

Wind Resource Summary for Olga Site

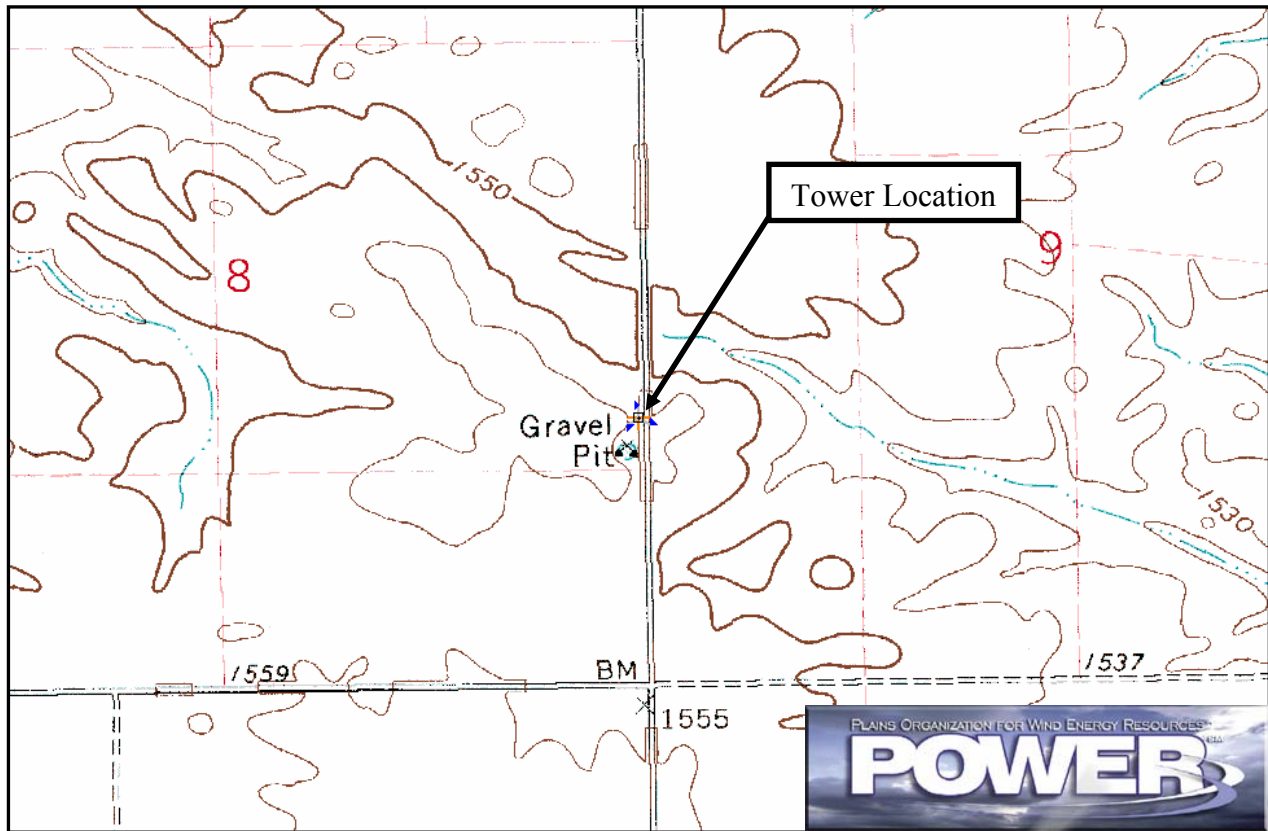
North Dakota Utility Study

Springs^a 1995, 1996, 1997, 1998, 1999, 2000, 2001 & 2002

Site Description:

Latitude: N 48° 46' 48"	Township: 161 N
Longitude: W 98° 2' 16"	Range: 57 W
Elevation: 1555 feet	Section: 9
Tower Type: Utility Tower	Tower Height: 300 feet

The monitoring site was 9.1 miles northeast of the town of Osnabrock, North Dakota. The tower was instrumented at four levels: 33 feet (10 m), 82 feet (25 m), 131 feet (40 m), and 180 feet (55 m). A gravel pit is located 200 feet due south of the site, as well as a windbreak roughly 0.3 miles south and southwest.



Summary Wind Data:	33 ft AGL ^b	82 ft AGL	131 ft AGL	180 ft AGL
Mean Wind Speed (mph)	11.6 mph	14.9 mph	16.2 mph	16.3 mph
Maximum, 60-min Mean Wind Speed	54.9 mph at 180 ft AGL – 4/6/1997 5:00 am			
Estimated Wind Power Class ^c	Class 3 (394 W/m ² at 180 ft AGL)			

^a Spring is defined as the months of March, April and May. Spring 1995 begins with March 1995. Data recovery rates at 33, 82, 131 and 180 feet were 41%, 41%, 40% and 53%, respectively.

^b Above ground level.

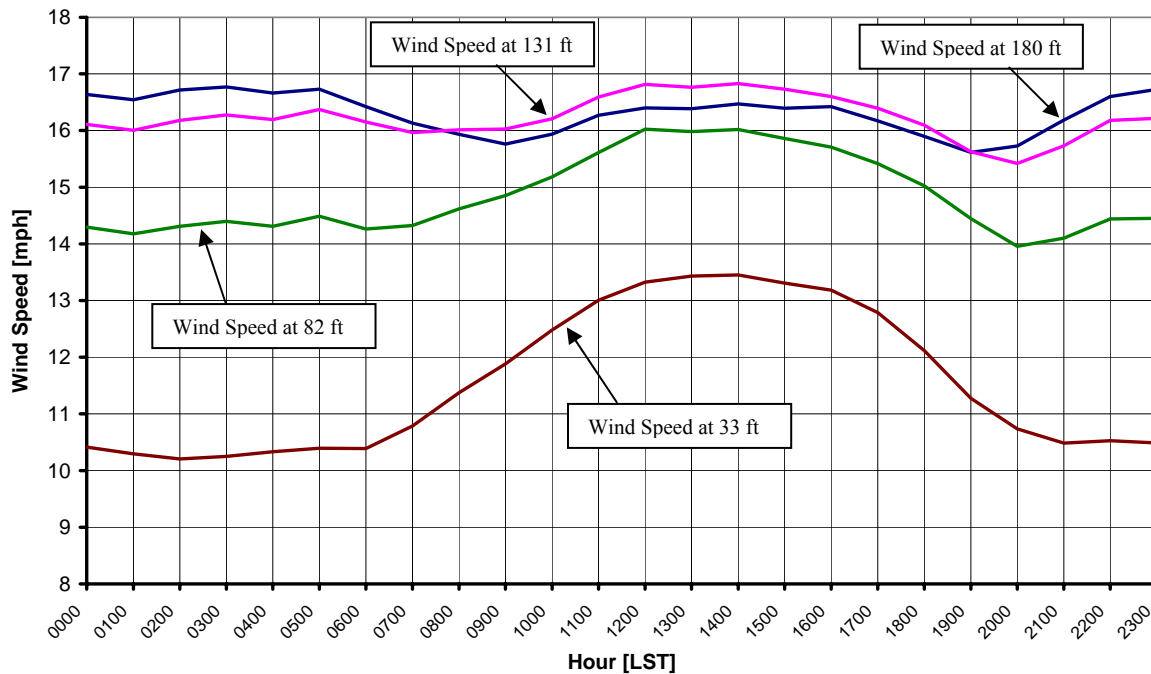
^c Air temperature was not factored into calculations.

Average Hourly Wind Speeds

LST ^d	180 ft AGL*		131 ft AGL*		82 ft AGL		33 ft AGL	
	mph	m/s	mph	m/s	mph	m/s	mph	m/s
0000	16.6	7.44	16.1	7.20	14.3	6.39	10.4	4.66
0100	16.5	7.40	16.0	7.15	14.2	6.34	10.3	4.60
0200	16.7	7.47	16.2	7.23	14.3	6.40	10.2	4.56
0300	16.8	7.50	16.3	7.28	14.4	6.44	10.3	4.58
0400	16.7	7.45	16.2	7.24	14.3	6.40	10.3	4.62
0500	16.7	7.48	16.4	7.32	14.5	6.48	10.4	4.65
0600	16.4	7.34	16.2	7.22	14.3	6.38	10.4	4.64
0700	16.1	7.21	16.0	7.14	14.3	6.40	10.8	4.82
0800	15.9	7.12	16.0	7.16	14.6	6.54	11.4	5.09
0900	15.8	7.05	16.0	7.16	14.9	6.64	11.9	5.31
1000	15.9	7.13	16.2	7.25	15.2	6.79	12.5	5.58
1100	16.3	7.27	16.6	7.42	15.6	6.98	13.0	5.82
1200	16.4	7.33	16.8	7.52	16.0	7.16	13.3	5.96
1300	16.4	7.33	16.8	7.49	16.0	7.14	13.4	6.01
1400	16.5	7.36	16.8	7.52	16.0	7.16	13.5	6.01
1500	16.4	7.33	16.7	7.48	15.9	7.09	13.3	5.95
1600	16.4	7.34	16.6	7.42	15.7	7.02	13.2	5.89
1700	16.2	7.23	16.4	7.33	15.4	6.89	12.8	5.72
1800	15.9	7.11	16.1	7.19	15.0	6.72	12.1	5.42
1900	15.6	6.98	15.6	6.99	14.4	6.46	11.3	5.04
2000	15.7	7.03	15.4	6.89	14.0	6.24	10.7	4.80
2100	16.2	7.24	15.7	7.03	14.1	6.30	10.5	4.69
2200	16.6	7.42	16.2	7.23	14.4	6.45	10.5	4.71
2300	16.7	7.48	16.2	7.25	14.5	6.46	10.5	4.69

* A decrease in average wind speed with height is due to differences in data recovery.

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^d Local standard time.



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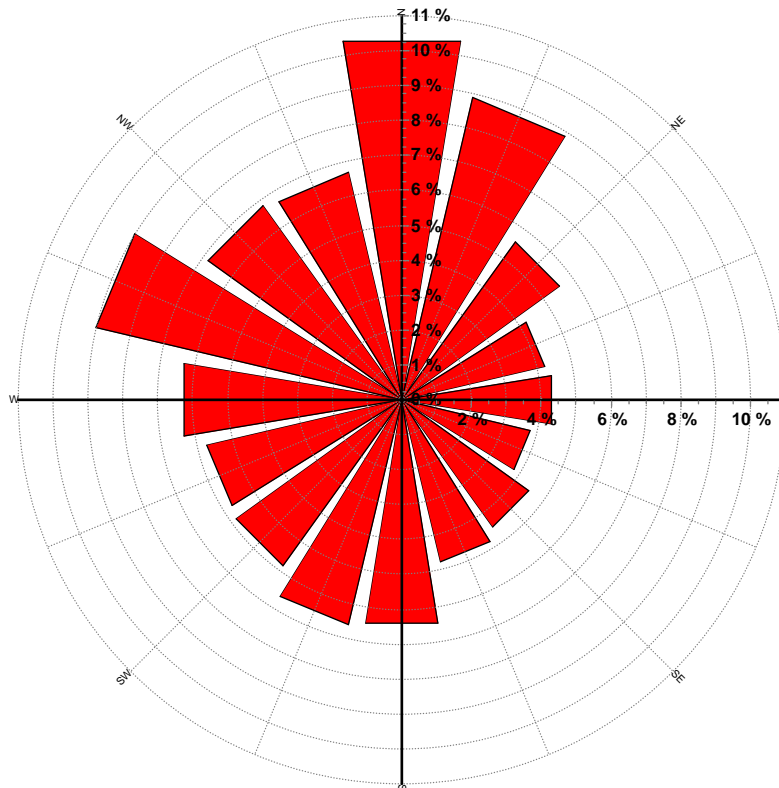
Creation Date: 3/24/2005

Wind Directional Frequency

Winds from the... Frequency (%)

NNW	6.7
NW	6.9
WNW	9.0
W	6.3
WSW	5.7
SW	5.8
SSW	6.6
S	6.5
SSE	4.8
SE	4.5
ESE	3.8
E	4.4
ENE	4.2
NE	5.6
NNE	8.9
N	10.4

North Dakota Utility Study – Olga Site
Wind Rose for 180 ft AGL
Springs 1995, 1996, 1997, 1998, 1999, 2000, 2001 & 2002



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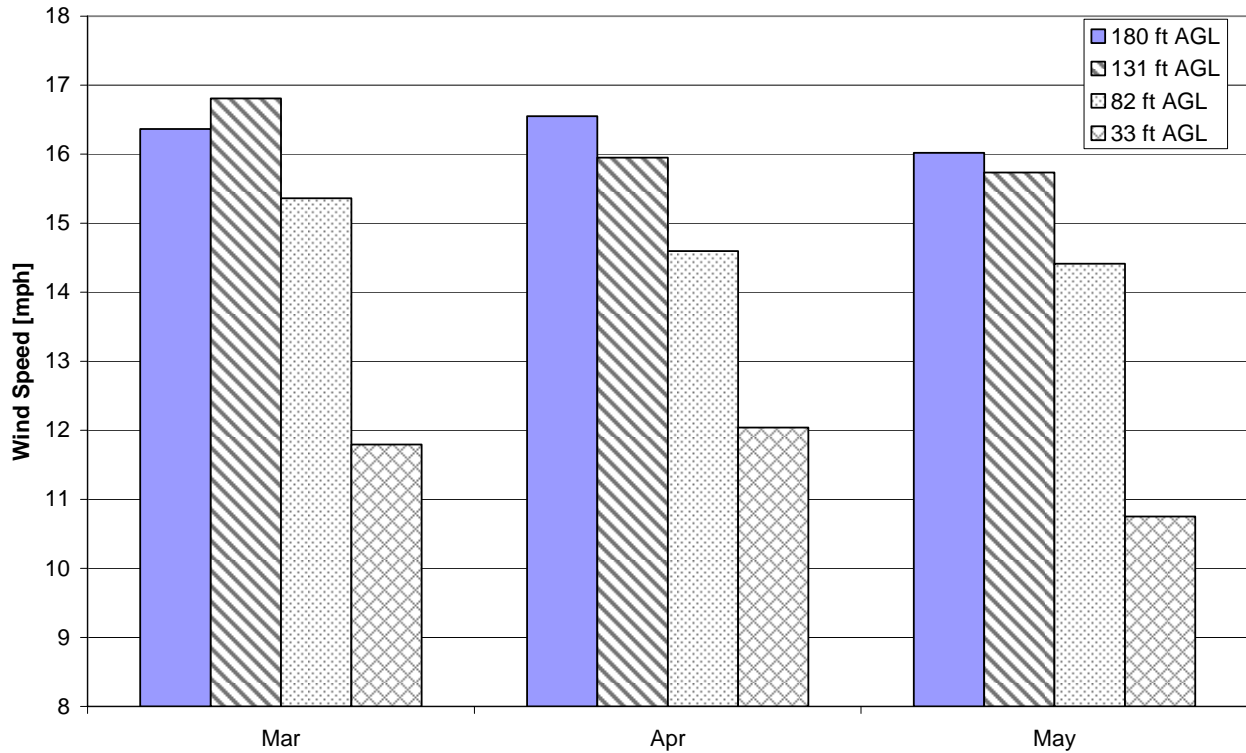
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Monthly Wind Speed Averages

Month	180 ft AGL*		131 ft AGL*		82 ft AGL		33 ft AGL	
	mph	m/s	mph	m/s	mph	m/s	mph	m/s
Mar	16.4	7.32	16.8	7.51	15.4	6.87	11.8	5.27
Apr	16.6	7.40	16.0	7.13	14.6	6.53	12.0	5.38
May	16.0	7.16	15.7	7.03	14.4	6.44	10.7	4.81

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