POWERTECH (USA) INC.

APPENDIX G

CLIMATIC DATA

1.1 Meteorology

1.1.1 Introduction

The proposed project is located in an area in southwestern South Dakota that can be characterized as a semiarid or steppe climate. It lies adjacent to the southwestern extension of the Black Hills. The area experiences abundant sunshine, low relative humidity, and sustained winds which lead to high evaporative demand. There are also large diurnal and annual variations in temperature.

Precipitation in the PAA is generally light. Migratory storm systems that originate in the Pacific Ocean release a majority of their moisture over the Rocky or Cascade Mountains. Major precipitation events can occur when these systems regain moisture already present in the area or moisture advected from the Gulf of Mexico. Localized summer convective storms, caused by the Black Hills, can produce heavy precipitation events.

To complete the site-specific analysis, a weather station was installed in coordination with the South Dakota State Climatology office at approximately the center of the PAA in July 2007. This site collects temperature, humidity, solar radiation, wind speed/direction, barometric pressure, and precipitation at 1-minute, 5-minute, and hourly time steps. To determine whether this period of data collection (July 18, 2007, to July 17, 2008) was representative of long-term meteorological conditions, weather data from the nearest National Weather Service (NWS) site at Chadron, Nebraska, for the same period was compared to data collected at the site from years 1978–2007.

The data compiled from several sites (listed in Table 1.1-1 and shown in Figure 1.1-1) surrounding the PAA from the High Plains Regional Climate Center (HPRCC) and South Dakota State University (SDSU) was used to represent the long-term meteorological conditions of the Proposed Action region. All the sites were used to characterize regional trends of temperature and precipitation along with growing, heating, and cooling degree days. Only the SDSU sites had sufficient data available to analyze regional patterns of humidity, and only the Oral, South Dakota, site had adequate data to characterize wind speed/direction and evapotranspiration.

Data were analyzed at each site by time of day, month, and season of the year. The seasons for this analysis are defined as: winter (December, January, February), spring (March, April, May), summer (June, July, August), and fall (September, October, November).

Table 1.1-1: Meteorological Stations Included in Climatology Analysis

Name	Data Source	*X* (ft)	*Y* (ft)	*Z* (ft)	Years of Operation
Redbird	NCDC[(a)]	10,417	4,315	3,890	1948–2006
Oral	SDSU[(b)]	10,316	4,324	2,960	1971–2007
Oelrichs	NCDC	10,314	4,311	3,340	1948–2007
Newcastle	NCDC	10,414	4,351	4,380	1918–2006
Edgemont	NCDC	10,349	4,318	3,440	1948–2007
Custer	NCDC	10,336	4,346	5,330	1926–2007
Ardmore	NCDC	10,339	4,304	3,550	1948–2007
Angostura	NCDC	10,326	4,322	3,140	1948–2007
Jewel Cave	SDSU	10,349	4,343	5,298	2004–2008

Source: High Plains Regional Climate Center, 2008; South Dakota State University, 2008

(a) National Climatic Data Center.

(b) South Dakota State University Climate Web site.

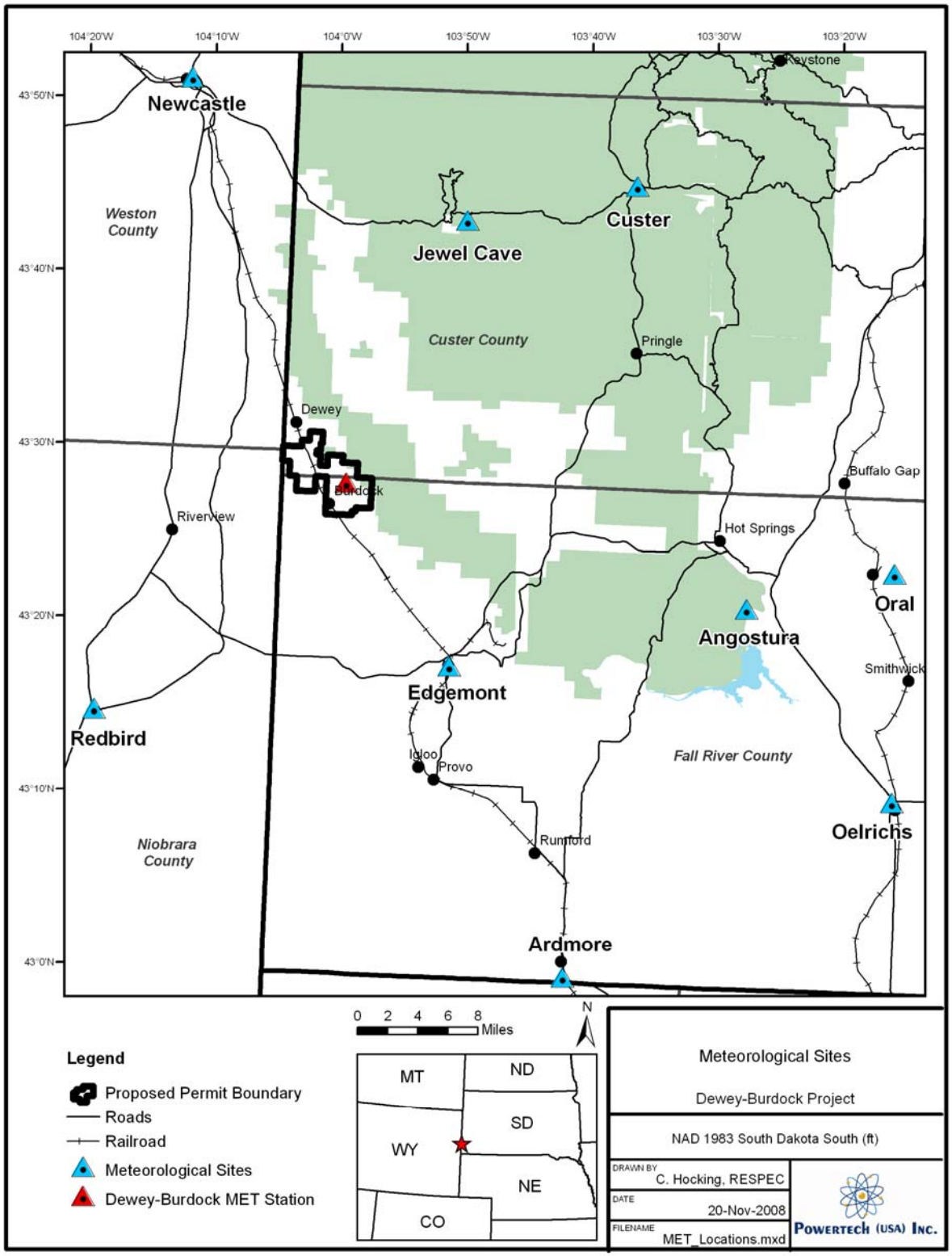


Figure 1.1-1: Meteorological Sites

1.1.2 Regional Overview

Meteorological data from the NWS site at Chadron, Nebraska, were collected from the HPRCC and analyzed to determine whether the past year's data (July 18, 2007, to July 17, 2008) was representative of long-term meteorological conditions (January 1, 1978, to July 17, 2008) in the area. The parameters analyzed were average daily temperature, wind speed, and precipitation.

The average daily temperature over the last (current) year was 47.8 degrees F, which is slightly cooler than the 30-year average (historic) daily temperature of 50.5 degrees F. Figure 1.1-2 displays a boxplot of the current and historic temperature data. The interquartile range for the current data is from 30.3 degrees F to 64.5 degrees F with a median value of 48.2 degrees F, compared to the historic data that has an interquartile range from 35.3 degrees F to 68.3 derees F and a median value of 50.5 degrees F. When looking at the data on a month-by-month basis, the mean value of the current data lies within one standard deviation of the mean value of the historic data (see Appendix 1.1-A).

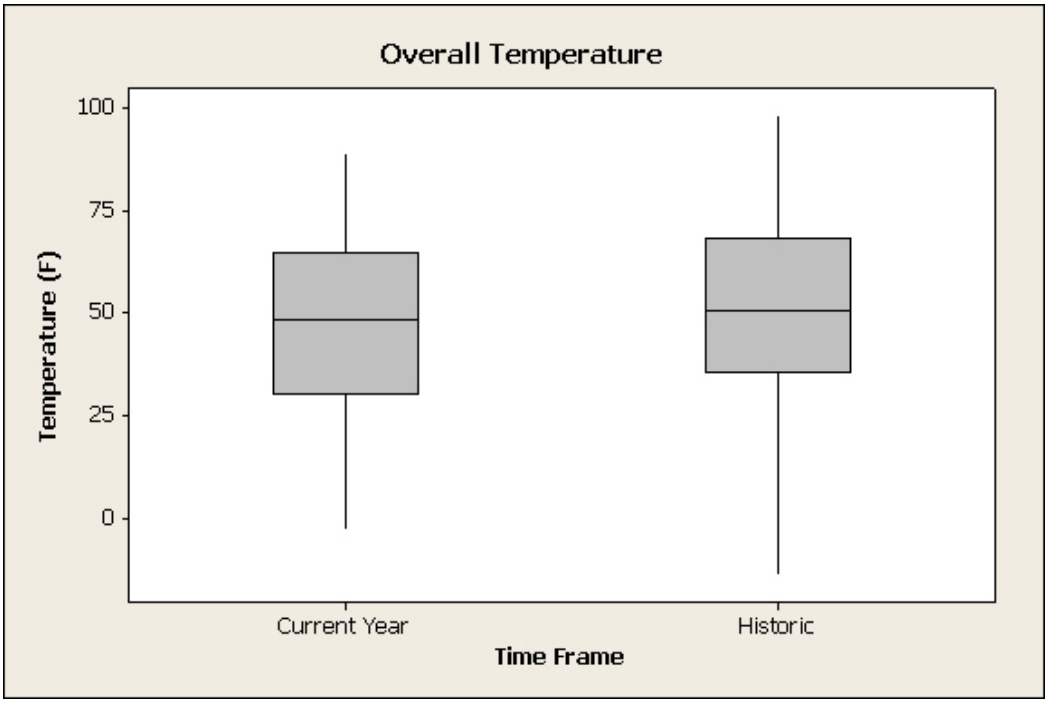


Figure 1.1-2: Temperature at Chadron, Nebraska, National Weather Service Site

The average daily wind speed over the current year was approximately 1 mph less than historically (9.8 to 10.8 mph). Figure 1.1-3 displays a boxplot of monthly wind speed for the current and historic data. The median value lies with the interquartile range for all months.

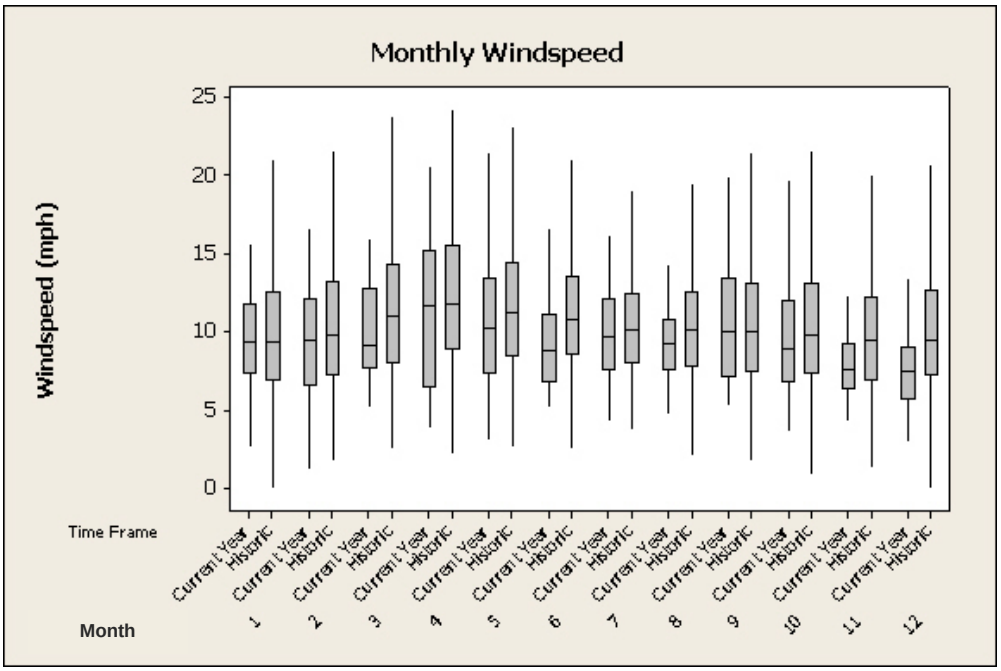
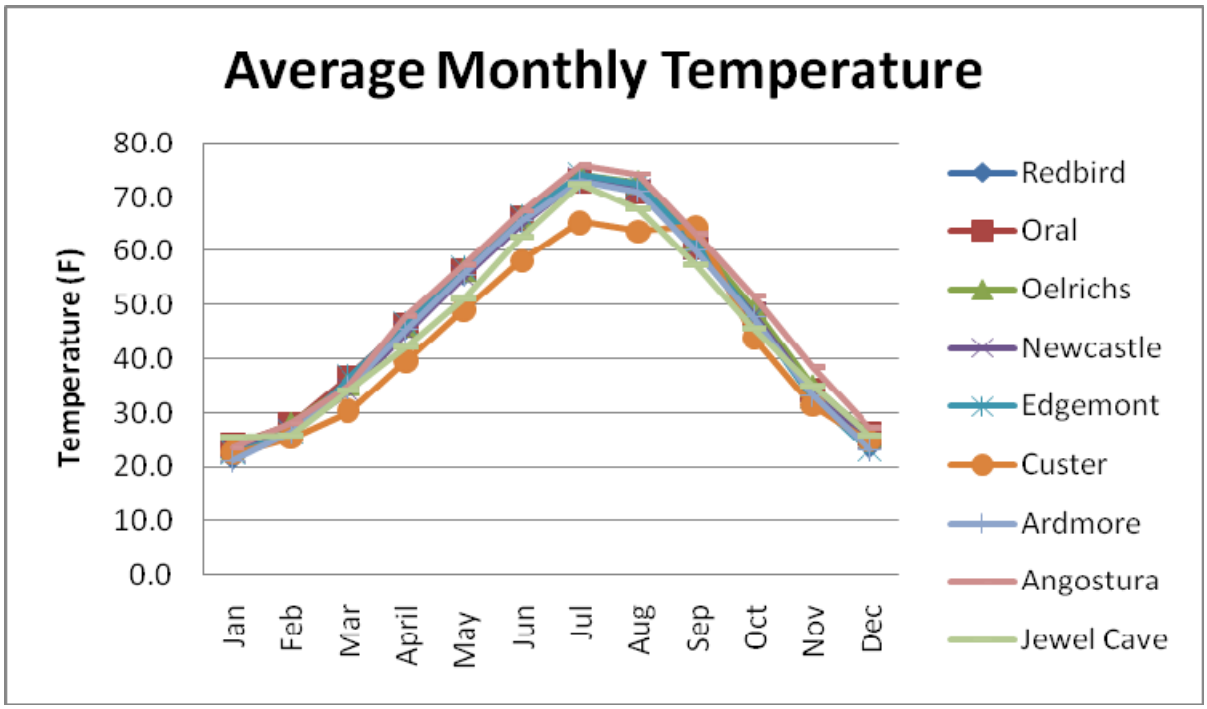


Figure 1.1-3: Monthly Wind Speed at Chadron, Nebraska, National Weather Service Site

The current year had well above the average amount of yearly precipitation. The current year had 32.8 inches of precipitation compared to the average yearly historic precipitation of 18.2 inches.

1.1.2.1 Temperature

The annual average temperature in this region is 46.7 degrees F. Figure 1.1-4 and Table 1.1-2 display the monthly, annual, and seasonal average temperatures. This region has some of its warmest days in the summer months with the hottest month being July (average temperature of 72.8 degrees F). The coldest month of the year is January, with an average temperature of 23.0 degrees F. The differences seen between sites can be attributed to elevation. Custer and Jewel Cave have the lowest average temperature primarily because these sites are nearly 1,000 feet higher in elevation than all other sites.



Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

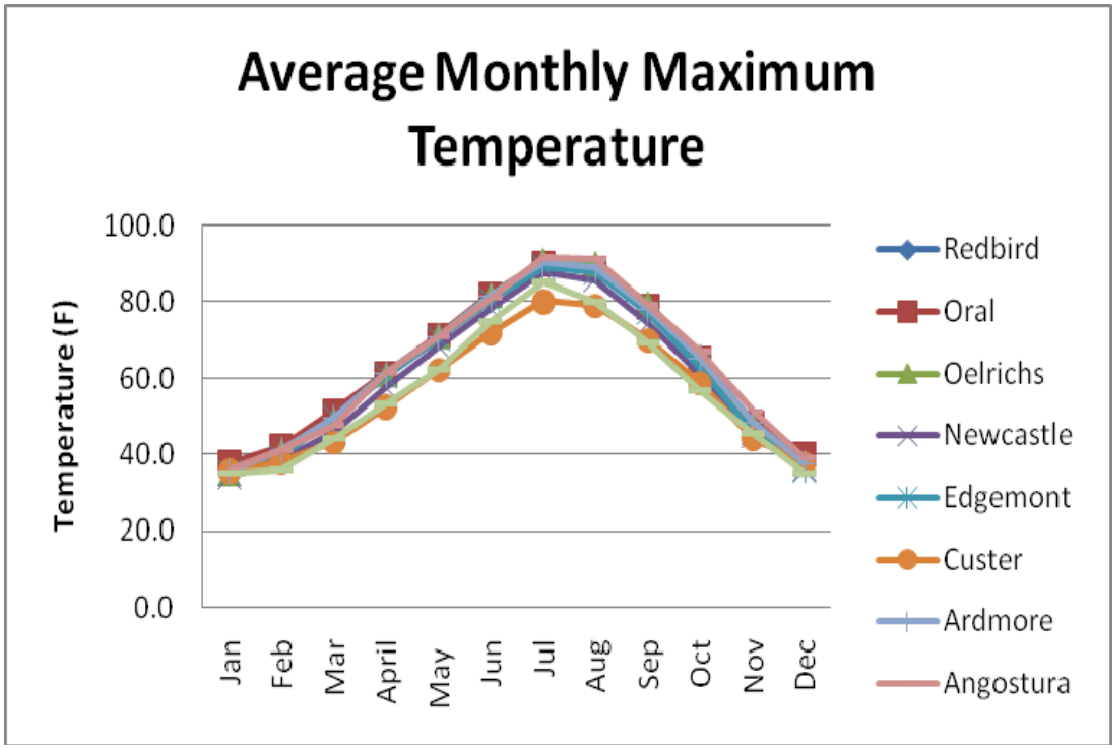
Figure 1.1-4: Average Monthly Temperatures for Regional Sites

Table 1.1-2: Average Monthly, Annual, and Seasonal Temperatures for Regional Sites (ºF)

Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Winter	Spring	Summer	Fall
Redbird	21.8	27.3	35.1	45.8	55.8	65.5	73.3	71.4	60.4	47.9	33.1	23.8	46.8	24.3	45.6	70.1	47.2
Oral	24.1	27.9	36.6	46.3	56.6	66.2	73.2	71.1	60.7	48.3	34.3	26.1	47.6	26.1	46.5	70.2	47.8
Oelrichs	23.2	28.0	35.4	46.3	56.5	66.3	74.2	72.8	62.1	49.5	35.0	25.7	47.9	25.7	46.1	71.1	48.9
Newcastle	22.8	26.7	34.1	44.9	55.3	64.9	73.3	71.3	60.5	48.2	33.9	25.4	46.8	25.0	44.7	69.8	47.5
Edgemont	22.5	26.3	36.6	46.5	56.8	66.4	74.1	72.3	61.4	47.7	32.9	23.1	47.2	24.0	46.6	70.9	47.3
Custer	22.5	25.3	30.3	39.6	49.1	58.2	65.4	63.8	64.5	43.9	31.4	24.8	42.4	24.2	39.7	62.5	43.3
Ardmore	21.3	26.5	34.8	45.5	55.7	65.6	73.1	71.2	60.2	47.8	33.4	23.3	46.5	23.7	45.3	70.0	47.1
Angostura	23.5	28.1	34.9	47.9	57.5	67.4	75.9	74.3	63.3	51.8	38.4	27.3	49.2	26.3	46.8	72.5	51.2
Jewel Cave	25.5	25.8	34.0	42.2	51.1	62.7	72.5	67.9	57.6	45.6	35.0	25.7	45.5	25.7	42.4	67.7	46.1
Regional Average	23.0	26.9	34.6	45.0	54.9	64.8	72.8	70.7	61.2	47.9	34.2	25.0	46.7	25.0	44.9	69.4	47.4

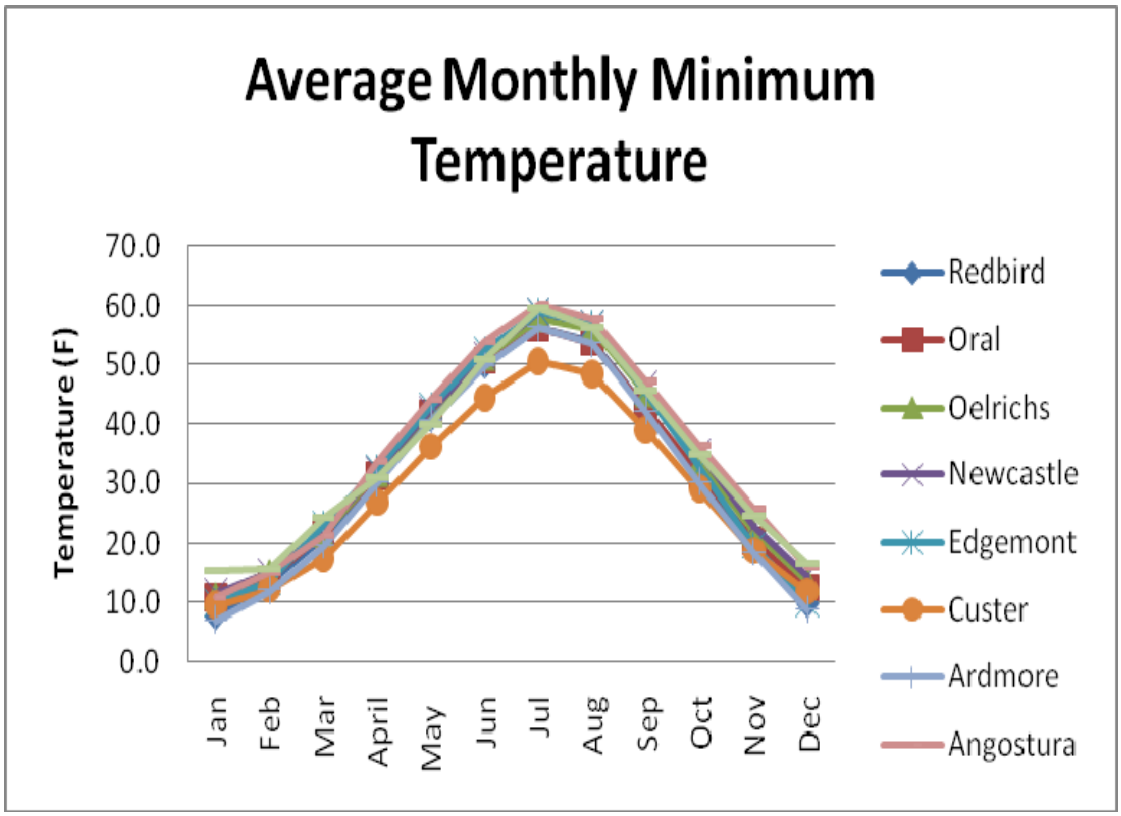
Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

Figures 1.1-5 and 1.1-6 show the average maximum and minimum temperatures in the region. The average maximum temperature is 60.7 degrees F annually, while the annual average minimum temperature is 32.7 degrees F, as shown in Tables 1.1-3 and 1.1-4. The highest average maximum temperatures in the region usually fall during the month of July (88.3 degrees F). The lowest minimum temperatures can be found in January with a regional average of 10.4 degrees F.



Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

Figure 1.1-5: Average Monthly Maximum Temperatures for Regional Sites



Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

Figure 1.1-6: Average Monthly Minimum Temperatures for Regional Sites

Table 1.1-3: Average Monthly, Annual and Seasonal Maximum Temperatures for Regional Sites (ºF)

Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Winter	Spring	Summer	Fall
Redbird	35.8	41.3	49.3	60.7	70.6	81.1	90.2	88.9	78.2	65.0	47.4	37.9	62.2	38.3	60.2	86.7	63.5
Oral	37.7	42.2	51.4	61.2	71.2	81.8	90.1	88.5	78.8	65.0	48.3	40.1	63.0	40.0	61.3	86.8	64.0
Oelrichs	35.3	40.8	49.0	60.9	71.0	81.5	90.6	89.7	79.3	65.5	48.0	37.8	62.5	38.0	60.3	87.3	64.2
Newcastle	34.2	38.4	46.0	57.5	68.1	78.2	87.7	85.7	74.3	61.1	45.0	36.3	59.4	36.3	57.2	83.9	60.1
Edgemont	35.2	39.3	49.9	60.6	70.3	80.4	89.0	87.7	77.1	62.8	45.9	36.2	61.2	36.9	60.3	85.7	61.9
Custer	35.5	38.2	43.2	52.4	62.1	71.8	80.2	79.1	69.9	58.7	44.2	37.5	56.1	37.1	52.5	77.0	57.6
Ardmore	35.6	41.2	49.7	61.2	70.8	81.4	90.1	88.9	78.2	65.4	48.4	37.8	62.4	38.2	60.5	86.8	64.0
Angostura	36.2	41.2	47.7	61.6	70.8	80.9	91.4	91.0	79.1	67.2	51.4	39.4	63.2	38.9	60.0	87.8	65.9
Jewel Cave	35.4	36.2	44.3	53.3	62.4	74.6	85.1	80.0	69.2	56.8	45.9	35.4	56.5	35.6	53.3	79.9	57.3
Regional Average	35.7	39.9	47.8	58.8	68.6	79.1	88.3	86.6	76.0	63.1	47.2	37.6	60.7	37.7	58.4	84.7	62.1

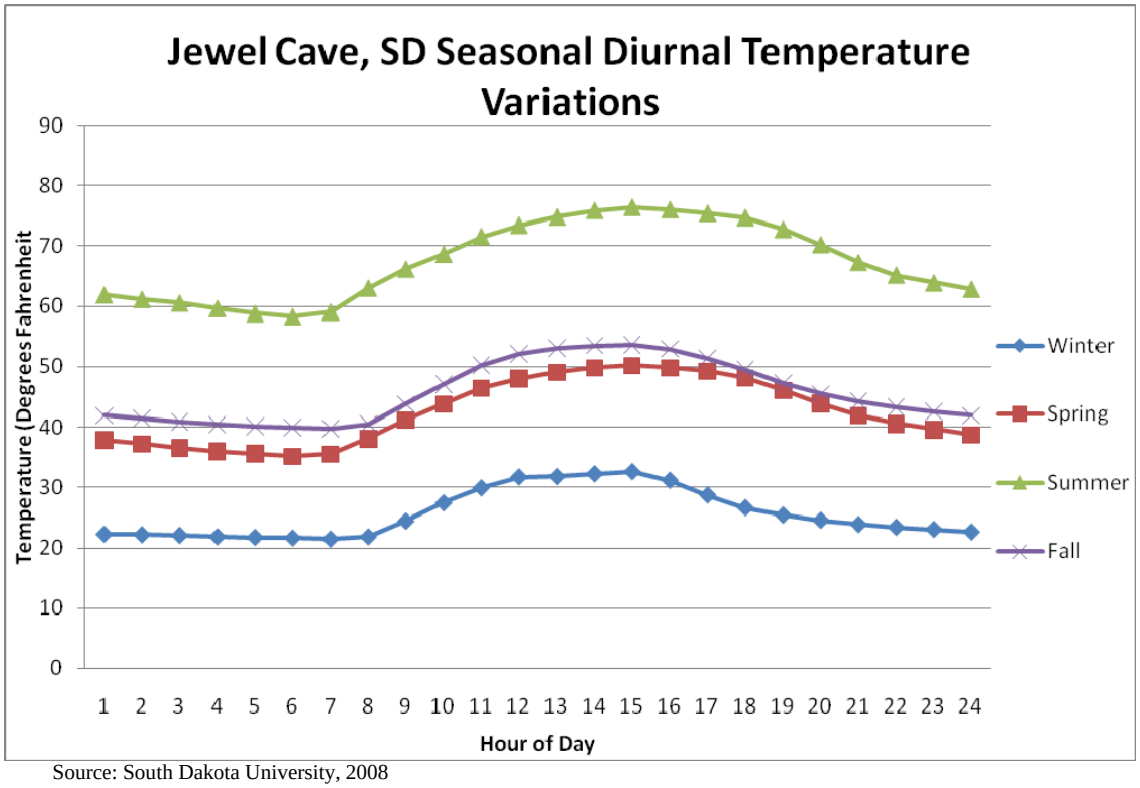
Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

Table 1.1-4: Average Monthly, Annual, and Seasonal Minimum Temperatures for Regional Sites (ºF)

Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Winter	Spring	Summer	Fall
Redbird	7.8	13.2	21.0	30.8	41.1	49.9	56.3	53.9	42.6	30.9	18.8	9.8	31.4	10.3	31.0	53.4	30.8
Oral	10.6	13.8	22.2	31.3	41.9	50.7	56.4	53.7	42.7	31.6	20.4	12.3	32.3	12.2	31.8	53.6	31.6
Oelrichs	11.1	15.0	21.7	31.7	42.0	51.2	57.7	55.9	45.2	33.6	21.9	13.6	33.4	13.3	31.8	54.9	33.6
Newcastle	11.5	15.0	22.2	32.2	42.4	51.5	59.1	57.0	46.6	35.3	22.8	14.5	34.2	13.6	32.3	55.9	34.9
Edgemont	10.0	13.4	23.2	32.5	43.2	52.4	59.1	56.9	45.6	32.7	19.7	9.9	33.2	11.1	33.0	56.1	32.7
Custer	9.4	12.2	17.4	26.8	36.2	44.6	50.7	48.5	39.2	29.1	18.7	11.8	28.7	11.1	26.8	47.9	29.0
Ardmore	7.0	11.9	19.7	30.0	40.7	49.7	56.2	53.5	42.2	30.2	18.4	8.7	30.7	9.2	30.2	53.1	30.2
Angostura	10.8	15.1	21.5	33.7	44.3	53.9	60.3	57.8	47.4	36.5	25.9	16.0	35.3	14.0	33.2	57.3	36.6
Jewel Cave	15.4	15.7	24.5	31.1	40.0	51.0	59.7	56.3	45.9	35.1	24.8	16.6	34.7	15.9	31.9	55.7	35.3
Regional Average	10.4	13.9	21.5	31.1	41.3	50.5	57.3	54.8	44.2	32.8	21.3	12.6	32.7	12.3	31.3	54.2	32.7

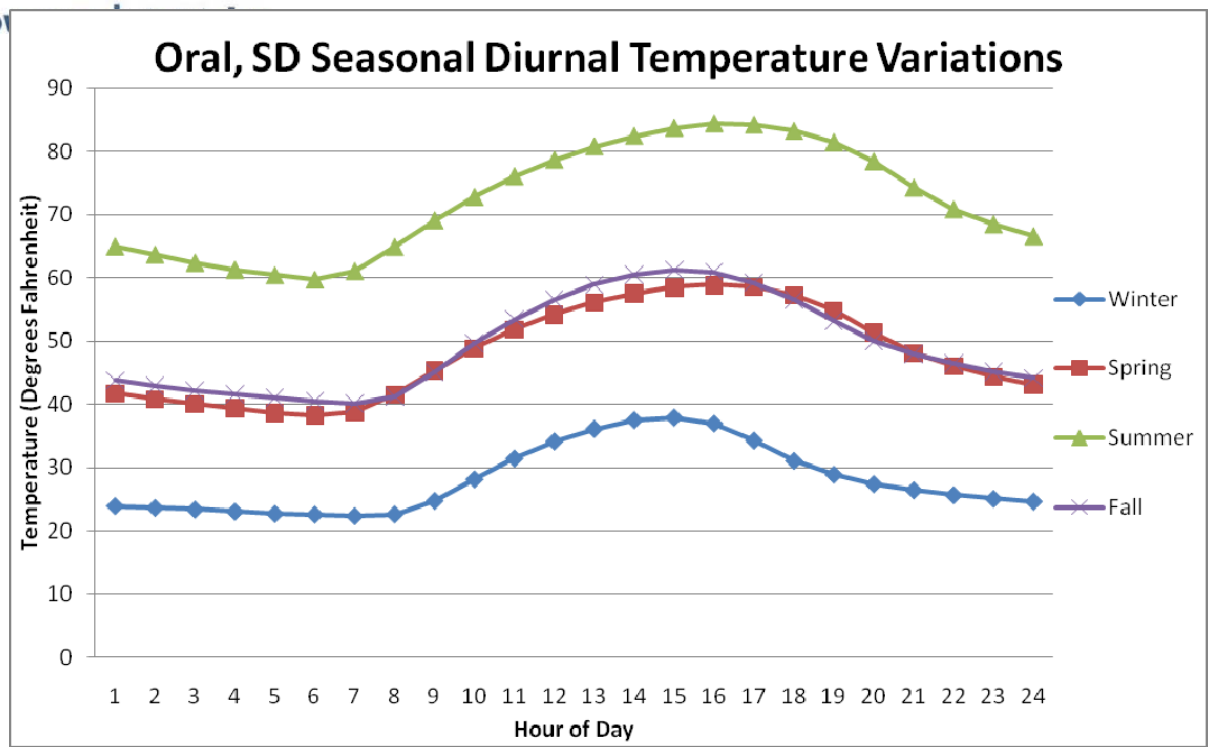
Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

Figures 1.1-7 and 1.1-8 display diurnal temperature variations by season for the Jewel Cave and Oral sites. These sites were used because they were the only sites that recorded hourly temperatures near the Proposed Action. As the figures show, there are large variations in diurnal temperature, especially during the summer months.



Source: South Dakota University, 2008

Figure 1.1-7: Jewel Cave, South Dakota, Seasonal Diurnal Temperature Variations

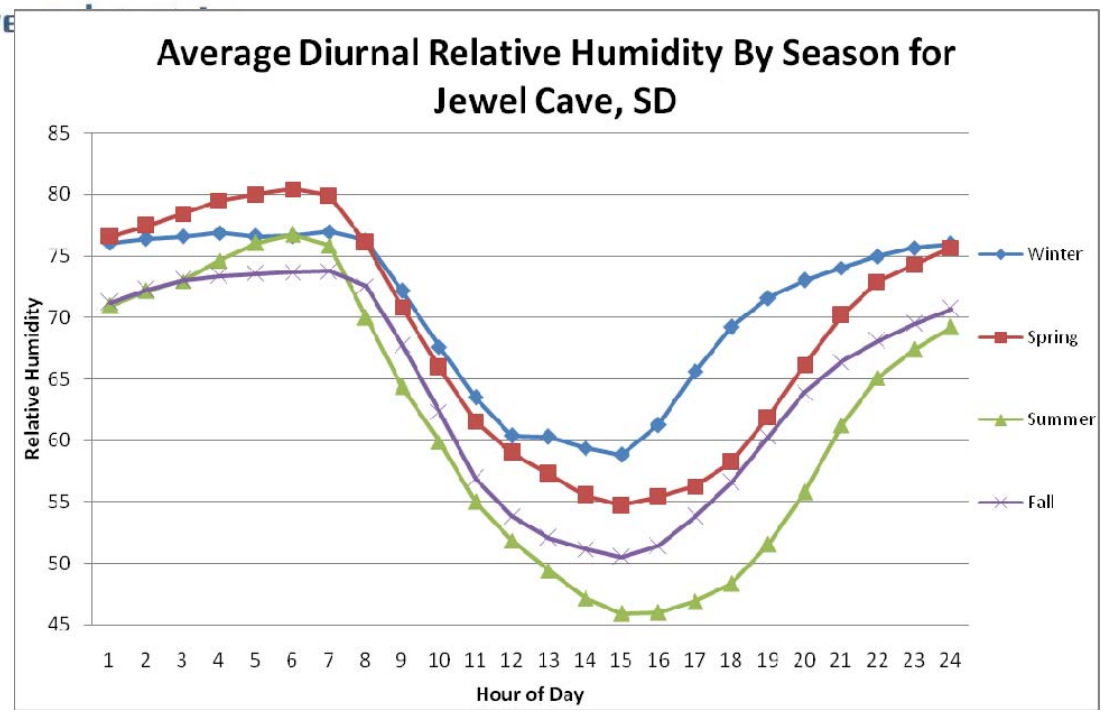


Source: South Dakota University, 2008

Figure 1.1-8: Oral, South Dakota, Seasonal Diurnal Temperature Variations

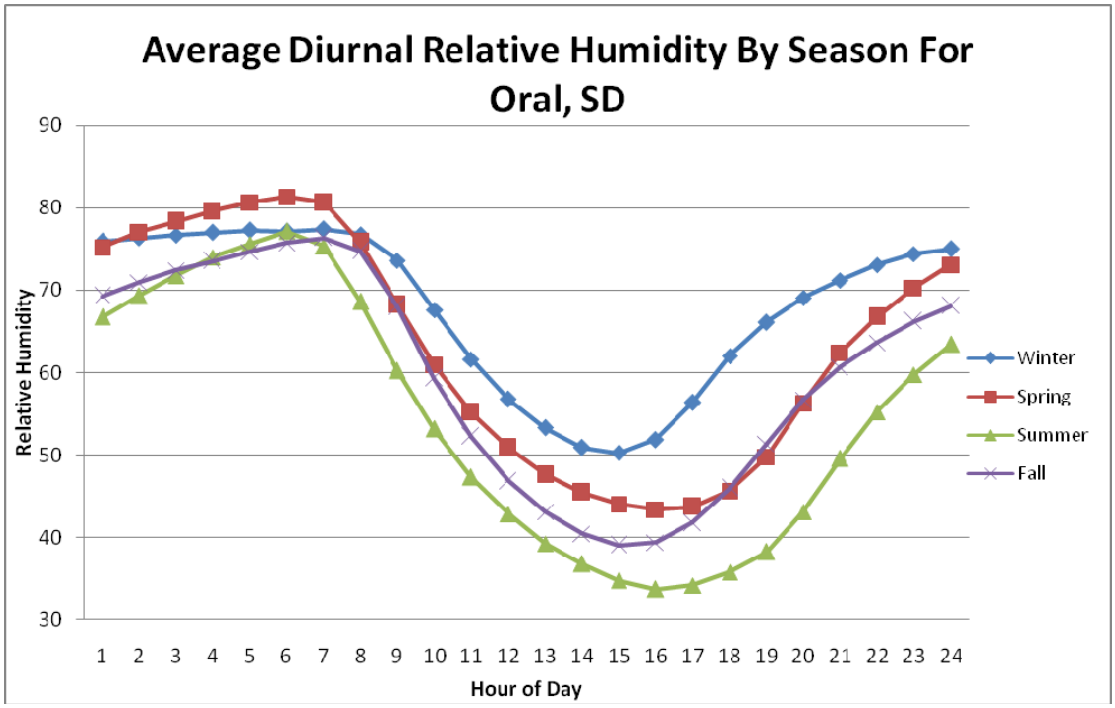
1.1.2.2 Relative Humidity

Relative humidity measures the fraction of moisture in the air to saturated moisture content at a certain temperature. This parameter was analyzed for both the Jewel Cave and Oral sites. Figures 1.1-9 and 1.1-10 display the relationship of relative humidity to the season and time of day for each site. The figures show that the summer has the lowest relative humidity, averaging 60 percent, while winter has the highest relative humidity, averaging 69 percent.



Source: South Dakota University, 2008

Figure 1.1-9: Average Diurnal Relative Humidity by Season for Jewel Cave, South Dakota



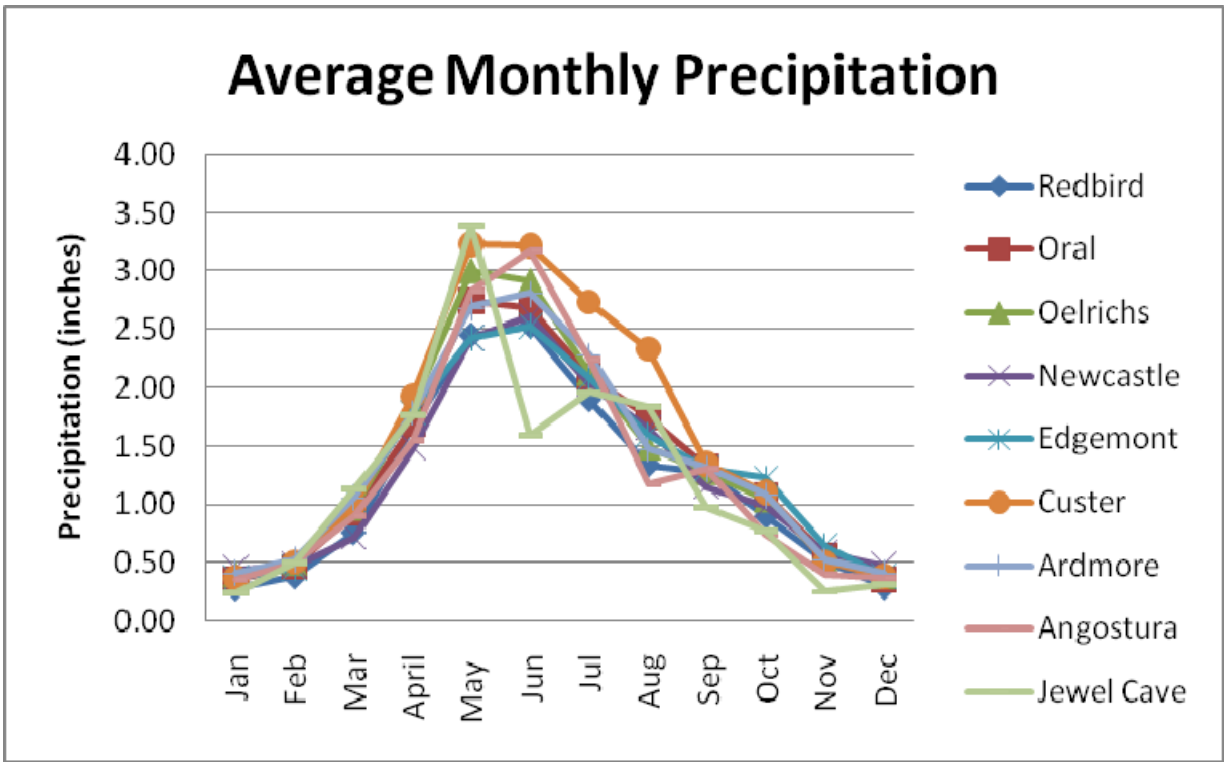
Source: South Dakota University, 2008

Figure 1.1-10: Average Diurnal Relative Humidity by Season for Oral, South Dakota

The relative humidity in this region peaks out in the morning at around 6:00 am with the minimum falling in the afternoon around 3:00 pm. The readings during the peak time average 77 percent at Jewel Cave and 78 percent at the Oral site. The readings with the lowest relative humidity during the day average 53 percent and 42 percent at Jewel Cave and Oral, respectively.

1.1.2.3 Precipitation

Figure 1.1-11 and Table 1.1-5 show that this area can be very dry at times with a regional annual average precipitation of 16.5 inches. Most of the precipitation accumulates during May, June, and July (48 percent of the annual). Typically, May is the wettest month of the year for this region with an average accumulation of 2.8 inches. Winter receives roughly 8 percent of the annual accumulated precipitation. January is the driest month of the year with an average accumulation of 0.36 inches of precipitation.



Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

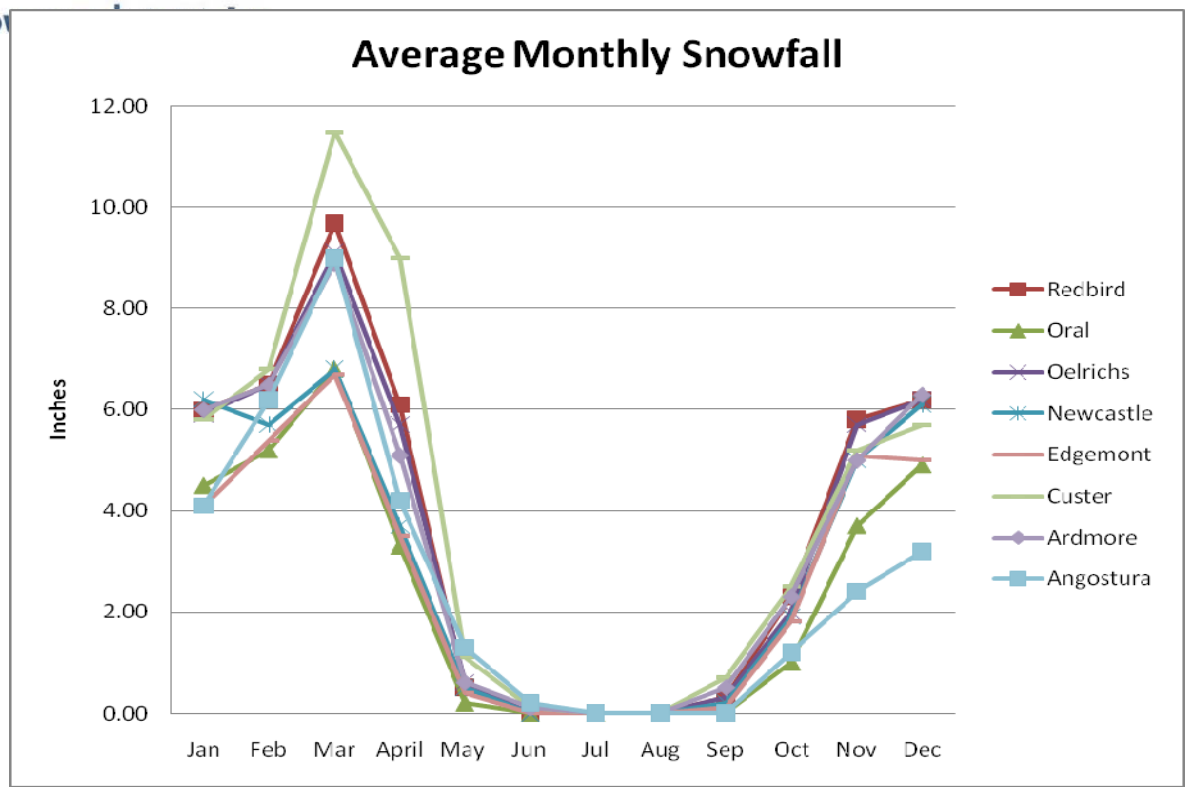
Figure 1.1-11: Average Monthly Precipitation for Regional Sites

Table 1.1-5: Average Seasonal and Annual Precipitation for Regional Sites (inches)

Name	Annual	Winter	Spring	Summer	Fall
Redbird	14.29	0.95	4.89	5.77	2.68
Oral	16.10	1.19	5.37	6.54	3.00
Oelrichs	16.50	1.28	5.83	6.54	2.85
Newcastle	15.11	1.41	4.65	6.32	2.73
Edgemont	15.87	1.22	5.26	6.20	3.19
Custer	18.66	1.27	6.15	8.28	2.96
Ardmore	16.35	1.34	5.54	6.56	2.91
Angostura	15.51	1.22	5.26	6.59	2.44
Jewel Cave	20.00	6.30	6.30	5.40	2.00
Region Average	16.49	1.80	5.47	6.47	2.75

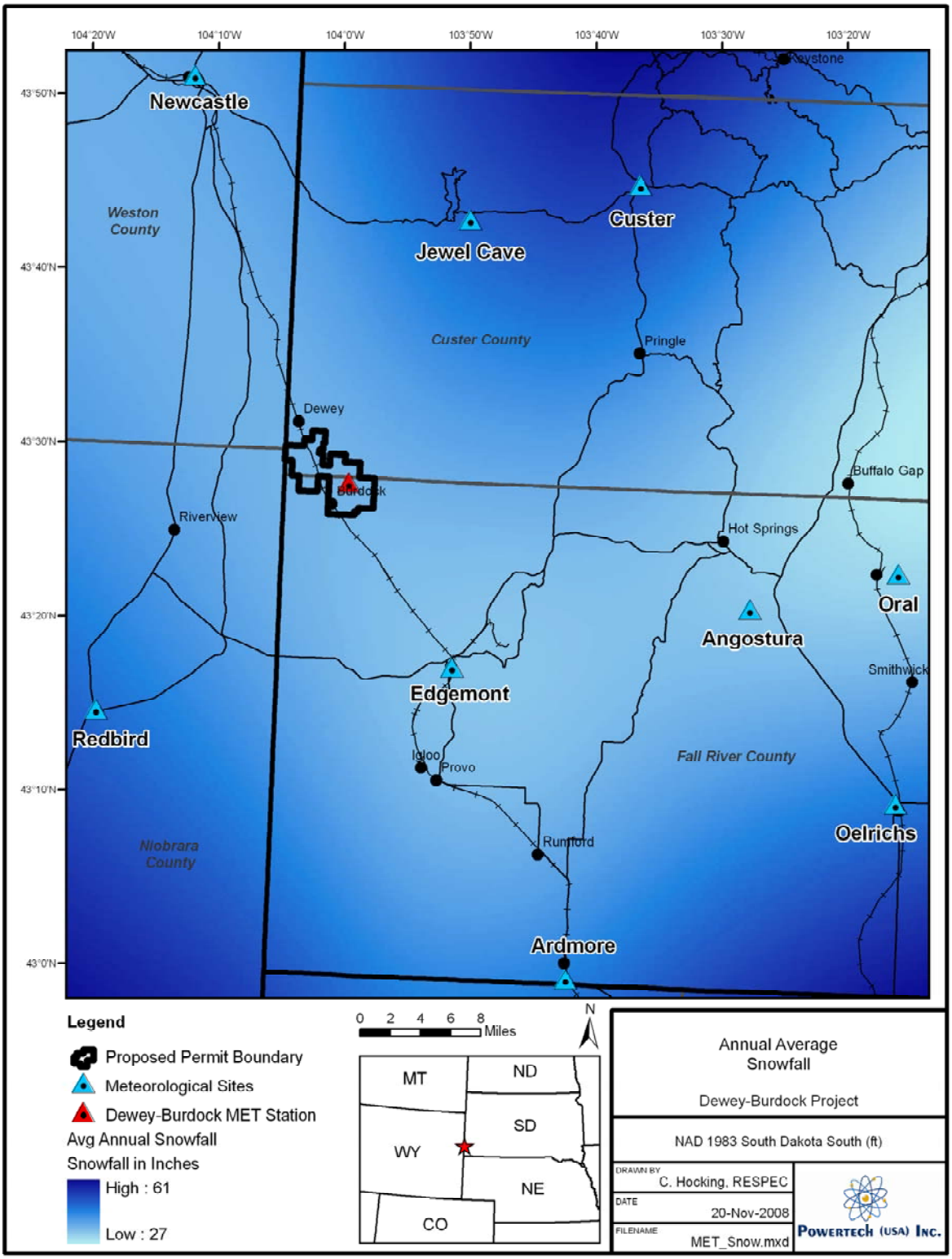
Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

This region receives an average of 38 inches of snowfall each year. As shown in Figure 1.1-12, most snowfall accumulates during the month of March with a regional average of 8.5 inches. Custer receives the most annual snowfall (48 inches). This can be attributed to the higher elevation and the influence of the Black Hills that surround it (Figure 1.1-13).



Source: South Dakota University, 2008

Figure 1.1-12: Average Monthly Snowfall at Regional Sites

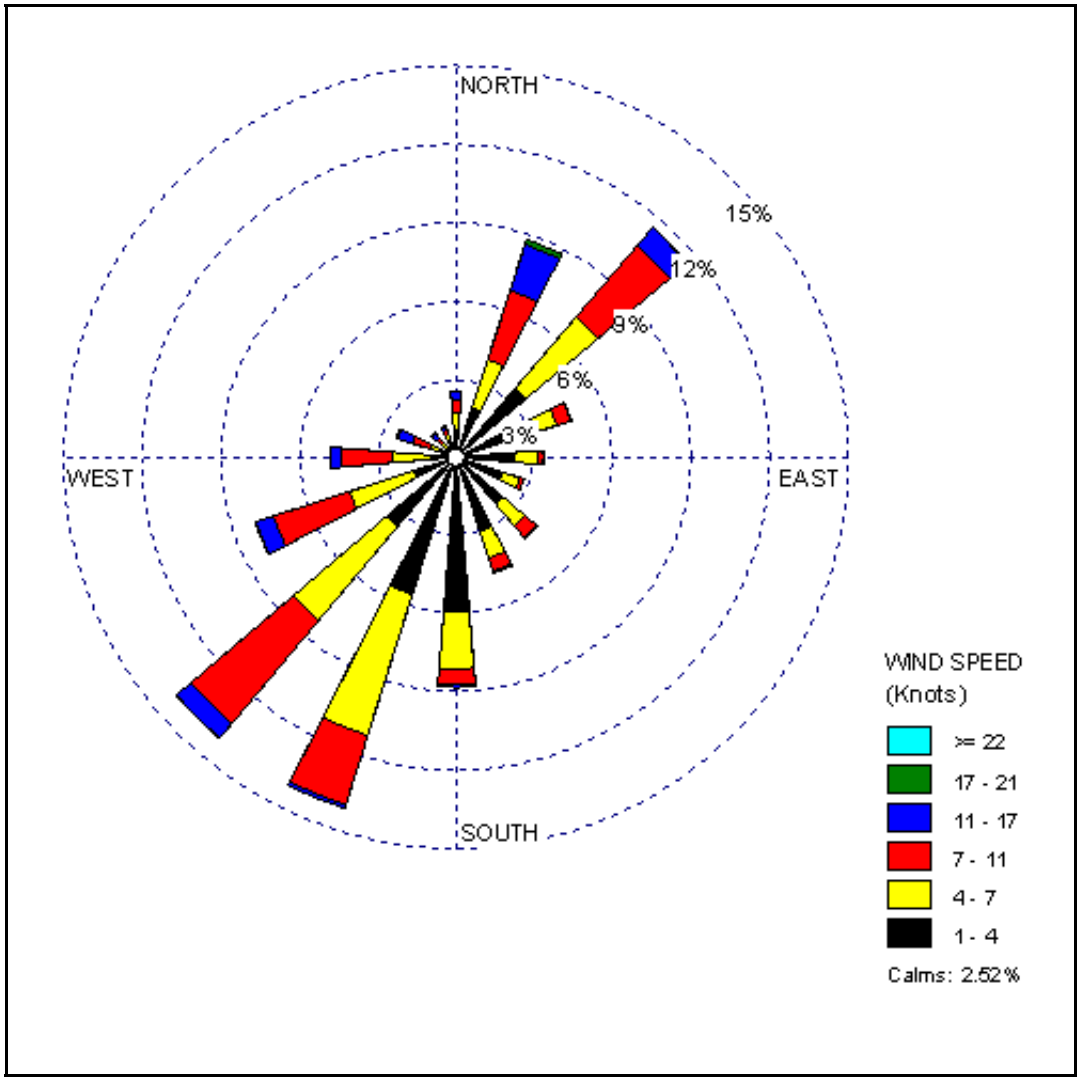


Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

Figure 1.1-13: Average Snowfall Accumulation throughout the Region

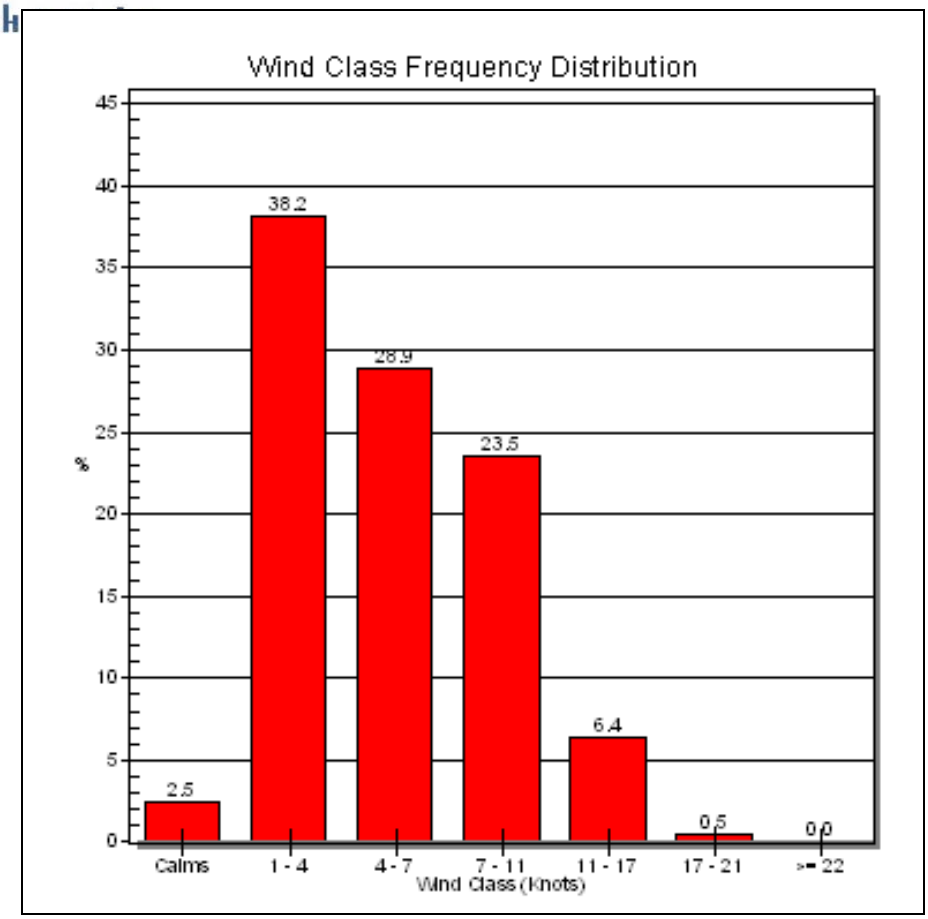
1.1.2.4 Wind Patterns

The Oral site was the only site in the region with representative data for wind speed and direction. The wind speed averaged 6.4 mph over the entire period of record with approximately 51 percent of the winds blowing from the southwest (Figure 1.1-14). Over 38 percent of the wind is between 1.2 and 4.6 mph (1 to 4 knots) with calm winds (less than 1.2 mph or 1 knot) occurring 2.5 percent of the time (Figure 1.1-15).



Source: South Dakota University, 2008

Figure 1.1-14: Wind Rose of Data from Oral, South Dakota

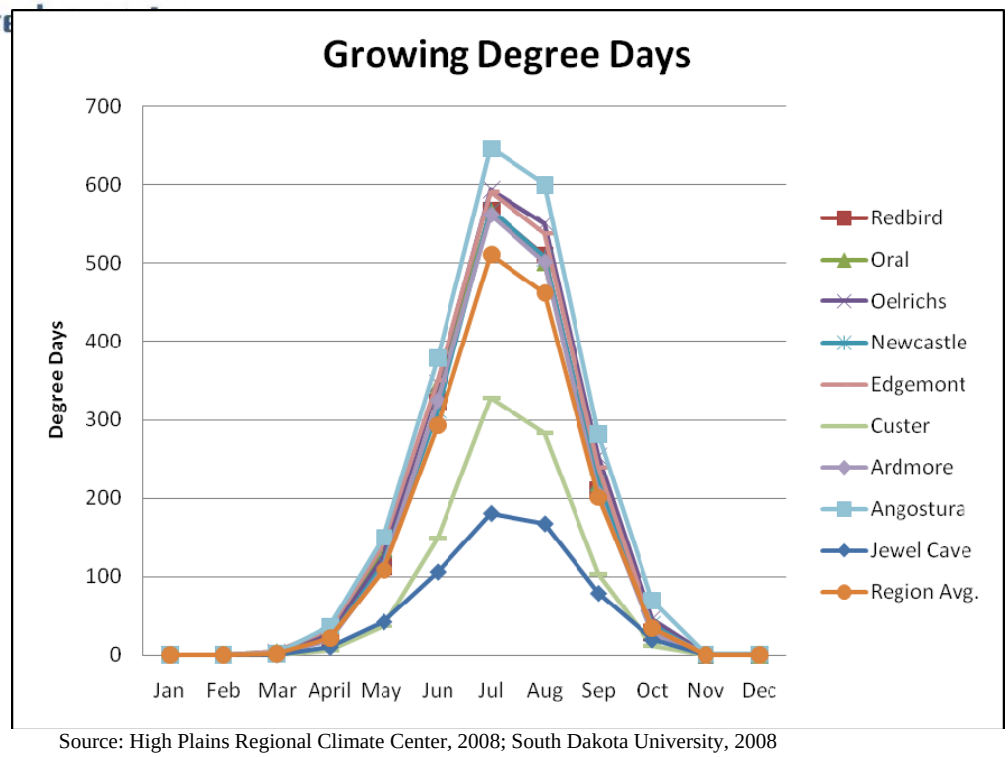


Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

Figure 1.1-15: Wind Class Frequency Distribution for Oral, South Dakota, from November 2002 – July 2008

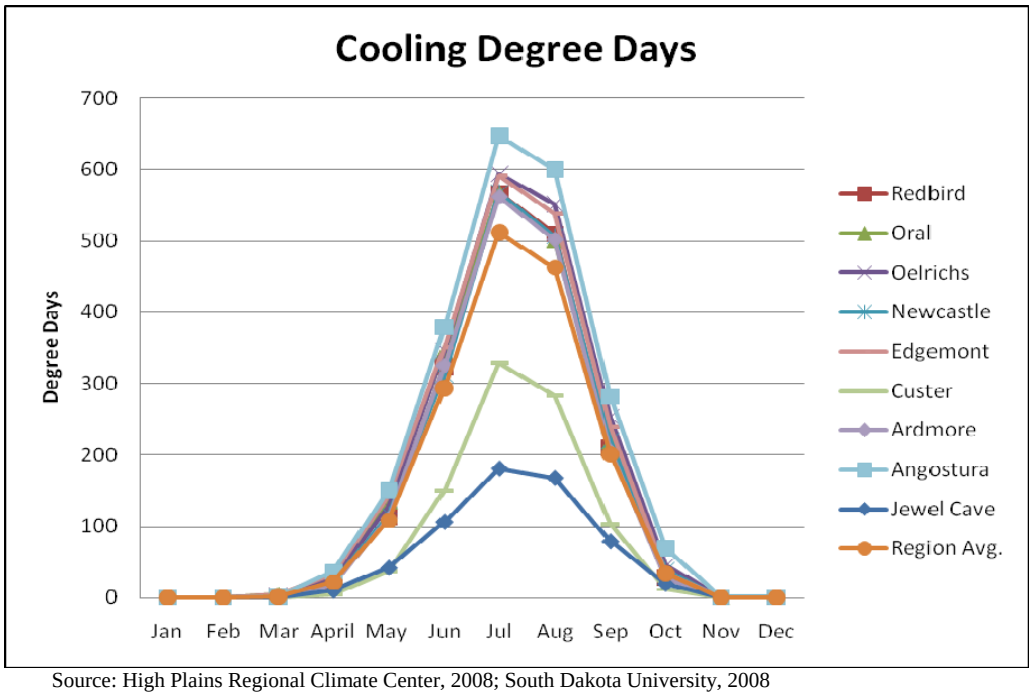
1.1.2.5 Cooling, Heating and Growing Degree Days

The graphs shown in Figures 1.1-16, 1.1-17, and 1.1-18 summarize the growing degree, cooling, and heating days for the nine meteorological sites in the area. The data show a similar pattern for all three parameters throughout the sites with the exception of the Jewel Cave and Custer sites, which is likely caused by the higher relative elevation of these two sites.



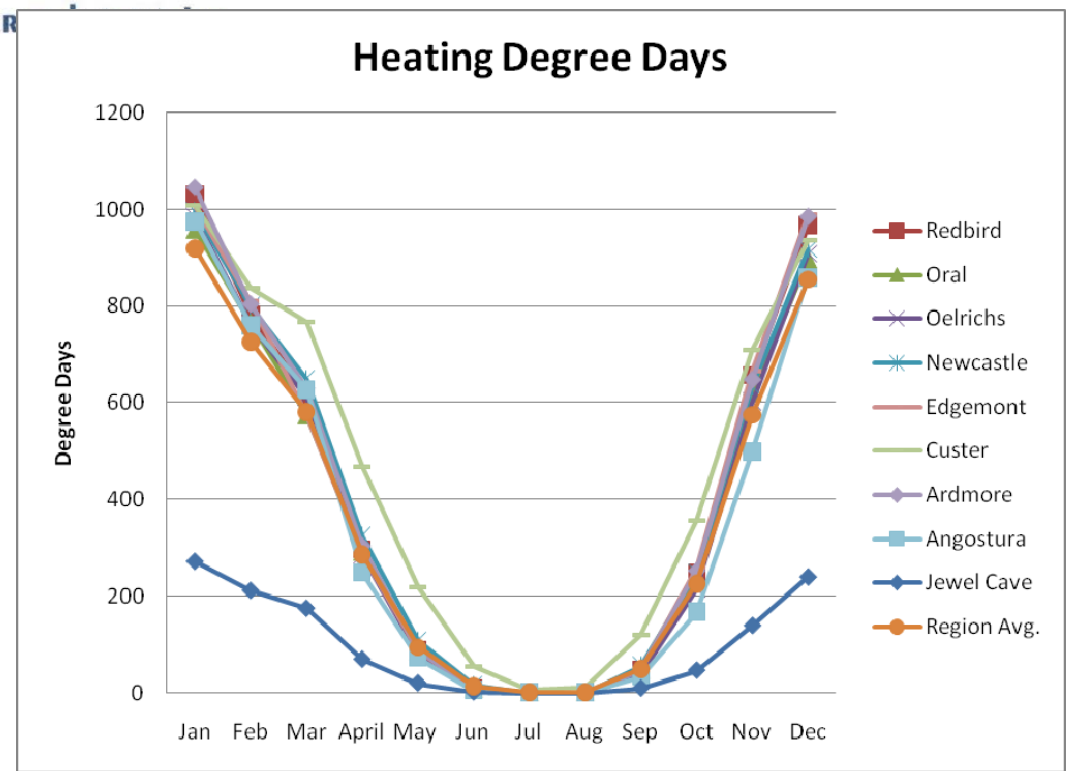
Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

Figure 1.1-16: Growing Degree Days for Regional Sites



Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

Figure 1.1-17: Cooling Degree Days for Regional Sites



Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

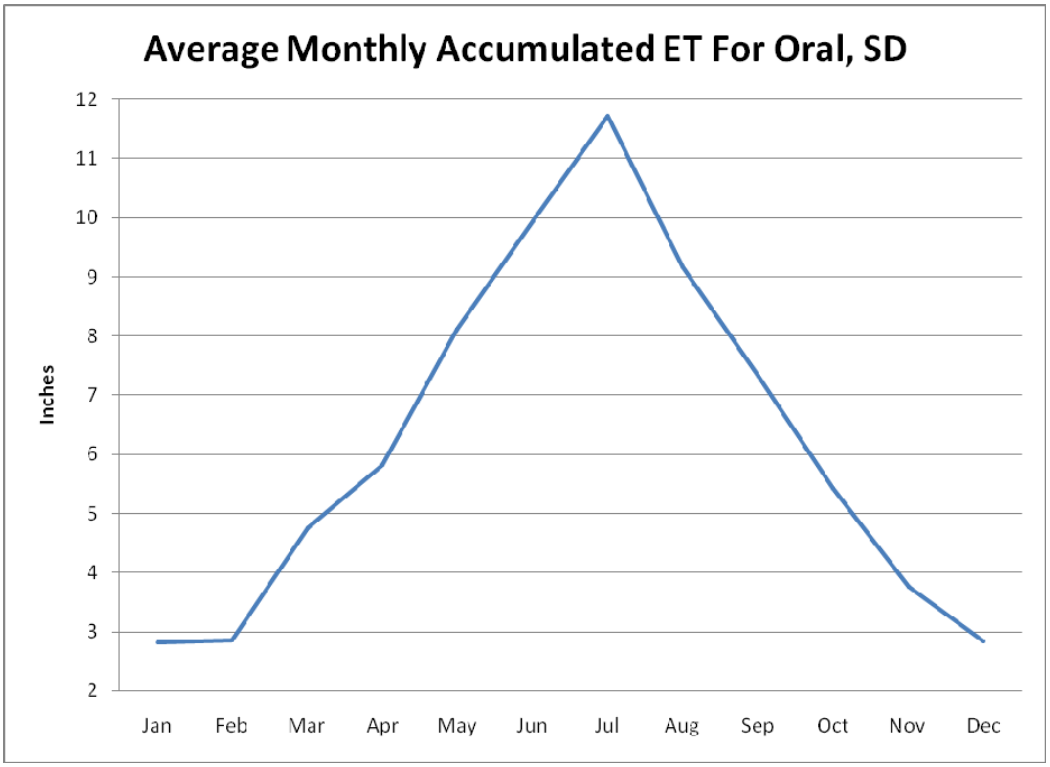
Figure 1.1-18: Heating Degree Days for Regional Sites

All degree days calculations used a base temperature of 55 degrees F. Heating and cooling degree days are included to show deviation of the average daily temperature from the chosen base temperature. The number of heating degree days is computed by taking the average of the high and low temperature occurring that day and subtracting it from the base temperature. The number of growing degree days and cooling degree days is computed in the opposite fashion where the base temperature is subtracted from the average of the high and low temperature for the day. Negative values are disregarded for both calculations.

1.1.2.6 Evapotranspiration

The American Society of Civil Engineers (ASCE) Standardized Reference Evapotranspiration Equation was used to calculate daily evapotranspiration (ET) using a tall reference crop coefficient. The weather parameters needed to calculate ET using this method are daily maximum and minimum temperature, maximum and minimum relative humidity, total solar radiation, and average wind speed. The Oral site was the only one in the region with all these weather parameters being sampled, and was, therefore, the site used for this analysis. The data were available from May 8, 2003, to July 20, 2008. Figure 1.1-19 displays a graph of the average accumulated ET for each month. Most ET

occurs during the summer months of June, July, and August with an average monthly accumulation of 10.3 inches. During the winter months, low ET (2.8 inches) occurs because of low temperatures and low solar radiation.



Source: High Plains Regional Climate Center, 2008; South Dakota University, 2008

Figure 1.1-19: Average Monthly Accumulated Evapotranspiration for Oral, South Dakota

1.1.3 Site Specific Analysis

The site-specific analysis was completed using data collected from a weather station installed in approximately the center of the proposed permit boundary. The station is located on a site that is representative of the area within the boundary. Twelve months of data from July 18, 2007, to July 17, 2008, are used for this analysis.

This site was installed in cooperation with the South Dakota State Climatology office according to the standards they use to install their Automatic Weather Data Network (AWDN) stations. The parameters being sampled at the site are air temperature, solar radiation, humidity, precipitation, and wind speed/direction at both 3- and 10-m heights (9.8 and 32.8 feet). Table 1.1-6 lists the model number and specifications of the sensors that were installed. The accuracy of all the sensors used is within the standards required

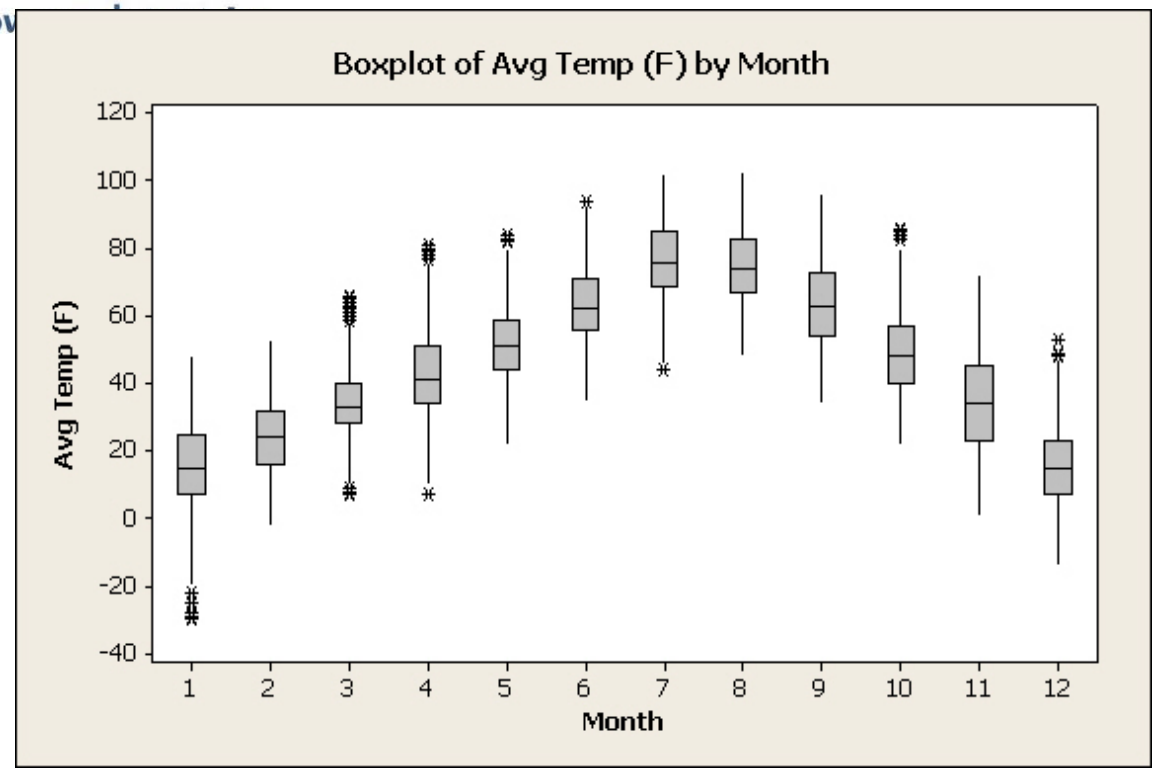
by the NRC. All results of the statistical analysis, completed using Minitab software version 14.0 for the parameters analyzed, are included in Appendix 1.1-B.

Table 1.1-6: Specifications for Weather Instruments Installed to Perform Site-Specific Analysis

Measurement	Model	Manufacturer	Accuracy	Operating Temperature
Precipitation	VR6101	Vaisala	0.01 inch	–40°C to 60°C
Wind Direction	024A	Met-One	±5 degrees	–50°C to 70°C
Wind Speed	014A	Met-One	0.25 mph (0.11 m/s)	–50°C to 70°C
Temperature and RH	HMP45C	Vaisala	±2% for 10–90% RH; ±3% of 90–100% RH	–40°C to 60°C
Solar Radiation	L1200X	Lt-Cor	Absolute error in natural daylight is ±5% max; ±3% typical	–40°C to 65°C

1.1.3.1 Temperature

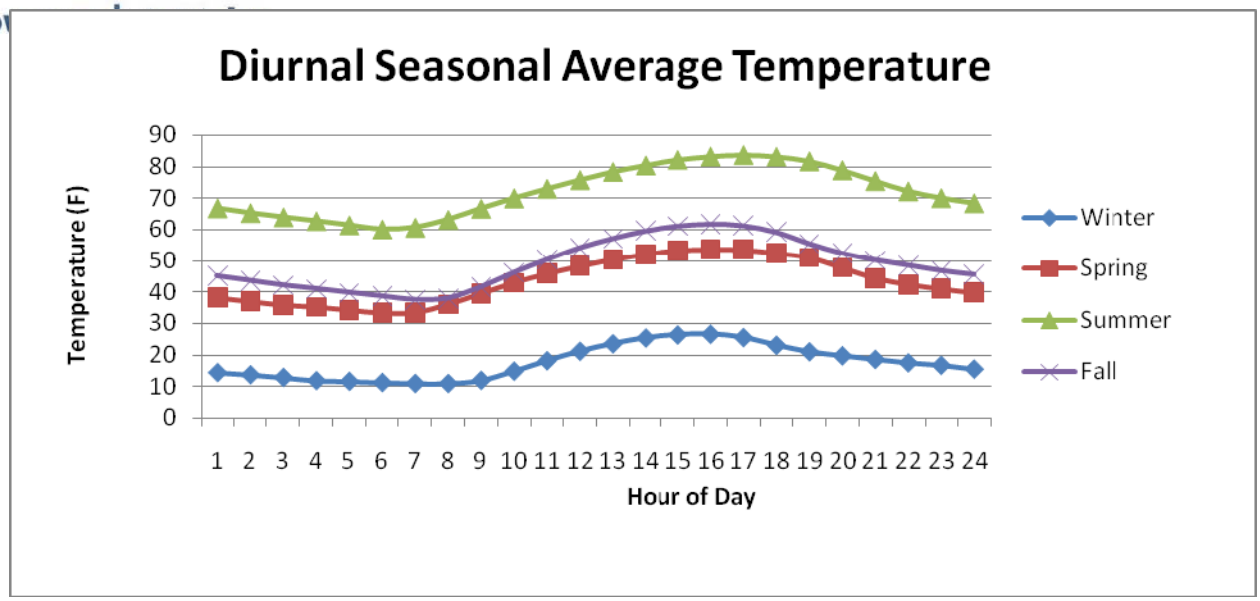
The average hourly temperature over the year for the site was 45.5 degrees F. A maximum temperature of 104 degrees F was reached on both July 21, 2007, and August 13, 2007, while the minimum temperature for the period of record was –28 degrees F on January 22, 2008. A boxplot of the average temperature by month is shown in Figure 1.1-20. July was the warmest month with a median temperature of 76 degrees F with a first quartile of 69 degrees F and a third quartile value of 85 degrees F. Conversely, December and January were the coolest months with a median temperature of 15 degrees F.



Source: South Dakota University, 2008

Figure 1.1-20: Average Temperature (degrees Fahrenheit) by Month from the PAA Meteorological site

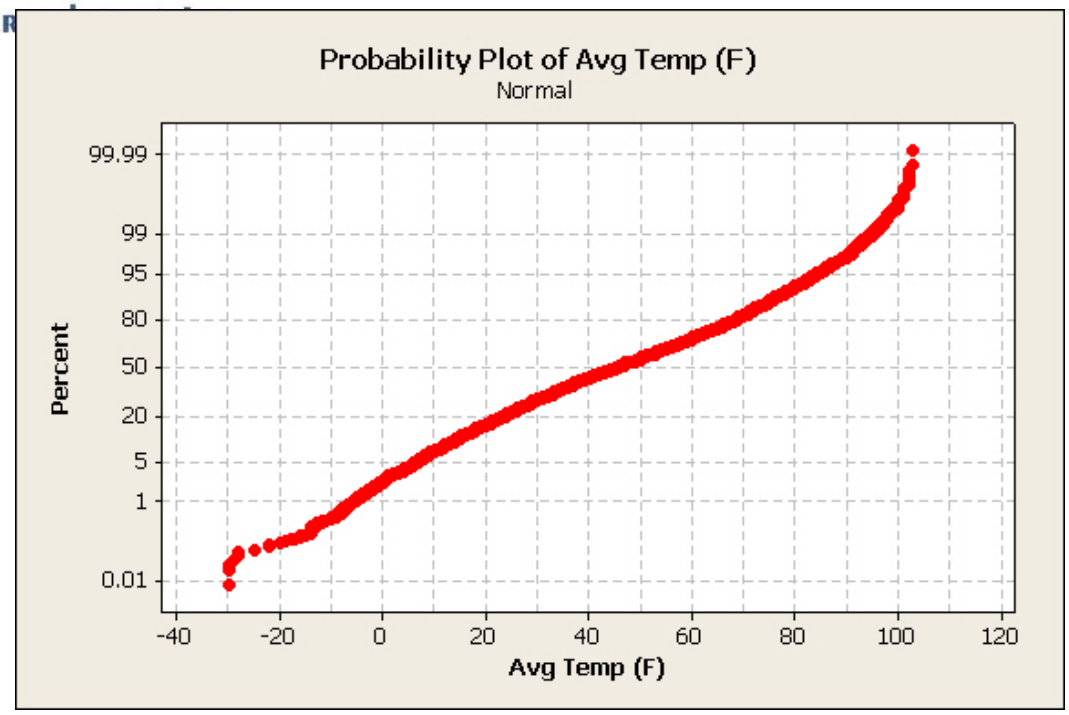
There were large variations in seasonal and diurnal temperature (Figure 1.1-21). In the summer season, average temperatures were as low as 60 degrees F at 6:00 am to 83.6 degrees F at 5:00 pm. In the winter season, temperatures varied from an average of 11 degrees F between 7:00 am and 8:00 am and rose to nearly 27 degrees F at 4:00 pm. The diurnal variations are the result of the lack of relative humidity in the atmosphere at the site, which causes the earth's surface to rapidly absorb and release the energy supplied by the sun.



Source: South Dakota University, 2008

Figure 1.1-21: Diurnal Average Temperature for the PAA Meteorological Site by Season

Figure 1.1-22 shows a probability plot of average hourly temperature for the year. Temperatures above or below 46 degrees F were expected at the site 50 percent of the time, and temperatures dipped below the freezing mark of 32 degrees F 31 percent of the time.



Source: South Dakota University, 2008

Figure 1.1-22: Probability Plot of Average Temperature from the PAA Meteorological Site

1.1.3.2 Wind Patterns

Wind speed and direction was measured in the field using Met-One 014A and 024A model sensors. Statistical analysis and visualization of wind data were performed using WRPLOT View Version 5.3 distributed by Lakes Environmental. All data analysis outputs are included in Appendix 1.1-C. The average wind speed over the period of record was approximately 5 mph, while calm winds occurred only 1.8 percent of the time.

As shown in Table 1.1-7, a majority of the winds (51 percent) come from the southeast and approximately 55 percent of all winds were less than 4.6 mph. December had the least amount of wind with 7.66 percent of the total winds being classified as calm and having an average wind speed of 2.8 mph. In contrast, May was the windiest month with only 0.41 percent of calm winds and an average wind speed of 6.9 mph. Southeasterly winds were prevalent in the winter months (38 percent of total shown in Figure 1.1-23) as well as the summer months (56 percent of total shown in Figure 1.1-24).

Table 1.1-7: Normalized Frequency Distribution of Wind at the PAA Meteorological Site

Frequency Distribution (Normalized)							
Wind Direction	**Knots**						
	1–4	**4–7**	**7–11**	**11–17**	**17–21**	**≥ 22**	**Total**
348.75–11.25	0.000345	0.000115	0.000000	0.000000	0.000000	0.000000	0.000459
11.25–33.75	0.002526	0.000804	0.000459	0.000115	0.000000	0.000000	0.003904
33.75–56.25	0.012517	0.003790	0.003790	0.000804	0.000230	0.000230	0.021360
56.25– 78.75	0.028250	0.016996	0.021475	0.003330	0.000459	0.000000	0.070510
78.75–101.25	0.057074	0.037322	0.018489	0.001263	0.000000	0.000000	0.114148
101.25– 123.75	0.069936	0.025609	0.011713	0.000000	0.000000	0.000000	0.107258
123.75–146.25	0.070740	0.022738	0.007350	0.000115	0.000115	0.000000	0.101056
146.25–168.75	0.071199	0.015618	0.001378	0.000345	0.000000	0.000000	0.088539
168.75–191.25	0.057533	0.004364	0.000459	0.000230	0.000000	0.000000	0.062586
191.25–213.75	0.035829	0.004364	0.000345	0.000115	0.000000	0.000000	0.040652
213.75–236.25	0.035140	0.005397	0.002182	0.001034	0.000000	0.000000	0.043753
236.25– 258.75	0.030202	0.006890	0.004593	0.001493	0.000115	0.000000	0.043294
258.75– 281.25	0.032269	0.014469	0.004364	0.001952	0.000000	0.000000	0.053055
281.25–303.75	0.027905	0.034566	0.019982	0.002986	0.000000	0.000000	0.085439
303.75–326.25	0.017570	0.040652	0.052710	0.015962	0.000230	0.000000	0.127124
326.25–348.75	0.004364	0.006546	0.006775	0.001263	0.000115	0.000000	0.019063
Subtotal	**0.553399**	**0.240239**	**0.156063**	**0.031006**	**0.001263**	**0.00023**	**0.973702**
Calms							**0.017646**
Missing/Incomplete							**0.008652**
Total							**1.000000**

Source: South Dakota University, 2008

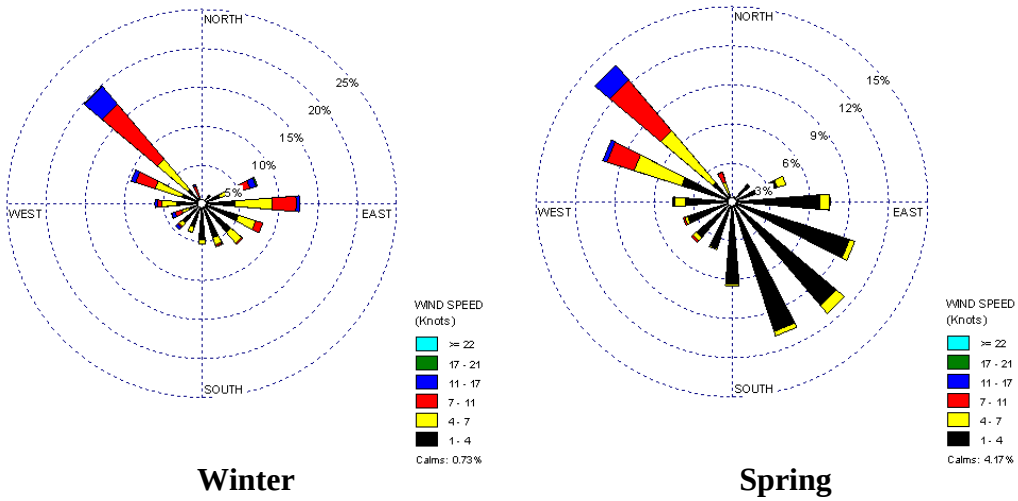


Figure 1.1-23: Winter and Spring Wind Roses

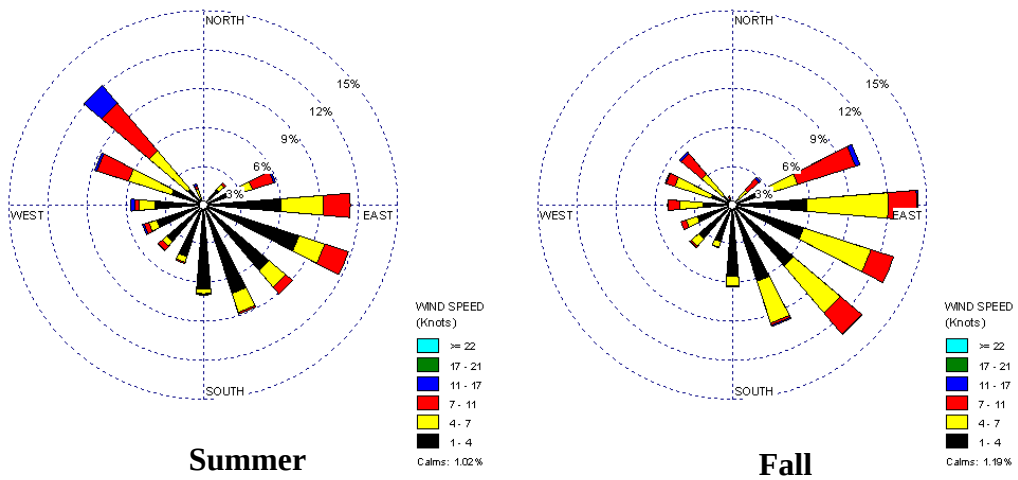
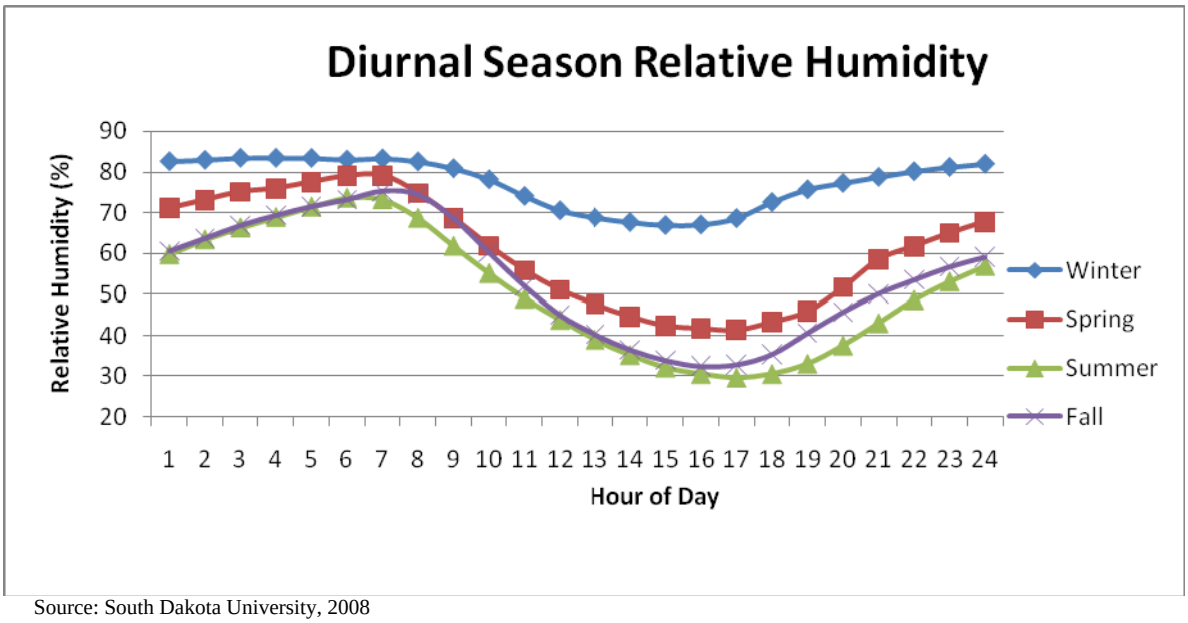


Figure 1.1-24: Summer and Fall Wind Roses

1.1.3.3 Relative Humidity

As mentioned in previous sections, the relative humidity at the site is low. Mean values range from a low of 51 percent in the summer months compared to a high of 77 percent in the winter months. Relative humidity values varied greatly throughout the day, especially in the summer and spring months. On average, during the spring, summer, and fall months, relative humidity reached its maximum from 5:00 am to 7:00 am and then declined steadily until 4:00 pm to 5:00 pm when it began its evening ascent (Figure 1.1-

25). During the winter months, the diurnal relative humidity range was much less because of less intense and shorter duration solar radiation.

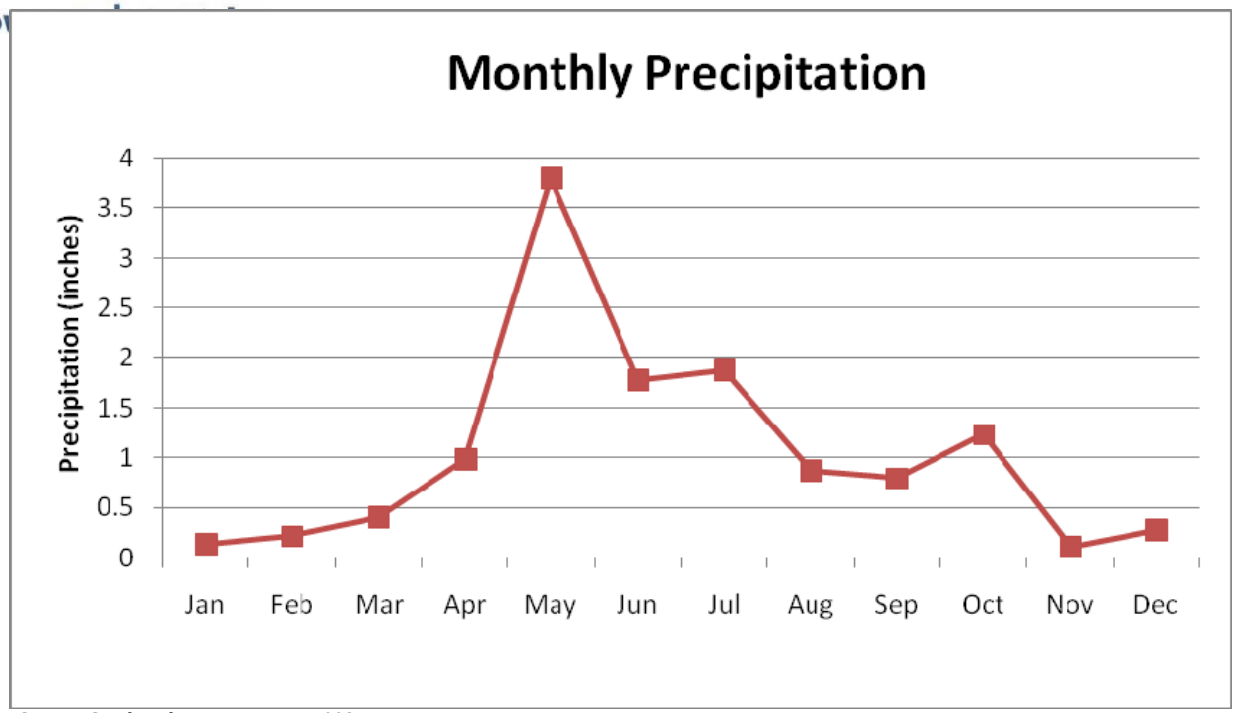


Source: South Dakota University, 2008

Figure 1.1-25: Diurnal Relative Humidity by Season from Project Meteorological Site

1.1.3.4 Precipitation

Data for this site were collected using a Vaisala VRG 101 all-weather precipitation gauge. The region received 12.42 inches of precipitation during the year of monitoring. Figure 1.1-26 displays the precipitation totals by month. The largest monthly precipitation total occurred in May (3.8 inches) and the least occurred in November (0.10 inch). The greatest daily precipitation total (1.29 inches) occurred on May 23, 2008. Also on May 23, 2008, the area received 0.71 inch of precipitation between the hours of 8 p.m. and 9 p.m., which was the most intense event of the sampled year.

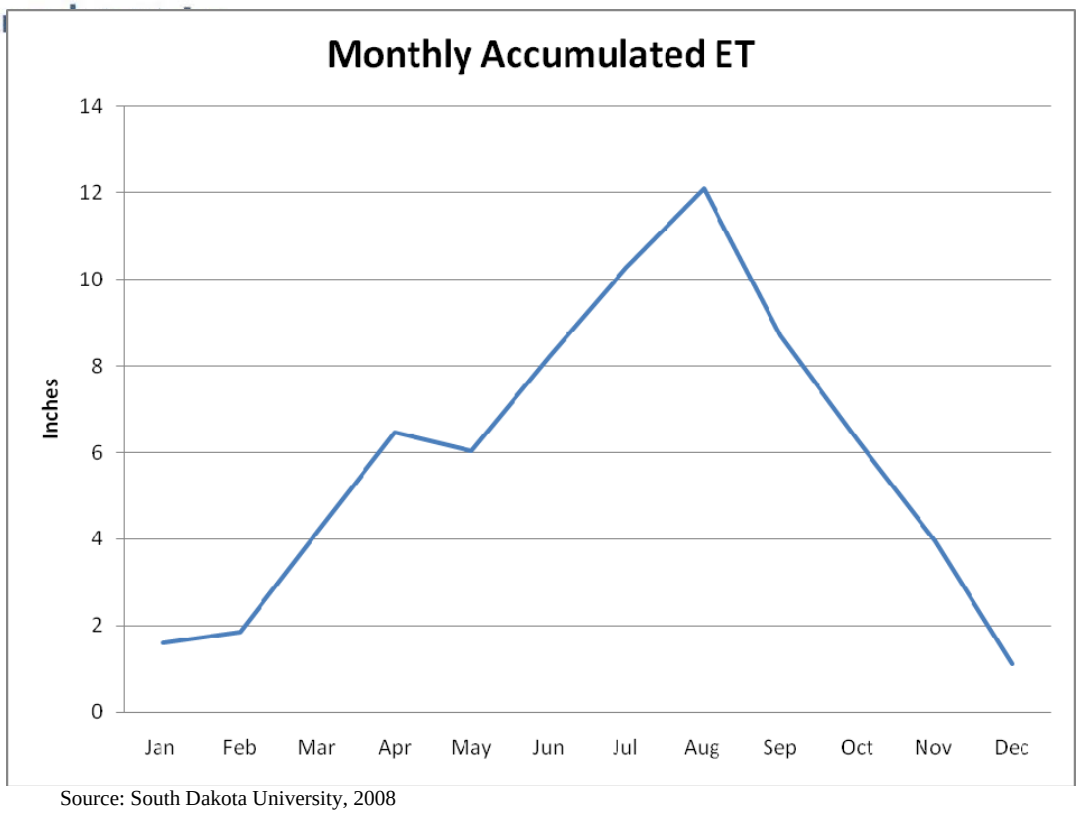


Source: South Dakota University, 2008

Figure 1.1-26: Monthly Precipitation from the PAA Meteorological Site

1.1.3.5 Potential Evapotranspiration

The potential ET data were taken from July 18, 2007, to July 14, 2008. The ASCE Standardized Reference Evapotranspiration Equation for a tall reference crop was used to estimate daily ET. The weather parameters needed to estimate ET using this method are daily, maximum and minimum temperature, maximum and minimum relative humidity, total solar radiation, and average wind speed. Most ET occurs during the months of July, August, and September with an average monthly accumulation of 10.3 inches (Figure 1.1-27) because of the high temperatures and unstable weather. During the winter low, ET occurs because of low temperatures and low solar radiation. The average ET during the winter months is 1.5 inches.



Source: South Dakota University, 2008

Figure 1.1-27: Estimated Evapotranspiration Calculated Using Weather Data Collected at the PAA Meteorological Site

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APPENDIX 1.1-A

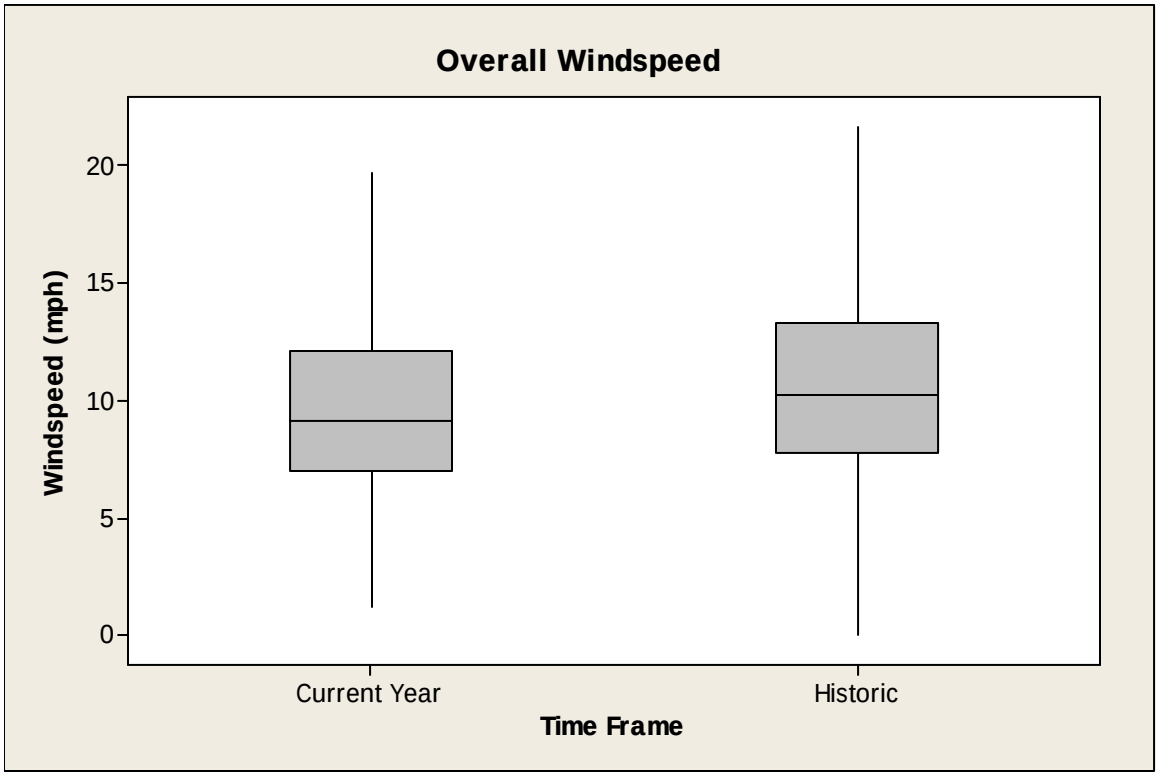
STATISTICAL REPORTS FOR CHADRON, NEBRASKA, METEOROLOGICAL SITE

APPENDIX 1.1-A
STATISTICAL REPORTS FOR CHADRON, NEBRASKA, METEOROLOGICAL SITE

WIND SPEED ANALYSIS

Descriptive Statistics: Average

Variable	Time Frame	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	363	0	9.766	3.901	1.202	7.003	9.097	12.062	24.197
	Historic	9323	0	10.834	4.380	0.0000	7.705	10.251	13.276	36.090



Descriptive Statistics: Average

Results for Month = 1

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	31	10.039	4.094	2.628	7.401	9.351	11.741	22.461
	Historic	805	9.969	4.400	0.000	6.872	9.351	12.545	33.099

Results for Month = 2

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	28	9.265	3.874	1.202	6.539	9.456	12.080	16.662
	Historic	734	10.475	4.672	1.727	7.250	9.768	13.160	33.239

Results for Month = 3

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	31	10.404	3.879	5.155	7.690	9.111	12.706	24.197
	Historic	806	11.572	4.854	2.488	7.990	10.971	14.349	32.986

Results for Month = 4

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	30	11.210	4.791	3.812	6.482	11.637	15.219	20.545
	Historic	779	12.533	4.954	2.187	8.901	11.800	15.525	36.090

Results for Month = 5

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	30	11.037	4.779	3.040	7.314	10.209	13.414	21.464
	Historic	803	11.847	4.651	2.614	8.515	11.193	14.401	29.690

Results for Month = 6

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	30	9.173	2.852	5.124	6.830	8.768	11.103	16.576
	Historic	779	11.213	3.746	2.507	8.571	10.725	13.566	24.299

Results for Month = 7

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	31	9.991	3.371	4.327	7.597	9.627	12.062	19.401
	Historic	792	10.542	3.369	0.000	8.053	10.094	12.467	24.818

Results for Month = 8

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	30	9.421	3.151	2.865	7.624	9.205	10.766	18.912
	Historic	775	10.472	3.429	2.064	7.844	10.132	12.514	24.324

Results for Month = 9

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	30	10.667	4.215	5.220	7.115	10.023	13.396	19.880
	Historic	750	10.526	4.003	1.749	7.420	9.984	13.051	25.404

Results for Month = 10

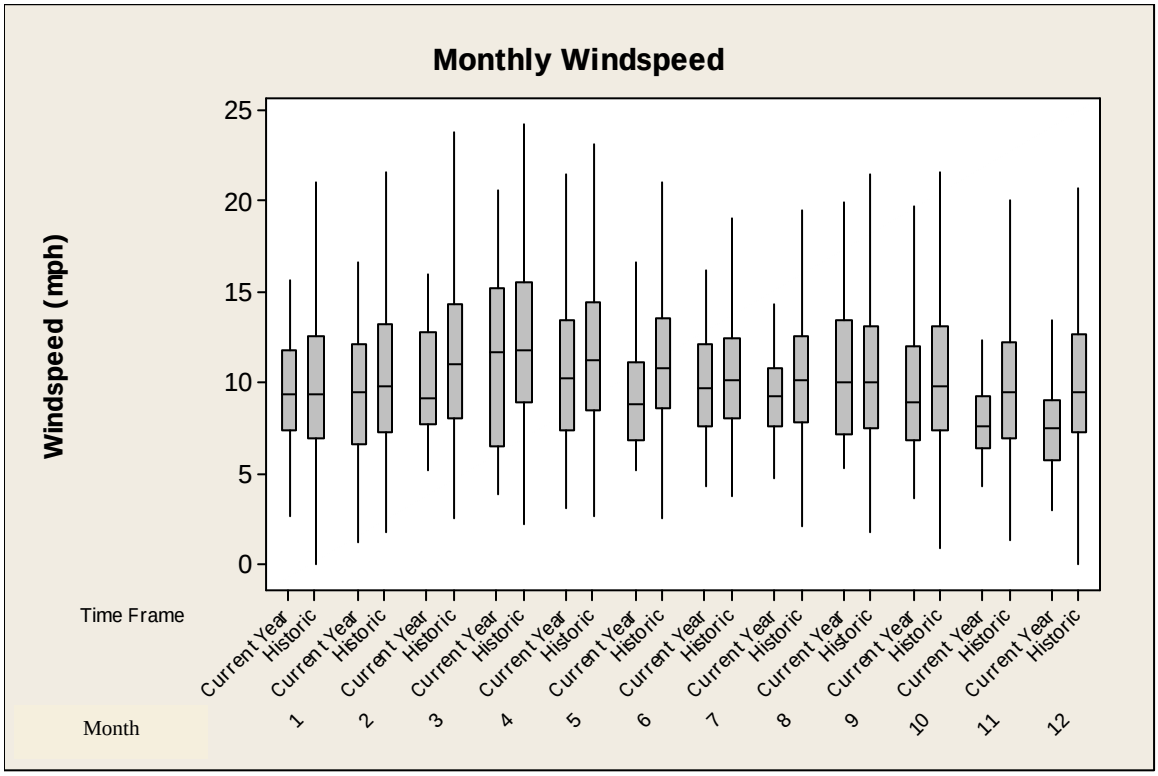
Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	31	9.678	3.770	3.607	6.814	8.911	12.034	19.648
	Historic	775	10.565	4.585	0.895	7.322	9.743	13.080	29.291

Results for Month = 11

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	30	8.398	3.250	4.316	6.382	7.567	9.261	18.245
	Historic	750	10.062	4.299	1.263	6.878	9.442	12.215	30.728

Results for Month = 12

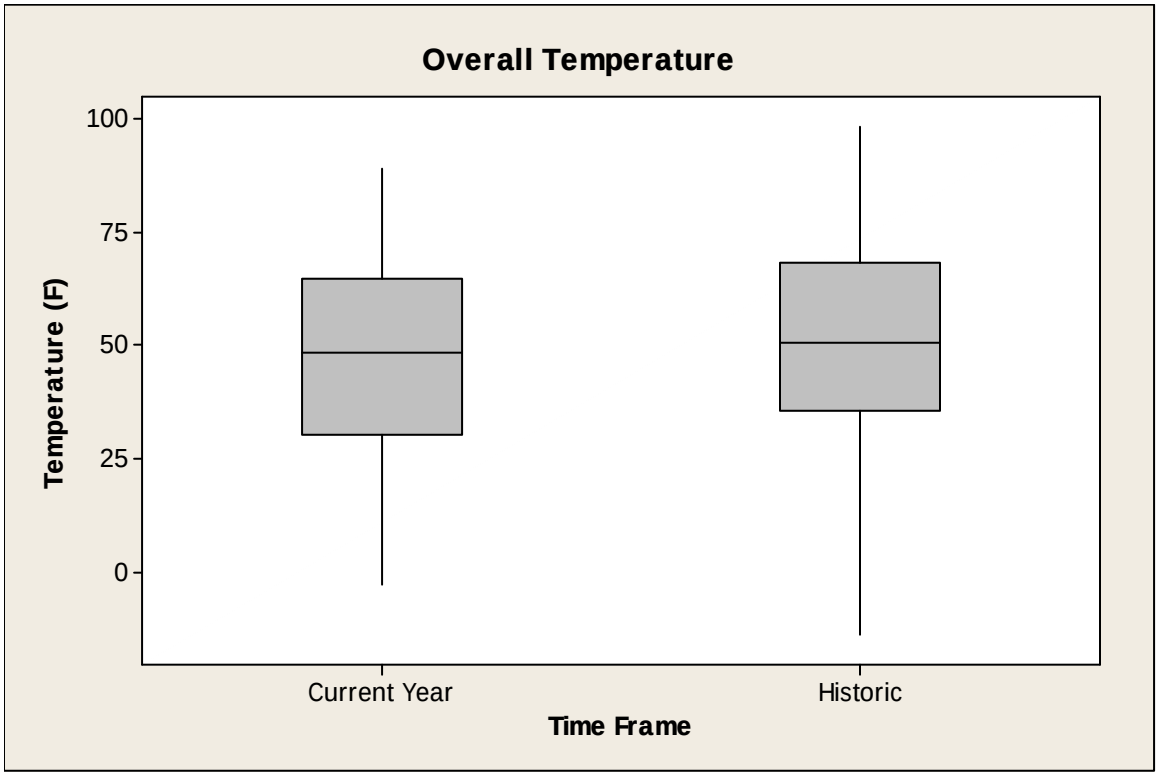
Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	31	7.899	3.515	2.945	5.676	7.419	8.985	18.620
	Historic	775	10.139	4.447	0.000	7.200	9.405	12.690	28.052



TEMPERATURE ANALYSIS

Descriptive Statistics: Average

Variable	Time Frame	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	360	0	47.81	21.42	-3.06	30.29	48.15	64.48	89.00
	Historic	9323	0	50.520	21.204	-22.804	35.285	50.470	68.277	98.060



Descriptive Statistics: Average

Results for Month = 1

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	31	20.10	11.15	-3.06	11.02	20.90	30.05	41.75
	Historic	805	25.444	13.243	-13.206	16.486	28.325	35.735	52.363

Results for Month = 2

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	25	26.63	8.83	6.80	22.10	25.57	30.77	44.60
	Historic	734	29.789	14.064	-19.400	21.961	32.404	40.138	56.264

Results for Month = 3

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	31	35.66	6.83	19.68	31.56	35.21	39.92	49.40
	Historic	806	39.270	11.838	-5.766	32.195	39.824	47.376	67.179

Results for Month = 4

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	30	44.52	10.23	25.51	37.89	42.09	50.58	66.80
	Historic	779	48.966	10.533	17.825	41.879	48.650	56.150	78.016

Results for Month = 5

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	30	53.27	8.48	32.77	48.52	54.41	59.74	65.38
	Historic	803	59.470	9.313	32.300	52.925	59.942	66.412	82.085

Results for Month = 6

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	30	64.19	5.76	53.76	59.61	63.96	68.17	74.60
	Historic	779	70.139	8.401	42.271	64.510	70.600	76.087	90.100

Results for Month = 7

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	31	77.43	6.60	66.13	73.28	77.70	82.25	89.00
	Historic	792	77.463	7.490	55.772	72.369	77.528	82.714	98.060

Results for Month = 8

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	30	76.66	7.91	56.86	74.04	78.56	81.44	88.91
	Historic	775	75.797	7.493	49.964	71.150	76.175	81.170	96.080

Results for Month = 9

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	30	65.18	10.71	47.98	56.67	66.24	74.34	83.08
	Historic	750	65.205	10.569	30.920	57.805	65.806	72.905	92.104

Results for Month = 10

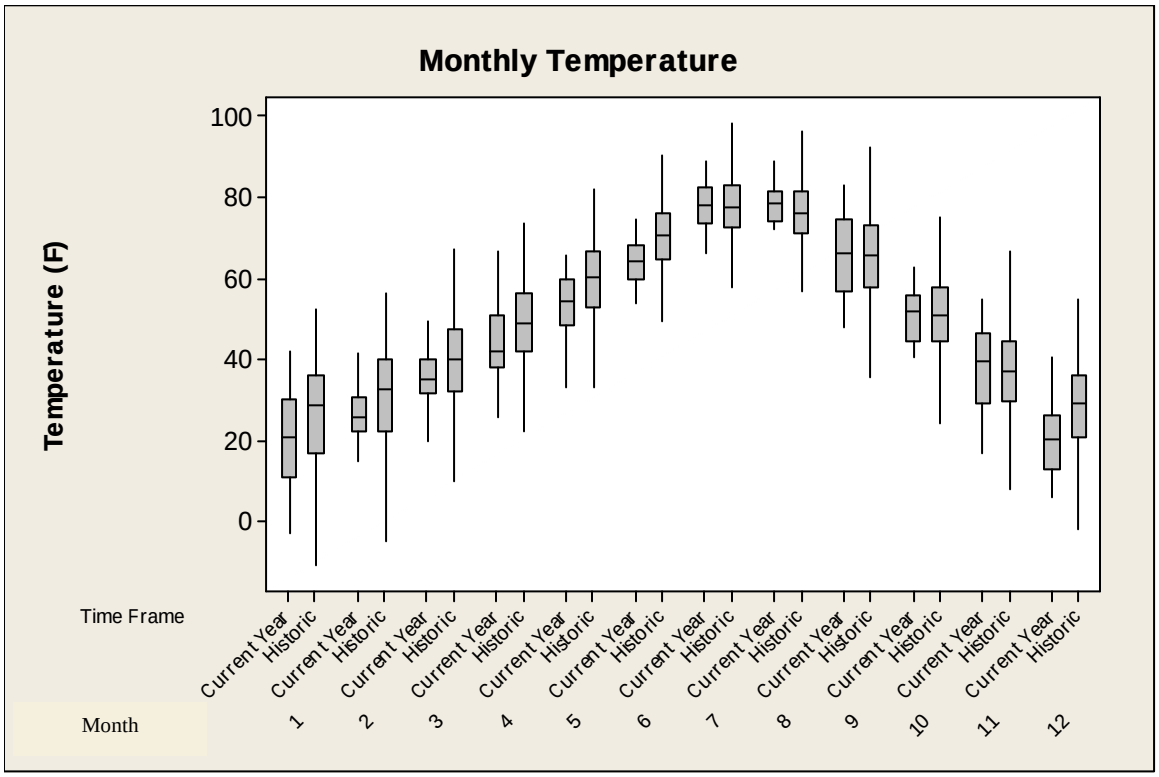
Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	31	50.72	6.48	40.40	44.46	51.80	55.79	62.83
	Historic	775	50.781	9.958	6.935	44.293	51.013	57.740	75.094

Results for Month = 11

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	30	37.37	10.94	16.48	28.94	39.33	46.27	54.82
	Historic	750	36.365	11.494	-1.710	29.576	37.075	44.349	66.358

Results for Month = 12

Variable	Time Frame	Total Count	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Average	Current Year	31	19.62	8.59	5.98	12.78	20.24	26.15	40.45
	Historic	775	26.888	12.946	-22.804	20.427	28.811	35.960	54.950


Monthly Temperature
Temperature (F)
100
80
60
40
20
0
Time Frame
Current Year
Historic
Month
1
2
3
4
5
6
7
8
9
10
11
12

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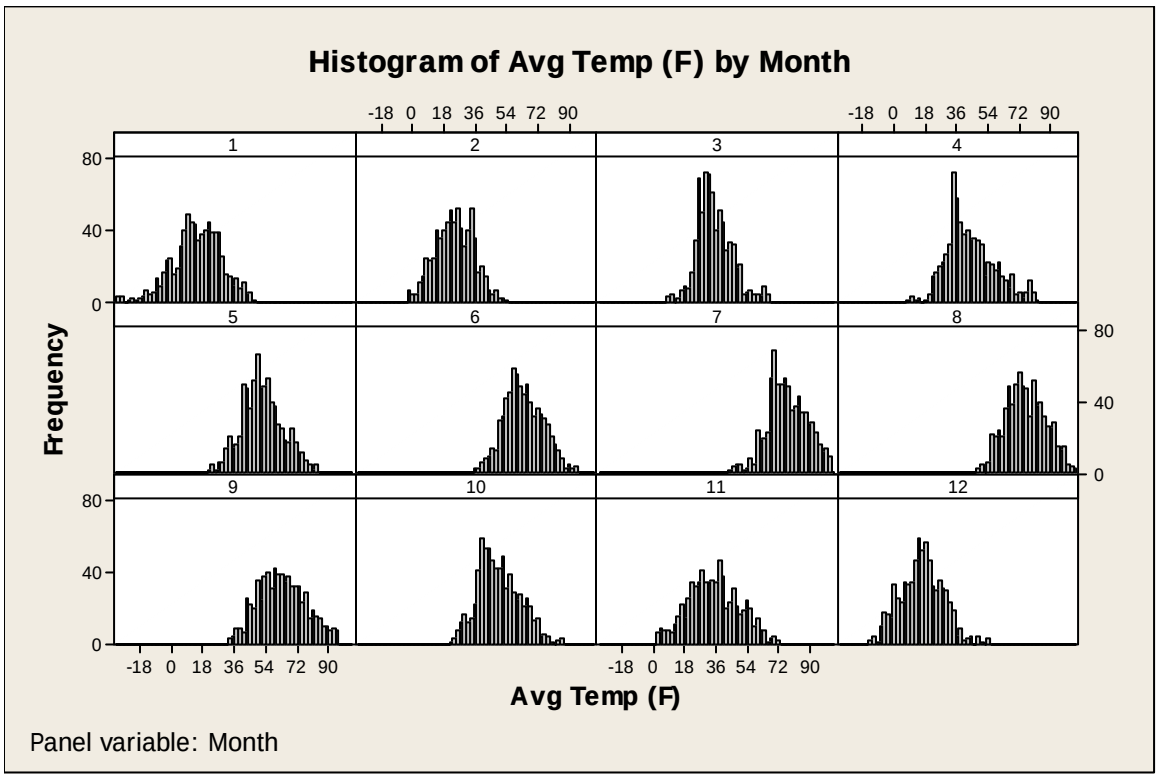
APPENDIX 1.1-B

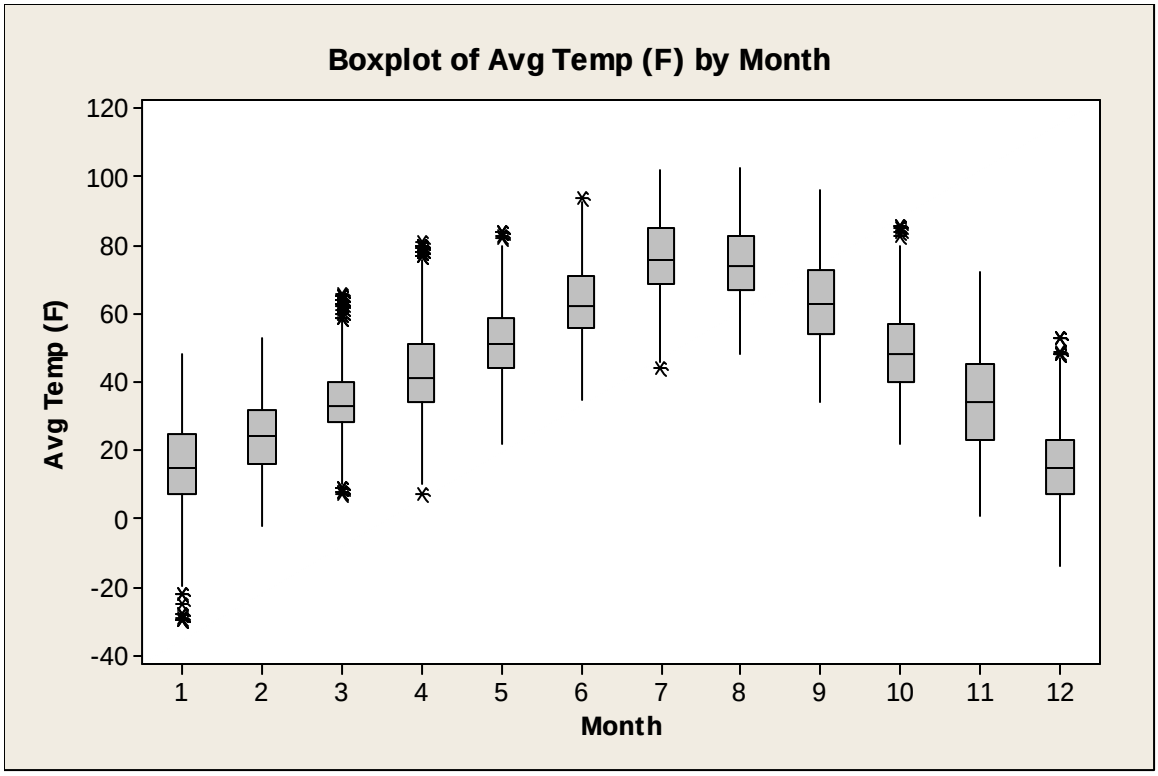
STATISTICAL REPORTS FOR DEWEY-BURDOCK METEOROLOGICAL SITE

APPENDIX 1.1-B
STATISTICAL REPORTS FOR DEWEY-BURDOCK METEOROLOGICAL SITE

Descriptive Statistics: Avg Temp (F)

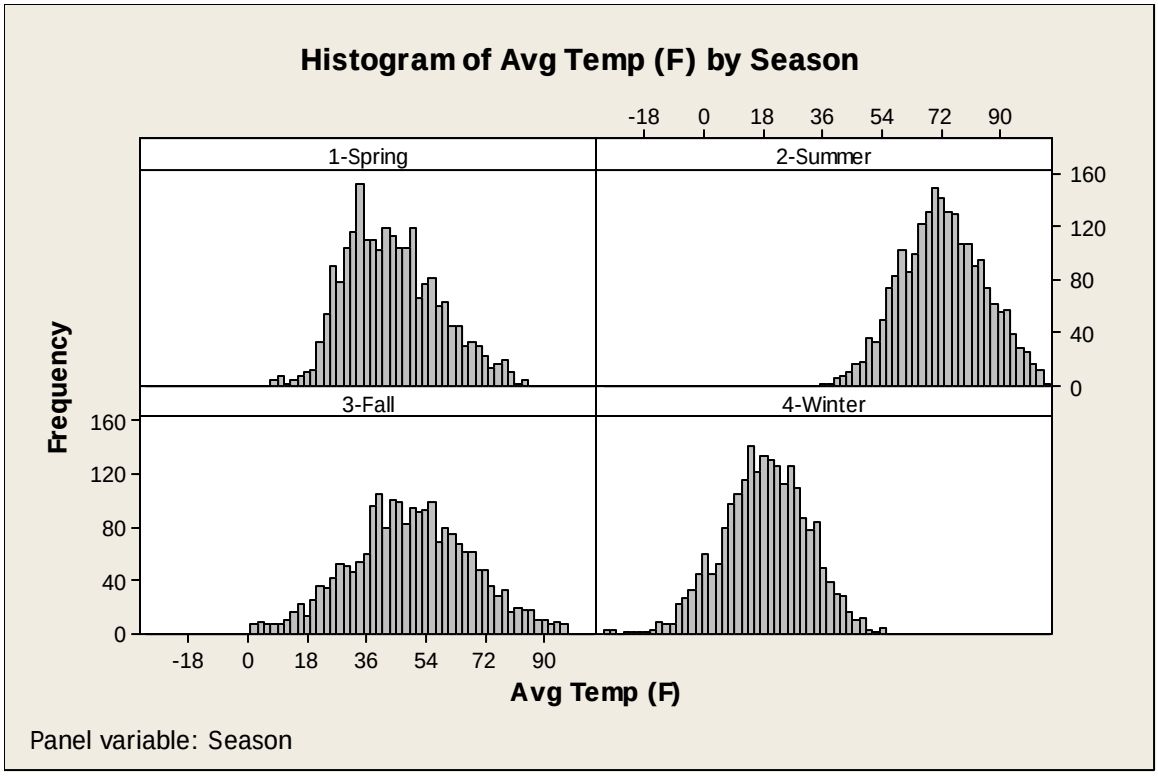
Variable	Month	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Avg Temp (F)	1	744	0	14.792	13.859	-30.000	7.000	15.000	25.000	48.000
	2	696	0	23.520	10.861	-2.000	16.000	24.000	32.000	53.000
	3	720	0	34.550	10.040	7.000	28.000	33.000	40.000	66.000
	4	720	0	43.082	13.914	7.000	34.000	41.000	51.000	81.000
	5	744	0	52.173	11.654	22.000	44.000	51.000	59.000	84.000
	6	720	0	63.306	10.914	35.000	56.000	62.000	71.000	94.000
	7	744	0	76.858	11.231	44.000	69.000	76.000	85.000	102.000
	8	744	0	75.160	11.226	48.000	67.000	74.000	83.000	103.000
	9	720	0	63.747	13.787	34.000	54.000	63.000	73.000	96.000
	10	744	0	49.210	12.055	22.000	40.000	48.000	57.000	86.000
	11	720	0	34.061	14.761	1.000	23.000	34.000	45.000	72.000
	12	744	0	15.073	12.085	-14.000	7.000	15.000	23.000	53.000

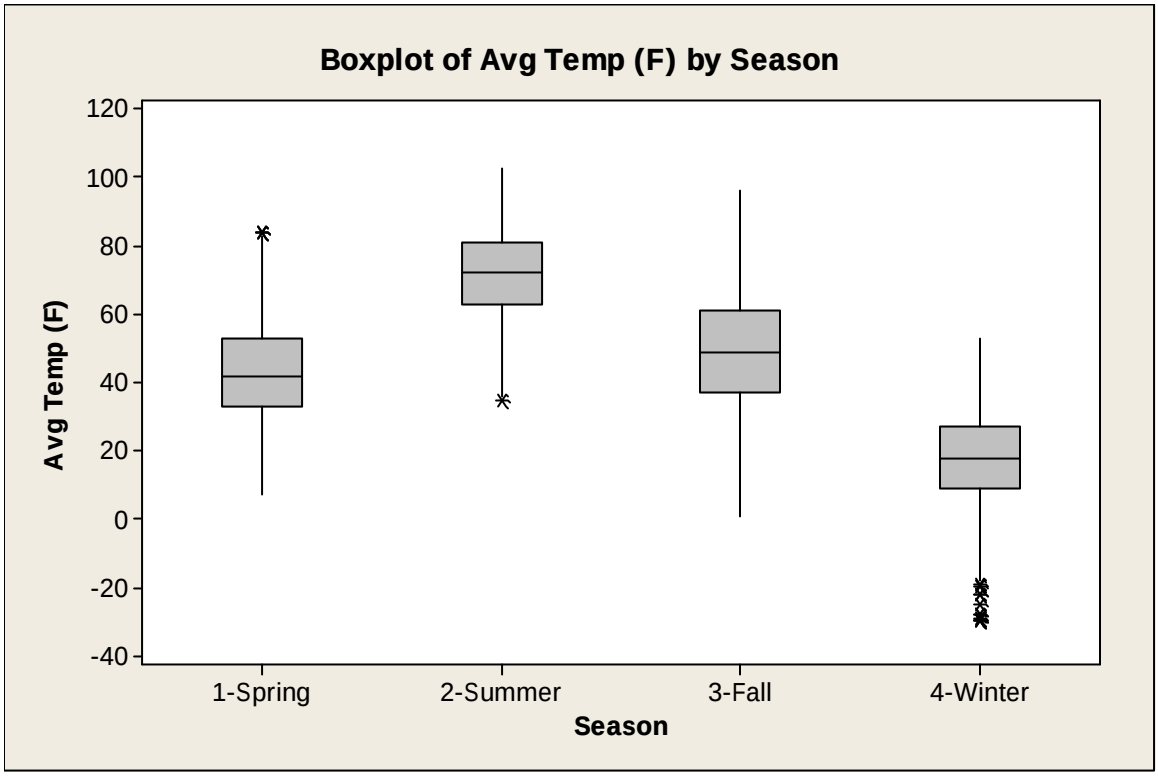




Descriptive Statistics: Avg Temp (F)

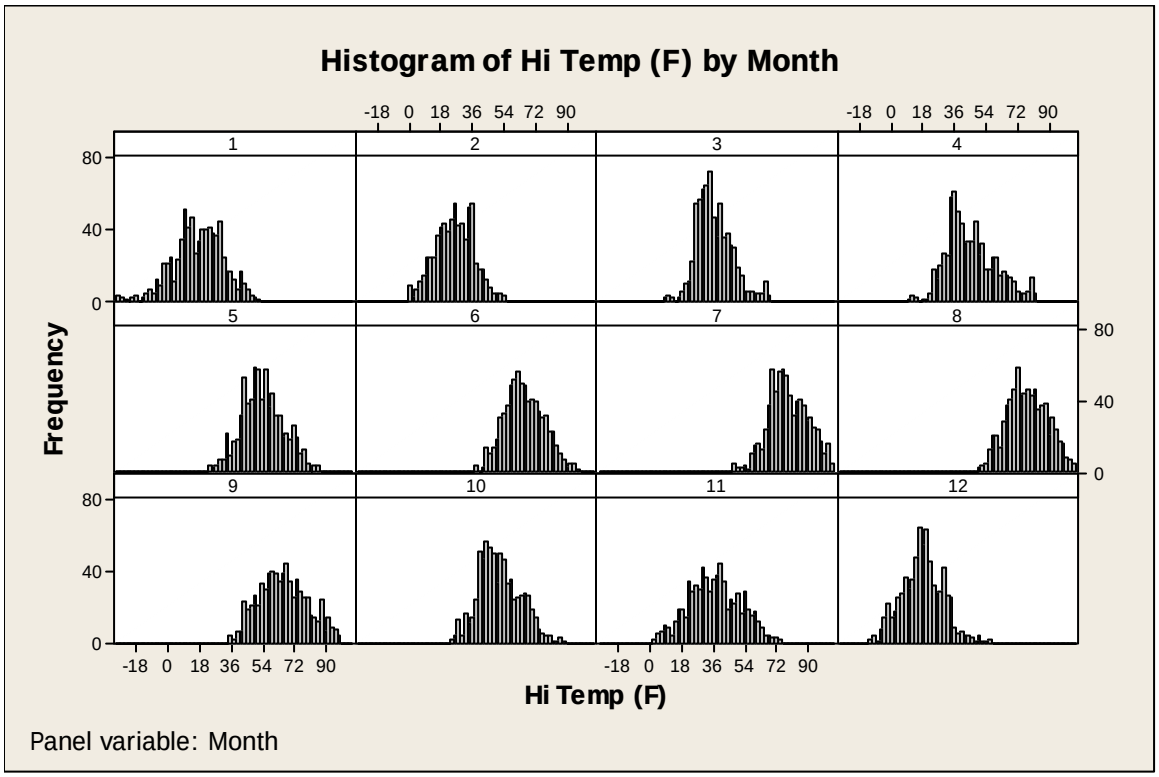
Variable	Season	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Avg Temp (F)	1-Spring	2184	0	43.366	13.975	7.000	33.000	42.000	53.000	84.000
	2-Summer	2208	0	71.866	12.636	35.000	63.000	72.000	81.000	103.000
	3-Fall	2184	0	49.008	18.144	1.000	37.000	49.000	61.000	96.000
	4-Winter	2184	0	17.669	12.987	-30.000	9.000	18.000	27.000	53.000

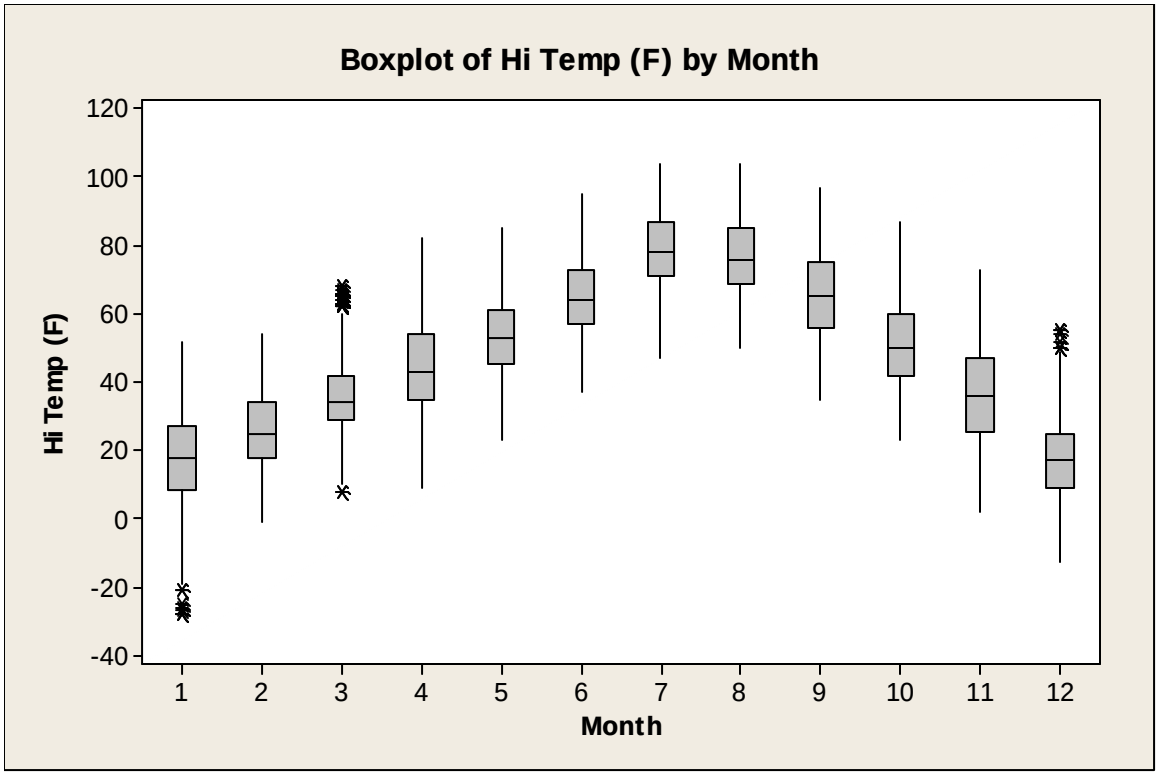

Histogram of Avg Temp (F) by Season
1-Spring
2-Summer
3-Fall
4-Winter
Frequency
Avg Temp (F)
Panel variable: Season


Boxplot of Avg Temp (F) by Season
Avg Temp (F)
1-Spring
2-Summer
3-Fall
4-Winter
Season

Descriptive Statistics: Hi Temp (F)

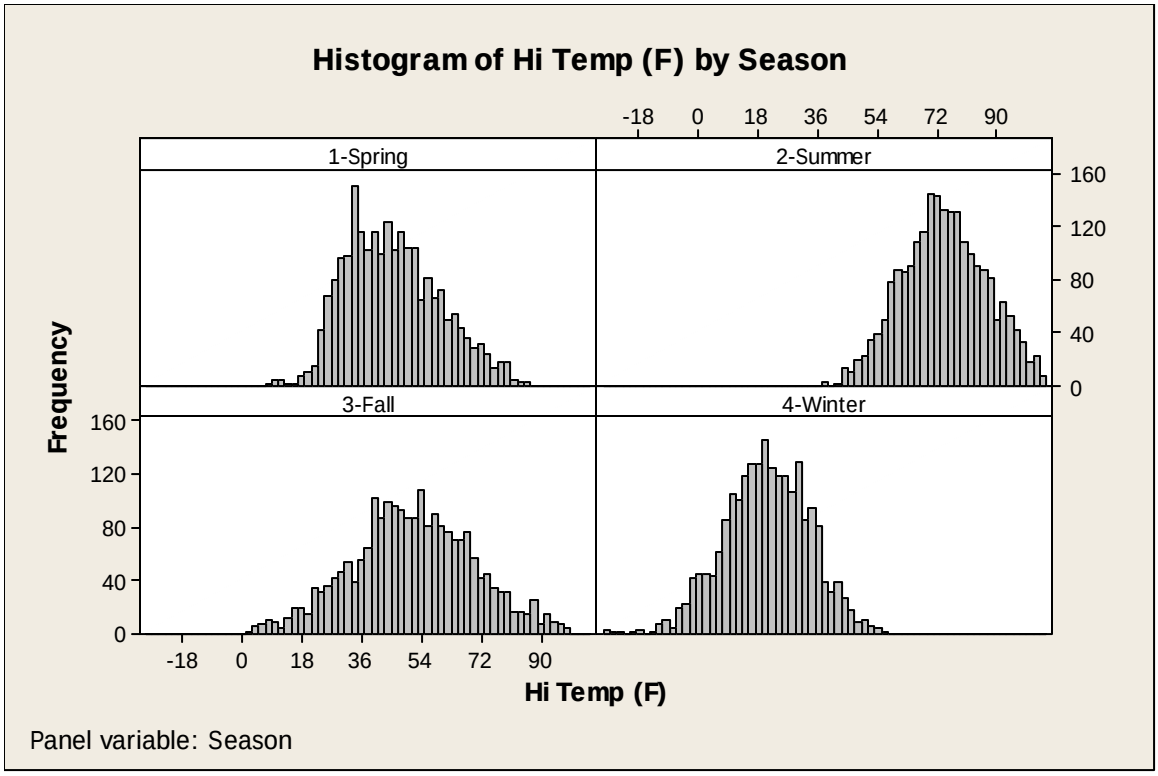
Variable	Month	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Hi Temp (F)	1	744	0	17.176	14.043	-28.000	8.250	18.000	27.000	52.000
	2	696	0	25.307	10.827	-1.000	18.000	25.000	34.000	54.000
	3	720	0	36.100	10.286	8.000	29.000	34.000	42.000	68.000
	4	720	0	44.954	14.008	9.000	35.000	43.000	54.000	82.000
	5	744	0	53.663	11.834	23.000	45.000	53.000	61.000	85.000
	6	720	0	65.026	10.932	37.000	57.000	64.000	73.000	95.000
	7	744	0	78.593	11.209	47.000	71.000	78.000	87.000	104.000
	8	744	0	76.902	11.387	50.000	69.000	76.000	85.000	104.000
	9	720	0	65.635	13.798	35.000	56.000	65.000	75.000	97.000
	10	744	0	51.003	12.020	23.000	42.000	50.000	60.000	87.000
	11	720	0	36.133	14.917	2.000	25.250	36.000	47.000	73.000
	12	744	0	17.262	11.831	-13.000	9.000	17.000	25.000	55.000

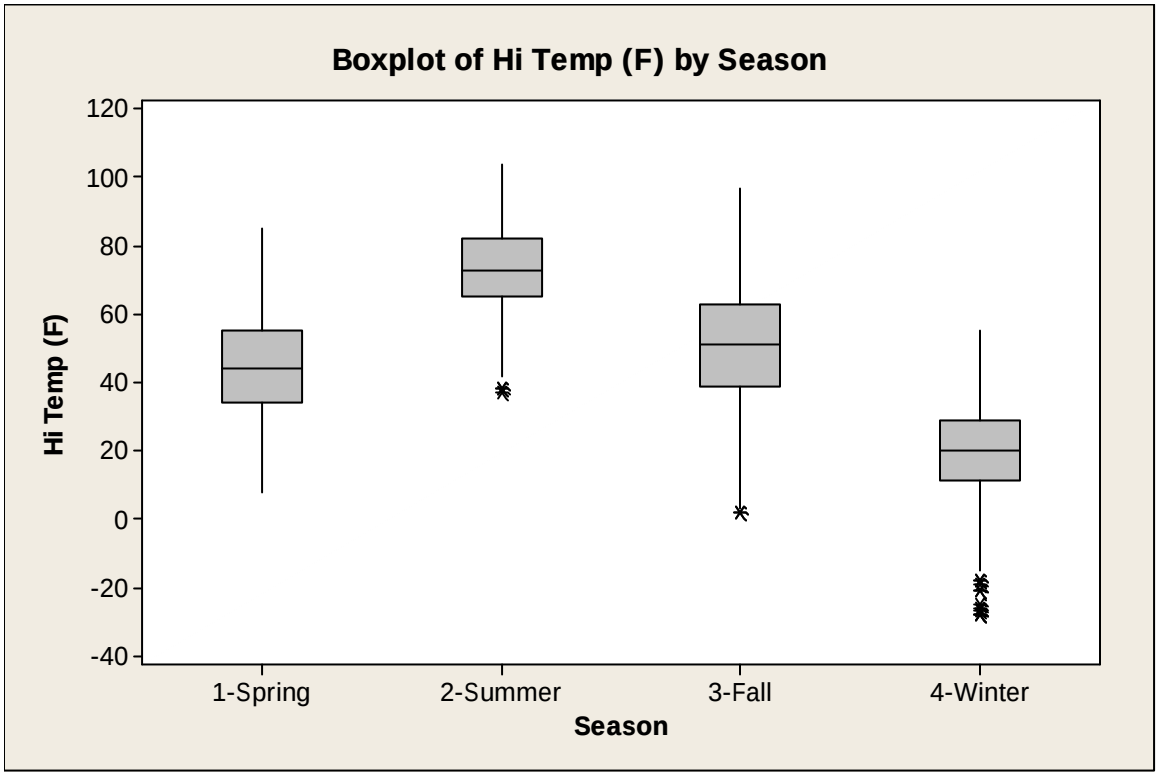




Descriptive Statistics: Hi Temp (F)

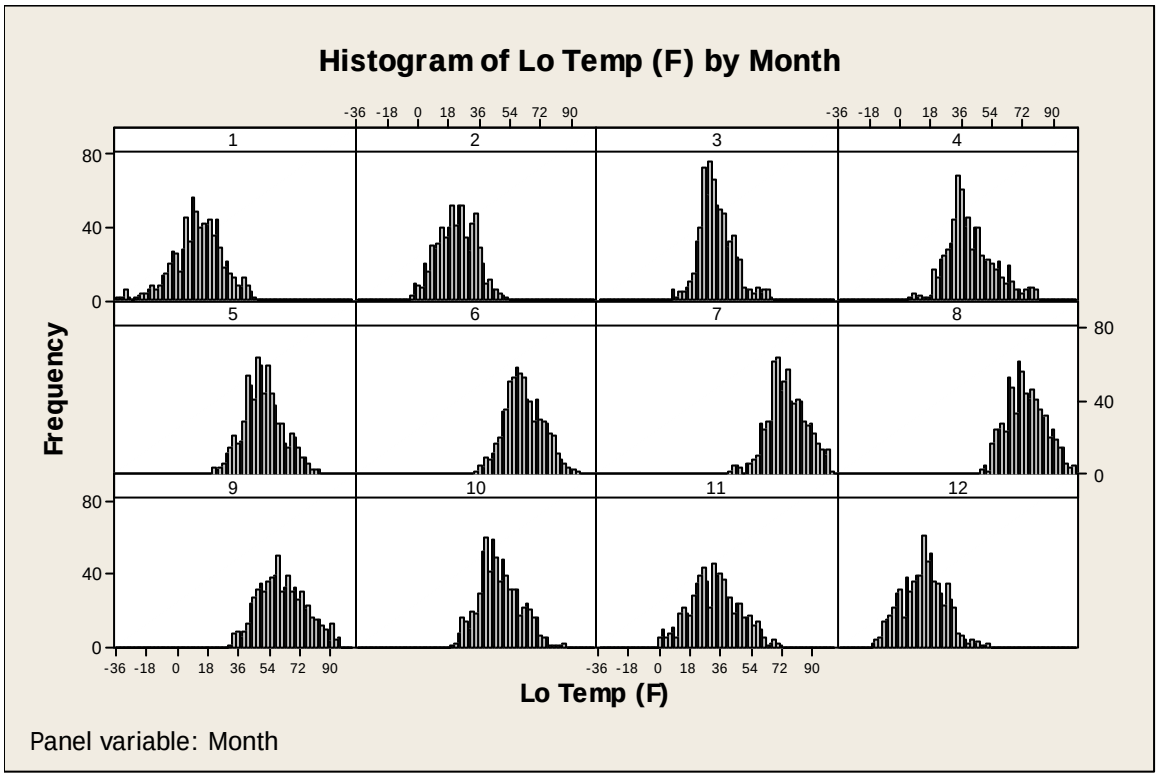
Variable	Season	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Hi Temp (F)	1-Spring	2184	0	45.002	14.101	8.000	34.000	44.000	55.000	85.000
	2-Summer	2208	0	73.599	12.686	37.000	65.000	73.000	82.000	104.000
	3-Fall	2184	0	50.924	18.130	2.000	39.000	51.000	63.000	97.000
	4-Winter	2184	0	19.797	12.896	-28.000	11.000	20.000	29.000	55.000

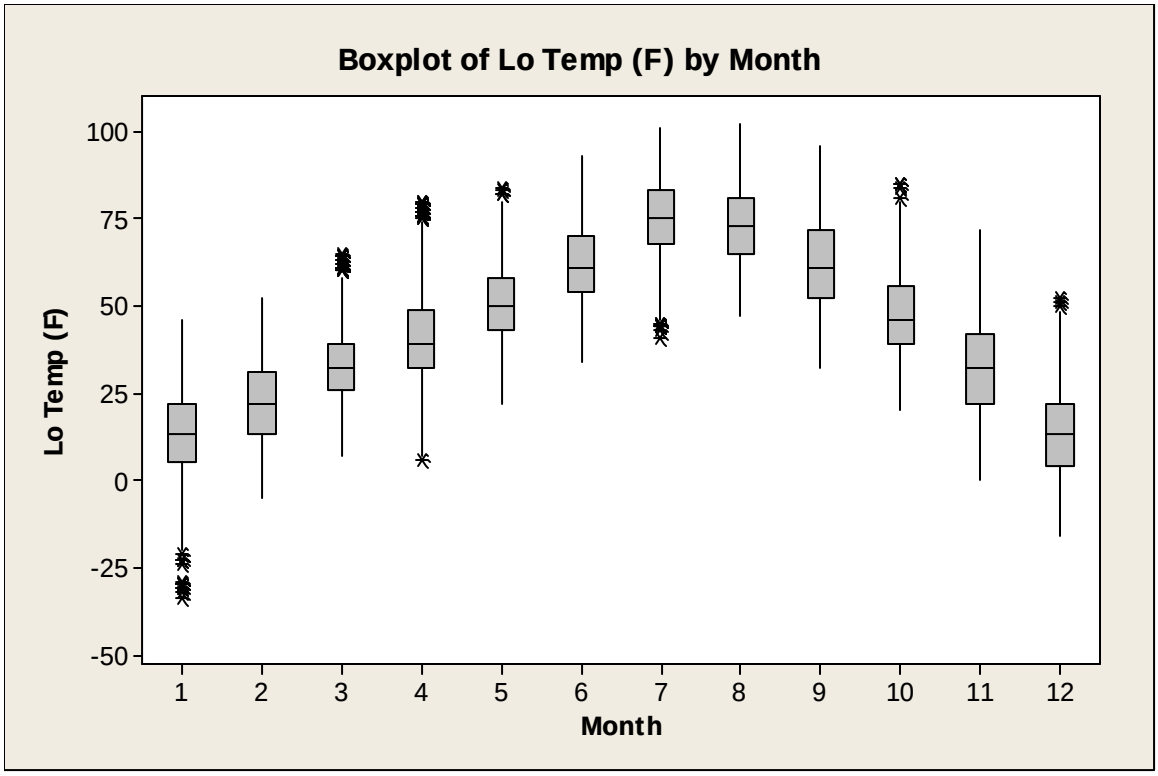




Descriptive Statistics: Lo Temp (F)

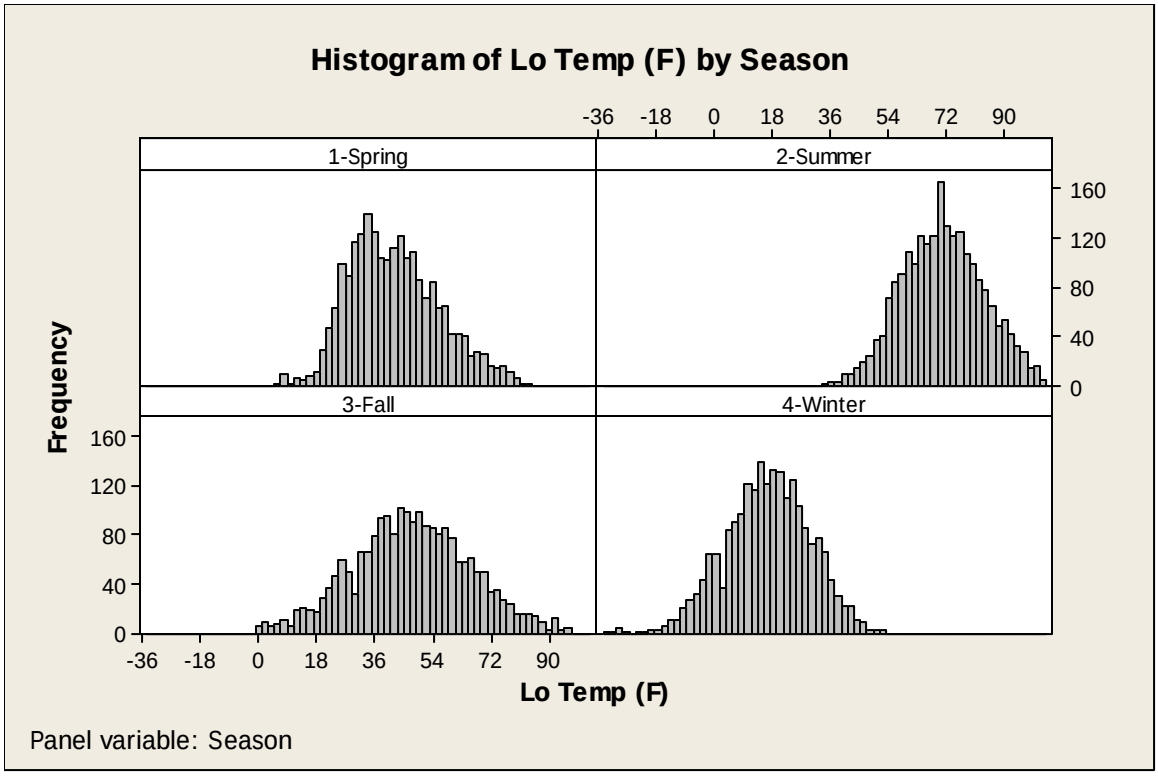
Variable	Month	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Lo Temp (F)	1	744	0	12.538	13.869	-34.000	5.000	13.000	22.000	46.000
	2	696	0	21.797	11.032	-5.000	13.250	22.000	31.000	52.000
	3	720	0	32.993	9.890	7.000	26.000	32.000	39.000	65.000
	4	720	0	41.326	13.840	6.000	32.000	39.000	49.000	80.000
	5	744	0	50.719	11.503	22.000	43.000	50.000	58.000	84.000
	6	720	0	61.635	10.928	34.000	54.000	61.000	70.000	93.000
	7	744	0	75.144	11.330	41.000	68.000	75.000	83.000	101.000
	8	744	0	73.449	11.173	47.000	65.000	73.000	81.000	102.000
	9	720	0	61.931	13.775	32.000	52.000	61.000	72.000	96.000
	10	744	0	47.539	12.074	20.000	39.000	46.000	55.750	85.000
	11	720	0	32.004	14.599	0.000	22.000	32.000	42.000	72.000
	12	744	0	12.957	12.541	-16.000	4.000	13.000	22.000	52.000

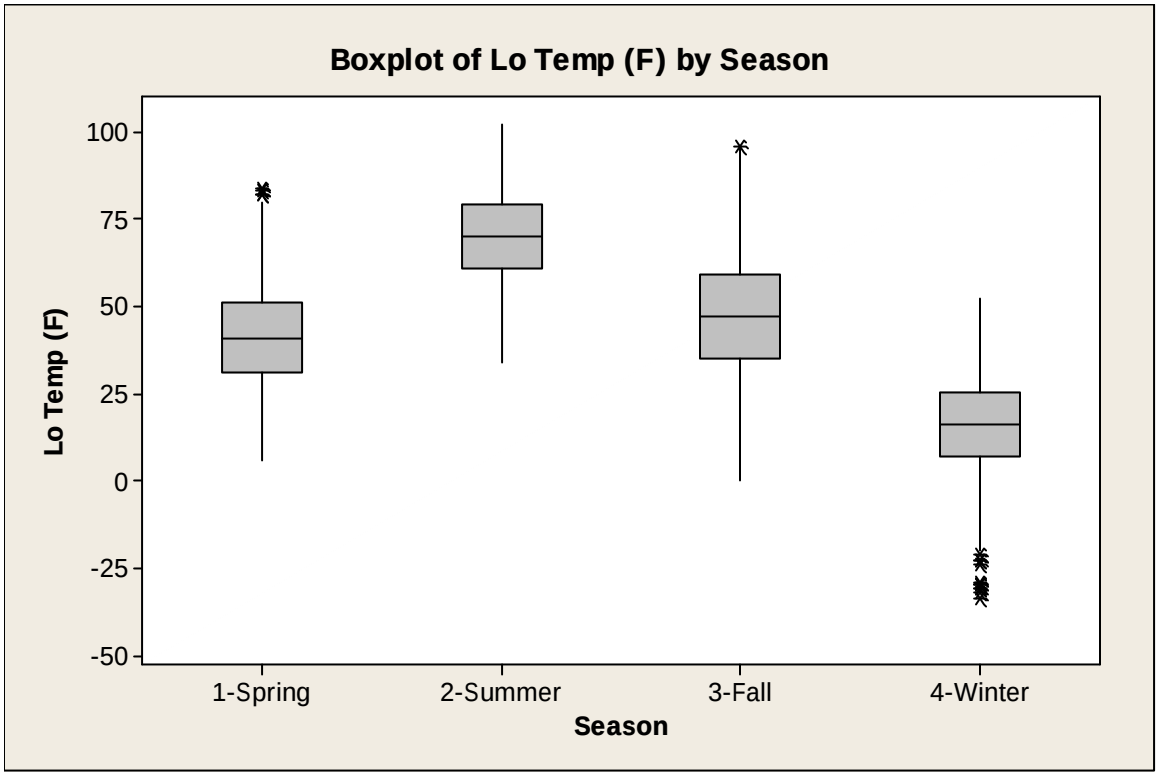




Descriptive Statistics: Lo Temp (F)

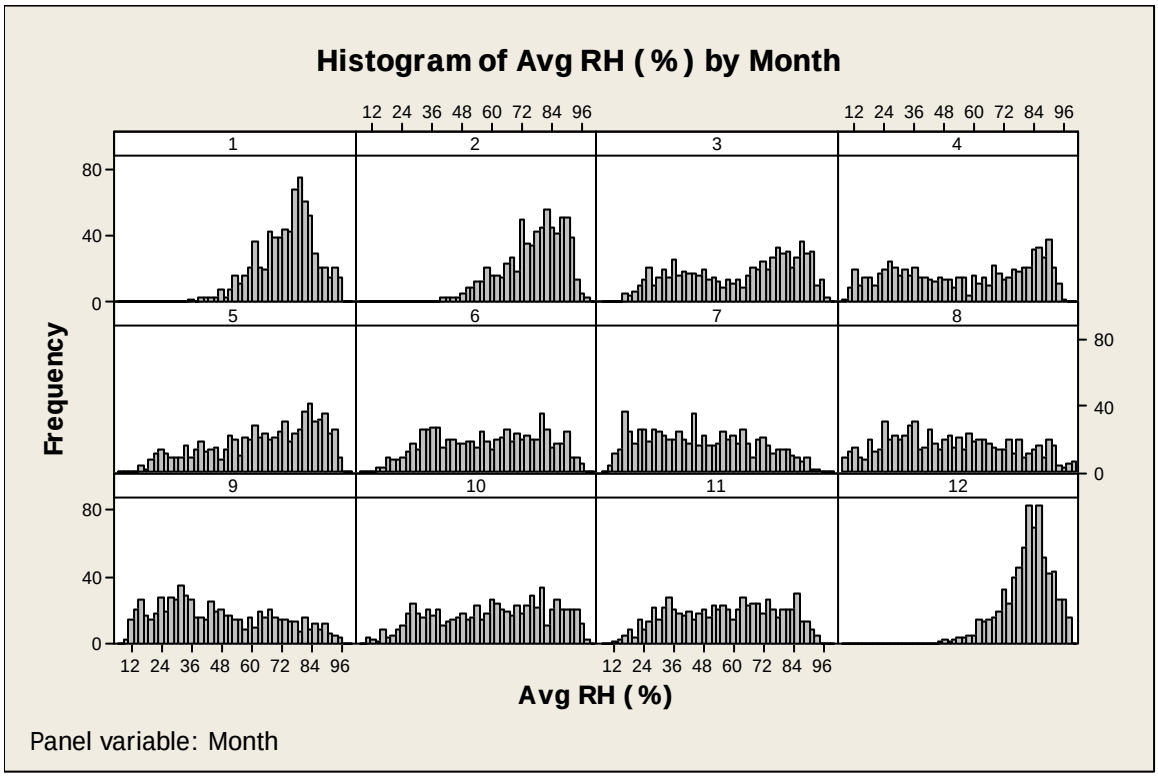
Variable	Season	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Lo Temp (F)	1-Spring	2184	0	41.779	13.896	6.000	31.000	41.000	51.000	84.000
	2-Summer	2208	0	70.168	12.644	34.000	61.000	70.000	79.000	102.000
	3-Fall	2184	0	47.162	18.168	0.000	35.000	47.000	59.000	96.000
	4-Winter	2184	0	15.631	13.250	-34.000	7.000	16.000	25.000	52.000

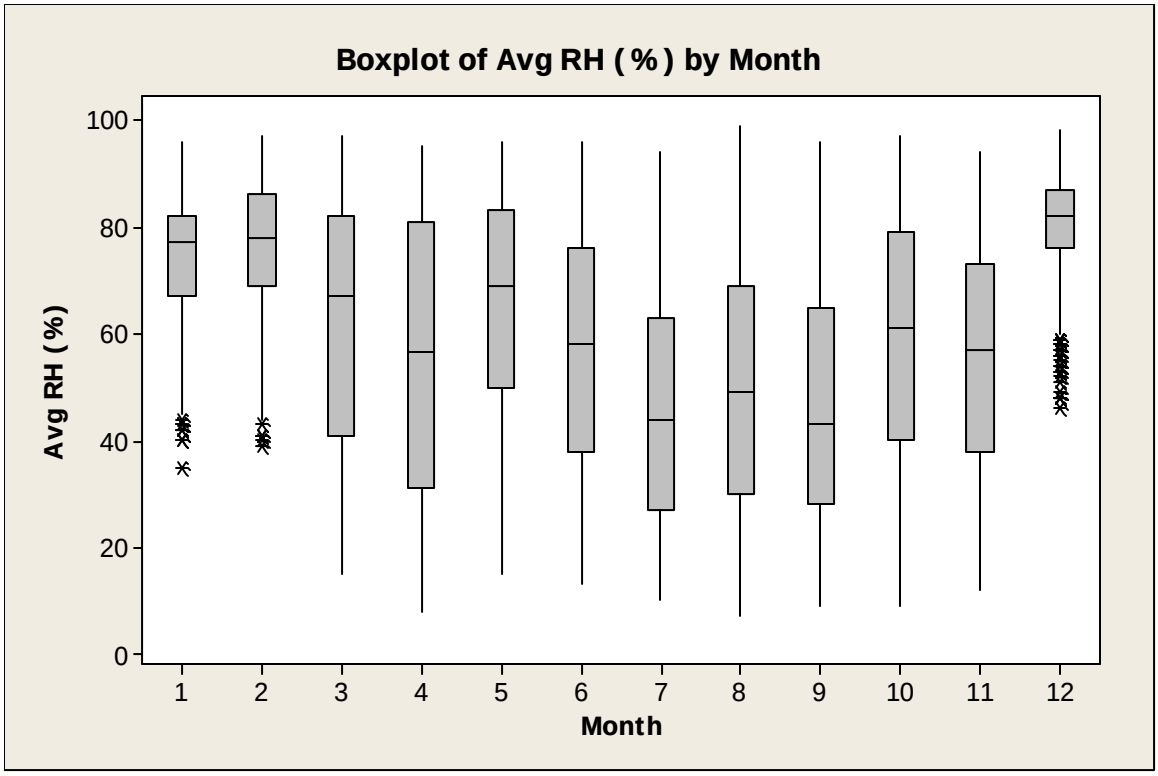




Descriptive Statistics: Avg RH (%)

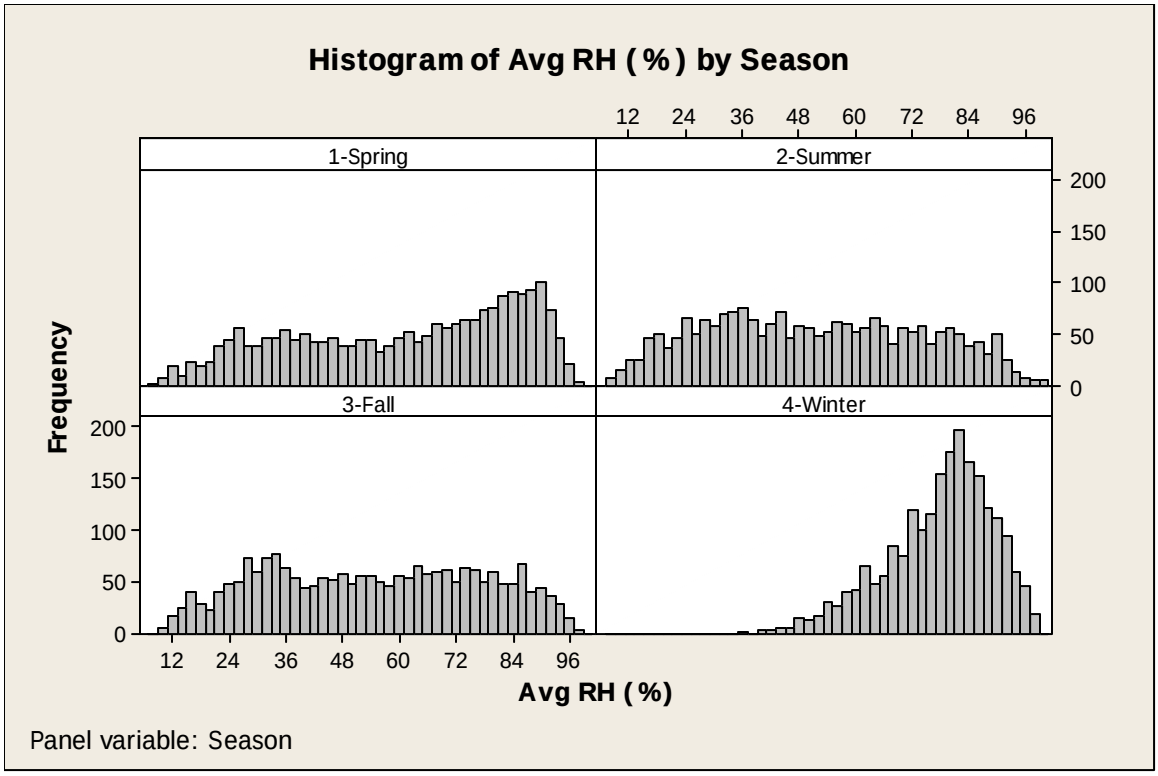
Variable	Month	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Avg RH (%)	1	744	0	74.401	11.316	35.000	67.000	77.000	82.000	96.000
	2	696	0	76.204	12.055	39.000	69.000	78.000	86.000	97.000
	3	720	0	61.858	22.846	15.000	41.000	67.000	82.000	97.000
	4	720	0	55.276	26.033	8.000	31.250	56.500	80.750	95.000
	5	744	0	64.849	21.121	15.000	50.000	69.000	83.000	96.000
	6	720	0	57.286	21.158	13.000	38.000	58.000	76.000	96.000
	7	744	0	45.902	21.533	10.000	27.000	44.000	63.000	94.000
	8	744	0	49.981	23.951	7.000	30.000	49.000	69.000	99.000
	9	720	0	46.239	22.786	9.000	28.000	43.000	65.000	96.000
	10	744	0	59.480	22.502	9.000	40.000	61.000	79.000	97.000
	11	720	0	56.265	20.717	12.000	38.000	57.000	73.000	94.000
	12	744	0	80.942	9.595	46.000	76.000	82.000	87.000	98.000

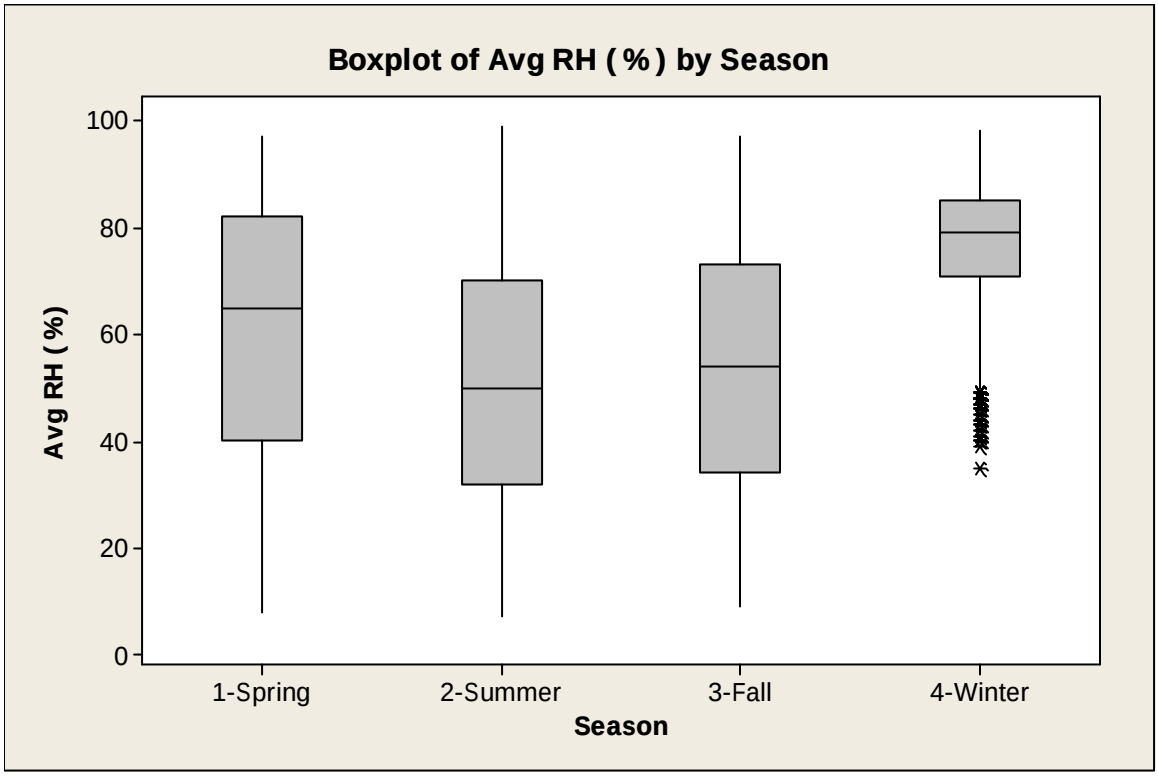




Descriptive Statistics: Avg RH (%)

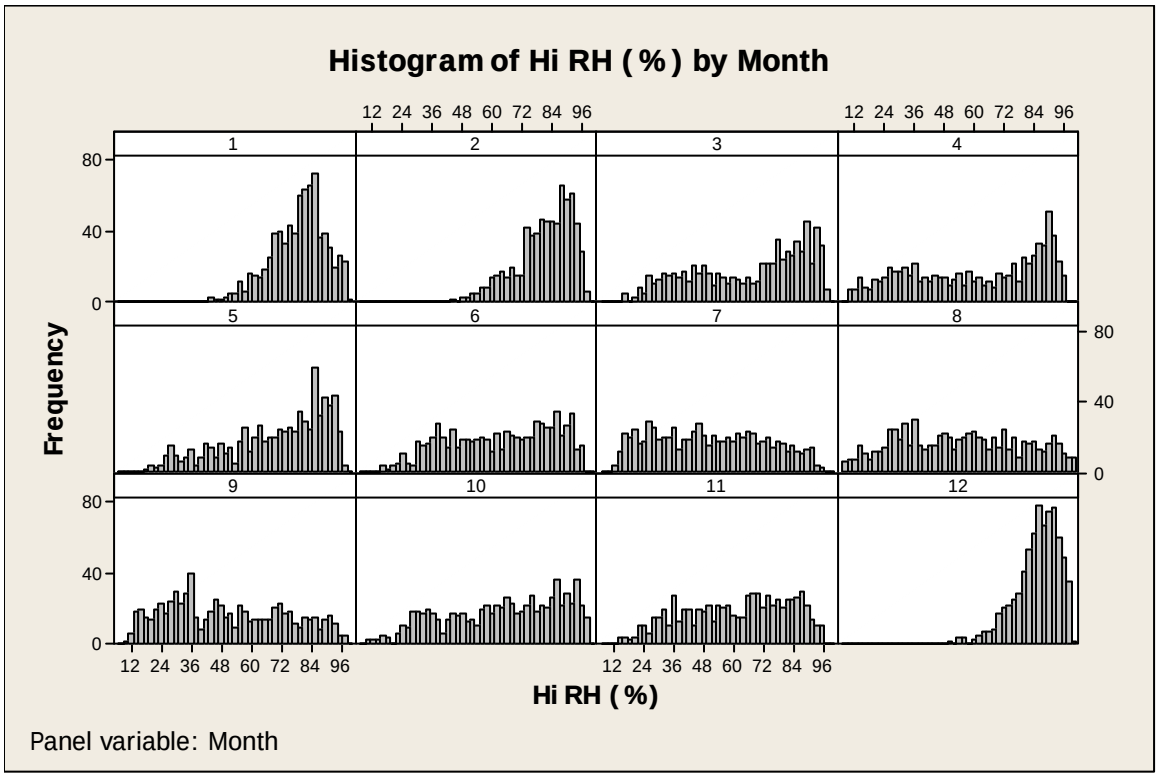
Variable	Season	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Avg RH (%)	1-Spring	2184	0	60.707	23.727	8.000	40.000	65.000	82.000	97.000
	2-Summer	2208	0	50.989	22.739	7.000	32.000	50.000	70.000	99.000
	3-Fall	2184	0	54.055	22.726	9.000	34.000	54.000	73.000	97.000
	4-Winter	2184	0	77.204	11.355	35.000	71.000	79.000	85.000	98.000

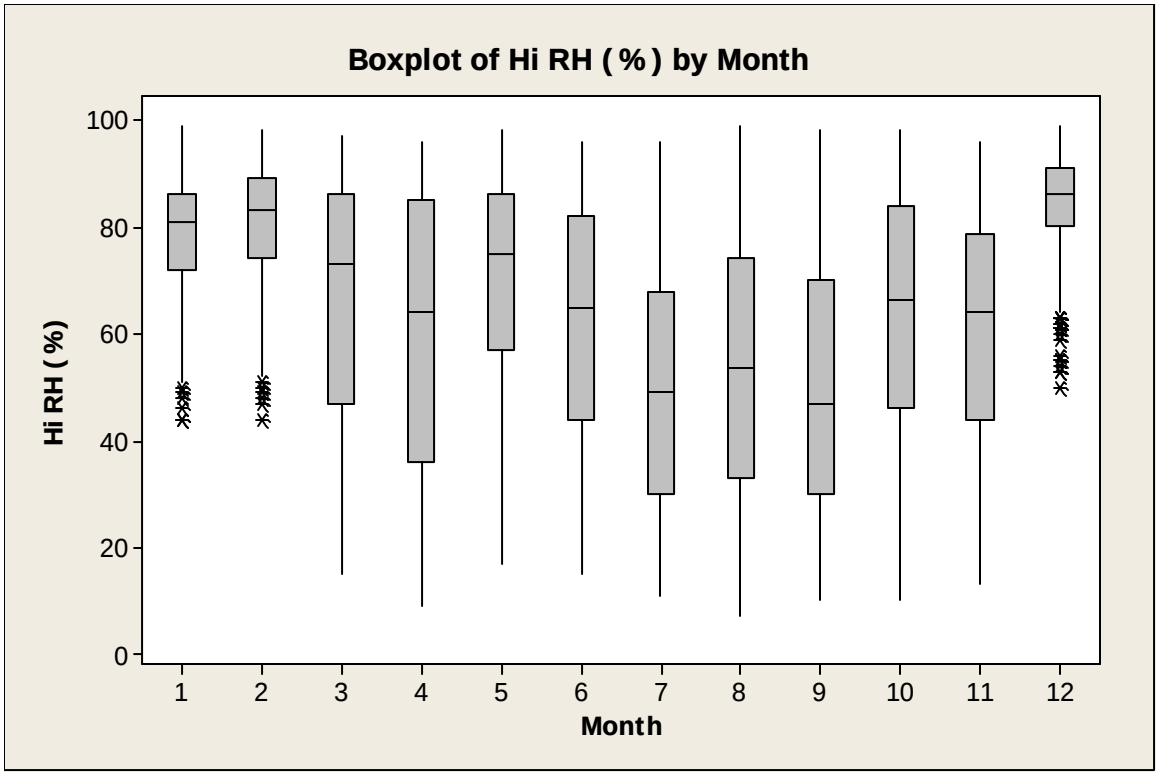




Descriptive Statistics: Hi RH (%)

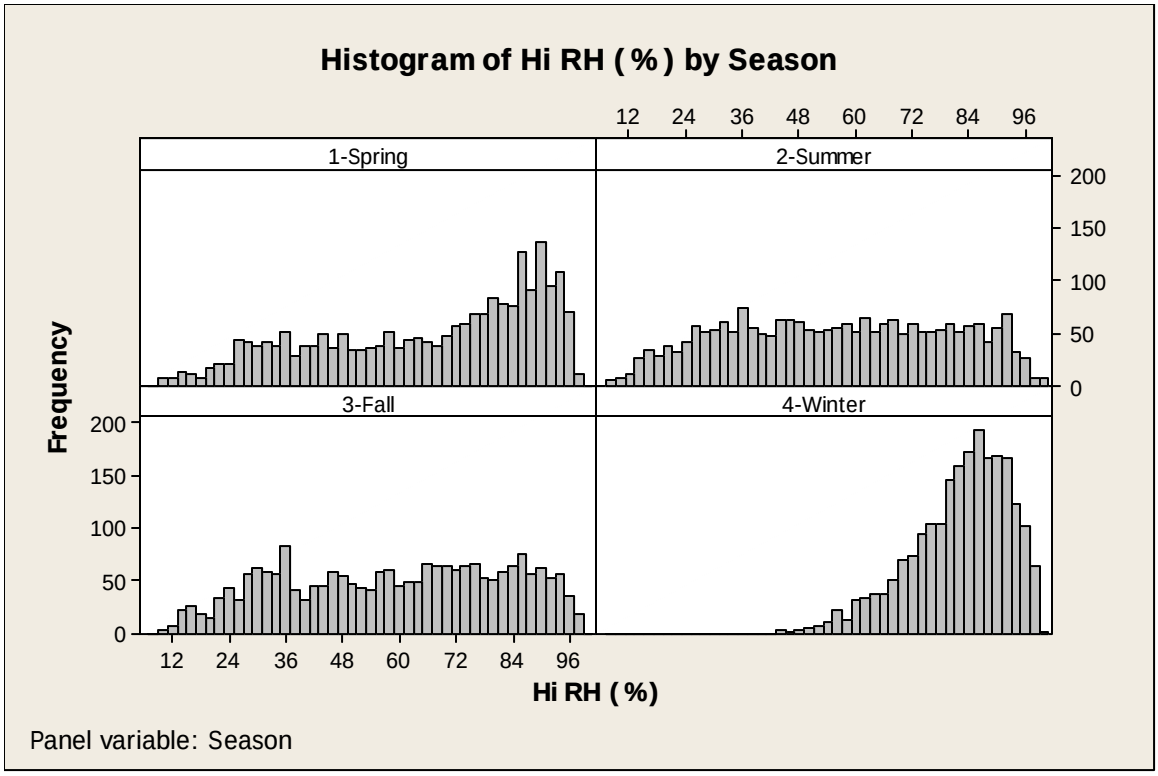
Variable	Month	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Hi RH (%)	1	744	0	79.089	10.652	44.000	72.000	81.000	86.000	99.000
	2	696	0	80.704	10.902	44.000	74.000	83.000	89.000	98.000
	3	720	0	66.451	22.568	15.000	47.000	73.000	86.000	97.000
	4	720	0	60.206	26.101	9.000	36.000	64.000	85.000	96.000
	5	744	0	69.940	20.135	17.000	57.000	75.000	86.000	98.000
	6	720	0	62.814	21.013	15.000	44.000	65.000	82.000	96.000
	7	744	0	49.991	22.415	11.000	30.000	49.000	68.000	96.000
	8	744	0	53.909	24.419	7.000	33.000	53.500	74.000	99.000
	9	720	0	50.150	23.648	10.000	30.000	47.000	70.000	98.000
	10	744	0	63.888	22.670	10.000	46.000	66.500	84.000	98.000
	11	720	0	60.954	20.860	13.000	44.000	64.000	78.750	96.000
	12	744	0	84.997	8.711	50.000	80.000	86.000	91.000	99.000

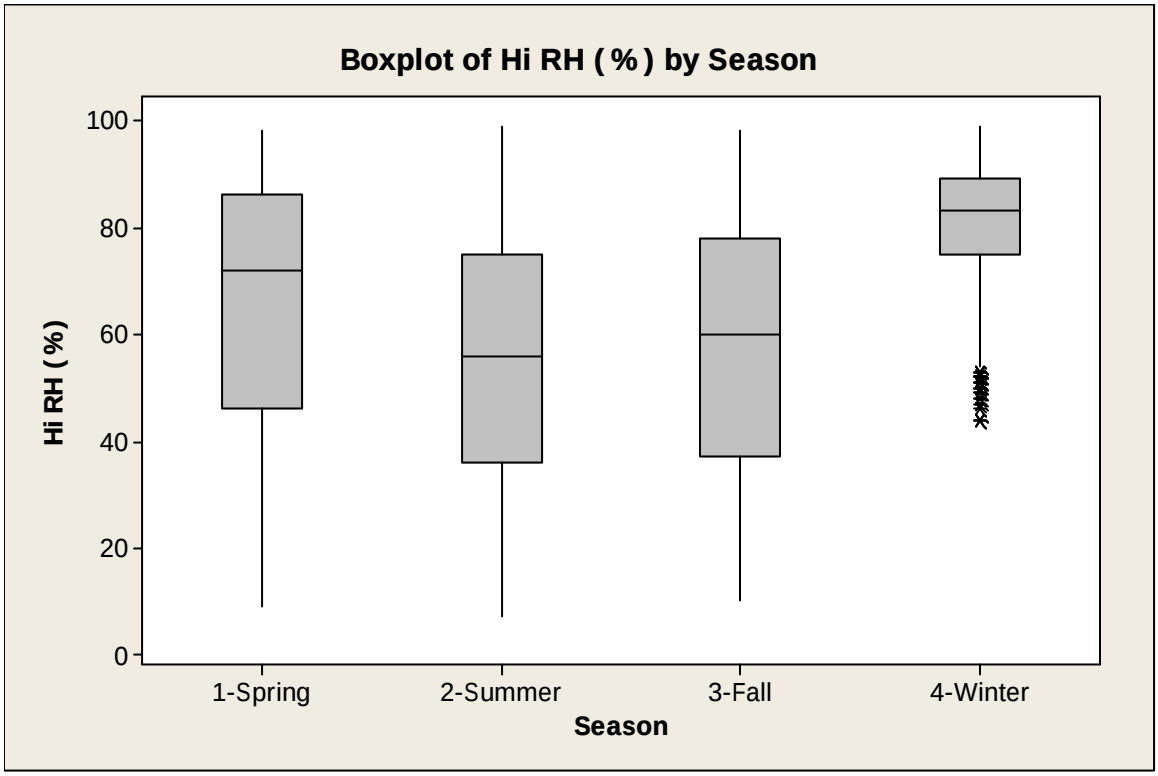




Descriptive Statistics: Hi RH (%)

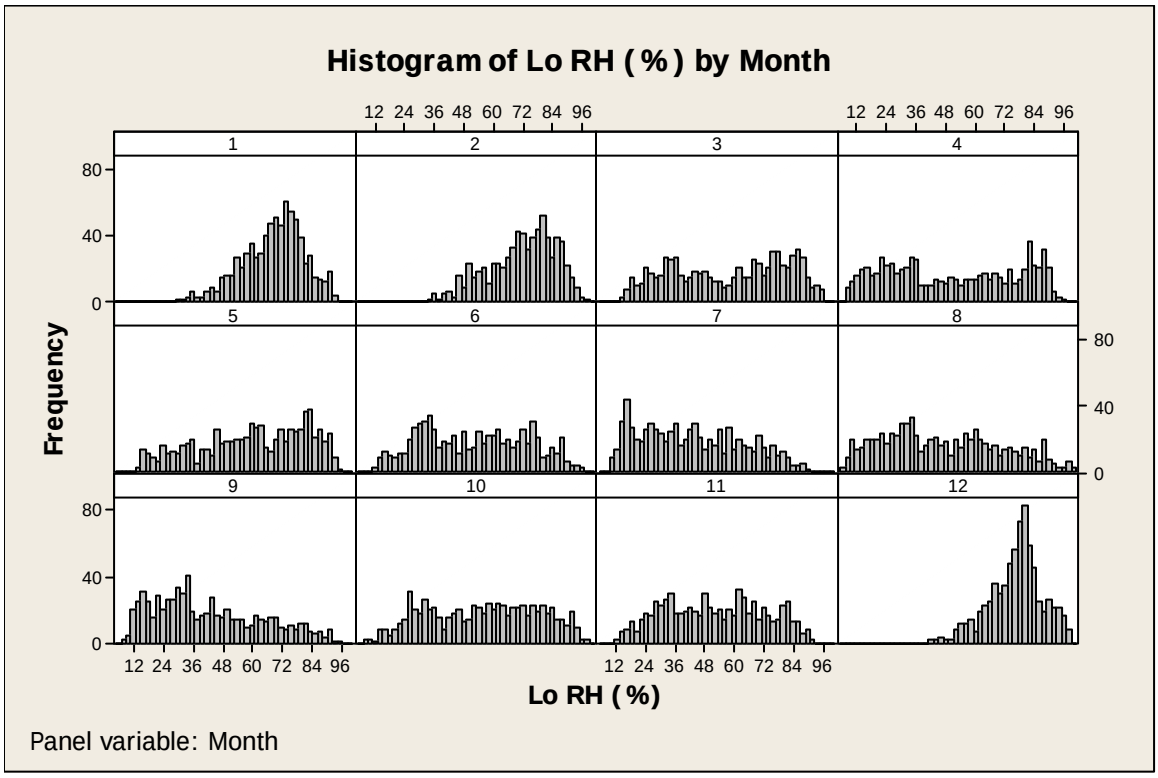
Variable	Season	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Hi RH (%)	1-Spring	2184	0	65.581	23.375	9.000	46.000	72.000	86.000	98.000
	2-Summer	2208	0	55.492	23.286	7.000	36.000	56.000	75.000	99.000
	3-Fall	2184	0	58.392	23.180	10.000	37.000	60.000	78.000	98.000
	4-Winter	2184	0	81.616	10.422	44.000	75.000	83.000	89.000	99.000

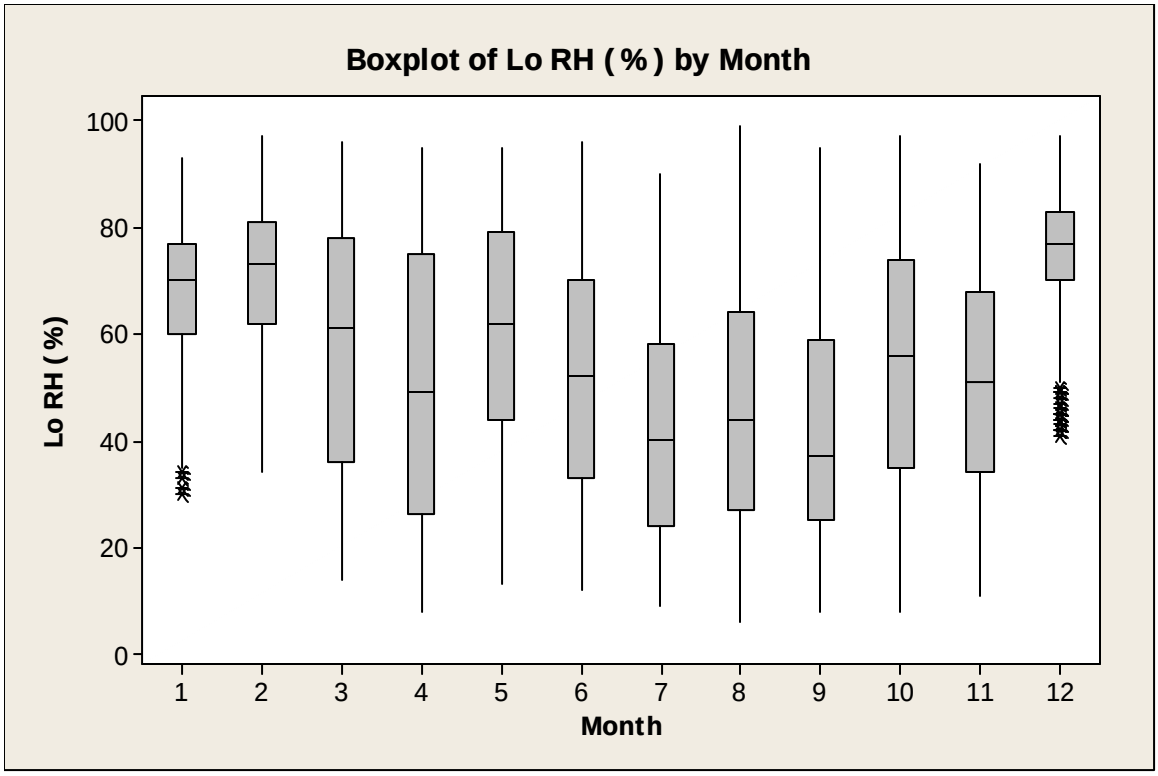




Descriptive Statistics: Lo RH (%)

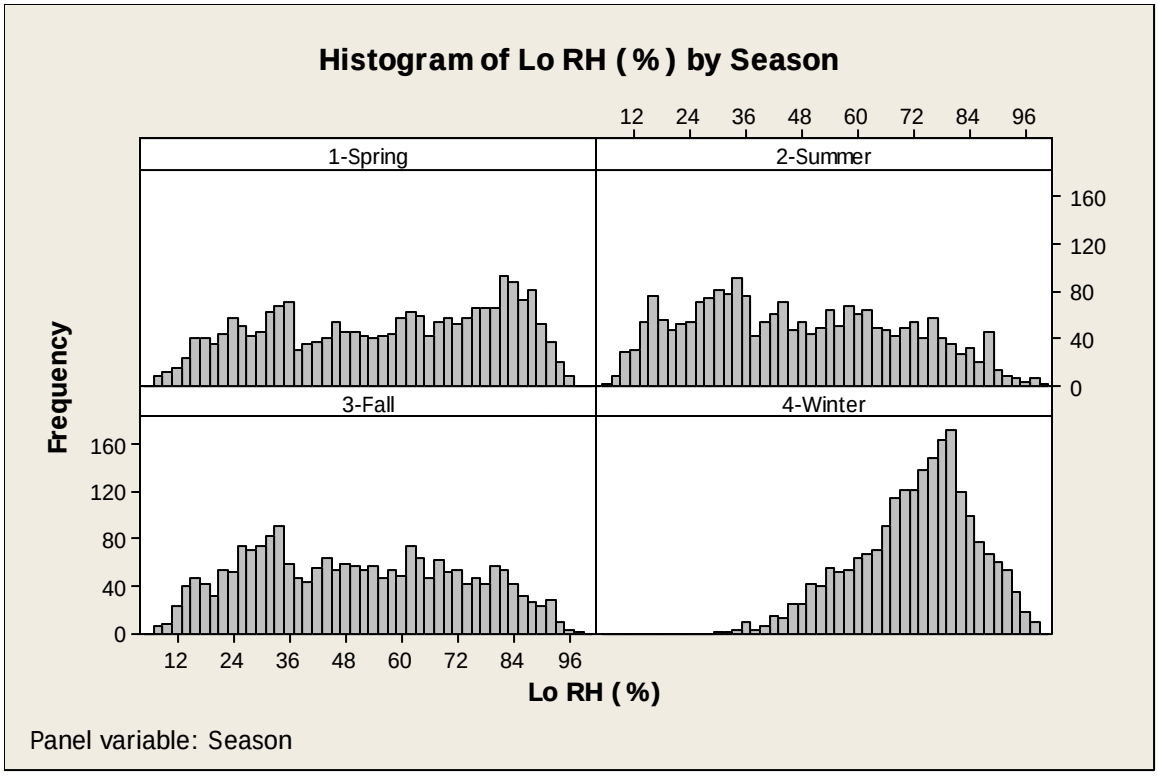
Variable	Month	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Lo RH (%)	1	744	0	68.601	12.330	30.000	60.000	70.000	77.000	93.000
	2	696	0	71.119	13.476	34.000	62.000	73.000	81.000	97.000
	3	720	0	57.353	22.974	14.000	36.000	61.000	78.000	96.000
	4	720	0	50.326	25.874	8.000	26.250	49.000	75.000	95.000
	5	744	0	59.954	21.723	13.000	44.000	62.000	79.000	95.000
	6	720	0	51.854	21.077	12.000	33.000	52.000	70.000	96.000
	7	744	0	42.000	20.728	9.000	24.000	40.000	58.000	90.000
	8	744	0	45.991	23.599	6.000	27.000	44.000	64.000	99.000
	9	720	0	42.293	21.856	8.000	25.000	37.000	59.000	95.000
	10	744	0	54.921	22.251	8.000	35.000	56.000	74.000	97.000
	11	720	0	51.574	20.250	11.000	34.000	51.000	68.000	92.000
	12	744	0	75.931	11.041	41.000	70.000	77.000	83.000	97.000

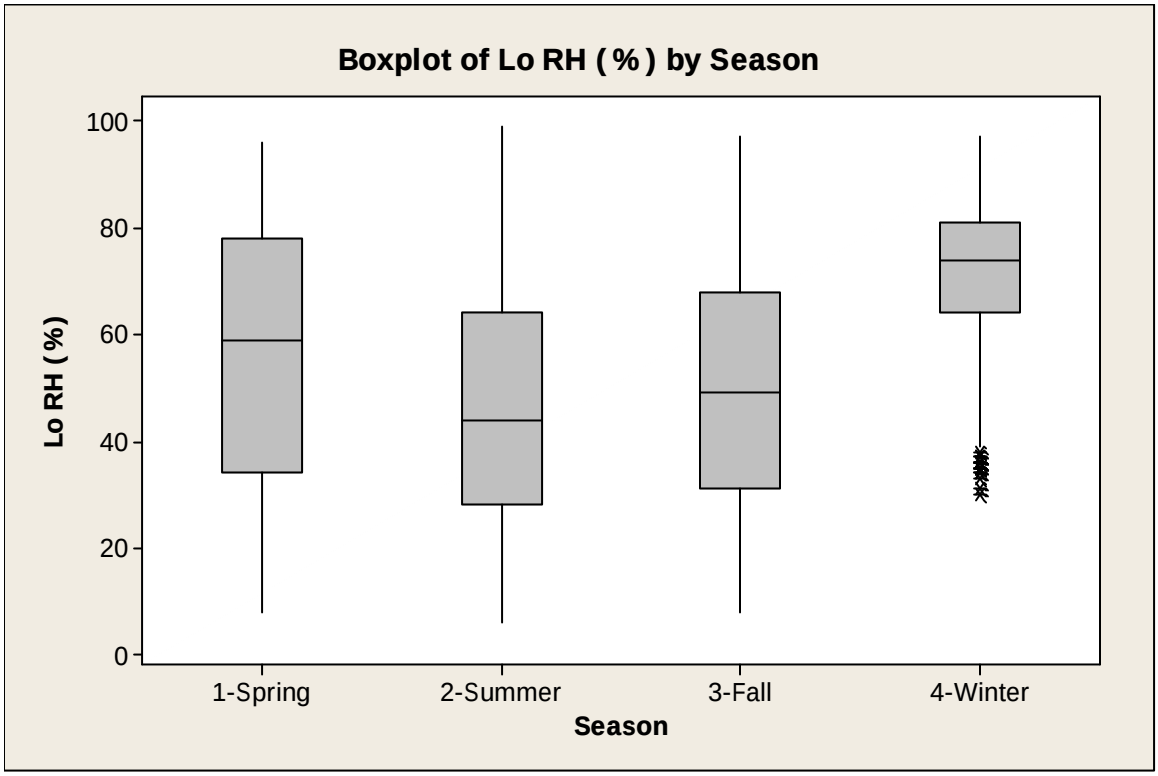




Descriptive Statistics: Lo RH (%)

Variable	Season	N	N*	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Lo RH (%)	1-Spring	2184	0	55.923	23.906	8.000	34.000	59.000	78.000	96.000
	2-Summer	2208	0	46.558	22.206	6.000	28.000	44.000	64.000	99.000
	3-Fall	2184	0	49.654	22.123	8.000	31.000	49.000	68.000	97.000
	4-Winter	2184	0	71.901	12.669	30.000	64.000	74.000	81.000	97.000


Histogram of Lo RH (%) by Season
1-Spring
2-Summer
3-Fall
4-Winter
Frequency
Lo RH (%)
Panel variable: Season


Boxplot of Lo RH (%) by Season
Lo RH (%)
1-Spring
2-Summer
3-Fall
4-Winter
Season

Descriptive Statistics: Precip (Inches)

Variable	Month	N	N*	Sum	Maximum
Precip (Inches)	1	744	0	0.130000	0.050000
	2	696	0	0.210000	0.040000
	3	720	0	0.400000	0.130000
	4	720	0	0.980000	0.330000
	5	744	0	3.80000	0.71000
	6	720	0	1.770000	0.420000
	7	744	0	1.870000	0.460000
	8	744	0	0.870000	0.160000
	9	720	0	0.790000	0.140000
	10	744	0	1.230000	0.220000
	11	720	0	0.100000	0.050000
	12	744	0	0.270000	0.040000

POWERTECH (USA) INC.

APPENDIX 1.1-C

SITE-SPECIFIC WIND ANALYSIS

APPENDIX 1.1-C
SITE-SPECIFIC WIND ANALYSIS

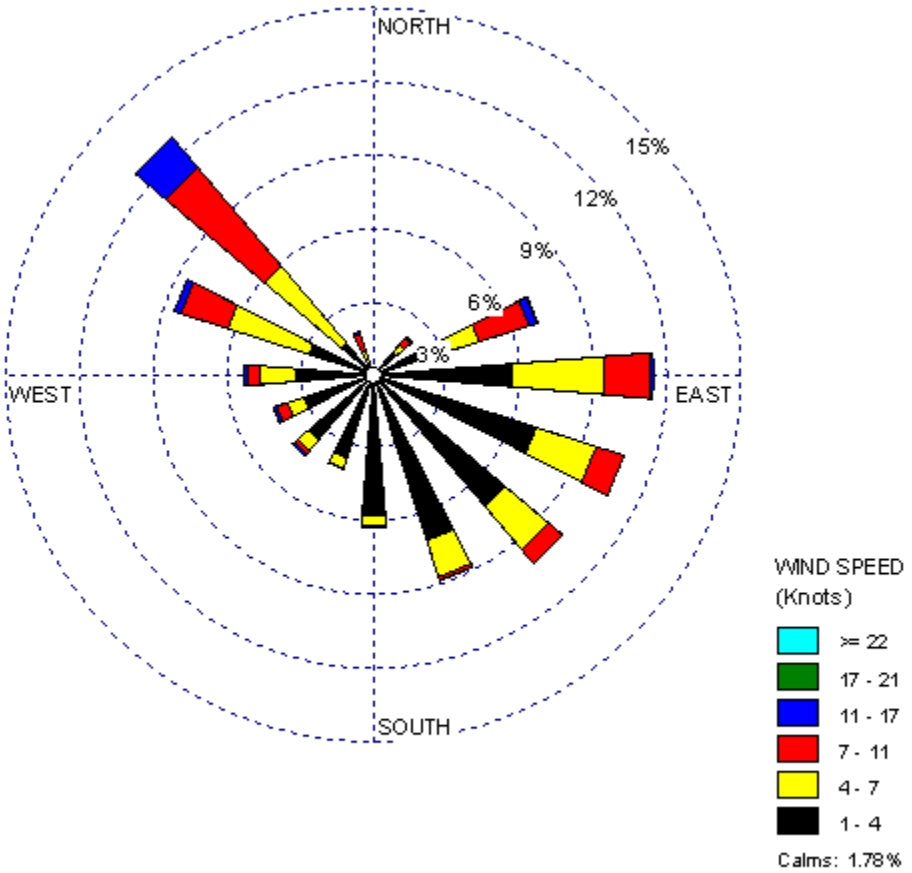
Station ID: 1 Run ID:
Year: 2007 2008
Date Range: July 2007–July 2008
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000345	0.000115	0.000000	0.000000	0.000000	0.000000	0.000459
11.25 - 33.75	0.002526	0.000804	0.000459	0.000115	0.000000	0.000000	0.003904
33.75 - 56.25	0.012517	0.003790	0.003790	0.000804	0.000230	0.000230	0.021360
56.25 - 78.75	0.028250	0.016996	0.021475	0.003330	0.000459	0.000000	0.070510
78.75 - 101.25	0.057074	0.037322	0.018489	0.001263	0.000000	0.000000	0.114148
101.25 - 123.75	0.069936	0.025609	0.011713	0.000000	0.000000	0.000000	0.107258
123.75 - 146.25	0.070740	0.022738	0.007350	0.000115	0.000115	0.000000	0.101056
146.25 - 168.75	0.071199	0.015618	0.001378	0.000345	0.000000	0.000000	0.088539
168.75 - 191.25	0.057533	0.004364	0.000459	0.000230	0.000000	0.000000	0.062586
191.25 - 213.75	0.035829	0.004364	0.000345	0.000115	0.000000	0.000000	0.040652
213.75 - 236.25	0.035140	0.005397	0.002182	0.001034	0.000000	0.000000	0.043753
236.25 - 258.75	0.030202	0.006890	0.004593	0.001493	0.000115	0.000000	0.043294
258.75 - 281.25	0.032269	0.014469	0.004364	0.001952	0.000000	0.000000	0.053055
281.25 - 303.75	0.027905	0.034566	0.019982	0.002986	0.000000	0.000000	0.085439
303.75 - 326.25	0.017570	0.040652	0.052710	0.015962	0.000230	0.000000	0.127124
326.25 - 348.75	0.004364	0.006546	0.006775	0.001263	0.000115	0.000000	0.019063
Sub-Total:	0.553399	0.240239	0.156063	0.031006	0.001263	0.000230	0.973702
Calms:							0.017646
Missing/Incomplete:							0.008652
Total:							1.000000

Frequency of Calm Winds: 1.78%
Average Wind Speed: 4.38 Knots


NORTH
WEST
EAST
SOUTH
3%
6%
9%
12%
15%
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 1.78%

POWERTECH (USA) INC.

JANUARY

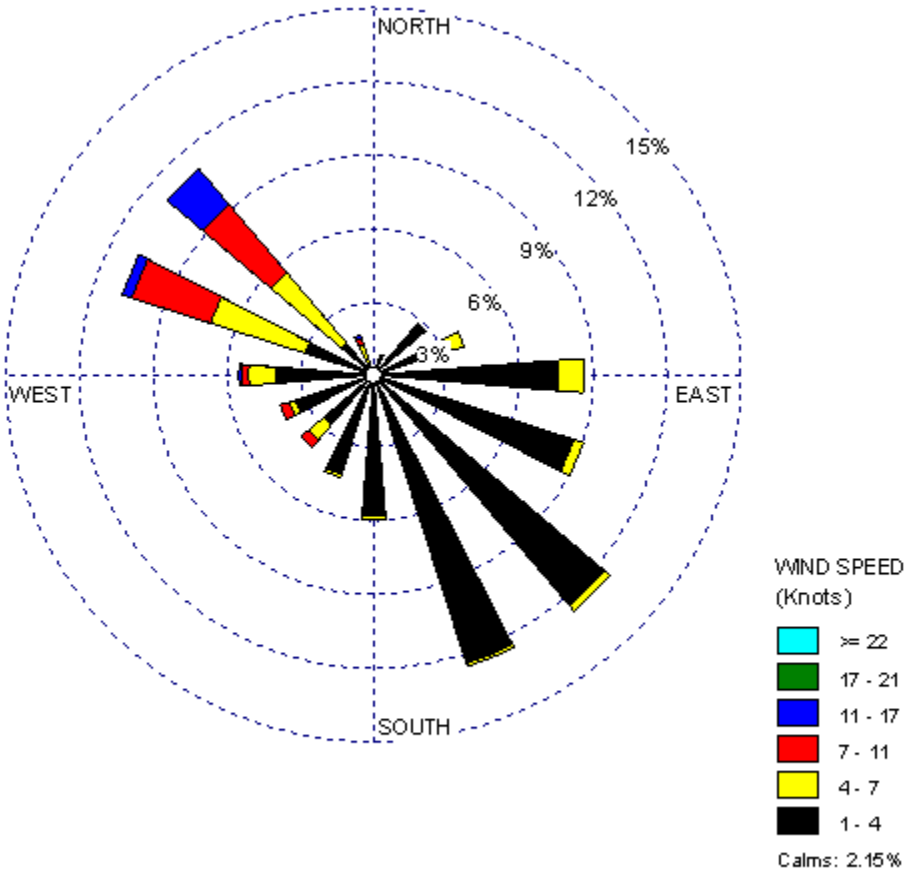
Station ID: 1 Run ID:
Year: 2008
Date Range: Jan 1 - Jan 31
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.001344	0.000000	0.000000	0.000000	0.000000	0.000000	0.001344
11.25 - 33.75	0.009409	0.000000	0.000000	0.000000	0.000000	0.000000	0.009409
33.75 - 56.25	0.028226	0.000000	0.000000	0.000000	0.000000	0.000000	0.028226
56.25 - 78.75	0.032258	0.006720	0.000000	0.000000	0.000000	0.000000	0.038978
78.75 - 101.25	0.075269	0.010753	0.000000	0.000000	0.000000	0.000000	0.086022
101.25 - 123.75	0.086022	0.004032	0.000000	0.000000	0.000000	0.000000	0.090054
123.75 - 146.25	0.123656	0.002688	0.000000	0.000000	0.000000	0.000000	0.126344
146.25 - 168.75	0.123656	0.001344	0.000000	0.000000	0.000000	0.000000	0.125000
168.75 - 191.25	0.057796	0.001344	0.000000	0.000000	0.000000	0.000000	0.059140
191.25 - 213.75	0.043011	0.001344	0.000000	0.000000	0.000000	0.000000	0.044355
213.75 - 236.25	0.026882	0.008065	0.004032	0.000000	0.000000	0.000000	0.038978
236.25 - 258.75	0.033602	0.002688	0.004032	0.000000	0.000000	0.000000	0.040323
258.75 - 281.25	0.040323	0.010753	0.002688	0.001344	0.000000	0.000000	0.055108
281.25 - 303.75	0.029570	0.040323	0.033602	0.004032	0.000000	0.000000	0.107527
303.75 - 326.25	0.017473	0.037634	0.036290	0.018817	0.000000	0.000000	0.110215
326.25 - 348.75	0.004032	0.009409	0.002688	0.001344	0.000000	0.000000	0.017473
Sub-Total:	0.732527	0.137097	0.083333	0.025538	0.000000	0.000000	0.887805
Calms:							0.019512
Missing/Incomplete:							0.092683
Total:							1.000000

Frequency of Calm Winds: 2.15%
Average Wind Speed: 3.38 Knots


NORTH
15%
12%
9%
6%
3%
WEST
EAST
SOUTH
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 2.15%

POWERTECH (USA) INC.

FEBRUARY

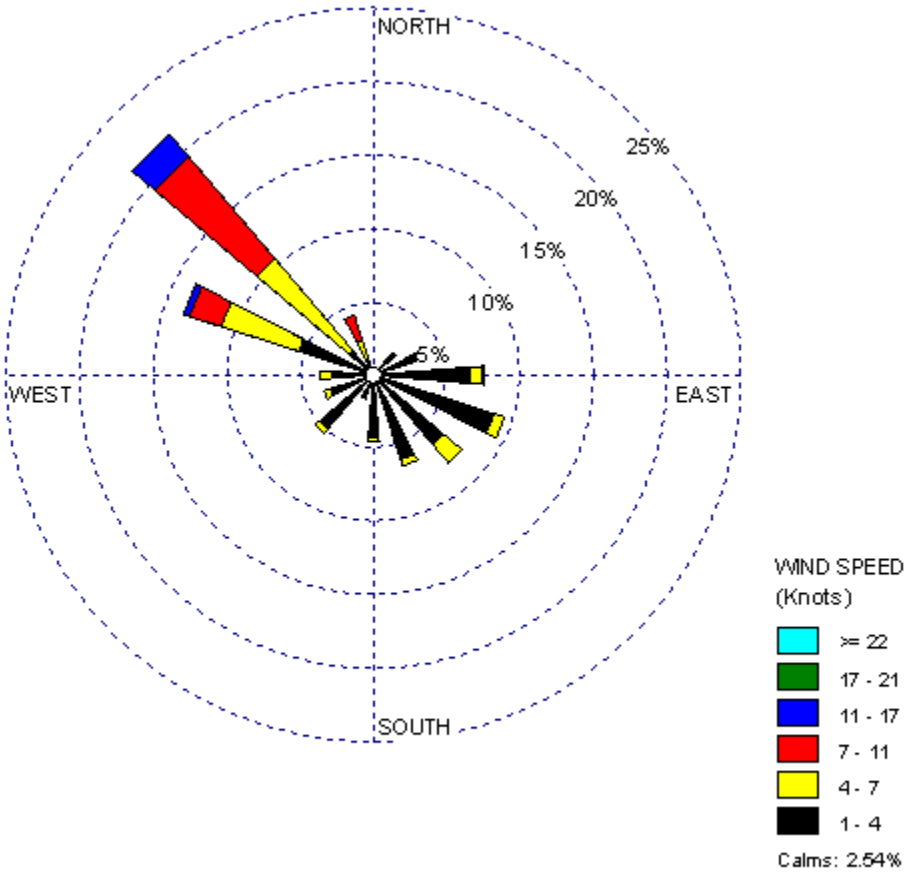
Station ID: 1 Run ID:
Year: 2008
Date Range: Feb 1 - Feb 28
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.001493	0.000000	0.000000	0.000000	0.000000	0.000000	0.001493
11.25 - 33.75	0.001493	0.000000	0.000000	0.000000	0.000000	0.000000	0.001493
33.75 - 56.25	0.020896	0.000000	0.000000	0.000000	0.000000	0.000000	0.020896
56.25 - 78.75	0.044776	0.007463	0.000000	0.000000	0.000000	0.000000	0.052239
78.75 - 101.25	0.065672	0.008955	0.001493	0.000000	0.000000	0.000000	0.076119
101.25 - 123.75	0.086567	0.007463	0.000000	0.000000	0.000000	0.000000	0.094030
123.75 - 146.25	0.062687	0.016418	0.000000	0.000000	0.000000	0.000000	0.079104
146.25 - 168.75	0.061194	0.004478	0.000000	0.000000	0.000000	0.000000	0.065672
168.75 - 191.25	0.043284	0.002985	0.000000	0.000000	0.000000	0.000000	0.046269
191.25 - 213.75	0.017910	0.000000	0.000000	0.000000	0.000000	0.000000	0.017910
213.75 - 236.25	0.049254	0.002985	0.000000	0.000000	0.000000	0.000000	0.052239
236.25 - 258.75	0.031343	0.004478	0.000000	0.000000	0.000000	0.000000	0.035821
258.75 - 281.25	0.028358	0.008955	0.000000	0.000000	0.000000	0.000000	0.037313
281.25 - 303.75	0.053731	0.055224	0.022388	0.004478	0.000000	0.000000	0.135821
303.75 - 326.25	0.022388	0.082090	0.089552	0.020896	0.000000	0.000000	0.214925
326.25 - 348.75	0.007463	0.017910	0.017910	0.000000	0.000000	0.000000	0.043284
Sub-Total:	0.598507	0.219403	0.131343	0.025373	0.000000	0.000000	0.875335
Calms:							0.022788
Missing/Incomplete:							0.101877
Total:							1.000000

Frequency of Calm Winds: 2.54%
Average Wind Speed: 3.91 Knots


NORTH
SOUTH
WEST
EAST
5%
10%
15%
20%
25%
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 2.54%

POWERTECH (USA) INC.

MARCH

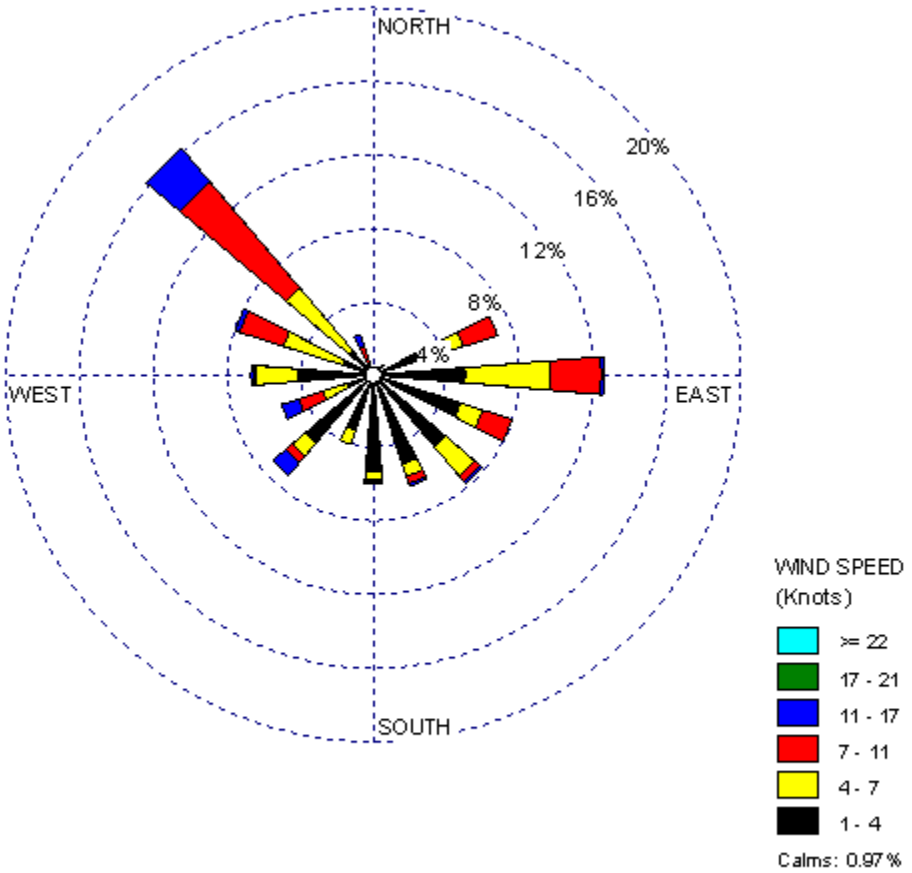
Station ID: 1 Run ID:
Year: 2008
Date Range: Mar 1 - Mar 31
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
11.25 - 33.75	0.000000	0.000000	0.001389	0.000000	0.000000	0.000000	0.001389
33.75 - 56.25	0.019444	0.000000	0.004167	0.000000	0.000000	0.000000	0.023611
56.25 - 78.75	0.023611	0.020833	0.016667	0.000000	0.000000	0.000000	0.061111
78.75 - 101.25	0.040278	0.047222	0.027778	0.000000	0.000000	0.000000	0.115278
101.25 - 123.75	0.061111	0.030556	0.002778	0.000000	0.000000	0.000000	0.094444
123.75 - 146.25	0.047222	0.022222	0.000000	0.000000	0.000000	0.000000	0.069444
146.25 - 168.75	0.048611	0.013889	0.002778	0.000000	0.000000	0.000000	0.065278
168.75 - 191.25	0.047222	0.006944	0.000000	0.000000	0.000000	0.000000	0.054167
191.25 - 213.75	0.025000	0.005556	0.000000	0.001389	0.000000	0.000000	0.031944
213.75 - 236.25	0.020833	0.002778	0.002778	0.000000	0.000000	0.000000	0.026389
236.25 - 258.75	0.026389	0.008333	0.008333	0.002778	0.001389	0.000000	0.047222
258.75 - 281.25	0.030556	0.022222	0.008333	0.009722	0.000000	0.000000	0.070833
281.25 - 303.75	0.026389	0.036111	0.030556	0.005556	0.000000	0.000000	0.098611
303.75 - 326.25	0.037500	0.056944	0.080556	0.027778	0.000000	0.000000	0.202778
326.25 - 348.75	0.004167	0.008333	0.015278	0.001389	0.000000	0.000000	0.029167
Sub-Total:	0.458333	0.281944	0.201389	0.048611	0.001389	0.000000	0.896985
Calms:							0.007538
Missing/Incomplete:							0.095477
Total:							1.000000

Frequency of Calm Winds: 0.83%
Average Wind Speed: 5.04 Knots


NORTH
SOUTH
WEST
EAST
4%
8%
12%
16%
20%
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 0.97%

POWERTECH (USA) INC.

APRIL

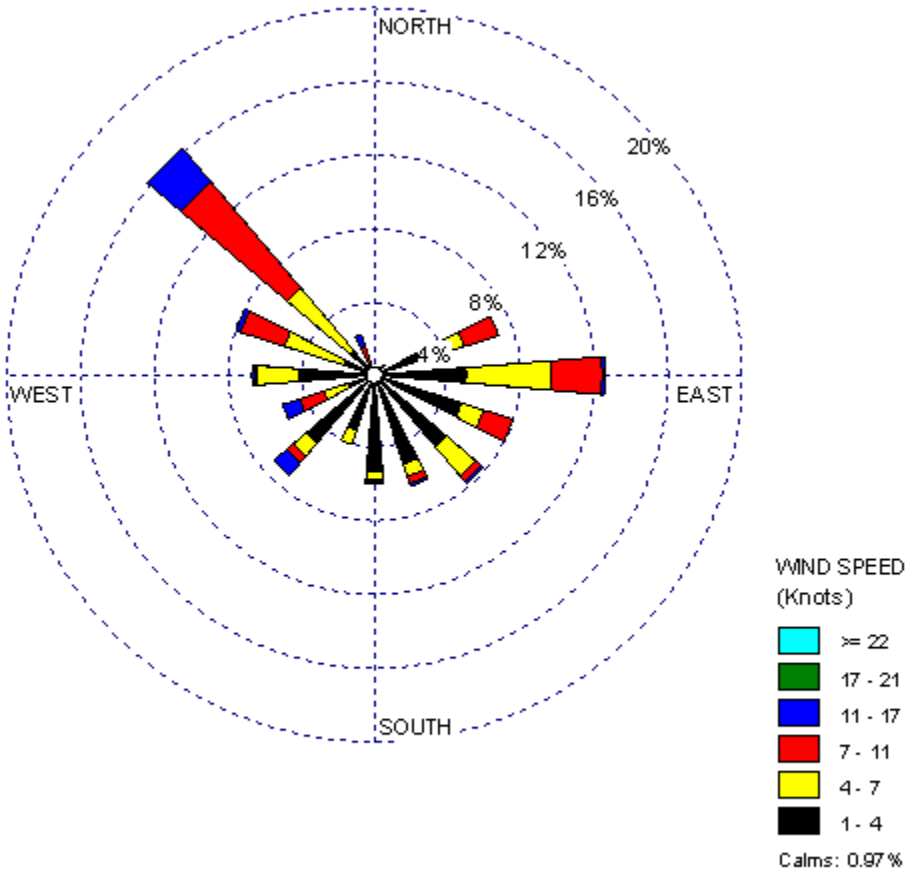
Station ID: 1 Run ID:
Year: 2008
Date Range: Apr 1 - Apr 30
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.001393	0.000000	0.000000	0.000000	0.000000	0.000000	0.001393
11.25 - 33.75	0.005571	0.000000	0.000000	0.000000	0.000000	0.000000	0.005571
33.75 - 56.25	0.005571	0.002786	0.000000	0.000000	0.000000	0.000000	0.008357
56.25 - 78.75	0.029248	0.022284	0.019499	0.000000	0.000000	0.000000	0.071031
78.75 - 101.25	0.050139	0.045961	0.027855	0.001393	0.000000	0.000000	0.125348
101.25 - 123.75	0.050139	0.012535	0.016713	0.000000	0.000000	0.000000	0.079387
123.75 - 146.25	0.051532	0.020891	0.004178	0.001393	0.000000	0.000000	0.077994
146.25 - 168.75	0.051532	0.006964	0.004178	0.001393	0.000000	0.000000	0.064067
168.75 - 191.25	0.052925	0.004178	0.001393	0.001393	0.000000	0.000000	0.059889
191.25 - 213.75	0.032033	0.008357	0.000000	0.000000	0.000000	0.000000	0.040390
213.75 - 236.25	0.048747	0.009749	0.004178	0.009749	0.000000	0.000000	0.072423
236.25 - 258.75	0.015320	0.013928	0.013928	0.009749	0.000000	0.000000	0.052925
258.75 - 281.25	0.041783	0.022284	0.001393	0.001393	0.000000	0.000000	0.066852
281.25 - 303.75	0.018106	0.033426	0.025070	0.002786	0.000000	0.000000	0.079387
303.75 - 326.25	0.018106	0.044568	0.075209	0.023677	0.000000	0.000000	0.161560
326.25 - 348.75	0.004178	0.002786	0.009749	0.006964	0.000000	0.000000	0.023677
Sub-Total:	0.476323	0.250696	0.203343	0.059889	0.000000	0.000000	0.895466
Calms:							0.008816
Missing/Incomplete:							0.095718
Total:							1.000000

Frequency of Calm Winds: 0.97%
Average Wind Speed: 5.17 Knots


NORTH
SOUTH
WEST
EAST
4%
8%
12%
16%
20%
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 0.97%

POWERTECH (USA) INC.

MAY

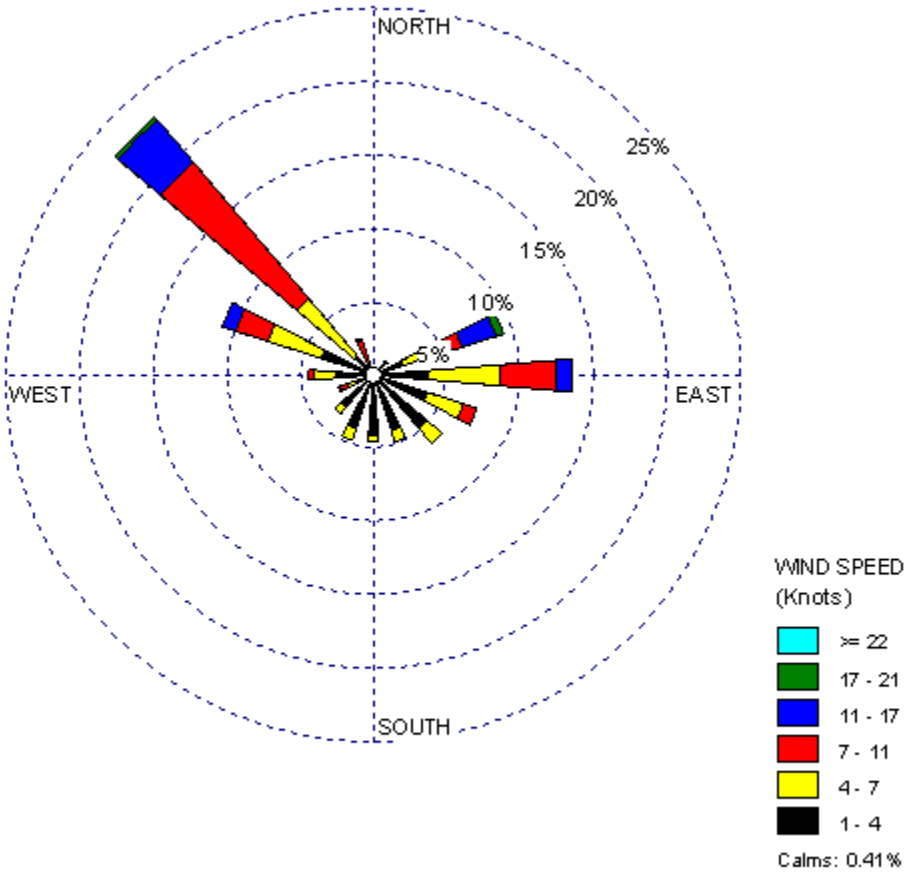
Station ID: 1 Run ID:
Year: 2008
Date Range: May 1 - May 31
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
11.25 - 33.75	0.002703	0.001351	0.001351	0.000000	0.000000	0.000000	0.005405
33.75 - 56.25	0.001351	0.001351	0.001351	0.004054	0.002703	0.002703	0.013514
56.25 - 78.75	0.021622	0.012162	0.029730	0.024324	0.005405	0.000000	0.093243
78.75 - 101.25	0.037838	0.048649	0.037838	0.010811	0.000000	0.000000	0.135135
101.25 - 123.75	0.039189	0.025676	0.009459	0.000000	0.000000	0.000000	0.074324
123.75 - 146.25	0.048649	0.013514	0.000000	0.000000	0.000000	0.000000	0.062162
146.25 - 168.75	0.040541	0.008108	0.000000	0.000000	0.000000	0.000000	0.048649
168.75 - 191.25	0.041892	0.004054	0.000000	0.000000	0.000000	0.000000	0.045946
191.25 - 213.75	0.039189	0.008108	0.000000	0.000000	0.000000	0.000000	0.047297
213.75 - 236.25	0.029730	0.005405	0.000000	0.000000	0.000000	0.000000	0.035135
236.25 - 258.75	0.012162	0.006757	0.005405	0.001351	0.000000	0.000000	0.025676
258.75 - 281.25	0.025676	0.014865	0.004054	0.000000	0.000000	0.000000	0.044595
281.25 - 303.75	0.037838	0.037838	0.022973	0.009459	0.000000	0.000000	0.108108
303.75 - 326.25	0.017568	0.051351	0.120270	0.037838	0.002703	0.000000	0.229730
326.25 - 348.75	0.005405	0.004054	0.016216	0.000000	0.001351	0.000000	0.027027
Sub-Total:	0.401351	0.243243	0.248649	0.087838	0.012162	0.002703	0.903186
Calms:							0.003676
Missing/Incomplete:							0.093137
Total:							1.000000

Frequency of Calm Winds: 0.41%
Average Wind Speed: 6.00 Knots


NORTH
SOUTH
WEST
EAST
5%
10%
15%
20%
25%
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 0.41%

POWERTECH (USA) INC.

JUNE

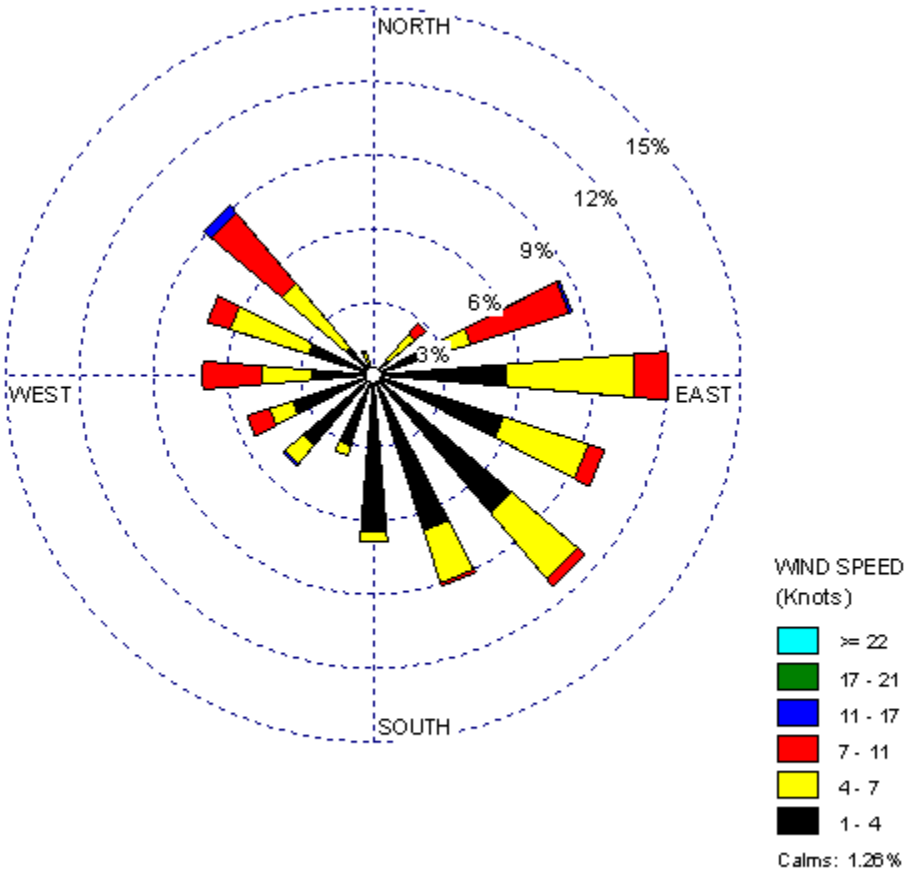
Station ID: 1 Run ID:
Year: 2008
Date Range: Jun 1 - Jun 30
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
11.25 - 33.75	0.000000	0.001397	0.000000	0.000000	0.000000	0.000000	0.001397
33.75 - 56.25	0.008380	0.013966	0.005587	0.000000	0.000000	0.000000	0.027933
56.25 - 78.75	0.023743	0.018156	0.041899	0.001397	0.000000	0.000000	0.085196
78.75 - 101.25	0.054469	0.051676	0.013966	0.000000	0.000000	0.000000	0.120112
101.25 - 123.75	0.055866	0.036313	0.006983	0.000000	0.000000	0.000000	0.099162
123.75 - 146.25	0.074022	0.034916	0.004190	0.000000	0.000000	0.000000	0.113128
146.25 - 168.75	0.067039	0.022346	0.001397	0.000000	0.000000	0.000000	0.090782
168.75 - 191.25	0.064246	0.004190	0.000000	0.000000	0.000000	0.000000	0.068436
191.25 - 213.75	0.030726	0.004190	0.000000	0.000000	0.000000	0.000000	0.034916
213.75 - 236.25	0.037709	0.009777	0.000000	0.001397	0.000000	0.000000	0.048883
236.25 - 258.75	0.034916	0.009777	0.009777	0.000000	0.000000	0.000000	0.054469
258.75 - 281.25	0.025140	0.020950	0.023743	0.000000	0.000000	0.000000	0.069832
281.25 - 303.75	0.027933	0.033520	0.009777	0.000000	0.000000	0.000000	0.071229
303.75 - 326.25	0.015363	0.033520	0.037709	0.004190	0.000000	0.000000	0.090782
326.25 - 348.75	0.000000	0.009777	0.001397	0.000000	0.000000	0.000000	0.011173
Sub-Total:	0.519553	0.304469	0.156425	0.006983	0.000000	0.000000	0.892677
Calms:							0.011364
Missing/Incomplete:							0.095960
Total:							1.000000

Frequency of Calm Winds: 1.26%
Average Wind Speed: 4.45 Knots


NORTH
15%
12%
9%
6%
3%
WEST
EAST
SOUTH
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 1.26%

POWERTECH (USA) INC.

JULY

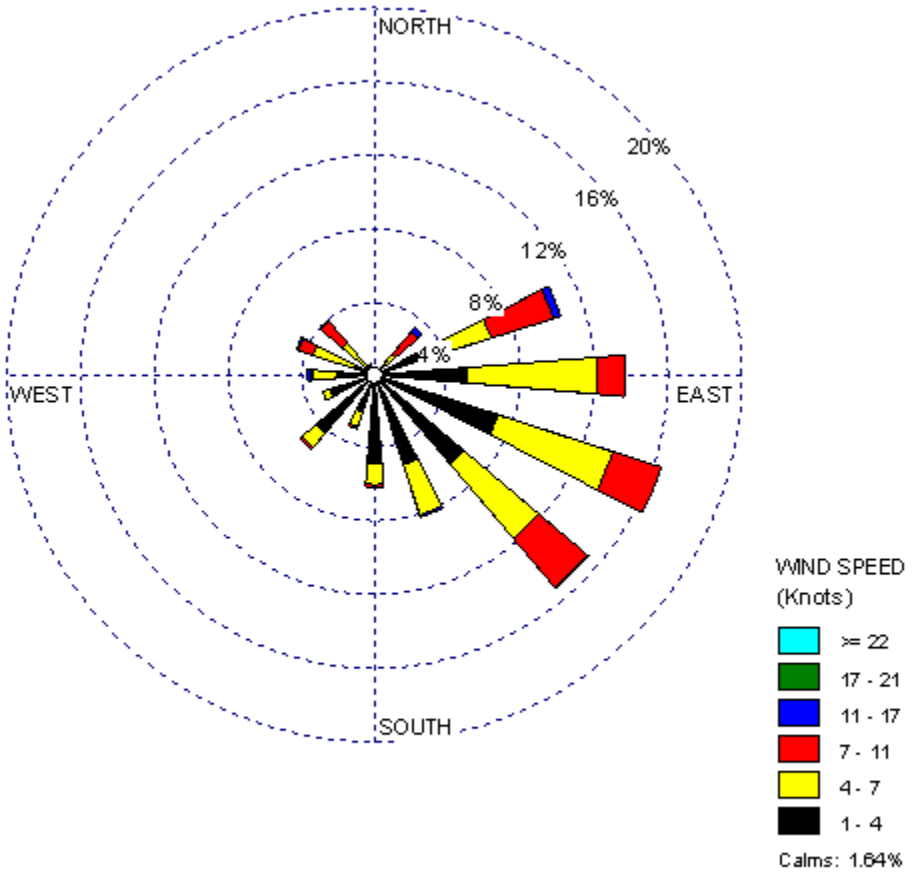
Station ID: 1 Run ID:
Year: 2007
Date Range: Jul 1 - Jul 31
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
11.25 - 33.75	0.000000	0.001364	0.001364	0.001364	0.000000	0.000000	0.004093
33.75 - 56.25	0.005457	0.009550	0.016371	0.002729	0.000000	0.000000	0.034106
56.25 - 78.75	0.031378	0.035471	0.035471	0.004093	0.000000	0.000000	0.106412
78.75 - 101.25	0.050477	0.070941	0.015007	0.000000	0.000000	0.000000	0.136426
101.25 - 123.75	0.070941	0.065484	0.027285	0.000000	0.000000	0.000000	0.163711
123.75 - 146.25	0.064120	0.053206	0.034106	0.000000	0.001364	0.000000	0.152797
146.25 - 168.75	0.051842	0.028649	0.000000	0.001364	0.000000	0.000000	0.081855
168.75 - 191.25	0.049113	0.010914	0.001364	0.000000	0.000000	0.000000	0.061392
191.25 - 213.75	0.021828	0.008186	0.001364	0.000000	0.000000	0.000000	0.031378
213.75 - 236.25	0.042292	0.009550	0.001364	0.000000	0.000000	0.000000	0.053206
236.25 - 258.75	0.025921	0.004093	0.000000	0.000000	0.000000	0.000000	0.030014
258.75 - 281.25	0.020464	0.013643	0.001364	0.001364	0.000000	0.000000	0.036835
281.25 - 303.75	0.012278	0.023192	0.008186	0.001364	0.000000	0.000000	0.045020
303.75 - 326.25	0.006821	0.016371	0.015007	0.001364	0.000000	0.000000	0.039563
326.25 - 348.75	0.002729	0.000000	0.004093	0.000000	0.000000	0.000000	0.006821
Sub-Total:	0.455662	0.350614	0.162347	0.013643	0.001364	0.000000	0.891224
Calms:							0.014833
Missing/Incomplete:							0.093943
Total:							1.000000

Frequency of Calm Winds: 1.64%
Average Wind Speed: 4.66 Knots


NORTH
20%
16%
12%
8%
4%
WEST
EAST
SOUTH
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 1.64%

POWERTECH (USA) INC.

AUGUST

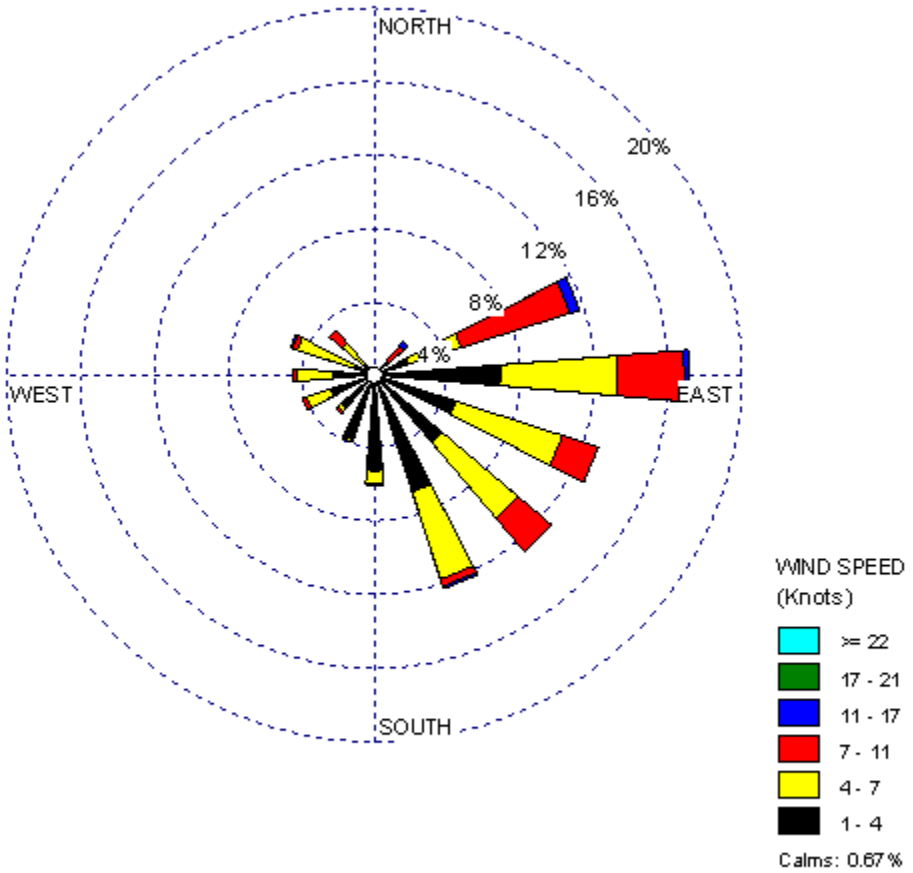
Station ID: 1 Run ID:
Year: 2007
Date Range: Aug 1 - Aug 31
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
11.25 - 33.75	0.001346	0.001346	0.001346	0.000000	0.000000	0.000000	0.004038
33.75 - 56.25	0.005384	0.004038	0.012113	0.002692	0.000000	0.000000	0.024226
56.25 - 78.75	0.020188	0.029610	0.061911	0.005384	0.000000	0.000000	0.117093
78.75 - 101.25	0.068641	0.063257	0.036339	0.002692	0.000000	0.000000	0.170929
101.25 - 123.75	0.047106	0.060565	0.020188	0.000000	0.000000	0.000000	0.127860
123.75 - 146.25	0.048452	0.053836	0.024226	0.000000	0.000000	0.000000	0.126514
146.25 - 168.75	0.067295	0.049798	0.004038	0.001346	0.000000	0.000000	0.122476
168.75 - 191.25	0.052490	0.006729	0.001346	0.000000	0.000000	0.000000	0.060565
191.25 - 213.75	0.037685	0.001346	0.000000	0.000000	0.000000	0.000000	0.039031
213.75 - 236.25	0.024226	0.002692	0.001346	0.000000	0.000000	0.000000	0.028264
236.25 - 258.75	0.025572	0.013459	0.002692	0.000000	0.000000	0.000000	0.041723
258.75 - 281.25	0.022880	0.020188	0.001346	0.000000	0.000000	0.000000	0.044415
281.25 - 303.75	0.012113	0.032301	0.002692	0.001346	0.000000	0.000000	0.048452
303.75 - 326.25	0.008075	0.014805	0.009421	0.000000	0.000000	0.000000	0.032301
326.25 - 348.75	0.000000	0.001346	0.004038	0.000000	0.000000	0.000000	0.005384
Sub-Total:	0.441454	0.355316	0.183042	0.013459	0.000000	0.000000	0.901099
Calms:							0.006105
Missing/Incomplete:							0.092796
Total:							1.000000

Frequency of Calm Winds: 0.67%
Average Wind Speed: 4.85 Knots


NORTH
SOUTH
WEST
EAST
4%
8%
12%
16%
20%
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 0.67%

POWERTECH (USA) INC.

SEPTEMBER

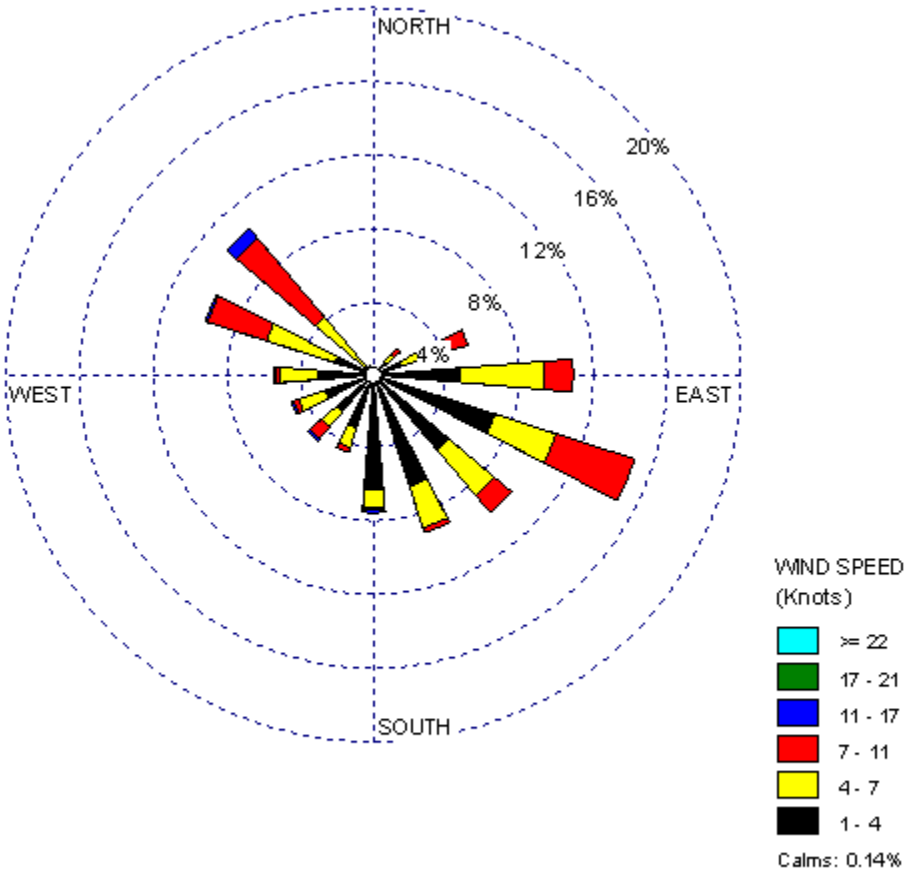
Station ID: 1 Run ID:
Year: 2007
Date Range: Sep 1 - Sep 30
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
11.25 - 33.75	0.001395	0.000000	0.000000	0.000000	0.000000	0.000000	0.001395
33.75 - 56.25	0.009763	0.005579	0.004184	0.000000	0.000000	0.000000	0.019526
56.25 - 78.75	0.016736	0.026499	0.011158	0.000000	0.000000	0.000000	0.054393
78.75 - 101.25	0.047420	0.046025	0.015342	0.000000	0.000000	0.000000	0.108787
101.25 - 123.75	0.069735	0.034868	0.044630	0.000000	0.000000	0.000000	0.149233
123.75 - 146.25	0.054393	0.032078	0.012552	0.000000	0.000000	0.000000	0.099024
146.25 - 168.75	0.064156	0.023710	0.002789	0.000000	0.000000	0.000000	0.090656
168.75 - 191.25	0.062762	0.009763	0.001395	0.001395	0.000000	0.000000	0.075314
191.25 - 213.75	0.030683	0.011158	0.002789	0.000000	0.000000	0.000000	0.044630
213.75 - 236.25	0.026499	0.011158	0.008368	0.001395	0.000000	0.000000	0.047420
236.25 - 258.75	0.027894	0.015342	0.002789	0.001395	0.000000	0.000000	0.047420
258.75 - 281.25	0.030683	0.020921	0.001395	0.001395	0.000000	0.000000	0.054393
281.25 - 303.75	0.022315	0.039052	0.033473	0.001395	0.000000	0.000000	0.096234
303.75 - 326.25	0.006974	0.034868	0.055788	0.006974	0.000000	0.000000	0.104603
326.25 - 348.75	0.001395	0.001395	0.002789	0.000000	0.000000	0.000000	0.005579
Sub-Total:	0.472803	0.312413	0.199442	0.013947	0.000000	0.000000	0.902900
Calms:							0.001261
Missing/Incomplete:							0.095839
Total:							1.000000

Frequency of Calm Winds: 0.14%
Average Wind Speed: 4.76 Knots


NORTH
SOUTH
WEST
EAST
4%
8%
12%
16%
20%
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 0.14%

POWERTECH (USA) INC.

OCTOBER

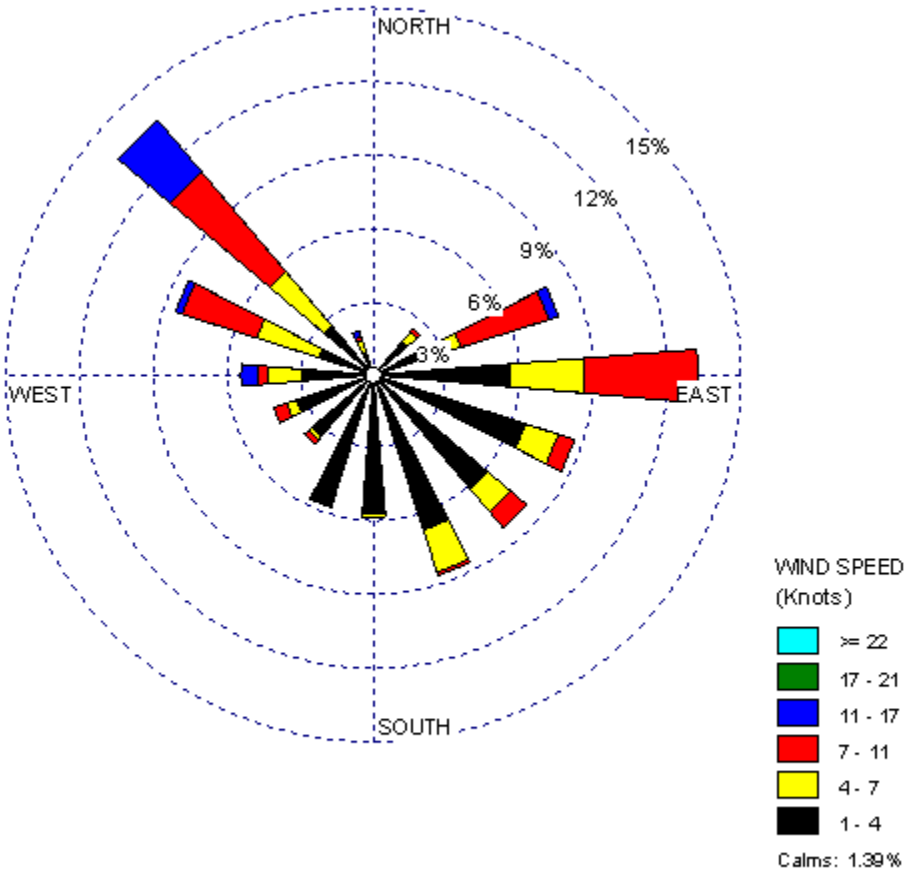
Station ID: 1 Run ID:
Year: 2007
Date Range: Oct 1 - Oct 31
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000000	0.001391	0.000000	0.000000	0.000000	0.000000	0.001391
11.25 - 33.75	0.000000	0.002782	0.000000	0.000000	0.000000	0.000000	0.002782
33.75 - 56.25	0.018081	0.005563	0.001391	0.000000	0.000000	0.000000	0.025035
56.25 - 78.75	0.026426	0.011127	0.037552	0.004172	0.000000	0.000000	0.079277
78.75 - 101.25	0.055633	0.030598	0.045897	0.000000	0.000000	0.000000	0.132128
101.25 - 123.75	0.065369	0.013908	0.006954	0.000000	0.000000	0.000000	0.086231
123.75 - 146.25	0.061196	0.012517	0.008345	0.000000	0.000000	0.000000	0.082058
146.25 - 168.75	0.066759	0.018081	0.001391	0.000000	0.000000	0.000000	0.086231
168.75 - 191.25	0.057024	0.001391	0.000000	0.000000	0.000000	0.000000	0.058414
191.25 - 213.75	0.057024	0.000000	0.000000	0.000000	0.000000	0.000000	0.057024
213.75 - 236.25	0.033380	0.001391	0.002782	0.000000	0.000000	0.000000	0.037552
236.25 - 258.75	0.033380	0.004172	0.005563	0.000000	0.000000	0.000000	0.043115
258.75 - 281.25	0.029207	0.013908	0.004172	0.006954	0.000000	0.000000	0.054242
281.25 - 303.75	0.023644	0.026426	0.031989	0.002782	0.000000	0.000000	0.084840
303.75 - 326.25	0.026426	0.029207	0.052851	0.027816	0.000000	0.000000	0.136300
326.25 - 348.75	0.009736	0.005563	0.001391	0.002782	0.000000	0.000000	0.019471
Sub-Total:	0.563282	0.178025	0.200278	0.044506	0.000000	0.000000	0.891824
Calms:							0.012579
Missing/Incomplete:							0.095597
Total:							1.000000

Frequency of Calm Winds: 1.39%
Average Wind Speed: 4.62 Knots


NORTH
15%
12%
9%
6%
3%
WEST
EAST
SOUTH
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 1.39%

NOVEMBER

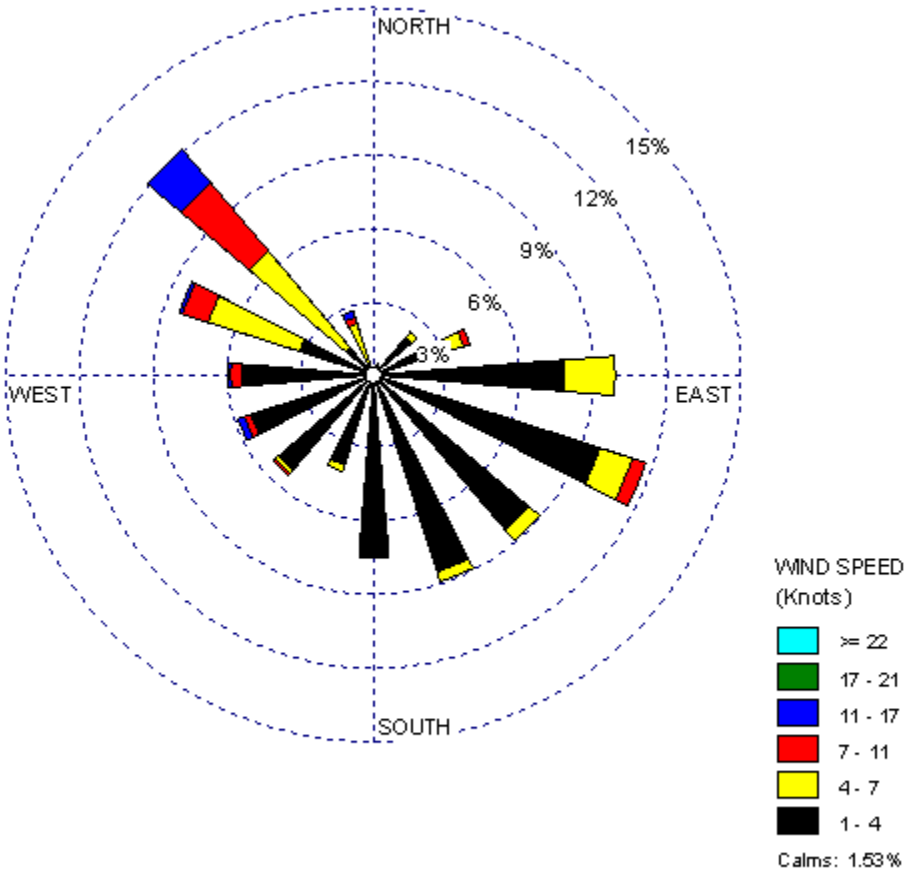
Station ID: 1 Run ID:
Year: 2007
Date Range: Nov 1 - Nov 30
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
11.25 - 33.75	0.004167	0.001389	0.000000	0.000000	0.000000	0.000000	0.005556
33.75 - 56.25	0.020833	0.002778	0.000000	0.000000	0.000000	0.000000	0.023611
56.25 - 78.75	0.031944	0.006944	0.002778	0.000000	0.000000	0.000000	0.041667
78.75 - 101.25	0.077778	0.020833	0.000000	0.000000	0.000000	0.000000	0.098611
101.25 - 123.75	0.097222	0.013889	0.005556	0.000000	0.000000	0.000000	0.116667
123.75 - 146.25	0.083333	0.005556	0.000000	0.000000	0.000000	0.000000	0.088889
146.25 - 168.75	0.084722	0.004167	0.000000	0.000000	0.000000	0.000000	0.088889
168.75 - 191.25	0.075000	0.000000	0.000000	0.000000	0.000000	0.000000	0.075000
191.25 - 213.75	0.038889	0.002778	0.000000	0.000000	0.000000	0.000000	0.041667
213.75 - 236.25	0.051389	0.001389	0.001389	0.000000	0.000000	0.000000	0.054167
236.25 - 258.75	0.052778	0.000000	0.002778	0.002778	0.000000	0.000000	0.058333
258.75 - 281.25	0.052778	0.001389	0.004167	0.001389	0.000000	0.000000	0.059722
281.25 - 303.75	0.031944	0.038889	0.011111	0.001389	0.000000	0.000000	0.083333
303.75 - 326.25	0.015278	0.051389	0.036111	0.018056	0.000000	0.000000	0.120833
326.25 - 348.75	0.005556	0.016667	0.002778	0.002778	0.000000	0.000000	0.027778
Sub-Total:	0.723611	0.168056	0.066667	0.026389	0.000000	0.000000	0.890704
Calms:							0.013819
Missing/Incomplete:							0.095477
Total:							1.000000

Frequency of Calm Winds: 1.53%
Average Wind Speed: 3.36 Knots


NORTH
15%
12%
9%
6%
3%
WEST
EAST
SOUTH
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 1.53%

POWERTECH (USA) INC.

DECEMBER

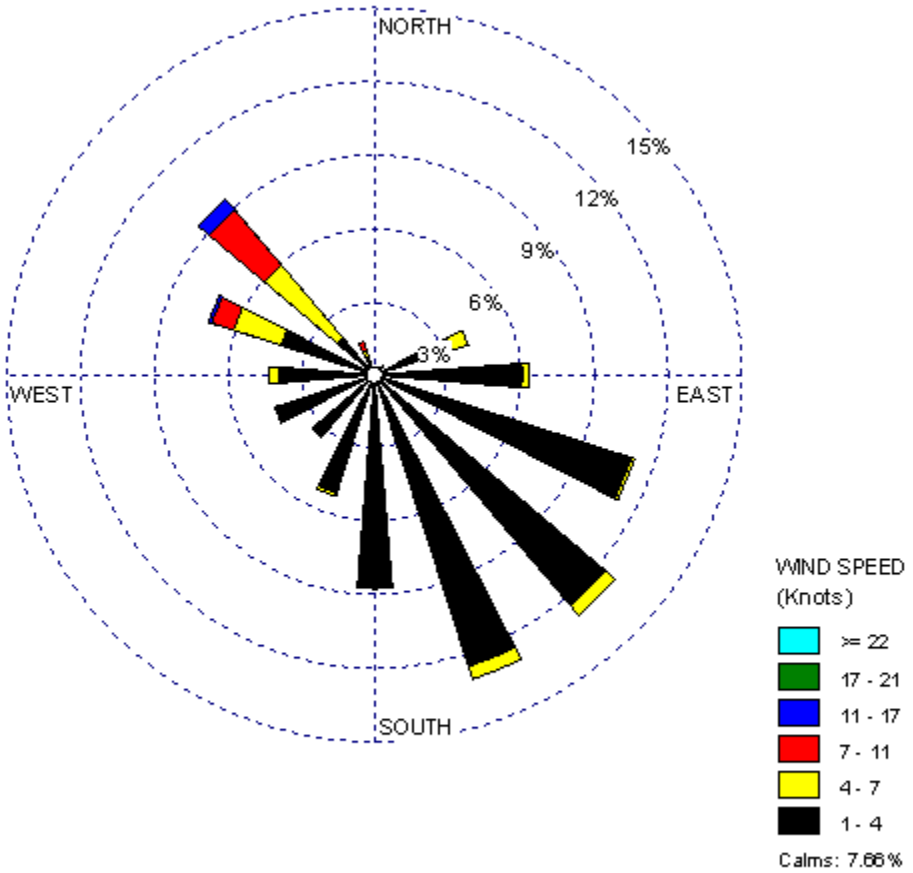
Station ID: 1 Run ID:
Year: 2007
Date Range: Dec 1 - Dec 31
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
11.25 - 33.75	0.004032	0.000000	0.000000	0.000000	0.000000	0.000000	0.004032
33.75 - 56.25	0.005376	0.000000	0.000000	0.000000	0.000000	0.000000	0.005376
56.25 - 78.75	0.033602	0.006720	0.000000	0.000000	0.000000	0.000000	0.040323
78.75 - 101.25	0.060484	0.002688	0.000000	0.000000	0.000000	0.000000	0.063172
101.25 - 123.75	0.110215	0.001344	0.000000	0.000000	0.000000	0.000000	0.111559
123.75 - 146.25	0.123656	0.005376	0.000000	0.000000	0.000000	0.000000	0.129032
146.25 - 168.75	0.125000	0.005376	0.000000	0.000000	0.000000	0.000000	0.130376
168.75 - 191.25	0.087366	0.000000	0.000000	0.000000	0.000000	0.000000	0.087366
191.25 - 213.75	0.051075	0.001344	0.000000	0.000000	0.000000	0.000000	0.052419
213.75 - 236.25	0.033602	0.000000	0.000000	0.000000	0.000000	0.000000	0.033602
236.25 - 258.75	0.043011	0.000000	0.000000	0.000000	0.000000	0.000000	0.043011
258.75 - 281.25	0.038978	0.004032	0.000000	0.000000	0.000000	0.000000	0.043011
281.25 - 303.75	0.040323	0.020161	0.009409	0.001344	0.000000	0.000000	0.071237
303.75 - 326.25	0.020161	0.038978	0.029570	0.005376	0.000000	0.000000	0.094086
326.25 - 348.75	0.008065	0.002688	0.004032	0.000000	0.000000	0.000000	0.014785
Sub-Total:	0.784946	0.088710	0.043011	0.006720	0.000000	0.000000	0.837805
Calms:							0.069512
Missing/Incomplete:							0.092683
Total:							1.000000

Frequency of Calm Winds: 7.66%
Average Wind Speed: 2.46 Knots


NORTH
15%
12%
9%
6%
3%
WEST
EAST
SOUTH
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 7.66%

POWERTECH (USA) INC.

WINTER

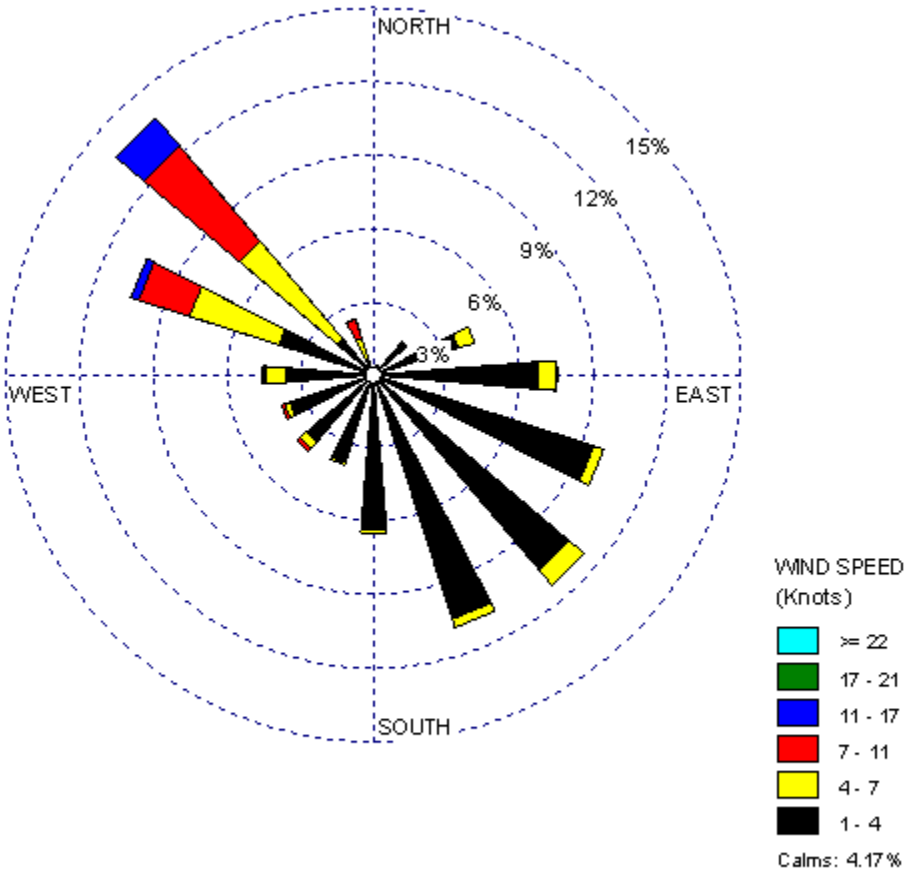
Station ID: 1 Run ID:
Year: 2007 2008
Date Range: Dec 2007-Feb 2008
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000927	0.000000	0.000000	0.000000	0.000000	0.000000	0.000927
11.25 - 33.75	0.005097	0.000000	0.000000	0.000000	0.000000	0.000000	0.005097
33.75 - 56.25	0.018072	0.000000	0.000000	0.000000	0.000000	0.000000	0.018072
56.25 - 78.75	0.036608	0.006951	0.000000	0.000000	0.000000	0.000000	0.043559
78.75 - 101.25	0.067192	0.007414	0.000463	0.000000	0.000000	0.000000	0.075070
101.25 - 123.75	0.094532	0.004171	0.000000	0.000000	0.000000	0.000000	0.098703
123.75 - 146.25	0.104727	0.007878	0.000000	0.000000	0.000000	0.000000	0.112604
146.25 - 168.75	0.104727	0.003707	0.000000	0.000000	0.000000	0.000000	0.108434
168.75 - 191.25	0.063485	0.001390	0.000000	0.000000	0.000000	0.000000	0.064875
191.25 - 213.75	0.037998	0.000927	0.000000	0.000000	0.000000	0.000000	0.038925
213.75 - 236.25	0.036145	0.003707	0.001390	0.000000	0.000000	0.000000	0.041242
236.25 - 258.75	0.036145	0.002317	0.001390	0.000000	0.000000	0.000000	0.039852
258.75 - 281.25	0.036145	0.007878	0.000927	0.000463	0.000000	0.000000	0.045412
281.25 - 303.75	0.040778	0.037998	0.021779	0.003244	0.000000	0.000000	0.103800
303.75 - 326.25	0.019926	0.051900	0.050510	0.014829	0.000000	0.000000	0.137164
326.25 - 348.75	0.006487	0.009731	0.007878	0.000463	0.000000	0.000000	0.024560
Sub-Total:	0.708990	0.145968	0.084337	0.018999	0.000000	0.000000	0.925694
Calms:							0.040286
Missing/Incomplete:							0.034020
Total:							1.000000

Frequency of Calm Winds: 4.17%
Average Wind Speed: 3.23 Knots


NORTH
15%
12%
9%
6%
3%
WEST
EAST
SOUTH
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 4.17%

POWERTECH (USA) INC.

SPRING

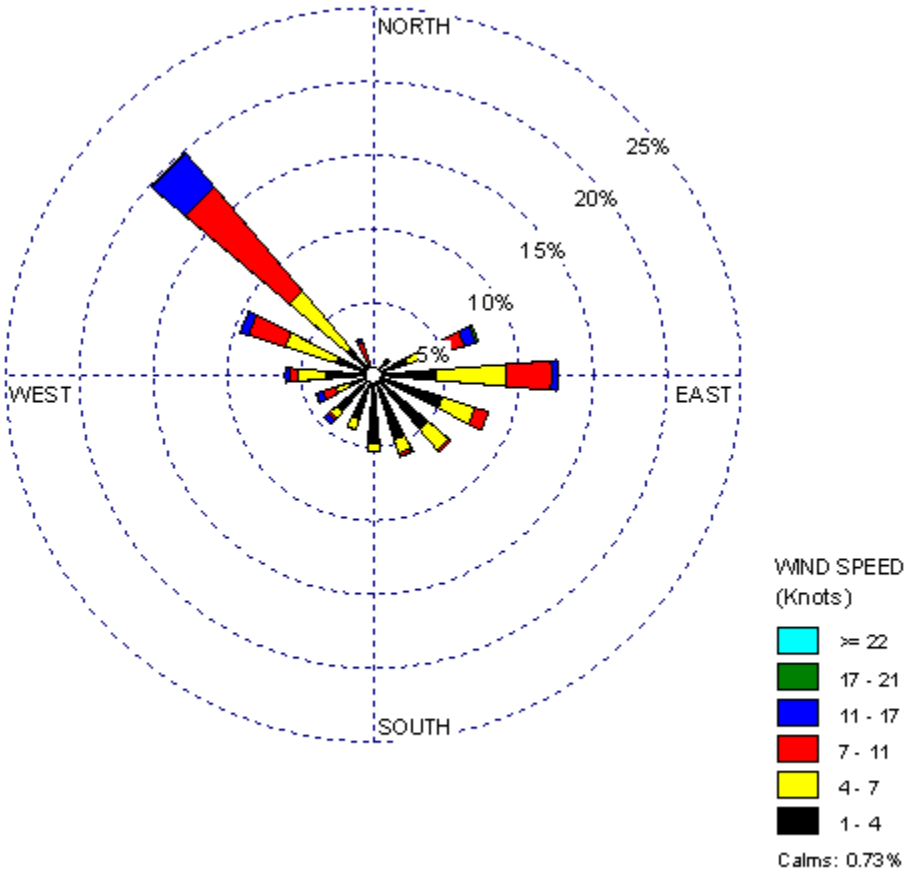
Station ID: 1 Run ID:
Year: 2008
Date Range: Mar 1 - May 31
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000459	0.000000	0.000000	0.000000	0.000000	0.000000	0.000459
11.25 - 33.75	0.002755	0.000459	0.000918	0.000000	0.000000	0.000000	0.004132
33.75 - 56.25	0.008724	0.001377	0.001837	0.001377	0.000918	0.000918	0.015152
56.25 - 78.75	0.024793	0.018365	0.022039	0.008264	0.001837	0.000000	0.075298
78.75 - 101.25	0.042700	0.047291	0.031221	0.004132	0.000000	0.000000	0.125344
101.25 - 123.75	0.050046	0.022957	0.009642	0.000000	0.000000	0.000000	0.082645
123.75 - 146.25	0.049128	0.018825	0.001377	0.000459	0.000000	0.000000	0.069789
146.25 - 168.75	0.046832	0.009642	0.002296	0.000459	0.000000	0.000000	0.059229
168.75 - 191.25	0.047291	0.005051	0.000459	0.000459	0.000000	0.000000	0.053260
191.25 - 213.75	0.032140	0.007346	0.000000	0.000459	0.000000	0.000000	0.039945
213.75 - 236.25	0.033058	0.005969	0.002296	0.003214	0.000000	0.000000	0.044536
236.25 - 258.75	0.017906	0.009642	0.009183	0.004591	0.000459	0.000000	0.041781
258.75 - 281.25	0.032599	0.019743	0.004591	0.003673	0.000000	0.000000	0.060606
281.25 - 303.75	0.027548	0.035813	0.026171	0.005969	0.000000	0.000000	0.095500
303.75 - 326.25	0.024334	0.050964	0.092287	0.029844	0.000918	0.000000	0.198347
326.25 - 348.75	0.004591	0.005051	0.013774	0.002755	0.000459	0.000000	0.026630
Sub-Total:	0.444904	0.258494	0.218090	0.065657	0.004591	0.000918	0.959184
Calms:							0.007098
Missing/Incomplete:							0.033718
Total:							1.000000

Frequency of Calm Winds: 0.73%
Average Wind Speed: 5.41 Knots


NORTH
SOUTH
WEST
EAST
5%
10%
15%
20%
25%
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 0.73%

POWERTECH (USA) INC.

SUMMER

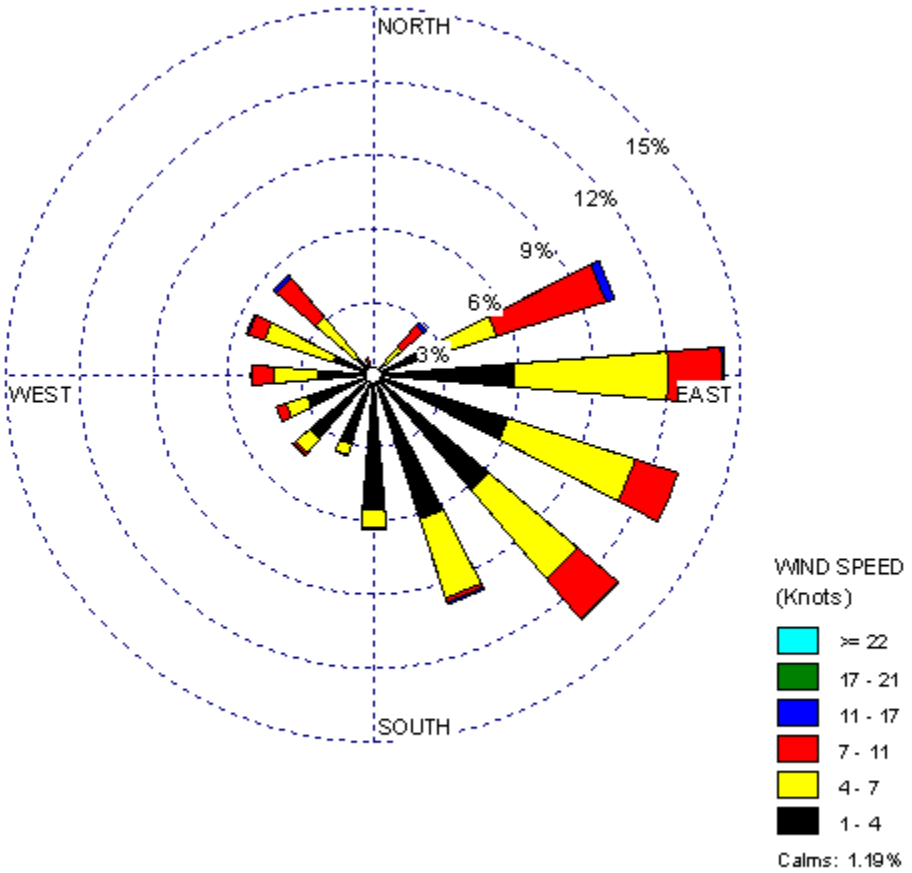
Station ID: 1 Run ID:
Year: 2007 2008
Date Range: Jun 1 - Aug 31
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
11.25 - 33.75	0.000456	0.001369	0.000912	0.000456	0.000000	0.000000	0.003193
33.75 - 56.25	0.006387	0.009124	0.011405	0.001825	0.000000	0.000000	0.028741
56.25 - 78.75	0.025091	0.027828	0.046533	0.003650	0.000000	0.000000	0.103102
78.75 - 101.25	0.057938	0.062044	0.021898	0.000912	0.000000	0.000000	0.142792
101.25 - 123.75	0.057938	0.054288	0.018248	0.000000	0.000000	0.000000	0.130474
123.75 - 146.25	0.062044	0.047445	0.020985	0.000000	0.000456	0.000000	0.130931
146.25 - 168.75	0.062044	0.033759	0.001825	0.000912	0.000000	0.000000	0.098540
168.75 - 191.25	0.055201	0.007299	0.000912	0.000000	0.000000	0.000000	0.063412
191.25 - 213.75	0.030109	0.004562	0.000456	0.000000	0.000000	0.000000	0.035128
213.75 - 236.25	0.034672	0.007299	0.000912	0.000456	0.000000	0.000000	0.043339
236.25 - 258.75	0.028741	0.009124	0.004106	0.000000	0.000000	0.000000	0.041971
258.75 - 281.25	0.022810	0.018248	0.008668	0.000456	0.000000	0.000000	0.050182
281.25 - 303.75	0.017336	0.029653	0.006843	0.000912	0.000000	0.000000	0.054745
303.75 - 326.25	0.010036	0.021442	0.020529	0.001825	0.000000	0.000000	0.053832
326.25 - 348.75	0.000912	0.003650	0.003193	0.000000	0.000000	0.000000	0.007755
Sub-Total:	0.471715	0.337135	0.167427	0.011405	0.000456	0.000000	0.955026
Calms:							0.011464
Missing/Incomplete:							0.033510
Total:							1.000000

Frequency of Calm Winds: 1.19%
Average Wind Speed: 4.66 Knots


NORTH
15%
12%
9%
6%
3%
WEST
EAST
SOUTH
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 1.19%

POWERTECH (USA) INC.

FALL

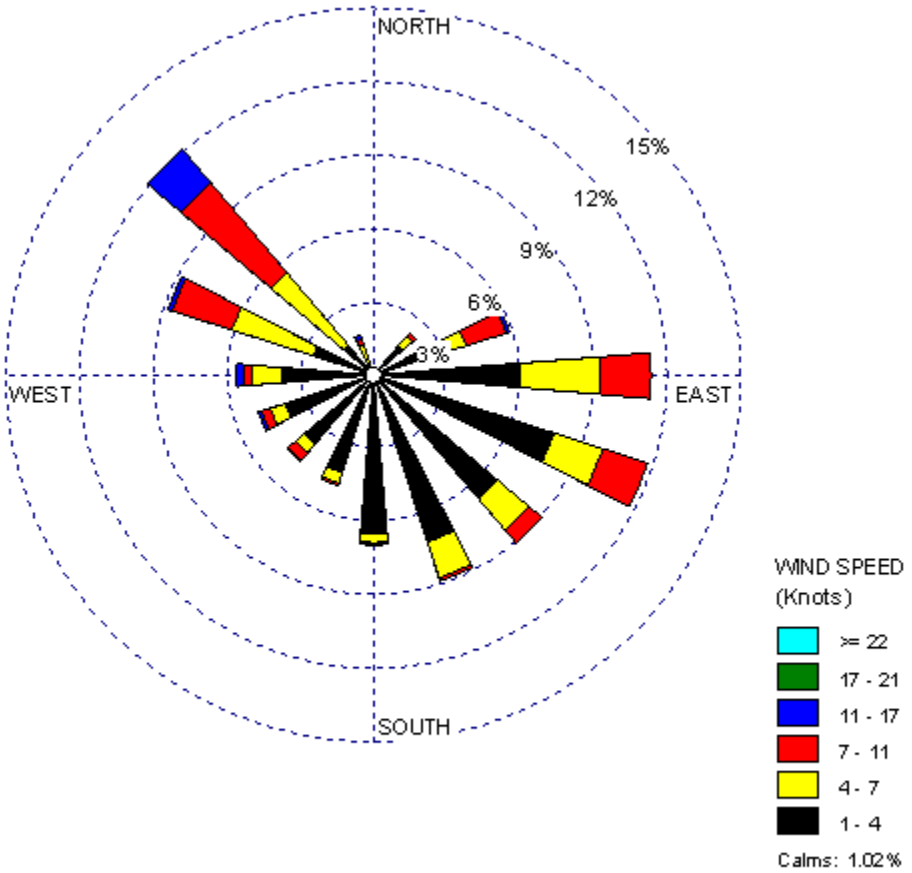
Station ID: 1 Run ID:
Year: 2007
Date Range: Sep 1 - Nov 30
Time Range: 00:00 - 23:00

Frequency Distribution
(Normalized)

Speed Knots

Wind Direction	1 - 4	4 - 7	7 - 11	11 - 17	17 - 21	>= 22	Total
348.75 - 11.25	0.000000	0.000464	0.000000	0.000000	0.000000	0.000000	0.000464
11.25 - 33.75	0.001855	0.001391	0.000000	0.000000	0.000000	0.000000	0.003247
33.75 - 56.25	0.016234	0.004638	0.001855	0.000000	0.000000	0.000000	0.022727
56.25 - 78.75	0.025046	0.014842	0.017161	0.001391	0.000000	0.000000	0.058442
78.75 - 101.25	0.060297	0.032468	0.020408	0.000000	0.000000	0.000000	0.113173
101.25 - 123.75	0.077458	0.020872	0.019017	0.000000	0.000000	0.000000	0.117347
123.75 - 146.25	0.066327	0.016698	0.006957	0.000000	0.000000	0.000000	0.089981
146.25 - 168.75	0.071892	0.015306	0.001391	0.000000	0.000000	0.000000	0.088590
168.75 - 191.25	0.064935	0.003711	0.000464	0.000464	0.000000	0.000000	0.069573
191.25 - 213.75	0.042208	0.004638	0.000928	0.000000	0.000000	0.000000	0.047774
213.75 - 236.25	0.037106	0.004638	0.004174	0.000464	0.000000	0.000000	0.046382
236.25 - 258.75	0.038033	0.006494	0.003711	0.001391	0.000000	0.000000	0.049629
258.75 - 281.25	0.037570	0.012059	0.003247	0.003247	0.000000	0.000000	0.056122
281.25 - 303.75	0.025974	0.034787	0.025510	0.001855	0.000000	0.000000	0.088126
303.75 - 326.25	0.016234	0.038497	0.048237	0.017625	0.000000	0.000000	0.120594
326.25 - 348.75	0.005566	0.007885	0.002319	0.001855	0.000000	0.000000	0.017625
Sub-Total:	0.586735	0.219388	0.155380	0.028293	0.000000	0.000000	0.956093
Calms:							0.009857
Missing/Incomplete:							0.034050
Total:							1.000000

Frequency of Calm Winds: 1.02%
Average Wind Speed: 4.25 Knots


NORTH
WEST
EAST
SOUTH
3%
6%
9%
12%
15%
WIND SPEED
(Knots)
>= 22
17 - 21
11 - 17
7 - 11
4 - 7
1 - 4
Calms: 1.02%