eastern steep slopes. A mountain pass exists at the extreme northern end of the ridgeline, where Garceau Gulch and the Irvine Creek drainage almost meet (Figure 1). A less prominent pass in the form of several ridgeline saddles exists in the northern region of the reference area, with Oliver Gulch to the west and the Flathead River valley to the east (Figure 1). Spatial and temporal use of these areas by hunting and/or migrating raptors is unknown. The CSKT NRD has expressed the need for surveys in these areas.

3.5 *Bat Issues*

Due to the current lack of understanding of bat communities in North America, the species and relative abundance of bats occurring in the evaluation area are difficult to determine. However, silver-haired bats (*Lasionysteris noctivagans*) and little brown bats (*Myotis lucifugus*) are listed as common on the Flathead Reservation (CSKT NRD). Six other species are known to occur on the reservation as well: hoary bat (*Lasiurus cinereus*), big brown bat (*Eptesicus fuscus*), Townsend's big-eared bat (*Corynorhinus townsendii*), long-legged myotis (*Myotis volans*), long-eared myotis (*Myotis evotis*), and Yuma myotis (*Myotis yumanensis*). In addition to these eight, the following three species could also possibly occur on the reservation: western small-footed myotis (*Myotis ciliolabrum*), California myotis (*Myotis californicus*), and fringed myotis (*Myotis thysanodes*) (MNHP 2004).

All these species are at least potential summer residents, some may reside year round, and others migrate or may migrate (e.g., hoary bat, silver-haired bat, little brown bat, long-legged myotis). Several are known to roost in, or near, forest habitats (e.g., Douglas Fir/Ponderosa Pine, riparian deciduous). Several are known to forage in forest habitats, and over streams or rivers near forest habitats. Examples of bat roosts are trees, snags, caves, abandoned mines or houses, and bridge abutments. Some bats roost alone, others communally.

No caves were observed, although it is unknown if they occur along bluffs of the ridgeline or in drainage ravines. Rock outcrops were noted along areas of both the development and reference area ridgelines, some of the east slope rock formations were vertical and possibly forming recessed alcoves. The suitability of these outcrops for roost or foraging sites is unknown. The use of trees and snags for roost sites by bats in the upper elevations of the proposed development is also unknown. Bats may forage over the entire project area, especially near riparian waterways.

Bat casualties have been reported from most windpower facilities where post-construction fatality data are publicly available. Reported estimates of bat mortality at

windpower facilities have ranged from 0.1 – 40.9 per turbine per year in the U.S. (Table 4). Most of the bat casualties at windpower facilities to date are migratory species which conduct long migrations between summer roosts and winter hibernacula. Examples of these species commonly found as fatalities at windpower facilities include hoary bats, silver-haired bats and eastern red bats. A recent report of bat fatalities at a windpower facility in West Virginia includes relatively high numbers of red bats, hoary bats, eastern pipistrelle and little brown bat (*Myotis lucifugus*) over the course of one year. The West Virginia site is located on a prominent ridge in the Appalachian Mountains and may be located within a bat migration corridor. The causes of the relatively high number of migratory bat deaths at windpower facilities are not well understood. Some have suggested it may be related to the lack or reduction of echolocation during migration (Johnson 2003). Furthermore, strong field methods to provide quantitative predictions of migratory bat use are lacking. Due to a lack of information concerning bat migration habits, it is difficult to predict if the proposed project area is located within a bat migration corridor.

Table 4. Bat fatality estimates for windpower facilities in the United States (Johnson et al. 2004). All estimates are adjusted for searcher biases, except Buffalo Mtn., TN.

Location	**Year(s)**	**Number of bat fatalities found**	**Mortalities per turbine / MW per year**	**Annual Mortality Estimate**
Buffalo Ridge, MN Phase 1, 73 turbines	1994-1998	20	0.1/0.3	7
Buffalo Ridge, MN Phase 2&3, 281 turbines	1998-2002	400	2.0/2.7	562
Iowa, northern region, 89 turbines	2003	31	6.4/7.1	570
Wisconsin, northeastern region, 31 turbines	1999-2001	72	4.3/6.5	133
Foote Creek Rim, WY, 105 turbines	1999-2002	135	1.3/2.0	137
Buffalo Mtn., TN, 3 turbines	2001-2003	119	19.7/29.8	59
Mountaineer, WV, 44 turbines	2003	475	40.9/27.3	1800
Stateline, OR/WA border, 399 turbines	1999-2003	150	1.1/1.7	439
Klondike, OR, 16 turbines	2002	6	1.2/0.8	19
Nine Canyon, WA, 37 turbines	2003	27	3.2/2.5	118
Vansycle, OR, 38 turbines	1999	28	0.7/1.1	27

The proposed project will likely result in the mortality of some bat species, including migratory bats, although the magnitude of these fatalities and the degree to which other bat species will be affected is difficult to determine. The proposed project is not located near any large, known bat colonies. However, no formal bat inventories or other bat research have been conducted in the project or evaluation area. Bat research at the Foote Creek Rim wind plant, WY, documented hoary bats near the project using deciduous riparian and coniferous habitats during spring and early summer, but almost all fatalities occurred during the late-summer and early fall migratory period (D.Young, pers. comm.). At the Buffalo Ridge wind plant, MN, bat research showed resident populations of big brown and little brown bats during the breeding season frequently using wetlands and/or woodlots near the wind plant (within 100 m) yet no fatalities were documented during this time period (Johnson *et al.* 2002b). At this time, if a wind plant was developed in the Salish range, we expect the majority of bat casualties to be migrants. This also agrees with the mortality patterns being exhibited at the two eastern U.S. wind plants that have high levels of bat fatalities as well as large populations of resident bat species.

Six bat species are listed in Montana as species of concern (MNHP 2004). Of these, only the fringed myotis and Townsend's big-eared bat may occur in the project evaluation area, foraging away from roost sites or flying through the project area toward foraging sites. No bat species occurring in Montana are state or federally listed as threatened or endangered. The CSKT NRD recommended using Anabat detectors in areas of the proposed development during the migratory period (J. Lichtenberg, pers.comm.).

4.0 DISCUSSION AND CONCLUSIONS:

This report addresses wildlife resource concerns stemming from the potential impact of windpower development on the Flathead Indian Reservation's Salish Mountains, Lake and Sanders Counties, Montana. This report does not address aesthetic or cultural issues, but does attempt to emphasize objectivity when considering all possible influences from development on the site's wildlife resources. With that in mind, it is also important to acknowledge that some landscape fragmentation already exists in the Salish range evaluation area, in the form of large overhead powerlines and supporting structures.

A number of general concerns and issues often surface nationwide in regards to wind power developments such as compliance with the federal USFWS wind power guidelines, state wildlife agency recommendations (primarily tribal agency in this case), coordination with conservation groups such as local Audubon Society chapters, and the need for further study. Each of these is addressed individually below in the context of the proposed Salish Mountain project.

USFWS Interim Guidelines

The USFWS published some *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines*. According to the guidance directive they are intended to assist

USFWS staff in providing technical assistance to the wind energy industry and project proposals to minimize impacts to wildlife and habitat. The guidance contains three components: (1) evaluation of wind development sites, (2) location and design of turbines and project features, and (3) pre- and post-construction research and studies. The guidelines are not considered mandatory and will be subject to revision after a two year interim period; however, the comments and participation of USFWS agency personnel in the development of projects generally focuses on the guidelines.

The site evaluation procedure uses a detailed ranking system that provides a potential impact index for determining which sites are the least likely to have substantial impacts to wildlife either through disturbance to habitat or direct mortality effects. This system was designed using areas within Montana, although is has not been utilized to a great extent nationally. However, this report provides the necessary information to calculate the impact index. Using this system, we determined that the proposed project development area has a high medium-low impact rank (Appendix F, score = 142), and the reference area has a low medium-high impact rank (Appendix F, score = 157); see Appendix F for analysis. Using this index analysis, we may say that the proposed project development has a moderate chance of having a substantial impact to wildlife, and that the reference area has a higher than moderate risk of having a substantial impact to wildlife. This index of course is based upon the current knowledge of the site, at least that which is presented in this report, and does not take into account any mitigation measures.

The USFWS guidelines provide a list of site development recommendations. In most cases, state-of-the-art wind power development takes into consideration the recommendations (e.g., use of tubular turbine towers, underground collector system). However, it is our recommendation to utilize the list as a point of coordination with the USFWS to generate support and show good faith in managing natural resource impacts from the proposed project. This screening report can be utilized to address several of the recommendations. For example, the following USFWS recommendations are addressed by the outcome of this report.

- Avoid placing turbines in locations documented to have species protected by the Endangered Species Act. Bald eagles are known to utilize the Flathead River for nesting near the reference area. Gray wolves are known to travel through the evaluation area, their tolerance to wind turbines is uncertain.
- Avoid locating turbines in known bird migration pathways or high concentration areas. Based on this investigation the site does not fall within known bird migration pathways, although forest of the project area and riparian areas of the reference area may provide migration stopover sites. Grassland/shrupsteppe may provide foraging areas for raptors, but to what level they are utilized is unknown.
- Avoid placing turbines near known bat hibernacula or other important bat areas. This investigation found no sources identifying known bat hibernacula. However, no formal studies have been conducted to establish presence/absence of hibernacula or roost sites in the proposed development area.
- Configure turbines to avoid landscape features that attract raptors. Spatial and

temporal use of the Salish ridge landscape by raptor is currently unknown, obtaining accurate wind data may help anticipate raptor use of the landscape.

- Avoid placing turbines so that they fragment large contiguous blocks of wildlife habitat and preferentially locate them in already altered or cultivated areas. The project and reference areas contain large blocks of wildlife habitat, although some fragmentation already exists from overhead powerlines.
- Avoid placing turbines in habitat known to be occupied by prairie grouse or other species that exhibit avoidance of vertical structures and/or structural habitat fragmentation. Columbian sharp-tailed grouse do not exist on the reservation. However the CSKT is involved with a recovery program for this prairie grouse and is currently assessing habitat suitability of the Salish evaluation area and surrounding areas.

Additional USFWS recommendations focus on wind plant layout, turbine characteristics, and site management. Measures that DISGEN intends to utilize should be expressed to provide a level of comfort to USFWS.

Tribal Recommendations

To our knowledge, the CSKT at this time does not have written guidelines or recommendations pertaining to wind power development. They do have concerns about potential impacts to some natural resources as outlined above. A few species were mentioned as culturally significant to the tribes by NRD biologists, however we did not review any comprehensive list. This may be a wildlife resource item to request guidance or review of by the tribe, especially as it pertains to the species listed in this report. For example, osprey is evidently a culturally significant species, and was observed nesting in the reference area.

Conservation Group Coordination

The National Audubon Society is generally supportive of renewable energy but does not typically govern local chapters or regional opinion. In some cases, local Audubon chapters have raised opposition to wind power developments. It is our recommendation that the local Audubon chapter be contacted and outreach conducted to determine if any new issues or concerns surface that should be addressed:

Flathead Audubon Society
P.O. Box 9173
Kalispell, MT 59904

In many cases coordination with the local Audubon groups and other conservation organizations depends on the level of environmental impact analyses needed for permitting. In cases where a formal environmental impact document is required, public scoping is required and it is important to engage in outreach to target audiences that are likely to raise some concern over the project. In addition, meeting with the Audubon group also provides an opportunity to educate knowledgeable individuals interested in natural resource conservation and green energy. It is recommended that actions taken

with regards to identifying natural resource concerns for the project be presented to the group (e.g., coordination with agencies, previous or proposed further study, and permitting or agency requirements).

Further Study

Further study of avian and other wildlife resources of a site is a common event associated with wind development in many parts of the U.S. The typical objectives of pre-construction baseline studies are to (1) provide information useful in evaluating potential impacts from the project, and (2) provide information that may be useful in designing a wind plant that minimizes risk to sensitive resources at the site. Typical objectives of post-construction monitoring studies are to (1) determine the extent of impacts and (2) to a lesser extent help define further monitoring or mitigation needs. Field studies of wind plants are often based on resource agency personnel opinion and views and not often on results of previous study. However, the CSKT NRD has considerable expert knowledge of the project evaluation area, which should prove advantageous with regard to assessing and prioritizing further study. It is our recommendation, to rigorously evaluate the need for additional study through meetings with agency and regulatory personnel and come to consensus about the objectives of the study. The need for additional study of a site should be based on a number of factors such as potential presence of sensitive resources, agency guidance, and economics of site development. To a large degree the need for additional study should be balanced with permitting requirements and the potential for substantial impacts.

Summary of Conclusions

- The Salish Mountain range project and reference area are representative of regions in the Northern Rockies of western Montana, with coniferous dry forest, intermountain valleys of grassland/shrubland steppe, and riparian zones as you approach the Flathead River.

- The site is composed of rangeland and forest grazed by cattle, and already contains powerline infrastructure throughout the evaluation area.

- USFWS lists eight threatened or candidate species (federal) that occur or are likely to occur on the Flathead Indian Reservation (bald eagle, bull trout, gray wolf, grizzly bear, Canada lynx, Spalding's catchfly, water howellia, and linearleaf moonwort). Six additional state endangered or threatened species with federal protection are also addressed in this report but were not deemed to likely occur or reoccur in the evaluation area (black-footed ferret, least tern, piping plover, whooping crane, pallid sturgeon, white sturgeon).

  Two bald eagle nests may be present within two miles of the reference area, and would be several miles from the project area. Exact locations and distances may need to be confirmed with CSKT NRD when a more formal project layout is determined. It is unknown as to what extent resident or transient bald eagles use the project area. No impacts to bull trout of the

Flathead River or tributaries are expected. No grizzlies or Canada lynx are known to utilize the evaluation area. A transient wolf pack travels through the evaluation area occasionally, whether or not wind power development and operations would inhibit such forays is unknown. It is unknown if Spalding's catchfly exists along the foothills of the evaluation area. It is unknown if linearleaf moonwort exists in the evaluation area, although it is quite possible that project road development would benefit this species.

- USFWS lists 28 bird species of conservation concern occurring in the Northern Rockies region; 12 species may breed within the evaluation area and 20 either occur or may fly through the evaluation area during migration.

- In addition to the USFWS list, Montana (MNHP & state Fish, Wildlife, and Parks) lists 20 additional species of concern; 14 of which breed on the reservation.

- Douglas-fir/Ponderosa pine dry forest with varying understory of shrubs and/or herbaceous vegetation exists as a large contiguous tract in the project area, and to a lesser degree in the reference area. This habitat consists of a mix of early and late successional forest providing new and older growth trees, broken-topped trees, and old soft snags. Mature dry forest is important to interior forest nesting birds, including neotropical migrants. The forest of the project area is used by resident elk, mule deer, black bear, and by the transient gray wolf pack. Sagebrush steppe and intermountain grasslands are also present within the evaluation area. These habitats are important to grassland and shrubland nesting birds and also for wintering and post-winter big game herds.

  It is unknown if wind turbines and human activity related to regular operations and maintenance will displace elk or exceed tolerance thresholds for wintering elk and mule deer. Affects of wind power development on bears are unknown. The Migratory Bird Treaty Act protects birds while nesting, therefore upon turbine layout determination existing nesting data should be acquired from the CSKT NRD and consultation with them and the USFWS should assess the need for any pre-construction avian surveys along transects following proposed turbine strings to identify locations of nesting birds.

- No streams or wetlands harboring fishes or amphibians are expected in the project or reference area ridgelines, although such habitat exists along the Flathead River at the southeast edge of the evaluation area (edge of 2-mile buffer).

- Many owl species, American kestrels, northern goshawks, and potentially golden eagles may nest within the forest area of the project. However, raptor nest density is likely higher in the valley and riparian areas of the Flathead or Little Bitterroot Rivers. No concentrations of raptor prey species are known in the evaluation area. Although high in numbers, wintering rough-legged hawks and bald eagles are thought to utilize the lower-elevation valleys rather than the Salish range. A mountain pass exists at the north end of the project ridgeline, and a less prominent pass in the form of several ridgeline saddles exists in the north region of the

reference area. However, spatial and temporal use of the Salish range by raptors is largely unquantified.

- The CSKT NRD is involved with a trumpeter swan recovery program and has been conducting reintroductions of this species on the reservation. This species is apparently culturally significant to the tribes, and was on it's way to extinction prior to the 1930's. Observations have been made of trumpeters flying from wetlands of the Flathead valley across the Salish range to wetlands of the Hot Springs area. As with raptors, little has been quatified as to large bird use of the Salish range.

- The CSKT has received a large grant from the USFWS to develop a Conservation Program for the Columbian sharp-tailed grouse. No populations currently exist on the reservation. The CSKT NRD has expressed concern regarding suitable habitat within the evaluation area, which could prove to be an issue if that area is considered important to future reintroductions of sharp-tailed grouse. Such determination is pending a comprehensive habitat suitability assessment by the CSKT NRD. This species is also considered culturally significant to the tribes.

- No large bat colonies or hibernacula are known on or near the project, thus the majority of bat casualties are likely to be migrants. The magnitude of these fatalities and degree to which other bat species will be affected is difficult to determine.

- The USFWS wind resource site impact index analysis ranks the proposed project development with a moderate chance of having a substantial impact to wildlife, and that the reference area has a higher than moderate risk of having a substantial impact to wildlife. This index does not take into account any mitigation measures.

- Evaluation of the need for additional studies should be conducted by having meetings with agency and regulatory personnel and come to mutual consensus. If studies are requested, specific objectives and goals should be stated that support the justification for the study.

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FIGURE 1 - Salish Mountains, Flathead Indian Reservation; diagonal lines depict existing transmission lines.

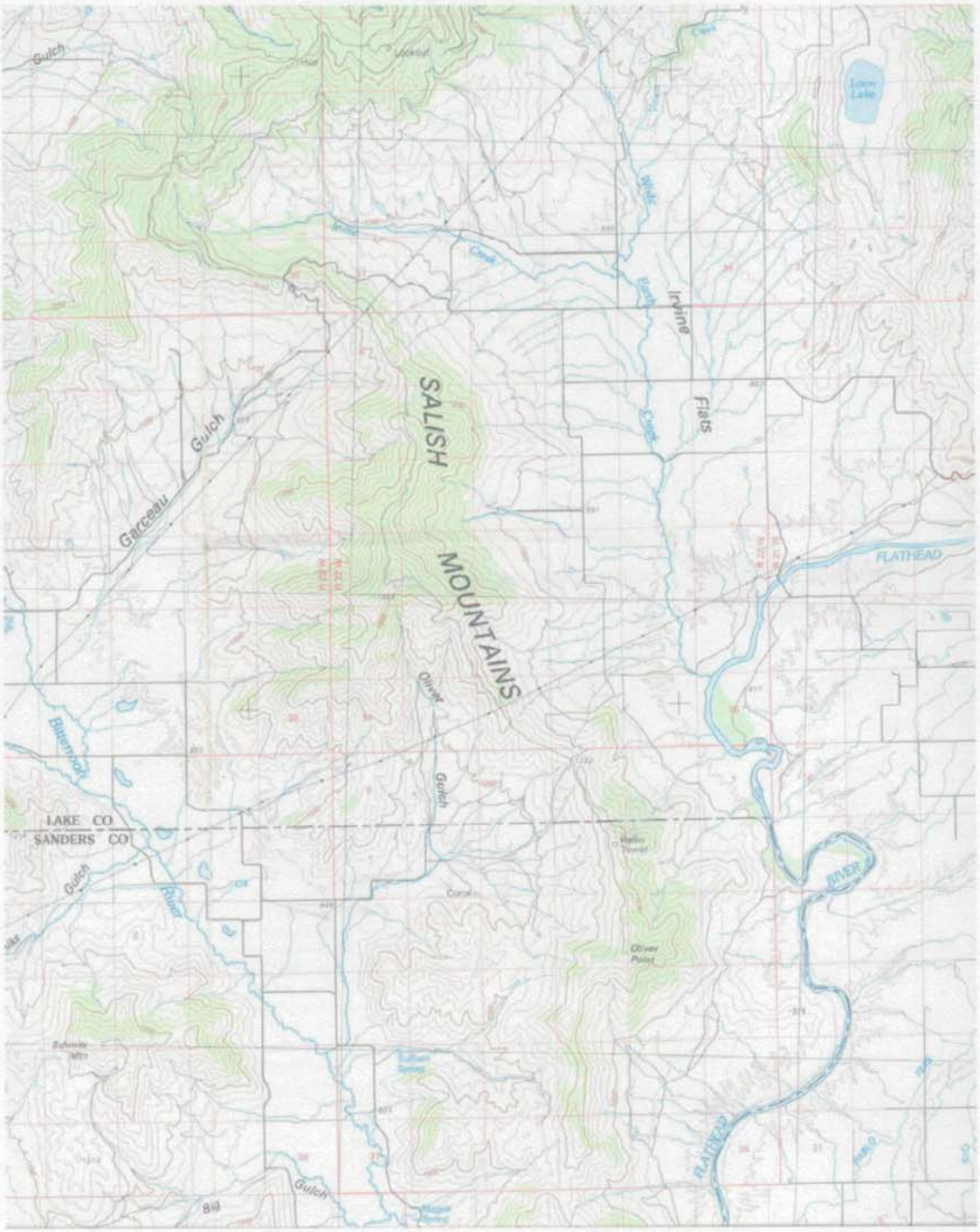
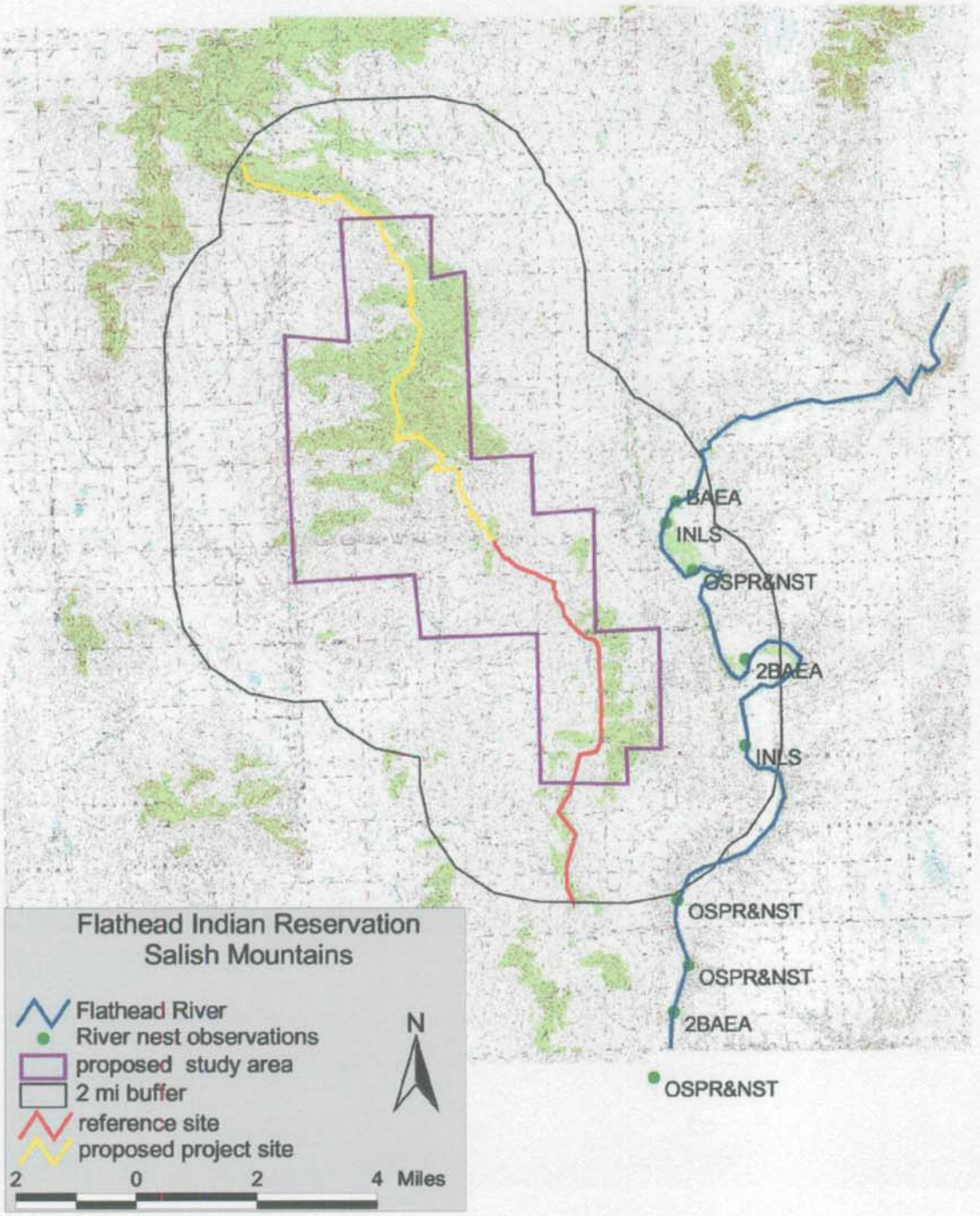
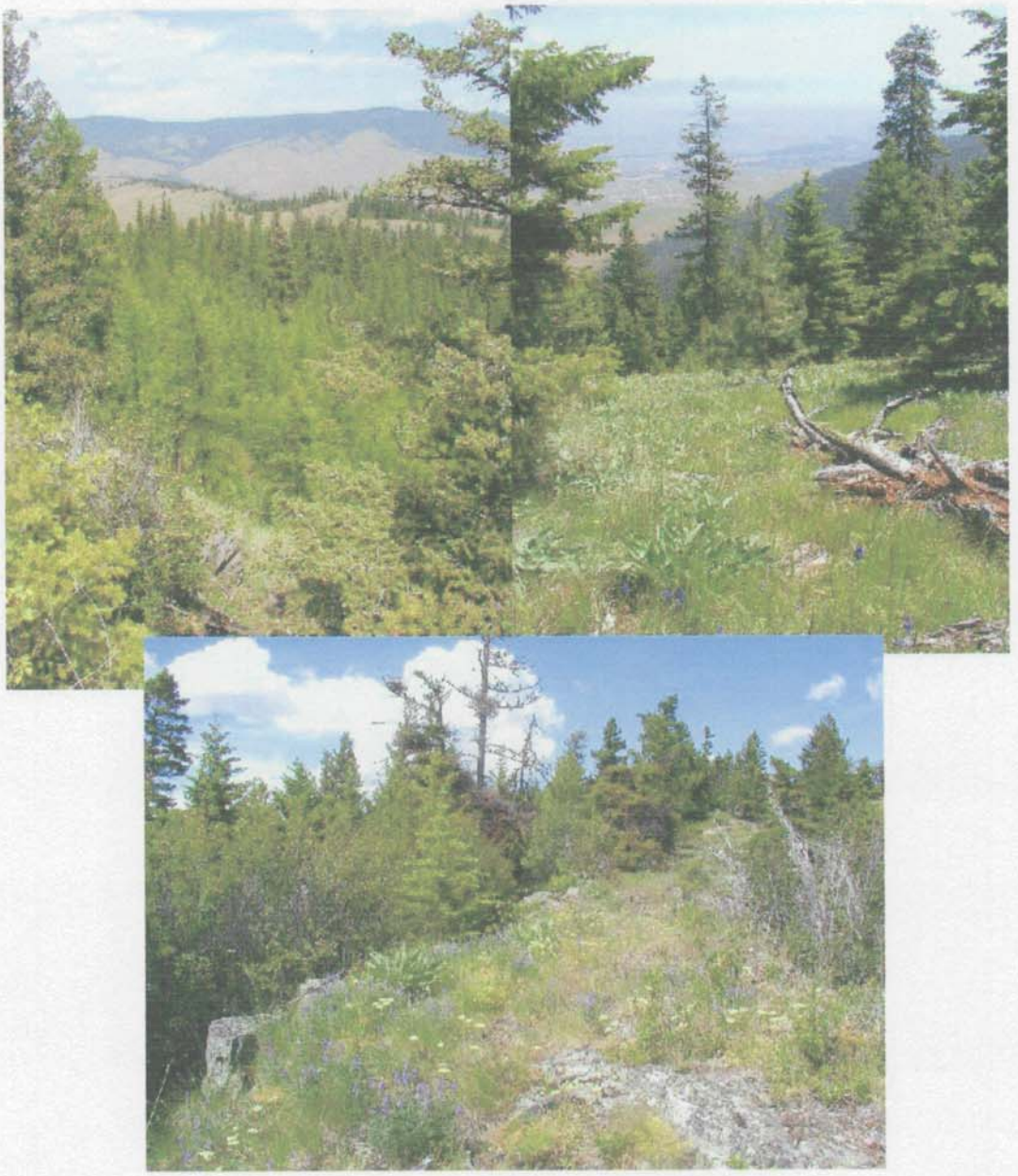


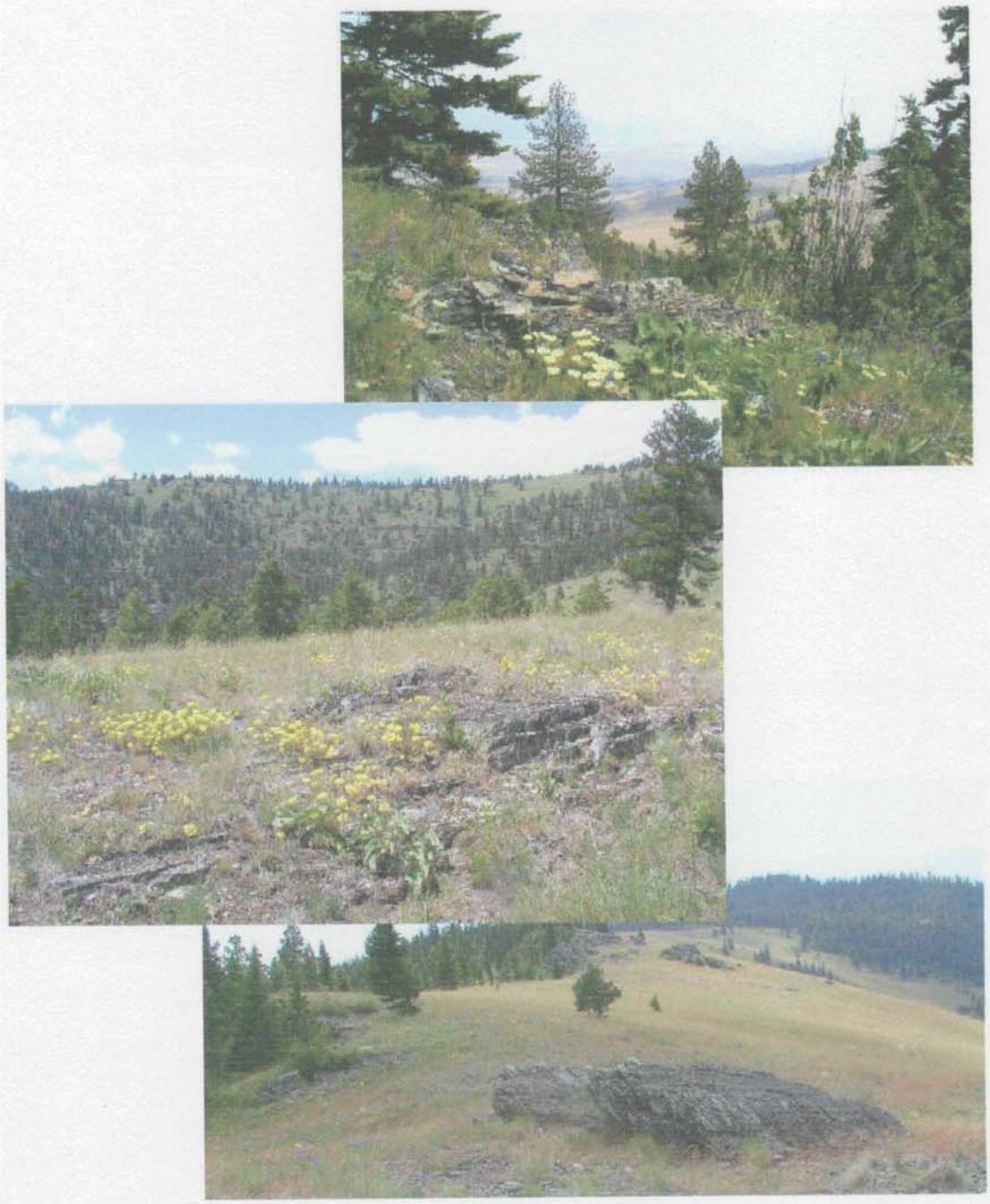
FIGURE 2 - Prospective wind power development area. Codes: bald eagle observation (BAEA), inactive large stick nest (INLS), osprey on nest (OSPR&NST).



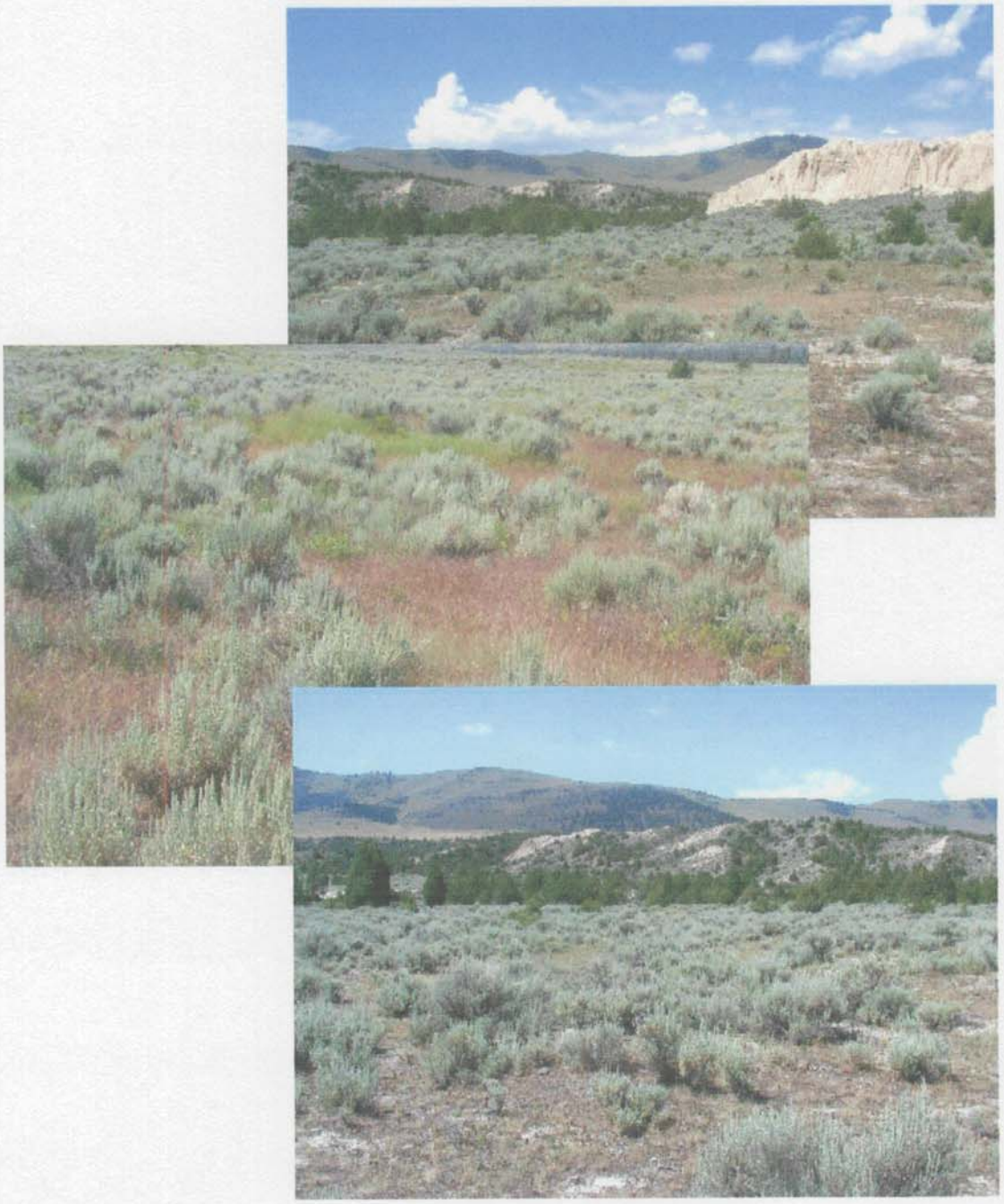
APPENDIX A - Examples of Dry Forest of the project area.



APPENDIX B - Examples of rock outcrops of the evaluation area.

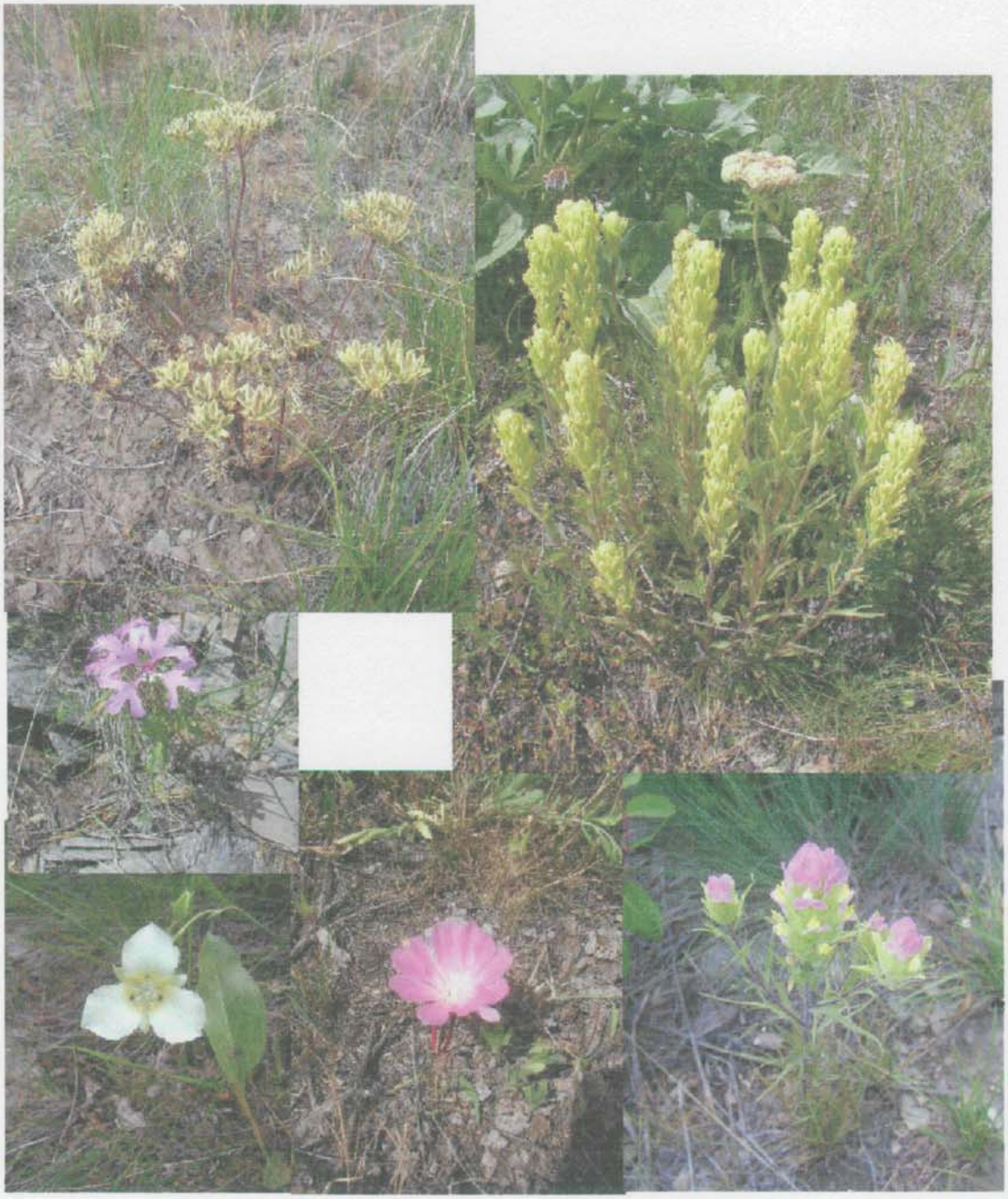


APPENDIX C - Examples of sagebrush steppe within the evaluation area.



APPENDIX D - Grassland/Intermountain grassland shrubsteppe of evaluation area.

APPENDIX E - Examples of grassland forbes/wildflowers of evaluation area.



APPENDIX F

POTENTIAL IMPACT INDEX CHECKLISTS

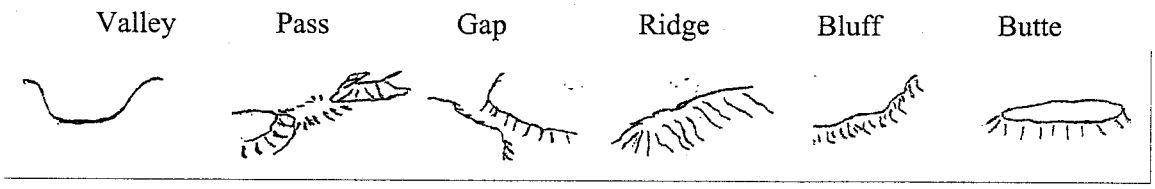
PHYSICAL ATTRIBUTE CHECKLIST

Physical Attribute				Site: PROJECT	Site: REFERENCE	Site:	Site:
Topography	Mountain Aspect*	Side	W				
			E				
			N				
			S				
		Top		X	X		
		Foothill	W				
			E				
			N				
			S				
	Valley*						
	Pass*			X	X		
	Gap*						
	Ridge*			X	X		
	Bluff*						
	Butte*						
Wind* Direction	S						
	N			X	X		
	E						
	W			X	X		
	Updrafts*			X	X		
Migratory* Corridor Potential	Latitudinal (N ↔ S)			X	X		
	Longitudinal (E ↔ W)						
	Wide Approaches (>30 km)*			X	X		
	Funnel Effect*	Horizontal					
		Vertical					
Site Size (acres) & Configuration*	<640						
	>640 <1000						
	>1000 <1500			X	X		
	Turbine Rows not Parallel to Migration						
Infrastructure To Build	Transmission						
	Roads			X	X		
	Buildings*	Storage					
		Maintenance					
		Daily Activity					
	Substation			X	X		
Increased Activity*				X	X		
Totals				12	12		

PHYSICAL ATTRIBUTE CRITERIA - 36 categories, max $\sum = 36$, ($p = 0.25$).

Topography - Terrain characteristic within the ecological influence of the proposed wind farm, generally, but not restricted to ± 8 km.

Mountain Aspect - Aspect of topography for site of proposed development. Multiple categories may be checked.



Wind Direction - Compass direction *from* which prevailing winds approach. Multiple categories may be checked.

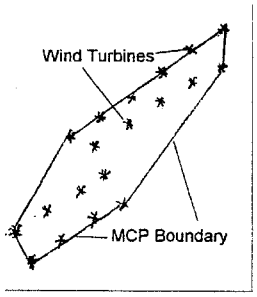
Updrafts - Do updrafts/upslope winds prevail?

Migratory Corridor Potential - Subjective estimate of area to be a potential avian/bat migratory corridor based strictly on topographical characteristics. Multiple categories may be checked.

Wide (>30 km) - Terrain characteristics of approaches to site from each migratory direction, i.e., a large plain, river corridor, long valley. The larger the area that migrant birds/bats are drawn from, the more may be at risk

Funnel Effect - Is the site in or near an area where migrant birds/bats may be funneled (concentrated) into a smaller area, either altitudinally, laterally, or both?

Site Size & Configuration – Size is estimated as if a minimum convex polygon (MCP) were drawn around peripheral turbines.



Successive boxes are checked to convey relationship of larger size = increased impact to birds/bats, *e.g.*, a 700 acre site will have 2 categories checked while a 1200 acre site will have all 3 categories checked.

Configuration of turbine rows is usually perpendicular to prevailing wind direction. Rows aligned perpendicular or oblique to route of migration intuitively presents more risk to birds than rows aligned parallel to movement.

Buildings – Building are categorized by relative size and visitation frequency, *i.e.*, structures that are visited daily are usually larger and present more impact than those that are not. If a "Daily Activity" building is required, all Building categories are checked. If a maintenance structure is required, Storage is also checked.

Increased Activity - Will any type of human activity increase? Sites in urban-suburban or otherwise developed areas (oil, gas, mines) will have less impact on vertebrate wildlife than those in remote or undeveloped areas.

Avian Species of Special Concern Checklist
(Complete prior to SPECIES OCCURRENCE & STATUS CHECKLIST)

	Site											
Birds (n = 32)	PROJECT			REFERENCE								
Occurrence[1]	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**
Common Loon		X	1		X	1						
Clark's Grebe												
American White Pelican		X	1		X	1						
Black-crowned Night-heron					X	1						
White faced Ibis												
Trumpeter Swan		X	1		X	1						
Harlequin Duck					X	1						
Northern Goshawk	X	X	2	X	X	2						
Ferruginous Hawk		X	1		X	1						
Peregrine Falcon		X	1		X	1						
Columbian Sharp-tailed Grouse												
Yellow Rail												
Black necked Stilt												
Franklin's Gull		X	1		X	1						
Caspian Tern		X	1		X	1						
Common Tern		X	1		X	1						
Forster's Tern		X	1		X	1						
Black Tern		X	1		X	1						
Yellow-billed Cuckoo					X	1						
Flammulated Owl		X	1		X	1						
Burrowing Owl												
Great Gray Owl		X	1		X	1						
Boreal Owl	X	X	2	X	X	2						
Black Swift		X	1		X	1						
Blackbacked Woodpecker		X	1		X	1						
Alder Flycatcher												
Cassin's Kingbird												
Blue-gray Gnatcatcher												
Dickcissel												
Baird's Sparrow												
Le Conte's Sparrow												
Nelson's Sharp tailed Sparrow												
Subtotals	2	16	18	2	19	21						
		Total	18			21						

Avian Species of Special Concern Checklist (32 species, max $\sum = 64$)

Column totals of this list are added to appropriate cells in the SPECIES OCCURRENCE & STATUS CHECKLIST. Appropriate avian field guides (*e.g.,* Sibley 2000) and species accounts (*e.g.,* Rauscher 2000) should be consulted for confirmation of species distribution and habitat associations. Montana Natural Heritage Program (http://orion2.nris.state.mt.us/mtnhp/animal/index.html) also provides species accounts in Vertebrate Characterization Abstracts (VCA) which include additional information useful in completing checklists.

In addition to species lists (rows), season of occurrence is also indicated (columns). "B" indicates breeding or summer occurrence and "M/W" indicates presence during migration or as wintering species. If occurrence within or in the vicinity ($\leq$ 7 km) of a proposed site is confirmed or suspected, an "X" is entered.

Bat Species Of Special Concern Checklist
(Complete prior to SPECIES OCCURRENCE & STATUS CHECKLIST)

Bats ($n = 5$)	Site											
	PROJECT			REFERENCE								
Occurrence	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**	**B**	**M/W**	**∑**
Fringed Myotis		X	1		X	1						
Northern Long-eared Myotis		X	1		X	1						
Spotted Bat												
Townsend's Big-eared Bat		X	1		X	1						
Pallid Bat												
Subtotals												
Total			3			3						

Bat Species Of Special Concern Checklist (5 species, max $\sum = 10$).

Column totals of this list are added to appropriate cells in the SPECIES OCCURRENCE & STATUS CHECKLIST. Appropriate bat field guides and references (Barbour and Davis 1969, Harvey et al. 1999, Rauscher 2000) should be consulted for confirmation of species distribution and habitat associations. Montana Natural Heritage Program (http://orion2.nris.state.mt.us/mtnhp/animal/index.html) also provides species accounts in Vertebrate Characterization Abstracts (VCA) which include additional information useful in completing checklists.

In addition to species lists (rows), season of occurrence is also indicated (columns). "B" indicates breeding or summer occurrence and "M/W" indicates presence during migration or as wintering species. If occurrence within or in the vicinity ($\leq$ 7 km) of a proposed site is confirmed or suspected, an "X" is entered.

SPECIES OCCURRENCE & STATUS CHECKLIST

Species		Site: PROJECT			REFERENCE								
	Occurrence	**B**	**M/W**	**Σ**	**B**	**M/W**	**Σ**	**B**	**M/W**	**Σ**	**B**	**M/W**	**Σ**
Threatened & Endangered	Bald Eagle	X	X	2	X	X	2						
	Whooping Crane												
	Piping Plover												
	Interior Least Tern												
	Grizzly Bear												
	Gray Wolf		X	1		X	1						
	Black-footed Ferret												
	Pallid Sturgeon												
	Woodland Caribou												
	White Sturgeon (Kootenai River)												
	Bull Trout												
Candidate*	Mountain Plover												
	Yellow billed Cuckoo					X	1						
	Black-tailed Prairie Dog												
	Swift Fox												
Special Concern*	Birds (max ∑=64)	2	16	18	2	19	21						
	Bats (max ∑=10)		3	3		3	3						
Golden Eagle*			X	1		X	1						
Sage Grouse*													
Bats*			8	8		8	8						
	Subtotals	3	30	33	3	34	37						
	Total			33			37						

SPECIES OCCURRENCE & STATUS CHECKLIST (20 categories, max $\sum = 92$, ($p = 0.63$).

Checklist totals for each column in "Avian Species of Special Concern List" and "Bat Species of Special Concern List are inserted in this checklist.

Threatened & Endangered Species - Species include in the Federal List of Endangered and Threatened Species (USFWS 2001a).

Candidate Species - Species being investigated for inclusion in the Federal List of Endangered and Threatened Species (USFWS 2001b).

Species of Special Concern - MNHP (2004) maintains an inventory of the elements of biological diversity in Montana. Species included in this checklist are those *listed by MNHP* that are known or suspected to be rare, endemic, disjunct, threatened or endangered. The list has been developed largely from information in the scientific literature, unpublished reports, agency databases, field research, and field inventories from a variety of cooperating local, state and federal agencies, private organizations and businesses, academic researchers, and interested individuals.

Golden eagles are included in this checklist because of special protective status afforded under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d). Sage grouse are included because of recent (*ca.* Y2K) concern over population declines range wide (citation). Bats (other than bat Species of Special Concern) are included due to generally unknown impacts of wind farms on individual and populations.

ECOLOGICAL ATTRACTIVENESS CHECKLIST

			Site			
Ecological Attractor			PROJECT	REFERENCE		
Migration Route*		Local	X	X		
	Continental*	N				
		S				
		E				
		W				
Ecological Magnets*		Lotic System		X		
		Lentic System				
		Wetlands				
		Native Grassland	X	X		
		Forest	X	X		
		Food Concentrated				
		Energetic Foraging	X	X		
	Vegetation/ Habitat	Unique				
		Diverse	X	X		
Significant Ecological Event*						
Site of Special Conservation Status*						
		Total	5	6		

ECOLOGICAL ATTRACTIVENESS CRITERIA - 16 categories, max$\sum$ = 17, (p = 0.12).

Migration Route - Indicates predominate direction of movement of seasonal migrations. Multiple categories may be checked.

Local - Some avian populations move only altitudinally & direction may be East-West (sage grouse, owls, bald eagles).

Continental - Some migratory corridors experience mass movements in only one season/direction annually (*e.g.*, Bridger Mountains autumn eagle migration).

Ecological Magnets - Special, unique, unusual, or super ordinary habitats or conditions within the vicinity of the site that may attract vertebrate wildlife. Lotic systems include small perennial or seasonal creeks to major rivers. Lentic systems include stock ponds to lakes. Multiple categories may be checked.

Vegetation/Habitat - Unique or exceptionally diverse vegetation or habitat in the vicinity may indicate exceptional diversity and abundance of avian species or bats.

Significant Ecological Event - Special, unique, unusual, or super ordinary events that occur or are suspected to occur in the vicinity of the site, *e.g.*, up to one third of the Continental population of Trumpeter Swans visit Ennis Lake, < 4 km from a proposed Wind Resource Area; the Continental migration of shorebirds passes over (many stop) @ Benton Lake National Wildlife Refuge) and up to 2000 golden eagles pass over the Bridger Mountains in autumn. If unknown but suspected a "?" is entered. Specifics regarding the cell are then addressed in the appropriate box of the SITE SPECIFIC COMMENTS sheet to focus follow-up investigation and assist in definition of study objectives.

Site of Special Conservation Status - Any existing or proposed covenants, conservation easements, or other land development limitations intended to conserve, protect, or enhance wildlife or habitat. This criterion is weighted (2 entered if true) because of previous financial or other investment in ecological values. Specifics regarding the easement are then addressed in the appropriate box of the SITE SPECIFIC COMMENTS sheet to focus follow-up attention.

POTENTIAL IMPACT INDEX

Checklist (p)[1]	Site: PROJECT ∑	PROJECT ∑/p	REFERENCE ∑	REFERENCE ∑/p	∑	∑/p	∑	∑/p
Physical (p =36 checks = 36/145 = 0.25)	12	48	12	48				
Species Occurrence & Status (p = 0.63)	33	52	37	59				
Ecological (p = 0.12)	5	42	6	50				
Totals		142		157				

[1]Proportion of total (145) checklist scores.

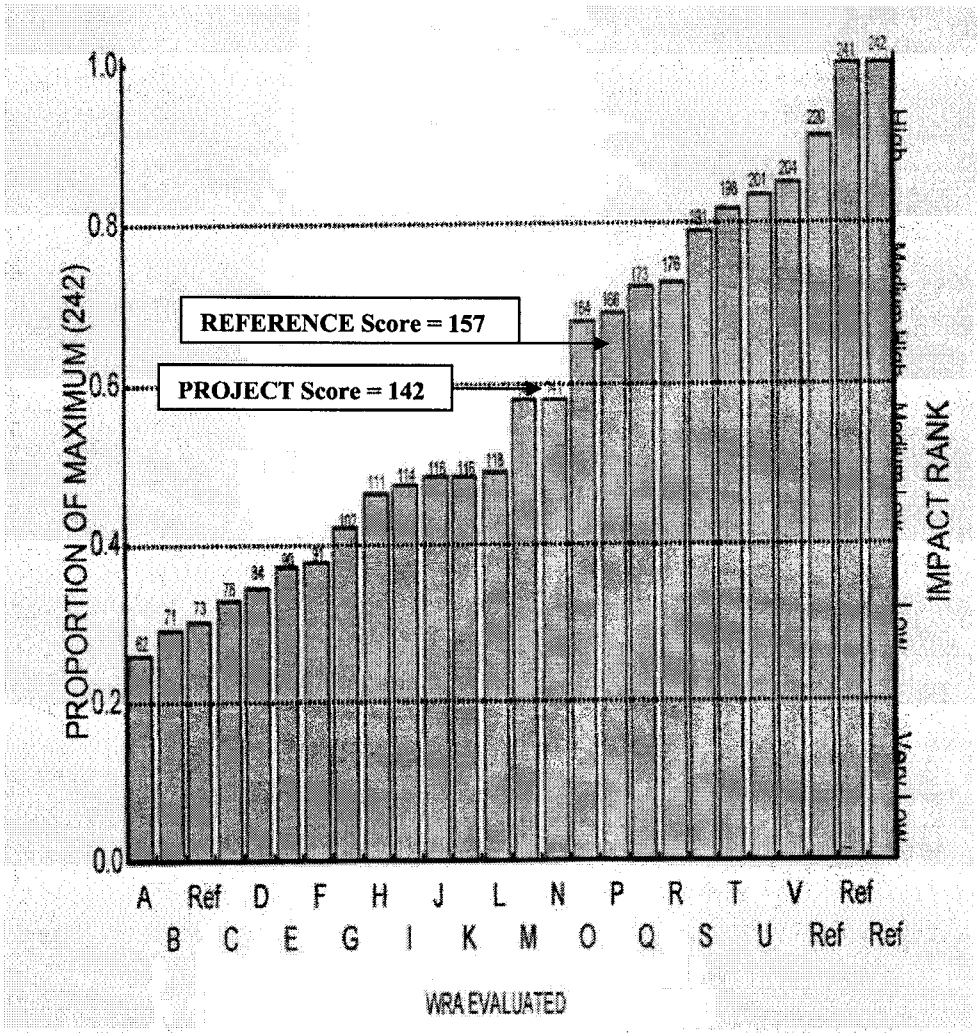


Figure 2. Impact ranks of proposed Wind Resource Areas in Montana. The number above each bar is the PII score. Rank is a function of the proportional relationship of proposed development sites to the maximum score of 4 Reference Sites evaluated.

ECOLOGICAL ATTRACTIVENESS CHECKLIST

			Site			
Ecological Attractor			PROJECT	REFERENCE		
Migration Route*		Local	X	X		
	Continental*	N				
		S				
		E				
		W				
Ecological Magnets*		Lotic System		X		
		Lentic System				
		Wetlands				
		Native Grassland	X	X		
		Forest	X	X		
		Food Concentrated				
		Energetic Foraging	X	X		
	Vegetation/ Habitat	Unique				
		Diverse	X	X		
Significant Ecological Event*						
Site of Special Conservation Status*						
		Total	5	6		

Tribal Renewable Energy
Final Technical Report

Tab 4

Cultural Assessment

Project Title: Flathead Reservation Renewable Energy Feasibility Study

Date of Report: September 2006

Recipient Organization: Salish & Kootenai Holding Company, Inc.

Award Number: DE-FG36-04GO14024

Partners: Salish & Kootenai Holding Company, Inc.
Distributed Generation Systems, Inc. (cost sharing partner)

Flathead Indian Reservation Wind Power Feasibility Study Cultural Resource Report

For

Distributed Generations Services, Inc.
200 Union Blvd, Suite 304
Lakewood, Colorado 80228-1831

Under
Department of Energy Grant #DE-FG36-04GO14024

By
Dave Schwab
Joanne Bigcrane
Mike Durglo Sr.

Confederated Salish and Kootenai Tribal Historic Preservation Department
P.O. box 278
Pablo, MT 59855

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION. In the fall of 2005, Distributed Generation Services, Inc. (Disgen) contracted with the Confederated Salish and Kootenai Tribal Historic Preservation Department (TPD) to conduct a cultural resource records search and review for the Flathead Indian Reservation Wind Power Feasibility Study Area, in Lake and Sanders Counties, Montana. The study is designed to evaluate wind and alternative energy options that may be available to help the Confederated Salish and Kootenai Tribes of the Flathead Nation (CSKT) become self sufficient in providing energy on Tribal lands. Disgen is currently under contract to conduct energy feasibility studies for the CSKT under the Department of Energy Grant Solicitation #DE-FG36-04GO14024. The project study area covers upland slopes and ridge tops of the Salish Mountain Range extending from Irvine Hill to the north, to the southern terminus of the range at the Little Bitterroot Valley on the south (Figures 1 & 2). The project covers a distance of approximately 15 miles along the Salish mountain ridge tops.

2.0 METHODOLOGY. TPD conducted a cultural resource records search at the TPD Tribal Registry files. The TPD Tribal Registry contains a complete record of all previously recorded cultural resources located within the exterior boundaries of the Flathead Indian Reservation. Historical research was conducted within the TPD archives and library, and at the Salish-Kootenai College Library. Oral history tapes and written records were reviewed for any specific references to the study area. A field tour and oral history interview was conducted with Mike Durglo Sr., Tribal Elder and TPD mapping expert. Mike Durglo Sr. and Clayton Burke conducted Salish and Kootenai place names reviews. On the ground intensive cultural resource examinations were not conducted as a part of this study, however a reconnaissance field review was conducted on October 4, 2005.

3.0 BACKGROUND RESEARCH. A review of tribal records indicates that no previous archaeological surveys or cultural studies have been conducted within the project area.

3.1 Cultural Resource Records Search. A cultural resource records search was conducted for the legal locations listed in Table 1. A single previously recorded site was identified during the file search. Site ***SKP-SA-280*** (Smithsonian number 24SA1073) consists of a cluster of 6 to 8 small rock cairns located on the crest of a ridge in the Salish Range. The site sits in an area of rocky outcrops separating the Little Bitterroot and Flathead River drainages. The rock cairn complex's function is unknown, however rock cairns of this type are common along saddles and ridgetops on the Flathead Reservation. They may be associated with trails and/or hunting activity.

Table 1. Legal Locations of Project File Search

Township	Range	Portion of Sections
23N	22W	31, 32
23N	23W	36
22N	23W	24
22N	22W	5-8, 17-20, 28-34
21N	22W	3,4, 10, 11, 14, 15, 21, 22, 27, 28, 33, 34
20N	22W	3-5, 9

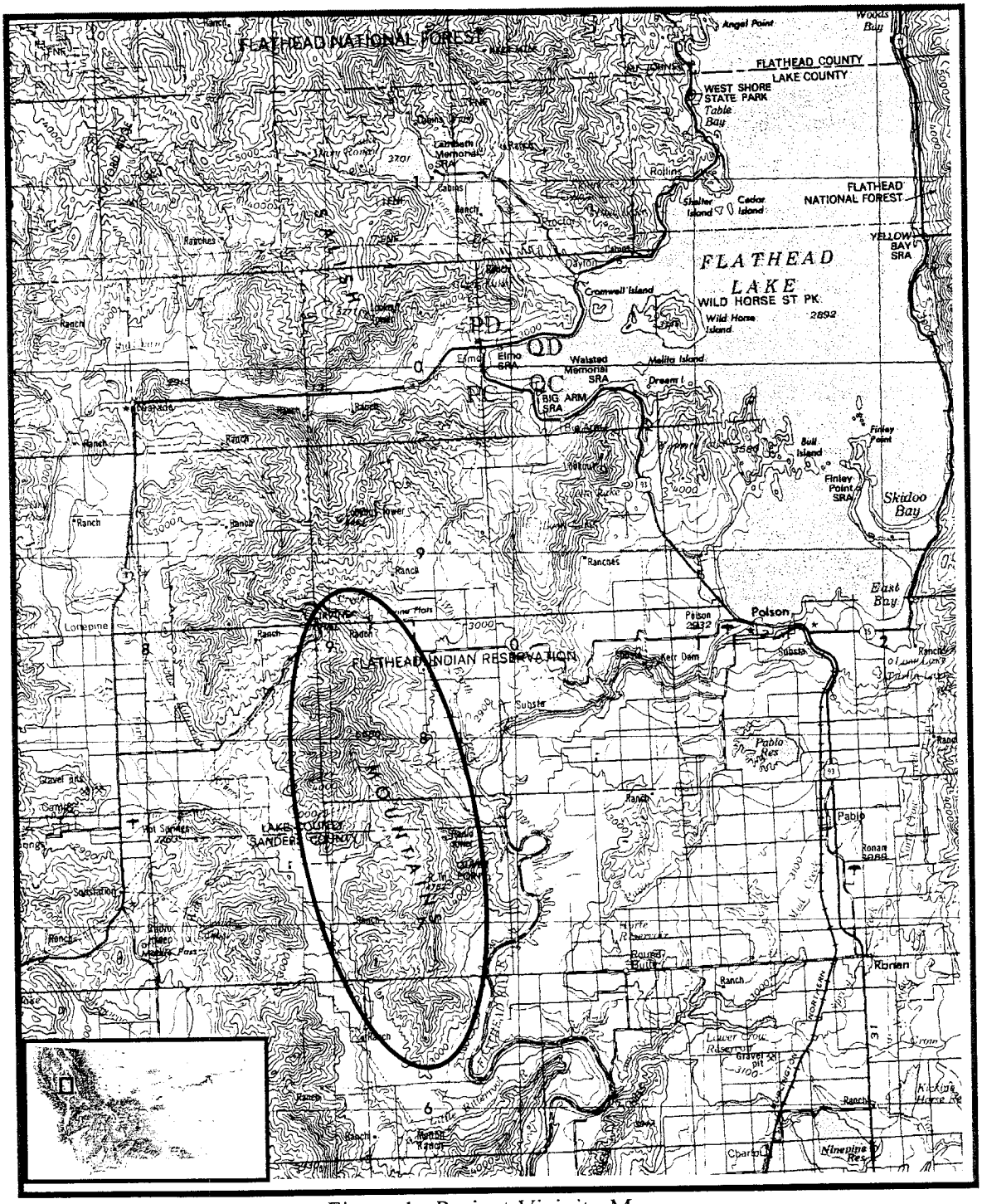


Figure 1. Project Vicinity Map

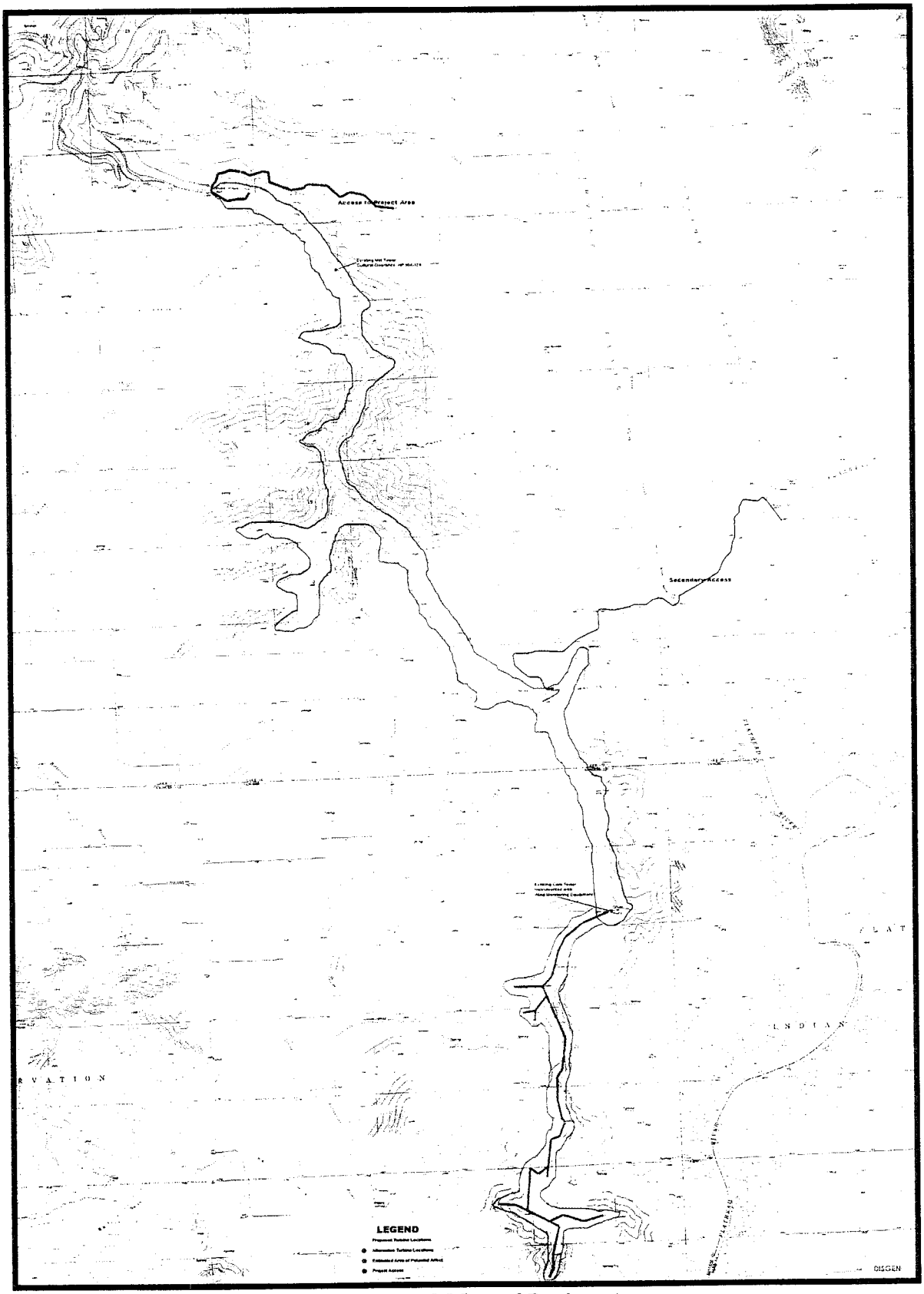


Figure 2. Detailed Map of Project Area

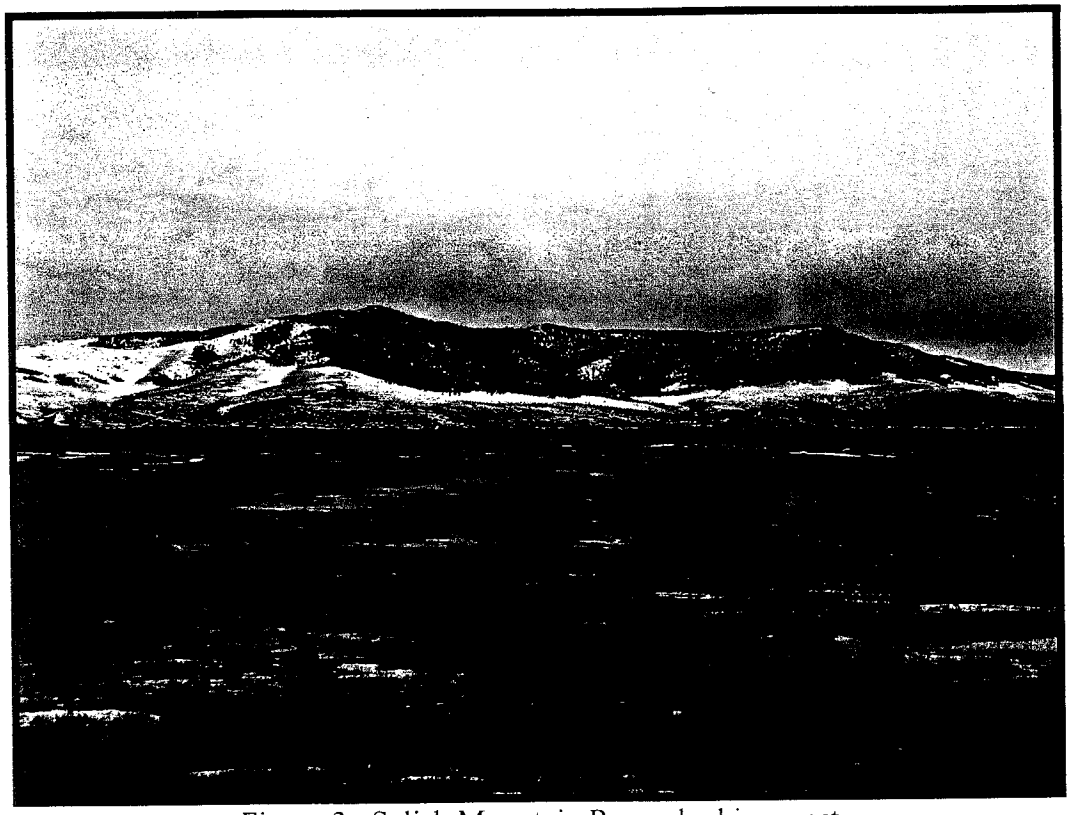


Figure 3. Salish Mountain Range looking west

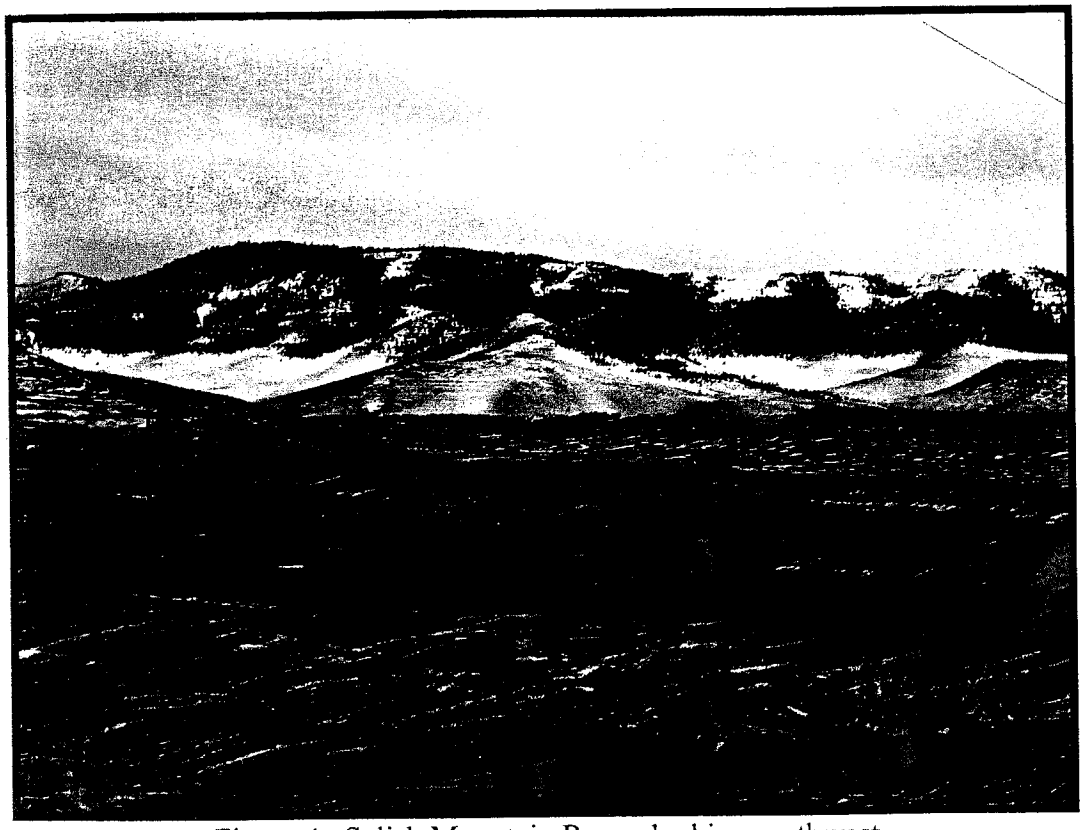


Figure 4. Salish Mountain Range looking northwest

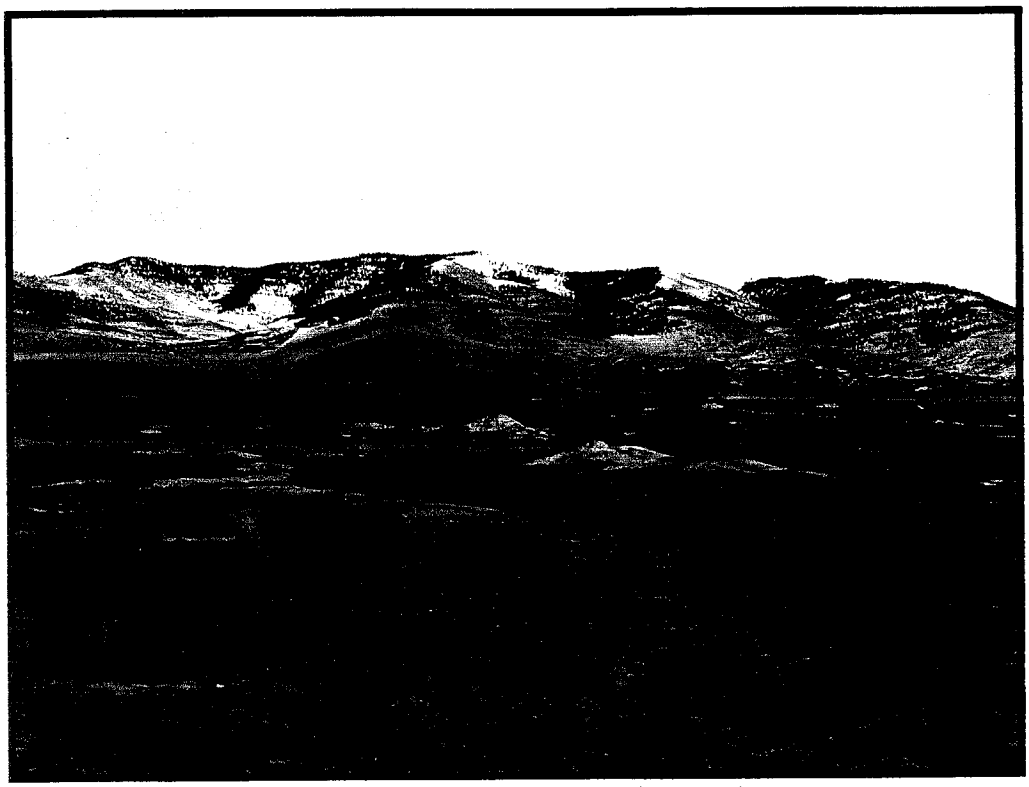


Figure 5. Salish Range looking south.

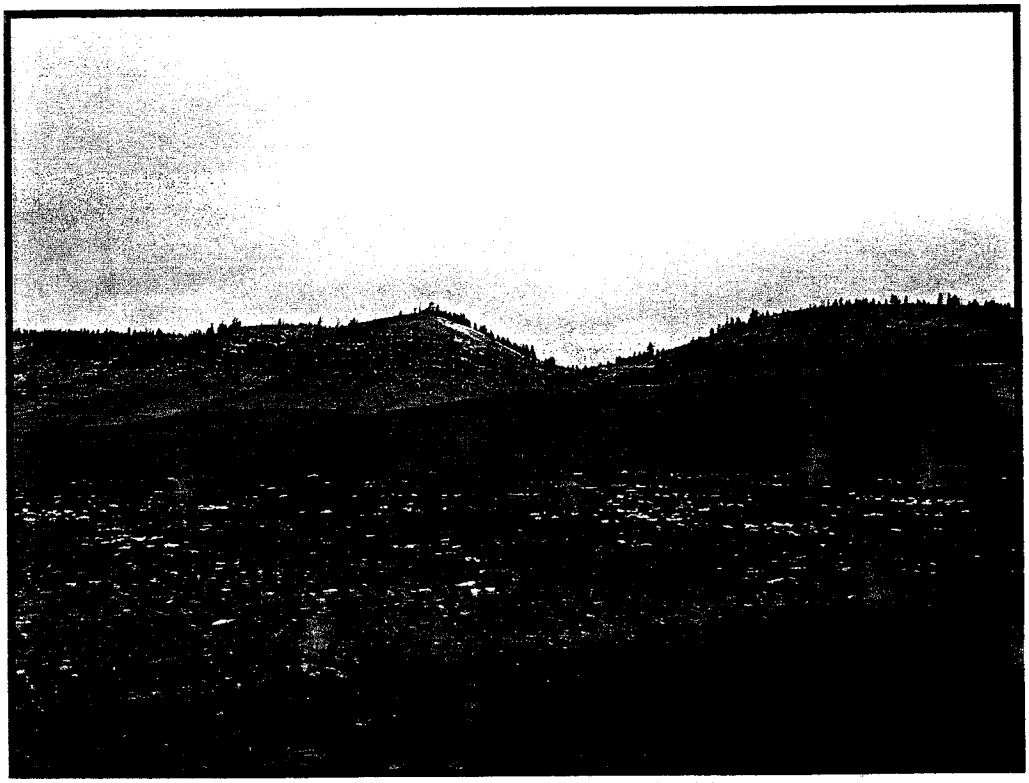


Figure 6. Saddle in Salish Range looking east.

4.0 PHYSICAL ENVIRONMENT. The project area lies within the Salish Range, which separates the Little Bitterroot and Flathead River drainages. The project is located in the Northwest portion of the Flathead Reservation in the Camas-Hot Springs study area. The Salish range stretches from the north reservation boundary to the central part of the reservation separating the two north-south valleys. The range is composed of Belt Supergroup bedrock, and outcrops of argillite, siltite, and quartzite are common. Rocks in the Salish Range are older belt formations than those in the nearby Mission and Swan Ranges (Alt and Hyndman 1986). The area is geologically active with hot water springs located to the northwest of the project area at Hot Springs. Precipitation in the higher elevations of the Salish Mountains range from 18-20 inches per year. Vegetation ranges from Pine and Fir forested tracts interspersed with grasslands of wheatgrass and rough fescue. Noxious weeds are a growing problem in the area.

5.0 PREHISTORIC CHRONOLOGY. For years archaeologists viewed the Northern Rocky Mountains as a "barrier" separating the Great Plains, Columbia Plateau, and Great Basin "Culture Areas". More recently, the distinct nature of the archaeological record of the Northern Rocky Mountains has caused a reconsideration of the region as a separate and unique Culture Area. Various prehistoric cultural chronologies have been developed for the Indigenous Peoples of the Northern Rockies (see for example Malouf 1956; Roll 1982; Reeves 1970) but comparatively little systematic archaeological research has been conducted. The paucity of data has created some gaps and disagreement in the comparative studies of regional archaeology.

Cultural chronologies developed in the Northern Plains and Northern Rockies rely almost exclusively upon projectile point morphology. Over decades of research, identified point styles recovered in dated sites have been compared. This facilitated the creation of a prehistoric chronology based on point style changes through times that is used as a common reference among archaeologists working in the region. The prehistoric chronology used in the Northern Rocky Mountains is primarily derived from work conducted in other regions, and therefore its applicability has been questioned. Presented below is a more detailed discussion of chronological periods identified in McLeod and Melton (1986) for the Northern Rockies.

5.1 Early Prehistoric Period (13,000-5500 B.C.). This period encompasses the late Pleistocene and Early Holocene geological eras, a transitional period during the latter part of the Wisconsin Glaciation. It was a time when the Cordilleran mountain glaciers were receding throughout the Northern Rockies and glacial lakes formed in many of the valleys on both slopes of the continental divide. Changing climatic conditions caused a transition in flora and fauna and alternation of opportunities for early hunter-gatherers.

On the shores of Glacial Lake Missoula and other ancient lakes that filled the valleys, small bands of Paleo-Indian hunters occupied the high terraces and the valley margins of the intermontane valleys of Western Montana. They practiced an economy based on seasonal exploitation of a wide range of wild plants, small game and large megafauna. Although there is scant evidence, Paleo-Indians in the Northern Rockies may have fished and used watercrafts as transportation on the numerous glacial lakes in the region. They made wide

use of the abundant lithic sources available in the region and exhibited exceptional technological skills in stone quarrying and tool manufacture. Point styles common in this period include Folsom, Clovis, Agate Basin, Barton Gulch, Windust and Cascade.

5.2 Middle Prehistoric Period (5500 B.C. - A.D. 500). Much of this period covers a post-glacial shift to warmer and dryer climate conditions referred as the altithermal. Conventional wisdom over the last several decades suggests that this period of "drought like" conditions reduced indigenous population sizes in the Western United States because of a relative paucity of archaeological remains found on the Great Plains from this era. This pattern is not apparent, however, in the Northern Rocky Mountains. Based on a handful of radiocarbon dates and numerous diagnostic artifacts attributed to the Middle Prehistoric Period, it seems clear that indigenous cultures were on the rise in these mountainous zones. Some archaeologists suggest that the mountain environment provided a refuge for groups escaping drought conditions on the Plains during the altithermal.

The Middle Prehistoric Period is typically delineated in three phases by archaeologists, the Early, Middle, and Late Phases. These phases are indicated by minor fluctuations in point styles used through time. The Middle Prehistoric Period is characterized by the introduction of corner and side notched projectile points indicating a different hafting system then that used in the Early Prehistoric Period. Apparently, the primary weapons system for hunting was the atlatl and dart system. Projectile points representative of the Middle Period are triangular dart points used with the atlatl system. Point types diagnostic of the Middle Prehistoric Period include Oxbow and Mummy Cave (Early Phase); McKean, Duncan and Hanna (Middle Phase); and Pelican Lake and Besant (Late Phase).

5.3 Late Prehistoric Period (A.D. 500-1680). The Late Prehistoric Period saw the continuation of a "broad spectrum" economy and intensification of resource use and population growth. As during the Middle Prehistoric Period, base camps were located in the major river valleys near the confluence with primary streams. Fishing became increasingly a focus of food gathering efforts in the Northern Rockies with the innovation of fish weirs, nets, and traps. Primary base camps established in major stream valleys served as access points for smaller sub groups to traditional berrying, gathering, hunting, and spiritual use sites.

During this period the bow and arrow was introduced and this new technology enhanced the capability of hunters to provide food. Diagnostic projectile points from the Late Prehistoric Period are designed to attach to arrows rather than atlatl dart shafts. Late Prehistoric Period points identified with bow and arrow technology include Avonlea, Prairie Side-Notched, Late Plains Side Notched, and Old Woman's Phase styles. Use of communal hunting methods continued with application to deer, sheep and bison.

5.4 Proto-Historic Period (A.D. 1680-1805). By the early 1700s, the horse had been introduced into western Montana from the south. This had a dramatic effect on the lifeways of Salish, Pend d'Oreille and Kootenai groups, providing increased mobility and related changes in subsistence and settlement patterns. Increased mobility enhanced the

opportunities for travel, trade and exchange, bringing groups together more readily. Seasonal rounds were increased and tribal members traveled farther on subsistence treks.

Mobility also increased tensions among neighboring Tribes as other tribal groups began entering the traditional territories of the Salish and Kootenai Tribes. European invasion encumbered the spread of deadly new diseases. When the gun and other European trade goods entered the region, the balance of power among groups competing for dwindling hunting and fishing grounds was further upset. The proto-historic period ended with the first written accounts by white explorers and entrepreneurs in the early 1800s.

6.0 TRIBAL HISTORY. Tribal people lived intimately with animals and plants, the elements of sun, wind, water and the earth, and accordingly with the life cycles of all throughout the seasons. The Tribal calendar included the cyclical appearance of leaves, flowers, berries and color changes according to each locale. They closely observed signs such as these and made harvesting and traveling preparations accordingly. As Ferris observed,

> *"...Most of the [Pend d'Oreille] families have light canoes, with which they glide about on the river, and gather roots and berries, in their proper season; but in winter they separate into small parties, and not infrequently into single families, who then seek the mountains and pass the inclement season there..."(Ferris, 1940)*

The Salish, Pend d'Oreille and Kootenai cultural landscape includes high plateau prairies, river valleys, alpine slopes and forested mountains, offering a diverse variety of animal species and plant communities for cultural subsistence activities. The landscape sustains several hundred plant species and a large number of those species have been adopted by Tribal people for all of their subsistence needs. Intimate knowledge of wildlife habits and movement patterns and the life cycle of native fish created opportunities for hunting, fishing, and trapping throughout the year. The observations of the people created a body of knowledge about the environment closely tied to the seasons, locations, and biology. As they traveled through lower and warmer elevations cleared by spring weather, they knew which plants would likely be in the draws and ravines. As spring and summer matured toward fall, edible berries were available for harvesting and drying. Chokecherries, sarvis berries, russet buffalo berries, huckleberries, Oregon grape, hawthorn and even the fruit of the dogwood were gathered adding to the menu.

The past, present, and future foundation of traditional Tribal culture and subsistence depends on the gathering and utilization of native plant materials. While gathering fresh foods for meals was of high importance, replenishing botanical materials for household goods and hunting equipment as well as for trade and winter storage was of equal priority. The tribal oral history is rich with anecdote and culture stories of landscapes and associated place names describing a long relationship spanning many, many millennia. The traditional environmental knowledge of the Salish, Pend d'Oreille and Kootenai accommodates the biological and environmental changes that can occur not only yearly, but also through decades and centuries. Observant tribal individuals watched for which plants came in after a wildfire, and those plant species that benefited from a regular fire

regime. Failure of any of the accustomed food staples, such as bitterroot, camas, and any of the berries is as significant as it was in the past, but without the same dire consequences. Presently, industries such as logging, agriculture, cattle production, and other land uses are part of tribal economic activities. Huckleberries, camas and bitterroot are diligently sought after, as they have been for generations.

The Salish, Kootenai and Pend d'Oreille aboriginal area is crisscrossed with an extensive trail system connecting key hunting and gathering sites from one region to another. Movement between the western valleys of the Northern Rockies to the high plains of the eastern Rocky Mountain Front was conducted seasonally by Tribal bands, often twice per year. As the Tribal people traveled from the winter camps to established hunting and gathering grounds throughout western Montana, they stopped at familiar locations to replenish needed materials such as flint for stone tools, wood for bows, or herbal medicines. Many of the creek drainages and wetlands adjacent to the trails and campgrounds held a variety of natural materials for making mats and baskets, as well as opportunities for fishing.

7.0 HISTORIC USES OF THE PROJECT AREA. Three primary historic uses for the project have been identified. These include use as a travel corridor, hunting area, and plant gathering area. Taken together, this pristine natural area makes up a cultural landscape significant to the history and culture of the Pend d'Oreille, Kootenai and Salish people. A more detailed discussion follows.

7.1 Travel corridor. The project area lies within an important travel corridor. East-west trail passages exist that cross the mountains forming connections between camping and procurement areas in the Little Bitterroot and Flathead River drainages. Both valleys served as seasonal base camps for hunting, collecting and fishing activities. Most of these trail routes follow minor stream drainages and traverse saddles along the uplands. These historic foot and horse trails follow long-established game trails and wildlife corridors.

Another ancient north-south trail system follows the ridgeline of the drainage divide. The modern two-track road within the project area roughly follows the route of the old trail. Upland trails provided a more direct linear access and therefore are favored because they are more easily traveled and more direct. Primary use of the upland trail was likely during the spring, summer and fall, however winter use was not uncommon using snowshoes.

7.2 Hunting. The high upland areas of the Salish Range are important habitat for Mule Deer and Elk. The area has been an important hunting area used traditionally for thousands of years. Uplands of the Salish Range were noted historically for their high numbers of deer and are still a favorite hunting area for modern tribal members. According to Tribal Elders, communal deer hunts often took place in the upland areas. Small groups of hunters would work cooperatively with the goal of driving game down the mountain slopes to waiting hunters at the foothills of the range. The animals were then dispatched and moved to nearby base camps for processing. For many families,

animals hunted in the project area formed the basis for their winter food storage used throughout the year.

7.3 Plant Gathering. Another important economic activity in the project area for both historical and recent times is the harvest of native cultural plants. Bitterroot, a critically important food source, was harvested in the midslopes and foothills of the Salish Range. Upland zones contained important plants used for teas, medicines and toolmaking. According to the Salish/Pend d'Oreille Culture Committee:

> *The Flathead Reservation area has always been a rich and bountiful area for many kinds of foods and other materials that the Sqelix^{w} use in their daily lives. Bitterroot grows abundantly in Camas Prairie (Qln?i) and along the Flathead River. Great camas digging grounds are tucked into the wet areas of Camas Prairie, ... The mountains have always been good places to find our medicines.*

7.4 Cultural Landscape. A cultural landscape is defined as a local landscape where groups of people have established a connection over time and through tradition, a place where they have invested their collective thoughts, stories and sensibilities, and to which they feel that they belong. There is a long tradition of use of the project area that ties people to this place, and has become intimately tied to their traditions and living culture. The project area qualifies as a part of the Tribal cultural landscape because there is a continuum of use that remains intact.

The resources on the Flathead Reservation continued to be less available for the tribal people when the lands were divided and re-apportioned through the Allotment Act. Non-tribal land ownership and cultural conflicts grew to such a level as to reduce traditional harvesting practices for the majority of the tribal people. Often non-tribal landowners refused access to tribal people for subsistence harvesting even when they had no interest in the plants. In some cases, camas and bitterroot were eradicated due to agricultural practices. Because of this landscapes such as the project area that are relatively intact and unaltered from their natural condition are increasingly important as islands of what was once a much larger cultural landscape. For this reason any development in the area must be carefully considered as to its impact on the cultural landscape including visual, audio and direct physical impacts.

7.5 Archaeological resources. As noted earlier, only one archaeological property, a cluster of rock cairns, has been recorded in the project area. The lack of recorded archaeological sites is not unusual considering that there has never been a systematic cultural resource surveys in the project area. Prehistoric quarry sites have been documented nearby in the Hot Springs (*Nayayk^{w}*) area and prehistoric occupation and lithic scatter sites are abundant in the adjacent river valleys. Given the oral history record for the project area and the high density of archaeological sites in the Little Bitterroot and Flathead River valleys, it seems likely that there is high potential for the presence of undocumented archaeological resources within the project area. Anticipated archaeological sites include intact trail segments, lithic scatters, workshops, lookouts, hunting pits, rock cairns and other stone construction features.

Tribal Renewable Energy
Final Technical Report

Tab 5

Transmission Review and Market Study

Project Title: Flathead Reservation Renewable Energy Feasibility Study

Date of Report: September 2006

Recipient Organization: Salish & Kootenai Holding Company, Inc.

Award Number: DE-FG36-04GO14024

Partners: Salish & Kootenai Holding Company, Inc.
Distributed Generation Systems, Inc. (cost sharing partner)

TRANSMISSION ASSESSMENT

for

Confederated Salish and Kootenai Tribes of Montana

submitted on

3 June, 2005

by

Distributed Generation Systems, Inc. (Disgen)
Author: Krista Jo Gordon, Manager of Engineering

Table of Contents

Introduction

In April, 2003 Distributed Generation Systems, Inc. (Disgen) signed an Energy Services Contract with the Confederated Salish and Kootenai Tribes of Montana (Tribe) to explore and develop the Tribe's renewable energy resources. Shortly after, Disgen applied to the Department of Energy (DoE) for funding for the development of its renewable resources, specifically wind, hydro, biomass, and solar. The total amount of the grant was $193,000. A meteorological tower was installed at the selected site in October, 2004. At the time of writing, four months of wind data had been recorded and synthesized even though six months of data had been collected. This Transmission Assessment will discuss the two transmission lines that cross over the project boundary.

The project will be located on the Salish Mountains within the borders of the Flathead Indian Reservation. The northern part of the project will be in Lake County, Montana and the southern part will be in Sanders County, Montana. The wind turbines will be located exclusively at high elevation sites within this area. There is enough land in the project area to support approximately 70MW of wind energy. This report will consider 70MW to be the project size cap. An outline map of the project area has been included in Appendix 1.

The nature of the wind resource will not be addressed in this Assessment for two reasons. First, it is premature at this time to discuss the economic feasibility of a wind project based on wind resource since substantially less than one year of data has been collected. Second, Disgen was contracted to perform this Transmission Assessment regardless of the viability of a wind power project.

Transmission System

There are two high-voltage transmission lines that cross the project area. The first is a double-circuit 115kV (115,000 Volt) transmission line owned by Northwestern Energy (NWE). It connects the Kerr Dam and Thompson Falls City. The second is a 230kV transmission line owned by Bonneville Power Administration (BPA). It connects the Hot Springs Substation and the Flathead Substation. These two lines will be abbreviated as K-TF and HS-F respectively. A transmission map is included at the end of this report in Appendix 2. Appendix 2 also includes topographical maps showing the locations of the Hot Springs Substation, Kerr Dam (including substation), and project area with both transmission lines passing overhead.

There are many factors that determine the feasibility of interconnecting a new generator to an existing transmission system. Chief among these are equipment voltages, size ratings, other regional loads and generators, transfer capability from one region to another, and market. All of these will be discussed herein. However, it is worth noting that this report is *not* an official interconnection study since it has *not* been written or reviewed by any transmission agency, although it was written with input and interviews with relevant regional utilities.

The wind project under current consideration is somewhat unique in that it has more than one interconnection option and even more than one utility from which to choose. A

decision should be made before filing an Interconnection Request in order to avoid both superfluous study fees and excessive time spent studying this interconnection.

The K-TF line carries two different circuits on the same structures (power poles) and they are both charged at 115kV. These two circuits can actually be treated as two interconnection options. Together, the two circuits have a thermal rating of approximately 130MW. They step up to 161kV at the Kerr Dam by way of a 115:161kV transformer and from there carry power 150 miles south to Missoula and Butte. The primary source of power carried on these two lines is from hydro facilities at Thompson Falls, Kerr, and Rattlesnake. Interconnection to this line appears to be technically feasible.

The HS-F line has an individual power rating sufficient to carry much more than 70MW. However, it is on the eastern edge of a substantial transmission bottleneck that exists on the west side of the Hot Springs Substation. This path is shown in detail in Appendix 6. The bottleneck is due to both thermal and contractual constraints. This path is a major carrier of hydro power from Montana to load centers farther west. The current east to west path rating is 2200MW and the west to east rating is 1350MW. There is no firm point-to-point transmission service for selling power west. It would likely be feasible to sell it west using the network transmission service of the power purchaser, but that would very likely include some system upgrades. Selling power north towards the Flathead Substation would probably be more feasible, but BPA's market is to the west. Therefore, if the project connected to this line and sold north then the buyer would most likely not be BPA, so transmission charges would be applied. If the project connected to this line and sold west, the project would face costly upgrades to get the power to market. The first items to be replaced to mitigate thermal constraints would be two series capacitors in the 500kV transmission lines that connect Garrison and Taft. The stability limit for this path is greater than the thermal limit. This interconnection option appears to be expensive regardless of how the power is sold.

Transmission charges ("wheeling") and other ancillary charges are very important factors to consider in selecting an interconnection point. It can be cripplingly expensive to connect to one utility, wheel power through that utility, and then sell power to a different utility. Transmission charges vary by type of service, regional reliability council, and individual utility. The basic types of transmission service include firm point-to-point, non-firm point-to-point, and network energy service.

The rate schedules for transmission and ancillary services for BPA and NWE have been included in this report as Appendix 3. In some cases, it is possible to make arrangements to avoid some or all of these charges. Some utilities are network customers of other utilities, and if a generator is connecting to one such utility and selling to one of its network customers, then wheeling charges may be avoided. Most or all ancillary charges are waived when the interconnecting generator seeks network transmission service from the purchaser of its power. It is also possible for a generator to avoid certain ancillary charges by carefully selecting the right equipment for the wind project. For example, VAR regulation charges can be avoided if the developer chooses wind turbines or

substation equipment that provide sufficient VAR support on their own. If the project is able to offer black start capability, then that charge may be avoided as well.

Interconnection Procedure

Once the Tribe has received its final wind assessment report from Disgen and if it decides that it wishes to pursue a wind power project, it will be appropriate to file an Interconnection Request with either NWE or BPA. A blank NWE Interconnection Request form has been included as Appendix 4. It is important to know many technical aspects of the generator(s) selected for interconnection when this form is completed. Disgen is experienced in both selecting the most appropriate wind turbines for a given wind site and providing detailed electrical information as required. Disgen would be pleased to assist the Tribe in completing both of these activities when the time comes.

The typical *official* study process for interconnecting a new generator to the grid is fairly standard from one utility to the next as long as they are both governed by the Federal Energy Regulatory Commission (FERC). This is a three-tiered process that ends with the Interconnection Agreement. It is separate from the process to request and obtain transmission service.

The submittal of the Interconnection Request form, along with a $10,000 deposit, sets the interconnection study process in motion. The deposit is meant to cover any charges associated with the Feasibility Study. The purpose of the Feasibility Study is to satisfy an Interconnection Customer's curiosity about moving a project forward or not. It essentially provides a "thumbs up" or "thumbs down" on proceeding with it. The Feasibility Study typically takes 90 days.

Once the Feasibility Study is complete, the Customer (in this case the Tribe and/or its representative) meets with the utility (Transmission Service Provider or TSP) to discuss its results and make plans for the second study. This study is called the System Impact Study and it typically takes 90 days to complete. A deposit of $50,000 is required. This study will make an in-depth examination of all power flow, short circuit, and system stability analysis. The power flow analysis covers the basic thermal results of interconnecting the new generator. An analogy might be to think of the transmission system as a network of pipes, valves, pumps, etc. As additional water is inserted into the pipe network, an examination must be conducted to ensure that the existing elements are not overstressed. A typical analysis would include "system intact" as well as "N-1" conditions. System intact means that all elements are in service and functioning properly. N-1 means that one element is not working, so the other parts must work a little bit harder to maintain the same system performance. This one element could be any element: transmission line, transformer, circuit breaker, etc.

The purpose of the short circuit analysis is to see what happens when a fault occurs. This is different than N-1. Whereas in N-1 something is simply taken out of service, in a short circuit situation current flows where it is not supposed to go. This generally means it will either flow from one phase to another (from one wire to another) or from one or more phases to ground. This can result in severe interruption of proper flows, so care must be

taken to address these potential faults. Since local faults are typically the focus of this portion of the study, and since fault current contribution varies from one generator to the next, it is important that the specific wind turbine model be chosen no later than at this stage.

The system stability analysis addresses the behavior of the wind project when there are faults on other parts of the transmission system. For example, if there is a fault on a line 200 miles away, will the wind project stay on-line or trip off-line? It will be at the discretion of the TSP to decide whether it is desirable for the project to ride through a fault or briefly go off-line.

When the System Impact Study is complete, the TSP and Customer will have another scoping meeting to review its results and prepare for the Facilities Study. This is the stage of the study process where the TSP makes estimates for the Customer as to the new or upgraded facilities required to interconnect the generator. This study also takes approximately 90 days. The estimates will include both those facilities to be provided and owned by the Customer and those to be provided and owned by the TSP. The cost estimates will be within +/- 20%. The deposit for this study is $100,000.

Following the completion of the Facilities Study, negotiations will begin on the Interconnection Agreement. If following the FERC guidelines, this is a standard form called the Large Generator Interconnection Agreement (LGIA) and can be found on most major utilities' websites.

It is important to note that the three deposits required for the three tiers of study are simply initial downpayments and do not necessarily reflect actual costs. The actual costs may vary up or down depending on the size and complexity of the wind project as well as the efficiency of the utility carrying out the studies.

The interconnection process described above will be nearly identical regardless of which line the project decides to connect to since NWE and BPA follow the same basic guidelines.

Markets

As noted above, it is commonly beneficial to connect to the same utility which will buy the output of the project. Therefore, since the owners of the two interconnection options are BPA and NWE, they are the two natural first choices for power purchasers. Close second choices would be any of their network customers who could accept the power from the wind project into their remote systems even thought they would have to transmit the power over facilities owned by either BPA or NWE. A list of the network customers of both utilities has been included in Appendix 5. Third choices would be any utilities that could be reached by way of the BPA or NWE transmission system. It is important to make sure the buyer can be reached easily or transmission charges could build up. This is referred to as "pancaking". Paying transmission charges once is expensive; paying them twice is very expensive.

BPA and NWE have both been attentive to wind project in the past couple of years, due in large part to the fact that their service areas tend to be in or near good wind sites. NWE issued a Request for Proposals in 2004 for 200MW of wind power and awarded contracts up to 150MW. Since NWE's peak load is approximately 1000MW, this represents roughly 15%. NWE's desire to purchase more wind may be negatively affected by this already sizeable percentage. However, the fact that the project selected is not electrically close to the proposed Flathead project plays to Flathead's advantage. The selected project will be located in Wheatland County and has a power price of approximately $31/MWh. This price, while not a direct target, is a good number to keep in mind as a comparison when formulating the economics of a wind project on the Flathead Reservation.

BPA currently has several wind projects in its generation portfolio. These include the 50MW Condon Wind Project in Gilliam County, Oregon; 17MW of the 43 MW Foote Creek Wind Project in Carbon County, Wyoming; the 24MW Klondike Wind Project in Sherman County, Oregon; and 90MW of the 263MW Stateline Wind Project in Walla Walla County, Washington and Umatilla County, Oregon.

Absent the injection capability of either of these two transmission lines, the anticipated cost of Customer-owned facilities must be taken into account. Since the voltage of the BPA line is twice that of the NWE line, the rating of the substation equipment selected must be correspondingly higher. Disgen believes from an examination of local transmission facilities as well as conversations with NWE and BPA that both lines have the ability to accept an additional 70MW. However, three arguments can be made for connecting to the K-TF line rather than the HS-F line. The first is that the cost of 230kV substation facilities is noticeably higher than the cost of 115kV facilities. The second is that system reliability requirements for connecting to a 230kV line are likely to be more stringent than for a 115kV line. The third is the transmission bottleneck west of the Hot Springs Substation discussed in the Transmission System section above. Therefore, at this time Disgen recommends interconnection to the Kerr – Thompson Falls 115kV transmission line. It should be left to NWE to decide which of its two circuits would be most appropriate.

Dams

If the wind project in question connects to the K-TF line, the Kerr Dam and Thompson Falls Dam will be very close in terms of electrical proximity. Both dams are owned and operated by PPL Montana (PPL MT). PPL MT does not own any transmission lines, but it does own generators and markets. It serves many network customers of NWE, so this is one case where it may make sense to connect to NWE but sell power to PPL MT. PPL MT has also expressed a general interest in owning wind projects as an alternative to being the off-take entity for a project with a different owner. PPL MT does not currently have any wind in its portfolio, but that is not by design.

It is a well-known fact that a wind project is not in itself a firm or dispatchable resource. Hydro can be an excellent regulator but it is subject to climatological shifts in the form of floods and droughts. Wind is subject to daily and seasonal variability, but this fluctuation

is not directly related to the forces that affect hydro power. Therefore, the partnership of a wind and hydro project should be an excellent match; each one improves the reliability of the other. Wind-hydro collaboration has been studied in several places on a large scale and exists in practice on a system-wide scale for many utilities whose portfolios include both wind and hydro power. Disgen proposes that PPL MT be engaged in discussions about purchasing the output from the wind project and integrating it into their existing hydro resources. Since they both own and operate the dams, they will have a substantial amount of freedom to design control schemes that best serve their customers. As discussed earlier, a PPA with PPL MT also has the added benefit of avoiding transmission charges.

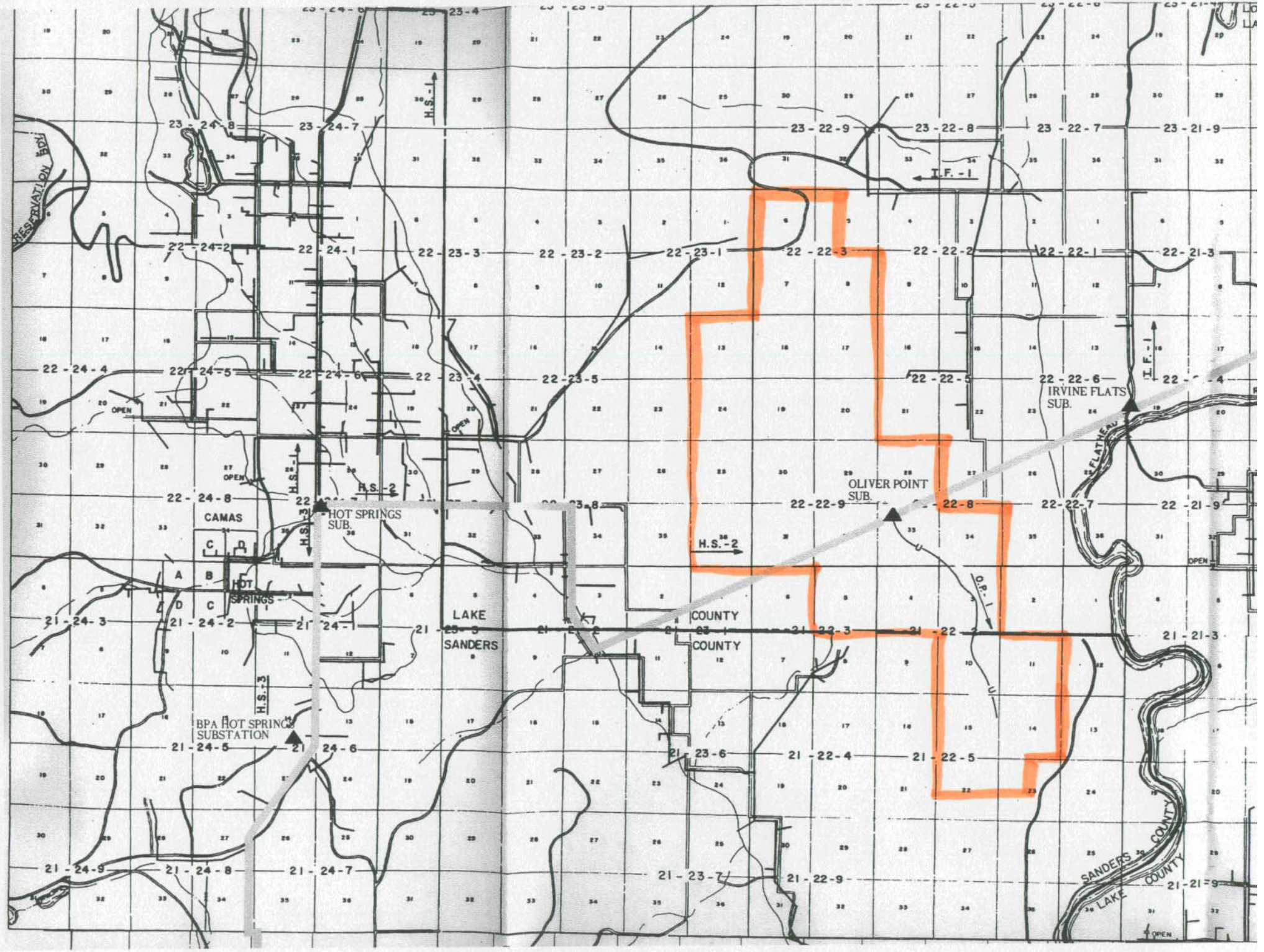
It is premature at this point to attempt to demonstrate the day-by-day and month-by-month logic of integrating a wind project in the Salish Mountains with the Kerr and/or Thompson Falls Dams since less than one year of wind data has been collected to date. Even so, historical data for the Kerr Dam has been supplied in Appendix 7. Disgen recommends comparing the anticipated output of the wind project with the dams' data when a full year has been collected. PPL MT should then be approached to discuss such an arrangement.

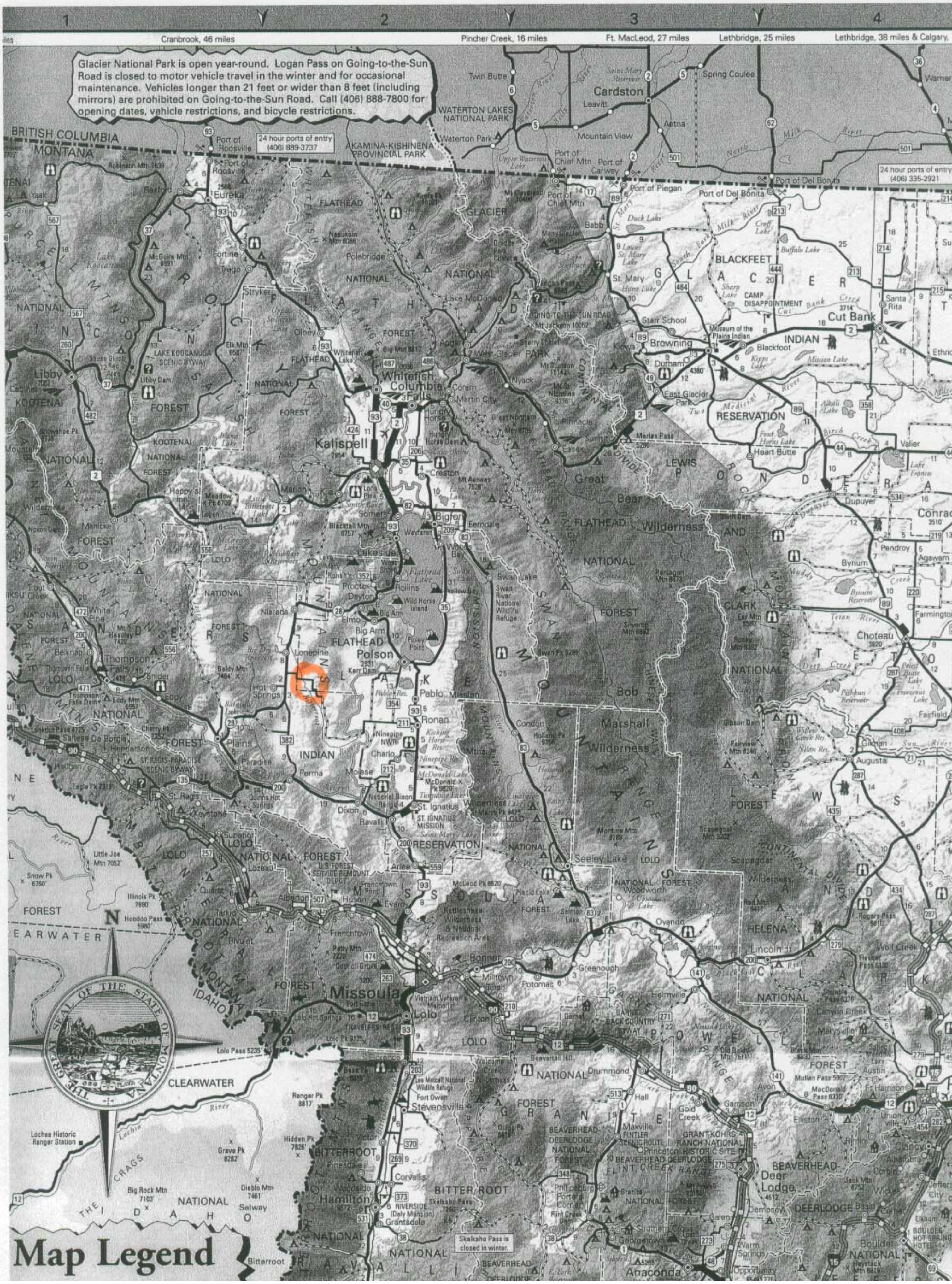
Conclusion

It is possible to avoid wasting months of time and thousands of dollars in the late development stages by making a few prudent decisions in the early stages. These include the selection of the interconnection point, target power purchaser, and basic project size. From an initial, cursory look at the local transmission system, it appears that the best interconnection point would be the Northwestern Energy Kerr – Thompson Falls transmission line. The target power purchaser would thus be either NWE or PPL MT. PPL MT may be the more likely buyer. Finally, the project size should be set at roughly 70MW. If conditions change in the future, these three recommendations would also be subject to change.

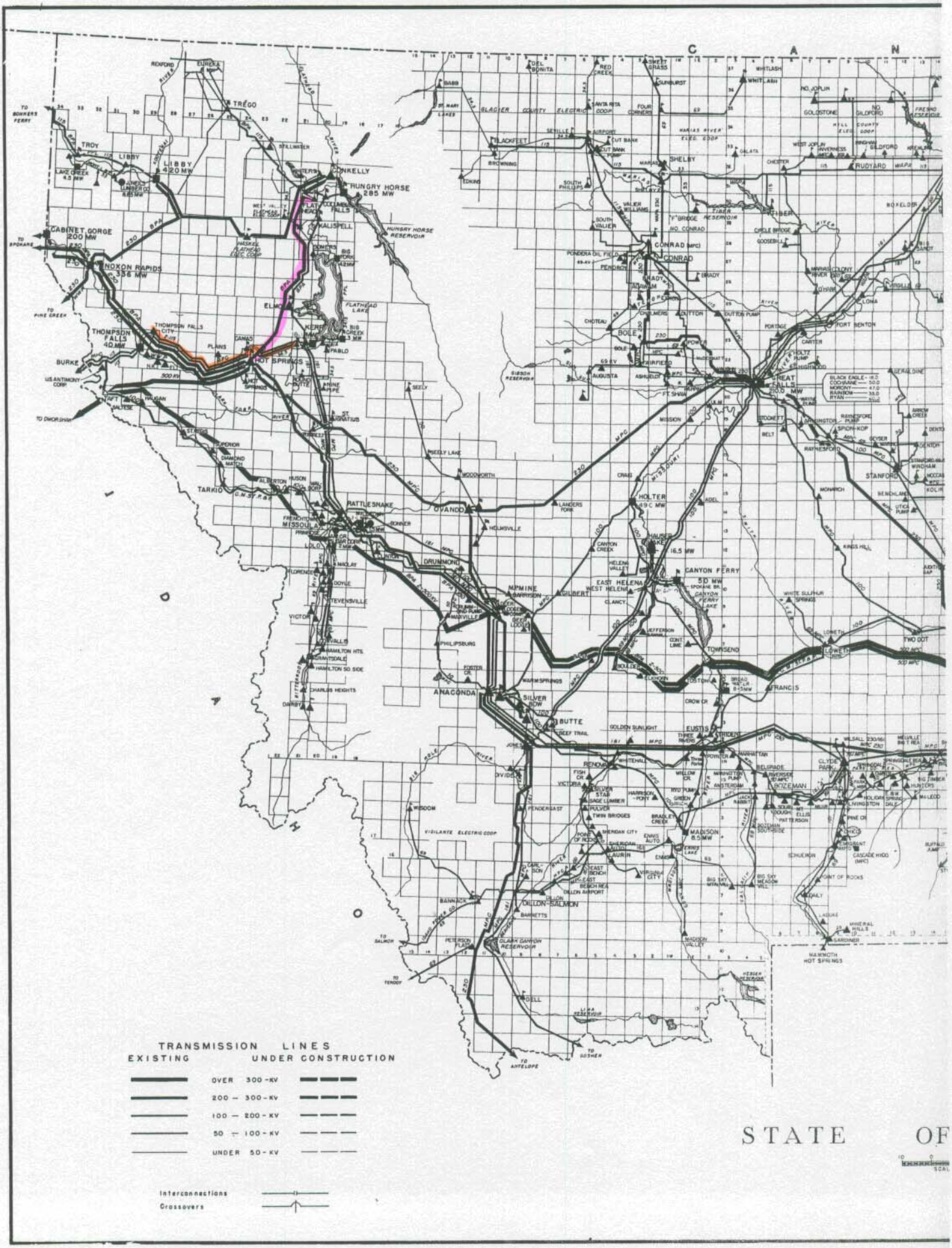
Disgen is confident of its abilities to guide the Tribe deftly and efficiently through the sometimes tricky interconnection process and thus help make a wind project on the Flathead Reservation a rapidly-approaching reality.

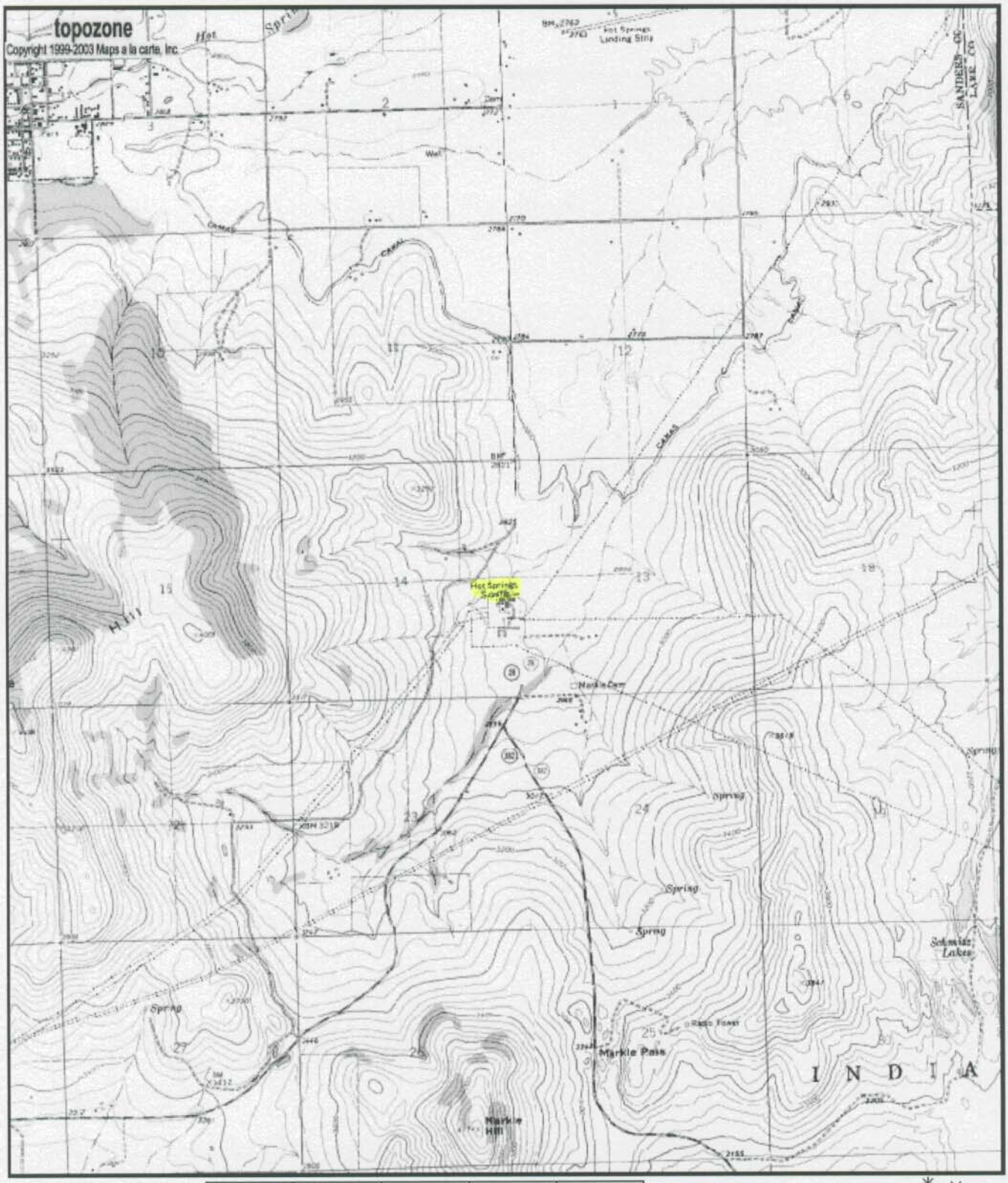
APPENDIX 1 – SITE MAP


HOT SPRINGS SUB.
OLIVER POINT SUB.
IRVINE FLATS SUB.
BPA HOT SPRINGS SUBSTATION
CAMAS
LAKE SANDERS COUNTY
SANDERS COUNTY LAKE COUNTY
H.S.-1
H.S.-2
H.S.-3
T.F.-1
O.P.-1
OPEN


1
2
3
4
Cranbrook, 46 miles
Pincher Creek, 16 miles
Ft. MacLeod, 27 miles
Lethbridge, 25 miles
Lethbridge, 38 miles & Calgary, 1
Glacier National Park is open year-round. Logan Pass on Going-to-the-Sun Road is closed to motor vehicle travel in the winter and for occasional maintenance. Vehicles longer than 21 feet or wider than 8 feet (including mirrors) are prohibited on Going-to-the-Sun Road. Call (406) 888-7800 for opening dates, vehicle restrictions, and bicycle restrictions.
24 hour ports of entry (406) 889-3737
24 hour ports of entry (406) 335-2921
BRITISH COLUMBIA
MONTANA
WATERTON LAKES NATIONAL PARK
AKAMINA-KISHINENA PROVINCIAL PARK
Cardston
Twin Butte
Spring Coulee
Mountain View
Waterton Park
Port of Roosville
Port of Chief Mtn
Port of Piegan
Port of Del Bonita
Eureka
Glacier National Park
Flathead National Forest
Kootenai National Forest
Blackfeet Indian Reservation
Browning
East Glacier Park
Cut Bank
Whitefish
Columbia Falls
Kalispell
Libby
Bigfork
Lakeside
Polson
Flathead Lake
Flathead Indian Reservation
Ronan
St. Ignatius
Hot Springs
Thompson Falls
Plains
Superior
Lolo National Forest
Bob Marshall Wilderness
Great Bear Wilderness
Swan Lake
Seeley Lake
Choteau
Conrad
Augusta
Missoula
Lolo
Stevensville
Hamilton
Bitterroot National Forest
Deer Lodge
Anaconda
Helena
Lincoln
Clearwater
IDAHO
MONTANA
Skalkaho Pass is closed in winter.
Map Legend

APPENDIX 2 – TRANSMISSION MAPS


C A N
TRANSMISSION LINES
EXISTING
UNDER CONSTRUCTION
OVER 300 - KV
200 - 300 - KV
100 - 200 - KV
50 - 100 - KV
UNDER 50 - KV
Interconnections
Crossovers
STATE OF



0 0.6 1.2 1.8 2.4 3 km

0 0.4 0.8 1.2 1.6 2 mi

Map center is UTM 11 678427E 5272238N (WGS84/NAD83)

Hot Springs quadrangle

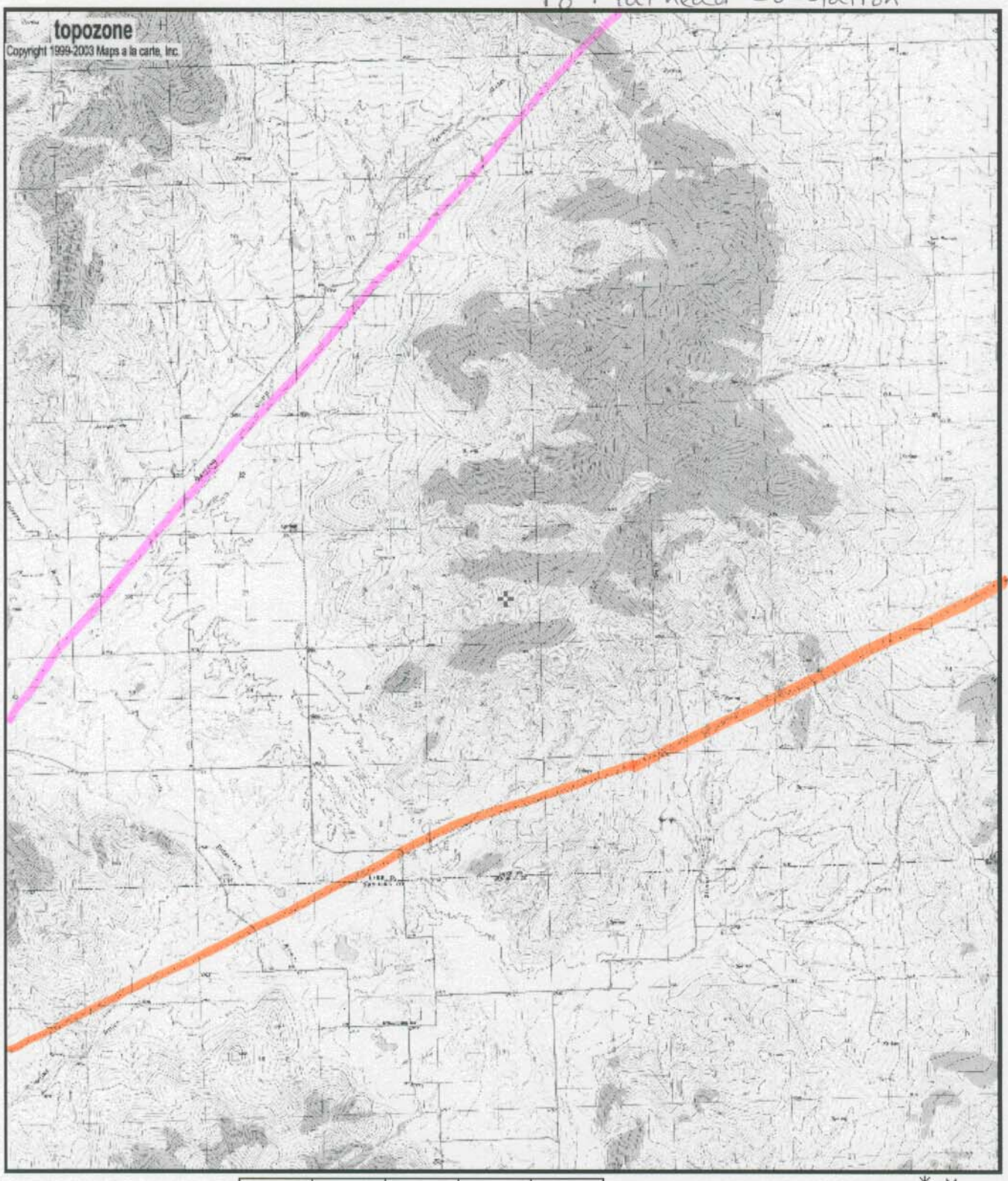
Projection is UTM Zone 11 NAD83 Datum

M=16.02

G=1.753

Salish Mtn Site Area

To Flathead Substation



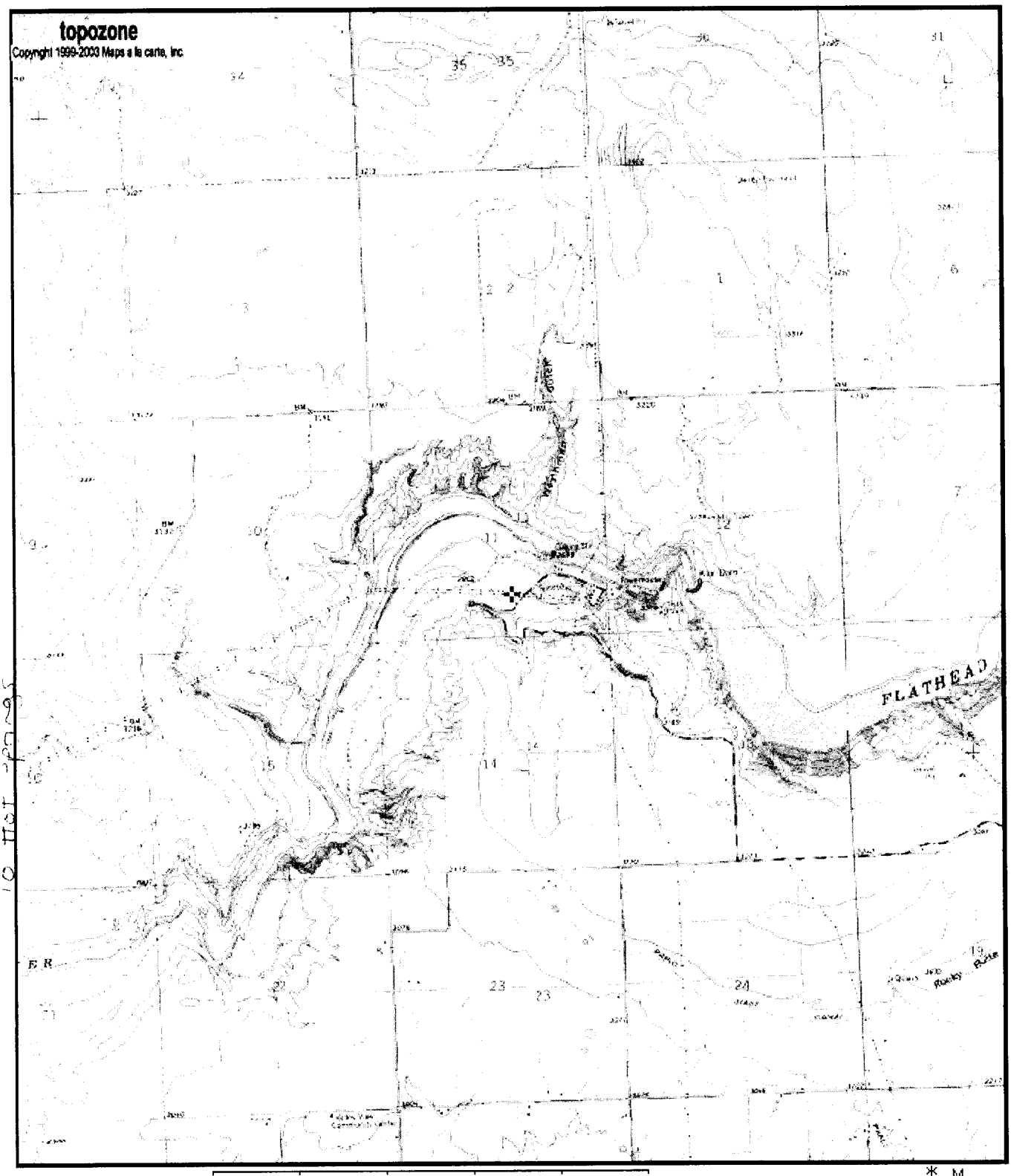
0 1 2 3 4 5 km

0 0.8 1.6 2.4 3.2 4 mi

Map center is UTM 11 689014E 5279004N (WGS84/NAD83)
Irvine Hill quadrangle
Projection is UTM Zone 11 NAD83 Datum

M=15.982
G=1.86

Kerr Dam



Map center is UTM 11 706306E 5284155N (WGS84/NAD83)
Buffalo Bridge quadrangle
Projection is UTM Zone 11 NAD83 Datum

M=15.904
G=2.034

APPENDIX 3 – RATE SCHEDULES

Comparative Transmission and Ancillary Service Charges

	Bonneville Power Authority	*Northwestern Energy*
Type of Service	*Cost*	*Cost*
Firm Point-to-Point	$12.34/kW per year	$37.20/kW per year
Nonfirm Point-to-Point	$0.035-0.047/kW per day	$3.10/kW per month
Scheduling, System Control, and Dispatch	$1.99/kW per year	$2.04/kW per year
Reactive Supply and Voltage Control	$0.80/kW per year	$1.56/kW per year
Regulation and Frequency Response	$0.0003/kWh	$1.22/kW per year
Energy Imbalance	charge is 110% of incremental cost if between +7.5% and +1.5% of scheduled output credit is 90% of incremental cost if between -7.5% and -1.5% of scheduled output charge is 125% of highest incremental cost if greater than +7.5% of scheduled output credit is 75% of lowest incremental cost if less than -7.5% of scheduled output	90% of market power price if between +/-10% and +/-2.5% of scheduled output. 80% of market power price if outside +/-10% of scheduled output
Operating Reserve - Spinning Reserve	$0.00839/kWh	$7.56/kW per month
Operating Reserve - Supplemental Reserve	$0.00839/kWh	$7.32/kW per month

***Please note that not all of the above charges will be applied. The specific charges to be applied depend on the nature of the interconnection, sale of power, and transmission service sought.

APPENDIX 4 – INTERCONNECTION REQUEST FORM

NorthWestern Energy

Generation Interconnection Request

Date Received by NorthWestern Energy

1. Project Name

2. Description of Project

☐ Proposed New Large Generating Facility

☐ Increase in Generating Capacity or a Material Modification of an existing Generating Facility

3. Type of Interconnection Service Requested (check one or both as appropriate)

☐ Energy Resource – Connected resource may deliver the Generating Facility's electric output using the existing firm or non firm capacity on an as available basis.

☐ Network Resource – Connected resource integrated to serve NorthWestern Energy Native load

4. Proposed Commercial Operation Date

5. Total Project Name Plate Rating (Attachment A to be completed for generator details)

Maximum Summer Output @ Ambient degrees C

Maximum Winter Output @ Ambient degrees C

6. Initial Processing Fee

Based upon total Project name Plate Rating (kW), the initial processing fee to be submitted with the application will be:

☐ Less than 26 kW-$100

☐ 26 thru 10,000 kW -$1,000

☐ 10,001 thru 20,000 kW -$2,000

☐ Greater than 20,000 kW -$10,000

7. Project Location (Please provide sketch or map)

General Location

NorthWestern Energy facilities, including voltage level, the Project is expected to interconnect to

State	County	Township
Range	Quarter	Section

OR

Street Address

Nearest Intersection

8. Evidence of Site Control as specified in the LGIP (check one)

☐ Is attached to the Interconnection Request.
☐ Will be provided at a later date in accordance with the LGIP (Additional $10,000 deposit required)

9. Project Developer

Company		
Contact		
Mailing Address		
Mailing Address		
City	State	Zip
Phone	Fax	
Note: This application is an interconnection request, not a request for transmission service. This application does not address the requirements for additional studies and/or upgrades for any transmission services that might be required for delivery of energy to a purchaser. Transmission service is acquired under NorthWestern Energy's Open Access Transmission Tariff. The tariff and the procedures for obtaining transmission service can be found on the NorthWestern Energy OASIS site at http://www.nwoasis.org/oasis/nwmt.		

10. Submitted By

Name (Type or Print)	Signature:
Title and Company	Date

Submit Generation Interconnection Request to:

NorthWestern Energy
Attn: Dan Wheeler
Transmission Services
40 E. Broadway
Butte, MT 59701

Attachment A
Interconnection Request
(Page 1)

LARGE GENERATING FACILITY DATA

1. UNIT RATINGS

KVA:	°F:
Voltage:	Power Factor:
Speed (RPM):	Connection (e.g. Wye):
Short Circuit Ratio:	Frequency (Hertz):
Stator Amperes at Rated KVA:	Field Volts:
Max Turbine MW:	°F:

2. COMBINED TURBINE-GENERATOR-EXCITER INERTIA DATA

Inertia Constant: H =	KW sec/ KVA
Moment-of-Inertia: WR2 =	lb. ft.^{2}

3. REACTANCE DATA (PER UNIT-RATED KVA)

	DIRECT AXIS	QUADRATURE AXIS
Synchronous - saturated	X_{dv} =	X_{qv} =
Synchronous - unsaturated	X_{di} =	X_{qi} =
Transient - saturated	X'_{qv} =	X'_{qi} =
Transient - unsaturated	X'_{di} =	X'_{qi} =
Subtransient - saturated	X''_{di} =	X''_{qv} =
Subtransient - unsaturated	X''_{di} =	X''_{qi} =
Negative Sequence - saturated	X_{2v} =	
Negative sequence - unsaturated	X_{2i} =	
Zero Sequence - saturated	X_{0v} =	
Zero Sequence - unsaturated	X_{0i} =	
Leakage Reactance	X_{lm} =	

4. FIELD TIME CONSTANT DATA (SEC)

Open Circuit	T'_{d0} =	T'_{q0} =
Three Phase Short Circuit Transient	T'_{d3} =	T'_{d3} =
Line to Line Short Circuit Transient	T'_{d2} =	
Line to Neutral Short Circuit Transient	T'_{d1} =	
Short Circuit Subtransient	T''_{d} =	T''_{q} =
Open Circuit Subtransient	T''_{do} =	T''_{qo} =

5. ARMATURE TIME CONSTANT DATA (SEC)

Three Phase Short Circuit	T_{a3} =
Line to Line Short Circuit	T_{a2} =
Line to Neutral Short Circuit	T_{a1} =
Note: If requested information is not applicable, indicate by marking "N/A"	

6. ARMATURE WINDING RESISTANCE DATA (PER UNIT)

Positive	R_1 =	
Negative	R_2 =	
Zero	R_0 =	
Rotor Short Time Thermal Capacity	I^2t =	
Field Current at Rated KVA, Field Current and PF	Amps	
Field Current at Rated KVA, Field Current, 0 PF	Amps	
Three Phase Armature Winding Capacitance	Microfarad	
Field Winding Resistance	Ohms	°C
Armature Winding Resistance (Per Phase)	Ohms	°C

7. CURVES

☐	Provide Saturation, Vee, Reactive Capability, Capacity Temperature Correction Curves
☐	Designate normal and emergency Hydrogen Pressure operating range for multiple curves

8. GENERATOR STEP-UP TRANSFORMER DATA

Capacity	Self-cooled =	KVA	Maximum =	KVA
Voltage Ratio	Generator Side =	kV	System Side =	kV
Winding Connections (Wye or Delta)	Generator =		System Side =	
Fixed Taps Available				
Present Tap Setting	Generator Side =	kV	System Side =	kV
Positive Sequence Impedance	OA Rating Z_1 =	%	X/R =	
Zero Sequence Impedance	OA Rating Z_0 =	%	X/R =	

9. EXCITATION SYSTEM DATA

Identify appropriate IEEE model block diagram of excitation system and power system stabilizer (PSS) for computer representation in power system stability simulations and the corresponding excitation system and PSS constants for use in the model.

10. GOVERNOR SYSTEM DATA

Identify appropriate IEEE model block diagram of governor system for computer representation in power system stability simulations and the corresponding governor system constants for use in the model.

11. WIND GENERATOR DATA

Number of generators to be interconnected pursuant to this interconnection request		KVA each	☐ Single Phase ☐ Three Phase
Rotor Elevation above ground		ft.	
Inverter Manufacturer			
Model Name			
Model Number			
Version			
List the adjustable set points for the protective equipment or software:			
Note: A completed PTI (PSS/E) model data sheet must be supplied with the interconnection Request. ☐ Model has been supplied with the request. ☐ Model will be supplied at the Scoping Meeting			

12. INDUCTION GENERATOR DATA

(*) Field Volts		Volts
(*) Field Amperes		Amps
(*) Motoring Power (kW)		KW
(*) Neutral Grounding Resistor (If Applicable)		
(*) I_2^2t or K (Heating Time Constant)		
(*) Rotor Resistance		
(*) Stator Resistance		
(*) Stator Reactance		
(*) Rotor Reactance		
(*) Magnetizing Reactance		
(*) Short Circuit Reactance		
(*) Exciting Current		Amps
(*) Temperature Rise		
(*) Frame Size		
(*) Design Letter		
(*) Reactive Power Required in VARs (No Load)		VARs
(*) Reactive Power Required in VARs (Full Load)		VARs
(*) Total Rotating Inertia	H=	Per Unit on KVA Base
Note: Please consult NorthWestern Energy prior to submitting the Interconnection Request to determine if the information designated by (*) is required.		

APPENDIX 5 – LIST OF CUSTOMERS

ATTACHMENT E

Index Of Point-To-Point Transmission Service Customers

Customer	Date of Service Agreement
Missoula Electric Cooperative, Inc. (Firm and Non-Firm)	October 1, 1996
Vigilante Electric Cooperative, Inc. (Firm and Non-Firm)	September 30, 1996
Idaho Power Company (Non-Firm)	November 1, 1996
PacifiCorp (Non-Firm)	November 1, 1996
Portland General Electric Company (Non-Firm)	November 1, 1996
Puget Sound Power & Light Company (Non-Firm)	November 1, 1996
Sierra Pacific Power Company (Non-Firm)	November 1, 1996
The Washington Water Power Company (Non-Firm)	November 1, 1996
Western Area Power Administration, Rocky Mountain Region (Non-Firm)	November 1, 1996
Aquila Power Corporation	January 24, 1997
Citizens Lehman Power Sales	January 24, 1997
Los Angeles Department of Water and Power	January 27, 1997
Powerex	April 7, 1997
Idaho Power Company (Firm)	June 30, 1997
PacifiCorp (Firm)	July 18, 1997
Powerex (Firm)	July 18, 1997
Idaho Power Company (Firm - Replaces Rate Schedule FERC No. 221)	February 1, 1998
Western Area Power Administration (Firm - Replaces Rate Schedule FERC No. 227)	February 1, 1998
PacifiCorp (Firm)	April 6, 1998
Portland General Electric Company (Firm)	April 9, 1998
Puget Sound Energy, Inc. (Firm)	April 9, 1998
The Washington Water Power Company (Firm)	April 9, 1998

Index Of Point-To-Point Transmission Service Customers (cont.)

Customer	Date of Service Agreement
Illinova Energy Partners, Inc. (Firm and Non-Firm)	July 13, 1998
PG&E Energy Trading - Power, L.P. (Firm and Non-Firm)	July 22, 1998
Stone Container Corporation (Firm)	November 9, 1998
Ash Grove Cement West, Inc. (Firm)	December 1, 1998
Conoco, Inc.	January 1, 1999
Arizona Public Service (Firm and Non-Firm)	June 1, 1999
Transalta Energy Marketing (US) Inc. (Firm and Non-Firm)	August 10, 1998
Western Area Power Administration (Firm and Non-Firm)	July 28, 1999
PacifiCorp Power Marketing, Inc. (Firm and Non-Firm)	October 1, 1999
Enron Power Marketing, Inc. (Firm and Non-Firm)	October 8, 1999
Cargill-Alliant, LLC (Firm and Non-Firm)	September 22, 1999
PP&L Energy Plus Co. (Firm and Non-Firm)	June 11, 1999
PP&L Montana, LLc (Firm and Non-Firm)	November 9, 1999
NorthWestern Energy, Colstrip 4 Lease Management Division (Firm and Non-Firm)	December 9, 1999
Duke Energy Trading and Marketing, LLC (Firm and Non-Firm)	December 14, 1999
Sierra Pacific Energy Company (Firm and Non-Firm)	January 19, 2000
Amoco Energy Trading Corporation (Firm and Non-Firm)	March 13, 1998
Southern Company Energy Marketing L.L.C. (Firm and Non-Firm)	April 4, 2000
Public Service Company of Colorado (Firm and Non-Firm)	July 13, 2000
Constellation Power Source, Inc. (Firm and Non-Firm)	July 21, 2000
Powerex ((2) Long-Term Firm)	March 23, 2001
The Montana Power Power Marketing Company (Long-Term Firm)	June 1, 2001

Index Of Point-To-Point Transmission Service Customers (cont.)

Customer	Date of Service Agreement
IdaCorp Energy (Firm)	March 1, 2002
Morgan Stanley Capital Group, Inc. (Firm and Non-Firm)	July 19, 2002
Rainbow Energy Marketing Corp. (Firm and Non-Firm)	November 1, 2004
Basin Electric Power Cooperative (Firm and Non-Firm)	November 1, 2004
Calpine Electric (Firm and Non-Firm)	November 1, 2004

ATTACHMENT I

Index Of Network Integration Transmission Service Customers

Customer	Date of Service Agreement
Commercial Energy of Montana	September 30, 1998
Conoco Pipe Line Company	October 1, 1998
The Colstrip Project Owners	October 1, 1998
Ballard Petroleum LLC	October 15, 1998
The Town of Philipsburg	November 1, 1998
Montana Resources	January 1, 1999
Golden Sunlight Mines, Inc.	March 1, 1999
Cenex Harvest States Cooperatives	March 1, 1999
Illinova Energy Partners, Inc.	March 1, 1999
Ash Grove Cement Company	March 1, 1999
Montana Refining Company	March 15, 1999
Energy West Resources, Inc.	April 1, 1999
Western Area Power Administration	July 1, 1999
Louisiana-Pacific Corporation	August 1, 1999
Smurfit-Stone Container Corporation	October 1, 1999
Big Horn County Electric Cooperative Inc.	December 15, 1999
Central Montana Electric Power Cooperative Inc.	July 1, 1999
PPL EnergyPlus, LLC	June 1, 2000
Stimson Lumber Company	July 1, 2000
Holnam, Inc.	September 1, 2000
Luzenac America, Inc.	May 1, 2001
ExxonMobil Corporation	June 1, 2001
Advanced Silion Materials LLC	July 1, 2001
Express Pipeline LLC	July 15, 2001
Barretts Minerals Inc.	July 1, 2002
Stillwater Mining Company	July 1, 2002

ATTACHMENT E

Index Of Point-To-Point Transmission Service Customers

Customer	Contract Number	Effective
AES Pacific Inc.	98TX-10170	7/17/98
AIG Trading	97TX-20100	9/26/97
ALCOA	01TX-10630	10/1/01
Allegheny Energy Supply	01TX-10447	4/2/01
American Electric Power	98TX-10134	2/8/98
Arizona Public Service	98TX-10130	9/1/98
Avista Corp - WWP	96MS-96008	10/1/96
Avista Corp. Transmission	01TX-10385	12/1/00
Avista Energy	97TX-50002	8/1/97
Axia Energy, LP	01TX-10475	10/1/01
BC Powerex	96MS-96084	2/1/99
BC Powerex	99TX-10230	5/1/02
BC Powerex	99TX-10251	6/16/01
Benton PUD	97TX-10041	6/1/97
Bonneville PBL	96MS-95363	10/1/96
BP Energy Company	98TX-10135	3/1/98
Calpine	98TX-10154	5/10/99
Calpine	01TX-10446	6/1/05
Cargill-Alliant	01TX-10734	10/1/01
Chehalis Power Generating	01TX-10395	11/1/03
Clatskanie	01TX-10649	10/1/01
Columbia Falls Aluminum	01TX-10685	10/1/01
ConAgra Energy Services	98TX-10149	4/1/98
Conoco	01TX-10459	4/24/01
Constellation Power	97TX-10089	10/1/97
Coral Power	00TX-10286	1/1/00
El Paso Power Services	99TX-10216	3/1/99
Engage Energy America LLC	98TX-10158	5/30/98
Enron Power Marketing	01TX-10728	10/1/01
Entergy Services	99TX-10262	8/13/99
EWEB	01TX-10710	10/1/01
FPLEMT-FPLM	99TX-10269	10/1/99
Franklin	97TX-10043	6/1/97
Goldendale Aluminum	96MS-96109	10/1/96
Grant	01TX-10679	10/1/01
Grays Harbor	96MS-96083	5/1/97
Idaho Falls Power	01TX-10576	10/1/01
Idaho Power Marketing	96MS-96108	10/1/96
Kaiser Aluminum	96MS-96107	10/1/01

Klamath Falls	99TX-10204	1/19/99
Klickitat	97TX-10038	10/1/97
Maclaren Energy	00TX-10361	1/1/03
McMinnville	01TX-10733	10/1/01
Merchant Energy Group	98TX-20111	11/16/98
Merrill Lynch Capital	01TX-20122	12/1/00
Mieco	99TX-10272	10/1/99
Mirant Americas	01TX-10472	5/24/01
Morgan Stanley	97TX-10031	4/1/97
NESCO	00TX-10363	1/1/02
Northwest Aluminum	96MS-96111	10/1/96
Okanogan PUD	01TX-10686	10/1/01
PacifiCorp	96MS-96035	10/1/96
PacifiCorp	00TX-10346	10/1/99
PacifiCorp	01TX-10458	5/30/01
PacifiCorp Pwr Marketing	00TX-10367	10/1/01
Pend Oreille	97TX-10090	10/1/97
PGE Marketing	96MS-96095	10/1/96
Portland General Electric	98TX-10174	10/22/98
PP&L - Montana	00TX-20117	10/22/99
Public Svc. of Colorado	00TX-10281	12/1/99
Public Svc. of New Mexico	99TX-10202	1/12/99
Puget Sound Energy	01TX-10748	10/1/01
Reliant Energy Services	01TX-10513	6/21/01
Richland	97TX-10049	6/1/97
San Diego	01TX-10456	4/20/01
Saskatchewan Power Corp	01TX-10473	5/20/01
Seattle City Light	96MS-96018	8/1/99
Sierra Marketer	01TX-10461	1/1/02
Sierra Pacific Energy	00TX-10284	2/1/00
Snohomish	96MS-96092	10/1/96
Springfield Utility Board	01TX-10706	10/1/01
Tacoma Power	98TX-10103	2/1/98
Tenaska Power Services	98TX-10129	1/24/98
Tractebel Energy Mktg.	99TX-10208	4/1/99
TransAlta Energy Mktg US	97TX-20103	7/22/97
TransAlta Energy Mktg US	98TX-10172	8/6/98
Turlock	00TX-10344	7/18/00
TXU Energy Traders	99TX-10259	7/1/99
Vanalco	01TX-10775	10/1/01
Vernon	99TX-10207	2/16/99
Vitol	97TX-20102	7/12/97
Williams Energy Marketing	01TX-10729	10/1/01

ATTACHMENT I

Index Of Network Integration Transmission Service Customers

Customer	Contract Number	Effective
Albion	01TX-10654	10/1/01
Alder Mutual Light Co	01TX-10436	10/1/01
Ashland, City of	01TX-10524	10/1/01
Asotin PUD	00TX-10351	10/1/01
Bandon, City of	01TX-10530	10/1/01
Benton REA	96MS-95364	10/1/96
Big Bend Electric Coop	00TX-10352	10/1/01
Blaine	00TX-10357	10/1/01
Bonners Ferry	01TX-10411	10/1/01
Canby	01TX-10648	10/1/01
Cascade Locks, City of	01TX-10435	10/1/01
Central Lincoln PUD	98TX-10136	11/1/99
Central Montana Electric	00TX-10316	6/21/00
Centralia, City of	98TX-10178	11/1/98
Cheney	01TX-10721	10/1/01
Chewelah, City of	01TX-10544	10/1/01
Clallam	01TX-10410	10/1/01
Clark Public Utilities	01TX-10381	10/1/01
Columbia Basin Electric	00TX-10370	10/1/01
Columbia Power Coop	00TX-10338	10/1/01
Columbia REA	00TX-10331	10/1/01
Columbia River PUD	01TX-10463	10/1/01
Consolidated Irrigation	01TX-10483	10/1/01
Coulee Dam, City of	01TX-10546	10/1/01
Cowlitz	01TX-10691	10/1/01
DOE-Albany	01TX-10538	10/1/01
DOE-Richland	00TX-10353	7/23/01
Drain, City of	01TX-10425	10/1/01
Eatonville Power & Light	01TX-10604	10/1/01
Ellensburg	96MS-96082	10/1/96
Elmhurst Mutual P&L	01TX-10420	10/1/01
Emerald PUD	01TX-10695	10/1/01
Energy NW (WPPSS)	01TX-10380	10/1/01
Fairchild AFB	01TX-10543	10/1/01
Ferry County	01TX-10448	10/1/01
Fircrest	96MS-96073	10/1/01
Flathead	00TX-10350	10/1/01
Forest Grove	00TX-10297	10/1/01
Glacier	96MS-96063	10/1/96
Grant	01TX-10680	10/1/01

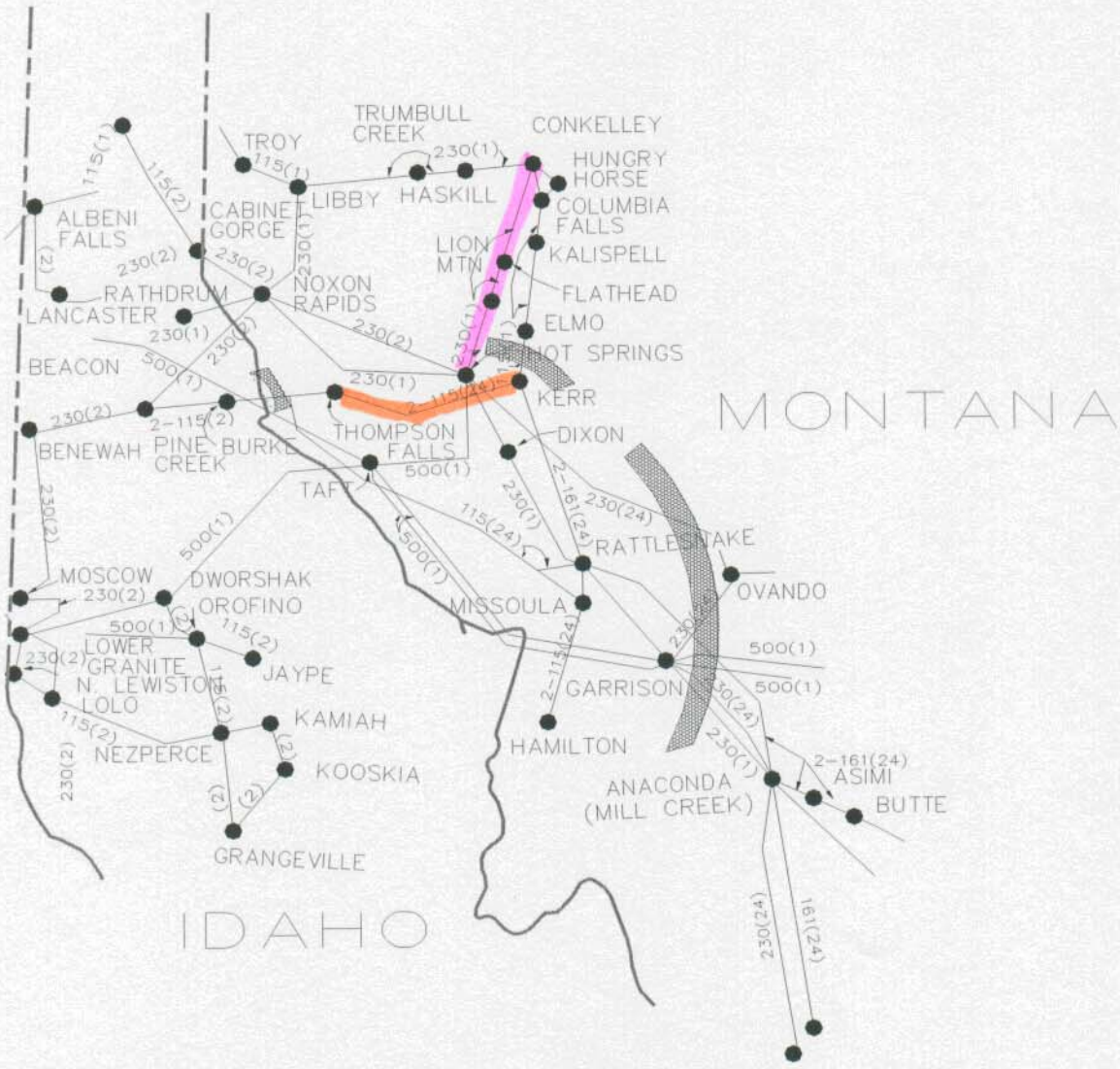
Harney	00TX-10333	10/1/01
Hermiston	01TX-10521	10/1/01
Hood River	00TX-10364	10/1/01
Idaho Energy Auth (IDEA)	00TX-10311	10/1/01
Inland Power	01TX-10450	10/1/01
Kittitas	01TX-10451	10/1/01
Kootenai	96MS-95360	10/1/01
Lewis	96MS-96091	10/1/96
Lincoln Electric Coop	96MS-96062	10/1/96
Longview Aluminum	01TX-01-10681	10/1/01
Mason 1	01TX-10427	10/1/01
Mason 3	01TX-10421	10/1/01
McCleary	01TX-10742	10/1/01
McMinnville	96MS-96086	10/1/96
Midstate Electric	00TX-10308	10/1/01
Milton	01TX10452	10/1/01
Milton-Freewater	00TX-10332	10/1/01
Missoula	96MS-96064	10/1/96
Modern	01TX-10449	10/1/01
Monmouth	01TX-10428	10/1/01
Nespelem	01TX-10487	10/1/01
Northern Wasco	01TX-10409	10/1/01
Ohop	96MS-96068	10/1/96
Orcas	98TX-10128	7/1/99
Oregon Trail	00TX-10295	5/1/01
Pacific PUD	01TX-10422	10/1/01
PacifiCorp	00TX-10327	10/1/00
Pend Oreille	00TX-10323	10/1/00
Peninsula	01TX-10390	10/1/01
Plummer	01TX-10545	10/1/01
Port Angeles	96MS-96090	10/1/96
Port of Seattle (Sea-Tac)	01TX-10460	7/1/01
Port Townsend Paper	01TX-10605	10/1/01
Ravalli	00TX-10294	10/1/01
Salem Electric	00TX-10309	10/1/01
Salmon River	01TX-10296	10/1/01
Skamania	01TX-10470	10/1/01
Springfield Utility Board	01TX-10697	10/1/01
Steilacoom	01TX-10391	10/1/01
Sumas	00TX-10365	10/1/01
Surprise Valley	01TX-10457	10/1/01
Tanner	01TX-10591	10/1/01
Tillamook	01TX-10682	10/1/01
Troy	00TX-10320	10/1/01
Umpqua	01TX-10606	10/1/01
US Navy - Bangor	00TX-10366	10/1/01

USBIA - Mission Valley	96MS-96065	10/1/96
USBIA - Wapato	01TX-10430	10/1/01
Vera Irrigation	01TX-10433	10/1/01
Vigilante	96MS-96046	10/1/96
Wahkiakum	01TX-10471	10/1/01
Wasco	01TX-10440	10/1/01
Wells REC	01TX-10423	10/1/01
Whatcom	98TX-10173	12/1/98

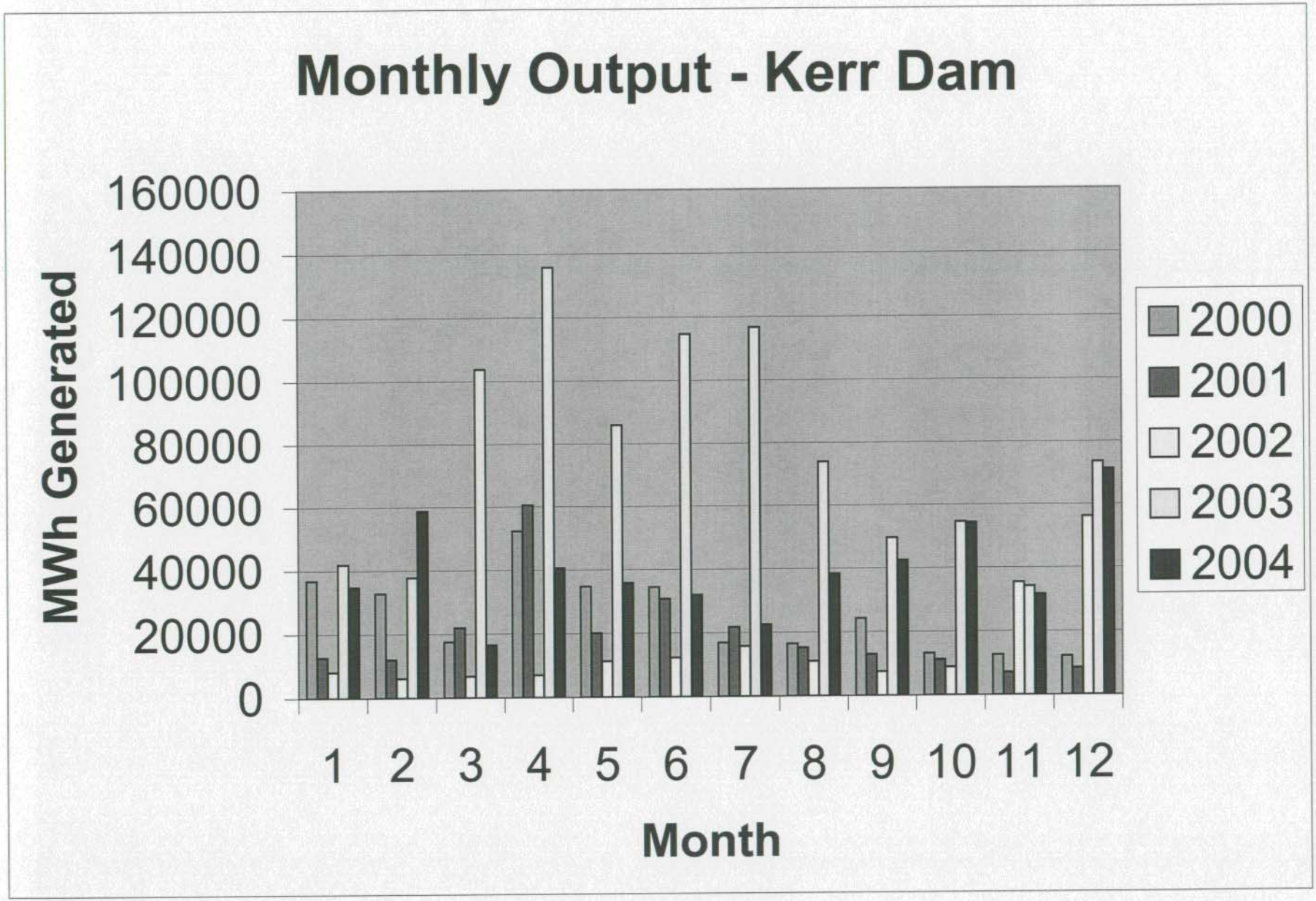
APPENDIX 6 – TRANSFER PATH MAP

WECC Transfer Paths

Montana to Northwest



APPENDIX 7 – DAM DATA (HISTORICAL)


Monthly Output - Kerr Dam
MWh Generated
160000
140000
120000
100000
80000
60000
40000
20000
0
1
2
3
4
5
6
7
8
9
10
11
12
Month
2000
2001
2002
2003
2004

Kerr Dam Output Data by Month

2000	2001	2002	2003	2004
36824.1	12686.3	8116.4	41943.1	34765.7
32753.4	12033.5	6188.5	37754.2	58791.1
17542.4	21999.5	6735.5	103678.9	16504
52297.3	60543.4	7010.4	135758.8	40638.3
34736.4	20112.2	11314.8	85904.1	35825.6
34477.4	30812.1	12300.1	114655.6	31973.7
16858.7	21768.1	15759.9	116668.6	22477.8
16406.5	15160.9	10891.5	73889.1	38315.8
24295	12951.5	7542.4	49614.5	42479.4
13171.1	11203.7	8893.5	54573.7	54342.9
12599.4	7090.2	35434	34131.6	31598.6
12156.5	8451	56141.4	73489.5	71180.7

Tribal Renewable Energy
Final Technical Report

Tab 6

Project Economics

Project Title: Flathead Reservation Renewable Energy Feasibility Study

Date of Report: September 2006

Recipient Organization: Salish & Kootenai Holding Company, Inc.

Award Number: DE-FG36-04GO14024

Partners: Salish & Kootenai Holding Company, Inc. Distributed Generation Systems, Inc. (cost sharing partner)

PRELIMINARY

PROJECT ECONOMICS FOR WIND FACILTY

For

S&K Holding Company

Summary

Distributed Generations Systems, Inc produced a financial model for consideration by the S&K Holding Company.

Disgen has provided a set of preliminary project economics for a 30MW facility to be interconnected to the Northwestern Energy 115kV Transmission Line as a baseline to the economic viability of this proposed project. This model assumed a Tribally owned project on Tribal trust lands, without using the existing production tax credit, and using no loans. It also assumed no property taxes being paid to the state Montana and Federal Government and no landowner payments to the Confederate Tribes of Salish & Kootenai. Given the low capacity of 19.3% for a Suzlon 88 Wind Turbine 2100kW, the breakeven energy sales price is 10.0 cents per kWh to make this propose wind project to deliver a rate of return of 9.0%. If the Tribe chooses to partner with a private investment partner who needs to utilize the existing Production Tax Credit, and negotiates a landowner payment, the rate of return and price per kWh can only improve to 8.4 cents per kWh.

A large component in delivering a competitive price is the amount of energy produced from the wind turbine. If the Salish Mountains had the wind resource of an annual average wind speed of more than 16 mph and at least a 35% capacity factor, the energy prices to be sold could go as low as 3.5 cents per kWh.

Sources and Uses of Funds

Flathead Model
Tribal Ownership, No Debt

		Unit Price	Units	Percent	Amount	
SOURCES						
	Senior Loan			0.0%		
	Other Debt			0.0%		
	Equity			100.0%	45,850,725	
	Total Sources			100.0%	45,850,725	
USES						
1.0	**Wind Turbine Cost**					
1.01	Wind Turbines and Towers	2,125,000	15	69.5%	31,875,000	
1.02	Wind Turbine Contingency	-	15	0.0%	0	
1.03	Shipping and Packing	100,000	15	3.3%	1,500,000	
1.04	Turbine Warranty (Years 3-5 total)	90,000	15	2.9%	1,350,000	
1.05	Sales Tax	0	15	0.0%	0	
	Subtotal			75.7%		34,725,000
2.0	**Balance of Construction**					
2.01	Base Construction Cost	525,000	15	17.2%	7,875,000	
2.02	Dynamic VAR Comp	-	1	0.0%	0	
2.03	Substation	2,000,000	1	4.4%	2,000,000	
2.04	O & M Building	-	1	0.0%	0	
2.05	Construction Interest			1.6%	741,963	
2.06	Construction Contingency			0.6%	296,250	
2.07	Sales Tax			0.0%	0	
	Subtotal Construction			23.8%		10,913,213
3.0	**Working Capital and Initial Operating Expenses**					
3.01	Working Capital Funding			0.1%	34,387	
3.02	Spare Parts			0.0%	-	
3.03	First Half -Year Insurance Premium			0.3%	118,125	
3.04	Initial Operations and Management Fee			0.0%	-	
3.05	Other Initial Operating Expense			0.0%	-	
	Subtotal Working Capital and Initial Operating Expenses			0.3%		152,512
3.0	**Lender Transaction Expenses**					
3.01	Legal Expenses			0.0%	-	
3.02	Construction Loan Fee			0.0%	-	
3.03	Permanent Loan Fee			0.0%	-	
3.04	Lender Consulting Expenses			0.0%	-	
3.05	Other Lender Costs			0.0%	-	
3.06	Title Insurance			0.0%	5,000	
3.07	Other			0.0%	-	
3.08	Initial Debt Reserve Funding			0.0%	-	
3.09	First Year Agency Fee			0.0%	-	
	Subtotal Lender Transaction Expenses			0.0%		5,000
4.0	**Equity Financing and Other Expenses**					
4.01	Equity Consulting Expenses			0.0%	-	
4.02	Development Costs			0.0%	-	
4.03	Legal Expenses			0.1%	50,000	
4.04	Organizational Costs			0.0%	5,000	
	Subtotal Equity Financing and Other Expenses			0.1%		55,000
5.0	**Development Costs and Fees**					
5.01	Developer Development Cost Reimbursement			0.0%	-	
5.02	Other Development Cost Reimbursement			0.0%		
5.03	Base Development Fee			0.0%	-	
5.04	Additional Development Fee			0.0%	-	
5.05	Project Construction Management			0.0%	-	
5.06	Land Owner Installation Fee ($/MW)	0	31.5	0.0%	-	
5.07	Substation Installation Fee			0.0%	-	
5.08	Development Contingency			0.0%	-	
	Subtotal Development Costs and Fees			0.0%		-
	Total Budget			100.0%		45,850,725

Flathead Model
Tribal Ownership, No Debt

Project Assumptions

Turbine Manufacturer		Suzlon S-88
Turbine Type		2100
Number of Turbines		15
KW Rating	kW	2,100
Capacity Installed	MW	31.50
Turbine Price (including tower)	$	2,125,000
Gross Annual kWh per Turbine	kWh	4,025,483
Net Output as Percent of Gross	%	90.0%
Net Annual kWh per Turbine	kWh	3,622,935
Availability	%	98.0%
Annual Production to Meter per Turbine	kWh	3,550,476
Total Annual Production to Meter	MWh	53,257
Net Capacity Factor	%	19.30%
Annual Decrease In Availability	%	0.00%
Project Life	years	30
1st Year of Operation	yyyy	2008
1st Month of Operation	number	12
1st Year Percent for Operating Costs	%	8.3%
1st Year Percent for kWh Production	%	3.0%
Base Year for Capital Costs	yyyy	2008
Construction Loan Closing	mm/dd/yy	07/01/08
Permanent Loan Closing	mm/dd/yy	12/01/08
Initial Spare Parts	$	-
Initial O&M/Mgt. Payment	no. of mo.	3
Percent of 1st Year Interest	%	8.3%
Base Construction Cost per Turbine	$	525,000
Construction Contingency	%	3%
First Year in Financial Model		2008
Final Year in Financial Model		2037

Capacity Factor Calculator		
Net Capacity Factor:	19.30%	
Gross Output:		

525,000	$250	/ kw

Electricity Purchaser	Begin	End
IOU Purchaser	12/1/2008	11/30/2028
Avoided Cost Purchaser	12/1/2028	11/30/2038

Contract Term: yrs 20

IOU Purchaser

PRODUCTION PER CONTRACT TERM

			Begin	End
Phase 1	%	50%	2008	2027
Phase 2	%	25%	2008	2027
Phase 3	%	25%	2008	2027

need to fix production %: **cannot be = 0% as currently modeled**

Levelized Cost of Energy over Project Life

		cents
Constant Currency - Base Yr	2008	0.000
Constant Currency - Op Yr 1	2008	0.000
Levelized Nominal Currency	2008	0.000

Nominal Discount Rate: 9.00%

Flathead Model
Tribal Ownership, No Debt

Energy Sale Prices

20 yr After Tax ROR: 9.0%

Base Energy Prices

	Begin Yr.	End Yr.	Contract Pricing	Avoided Cost	
Tranche 1	2008	2028	9.40	3.00	cents/kWh
Tranche 2	2029	2038	0.00	3.00	cents/kWh
Tranche 3	2039	2039	0.00	0.00	cents/kWh
Capacity Payment	2040	2040	0.00	0.00	$/kW-yr

Escalation of Contract Energy Prices

Tranche 1	Yrs Starting:	2008	2028	2038
	Rate	2.0%	2.0%	2.0%
Tranche 2	Yrs Starting:	2008	2028	2038
	Rate	2.0%	2.0%	2.0%
Tranche 3	Yrs Starting:	2008	2028	2038
	Rate	2.0%	2.0%	2.0%
Capacity Payment	Yrs Starting:	2008	2028	2038
	Rate	2.0%	2.0%	2.0%

Escalation of Avoided Cost Energy Prices

Tranche 1	Yrs Starting:	2008	2028	2038
	Rate	2.0%	2.0%	2.0%
Tranche 2	Yrs Starting:	2008	2028	2038
	Rate	2.0%	2.0%	2.0%
Tranche 3	Yrs Starting:	2008	2028	2038
	Rate	2.0%	2.0%	2.0%
Capacity Payment	Yrs Starting:	2008	2028	2038
	Rate	2.0%	2.0%	2.0%

Base Year (EOY) 2008

Debt Financing

Senior Loan

		Amortized	Cover. Ratios - Senior Debt	
			Minimum	Average
% Debt (if amort) or Coverage Ratio		0%		
Fixed Interest Rate		5.00%	0.00	0.00
Amortization Period (Years)		20		
Interest Only Period (Years)				
			Average Life (Years)	
Total Term		20	N/A	
Variable Coverage Ratio	Yrs Starting:	2008	2007	2010
	Percent			
Initial Loan Fee	1.00%			
Annual Agency Fee	$ -			

Other Debt

	Amortized	Cover. Ratios - Total Debt	
		Minimum	Average
% Debt (if amort) or Coverage Ratio	0%		
Interest Rate	8.25%	0.00	0.00
Term (Years)	15		
Interest Only Period (Years)	1		
		Average Life (Years)	
Total Term	16	N/A	

Debt Service Reserve

Debt Service Reserve (% of Annual)	50%	
Initial DSR (% of 1st Year Debt Service)	50%	
% of Cash Flow to Fund Reserve	50%	

Construction Debt

Construction Loan?	(Yes/No)	Yes
Amount	% of Cost	100%
Interest Rate	%	5.3%
Commitment Fee on Unused Funds	%	0.5%
Initial Loan Fee	%	0.0%

Flathead Model
Tribal Ownership, No Debt

Operations and Maintenance Expenses

Base Year		2008	
Operations & Maintenance Fee Options			
Cents/kWh (escalating)	cents	0.00	
Fixed Annual Pmt (escalating)	$		
Fixed Annual Pmt per Turbine (escalating)	$	25,000	
Percent of Revenues	%	0.00%	
% of Total O&M Subordinated	%	0.00%	
1st Year/Month Fees Begin		2008	12
Landowner Pymt Options			
Fixed Annual Pymt	$		(Landowner electric bill reimbursement)
Per kW (esc)	$		
% of Revenues (fixed)	%	0.00%	
% of Revenues (variable)		Year	Percent
Applied to Yrs Starting		2008	
Applied to Yrs Starting		2020	
Applied to Yrs Starting		2026	
Minimum Annual Pymt	$/Turbine		
Standby Electric Rate (escalating)	$/kWh	0.060	
Standby Electric Consumption	kWh	50,000	
Interconnect Fee to Utility (fixed $/KW-yr)	$	-	
Insurance/kW (escalating)	$	7.50	
Administration (esc)	$	20,000	
Audit/Legal/Miscellaneous (esc)	$	20,000	
Management Oversight Expense (esc)	$	20,000	
Other Expense (esc)	$	-	
Other Expense (% of rev)	%	0.0%	
Other Expense (constant)	$		
Other Expense Subordinated (esc)	$	-	
Developer Subordinated Fee (% of rev)	%	0.0%	
Interest Rate (Income) on Debt Resv/Cash		2.0%	
Accrued Interest as a % of Cash Interest Pymt		100%	
Working Capital Requirement as % of 1st Year Expenses		5.0%	
Capital Costs & General Inflation	(all years)	2.0%	
Operating Expense Escalation	(all years)	2.0%	
Book Life of Project	years	30	
Amortization Period for Intangible Assets	years	5	

Income & Other Taxes

Income Taxes

	Federal	CO		
Tax Rates	0.00%	0.00%	Yr Placed in Service	2008
			Short first yr?	No
At-Risk Limitations?	No	No	1st Year Percent	8.3%
Utilize Tax Losses?	Yes	Yes		

	Depr Methods Code	Type		Yrs or DB%	DB/SL Yrs	Book Life	D/A
Facility Costs	1	MACRS	42,338	5		30	D
Interconnect Costs	2	SL	2,000	20		30	D
Loan Expenses	3	SL	5	20		20	A
Organizational Costs	4	SL	5	5		5	A
			44,348				

			PTC Escalator	
1st Yr PTC	cents/kWh	-	1.8	2003
PTC Base Year	yyyy	2008	1.827	2004
Last Year of PTC	yyyy	2018	1.854405	2005
PTC Annual Escalation	%	1.5%	1.882221075	2006
			1.910454391	2007
			1.939111207	2008

Property Taxes

Cost of Equipment	45,638,213	Total Wind Turbine Costs (budget)	34,725,000
Assessed Value as Percent	29.0%	Total Balance of Plant Costs (budget)	10,913,213
Mil Rate ($ per $1000)	-	TOTAL COST OF EQUIPMENT	45,638,213
Decr in Prop Value/Yr	5.0%		
Min. Mil Rate (% of orig.)	20%		

Sales Taxes

Rate	0.00%

Flathead Model
Tribal Ownership, No Debt

Internal Rates of Returns/Development Fees

Internal Rates of Return

	Returns		ApproxUnleveragedReturns
Years	**Pre-tax**	**After-tax**	**Pre-tax**
5+			
10+	1.2%	1.2%	1.2%
15+	6.9%	6.9%	6.9%
20+	9.0%	9.0%	9.0%
25+	9.2%	9.2%	9.2%
30+	9.4%	9.4%	9.4%

Development Fees

Base Development Fee	% of cost	0.0%	of first	200	MW
Additional Development Fee	% of cost	0.0%	all over	200	MW

Income Statement

Flathead Model
Tribal Ownership, No Debt

	Closing	2008	2009	2010	2011	2012	2013	2014
		1	2	3	4	5	6	7
Operating Revenue								
Capacity Sales								
Electricity Sales		150	5,106	5,208	5,313	5,419	5,527	5,638
Total Revenues		150	5,106	5,208	5,313	5,419	5,527	5,638
Operating Expenses								
Operations & Maintenance		31	383	390	398	406	414	422
Landowner Payments		-	-	-	-	-	-	-
Interconnect and Electricity Consumption		0	3	3	3	3	3	3
Insurance		20	241	246	251	256	261	266
General and Administrative		2	20	21	21	22	22	23
Audit, Legal, Miscellaneous		20	20	21	21	22	22	23
Property Taxes		-						
Management		2	20	21	21	22	22	23
Lender Agency Fee		-	-	-	-	-	-	-
Other		-	-	-	-	-	-	-
Total Operating Expenses		75	688	701	716	730	744	759
NET OPERATING INCOME		76	4,419	4,507	4,597	4,689	4,783	4,878
Depreciation		123	1,478	1,478	1,478	1,478	1,478	1,478
Amortization		0	1	1	1	1	1	0
Subordinated Expenses								
Interest Income		(0)	(44)	(45)	(46)	(47)	(48)	(49)
Interest Expense								
PRETAX INCOME		(47)	2,984	3,073	3,164	3,257	3,352	3,449
Production Tax Credit								
Tax Provision								
NET INCOME		(47)	2,984	3,073	3,164	3,257	3,352	3,449

Income Statement

Flathead Model
Tribal Ownership, No Debt

	2015	2016	2017	2018	2019	2020	2021	2022
	8	9	10	11	12	13	14	15
Operating Revenue								
Capacity Sales								
Electricity Sales	5,751	5,866	5,983	6,102	6,225	6,349	6,476	6,606
Total Revenues	5,751	5,866	5,983	6,102	6,225	6,349	6,476	6,606
Operating Expenses								
Operations & Maintenance	431	439	448	457	466	476	485	495
Landowner Payments	-	-	-	-	-	-	-	-
Interconnect and Electricity Consumption	3	4	4	4	4	4	4	4
Insurance	271	277	282	288	294	300	306	312
General and Administrative	23	23	24	24	25	25	26	26
Audit, Legal, Miscellaneous	23	23	24	24	25	25	26	26
Property Taxes								
Management	23	23	24	24	25	25	26	26
Lender Agency Fee	-	-	-	-	-	-	-	-
Other	-	-	-	-	-	-	-	-
Total Operating Expenses	775	790	806	822	838	855	872	890
NET OPERATING INCOME	4,976	5,076	5,177	5,281	5,386	5,494	5,604	5,716
Depreciation	1,478	1,478	1,478	1,478	1,478	1,478	1,478	1,478
Amortization	0	0	0	0	0	0	0	0
Subordinated Expenses								
Interest Income	(50)	(51)	(52)	(53)	(54)	(55)	(56)	(57)
Interest Expense								
PRETAX INCOME	3,548	3,648	3,751	3,855	3,962	4,071	4,182	4,295
Production Tax Credit								
Tax Provision								
NET INCOME	3,548	3,648	3,751	3,855	3,962	4,071	4,182	4,295

Income Statement

Flathead Model
Tribal Ownership, No Debt

	2023	2024	2025	2026	2027	2028	2029	2030
	16	17	18	19	20	21	22	23
Operating Revenue								
Capacity Sales								
Electricity Sales	6,738	6,872	7,010	7,150	7,293	2,374	2,422	2,470
Total Revenues	6,738	6,872	7,010	7,150	7,293	2,374	2,422	2,470
Operating Expenses								
Operations & Maintenance	505	515	525	536	546	557	568	580
Landowner Payments	-	-	-	-				
Interconnect and Electricity Consumption	4	4	4	4	4	4	5	5
Insurance	318	324	331	337	344	351	358	365
General and Administrative	27	27	28	29	29	30	30	31
Audit, Legal, Miscellaneous	27	27	28	29	29	30	30	31
Property Taxes								
Management	27	27	28	29	29	30	30	31
Lender Agency Fee	-	-	-	-	-	-	-	-
Other	-	-	-	-				
Total Operating Expenses	907	926	944	963	982	1,002	1,022	1,042
NET OPERATING INCOME	5,830	5,947	6,066	6,187	6,311	1,372	1,400	1,428
Depreciation	1,478	1,478	1,478	1,478	1,478	1,478	1,478	1,478
Amortization	0	0	0	0	0	0		
Subordinated Expenses								
Interest Income	(58)	(59)	(61)	(62)	(63)	(14)	(14)	(14)
Interest Expense								
PRETAX INCOME	4,410	4,528	4,648	4,771	4,896	(92)	(64)	(36)
Production Tax Credit								
Tax Provision								
NET INCOME	4,410	4,528	4,648	4,771	4,896	(92)	(64)	(36)

Income Statement

Flathead Model
Tribal Ownership, No Debt

	2031	2032	2033	2034	2035	2036	2037
	24	25	26	27	28	29	30
Operating Revenue							
Capacity Sales							
Electricity Sales	2,519	2,570	2,621	2,674	2,727	2,782	2,837
Total Revenues	2,519	2,570	2,621	2,674	2,727	2,782	2,837
Operating Expenses							
Operations & Maintenance	591	603	615	628	640	653	666
Landowner Payments							
Interconnect and Electricity Consumption	5	5	5	5	5	5	5
Insurance	373	380	0	0	0	0	0
General and Administrative	32	32	33	33	34	35	36
Audit, Legal, Miscellaneous	32	32	33	33	34	35	36
Property Taxes							
Management	32	32	33	33	34	35	36
Lender Agency Fee	-	-	-	-	-	-	-
Other							
Total Operating Expenses	1,063	1,084	719	733	748	763	778
NET OPERATING INCOME	1,456	1,485	1,902	1,940	1,979	2,019	2,059
Depreciation	1,478	1,478	1,478	1,478	1,478	1,478	1,478
Amortization							
Subordinated Expenses							
Interest Income	(15)	(15)	(19)	(19)	(20)	(20)	(21)
Interest Expense							
PRETAX INCOME	(7)	22	443	482	521	561	602
Production Tax Credit							
Tax Provision							
NET INCOME	(7)	22	443	482	521	561	602

Cash Flow Statement

Flathead Model
Tribal Ownership, No Debt

		2008	2009	2010	2011	2012	2013	2014
PRETAX INCOME		(47)	2,984	3,073	3,164	3,257	3,352	3,449
Increased by:								
Book Depreciation		123	1,478	1,478	1,478	1,478	1,478	1,478
Book Amortization		0	1	1	1	1	1	0
Subordinated Expenses								
Accrued Interest Expense								
Cash Flow before Debt Service, Reserves & Taxes		76	4,463	4,552	4,643	4,736	4,831	4,927
Decreased by:								
Interest Payments		0	0	0	0	0	0	0
Principal Payments		0	0	0	0	0	0	0
Cash Flow before Reserves & Taxes		76	4,463	4,552	4,643	4,736	4,831	4,927
Debt Reserve Releases (Additions)								
Equity Investment	(45,851)							
PRETAX CASH FLOW	(45,851)	76	4,463	4,552	4,643	4,736	4,831	4,927
Production Tax Credit		0	0	0	0	0	0	0
Income Tax Benefit (Payment)								
AFTER-TAX CASH FLOW	(45,851)	76	4,463	4,552	4,643	4,736	4,831	4,927

Cash Flow Statement

Flathead Model
Tribal Ownership, No Debt

	2015	2016	2017	2018	2019	2020	2021	2022
PRETAX INCOME	3,548	3,648	3,751	3,855	3,962	4,071	4,182	4,295
Increased by:								
Book Depreciation	1,478	1,478	1,478	1,478	1,478	1,478	1,478	1,478
Book Amortization	0	0	0	0	0	0	0	0
Subordinated Expenses								
Accrued Interest Expense								
Cash Flow before Debt Service, Reserves & Taxes	5,026	5,126	5,229	5,333	5,440	5,549	5,660	5,773
Decreased by:								
Interest Payments	0	0	0	0	0	0	0	0
Principal Payments	0	0	0	0	0	0	0	0
Cash Flow before Reserves & Taxes	5,026	5,126	5,229	5,333	5,440	5,549	5,660	5,773
Debt Reserve Releases (Additions)								
Equity Investment								
PRETAX CASH FLOW	5,026	5,126	5,229	5,333	5,440	5,549	5,660	5,773
Production Tax Credit	0	0	0	0	0	0	0	0
Income Tax Benefit (Payment)								
AFTER-TAX CASH FLOW	5,026	5,126	5,229	5,333	5,440	5,549	5,660	5,773

Cash Flow Statement

Flathead Model
Tribal Ownership, No Debt

	2023	2024	2025	2026	2027	2028	2029	2030
PRETAX INCOME	4,410	4,528	4,648	4,771	4,896	(92)	(64)	(36)
Increased by:								
Book Depreciation	1,478	1,478	1,478	1,478	1,478	1,478	1,478	1,478
Book Amortization	0	0	0	0	0	0		
Subordinated Expenses								
Accrued Interest Expense								
Cash Flow before Debt Service, Reserves & Taxes	5,888	6,006	6,126	6,249	6,374	1,386	1,414	1,442
Decreased by:								
Interest Payments	0	0	0	0	0	0	0	0
Principal Payments	0	0	0	0	0	0	0	0
Cash Flow before Reserves & Taxes	5,888	6,006	6,126	6,249	6,374	1,386	1,414	1,442
Debt Reserve Releases (Additions)								
Equity Investment								
PRETAX CASH FLOW	5,888	6,006	6,126	6,249	6,374	1,386	1,414	1,442
Production Tax Credit	0	0	0	0	0	0	0	0
Income Tax Benefit (Payment)								
AFTER-TAX CASH FLOW	5,888	6,006	6,126	6,249	6,374	1,386	1,414	1,442

Cash Flow Statement

Flathead Model
Tribal Ownership, No Debt

	2031	2032	2033	2034	2035	2036	2037
PRETAX INCOME	(7)	22	443	482	521	561	602
Increased by:							
Book Depreciation	1,478	1,478	1,478	1,478	1,478	1,478	1,478
Book Amortization							
Subordinated Expenses							
Accrued Interest Expense							
Cash Flow before Debt Service, Reserves & Taxes	1,471	1,500	1,921	1,960	1,999	2,039	2,080
Decreased by:							
Interest Payments	0	0	0	0	0	0	0
Principal Payments	0	0	0	0	0	0	0
Cash Flow before Reserves & Taxes	1,471	1,500	1,921	1,960	1,999	2,039	2,080
Debt Reserve Releases (Additions)							
Equity Investment							
PRETAX CASH FLOW	1,471	1,500	1,921	1,960	1,999	2,039	2,080
Production Tax Credit	0	0	0	0	0	0	0
Income Tax Benefit (Payment)							
AFTER-TAX CASH FLOW	1,471	1,500	1,921	1,960	1,999	2,039	2,080