

Wind Resource Summary for Detroit Lakes Site

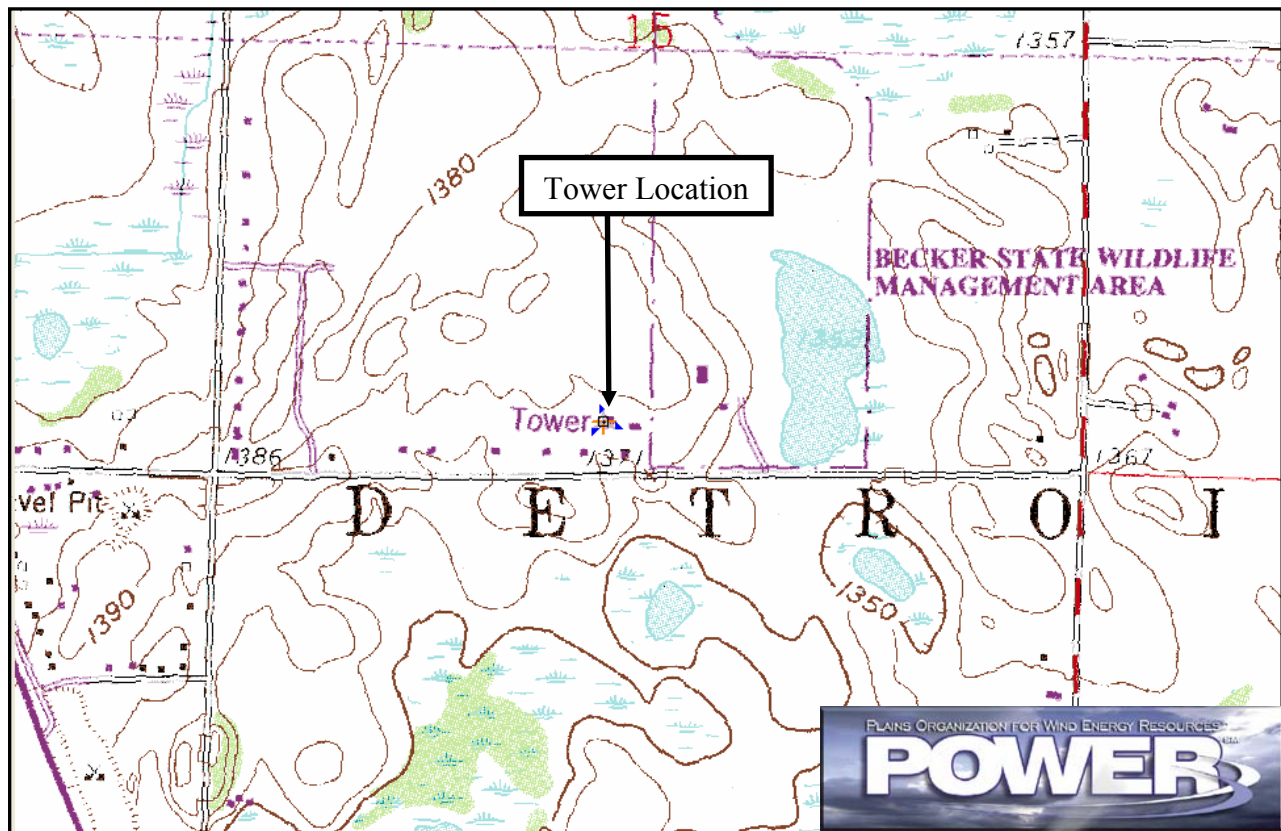
Minnesota Department of Commerce

Monitoring Period:^a 7/24/2002 – 8/8/2003

Site Description:

| | |
|----------------------------------|------------------------|
| Latitude: N 46° 50' 53" | Township: 139 N |
| Longitude: W 95° 50' 53" | Range: 41 W |
| Elevation: 1,375 feet | Section: 15 |
| | |
| Tower Type: Communications Tower | Tower Height: 300 feet |

The monitoring site was 1.5 miles north of the town of Detroit Lakes, Minnesota. The tower was instrumented at 3 levels: 98 feet (30 m), 164 feet (50 m), and 279 feet (85 m). The tower is located in the Becker State Wildlife Management Area. Floyd Lake is a mile to the north. The terrain has a mixture of woods, marshes, and meadows.



| Summary Wind Data: | 98 ft AGL ^b | 164 ft AGL | 279 ft AGL |
|---|--|------------|------------|
| Mean Wind Speed | 9.5 mph | 11.7 mph | 13.1 mph |
| Maximum, 10-min Mean Wind Speed | 43.6 mph at 279 ft AGL – 11/29/2002 11:50 am | | |
| Estimated Wind Power Class ^c | Class 1 (196 W/m ² at 279 ft AGL) | | |

^a Data recovery rates at 98, 164, and 279 feet were 72%, 75%, and 71%, respectively. Poor recovery rates are due to a large data gap from 4/16/2003 to 7/10/2003.

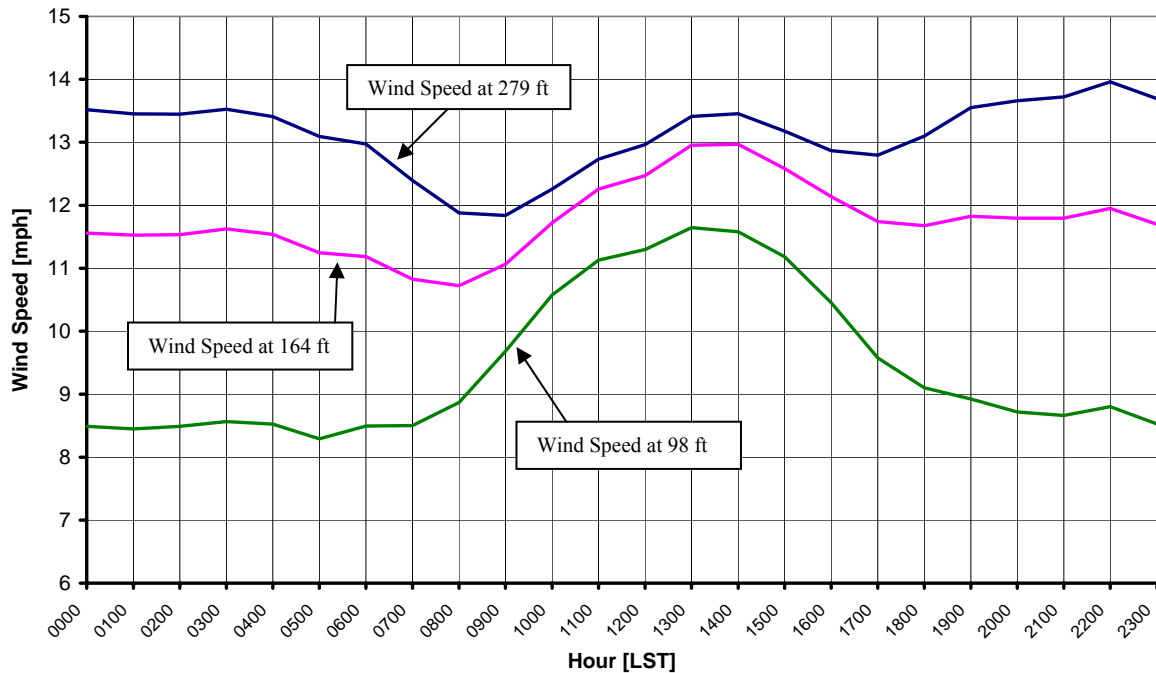
^b Above ground level.

^c Air temperature was not factored into calculation.

Average Hourly Wind Speeds

| LST ^d | 279 ft AGL | | 164 ft AGL | | 98 ft AGL | |
|------------------|------------|------|------------|------|-----------|------|
| | mph | m/s | mph | m/s | mph | m/s |
| 0000 | 13.5 | 6.04 | 11.6 | 5.17 | 8.5 | 3.80 |
| 0100 | 13.5 | 6.01 | 11.5 | 5.15 | 8.4 | 3.78 |
| 0200 | 13.4 | 6.01 | 11.5 | 5.16 | 8.5 | 3.80 |
| 0300 | 13.5 | 6.05 | 11.6 | 5.20 | 8.6 | 3.83 |
| 0400 | 13.4 | 5.99 | 11.5 | 5.16 | 8.5 | 3.81 |
| 0500 | 13.1 | 5.85 | 11.2 | 5.03 | 8.3 | 3.71 |
| 0600 | 13.0 | 5.80 | 11.2 | 5.00 | 8.5 | 3.80 |
| 0700 | 12.4 | 5.54 | 10.8 | 4.84 | 8.5 | 3.80 |
| 0800 | 11.9 | 5.31 | 10.7 | 4.79 | 8.9 | 3.96 |
| 0900 | 11.8 | 5.29 | 11.1 | 4.95 | 9.7 | 4.33 |
| 1000 | 12.3 | 5.48 | 11.7 | 5.24 | 10.6 | 4.73 |
| 1100 | 12.7 | 5.69 | 12.3 | 5.48 | 11.1 | 4.98 |
| 1200 | 13.0 | 5.80 | 12.5 | 5.58 | 11.3 | 5.05 |
| 1300 | 13.4 | 5.99 | 13.0 | 5.79 | 11.6 | 5.21 |
| 1400 | 13.5 | 6.01 | 13.0 | 5.80 | 11.6 | 5.18 |
| 1500 | 13.2 | 5.89 | 12.6 | 5.62 | 11.2 | 5.00 |
| 1600 | 12.9 | 5.75 | 12.1 | 5.43 | 10.5 | 4.67 |
| 1700 | 12.8 | 5.72 | 11.7 | 5.25 | 9.6 | 4.28 |
| 1800 | 13.1 | 5.85 | 11.7 | 5.22 | 9.1 | 4.07 |
| 1900 | 13.5 | 6.06 | 11.8 | 5.29 | 8.9 | 3.99 |
| 2000 | 13.7 | 6.11 | 11.8 | 5.27 | 8.7 | 3.90 |
| 2100 | 13.7 | 6.13 | 11.8 | 5.27 | 8.7 | 3.87 |
| 2200 | 14.0 | 6.24 | 11.9 | 5.34 | 8.8 | 3.94 |
| 2300 | 13.7 | 6.12 | 11.7 | 5.23 | 8.5 | 3.81 |

**Minnesota Department of Commerce – Detroit Lakes
7/24/2002 – 8/8/2003**



^d Local standard time.



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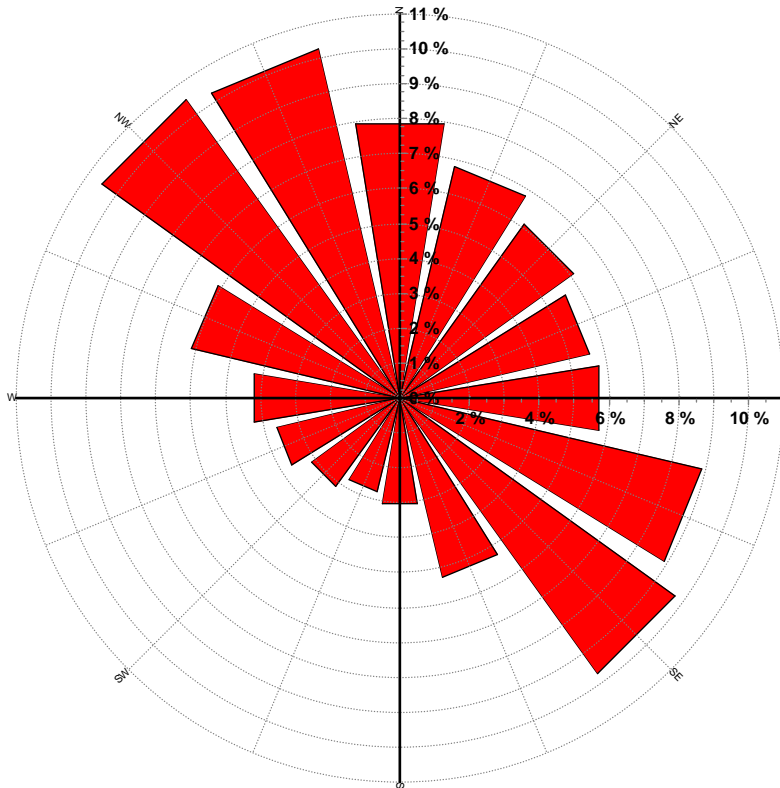
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Wind Directional Frequency

Winds from the... Frequency (%)

| | |
|-----|------|
| NNW | 10.3 |
| NW | 10.5 |
| WNW | 6.1 |
| W | 4.2 |
| WSW | 3.6 |
| SW | 3.1 |
| SSW | 2.8 |
| S | 3.1 |
| SSE | 5.3 |
| SE | 9.7 |
| ESE | 8.9 |
| E | 5.8 |
| ENE | 5.6 |
| NE | 6.1 |
| NNE | 6.8 |
| N | 8.0 |

Minnesota Department of Commerce – Detroit Lakes
Wind Rose for 98 ft AGL
7/24/2002 – 8/8/2003



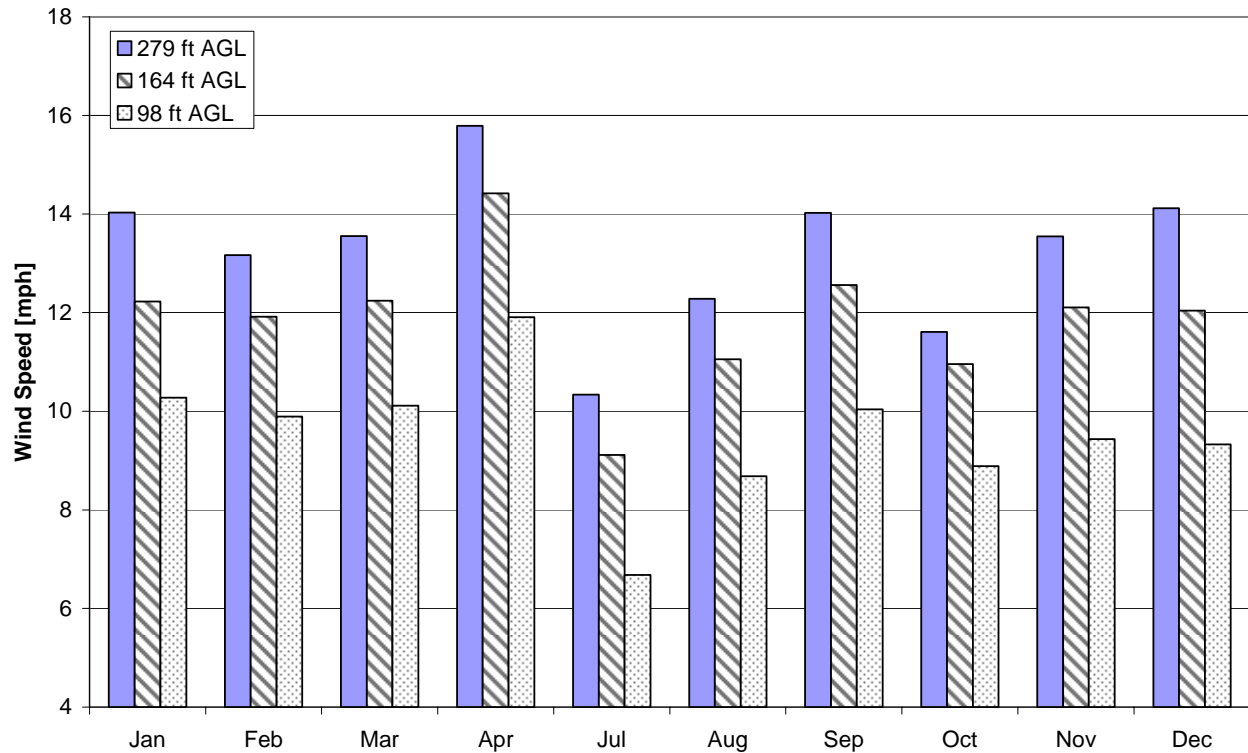
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Monthly Wind Speed Averages

| Month | 279 ft AGL | | 164 ft AGL | | 98 ft AGL | |
|-------|------------|------|------------|------|-----------|------|
| | mph | m/s | mph | m/s | mph | m/s |
| Jan | 14.0 | 6.27 | 12.2 | 5.47 | 10.3 | 4.59 |
| Feb | 13.2 | 5.89 | 11.9 | 5.33 | 9.9 | 4.42 |
| Mar | 13.6 | 6.06 | 12.2 | 5.47 | 10.1 | 4.52 |
| Apr | 15.8 | 7.06 | 14.4 | 6.45 | 11.9 | 5.32 |
| May | N/A | N/A | N/A | N/A | N/A | N/A |
| Jun | N/A | N/A | N/A | N/A | N/A | N/A |
| Jul | 10.3 | 4.62 | 9.1 | 4.07 | 6.7 | 2.99 |
| Aug | 12.3 | 5.49 | 11.1 | 4.94 | 8.7 | 3.88 |
| Sep | 14.0 | 6.27 | 12.6 | 5.62 | 10.0 | 4.49 |
| Oct | 11.6 | 5.19 | 11.0 | 4.90 | 8.9 | 3.97 |
| Nov | 13.5 | 6.06 | 12.1 | 5.41 | 9.4 | 4.22 |
| Dec | 14.1 | 6.31 | 12.0 | 5.38 | 9.3 | 4.17 |

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