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Hanford Site Climatological Data Summary 2003 with Historical Data

D. J. Hoitink
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J. V. Ramsdell
W. J. Shaw

May 2004

Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RL01830

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Summary

This document presents the climatological data measured at the U.S. Department of Energy's Hanford Site for calendar year 2003. Pacific Northwest National Laboratory[1] operates the Hanford Meteorology Station and the Hanford Meteorological Monitoring Network from which these data were collected. This report contains updated historical information for temperature, precipitation, normal and extreme values of temperature and precipitation, and other miscellaneous meteorological parameters. Further, the data are adjunct to and update Hoitink et al. (1999, 2000, 2001, 2002, 2003) and Hoitink and Burk (1994, 1995, 1996, 1997, 1998); however, data from Appendix B – Wind Climatology (Hoitink and Burk 1994) are excluded.

Calendar year 2003 was warmer than normal[2] at the Hanford Meteorology Station with an average temperature of 55.6°F, 2.0°F above normal (53.6°F). The hottest temperature was 108°F on July 28, 29, and 30, while the coldest was 8°F on December 30. For the 12-month period, 9 months were warmer than normal, and 3 months were cooler than normal.

Precipitation for 2003 totaled 8.14 inches, 117% of normal (6.98 inches); calendar year snowfall totaled 8.7 inches (compared to the normal of 15.4 inches). April 2003 was the wettest April on record with 2.23 inches of precipitation (previous record 1.54 inches in 1995). July 2003 was the driest July on record with no precipitation recorded (previous record was a trace in 1980 and earlier years).

Calendar year 2003 had an average wind speed of 7.8 mph, 0.2 mph above normal (7.6 mph). There were 36 days with peak gusts ≥40 mph, compared to a yearly average of 27 days. The peak gust during the year was 60 mph on October 28.

The heating-degree days for 2002-2003 were 4,706 (9% below the 5,160 normal). Cooling-degree days for 2003 were 1,331 (31% above the 1,014 normal).

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[1] Pacific Northwest National Laboratory is operated by Battelle for the U.S. Department of Energy.
[2] Normals for the 2003 summary are 30-year averages based on the period 1971-2000.

Notes on Units of Measure

This document mainly uses English units (e.g., miles per hour [mph], inches, feet, or degrees Fahrenheit [°F]) when presenting all information. This decision to use English units was based on the fact that English units are still the standard in National Oceanic and Atmospheric Administration (specifically, the National Climatic Data Center and National Weather Service) reporting and publications.

Throughout this document the term "normal" is used to indicate climatological normal, defined as an average value over a period of years of any meteorological element such as temperature, pressure, and rainfall. The convention uses a 30-year time period, ending with the first year of each new decade (such as 1951-1980, 1961-1990, 1971-2000). **The time period used for climatological normals for comparative purposes in this document is 1971-2000.**

Some useful conversions between English units and metric equivalents are:

1 foot (ft) = 0.3048 meter (m)
1 mile (mi) = 1.609 kilometers (km)
1 inch (in.) = 2.54 centimeters (cm)
1 mile per hour (mph) = 0.447 meter/second (m/s)
degrees Fahrenheit (°F) = (9/5 x °C) + 32
degrees Celsius (°C) = 5/9 x (°F -32)
1 langley = 1gm-cal/cm^2

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1.0 Introduction

The U.S. Department of Energy's Hanford Site lies within the semiarid shrub-steppe (see Appendix A) Pasco Basin of the Columbia Plateau in southeastern Washington State. The Hanford Site occupies an area of ~586 square miles north of the confluence of the Snake and Yakima Rivers with the Columbia River (DOE 1999). The Columbia River flows through the northern part of the Hanford Site and, turning south, forms part of the site's eastern boundary. The Yakima River runs along part of the southern boundary and joins the Columbia River at the city of Richland, which bounds the Hanford Site on the southeast. Rattlesnake Mountain, Yakima Ridge, and Umtanum Ridge form the southwestern and western boundaries. The Saddle Mountains form the northern boundary of the Hanford Site.

The regional temperatures, precipitation, and winds are greatly affected by the presence of mountain barriers. The Cascade Range, beyond Yakima to the west, influences the climate of the Hanford Site area by its rain shadow effect. The Rocky Mountains and ranges in southern British Columbia protect the inland basin from the more severe cold polar air masses moving south across Canada and from the winter storms associated with them.

This document presents the calendar year 2003 climatological data summary for the Hanford Meteorology Station and additional information for temperature, wind, precipitation, and other meteorological parameters for the Hanford Meteorology Station and the automated stations of the Hanford Meteorological Monitoring Network. Climatological normal and extreme values for temperature and precipitation are also presented. Thirty monitoring stations are located within and near the Hanford Site (Table 1.1, Figure 1.1).

Operation of the Hanford Meteorology Station is a function of the Meteorological and Climatological Services Project funded by the U.S. Department of Energy. This project, managed by the Pacific Northwest National Laboratory, is responsible for providing ongoing meteorological and climatological services to the U.S. Department of Energy and Hanford Site contractors, primarily for emergency response activities, Hanford Site work scheduling, and general site safety. Detailed, real-time meteorological data are needed in the event of a release of hazardous material to the atmosphere from any of the Hanford Site facilities. These data can be used to model atmospheric dispersion and to estimate the environmental impact of the release. Meteorological data and weather forecasts also are necessary to ensure that operations and activities on the Hanford Site are conducted safely, particularly where specific weather conditions might affect those operations or activities. The climatological database also is used in environmental studies, environmental impact reports, facility design, and planning operations.

During the period April 1912 through March 1943, cooperative observers for the U.S. Weather Bureau (now the National Weather Service) recorded daily maximum and minimum temperatures and precipitation, including measurements of unmelted snow at the Hanford town site ~10 miles east-northeast of the present Hanford Meteorology Station. From late 1943 until mid-1944, the U.S. Weather

Table 1.1. Station Numbers, Names, and Codes for the Hanford Meteorological Monitoring Network

Station Number	Station Name	Station Code	Station Elevation (ft)	Longitude Degrees	Latitude Degrees	Period of Operation
1	Prosser Barricade	PROS	480	119.412	46.392	01/82 - Present
2	Emergency Operations Center	EOC	1,240	119.537	46.392	01/82 - Present
3	Army Loop Road	ARMY	565	119.551	46.489	01/82 - Present
4	Rattlesnake Springs	RSPG	680	119.700	46.506	01/82 - Present
5	Edna	EDNA	410	119.397	46.587	01/82 - Present
6	200 East	200E	680	119.521	46.556	01/82 - Present
7	200 West	200W	650	119.663	46.543	01/82 - Present
8	Beverly	BVLY	555	119.944	46.752	08/91 - Present
9	Fast Flux Test Facility	FFTF	570	119.360	46.430	01/82 - Present
10	Yakima Barricade	YAKB	795	119.726	46.578	01/82 - Present
11	300 Area	300A	390	119.286	46.364	01/82 - Present
12	Wye Barricade	WYEB	550	119.391	46.482	01/82 - Present
13	100-N	100N	460	119.551	46.689	01/82 - Present
14	WNP-2	WPPS	450	119.345	46.470	01/82 - Present
15	Franklin County	FRNK	875	119.238	46.417	01/82 - Present
16	Gable Mountain	GABL	1,085	119.460	46.598	01/82 - Present
17	Ringold	RING	620	119.238	46.545	01/82 - Present
18	Richland Airport	RICH	390	119.301	46.301	01/82 - Present
19	Plutonium Finishing Plant-200W	PFP	675	119.633	46.545	02/94 - Present
20	Rattlesnake Mountain	RMTN	3,560	119.593	46.394	01/82 - Present
21	Hanford Meteorology Station	HMS	733	119.599	46.563	01/82 - Present
22	Pasco Airport	PASC	410	119.114	46.257	10/87 - Present
23	Gable West	GABW	490	119.558	46.612	03/86 - Present
24	100-F	100F	410	119.452	46.635	03/86 - Present
25	Vernita Bridge	VERN	430	119.728	46.641	02/88 - Present
26	Benton City	BENT	1,055	119.608	46.290	02/95 - Present
27	Tri-City Vocational Skills Center	VSTA	505	119.201	46.218	02/91 - Present
28	Roosevelt, WA	SURF	350	120.218	45.744	09/94 - Present
29	100-K	100K	450	119.578	46.657	03/96 - Present
30	HAMMER	HAMR	450	119.326	46.356	01/98 - Present

Bureau recorded some meteorological operations in Richland. Then, in 1944 as part of the Manhattan Project, the Hanford Meteorology Station was established. Hourly observations began on December 7, 1944.

The Hanford Meteorology Station and its 408-foot instrument tower are located near the center of the Hanford Site between the 200 West and 200 East Areas (Figure 1.1). Hourly observations of wind direction, wind speed, and air temperature are made at multiple levels on the 408-foot tower. Throughout this document, wind measurements from the Hanford Meteorology Station are reported from the 50-foot level and temperature measurements are reported from the 3-foot level. A variety of other meteorological variables also are measured or observed, including current weather, dew point temperature, relative humidity,

precipitation, atmospheric pressure, cloud cover, visibility, and solar radiation. Several climatological summaries of data collected at the Hanford Meteorology Station, at the Hanford town site, and Richland monitoring locations were published over the past 30 years (Jenne and Kerns 1959; Stone et al. 1972, 1983; Hoitink and Burk 1994, 1995, 1996, 1997, 1998; Hoitink et al. 1999, 2000, 2001, 2002, 2003).

This document is composed of the following information. The 2003 calendar year summary of climatological data for the Hanford Site is contained in Section 2.0. Temperature, precipitation, wind, and miscellaneous climatological statistics are contained in Sections 3.0 through 6.0, respectively. Section 7.0 contains information on extreme value analysis. Section 8.0 lists the references cited in the document, and Section 9.0 provides a bibliography of database, computer code, and other pertinent reports. Appendix A describes in detail the climate classification of the Mid-Columbia region. Appendix B gives the station-specific wind roses and joint frequency distributions for 2003.

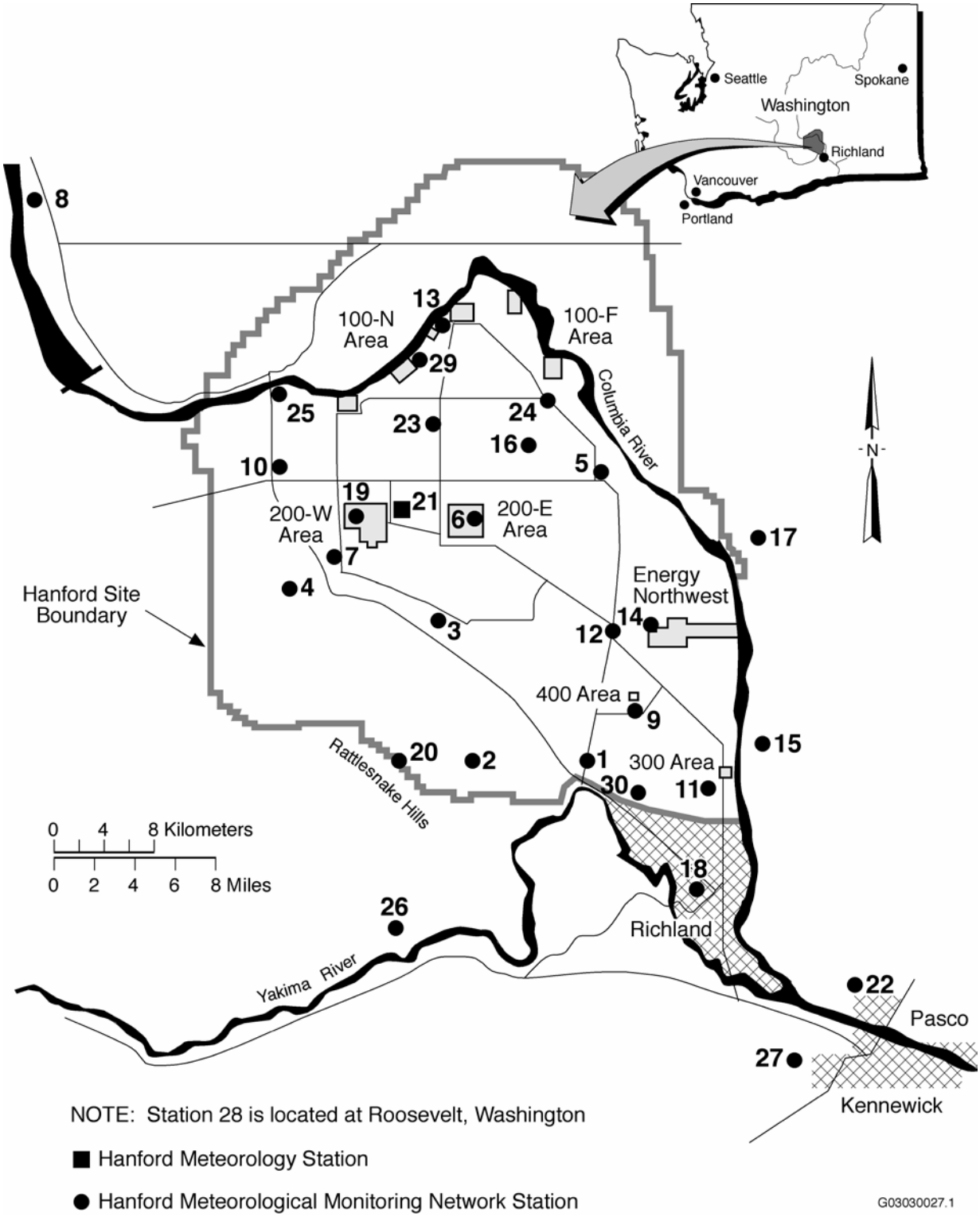

Figure 1.1. Map of the Hanford Site and Surrounding Areas (Refer to Table 1.1 for numbered locations on this map.)

2.0 Calendar Year 2003 Summary

This section summarizes weather conditions for calendar year 2003 (Table 2.1). More detailed information can be found in Section 3.0 – Temperature Climatology, Section 4.0 – Precipitation Climatology, and Section 5.0 – Wind Climatology.

The 2002-2003-winter season (December 2002, January, and February 2003) was much warmer than normal, averaging 38.4ºF, 4.6º above normal (33.8ºF). The warmest winter (1966-67) averaged 40.6ºF, while the coldest (1948-49) averaged only 24.2ºF. Winter season precipitation totaled 5.05 inches, 190% of normal (2.66 inches). The wettest winter (1996-97) received 5.45 inches, while the driest (1946-47) received 0.70 inch.

The 2003 spring season (March, April, and May) was slightly warmer than normal, averaging 54.1ºF, 0.3ºF above normal (53.8ºF). The warmest spring (1992) averaged 58.2ºF, while the coolest (1955) averaged 48.0ºF. Spring season 2003 precipitation totaled 2.57 inches, 163% of normal and was the sixth wettest spring on record. The wettest (1995) received 3.28 inches, while the driest (1968) received only 0.09 inch.

The 2003 summer season (June, July, and August) averaged 76.4ºF, 2.7º above normal (73.7ºF), and was the sixth warmest summer on record. The warmest summer (1958) averaged 78.2ºF, while the coolest (1980) averaged 70.2ºF. The hottest temperature was 108ºF on July 28, 29, and 30. Summer precipitation totaled 0.46 inch, 48 percent of normal (0.95 inch). The wettest summer (1950) received 2.99 inches, while the driest (1973) received 0.03 inch.

The 2003 autumn season (September, October, and November) averaged 54.8°F, 1.8° above normal (53.0°F). The warmest autumn (1990) averaged 57.1°F, while the coolest (1985) averaged 44.5°F. Precipitation for autumn 2003 totaled 0.46 inch, 26% of normal (1.80 inches). The wettest autumn (1973) received 4.79 inches, while the driest (1976) received only 0.04 inch.

The following are some additional statistics for 2003:

Category	Number of Days	Normal	Record Maximum	Record Minimum
Maximum temperatures ≥100°F	19	12	28 (1958)	1 (1954)
Maximum temperatures ≥90°F	72	52	79 (1967)	29 (1980)
Maximum temperatures ≤32°F	5	23	58 (1984-85)	2 (1966-67)
Minimum temperatures ≥70°F	10	7	21 (1958)	0 (1954)
Minimum temperatures ≤32°F	98	105	143 (1984-85)	70 (1991-92)
Minimum temperatures ≤0°F	0	3	18 (1949-50)	0 (2001-02)
Thunderstorms	5	10	23(1948)	3 (1949)
Fog (visibility ≤6 mi)	45	47	84 (1985-86)	22 (1948-49)
Dense fog (visibility ≤0.25 mi)	25	24	42 (1950-51)	9 (1948-49)
Peak wind gusts ≤12 mph	33	50	87 (1952)	28 (1973)
Peak wind gusts ≥25 mph	173	156	192 (1999)	123 (1952)
Peak wind gusts ≥40 mph	36	27	57 (1990)	10 (1978)
Peak wind gusts ≥50 mph	6	6	18 (1990)	0 (1985)

Table 2.1. 2003 Climatological Data Summary

Month	Temperatures, °F								Degree Days Base 65, °F				Precipitation, inches								Relative Humidity, %	
	Averages				Extremes												Snow, Ice Pellets, inches					
	Daily Maximum	Daily Minimum	Monthly	Departure[a]	Highest	Date	Lowest	Date	Heating	Departure[a]	Cooling	Departure[a]	Total	Departure[a]	Greatest in 24 Hours	Date	Total	Departure[a]	Greatest in 24 Hours	Date	Average	Departure[a]
J	43.2	32.7	38.0	+6.2	67	26	22	10	838	-190	0	0	1.87	+1.00	0.42	11-12	0.7	-3.5	0.7	21-22	86.5	+9.2
F	50.3	29.6	39.9	+2.0	62	21	15	25	705	-62	0	0	0.82	+0.14	0.38	15-16	0	-2.6	0	-	66.3	-4.2
M	60.7	37.4	49.0	+2.9	77	30	27	24[b]	500	-87	0	0	0.26	-0.32	0.10	26	0	-0.4	0	-	55.6	-1.0
A	64.3	40.1	52.2	-1.3	78	8	24	4	381	+31	0	-5	2.23	+1.79	1.24	13-14	0	-T[c]	0	-	55.5	-8.2
M	74.4	47.8	61.1	-0.7	93	28	34	19	181	+25	58	+1	0.08	-0.47	0.06	12	0	0	0	-	44.4	+1.4
J	87.6	57.4	72.5	+3.2	100	28	45	21	12	-21	234	+71	T	-0.41	T	1	0	0	0	-	33.3	-6.3
J	97.3	63.1	80.2	+3.9	108	30[b]	52	9	0	-4	475	+120	0	-0.27	0	-	0	0	0	-	28.4	-5.0
A	92.2	60.7	76.5	+1.1	104	1	53	24	0	-5	358	+32	0.46	+0.19	0.36	7	0	0	0	-	36.6	+1.0
S	84.4	53.9	69.2	+3.3	102	4	41	14	47	-28	174	+71	0.24	-0.09	0.24	7-8	0	0	0	-	38.8	-3.5
O	71.0	43.8	57.4	+4.4	89	21	19	31	271	-105	32	+28	0.07	-0.42	0.06	15-16	0	-0.1	0	-	49.1	-7.3
N	48.4	27.1	37.8	-2.3	68	18	13	22	814	+67	0	0	0.15	-0.83	0.06	28-29[b]	T	-2.3	0	-	62.9	-10.8
D	38.7	27.1	32.9	+1.2	51	6	8	30	993	-39	0	0	1.96	+0.85	0.56	13	8.0	+2.2	3.2	9-10	87.0	+6.9
Year Total	67.7	43.4	55.6	+2.0	108	Jul 30[b]	8	Dec 30	4,742	-418	1,331	+316	8.14	+1.16	1.24	Apr 13-14	8.7	- 6.7	3.2	Dec 9-10	53.7	-0.9

Table 2.1. (contd)

Month	Mean Sky Cover, Tenths		Solar Radiation, Langleys						50-ft Wind					Number of Days							
											Peak Gusts							Maximum Temperature, °F		Minimum Temperature, °F	
	Average	Departure[a]	Average Daily Total	Departure[a]	Greatest Daily Total	Date	Least Daily Total	Date	Average Speed, mph	Departure[a]	Speed, mph	Direction	Date	Thunderstorms	Heavy Fog	Precipitation ≥0.10 in.	Snowfall ≥1 in.	≥90°F	≤32°F	≤32°F	≤0°F
J	9.2	+1.3	57	-50	156	28	12	8	5.2	-1.1	39	S	2	0	7	8	0	0	0	14	0
F	4.1	-3.4	196	+12	293	24	49	13	7.1	0	52	SW	20	0	4	3	0	0	0	17	0
M	7.0	+0.2	261	-59	397	28	80	12	9.3	+1.3	53	W	5	0	0	1	0	0	0	9	0
A	7.3	+0.9	395	-55	586	27	138	24	7.8	-1.0	48	SW	9	2	1	3	0	0	0	4	0
M	6.7	+0.8	482	-67	635	29	239	30	8.2	-0.7	41	W	14	1	0	0	0	2	0	0	0
J	2.4	-2.8	610	+13	689	30	343	18	9.1	+0.1	45	WNW	18	0	0	0	0	12	0	0	0
J	1.1	-1.9	637	+7	685	2	551	24	8.4	-0.2	41	WSW	12	0	0	0	0	26	0	0	0
A	2.5	-0.8	484	-54	578	1	82	22	7.6	-0.4	45	WNW	19	2	0	1	0	23	0	0	0
S	3.6	-0.3	356	-48	482	1	137	8	7.4	+0.1	44	WNW	12	0	0	1	0	9	0	0	0
O	5.5	-0.1	212	-42	314	3	35	16	8.6	+2.1	60	SW	28	0	0	0	0	0	0	3	0
N	6.1	-1.4	116	-8	217	5	25	19	9.9	+3.4	54	SW	18	0	2	0	0	0	1	25	0
D	8.0	-0.1	60	-24	133	3	14	2	5.5	-0.5	36	SSW	6	0	11	5	2	0	4	26	0
Year Total	5.3	-0.6	322	-32	689	Jun 30	12	Jan 8	7.8	+0.2	60	SW	Oct 28	5	25	22	2	72	5	98	0

(a) Departure columns indicate positive or negative departure of meteorological parameters from 30-year (1971-2000) climatological normals.
(b) Latest date of multiple occurrences.
(c) Trace of snowfall is normal; no occurrence in April.
T = Trace.

2.1 Temperature

Calendar year 2003 was warmer than normal at the Hanford Meteorology Station. The average temperature was 55.6°F, 2.0° above normal (53.6°F). The warmest years on record are 1992 and 1998, which averaged 56.4°F; the coldest year on record is 1985, which averaged 49.6°F. The hottest temperature of 2003 was 108°F on July 28, 29, and 30; the coldest was 8°F on December 30. Calendar year 2003 recorded 72 days with maximum temperatures ≥90°F compared to a normal of 52 days, a maximum of 79 days in 1967, and a minimum of 29 days in 1980. There were 19 days with maximum temperatures ≥100°F compared to a normal of 12 days, a maximum of 28 days in 1958, and a minimum of 1 day in 1954.

Nine months during the year were warmer than normal, and 3 months cooler than normal. Five months departed from normal by more than 3°, with January 6.2° above normal. November 2003 was 2.3º below normal.

The average temperature for January 2003 was much warmer than normal, averaging 38.0ºF, 6.2° above normal (31.8°F). The warmest January occurred in 1953 and averaged 42.5°F, while the coldest, in 1950, averaged 12.1°F. Twenty-four days during January 2003 had average temperatures that were normal or above normal.

The average temperature for February 2003 was much warmer than normal, averaging 39.9ºF, 2.0° above normal (37.9°F). The warmest February occurred in 1958 and averaged 44.5°F, while the coldest, in 1956, averaged 25.6°F. Twenty-one days during February 2003 had average temperatures that were normal or above normal.

The 2002-2003-winter season (December 2002, January, and February 2003) was much warmer than normal, averaging 38.4ºF, 4.6º above normal (33.8ºF). The warmest winter (1966-67) averaged 40.6ºF, while the coldest (1948-49) averaged only 24.2ºF.

The average temperature for March 2003 was warmer than normal, averaging 49.0ºF, 2.9° above normal (46.1°F). The warmest March occurred in 1992 and averaged 51.5°F, while the coldest, in 1955, averaged 39.4°F.

The average temperature for April 2003 was cooler than normal, averaging 52.2ºF, 1.3° below normal (53.5°F). The warmest April occurred in 1994 and averaged 58.2°F, while the coldest, in 1955, averaged 47.5°F.

The average temperature for May 2003 was cooler than normal, averaging 61.1ºF, 0.7° below normal (61.8°F). The warmest May occurred in 1947 and averaged 68.7°F, while the coldest, in 1984, averaged 56.0°F. The first day of 2003 with a maximum of 80ºF or greater occurred on May 22, the second latest in any year to reach that temperature.

The 2003 spring season (March, April, and May) was slightly warmer than normal, averaging 54.1ºF, 0.3ºF above normal (53.8ºF). The warmest spring (1992) averaged 58.2ºF, while the coolest (1955) averaged 48.0ºF.

The average temperature for June 2003 was warmer than normal, averaging 72.5ºF, 3.2° above normal (69.3°F). The warmest June occurred in 1992 and averaged 76.8°F, while the coolest, in 1953, averaged 63.0°F. There were been 14 days with maximum temperatures ≥90ºF through June 30 (normal is 11), and one day above 100ºF (normal through June is 1).

The average temperature for July 2003 was much warmer than normal, averaging 80.2ºF, 3.9° above normal (76.3°F). It was the seventh warmest July on record and the tenth warmest month of all time. The warmest July occurred in 1985 and averaged 82.2°F, while the coolest, in 1993, averaged 70.5°F. The average maximum temperature for the last two weeks of July was 103.5ºF. There were 40 days with maximum temperatures ≥90ºF through July 31 (normal is 30), and 13 days above 100ºF (normal through July is 7).

The average temperature for August 2003 was warmer than normal, averaging 76.5ºF, 1.1° above normal (75.4°F). The warmest August occurred in 1967 and averaged 81.5°F, while the coolest, in 1964, averaged 69.8°F. There were 63 days with maximum temperatures ≥90ºF through August 31 (normal is 47), and 16 days above 100ºF (normal through August and for the summer is 12).

The 2003 summer season (June, July, and August) averaged 76.4ºF, 2.7º above normal (73.7ºF), and was the 6th warmest summer on record. The warmest summer (1958) averaged 78.2ºF; while the coolest (1980) averaged 70.2ºF. The hottest temperature was 108ºF on July 28, 29, and 30.

The average temperature for September 2003 was much warmer than normal, averaging 69.2ºF, 3.3° above normal (65.9°F). The warmest September occurred in 1990 and averaged 72.4°F, while the coolest, in 1985, averaged 58.8°F. There were 72 days during 2003 with maximum temperatures ≥90ºF, the fourth greatest number on record (normal is 52, the most was 79 in 1967 and least was 29 in 1980). There were 19 days during this calendar year with maximum temperatures ≥100ºF, compared to a normal of 12 (the most was 28 days in 1958 and least was 1 day in 1954).

The average temperature for October 2003 was much warmer than normal, averaging 57.4ºF, 4.4° above normal (53.0°F), and the third warmest on record. The warmest October occurred in 1988 and averaged 59.6°F, while the coolest, in 1984, averaged 47.9°F. The period from October 16-28 averaged 10.2° above normal.

The average temperature for November 2003 was cooler than normal, averaging 37.8ºF, 2.3° below normal (40.1°F). The warmest November occurred in 1990 and averaged 46.5°F, while the coldest, in 1985, averaged 24.8°F. The period from November 1-7 averaged 12.1° below normal.

The 2003 autumn season (September, October, and November) averaged 54.8°F, 1.8° above normal (53.0°F). The warmest autumn (1990) averaged 57.1°F, while the coolest (1985) averaged 44.5°F.

The average temperature for December 2003 was warmer than normal, averaging 32.9ºF, 1.2° above normal (31.7°F). The warmest December occurred in 1957 and averaged 38.5°F, while the coldest, in 1985, averaged 21.0°F.

Table 2.2 lists the daily temperature records for 2003 along with the previous record and year of occurrence. Table 2.1 lists the monthly and annual totals for numerous meteorological variables for 2003. Table 2.3 lists the 2003 monthly and seasonal temperature and precipitation compared to normals and extremes. Table 2.4, Table 2.5, and Table 2.6 list the 2003 monthly and annual average temperature, precipitation, and wind speed, respectively, from the Hanford Meteorological Monitoring Network.

Figure 2.1 depicts the 2003 observed daily maximum and minimum temperatures and the normal maximum, minimum, and mean daily temperatures for the Hanford Meteorology Station.

Table 2.2. 2003 Daily Temperature Records (previous record and year of occurrence in parentheses)

	Maximum (°F)		Minimum (°F)	
Date	High	Low	High	Low
Jan 26	67 (61, 1971)			
Mar 11			44[a] (44, 2002[b])	
Mar 13			49 (44, 1998[b])	
Mar 14			48 (45, 1961)	
Mar 21			47 (46, 1998[b])	
Mar 30	77 (75, 1992)			
Mar 31			49 (47, 1961)	
Apr 4				24 (27, 1950)
May 17		58 (61, 1974)		36 (38, 1988[b])
Jun 21				45[a] (45, 1956)
Jun 28			68[a] (68, 1987)	
Jul 28	108[a] (108, 1998[b])			
Jul 29	108 (107, 1982)			
Jul 30	108 (107, 1971)			
Sep 4	102[a] (102, 1988)			
Sep 5	100[a] (102, 1955)			
Sep 6			68 (65, 1957[b])	
Sep 27			60[a] (60, 1949)	
Sep 29			61[a] (61, 1989)	
Oct 5			56 (52, 1988[b])	
Oct 6	87 (85, 1980)			
Oct 17	79 (77,1997)		49[a] (49, 1955)	
Oct 18	77 (76, 1973)			
Oct 19			54 (52, 1992)	
Oct 20	80 (74, 1978)		56 (54, 1973)	
Oct 21	89[c] (73, 1991[b])		65[d] (54, 1963)	
Oct 22	81 (74, 1959)		57 (51, 1952)	
Oct 28	80 (68, 1965[b])			
Nov 2		37 (38, 1991)		
Nov 5				18 (20, 1973[b])
Nov 18	68 (64, 1946)		52 (47, 1954)	

(a) Ties record.
(b) Most recent of several occurrences.
(c) Ties all-time record for October (previously recorded October 3, 1958 and October 4, 1980).
(d) All-time record for October (previous record 60ºF on October 25, 1945, and October 2 and 15, 1988).

Table 2.3. 2003 Monthly and Seasonal Temperature and Precipitation

Month/ Season	Average Temperature, °F	Departure[a]	Normal, °F	Warmest of Record, °F	Year	Coolest of Record, °F	Year	Precipitation, in.	Percent of Normal	Normal	Wettest of Record, in.	Year	Driest of Record, in.	Year
Jan	38.0	+6.2	31.8	42.5	1953	12.1	1950	1.87	215	0.87	2.47	1970	0.08	1977
Feb	39.9	+2.0	37.9	44.5	1958	25.6	1956	0.82	120	0.68	2.10	1961	T	1988[b]
Mar	49.0	+2.9	46.1	51.5	1992	39.4	1955	0.26	45	0.58	1.86	1957	0.02	1968
Apr	52.2	-1.3	53.5	58.2	1994	47.5	1955	2.23	507	0.44	2.23	2003	T	1999[b]
May	61.1	-0.7	61.8	68.7	1947	56.0	1984	0.08	14	0.55	2.03	1972	T	1992[b]
Jun	72.5	+3.2	69.3	76.8	1992	63.0	1953	T	0	0.41	2.92	1950	T	2003[b]
Jul	80.2	+3.9	76.3	82.2	1985	70.5	1993	0	0	0.27	1.76	1993	0	2003
Aug	76.5	+1.1	75.4	81.5	1967	69.8	1964	0.46	170	0.27	1.36	1977	0	1988[b]
Sep	69.2	+3.3	65.9	72.4	1990	58.8	1985	0.24	73	0.33	1.34	1947	0	1999[b]
Oct	57.4	+4.4	53.0	59.6	1988	47.9	1984	0.07	14	0.49	2.72	1957	T	1987[b]
Nov	37.8	-2.3	40.1	46.5	1990	24.8	1985	0.15	15	0.98	2.67	1996	T	1976
Dec	32.9	+1.2	31.7	38.5	1957	21.0	1985	1.96	177	1.11	3.69	1996	0.07	1999
Winter[c]	38.4	+4.6	33.8	40.6	1966-67	24.2	1948-49	5.05	190	2.66	5.45	1996-97	0.70	1946-47
Spring	54.1	+0.3	53.8	58.2	1992	48.0	1955	2.57	163	1.58	3.28	1995	0.09	1968
Summer	76.4	+2.7	73.7	78.2	1958	70.2	1980	0.46	48	0.95	2.99	1950	0.03	1973
Autumn	54.8	+1.8	53.0	57.1	1990	44.5	1985	0.46	26	1.80	4.79	1973	0.04	1976
Calendar Year Total	55.6	+2.0	53.6	56.4	1998[b]	49.6	1985	8.14	117	6.98	12.31	1995	2.99	1976

(a) Departure indicates positive or negative departure from 30-year (1971-2000) climatological normals.
(b) Latest of multiple occurrences.
(c) Winter is December 2002, January and February 2003.
T = Trace.

Table 2.4. 2003 Monthly and Annual Average Temperatures (°F) from the Hanford Meteorological Monitoring Network

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1 PROS	38.6	39.4	49.5	53.1	61.6	72.8	80.1	76.1	67.6	56.3	37.9	33.8	55.7
2 EOC	38.6	40.2	49.3	51.8	60.4	71.9	79.9	76.6	69.9	58.2	39.4	34.2	55.9
3 ARMY	38.8	39.9	49.9	53.2	61.7	73.4	81.0	77.0	69.4	57.9	38.7	34.0	56.4
4 RSPG	38.6	39.6	49.5	52.3	60.5	72.3	80.0	76.4	68.5	57.0	38.2	33.6	55.6
5 EDNA	38.3	39.4	48.7	52.7	61.0	72.5	79.8	75.7	67.7	56.5	37.5	33.9	55.5
6 200E	38.6	40.7	50.2	53.7	62.5	74.2	82.1	78.1	70.7	58.8	39.4	34.3	57.0
7 200W	38.0	38.9	49.5	52.8	61.0	72.7	80.6	76.3	68.5	56.3	37.2	33.2	55.5
8 BVLY	38.1	40.3	48.7	53.1	61.5	72.5	79.8	75.5	68.2	56.9	39.2	34.5	55.8
9 FFTF	38.4	39.8	49.6	52.9	61.4	72.6	80.3	76.5	68.8	57.3	38.6	34.0	55.9
10 YAKB	38.0	39.9	49.0	52.3	61.4	73.6	83.3	77.7	70.5	57.8	38.6	33.4	55.9
11 300A	39.4	39.7	50.1	53.5	61.4	72.0	79.3	76.1	67.7	56.9	38.7	34.9	55.8
12 WYEB	38.5	39.9	49.8	53.2	61.8	73.2	80.9	76.8	69.0	57.4	38.4	34.0	56.2
13 100N	37.7	39.3	47.9	52.2	60.7	72.3	79.2	75.6	68.7	57.1	38.0	33.9	55.2
14 WPPS	38.6	39.0	49.3	52.8	61.1	72.7	80.4	76.1	68.3	56.9	37.9	34.3	55.7
15 FRNK	38.2	39.5	48.9	51.4	59.3	69.4	76.1	72.3	65.7	55.3	38.1	33.6	54.1
16 GABL	37.9	40.6	48.9	52.1	60.8	72.5	80.6	77.0	70.2	58.7	39.1	33.7	56.1
17 RING	38.5	39.2	48.5	51.9	59.5	69.7	75.6	72.6	65.5	55.2	37.9	34.2	54.1
18 RICH	40.0	40.9	51.4	54.1	61.8	72.5	80.2	76.8	68.6	57.9	40.0	35.4	56.7
19 PFP	38.0	39.8	49.6	52.9	61.5	73.4	81.1	77.2	69.8	57.9	38.4	33.5	56.2
20 RMTN	32.8	32.5	39.4	41.9	50.8	62.9	72.3	68.6	61.7	50.6	31.1	29.1	47.9
21 HMS	38.0	39.9	49.0	52.2	61.1	72.5	80.2	76.5	69.2	57.4	37.8	32.9	55.6
22 PASC	39.9	39.8	51.3	54.3	62.0	72.5	80.2	76.6	67.6	57.0	39.4	35.0	56.4
23 GABW	37.6	38.6	48.1	52.1	60.8	72.7	80.4	75.9	68.0	56.0	36.5	33.2	55.1
24 100F	38.1	39.1	48.5	52.7	61.2	72.7	79.9	75.8	68.0	56.6	37.5	33.9	55.4
25 VERN	38.9	40.7	49.2	53.2	61.9	73.4	81.2	77.7	70.5	58.6	40.0	35.1	56.8
26 BENT	38.8	39.6	48.6	51.8	60.8	70.3	77.7	73.9	67.5	56.1	38.0	33.6	54.8
27 VSTA	40.7	41.4	51.8	54.5	61.2	72.5	80.7	77.0	68.9	58.3	40.7	36.2	56.7
28 SURF	40.7	40.8	49.6	52.5	60.7	71.2	80.1	75.7	68.5	57.3	40.5	37.4	56.3
29 100K	38.3	39.8	48.6	52.8	61.7	73.1	80.3	76.5	69.3	57.4	38.2	34.1	55.9
30 HAMR	39.3	40.0	50.5	53.6	61.6	72.2	80.0	76.4	68.3	57.3	39.1	34.7	56.2

Table 2.5. 2003 Monthly and Annual Precipitation (inches) from the Hanford Meteorological Monitoring Network[(a)]

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1 PROS	1.56	0.69	0.28	0.95	0.20	0.00	0.00	0.58	0.29	0.06	0.16	1.27	6.04
2 EOC	1.98	0.73	0.63	1.12	0.35	0.00	0.00	0.89	0.02	0.15	0.37	1.74	7.98
3 ARMY	0.59	0.50	0.20	1.32	0.33	0.00	0.00	0.53	0.24	0.20	0.14	1.38	5.43
4 RSPG	1.51	0.62	0.25	1.57	0.40	0.00	0.00	0.34	0.13	0.10	0.16	1.75	6.83
6 200E	1.57	0.61	0.27	1.89	0.08	0.00	0.00	0.35	0.19	0.05	0.10	1.22	6.33
7 200W	1.73	0.78	0.21	1.93	0.25	0.00	0.00	0.30	0.08	0.04	0.11	1.41	6.84
8 BVLY	1.02	0.31	0.11	1.53	0.09	0.00	0.00	0.21	0.04	0.02	0.01	1.07	4.41
9 FFTF	1.08	0.54	0.19	1.16	0.34	0.00	0.00	0.40	0.22	0.08	0.17	0.65	4.83
10 YAKB	1.76	0.85	0.27	2.07	0.15	0.00	0.00	0.32	0.09	0.04	0.04	1.70	7.29
11 300A	1.31	0.55	0.48	1.13	0.14	0.00	0.00	0.10	0.29	0.06	0.29	1.36	5.71
12 WYEB	1.73	0.70	0.29	1.25	0.39	0.00	0.00	0.49	0.13	0.14	0.28	1.58	6.98
13 100N	1.79	0.49	0.21	1.56	0.00	0.00	0.00	0.37	0.05	0.05	0.14	1.37	6.03
14 WPPS	1.69	0.72	0.28	1.43	0.29	0.00	0.00	0.47	0.17	0.14	0.30	1.54	7.03
17 RING	1.83	0.62	0.53	1.47	0.05	0.00	0.00	0.25	0.09	0.11	0.48	1.51	6.94
18 RICH	1.17	0.52	0.22	0.54	0.18	0.00	0.00	0.17	0.20	0.10	0.22	1.15	4.47
20 RMTN	1.88	0.70	0.36	0.85	0.61	0.00	0.00	0.84	0.15	0.18	0.15	0.87	6.59
21 HMS	1.87	0.82	0.26	2.23	0.08	0.00	0.00	0.46	0.24	0.07	0.15	1.96	8.14
22 PASC	1.81	0.84	0.31	0.86	0.51	0.00	0.00	0.02	0.23	0.21	0.30	1.41	6.50
24 100F	1.65	0.56	0.44	1.79	0.00	0.00	0.00	0.42	0.11	0.14	0.16	1.97	7.24
26 BENT	2.03	0.97	0.64	1.40	0.12	0.00	0.00	0.56	0.19	0.24	0.31	1.89	8.35
27 VSTA	1.47	0.67	0.24	0.43	0.43	0.00	0.00	0.10	0.16	0.22	0.28	1.41	5.41
28 SURF	2.42	0.72	0.82	0.89	0.20	0.00	0.00	0.44	0.05	0.45	0.63	1.93	8.55
29 100K	--	--	0.26	2.05	0.01	0.00	0.00	0.30	0.10	0.15	0.16	1.74	[(b)]

(a) Stations 5, 15, 16, 19, 23, and 25 are solar powered; therefore, insufficient power is available to operate the heated tipping-bucket precipitation gauges.
(b) Incomplete data.
NOTE: Dashes indicate no data are available.

Table 2.6. 2003 Monthly and Annual Average Wind Speed (mph) from the Hanford Meteorological Monitoring Network

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1 PROS	5.3	6.8	9.2	7.9	8.0	7.7	6.7	6.4	6.3	7.6	8.8	6.8	7.3
2 EOC	6.9	9.9	12.5	9.8	9.0	8.2	7.0	7.5	9.0	10.9	12.8	8.0	9.3
3 ARMY	3.7	5.3	7.4	7.1	7.2	7.2	5.3	5.6	6.1	7.8	7.5	5.1	6.3
4 RSPG	4.8	7.8	9.3	8.1	8.0	8.0	7.5	7.6	7.7	8.8	8.6	5.4	7.6
5 EDNA	4.3	5.6	7.3	6.6	6.5	7.3	6.6	6.0	5.9	7.2	6.7	4.9	6.2
6 200E	4.4	6.5	8.7	7.7	8.1	9.3	8.4	7.6	7.5	8.2	7.6	5.4	7.5
7 200W	3.9	5.5	8.1	6.9	6.9	7.8	6.8	6.1	5.8	7.1	6.7	4.4	6.3
8 BVLY	4.5	5.5	6.5	5.9	6.1	7.4	6.4	5.8	5.3	5.9	5.9	4.9	5.8
9 FFTF	5.8	7.9	10.0	8.6	8.5	8.6	7.3	7.3	7.5	9.1	9.5	6.8	8.1
10 YAKB	4.9	7.1	8.9	7.9	8.6	9.8	8.7	7.9	7.4	8.4	8.0	5.6	7.8
11 300A	5.6	7.3	9.4	8.2	8.3	7.9	7.0	6.8	6.3	8.1	9.1	6.6	7.5
12 WYEB	5.0	6.9	8.6	7.8	7.8	8.1	7.0	6.7	6.9	8.5	8.2	6.0	7.3
13 100N	3.7	5.6	6.7	6.3	6.7	7.6	6.5	5.6	5.8	6.6	5.9	4.0	5.9
14 WPPS	5.0	6.4	8.4	7.6	7.1	7.4	6.4	6.2	6.3	7.7	7.9	5.8	6.8
15 FRNK	5.3	7.0	8.6	7.2	6.6	6.4	5.6	5.4	5.7	7.0	7.9	5.8	6.5
16 GABL	7.0	9.8	13.1	11.5	11.5	12.8	11.7	10.7	11.2	12.5	12.1	8.2	11.0
17 RING	4.7	6.3	7.8	6.5	6.4	6.2	5.4	5.3	5.7	7.3	7.7	5.2	6.2
18 RICH	4.5	6.0	8.1	6.9	6.8	6.2	5.2	5.2	5.1	6.5	7.4	5.6	6.1
19 PFP	3.3	4.3	6.6	5.5	5.5	6.0	5.1	4.7	4.5	5.9	5.1	3.4	5.0
20 RMTN	15.9	19.3	24.2	18.3	15.6	13.6	11.0	12.8	16.8	22.8	22.9	17.9	17.6
21 HMS	5.2	7.1	9.3	7.8	8.2	9.1	8.4	7.6	7.4	8.6	9.9	5.5	7.8
22 PASC	3.9	4.9	7.6	6.4	6.1	5.6	4.6	4.5	4.3	5.7	6.4	4.3	5.4
23 GABW	4.1	5.7	7.3	6.7	7.1	8.5	7.6	6.5	6.2	6.9	6.1	4.3	6.4
24 100F	3.6	5.4	6.9	6.5	6.4	7.4	6.3	5.8	5.7	7.0	6.2	4.0	5.9
25 VERN	5.3	6.8	7.6	7.3	8.3	9.7	8.8	7.9	7.3	7.5	7.0	5.9	7.4
26 BENT	4.7	6.9	7.6	6.5	6.1	6.1	5.6	5.6	5.8	6.7	6.4	4.9	6.1
27 VSTA	4.2	5.2	8.4	7.0	6.5	6.3	5.3	5.3	5.0	6.0	7.0	4.8	5.9
28 SURF	5.1	9.1	11.1	10.3	11.6	12.6	12.1	10.8	9.3	9.1	8.9	6.9	9.7
29 100K	3.8	5.4	7.1	6.6	7.1	8.1	6.8	6.0	5.8	6.7	5.7	4.1	6.1
30 HAMR	4.9	6.6	8.4	7.4	7.4	7.2	5.9	6.0	5.9	7.2	8.4	6.2	6.8

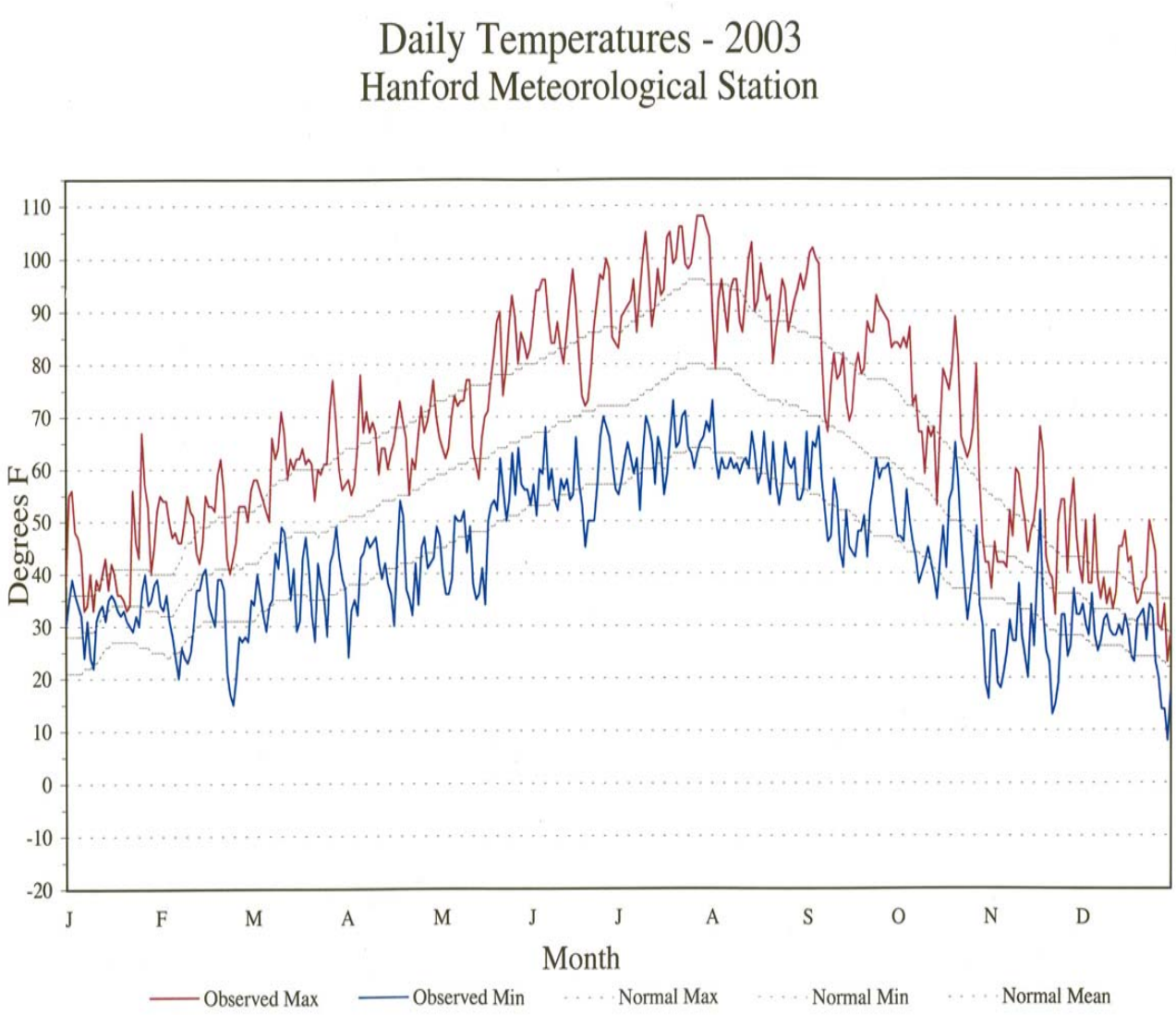

Figure 2.1. 2003 Observed Daily Temperatures from the Hanford Meteorology Station

2.2 Precipitation

Precipitation for 2003 totaled 8.14 inches, 117% of normal (6.98 inches). The wettest year was 1995 with 12.31 inches; the driest was 1976 with only 2.99 inches. Calendar year snowfall totaled 8.7 inches, compared to an annual normal snowfall of 15.4 inches. The greatest calendar year snowfall was 57.5 inches (1996); the least was 0.6 inch (1999).

Precipitation for January 2003 was 1.87 inches, 215% of normal (0.87 inch). This was the fifth wettest January on record. The wettest, in 1970, received 2.47 inches, while the driest, in 1977, received 0.08 inch. Snowfall for January 2003 totaled 0.7 inch, compared to a normal of 4.2 inches. Total snow season snowfall is only 1.3 inches, compared to a normal through January of 12.4 inches.

Precipitation for February 2003 was 0.82 inch, 120% of normal (0.68 inch). The wettest February occurred in 1961 and received 2.10 inches, while the driest, in 1988 and earlier years, received only a trace. There was no snow recorded in February 2003, compared to a normal of 2.6 inches. Total snow season snowfall is only 1.3 inches, compared to a normal through February of 15.0 inches.

Winter season precipitation totaled 5.05 inches, 190% of normal (2.66 inches). The wettest winter (1996-97) received 5.45 inches, while the driest (1946-47) received 0.70 inch.

Precipitation for March 2003 was 0.26 inches, 45% of normal (0.58 inch). The wettest March occurred in 1957 and received 1.86 inches, while the driest, in 1968, received 0.02 inch. There was no snow recorded in March 2003, compared to a normal of 0.4 inch. Total snow season snowfall was only 1.3 inches, compared to a normal of 15.4 inches.

April 2003 established several precipitation records. Precipitation for the month totaled 2.23 inches, 507% of normal (0.44 inches), the wettest April on record. The previous wettest April occurred in 1995 and received 1.54 inches, while the driest, in 1999 and earlier years, received only a trace. It was also the thirteenth wettest month at the Hanford Meteorological Station since record keeping began in December 1944. The wettest month ever was December 1996 with 3.69 inches. There were two days in April 2003 with precipitation totals >0.50 inch (an April record), with one 24-hour period receiving 1.24 inches, a record 24-hour precipitation total for any April, and the fifth greatest 24-hour amount in the history of the Hanford Meteorological Station. The greatest 24-hour precipitation amount was 1.91 inches on October 1-2, 1957.

Precipitation for May 2003 was 0.08 inch, 14% of normal (0.55 inch). The wettest May occurred in 1972 and received 2.03 inches, while the driest May, in 1992 and earlier years, received only a trace.

Spring season 2003 precipitation totaled 2.57 inches, 163% of normal and was the sixth wettest spring on record. The wettest (1995) received 3.28 inches, while the driest (1968) received only 0.09 inch.

Precipitation for June 2003 totaled only a trace, compared to a June normal of 0.41 inch. June 1979 and 1986 also received only a trace of precipitation. The wettest June occurred in 1950 and received 2.92 inches.

There was no precipitation recorded during July 2003, compared to a July normal of 0.27 inch. This is the first time that any July has been totally without rainfall; numerous previous months of July have received only a trace. This was also only the fifth month not to receive any precipitation – that also happened in August 1955, August 1988, September 1991, and September 1999. The last July to record only a trace was in 1980. The wettest July on record, in 1993, received 1.73 inches. The last measurable precipitation at the Hanford Meteorology Station occurred on May 16 (a period of 76 days, and currently the third longest period on record without measurable precipitation).

Precipitation for August 2003 totaled 0.46 inch, 170% of normal (0.27 inch). The wettest August on record, in 1977, received 1.36 inches; and the driest, in 1988 and 1955, received no precipitation. The period from June 2 through August 1 (61 days) was the second longest period on record with no precipitation (the longest period was 66 days, from July 14, 1988 through September 17, 1988).

Precipitation for September 2003 totaled 0.24 inch, 73% of normal (0.33 inch). The wettest September on record, in 1947, received 1.34 inches; and the driest, in 1991 and 1999, received no precipitation.

Precipitation for October 2003 totaled 0.07 inch, 14% of normal (0.49 inch). The wettest October on record, in 1957, received 2.72 inches; and the driest (1972, 1978, and 1987) received only a trace.

Precipitation for November 2003 totaled 0.15 inch, 15% of normal (0.98 inch). The wettest November on record, in 1996, received 2.67 inches; and the driest (1976) received only a trace. A trace of snow was received in November 2003 (normal for November is 2.3 inches; the greatest November total was 18.3 inches in 1985).

Precipitation for autumn 2003 totaled 0.46 inch, 26% of normal (1.80 inches). The wettest autumn (1973) received 4.79 inches, while the driest (1976) received only 0.04 inch.

Precipitation for December 2003 totaled 1.96 inches, 177% of normal (1.11 inches). The wettest December on record, in 1996, received 3.69 inches; and the driest (1999) received 0.07 inch. The period from November 28 through December 14 (17 days) established a new record for consecutive days with precipitation. The previous record was 15 days from December 19, 1985 through January 2, 1986 (and three previous occasions). Snowfall for December 2003 totaled 8.0 inches, compared to a normal of 5.8 inches. Total snowfall for the 2003-2004 snow season (through December) was 8.0 inches, compared to a normal of 8.2 inches.

2.3 Wind

The average wind speed for 2003 was 7.8 miles per hour (mph), which was 0.2 mph above normal (7.6 mph). The windiest year was 1999, which averaged 8.8 mph, while 1957 was the year with the lightest winds, averaging 6.3 mph. The peak gust for 2003 was 60 mph on October 28.

The average wind speed for January 2003 was 5.2 mph, 1.1 mph below normal (6.3 mph). The windiest January on record averaged 10.3 mph (1972), while the January with the lightest winds (1985) averaged 2.9 mph. The peak gust for the month was 39 mph on January 2. The record wind gust for January was 80 mph in 1972.

The average wind speed for February 2003 was 7.1 mph, right at normal (7.1 mph). The windiest February on record averaged 11.1 mph (1999), while the February with the lightest winds (1963) averaged 4.6 mph. The peak gust for the month was 52 mph on February 20. The record wind gust for February was 65 mph in 1971.

The average wind speed for March 2003 was 9.3 mph, 1.3 mph above normal (8.0 mph). The windiest March on record averaged 10.7 mph (1977 and earlier years), while the March with the lightest winds (1958) averaged 5.9 mph. The peak gust for the month was 53 mph on March 5. The record wind gust for March was 70 mph in 1956.

The average wind speed for April 2003 was 7.8 mph, 1.0 mph below normal (8.8 mph). The windiest April on record averaged 11.1 mph (1972 and earlier years), while the April with the lightest winds (1958 and earlier years) averaged 7.4 mph. The peak gust for the month was 48 mph on April 9. The record wind gust for April was 73 mph in 1972.

The average wind speed for May 2003 was 8.2 mph, 0.7 mph below normal (8.9 mph). The windiest May on record averaged 10.7 mph (1983), while the May with the lightest winds (1957) averaged 5.8 mph. The peak gust for the month was 41 mph on May 14. The record wind gust for May was 71 mph in 1948.

The average wind speed for June 2003 was 9.1 mph, 0.1 mph above normal (9.0 mph). The windiest June on record averaged 10.7 mph (1983), while the June with the lightest winds (1950) averaged 7.7 mph. The peak gust for the month was 45 mph on June 18. The record wind gust for June was 72 mph in 1957.

The average wind speed for July 2003 was 8.4 mph, 0.2 mph below normal (8.6 mph). The windiest July on record averaged 10.7 mph (1983), while the July with the lightest winds (1955) averaged 6.8 mph. The peak gust for the month was 41 mph on July 12. The record wind gust for July was 69 mph in 1979.

The average wind speed for August 2003 was 7.6 mph, 0.4 mph below normal (8.0 mph). The windiest August on record averaged 9.5 mph (1996), while the August with the lightest winds (1956) averaged 6.0 mph. The peak gust for the month was 45 mph on August 19. The record wind gust for July was 66 mph in 1961.

The average wind speed for September 2003 was 7.4 mph, 0.1 mph above normal (7.3 mph). The windiest September on record averaged 9.2 mph (1961), while the September with the lightest winds (1957) averaged 5.4 mph. The peak gust for the month was 44 mph on September 12 and 19. The record wind gust for September was 65 mph in 1953.

The average wind speed for October 2003 was 8.6 mph, 2.1 mph above normal (6.5 mph). The windiest October on record averaged 9.1 mph (1946), while the October with the lightest winds (1952) averaged 4.4 mph. The peak gust for the month was 60 mph on October 28. The 8 days with peak gusts ≥40 mph tied the record for that category, also occurring in 1967. The record wind gust for October was 72 mph in 1997.

The average wind speed for November 2003 was 9.9 mph, 3.4 mph above normal (6.5 mph). The windiest November on record averaged 10.0 mph (1990), while the November with the lightest winds (1956) averaged 2.9 mph. The peak gust for the month was 54 mph on November 18. The record wind gust for November was 67 mph in 1993.

The average wind speed for December 2003 was 5.6 mph, 0.4 mph below normal (6.0 mph). The windiest December on record averaged 8.3 mph (1968), while the December with the lightest winds (1985) averaged 3.3 mph. The peak gust for the month was 36 mph on December 6. The record wind gust for December was 71 mph in 1955.

Figure 2.2 and Figure 2.3 give a composite of the wind roses (at the 30-foot and 60-meter levels, respectively) from the Hanford Meteorological Monitoring Network for 2003. The Appendix B gives the individual 2003 wind roses from the Hanford Meteorological Monitoring Network stations.

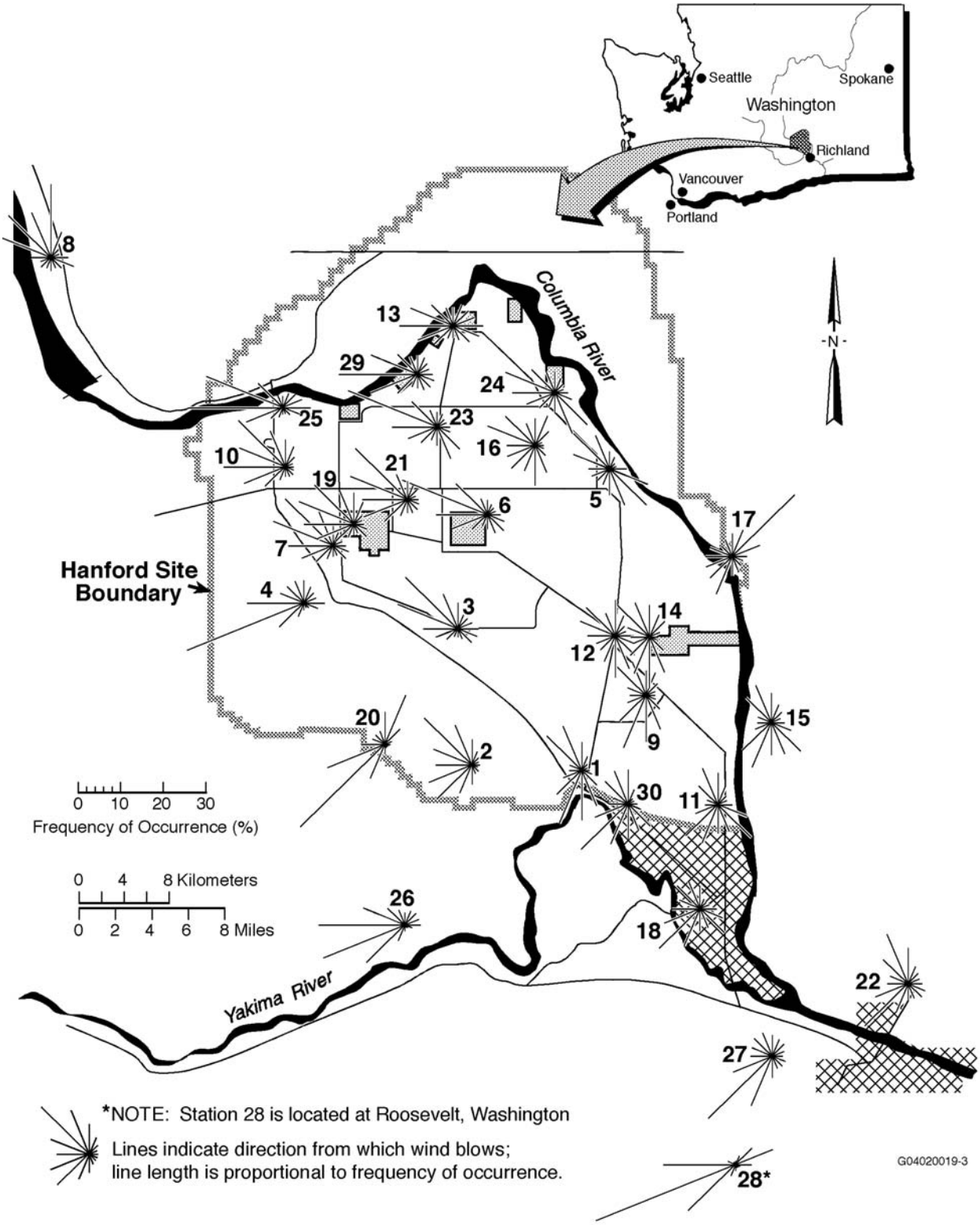

Figure 2.2. 2003 Hanford Meteorological Monitoring Network Wind Roses at 30 Feet (Refer to Table 1.1 for the names of the numbered locations on this map; see Appendix B for station-specific wind rose.)

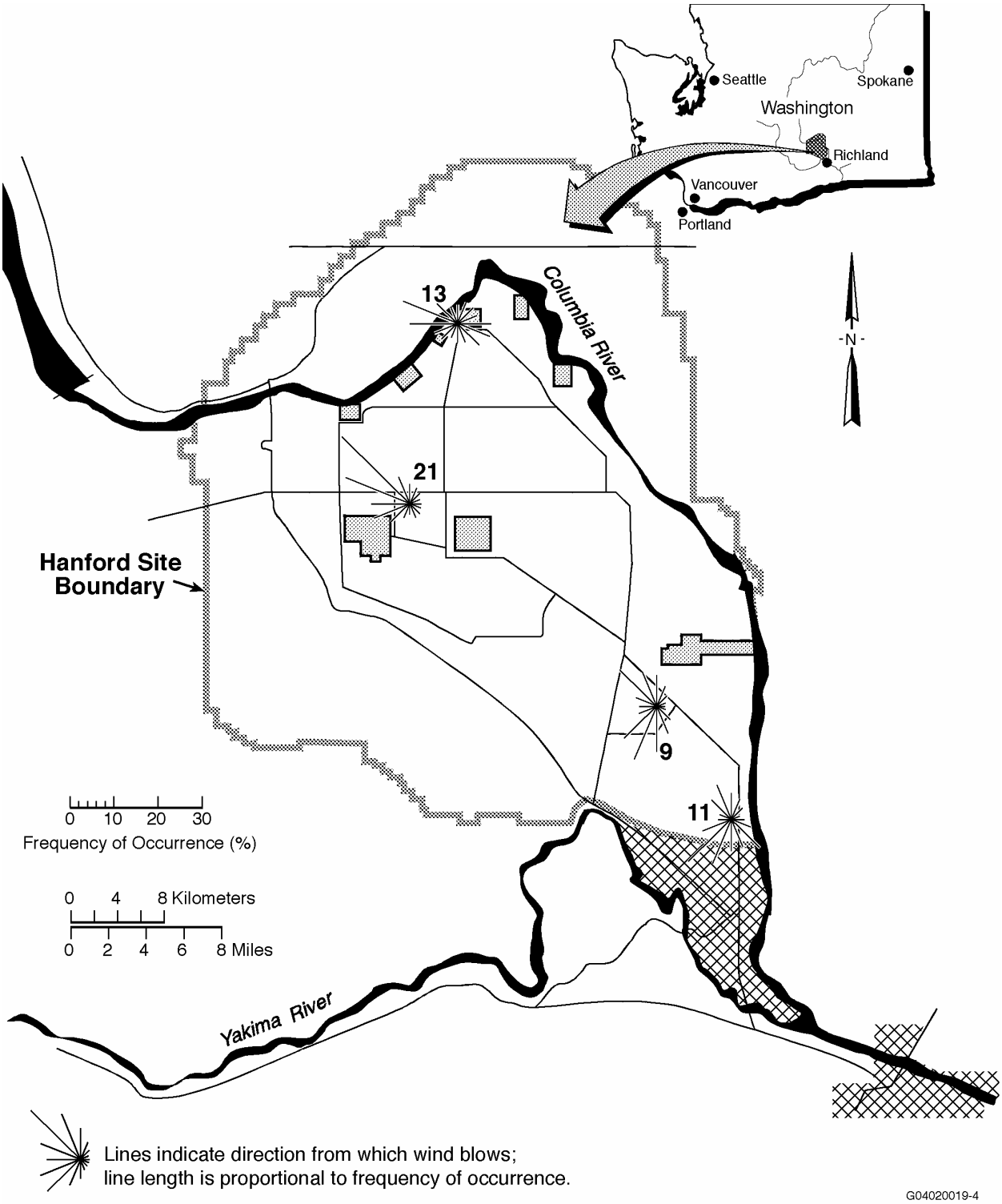

Figure 2.3. 2003 Hanford Meteorological Monitoring Network Wind Roses at 60-Meter Level (Refer to Table 1.1 for the names of the numbered locations on this map; see Appendix B for station-specific wind rose.)

3.0 Temperature Climatology

3.1 Monthly, Seasonal, and Annual Average

Monthly, seasonal, and annual average temperatures, computed from observed daily maximum and minimum temperatures for the period 1945 through 2003, are presented in Table 3.1 and Table 3.2. In these tables, the highest and lowest values representing the warmest and coldest month, season, or year, are noted. Averages are based on the entire period of record, and climatological normal temperatures are based on the period 1971 through 2000.

As indicated in Table 3.1, much wider ranges and variabilities in temperatures are found during the late autumn and winter months (November through February) than during the rest of the year. The range of average monthly temperatures for January is from 12.1°F (1950) to 42.5°F (1953), a span of 30.4°F; for November, 21.7°F; February, 18.9°F; and December, 17.5°F; whereas for the rest of the year, the monthly temperature span is from a low of 10.5°F in April to a high of 13.8°F in June. The coldest month recorded was January 1950 (12.1°F); the hottest month recorded was July 1985 (82.2°F). As shown in Table 3.2, the seasonal range is from 8.0°F during the summer (June, July, and August) to 16.4°F in winter (December, January, and February). The coldest season was the winter of 1948-1949 (24.2°F); the hottest was the summer of 1958 (78.2°F).

3.2 Days with Maximum Temperatures ≥100°F, ≥90°F, and ≤32°F

Table 3.3 contains the number of days each year with maximum temperatures in the categories ≥100°F, ≥90°F, and ≤32°F.

Maximum temperatures ≥100°F have occurred as early as May 5 (1966) and as late as September 6 (1955). The annual number of days with maximum temperatures in this category ranged from 1 to 28 (1954 and 1958, respectively). The greatest number of consecutive days with maximum temperatures ≥100°F is 11, which occurred 3 times: July 22 through August 1, 1962; August 10 through 20, 1967; and August 6 through 16, 1981.

One particularly notable period of above normal temperatures occurred July 15 through August 13, 1971. This 30-day period included 27 days with maximum temperatures ≥100°F in 3 separate periods of 9 consecutive days each. The lowest maximum temperature during the 30-day period was 98°F; the highest was 112°F. The average maximum temperature during this period was 104.7°F.

Table 3.4 lists the dates of all occurrences of maximum temperatures ≥104°F.

Table 3.1. Monthly and Annual Average Temperatures (°F)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1945	33.9	38.6	42.1	50.3	61.7	67.5	78.0	77.5	64.6	56.4	40.6	32.7	53.7
1946	34.4	39.6	45.5	53.7	64.2	66.9	76.1	76.6	63.5	49.5	35.8	34.8	53.4
1947	27.4	40.0	49.6	56.1	**68.7**[a]	67.8	75.3	71.8	65.4	53.4	41.2	33.1	54.2
1948	32.0	31.8	42.1	49.4	58.3	72.4	72.8	71.8	64.4	51.0	40.8	26.9	51.1
1949	13.9	31.8	45.2	55.5	67.0	69.3	74.9	74.8	68.3	50.2	45.2	35.1	52.6
1950	**12.1**[a]	30.7	42.3	49.9	59.0	66.5	75.4	76.4	67.5	51.1	40.7	36.2	50.6
1951	33.0	36.9	40.1	54.1	61.1	69.4	76.7	74.2	66.8	51.5	39.5	27.4	52.6
1952	25.2	36.7	44.1	55.2	62.7	67.1	77.0	74.0	69.0	59.0	34.0	34.8	53.2
1953	**42.5**[a]	41.2	46.2	51.0	58.0	**63.0**[a]	75.8	74.0	67.8	55.4	43.4	37.6	54.7
1954	28.9	39.3	41.5	51.4	62.9	65.5	73.9	71.4	65.1	51.4	46.0	34.0	52.6
1955	30.0	35.3	**39.4**[a]	**47.5**[a]	57.0	70.2	73.0	75.5	66.4	53.3	31.3	29.4	50.7
1956	31.8	**25.6**[a]	43.8	56.2	65.3	65.7	78.9	75.3	67.3	52.1	36.6	34.6	52.8
1957	16.5	34.1	44.0	55.2	65.9	70.8	74.3	72.9	69.0	50.7	40.4	**38.5**[a]	52.7
1958	37.1	**44.5**[a]	43.5	51.3	68.1	73.9	81.2	79.4	65.6	54.4	40.6	35.2	56.2
1959	32.0	35.5	45.1	54.2	57.5	68.6	77.7	71.8	62.6	53.4	36.5	33.1	52.3
1960	23.3	37.4	45.1	52.6	58.5	70.1	81.8	71.4	67.7	54.5	41.2	29.0	52.7
1961	35.0	43.7	46.1	52.3	60.0	74.0	79.4	80.2	63.8	51.6	35.3	33.7	54.6
1962	29.8	36.6	42.6	55.6	56.9	68.3	76.0	71.9	67.1	52.6	43.2	36.8	53.1
1963	25.4	38.3	46.4	49.8	61.7	69.4	72.4	75.7	71.1	56.0	42.8	30.2	53.3
1964	35.6	38.1	43.8	50.2	59.7	67.7	74.5	**69.8**[a]	63.0	53.3	38.2	25.5	51.6
1965	32.3	40.5	42.9	54.8	60.5	69.3	76.5	74.7	62.4	57.1	43.1	33.0	53.9
1966	34.0	39.9	45.4	54.6	63.2	66.9	73.3	75.6	68.8	53.4	43.7	38.2	54.8
1967	39.8	43.7	44.3	47.6	60.5	72.5	78.6	**81.5**[a]	71.8	55.1	41.5	33.1	55.8
1968	35.7	41.8	49.0	51.3	62.4	69.8	79.7	71.5	66.8	50.3	41.7	30.6	54.2
1969	19.8	31.7	45.8	52.2	64.6	75.1	76.0	72.8	67.4	51.0	40.2	34.6	52.6
1970	30.7	40.6	45.0	49.0	61.5	73.6	78.6	76.3	61.8	50.9	39.7	30.8	53.2
1971	35.8	39.1	40.7	52.0	64.0	65.3	78.7	80.5	61.5	51.7	40.4	30.6	53.4
1972	30.5	34.8	47.0	49.6	64.3	69.7	76.2	77.6	61.4	52.3	39.9	27.3	52.6
1973	29.1	38.5	47.4	53.6	63.1	68.7	78.2	73.9	65.7	52.4	38.4	38.1	53.9
1974	29.4	40.9	45.2	52.9	57.9	72.6	74.5	75.5	68.0	52.5	41.6	36.2	53.9
1975	32.5	33.7	42.5	48.2	60.2	67.2	79.5	71.0	68.0	52.5	39.5	34.5	52.4
1976	32.0	37.6	41.4	50.8	60.5	65.6	75.1	70.8	69.0	52.4	40.6	30.7	52.2
1977	25.2	40.5	45.4	57.3	56.9	72.6	73.7	79.2	61.5	52.0	38.9	33.8	53.1
1978	32.5	37.9	47.5	51.9	58.6	70.3	75.7	72.7	63.8	52.2	32.3	27.5	51.9
1979	13.9	34.2	46.5	52.8	64.1	70.8	77.2	74.6	69.2	56.5	34.2	36.4	52.5
1980	23.7	34.6	44.5	55.2	61.4	64.7	74.7	71.2	66.0	52.6	41.0	36.6	52.2
1981	38.0	39.7	48.7	54.0	60.5	66.0	73.9	79.0	66.3	52.0	42.7	32.8	54.5
1982	29.8	38.1	45.9	49.4	60.4	73.1	74.9	75.8	65.4	51.4	36.9	32.0	52.8
1983	37.5	40.9	48.5	51.1	63.8	65.4	71.3	74.4	61.7	52.6	43.6	21.2	52.7
1984	31.6	38.7	47.2	50.5	**56.0**[a]	65.7	76.1	74.0	62.1	**47.9**[a]	39.4	23.6	51.1
1985	25.0	29.9	44.0	55.5	63.2	70.2	**82.2**[a]	70.5	**58.8**[a]	49.8	**24.8**[a]	**21.0**[a]	**49.6**[a]
1986	34.0	39.1	48.6	50.9	62.3	73.0	70.6	79.2	62.2	54.7	42.3	32.4	54.1
1987	30.7	40.1	48.3	58.0	66.2	73.4	74.3	76.6	69.9	55.5	43.6	31.5	55.7
1988	31.9	41.0	45.9	55.2	61.1	69.2	77.3	75.2	65.6	**59.6**[a]	44.2	31.8	54.8
1989	37.2	27.3	43.8	56.6	61.5	72.0	75.5	73.4	67.4	54.0	44.3	33.3	53.9
1990	40.4	37.6	48.0	57.9	60.7	70.1	80.8	76.8	**72.4**[a]	52.3	**46.5**[a]	24.1	55.6
1991	28.7	**44.5**[a]	44.1	54.0	60.4	65.6	78.0	78.9	69.7	52.9	41.3	37.8	54.7
1992	37.5	42.6	**51.5**[a]	56.0	67.2	**76.8**[a]	76.6	76.9	64.5	55.7	41.2	30.0	**56.4**[a]
1993	24.8	30.8	43.2	52.5	66.5	68.4	**70.5**[a]	73.1	66.4	55.4	34.6	35.4	51.8
1994	38.6	36.0	49.2	**58.2**[a]	64.9	69.8	81.0	76.6	70.5	54.4	39.6	35.1	56.2
1995	34.2	43.1	46.1	52.6	64.5	68.1	77.1	72.0	69.9	52.1	44.1	32.6	54.7
1996	28.8	32.8	44.8	55.0	58.1	69.0	79.5	75.6	64.4	52.4	38.4	29.8	52.4
1997	33.6	40.2	47.4	51.8	65.0	68.5	75.3	78.0	66.8	53.2	43.2	34.7	54.8
1998	36.2	42.2	48.4	54.4	62.4	71.0	82.0	77.9	71.0	52.4	45.6	33.0	**56.4**[a]
1999	38.3	41.7	46.3	50.9	57.9	67.4	73.8	76.2	65.0	51.8	45.8	37.7	54.4
2000	32.9	38.7	44.7	55.4	61.2	69.9	75.5	74.0	63.6	52.1	34.0	29.8	52.6
2001	33.4	35.7	46.8	51.4	63.7	66.5	76.0	77.7	69.0	53.5	42.8	34.9	54.3
2002	37.6	38.4	42.4	53.2	60.1	71.6	79.6	75.5	66.3	50.4	41.0	37.2	54.4
2003	38.0	39.9	49.0	52.2	61.1	72.5	80.2	76.5	69.2	57.4	37.8	32.9	55.6
Average[b]	31.1	37.7	45.3	52.9	61.8	69.4	76.5	75.1	66.2	53.0	40.1	32.5	53.5
Normal	31.8	37.9	46.1	53.5	61.8	69.3	76.3	75.4	65.9	53.0	40.1	31.7	53.6

(a) Highest and lowest averages.
(b) Based on entire period of record, 1945 through 2003.

Table 3.2. Seasonal Average Temperatures (°F)

Year	Winter Dec-Feb	Spring Mar-May	Summer Jun-Aug	Autumn Sep-Nov
1945	--	51.4	74.3	53.9
1946	35.6	54.5	73.2	49.6
1947	34.1	58.1	71.6	53.3
1948	32.3	49.9	72.3	52.1
1949	**24.2**[a]	55.9	73.0	54.6
1950	26.0	50.4	72.8	53.1
1951	35.4	51.8	73.4	52.6
1952	29.8	54.0	72.7	54.0
1953	39.5	51.7	70.9	55.5
1954	35.3	51.9	70.3	54.2
1955	33.1	**48.0**[a]	72.9	50.3
1956	28.9	55.1	73.3	52.0
1957	28.4	55.0	72.7	53.4
1958	40.0	54.3	**78.2**[a]	53.5
1959	34.2	52.3	72.7	50.8
1960	31.3	52.1	74.4	54.5
1961	35.9	52.8	77.9	50.2
1962	33.4	51.7	72.1	54.3
1963	33.5	52.6	72.5	56.6
1964	34.6	51.2	70.7	51.5
1965	32.8	52.7	73.5	54.2
1966	35.6	54.4	71.9	55.3
1967	**40.6**[a]	50.8	77.5	56.1
1968	36.9	54.2	73.7	52.9
1969	27.4	54.2	74.6	52.9
1970	35.3	51.8	76.2	50.8
1971	35.2	52.2	74.8	51.2
1972	32.0	53.6	74.5	51.2
1973	31.6	54.7	73.6	52.2
1974	36.1	52.0	74.2	54.0
1975	34.1	50.3	72.6	53.3
1976	34.7	50.9	70.5	54.0
1977	32.1	53.2	75.2	50.8
1978	34.7	52.7	72.9	49.4
1979	25.2	54.5	74.2	53.3
1980	31.6	53.7	**70.2**[a]	53.2
1981	38.1	54.4	73.0	53.7
1982	33.6	51.9	74.6	51.2
1983	36.8	54.5	70.4	52.6
1984	30.5	51.2	71.9	49.8
1985	26.2	54.2	74.3	**44.5**[a]
1986	31.4	53.9	74.3	53.1
1987	34.4	57.5	74.8	56.3
1988	34.8	54.1	73.9	56.5
1989	32.1	54.0	73.6	55.2
1990	37.1	55.5	75.9	**57.1**[a]
1991	32.4	52.8	74.2	54.6
1992	39.3	**58.2**[a]	76.8	53.8
1993	28.5	54.1	70.7	52.1
1994	36.7	57.4	75.8	54.8
1995	37.5	54.4	72.4	55.4
1996	31.4	52.6	74.7	51.7
1997	34.5	54.7	73.9	54.4
1998	37.7	55.1	77.0	56.3
1999	37.7	51.7	72.5	54.2
2000	36.4	53.8	73.1	49.9
2001	32.9	54.0	73.4	55.1
2002	37.0	51.9	75.7	52.6
2003	38.4	54.1	76.4	54.8
Average[b]	33.7	53.3	73.6	53.1
Normal	33.8	53.8	73.7	53.0

(a) Highest and lowest averages.
(b) Based on entire period of record, 1945 through 2003.

Table 3.3. Monthly and Seasonal Number of Days with Maximum Temperatures (°F) Above or Below Certain Thresholds

	100°F or Above						90°F or Above								32°F or Below							
Year	May	Jun	Jul	Aug	Sep	Total	Apr	May	Jun	Jul	Aug	Sep	Oct	Total	Season	Oct	Nov	Dec	Jan	Feb	Mar	Total
1945	0	0	8	4	0	12	0	1	7	22	21	5	0	56	1944-45	--	--	--	12	1	1	14
1946	0	0	7	6	0	13	1	0	4	15	18	0	0	38	1945-46	0	2	9	0	0	0	11
1947	1	0	2	0	0	3	0	8	4	17	11	2	0	42	1946-47	0	4	4	14	0	0	22
1948	0	2	0	0	0	2	0	1	9	14	7	7	0	38	1947-48	0	0	6	8	9	0	23
1949	0	1	6	2	1	10	0	8	8	15	18	8	0	57	1948-49	0	0	13	28	8	0	49
1950	0	0	2	3	2	7	0	1	5	20	22	8	0	56	1949-50	0	0	5	24	5	1	35
1951	0	0	8	3	0	11	0	1	8	23	19	5	0	56	1950-51	0	0	2	8	2	0	12
1952	0	0	9	4	0	13	0	2	5	21	17	12	0	57	1951-52	0	0	16	19	0	0	35
1953	0	0	4	4	0	8	0	0	0	21	13	11	0	45	1952-53	0	9	6	1	0	0	16
1954	0	0	1	0	0	**1**[a]	0	2	3	20	9	3	0	37	1953-54	0	0	2	12	4	0	18
1955	0	2	5	2	2	11	0	0	9	12	19	8	0	48	1954-55	0	0	5	13	2	1	21
1956	0	0	10	5	0	15	0	7	2	22	16	7	0	54	1955-56	0	15	16	7	15	0	53
1957	0	1	1	0	0	2	0	3	8	14	8	6	0	39	1956-57	0	7	10	22	7	0	46
1958	1	6	10	11	0	**28**[a]	0	8	11	28	25	5	0	77	1957-58	0	0	2	2	0	0	4
1959	0	0	8	1	0	9	0	1	7	21	12	3	0	44	1958-59	0	3	5	8	2	0	18
1960	0	0	16	5	0	21	0	1	12	28	12	5	0	58	1959-60	0	5	7	23	1	2	38
1961	0	7	8	10	0	25	0	1	15	26	24	1	0	67	1960-61	0	0	14	10	0	0	24
1962	0	0	10	1	0	11	0	0	11	17	10	8	0	46	1961-62	0	0	7	12	2	0	21
1963	0	3	0	3	0	6	0	4	7	8	18	11	0	48	1962-63	0	0	3	14	3	0	20
1964	0	0	6	0	0	6	0	0	5	14	10	2	0	31	1963-64	0	1	11	3	0	0	15
1965	0	0	6	5	0	11	0	1	7	20	12	1	0	41	1964-65	0	0	14	5	0	0	19
1966	1	0	2	4	0	7	0	5	2	15	21	7	0	50	1965-66	0	1	8	3	0	0	12
1967	0	2	6	15	0	23	0	2	13	25	27	12	0	**79**[a]	1966-67	0	0	2	0	0	0	**2**[a]
1968	0	0	10	3	0	13	1	1	5	22	12	4	0	45	1967-68	0	0	10	4	0	0	14
1969	0	3	4	2	0	9	0	6	17	20	15	7	0	65	1968-69	0	0	7	20	4	0	31
1970	0	9	11	5	0	25	0	2	15	22	19	0	0	58	1969-70	0	3	9	15	0	0	27
1971	0	0	16	11	0	27	0	2	2	20	26	2	0	52	1970-71	0	3	11	9	1	0	24
1972	0	0	5	10	0	15	0	5	8	21	19	5	0	58	1971-72	1	0	10	9	7	0	27
1973	0	2	10	5	0	17	0	6	7	21	18	4	0	56	1972-73	0	0	14	10	0	0	24
1974	0	6	5	3	0	14	0	0	18	16	18	6	0	58	1973-74	0	4	1	12	0	0	17
1975	0	0	9	0	0	9	0	2	4	22	12	8	0	48	1974-75	0	0	0	6	6	0	12
1976	0	1	2	0	1	4	0	1	4	17	9	4	0	35	1975-76	0	3	5	7	0	0	15
1977	0	1	2	13	0	16	1	0	13	16	22	0	0	52	1976-77	0	0	12	20	3	0	35
1978	0	1	6	6	0	13	0	0	12	17	11	2	0	42	1977-78	0	5	9	6	2	0	22
1979	0	2	7	1	0	10	0	1	13	23	20	7	0	64	1978-79	0	7	11	30	4	0	52
1980	0	0	3	0	0	3	0	0	0	18	9	2	0	**29**[a]	1979-80	0	7	3	16	6	0	32

Table 3.3. (contd)

Year	100°F or Above						90°F or Above								32°F or Below							
	May	Jun	Jul	Aug	Sep	Total	Apr	May	Jun	Jul	Aug	Sep	Oct	Total	Season	Oct	Nov	Dec	Jan	Feb	Mar	Total
1981	0	0	3	13	0	16	1	0	4	19	22	11	0	57	1980-81	0	1	6	0	2	0	9
1982	0	2	5	3	0	10	0	0	15	16	17	5	0	53	1981-82	0	0	8	10	2	0	20
1983	1	0	1	0	0	2	0	8	2	9	13	0	0	32	1982-83	0	3	10	5	0	0	18
1984	0	0	3	3	0	6	0	1	4	21	16	4	0	46	1983-84	0	0	25	12	1	0	38
1985	0	1	15	0	0	16	0	3	10	30	7	0	0	50	1984-85	0	2	18	29	9	0	**58**[a]
1986	3	1	0	6	0	10	0	6	11	9	27	3	0	56	1985-86	0	15	25	5	1	0	46
1987	1	5	3	4	1	14	2	6	15	14	19	12	0	68	1986-87	0	0	7	9	0	0	16
1988	0	0	8	3	3	14	0	4	11	19	20	7	0	61	1987-88	0	0	16	11	1	0	28
1989	0	0	2	2	0	4	0	0	13	20	9	3	0	45	1988-89	0	0	11	2	8	1	22
1990	0	0	11	9	0	20	0	1	8	24	15	12	0	60	1989-90	0	2	6	0	1	0	9
1991	0	0	4	8	0	12	0	0	1	25	23	5	0	54	1990-91	0	0	15	13	0	0	28
1992	0	7	5	9	0	21	0	8	16	15	17	3	0	59	1991-92	0	0	3	0	0	0	3
1993	1	0	0	2	0	3	0	7	6	4	15	11	0	43	1992-93	0	1	11	20	8	2	42
1994	0	1	13	7	0	21	0	5	8	25	18	12	0	68	1993-94	0	6	4	1	8	0	19
1995	0	0	5	3	1	9	0	4	7	17	11	12	0	51	1994-95	0	0	5	6	2	0	13
1996	0	0	13	6	0	19	0	0	8	25	18	5	0	56	1995-96	0	0	8	9	5	0	22
1997	0	0	3	7	0	10	0	5	3	18	22	5	0	53	1996-97	0	5	12	8	2	0	27
1998	0	0	14	9	3	26	1	3	7	26	24	12	0	73	1997-98	0	0	2	5	0	0	7
1999	0	1	4	2	0	7	0	2	5	17	21	4	0	49	1998-99	0	0	7	3	0	0	10
2000	0	1	5	1	0	7	0	0	9	19	16	1	0	45	1999-2000	0	0	4	4	0	0	8
2001	1	1	4	8	0	14	0	7	3	20	21	8	0	59	2000-2001	0	5	10	6	2	0	23
2002	0	3	11	2	0	16	0	0	11	24	17	7	0	59	2001-2002	0	2	5	0	0	0	7
2003	0	1	12	3	3	19	0	2	12	26	23	9	0	72	2002-2003	0	4	3	0	0	0	7
															2003-2004	0	1	4	--	--	--	5
Average[b]	<1	1	6	4	<1	12	<1	3	8	19	17	6	0	52	Average	<1	2	8	10	2	<1	23
Normal	<1	1	6	5	<1	12	<1	3	8	19	17	6	0	52	Normal	<1	2	9	9	3	<1	23

(a) Greatest and least seasonal totals.
(b) Based on entire period of record, 1945 through 2003.
Note: Dashes indicate no data are available.

Table 3.4. Days with Maximum Temperatures ≥104°F

Temperature (°F)	Date(s) of Occurrence					
113	07/13/2002	08/04/1961				
112	07/12/2002	07/27/1998	08/09/1971			
111	07/22/1994	06/23/1992	07/31/1971			
110	08/04/1998	07/23/1990	07/20/1979	07/09/1975	08/08/1972	07/06/1968
	07/18/1960	07/17/1960				
109	07/11/2002	08/10/1996	07/24/1994	07/23/1994	07/21/1994	08/14/1992
	07/11/1990	07/19/1979	08/07/1972	08/10/1971	08/01/1971	
108	07/30/2003	07/29/2003	07/28/2003	07/23/1998	07/26/1998	07/26/1996
	07/15/1996	06/24/1992	08/05/1990	07/18/1979	07/27/1975	07/05/1975
	08/12/1971	08/11/1971	07/27/1971	07/19/1971	07/28/1968	07/08/1968
	07/04/1968	08/18/1967	08/17/1967	08/16/1967	07/31/1965	07/13/1961
	06/17/1961					
107	07/31/2000	08/13/1992	08/01/1992	07/31/1992	06/25/1992	07/14/1987
	07/29/1982	07/28/1982	08/08/1981	07/17/1979	08/18/1977	08/08/1971
	07/30/1971	07/28/1971	07/05/1968	08/03/1961	07/22/1959	07/20/1959
	07/19/1959	07/28/1958	07/14/1955			
106	07/31/2003	07/23/2003	07/22/2003	07/24/2002	07/04/2001	08/14/1998
	08/05/1998	08/14/1997	08/04/1997	07/27/1996	07/14/1996	08/02/1994
	08/18/1992	07/18/1992	06/22/1992	09/01/1987	06/30/1987	07/09/1985
	07/25/1984	07/22/1980	08/09/1978	07/23/1978	08/17/1977	08/13/1977
	07/10/1975	07/29/1973	07/15/1973	08/06/1972	07/20/1971	07/04/1970
	08/01/1965	07/12/1964	07/24/1962	06/16/1961	06/22/1958	07/19/1956
	07/09/1952					
105	07/19/2003	07/11/2003	08/12/2001	07/28/1999	08/13/1998	07/22/1998
	08/06/1997	08/05/1997	08/25/1996	07/28/1996	07/24/1996	07/19/1995
	07/17/1992	07/03/1991	07/22/1990	07/15/1990	07/26/1988	08/09/1987
	07/20/1985	07/27/1982	07/26/1982	08/16/1981	08/13/1981	08/12/1981
	08/04/1978	08/03/1978	07/04/1975	07/21/1971	07/18/1971	08/23/1970
	07/19/1970	07/16/1970	07/08/1970	07/27/1968	07/07/1968	07/03/1968
	08/30/1967	08/20/1967	08/19/1967	08/15/1967	08/13/1967	07/03/1967
	08/02/1961	08/11/1960	07/19/1960	07/07/1960	07/13/1955	08/04/1952
	07/30/1952	07/10/1952	07/20/1946	08/16/1945		
104	08/01/2003	07/18/2003	06/26/2002	08/15/2001	08/09/2000	08/03/1998
	07/25/1998	07/17/1998	08/09/1996	07/25/1996	07/23/1996	07/13/1996
	07/18/1995	07/20/1994	07/17/1994	07/10/1990	07/25/1988	07/21/1988
	07/20/1988	05/31/1986	05/30/1986	07/29/1985	07/21/1985	07/08/1985
	07/04/1985	08/07/1982	08/11/1981	08/10/1981	08/07/1981	07/27/1981
	07/04/1981	08/08/1978	07/25/1978	08/20/1977	08/12/1977	07/30/1974
	07/28/1974	08/01/1973	07/27/1973	07/19/1973	06/22/1973	08/28/1972
	08/09/1972	08/13/1971	08/07/1971	07/16/1971	07/09/1970	07/03/1970
	06/23/1970	06/21/1970	08/31/1967	08/11/1967	07/12/1967	07/30/1965
	07/25/1962	07/23/1962	08/14/1961	06/18/1961	08/10/1960	07/16/1960
	07/18/1959	08/25/1958	08/24/1958	08/11/1958	07/17/1958	07/11/1958
	08/22/1956	07/24/1956	07/23/1956	07/21/1956	07/22/1955	08/15/1953
	07/23/1951	07/17/1951	08/01/1949	07/31/1949	07/30/1949	07/15/1949
	06/29/1948	08/22/1946	08/21/1946	07/28/1946	07/21/1946	07/11/1945
	07/10/1945					

Maximum temperatures ≥90°F occur an average of 52 times per year and vary from a low of 29 times in 1980 to a high of 79 times in 1967. The earliest occurrences varied from early in the year (April 24, 1977) to late in the year (July 2, 1953), with an average annual occurrence of May 21 (Table 3.5). The latest annual occurrence of maximum temperatures ≥90°F varied from August 17 (1983) to September 29

Table 3.5. Record of Annual First and Last Dates with Maximum Temperatures ≥90°F and Minimum Temperatures ≤32°F

	Maximum Temperature ≥90°F		Minimum Temperature ≤32°F		
Year	First in Spring	Last in Summer	Last in Spring	First in Autumn	Growing Days[a]
1945	May 30	Sep 14	Apr 10	Oct 18	190
1946	Apr 25	Aug 24	Apr 07	Oct 11	186
1947	May 06	Sep 12	Apr 07	Nov 04	210
1948	May 26	Sep 13	May 02	Oct 17	167
1949	May 08	Sep 27	May 03	Oct 08	157
1950	May 26	Sep 23	Apr 27	Nov 08	194
1951	May 22	Sep 19	Apr 21	Oct 15	176
1952	May 24	Sep 26	Apr 29	Nov 01	185
1953	**Jul 02**[b]	Sep 15	Apr 15	Oct 24	191
1954	May 17	Sep 10	May 01	Oct 01	152
1955	Jun 06	Sep 10	May 14	Oct 31	169
1956	May 16	Sep 19	Apr 06	Oct 22	198
1957	May 29	Sep 15	Mar 26	Oct 22	209
1958	May 18	Sep 10	**Mar 19**[b]	Oct 21	215
1959	May 13	Sep 13	May 05	Oct 30	177
1960	May 10	Sep 18	Apr 21	Oct 11	172
1961	May 25	Sep 04	Apr 19	Oct 20	183
1962	Jun 08	Sep 26	May 04	**Nov 12**[b]	191
1963	May 20	Sep 29	Apr 16	Oct 25	191
1964	Jun 23	Sep 24	Apr 19	Oct 16	179
1965	May 28	Sep 01	May 05	Oct 16	163
1966	May 03	Sep 22	Apr 19	Oct 14	177
1967	May 20	Sep 28	Apr 28	Oct 26	180
1968	Apr 29	Sep 09	Apr 22	Oct 21	181
1969	May 09	Sep 12	Apr 26	Oct 13	169
1970	May 16	Aug 31	May 11	Oct 07	148
1971	May 11	Sep 10	Apr 22	Oct 16	176
1972	May 13	Sep 16	Apr 30	Sep 25	147
1973	May 13	Sep 11	Apr 08	Oct 04	178
1974	Jun 10	Sep 25	**May 16**[b]	Oct 06	142
1975	May 30	Sep 15	Apr 29	Oct 23	176
1976	May 16	Sep 29	Apr 23	Oct 19	178
1977	**Apr 24**[b]	Aug 22	Apr 14	Oct 27	195
1978	Jun 02	Sep 03	Apr 23	Oct 07	166
1979	May 22	Sep 20	Apr 19	Oct 31	194
1980	Jun 01	Sep 06	Apr 11	Oct 22	193
1981	Apr 30	Sep 18	Apr 13	Oct 14	183
1982	Jun 10	Sep 08	Apr 21	Oct 18	179
1983	May 23	**Aug 17**[b]	Apr 16	Oct 11	177
1984	May 29	Sep 18	Apr 13	Oct 14	183
1985	May 18	Aug 29	Apr 21	Oct 07	168
1986	May 25	Sep 04	Apr 30	Nov 09	192
1987	Apr 27	Sep 23	Apr 20	Oct 16	178
1988	May 11	Sep 14	Apr 09	Oct 27	200
1989	Jun 01	Sep 24	Mar 30	Oct 29	212
1990	May 05	Sep 29	Mar 27	Oct 17	203
1991	Jun 10	Sep 26	Apr 08	Oct 22	196
1992	May 04	Sep 03	Apr 08	Oct 15	189
1993	May 10	**Sep 29**[b,c]	Apr 06	Oct 20	196
1994	May 07	Sep 28	Mar 26	Oct 29	216
1995	May 28	Sep 17	Apr 15	Oct 29	196
1996	Jun 02	Sep 15	May 08	Oct 17	161
1997	May 12	Sep 25	May 02	Oct 08	158
1998	Apr 30	Sep 17	Apr 13	Oct 19	188
1999	May 23	Sep 22	May 08	Oct 17	163
2000	Jun 04	Sep 14	Apr 07	**Sep 23**[b]	168
2001	May 12	Sep 24	Apr 14	Oct 28	196
2002	Jun 12	Sep 15	May 8	Oct 12	156
2003	May 24	Sep 27	Apr 25	Oct 25	182
Average[d]	May 21	Sep 16	Apr 20	Oct 19	181
Normal	May 21	Sep 16	Apr 18	Oct 17	181

(a) Days between last freezing temperature in spring and first freezing temperature in autumn.
(b) Earliest and latest dates.
(c) Also in previous years.
(d) Based on entire period of record, 1945 through 2003.

(1993 and earlier years). The average date for maximum temperatures ≥90°F for the period 1946 through 2003 is September 16. The longest period of consecutive maximum temperatures ≥90°F is 32 days from July 13 through August 13, 1971.

The average seasonal number of days with maximum temperatures ≤32°F is 23. The earliest seasonal occurrence of a day with a maximum temperature ≤32°F was October 30 (1971) and the latest was March 11 (1950). The number of winter days with maximum temperatures ≤32°F varied from 2 to 58 days (winters of 1966-1967 and 1984-1985, respectively). The greatest consecutive number of days with maximum temperatures ≤32°F is 29 days, from December 30, 1984, through January 27, 1985. During the period December 27, 1978, through February 4, 1979 (40 days), only 1 maximum temperature greater than 32°F occurred. The average maximum temperature for that period was 21°F.

Table 3.6 lists the monthly and annual maximum temperatures. Only 6 days were recorded when the daily maximum temperature was ≤0°F. These were:

Maximum Date	Temperature
January 31, 1950	-2°F
February 1, 1950	-3°F
February 2, 1950	-3°F
January 27, 1957	0°F
December 29, 1968	-2°F
December 30, 1968	-2°F

3.3 Days with Minimum Temperatures ≤32°F or ≤0°F

The monthly and seasonal number of days with minimum temperatures at or below 32°F or 0°F are listed in Table 3.7.

The seasonal average number of days with minimum temperatures ≤32°F is 106; however, the number ranges from 70 to 143 days (winters of 1991-1992 and 1984-1985, respectively). The greatest consecutive number of days with minimum temperatures of ≤32°F is 93, from November 9, 1978, through February 9, 1979.

The first autumn temperature ≤32°F occurred as early as September 23 (2000) and as late as November 12 (1962). The average date is October 19 (Table 3.5). The last date in spring for minimum temperatures ≤32°F varied from March 19 (1958) to May 16 (1974), with an average date of April 20. The average number of days between last freezing temperature in the spring and first freezing temperature in the autumn is 181 days.

On average, 3 days per winter season have a minimum temperature ≤0°F; however, nearly half of all winters have no minimum temperatures in this category (Table 3.7). The greatest number of these days in any season was 18 (winter of 1949-1950) and the least number of these days was 0 (as recently as the winter of 2002-2003). The greatest number of consecutive days with minimum temperatures ≤0°F is 11 days, from January 25 through February 4, 1950. During this same period, 4 consecutive days had minimum temperatures ≤-20°F. Table 3.8 lists all days with minimum temperatures ≤0°F. Table 3.9 lists monthly and annual minimum temperatures.

Table 3.6. Monthly and Annual Maximum Temperatures (°F)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1945	61	65	72	76	90	98	104	105	93	84	72	57	105
1946	57	60	76	91	89	98	105	104	89	75	64	64	105
1947	57	68	76	88	101	97	103	98	94	83	63	55	103
1948	60	64	73	76	91	104	98	97	98	78	57	52	104
1949	48	56	64	84	98	102	104	104	100	74	65	60	104
1950	50	63	64	78	90	99	102	103	102	76	62	55	103
1951	55	65	65	82	94	97	104	101	97	79	60	58	104
1952	50	55	70	89	92	94	106	105	97	85	62	54	106
1953	63	65	69	78	88	86	103	104	97	81	65	59	104
1954	59	63	65	83	98	94	100	99	92	73	62	54	100
1955	50	58	63	77	86	102	107	101	101	75	66	56	107
1956	59	56	64	85	96	95	106	104	94	79	64	59	106
1957	48	65	66	89	97	100	102	96	98	73	60	59	102
1958	60	63	63	78	101	106	107	104	97	89	67	60	107
1959	59	60	65	79	91	97	107	103	92	77	70	64	107
1960	55	55	83	82	90	96	110	105	94	82	63	52	110
1961	60	64	68	75	94	108	108	113	90	81	58	56	113
1962	63	60	70	85	81	98	106	100	97	76	67	56	106
1963	56	64	70	72	93	102	96	101	98	83	61	57	102
1964	57	60	74	73	88	95	106	97	90	80	60	57	106
1965	60	67	71	82	91	96	108	106	91	84	64	56	108
1966	56	59	78	81	100	95	100	102	99	82	64	56	102
1967	62	67	65	71	92	101	105	108	98	78	65	62	108
1968	66	64	68	90	90	99	110	102	97	73	60	59	110
1969	44	46	74	80	95	103	101	102	96	74	63	54	103
1970	56	60	67	71	92	104	106	105	89	86	63	58	106
1971	72	66	65	76	92	99	111	112	91	85	64	50	112
1972	59	68	76	78	96	98	103	110	95	83	58	65	110
1973	51	61	68	80	98	104	106	104	98	76	62	58	106
1974	61	59	69	77	86	103	104	103	92	80	64	60	104
1975	56	58	65	75	90	95	110	98	96	82	75	62	110
1976	59	59	69	80	90	100	102	98	102	84	71	57	102
1977	61	70	73	94	82	100	101	107	87	75	68	64	107
1978	51	57	74	76	87	101	106	106	90	81	69	54	106
1979	37	62	76	83	94	102	110	101	96	84	59	59	110
1980	51	59	68	87	87	88	106	98	95	89	65	69	106
1981	55	66	70	91	89	96	104	107	99	83	65	58	107
1982	57	68	71	81	88	102	107	104	94	75	63	62	107
1983	61	62	64	77	103	92	100	99	87	78	67	46	103
1984	60	62	67	79	94	96	106	103	92	81	61	52	106
1985	36	60	68	82	95	102	106	97	86	74	66	39	106
1986	57	72	74	84	104	103	99	103	95	84	63	52	104
1987	55	60	70	93	102	106	107	105	106	87	66	59	107
1988	54	71	71	83	94	99	105	102	102	88	69	57	105
1989	67	53	67	80	88	97	101	103	94	80	73	58	103
1990	60	64	76	81	94	96	110	108	98	80	68	57	110
1991	59	66	69	82	83	93	105	103	95	88	65	59	105
1992	60	62	78	85	98	111	107	109	91	87	62	53	111
1993	56	52	66	73	100	98	96	100	98	86	65	67	100
1994	61	63	79	88	95	101	111	106	94	84	62	64	111
1995	67	68	69	80	95	98	105	102	101	74	69	57	105
1996	58	63	68	82	86	98	108	109	94	86	66	52	109
1997	57	64	76	75	94	98	101	106	95	77	63	52	106
1998	57	58	72	92	93	99	112	110	103	84	67	60	112
1999	62	62	75	82	97	102	105	101	91	81	76	62	105
2000	55	54	68	82	87	100	107	104	92	76	58	49	107
2001	56	54	70	83	101	100	106	105	95	83	68	58	106
2002	63	68	70	80	86	104	113	103	96	81	67	56	113
2003	67	62	77	78	93	100	108	104	102	89	68	51	108

Table 3.7. Monthly and Seasonal Number of Days with Minimum Temperatures (°F) at or below 32°F or 0°F

	Minimum Temperature ≤32°F										Minimum Temperature ≤0°F				
Season	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total	Nov	Dec	Jan	Feb	Total
1944-1945	--	--	--	--	27	18	12	6	0	63	--	--	0	0	0
1945-1946	0	5	14	25	27	20	10	2	0	103	0	0	0	0	0
1946-1947	0	8	23	24	27	19	6	1	0	108	0	0	1	0	1
1947-1948	0	0	11	26	25	24	21	7	1	115	0	0	0	0	0
1948-1949	0	8	15	30	31	25	11	4	1	125	0	2	9	0	11
1949-1950	0	10	4	25	30	22	18	4	0	113	0	0	14	4	**18**[a]
1950-1951	0	0	13	19	26	25	21	2	0	106	0	0	0	0	0
1951-1952	0	6	19	26	31	24	20	6	0	132	0	0	0	0	0
1952-1953	0	0	25	19	9	15	12	4	0	84	0	0	0	0	0
1953-1954	0	1	14	22	23	16	19	4	1	100	0	0	2	0	2
1954-1955	0	6	6	26	30	25	22	10	1	126	0	0	0	0	0
1955-1956	0	1	22	28	25	26	14	2	0	118	1	0	2	3	6
1956-1957	0	3	18	21	31	23	11	0	0	107	0	0	12	1	13
1957-1958	0	2	17	16	19	5	16	0	0	75	0	0	0	0	0
1958-1959	0	4	14	24	25	24	14	2	1	108	0	0	2	0	2
1959-1960	0	2	24	26	31	21	10	4	0	118	0	0	1	0	1
1960-1961	0	4	15	29	23	10	7	5	0	93	0	0	0	0	0
1961-1962	0	7	28	26	27	17	19	0	1	125	0	0	1	0	1
1962-1963	0	0	13	17	27	17	11	2	0	87	0	0	2	0	2
1963-1964	0	5	8	31	26	26	16	4	0	116	0	0	0	0	0
1964-1965	0	5	13	29	25	18	19	1	1	111	0	2	0	0	2
1965-1966	0	1	8	25	26	22	13	3	0	98	0	0	0	0	0
1966-1967	0	3	11	18	20	17	18	9	0	96	0	0	0	0	0
1967-1968	0	1	17	25	23	13	6	5	0	90	0	0	0	0	0
1968-1969	0	4	8	24	30	25	15	1	0	107	0	4	5	1	10
1969-1970	0	5	19	21	28	13	16	7	1	110	0	0	0	0	0
1970-1971	0	8	14	28	24	19	20	7	0	120	0	0	0	0	0
1971-1972	0	9	18	27	25	23	13	6	0	121	0	0	3	1	4
1972-1973	3	6	13	23	30	23	10	4	0	112	0	7	1	0	8
1973-1974	0	4	14	16	19	15	12	0	1	81	0	0	8	0	8
1974-1975	0	4	12	26	29	24	17	7	0	119	0	0	0	0	0
1975-1976	0	2	23	28	30	22	19	6	0	130	0	0	0	0	0
1976-1977	0	8	17	30	30	19	14	1	0	119	0	0	0	0	0
1977-1978	0	3	18	25	22	17	11	4	0	100	0	1	2	0	3
1978-1979	0	7	26	31	31	21	13	2	0	131	0	3	8	2	13
1979-1980	0	1	23	22	31	22	13	3	0	115	0	0	1	0	1
1980-1981	0	4	16	16	17	17	11	6	0	87	0	0	0	0	0
1981-1982	0	5	13	23	27	17	12	12	0	109	0	0	2	0	2
1982-1983	0	4	21	26	20	13	4	9	0	97	0	0	0	0	0
1983-1984	0	3	11	31	26	17	5	2	0	95	0	4	0	0	4
1984-1985	0	14	20	31	31	25	20	2	0	**143**[a]	0	4	0	3	7
1985-1986	0	7	23	31	23	17	8	4	0	113	5	1	0	0	6
1986-1987	0	0	11	29	25	17	9	2	0	93	0	0	0	0	0
1987-1988	0	3	11	25	29	22	13	2	0	105	0	0	0	0	0
1988-1989	0	1	12	23	24	25	11	0	0	96	0	0	0	4	4
1989-1990	0	2	11	25	18	20	11	0	0	87	0	0	0	0	0
1990-1991	0	2	11	27	27	14	14	2	0	97	0	8	0	0	8
1991-1992	0	6	8	18	22	11	3	2	0	**70**[a]	0	0	0	0	0
1992-1993	0	1	9	29	27	23	10	1	0	100	0	0	2	0	2
1993-1994	0	5	26	22	21	21	12	0	0	107	1	0	0	0	1
1994-1995	0	2	20	24	20	11	13	2	0	92	0	0	0	0	0
1995-1996	0	3	12	25	28	22	13	5	1	109	0	0	2	3	5
1996-1997	0	7	19	26	24	18	10	7	1	112	0	1	0	0	1
1997-1998	0	4	12	25	21	14	9	3	0	88	0	0	0	0	0
1998-1999	0	5	10	23	20	15	13	7	2	95	0	1	0	0	1
1999-2000	0	6	10	22	29	21	14	2	0	104	0	0	0	0	0
2000-2001	1	5	27	30	28	26	12	4	0	133	0	0	0	0	0
2001-2002	0	1	14	26	19	22	20	7	1	110	0	0	0	0	0
2002-2003	0	10	14	15	14	17	9	4	0	83	0	0	0	0	**0**[a,b]
Average[c]	<1	4	15	25	25	19	13	4	<1	106	<1	1	1	<1	3
Normal	<1	4	16	25	25	19	12	4	<1	105	<1	1	1	<1	3

(a) Greatest and least seasonal totals.
(b) Most recent of numerous occurrences.
(c) Based on entire period of record, 1945 through 2003.

Table 3.8. Days with Minimum Temperatures ≤0°F

Temperature (°F)	Date(s) of Occurrence					
-23	02/03/50	02/01/50				
-22	01/26/57					
-21	01/27/57	02/02/50	01/31/50			
-18	02/01/96	01/31/96	01/29/50			
-15	02/03/96					
-14	02/02/96	12/30/68	01/29/57	01/28/57		
-13	11/23/85	12/22/83	01/09/74	12/16/64	01/30/50	
-12	12/22/90	11/24/85	02/01/79	12/17/64	01/25/57	
-11	01/30/96	01/01/79	01/17/50	01/14/50	01/25/49	
-10	12/29/90 02/02/56	12/21/90 02/01/56	02/02/79	12/30/78	01/06/74	12/29/68
-9	12/23/83	01/06/79	12/31/78	01/02/78	01/08/74	
-8	12/01/85 01/16/50	01/06/82	01/07/74	12/10/72	01/23/69	01/30/57
-7	01/07/79	01/31/56	01/28/50	01/05/50		
-6	12/28/96 01/29/69 01/11/49	11/22/85 01/28/69	01/31/79 01/18/57	01/05/74 01/20/54	12/13/72 01/04/50	12/08/72 01/24/49
-5	02/05/89 01/15/50	02/04/85	01/01/78	1/10/74	12/12/72	12/09/72
-4	01/13/93 01/11/74 01/12/49	12/23/90 12/11/72	02/04/89 01/28/72	12/19/84 01/12/63	12/21/83 01/28/49	01/27/79 01/13/49
-3	02/06/89 12/29/78 01/11/63	11/25/85 12/31/77 01/17/57	02/03/85 01/31/69	12/18/84 01/30/69	01/10/80 12/31/68	01/08/79 12/28/68
-2	12/31/90 01/04/74 01/10/49	12/30/90 12/14/72 12/27/48	12/20/90 01/22/62	12/21/84 01/31/57	12/20/84 01/19/57	01/05/79 01/20/49
-1	12/21/98 02/01/69 01/30/56	11/24/93 01/18/60 11/14/55	11/26/85 01/04/59 02/04/50	01/08/73 02/02/57 01/25/50	02/03/72 01/16/57 01/13/50	01/26/72 02/03/56
0	01/11/93 01/28/79 01/26/50	12/24/90 01/27/72 01/04/49	02/02/89 01/03/59 12/26/48	02/06/85 01/24/57 01/15/47	12/27/83 01/21/54	01/07/82 01/27/50

Table 3.9. Monthly and Annual Minimum Temperatures (°F)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1945	21	14	10	28	38	46	53	47	35	26	16	13	10
1946	18	18	25	30	33	44	50	49	35	21	16	6	6
1947	0	11	23	32	42	45	53	50	40	34	22	16	0
1948	14	1	13	28	32	51	49	47	34	22	20	-2	-2
1949	-11	3	27	30	31	42	49	47	38	23	28	10	-11
1950	-21	-23	20	27	38	44	49	51	38	34	21	22	-23
1951	6	18	22	26	37	41	51	47	39	27	23	4	4
1952	5	16	24	27	37	42	49	46	42	34	7	17	5
1953	24	20	23	27	36	40	52	51	37	30	24	20	20
1954	-6	17	18	26	28	41	45	48	36	26	23	14	-6
1955	18	15	6	26	31	42	43	48	37	32	-1	9	-1
1956	-7	-10	15	28	38	40	54	49	39	31	15	2	-10
1957	-22	-1	28	34	48	48	51	52	36	32	20	23	-22
1958	16	29	23	34	38	47	49	53	34	30	9	21	9
1959	-1	19	25	30	30	41	49	49	41	26	6	14	-1
1960	-1	10	13	30	33	46	52	41	40	30	22	14	-1
1961	16	27	25	31	38	44	50	56	36	26	10	3	3
1962	-2	7	15	33	31	37	42	49	40	34	16	16	-2
1963	-4	8	22	28	36	45	49	49	45	23	17	7	-4
1964	15	19	15	30	35	45	50	44	39	30	20	-13	-13
1965	10	18	14	32	32	48	50	42	33	30	26	10	10
1966	17	19	19	26	37	38	48	50	43	29	22	22	17
1967	23	20	20	27	34	47	52	56	43	30	17	6	6
1968	10	15	25	23	33	42	51	47	39	30	23	-14	-14
1969	-8	-1	22	31	38	52	53	45	41	29	19	19	-8
1970	8	21	24	26	30	46	50	52	34	23	11	8	8
1971	8	15	15	27	36	44	44	51	38	13	21	5	5
1972	-4	-1	24	26	36	45	50	49	30	20	24	-8	-8
1973	-1	21	26	27	34	45	46	46	43	31	16	14	-1
1974	-13	23	21	33	32	41	48	48	40	29	24	17	-13
1975	14	10	19	21	33	38	53	46	44	26	15	14	10
1976	16	10	11	25	35	37	47	44	42	28	13	12	10
1977	4	21	24	31	34	39	49	48	36	28	9	-3	-3
1978	-9	17	25	30	37	44	50	47	41	21	7	-10	-10
1979	-11	-12	20	29	38	45	39	53	42	32	13	19	-12
1980	-3	19	25	28	38	40	47	42	41	30	18	9	-3
1981	23	8	24	24	35	40	45	48	34	27	19	8	8
1982	-8	9	24	24	33	47	45	51	41	26	18	13	-8
1983	12	15	29	27	37	40	49	50	35	29	22	-13	-13
1984	10	24	25	30	33	37	51	47	36	12	25	-4	-4
1985	5	-5	21	26	33	44	56	46	33	26	-13	-8	-13
1986	12	15	29	28	37	43	48	54	38	33	16	18	12
1987	9	18	24	30	38	43	49	51	41	31	17	9	9
1988	14	9	24	31	35	42	47	52	38	32	28	8	8
1989	15	-5	14	35	39	46	49	52	44	27	21	19	-5
1990	22	9	24	37	39	47	46	52	48	31	28	-12	-12
1991	5	26	22	31	38	44	55	47	42	23	23	20	5
1992	19	22	32	27	37	49	54	43	40	30	17	12	12
1993	-4	3	17	32	35	46	50	43	37	29	-1	21	-4
1994	20	5	19	35	36	44	50	53	47	30	19	8	5
1995	8	8	21	28	39	47	52	45	42	16	17	16	8
1996	-18	-18	18	30	29	45	49	48	34	34	17	-6	-18
1997	8	20	28	25	30	46	49	52	44	29	23	19	8
1998	7	22	23	29	39	47	58	50	43	25	27	-1	-1
1999	18	20	25	25	30	38	45	43	36	27	26	20	18
2000	18	21	24	29	33	43	44	49	32	30	18	13	13
2001	20	17	23	28	34	44	53	50	38	31	26	16	16
2002	13	16	18	29	32	46	50	50	38	7	11	23	7
2003	22	15	27	24	34	45	52	53	41	19	13	8	8

3.4 Monthly Extremes of Daily Maximum and Minimum Temperatures

Monthly extremes of daily maximum and minimum temperatures are presented in Table 3.10. Note that ranges are comparable in the winter and in the summer. February temperatures ranged from 72°F to -23°F, a range of 95°F. July temperatures ranged from 112°F to 39°F, a range of 83°F.

3.5 Daily Temperature Distributions

Daily temperatures are generally described relative to a long-term average temperature or to a record high or low temperature. For example, the daily maximum temperature may be described as above average or near the record for the day. However, this type of description does not provide information about whether the temperature is in the range of temperatures that is typical for the day. Figure 3.1 shows an example of a different way of presenting temperature information that places the temperatures in the context of the climatological records. The figure shows the record low and high daily maximum temperatures at the Hanford Meteorology Station for January 7 based on climatological records from 1945 through 2003. Between the record low and high temperatures, the figure has a bar that shows the range of daily maximum temperatures that have occurred 70% of the time centered on the median. This range can be considered the range of typical daily maximum temperatures for the date. In 15% of the years, the daily maximum temperature has been above the range, and in 15% of the years, it has been below the range. On the bar there is a horizontal mark that indicates the median daily maximum temperature. The median temperature is the daily maximum temperature that has been exceeded in 50% of the years of record. For the Hanford Meteorology Station, the median daily maximum temperature is generally quite close to the long-term average daily maximum temperature. Finally, there is a solid square on the bar. The solid square shows the daily maximum temperature for January 7, 2002. A similar presentation can be prepared for daily minimum temperatures. Figure 3.2 through 3.25 show daily maximum and daily minimum temperature data by month and the data for 2003.

3.6 Average Daily Temperature Range

Table 3.11 represents the average daily temperature range by month and year for the period 1945 through 2003. This statistic is compiled by determining each daily temperature range (the difference between the maximum and minimum temperature), totaling for every day of the month, and dividing by the number of days in the month. As can be seen from the table, the average daily temperature ranges for July and August (>30°F) are more than double the ranges for December and January (<15°F). The lowest average daily temperature range was 6.8°F in January 1985; the greatest was 34.5°F in August 1967. The greatest range for any single day was 48°F on August 14, 1995 (high of 93°F, low of 45°F) and also on May 11, 1946 (high of 86°F, low of 38°F). The smallest range for any single day was 1°F as recently as December 25, 2000 (high of 31°F, low of 30°F).

3.7 Normal and Extreme Daily Temperatures

Table 3.12 lists the normal and extreme daily maximum and minimum temperatures. Climatological normals are computed every 10 years and are based on a 30-year period, ending with the first year of each new decade. This table is using normals based on the period 1971 through 2000. The normal temperatures in Table 3.12 are computed using a 7-day running mean, centered on each day.

Table 3.10. Monthly Normal Temperature (°F) and Monthly Extremes of Maximum and Minimum Temperatures (°F)

	Normal (1971-2000)			Daily Extreme											
				Maximum						Minimum					
Month	Maximum	Minimum	Mean	High	Day	Year	Low	Day	Year	High	Day	Year	Low	Day	Year
Jan	39.0	24.7	31.8	72	31	1971	-2	31	1950	53	30	1971	-22	26	1957
Feb	47.1	28.7	37.9	72	25	1986	-3	1	1950	60	24	1986	-23	3	1950
				72	24	1986							-23	1	1950
Mar	57.8	34.3	46.1	83	25	1960	24	3	1960	50	15	1992	6	5	1955
										50	5	1987			
										50	3	1987			
Apr	66.8	40.2	53.5	94	24	1977	41	7	1945	64	28	1987	21	5	1975
May	75.7	47.9	61.8	104	31	1986	51	11	1967	71	29	1986	28	1	1954
				104	30	1986									
Jun	83.6	55.1	69.3	111	23	1992	55	3	1966	80	24	1992	37	3	1962
													37	2	1976
													37	1	1984
Jul	91.6	61.1	76.3	113	13	2002	59	2	1966	82	23	1994	39	2	1979
Aug	90.7	60.1	75.4	113	4	1961	64	31	1999	81	4	1961	41	22	1960
Sep	80.6	51.3	65.9	106	1	1987	52	22	1984	72	7	1955	30	27	1972
													30	25	1972
Oct	65.8	40.2	53.0	89	21	2003	32	30	1971	65	21	2003	7	31	2002
				89	4	1980									
				89	3	1958									
Nov	48.5	31.7	40.1	76	13	1999	6	24	1985	60	9	1989	-13	23	1985
Dec	38.4	25.0	31.7	69	26	1980	-2	30	1968	56	2	1975	-14	30	1968
							-2	29	1968						
Annual	65.5	41.7	53.6	113		7/13/02	-3		2/1/50	82		7/23/94	-23		2/3/50
						8/4/61									2/1/50

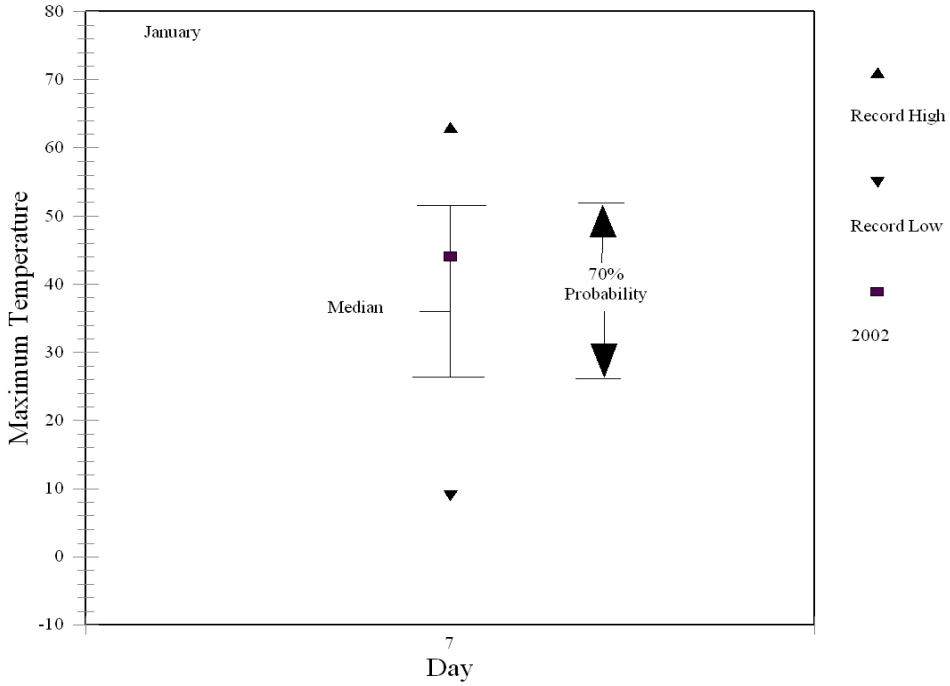

Figure 3.1. Graphical Presentation of Daily Maximum Temperatures

Four possible temperature extremes are presented for each day, a record high and low maximum and a record high and low minimum. These daily records, plus the year of occurrence for the period 1945 through 2002, also are indicated in Table 3.12.

3.8 Heating- and Cooling-Degree Days

Data about heating- and cooling-degree days are generally used by the utility industry and those involved in building design to assess heating and cooling energy requirements. A temperature of 65°F is generally used as the basis for this calculation. To determine whether a day has either heating-degree days or cooling-degree days, 65 is subtracted from the daily average temperature (computed by adding the daily maximum and minimum temperatures and dividing by two). If the difference is positive, the day has cooling-degree days. If the difference is negative, the day has heating-degree days.

Example Calculations

	Summer Day	Winter Day
Daily high temperature	90	42
Daily low temperature	60	20
Daily average temperature	75 (150÷2)	31 (62÷2)
Threshold temperature	-65	-65
Difference	10 (10 CDDs)*	-34 (34 HDDs)*

*CDDs = cooling-degree days; HDDs = heating-degree days.

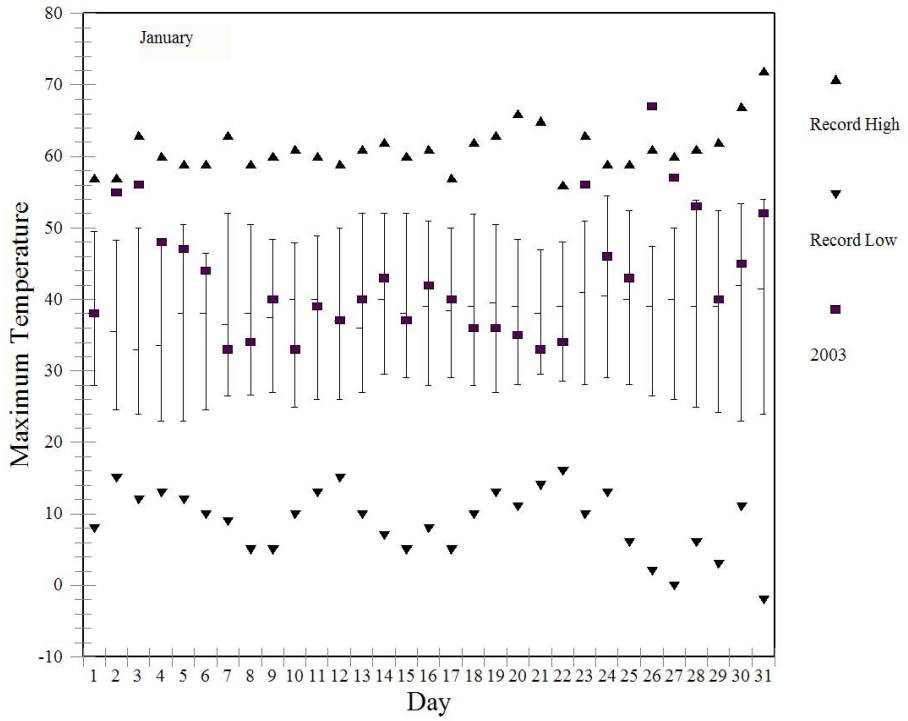

Figure 3.2. Daily Maximum Temperatures (°F), January 2003

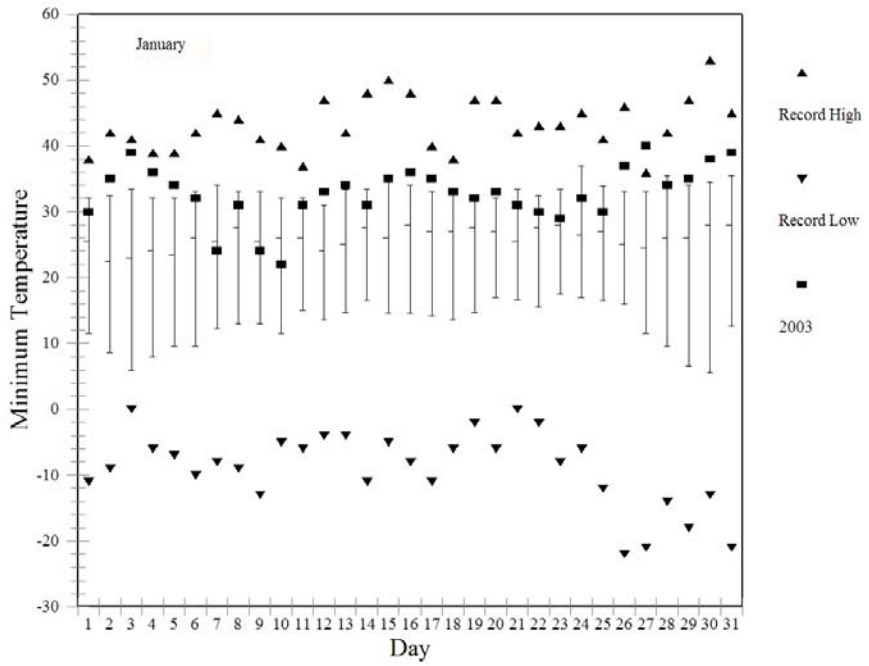

Figure 3.3. Daily Minimum Temperatures (°F), January 2003

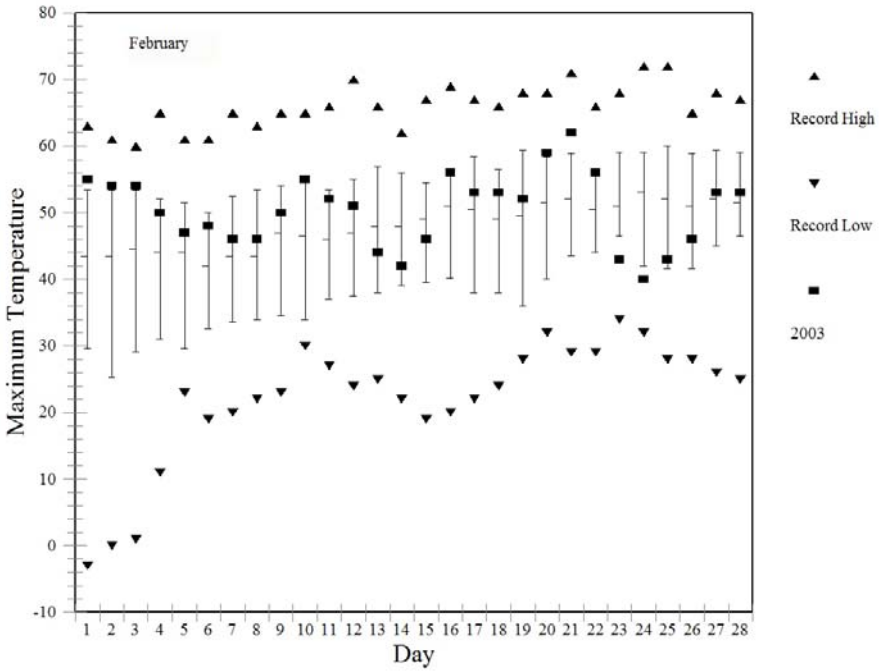

Figure 3.4. Daily Maximum Temperatures (°F), February 2003

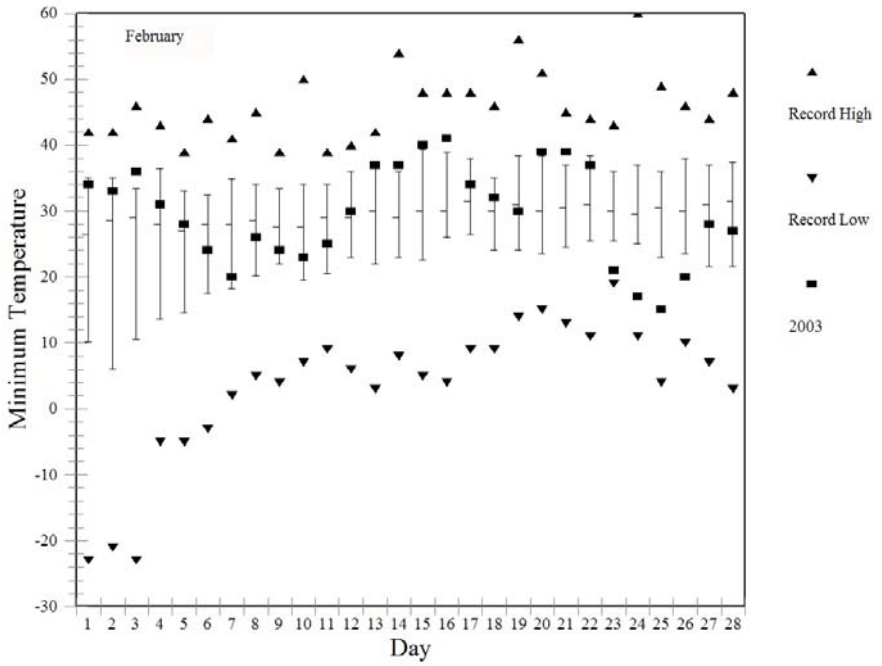

Figure 3.5. Daily Minimum Temperatures (°F), February 2003

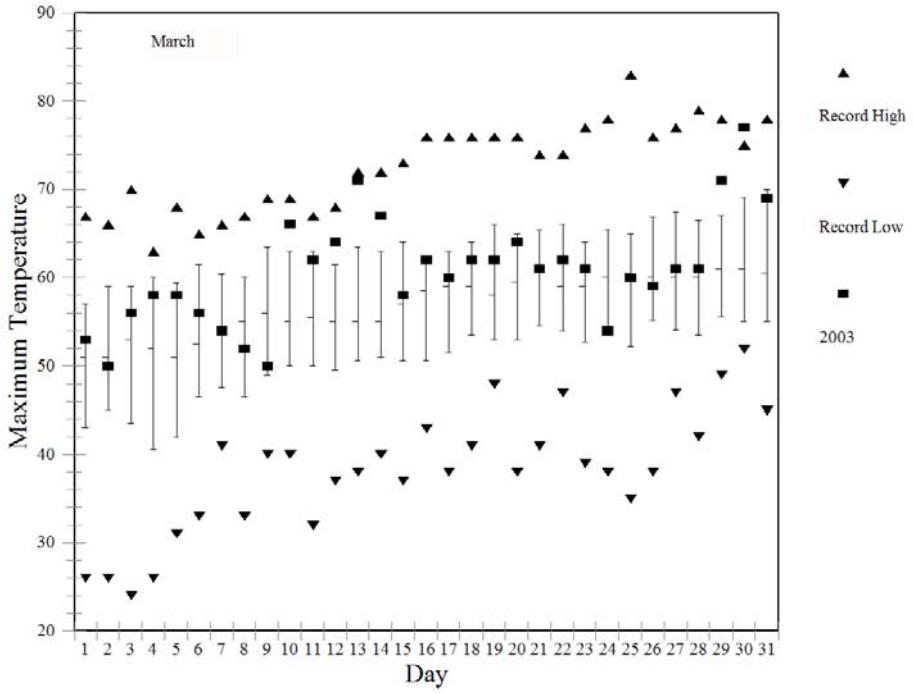

Figure 3.6. Daily Maximum Temperatures (°F), March 2003

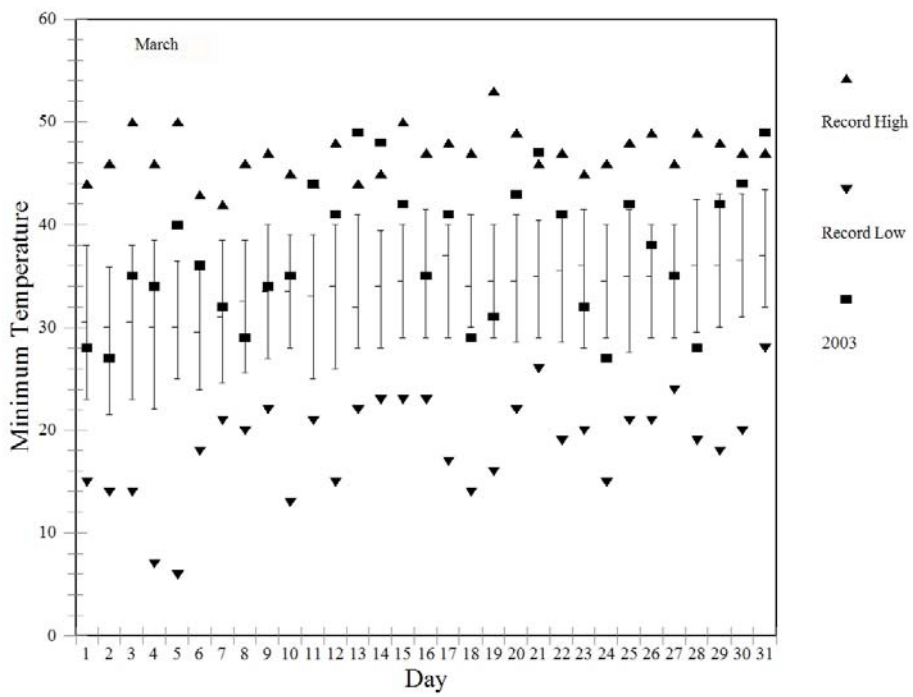

Figure 3.7. Daily Minimum Temperatures (°F), March 2003

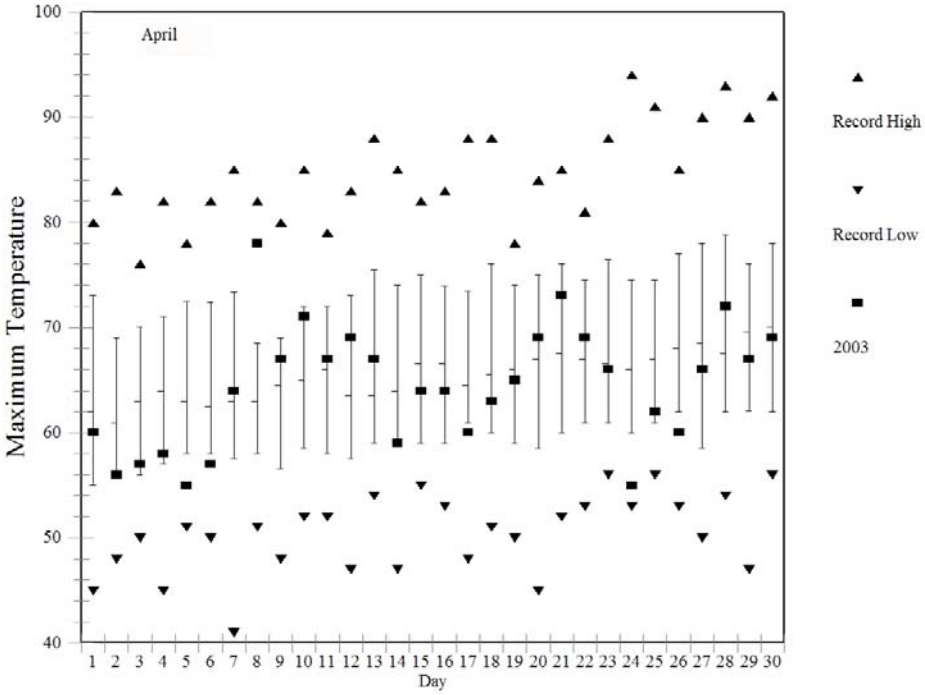

Figure 3.8. Daily Maximum Temperatures (°F), April 2003

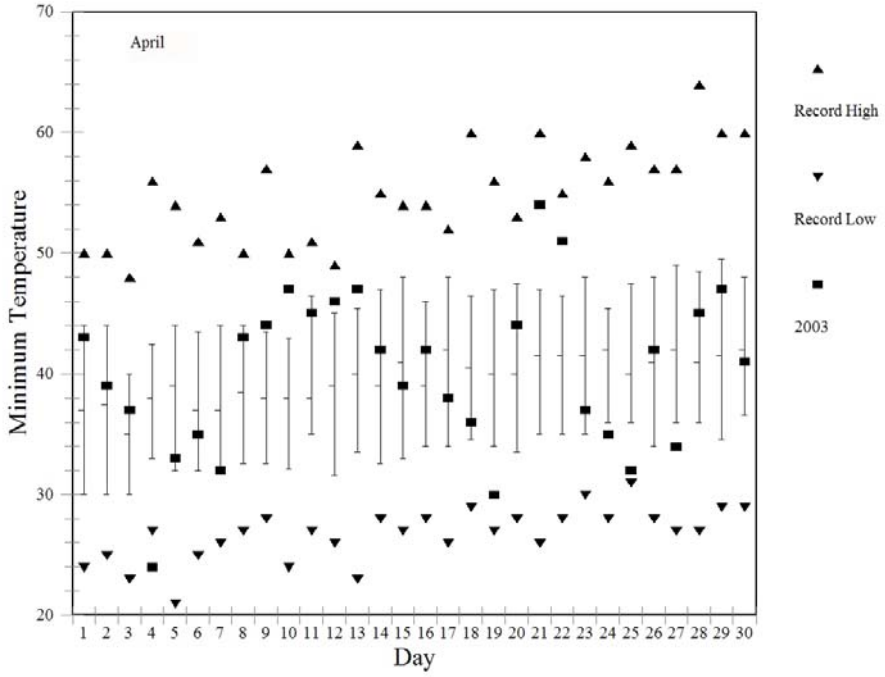

Figure 3.9. Daily Minimum Temperatures (°F), April 2003

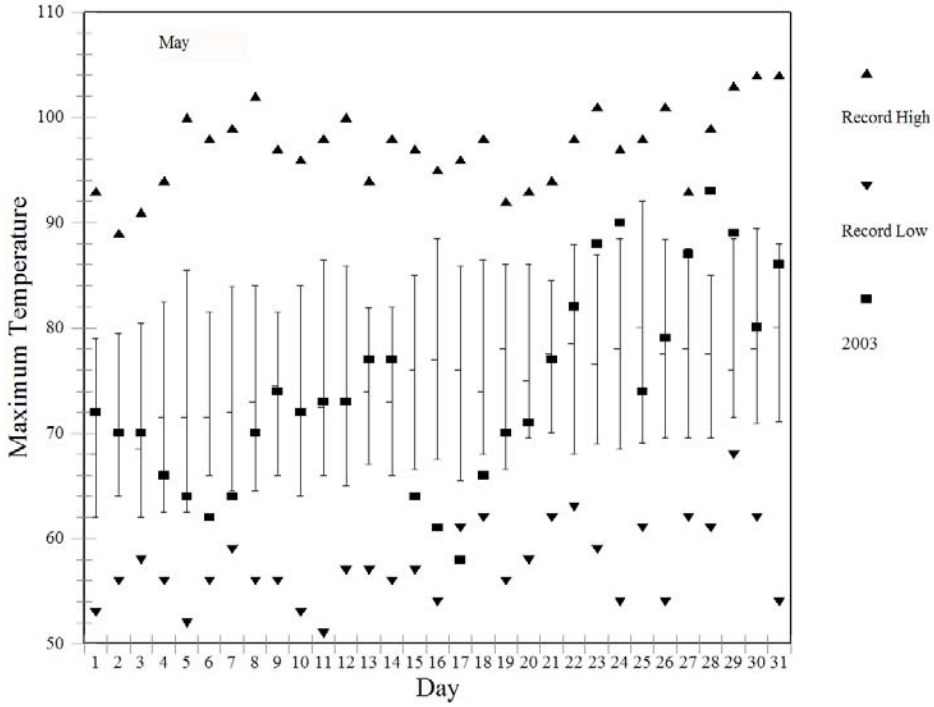

Figure 3.10. Daily Maximum Temperatures (°F), May 2003

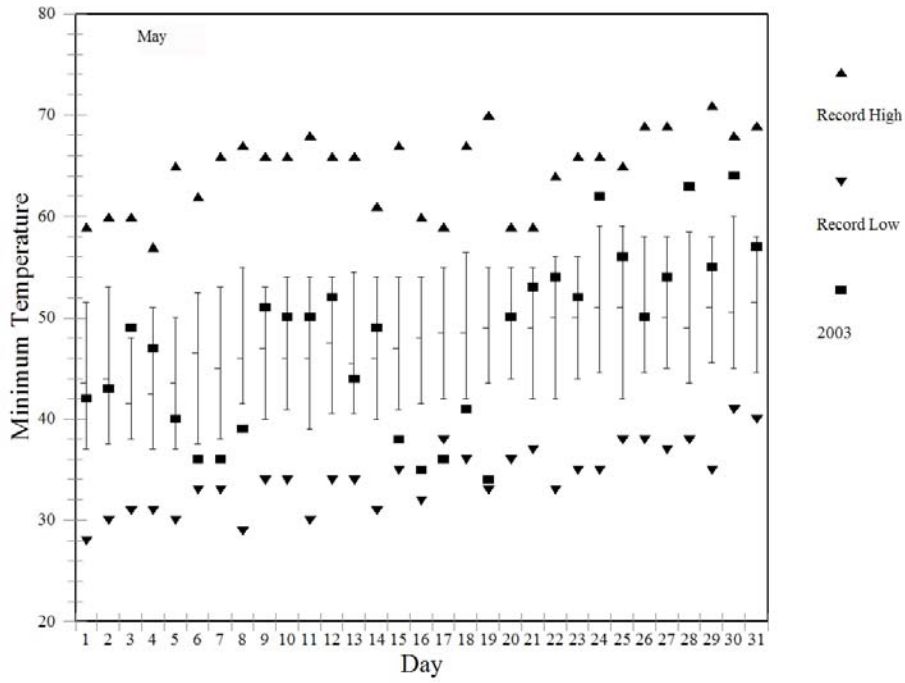

Figure 3.11. Daily Minimum Temperatures (°F), May 2003

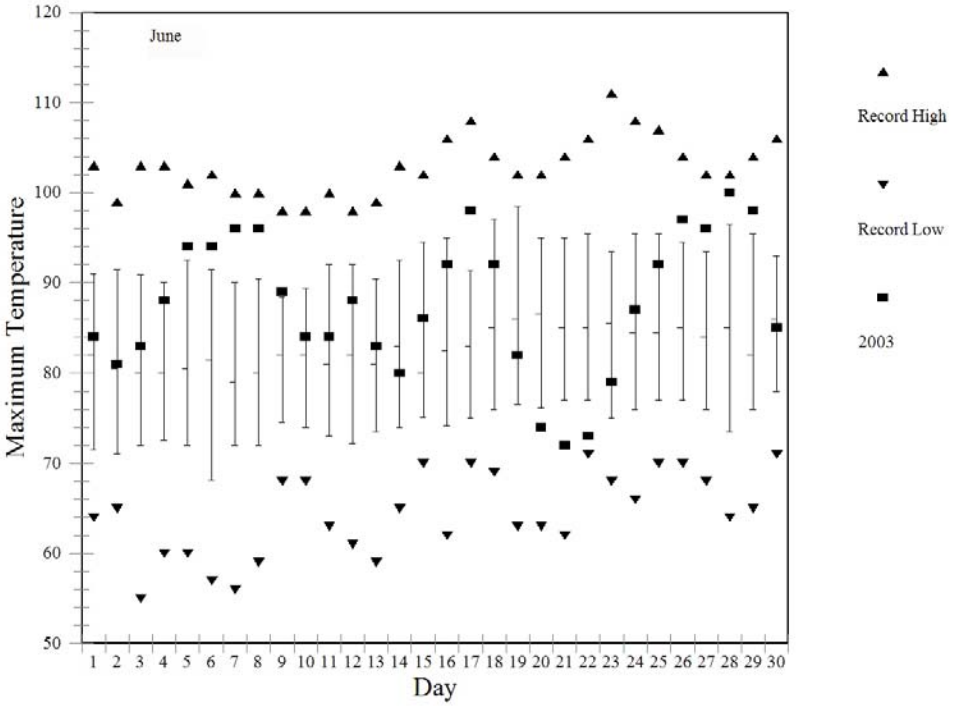

Figure 3.12. Daily Maximum Temperatures (°F), June 2003

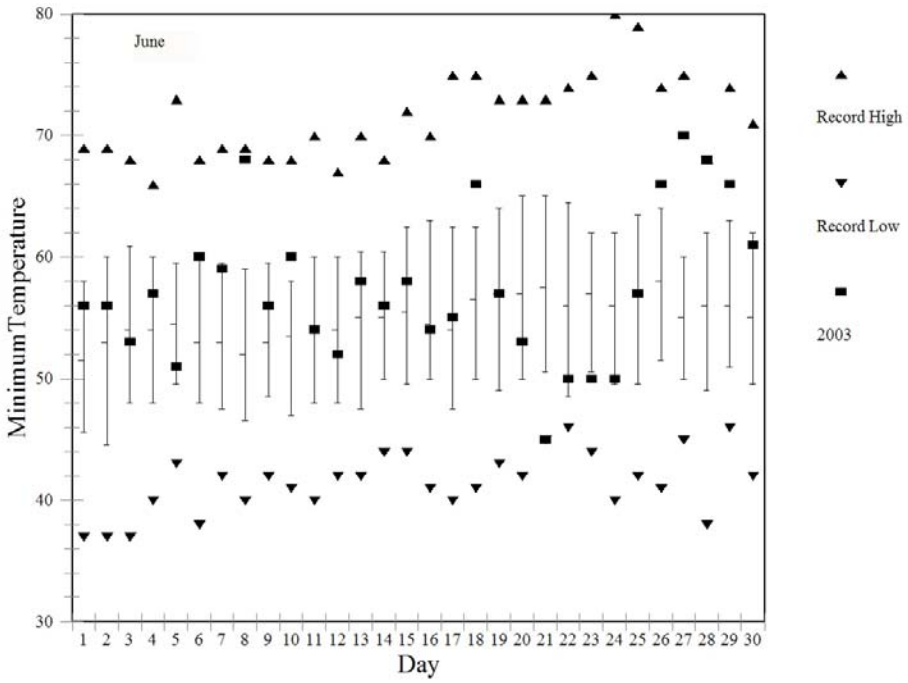

Figure 3.13. Daily Minimum Temperatures (°F), June 2003

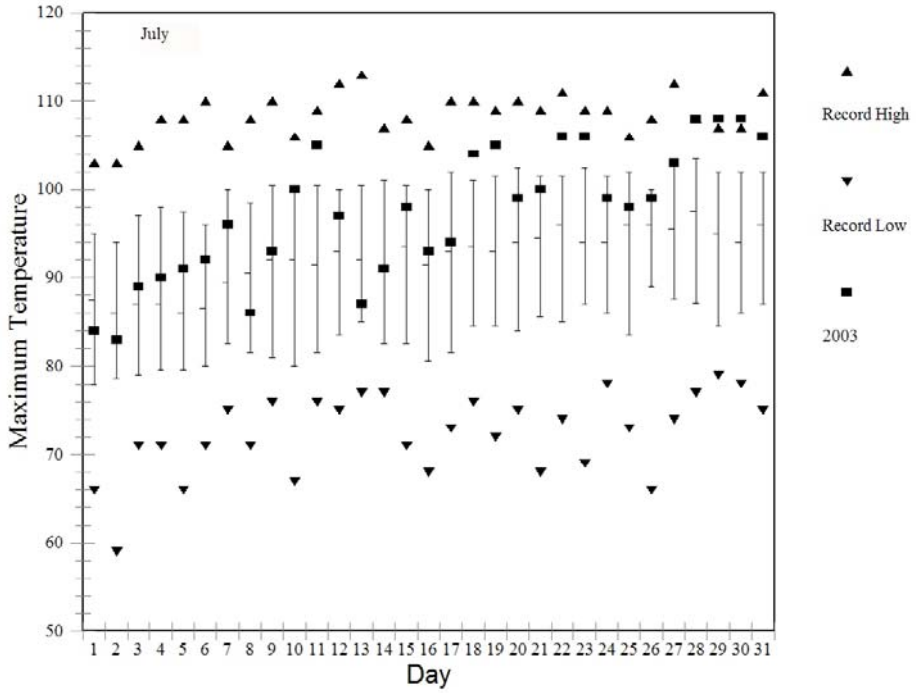

Figure 3.14. Daily Maximum Temperatures (°F), July 2003

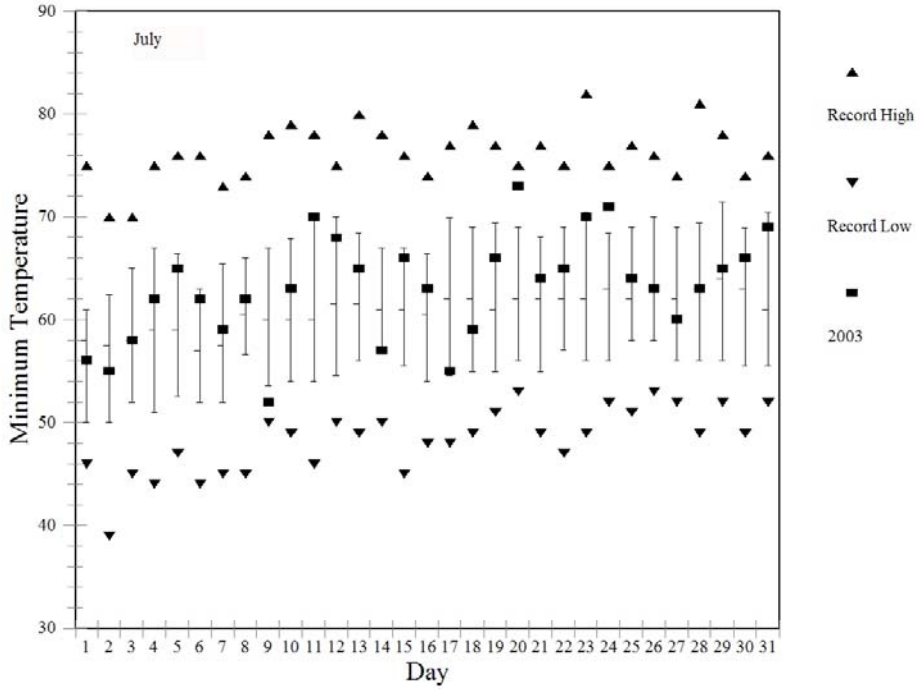

Figure 3.15. Daily Minimum Temperatures (°F), July 2003

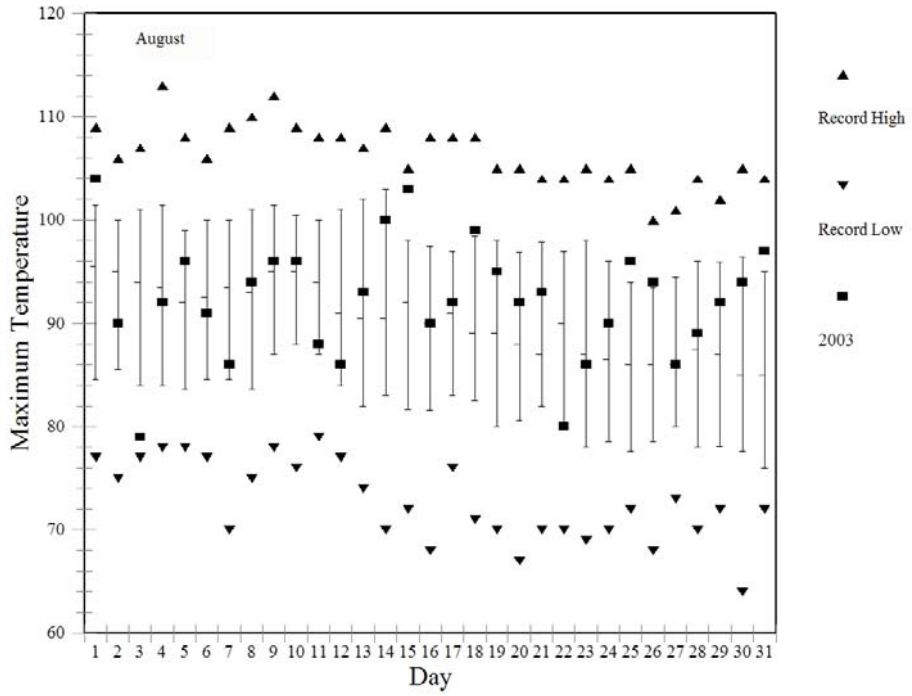

Figure 3.16. Daily Maximum Temperatures (°F), August 2003

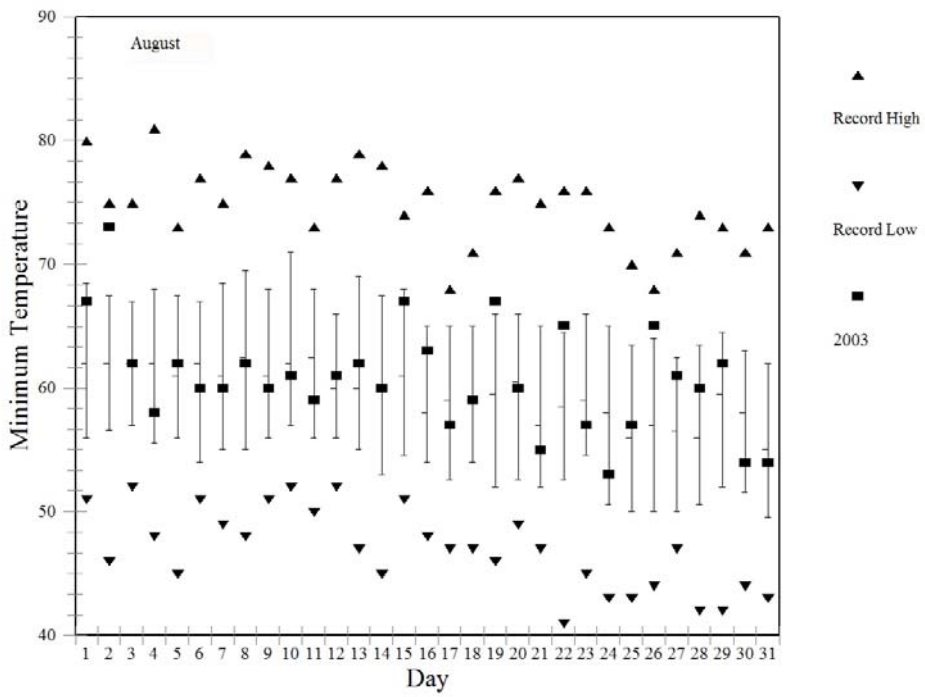

Figure 3.17. Daily Minimum Temperatures (°F), August 2003

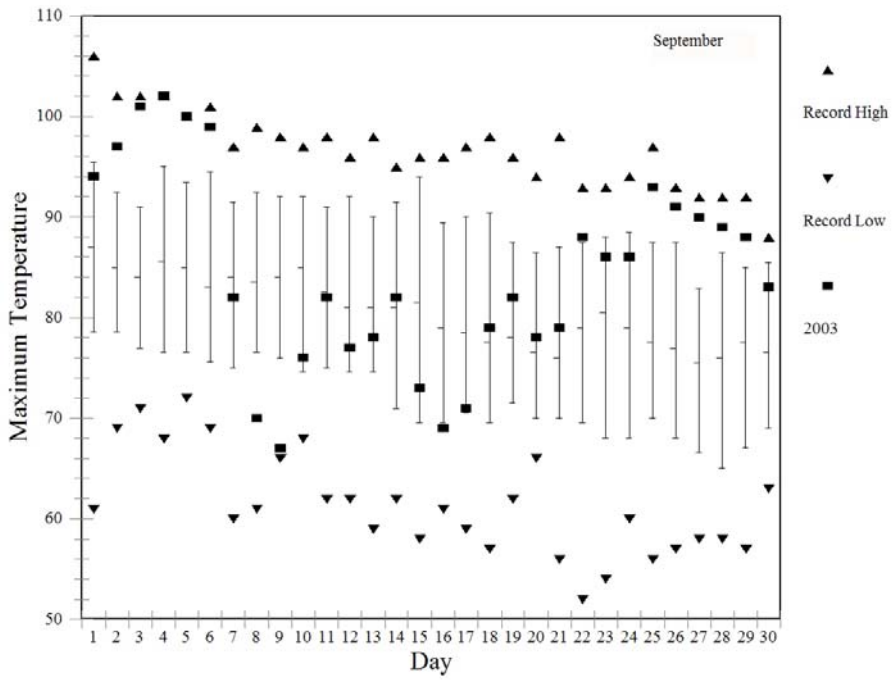

Figure 3.18. Daily Maximum Temperatures (°F), September 2003

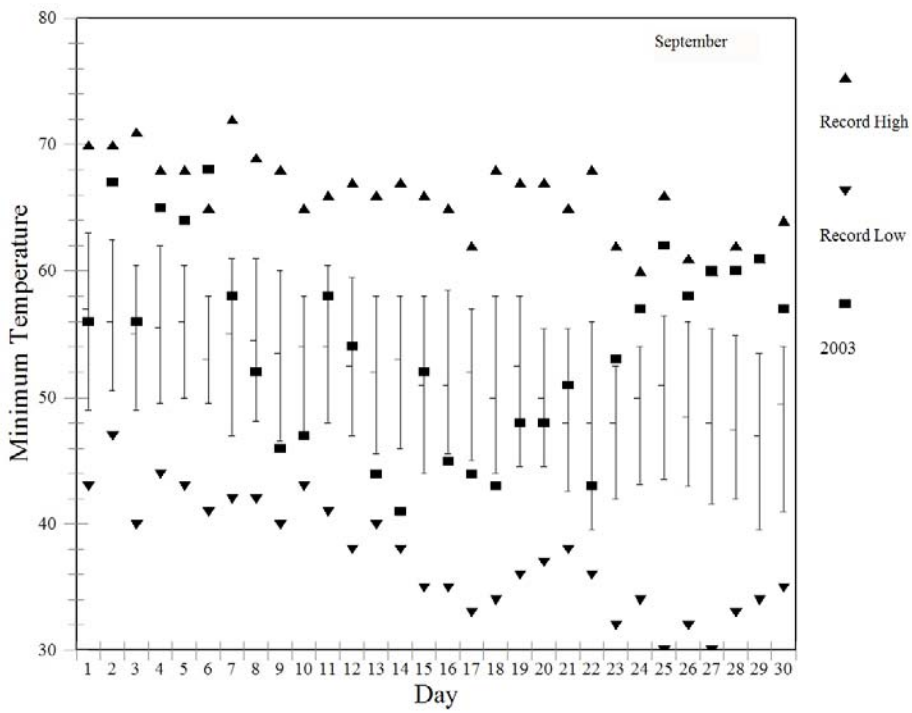

Figure 3.19. Daily Minimum Temperatures (°F), September 2003

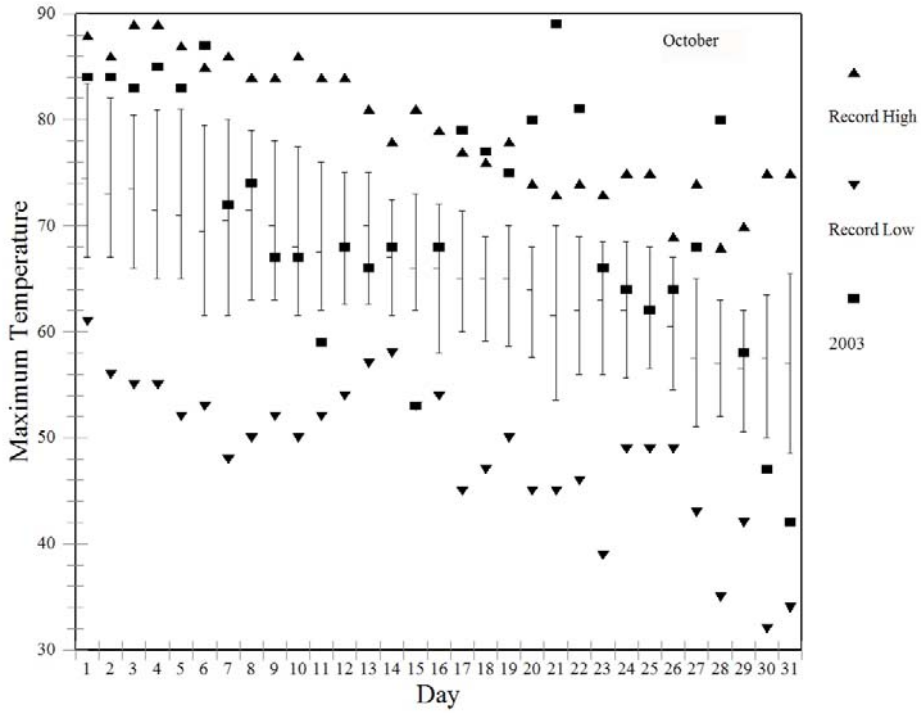

Figure 3.20. Daily Maximum Temperatures (°F), October 2003

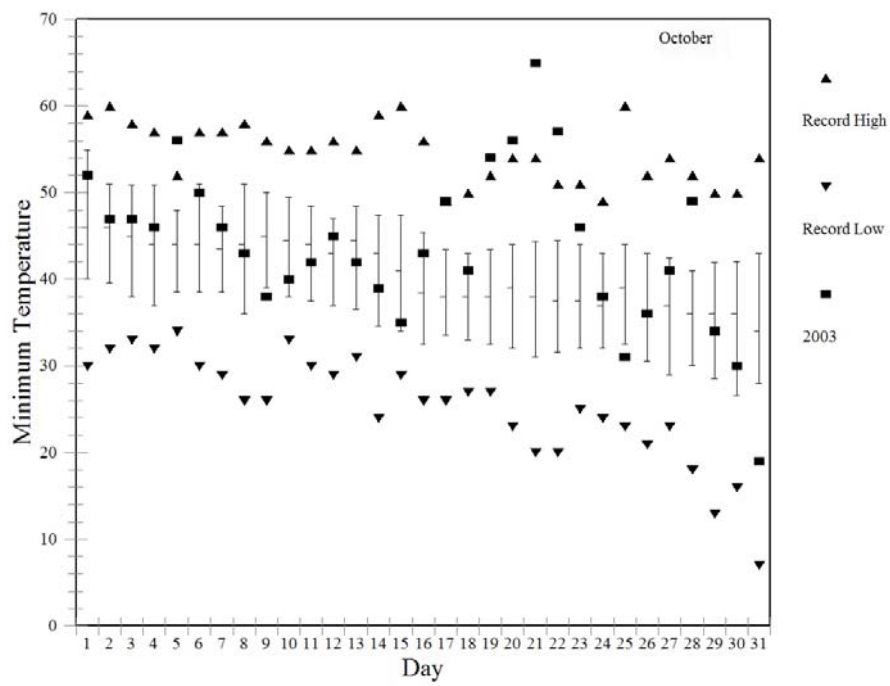

Figure 3.21. Daily Minimum Temperatures (°F), October 2003

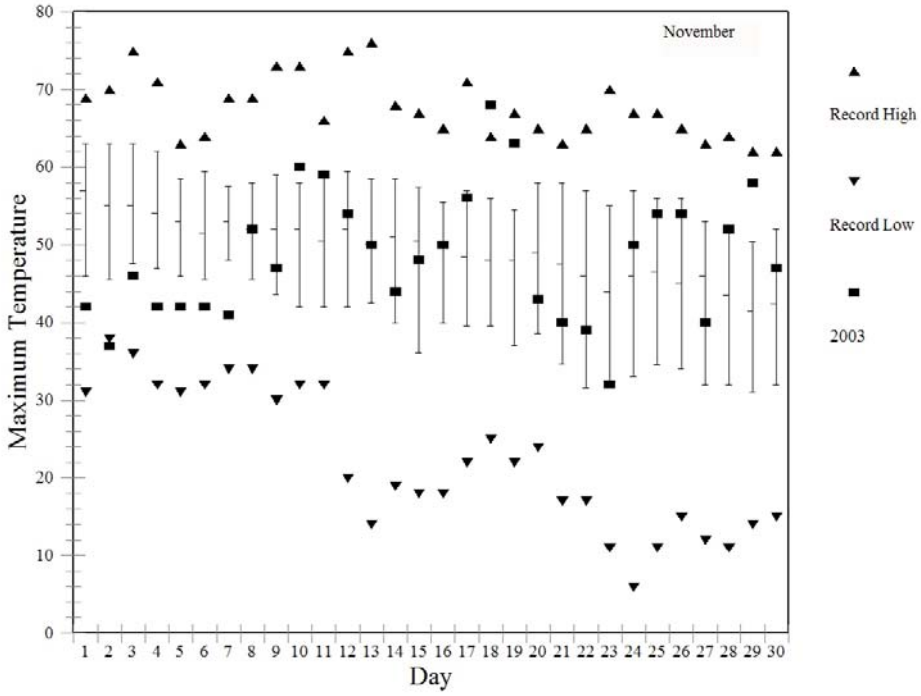

Figure 3.22. Daily Maximum Temperatures (°F), November 2003

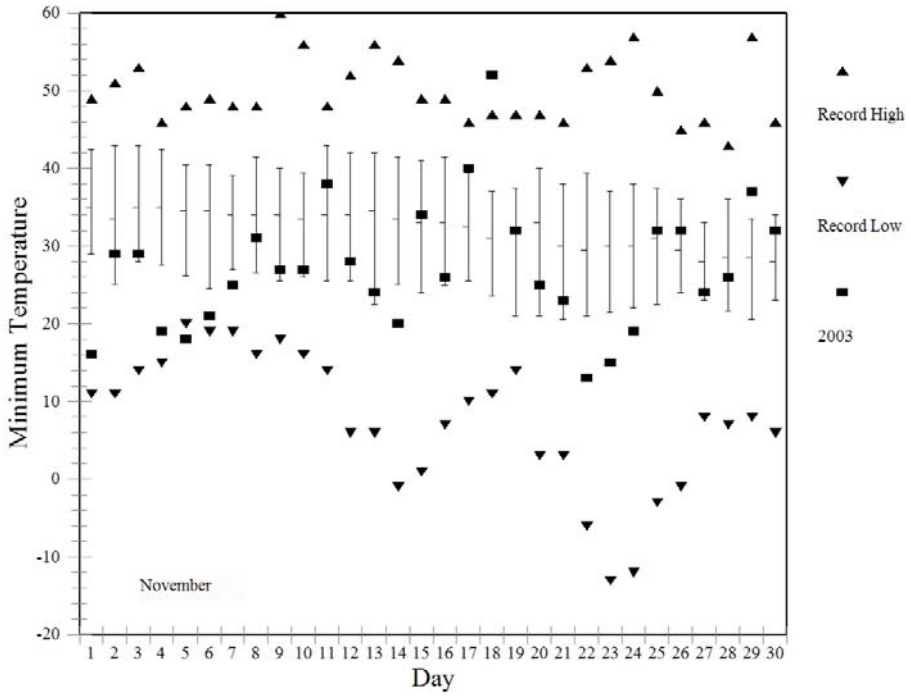

Figure 3.23. Daily Minimum Temperatures (°F), November 2003

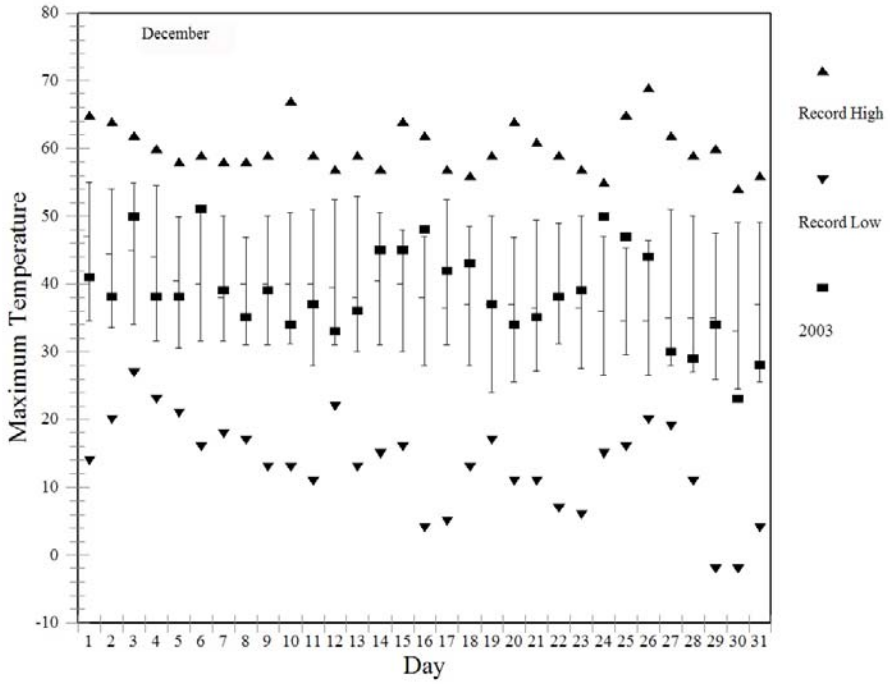

Figure 3.24. Daily Maximum Temperatures (°F), December 2003

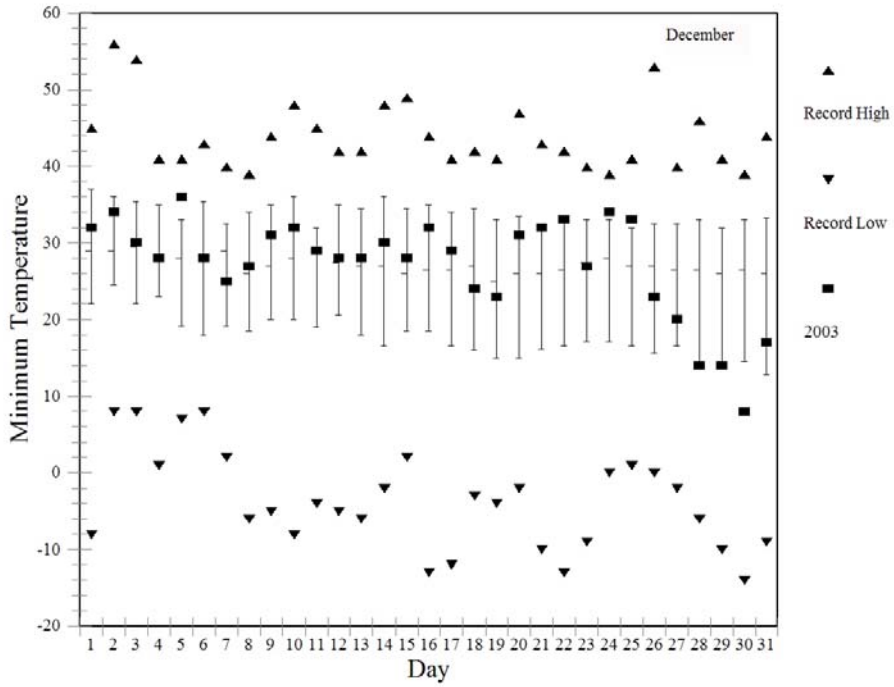

Figure 3.25. Daily Minimum Temperatures (°F), December 2003

Table 3.11. Average Daily Temperature (°F) Range

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1946	17.3	21.0	21.8	26.1	29.6	25.6	30.4	29.4	26.8	23.6	17.7	15.8	23.8
1947	18.4	22.2	25.5	27.7	29.6	**25.3**[a]	29.3	28.8	27.3	**18.1**[a]	15.4	11.1	23.2
1948	15.0	17.2	23.0	23.2	**22.6**[a]	26.4	29.1	28.0	28.7	26.5	17.8	15.9	22.8
1949	**18.8**[a]	19.3	20.6	30.5	28.2	30.2	30.5	30.4	27.2	26.6	16.8	16.7	24.6
1950	16.0	15.6	20.0	25.3	29.6	25.7	32.3	31.6	32.4	18.2	14.7	9.7	22.6
1951	13.7	18.4	20.8	30.3	30.2	28.9	**33.8**[a]	31.5	30.9	23.3	17.4	13.7	24.4
1952	12.6	17.0	22.8	30.3	28.1	27.3	32.6	32.2	32.8	29.0	16.0	9.4	24.2
1953	15.6	19.8	24.4	24.0	27.9	26.4	32.8	29.1	32.5	27.8	20.3	**17.7**[a]	24.9
1954	14.3	13.8	23.7	26.3	28.1	26.8	31.4	27.6	26.2	24.5	15.8	13.2	22.6
1955	9.2	18.9	21.8	24.9	25.3	29.4	27.9	31.7	27.5	22.7	16.1	12.3	22.3
1956	12.9	15.0	20.9	28.0	26.6	26.9	30.8	28.8	30.6	22.1	13.9	13.4	22.5
1957	15.2	18.3	**18.4**[a]	24.7	24.8	27.7	28.7	27.0	29.8	18.4	19.1	14.7	22.2
1958	13.3	15.0	22.0	23.9	29.6	27.3	30.5	33.1	27.0	27.8	17.8	10.2	23.1
1959	14.1	16.2	24.3	26.9	26.5	27.1	31.1	29.9	23.8	24.4	21.9	13.4	23.3
1960	14.6	19.3	23.2	25.7	26.5	31.2	32.8	28.1	28.3	25.7	18.7	10.9	23.8
1961	12.5	17.2	20.0	25.3	25.5	31.5	30.6	30.9	26.9	25.4	20.4	15.0	23.4
1962	18.1	17.4	22.0	28.9	23.2	29.9	30.2	28.3	29.9	21.4	17.3	11.4	23.2
1963	17.2	16.8	23.3	**21.4**[a]	28.1	26.6	27.8	30.7	29.8	24.5	16.9	9.5	22.7
1964	16.0	**24.1**[a]	23.7	27.1	27.9	26.4	31.2	29.4	29.7	26.4	**12.2**[a]	14.8	24.1
1965	12.3	20.3	25.6	26.4	28.3	28.1	31.1	27.7	29.8	27.4	14.2	15.7	23.9
1966	14.3	19.3	24.4	28.2	30.7	27.3	28.7	29.1	28.4	25.7	18.1	13.4	24.0
1967	17.6	24.0	24.6	24.4	27.7	28.7	32.0	**34.5**[a]	31.7	25.5	19.9	15.7	**25.5**[a]
1968	17.2	20.4	23.5	27.5	27.5	27.3	31.2	**26.2**[a]	28.2	22.8	14.2	13.9	23.3
1969	12.2	14.1	25.5	24.5	29.2	27.7	31.3	33.3	27.6	25.0	17.4	9.2	23.1
1970	12.0	16.4	23.8	25.3	29.2	29.3	31.7	33.1	27.2	26.5	17.8	15.4	24.0
1971	18.4	21.1	22.8	26.8	27.7	26.9	32.0	32.3	27.8	25.8	17.8	14.8	24.5
1972	17.3	18.3	25.2	26.8	27.2	26.9	30.1	30.6	30.5	27.5	13.1	17.2	24.2
1973	15.7	16.6	24.6	29.6	31.1	29.7	32.1	32.7	27.0	22.2	12.6	12.5	23.9
1974	17.8	18.8	23.2	23.4	27.3	**32.7**[a]	29.8	31.9	32.2	28.3	16.3	16.5	24.8
1975	15.0	17.0	21.2	24.8	29.5	28.2	30.3	28.7	32.2	22.0	20.9	14.8	23.7
1976	15.2	21.0	25.3	26.0	30.6	28.8	30.5	28.0	30.5	27.5	20.3	16.6	25.0
1977	10.8	20.7	23.4	**30.6**[a]	26.0	30.2	30.5	29.1	23.8	26.6	19.1	15.1	23.8
1978	11.4	15.2	23.0	23.8	27.7	31.3	31.0	29.0	25.8	**30.3**[a]	18.2	16.8	23.6
1979	15.5	18.7	26.0	26.5	29.4	31.1	32.9	32.0	31.1	25.6	13.0	12.9	24.6
1980	13.2	**10.5**[a]	22.1	27.1	25.8	25.8	31.3	29.9	27.3	24.6	15.3	11.4	**22.0**[a]
1981	9.9	17.5	25.9	27.4	27.1	28.3	31.7	32.9	30.8	26.0	20.0	14.2	24.3
1982	16.0	21.4	24.4	28.2	29.9	28.0	30.6	29.5	27.1	24.9	16.6	13.0	24.1
1983	15.5	17.3	20.7	27.9	28.4	27.9	26.3	28.4	27.5	24.7	15.5	11.0	22.6
1984	13.5	15.2	21.6	23.9	26.3	26.1	32.3	32.0	26.6	25.5	14.0	15.7	22.7
1985	**6.8**[a]	20.4	25.4	28.7	29.2	29.4	32.0	29.9	24.3	25.4	15.8	**8.0**[a]	22.9
1986	12.5	17.1	22.1	26.4	26.6	29.1	28.6	31.0	**23.5**[a]	26.8	15.1	8.4	22.3
1987	11.9	19.0	22.4	28.2	28.9	31.2	28.1	30.1	33.0	28.9	19.8	12.0	24.5
1988	13.4	23.8	25.1	25.3	27.4	26.3	30.0	32.1	31.2	26.2	16.9	11.4	24.1
1989	16.5	17.3	20.2	26.2	26.0	28.5	31.1	27.3	31.1	24.0	16.0	9.4	22.8
1990	15.7	20.5	26.5	27.1	24.4	26.8	28.8	27.3	32.2	23.6	18.4	16.0	23.9
1991	16.0	21.4	22.7	26.0	25.1	25.6	30.2	29.6	31.1	26.4	13.1	13.5	23.4
1992	12.5	15.2	25.9	24.6	**31.9**[a]	28.5	28.0	31.6	28.1	24.4	13.6	14.5	23.2
1993	12.8	15.1	18.6	23.7	29.1	27.1	**25.5**[a]	29.5	**33.5**[a]	28.6	**23.9**[a]	10.5	23.2
1994	15.7	17.2	**28.4**[a]	26.0	26.5	29.4	33.0	31.2	31.2	25.4	17.2	13.6	24.6
1995	13.2	20.1	23.7	25.2	28.0	26.3	29.9	30.6	30.2	24.3	19.5	11.7	23.6
1996	14.0	21.2	22.9	26.0	26.6	31.0	33.7	34.1	30.8	23.9	17.0	13.1	24.5
1997	15.6	18.8	22.1	25.7	28.1	27.3	31.2	31.2	26.7	24.3	17.6	14.2	23.6
1998	15.9	19.0	23.7	28.5	27.5	29.2	30.5	33.2	31.9	26.6	16.2	**17.7**[a]	25.0
1999	16.4	18.0	22.2	28.9	28.0	28.0	30.2	29.0	32.9	25.7	17.7	13.5	24.2
2000	14.0	16.8	23.3	28.2	26.4	29.0	31.9	32.7	27.9	23.5	14.1	9.1	23.1
2001	10.5	17.7	24.3	24.2	30.6	26.7	29.5	31.4	31.0	23.8	16.2	13.4	23.3
2002	15.3	22.4	22.5	26.9	26.8	28.8	32.1	29.8	30.9	29.9	19.2	8.9	24.3
2003	10.5	20.8	23.3	24.2	26.6	30.2	34.3	31.5	30.5	27.2	21.3	11.6	24.3
Average[b]	14.4	18.3	23.1	26.4	27.7	28.1	30.6	30.3	29.1	25.1	16.9	13.3	23.6
Normal	14.3	18.3	23.5	26.6	27.8	28.5	30.5	30.6	29.3	25.6	16.8	13.3	23.8

(a) Greatest and least values.
(b) Based on entire period of record, 1945 through 2003.

Table 3.12. Normal and Extreme Daily Maximum and Minimum Temperatures (°F)

	Normal (1971-2000)			Extreme (1945-2003)							
				Maximum				Minimum			
Day	Maximum	Minimum	Mean	High	Year	Low	Year	High	Year	Low	Year
					January						
1	35	21	28	57	98[a]	8	69	38	81[a]	-11	79
2	36	21	28	57	97	15	69	42	63	-9	78
3	36	21	28	63	89	12	50	41	81	0	59
4	36	21	28	60	94[a]	13	59	39	54	-6	50
5	36	21	28	59	90[a]	12	50	39	81	-7	50
6	36	22	28	59	90[a]	10	82	42	98	-10	74
7	36	22	29	63	02[a]	9	79	45	90	-8	74
8	36	22	29	59	02	5	74	44	53	-9	74
9	36	22	29	60	90[a]	5	74	41	90	-13	74
10	36	23	29	61	83	10	74	40	83	-5	74
11	37	23	30	60	83[a]	13	63	37	90	-6	49
12	38	24	31	59	53	15	63	47	53	-4	63[a]
13	39	25	32	61	94	10	50	42	66	-4	93[a]
14	40	26	33	62	99	7	50	48	61	-11	50
15	40	26	33	60	74[a]	5	50	50	74	-5	50
16	41	27	34	61	74	8	50	48	89	-8	50
17	41	27	34	57	98	5	50	40	89	-11	50
18	41	27	34	62	89	10	50	38	89	-6	57
19	41	27	34	63	68	13	50	47	68	-2	57
20	41	27	34	66	68	11	54	47	72	-6	54
21	41	27	34	65	68	14	54	42	72	0	54
22	41	27	34	56	90	16	69	43	81	-2	62
23	41	27	34	63	53	10	69	43	81	-8	69
24	41	27	34	59	84[a]	13	57	45	02	-6	49
25	41	26	34	59	92[a]	6	50	41	74[a]	-12	57
26	41	26	34	67	03	2	57	46	62	-22	57
27	41	26	33	60	84[a]	0	57	36	95[a]	-21	57
28	41	26	33	61	67	6	57	42	99	-14	57
29	40	25	33	62	67	3	50	47	99	-18	50
30	40	25	33	67	89[a]	11	57	53	71	-13	50
31	40	25	33	72	71	-2	50	45	53	-21	50
					February						
1	40	25	32	63	71	-3	50	42	92	-23	50
2	40	25	32	61	91[a]	0	50	42	68	-21	50
3	40	24	32	60	67[a]	1	50	46	91	-23	50
4	40	24	32	65	67	11	85	43	68	-5	85
5	40	25	32	61	65	23	85	39	61	-5	89
6	41	25	33	61	67	19	85	44	99	-3	89
7	42	25	34	65	45	20	48	41	55	2	89
8	43	26	35	63	96	22	56	45	45	5	94[a]
9	45	27	36	65	51	23	56	39	61[a]	4	85
10	46	28	37	65	77	30	56[a]	50	51	7	85
11	46	28	37	66	88	27	54	39	93[a]	9	48
12	47	29	38	70	77	24	49	40	77	6	48
13	48	30	39	66	71	25	49	42	47	3	49
14	49	30	40	62	97[a]	22	80	54	82	8	95
15	49	31	40	67	82	19	56	48	81	5	56
16	49	31	40	69	77	20	56	48	81	4	56
17	49	31	40	67	77[a]	22	56	48	48	9	56
18	50	31	40	66	81	24	56	46	81	9	90
19	50	31	41	68	95	28	56	56	95	14	90[a]

Table 3.12. (contd)

	Normal (1971-2000)			Extreme (1945-2003)							
				Maximum				Minimum			
Day	Maximum	Minimum	Mean	High	Year	Low	Year	High	Year	Low	Year
20	51	31	41	68	82	32	57[a]	51	61	15	86
21	51	31	41	71	88	29	57	45	95	13	57
22	51	31	41	66	02	29	57	44	02	11	93
23	51	31	41	68	47	34	93[a]	43	83[a]	19	93
24	51	31	41	72	86	32	62	60	86	11	93[a]
25	52	31	41	72	86	28	93	49	86	4	93
26	52	31	41	65	57[a]	28	93[a]	46	92	10	93
27	52	31	41	68	72	26	93	44	92	7	62
28	52	31	41	67	67	25	93	48	72	3	93
29	52	31	41	63	88[a]	40	60	43	92	12	60
				March							
1	52	31	42	67	94	26	93	44	94	15	71[a]
2	52	31	42	66	68	26	60	46	87	14	60
3	52	31	42	70	94	24	60	50	87	14	89
4	52	31	42	63	53	26	55	46	87	7	55
5	53	32	42	68	72	31	45	50	87	6	55
6	53	33	43	65	67[a]	33	57	43	79	18	60
7	54	33	44	66	53	41	45	42	86[a]	21	74[a]
8	55	33	44	67	53	33	51	46	83	20	02[a]
9	56	34	45	69	53	40	51	47	83	22	94[a]
10	57	34	46	69	72	40	48	45	87[a]	13	48
11	57	35	46	67	95[a]	32	50	44	03[a]	21	50
12	58	35	46	68	98[a]	37	51	48	87	15	56
13	58	35	46	72	98	38	51	49	03	22	69[a]
14	58	35	47	72	92	40	49	48	03	23	53
15	59	35	47	73	94	37	49	50	92	23	76
16	59	36	47	76	72	43	89	47	94	23	55
17	60	36	48	76	72	38	65	48	69	17	65
18	60	36	48	76	47	41	65	47	90	14	65
19	60	36	48	76	47	48	65[a]	53	97	16	65
20	60	36	48	76	47	38	02	49	88	22	74
21	60	36	48	74	60	41	75	47	03	26	82[a]
22	60	35	48	74	78[a]	47	71	47	78	19	94
23	60	35	48	77	60	39	64	45	98[a]	20	48
24	60	35	48	78	60	38	55	46	01	15	64
25	60	35	48	83	60	35	55	48	52	21	96
26	60	35	48	76	46	38	65	49	92[a]	21	85
27	61	35	48	77	94	47	79	46	89	24	75
28	61	35	48	79	94	42	54	49	78	19	75
29	61	36	49	78	94[a]	49	54	48	94[a]	18	54
30	62	36	49	77	03	52	67	47	92[a]	20	54
31	62	36	49	78	92	45	96	49	03	28	53
				April							
1	63	37	50	80	90	45	76	50	59	24	82
2	63	37	50	83	92	48	82	50	87	25	76
3	64	37	50	76	00[a]	50	63[a]	48	77	23	75
4	64	38	51	82	60	45	75	56	91	24	03
5	64	38	51	78	77[a]	51	75	54	60	21	75
6	64	38	51	82	77	50	82	51	62	25	97
7	64	38	51	85	77	41	45	53	60	26	54
8	65	38	51	82	96	51	53	50	96	27	92[a]
9	65	38	51	80	85	48	92	57	96	28	01
10	65	38	52	85	68	52	45	50	96	24	81

Table 3.12. (contd)

	Normal (1971-2000)			Extreme (1945-2003)							
				Maximum				Minimum			
Day	Maximum	Minimum	Mean	High	Year	Low	Year	High	Year	Low	Year
11	65	39	52	79	88	52	83	51	56[a]	27	83
12	66	39	52	83	88	47	95	48	82[a]	26	97
13	66	40	53	88	47	54	55	59	88	23	68
14	66	40	53	85	62[a]	47	75	55	85	28	01
15	67	40	54	82	88	55	75[a]	54	87	27	55
16	67	41	54	83	54	53	63	54	92	28	82
17	67	41	54	88	94	48	63	52	90	26	55
18	68	41	54	88	94	51	67	60	94	29	68
19	68	41	54	78	56	50	51	56	94	27	66
20	68	41	55	84	56	45	67	53	90[a]	28	82
21	68	42	55	85	56	52	67	60	56	26	85[a]
22	68	42	55	81	82[a]	53	88	55	98	28	72
23	68	42	55	88	81[a]	56	79[a]	58	77	30	78
24	69	42	55	94	77	53	75	56	52	28	86[a]
25	69	42	56	91	46	56	58	59	52	31	55
26	69	43	56	85	92	53	48	57	78	28	48
27	70	43	56	90	87	50	90	57	92	27	70
28	70	43	57	93	87	54	95	64	87	27	67
29	71	44	57	90	68	47	67	60	87	29	52
30	71	44	58	92	98	56	67[a]	60	98	29	86
				May							
1	72	44	58	93	98	53	69	59	98[a]	28	54
2	72	44	58	89	98[a]	56	88	60	71	30	97
3	73	45	59	91	66	58	93	60	71	31	49
4	73	45	59	94	66	56	63	57	46	31	62
5	73	45	59	100	66	52	61	65	66	30	59
6	73	45	59	98	92	56	86	62	87	33	00
7	74	46	60	99	87	59	99	66	92	33	84
8	74	46	60	102	87	56	99[a]	67	94[a]	29	96
9	74	46	60	97	87	56	48	66	49	34	99[a]
10	75	47	61	96	49	53	67	66	49	34	70
11	75	47	61	98	49	51	67	68	49	30	70
12	75	47	61	100	93	57	70	66	93	34	85
13	75	47	61	94	97	57	55	66	97	34	85
14	76	48	62	98	73	56	55	61	73[a]	31	55
15	76	48	62	97	73	57	59	67	97	35	74
16	76	48	62	95	73	54	55	60	73	32	74
17	76	48	62	96	73	58	03	59	85	36	03
18	76	48	62	98	54	62	74	67	56	36	72
19	76	48	62	92	93	56	62	70	56	33	75
20	76	48	62	93	47	58	60	59	56	36	71
21	77	49	63	94	58	62	60[a]	59	58	37	74[a]
22	78	49	63	98	58	63	64	64	58	33	60
23	78	50	64	101	01	59	62	66	58	35	64
24	78	50	64	97	01[a]	54	62	66	01	35	75
25	78	50	64	98	92[a]	61	98	65	83	38	91[a]
26	78	51	64	101	58[a]	54	80	69	47	38	78
27	78	51	65	93	83	62	89	69	58	37	73
28	78	51	65	99	83	61	89	63	72[a]	38	79[a]
29	79	51	65	103	83	68	98[a]	71	86	35	76
30	79	51	65	104	86	62	76[a]	68	86	41	55[a]
31	79	52	66	104	86	54	71	69	86	40	96[a]
				June							
1	80	52	66	103	86	64	76	69	86	37	84
2	80	52	66	99	70	65	99[a]	69	89[a]	37	76

Table 3.12. (contd)

	Normal (1971-2000)			Extreme (1945-2003)							
				Maximum				Minimum			
Day	Maximum	Minimum	Mean	High	Year	Low	Year	High	Year	Low	Year
3	80	52	66	103	70	55	66	68	86[a]	37	62
4	80	53	66	103	69	60	74	66	86[a]	40	80[a]
5	80	53	66	101	78	60	88	73	69	43	76[a]
6	81	53	67	102	70[a]	57	95	68	77	38	99
7	81	53	67	100	77	56	50	69	77	42	99
8	81	53	67	100	48	59	64	69	69	40	53
9	82	53	67	98	55	68	59	68	69[a]	42	99
10	82	54	68	98	55	68	00	68	79	41	59
11	82	54	68	100	55	63	00	70	55	40	56
12	83	54	69	98	74	61	01	67	87[a]	42	68
13	83	55	69	99	74	59	80	70	99	42	52
14	83	55	69	103	74	65	95	68	87	44	78[a]
15	83	55	69	102	99[a]	70	65	72	63	44	54
16	84	55	69	106	61	62	49	70	63	41	54
17	84	56	70	108	61	70	73	75	61	40	81
18	84	56	70	104	61	69	64	75	58	41	54
19	85	56	70	102	85	63	95	73	58	43	86
20	85	56	71	102	82	63	91	73	59	42	53
21	85	57	71	104	70	62	84	73	58	45	03[a]
22	86	57	71	106	92[a]	71	93	74	92	46	97[a]
23	86	57	71	111	92	68	72	75	58	44	52
24	86	57	71	108	92	66	72	80	92	40	83
25	86	57	72	107	92	70	46	79	92	42	76
26	86	57	72	104	02	70	75	74	70	41	76[a]
27	87	57	72	102	92	68	47	75	87	45	64[a]
28	87	57	72	102	87[a]	64	46	68	03[a]	38	75
29	87	57	72	104	48	65	52	74	87	46	71[a]
30	87	57	72	106	87	71	55	71	87	42	49
				July							
1	87	57	72	103	87	66	66	75	87	46	73[a]
2	86	57	72	103	96	59	66	70	45	39	79
3	86	57	72	105	91[a]	71	66	70	67	45	99
4	87	57	72	108	68	71	86	75	70	44	00
5	87	58	72	108	75	66	51	76	75	47	99[a]
6	88	58	73	110	68	71	55	76	68	44	71
7	88	59	73	105	68[a]	75	81	73	68	45	71
8	88	59	73	108	68	71	72	74	85	45	81
9	89	59	74	110	75	76	55	78	75	50	72[a]
10	89	60	74	106	75	67	74	79	75	49	97[a]
11	90	60	75	109	02[a]	76	74	78	75	46	81
12	90	60	75	112	02	75	88	75	90	50	74
13	90	60	75	113	02	77	93[a]	80	02	49	76
14	91	61	76	107	87[a]	77	83	78	61	50	83
15	91	61	76	108	96	71	82	76	55	45	82
16	92	61	77	105	70	68	86	74	90	48	74
17	92	62	77	110	60	73	93	77	58	48	86
18	93	62	77	110	60	76	96	79	60	49	96[a]
19	93	62	78	109	79	72	49	77	79	51	77
20	94	63	78	110	79	75	65[a]	75	95	53	68[a]
21	94	63	79	109	94	68	65	77	88	49	49
22	94	63	79	111	94	74	92	75	94[a]	47	82
23	95	63	79	109	94	69	92	82	94	49	63
24	95	63	79	109	94	78	63	75	62	52	52[a]
25	96	64	80	106	84	73	90	77	62	51	49[a]
26	96	64	80	108	98[a]	66	55	76	88	53	99
27	96	64	80	112	98	74	48	74	98[a]	52	86

Table 3.12. (contd)

	Normal (1971-2000)			Extreme (1945-2003)							
				Maximum				Minimum			
Day	Maximum	Minimum	Mean	High	Year	Low	Year	High	Year	Low	Year
28	96	64	80	108	03[a]	77	50[a]	81	98	49	59
29	96	64	80	108	03	01	93[a]	78	82	52	50
30	96	64	80	108	03	78	75	74	90	49	50
31	95	64	79	111	71	75	85	76	00	52	95
				August							
1	95	64	79	109	71	77	76[a]	80	49	51	87
2	95	63	79	106	94	75	56	75	77[a]	46	64
3	95	63	79	107	61	77	62	75	99[a]	52	59
4	95	63	79	113	61	78	02[a]	81	61	48	54
5	95	63	79	108	90	78	02	72	91	45	69
6	95	63	79	106	72	77	46	77	90	51	47
7	95	63	79	109	72	70	62	75	45	49	46
8	94	63	79	110	72	75	62	79	82[a]	48	49
9	94	63	78	112	71	78	47	78	90	51	95[a]
10	94	62	78	109	96[a]	76	85	77	71	52	47
11	94	62	78	108	71	79	83	73	58	50	85
12	93	62	77	108	71	77	95	77	92	52	00
13	92	61	76	107	92	74	68	79	92	47	95
14	91	60	76	109	92	70	68	78	92[a]	45	95
15	90	60	75	105	67	72	60	74	92	51	74
16	90	60	75	108	67	68	93	76	45	48	76
17	89	59	74	108	67	76	95	68	91	47	76
18	89	59	74	108	67	71	80	71	97	47	76
19	88	59	74	105	67	70	68	76	91	46	80[a]
20	88	59	73	105	67	67	59	77	82	49	52
21	88	58	73	104	46	70	60	75	46	47	85[a]
22	88	58	73	104	56[a]	70	92	76	61[a]	41	60
23	88	58	73	105	70	69	92	76	46	45	92
24	88	57	73	104	58	70	68	73	00	43	92
25	88	57	72	105	96	72	77	70	46	43	93
26	88	57	72	100	84	68	56	70	96	44	93[a]
27	88	57	72	101	72	73	68	71	67	47	78[a]
28	87	57	72	104	72	70	51	74	86	42	80
29	87	57	72	102	67	72	51	73	67	42	65
30	86	57	72	105	67	64	99	71	67	44	64
31	86	56	71	104	67	72	99[a]	73	67	43	99
				September							
1	86	56	71	106	87	61	71	70	87	43	99
2	86	56	71	102	98[a]	69	00	70	49	47	75[a]
3	85	55	70	102	98	71	97	71	95	40	00
4	85	55	70	102	03[a]	68	59	68	55	44	80
5	85	55	70	100	03[a]	72	60	68	63	43	69
6	85	55	70	101	55	69	46	68	03	41	96
7	84	54	69	97	58	60	78	72	55	42	92[a]
8	84	54	69	99	81	61	85	69	63	42	76[a]
9	83	53	68	98	81[a]	66	85	68	69	40	62
10	83	53	68	97	93	68	85	65	63	43	82[a]
11	82	53	68	98	90[a]	62	85	66	69	41	88
12	82	52	67	96	02[a]	62	70	67	53	38	49
13	82	52	67	98	48	59	80	66	01	40	74
14	81	52	67	95	01	62	92	67	00	38	70
15	81	52	66	96	79[a]	58	59	66	00	35	70
16	80	52	66	96	81[a]	61	46	65	79	35	65
17	80	51	65	97	81	59	86	62	51	33	65
18	79	51	65	98	81	57	83	68	00	34	65

Table 3.12. (contd)

	Normal (1971-2000)			Extreme (1945-2003)							
				Maximum				Minimum			
Day	Maximum	Minimum	Mean	High	Year	Low	Year	High	Year	Low	Year
19	78	50	64	96	67	62	83	67	56	36	57
20	78	49	64	94	94	66	72[a]	67	94	37	83
21	78	49	63	98	67	56	00	65	62	38	93[a]
22	77	48	62	93	66	52	84	68	66	36	81[a]
23	77	48	62	93	87	54	77	62	92	32	00
24	77	47	62	94	01[a]	60	72	60	50	34	00[a]
25	77	47	62	97	52	56	77	66	49	30	72
26	77	47	62	93	52	57	48	61	79	32	72
27	77	47	62	92	63[a]	58	77	60	03[a]	30	72
28	77	47	62	92	67	58	77	62	76	33	85
29	76	47	62	92	96[a]	57	77	61	03[a]	34	85[a]
30	76	47	61	88	93[a]	63	54[a]	64	93	35	85
				October							
1	75	46	61	88	91[a]	61	59	59	92	30	54
2	75	46	60	86	93[a]	56	67	60	88	32	54
3	74	46	60	89	58	55	50	58	88[a]	33	99[a]
4	73	45	59	89	80	55	50	57	88	32	73
5	72	44	58	87	58	52	57	56	03	34	82[a]
6	72	44	58	87	03	53	57[a]	57	60	30	74
7	72	44	58	86	80	48	57	57	88	29	74
8	71	44	57	84	65	50	97	58	87	26	85
9	71	44	57	84	45	52	58	56	96	26	85
10	70	43	57	86	96	50	62	55	96	33	59
11	70	43	56	84	52	52	68[a]	55	63	30	60
12	69	43	56	84	45	54	66	56	52	29	02
13	68	42	55	81	99	57	69	55	88	31	69
14	68	41	54	78	45	58	90[a]	59	88	24	69
15	67	40	54	81	63	53	92	60	88	29	70
16	66	40	53	79	63	54	92[a]	56	95	26	46
17	65	39	52	79	03	45	96	49	03[a]	26	96
18	65	38	51	77	03	47	49	50	00[a]	27	49
19	64	38	51	78	92[a]	50	45	54	03	27	69[a]
20	63	37	50	80	03	45	47	56	03	23	49
21	63	37	50	89	03	45	96	65	03	20	84
22	62	37	50	81	03	46	50	57	03	20	84
23	62	37	49	73	66[a]	39	84	51	60	25	84
24	61	37	49	75	77[a]	49	57	49	46	24	02
25	60	37	48	75	55[a]	49	57	60	45	23	02
26	59	37	48	69	92	49	00[a]	52	94	21	78
27	59	36	47	74	85	43	99[a]	54	81	23	70
28	58	36	47	80	03	35	91	52	49	18	71
29	57	35	46	70	53	42	91[a]	50	97	13	71
30	56	35	45	75	67	32	71	50	97	16	02
31	56	35	45	75	67	34	84	54	67	7	02
				November							
1	55	35	45	69	88	31	84	49	87	11	02
2	55	35	45	70	45	37	03	51	85	11	02
3	54	35	45	75	75	36	73	53	83	14	02
4	54	35	44	71	75	32	73	46	89[a]	15	02
5	54	35	44	63	89	31	73	48	88	18	03
6	53	35	44	64	58	32	73	49	89	19	73
7	52	34	43	69	78	34	45	48	97[a]	19	93[a]
8	52	34	43	69	95	34	45	48	89	16	45
9	51	34	43	73	89	30	45	60	89	18	86

Table 3.12. (contd)

	Normal (1971-2000)			Extreme (1945-2003)							
				Maximum				Minimum			
Day	Maximum	Minimum	Mean	High	Year	Low	Year	High	Year	Low	Year
10	51	34	43	73	89	32	45	56	89	16	86
11	51	34	42	66	89	32	85	48	89	14	78
12	50	33	42	75	99	20	55	52	49	6	55
13	50	33	41	76	99	14	55	56	98	6	59
14	50	33	41	68	01	19	55	54	01	-1	55
15	49	33	41	67	98	18	55	49	01	1	55
16	49	32	40	65	76	18	55	49	54	7	59
17	48	32	40	71	76	22	55	46	83[a]	10	61
18	48	31	40	68	03	25	55	52	03	11	55
19	47	31	39	67	02[a]	22	85	47	02	14	85
20	46	30	38	65	58	24	85	47	74	3	85
21	45	29	37	63	58	17	85	46	65	3	85
22	45	29	37	65	67[a]	17	85	53	90	-6	85
23	44	29	37	70	59	11	85	54	90	-13	85
24	44	28	36	67	95[a]	6	85	57	90	-12	85
25	43	28	36	67	98	11	85	50	98	-3	85
26	43	28	36	65	49	15	85	45	49	-1	85
27	43	28	36	63	49	12	85	46	49	8	85
28	43	28	36	64	95	11	85	43	73	7	85
29	43	28	36	62	95	14	85	57	95	8	85
30	43	28	36	62	95[a]	15	85	46	94	6	85
				December							
1	43	28	36	65	72	14	85	45	81	-8	85
2	43	28	35	64	77	20	85	56	75	8	85
3	42	27	35	62	82[a]	27	85[a]	54	75	8	85
4	42	27	34	60	75[a]	23	72	41	52	1	72
5	41	26	34	58	91[a]	21	72	41	87	7	72
6	40	26	33	59	87	16	56	43	87	8	56
7	40	26	33	58	73[a]	18	56	40	52	2	56
8	40	26	33	58	89	17	72	48	46	-6	72
9	40	26	33	59	87[a]	13	72	44	56	-5	72
10	40	26	33	67	93	13	72	48	46	-8	72
11	40	26	33	59	91[a]	11	72	45	46	-4	72
12	40	26	33	57	99[a]	22	72	42	77[a]	-5	72
13	40	26	33	59	46	13	72	42	46	-6	72
14	40	26	33	57	79[a]	15	72	48	79	-2	72
15	39	26	32	64	59	16	72	49	99	2	72
16	39	25	32	62	99	4	64	44	99	-13	64
17	38	25	31	57	98[a]	5	64	41	62	-12	64
18	38	24	31	56	99[a]	13	64	42	99	-3	84
19	37	24	30	59	94	17	84	41	94	-4	84
20	37	24	30	64	94	11	84	47	94	-2	90[a]
21	36	24	30	61	72	11	90	43	73	-10	90
22	36	24	30	59	80	7	90	42	72	-13	83
23	36	24	30	57	63	6	83	40	72	-9	83
24	36	24	30	55	61[a]	15	90[a]	39	80[a]	0	90
25	36	24	30	65	80	16	90	41	72	1	90
26	36	24	30	69	80	20	90[a]	53	80	0	48
27	36	24	30	62	80[a]	19	48	40	94[a]	-2	48
28	35	23	29	59	98	11	96	46	98	-6	96
29	35	23	29	60	98[a]	-2	68	41	98	-10	90[a]
30	35	22	29	54	70	-2	68	39	88[a]	-14	68
31	35	22	28	56	62	4	68	44	80	-9	78

(a) Latest of several occurrences.

Table 3.13 and Table 3.14 provide monthly heating-degree day and cooling-degree day data, respectively, for the period 1945 through 2003. The heating-degree days are traditionally totaled for the 12-month period July through June of the following year.

The heating degree accumulation begins July 1 of one year and ends June 30 of the following year. Figure 3.26 shows the climatological variation of the accumulation heating-degree days for the period from July 1945 through June 2002. It also shows the accumulation of heating-degree days for the 2002-2003 heating season. The figure shows a cooler than average fall followed by a warmer than average winter, with cumulative heating-degree days below the range of typical seasons at the end of the season.

Figure 3.27 presents the climatological statistics for cooling-degree days and data for the 2003 cooling season. The figure shows a warm late-spring, followed by a hot summer. Overall, the cooling season was much warmer than typical summers.

The record highs and lows in Figure 3.26 and Figure 3.27 are cumulative values at each date. The record values did not all occur in the same season.

3.9 Subsurface Soil Temperatures

Hourly subsurface soil temperature data at depths of ~0.5 inch, 15 inches, and 36 inches are available for the period from 1955 through 2003. The subsurface soil temperature sensors are installed in the natural soil of the area with the vegetation cover removed. The soil is sandy and mixed with large gravel.

Monthly averages and extremes of monthly averages are presented in Table 3.15. The absolute hourly extremes are also indicated in that table.

Table 3.13. Monthly and Seasonal Heating-Degree Days

Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Season
1944-45	--	--	--	--	--	--	967	738	709	442	141	38	--
1945-46	0	2	97	277	733	1,000	949	710	603	331	79	42	4,823
1946-47	0	1	101	479	875	935	1,168	702	476	266	**36**[a]	25	5,064
1947-48	0	7	70	351	714	989	1,024	963	709	471	237	5	5,540
1948-49	2	0	109	438	725	1,184	1,581	928	616	281	85	36	5,985
1949-50	1	0	52	456	592	927	**1,640**[a]	959	704	452	196	66	6,045
1950-51	0	0	64	431	728	895	994	786	773	325	146	45	5,187
1951-52	5	19	46	421	763	1,164	1,235	823	645	311	118	45	5,595
1952-53	0	2	34	**200**[a]	929	934	**694**[a]	664	585	419	228	**90**[a]	4,779
1953-54	0	3	59	298	649	851	1,118	720	722	408	124	77	5,029
1954-55	10	4	79	423	567	957	1,090	832	**794**[a]	**522**[a]	253	23	5,554
1955-56	**22**[a]	0	108	364	1,008	1,105	1,029	**1,147**[a]	655	273	110	55	5,876
1956-57	0	6	32	399	850	940	1,499	862	650	308	50	11	5,607
1957-58	0	0	37	443	739	**822**[a]	862	576	666	411	72	3	4,631
1958-59	0	0	74	339	731	927	1,025	827	617	325	248	29	5,142
1959-60	4	6	118	359	855	987	1,292	799	616	374	227	21	5,658
1960-61	0	**32**[a]	35	330	717	1,114	930	598	587	380	179	16	4,918
1961-62	0	0	91	418	893	974	1,090	797	698	287	255	51	5,554
1962-63	12	1	60	385	657	874	1,228	747	577	456	170	25	5,192
1963-64	1	1	25	285	668	1,078	913	784	656	445	195	33	5,084
1964-65	0	21	94	360	804	1,224	1,009	686	685	307	171	16	5,377
1965-66	5	14	115	247	660	995	963	702	605	311	133	58	4,808
1966-67	17	2	26	362	638	829	782	598	639	519	175	12	4,599
1967-68	0	0	13	305	704	993	907	670	495	416	117	23	4,643
1968-69	0	13	50	458	702	1,064	1,399	932	591	384	88	6	5,687
1969-70	0	5	39	431	745	941	1,064	683	625	480	137	23	5,173
1970-71	0	0	122	439	758	1,063	906	726	752	392	124	50	5,332
1971-72	13	3	133	420	728	1,064	1,065	878	560	463	112	23	5,462
1972-73	1	3	179	397	754	1,168	1,112	742	544	338	144	38	5,420
1973-74	2	9	73	389	798	837	1,104	675	611	361	236	27	5,122
1974-75	8	0	32	388	698	892	996	880	704	504	174	31	5,307
1975-76	0	13	25	388	764	949	1,024	796	735	422	159	74	5,349
1976-77	5	15	23	392	736	1,065	1,232	684	608	253	258	22	5,293
1977-78	5	7	153	401	783	967	1,001	761	550	393	203	22	5,246
1978-79	1	10	76	390	981	1,162	1,582	861	571	369	94	21	**6,118**[a]
1979-80	13	0	10	266	924	887	1,277	888	638	302	138	68	5,411
1980-81	5	18	53	394	723	883	838	707	503	345	165	51	4,685
1981-82	8	0	108	402	668	998	1,092	754	590	469	164	17	5,270
1982-83	10	0	75	420	844	1,023	855	676	511	419	151	50	5,034
1983-84	8	0	125	387	643	1,357	1,035	763	552	432	**292**[a]	70	5,664
1984-85	0	3	145	**532**[a]	768	1,288	1,245	982	651	288	137	21	6,060
1985-86	0	10	**197**[a]	475	**1,206**[a]	**1,362**[a]	959	724	509	426	213	10	6,091
1986-87	18	0	153	319	680	1,009	1,066	696	522	239	85	16	4,803
1987-88	1	0	32	304	640	1,040	1,028	695	591	301	166	65	4,863
1988-89	3	0	100	208	625	1,033	859	1,054	658	254	141	6	4,941
1989-90	1	0	12	339	621	985	763	767	530	217	149	28	4,412
1990-91	4	**0**[a]	**0**[a]	401	**553**[a]	1,269	1,124	**575**[a]	649	330	148	55	5,108
1991-92	0	0	12	381	710	842	851	648	**418**[a]	278	77	13	**4,230**[a]
1992-93	1	18	94	298	716	1,084	1,247	958	674	374	94	23	5,581
1993-94	1	13	89	303	911	914	819	813	490	**217**[a,b]	97	22	4,689
1994-95	0	0	3	332	759	924	954	614	581	372	89	46	4,674
1995-96	0	1	24	398	623	1,003	1,124	935	623	302	225	14	5,272
1996-97	3	0	99	401	797	1,090	973	692	544	395	95	2	5,091
1997-98	2	0	38	367	658	941	892	642	521	332	131	**1**[a]	4,523
1998-99	0	0	15	393	582	1,000	829	651	581	424	265	62	4,802
1999-00	8	17	65	407	576	846	995	760	630	288	143	35	4,770
2000-01	8	1	115	400	931	1,093	981	820	562	411	138	56	5,516
2001-02	**0**[a,b]	**0**[a,b]	30	363	669	936	854	745	698	359	181	28	4,863
2002-03	1	1	54	454	714	865	838	705	500	381	181	12	4,706
2003-04	0	0	47	271	814	993	--	--	--	--	--	--	--
Average[c]	4	5	70	374	746	992	1,050	771	611	365	155	33	5,193
Normal	4	5	75	376	747	1,032	1,028	767	587	350	156	33	5,160

(a) Greatest and least values.
(b) Most recent of numerous occurrences.
(c) Based on entire period of record, 1945 through 2003.
NOTE: Dashes indicate no data are available.

Table 3.14. Monthly and Annual Cooling-Degree Days

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1945	0	0	0	0	39	113	325	388	86	11	0	0	962
1946	0	0	0	9	53	100	345	360	57	0	0	0	924
1947	0	0	0	3	153	108	321	217	86	11	0	0	899
1948	0	0	0	0	31	230	243	213	90	0	0	0	807
1949	0	0	0	4	147	168	311	307	146	0	0	0	1,083
1950	0	0	0	0	13	112	321	353	139	0	0	0	938
1951	0	0	0	1	26	173	370	303	123	0	0	0	996
1952	0	0	0	16	46	110	371	281	151	16	0	0	991
1953	0	0	0	0	8	**26**[a]	336	282	143	1	0	0	796
1954	0	0	0	0	55	90	289	204	91	0	0	0	729
1955	0	0	0	0	4	174	270	325	13	0	0	0	786
1956	0	0	0	10	122	78	430	322	106	0	0	0	1,068
1957	0	0	0	12	77	185	289	255	160	0	0	0	978
1958	0	0	0	0	**167**[a]	282	500	447	93	14	0	0	**1,503**[a]
1959	0	0	0	0	15	137	397	218	45	0	0	0	812
1960	0	0	0	2	26	174	518	233	118	3	0	0	1,074
1961	0	0	0	0	23	288	447	469	55	0	0	0	1,282
1962	0	0	0	5	**3**[a]	148	352	215	125	0	0	0	848
1963	0	0	0	0	67	156	232	333	205	5	0	0	998
1964	0	0	0	0	30	115	299	**171**[a]	34	0	0	0	**649**[a]
1965	0	0	0	0	31	145	362	314	33	2	0	0	887
1966	0	0	0	0	80	116	274	332	141	1	0	0	944
1967	0	0	0	0	34	237	419	**508**[a]	216	0	0	0	1,414
1968	0	0	0	5	35	168	451	213	104	0	0	0	976
1969	0	0	0	0	73	310	338	245	110	0	0	0	1,076
1970	0	0	0	0	29	281	421	351	27	1	0	0	1,110
1971	0	0	0	0	94	59	437	481	28	10	0	0	1,109
1972	0	0	0	0	87	164	339	392	67	1	0	0	1,050
1973	0	0	0	0	87	149	413	285	94	0	0	0	1,028
1974	0	0	0	0	12	264	303	326	125	0	0	0	1,030
1975	0	0	0	0	28	102	451	202	117	0	0	0	900
1976	0	0	0	0	22	91	319	195	141	3	0	0	771
1977	0	0	0	24	5	253	276	447	46	0	0	0	1,051
1978	0	0	0	0	5	182	332	248	41	0	0	0	808
1979	0	0	0	1	65	197	394	299	138	5	0	0	1,099
1980	0	0	0	7	26	57	305	207	80	9	0	0	691
1981	0	0	0	16	25	82	287	438	144	0	0	0	992
1982	0	0	0	0	20	261	315	333	88	0	0	0	1,017
1983	0	0	0	0	115	61	203	291	26	1	0	0	697
1984	0	0	0	0	11	88	340	280	60	0	0	0	779
1985	0	0	0	3	83	175	**532**[a]	183	**11**[a]	0	0	0	987
1986	0	**1**[a]	0	3	125	245	192	442	68	1	0	0	1,077
1987	0	0	0	**26**[a]	125	265	289	359	179	11	0	0	1,254
1988	0	0	0	6	45	187	385	318	113	**44**[a]	0	0	1,098
1989	0	0	0	1	34	215	323	260	89	0	**1**[a]	0	923
1990	0	0	0	3	16	182	491	367	**222**[a]	3	0	0	1,284
1991	0	0	0	3	6	72	400	427	155	7	0	0	1,070
1992	0	0	0	11	147	**365**[a]	362	392	81	10	0	0	1,368
1993	0	0	0	0	139	127	**171**[a]	265	135	6	0	0	843
1994	0	0	0	15	94	163	501	358	167	3	0	0	1,301
1995	0	0	0	0	73	142	376	216	174	0	0	0	981
1996	0	0	0	4	14	134	450	324	79	9	0	0	1,014
1997	0	0	0	0	96	118	324	404	92	0	0	0	1,034
1998	0	0	0	16	55	183	527	398	195	3	0	0	1,377
1999	0	0	0	0	43	135	281	366	66	**0**[a,b]	0	0	891
2000	0	0	0	1	25	185	335	282	74	1	0	0	903
2001	0	0	0	7	98	100	343	390	150	4	0	0	1,092
2002	0	0	0	1	28	224	456	327	94	1	0	0	1,131
2003	0	**0**[a,b]	0	**0**[a,b]	58	234	475	358	174	32	**0**[a,b]	0	1,331
Average[c]	0	<1	0	4	56	164	359	317	105	4	<1	0	1,009
Normal	0	<1	0	5	57	163	355	326	103	4	<1	0	1,014

(a) Greatest and least values.
(b) Most recent of numerous occurrences.
(c) Based on entire period of record, 1945 through 2003.

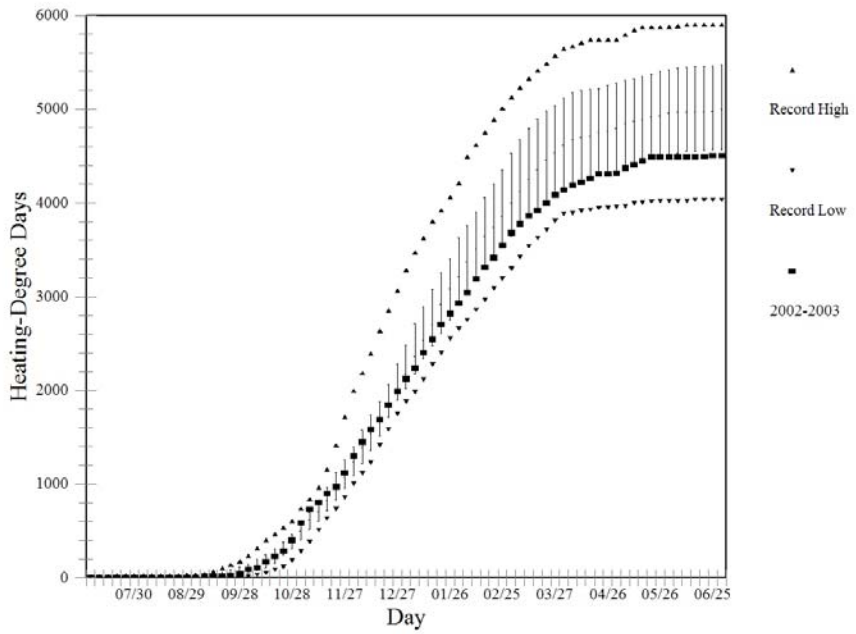

Figure 3.26. Climatological Statistics on Heating-Degree Days with Data for the 2002-2003 Heating Season

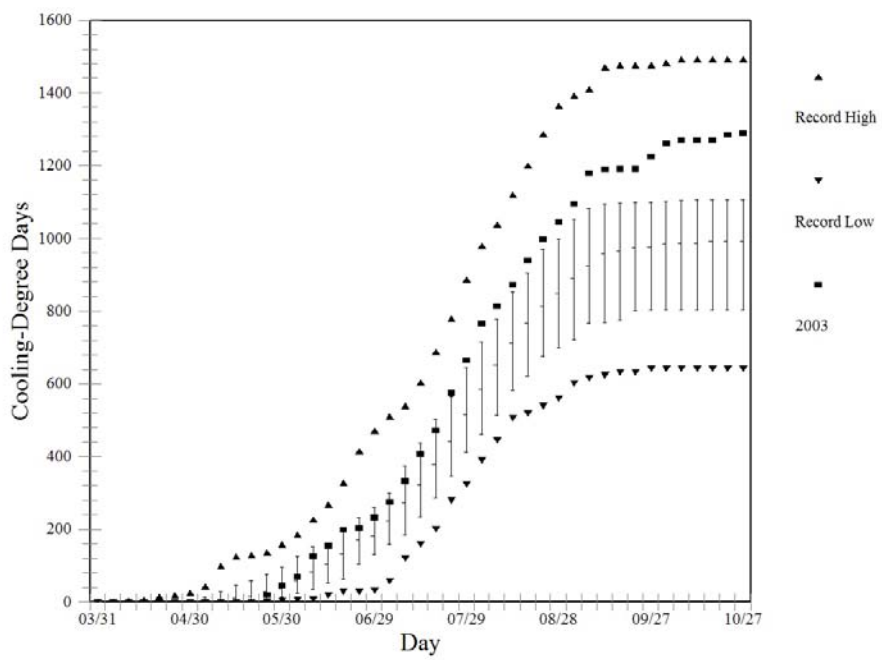

Figure 3.27. Climatological Statistics on Cooling-Degree Days with Data for the 2003 Cooling Season

Table 3.15. Subsurface Soil Temperatures (°F) at Depths of 0.5, 15, and 36 Inches

	Monthly Averages			0.5-in. Depth				15-in. Depth				36-in. Depth			
Month	0.5 in.	15 in.	36 in.	Highest Monthly Average	Year	Lowest Monthly Average	Year	Highest Monthly Average	Year	Lowest Monthly Average	Year	Highest Monthly Average	Year	Lowest Monthly Average	Year
Jan	32.8	36.3	42.7	39.4	1967	19.2	1979	42.7	1981	25.5	1979	48.7	1975	36.3	1979
Feb	38.3	38.9	42.0	45.1	1958	28.6	1989	44.9	1967	29.6	1957	46.9	1967	33.5	1957
Mar	48.1	46.4	46.1	54.3	1992	42.4	1955	52.6	1968	37.7	1956	51.7	1968	38.0	1956
Apr	59.8	55.7	53.1	69.4	1977	52.4	1984	62.1	1977	48.7	1955	57.4	1966	47.3	1955
May	72.0	65.5	60.7	81.4	1992	63.6	1984	71.4	1992	58.7	1984	65.1	1987	54.8	1955
Jun	82.6	75.1	68.6	90.4	1986	75.3	1956	84.5	1966	70.2	1956	73.4	1969	62.8	1984
Jul	90.9	81.8	75.1	96.2	1973	81.0	1993	88.2	1967	75.4	1955	81.1	1967	70.8	1955
Aug	87.6	82.8	78.5	94.9	1971	81.6	1960	89.2	1967	77.5	1964	83.9	1967	75.3	1999[a]
Sep	74.0	74.7	74.9	81.0	1967	65.5	1985	82.2	1967	68.8	1959	81.4	1967	70.1	1978
Oct	56.5	62.5	67.3	62.6	1988	52.4	1985	67.0	2003	57.9	1957	72.3	1967	62.9	1959
Nov	40.7	48.1	56.8	45.7	1999	31.9	1985	54.0	1974	42.5	1955	62.7	1974	51.2	1955
Dec	33.5	39.1	47.8	38.7	1974	26.5	1984	45.0	1974	34.1	1984	54.6	1974	41.4	1955
Annual	59.7	58.9	59.6	62.8	1967	55.9	1955	63.0	1967	54.6	1955	67.3	1987	55.5	1955
				Absolute Hourly Extremes											
				156.8	1996	-2.0	1972	93.0	1967	16.1	1979	85.3	1967	32.2	1957

(a) Most recent of multiple occurrences.

4.0 Precipitation Climatology

4.1 Monthly and Annual Totals

Table 4.1 shows monthly and annual precipitation totals for the period of record, 1946 through 2003. Normal monthly precipitation amounts for the period 1971 through 2000 and averages for the entire period of record are noted on the table, as are monthly and annual extremes. Normal annual precipitation at the Hanford Meteorology Station is 6.98 inches. The wettest year on record was 1995, with 12.31 inches; the driest was 1976, with 2.99 inches.

Historically, the months of November through February provide 3.64 inches (52%) of the normal annual precipitation. Although December has the highest average and normal precipitation due to more extreme events (Table 4.1), November has the highest median precipitation (Figure 4.1). July and August are the driest, receiving only 0.27 inch. The wettest month on record was December 1996, with 3.69 inches. September 1999, September 1991, August 1988, and August 1955 received no precipitation.

4.2 Precipitation Distributions

The method of presenting climatological data described in Section 3.5 is appropriate for presentation of climatological precipitation data as well, as long as the precipitation data are aggregated for sufficiently long periods of time. Figure 4.1 shows the monthly climatological statistics for the Hanford Meteorological Station for the years from 1947 through 2003. The figure also shows the total precipitation for each month during 2003

Figure 4.2 shows the climatological statistics of seasonal precipitation accumulation and the accumulation for the 2002-2003 season. The precipitation season is defined as beginning July 1 and continuing through June 30 the following year. This definition puts the break between seasons at in the beginning of the driest part of the year, rather than in the middle of the wettest part of the year. The accumulation is shown in Figure 4.2 in 5-day intervals, except for the interval containing February 29, which is a 6-day interval every fourth year.

4.3 Seasonal Precipitation

Table 4.2 provides seasonal precipitation information, with normal and average seasonal data noted. The extremes for each season are also noted. The wettest season was the winter of 1996-1997, with 5.45 inches; the driest received only 0.03 inch (summer 1973).

4.4 Average Number of Days with Specified Amounts of Precipitation

Table 4.3 presents information on the average number of days per year with precipitation events in six categories. A trace is less than 0.01 inch of precipitation. An average of 122 days per year have a trace or more of precipitation; however, only 24 days receive totals of 0.10 inch or more. During the 58-year period of record, only 5 days had an inch or more of precipitation.

Table 4.1. Monthly and Annual Precipitation (inches)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1946	--	--	--	--	--	--	0.15	0.35	0.52	0.65	0.66	0.11	--
1947	0.32	0.27	0.42	0.70	0.02	1.07	0.71	0.68	**1.34**[a]	2.20	0.81	0.75	9.29
1948	1.36	0.69	0.07	0.95	1.71	1.47	0.40	0.39	0.16	0.45	0.95	1.11	9.71
1949	0.13	0.68	1.12	0.02	0.16	0.01	0.01	0.03	0.23	0.10	1.47	0.16	4.12
1950	1.80	1.06	0.87	0.47	0.27	**2.92**[a]	0.07	T	0.01	2.46	0.55	0.97	11.45
1951	0.84	0.51	0.46	0.53	0.43	1.38	0.37	0.15	0.10	0.71	0.82	0.70	7.00
1952	0.65	0.50	0.06	0.13	0.58	1.07	T	0.08	0.08	0.04	0.20	0.77	4.16
1953	2.16	0.25	0.17	0.77	0.28	0.55	T	0.96	0.13	0.20	0.96	0.49	6.92
1954	1.48	0.28	0.59	0.07	0.41	0.10	0.22	0.42	0.51	0.42	0.86	0.35	5.71
1955	0.56	0.22	0.17	0.40	0.59	0.28	0.57	0	0.77	0.40	1.54	2.03	7.53
1956	1.71	0.56	0.10	T	0.22	0.86	T	0.38	0.01	1.03	0.15	0.58	5.60
1957	0.48	0.23	**1.86**[a]	0.38	0.82	0.47	0.05	0.02	0.34	**2.72**[a]	0.39	0.53	8.29
1958	1.74	1.48	0.46	0.64	0.74	0.81	0.02	T	0.05	0.19	0.77	1.84	8.74
1959	2.05	1.17	0.40	0.20	0.50	0.23	T	0.03	1.26	0.56	0.41	0.26	7.07
1960	0.51	0.58	0.67	0.53	0.71	0.14	T	0.26	0.23	0.23	0.92	0.64	5.42
1961	0.33	**2.10**[a]	1.02	0.48	0.80	0.42	0.15	0.09	T	0.07	0.49	0.89	6.84
1962	0.13	0.90	0.14	0.34	1.35	0.12	T	0.50	0.38	0.95	0.65	0.60	6.06
1963	0.95	0.69	0.53	1.17	0.43	0.28	0.31	0.01	0.02	0.04	0.74	1.14	6.31
1964	0.37	0.01	0.03	0.11	0.04	0.90	0.04	0.24	0.09	0.28	0.94	2.34	5.39
1965	0.93	0.14	0.03	0.09	0.15	0.49	0.11	0.03	0.11	0.01	1.17	0.39	3.65
1966	0.68	0.03	0.39	0.03	0.05	0.43	0.81	T	0.27	0.39	2.25	0.60	5.93
1967	0.32	T	0.14	0.90	0.56	0.57	T	T	0.05	0.13	0.16	0.43	3.26
1968	0.88	0.58	**0.02**[a]	0.01	0.06	0.19	0.04	0.51	0.25	0.93	1.23	1.25	5.95
1969	1.24	0.54	0.10	1.22	0.51	0.75	T	T	0.48	0.10	0.13	1.29	6.36
1970	**2.47**[a]	0.75	0.27	0.45	0.54	0.25	0.01	T	0.03	0.24	0.71	0.61	6.33
1971	0.78	0.10	1.02	0.07	0.56	0.71	0.13	0.09	1.13	0.18	0.46	1.07	6.30
1972	0.19	0.27	0.58	0.10	**2.03**[a]	0.66	0.16	0.56	0.02	T	0.55	1.27	6.39
1973	0.90	0.21	0.08	T	0.24	0.01	T	0.02	0.43	1.72	2.64	2.02	8.27
1974	0.90	0.41	0.52	0.46	0.28	0.12	0.71	T	0.01	0.21	0.71	0.97	5.30
1975	1.43	0.98	0.33	0.42	0.38	0.24	0.32	1.16	0.03	0.87	0.60	0.70	7.46
1976	0.56	0.36	0.23	0.41	0.08	0.11	0.13	0.96	T	0.04	**T**[a]	**0.11**[a,b]	**2.99**[a]
1977	**0.08**[a]	0.57	0.41	T	0.65	0.37	0.06	**1.36**[a]	0.66	0.15	0.63	1.47	6.41
1978	1.72	0.92	0.30	0.46	0.41	0.09	0.52	0.57	0.11	T	1.21	0.26	6.57
1979	0.54	0.17	0.54	0.52	0.10	T	0.09	0.38	0.20	0.67	1.36	0.99	5.56
1980	1.32	1.30	0.30	0.86	1.41	0.96	T	0.02	0.85	0.33	0.44	1.89	9.68
1981	0.56	0.60	0.70	0.02	0.99	0.43	0.19	0.03	0.60	0.39	1.08	1.45	7.04
1982	0.33	0.57	0.30	0.75	0.28	0.75	0.22	0.20	0.55	1.33	0.91	1.79	7.98
1983	1.44	1.36	1.00	0.42	0.52	0.68	0.31	0.12	0.46	0.52	2.12	2.12	11.07
1984	0.23	0.94	1.01	0.60	0.55	0.99	0.06	T	0.42	0.07	1.83	0.57	7.27
1985	0.34	0.82	0.36	0.01	0.12	0.15	0.12	0.01	0.63	0.46	1.24	0.84	5.10
1986	1.76	1.37	0.76	T	0.30	T	0.21	0.02	0.96	0.29	0.65	0.77	7.09
1987	0.80	0.19	1.05	0.14	0.17	0.11	0.50	0.07	0.01	**T**[a,b]	0.40	1.63	5.07
1988	0.48	**T**[a,b]	0.39	1.12	0.33	0.11	0.13	**0**[a,b]	0.39	0.01	0.82	0.40	4.18
1989	0.21	1.67	1.56	0.84	0.59	0.01	0.01	0.26	0.02	0.42	1.04	0.29	6.92
1990	0.77	0.09	0.10	0.40	0.86	0.36	0.14	0.83	T	0.78	0.02	0.72	5.07
1991	0.33	0.19	1.12	0.45	0.49	1.44	0.29	0.07	0	0.53	1.44	0.40	6.75
1992	0.44	0.94	0.09	0.94	**T**[a]	1.14	0.38	0.20	0.27	0.61	1.07	1.82	7.90
1993	1.30	1.17	0.67	0.71	0.60	0.12	**1.76**[a]	0.24	0.04	0.09	0.19	0.94	7.83
1994	0.44	0.11	0.03	0.61	1.27	0.38	0.15	0.08	0.08	0.93	0.68	1.36	6.12
1995	2.14	0.69	0.95	1.54	0.79	0.77	0.34	0.07	0.79	0.87	1.04	2.32	**12.31**[a]
1996	1.42	1.22	0.83	0.43	0.62	0.05	0.14	0.02	0.22	0.88	**2.67**[a]	**3.69**[a]	12.19
1997	1.51	0.25	0.70	0.33	0.33	0.46	0.19	0.06	0.32	0.92	1.01	0.31	6.39
1998	1.24	1.15	0.50	0.07	0.52	0.48	0.34	0.04	0.10	0.28	1.29	0.44	6.45
1999	0.89	0.70	0.06	**T**[a,b]	0.34	0.31	0.07	0.57	**0**[a,b]	0.48	0.26	0.07	3.75
2000	1.09	1.12	0.94	0.57	0.77	0.25	0.46	T	0.56	0.57	1.08	0.67	8.08
2001	0.29	0.42	0.67	0.83	0.08	1.27	0.05	0.08	0.13	0.37	1.67	0.80	6.66
2002	0.42	0.67	0.19	0.29	0.16	0.65	0.16	0.01	T	0.12	0.38	2.26	5.41
2003	1.87	0.82	0.26	**2.23**[a]	0.08	**T**[a,b]	**0**[a]	0.46	0.24	0.07	0.15	1.96	8.14
Average[c]	0.93	0.64	0.50	0.48	0.51	0.53	0.21	0.23	0.30	0.53	0.89	1.04	6.79
Normal	0.87	0.68	0.58	0.44	0.55	0.41	0.27	0.27	0.33	0.49	0.98	1.11	6.98

(a) Greatest and least values.
(b) Most recent of multiple occurrences.
(c) Based on the entire period of record, 1946 through 2003.
NOTE: Dashes indicate no data are available.

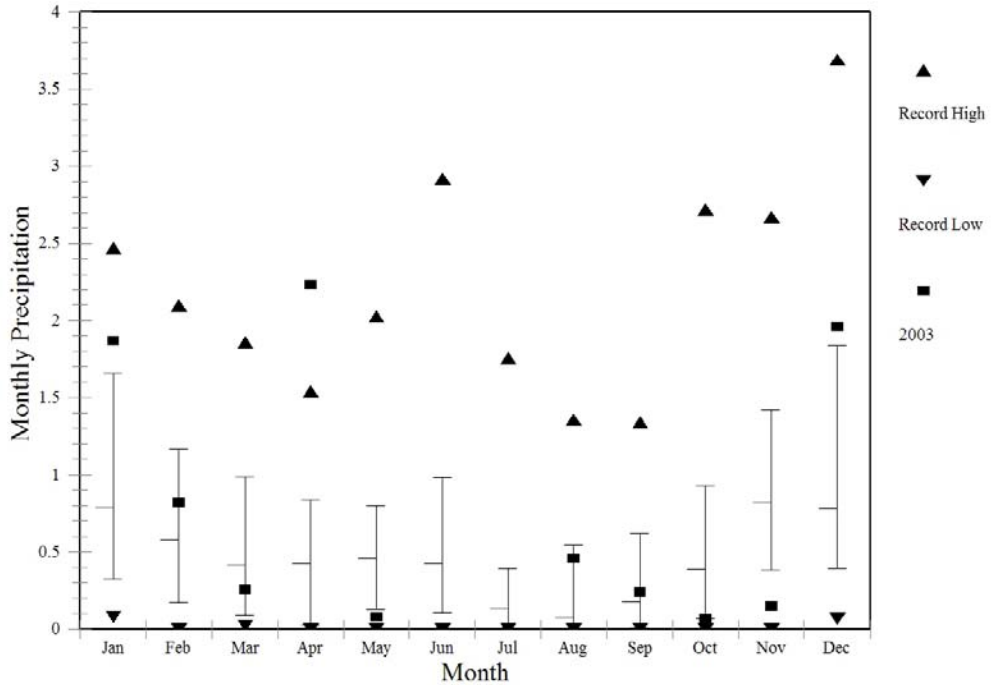

Figure 4.1. Monthly Precipitation Totals (inches, water equivalent)

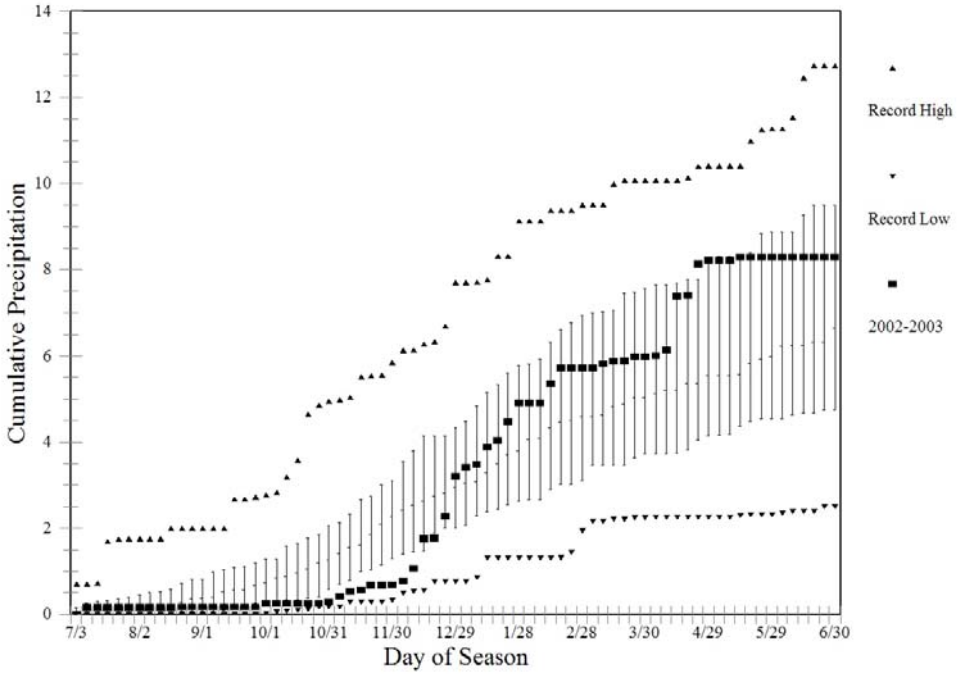

Figure 4.2. Seasonal Precipitation Accumulation (inches, water equivalent)

Table 4.2. Seasonal Precipitation (inches)

Year	Winter[a] Dec-Feb	Spring Mar-May	Summer Jun-Aug	Autumn Sep-Nov
1946	--	--	--	1.83
1947	**0.70**[b]	1.14	2.46	4.35
1948	2.80	2.73	2.26	1.56
1949	1.92	1.30	0.05	1.80
1950	3.02	1.61	**2.99**[b]	3.02
1951	2.32	1.42	1.90	1.63
1952	1.85	0.77	1.15	0.32
1953	3.18	1.22	1.51	1.29
1954	2.25	1.07	0.74	1.79
1955	1.13	1.16	0.85	2.71
1956	4.30	0.32	1.24	1.19
1957	1.29	3.06	0.54	3.45
1958	3.75	1.84	0.83	1.01
1959	5.06	1.10	0.26	2.23
1960	1.35	1.91	0.40	1.38
1961	3.07	2.30	0.66	0.56
1962	1.92	1.83	0.62	1.98
1963	2.24	2.13	0.60	0.80
1964	1.52	0.18	1.18	1.31
1965	3.41	0.27	0.63	1.29
1966	1.10	0.47	1.24	2.91
1967	0.92	1.60	0.57	0.34
1968	1.89	**0.09**[b]	0.74	2.41
1969	3.03	1.83	0.75	0.71
1970	4.51	1.26	0.26	0.98
1971	1.49	1.65	0.93	1.77
1972	1.53	2.71	1.38	0.57
1973	2.38	0.32	**0.03**[b]	**4.79**[b]
1974	3.33	1.26	0.83	0.93
1975	3.65	1.13	1.72	1.50
1976	1.62	0.72	1.20	**0.04**[b]
1977	0.76	1.06	1.79	1.44
1978	3.91	1.17	1.18	1.32
1979	0.97	1.16	0.47	2.23
1980	3.61	2.57	0.98	1.62
1981	3.05	1.71	0.65	2.07
1982	2.35	1.33	1.17	2.79
1983	4.59	1.94	1.11	3.10
1984	3.29	2.16	1.05	2.32
1985	1.73	0.49	0.28	2.33
1986	3.97	1.06	0.23	1.90
1987	1.76	1.36	0.68	0.41
1988	2.11	1.84	0.24	1.22
1989	2.28	2.99	0.28	1.48
1990	1.15	1.36	1.33	0.80
1991	1.24	2.06	1.80	1.97
1992	1.78	1.03	1.72	1.95
1993	4.29	1.98	2.12	0.32
1994	1.49	1.91	0.61	1.69
1995	4.19	**3.28**[b]	1.18	2.70
1996	4.96	1.88	0.21	3.77
1997	**5.45**[b]	1.36	0.71	2.25
1998	2.70	1.09	0.86	1.67
1999	2.03	0.40	0.95	0.74
2000	2.28	2.28	0.71	2.21
2001	1.38	1.58	1.40	2.17
2002	1.89	0.64	0.82	0.50
2003	5.05	2.57	0.46	0.46
Average[c]	2.61	1.49	0.97	1.72
Normal	2.66	1.58	0.95	1.80

(a) For the winter season, December is included in the previous year.
(b) Greatest and least values.
(c) Based on entire period of record, 1945 through 2003.
NOTE: Dashes indicate no data are available.

Table 4.3. Average Number of Days with Precipitation of Specified Amount

Month	Trace or more	0.01 in. or more	0.10 in. or more	0.25 in. or more	0.50 in. or more	1.00 in. or more
Jan	16	9	3	1	(a)	0
Feb	12	7	2	1	(a)	0
Mar	11	6	2	(a)	(a)	(a)
Apr	10	5	2	1	(a)	0
May	10	5	2	1	(a)	0
Jun	9	4	2	1	(a)	(a)
Jul	5	2	1	(a)	(a)	(a)
Aug	5	2	1	(a)	(a)	0
Sep	6	3	1	(a)	(a)	0
Oct	9	5	2	1	(a)	(a)
Nov	14	9	3	1	(a)	(a)
Dec	16	10	4	1	(a)	0
Annual[b]	122	68	23	7	1[c]	(a)

(a) Used to denote an average of less than 1/2 day.
(b) Annual totals may differ from summation of monthly events because of rounding.
(c) Although the number of days with 0.50 inch or more averages less than 1/2 day for any one month, 80 such days were recorded during 58 years of record.

4.5 Total Time with Precipitation Observed

The total time during which precipitation was observed at the Hanford Meteorology Station includes all types of precipitation. Observations of precipitation are recorded in hours and minutes, with the weather observer recording the starting and ending time of each precipitation event. These data are presented in Table 4.4. No record was kept for the hours 1600 through 2400 from July 1971 through June 1974; therefore, a 3-year gap exists in the record for those hours. Also, beginning in late April 1995, operations at the Hanford Meteorology Station were decreased to 8 hours (0600 to 1400) on weekends and holidays. However, a combination of precipitation sensors and computer programs was initiated to help ascertain the beginning and ending times of precipitation events during periods when the Hanford Meteorology Station is not staffed. Table 4.5 lists total hours of precipitation by month for the period 1946 through 2003. As previously noted, complete precipitation duration data for the period July 1971 through June 1974 are not available, and incomplete data are not included.

The months of November through February, which contribute more than half of the annual precipitation, received precipitation 10.1% of the time, three times more than the other 8 months of the year (3.3%).

Table 4.4. Monthly and Annual Averages and Extremes in Total Time with Precipitation Observed: July 1946 through June 1971, July 1974 through December 2003

	Averages		Greatest			Least		
Month	No. of Hours	% of Time	No. of Hours	% of Time	Year	No. of Hours	% of Time	Year
Jan	87.8	11.8	212.0	28.5	1969	29.1	3.9	2002
Feb	55.5	8.2	151.6	22.6	1980	2.5	0.4	1988
Mar	38.7	5.2	135.2	18.2	1957	6.4	0.9	1994
Apr	29.4	4.1	69.2	9.6	1953	1.6	0.2	1985
May	29.8	4.0	89.9	12.1	1948	1.2	0.2	1992
Jun	26.3	3.7	80.8	11.2	1950	0.3	<0.1	2003
Jul	10.0	1.3	38.2	5.1	1966	0.0	0.0	2003
Aug	11.6	1.6	61.7	8.3	1968	0.0	0.0	1988[(a)]
Sep	15.2	2.1	66.4	9.2	1977	0.0	0.0	1999[(a)]
Oct	30.9	4.2	119.9	16.1	1947	0.4	0.1	1978
Nov	60.0	8.3	146.5	20.3	1985	4.8	0.7	1976
Dec	88.9	11.9	230.5	31.0	1985	15.8	2.1	1976
Annual	484.0	5.5	738.0	8.4	1950	286.7	3.3	1990

(a) Most recent of several occurrences.

4.6 Notable Wet Periods

Eleven periods are listed when precipitation was particularly high:

	Number of Days with Trace or More		Total Amount (inches)		
Period	Altogether	Greatest Consecutive	Measurable Precipitation	Water Equivalent	Snowfall
Oct 7 - Nov 4, 1947	23 out of 29	10	17	2.21	0.0
Jan 3 - 28, 1950	21 out of 26	10	15	1.80	23.4
Nov 11 - Dec 19, 1950	33 out of 39	12	20	1.37	3.7
Nov 16 - Dec 22, 1955	31 out of 37	15	24	3.19	22.7
Oct 31 - Dec 7, 1973	32 out of 38	14	20	3.45	8.1
Nov 15 - Dec 7, 1985	17 out of 23	8	14	1.96	25.2
Dec 27, 1992 - Jan 23, 1993	26 out of 29	12	19	2.02	26.8
Nov 13 - 27, 1996	12 out of 15	7	10	2.66	11.9
Dec 20 - 31, 1996	11 out of 12	9	9	3.00	20.1
Dec 2, 2002 - Jan 4, 2003	28 out of 34	12	24	2.74	0.6
Nov 28, 2003 - Jan 7, 2004	32 out of 41	17	27	3.82	26.5

Table 4.5. Total Duration (hours) of Precipitation by Month and Year

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1946	--	--	--	--	--	--	6.0	16.3	12.2	38.2	66.0	31.5	--
1947	34.6	29.8	30.2	32.7	4.8	38.4	17.4	12.6	36.4	**119.9**[a]	48.1	71.1	476.0
1948	70.7	70.4	16.6	43.8	**89.9**[a]	36.4	15.2	16.6	15.8	19.7	44.4	81.9	521.4
1949	**29.2**[a]	69.9	63.5	5.6	13.2	3.2	2.2	1.6	21.2	15.0	98.7	32.1	355.4
1950	147.4	78.0	72.0	23.3	13.9	**80.8**[a]	5.0	2.3	1.3	112.3	92.9	108.8	**738.0**[a]
1951	66.3	55.9	34.8	21.5	23.7	60.8	12.8	17.7	26.6	66.5	66.0	86.7	539.3
1952	151.0	57.8	19.3	22.1	25.4	77.7	4.3	5.4	7.1	3.6	71.2	137.0	581.9
1953	89.3	29.7	32.3	**69.2**[a]	20.6	37.1	2.0	25.2	7.1	23.6	59.4	32.2	427.7
1954	92.6	90.0	35.8	18.4	33.7	32.4	17.8	22.2	15.1	17.9	74.3	39.9	490.1
1955	116.4	33.4	20.0	57.2	47.8	10.2	36.9	0.0	40.1	42.3	132.2	141.0	677.5
1956	126.9	74.4	15.9	1.8	35.8	30.8	4.2	17.4	6.6	65.7	71.0	98.8	549.3
1957	140.6	46.4	**135.2**[a]	19.5	43.4	20.8	2.6	5.7	23.1	72.0	21.4	49.3	580.0
1958	82.8	106.8	37.5	54.5	24.2	24.2	1.2	2.0	13.4	13.6	58.5	107.7	526.4
1959	129.5	98.2	32.6	17.5	33.0	29.8	4.2	15.9	52.2	27.2	44.8	51.8	536.7
1960	86.8	48.0	49.9	32.8	47.2	6.3	3.5	27.3	15.8	34.8	64.1	120.8	537.3
1961	91.8	94.4	60.7	39.2	48.7	23.9	4.2	17.2	2.0	15.9	57.2	99.0	554.2
1962	43.9	58.8	55.1	24.8	80.2	13.9	4.3	24.9	21.6	71.5	44.4	139.6	583.0
1963	56.3	88.4	31.2	66.5	51.3	37.1	20.9	4.4	11.2	26.4	61.0	179.6	634.3
1964	49.1	5.2	8.3	15.7	6.1	46.8	14.5	14.1	7.2	19.2	109.0	149.0	444.2
1965	153.3	18.8	14.2	30.9	15.2	28.6	6.8	18.4	11.2	11.2	89.1	57.8	455.5
1966	51.7	12.4	42.9	9.1	7.2	30.4	**38.2**[a]	3.7	15.9	26.3	103.5	75.6	416.9
1967	34.1	4.7	30.6	60.9	52.9	23.3	2.2	1.7	12.1	29.4	27.0	88.2	367.1
1968	99.1	42.0	7.3	18.6	29.9	38.3	5.6	**61.7**[a]	17.2	45.3	68.9	134.2	568.1
1969	**212.0**[a]	75.4	9.7	52.2	51.9	38.7	1.3	0.3	26.8	20.4	44.1	148.3	681.1
1970	157.2	72.9	34.0	19.2	27.2	31.1	6.9	2.3	5.3	32.2	85.8	83.9	558.0
1971	49.5	14.8	68.0	25.0	43.7	52.7	(b)	(b)	(b)	(b)	(b)	(b)	(b)
1972	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
1973	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)	(b)
1974	(b)	(b)	(b)	(b)	(b)	(b)	21.8	0.8	1.3	26.2	58.9	64.9	(b)
1975	105.7	103.8	42.3	29.5	29.2	20.8	13.5	26.8	1.0	65.6	56.1	76.6	570.9
1976	79.8	28.6	35.2	36.8	16.7	10.1	15.1	38.8	2.2	10.7	**4.8**[a]	15.8	294.6
1977	138.7	37.1	37.8	4.6	45.9	24.8	14.2	28.9	**66.4**[a]	15.8	77.1	98.1	589.4
1978	147.9	98.6	46.2	53.4	45.2	8.1	27.6	37.7	27.9	**0.4**[a]	71.6	43.7	608.3
1979	111.5	73.7	45.0	29.6	14.0	4.5	8.6	27.4	10.0	47.3	86.9	104.2	562.7
1980	118.5	**151.6**[a]	35.4	33.8	60.2	45.0	1.5	8.8	24.5	22.0	44.2	121.2	666.7
1981	72.0	31.7	32.0	3.4	28.4	21.1	7.5	1.0	17.4	24.8	34.1	91.8	365.2
1982	47.5	29.2	27.8	33.6	9.4	21.8	5.8	5.3	23.2	40.1	42.8	81.7	368.2
1983	72.5	76.1	59.4	15.2	13.2	22.4	17.9	13.7	12.5	19.8	79.3	133.2	535.2
1984	32.6	58.1	40.8	35.2	34.2	37.9	0.5	0.5	20.5	7.1	97.6	75.5	440.5
1985	151.2	54.9	26.0	**1.6**[a]	7.0	17.4	3.2	1.2	30.8	17.2	**146.5**[a]	**230.5**[a]	687.5
1986	107.6	68.9	47.4	14.4	22.3	2.9	13.3	1.1	28.2	10.3	31.3	143.8	491.5
1987	64.6	20.8	74.0	10.8	14.6	11.8	16.1	4.5	0.5	1.8	21.1	125.6	366.2
1988	92.4	**2.5**[a]	24.8	36.2	18.3	17.4	6.2	**0.0**[a,c]	13.8	2.2	55.8	62.7	332.3
1989	35.2	114.4	102.2	36.8	25.8	5.4	3.8	14.4	0.7	23.1	33.2	57.9	452.9
1990	34.6	20.5	18.2	29.9	31.0	8.6	7.3	15.4	0.1	49.1	7.1	64.9	286.7
1991	57.5	28.0	43.8	15.8	39.0	41.8	9.8	4.2	0.0	42.9	70.2	48.2	401.2
1992	36.2	56.2	7.9	42.0	**1.2**[a]	35.9	22.5	6.6	23.6	36.6	53.0	92.6	414.3
1993	171.0	64.4	65.2	57.0	38.7	13.0	35.2	12.1	3.0	6.8	30.3	58.2	554.9
1994	40.5	55.8	6.4	43.2	40.7	21.2	4.7	3.8	8.9	37.6	52.9	72.2	387.9
1995	113.8	39.2	47.3	56.2	27.3	52.6	8.3	7.9	14.5	33.0	47.1	62.2	509.4
1996	102.1	73.0	55.4	23.2	30.8	3.6	8.2	3.3	13.7	46.8	81.5	124.4	566.0
1997	69.5	17.7	36.1	13.7	19.2	14.7	12.7	4.1	19.7	29.4	43.6	**15.5**[a]	295.9
1998	60.0	72.3	34.2	8.6	45.7	13.7	12.7	1.8	6.8	14.8	45.1	54.1	369.8
1999	52.9	56.6	**4.8**[a]	3.1	15.2	9.4	2.1	9.4	**0.0**[a,c]	20.9	44.8	35.2	**254.4**[a]
2000	85.8	78.8	39.6	17.3	25.7	19.8	7.1	0.8	27.5	23.0	56.4	49.9	431.7
2001	43.8	55.0	47.4	44.6	8.4	34.6	2.9	10.1	4.9	34.7	66.5	49.3	402.2
2002	29.1	24.2	28.3	17.9	12.6	27.2	1.5	0.9	1.9	12.1	31.4	154.4	341.5
2003	106.1	27.9	20.8	59.7	9.1	**0.3**[a]	**0.0**[a]	16.2	7.0	10.5	29.6	133.7	420.9
Average[d]	89.5	56.6	39.1	28.8	30.9	26.7	10.5	11.8	15.8	31.6	61.0	87.5	489.6
Normal	83.4	56.6	40.9	26.3	27.5	20.7	11.4	10.4	14.8	25.0	54.6	81.7	453.0

(a) Greatest and least values.
(b) Incomplete data not included. See Section 4.5.
(c) Most recent of numerous occurrences.
(d) Based on entire period of record, 1945 through 2003.
NOTE: Dashes indicate no data are available.

The period from November 28 through December 14, 2003 established a new record for number of consecutive days with precipitation with 17 days. The previous record had been 15 days on four separate occasions, the most recent being December 19, 1985 through January 2, 1986.

From a precipitation standpoint, 1973 was an unusual year. Total precipitation for 1973 was 8.27 inches, 132% of normal (6.26 inches). The period March 30 through September 18, 1973, was extremely dry, receiving only 0.29 inch of precipitation during that 173-day period; however, the period October 31 through December 7, 1973 was a notable wet period. During the months of October, November, and December 1973, 6.38 inches of precipitation were recorded, 289% of normal (2.21 inches) for those months. November and December 1996 received 6.36 inches of precipitation, 328% of normal (1.94 inches) for those months, which is greater than the normal precipitation amount for an entire year (6.26 inches).

4.7 Notable Dry Periods

The Hanford Meteorology Station is in a semiarid region; thus, it experiences many dry periods. January, March, and December are the only months that have always received measurable precipitation (1946 through 2003). In 2002, a 130-day dry period occurred between June 30 and November 6, when total precipitation measured 0.29 inch.

During 1946 through 2003, there were 42 months without measurable precipitation, with the months of July and August accounting for 22 of those months. The record number of consecutive days with no precipitation (not even a trace) occurred in 1988, when the period July 14 through September 17 (66 days) was totally dry. The following list indicates some long periods with small amounts of precipitation.

Notable Dry Periods

Year	From	To	Number of Days	Total Precipitation (inch)
1952	Jun 30	Nov 10	134	0.20
1967	Jun 22	Nov 7	139	0.18
1968	Feb 24	Aug 13	172	0.32
1973	Mar 30	Sep 18	173	0.29
1976	Aug 26	Dec 31	128	0.15
1985	Mar 31	Sep 7	161	0.43
1986	May 6	Sep 12	129	0.30
1987	Jul 19	Oct 31	105	0.08
1988	Jun 6	Sep 17	105	0.13
2002	Jun 30	Nov 6	130	0.29

The driest year on record was 1976, which had 2.99 inches recorded (less than 50% of normal). During the period September through December 1976, total precipitation was 0.15 inch, which was 6% of normal (2.52 inches) for those months.

4.8 Snowfall

Snowfall, which includes all frozen precipitation, varied from a seasonal total of 0.3 to 56.1 inches in 1957-1958 and 1992-1993, respectively. Table 4.6 provides information on monthly and seasonal snowfall amounts, as well as the dates and amounts of earliest and latest snowfall each season. The earliest measurable snowfall (0.3 inch) was recorded on October 26, 1957; the latest measurable snowfall (1 inch)

Table 4.6. Monthly and Seasonal Snowfall (inches), Including First and Last Dates of Both Trace and Measurable Snowfalls

									First		First Measurable		Last Measurable		Last	
Season	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total	Date	Amount	Date	Amount	Date	Amount	Date	Amount
1945-1946	--	--	--	--	--	--	--	--	--	--	--	--				
1946-1947	T	7.2	0.5	3.3	T	T	0	11.0			11/17	0.2	01/31	2.2		
1947-1948	0	T	3.0	2.6	5.5	0.1	T	11.2	11/14	T	12/03	0.1	03/09	0.1	04/07	T
1948-1949	0	1.7	8.1	1.8	6.9	T	0	18.5	11/07	T	11/18	0.2	02/21	0.2	03/15	T
1949-1950	T	0	0.7	**23.4**[a]	3.1	1.5	T	28.7	10/18	T	12/16	0.1	03/13	0.3	04/02	T
1950-1951	0	0.8	2.9	5.3	5.3	**4.2**[a]	0	18.5	11/19	T	11/30	0.8	03/12	1.1		
1951-1952	0	0.5	4.4	7.5	3.1	T	0	15.5			11/25	0.5	02/24	0.1	03/20	T
1952-1953	0	T	3.1	2.7	0	T	0	5.8	11/22	T	12/01	0.3	01/02	2.7	03/31	T
1953-1954	0	0	1.0	14.3	1.6	T	0	16.9			12/08	1.0	02/11	1.6	03/10	T
1954-1955	0	0	1.8	6.0	2.4	0.7	T	10.9	12/03	T	12/04	1.8	03/25	0.7	04/02	T
1955-1956	0	12.7	13.4	10.2	2.2	T	0	38.5			11/02	0.2	02/23	0.1	03/26	T
1956-1957	T	0.1	2.5	7.9	1.4	4.0	T	15.9	10/26	T	11/26	0.1	03/06	1.7	03/12	T
1957-1958	0.3	0	T	T	0	T	0	**0.3**[a]			10/26	0.3	10/26	0.3	03/16	T
1958-1959	0	T	0.9	4.5	12.7	0	0	18.1	11/14	T	12/06	0.4	02/19	1.2		
1959-1960	0	0.3	1.0	5.9	T	1.5	0	8.7	11/04	T	11/15	0.1	03/05	1.4		
1960-1961	0	0	3.3	1.9	0	1.6	0	6.8	12/09	T	12/10	0.1	03/05	1.6		
1961-1962	0	0.5	6.1	0.4	2.4	0.9	0	10.3	11/18	T	11/23	0.1	03/09	0.1	03/11	T
1962-1963	0	T	**T**[a,b]	7.1	0.6	0	0	7.7	11/29	T	01/30	0.4	02/01	0.6	02/13	T
1963-1964	0	T	6.4	2.9	T	T	T	9.3	11/19	T	12/08	4.3	01/24	1.5	03/22	T
1964-1965	0	0.1	19.1	6.6	T	T	0	25.8	11/21	T	11/29	0.1	01/23	3.1	03/27	T
1965-1966	0	T	6.9	2.6	T	T	0	9.5	11/23	T	12/23	0.6	01/22	0.2	03/21	T
1966-1967	0	0.4	2.8	0.1	0	0	0	3.3			11/11	0.2	01/26	0.1		
1967-1968	0	0	5.7	4.5	0.3	0	T	10.5	12/06	T	12/09	0.6	02/17	0.3	04/16	T
1968-1969	0	T	9.7	15.9	2.1	0	0	27.7	11/16	T	12/19	0.1	02/23	2.0	02/28	T
1969-1970	0	T	2.7	6.6	T	0.2	0	9.5	11/29	T	12/08	1.3	03/01	0.2		
1970-1971	0	0.5	4.4	2.0	T	0.6	0	7.5	11/22	T	11/30	0.5	03/14	0.1	03/22	T
1971-1972	0.6	T	8.1	4.9	1.4	0.1	T	15.1	11/27	T	11/29	0.1	02/05	0.1	04/12	T
1972-1973	0	T	7.2	4.3	1.7	0	0	13.2	12/02	T	12/03	1.7	02/10	1.7	02/13	T
1973-1974	**1.5**[a]	6.6	7.5	3.9	0	T	0	19.5			10/31	1.5	01/12	2.3	03/06	T
1974-1975	0	0	0.7	2.5	12.1	T	T	15.3	12/02	T	12/12	0.3	02/09	1.7	04/04	T
1975-1976	0	1.7	3.8	6.0	0.2	T	T	11.7			11/10	0.6	02/03	0.2	04/01	T
1976-1977	0	0	0.2	2.9	T	T	0	3.1	12/04	T	12/23	0.2	01/31	0.2	03/27	T
1977-1978	0	2.1	3.4	2.9	0.9	T	0	9.3	11/15	T	11/18	0.1	02/26	0.1	03/05	T
1978-1979	0	10.1	1.4	10.3	0.5	0.1	0	22.6	11/15	T	11/18	5.3	03/03	0.1		
1979-1980	0	5.6	7.3	8.7	4.5	0.3	0	26.2			11/22	1.4	03/05	0.3		

Table 4.6. (contd)

Season	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total	First Date	First Amount	First Measurable Date	First Measurable Amount	Last Measurable Date	Last Measurable Amount	Last Date	Last Amount
1980-1981	0	0.3	2.2	T	T	0	0	2.5			11/14	0.3	12/06	0.3	02/13	T
1981-1982	0	0	12.1	2.4	T	T	**1.0**[a]	15.5	12/03	T	12/13	2.5	04/06	1.0		
1982-1983	0	0.2	4.6	3.2	2.3	0	0	10.3	11/12	T	11/26	0.2	02/09	0.3		
1983-1984	0	T	17.8	1.5	T	0	0	19.3	11/28	T	12/02	0.5	01/21	1.5	02/09	T
1984-1985	T	4.9	5.8	1.3	8.5	1.4	0	21.9	10/23	T	11/24	0.2	03/04	1.4		
1985-1986	0	**18.3**[a]	7.6	2.7	5.5	0	0	34.1			11/10	0.6	02/21	0.9		
1986-1987	0	0	5.1	3.3	0	0	0	8.4			12/04	0.4	01/26	0.1		
1987-1988	0	1.1	4.7	5.6	0	0	0.2	11.6			11/30	1.1	04/30	0.2		
1988-1989	0	0	3.5	0.2	**17.0**[a]	3.1	T	23.8			12/18	0.3	03/05	0.2	05/18	T
1989-1990	0	0	1.4	0.6	0.7	T	0	2.7	12/25	T	12/26	0.3	02/17	0.2		
1990-1991	0	0	6.1	3.8	0	0.1	0	10.0			12/18	0.1	03/02	0.1		
1991-1992	1.2	T	0.6	0.3	T	0	0	2.1			10/28	0.8	01/05	0.3	02/07	T
1992-1993	0	2.1	21.0	17.1	12.4	3.5	0	**56.1**[a]			11/21	0.2	03/03	1.5	03/16	T
1993-1994	0	1.4	1.8	**0**[a]	0.9	0	0	4.1			11/22	0.6	02/26	0.3		
1994-1995	0	0.1	4.2	2.7	T	0	T	7.0			11/17	0.1	12/14	0.7	04/14	T
1995-1996	0	1.0	4.0	16.7	5.9	0.4	0	28.0			11/10	1.0	03/04	0.4	03/05	T
1996-1997	0	11.9	**22.6**[a]	1.8	2.7	1.5	0	40.5			11/19	6.2	03/15	1.5	03/31	T
1997-1998	0	0	1.8	6.3	T	T	0	8.1			12/07	1.8	01/21	0.2	03/05	T
1998-1999	0	0	0.9	T	T	0	0	0.9	12/05	T	12/24	0.9	12/24	0.9	02/18	T
1999-2000	0	0	0.6	8.2	0.5	0	0	9.3	12/08	T	12/31	0.6	02/14	0.5		
2000-2001	0	1.2	6.6	2.3	4.3	0	0	14.4	11/09	T	11/23	0.3	02/16	0.9	02/18	T
2001-2002	0	5.0	3.5	0.6	0.2	1.4	0	2.8			11/28	5.0	03/06	1.4	03/20	T
2002-2003	0	T	0.6	0.7	**0**[a,b]	**0**[a,b]	**0**[a,b]	1.3	11/28	T	12/03	0.1	01/22	0.3		
2003-2004	**0**[a,b]	**0**[a,b]	8.0	--	--	--	--	--	11/02	T	12/04	0.1	--	--	--	--
Average[c]	0.1	1.7	5.1	4.8	2.3	0.5	T	14.5	11/21		11/30		02/13		03/10	
Normal	0.1	2.3	5.8	4.2	2.6	0.4	T	15.4	11/24		11/29		02/13		03/10	

(a) Greatest and least values.
(b) Most recent of multiple occurrences.
(c) Based on entire period of record, 1946 through 2003.
T = Trace.
NOTE: Dashes indicate no data are available.

was recorded on April 6, 1982. The average date of the first measurable snow is November 30; the average last measurable snow date is February 13. Normal snowfall for the period 1971 through 2000 and averages for the entire period of record are noted on the table, as are monthly and seasonal extremes.

Table 4.7 lists the greatest single storm snowfall amounts by month for the period 1946 through 2002. The greatest single snowstorm, on February 18-20, 1993, produced 12.4 inches of snow. During the winter of 1957-58 (the only snowfall was recorded in October), the greatest single snowstorm produced only 0.3 inch.

Table 4.8 lists some miscellaneous snowfall statistics for the Hanford Meteorology Station for the period 1946 through 2003. Included in this table are average number of days per month with snow depth above certain threshold values, greatest number of days per month with snow depth above certain threshold values, record number of consecutive days with snow depth above certain threshold values, record monthly snow depth, and 24-hour snowfall amounts. The record snow depth at the Hanford Meteorology Station is 15.6 inches, recorded in December 1985. The record number of days with snow depth ≥6 inches was 43 days in the winter of 1992-1993.

4.9 Normal and Maximum Daily Precipitation

Table 4.9 contains annual maximum precipitation statistics for the time periods 1, 2, 3, 6, 12, and 24 hours, including the dates of occurrence for each time period, 1947 through 2003. Table 4.10 contains normal and maximum values of precipitation (minimum values are not needed because every day of the year has a minimum value of 0). The normal precipitation values are based on the period 1971 through 2000; the daily maximum values are for the entire period of record (1945 through 2003). The maximum daily value for each month is noted on the table.

October 1, 1957, recorded the greatest precipitation in one day, 1.60 inches. There have been only 5 days during the period of record that have never received measurable precipitation. However, all have received a trace.

Table 4.7. Snowfall (inches) - Greatest Amount from a Single Storm

Year	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Season
1946-47	0	0	0	T	4.5	0.3	2.2	T	T	0	0	0	4.5
1947-48	0	0	0	0	T	1.8	2.6	5.2	0.1	T	0	0	5.2
1948-49	0	0	0	0	1.7	1.9	0.8	4.4	T	0	0	0	4.4
1949-50	0	0	0	T	0	0.4	5.1	2.2	1.2	T	0	0	5.1
1950-51	0	0	0	0	0.8	2.1	2.3	3.5	2.2	0	0	0	3.5
1951-52	0	0	0	0	0.5	2.1	3.0	2.5	T	0	0	0	3.0
1952-53	0	0	0	0	T	1.1	2.7	0	T	0	0	0	2.7
1953-54	0	0	0	0	0	1.0	**9.6**[a]	1.6	T	0	0	0	9.6
1954-55	0	0	0	0	0	1.8	1.7	2.2	0.7	T	T	0	2.2
1955-56	0	0	0	0	4.8	3.4	4.4	0.6	T	0	0	0	4.8
1956-57	0	0	0	T	0.1	2.4	3.5	1.2	2.2	0	0	0	3.5
1957-58	0	0	0	0.3	0	T	T	0	T	0	0	0	**0.3**[b]
1958-59	0	0	0	0	T	0.4	2.7	5.9	0	0	0	0	5.9
1959-60	0	0	0	0	0.2	0.6	3.6	T	1.5	0	T	0	3.6
1960-61	0	0	0	0	0	2.0	1.9	0	1.6	0	0	0	2.0
1961-62	0	0	0	0	0.4	3.0	0.3	2.0	0.8	0	0	0	3.0
1962-63	0	0	0	0	0	T	7.1	0.6	0	0	0	0	7.1
1963-64	0	0	0	0	T	4.3	1.5	T	T	T	T	0	4.3
1964-65	0	0	0	0	0.1	5.3	3.2	T	T	0	0	0	5.3
1965-66	0	0	0	0	T	5.4	1.9	T	T	0	0	0	5.4
1966-67	0	0	0	0	0.4	0.3	0.1	0	T	0	0	0	0.4
1967-68	0	0	0	0	0	3.3	2.9	0.3	0	T	0	0	3.3
1968-69	0	0	0	0	T	3.6	6.4	2.0	0	0	0	0	6.4
1969-70	0	0	0	0	T	1.3	3.0	T	0.2	0	0	0	3.0
1970-71	0	0	0	0	0.5	3.1	1.8	T	0.5	0	0	0	3.1
1971-72	0	0	0	0.6	T	3.4	3.9	1.3	0.1	T	0	0	3.9
1972-73	0	0	0	0	T	4.0	2.8	1.7	0	0	0	0	4.0
1973-74	0	0	0	**1.5**[a]	3.9	5.8	2.3	0	0	0	0	0	5.8
1974-75	0	0	0	0	0	0.4	0.9	5.6	T	T	0	0	5.6
1975-76	0	0	0	0	1.7	3.1	2.4	0.2	T	0	0	0	3.1
1976-77	0	0	0	0	0	0.2	1.8	T	T	0	0	0	1.8
1977-78	0	0	0	0	1.8	2.5	2.2	0.8	T	0	0	0	2.5
1978-79	0	0	0	0	**9.1**[a]	1.0	5.0	0.3	0	0	0	0	9.1
1979-80	0	0	0	0	3.4	3.6	6.4	4.5	0.3	0	0	0	6.4
1980-81	0	0	0	0	0.3	1.9	T	T	0	0	0	0	1.9
1981-82	0	0	0	0	0	3.8	1.0	T	T	**1.0**[a]	0	0	3.8
1982-83	0	0	0	0	0.2	2.6	2.0	2.0	0	0	T	0	2.6
1983-84	0	0	0	0	T	5.1	1.5	T	0	0	0	0	5.1
1984-85	0	0	0	T	4.7	2.4	1.3	2.9	0	0	0	0	4.7
1985-86	0	0	0	0	8.8	**6.6**[a]	1.1	2.7	0	0	0	0	8.8
1986-87	0	0	0	0	0	2.1	0.8	0	0	0	0	0	2.1
1987-88	0	0	0	0	1.1	4.4	2.3	0	0	0	0	0	4.4
1988-89	0	0	0	0	0	1.7	0.2	10.0	**2.7**[a]	T	**T**[a,c]	0	10.0
1989-90	0	0	0	0	0	1.1	0.6	0.7	T	0	0	0	1.1
1990-91	0	0	0	0	0	2.8	2.1	0	0.1	0	0	0	2.8
1991-92	0	0	0	0.9	T	0.6	0.3	T	0	0	0	0	0.9
1992-93	0	0	0	0	1.6	3.8	7.3	**12.4**[a]	2.0	0	0	0	**12.4**[a]
1993-94	0	0	0	0	0.6	1.0	0	0.3	0	0	0	0	1.0
1994-95	0	0	0	0	0.1	1.7	1.9	T	0	T	0	0	1.9
1995-96	0	0	0	0	1.0	2.7	3.5	4.0	0.4	0	0	0	4.0
1996-97	0	0	0	0	7.1	6.0	0.9	2.7	1.5	0	0	0	7.1
1997-98	0	0	0	0	0	1.8	3.3	T	T	0	0	0	3.3
1998-99	0	0	0	0	0	0.9	T	0	0	0	0	0	0.9
1999-2000	0	0	0	0	0	0.6	2.2	0.5	0	0	0	0	2.2
2000-2001	0	0	0	0	0.7	1.4	0.9	2.2	0	0	0	0	2.2
2001-2002	0	0	0	0	5.0	1.9	0.6	0.2	0	0	0	0	5.0
2002-2003	0	0	0	0	T	0.3	0.7	0	0	0	0	0	0.7
2003-2004	0	0	0	0	T	3.6	--	--	--	--	--	--	--

(a) Greatest value.
(b) Seasonal low.
(c) Most recent of multiple occurrences.
T = Trace
NOTE: Dashes indicate no data are available.

Table 4.8. Miscellaneous Snowfall Statistics, 1946 through 2003

	Oct	Nov	Dec	Jan	Feb	Mar	Season
Average Number of Days of Given Depth at 0400 PST							
≥1 inch	(a)	1	6	8	4	(a)	20
≥3 inches	0	1	2	5	2	(a)	11
≥6 inches	0	(a)	1	2	1	(a)	4
≥12 inches	0	0	(a)	(a)	0	0	(a)
Record Greatest Number of Days of Given Depth at 0400 PST							
≥1 inch	0	12 (1996)[b]	31 (1985)	31 (1969)	20 (1989)	7 (1993)	72 (1992-93)
≥3 inches	0	12 (1996)	31 (1985)	27 (1993)	16 (1950)	6 (1993)	58 (1985-86)
≥6 inches	0	9 (1985)	23 (1985)	25 (1993)	9 (1993)	5 (1993)	43 (1992-93)
≥12 inches	0	0	4 (1964)	10 (1993)	0	0	10 (1992-93)
Record Greatest Depth	1.5 (1973)	10.0 (1985)	15.6 (1985)	15.0 (1993)	10.0 (1969)	9.1 (1993)	15.6 (Dec 1985)
Greatest in 24 hours	1.5 (1973)	8.8 (1985)	6.6 (1985)	7.1 (1954)	10.2 (1993)	2.7 (1989)	10.2 (Feb 1993)

Record Consecutive Number of Days of Given Depth at 0400 PST	Number of Days	From	To
≥1 inch	60	November 20, 1985	January 18, 1986
≥3 inches	57	November 22, 1985	January 17, 1986
≥6 inches	32	December 20, 1964	January 20, 1965
≥12 inches	6	January 15, 1993	January 20, 1993

(a) Denotes less than 1/2 day.
(b) Year of occurrence in parentheses.
PST = Pacific Standard Time.

Table 4.9. Maximum Precipitation (inches)

Year	1 h	Date	2 h	Date	3 h	Date	6 h	Date	12 h	Date	24 h	Date
1947	0.48	08-29	0.51	06-07	0.54	06-07	0.67	09-15	0.75	09/16-17	0.88	10/19-20
1948	0.24	05-19	0.30	06-11	0.31	06/10-11	0.50	01/6-7	0.65	01-06	1.08	01/06-07
1949	0.18	11-23	0.28	11-23	0.41	11-23	0.60	11-23	0.63	11-23	0.65	11/23-24
1950	0.30	06-17	0.52	06-17	0.58	06-17	0.87	06-17	1.05	06-17	1.24	06/16-17
1951	0.28	04-28	0.41	04-28	0.44	04-28	0.45	06-06	0.47	06-06	0.70	06/05-06
1952	0.27	05-10	0.27	05-10	0.27	05-10	0.29	06-29	0.39	06-29	0.48	06-29
1953	0.35	08-26	0.35	08-26	0.35	08-26	0.44	01/08-09	0.77	01/08-09	0.83	01/08-09
1954	0.16	03-19	0.19	05-26	0.27	01-16	0.52	01-16	0.72	01/15-16	0.77	01/15-16
1955	0.13	12-31	0.21	12-21	0.31	12-21	0.49	12-21	0.61	12-21	0.64	11/26-27
1956	0.16	06-14	0.22	06-14	0.27	06-14	**0.28**[a]	01-15	0.44	01/14-15	0.73	01/14-15
1957	0.47	10-01	**0.88**[a]	10-01	**1.08**[a]	10-01	**1.68**[a]	10/01-02	**1.88**[a]	10/01-02	**1.91**[a]	10/01-02
1958	0.43	06-12	0.43	06-12	0.43	06-12	0.65	12/10-11	0.88	12/10-11	1.00	12/10-11
1959	0.18	05-17	0.18	05-17[b]	0.23	09-14[b]	0.40	01-11	0.54	01/11-12	0.82	01/11-12
1960	0.22	03-27	0.23	03-27	0.33	05/06-07	0.43	05/06-07	0.44	05/06-07	0.44	05/06-07
1961	0.21	02-01	0.39	02-01	0.42	02-01	0.46	05/09-10	0.72	02-01	0.72	02-01
1962	0.19	11-30	0.27	11-30	0.34	02-09	0.40	10-12	0.52	10-12	0.52	10-12
1963	0.22	01-31	0.37	01-31	0.44	01-31	0.54	01-31	0.94	01-31/02-01	0.98	01-31/02-01
1964	0.16	12-22	0.20	06-08	0.32	12-21	0.42	12-21	0.54	12-21	0.60	12/21-22
1965	**0.10**[a]	05-19	**0.14**[a]	11-24[b]	**0.18**[a]	06-17	0.29	06-17	0.39	06-17	0.48	06-17
1966	0.14	07-02	0.17	07-02	0.22	11-19	0.37	11-19	0.74	11/19-20	0.78	11/19-20
1967	0.15	04-18	0.26	06-21	0.31	06-21	0.31	06-21	**0.32**[a]	06-21	**0.37**[a]	04/17-18
1968	0.12	12-24	0.21	12-24	0.28	12-24	0.36	12-24	0.43	10-11	0.54	10/07-08
1969	**0.55**[a]	06-12	0.59	06-12	0.59	06-12	0.60	06-12	0.60	06/12-13	0.60	06-12
1970	0.15	05-12	0.29	05-12	0.37	05-12	0.47	05-12	0.50	05-12	0.61	01/22-23
1971	0.15	03-15	0.26	03-25	0.35	01-16	0.48	03/25-26	0.53	01-16	0.53	01-16
1972	0.18	05-20	0.32	05-30	0.45	05-20	0.80	05/20-21	1.24	5/20-21	1.39	05/20-21
1973	0.15	10-31	0.21	10-31[b]	0.30	11-12	0.53	10-31	0.64	10-31	0.64	11/11-12
1974	0.45	07-19	0.45	07-19	0.45	07-19	0.45	07-19	0.45	07-19	0.45	07-19
1975	0.30	08-18	0.47	08-18	0.55	08-18	0.69	08-18	0.69	08-18	0.69	08-18
1976	0.32	08-07	0.33	08-07	0.33	08-07	0.33	08-07	0.33	08-07	0.40	08/24-25
1977	0.16	12-13	0.28	12-13	0.36	12-13	0.61	12-13	0.75	12-13	0.89	08/29-30
1978	0.15	04-27	0.22	04-27	0.23	04-27	0.31	11-18[b]	0.58	11/18-19	0.67	11/18-19
1979	0.11	04-17	0.18	03-27	0.22	03-27	0.29	03-27	0.40	03-27	0.42	11-16+
1980	0.14	12-25	0.24	04-20	0.29	04-20	0.47	05/25-26	0.74	09-13	0.90	05/25-26
1981	0.22	05-25	0.34	05-25	0.38	05-25	0.73	05-25	0.74	05-25	0.74	05-25
1982	0.22	07-07	0.33	11-18	0.40	11-18	0.64	10-28	0.95	10/28-29	0.97	10/28-29
1983	0.24	09-01	0.31	11-10	0.39	11-10	0.45	11/23-24	0.60	11/23-24	0.66	11-10
1984	0.20	06-28	0.38	03-20	0.39	03-20	0.48	03/20-21	0.51	03/20-21	0.53	03/20-21
1985	0.14	12-07	0.22	11-21	0.29	11-21	0.46	11-21	0.52	11/21-22	0.52	11/21-22
1986	0.24	09-15	0.43	09-15	0.45	09-15	0.47	09-15	0.47	09-15	0.54	09-15
1987	0.21	07-09	0.24	07-09	0.27	07-09	0.31	12-09	0.34	12-09	0.55	12-09
1988	0.31	04-28	0.42	04-28	0.42	04-28	0.42	04-28	0.48	04-28	0.49	04/27-28
1989	0.16	04-25	0.25	04-25	0.26	04-25	0.31	05-23	0.38	02/16-17	0.56	02/16-17
1990	0.25	06-06	0.33	08-21[b]	0.43	08-21	0.66	08-21	0.77	08/20-21	0.77	08/20-21
1991	0.49	06-29	0.50	06-29	0.51	06-29	0.51	06-29	0.53	06-29	0.59	06/05-06
1992	0.17	06-12	0.25	06-12	0.31	06-12	0.44	06-12	0.70	06-12	0.79	06-12
1993	0.32	07-17	0.45	07-17	0.55	07-17	0.82	07-17	1.01	07/16-17	1.39	07/16-17
1994	0.27	05-15	0.32	10-14	0.37	05-15	0.49	05-15	0.58	05-15	0.59	05/14-15
1995	0.48	05-09	0.53	05-09	0.53	05-09	0.55	12-12	0.65	12-12	1.04	12/11-12
1996	0.16	12-31[b]	0.29	12-29	0.40	12-29	0.65	12-29	0.90	11-19	1.70	11/18-19
1997	0.27	10-08	0.36	10-08	0.40	10-08	0.48	01-31	0.57	11-07	0.70	01-17
1998	0.19	11-05	0.29	11-05	0.36	11-05	0.49	11-05	0.62	11-05	0.62	11-05
1999	0.40	08-05	0.40	08-05	0.47	08-05	0.48	08-05	0.48	08-05	0.51	01/22-23
2000	0.18	07-16	0.23	05-31	0.29	05-31	0.40	05-31	0.50	04-13	0.54	04-13
2001	0.15	06-05	0.25	06-26	0.34	06-26	0.47	06/26-27	0.48	06/26-27	0.72	06/26-27
2002	0.22	02-07	0.32	02-07	0.39	02-07	0.51	02-07	0.53	02-07	0.64	12/13-14
2003	0.23	04-14	0.39	04-14	0.54	04-14	0.92	04-14	1.19	04-14	1.24	04/14

(a) Greatest and least values.
(b) Last of multiple occurrences.

Table 4.10. Normal and Maximum Daily Precipitation (inches)

	Normal Period (1971-2000)					Historical Period (1945-2003)	
		Number of Years					
Day	Normal	W/Meas.	W/Trace	Maximum	Year	Maximum	Year
				January			
1	0.02	8	3	0.20	1987	0.20	1987
2	0.02	10	6	0.17	1983	0.27	1953
3	0.02	10	6	0.20	1975	0.28	1966
4	0.02	8	8	0.17	1976	0.25	1956
5	0.03	7	6	0.19	1986	0.23	1966
6	0.03	4	8	0.50	1983	0.87	1948
7	0.03	13	3	0.31	1990	0.31	1990
8	0.03	9	9	0.34	1993	0.59	1953
9	0.03	9	9	0.41	1995	0.41	1995[a]
10	0.04	14	5	0.22	1995	0.22	1995
11	0.04	11	7	0.19	1995	0.48	1959
12	0.04	7	11	0.32	1973	0.58	1958
13	0.04	9	7	0.33	1980	0.37	1950
14	0.04	16	2	0.27	1993	0.40	1968[a]
15	0.04	7	6	0.43	1978	0.43	1978
16	0.04	14	5	0.53	1971	0.70	1954
17	0.03	8	6	0.31	1997	0.31	1997
18	0.03	8	8	0.28	1996	0.28	1996
19	0.03	8	3	0.12	1983	0.39	1950
20	0.02	8	2	0.26	1985	0.32	1953
21	0.02	7	6	0.16	1997	0.16	1997[a]
22	0.02	7	7	0.47	1999	0.54	1970
23	0.03	11	5	0.13	1998	0.27	1965
24	0.03	8	4	0.26	1996	0.26	1996
25	0.03	7	4	0.72	1975	0.72	1975
26	0.02	7	4	0.20	1983	0.36	1970
27	0.02	9	5	0.21	1996	0.32	1954
28	0.02	8	5	0.19	1995[a]	0.19	1995[a]
29	0.02	6	4	0.21	1986	0.33	1958
30	0.02	7	6	0.24	1995	0.27	2003
31	0.02	9	9	0.69	1997	**0.94**[b]	**1963**[b]
				February			
1	0.02	8	6	0.26	1985	0.72	1961
2	0.02	4	9	0.12	1980	0.26	1963
3	0.02	6	6	0.31	1998	0.31	1998
4	0.02	6	3	0.28	1975	0.28	1975
5	0.02	7	7	0.10	1996	0.15	1953
6	0.02	9	4	0.16	1983[a]	0.18	1961
7	0.02	8	6	0.34	1995	0.53	2002
8	0.02	5	5	0.12	1985	0.12	1985
9	0.02	7	4	0.21	1992	0.43	1959
10	0.02	2	5	0.15	1973	0.64	1961
11	0.02	10	5	0.25	1997	0.30	1969
12	0.02	9	5	0.37	1998	0.42	1958
13	0.02	9	7	0.21	1981	0.21	1981
14	0.03	7	8	0.39	1986	0.39	1986
15	0.03	10	4	0.20	1982	0.30	1970
16	0.04	5	8	0.42	1989	0.42	1989
17	0.04	10	5	0.42	1989	0.42	1989
18	0.03	11	5	0.34	1983	0.34	1983[a]
19	0.03	10	5	0.78	1993	**0.78**[b]	**1993**[b]
20	0.03	10	4	0.18	1984	0.18	1984
21	0.03	10	5	0.20	1986	0.36	1956
22	0.02	3	2	0.15	1989	0.21	1949

Table 4.10. (contd)

	Normal Period (1971-2000)					Historical Period (1945-2003)	
		Number of Years					
Day	Normal	W/Meas.	W/Trace	Maximum	Year	Maximum	Year
23	0.02	7	4	0.16	1986	0.22	1968
24	0.02	7	7	0.13	1996	0.33	1950
25	0.02	9	7	0.22	1996[a]	0.25	1948
26	0.02	7	4	0.30	2000[a]	0.30	2000[a]
27	0.02	9	5	0.32	1999	0.32	1999
28	0.02	8	2	0.33	1977	0.33	1977
29	0.02	2	2	0.04	1984	0.04	1984
				March			
1	0.02	11	3	0.15	1972	0.15	1972
2	0.02	8	7	0.20	1991	0.20	1991[a]
3	0.02	8	6	0.15	1991[a]	0.15	1991[a]
4	0.02	12	5	0.48	2000	0.48	2000
5	0.02	5	6	0.23	1989	0.23	1989
6	0.02	5	2	0.07	1971[a]	0.24	1957
7	0.02	6	4	0.21	1986	0.21	1986
8	0.02	7	4	0.19	1988	0.23	1951
9	0.02	4	8	0.42	1995	0.42	1995
10	0.02	14	3	0.21	1995	0.21	1995
11	0.02	6	7	0.24	1989	0.24	1989
12	0.02	7	3	0.42	1987	0.42	1987
13	0.02	8	8	0.35	1983	0.35	1983
14	0.02	6	5	0.16	1995	0.16	1995
15	0.02	7	3	0.18	1987	0.25	1949
16	0.02	9	5	0.34	1997	0.34	1997[a]
17	0.02	3	6	0.03	1975	0.16	1949
18	0.02	7	6	0.08	1997	0.25	1949
19	0.02	3	3	0.12	1987	0.12	1987
20	0.01	7	2	0.43	1984	0.43	1984
21	0.02	4	2	0.10	1984[a]	0.18	1958
22	0.02	6	6	0.21	1971	0.22	1961
23	0.02	6	6	0.26	1986	0.26	1986
24	0.02	4	0	0.52	1991	**0.52**[b]	**1991**[b]
25	0.02	7	2	0.43	1971	0.43	1971
26	0.02	4	5	0.50	1981	0.50	1981
27	0.02	4	3	0.42	1979	0.42	1979
28	0.02	4	2	0.13	1982	0.13	1982
29	0.01	6	1	0.15	1983	0.15	1983
30	0.01	3	6	0.23	1974	0.23	1974
31	0.01	5	5	0.26	1996	0.26	1996
				April			
1	0.01	6	7	0.18	1983	0.22	1958
2	0.01	5	4	0.11	1993	0.18	1948
3	0.01	3	4	0.10	1993	0.18	1947
4	0.01	4	5	0.13	1984	0.18	1948
5	0.01	5	4	0.07	1972	0.44	1969
6	0.01	6	3	0.36	1982	0.36	1982
7	0.01	3	3	0.22	1984	0.30	1953
8	0.01	7	3	0.18	1991	0.18	1991
9	0.01	4	9	0.32	1992	0.32	1992
10	0.02	3	6	0.06	1995	0.26	2001
11	0.02	4	9	0.23	1982	0.25	2001
12	0.01	6	2	0.36	1995	0.36	1995
13	0.01	5	2	0.54	2000	0.54	2000

Table 4.10. (contd)

	Normal Period (1971-2000)					Historical Period (1945-2003)	
		Number of Years					
Day	Normal	W/Meas.	W/Trace	Maximum	Year	Maximum	Year
14	0.01	5	5	0.17	1975[a]	**1.04**	**2003[b]**
15	0.01	2	6	0.17	1991	0.17	1991
16	0.01	4	6	0.08	1979[a]	0.11	1948
17	0.01	3	7	0.36	1988	0.36	1988
18	0.01	1	4	0.12	1984	0.31	1967
19	0.02	5	8	0.22	1994	0.41	1970
20	0.02	5	3	0.56	1980	0.56	1980
21	0.02	1	4	0.07	1989	0.07	1989
22	0.02	7	4	0.28	1996	0.28	1996
23	0.02	7	4	0.22	1974	0.22	1974
24	0.02	4	7	0.22	1975	0.22	1975
25	0.02	5	6	0.35	1989	0.35	1989
26	0.02	2	3	0.04	1989	0.67	2003
27	0.02	6	5	0.34	1995	0.34	1995
28	0.02	7	4	0.48	1988	0.51	1951
29	0.02	2	1	0.10	1992	0.30	1961
30	0.02	8	0	0.12	1984	0.12	1984
				May			
1	0.01	4	5	0.19	1984	0.19	1984
2	0.01	6	2	0.17	1975	0.17	1975
3	0.01	6	5	0.29	1977	0.29	1977
4	0.01	6	3	0.06	1973	0.10	1967
5	0.02	8	2	0.07	2000	0.28	1963
6	0.02	4	6	0.20	1986	0.20	1986
7	0.02	4	2	0.39	1983	0.39	1983
8	0.02	5	7	0.55	1972	0.55	1972
9	0.02	3	5	0.53	1995	0.53	1995
10	0.02	5	5	0.15	1980	0.39	1961
11	0.02	6	3	0.11	1975	0.39	1951
12	0.01	4	5	0.14	1996	0.50	1970
13	0.01	4	3	0.11	1985	0.15	1952
14	0.01	6	6	0.25	1978	0.25	1978
15	0.01	5	5	0.58	1994	0.58	1994
16	0.02	1	5	0.14	1991	0.14	1991
17	0.02	8	2	0.23	1998	0.25	1959
18	0.02	6	3	0.13	1981	0.13	1981
19	0.02	5	3	0.20	1994	0.55	1948
20	0.02	5	1	0.70	1972	0.70	1972
21	0.02	4	1	0.69	1972	0.69	1972
22	0.02	5	4	0.12	1984	0.12	1984
23	0.03	5	5	0.33	1990	0.33	1990
24	0.02	5	3	0.14	1998	0.51	1962
25	0.02	8	1	0.74	1981	0.74	1981
26	0.02	4	7	0.79	1980	**0.79[b]**	**1980[b]**
27	0.02	7	3	0.11	1990	0.16	2002
28	0.02	8	4	0.28	1988	0.28	1988
29	0.02	4	3	0.09	1996	0.11	1961
30	0.02	7	1	0.14	1987	0.14	1987
31	0.02	6	3	0.45	2000	0.45	2000
				June			
1	0.02	2	3	0.29	1977	0.29	1977
2	0.02	4	2	0.10	1975	0.12	1966
3	0.02	4	11	0.30	1971	0.30	1971

Table 4.10. (contd)

	Normal Period (1971-2000)					Historical Period (1945-2003)	
		Number of Years					
Day	Normal	W/Meas.	W/Trace	Maximum	Year	Maximum	Year
4	0.02	7	2	0.25	1984	0.45	1951
5	0.02	5	4	0.49	1991	0.49	1991
6	0.02	5	4	0.36	1990	0.54	1951
7	0.02	7	4	0.15	1972	0.71	1947
8	0.02	6	3	0.21	1981	0.49	1964
9	0.02	2	3	0.04	1972	0.22	1948
10	0.01	1	4	0.08	1983	0.14	1956
11	0.01	4	4	0.06	1997	0.39	1950
12	0.01	5	7	0.79	1992	0.79	1992
13	0.01	6	3	0.35	1980	0.49	1948
14	0.01	4	1	0.10	1995	0.37	1956
15	0.01	6	2	0.03	1998[a]	0.15	1964
16	0.01	3	5	0.14	1980	0.18	1948
17	0.01	2	5	0.06	1975	**1.09**[b]	**1950**[b]
18	0.01	3	3	0.09	1994	0.09	1994
19	0.01	4	2	0.29	1998	0.29	1998
20	0.01	6	2	0.24	1984	0.24	1984
21	0.01	4	2	0.03	1991[a]	0.32	1967
22	0.01	4	6	0.14	1971	0.14	1971
23	0.01	6	1	0.05	1996[a]	0.17	1963
24	0.01	7	2	0.21	1972	0.21	1972
25	0.01	3	5	0.02	1980	0.03	1954
26	0.02	3	4	0.27	1982	0.39	2001
27	0.02	3	1	0.37	1983	0.37	1983
28	0.01	5	6	0.24	1992	0.24	1992
29	0.01	5	2	0.53	1991	0.53	1991
30	0.01	1	2	0.06	1976	0.06	1976
			July				
1	0.01	2	2	0.16	1978	0.31	1966
2	0.01	3	6	0.07	1986	0.34	1966
3	0.01	3	3	0.31	1978	0.31	1978
4	0.01	5	2	0.10	1986	0.10	1986
5	0.01	3	2	0.19	1981	0.36	1951
6	0.01	4	2	0.25	2000	0.25	2000
7	0.01	3	1	0.22	1982	0.30	1963
8	0.01	7	2	0.20	1995	0.20	1995
9	0.01	6	1	0.27	1987	0.27	1987
10	0.01	4	5	0.12	1997	0.16	1954
11	0.01	2	3	0.04	1979	0.04	1979
12	0.01	0	2	T	1982[a]	T	1982[a]
13	0.01	4	4	0.28	1975	0.28	1975
14	0.01	0	2	T	1993[a]	0.05	1957
15	0.01	3	1	0.08	1991	0.08	1991
16	0.02	6	2	0.50	1993	0.50	1993
17	0.01	6	2	0.89	1993	**0.89**[b]	**1993**[b]
18	0.01	2	2	0.12	1987	0.12	1987
19	0.01	2	2	0.45	1974	0.45	1974
20	0.01	2	3	0.01	1992[a]	0.09	1965
21	T	1	2	0.01	1997	0.02	1965
22	T	0	3	T	1993[a]	T	1993[a]
23	T	2	0	0.28	1992	0.28	1992
24	0.01	2	2	0.06	1990	0.07	1955
25	0.01	3	2	0.23	1983	0.23	1983
26	0.01	1	2	0.04	1995	0.22	1955

Table 4.10. (contd)

	Normal Period (1971-2000)					Historical Period (1945-2003)	
		Number of Years					
Day	Normal	W/Meas.	W/Trace	Maximum	Year	Maximum	Year
27	0.01	1	0	0.02	1983	0.31	1947
28	0.01	1	3	0.06	1984	0.28	1947
29	0.01	3	2	0.05	1997	0.05	1997
30	T	0	4	T	1997[a]	T	2001[a]
31	T	3	2	0.16	1998	0.16	1998
				August			
1	T	1	0	0.08	1976[a]	0.08	1976[a]
2	T	2	0	0.01	1996	0.01	1996[a]
3	T	0	1	T	1971	0.29	1962
4	T	1	0	0.01	1985	0.04	1948
5	T	1	3	0.48	1999	0.48	1999
6	0.01	2	1	0.11	1976	0.11	1976
7	0.01	2	1	0.33	1976	0.36	2003
8	0.01	1	3	0.01	1994	0.08	1952
9	0.01	2	1	0.10	1982	0.10	1982
10	T	1	3	0.06	1995	0.06	1947
11	T	1	1	0.01	1983	0.11	1947
12	T	1	2	0.01	1972	0.18	1962
13	0.01	4	3	0.04	1987[a]	0.04	1987[a]
14	0.01	4	3	0.09	1979	0.09	1979
15	0.01	3	1	0.42	1972	0.42	1972
16	0.01	1	1	0.24	1993	0.24	1993
17	0.01	0	3	T	1995[a]	T	1995[a]
18	0.01	3	1	0.69	1975	0.69	1975
19	0.01	3	4	0.05	1979	0.18	1954
20	0.01	6	3	0.03	1978	0.22	1953
21	0.02	3	4	0.76	1990	**0.76**[b]	**1990**[b]
22	0.02	6	0	0.18	1978	0.18	1978
23	0.02	3	1	0.14	1975	0.14	1975
24	0.02	6	2	0.38	1977	0.38	1977
25	0.01	1	2	0.29	1976	0.29	1976
26	0.01	3	2	0.02	1994[a]	0.38	1953
27	0.01	3	2	0.14	1989	0.14	1989
28	0.01	2	5	0.13	1975	0.13	1975
29	0.01	6	2	0.28	1977	0.51	1947
30	0.01	3	3	0.61	1977	0.61	1977
31	0.01	1	4	0.01	1973	0.02	1961[a]
				September			
1	0.01	6	0	0.43	1971	0.43	1971
2	0.01	3	3	0.17	1971	0.17	1971
3	0.01	5	0	0.15	1997	0.15	1997
4	0.01	1	2	0.02	1977	0.19	1960
5	0.01	3	1	0.19	1971	0.19	1971
6	0.01	4	0	0.48	1995	0.48	1995
7	0.01	3	2	0.19	1995	0.23	1947
8	0.01	2	4	0.10	1985	0.21	2003
9	0.01	3	4	0.07	1985	0.07	1985
10	0.01	2	3	0.27	2000	0.27	2000
11	0.01	2	1	0.05	1982	0.10	1966
12	0.01	0	1	T	1980[a]	0.03	1958
13	0.01	3	1	0.79	1980	**0.79**[b]	**1980**[b]
14	0.01	5	3	0.14	1996	0.41	1959
15	0.01	3	5	0.54	1986	0.54	1986

Table 4.10. (contd)

	Normal Period (1971-2000)					Historical Period (1945-2003)	
		Number of Years					
Day	Normal	W/Meas.	W/Trace	Maximum	Year	Maximum	Year
16	0.01	2	5	0.03	1985	0.66	1947
17	0.02	3	4	0.16	1985	0.26	1969
18	0.02	4	5	0.22	1983	0.41	1959
19	0.02	6	4	0.26	1973	0.26	1973
20	0.01	5	6	0.13	1988	0.13	1988
21	0.01	4	2	0.05	2000	0.05	2000
22	0.01	3	1	0.20	1984	0.20	1984
23	0.01	5	0	0.21	1986	0.21	1986
24	0.01	4	1	0.10	1977	0.10	1977
25	0.01	4	3	0.25	1982	0.25	1982
26	0.01	4	2	0.22	1981	0.22	1981
27	0.01	4	0	0.38	1981	0.43	1955
28	0.01	4	2	0.11	1977	0.34	1962
29	0.01	3	1	0.07	1986	0.07	1986
30	0.01	1	3	0.02	1995	0.03	1953[a]
				October			
1	0.01	2	4	0.14	2000	**1.60**[b]	**1957**[b]
2	0.01	3	5	0.09	1995	0.31	1957
3	0.01	4	1	0.38	1995	0.38	1995
4	0.01	1	1	0.01	1996	0.15	1950
5	T	0	4	T	1981[a]	0.25	1950
6	0.01	5	2	0.22	1973	0.22	1973
7	0.01	1	1	0.25	1985	0.25	1985
8	0.01	2	3	0.46	1997	0.49	1950
9	0.01	1	3	0.04	1975	0.32	1947
10	0.01	5	4	0.22	2000	0.32	1959
11	0.01	2	3	0.18	1995	0.43	1968
12	0.01	3	4	0.09	1996	0.52	1962
13	0.01	4	2	0.16	1994	0.16	1994
14	0.01	4	3	0.22	1994	0.43	1950
15	0.01	1	1	0.01	1980	0.15	1947
16	0.01	1	2	0.02	1993	0.24	1947
17	0.01	3	1	0.09	1995	0.23	1950
18	0.01	4	1	0.28	1979	0.28	1979
19	0.01	4	3	0.12	1979	0.64	1947
20	0.02	5	4	0.18	2000	0.37	1947
21	0.02	6	3	0.45	1975	0.45	1975
22	0.02	6	4	0.20	1983	0.23	1957
23	0.02	4	2	0.39	1973	0.39	1973
24	0.02	6	3	0.12	1991	0.12	1991
25	0.03	8	3	0.22	1975	0.22	1975
26	0.03	8	2	0.12	1989	0.18	1956
27	0.03	7	4	0.36	1999	0.36	1999
28	0.03	8	6	0.93	1982	0.93	1982
29	0.03	11	4	0.18	1986	0.38	1950
30	0.03	5	4	0.52	1990	0.52	1990
31	0.03	7	6	0.64	1973	0.64	1973
				November			
1	0.03	8	3	0.18	1987	0.26	1948
2	0.03	4	2	0.25	1984	0.25	1984
3	0.03	6	3	0.15	1972	0.28	1965
4	0.03	10	3	0.24	1991	0.24	1991

Table 4.10. (contd)

	Normal Period (1971-2000)					Historical Period (1945-2003)	
		Number of Years					
Day	Normal	W/Meas.	W/Trace	Maximum	Year	Maximum	Year
5	0.03	10	2	0.62	1998	0.62	1998
6	0.03	10	3	0.30	1980	0.30	1980[a]
7	0.03	8	4	0.57	1997	0.57	1997
8	0.03	9	5	0.53	2000	0.53	2000
9	0.03	8	6	0.16	1973	0.27	1949
10	0.03	8	5	0.66	1983	0.66	1983
11	0.03	10	3	0.19	1973	0.26	1970
12	0.03	7	5	0.57	1973	0.57	1973
13	0.03	8	5	0.47	1981	0.47	1981
14	0.03	4	5	0.10	1981	0.35	1966
15	0.03	11	5	0.19	1994	0.19	1994
16	0.04	13	2	0.42	1979	0.45	2001
17	0.04	11	6	0.12	1974	0.18	1955
18	0.04	6	2	0.51	1996	0.51	1996
19	0.04	12	5	1.39	1996	**1.39**[b]	**1996**[b]
20	0.04	3	5	0.26	1984	0.42	1966
21	0.04	10	5	0.50	1985	0.50	1985
22	0.04	9	8	0.30	1979	0.30	1979
23	0.04	15	4	0.42	1983	0.63	1949
24	0.03	9	6	0.33	1996	0.37	1965
25	0.03	8	7	0.30	2000	0.30	2000
26	0.03	7	6	0.37	1991	0.54	1955
27	0.03	12	5	0.49	1984	0.49	1984
28	0.03	9	4	0.19	1986	0.46	2001
29	0.03	11	4	0.18	1978	0.18	1978
30	0.03	10	2	0.34	1998	0.34	1998
			December				
1	0.03	8	2	0.11	1987	0.32	2003
2	0.03	12	4	0.34	1985[a]	0.34	1985[a]
3	0.03	7	5	0.56	1980	0.56	1980
4	0.04	10	2	0.28	1974	0.28	1974
5	0.04	10	5	0.32	1983	0.43	1963
6	0.04	12	8	0.18	1985	0.18	1985
7	0.04	10	3	0.32	1983	0.36	1948
8	0.04	6	6	0.33	1993	0.36	1963
9	0.04	7	10	0.55	1987	0.55	1987
10	0.04	8	8	0.46	1992	0.54	1958
11	0.04	8	4	0.40	1995	0.53	1958
12	0.04	11	2	0.65	1995	0.65	1995
13	0.04	8	5	0.76	1977	0.76	1977
14	0.04	9	5	0.23	1981	0.50	2002
15	0.03	10	1	0.22	1981	0.22	1981
16	0.03	8	8	0.37	1994	0.37	1994
17	0.03	8	5	0.22	1973	0.22	1973
18	0.03	9	6	0.22	1981	0.27	1960
19	0.03	10	7	0.16	1981	0.20	1953
20	0.03	9	6	0.33	1982	0.33	1982
21	0.03	10	6	0.30	1980	0.61	1955
22	0.03	8	4	0.21	1972	0.59	1964
23	0.04	6	8	0.31	1975	0.31	1975
24	0.04	12	4	0.15	1980	0.36	1968
25	0.04	12	7	0.32	1996	0.32	1996
26	0.04	8	4	0.58	1996	0.58	1996
27	0.04	8	10	0.36	1973	0.36	1973

Table 4.10. (contd)

	Normal Period (1971-2000)					Historical Period (1945-2003)	
		Number of Years					
Day	Normal	W/Meas.	W/Trace	Maximum	Year	Maximum	Year
28	0.04	10	9	0.09	1990[a]	0.25	2002
29	0.04	12	5	0.80	1996	**0.80**[b]	**1996**[b]
30	0.03	8	3	0.29	1995	0.41	2002
31	0.03	8	7	0.72	1996	0.72	1996

(a) Most recent of several occurrences.
(b) Greatest monthly value and year of occurrence.
T = Trace.

5.0 Wind Climatology

5.1 Monthly and Annual Prevailing Wind Directions, Average Speeds, and Peak Gusts

At the Hanford Meteorology Station, the prevailing wind direction for every month of the year is either WNW or NW (Table 5.1), and the peak gusts for every month are from the SSW, SW, or WSW. Hourly observations of wind direction and speed are taken at the 50-foot level of a 408-foot instrumented tower. The highest monthly average wind speeds occur in June, the lowest in December. The variability in monthly average wind speeds is much greater in the winter months than during the remainder of the year. The highest January average of 10.3 mph is more than 3.5 times greater than the lowest (2.9 mph); however, in June, the highest average (10.7 mph) is only 1.4 times greater than the lowest (7.7 mph).

Table 5.1. Monthly and Annual Prevailing Wind Directions, Average Speeds, and Peak Gusts at 50-Foot Level, 1945 through 2003

Month	Prevailing Direction	Average Speed, mph	Highest Average		Lowest Average		Peak Gusts		
			mph	Year	mph	Year	Speed, mph	Direction	Year
Jan	NW	6.3	10.3	1972	2.9	1985	80	SW	1972
Feb	NW	7.1	11.1	1999	4.6	1963	65	SW	1971
Mar	WNW	8.2	10.7	1977[a]	5.9	1958	70	SW	1956
Apr	WNW	8.8	11.1	1972[a]	7.4	1989[a]	73	SSW	1972
May	WNW	8.8	10.7	1983	5.8	1957	71	SSW	1948
Jun	NW	9.1	10.7	1983[a]	7.7	1950[a]	72	SW	1957
Jul	NW	8.6	10.7	1983	6.8	1955	69	WSW	1979
Aug	WNW	8.0	9.5	1996	6.0	1956	66	SW	1961
Sep	WNW	7.5	9.2	1961	5.4	1957	65	SSW	1953
Oct	NW	6.6	9.1	1946	4.4	1952	72	SW	1997
Nov	NW	6.4	10.0	1990	2.9	1956	67	WSW	1993
Dec	NW	6.0	8.3	1968	3.3	1985	71	SW	1955
Annual	NW	7.6	8.8	1999	6.2	1989	80	SW	Jan 1972

(a) Also in earlier years.

5.2 Days with Peak Gusts Above or Below Specific Thresholds

Table 5.2 lists the number of days by month and year with peak wind gusts (at 50-foot level) above or below specific threshold wind speeds. June and July have the highest average number of days with gusts ≥25 mph (nearly 20 each); however, January, March, April, and December have the highest average number of days with gusts ≥40 mph (nearly 3 days), and January and December have the highest average number of days with gusts ≥50 mph (0.9 and 0.8 day, respectively). January also has the record highest number of gusts ≥40 and ≥50 mph at 11 and 7 days, respectively, in 1990. Calendar year 1990 recorded the most days with gusts ≥40 and ≥50 mph at 57 and 18 days, respectively. Of particular interest is that previous records for these categories were 41 days ≥40 mph in 1961 and 10 days ≥50 mph in 1972.

5.3 Frequency of Monthly and Annual Wind Direction and Speed at 50-Foot Level

Table 5.3 presents Hanford Meteorology Station data on the percent frequency of monthly and annual wind direction and wind speed at the 50-foot level. This table shows that for every month of the year the prevailing wind direction is either from the WNW or NW. Winds are relatively evenly distributed from the NNE through the SSW at between 2% and 4% on an annual average for each direction.

The wind speed class with the highest frequency of occurrence is 4 to 7 mph, with winds in that category 37% of the time. The speed class with the second highest frequency is 8 to 12 mph, at 25%. Winds averaging greater than 25 mph occur only 1% of the time on an annual basis, with the highest frequency occurring in March (1.6%).

5.4 Composite Wind Roses and Joint Frequency Distributions for the Hanford Meteorological Monitoring Network

Figure 5.1 and Table 5.4 contain composite wind roses and joint frequency distributions at the 30-foot level for the entire Hanford Meteorological Monitoring Network (see Table 1.1 and Figure 1.1) for the entire period of operation 1982 through 2003.

Figure 5.2 and Table 5.5 contain composite wind roses and joint frequency distributions at the 60-meter level for stations 9, 11, 13, and 21 for the entire period of operation 1986 through 2003.

Table 5.2. Number of Days with Peak Gusts Above or Below Specific Thresholds at 50-Foot Level, 1945 through 2003

	Days with Peak Gusts ≤12 mph					Days with Peak Gusts ≥25 mph					Days with Peak Gusts ≥40 mph					Days with Peak Gusts ≥50 mph				
Month	Avg	Max	Year	Min	Year	Avg	Max	Year	Min	Year	Avg	Max	Year	Min	Year	Avg	Max	Year	Min	Year
Jan	9.6	29	1985	3	1968	7.6	21	1953	0	1985[a]	2.8	11	1990[a]	0	2003[a]	0.9	7	1990	0	2003[a]
Feb	6.2	16	1963	0	1990	8.6	17	1976[a]	2	1952[a]	2.4	10	1999[a]	0	2001[a]	0.6	4	1972	0	2002[a]
Mar	2.6	8	1992	0	2003[a]	13.2	21	1977	4	1992	2.8	9	1956	0	1998[a]	0.6	4	1956	0	2000[a]
Apr	0.6	6	1951	0	2003[a]	17.0	26	1954	8	1946	2.8	8	1991	0	1998[a]	0.4	2	1997[a]	0	2003[a]
May	0.3	3	1955	0	2003[a]	18.8	26	1978	9	1945	2.4	7	2002	0	1997[a]	0.2	2	1993[a]	0	2003[a]
Jun	0.1	1	1980[a]	0	2003[a]	19.7	26	1963	11	1950[a]	2.4	7	1985	0	1982[a]	0.2	2	1992[a]	0	2003[a]
Jul	0.1	1	1957[a]	0	2003[a]	19.5	26	1995	11	1955	1.8	5	1995[a]	0	1981[a]	0.2	1	2002[a]	0	2003[a]
Aug	0.2	2	1972	0	2003[a]	15.9	24	2000	7	1945	1.3	5	1951	0	2000[a]	0.1	1	1998[a]	0	2003[a]
Sep	2.4	9	1987	0	2003[a]	11.3	17	2002[a]	7	1975[a]	1.4	4	1946	0	2002[a]	0.2	2	1953	0	2003[a]
Oct	6.7	15	1974	2	2003[a]	9.0	19	2003	3	1987[a]	1.9	8	2003[a]	0	1993[a]	0.2	2	2003[a]	0	2002[a]
Nov	9.2	20	1956[a]	2	1977[a]	8.3	16	1990	0	1979	2.3	8	1990	0	2002[a]	0.6	4	1998[a]	0	2002[a]
Dec	11.1	23	1985	3	1968	7.4	15	1968	0	1985	2.6	8	1957[a]	0	2003[a]	0.8	5	2001	0	2003[a]
Annual	49.2	87	1952	28	1973	156.6	192	1999	123	1952	27.0	57	1990	10	1978	5.0	18	1990	0	1985

(a) Most recent of multiple occurrences.

Table 5.3. Frequency (%) of Monthly and Annual Wind Direction and Speed at 50-Foot Level, 1955 through 2003

Direction	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
N	4.2	4.8	4.6	4.1	3.7	3.6	4.6	4.7	5.5	5.0	4.4	4.2	4.4
NNE	3.7	4.5	4.4	3.7	3.4	3.2	4.1	3.9	5.4	4.1	3.5	3.3	3.9
NE	3.0	3.7	3.4	3.4	3.3	3.1	3.5	3.5	4.2	3.6	3.0	2.9	3.4
ENE	2.4	2.1	2.1	2.4	2.4	2.2	2.5	2.5	2.4	2.6	2.5	2.5	2.4
E	2.6	2.2	2.3	2.5	2.5	2.5	2.9	3.1	3.1	3.0	2.7	2.8	2.7
ESE	2.9	2.6	2.7	2.6	2.7	2.7	2.9	3.3	3.2	3.8	3.3	3.2	3.0
SE	4.0	3.6	3.8	3.0	3.1	2.9	3.0	3.5	3.9	4.9	4.4	4.5	3.7
SSE	3.4	3.3	3.4	3.0	3.0	2.8	2.5	2.8	3.3	4.0	4.0	3.8	3.3
S	3.3	3.2	3.5	3.2	2.7	2.7	2.5	2.6	2.7	3.6	4.1	3.6	3.1
SSW	4.8	4.4	5.0	4.4	3.6	3.5	2.8	3.0	3.3	4.2	5.2	4.7	4.1
SW	6.6	7.7	9.2	8.9	7.0	6.5	5.6	5.9	5.8	6.9	7.7	6.7	7.0
WSW	6.7	7.4	10.6	12.0	10.5	9.6	8.2	8.8	9.2	8.7	8.1	7.3	8.9
W	6.7	8.3	9.7	11.5	11.5	10.9	9.7	10.8	11.2	10.4	8.4	7.2	9.7
WNW	15.3	15.1	14.5	16.2	18.4	19.1	19.6	18.1	15.3	13.3	12.8	13.8	15.9
NW	19.2	18.0	14.4	14.2	17.5	19.5	20.0	17.6	14.6	13.5	15.6	18.1	16.9
NNW	7.5	6.9	5.8	4.5	4.3	4.8	5.4	5.4	5.9	6.4	7.0	7.1	5.9
Calm	3.8	2.2	0.7	0.4	0.4	0.4	0.3	0.4	0.9	2.0	3.4	4.3	1.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Speed, mph	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Calm	3.8	2.2	0.7	0.4	0.5	0.4	0.3	0.4	0.9	2.0	3.5	4.4	1.6
1-3	30.4	24.2	16.8	13.0	11.6	9.6	10.8	13.4	18.0	26.0	29.4	33.3	19.7
4-7	35.1	36.0	36.5	35.2	35.2	35.8	39.2	42.2	41.6	39.2	36.1	34.1	37.2
8-12	20.2	24.4	27.7	28.9	30.6	30.3	29.3	27.7	26.0	21.7	20.2	18.3	25.4
13-18	6.7	8.5	12.2	15.4	15.7	16.6	14.3	11.7	9.8	7.8	7.0	6.2	11.0
19-24	2.5	3.2	4.5	5.5	5.4	6.2	5.3	4.0	3.2	2.6	2.7	2.6	4.0
25-31	1.0	1.2	1.4	1.4	1.0	1.1	0.9	0.6	0.5	0.6	1.0	0.9	1.0
32-38	0.3	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
>46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

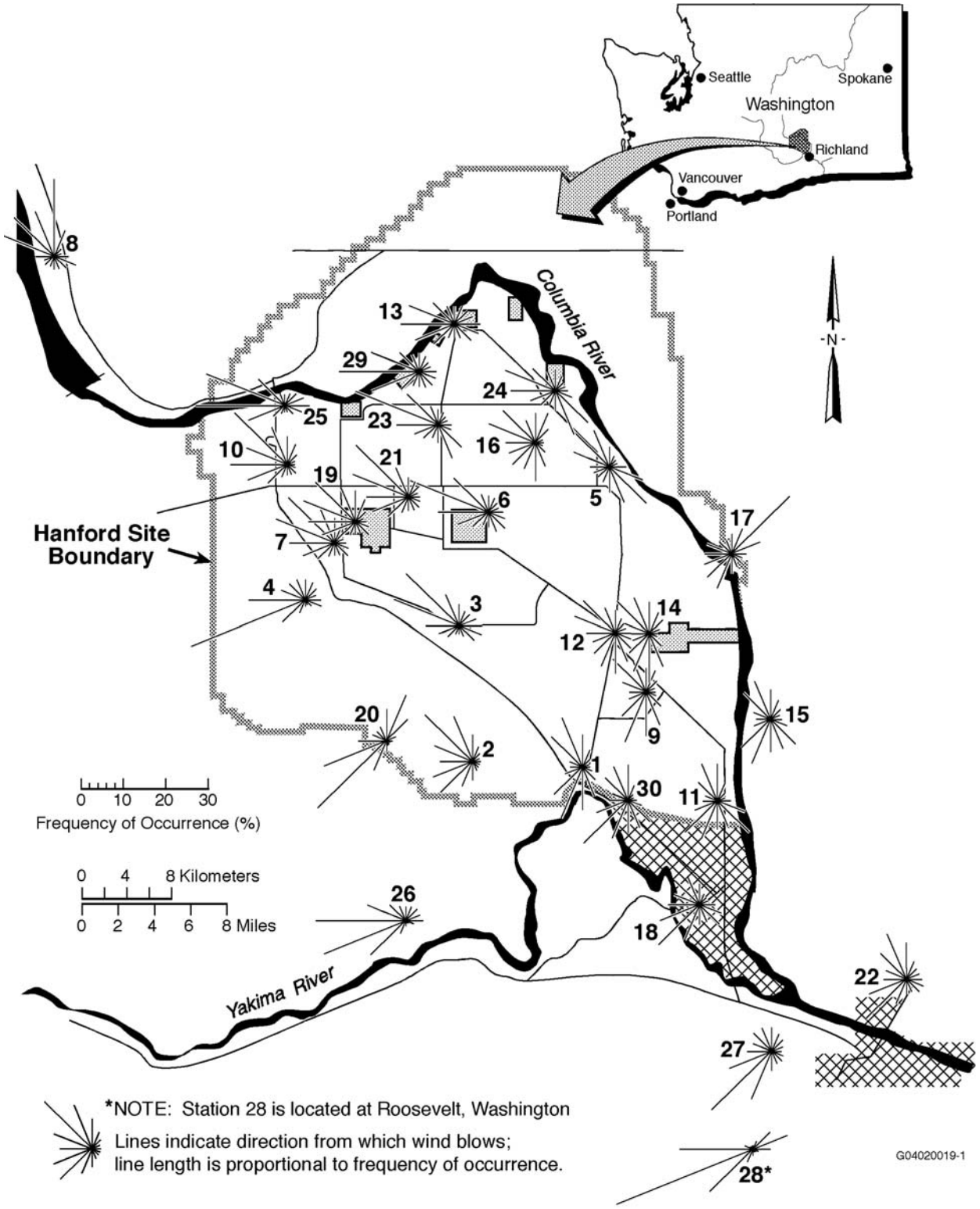

Figure 5.1. Hanford Meteorological Monitoring Network Wind Roses at 30 Feet, 1982 through 2003 (Refer to Table 1.1 for the names of the numbered locations on this map.)

Table 5.4. Joint Frequency Distributions (%) for Hanford Meteorological Monitoring Network Wind Stations at 30 Feet, 1982 through 2003

Station: (1) PROS

Begin: 1/1982 End: 12/2003 Total Hours: 188151

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.1
1-3	2.1	1.5	1.2	0.9	1.0	1.2	1.7	2.2	2.4	2.1	1.7	1.2	1.1	1.4	2.1	2.6	0.0	26.3
4-7	3.2	1.8	1.0	0.7	0.8	1.1	2.2	4.2	4.6	3.6	2.0	0.8	0.7	1.0	3.1	4.8	0.0	35.6
8-12	1.9	0.9	0.3	0.1	0.1	0.2	0.5	1.1	2.6	4.4	2.4	0.8	0.5	0.6	2.7	3.9	0.0	23.1
13-18	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.5	2.5	1.9	0.9	0.4	0.2	1.7	1.2	0.0	10.5
19-24	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.7	0.4	0.2	0.0	0.5	0.2	0.0	2.6
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.0	0.0	0.1	0.0	0.0	0.7
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	7.8	4.4	2.7	1.7	1.9	2.5	4.4	7.5	10.1	13.2	9.2	4.3	3.0	3.2	10.2	12.7	1.1	100.0

Station: (2) EOC

Begin: 1/1982 End: 12/2003 Total Hours: 188694

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
1-3	1.2	1.1	1.1	1.0	0.9	0.8	0.8	0.9	1.2	1.2	1.3	1.2	1.6	1.8	1.8	1.4	0.0	19.3
4-7	2.7	1.9	1.3	0.9	1.0	1.1	1.1	1.2	1.9	2.0	1.4	1.2	2.0	3.6	4.1	3.2	0.0	30.7
8-12	1.8	0.6	0.2	0.1	0.0	0.1	0.3	0.4	1.1	2.2	2.6	1.9	1.5	3.2	5.9	3.9	0.0	25.7
13-18	0.6	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.7	2.2	2.3	1.4	0.7	3.3	2.4	0.0	13.9
19-24	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.5	2.0	0.9	0.2	0.6	0.4	0.0	6.0
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.3	0.1	0.1	0.0	0.0	2.6
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.6
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	6.4	3.8	2.6	1.9	2.0	2.0	2.2	2.5	4.4	6.4	10.5	9.9	7.7	9.5	15.7	11.4	1.0	100.0

Station: (3) ARMY

Begin: 1/1982 End: 12/2003 Total Hours: 188540

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.1
1-3	1.9	1.7	2.0	2.2	2.5	2.3	1.8	1.1	0.9	0.8	0.9	1.2	2.2	3.2	3.3	2.4	0.0	30.3
4-7	2.0	1.4	1.5	1.8	2.5	2.8	2.1	0.9	0.6	0.4	0.6	0.9	2.4	7.2	7.6	3.4	0.0	38.0
8-12	0.9	0.5	0.3	0.2	0.4	0.7	0.9	0.6	0.4	0.4	0.6	1.1	1.9	4.8	4.1	1.5	0.0	19.3
13-18	0.2	0.2	0.1	0.0	0.0	0.1	0.2	0.2	0.2	0.3	0.6	1.1	1.0	1.1	1.6	0.4	0.0	7.3
19-24	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.6	0.3	0.2	0.7	0.1	0.0	2.8
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.1	0.0	0.1	0.0	0.0	0.9
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.1	3.8	3.8	4.3	5.5	5.9	5.1	2.8	2.0	2.2	3.7	5.2	7.9	16.5	17.3	7.9	1.1	100.0

Station: (4) RSPG

Begin: 1/1982 End: 12/2003 Total Hours: 188029

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
1-3	1.6	1.8	1.9	1.6	1.8	1.7	1.1	0.8	0.8	1.0	1.8	2.6	1.9	1.2	1.1	1.2	0.0	23.9
4-7	2.6	2.1	1.5	1.1	1.8	2.1	0.8	0.4	0.4	0.7	2.4	9.7	4.4	1.8	1.8	2.2	0.0	35.9
8-12	0.6	0.4	0.2	0.1	0.1	0.3	0.1	0.1	0.2	0.7	1.7	14.0	5.1	2.3	1.6	1.2	0.0	28.7
13-18	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.0	2.2	1.8	0.9	0.8	0.5	0.0	8.1
19-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.4	0.2	0.1	0.1	0.1	0.0	1.9
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.5
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.9	4.5	3.7	2.8	3.7	4.1	2.1	1.3	1.6	3.3	7.6	29.1	13.5	6.2	5.4	5.2	1.0	100.0

Table 5.4. (contd)

Station: (5) EDNA

Begin: 1/1982 End: 12/2003 Total Hours: 189200

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.2
1-3	1.2	0.8	0.7	0.8	1.1	2.0	3.5	3.9	3.0	1.9	1.4	1.2	1.7	2.8	3.2	2.1	0.0	31.6
4-7	2.2	1.1	0.9	1.0	2.0	4.6	7.2	3.8	1.7	0.8	0.7	0.7	1.0	2.5	6.0	4.8	0.0	41.0
8-12	1.2	0.6	0.4	0.2	0.8	1.8	1.4	1.1	0.9	0.6	0.7	0.9	1.1	1.7	2.3	2.0	0.0	17.4
13-18	0.2	0.2	0.2	0.1	0.0	0.1	0.2	0.3	0.5	0.4	0.5	0.7	0.6	1.4	1.0	0.2	0.0	6.5
19-24	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.3	0.2	0.5	0.3	0.0	0.0	1.9
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.4
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.8	2.8	2.2	2.1	3.9	8.5	12.3	9.1	6.2	3.9	3.5	3.9	4.7	9.0	12.9	9.1	1.2	100.0

Station: (6) 200E

Begin: 1/1982 End: 12/2003 Total Hours: 188774

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.1
1-3	1.5	1.3	1.4	1.5	1.7	1.7	1.6	1.3	1.1	0.9	1.0	1.1	1.4	1.8	1.9	1.6	0.0	22.9
4-7	1.6	1.3	1.0	1.0	1.5	2.1	3.0	2.3	1.5	1.1	1.5	2.4	4.3	6.1	4.4	2.1	0.0	37.2
8-12	0.7	0.7	0.3	0.1	0.3	0.4	0.9	1.1	0.7	0.5	1.0	2.2	4.5	7.5	2.7	0.7	0.0	24.2
13-18	0.2	0.2	0.1	0.0	0.0	0.0	0.1	0.2	0.3	0.3	0.8	1.3	1.4	3.5	1.4	0.1	0.0	10.1
19-24	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.5	0.6	0.3	1.0	0.7	0.0	0.0	3.5
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.1	0.2	0.2	0.0	0.0	0.8
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	3.9	3.6	2.9	2.6	3.5	4.3	5.6	5.0	3.5	3.2	5.1	7.8	11.9	20.1	11.3	4.5	1.1	100.0

Station: (7) 200W

Begin: 1/1982 End: 12/2003 Total Hours: 174638

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.6
1-3	2.2	1.8	1.5	1.4	1.6	1.8	2.1	2.0	1.8	1.6	1.9	2.4	3.4	4.2	3.6	2.6	0.0	35.9
4-7	2.9	1.6	1.0	0.8	1.0	1.5	1.8	1.0	0.7	0.8	1.2	1.8	3.8	6.7	5.2	3.4	0.0	35.2
8-12	0.7	0.5	0.2	0.1	0.1	0.3	0.4	0.2	0.2	0.6	1.1	1.7	2.5	3.1	3.4	1.9	0.0	16.9
13-18	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.9	1.4	0.8	0.8	2.0	0.5	0.0	7.4
19-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.5	0.2	0.1	0.8	0.1	0.0	2.4
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.5
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	6.0	4.1	2.9	2.3	2.7	3.6	4.3	3.2	2.9	3.5	5.7	8.0	10.7	14.9	15.2	8.4	1.6	100.0

Station: (8) BVLY

Begin: 8/1991 End: 12/2003 Total Hours: 108013

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
1-3	2.9	2.2	1.7	1.4	1.7	1.8	1.9	1.7	1.6	1.2	1.1	1.1	1.3	1.6	2.1	2.5	0.0	27.9
4-7	8.5	2.8	0.6	0.4	1.4	3.1	1.7	1.1	1.0	0.8	0.7	0.8	1.5	2.7	4.9	6.9	0.0	38.9
8-12	6.5	1.6	0.1	0.0	0.3	0.7	0.3	0.3	0.2	0.3	0.4	0.4	1.2	3.7	3.3	1.9	0.0	21.3
13-18	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.5	0.3	0.5	3.3	2.0	0.1	0.0	7.9
19-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	1.2	0.6	0.0	0.0	2.3
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.3	0.1	0.0	0.0	0.6
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	18.3	6.8	2.5	1.9	3.4	5.7	4.0	3.2	3.1	2.6	3.0	2.6	4.5	12.9	13.1	11.5	1.0	100.0

Table 5.4. (contd)

Station: (9) FFTF

Begin: 1/1982 End: 12/2003 Total Hours: 188278

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
1-3	1.2	1.1	0.9	0.8	0.8	1.0	1.0	1.1	1.2	1.2	1.1	1.0	1.0	1.1	1.3	1.2	0.0	16.9
4-7	2.8	2.7	1.9	1.1	1.1	1.4	2.7	3.8	4.2	3.6	2.0	1.3	1.4	2.0	3.5	3.3	0.0	38.8
8-12	1.4	1.3	0.7	0.2	0.2	0.3	1.2	3.2	3.9	4.4	1.8	0.8	0.9	1.7	3.9	2.7	0.0	28.6
13-18	0.3	0.3	0.2	0.0	0.0	0.0	0.1	0.3	0.9	3.0	1.8	0.7	0.5	0.8	1.7	0.5	0.0	11.2
19-24	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.6	0.8	0.4	0.2	0.2	0.5	0.1	0.0	3.0
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.0	0.0	0.1	0.0	0.0	0.8
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.7	5.5	3.7	2.2	2.2	2.6	5.0	8.4	10.3	12.9	8.0	4.3	4.0	5.9	10.9	7.8	0.5	100.0

Station: (10) YAKB

Begin: 1/1982 End: 12/2003 Total Hours: 189080

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6
1-3	1.7	1.6	1.4	1.1	0.9	1.0	1.1	1.2	1.2	1.1	1.4	1.9	2.4	2.0	1.7	1.6	0.0	23.3
4-7	3.7	2.9	1.6	0.9	0.8	1.0	1.5	1.2	0.9	0.9	1.6	3.5	7.0	4.4	3.7	3.5	0.0	39.1
8-12	1.3	0.5	0.2	0.1	0.1	0.2	0.3	0.2	0.3	0.5	1.5	2.6	3.3	2.5	5.6	3.1	0.0	22.3
13-18	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.3	1.2	1.4	0.6	1.0	4.0	0.9	0.0	10.0
19-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.4	0.1	0.3	1.9	0.1	0.0	3.7
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.1	0.4	0.0	0.0	0.8
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	6.8	5.2	3.3	2.1	1.8	2.2	2.9	2.7	2.6	3.2	6.4	9.9	13.5	10.2	17.3	9.4	0.6	100.0

Station: (11) 300A

Begin: 1/1982 End: 12/2003 Total Hours: 175787

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
1-3	1.2	0.7	0.6	0.6	0.8	1.2	1.7	1.8	1.7	1.4	1.3	1.2	1.2	1.3	1.8	1.7	0.0	20.2
4-7	3.5	1.6	1.0	1.2	1.9	4.4	6.8	3.7	3.0	2.5	1.9	1.2	0.9	1.0	2.1	4.0	0.0	40.8
8-12	3.4	1.9	0.8	0.3	0.4	1.3	1.7	0.9	1.6	3.2	3.3	1.6	0.6	0.4	1.1	2.6	0.0	25.1
13-18	0.6	0.5	0.1	0.1	0.0	0.0	0.1	0.1	0.4	1.5	2.5	1.3	0.4	0.2	0.9	0.9	0.0	9.5
19-24	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.9	0.5	0.2	0.0	0.3	0.2	0.0	2.8
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.1	0.1	0.0	0.1	0.0	0.0	0.8
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	8.7	4.8	2.7	2.1	3.1	6.9	10.4	6.5	6.8	9.2	10.4	5.9	3.4	3.0	6.3	9.4	0.6	100.0

Station: (12) WYEB

Begin: 1/1982 End: 12/2003 Total Hours: 188399

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4
1-3	1.3	1.2	1.2	1.2	1.4	1.5	1.4	1.4	1.4	1.3	1.2	1.2	1.2	1.2	1.4	1.3	0.0	20.8
4-7	2.6	1.6	1.3	1.4	2.1	2.1	2.8	3.6	3.9	2.8	2.3	2.1	2.5	3.1	3.8	3.0	0.0	40.9
8-12	1.2	0.6	0.3	0.2	0.3	0.4	0.9	2.0	2.9	2.3	1.5	1.3	2.1	4.0	3.2	1.5	0.0	24.6
13-18	0.3	0.2	0.1	0.0	0.0	0.0	0.1	0.3	1.0	1.5	1.0	0.7	0.9	1.5	1.4	0.3	0.0	9.4
19-24	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.5	0.6	0.4	0.2	0.4	0.6	0.1	0.0	3.0
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.0	0.0	0.8
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.4	3.7	3.0	2.8	3.8	4.0	5.3	7.3	9.3	8.5	6.9	5.7	6.9	10.2	10.5	6.3	0.4	100.0

Table 5.4. (contd)

Station: (13) 100N

Begin: 1/1982 End: 12/2003 Total Hours: 188576

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.9
1-3	2.1	1.8	2.1	2.3	3.1	3.1	2.5	1.8	1.7	1.6	2.1	2.6	3.2	3.3	3.1	2.5	0.0	38.9
4-7	1.5	1.6	1.6	2.0	2.7	2.7	2.2	1.3	0.9	1.0	2.2	4.4	4.9	3.2	2.1	1.5	0.0	35.7
8-12	0.4	0.8	0.6	0.2	0.2	0.4	0.8	0.5	0.3	0.5	1.2	2.1	3.2	2.3	0.7	0.4	0.0	14.5
13-18	0.2	0.4	0.2	0.1	0.0	0.0	0.1	0.1	0.1	0.3	0.8	0.6	1.2	2.0	0.7	0.1	0.0	7.0
19-24	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.2	0.7	0.4	0.0	0.0	2.3
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.6
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.2	4.7	4.6	4.7	6.1	6.2	5.7	3.7	3.1	3.6	6.7	9.9	12.8	11.6	7.1	4.5	0.9	100.0

Station: (14) WPPS

Begin: 1/1982 End: 12/2003 Total Hours: 189104

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.9
1-3	2.5	2.1	1.8	1.3	1.1	1.0	1.4	1.8	2.1	1.8	1.6	1.4	1.6	1.8	2.6	2.7	0.0	28.5
4-7	3.5	2.4	2.1	1.2	0.7	0.9	1.9	4.3	5.2	3.0	1.7	1.2	1.3	1.8	3.8	4.4	0.0	39.4
8-12	1.2	0.7	0.5	0.2	0.1	0.2	0.8	2.1	3.4	2.6	1.4	0.8	0.9	1.7	2.4	1.5	0.0	20.6
13-18	0.3	0.2	0.1	0.0	0.0	0.0	0.1	0.2	0.7	1.6	1.2	0.5	0.5	0.8	1.3	0.3	0.0	7.8
19-24	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.6	0.2	0.1	0.1	0.5	0.0	0.0	2.2
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.1	0.0	0.0	0.5
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	7.5	5.5	4.6	2.6	1.9	2.1	4.1	8.3	11.6	9.6	6.7	4.2	4.4	6.2	10.7	9.0	1.0	100.0

Station: (15) FRNK

Begin: 1/1982 End: 12/2003 Total Hours: 188679

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7
1-3	1.2	1.0	1.0	0.8	0.9	1.1	1.4	1.4	1.2	1.1	1.1	1.1	1.3	1.4	1.6	1.4	0.0	19.0
4-7	4.1	2.7	1.7	1.2	1.5	2.5	5.0	4.3	3.5	3.0	2.4	1.3	1.4	2.0	4.7	5.4	0.0	46.7
8-12	1.6	0.9	0.5	0.3	0.3	0.7	1.7	1.6	2.5	4.8	3.4	1.0	0.5	0.6	2.1	2.5	0.0	25.0
13-18	0.1	0.2	0.2	0.1	0.0	0.0	0.1	0.2	0.4	1.9	1.8	0.6	0.2	0.2	0.4	0.2	0.0	6.8
19-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.2	0.1	0.0	0.1	0.0	0.0	1.3
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.4
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	7.0	4.9	3.4	2.4	2.7	4.3	8.3	7.5	7.8	11.2	9.5	4.2	3.5	4.2	8.9	9.5	0.7	100.0

Station: (16) GABL

Begin: 1/1982 End: 12/2003 Total Hours: 188118

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8
1-3	1.0	0.9	0.8	0.6	0.6	0.6	0.7	0.8	1.0	1.0	0.9	0.8	0.7	0.7	0.8	0.9	0.0	12.8
4-7	2.3	2.3	1.6	0.9	0.9	0.9	1.3	2.1	3.2	2.4	1.8	1.5	1.5	1.7	2.2	2.1	0.0	28.6
8-12	2.0	2.2	1.1	0.3	0.4	0.5	0.9	1.8	2.4	1.5	1.5	1.6	1.7	2.2	2.9	1.8	0.0	24.9
13-18	1.3	1.4	0.5	0.1	0.1	0.1	0.3	1.0	1.4	0.9	1.3	1.4	1.8	2.9	2.5	0.8	0.0	17.7
19-24	0.4	0.5	0.3	0.0	0.0	0.0	0.0	0.3	0.6	0.5	0.9	0.9	0.9	2.7	1.7	0.2	0.0	9.8
25-31	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.6	0.4	0.2	1.3	0.5	0.0	0.0	4.0
32-38	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.1	0.0	0.2	0.0	0.0	0.0	1.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	7.0	7.5	4.5	2.0	2.0	2.1	3.2	6.1	9.0	6.8	7.3	6.7	7.0	11.7	10.6	5.7	0.8	100.0

Table 5.4. (contd)

Station: (17) RING

Begin: 1/1982 End: 12/2003 Total Hours: 188267

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.1
1-3	2.1	3.4	7.2	3.5	2.1	1.7	1.4	1.3	1.5	1.6	2.0	2.3	2.1	1.4	1.4	1.6	0.0	36.8
4-7	1.8	2.1	10.9	3.3	1.2	0.9	1.2	1.4	1.9	2.8	2.5	2.7	2.2	1.3	1.2	1.2	0.0	38.6
8-12	0.8	0.6	0.8	0.4	0.1	0.1	0.3	0.5	1.2	3.3	2.0	1.1	1.5	1.8	0.9	0.4	0.0	16.0
13-18	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.1	0.2	1.0	1.0	0.5	0.6	1.4	0.4	0.1	0.0	5.8
19-24	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.2	0.1	0.4	0.0	0.0	0.0	1.3
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.9	6.5	19.3	7.2	3.4	2.7	3.0	3.3	4.8	8.8	7.9	6.9	6.5	6.4	4.0	3.3	1.1	100.0

Station: (18) RICH

Begin: 1/1982 End: 12/2003 Total Hours: 189348

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.1
1-3	1.3	0.9	0.9	1.0	1.6	2.6	3.1	2.6	2.2	2.1	2.3	2.4	2.5	2.7	2.5	1.9	0.0	32.5
4-7	2.0	0.9	0.9	1.0	1.8	2.8	3.2	1.7	1.7	3.0	4.1	3.2	2.3	2.7	3.0	2.6	0.0	36.9
8-12	1.3	0.7	0.4	0.3	0.2	0.2	0.3	0.2	0.6	2.6	3.9	2.7	1.5	0.9	1.3	1.5	0.0	18.6
13-18	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	1.2	2.3	1.3	0.9	0.3	0.8	0.7	0.0	8.4
19-24	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.7	0.3	0.2	0.1	0.2	0.2	0.0	2.1
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.4
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.0	2.7	2.3	2.3	3.7	5.6	6.6	4.5	4.7	9.0	13.5	10.0	7.5	6.7	7.9	6.9	1.1	100.0

Station: (19) PFP

Begin: 2/1994 End: 12/2003 Total Hours: 86475

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	2.1
1-3	3.4	3.2	2.0	1.4	1.4	1.8	2.2	1.8	1.8	1.8	2.3	3.2	5.0	5.1	3.8	3.2	0.0	43.3
4-7	3.4	2.1	0.9	0.6	0.8	1.5	1.9	0.8	0.6	0.7	1.2	1.9	4.2	6.5	5.1	3.7	0.0	36.0
8-12	0.4	0.5	0.2	0.1	0.1	0.2	0.3	0.2	0.3	0.6	1.3	1.9	1.5	1.6	3.2	1.2	0.0	13.5
13-18	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.8	1.0	0.4	0.2	1.2	0.2	0.0	4.3
19-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.6
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	7.3	5.8	3.3	2.1	2.4	3.4	4.4	2.9	2.8	3.4	5.9	8.3	11.1	13.2	13.3	8.3	2.1	100.0

Station: (20) RMTN

Begin: 1/1982 End: 12/2003 Total Hours: 186776

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6
1-3	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.3	0.4	0.6	0.7	0.5	0.4	0.4	0.4	0.4	0.0	7.0
4-7	1.4	1.4	1.3	0.9	0.7	0.5	0.5	0.5	0.8	1.4	2.0	1.4	0.9	0.7	0.7	0.9	0.0	15.8
8-12	2.2	2.5	1.8	0.8	0.4	0.2	0.2	0.3	0.7	1.8	3.5	2.3	1.4	0.9	0.8	1.1	0.0	20.7
13-18	2.1	2.8	1.3	0.3	0.1	0.0	0.1	0.1	0.4	1.6	4.6	3.0	1.6	0.9	0.7	0.9	0.0	20.5
19-24	1.0	2.0	0.8	0.1	0.0	0.0	0.0	0.0	0.1	0.8	3.5	2.8	1.2	0.5	0.3	0.3	0.0	13.7
25-31	0.4	1.3	0.6	0.1	0.0	0.0	0.0	0.0	0.1	0.6	3.2	2.6	0.7	0.2	0.1	0.0	0.0	9.9
32-38	0.1	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.4	2.4	1.7	0.3	0.0	0.0	0.0	0.0	6.0
39-46	0.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.7	0.9	0.1	0.0	0.0	0.0	0.0	3.5
> 46	0.0	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.1	0.5	0.0	0.0	0.0	0.0	0.0	2.2
TOTAL	7.6	11.7	7.1	2.6	1.5	1.1	1.1	1.3	2.6	7.5	22.8	15.8	6.7	3.6	3.0	3.5	0.6	100.0

Table 5.4. (contd)

Station: (21) HMS

Begin: 1/1982 End: 12/2003 Total Hours: 191465

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.1
1-3	2.0	1.7	1.7	1.4	1.4	1.5	1.7	1.3	1.2	1.2	1.3	1.4	1.6	1.9	2.1	2.1	0.0	25.5
4-7	2.2	1.4	1.1	1.0	1.2	1.4	1.7	1.6	1.4	1.5	2.3	3.7	5.0	6.2	6.7	3.8	0.0	42.3
8-12	0.5	0.5	0.3	0.1	0.2	0.1	0.2	0.4	0.4	0.6	1.3	2.4	2.5	4.5	5.3	1.1	0.0	20.4
13-18	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.4	1.1	1.2	0.6	1.4	2.5	0.3	0.0	8.2
19-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.3	0.1	0.2	0.7	0.0	0.0	2.2
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.3
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.8	3.9	3.3	2.5	2.8	3.0	3.6	3.4	3.2	4.0	6.6	9.1	9.9	14.2	17.4	7.3	1.1	100.0

Station: (22) PASC

Begin: 10/1987 End: 12/2003 Total Hours: 137184

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
1-3	4.6	2.8	2.4	2.3	2.5	2.3	1.9	1.4	1.3	1.2	1.1	1.2	1.5	2.1	3.4	5.3	0.0	37.4
4-7	2.8	1.2	0.7	0.9	1.3	1.9	1.9	1.4	1.7	2.6	3.2	2.1	2.0	2.2	3.5	4.3	0.0	33.9
8-12	1.0	0.4	0.2	0.1	0.1	0.2	0.3	0.3	0.5	2.0	4.7	2.3	0.9	0.6	1.2	1.5	0.0	16.4
13-18	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.5	3.0	2.0	0.6	0.2	0.3	0.3	0.0	7.6
19-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	1.0	0.2	0.1	0.1	0.0	0.0	2.5
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.5	0.1	0.0	0.0	0.0	0.0	0.9
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.3
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	8.6	4.6	3.4	3.3	3.8	4.4	4.2	3.2	3.5	6.4	13.4	9.3	5.5	5.3	8.6	11.5	1.1	100.0

Station: (23) GABW

Begin: 3/1986 End: 12/2003 Total Hours: 153360

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3
1-3	1.5	1.3	1.2	1.3	1.5	1.7	2.3	2.5	2.1	1.6	1.6	1.7	2.6	3.6	3.1	2.0	0.0	31.6
4-7	1.5	1.1	0.9	1.0	1.3	1.3	4.0	4.9	1.6	0.9	1.0	1.5	3.1	7.3	3.9	1.9	0.0	37.3
8-12	0.5	0.5	0.3	0.1	0.2	0.3	1.3	1.0	0.3	0.5	1.0	1.5	2.9	5.4	1.7	0.6	0.0	18.2
13-18	0.1	0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.8	0.9	1.0	3.5	1.0	0.1	0.0	8.6
19-24	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.3	0.2	1.1	0.3	0.0	0.0	2.6
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.4
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	3.7	3.1	2.6	2.5	3.1	3.3	7.7	8.5	4.2	3.4	4.8	6.1	9.8	21.0	10.1	4.6	1.3	100.0

Station: (24) 100F

Begin: 3/1986 End: 12/2003 Total Hours: 153493

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	1.6
1-3	1.8	1.4	1.2	1.1	1.4	1.8	2.7	2.8	2.2	1.8	1.8	2.3	3.6	4.1	3.5	2.4	0.0	35.9
4-7	2.0	1.3	1.1	1.1	1.2	1.7	5.3	5.6	1.6	0.9	1.0	1.6	3.3	3.7	2.6	2.0	0.0	36.1
8-12	1.0	0.7	0.3	0.3	0.2	0.6	2.5	2.4	0.6	0.5	0.8	1.3	2.5	2.6	0.6	0.5	0.0	17.4
13-18	0.2	0.2	0.1	0.0	0.0	0.0	0.3	0.3	0.3	0.3	0.6	0.8	1.0	1.8	0.5	0.1	0.0	6.6
19-24	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.3	0.2	0.6	0.2	0.0	0.0	2.0
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.4
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.0	3.7	2.8	2.6	2.9	4.2	10.8	11.2	4.8	3.6	4.6	6.4	10.6	12.8	7.4	5.0	1.6	100.0

Table 5.4. (contd)

Station: (25) VERN

Begin: 2/1988 End: 12/2003 Total Hours: 137607

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
1-3	1.1	1.2	1.3	1.6	2.1	2.0	1.7	1.2	0.9	0.8	1.2	2.2	2.7	1.7	1.2	1.0	0.0	23.7
4-7	0.8	1.4	2.2	2.8	3.4	2.1	1.0	0.5	0.4	0.4	0.6	4.0	7.7	4.1	2.0	1.0	0.0	34.4
8-12	0.5	0.4	0.4	0.5	0.4	0.2	0.1	0.1	0.2	0.4	0.7	2.0	7.9	7.3	2.6	0.7	0.0	24.3
13-18	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.7	0.7	2.5	5.3	2.1	0.2	0.0	12.5
19-24	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.2	0.4	1.4	0.7	0.0	0.0	3.4
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.6
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2.7	3.1	4.0	4.9	5.9	4.3	2.9	1.8	1.6	2.1	3.7	9.2	21.2	20.0	8.7	3.0	1.0	100.0

Station: (26) BENT

Begin: 2/1995 End: 12/2003 Total Hours: 77472

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
1-3	1.1	1.0	0.9	0.8	0.8	0.7	0.5	0.4	0.5	0.7	1.2	1.8	2.5	2.0	1.5	1.1	0.0	17.7
4-7	1.4	1.1	1.5	2.0	2.3	1.2	0.3	0.3	0.5	1.3	5.3	12.0	13.6	5.6	2.8	2.0	0.0	53.3
8-12	0.5	0.7	1.0	0.9	1.0	0.3	0.0	0.0	0.2	0.8	3.2	5.9	4.7	1.9	1.1	0.4	0.0	22.6
13-18	0.3	0.6	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.4	1.4	0.9	0.5	0.2	0.1	0.1	0.0	4.8
19-24	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.2	0.1	0.0	0.0	0.0	0.0	1.1
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	3.3	3.6	3.9	3.7	4.1	2.1	0.9	0.7	1.3	3.2	11.5	20.9	21.4	9.7	5.4	3.7	0.3	100.0

Station: (27) VSTA

Begin: 2/1991 End: 12/2003 Total Hours: 111534

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7
1-3	2.2	2.2	2.0	1.6	1.6	1.8	2.0	1.8	2.1	2.4	2.7	2.5	2.2	1.8	1.8	1.7	0.0	32.5
4-7	3.0	2.0	1.6	1.2	0.8	1.1	1.1	1.2	2.0	4.3	5.9	4.0	2.4	2.5	3.1	3.0	0.0	39.2
8-12	0.5	0.2	0.1	0.0	0.0	0.1	0.1	0.2	0.6	3.9	6.0	2.7	0.8	0.4	1.0	1.2	0.0	17.9
13-18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.6	4.0	1.1	0.4	0.2	0.1	0.1	0.0	7.7
19-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.1	0.3	0.1	0.0	0.0	0.0	0.0	1.7
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.7	4.5	3.7	2.9	2.4	3.0	3.3	3.2	4.8	12.3	19.9	10.6	5.9	4.9	6.1	6.0	0.7	100.0

Station: (28) SURF

Begin: 9/1994 End: 12/2003 Total Hours: 81362

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7
1-3	0.4	0.6	1.2	1.2	1.2	0.8	0.7	0.7	1.1	2.1	3.4	3.6	1.8	0.7	0.4	0.3	0.0	20.1
4-7	0.2	0.5	2.4	3.9	2.0	0.6	0.3	0.2	0.5	1.1	3.9	6.0	1.6	0.2	0.1	0.1	0.0	23.5
8-12	0.2	0.6	1.9	3.0	0.7	0.0	0.0	0.0	0.0	0.1	4.4	10.0	3.6	0.3	0.0	0.0	0.0	25.0
13-18	0.2	0.3	0.2	0.5	0.2	0.0	0.0	0.0	0.0	0.0	2.1	9.2	5.9	0.6	0.0	0.0	0.0	19.3
19-24	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	4.4	3.1	0.3	0.0	0.0	0.0	8.6
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.3	1.1	0.1	0.0	0.0	0.0	2.7
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.3
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.9	2.1	5.7	8.7	4.1	1.5	1.0	0.9	1.6	3.3	14.3	34.8	17.3	2.2	0.6	0.5	0.7	100.0

Table 5.4. (contd)

Station: (29) 100K

Begin: 3/1996 End: 12/2003 Total Hours: 68096

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	1.8
1-3	2.1	1.7	1.7	1.9	2.2	2.1	2.0	1.7	1.7	1.6	2.1	3.1	4.1	3.0	2.6	2.2	0.0	35.7
4-7	1.6	1.3	0.9	1.0	1.5	1.6	1.7	1.6	1.1	0.9	1.6	4.8	6.7	3.4	2.1	1.7	0.0	33.5
8-12	0.5	0.6	0.3	0.1	0.3	0.4	0.7	0.7	0.4	0.6	1.1	3.1	5.7	2.5	0.8	0.4	0.0	18.2
13-18	0.2	0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.2	0.3	0.9	0.9	2.0	2.2	0.7	0.1	0.0	8.1
19-24	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.2	0.3	0.9	0.2	0.0	0.0	2.3
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.4
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.4	3.9	3.0	3.0	4.0	4.2	4.5	4.1	3.5	3.6	6.0	12.2	18.9	12.2	6.4	4.4	1.8	100.0

Station: (30) HAMR

Begin: 1/1998 End: 12/2003 Total Hours: 52451

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
1-3	1.2	0.8	0.8	0.6	0.8	1.1	1.9	2.2	2.1	1.6	1.4	1.2	1.2	1.3	1.4	1.2	0.0	20.9
4-7	4.0	1.8	0.8	0.7	1.0	2.1	4.8	4.4	4.1	3.8	4.0	2.4	1.6	1.8	2.8	3.7	0.0	44.0
8-12	2.5	1.0	0.3	0.1	0.3	0.3	0.4	0.4	1.2	3.0	6.0	2.6	0.7	0.6	1.6	2.4	0.0	23.5
13-18	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.9	2.4	1.3	0.5	0.2	1.3	1.0	0.0	8.7
19-24	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.6	0.3	0.2	0.0	0.3	0.1	0.0	2.0
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.5
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	8.3	3.8	1.9	1.5	2.1	3.5	7.2	7.1	7.8	9.6	14.6	7.9	4.3	3.9	7.4	8.4	0.5	100.0

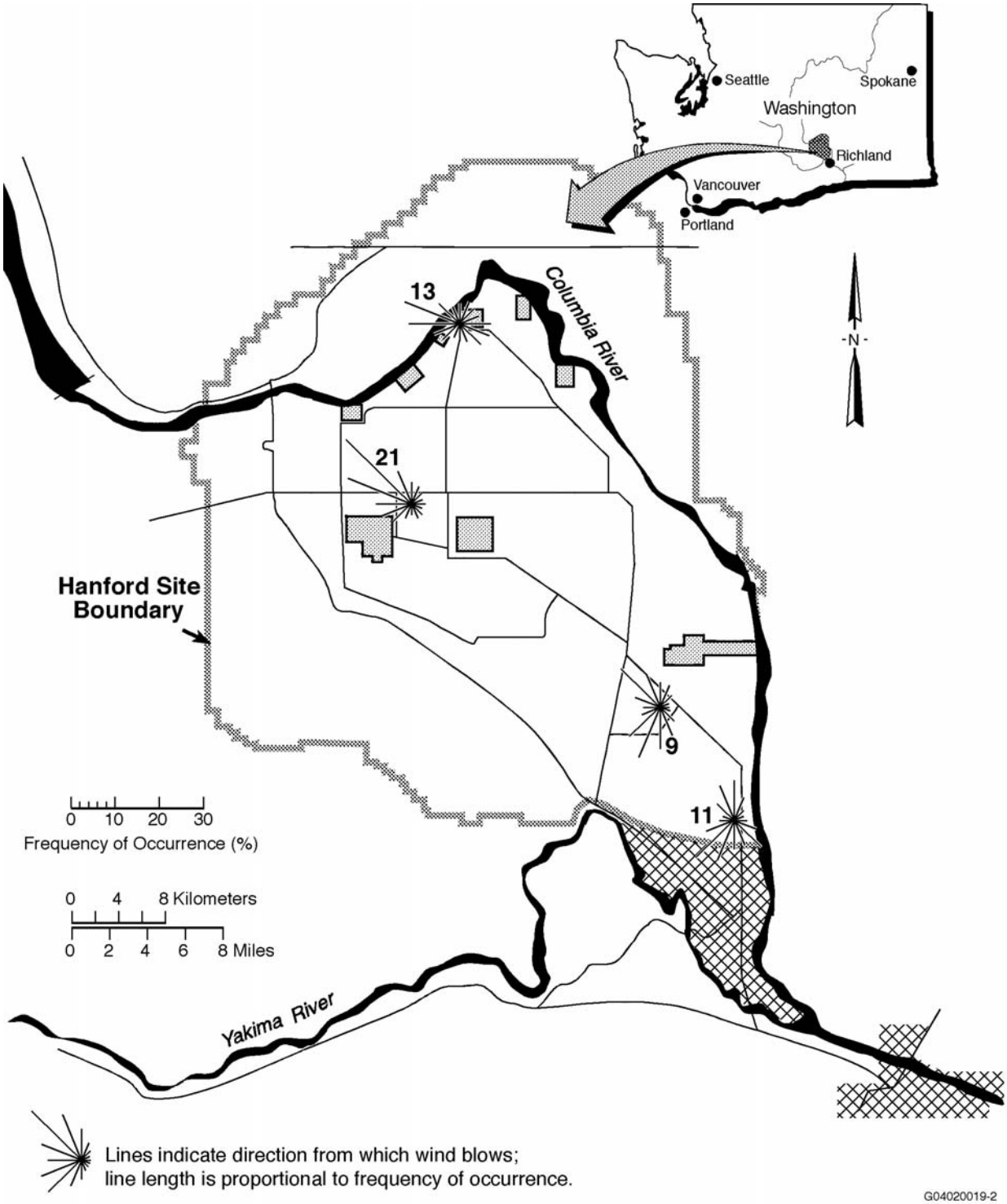

Figure 5.2. Hanford Meteorological Monitoring Network Wind Roses at 60-Meter Level, 1986 through 2003 (Refer to Table 1.1 for the names of the numbered locations on this map.)

Table 5.5. Joint Frequency Distributions (%) for Hanford Meteorological Monitoring Network Wind Stations at 60-Meter Level, 1986 through 2003

Tower: 100 Area

Begin: 1/1986 End: 12/2003 Total Hours: 151963

	DIRECTION																	
SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.7
1-3	1.7	1.6	1.8	2.2	3.2	3.0	2.4	1.7	1.4	1.2	1.3	1.5	1.9	2.0	1.9	1.7	0.0	30.4
4-7	1.7	1.9	1.6	1.8	3.1	3.2	2.6	1.5	1.0	0.8	1.3	2.0	3.0	3.1	2.2	1.4	0.0	32.1
8-12	0.7	1.0	0.8	0.4	0.5	0.7	1.2	0.6	0.5	0.5	1.0	1.3	2.6	2.6	0.9	0.5	0.0	16.0
13-18	0.4	0.6	0.4	0.2	0.1	0.2	0.5	0.4	0.3	0.4	0.8	0.9	2.6	3.0	0.7	0.2	0.0	11.6
19-24	0.2	0.3	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.5	0.4	1.0	1.9	0.6	0.1	0.0	6.0
25-31	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.2	0.3	0.7	0.3	0.0	0.0	2.5
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.0	0.6
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
>46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.8	5.5	4.9	4.8	7.0	7.2	6.8	4.4	3.3	3.4	5.3	6.4	11.4	13.4	6.6	4.1	0.7	100.0

Tower: 200 Area

Begin: 1/1986 End: 12/2003 Total Hours: 157604

	DIRECTION																	
SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
1-3	1.2	1.1	1.1	1.0	1.0	1.0	1.2	0.9	0.7	0.6	0.7	0.6	0.8	0.9	1.1	1.3	0.0	15.1
4-7	2.5	1.9	1.5	1.3	1.6	1.3	1.8	1.6	1.0	1.0	1.2	1.4	2.0	2.9	4.2	3.7	0.0	31.0
8-12	1.0	0.7	0.5	0.3	0.4	0.3	0.4	0.7	0.4	0.6	1.2	1.9	2.7	4.8	6.2	2.2	0.0	24.4
13-18	0.2	0.3	0.2	0.1	0.1	0.0	0.1	0.3	0.3	0.5	1.1	1.9	2.0	4.6	5.6	0.6	0.0	17.9
19-24	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.9	0.9	0.5	1.7	2.5	0.1	0.0	7.4
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.6	0.4	0.1	0.5	1.1	0.0	0.0	3.2
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.1	0.1	0.0	0.0	0.6
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
>46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.0	4.2	3.4	2.7	3.1	2.7	3.5	3.6	2.6	3.5	5.9	7.2	8.1	15.5	20.8	7.9	0.3	100.0

Tower: 300 Area

Begin: 1/1986 End: 12/2003 Total Hours: 147650

	DIRECTION																	
SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6
1-3	1.0	0.8	0.7	0.6	0.8	1.1	1.2	1.2	1.1	0.9	0.8	0.7	0.7	0.8	0.9	1.0	0.0	14.2
4-7	2.8	1.8	1.2	1.2	1.7	2.8	4.2	3.1	2.8	2.5	2.0	1.2	0.9	0.8	1.3	2.4	0.0	33.1
8-12	3.2	2.0	0.9	0.4	0.4	1.2	2.7	1.5	1.9	3.5	3.3	1.7	0.7	0.6	1.2	2.6	0.0	28.0
13-18	1.7	0.9	0.2	0.1	0.0	0.2	0.4	0.3	0.5	2.0	3.3	1.9	0.6	0.4	1.1	1.9	0.0	15.6
19-24	0.2	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.7	1.5	0.9	0.3	0.2	0.7	0.4	0.0	5.5
25-31	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.8	0.3	0.1	0.0	0.2	0.1	0.0	2.1
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.6
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
>46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	9.0	5.7	3.1	2.3	3.0	5.3	8.6	6.1	6.6	9.8	12.0	6.7	3.4	2.8	5.5	8.3	0.6	100.0

Tower: 400 Area

Begin: 1/1986 End: 12/2003 Total Hours: 152299

	DIRECTION																	
SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
1-3	0.8	0.7	0.7	0.6	0.7	0.8	0.9	0.9	0.9	0.8	0.8	0.6	0.7	0.6	0.7	0.8	0.0	12.3
4-7	2.2	2.0	1.6	1.0	1.1	1.3	2.0	2.8	3.0	2.3	1.6	1.2	1.2	1.4	2.1	2.2	0.0	28.9
8-12	1.9	1.7	1.0	0.4	0.3	0.3	1.3	2.3	3.5	3.7	2.1	0.9	0.9	1.4	2.9	2.7	0.0	27.4
13-18	0.7	0.6	0.3	0.1	0.0	0.0	0.5	0.8	1.6	3.7	2.4	0.8	0.6	1.5	3.7	1.8	0.0	19.0
19-24	0.1	0.2	0.1	0.0	0.0	0.0	0.1	0.1	0.3	1.4	1.4	0.6	0.3	0.9	2.2	0.3	0.0	8.1
25-31	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.7	0.3	0.1	0.2	0.6	0.1	0.0	2.8
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.0	0.0	0.1	0.0	0.0	0.7
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
>46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
TOTAL	5.8	5.3	3.8	2.2	2.1	2.5	4.8	7.0	9.4	12.5	9.5	4.5	3.9	6.1	12.4	7.9	0.3	100.0

6.0 Miscellaneous Climatological Statistics

6.1 Sky Cover

The term sky cover is used to express the portion of the celestial dome that is (1) covered, but not necessarily hidden, by clouds or obscuring phenomena aloft; (2) hidden by an obscuring phenomenon on the ground (such as fog or smoke); or (3) a combination of both 1 and 2. The sky cover is determined hourly by scanning the sky and estimating the number of tenths that are covered (0 denotes clear and 10 denotes overcast). Average monthly sunrise-to-sunset sky covers for the period 1946 through 2003 are shown in Table 6.1. Also shown in Table 6.1 is the number of clear, partly cloudy, and cloudy days for the period 1954 through 2003. The number of clear, partly cloudy, and cloudy days is the result of assigning each day to one of the following categories based on its average sky cover for that day:

Category	Average Sky Cover
Clear	0 - 3 tenths
Partly cloudy	4 - 7 tenths
Cloudy	8 - 10 tenths

During the period of record (1954 through 2003), an average of 203 sunny days (the sum of the clear and partly cloudy days) was recorded per year at the Hanford Meteorology Station. The longest consecutive number of cloudy days was 28, from January 30 through February 26, 1958.

6.2 Fog and Dense Fog

Table 6.2 shows the average monthly and annual number of days with fog and dense fog. Fog is reported any time horizontal visibility is reduced to 6 miles or less because of the suspension of water droplets in the surface layer of the atmosphere. Dense fog is reported when horizontal visibility is reduced to 0.25 mile or less. Most fog at the Hanford Meteorology Station is radiation fog, a common type of fog that forms during nights characterized by light wind, clear sky, and moist air in the lower levels of the atmosphere. Nearly 90% of both fog and dense fog at the Hanford Meteorology Station occurs during the late autumn and winter months, though fog is observed every month of the year.

6.3 Psychrometric Data

Psychrometric data include observations of dry bulb, wet bulb, dew point temperatures, and relative humidity. The dry bulb temperature is the temperature of the ambient air; the wet bulb temperature is the lowest temperature to which a parcel of air, under constant pressure, can be cooled by evaporating water into it. The dew point temperature is the temperature to which a given parcel of air, under constant water-vapor content, must be cooled to attain saturation. Relative humidity is the ratio of the actual water-vapor content of the air to the one where saturation would occur if the pressure and temperature remained unchanged. Relative humidity has a diurnal cycle, with the highest values generally between 4 a.m. and 6 a.m., and the lowest values between 2 p.m. and 4 p.m.

Table 6.1. Average Sky Cover (sunrise to sunset), 1946 through 2003, and Number of Days Clear, Partly Cloudy, and Cloudy, 1954 through 2003

	Sky Cover (Scale 0-10)					Number of Clear Days					Number of Partly Cloudy Days	Number of Cloudy Days				
Month	Avg	Max	Year	Min	Year	Avg	Max	Year	Min	Year		Avg	Max	Year	Min	Year
Jan	8.0	9.2	2003[a]	4.3	1949	3.4	9	1984	0	1955[a]	5.2	22.4	28	1978	17	1963
Feb	7.4	9.3	1980	5.9	1996	4.6	14	2003	0	1984[a]	5.4	18.2	26	1980[a]	7	2003
Mar	6.8	8.5	1978	4.9	1965	6.2	12	1979[a]	1	1978[a]	8.3	16.5	24	1993	9	1979[a]
Apr	6.4	8.1	1963	3.7	1951	6.5	12	1962	1	1963	9.1	14.3	21	1979[a]	6	1956
May	5.9	8.1	1993	3.6	1992	8.5	18	1992	1	1977	10.3	12.2	19	1977[a]	3	1992
Jun	5.1	7.0	1950	2.8	1961	10.5	21	1961	5	1972[a]	10.0	9.4	15	1983[a]	5	1979[a]
Jul	3.0	5.0	1983	0.9	1953	19.1	26	2003[a]	12	1987[a]	7.6	4.3	12	1976	0	2003[a]
Aug	3.2	5.9	1968	0.6	1955	18.9	30	1955	9	1978	7.4	4.7	13	1983[a]	0	2000[a]
Sep	3.9	6.7	1978	1.4	1990[a]	15.7	27	1975	6	1978	7.4	6.9	16	1977	0	1990
Oct	5.6	8.0	1975	3.3	1987	10.6	25	2002	1	1975	7.9	12.5	22	1973	6	1986
Nov	7.5	9.1	1972	5.2	1993	4.7	12	1993	1	1973[a]	5.8	19.5	25	1973[a]	13	1993
Dec	8.1	9.3	1985	6.4	1978	3.8	9	1978	1	2002[a]	4.5	22.8	29	1985	17	1978
Annual	5.9	6.6	1978[a]	5.1	1949	112.9	144	1998	80	1977	89.0	163.4	193	1978	133	2002

(a) Most recent of multiple occurrences.

Table 6.2. Monthly and Annual Number of Days with Fog and Dense Fog, 1945 through 2003

	Days with Fog (Visibility ≤6 miles)					Days with Dense Fog (Visibility ≤0.25 mile)				
Month	Avg	Max	Year	Min	Year	Avg	Max	Year	Min	Year
Jan	11.7	25	1979	0	1949	6.2	15	1994[a]	0	1949
Feb	6.6	20	1963	0	1988[a]	3.2	11	1963	0	1999[a]
Mar	2.0	10	1993	0	2003[a]	0.8	5	1993[a]	0	2003[a]
Apr	0.5	3	1992	0	2002[a]	0.1	1	2003[a]	0	2002[a]
May	0.2	3	1948	0	2003[a]	<0.1	1	1958	0	2002[a]
Jun	0.1	2	1971	0	2003[a]	<0.1	1	1971	0	2003[a]
Jul	<0.1	1	1966	0	2003[a]	0	0	0		
Aug	0.1	1	1985[a]	0	2003[a]	<0.1	1	1985[a]	0	2003[a]
Sep	0.3	2	1985[a]	0	2003[a]	0.1	1	1995[a]	0	2003[a]
Oct	2.0	9	1962	0	1989[a]	1.0	7	1980	0	1998[a]
Nov	9.89	19	1985[a]	0	1990	5.6	14	2001	0	1990[a]
Dec	14.3	25	1989[a]	2	1968	7.5	17	1950	2	1996[a]
Annual	47.5	84	1985-86	22	1948-49	24.8	42	1950-51	9	1948-49

(a) Most recent of multiple occurrences.
Longest duration of fog: 113.7 hours, December 16-20, 1985.
Longest duration of dense fog: 47.0 hours, December 1957.

Table 6.3 presents monthly averages and extremes of dry bulb, wet bulb, dew point temperatures, and relative humidity from the Hanford Meteorology Station for the period 1950 through 2003. These variables are collected hourly and are averaged on a monthly (as opposed to a daily) basis. Prior to 1975, wet bulb temperatures ≥75°F had never been observed at the Hanford Meteorology Station. On July 8, 9, and 10, 1975, 7 hourly observations were made of wet bulb temperatures ≥75°F.

6.4 Solar Radiation

Table 6.4 presents average and extreme daily solar radiation values by month for the period 1953 through 2003. These data are reported in langleys (a langley is a unit defined as 1 gram calorie per square centimeter) and are integrated over an hour period and totaled for a daily value.

The highest daily values occur with a clear sky and clean air; the lowest commonly occur on days overcast with low stratus clouds. The lowest midday values of hourly solar radiation occurred on May 18, 1980, as the dense ash cloud from the morning eruption of Mount St. Helens passed over eastern Washington. Hourly solar radiation values dropped to 0 at 1100 hours and remained at 0 for the rest of that day.

6.5 Thunderstorms, Dust, and Glaze

A thunderstorm day is one in which thunder is heard at the observing station one or more times during a calendar day. If a thunderstorm were to begin before midnight and continue until after midnight, it is possible to have two thunderstorm days from a single storm.

Table 6.3. Monthly Averages and Extremes of Psychrometric Data, 1950 through 2003

Category[a]	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
	Monthly Averages												
Dry bulb	31.4	37.6	45.2	53.2	62.1	69.9	77.3	75.7	66.5	53.0	40.1	32.6	53.7
Wet bulb	29	34	39	44	50	55	58	58	53	45	37	31	44
Rel. hum.	77.5	70.4	56.6	47.5	42.9	39.5	33.3	35.6	42.1	56.1	73.6	80.4	54.6
Dew point	24.8	27.8	29.0	31.8	37.0	41.6	43.8	44.1	40.4	36.0	31.5	26.7	34.5
	Extremes of Monthly Averages												
Dry Bulb													
Highest	43.0	44.6	51.6	58.6	68.7	77.3	83.3	82.5	72.7	59.5	46.4	38.8	56.6
Year	1953	1991	1992	1987	1958	1992	1985	1967	1990	1988	1999	1953	1992
Lowest	12.9	25.8	39.6	48.3	57.0	64.2	71.3	70.6	58.9	48.1	25.7	21.9	50.2
Year	1950	1956	1955	1955	1984	1953	1986	1964	1985	1984	1985	1985	1985
Wet Bulb													
Highest	39	41	44	47	55	59	63	61	56	50	42	36	47
Year	1953	1956	1992	1992	1958	1992[b]	1998	1999[b]	1995[b]	1988	1999[b]	1991[b]	1992
Lowest	12	23	33	39	45	51	56	55	48	40	24	21	41
Year	1950	1956	1955	1955	1959	1983[b]	1986[b]	1980[b]	1970	1984	1978	1985[b]	1985
Relative Humidity													
Highest	88.8	86.9	69.1	64.5	61.9	53.5	45.6	47.8	55.5	74.2	88.7	90.5	58.9
Year	1960	1963	1993	1963	1948	1950	1993	1976	1977	1962	1979	1950	1978
Lowest	60.0	54.0	44.0	36.9	31.2	30.0	21.9	24.5	33.2	42.5	62.8	69.0	49.4
Year	1963	1967	1965	1966	1966	1949	1959	1967	1974	1952	1976	1968	1967
Dew Point													
Highest	34.4	36.7	37.2	37.1	43.9	47.5	50.1	48.4	45.4	43.5	38.3	34.3	37.7
Year	1953	1992[b]	1986	1992[b]	1998	1958	1975	1976	1963	1962	1954	1950	1958
Lowest	6.5	17.3	20.8	26.0	30.4	37.5	35.4	38.4	33.8	30.2	19.4	15.1	31.5
Year	1950	1956	1965[b]	1982	1964	1954	1959	1955	1970	1984	1985	1983	1955

(a) Dry bulb, wet bulb, and dew point temperatures in °F, relative humidity in %.
(b) Most recent of multiple occurrences.

Table 6.4. Average and Extreme Solar Radiation Daily Values (langley), 1953 through 2003

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	105	185	317	446	546	604	628	535	402	252	123	82	352
Highest	277	422	542	704	838	821	808	721	591	434	295	196	838
Year	1969	1958	1968	1972	1977	1971	1974	1957	1970	1973	1971	1972	May 1977
Lowest	16	11	44	75	67	92	118	82	61	33	13	6	6
Year	1976[a]	1995	1979	1974	1962	1992	1972	2003	1957	1974	2001	2002	Dec 2002

(a) Most recent of multiple occurrences.

Table 6.5 shows that thunderstorms occurred in every month of the year, except January and November. The thunderstorm season is essentially from April through September. The average number of thunderstorm days per year is 10; however, the total varies from a low of 3 in 1949 to a high of 23 in 1948. The largest number of thunderstorms in any single month was 8 in July 1998, July 1983, June 1972, and August 1953.

Table 6.5. Average Number of Days of Various Meteorological Phenomena, 1945 through 2003

Phenomenon	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Thunderstorm	0	≤0.1	0.2	0.8	1.5	2.2	2.2	2.0	0.7	0.2	0	≤0.1	9.8
Dust or blowing dust	0.4	0.4	0.5	0.6	0.6	0.4	0.4	0.2	0.5	0.3	0.2	0.2	4.6
Glaze	2.0	0.6	≤0.1	0	0	0	0	0	0	0	0.8	2.4	6.0

The criterion for both dust and blowing dust is that horizontal visibility be reduced to 6 miles or less. Dust is carried into the area from a distant source and may occur without strong winds. Blowing dust occurs when dust is picked up locally and occurs with stronger winds. Both dust and blowing dust occur at the Hanford Meteorology Station; however, in most cases, it is blowing dust. Table 6.5 presents the average number of days per month and year of dust and blowing dust during the period 1945 through 2003. The average number of days per year with dust or blowing dust is 5. The greatest number of such days in any year was 20 in 1980; the fewest was 0 in 1987 and earlier years. The greatest number of days with dust or blowing dust in any month was 9 in May 1980. This peak in the number of days with dust or blowing dust (for either a month or a year) resulted from the eruption of Mount St. Helens on May 18, 1980, and subsequent dates.

Glaze is a coating of ice formed when rain or drizzle freezes on contact with any surface having a temperature that is below freezing. Table 6.5 provides data on the number of days per month and year with glaze for the period 1945 through 2003. The average number of days with freezing rain or freezing drizzle is 6. The highest number of days with glaze in any winter season was 18 during the winter of 1969-1970; the least, 1 day during the winter of 1987-1988 and earlier winters. The greatest number of such days in any single month was 9 in January 1970.

6.6 Atmospheric Pressure

Table 6.6 contains atmospheric pressure data for the period 1955 through 2003. This table lists both station and sea-level pressure, including extremes and years of occurrence. Atmospheric pressure may be indicated in several different units, including inches of mercury, millimeters of mercury, millibars, or Pascals; however, in this table, pressure is stated in inches of mercury. Station pressure is the barometric pressure measured at the Hanford Meteorology Station (at an elevation of 733 feet); sea-level pressure is the station pressure adjusted to sea level. Most are familiar with barometric pressure adjusted to sea level, which allows atmospheric pressures for all locations to be compared, regardless of the elevation of the station where the data are measured.

The highest sea-level pressure ever recorded at the Hanford Meteorology Station was 31.12 inches in January 1979; the lowest was 28.91 inches in December 2002.

Some rapid pressure changes occurred on November 3, 1958, falling 0.492 inch over a 6-hour period (0.082 inch per hour), including a 1-hour fall of 0.160 inch. On the same day, the pressure rose 0.554 inch during a 6-hour period (0.090 inch per hour), including a 1-hour rise of 0.145 inch. The greatest sea-level pressure change during a 1-day period was 1.02 inches (December 8, 1971).

Table 6.6. Average and Extreme Station and Sea-Level Pressure Data, 1955 through 2003 (inches of mercury)

	Station Pressure						Sea-Level Pressure			
Month	Average	High	Year	Low	Year	Greatest Daily Range	High	Year	Low	Year
Jan	29.32	30.23	1979[a]	28.18	1980	0.77	31.12	1979	28.94	1964
Feb	29.27	30.08	1956	28.23	1958[a]	0.86	30.97	1956[a]	28.98	1958[a]
Mar	29.20	29.92	1955	28.34	1995	0.85	30.79	1955	29.11	1995
Apr	29.19	29.91	1999	28.49	1962[a]	0.81	30.73	1999	29.26	1962
May	29.16	29.72	2003	28.61	1999	0.47	30.53	2003	29.38	1999[a]
Jun	29.14	29.60	1987[a]	28.67	1992[a]	0.54	30.40	1987	29.42	1992
Jul	29.14	29.56	1993[a]	28.80	2002[a]	0.48	30.34	1993[a]	29.55	2002[a]
Aug	29.14	29.55	1968	28.75	1980	0.39	30.32	1968	29.52	1980
Sep	29.18	29.79	1983[a]	28.48	1986[a]	0.56	30.60	1983	29.25	1986
Oct	29.25	29.86	1999	28.39	1962	0.74	30.68	1999[a]	29.15	1962
Nov	29.28	30.06	1979[a]	28.36	2002[a]	0.78	30.90	1979[a]	29.13	2002[a]
Dec	29.32	30.20	1978	28.15	2002	1.02	31.07	1978[a]	28.91	2002
Annual	29.22	30.23	Jan 1979[a]	28.15	Dec 2002	1.02	31.12	Jan 1979	28.91	Dec 2002

(a) Most recent of several occurrences.

6.7 Sunrise and Sunset Times for the Hanford Meteorological Station

Table 6.7 lists the sunrise and sunset times for the Hanford Meteorological Station in Pacific Standard Time (PST). The longest days of the year (period between sunrise and sunset) are June 22 and 23 at 15 hours and 50 minutes each. The shortest days of the year are December 19 through 23 at 8 hours and 34 minutes. Sunrise varies from 4:04 am PST (earliest) on June 11 through 14 to 7:42 am PST (latest) from December 28 through January 7. Sunset varies from 4:11 pm PST (earliest) from December 5 through 16 to 7:55 pm PST from June 22 through July 1.

Table 6.7. Sunrise and Sunset Times (PST) at the Hanford Meteorological Station

	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
Day	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	p.m.
1	0742	1621	0722	1702	0639	1743	0538	1827	0444	1907	0409	1943	0408	1955	0438	1930	0517	1838	0557	1738	0640	1643	0721	1613
2	0742	1622	0722	1703	0637	1745	0537	1828	0443	1908	0408	1944	0409	1954	0439	1929	0519	1836	0558	1736	0641	1642	0722	1612
3	0742	1623	0719	1705	0635	1746	0534	1830	0440	1910	0408	1945	0410	1954	0440	1927	0520	1834	0600	1734	0643	1640	0723	1612
4	0742	1624	0719	1706	0632	1748	0532	1831	0439	1911	0407	1946	0411	1954	0442	1926	0521	1832	0601	1732	0643	1639	0725	1612
5	0742	1625	0717	1708	0631	1749	0530	1832	0439	1912	0407	1946	0411	1953	0443	1924	0522	1830	0602	1730	0646	1637	0726	1611
6	0742	1626	0716	1709	0529	1750	0528	1834	0436	1914	0406	1947	0412	1953	0444	1923	0523	1829	0602	1729	0647	1636	0727	1611
7	0742	1627	0714	1711	0628	1752	0526	1835	0435	1915	0406	1948	0413	1953	0446	1921	0525	1827	0604	1727	0648	1635	0728	1611
8	0741	1629	0714	1712	0626	1753	0524	1836	0434	1916	0406	1949	0414	1952	0446	1920	0526	1825	0605	1725	0650	1633	0729	1611
9	0741	1630	0711	1714	0623	1755	0522	1838	0432	1918	0405	1949	0414	1952	0449	1918	0527	1823	0607	1723	0652	1632	0730	1611
10	0741	1631	0710	1715	0622	1756	0521	1839	0431	1919	0405	1950	0415	1951	0449	1917	0528	1821	0609	1721	0652	1631	0731	1611
11	0740	1632	0708	1717	0619	1758	0519	1840	0429	1920	0404	1951	0416	1950	0451	1915	0530	1819	0610	1719	0653	1630	0732	1611
12	0740	1633	0707	1718	0617	1759	0517	1842	0428	1922	0404	1951	0417	1950	0452	1913	0531	1817	0611	1717	0656	1628	0733	1611
13	0739	1635	0705	1720	0616	1800	0515	1843	0427	1923	0404	1952	0418	1949	0453	1912	0532	1815	0613	1715	0657	1627	0733	1611
14	0739	1636	0704	1721	0613	1802	0513	1844	0425	1924	0404	1952	0419	1948	0455	1910	0533	1813	0614	1713	0659	1626	0734	1611
15	0738	1637	0702	1723	0611	1803	0511	1846	0424	1925	0405	1953	0420	1948	0456	1908	0535	1811	0615	1712	0700	1625	0735	1611
16	0738	1638	0701	1724	0610	1805	0510	1847	0423	1926	0405	1953	0420	1947	0457	1907	0536	1809	0617	1710	0702	1624	0735	1611
17	0737	1640	0659	1726	0608	1806	0508	1848	0422	1927	0405	1953	0421	1946	0458	1905	0538	1806	0618	1708	0703	1623	0736	1612
18	0736	1641	0657	1727	0605	1808	0506	1850	0421	1929	0405	1954	0422	1945	0500	1903	0538	1805	0619	1705	0704	1622	0737	1612
19	0736	1642	0656	1729	0604	1809	0504	1851	0420	1930	0405	1954	0423	1944	0501	1901	0541	1802	0621	1705	0706	1621	0738	1612
20	0735	1644	0654	1730	0602	1810	0503	1852	0419	1931	0405	1954	0424	1944	0502	1900	0542	1800	0622	1703	0707	1620	0739	1613
21	0734	1645	0652	1732	0600	1812	0501	1854	0418	1932	0405	1954	0426	1943	0503	1858	0543	1758	0624	1701	0708	1619	0739	1613
22	0733	1647	0651	1733	0558	1813	0459	1855	0417	1933	0405	1955	0427	1942	0505	1856	0544	1756	0625	1659	0710	1618	0739	1613
23	0732	1648	0649	1735	0555	1815	0457	1856	0416	1934	0405	1955	0428	1941	0506	1854	0546	1754	0626	1658	0711	1617	0740	1614
24	0731	1649	0647	1736	0554	1816	0455	1858	0415	1935	0406	1955	0429	1939	0507	1853	0547	1752	0628	1656	0712	1617	0740	1615
25	0730	1651	0646	1737	0552	1817	0454	1859	0414	1936	0406	1955	0430	1938	0508	1851	0548	1750	0629	1654	0714	1616	0741	1616
26	0730	1652	0544	1739	0549	1819	0452	1900	0413	1937	0406	1955	0431	1937	0510	1849	0551	1748	0631	1653	0715	1615	0741	1616
27	0728	1654	0642	1740	0548	1820	0450	1902	0412	1938	0407	1955	0432	1936	0511	1847	0551	1746	0632	1651	0716	1615	0741	1617
28	0727	1655	0640	1742	0546	1821	0449	1903	0412	1939	0407	1955	0433	1935	0512	1845	0553	1744	0633	1650	0718	1614	0742	1618
29	0726	1657	0639	1743	0543	1823	0448	1904	0411	1940	0408	1955	0434	1934	0513	1844	0554	1742	0635	1648	0719	1614	0742	1618
30	0725	1658			0542	1824	0445	1906	0410	1941	0408	1955	0436	1932	0515	1842	0556	1740	0635	1647	0720	1613	0742	1619
31	0724	1700			0540	1826			0410	1942			0437	1931	0516	1840			0638	1645			0742	1620

7.0 Extreme Values

Extreme values are generally described in terms of probability of occurrence or in terms of return period. For low probability events, the return period is simply the reciprocal of the probability when the probability is expressed as the likelihood of the event occurring in a given year. As with all estimated extreme values, the uncertainty in the estimates increases as the return period increases. In addition, the extreme value estimates assume that the climate in the future will be the same as it has been since the Hanford Meteorology Station was established. This section was not updated to include 2003 data.

7.1 Annual Temperature Extremes

Annual maximum and minimum temperatures with return periods from 2 to 1,000 years are listed in Table 7.1. The probabilities of exceeding various maximum and minimum temperatures are shown in Figure 7.1 and Figure 7.2 along with the maximum and minimum temperatures observed at the Hanford Meteorology Station from 1945 through 2002. The curves were estimated by assuming that the annual extreme temperatures may be fit using a normal distribution and calculating distribution parameters from the observed data.

7.2 Precipitation Rates

Maximum precipitation rates for return periods of 2 to 1,000 years are listed in Table 7.2. The corresponding precipitation amounts are listed in Table 7.3. The precipitation rate estimates are based on precipitation measurements made at the Hanford Meteorology Station from 1947 through 2002. The precipitation rates were estimated for each return period assuming a lognormal distribution and distribution parameters calculated from the data. Figure 7.3 shows the predicted rates for 1, 3, 6, and 12 hours duration along with the observed data.

7.3 Snow

Snow extremes for return periods from 2 to 1,000 years are listed in Table 7.4. The estimates are based on data from the Hanford Meteorology Station for the 1946-1947 through 2001-2002 snow seasons. The values in the tables were estimated assuming a Type 1 (Gumbel) extreme value distribution (Johnson et al. 1995) using maximum-likelihood estimates (Kinnison 1985) of the distribution parameter values calculated from the Hanford Meteorology Station data. Figure 7.4, Figure 7.5, and Figure 7.6 show the probabilities of seasonal maximum snowfall, maximum single storm snowfall, and maximum snow depth, respectively with the corresponding Hanford Meteorology Station data.

7.4 Peak Wind Gusts

Peak wind gusts for return periods of 2 to 10,000 years are listed in Table 7.5 for heights of 30, 50, 200, and 400 feet above ground. The peak wind gust estimates are based on wind measurements made at the 50-, 200-, 400-foot levels of the tower at the Hanford Meteorology Station. The peak wind gusts for each return period for these levels were estimated assuming a Type 1 extreme value distribution and maximum likelihood distribution parameters calculated from the Hanford Meteorology Station data. The

peak wind gusts for the 30-foot level were made by first adjusting the peak gusts observed at 50 feet to 30 feet using the technique described by Peterka and Shahid (1998) and then calculating the distribution parameters using maximum likelihood techniques. Figure 7.7 shows the probabilities of peak wind gusts at all four levels along with the Hanford Meteorology Station peak wind gust data for 50, 200, and 400 feet.

Table 7.1. Return Periods[(a)] for Annual Maximum and Minimum Temperatures

Return Period (years)	Maximum Temperature (°F)	Minimum Temperature (°F)
2	106.2	0.1
5	108.8	-8.5
10	110.2	-13.1
20	111.4	-16.8
25	111.7	-17.9
50	112.7	-21.0
100	113.6	-23.8
200	114.8	-26.3
500	115.5	-29.4
1,000	116.2	-31.6

(a) Return periods are the frequency we may expect these temperatures to occur.

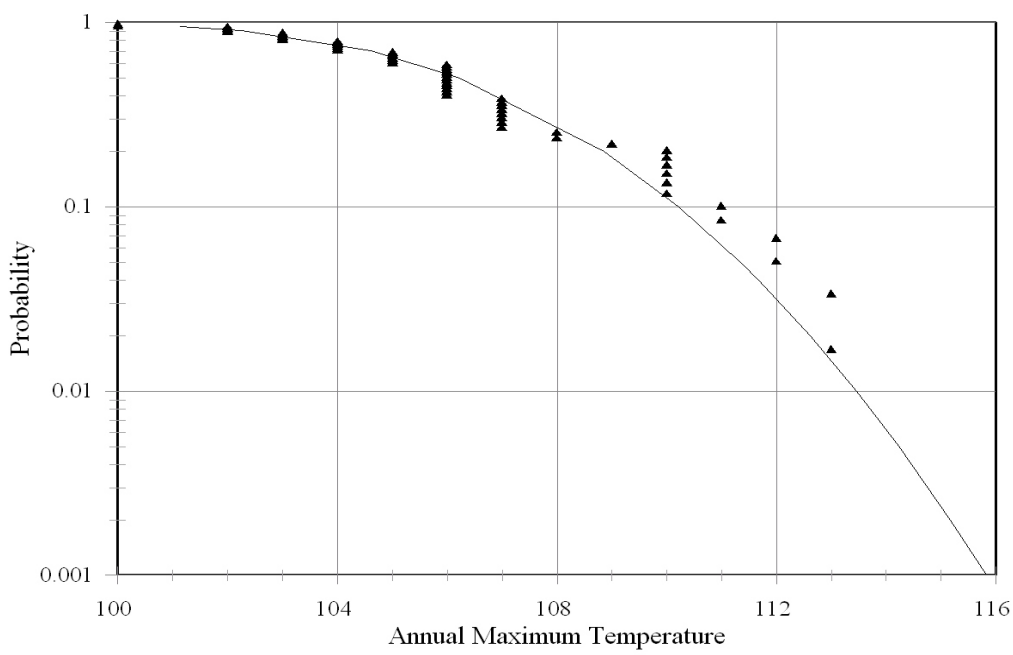

Figure 7.1. Probability (1/yr) of an Annual Maximum Temperature (°F) Exceeding a Given Value

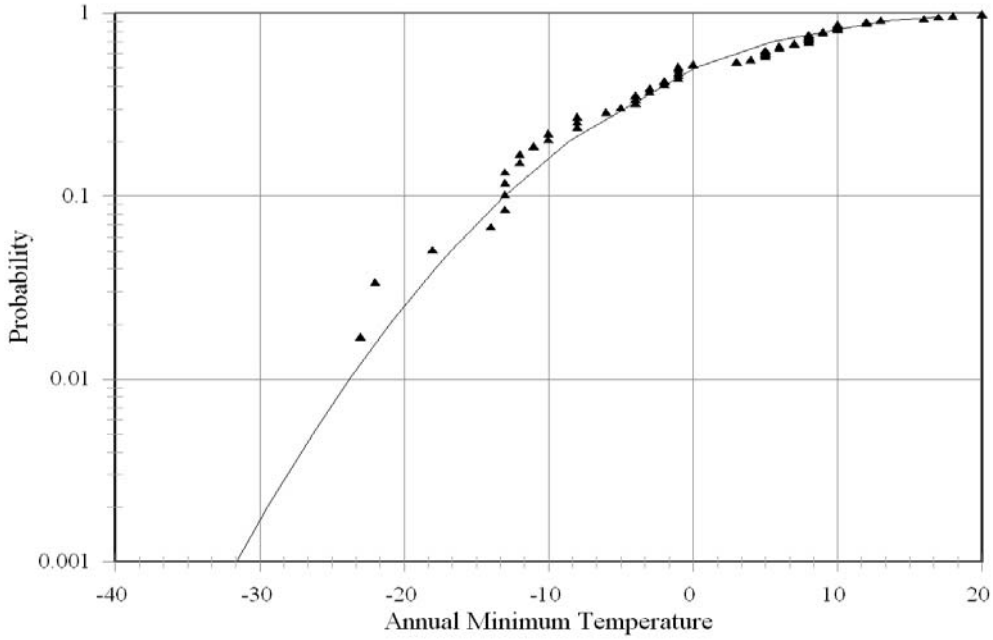

Figure 7.2. Probability (1/yr) of an Annual Minimum Temperature (°F) Being Less Than a Given Value

Table 7.2. Precipitation Rates (inches per hour) for 1 to 24 Hours Duration and Return Periods from 2 to 1,000 Years

Return Period (years)	Duration					
	1 hour	2 hours	3 hours	6 hours	12 hours	24 hours
2	0.22	0.15	0.12	0.08	0.05	0.03
5	0.31	0.21	0.16	0.11	0.07	0.04
10	0.37	0.24	0.18	0.12	0.08	0.04
20	0.43	0.27	0.20	0.14	0.09	0.05
25	0.45	0.28	0.21	0.14	0.09	0.05
50	0.52	0.32	0.23	0.16	0.10	0.06
100	0.58	0.35	0.25	0.17	0.11	0.06
200	0.64	0.38	0.26	0.18	0.12	0.07
500	0.73	0.42	0.29	0.20	0.13	0.08
1,000	0.79	0.46	0.31	0.22	0.14	0.08

Table 7.3. Precipitation Amounts (inches) for 1 to 24 Hours in Periods and Return Periods from 2 to 1,000 Years

Return Period (years)	Duration					
	1 hour	2 hours	3 hours	6 hours	12 hours	24 hours
2	0.22	0.31	0.36	0.48	0.60	0.69
5	0.31	0.41	0.47	0.63	0.79	0.93
10	0.37	0.48	0.54	0.73	0.92	1.08
20	0.43	0.55	0.60	0.82	1.04	1.23
25	0.45	0.57	0.62	0.85	1.08	1.27
50	0.52	0.63	0.68	0.93	1.19	1.42
100	0.58	0.70	0.74	1.02	1.30	1.56
200	0.64	0.76	0.79	1.10	1.42	1.70
500	0.73	0.85	0.87	1.22	1.57	1.88
1,000	0.79	0.91	0.93	1.30	1.69	2.03

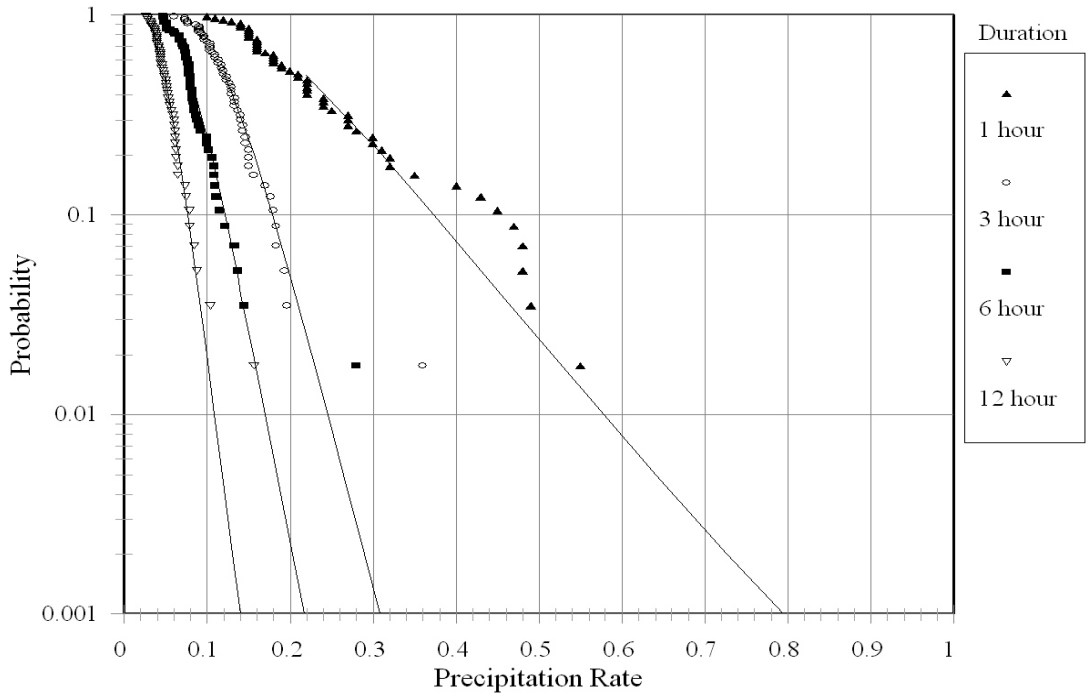

Figure 7.3. Probability (1/yr) of Precipitation Rate (inches per hour) Exceeding Given Values by Duration

Table 7.4. Snowfall Extremes for Return Periods from 2 to 1,000 Years

Return Period (years)	Seasonal Total (inches)	Single Storm (inches)	Maximum on Ground (inches)
2	12.9	3.7	4.9
5	21.3	5.9	7.9
10	26.9	7.3	10.0
20	32.3	8.7	11.9
25	34.0	9.1	12.6
50	39.2	10.5	14.5
100	44.4	11.8	16.4
200	49.6	13.1	18.3
500	56.4	14.9	20.8
1,000	61.6	16.2	22.6

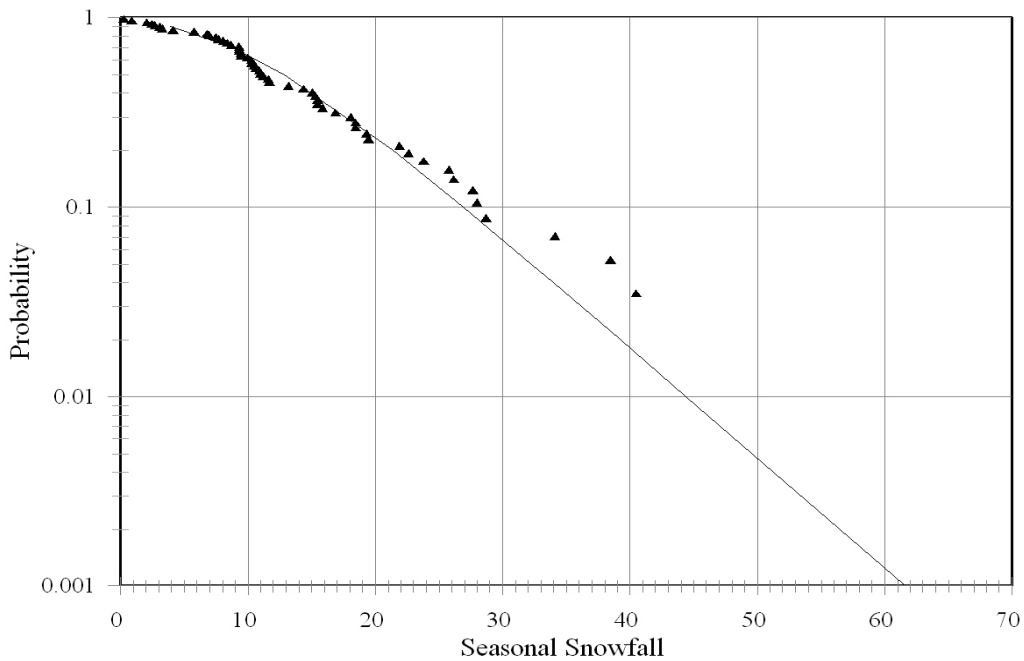

Figure 7.4. Probability (1/yr) of Exceeding a Given Seasonal Snowfall (inches)

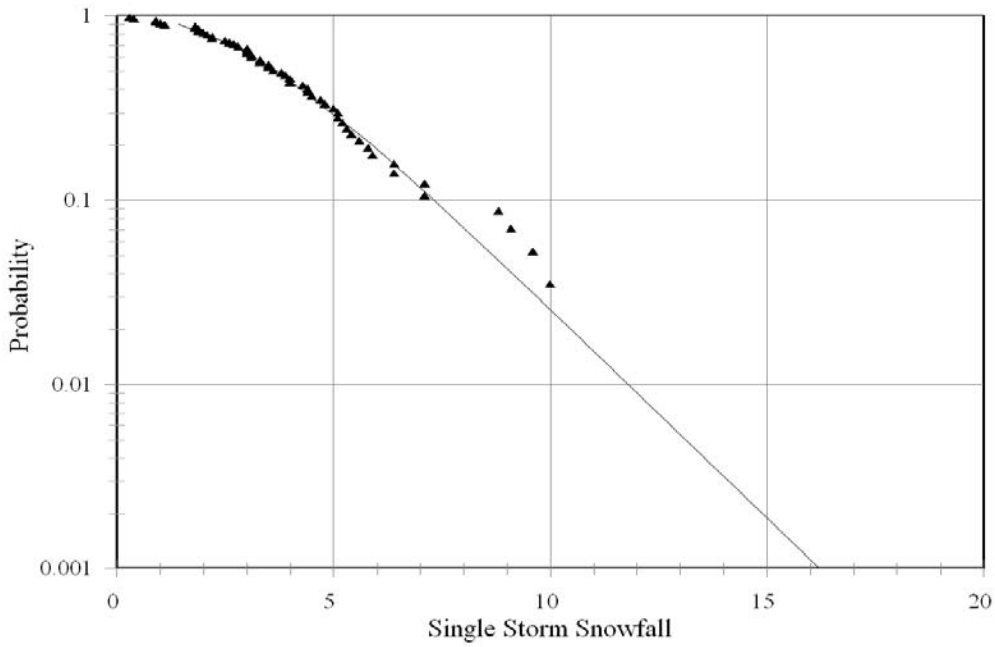

Figure 7.5. Probability (1/yr) of Exceeding a Given Snowfall (inches) in a Single Storm

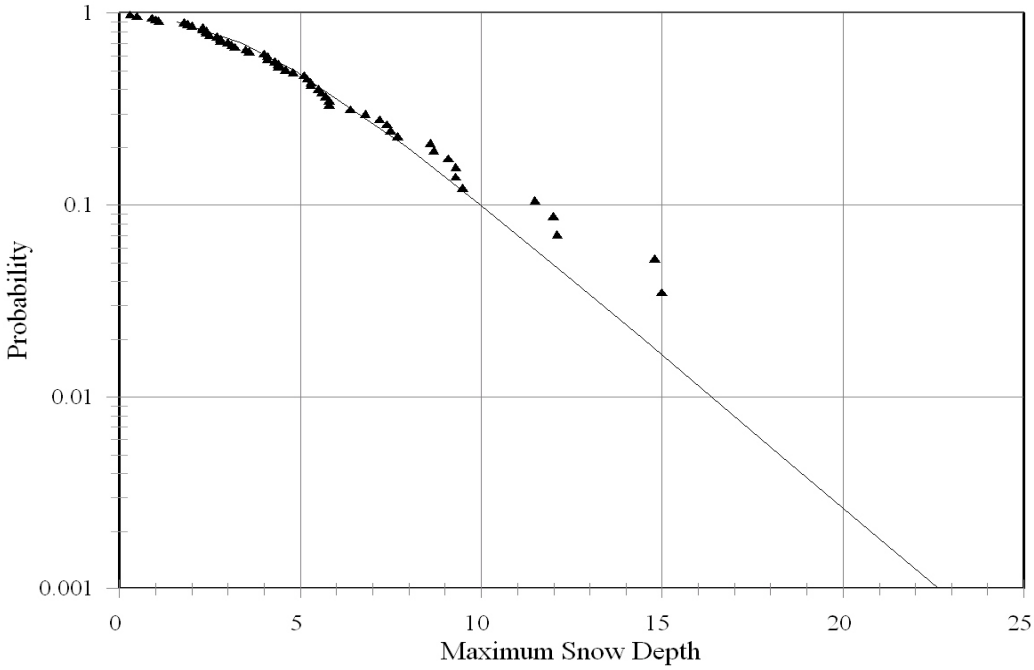

Figure 7.6. Probability (1/yr) of Exceeding a Given Snow Depth (inches)

Table 7.5. Peak Wind Gusts (mph) for Return Periods from 2 to 10,000 Years

Return Period (years)	Height Above Ground			
	30 feet	50 feet	200 feet	400 feet
2	57.6	60.3	67.4	71.6
5	63.9	66.8	75.0	80.3
10	68.1	71.2	80.0	86.1
20	72.0	75.3	84.8	91.7
25	73.3	76.6	86.4	93.4
50	77.2	80.7	91.1	98.9
100	81.1	84.7	95.7	104.2
200	85.0	88.7	100.4	109.6
500	90.1	94.0	106.5	116.7
1,000	93.9	98.0	111.2	122.0
2,000	97.8	102.0	115.8	127.4
5,000	102.8	107.2	122.0	134.4
10,000	106.7	111.2	126.6	139.8

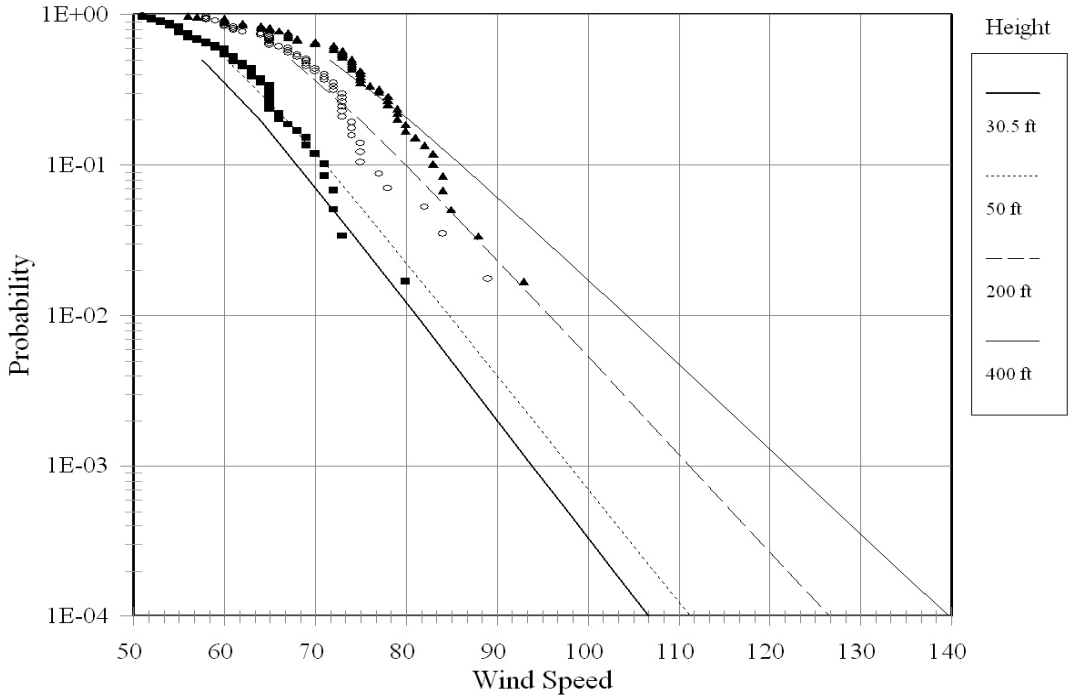

Figure 7.7. Probabilities (1/yr) of Peak Wind Gusts (miles per hour) Exceeding Given Values

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Appendix A

Climate Classification of the Mid-Columbia Region

Appendix A

Climate Classification of the Mid-Columbia Region

What is the proper description of the climate of the Mid-Columbia Region? The local Tri-City Herald has a Sunday newspaper section called "Desert Living." Numerous place names in eastern Washington contain the word "desert," since people commonly regard any region that is too dry to support trees, except perhaps in river bottoms, as desert. On the other hand, popular and other publications of both the Nature Conservancy and the National Audubon Society carefully describe this region as a shrub-steppe.

The classification of the climate of the Mid-Columbia Region has not been consistent among the numerous meteorological and ecological publications that have described the area, either. In these publications, one finds the Mid-Columbia alternately described as shrub-steppe (or semi-arid) and desert (or arid)—sometimes within the same publication (e.g., Rogers and Rickard 1988; p. 1ff and p. 8). To further confuse the issue, the terms "arid" or "desert" and "semiarid" or "steppe" are used as a subdivision of the general term "arid," which represents a climatic condition in which the potential evaporation exceeds precipitation on average (American Meteorological Society 2000). In fairness to Rogers and Rickard, their use of "arid" cited above was most likely intended in the general sense rather than as a contrast to "semiarid."

Climate, an abstract concept of the weather conditions at a particular location over a long period of time, is popularly understood among laypeople and scientists alike in terms of its effects. In their introductory text on climate, Trewartha and Horn (1980) note that climate fundamentally controls the distribution of natural things such as plants, animals, and soils. They further comment (p. 218) that if "one disregards the distribution of non-climatic phenomena [e.g., plants, animals, and soils], it is difficult to provide meaningful temperature-rainfall limits of climatic types." In other words, assessing the climate of a particular area, especially near boundaries of climate types, requires consideration of not only meteorological variables but also those natural things that respond to them.

The non-climatic phenomenon that is most frequently associated with climate is the distribution of vegetation. Because the vegetation distribution is heavily determined by temperature and available moisture, most of the classification systems for climate have been empirically developed by correlating vegetation and some measure of temperature and humidity. In fact, the general correspondence between patterns of climate variables and patterns of vegetation is so strong that categories of some climate types are named for the dominant vegetation type (e.g., tropical rainforest or steppe) that they generate. Climate classification systems have generally sought to create indices that are indicative of specific climate types for specified ranges of the index variable.

A.1 Climate Classification Systems

Numerous classification schemes have been developed for climate. Gedzelman (1985) in his introductory chapter to the *Handbook of Applied Meteorology* provides a helpful and detailed overview of the more prominent of these systems. Much of the discussion that follows is based on his writing.

One of the earliest and still most widely used climate classification schemes was developed by Köppen in the early twentieth century. This system sought to describe regions of similar vegetation in terms of temperature and humidity, whose cumulative effect Köppen expressed in terms of combinations of three letters. The first letter (A-E) denotes temperature, except for "B," which indicates a lack of moisture. The second letter indicates quantity of precipitation, and the third, if present, relates to mean monthly temperatures. As the scheme applies to the Columbia Basin, the classification is either BS (steppe) or BW (desert), and is determined as follows:

(a) If 70% or more of the mean annual precipitation $\overline{R}$ occurs in the six cooler months (October through March in the Northern Hemisphere), then the classification is given in terms of $\overline{R}$ (cm) and the mean annual temperature $\overline{T}$ (°C) as

$\overline{T} \le \overline{R} < 2\overline{T}$	station climate is steppe (BS)
$\overline{R} < \overline{T}$	station climate is desert (BW)

(b) If 70% or more of $\overline{R}$ occurs in the six warmer months, then the classification is

$\overline{T} + 14 \le \overline{R} < 2\left(\overline{T} + 14\right)$	station climate is BS
$\overline{R} < \overline{T} + 14$	station climate is BW

(c) If precipitation is evenly distributed throughout the year [i.e., neither (a) nor (b) applies], then the classification is

$\overline{T} + 7 \le \overline{R} < 2\left(\overline{T} + 7\right)$	station climate is BS
$\overline{R} < \overline{T} + 7$	station climate is BW

Note that the boundary between desert and steppe in each of these sets of inequalities occurs at half the value of precipitation required for the boundary between steppe and humid climates.

From the historical averages through 2000 at the Hanford Meteorological Station, the mean annual temperature is 53.4°F (11.9°C), and the mean annual precipitation is 6.79 inches (17.2 centimeters) of which 66.6% falls from October through March. Since this percentage falls just short of Köppen's criterion of 70% for a winter maximum of precipitation, one might infer that (c) applies and the climate classification is BW, or desert. These formulas exhibit an inconsistent behavior, however. If the precipitation were the same in the winter but less in the summer months by 0.33 inch, the appropriate formulas would be (a) in which case the climate classification would be BS, or steppe. Thus by *reducing*

annual rainfall in this manner, the Hanford Site would move to a *more moist* Köppen classification. This suggests that it is not useful to be too inflexible in the application of classification formulas, especially near zone boundaries.

Patton (1962) offered a simplification of Köppen's system that expressed the boundary between humid and semiarid climates as a single, easily memorized equation:

$$R' = \frac{1}{2}T' - \frac{1}{4}P'w$$

where R' = annual precipitation in inches
T' = temperature in degrees Fahrenheit
$P'w$ = the percentage of precipitation that falls in the winter months.

Mean precipitation greater than R' results in a humid climate. Precipitation less than R' but greater than $1/2R'$ generates a steppe climate, and less than $1/2R'$ generates desert conditions. This formula was shown to give results that are not significantly different from Köppen's set of three relations. Patton's relation, incidentally, also solves the problem of the inconsistency noted above in Köppen's formulas near the precipitation regime boundaries. Applying Patton's result to the Hanford Meteorological Station data

$$\begin{aligned}\frac{1}{2}R' &= \frac{1}{4}T' - \frac{1}{8}P'w \\ &= \frac{1}{4}(53.4) - \frac{1}{8}(66.6) \\ &= 5.03 \text{ in}\end{aligned}$$

This precipitation value for the boundary between steppe and desert is significantly lower than the Hanford Meteorological Station mean annual precipitation of 6.79 inches, placing the Hanford Site in a steppe climate by this representation of the Köppen system.

Another classification for climate that has been widely used is that given by Thornthwaite (1931). Thornthwaite was the first to attempt to develop a numerical index by which climate zones could be defined. In fact, he developed two climate indices: a "temperature efficiency" index *TE* and a "precipitation effectiveness" index *PE*. Like Köppen, he based his indices on temperature and humidity for a region in such a way as to try to make them representative of patterns of plant communities. These indices are defined as follows:

$$TE = \frac{1}{4}\sum_{k=1}^{12}\left(\overline{T_k} - 32\right)$$

where $\overline{T_k}$ is the mean temperature in ^oF for month k, and

$$PE = 115\sum_{k=1}^{12}\left(\frac{\overline{r_k}}{\overline{T_k} - 10}\right)^{10/9}$$

where $\overline{r_k}$ is the mean precipitation for month k in inches.

Using the same Hanford Meteorological Station data as those for calculating the Köppen classification above, the Thornthwaite indices for the Hanford Site are $TE = 64.5$ and $PE = 16.1$. The *TE* value is near the boundary of 63.5 between Thornthwaite's "microthermal" (cool) and "mesothermal" (warm, but not hot) climates. The *PE* value for the Hanford Site, of primary interest here, places the Hanford Meteorological Station in a semiarid climate but is very near Thornthwaite's boundary value between arid (*PE*<16) and semiarid ($16 \le PE < 31$).

Thornthwaite (1948) updated his classification in an effort to tie it more closely to the physical water balance. The result was more philosophically satisfying but also considerably more complicated, since not only temperature and precipitation but also soil characteristics must be considered. Daubenmire (1988), in his definitive study of eastern Washington vegetation, found that the resulting values of Thornthwaite's Moisture Index overlapped distinct steppe zones and that the index was not as practical as simpler formulations. Knapp (1985) suggested that Thornthwaite's index may not be applicable to dry regions because its correlations were developed from the humid zones of the central and eastern United States.

A.2 Reliability of Precipitation

Another important distinction between desert and steppe climates is the reliability of precipitation. True desert regions are generally characterized by sporadic albeit sometimes heavy precipitation events. Because of this, the routine availability of moisture is often much less than would be suggested by the mean annual precipitation value. Thus, one region, with long periods between significant precipitation events, may only be able to support desert vegetation while another, with a similar mean value of temperature and precipitation, may support the grasses and shrubs of the steppe. Daubenmire (1988) criticized the Thornwaite index for this reason because it uses mean annual rainfall rather than the probably more appropriate median value.

Under the definition of "semiarid zone," the *Glossary of Meteorology* (American Meteorological Society 2000) notes that the coefficient of variation for arid zones exceeds 50%, while the value for semiarid zones is 30–50%. This quantity is defined as

$$C_r = 100\frac{\sigma_r}{\overline{r}}$$

where $\overline{r}$ = the mean of the annual precipitation.
σ_r = its standard deviation.

Using historical data from the Hanford Meteorological Station through 2000, this value is $C_r = 30.5\%$, far from the variability that characterizes desert regions.

A.3 Vegetation of the Mid-Columbia Region

Vegetation may be viewed as an integrator of weather that reflects the climate. The Mid-Columbia region, where the surface is undisturbed, is characterized by a substantial cover of xerophytic shrubs (i.e., those adapted to dry regions, such as sagebrush) and perennial grasses. From Daubenmire's (1988) perspective

> "reasonable limits would be to consider *desert* as regions too dry to support a noticeable cover of perennial grasses on zonal soils, and *steppe* as regions with moisture relations adequate to support an appreciable cover of perennial grasses on zonal soil, yet not enough for arborescent vegetation. Since even the driest part of eastern Washington can support a heavy cover of perennial grasses wherever there is a zonal soil, a continuous film of cryptogams covers the soil surface, and at least 0.7 metric tons/ha/yr of dry matter is produced, its classification as steppe rather than desert seems preferable."

Some writers have attempted to disregard vegetation in classifying the climate of the intermountain West. In a recent textbook, Bailey (1996) relied on an apparently rigid application of the Köppen-Trewartha system to conclude that, despite the widespread support of semi-desert shrubs and other vegetation, the Great Basin and Columbia Basin were true deserts. This is a curious result, since the climate mapping produced by Trewartha himself (Trewartha and Horn 1980) classifies the northern Great Basin and the Columbia Basin as steppe.

A.4 Summary

From virtually all perspectives but the popular criterion of lack of naturally growing trees, the climate of the Hanford Site as well as the rest of the Mid-Columbia region is best classified as steppe (or, equivalently, semiarid), although it is on the dry side of that classification. With respect to classification schemes, only the most rigid application of the Köppen formulation places the area in the desert class. The precipitation falls with a reliability that is characteristic of steppes rather than deserts, and the vegetation that is present is considered typical of a shrub-steppe ecosystem. For these reasons, we believe that the most appropriate term for the local climate is "steppe."

Table A.1 organizes the terminology discussed above.

Table A.1. Description of the Uses of the Terms "arid" and "semiarid" with Respect to Climate.

Arid Climate	
Conventional Boundary of Classification:	On an annual average, more moisture can leave the vegetation and soil surfaces than falls as precipitation
Effect:	No arborescent vegetation (i.e., trees), except perhaps in river bottoms
Equivalent Terms:	None in this general sense, except perhaps "dry climate"

Semiarid Climate		**Arid Climate**	
Conventional Boundary of Classification:	Within the general arid designation, the annual precipitation is half or more of the moisture that could escape to the atmosphere from the soil and plant surfaces	Conventional Boundary of Classification:	Within the general arid designation, the annual precipitation is less than half of the moisture that could escape to the atmosphere from the soil and plant surfaces.
Effect:	Widespread coverage of undisturbed soil surface by annual and perennial grasses and, in some areas, by shrubs adapted to dry climates	Effect:	Sparse coverage of undisturbed soil surface by shrubs and perhaps grasses; a significant fraction of the soil surface is free of vegetation
Equivalent Terms:	steppe, shrub-steppe (if shrubs are present), semi-desert	Equivalent Term:	desert

NOTE that "arid" can mean either "dry" or "desert" depending on context. Because of the tight link between climate and vegetation, terms that fundamentally describe ecosystems, such as "steppe," are widely used interchangeably with terms such as "semiarid" that describe the physical water balance of a region.

A.5 References

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Appendix B

2003 Wind Climatology

Appendix B

2003 Wind Climatology

This appendix provides the 2003 station-specific wind roses (Figures B.1[a] and B.2[a]) from the Hanford Meteorological Monitoring Network. Each petal of the wind rose represents the proportional amount of time that the wind blew from that direction. The width of the petal corresponds to each wind speed category. Starting from the center of the rose, the narrowest petal represents winds in the 1- to 3-miles per hour (mph) class, the next widest represents the 4- to 7-mph class, and so forth. The length of each of these petals is proportional to the frequency of occurrence for each speed class.

The wind speed histograms (Figures B.1[b] and A.2[b]) represent the proportional amount of time in each speed class.

Table B.1 lists joint frequency distributions (at 30 feet) of wind direction versus wind speed class for the individual stations (see Figure 2.1 in text for locations). Table B.2 lists joint frequency distributions (at 60 meters) for stations 9, 11, 13, and 21 (see Figure 2.2 in text for locations).

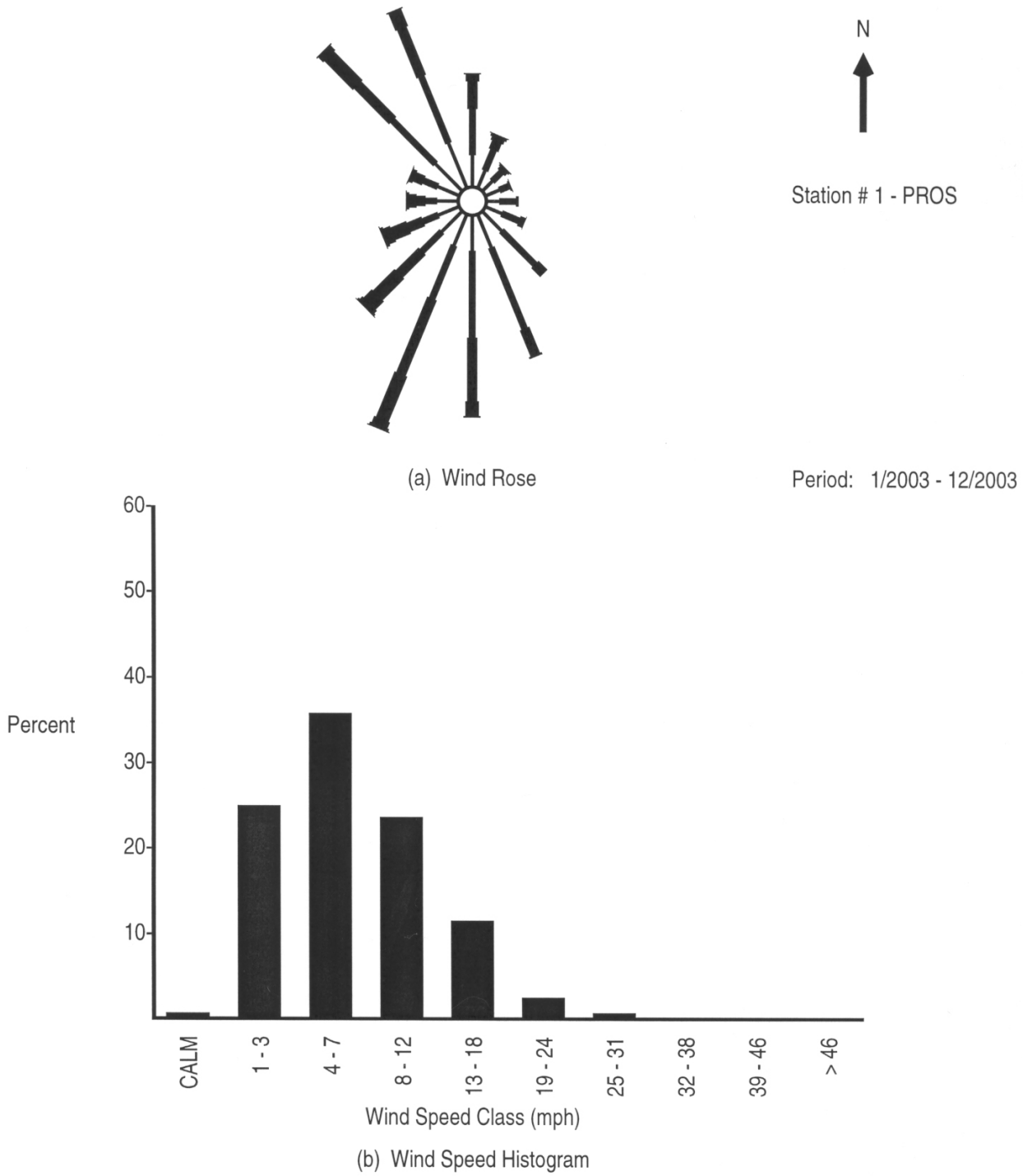


Figure B.1. Wind Rose and Wind Speed Histogram, 30 Feet

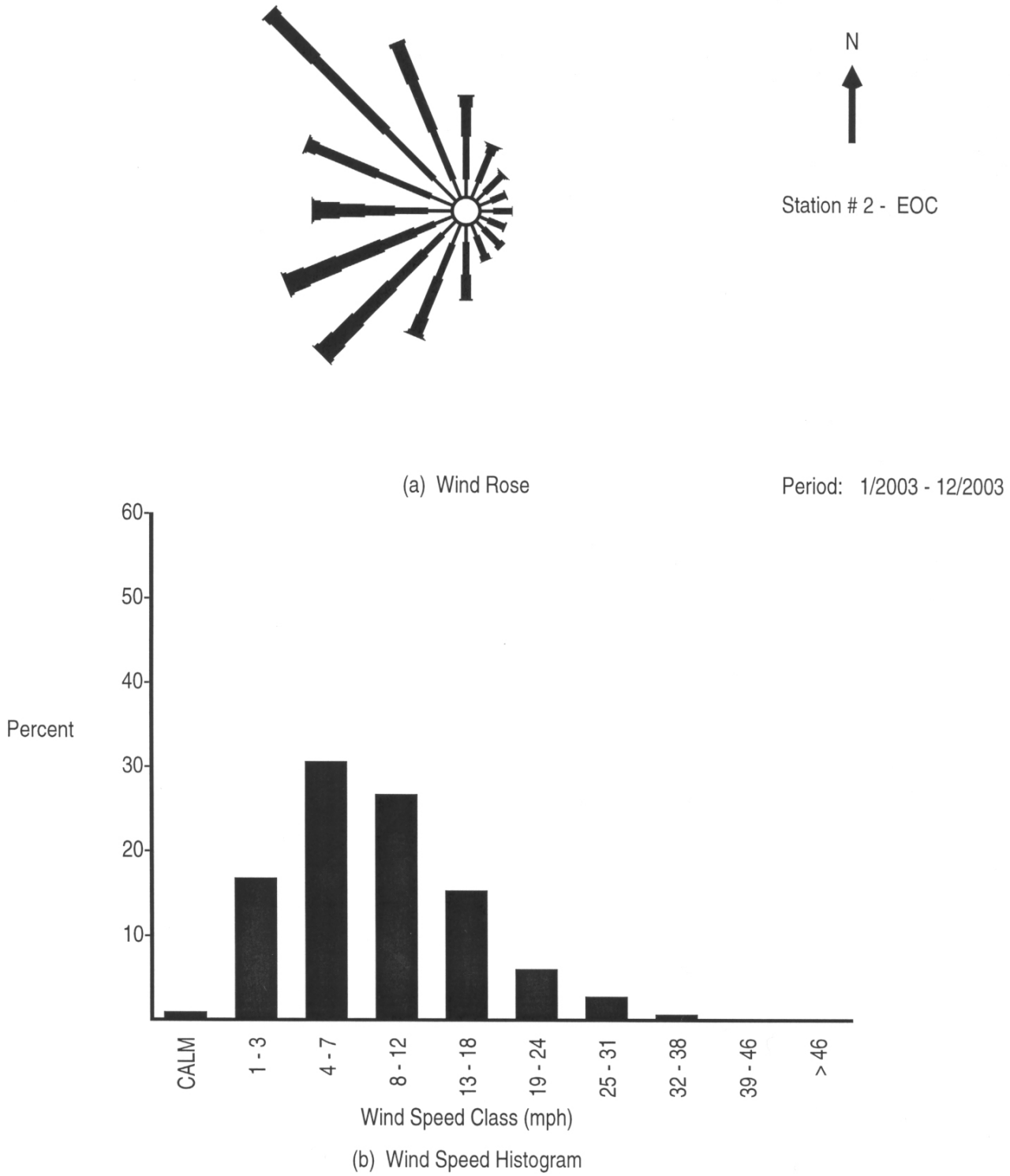
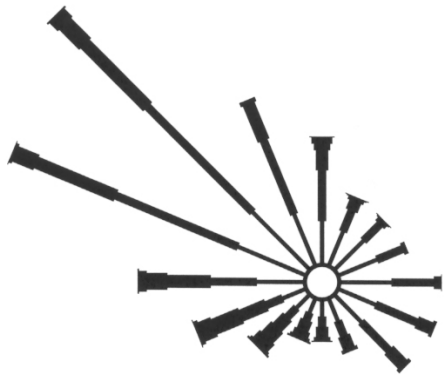


Figure B.1. (contd)

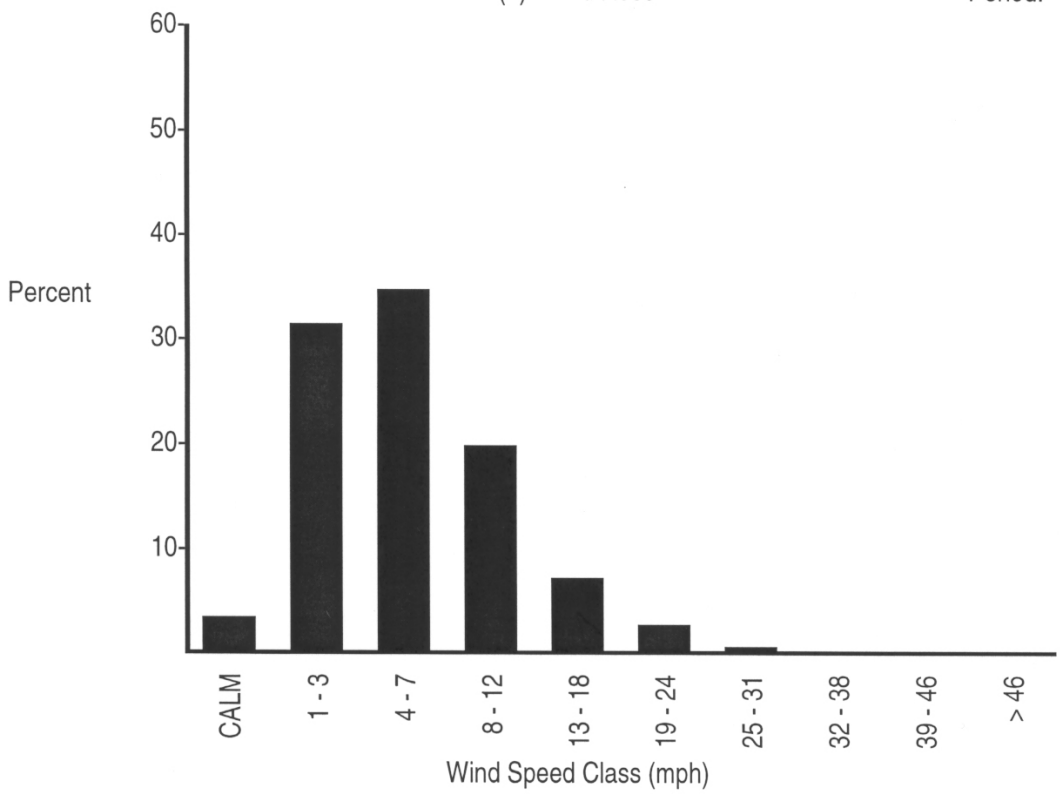


N

Station # 3 - ARMY

(a) Wind Rose

Period: 1/2003 - 12/2003



(b) Wind Speed Histogram

Figure B.1. (contd)

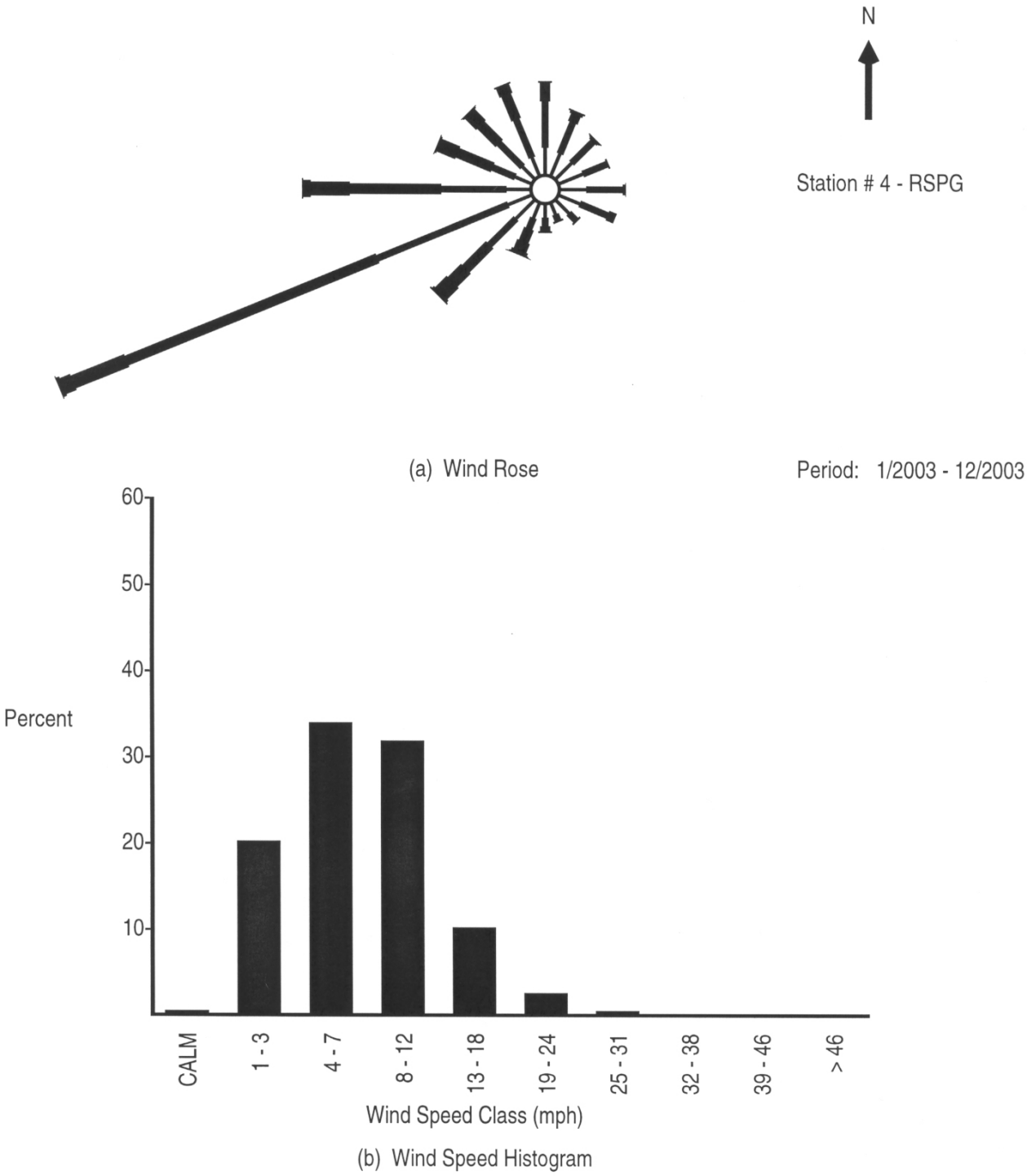
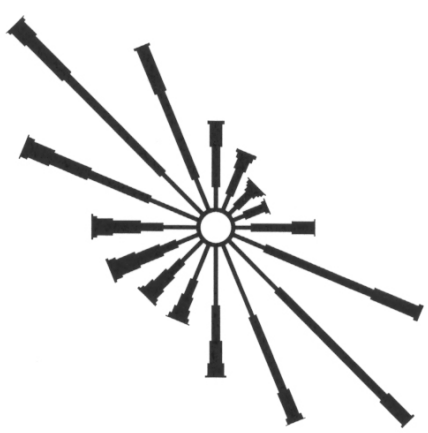
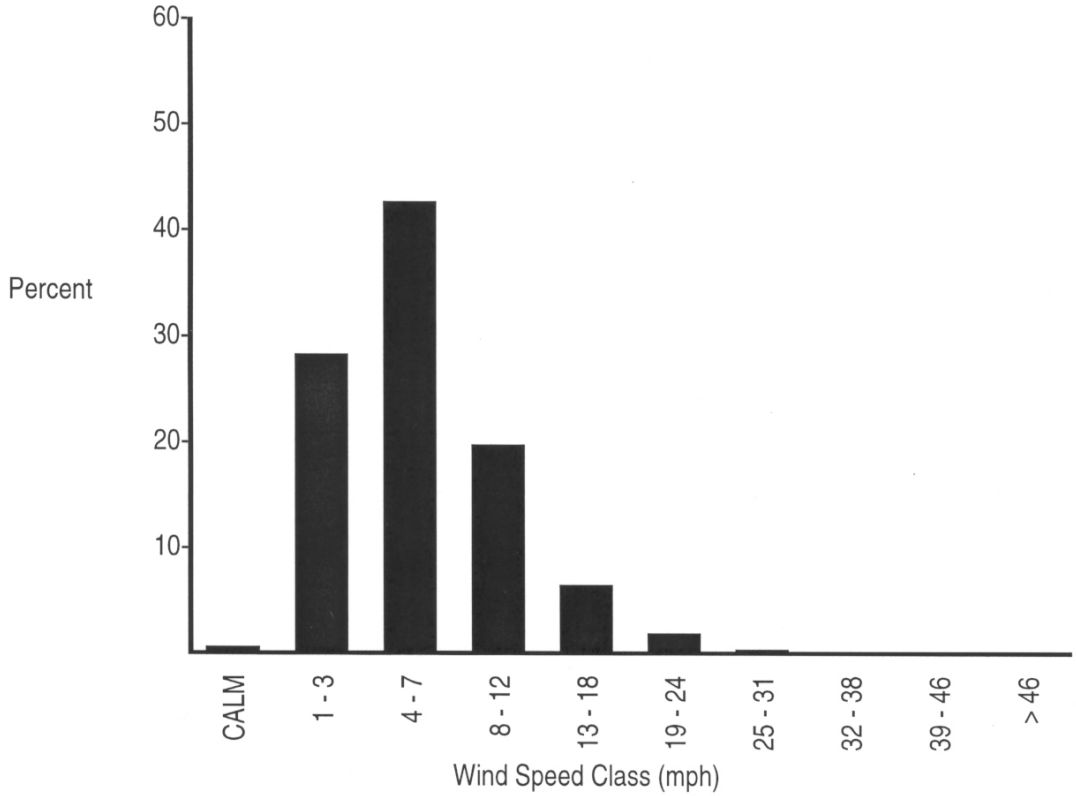


Figure B.1. (contd)



(a) Wind Rose

Period: 1/2003 - 12/2003



(b) Wind Speed Histogram

Figure B.1. (contd)

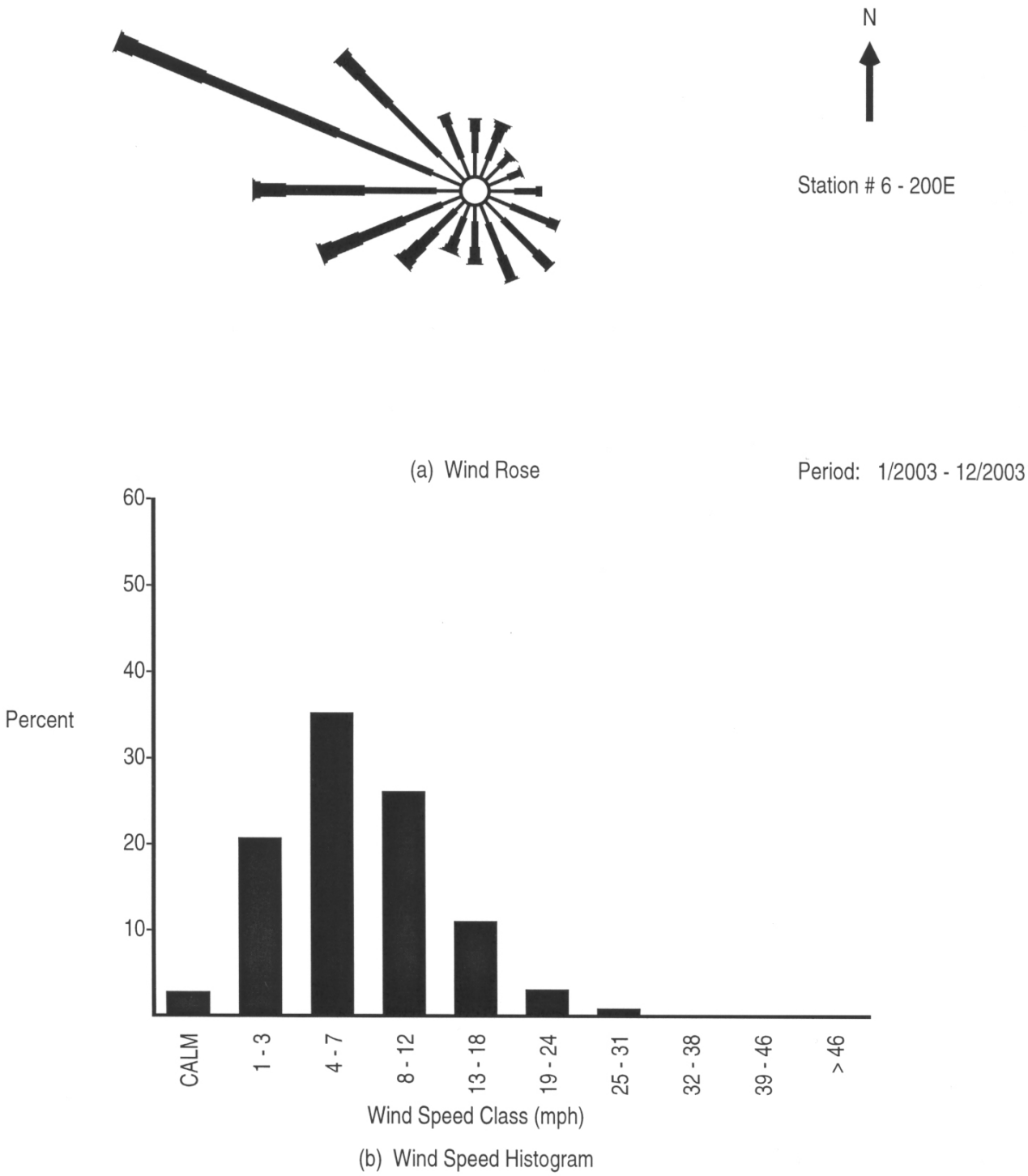
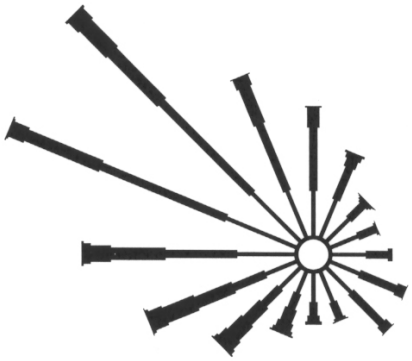


Figure B.1. (contd)

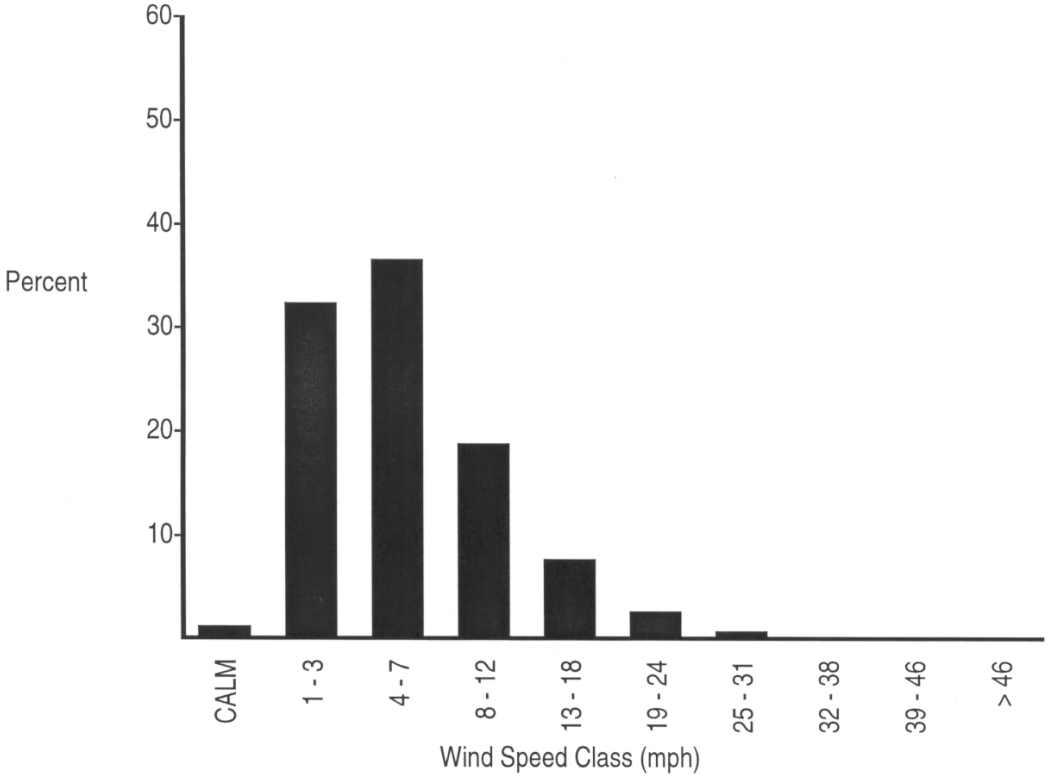


N

Station # 7 - 200W

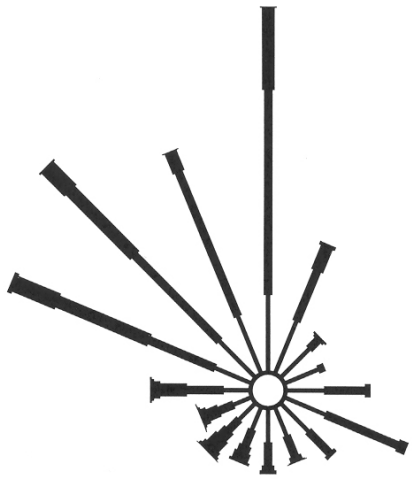
(a) Wind Rose

Period: 1/2003 - 12/2003



(b) Wind Speed Histogram

Figure B.1. (contd)

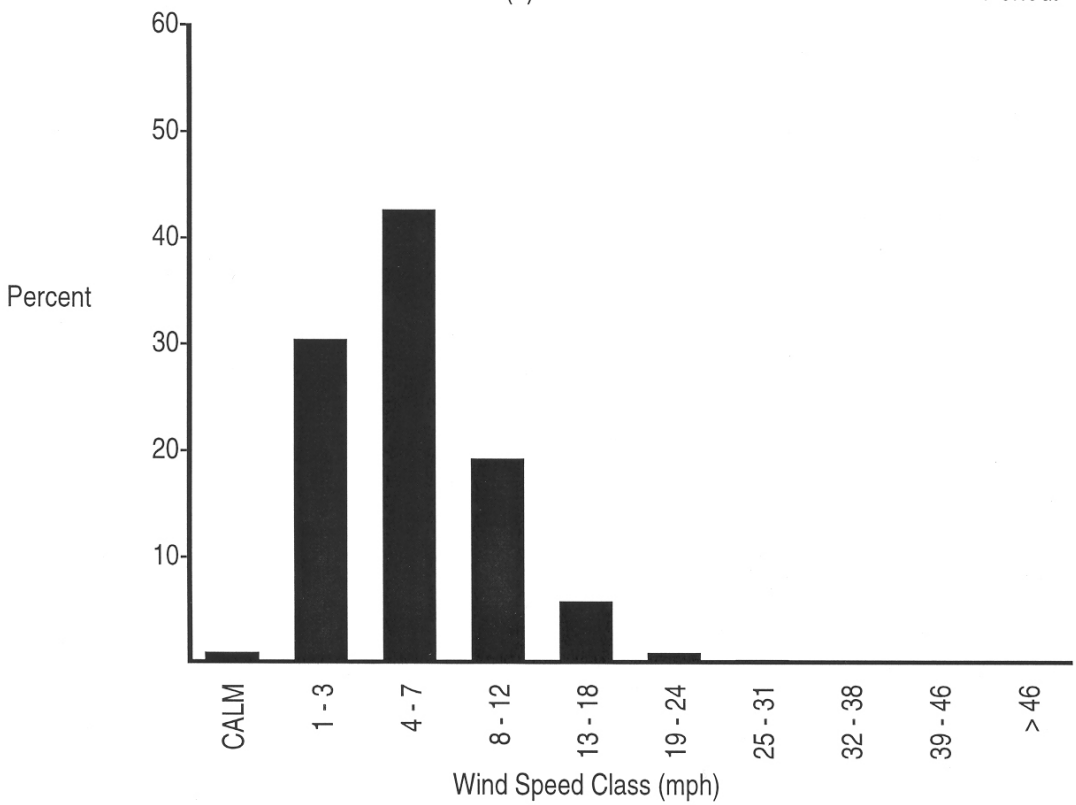


N

Station # 8 - BVLY

(a) Wind Rose

Period: 1/2003 - 12/2003



(b) Wind Speed Histogram

Figure B.1. (contd)

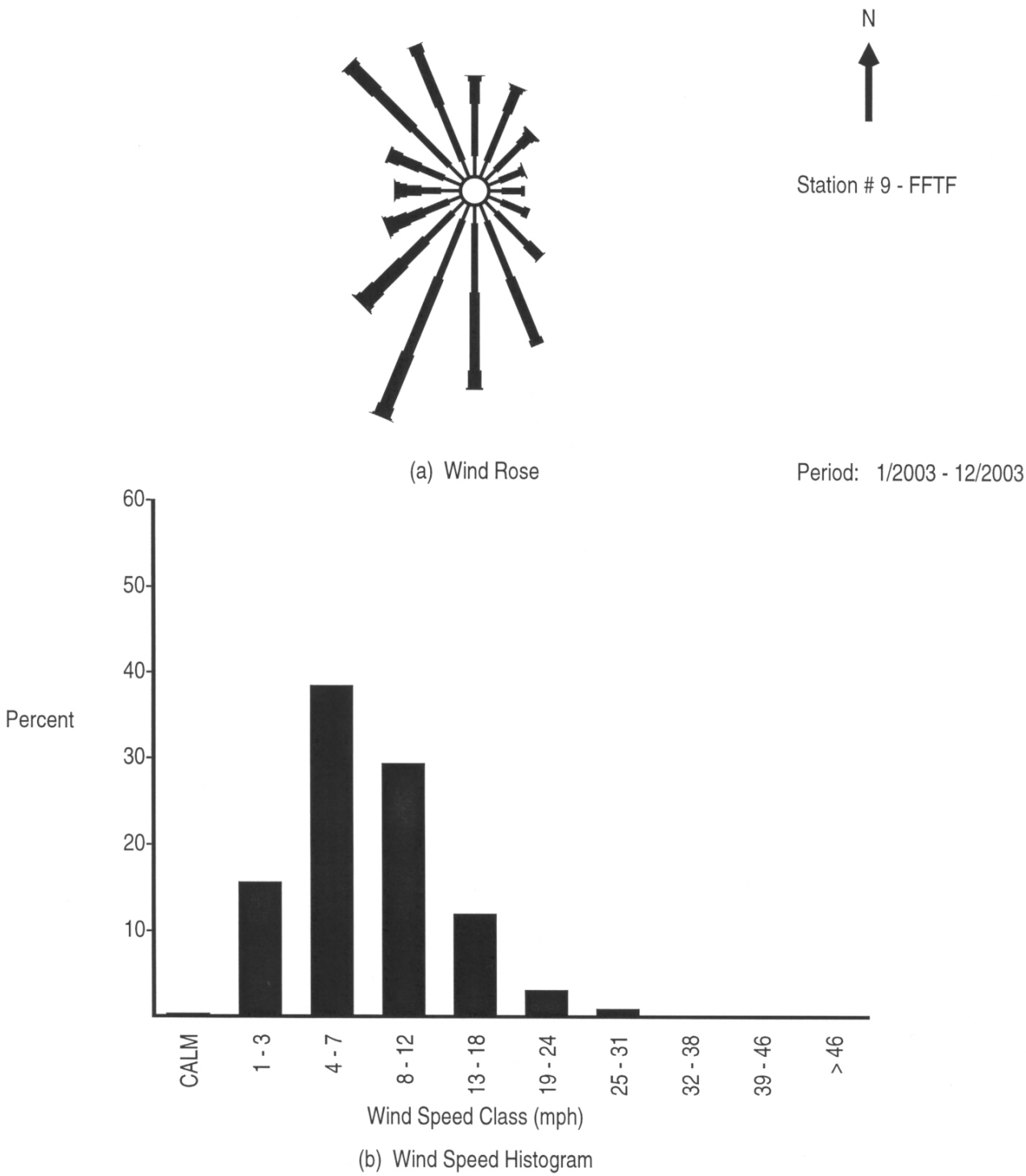
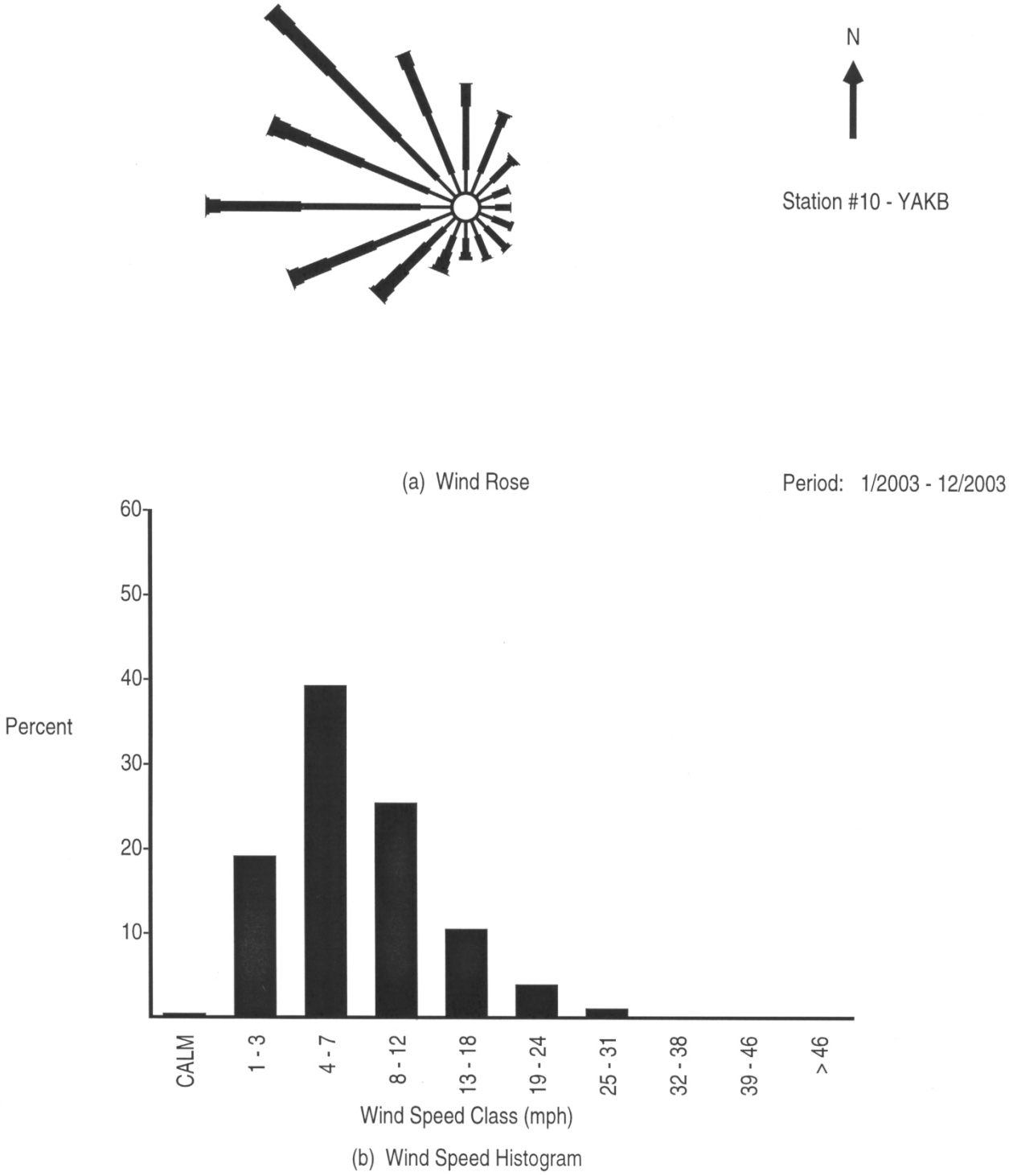


Figure B.1. (contd)



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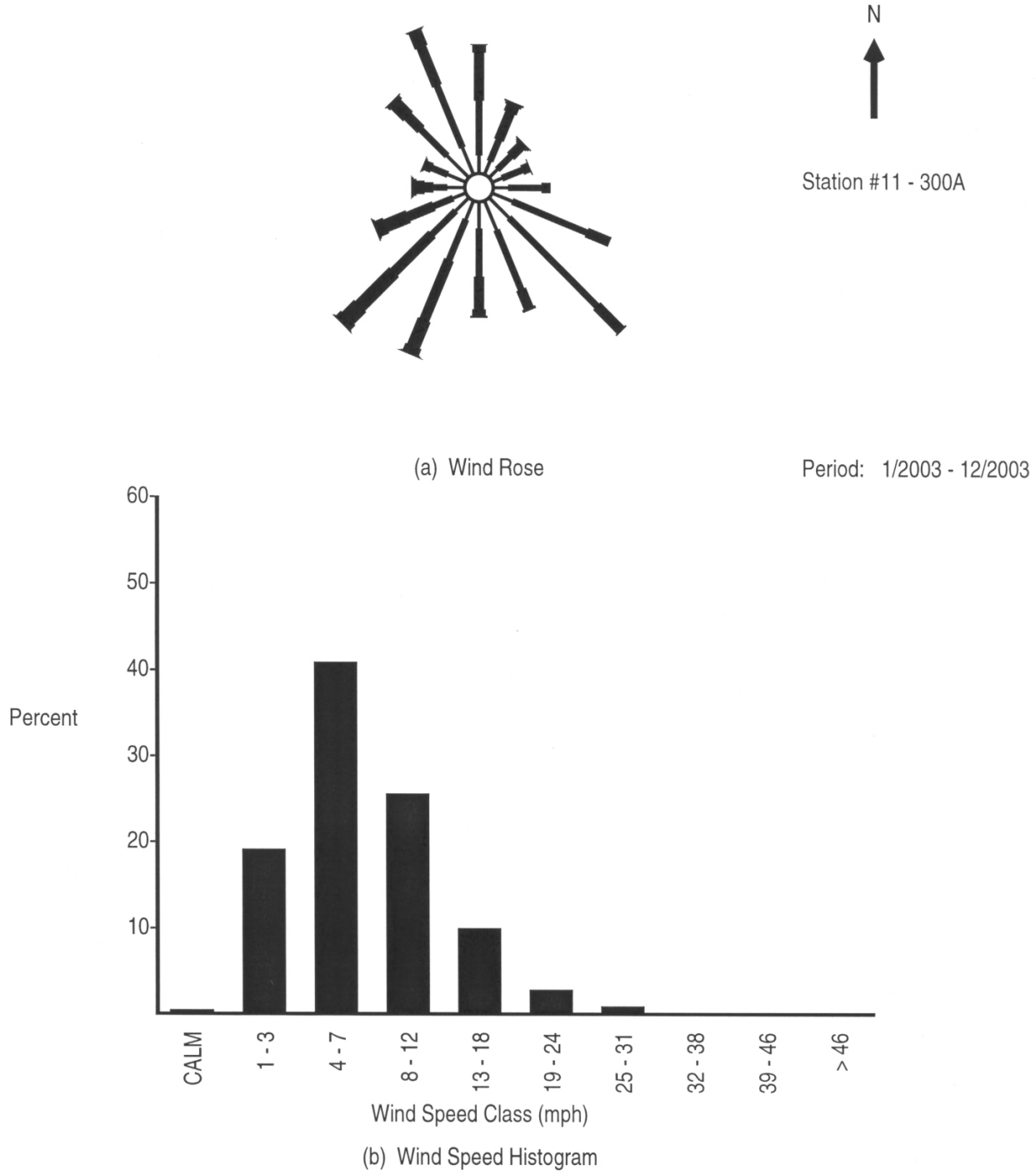
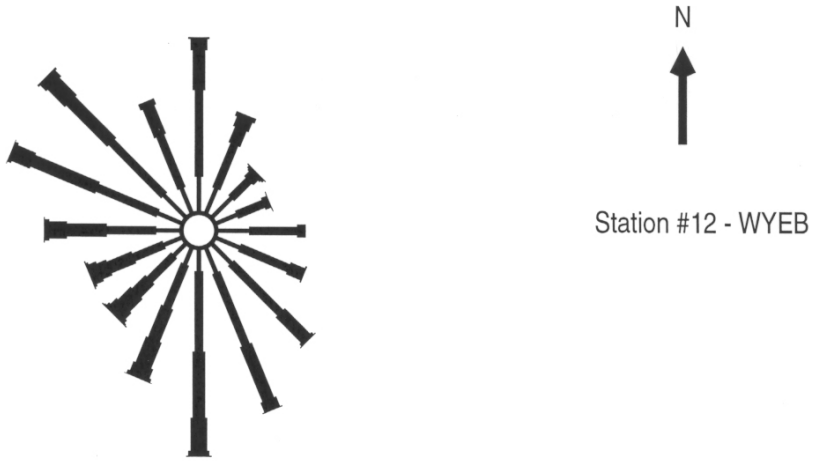
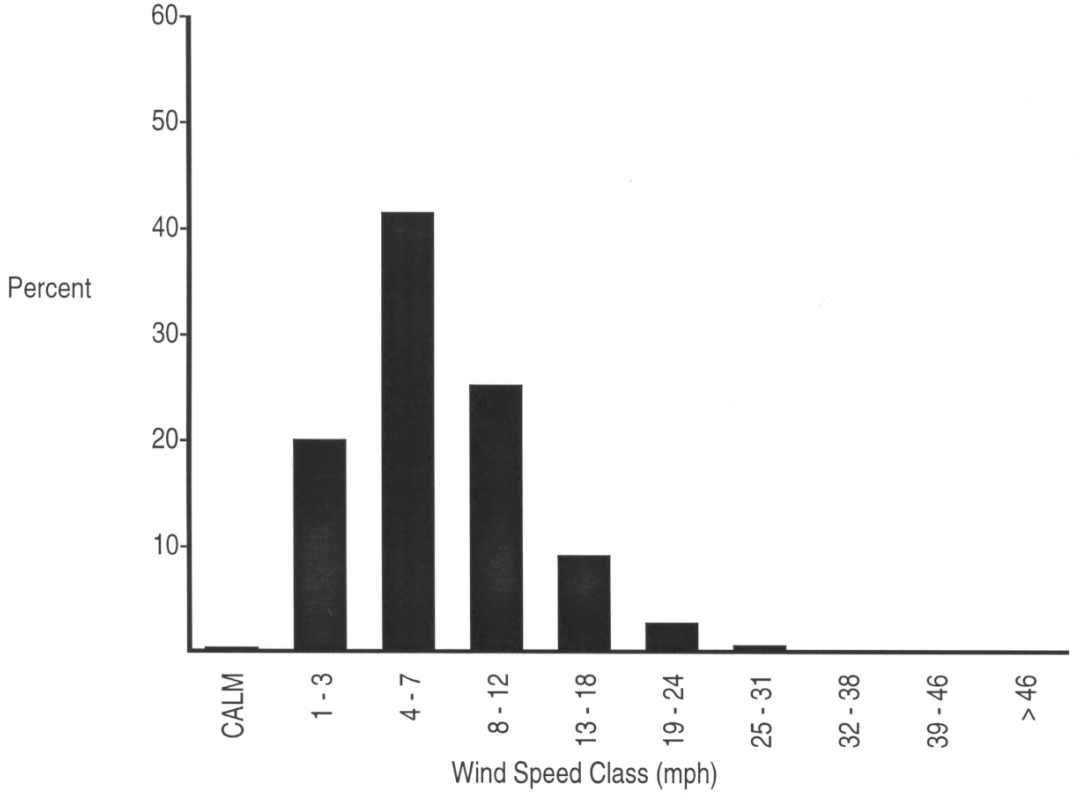


Figure B.1. (contd)



(a) Wind Rose

Period: 1/2003 - 12/2003



(b) Wind Speed Histogram

Figure B.1. (contd)

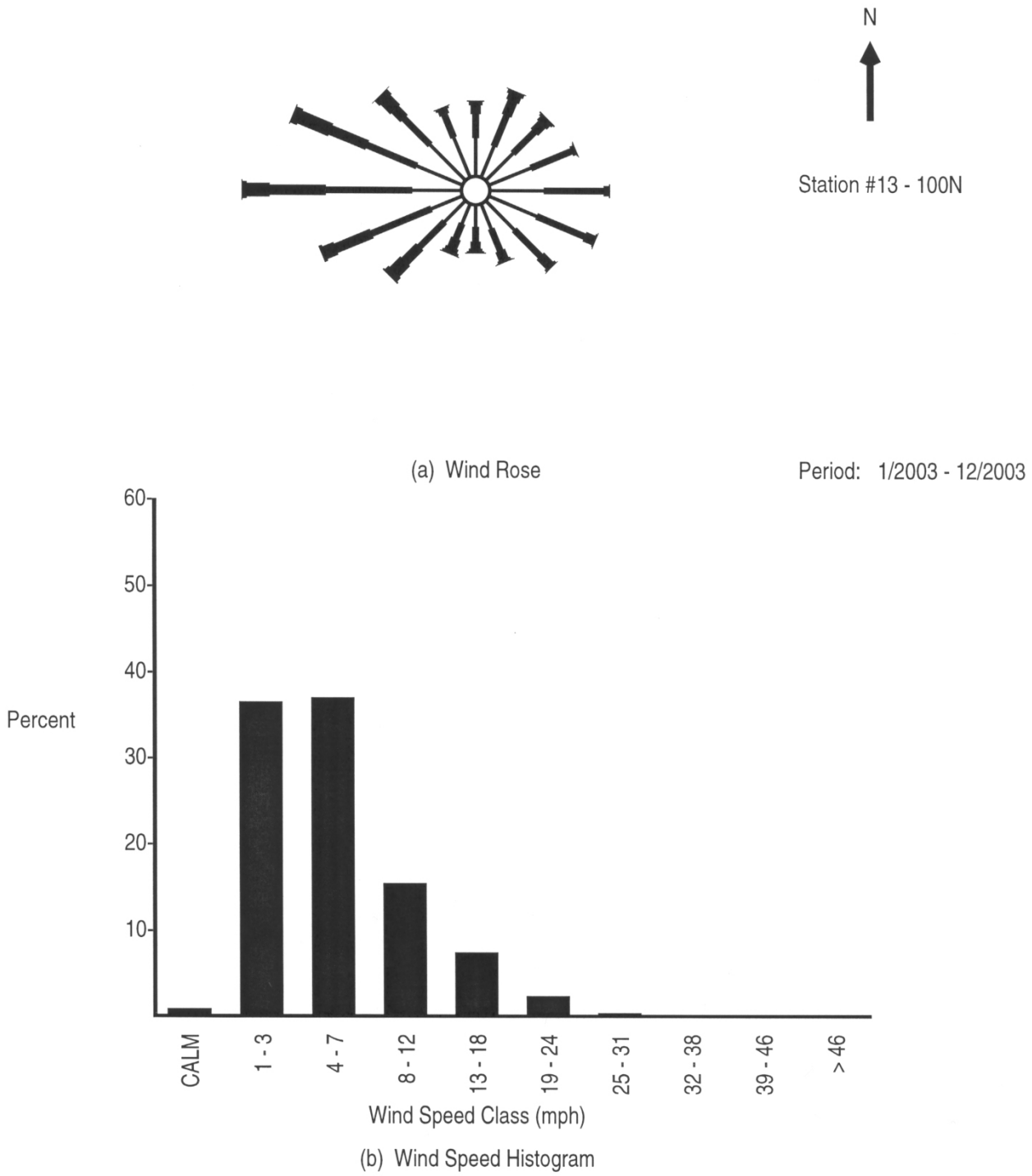
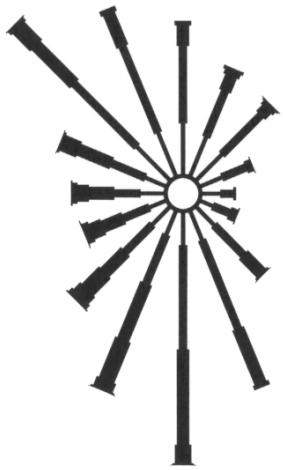


Figure B.1. (contd)

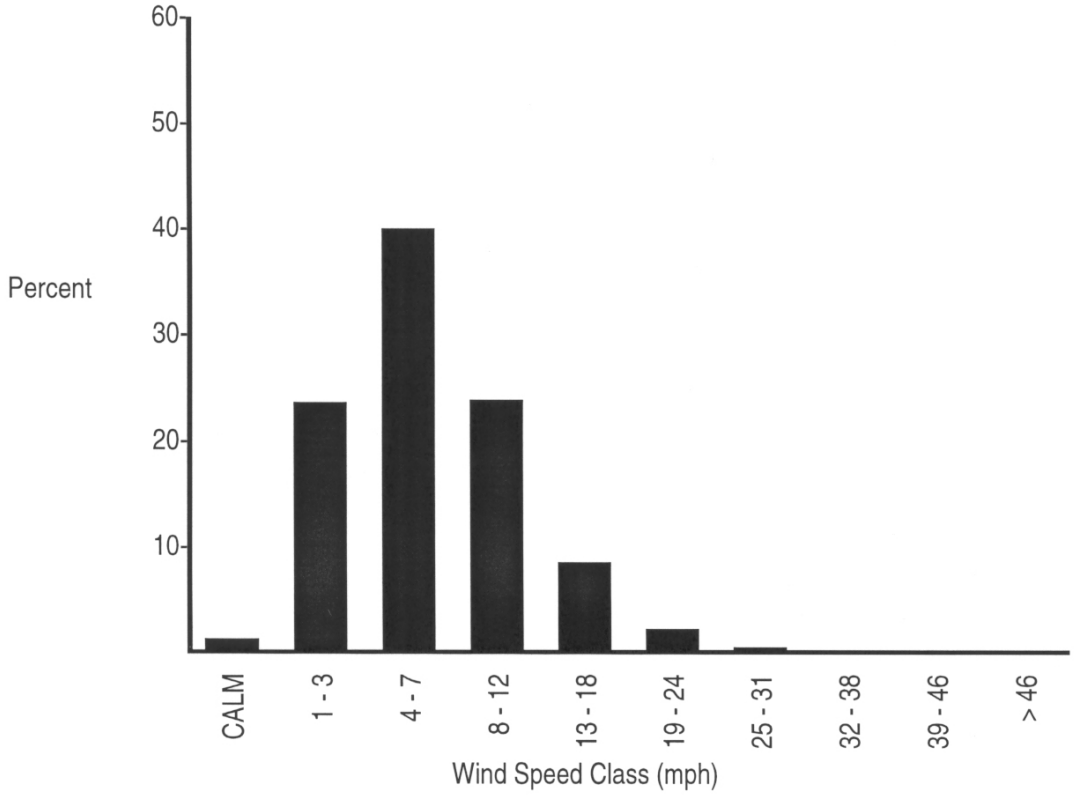


N

Station #14 - WPPS

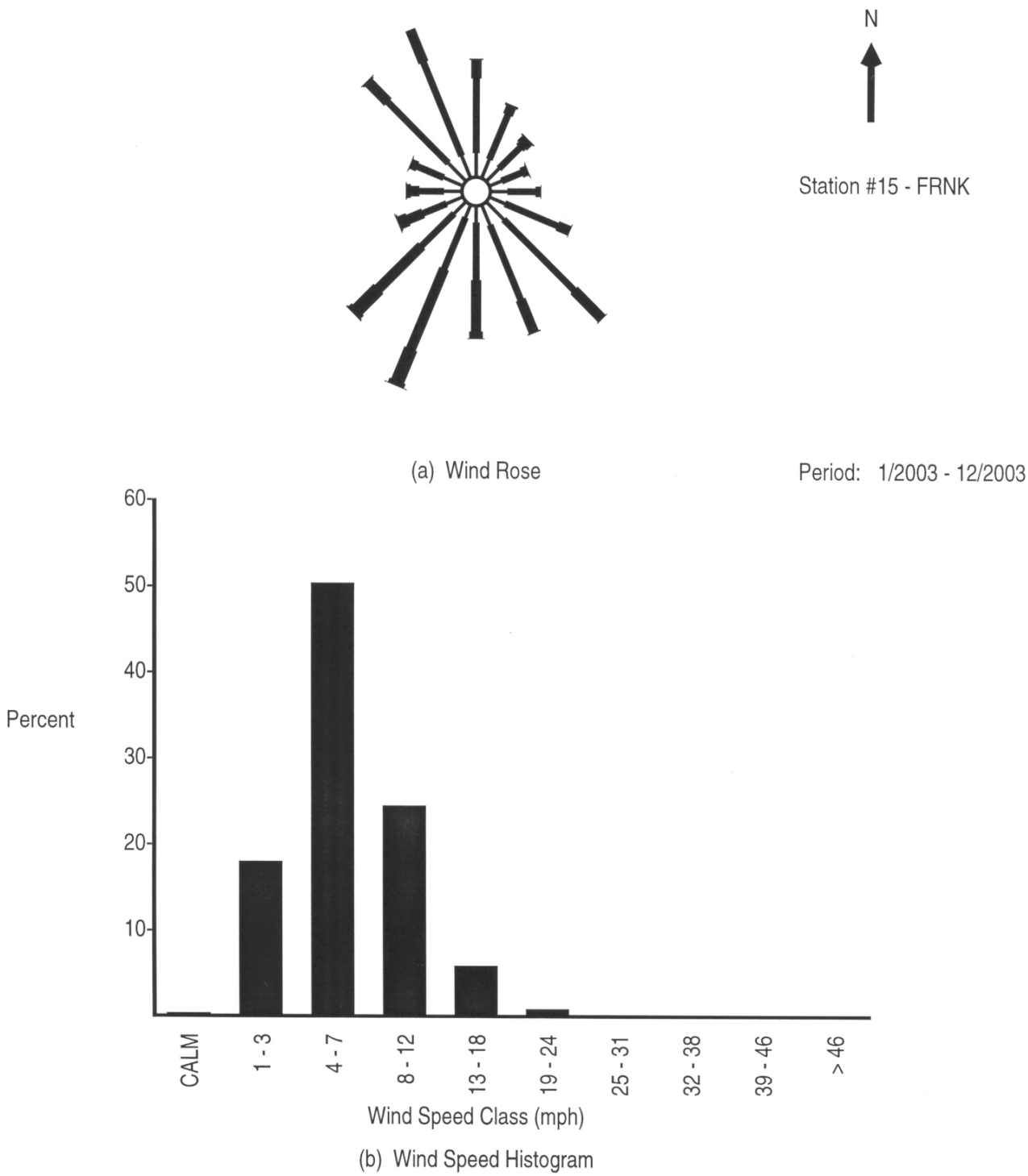
(a) Wind Rose

Period: 1/2003 - 12/2003



(b) Wind Speed Histogram

Figure B.1. (contd)



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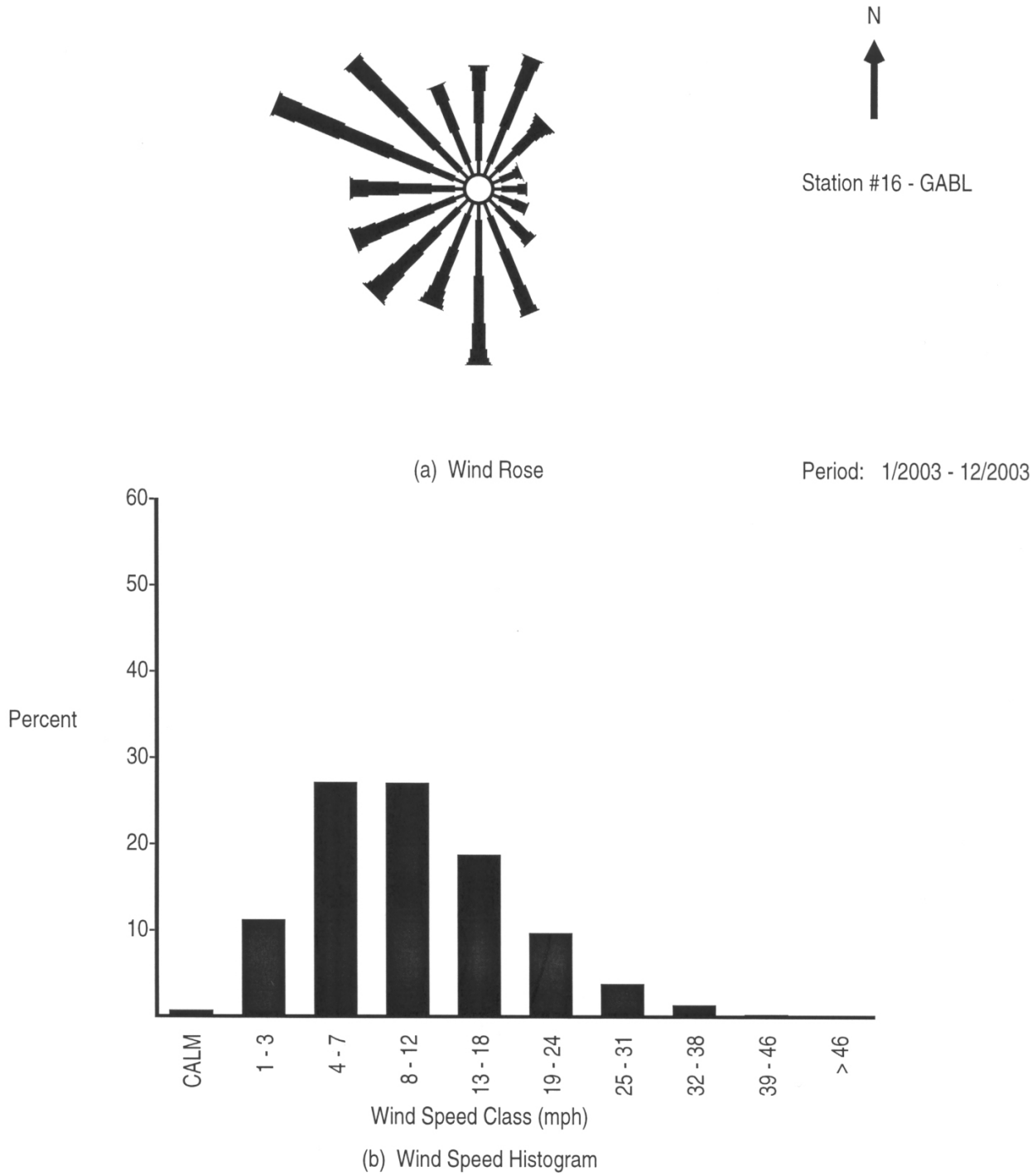

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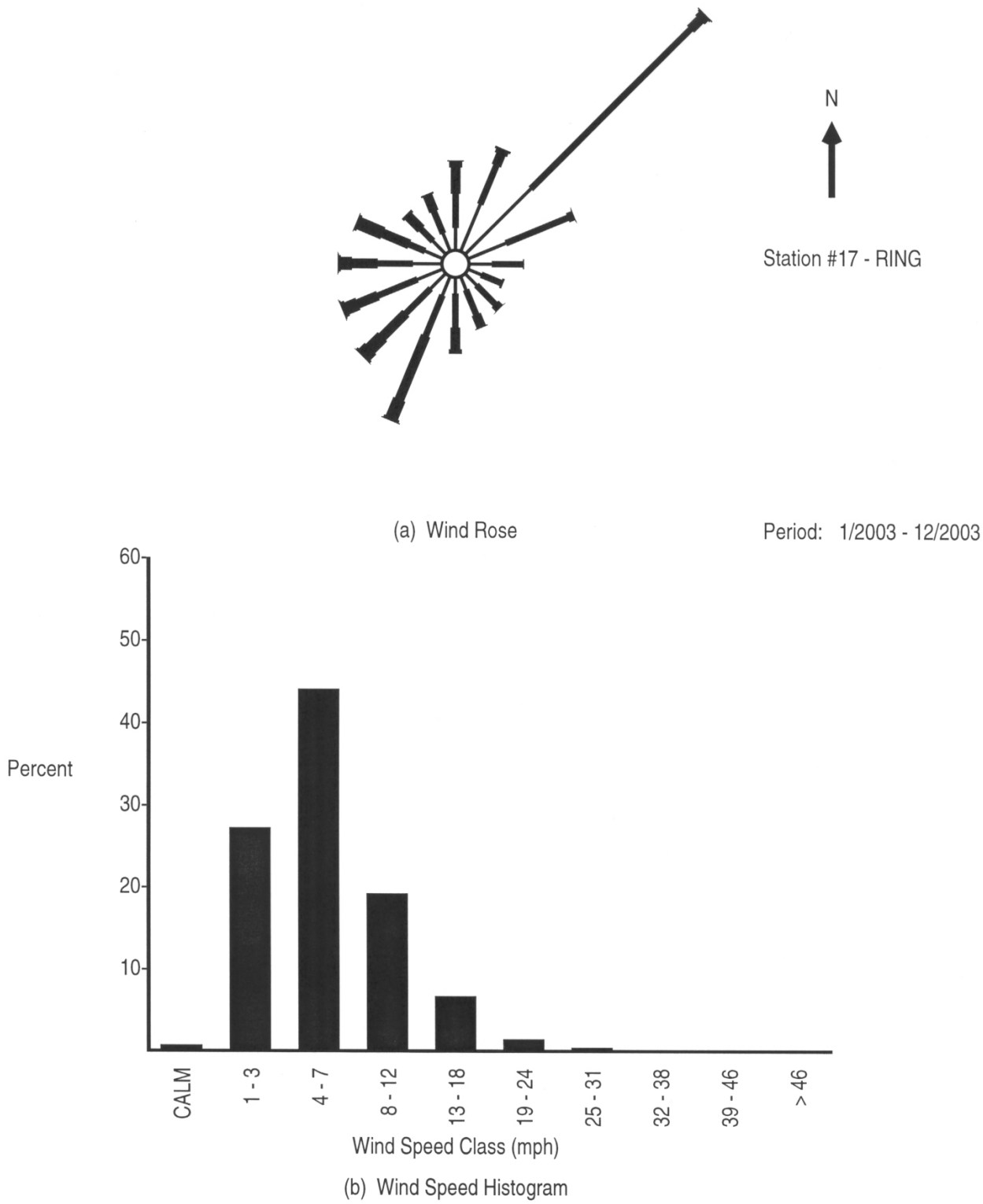

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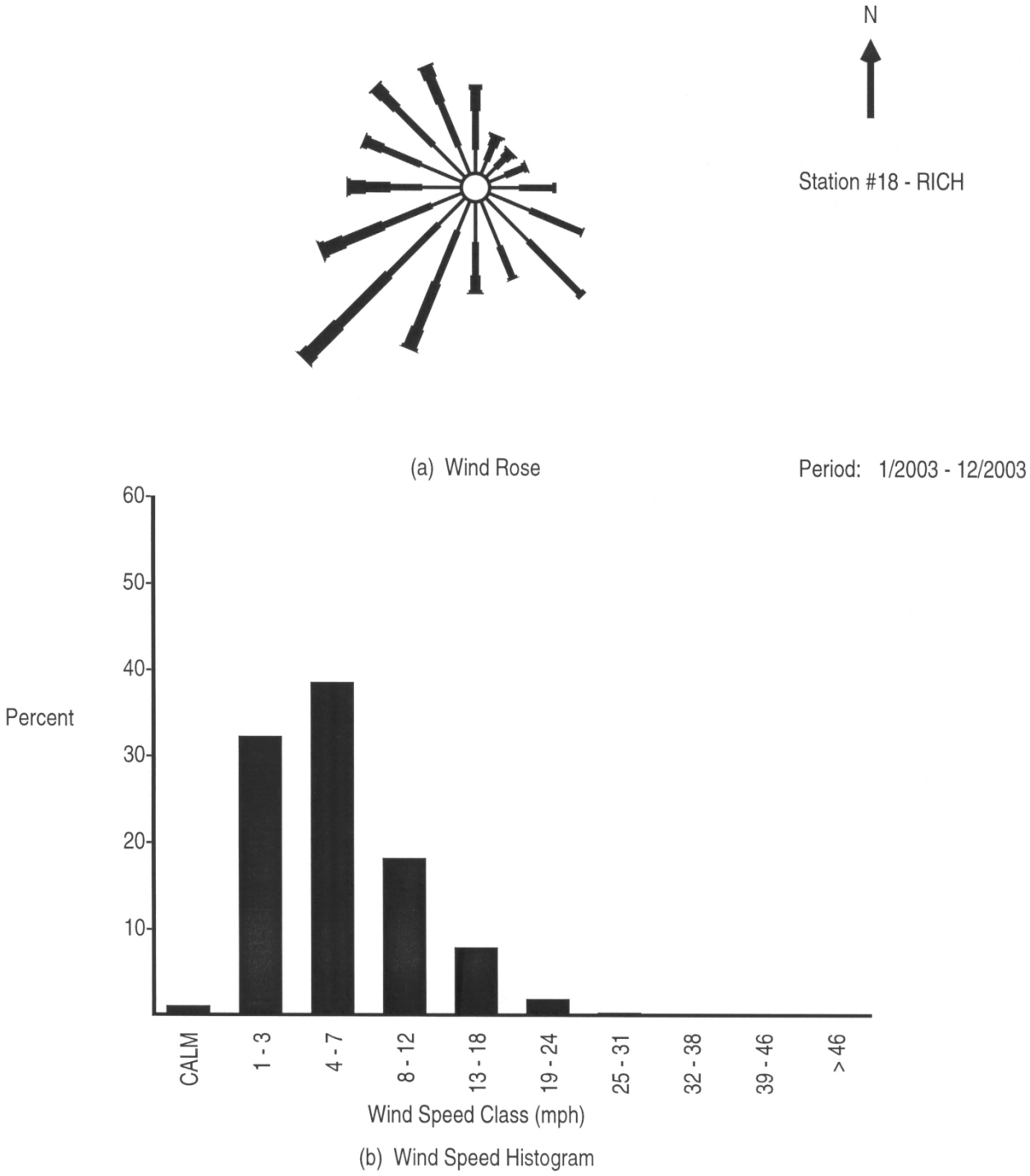

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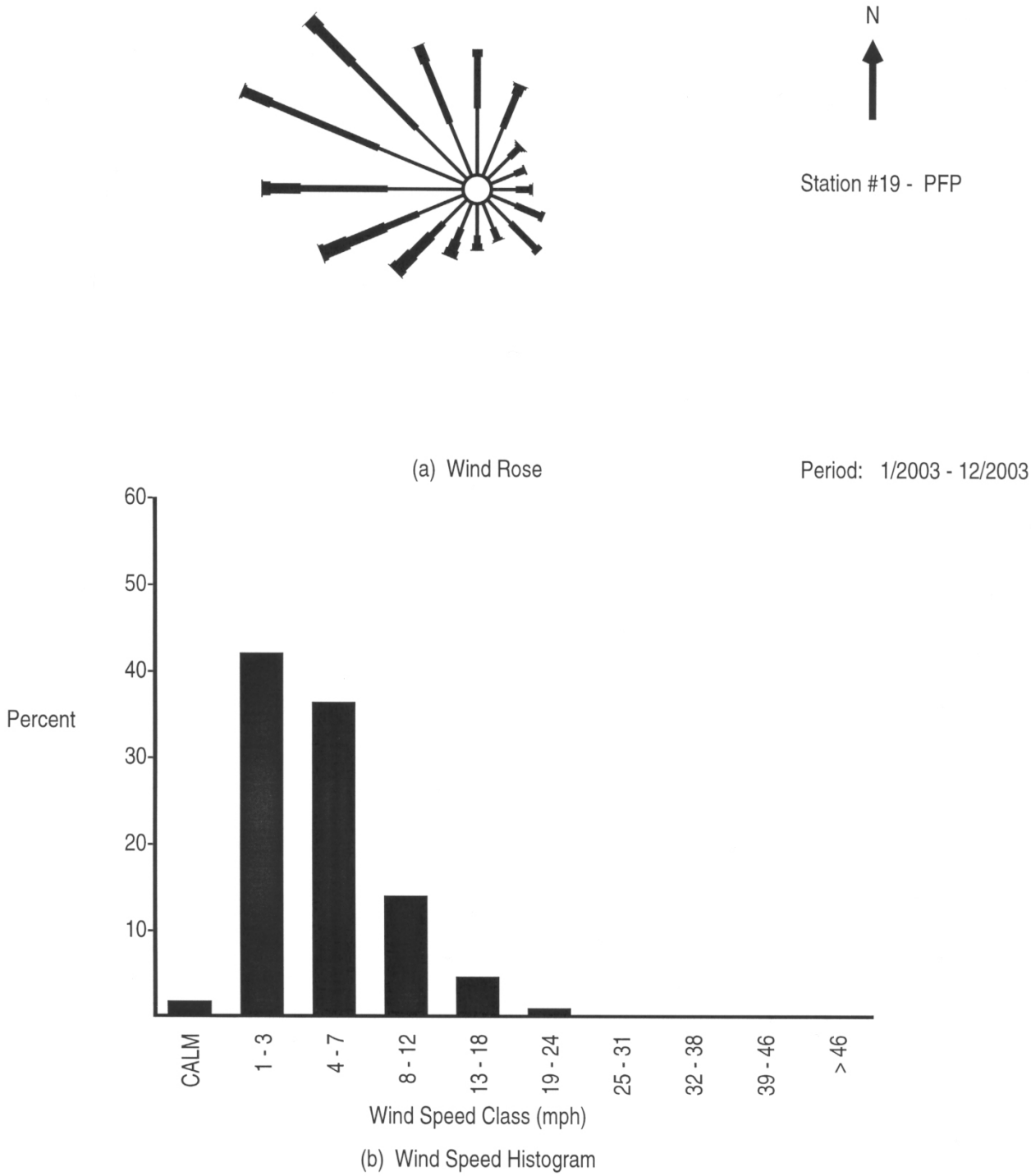

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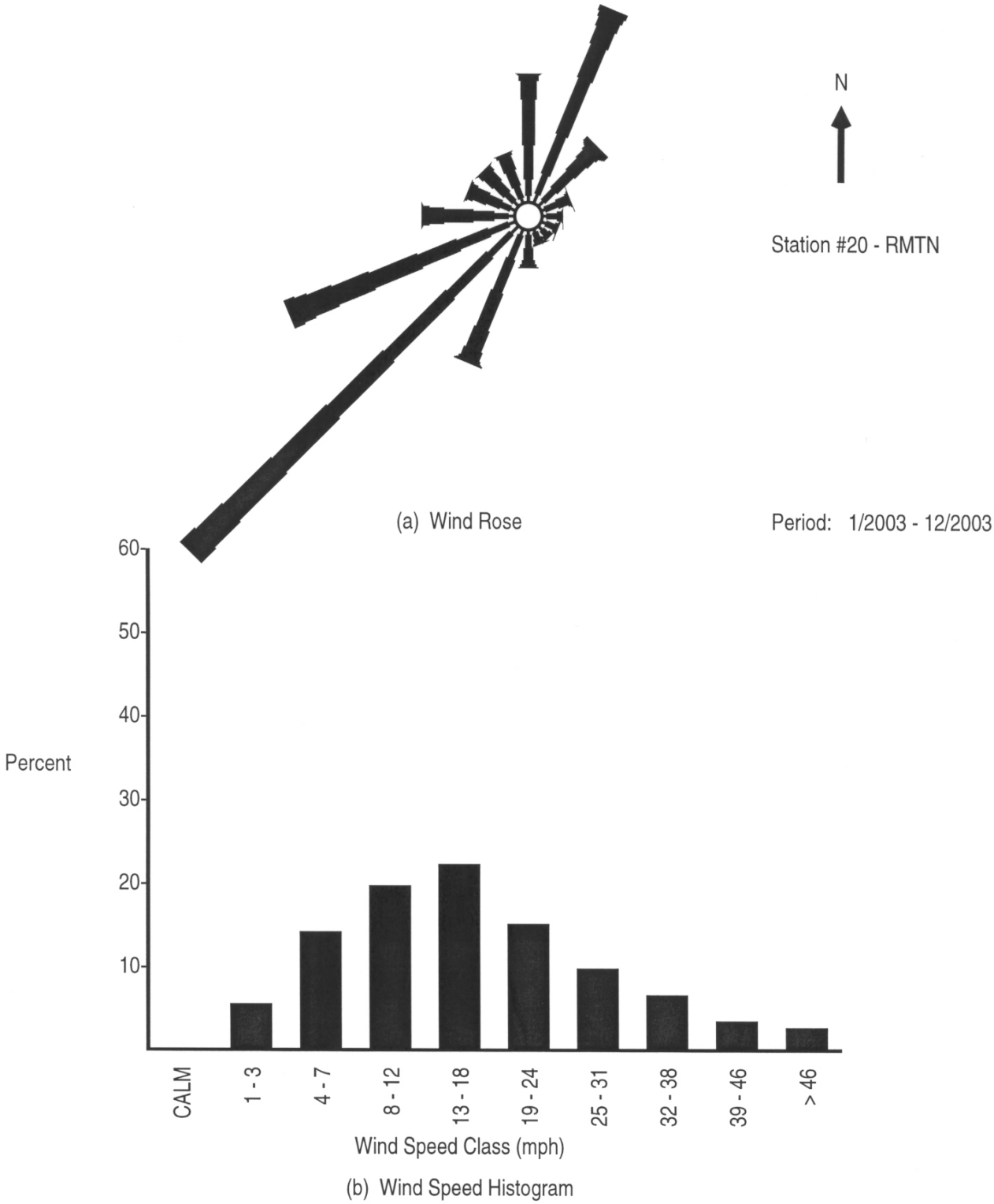
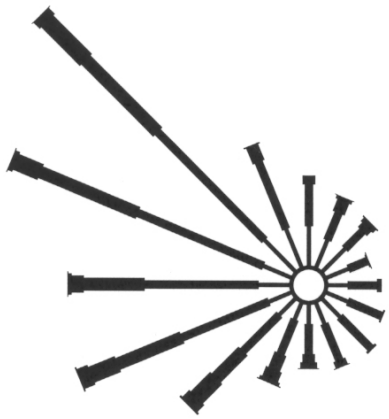


Figure B.1. (contd)

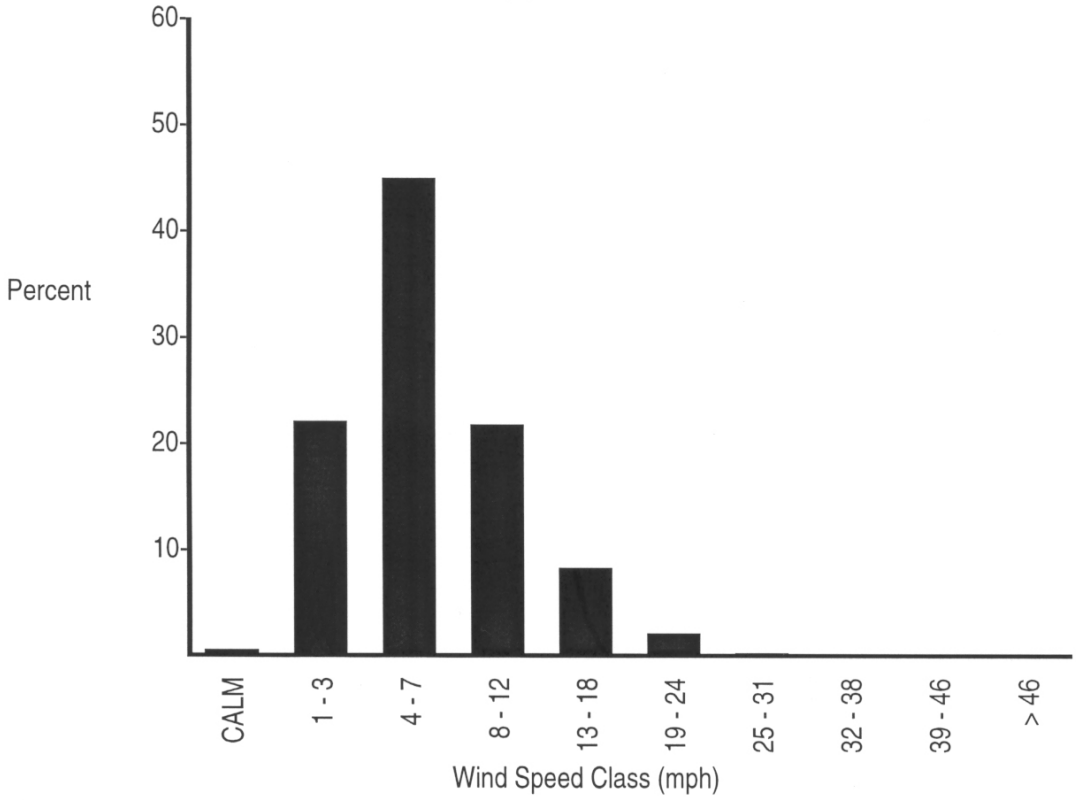


N

Station #21 - HMS

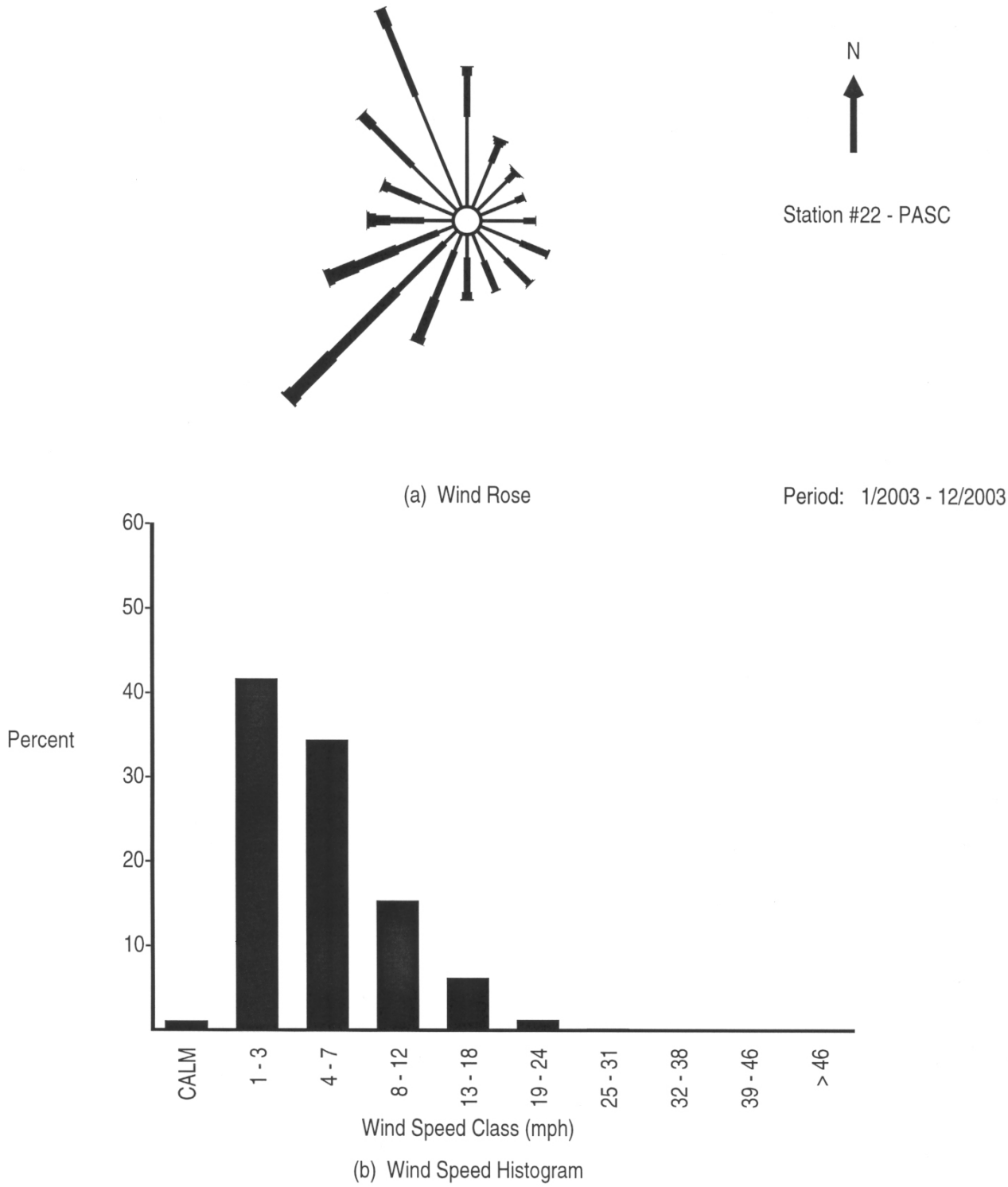
(a) Wind Rose

Period: 1/2003 - 12/2003



(b) Wind Speed Histogram

Figure B.1. (contd)



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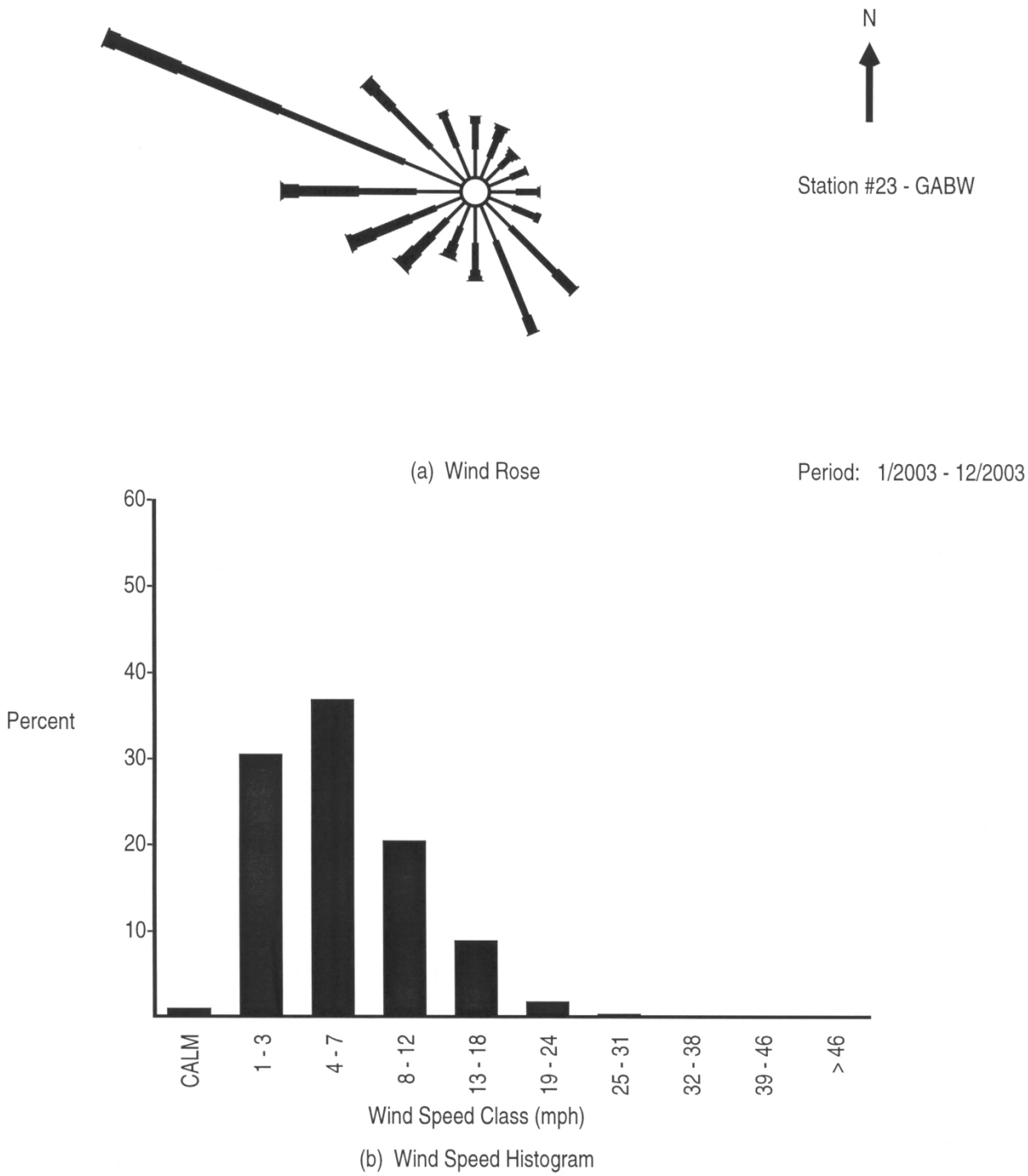


Figure B.1. (contd)

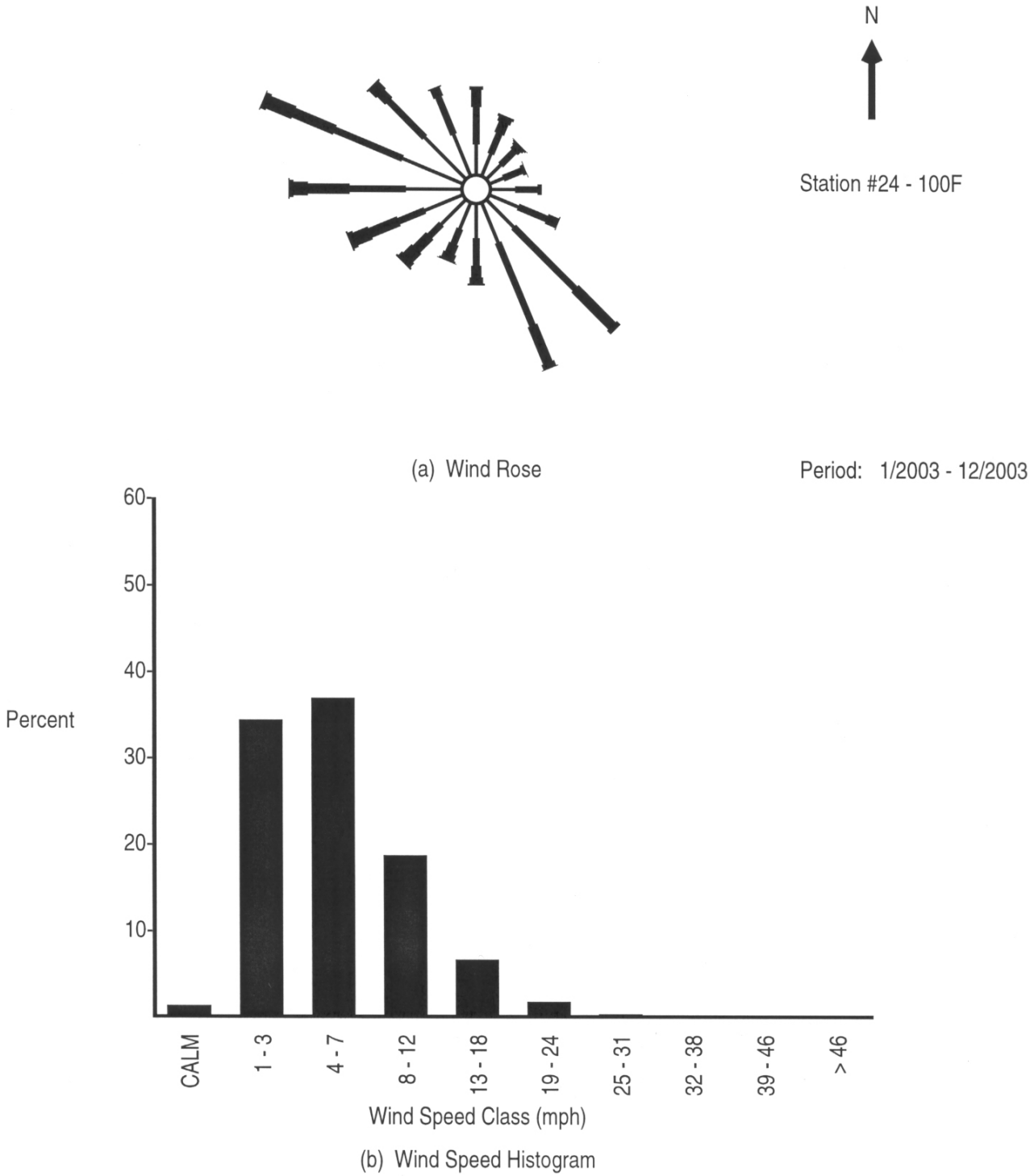
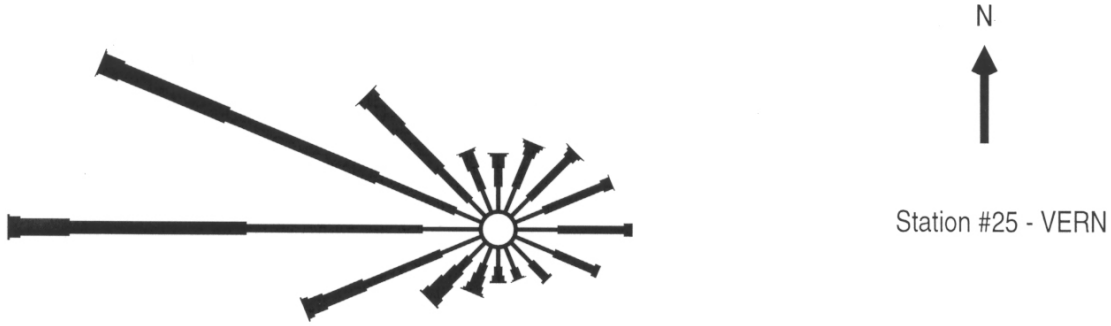
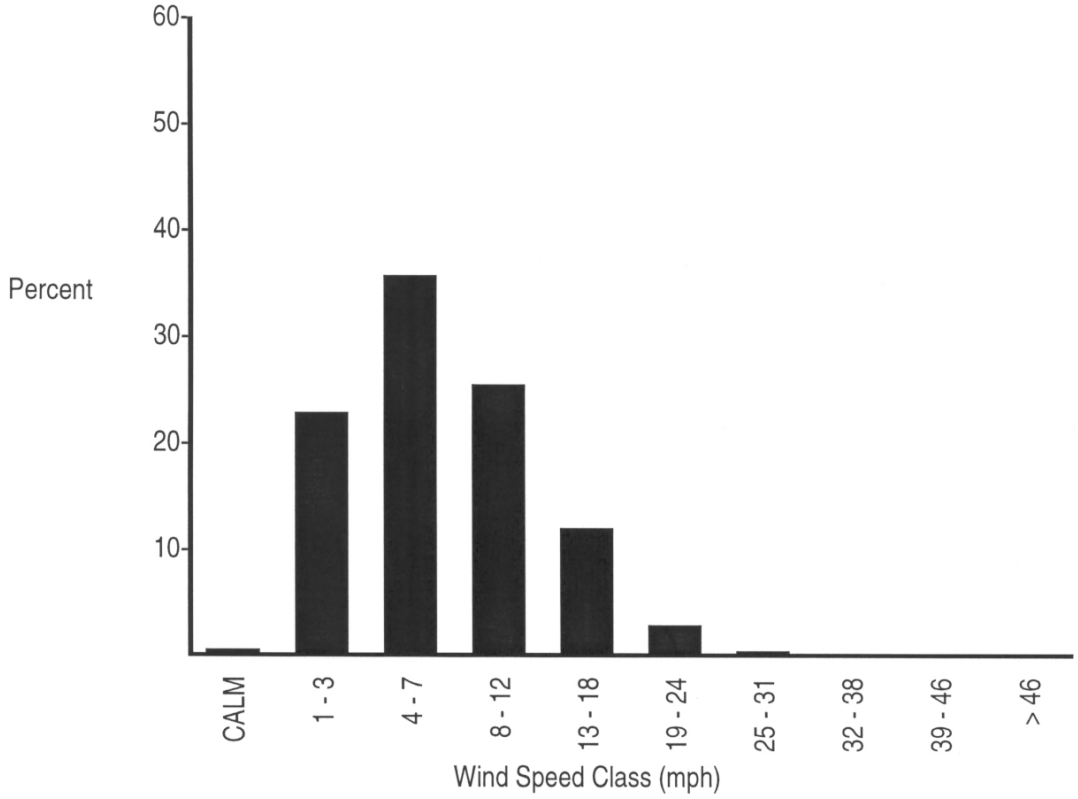


Figure B.1. (contd)



(a) Wind Rose

Period: 1/2003 - 12/2003



(b) Wind Speed Histogram

Figure B.1. (contd)

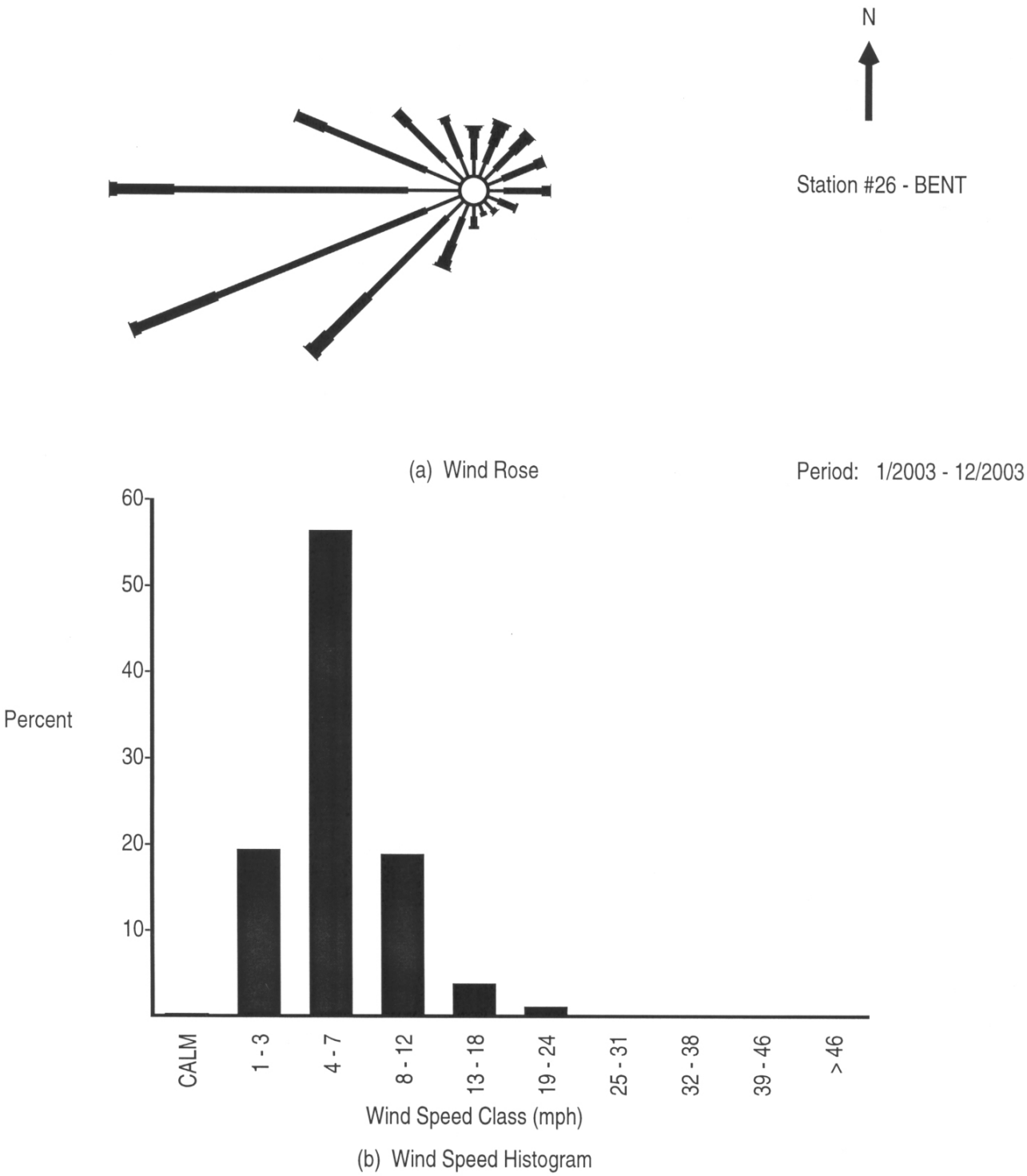


Figure B.1. (contd)

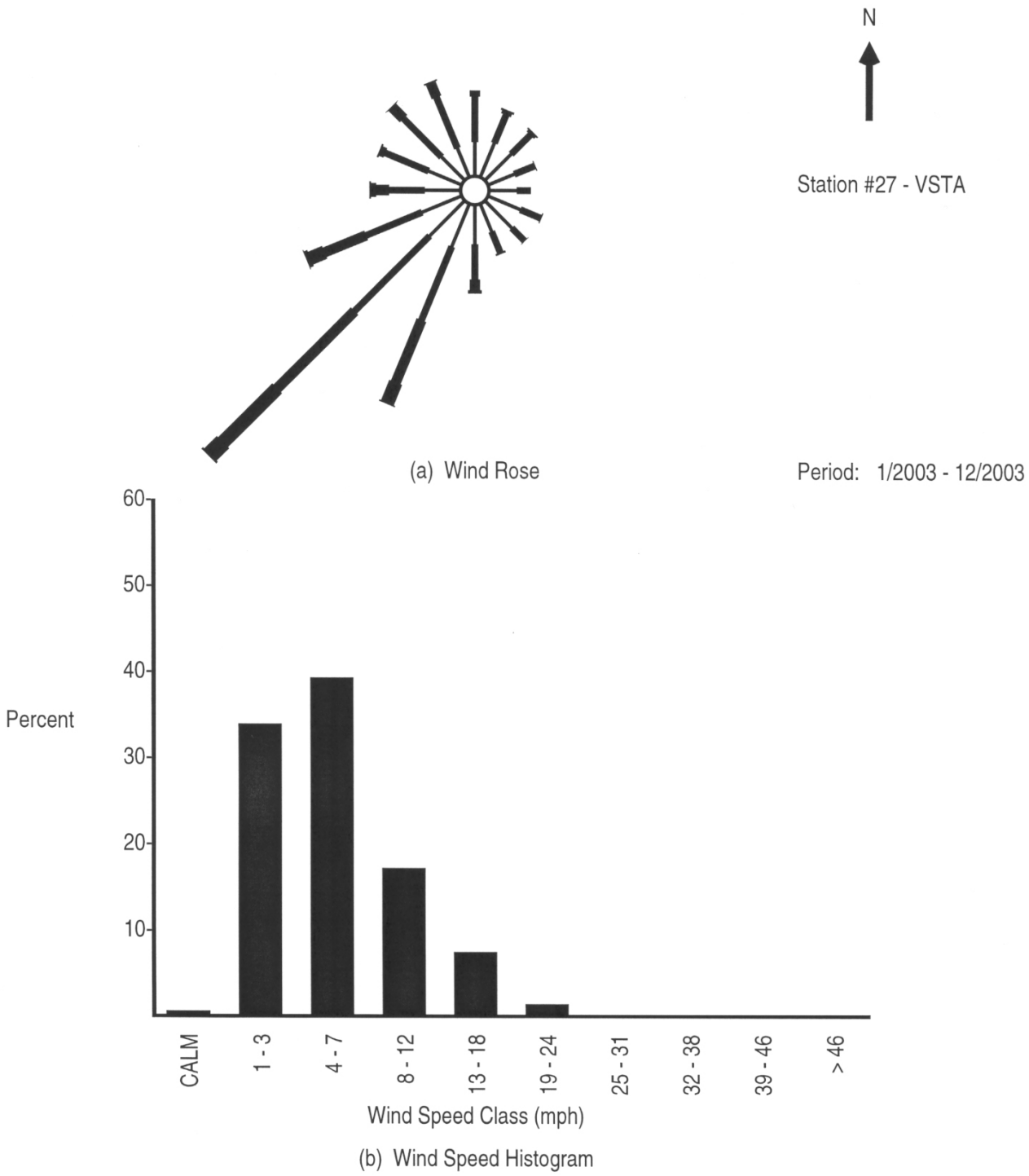
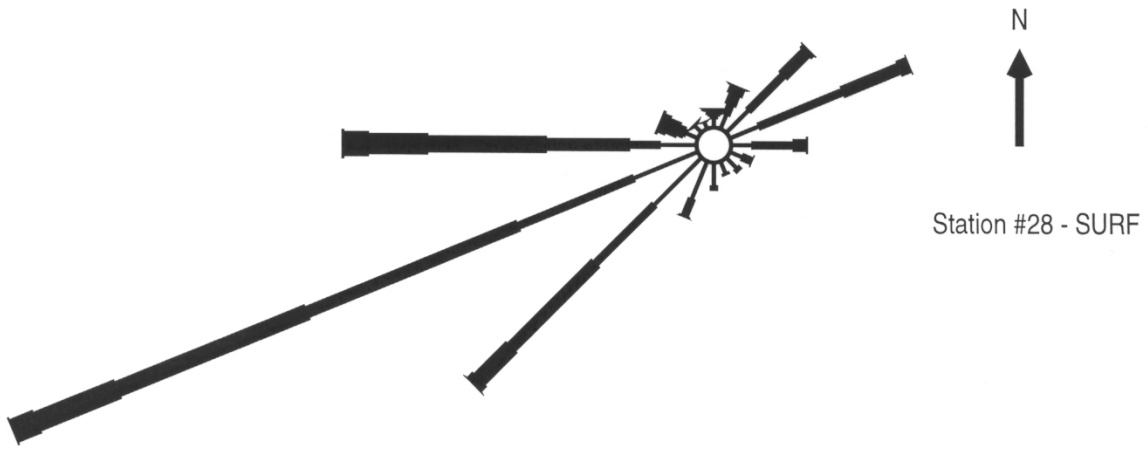
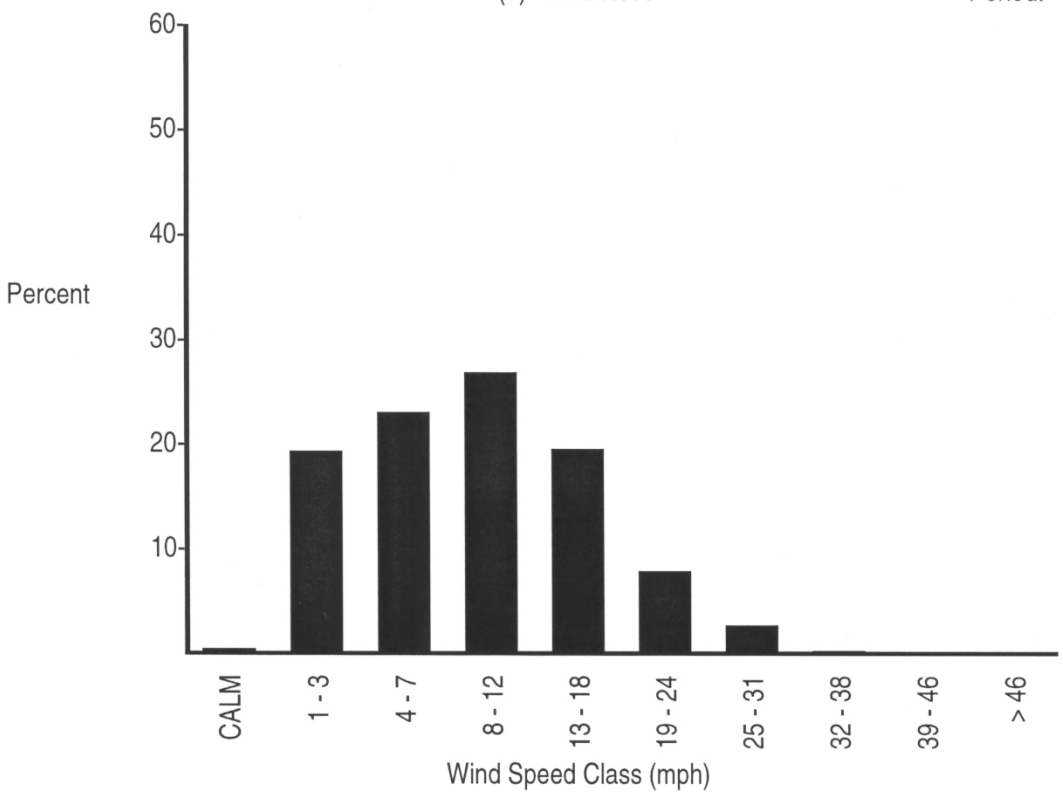


Figure B.1. (contd)



(a) Wind Rose

Period: 1/2003 - 12/2003



(b) Wind Speed Histogram

Figure B.1. (contd)

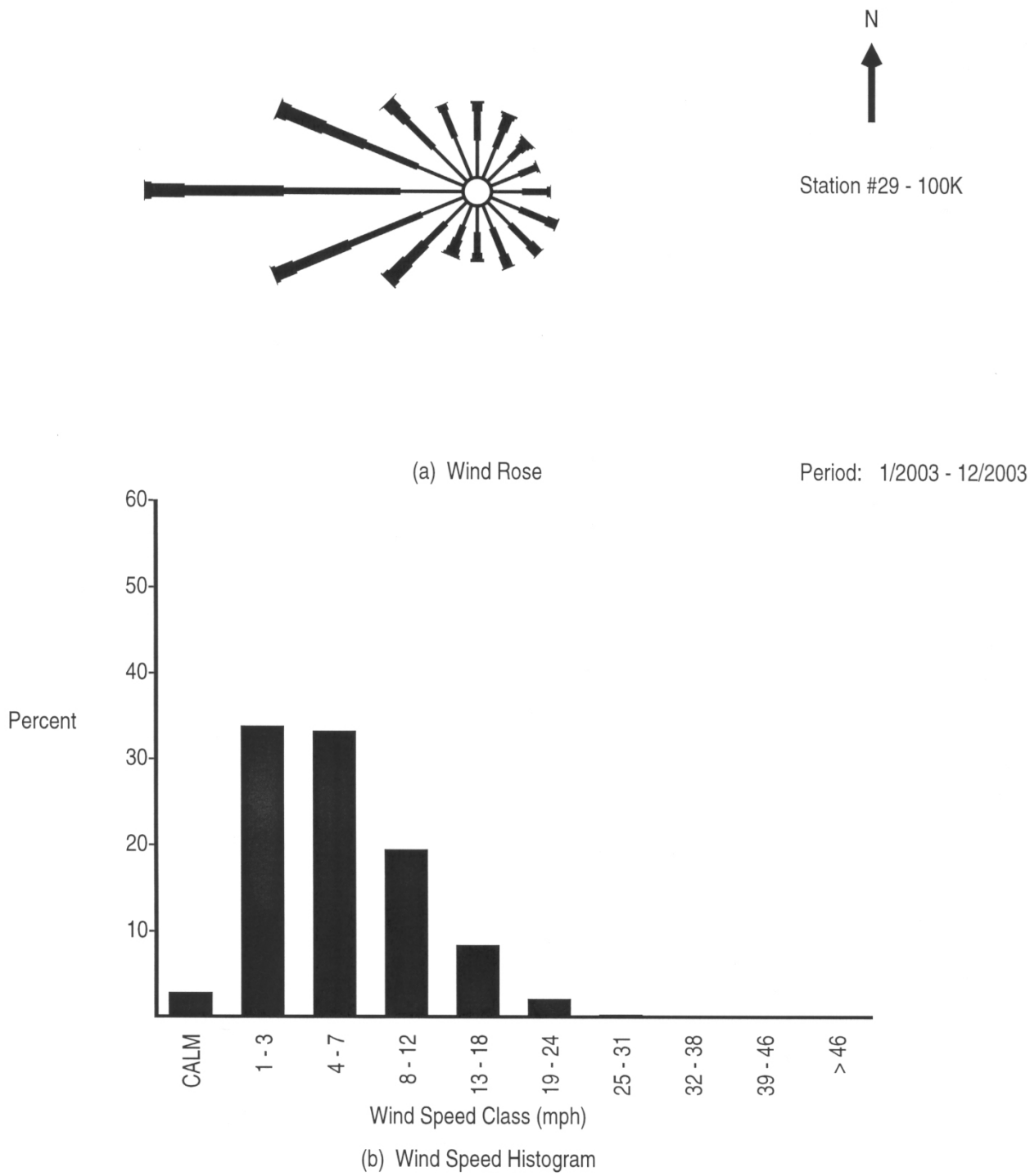


Figure B.1. (contd)

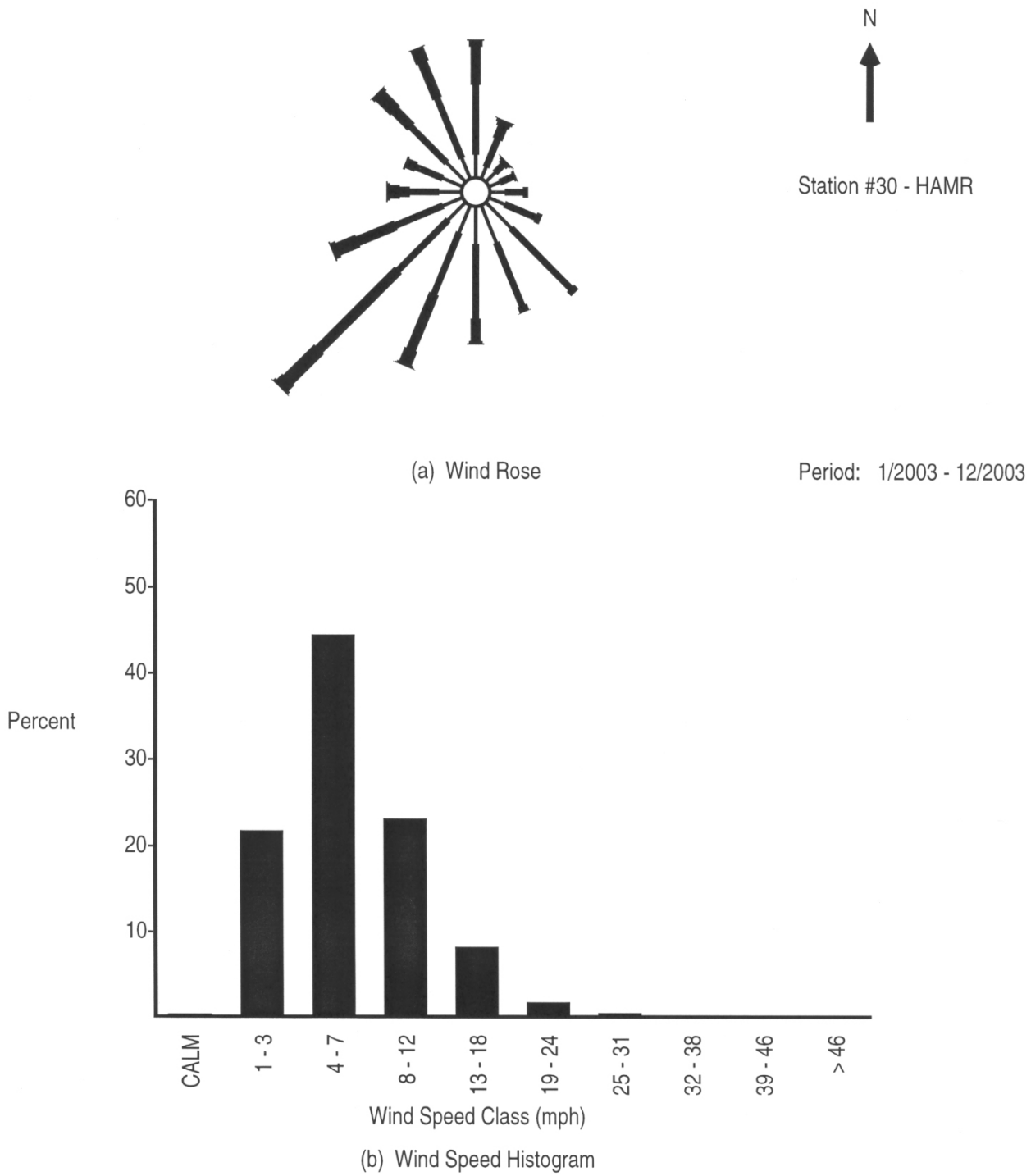


Figure B.1. (contd)

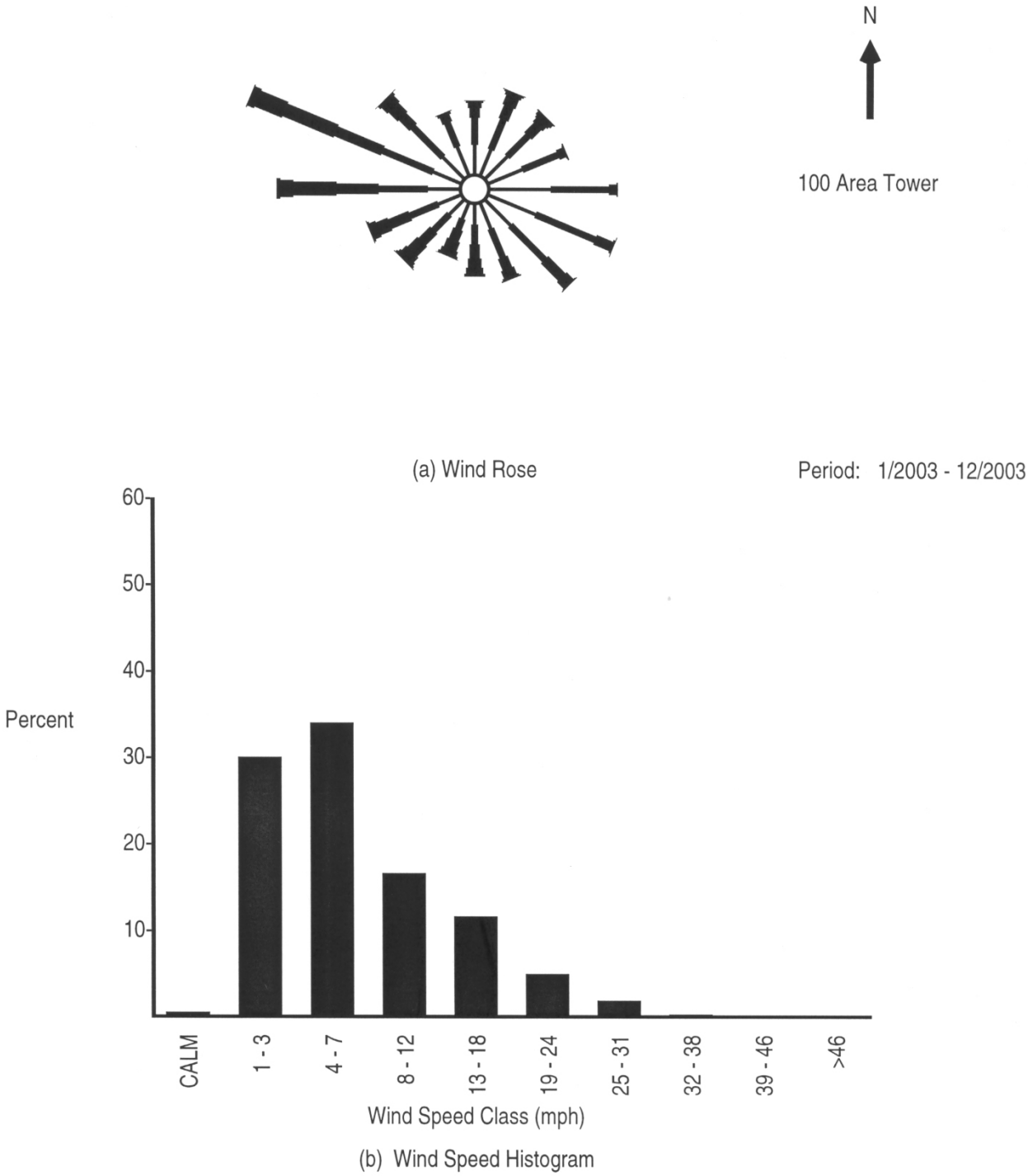


Figure B.2. Wind Rose and Wind Speed Histogram, 60 meters

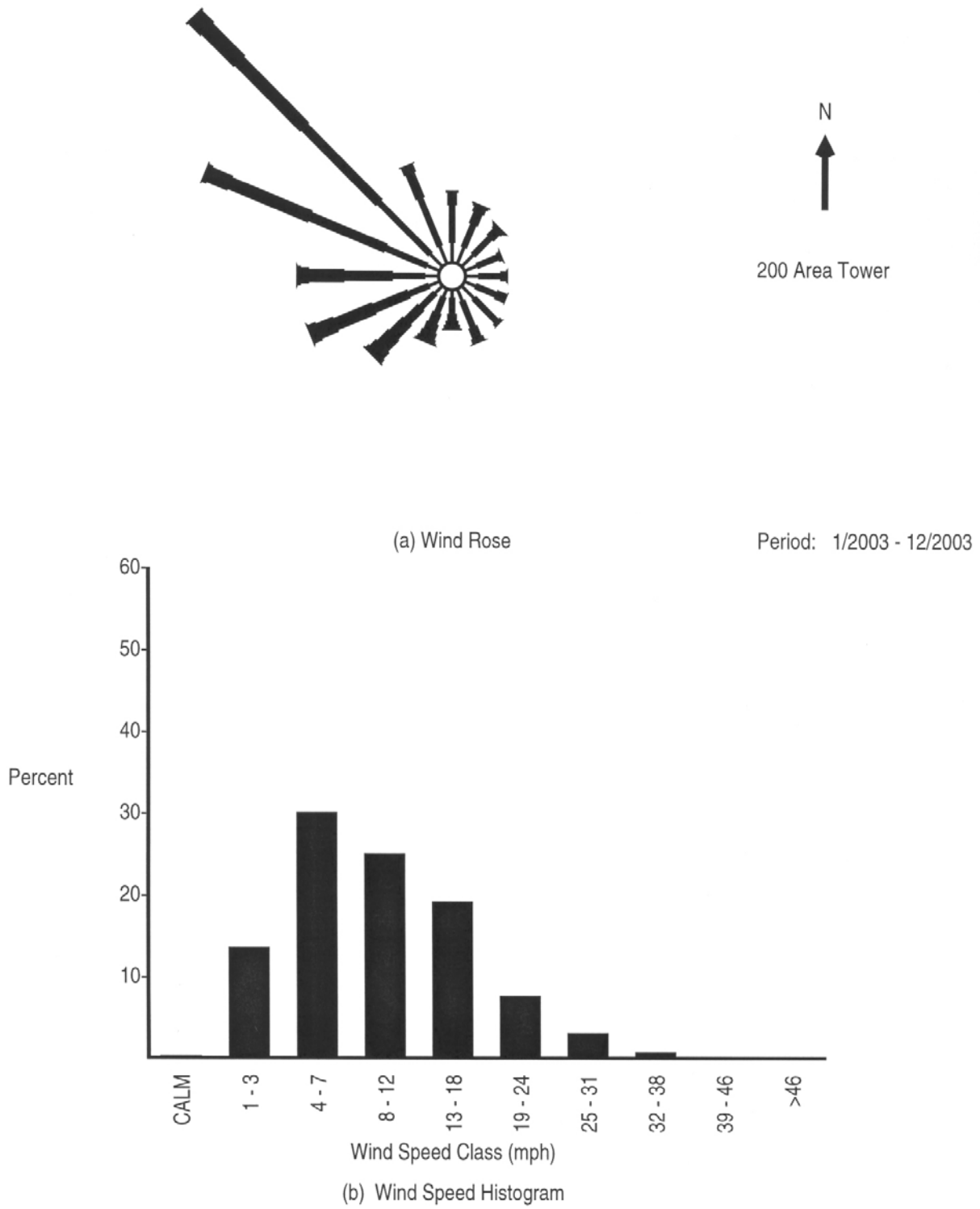


Figure B.2. (contd)

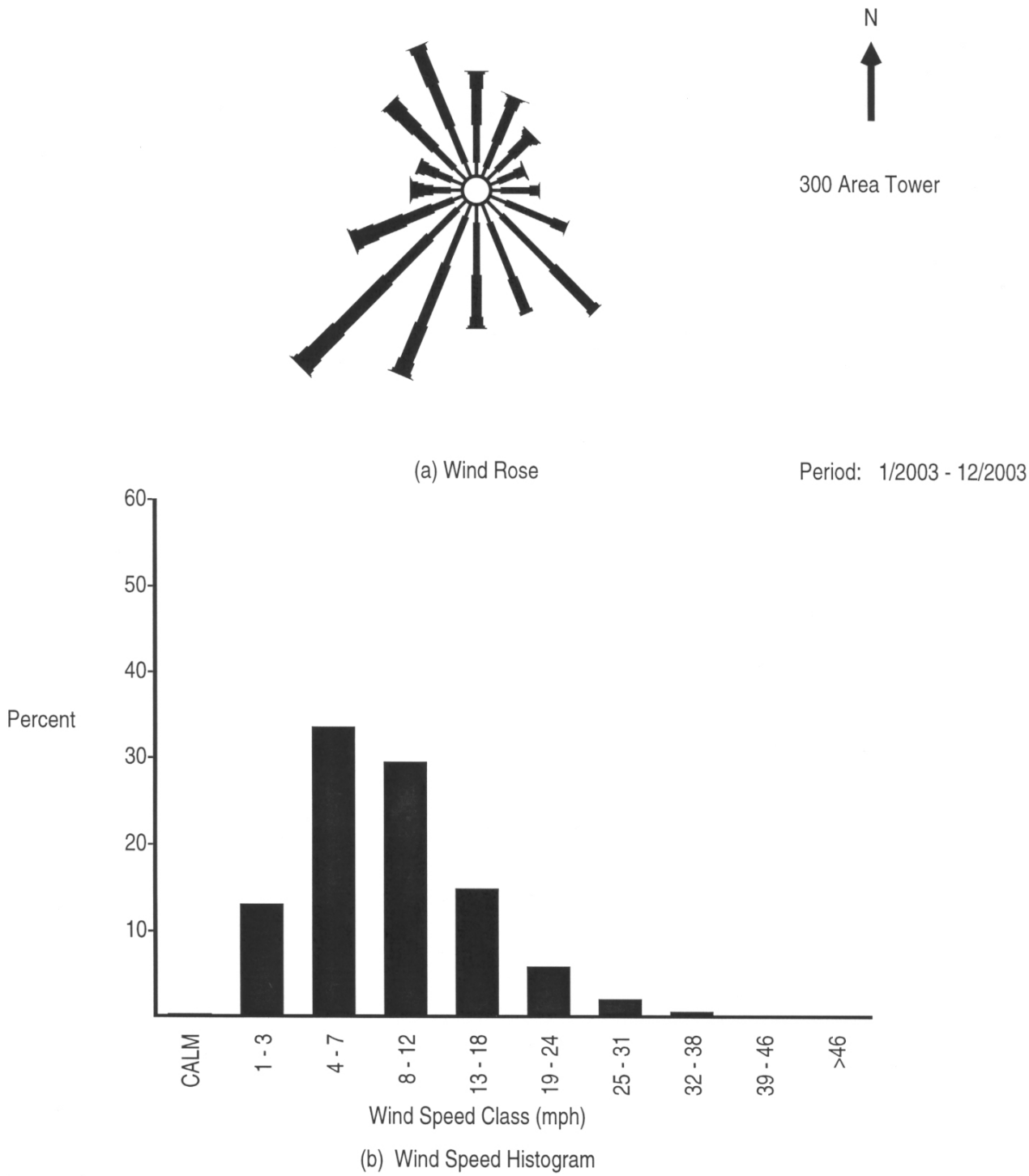
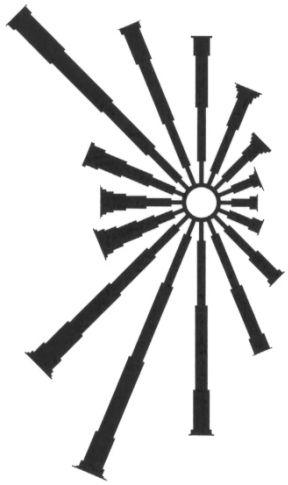


Figure B.2. (contd)

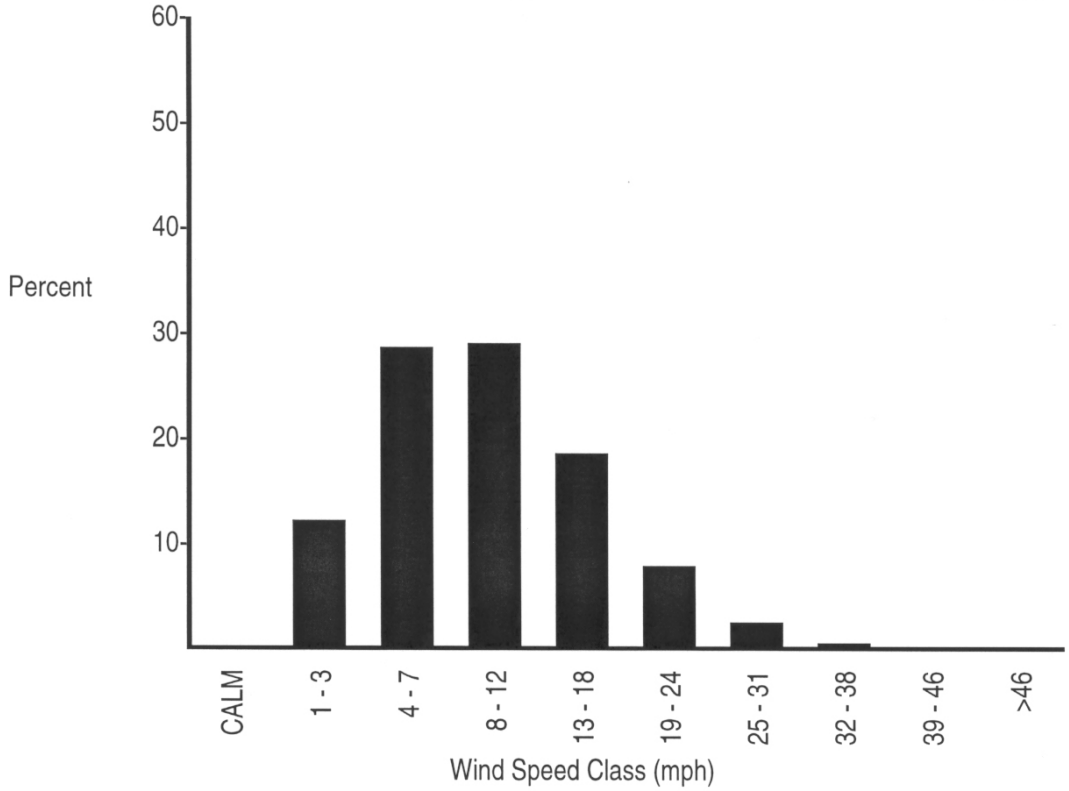


N

400 Area Tower

(a) Wind Rose

Period: 1/2003 - 12/2003



(b) Wind Speed Histogram

Figure B.2. (contd)

Table B.1. Joint Frequency Distributions (%) for Hanford Meteorological Monitoring Network Wind Stations at 30 Feet, 2003

Station: (1) PROS

Begin: 1/2003 End: 12/2003 Total Hours: 8731

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.7	.7
1-3	1.9	1.1	.8	.9	.8	1.0	1.6	2.1	2.1	2.0	1.7	1.3	1.2	1.4	2.2	2.8	0.0	25.0
4-7	2.7	1.3	.7	.6	1.0	1.1	2.8	5.1	5.1	3.4	1.6	1.0	.7	.9	3.6	4.2	0.0	35.8
8-12	1.6	.5	.2	.1	.2	.3	.7	1.7	3.7	4.8	1.9	.9	.5	.6	2.9	3.0	0.0	23.6
13-18	.4	.2	.1	0.0	0.0	0.0	0.0	.1	.9	2.9	1.8	1.0	.4	.2	2.4	1.1	0.0	11.5
19-24	.1	.2	0.0	0.0	0.0	0.0	0.0	0.0	.1	.4	.7	.4	.2	.1	.4	.1	0.0	2.5
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.2	0.0	0.0	.1	0.0	0.0	.7
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	.2
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	6.7	3.3	1.9	1.6	1.9	2.5	5.1	9.0	11.8	13.6	8.1	4.8	3.1	3.1	11.5	11.2	.7	100.0

Station: (2) EOC

Begin: 1/2003 End: 12/2003 Total Hours: 8662

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.9	.9
1-3	1.0	1.0	.7	.8	.8	.6	.6	.8	1.0	1.3	1.1	1.2	1.4	1.4	1.8	1.2	0.0	16.8
4-7	2.5	1.8	1.4	.9	1.1	1.0	1.2	1.2	1.9	2.2	1.5	1.3	2.0	3.4	4.0	3.1	0.0	30.6
8-12	1.7	.4	.1	.1	0.0	.1	.3	.4	1.5	2.5	2.7	2.1	1.8	3.9	6.0	3.1	0.0	26.7
13-18	.6	.2	.1	0.0	0.0	0.0	0.0	0.0	.1	1.0	2.9	2.8	1.5	.5	3.3	2.3	0.0	15.3
19-24	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.2	1.7	2.0	1.1	.1	.5	.2	0.0	6.0
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	1.0	1.1	.4	.1	.1	0.0	0.0	2.8
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.3	.2	.1	0.0	0.0	0.0	0.0	.7
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.1	0.0	0.0	0.0	0.0	.2
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	6.1	3.4	2.3	1.8	1.9	1.7	2.2	2.3	4.5	7.2	11.3	10.8	8.4	9.5	15.7	10.0	.9	100.0

Station: (3) ARMY

Begin: 1/2003 End: 12/2003 Total Hours: 8693

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	3.4
1-3	2.1	1.8	2.0	2.0	2.5	2.0	1.8	1.2	.8	.7	.9	1.2	2.3	3.5	3.9	2.7	0.0	31.4
4-7	2.5	1.1	1.1	1.3	2.0	2.1	1.9	.8	.5	.4	.6	.9	2.2	6.3	7.1	3.8	0.0	34.7
8-12	1.0	.5	.2	.2	.4	.7	.9	.6	.5	.5	.7	1.3	2.1	4.1	4.2	1.9	0.0	19.8
13-18	.3	.1	.1	0.0	0.0	.2	.2	.2	.2	.3	.7	1.4	1.0	1.1	1.4	.2	0.0	7.2
19-24	.3	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.5	.6	.4	.2	.5	0.0	0.0	2.7
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.1	.2	0.0	0.0	.1	0.0	0.0	.6
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	6.2	3.6	3.4	3.6	4.9	5.0	4.8	2.7	2.0	2.1	3.6	5.7	8.0	15.2	17.2	8.6	3.4	100.0

Station: (4) RSPG

Begin: 1/2003 End: 12/2003 Total Hours: 8734

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	.5
1-3	1.6	1.4	1.4	1.5	1.6	1.3	1.1	.7	.8	1.0	1.6	1.5	1.4	1.1	1.0	1.2	0.0	20.2
4-7	2.7	2.0	1.7	1.5	2.1	1.8	.6	.4	.5	.7	2.2	8.3	3.8	1.4	1.9	2.4	0.0	33.9
8-12	1.1	.5	.1	.1	.2	.5	.1	.1	.3	.8	2.0	15.7	5.3	2.2	1.5	1.5	0.0	31.9
13-18	.1	.1	.1	0.0	0.0	0.0	0.0	0.0	.1	.6	1.1	3.3	2.3	1.1	.9	.6	0.0	10.2
19-24	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.2	.9	.6	.4	.1	.1	.1	0.0	2.6
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.1	.2	.1	0.0	0.0	0.0	0.0	.5
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.5	4.1	3.3	3.2	3.9	3.6	1.8	1.2	1.7	3.3	8.0	29.6	13.3	6.0	5.5	5.7	.5	100.0

Table B.1. (contd)

Station: (5) EDNA

Begin: 1/2003 End: 12/2003 Total Hours: 8676

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
								DIRECTION										
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.6	.6
1-3	1.1	.8	.5	.6	.8	1.7	3.3	3.7	2.8	1.8	1.4	1.2	1.7	2.5	2.7	1.6	0.0	28.3
4-7	1.9	1.3	.9	1.0	1.9	5.5	7.2	3.8	1.7	.8	.8	.8	1.1	3.1	6.4	4.4	0.0	42.6
8-12	1.1	.5	.2	.2	1.1	2.2	1.5	1.3	1.1	.6	.8	1.2	1.3	1.9	2.4	2.3	0.0	19.7
13-18	.2	.2	.1	0.0	.1	.2	.1	.3	.6	.4	.5	1.0	.8	1.1	.9	.1	0.0	6.4
19-24	0.0	.2	.2	0.0	0.0	0.0	0.0	0.0	.1	.2	.2	.3	.2	.3	.2	0.0	0.0	1.9
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.1	.1	0.0	0.0	0.0	0.0	.4
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.2	3.0	1.9	1.8	3.9	9.7	12.1	9.1	6.2	3.9	3.8	4.6	5.1	9.0	12.6	8.4	.6	100.0

Station: (6) 200E

Begin: 1/2003 End: 12/2003 Total Hours: 8734

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
								DIRECTION										
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	2.8
1-3	1.4	1.1	1.2	1.3	1.5	1.4	1.5	1.2	.9	.8	.8	1.2	1.4	1.9	2.1	1.2	0.0	20.7
4-7	1.2	1.2	.7	.7	1.3	2.3	2.7	2.1	1.5	1.3	1.6	2.4	4.2	5.9	4.1	2.0	0.0	35.3
8-12	.7	.7	.2	.1	.4	.6	1.1	1.4	.6	.5	1.1	2.7	4.6	8.4	2.4	.6	0.0	26.2
13-18	.1	.3	.1	0.0	0.0	0.0	.1	.2	.3	.3	.9	1.7	1.5	4.3	1.2	.1	0.0	11.0
19-24	0.0	.2	0.0	0.0	0.0	0.0	0.0	0.0	.1	.1	.4	.6	.3	.9	.4	0.0	0.0	3.1
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.2	.1	.2	.1	0.0	0.0	.9
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	3.4	3.5	2.2	2.1	3.1	4.4	5.4	4.8	3.4	3.0	5.1	8.9	12.1	21.6	10.2	4.0	2.8	100.0

Station: (7) 200W

Begin: 1/2003 End: 12/2003 Total Hours: 8734

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
								DIRECTION										
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.2
1-3	2.3	2.0	1.6	1.5	1.7	1.6	1.7	1.6	1.5	1.2	1.5	1.7	2.9	3.7	3.4	2.5	0.0	32.3
4-7	3.1	1.7	1.0	.9	1.1	1.9	2.1	.8	.7	.8	1.1	1.7	3.5	6.6	6.2	3.5	0.0	36.6
8-12	1.0	.4	.1	.1	.2	.5	.4	.1	.3	.7	1.1	2.0	2.6	3.9	3.4	1.9	0.0	18.8
13-18	0.0	.2	.1	0.0	0.0	0.0	0.0	0.0	.2	.4	1.0	1.6	1.0	.8	1.8	.5	0.0	7.7
19-24	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.2	.5	.7	.3	.1	.7	0.0	0.0	2.6
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.2	.1	0.0	.1	0.0	0.0	.7
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	6.4	4.5	2.8	2.5	3.0	4.0	4.3	2.6	2.6	3.3	5.5	7.8	10.4	15.1	15.6	8.5	1.2	100.0

Station: (8) BVLY

Begin: 1/2003 End: 12/2003 Total Hours: 8719

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
								DIRECTION										
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.9	.9
1-3	3.6	2.7	1.9	1.7	1.8	2.1	1.9	1.4	1.6	1.1	1.1	.9	1.3	1.9	2.4	2.9	0.0	30.4
4-7	9.6	2.6	.6	.3	1.9	3.7	1.4	1.0	1.1	.8	.7	.7	1.7	3.4	5.7	7.3	0.0	42.6
8-12	3.9	1.2	.1	0.0	.3	.5	.2	.2	.2	.3	.5	.6	1.3	4.7	4.3	1.0	0.0	19.2
13-18	0.0	.2	.1	0.0	0.0	0.0	0.0	0.0	.2	.4	.6	.2	.3	2.2	1.5	0.0	0.0	5.8
19-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.1	.1	.2	.1	0.0	0.0	.8
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	.1	0.0	0.0	0.0	0.0	.2
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	17.2	6.6	2.7	2.1	4.0	6.3	3.5	2.8	3.1	2.8	3.2	2.6	4.7	12.3	14.0	11.3	.9	100.0

Table B.1. (contd)

Station: (9) FFTF

Begin: 1/2003 End: 12/2003 Total Hours: 8728

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.3	.3
1-3	1.2	1.0	.9	.7	.8	.9	.9	1.0	1.0	1.0	1.0	.8	1.1	1.1	1.2	1.0	0.0	15.6
4-7	3.1	3.1	2.0	1.3	1.1	1.3	2.5	3.6	4.0	3.7	2.2	1.6	1.1	1.5	3.0	3.4	0.0	38.4
8-12	1.3	1.3	.6	.2	.2	.4	1.1	3.8	4.5	4.7	1.9	1.0	.8	1.2	3.0	3.3	0.0	29.4
13-18	.3	.2	.2	0.0	0.0	0.0	.1	.4	1.0	3.3	2.1	.8	.4	.6	1.9	.5	0.0	12.0
19-24	0.0	.1	.1	.1	0.0	0.0	0.0	0.0	.1	.6	.9	.4	.3	.2	.4	0.0	0.0	3.1
25-31	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.1	.3	.2	.1	0.0	.1	0.0	0.0	.9
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.9	5.8	3.9	2.3	2.1	2.6	4.6	8.8	10.7	13.4	8.5	4.8	3.9	4.6	9.5	8.3	.3	100.0

Station: (10) YAKB

Begin: 1/2003 End: 12/2003 Total Hours: 8734

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	.5
1-3	1.4	1.4	1.3	.9	.9	.9	.8	1.0	1.0	1.0	.9	1.5	1.9	1.5	1.5	1.3	0.0	19.2
4-7	3.7	3.0	1.6	1.0	.9	1.1	1.6	1.4	.8	.9	1.4	3.5	7.1	4.2	3.3	3.8	0.0	39.3
8-12	1.3	.6	.2	.1	.1	.2	.2	.2	.3	.5	1.9	2.9	4.7	3.5	5.6	3.0	0.0	25.4
13-18	0.0	.1	.1	0.0	0.0	0.0	0.0	0.0	.2	.5	1.3	1.8	.6	1.3	3.5	.8	0.0	10.5
19-24	0.0	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	.2	.7	.6	.2	.7	1.3	.1	0.0	3.9
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.3	.1	0.0	.4	.2	0.0	0.0	1.1
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	6.5	5.2	3.2	2.0	1.9	2.2	2.7	2.5	2.3	3.3	6.6	10.4	14.6	11.7	15.5	9.0	.5	100.0

Station: (11) 300A

Begin: 1/2003 End: 12/2003 Total Hours: 8731

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	.5
1-3	1.1	.8	.7	.6	.9	1.3	1.6	1.8	1.6	1.2	1.1	.8	1.0	1.1	1.8	1.7	0.0	19.1
4-7	3.2	1.3	1.1	1.3	1.9	4.7	7.2	3.7	2.8	2.6	1.9	1.2	.8	1.0	2.1	3.9	0.0	40.9
8-12	2.8	1.7	.8	.4	.5	1.4	2.0	1.1	1.9	3.8	3.1	1.6	.5	.4	1.1	2.4	0.0	25.6
13-18	.5	.4	.1	0.0	0.0	0.0	.1	.2	.4	1.6	2.8	1.4	.5	.1	1.0	1.0	0.0	10.0
19-24	0.0	.1	.1	0.0	0.0	0.0	0.0	0.0	.1	.4	1.0	.5	.2	0.0	.2	.1	0.0	2.8
25-31	0.0	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	.1	.4	.1	.1	0.0	.1	0.0	0.0	.9
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.1	0.0	0.0	0.0	0.0	0.0	.2
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	7.5	4.6	2.9	2.4	3.3	7.4	10.9	6.9	6.7	9.7	10.4	5.7	3.1	2.7	6.3	9.1	.5	100.0

Station: (12) WYEB

Begin: 1/2003 End: 12/2003 Total Hours: 8734

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.4	.4
1-3	1.7	1.3	1.3	1.1	1.6	1.3	1.3	1.3	1.1	.9	.8	1.0	1.2	1.3	1.5	1.3	0.0	20.1
4-7	4.1	2.2	1.2	1.4	2.3	2.5	3.3	3.7	3.8	2.2	1.6	1.6	2.3	3.1	3.5	2.7	0.0	41.6
8-12	1.9	.8	.3	.3	.4	.7	1.7	2.8	3.1	1.7	.9	1.3	1.9	3.3	2.8	1.5	0.0	25.3
13-18	.5	.5	.1	0.0	0.0	0.0	.1	.5	1.6	1.3	.8	.5	.8	.9	1.1	.3	0.0	9.2
19-24	.1	.2	.1	0.0	0.0	0.0	0.0	0.0	.2	.5	.4	.4	.2	.2	.4	0.0	0.0	2.8
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.2	.2	.1	0.0	0.0	.1	0.0	0.0	.6
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	8.3	5.1	3.1	2.8	4.2	4.6	6.5	8.3	9.8	6.7	4.9	4.8	6.5	8.8	9.4	5.8	.4	100.0

Table B.1. (contd)

Station: (13) 100N

Begin: 1/2003 End: 12/2003 Total Hours: 8732

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.8	.8
1-3	2.2	2.0	2.3	2.7	3.1	3.0	2.4	1.5	1.3	1.2	1.7	2.0	2.9	2.9	2.9	2.5	0.0	36.5
4-7	1.4	1.9	1.8	2.6	3.5	3.0	2.2	1.4	.8	.9	2.1	3.8	5.0	3.1	2.1	1.4	0.0	37.0
8-12	.5	.9	.6	.2	.3	.6	.8	.5	.4	.6	1.2	2.3	3.3	2.3	.7	.3	0.0	15.4
13-18	.2	.4	.3	.1	.1	.1	.2	.1	.2	.2	.9	.7	1.3	1.9	.8	.1	0.0	7.4
19-24	.1	.2	.1	0.0	0.0	0.0	0.0	0.0	.1	.2	.3	.2	.2	.4	.4	0.0	0.0	2.4
25-31	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.4
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.4	5.4	5.1	5.5	7.0	6.7	5.4	3.6	2.8	3.1	6.2	8.9	12.7	10.7	7.0	4.4	.8	100.0

Station: (14) WPPS

Begin: 1/2003 End: 12/2003 Total Hours: 8734

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.2
1-3	2.5	2.0	1.8	1.2	.9	.7	1.3	1.5	1.6	1.3	1.2	.9	1.2	1.1	2.3	2.3	0.0	23.6
4-7	3.7	2.3	2.6	1.2	.6	.9	2.0	4.5	4.9	2.5	1.8	1.3	1.3	1.7	4.2	4.4	0.0	40.0
8-12	1.0	.8	.4	.3	.1	.4	1.2	2.8	4.5	2.9	1.4	1.1	1.2	1.7	2.6	1.7	0.0	23.9
13-18	.2	.2	.2	0.0	0.0	0.0	.1	.2	.9	2.1	1.1	.6	.5	.8	1.2	.3	0.0	8.5
19-24	0.0	.2	.1	0.0	0.0	0.0	0.0	0.0	.1	.5	.5	.3	.2	.1	.2	0.0	0.0	2.2
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.3	0.0	.1	0.0	0.0	0.0	0.0	.5
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	7.3	5.6	5.1	2.7	1.7	1.9	4.6	9.0	12.0	9.2	6.3	4.2	4.5	5.5	10.5	8.6	1.2	100.0

Station: (15) FRNK

Begin: 1/2003 End: 12/2003 Total Hours: 8734

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.4	.4
1-3	1.4	1.2	1.1	.8	1.0	1.0	1.4	1.3	1.0	.8	1.0	1.0	1.0	1.2	1.5	1.4	0.0	18.0
4-7	4.4	2.8	1.7	1.3	1.6	3.3	5.8	4.7	3.4	3.2	2.7	1.5	1.4	1.7	5.0	5.9	0.0	50.3
8-12	1.1	.5	.2	.3	.3	.8	2.3	2.0	3.0	5.0	3.6	.9	.5	.4	1.6	2.0	0.0	24.5
13-18	.1	.1	.4	.1	0.0	0.0	0.0	.1	.4	2.0	1.7	.5	.2	0.0	.1	0.0	0.0	5.9
19-24	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.3	.3	.1	.1	0.0	0.0	0.0	0.0	.8
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.1
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	6.9	4.6	3.5	2.4	3.0	5.1	9.6	8.0	7.7	11.4	9.3	4.1	3.3	3.3	8.2	9.3	.4	100.0

Station: (16) GABL

Begin: 1/2003 End: 12/2003 Total Hours: 8678

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.7	.7
1-3	.8	.8	.7	.5	.5	.5	.7	.9	1.0	.8	.8	.7	.5	.7	.7	.8	0.0	11.2
4-7	2.2	2.2	1.5	.9	.9	.8	1.3	2.1	3.2	2.1	1.7	1.4	1.4	1.4	1.9	2.0	0.0	27.1
8-12	1.9	2.5	1.3	.2	.5	.8	1.0	2.3	2.7	1.6	1.6	1.7	1.9	2.5	2.8	1.8	0.0	27.1
13-18	1.2	1.3	.4	.2	.1	.1	.4	1.3	1.5	.9	1.7	1.8	1.8	3.1	2.3	1.0	0.0	18.7
19-24	.3	.5	.3	0.0	0.0	0.0	.1	.3	.5	.5	1.0	.9	.9	2.7	1.6	.1	0.0	9.7
25-31	.1	.1	.2	0.0	0.0	0.0	0.0	.1	.2	.4	.6	.4	.1	1.2	.3	0.0	0.0	3.8
32-38	0.0	0.0	.2	0.0	0.0	0.0	0.0	0.0	.1	.2	.3	.2	0.0	.2	0.0	0.0	0.0	1.3
39-46	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.3
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.1
TOTAL	6.4	7.4	4.6	1.8	2.0	2.2	3.4	7.0	9.3	6.5	7.8	7.0	6.7	12.0	9.6	5.6	.7	100.0

Table B.1. (contd)

Station: (17) RING

Begin: 1/2003 End: 12/2003 Total Hours: 8728

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
	DIRECTION																	
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.7	.7
1-3	1.4	3.1	5.7	2.5	1.4	.9	1.0	.9	1.0	1.2	1.3	1.7	1.8	1.2	1.1	1.2	0.0	27.2
4-7	2.1	2.6	13.8	4.1	1.9	1.3	1.6	1.6	2.1	2.7	2.1	2.6	2.2	1.0	1.0	1.5	0.0	44.1
8-12	1.6	.7	.8	.3	.1	.1	.4	.8	1.3	4.2	2.0	1.3	1.6	1.7	1.1	1.0	0.0	19.2
13-18	.4	.2	.3	0.0	0.0	0.0	0.0	.1	.3	1.2	1.0	.7	.7	1.6	.2	.1	0.0	6.7
19-24	.1	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	.2	.5	.2	.1	.2	0.0	0.0	0.0	1.5
25-31	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.1	.1	0.0	0.0	0.0	0.0	.4
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.5	6.8	20.7	7.0	3.4	2.3	3.0	3.4	4.6	9.5	7.2	6.6	6.4	5.7	3.4	3.8	.7	100.0

Station: (18) RICH

Begin: 1/2003 End: 12/2003 Total Hours: 8734

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
	DIRECTION																	
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
1-3	1.4	.8	.8	1.0	1.7	2.6	3.5	2.8	2.3	1.9	2.2	1.9	2.3	2.6	2.6	1.7	0.0	32.2
4-7	2.3	.9	.7	1.1	1.9	3.3	4.2	1.9	1.9	3.2	4.1	3.0	1.8	2.4	3.0	2.7	0.0	38.5
8-12	1.2	.5	.4	.2	.2	.1	.3	.2	.9	2.8	4.1	2.5	1.4	.9	1.0	1.5	0.0	18.2
13-18	.3	.1	.1	.1	0.0	0.0	0.0	0.0	.2	1.1	2.2	1.1	.9	.3	.7	.7	0.0	7.8
19-24	0.0	.1	.1	0.0	0.0	0.0	0.0	0.0	.1	.2	.6	.3	.2	.1	.1	.1	0.0	1.9
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.1	.1	0.0	0.0	0.0	0.0	.3
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.2	2.5	2.1	2.4	3.9	5.9	8.0	4.9	5.3	9.3	13.3	8.9	6.7	6.2	7.5	6.9	1.0	100.0

Station: (19) PFP

Begin: 1/2003 End: 12/2003 Total Hours: 8734

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
	DIRECTION																	
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	1.8
1-3	3.9	3.0	1.8	1.5	1.4	1.6	1.9	1.6	1.8	1.6	1.9	2.9	4.4	5.4	4.2	3.3	0.0	42.1
4-7	3.0	2.0	.7	.6	.8	1.5	2.0	.7	.5	.8	1.0	2.1	5.0	6.7	5.3	3.8	0.0	36.4
8-12	.4	.5	.1	.1	.2	.3	.3	.1	.4	.6	1.5	2.4	1.7	1.7	2.7	1.1	0.0	14.1
13-18	0.0	.2	.1	0.0	0.0	0.0	0.0	0.0	.1	.4	1.0	1.4	.5	.1	.8	0.0	0.0	4.6
19-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.4	.3	.1	0.0	0.0	0.0	0.0	1.0
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	7.3	5.7	2.8	2.2	2.4	3.3	4.2	2.4	2.7	3.4	5.9	9.0	11.7	13.9	13.0	8.2	1.8	100.0

Station: (20) RMTN

Begin: 1/2003 End: 12/2003 Total Hours: 8734

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
	DIRECTION																	
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.1
1-3	.4	.6	.4	.2	.2	.3	.3	.2	.3	.4	.6	.4	.3	.3	.4	.3	0.0	5.6
4-7	1.0	1.3	.9	.8	.7	.5	.3	.4	.8	1.6	1.8	1.3	.9	.6	.6	.8	0.0	14.3
8-12	2.0	2.6	1.4	.6	.3	.2	.2	.3	.7	2.1	3.4	2.0	1.3	.9	.8	1.0	0.0	19.8
13-18	2.7	3.6	1.0	.1	.1	.1	0.0	.1	.2	2.4	5.2	2.5	1.8	.8	.7	.9	0.0	22.4
19-24	1.1	2.2	.6	.1	0.0	0.0	0.0	0.0	.2	1.4	4.7	3.1	.9	.3	.4	.2	0.0	15.2
25-31	.3	1.1	.2	0.0	0.0	0.0	0.0	0.0	.1	.6	4.6	2.4	.4	.1	.1	0.0	0.0	9.8
32-38	.1	.6	.1	0.0	0.0	0.0	0.0	0.0	0.0	.2	4.0	1.6	.1	0.0	0.0	0.0	0.0	6.7
39-46	0.0	.3	.1	0.0	0.0	0.0	0.0	0.0	0.0	.1	2.2	.7	0.0	0.0	0.0	0.0	0.0	3.5
> 46	0.0	.4	.4	0.0	0.0	0.0	0.0	0.0	0.0	.1	1.2	.7	0.0	0.0	0.0	0.0	0.0	2.7
TOTAL	7.7	12.6	5.1	1.9	1.3	1.1	.9	1.0	2.3	8.7	27.8	14.7	5.6	3.1	3.0	3.2	.1	100.0

Table B.1. (contd)

Station: (21) HMS

Begin: 1/2003 End: 12/2003 Total Hours: 8734

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	.5
1-3	1.9	1.4	1.6	1.2	1.0	1.2	1.2	1.1	1.0	.9	1.1	1.2	1.5	1.5	2.1	2.0	0.0	22.1
4-7	2.0	1.4	1.2	1.0	1.4	1.7	2.1	1.8	1.4	1.8	2.4	4.5	5.4	6.4	7.2	3.4	0.0	45.0
8-12	.4	.6	.3	.1	.2	.1	.1	.3	.4	.8	1.8	3.3	2.8	5.0	4.8	.8	0.0	21.8
13-18	0.0	.2	.2	0.0	0.0	0.0	0.0	0.0	.3	.5	1.3	1.3	.6	1.2	2.6	0.0	0.0	8.3
19-24	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.2	.5	.5	.2	.2	.4	0.0	0.0	2.1
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.1	0.0	0.0	0.0	0.0	0.0	.3
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.3	3.6	3.3	2.2	2.6	3.0	3.4	3.3	3.1	4.1	7.2	10.9	10.6	14.4	17.1	6.3	.5	100.0

Station: (22) PASC

Begin: 1/2003 End: 12/2003 Total Hours: 8723

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	1.1
1-3	5.4	2.9	2.5	2.3	2.5	2.6	2.4	1.8	1.4	1.1	1.1	1.0	1.7	2.1	3.7	7.2	0.0	41.7
4-7	2.4	1.1	.6	.5	.7	1.7	2.0	1.9	2.0	3.1	4.0	2.6	2.0	2.0	3.3	4.4	0.0	34.3
8-12	.5	.2	.1	.1	0.0	.1	.1	.1	.4	2.4	5.4	2.6	.8	.4	.9	1.1	0.0	15.3
13-18	.1	.2	.1	0.0	0.0	0.0	0.0	0.0	.1	.5	3.1	1.6	.4	.1	.1	0.0	0.0	6.2
19-24	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.5	.4	.1	0.0	0.0	0.0	0.0	1.2
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.2
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	8.4	4.5	3.4	2.9	3.3	4.4	4.5	3.7	3.9	7.0	14.2	8.2	5.1	4.6	8.1	12.7	1.1	100.0

Station: (23) GABW

Begin: 1/2003 End: 12/2003 Total Hours: 8734

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
1-3	1.6	1.3	1.2	1.4	1.5	1.5	2.1	2.3	2.1	1.4	1.5	1.6	2.6	3.6	2.8	2.0	0.0	30.5
4-7	1.5	1.1	.7	.9	1.2	1.4	3.7	4.7	1.6	1.0	1.3	1.6	3.4	7.8	3.2	1.9	0.0	36.9
8-12	.4	.6	.2	.1	.2	.3	1.5	1.0	.3	.5	1.3	2.3	3.5	6.3	1.4	.3	0.0	20.5
13-18	0.0	.2	.2	0.0	0.0	0.0	.1	.1	.3	.3	.9	1.3	.9	3.8	.7	0.0	0.0	8.9
19-24	0.0	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	.1	.3	.3	.1	.7	.1	0.0	0.0	1.8
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.1	0.0	.1	0.0	0.0	0.0	.3
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	3.6	3.3	2.4	2.5	3.0	3.3	7.4	8.1	4.4	3.3	5.3	7.2	10.5	22.4	8.2	4.2	1.0	100.0

Station: (24) 100F

Begin: 1/2003 End: 12/2003 Total Hours: 8734

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3
1-3	1.8	1.4	1.2	.9	1.4	1.8	2.3	2.5	2.0	1.6	2.0	2.4	3.2	3.8	3.4	2.6	0.0	34.4
4-7	2.2	1.3	1.1	1.1	1.3	1.8	5.0	5.2	1.6	.9	1.0	1.6	3.3	4.3	2.9	2.3	0.0	36.9
8-12	1.0	.7	.2	.2	.2	.7	3.0	2.3	.7	.6	1.1	1.8	2.4	2.6	.6	.6	0.0	18.7
13-18	.2	.3	.1	0.0	0.0	0.0	.3	.3	.4	.4	.7	.9	.8	1.6	.6	.1	0.0	6.6
19-24	0.0	.2	.1	0.0	0.0	0.0	0.0	0.0	.1	.1	.3	.3	.2	.3	.1	0.0	0.0	1.7
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	.1	.1	0.0	0.0	0.0	0.0	0.0	.3
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.1	3.7	2.8	2.3	3.0	4.3	10.6	10.4	4.7	3.6	5.2	7.1	10.0	12.6	7.7	5.5	1.3	100.0

Table B.1. (contd)

Station: (25) VERN

Begin: 1/2003 End: 12/2003 Total Hours: 8734

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6
1-3	1.2	1.3	1.2	1.5	2.0	2.0	1.3	1.1	0.9	0.9	1.1	2.1	2.7	1.4	1.1	1.1	0.0	22.9
4-7	0.9	1.6	2.6	3.0	3.1	2.0	1.0	0.5	0.4	0.5	0.7	3.9	8.3	4.0	2.0	1.1	0.0	35.7
8-12	0.5	0.3	0.3	0.5	0.4	0.3	0.1	0.1	0.3	0.5	0.8	2.0	8.3	7.6	2.7	0.8	0.0	25.5
13-18	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.8	0.7	2.3	5.4	1.8	0.1	0.0	12.0
19-24	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.3	0.5	0.9	0.4	0.0	0.0	2.9
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.4
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2.8	3.6	4.3	5.0	5.5	4.3	2.5	1.7	1.7	2.4	3.8	9.1	22.2	19.4	8.0	3.1	0.6	100.0

Station: (26) BENT

Begin: 1/2003 End: 12/2003 Total Hours: 8670

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
1-3	0.9	0.9	0.9	1.0	0.9	0.7	0.7	0.5	0.7	0.9	1.3	2.2	3.0	2.2	1.6	1.2	0.0	19.4
4-7	1.3	1.1	1.4	2.1	2.2	1.0	0.3	0.2	0.6	1.6	6.5	13.1	13.5	6.4	3.0	2.2	0.0	56.4
8-12	0.5	0.6	0.9	0.6	0.5	0.1	0.0	0.0	0.2	1.0	3.2	4.8	3.3	1.8	1.0	0.4	0.0	18.8
13-18	0.2	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.4	1.1	0.4	0.4	0.1	0.0	0.0	0.0	3.8
19-24	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.1	0.0	0.0	0.0	0.0	0.0	1.1
25-31	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	2.9	3.5	3.8	3.6	3.7	1.9	1.0	0.7	1.4	4.0	12.6	20.6	20.3	10.4	5.6	3.8	0.3	100.0

Station: (27) VSTA

Begin: 1/2003 End: 12/2003 Total Hours: 8701

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.6
1-3	2.0	2.1	2.2	1.7	1.6	2.0	2.2	1.7	2.3	2.7	2.9	2.5	2.1	2.1	1.9	1.8	0.0	33.9
4-7	2.6	1.8	1.6	1.3	0.8	1.3	1.1	1.3	2.1	4.6	6.2	3.5	2.1	2.7	3.2	3.2	0.0	39.3
8-12	0.4	0.2	0.1	0.0	0.0	0.1	0.0	0.1	0.6	3.9	6.3	2.6	0.8	0.3	0.9	0.9	0.0	17.2
13-18	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.2	1.3	4.4	0.9	0.3	0.1	0.0	0.1	0.0	7.5
19-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.0	0.2	0.1	0.0	0.0	0.0	0.0	1.4
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	5.0	4.2	4.0	3.0	2.4	3.4	3.3	3.1	5.1	12.6	21.0	9.8	5.3	5.2	6.0	6.0	0.6	100.0

Station: (28) SURF

Begin: 1/2003 End: 12/2003 Total Hours: 8734

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
1-3	0.4	0.7	1.5	1.5	1.0	0.6	0.7	0.6	1.1	1.9	3.2	3.3	1.7	0.6	0.4	0.3	0.0	19.3
4-7	0.1	0.5	2.3	4.3	2.0	0.5	0.2	0.1	0.3	0.9	4.0	6.0	1.5	0.1	0.0	0.0	0.0	23.0
8-12	0.1	0.5	1.5	2.9	0.6	0.0	0.0	0.0	0.0	0.1	5.7	10.9	4.0	0.3	0.0	0.0	0.0	26.9
13-18	0.1	0.4	0.2	0.5	0.1	0.0	0.0	0.0	0.0	0.0	2.2	9.7	5.7	0.5	0.1	0.0	0.0	19.5
19-24	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	4.1	2.8	0.3	0.0	0.0	0.0	7.9
25-31	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.2	0.1	0.0	0.0	0.0	2.7
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.3
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.9	2.2	5.6	9.3	3.7	1.2	0.9	0.7	1.4	2.9	15.5	35.3	17.0	2.0	0.5	0.4	0.5	100.0

Table B.1. (contd)

Station: (29) 100K

Begin: 1/2003 End: 12/2003 Total Hours: 8731

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	2.8
1-3	2.2	1.9	1.8	1.8	1.8	1.8	1.9	1.4	1.5	1.3	1.8	2.7	3.7	2.9	2.8	2.6	0.0	33.8
4-7	1.7	1.1	0.8	1.0	1.4	1.7	1.6	1.7	1.2	0.8	1.7	4.6	6.8	3.3	2.2	1.7	0.0	33.2
8-12	0.5	0.8	0.3	0.1	0.2	0.6	0.8	0.7	0.3	0.5	1.4	3.4	5.7	2.6	0.9	0.4	0.0	19.4
13-18	0.1	0.2	0.2	0.0	0.0	0.1	0.0	0.1	0.2	0.4	1.2	1.1	1.9	2.2	0.7	0.0	0.0	8.4
19-24	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.2	0.4	0.6	0.0	0.0	0.0	2.1
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.3
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.5	4.1	3.4	3.0	3.5	4.2	4.3	4.0	3.3	3.2	6.5	12.0	18.5	11.7	6.6	4.7	2.8	100.0

Station: (30) HAMR

Begin: 1/2003 End: 12/2003 Total Hours: 8734

DIRECTION

SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
1-3	1.3	0.7	0.8	0.7	0.9	1.0	2.1	2.3	2.1	1.7	1.4	1.2	1.3	1.3	1.6	1.3	0.0	21.7
4-7	4.1	1.8	0.6	0.8	1.0	2.0	4.9	3.9	4.3	3.8	4.1	3.0	1.7	1.7	2.9	3.8	0.0	44.5
8-12	2.2	0.8	0.2	0.1	0.3	0.3	0.4	0.4	1.3	3.5	6.5	2.4	0.6	0.6	1.3	2.3	0.0	23.1
13-18	0.3	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.9	2.5	1.2	0.6	0.1	1.2	0.9	0.0	8.2
19-24	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.5	0.3	0.1	0.0	0.3	0.1	0.0	1.7
25-31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.4
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
> 46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	8.0	3.7	1.7	1.7	2.2	3.3	7.4	6.6	8.0	10.1	15.3	8.2	4.4	3.6	7.3	8.2	0.3	100.0

Table B.2. Joint Frequency Distributions (%) for Hanford Meteorological Monitoring Network Wind Stations at 60 Meters, 2003

Tower: 100 Area

Begin: 1/2003 End: 12/2003 Total Hours: 8750

	DIRECTION																	
SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.5
1-3	1.7	1.7	1.9	2.2	3.6	3.0	2.1	1.6	1.2	1.0	1.2	1.4	1.9	1.8	1.8	1.8	0.0	30.0
4-7	1.6	1.9	1.7	2.2	3.4	3.7	2.8	1.8	1.1	0.6	1.3	1.8	2.9	3.2	2.5	1.5	0.0	34.0
8-12	0.6	0.8	0.8	0.4	0.4	1.0	1.4	0.7	0.8	0.7	1.0	1.3	2.5	2.9	0.9	0.4	0.0	16.6
13-18	0.3	0.6	0.3	0.0	0.1	0.1	0.6	0.5	0.6	0.6	0.8	0.7	2.5	3.2	0.7	0.2	0.0	11.7
19-24	0.1	0.2	0.2	0.1	0.0	0.0	0.0	0.1	0.3	0.3	0.4	0.4	0.8	1.7	0.5	0.0	0.0	5.0
25-31	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.2	0.4	0.2	0.0	0.0	1.9
32-38	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
>46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.3	5.2	5.1	4.9	7.5	7.9	7.0	4.8	4.2	3.4	5.0	5.7	10.7	13.3	6.5	3.9	0.5	100.0

Tower: 200 Area

Begin: 1/2003 End: 12/2003 Total Hours: 8744

	DIRECTION																	
SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
1-3	1.2	1.1	1.0	0.8	0.8	0.7	1.1	0.8	0.5	0.5	0.6	0.7	0.8	0.8	1.1	1.1	0.0	13.6
4-7	2.3	1.5	1.5	1.4	1.4	1.4	2.0	1.7	1.0	1.0	1.2	1.3	2.0	2.8	4.5	3.2	0.0	30.2
8-12	0.8	0.8	0.5	0.2	0.4	0.7	0.2	0.7	0.5	0.7	1.2	2.3	3.0	5.0	6.5	1.7	0.0	25.1
13-18	0.1	0.3	0.2	0.0	0.1	0.0	0.0	0.3	0.2	0.5	1.2	2.6	2.2	5.3	5.7	0.5	0.0	19.2
19-24	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.4	1.0	1.1	0.5	1.3	2.8	0.0	0.0	7.7
25-31	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.5	0.5	0.2	0.3	1.0	0.0	0.0	3.1
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.1	0.0	0.1	0.1	0.0	0.0	0.7
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
>46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	4.4	3.9	3.4	2.5	2.6	2.8	3.3	3.5	2.5	3.5	6.1	8.6	8.8	15.6	21.6	6.5	0.3	100.0

Tower: 300 Area

Begin: 1/2003 End: 12/2003 Total Hours: 8750

	DIRECTION																	
SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.3
1-3	0.8	0.6	0.8	0.5	0.6	1.0	1.2	1.2	1.0	0.8	0.7	0.6	0.7	0.7	1.0	0.9	0.0	13.1
4-7	2.2	1.6	1.2	1.1	1.7	2.9	4.2	3.4	3.0	3.0	2.3	1.3	1.0	0.9	1.6	2.2	0.0	33.6
8-12	2.1	2.2	1.2	0.5	0.5	0.9	3.2	2.0	2.4	3.7	3.5	1.8	0.5	0.7	1.5	2.7	0.0	29.5
13-18	0.8	0.6	0.2	0.0	0.1	0.0	0.3	0.2	0.5	2.3	4.0	1.8	0.3	0.4	1.2	2.0	0.0	14.9
19-24	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.7	2.0	1.0	0.3	0.1	0.8	0.4	0.0	5.9
25-31	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.7	0.4	0.1	0.0	0.2	0.0	0.0	2.1
32-38	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.6
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
>46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	6.1	5.1	3.8	2.2	2.9	4.8	9.0	6.8	7.1	10.7	13.6	7.0	3.0	2.8	6.3	8.3	0.3	100.0

Tower: 400 Area

Begin: 1/2003 End: 12/2003 Total Hours: 8746

	DIRECTION																	
SPEED	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	TOTAL
CALM	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2
1-3	1.1	0.7	0.7	0.8	0.6	0.6	0.9	0.8	1.0	0.9	0.8	0.6	0.6	0.6	0.7	1.0	0.0	12.2
4-7	2.6	2.3	1.5	1.0	0.9	1.1	1.8	2.7	3.1	2.5	1.7	0.9	1.2	1.2	1.9	2.3	0.0	28.7
8-12	2.5	1.4	0.6	0.3	0.4	0.5	1.3	2.5	4.0	3.8	2.4	0.9	1.0	1.4	3.0	3.1	0.0	29.1
13-18	0.9	0.3	0.2	0.1	0.0	0.0	0.3	0.8	1.9	3.9	2.7	1.0	0.6	1.1	3.3	1.6	0.0	18.6
19-24	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.2	1.6	1.5	0.6	0.4	0.6	2.4	0.3	0.0	7.9
25-31	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.7	0.3	0.2	0.2	0.4	0.0	0.0	2.5
32-38	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.5
39-46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2
>46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
TOTAL	7.1	5.0	3.3	2.2	1.9	2.2	4.3	6.8	10.2	13.1	10.2	4.4	4.0	5.1	11.7	8.3	0.2	100.0

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