WIND RESOURCE ANALYSIS PROGRAM 2002

MINNESOTA DEPARTMENT OF COMMERCE

MINNESOTA
DEPARTMENT OF
COMMERCE

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October, 2002

To readers of the WRAP Report:

This 14th edition of the Wind Resource Analysis Program (WRAP) Report is both an expanded and a reduced version of our previous reports. As with the our latest Quadrennial Report, we've made this WRAP report a "friendlier" document by adding more text information about the program and the wind energy industry, while streamlining the amount of published data for each monitoring site. Those interested in obtaining additional information about particular sites or analyzing the raw data that has been collected are welcome to contact one of our staff engineers.

We have some important decisions to make about our energy future. As a state and a nation we're dealing with issues of electric reliability, environmental concerns, and generation and transmission issues. Our population and our demand for electricity is steadily growing every year. With that increased demand comes the challenge of generating and delivering additional electricity in a way that is reliable, reasonably priced, efficient, economically sound and environmentally responsible.

Wind in particular can make an important contribution to meeting the increased energy demand. The wind turbines installed in 2001 can produce twice the power of those installed in 1999. Our state is among the top producers of wind energy nationwide, and we plan to continue being a leader. We are pleased that our monitoring program has helped foster interest in wind development. The last WRAP report, published in 1999, continues to be very popular; our web site data shows that two years after the report was issued it continues to be read by thousands monthly.

We also are actively expanding our renewable energy program to include solar and biomass assessment and monitoring, and we will add information from these studies to future reports.

We are pleased to present to you our most recent WRAP Report. We hope it will help encourage the development of both the small and large scale wind projects. We will continue to monitor Minnesota's wind resources and make this data publicly available.

James C. Bernstein
COMMISSIONER

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This WRAP Report was prepared under the direction Department of Commerce Engineers Rory Artig and Jeffrey Haase. Rory is the engineer in charge of wind energy analysis. The WRAP report could not have been completed without the assistance of Chris Eriksen, Andy Holl, Julie Choi, Peter Westman, Rebecca Anderson, Joseph Sheehy, Mindi Kvaal, Mike Rulseh, and James Madson, who have all been engineering interns with the Department through the University of Minnesota Mechanical Engineering Co-op Program.

Copies of this WRAP Report are available from the
DOC Energy InformationCenter
651-296-5175 or 1-800-657-3710
or http://www.commerce.state.mn.us.

Introduction

The Department of Commerce frequently receives calls from Minnesotans who are curious about a particular location's potential for wind power, describing the area as "windy." But what exactly is "windy?" In relative terms, western Minnesota is windier than eastern Minnesota. Winter is windier than summer. Higher elevations are windier than lower ones.

While all true, relativity alone did not place Minnesota first in the nation in terms of installed wind capacity from 1995-2000. Relativity did not produce almost 803 million kilowatt-hours of wind-based electricity in 2001. To a homeowner planning to spend $10,000 or a wind developer spending $100 million, relativity is not very reassuring.

Since 1982, the Commerce Department has been systematically monitoring the state's wind resources to remove questions of relativity from the decision-making process. The Wind Resource Assessment Program (WRAP) seeks to accurately measure and map wind speeds in Minnesota, allowing any individual, company, utility or independent power producer to perform an initial assessment of the potential feasibility of a chosen wind site without the usual cost and delay of erecting a tower to measure the wind speeds.

The 2002 WRAP Report details the progress of the department's data collection efforts since the last WRAP Report in March 1999. In general, data collection of this scale does have limitations and cannot replace a comprehensive analysis at an individual site, but it can provide an educated foundation to begin assessing local wind resources.

Mission Statement

The Minnesota Department of Commerce's Wind Resource Assessment Program seeks to collect and publicize comprehensive statewide wind resource data in order to facilitate the development of the wind energy industry, policies and ultimately installations in Minnesota.

History

Before the federal government expanded electric service to rural communities in the late 1930s, many homes and businesses, including farmers, produced the energy they needed from windmills. Every year, several visitors to the Department's booth at the Minnesota State Fair recall the use of small wind turbines on their family farms to power a battery for a few lights. Some people even mention that the turbine is still stored in an old barn or garage on the farm. Today, wind turbine technologies have expanded from the beginnings of yesteryear to modern wind turbines powering hundreds of homes and wind farms powering thousands. Wind turbines, no matter the size, are most effective in areas of the highest wind resource.

The Department started the Wind Resource Assessment Program in 1982 to quantify the relative impressions of "windy." The first measurement towers had one anemometer located at 30 meters above ground. The program was significantly upgraded in 1994 to 14 sites with three levels of anemometers at 30, 50, and 70 meters. Currently there are approximately 30 monitoring sites operating at any one time, which includes five towers with peak measurement heights of 90 meters and seven portable tip-up towers ranging from 30 to 50 meters tall. These portable towers allow for flexibility in site locations to verify local conditions for wind turbine siting, which may vary due to local terrain and development. Recently the program has expanded monitoring to include areas in southeastern and northeastern Minnesota.

Future Wind Monitoring Developments

WRAP has evolved as the wind monitoring technology, techniques, data needs and the wind industry has developed. Proposed future developments include:

Additional southeast, north central, and north east wind monitoring

After extensive monitoring in the west, the program will expand stations and equipment to other areas of the state with lesser known resources, including the Mississippi River Valley, the Arrowhead region, the Iron Range, and north-central Minnesota.

Anemometer and/or portable tower loan program

Large-scale wind development has rapidly taken place over the last several years. Individuals, small wind developers, and locally owned wind installations have not yet materialized into a developing market. The Department would like to begin encouraging this market segment by establishing an anemometer and/or portable monitoring tower loan program for use in promising sites with a strong potential for wind turbine development of 500 kW or greater.

Increase long-term peak monitoring heights to 90-120 meters

Modern wind turbine towers are increasing in height to 75 meters, with the rotor blades reaching up an additional 35 meters. The height of the measurement equipment needs to keep pace with industry developments to remain valuable.

Updated monitoring and mapping techniques

The data collection and interpretation techniques are evolving and can be updated to include 2-minute peak wind measurements, whereas previous measurements only included a 24-hour peak measurement. In addition, the traditional interpolation techniques based on wind measurements, elevation, and land use, are gradually being replaced with a Meso-scale weather model based on techniques that use ground measurements for verification. The U.S. Department of Energy expects to develop a revised national map in two to three years based on this method. Finally, regional monitoring and mapping are emerging as cost-effective and logical means to resource data acquisition and wind energy planning. The combined efforts and resources will enhance data presentation methods across state lines.

Wind Energy Developments

Recent wind energy installations in Minnesota largely fall into two size categories, small (less than 40 kW) and large (more than 660 kW). Many individual facilities smaller than 40 kW were installed in the late 1980s and early 1990s in rural locations and were eligible for net metering. Net metering requires utilities to pay qualified facilities nearly the same amount for the electricity they generate as for the electricity they consume. Many of these early wind facilities have increased maintenance costs and their numbers are declining. With increased awareness in energy and energy-related issues, newer small-scale installations are beginning to emerge again.

Large wind energy development in Minnesota accelerated rapidly in the late 1990s, largely due to Xcel Energy's mandated wind installations. During this time Xcel

Energy continued to contract for wind installations to meet their statutory mandate of 425 MW by 2003. The final 130 MW should be installed in 2002 using a 1.5 MW machine, the largest in Minnesota.

Additionally, development increased due to the declining cost to install wind energy operations and also through green pricing programs offered by Minnesota electric cooperatives and municipal utilities. Great River Energy, Moorhead Municipal, and the Southern Minnesota Municipal Power Agency all offer green pricing programs, where customers pay a small premium to purchase some or all of their electricity from wind power. Both Great River Energy and Moorhead Municipal filled their initial green power offerings and have added wind turbine installations for the second phase of their programs. A 2001 law was passed that requires all Minnesota utilities to begin offering green pricing programs to their customers, which should encourage new wind development. Finally, Great River Energy has decided to install 20 MW of wind power to include in their general electric services because they found that wind-generated electricity can benefit their underlying electric rates in the long term.

Nearest City	Developer	Date	MW	Affiliated Electric Utility	#, Manufacturer, Size
Marshall	Navitas Energy	1992	0.6	Marshall Municipal Utility	5, WindWorld, 120 kW
Buffalo Ridge	Kenetech Windpower	1994	24.82	Xcel Energy	73, Kenetech, 340 kW
Chandler (I)	enXco, PRC	1998	1.98	Great River Energy[G]	3, Vestas, 660 kW
Lake Benton (I)	Enron Wind Corp.	1998	107.25	Xcel Energy	143, Zond, 750 kW
Woodstock	Edison Capital	1999	10.2	Xcel Energy	17, Vestas, 600 kW
Moorhead (I)	Moorhead Public Service	1999	0.75	Moorhead Public Service[G]	1, NEG Micon, 750 kW
Hendricks	Navitas Energy	1999	11.25	Xcel Energy	15, NEG Micon, 750 kW
Lake Benton (II)	FPL Energy	1999	103.5	Xcel Energy	138, Zond, 750 kW
Hendricks	Navitas Energy	1999	11.88	Xcel Energy	18, Vestas, 660 kW
Elk River	Navitas Energy	2001	0.66	Xcel Energy	1, Vestas, 660 kW
Ruthton	Navitas Energy	2001	15.84	Xcel Energy	24, Vestas, 660 kW
Hendricks	Navitas Energy	2001	11.88	Xcel Energy	18 Vestas, 660 kW
Averill	Navitas Energy	2001	1.98	Xcel Energy	3, Vestas, 660 kW
Chandler (II)	enXco, PRC	2001	3.96	Great River Energy[G]	6, Vestas, 660 kW
Wilmont	Navitas Energy	2001	1.5	Alliant EnergyG	1, NEG Micon, 1500 kW
Moorhead (II)	Moorhead Public Service	2001	0.75	Moorhead Public Service[G]	1, NEG Micon, 750 kW
Hendricks	Navitas Energy	2001	0.9	Ottertail Power [G]	1, NEG Micon, 900 kW
Wilmont	Navitas Energy	2001	0.9	SMMPA[G]	1, NEG Micon, 900 kW
Worthington	Missouri River	2002	1.8	Missouri River[G]	2, NEG Micon, 900 kW
Dodge Center	ReGen Technologies	2002	9.0	Xcel Energy	10, NEG Micon, 900 kW
Pipestone	DanMar Associates	2002	3.0	Xcel Energy	4, NEG Micon 750 kW
Total Installed			324.4		
Estimated homes/yr	124,326*				

- Navitas Energy, formerly Northern Alternative Energy; PRC: Project Resources Incorporated
- Xcel Energy is mandated to acquire 425 MW of wind power by the end of 2002 and an additional 400 MW by 2012.
- [G] Green power program.
- * Based on average use of 8,000 kWh/household/yr and 35% capacity factor of electricity production.

Current and Future Wind Energy Policy and Issues

There are numerous wind energy related policies and issues to address, but a few in particular are specific to Minnesota's wind energy future: utility, non-utility, and technology/resource related.

Utility Related

Transmission constraints: The southwestern portion of the state, where most wind development has taken place, has a transmission system that was built to import relatively small amounts of electricity to rural towns and farms. With the recent wind boom, these transmission lines are currently a bottleneck to exporting large amounts of wind generation and are hindering further wind installation development in this part of the state. Not all of these transmission developments are driven by wind power alone. The region's transmission deficiencies include the Sioux Falls, S.D. area, which has been in need of an upgrade for some time. Several proposals are being developed to temporarily patch Xcel Energy's transmission facilities in this area to provide transmission access for their next 130 MW phase, but ultimately a long-term plan needs to be developed to address wind energy's future in the area.

Standard Interconnection Agreement: A standard interconnection agreement exists for facilities under 40 kW, but not for larger facilities. Experienced wind developers with large capital outlays have a staff of engineers and lawyers handle the details of contract negotiations and interconnection details. For individuals, small entities, and cooperatives, these details can be costly and expensive. A standard interconnection agreement would define the process and details by which non-utilities can interconnect their distributed generation, wind energy or otherwise. The 2001 Minnesota Legislature directed the Public Utilities Commission to begin developing a statewide standard interconnection agreement and process that balanced efficacy for the non-utility and utility alike. Barriers to interconnection will have to be meshed with safety and technical needs to encourage safe, reliable, and cost-effective interconnections.

Green Pricing: The 2001 Minnesota Legislature also directed all electric utilities in the state to offer additional electricity products designated as green power. Utilities can use modern technologies, renewable energy, and clean fuels to offer a cleaner and/or more renewable electricity mix. Several utilities already offer green power programs using wind installations ahead of the legislation, with additional programs expected to result in an increased demand for wind powered electricity. Green pricing programs are typically subscribed by 1–2% of retail residential customers and could create a small demand for new wind turbines to be installed—on the order of 10–20 MW/yr—through 2015.

Non-utility related

Production Incentives: Federal and state incentive exist for wind-generated electricity in the form of tax credits and production incentives, respectively. These incentives were not originally enacted as a subsidy to wind power, but rather as a compensation for existing subsidies of fossil and nuclear generated electricity in the form of research, tax breaks, and a variety of other incentives. The federal incentive has been renewed several times, while the Minnesota incentive expires when 100 megawatts have been enrolled. That milestone is expected to be reached in 2003. These incentives are especially important to smaller, locally owned wind installations. The reliable availability of these incentives will create stability in the wind development industry.

Financing: The success or failure of any capital expenditure is based on the cost of money, e.g. financial loans. Many larger non-utilities have adequate resources or have pooled resources to finance projects with acceptable internal rates of return. Smaller entities, for example those installing one or two turbines, are subject to conventional equity bank loans that leverage existing property as collateral. Financing turbines less than $100,000 may be reasonable via this method, but for projects that are sized significantly larger, a different approach is needed. One opportunity exists in creating wind energy cooperatives, where individuals pool their equity resources to finance an installation of one or more turbines. Lenders need to be educated in the financial viability of wind energy installations and sound wind monitoring data provides the basis for guaranteeing a cash stream.

Technology/Resource related

The wind energy industry has seen dramatic decreases in installed costs and increases in the capacity rating of

wind turbines in the 1990s. Whether measured by installed costs ($/kW) or energy costs ($/kWh), wind energy can provide cost-competitive energy savings to utilities when located in the prime wind resource areas. Although not able to provide firm summer capacity, when many utilities see peak electricity demands, wind energy does offset the use of fossil fuel resources that would have otherwise been used.

The southwest region of the state has seen the majority of wind development because of its high wind resource. However, space and transmission limitations will at some point necessitate the migration of wind power development to other areas of Minnesota. The distribution of wind power development to areas outside of Buffalo Ridge provide educational benefits to different parts of the state in addition to the electrical energy produced. The wind industry's ability to capture these lower wind resource areas will be the next major development in technological and planning advances.

Renewable Energy Objective

A 2001 state statute known as the Renewable Energy Objective (REO) requires electric utilities to put forth a *good faith effort* to have 10% renewable electricity in their generating mix by 2015. This mix could include wind, solar, biomass, or small-hydro facilities. If the REO is fully implemented with 100% wind, the amount of wind power installed would be more than 3200 MW, nearly 10 times what is currently installed.

Technical Details

Why Wind Monitoring?

Any wind energy project is a major financial undertaking for the individual or company that is considering it. The ability of a project to be financed depends on the ability of the project to generate income. As the state's main provider of energy information, the State Energy Office monitors the state's wind resources and publicizes the information in an effort to promote wind development.

The only way to be certain of a project's ability to generate income is to undertake a monitoring effort on the site of the proposed wind turbine(s) with data collected at or near the turbine hub height. Preferably data would be collected for a period of one year or longer. The data collected will provide information on the distribution of wind speeds at the site, from which a reasonably accurate estimate of production can be achieved. This production estimate can be used to determine a project's cash flow from a power purchase agreement, state and federal incentives, as well as any green pricing programs that may be applicable to the project.

Site-specific data, i.e. data recorded at the site of the potential wind energy development, is the most valuable to a particular project. However, some very sophisticated computer modeling programs have been developed that can accurately predict production estimates at one location using data from a wind monitoring site located at a different location.

What does the data represent?

The most recent version of the WRAP report provides summary data for each site the Minnesota Department of Commerce monitors. The data for each site is presented as follows:

Monthly average wind speed data for each elevation level: The average wind speed for each monitoring height has been averaged by month and is presented by year. This will provide the user with an indication of the interannual variation from year to year in particular regions within the state.

Monthly average power available from the wind at each elevation level: This data may be most useful for the individuals interested in conducting "back of the envelope" analyses for their site. The data is presented in watts per square meter, and can be converted into electrical energy if the data user has efficiency information for a particular wind turbine of interest. A reasonable production estimate could be developed based on the swept rotor area (M2).

Monthly average wind shear between elevation levels: The data for wind shear provides information on the behavior of the wind as the height above ground is increased. The amount with which the velocity of the wind increases as the height above ground increases is site specific, and is a function of the relative roughness of the surrounding terrain.

Wind rose: The wind rose provides a visual indication of the directional behavior of the wind at each monitoring site. The wind rose is broken down into two components, percent time and percent energy. It is important to have an indication of the directional behavior of the wind because it will have an effect on a wind turbine's yaw mechanisms. It is also important to know that if a site has an obstruction that would tend to block the wind getting to the wind turbine that the obstruction is not blocking a primary wind direction.

How to Use Data

The data provided in the 2002 WRAP Report could be used to provide rough estimates of the potential that a particular area has for wind energy production. Since the data is specific to the site that the data was collected at, the applicability to other areas, even in the near vicinity of the monitoring site, will have to be done with caution.

The Department of Commerce only summarizes the data that we have collected from the monitoring sites. The average wind speeds that are represented in the WRAP Report do not provide any information on the distribution of the wind speeds at a particular site.

The Department's wind monitoring sites vary in terms of configuration, some of the sites monitor the wind speeds at three different heights, whereas other sites monitor at six different heights. We have recently added sites that monitor wind speeds up to 90 meters to try to stay ahead of the increasing size of turbines that the industry is manufacturing.

Additional Data Available

The information presented in this WRAP Report represents only a small portion of what is actually available. We may be able to process data requests for specific sites very quickly. Depending on the location of your potential project the data that we have may be very applicable. Additionally, more detailed analysis can be run to determine the energy production potential at a specific location based on the data from one or more of our sites.

The Department of Commerce State Energy Office is interested in working with communities that are interested in developing wind energy projects to meet a portion of its energy needs. If interested in a local monitoring effort, the SEO may be able to fill requests with a 40 or 50 meter monitoring station. Please contact the Department of Commerce Energy Information Center at 651-296-5175 or 1-800-657-3710 if interested in this type of monitoring effort.

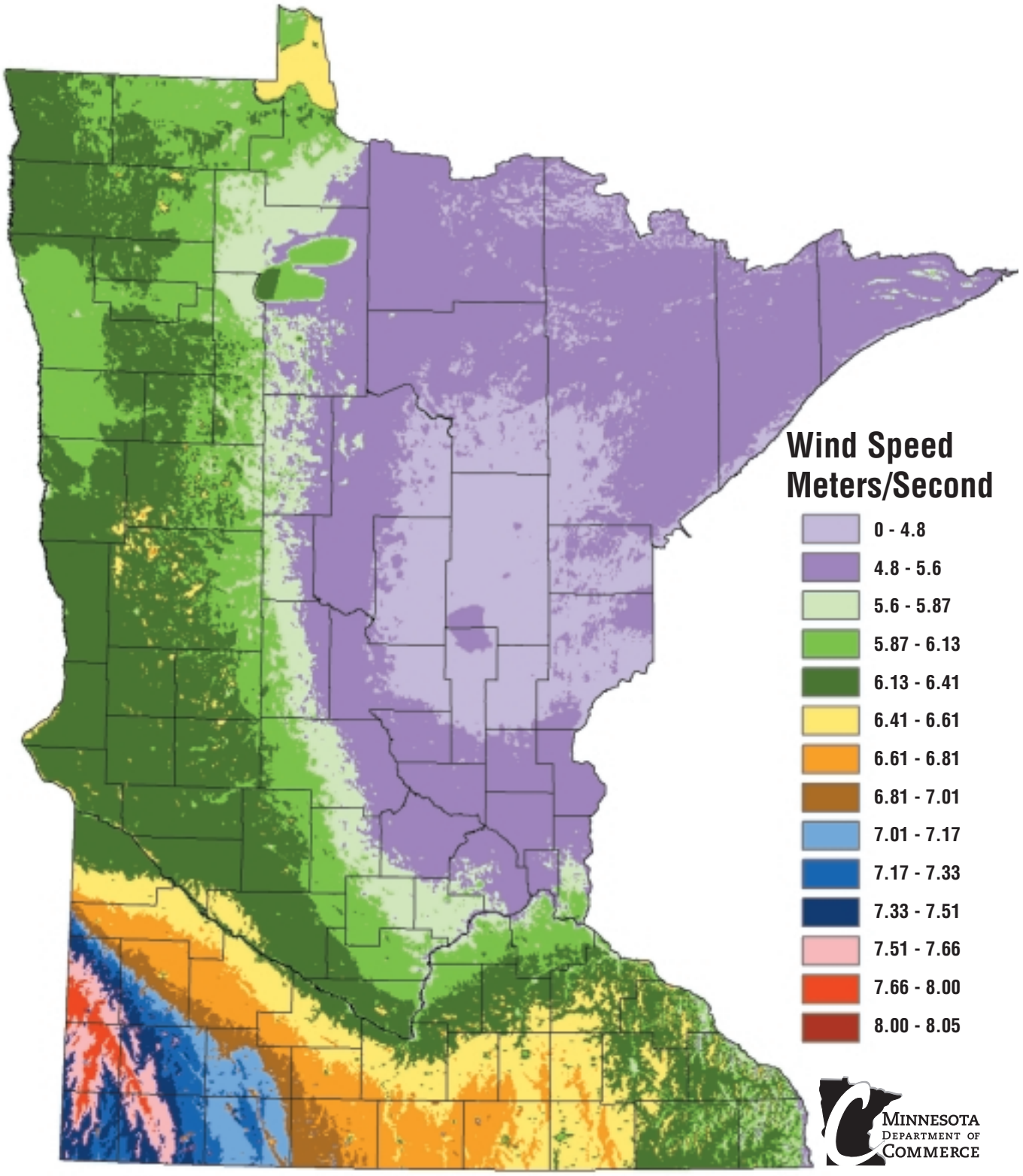
Future Data Availability Plans

Future plans are to continuously update the WRAP Report and make data available on the Department of Commerce web site (www.commerce.state.mn.us) so that the most up to date and accurate information will be available for both our current and future sites. We will also be looking to add various components to the data reporting such as annual velocity bin data. If you have any suggestions for how the Department may be able to better meet your needs as a data user, please contact the Department.

The Department of Commerce has also been working with the Plains Organization for Wind Energy Resources (POWER), to make all of the collected data available online through the University of North Dakota, Energy & Environment Research Center web site at www.undeerc.org/wind. The POWER group will be making the data available through a web based interactive query system that will allow the user to select the specific sites and timeframes of interest. This web site should have the Minnesota wind data available by the end of 2002.

Minnesota Wind Maps

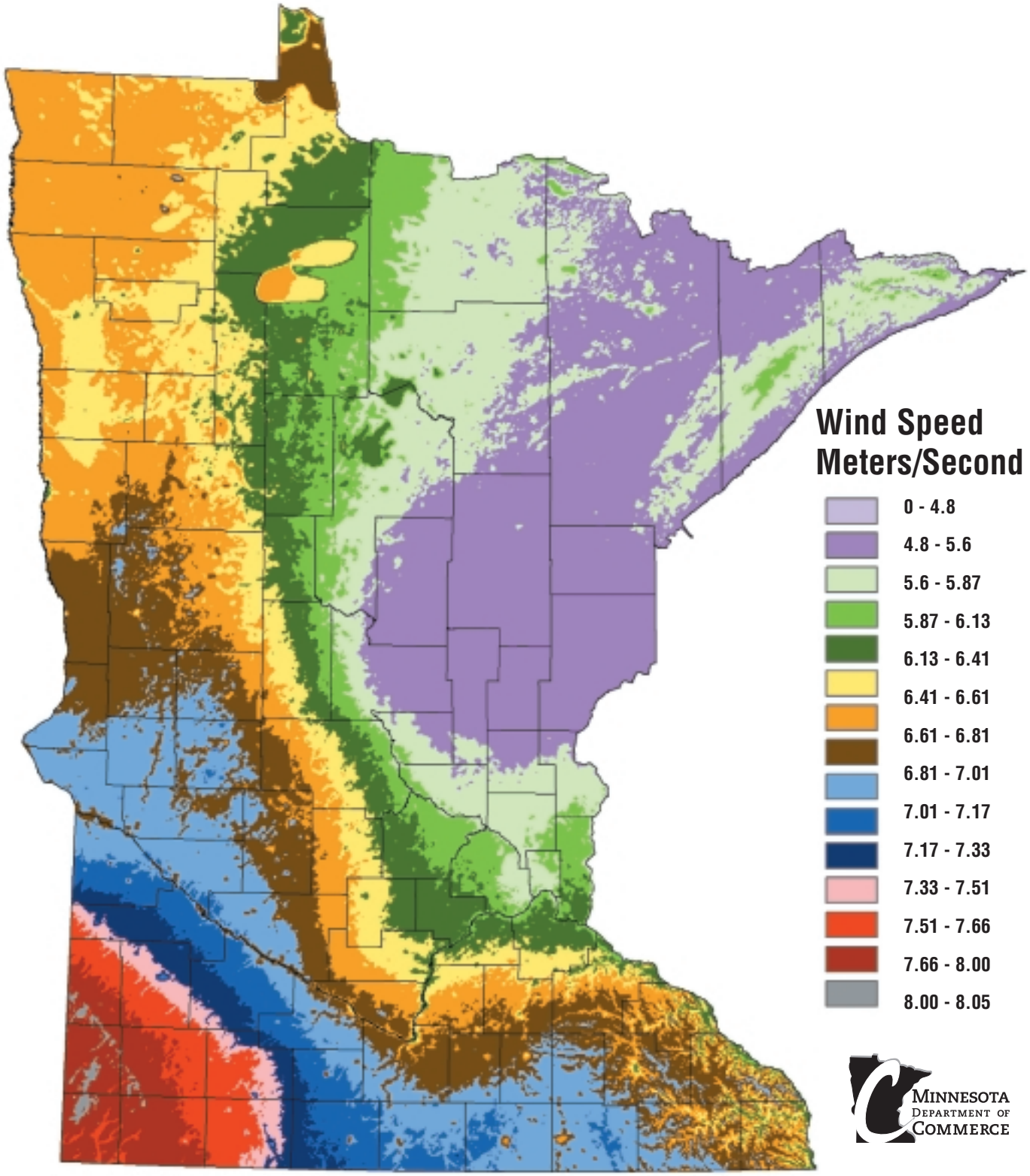
Wind Speed at 50 Meters



The Department of Commerce prepared this map using the WindMap program, which takes into account wind data, topography, and land use characteristics. Data is averaged over a cell area 750 meters square, and within any one cell there could easily be features that could increase or decrease the results shown on the map. Regions with the greatest concentrations of monitoring sites show the most accurate results. This map shows the general variation of Minnesota's wind resources and should not be used to determine the performance of specific projects.

June 2002

Wind Speed at 70 Meters



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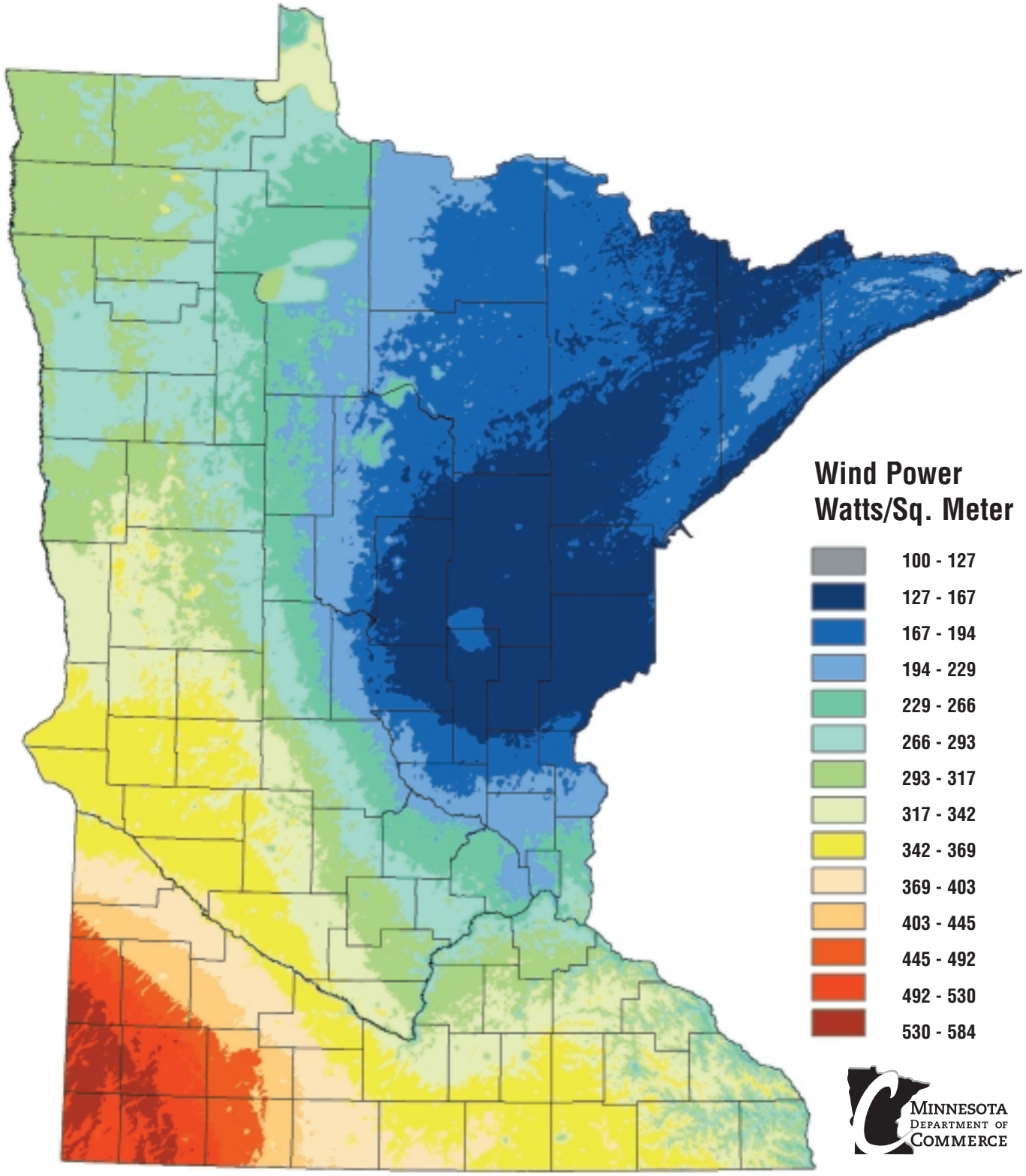
June 2002

Wind Power at 70 Meters



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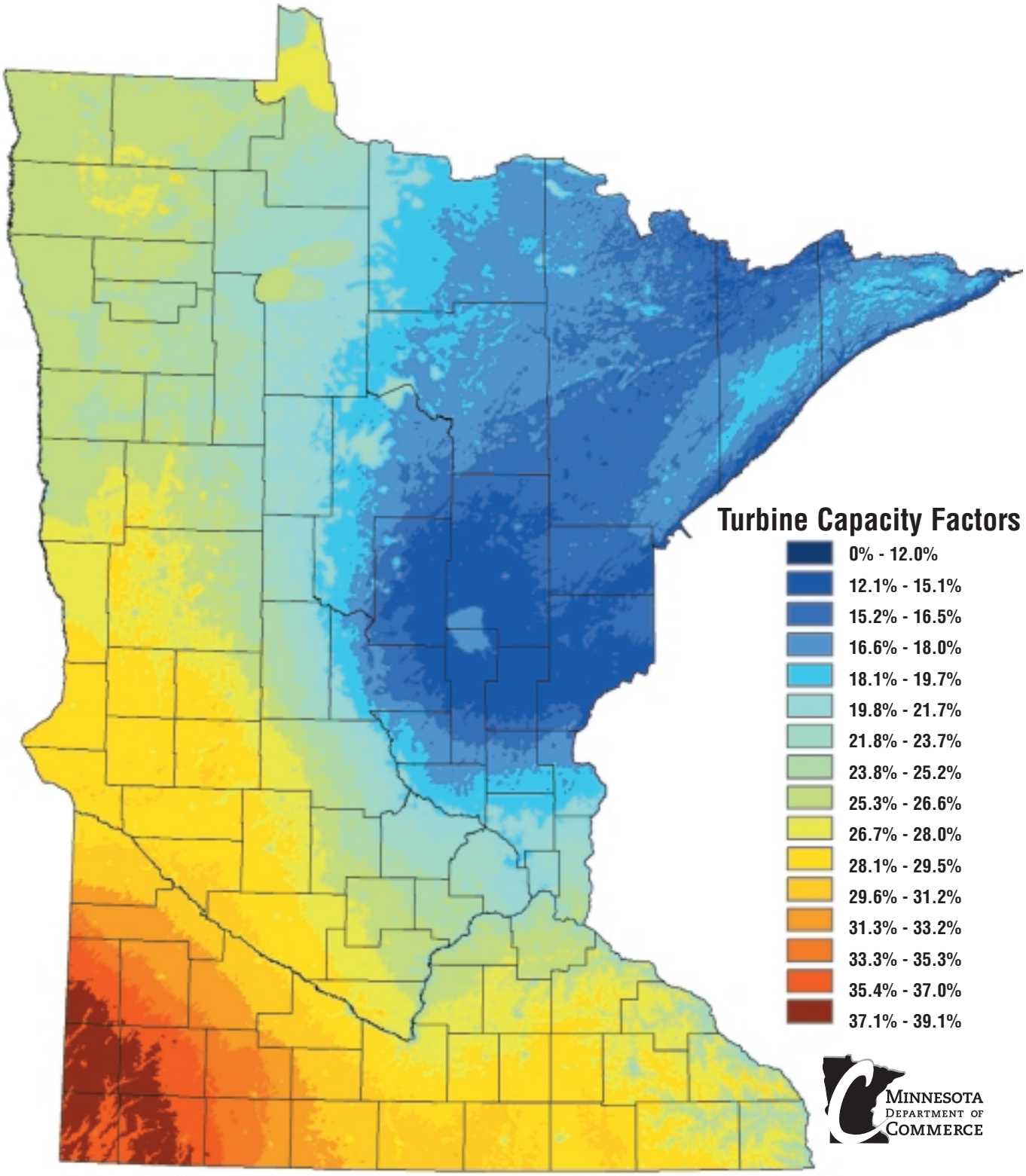
June 2002

Turbine Capacity at 70 Meter Hub Height



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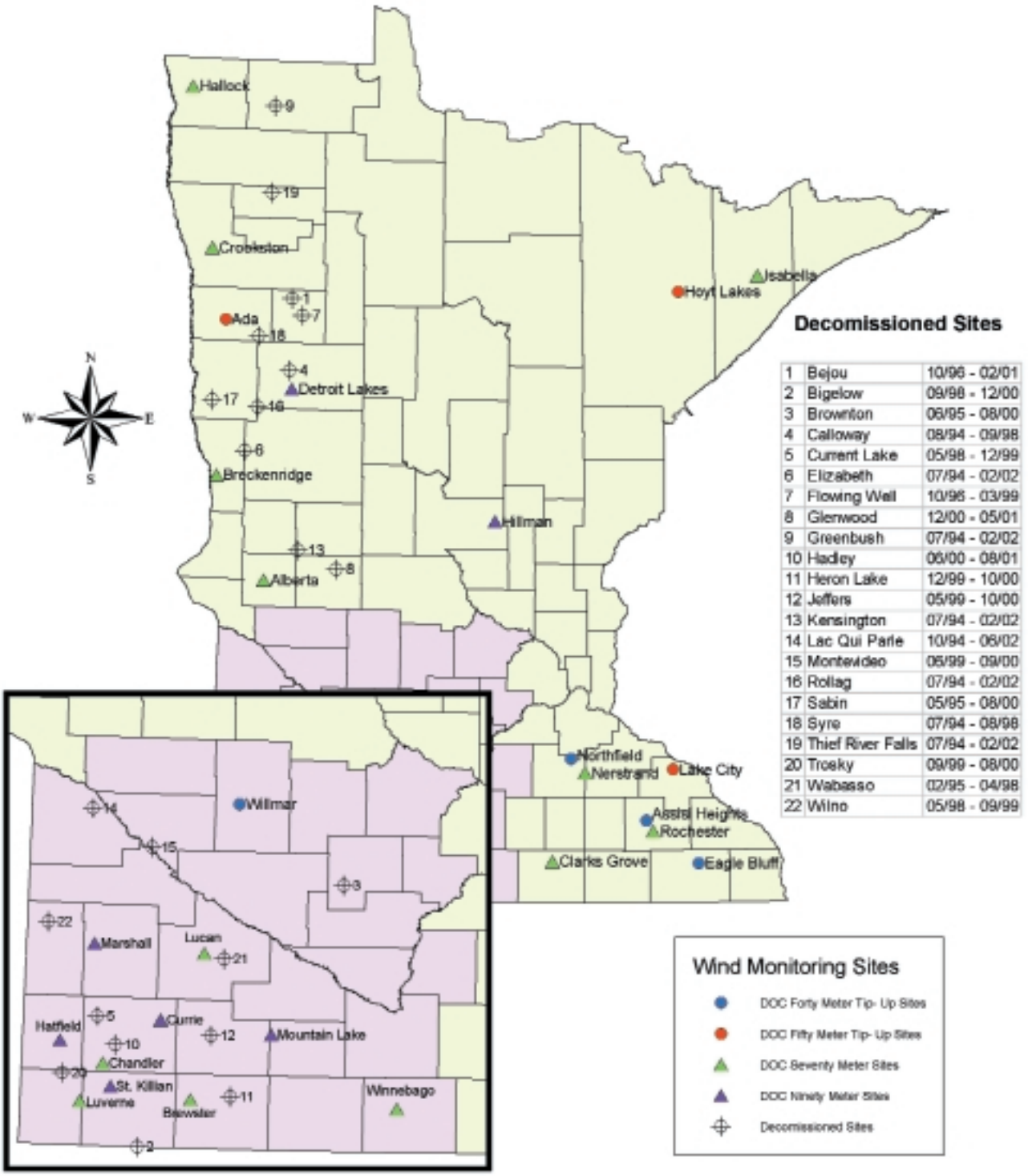
June 2002

Minnesota Wind Monitoring Sites



Decomissioned Sites

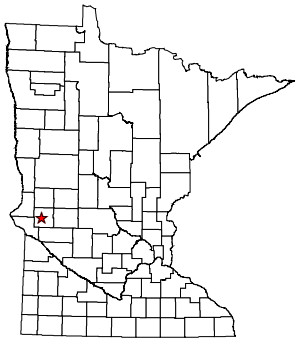
1	Bejou	10/96 - 02/01
2	Bigelow	09/98 - 12/00
3	Browntion	06/95 - 08/00
4	Calloway	08/94 - 09/98
5	Current Lake	05/98 - 12/99
6	Elizabeth	07/94 - 02/02
7	Flowing Well	10/96 - 03/99
8	Glenwood	12/00 - 05/01
9	Greenbush	07/94 - 02/02
10	Hadley	06/00 - 08/01
11	Heron Lake	12/99 - 10/00
12	Jeffers	05/99 - 10/00
13	Kensington	07/94 - 02/02
14	Lac Qui Parle	10/94 - 06/02
15	Montevideo	05/99 - 09/00
16	Rollag	07/94 - 02/02
17	Sabin	05/95 - 08/00
18	Syre	07/94 - 08/98
19	Thief River Falls	07/94 - 02/02
20	Troeky	09/99 - 08/00
21	Wabasso	02/95 - 04/98
22	Wilno	05/98 - 09/99

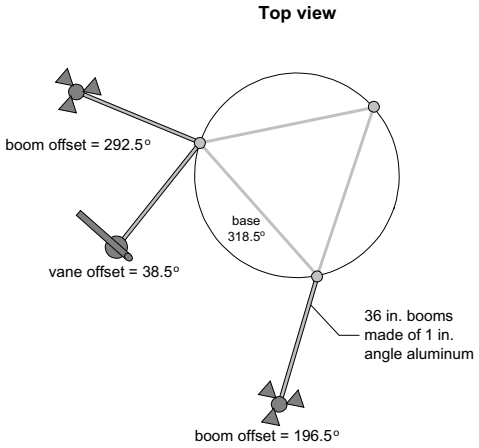
October 2002

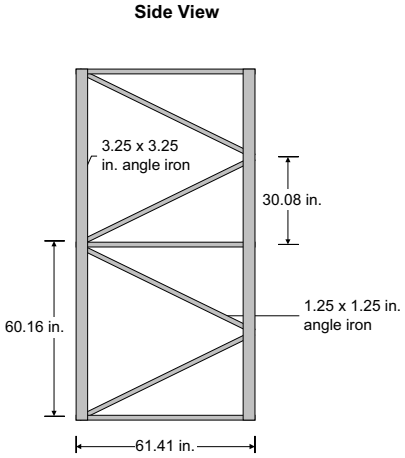
Minnesota Department of Commerce

70 Meter Sites

Alberta





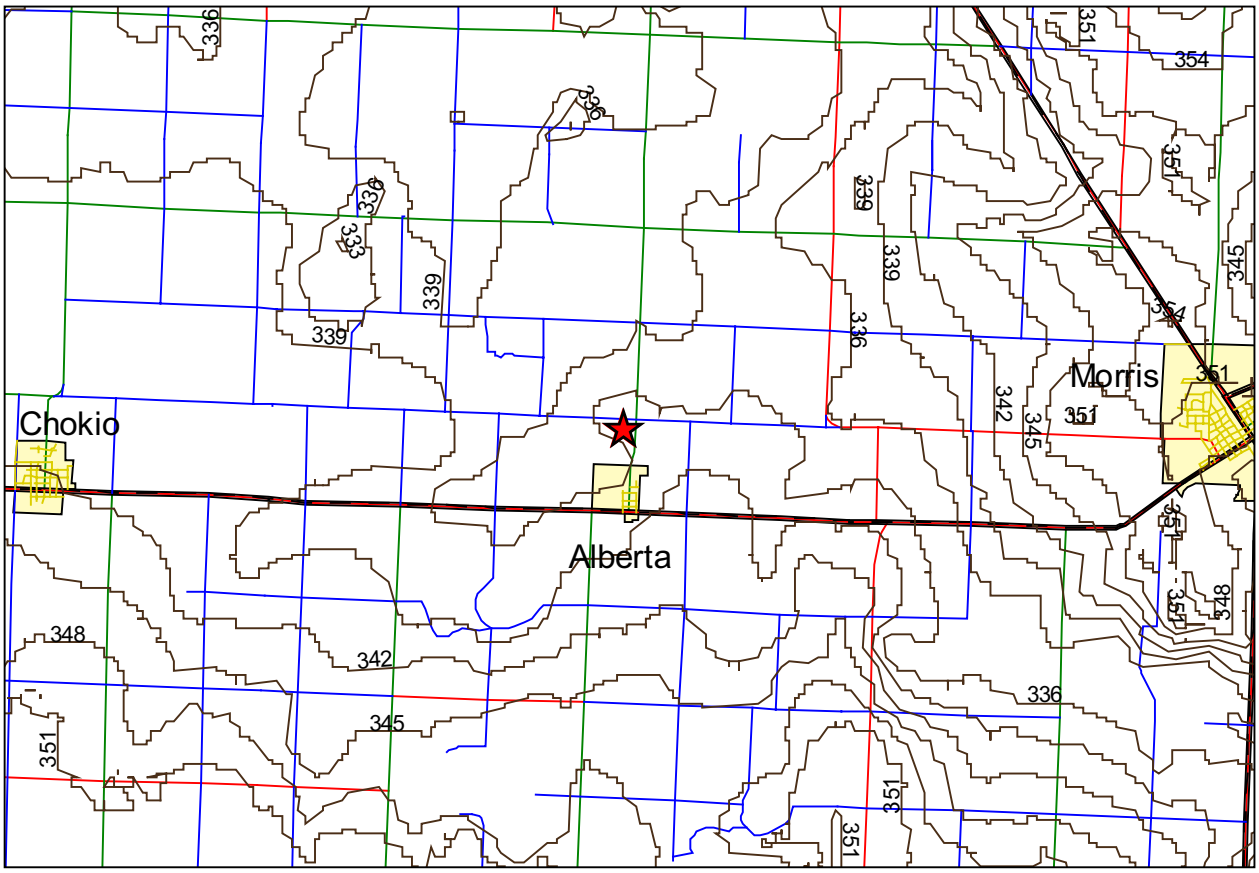


Coordinates

Long/Lat	UTM
N 45.5841	E 262254
W 96.0476	N 5052356

Elevation: 1109 feet

Additional Tower Information:
Anemometers are located at 30, 50, and 70 meters.
Vanes are located at 30 and 70 meters.
There is one wire satellite dish about 2.5 meters above the 30 meter anemometer.



Contour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Alberta

Wind Shear Exponent (Alpha)

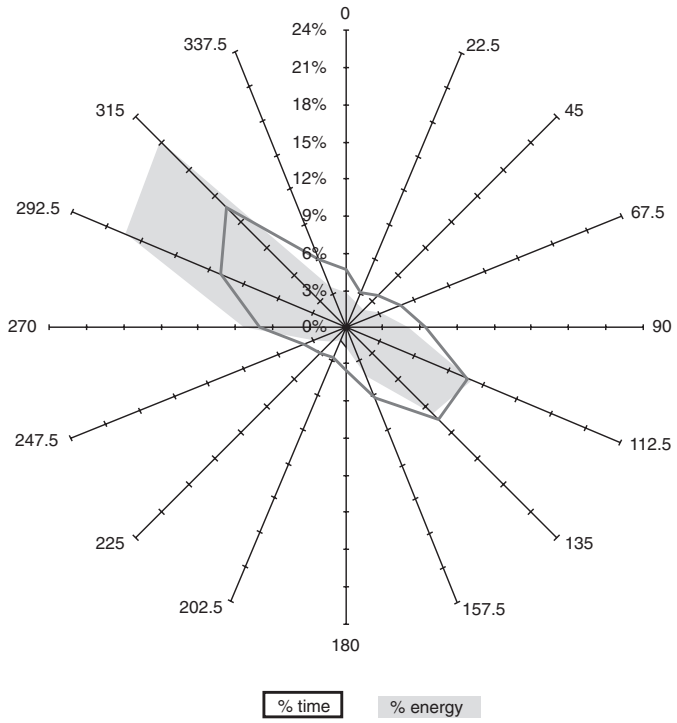
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m-50m	0.46	0.37	0.33	0.33	0.37	0.37	0.41	0.40	0.46	0.44	0.35	0.39	**0.39**
1995	**50m-70m**	0.27	0.19	0.15	0.16	0.21	0.20	0.22	0.25	0.26	0.23	0.15	0.20	**0.21**
	30m-50m	0.45	0.44	0.38	0.34	0.32	0.36	0.42	0.44	0.43	0.41	0.42	0.34	**0.40**
1996	**50m-70m**	0.22	0.23	0.18	0.17	0.18	0.20	0.19	0.27	0.24	0.25	0.21	0.27	**0.22**
	30m-50m	0.50	0.36	0.37	0.33	0.31	0.32	0.32	0.36	0.41	0.34	0.36	0.42	**0.37**
1997	**50m-70m**	0.24	0.20	0.24	0.21	0.23	0.25	0.22	0.22	0.28	0.24	0.18	0.20	**0.23**
	30m-50m	0.26	0.31	0.25	0.28	0.29	0.31	0.36	0.37	0.42	0.37	0.48	0.48	**0.35**
1998	**50m-70m**	0.25	0.28	*	*	*	*	*	*	*	*	*	*	**0.27**
	30m-50m	0.55	0.40	0.31	0.27	0.27	0.28	0.39	0.40	0.41	0.42	0.44	0.41	**0.38**
1999	**50m-70m**	0.27	0.25	0.28	0.26	0.24	0.22	0.30	0.32	0.35	0.34	0.35	0.34	**0.29**
	30m-50m	0.36	0.38	0.31	0.25	0.29	0.31	0.32	0.39	0.39	0.34	0.36	0.32	**0.34**
2000	**50m-70m**	0.33	0.39	0.31	0.28	0.34	0.32	0.41	0.42	0.42	0.40	0.34	0.29	**0.35**
	30m-50m	0.27	0.12	0.21	-0.15	-0.29	-0.51	-0.56	0.25	0.30	0.34	0.32	0.41	**0.06**
2001	**50m-70m**	0.55	0.70	0.55	1.01	1.25	1.58	1.72	0.62	0.54	0.40	0.40	0.34	**0.80**
	30m-50m	0.43	0.38	0.33	0.30	0.31	0.33	0.37	0.39	0.42	0.39	0.40	0.39	**0.37**
Average	**50m-70m**	0.26	0.26	0.23	0.22	0.24	0.24	0.27	0.30	0.31	0.29	0.25	0.26	**0.26**

* Equipment was damaged during this period. Also notice the lower wind speeds and wind powers for the 70m level during this period

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m	5.2	6.1	6.0	5.6	5.3	5.1	4.5	4.3	4.7	5.6	5.8	5.8	**5.3**
1995	**50m**	6.5	7.3	7.1	6.6	6.4	6.2	5.6	5.3	5.9	7.0	7.0	7.1	**6.5**
	70m	7.1	7.8	7.5	7.0	6.8	6.6	6.0	5.8	6.4	7.6	7.3	7.5	**7.0**
	30m	5.5	6.8	5.9	5.8	5.6	4.8	4.3	4.7	4.5	6.4	5.3	6.3	**5.5**
1996	**50m**	6.9	8.4	7.2	6.9	6.5	5.8	5.3	5.9	5.6	7.8	6.5	7.3	**6.7**
	70m	7.4	9.0	7.6	7.3	6.9	6.2	5.7	6.5	6.1	8.5	7.0	7.9	**7.2**
	30m	6.6	5.8	6.7	5.7	6.5	5.3	4.7	3.9	5.1	6.1	5.5	5.1	**5.6**
1997	**50m**	8.4	6.9	7.9	6.7	7.6	6.2	5.5	4.7	6.2	7.3	6.5	6.1	**6.7**
	70m	9.1	7.4	8.6	7.2	8.2	6.7	5.9	5.1	6.9	7.9	6.9	6.6	**7.2**
	30m	4.6	4.8	5.7	5.4	5.7	5.4	4.0	4.1	4.8	5.7	5.2	5.4	**5.1**
1998	**50m**	5.6	5.8	6.4	6.3	6.6	6.2	4.7	5.0	5.9	6.9	6.7	6.8	**6.1**
	70m	3.9	6.3	6.2	6.3	6.4	5.9	4.8	5.0	6.1	6.3	6.7	7.0	**5.9**
	30m	5.1	6.7	5.9	6.4	6.6	5.5	4.4	4.5	4.9	5.5	5.6	5.7	**5.6**
1999	**50m**	6.7	8.1	6.9	7.2	7.6	6.3	5.3	5.4	6.1	6.7	6.9	7.0	**6.7**
	70m	6.5	8.5	7.5	7.8	8.1	6.7	5.8	6.0	6.7	7.4	7.6	7.7	**7.2**
	30m	5.4	5.3	5.6	6.2	5.9	5.6	3.9	4.6	5.1	5.1	5.7	6.0	**5.4**
2000	**50m**	6.4	6.4	6.6	7.0	6.8	6.5	4.6	5.6	6.1	6.0	6.8	7.0	**6.3**
	70m	7.1	7.2	7.2	7.7	7.6	7.2	5.3	6.4	7.0	6.9	7.5	7.6	**7.1**
	30m	5.2	5.8	5.0	6.6	6.2	5.4	4.4	4.3	4.4	6.2	5.7	6.1	**5.4**
2001	**50m**	6.4	0.4	5.7	5.6	4.2	1.4	0.7	4.0	5.1	7.3	6.7	7.4	**4.6**
	70m	7.6	8.2	6.8	8.5	7.8	6.8	5.8	6.0	6.1	8.4	7.7	8.3	**7.3**
	30m	5.4	5.9	5.8	6.0	6.0	5.3	4.3	4.3	4.8	5.8	5.5	5.8	**5.4**
Average	**50m**	6.7	6.2	6.8	6.6	6.5	5.5	4.5	5.1	5.8	7.0	6.7	7.0	**6.2**
(m/s)	**70m**	7.0	7.8	7.3	7.4	7.4	6.6	5.6	5.8	6.5	7.6	7.2	7.5	**7.0**
	30m	12.0	13.2	13.1	13.3	13.4	11.9	9.6	9.7	10.7	13.0	12.4	12.9	**12.1**
Average	**50m**	15.0	13.8	15.3	14.8	14.6	12.3	10.1	11.5	13.0	15.7	15.1	15.6	**13.9**
(mph)	**70m**	15.6	17.4	16.4	16.5	16.6	14.7	12.5	13.0	14.5	16.9	16.2	16.8	**15.6**

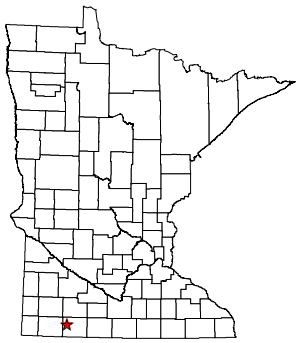
Alberta 50 Meter Wind Rose

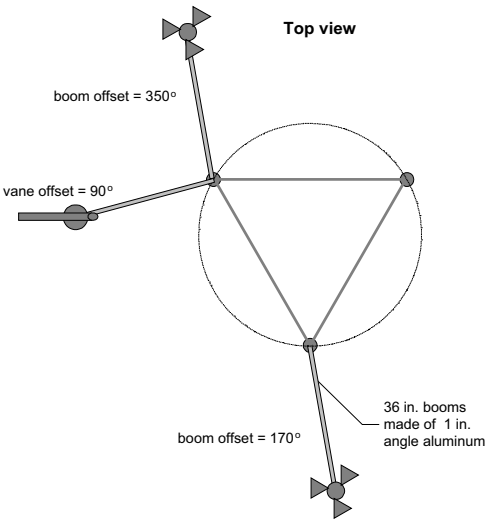


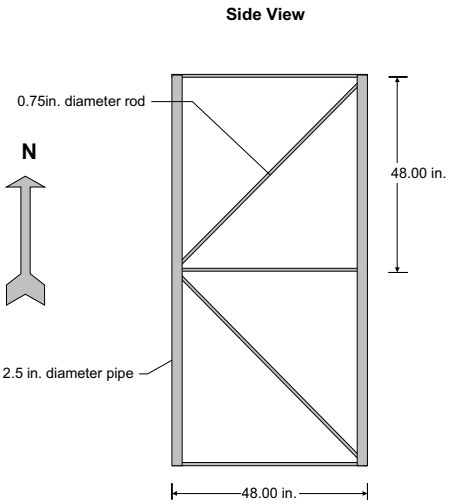
Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m	113	279	217	223	171	124	108	75	115	194	232	332	**182**
1995	**50m**	223	448	346	339	282	208	195	133	213	346	383	556	**306**
	70m	305	532	429	416	345	259	248	178	282	434	452	662	**379**
	30m	292	344	244	209	165	112	77	88	91	288	187	337	**203**
1996	**50m**	500	627	411	333	245	186	137	163	165	508	310	543	**344**
	70m	589	738	487	400	263	231	171	220	218	620	368	649	**413**
	30m	373	210	306	226	290	138	117	60	138	233	231	142	**205**
1997	**50m**	722	344	492	371	441	211	179	100	240	370	371	253	**341**
	70m	893	424	622	432	531	271	223	135	319	479	458	339	**427**
	30m	136	166	217	163	190	152	59	67	108	203	209	177	**154**
1998	**50m**	181	246	306	240	291	222	97	113	184	323	405	319	**244**
	70m	215	321	327	254	285	192	106	114	207	240	420	335	**251**
	30m	164	351	257	255	294	161	90	88	112	169	186	228	**196**
1999	**50m**	324	619	398	352	430	233	154	149	196	288	329	385	**321**
	70m	314	705	501	437	520	272	195	195	263	382	429	507	**393**
	30m	257	300	236	331	288	259	93	59	184	161	268	317	**229**
2000	**50m**	355	412	315	425	363	330	133	102	264	240	347	408	**308**
	70m	435	516	382	510	441	380	177	152	342	316	402	473	**377**
	30m	180	199	122	291	223	132	65	65	71	229	182	211	**164**
2001	**50m**	342	281	189	389	228	44	23	91	107	364	288	375	**227**
	70m	462	418	278	568	405	260	148	163	186	506	404	489	**357**
	30m	216	264	229	242	232	154	87	72	117	211	214	249	**191**
Average	**50m**	378	425	351	350	326	205	131	122	196	348	347	406	**299**
	70m	459	522	432	431	399	266	181	165	260	425	419	493	**371**

Brewster





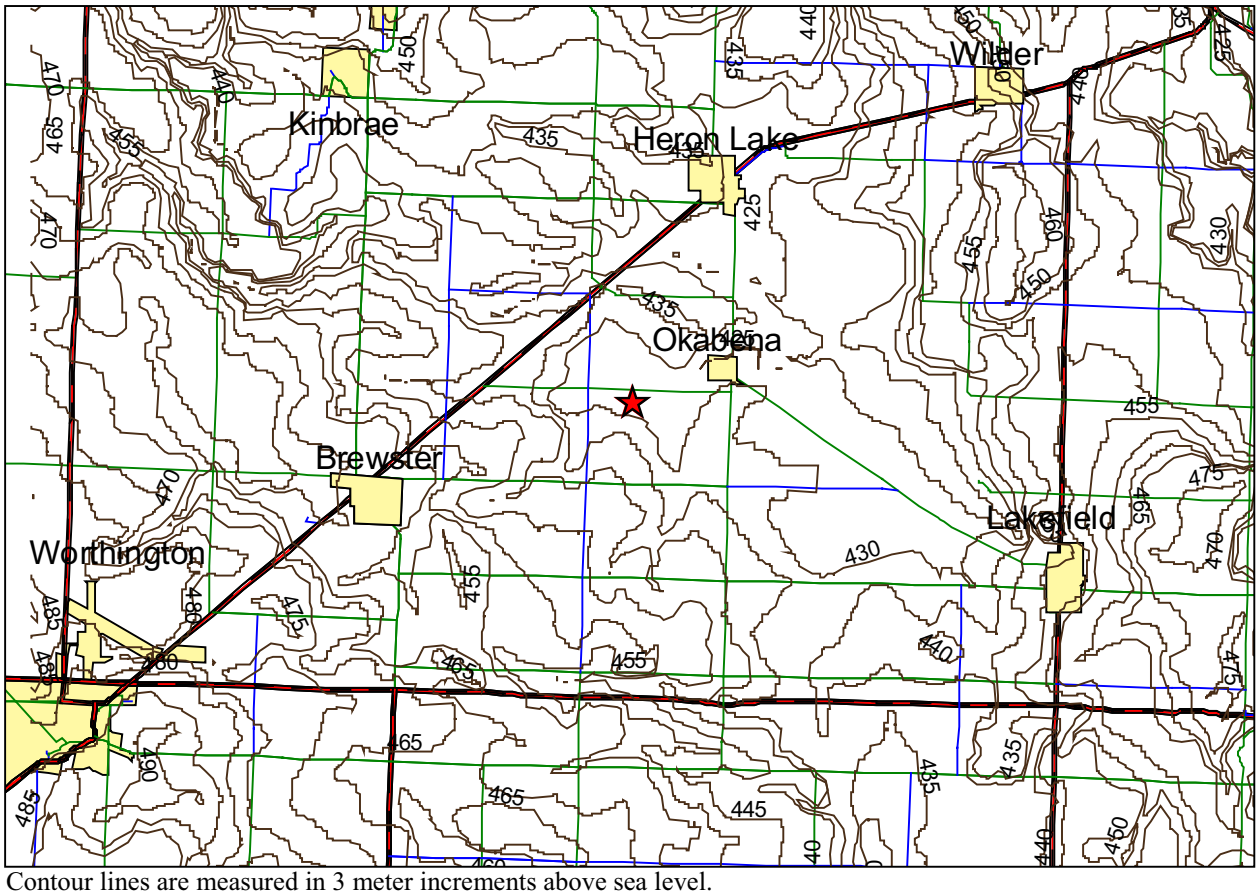


Coordinates

Long/Lat	UTM
N 43.7287	E 310199
W 95.3566	N 4844442

Elevation: 1401 feet

Additional Tower Information:
Anemometers located at 30, 50, and 70 meters.
Vanes located at 30 and 70 meters.



Contour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Brewster

Wind Shear Exponet (Alpha)

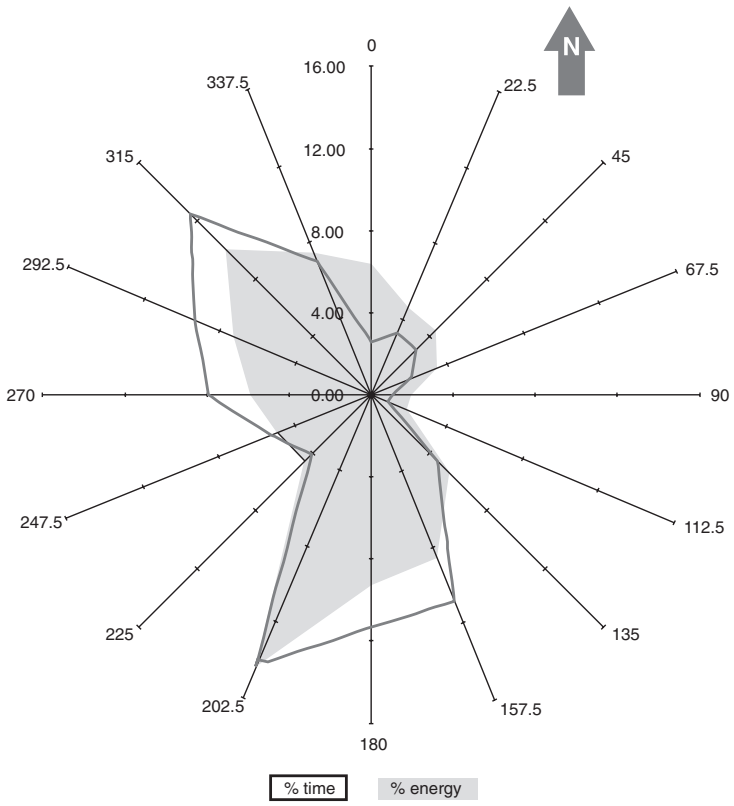
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m-50m						0.21	0.25	0.27	0.31	0.25	0.22	0.16	**0.24**
1995	**50m-70m**						0.20	0.25	0.30	0.30	0.26	0.19	0.09	0.23
	30m-50m	0.15	0.20	0.21	0.19	0.18	0.18	0.27	0.32	0.32	0.27	0.24	0.18	**0.23**
1996	**50m-70m**	0.15	0.22	0.18	0.20	0.17	0.18	0.23	0.28	0.30	0.25	0.23	0.14	**0.21**
	30m-50m	0.20	0.18	0.18	0.22	0.19	0.21	0.24	0.29	0.29	0.23	0.21	0.21	**0.22**
1997	**50m-70m**	0.17	0.16	0.18	0.19	0.18	0.21	0.22	0.28	0.24	0.22	0.17	0.19	**0.20**
	30m-50m	0.23	0.27	0.33	0.34	0.26	0.29	0.32	0.36	0.36	0.27	0.23	0.26	**0.29**
1998	**50m-70m**	0.12	0.17	0.12	0.16	0.14	0.17	0.23	0.28	0.29	0.23	0.20	0.23	**0.20**
	30m-50m	0.22	0.20	0.23	0.20	0.19	0.20	0.27	0.30	0.31	0.29	0.29	0.27	**0.25**
1999	**50m-70m**	0.29	0.22	0.24	0.19	0.17	0.20	0.26	0.29	0.32	0.28	0.28	0.27	**0.25**
	30m-50m	0.28	0.22	0.25	0.20	*	0.21	0.35	0.40	0.39	0.33	0.32	0.19	**0.29**
2000	**50m-70m**	0.31	0.25	0.25	0.36	*	0.70	0.25	0.30	0.30	0.31	0.26	0.24	**0.32**
	30m-50m	0.29	0.22	0.25	0.26	0.24	0.23	0.31	0.29	0.29	0.25	0.25	0.22	**0.26**
2001	**50m-70m**	0.22	0.14	0.21	0.16	0.17	0.13	0.19	0.30	0.33	0.26	0.28	0.32	**0.23**
	30m-50m	0.23	0.21	0.24	0.24	0.21	0.22	0.29	0.32	0.32	0.27	0.25	0.21	**0.25**
Average	**50m-70m**	0.21	0.19	0.20	0.21	0.17	0.26	0.23	0.29	0.30	0.26	0.23	0.21	**0.23**

* Equipment was damaged during this period

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						5.4	5.1	4.6	5.2	6.6	6.9	6.2	**5.7**
1995	**50m**						6.0	5.8	5.2	6.1	7.5	7.6	6.7	**6.4**
	70m						6.4	6.3	5.8	6.8	8.1	7.9	7.1	**6.9**
	30m	6.6	7.6	7.2	7.0	6.6	5.8	4.8	4.5	5.0	7.3	6.1	6.8	**6.3**
1996	**50m**	6.7	8.4	7.9	7.6	7.2	6.4	5.5	5.3	5.8	8.3	6.9	7.5	**7.0**
	70m	7.0	9.0	8.4	8.1	7.6	6.7	5.9	5.8	6.4	8.9	7.4	7.9	**7.4**
	30m	7.7	6.7	7.4	6.4	7.4	5.7	5.5	4.1	5.4	7.4	6.3	5.7	**6.3**
1997	**50m**	8.4	7.3	8.1	7.1	8.1	6.3	6.2	4.8	6.3	8.2	7.1	6.4	**7.0**
	70m	8.5	7.8	8.6	7.5	8.6	6.8	6.7	5.3	6.8	8.8	7.5	6.8	**7.5**
	30m	4.9	5.1	6.2	6.2	6.5	5.4	3.9	4.1	5.1	6.3	7.1	6.4	**5.6**
1998	**50m**	5.4	5.9	7.2	7.2	7.3	6.2	4.5	5.0	6.0	7.1	7.9	7.3	**6.4**
	70m	5.6	6.3	7.5	7.6	7.7	6.6	4.9	5.5	6.7	7.7	8.5	7.9	**6.9**
	30m	6.1	7.2	6.6	7.4	7.1	6.3	5.3	5.0	6.0	6.6	6.5	6.5	**6.4**
1999	**50m**	6.6	7.9	7.4	8.1	7.8	6.9	6.1	5.8	6.9	7.6	7.4	7.3	**7.1**
	70m	7.0	8.5	8.0	8.5	8.2	7.3	6.5	6.4	7.6	8.2	8.1	7.9	**7.7**
	30m	6.1	6.6	6.0	6.8	6.5	6.6	4.3	4.5	5.4	5.6	6.6	6.6	**6.0**
2000	**50m**	6.9	7.3	6.7	4.8	*	5.1	5.1	5.5	6.5	6.6	7.6	7.2	**6.3**
	70m	7.6	7.9	7.2	7.9	7.6	7.7	5.5	6.0	7.2	7.2	8.2	7.7	**7.3**
	30m	5.9	6.4	5.7	7.2	6.4	6.5	4.5	4.5	4.7	7.1	6.8	6.9	**6.1**
2001	**50m**	7.3	7.1	6.4	8.1	7.2	7.3	5.2	5.2	5.5	8.0	8.0	7.8	**6.9**
	70m	7.9	7.2	7.0	8.6	7.6	7.6	5.5	5.8	6.1	8.7	8.9	8.6	**7.5**
	30m	6.2	6.6	6.5	6.8	6.8	6.1	4.7	4.5	5.3	6.7	6.6	6.5	**6.1**
Average	**50m**	6.9	7.3	7.3	7.2	7.5	6.4	5.4	5.3	6.2	7.6	7.5	7.2	**6.8**
(m/s)	**70m**	7.3	7.8	7.8	8.0	7.9	7.1	5.8	5.8	6.8	8.2	8.1	7.8	**7.4**
	30m	13.9	14.8	14.6	15.3	15.1	13.6	10.6	10.0	11.8	15.0	14.7	14.5	**13.6**
Average	**50m**	15.4	16.4	16.3	16.0	16.8	14.3	12.1	11.8	13.8	17.0	16.8	16.2	**15.2**
(mph)	**70m**	16.3	17.4	17.4	18.0	17.6	15.9	13.1	13.0	15.2	18.5	18.1	17.4	**16.5**

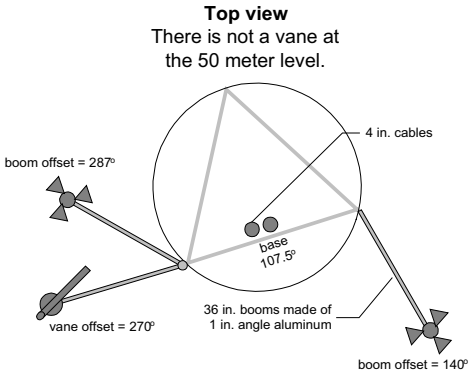
Brewster 50 Meter Wind Rose

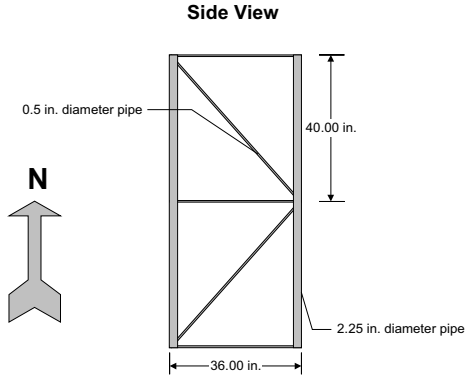


Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						116	143	90	163	294	354	329	**213**
1995	**50m**						153	200	131	234	401	463	422	**286**
	70m						184	256	178	308	495	538	521	**354**
	30m	301	463	333	353	284	199	99	88	114	395	233	370	**269**
1996	**50m**	349	594	421	452	345	249	144	139	175	529	316	473	**349**
	70m	404	705	493	537	403	290	180	184	234	639	385	555	**417**
	30m	504	309	379	328	401	184	187	72	164	388	311	197	**285**
1997	**50m**	639	403	486	415	506	235	250	108	239	502	419	270	**373**
	70m	724	488	577	475	583	283	300	144	303	604	510	338	**444**
	30m	116	173	270	270	285	167	59	68	124	217	401	270	**202**
1998	**50m**	170	250	423	385	393	230	93	112	196	310	543	384	**291**
	70m	189	310	472	455	447	270	121	153	259	385	660	482	**350**
	30m	255	373	395	428	325	243	177	122	175	272	264	285	**276**
1999	**50m**	327	493	507	529	409	302	243	179	254	374	371	382	**364**
	70m	393	601	596	600	469	352	297	232	335	461	468	467	**439**
	30m	239	310	277	355	297	294	87	87	165	151	282	307	**238**
2000	**50m**	328	404	361	314	*	224	128	140	258	219	396	381	**287**
	70m	413	489	431	515	420	426	159	184	338	294	487	466	**385**
	30m	240	242	172	367	233	230	81	72	88	328	266	278	**216**
2001	**50m**	372	306	238	498	309	307	117	110	131	438	382	386	**299**
	70m	476	318	297	572	357	341	142	150	178	528	502	492	**363**
	30m	283	326	331	347	318	200	125	88	151	286	307	293	**255**
Average	**50m**	363	429	440	419	413	232	176	135	226	389	418	385	**335**
	70m	425	519	514	516	465	301	219	179	296	480	508	472	**408**

Brownton

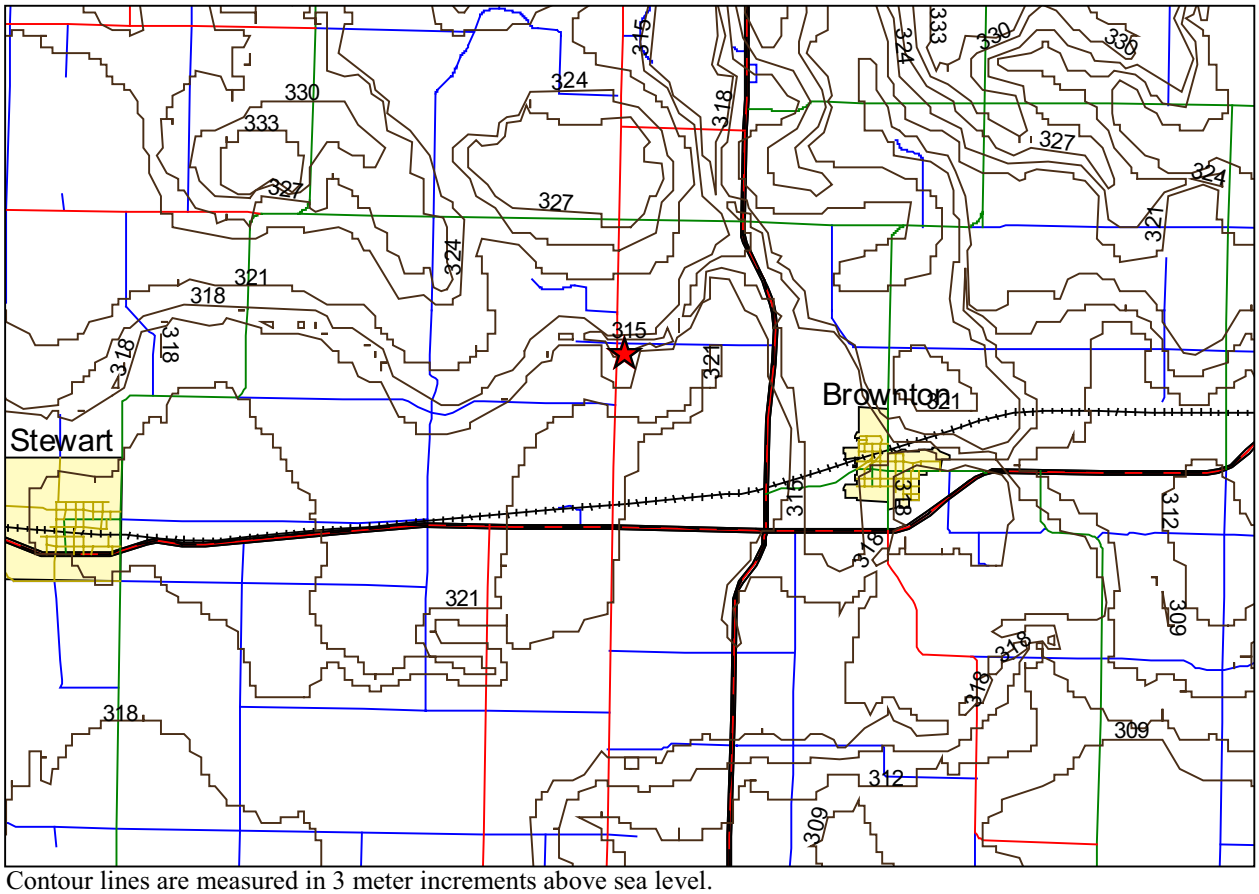




Coordinates

Long/Lat	UTM
N 44.7454	E 389566
W 94.3950	N 4955610

Elevation: 1031 feet



Contour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Brownton

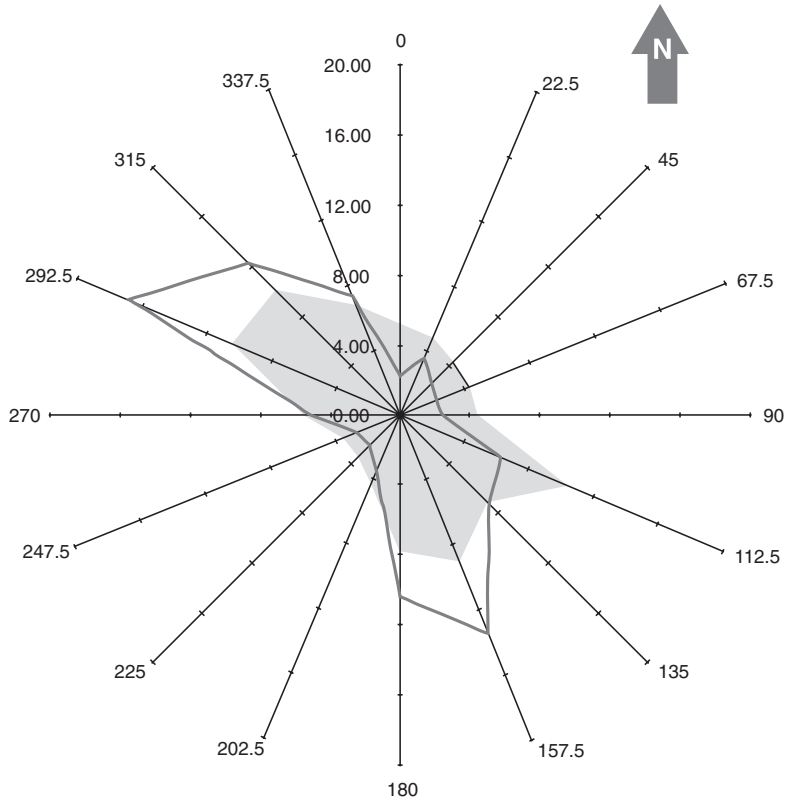
Wind Shear Exponet (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m-50m						0.32	0.39	0.38	0.42	0.38	0.33	0.29	**0.36**
1995	**50m-70m**						0.27	0.30	0.30	0.37	0.31	0.28	0.30	**0.30**
	30m-50m	0.33	0.35	0.30	0.29	0.27	0.30	0.37	*	0.43	0.34	0.37	0.40	**0.31**
1996	**50m-70m**	0.31	0.31	0.27	0.23	0.25	0.26	0.31	*	0.32	0.31	0.31	0.30	**0.27**
	30m-50m	0.47	0.47	0.45	0.36	0.36	0.31	0.32	0.36	0.39	0.35	0.32	0.26	**0.37**
1997	**50m-70m**	0.31	0.10	-0.28	0.14	0.16	0.24	0.29	0.32	0.34	0.34	0.37	0.34	**0.22**
	30m-50m	0.28	0.31	0.23	0.28	0.29	0.34	0.39	0.39	0.39	0.31	0.32	0.35	**0.29**
1998	**50m-70m**	0.34	0.33	0.26	0.29	0.30	0.32	0.34	0.42	0.40	0.37	0.34	0.37	**0.31**
	30m-50m	0.22	0.20	0.23	0.20	0.19	0.20	0.27	0.30	0.31	0.29	0.29	0.27	**0.25**
1999	**50m-70m**	0.29	0.22	0.24	0.19	0.17	0.20	0.26	0.29	0.32	0.28	0.28	0.27	**0.25**
	30m-50m	0.39	0.38	0.32	0.31	0.34	0.11							**0.31**
2000	**50m-70m**	0.42	0.42	0.38	0.35	0.43	0.35							**0.39**
	30m-50m	0.34	0.34	0.31	0.29	0.29	0.26	0.35	0.36	0.39	0.33	0.33	0.31	**0.32**
Average	**50m-70m**	0.33	0.28	0.17	0.24	0.26	0.27	0.30	0.33	0.35	0.32	0.32	0.32	**0.26**

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						4.2	4.3	3.7	4.2	5.3	5.4	5.1	**4.6**
1995	**50m**						5.0	5.2	4.5	5.2	6.4	6.3	5.9	**5.5**
	70m						5.4	5.8	5.0	5.8	7.1	6.9	6.5	**6.1**
	30m	5.6	6.2	5.9	5.7	5.1	4.6	3.9	*	4.1	6.5	5.0	5.1	**5.3**
1996	**50m**	6.5	7.4	6.9	6.6	5.9	5.4	4.8	*	5.1	7.7	6.0	6.2	**6.2**
	70m	7.2	8.1	7.5	7.1	6.4	5.9	5.3	*	5.7	8.4	6.7	6.9	**6.8**
	30m	5.3	4.9	5.5	5.2	5.5	4.7	4.5	3.6	4.8	5.9	5.0	4.6	**5.0**
1997	**50m**	6.8	6.2	6.8	6.3	6.6	5.5	5.3	4.3	5.8	6.9	5.8	5.3	**6.0**
	70m	7.5	6.4	6.9	6.6	6.9	5.9	5.9	4.8	6.5	7.7	6.6	6.0	**6.5**
	30m	4.1	4.3	5.3	5.3	5.3	4.4	3.4	3.7	4.5	5.2	5.3	5.1	**4.5**
1998	**50m**	4.7	5.0	6.0	6.0	6.1	5.2	4.1	4.4	5.5	6.1	6.3	6.1	**5.2**
	70m	5.3	5.6	6.5	6.6	6.7	5.8	4.6	5.1	6.3	6.9	7.0	6.9	**5.8**
	30m	6.1	7.2	6.6	7.4	7.1	6.3	5.3	5.0	6.0	6.6	6.5	6.5	**6.4**
1999	**50m**	6.6	7.9	7.4	8.1	7.8	6.9	6.1	5.8	6.9	7.6	7.4	7.3	**7.1**
	70m	7.0	8.5	8.0	8.5	8.2	7.3	6.5	6.4	7.6	8.2	8.1	7.9	**7.7**
	30m	4.9	5.1	5.0	5.5	5.2	5.1	3.8	3.7					**4.8**
2000	**50m**	6.0	6.1	5.8	6.4	4.6	*	*	*					**5.8**
	70m	6.8	7.0	6.5	4.6	*	*	*	*					**6.2**
	30m	5.2	5.5	5.7	5.8	5.7	4.9	4.2	3.9	4.7	5.9	5.4	5.3	**5.1**
Average	**50m**	6.1	6.5	6.6	6.7	6.2	5.6	5.1	4.8	5.7	6.9	6.4	6.2	**5.9**
(m/s)	**70m**	6.8	7.1	7.1	6.7	7.0	6.1	5.6	5.3	6.4	7.7	7.1	6.8	**6.5**
	30m	11.7	12.4	12.7	13.0	12.6	10.9	9.4	8.8	10.5	13.2	12.2	11.8	**11.4**
Average	**50m**	13.7	14.6	14.7	14.9	13.9	12.5	11.4	10.6	12.7	15.5	14.2	13.8	**13.3**
(mph)	**70m**	15.2	15.9	15.8	14.9	15.8	13.6	12.6	11.9	14.3	17.1	15.8	15.3	**14.5**

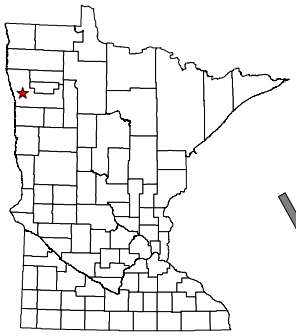
Brownton 50 Meter Wind Rose

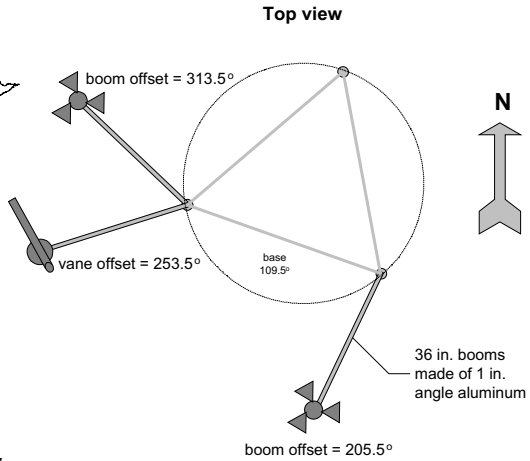


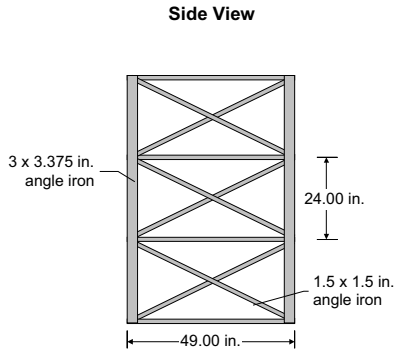
Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	30m						60	100	51	85	165	178	212	122
1995	50m						95	154	85	140	204	281	313	182
	70m						125	202	117	199	346	365	408	252
	30m	229	237	217	197	134	110	57	*	67	300	122	145	169
1996	50m	338	377	321	282	183	154	92	*	114	450	201	251	250
	70m	428	494	404	353	230	196	126	*	157	578	273	336	319
	30m	161	128	166	162	171	112	100	50	113	236	137	93	136
1997	50m	311	222	294	275	298	160	155	78	188	346	214	149	224
	70m	420	263	325	296	325	203	203	106	257	448	298	217	280
	30m	85	108	172	178	175	100	47	51	94	142	187	138	115
1998	50m	129	159	234	247	243	146	74	81	148	209	293	214	164
	70m	175	205	290	313	304	189	104	120	214	281	396	299	213
	30m	255	373	395	428	325	243	177	122	175	272	264	285	276
1999	50m	327	493	507	529	409	302	243	179	254	374	371	382	364
	70m	393	601	596	600	469	352	297	232	335	461	468	467	439
	30m	118	137	154	189	154	138	64	45					125
2000	50m	191	220	229	281	172	*	*	*					219
	70m	276	319	306	252	*	*	*	*					288
	30m	170	197	221	231	192	127	91	64	107	223	178	175	161
Average	50m	259	294	317	323	261	171	144	106	169	317	272	262	234
	70m	338	376	384	363	332	213	186	144	232	423	360	345	292
	70m	170	197	221	231	192	138	89	66	111	234	178	167	163

Crookston







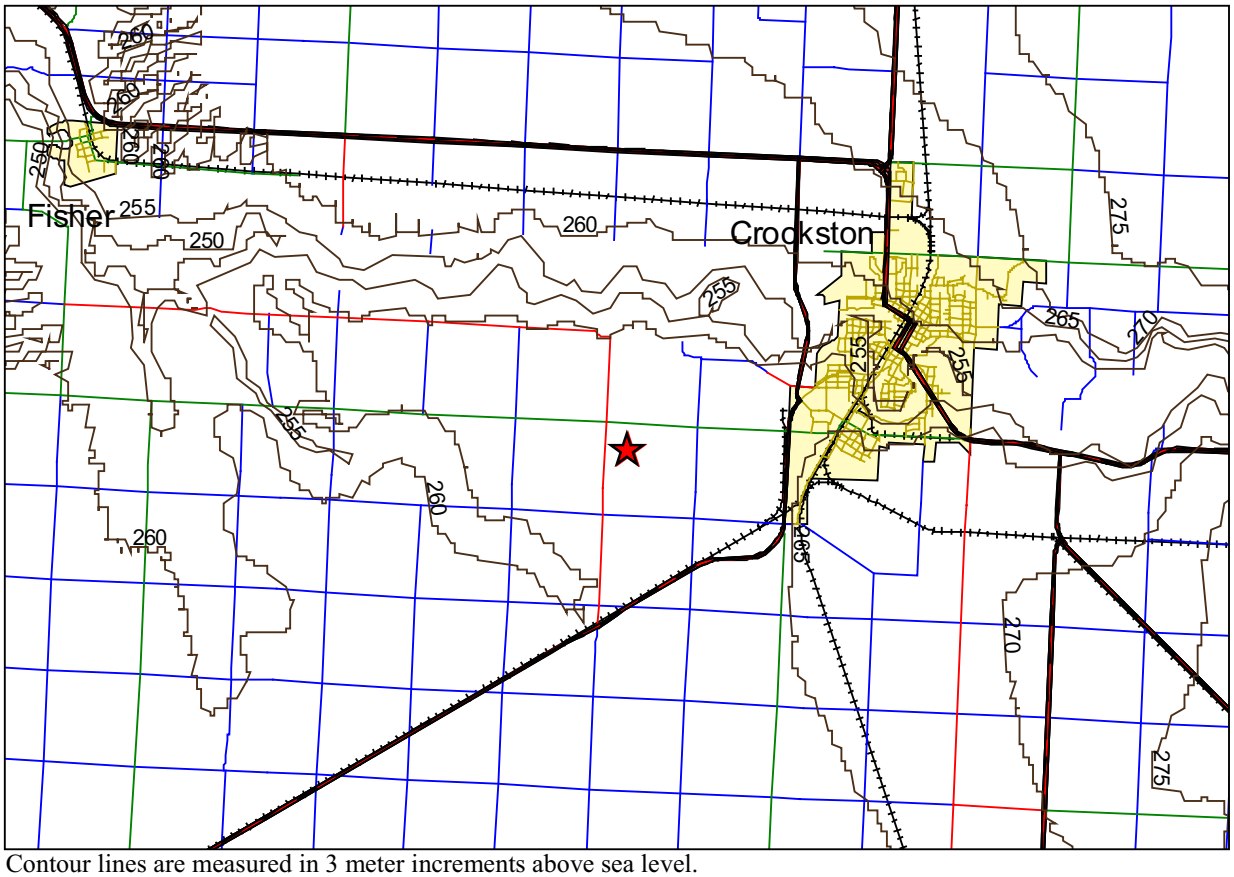
Coordinates

Long/Lat	UTM
N 47.7563	E 224991
W 96.6697	N 5295737

Elevation: 866 feet

Additional Tower Information:

- Anemometers are located at 30, 50, and 70 meters.
- Vanes are located at 30 and 70 meters.
- There are three satellite dishes on the top of the tower.
- Guy wires connect to the tower between the 30 m and 50 m sensors as well as the between the 50m and 70 m sensors.
- There are two vertical antennas 6 m above the 70 m anemometer (offset 45° from the north leg).



Contour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Crookston

Wind Shear Exponet (Alpha)

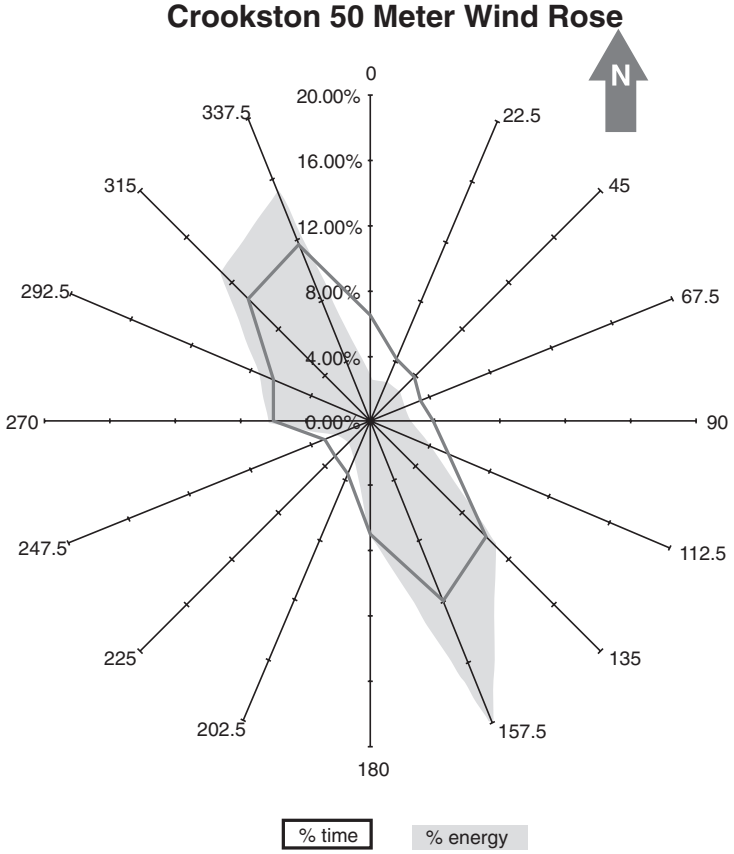
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
1995	**30m-50m**	*	*	*	*	*	0.23	0.27	0.29	0.31	0.25	0.22	0.21	**0.25**
	50m-70m	*	*	*	*	*	0.21	0.26	0.25	0.21	0.23	0.17	0.14	**0.21**
1996	**30m-50m**	0.21	0.23	0.25	0.21	0.21	0.22	0.28	0.33	0.30	0.25	0.22	0.15	**0.24**
	50m-70m	0.16	0.22	0.20	0.18	0.20	0.19	0.23	0.28	0.22	0.21	0.19	0.17	**0.20**
1997	**30m-50m**	0.18	0.20	0.23	0.45	0.32	0.21	0.29	0.27	0.29	0.24	0.22	0.25	**0.26**
	50m-70m	0.16	0.12	0.23	*	*	*	0.27	0.24	0.25	0.19	0.21	0.22	**0.21**
1998	**30m-50m**	0.19	0.19	0.16	0.22	0.22	0.24	0.29	0.27	0.27	0.27	0.25	0.30	**0.24**
	50m-70m	0.16	0.18	0.14	0.18	0.17	0.18	0.20	0.20	0.24	0.20	0.16	0.25	**0.19**
1999	**30m-50m**	0.23	0.25	0.25	0.24	0.18	0.23	0.29	0.26	0.30	0.28	0.32	0.25	**0.26**
	50m-70m	0.23	0.25	0.26	0.26	0.27	0.28	0.35	0.32	0.31	0.34	0.27	0.23	**0.28**
2000	**30m-50m**	0.24	0.26	0.24	0.22	0.23	0.24	0.29	0.32	0.31	0.27	0.25	0.19	**0.25**
	50m-70m	0.27	0.27	0.24	0.22	0.22	0.21	0.26	0.32	0.30	0.27	0.23	0.19	**0.25**
2001	**30m-50m**	0.19	0.24	0.19	0.22	0.20	0.22	0.24	0.28	0.24	0.27	0.26	0.22	**0.23**
	50m-70m	0.03	0.19	0.15	0.16	0.17	0.17	0.26	0.29	0.31	0.24	0.22	0.19	**0.20**
Average	**30m-50m**	0.21	0.23	0.22	0.26	0.23	0.23	0.28	0.29	0.29	0.26	0.25	0.22	**0.25**
	50m-70m	0.17	0.21	0.20	0.20	0.21	0.21	0.26	0.27	0.26	0.24	0.21	0.20	**0.22**

*Equipment was damaged during this period

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						5.4	4.2	5.5	4.9	5.1	5.8	5.8	**5.2**
1995	**50m**						6	4.8	6.3	5.7	6	6.5	6.5	**6.0**
	70m						6.5	5.2	6.9	6.1	6.4	6.8	6.8	**6.4**
	30m	5.1	6.8	5.8	5.9	5.6	5.5	4.4	5.4	4.9	6.8	5.2	6.1	**5.6**
1996	**50m**	5.7	7.6	6.5	6.5	6.2	6.2	5.1	6.3	5.6	7.7	5.8	6.5	**6.3**
	70m	6	8.2	6.9	6.9	6.6	6.6	5.5	6.9	6.1	8.2	6.2	6.9	**6.8**
	30m	6	6.2	6.3	4.9	5.7	5.3	4.5	4.4	5.8	6.6	6	5.8	**5.6**
1997	**50m**	7.1	6.8	7	6	6.8	5.8	5.1	5.1	6.6	7.4	6.7	6.5	**6.4**
	70m	7.4	6.9	7.6	*	*	*	5.6	5.5	7.2	7.9	7.2	7	**6.9**
	30m	5.1	5.1	5.5	5.6	5.2	5	4.1	4.3	5.5	5.9	5.3	5.4	**5.2**
1998	**50m**	5.5	5.8	5.9	6.2	5.8	5.5	4.8	5	6.3	6.7	6	6.2	**5.8**
	70m	5.8		6.2	6.6	6.2	5.9	5.1	5.4	6.8	7.2	6.4	6.8	**6.2**
	30m	6.1	6.9	5.8	5.6	6.8	5.4	4.7	4.7	5.4	6.0	5.6	6.0	**5.7**
1999	**50m**	6.8	7.7	6.5	5.6	6.5	5.6	5.1	4.9	5.8	6.1	6.5	6.8	**6.2**
	70m	7.2	8.2	7.0	6.0	7.0	6.1	5.7	5.4	6.3	6.7	7.0	7.2	**6.6**
	30m	5.6	5.6	5.8	6.3	5.6	5.3	4.2	4.9	5.7	5.8	5.7	5.6	**5.5**
2000	**50m**	6.3	6.3	6.5	6.9	6.3	6.0	4.8	5.8	6.6	6.6	6.3	6.1	**6.2**
	70m	6.7	6.8	7.0	7.4	6.7	6.4	5.2	6.3	7.2	7.2	6.7	6.4	**6.7**
	30m	6.0	6.0	5.8	6.3	6.2	4.9	4.9	5.0	4.9	6.3	6.1	5.8	**5.7**
2001	**50m**	6.6	6.7	6.3	7.0	6.8	5.5	5.5	5.8	5.6	7.2	6.9	6.4	**6.4**
	70m	6.8	7.2	6.7	7.4	7.2	5.8	6.0	6.4	6.2	7.8	7.4	6.9	**6.8**
	30m	5.7	6.1	5.8	5.8	5.9	5.3	4.4	4.9	5.3	6.1	5.7	5.8	**5.6**
Average	**50m**	6.3	6.8	6.5	6.4	6.4	5.8	5.0	5.6	6.0	6.8	6.4	6.4	**6.2**
(m/s)	**70m**	6.7	7.5	6.9	6.8	6.7	6.2	5.5	6.1	6.5	7.3	6.8	6.9	**6.7**
	30m	12.6	13.6	13.0	12.9	13.1	11.8	9.9	10.9	11.9	13.6	12.7	13.0	**12.4**
Average	**50m**	14.2	15.3	14.4	14.2	14.3	13.0	11.3	12.5	13.5	15.3	14.3	14.4	**13.9**
(mph)	**70m**	14.9	16.7	15.4	15.3	15.1	13.9	12.2	13.7	14.6	16.4	15.3	15.3	**14.9**

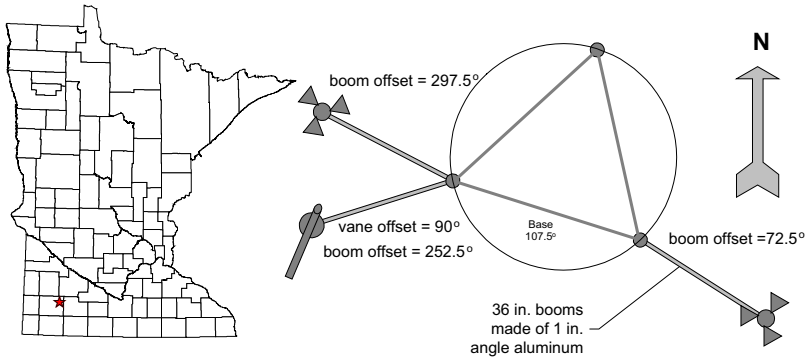
Crookston 50 Meter Wind Rose

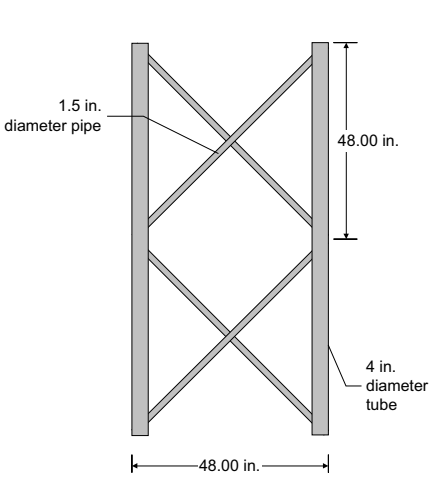


Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						168	131	158	134	159	233	279	**180**
1995	**50m**						219	174	224	189	232	306	380	**246**
	70m						270	210	282	236	283	358	450	**298**
	30m	225	363	237	232	170	164	85	139	143	348	171	312	**216**
1996	**50m**	279	465	304	297	219	216	124	210	192	459	223	375	**280**
	70m	336	564	368	361	267	267	157	280	238	536	262	442	**340**
	30m	293	292	255	165	200	135	106	106	188	287	305	194	**211**
1997	**50m**	427	371	334	277	374	183	146	151	271	392	391	271	**299**
	70m	481	429	419	*	*	*	185	196	347	478	468	341	**372**
	30m	148	175	207	172	163	115	71	78	166	227	169	201	**158**
1998	**50m**	185	233	249	229	218	155	109	117	235	313	227	285	**213**
	70m	210	295	280	276	256	187	140	152	295	379	282	358	**259**
	30m	243	352	270	172	321	169	100	111	148	213	210	254	**214**
1999	**50m**	327	465	361	166	284	194	132	133	183	239	316	346	**262**
	70m	403	562	447	209	342	237	178	170	231	307	389	415	**324**
	30m	201	197	232	241	198	166	72	123	188	160	173	243	**183**
2000	**50m**	270	271	308	313	262	229	107	182	273	226	233	296	**247**
	70m	330	335	376	370	310	274	135	238	348	290	278	335	**302**
	30m	234	207	180	292	214	102	101	100	121	233	207	192	**182**
2001	**50m**	328	285	228	366	275	137	141	148	165	323	286	254	**245**
	70m	389	342	261	421	320	163	181	204	218	400	356	306	**297**
	30m	224	264	230	212	211	146	95	117	155	232	210	239	**195**
Average	**50m**	303	348	297	275	272	190	133	167	215	312	283	315	**259**
	70m	358	421	359	327	299	233	169	217	273	382	342	378	**313**

Currie





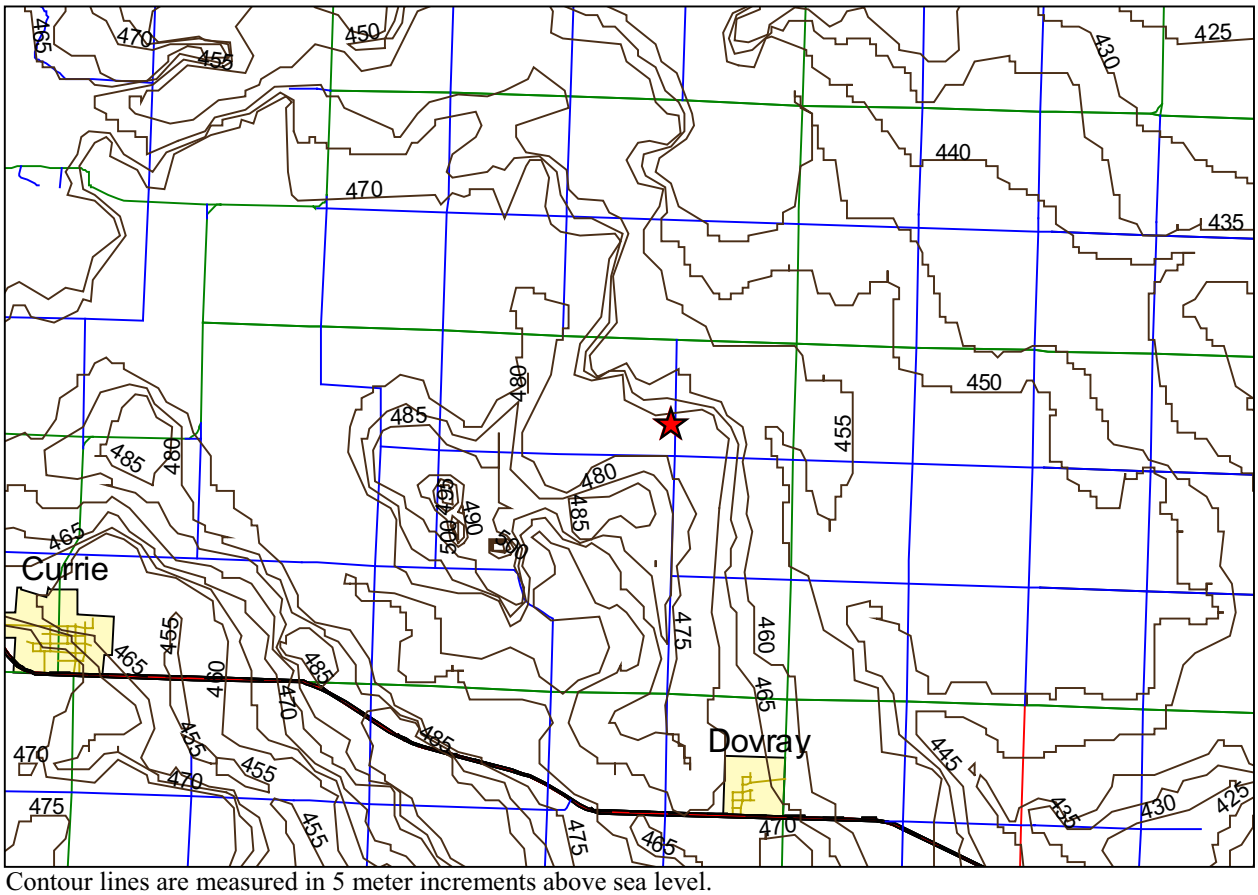
Coordinates

Long/Lat	UTM
N 44.0984	E 294803
W 95.5636	N 4886003

Elevation: 1544 feet

Additional Tower Information:

- Anemometers are located at 30, 50, and 70 meters.
- Vanes are located at 30 and 70 meters.



Contour lines are measured in 5 meter increments above sea level.
County roads are approximately 1 mile apart.

Currie

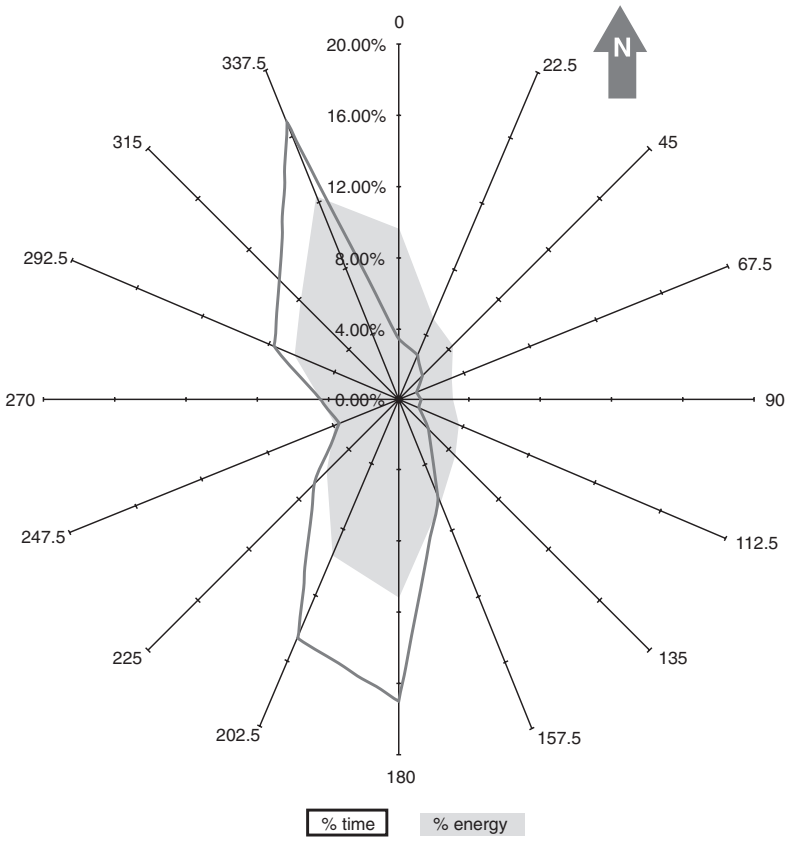
Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						5.8	5.7	5.3	6.1	7.2	7.2	6.8	**6.3**
1995	**50m**						6.3	6.3	5.9	6.8	7.9	7.9	7	**6.9**
	70m						6.8	6.8	6.4	7.5	8.6	8.4	7.6	**7.4**
	30m	7.8	8.4	7.1	7.1	6.4	6.1	5.3	5.5	5.2	7.9	6.1	5.4	**6.7**
1996	**50m**	8.3	9.1	7.8	7.7	6.9	6.6	5.9	6.1	6	8.8	6.6	*	**7.3**
	70m	8.5	9.8	8.3	8.2	7.3	7.1	6.4	6.6	6.6	9.5	6.9	*	**7.8**
	30m	6.6	7.6	8.1	6.9	7.7	6.1	5.8	4.7	6.1	8	6.9	7	**6.8**
1997	**50m**	7.1	8.1	8.7	7.5	8.2	6.7	6.3	5.3	6.8	8.6	7.3	7.4	**7.3**
	70m	6.4	8.6	9.1	7.9	8.7	7.1	6.8	5.7	7.4	9.4	7.9	8	**7.8**
	30m	5.5	6	7.1	6.6	7.1	5.9	4.6	4.9	6.1	6.5	7.2	7.3	**6.0**
1998	**50m**	5.8	6.4	7.6	7.1	7.6	6.5	5.2	5.6	6.9	7.3	7.9	8	**6.5**
	70m	5.9	6.8	7.9	7.4	8	6.8	5.5	6	7.5	7.8	8.6	8.6	**6.8**
	30m	6.4	8.0	7.1	7.4	7.5	6.6	5.9	5.7	6.4	7.2	7.5	7.3	**6.9**
1999	**50m**	6.8	8.6	8.1	8.1	7.9	7.1	6.5	6.4	7.3	8.0	8.3	7.9	**7.6**
	70m	8.3	9.1	8.1	8.4	8.4	7.5	7.0	6.9	7.9	8.6	8.9	8.3	**8.1**
	30m	7.0	7.1	6.7	7.7	*	*	*	*					**7.1**
2000	**50m**	7.7	7.7	7.4	6.0	*	*	*	*					**7.2**
	70m	8.2	8.2	7.8	6.2	*	*	*	*					**7.6**
	30m	6.7	7.4	7.2	7.2	7.2	6.1	5.5	5.2	6.0	7.4	7.0	6.8	**6.5**
Average	**50m**	7.1	8.0	7.9	7.3	7.7	6.6	6.0	5.9	6.8	8.1	7.6	7.6	**7.1**
(m/s)	**70m**	7.5	8.5	8.2	7.6	8.1	7.1	6.5	6.3	7.4	8.8	8.1	8.1	**7.5**
	30m	14.9	16.6	16.1	16.0	16.0	13.7	12.2	11.7	13.4	16.5	15.6	15.1	**14.7**
Average	**50m**	16.0	17.9	17.7	16.3	17.1	14.8	13.5	13.1	15.1	18.2	17.0	16.9	**15.8**
(mph)	**70m**	16.7	19.0	18.4	17.1	18.1	15.8	14.5	14.1	16.5	19.7	18.2	18.2	**16.7**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						143	190	131	236	364	399	388	**155**
1995	**50m**						182	255	186	322	467	508	525	**208**
	70m						220	331	244	418	586	632	635	**265**
	30m	609	587	354	354	265	224	130	169	133	471	274	364	**328**
1996	**50m**	723	732	445	442	324	275	177	226	196	604	341	*	**408**
	70m	832	895	535	545	389	333	224	286	263	743	443	*	**499**
	30m	498	452	484	355	431	216	211	97	220	466	413	333	**343**
1997	**50m**	557	556	606	435	521	277	268	138	301	572	505	415	**420**
	70m	723	667	728	517	603	334	330	179	390	721	621	537	**510**
	30m	159	232	405	281	352	198	99	104	201	224	369	372	**229**
1998	**50m**	202	294	474	347	426	248	137	150	286	317	488	471	**285**
	70m	238	364	537	401	489	289	170	193	366	388	617	587	**335**
	30m	345	529	451	407	357	265	216	168	209	324	376	377	**335**
1999	**50m**	404	637	544	494	417	310	276	230	294	436	499	471	**418**
	70m	589	763	653	558	495	373	343	291	381	550	620	566	**515**
	30m	335	380	335	481	*	*	*	*					**383**
2000	**50m**	429	482	426	355	*	*	*	*					**423**
	70m	530	575	499	406	*	*	*	*					**503**
	30m	389	436	406	376	351	209	169	134	200	370	366	367	**309**
Average	**50m**	463	540	499	415	422	258	223	186	280	479	468	470	**376**
	70m	582	653	590	485	494	310	280	239	364	598	587	581	**454**

Currie 50 Meter Wind Rose

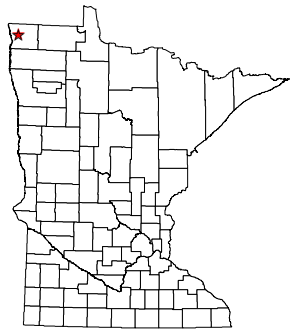


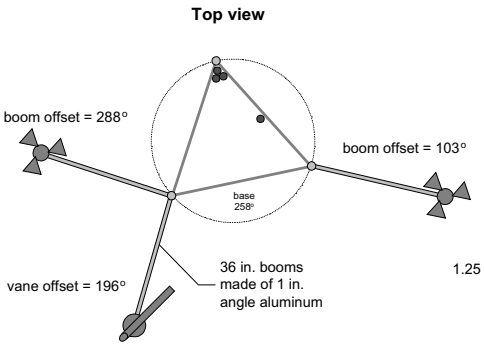
Wind Shear Exponent (Alpha)

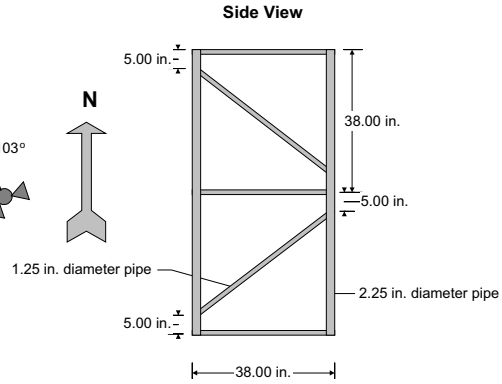
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	30m-50m	*	*	*	*	*	0.17	0.19	0.22	0.21	0.21	0.17	-0.22	**0.14**
1995	**50m-70m**	*	*	*	*	*	0.20	0.25	0.24	0.26	0.24	0.22	0.15	**0.22**
	30m-50m	0.11	0.17	0.18	0.18	0.16	0.17	0.21	0.22	0.29	0.23	0.15	*	**0.18**
1996	**50m-70m**	0.02	0.22	0.18	0.20	0.19	0.16	0.21	0.23	0.27	0.24	0.19	*	**0.18**
	30m-50m	0.10	0.13	0.16	0.16	0.15	0.18	0.19	0.22	0.21	0.16	0.10	0.11	**0.16**
1997	**50m-70m**	0.16	0.13	0.11	0.18	0.16	0.16	0.21	0.23	0.22	0.26	0.22	0.16	**0.18**
	30m-50m	0.04	0.12	0.14	0.15	0.15	0.18	0.22	0.26	0.24	0.24	0.20	0.17	**0.16**
1998	**50m-70m**	0.02	0.13	0.09	0.13	0.12	0.14	0.16	0.21	0.21	0.18	0.18	0.18	**0.13**
	30m-50m	0.18	0.16	0.17	0.19	0.14	0.15	0.21	0.24	0.25	0.24	0.22	0.20	**0.20**
1999	**50m-70m**	0.30	0.21	0.21	0.17	0.18	0.19	0.23	0.24	0.26	0.24	0.23	0.22	**0.22**
	30m-50m	0.20	0.20	0.20	0.17	*	*	*	*	*	*	*	*	**0.19**
2000	**50m-70m**	0.23	0.22	0.22	0.22	*	*	*	*	*	*	*	*	**0.22**
	30m-50m	0.13	0.16	0.17	0.17	0.15	0.17	0.20	0.23	0.24	0.22	0.17	0.07	**0.17**
Average	**50m-70m**	0.15	0.18	0.16	0.18	0.16	0.17	0.21	0.23	0.24	0.23	0.21	0.18	**0.18**

*Equipment was damaged during this period

Hallock







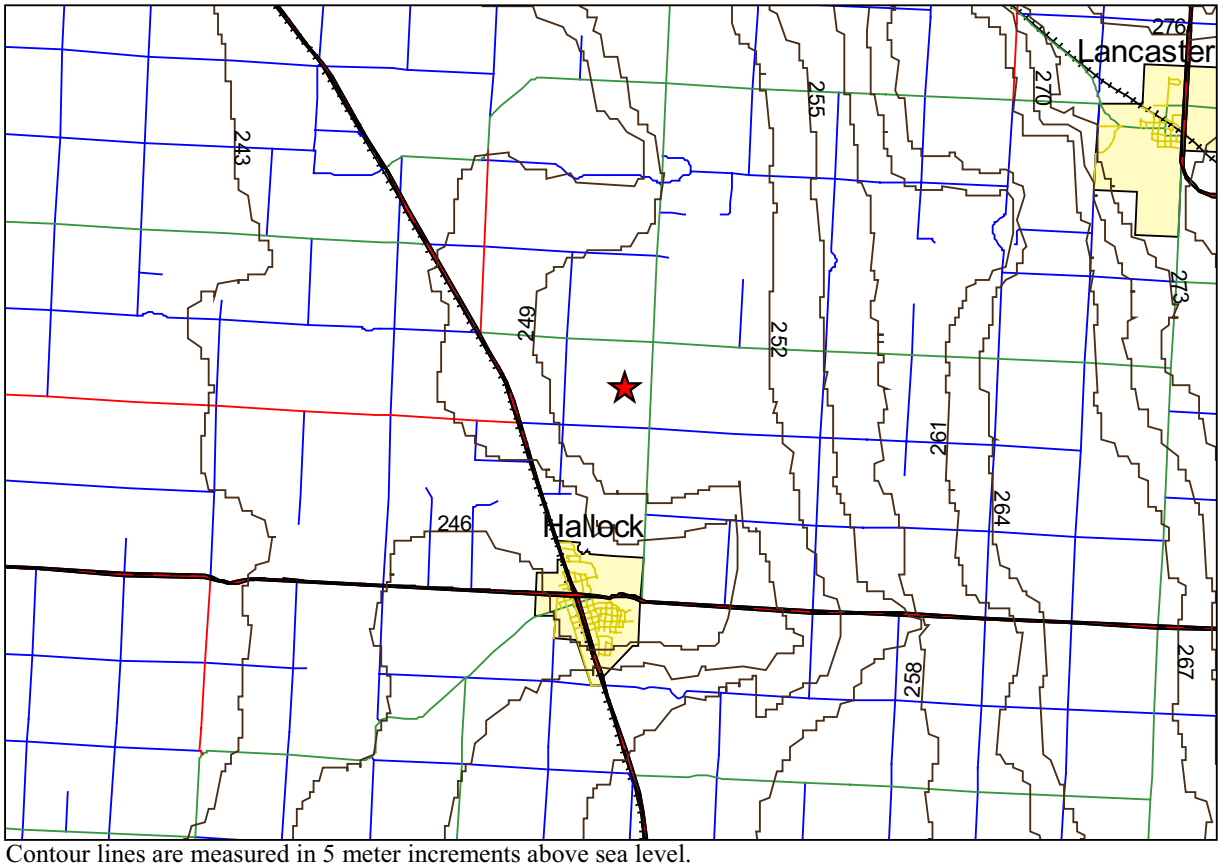
Coordinates

Long/Lat	UTM
N 48.7625	E 210877
W 96.9346	N 5408524

Elevation: 820 feet

Additional Tower Information:

- Anemometers are located at 30, 50, and 70 meters.
- Vanes are located at 30 and 70 meters.
- There is a curved wire dish facing SW midway between the 30 meter and 50 meter sensors.
- Two X-mas tree antennas facing N and SW are located halfway between the 50 meter and 70 meter sensors.
- Three 2 inch diameter electrical cables are on the north leg of the tower.
- On the east side of the tower there is a 2 inch diameter bundle of cables.
- There are five satellite dishes in line on the ground to the south of the tower.
- Two tower sheds are located to the north and northwest of the tower.



Contour lines are measured in 5 meter increments above sea level.
County roads are approximately 1 mile apart.

Hallock

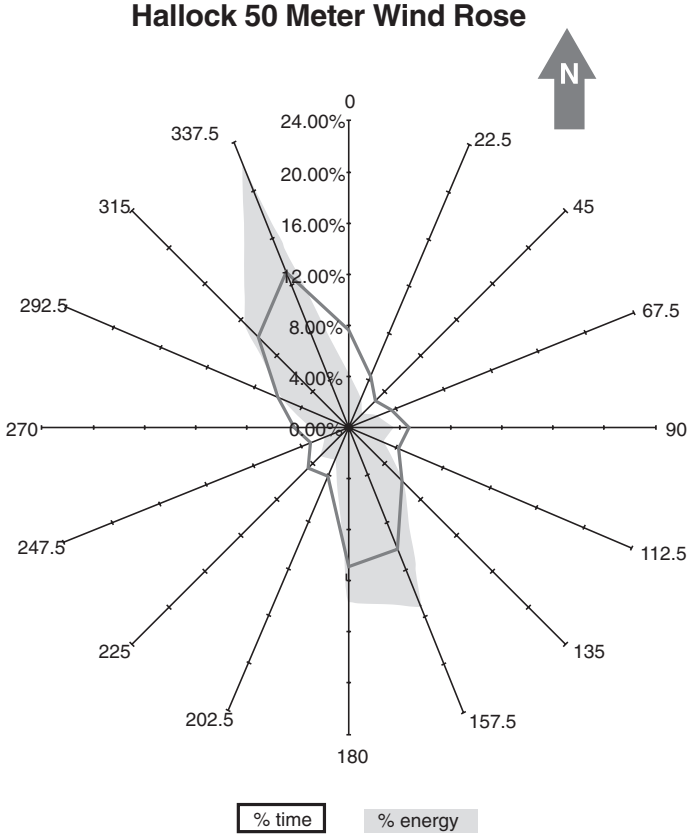
Wind Shear Exponet (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
1995	**30m-50m**						0.19	0.24	0.25	0.24	0.23	0.18	0.15	**0.21**
	50m-70m						0.16	0.24	..22	0.19	0.22	0.20	0.21	**0.20**
1996	**30m-50m**	0.16	0.18	0.19	0.18	0.16	0.15	0.24	0.28	0.23	0.20	0.16	0.12	**0.19**
	50m-70m	0.17	0.20	0.20	0.15	0.17	0.18	0.22	0.26	0.26	0.20	0.16	0.12	**0.19**
1997	**30m-50m**	0.17	0.18	0.18	*	*	0.20	0.26	0.26	0.24	0.19	0.18	0.22	**0.21**
	50m-70m	0.19	0.19	0.19	*	*	0.14	0.23	0.22	0.22	0.20	0.14	0.19	**0.19**
1998	**30m-50m**	0.11	0.03	0.14	0.18	0.16	0.20	0.26	0.26	0.23	0.20	0.19	0.23	**0.18**
	50m-70m	0.02	0.05	0.11	0.19	0.16	0.17	0.23	0.22	0.24	0.18	0.20	0.22	**0.17**
1999	**30m-50m**	0.20	0.22	0.17	0.19	0.16	0.20	0.25	0.25	0.23	0.23	0.26	0.22	**0.21**
	50m-70m	0.24	0.22	0.17	0.19	0.18	0.21	0.28	0.25	0.26	0.24	0.25	0.24	**0.23**
2000	**30m-50m**	0.20	0.23	0.19	0.17	0.18	0.19	0.24	0.25	0.25	0.24	0.22	0.18	**0.21**
	50m-70m	0.23	0.26	0.21	0.21	0.24	0.22	0.29	0.29	0.47	0.25	0.24	0.19	**0.26**
2001	**30m-50m**	0.15	0.15	0.15	0.15	0.18	0.17	0.20	0.20	0.17	0.11	0.13	0.07	**0.15**
	50m-70m	0.24	0.13	0.13	0.01	0.04	0.13	0.00	0.23	0.29	0.40	0.49	0.60	**0.22**
Average	**30m-50m**	0.17	0.17	0.17	0.18	0.17	0.19	0.24	0.25	0.23	0.20	0.19	0.17	**0.19**
	50m-70m	0.18	0.17	0.17	0.15	0.16	0.17	0.21	0.25	0.28	0.24	0.24	0.25	**0.21**

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						5.6	5.0	6.1	5.2	5.5	6.4	5.8	**5.7**
1995	**50m**						6.2	5.6	6.9	5.9	6.1	7.0	6.2	**6.3**
	70m						6.5	6.1	7.4	6.3	6.6	7.5	6.6	**6.7**
	30m	5.6	7.1	6.3	6.0	5.7	6.1	4.5	5.4	5.3	7.0	5.9	6.3	**5.9**
1996	**50m**	6.1	7.7	6.9	0.6	6.1	6.6	5.1	6.2	5.9	7.6	6.4	6.7	**6.0**
	70m		8.1	7.4	7.0	6.5	6.9	5.5	6.8	6.4	8.1	6.8	7.0	**7.0**
	30m	7.6	6.6	6.5	*	*	5.0	4.9	4.7	6.1	7.0	6.3	6.0	**6.1**
1997	**50m**	8.3	7.3	7.2	*	*	5.6	5.6	5.4	6.9	7.7	6.8	6.6	**6.7**
	70m	8.7	7.7	7.6	*	*	5.9	6.0	5.9	7.4	8.2	7.2	7.1	**7.2**
	30m	5.5	5.6	5.7	5.7	6.0	5.1	4.4	4.6	6.0	6.3	6.1	5.5	**5.5**
1998	**50m**	5.7	5.6	6.1	6.2	6.5	5.6	5.1	5.3	6.6	6.9	6.6	6.0	**6.0**
	70m	5.9	6.2	6.3	6.7	6.8	5.9	5.5	5.8	7.1	7.4	7.1	6.5	**6.4**
	30m	6.4	7.2	6.3	5.9	7.6	5.8	4.8	4.7	5.7	6.3	6.0	6.2	**6.1**
1999	**50m**	6.9	7.9	6.8	6.4	8.1	6.3	5.5	5.4	6.4	7.0	6.8	6.9	**6.7**
	70m	7.3	8.4	7.2	6.7	8.5	6.7	5.9	5.8	6.9	7.5	7.2	7.3	**7.1**
	30m	6.1	6.0	6.4	6.7	6.0	5.7	4.6	5.5	6.0	6.2	5.7	5.7	**5.9**
2000	**50m**	6.7	6.7	7.0	7.2	6.5	6.3	5.2	6.2	6.8	7.0	6.4	6.1	**6.5**
	70m	7.1	7.1	7.4	7.6	6.9	6.7	5.7	6.8	8.3	7.5	6.8	6.3	**7.0**
	30m	5.4	6.3	6.3	6.4	6.7	5.8	4.3	5.4	5.3	6.5	6.1	6.3	**5.9**
2001	**50m**	6.0	6.8	6.7	6.9	7.3	6.3	4.8	6.0	5.7	6.9	6.5	6.5	**6.4**
	70m	6.6	7.3	7.3	7.0	7.4	6.8	4.9	6.5	6.4	7.9	7.9	8.3	**7.0**
	30m	6.1	6.5	6.2	6.1	6.4	5.6	4.7	5.2	5.7	6.4	6.1	6.0	**5.9**
Average	**50m**	6.6	7.0	6.8	5.5	6.9	6.1	5.3	5.9	6.3	7.0	6.6	6.4	**6.4**
(m/s)	**70m**	7.1	7.5	7.2	7.0	7.2	6.5	5.7	6.4	7.0	7.6	7.2	7.0	**7.0**
	30m	13.7	14.5	14.0	13.7	14.3	12.5	10.4	11.6	12.7	14.3	13.6	13.4	**13.2**
Average	**50m**	14.8	15.6	15.2	12.2	15.4	13.7	11.8	13.2	14.1	15.7	14.8	14.4	**14.3**
(mph)	**70m**	15.9	16.7	16.1	15.7	16.2	14.5	12.6	14.4	15.6	17.0	16.2	15.7	**15.5**

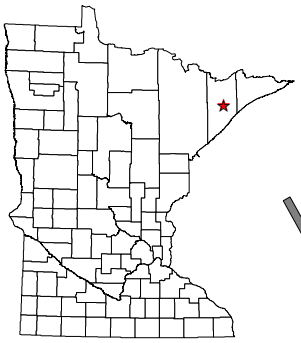
Hallock 50 Meter Wind Rose

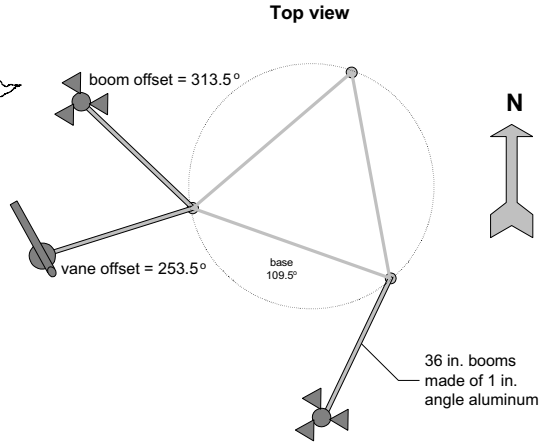


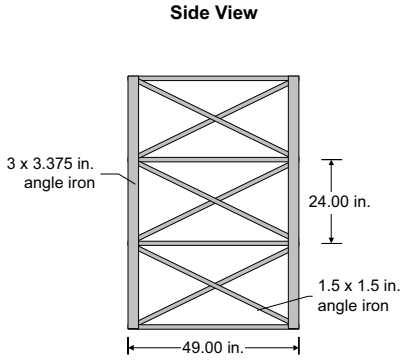
Wind Power (Watts per Square Meter)=

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						200	131	222	155	207	323	344	**226**
1995	**50m**						250	182	297	213	274	407	427	**293**
	70m						291	230	367	265	324	473	502	**350**
	30m	277	416	346	248	187	224	96.6	143	144	365	342	363	**263**
1996	**50m**	334	508	417	314	231	273	132	207	197	462	409	426	**326**
	70m	379	575	469	370	267	313	165	267	248	542	466	477	**378**
	30m	596	371	299	*	*	106	140	105	219	337	384	225	**278**
1997	**50m**	709	462	373	*	*	145	190	150	292	432	461	295	**351**
	70m	780	532	442	*	*	181	230	192	360	509	529	354	**411**
	30m	207	209	228	194	219	122	89.3	94.1	234	254	293	212	**196**
1998	**50m**	228	232	268	247	265	155	130	137	299	323	367	271	**244**
	70m	225	254	294	297	308	184	167	176	361	385	436	330	**285**
	30m	299	436	344	205	426	200	109	111	188	262	268	327	**264**
1999	**50m**	368	541	421	249	509	251	150	149	246	339	357	410	**333**
	70m	426	616	482	287	567	292	193	183	297	402	426	472	**387**
	30m	257	256	329	311	223	211	91	157	220	192	190	293	**228**
2000	**50m**	324	331	402	378	272	264	127	217	296	268	250	332	**289**
	70m	374	396	464	450	325	328	164	279	1529	353	303	354	**443**
	30m	248	278	236	297	304	161	80	121	126	295	198	237	**215**
2001	**50m**	326	331	280	354	366	198	106	160	155	339	241	263	**260**
	70m	422	451	581	388	391	367	142	239	260	527	682	909	**447**
	30m	314	328	297	251	272	175	105	136	184	273	285	286	**242**
Average	**50m**	382	401	360	309	329	219	145	188	243	348	356	346	**302**
	70m	434	471	455	358	372	279	184	243	474	435	474	485	**389**

Isabella





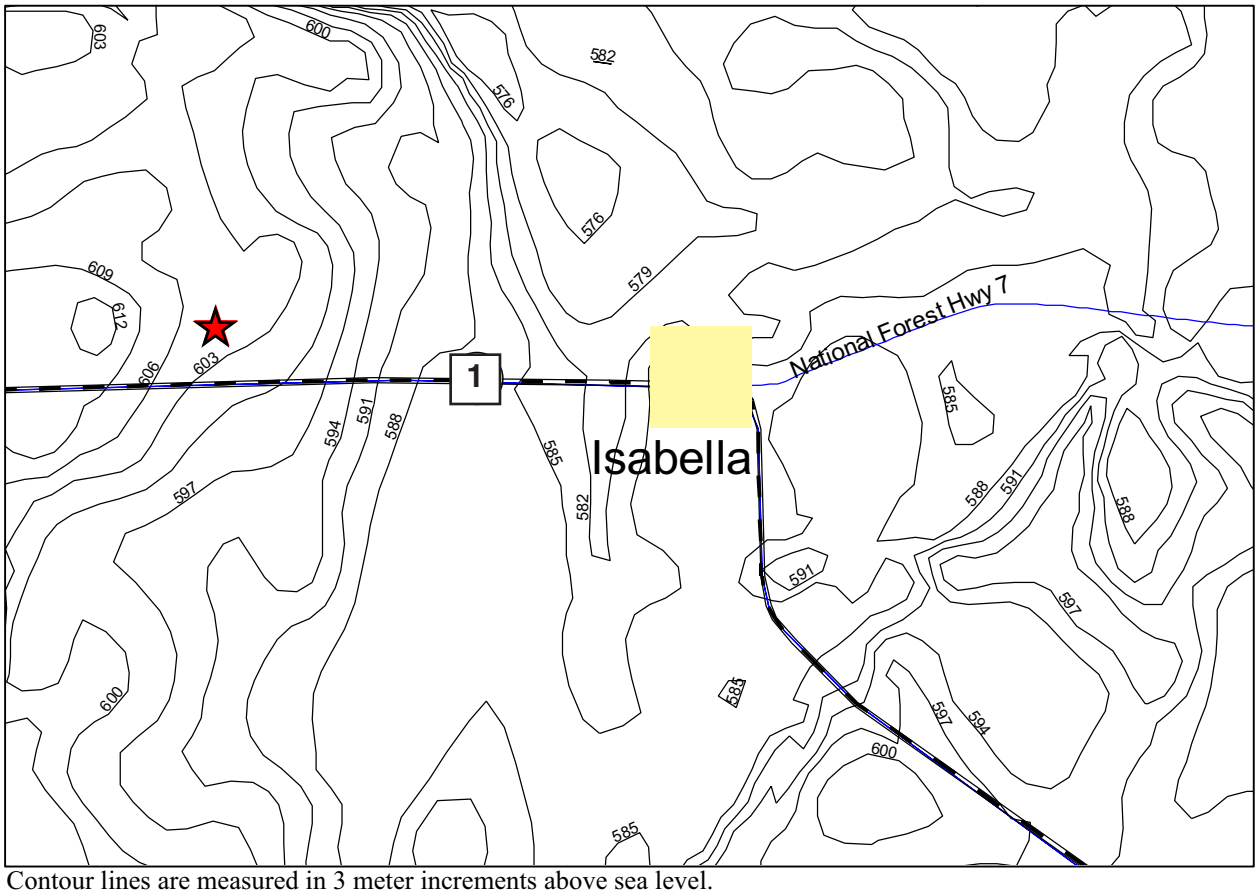


Coordinates

Long/Lat	UTM
N 47.6187	E 622586
W 91.3686	N 5275211

Elevation: 1949 feet

*Tower information is not current



Contour lines are measured in 3 meter increments above sea level.

Isabella

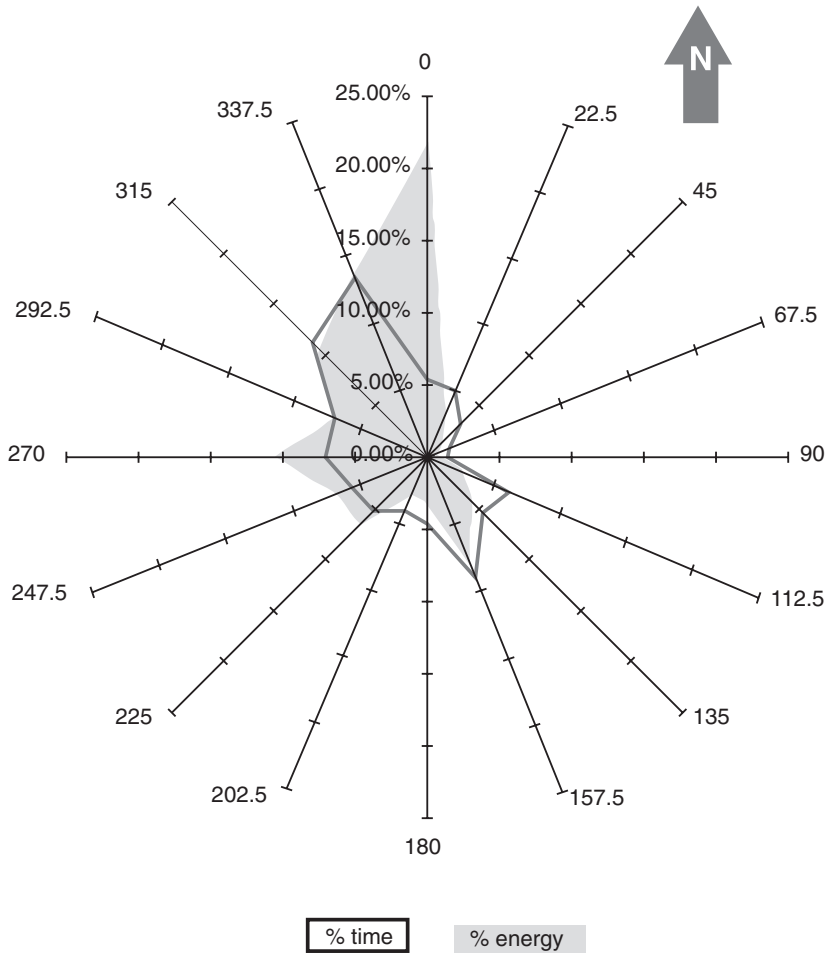
Wind Speed (m/s)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	30m												3.2	**3.2**
2000	**50m**												4.1	**4.1**
	75m												3.8	**3.8**
	30m	4.1	4.0	3.9	3.5	3.9	3.6	3.4	3.4	3.1	4.1	4.4	4.4	**3.8**
2001	**50m**	5.3	5.1	5.8	4.6	5.1	4.9	4.7	4.6	4.1	5.3	5.4	5.3	**5.0**
	75m	6.4	5.9	6.7	5.6	6.0	5.8	5.5	5.6	5.0	6.7	6.9	6.6	**6.0**
	30m	4.1	4.0	3.9	3.5	3.9	3.6	3.4	3.4	3.1	4.1	4.4	3.8	**3.8**
Average	**50m**	5.3	5.1	5.8	4.6	5.1	4.9	4.7	4.6	4.1	5.3	5.4	4.7	**5.0**
	75m	6.4	5.9	6.7	5.6	6.0	5.8	5.5	5.6	5.0	6.7	6.9	5.2	**5.9**
	30m	8.5	8.4	8.1	7.3	8.1	7.6	7.2	7.1	6.4	8.6	9.1	8.0	**7.9**
Average	**50m**	11.1	10.7	12.2	9.6	10.7	10.2	9.8	9.6	8.6	11.1	11.2	9.8	**10.4**
	75m	13.3	12.4	14.1	11.7	12.6	12.1	11.5	11.7	10.5	14.0	14.4	10.9	**12.4**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	30m												36	**36**
2000	**50m**												71	**71**
	75m												75	**75**
	30m	63	57	44	49	44	42	32	30	27	54	67	75	**49**
2001	**50m**	139	119	91	100	95	89	72	69	60	109	133	131	**100**
	75m	245	188	150	171	158	146	122	129	109	217	239	240	**176**
	30m	63	57	44	49	44	42	32	30	27	54	67	56	**47**
Average	**50m**	139	119	91	100	95	89	72	69	60	109	133	101	**98**
	75m	245	188	150	171	158	146	122	129	109	217	239	158	**169**

Isabella 50 Meter Wind Rose



Wind Shear Exponent (Alpha)

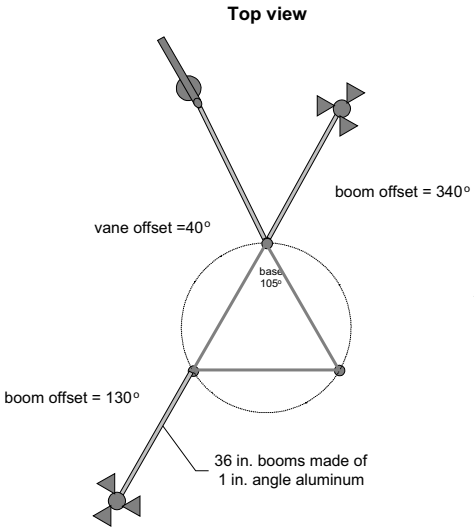
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
2000	**30m-50m**												0.48	**0.48**
	50m-75m												0.31	**0.31**
2001	**30m-50m**	0.50	0.50	0.54	0.54	0.54	0.57	0.59	0.60	0.58	0.52	0.50	0.43	**0.53**
	50m-75m	0.40	0.39	0.42	0.42	0.41	0.44	0.41	0.51	0.52	0.59	0.53	0.48	**0.46**
Average	**30m-50m**	0.50	0.50	0.54	0.54	0.54	0.57	0.59	0.60	0.58	0.52	0.50	0.45	**0.54**
	50m-75m	0.40	0.39	0.42	0.42	0.41	0.44	0.41	0.51	0.52	0.59	0.53	0.40	**0.45**

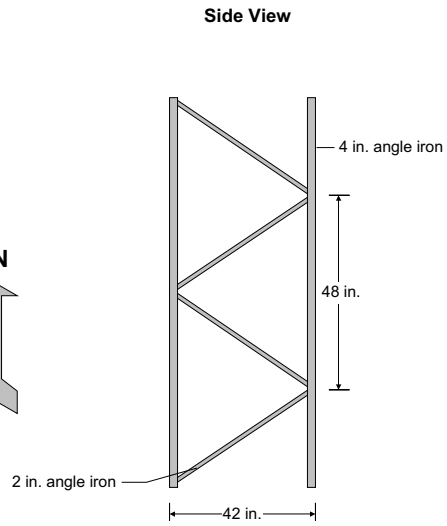
Lucan

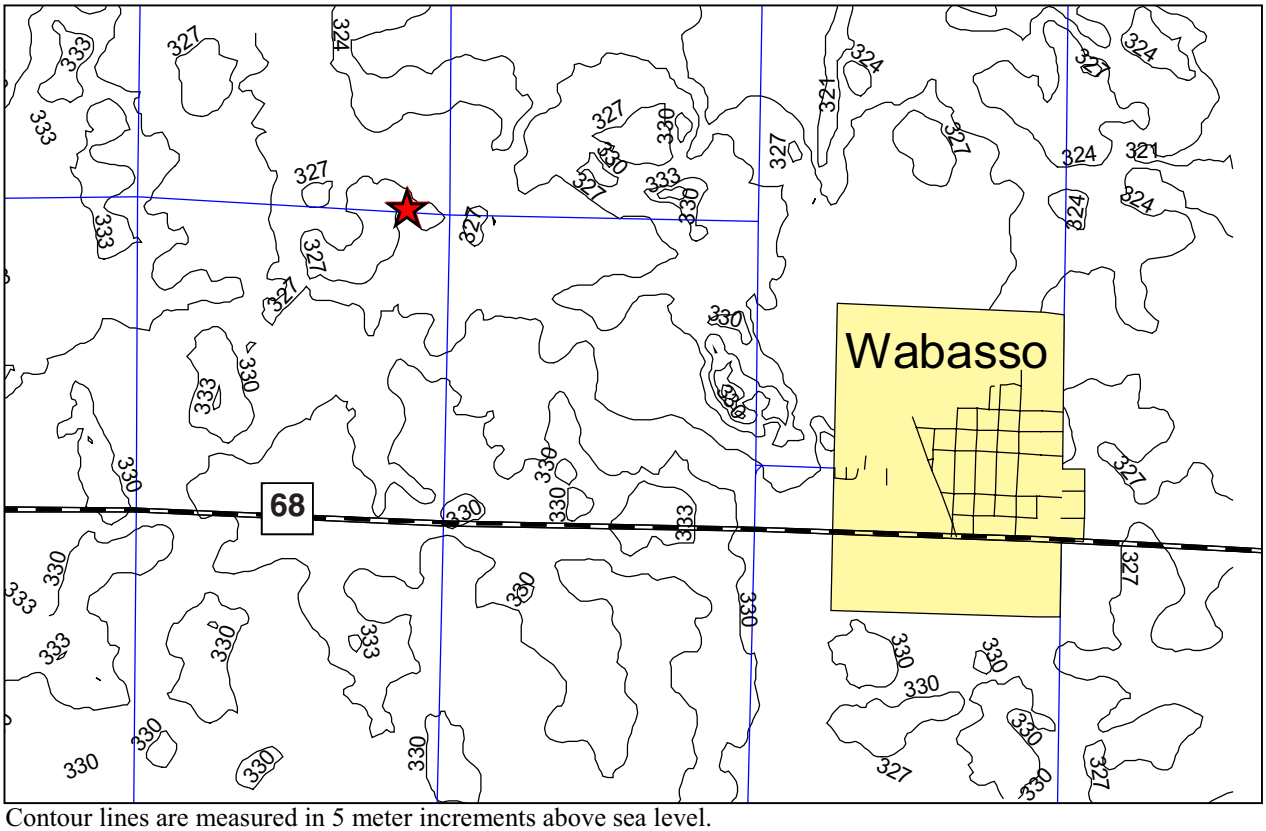
Coordinates

Long/Lat	UTM
N 44.4139	E 317456
W 95.2928	N 4920403

Elevation: 1089 feet







Contour lines are measured in 5 meter increments above sea level.
County roads are approximately 1 mile apart.

Lucan

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	30m		7.1	6.4	7.0	7.2	5.8	4.8	4.8	5.4	6.4	6.4	6.3	**6.1**
1999	**50m**		7.7	7.0	7.6	7.8	6.4	5.5	5.5	6.4	7.2	7.2	7.1	**6.8**
	70m		8.1	7.3	8.0	8.1	6.7	6.0	6.1	7.0	7.8	7.7	7.6	**7.3**
	30m	6.0	6.1	6.0	6.2	6.4	6.0	4.4	4.6	5.5	5.6	6.5	6.8	**5.8**
2000	**50m**	6.7	6.8	6.6	7.3	7.0	6.7	5.0	5.4	6.3	6.3	7.0	7.3	**6.5**
	70m	7.1	7.1	7.0	7.7	7.4	7.2	5.4	5.9	6.8	6.7	7.4	7.5	**6.9**
	30m	6.4	*	*	*	*	*	*	*	*	*	*	*	**6.4**
2001	**50m**	6.8	*	*	*	*	*	*	*	*	*	*	*	**6.8**
	70m	7.8	7.7	6.5	8.4	7.4	7.0	5.2	5.7	6.0	8.2	7.8	8.0	**7.1**
	30m	6.2	6.6	6.2	6.6	6.8	5.9	4.6	4.7	5.5	6.0	6.4	6.5	**6.0**
Average	**50m**	6.8	7.2	6.8	7.4	7.4	6.6	5.3	5.4	6.4	6.8	7.1	7.2	**6.7**
	70m	7.5	7.6	6.9	8.0	7.7	7.0	5.5	5.9	6.6	7.6	7.6	7.7	**7.1**

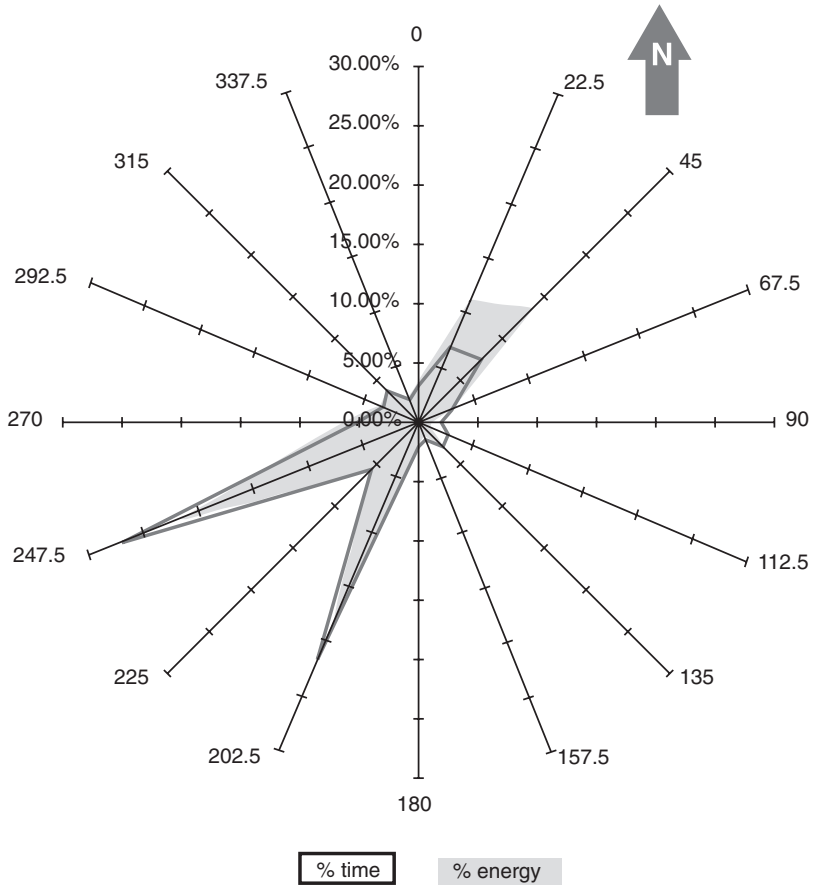
Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	30m		442	375	351	346	198	126	103	140	256	263	285	**262**
1999	**50m**		537	467	420	424	253	178	156	214	341	351	377	**338**
	70m		606	531	485	480	292	218	204	277	409	427	446	**398**
	30m	241	262	286	355	280	233	91	93	166	145	266	383	**233**
2000	**50m**	317	336	355	437	352	305	128	140	233	197	329	444	**298**
	70m	371	392	404	497	404	353	157	185	290	243	375	477	**346**
	30m	263	*	*	*	*	*	*	*	*	*	*	*	**263**
2001	**50m**	340	*	*	*	*	*	*	*	*	*	*	*	**340**
	70m	433	424	246	538	352	285	110	139	164	468	405	440	**334**
	30m	252	352	330	353	313	216	109	98	153	201	265	334	**248**
Average	**50m**	328	436	411	428	388	279	153	148	224	269	340	411	**318**
	70m	402	474	394	507	412	310	162	176	244	373	402	454	**359**

*The 30 meter and 50 meter anemometers failed during 2001. Consequently no shear values are reportable for this year.

Lucan

Lucan 50 Meter Wind Rose

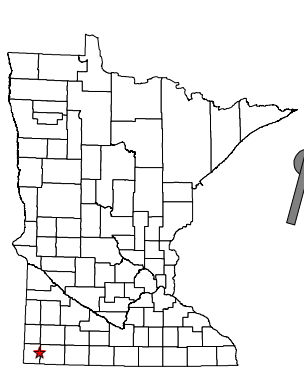


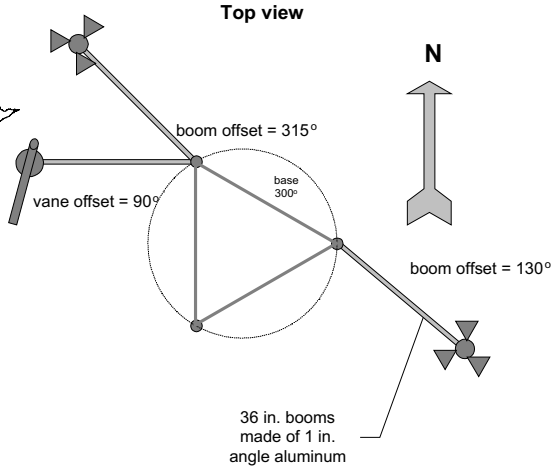
Wind Shear Exponent (Alpha)

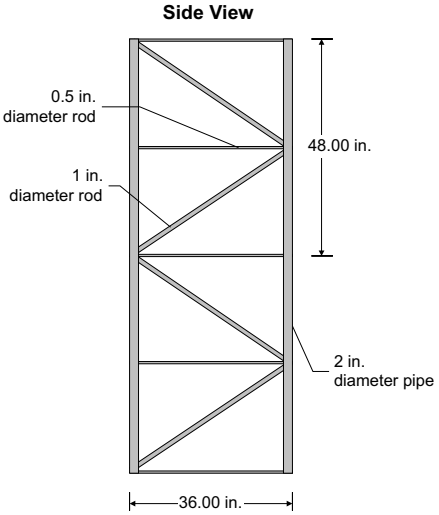
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1999	**30m-50m**		0.20	0.21	0.19	0.18	0.21	0.28	0.31	0.34	0.27	0.27	0.26	**0.25**
	50m-70m		0.22	0.22	0.23	0.20	0.23	0.29	0.32	0.33	0.27	0.27	0.25	**0.26**
2000	**30m-50m**	0.25	0.22	0.24	0.20	0.22	0.24	0.28	0.31	0.29	0.26	0.19	0.16	**0.24**
	50m-70m	0.24	0.23	0.25	0.21	0.24	0.24	0.28	0.32	0.29	0.27	0.21	0.16	**0.24**
2001	**30m-50m**	0.24	*	*	*	*	*	*	*	*	*	*	*	**0.24**
	50m-70m	0.27	*	*	*	*	*	*	*	*	*	*	*	**0.27**
Average	**30m-50m**	0.25	0.21	0.22	0.19	0.20	0.23	0.28	0.31	0.32	0.26	0.23	0.21	**0.24**
	50m-70m	0.26	0.22	0.23	0.22	0.22	0.23	0.28	0.32	0.31	0.27	0.24	0.21	**0.25**

*The 30 meter and 50 meter anemometers failed during 2001. Consequently no shear values are reportable for this year.

Luverne







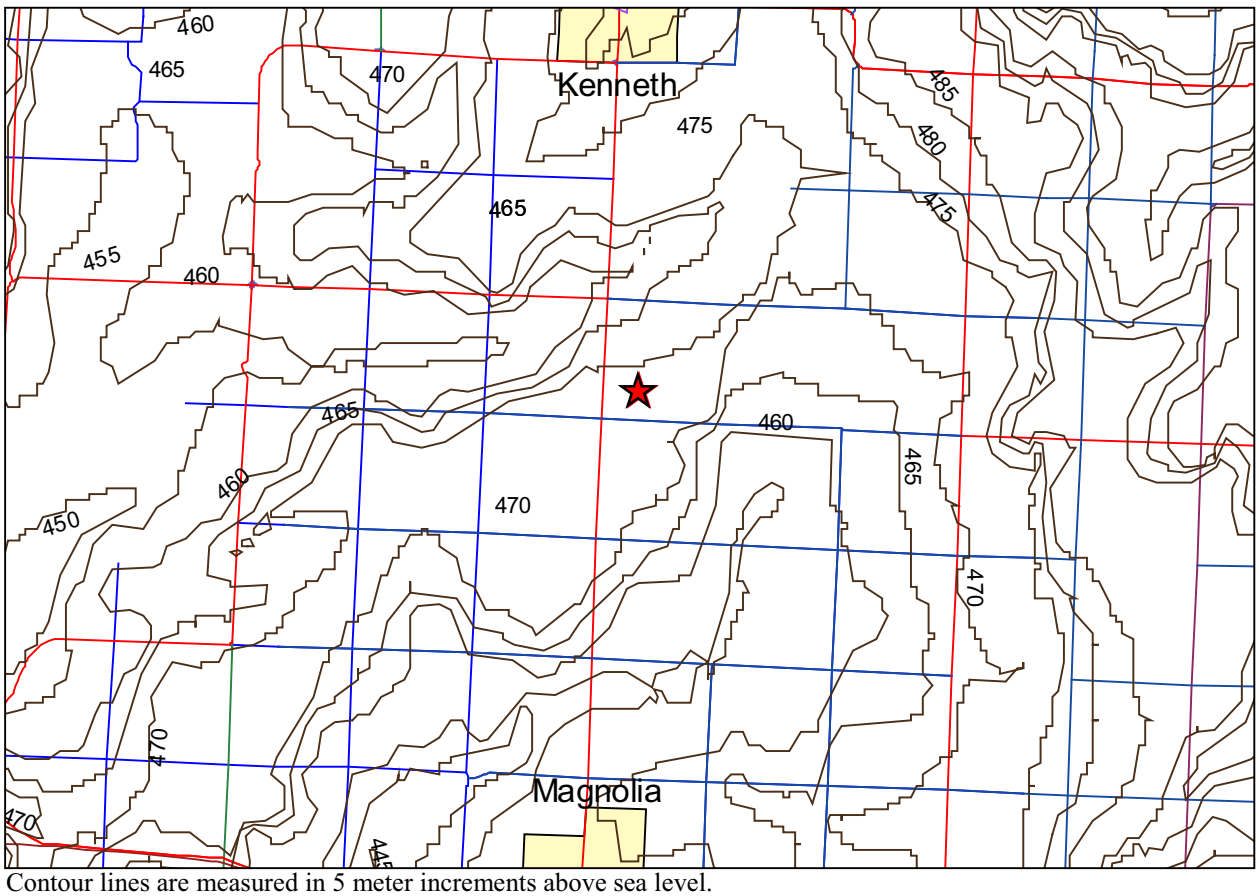
Coordinates

Long/Lat	UTM
N 43.7070	E 252886
W 96.0671	N 4843900

Elevation: 1549 feet

Additional Tower Information:

- Anemometers are located at 30, 50, and 70 meters.
- Vanes are located at 30 and 70 meters.



Contour lines are measured in 5 meter increments above sea level.
County roads are approximately 1 mile apart.

Luverne

Wind Shear Exponent (Alpha)

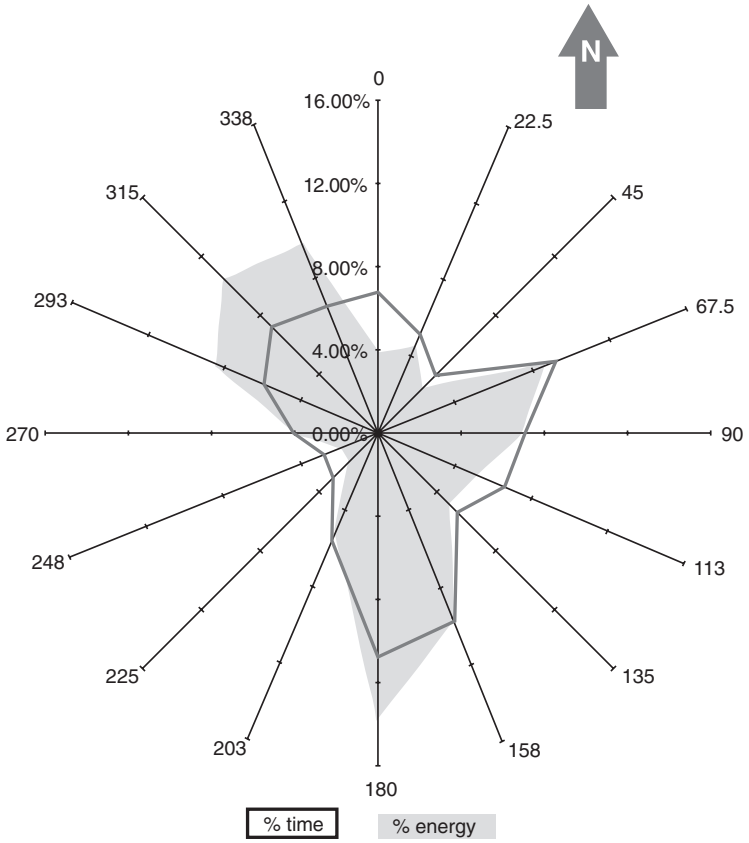
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	30m-50m						0.25	0.27	0.3	0.32	0.26	0.24	0.19	0.26
1995	50m-70m						0.24	0.27	0.28	0.32	0.25	0.22	0.22	0.26
	30m-50m	0.19	0.22	0.22	0.22	0.19	0.22	0.26	0.35	0.34	0.3	*	*	0.25
1996	50m-70m	0.19	0.23	0.21	0.22		0.2	0.26	0.3	0.3	0.23	*	*	0.24
	30m-50m	0.17	0.2	0.23	0.26	0.18	0.26	0.27	0.29	0.33	0.27	0.24	0.24	0.25
1997	50m-70m	0.19	0.22	0.23	0.24	0.23	0.24	0.22	0.29	0.27	0.24	0.21	0.21	0.23
	30m-50m	0.19	0.1	0.09	0.2	0.22	0.2	0.34	0.37	0.39	0.33	0.3	0.3	0.25
1998	50m-70m	0.25	0.33	0.21	0.27	0.12	0.27	0.29	0.33	0.34	0.28	0.26	0.26	0.27
	30m-50m	0.26	0.25	0.29	0.22	0.25	0.22	0.32	0.30	0.33	0.35	0.34	0.33	0.29
1999	50m-70m	0.25	0.24	0.24	0.18	0.21	0.21	0.29	0.31	0.32	0.35	0.36	0.33	0.27
	30m-50m	0.32	0.28	0.27	0.24	*	0.24	0.33	0.34	0.35	0.32	0.24	0.22	0.29
2000	50m-70m	0.30	0.27	0.28	0.23	*	0.24	0.33	0.35	0.34	0.32	0.35	0.25	0.30
	30m-50m	0.26	0.25	0.27	0.23	0.24	0.25	0.32	0.37	0.36	0.31	0.28	0.30	0.29
2001	50m-70m	0.08	-0.16	-0.57	-1.38	-1.70	-2.98	0.22	0.39	0.34	0.32	0.28	0.33	-0.40
	30m-50m	0.23	0.22	0.23	0.23	0.22	0.23	0.31	0.34	0.35	0.31	0.28	0.28	0.27
Average	50m-70m	0.21	0.19	0.10	-0.04	-0.28	-0.30	0.27	0.33	0.32	0.29	0.29	0.28	0.14

*Equipment was damaged during this period

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	30m						5.4	4.9	4.7	5	6.5	6.4	5.7	5.5
1995	50m						6	5.7	5.4	5.9	7.4	7.1	6.2	6.2
	70m						6.5	6.2	6	6.5	8	7.6	6.8	6.8
	30m	6.6	7.2	6.7	7	6.8	5.6	4.6	4.4	5	6.9	5.2	*	6.0
1996	50m	7.2	7.9	7.4	7.8	7.4	6.3	5.3	5.2	6	7.9	6.3	7.8	6.9
	70m	7.6	8.5	7.9	8.3	7.8	6.7	5.8	5.8	6.6	8.5	6.2	*	7.2
	30m	7	5.9	7	5.8	6.9	5.7	5.4	3.9	5.1	6.8	5.8	5.4	5.9
1997	50m	7.9	6.6	7.8	6.5	7.7	6.5	6.1	4.7	6	7.7	6.5	6.2	6.7
	70m	8	7	8.4	7	8.2	7	6.5	5.2	6.6	8.3	7	6.7	7.2
	30m	4.9	5.3	6.7	6.4	6.4	5.2	3.8	4	4.8	5.8	6.4	5.8	5.5
1998	50m	5.3	5.6	7	6.9	6.8	5.7	4.5	4.8	5.9	6.8	7.3	6.7	6.1
	70m	5.8	6.2	7.4	7.6	7.5	6.2	5	5.4	6.5	7.4	7.8	7.2	6.7
	30m	6.0	6.9	6.4	7.6	6.8	6.1	5.0	4.9	5.5	5.9	5.8	5.5	6.0
1999	50m	6.5	7.8	7.3	8.4	7.6	6.7	5.9	5.7	6.5	6.9	6.9	6.5	6.9
	70m	6.7	7.6	7.4	8.5	7.3	6.8	6.4	6.3	7.1	7.6	7.6	7.0	7.2
	30m	5.6	6.2	5.7	6.9	6.5	6.2	4.3	4.5	5.4	5.4	6.2	6.1	5.8
2000	50m	6.6	7.1	6.4	4.9	0.1	4.6	5.1	5.4	6.3	6.3	6.9	6.7	5.5
	70m	7.2	7.6	6.9	8.1	7.6	7.4	5.6	6.0	7.0	6.9	7.2	7.1	7.0
	30m	4.8	5.9	5.1	7.3	6.7	6.3	4.2	4.2	4.7	6.5	6.3	6.1	5.7
2001	50m	5.5	6.6	5.8	8.1	7.5	7.2	5.0	5.2	5.7	7.5	6.9	7.1	6.5
	70m	5.8	6.2	5.5	3.6	3.0	1.0	1.6	5.9	6.4	8.3	7.5	7.9	5.2
	30m	5.8	6.2	6.3	6.8	6.7	5.8	4.6	4.4	5.1	6.3	6.0	5.8	5.8
Average	50m	6.5	6.9	7.0	7.1	6.2	6.2	5.4	5.2	6.0	7.2	6.8	6.7	6.4
(m/s)	70m	6.8	7.2	7.2	7.2	6.9	5.9	5.3	5.8	6.7	7.9	7.3	7.1	6.8
	30m	13.0	13.9	14.0	15.3	15.0	13.0	10.3	9.8	11.3	14.0	13.5	12.9	13.0
Average	50m	14.5	15.5	15.6	15.9	13.8	13.8	12.0	11.6	13.5	16.1	15.3	15.1	14.4
(mph)	70m	15.3	16.1	16.2	16.1	15.5	13.3	11.8	13.0	14.9	17.6	16.3	15.9	15.2

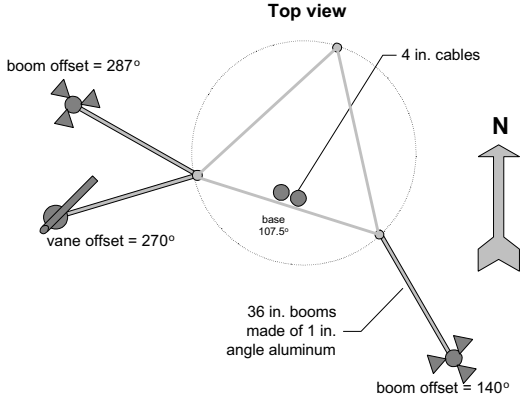
Luverne 50 Meter Wind Rose

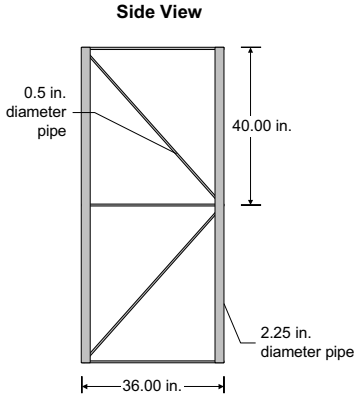


Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	30m						123	134	95	152	331	291	265	199
1995	50m						161	190	147	215	432	378	350	268
	70m						194	243	193	275	517	458	388	324
	30m	443	457	295	366	341	179	96	80	114	350	181	*	264
1996	50m	539	567	373	462	419	234	133	127	180	473	262	634	367
	70m	605	652	441	546	477	280	167	171	241	568	307	*	405
	30m	484	257	348	234	355	187	163	67	142	326	285	181	252
1997	50m	563	344	463	304	457	251	219	103	211	438	375	246	331
	70m	685	413	564	363	530	307	265	136	270	528	438	302	400
	30m	115	199	322	297	264	152	54	65	107	179	326	214	191
1998	50m	149	223	357	359	313	193	87	106	175	273	432	309	248
	70m	188	313	432	443	397	242	116	144	240	348	466	384	309
	30m	247	356	327	476	294	216	139	122	151	205	218	192	245
1999	50m	325	495	446	600	390	282	204	177	222	295	326	276	337
	70m	362	466	460	631	327	284	257	223	285	379	414	338	369
	30m	207	256	250	367	312	256	79	85	151	135	263	281	220
2000	50m	293	356	324	327	*	198	122	134	230	200	332	356	261
	70m	354	429	375	531	445	390	155	180	299	265	368	403	349
	30m	153	236	149	364	275	228	74	63	90	269	268	222	199
2001	50m	215	302	202	480	358	320	110	104	143	365	339	315	271
	70m	284	287	263	141	56	13	41	151	201	470	411	413	228
	30m	275	293	282	351	307	203	101	80	126	244	257	218	228
Average	50m	347	381	361	422	387	246	146	125	193	341	344	356	304
	70m	413	427	422	442	372	253	167	168	256	426	401	368	343

Montevideo





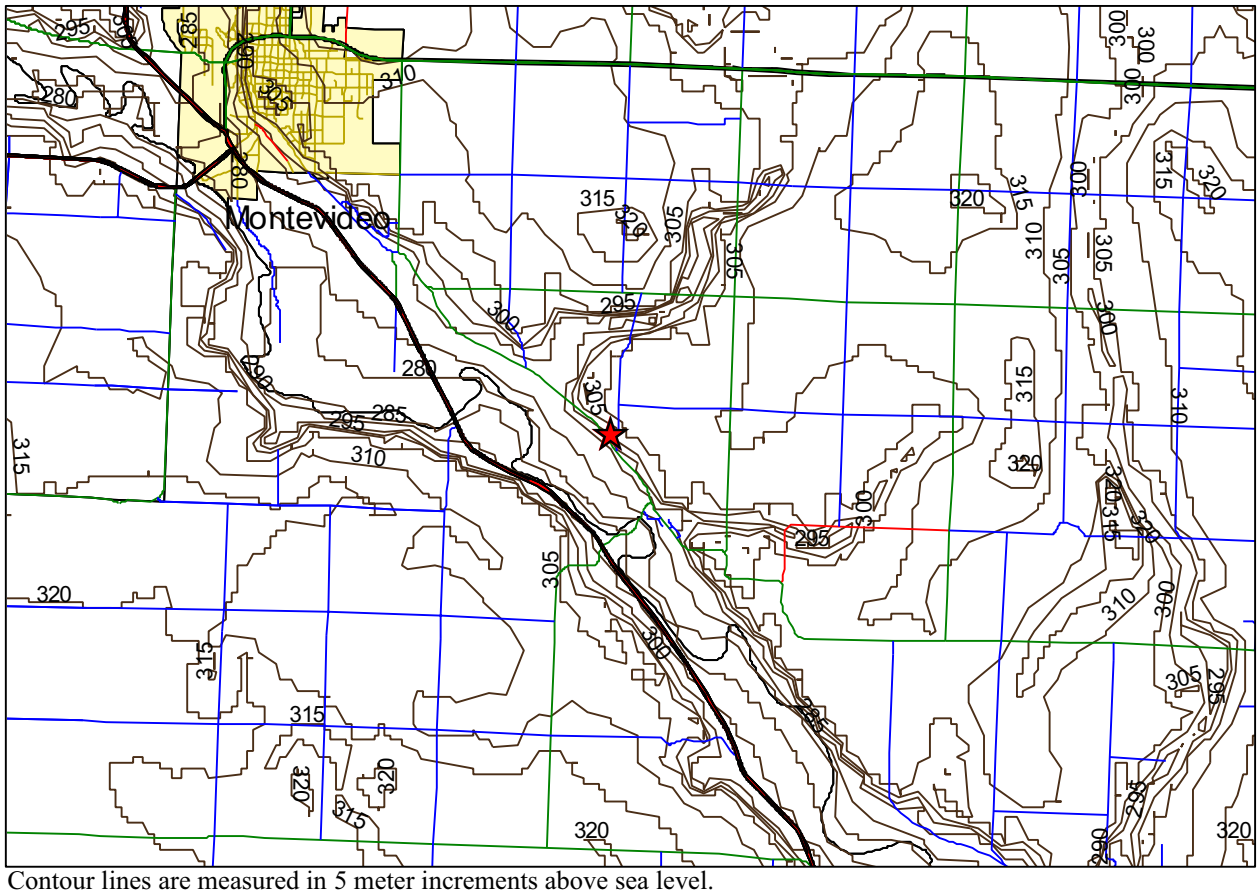
Coordinates

Long/Lat	UTM
N 44.9021	E 290249
W 95.6568	N 4975511

Elevation: 994 feet

Additional Tower Information:

- Anemometers are located at 30, 50, and 70 meters.
- Vanes are located at 30 and 70 meters.
- There are two clearance lights 1 meter below the 70 meter sensors on the north legs.
- There are two 4 in. cables in the middle of the south side of the tower.



Contour lines are measured in 5 meter increments above sea level.
County roads are approximately 1 mile apart.

Montevideo

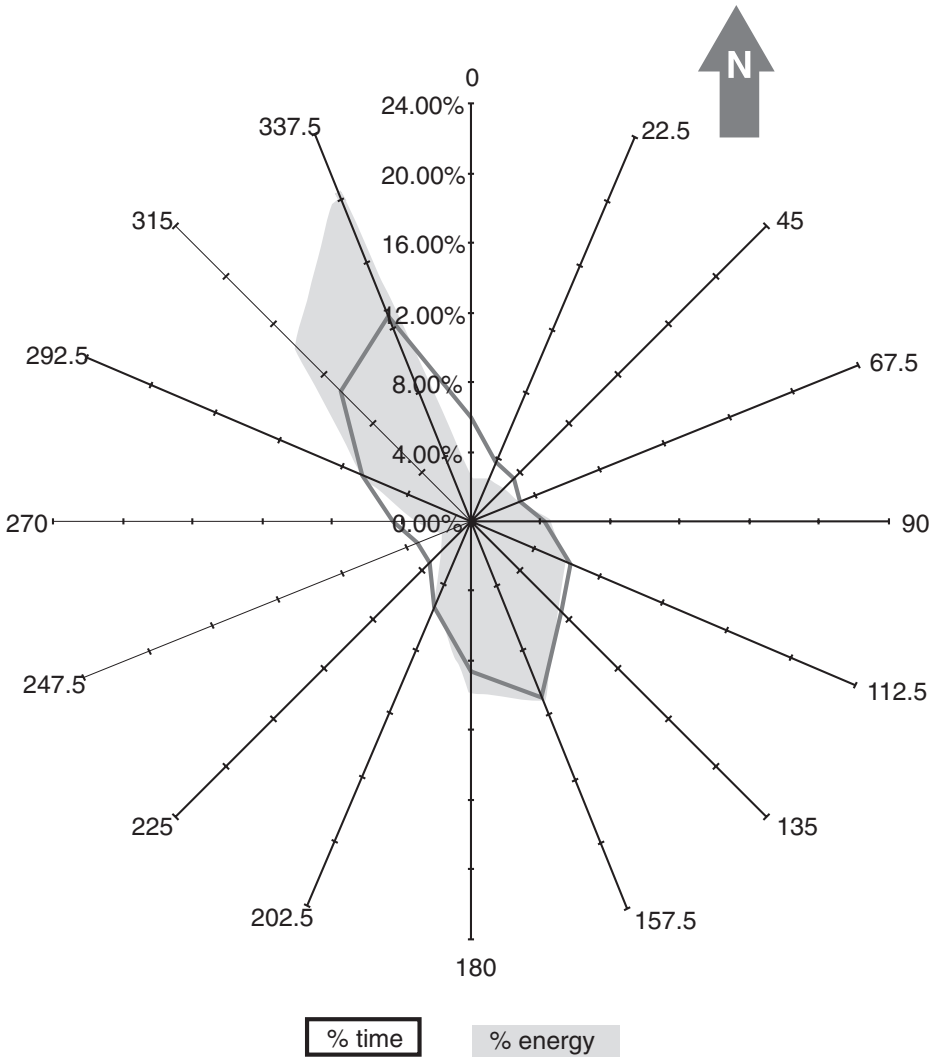
Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						4.4	4.2	4.2	4.4	4.4	5.4	4.8	**4.5**
1995	**50m**						5.1	4.9	4.8	5.2	5.2	6.1	5.5	**5.3**
	70m						5.6	5.5	5.4	5.8	5.7	6.6	6.1	**5.8**
	30m	5.3	5.9	5.4	5.7	5.3	4.5	4.1	4.2	4.3	6.2	4.1	5.0	**5.0**
1996	**50m**	6.1	6.8	6.1	6.4	5.7	5.2	4.8	5.0	5.0	7.2	4.9	5.8	**5.8**
	70m	6.7	7.5	6.6	7.0	6.4	5.7	5.2	5.6	5.7	7.9	5.5	6.3	**6.3**
	30m	6.2	5.1	5.6	5.4	6.0	4.9	4.5	3.6	4.6	5.9	4.8	4.6	**5.1**
1997	**50m**	7.0	5.8	6.4	6.0	6.6	5.5	5.2	4.3	5.5	6.8	5.6	5.4	**5.8**
	70m	7.6	6.4	7.0	6.6	7.3	6.2	5.7	4.7	6.1	7.4	6.1	5.9	**6.4**
	30m	4.9	5.1	6.4	6.0	6.3	5.3	3.9	4.1	5.1	6.1	6.6	6.6	**5.5**
1998	**50m**	5.3	5.6	6.9	6.6	7.0	6.0	4.5	4.8	6.0	6.9	7.5	7.4	**6.2**
	70m	5.7	6.2	7.3	7.1	7.5	6.5	5.0	5.4	6.8	7.6	8.2	8.1	**6.8**
	30m	4.9	5.8	5.5	6.2	5.9	4.9	4.1	4.3	4.6	5.1	5.2	5.1	**5.1**
1999	**50m**	5.8	6.6	6.2	7.0	6.7	5.7	4.9	5.1	5.5	6.1	6.1	5.9	**6.0**
	70m	6.3	7.1	6.7	7.5	7.2	6.2	5.4	5.7	6.1	6.8	6.8	6.5	**6.5**
	30m	4.9	4.9	5.1	5.9	5.5	5.2	3.9	4.1					**4.9**
2000	**50m**	5.7	5.7	5.9	6.6	6.3	6.1	4.6	5.0					**5.7**
	70m	6.1	6.1	6.2	7.0	6.7	6.4	4.9	5.3					**6.1**
	30m	5.2	5.4	5.6	5.9	5.8	4.9	4.1	4.1	4.6	5.5	5.2	5.2	**5.1**
Average	**50m**	6.0	6.1	6.3	6.5	6.4	5.6	4.8	4.8	5.4	6.4	6.0	6.0	**5.9**
(m/s)	**70m**	6.5	6.7	6.8	7.0	7.0	6.1	5.3	5.3	6.1	7.1	6.6	6.6	**6.4**
	30m	11.7	12.0	12.5	13.1	13.0	10.9	9.2	9.2	10.3	12.4	11.7	11.7	**11.5**
Average	**50m**	13.4	13.6	14.1	14.6	14.4	12.5	10.8	10.8	12.2	14.4	13.5	13.4	**13.1**
(mph)	**70m**	14.5	14.9	15.1	15.8	15.7	13.6	11.8	11.9	13.6	15.8	14.9	14.7	**14.4**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						69	87	68	102	98	180	173	**111**
1995	**50m**						104	134	104	160	143	249	260	**165**
	70m						139	177	143	221	189	313	336	**217**
	30m	221	246	167	194	144	95	66	70	77	246	96	155	**148**
1996	**50m**	316	343	232	261	184	137	97	112	121	357	144	248	**213**
	70m	415	438	294	327	239	177	128	154	167	464	185	294	**274**
	30m	304	142	183	159	232	113	109	47	98	208	171	101	**156**
1997	**50m**	405	205	256	220	306	154	156	76	158	304	247	151	**220**
	70m	496	268	333	279	385	206	198	105	219	373	317	201	**282**
	30m	158	167	306	234	270	147	62	64	128	214	352	307	**201**
1998	**50m**	201	218	365	310	355	197	93	98	194	284	483	424	**268**
	70m	245	281	427	382	432	248	129	142	271	371	607	537	**339**
	30m	130	217	208	242	190	110	79	79	88	133	144	148	**147**
1999	**50m**	195	307	287	315	264	160	122	123	138	201	218	219	**212**
	70m	239	380	354	385	322	196	159	162	186	273	291	281	**269**
	30m	122	121	163	250	178	149	61	55					**137**
2000	**50m**	182	184	232	328	243	213	94	90					**196**
	70m	*	*	*	*	*	*	*	*					*
	30m	187	179	205	216	203	114	77	64	99	180	189	177	**157**
Average	**50m**	260	251	274	287	270	161	116	100	154	258	268	260	**222**
	70m	349	342	352	343	344	193	158	141	213	334	343	330	**287**

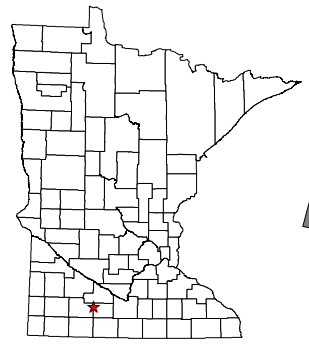
Montevideo 50 Meter Wind Rose



Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
1995	**30m-50m**						0.27	0.30	0.30	0.36	0.31	0.24	0.29	**0.30**
	50m-70m						0.31	0.34	0.33	0.35	0.30	0.24	0.31	**0.31**
1996	**30m-50m**	0.29	0.32	0.26	0.23	0.17	0.27	0.29	0.34	0.33	0.28	0.37	0.29	**0.29**
	50m-70m	0.30	0.33	0.26	0.24	0.32	0.29	0.28	0.32	0.34	0.29	0.33	0.23	**0.29**
1997	**30m-50m**	0.27	0.27	0.27	0.24	0.24	0.24	0.29	0.32	0.37	0.32	0.29	0.31	**0.29**
	50m-70m	0.26	0.28	0.28	0.27	0.31	0.33	0.27	0.32	0.33	0.27	0.25	0.26	**0.29**
1998	**30m-50m**	0.18	0.18	0.14	0.20	0.20	0.22	0.27	0.29	0.32	0.23	0.25	0.24	**0.23**
	50m-70m	0.20	0.26	0.21	0.20	0.23	0.26	0.31	0.37	0.34	0.31	0.28	0.27	**0.27**
1999	**30m-50m**	0.36	0.26	0.26	0.23	0.26	0.28	0.35	0.35	0.38	0.37	0.36	0.35	**0.32**
	50m-70m	0.29	0.30	0.27	0.26	0.24	0.26	0.34	0.32	0.35	0.36	0.35	0.32	**0.30**
2000	**30m-50m**	0.33	0.33	0.30	0.25	0.29	0.30	0.32	0.36					**0.31**
	50m-70m	0.30	0.31	0.27	0.25	0.28	0.26	0.31	0.33					**0.29**
Average	**30m-50m**	0.28	0.27	0.25	0.23	0.23	0.26	0.30	0.33	0.35	0.30	0.30	0.30	**0.28**
	50m-70m	0.27	0.30	0.26	0.24	0.28	0.28	0.31	0.33	0.34	0.31	0.29	0.28	**0.29**

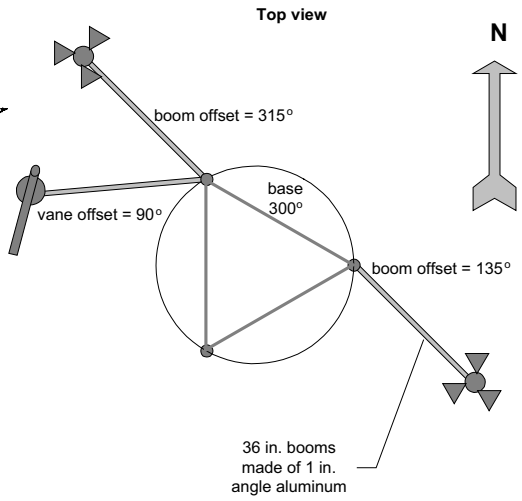
Mountain Lake

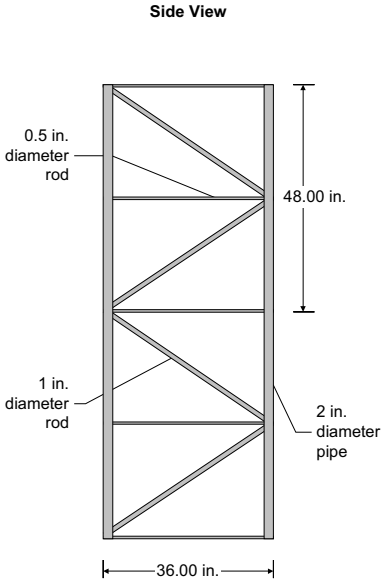


Coordinates

Long/Lat	UTM
N 44.0416	E 351964
W 94.8477	N 4878158

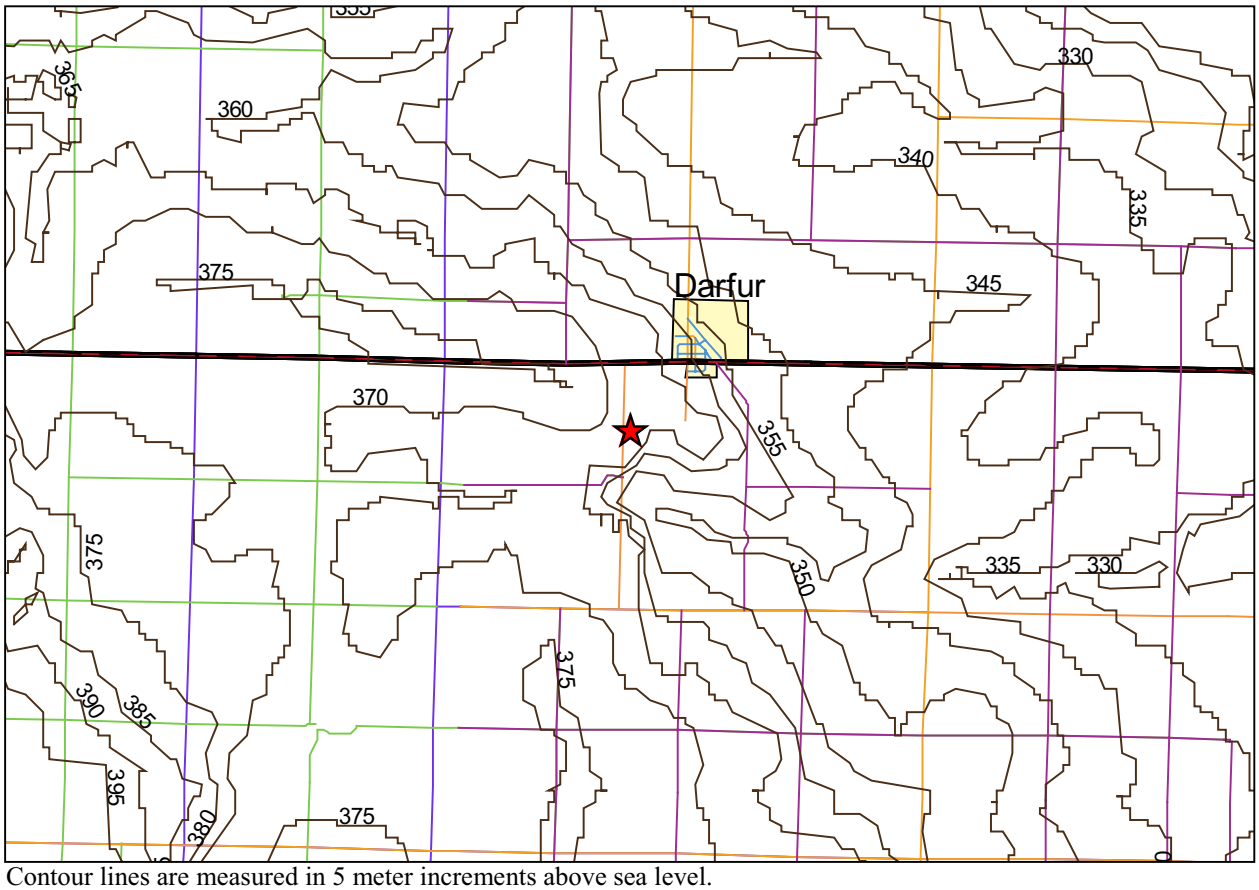
Elevation: 1201 feet





Additional Tower Information:

- Anemometers are located at 30, 50, and 70 meters.
- Vanes are located at 30 and 70 meters.



Contour lines are measured in 5 meter increments above sea level.
County roads are approximately 1 mile apart.

Mountain Lake

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						5.1	4.8	4.3	5.0	6.6	6.7	6.0	**5.5**
1995	**50m**						5.6	5.7	5.1	6.0	7.5	7.5	6.6	**6.3**
	70m						6.0	6.3	5.7	6.7	8.2	8.0	7.1	**6.9**
	30m	6.2	8.0	6.9	6.5	5.8	5.5	4.7	4.2	4.7	6.7	5.8	*	**5.9**
1996	**50m**	6.9	8.8	7.6	7.2	6.5	6.1	5.3	5.0	5.5	7.8	5.5	*	**6.6**
	70m	7.3	9.5	8.1	7.8	7.0	6.5	5.8	5.6	6.2	8.4	7.0	7.7	**7.2**
	30m	8.0	6.7	7.3	6.2	7.1	5.3	5.0	3.9	5.2	6.8	6.0	6.0	**6.1**
1997	**50m**	*	7.4	8.0	7.0	7.8	6.0	5.7	4.7	6.0	7.7	6.8	6.5	**6.7**
	70m	9.1	7.5	8.4	7.4	8.3	6.4	6.2	5.1	6.7	8.4	7.3	7.0	**7.3**
	30m	8.0	6.7	7.3	6.2	7.1	5.3	5.0	3.9	5.2	6.8	6.0	6.0	**6.1**
1998	**50m**	2.4	7.4	8.0	7.0	7.8	6.0	5.7	4.7	6.0	7.7	6.8	6.5	**6.3**
	70m	9.1	7.5	8.4	7.4	8.3	6.4	6.2	5.1	6.7	8.4	7.3	7.0	**7.3**
	30m	7.0	7.8	7.0	7.5	7.7	6.6	5.8	5.6	6.6	7.4	7.5	7.2	**7.0**
1999	**50m**	7.0	7.8	7.0	7.5	7.7	6.6	5.8	5.6	6.6	7.4	7.5	7.2	**7.0**
	70m	7.2	8.1	7.3	7.8	8.1	7.1	6.3	6.2	7.3	8.1	8.2	7.9	**7.5**
	30m	6.3	6.3	5.9	6.5	6.4	6.3	4.3	4.5	5.4	5.4	6.7	7.0	**5.9**
2000	**50m**	7.1	7.0	6.6	7.2	6.8	7.0	4.9	5.2	6.3	6.2	7.4	7.6	**6.6**
	70m	7.7	7.7	7.2	7.7	7.4	7.4	5.4	5.9	7.0	7.0	7.9	8.1	**7.2**
	30m	6.2	6.8	5.9	7.0	6.3	6.0	4.3	4.4	4.5	6.7	6.1	6.9	**5.9**
2001	**50m**	6.6	7.4	6.5	7.7	7.0	6.7	5.0	5.2	5.3	7.6	6.9	7.6	**6.6**
	70m	7.5	7.8	7.0	8.3	7.4	7.2	5.4	5.8	6.0	8.3	7.6	2.2	**6.7**
	30m	7.1	7.1	6.9	6.6	6.8	5.7	4.9	4.4	5.4	6.6	6.4	6.4	**6.2**
Average	**50m**	5.8	7.7	7.4	7.2	7.3	6.2	5.5	5.0	6.1	7.4	6.9	6.9	**6.6**
(m/s)	**70m**	8.1	8.0	7.9	7.6	7.8	6.6	6.0	5.6	6.8	8.1	7.6	7.5	**7.3**
	30m	15.9	15.9	15.4	14.7	15.2	12.7	11.0	9.8	12.0	14.8	14.4	14.4	**13.9**
Average	**50m**	13.1	17.2	16.6	16.1	16.4	13.9	12.3	11.3	13.6	16.5	15.5	15.4	**14.8**
(mph)	**70m**	18.1	18.0	17.6	17.1	17.5	14.8	13.5	12.5	15.2	18.1	17.0	16.7	**16.3**

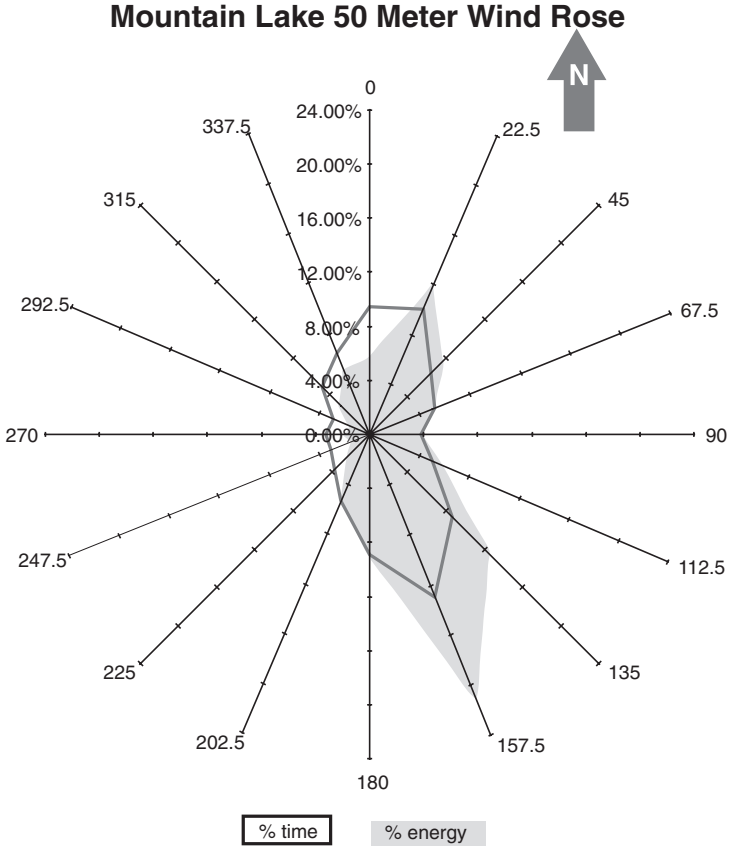
Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m-50m						0.21	0.33	0.36	0.35	0.29	0.22	0.18	**0.28**
1995	**50m-70m**						0.23	0.26	0.28	0.31	0.26	0.21	0.21	**0.25**
	30m-50m	0.19	0.22	0.20	0.22	0.21	0.21	0.26	0.35	0.32	0.31	0.25	*	**0.25**
1996	**50m-70m**	0.19	0.24	0.20	0.22	0.25	0.22	0.24	0.32	0.34	0.27	0.25	*	**0.25**
	30m-50m	*	0.19	0.18	0.22	0.21	0.26	0.29	0.34	0.31	0.26	0.21	0.16	**0.24**
1997	**50m-70m**	*	0.03	0.15	0.21	0.18	0.23	0.26	0.27	0.30	0.26	0.19	0.18	**0.21**
	30m-50m	0.18	0.18	0.14	0.20	0.20	0.22	0.27	0.29	0.32	0.23	0.25	0.24	**0.23**
1998	**50m-70m**	0.20	0.26	0.21	0.20	0.23	0.26	0.31	0.37	0.34	0.31	0.28	0.27	**0.27**
	30m-50m	0.21	0.23	0.24	0.20	0.18	0.21	0.29	0.31	0.34	0.28	0.29	0.26	**0.25**
1999	**50m-70m**	0.29	0.26	0.23	0.20	0.20	0.22	0.29	0.32	0.31	0.30	0.32	0.29	**0.27**
	30m-50m	0.25	0.23	0.26	0.25	0.26	0.24	0.27	0.31	0.30	0.30	0.22	0.18	**0.26**
2000	**50m-70m**	0.28	0.28	0.29	0.25	0.39	0.27	0.30	0.36	0.33	0.36	0.25	0.23	**0.30**
	30m-50m	0.24	0.19	0.20	0.22	0.20	0.22	0.29	0.32	0.34	0.28	0.27	0.20	**0.25**
2001	**50m-70m**	0.25	0.19	0.19	0.23	0.22	0.19	0.26	0.31	0.35	0.29	0.27	*	**0.25**
	30m-50m	0.21	0.21	0.20	0.22	0.21	0.23	0.28	0.32	0.32	0.28	0.25	0.21	**0.24**
Average	**50m-70m**	0.24	0.21	0.21	0.22	0.24	0.23	0.28	0.32	0.33	0.30	0.26	0.24	**0.26**

*Equipment was damaged during this period

Mountain Lake

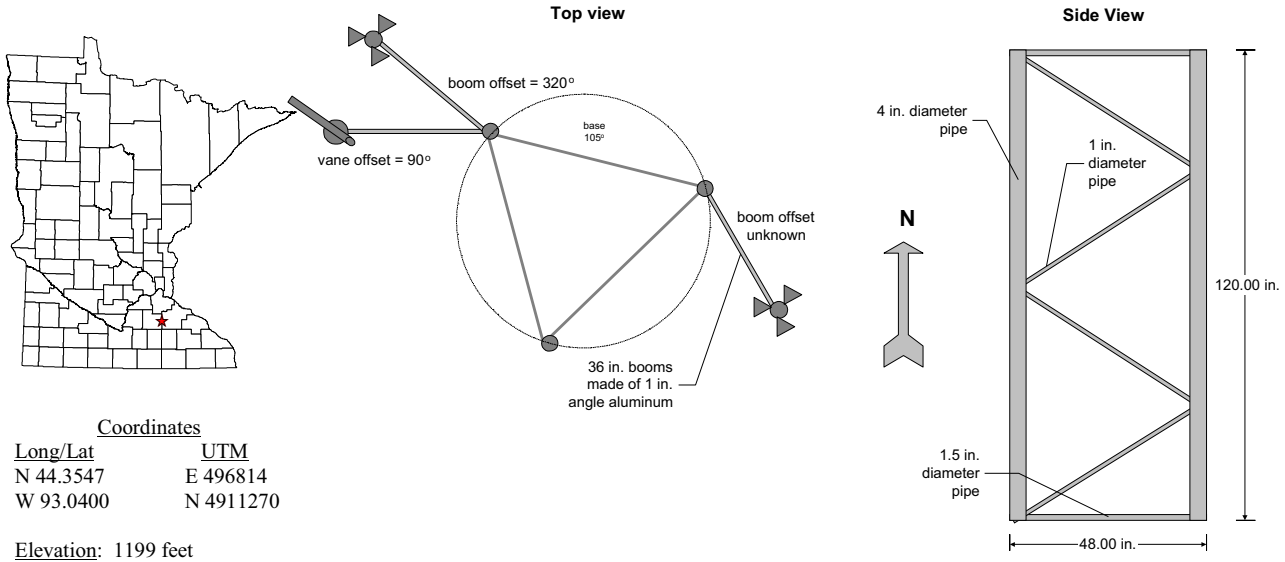
Mountain Lake 50 Meter Wind Rose



Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	30m						101	122	77	152	298	346	306	**200**
1995	50m						135	188	126	233	413	455	398	**278**
	70m						164	248	171	310	512	546	469	**346**
	30m	249	538	304	292	182	163	91	71	96	348	203	*	**231**
1996	50m	328	692	391	383	249	218	132	113	147	477	267	*	**309**
	70m	396	826	466	466	313	269	171	159	205	579	354	577	**398**
	30m	653	303	360	278	401	139	141	60	144	308	308	222	**276**
1997	50m	*	397	467	357	507	193	197	97	217	421	401	293	**322**
	70m	856	443	546	422	590	245	247	130	288	534	482	372	**430**
	30m	158	167	306	234	270	147	62	64	128	308	352	307	**209**
1998	50m	201	218	365	310	355	197	93	98	194	421	483	424	**280**
	70m	245	281	427	382	432	248	129	142	271	534	607	537	**353**
	30m	308	401	341	340	322	204	140	106	152	257	277	287	**261**
1999	50m	375	517	452	427	406	265	203	157	231	355	392	386	**347**
	70m	420	555	495	466	467	318	263	213	305	456	511	486	**413**
	30m	262	278	266	315	256	242	75	79	157	132	290	390	**229**
2000	50m	344	372	346	395	294	320	111	122	238	193	369	476	**298**
	70m	432	470	421	468	374	375	148	172	321	272	450	576	**373**
	30m	280	310	192	361	223	188	70	67	76	285	234	292	**215**
2001	50m	364	386	251	467	282	252	101	105	119	379	329	377	**284**
	70m	485	452	313	566	341	308	133	149	172	467	433	43	**322**
	30m	318	333	295	303	276	181	96	74	125	273	277	299	**238**
Average	50m	322	430	379	390	349	241	140	115	191	374	373	391	**308**
	70m	472	505	445	462	420	294	182	161	260	474	473	432	**382**

Nerstrand



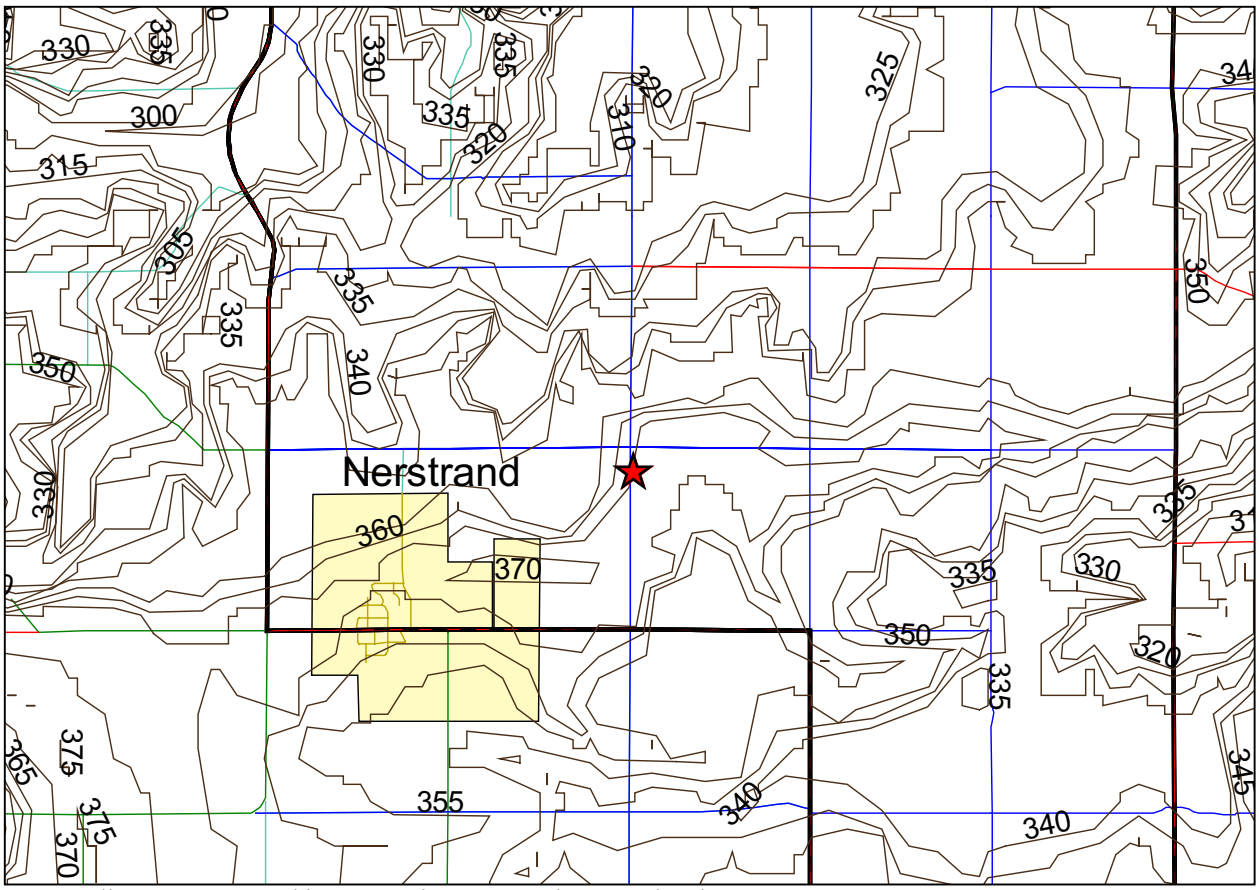
Coordinates

Long/Lat	UTM
N 44.3547	E 496814
W 93.0400	N 4911270

Elevation: 1199 feet

Additional Tower Information:

- Anemometers are located at 30, 50, and 70 meters.
- Vanes are located at 30 and 70 meters.



Contour lines are measured in 5 meter increments above sea level.
County roads are approximately 1 mile apart.

Nerstrand

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						6.5	5.2	4.8	5.3	6.3	6.4	6.0	**5.8**
1995	**50m**						7.5	5.9	5.5	6.2	7.1	7.1	6.6	**6.6**
	70m						8.2	6.5	6.0	6.8	7.7	7.6	7.0	**7.1**
	30m	5.8	7.2	6.8	6.1	5.7	5.2	4.6	4.5	5.0	7.2	5.7	5.0	**5.7**
1996	**50m**	6.5	7.9	7.4	6.7	6.2	5.8	5.3	5.1	5.8	8.1	6.4	5.2	**6.4**
	70m	7.0	8.5	7.9	7.1	6.6	6.2	5.8	5.5	6.4	8.7	7.1	6.5	**6.9**
	30m	5.9	6.1	6.6	6.0	6.4	5.2	5.0	4.2	5.4	6.8	5.4	5.4	**5.7**
1997	**50m**	6.1	6.7	7.3	6.6	7.1	5.8	5.6	4.9	6.3	7.6	6.1	6.0	**6.3**
	70m	7.6	7.3	7.7	7.0	7.5	6.3	6.1	5.3	6.9	8.2	6.5	6.3	**6.9**
	30m	5.2	5.1	6.1	6.1	5.9	5.0	4.1	4.0	5.2	5.6	6.5	6.0	**5.4**
1998	**50m**	5.5	5.6	6.6	6.7	6.5	5.6	4.9	5.1	6.3	6.6	7.3	6.8	**6.1**
	70m	6.1	6.0	7.0	7.1	7.0	6.0	5.3	5.5	6.9	7.2	7.9	7.3	**6.6**
	30m	6.1	6.8	6.5	6.3	6.4	6.1	5.6	5.0	5.6	6.2	6.5	5.9	**6.1**
1999	**50m**	6.9	7.5	7.1	6.9	6.9	6.6	6.3	5.7	6.4	7.1	7.4	6.6	**6.8**
	70m	7.2	8.0	7.7	7.3	7.5	7.1	6.8	6.3	7.2	7.7	8.1	7.2	**7.3**
	30m	6.0	6.3	5.7	6.6	6.3	6.2	4.5	4.7	5.8	6.0	6.1	5.5	**5.8**
2000	**50m**	6.8	7.1	6.3	7.2	7.0	6.8	5.2	5.3	6.7	6.7	6.6	6.1	**6.5**
	70m	7.4	7.7	6.8	7.7	7.5	7.4	5.7	5.9	7.4	7.4	7.3	6.7	**7.1**
	30m	5.5	3.3	5.1	7.0	5.9	5.7	4.6	4.3	4.7	6.6	6.2	6.4	**5.4**
2001	**50m**	5.0	3.1	5.9	7.8	6.5	6.2	5.2	5.4	5.5	7.5	6.9	7.1	**6.0**
	70m	7.6	6.8	*	*	*	*	*	*	*	8.1	7.8	7.8	**7.6**
	30m	5.8	6.3	6.3	6.2	6.1	5.7	4.8	4.5	5.4	6.4	6.1	5.6	**5.8**
Average	**50m**	6.4	6.9	7.0	6.8	6.7	6.3	5.5	5.3	6.3	7.2	6.8	6.2	**6.5**
(m/s)	**70m**	7.1	7.5	7.4	7.2	7.2	6.9	6.0	5.7	6.9	7.8	7.4	6.8	**7.0**
	30m	13.0	14.1	14.2	13.9	13.7	12.7	10.8	10.1	12.0	14.2	13.6	12.6	**12.9**
Average	**50m**	14.2	15.5	15.6	15.3	15.1	14.2	12.4	11.8	14.1	16.1	15.3	13.9	**14.5**
(mph)	**70m**	15.8	16.8	16.6	16.2	16.1	15.3	13.5	12.9	15.5	17.5	16.6	15.3	**15.7**

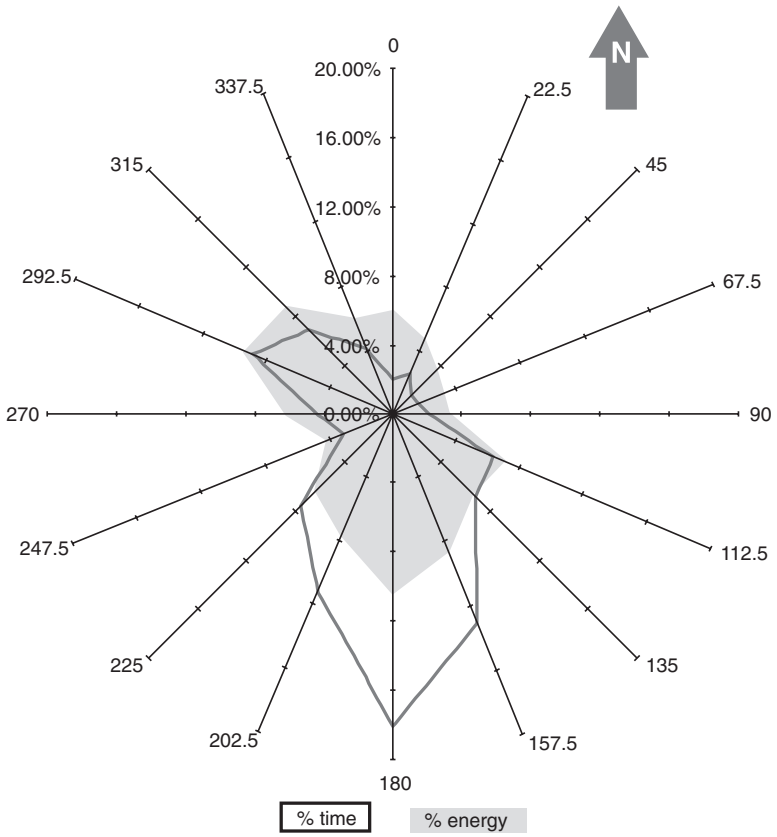
Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m-50m						0.29	0.26	0.28	0.30	0.25	0.20	0.18	**0.25**
1995	**50m-70m**						0.28	0.28	0.25	0.28	0.25	0.20	0.18	**0.25**
	30m-50m	0.22	0.22	0.20	0.20	0.20	0.22	0.27	0.26	0.30	0.23	0.22	0.02	**0.21**
1996	**50m-70m**	0.24	0.22	0.20	0.17	0.19	0.20	0.25	0.22	0.28	0.23	0.26	0.38	**0.24**
	30m-50m	0.09	0.19	0.20	0.19	0.21	0.21	0.24	0.29	0.28	0.21	0.22	0.19	**0.21**
1997	**50m-70m**	0.64	0.24	0.17	0.20	0.18	0.21	0.22	0.24	0.26	0.22	0.19	0.14	**0.24**
	30m-50m	0.20	0.20	0.17	0.20	0.21	0.23	0.37	0.45	0.37	0.35	0.26	0.23	**0.27**
1998	**50m-70m**	0.11	0.17	0.17	0.17	0.18	0.18	0.22	0.24	0.28	0.25	0.21	0.20	**0.20**
	30m-50m	0.21	0.21	0.21	0.20	0.19	0.19	0.25	0.29	0.30	0.29	0.28	0.26	**0.24**
1999	**50m-70m**	0.24	0.26	0.24	0.23	0.26	0.24	0.25	0.30	0.32	0.29	0.29	0.26	**0.26**
	30m-50m	0.27	0.24	0.22	0.21	0.23	0.22	0.30	0.27	0.30	0.25	0.20	0.22	**0.24**
2000	**50m-70m**	0.27	0.27	0.25	0.20	0.23	0.26	0.28	0.33	0.32	0.31	0.31	0.28	**0.28**
	30m-50m	0.20	0.22	0.24	0.21	0.19	0.19	0.26	0.30	0.32	0.24	0.24	0.23	**0.24**
2001	**50m-70m**	0.28	0.18	*	*	*	*	*	*	*	0.26	0.24	0.29	**0.25**
	30m-50m	0.20	0.21	0.21	0.20	0.21	0.21	0.28	0.31	0.31	0.26	0.24	0.19	**0.24**
Average	**50m-70m**	0.30	0.22	0.21	0.19	0.21	0.22	0.25	0.26	0.29	0.26	0.25	0.26	**0.24**

*Equipment was damaged during this period

Nerstrand

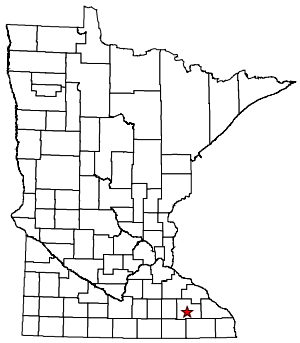
Nerstrand 50 Meter Wind Rose



Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						188	144	105	167	242	280	267	**199**
1995	**50m**						268	207	158	245	337	364	355	**276**
	70m						341	273	210	331	429	442	431	**351**
	30m	227	347	390	253	186	143	87	93	117	352	225	199	**218**
1996	**50m**	289	455	402	328	238	185	127	138	176	482	298	232	**279**
	70m	352	563	576	406	283	226	167	180	236	601	378	325	**358**
	30m	218	270	293	262	268	139	132	79	157	328	177	167	**208**
1997	**50m**	251	350	383	338	349	187	180	117	234	434	249	220	**274**
	70m	430	445	464	413	417	241	231	156	319	551	325	277	**356**
	30m	135	184	266	258	228	179	65	63	133	159	317	244	**186**
1998	**50m**	187	236	322	327	288	235	108	118	215	257	440	335	**256**
	70m	215	285	374	394	348	286	148	160	299	337	557	435	**320**
	30m	223	311	339	258	272	215	193	137	148	237	268	234	**236**
1999	**50m**	307	410	434	325	331	265	261	198	225	334	376	315	**315**
	70m	371	514	536	386	409	331	338	263	319	436	502	397	**400**
	30m	213	278	224	289	236	228	98	102	206	171	234	175	**205**
2000	**50m**	295	368	298	368	313	292	138	145	293	233	289	231	**272**
	70m	378	471	376	440	382	369	178	199	394	317	369	298	**348**
	30m	212	182	124	327	190	160	85	87	91	269	198	232	**180**
2001	**50m**	313	248	174	423	236	202	117	129	138	360	277	307	**244**
	70m	438	313	*	*	*	*	*	*	*	457	347	386	**388**
	30m	205	262	273	275	230	177	110	94	142	253	236	209	**205**
Average	**50m**	274	344	336	352	292	228	155	141	214	350	322	273	**273**
	70m	364	432	465	408	368	291	212	192	313	450	413	353	**355**

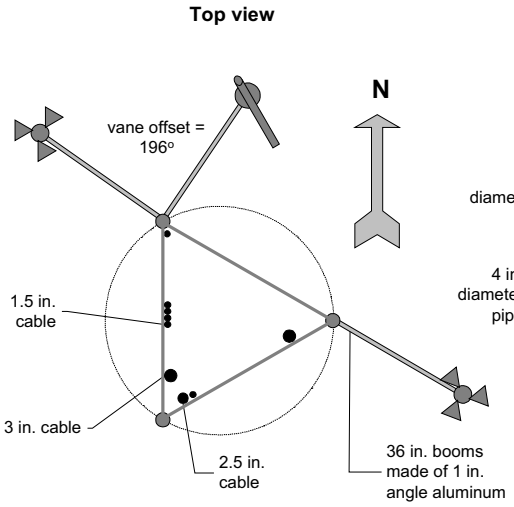
Rochester

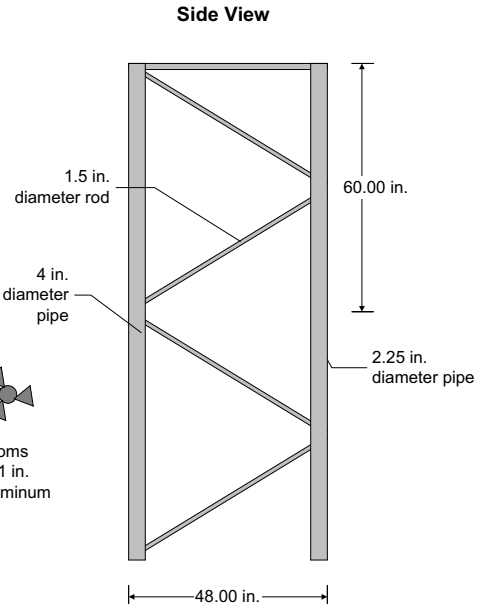


Coordinates

Long/Lat	UTM
N 43.9700	E 546661
W 92.4183	N 4868706

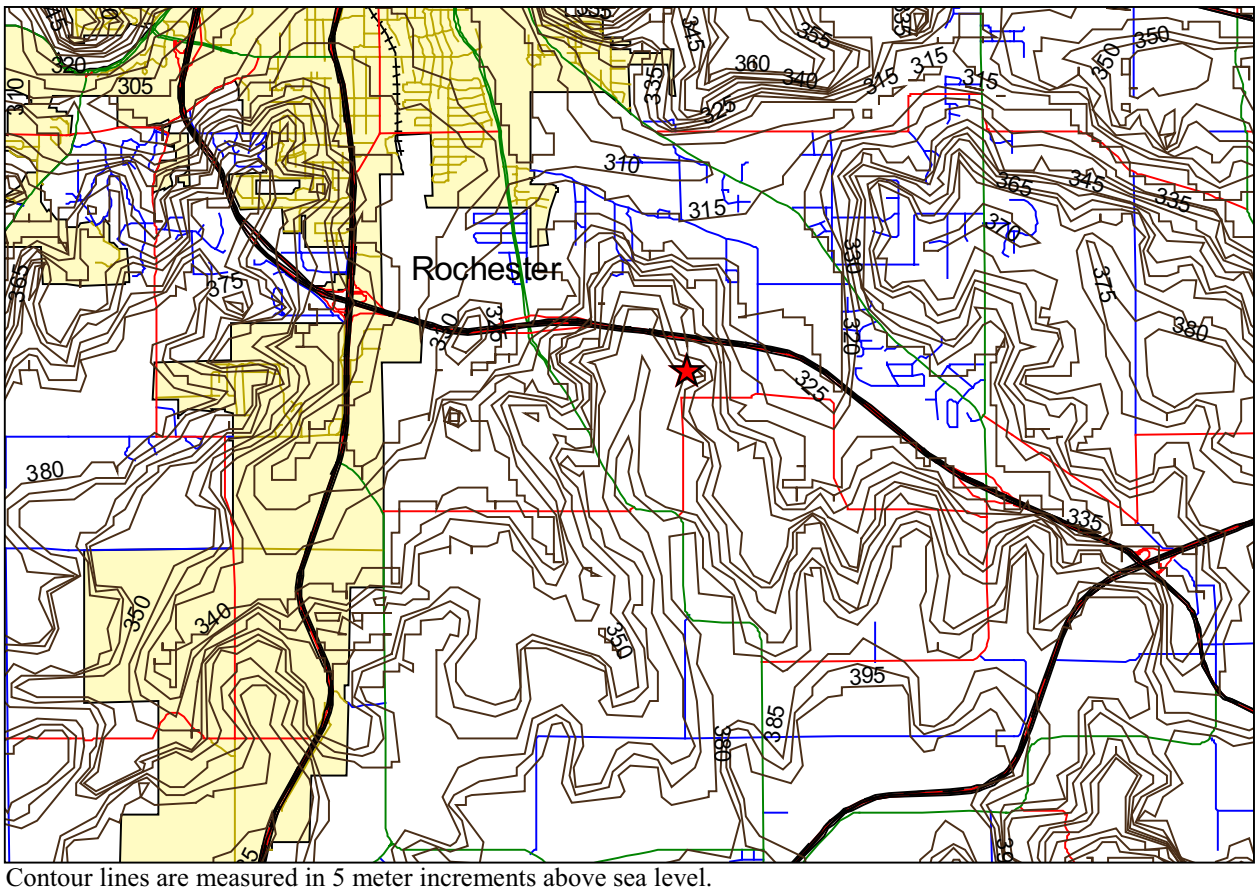
Elevation: 1193 feet





Additional Tower Information:

- Anemometers are located at 30, 50, and 70 meters.
- Vanes are located at 30 and 70 meters.
- Some interference from coaxial cable in the tower.



Contour lines are measured in 5 meter increments above sea level.
County roads are approximately 1 mile apart.

Rochester

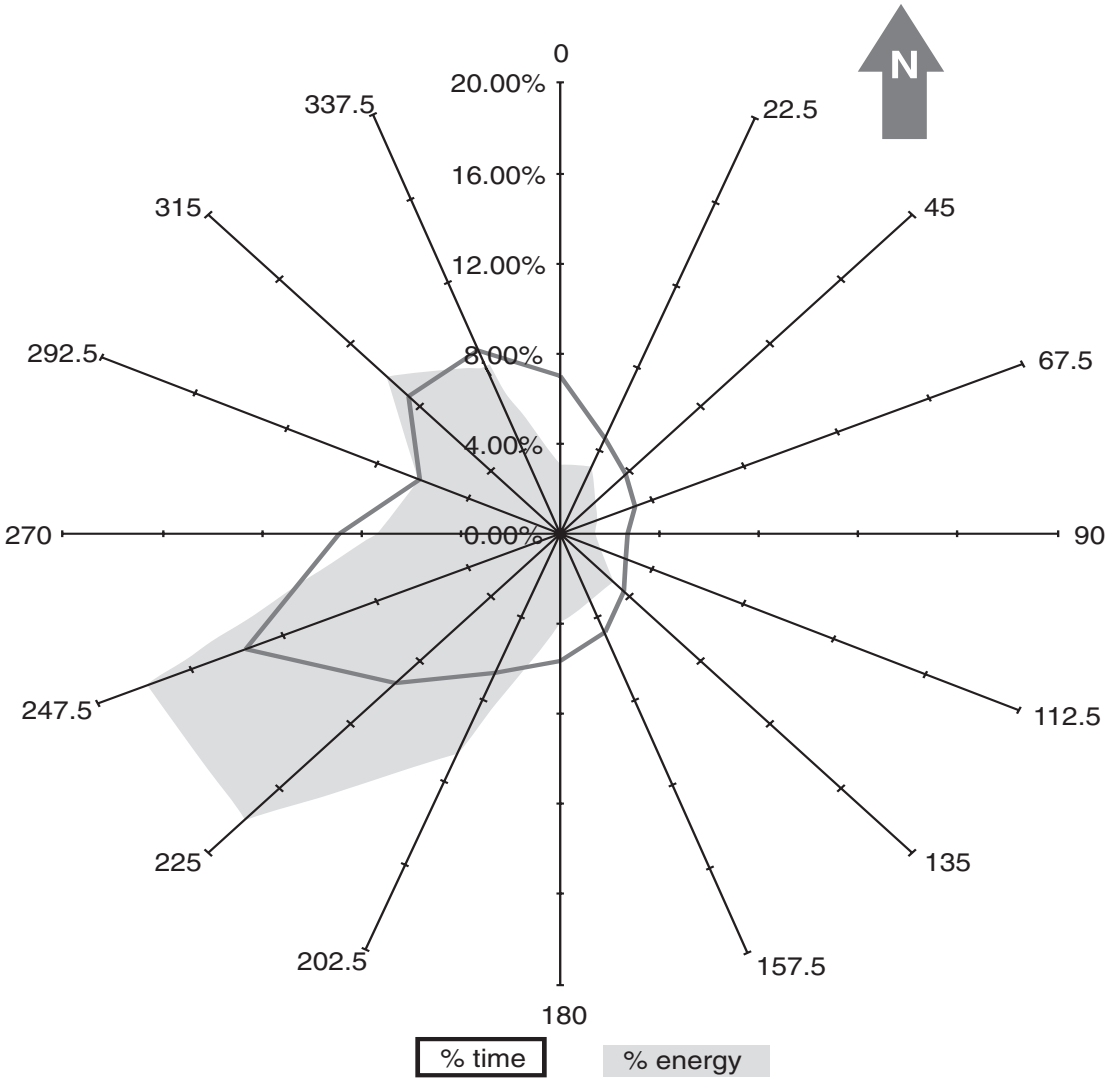
Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m									5.9	6.5	5.6	*	**6.0**
1996	**50m**									6.6	7.2	6.1	*	**6.6**
	70m									7.2	7.9	6.5	*	**7.2**
	30m	6.1	5.5	6.1	5.6	6	4.4	4.6	3.9	5	6.3	5	4.8	**5.3**
1997	**50m**	6.4	6	6.6	6.1	6.6	5	5.2	4.4	5.7	7	5.5	5.3	**5.8**
	70m	6.5	6.3	7	6.6	7.1	5.5	5.7	4.9	6.3	7.6	5.9	5.6	**6.3**
	30m	4.7	4.6	5.6	5.6	5.2	4.6	3.7	4	4.8	5.5	6.4	5.7	**5.0**
1998	**50m**	4.9	5	6.1	6.1	5.8	5.1	4.2	4.6	5.5	6.2	7.1	6.3	**5.6**
	70m	5	5.4	6.4	6.6	6.3	5.6	4.7	5.1	6.1	6.8	7.6	6.7	**6.0**
	30m	5.2	6.1	6.0	5.7	5.6	5.2	5.0	4.3	5.0	5.8	5.7	5.4	**5.4**
1999	**50m**	5.7	6.6	6.6	6.2	6.2	5.8	5.7	4.9	5.8	6.5	6.5	6.0	**6.1**
	70m	6.1	7.1	7.1	6.6	6.7	6.4	6.2	5.5	6.5	7.1	7.1	6.4	**6.6**
	30m	5.3	5.7	5.1	6.1	5.7	5.8	4.4	4.2	5.5	5.1	5.7	5.0	**5.3**
2000	**50m**	5.8	6.2	5.7	6.7	6.4	6.4	4.9	4.8	6.2	5.8	6.2	5.4	**5.9**
	70m	6.3	6.8	6.2	7.1	6.9	6.9	5.4	5.4	6.8	6.5	6.6	5.7	**6.4**
	30m	5.1	5.0	5.0	6.5	5.2	5.1	4.1	4.2	4.1	6.2	5.8	6.0	**5.2**
2001	**50m**	5.6	4.7	5.1	6.5	5.3	5.3	4.3	4.5	4.2	6.3	6.2	5.9	**5.3**
	70m	6.1	5.4	6.1	7.7	6.3	6.2	5.3	5.3	5.3	7.4	7.2	7.0	**6.3**
	30m	5.3	5.5	5.7	5.7	5.6	5.0	4.4	4.1	5.2	5.8	5.7	5.2	**5.3**
Average	**50m**	5.7	6.0	6.3	6.3	6.2	5.6	5.0	4.7	6.0	6.5	6.3	5.7	**5.9**
(m/s)	**70m**	6.0	6.4	6.7	6.7	6.7	6.1	5.5	5.2	6.6	7.2	6.7	6.1	**6.3**
	30m	11.9	12.2	12.8	12.8	12.6	11.2	9.9	9.2	11.7	13.1	12.7	11.7	**11.8**
Average	**50m**	12.8	13.3	14.0	14.0	14.0	12.5	11.2	10.5	13.3	14.6	14.0	12.8	**13.1**
(mph)	**70m**	13.3	14.3	14.9	15.1	15.1	13.6	12.3	11.6	14.7	16.1	15.1	13.7	**14.2**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m									204	294	223	*	**240**
1996	**50m**									269	375	277	*	**307**
	70m									329	463	337	*	**376**
	30m	243	186	233	238	255	101	113	59	151	267	138	109	**174**
1997	**50m**	296	239	289	293	312	138	147	85	206	350	182	145	**224**
	70m	305	286	349	346	366	177	185	115	265	439	224	179	**270**
	30m	88.7	139	208	212	166	102	50.5	64.2	106	167	367	193	**155**
1998	**50m**	106	172	258	266	216	138	73.2	92.8	154	223	469	257	**202**
	70m	110	212	298	317	265	175	101	126	205	280	557	314	**247**
	30m	153	248	294	213	183	137	141	92	114	203	193	188	**180**
1999	**50m**	191	312	373	264	229	186	195	129	168	275	268	243	**236**
	70m	221	392	442	307	279	233	245	169	226	349	346	294	**292**
	30m	156	218	177	248	179	196	82	78	178	116	185	140	**163**
2000	**50m**	196	279	226	310	236	260	111	107	250	161	233	174	**212**
	70m	240	346	276	362	289	315	142	143	327	216	280	200	**261**
	30m	144	152	108	291	144	111	64	68	62	244	174	192	**146**
2001	**50m**	187	154	125	321	158	130	75	82	77	290	220	202	**168**
	70m	237	195	180	433	220	192	116	126	125	381	298	299	**234**
	30m	157	189	204	240	185	129	90	72	136	215	213	164	**166**
Average	**50m**	195	231	254	291	230	171	120	99	187	279	275	204	**211**
	70m	223	286	309	353	284	219	158	136	246	355	340	257	**264**

Rochester 50 Meter Wind Rose

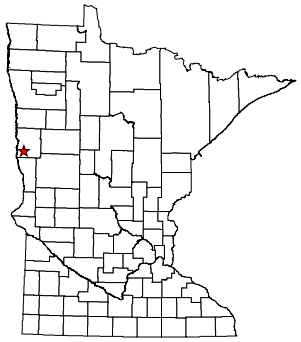


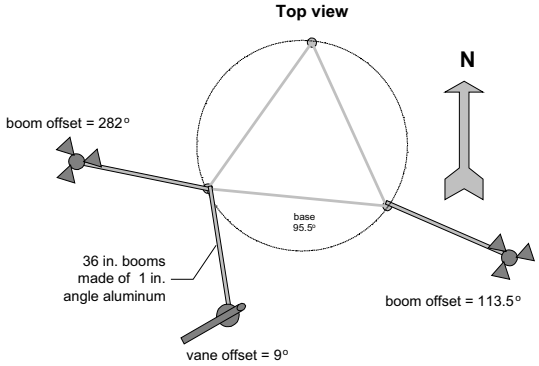
Wind Shear Exponent (Alpha)

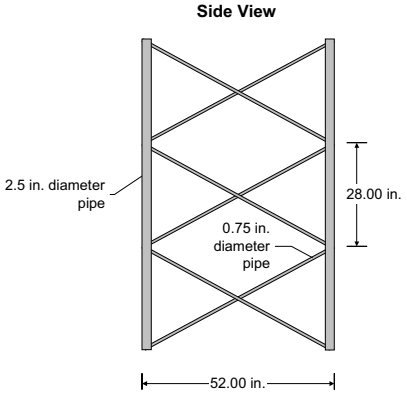
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	30m-50m									0.22	0.23	0.18	*	**0.21**
1996	**50m-70m**									0.25	0.29	0.20	*	**0.25**
	30m-50m	0.14	0.17	0.17	0.19	0.20	0.25	0.22	0.26	0.27	0.22	0.18	0.18	**0.20**
1997	**50m-70m**	0.01	0.12	0.18	0.23	0.24	0.27	0.32	0.31	0.30	0.25	0.21	0.17	**0.22**
	30m-50m	0.07	0.19	0.17	0.20	0.24	0.24	0.25	0.28	0.29	0.23	0.21	0.20	**0.21**
1998	**50m-70m**	-0.06	0.25	0.17	0.22	0.28	0.29	0.31	0.32	0.31	0.28	0.22	0.17	**0.23**
	30m-50m	0.18	0.19	0.20	0.21	0.21	0.24	0.24	0.27	0.30	0.25	0.26	0.22	**0.23**
1999	**50m-70m**	0.25	0.25	0.26	0.24	0.27	0.28	0.29	0.33	0.34	0.31	0.33	0.27	**0.28**
	30m-50m	0.22	0.22	0.21	0.20	0.24	0.22	0.23	0.25	0.25	0.26	0.19	0.18	**0.22**
2000	**50m-70m**	0.30	0.30	0.27	0.24	0.27	0.25	0.30	0.34	0.32	0.34	0.25	0.26	**0.29**
	30m-50m	0.18	-0.07	0.10	0.00	0.01	0.08	0.07	0.11	0.11	0.02	0.15	0.00	**0.06**
2001	**50m-70m**	0.29	0.44	0.43	0.54	0.57	0.47	0.59	0.45	0.58	0.54	0.37	0.48	**0.48**
	30m-50m	0.16	0.14	0.17	0.16	0.18	0.21	0.20	0.23	0.24	0.20	0.20	0.16	**0.19**
Average	**50m-70m**	0.16	0.27	0.26	0.29	0.33	0.31	0.36	0.35	0.37	0.34	0.28	0.27	**0.30**

*Equipment was damaged during this period

Sabin







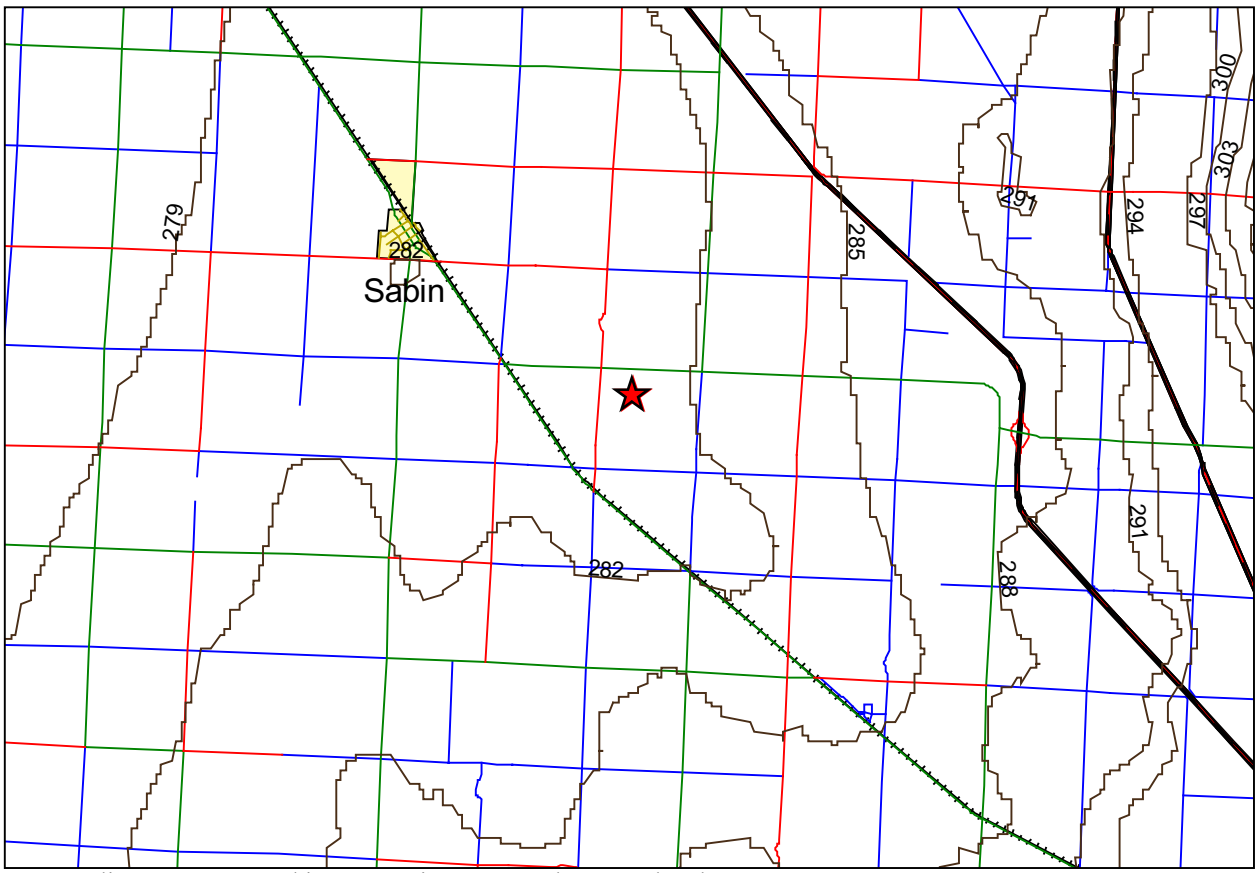
Coordinates

Long/Lat	UTM
N 46.7578	E 224796
W 96.6038	N 5184555

Elevation: 919 feet

Additional Tower Information:

- Anemometers are located at 30, 50, and 70 meters.
- Vanes are located at 30 and 70 meters.
- There is a set of guy wires that connects to the tower at 30 meters.
- Next set of guy wires connects halfway between the 50 meter and 70 meter sensors.
- Thare are two wire satellite dishes pointing north 6 meters above the 70 meter sensors.



Contour lines are measured in 5 meter increments above sea level.
County roads are approximately 1 mile apart.

Sabin

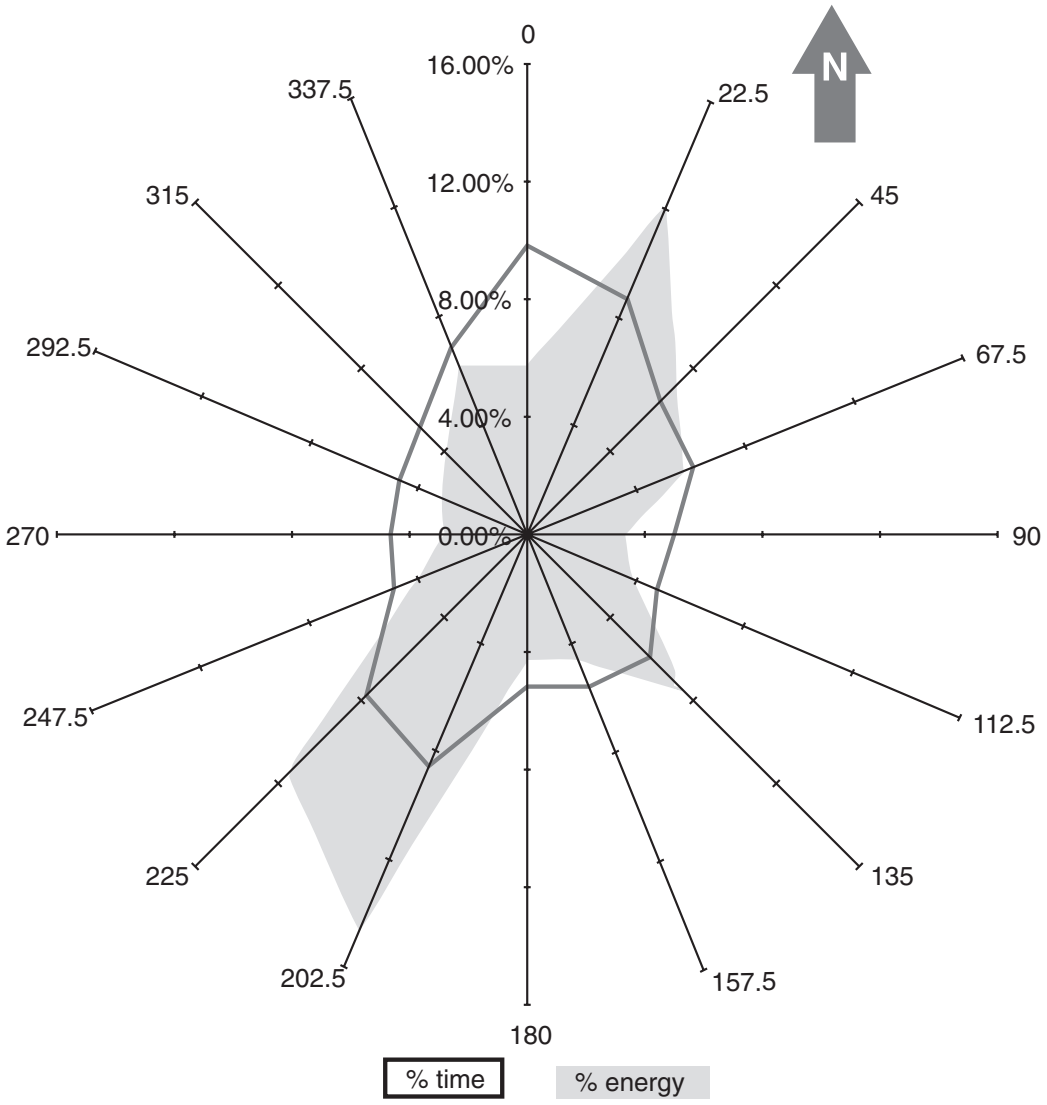
Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						5.3	4.4	5.3	4.9	5.3	5.9	5.3	**5.2**
1995	**50m**						6.2	5.3	6.3	5.9	6.2	6.7	5.5	**6.0**
	70m						6.8	5.8	6.9	6.5	6.8	7.3	5.7	**6.5**
	30m	5.1	7.0	5.8	5.9	5.5	5.0	4.3	5.5	4.5	6.7	5.4	6.0	**5.6**
1996	**50m**	5.8	8.0	6.6	6.7	6.3	5.9	5.1	6.6	5.5	7.8	6.1	6.6	**6.4**
	70m	6.3	8.8	7.1	7.2	6.8	6.4	5.6	7.3	6.0	8.4	6.4	7.1	**7.0**
	30m	5.9	5.4	6.1	4.7	6.5	5.1	4.5	4.0	5.4	6.3	5.7	5.2	**5.4**
1997	**50m**	6.6	6.1	7.1	5.5	7.3	5.8	5.3	4.8	6.4	7.3	6.5	6.0	**6.2**
	70m	7.1	6.7	7.8	5.9	7.7	6.4	5.9	5.3	7.1	8.0	7.1	6.8	**6.8**
	30m	4.7	5.1	5.4	5.4	5.2	4.9	4.0	4.3	5.1	5.6	5.5	5.2	**5.0**
1998	**50m**	5.1	5.7	5.9	6.0	5.8	5.5	4.6	5.0	6.1	6.4	6.4	5.9	**5.7**
	70m	5.6	6.6	6.5	6.6	6.4	6.2	5.2	5.6	6.9	7.1	7.0	6.5	**6.4**
	30m	5.7	6.6	5.6	5.5	6.4	5.2	4.0	4.4	4.8	5.2	5.6	5.9	**5.4**
1999	**50m**	6.5	7.8	6.5	6.3	7.4	6.1	5.1	5.4	6.1	6.5	6.5	6.8	**6.4**
	70m	7.0	8.5	7.1	6.9	8.0	6.8	5.8	6.1	6.8	7.3	7.2	7.5	**7.1**
	30m	5.4	5.4	5.6	6.2	5.5	5.3	3.9	4.2					**5.2**
2000	**50m**	6.1	6.3	6.5	7.1	6.4	6.1	4.6	4.9					**6.0**
	70m	6.7	7.1	7.1	7.7	7.0	6.7	5.2	5.6					**6.6**
	30m	5.3	5.9	5.7	5.5	5.8	5.1	4.2	4.6	4.9	5.8	5.6	5.5	**5.3**
Average	**50m**	6.0	6.8	6.5	6.3	6.6	5.9	5.0	5.5	6.0	6.8	6.4	6.2	**6.2**
(m/s)	**70m**	6.6	7.6	7.1	6.9	7.2	6.6	5.6	6.1	6.7	7.5	7.0	6.7	**6.8**
	30m	12.0	13.2	12.7	12.4	13.0	11.5	9.4	10.3	11.0	13.0	12.6	12.4	**12.0**
Average	**50m**	13.5	15.2	14.6	14.1	14.8	13.3	11.2	12.3	13.4	15.3	14.4	13.8	**13.8**
(mph)	**70m**	14.7	16.9	15.9	15.4	16.1	14.7	12.5	13.7	14.9	16.8	15.7	15.0	**15.2**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						147	111	136	147	179	241	271	**176**
1995	**50m**						230	173	215	232	264	333	392	**263**
	70m						297	221	278	305	335	409	490	**334**
	30m	259	391	255	232	171	135	78	138	112	343	224	313	**221**
1996	**50m**	366	552	356	330	250	205	123	229	187	494	297	433	**319**
	70m	466	685	443	410	312	262	163	305	249	611	361	540	**401**
	30m	269	197	262	168	293	119	118	74	169	266	259	160	**196**
1997	**50m**	357	286	386	263	402	178	181	118	257	394	374	239	**286**
	70m	454	386	512	352	481	236	239	163	348	504	475	333	**374**
	30m	126	201	196	178	174	114	70	77	129	226	238	184	**159**
1998	**50m**	163	278	256	240	233	159	106	122	205	321	350	258	**224**
	70m	210	414	331	321	303	212	148	170	285	424	448	333	**300**
	30m	198	337	249	171	294	149	68	98	111	153	215	257	**192**
1999	**50m**	284	520	368	249	420	238	129	169	207	265	311	370	**294**
	70m	371	658	460	325	527	309	183	227	281	366	410	477	**383**
	30m	188	184	219	275	189	168	68	71					**170**
2000	**50m**	275	286	334	380	267	247	108	111					**251**
	70m	357	388	427	472	340	317	148	162					**327**
	30m	208	262	236	205	224	139	85	99	134	233	235	237	**191**
Average	**50m**	289	384	340	292	315	210	137	161	218	348	333	338	**280**
	70m	372	506	435	376	393	272	184	218	294	448	421	435	**363**

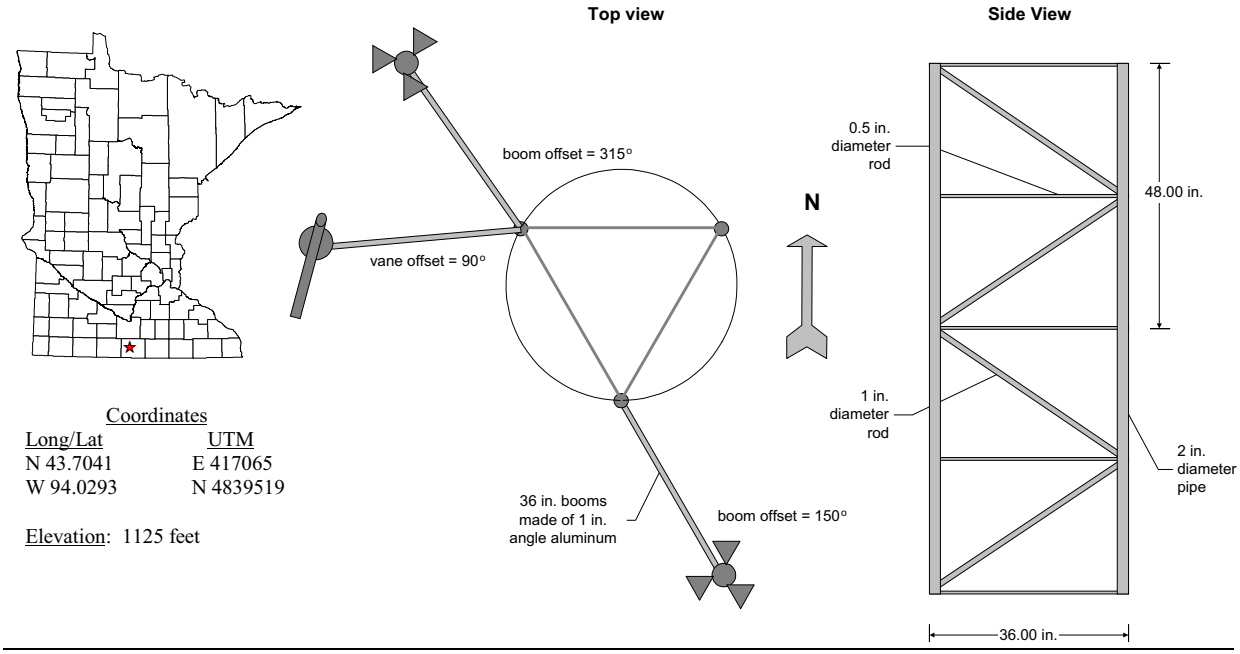
Sabin 50 Meter Wind Rose



Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	30m-50m						0.33	0.35	0.36	0.35	0.32	0.25	0.21	**0.31**
1995	**50m-70m**						0.27	0.26	0.28	0.24	0.27	0.24	0.19	**0.25**
	30m-50m	0.24	0.29	0.23	0.24	0.29	0.30	0.34	0.38	0.37	0.30	0.26	0.20	**0.29**
1996	**50m-70m**	0.23	0.27	0.25	0.21	0.23	0.23	0.25	0.27	0.29	0.24	0.23	0.17	**0.24**
	30m-50m	0.21	0.21	0.29	0.27	0.24	0.29	0.32	0.30	0.32	0.29	0.23	0.26	**0.27**
1997	**50m-70m**	0.22	0.24	0.30	0.22	0.16	0.29	0.35	0.32	0.33	0.27	0.29	0.41	**0.28**
	30m-50m	0.16	0.18	0.17	0.20	0.20	0.25	0.30	0.31	0.35	0.29	0.28	0.27	**0.25**
1998	**50m-70m**	0.33	0.46	0.30	0.30	0.34	0.33	0.34	0.34	0.36	0.30	0.26	0.28	**0.33**
	30m-50m	0.29	0.35	0.30	0.30	0.30	0.34	0.45	0.42	0.47	0.44	0.32	0.30	**0.36**
1999	**50m-70m**	0.29	0.29	0.27	0.29	0.27	0.32	0.39	0.36	0.37	0.37	0.35	0.32	**0.32**
	30m-50m	0.29	0.35	0.30	0.27	0.28	0.30	0.33	0.33					**0.31**
2000	**50m-70m**	0.31	0.38	0.29	0.27	0.29	0.30	0.35	0.40					**0.32**
	30m-50m	0.23	0.27	0.27	0.25	0.23	0.30	0.35	0.34	0.36	0.31	0.27	0.29	**0.29**
Average	**50m-70m**	0.24	0.29	0.25	0.24	0.24	0.28	0.32	0.32	0.33	0.29	0.28	0.27	**0.28**

Winnebago



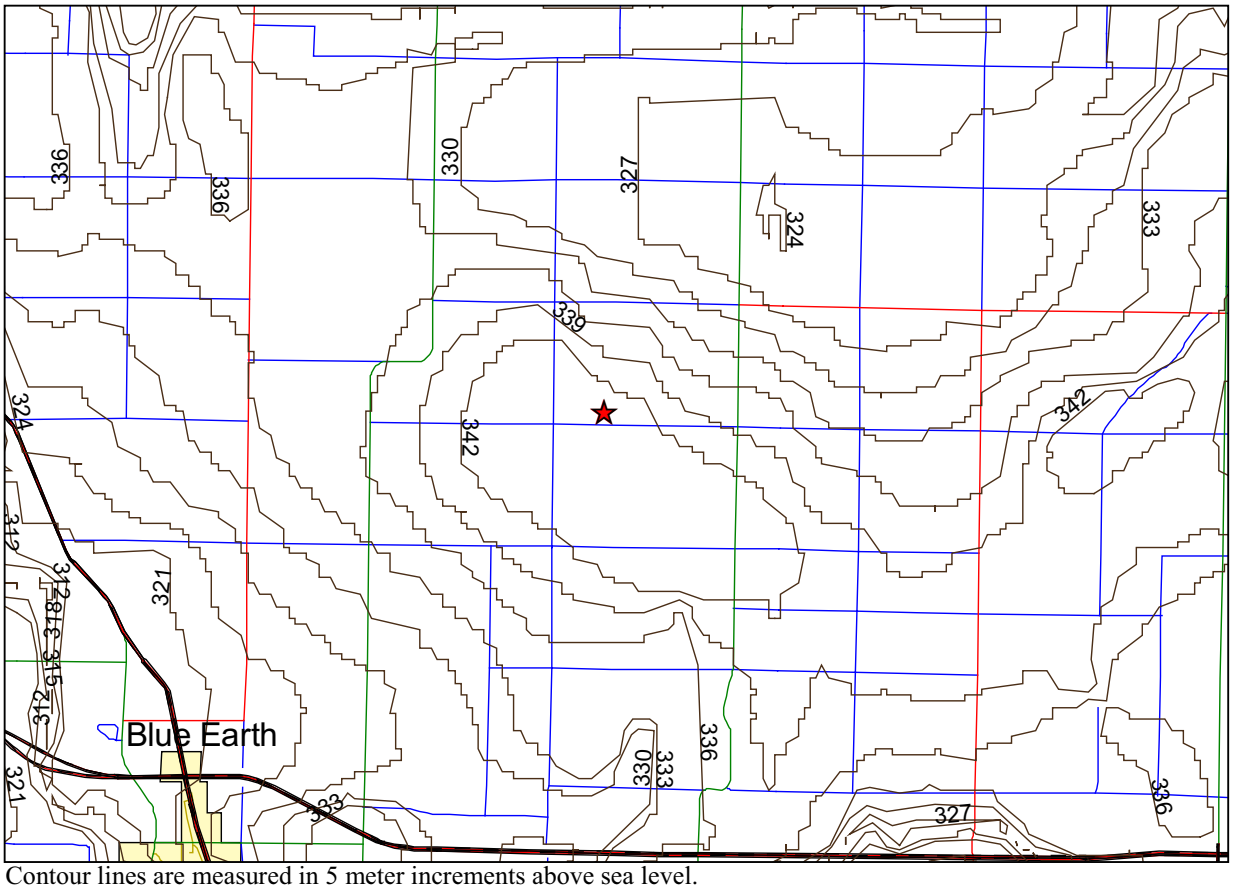
Coordinates

Long/Lat	UTM
N 43.7041	E 417065
W 94.0293	N 4839519

Elevation: 1125 feet

Additional Tower Information:

- Anemometers are located at 30, 50, and 70 meters.
- Vanes are located at 30 and 70 meters.



Contour lines are measured in 5 meter increments above sea level.
County roads are approximately 1 mile apart.

Winnebago

Wind Speed (Meters per second

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	30m						4.9	5.1	4.5	5.3	6.8	6.9	6.6	**5.7**
1995	50m						5.5	5.8	5.2	6.2	7.6	7.6	7.3	**6.5**
	70m						5.9	6.4	5.8	6.9	8.3	8.1	7.9	**7.0**
	30m	7.1	7.3	6.9	6.3	5.9	5.5	4.2	2.8	4.6	6.8	6.3	*	**5.8**
1996	50m	7.9	8.2	7.9	7.2	6.7	6.2	5.0	3.3	5.6	7.8	7.1	*	**6.6**
	70m	8.5	8.7	8.4	7.6	7.2	6.6	5.6	3.7	6.3	8.6	7.7	*	**7.2**
	30m	7.6	6.5	7.2	6.3	7.1	5.2	5.0	4.0	5.3	7.0	6.2	5.6	**6.1**
1997	50m	8.4	7.1	8.0	6.9	7.8	6.0	5.9	4.7	6.3	7.9	7.0	6.2	**6.9**
	70m	8.8	7.5	8.3	7.1	7.9	6.3	6.3	5.1	6.9	8.5	7.5	6.3	**7.2**
	30m	5.3	5.2	6.4	6.4	6.3	5.0	3.8	4.1	5.4	5.9	7.0	6.1	**5.6**
1998	50m	5.6	5.9	7.0	7.2	7.0	5.7	4.6	4.9	6.2	6.9	7.8	6.8	**6.3**
	70m	5.8	6.3	7.4	7.8	7.5	6.2	5.0	5.5	6.8	7.7	8.4	7.3	**6.8**
	30m	6.5	7.1	6.7	7.0	6.8	6.0	5.5	4.8	5.7	6.5	6.7	6.3	**6.3**
1999	50m	7.1	7.9	7.5	7.8	7.6	6.8	6.1	5.6	6.7	7.3	7.4	7.0	**7.1**
	70m	7.6	8.5	8.0	8.6	8.2	7.3	6.6	6.1	7.3	7.9	8.1	7.6	**7.7**
	30m	6.4	6.6	5.8	6.9	6.7	6.3	4.6	4.4	5.7	6.1	6.5	6.7	**6.1**
2000	50m	7.2	7.4	6.5	7.6	7.3	7.0	5.2	5.3	6.6	7.0	7.1	7.3	**6.8**
	70m	7.8	8.0	7.0	8.1	7.9	7.4	5.7	6.0	7.2	7.6	7.5	7.7	**7.3**
	30m	6.2	*	*	*	*	*	*	*	*	6.5	5.8	6.8	**6.3**
2001	50m	6.8	*	*	*	*	*	*	*	*	8.0	7.5	8.1	**7.6**
	70m	7.0	6.3	6.4	7.8	6.9	6.7	5.4	5.5	5.6	8.8	8.3	9.1	**7.0**
	30m	6.5	6.6	6.6	6.6	6.6	5.5	4.7	4.1	5.3	6.5	6.5	6.3	**6.0**
Average	50m	7.2	7.3	7.4	7.3	7.3	6.2	5.4	4.8	6.3	7.5	7.4	7.1	**6.8**
(m/s)	70m	7.6	7.6	7.6	7.8	7.6	6.6	5.9	5.4	6.7	8.2	7.9	7.6	**7.2**
	30m	14.6	14.7	14.8	14.7	14.7	12.3	10.5	9.2	11.9	14.6	14.5	14.2	**13.4**
Average	50m	16.0	16.4	16.5	16.4	16.3	13.8	12.2	10.8	14.0	16.8	16.5	15.9	**15.1**
(mph)	70m	17.0	16.9	17.0	17.5	17.0	14.8	13.1	12.0	15.0	18.4	17.7	17.1	**16.1**

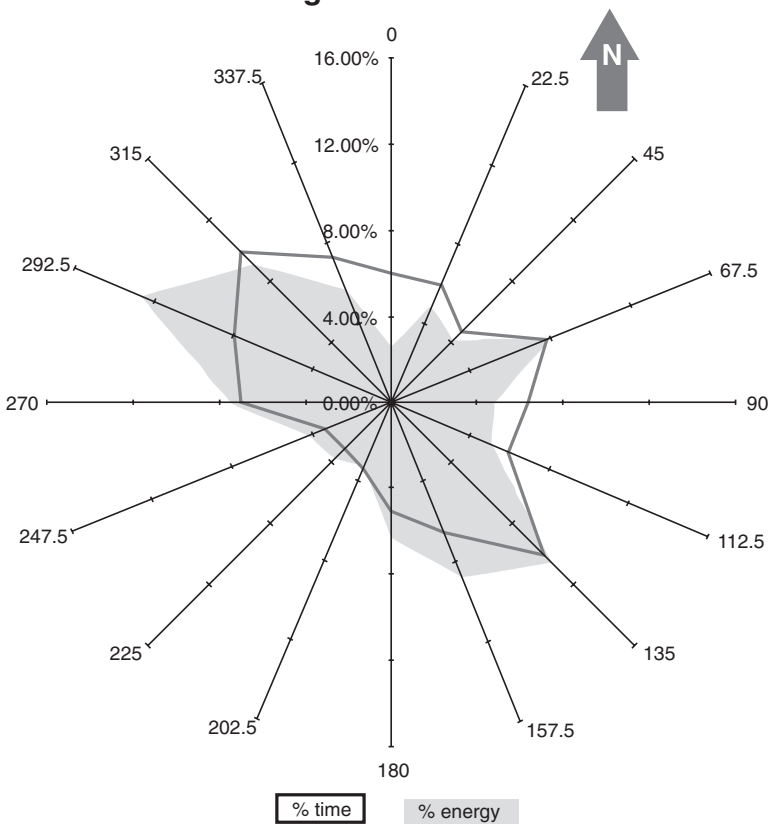
Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	30m-50m						0.24	0.26	0.31	0.33	0.24	0.19	0.20	**0.25**
1995	50m-70m						0.21	0.24	0.28	0.28	0.26	0.23	0.23	**0.25**
	30m-50m	0.22	0.25	0.28	0.28	0.27	0.23	0.31	0.34	0.37	0.30	0.24	*	**0.28**
1996	50m-70m	0.19	0.17	0.18	0.14	0.19	0.20	0.30	0.33	0.36	0.28	0.20	*	**0.23**
	30m-50m	0.21	0.19	0.21	0.21	0.19	0.27	0.33	0.33	0.34	0.24	0.22	0.20	**0.25**
1997	50m-70m	0.11	0.11	0.14	0.04	0.05	0.16	0.23	0.21	0.27	0.21	0.21	0.03	**0.15**
	30m-50m	0.16	0.23	0.17	0.21	0.23	0.28	0.35	0.37	0.35	0.30	0.23	0.21	**0.26**
1998	50m-70m	0.10	0.20	0.18	0.23	0.22	0.23	0.24	0.34	0.29	0.30	0.21	0.21	**0.23**
	30m-50m	0.21	0.22	0.24	0.25	0.23	0.25	0.26	0.32	0.33	0.26	0.25	0.24	**0.25**
1999	50m-70m	0.32	0.27	0.30	0.37	0.28	0.28	0.27	0.32	0.32	0.30	0.29	0.26	**0.30**
	30m-50m	0.25	0.24	0.24	0.20	0.19	0.20	0.27	0.38	0.31	0.28	0.20	0.19	**0.24**
2000	50m-70m	0.29	0.29	0.32	0.28	0.30	0.25	0.34	0.43	0.34	0.29	0.22	0.21	**0.30**
	30m-50m	0.19	*	*	*	*	*	*	*	*	0.43	0.43	0.37	**0.35**
2001	50m-70m	-0.05	*	*	*	*	*	*	*	*	0.30	0.27	0.34	**0.22**
	30m-50m	0.21	0.23	0.23	0.23	0.22	0.25	0.30	0.35	0.34	0.30	0.26	0.24	**0.26**
Average	50m-70m	0.16	0.21	0.22	0.21	0.21	0.23	0.28	0.32	0.32	0.28	0.24	0.21	**0.24**

*Equipment was damaged during this period

Winnebago

Winnebago 50 Meter Wind Rose

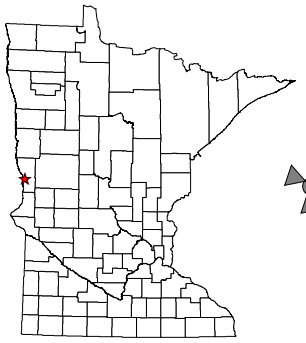


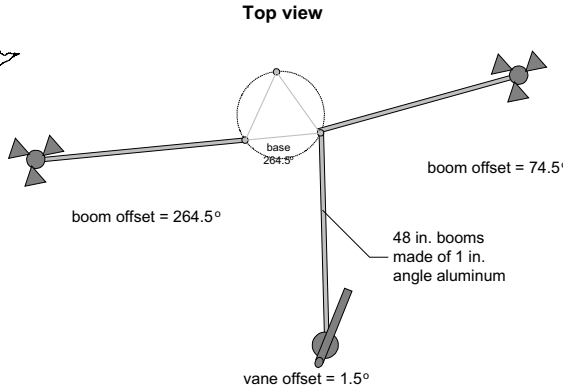
Wind Power (Watts per Square Meter)

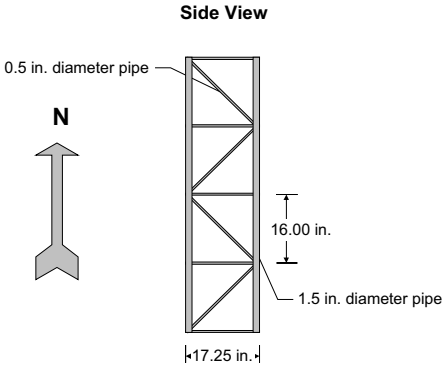
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m						99	137	85	154	301	364	342	**212**
1995	**50m**						135	196	130	231	404	458	444	**285**
	70m						174	257	179	314	512	562	552	**364**
	30m	433	408	319	279	213	172	66	31	91	361	250	*	**238**
1996	**50m**	562	554	434	399	293	223	102	51	151	499	352	*	**329**
	70m	674	678	528	468	348	271	143	74	220	623	440	*	**406**
	30m	477	277	343	273	367	142	131	65	154	325	255	180	**249**
1997	**50m**	606	361	458	356	473	197	194	104	238	450	354	248	**337**
	70m	742	427	529	374	475	237	241	134	315	555	438	312	**398**
	30m	160	175	292	284	275	118	56	65	120	175	370	262	**196**
1998	**50m**	185	262	364	375	353	174	92	109	190	277	501	343	**269**
	70m	205	341	430	476	420	220	122	160	259	389	591	416	**336**
	30m	303	370	401	360	291	200	182	100	151	244	268	267	**261**
1999	**50m**	387	497	523	467	399	270	244	158	232	337	371	363	**354**
	70m	471	625	610	610	502	332	288	210	304	427	474	448	**442**
	30m	257	300	236	331	288	259	93	59	184	161	268	317	**229**
2000	**50m**	355	412	315	425	363	330	133	102	264	240	347	408	**308**
	70m	435	516	382	510	441	380	177	152	342	316	402	473	**377**
	30m	244	*	*	*	*	*	*	*	*	271	186	252	**238**
2001	**50m**	324	*	*	*	*	*	*	*	*	438	318	422	**375**
	70m	356	281	229	488	269	255	144	128	160	576	449	582	**326**
	30m	312	306	318	305	287	178	105	64	140	256	266	256	**233**
Average	**50m**	403	417	419	404	376	239	153	105	215	374	374	357	**320**
	70m	481	478	451	488	409	282	186	143	267	481	466	446	**381**

70 Meter Sites
with two data loggers
and sensors at
10, 30, 40, 50, 60, and
70 meters.

Breckenridge







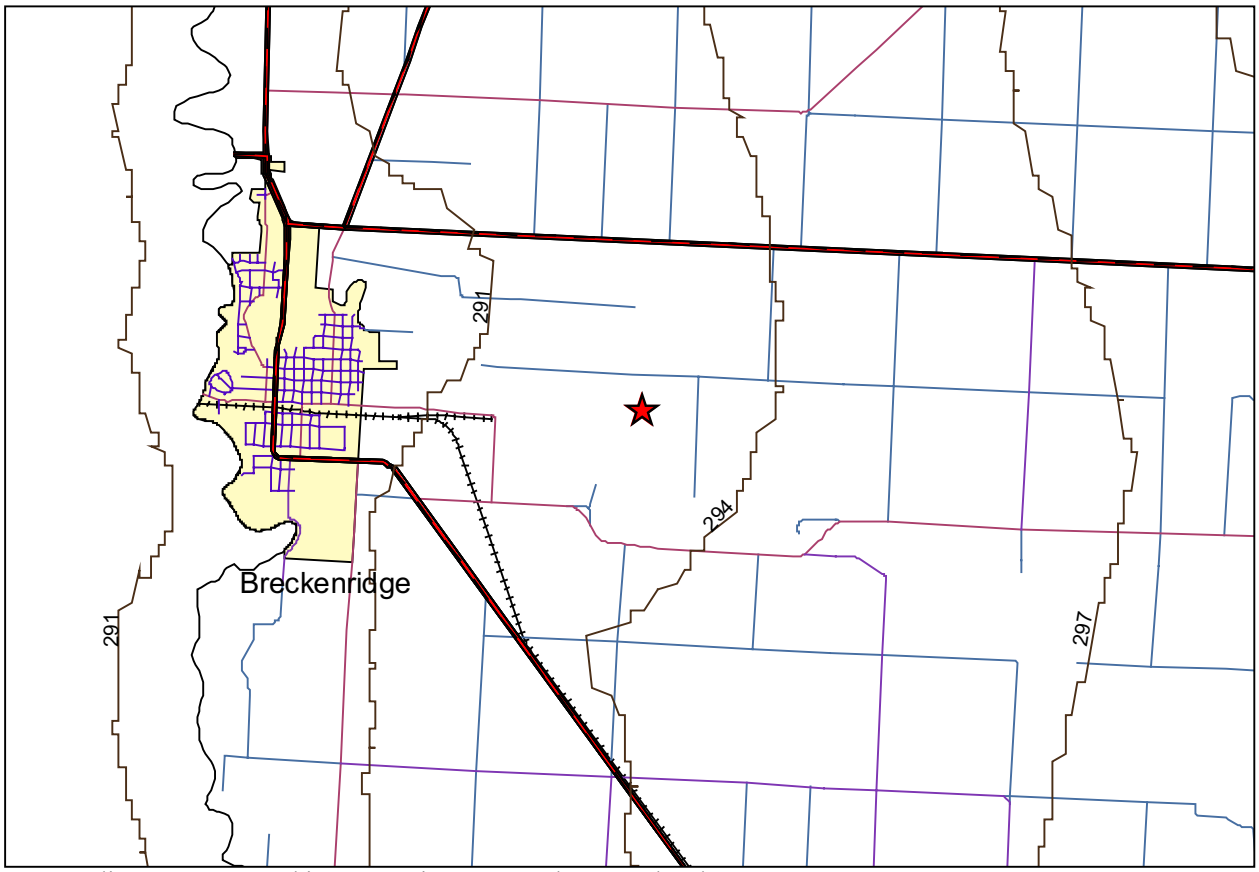
Coordinates

Long/Lat	UTM
N 46.2646	E 227887
W 96.5312	N 5129512

Elevation: 958 feet

Additional Tower Information:

- Anemometers are located at 10, 30, 50, 60, and 70 meters.
- Vanes are located at 10, 30, 60, and 70 meters.
- There is a small wire satellite dish between the 60 meter and 70 meter sensors.



Contour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Breckenridge

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m					5	4.5	3.6	4.36	4.09	6	5.2	6.1	**4.9**
	30m					5.8	5.4	4.7	5.7	5.1	7.1	6	6.7	**5.8**
1996	**40m**					6.1	5.6	5	5.5	5.1	7.6	6.4	7	**6.0**
	50m					6.5	6	5.4	6.5	5.8	8	6.6	7.3	**6.5**
	60m					6.7	6.2	5.6	6.9	6.1	8.3	6.7	7.5	**6.8**
	70m					6.9	6.4	5.9	7.2	6.3	8.6	6.9	7.7	**7.0**
	10m	5.6	5.2	5.9	4.7	6	4.5	3.77	3.42	4.5	5.6	5.2	4.8	**4.9**
	30m	6.3	6	7	5.6	7	5.4	4.9	4.4	5.8	6.7	6	5.7	**5.9**
1997	**40m**	6.6	6.4	7.2	5.9	7.3	5.8	5.2	4.7	6.2	7.1	6.3	6	**6.2**
	50m	6.9	6.8	7.9	6.3	7.7	6.1	5.6	5	6.6	7.5	6.8	6.4	**6.6**
	60m	6.8	7	8.2	6.5	7.9	6.3	5.8	5.2	6.9	7.7	6.9	6.6	**6.8**
	70m	7.1	7.3	8.5	6.8	8.1	6.6	6.1	5.5	7.2	8	7.2	6.9	**7.1**
	10m	4.6	4.7	5.5	4.9	4.9	4.4	3.3	3.7	4.3	5.2	4.8	4.8	**4.6**
	30m	5.2	5.4	6.2	5.9	5.8	5.3	4.4	4.7	5.4	6.1	5.7	5.7	**5.5**
1998	**40m**	5.3	5.8	6.5	6.3	6.1	5.6	4.7	5.1	5.8	6.5	6.1	6.1	**5.8**
	50m	5.8	5.8	6.5	6.5	6.2	6	4.9	5.4	6.1	6.8	6.5	6.5	**6.1**
	60m	5.5	6.5	9.8	6.7	6.4	6.2	5.3	5.7	6.5	7	6.8	6.7	**6.6**
	70m	5.6	6.6	7	7.1	6.9	6.5	5.6	5.9	6.7	7.3	7	7	**6.6**
	10m	5.5	6.4	5.4	5.4	6.3	4.6	3.4	4.1	4.3	4.6	4.8	5.2	**5.0**
	30m	6.1	7.3	6.2	6.3	7.2	5.7	4.6	5.0	5.4	5.8	6.0	6.2	**6.0**
1999	**40m**	6.6	7.8	6.6	6.7	7.6	6.1	5.0	5.4	5.8	6.3	6.4	6.7	**6.4**
	50m	6.9	8.2	6.9	7.0	7.8	6.4	5.3	5.7	6.2	6.7	6.8	7.0	**6.7**
	60m	6.9	8.2	6.9	7.0	7.8	6.4	5.3	5.7	6.2	6.7	6.8	7.0	**6.7**
	70m	7.4	8.8	7.3	7.5	8.3	6.9	6.0	6.3	6.9	7.4	7.4	7.6	**7.3**
	10m	5.0	4.7	5.1	5.6	5.2	5.0	3.3	4.1	3.7	5.0	5.1	5.6	**4.8**
	30m	5.8	5.8	6.0	6.6	6.1	5.9	4.2	5.4	4.7	6.0	6.0	6.3	**5.7**
2000	**40m**	6.2	6.3	6.4	6.9	6.4	6.2	4.6	5.7	5.1	6.3	6.2	6.6	**6.1**
	50m	6.6	6.7	6.8	7.3	6.8	6.5	4.9	6.1	5.2	6.7	6.5	6.8	**6.4**
	60m	6.9	7.0	7.0	7.6	7.0	6.8	5.1	6.4	5.7	7.0	6.9	7.2	**6.7**
	70m	7.1	7.3	7.2	7.8	7.3	7.1	5.4	6.7	5.9	7.3	7.1	7.4	**7.0**
	10m	4.6	5.3	4.5	6.1	5.8	4.7	3.4	3.6	3.4	5.3	5.1	5.6	**4.8**
	30m	5.4	6.1	5.3	7.1	6.7	5.6	4.5	5.0	4.7	7.0	6.2	6.4	**5.8**
2001	**40m**	5.8	6.5	5.6	7.1	7.0	5.9	4.9	5.4	5.2	7.0	6.6	6.7	**6.1**
	50m	6.1	6.4	5.4	7.5	7.0	6.1	5.1	5.7	5.7	7.4	7.1	7.2	**6.4**
	60m	6.6	7.1	6.2	7.8	7.6	6.5	5.5	6.1	5.9	7.8	7.4	7.5	**6.8**
	70m	6.8	7.5	6.5	8.5	7.8	6.8	5.8	6.4	6.2	8.2	7.8	7.7	**7.2**
	10m	5.1	5.3	5.3	5.3	5.5	4.6	3.4	3.9	4.0	5.3	5.0	5.3	**4.8**
	30m	5.8	6.1	6.1	6.3	6.4	5.5	4.6	5.0	5.2	6.4	6.0	6.2	**5.8**
Average	**40m**	6.1	6.6	6.5	6.6	6.7	5.9	4.9	5.3	5.5	6.8	6.3	6.5	**6.1**
(m/s)	**50m**	6.5	6.8	6.7	6.9	7.0	6.2	5.2	5.8	5.9	7.2	6.7	6.9	**6.5**
	60m	6.5	7.2	7.6	7.1	7.2	6.4	5.4	6.0	6.2	7.4	6.9	7.1	**6.8**
	70m	6.8	7.5	7.3	7.5	7.6	6.7	5.8	6.3	6.6	7.8	7.2	7.4	**7.0**
	10m	11.3	11.8	11.9	11.9	12.4	10.3	7.7	8.7	9.0	11.8	11.3	12.0	**10.8**
	30m	12.9	13.7	13.7	14.1	14.4	12.4	10.2	11.2	11.6	14.4	13.3	13.8	**13.0**
Average	**40m**	13.7	14.7	14.4	14.8	15.1	13.1	10.9	11.8	12.4	15.2	14.2	14.6	**13.7**
(mph)	**50m**	14.5	15.1	15.0	15.5	15.7	13.8	11.6	12.9	13.3	16.1	15.0	15.4	**14.5**
	60m	14.6	16.0	17.0	15.9	16.2	14.3	12.2	13.4	13.9	16.6	15.5	15.8	**15.1**
	70m	15.2	16.7	16.4	16.9	16.9	15.0	13.0	14.2	14.7	17.4	16.2	16.5	**15.8**

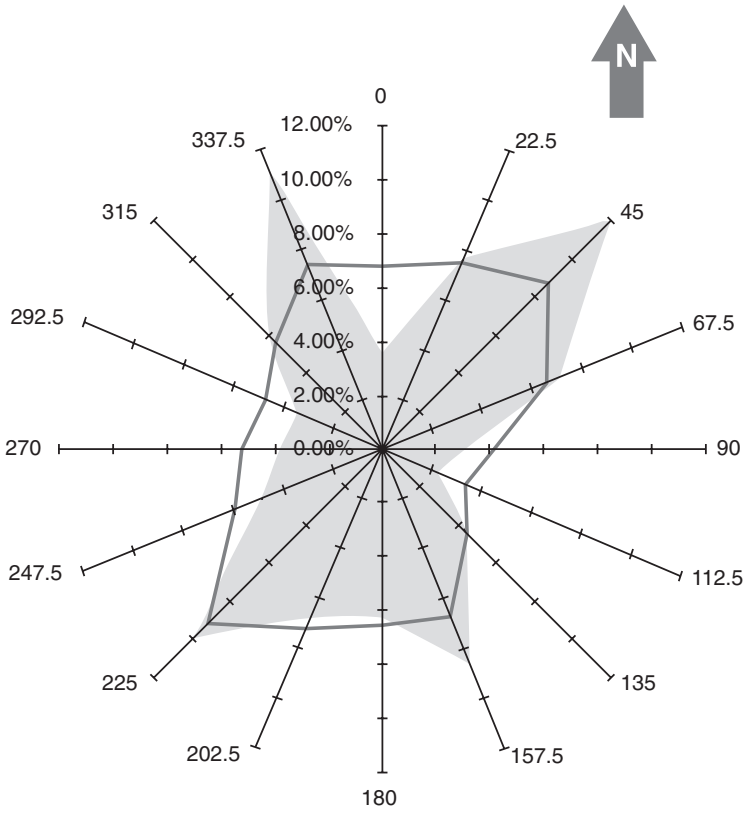
Breckenridge

Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m-30m					0.15	0.17	0.23	0.24	0.20	0.17	0.14	0.09	**0.17**
	30m-40m					0.20	0.18	0.25	0.26	0.29	0.22	0.24	0.19	**0.23**
	40m-50m					0.28	0.26	0.31	0.35	0.34	0.28	0.27	0.22	**0.29**
1996	**50m-60m**					0.18	0.20	0.24	0.29	0.25	0.23	0.18	0.18	**0.22**
	60m- 70m					0.23	0.22	0.29	0.28	0.25	0.24	0.22	0.19	**0.24**
	30m-50m					0.24	0.22	0.26	0.28	0.29	0.26	0.24	0.20	**0.25**
	50m-70m					0.19	0.19	0.25	0.27	0.24	0.23	0.18	0.17	**0.22**
	10m-30m	0.12	0.14	0.15	0.17	0.15	0.18	0.23	0.21	0.22	0.17	0.14	0.16	**0.17**
	30m-40m	0.09	0.23	0.23	0.23	0.20	0.22	0.26	0.23	0.28	0.20	0.19	0.20	**0.21**
	40m-50m	0.21	0.30	0.30	0.28	0.28	0.23	0.31	0.27	0.31	0.27	0.24	0.30	**0.28**
1997	**50m-60m**	0.12	0.20	0.20	0.19	0.14	0.22	0.24	0.24	0.27	0.17	0.18	0.22	**0.20**
	60m- 70m	0.20	0.21	0.27	0.25	0.22	0.28	0.31	0.27	0.30	0.27	0.23	0.28	**0.26**
	30m-50m	0.12	0.25	0.26	0.25	0.23	0.22	0.28	0.24	0.29	0.23	0.20	0.23	**0.23**
	50m-70m	0.03	0.19	0.21	0.20	0.16	0.23	0.26	0.24	0.27	0.20	0.18	0.24	**0.20**
	10m-30m	0.09	0.15	0.11	0.16	0.15	0.18	0.22	0.21	0.21	0.16	0.18	0.18	**0.17**
	30m-40m	0.17	0.25	0.17	0.24	0.23	0.24	0.26	0.25	0.26	0.24	0.25	0.25	**0.23**
	40m-50m	0.20	0.05	0.01	0.16	0.08	0.26	0.17	0.26	0.23	0.23	0.30	0.28	**0.19**
1998	**50m-60m**	0.11	0.37	0.26	0.18	0.15	0.22	0.47	0.28	0.31	0.23	0.24	0.23	**0.25**
	60m- 70m	0.12	0.38	0.23	0.38	0.44	0.32	0.34	0.27	0.26	0.20	0.24	0.24	**0.29**
	30m-50m	0.20	0.17	0.10	0.20	0.16	0.25	0.22	0.25	0.24	0.23	0.27	0.26	**0.21**
	50m-70m	0.12	0.37	0.25	0.27	0.28	0.27	0.42	0.27	0.28	0.21	0.24	0.23	**0.27**
	10m-30m	0.12	0.14	0.13	0.16	0.14	0.19	0.26	0.19	0.21	0.22	0.21	0.18	**0.18**
	30m-40m	0.23	0.24	0.22	0.23	0.20	0.25	0.32	0.27	0.32	0.32	0.30	0.28	**0.26**
	40m-50m	0.30	0.27	0.25	0.27	0.24	0.31	0.40	0.38	0.36	0.36	0.41	0.37	**0.33**
1999	**50m-60m**	0.32	0.27	0.24	0.21	0.28	0.32	0.37	0.31	0.37	0.37	0.36	0.34	**0.31**
	60m- 70m	0.25	0.26	0.25	0.24	0.21	0.28	0.36	0.32	0.34	0.32	0.31	0.31	**0.29**
	30m-50m	0.24	0.24	0.22	0.22	0.19	0.25	0.33	0.31	0.32	0.32	0.33	0.29	**0.27**
	50m-70m	0.24	0.24	0.22	0.21	0.23	0.28	0.35	0.30	0.34	0.33	0.31	0.30	**0.28**
	10m-30m	0.16	0.20	0.15	0.15	0.14	0.14	0.21	0.24	0.21	0.16	0.14	0.11	**0.17**
	30m-40m	0.26	0.33	0.25	0.22	0.22	0.21	0.28	0.24	0.27	0.23	0.21	0.18	**0.24**
	40m-50m	0.28	0.35	0.29	0.25	0.26	0.24	0.31	0.30	0.32	0.26	0.26	0.21	**0.28**
2000	**50m-60m**	0.28	0.35	0.29	0.25	0.26	0.24	0.31	0.30	0.32	0.26	0.26	0.21	**0.28**
	60m- 70m	0.36	0.44	0.37	0.31	0.33	0.32	0.38	0.39	0.40	0.35	0.36	0.28	**0.36**
	30m-50m	0.31	0.35	0.28	0.24	0.27	0.29	0.32	0.29	0.57	0.26	0.30	0.31	**0.31**
	50m-70m	0.27	0.31	0.24	0.23	0.25	0.27	0.31	0.30	0.45	0.26	0.29	0.25	**0.29**
	10m-30m	0.15	0.15	0.14	0.16	0.13	0.17	0.26	0.30	0.30	0.21	0.18	0.14	**0.19**
	30m-40m	0.26	0.20	0.22	0.06	0.16	0.20	0.27	0.27	0.33	0.25	0.22	0.19	**0.22**
2001	**40m-50m**	0.29	0.03	0.07	0.28	0.10	0.14	0.19	0.31	0.36	0.28	0.33	0.31	**0.22**
	50m-60m	0.33	0.51	0.45	0.19	0.37	0.33	0.37	0.32	0.27	0.28	0.25	0.22	**0.32**
	60m- 70m	0.26	0.36	0.35	0.59	0.20	0.26	0.35	0.29	0.33	0.34	0.31	0.25	**0.32**
	30m-50m	0.28	0.13	0.14	0.15	0.13	0.17	0.23	0.28	0.34	0.26	0.27	0.24	**0.22**
	50m-70m	0.26	0.44	0.41	0.37	0.29	0.30	0.35	0.30	0.29	0.30	0.28	0.23	**0.32**
	10m-30m	0.13	0.15	0.14	0.16	0.14	0.17	0.23	0.23	0.22	0.18	0.16	0.14	**0.17**
	30m-40m	0.20	0.25	0.22	0.20	0.20	0.22	0.27	0.25	0.29	0.24	0.23	0.21	**0.23**
	40m-50m	0.26	0.20	0.18	0.25	0.21	0.24	0.28	0.31	0.32	0.28	0.30	0.28	**0.26**
Average	**50m-60m**	0.23	0.34	0.29	0.20	0.23	0.26	0.33	0.29	0.30	0.26	0.24	0.23	**0.27**
	60m- 70m	0.24	0.33	0.29	0.35	0.27	0.28	0.34	0.30	0.31	0.29	0.28	0.26	**0.30**
	30m-50m	0.23	0.23	0.20	0.21	0.20	0.23	0.27	0.27	0.34	0.26	0.27	0.25	**0.25**
	50m-70m	0.18	0.31	0.26	0.26	0.23	0.26	0.32	0.28	0.31	0.26	0.25	0.24	**0.26**

Breckenridge

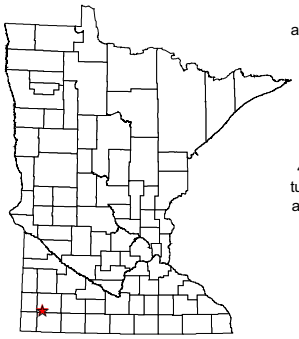
Breckenridge 50 Meter Wind Rose



Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	30m					199	153	102	147	149	390	275	441	**232**
1996	**50m**					264	205	144	214	210	524	359	529	**306**
	70m					314	247	183	282	262	639	415	592	**367**
	30m	344	245	360	184	362	150	130	93	204	297	348	197	**243**
1997	**50m**	430	330	498	253	462	206	182	132	278	394	439	266	**323**
	70m	478	406	610	321	524	259	229	169	349	480	517	330	**389**
	30m	166	236	281	238	205	144	79	97	142	276	276	232	**198**
1998	**50m**	221	262	322	287	244	193	107	135	194	344	361	302	**248**
	70m	216	395	393	383	328	238	156	178	258	422	426	364	**313**
	30m	244	439	313	256	391	171	101	121	142	209	249	300	**245**
1999	**50m**	332	559	396	329	462	242	151	178	209	294	331	398	**323**
	70m	405	681	462	386	555	300	203	226	278	385	417	493	**399**
	30m	222	220	280	312	244	218	78	146	82	204	242	337	**215**
2000	**50m**	300	318	379	401	311	286	117	212	117	293	303	400	**286**
	70m	370	400	452	486	383	347	153	271	177	362	371	488	**355**
	30m	226	261	166	436	319	162	80	103	111	337	267	282	**229**
2001	**50m**	312	287	188	461	339	202	116	156	178	427	373	380	**285**
	70m	425	404	287	669	472	273	169	217	241	557	481	464	**388**
	30m	240	280	280	285	287	166	95	118	138	286	276	298	**229**
Average	**50m**	319	351	356	346	347	222	136	171	198	379	361	379	**297**
	70m	379	457	441	449	429	277	182	224	261	474	438	455	**372**

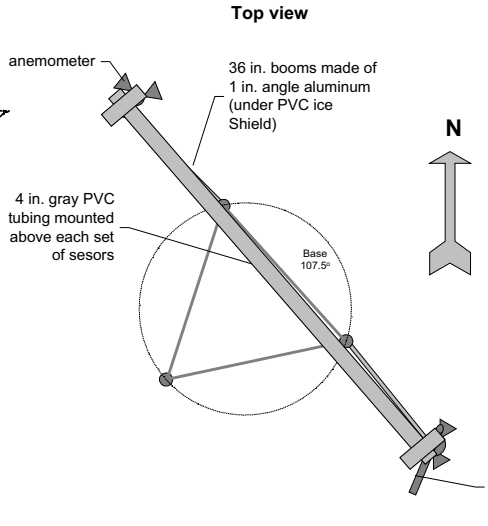
Chandler

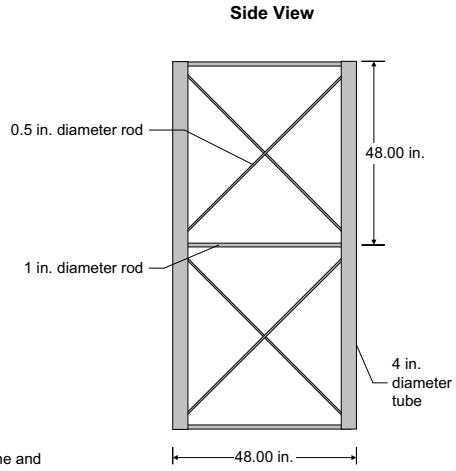


Coordinates

Long/Lat	UTM
N 43.8876	E 264765
W 95.9285	N 4863553

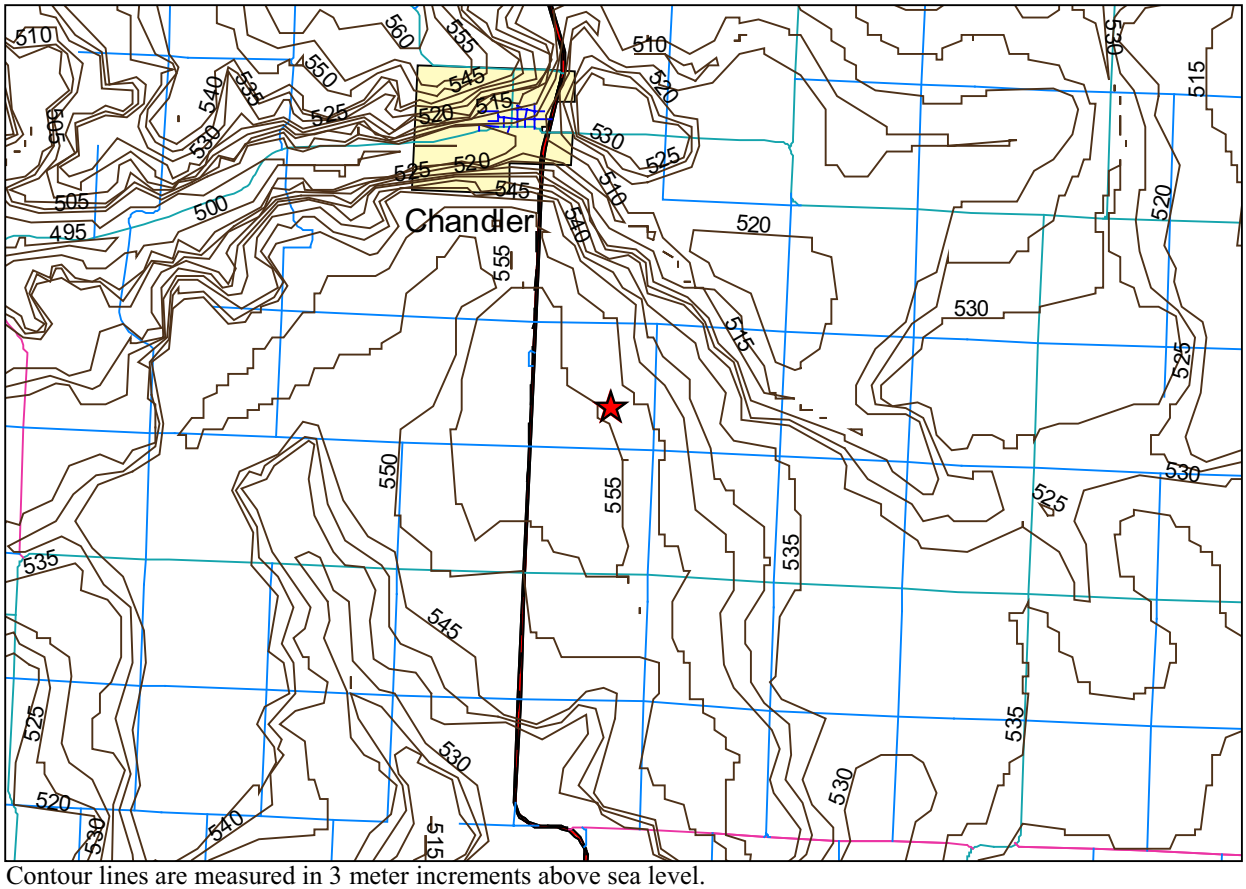
Elevation: 1820 feet





Additional Tower Information:

- Anemometers are located at 10, 30, 40, 50, 60, and 70 meters.
- Vanes are located at 30 meters and 70 meters.
- The 4 in. gray PVC tubing mounted above each set of sesors act as a shield from falling ice that forms on the tower.



Contour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Chandler

Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	10m-30m					0.13	0.15	0.20	0.22	0.23	0.18	0.17	0.15	**0.18**
	30m-40m					0.15	0.15	0.22	0.24	0.27	0.23	0.16	.	**0.20**
1996	40m-50m					0.15	0.17	0.20	0.24	0.23	0.23	0.15	0.32	**0.21**
	50m-60m					0.16	0.15	0.20	0.28	0.26	0.20	0.16	0.15	**0.20**
	60m-70m					0.24	0.26	0.31	0.34	0.34	0.26	0.47	0.30	**0.32**
	30m-50m					0.15	0.17	0.21	0.25	0.27	0.22	0.13	0.17	**0.20**
	50m-70m					0.19	0.20	0.25	0.30	0.29	0.22	0.29	0.19	**0.24**
	10m-30m	0.06	0.15	0.19	0.16	0.16	0.19	0.23	0.31	0.28	0.20	0.14	0.15	**0.19**
	30m-40m	0.04	0.00	0.10	0.25	0.25	0.30	0.21	0.26	0.26	0.19	0.14	0.13	**0.18**
1997	40m-50m	0.09	0.24	0.04	0.10	0.04	0.04	0.07	0.04	0.13	0.13	0.22	0.09	**0.10**
	50m-60m	0.54	0.25	-0.10	0.15	0.17	0.16	0.36	0.36	0.32	0.22	0.21	0.30	**0.25**
	60m-70m	0.24	0.13	0.60	0.26	0.29	0.40	0.41	0.49	0.43	0.38	0.35	0.22	**0.35**
	30m-50m	0.06	0.10	0.08	0.16	0.15	0.19	0.15	0.17	0.20	16.00	0.18	0.11	**1.46**
	50m-70m	0.43	0.00	0.16	0.21	0.23	0.26	0.38	0.42	0.37	0.29	0.27	0.26	**0.27**
	10m-30m	0.06	0.12	0.10	0.15	0.12	0.16	0.24	0.23	0.23	0.18	0.18	0.19	**0.16**
	30m-40m	0.28	0.16	0.12	0.16	0.13	0.19	0.22	0.29	0.27	0.22	0.15	0.21	**0.20**
1998	40m-50m	0.01	*	*	*	*	*	0.16	0.21	0.23	0.21	0.14	0.22	**0.17**
	50m-60m	-0.27	*	*	*	*	*	0.23	0.26	0.25	0.21	0.16	0.19	**0.15**
	60m-70m	0.35	0.38	0.35	0.37	0.27	0.27	0.49	0.51	0.48	0.35	0.33	0.40	**0.38**
	30m-50m	0.17	*	*	*	*	*	0.20	0.25	0.25	0.22	0.15	0.21	**0.21**
	50m-70m	0.01	0.58	1.62	1.37	1.78	0.37	0.35	0.37	0.35	0.28	0.24	0.29	**0.63**
	10m-30m	0.17	0.18	0.18	0.15	0.15	0.17	0.26	0.30	0.30	0.24	0.22	0.20	**0.21**
	30m-40m	0.21	0.18	0.19	0.16	0.16	0.16	0.21	0.23	0.25	0.24	0.25	0.24	**0.21**
1999	40m-50m	0.29	0.20	0.21	0.19	0.17	0.20	0.28	0.28	0.29	0.27	0.26	0.44	**0.26**
	50m-60m	0.28	0.21	0.21	0.18	0.21	0.23	0.25	0.28	0.25	0.24	0.23	0.31	**0.24**
	60m-70m	0.38	0.41	0.42	0.31	0.34	0.39	0.37	0.47	0.37	0.39	0.37	0.47	**0.39**
	30m-50m	0.22	0.20	0.23	0.20	0.19	0.20	0.27	0.30	0.31	0.29	0.29	0.27	**0.25**
	50m-70m	0.29	0.22	0.24	0.19	0.17	0.20	0.26	0.29	0.32	0.28	0.28	0.27	**0.25**
	10m-30m	0.19	0.21	0.23	0.18	0.18	0.16	0.19	0.23	0.17	0.18	0.16	0.12	**0.18**
	30m-40m	0.23	0.23	0.23	0.19	0.18	0.20	0.23	0.26	0.20	0.25	0.23	0.21	**0.22**
2000	40m-50m	0.41	0.48	0.42	0.36	0.31	0.23	0.25	0.32	0.24	0.31	0.26	0.32	**0.33**
	50m-60m	0.25	0.23	0.21	0.47	0.24	0.25	0.23	0.30	0.24	0.27	0.22	0.20	**0.26**
	60m-70m	0.37	0.40	0.38	0.38	0.34	0.33	0.21	0.27	0.23	0.28	0.24	0.22	**0.30**
	30m-50m	0.26	0.24	0.21	0.22	0.22	0.19	0.22	0.27	0.20	0.27	0.21	0.19	**0.23**
	50m-70m	0.29	0.29	0.28	0.40	0.27	0.27	0.21	0.27	0.21	0.25	0.21	0.20	**0.26**
	10m-30m	0.21	0.14	0.21	0.15	0.15	0.14	0.26	0.31	0.31	0.25	0.19	0.18	**0.21**
	30m-40m	0.28	0.08	0.10	0.49	0.25	0.16	0.26	0.26	0.27	0.21	0.18	0.18	**0.22**
2001	40m-50m	0.28	0.04	-0.15	-0.24	0.10	0.14	0.23	0.25	0.25	0.23	0.19	0.18	**0.13**
	50m-60m	0.17	0.11	0.14	0.08	0.18	0.23	0.30	0.31	0.30	0.29	0.25	0.36	**0.23**
	60m-70m	0.22	-0.21	0.37	0.57	0.34	0.13	0.21	0.24	0.24	0.20	0.18	0.17	**0.22**
	30m-50m	0.30	0.05	0.05	0.17	0.18	0.15	0.25	0.26	0.26	0.22	0.18	0.18	**0.19**
	50m-70m	0.20	-0.13	0.24	0.30	0.25	0.19	0.26	0.28	0.27	0.25	0.22	0.28	**0.22**
	10m-30m	0.14	0.16	0.18	0.16	0.15	0.16	0.23	0.27	0.25	0.21	0.18	0.17	**0.19**
	30m-40m	0.21	0.13	0.15	0.25	0.19	0.19	0.22	0.26	0.25	0.22	0.18	0.19	**0.20**
Average	40m-50m	0.21	0.24	0.13	0.10	0.15	0.15	0.20	0.22	0.23	0.23	0.20	0.26	**0.20**
	50m-60m	0.20	0.20	0.11	0.22	0.19	0.20	0.26	0.30	0.27	0.24	0.20	0.25	**0.22**
	60m-70m	0.31	0.22	0.42	0.38	0.30	0.30	0.33	0.39	0.35	0.31	0.32	0.30	**0.33**
	30m-50m	0.20	0.15	0.14	0.19	0.18	0.18	0.22	0.25	0.25	2.87	0.19	0.19	**0.42**
	50m-70m	0.24	0.19	0.51	0.50	0.48	0.25	0.28	0.32	0.30	0.26	0.25	0.25	**0.32**

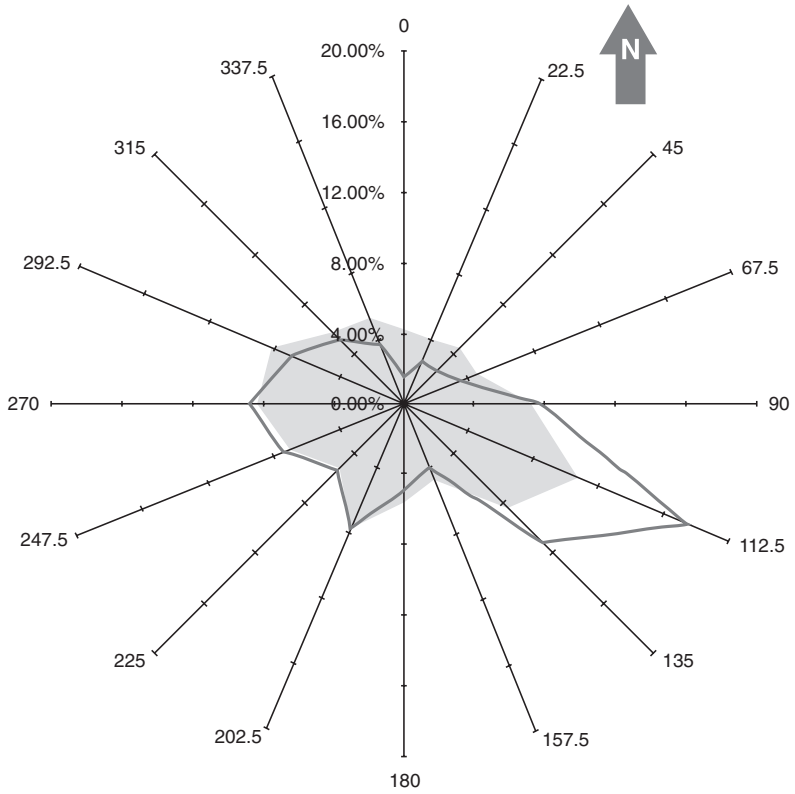
Chandler

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m					6.8	5.7	4.7	4.4	4.8	7.0	5.1	3.2	**5.2**
	30m					7.7	6.7	5.8	5.6	6.1	8.4	4.1	7.0	**6.4**
1996	**40m**					8.3	7.0	6.1	6.2	6.7	8.8	3.6	7.1	**6.7**
	50m					8.3	7.3	6.4	6.3	7.0	9.3	4.3	7.9	**7.1**
	60m					8.5	7.5	6.7	6.7	7.4	9.7	4.5	8.1	**7.4**
	70m					8.8	7.8	7.0	7.0	7.8	10.0	5.5	8.5	**7.8**
	10m	6.6	6.7	7.4	6.1	7.0	5.5	4.9	3.7	4.9	7.1	5.7	5.9	**6.0**
	30m	8.0	8.4	9.4	7.0	8.1	6.6	6.3	5.1	6.5	8.7	6.7	7.1	**7.3**
1997	**40m**	8.1	7.9	9.0	7.6	8.6	7.1	6.7	5.5	7.0	9.1	6.8	7.3	**7.6**
	50m	8.0	7.8	9.1	7.8	8.7	7.2	6.8	5.6	7.2	9.4	7.8	7.7	**7.8**
	60m	9.1	9.8	9.3	8.1	9.1	7.5	7.2	6.0	7.7	9.8	7.7	8.0	**8.3**
	70m	7.5	9.4	9.7	8.4	9.3	7.9	7.7	6.5	8.2	10.3	8.4	8.5	**8.5**
	10m	5.3	5.7	6.9	6.3	6.7	5.2	4.0	4.1	5.0	6.1	6.5	6.1	**5.7**
	30m	5.6	6.5	7.7	7.4	7.6	6.1	5.0	5.3	6.5	7.3	7.7	7.4	**6.7**
1998	**40m**	6.1	6.9	8.0	7.7	7.8	6.4	5.3	5.8	7.0	7.7	8.2	7.9	**7.1**
	50m	6.1	*	*	*	*	*	5.5	6.0	7.4	8.1	8.4	8.3	**7.1**
	60m	6.0	7.3	8.3	8.3	8.4	7.0	5.8	6.4	7.7	8.4	8.8	8.6	**7.6**
	70m	6.2	8.2	8.7	8.8	8.8	7.3	6.2	6.9	8.3	8.9	9.1	9.1	**8.0**
	10m	6.0	6.7	6.5	7.5	6.8	6.1	5.0	4.5	5.0	6.1	6.2	5.8	**6.0**
	30m	6.1	7.2	6.6	7.4	7.1	6.3	5.3	5.0	6.0	6.6	6.5	6.5	**6.4**
1999	**40m**	7.8	8.6	8.1	8.9	8.2	7.5	6.9	6.6	7.3	8.3	8.3	7.0	**7.8**
	50m	7.5	9.0	8.4	9.2	8.4	7.8	7.3	7.0	7.8	8.7	8.7	7.6	**8.1**
	60m	7.8	9.1	8.5	9.5	8.8	8.1	7.6	7.3	8.1	9.1	9.1	7.9	**8.4**
	70m	8.2	9.5	9.1	9.9	9.2	8.6	8.0	7.9	8.6	9.6	9.6	8.4	**8.9**
	10m	6.2	6.2	5.6	6.5	6.5	6.4	4.6	4.5	5.8	5.4	6.7	6.8	**5.9**
	30m	7.4	7.5	6.9	7.8	7.7	7.5	5.6	5.8	6.9	6.6	7.8	16.7	**7.9**
2000	**40m**	7.7	7.6	7.0	5.0	7.0	7.8	5.9	6.2	7.3	7.0	8.1	7.6	**7.0**
	50m	8.3	8.3	7.6	5.7	6.8	8.1	6.2	6.6	7.7	7.4	8.5	8.0	**7.5**
	60m	8.6	8.6	7.9	9.0	8.8	8.5	6.5	6.9	8.1	7.8	8.8	8.2	**8.1**
	70m	9.1	9.1	8.4	9.4	9.2	8.9	6.7	7.2	8.3	8.0	9.1	8.4	**8.5**
	10m	4.1	5.8	5.6	7.2	6.2	6.4	4.0	4.1	4.1	6.2	6.2	6.4	**5.5**
	30m	5.6	6.9	7.5	8.4	7.2	7.4	5.3	5.7	5.7	7.9	7.5	7.7	**6.9**
2001	**40m**	5.9	7.1	7.8	9.9	7.7	7.7	5.6	6.1	6.1	8.3	7.8	8.1	**7.4**
	50m	6.3	7.0	6.9	9.1	7.8	7.9	6.0	6.5	6.5	8.8	8.2	8.5	**7.5**
	60m	6.5	7.1	7.2	9.2	8.1	8.3	6.3	6.9	6.9	9.2	8.6	9.1	**7.8**
	70m	6.9	6.9	7.9	10.1	8.5	8.5	6.5	7.2	7.2	9.5	8.9	9.3	**8.1**
	10m	5.4	6.2	6.3	6.8	6.6	5.9	4.5	4.2	4.8	6.3	6.1	5.8	**5.7**
	30m	6.4	7.2	7.6	7.7	7.5	6.8	5.5	5.4	6.2	7.6	6.8	8.6	**7.0**
Average	**40m**	6.9	7.6	8.0	8.2	7.9	7.3	6.0	6.1	6.8	8.2	7.2	7.6	**7.3**
(m/s)	**50m**	7.1	7.8	7.8	8.2	8.0	7.7	6.3	6.4	7.2	8.6	7.7	8.1	**7.6**
	60m	7.4	8.2	8.1	8.9	8.5	7.9	6.6	6.7	7.5	9.0	8.0	8.4	**7.9**
	70m	7.4	8.3	8.6	9.5	8.9	8.2	7.0	7.1	7.9	9.4	8.5	8.8	**8.3**
	10m	12.1	13.8	14.0	15.2	14.8	13.3	10.0	9.4	10.7	14.1	13.6	13.0	**12.8**
	30m	14.3	16.2	17.0	17.2	16.8	15.3	12.3	12.2	13.9	17.1	15.3	19.2	**15.6**
Average	**40m**	15.5	16.9	17.8	18.3	17.7	16.4	13.5	13.6	15.2	18.4	16.2	17.0	**16.4**
(mph)	**50m**	15.9	17.5	17.5	18.3	17.9	17.3	14.1	14.2	16.0	19.3	17.3	18.0	**16.9**
	60m	16.6	18.2	18.0	19.9	19.1	17.6	14.8	15.0	16.9	20.2	17.9	18.8	**17.8**
	70m	16.7	18.6	19.2	21.1	19.9	18.3	15.5	15.9	17.8	21.1	19.0	19.7	**18.6**

Chandler

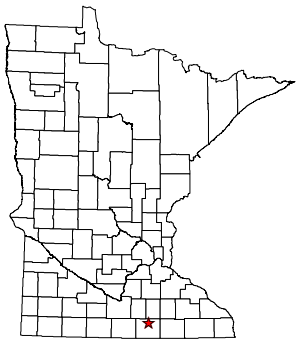
Chandler 50 Meter Wind Rose



Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m					461	274	155	150	184	527	332	561	**331**
1996	**50m**					546	345	214	221	277	703	422	606	**417**
	70m					627	416	272	304	372	854	527	763	**517**
	30m	776	1033	1378	335	486	262	234	117	244	578	452	345	**520**
1997	**50m**	459	590	659	482	573	332	299	166	344	718	654	482	**480**
	70m	613	889	814	580	706	427	401	241	474	917	817	642	**627**
	30m	221	293	487	405	401	215	108	123	224	316	452	393	**303**
1998	**50m**	299	*	*	*	*	*	148	182	335	416	541	519	**349**
	70m	346	560	686	653	605	343	213	264	475	553	695	691	**507**
	30m	255	373	395	428	325	243	177	122	175	272	264	285	**276**
1999	**50m**	327	493	507	529	409	302	243	179	254	374	371	382	**364**
	70m	393	601	596	600	469	352	297	232	335	461	468	467	**439**
	30m	380	398	367	476	459	392	157	150	269	246	467	460	**352**
2000	**50m**	499	528	467	402	440	473	212	225	384	354	576	559	**427**
	70m	638	687	590	763	696	602	268	305	501	465	681	646	**570**
	30m	428	515	786	548	343	369	144	148	170	471	448	417	**399**
2001	**50m**	465	425	367	682	427	450	201	227	257	606	588	537	**436**
	70m	606	440	520	895	545	545	262	309	348	768	742	706	**557**
	30m	412	523	683	438	412	292	163	135	211	402	402	410	**374**
Averge	**50m**	410	509	500	524	479	380	220	200	308	529	525	514	**425**
	70m	519	635	641	698	608	447	285	276	418	670	655	652	**542**

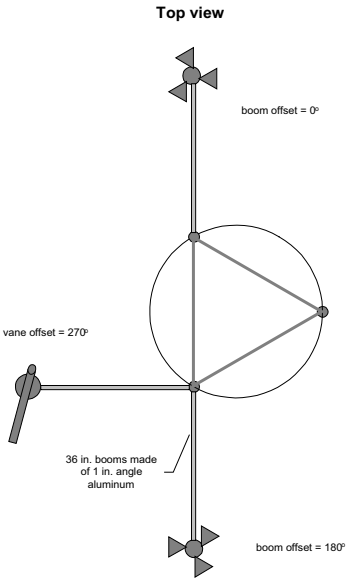
Clarks Grove

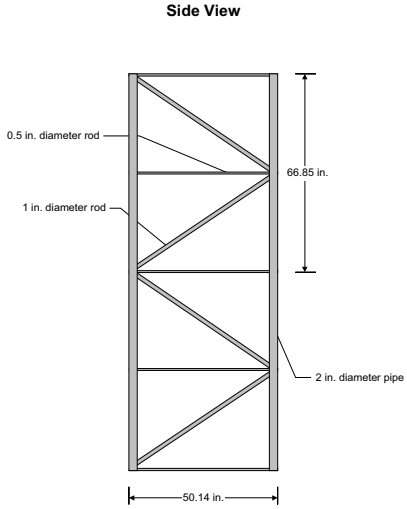


Coordinates

Long/Lat	UTM
N **.****	E 473227
W **.****	N 4846693

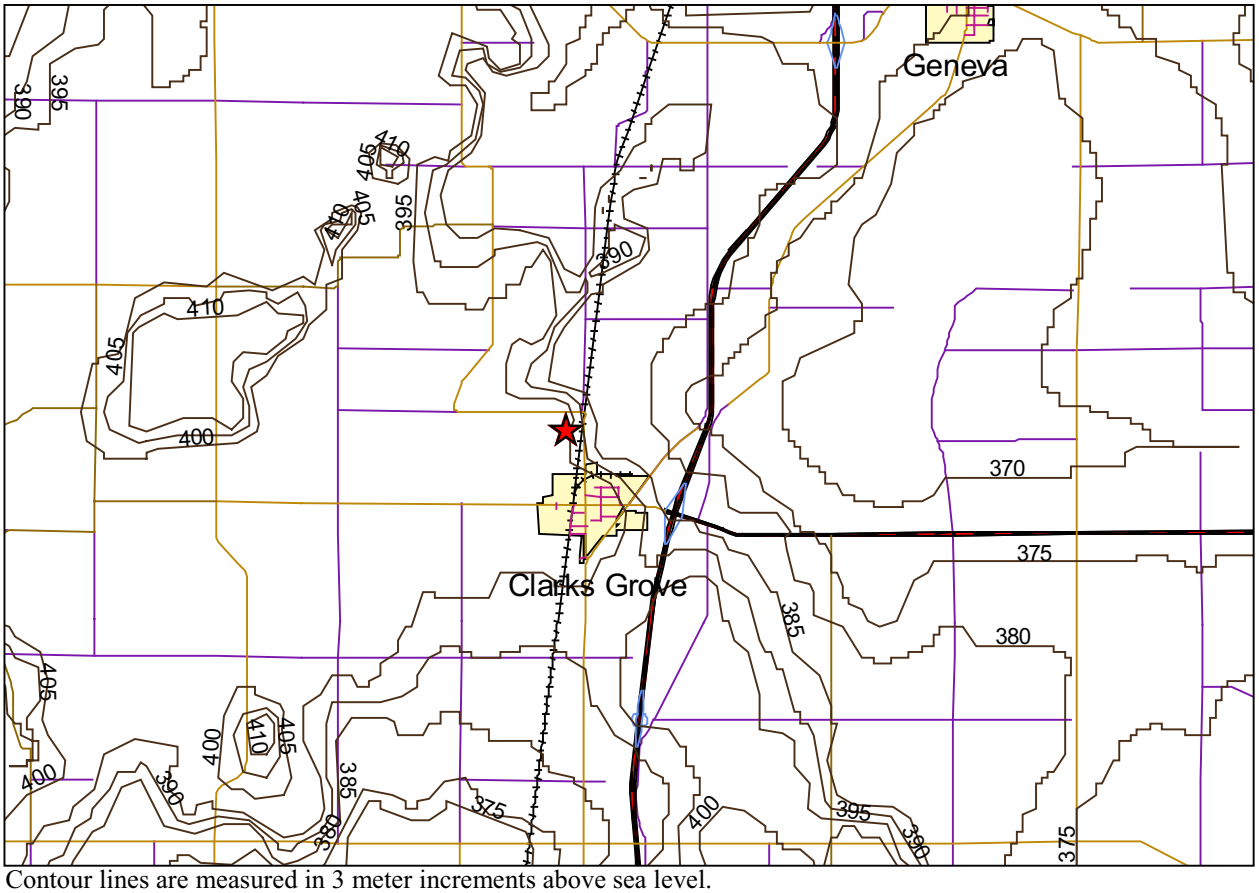
Elevation: **** feet





Additional Tower Information:

- Anemometers are located at 10, 30, 40, 50, 60, and 70 meters.
- Vanes are located at 10, 30, 60, and 70 meters.



Contour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Clarks Grove

Wind Speed (Meters per Second)

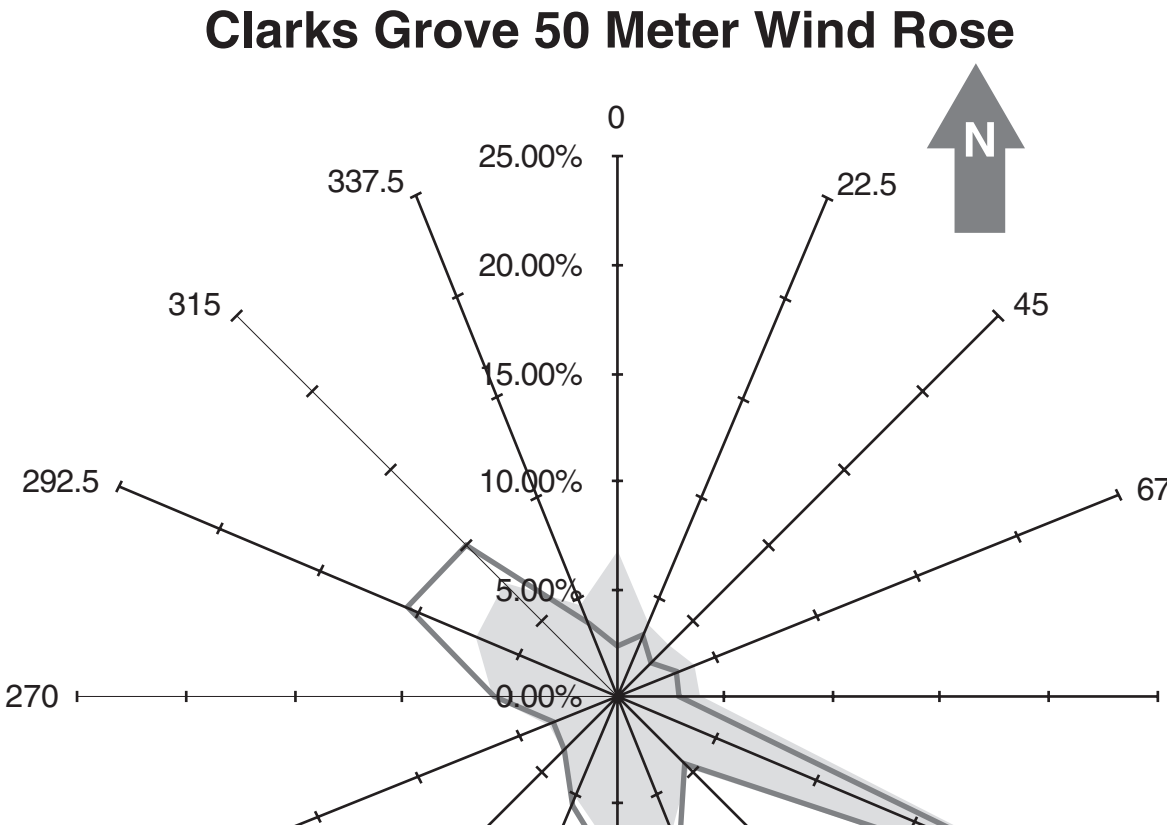
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m						4.0	3.9	3.4	3.7	5.9	5.3	5.1	**4.5**
	30m						4.9	4.9	4.5	5.1	7.3	5.8	6.2	**5.5**
1996	**40m**						5.0	5.3	4.6	5.6	7.8	6.1	4.9	**5.6**
	50m						5.6	5.7	5.3	6.1	8.3	6.4	6.9	**6.3**
	60m						5.8	5.8	5.4	6.3	8.6	6.3	7.0	**6.5**
	70m						6.0	6.0	5.7	6.6	8.9	6.6	7.4	**6.7**
	10m	6.7	5.8	6.2	5.2	5.9	4.1	4.1	3.2	4.2	5.4	5.1	4.8	**5.1**
	30m	7.7	6.7	7.3	6.2	7.0	5.1	5.3	4.3	5.5	6.7	6.1	5.7	**6.1**
1997	**40m**	8.1	6.9	7.4	6.5	7.4	5.5	5.6	4.7	5.9	7.1	6.0	5.2	**6.4**
	50m	8.5	7.3	7.9	6.9	7.8	5.9	6.0	5.0	6.3	7.7	6.8	6.2	**6.9**
	60m	8.8	7.5	8.2	7.1	8.0	6.1	6.2	5.2	6.6	7.9	7.1	6.5	**7.1**
	70m	9.1	7.7	8.4	7.4	8.3	6.3	6.5	5.4	6.9	8.3	7.4	6.7	**7.4**
	10m	4.4	4.5	5.4	5.0	5.0	4.1	3.2	3.3	4.1	5.1	5.6	5.5	**4.6**
	30m	5.0	5.2	6.3	6.2	6.0	5.2	4.1	4.3	5.3	6.3	6.8	6.6	**5.6**
1998	**40m**	5.0	5.2	6.3	6.4	6.0	5.5	4.4	4.7	5.7	6.8	7.3	6.9	**5.8**
	50m	5.2	5.8	6.9	7.0	6.7	5.9	4.8	5.1	6.2	7.2	7.7	7.3	**6.3**
	60m	5.9	5.8	5.6	4.2	3.7	6.0	4.9	5.3	6.4	7.5	7.8	7.4	**5.9**
	70m	5.6	5.0	3.3	4.5	4.2	6.3	5.1	5.5	6.7	7.8	8.3	7.9	**5.9**
	10m	5.4	5.9	5.5	5.5	6.0	5.3	4.3	3.7	4.2	5.2	5.5	5.2	**5.1**
	30m	6.5	6.9	6.6	6.9	6.8	6.2	5.5	5.0	5.6	6.6	6.7	6.2	**6.3**
1999	**40m**	6.8	7.3	7.0	7.4	7.1	6.5	5.8	5.4	6.2	7.0	7.1	6.6	**6.7**
	50m	7.1	7.7	7.3	7.8	7.5	6.8	6.1	5.8	6.6	7.4	7.6	7.0	**7.1**
	60m	7.3	7.9	7.5	8.0	7.6	7.0	6.3	6.0	6.9	7.7	7.8	7.2	**7.3**
	70m	7.6	8.3	7.8	8.3	7.9	7.3	6.6	6.3	7.3	8.0	8.2	7.6	**7.6**
	10m	5.3	5.5	4.9	5.7	5.5	5.3	3.8	3.7	4.9	4.7	5.2	5.5	**5.0**
	30m	6.6	6.7	5.9	6.9	6.6	6.3	4.9	4.9	6.0	5.8	6.5	6.3	**6.1**
2000	**40m**	7.0	7.0	6.3	7.3	7.0	6.7	5.2	5.2	6.3	6.2	6.8	6.5	**6.5**
	50m	7.3	7.3	5.3	7.5	7.3	7.0	5.5	5.6	6.7	6.6	7.1	6.8	**6.7**
	60m	7.7	7.7	6.8	7.8	7.5	7.2	5.7	5.7	6.9	6.9	7.4	7.0	**7.0**
	70m	8.0	8.1	7.1	8.1	7.7	7.3	5.9	6.1	7.2	7.2	7.6	7.2	**7.3**
	10m	4.8	3.3	3.2	4.8	3.4	2.2	2.0	1.5	2.0	4.9	4.8	5.6	**3.5**
	30m	5.9	3.7	3.5	3.5	4.3	4.2	2.5	3.1	2.4	6.4	5.9	6.6	**4.3**
2001	**40m**	5.9	5.9	6.0	7.3	6.3	5.4	4.7	4.6	4.5	6.7	6.2	6.9	**5.9**
	50m	6.5	5.9	6.4	7.6	6.8	5.9	5.1	4.9	5.1	7.7	7.3	7.9	**6.4**
	60m	6.8	5.9	6.6	8.0	7.1	3.3	2.5	1.9	3.1	8.0	7.6	8.1	**5.7**
	70m	7.4	6.6	7.2	8.6	7.5	6.8	6.0	5.8	5.9	8.3	7.8	8.4	**7.2**
	10m	6.3	6.2	5.7	6.4	6.2	5.4	4.4	4.2	5.1	5.8	6.1	6.0	**5.6**
	30m	6.6	6.3	5.8	6.5	6.4	5.7	4.7	4.6	5.4	6.4	6.5	6.4	**5.9**
Average	**40m**	6.7	6.3	5.9	6.7	6.4	5.7	4.8	4.7	5.4	6.7	6.6	6.4	**6.0**
(m/s)	**50m**	6.7	6.3	6.0	6.8	6.5	5.8	4.9	4.8	5.4	7.0	6.8	6.9	**6.2**
	60m	6.8	6.2	6.1	6.6	6.2	5.5	4.7	4.5	5.2	7.2	6.9	7.0	**6.1**
	70m	6.8	6.0	6.0	6.8	6.4	5.5	4.8	4.6	5.2	7.5	7.1	7.3	**6.2**
	10m	14.1	13.8	12.7	14.3	13.8	12.1	9.9	9.4	11.4	13.0	13.6	13.3	**12.6**
	30m	14.9	14.0	13.0	14.6	14.2	12.7	10.5	10.2	12.0	14.4	14.5	14.4	**13.3**
Average	**40m**	14.9	14.0	13.2	14.9	14.3	12.7	10.7	10.4	12.1	14.9	14.7	14.3	**13.4**
(mph)	**50m**	15.0	14.1	13.5	15.3	14.6	12.9	11.0	10.7	12.2	15.7	15.2	15.3	**13.8**
	60m	15.1	13.8	13.7	14.9	14.0	12.3	10.5	10.1	11.7	16.1	15.4	15.8	**13.6**
	70m	15.1	13.5	13.3	15.2	14.2	12.4	10.7	10.3	11.7	16.7	15.8	16.3	**13.8**

Clarks Grove

Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m-30m						0.17	0.20	0.23	0.27	0.21	0.15	0.18	**0.20**
	30m-40m						0.27	0.28	0.32	0.34	0.24	0.15	0.19	**0.26**
1996	**40m-50m**						0.31	0.32	0.16	0.38	0.31	0.18	0.29	**0.28**
	50m-60m						0.16	0.13	0.31	0.22	0.21	0.17	0.18	**0.20**
	60m-m69						0.22	0.28	0.32	0.33	0.26	0.16	0.15	**0.25**
	30m-50m						0.27	0.28	0.32	0.34	0.27	0.17	0.23	**0.27**
	50m-70m						0.19	0.20	0.23	0.27	0.23	0.14	0.18	**0.21**
	10m-30m	0.15	0.13	0.17	0.17	0.18	0.20	0.21	0.24	0.25	0.21	0.16	0.15	**0.19**
	30m-40m	0.18	0.16	0.17	0.20	0.21	0.24	0.24	0.27	0.28	0.23	0.13	-1.40	**0.08**
1997	**40m-50m**	0.24	0.21	0.22	0.28	0.25	0.30	0.31	0.31	0.34	0.30	0.29	0.35	**0.28**
	50m-60m	0.22	0.16	0.16	0.17	0.18	0.17	0.20	0.20	0.23	0.19	0.20	0.20	**0.19**
	60m-m69	0.21	0.10	0.14	0.21	0.20	0.26	0.27	0.25	0.30	0.29	0.24	0.16	**0.22**
	30m-50m	0.20	0.18	0.19	0.23	0.23	0.26	0.27	0.29	0.31	0.26	0.24	0.17	**0.24**
	50m-70m	0.21	0.13	0.15	0.19	0.19	0.22	0.23	0.22	0.26	0.23	0.22	0.17	**0.20**
	10m-30m	0.10	0.15	0.15	0.21	0.18	0.21	0.20	0.24	0.22	0.20	0.21	0.19	**0.19**
	30m-40m	-0.16	0.01	0.04	0.12	0.05	0.25	0.26	0.29	0.29	0.24	0.23	0.20	**0.15**
1998	**40m-50m**	0.10	0.50	0.38	0.43	0.48	0.27	0.34	0.34	0.36	0.29	0.26	0.24	**0.33**
	50m-60m	-0.07	-0.03	-0.26	-1.46	-1.33	0.16	0.11	0.21	0.19	0.19	0.05	0.09	**-0.18**
	60m-m69	-0.20	-0.78	-3.65	0.75	-0.46	0.25	0.23	0.29	0.32	0.25	0.40	0.37	**-0.19**
	30m-50m	-0.04	0.23	0.19	0.25	0.24	0.26	0.29	0.32	0.32	0.26	0.24	0.22	**0.23**
	50m-70m	-0.14	-0.37	-1.81	-0.47	-0.59	0.20	0.16	0.24	0.25	0.22	0.21	0.22	**-0.16**
	10m-30m	0.19	0.17	0.17	0.23	0.13	0.15	0.22	0.27	0.25	0.21	0.20	0.18	**0.20**
	30m-40m	0.22	0.24	0.22	0.24	0.19	0.20	0.25	0.30	0.33	0.27	0.26	0.25	**0.25**
1999	**40m-50m**	0.25	0.25	0.28	0.25	0.24	0.23	0.26	0.31	0.31	0.28	0.30	0.29	**0.27**
	50m-60m	0.25	0.23	0.23	0.19	0.18	0.19	0.20	0.22	0.26	0.21	0.22	0.21	**0.22**
	60m-m70	0.41	0.35	0.27	0.25	0.26	0.34	0.31	0.33	0.37	0.33	0.35	0.34	**0.33**
	30m-50m	0.22	0.23	0.23	0.24	0.20	0.21	0.25	0.30	0.32	0.27	0.27	0.26	**0.25**
	50m-70m	0.26	0.24	0.23	0.21	0.20	0.23	0.23	0.25	0.30	0.26	0.26	0.26	**0.24**
	10m-30m	0.22	0.20	0.17	0.19	0.18	0.18	0.20	0.22	0.21	0.20	0.19	0.14	**0.19**
	30m-40m	0.25	0.22	0.25	0.22	0.23	0.24	0.27	0.28	0.24	0.27	0.23	0.19	**0.24**
2000	**40m-50m**	0.28	0.25	0.23	0.26	0.23	0.22	0.30	0.32	0.27	0.33	0.26	0.24	**0.27**
	50m-60m	0.30	0.33	0.69	0.31	0.26	0.25	0.22	0.25	0.20	0.27	0.24	0.20	**0.29**
	60m-m70	0.34	0.33	0.30	0.24	0.26	0.25	0.29	0.36	0.29	0.36	0.24	0.23	**0.29**
	30m-50m	0.25	0.22	0.23	0.23	0.22	0.22	0.27	0.28	0.24	0.28	0.23	0.20	**0.24**
	50m-70m	0.31	0.32	0.47	0.25	0.23	0.24	0.24	0.28	0.22	0.28	0.22	0.19	**0.27**
	10m-30m	0.22	0.16	0.14	0.05	0.18	0.16	0.22	0.33	0.26	0.25	0.21	0.17	**0.20**
	30m-40m	0.16	0.78	0.64	1.07	0.74	0.37	0.51	0.66	0.53	0.19	0.14	0.16	**0.50**
2001	**40m-50m**	0.17	0.18	0.31	0.17	0.34	0.39	0.45	0.23	0.48	0.68	0.71	0.59	**0.39**
	50m-60m	0.36	0.15	0.13	0.27	0.32	-0.22	-0.58	-0.60	-0.22	0.20	0.22	0.18	**0.02**
	60m-m70	0.40	0.49	0.52	0.53	0.37	0.95	1.45	1.43	1.11	0.24	0.24	0.19	**0.66**
	30m-50m	0.14	0.45	0.43	0.66	0.55	0.37	0.43	0.34	0.55	0.41	0.39	0.35	**0.42**
	50m-70m	0.38	0.24	0.31	0.39	0.34	0.43	0.43	0.52	0.40	0.21	0.23	0.18	**0.34**
	10m-30m	0.18	0.16	0.16	0.17	0.17	0.18	0.21	0.26	0.24	0.21	0.19	0.17	**0.19**
	30m-40m	0.13	0.28	0.27	0.37	0.28	0.26	0.30	0.35	0.33	0.24	0.19	-0.07	**0.25**
Average	**40m-50m**	0.21	0.28	0.28	0.28	0.31	0.29	0.33	0.28	0.36	0.37	0.33	0.33	**0.30**
	50m-60m	0.21	0.17	0.19	-0.10	-0.08	0.12	0.05	0.10	0.15	0.21	0.18	0.18	**0.11**
	60m-m70	0.23	0.10	-0.48	0.40	0.13	0.38	0.47	0.50	0.45	0.29	0.27	0.24	**0.25**
	30m-50m	0.15	0.26	0.25	0.32	0.29	0.27	0.30	0.31	0.35	0.29	0.26	0.24	**0.27**
	50m-70m	0.20	0.11	-0.13	0.12	0.08	0.25	0.25	0.29	0.28	0.24	0.21	0.20	**0.18**

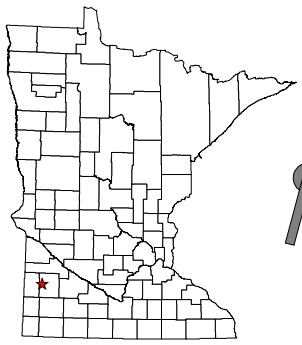
Clarks Grove



Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	30m						136	105	95	114	393	272	242	**194**
1996	**50m**						184	150	142	179	534	354	340	**269**
	70m						221	187	186	238	648	429	426	**334**
	30m	468	295	358	278	379	130	148	77	168	282	229	175	**249**
1997	**50m**	609	379	458	362	484	184	210	114	251	396	306	242	**333**
	70m	728	453	540	422	565	229	260	147	324	49	381	314	**368**
	30m	144	196	292	249	229	134	64	75	119	215	361	285	**197**
1998	**50m**	174	263	364	339	302	187	98	116	182	302	509	381	**268**
	70m	250	154	68	149	127	226	124	153	244	378	617	472	**247**
	30m	290	329	359	319	298	198	171	117	147	256	265	268	**251**
1999	**50m**	375	438	452	432	369	252	226	170	224	349	369	364	**335**
	70m	462	545	538	513	438	312	270	223	304	441	470	451	**414**
	30m	266	295	248	334	268	246	105	98	192	171	284	290	**233**
2000	**50m**	352	379	217	397	346	313	144	141	253	238	365	361	**292**
	70m	448	491	395	497	402	346	177	185	305	306	436	421	**367**
	30m	235	121	79	92	121	101	37	52	33	290	192	261	**134**
2001	**50m**	307	296	229	480	287	194	122	104	114	477	337	424	**281**
	70m	450	395	317	652	382	285	183	172	181	559	415	497	**374**
	30m	280	247	267	254	259	158	105	86	129	268	267	254	**214**
Average	**50m**	363	351	344	402	357	219	158	131	201	383	373	352	**303**
	70m	467	408	372	447	383	270	200	178	266	397	458	430	**356**

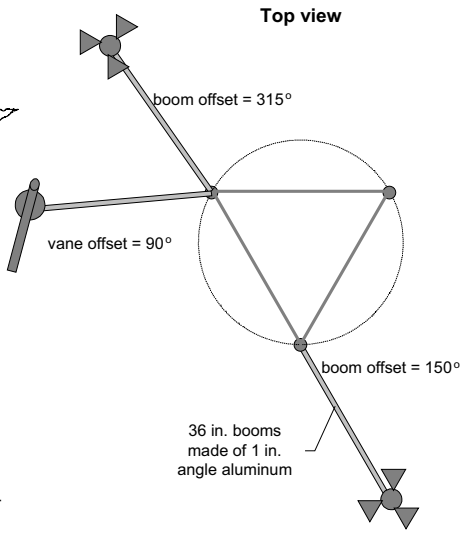
Marshall

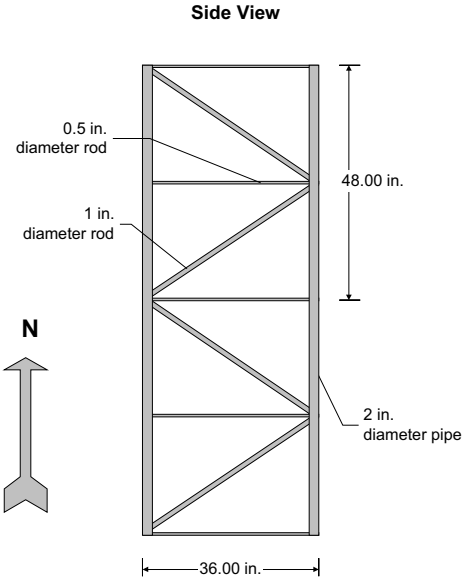


Coordinates

Long/Lat	UTM
N 44.4451	E 260509
W 96.0097	N 4925714

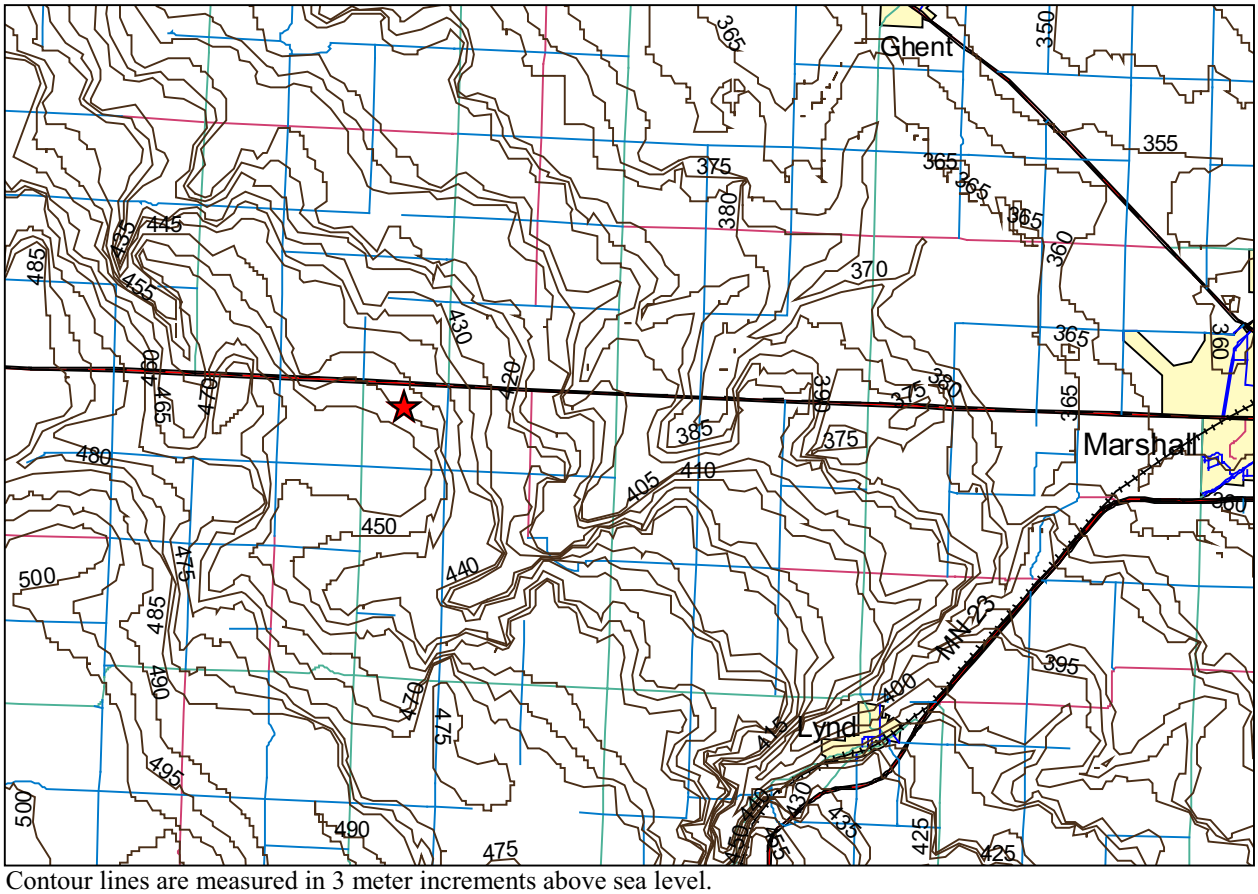
Elevation: 1460 feet





Additional Tower Information:

- Anemometers are located at 10, 30, 50, 60, and 70 meters.
- Vanes are located at 10, 30, 60, and 70 meters.



Contour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Marshall

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m						4.6	4.2	4.4	4.3	6.5	5.1	6.5	**5.1**
	30m						5.5	5.2	5.4	5.4	7.9	6.4	8.2	**6.3**
1996	**40m**						6.0	5.8	6.1	6.2	8.7	6.9	7.6	**6.8**
	50m						6.1	5.9	6.2	6.2	8.8	7.1	9.2	**7.1**
	60m						6.3	6.2	6.5	6.5	9.1	7.4	8.9	**7.3**
	70m						6.5	6.3	6.7	6.8	9.4	7.7	9.7	**7.6**
	10m	6.9	6.7	6.8	5.7	6.4	5.2	4.9	3.8	5.0	6.6	6.0	6.1	**5.8**
	30m	8.4	8.4	8.8	6.9	7.6	6.2	5.8	4.7	6.2	8.0	7.1	7.3	**7.1**
1997	**40m**	8.4	8.2	7.7	7.2	8.0	6.7	6.2	5.1	6.8	8.5	7.1	7.0	**7.2**
	50m	8.7	9.3	9.2	7.3	8.1	6.7	6.2	5.2	7.0	8.8	7.7	7.9	**7.7**
	60m	9.1	9.2	9.8	7.7	8.5	7.1	6.6	5.5	7.4	9.1	8.0	8.2	**8.0**
	70m	9.5	10.3	10.2	7.9	8.6	7.3	6.7	5.6	7.6	9.4	8.2	8.5	**8.3**
	10m	4.5	5.3	5.9	5.2	6.1	4.8	3.6	3.6	4.5	5.1	5.7	5.9	**5.0**
	30m	5.3	6.3	6.8	6.4	7.1	5.9	4.7	4.8	6.0	6.5	6.9	7.4	**6.2**
1998	**40m**	5.7	6.6	7.0	6.7	7.5	6.2	5.1	5.2	6.6	7.0	7.2	7.9	**6.6**
	50m	5.9	6.8	7.0	6.9	7.7	6.4	5.3	5.5	6.9	7.3	7.5	8.2	**6.8**
	60m	6.1	7.2	7.3	7.1	8.0	6.7	5.5	5.8	7.3	7.7	8.0	8.6	**7.1**
	70m	6.1	7.3	6.4	6.7	7.6	6.7	5.7	6.0	7.6	8.0	8.3	8.9	**7.1**
	10m	5.5	6.9	6.0	5.9	6.2	5.4	4.6	4.5	11.0	5.4	5.7	6.1	**6.1**
	30m	7.0	8.1	7.2	7.1	7.3	6.4	5.8	5.8	6.3	7.0	7.2	7.4	**6.9**
1999	**40m**	7.4	8.5	7.5	7.4	7.7	6.7	6.2	6.3	6.9	7.5	7.7	7.9	**7.3**
	50m	7.9	8.8	7.8	7.6	7.9	6.9	6.4	6.5	7.2	7.9	8.0	8.2	**7.6**
	60m	8.4	9.2	8.1	8.0	8.2	7.1	6.6	6.8	7.5	8.3	8.4	8.6	**7.9**
	70m	8.7	9.4	8.3	8.2	8.4	7.5	7.0	7.1	7.9	8.6	8.7	8.8	**8.2**
	10m	5.5	5.6	5.5	4.3	*	*	*	*					**5.2**
	30m	6.7	6.7	6.6	5.0	*	*	*	*					**6.3**
2000	**40m**	7.1	7.1	7.0	7.4	6.5	5.8	*	*	Converted to a 90 meter tower				**6.8**
	50m	7.4	7.3	7.2	7.7	7.3	7.6	5.3	5.9					**7.0**
	60m	7.8	7.7	7.5	8.8	*	*	*	*					**8.0**
	70m	8.1	7.9	7.7	8.2	*	*	*	*					**8.0**
	10m	5.6	6.1	6.1	5.3	6.2	5.0	4.3	4.1	6.2	5.9	5.6	6.1	**5.6**
	30m	6.9	7.4	7.3	6.4	7.3	6.0	5.4	5.2	6.0	7.3	6.9	7.6	**6.6**
Average	**40m**	7.2	7.6	7.3	7.2	7.4	6.3	5.8	5.7	6.6	7.9	7.2	7.6	**7.0**
(m/s)	**50m**	7.5	8.1	7.8	7.4	7.8	6.7	5.8	5.9	6.8	8.2	7.6	8.4	**7.3**
	60m	7.9	8.3	8.2	7.9	8.2	6.8	6.2	6.1	7.2	8.5	8.0	8.6	**7.7**
	70m	8.1	8.7	8.2	7.7	8.2	7.0	6.4	6.4	7.5	8.8	8.2	9.0	**7.9**
	10m	12.6	13.7	13.5	11.8	13.9	11.2	9.7	9.1	13.9	13.2	12.6	13.7	**12.4**
	30m	15.3	16.5	16.4	14.2	16.4	13.4	12.0	11.6	13.4	16.4	15.4	17.0	**14.8**
Average	**40m**	16.0	17.0	16.3	16.1	16.6	14.1	13.0	12.7	14.8	17.7	16.2	17.0	**15.6**
(mph)	**50m**	16.7	18.0	17.4	16.5	17.3	15.1	13.0	13.1	15.3	18.3	17.0	18.7	**16.4**
	60m	17.6	18.6	18.3	17.7	18.4	15.2	13.9	13.7	16.0	19.1	17.8	19.2	**17.1**
	70m	18.1	19.5	18.2	17.3	18.4	15.6	14.4	14.2	16.7	19.8	18.4	20.1	**17.6**

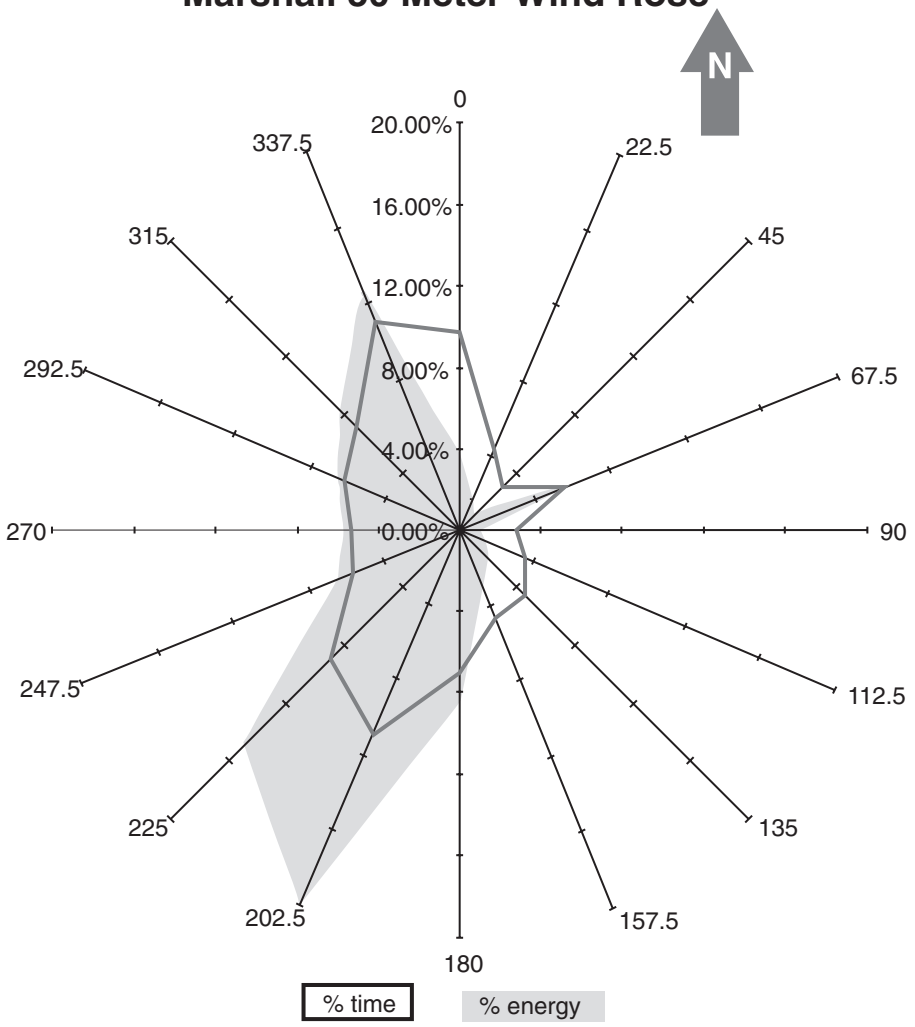
Marshall

Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	10m-30m						0.17	0.19	0.20	0.21	0.19	0.20	0.15	**0.19**
	30m-40m						0.24	0.28	0.26	0.28	0.24	0.23	0.15	**0.24**
	40m-50m						0.20	0.21	0.19	0.23	0.21	0.21	0.12	**0.20**
1996	50m-60m						0.18	0.21	0.27	0.28	0.21	0.26	0.20	**0.23**
	60m-70m						0.18	0.16	0.18	0.22	0.20	0.15	0.16	**0.18**
	30m-50m						0.23	0.25	0.23	0.26	0.23	0.23	0.14	**0.22**
	50m-70m						0.18	0.18	0.23	0.25	0.20	0.21	0.18	**0.20**
	10m-30m	0.17	0.16	0.18	0.18	0.18	0.17	0.16	0.19	0.21	0.19	0.15	0.17	**0.18**
	30m-40m	0.16	0.15	0.20	0.18	0.18	0.23	0.22	0.25	0.29	0.24	0.16	0.17	**0.20**
	40m-50m	0.12	*	*	*	*	0.05	0.02	0.01	0.13	0.13	0.09	0.08	**0.08**
1997	50m-60m	0.12	0.40	0.49	0.42	0.35	0.34	0.32	0.36	0.30	0.25	0.26	0.00	**0.30**
	60m-70m	0.35	0.19	0.12	0.08	0.05	0.17	0.15	0.09	0.11	0.24	0.09	0.35	**0.17**
	30m-50m	0.15	0.09	0.10	0.08	0.08	0.14	0.14	0.14	0.22	0.19	0.13	0.13	**0.13**
	50m-70m	0.24	0.31	0.35	0.34	0.31	0.33	0.28	0.29	0.30	0.25	0.29	0.13	**0.29**
	10m-30m	0.13	0.15	0.12	0.19	0.15	0.20	0.25	0.28	0.28	0.23	0.20	0.22	**0.20**
	30m-40m	0.17	0.15	0.11	0.16	0.17	0.20	0.26	0.26	0.29	0.26	0.20	0.21	**0.20**
	40m-50m	0.06	0.07	*	0.11	0.11	0.12	0.13	0.19	0.20	0.18	0.14	0.17	**0.13**
1998	50m-60m	0.18	0.24	0.21	0.23	0.20	0.24	0.28	0.29	0.27	0.27	0.31	0.27	**0.25**
	60m-70m	0.04	0.03	*	*	*	*	0.16	0.26	0.25	0.30	0.27	0.20	**0.19**
	30m-50m	0.12	0.12	0.05	0.14	0.14	0.17	0.20	0.23	0.25	0.23	0.18	0.19	**0.17**
	50m-70m	0.10	0.15	*	*	*	0.10	0.23	0.28	0.26	0.28	0.30	0.24	**0.22**
	10m-30m	0.17	0.15	0.16	0.17	0.17	0.17	0.21	0.24	0.24	0.24	0.22	0.20	**0.20**
	30m-40m	0.20	0.20	0.18	0.19	0.18	0.19	0.25	0.29	0.30	0.28	0.26	0.23	**0.23**
	40m-50m	0.21	0.19	0.18	0.18	0.15	0.17	0.21	0.21	0.26	0.24	0.24	0.22	**0.21**
1999	50m-60m	0.28	0.25	0.34	0.33	0.38	0.37	0.33	0.35	0.30	0.36	0.35	0.34	**0.33**
	60m-70m	0.31	0.29	0.30	0.34	0.39	0.40	0.43	0.41	0.42	0.39	0.41	0.36	**0.37**
	30m-50m	0.19	0.19	0.18	0.18	0.16	0.17	0.23	0.24	0.28	0.25	0.24	0.21	**0.21**
	50m-70m	0.25	0.22	0.22	0.24	0.21	0.23	0.27	0.28	0.28	0.27	0.26	0.23	**0.25**
	10m-30m	0.18	0.17	0.19	0.17	*	*	*	*					**0.18**
	30m-40m	0.23	0.21	0.20	0.33	*	*	*	*					**0.24**
	40m-50m	0.23	0.20	0.21	0.21	*	*	*	*					**0.21**
2000	50m-60m	0.39	0.37	0.40	0.27	*	*	*	*					**0.36**
	60m-70m	0.38	0.34	0.40	0.33	*	*	*	*					**0.37**
	30m-50m	0.21	0.20	0.20	0.26	*	*	*	*					**0.22**
	50m-70m	0.26	0.25	0.24	0.19	*	*	*	*					**0.24**
	10m-30m	0.16	0.16	0.16	0.18	0.17	0.18	0.20	0.23	0.24	0.21	0.19	0.19	**0.19**
	30m-40m	0.19	0.18	0.17	0.21	0.18	0.21	0.25	0.27	0.29	0.26	0.21	0.19	**0.22**
Average	40m-50m	0.15	0.15	0.20	0.17	0.13	0.14	0.14	0.15	0.20	0.19	0.17	0.15	**0.16**
	50m-60m	0.24	0.32	0.36	0.31	0.31	0.28	0.28	0.32	0.29	0.27	0.29	0.20	**0.29**
	60m-70m	0.27	0.21	0.27	0.25	0.22	0.25	0.22	0.24	0.25	0.28	0.23	0.27	**0.25**
	30m-50m	0.17	0.15	0.13	0.16	0.13	0.18	0.20	0.21	0.25	0.23	0.19	0.17	**0.18**
	50m-70m	0.21	0.23	0.27	0.26	0.26	0.21	0.24	0.27	0.27	0.25	0.26	0.20	**0.24**

Marshall

Marshall 50 Meter Wind Rose

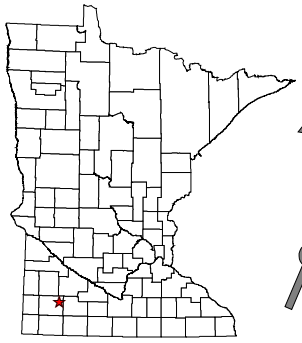


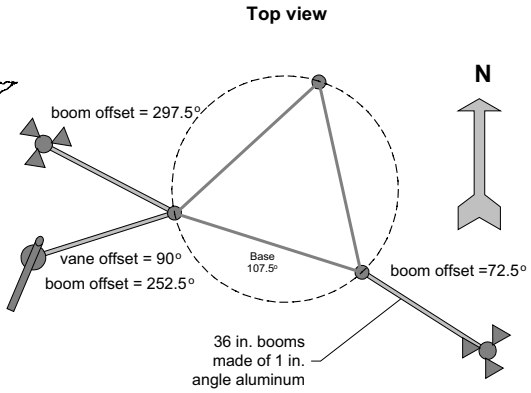
Wind Power (Watts per Square Meter)

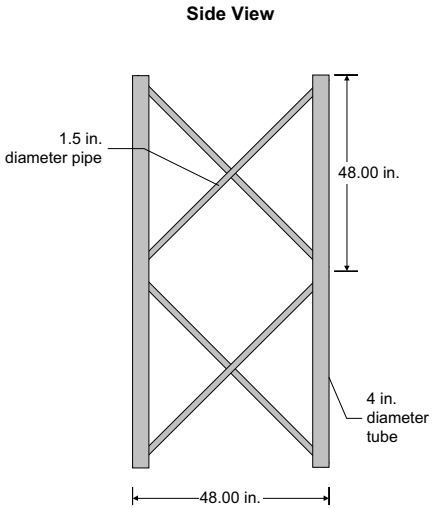
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	30m						179	126	152	153	471	288	602	**282**
1996	**50m**						239	184	220	222	642	394	816	**388**
	70m						286	230	281	289	781	487	964	**474**
	30m	632	594	612	364	430	254	230	118	262	503	453	384	**403**
1997	**50m**	687	817	744	449	518	325	291	160	381	657	594	527	**513**
	70m	903	1116	966	536	306	382	345	199	470	778	698	665	**614**
	30m	201	279	355	293	362	200	103	103	213	244	379	403	**261**
1998	**50m**	273	370	409	366	450	260	146	152	317	348	505	544	**345**
	70m	313	445	328	360	443	294	188	204	421	456	671	687	**401**
	30m	392	590	508	349	364	269	223	186	220	313	348	433	**350**
1999	**50m**	547	770	652	428	445	335	306	260	323	444	486	583	**465**
	70m	704	942	774	515	532	407	384	337	423	567	624	717	**577**
	30m	312	340	332	271	*	*	*	*					**314**
2000	**50m**	422	454	420	460	414	430	167	174	Converted to 90 meter Tower				**368**
	70m	535	566	502	540	*	*	*	*					**536**
	30m	384	451	452	319	385	225	171	140	212	383	367	456	**329**
Average	**50m**	482	603	556	426	457	318	219	193	311	523	495	617	**433**
	70m	614	767	642	488	427	342	287	255	401	645	620	758	**521**

90 Meter Sites

Currie







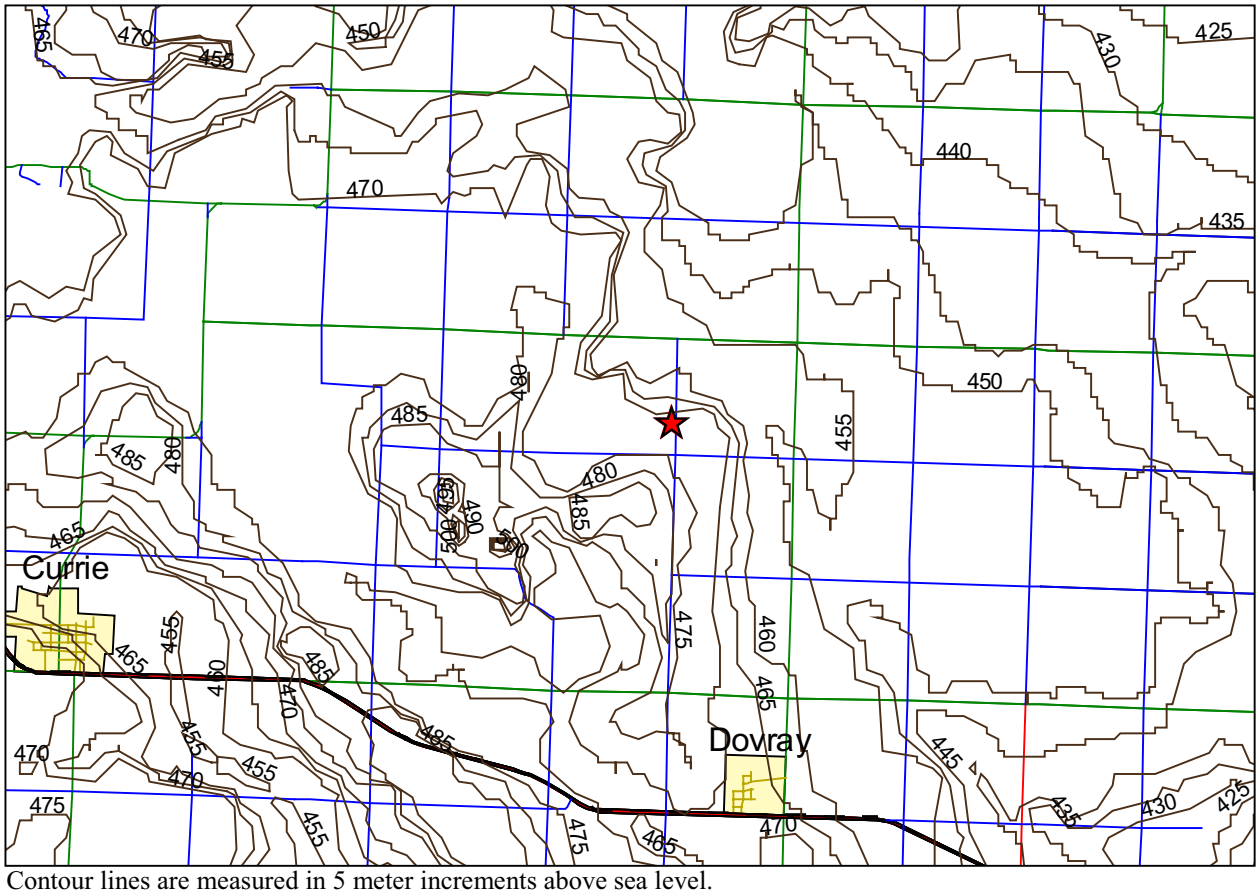
Coordinates

Long/Lat	UTM
N 44.0984	E 294803
W 95.5636	N 4886003

Elevation: 1544 feet

Additional Tower Information:

- Anemometers are located at 30, 60, and 90 meters.
- Vanes are located at 30 and 90 meters.



Contour lines are measured in 5 meter increments above sea level.
County roads are approximately 1 mile apart.

Currie

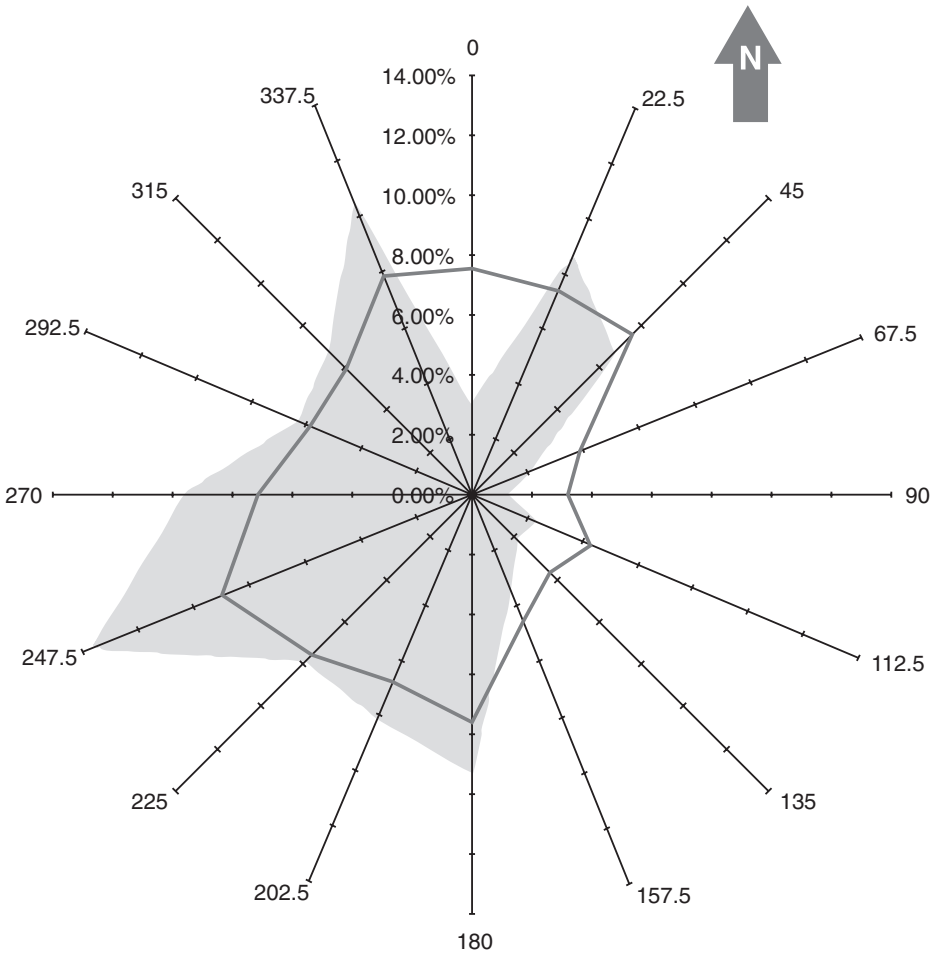
Wind Speed (m/s)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m								4.9	6.3	6.2	7.5	7.6	**6.5**
2000	**60m**								5.9	7.5	7.3	8.4	8.2	**7.4**
	90m								6.6	8.2	8.1	8.9	8.6	**8.1**
	30m	6.1	7.5	6.3	7.7	6.9	7.2	4.8	5.3	5.3	7.4	6.9	7.4	**6.6**
2001	**60m**	6.7	8.0	6.9	8.7	7.8	8.1	5.8	6.3	6.4	8.7	8.1	8.6	**7.5**
	90m	7.9	6.7	7.8	9.2	8.1	8.6	6.1	6.8	7.0	9.4	8.7	9.5	**8.0**
	30m	6.1	7.5	6.3	7.7	6.9	7.2	4.8	5.1	5.8	6.8	7.2	7.5	**6.6**
Average	**60m**	6.7	8.0	6.9	8.7	7.8	8.1	5.8	6.1	6.9	8.0	8.2	8.4	**7.5**
	90m	7.9	6.7	7.8	9.2	8.1	8.6	6.1	6.7	7.6	8.8	8.8	9.0	**7.9**
	30m	13.6	16.9	14.1	17.3	15.4	16.0	10.8	11.5	13.0	15.2	16.2	16.7	**14.7**
Average	**60m**	15.0	17.9	15.5	19.5	17.4	18.2	12.9	13.6	15.5	17.9	18.4	18.7	**16.7**
(mph)	**90m**	17.6	15.1	17.4	20.6	18.1	19.3	13.7	15.0	17.0	19.6	19.8	20.2	**17.8**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m								128	228	183	373	447	**272**
2000	**60m**								204	369	294	503	547	**383**
	90m								287	510	419	615	647	**496**
	30m	387	394	256	493	339	363	122	141	151	379	377	387	**316**
2001	**60m**	566	455	353	663	459	506	194	236	261	596	571	579	**453**
	90m	821	442	472	794	528	611	246	307	357	768	743	768	**571**
	30m	387	394	256	493	339	363	122	134	190	281	375	417	**313**
Average	**60m**	566	455	353	663	459	506	194	220	315	445	537	563	**440**
	90m	821	442	472	794	528	611	246	297	433	594	679	708	**552**

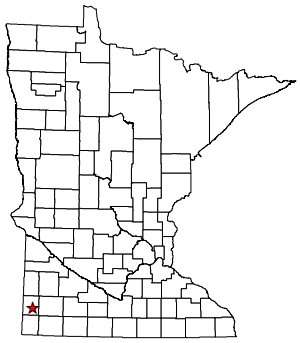
Currie 90 Meter Wind Rose

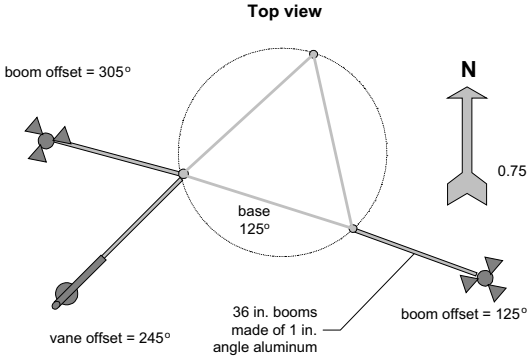


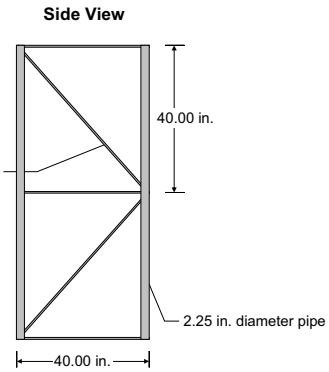
Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m-60m								0.22	0.23	0.23	0.15	0.11	**0.19**
2000	**60m-90m**								0.23	0.22	0.25	0.13	0.13	**0.19**
	30m-60m	0.12	0.10	0.12	0.17	0.20	0.18	0.26	0.25	0.28	0.24	0.19	0.23	**0.20**
2001	**60m-90m**	0.14	0.02	0.25	0.11	0.06	0.12	0.07	0.12	0.13	0.17	0.13	0.16	**0.12**
	30m-60m	0.12	0.10	0.12	0.17	0.20	0.18	0.26	0.24	0.26	0.24	0.17	0.17	**0.19**
Average	**60m-90m**	0.14	0.02	0.25	0.11	0.06	0.12	0.07	0.18	0.18	0.21	0.13	0.14	**0.13**

Hatfield





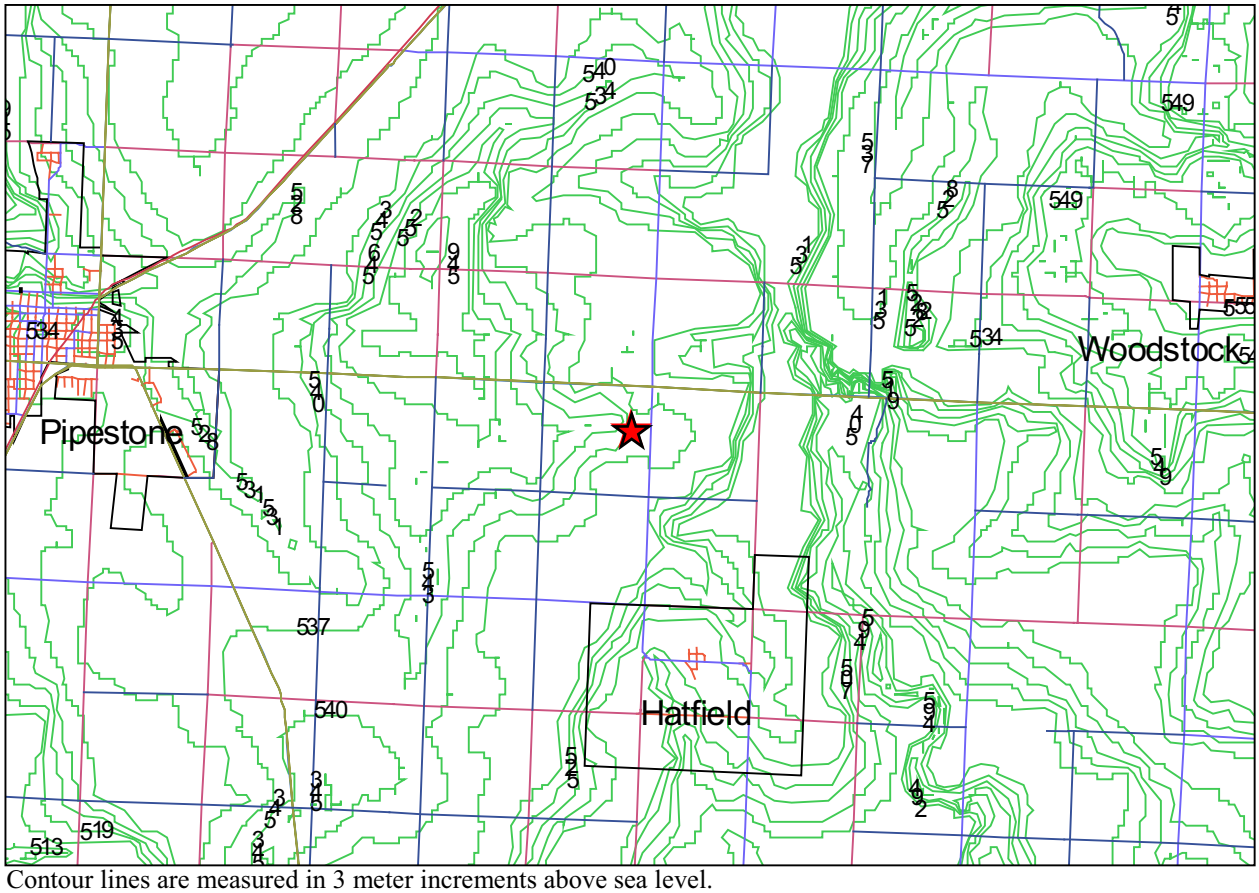


Coordinates

Long/Lat	UTM
N 43.9877	E 242661
W 96.2080	N 4875546

Elevation: 1761 feet

Additional Tower Information:
Anemometers are located at 30, 60, and 90 meters.
Vanes are located at 30 and 90 meters.



Contour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Hatfield

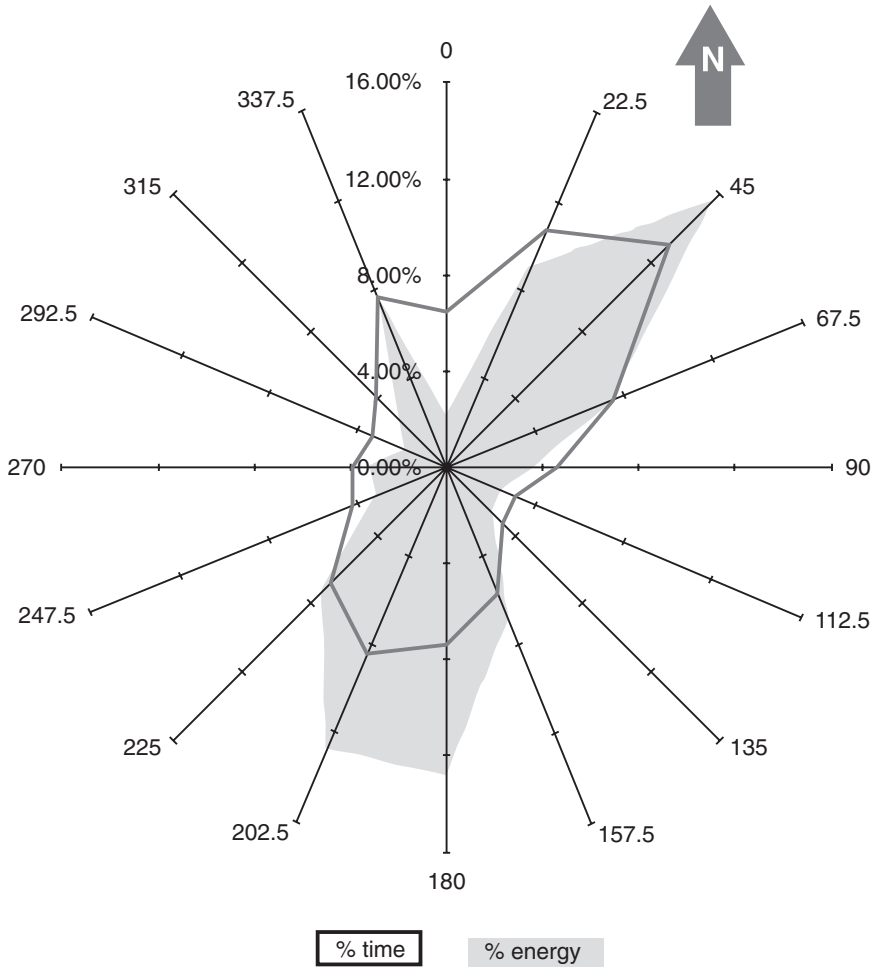
Wind Speed (m/s)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m	5.8	7.2	6.4	7.3	6.8	5.9	5.2	5.0	5.6	6.1	6.0	5.9	**6.1**
1999	**60m**	7.6	8.2	7.5	8.4	7.8	6.9	6.3	6.2	6.9	7.5	7.4	7.0	**7.3**
	90m	8.3	9.1	8.3	9.2	8.6	7.7	7.2	7.1	7.9	8.5	8.5	7.8	**8.2**
	30m	6.0	6.2	5.9	6.8	6.7	6.4	4.4	4.7	5.4	5.2	6.6	7.0	**5.9**
2000	**60m**	7.3	7.4	6.9	7.8	7.6	7.4	5.3	6.0	6.8	6.5	7.9	7.8	**7.1**
	90m	8.2	8.1	7.5	8.5	8.3	8.1	5.9	6.7	7.8	7.4	8.6	8.3	**7.8**
	30m	4.5	5.9	5.3	7.3	6.4	6.2	4.4	4.5	4.7	6.6	6.6	6.4	**5.7**
2001	**60m**	5.3	6.6	6.2	8.5	7.5	7.3	5.5	5.8	6.1	8.0	8.0	7.8	**6.9**
	90m	6.3	5.9	6.9	9.4	8.2	8.1	6.2	6.6	7.1	9.0	8.8	8.9	**7.6**
	30m	5.5	6.4	5.8	7.1	6.6	6.1	4.7	4.7	5.2	6.0	6.4	6.4	**5.9**
Average	**60m**	6.7	7.4	6.9	8.2	7.7	7.2	5.7	6.0	6.6	7.3	7.8	7.6	**7.1**
(m/s)	**90m**	7.6	7.7	7.6	9.0	8.4	8.0	6.4	6.8	7.6	8.3	8.6	8.3	**7.9**
	30m	12.2	14.4	13.1	15.9	14.9	13.7	10.4	10.5	11.7	13.4	14.3	14.4	**13.2**
Average	**60m**	15.0	16.5	15.4	18.4	17.1	16.1	12.8	13.4	14.8	16.4	17.4	16.9	**15.9**
(mph)	**90m**	17.0	17.2	17.0	20.2	18.7	17.8	14.4	15.2	16.9	18.6	19.3	18.6	**17.6**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m	286	409	347	397	293	202	160	125	151	220	222	219	**253**
1999	**60m**	461	576	493	562	409	297	254	214	264	358	360	341	**382**
	90m	599	752	660	712	532	407	359	312	395	525	542	471	**522**
	30m	240	255	264	348	325	267	84	89	145	145	319	456	**245**
2000	**60m**	371	386	375	482	440	385	140	171	265	247	490	580	**361**
	90m	371	386	375	482	440	385	140	171	265	247	490	580	**361**
	30m	172	265	166	436	279	250	89	82	102	310	313	254	**226**
2001	**60m**	286	352	266	629	400	364	159	160	197	471	491	420	**350**
	90m	489	394	429	826	506	547	276	298	369	748	814	756	**538**
	30m	172	265	166	436	279	250	89	82	102	310	313	254	**226**
Average	**60m**	286	352	266	629	400	364	159	160	197	471	491	420	**350**
	90m	489	394	429	826	506	547	276	298	369	748	814	756	**538**

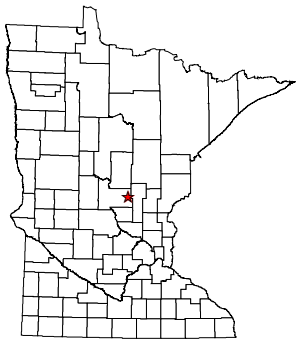
Hatfield Wind Rose

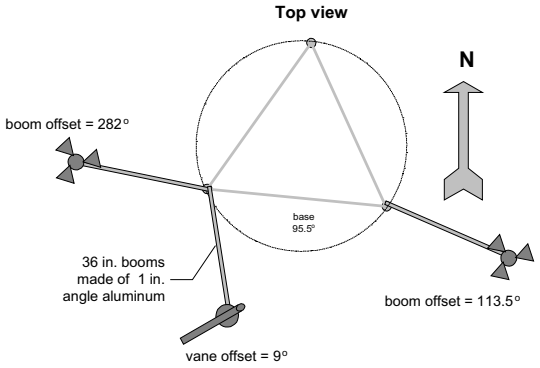


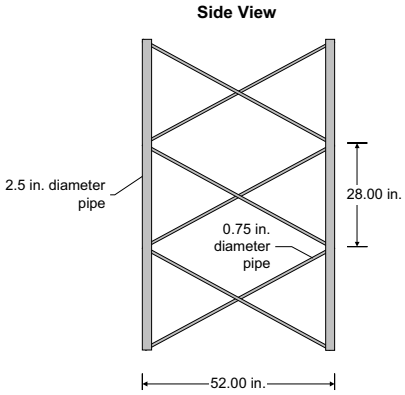
Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
1999	**30m-60m**	0.25	0.21	0.26	0.23	0.23	0.26	0.30	0.34	0.34	0.32	0.34	0.30	**0.28**
	60m-90m	0.32	0.27	0.28	0.24	0.24	0.28	0.32	0.34	0.34	0.36	0.37	0.35	**0.31**
2000	**30m-60m**	0.31	0.27	0.27	0.25	0.23	0.25	0.30	0.36	0.36	0.34	0.28	0.19	**0.28**
	60m-90m	0.34	0.31	0.29	0.27	0.26	0.26	0.28	0.33	0.34	0.34	0.28	0.24	**0.29**
2001	**30m-60m**	0.25	0.20	0.25	0.24	0.26	0.26	0.32	0.36	0.39	0.31	0.30	0.33	**0.29**
	60m-90m	0.33	0.11	0.19	0.23	0.22	0.25	0.26	0.28	0.33	0.29	0.24	0.31	**0.25**
Average	**30m-60m**	0.25	0.20	0.25	0.24	0.26	0.26	0.32	0.36	0.39	0.31	0.30	0.33	**0.29**
	60m-90m	0.33	0.11	0.19	0.23	0.22	0.25	0.26	0.28	0.33	0.29	0.24	0.31	**0.25**

Hillman





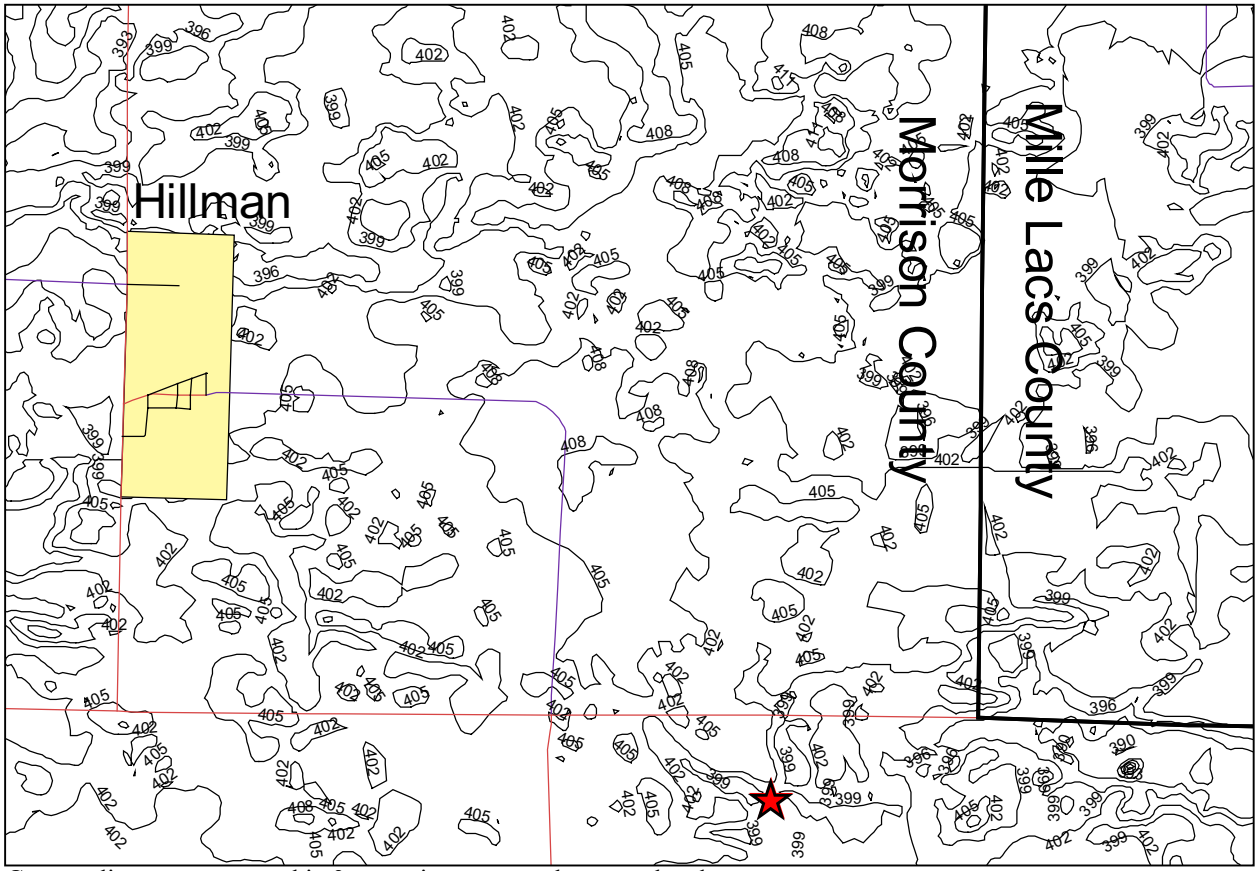


Coordinates

Long/Lat	UTM
N 46.0070	E 431264
W 93.8878	N 5095204

Elevation: 1309 feet

*Tower information is not current



Contour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Hillman

Wind Speed (m/s)

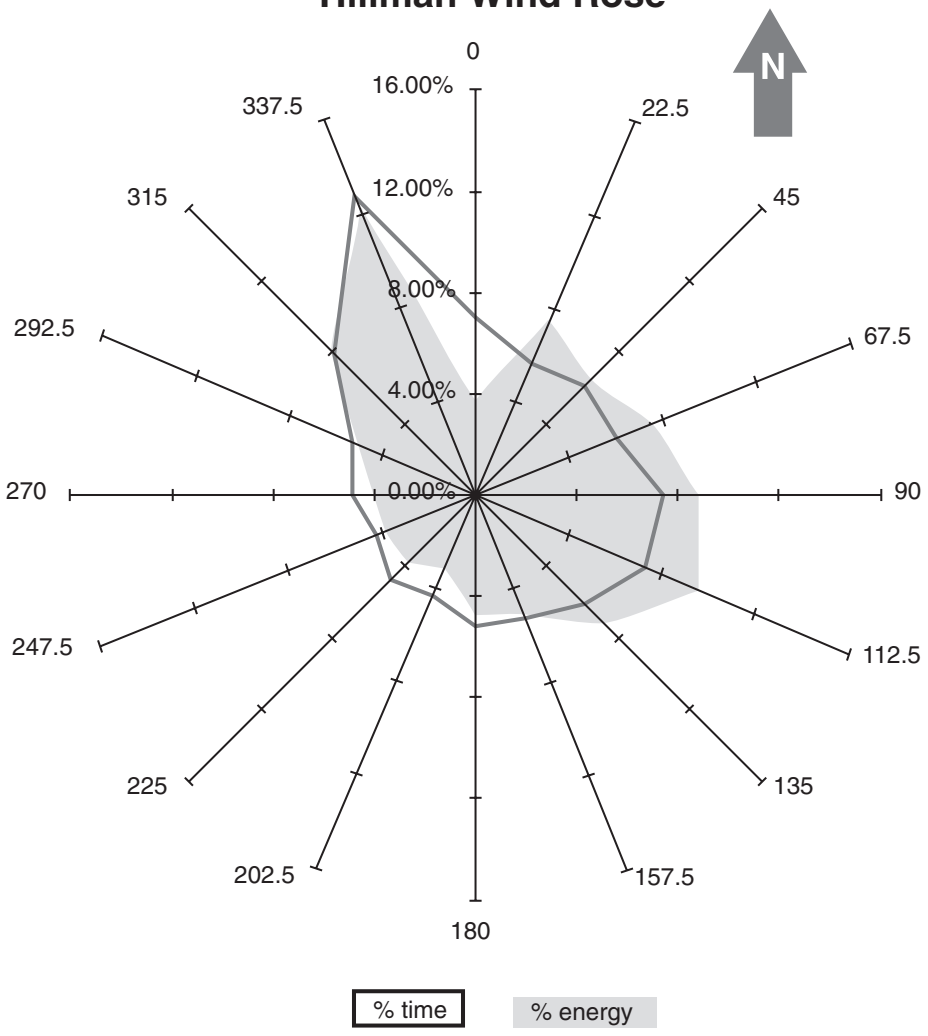
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	30m	3.5	3.5	3.3	4.2	3.6	3.4	2.7	2.8	2.6	4.0	4.1	3.7	**3.5**
2001	**60m**	4.3	4.3	4.1	5.2	4.7	4.4	3.7	4.0	3.8	5.2	5.3	4.7	**4.5**
	90m	5.5	5.2	5.1	6.3	5.8	5.4	4.7	5.0	4.8	6.5	6.5	5.9	**5.6**
	30m	3.5	3.5	3.3	4.2	3.6	3.4	2.7	2.8	2.6	4.0	4.1	3.7	**3.5**
Average	**60m**	4.3	4.3	4.1	5.2	4.7	4.4	3.7	4.0	3.8	5.2	5.3	4.7	**4.5**
	90m	5.5	5.2	5.1	6.3	5.8	5.4	4.7	5.0	4.8	6.5	6.5	5.9	**5.6**
	30m	7.9	7.8	7.5	9.4	8.2	7.5	6.0	6.4	5.9	9.0	9.2	8.2	**7.7**
Average	**60m**	9.7	9.6	9.2	11.7	10.6	9.9	8.3	9.0	8.5	11.7	11.8	10.6	**10.0**
(mpn)	**90m**	12.3	11.7	11.4	14.0	12.9	12.2	10.5	11.3	10.8	14.6	14.6	13.1	**12.4**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	30m	47	45	35	82	51	39	23	24	24	64	77	55	**47**
2001	**60m**	80	78	61	143	94	78	50	55	53	123	143	102	**88**
	90m	158	141	113	232	166	145	99	108	108	228	248	183	**161**
	30m	47	45	35	82	51	39	23	24	24	64	77	55	**47**
Average	**60m**	80	78	61	143	94	78	50	55	53	123	143	102	**88**
	90m	158	141	113	232	166	145	99	108	108	228	248	183	**161**

Hillman

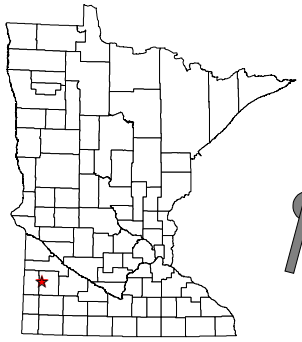
Hillman Wind Rose



Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
2001	**30m-60m**	0.33	0.32	0.30	0.31	0.35	0.36	0.42	0.44	0.44	0.38	0.37	0.34	**0.36**
	60m-90m	0.58	0.56	0.55	0.50	0.51	0.53	0.58	0.59	0.61	0.59	0.54	0.54	**0.56**
Average	**30m-60m**	0.33	0.32	0.30	0.31	0.35	0.36	0.42	0.44	0.44	0.38	0.37	0.34	**0.36**
	60m-90m	0.58	0.56	0.55	0.50	0.51	0.53	0.58	0.59	0.61	0.59	0.54	0.54	**0.56**

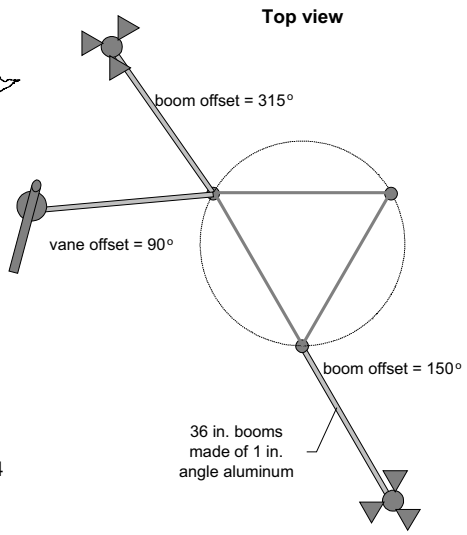
Marshall

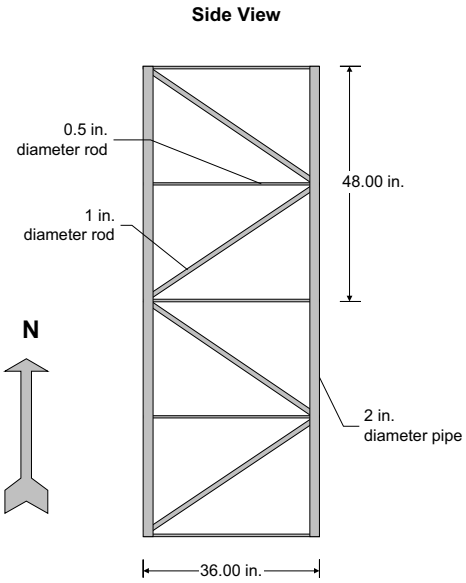


Coordinates

Long/Lat	UTM
N 44.4451	E 260509
W 96.0097	N 4925714

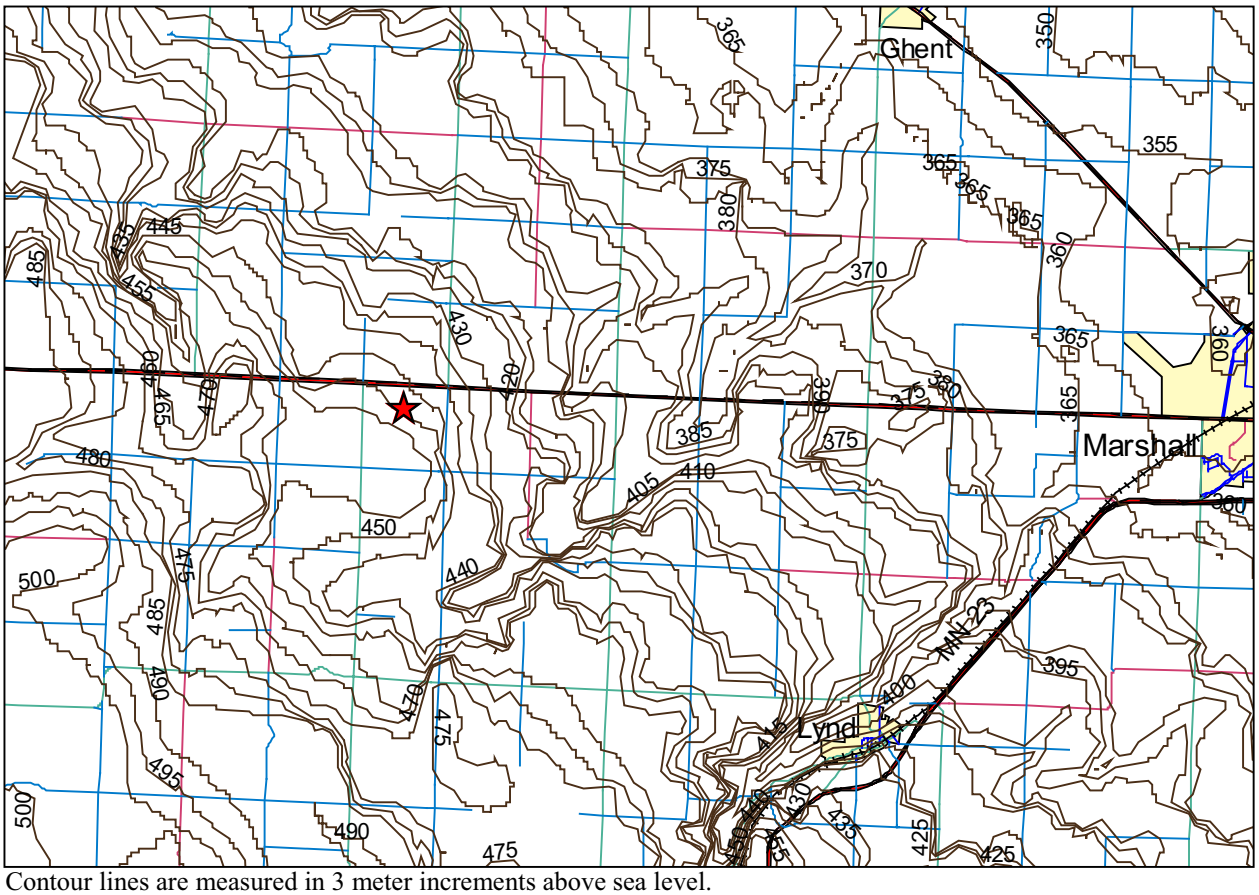
Elevation: 1460 feet





Additional Tower Information:

- Anemometers are located at 30, 60, and 90 meters.
- Vanes are located at 30 and 90 meters.



Contour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Marshall

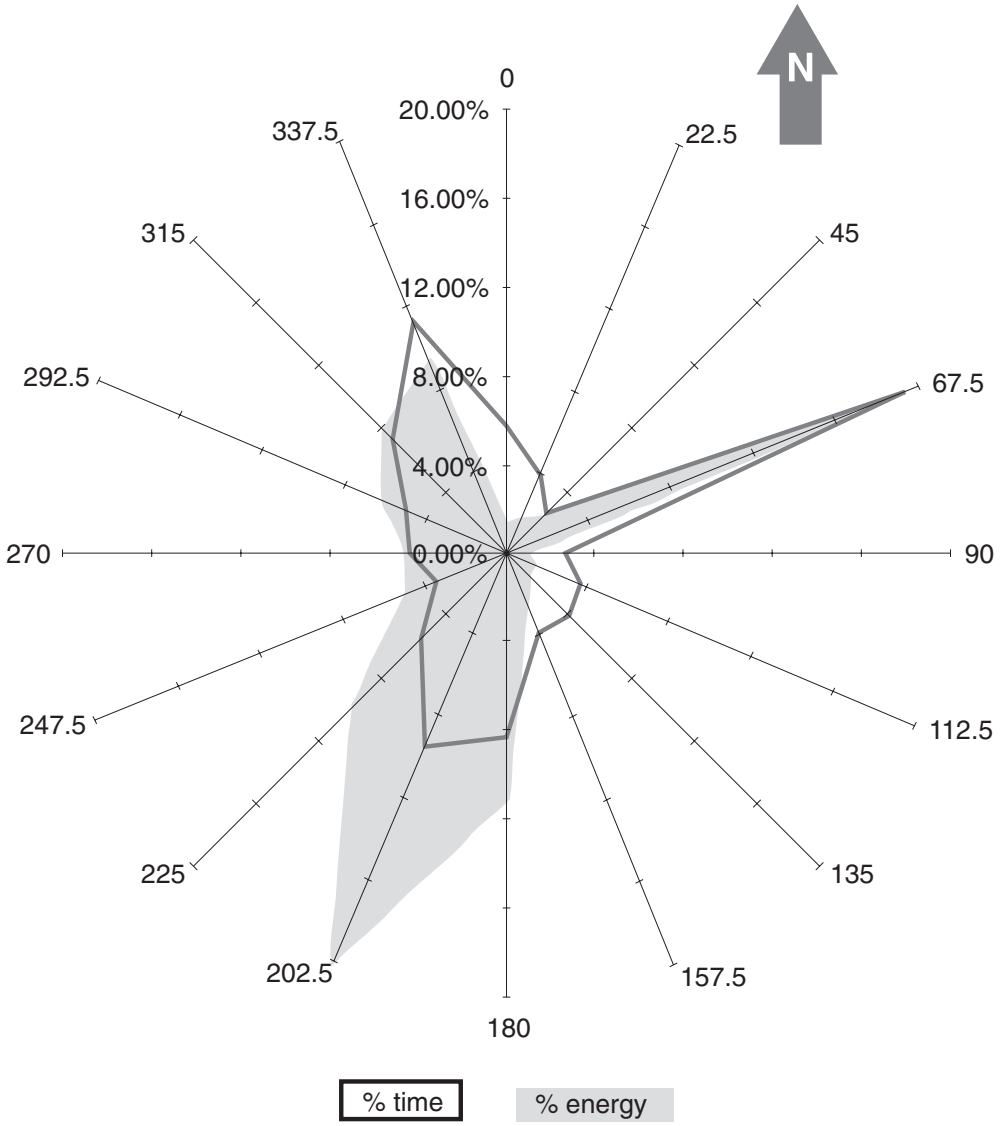
Wind Speed (m/s)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m								5.5	6.3	6.1	7.6	7.1	**6.5**
2000	**60m**								6.5	7.4	7.1	8.5	7.8	**7.5**
	90m								7.2	8.2	7.8	9.2	8.2	**8.1**
	30m	6.8	6.3	6.0	4.7	6.1	7.5	4.8	5.1	5.3	7.5	7.8	7.3	**6.3**
2001	**60m**	7.9	6.8	6.9	5.5	6.8	8.5	5.7	6.1	6.4	8.9	8.4	8.7	**7.2**
	90m	8.8	7.6	7.6	6.0	7.3	9.2	6.2	6.8	7.2	9.7	9.1	9.5	**7.9**
	30m	6.8	6.3	6.0	4.7	6.1	7.5	4.8	5.3	5.8	6.8	7.7	7.2	**6.2**
Average	**60m**	7.9	6.8	6.9	5.5	6.8	8.5	5.7	6.3	6.9	8.0	8.5	8.2	**7.2**
(m/s)	**90m**	8.8	7.6	7.6	6.0	7.3	9.2	6.2	7.0	7.7	8.8	9.2	8.9	**7.9**
	30m	15.2	14.1	13.4	10.6	13.6	16.8	10.7	11.8	13.0	15.2	17.2	16.1	**14.0**
Average	**60m**	17.6	15.3	15.5	12.3	15.3	19.0	12.7	14.1	15.5	17.8	18.9	18.4	**16.0**
(mph)	**90m**	19.8	17.1	16.9	13.4	16.4	20.5	14.0	15.7	17.2	19.6	20.5	19.8	**17.6**

Wind Power (Watts per square meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m								146	234	178	364	395	**263**
2000	**60m**								241	378	276	515	531	**388**
	90m								335	530	382	648	636	**506**
	30m	511	320	240	116	249	322	95	109	138	352	370	341	**264**
2001	**60m**	767	407	352	175	400	578	197	236	293	650	623	594	**439**
	90m	1093	523	466	224	494	732	269	337	417	845	822	811	**586**
	30m	511	320	240	116	249	322	95	127	186	265	367	368	**264**
Average	**60m**	767	407	352	175	400	578	197	238	336	463	569	562	**420**
	90m	1093	523	466	224	494	732	269	336	473	613	735	724	**557**

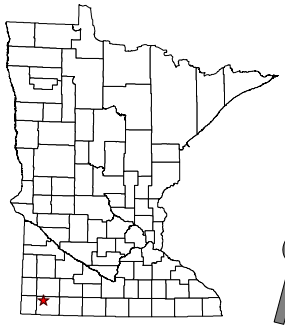
Marshall Wind Rose



Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
2000	**30m-60m**								0.24	0.23	0.21	0.15	0.11	**0.19**
	60m-90m								0.24	0.22	0.25	0.17	0.10	**0.20**
2001	**30m-60m**	0.17	0.12	0.15	0.20	0.17	0.17	0.23	0.25	0.26	0.25	0.18	0.25	**0.20**
	60m-90m	0.20	0.12	0.19	0.24	0.16	0.17	0.20	0.24	0.27	0.21	0.16	0.25	**0.20**
Average	**30m-60m**	0.17	0.12	0.15	0.20	0.17	0.17	0.23	0.25	0.25	0.23	0.16	0.18	**0.19**
	60m-90m	0.20	0.12	0.19	0.24	0.16	0.17	0.20	0.24	0.25	0.23	0.16	0.18	**0.20**

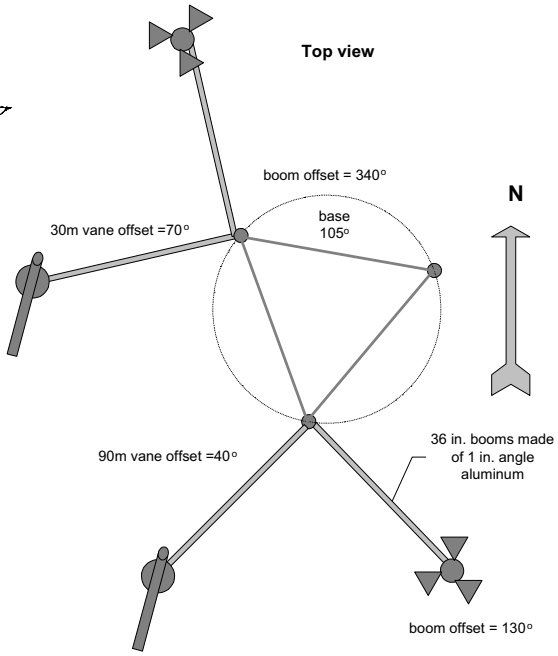
St. Killian

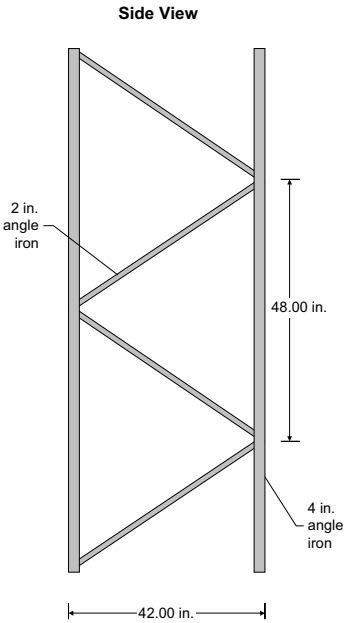


Coordinates

Long/Lat	UTM
N 43.7823	E 268776
W 95.8735	N 4851707

Elevation: 1781 feet





Additional Tower Information:

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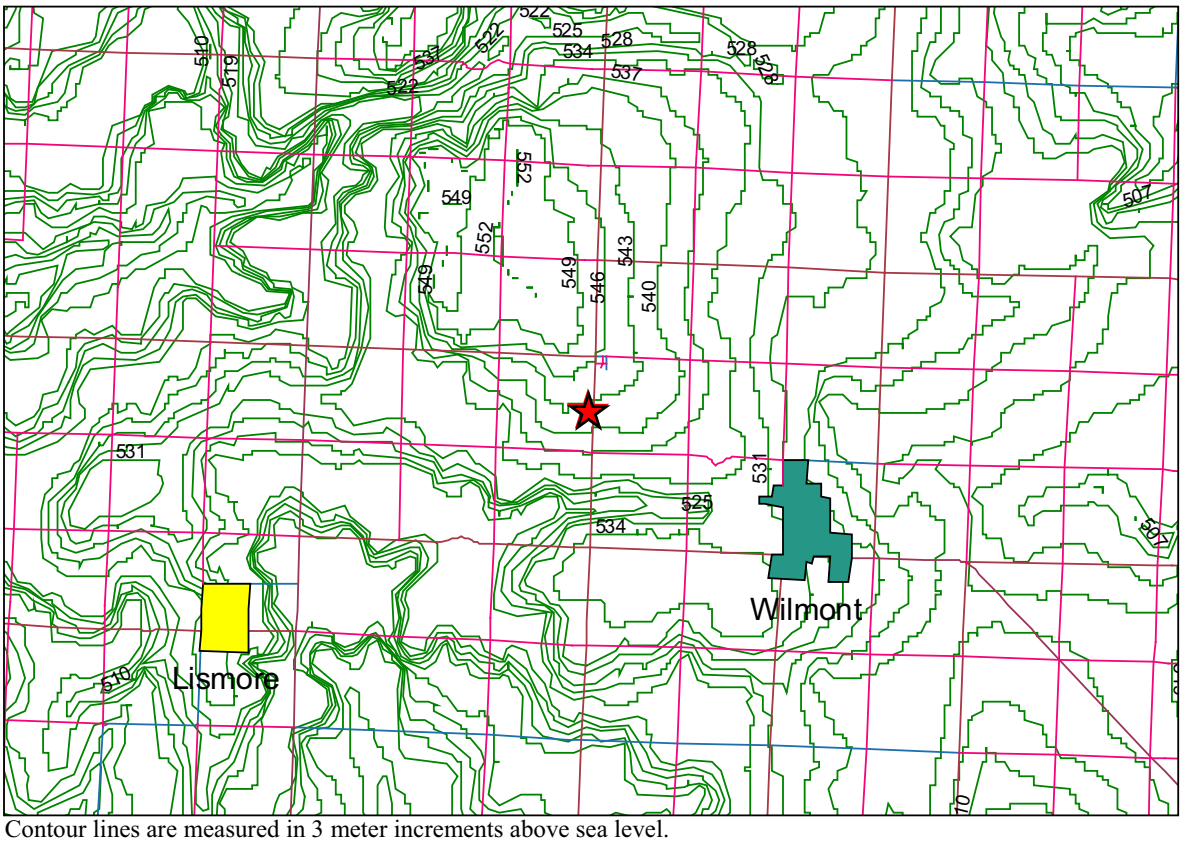
- Vanes are located at 30 and 90 meters.



Contour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

St. Killian

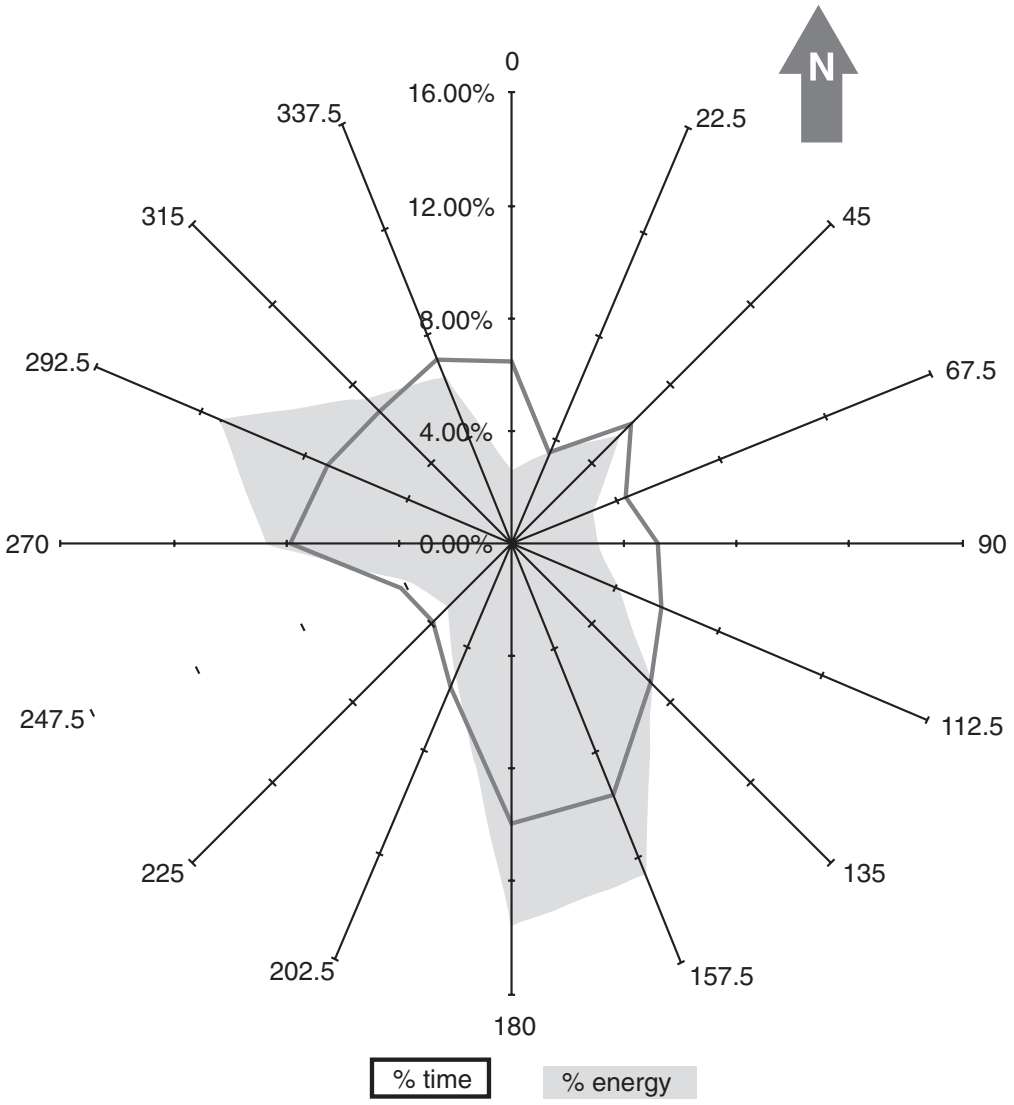
Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m	7.1	7.5	7.1	8.1	7.1	6.5	5.8	5.5	6.1	6.8	6.9	6.4	**6.7**
1999	**60m**	8.2	8.6	8.2	9.0	8.1	7.4	6.9	6.6	7.5	8.2	8.4	7.5	**7.9**
	90m	8.4	9.0	8.5	9.5	8.4	7.8	7.4	7.1	7.9	8.7	8.8	7.8	**8.3**
	30m	6.7	7.0	6.4	6.7	6.7	6.4	4.9	5.2	6.1	6.0	7.1	6.7	**6.3**
2000	**60m**	8.1	8.1	7.5	6.9	6.1	7.7	6.0	6.7	7.8	7.6	8.4	7.9	**7.4**
	90m	8.4	8.4	7.7	8.8	8.7	8.2	6.3	6.9	8.1	7.8	8.5	7.7	**8.0**
	30m	5.2	6.4	5.8	7.8	6.7	6.3	5.0	4.8	5.2	7.2	6.5	6.8	**6.2**
2001	**60m**	5.1	5.7	6.4	8.8	7.4	7.1	5.6	6.4	6.7	8.9	7.9	8.4	**7.0**
	90m	5.6	5.3	6.5	8.9	7.5	7.5	6.0	6.6	7.0	9.1	8.3	8.1	**7.2**
	30m	6.4	7.0	6.5	7.5	6.9	6.4	5.3	5.2	5.8	6.7	6.9	6.6	**6.4**
Average	**60m**	7.2	7.5	7.3	8.2	7.2	7.4	6.2	6.5	7.3	8.2	8.2	7.9	**7.4**
	90m	7.5	7.5	7.6	9.1	8.2	7.8	6.5	6.9	7.7	8.6	8.5	7.9	**7.8**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	30m	376	416	416	541	304	241	190	145	191	270	292	245	**302**
1999	**60m**	564	624	605	718	432	348	308	245	319	458	500	393	**460**
	90m	586	675	665	814	477	404	369	303	378	548	574	451	**520**
	30m	287	318	298	380	357	276	111	113	201	194	363	385	**274**
2000	**60m**	463	487	436	497	396	444	197	243	391	368	561	577	**422**
	90m	515	548	472	656	636	493	224	274	441	419	573	528	**482**
	30m	220	318	211	499	302	279	107	96	128	400	319	286	**264**
2001	**60m**	349	307	305	670	384	366	174	218	274	648	556	500	**396**
	90m	412	345	332	685	378	416	215	248	311	679	626	444	**424**
	30m	294	350	309	473	321	265	136	118	173	288	324	305	**280**
Average	**60m**	459	473	449	629	404	386	226	235	328	491	539	490	**426**
	90m	505	523	489	718	497	438	269	275	377	549	591	474	**475**

St. Kilian Wind Rose



Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	30m-60m	0.26	0.22	0.21	0.18	0.20	0.21	0.28	0.28	0.30	0.30	0.28	0.29	**0.25**
1999	**60m-90m**	0.20	0.17	0.15	0.15	0.13	0.17	0.20	0.21	0.20	0.20	0.17	0.22	**0.18**
	30m-60m	0.30	0.26	0.25	0.28	0.42	0.32	0.31	0.37	0.36	0.34	0.28	0.30	**0.31**
2000	**60m-90m**	0.20	0.17	0.16	0.67	1.12	0.32	0.21	0.21	0.22	0.21	0.20	0.22	**0.33**
	30m-60m	0.19	-0.01	0.09	0.16	0.16	0.17	0.21	0.38	0.37	0.32	0.24	0.29	**0.22**
2001	**60m-90m**	0.06	0.03	-0.01	0.04	0.04	0.14	0.21	0.10	0.10	0.07	0.10	-0.07	**0.07**
	30m-60m	0.25	0.16	0.18	0.21	0.26	0.23	0.26	0.34	0.34	0.32	0.27	0.29	**0.26**
Average	**60m-90m**	0.16	0.12	0.10	0.29	0.43	0.21	0.21	0.18	0.17	0.16	0.16	0.12	**0.19**

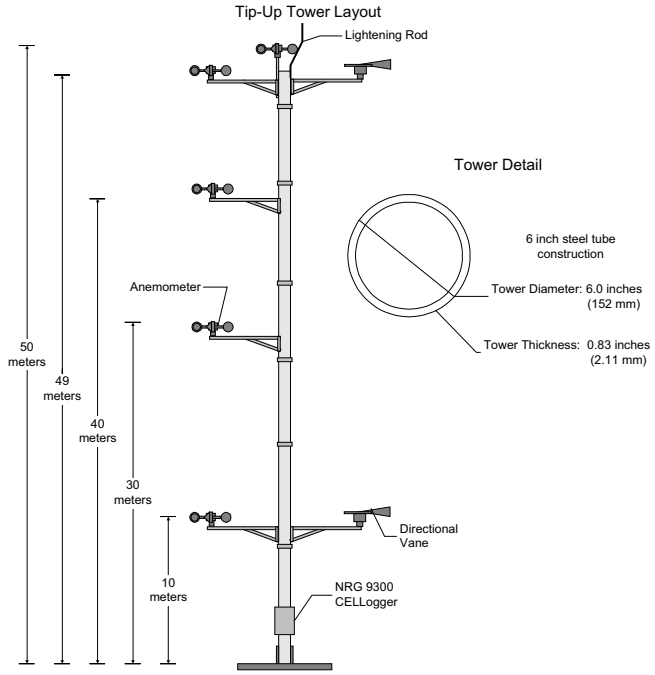
50 Meter Tip-Up Sites

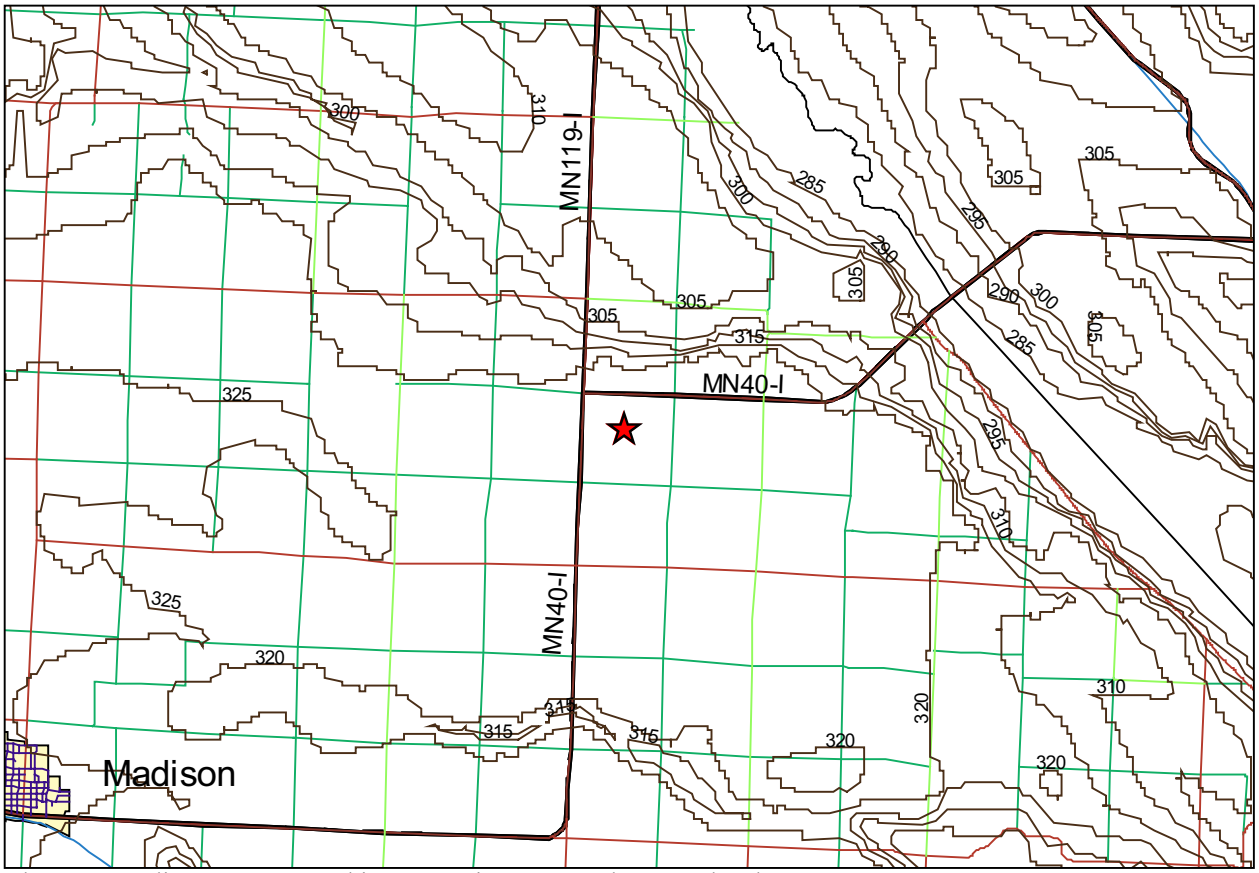
Lac Qui Parle

Coordinates

Long/Lat	UTM
N 45.0680	E 259689
W 96.0527	N 4995037

Elevation: 1053 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Lac Qui Parle

Wind Speed (Meters per Second)

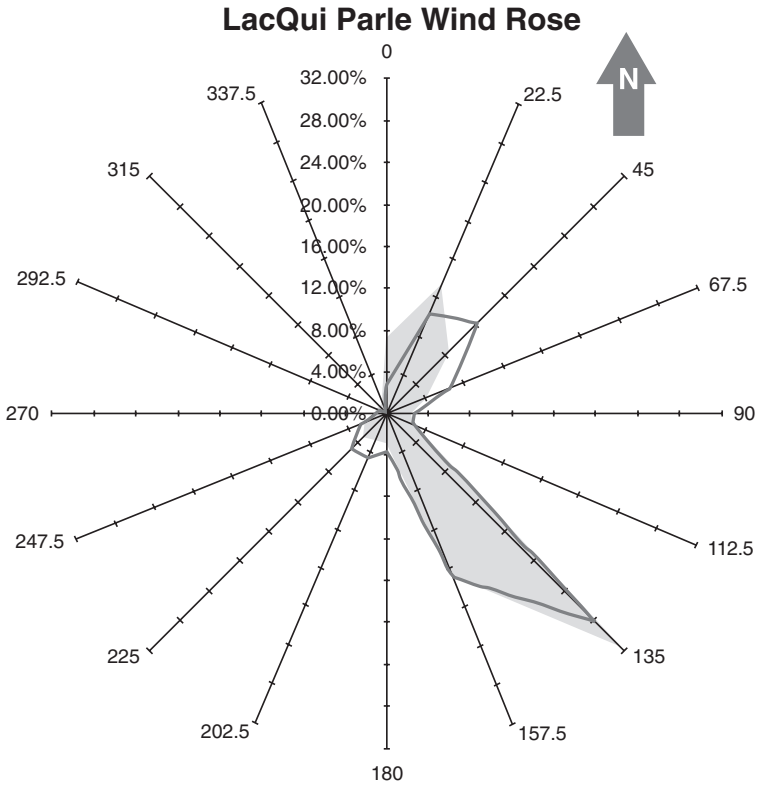
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m												3.8	**3.8**
1994	**30m**												5.3	**5.3**
	40m												5.3	**5.3**
	10m	4.7	4.9	4.7	4.9	4.6	4.0	3.5	3.3	3.5	4.7	4.8	4.2	**4.3**
1995	**30m**	5.9	6.0	6.0	6.0	5.8	5.4	4.8	4.5	4.9	6.2	6.1	5.7	**5.6**
	40m	6.2	6.3	6.1	*	*	6.1	5.1	*	*	7.0	6.6	5.7	**6.1**
	10m	4.9	5.6	5.1	5.0	4.4	3.6	3.4	3.3	3.4	4.8	4.5	4.1	**4.3**
1996	**30m**	6.1	7.0	6.2	6.1	5.5	4.9	4.6	4.7	4.8	6.4	5.8	5.0	**5.6**
	40m	6.5	7.6	6.7	6.6	5.9	5.4	5.0	5.3	5.2	7.0	6.2	5.2	**6.1**
	10m	5.7	4.8	5.3	4.6	5.3	3.8	3.6	2.8	3.7	4.6	4.4	4.0	**4.4**
1997	**30m**	7.0	6.1	6.6	5.9	6.7	5.1	4.7	3.9	5.1	6.3	5.7	5.1	**5.7**
	40m	*	*	7.0	6.2	7.0	5.2	4.7	4.0	5.4	6.6	5.7	5.1	**5.7**
	10m	3.3	3.7	4.9	4.2	4.4	4.2	2.8	3.0	3.4	4.1	4.1	4.1	**3.9**
1998	**30m**	3.9	4.8	5.7	5.3	5.7	5.4	3.8	4.1	4.9	5.5	5.3	5.5	**5.0**
	40m	4.2	5.1	6.1	5.7	6.1	5.8	4.2	4.4	5.4	6.0	5.7	5.9	**5.4**
	50m	4.7	5.7	6.7	6.3	6.7	6.5	4.8	5.1	6.2	6.7	6.5	7.2	**6.1**
	10m	4.5	5.2	4.5	5.1	5.1	4.1	3.2	3.3	3.7	4.1	4.0	4.3	**4.2**
1999	**30m**	5.6	6.5	5.7	6.4	6.5	5.4	4.5	4.6	5.1	5.6	5.6	5.8	**5.6**
	40m	6.0	7.0	6.1	6.6	7.0	5.8	5.0	5.0	5.6	6.2	6.1	6.3	**6.1**
	50m	7.1	8.2	7.3	7.3	7.3	6.1	5.3	5.4	6.0	6.6	6.5	6.7	**6.7**
	10m	4.0	3.9	4.2	5.0	4.5	4.4	2.9	3.3	3.8	3.8	4.4	4.8	**4.1**
2000	**30m**	5.2	5.2	5.5	6.3	5.9	5.8	4.0	4.6	5.3	5.3	5.9	6.0	**5.4**
	40m	5.7	5.6	6.0	6.6	6.3	6.2	4.5	5.1	5.8	5.8	6.2	6.4	**5.8**
	50m	6.1	6.0	6.3	6.9	6.5	6.4	4.8	5.3	6.1	6.0	6.5	6.8	**6.1**
	10m	3.5	4.4	4.0	5.1	4.7	4.0	3.0	3.0	3.1	4.4	4.2	4.1	**4.0**
2001	**30m**	4.9	5.7	5.1	6.6	6.1	5.7	4.3	4.4	4.4	6.1	5.9	5.9	**5.4**
	40m	5.2	6.0	5.4	7.1	6.5	6.0	4.8	4.8	4.9	6.7	6.3	6.4	**5.8**
	50m	5.6	6.2	5.7	7.5	6.7	6.3	4.9	5.0	5.2	7.1	6.8	6.8	**6.2**
	10m	4.4	4.6	4.7	4.8	4.7	4.0	3.2	3.1	3.5	4.4	4.4	4.2	**4.2**
Average	**30m**	5.5	5.9	5.8	6.1	6.0	5.4	4.4	4.4	4.9	5.9	5.8	5.5	**5.5**
(m/s)	**40m**	5.6	6.3	6.2	6.5	6.4	5.8	4.7	4.8	5.4	6.5	6.1	5.8	**5.8**
	50m	5.3	5.6	5.7	5.8	5.7	5.1	4.1	4.2	4.7	5.6	5.5	5.5	**5.2**
	10m	9.7	10.4	10.4	10.8	10.6	9.0	7.2	7.0	7.9	9.8	9.7	9.3	**9.3**
Average	**30m**	12.3	13.2	13.0	13.6	13.5	12.0	9.8	9.8	11.0	13.2	12.9	12.4	**12.2**
(mph)	**40m**	12.6	14.0	13.9	14.4	14.4	13.0	10.6	10.7	12.0	14.4	13.7	12.9	**13.1**
	50m	11.8	12.6	12.9	13.0	12.8	11.4	9.3	9.3	10.5	12.5	12.3	12.3	**11.7**

Lac Qui Parle

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m												74	**74**
1994	**30m**												154	**154**
	40m												154	**154**
	10m	129	164	119	154	128	73	61	42	71	151	150	151	**116**
1995	**30m**	226	271	213	258	222	146	133	95	150	280	276	289	**213**
	40m	257	308	245	*	*	191	160	*	*	369	332	323	**273**
	10m	263	245	206	150	92	60	48	38	47	360	128	96	**144**
1996	**30m**	423	413	322	256	162	132	98	96	106	689	238	161	**258**
	40m	477	496	381	314	203	171	123	134	142	844	281	206	**314**
	10m	320	137	171	131	189	192	64	25	72	113	160	77	**138**
1997	**30m**	508	240	297	231	335	442	124	59	152	264	285	143	**257**
	40m	*	*	393	274	379	488	134	63	176	305	304	146	**266**
	10m	41	75	154	88	96	91	27	32	53	90	125	98	**81**
1998	**30m**	63	146	235	161	191	171	58	69	117	173	229	185	**150**
	40m	79	178	269	196	225	198	74	86	148	212	276	224	**180**
	50m	106	244	337	264	290	267	105	124	213	292	380	438	**255**
	10m	126	203	152	164	145	71	47	41	60	91	91	115	**109**
1999	**30m**	204	354	270	270	276	154	107	95	123	178	187	220	**203**
	40m	253	425	320	293	329	191	135	122	154	222	235	276	**246**
	50m	601	739	520	461	815	315	592	577	177	258	*	349	**491**
	10m	86	151	240	319	129	88	151	64	86	68	312	475	**181**
2000	**30m**	170	170	218	299	232	219	70	85	146	117	218	279	**185**
	40m	212	210	262	339	264	261	94	115	185	151	255	339	**224**
	50m	219	408	558	676	328	238	375	236	442	192	728	941	**445**
	10m	80	116	69	161	122	65	28	26	29	97	97	92	**82**
2001	**30m**	167	200	124	305	221	160	65	66	72	212	205	200	**166**
	40m	208	230	149	361	258	192	87	88	100	269	249	253	**204**
	50m	246	239	170	412	282	215	98	101	117	319	297	299	**233**
	10m	149	156	159	167	129	91	61	38	60	139	152	147	**121**
Average	**30m**	251	256	240	254	234	203	94	81	124	273	234	204	**204**
	40m	248	308	288	296	276	242	115	101	151	339	276	240	**240**
	50m	241	281	279	292	278	181	171	147	149	222	281	306	**236**

Lac Qui Parle



Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m-30m												0.35	**0.35**
1994	**30m-40m**												*	*****
	10m-30m	0.26	0.25	0.26	0.23	0.26	0.31	0.30	0.35	0.36	0.32	0.24	0.25	**0.28**
1995	**30m-40m**	0.21	0.23	0.26	*	*	0.23	0.39	*	*	0.37	0.34	0.29	**0.29**
	10m-30m	0.24	0.27	0.24	0.24	0.26	0.30	0.33	0.42	0.39	0.32	0.26	0.26	**0.29**
1996	**30m-40m**	0.32	0.36	0.34	0.38	0.34	0.40	0.40	0.44	0.35	0.35	0.25	0.11	**0.34**
	10m-30m	0.24	0.23	0.24	0.25	0.26	0.30	0.29	0.39	0.36	0.33	0.29	0.24	**0.29**
1997	**30m-40m**	*	*	0.26	0.19	0.15	0.10	0.08	0.16	0.16	0.14	0.21	0.10	**0.16**
	10m-30m	0.13	0.23	0.16	0.21	0.23	0.24	0.25	0.25	0.29	0.27	0.25	0.27	**0.23**
1998	**30m-40m**	0.34	0.27	0.24	0.26	0.22	0.26	0.30	0.28	0.32	0.32	0.28	0.30	**0.28**
	30m-50m	0.41	0.38	0.31	0.33	0.31	0.35	0.39	0.41	0.43	0.42	0.39	0.52	**0.39**
	10m-30m	0.20	0.22	0.21	0.20	0.23	0.24	0.28	0.28	0.27	0.28	0.30	0.28	**0.25**
1999	**30m-40m**	0.31	0.29	0.29	0.26	0.28	0.32	0.36	0.35	0.36	0.35	0.37	0.33	**0.32**
	30m-50m	0.51	0.47	0.42	0.29	0.24	0.32	0.30	0.29	0.26	0.37	*	0.53	**0.36**
	10m-30m	0.25	0.24	0.25	0.23	0.25	0.24	0.26	0.26	0.28	0.28	0.25	0.20	**0.25**
2000	**30m-40m**	0.33	0.33	0.33	0.31	0.27	0.29	0.37	0.42	0.36	0.34	0.25	0.27	**0.32**
	30m-50m	0.24	0.27	0.24	0.23	0.30	0.26	0.33	0.31	0.39	0.25	0.26	0.19	**0.27**
	10m-30m	0.30	0.24	0.23	0.24	0.22	0.30	0.27	0.31	0.31	0.30	0.31	0.31	**0.28**
2001	**30m-40m**	0.25	0.23	0.19	0.26	0.22	0.24	0.36	0.33	0.37	0.33	0.25	0.27	**0.27**
	30m-50m	0.29	0.26	0.21	0.27	0.19	0.20	0.26	0.26	0.29	0.30	0.30	0.30	**0.26**
	10m-30m	0.23	0.24	0.22	0.22	0.24	0.27	0.28	0.31	0.32	0.30	0.27	0.26	**0.26**
Average	**30m-40m**	0.29	0.28	0.27	0.29	0.26	0.29	0.36	0.36	0.35	0.34	0.29	0.26	**0.31**
	30m-50m	0.32	0.31	0.28	0.27	0.26	0.29	0.32	0.35	0.35	0.33	0.30	0.34	**0.31**

*Equipment was damaged during this period

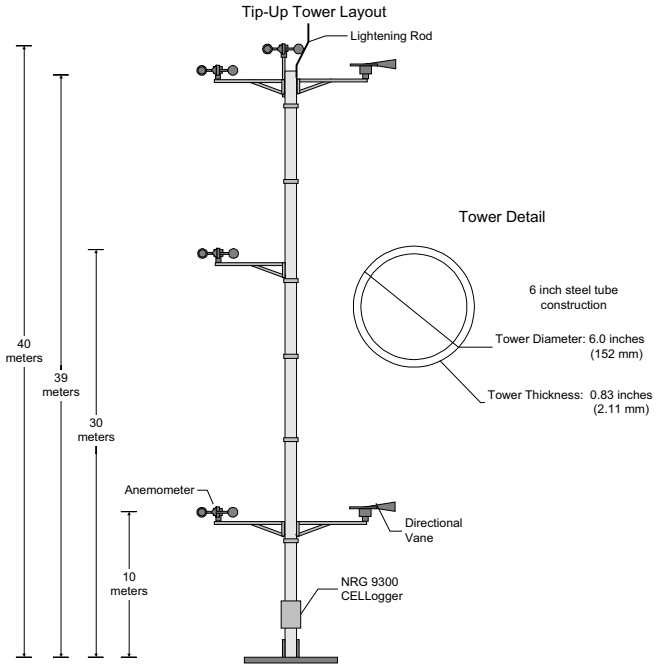
40 Meter Tip-Up Sites

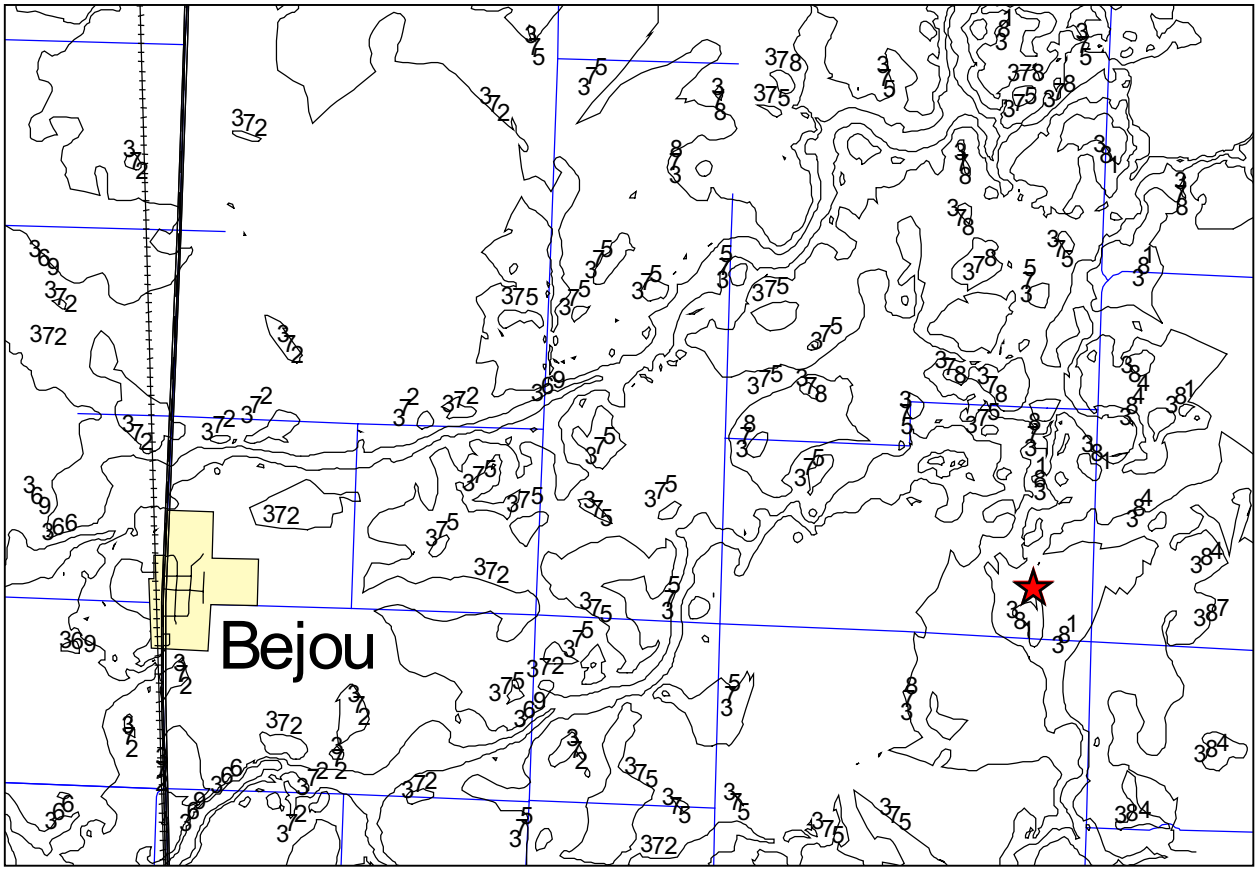
Bejou

Coordinates

Long/Lat	UTM
N 47.4425	E 283169
W 95.8730	N 5258347

Elevation: 1325 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Bejou

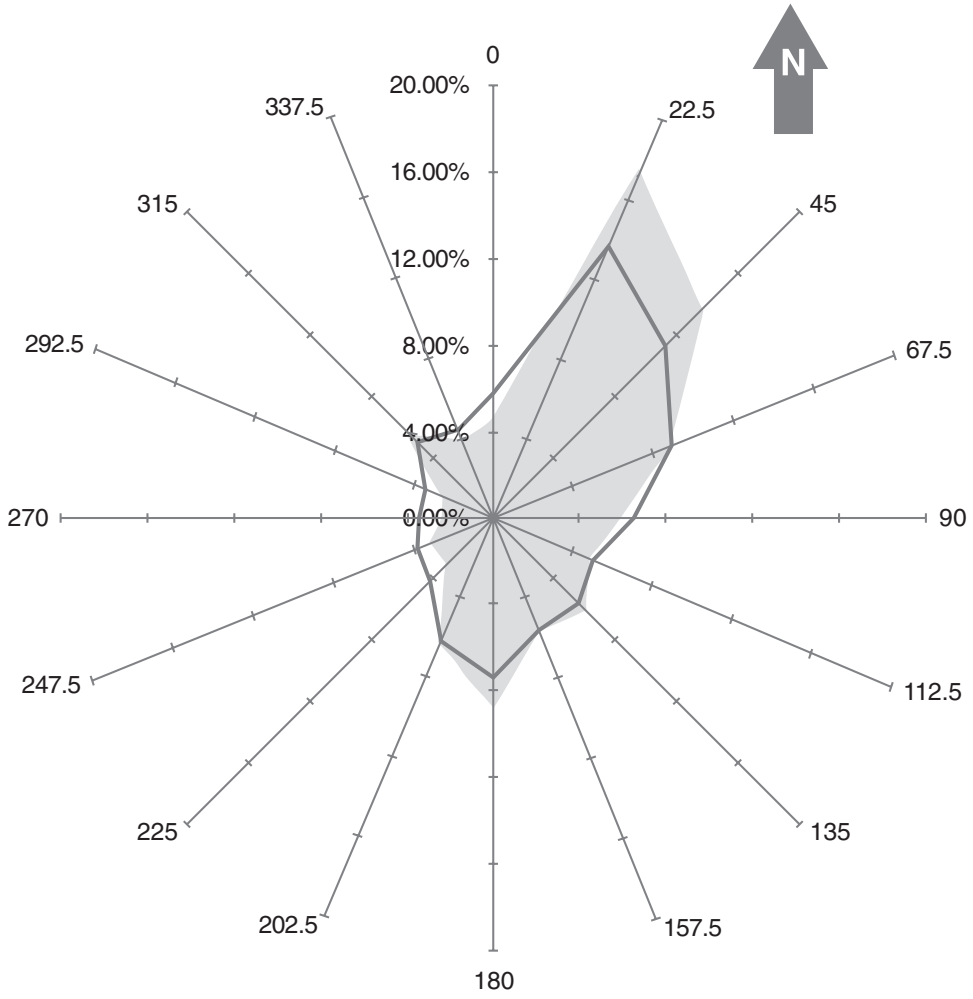
Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m										6.2	4.6	4.7	**5.2**
1996	**30m**										7.2	5.3	5.2	**5.9**
	40m										7.7	5.7	5.5	**6.3**
	10m	5.1	4.4	5.0	4.6	5.5	4.3	3.7	3.5	4.8	5.6	4.8	4.3	**4.6**
1997	**30m**	5.8	4.7	5.7	5.1	6.3	5.3	4.7	4.5	5.8	6.6	5.5	5.1	**5.4**
	40m	6.1	4.5	6.1	4.9	6.6	5.6	4.9	4.7	6.1	7.0	5.8	5.5	**5.7**
	10m	3.9	4.3	4.7	5.0	4.5	3.9	3.0	5.6	4.2	4.6	4.5	4.2	**4.4**
1998	**30m**	4.3	4.8	5.4	5.8	5.2	4.7	4.0	6.7	5.2	5.3	5.3	5.1	**5.2**
	40m	4.5	4.7	5.6	6.3	5.6	5.1	4.4	7.5	5.6	5.9	5.7	5.7	**5.5**
	10m	4.6	6.0	*	*	*	*	*	3.8	4.2	4.6	4.7	4.7	**4.7**
1999	**30m**	5.2	6.8	*	*	*	*	*	4.7	5.2	5.7	5.7	5.4	**5.5**
	40m	5.6	6.8	*	*	*	*	*	5.1	5.6	6.1	6.0	5.7	**5.8**
	10m	4.5	4.5	4.7	5.2	4.9	4.6	3.2	3.9	4.6	4.7	4.7	4.4	**4.5**
2000	**30m**	5.2	5.4	5.5	6.1	5.7	5.5	4.1	5.0	5.5	5.6	5.5	5.0	**5.3**
	40m	5.4	5.8	5.7	6.4	6.1	5.8	4.6	5.2	6.0	5.8	5.8	5.3	**5.7**
	10m	4.7	4.6											**4.7**
2001	**30m**	5.6	5.4											**5.5**
	40m	5.9	5.6											**5.8**
	10m	4.6	4.8	4.8	4.9	4.9	4.3	3.3	4.2	4.4	5.2	4.6	4.5	**4.5**
Average	**30m**	5.2	5.4	5.5	5.7	5.7	5.1	4.3	5.2	5.4	6.1	5.5	5.2	**5.4**
	40m	5.5	5.5	5.8	5.9	6.1	5.5	4.6	5.6	5.8	6.5	5.8	5.5	**5.7**
	10m	10.2	10.6	10.7	11.1	11.1	9.5	7.4	9.4	9.9	11.5	10.4	10.0	**10.2**
Average	**30m**	11.6	12.1	12.4	12.6	12.8	11.5	9.6	11.7	12.2	13.6	12.2	11.6	**12.0**
(mph)	**40m**	12.3	12.3	13.0	13.1	13.6	12.3	10.4	12.6	13.0	14.5	12.9	12.4	**12.7**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m										315	145	130	**197**
1996	**30m**										431	197	170	**266**
	40m										498	219	188	**302**
	10m	181	122	149	156	210	94	78	61	140	197	170	98	**138**
1997	**30m**	235	167	204	178	272	140	121	104	220	285	239	150	**193**
	40m	265	187	244	181	299	164	136	125	241	334	279	177	**219**
	10m	80	109	139	140	121	64	37	117	85	138	141	103	**106**
1998	**30m**	106	159	189	200	167	100	70	199	134	185	204	157	**156**
	40m	124	205	207	250	196	129	93	277	164	250	234	214	**195**
	10m	126	245	*	*	*	*	*	70	81	122	130	151	**132**
1999	**30m**	183	340	*	*	*	*	*	116	139	191	202	213	**198**
	40m	219	330	*	*	*	*	*	134	164	231	228	225	**219**
	10m	118	115	138	156	145	116	38	73	111	99	115	137	**113**
2000	**30m**	166	172	200	226	198	180	70	123	169	154	162	171	**166**
	40m	177	206	217	257	230	213	92	133	201	175	193	188	**190**
	10m	135	116											**126**
2001	**30m**	189	155											**172**
	40m	231	179											**205**
	10m	128	141	142	151	158	91	51	80	104	174	140	124	**124**
Average	**30m**	176	199	198	201	212	140	87	135	165	249	201	172	**178**
	40m	203	221	223	230	241	168	107	167	193	298	231	198	**207**

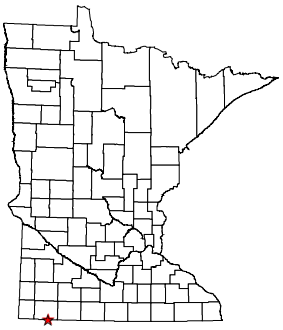
Bejou Wind Rose



Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	10m-30m										0.15	0.13	0.11	**0.13**
1996	**30m-40m**										0.36	0.35	0.33	**0.35**
	10m-30m	0.13	0.13	0.15	0.15	0.14	0.19	0.20	0.21	0.19	0.15	0.15	0.15	**0.16**
1997	**30m-40m**	0.34	0.36	0.40	0.42	0.36	0.38	0.40	0.39	0.40	0.40	0.35	0.43	**0.39**
	10m-30m	0.12	0.15	0.12	0.17	0.15	0.17	0.23	0.16	0.20	0.14	0.18	0.20	**0.17**
1998	**30m-40m**	0.44	0.39	0.27	0.43	0.44	0.46	0.46	0.39	0.47	0.52	0.49	0.47	**0.44**
	10m-30m	0.14	0.13	*	*	*	*	*	0.19	0.20	0.19	0.19	0.16	**0.17**
1999	**30m-40m**	0.45	0.40	*	*	*	*	*	0.44	0.39	0.40	0.44	0.38	**0.41**
	10m-30m	0.14	0.17	0.16	0.15	0.14	0.18	0.22	0.21	0.18	0.18	0.14	0.12	**0.17**
2000	**30m-40m**	0.35	0.42	0.38	0.33	0.40	0.41	0.50	0.44	0.50	0.38	0.36	0.31	**0.40**
	10m-30m	0.14	0.15											**0.15**
2001	**30m-40m**	0.34	0.34											**0.34**
	10m-30m	0.14	0.15	0.14	0.16	0.14	0.18	0.22	0.19	0.19	0.16	0.16	0.15	**0.16**
Average	**30m-40m**	0.38	0.38	0.35	0.40	0.40	0.41	0.45	0.41	0.44	0.41	0.40	0.38	**0.40**

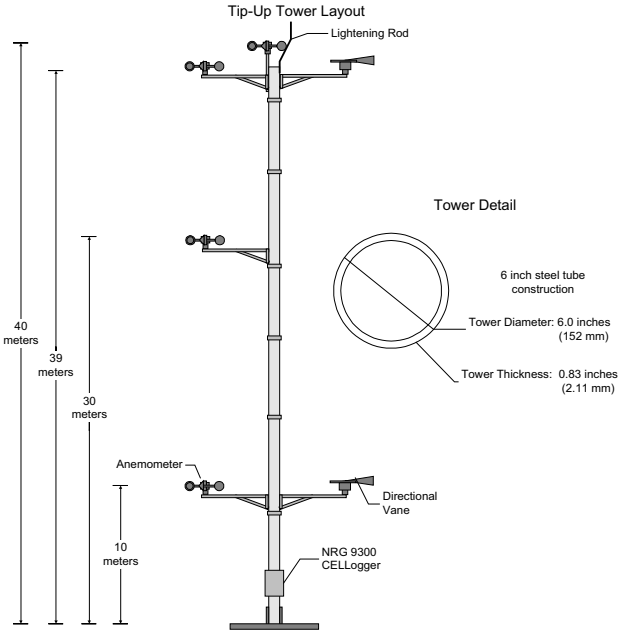
Bigelow

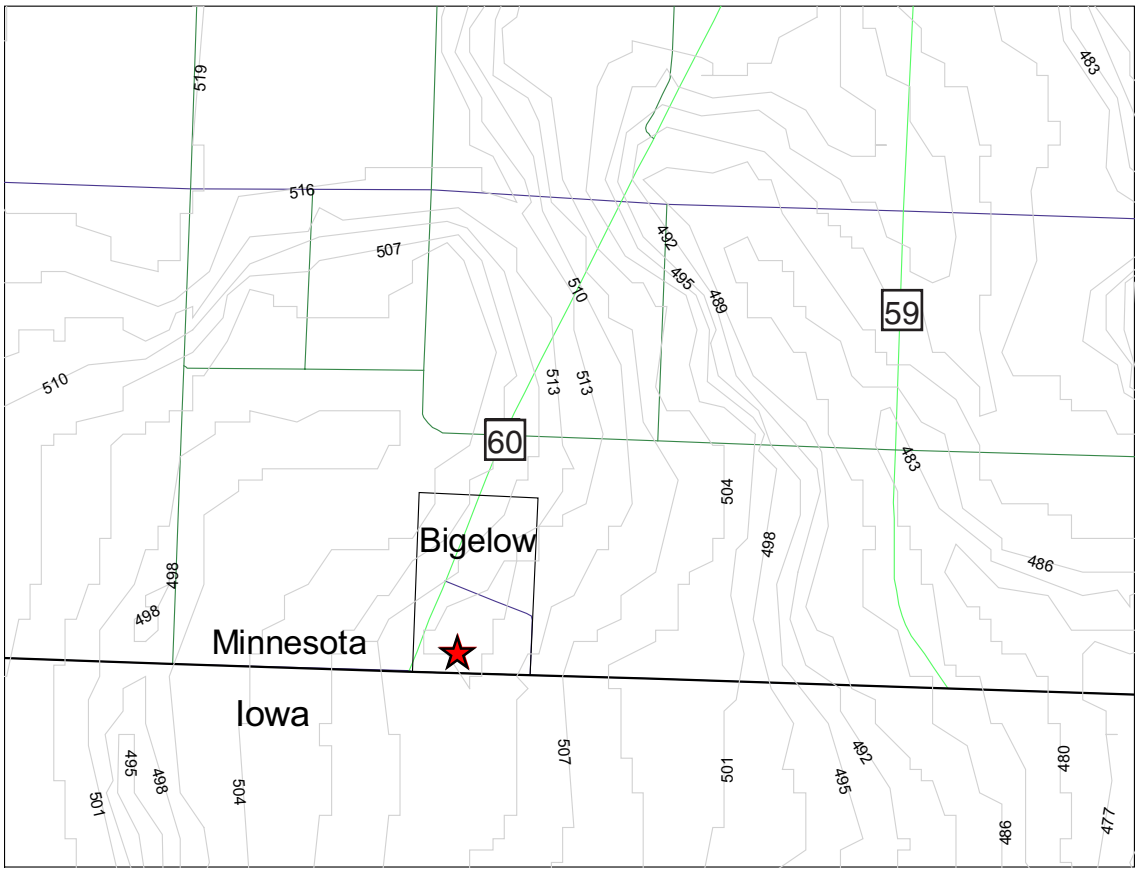


Coordinates

Long/Lat	UTM
N 43.5251	E 279569
W 95.7277	N 4822743

Elevation: 1683 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Bigelow

Wind Speed (Meters per Second)

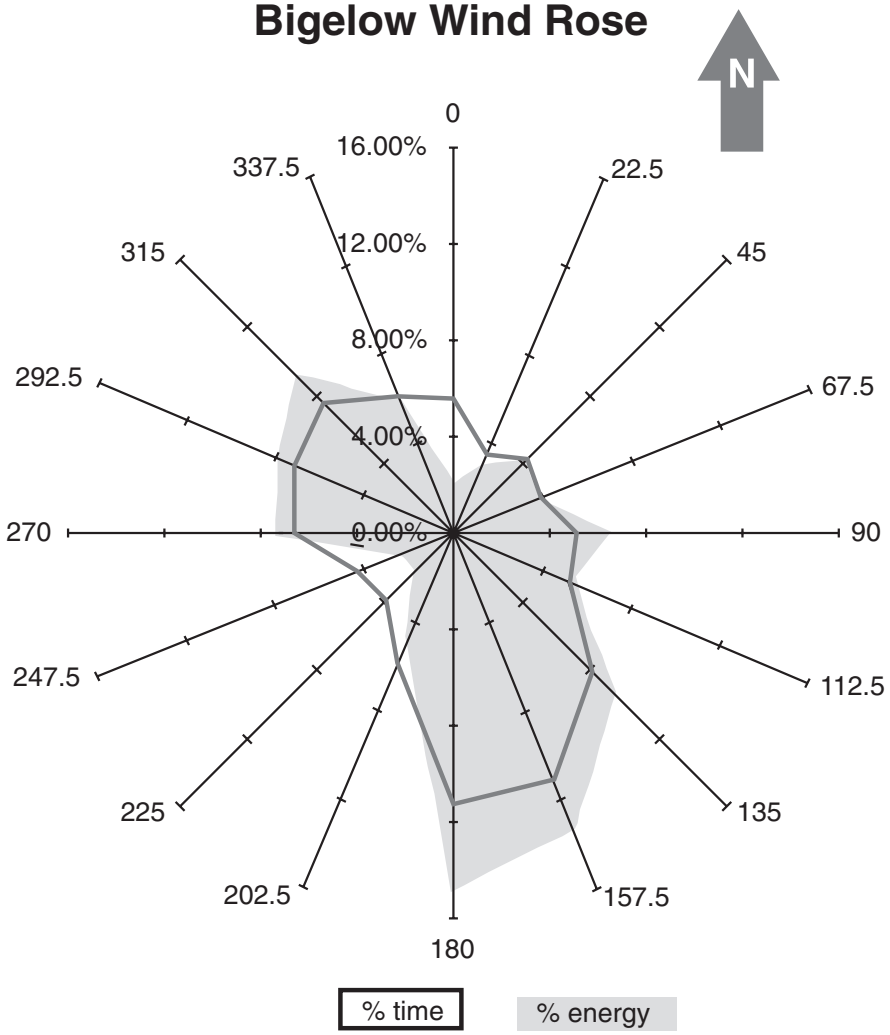
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m									4.1	5.5	5.6	5.0	**5.0**
1998	**30m**									5.3	6.7	6.9	6.4	**6.3**
	40m									6.0	7.5	7.8	7.0	**7.1**
	10m	5.7	6.2	5.8	6.7	6.2	5.1	4.4	4.1	4.7	5.3	5.2	4.5	**5.3**
1999	**30m**	6.5	7.4	7.0	7.9	7.4	6.3	5.6	5.4	6.1	6.7	6.7	5.9	**6.6**
	40m	7.0	8.1	7.8	8.8	7.8	6.9	6.3	6.1	6.8	7.4	7.4	6.6	**7.2**

Wind Power (Watts per Square Meter)

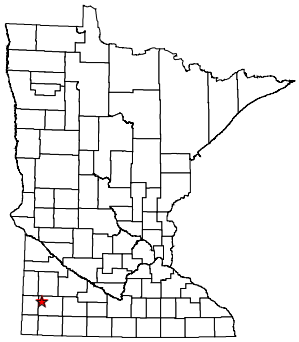
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m									83	171	255	170	**170**
1998	**30m**									151	277	404	284	**279**
	40m									204	358	535	354	**363**
	10m	193	279	277	326	237	149	109	80	110	162	164	96	**133**
1999	**30m**	282	426	433	503	370	247	192	146	193	274	285	183	**234**
	40m	379	528	526	697	424	310	249	194	250	348	371	250	**305**

Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m-30m									0.24	0.19	0.20	0.21	**0.21**
1998	**30m-40m**									0.47	0.43	0.46	0.38	**0.44**
	10m-40m									0.27	0.23	0.24	0.24	**0.25**
	10m-30m	0.15	0.16	0.19	0.17	0.17	0.19	0.21	0.22	0.23	0.23	0.23	0.25	**0.20**
1999	**30m-40m**	0.48	0.36	0.45	0.43	0.28	0.37	0.43	0.42	0.39	0.40	0.41	0.42	**0.40**
	10m-40m	0.20	0.20	0.23	0.21	0.18	0.22	0.25	0.25	0.26	0.25	0.26	0.28	**0.23**


Bigelow Wind Rose
N
0
16.00%
22.5
45
67.5
90
112.5
135
157.5
180
202.5
225
247.5
270
292.5
315
337.5
12.00%
8.00%
4.00%
0.00%
% time
% energy

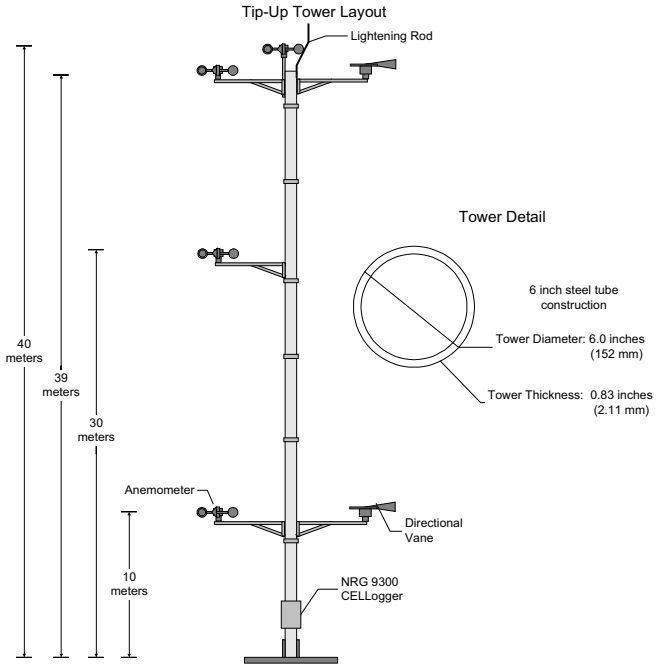
Current Lake

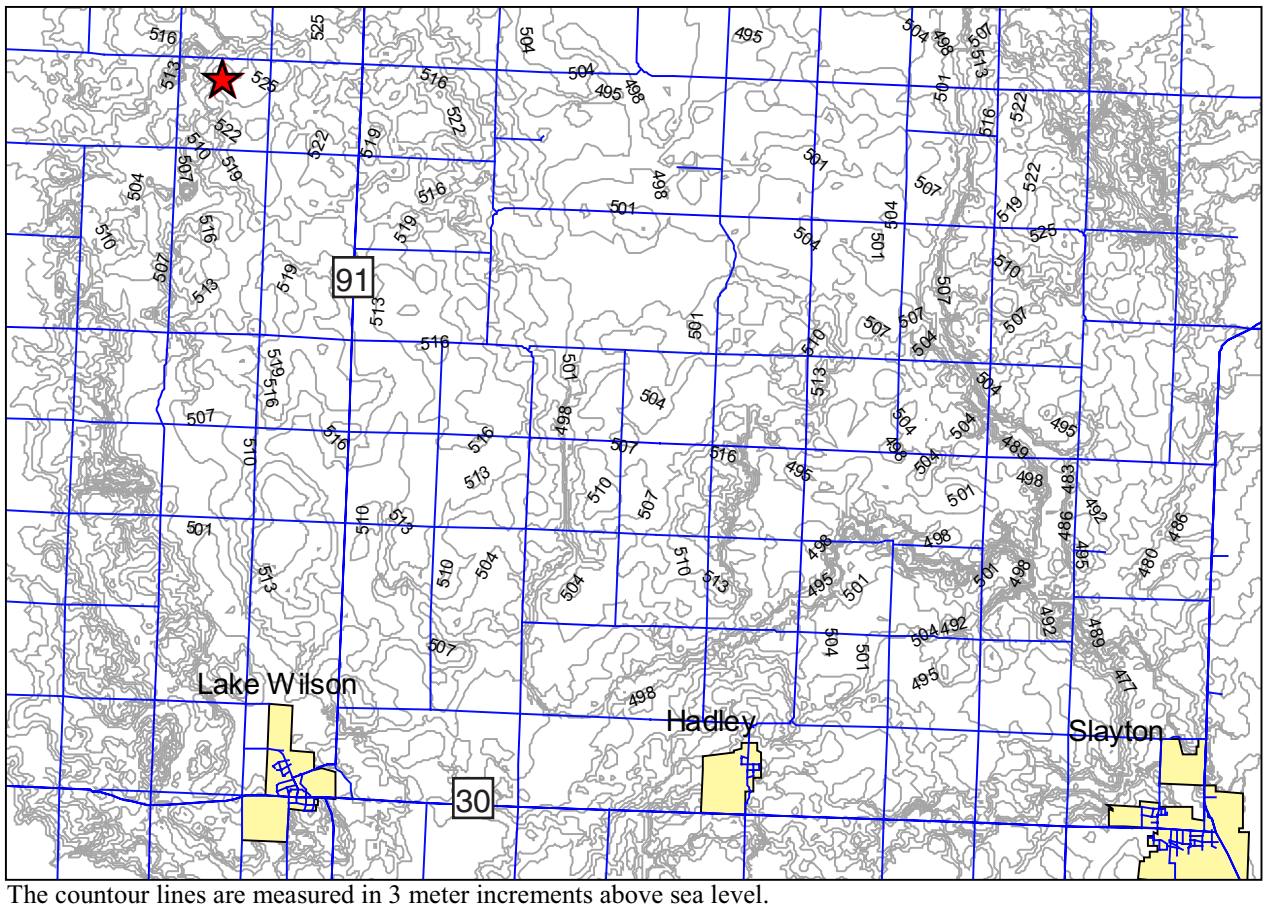


Coordinates

Long/Lat	UTM
N 44.1065	E 261992
W 95.9739	N 4888004

Elevation: 1747 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Current Lake

Wind Speed (m/s)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m					6.1	4.7	3.4	3.5	4.2	5.1	5.0	5.5	**4.7**
1998	**30m**					7.0	5.7	4.3	4.6	5.5	6.3	6.2	6.7	**5.8**
	40m					7.8	6.3	4.9	5.2	6.2	7.2	6.9	7.4	**6.5**
	10m	5.8	6.7	5.8	6.3	6.3	5.4	4.7	4.4	4.9	5.6	5.2	10.0	**5.9**
1999	**30m**	6.9	7.8	6.8	7.3	7.4	6.5	5.8	5.6	6.3	6.9	6.5	11.7	**7.1**
	40m	7.6	8.6	7.5	8.1	8.1	7.1	6.5	6.2	7.1	7.7	7.4	12.2	**7.8**
	10m	5.8	6.7	5.8	6.3	6.2	5.1	4.0	3.9	4.6	5.3	5.1	7.8	**5.6**
Average	**30m**	6.9	7.8	6.8	7.3	7.2	6.1	5.1	5.1	5.9	6.6	6.3	9.2	**6.7**
	40m	7.6	8.6	7.5	8.1	8.0	6.7	5.7	5.7	6.6	7.4	7.1	9.8	**7.4**
	10m	13.1	14.9	13.1	14.2	13.8	11.3	9.0	8.8	10.2	11.9	11.3	17.3	**12.4**
Average	**30m**	15.5	17.5	15.3	16.4	16.1	13.6	11.4	11.4	13.3	14.8	14.1	20.5	**15.0**
(mph)	**40m**	17.0	19.2	16.8	18.2	17.8	15.0	12.7	12.8	14.9	16.6	16.0	22.0	**16.6**

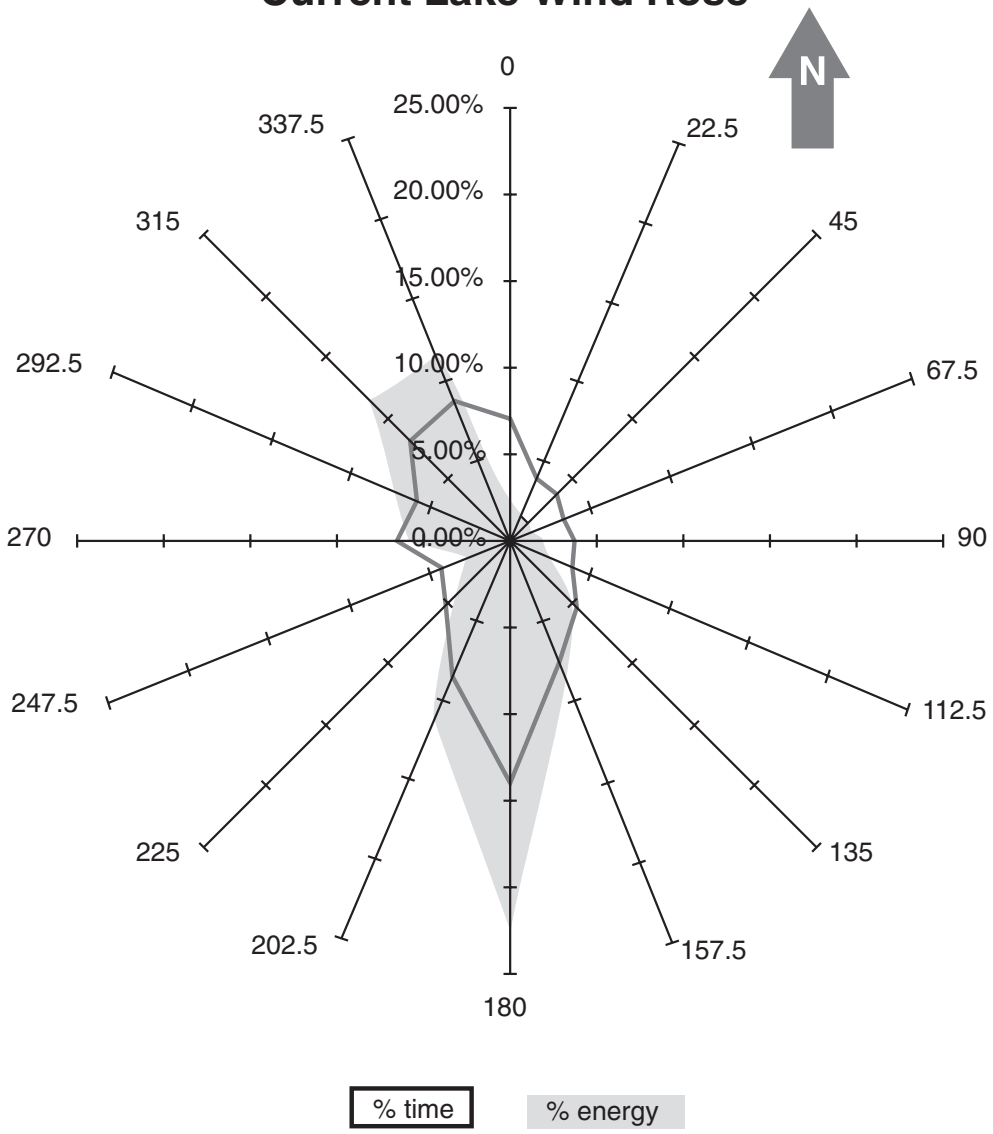
Power (m/s)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m					251	123	47	48	90	124	138	195	**127**
1998	**30m**					355	186	85	96	163	217	239	312	**207**
	40m					464	245	118	131	225	309	334	422	**281**
	10m	240	334	268	310	239	172	135	97	122	185	164	623	**217**
1999	**30m**	358	515	402	441	368	279	224	173	219	309	286	978	**355**
	40m	465	679	528	554	471	356	303	234	302	417	411	1122	**452**
	10m	240	334	268	310	245	147	91	73	106	154	151	409	**172**
Average	**30m**	358	515	402	441	362	232	154	134	191	263	263	645	**281**
	40m	465	679	528	554	468	300	211	183	264	363	372	772	**367**

Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
1998	**10m-30m**					0.16	0.20	0.27	0.30	0.30	0.25	0.22	0.22	**0.24**
	30m-40m					0.39	0.38	0.40	0.42	0.42	0.44	0.40	0.37	**0.18**
1999	**10m-30m**	0.14	0.14	0.17	0.14	0.15	0.16	0.20	0.22	0.24	0.22	0.22	0.14	**0.18**
	30m-40m	0.12	0.34	0.36	0.37	0.33	0.31	0.38	0.37	0.38	0.42	0.49	0.16	**0.34**
Average	**10m-30m**	0.14	0.14	0.17	0.14	0.15	0.18	0.23	0.26	0.27	0.24	0.22	0.18	**0.19**
	30m-40m	0.12	0.34	0.36	0.37	0.36	0.34	0.39	0.40	0.40	0.43	0.44	0.26	**0.35**

Current Lake Wind Rose

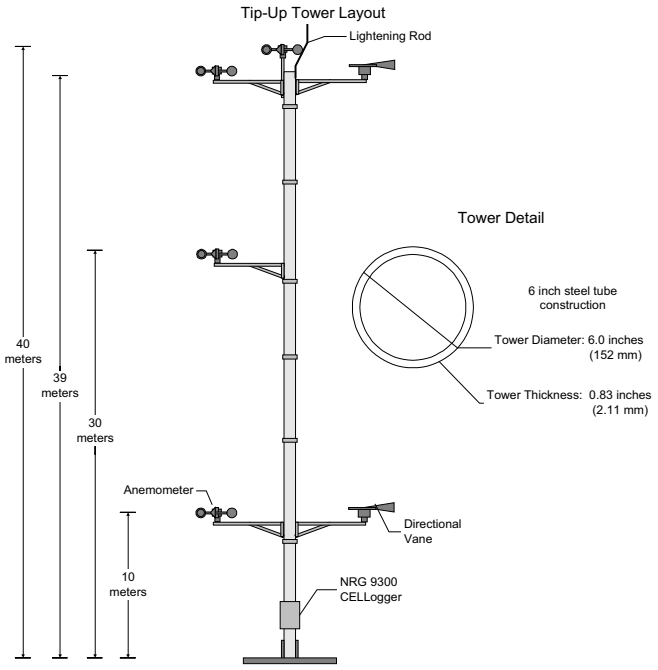


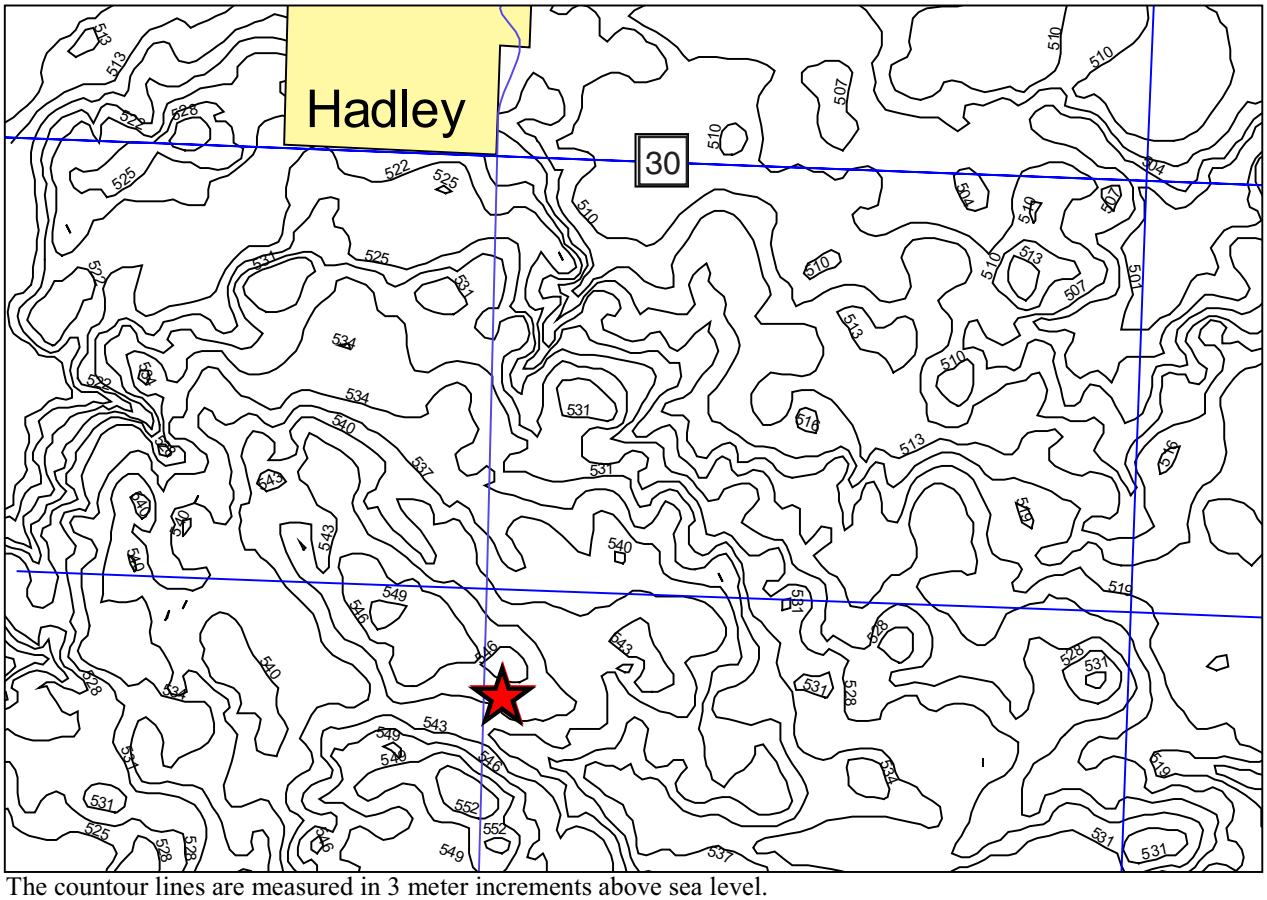
Hadley

Coordinates

Long/Lat	UTM
N 43.9752	E 271192
W 95.8527	N 4873077

Elevation: 1759 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Hadley

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m						6.0	4.0	4.2	5.1	6.0	6.7	6.5	**5.5**
2000	**30m**						7.1	5.1	5.3	6.4	6.7	7.9	7.2	**6.5**
	40m						8.0	5.9	6.4	7.6	8.0	8.9	8.1	**7.6**
	10m	4.2	6.1	5.4	6.9	5.9	5.6	3.9	4.1					**5.3**
2001	**30m**	5.3	6.2	*	*	*	*	*	*					**5.8**
	40m	6.4	7.9	7.0	9.0	7.6	7.1	5.5	6.1					**7.1**
	10m	4.2	6.1	5.4	6.9	5.9	5.8	3.9	4.2	5.1	6.0	6.7	6.5	**5.6**
Average	**30m**	5.3	6.2	*	*	*	7.1	5.1	5.3	6.4	6.7	7.9	7.2	**6.4**
	40m	6.4	7.9	7.0	9.0	7.6	7.6	5.7	6.3	7.6	8.0	8.9	8.1	**7.5**

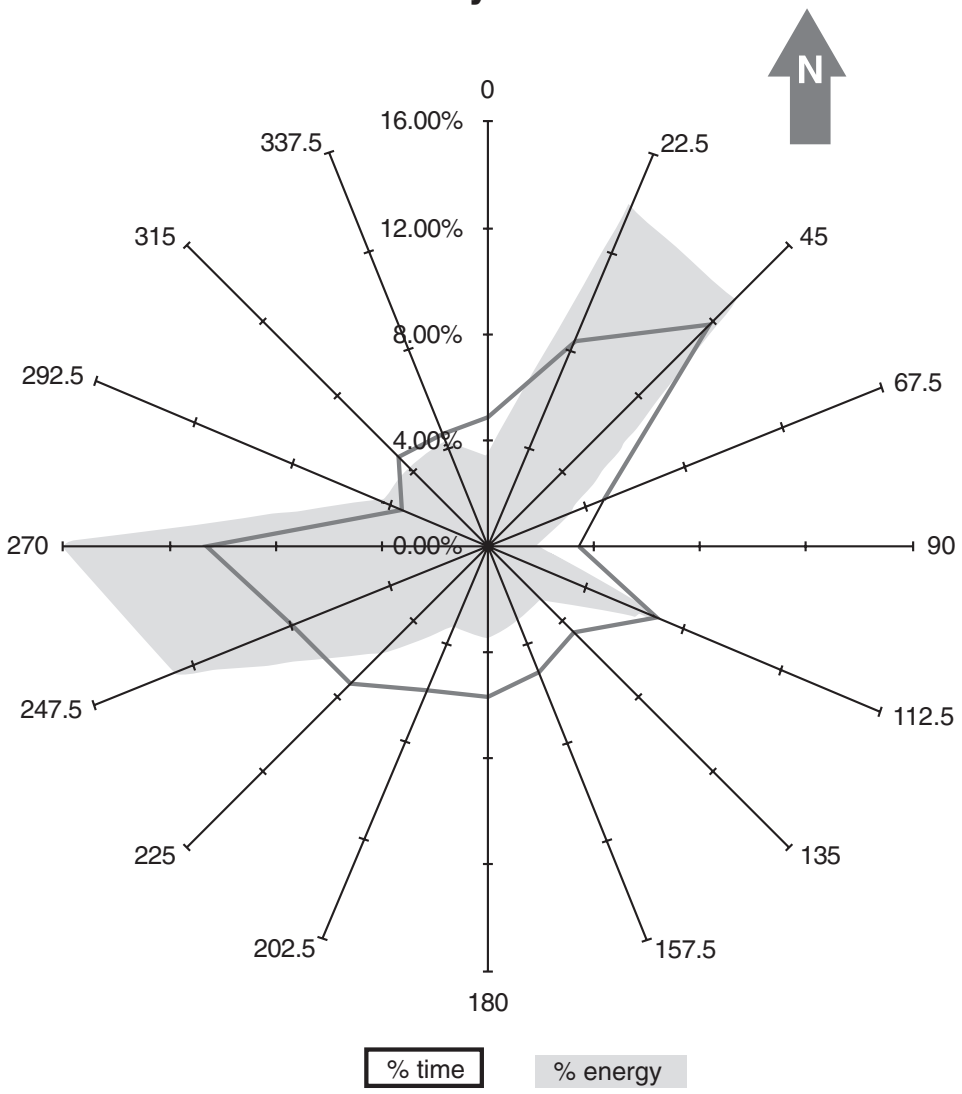
Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m						239	75	75	134	149	269	304	**178**
2000	**30m**						360	128	131	243	226	417	416	**274**
	40m						506	197	231	401	373	590	555	**407**
	10m	174	234	159	314	195	161	60	56					**169**
2001	**30m**	325	264	*	*	*	*	*	*					**294**
	40m	518	474	337	628	371	303	141	162					**367**
	10m	174	234	159	314	195	200	68	65	134	149	269	304	**189**
Average	**30m**	325	264	*	*	*	360	128	131	243	226	417	416	**279**
	40m	518	474	337	628	371	405	169	197	401	373	590	555	**418**

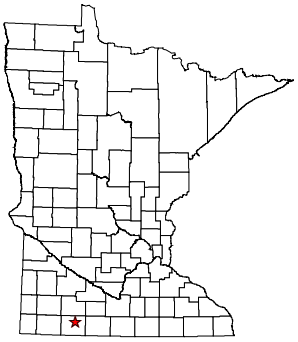
Wind Shear Exponent (Alpha)

	10m-30m						0.18	0.22	0.23	0.24	0.18	0.17	0.11	**0.19**
2000	**10m-40m**						0.23	0.27	0.30	0.30	0.25	0.22	0.16	**0.25**
	30m-40m						0.47	0.51	0.71	0.62	0.61	0.48	0.45	**0.55**
	10m-30m	0.18	0.16	*	*	*	*	*	*					**0.17**
2001	**10m-40m**	0.29	0.20	0.20	0.20	0.18	0.17	0.25	0.28					**0.22**
	30m-40m	0.52	0.54	*	*	*	*	*	*					**0.53**

Hadley Wind Rose



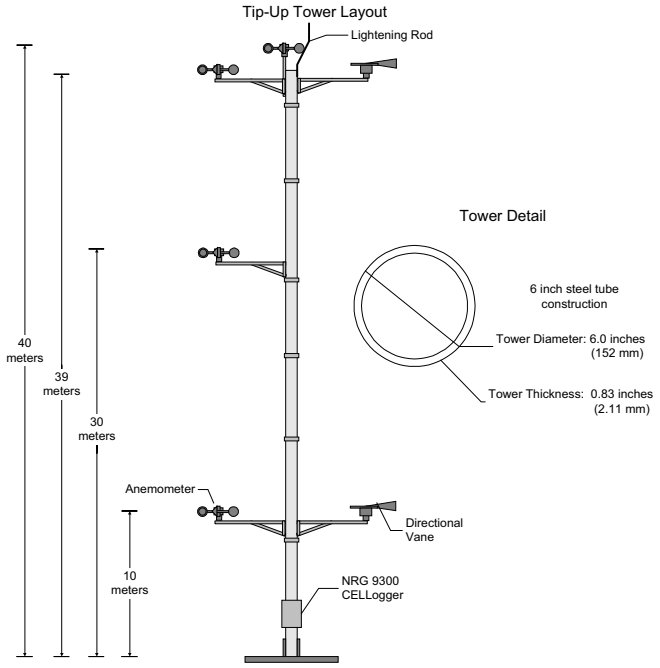
Heron Lake

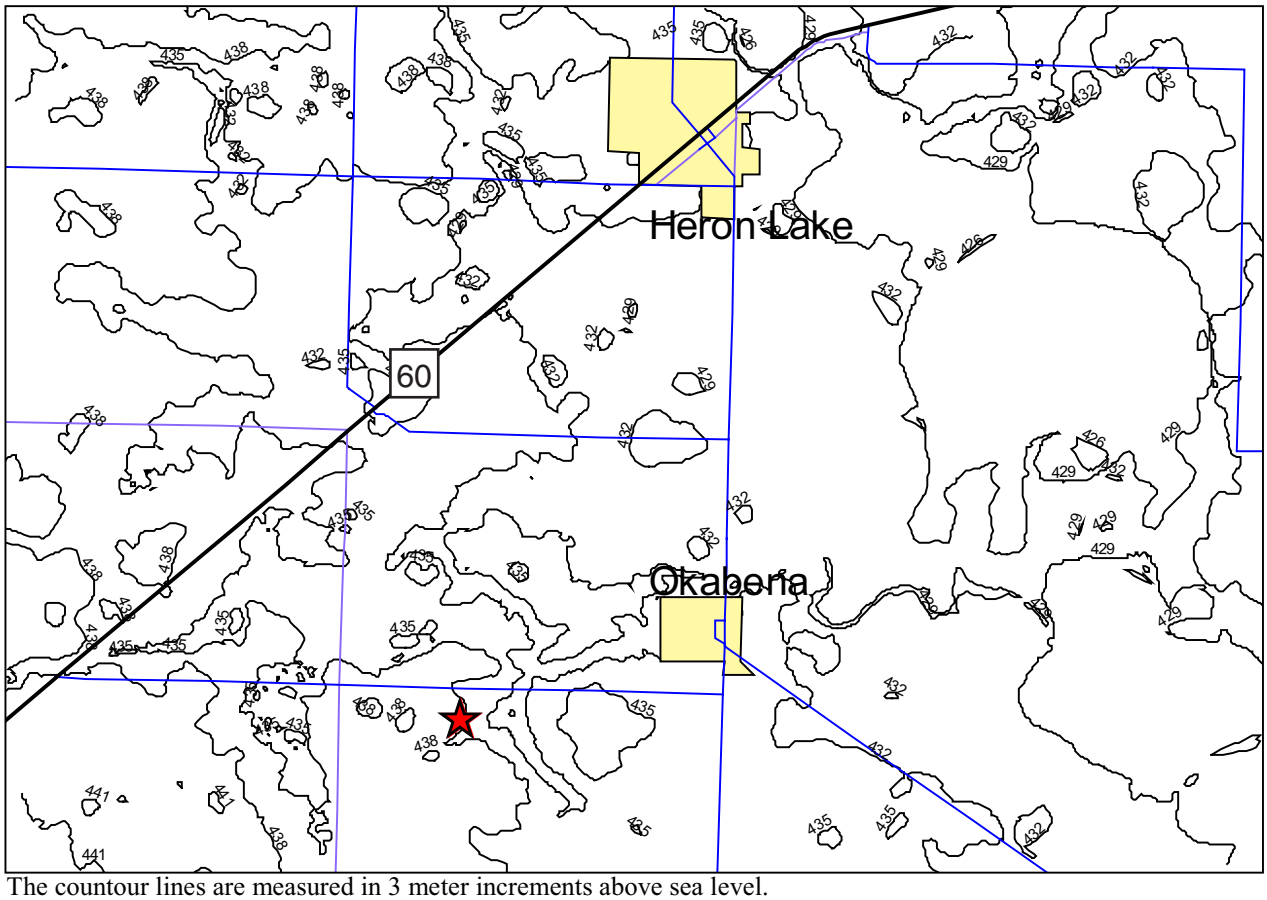


Coordinates

Long/Lat	UTM
N 43.7470	E 330711
W 95.1026	N 4845922

Elevation: 1453 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Heron Lake

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m												5.9	**5.9**
1999	**30m**												6.9	**6.9**
	40m												7.8	**7.8**
	10m	5.6	6.0	5.6	5.9	6.7	4.2	3.6	3.7	4.3				**5.1**
2000	**30m**	6.6	7.0	6.4	7.0	7.8	5.2	4.7	4.9	5.8				**6.1**
	40m	7.5	8.0	7.5	7.7	8.7	5.8	5.3	5.7	6.6				**7.0**
	10m	5.6	6.0	5.6	5.9	6.7	4.2	3.6	3.7	4.3	*	*	5.9	**5.1**
Average	**30m**	6.6	7.0	6.4	7.0	7.8	5.2	4.7	4.9	5.8	*	*	6.9	**6.2**
	40m	7.5	8.0	7.5	7.7	8.7	5.8	5.3	5.7	6.6	*	*	7.8	**7.1**

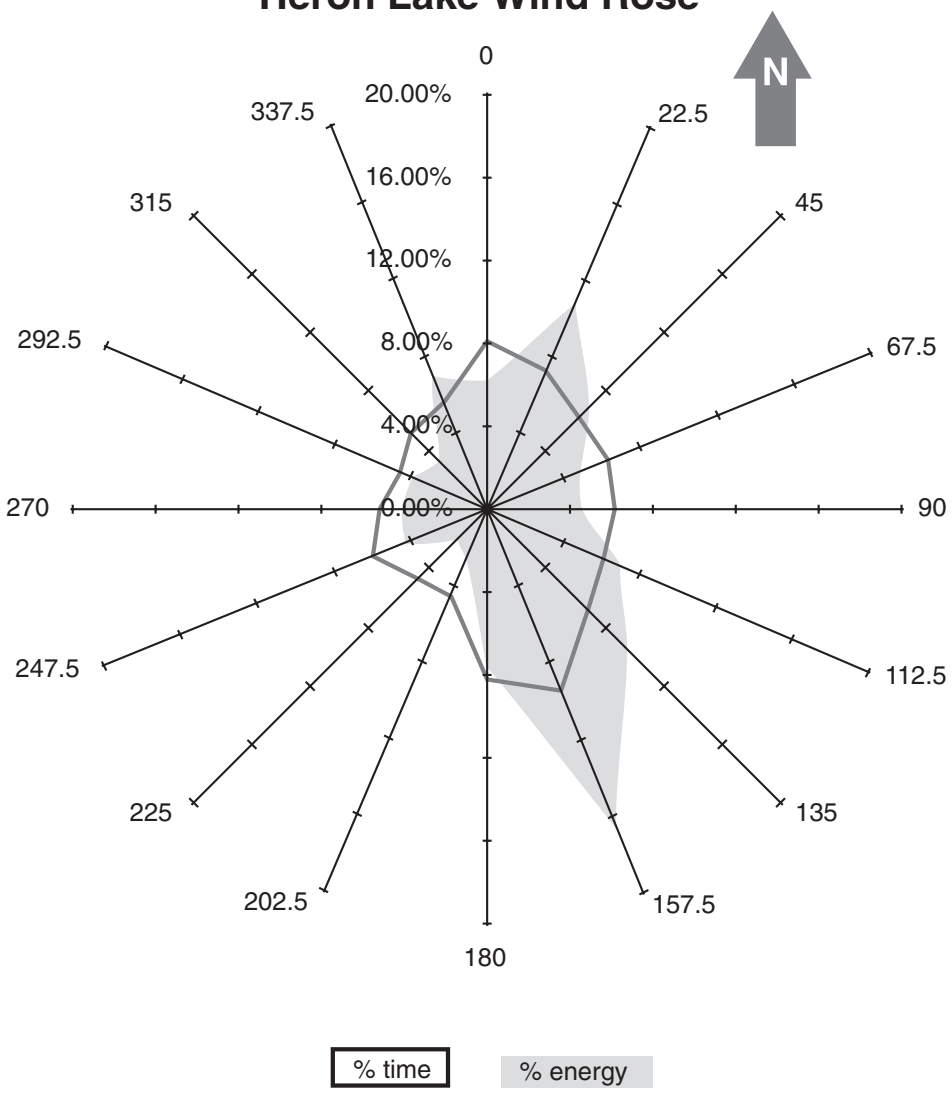
Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m												227	**227**
1999	**30m**												343	**343**
	40m												468	**468**
	10m	198	252	241	246	379	101	54	58	92				**180**
2000	**30m**	292	365	325	354	548	164	99	106	180				**271**
	40m	421	529	466	468	728	220	144	167	267				**379**
	10m	198	252	241	246	379	101	54	58	92	*	*	227	**180**
Average	**30m**	292	365	325	354	548	164	99	106	180	*	*	343	**271**
	40m	421	529	466	468	728	220	144	167	267	*	*	468	**379**

Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m-30m												0.10	**0.10**
1999	**10m-40m**												0.12	**0.12**
	30m-40m												0.25	**0.25**
	10m-30m	0.09	0.10	0.07	0.09	0.09	0.13	0.13	0.16	0.15				**0.11**
2000	**10m-40m**	0.13	0.14	0.11	0.12	0.13	0.15	0.17	0.21	0.18				**0.15**
	30m-40m	0.32	0.34	0.24	0.27	0.29	0.24	0.28	0.36	0.33				**0.30**
	10m-30m	0.09	0.10	0.07	0.09	0.09	0.13	0.13	0.16	0.15			0.10	**0.11**
Average	**10m-40m**	0.13	0.14	0.11	0.12	0.13	0.15	0.17	0.21	0.18			0.12	**0.15**
	30m-40m	0.32	0.34	0.24	0.27	0.29	0.24	0.28	0.36	0.33			0.25	**0.29**

Heron Lake Wind Rose

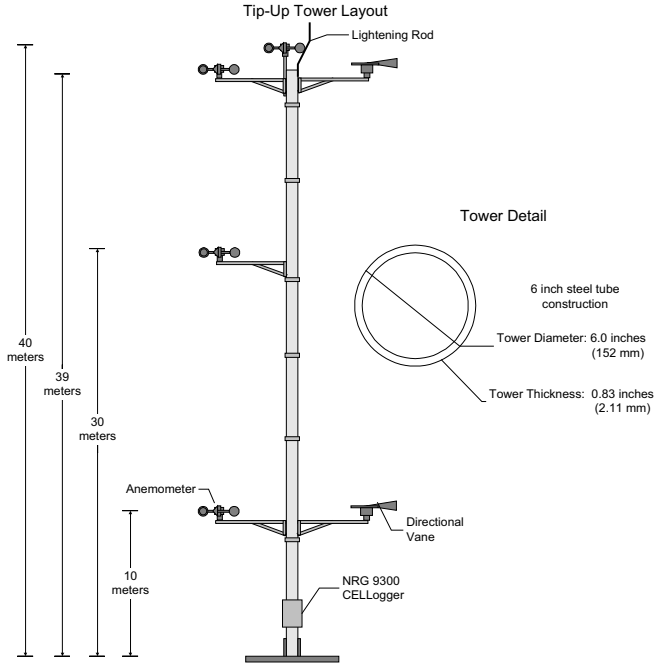


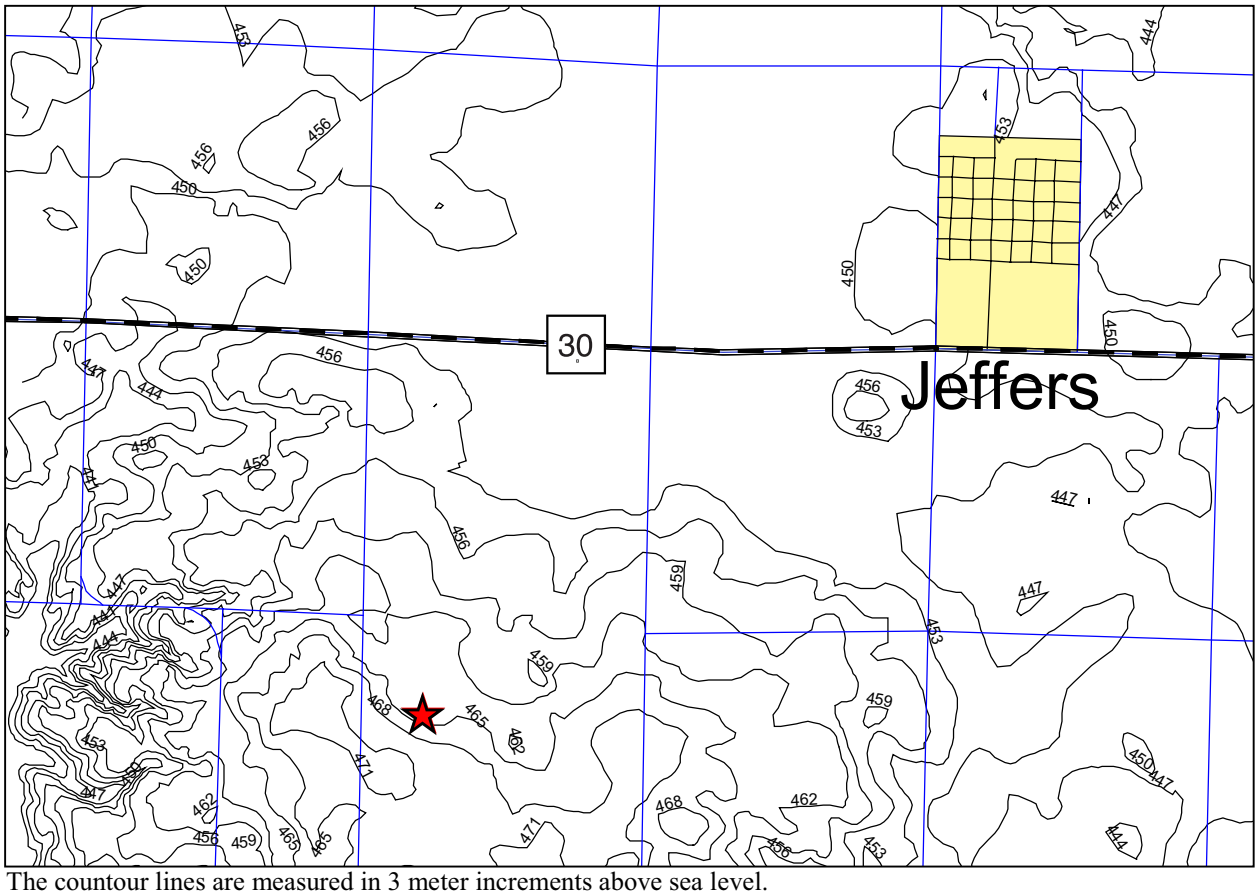
Jeffers

Coordinates

Long/Lat	UTM
N 44.0211	E 322048
W 95.2203	N 4876616

Elevation: 1551 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Jeffers

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	10m					6.4	5.7	4.8	4.5	5.2	6.1	6.3	6.4	5.7
1999	30m					7.3	6.7	5.9	5.8	6.7	7.5	7.5	7.5	6.9
	40m					7.6	7.2	*	*	*	*	*	*	7.4
	10m	6.3	6.3	5.8	6.5	6.4	6.1	3.8	4.0	4.6	5.0			5.5
2000	30m	7.4	7.3	6.8	7.4	7.3	7.2	5.0	5.5	6.3	6.7			6.7
	40m	*	*	*	*	*	*	*	*	*	*			*
	10m	6.3	6.3	5.8	6.5	6.4	5.9	4.3	4.3	4.9	5.5	6.3	6.4	5.6
Average	30m	7.4	7.3	6.8	7.4	7.3	6.9	5.4	5.7	6.5	7.1	7.5	7.5	6.8
	40m	*	*	*	*	7.6	7.2	*	*	*	*	*	*	7.4

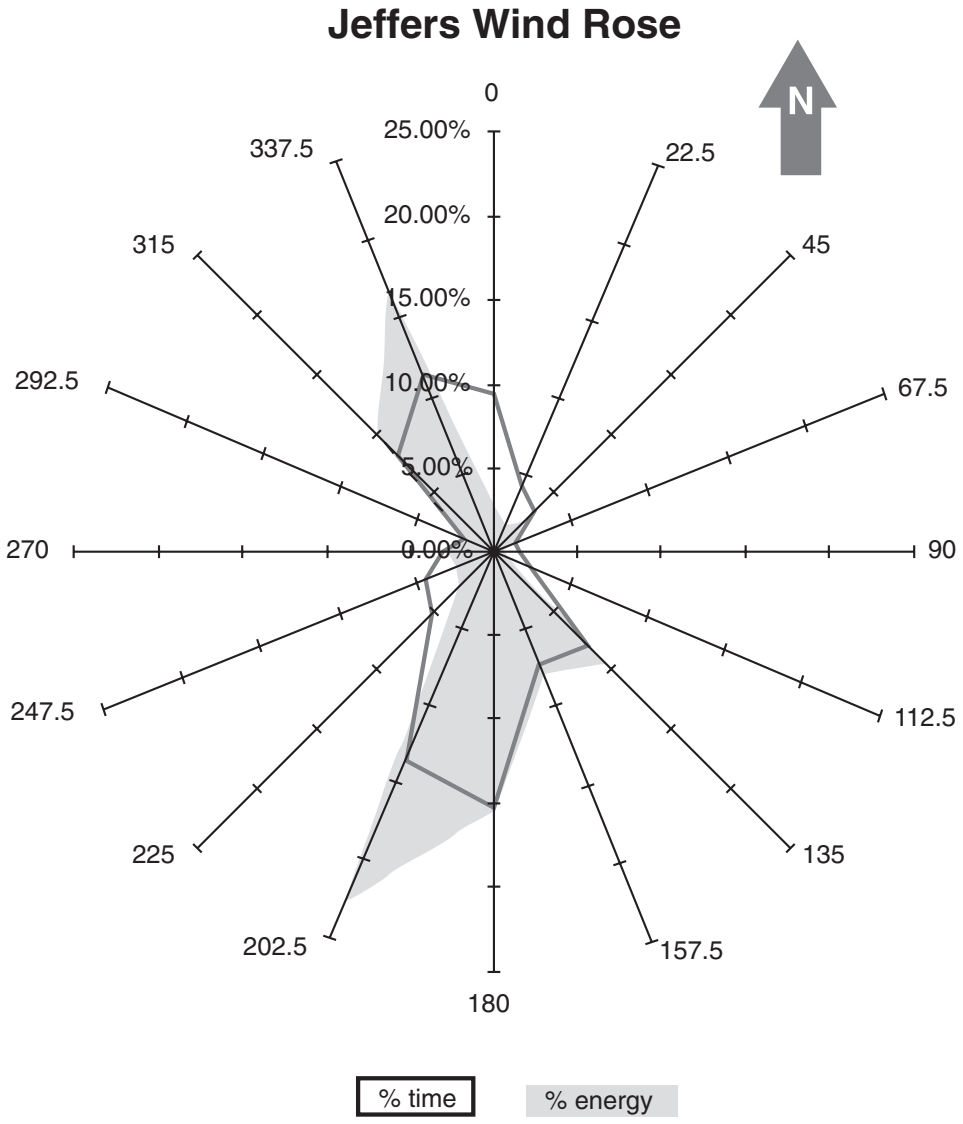
Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
	10m					255	184	123	88	122	237	247	293	194
1999	30m					352	275	214	171	232	372	384	421	303
	40m					388	325	*	*	*	*	*	*	356
	10m	271	276	253	281	277	221	57	56	93	88			187
2000	30m	395	393	351	391	369	333	115	139	221	204			291
	40m	*	*	*	*	*	*	*	*	*	*			*
	10m	271	276	253	281	266	203	90	72	107	163	247	293	198
Average	30m	395	393	351	391	360	304	165	155	226	288	384	421	303
	40m	*	*	*	*	388	325	*	*	*	*	*	*	356

Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1999	10m-30m					0.14	0.16	0.20	0.23	0.24	0.19	0.18	0.17	0.19
	30m-40m					0.18	0.21	*	*	*	*	*	*	0.20
2000	10m-30m	0.16	0.15	0.17	0.15	0.14	0.17	0.23	0.29	0.30	0.28			0.20
	30m-40m	*	*	*	*	*	*	*	*	*	*			*
Average	10m-30m	0.16	0.15	0.17	0.15	0.14	0.16	0.22	0.26	0.27	0.23	0.18	0.17	0.19
	30m-40m	*	*	*	*	0.18	0.21	*	*	*	*	*	*	0.20

* Equipment was damaged during this period.

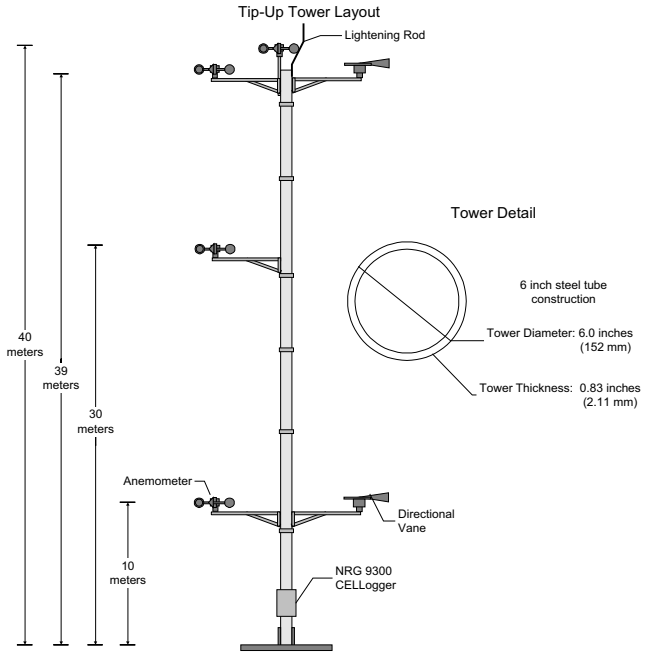

Jeffers Wind Rose
N
0
22.5
45
67.5
90
112.5
135
157.5
180
202.5
225
247.5
270
292.5
315
337.5
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
% time
% energy

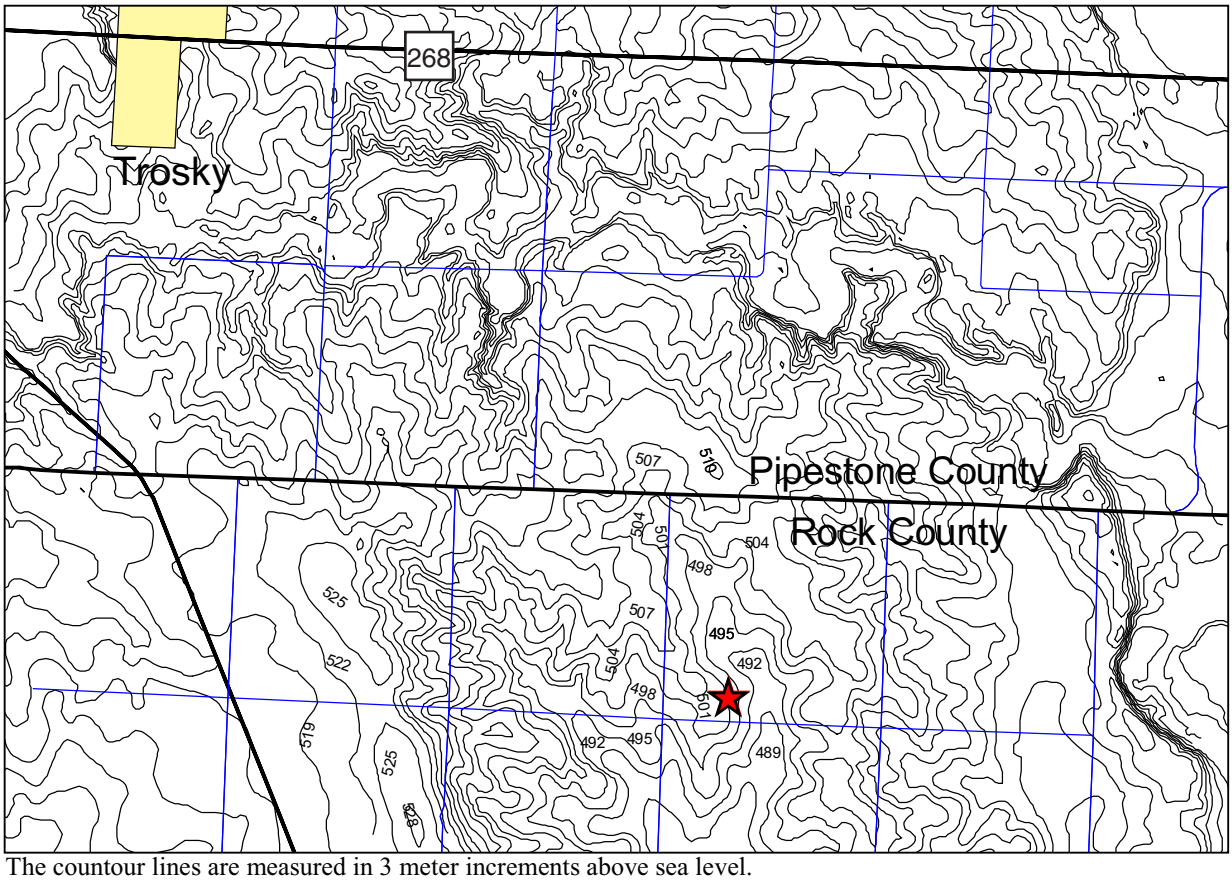
Trosky

Coordinates

Long/Lat	UTM
N 43.8353	E 243808
W 96.1866	N 4858522

Elevation: 1629 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Trosky

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m									4.7	5.5	5.5	5.3	**5.3**
1999	**30m**									6.2	6.9	6.9	6.7	**6.7**
	40m									6.7	7.3	7.4	7.0	**7.1**
	10m	5.5	5.7	5.2	3.5	*	*	*	*					**5.0**
2000	**30m**	6.8	7.0	6.4	7.4	7.2	7.0	5.1	5.2					**6.5**
	40m	7.2	7.4	6.7	7.7	7.5	7.2	5.2	5.5					**6.8**
	10m	5.5	5.7	5.2	3.5	*	*	*	*	4.7	5.5	5.5	5.3	**5.1**
Average	**30m**	6.8	7.0	6.4	7.4	7.2	7.0	5.1	5.2	6.2	6.9	6.9	6.7	**6.6**
	40m	7.2	7.4	6.7	7.7	7.5	7.2	5.2	5.5	6.7	7.3	7.4	7.0	**6.9**

Wind Power (Watts per Square Meter)

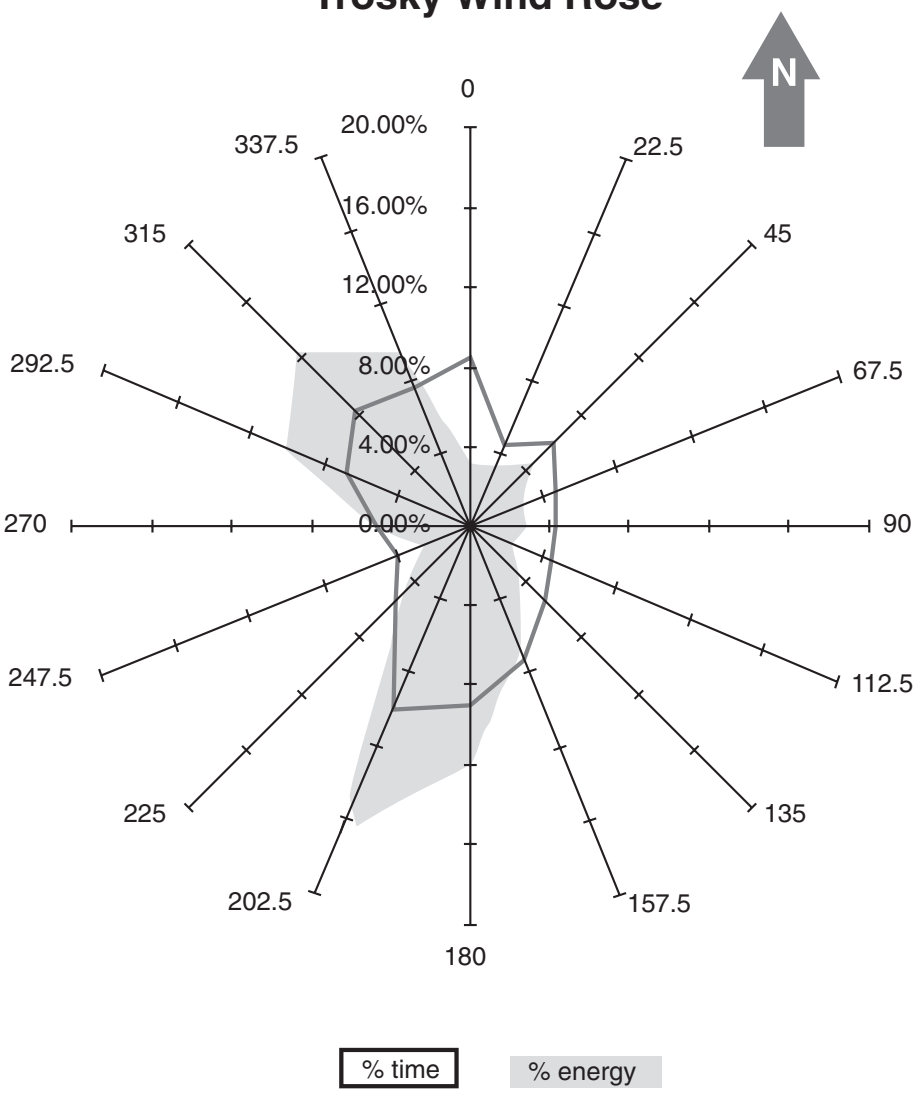
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m									104	168	179	167	**155**
1999	**30m**									206	296	316	290	**277**
	40m									248	344	375	335	**326**
	10m	183	208	203	176	*	*	*	*					**192**
2000	**30m**	311	345	327	431	401	356	128	122					**303**
	40m	366	398	361	484	445	386	141	141					**340**
	10m	183	208	203	176	*	*	*	*	104	168	179	167	**174**
Average	**30m**	311	345	327	431	401	356	128	122	206	296	316	290	**294**
	40m	366	398	361	484	445	386	141	141	248	344	375	335	**335**

Wind Shear Exponent (Alpha)

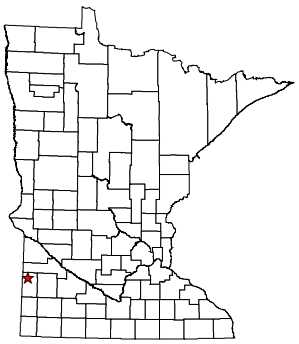
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m-30m									0.27	0.22	0.23	0.21	**0.24**
1999	**30m-40m**									0.27	0.25	0.27	0.25	**0.26**
	10m-40m									0.27	0.22	0.23	0.21	**0.23**
	10m-30m	0.22	0.19	0.21	0.19	*	*	*	*					**0.20**
2000	**30m-40m**	0.27	0.22	0.21	0.23	0.22	0.16	0.22	0.25					**0.22**
	10m-40m	0.21	0.19	0.20	0.18	*	*	*	*					**0.19**
	10m-30m	0.22	0.19	0.21	0.19	*	*	*	*	0.27	0.22	0.23	0.21	**0.22**
Average	**30m-40m**	0.27	0.22	0.21	0.23	0.22	0.16	0.22	0.25	0.27	0.25	0.27	0.25	**0.23**
	10m-40m	0.21	0.19	0.20	0.18	*	*	*	*	0.27	0.22	0.23	0.21	**0.21**

* Equipment was damaged during this period

Trosky Wind Rose



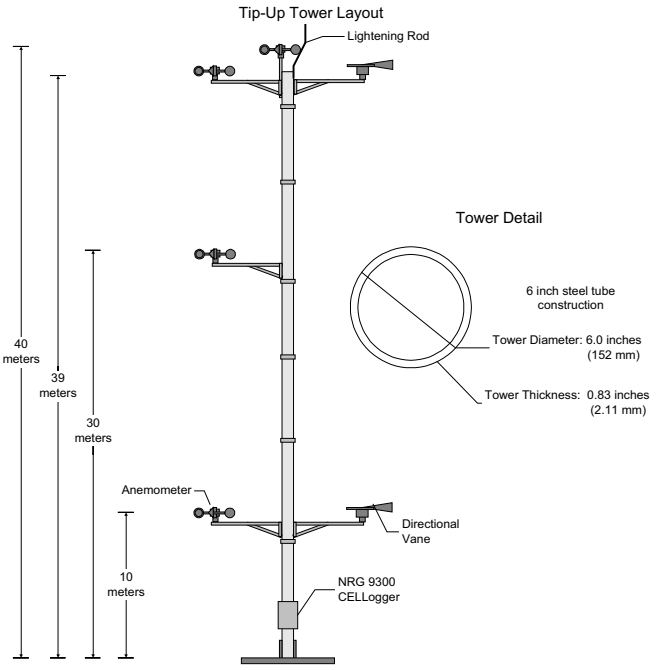
Wilno

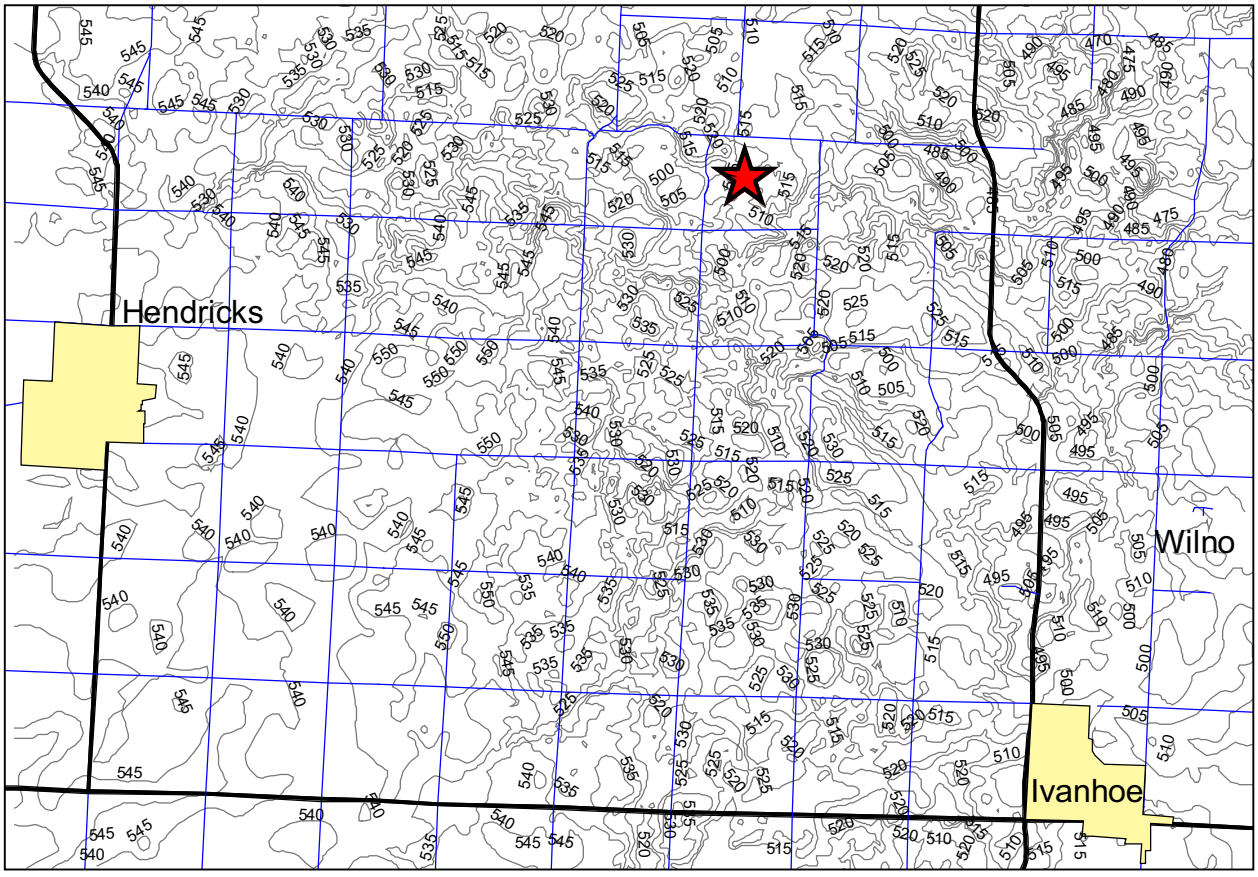


Coordinates

Long/Lat	UTM
N 44.5545	E 716605
W 96.2728	N 4937076

Elevation: 1604feet





The countour lines are measured in 5 meter increments above sea level.
County roads are approximately 1 mile apart.

Wilno

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
	10m					5.1	3.2	3.2	3.9	4.5	5.1	3.3	5.8	**4.3**
1998	30m					5.8	3.8	3.5	4.7	5.8	6.4	5.9	7.0	**5.4**
	40m					6.2	4.1	4.3	5.3	6.6	6.8	6.3	7.5	**5.9**
	10m	5.7	6.1	5.8	6.0	6.2	5.4	4.7	4.8	5.4				**5.6**
1999	30m	6.9	7.8	6.8	6.9	7.1	6.2	5.6	5.8	6.5				**6.6**
	40m	6.9	7.8	6.8	6.9	7.1	6.2	5.6	5.8	6.5				**6.6**
	10m	5.7	6.1	5.8	6.0	5.7	4.3	3.9	4.4	5.0	5.1	3.3	5.8	**5.1**
Average	30m	6.9	7.8	6.8	6.9	6.4	5.0	4.5	5.2	6.2	6.4	5.9	7.0	**6.3**
	40m	6.9	7.8	6.8	6.9	6.7	5.1	4.9	5.5	6.6	6.8	6.3	7.5	**6.5**

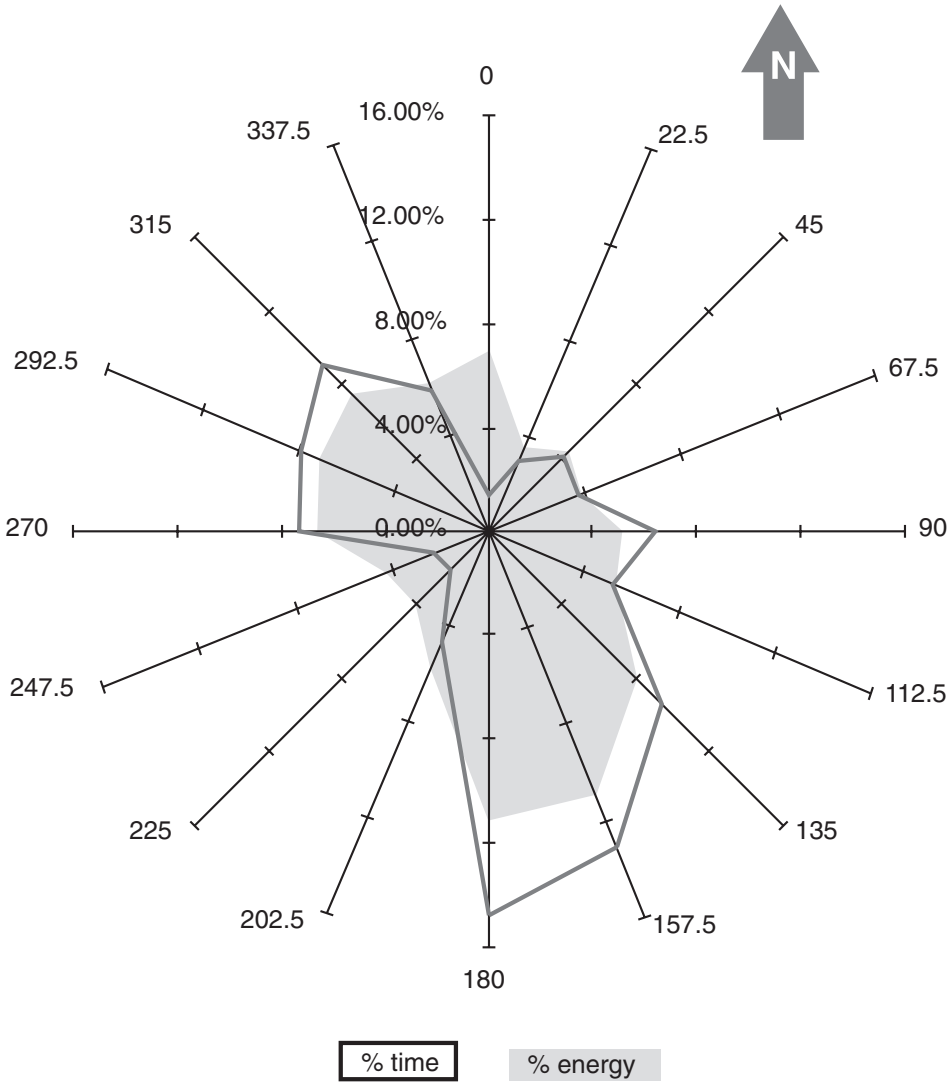
Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
	10m					165	64	38	62	121	164	235	231	**135**
1998	30m					247	93	57	99	193	257	388	352	**211**
	40m					307	119	90	148	279	294	428	413	**260**
	10m	248	357	279	237	243	168	121	124	159				**215**
1999	30m	373	541	407	338	344	245	190	198	256				**321**
	40m	156	940	848	750	666	624	239	595	230				**561**
	10m	248	357	279	237	204	116	79	93	140	164	235	231	**199**
Average	30m	373	541	407	338	296	169	124	149	224	257	388	352	**301**
	40m	156	940	848	750	487	371	164	372	255	294	428	413	**456**

Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1998	10m-30m					0.12	0.22	0.21	0.20	0.23	0.19	0.17	0.17	**0.19**
	30m-40m					0.15	0.19	0.42	0.33	0.26	0.23	0.25	0.22	**0.26**
1999	10m-30m	0.14	0.14	0.15	0.13	0.11	0.12	0.17	0.18	0.17				**0.15**
	30m-40m	0.19	0.16	0.20	0.16	0.20	0.23	0.27	0.26	0.21				**0.21**
Average	10m-30m	0.14	0.14	0.15	0.13	0.12	0.17	0.19	0.19	0.20	0.19	0.17	0.17	**0.16**
	30m-40m	0.19	0.16	0.20	0.16	0.17	0.21	0.34	0.29	0.24	0.23	0.25	0.22	**0.22**

Wilno Wind Rose

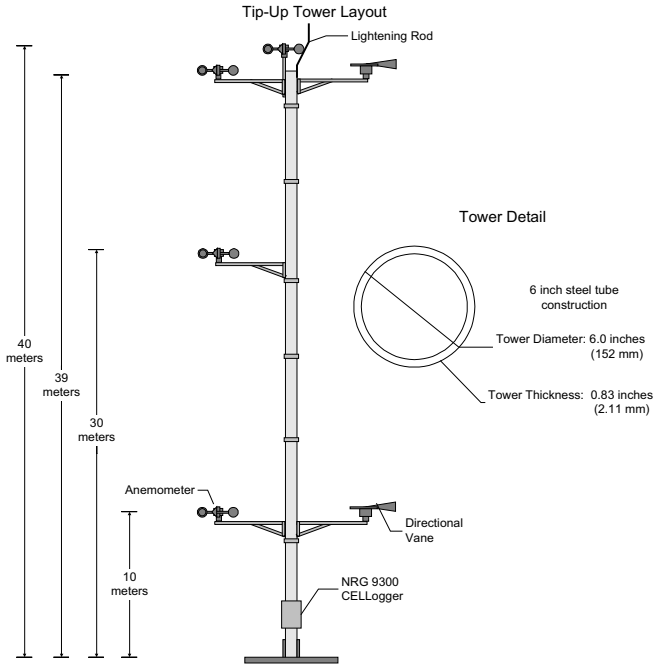


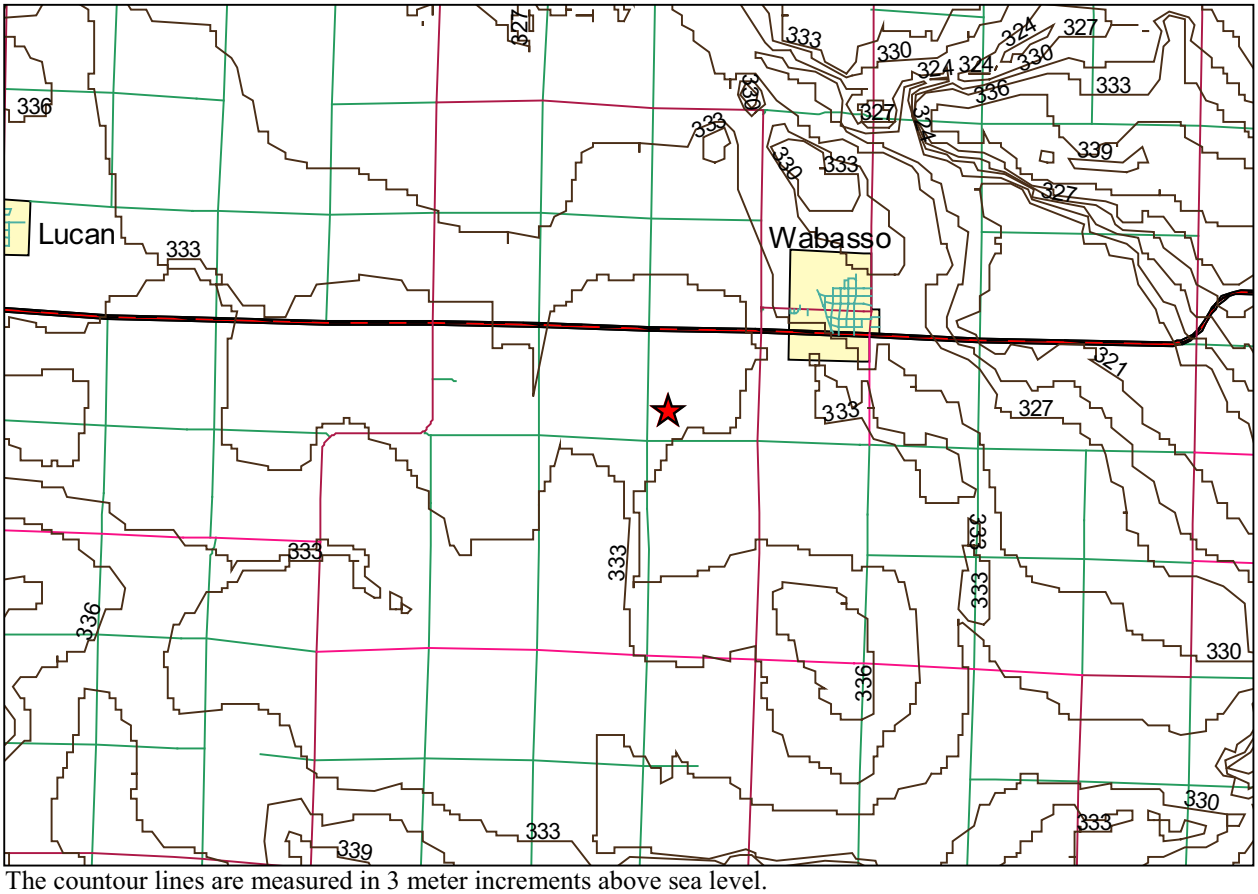
Wabasso

Coordinates

Long/Lat	UTM
N 44.3877	E 317669
W 95.2891	N 4917486

Elevation: 1096 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
	10m		5.8	5.2	5.4	5.1	4.7	3.7	3.2	3.7	5.5	5.6	5.2	4.8
1995	30m		6.8	6.1	6.4	6.1	5.7	4.9	4.4	5.0	6.7	6.6	6.0	5.9
	40m		7.6	6.8	7.1	6.6	6.2	5.4	5.1	5.6	7.4	7.1	6.6	6.5
	10m	5.9	6.3	5.9	5.5	4.9	4.4	3.5	3.2	3.4	5.6	4.9	5.4	4.9
1996	30m	6.8	7.4	6.9	6.5	5.9	5.5	4.8	4.4	4.6	7.0	5.9	6.4	6.0
	40m	7.4	8.1	7.5	7.1	6.5	6.0	5.2	5.0	5.4	7.8	6.5	6.9	6.6
	10m	6.2	5.4	5.7	5.3	6.0	4.5	3.7	2.8	3.7	5.4	4.9	4..82	4.9
1997	30m	7.5	6.4	6.8	6.2	7.1	5.6	4.9	3.9	5.0	6.7	5.9	5.8	6.0
	40m	8.0	7.0	7.4	6.7	7.5	5.8	5.0	4.1	5.4	7.1	6.2	6.1	6.4
	10m	4.0	4.0	5.2	5.2									4.6
1998	30m	4.8	5.0	6.1	6.2									5.5
	40m	5.1	5.4	6.5	6.7									5.9
	10m	5.4	5.4	5.5	5.3	5.3	4.5	3.6	3.1	3.6	5.5	5.1	5.3	4.8
Average	30m	6.4	6.4	6.5	6.3	6.4	5.6	4.8	4.2	4.9	6.8	6.1	6.1	5.9
(m/s)	40m	6.8	7.0	7.0	6.9	6.9	6.0	5.2	4.7	5.5	7.4	6.6	6.5	6.4
	10m	12.0	12.0	12.3	11.9	12.0	10.1	8.1	6.9	8.1	12.2	11.4	11.8	10.7
Average	30m	14.2	14.3	14.5	14.1	14.2	12.5	10.8	9.5	10.9	15.2	13.7	13.6	13.1
(mph)	40m	15.3	15.7	15.8	15.4	15.4	13.4	11.7	10.6	12.3	16.6	14.7	14.5	14.3

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
	10m		216	168	194	163	111	73	39	77	209	215	231	154
1995	30m		319	260	297	249	171	134	85	154	342	333	349	245
	40m		403	347	396	312	204	180	123	201	420	403	408	309
	10m	331	326	253	201	138	102	48	40	47	226	152	251	176
1996	30m	470	492	368	309	211	169	100	84	101	397	238	379	277
	40m	550	576	433	379	270	215	129	116	150	496	294	438	337
	10m	366	174	203	198	276	98	78	25	71	181	185	144	167
1997	30m	566	268	322	298	416	174	150	59	150	322	292	237	271
	40m	641	335	399	355	470	194	157	68	175	362	321	257	311
	10m	92	95	183	156									132
1998	30m	152	169	279	249									212
	40m	168	211	313	287									245
	10m	263	203	202	187	192	104	66	35	65	205	184	209	160
Average	30m	396	312	307	288	292	171	128	76	135	354	288	322	256
	40m	453	381	373	354	351	204	155	102	175	426	339	368	307

There is no Wind Rose available for Wabasso.

Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1995	10m-30m		0.21	0.20	0.18	0.21	0.24	0.35	0.40	0.35	0.24	0.18	0.14	0.25
	30m-40m		0.34	0.34	0.38	0.29	0.29	0.43	0.46	0.43	0.38	0.35	0.42	0.37
1996	10m-30m	0.17	0.21	0.21	0.20	0.20	0.26	0.36	0.36	0.32	0.24	0.24	0.21	0.25
	30m-40m	0.29	0.36	0.36	0.36	0.39	0.30	0.27	0.49	0.63	0.44	0.54	0.44	0.41
1997	10m-30m	0.22	0.17	0.17	0.17	0.18	0.24	0.30	0.33	0.29	0.21	0.19	0.16	0.22
	30m-40m	0.36	0.41	0.41	0.33	0.24	0.17	0.23	0.37	0.42	0.28	0.31	0.14	0.31
1998	10m-30m	0.17	0.16	0.16	0.18									0.17
	30m-40m	0.27	0.28	0.28	0.32									0.29
Average	10m-30m	0.19	0.19	0.19	0.18	0.20	0.25	0.34	0.36	0.32	0.23	0.20	0.17	0.23
	30m-40m	0.31	0.35	0.35	0.35	0.31	0.25	0.31	0.44	0.49	0.37	0.40	0.33	0.35

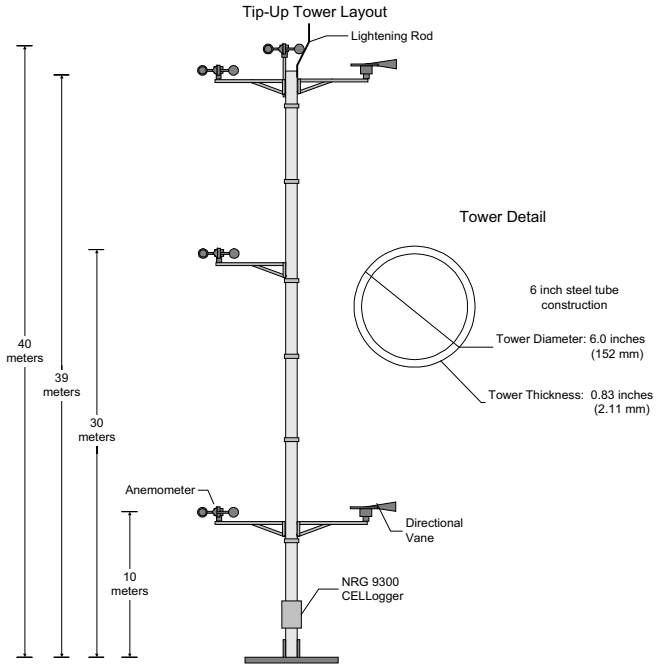
Ottertail Power Sites

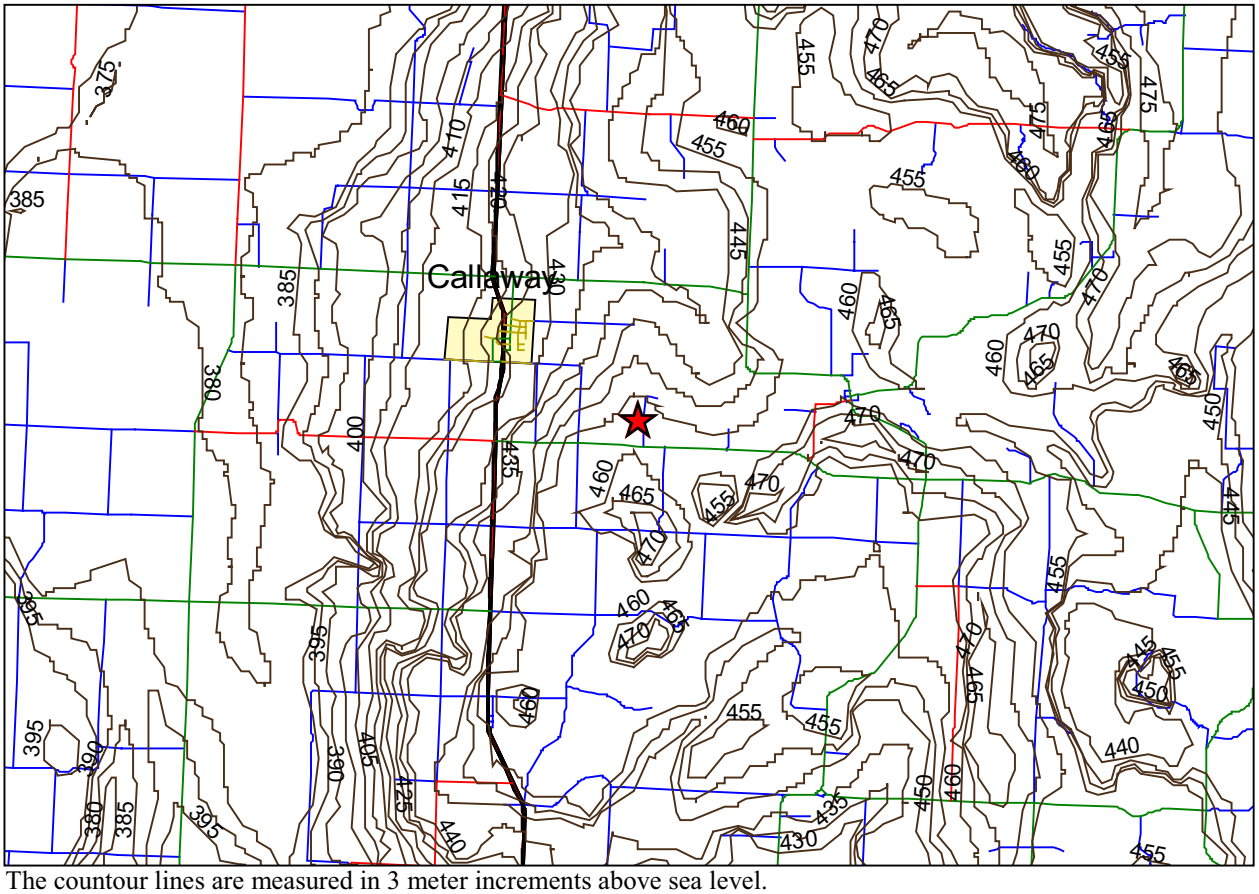
Callaway

Coordinates

Long/Lat	UTM
N 46.9685	E 281291
W 95.8752	N 5205672

Elevation: 1500 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Callaway

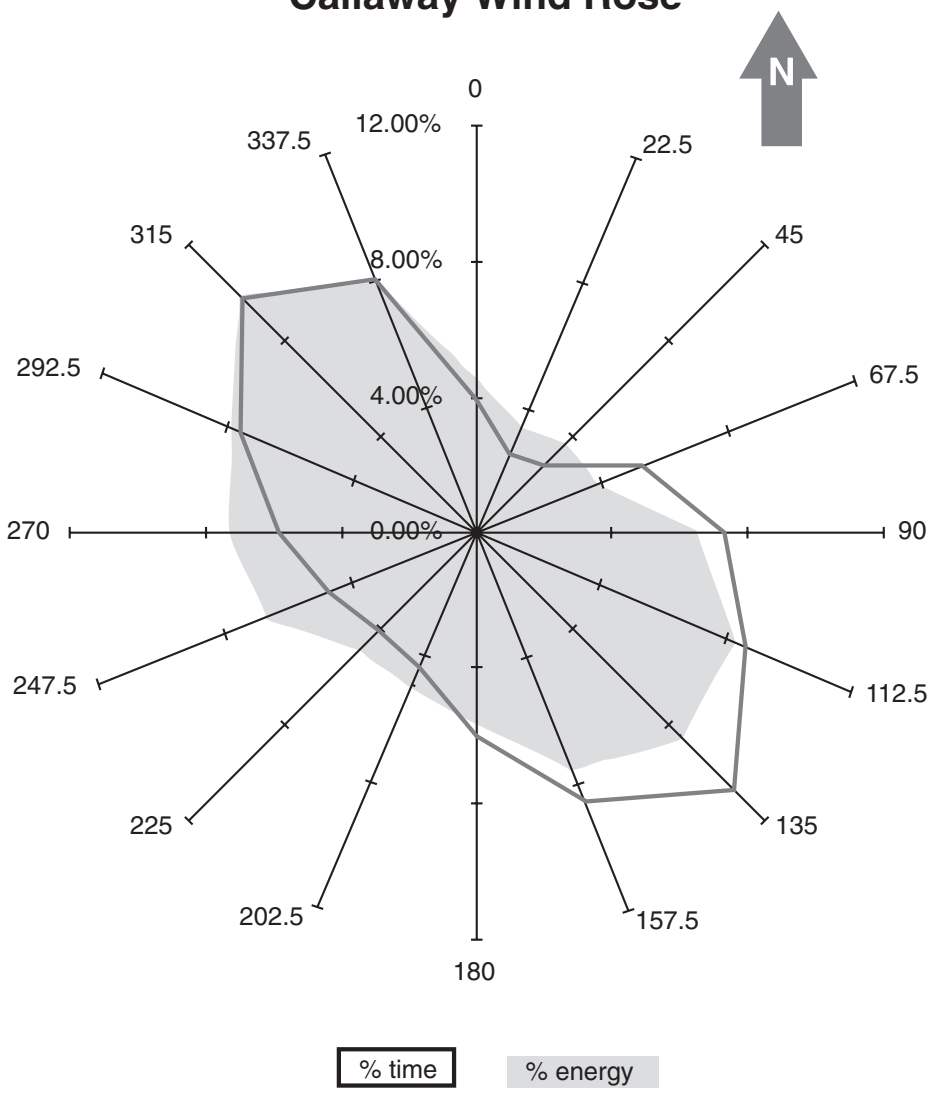
Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m							2.8	3.8	4.2	5.8	6.3	5.0	**4.7**
1994	**30m**							3.7	4.9	5.4	7.1	7.4	6.0	**5.8**
	40m							4.0	5.3	5.8	7.5	7.8	6.2	**6.1**
	10m	4.7	5.2	5.4	4.9	5.1	4.6	3.9	4.8	*	5.1	5.6	5.4	**5.0**
1995	**30m**	5.6	6.1	6.3	5.6	5.9	5.4	5.1	6.0	*	6.1	6.5	6.3	**5.9**
	40m	5.7	6.5	6.7	6.1	6.4	5.7	5.4	6.5	*	6.5	6.7	6.4	**6.2**
	10m	4.2	6.3	5.3	5.3	5.1	4.7	4.0	4.6	3.6	6.3	4.6	5.1	**4.9**
1996	**30m**	4.8	7.3	6.1	6.2	5.9	5.6	5.0	5.8	4.7	7.4	5.9	5.7	**5.9**
	40m	5.2	7.9	6.5	6.6	6.4	5.9	5.3	6.2	5.1	7.9	6.5	6.2	**6.3**
	10m	5.7	4.8	5.6	5.3	5.9	4.7	4.1	3.6	4.9	6.0	5.0	4.9	**5.1**
1997	**30m**	6.6	5.8	6.5	6.1	6.8	5.6	5.2	4.6	6.0	7.1	6.0	6.1	**6.0**
	40m	6.9	6.0	7.0	6.4	7.2	6.1	5.6	4.9	6.5	7.5	6.3	6.5	**6.4**
	10m	4.7	4.6	4.8	5.2	4.9	4.3	3.8	3.8					**4.5**
1998	**30m**	5.0	5.6	5.4	6.0	5.7	5.0	4.7	4.8					**5.3**
	40m	5.0	5.9	5.9	6.5	6.2	5.3	5.0	5.2					**5.6**
	10m	4.8	5.2	5.3	5.2	5.3	4.6	3.7	4.1	4.2	5.8	5.4	5.1	**4.9**
Average	**30m**	5.5	6.2	6.1	6.0	6.1	5.4	4.7	5.2	5.4	6.9	6.4	6.0	**5.8**
	40m	5.7	6.6	6.5	6.4	6.5	5.8	5.1	5.6	5.8	7.4	6.8	6.3	**6.2**
	10m	10.8	11.7	11.8	11.5	11.8	10.2	8.3	9.2	9.5	13.0	12.0	11.4	**10.9**
Average	**30m**	12.2	13.8	13.6	13.3	13.6	12.1	10.6	11.7	12.0	15.5	14.4	13.5	**13.0**
(mph)	**40m**	12.7	14.7	14.6	14.3	14.6	12.9	11.3	12.6	13.0	16.5	15.3	14.2	**13.9**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m							16	59	89	185	276	136	**127**
1994	**30m**							32	108	158	314	410	217	**207**
	40m							40	133	192	364	443	237	**235**
	10m	120	189	164	172	145	93	84	112	*	154	206	275	**156**
1995	**30m**	178	264	245	238	205	142	153	189	*	243	303	394	**232**
	40m	200	310	299	287	243	162	179	236	*	289	331	404	**267**
	10m	108	298	187	169	145	104	62	92	50	315	127	178	**153**
1996	**30m**	141	416	261	248	202	161	108	164	95	460	211	241	**226**
	40m	175	510	302	296	245	188	129	190	117	510	278	294	**270**
	10m	232	150	200	212	235	100	87	55	127	225	180	134	**161**
1997	**30m**	320	233	282	268	334	154	148	99	207	335	265	214	**238**
	40m	368	264	337	275	398	187	172	119	256	398	308	260	**278**
	10m	123	162	151	163	145	92	60	50					**118**
1998	**30m**	146	249	202	227	208	132	103	92					**170**
	40m	154	289	250	274	253	154	122	111					**201**
	10m	146	200	175	179	167	97	62	73	88	220	197	181	**149**
Average	**30m**	196	290	248	245	237	147	109	130	153	338	297	267	**222**
	40m	224	343	297	283	285	173	129	158	188	390	340	299	**259**

Callaway Wind Rose



Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
1994	**10m-30m**							0.18	0.22	0.22	0.19	0.18	0.17	**0.19**
	30m-40m							0.25	0.30	0.30	0.22	0.22	0.20	**0.25**
1995	**10m-30m**	0.11	0.16	0.15	0.14	0.14	0.16	0.22	0.20	*	0.18	0.15	0.12	**0.16**
	30m-40m	0.18	0.25	0.25	0.28	0.28	0.21	0.27	0.32	*	0.23	0.15	0.14	**0.23**
1996	**10m-30m**	0.12	0.15	0.14	0.15	0.14	0.17	0.21	0.23	0.24	0.16	0.11	0.04	**0.15**
	30m-40m	0.35	0.27	0.24	0.26	0.26	0.22	0.24	0.21	0.26	0.25	0.22	0.26	**0.25**
1997	**10m-30m**	0.13	0.10	0.15	0.15	0.14	0.17	0.20	0.21	0.19	0.16	0.16	0.19	**0.16**
	30m-40m	0.18	0.22	0.27	0.23	0.26	0.30	0.28	0.29	0.28	0.24	0.26	0.34	**0.26**
1998	**10m-30m**	0.07	0.14	0.11	0.13	0.15	0.15	0.20	0.22					**0.15**
	30m-40m	*	0.28	0.29	0.29	0.26	0.23	0.23	0.28					**0.27**
Average	**10m-30m**	0.11	0.14	0.14	0.14	0.14	0.16	0.20	0.22	0.22	0.17	0.15	0.13	**0.16**
	30m-40m	0.24	0.26	0.26	0.27	0.26	0.24	0.25	0.28	0.28	0.24	0.21	0.23	**0.25**

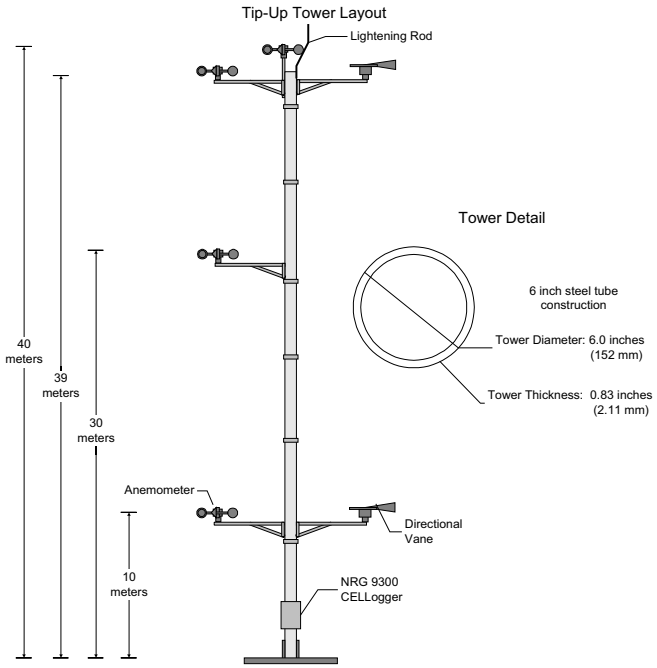
* Equipment was damaged during this period

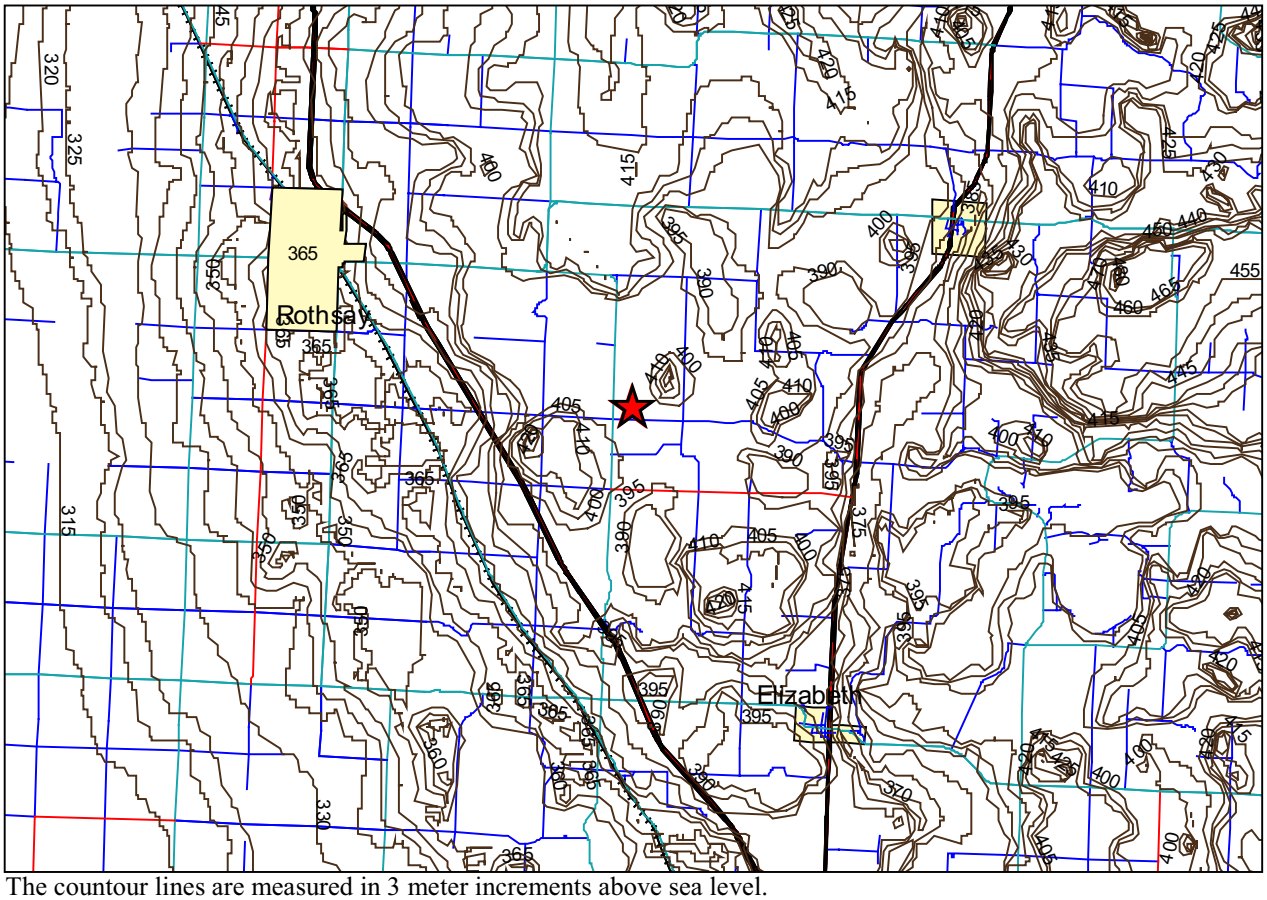
Elizabeth

Coordinates

Long/Lat	UTM
N 46.4332	E 248585
W 96.2726	N 5147383

Elevation: 1194 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Elizabeth

Wind Speed (meters per second)

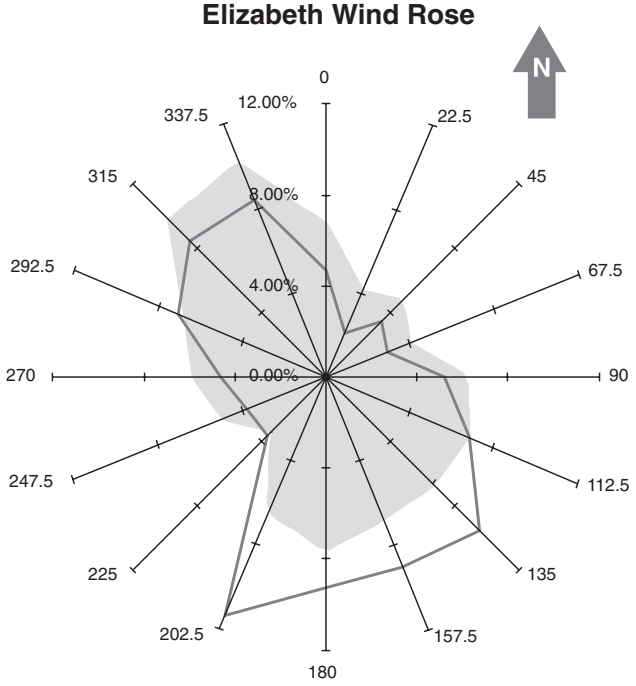
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m							3.3	3.7	3.8	5.6	6.0	4.5	**4.5**
1994	**30m**							4.3	4.9	5.1	6.9	7.3	5.7	**5.7**
	40m							4.7	5.4	5.5	7.3	7.8	6.1	**6.1**
	10m	4.5	5.0	5.1	4.9	5.0	4.3	3.8	4.3	4.2	4.9	5.2	5.0	**4.7**
1995	**30m**	5.5	6.0	6.0	5.8	6.0	5.3	5.0	5.4	5.3	6.0	6.2	5.5	**5.7**
	40m	5.9	6.4	6.5	6.4	6.5	5.7	5.3	5.9	5.7	6.5	6.6	6.3	**6.1**
	10m	4.5	6.1	5.2	5.1	4.9	4.3	3.8	4.6	4.0	6.0	4.7	5.3	**4.9**
1996	**30m**	5.4	7.2	6.1	6.1	5.8	5.3	4.9	5.8	4.9	7.1	5.9	6.1	**5.9**
	40m	5.7	7.7	6.5	6.6	6.1	5.6	5.2	6.1	5.5	7.7	6.1	6.4	**6.2**
	10m	5.6	4.7	5.4	5.1	2.4	4.4	3.9	3.4	4.3	5.4	5.1	4.4	**4.5**
1997	**30m**	6.7	5.4	6.4	6.1	2.9	5.3	4.9	4.4	5.7	6.7	6.0	5.3	**5.5**
	40m	7.3	5.8	7.0	6.5	3.5	*	4.7	4.8	6.1	7.2	6.5	5.8	**5.9**
	10m	3.7	4.0	5.0	5.0	4.7	4.4	3.3	3.8	4.4	4.9	4.6	4.9	**4.4**
1998	**30m**	4.8	5.0	5.7	6.0	5.7	5.4	4.4	4.8	5.6	6.1	5.6	6.1	**5.4**
	40m	5.2	5.5	6.1	6.4	6.1	5.9	4.8	5.3	6.0	6.7	6.1	6.6	**5.9**
	10m	4.9	5.9	5.1	5.0	5.9	4.6	3.6	4.0	4.3	4.6	4.9	5.0	**4.8**
1999	**30m**	5.9	6.9	6.2	6.1	7.0	5.8	4.9	5.2	5.5	6.0	6.2	6.2	**6.0**
	40m	6.3	7.2	6.6	6.7	7.4	6.1	5.3	5.5	5.8	6.4	6.6	6.4	**6.4**
	10m	4.8	4.8	5.2	5.8	5.5	5.1	6.7	*	*	*	*	4.3	**5.3**
2000	**30m**	6.0	6.0	6.4	6.8	6.5	6.2	8.6	*	*	*	*	5.2	**6.5**
	40m	6.3	6.5	6.7	7.3	7.0	6.5	9.3	*	*	*	*	5.4	**6.9**
	10m	4.7	4.9	4.7	5.7	5.3	4.3	3.8	3.9	3.8	5.2	5.2	5.3	**4.7**
2001	**30m**	5.6	5.8	5.6	6.8	6.3	5.3	5.0	5.1	5.0	6.5	6.4	6.3	**5.8**
	40m	6.4	6.3	5.9	7.3	6.7	5.8	5.4	5.4	5.4	6.9	6.9	6.7	**6.2**
	10m	4.7	5.0	5.1	5.2	4.8	4.5	4.0	3.9	4.1	5.2	5.1	4.8	**4.7**
Average	**30m**	5.7	6.1	6.1	6.2	5.7	5.5	5.2	5.1	5.3	6.5	6.3	5.8	**5.8**
	40m	6.1	6.5	6.5	6.7	6.2	5.9	5.6	5.5	5.7	6.9	6.6	6.2	**6.2**
	10m	10.5	11.3	11.4	11.7	10.7	10.0	9.0	8.8	9.2	11.7	11.4	10.8	**10.5**
Average	**30m**	12.7	13.5	13.6	14.0	12.8	12.3	11.7	11.3	11.8	14.5	14.0	13.0	**12.9**
(mph)	**40m**	13.7	14.5	14.5	15.1	13.9	13.2	12.5	12.2	12.8	15.5	14.9	13.9	**13.9**

Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
1994	**10m-30m**							0.26	0.24	0.28	0.21	0.20	0.21	**0.23**
	30m-40m							0.33	0.35	0.29	0.22	0.21	0.27	**0.28**
1995	**10m-30m**	0.17	0.18	0.17	0.15	0.18	0.19	0.23	0.21	0.21	0.19	0.17	0.14	**0.18**
	30m-40m	0.24	0.25	0.27	0.33	0.29	0.21	0.25	0.32	0.26	0.28	0.25	0.29	**0.27**
1996	**10m-30m**	0.17	0.18	0.16	0.16	0.16	0.19	0.22	0.20	0.19	0.17	0.18	0.11	**0.17**
	30m-40m	0.27	0.26	0.24	0.29	0.21	0.16	0.22	0.22	0.38	0.28	0.31	0.27	**0.26**
1997	**10m-30m**	0.17	0.15	0.17	0.18	0.22	0.17	0.22	0.23	0.25	0.19	0.18	0.20	**0.19**
	30m-40m	0.36	0.25	0.35	0.26	0.67	*	0.25	0.29	0.30	0.30	0.27	0.32	**0.33**
1998	**10m-30m**	0.17	0.17	0.14	0.17	0.17	0.20	0.24	0.21	0.22	0.20	0.20	0.21	**0.19**
	30m-40m	0.29	0.31	0.24	0.28	0.31	0.33	0.30	0.33	0.30	0.36	0.34	0.27	**0.30**
1999	**10m-30m**	0.16	0.16	0.19	0.18	0.17	0.20	0.26	0.23	0.22	0.26	0.24	0.21	**0.21**
	30m-40m	0.21	0.21	0.27	0.32	0.23	0.18	0.33	0.23	0.22	0.25	0.19	0.12	**0.23**
2000	**10m-30m**	0.21	0.23	0.19	0.16	0.17	0.18	0.23	*	*	*	*	0.18	**0.19**
	30m-40m	0.15	0.25	0.18	0.25	0.25	0.21	0.28	*	*	*	*	0.12	**0.21**
2001	**10m-30m**	0.17	0.19	0.17	0.19	0.16	0.19	0.24	0.25	0.24	0.23	0.21	0.18	**0.20**
	30m-40m	0.22	0.24	0.16	0.25	0.26	0.30	0.28	0.25	0.26	0.19	0.24	0.18	**0.23**
Average	**10m-30m**	0.17	0.18	0.17	0.17	0.18	0.19	0.24	0.22	0.23	0.21	0.19	0.18	**0.19**
	30m-40m	0.25	0.25	0.25	0.28	0.32	0.23	0.28	0.28	0.29	0.27	0.26	0.23	**0.27**

Elizabeth

Elizabeth Wind Rose



Wind Power (Watts per Square Meter)

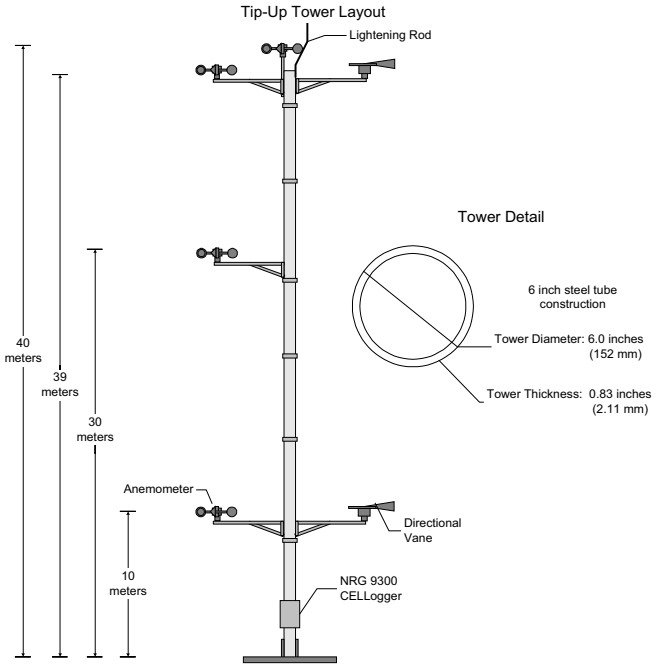
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
	10m							22	52	65	173	246	106	**111**
1994	30m							46	107	139	299	401	185	**196**
	40m							62	130	170	352	472	218	**234**
	10m	113	168	136	165	140	79	70	73	88	144	168	212	**130**
1995	30m	184	252	216	252	214	138	132	133	152	234	257	299	**205**
	40m	227	301	267	324	269	155	156	171	184	282	308	390	**253**
	10m	175	287	164	153	116	85	56	88	79	249	130	214	**150**
1996	30m	242	412	244	236	178	142	103	154	130	377	224	303	**229**
	40m	277	485	284	285	203	165	122	175	163	449	229	340	**265**
	10m	262	127	173	187	11	80	67	44	83	169	191	100	**125**
1997	30m	403	186	266	275	21	130	123	86	169	285	293	162	**200**
	40m	497	216	339	317	40	*	94	106	206	336	347	198	**245**
	10m	65	100	165	139	121	84	41	52	83	136	163	142	**108**
1998	30m	116	186	237	215	186	140	79	95	145	235	231	235	**175**
	40m	141	236	279	257	224	177	101	123	177	308	296	285	**217**
	10m	131	245	178	135	216	100	51	69	81	114	124	149	**133**
1999	30m	204	365	284	218	334	180	106	127	143	209	217	247	**220**
	40m	242	405	329	283	387	204	132	147	167	260	252	276	**257**
	10m	127	117	162	189	149	120	146	*	*	*	*	54	**133**
2000	30m	208	202	256	285	228	190	310	*	*	*	*	95	**222**
	40m	234	242	287	349	271	221	395	*	*	*	*	108	**263**
	10m	127	135	111	235	174	88	58	54	63	164	162	155	**127**
2001	30m	202	203	168	365	265	148	120	110	127	290	270	250	**210**
	40m	276	249	191	434	312	181	144	132	152	332	320	283	**251**
	10m	143	168	156	172	132	91	64	62	78	164	169	142	**128**
Average	30m	223	258	239	264	204	153	127	116	144	276	271	222	**208**
	40m	271	305	283	321	243	184	151	141	174	331	318	262	**249**

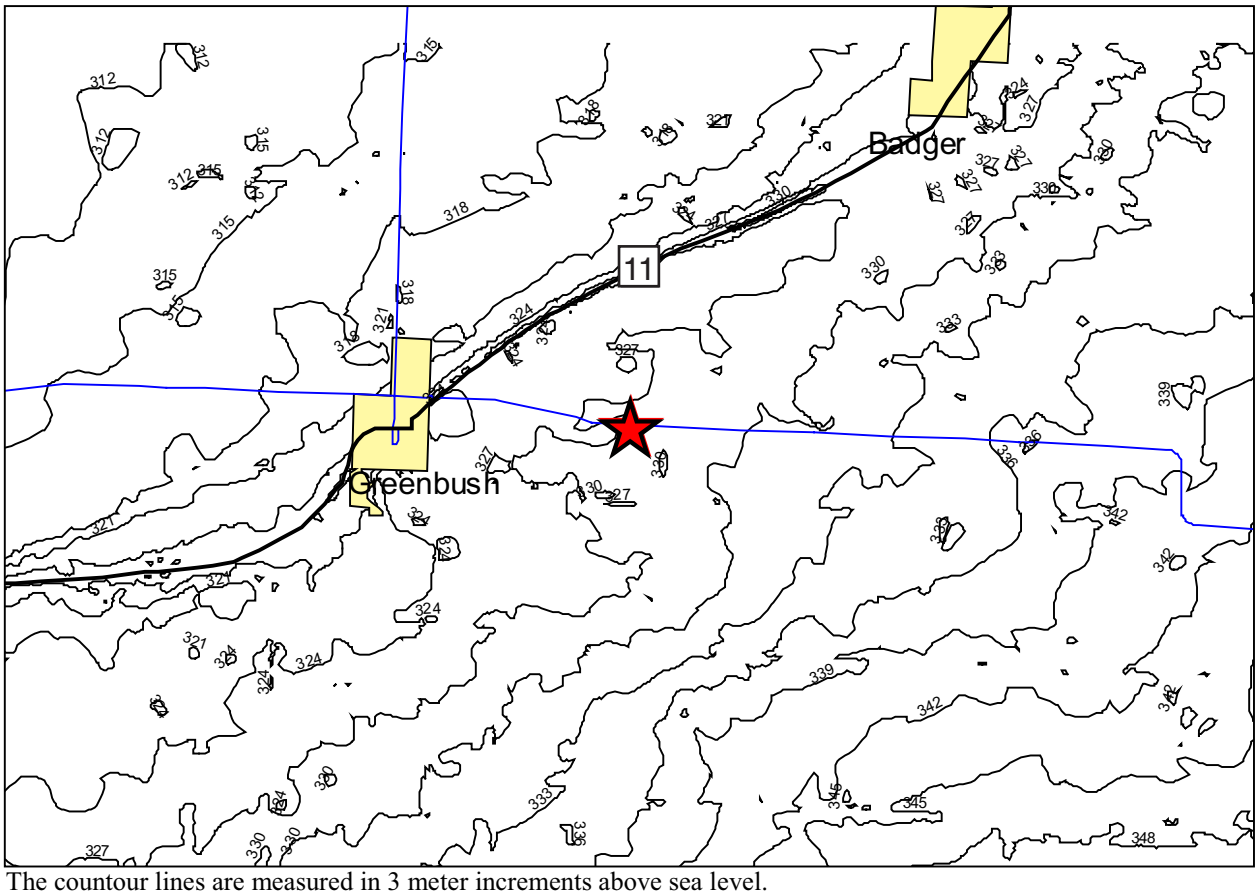
Greenbush

Coordinates

Long/Lat	UTM
N 48.7021	E 270899
W 96.1139	N 5399024

Elevation: 1070 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Greenbush

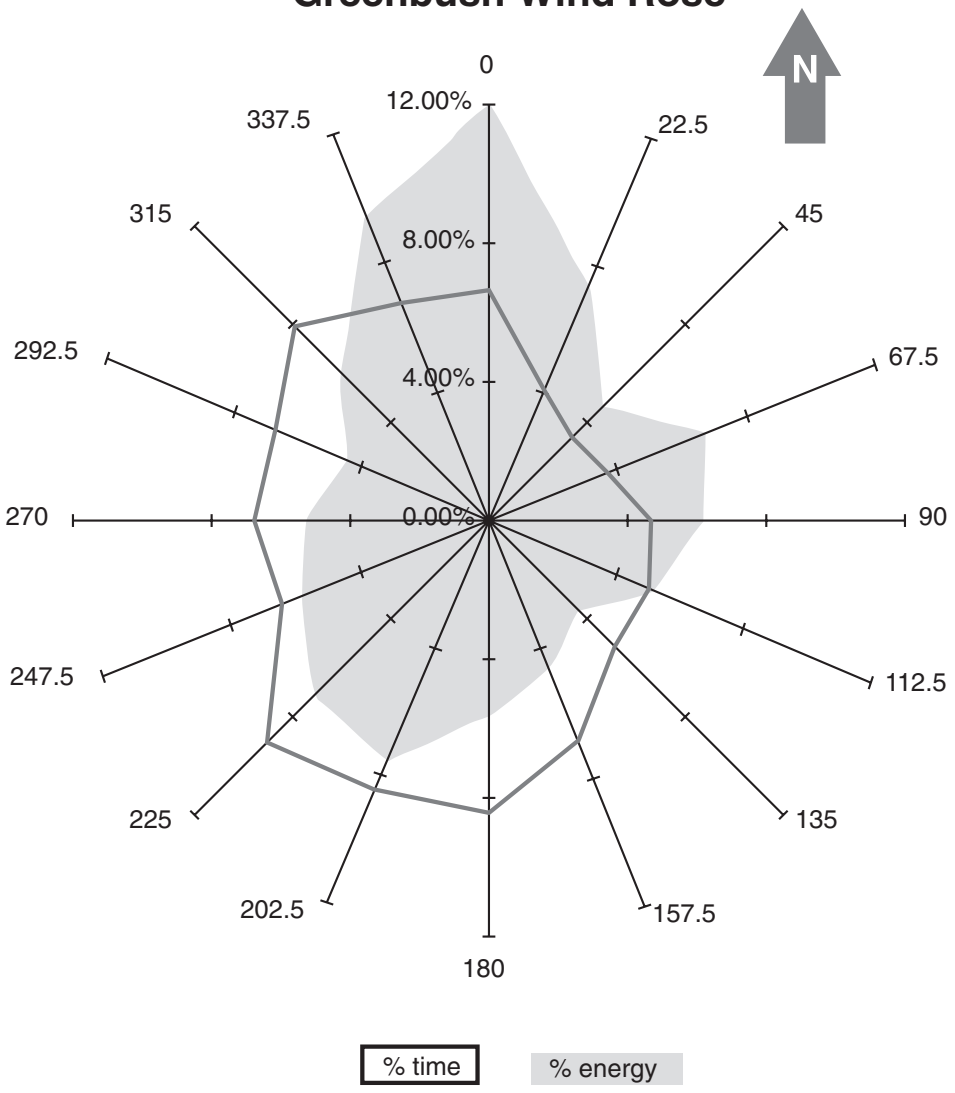
Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m										4.8	4.3	4.3	**4.4**
1998	**30m**										5.9	5.3	5.4	**5.6**
	40m										6.5	5.9	6.0	**6.2**
	10m	4.5	5.3	4.5	4.3	5.5	4.4	3.8	3.5	4.1	4.6	4.6	4.8	**4.5**
1999	**30m**	5.6	6.5	5.6	5.3	6.6	5.4	4.9	4.6	5.3	5.9	5.9	6.0	**5.6**
	40m	6.3	7.2	6.3	6.0	7.2	5.8	5.4	5.1	5.8	6.5	6.5	6.6	**6.2**
	10m	4.7	4.7	5.1	5.2	4.7	4.9	3.7	3.6	*	*	*	*	**4.6**
2000	**30m**	5.8	5.9	6.2	6.2	5.7	5.9	4.8	5.0	*	*	*	*	**5.7**
	40m	6.5	6.6	6.8	6.9	6.2	6.6	5.3	5.6	*	*	*	*	**6.3**
	10m	4.1	4.5	4.4	4.7	5.1	3.9	3.0	3.8	3.8	4.8	4.6	4.5	**4.3**
2001	**30m**	4.9	5.5	5.4	5.8	6.1	5.0	4.1	5.0	4.8	6.0	5.8	5.6	**5.4**
	40m	5.7	6.1	6.0	6.4	6.7	5.6	4.4	5.6	5.4	6.7	6.5	6.1	**5.9**
	10m	4.4	4.8	4.7	4.7	5.1	4.4	3.5	3.7	3.9	4.7	4.5	4.5	**4.4**
Average	**30m**	5.4	6.0	5.7	5.8	6.1	5.4	4.6	4.9	5.1	6.0	5.7	5.7	**5.5**
	40m	6.1	6.6	6.4	6.4	6.7	6.0	5.1	5.4	5.6	6.6	6.3	6.3	**6.1**
	10m	9.9	10.8	10.4	10.5	11.3	9.8	7.8	8.2	8.8	10.6	10.1	10.2	**9.9**
Average	**30m**	12.1	13.3	12.8	12.9	13.7	12.2	10.3	10.9	11.4	13.3	12.7	12.7	**12.4**
(mph)	**40m**	13.7	14.8	14.2	14.3	15.0	13.4	11.3	12.1	12.6	14.8	14.2	14.0	**13.7**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m										111	113	92	**105**
1998	**30m**										192	196	174	**187**
	40m										253	261	240	**251**
	10m	90	170	126	89	172	95	59	50	67	114	114	148	**108**
1999	**30m**	162	274	210	145	276	153	110	93	129	215	214	256	**187**
	40m	226	358	281	211	341	185	145	120	168	283	288	333	**245**
	10m	115	107	144	138	108	123	50	64	*	*	*	*	**106**
2000	**30m**	195	198	239	226	177	200	95	118	*	*	*	*	**181**
	40m	261	267	299	297	231	291	128	157	*	*	*	*	**241**
	10m	89	100	91	146	139	64	34	54	56	123	109	90	**91**
2001	**30m**	154	172	153	245	227	119	74	109	107	214	193	156	**160**
	40m	217	228	205	308	288	165	95	147	142	281	259	204	**212**
	10m	98	126	120	124	140	94	48	56	62	116	112	110	**100**
Average	**30m**	170	215	201	205	227	158	93	107	118	207	201	195	**175**
	40m	235	284	262	272	287	213	122	141	155	272	269	259	**231**

Greenbush Wind Rose



Wind Shear Exponent (Alpha)

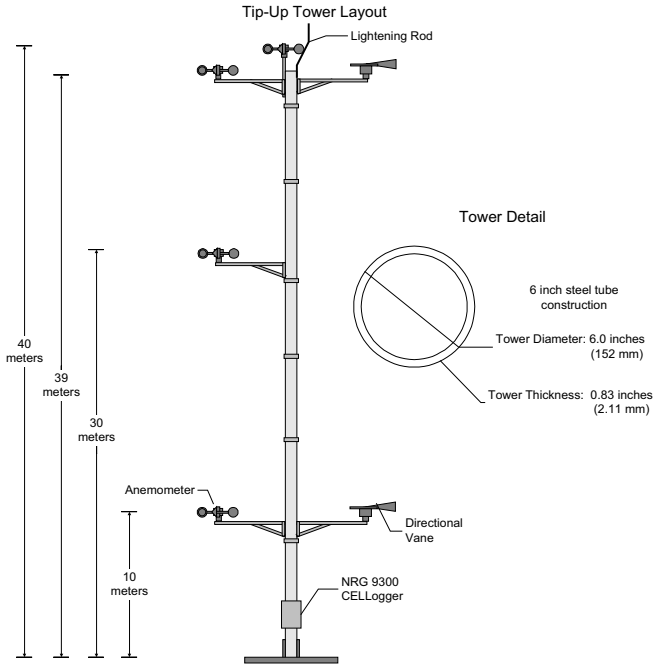
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
1998	**10m-30m**										0.21	0.21	0.25	**0.23**
	30m-40m										0.34	0.38	0.38	**0.37**
1999	**10m-30m**	0.21	0.20	0.21	0.21	0.19	0.19	0.24	0.22	0.24	0.24	0.17	0.17	**0.21**
	30m-40m	0.45	0.39	0.42	0.44	0.33	0.30	0.38	0.34	0.33	0.34	0.36	0.33	**0.37**
2000	**10m-30m**	0.15	0.18	0.14	0.13	0.13	0.13	0.15	0.17	*	*	*	*	**0.14**
	30m-40m	0.35	0.37	0.30	0.33	0.32	0.39	0.35	0.38	*	*	*	*	**0.35**
2001	**10m-30m**	0.13	0.20	0.20	0.21	0.18	0.22	0.28	0.26	0.22	0.24	0.23	0.19	**0.21**
	30m-40m	0.30	0.33	0.35	0.35	0.31	0.39	0.32	0.38	0.39	0.41	0.41	0.34	**0.36**
Average	**10m-30m**	0.16	0.19	0.18	0.18	0.17	0.18	0.22	0.22	0.23	0.23	0.20	0.20	**0.20**
	30m-40m	0.37	0.36	0.36	0.37	0.32	0.36	0.35	0.37	0.36	0.36	0.38	0.35	**0.36**

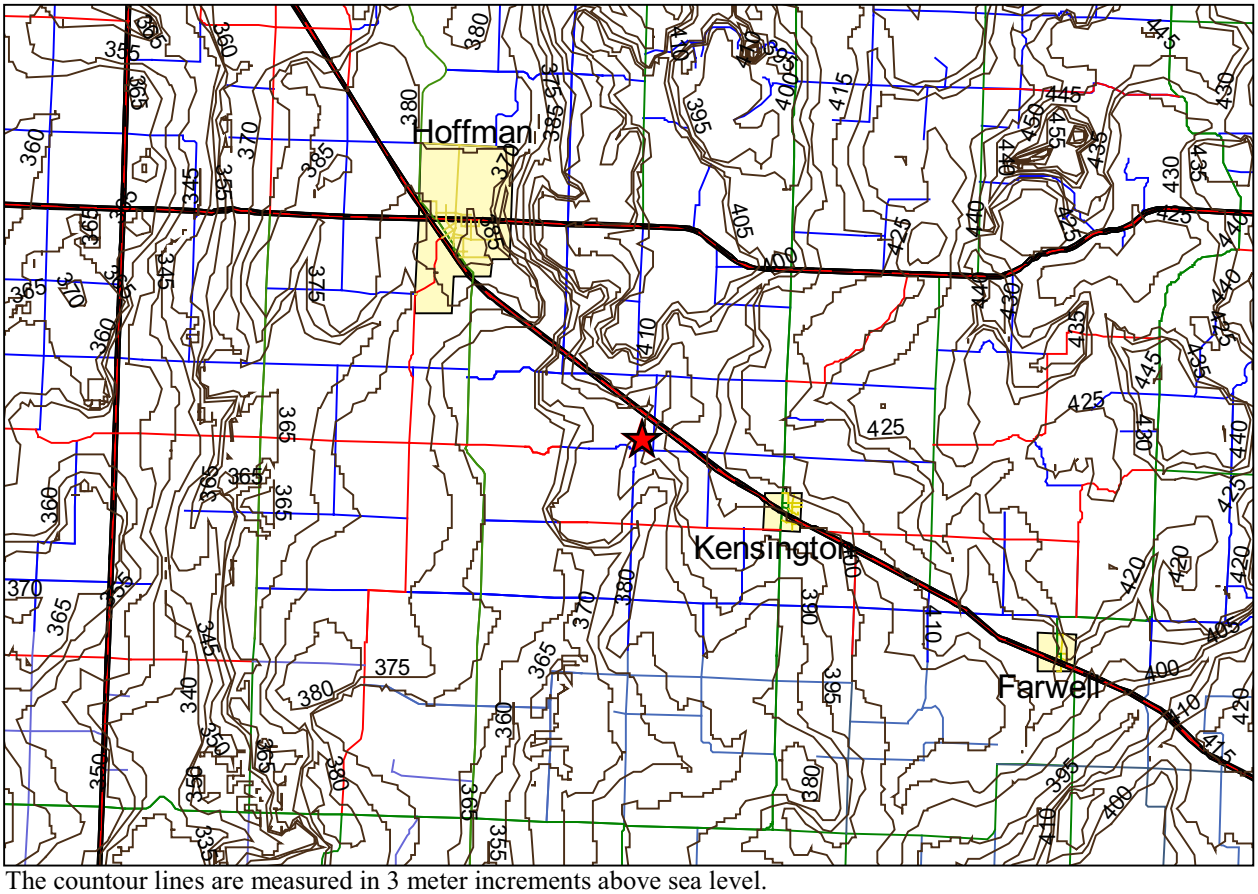
Kensington

Coordinates

Long/Lat	UTM
N 45.7895	E 287246
W 95.7373	N 5074309

Elevation: 1274 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Kensington

Wind Speed (Meters per Second)

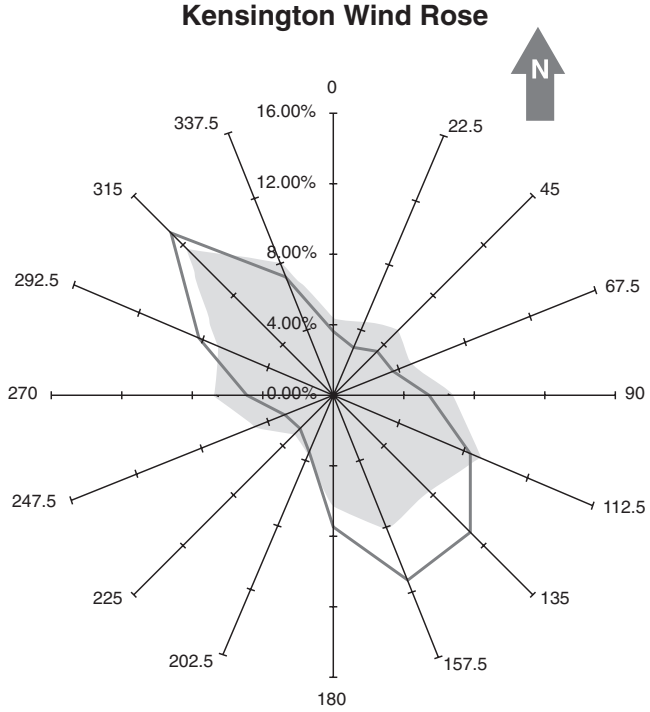
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**10m**
						2.9	4.0	4.3	5.8	6.2	4.8	**4.7**		
1994	**30m**							3.7	5.1	5.5	7.1	7.5	5.8	**5.8**
	40m							3.9	5.5	6.0	7.6	8.0	6.3	**6.2**
	10m	5.2	5.6	5.5	5.2	5.2	4.4	4.0	3.9	4.2	5.3	5.7	5.0	**4.9**
1995	**30m**	5.9	6.5	6.3	6.0	6.2	5.5	5.1	5.1	5.4	6.4	6.6	6.1	**5.9**
	40m	6.4	6.9	7.0	6.7	6.7	5.9	5.6	5.6	5.9	7.0	7.0	6.8	**6.5**
	10m	4.9	6.1	5.6	5.5	5.1	4.3	3.1	4.3	4.1	6.2	5.1	5.6	**5.0**
1996	**30m**	5.8	7.2	6.4	6.5	6.0	5.2	4.3	5.6	5.3	7.5	6.1	6.2	**6.0**
	40m	6.2	6.7	*	*	*	*	*	5.7	5.7	7.9	6.7	6.7	**6.5**
	10m	6.1	5.1	5.7	5.3	5.9	4.4	4.1	3.3	4.3	5.6	5.0	4.6	**4.9**
1997	**30m**	6.9	5.8	6.7	6.3	6.8	5.4	5.1	4.4	5.7	6.9	5.9	5.5	**6.0**
	40m	6.4	6.2	7.3	6.8	7.4	5.8	5.5	4.8	6.1	7.3	6.2	5.8	**6.3**
	10m	4.4	4.5	5.3	5.3	5.1	4.4	3.1	3.4	4.0	5.3	5.1	4.7	**4.5**
1998	**30m**	5.2	5.2	6.0	6.2	6.0	5.5	4.3	4.7	5.5	6.5	6.0	5.8	**5.6**
	40m	5.6	5.9	6.4	6.7	6.5	5.9	4.6	5.1	5.8	6.9	6.5	6.2	**6.0**
	10m	5.5	6.4	3.0	5.9	6.3	6.2	*	*	*	*	4.9	5.1	**5.4**
1999	**30m**	6.4	7.4	3.3	6.7	7.3	6.7	*	*	*	*	6.2	6.4	**6.3**
	40m	6.8	7.8	3.6	7.3	7.7	6.9	*	*	*	*	6.5	6.6	**6.7**
	10m	5.1	5.1	5.3	6.0	5.7	5.3	3.8	4.2	4.6	4.7	5.2	5.5	**5.0**
2000	**30m**	6.2	6.3	6.4	6.9	6.8	6.4	5.0	5.6	6.0	5.8	6.1	6.3	**6.1**
	40m	6.6	6.7	6.8	7.4	7.2	6.7	6.7	*	*	7.4	6.5	6.6	**6.8**
	10m	4.7	5.3	4.3	6.2	5.5	4.6	3.7	3.5	3.6	5.1	5.4	5.6	**4.8**
2001	**30m**	5.6	6.1	5.2	7.3	6.5	5.6	5.1	5.0	5.2	6.8	6.7	6.8	**6.0**
	40m	5.9	6.3	5.6	7.9	6.9	6.0	5.4	5.4	5.5	7.1	7.1	7.0	**6.3**
	10m	5.1	5.4	4.9	5.6	5.5	4.8	3.5	3.8	4.2	5.4	5.3	5.1	**4.9**
Average	**30m**	6.0	6.4	5.8	6.6	6.5	5.8	4.7	5.1	5.5	6.7	6.4	6.1	**6.0**
	40m	6.3	6.6	6.1	7.1	7.1	6.2	5.3	5.3	5.8	7.3	6.8	6.5	**6.4**
	10m	11.5	12.2	11.1	12.6	12.4	10.7	7.9	8.5	9.3	12.1	11.9	11.5	**11.0**
Average	**30m**	13.4	14.2	12.9	14.7	14.6	12.9	10.4	11.3	12.3	15.0	14.3	13.7	**13.3**
(mph)	**40m**	14.0	14.9	13.6	15.9	15.8	13.9	11.8	12.0	13.0	16.4	15.3	14.5	**14.3**

Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
1994	**10m-30m**							0.21	0.22	0.23	0.20	0.20	0.19	**0.21**
	30m-40m							0.20	0.27	0.29	0.27	0.25	0.29	**0.26**
1995	**10m-30m**	0.13	0.17	0.15	0.14	0.16	0.19	0.22	0.23	0.25	0.20	0.15	0.16	**0.18**
	30m-40m	0.18	0.20	0.32	0.35	0.34	0.28	0.30	0.33	0.30	0.30	0.25	0.24	**0.28**
1996	**10m-30m**	0.17	0.19	0.15	0.16	0.15	0.19	0.26	0.24	0.23	0.20	0.19	0.11	**0.19**
	30m-40m	0.29	-0.04	*	*	*	*	*	0.21	0.28	0.22	0.28	0.29	**0.22**
1997	**10m-30m**	0.13	0.16	0.17	0.17	0.15	0.19	0.20	0.23	0.26	0.20	0.16	0.15	**0.18**
	30m-40m	-0.03	0.25	0.33	0.27	0.30	0.28	0.31	0.30	0.26	0.23	0.27	0.20	**0.25**
1998	**10m-30m**	0.12	0.15	0.11	0.16	0.16	0.21	0.27	0.28	0.30	0.20	0.17	0.19	**0.19**
	30m-40m	0.31	0.33	0.25	0.26	0.27	0.26	0.26	0.30	0.23	0.21	0.34	0.30	**0.28**
1999	**10m-30m**	0.14	0.15	0.10	0.13	0.16	0.13	*	*	*	*	0.24	0.20	**0.16**
	30m-40m	0.25	0.22	0.27	0.33	0.19	0.20	*	*	*	*	0.17	0.12	**0.22**
2000	**10m-30m**	0.19	0.20	0.19	0.14	0.17	0.18	0.22	0.26	0.24	0.19	0.16	0.14	**0.19**
	30m-40m	0.18	0.26	0.21	0.25	0.20	0.17	0.20	*	*	0.17	0.22	0.13	**0.20**
2001	**10m-30m**	0.19	0.16	0.18	0.17	0.18	0.20	0.27	0.31	0.31	0.28	0.21	0.20	**0.22**
	30m-40m	0.16	0.11	0.27	0.31	0.23	0.25	0.25	0.25	0.24	0.19	0.24	0.15	**0.22**
Average	**10m-30m**	0.15	0.17	0.15	0.15	0.16	0.18	0.24	0.25	0.26	0.21	0.18	0.17	**0.19**
	30m-40m	0.19	0.19	0.27	0.29	0.25	0.24	0.25	0.28	0.27	0.23	0.25	0.22	**0.24**

Kensington

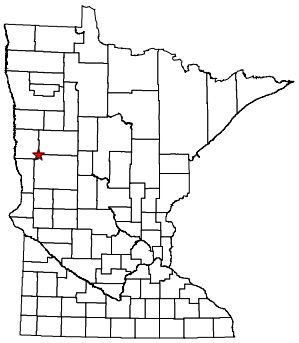
Kensington Wind Rose



Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m							20	75	96	198	306	138	**139**
1994	**30m**							38	130	170	330	466	211	**224**
	40m							46	159	210	393	535	265	**268**
	10m	161	253	182	216	183	95	86	63	94	183	227	286	**169**
1995	**30m**	225	342	265	303	262	159	158	123	172	285	333	423	**254**
	40m	277	398	353	391	333	191	189	158	213	355	389	495	**312**
	10m	214	315	216	191	135	91	31	79	80	302	164	241	**171**
1996	**30m**	287	438	300	277	196	145	65	148	146	452	234	311	**250**
	40m	337	370	*	*	*	*	*	142	173	501	308	358	**313**
	10m	331	165	224	215	268	88	88	44	93	187	196	126	**169**
1997	**30m**	430	229	313	311	370	150	146	90	186	331	277	183	**251**
	40m	327	268	401	355	444	175	167	110	224	378	317	210	**281**
	10m	117	155	205	175	149	97	36	46	66	174	231	136	**132**
1998	**30m**	167	229	269	256	226	166	78	101	147	286	328	205	**205**
	40m	198	288	314	308	264	202	94	122	175	325	387	244	**244**
	10m	204	341	20	206	282	242	*	*	*	*	116	190	**200**
1999	**30m**	280	483	29	276	409	328	*	*	*	*	197	287	**286**
	40m	330	559	34	361	459	353	*	*	*	*	226	317	**330**
	10m	158	151	176	232	181	142	53	74	110	116	182	264	**153**
2000	**30m**	240	234	266	314	267	224	96	141	202	186	259	347	**231**
	40m	274	274	303	393	308	256	194	*	*	325	300	386	**301**
	10m	141	194	105	307	208	109	55	46	53	173	194	189	**148**
2001	**30m**	207	260	152	436	303	183	122	112	129	354	319	305	**240**
	40m	239	276	179	527	349	214	146	135	154	379	376	346	**277**
	10m	189	225	161	220	201	123	53	61	85	190	202	196	**159**
Average	**30m**	262	316	228	311	290	193	100	121	164	318	302	284	**241**
	40m	283	348	264	389	359	232	139	138	191	379	355	327	**284**

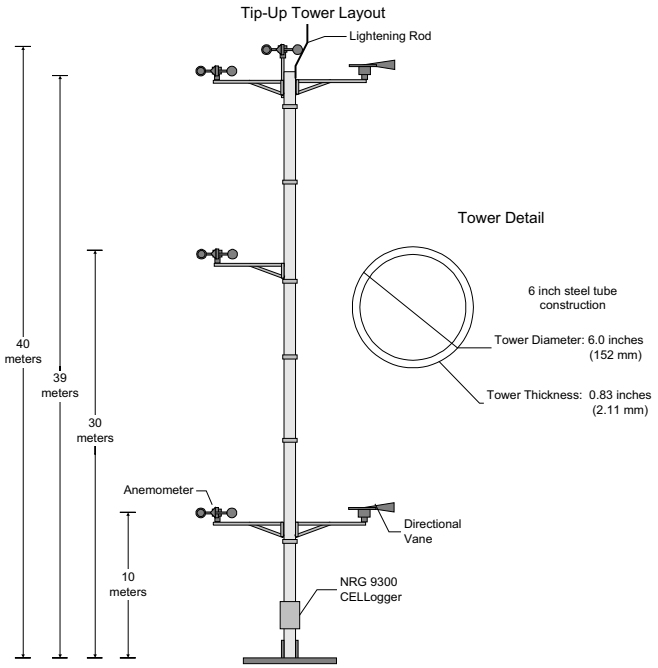
Rollag

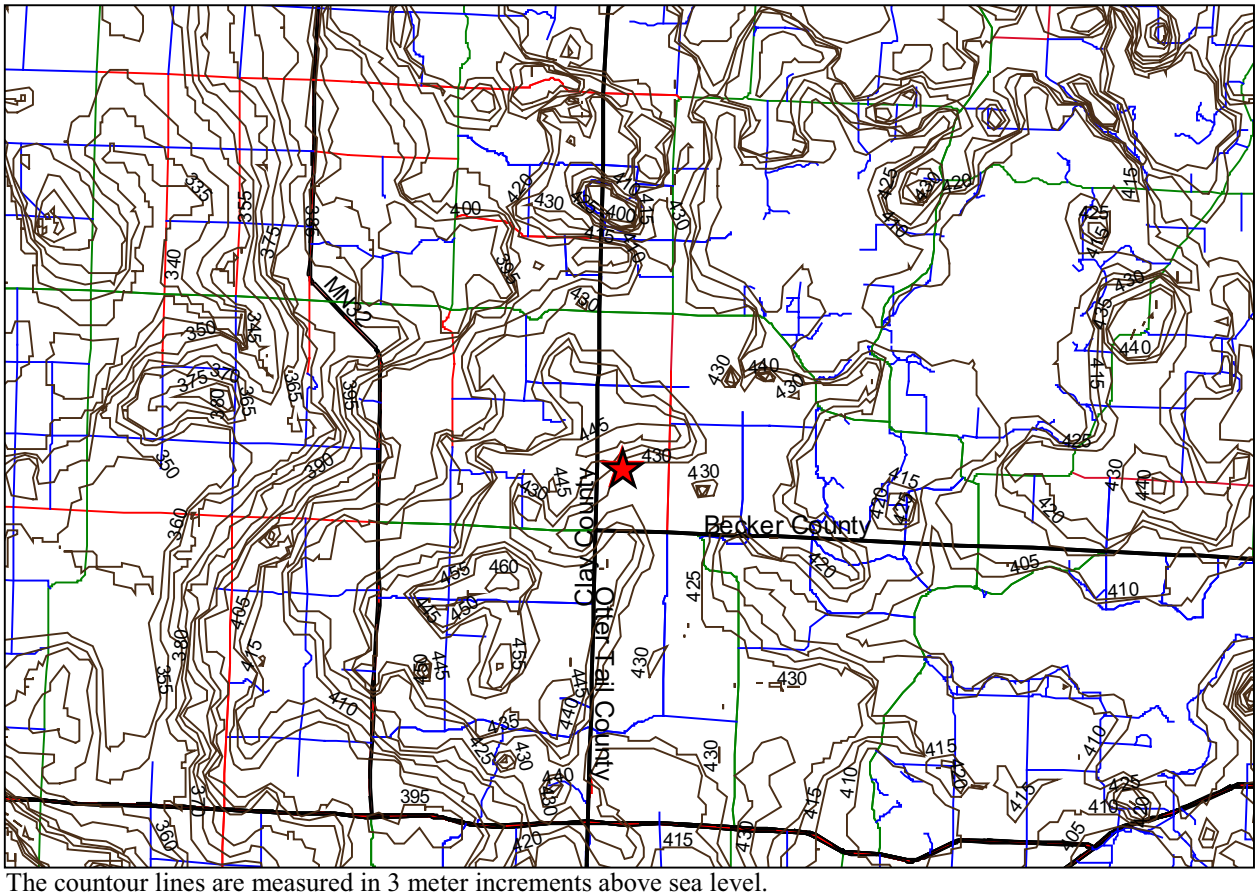


Coordinates

Long/Lat	UTM
N 46.7219	E 257875
W 96.1685	N 5179136

Elevation: 1404 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Rollag

Wind Speed (Meters per Second)

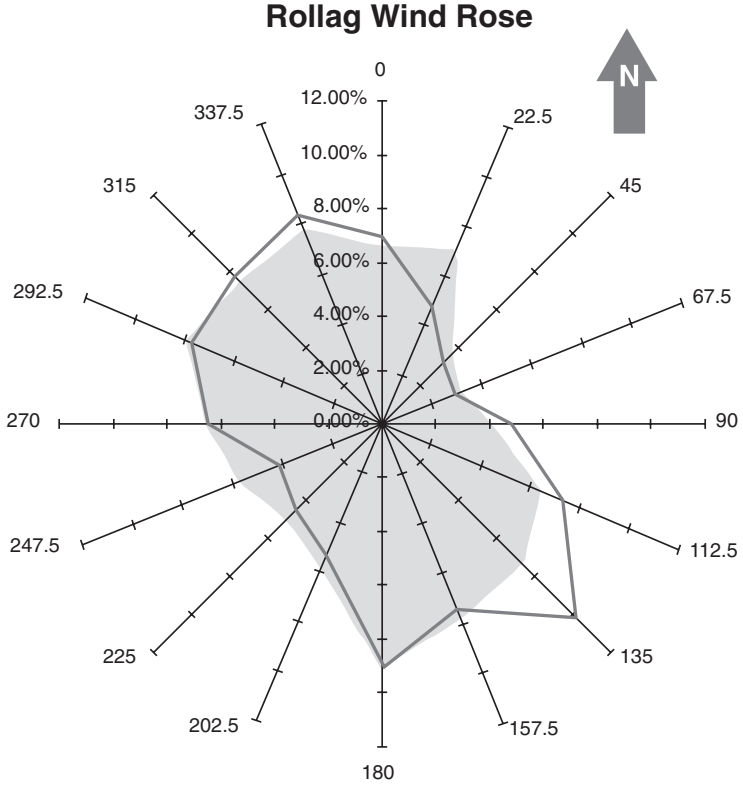
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m							3.2	3.9	4.4	5.8	6.1	4.4	**4.6**
1994	**30m**							4.1	5.1	5.5	7.1	7.4	5.5	**5.8**
	40m							4.2	5.4	5.8	7.6	7.9	5.8	**6.1**
	10m	4.5	5.1	5.2	4.8	5.1	4.5	4.2	5.1	4.4	5.0	5.3	4.8	**4.8**
1995	**30m**	5.2	6.1	6.2	5.7	6.1	5.5	5.3	6.2	5.5	6.1	6.3	6.3	**5.9**
	40m	5.5	6.4	6.6	6.1	6.5	5.9	5.7	6.6	5.9	6.5	6.6	6.7	**6.2**
	10m	4.6	6.4	5.1	5.2	5.1	4.5	4.2	5.0	4.4	6.1	4.8	5.4	**5.1**
1996	**30m**	5.3	7.4	6.1	6.2	6.0	5.5	5.1	6.1	5.4	7.3	5.5	6.2	**6.0**
	40m	5.7	7.8	6.5	6.6	6.4	5.9	5.5	6.5	5.8	7.9	5.9	6.3	**6.4**
	10m	6.2	5.0	5.9	5.0	5.8	4.5	4.2	3.8	4.8	5.7	5.0	4.7	**5.0**
1997	**30m**	6.9	5.7	6.8	5.9	6.8	5.5	5.2	4.7	6.0	6.9	6.1	5.8	**6.0**
	40m	7.1	6.1	7.2	10.6	*	*	4.8	4.9	6.4	7.4	6.4	6.1	**6.7**
	10m	4.0	4.3	4.7	5.1	4.7	4.5	3.7	4.1	4.6	5.2	4.9	4.9	**4.6**
1998	**30m**	4.3	5.4	5.4	6.0	5.6	5.4	4.6	5.1	5.7	6.3	6.0	5.9	**5.5**
	40m	4.6	5.7	5.7	6.4	6.1	5.9	4.9	5.5	6.2	6.8	6.3	6.6	**5.9**
	10m	5.0	6.0	5.1	5.0	6.1	4.9	4.2	4.2	4.5	5.0	4.9	5.1	**5.0**
1999	**30m**	5.8	7.0	6.2	6.0	7.1	5.9	5.3	5.2	5.7	6.4	6.2	6.3	**6.1**
	40m	6.2	7.4	6.5	6.4	7.4	6.2	5.7	5.5	6.1	6.7	6.7	6.7	**6.5**
	10m	4.9	4.8	5.2	5.9	6.0								**5.3**
2000	**30m**	6.0	5.9	6.3	6.9	7.2								**6.5**
	40m	6.5	6.4	6.7	7.3	7.6								**6.9**
	10m	4.8	5.2	5.2	5.2	5.5	4.6	4.0	4.4	4.5	5.5	5.2	4.9	**4.9**
Average	**30m**	5.6	6.2	6.1	6.1	6.5	5.6	4.9	5.4	5.6	6.7	6.3	6.0	**5.9**
	40m	5.9	6.6	6.5	7.2	6.8	6.0	5.1	5.7	6.0	7.1	6.6	6.3	**6.3**
	10m	10.8	11.7	11.6	11.6	12.2	10.3	8.9	9.8	10.1	12.3	11.6	10.9	**11.0**
Average	**30m**	12.5	14.0	13.7	13.7	14.5	12.5	11.0	12.1	12.6	15.0	14.0	13.4	**13.2**
(mph)	**40m**	13.3	14.8	14.6	16.2	15.2	13.3	11.4	12.8	13.5	15.9	14.8	14.2	**14.2**

Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
1994	**10m-30m**							0.22	0.20	0.21	0.19	0.20	0.20	**0.21**
	30m-40m							0.07	0.21	0.19	0.22	0.24	0.20	**0.19**
1995	**10m-30m**	0.12	0.17	0.17	0.16	0.18	0.18	0.19	0.18	0.21	0.19	0.18	0.14	**0.17**
	30m-40m	0.11	0.24	0.25	0.24	0.26	0.23	0.25	0.25	0.24	0.21	0.21	0.21	**0.22**
1996	**10m-30m**	0.13	0.16	0.17	0.17	0.16	0.17	0.17	0.18	0.19	0.18	0.15	0.06	**0.16**
	30m-40m	0.23	0.25	0.26	0.22	0.26	0.27	0.23	0.25	0.24	0.29	0.24	0.21	**0.25**
1997	**10m-30m**	0.11	0.08	0.15	0.18	0.16	0.18	0.18	0.19	0.20	0.18	0.16	0.17	**0.16**
	30m-40m	0.15	0.20	0.26	0.04	*	*	0.11	0.18	0.23	0.24	0.23	0.27	**0.19**
1998	**10m-30m**	0.11	0.20	0.13	0.15	0.16	0.17	0.19	0.18	0.21	0.18	0.19	0.21	**0.17**
	30m-40m	0.29	0.31	0.20	0.29	0.27	0.25	0.25	0.28	0.30	0.27	0.21	0.25	**0.26**
1999	**10m-30m**	0.15	0.16	0.17	0.16	0.15	0.17	0.21	0.20	0.20	0.22	0.24	0.20	**0.18**
	30m-40m	0.29	0.19	0.19	0.25	0.17	0.19	0.24	0.20	0.28	0.22	0.24	0.17	**0.22**
2000	**10m-30m**	0.20	0.20	0.18	0.16	0.18								**0.18**
	30m-40m	0.28	0.31	0.28	0.21	0.23								**0.26**
Average	**10m-30m**	0.14	0.16	0.16	0.16	0.16	0.17	0.20	0.19	0.20	0.19	0.18	0.16	**0.17**
	30m-40m	0.23	0.25	0.24	0.21	0.24	0.23	0.19	0.23	0.25	0.24	0.23	0.22	**0.23**

Rollag

Rollag Wind Rose



Wind Power (Watts per Square Meter)

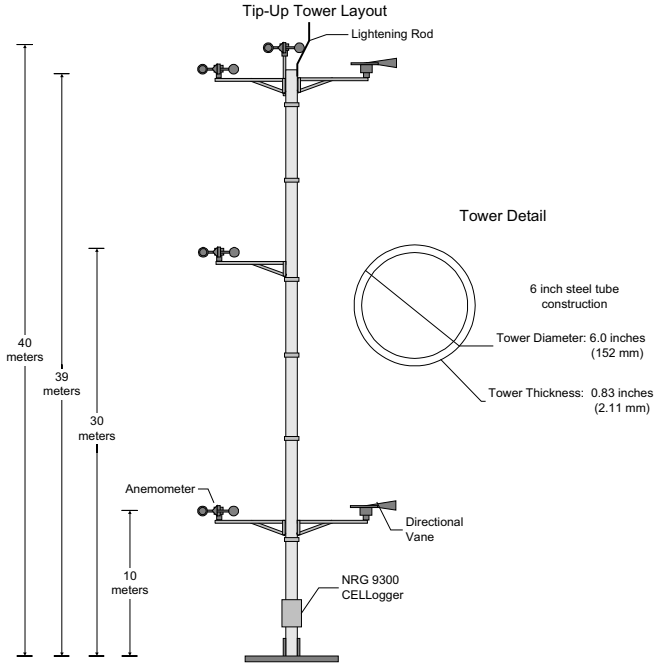
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Avg**
	10m							103	160	144	162	141	98	**135**
1994	**30m**							44	118	166	326	420	169	**207**
	40m							48	136	185	379	493	194	**239**
	10m	103	160	144	162	141	98	96	132	102	148	168	209	**139**
1995	**30m**	150	242	227	242	216	157	161	205	170	240	267	364	**220**
	40m	180	263	271	274	254	182	184	243	203	273	300	445	**256**
	10m	182	286	164	161	130	96	77	121	109	269	139	197	**161**
1996	**30m**	231	406	245	243	196	155	120	191	171	414	193	288	**238**
	40m	249	445	281	282	232	182	138	227	196	478	225	302	**270**
	10m	303	158	213	173	214	92	93	66	115	208	178	106	**160**
1997	**30m**	378	220	299	233	318	149	149	108	193	328	285	187	**237**
	40m	382	266	349	727	*	*	102	124	234	380	308	214	**309**
	10m	69	135	138	151	131	97	60	71	96	186	172	133	**120**
1998	**30m**	92	219	193	216	197	147	99	114	162	282	279	210	**184**
	40m	106	249	215	256	235	182	121	136	199	326	311	272	**217**
	10m	131	244	194	136	234	130	75	86	97	141	125	157	**146**
1999	**30m**	191	357	294	206	346	202	129	138	162	245	218	253	**228**
	40m	228	398	314	242	372	228	158	160	199	283	257	298	**261**
	10m	128	112	151	190	168								**150**
2000	**30m**	208	191	226	287	262								**235**
	40m	249	229	265	326	309								**276**
	10m	153	182	167	162	170	102	84	106	110	185	154	150	**144**
Average	**30m**	208	273	248	238	256	162	117	146	171	306	277	245	**220**
	40m	232	308	282	351	280	193	125	171	202	353	316	287	**259**

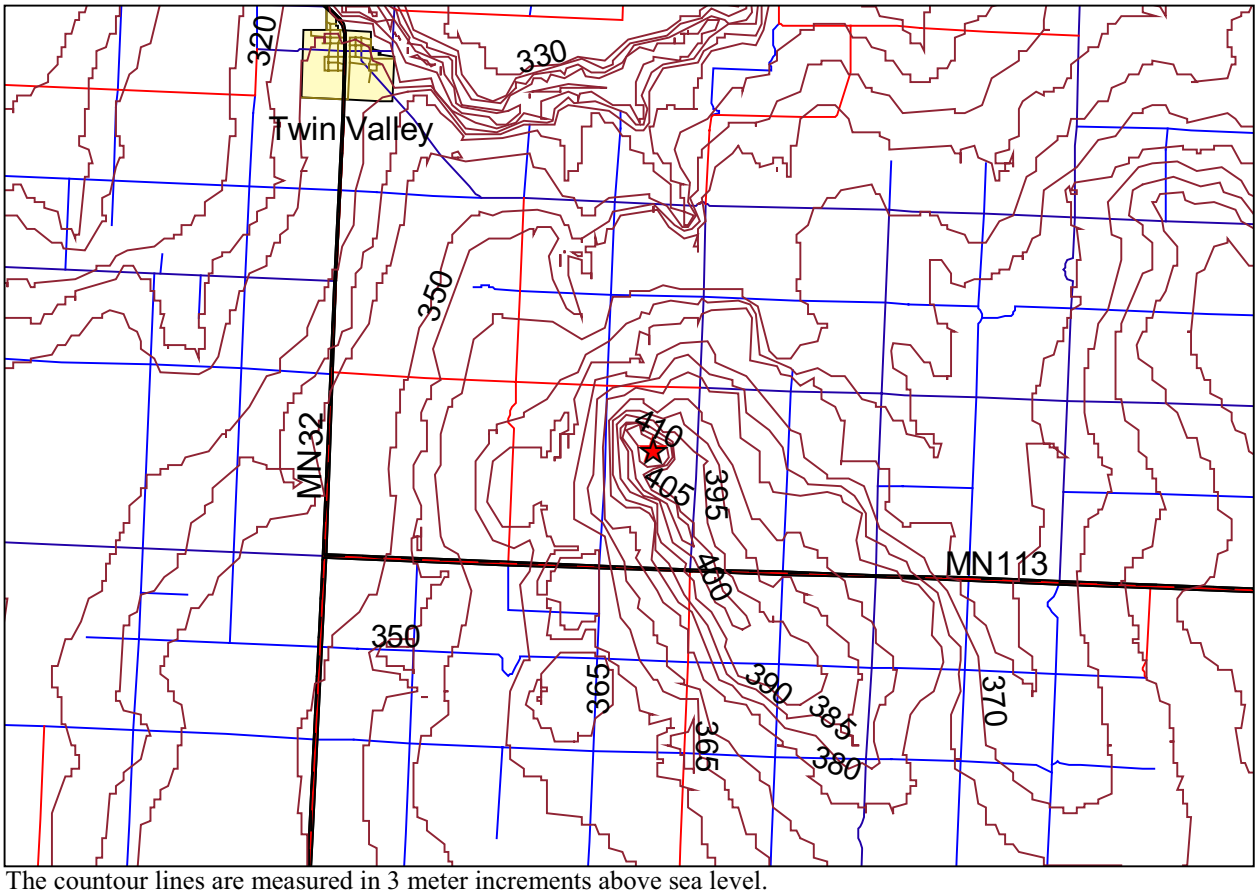
Syre

Coordinates

Long/Lat	UTM
N 47.1896	E 258869
W 96.1831	N 5231145

Elevation: 1286 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Syre

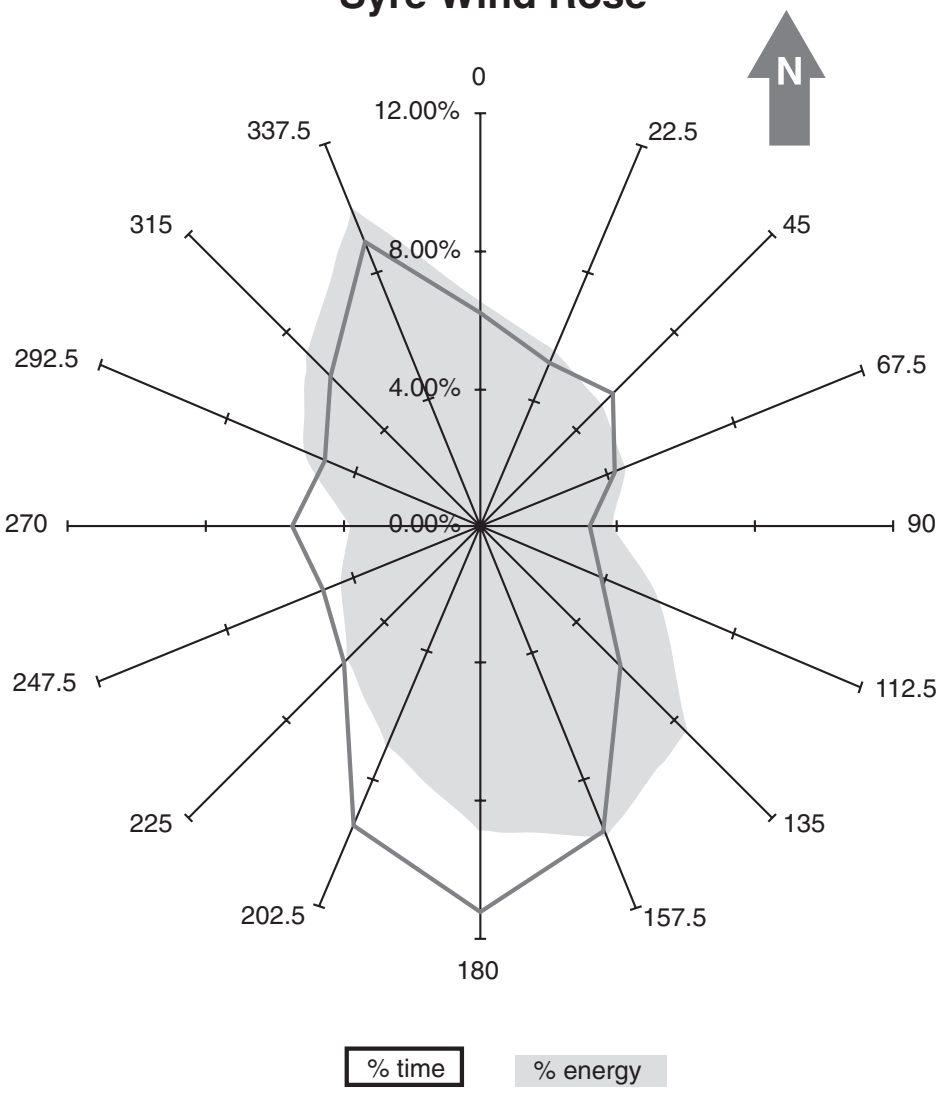
Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m							4.2	4.4	4.2	6.0	6.3	5.3	**5.1**
1994	**30m**							4.9	5.4	5.4	7.1	7.5	6.3	**6.1**
	40m							5.4	6.0	6.1	7.8	8.2	6.9	**6.7**
	10m	4.5	5.2	5.5	4.8	5.0	4.7	4.4	5.3	4.8	5.0	5.4	5.1	**5.0**
1995	**30m**	5.3	6.1	6.4	5.7	5.9	5.7	5.4	6.5	5.9	6.0	6.3	6.1	**6.0**
	40m	5.8	6.8	7.1	6.3	6.5	6.3	5.9	7.2	6.4	6.6	6.8	7.2	**6.6**
	10m	4.6	6.5	5.3	5.5	5.1	4.8	4.1	3.9	4.2	6.3	4.7	5.1	**5.0**
1996	**30m**	5.1	7.5	6.1	6.5	6.1	5.8	5.1	5.9	5.4	7.5	5.5	5.7	**6.0**
	40m	5.7	8.3	6.8	7.0	6.6	6.4	5.6	6.4	5.9	8.2	6.1	6.3	**6.6**
	10m	5.8	5.0	5.7	5.0	5.9	4.9	4.5	4.2	5.3	5.9	5.3	4.9	**5.2**
1997	**30m**	6.4	5.8	6.8	5.7	7.0	5.9	5.6	5.2	6.4	7.1	6.1	5.9	**6.2**
	40m	6.9	6.5	7.4	6.4	7.6	6.5	6.0	4.4	8.3	*	*	*	**6.7**
	10m	4.3	4.5	4.8	5.3	4.6	4.6	3.9	4.2					**4.5**
1998	**30m**	4.9	5.4	5.6	6.4	5.6	5.7	4.9	5.3					**5.5**
	40m	*	*	*	*	*	3.8	*	*					**3.8**
	10m	4.8	5.3	5.3	5.2	5.1	4.7	4.2	4.4	4.6	5.8	5.4	5.1	**5.0**
Average	**30m**	5.4	6.2	6.2	6.1	6.2	5.8	5.2	5.6	5.8	6.9	6.4	6.0	**6.0**
	40m	6.1	7.2	7.1	6.6	6.9	5.7	5.7	6.0	6.7	7.5	7.0	6.8	**6.6**
	10m	10.7	11.8	11.9	11.5	11.5	10.6	9.5	9.9	10.3	12.9	12.1	11.4	**11.2**
Average	**30m**	12.2	13.9	13.9	13.6	13.8	12.9	11.5	12.6	12.9	15.5	14.2	13.4	**13.4**
(mph)	**40m**	13.7	16.1	15.9	14.7	15.5	12.8	12.8	13.5	15.0	16.8	15.8	15.2	**14.8**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m							66	78	76	184	240	144	**131**
1994	**30m**							94	134	147	305	388	233	**217**
	40m							124	180	205	386	495	312	**284**
	10m	110	158	164	150	121	102	92	128	110	136	177	195	**137**
1995	**30m**	165	239	260	241	193	173	156	221	189	220	273	308	**220**
	40m	213	309	351	305	251	223	203	286	246	279	344	435	**287**
	10m	148	296	164	171	120	99	64	36	80	267	108	160	**143**
1996	**30m**	181	435	243	270	192	172	112	119	150	431	182	230	**226**
	40m	236	554	313	336	241	221	146	160	194	534	222	308	**289**
	10m	217	163	191	150	223	99	92	74	136	191	196	122	**154**
1997	**30m**	297	241	301	194	350	165	165	131	236	313	283	200	**240**
	40m	357	317	389	265	433	215	207	81	440	*	*	*	**301**
	10m	95	122	142	145	106	91	67	62					**104**
1998	**30m**	141	225	206	241	177	153	116	116					**172**
	40m	*	*	*	*	*	74	*	*					**74**
	10m	142	185	165	154	142	98	76	76	100	194	180	155	**139**
Average	**30m**	196	285	252	236	228	166	128	144	180	317	281	243	**222**
	40m	269	393	351	302	308	183	170	177	271	400	354	352	**294**

Syre Wind Rose



Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
1994	**10m-30m**							0.13	0.18	0.24	0.17	0.17	0.14	**0.17**
	30m-40m							0.39	0.38	0.43	0.32	0.32	0.34	**0.36**
1995	**10m-30m**	0.15	0.16	0.15	0.16	0.17	0.18	0.19	0.20	0.19	0.16	0.15	0.13	**0.17**
	30m-40m	0.31	0.36	0.38	0.35	0.35	0.31	0.32	0.35	0.34	0.34	0.30	0.30	**0.33**
1996	**10m-30m**	0.10	0.14	0.14	0.16	0.17	0.20	0.19	0.36	0.24	0.18	0.16	0.06	**0.18**
	30m-40m	0.43	0.39	0.37	0.29	0.30	0.30	0.33	0.32	0.31	0.31	0.32	0.36	**0.34**
1997	**10m-30m**	0.11	0.09	0.17	0.18	0.17	0.18	0.20	0.20	0.20	0.18	0.16	0.18	**0.17**
	30m-40m	0.28	0.33	0.33	0.26	0.30	0.32	0.29	0.16	*	*	*	*	**0.28**
1998	**10m-30m**	0.13	0.15	0.15	0.17	0.19	0.19	0.21	0.21					**0.17**
	30m-40m	*	*	*	*	*	*	*	*					*****
Average	**10m-30m**	0.12	0.13	0.15	0.17	0.18	0.19	0.18	0.23	0.22	0.17	0.16	0.13	**0.17**
	30m-40m	0.34	0.36	0.36	0.30	0.31	0.31	0.33	0.30	0.36	0.33	0.31	0.33	**0.33**

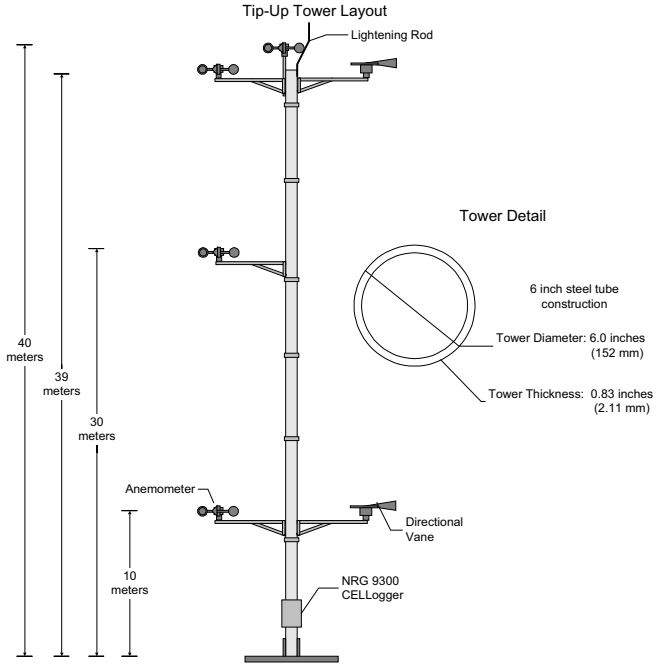
* The 40 meter anemometer was damaged during this time period. It was not repaired during the course of the year because the site was due to be decommissioned.

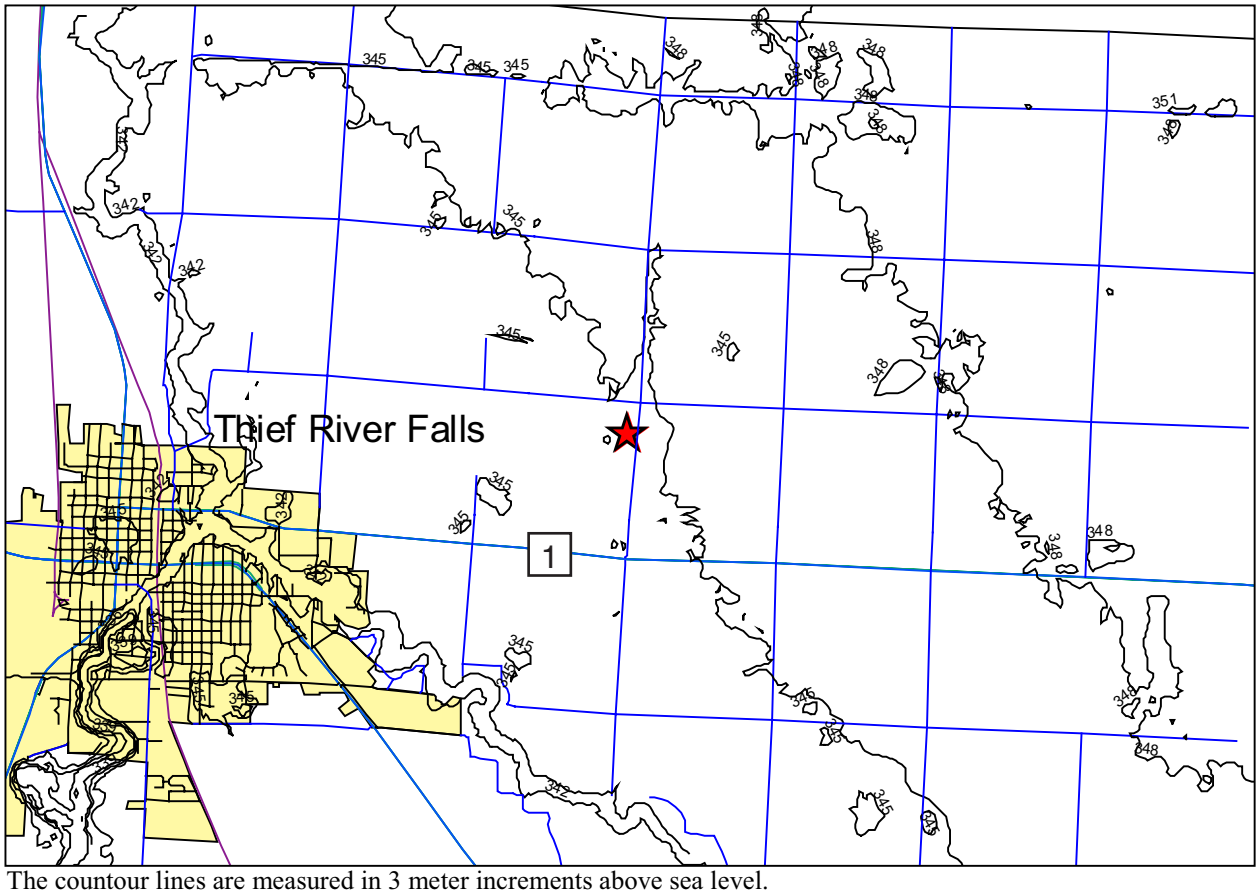
Thief River Falls

Coordinates

Long/Lat	UTM
N 48.1332	E 268511
W 96.1114	N 5335789

Elevation: 1132 feet





The countour lines are measured in 3 meter increments above sea level.
County roads are approximately 1 mile apart.

Thief River Falls

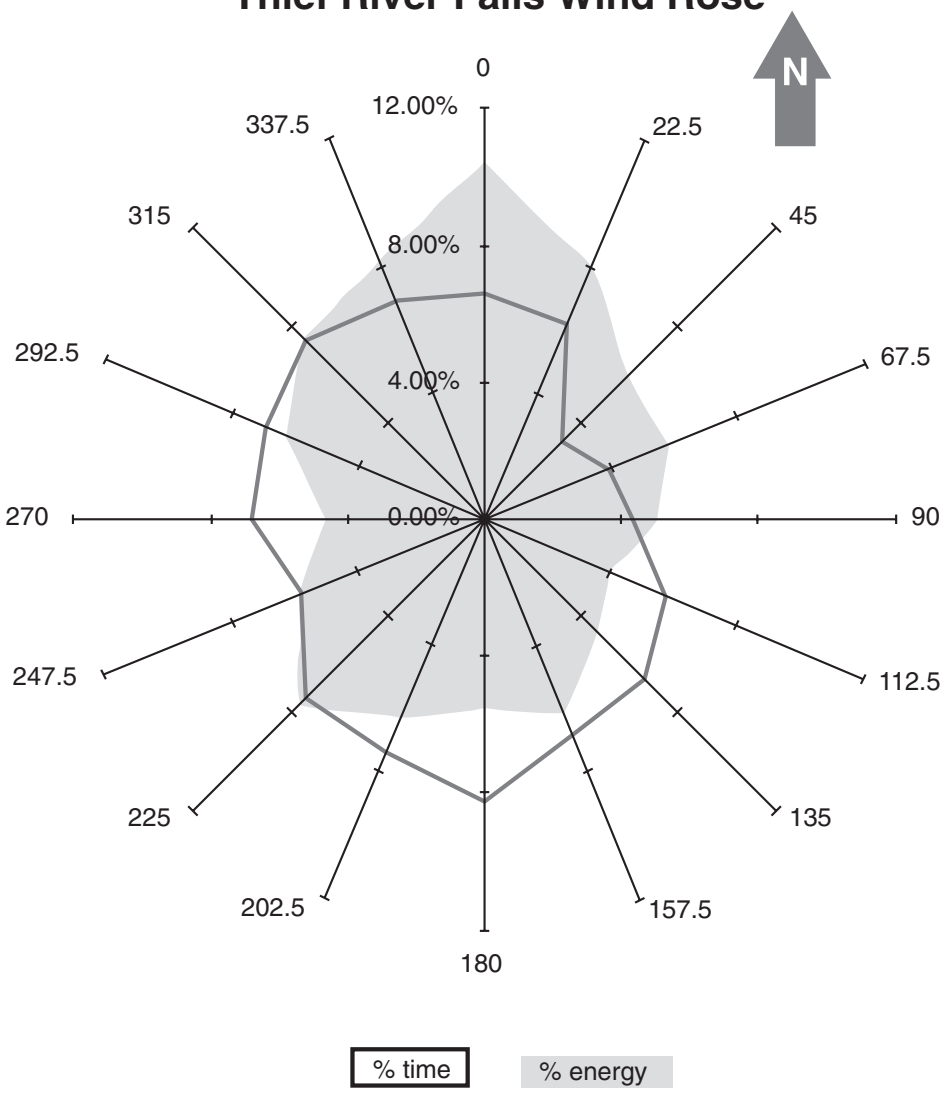
Wind Speed (Meters per Second)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m										4.3	4.1	3.9	**4.1**
1998	**30m**										5.7	5.3	4.5	**5.1**
	40m										6.3	4.3	6.4	**5.7**
	10m	4.1	5.0	4.2	3.8	4.9	4.1	3.4	3.2	3.8	4.4	4.1	4.6	**4.1**
1999	**30m**	4.4	5.8	5.0	4.4	5.7	4.6	4.2	3.7	4.4	5.4	5.0	5.3	**4.8**
	40m	5.9	6.8	6.0	5.6	6.9	5.9	5.5	4.9	5.7	6.6	6.4	6.4	**6.1**
	10m	4.3	4.4	4.6	4.7	4.2	4.3	3.3	3.5	4.2	4.0	4.2	3.9	**4.1**
2000	**30m**	5.1	5.4	5.6	5.6	5.1	5.1	4.0	4.2	5.3	4.7	5.1	4.7	**5.0**
	40m	6.1	6.4	6.6	6.7	6.1	6.3	5.2	5.4	6.3	5.9	5.8	5.3	**6.0**
	10m	4.4	4.4	4.2	4.4									**4.3**
2001	**30m**	5.0	5.3	5.0	5.2									**5.1**
	40m	6.2	5.9	5.7	5.9									**5.9**
	10m	4.3	4.6	4.3	4.3	4.6	4.2	3.4	3.4	4.0	4.2	4.1	4.1	**4.1**
Average	**30m**	4.9	5.5	5.2	5.1	5.4	4.9	4.1	4.0	4.8	5.3	5.1	4.8	**4.9**
	40m	6.1	6.4	6.1	6.1	6.5	6.1	5.4	5.2	6.0	6.3	5.5	6.0	**6.0**
	10m	9.6	10.3	9.7	9.6	10.3	9.4	7.6	7.5	9.0	9.5	9.2	9.3	**9.2**
Average	**30m**	10.9	12.2	11.6	11.3	12.1	10.9	9.1	8.8	10.8	11.8	11.4	10.8	**11.0**
(mph)	**40m**	13.6	14.3	13.6	13.6	14.5	13.7	12.0	11.6	13.4	14.1	12.3	13.5	**13.3**

Wind Power (Watts per Square Meter)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
	10m										92	102	76	**90**
1998	**30m**										184	193	112	**163**
	40m										241	127	256	**208**
	10m	79	164	116	66	136	81	50	43	60	104	96	135	**94**
1999	**30m**	106	228	171	101	206	114	86	63	93	181	170	213	**144**
	40m	194	323	243	170	298	185	154	112	160	278	272	299	**224**
	10m	102	96	120	115	97	88	39	55	90	70	86	105	**89**
2000	**30m**	158	166	200	187	158	150	67	89	153	108	138	159	**145**
	40m	233	247	288	266	222	231	118	140	231	174	193	205	**212**
	10m	111	98	85	129									**106**
2001	**30m**	172	152	123	203									**163**
	40m	277	210	167	260									**229**
	10m	97	119	107	104	117	84	45	49	75	89	95	105	**90**
Average	**30m**	145	182	165	164	182	132	77	76	123	157	167	161	**144**
	40m	235	260	233	232	260	208	136	126	196	231	198	253	**214**

Thief River Falls



Wind Shear Exponent (Alpha)

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Average**
1998	**10m-30m**										0.26	0.24	0.08	**0.19**
	30m-40m										0.37	0.61	1.47	**0.82**
1999	**10m-30m**	0.01	0.08	0.12	0.15	0.15	0.12	0.18	0.11	0.14	0.18	0.15	0.12	**0.12**
	30m-40m	1.25	0.87	0.86	0.91	0.71	0.83	0.99	0.95	0.93	0.87	0.66	0.49	**0.86**
2000	**10m-30m**	0.12	0.16	0.14	0.13	0.14	0.15	0.14	0.18	0.19	0.18	0.14	0.13	**0.15**
	30m-40m	0.48	0.51	0.48	0.47	0.46	0.51	0.55	0.83	0.77	0.80	0.65	0.61	**0.59**
2001	**10m-30m**	0.10	0.16	0.15	0.16									**0.14**
	30m-40m	0.54	0.55	0.57	0.56									**0.55**
Average	**10m-30m**	0.08	0.13	0.14	0.14	0.14	0.13	0.16	0.14	0.17	0.21	0.17	0.11	**0.14**
	30m-40m	0.76	0.64	0.64	0.64	0.58	0.67	0.77	0.89	0.85	0.68	0.64	0.85	**0.72**

Wind Speed

Wind speed, measured using an anemometer, is the fundamental measurement that allows for all wind power analysis. Each hour, a data logger averages the anemometer output providing an hourly average wind speed. Some of the newer sites are set up such that the wind speed is averaged every 10 or 15 minutes.

Wind speeds are averaged for each site on a monthly, yearly, or cumulative basis. These averages are the values used in wind power calculations for each site.

Tower Shading

In most cases, the monitoring tower has anemometers at 30, 50, and 70 meters. Two anemometers are located at each height on different sides of the tower. The redundant sensor is present to account for tower shading. Tower shading occurs when the tower slows the wind before it reaches the anemometer. The amount of shading depends on the amount of conduit, contraction of the tower, and other obstacles on the tower. Figure 1 shows a typical scenario that could result in tower shadowing.

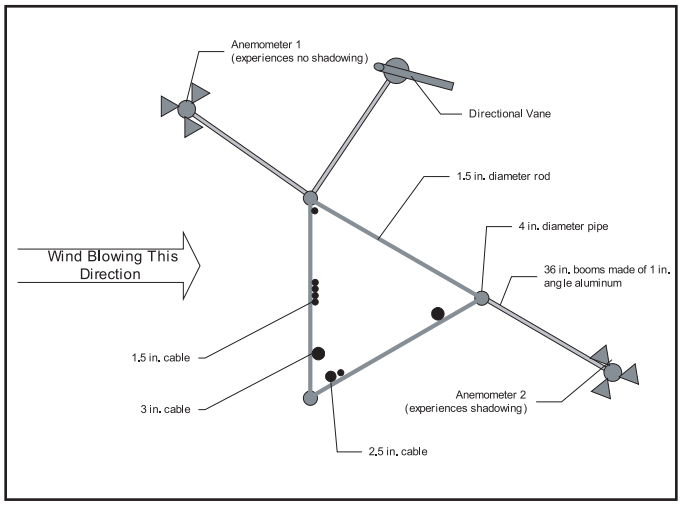


Figure 1: Example of Tower Shading (top view of tower)

When tower shadowing does occur, only data from the valid anemometer is used in calculations.

Wind Shear

The tendency for wind speed to increase with height above ground is called wind shear. Wind shear is caused by surface roughness and obstacles on the ground, which cause friction and slow the wind. Wind shear effects are amplified with rougher surfaces and more obstacles present. The result of wind shear is a wind speed distribution typical of Figure 2.

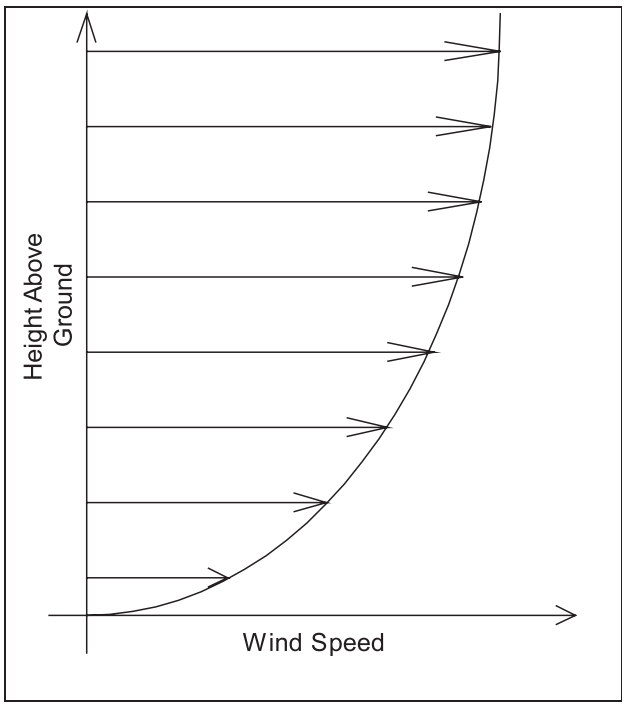


Figure 2: Typical Wind Shear Behavior

This behavior can be modeled mathematically by,

$$\frac{S}{S_O} = \left(\frac{H}{H_O}\right)^{\alpha} \quad (1)$$

where S_o and H_o are the original or known speed and height respectively. H is the greater height where there is a higher wind speed, S. $\alpha 6$ is called the wind shear exponent which is dependent on the roughness of the ground. A smooth surface, such as a grassy plain, has a typical wind shear exponent of 1/7 (0.14). The wind shear exponent increases as the surface roughness increases. A rough terrain or wooded region can have a wind shear exponent as high as 1/4. Recent DOC studies have found that much of western and southern Minnesota may have wind shear exponents as high as 1/5 to 1/4.

The wind shear exponent may be found between any two heights where the wind speed is known at each height. α can be found by rearranging Equation 1 where

$$\alpha = \frac{\log\left(S/S_O\right)}{\log\left(H/H_O\right)} \quad (2)$$

Wind shear values are found between the 30 meter and 50 meter monitoring levels as well as the 50 meter and 70 meter levels. These values are averaged monthly for each set of heights at each site. The results can be found in the Summary Data and Site Descriptions Section.

Wind Power Density

Wind power density is a measurement of how much power is in the wind. The amount of energy in the wind is a function of its speed (v) and mass (m) and is given by the equation for kinetic energy (KE),

$$KE = \frac{1}{2} \cdot m \cdot v^2 \quad (3)$$

Power (P) is energy applied over a given time. Therefore, the power in the wind is the kinetic energy per unit time (t) where the standard unit time is one second.

$$P = \frac{KE}{t} = \frac{1/2 \cdot m \cdot v^2}{t} \quad (4)$$

Note that from the above equation, the "mass/time" term is a mass flow rate ($\dot{m}$). The mass flow rate can be written as the product of the density (ρ) and the volumetric flow rate (Q).

$$\dot{m} = \rho \cdot Q \quad (5)$$

The volumetric flow rate, Q, is the amount of air that passes through a specified area. Q can be found by multiplying the velocity of the wind (v) by the area (A),

$$Q = v \cdot A \quad (6)$$

Therefore the mass flow rate can be written as,

$$\dot{m} = \rho \cdot v \cdot A \quad (7)$$

Next, substituting the mass flow rate formula into Equation 4, we find that,

$$P = 1/2 \cdot \rho \cdot v^3 \cdot A \quad (8)$$

The wind power density (wpd) is the power per unit area,

$$wpd = \frac{P}{A} \quad (9)$$

where the standard unit area is one square meter. Therefore the wind power density is,

$$wpd = 1/2 \cdot \rho \cdot v^3 \quad (10)$$

The wind power density equation above does not take into consideration changes in air density. Air density is a function of the altitude and temperature. The standard density of air defined at sea level, one atmosphere of pressure, and 60°F, is 1.225 kg/m3. The wind power density must be adjusted for each site by multiplying the power density by both a temperature (CT) and altitude (CA) correction factor.

Determining C_A

The altitude correction factor is a ratio of the atmospheric pressure (p_{ACTUAL}) at the site to standard pressure ($p_{STANDARD}$) at sea level, 14.7 psi.

$$C_A = \frac{p_{ACTUAL}}{p_{STANDARD}} \quad (11)$$

The pressure of the air is inversely proportional to the altitude such that when the altitude increases the pressure decreases. The relation between the pressure and altitude can be found in the Gas Engineers Handbook, 1985, Table 6-7, "Elevation Effects on Pressure and Temperature." This relation is shown in Equation 12

$$p_{ACTUAL} = \frac{28682.5 - Altitude}{1951.7} \quad (12)$$

where the altitude is in feet. Upon combining Equations 11 and 12 we find that,

$$C_A = 1 - \frac{Altitude}{28682.5} \quad (13)$$

Determining C_T

The temperature correction factor is a ratio of the standard temperature (60° F, equivalent to 519.67°R) to the average monthly temperature at the site.

$$C_T = \frac{519.67}{T + 459.67} \quad (14)$$

The average monthly temperatures are from the National Oceanic and Atmospheric Administration's 30 Year Normal.

Final Calculations for Wind Power Density

Finally, the wind power density is multiplied by the correction factors,

$$wpd = 1/2 \cdot \rho \cdot v^3 \cdot C_A \cdot C_T \quad (15)$$

Equation 15 can be further simplified by inserting the known value for the density of air (ρ = 1.225 kg/m3). The final expression for the wind power density is in the form of Equation 16,

$$wpd = 0.6125 \cdot v^3 \cdot C_A \cdot C_T \quad (16)$$

Values for wind power density for each site on average monthly intervals can be found in the Summary Data and Site Descriptions Section.