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**Pacific Northwest  
National Laboratory**

Operated by Battelle for the  
U.S. Department of Energy

## **Hanford Site Climatological Data Summary 2002 with Historical Data**

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

May 2003



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

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Cover Photo: The present and past natural history of the Hanford Site come together along the last free-flowing stretch of the Columbia River. The active sands dunes of the Hanford Reach National Monument march eastward across the desert to the Columbia River with the ancestral Columbia River deposits of the White Bluffs forming a backdrop. The photo is from LMSI (92100762-24cn), Richland, Washington.



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Richland, Washington 99352

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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 2002. Pacific Northwest National Laboratory<sup>1</sup> 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) and Hoitink and Burk (1994, 1995, 1996, 1997, 1998); however, data from Appendix B – Wind Climatology (Hoitink and Burk 1994) are excluded.

Calendar year 2002 was slightly warmer than normal<sup>2</sup> at the Hanford Meteorology Station with an average temperature of 54.4°F, 0.8°F above normal (53.6°F). The hottest temperature was 113°F on July 13, while the coldest was 7°F on October 31. For the 12-month period, 8 months were warmer than normal, and 4 months were cooler than normal.

Precipitation for 2002 totaled 5.41 inches, 78% of normal (6.98 inches); calendar year snowfall totaled 2.8 inches (compared to the normal of 15.4 inches). December 2002 established a new record for any month for days with measurable precipitation. There were 21 days with  $\geq 0.01$  inch; the previous record was 18 days in November 1983 and December 1973. December 2002 also established a new December record for days with  $\geq 0.25$  inch of precipitation (5), and tied the record for any month (November 1966 also recorded 5 days). However, a notable dry period occurred for 130 days between June 30 and November 6, 2002, when precipitation measured 0.29 inch.

Calendar year 2002 had an average wind speed of 7.8 mph, 0.2 mph above normal (7.6 mph). There were 32 days with peak gusts  $\geq 40$  mph, compared to a yearly average of 27 days. The peak gust during the year was 63 mph on December 27.

November 2002 established new November records for persistence of both fog and dense fog (visibility  $\leq 1/4$  mile). There were 99.2 consecutive hours of fog during the period November 26-30, 2002, and 44.0 consecutive hours of dense fog during the period of November 27-29, 2002. The previous records were 65.4 hours and 20.6 hours, respectively, in November 1963.

The barometric pressure (corrected to sea-level) on December 16 fell to a low of 28.91 inches of mercury (979.1 millibars). This was the third lowest pressure ever recorded at the Hanford Meteorology Station. The lowest ever was 28.86 inches of mercury on December 4, 1951.

The heating-degree days for 2001-2002 were 4,863 (6% below the 5,160 normal). Cooling-degree days for 2002 were 1,131 (12% above the 1,014 normal).

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<sup>1</sup> Pacific Northwest National Laboratory is operated by Battelle for the U.S. Department of Energy.

<sup>2</sup> Normals for the 2002 summary are 30-year averages based on the period 1971-2000.



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## 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) =  $(9/5 \times ^\circ\text{C}) + 32$   
degrees Celsius (°C) =  $5/9 \times (^\circ\text{F} - 32)$   
1 langley = 1 gm-cal/cm<sup>2</sup>

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## 1.0 Introduction

The U.S. Department of Energy's Hanford Site lies within the semiarid shrub-steppe (see Appendix B) 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 below 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, greatly 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 2002 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. Currently, 30 monitoring stations are located within and near the U.S. Department of Energy's Hanford Site (Table 1.1, Figure 1.1). A detailed description of each monitoring station, including photographs of the topography surrounding each site, is provided in Glantz and Islam (1988), and excerpts from this document are included in Appendix C. A description of instrumentation and calibration is provided in DOE (2000).

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 the U.S. Department of Energy and Hanford Site contractors ongoing meteorological and climatological services, 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**

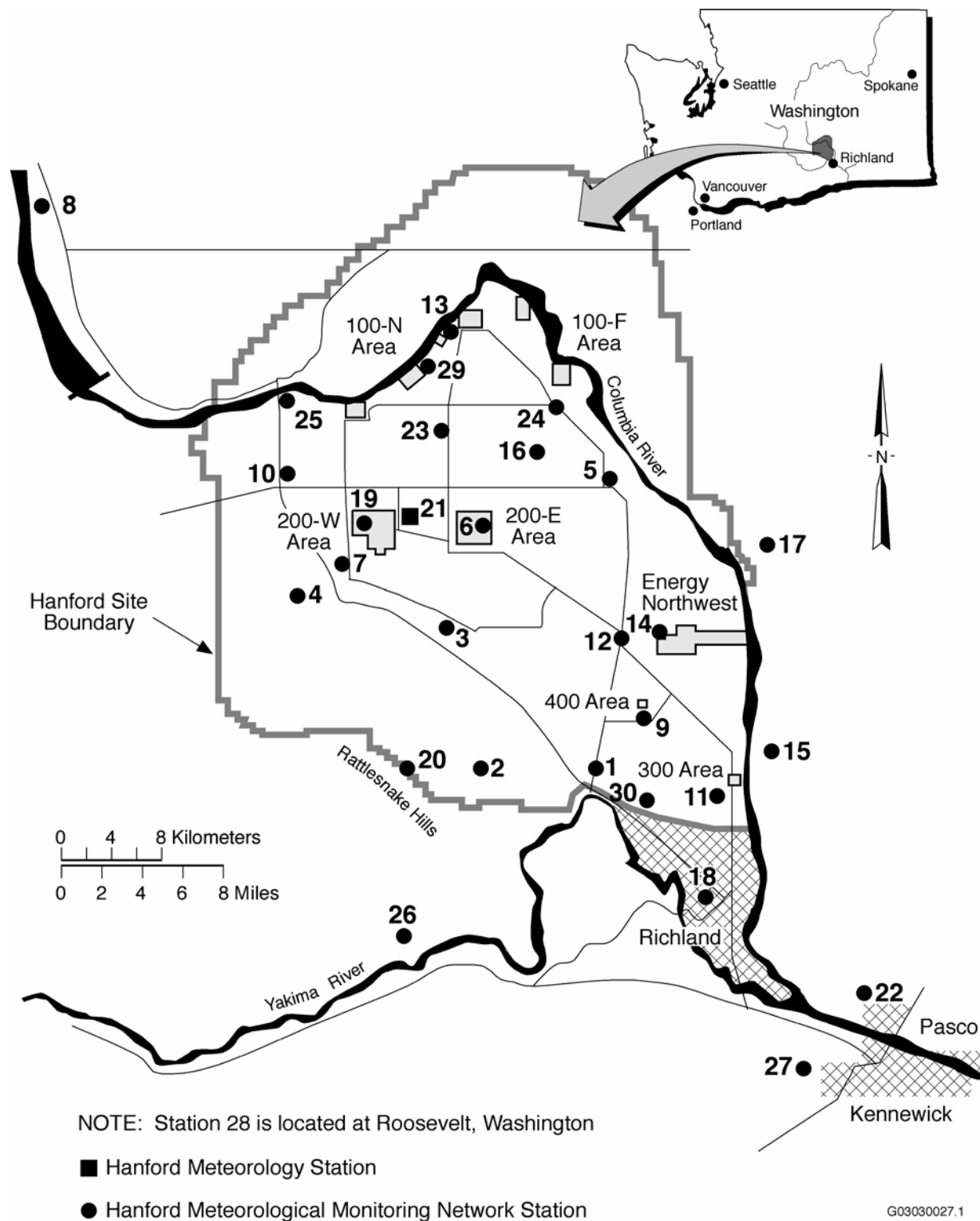
| Station Number | Station Name                      | Station Code | Station Elevation (ft) | Longitude Degrees | Latitude Degrees | Period of Operation |
|----------------|-----------------------------------|--------------|------------------------|-------------------|------------------|---------------------|
| 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).

This document is composed of the following information. The 2002 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 gives the station-specific wind roses and joint frequency distributions for 2002. Appendix B describes in detail the climate classification of the Mid-Columbia region. Appendix C provides a description of the Hanford Meteorological Monitoring Network.



**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 2002 Summary

This section summarizes weather conditions for calendar year 2002 (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 2001-2002 winter season (December 2001, January and February 2002) was warmer than normal, averaging 37.0°F, 3.2° above normal (33.8°F). The warmest winter, 1966-1967, averaged 40.6°F, while the coldest winter, 1948-1949, averaged 24.2°F. Winter season precipitation totaled 1.89 inches, 71% of normal (2.66 inches). The wettest winter, 1996-1997, received 5.45 inches, while the driest, 1946-1947, received 0.70 inch.

Spring 2002 (March, April and May) was cooler than normal, averaging 51.9°F, 1.9° below normal (53.8°F). The warmest spring, in 1992, averaged 58.2°F, while the coolest, in 1955, averaged 48.0°F. Spring season precipitation totaled 0.64 inch, 40% of normal (1.58 inches). The wettest spring (1955) received 3.28 inches, while the driest (1968) received only 0.09 inch.

The 2002 summer season (June, July and August) was warmer than normal, averaging 75.7°F, 2.0° above normal (73.7°F). The warmest summer (1958) averaged 78.2°F, while the coolest, in 1980, averaged 70.2°F. The summer's warmest temperature was 113°F on July 13. This was a record high maximum for the month of July and tied the all-time maximum temperature for Hanford (previously recorded on August 4, 1961). Precipitation for the summer totaled 0.82 inch, 86% of normal (0.95 inch). The wettest summer (1950) received 2.99 inches, while the driest (1973) received only 0.03 inch.

Autumn 2002 (September, October and November) was slightly cooler than normal, averaging 52.6°F, 0.4° below normal (53.0°F). The warmest autumn (1990) averaged 57.1°F, while the coolest (1985) averaged 44.5°F. Autumn precipitation totaled 0.50 inch, 28% 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 2002:

| Category  | Number<br>of Days | Normal | Record        |              |
|---|-------------------|--------|---------------|--------------|
|   |                   |        | Maximum       | Minimum      |
| Maximum temperatures $\geq 100^{\circ}\text{F}$ | 16                | 13     | 28 (1958)     | 1 (1954)     |
| Maximum temperatures $\geq 90^{\circ}\text{F}$  | 59                | 52     | 79 (1967)     | 29 (1980)    |
| Maximum temperatures $\leq 32^{\circ}\text{F}$  | 7                 | 24     | 58 (1984-85)  | 2 (1966-67)  |
| Minimum temperatures $\geq 70^{\circ}\text{F}$  | 11                | 7      | 21 (1958)     | 0 (1954)     |
| Minimum temperatures $\leq 32^{\circ}\text{F}$  | 108               | 105    | 143 (1984-85) | 70 (1991-92) |
| Minimum temperatures $\leq 0^{\circ}\text{F}$   | 0                 | 3      | 18 (1949-50)  | 0 (2001-02)  |
| Thunderstorms                                   | 8                 | 10     | 23 (1948)     | 3 (1949)     |
| Fog (visibility $\leq 6$ mi)                    | 46                | 47     | 84 (1985-86)  | 22 (1948-49) |
| Dense fog (visibility $\leq 0.25$ mi)           | 28                | 24     | 42 (1950-51)  | 9 (1948-49)  |
| Peak wind gusts $\leq 12$ mph                   | 50                | 50     | 87 (1952)     | 28 (1973)    |
| Peak wind gusts $\geq 25$ mph                   | 187               | 156    | 192 (1999)    | 123 (1952)   |
| Peak wind gusts $\geq 40$ mph                   | 32                | 27     | 57 (1990)     | 10 (1978)    |
| Peak wind gusts $\geq 50$ mph                   | 7                 | 5      | 18 (1990)     | 0 (1985)     |

**Table 2.1. 2002 Climatological Data Summary**

| Month         | Temperatures, °F |                  |         |                          |          |           |        |                   | Degree Days<br>Base 65, °F |                          |         |                          | Precipitation, inches     |                          |                         |                   |                |                          |                         |          | Relative<br>Humidity, % |                          |
|---------------|------------------|------------------|---------|--------------------------|----------|-----------|--------|-------------------|----------------------------|--------------------------|---------|--------------------------|---------------------------|--------------------------|-------------------------|-------------------|----------------|--------------------------|-------------------------|----------|-------------------------|--------------------------|
|               | Averages         |                  |         |                          | Extremes |           |        |                   |                            |                          |         |                          | Snow, Ice Pellets, inches |                          |                         |                   |                |                          |                         |          |                         |                          |
|               | Daily<br>Maximum | Daily<br>Minimum | Monthly | Departure <sup>(a)</sup> | Highest  | Date      | Lowest | Date              | Heating                    | Departure <sup>(a)</sup> | Cooling | Departure <sup>(a)</sup> | Total                     | Departure <sup>(a)</sup> | Greatest in<br>24 Hours | Date              | Total          | Departure <sup>(a)</sup> | Greatest in<br>24 Hours | Date     | Average                 | Departure <sup>(a)</sup> |
| J             | 45.2             | 29.9             | 37.6    | +5.8                     | 63       | 7         | 13     | 29                | 854                        | -174                     | 0       | 0                        | 0.42                      | -0.45                    | 0.26                    | 2                 | 0.6            | -3.6                     | 0.6                     | 16       | 73.1                    | -4.2                     |
| F             | 49.6             | 27.2             | 38.4    | +0.5                     | 68       | 21        | 16     | 27 <sup>(b)</sup> | 745                        | -22                      | 0       | 0                        | 0.67                      | -0.01                    | 0.53                    | 7                 | 0.2            | -2.4                     | 0.2                     | 3        | 67.7                    | -2.8                     |
| M             | 53.6             | 31.2             | 42.4    | -3.7                     | 70       | 31        | 18     | 3                 | 698                        | +111                     | 0       | 0                        | 0.19                      | -0.39                    | 0.12                    | 6                 | 1.4            | +1.0                     | 1.4                     | 6        | 57.0                    | +0.4                     |
| A             | 66.6             | 39.7             | 53.2    | -0.3                     | 80       | 30        | 29     | 4                 | 359                        | +9                       | 1       | -4                       | 0.29                      | -0.15                    | 0.09                    | 26-27             | 0              | -T <sup>(c)</sup>        | 0                       | -        | 46.0                    | -1.3                     |
| M             | 73.5             | 46.7             | 60.1    | -1.7                     | 86       | 27        | 32     | 8                 | 181                        | +25                      | 28      | -29                      | 0.16                      | -0.39                    | 0.16                    | 27                | 0              | 0                        | 0                       | -        | 42.5                    | -0.5                     |
| J             | 85.9             | 57.2             | 71.6    | +2.3                     | 104      | 26        | 46     | 8 <sup>(b)</sup>  | 28                         | -5                       | 224     | +61                      | 0.65                      | +0.24                    | 0.35                    | 8-9               | 0              | 0                        | 0                       | -        | 40.4                    | +0.8                     |
| J             | 95.7             | 63.6             | 79.6    | +3.3                     | 113      | 13        | 50     | 4                 | 1                          | -3                       | 456     | +101                     | 0.16                      | -0.11                    | 0.16                    | 7-8               | 0              | 0                        | 0                       | -        | 32.1                    | -1.3                     |
| A             | 90.4             | 60.6             | 75.5    | +0.1                     | 103      | 14        | 50     | 17                | 1                          | -4                       | 327     | +1                       | 0.01                      | -0.26                    | 0.01                    | 23                | 0              | 0                        | 0                       | -        | 34.5                    | -1.1                     |
| S             | 81.7             | 50.8             | 66.3    | +0.4                     | 96       | 22        | 38     | 22                | 54                         | -21                      | 94      | -9                       | T <sup>(c)</sup>          | -0.33                    | T <sup>(c)</sup>        | 29 <sup>(b)</sup> | 0              | 0                        | 0                       | -        | 38.8                    | -3.5                     |
| O             | 65.4             | 35.4             | 50.4    | -2.6                     | 81       | 6         | 7      | 31                | 454                        | +78                      | 1       | -3                       | 0.12                      | -0.37                    | 0.08                    | 3                 | 0              | -0.1                     | 0                       | -        | 50.1                    | -5.3                     |
| N             | 50.6             | 31.5             | 41.0    | +0.9                     | 67       | 19        | 11     | 2 <sup>(b)</sup>  | 714                        | -33                      | 0       | 0                        | 0.38                      | -0.60                    | 0.16                    | 7-8               | T <sup>o</sup> | -2.3                     | T                       | 28       | 72.7                    | -1.0                     |
| D             | 41.6             | 32.7             | 37.2    | +5.5                     | 56       | 16        | 23     | 22                | 865                        | -167                     | 0       | 0                        | 2.36                      | +1.25                    | 0.63                    | 13-14             | 0.6            | -5.2                     | 0.3                     | 24       | 88.7                    | +8.6                     |
| Year<br>Total | 66.6             | 42.2             | 54.4    | +0.8                     | 113      | Jul<br>13 | 7      | Oct<br>31         | 4,954                      | -206                     | 1,131   | +118                     | 5.41                      | -1.57                    | 0.63                    | Dec<br>13-14      | 2.8            | -12.6                    | 1.4                     | Mar<br>6 | 53.6                    | -1.0                     |

**Table 2.1. (contd)**

| Month      | Mean Sky Cover, Tenths |                          | Solar Radiation, Langleys |                          |                      |       |                   |        | 50-ft Wind         |                          |            |           |        | Number of Days |           |                         |                 |                         |       |                         |      |
|------------|------------------------|--------------------------|---------------------------|--------------------------|----------------------|-------|-------------------|--------|--------------------|--------------------------|------------|-----------|--------|----------------|-----------|-------------------------|-----------------|-------------------------|-------|-------------------------|------|
|            | Average                | Departure <sup>(a)</sup> | Average Daily Total       | Departure <sup>(a)</sup> | Greatest Daily Total | Date  | Least Daily Total | Date   | Average Speed, mph | Departure <sup>(a)</sup> | Peak Gusts |           |        | Thunderstorms  | Heavy Fog | Precipitation ≥0.10 in. | Snowfall ≥1 in. | Maximum Temperature, °F |       | Minimum Temperature, °F |      |
|            |                        |                          |                           |                          |                      |       |                   |        |                    |                          | Speed, mph | Direction | Date   |                |           |                         |                 | ≥90°F                   | ≤32°F | ≤32°F                   | ≤0°F |
| J          | 7.6                    | -0.3                     | 84                        | -23                      | 163                  | 27    | 17                | 7      | 8.2                | +1.9                     | 57         | W         | 12     | 0              | 5         | 1                       | 0               | 0                       | 0     | 19                      | 0    |
| F          | 6.2                    | -1.3                     | 185                       | +1                       | 287                  | 25    | 48                | 7      | 6.1                | -1.0                     | 44         | SW        | 21     | 0              | 3         | 1                       | 0               | 0                       | 0     | 22                      | 0    |
| M          | 7.5                    | +0.7                     | 262                       | -58                      | 448                  | 30    | 100               | 20     | 8.9                | +0.7                     | 60         | SW        | 11     | 1              | 0         | 1                       | 1               | 0                       | 0     | 20                      | 0    |
| A          | 5.0                    | -1.4                     | 428                       | -22                      | 590                  | 23    | 197               | 9      | 9.0                | +0.2                     | 50         | WSW       | 14     | 2              | 0         | 0                       | 0               | 0                       | 0     | 7                       | 0    |
| M          | 6.1                    | +0.2                     | 482                       | -67                      | 657                  | 30    | 238               | 29     | 9.1                | +0.3                     | 52         | W         | 5      | 0              | 0         | 1                       | 0               | 0                       | 0     | 1                       | 0    |
| J          | 5.0                    | -0.2                     | 555                       | -52                      | 685                  | 19    | 288               | 28     | 9.0                | -0.1                     | 47         | NW        | 7      | 0              | 0         | 2                       | 0               | 11                      | 0     | 0                       | 0    |
| J          | 2.5                    | -0.5                     | 608                       | -22                      | 694                  | 1     | 431               | 23     | 9.3                | +0.7                     | 53         | NW        | 7      | 4              | 0         | 1                       | 0               | 24                      | 0     | 0                       | 0    |
| A          | 2.0                    | -1.3                     | 523                       | -15                      | 635                  | 2     | 405               | 4      | 8.2                | +0.2                     | 41         | NW        | 10     | 3              | 0         | 0                       | 0               | 17                      | 0     | 0                       | 0    |
| S          | 3.4                    | -0.5                     | 378                       | -26                      | 484                  | 2     | 217               | 16     | 7.6                | +0.1                     | 39         | WNW       | 15     | 0              | 0         | 0                       | 0               | 7                       | 0     | 0                       | 0    |
| O          | 2.1                    | -3.5                     | 260                       | +6                       | 351                  | 1     | 105               | 27     | 6.2                | -0.4                     | 43         | NNE       | 29     | 0              | 1         | 0                       | 0               | 0                       | 0     | 10                      | 0    |
| N          | 6.6                    | -0.9                     | 117                       | -7                       | 217                  | 1     | 19                | 30     | 5.7                | -0.6                     | 36         | SSW       | 16     | 0              | 9         | 1                       | 0               | 0                       | 4     | 14                      | 0    |
| D          | 9.0                    | +0.9                     | 39                        | -45                      | 121                  | 29    | 6                 | 11     | 5.7                | -0.3                     | 63         | SW        | 27     | 0              | 10        | 7                       | 0               | 0                       | 3     | 15                      | 0    |
| Year Total | 5.2                    | -0.7                     | 327                       | -27                      | 694                  | Jul 1 | 6                 | Dec 11 | 7.8                | +0.2                     | 63         | SW        | Dec 27 | 8              | 28        | 15                      | 1               | 59                      | 7     | 108                     | 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 2002 was warmer than normal at the Hanford Meteorology Station. The average temperature was 54.4°F, 0.8° 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 2002 was 113°F on July 13, which tied the hottest temperature ever recorded (also having occurred on August 4, 1961); the coldest was 7°F on October 31. Calendar year 2002 recorded 59 days with maximum temperatures  $\geq 90^\circ\text{F}$  compared to a normal of 52 days, a maximum of 79 days in 1967, and a minimum of 29 days in 1980. There were 16 days with maximum temperatures  $\geq 100^\circ\text{F}$  compared to a normal of 13 days, a maximum of 28 days in 1958, and a minimum of 1 day in 1954.

Eight months during the year were warmer than normal, and 4 months cooler than normal. Three months departed from normal by more than 3°, with January 5.8° above normal, December 5.5° above normal, and July 3.3° above normal. March 2002 was 3.7° below normal.

The average temperature for January 2002 was much warmer than normal, averaging 37.6°F, 5.8° 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-six days during January had above normal average temperatures.

The average temperature for February 2002 was slightly warmer than normal, averaging 38.4°F, 0.5° 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.

The 2001-2002 winter season (December 2001, January and February 2002) was warmer than normal, averaging 37.0°F, 3.2° above normal (33.8°F). The warmest winter, 1966-1967, averaged 40.6°F, while the coldest winter, 1948-1949, averaged 24.2°F.

The average temperature for March 2002 was much cooler than normal, averaging 42.4°F, 3.7° below normal (46.1°F). The warmest March occurred in 1992 and averaged 51.5°F, while the coldest, in 1955, averaged 39.3°F. Only 9 days during March 2002 had above normal average temperatures.

The average temperature for April 2002 was slightly cooler than normal, averaging 53.2°F, 0.3° below normal (53.5°F). The warmest April occurred in 1994 and averaged 58.2°F, while the coolest, in 1955, averaged 47.5°F.

The average temperature for May 2002 was cooler than normal, averaging 60.1°F, 1.7° below normal (61.8°F). The warmest May occurred in 1947 and averaged 68.7°F, while the coolest, in 1984, averaged 56.0°F.

Spring 2002 (March, April, and May) was cooler than normal, averaging 51.9°F, 1.9° below normal (53.8°F). The warmest spring, in 1992, averaged 58.2°F, while the coolest, in 1955, averaged 48.0°F.

The average temperature for June 2002 was warmer than normal, averaging 71.6°F, 2.3° 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 11 days with maximum temperatures  $\geq 90^{\circ}\text{F}$  in June, compared to a normal of 9 days; and 3 days  $\geq 100^{\circ}\text{F}$ , compared to a normal of 2.

The average temperature for July 2002 was much warmer than normal, averaging 79.6°F, 3.3° above normal (76.3°F). The warmest July occurred in 1985 and averaged 82.2°F, while the coolest, in 1993, averaged 70.5°F. The high temperatures for July 11-13 were the 3 hottest consecutive days ever recorded at the Hanford Meteorological Station. The high temperature of 113°F on July 13 established an all-time high temperature for July, and tied the all-time high temperature at the Hanford Meteorology Station. August 4, 1961 also reached 113°F. There were 24 days with maximum temperatures  $\geq 90^{\circ}\text{F}$  in July, compared to a normal of 19 days; and 11 days  $\geq 100^{\circ}\text{F}$ , compared to a normal of 6.

The average temperature for August 2002 was very nearly normal, averaging 75.5°F, 0.1° 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 17 days with maximum temperatures  $\geq 90^{\circ}\text{F}$  in August, which is normal, and 2 days  $\geq 100^{\circ}\text{F}$ , compared to a normal of 5.

The 2002 summer season (June, July, and August) was warmer than normal, averaging 75.7°F, 2.0° above normal (73.7°F). The warmest summer (1958) averaged 78.2°F, while the coolest, in 1980, averaged 70.2°F. The summer's warmest temperature was 113°F on July 13. This was a record high maximum for the month of July and tied the all-time maximum temperature for Hanford (previously recorded on August 4, 1961).

The average temperature for September 2002 was slightly above normal, averaging 66.3°F, 0.4° 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 7 days with maximum temperatures  $\geq 90^{\circ}\text{F}$  in September, which was 2 above normal. The yearly total was 59, compared to a normal of 52. The annual total of days  $\geq 100^{\circ}\text{F}$  was 16, compared to a normal of 13.

The average temperature for October 2002 was colder than normal, averaging 50.4°F, 2.6° below normal (53.0°F). The warmest October occurred in 1988 and averaged 59.6°F, while the coldest, in 1984, averaged 47.9°F. The period from October 23-31 averaged 9.1° below normal, including the coldest minimum temperature (7°F recorded on October 31) ever recorded in the month of October. The difference between the month's highest temperature (81°F on October 6) and the minimum mentioned above was 74°, the largest monthly October temperature range ever recorded. The previous largest range for October was 72° in 1971. The greatest monthly range ever recorded for any month was 86° in February 1950 (-23°F to +63°F).

The average temperature for November 2002 was slightly warmer than normal, averaging 41.0°F, 0.9° above 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 month was much cooler than normal during the first and last six days, and much warmer than normal during the middle of the month.

Autumn 2002 (September, October, and November) was slightly cooler than normal, averaging 52.6°F, 0.4° below 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 2002 was much warmer than normal, averaging 37.2°F, 5.5° 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. Except for the first 4 days of the month, every other day had average temperatures that were normal or above normal.

Table 2.2 lists the daily temperature records for 2002 along with the previous record and year of occurrence. Table 2.1 lists the monthly and annual totals for numerous meteorological variables for 2002. Table 2.3 lists the 2002 monthly and seasonal temperature and precipitation compared to normals and extremes. Table 2.4, Table 2.5, and Table 2.6 list the 2002 monthly and annual average temperature, precipitation, and wind speed, respectively, from the Hanford Meteorological Monitoring Network.

Figure 2.1 depicts the 2002 observed daily maximum and minimum temperatures and the normal maximum, minimum, and mean daily temperatures for the Hanford Meteorology Station.

**Table 2.2. 2002 Daily Temperature Records (previous record and year of occurrence in parentheses)**

| Date   | Maximum (°F)                   |  | Minimum (°F)                  |                               |
|--------|--------------------------------|--|-------------------------------|-------------------------------|
|        | High                           | Low  | High                          | Low                           |
| Jan 7  | 63 <sup>(a)</sup> (63, 1962)   |  |                               |                               |
| Jan 8  | 59 (56, 1983 <sup>[b]</sup> )  |  |                               |                               |
| Jan 24 |                                |  | 45 (43, 1958)                 |                               |
| Feb 22 | 66 (62, 1995 <sup>[b]</sup> )  |  | 44 (42, 1999 <sup>[b]</sup> ) |                               |
| Mar 8  |                                |  |                               | 20 <sup>(a)</sup> (20, 1976)  |
| Mar 11 |                                |  | 44 <sup>(a)</sup> (44, 1995)  |                               |
| Mar 20 |                                | 38 (49, 1950)                                |                               |                               |
| Jun 26 | 104 (103, 1987)                |  |                               |                               |
| Jul 11 | 109 <sup>(a)</sup> (109, 1990) |  |                               |                               |
| Jul 12 | 112 (110, 1990)                |  |                               |                               |
| Jul 13 | 113 <sup>(c)</sup> (108, 1961) |  | 80 (73, 1990 <sup>[b]</sup> ) |                               |
| Aug 4  |                                | 78 <sup>(b)</sup> (78, 1964 <sup>[b]</sup> ) |                               |                               |
| Aug 5  |                                | 78 (80, 1996 <sup>[b]</sup> )                |                               |                               |
| Sep 12 | 96 <sup>(a)</sup> (96, 1969)   |  |                               |                               |
| Oct 12 |                                |  |                               | 29 (34, 1985 <sup>[b]</sup> ) |
| Oct 24 |                                |  |                               | 24 (26, 1975)                 |
| Oct 25 |                                |  |                               | 23 (26, 1978)                 |
| Oct 30 |                                |  |                               | 16 (20, 1972)                 |
| Oct 31 |                                |  |                               | 7 <sup>(d)</sup> (12, 1984)   |
| Nov 1  |                                |  |                               | 11 (20, 1995)                 |
| Nov 2  |                                |  |                               | 11 (17, 1995)                 |
| Nov 3  |                                |  |                               | 14 (17, 1995)                 |
| Nov 4  |                                |  |                               | 15 (16, 1973)                 |
| Nov 19 | 67 <sup>(a)</sup> (67, 1962)   |  | 47 (44, 1954)                 |                               |

(a) Ties record.

(b) Most recent of several occurrences.

(c) All-time record for July (previous record 112°F on July 27, 1998), ties all-time record for any month (also recorded on August 4, 1961).

(d) All-time record low for October (previous record 12°F on October 31, 1984).

**Table 2.3. 2002 Monthly and Seasonal Temperature and Precipitation**

| Month/<br>Season          | Average<br>Temperature,<br>°F | Departure <sup>(a)</sup> | Normal,<br>°F | Warmest<br>of Record,<br>°F | Year                | Coolest of<br>Record, °F | Year    | Precipitation,<br>in. | Percent<br>of<br>Normal | Normal | Wettest of<br>Record, in. | Year    | Driest of<br>Record,<br>in. | Year                |
|---------------------------|-------------------------------|--------------------------|---------------|-----------------------------|---------------------|--------------------------|---------|-----------------------|-------------------------|--------|---------------------------|---------|-----------------------------|---------------------|
| Jan                       | 37.6                          | +5.8                     | 31.8          | 42.5                        | 1953                | 12.1                     | 1950    | 0.42                  | 48                      | 0.87   | 2.47                      | 1970    | 0.08                        | 1977                |
| Feb                       | 38.4                          | +0.5                     | 37.9          | 44.5                        | 1958                | 25.6                     | 1956    | 0.67                  | 98                      | 0.68   | 2.10                      | 1961    | T                           | 1988 <sup>(b)</sup> |
| Mar                       | 42.4                          | -3.7                     | 46.1          | 51.5                        | 1992                | 39.4                     | 1955    | 0.19                  | 33                      | 0.58   | 1.86                      | 1957    | 0.02                        | 1968                |
| Apr                       | 53.2                          | -0.3                     | 53.5          | 58.2                        | 1994                | 47.5                     | 1955    | 0.29                  | 66                      | 0.44   | 1.54                      | 1995    | T                           | 1999 <sup>(b)</sup> |
| May                       | 60.1                          | -1.7                     | 61.8          | 68.7                        | 1947                | 56.0                     | 1984    | 0.16                  | 29                      | 0.55   | 2.03                      | 1972    | T                           | 1992 <sup>(b)</sup> |
| Jun                       | 71.6                          | +2.3                     | 69.3          | 76.8                        | 1992                | 63.0                     | 1953    | 0.65                  | 158                     | 0.41   | 2.92                      | 1950    | T                           | 1986 <sup>(b)</sup> |
| Jul                       | 79.6                          | +3.3                     | 76.3          | 82.2                        | 1985                | 70.5                     | 1993    | 0.16                  | 59                      | 0.27   | 1.76                      | 1993    | T                           | 1980 <sup>(b)</sup> |
| Aug                       | 75.5                          | +0.1                     | 75.4          | 81.5                        | 1967                | 69.8                     | 1964    | 0.01                  | 4                       | 0.27   | 1.36                      | 1977    | 0                           | 1988 <sup>(b)</sup> |
| Sep                       | 66.3                          | +0.4                     | 65.9          | 72.4                        | 1990                | 58.8                     | 1985    | T                     | 0                       | 0.33   | 1.34                      | 1947    | 0                           | 1999 <sup>(b)</sup> |
| Oct                       | 50.4                          | -2.6                     | 53.0          | 59.6                        | 1988                | 47.9                     | 1984    | 0.12                  | 24                      | 0.49   | 2.72                      | 1957    | T                           | 1987 <sup>(b)</sup> |
| Nov                       | 41.0                          | +0.9                     | 40.1          | 46.5                        | 1990                | 24.8                     | 1985    | 0.38                  | 39                      | 0.98   | 2.67                      | 1996    | T                           | 1976                |
| Dec                       | 37.2                          | +5.5                     | 31.7          | 38.5                        | 1957                | 21.0                     | 1985    | 2.36                  | 213                     | 1.11   | 3.69                      | 1996    | 0.07                        | 1999                |
| Winter <sup>(c)</sup>     | 37.0                          | +3.2                     | 33.8          | 40.6                        | 1966-67             | 24.2                     | 1948-49 | 1.89                  | 71                      | 2.66   | 5.45                      | 1996-97 | 0.70                        | 1946-47             |
| Spring                    | 51.9                          | -1.9                     | 53.8          | 58.2                        | 1992                | 48.0                     | 1955    | 0.64                  | 40                      | 1.58   | 3.28                      | 1995    | 0.09                        | 1968                |
| Summer                    | 75.7                          | +2.0                     | 73.7          | 78.2                        | 1958                | 70.2                     | 1980    | 0.82                  | 86                      | 0.95   | 2.99                      | 1950    | 0.03                        | 1973                |
| Autumn                    | 52.6                          | -0.4                     | 53.0          | 57.1                        | 1990                | 44.5                     | 1985    | 0.50                  | 28                      | 1.80   | 4.79                      | 1973    | 0.04                        | 1976                |
| Calendar<br>Year<br>Total | 54.4                          | +0.8                     | 53.6          | 56.4                        | 1998 <sup>(b)</sup> | 49.6                     | 1985    | 5.41                  | 78                      | 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 2001, January and February 2002.

T = Trace.

**Table 2.4. 2002 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  | 38.2 | 37.9 | 42.6 | 53.1 | 59.9 | 71.2 | 79.1 | 74.6 | 64.8 | 47.9 | 40.8 | 37.8 | 54.2   |
| 2 EOC   | 38.3 | 39.6 | 42.4 | 52.6 | 58.3 | 70.6 | 78.8 | 74.9 | 66.7 | 51.3 | 41.5 | 38.3 | 54.5   |
| 3 ARMY  | 38.7 | 38.8 | 42.8 | 53.9 | 60.6 | 70.7 | 80.2 | 76.1 | 66.3 | 49.6 | 40.6 | 38.0 | 54.8   |
| 4 RSPG  | 38.5 | 38.2 | 42.4 | 52.9 | 59.7 | 70.8 | 78.8 | 74.9 | 65.5 | 49.0 | 39.9 | 37.4 | 54.1   |
| 5 EDNA  | 37.5 | 37.5 | 41.7 | 52.5 | 59.7 | 71.0 | 78.9 | 74.3 | 64.8 | 48.2 | 39.4 | 37.8 | 53.7   |
| 6 200E  | 38.7 | 39.7 | 43.2 | 54.5 | 61.0 | 72.1 | 80.4 | 76.4 | 67.4 | 51.7 | 41.5 | 37.9 | 55.5   |
| 7 200W  | 38.1 | 37.9 | 42.4 | 53.5 | 60.2 | 71.1 | 79.3 | 75.3 | 65.5 | 48.3 | 39.3 | 37.3 | 54.1   |
| 8 BVLY  | 38.2 | 39.4 | 42.1 | 53.6 | 60.3 | 70.2 | 77.4 | 74.3 | 65.0 | 49.9 | 41.4 | 38.1 | 54.2   |
| 9 FFTF  | 38.3 | 38.8 | 42.6 | 53.5 | 59.8 | 70.9 | 79.1 | 74.6 | 65.9 | 49.9 | 40.7 | 37.6 | 54.2   |
| 10 YAKB | 37.9 | 38.7 | 42.1 | 53.3 | 60.3 | 71.5 | 82.2 | 76.0 | 66.7 | 50.5 | 40.4 | 37.1 | 54.3   |
| 11 300A | 38.7 | 38.5 | 43.3 | 53.4 | 59.9 | 70.7 | 78.4 | 74.1 | 64.8 | 48.9 | 40.5 | 38.6 | 54.2   |
| 12 WYEB | 38.1 | 38.6 | 42.8 | 53.6 | 60.3 | 71.5 | 79.7 | 75.4 | 65.9 | 49.9 | 40.6 | 37.7 | 54.6   |
| 13 100N | 37.6 | 37.8 | 41.5 | 52.4 | 59.7 | 70.3 | 78.2 | 74.4 | 65.1 | 49.6 | 40.2 | 37.7 | 53.8   |
| 14 WPPS | 37.8 | 37.5 | 42.3 | 52.7 | 59.7 | 71.0 | 78.9 | 74.8 | 65.2 | 48.7 | 40.1 | 37.9 | 54.0   |
| 15 FRNK | 37.7 | 38.6 | 42.1 | 52.5 | 58.0 | 67.9 | 74.6 | 70.9 | 62.9 | 49.0 | 40.5 | 37.2 | 52.7   |
| 16 GABL | 38.2 | 39.7 | 42.1 | 53.1 | 59.3 | 70.3 | 78.8 | 75.1 | 67.0 | 52.5 | 41.7 | 37.1 | 54.7   |
| 17 RING | 37.8 | 37.8 | 42.0 | 52.1 | 58.4 | 68.6 | 75.3 | 70.8 | 62.5 | 47.2 | 39.9 | 38.1 | 52.6   |
| 18 RICH | 40.0 | 39.8 | 44.3 | 54.4 | 60.4 | 71.2 | 78.8 | 74.6 | 65.9 | 50.4 | 41.9 | 39.0 | 55.1   |
| 19 PFP  | 38.2 | 38.6 | 42.5 | 53.7 | 60.4 | 71.4 | 79.6 | 75.8 | 66.5 | 50.4 | 40.4 | 37.2 | 54.7   |
| 20 RMTN | 30.2 | 32.5 | 32.5 | 43.0 | 49.0 | 60.5 | 69.8 | 65.9 | 59.0 | 45.6 | 37.7 | 30.6 | 46.4   |
| 21 HMS  | 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   |
| 22 PASC | 39.1 | 38.8 | 43.9 | 54.2 | 60.6 | 71.3 | 78.7 | 74.1 | 65.0 | 49.0 | 41.2 | 39.2 | 54.7   |
| 23 GABW | 37.1 | 37.3 | 41.3 | 52.2 | 59.6 | 70.7 | 78.9 | 74.6 | 64.6 | 47.6 | 38.8 | 37.0 | 53.4   |
| 24 100F | 37.7 | 37.6 | 41.7 | 52.6 | 60.0 | 71.0 | 78.8 | 74.6 | 65.0 | 48.5 | 39.6 | 37.7 | 53.8   |
| 25 VERN | 39.0 | 39.6 | 42.6 | 53.8 | 60.8 | 71.1 | 79.2 | 76.0 | 67.1 | 51.1 | 41.3 | 38.7 | 55.1   |
| 26 BENT | 37.5 | 39.1 | 42.1 | 52.6 | 58.5 | 68.6 | 76.5 | 72.1 | 64.1 | 50.1 | 40.2 | 37.7 | 53.4   |
| 27 VSTA | 39.9 | 40.1 | 44.4 | 54.7 | 57.2 | 70.0 | 76.3 | 74.9 | 66.1 | 50.8 | 42.4 | 39.8 | 54.7   |
| 28 SURF | 39.3 | 40.1 | 43.1 | 52.9 | 60.0 | 70.3 | 78.1 | 74.2 | 66.4 | 51.3 | 41.7 | 39.7 | 54.8   |
| 29 100K | 37.9 | 38.3 | 41.9 | 52.8 | 60.3 | 71.1 | 79.2 | 75.1 | 65.5 | 49.4 | 40.2 | 37.8 | 54.2   |
| 30 HAMR | 39.1 | 38.9 | 43.7 | 53.8 | 60.1 | 70.8 | 78.6 | 74.5 | 65.3 | 49.6 | 40.9 | 38.4 | 54.6   |

**Table 2.5. 2002 Monthly and Annual Precipitation (inches) from the Hanford Meteorological Monitoring Network<sup>(a)</sup>**

| Station | Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  | Annual |
|---------|------|------|------|------|------|------|------|------|------|------|------|------|--------|
| 1 PROS  | 0.33 | 0.60 | 0.13 | 0.23 | 0.12 | 0.60 | 0.04 | 0.00 | 0.00 | 0.01 | 0.15 | 1.88 | 4.09   |
| 2 EOC   | 0.73 | 0.98 | 0.16 | 0.45 | 0.11 | 0.72 | 0.06 | 0.00 | 0.03 | 0.20 | 0.39 | 2.76 | 6.59   |
| 3 ARMY  | (b)  | (b)  | (b)  | 0.06 | 0.27 | 0.60 | 0.19 | 0.00 | 0.03 | 0.06 | 0.21 | 1.03 | (c)    |
| 4 RSPG  | 0.56 | 0.73 | 0.21 | 0.53 | 0.23 | 0.50 | 0.23 | 0.00 | 0.04 | 0.02 | 0.18 | 2.09 | 5.32   |
| 6 200E  | 0.41 | 0.69 | 0.17 | 0.25 | 0.20 | 0.70 | 0.17 | 0.01 | 0.00 | 0.11 | 0.35 | 1.74 | 4.80   |
| 7 200W  | 0.39 | 0.50 | 0.04 | 0.29 | 0.19 | 0.36 | 0.27 | 0.00 | 0.00 | 0.12 | 0.30 | 1.98 | 4.44   |
| 8 BVLY  | 0.31 | 0.48 | 0.02 | 0.60 | 0.25 | 0.55 | 0.13 | 0.00 | 0.00 | 0.16 | 0.23 | 1.74 | 4.47   |
| 9 FFTF  | 0.07 | 0.38 | 0.10 | 0.13 | 0.15 | 0.47 | 0.00 | 0.00 | 0.00 | 0.01 | 0.16 | 1.24 | 2.71   |
| 10 YAKB | 0.39 | 0.75 | 0.06 | 0.39 | 0.20 | 0.42 | 0.18 | 0.05 | 0.02 | 0.16 | 0.23 | 2.07 | 4.92   |
| 11 300A | 0.26 | 0.71 | 0.15 | 0.23 | 0.20 | 0.72 | 0.17 | 0.00 | 0.01 | 0.01 | 0.16 | 1.79 | 4.41   |
| 12 WYEB | 0.35 | 0.49 | 0.14 | 0.15 | 0.12 | 0.47 | 0.01 | 0.00 | 0.02 | 0.06 | 0.26 | 1.89 | 3.96   |
| 13 100N | 0.36 | 0.48 | 0.20 | 0.41 | 0.12 | 0.52 | 0.12 | 0.05 | 0.00 | 0.06 | 0.27 | 1.64 | 4.23   |
| 14 WPPS | 0.35 | 0.47 | 0.03 | 0.20 | 0.23 | 0.74 | 0.03 | 0.02 | 0.03 | 0.06 | 0.30 | 1.28 | 3.74   |
| 17 RING | 0.34 | 0.37 | 0.36 | 0.19 | 0.18 | 0.75 | 0.09 | 0.01 | 0.02 | 0.07 | 0.43 | 1.93 | 4.74   |
| 18 RICH | 0.20 | 0.86 | 0.13 | 0.27 | 0.09 | 0.62 | 0.07 | 0.03 | 0.00 | 0.05 | 0.16 | 1.47 | 3.95   |
| 20 RMTN | 0.69 | 0.42 | 0.22 | 0.36 | 0.26 | 0.90 | 0.22 | 0.02 | 0.01 | 0.16 | 0.32 | 1.90 | 5.48   |
| 21 HMS  | 0.42 | 0.67 | 0.19 | 0.29 | 0.16 | 0.65 | 0.16 | 0.01 | 0.00 | 0.12 | 0.38 | 2.36 | 5.41   |
| 22 PASC | 0.29 | 0.83 | 0.32 | 0.32 | 0.22 | 0.95 | 0.21 | 0.19 | 0.01 | 0.15 | 0.31 | 1.89 | 5.69   |
| 24 100F | 0.47 | 0.37 | 0.22 | 0.36 | 0.31 | 0.66 | 0.03 | 0.04 | 0.00 | 0.06 | 0.35 | 2.19 | 5.06   |
| 26 BENT | 0.57 | 0.79 | 0.03 | 0.17 | 0.38 | 0.73 | 0.08 | 0.01 | 0.05 | 0.04 | 0.32 | 2.86 | 6.03   |
| 27 VSTA | 0.27 | 0.82 | 0.22 | 0.11 | 0.18 | 0.48 | 0.23 | 0.08 | 0.00 | 0.07 | 0.04 | 1.78 | 4.28   |
| 28 SURF | 0.68 | 0.72 | 0.64 | 0.46 | 0.38 | 0.47 | 0.04 | 0.00 | 0.00 | 0.20 | 0.37 | 2.92 | 6.88   |
| 29 100K | 0.47 | 0.59 | 0.26 | 0.35 | 0.15 | 0.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 1.57 | 4.15   |

(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) Missing data.

(c) Incomplete data.

**Table 2.6. 2002 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  | 9.0  | 6.6  | 9.4  | 8.3  | 7.5  | 8.4  | 7.8  | 7.1  | 6.4  | 5.5  | 6.2  | 6.3  | 7.4    |
| 2 EOC   | 13.2 | 8.8  | 12.2 | 10.4 | 9.0  | 9.0  | 8.3  | 7.9  | 7.9  | 6.8  | 8.7  | 7.4  | 9.2    |
| 3 ARMY  | 8.4  | 6.7  | 8.6  | 8.2  | 8.0  | 7.9  | 7.7  | 7.1  | 6.7  | 5.1  | 5.0  | 5.2  | 7.1    |
| 4 RSPG  | 8.7  | 7.6  | 8.8  | 9.2  | 8.5  | 8.4  | 8.1  | 7.7  | 7.8  | 7.5  | 6.8  | 4.7  | 7.8    |
| 5 EDNA  | 6.4  | 5.8  | 7.6  | 7.4  | 7.3  | 7.7  | 7.6  | 6.7  | 6.1  | 4.9  | 4.5  | 5.0  | 6.4    |
| 6 200E  | 7.9  | 7.2  | 9.0  | 8.7  | 9.1  | 8.4  | 9.3  | 8.3  | 7.6  | 6.1  | 4.7  | 5.0  | 7.6    |
| 7 200W  | 8.0  | 5.9  | 8.3  | 8.2  | 8.2  | 7.9  | 7.7  | 7.0  | 6.3  | 4.6  | 4.2  | 4.2  | 6.7    |
| 8 BVLY  | 5.2  | 6.1  | 7.3  | 7.2  | 7.4  | 7.1  | 7.6  | 6.2  | 5.5  | 4.7  | 3.9  | 4.6  | 6.1    |
| 9 FFTF  | 9.6  | 7.6  | 10.0 | 9.0  | 8.2  | 9.0  | 8.2  | 8.0  | 7.3  | 6.4  | 6.6  | 6.5  | 8.0    |
| 10 YAKB | 8.3  | 6.9  | 9.0  | 9.0  | 9.5  | 9.4  | 10.0 | 8.7  | 7.9  | 6.3  | 5.4  | 5.1  | 8.0    |
| 11 300A | 9.4  | 7.1  | 9.5  | 8.7  | 8.0  | 8.5  | 8.0  | 7.2  | 6.6  | 5.3  | 6.3  | 6.3  | 7.6    |
| 12 WYEB | 8.1  | 6.9  | 8.7  | 8.1  | 8.0  | 8.5  | 8.1  | 7.3  | 6.9  | 6.1  | 5.5  | 5.8  | 7.3    |
| 13 100N | 5.7  | 5.2  | 7.1  | 7.5  | 7.8  | 7.8  | 7.6  | 6.7  | 6.0  | 4.5  | 3.7  | 4.5  | 6.2    |
| 14 WPPS | 8.0  | 6.3  | 8.7  | 7.8  | 7.4  | 8.0  | 7.4  | 7.1  | 6.3  | 5.3  | 5.3  | 5.7  | 6.9    |
| 15 FRNK | 8.8  | 7.2  | 9.0  | 7.7  | 6.6  | 6.9  | 6.5  | 6.1  | 5.6  | 4.8  | 5.8  | 5.7  | 6.7    |
| 16 GABL | 11.7 | 10.6 | 13.3 | 12.6 | 12.5 | 12.7 | 12.9 | 11.9 | 10.9 | 9.0  | 7.5  | 7.9  | 11.1   |
| 17 RING | 7.1  | 6.1  | 8.4  | 7.4  | 6.9  | 7.1  | 6.5  | 5.5  | 5.6  | 5.3  | 5.1  | 5.0  | 6.3    |
| 18 RICH | 8.1  | 5.6  | 8.8  | 7.6  | 6.6  | 6.9  | 6.2  | 5.6  | 5.1  | 4.1  | 5.3  | 5.1  | 6.3    |
| 19 PFP  | 5.9  | 4.6  | 6.4  | 6.3  | 6.1  | 6.0  | 5.7  | 5.1  | 4.8  | 3.6  | 3.3  | 3.4  | 5.1    |
| 20 RMTN | 25.3 | 19.7 | 23.1 | 19.4 | 16.7 | 17.7 | 14.2 | 14.3 | 15.3 | 14.5 | 16.6 | 18.0 | 17.9   |
| 21 HMS  | 8.2  | 6.1  | 8.9  | 9.0  | 9.1  | 9.0  | 9.3  | 8.2  | 7.6  | 6.2  | 5.7  | 5.7  | 7.8    |
| 22 PASC | 6.8  | 4.8  | 7.6  | 6.4  | 5.6  | 6.0  | 5.3  | 4.4  | 4.3  | 3.4  | 4.5  | 4.4  | 5.3    |
| 23 GABW | 6.3  | 6.0  | 7.2  | 7.3  | 8.1  | 8.3  | 8.4  | 7.3  | 6.5  | 5.0  | 3.9  | 4.4  | 6.6    |
| 24 100F | 6.3  | 5.5  | 7.2  | 7.1  | 7.5  | 7.7  | 7.2  | 6.4  | 5.9  | 4.8  | 3.9  | 4.0  | 6.1    |
| 25 VERN | 7.0  | 6.9  | 7.9  | 8.2  | 9.3  | 9.4  | 10.3 | 8.5  | 7.5  | 6.1  | 4.5  | 5.6  | 7.6    |
| 26 BENT | 7.7  | 6.8  | 8.7  | 8.2  | 6.3  | 6.8  | 6.1  | 5.9  | 5.8  | 6.0  | 5.3  | 4.8  | 6.5    |
| 27 VSTA | 7.8  | 5.4  | 8.4  | 7.2  | 6.2  | 6.7  | 5.8  | 5.0  | 5.0  | 3.9  | 5.1  | 4.8  | 5.9    |
| 28 SURF | 9.9  | 7.6  | 11.9 | 11.8 | 11.7 | 12.8 | 12.9 | 11.1 | 9.5  | 7.8  | 5.7  | 6.1  | 9.9    |
| 29 100K | 5.7  | 5.4  | 7.0  | 7.2  | 8.2  | 8.0  | 8.5  | 7.0  | 6.1  | 4.7  | 3.6  | 4.0  | 6.3    |
| 30 HAMR | 8.5  | 6.4  | 8.9  | 8.1  | 7.3  | 7.8  | 7.1  | 6.7  | 6.1  | 5.1  | 6.0  | 5.7  | 7.0    |

## Daily Temperatures - 2002 Hanford Meteorological Station

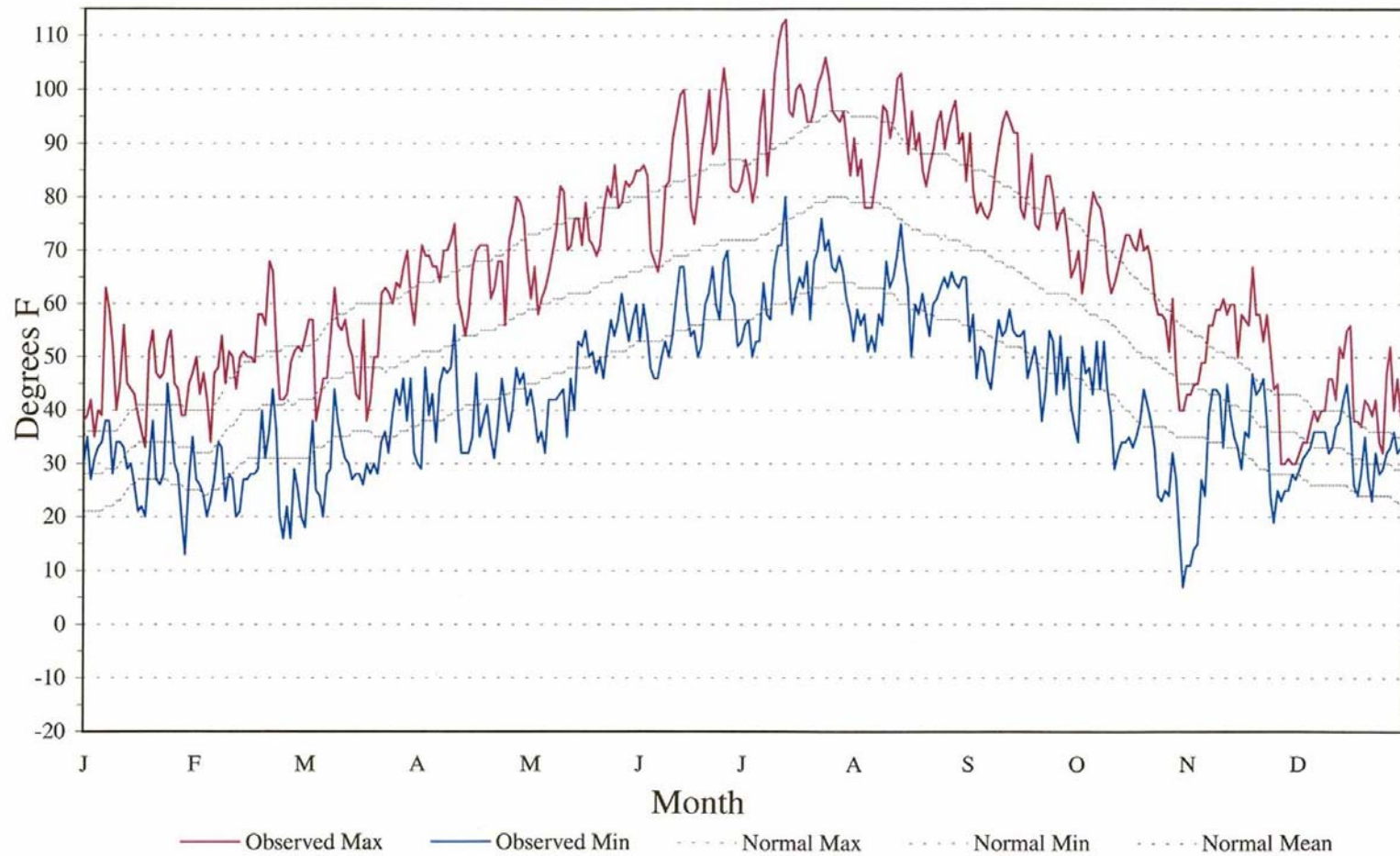


Figure 2.1. 2002 Observed Daily Temperatures from the Hanford Meteorology Station



## **2.2 Precipitation**

Precipitation for 2002 totaled 5.41 inches, 78% 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 only 2.8 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 2002 was 0.42 inch, 48% of normal (0.87 inch). The wettest January, in 1970, received 2.47 inches, while the driest, in 1977, received only 0.08 inch. Snowfall for January totaled 0.6 inch, compared to a normal of 4.2 inches. The greatest snowfall total for January was 23.4 inches in 1950, while January 1994 received no snow. Total snowfall for the 2001-2002 snow season (through January) was 9.1 inches, compared to a normal (through January) of 12.4 inches.

Precipitation for February 2002 was 0.67 inch, 98% of normal (0.68 inch). The wettest February, in 1961, received 2.10 inches, while the driest, in 1988 and earlier years, received only a trace. Snowfall for February totaled 0.2 inch, compared to a normal of 2.6 inches. The greatest snowfall total for February was 17.0 inches in 1989, while many February's (as recently as 1991) have not received snow. Total snowfall for the 2001-2002 snow season (through February) is 9.3 inches, compared to a normal (through February) of 15.0 inches.

Precipitation for the 2001-2002 winter season (December 2001, January, and February 2002) totaled 1.89 inches, 71% of normal (2.66 inches). The wettest winter, 1996-1997, received 5.45 inches, while the driest, 1946-1947, received 0.70 inch.

Precipitation for March 2002 was 0.19 inch, 33% of normal (0.58 inch). The wettest March, in 1957, received 1.86 inches, while the driest, in 1968, received 0.02 inch. Snowfall for March totaled 1.4 inches, compared to a normal of 0.4 inch. The greatest snowfall total for March was 4.2 inches in 1951, while March frequently receives no snowfall. Total snowfall for the 2001-2002 snow season was 10.7 inches, compared to a normal of 15.4 inches. The most snowfall in a season was 56.1 inches (1992-1993), while the least was 0.3 inch (1957-1958).

Precipitation for April 2002 was 0.29 inch, 66% of normal (0.44 inch). The wettest April, in 1995, received 1.54 inches, while the driest, in 1999 and earlier years, received only a trace amount. No snowfall was recorded in April. The greatest snowfall total for any April was 1.0 inch in 1982, while April usually receives no snowfall. Total snowfall for the 2001-2002 snow season was 10.7 inches, compared to a normal of 15.4 inches. The most snowfall in a season was 56.1 inches (1992-1993), while the least was 0.3 inch (1957-1958).

Precipitation for May 2002 was 0.16 inch, 29% of normal (0.55 inch). The wettest May, in 1972, received 2.03 inches, while the driest, in 1992 and earlier years, received only a trace amount.

Precipitation for the 2002 spring season (March, April, and May) totaled 0.64 inch, 40% of normal (1.58 inches). The wettest spring (1955) received 3.28 inches, while the driest (1968) received only 0.09 inch.

Precipitation for June 2002 was 0.65 inch, 158% of normal (0.41 inch). The wettest June, in 1950, received 2.92 inches, while the driest, in 1986 and earlier years, received only a trace amount.

Precipitation for July 2002 was 0.16 inch, 59% of normal (0.27 inch). The wettest July, in 1993, received 1.76 inches, while the driest, in 1980 and earlier years, received only a trace amount.

Precipitation for August 2002 was 0.01 inch, 4% of normal (0.27 inch). The wettest August, in 1977, received 1.36 inches, while the driest, in 1988 and earlier years, received no precipitation.

Precipitation for the 2002 summer season (June, July, and August) totaled 0.82 inch, 86% of normal (0.95 inch). The wettest summer (1950) received 2.99 inches, while the driest (1973) received only 0.03 inch.

Precipitation for September 2002 was only a trace, 0% of normal (0.33 inch). The wettest September, in 1947, received 1.34 inches, while the driest, in 1999 and earlier years, received no precipitation.

Precipitation for October 2002 was 0.12 inch, 24% of normal (0.49 inch). The wettest October, in 1957, received 2.72 inches, while the driest, in 1987 and earlier years, received only a trace.

Precipitation for November 2002 was 0.38 inch, 39% of normal (0.98 inch). The wettest November, in 1996, received 2.67 inches, while the driest, in 1976, received only a trace. There was a trace of snow recorded in November, compared to a November normal of 2.3 inches.

Precipitation for the 2002 autumn season (September, October, and November) totaled 0.50 inch, 28% 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 2002 was 2.36 inches, 213% of normal (1.11 inches). This was the second wettest December on record. The wettest, in 1996, received 3.69 inches, while the driest, in 1976, received 0.11 inch. Snowfall for December 2002 totaled 0.6 inch, compared to a normal of 5.8 inches. Total snow season snowfall is only 0.6 inch, compared to a normal through December of 8.2 inches.

## **2.3 Wind**

The average wind speed for 2002 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 2002 was 63 mph on December 27.

The average wind speed for January 2002 was 8.2 mph, 1.9 mph above normal (6.3 mph). The windiest January on record averaged 10.2 mph (1972), while the January with the lightest winds (1985) averaged 2.9 mph. The peak gust for the month was 57 mph on January 12. The record wind gust for January was 80 mph in 1972.

The average wind speed for February 2002 was 7.2 mph, nearly 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 44 mph on February 21. The record wind gust for February was 65 mph in 1971.

The average wind speed for March 2002 was 8.9 mph, 0.9 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 60 mph on March 11. The record wind gust for March was 70 mph in 1956.

The average wind speed for April 2002 was 9.0 mph, 0.2 mph above normal (8.8 mph). The windiest April on record averaged 11.1 mph (1972), while the April with the lightest winds (1989 and earlier years) averaged 7.4 mph. The peak gust for the month was 50 mph on April 14. The record wind gust for April was 73 mph in 1972.

The average wind speed for May 2002 was 9.1 mph, 0.2 mph above normal (8.9 mph). May 2002 established new records for numbers of days with peak gusts  $\geq 35$  mph with 13 (the previous record was 10 in 2000 and earlier years), and days with peak gusts  $\geq 40$  mph with 7 (the previous record was 6 in 2000 and earlier years). 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 52 mph on May 5. The record wind gust for May was 71 mph in 1948.

The average wind speed for June 2002 was 9.0 mph, which is normal (9.0 mph). The windiest June on record averaged 10.7 mph (1983 and earlier years), while the June with the lightest winds (1950 and earlier years) averaged 7.7 mph. The peak gust for the month was 47 mph on June 7. The record wind gust for June was 72 mph in 1957.

The average wind speed for July 2002 was 9.3 mph, 0.7 mph above 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 53 mph on July 7. The record wind gust for July was 69 mph in 1979.

The average wind speed for August 2002 was 8.2 mph, 0.2 mph above 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 41 mph on August 10. The record wind gust for August was 66 mph in 1961.

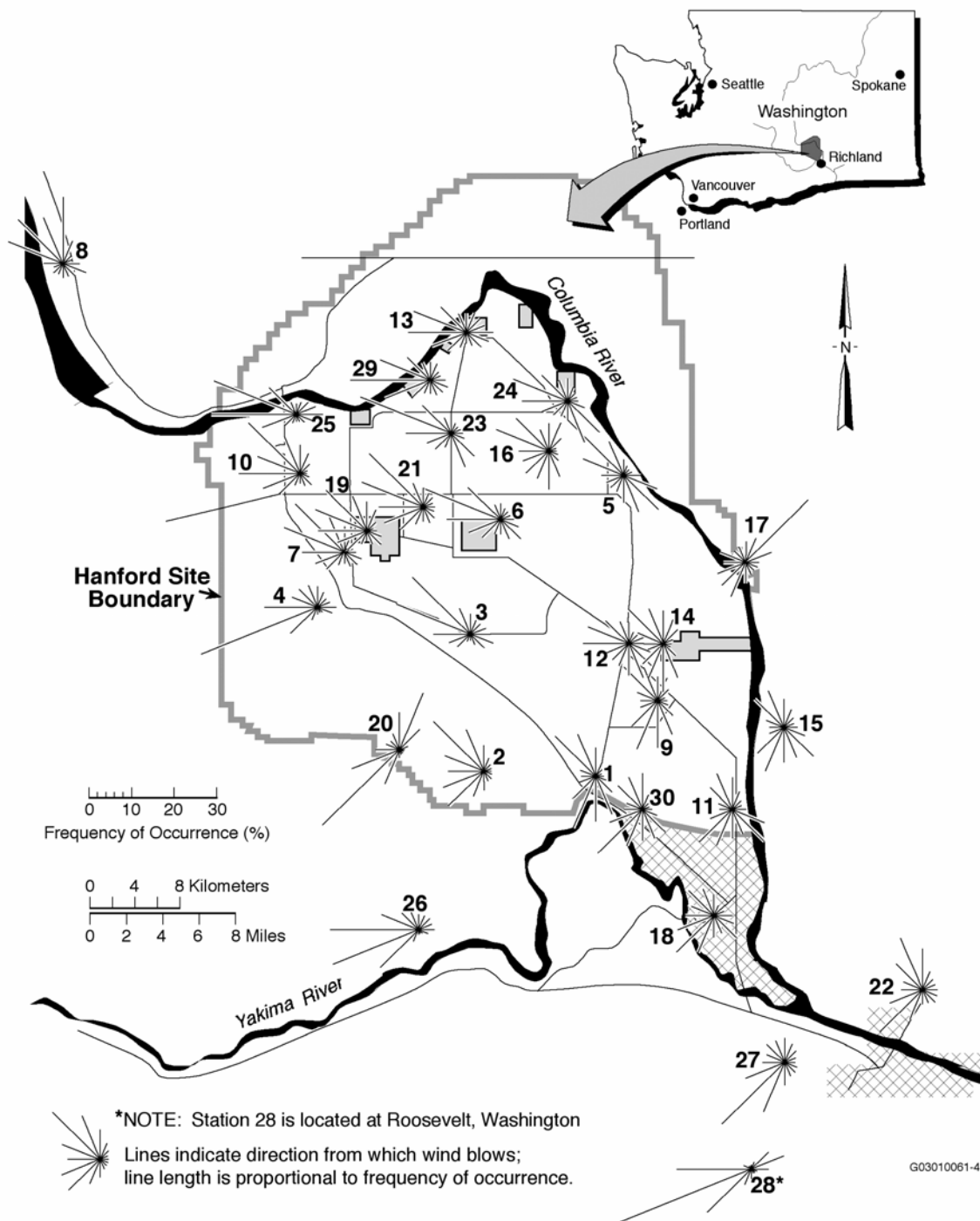
The average wind speed for September 2002 was 7.6 miles per hour (mph), 0.3 mph above normal (7.3 mph). The windiest September on record averaged 9.2 mph (1961), while the September with the lightest winds (1957) averaged 5.4 mph. The peak gust for the month was 39 mph on September 15. The record wind gust for September was 65 mph in 1953.

The average wind speed for October 2002 was 6.2 mph, 0.3 mph below 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 43 mph on October 29. The record wind gust for October was 72 mph in 1997.

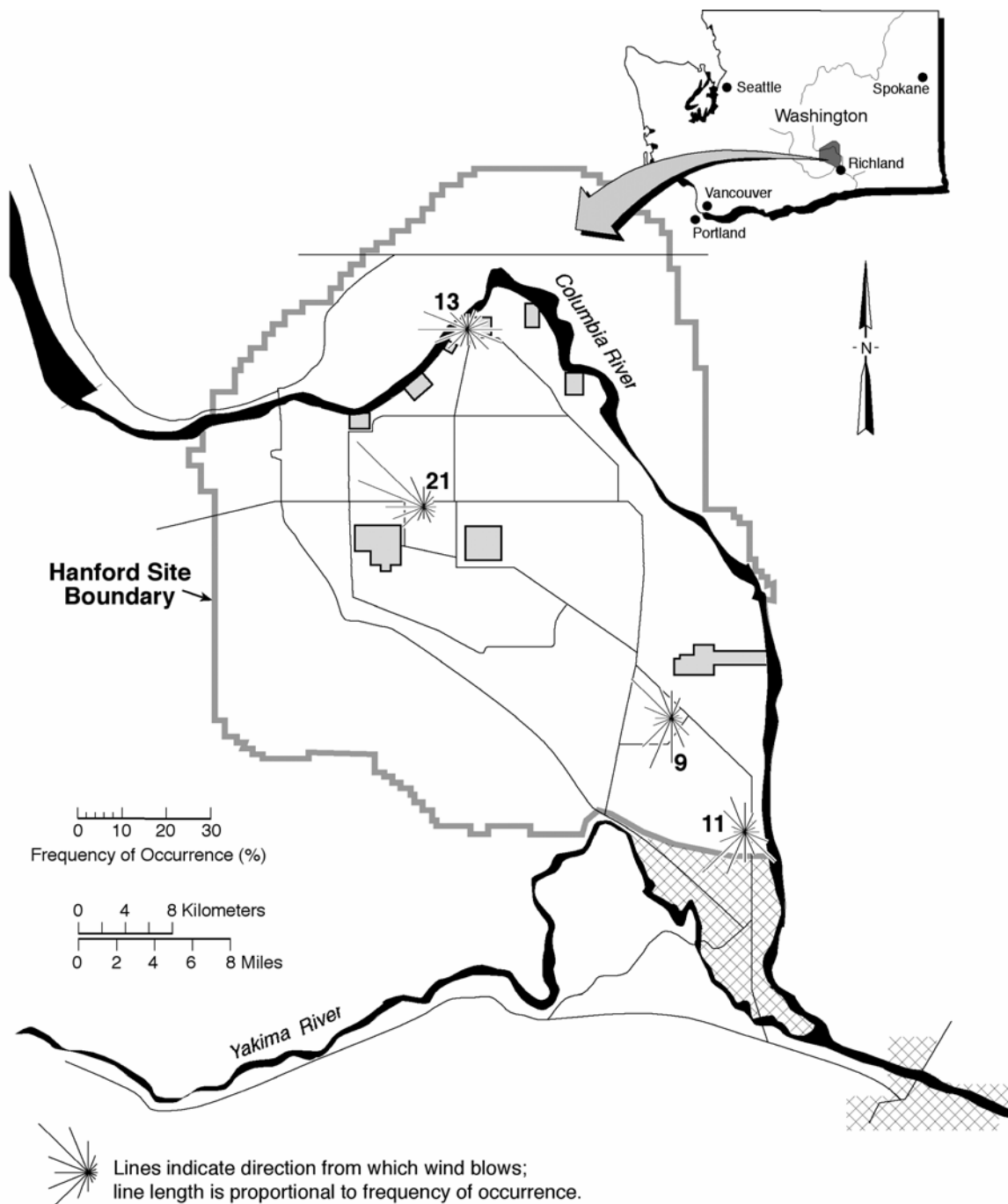
The average wind speed for November 2002 was 5.7 mph, 0.8 mph below normal (6.5 mph). The windiest November on record averaged 10.0 mph (1990), while the November with the lightest winds (1956) averaged 2.9 mph. The peak gust for the month was 36 mph on November 16. The record wind gust for November was 67 mph in 1993.

The average wind speed for December 2002 was 5.7 mph, 0.3 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 63 mph on December 27. 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 2002. The Appendix A gives the individual 2002 wind roses from the Hanford Meteorological Monitoring Network stations.



**Figure 2.2. 2002 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 A for station-specific wind rose.)**



G03010061-2

**Figure 2.3. 2002 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 A for station-specific wind rose.)

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## 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 2002, 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 $\geq 100^{\circ}\text{F}$ , $\geq 90^{\circ}\text{F}$ , and $\leq 32^{\circ}\text{F}$

Table 3.3 contains the number of days each year with maximum temperatures in the categories  $\geq 100^{\circ}\text{F}$ ,  $\geq 90^{\circ}\text{F}$ , and  $\leq 32^{\circ}\text{F}$ .

Maximum temperatures  $\geq 100^{\circ}\text{F}$  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  $\geq 100^{\circ}\text{F}$  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  $\geq 100^{\circ}\text{F}$  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  $\geq 104^{\circ}\text{F}$ .

**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                      | <b>68.7<sup>(a)</sup></b> | 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                   | <b>12.1<sup>(a)</sup></b> | 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                   | <b>42.5<sup>(a)</sup></b> | 41.2                      | 46.2                      | 51.0                      | 58.0                      | <b>63.0<sup>(a)</sup></b> | 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                      | <b>39.4<sup>(a)</sup></b> | <b>47.5<sup>(a)</sup></b> | 57.0                      | 70.2                      | 73.0                      | 75.5                      | 66.4                      | 53.3                      | 31.3                      | 29.4                      | 50.7                      |
| 1956                   | 31.8                      | <b>25.6<sup>(a)</sup></b> | 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                      | <b>38.5<sup>(a)</sup></b> | 52.7                      |
| 1958                   | 37.1                      | <b>44.5<sup>(a)</sup></b> | 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                      | <b>69.8<sup>(a)</sup></b> | 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                      | <b>81.5<sup>(a)</sup></b> | 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                      | <b>56.0<sup>(a)</sup></b> | 65.7                      | 76.1                      | 74.0                      | 62.1                      | <b>47.9<sup>(a)</sup></b> | 39.4                      | 23.6                      | 51.1                      |
| 1985                   | 25.0                      | 29.9                      | 44.0                      | 55.5                      | 63.2                      | 70.2                      | <b>82.2<sup>(a)</sup></b> | 70.5                      | <b>58.8<sup>(a)</sup></b> | 49.8                      | <b>24.8<sup>(a)</sup></b> | <b>21.0<sup>(a)</sup></b> | <b>49.6<sup>(a)</sup></b> |
| 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                      | <b>59.6<sup>(a)</sup></b> | 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                      | <b>72.4<sup>(a)</sup></b> | 52.3                      | <b>46.5<sup>(a)</sup></b> | 24.1                      | 55.6                      |
| 1991                   | 28.7                      | <b>44.5<sup>(a)</sup></b> | 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                      | <b>51.5<sup>(a)</sup></b> | 56.0                      | 67.2                      | <b>76.8<sup>(a)</sup></b> | 76.6                      | 76.9                      | 64.5                      | 55.7                      | 41.2                      | 30.0                      | <b>56.4<sup>(a)</sup></b> |
| 1993                   | 24.8                      | 30.8                      | 43.2                      | 52.5                      | 66.5                      | 68.4                      | <b>70.5<sup>(a)</sup></b> | 73.1                      | 66.4                      | 55.4                      | 34.6                      | 35.4                      | 51.8                      |
| 1994                   | 38.6                      | 36.0                      | 49.2                      | <b>58.2<sup>(a)</sup></b> | 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                      | <b>56.4<sup>(a)</sup></b> |
| 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                      |
| Average <sup>(b)</sup> | 31.0                      | 37.7                      | 45.2                      | 52.9                      | 61.8                      | 69.3                      | 76.4                      | 75.1                      | 66.2                      | 53.0                      | 40.2                      | 32.4                      | 53.4                      |
| Normal <sup>(c)</sup>  | 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 2001.

(c) Based on period 1971-2000.



**Table 3.2. Seasonal Average Temperatures (°F)**

| Year                   | Winter<br>Dec-Feb         | Spring<br>Mar-May         | Summer<br>Jun-Aug         | Autumn<br>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                   | <b>24.2<sup>(a)</sup></b> | 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                      | <b>48.0<sup>(a)</sup></b> | 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                      | <b>78.2<sup>(a)</sup></b> | 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                   | <b>40.6<sup>(a)</sup></b> | 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                      | <b>70.2<sup>(a)</sup></b> | 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                      | <b>44.5<sup>(a)</sup></b> |
| 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                      | <b>57.1<sup>(a)</sup></b> |
| 1991                   | 32.4                      | 52.8                      | 74.2                      | 54.6                      |
| 1992                   | 39.3                      | <b>58.2<sup>(a)</sup></b> | 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                      |
| Average <sup>(b)</sup> | 33.7                      | 53.3                      | 73.6                      | 53.1                      |
| Normal <sup>(c)</sup>  | 33.8                      | 53.8                      | 73.7                      | 53.0                      |

(a) Highest and lowest averages.

(b) Based on entire period of record, 1945 through 2002.

(c) Based on period 1971-2000.

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

| 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            |
| 1945 | 0              | 0   | 8   | 4   | 0   | 12                | 0             | 1   | 7   | 21  | 21  | 5   | 0   | 55                | 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 <sup>(a)</sup>  | 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 <sup>(a)</sup> | 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 <sup>(a)</sup> | 1966-67       | 0   | 0   | 2   | 0   | 0   | 0   | 2 <sup>(a)</sup> |
| 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 <sup>(a)</sup> | 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 <sup>(a)</sup> |
| 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                   | 1              | 4   | 2   | 0   | 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                 |
|                        |                |     |     |     |     |       |               |     |     |     |     |     |     |       | 2002-2003     | 0   | 4   | 3   | --  | --  | --  | --                |
| Average <sup>(b)</sup> | <1             | 1   | 6   | 4   | <1  | 12    | <1            | 3   | 8   | 19  | 17  | 6   | 0   | 52    | Average       | <1  | 2   | 8   | 10  | 3   | <1  | 23                |
| Normal <sup>(c)</sup>  | <1             | 2   | 6   | 5   | <1  | 13    | <1            | 2   | 9   | 19  | 17  | 5   | 0   | 52    | Normal        | <1  | 2   | 10  | 10  | 2   | <1  | 24                |

(a) Greatest and least seasonal totals.

(b) Based on entire period of record, 1945 through 2002.

(c) Based on period 1971-2000.

Note: Dashes indicate no data are available.

**Table 3.4. Days with Maximum Temperatures  $\geq 104^{\circ}\text{F}$** 

| Temperature,<br>$^{\circ}\text{F}$ | Date(s) of Occurrence  |  |  |  |  |  |  |
|------------------------------------|--|--|--|--|--|--|--|
| 113                                | 07/13/02   | 08/04/61   |  |  |  |  |  |
| 112                                | 07/12/02   | 07/27/98   | 08/09/71   |  |  |  |  |
| 111                                | 07/22/94   | 06/23/92   | 07/31/71   |  |  |  |  |
| 110                                | 08/04/98<br>07/17/60   | 07/12/90   | 07/20/79   | 07/09/75   | 08/08/72   | 07/06/68   | 07/18/60   |
| 109                                | 07/11/02<br>07/19/79   | 08/10/96<br>08/07/72   | 07/24/94<br>08/10/71   | 07/23/94<br>08/01/71   | 07/21/94   | 08/14/92   | 07/11/90   |
| 108                                | 07/28/98<br>07/27/75<br>07/08/68<br>06/17/61   | 07/26/98<br>07/05/75<br>07/04/68   | 07/26/96<br>08/12/71<br>08/18/67   | 07/15/96<br>08/11/71<br>08/17/67   | 06/24/92<br>07/27/71<br>08/16/67   | 08/05/90<br>07/19/71<br>07/31/65   | 07/18/79<br>07/28/68<br>07/13/61   |
| 107                                | 07/31/00<br>07/28/82<br>07/05/68   | 08/13/92<br>08/08/81<br>08/03/61   | 08/01/92<br>07/17/79<br>07/22/59   | 07/31/92<br>08/18/77<br>07/20/59   | 06/25/92<br>08/08/71<br>07/19/59   | 07/14/87<br>07/30/71<br>07/28/58   | 07/29/82<br>07/28/71<br>07/14/55   |
| 106                                | 07/24/02<br>07/14/96<br>07/09/85<br>07/10/75<br>07/12/64   | 07/04/01<br>08/02/94<br>07/25/84<br>07/29/73<br>07/24/62   | 08/14/98<br>08/18/92<br>07/22/80<br>07/15/73<br>06/16/61   | 08/05/98<br>07/18/92<br>08/09/78<br>08/06/72<br>06/22/58   | 08/14/97<br>06/22/92<br>07/23/78<br>07/20/71<br>07/19/56   | 08/04/97<br>09/01/87<br>08/17/77<br>07/04/70<br>07/09/52   | 07/27/96<br>06/30/87<br>08/13/77<br>08/01/65   |
| 105                                | 08/12/01<br>07/28/96<br>07/26/88<br>08/12/81<br>07/19/70<br>08/20/67<br>07/19/60<br>08/16/45   | 07/28/99<br>07/24/96<br>08/09/87<br>08/04/78<br>07/16/70<br>08/19/67<br>07/07/60   | 08/13/98<br>07/19/95<br>07/20/85<br>08/03/78<br>07/08/70<br>08/15/67<br>07/13/55   | 07/22/98<br>07/17/92<br>07/27/82<br>07/04/75<br>07/27/68<br>08/13/67<br>08/04/52   | 08/06/97<br>07/03/91<br>07/26/82<br>07/21/71<br>07/07/68<br>07/03/67<br>07/30/52   | 08/05/97<br>07/22/90<br>08/16/81<br>07/18/71<br>07/03/68<br>08/02/61<br>07/10/52   | 08/25/96<br>07/15/90<br>08/13/81<br>08/23/70<br>08/30/67<br>08/11/60<br>07/20/46   |
| 104                                | 06/26/02<br>07/25/96<br>07/25/88<br>07/08/85<br>07/04/81<br>08/01/73<br>08/07/71<br>08/11/67<br>08/10/60<br>07/11/58<br>07/23/51<br>08/22/46 | 08/15/01<br>07/23/96<br>07/21/88<br>07/04/85<br>08/08/78<br>07/27/73<br>07/16/71<br>07/12/67<br>07/16/60<br>08/22/56<br>07/17/51<br>08/21/46 | 08/09/00<br>07/13/96<br>07/20/88<br>08/07/82<br>07/25/78<br>07/19/73<br>07/09/70<br>07/30/65<br>07/18/59<br>07/24/56<br>08/01/49<br>07/28/46 | 08/03/98<br>07/18/95<br>05/31/86<br>08/11/81<br>08/20/77<br>06/22/73<br>07/03/70<br>07/25/62<br>08/25/58<br>07/23/56<br>07/31/49<br>07/21/46 | 07/25/98<br>07/20/94<br>05/30/86<br>08/10/81<br>08/12/77<br>08/28/72<br>06/23/70<br>07/23/62<br>08/24/58<br>07/21/56<br>07/30/49<br>07/11/45 | 07/17/98<br>07/17/94<br>07/29/85<br>08/07/81<br>07/30/74<br>08/09/72<br>06/21/70<br>08/14/61<br>08/11/58<br>07/22/55<br>07/15/49<br>07/10/45 | 08/09/96<br>07/10/90<br>07/21/85<br>07/27/81<br>07/28/74<br>08/13/71<br>08/31/67<br>06/18/61<br>07/17/58<br>08/15/53<br>06/29/48 |

Maximum temperatures  $\geq 90^{\circ}\text{F}$  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  $\geq 90^{\circ}\text{F}$  varied from August 17 (1983) to September 29 (1993 and earlier years). The average date for maximum temperatures  $\geq 90^{\circ}\text{F}$  for the period 1946 through 2002 is September 16. The longest period of consecutive maximum temperatures  $\geq 90^{\circ}\text{F}$  is 32 days from July 13 through August 13, 1971.

**Table 3.5. Record of Annual First and Last Dates with Maximum Temperatures  $\geq 90^{\circ}\text{F}$  and Minimum Temperatures  $\leq 32^{\circ}\text{F}$** 

| Year                   | Maximum Temperature $\geq 90^{\circ}\text{F}$ |                               | Minimum Temperature $\leq 32^{\circ}\text{F}$ |                             | Growing Days <sup>(a)</sup> |
|------------------------|---|-------------------------------|---|-----------------------------|-----------------------------|
|                        | First in Spring                               | Last in Summer                | Last in Spring                                | First in Autumn             |                             |
| 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                   | <b>Jul 02<sup>(b)</sup></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                        | <b>Mar 19<sup>(b)</sup></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  | <b>Nov 12<sup>(b)</sup></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                        | <b>May 16<sup>(b)</sup></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                   | <b>Apr 24<sup>(b)</sup></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  | <b>Aug 17<sup>(b)</sup></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  | <b>Sep 29<sup>(b,c)</sup></b> | 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  | <b>Sep 23<sup>(b)</sup></b> | 168                         |
| 2001                   | May 12  | Sep 24                        | Apr 14  | Oct 28                      | 196                         |
| 2002                   | Jun 12  | Sep 15                        | May 8   | Oct 12                      | 156                         |
| Average <sup>(d)</sup> | May 21  | Sep 16                        | Apr 20  | Oct 19                      | 181                         |
| Normal <sup>(e)</sup>  | 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 2002.

(e) Based on period 1971-2000.

The average seasonal number of days with maximum temperatures  $\leq 32^{\circ}\text{F}$  is 23. The earliest seasonal occurrence of a day with a maximum temperature  $\leq 32^{\circ}\text{F}$  was October 30 (1971) and the latest was March 11 (1950). The number of winter days with maximum temperatures  $\leq 32^{\circ}\text{F}$  varied from 2 to 58 days (winters of 1966-1967 and 1984-1985, respectively). The greatest consecutive number of days with maximum temperatures  $\leq 32^{\circ}\text{F}$  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  $32^{\circ}\text{F}$  occurred. The average maximum temperature for that period was  $21^{\circ}\text{F}$ .

Table 3.6 lists the monthly and annual maximum temperatures. Only 6 days were recorded when the daily maximum temperature was  $\leq 0^{\circ}\text{F}$ . These were:

| Maximum Date      | Temperature          |
|-------------------|----------------------|
| January 31, 1950  | $-2^{\circ}\text{F}$ |
| February 1, 1950  | $-3^{\circ}\text{F}$ |
| February 2, 1950  | $-3^{\circ}\text{F}$ |
| January 27, 1957  | $0^{\circ}\text{F}$  |
| December 29, 1968 | $-2^{\circ}\text{F}$ |
| December 30, 1968 | $-2^{\circ}\text{F}$ |

### 3.3 Days with Minimum Temperatures $\leq 32^{\circ}\text{F}$ or $\leq 0^{\circ}\text{F}$

The monthly and seasonal number of days with minimum temperatures at or below  $32^{\circ}\text{F}$  or  $0^{\circ}\text{F}$  are listed in Table 3.7.

The seasonal average number of days with minimum temperatures  $\leq 32^{\circ}\text{F}$  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  $\leq 32^{\circ}\text{F}$  is 93, from November 9, 1978, through February 9, 1979.

The first autumn temperature  $\leq 32^{\circ}\text{F}$  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  $\leq 32^{\circ}\text{F}$  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  $\leq 0^{\circ}\text{F}$ ; 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 2000-2001). The greatest number of consecutive days with minimum temperatures  $\leq 0^{\circ}\text{F}$  is 11 days, from January 25 through February 4, 1950. During this same period, 4 consecutive days had minimum temperatures  $\leq -20^{\circ}\text{F}$ . Table 3.8 lists all days with minimum temperatures  $\leq 0^{\circ}\text{F}$ . Table 3.9 lists monthly and annual minimum temperatures.

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

| <u>Year</u> | <u>Jan</u> | <u>Feb</u> | <u>Mar</u> | <u>Apr</u> | <u>May</u> | <u>Jun</u> | <u>Jul</u> | <u>Aug</u> | <u>Sep</u> | <u>Oct</u> | <u>Nov</u> | <u>Dec</u> | <u>Annual</u> |
|-------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|---------------|
| 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           |

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

| Season                 | Minimum Temperature ≤32°F |     |     |     |     |     |     |     |     |                    | Minimum Temperature ≤0°F |     |     |     |                    |
|------------------------|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|--------------------|--------------------------|-----|-----|-----|--------------------|
|                        | 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 <sup>(a)</sup>  |
| 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 <sup>(a)</sup> | 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 <sup>(a)</sup>  | 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 <sup>(a,b)</sup> |
| Average <sup>(c)</sup> | <1                        | 4   | 15  | 24  | 26  | 20  | 13  | 4   | <1  | 106                | <1                       | 1   | 1   | <1  | 3                  |
| Normal <sup>(d)</sup>  | <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 2002.

(d) Based on period 1971-2000.



**Table 3.8. Days with Minimum Temperatures  $\leq 0^{\circ}\text{F}$**

| Temperature<br>( $^{\circ}\text{F}$ ) | 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<br>02/02/56             | 12/21/90<br>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<br>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<br>01/29/69<br>01/11/49 | 11/22/85<br>01/28/69             | 01/31/79<br>01/18/57             | 01/05/74<br>01/20/54             | 12/13/72<br>01/04/50             | 12/08/72<br>01/24/49 |
| -5                                    | 02/05/89<br>01/15/50             | 02/04/85                         | 01/01/78                         | 1/10/74                          | 12/12/72                         | 12/09/72             |
| -4                                    | 01/13/93<br>01/11/74<br>01/12/49 | 12/23/90<br>12/11/72             | 02/04/89<br>01/28/72             | 12/19/84<br>01/12/63             | 12/21/83<br>01/28/49             | 01/27/79<br>01/13/49 |
| -3                                    | 02/06/89<br>12/29/78<br>01/11/63 | 11/25/85<br>12/31/77<br>01/17/57 | 02/03/85<br>01/31/69             | 12/18/84<br>01/30/69             | 01/10/80<br>12/31/68             | 01/08/79<br>12/28/68 |
| -2                                    | 12/31/90<br>01/04/74<br>01/10/49 | 12/30/90<br>12/14/72<br>12/27/48 | 12/20/90<br>01/22/62             | 12/21/84<br>01/31/57             | 12/20/84<br>01/19/57             | 01/05/79<br>01/20/49 |
| -1                                    | 12/21/98<br>02/01/69<br>01/30/56 | 11/24/93<br>01/18/60<br>11/14/55 | 11/26/85<br>01/04/59<br>02/04/50 | 01/08/73<br>02/02/57<br>01/25/50 | 02/03/72<br>01/16/57<br>01/13/50 | 01/26/72<br>02/03/56 |
| 0                                     | 01/11/93<br>01/28/79<br>01/26/50 | 12/24/90<br>01/27/72<br>01/04/49 | 02/02/89<br>01/03/59<br>12/26/48 | 02/06/85<br>01/24/57<br>01/15/47 | 12/27/83<br>01/21/54             | 01/07/82<br>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      |

### 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 2001. 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, 2000. A similar presentation can be prepared for daily minimum temperatures. Figure 3.2 through 3.25 show the daily maximum and daily minimum temperature data by month and the data for 2002.

### 3.6 Average Daily Temperature Range

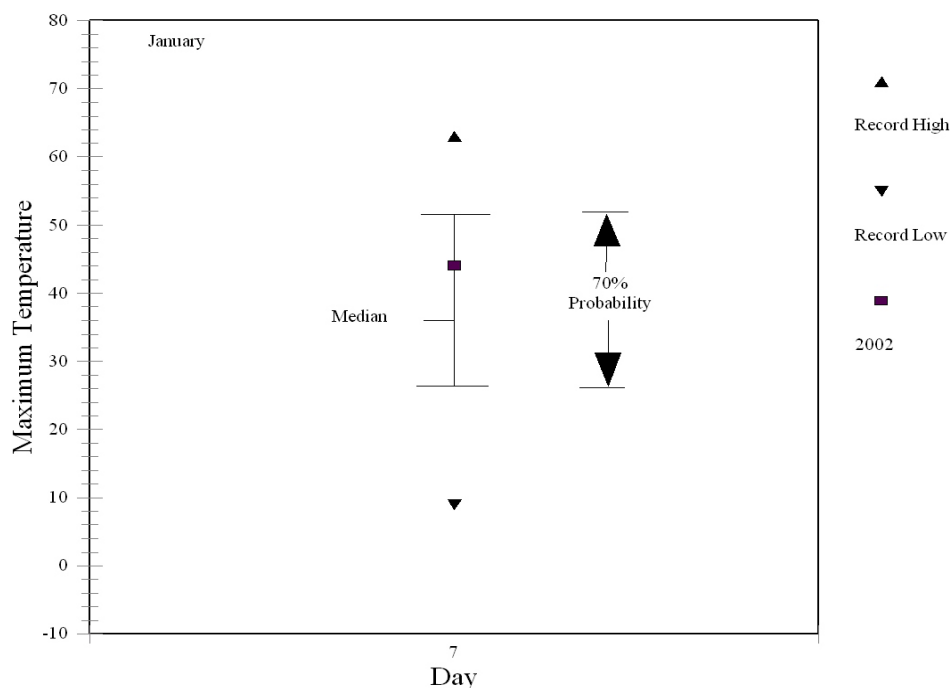
Table 3.11 represents the average daily temperature range by month and year for the period 1945 through 2002. This statistic is compiled by determining each daily temperature range (the difference between the maximum and minimum temperature), totaling for every day of the month, and dividing by the number 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 revised 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)**

| Month  | Normal (1971-2000) |         |      | Daily Extreme |     |                   |    |     |        |      |     |         |     |     |                  |
|--------|--------------------|---------|------|---------------|-----|-------------------|----|-----|--------|------|-----|---------|-----|-----|------------------|
|        | Maximum            | Minimum | Mean | High          | Day | Maximum           |    | Day | Year   | High | Day | Minimum |     | 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            | 4   | 1980              | 32 | 30  | 1971   | 60   | 25  | 1945    | 7   | 31  | 2002             |
|        |                    |         |      | 89            | 3   | 1958              |    |     |        | 60   | 15  | 1988    |     |     |                  |
|        |                    |         |      |               |     |                   |    |     |        | 60   | 2   | 1988    |     |     |                  |
| 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<br>8/4/61 | -3 |     | 2/1/50 | 82   |     | 7/23/94 | -23 |     | 2/3/50<br>2/1/50 |



**Figure 3.1. Graphical Presentation of Daily Maximum Temperatures**

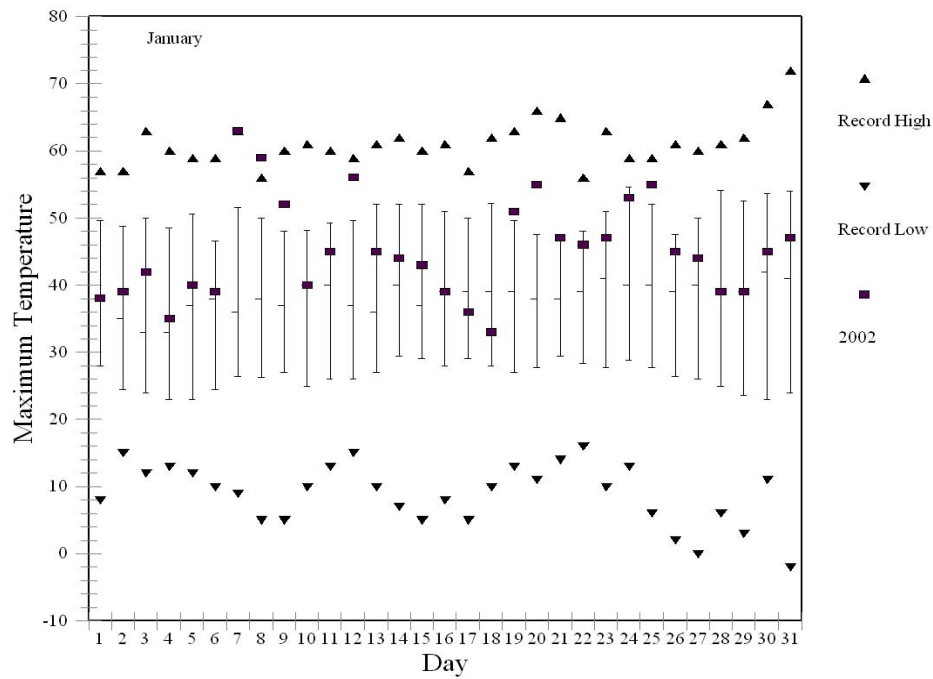
Four possible temperature extremes are presented for each day, a record high and low maximum and a record high and low minimum. These daily records, plus the year of occurrence for the period 1945 through 2002, also are indicated in Table 3.12.

### 3.8 Heating- and Cooling-Degree Days

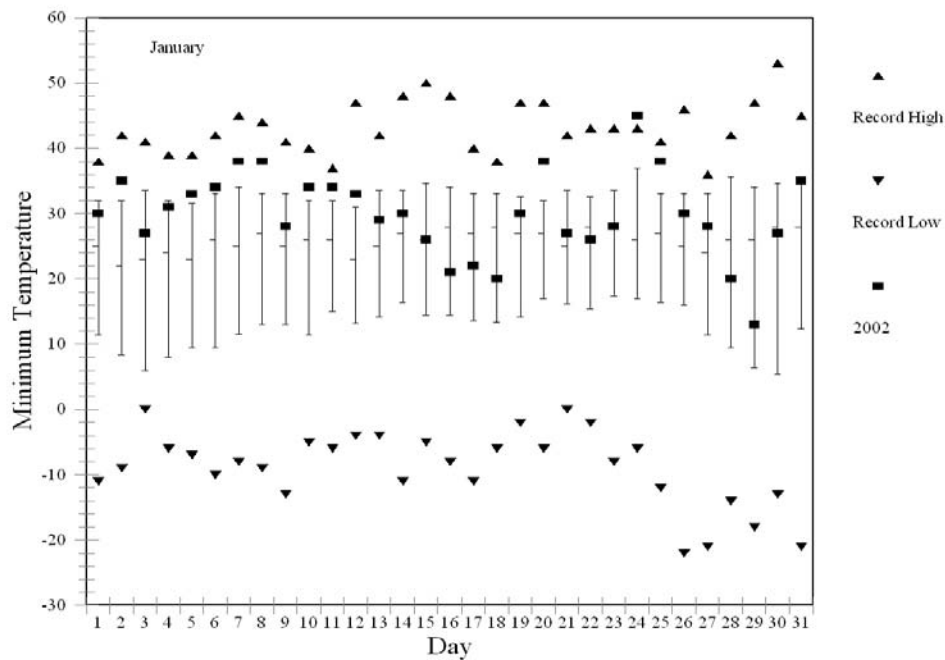
Data about heating- and cooling-degree days are generally used by the utility industry and those involved in building design to assess heating and cooling energy requirements. A temperature of 65°F is generally used as the basis for this calculation. To determine whether a day has either heating-degree 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)* |

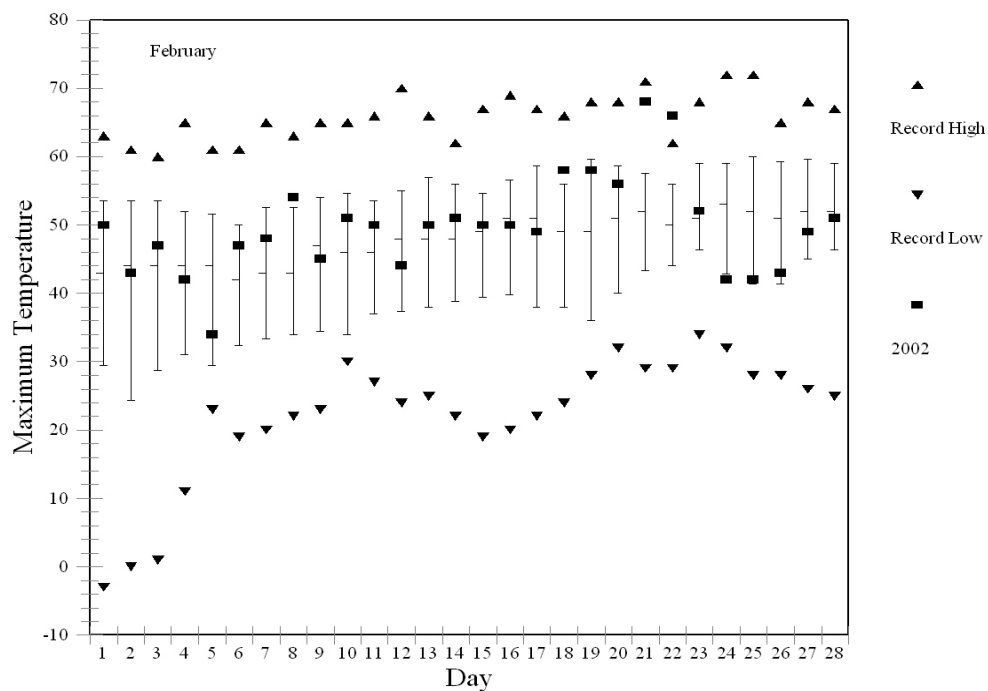
\*CDDs = cooling-degree days; HDDs = heating-degree days.



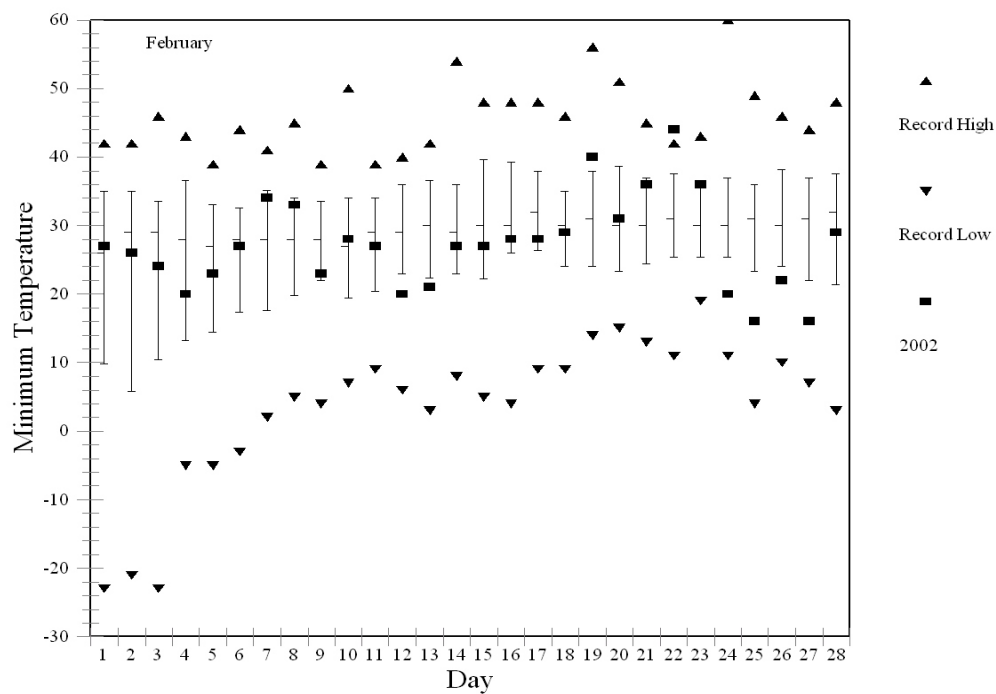
**Figure 3.2. Daily Maximum Temperatures (°F), January 2002**



**Figure 3.3. Daily Minimum Temperatures (°F), January 2002**



**Figure 3.4. Daily Maximum Temperatures (°F), February 2002**



**Figure 3.5. Daily Minimum Temperatures (°F), February 2002**

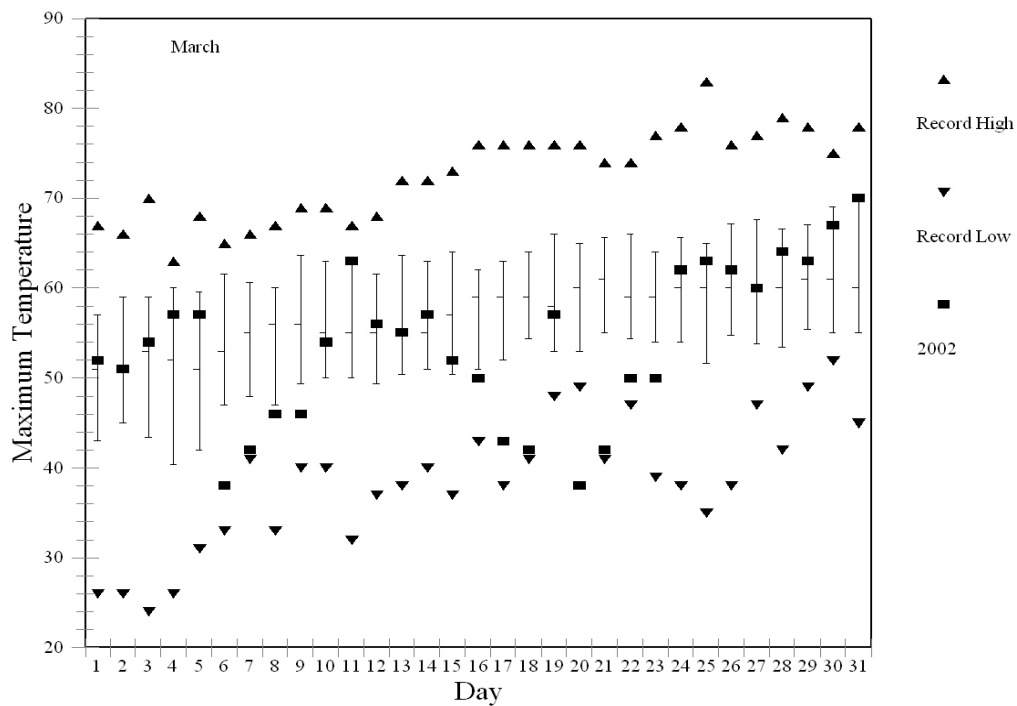


Figure 3.6. Daily Maximum Temperatures (°F), March 2002

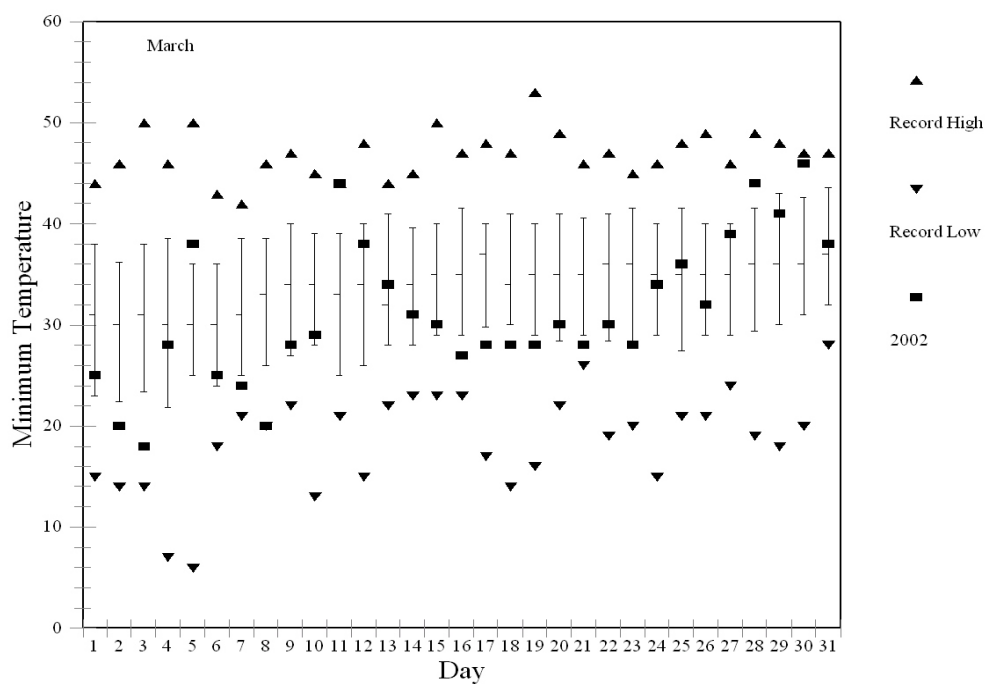
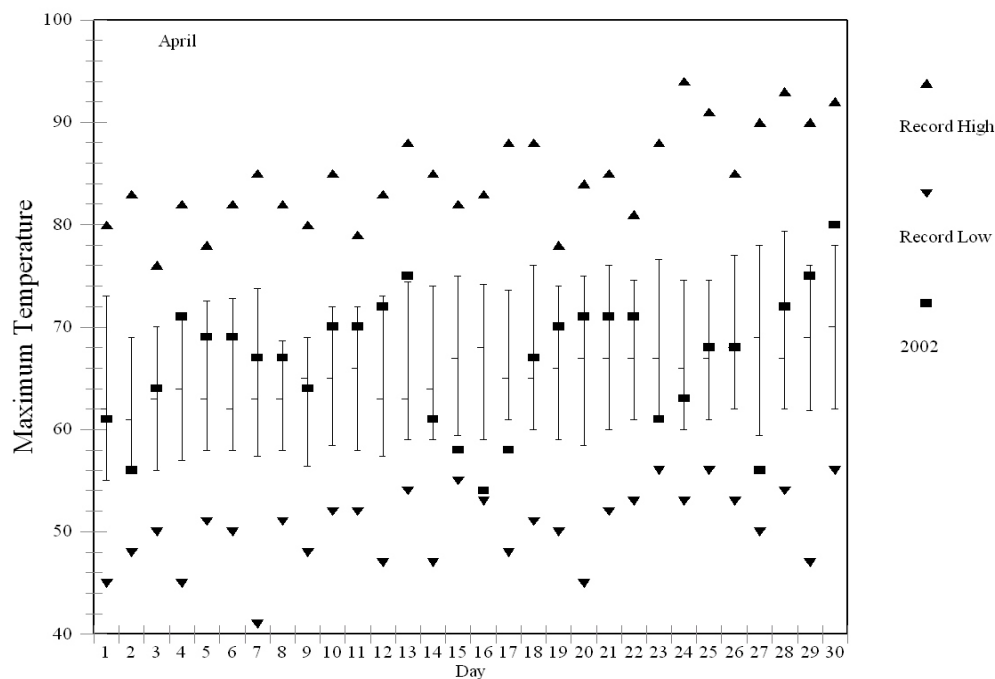
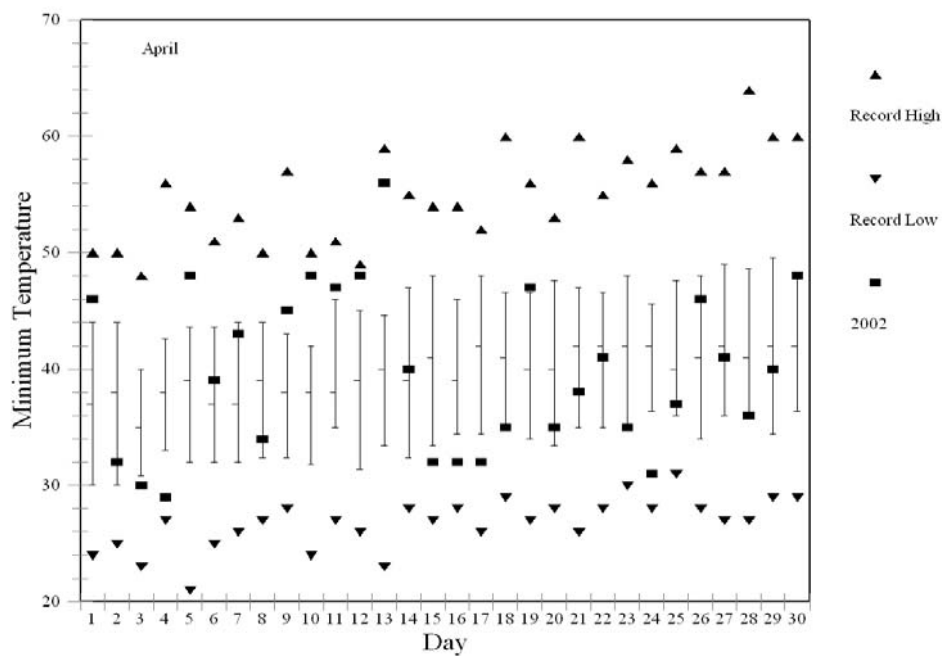


Figure 3.7. Daily Minimum Temperatures (°F), March 2002





**Figure 3.8. Daily Maximum Temperatures (°F), April 2002**



**Figure 3.9. Daily Minimum Temperatures (°F), April 2002**

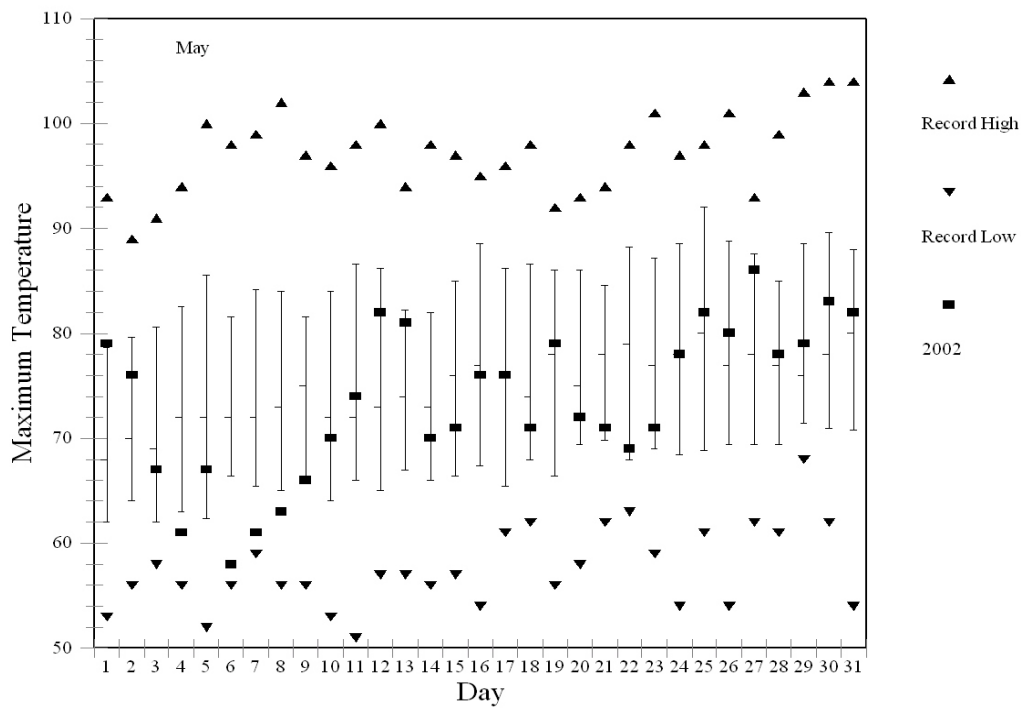


Figure 3.10. Daily Maximum Temperatures (°F), May 2002

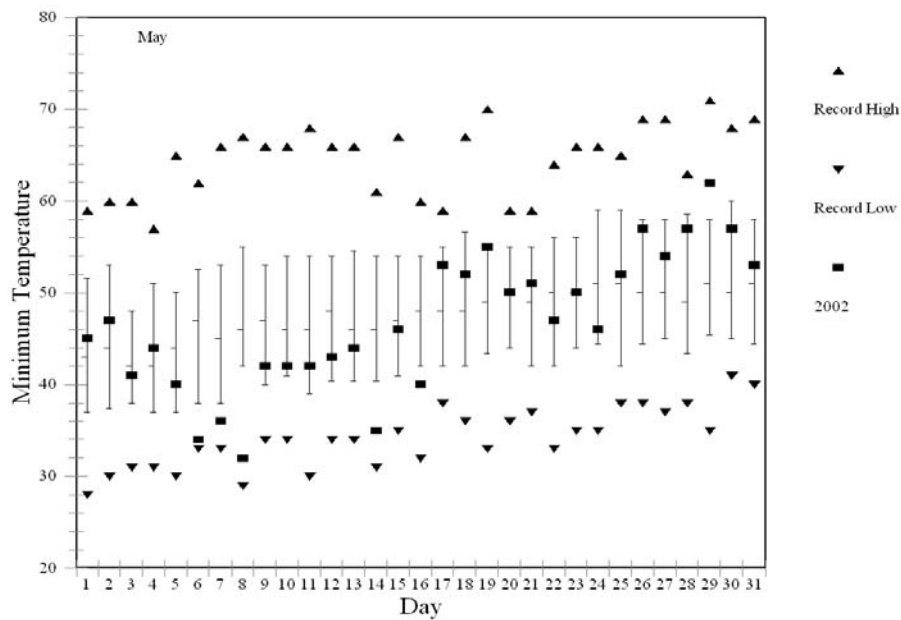


Figure 3.11. Daily Minimum Temperatures (°F), May 2002

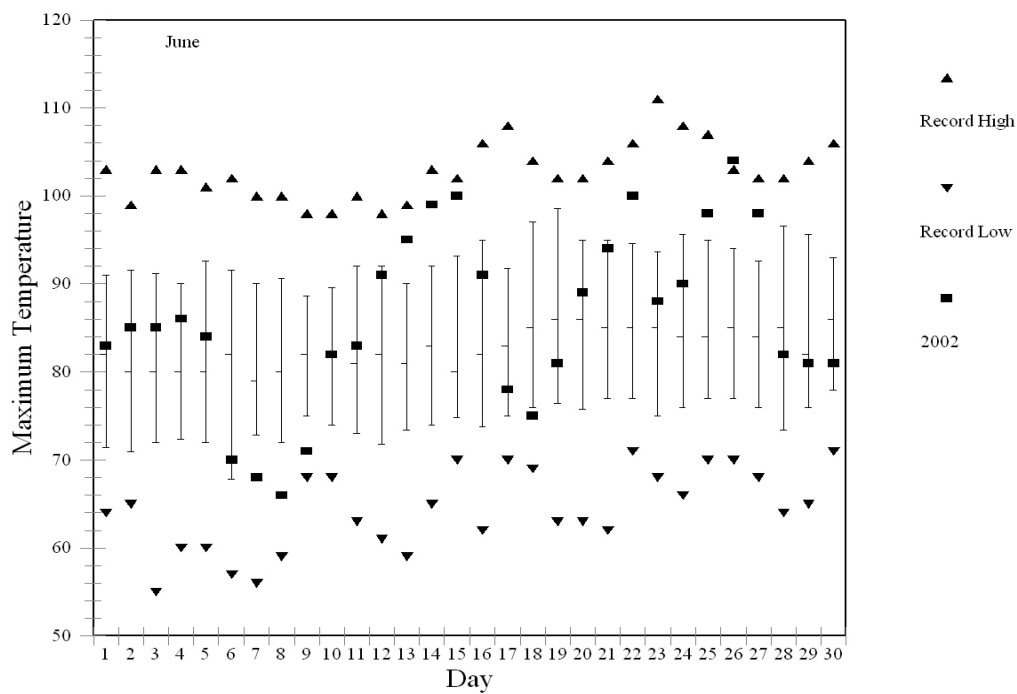


Figure 3.12. Daily Maximum Temperatures (°F), June 2002

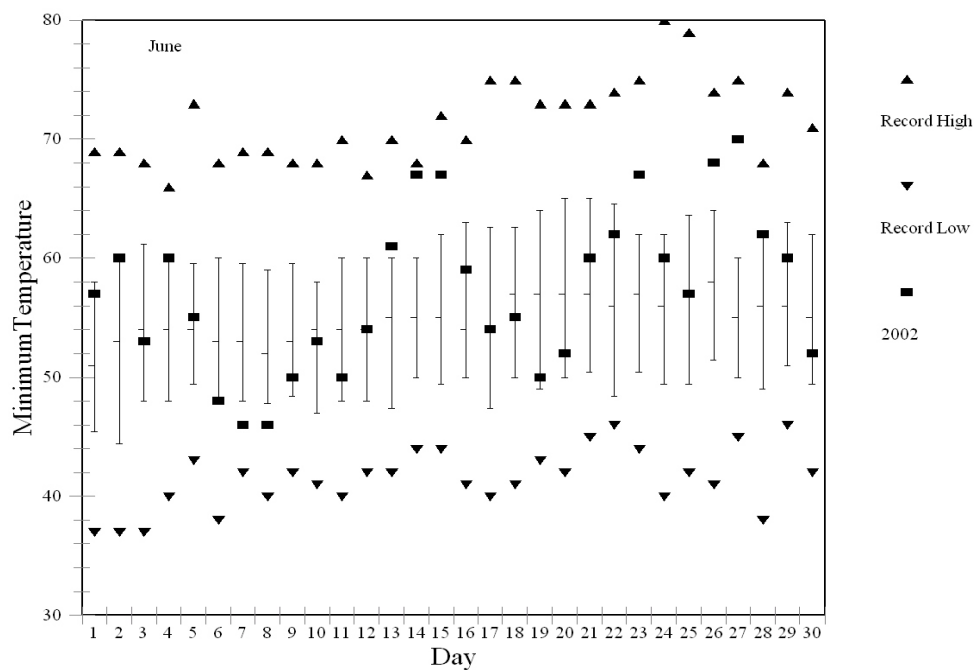


Figure 3.13. Daily Minimum Temperatures (°F), June 2002

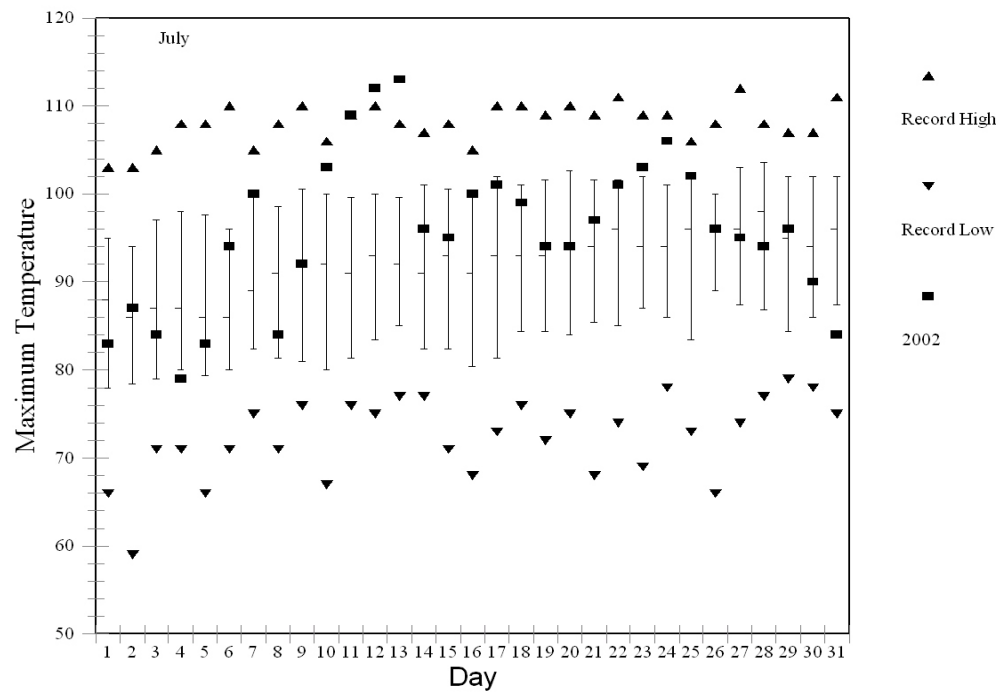


Figure 3.14. Daily Maximum Temperatures (°F), July 2002

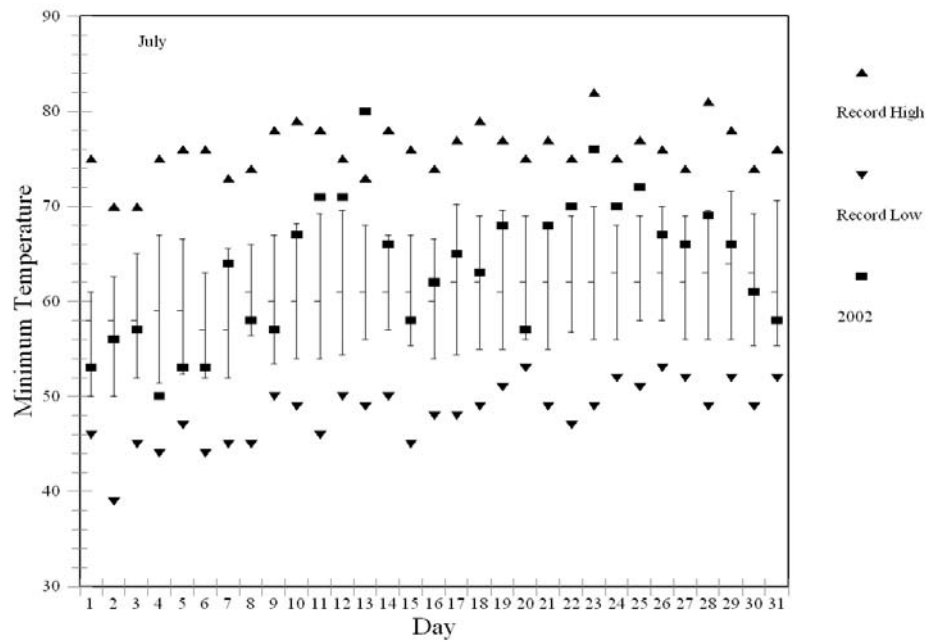
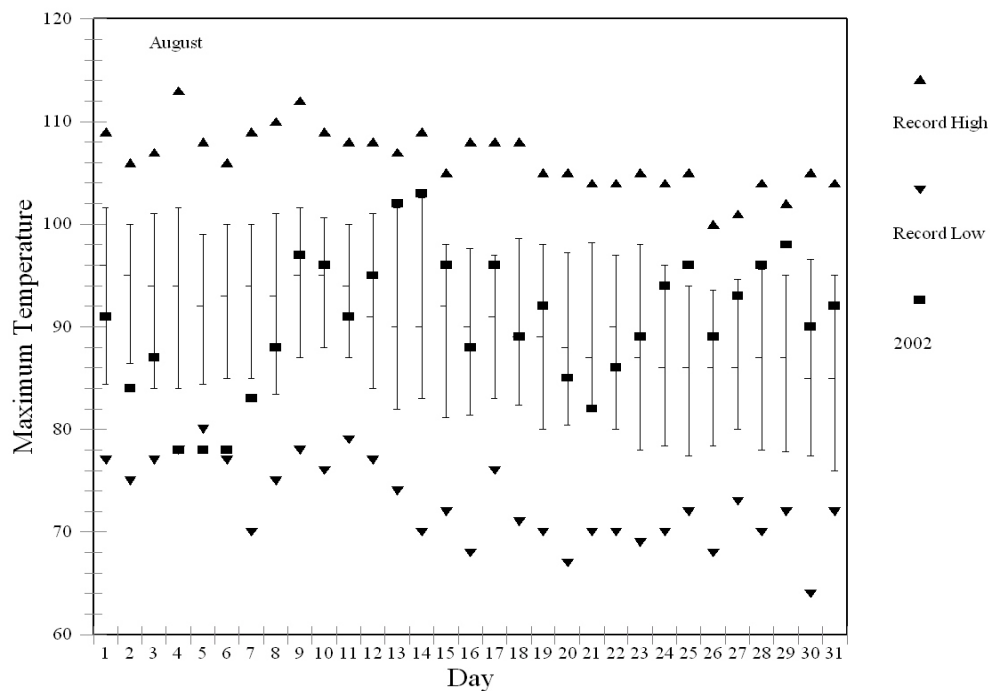
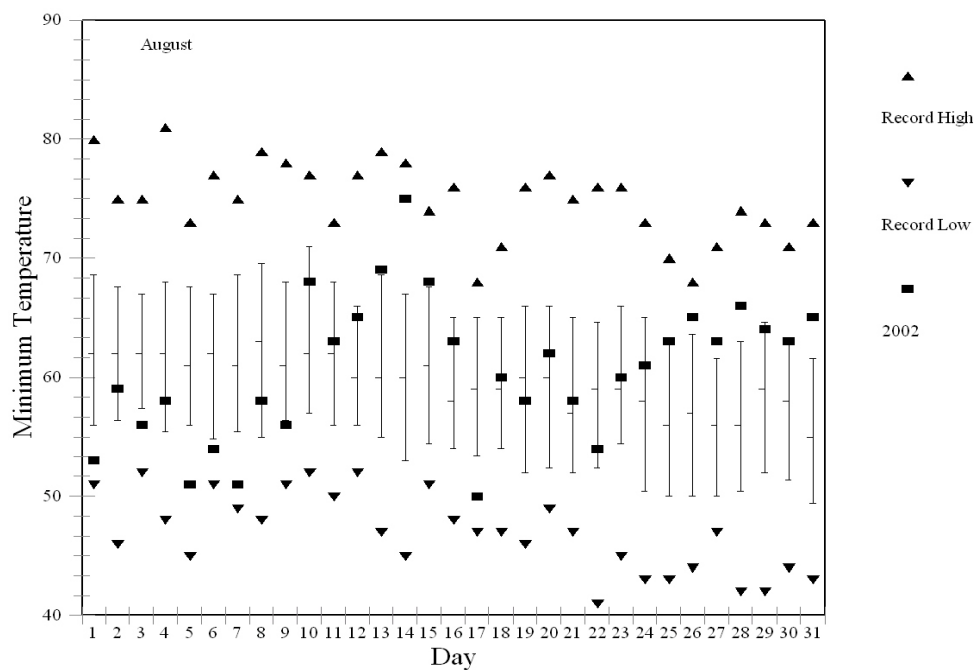


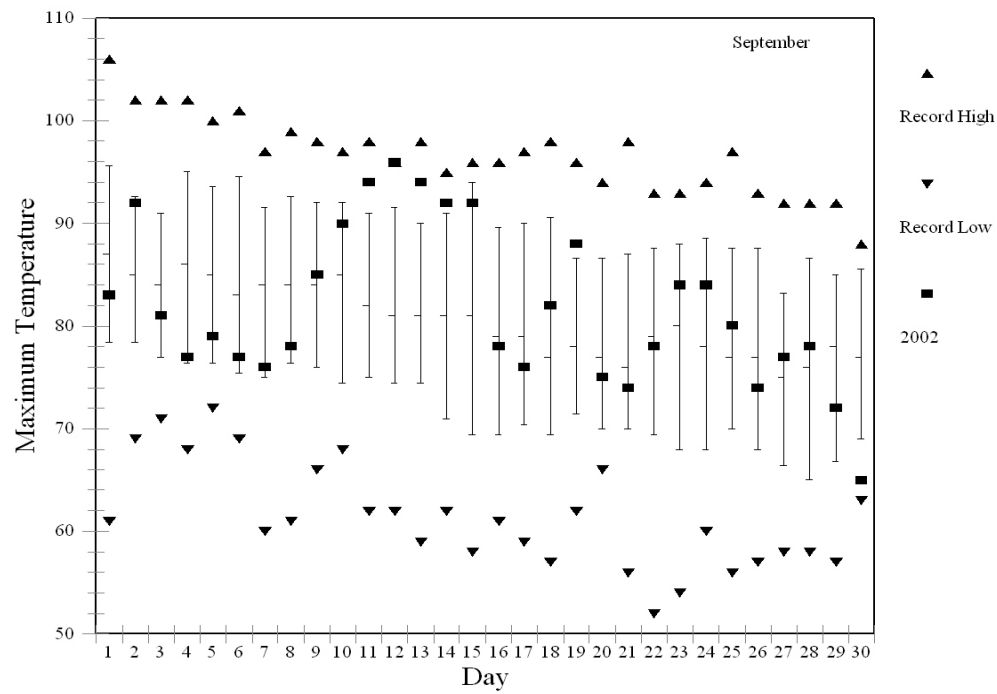
Figure 3.15. Daily Minimum Temperatures (°F), July 2002



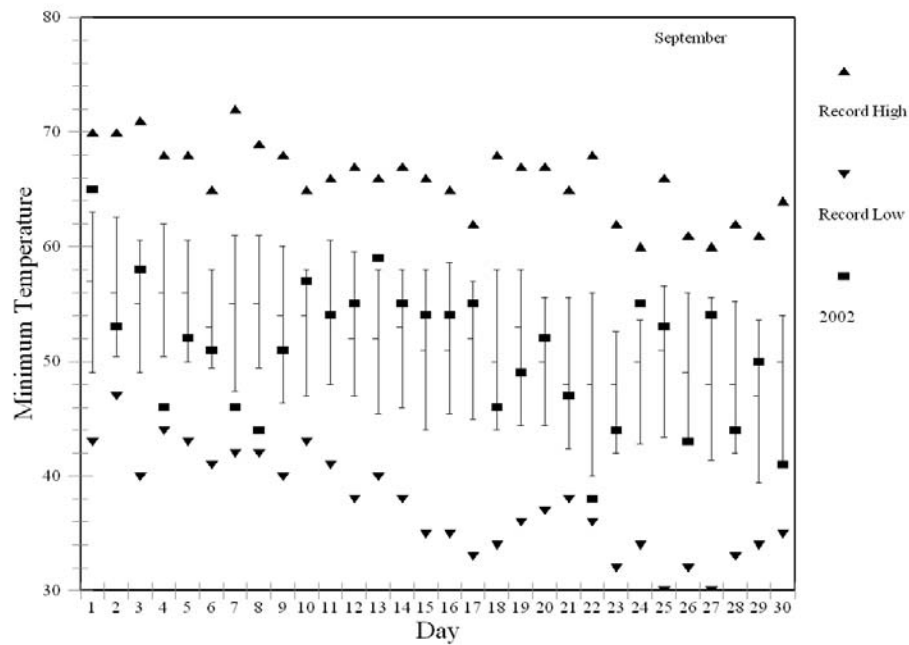
**Figure 3.16. Daily Maximum Temperatures (°F), August 2002**



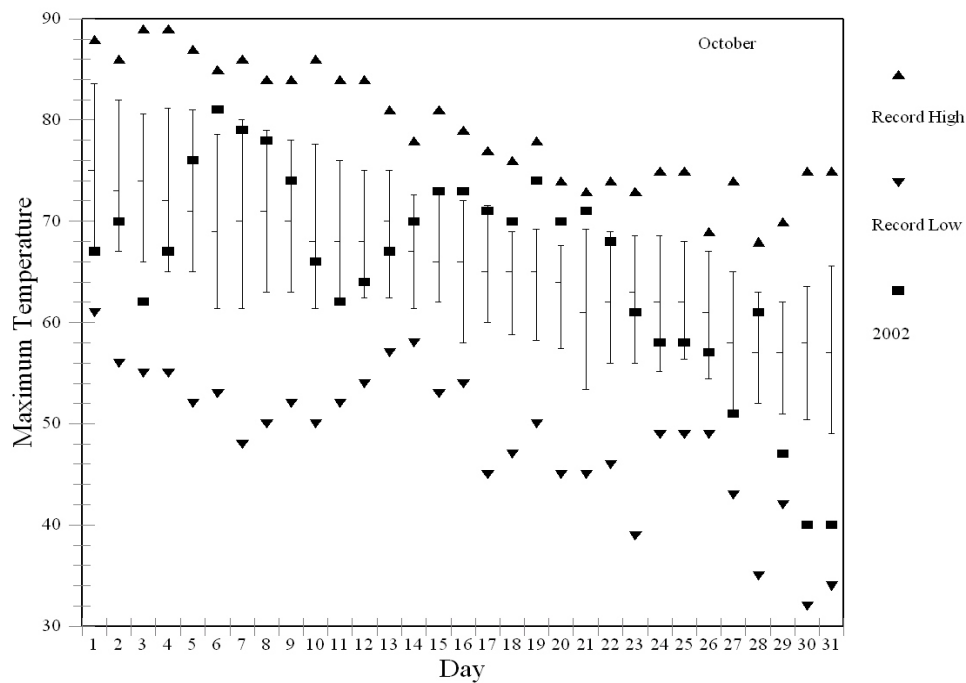
**Figure 3.17. Daily Minimum Temperatures (°F), August 2002**



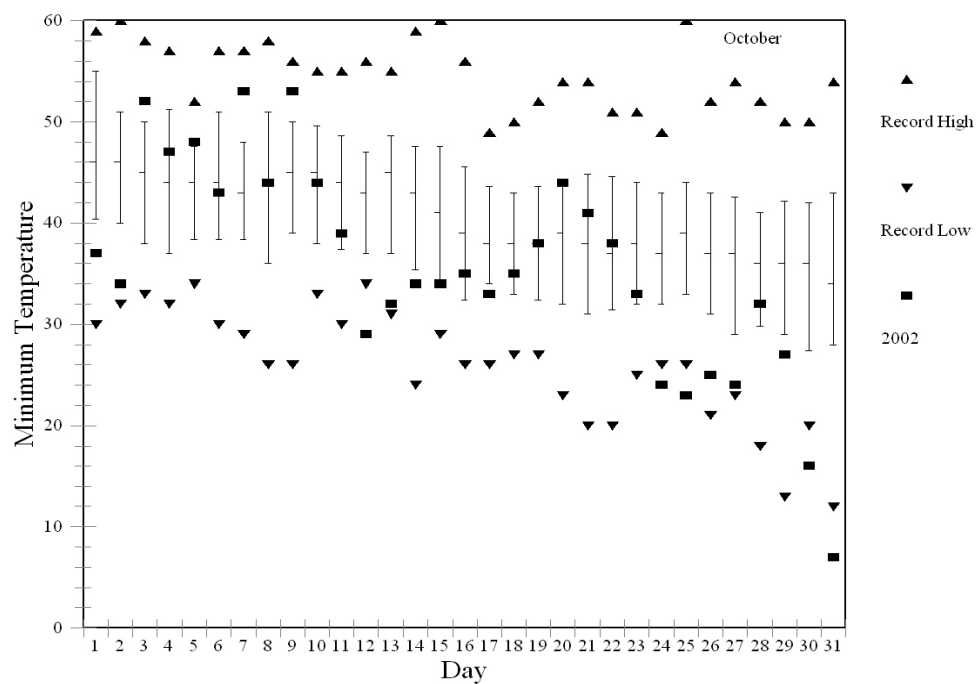
**Figure 3.18. Daily Maximum Temperatures (°F), September 2002**



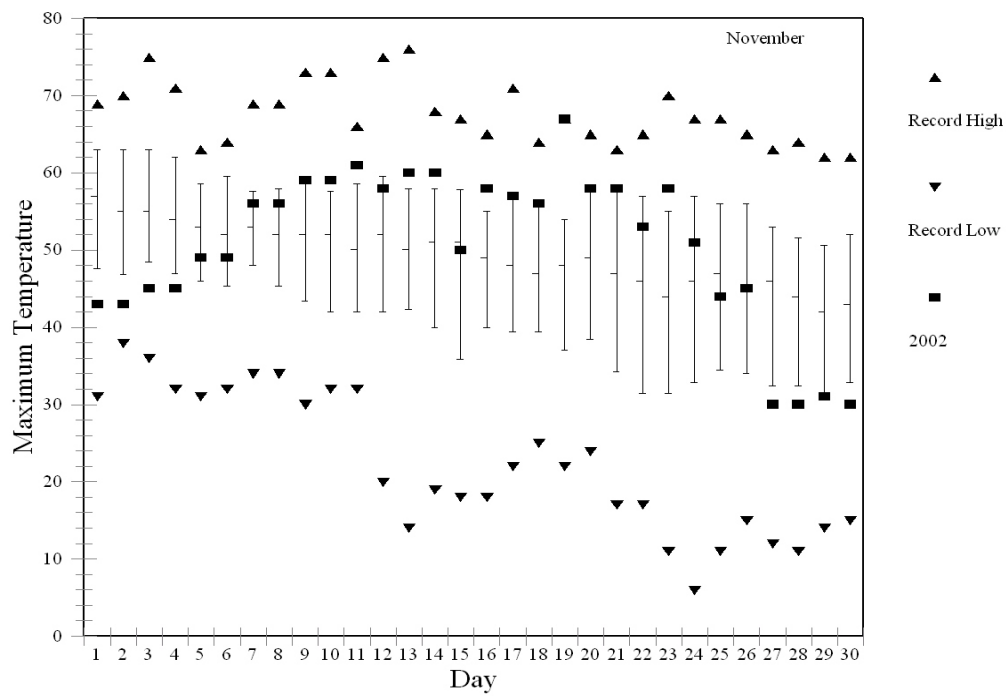
**Figure 3.19. Daily Minimum Temperatures (°F), September 2002**



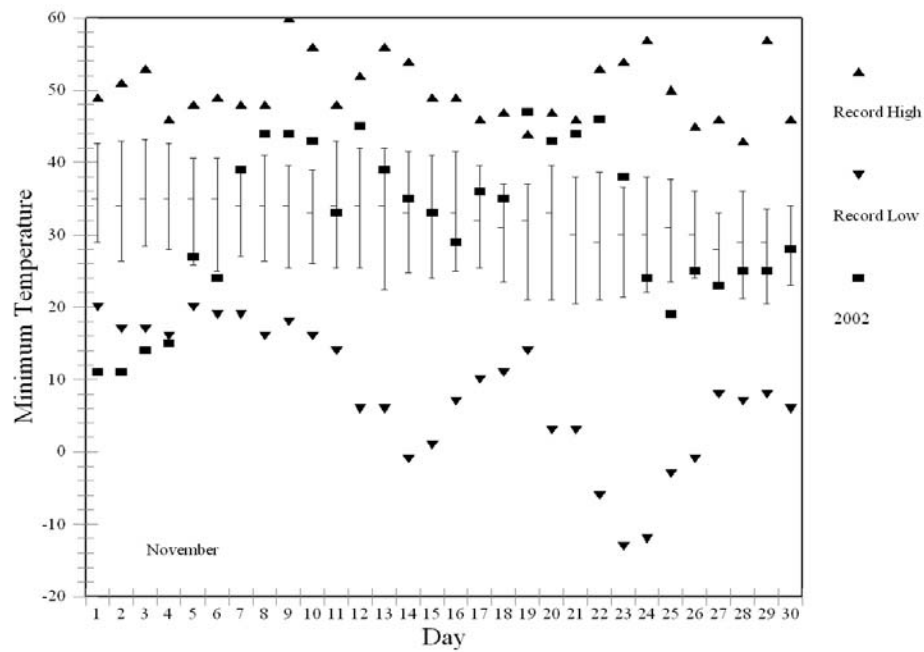
**Figure 3.20. Daily Maximum Temperatures (°F), October 2002**



**Figure 3.21. Daily Minimum Temperatures (°F), October 2002**

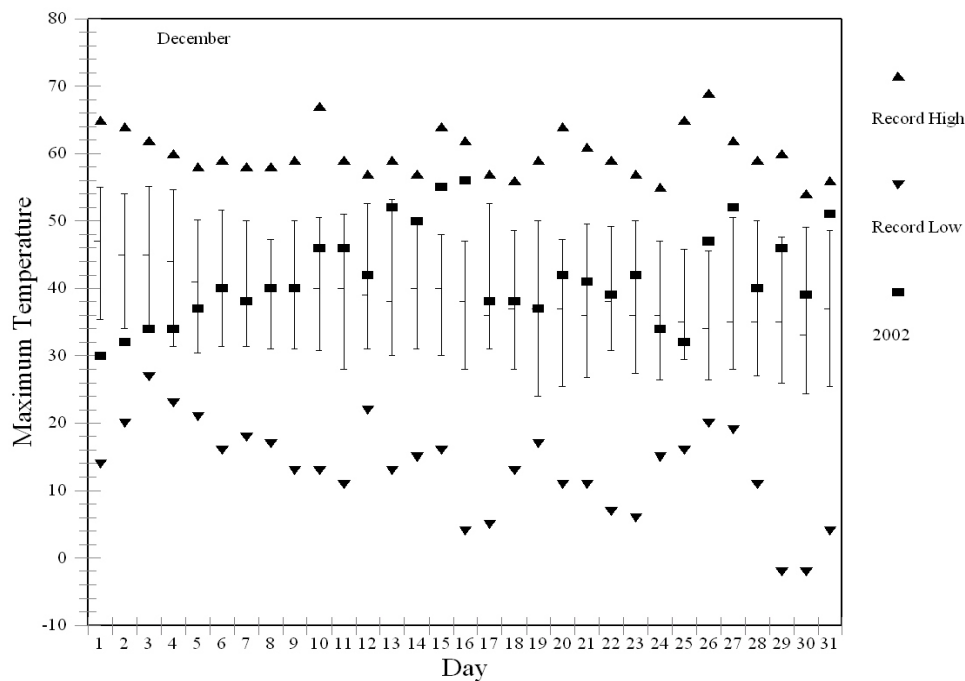


**Figure 3.22. Daily Maximum Temperatures (°F), November 2002**

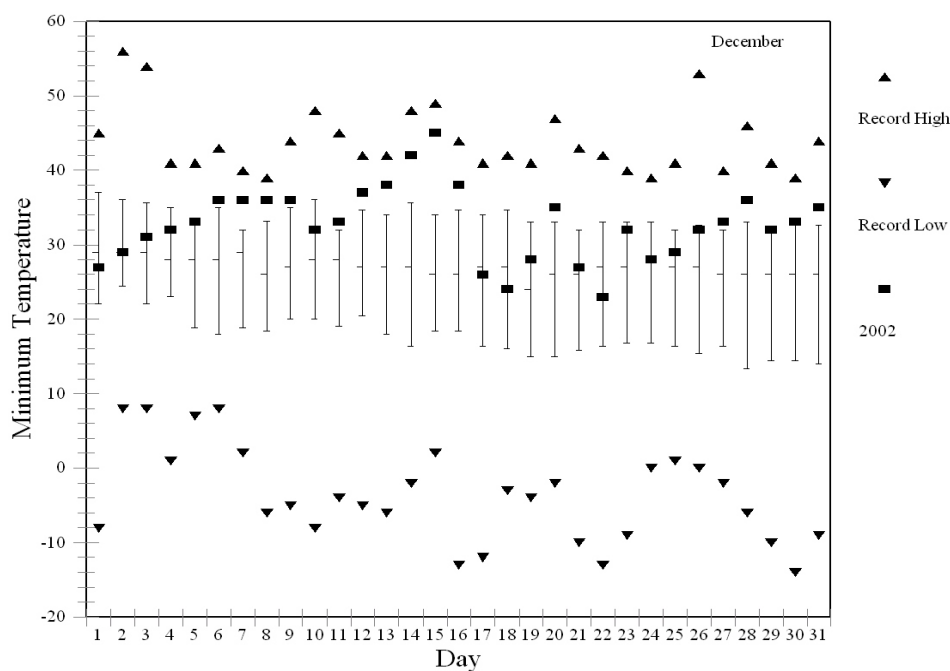


**Figure 3.23. Daily Minimum Temperatures (°F), November 2002**





**Figure 3.24. Daily Maximum Temperatures (°F), December 2002**



**Figure 3.25. Daily Minimum Temperatures (°F), December 2002**

**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                      | <b>25.3<sup>(a)</sup></b> | 29.3                      | 28.8                      | 27.3                      | <b>18.1<sup>(a)</sup></b> | 15.4                      | 11.1                      | 23.2                      |
| 1948                   | 15.0                      | 17.2                      | 23.0                      | 23.2                      | <b>22.6<sup>(a)</sup></b> | 26.4                      | 29.1                      | 28.0                      | 28.7                      | 26.5                      | 17.8                      | 15.9                      | 22.8                      |
| 1949                   | <b>18.8<sup>(a)</sup></b> | 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                      | <b>33.8<sup>(a)</sup></b> | 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                      | <b>17.7<sup>(a)</sup></b> | 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                      | <b>18.4<sup>(a)</sup></b> | 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                      | <b>21.4<sup>(a)</sup></b> | 28.1                      | 26.6                      | 27.8                      | 30.7                      | 29.8                      | 24.5                      | 16.9                      | 9.5                       | 22.7                      |
| 1964                   | 16.0                      | <b>24.1<sup>(a)</sup></b> | 23.7                      | 27.1                      | 27.9                      | 26.4                      | 31.2                      | 29.4                      | 29.7                      | 26.4                      | <b>12.2<sup>(a)</sup></b> | 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                      | <b>34.5<sup>(a)</sup></b> | 31.7                      | 25.5                      | 19.9                      | 15.7                      | <b>25.5<sup>(a)</sup></b> |
| 1968                   | 17.2                      | 20.4                      | 23.5                      | 27.5                      | 27.5                      | 27.3                      | 31.2                      | <b>26.2<sup>(a)</sup></b> | 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                      | <b>32.7<sup>(a)</sup></b> | 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                      | <b>30.6<sup>(a)</sup></b> | 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                      | <b>30.3<sup>(a)</sup></b> | 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                      | <b>10.5<sup>(a)</sup></b> | 22.1                      | 27.1                      | 25.8                      | 25.8                      | 31.3                      | 29.9                      | 27.3                      | 24.6                      | 15.3                      | 11.4                      | <b>22.0<sup>(a)</sup></b> |
| 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                   | <b>6.8<sup>(a)</sup></b>  | 20.4                      | 25.4                      | 28.7                      | 29.2                      | 29.4                      | 32.0                      | 29.9                      | 24.3                      | 25.4                      | 15.8                      | <b>8.0<sup>(a)</sup></b>  | 22.9                      |
| 1986                   | 12.5                      | 17.1                      | 22.1                      | 26.4                      | 26.6                      | 29.1                      | 28.6                      | 31.0                      | <b>23.5<sup>(a)</sup></b> | 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                      | <b>31.9<sup>(a)</sup></b> | 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                      | <b>25.5<sup>(a)</sup></b> | 29.5                      | <b>33.5<sup>(a)</sup></b> | 28.6                      | <b>23.9<sup>(a)</sup></b> | 10.5                      | 23.2                      |
| 1994                   | 15.7                      | 17.2                      | <b>28.4<sup>(a)</sup></b> | 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                      | <b>17.7<sup>(a)</sup></b> | 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                      |
| Average <sup>(b)</sup> | 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 <sup>(c)</sup>  | 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 2002.

(c) Based on period 1971-2000.

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

| Day      | Normal (1971-2000) |         |      | Extreme (1945-2002) |                   |     |                   |         |                   |     |                   |
|----------|--------------------|---------|------|---------------------|-------------------|-----|-------------------|---------|-------------------|-----|-------------------|
|          | Maximum            | Minimum | Mean | Maximum             |                   |     |                   | Minimum |                   |     |                   |
|          |                    |         |      | High                | Year              | Low | Year              | High    | Year              | Low | Year              |
| January  |                    |         |      |                     |                   |     |                   |         |                   |     |                   |
| 1        | 35                 | 21      | 28   | 57                  | 98 <sup>(a)</sup> | 8   | 69                | 38      | 81 <sup>(a)</sup> | -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 <sup>(a)</sup> | 13  | 59                | 39      | 54                | -6  | 50                |
| 5        | 36                 | 21      | 28   | 59                  | 90 <sup>(a)</sup> | 12  | 50                | 39      | 81                | -7  | 50                |
| 6        | 36                 | 22      | 28   | 59                  | 90 <sup>(a)</sup> | 10  | 82                | 42      | 98                | -10 | 74                |
| 7        | 36                 | 22      | 29   | 63                  | 02 <sup>(a)</sup> | 9   | 79                | 45      | 90                | -8  | 74                |
| 8        | 36                 | 22      | 29   | 59                  | 02                | 5   | 74                | 44      | 53                | -9  | 74                |
| 9        | 36                 | 22      | 29   | 60                  | 90 <sup>(a)</sup> | 5   | 74                | 41      | 90                | -13 | 74                |
| 10       | 36                 | 23      | 29   | 61                  | 83                | 10  | 74                | 40      | 83                | -5  | 74                |
| 11       | 37                 | 23      | 30   | 60                  | 83 <sup>(a)</sup> | 13  | 63                | 37      | 90                | -6  | 49                |
| 12       | 38                 | 24      | 31   | 59                  | 53                | 15  | 63                | 47      | 53                | -4  | 63 <sup>(a)</sup> |
| 13       | 39                 | 25      | 32   | 61                  | 94                | 10  | 50                | 42      | 66                | -4  | 93 <sup>(a)</sup> |
| 14       | 40                 | 26      | 33   | 62                  | 99                | 7   | 50                | 48      | 61                | -11 | 50                |
| 15       | 40                 | 26      | 33   | 60                  | 74 <sup>(a)</sup> | 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 <sup>(a)</sup> | 13  | 57                | 45      | 02                | -6  | 49                |
| 25       | 41                 | 26      | 34   | 59                  | 92 <sup>(a)</sup> | 6   | 50                | 41      | 74 <sup>(a)</sup> | -12 | 57                |
| 26       | 41                 | 26      | 34   | 61                  | 71                | 2   | 57                | 46      | 62                | -22 | 57                |
| 27       | 41                 | 26      | 33   | 60                  | 84 <sup>(a)</sup> | 0   | 57                | 36      | 95 <sup>(a)</sup> | -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 <sup>(a)</sup> | 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 <sup>(a)</sup> | 0   | 50                | 42      | 68                | -21 | 50                |
| 3        | 40                 | 24      | 32   | 60                  | 67 <sup>(a)</sup> | 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 <sup>(a)</sup> |
| 9        | 45                 | 27      | 36   | 65                  | 51                | 23  | 56                | 39      | 61 <sup>(a)</sup> | 4   | 85                |
| 10       | 46                 | 28      | 37   | 65                  | 77                | 30  | 56 <sup>(a)</sup> | 50      | 51                | 7   | 85                |
| 11       | 46                 | 28      | 37   | 66                  | 88                | 27  | 54                | 39      | 93 <sup>(a)</sup> | 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 <sup>(a)</sup> | 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 <sup>(a)</sup> | 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 <sup>(a)</sup> |

Table 3.12. (contd)

| Day   | Normal (1971-2000) |         |      | Extreme (1945-2002) |                   |     |                   |         |                   |     |                   |
|-------|--------------------|---------|------|---------------------|-------------------|-----|-------------------|---------|-------------------|-----|-------------------|
|       | Maximum            | Minimum | Mean | Maximum             |                   |     |                   | Minimum |                   |     |                   |
|       |                    |         |      | High                | Year              | Low | Year              | High    | Year              | Low | Year              |
| 20    | 51                 | 31      | 41   | 68                  | 82                | 32  | 57 <sup>(a)</sup> | 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 <sup>(a)</sup> | 43      | 83 <sup>(a)</sup> | 19  | 93                |
| 24    | 51                 | 31      | 41   | 72                  | 86                | 32  | 62                | 60      | 86                | 11  | 93 <sup>(a)</sup> |
| 25    | 52                 | 31      | 41   | 72                  | 86                | 28  | 93                | 49      | 86                | 4   | 93                |
| 26    | 52                 | 31      | 41   | 65                  | 57 <sup>(a)</sup> | 28  | 93 <sup>(a)</sup> | 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 <sup>(a)</sup> | 40  | 60                | 43      | 92                | 12  | 60                |
| March |                    |         |      |                     |                   |     |                   |         |                   |     |                   |
| 1     | 52                 | 31      | 42   | 67                  | 94                | 26  | 93                | 44      | 94                | 15  | 71 <sup>(a)</sup> |
| 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 <sup>(a)</sup> | 33  | 57                | 43      | 79                | 18  | 60                |
| 7     | 54                 | 33      | 44   | 66                  | 53                | 41  | 45                | 42      | 86 <sup>(a)</sup> | 21  | 74 <sup>(a)</sup> |
| 8     | 55                 | 33      | 44   | 67                  | 53                | 33  | 51                | 46      | 83                | 20  | 02 <sup>(a)</sup> |
| 9     | 56                 | 34      | 45   | 69                  | 53                | 40  | 51                | 47      | 83                | 22  | 94 <sup>(a)</sup> |
| 10    | 57                 | 34      | 46   | 69                  | 72                | 40  | 48                | 45      | 87 <sup>(a)</sup> | 13  | 48                |
| 11    | 57                 | 35      | 46   | 67                  | 95 <sup>(a)</sup> | 32  | 50                | 44      | 02 <sup>(a)</sup> | 21  | 50                |
| 12    | 58                 | 35      | 46   | 68                  | 98 <sup>(a)</sup> | 37  | 51                | 48      | 87                | 15  | 56                |
| 13    | 58                 | 35      | 46   | 72                  | 98                | 38  | 51                | 44      | 98 <sup>(a)</sup> | 22  | 69 <sup>(a)</sup> |
| 14    | 58                 | 35      | 47   | 72                  | 92                | 40  | 49                | 45      | 61                | 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 <sup>(a)</sup> | 53      | 97                | 16  | 65                |
| 20    | 60                 | 36      | 48   | 76                  | 47                | 49  | 50                | 38      | 02                | 22  | 74                |
| 21    | 60                 | 36      | 48   | 74                  | 60                | 41  | 75                | 46      | 98 <sup>(a)</sup> | 26  | 82 <sup>(a)</sup> |
| 22    | 60                 | 35      | 48   | 74                  | 78 <sup>(a)</sup> | 47  | 71                | 47      | 78                | 19  | 94                |
| 23    | 60                 | 35      | 48   | 77                  | 60                | 39  | 64                | 45      | 98 <sup>(a)</sup> | 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 <sup>(a)</sup> | 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 <sup>(a)</sup> | 49  | 54                | 48      | 94 <sup>(a)</sup> | 18  | 54                |
| 30    | 62                 | 36      | 49   | 75                  | 92                | 52  | 67                | 47      | 92 <sup>(a)</sup> | 20  | 54                |
| 31    | 62                 | 36      | 49   | 78                  | 92                | 45  | 96                | 47      | 61                | 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 <sup>(a)</sup> | 50  | 63 <sup>(a)</sup> | 48      | 77                | 23  | 75                |
| 4     | 64                 | 38      | 51   | 82                  | 60                | 45  | 75                | 56      | 91                | 27  | 50                |
| 5     | 64                 | 38      | 51   | 78                  | 77 <sup>(a)</sup> | 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 <sup>(a)</sup> |
| 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)

| Day  | Normal (1971-2000) |         |      | Extreme (1945-2002) |                   |     |                   |         |                   |     |                   |
|------|--------------------|---------|------|---------------------|-------------------|-----|-------------------|---------|-------------------|-----|-------------------|
|      | Maximum            | Minimum | Mean | Maximum             |                   |     |                   | Minimum |                   |     |                   |
|      |                    |         |      | High                | Year              | Low | Year              | High    | Year              | Low | Year              |
| 11   | 65                 | 39      | 52   | 79                  | 88                | 52  | 83                | 51      | 56 <sup>(a)</sup> | 27  | 83                |
| 12   | 66                 | 39      | 52   | 83                  | 88                | 47  | 95                | 48      | 82 <sup>(a)</sup> | 26  | 97                |
| 13   | 66                 | 40      | 53   | 88                  | 47                | 54  | 55                | 59      | 88                | 23  | 68                |
| 14   | 66                 | 40      | 53   | 85                  | 62 <sup>(a)</sup> | 47  | 75                | 55      | 85                | 28  | 01                |
| 15   | 67                 | 40      | 54   | 82                  | 88                | 55  | 75 <sup>(a)</sup> | 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 <sup>(a)</sup> | 28  | 82                |
| 21   | 68                 | 42      | 55   | 85                  | 56                | 52  | 67                | 60      | 56                | 26  | 85 <sup>(a)</sup> |
| 22   | 68                 | 42      | 55   | 81                  | 82 <sup>(a)</sup> | 53  | 88                | 55      | 98                | 28  | 72                |
| 23   | 68                 | 42      | 55   | 88                  | 81 <sup>(a)</sup> | 56  | 79 <sup>(a)</sup> | 58      | 77                | 30  | 78                |
| 24   | 69                 | 42      | 55   | 94                  | 77                | 53  | 75                | 56      | 52                | 28  | 86 <sup>(a)</sup> |
| 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 <sup>(a)</sup> | 60      | 98                | 29  | 86                |
| May  |                    |         |      |                     |                   |     |                   |         |                   |     |                   |
| 1    | 72                 | 44      | 58   | 93                  | 98                | 53  | 69                | 59      | 98 <sup>(a)</sup> | 28  | 54                |
| 2    | 72                 | 44      | 58   | 89                  | 98 <sup>(a)</sup> | 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 <sup>(a)</sup> | 67      | 94 <sup>(a)</sup> | 29  | 96                |
| 9    | 74                 | 46      | 60   | 97                  | 87                | 56  | 48                | 66      | 49                | 34  | 99 <sup>(a)</sup> |
| 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 <sup>(a)</sup> | 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                | 61  | 74                | 59      | 85                | 38  | 88 <sup>(a)</sup> |
| 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 <sup>(a)</sup> | 59      | 58                | 37  | 74 <sup>(a)</sup> |
| 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 <sup>(a)</sup> | 54  | 62                | 66      | 01                | 35  | 75                |
| 25   | 78                 | 50      | 64   | 98                  | 92 <sup>(a)</sup> | 61  | 98                | 65      | 83                | 38  | 91 <sup>(a)</sup> |
| 26   | 78                 | 51      | 64   | 101                 | 58 <sup>(a)</sup> | 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 <sup>(a)</sup> | 38  | 79 <sup>(a)</sup> |
| 29   | 79                 | 51      | 65   | 103                 | 83                | 68  | 98 <sup>(a)</sup> | 71      | 86                | 35  | 76                |
| 30   | 79                 | 51      | 65   | 104                 | 86                | 62  | 76 <sup>(a)</sup> | 68      | 86                | 41  | 55 <sup>(a)</sup> |
| 31   | 79                 | 52      | 66   | 104                 | 86                | 54  | 71                | 69      | 86                | 40  | 96 <sup>(a)</sup> |
| June |                    |         |      |                     |                   |     |                   |         |                   |     |                   |
| 1    | 80                 | 52      | 66   | 103                 | 86                | 64  | 76                | 69      | 86                | 37  | 84                |
| 2    | 80                 | 52      | 66   | 99                  | 70                | 65  | 99 <sup>(a)</sup> | 69      | 89 <sup>(a)</sup> | 37  | 76                |

Table 3.12. (contd)

| Day  | Normal (1971-2000) |         |      | Extreme (1945-2002) |                   |     |                   |         |                   |     |                   |
|------|--------------------|---------|------|---------------------|-------------------|-----|-------------------|---------|-------------------|-----|-------------------|
|      |                    |         | Mean | Maximum             |                   |     |                   | Minimum |                   |     |                   |
|      | Maximum            | Minimum |      | High                | Year              | Low | Year              | High    | Year              | Low | Year              |
| 3    | 80                 | 52      | 66   | 103                 | 70                | 55  | 66                | 68      | 86 <sup>(a)</sup> | 37  | 62                |
| 4    | 80                 | 53      | 66   | 103                 | 69                | 60  | 74                | 66      | 86 <sup>(a)</sup> | 40  | 80 <sup>(a)</sup> |
| 5    | 80                 | 53      | 66   | 101                 | 78                | 60  | 88                | 73      | 69                | 43  | 76 <sup>(a)</sup> |
| 6    | 81                 | 53      | 67   | 102                 | 70 <sup>(a)</sup> | 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 <sup>(a)</sup> | 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 <sup>(a)</sup> | 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 <sup>(a)</sup> |
| 15   | 83                 | 55      | 69   | 102                 | 99 <sup>(a)</sup> | 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  | 56                |
| 22   | 86                 | 57      | 71   | 106                 | 92 <sup>(a)</sup> | 71  | 93                | 74      | 92                | 46  | 97 <sup>(a)</sup> |
| 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 <sup>(a)</sup> |
| 27   | 87                 | 57      | 72   | 102                 | 92                | 68  | 47                | 75      | 87                | 45  | 64 <sup>(a)</sup> |
| 28   | 87                 | 57      | 72   | 102                 | 87 <sup>(a)</sup> | 64  | 46                | 68      | 87                | 38  | 75                |
| 29   | 87                 | 57      | 72   | 104                 | 48                | 65  | 52                | 74      | 87                | 46  | 71 <sup>(a)</sup> |
| 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 <sup>(a)</sup> |
| 2    | 86                 | 57      | 72   | 103                 | 96                | 59  | 66                | 70      | 45                | 39  | 79                |
| 3    | 86                 | 57      | 72   | 105                 | 91 <sup>(a)</sup> | 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 <sup>(a)</sup> |
| 6    | 88                 | 58      | 73   | 110                 | 68                | 71  | 55                | 76      | 68                | 44  | 71                |
| 7    | 88                 | 59      | 73   | 105                 | 68 <sup>(a)</sup> | 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 <sup>(a)</sup> |
| 10   | 89                 | 60      | 74   | 106                 | 75                | 67  | 74                | 79      | 75                | 49  | 97 <sup>(a)</sup> |
| 11   | 90                 | 60      | 75   | 109                 | 02 <sup>(a)</sup> | 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 <sup>(a)</sup> | 80      | 02                | 49  | 76                |
| 14   | 91                 | 61      | 76   | 107                 | 87 <sup>(a)</sup> | 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 <sup>(a)</sup> |
| 19   | 93                 | 62      | 78   | 109                 | 79                | 72  | 49                | 77      | 79                | 51  | 77                |
| 20   | 94                 | 63      | 78   | 110                 | 79                | 75  | 65 <sup>(a)</sup> | 75      | 95                | 53  | 68 <sup>(a)</sup> |
| 21   | 94                 | 63      | 79   | 109                 | 94                | 68  | 65                | 77      | 88                | 49  | 49                |
| 22   | 94                 | 63      | 79   | 111                 | 94                | 74  | 92                | 75      | 94 <sup>(a)</sup> | 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 <sup>(a)</sup> |
| 25   | 96                 | 64      | 80   | 106                 | 84                | 73  | 90                | 77      | 62                | 51  | 49 <sup>(a)</sup> |
| 26   | 96                 | 64      | 80   | 108                 | 98 <sup>(a)</sup> | 66  | 55                | 76      | 88                | 53  | 99                |
| 27   | 96                 | 64      | 80   | 112                 | 98                | 74  | 48                | 74      | 98 <sup>(a)</sup> | 52  | 86                |

Table 3.12. (contd)

| Day       | Normal (1971-2000) |         |      | Extreme (1945-2002) |                   |     |                   |         |                   |     |                   |
|-----------|--------------------|---------|------|---------------------|-------------------|-----|-------------------|---------|-------------------|-----|-------------------|
|           | Maximum            | Minimum | Mean | Maximum             |                   |     |                   | Minimum |                   |     |                   |
|           |                    |         |      | High                | Year              | Low | Year              | High    | Year              | Low | Year              |
| 28        | 96                 | 64      | 80   | 108                 | 98 <sup>(a)</sup> | 77  | 50 <sup>(a)</sup> | 81      | 98                | 49  | 59                |
| 29        | 96                 | 64      | 80   | 107                 | 79                | 01  | 93 <sup>(a)</sup> | 78      | 82                | 52  | 50                |
| 30        | 96                 | 64      | 80   | 107                 | 71                | 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 <sup>(a)</sup> | 80      | 49                | 51  | 87                |
| 2         | 95                 | 63      | 79   | 106                 | 94                | 75  | 56                | 75      | 77 <sup>(a)</sup> | 46  | 64                |
| 3         | 95                 | 63      | 79   | 107                 | 61                | 77  | 62                | 75      | 99 <sup>(a)</sup> | 52  | 59                |
| 4         | 95                 | 63      | 79   | 113                 | 61                | 78  | 02 <sup>(a)</sup> | 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 <sup>(a)</sup> | 48  | 49                |
| 9         | 94                 | 63      | 78   | 112                 | 71                | 78  | 47                | 78      | 90                | 51  | 95 <sup>(a)</sup> |
| 10        | 94                 | 62      | 78   | 109                 | 96 <sup>(a)</sup> | 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 <sup>(a)</sup> | 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 <sup>(a)</sup> |
| 20        | 88                 | 59      | 73   | 105                 | 67                | 67  | 59                | 77      | 82                | 49  | 52                |
| 21        | 88                 | 58      | 73   | 104                 | 46                | 70  | 60                | 75      | 46                | 47  | 85 <sup>(a)</sup> |
| 22        | 88                 | 58      | 73   | 104                 | 56 <sup>(a)</sup> | 70  | 92                | 76      | 61 <sup>(a)</sup> | 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 <sup>(a)</sup> |
| 27        | 88                 | 57      | 72   | 101                 | 72                | 73  | 68                | 71      | 67                | 47  | 78 <sup>(a)</sup> |
| 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 <sup>(a)</sup> | 73      | 67                | 43  | 99                |
| September |                    |         |      |                     |                   |     |                   |         |                   |     |                   |
| 1         | 86                 | 56      | 71   | 106                 | 87                | 61  | 71                | 70      | 87                | 43  | 99                |
| 2         | 86                 | 56      | 71   | 102                 | 98 <sup>(a)</sup> | 69  | 00                | 70      | 49                | 47  | 75 <sup>(a)</sup> |
| 3         | 85                 | 55      | 70   | 102                 | 98                | 71  | 97                | 71      | 95                | 40  | 00                |
| 4         | 85                 | 55      | 70   | 102                 | 88                | 68  | 59                | 68      | 55                | 44  | 80                |
| 5         | 85                 | 55      | 70   | 100                 | 55                | 72  | 60                | 68      | 63                | 43  | 69                |
| 6         | 85                 | 55      | 70   | 101                 | 55                | 69  | 46                | 65      | 57 <sup>(a)</sup> | 41  | 96                |
| 7         | 84                 | 54      | 69   | 97                  | 58                | 60  | 78                | 72      | 55                | 42  | 92 <sup>(a)</sup> |
| 8         | 84                 | 54      | 69   | 99                  | 81                | 61  | 85                | 69      | 63                | 42  | 76 <sup>(a)</sup> |
| 9         | 83                 | 53      | 68   | 98                  | 81 <sup>(a)</sup> | 66  | 85                | 68      | 69                | 40  | 62                |
| 10        | 83                 | 53      | 68   | 97                  | 93                | 68  | 85                | 65      | 63                | 43  | 82 <sup>(a)</sup> |
| 11        | 82                 | 53      | 68   | 98                  | 90 <sup>(a)</sup> | 62  | 85                | 66      | 69                | 41  | 88                |
| 12        | 82                 | 52      | 67   | 96                  | 02 <sup>(a)</sup> | 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 <sup>(a)</sup> | 58  | 59                | 66      | 00                | 35  | 70                |
| 16        | 80                 | 52      | 66   | 96                  | 81 <sup>(a)</sup> | 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)

| Day      | Normal (1971-2000) |         |      | Extreme (1945-2002) |                   |     |                   |         |                   |     |                   |
|----------|--------------------|---------|------|---------------------|-------------------|-----|-------------------|---------|-------------------|-----|-------------------|
|          |                    |         | Mean | Maximum             |                   |     |                   | Minimum |                   |     |                   |
|          | Maximum            | Minimum |      | 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 <sup>(a)</sup> | 67      | 94                | 37  | 83                |
| 21       | 78                 | 49      | 63   | 98                  | 67                | 56  | 00                | 65      | 62                | 38  | 93 <sup>(a)</sup> |
| 22       | 77                 | 48      | 62   | 93                  | 66                | 52  | 84                | 68      | 66                | 36  | 81 <sup>(a)</sup> |
| 23       | 77                 | 48      | 62   | 93                  | 87                | 54  | 77                | 62      | 92                | 32  | 00                |
| 24       | 77                 | 47      | 62   | 94                  | 01 <sup>(a)</sup> | 60  | 72                | 60      | 50                | 34  | 00 <sup>(a)</sup> |
| 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 <sup>(a)</sup> | 58  | 77                | 60      | 49                | 30  | 72                |
| 28       | 77                 | 47      | 62   | 92                  | 67                | 58  | 77                | 62      | 76                | 33  | 85                |
| 29       | 76                 | 47      | 62   | 92                  | 96 <sup>(a)</sup> | 57  | 77                | 61      | 89                | 34  | 85 <sup>(a)</sup> |
| 30       | 76                 | 47      | 61   | 88                  | 93 <sup>(a)</sup> | 63  | 54 <sup>(a)</sup> | 64      | 93                | 35  | 85                |
| October  |                    |         |      |                     |                   |     |                   |         |                   |     |                   |
| 1        | 75                 | 46      | 61   | 88                  | 91 <sup>(a)</sup> | 61  | 59                | 59      | 92                | 30  | 54                |
| 2        | 75                 | 46      | 60   | 86                  | 93 <sup>(a)</sup> | 56  | 67                | 60      | 88                | 32  | 54                |
| 3        | 74                 | 46      | 60   | 89                  | 58                | 55  | 50                | 58      | 88 <sup>(a)</sup> | 33  | 99 <sup>(a)</sup> |
| 4        | 73                 | 45      | 59   | 89                  | 80                | 55  | 50                | 57      | 88                | 32  | 73                |
| 5        | 72                 | 44      | 58   | 87                  | 58                | 52  | 57                | 52      | 88 <sup>(a)</sup> | 34  | 82 <sup>(a)</sup> |
| 6        | 72                 | 44      | 58   | 85                  | 80                | 53  | 57 <sup>(a)</sup> | 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 <sup>(a)</sup> | 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 <sup>(a)</sup> | 59      | 88                | 24  | 69                |
| 15       | 67                 | 40      | 54   | 81                  | 63                | 53  | 92                | 60      | 88                | 29  | 70                |
| 16       | 66                 | 40      | 53   | 79                  | 63                | 54  | 92 <sup>(a)</sup> | 56      | 95                | 26  | 46                |
| 17       | 65                 | 39      | 52   | 77                  | 97                | 45  | 96                | 49      | 55                | 26  | 96                |
| 18       | 65                 | 38      | 51   | 76                  | 73                | 47  | 49                | 50      | 00 <sup>(a)</sup> | 27  | 49                |
| 19       | 64                 | 38      | 51   | 78                  | 92 <sup>(a)</sup> | 50  | 45                | 52      | 92                | 27  | 69 <sup>(a)</sup> |
| 20       | 63                 | 37      | 50   | 74                  | 78                | 45  | 47                | 54      | 73                | 23  | 49                |
| 21       | 63                 | 37      | 50   | 73                  | 91 <sup>(a)</sup> | 45  | 96                | 54      | 63                | 20  | 84                |
| 22       | 62                 | 37      | 50   | 74                  | 59                | 46  | 50                | 51      | 52                | 20  | 84                |
| 23       | 62                 | 37      | 49   | 73                  | 66 <sup>(a)</sup> | 39  | 84                | 51      | 60                | 25  | 84                |
| 24       | 61                 | 37      | 49   | 75                  | 77 <sup>(a)</sup> | 49  | 57                | 49      | 46                | 24  | 02                |
| 25       | 60                 | 37      | 48   | 75                  | 55 <sup>(a)</sup> | 49  | 57                | 60      | 45                | 23  | 02                |
| 26       | 59                 | 37      | 48   | 69                  | 92                | 49  | 00 <sup>(a)</sup> | 52      | 94                | 21  | 78                |
| 27       | 59                 | 36      | 47   | 74                  | 85                | 43  | 99 <sup>(a)</sup> | 54      | 81                | 23  | 70                |
| 28       | 58                 | 36      | 47   | 68                  | 65 <sup>(a)</sup> | 35  | 91                | 52      | 49                | 18  | 71                |
| 29       | 57                 | 35      | 46   | 70                  | 53                | 42  | 91 <sup>(a)</sup> | 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                | 38  | 91                | 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 <sup>(a)</sup> | 15  | 02                |
| 5        | 54                 | 35      | 44   | 63                  | 89                | 31  | 73                | 48      | 88                | 20  | 73 <sup>(a)</sup> |
| 6        | 53                 | 35      | 44   | 64                  | 58                | 32  | 73                | 49      | 89                | 19  | 73                |
| 7        | 52                 | 34      | 43   | 69                  | 78                | 34  | 45                | 48      | 97 <sup>(a)</sup> | 19  | 93 <sup>(a)</sup> |
| 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)

| Day      | Normal (1971-2000) |         |      | Extreme (1945-2002) |                   |     |                   |         |                   |     |                   |
|----------|--------------------|---------|------|---------------------|-------------------|-----|-------------------|---------|-------------------|-----|-------------------|
|          | Maximum            | Minimum | Mean | Maximum             |                   |     |                   | Minimum |                   |     |                   |
|          |                    |         |      | 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 <sup>(a)</sup> | 10  | 61                |
| 18       | 48                 | 31      | 40   | 64                  | 46                | 25  | 55                | 47      | 54                | 11  | 55                |
| 19       | 47                 | 31      | 39   | 67                  | 02 <sup>(a)</sup> | 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 <sup>(a)</sup> | 17  | 85                | 53      | 90                | -6  | 85                |
| 23       | 44                 | 29      | 37   | 70                  | 59                | 11  | 85                | 54      | 90                | -13 | 85                |
| 24       | 44                 | 28      | 36   | 67                  | 95 <sup>(a)</sup> | 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 <sup>(a)</sup> | 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 <sup>(a)</sup> | 27  | 85 <sup>(a)</sup> | 54      | 75                | 8   | 85                |
| 4        | 42                 | 27      | 34   | 60                  | 75 <sup>(a)</sup> | 23  | 72                | 41      | 52                | 1   | 72                |
| 5        | 41                 | 26      | 34   | 58                  | 91 <sup>(a)</sup> | 21  | 72                | 41      | 87                | 7   | 72                |
| 6        | 40                 | 26      | 33   | 59                  | 87                | 16  | 56                | 43      | 87                | 8   | 56                |
| 7        | 40                 | 26      | 33   | 58                  | 73 <sup>(a)</sup> | 18  | 56                | 40      | 52                | 2   | 56                |
| 8        | 40                 | 26      | 33   | 58                  | 89                | 17  | 72                | 48      | 46                | -6  | 72                |
| 9        | 40                 | 26      | 33   | 59                  | 87 <sup>(a)</sup> | 13  | 72                | 44      | 56                | -5  | 72                |
| 10       | 40                 | 26      | 33   | 67                  | 93                | 13  | 72                | 48      | 46                | -8  | 72                |
| 11       | 40                 | 26      | 33   | 59                  | 91 <sup>(a)</sup> | 11  | 72                | 45      | 46                | -4  | 72                |
| 12       | 40                 | 26      | 33   | 57                  | 99 <sup>(a)</sup> | 22  | 72                | 42      | 77 <sup>(a)</sup> | -5  | 72                |
| 13       | 40                 | 26      | 33   | 59                  | 46                | 13  | 72                | 42      | 46                | -6  | 72                |
| 14       | 40                 | 26      | 33   | 57                  | 79 <sup>(a)</sup> | 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 <sup>(a)</sup> | 5   | 64                | 41      | 62                | -12 | 64                |
| 18       | 38                 | 24      | 31   | 56                  | 99 <sup>(a)</sup> | 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 <sup>(a)</sup> |
| 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 <sup>(a)</sup> | 15  | 90 <sup>(a)</sup> | 39      | 80 <sup>(a)</sup> | 0   | 90                |
| 25       | 36                 | 24      | 30   | 65                  | 80                | 16  | 90                | 41      | 72                | 1   | 90                |
| 26       | 36                 | 24      | 30   | 69                  | 80                | 20  | 90 <sup>(a)</sup> | 53      | 80                | 0   | 48                |
| 27       | 36                 | 24      | 30   | 62                  | 80 <sup>(a)</sup> | 19  | 48                | 40      | 94 <sup>(a)</sup> | -2  | 48                |
| 28       | 35                 | 23      | 29   | 59                  | 98                | 11  | 96                | 46      | 98                | -6  | 96                |
| 29       | 35                 | 23      | 29   | 60                  | 98 <sup>(a)</sup> | -2  | 68                | 41      | 98                | -10 | 90 <sup>(a)</sup> |
| 30       | 35                 | 22      | 29   | 54                  | 70                | -2  | 68                | 39      | 88 <sup>(a)</sup> | -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 2002. 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 July 2001. It also shows the accumulation of heating-degree days for the 2001-2002 heating season. The figure shows a somewhat warmer than average fall and early winter, with cumulative heating-degree days below the range of typical seasons. However, the early spring was cooler than average, as a result, the heating degree days for the season ended within the range of typical seasons.

Figure 3.27 presents the climatological statistics for cooling-degree days and data for the 2002 cooling season. The figure shows a typical spring, followed by a warm July and September. Overall, the cooling season was warmer than average, and ended at the top of the range of typical cooling seasons.

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 2002. 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                        | <b>36<sup>(a)</sup></b>  | 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                        | <b>1,640<sup>(a)</sup></b> | 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                       | <b>200<sup>(a)</sup></b> | 929                        | 934                        | <b>694<sup>(a)</sup></b>   | 664                        | 585                      | 419                        | 228                      | <b>90<sup>(a)</sup></b> | 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                        | <b>794<sup>(a)</sup></b> | <b>522<sup>(a)</sup></b>   | 253                      | 23                      | 5,554                      |
| 1955-56                | <b>22<sup>(a)</sup></b>  | 0                        | 108                      | 364                      | 1,008                      | 1,105                      | 1,029                      | <b>1,147<sup>(a)</sup></b> | 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                        | <b>822<sup>(a)</sup></b>   | 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                        | <b>32<sup>(a)</sup></b>  | 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                      | <b>6,118<sup>(a)</sup></b> |
| 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                        | <b>292<sup>(a)</sup></b> | 70                      | 5,664                      |
| 1984-85                | 0                        | 3                        | 145                      | <b>532<sup>(a)</sup></b> | 768                        | 1,288                      | 1,245                      | 982                        | 651                      | 288                        | 137                      | 21                      | 6,060                      |
| 1985-86                | 0                        | 10                       | <b>197<sup>(a)</sup></b> | 475                      | <b>1,206<sup>(a)</sup></b> | <b>1,362<sup>(a)</sup></b> | 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                        | <b>0<sup>(a)</sup></b>   | <b>0<sup>(a)</sup></b>   | 401                      | <b>553<sup>(a)</sup></b>   | 1,269                      | 1,124                      | <b>575<sup>(a)</sup></b>   | 649                      | 330                        | 148                      | 55                      | 5,108                      |
| 1991-92                | 0                        | 0                        | 12                       | 381                      | 710                        | 842                        | 851                        | 648                        | <b>418<sup>(a)</sup></b> | 278                        | 77                       | 13                      | <b>4,230<sup>(a)</sup></b> |
| 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                      | <b>217<sup>(a,b)</sup></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                      | <b>1<sup>(a)</sup></b>  | 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                | <b>0<sup>(a,b)</sup></b> | <b>0<sup>(a,b)</sup></b> | 30                       | 363                      | 669                        | 936                        | 854                        | 745                        | 698                      | 359                        | 181                      | 28                      | 4,863                      |
| 2002-03                | 1                        | 1                        | 54                       | 454                      | 714                        | 865                        | --                         | --                         | --                       | --                         | --                       | --                      | --                         |
| Average <sup>(c)</sup> | 4                        | 5                        | 71                       | 375                      | 745                        | 1,012                      | 1,057                      | 773                        | 612                      | 365                        | 154                      | 34                      | 5,205                      |
| Normal <sup>(d)</sup>  | 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 2002.

(d) Based on period 1971-2000.

NOTE: Dashes indicate no data are available.

**Table 3.14. Monthly and Annual Cooling-Degree Days**

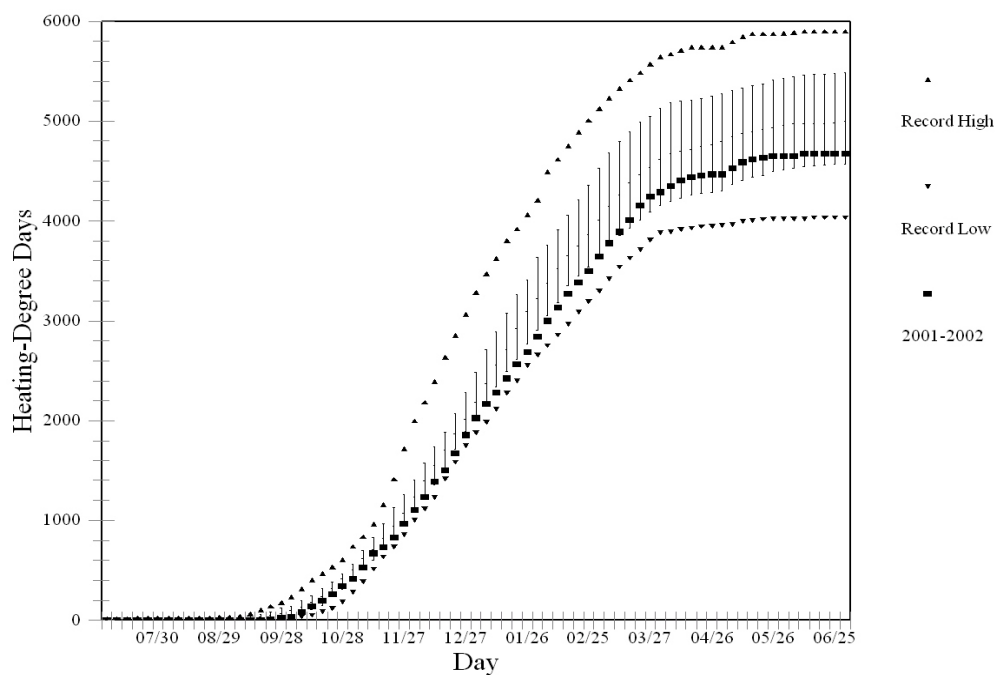
| Year                   | Jan | Feb                      | Mar | Apr                      | May                      | Jun                      | Jul                      | Aug                      | Sep                      | Oct                      | Nov                      | Dec | Annual                     |
|------------------------|-----|--------------------------|-----|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-----|----------------------------|
| 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                        | <b>26<sup>(a)</sup></b>  | 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                        | <b>167<sup>(a)</sup></b> | 282                      | 500                      | 447                      | 93                       | 14                       | 0                        | 0   | <b>1,503<sup>(a)</sup></b> |
| 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                        | <b>3<sup>(a)</sup></b>   | 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                      | <b>171<sup>(a)</sup></b> | 34                       | 0                        | 0                        | 0   | <b>649<sup>(a)</sup></b>   |
| 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                      | <b>508<sup>(a)</sup></b> | 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                      | <b>532<sup>(a)</sup></b> | 183                      | <b>11<sup>(a)</sup></b>  | 0                        | 0                        | 0   | 987                        |
| 1986                   | 0   | <b>1<sup>(a)</sup></b>   | 0   | 3                        | 125                      | 245                      | 192                      | 442                      | 68                       | 1                        | 0                        | 0   | 1,077                      |
| 1987                   | 0   | 0                        | 0   | <b>26<sup>(a)</sup></b>  | 125                      | 265                      | 289                      | 359                      | 179                      | 11                       | 0                        | 0   | 1,254                      |
| 1988                   | 0   | 0                        | 0   | 6                        | 45                       | 187                      | 385                      | 318                      | 113                      | <b>44<sup>(a)</sup></b>  | 0                        | 0   | 1,098                      |
| 1989                   | 0   | 0                        | 0   | 1                        | 34                       | 215                      | 323                      | 260                      | 89                       | 0                        | <b>1<sup>(a)</sup></b>   | 0   | 923                        |
| 1990                   | 0   | 0                        | 0   | 3                        | 16                       | 182                      | 491                      | 367                      | <b>222<sup>(a)</sup></b> | 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                      | <b>365<sup>(a)</sup></b> | 362                      | 392                      | 81                       | 10                       | 0                        | 0   | 1,368                      |
| 1993                   | 0   | 0                        | 0   | 0                        | 139                      | 127                      | <b>171<sup>(a)</sup></b> | 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   | <b>0<sup>(a,b)</sup></b> | 43                       | 135                      | 281                      | 366                      | 66                       | <b>0<sup>(a,b)</sup></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   | <b>0<sup>(a,b)</sup></b> | 0   | 1                        | 28                       | 224                      | 456                      | 327                      | 94                       | 1                        | <b>0<sup>(a,b)</sup></b> | 0   | 1,131                      |
| Average <sup>(c)</sup> | 0   | <1                       | 0   | 4                        | 56                       | 162                      | 355                      | 316                      | 104                      | 3                        | <1                       | 0   | 1,001                      |
| Normal <sup>(d)</sup>  | 0   | <1                       | 0   | 5                        | 57                       | 163                      | 355                      | 326                      | 103                      | 4                        | <1                       | 0   | 1,014                      |

(a) Greatest and least values.

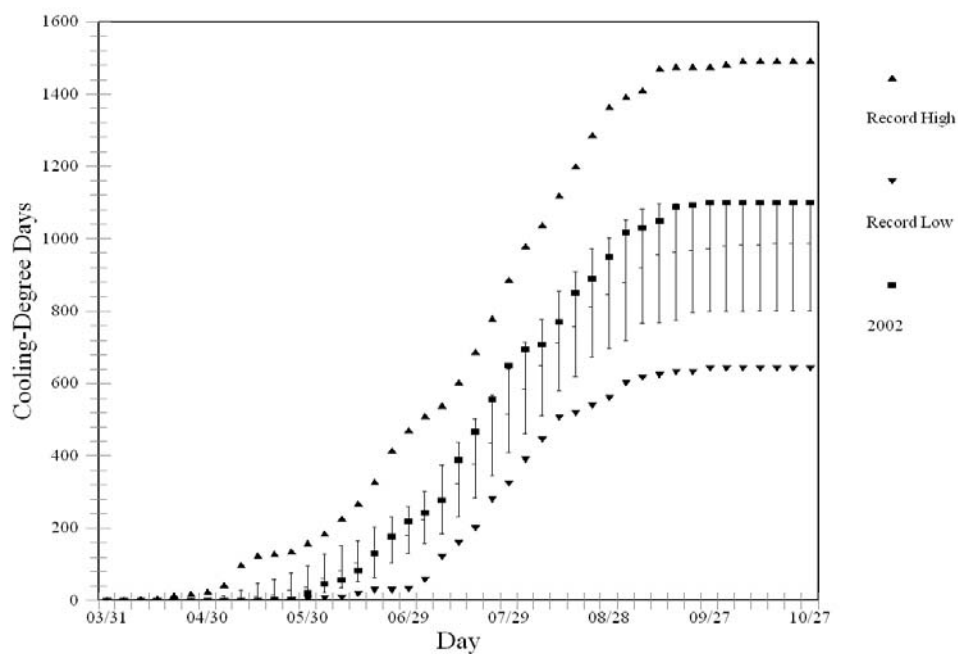
(b) Most recent of numerous occurrences.

(c) Based on entire period of record, 1945 through 2002.

(d) Based on period 1971-2000.



**Figure 3.26. Climatological Statistics on Heating-Degree Days with Data for the 2001-2002 Heating Season**



**Figure 3.27. Climatological Statistics on Cooling-Degree Days with Data for the 2002 Cooling Season**

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

| Month                    | Monthly Averages |        |        | 0.5-in. Depth |        |         |      | 15-in. Depth |        |         |      | 36-in. Depth |        |         |                     |
|--------------------------|------------------|--------|--------|---------------|--------|---------|------|--------------|--------|---------|------|--------------|--------|---------|---------------------|
|                          | 0.5 in.          | 15 in. | 36 in. | Highest       | Lowest |         |      | Highest      | Lowest |         |      | Highest      | Lowest |         |                     |
|                          |                  |        |        | Monthly       | Year   | Monthly | Year | Monthly      | Year   | Monthly | Year | Monthly      | Year   | Monthly | Year                |
|                          | Average          |        |        | Average       |        | Average |      | Average      |        | Average |      | Average      |        | Average |                     |
| Jan                      | 32.7             | 36.2   | 42.6   | 39.4          | 1967   | 19.2    | 1979 | 42.7         | 1981   | 25.5    | 1979 | 48.7         | 1975   | 36.3    | 1979                |
| Feb                      | 38.2             | 38.8   | 42.0   | 45.1          | 1958   | 28.6    | 1989 | 44.9         | 1967   | 29.6    | 1957 | 46.9         | 1967   | 33.5    | 1957                |
| Mar                      | 48.0             | 46.3   | 46.0   | 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             | 65.6   | 60.7   | 81.4          | 1992   | 63.6    | 1984 | 71.4         | 1992   | 58.7    | 1984 | 65.1         | 1987   | 54.8    | 1955                |
| Jun                      | 82.5             | 75.1   | 68.6   | 90.4          | 1986   | 75.3    | 1956 | 84.5         | 1966   | 70.2    | 1956 | 73.4         | 1969   | 62.8    | 1984                |
| Jul                      | 90.8             | 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             | 82.7   | 78.5   | 94.9          | 1971   | 81.6    | 1960 | 89.2         | 1967   | 77.5    | 1964 | 83.9         | 1967   | 75.3    | 1999 <sup>(a)</sup> |
| 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                      | 56.4             | 62.4   | 67.2   | 62.6          | 1988   | 52.4    | 1985 | 66.6         | 1967   | 57.9    | 1957 | 72.3         | 1967   | 62.9    | 1959                |
| Nov                      | 40.7             | 48.1   | 56.7   | 45.7          | 1999   | 31.9    | 1985 | 54.0         | 1974   | 42.5    | 1955 | 62.7         | 1974   | 51.2    | 1955                |
| Dec                      | 33.5             | 39.1   | 47.7   | 38.7          | 1974   | 26.5    | 1984 | 45.0         | 1974   | 34.1    | 1984 | 54.6         | 1974   | 41.4    | 1955                |
| Annual                   | 59.7             | 58.8   | 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.

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## 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 2002. 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 2002. The figure also shows the total precipitation for each month during 2002.

Figure 4.2 shows the climatological statistics of seasonal precipitation accumulation and the accumulation for the 2001-2002 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.

### 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 23 days receive totals of 0.10 inch or more. During the 57-year period of record, only 4 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                      | <b>1.34<sup>(a)</sup></b> | 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                      | <b>2.92<sup>(a)</sup></b> | 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                      | <b>1.86<sup>(a)</sup></b> | 0.38                      | 0.82                      | 0.47                      | 0.05                      | 0.02                      | 0.34                      | <b>2.72<sup>(a)</sup></b> | 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                      | <b>2.10<sup>(a)</sup></b> | 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                      | <b>0.02<sup>(a)</sup></b> | 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                   | <b>2.47<sup>(a)</sup></b> | 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                      | <b>2.03<sup>(a)</sup></b> | 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                      | <b>T<sup>(a)</sup></b>    | <b>0.11<sup>(a,b)</sup></b> | <b>2.99<sup>(a)</sup></b>  |
| 1977                   | <b>0.08<sup>(a)</sup></b> | 0.57                      | 0.41                      | T                         | 0.65                      | 0.37                      | 0.06                      | <b>1.36<sup>(a)</sup></b> | 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                      | <b>T<sup>(a,b)</sup></b>  | 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                      | <b>T<sup>(a,b)</sup></b>  | 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                      | <b>T<sup>(a,b)</sup></b>  | 0.40                      | 1.63                        | 5.07                       |
| 1988                   | 0.48                      | <b>T<sup>(a,b)</sup></b>  | 0.39                      | 1.12                      | 0.33                      | 0.11                      | 0.13                      | <b>0<sup>(a,b)</sup></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                      | <b>T<sup>(a)</sup></b>    | 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                      | <b>1.76<sup>(a)</sup></b> | 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                      | <b>1.54<sup>(a)</sup></b> | 0.79                      | 0.77                      | 0.34                      | 0.07                      | 0.79                      | 0.87                      | 1.04                      | 2.32                        | <b>12.31<sup>(a)</sup></b> |
| 1996                   | 1.42                      | 1.22                      | 0.83                      | 0.43                      | 0.62                      | 0.05                      | 0.14                      | 0.02                      | 0.22                      | 0.88                      | <b>2.67<sup>(a)</sup></b> | <b>3.69<sup>(a)</sup></b>   | 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                      | <b>T<sup>(a,b)</sup></b>  | 0.34                      | 0.31                      | 0.07                      | 0.57                      | <b>0<sup>(a,b)</sup></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                       |
| Average <sup>(c)</sup> | 0.91                      | 0.64                      | 0.51                      | 0.45                      | 0.51                      | 0.53                      | 0.22                      | 0.23                      | 0.30                      | 0.53                      | 0.91                      | 1.02                        | 6.76                       |
| Normal <sup>(d)</sup>  | 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 2002.

(d) Based on 1971-2000.

NOTE: Dashes indicate no data are available.



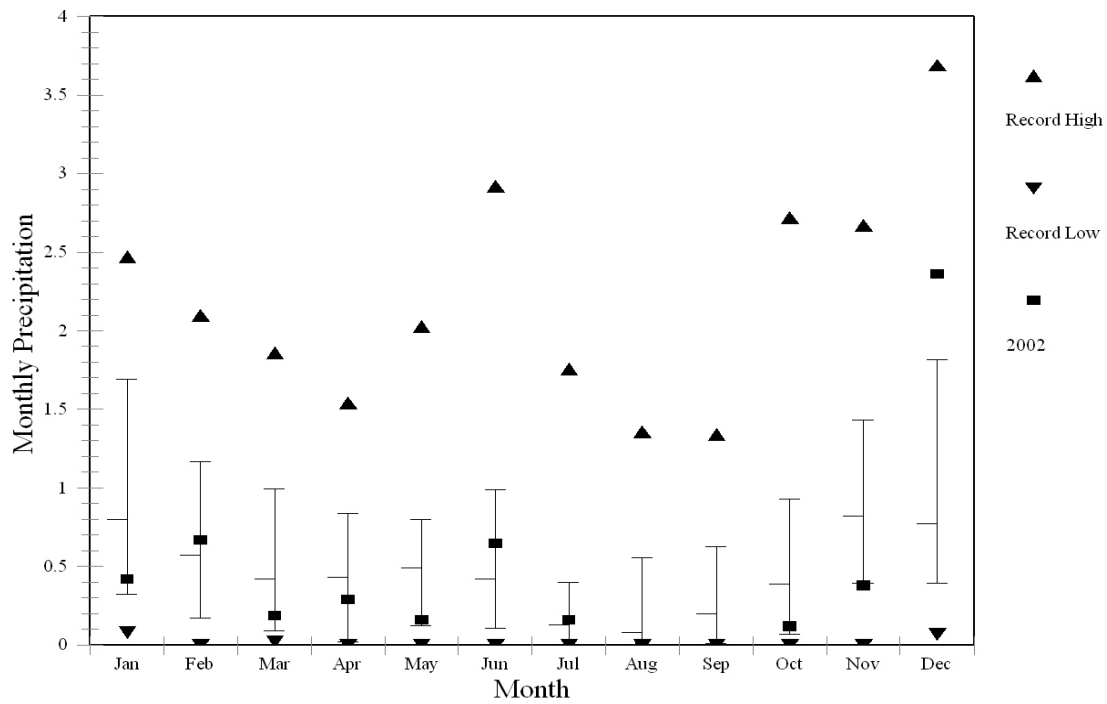


Figure 4.1. Monthly Precipitation Totals (inches, water equivalent)

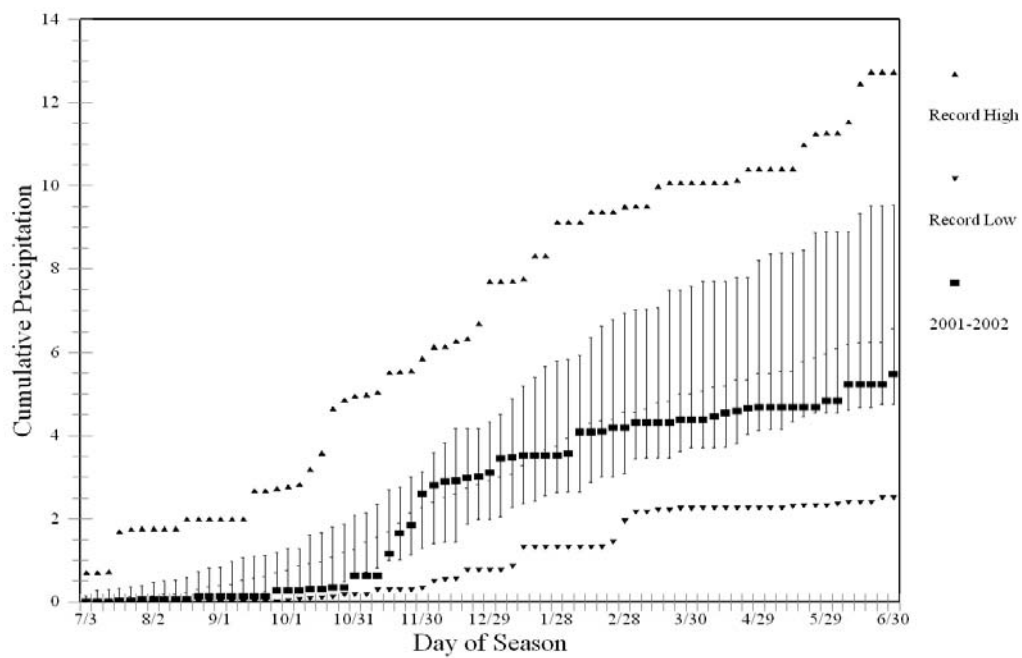


Figure 4.2. Seasonal Precipitation Accumulation (inches, water equivalent)

**Table 4.2. Seasonal Precipitation (inches)**

| Year                   | Winter <sup>(a)</sup><br>Dec-Feb | Spring<br>Mar-May         | Summer<br>Jun-Aug         | Autumn<br>Sep-Nov         |
|------------------------|----------------------------------|---------------------------|---------------------------|---------------------------|
| 1946                   | --                               | --                        | --                        | 1.83                      |
| 1947                   | <b>0.70<sup>(b)</sup></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                      | <b>2.99<sup>(b)</sup></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                             | <b>0.09<sup>(b)</sup></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                      | <b>0.03<sup>(b)</sup></b> | <b>4.79<sup>(b)</sup></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                      | <b>0.04<sup>(b)</sup></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                             | <b>3.28<sup>(b)</sup></b> | 1.18                      | 2.70                      |
| 1996                   | 4.96                             | 1.88                      | 0.21                      | 3.77                      |
| 1997                   | <b>5.45<sup>(b)</sup></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                      |
| Average <sup>(c)</sup> | 2.56                             | 1.47                      | 0.98                      | 1.74                      |
| Normal <sup>(d)</sup>  | 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 2002.

(d) Based on period 1971-2000.

NOTE: Dashes indicate no data are available.

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

| Month                 | Trace or<br>more | 0.01 in.<br>or more | 0.10 in.<br>or more | 0.25 in.<br>or more | 0.50 in.<br>or more | 1.00 in.<br>or more |
|-----------------------|------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Jan                   | 16               | 9                   | 3                   | 1                   | (a)                 | 0                   |
| Feb                   | 12               | 7                   | 2                   | 1                   | (a)                 | 0                   |
| Mar                   | 11               | 6                   | 2                   | (a)                 | (a)                 | 0                   |
| 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                  | 3                   | 1                   | (a)                 | 0                   |
| Annual <sup>(b)</sup> | 122              | 68                  | 23                  | 7                   | 1 <sup>(c)</sup>    | (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, 77 such days were recorded during 57 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 2002. 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 2002**

| Month  | Averages     |           | Greatest     |           | Year | Least        |           | Year                |
|--------|--------------|-----------|--------------|-----------|------|--------------|-----------|---------------------|
|        | No. of Hours | % of Time | No. of Hours | % of Time |      | No. of Hours | % of Time |                     |
| Jan    | 87.5         | 11.8      | 212.0        | 28.5      | 1969 | 29.1         | 3.9       | 2002                |
| Feb    | 56.0         | 8.3       | 151.6        | 22.6      | 1980 | 2.5          | 0.4       | 1988                |
| Mar    | 39.0         | 5.2       | 135.2        | 18.2      | 1957 | 6.4          | 0.9       | 1994                |
| Apr    | 28.9         | 4.0       | 69.2         | 9.6       | 1953 | 1.6          | 0.2       | 1985                |
| May    | 30.1         | 4.0       | 89.9         | 12.1      | 1948 | 1.2          | 0.2       | 1992                |
| Jun    | 26.8         | 3.7       | 80.8         | 11.2      | 1950 | 2.9          | 0.4       | 1986                |
| Jul    | 10.2         | 1.4       | 38.2         | 5.1       | 1966 | 0.5          | 0.1       | 1984                |
| Aug    | 11.5         | 1.6       | 61.7         | 8.3       | 1968 | 0.0          | 0.0       | 1988 <sup>(a)</sup> |
| Sep    | 15.3         | 2.1       | 66.4         | 9.2       | 1977 | 0.0          | 0.0       | 1999 <sup>(a)</sup> |
| Oct    | 31.3         | 4.2       | 119.9        | 16.1      | 1947 | 0.4          | 0.1       | 1978                |
| Nov    | 60.5         | 8.4       | 146.5        | 20.3      | 1985 | 4.8          | 0.7       | 1976                |
| Dec    | 88.0         | 11.8      | 230.5        | 31.0      | 1985 | 15.8         | 2.1       | 1976                |
| Annual | 485.2        | 5.5       | 738.0        | 8.4       | 1950 | 286.7        | 3.3       | 1990                |

(a) Most recent of several occurrences.

## 4.6 Notable Wet Periods

Ten periods are listed when precipitation was particularly high:

| Period                      | Number of Days with<br>Trace or More |                         | Total Amount (inches)       |                     |          |
|-----------------------------|--------------------------------------|-------------------------|-----------------------------|---------------------|----------|
|                             | Altogether                           | Greatest<br>Consecutive | Measurable<br>Precipitation | Water<br>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      |

**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                       | <b>119.9<sup>(a)</sup></b> | 48.1                       | 71.1                       | 476.0                      |
| 1948                   | 70.7                       | 70.4                       | 16.6                       | 43.8                      | <b>89.9<sup>(a)</sup></b> | 36.4                      | 15.2                      | 16.6                       | 15.8                       | 19.7                       | 44.4                       | 81.9                       | 521.4                      |
| 1949                   | <b>29.2<sup>(a)</sup></b>  | 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                      | <b>80.8<sup>(a)</sup></b> | 5.0                       | 2.3                        | 1.3                        | 112.3                      | 92.9                       | 108.8                      | <b>738.0<sup>(a)</sup></b> |
| 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                       | <b>69.2<sup>(a)</sup></b> | 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                       | <b>135.2<sup>(a)</sup></b> | 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                      | <b>38.2<sup>(a)</sup></b> | 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                       | <b>61.7<sup>(a)</sup></b>  | 17.2                       | 45.3                       | 68.9                       | 134.2                      | 568.1                      |
| 1969                   | <b>212.0<sup>(a)</sup></b> | 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                       | <b>4.8<sup>(a)</sup></b>   | 15.8                       | 294.6                      |
| 1977                   | 138.7                      | 37.1                       | 37.8                       | 4.6                       | 45.9                      | 24.8                      | 14.2                      | 28.9                       | <b>66.4<sup>(a)</sup></b>  | 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                       | <b>0.4<sup>(a)</sup></b>   | 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                      | <b>151.6<sup>(a)</sup></b> | 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                      | <b>0.5<sup>(a)</sup></b>  | 0.5                        | 20.5                       | 7.1                        | 97.6                       | 75.5                       | 440.5                      |
| 1985                   | 151.2                      | 54.9                       | 26.0                       | <b>1.6<sup>(a)</sup></b>  | 7.0                       | 17.4                      | 3.2                       | 1.2                        | 30.8                       | 17.2                       | <b>146.5<sup>(a)</sup></b> | <b>230.5<sup>(a)</sup></b> | 687.5                      |
| 1986                   | 107.6                      | 68.9                       | 47.4                       | 14.4                      | 22.3                      | <b>2.9<sup>(a)</sup></b>  | 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                       | <b>2.5<sup>(a)</sup></b>   | 24.8                       | 36.2                      | 18.3                      | 17.4                      | 6.2                       | <b>0.0<sup>(a,c)</sup></b> | 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                      | <b>1.2<sup>(a)</sup></b>  | 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                       | <b>15.5<sup>(a)</sup></b>  | 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                       | <b>4.8<sup>(a)</sup></b>   | 3.1                       | 15.2                      | 9.4                       | 2.1                       | 9.4                        | <b>0.0<sup>(a,c)</sup></b> | 20.9                       | 44.8                       | 35.2                       | <b>254.4<sup>(a)</sup></b> |
| 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                      |
| Average <sup>(d)</sup> | 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 <sup>(e)</sup>  | 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 2002.

(e) Based on period 1971-2000.

NOTE: Dashes indicate no data are available.

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 2001). In 2002, a 130-day dry period occurred between June 30 and November 6, when total precipitation measured 0.29 inch.

During 1946 through 2001, there were 40 months without measurable precipitation, with the months of July and August accounting for 21 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<br>of Days | Total Precipitation<br>(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) 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 4.6. Monthly and Seasonal Snowfall (inches), Including First and Last Dates of Both Trace and Measurable Snowfalls**

| Season    | Oct                      | Nov  | Dec                      | Jan                       | Feb  | Mar                      | Apr | Total                    | First |        | First Measurable |        | Last Measurable |        | Last  |        |
|-----------|--------------------------|------|--------------------------|---------------------------|------|--------------------------|-----|--------------------------|-------|--------|------------------|--------|-----------------|--------|-------|--------|
|           |                          |      |                          |                           |      |                          |     |                          | 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                      | <b>23.4<sup>(a)</sup></b> | 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  | <b>4.2<sup>(a)</sup></b> | 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 | <b>0.3</b>               | 0    | T                        | T                         | 0    | T                        | 0   | <b>0.3<sup>(a)</sup></b> |       |        | 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    | <b>T<sup>(a,b)</sup></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 | <b>1.5<sup>(a)</sup></b> | 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 |        | First Measurable |        | Last Measurable |        | Last  |        |
|------------------------|--------------------------|---------------------------|---------------------------|------------------------|---------------------------|--------------------------|--------------------------|---------------------------|-------|--------|------------------|--------|-----------------|--------|-------|--------|
|                        |                          |                           |                           |                        |                           |                          |                          |                           | Date  | Amount | Date             | Amount | Date            | Amount | Date  | 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                        | <b>1.0<sup>(a)</sup></b> | 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                        | <b>18.3<sup>(a)</sup></b> | 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                    | <b>17.0<sup>(a)</sup></b> | 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 <sup>(a,b)</sup>        | 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                        | <b>56.1<sup>(a)</sup></b> |       |        | 11/21            | 0.2    | 03/03           | 1.5    | 03/16 | T      |
| 1993-1994              | 0                        | 1.4                       | 1.8                       | <b>0<sup>(a)</sup></b> | 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                      | <b>22.6<sup>(a)</sup></b> | 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                        | <b>0<sup>(a,b)</sup></b>  | 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                       | <b>0<sup>(a,b)</sup></b> | 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                      | <b>0<sup>(a,b)</sup></b> | 2.8                       |       |        | 11/28            | 5.0    | 03/06           | 1.4    | 03/20 | T      |
| 2002-2003              | <b>0<sup>(a,b)</sup></b> | T                         | 0.6                       | --                     | --                        | --                       | --                       | --                        | 11/28 | T      | 12/03            | 0.1    | --              | --     | --    | --     |
| Average <sup>(c)</sup> | 0.1                      | 1.8                       | 5.2                       | 4.9                    | 2.4                       | 0.5                      | T                        | 14.7                      | 11/21 |        | 11/30            |        | 02/14           |        | 03/11 |        |
| Normal <sup>(d)</sup>  | 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 2002.

(d) Based on period 1971-2000.

T = Trace.

NOTE: Dashes indicate no data are available.



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 2002. 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  $\geq 6$  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 2002. 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 revised period 1971 through 2000; the daily maximum values are for the entire period of record (1945 through 2002). The maximum daily value for each month is noted on the table.

Climatologically speaking, the wettest period of the year is from December 4 through 14, with each day having a normal precipitation value of 0.04 inch. As discussed in Section 4.2, most days do not receive any precipitation, and those that do typically receive considerably more than 0.04 inch. October 1, 1957, recorded the greatest precipitation in one day, 1.60 inches. There have been only 4 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                      | <b>9.6<sup>(a)</sup></b> | 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   | <b>0.3<sup>(b)</sup></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   | <b>1.5<sup>(a)</sup></b> | 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                        | <b>9.1<sup>(a)</sup></b> | 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                        | <b>1.0<sup>(a)</sup></b> | 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                      | <b>6.6<sup>(a)</sup></b> | 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                      | <b>2.7<sup>(a)</sup></b> | T                        | <b>T<sup>(a,c)</sup></b> | 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                      | <b>12.4<sup>(a)</sup></b> | 2.0                      | 0                        | 0                        | 0   | <b>12.4<sup>(a)</sup></b> |
| 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                      | --                       | --                        | --                       | --                       | --                       | --  | --                        |

(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 2002**

|   | Oct               | Nov                      | Dec         | Jan              | Feb         | Mar        | Season          |
|---|-------------------|--------------------------|-------------|------------------|-------------|------------|-----------------|
| <hr/>   |                   |                          |             |                  |             |            |                 |
| Average Number<br>of Days of Given<br>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)             |
| <hr/>   |                   |                          |             |                  |             |            |                 |
| Record Greatest<br>Number of Days<br>of Given Depth<br>at 0400 PST    |                   |                          |             |                  |             |            |                 |
| ≥1 inch   | 0                 | 12 (1996) <sup>(b)</sup> | 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)    |
| <hr/>   |                   |                          |             |                  |             |            |                 |
| Record Greatest<br>Depth  | 1.5 (1973)        | 10.0 (1985)              | 15.6 (1985) | 15.0 (1993)      | 10.0 (1969) | 9.1 (1993) | 15.6 (Dec 1985) |
| <hr/>   |                   |                          |             |                  |             |            |                 |
| Greatest in<br>24 hours   | 1.5 (1973)        | 8.8 (1985)               | 6.6 (1985)  | 7.1 (1954)       | 10.2 (1993) | 2.7 (1989) | 10.2 (Feb 1993) |
| <hr/>   |                   |                          |             |                  |             |            |                 |
| Record Consecutive<br>Number of Days of<br>Given Depth at<br>0400 PST | Number<br>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                      | 12-31                | 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                | <b>0.28<sup>(a)</sup></b> | 01-15                | 0.44                      | 01/14-15    | 0.73                      | 01/14-15    |
| 1957 | 0.47                      | 10-01                | <b>0.88<sup>(a)</sup></b> | 10-01                | <b>1.08<sup>(a)</sup></b> | 10-01                | <b>1.68<sup>(a)</sup></b> | 10/01-02             | <b>1.88<sup>(a)</sup></b> | 10/01-02    | <b>1.91<sup>(a)</sup></b> | 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 <sup>(b)</sup> | 0.23                      | 09-14 <sup>(b)</sup> | 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 | <b>0.10<sup>(a)</sup></b> | 05-19                | <b>0.14<sup>(a)</sup></b> | 11-24 <sup>(b)</sup> | <b>0.18<sup>(a)</sup></b> | 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                | <b>0.32<sup>(a)</sup></b> | 06-21       | <b>0.37<sup>(a)</sup></b> | 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 | <b>0.55<sup>(a)</sup></b> | 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 <sup>(b)</sup> | 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 <sup>(b)</sup> | 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 <sup>(b)</sup> | 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 <sup>(b)</sup> | 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    |

(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<br>(1945-2002) |                           |
|---------------------------|--------|-----------------|---------|---------|---------------------|----------------------------------|---------------------------|
| Day                       | Normal | Number of Years |         | Maximum | Year                | Maximum                          | Year                      |
|                           |        | W/Meas.         | W/Trace |         |                     |                                  |                           |
| 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 <sup>(a)</sup>       |
| 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 <sup>(a)</sup>       |
| 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 <sup>(a)</sup>       |
| 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 <sup>(a)</sup> | 0.19                             | 1995 <sup>(a)</sup>       |
| 29                        | 0.02   | 6               | 4       | 0.21    | 1986                | 0.33                             | 1958                      |
| 30                        | 0.02   | 7               | 6       | 0.24    | 1995                | 0.24                             | 1995                      |
| 31                        | 0.02   | 9               | 9       | 0.69    | 1997                | <b>0.94<sup>(b)</sup></b>        | <b>1963<sup>(b)</sup></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 <sup>(a)</sup> | 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 <sup>(a)</sup>       |
| 19                        | 0.03   | 10              | 5       | 0.78    | 1993                | <b>0.78<sup>(b)</sup></b>        | <b>1993<sup>(b)</sup></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)

| Day   | Normal Period (1971-2000) |                 |         |         |                     | Historical Period (1945-2002) |                           |
|-------|---------------------------|-----------------|---------|---------|---------------------|-------------------------------|---------------------------|
|       | Normal                    | Number of Years |         | Maximum | Year                | Maximum                       | Year                      |
|       |                           | W/Meas.         | W/Trace |         |                     |                               |                           |
| 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 <sup>(a)</sup> | 0.25                          | 1948                      |
| 26    | 0.02                      | 7               | 4       | 0.30    | 2000 <sup>(a)</sup> | 0.30                          | 2000 <sup>(a)</sup>       |
| 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 <sup>(a)</sup>       |
| 3     | 0.02                      | 8               | 6       | 0.15    | 1991 <sup>(a)</sup> | 0.15                          | 1991 <sup>(a)</sup>       |
| 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 <sup>(a)</sup> | 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 <sup>(a)</sup>       |
| 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 <sup>(a)</sup> | 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                | <b>0.52<sup>(b)</sup></b>     | <b>1991<sup>(b)</sup></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)

| Day  | Normal Period (1971-2000) |                 |         |         |                     | Historical Period (1945-2002) |                           |
|------|---------------------------|-----------------|---------|---------|---------------------|-------------------------------|---------------------------|
|      | Normal                    | Number of Years |         | Maximum | Year                | Maximum                       | Year                      |
|      |                           | W/Meas.         | W/Trace |         |                     |                               |                           |
| 14   | 0.01                      | 5               | 5       | 0.17    | 1975 <sup>(a)</sup> | 0.17                          | 1975 <sup>(a)</sup>       |
| 15   | 0.01                      | 2               | 6       | 0.17    | 1991                | 0.17                          | 1991                      |
| 16   | 0.01                      | 4               | 6       | 0.08    | 1979 <sup>(a)</sup> | 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                | <b>0.56<sup>(b)</sup></b>     | <b>1980<sup>(b)</sup></b> |
| 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                | 0.25                          | 1955                      |
| 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                | <b>0.79<sup>(b)</sup></b>     | <b>1980<sup>(b)</sup></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)

| Day  | Normal Period (1971-2000) |                 |         |         |                     | Historical Period (1945-2002) |                           |
|------|---------------------------|-----------------|---------|---------|---------------------|-------------------------------|---------------------------|
|      | Normal                    | Number of Years |         | Maximum | Year                | Maximum                       | Year                      |
|      |                           | W/Meas.         | W/Trace |         |                     |                               |                           |
| 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 <sup>(a)</sup> | 0.15                          | 1964                      |
| 16   | 0.01                      | 3               | 5       | 0.14    | 1980                | 0.18                          | 1948                      |
| 17   | 0.01                      | 2               | 5       | 0.06    | 1975                | <b>1.09<sup>(b)</sup></b>     | <b>1950<sup>(b)</sup></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 <sup>(a)</sup> | 0.32                          | 1967                      |
| 22   | 0.01                      | 4               | 6       | 0.14    | 1971                | 0.14                          | 1971                      |
| 23   | 0.01                      | 6               | 1       | 0.05    | 1996 <sup>(a)</sup> | 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 <sup>(a)</sup> | T                             | 1982 <sup>(a)</sup>       |
| 13   | 0.01                      | 4               | 4       | 0.28    | 1975                | 0.28                          | 1975                      |
| 14   | 0.01                      | 0               | 2       | T       | 1993 <sup>(a)</sup> | 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                | <b>0.89<sup>(b)</sup></b>     | <b>1993<sup>(b)</sup></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 <sup>(a)</sup> | 0.09                          | 1965                      |
| 21   | T                         | 1               | 2       | 0.01    | 1997                | 0.02                          | 1965                      |
| 22   | T                         | 0               | 3       | T       | 1993 <sup>(a)</sup> | T                             | 1993 <sup>(a)</sup>       |
| 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)

| Day       | Normal Period (1971-2000) |                 |         |         |                     | Historical Period (1945-2002) |                           |
|-----------|---------------------------|-----------------|---------|---------|---------------------|-------------------------------|---------------------------|
|           | Normal                    | Number of Years |         | Maximum | Year                | Maximum                       | Year                      |
|           |                           | W/Meas.         | W/Trace |         |                     |                               |                           |
| 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 <sup>(a)</sup> | T                             | 2001 <sup>(a)</sup>       |
| 31        | T                         | 3               | 2       | 0.16    | 1998                | 0.16                          | 1998                      |
| August    |                           |                 |         |         |                     |                               |                           |
| 1         | T                         | 1               | 0       | 0.08    | 1976 <sup>(a)</sup> | 0.08                          | 1976 <sup>(a)</sup>       |
| 2         | T                         | 2               | 0       | 0.01    | 1996                | 0.01                          | 1996 <sup>(a)</sup>       |
| 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                | 0.33                          | 1976                      |
| 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 <sup>(a)</sup> | 0.04                          | 1987 <sup>(a)</sup>       |
| 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 <sup>(a)</sup> | T                             | 1995 <sup>(a)</sup>       |
| 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                | <b>0.76<sup>(b)</sup></b>     | <b>1990<sup>(b)</sup></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 <sup>(a)</sup> | 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 <sup>(a)</sup>       |
| 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                | 0.10                          | 1985                      |
| 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 <sup>(a)</sup> | 0.03                          | 1958                      |
| 13        | 0.01                      | 3               | 1       | 0.79    | 1980                | <b>0.79<sup>(b)</sup></b>     | <b>1980<sup>(b)</sup></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)

| Day      | Normal Period (1971-2000) |                 |         |         |                     | Historical Period<br>(1945-2002) |                           |
|----------|---------------------------|-----------------|---------|---------|---------------------|----------------------------------|---------------------------|
|          | Normal                    | Number of Years |         | Maximum | Year                | Maximum                          | Year                      |
|          |                           | W/Meas.         | W/Trace |         |                     |                                  |                           |
| 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 <sup>(a)</sup>       |
| October  |                           |                 |         |         |                     |                                  |                           |
| 1        | 0.01                      | 2               | 4       | 0.14    | 2000                | <b>1.60<sup>(b)</sup></b>        | <b>1957<sup>(b)</sup></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 <sup>(a)</sup> | 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)

| Day      | Normal Period (1971-2000) |                 |         |         |                     | Historical Period<br>(1945-2002) |                           |
|----------|---------------------------|-----------------|---------|---------|---------------------|----------------------------------|---------------------------|
|          | Normal                    | Number of Years |         | Maximum | Year                | Maximum                          | Year                      |
|          |                           | W/Meas.         | W/Trace |         |                     |                                  |                           |
| 5        | 0.03                      | 10              | 2       | 0.62    | 1998                | 0.62                             | 1998                      |
| 6        | 0.03                      | 10              | 3       | 0.30    | 1980                | 0.30                             | 1980 <sup>(a)</sup>       |
| 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                | <b>1.39<sup>(b)</sup></b>        | <b>1996<sup>(b)</sup></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                | 0.29                             | 1955                      |
| 2        | 0.03                      | 12              | 4       | 0.34    | 1985 <sup>(a)</sup> | 0.34                             | 1985 <sup>(a)</sup>       |
| 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)

| Day | Normal Period (1971-2000) |                 |         |         |                     | Historical Period<br>(1945-2002) |                           |
|-----|---------------------------|-----------------|---------|---------|---------------------|----------------------------------|---------------------------|
|     | Normal                    | Number of Years |         | Maximum | Year                | Maximum                          | Year                      |
|     |                           | W/Meas.         | W/Trace |         |                     |                                  |                           |
| 28  | 0.04                      | 10              | 9       | 0.09    | 1990 <sup>(a)</sup> | 0.25                             | 2002                      |
| 29  | 0.04                      | 12              | 5       | 0.80    | 1996                | <b>0.80<sup>(b)</sup></b>        | <b>1996<sup>(b)</sup></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.

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## 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 2002**

| 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 <sup>(a)</sup> | 5.9            | 1958                | 70         | SW        | 1956     |
| Apr    | WNW                  | 8.9                | 11.1            | 1972 <sup>(a)</sup> | 7.4            | 1989 <sup>(a)</sup> | 73         | SSW       | 1972     |
| May    | WNW                  | 8.8                | 10.7            | 1983                | 5.8            | 1957                | 71         | SSW       | 1948     |
| Jun    | NW                   | 9.1                | 10.7            | 1983 <sup>(a)</sup> | 7.7            | 1950 <sup>(a)</sup> | 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                   | 6.3                | 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  $\geq 25$  mph (nearly 20 each); however, January, March, and April have the highest average number of days with gusts  $\geq 40$  mph (nearly 3 days), and January and December have the highest average number of days with gusts  $\geq 50$  mph (0.9 and 0.8 day, respectively). January also has the record highest number of gusts  $\geq 40$  and  $\geq 50$  mph at 11 and 7 days, respectively, in 1990. Calendar year 1990 recorded the most days with gusts  $\geq 40$  and  $\geq 50$  mph at 57 and 18 days, respectively. Of particular interest is that previous records for these categories were 41 days  $\geq 40$  mph in 1961 and 10 days  $\geq 50$  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 2002.

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 2002.

**Table 5.2. Number of Days with Peak Gusts Above or Below Specific Thresholds at 50-Foot Level, 1945 through 2002**

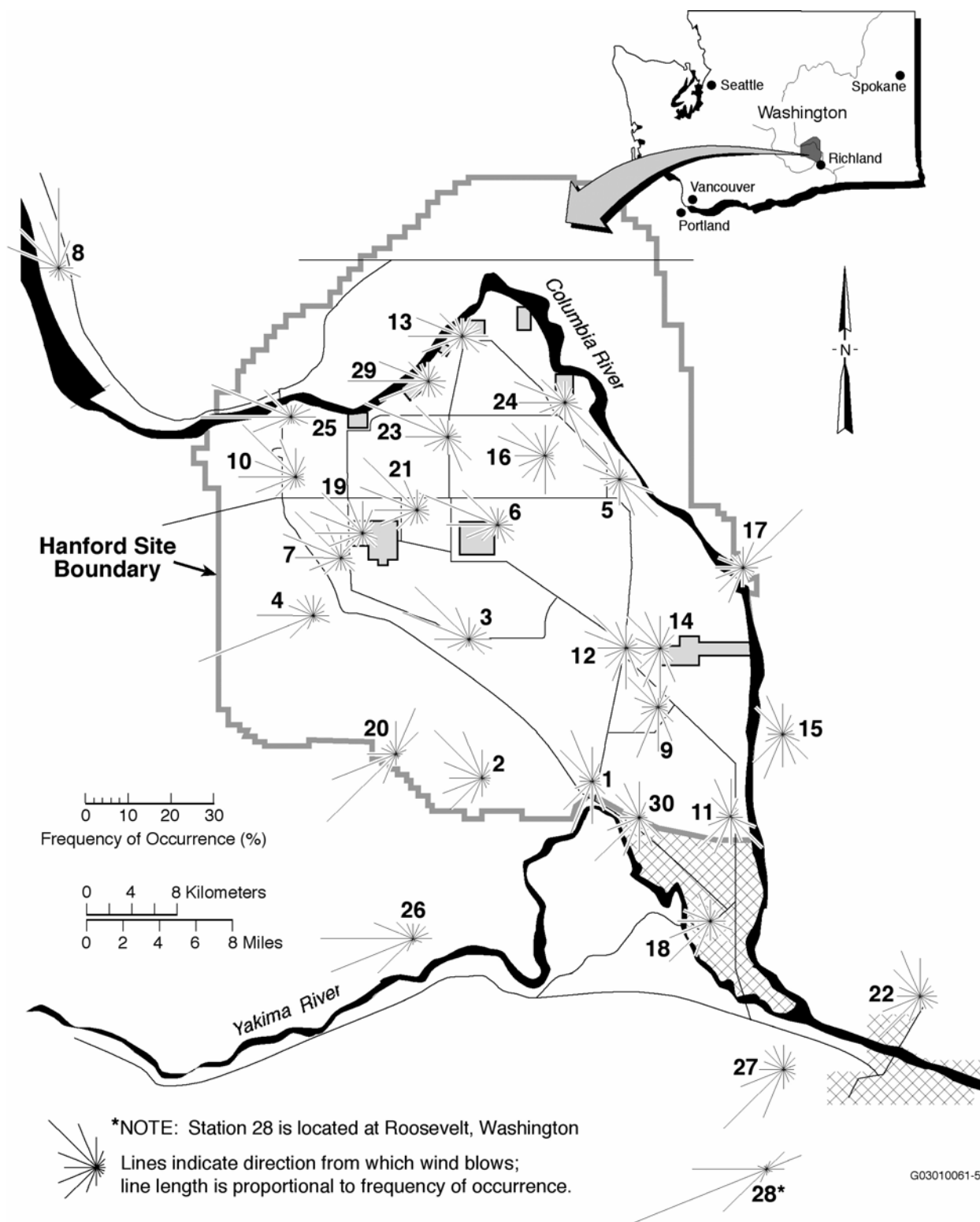
| Month  | Days with Peak Gusts $\leq 12$ mph |     |                     |     |                     | Days with Peak Gusts $\geq 25$ mph |     |                     |     |                     | Days with Peak Gusts $\geq 40$ mph |     |                     |     |                     | Days with Peak Gusts $\geq 50$ mph |     |                     |     |                     |
|--------|------------------------------------|-----|---------------------|-----|---------------------|------------------------------------|-----|---------------------|-----|---------------------|------------------------------------|-----|---------------------|-----|---------------------|------------------------------------|-----|---------------------|-----|---------------------|
|        | 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                | 7.7                                | 21  | 1953                | 0   | 1985 <sup>(a)</sup> | 2.8                                | 11  | 1990 <sup>(a)</sup> | 0   | 2001 <sup>(a)</sup> | 0.9                                | 7   | 1990                | 0   | 2001 <sup>(a)</sup> |
| Feb    | 6.2                                | 16  | 1963                | 0   | 1990                | 8.6                                | 17  | 1976 <sup>(a)</sup> | 2   | 1952 <sup>(a)</sup> | 2.4                                | 10  | 1999 <sup>(a)</sup> | 0   | 2001 <sup>(a)</sup> | 0.6                                | 4   | 1972                | 0   | 2002 <sup>(a)</sup> |
| Mar    | 2.7                                | 8   | 1992                | 0   | 1999 <sup>(a)</sup> | 13.0                               | 21  | 1977                | 4   | 1992                | 2.8                                | 9   | 1956                | 0   | 1998 <sup>(a)</sup> | 0.6                                | 4   | 1956                | 0   | 2000 <sup>(a)</sup> |
| Apr    | 0.6                                | 6   | 1951                | 0   | 2001 <sup>(a)</sup> | 16.9                               | 26  | 1954                | 8   | 1946                | 2.8                                | 8   | 1991                | 0   | 1998 <sup>(a)</sup> | 0.4                                | 2   | 1997 <sup>(a)</sup> | 0   | 2000 <sup>(a)</sup> |
| May    | 0.3                                | 3   | 1955                | 0   | 2002 <sup>(a)</sup> | 18.8                               | 26  | 1978                | 9   | 1945                | 2.4                                | 7   | 2002                | 0   | 1997 <sup>(a)</sup> | 0.2                                | 2   | 1993 <sup>(a)</sup> | 0   | 1999 <sup>(a)</sup> |
| Jun    | 0.1                                | 1   | 1980 <sup>(a)</sup> | 0   | 2002 <sup>(a)</sup> | 19.7                               | 26  | 1963                | 11  | 1950 <sup>(a)</sup> | 2.4                                | 7   | 1985                | 0   | 1982 <sup>(a)</sup> | 0.3                                | 2   | 1992 <sup>(a)</sup> | 0   | 2002 <sup>(a)</sup> |
| Jul    | 0.1                                | 1   | 1957 <sup>(a)</sup> | 0   | 2002 <sup>(a)</sup> | 19.5                               | 26  | 1995                | 11  | 1955                | 1.8                                | 5   | 1995 <sup>(a)</sup> | 0   | 1981 <sup>(a)</sup> | 0.2                                | 1   | 2002 <sup>(a)</sup> | 0   | 2001 <sup>(a)</sup> |
| Aug    | 0.2                                | 2   | 1972                | 0   | 2002 <sup>(a)</sup> | 15.8                               | 24  | 2000                | 7   | 1945                | 1.3                                | 5   | 1951                | 0   | 2000 <sup>(a)</sup> | 0.1                                | 1   | 1998 <sup>(a)</sup> | 0   | 2002 <sup>(a)</sup> |
| Sep    | 2.4                                | 9   | 1987                | 0   | 1991 <sup>(a)</sup> | 11.3                               | 17  | 2002 <sup>(a)</sup> | 7   | 1975 <sup>(a)</sup> | 1.3                                | 4   | 1946                | 0   | 2002 <sup>(a)</sup> | 0.2                                | 2   | 1953                | 0   | 2002 <sup>(a)</sup> |
| Oct    | 6.8                                | 15  | 1974                | 2   | 1975 <sup>(a)</sup> | 8.9                                | 17  | 1985 <sup>(a)</sup> | 3   | 1987 <sup>(a)</sup> | 1.8                                | 8   | 1967                | 0   | 1993 <sup>(a)</sup> | 0.2                                | 2   | 1967                | 0   | 2002 <sup>(a)</sup> |
| Nov    | 9.3                                | 20  | 1956 <sup>(a)</sup> | 2   | 1977 <sup>(a)</sup> | 8.3                                | 16  | 1990                | 0   | 1979                | 2.3                                | 8   | 1990                | 0   | 2002 <sup>(a)</sup> | 0.6                                | 4   | 1998 <sup>(a)</sup> | 0   | 2002 <sup>(a)</sup> |
| Dec    | 11.2                               | 23  | 1985                | 3   | 1968                | 7.5                                | 15  | 1968                | 0   | 1985                | 2.6                                | 8   | 1957 <sup>(a)</sup> | 0   | 1989 <sup>(a)</sup> | 0.8                                | 5   | 2001                | 0   | 2000 <sup>(a)</sup> |
| Annual | 49.5                               | 87  | 1952                | 28  | 1973                | 156.3                              | 192 | 1999                | 123 | 1952                | 26.8                               | 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 2002**

| <u>Direction</u>  | <u>Jan</u> | <u>Feb</u> | <u>Mar</u> | <u>Apr</u> | <u>May</u> | <u>Jun</u> | <u>Jul</u> | <u>Aug</u> | <u>Sep</u> | <u>Oct</u> | <u>Nov</u> | <u>Dec</u> | <u>Total</u> |
|-------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------------|
| N                 | 4.2        | 4.8        | 4.6        | 4.1        | 3.7        | 3.6        | 4.6        | 4.7        | 5.5        | 5.0        | 4.3        | 4.3        | 4.5          |
| NNE               | 3.6        | 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        | 3.5        | 3.3        | 3.1        | 3.5        | 3.5        | 4.2        | 3.6        | 3.0        | 2.9        | 3.4          |
| ENE               | 2.3        | 2.1        | 2.1        | 2.4        | 2.4        | 2.2        | 2.5        | 2.5        | 2.4        | 2.7        | 2.5        | 2.5        | 2.4          |
| E                 | 2.6        | 2.2        | 2.2        | 2.5        | 2.5        | 2.5        | 2.9        | 3.2        | 3.1        | 3.0        | 2.7        | 2.7        | 2.7          |
| ESE               | 2.8        | 2.6        | 2.7        | 2.6        | 2.7        | 2.7        | 2.9        | 3.3        | 3.3        | 3.7        | 3.3        | 3.2        | 3.0          |
| SE                | 4.0        | 3.6        | 3.8        | 2.9        | 3.1        | 2.9        | 2.9        | 3.4        | 3.8        | 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        | 3.3        | 3.5        | 3.1        | 2.7        | 2.7        | 2.5        | 2.6        | 2.7        | 3.6        | 4.1        | 3.7        | 3.1          |
| SSW               | 4.8        | 4.5        | 5.0        | 4.3        | 3.6        | 3.5        | 2.8        | 3.0        | 3.4        | 4.2        | 5.2        | 4.7        | 4.1          |
| SW                | 6.6        | 7.7        | 9.1        | 8.8        | 6.9        | 6.5        | 5.6        | 6.0        | 5.8        | 6.8        | 7.8        | 6.8        | 7.0          |
| WSW               | 6.8        | 7.4        | 10.4       | 11.9       | 10.5       | 9.6        | 8.2        | 8.8        | 9.2        | 8.7        | 8.0        | 7.3        | 8.9          |
| W                 | 6.7        | 8.2        | 9.7        | 11.5       | 11.5       | 10.9       | 9.7        | 10.7       | 11.2       | 10.4       | 8.4        | 7.2        | 9.7          |
| WNW               | 15.3       | 15.0       | 14.6       | 16.3       | 18.3       | 19.1       | 19.5       | 18.0       | 15.3       | 13.4       | 12.7       | 13.7       | 15.9         |
| NW                | 19.1       | 18.1       | 14.5       | 14.2       | 17.5       | 19.5       | 20.1       | 17.7       | 14.7       | 13.5       | 15.6       | 17.9       | 16.9         |
| NNW               | 7.4        | 6.9        | 5.8        | 4.6        | 4.3        | 4.8        | 5.4        | 5.4        | 5.9        | 6.4        | 6.9        | 7.0        | 5.9          |
| Calm              | 3.9        | 2.2        | 0.7        | 0.4        | 0.4        | 0.4        | 0.3        | 0.4        | 0.9        | 2.0        | 3.5        | 4.4        | 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        |
| <u>Speed, mph</u> | <u>Jan</u> | <u>Feb</u> | <u>Mar</u> | <u>Apr</u> | <u>May</u> | <u>Jun</u> | <u>Jul</u> | <u>Aug</u> | <u>Sep</u> | <u>Oct</u> | <u>Nov</u> | <u>Dec</u> | <u>Total</u> |
| Calm              | 3.9        | 2.2        | 0.8        | 0.4        | 0.5        | 0.4        | 0.3        | 0.4        | 0.9        | 2.0        | 3.5        | 4.4        | 1.6          |
| 1-3               | 30.4       | 24.3       | 16.8       | 13.0       | 11.6       | 9.6        | 10.7       | 13.4       | 18.1       | 26.1       | 29.7       | 33.4       | 19.8         |
| 4-7               | 34.9       | 35.9       | 36.6       | 35.1       | 35.2       | 35.8       | 39.2       | 42.1       | 41.6       | 39.2       | 36.0       | 33.9       | 37.1         |
| 8-12              | 20.3       | 24.4       | 27.6       | 28.8       | 30.4       | 30.3       | 29.3       | 27.7       | 25.9       | 21.7       | 20.0       | 18.2       | 25.4         |
| 13-18             | 6.8        | 8.5        | 12.1       | 15.5       | 15.8       | 16.6       | 14.3       | 11.8       | 9.8        | 7.7        | 7.0        | 6.3        | 11.0         |
| 19-24             | 2.5        | 3.2        | 4.4        | 5.6        | 5.5        | 6.2        | 5.4        | 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        | 0.9        | 1.0        | 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 2002 (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 2002****Station: ( 1 ) PROS**

Begin: 1/1982 End: 12/2002 Total Hours: 179420

| SPEED | DIRECTION |     |     |     |     |     |     |     |      |      |     |     |     |     |      |      | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|------|------|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S    | SSW  | SW  | WSW | W   | WNW | NW   | NNW  |      |       |
| 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  | 26.4  |
| 4-7   | 3.2       | 1.8 | 1.0 | 0.7 | 0.8 | 1.1 | 2.2 | 4.1 | 4.6  | 3.6  | 2.0 | 0.8 | 0.7 | 1.0 | 3.0  | 4.9  | 0.0  | 35.5  |
| 8-12  | 1.9       | 0.9 | 0.3 | 0.1 | 0.1 | 0.2 | 0.5 | 1.1 | 2.5  | 4.4  | 2.4 | 0.8 | 0.5 | 0.6 | 2.7  | 3.9  | 0.0  | 23.0  |
| 13-18 | 0.6       | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.4  | 2.5  | 2.0 | 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 | 7.9       | 4.5 | 2.7 | 1.7 | 1.9 | 2.5 | 4.4 | 7.5 | 10.0 | 13.1 | 9.2 | 4.3 | 3.0 | 3.2 | 10.1 | 12.8 | 1.1  | 100.0 |

**Station: ( 2 ) EOC**

Begin: 1/1982 End: 12/2002 Total Hours: 180032

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |      |     |     |     |      |      | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|------|------|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW   | WSW | W   | WNW | NW   | NNW  |      |       |
| 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   | 1.3       | 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  | 19.5  |
| 4-7   | 2.7       | 1.9 | 1.2 | 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 | 1.4 | 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 | 0.8 | 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 | 0.0  | 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 | 6.5       | 3.8 | 2.6 | 1.9 | 2.0 | 2.0 | 2.2 | 2.5 | 4.4 | 6.3 | 10.5 | 9.8 | 7.7 | 9.5 | 15.7 | 11.4 | 1.0  | 100.0 |

**Station: ( 3 ) ARMY**

Begin: 1/1982 End: 12/2002 Total Hours: 179847

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |     |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W   | WNW  | NW   | NNW |      |       |
| 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   | 1.9       | 1.7 | 2.0 | 2.3 | 2.5 | 2.3 | 1.8 | 1.1 | 0.9 | 0.8 | 0.9 | 1.2 | 2.1 | 3.2  | 3.2  | 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  | 38.2  |
| 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  | 0.1   |
| > 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       | 3.8 | 3.8 | 4.3 | 5.5 | 6.0 | 5.1 | 2.8 | 2.0 | 2.2 | 3.7 | 5.2 | 7.9 | 16.5 | 17.3 | 7.8 | 1.0  | 100.0 |

**Station: ( 4 ) RSPG**

Begin: 1/1982 End: 12/2002 Total Hours: 179295

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |      |      |     |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW  | W    | WNW | NW  | NNW |      |       |
| 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   | 1.6       | 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 | 1.3 | 0.0  | 24.1  |
| 4-7   | 2.6       | 2.1 | 1.5 | 1.1 | 1.8 | 2.1 | 0.9 | 0.4 | 0.4 | 0.7 | 2.4 | 9.8  | 4.5  | 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 | 1.6 | 13.9 | 5.1  | 2.3 | 1.6 | 1.2 | 0.0  | 28.5  |
| 13-18 | 0.0       | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.5 | 1.0 | 2.1  | 1.8  | 0.9 | 0.8 | 0.5 | 0.0  | 8.0   |
| 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  | 1.8   |
| 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 | 3.4 | 7.6 | 29.0 | 13.5 | 6.2 | 5.4 | 5.2 | 1.1  | 100.0 |

Table 5.4. (contd)

**Station: ( 5 ) EDNA**

Begin: 1/1982

End: 12/2002

Total Hours: 180524

| SPEED | DIRECTION |     |     |     |     |     |      |     |     |     |     |     |     |     |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE   | SSE | S   | SSW | SW  | WSW | W   | WNW | NW   | NNW |      |       |
| 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 | 1.2 | 2.0 | 3.5  | 3.9 | 3.1 | 1.9 | 1.4 | 1.3 | 1.7 | 2.8 | 3.2  | 2.1 | 0.0  | 31.7  |
| 4-7   | 2.2       | 1.1 | 0.9 | 1.0 | 2.0 | 4.5 | 7.2  | 3.8 | 1.7 | 0.8 | 0.7 | 0.7 | 1.0 | 2.5 | 6.0  | 4.8 | 0.0  | 40.9  |
| 8-12  | 1.2       | 0.6 | 0.4 | 0.2 | 0.7 | 1.7 | 1.4  | 1.1 | 0.9 | 0.6 | 0.7 | 0.9 | 1.1 | 1.7 | 2.3  | 1.9 | 0.0  | 17.3  |
| 13-18 | 0.2       | 0.2 | 0.2 | 0.1 | 0.0 | 0.1 | 0.2  | 0.3 | 0.4 | 0.4 | 0.5 | 0.6 | 0.6 | 1.4 | 1.1  | 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 | 0.1 | 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 | 4.9       | 2.7 | 2.2 | 2.1 | 3.9 | 8.4 | 12.3 | 9.1 | 6.1 | 3.9 | 3.5 | 3.9 | 4.7 | 9.0 | 12.9 | 9.2 | 1.2  | 100.0 |

**Station: ( 6 ) 200E**

Begin: 1/1982

End: 12/2002

Total Hours: 180040

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |      |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW   | NNW |      |       |
| 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 | 1.5 | 1.5 | 1.7 | 1.7 | 1.6 | 1.3 | 1.1 | 1.0 | 1.0 | 1.1 | 1.4  | 1.8  | 1.9  | 1.6 | 0.0  | 23.0  |
| 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  | 37.3  |
| 8-12  | 0.7       | 0.7 | 0.3 | 0.1 | 0.2 | 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 | 0.2 | 0.3 | 0.8 | 1.2 | 1.4  | 3.5  | 1.4  | 0.1 | 0.0  | 10.0  |
| 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 | 3.0 | 2.7 | 3.5 | 4.3 | 5.6 | 5.0 | 3.5 | 3.2 | 5.1 | 7.7 | 11.9 | 20.1 | 11.3 | 4.5 | 1.1  | 100.0 |

**Station: ( 7 ) 200W**

Begin: 1/1982

End: 12/2002

Total Hours: 165904

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |      |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW   | NNW |      |       |
| 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 | 2.0 | 2.5 | 3.4  | 4.3  | 3.6  | 2.6 | 0.0  | 36.1  |
| 4-7   | 2.9       | 1.6 | 1.0 | 0.8 | 1.0 | 1.5 | 1.8 | 1.1 | 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 | 1.0 | 1.7 | 2.5  | 3.0  | 3.4  | 1.9 | 0.0  | 16.8  |
| 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  | 2.1  | 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  | 0.9  | 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 | 2.2 | 2.7 | 3.6 | 4.3 | 3.3 | 2.9 | 3.5 | 5.7 | 8.0 | 10.7 | 14.9 | 15.2 | 8.4 | 1.6  | 100.0 |

**Station: ( 8 ) BVLV**

Begin: 8/1991

End: 12/2002

Total Hours: 99294

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |     |      |      |      | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W   | WNW  | NW   | NNW  |      |       |
| 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   | 2.8       | 2.2 | 1.7 | 1.4 | 1.7 | 1.8 | 1.9 | 1.8 | 1.6 | 1.2 | 1.1 | 1.1 | 1.3 | 1.6  | 2.1  | 2.5  | 0.0  | 27.7  |
| 4-7   | 8.4       | 2.8 | 0.6 | 0.4 | 1.4 | 3.1 | 1.7 | 1.1 | 1.0 | 0.8 | 0.7 | 0.8 | 1.4 | 2.6  | 4.8  | 6.9  | 0.0  | 38.6  |
| 8-12  | 6.7       | 1.7 | 0.1 | 0.0 | 0.3 | 0.7 | 0.3 | 0.3 | 0.2 | 0.3 | 0.4 | 0.4 | 1.2 | 3.7  | 3.2  | 2.0  | 0.0  | 21.5  |
| 13-18 | 0.5       | 0.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 | 0.5 | 0.3 | 0.5 | 3.4  | 2.1  | 0.1  | 0.0  | 8.1   |
| 19-24 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.1 | 0.1 | 1.3  | 0.7  | 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 | 0.1 | 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      | 6.9 | 2.4 | 1.9 | 3.4 | 5.7 | 4.0 | 3.3 | 3.1 | 2.6 | 3.0 | 2.6 | 4.5 | 13.0 | 13.0 | 11.5 | 1.0  | 100.0 |

**Table 5.4. (contd)****Station: ( 9) FFTF**

Begin: 1/1982

End: 12/2002

Total Hours: 179550

| SPEED | DIRECTION |     |     |     |     |     |     |     |      |      |     |     |     |     |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S    | SSW  | SW  | WSW | W   | WNW | NW   | NNW |      |       |
| 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 | 1.1 | 1.1 | 1.2  | 1.2  | 1.1 | 1.0 | 1.0 | 1.1 | 1.3  | 1.2 | 0.0  | 17.0  |
| 4-7   | 2.8       | 2.6 | 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  | 1.7 | 0.8 | 0.9 | 1.8 | 3.9  | 2.7 | 0.0  | 28.5  |
| 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  | 11.1  |
| 19-24 | 0.0       | 0.1 | 0.0 | 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 | 6.0 | 11.0 | 7.8 | 0.5  | 100.0 |

**Station: (10) YAKB**

Begin: 1/1982

End: 12/2002

Total Hours: 180346

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |      |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW   | NNW |      |       |
| 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 | 1.3 | 1.2 | 1.2 | 1.4 | 1.9 | 2.5  | 2.0  | 1.7  | 1.6 | 0.0  | 23.5  |
| 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 | 3.2  | 2.5  | 5.6  | 3.1 | 0.0  | 22.2  |
| 13-18 | 0.2       | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.3 | 1.1 | 1.4 | 0.6  | 0.9  | 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  | 0.0  | 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       | 5.1 | 3.3 | 2.1 | 1.8 | 2.2 | 2.9 | 2.8 | 2.6 | 3.2 | 6.4 | 9.9 | 13.5 | 10.1 | 17.3 | 9.4 | 0.6  | 100.0 |

**Station: (11) 300A**

Begin: 1/1982

End: 12/2002

Total Hours: 167056

| SPEED | DIRECTION |     |     |     |     |     |      |     |     |     |      |     |     |     |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|------|-----|-----|-----|------|-----|-----|-----|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE   | SSE | S   | SSW | SW   | WSW | W   | WNW | NW  | NNW |      |       |
| 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 | 1.4 | 1.8 | 1.7 | 0.0  | 20.3  |
| 4-7   | 3.5       | 1.6 | 1.0 | 1.2 | 1.8 | 4.4 | 6.8  | 3.7 | 3.1 | 2.5 | 1.9  | 1.2 | 0.9 | 1.0 | 2.1 | 4.0 | 0.0  | 40.7  |
| 8-12  | 3.5       | 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 | 2.4  | 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  | 0.4 | 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 | 8.8       | 4.8 | 2.6 | 2.1 | 3.0 | 6.9 | 10.3 | 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: 12/2002

Total Hours: 179665

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |     |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W   | WNW  | NW   | NNW |      |       |
| 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       | 1.1 | 1.2 | 1.2 | 1.4 | 1.5 | 1.5 | 1.4 | 1.4 | 1.3 | 1.3 | 1.2 | 1.2 | 1.2  | 1.4  | 1.3 | 0.0  | 20.9  |
| 4-7   | 2.5       | 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  | 40.8  |
| 8-12  | 1.2       | 0.6 | 0.3 | 0.2 | 0.3 | 0.3 | 0.9 | 1.9 | 2.8 | 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 | 5.3       | 3.6 | 3.0 | 2.8 | 3.8 | 4.0 | 5.2 | 7.2 | 9.3 | 8.6 | 7.0 | 5.8 | 6.9 | 10.3 | 10.6 | 6.3 | 0.4  | 100.0 |

Table 5.4. (contd)

**Station: (13) 100N**

Begin: 1/1982

End: 12/2002

Total Hours: 179844

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |      |      |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW  | NNW |      |       |
| 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 | 2.0 | 2.3 | 3.1 | 3.1 | 2.5 | 1.8 | 1.7 | 1.7 | 2.2 | 2.7 | 3.2  | 3.3  | 3.1 | 2.5 | 0.0  | 39.0  |
| 4-7   | 1.5       | 1.6 | 1.6 | 2.0 | 2.7 | 2.6 | 2.2 | 1.3 | 0.9 | 1.0 | 2.2 | 4.4 | 4.8  | 3.2  | 2.1 | 1.6 | 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 | 4.6 | 6.1 | 6.1 | 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: 12/2002

Total Hours: 180370

| SPEED | DIRECTION |     |     |     |     |     |     |     |      |     |     |     |     |     |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S    | SSW | SW  | WSW | W   | WNW | NW   | NNW |      |       |
| 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 | 1.1 | 1.4 | 1.8 | 2.1  | 1.9 | 1.7 | 1.4 | 1.6 | 1.8 | 2.6  | 2.8 | 0.0  | 28.8  |
| 4-7   | 3.4       | 2.4 | 2.1 | 1.2 | 0.7 | 0.9 | 1.9 | 4.3 | 5.3  | 3.0 | 1.7 | 1.2 | 1.3 | 1.9 | 3.8  | 4.5 | 0.0  | 39.3  |
| 8-12  | 1.2       | 0.7 | 0.5 | 0.2 | 0.1 | 0.2 | 0.8 | 2.0 | 3.4  | 2.6 | 1.4 | 0.8 | 0.9 | 1.7 | 2.4  | 1.5 | 0.0  | 20.4  |
| 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 | 2.2 | 4.1 | 8.3 | 11.5 | 9.6 | 6.7 | 4.2 | 4.4 | 6.2 | 10.8 | 9.1 | 0.9  | 100.0 |

**Station: (15) FRNK**

Begin: 1/1982

End: 12/2002

Total Hours: 179945

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW  | SW  | WSW | W   | WNW | NW  | NNW |      |       |
| 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   | 1.2       | 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  | 19.1  |
| 4-7   | 4.1       | 2.7 | 1.7 | 1.2 | 1.5 | 2.4 | 4.9 | 4.3 | 3.5 | 3.0  | 2.4 | 1.3 | 1.4 | 2.1 | 4.7 | 5.4 | 0.0  | 46.6  |
| 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  | 1.9 | 0.6 | 0.2 | 0.2 | 0.5 | 0.2 | 0.0  | 6.9   |
| 19-24 | 0.0       | 0.1 | 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 | 4.2 | 8.2 | 7.5 | 7.8 | 11.2 | 9.6 | 4.2 | 3.5 | 4.2 | 8.9 | 9.5 | 0.8  | 100.0 |

**Station: (16) GABL**

Begin: 1/1982

End: 12/2002

Total Hours: 179440

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |     |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W   | WNW  | NW   | NNW |      |       |
| 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 | 0.9 | 0.7 | 0.6 | 0.6 | 0.7 | 0.8 | 1.0 | 1.0 | 0.9 | 0.8 | 0.8 | 0.7  | 0.8  | 0.9 | 0.0  | 12.9  |
| 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 | 1.0 | 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  | 24.8  |
| 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       | 0.2 | 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  | 1.0   |
| 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 | 5.8 | 0.8  | 100.0 |

**Table 5.4. (contd)****Station: (17) RING**

Begin: 1/1982

End: 12/2002

Total Hours: 179539

| SPEED | DIRECTION |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     | CALM | TOTAL |
|-------|-----------|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-------|
|       | N         | NNE | NE   | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W   | WNW | NW  | NNW |      |       |
| 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   | 2.2       | 3.5 | 7.3  | 3.5 | 2.2 | 1.7 | 1.5 | 1.3 | 1.5 | 1.6 | 2.0 | 2.4 | 2.1 | 1.5 | 1.4 | 1.7 | 0.0  | 37.3  |
| 4-7   | 1.8       | 2.1 | 10.8 | 3.2 | 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  | 38.3  |
| 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  | 15.9  |
| 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 | 19.2 | 7.2 | 3.4 | 2.8 | 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: 12/2002

Total Hours: 180614

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |      |      |     |     |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW   | WSW  | W   | WNW | NW  | NNW |      |       |
| 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 | 1.1 | 1.6 | 2.6 | 3.1 | 2.5 | 2.2 | 2.1 | 2.3  | 2.5  | 2.6 | 2.7 | 2.5 | 1.9 | 0.0  | 32.6  |
| 4-7   | 2.0       | 1.0 | 0.9 | 1.0 | 1.8 | 2.8 | 3.1 | 1.7 | 1.7 | 2.9 | 4.1  | 3.2  | 2.4 | 2.8 | 3.0 | 2.6 | 0.0  | 36.8  |
| 8-12  | 1.3       | 0.7 | 0.4 | 0.3 | 0.2 | 0.2 | 0.3 | 0.2 | 0.6 | 2.6 | 3.9  | 2.8  | 1.5 | 0.9 | 1.4 | 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 | 3.6 | 5.6 | 6.5 | 4.5 | 4.6 | 9.0 | 13.5 | 10.1 | 7.6 | 6.7 | 8.0 | 6.9 | 1.1  | 100.0 |

**Station: (19) PFP**

Begin: 2/1994

End: 12/2002

Total Hours: 77741

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |      |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW   | NNW |      |       |
| 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 | 2.2  | 2.2   |
| 1-3   | 3.4       | 3.2 | 2.1 | 1.3 | 1.5 | 1.8 | 2.3 | 1.9 | 1.8 | 1.8 | 2.3 | 3.2 | 5.0  | 5.0  | 3.7  | 3.2 | 0.0  | 43.5  |
| 4-7   | 3.5       | 2.1 | 0.9 | 0.6 | 0.8 | 1.5 | 1.9 | 0.8 | 0.6 | 0.7 | 1.3 | 1.9 | 4.1  | 6.4  | 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 | 1.4  | 1.5  | 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  | 0.5   |
| 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 | 3.5 | 4.5 | 2.9 | 2.8 | 3.4 | 5.9 | 8.2 | 11.0 | 13.2 | 13.3 | 8.3 | 2.2  | 100.0 |

**Station: (20) RMTN**

Begin: 1/1982

End: 12/2002

Total Hours: 178042

| SPEED | DIRECTION |      |     |     |     |     |     |     |     |     |      |      |     |     |     |     | CALM | TOTAL |
|-------|-----------|------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|------|-------|
|       | N         | NNE  | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW   | WSW  | W   | WNW | NW  | NNW |      |       |
| 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  | 1.4 | 0.9 | 0.7 | 0.5 | 0.5 | 0.5 | 0.8 | 1.4 | 2.0  | 1.4  | 1.0 | 0.7 | 0.7 | 0.9 | 0.0  | 15.9  |
| 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  | 20.8  |
| 13-18 | 2.0       | 2.8  | 1.3 | 0.3 | 0.1 | 0.0 | 0.1 | 0.1 | 0.4 | 1.5 | 4.6  | 3.0  | 1.6 | 0.9 | 0.7 | 0.9 | 0.0  | 20.4  |
| 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  | 13.6  |
| 25-31 | 0.4       | 1.4  | 0.6 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.6 | 3.1  | 2.6  | 0.8 | 0.2 | 0.1 | 0.1 | 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  | 1.8  | 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 | 1.6  | 1.0  | 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       | 11.6 | 7.2 | 2.7 | 1.5 | 1.1 | 1.1 | 1.3 | 2.6 | 7.4 | 22.5 | 15.9 | 6.8 | 3.6 | 3.0 | 3.5 | 0.6  | 100.0 |

Table 5.4. (contd)

**Station: (21) HMS**

Begin: 1/1982

End: 12/2002

Total Hours: 182731

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |     |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W   | WNW  | NW   | NNW |      |       |
| 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 | 1.4 | 1.4 | 1.7 | 1.9  | 2.1  | 2.1 | 0.0  | 25.7  |
| 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  | 42.2  |
| 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  | 20.3  |
| 13-18 | 0.1       | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.4 | 1.1 | 1.1 | 0.6 | 1.5  | 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 | 3.2 | 2.5 | 2.8 | 3.0 | 3.6 | 3.4 | 3.2 | 4.0 | 6.6 | 9.0 | 9.9 | 14.2 | 17.4 | 7.3 | 1.1  | 100.0 |

**Station: (22) PASC**

Begin: 10/1987

End: 12/2002

Total Hours: 128461

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |      |     |     |     |     |      | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|------|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW   | WSW | W   | WNW | NW  | NNW  |      |       |
| 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 | 2.4 | 2.5 | 2.2 | 1.9 | 1.4 | 1.3 | 1.2 | 1.1  | 1.2 | 1.5 | 2.1 | 3.4 | 5.1  | 0.0  | 37.1  |
| 4-7   | 2.8       | 1.3 | 0.7 | 0.9 | 1.3 | 1.9 | 1.9 | 1.4 | 1.7 | 2.6 | 3.2  | 2.1 | 2.1 | 2.3 | 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 | 4.6  | 2.3 | 1.0 | 0.7 | 1.3 | 1.6  | 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 | 0.4 | 0.4  | 0.0  | 7.7   |
| 19-24 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 1.0  | 1.0 | 0.2 | 0.1 | 0.1 | 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 | 0.3  | 0.5 | 0.1 | 0.0 | 0.0 | 0.0  | 0.0  | 1.0   |
| 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 | 3.4 | 3.9 | 4.4 | 4.1 | 3.2 | 3.5 | 6.4 | 13.4 | 9.3 | 5.5 | 5.3 | 8.6 | 11.4 | 1.1  | 100.0 |

**Station: (23) GABW**

Begin: 3/1986

End: 12/2002

Total Hours: 144626

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |     |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W   | WNW  | NW   | NNW |      |       |
| 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 | 1.4 | 1.3 | 4.0 | 5.0 | 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 | 0.2 | 0.2 | 0.3 | 1.2 | 1.0 | 0.3 | 0.5 | 1.0 | 1.5 | 2.9 | 5.3  | 1.7  | 0.6 | 0.0  | 18.1  |
| 13-18 | 0.1       | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 | 0.7 | 0.9 | 1.0 | 3.5  | 1.1  | 0.1 | 0.0  | 8.6   |
| 19-24 | 0.0       | 0.0 | 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 | 0.2  | 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 | 3.8       | 3.1 | 2.6 | 2.5 | 3.1 | 3.3 | 7.7 | 8.6 | 4.2 | 3.4 | 4.8 | 6.0 | 9.8 | 21.0 | 10.3 | 4.7 | 1.3  | 100.0 |

**Station: (24) 100F**

Begin: 3/1986

End: 12/2002

Total Hours: 144759

| SPEED | DIRECTION |     |     |     |     |     |      |      |     |     |     |     |      |      |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|------|------|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE   | SSE  | S   | SSW | SW  | WSW | W    | WNW  | NW  | NNW |      |       |
| 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  | 36.0  |
| 4-7   | 2.0       | 1.4 | 1.1 | 1.1 | 1.2 | 1.7 | 5.3  | 5.7  | 1.6 | 0.9 | 1.0 | 1.6 | 3.4  | 3.7  | 2.6 | 1.9 | 0.0  | 36.0  |
| 8-12  | 1.0       | 0.7 | 0.3 | 0.3 | 0.2 | 0.6 | 2.5  | 2.5  | 0.6 | 0.5 | 0.8 | 1.2 | 2.5  | 2.6  | 0.6 | 0.5 | 0.0  | 17.3  |
| 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 | 2.7 | 2.6 | 2.9 | 4.2 | 10.8 | 11.3 | 4.8 | 3.6 | 4.5 | 6.3 | 10.7 | 12.9 | 7.4 | 5.0 | 1.6  | 100.0 |

Table 5.4. (contd)

**Station: (25) VERN**

Begin: 2/1988

End: 12/2002

Total Hours: 128873

|       | 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 | 2.3 | 2.7  | 1.7  | 1.2 | 1.0 | 0.0  | 23.8  |
| 4-7   | 0.8       | 1.4 | 2.1 | 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  | 34.3  |
| 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 | 7.8  | 7.3  | 2.6 | 0.7 | 0.0  | 24.2  |
| 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  | 2.2 | 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  | 3.5   |
| 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  | 0.1   |
| 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 | 21.1 | 20.0 | 8.7 | 2.9 | 1.0  | 100.0 |

**Station: (26) BENT**

Begin: 2/1995

End: 12/2002

Total Hours: 68802

| 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  | 2.4  | 2.0 | 1.5 | 1.1 | 0.0  | 17.4  |
| 4-7       | 1.4 | 1.1 | 1.6 | 2.0 | 2.3 | 1.2 | 0.4 | 0.3 | 0.5 | 1.2 | 5.1  | 11.9 | 13.6 | 5.5 | 2.8 | 2.0 | 0.0  | 52.9  |
| 8-12      | 0.5 | 0.7 | 1.0 | 0.9 | 1.0 | 0.3 | 0.0 | 0.0 | 0.2 | 0.7 | 3.1  | 6.1  | 4.9  | 2.0 | 1.1 | 0.4 | 0.0  | 23.1  |
| 13-18     | 0.3 | 0.6 | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.4 | 1.4  | 1.0  | 0.5  | 0.2 | 0.1 | 0.1 | 0.0  | 4.9   |
| 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     | 3.4 | 3.6 | 3.9 | 3.8 | 4.2 | 2.2 | 0.9 | 0.7 | 1.3 | 3.1 | 11.4 | 20.9 | 21.6 | 9.6 | 5.4 | 3.7 | 0.3  | 100.0 |

**Station: (27) VSTA**

Begin: 2/1991

End: 12/2002

Total Hours: 102833

|       | 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   | 2.2       | 2.2 | 2.0 | 1.6 | 1.6 | 1.8 | 2.0 | 1.8 | 2.0 | 2.4  | 2.7  | 2.5  | 2.2 | 1.8 | 1.8 | 1.7 | 0.0  | 32.4  |
| 4-7   | 3.0       | 2.0 | 1.6 | 1.2 | 0.8 | 1.1 | 1.2 | 1.2 | 1.9 | 4.2  | 5.8  | 4.0  | 2.5 | 2.5 | 3.1 | 3.0 | 0.0  | 39.2  |
| 8-12  | 0.6       | 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  | 18.0  |
| 13-18 | 0.1       | 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  | 7.8   |
| 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 | 5.8       | 4.5 | 3.7 | 2.9 | 2.4 | 3.0 | 3.3 | 3.2 | 4.8 | 12.3 | 19.8 | 10.7 | 5.9 | 4.9 | 6.1 | 6.0 | 0.8  | 100.0 |

**Station: (28) SURF**

Begin: 9/1994

End: 12/2002

Total Hours: 72628

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |      |      |      |     |     |     |     | CALM  | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|-----|-----|-----|-------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW   | WSW  | W    | WNW | NW  | NNW |     |       |       |
| 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 | 1.1 | 1.2 | 1.2 | 0.8 | 0.7 | 0.7 | 1.1 | 2.1 | 3.4  | 3.7  | 1.8  | 0.7 | 0.4 | 0.3 | 0.0 | 20.2  |       |
| 4-7   | 0.2       | 0.4 | 2.4 | 3.8 | 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 | 4.2  | 9.9  | 3.6  | 0.3 | 0.0 | 0.0 | 0.0 | 24.8  |       |
| 13-18 | 0.2       | 0.3 | 0.2 | 0.5 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.1  | 9.1  | 6.0  | 0.6 | 0.0 | 0.0 | 0.0 | 19.2  |       |
| 19-24 | 0.1       | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4  | 4.5  | 3.2  | 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  | 1.4  | 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 | 14.1 | 34.7 | 17.3 | 2.2 | 0.6 | 0.5 | 0.7 | 100.0 |       |



**Table 5.4.** (contd)**Station: (29) 100K**

Begin: 3/1996

End: 12/2002

Total Hours: 59365

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |      |      |      |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW  | W    | WNW  | NW  | NNW |      |       |
| 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   | 2.1       | 1.7 | 1.6 | 1.9 | 2.2 | 2.1 | 2.0 | 1.7 | 1.7 | 1.7 | 2.1 | 3.2  | 4.2  | 3.0  | 2.6 | 2.1 | 0.0  | 35.9  |
| 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  | 3.5  | 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 | 0.5 | 0.6 | 1.0 | 3.1  | 5.7  | 2.5  | 0.8 | 0.4 | 0.0  | 18.1  |
| 13-18 | 0.2       | 0.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 | 0.3 | 0.8 | 0.9  | 2.0  | 2.2  | 0.7 | 0.1 | 0.0  | 8.0   |
| 19-24 | 0.0       | 0.0 | 0.0 | 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  | 2.4   |
| 25-31 | 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  | 0.2  | 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       | 3.8 | 3.0 | 3.0 | 4.0 | 4.2 | 4.5 | 4.1 | 3.5 | 3.7 | 6.0 | 12.2 | 18.9 | 12.3 | 6.4 | 4.3 | 1.6  | 100.0 |

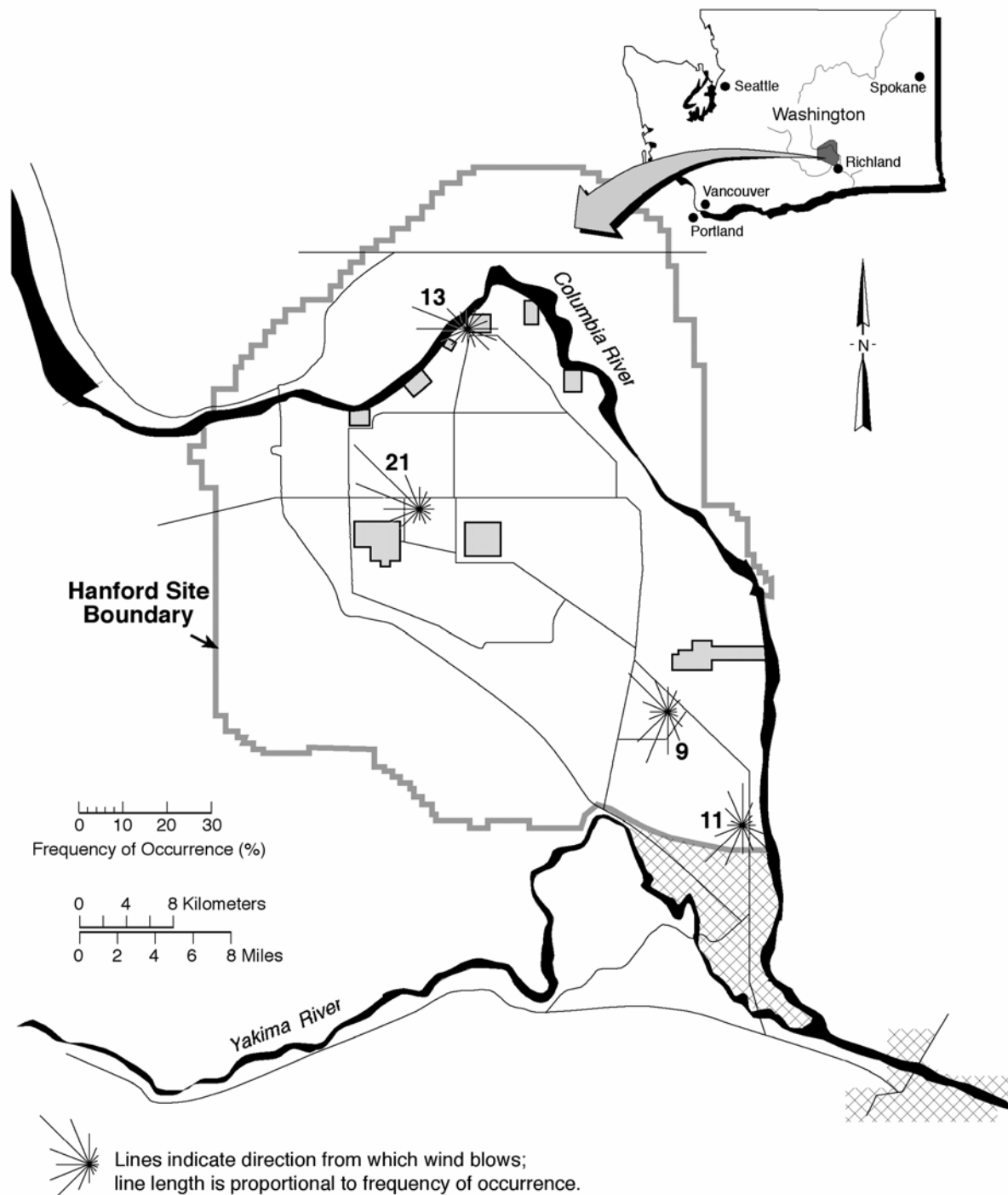
**Station: (30) HAMR**

Begin: 1/1998

End: 12/2002

Total Hours: 43717

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW   | WSW | W   | WNW | NW  | NNW |      |       |
| 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   | 1.1       | 0.8 | 0.8 | 0.6 | 0.8 | 1.1 | 1.9 | 2.2 | 2.1 | 1.6 | 1.4  | 1.1 | 1.2 | 1.3 | 1.4 | 1.2 | 0.0  | 20.7  |
| 4-7   | 4.0       | 1.8 | 0.8 | 0.7 | 1.0 | 2.1 | 4.8 | 4.5 | 4.1 | 3.8 | 4.0  | 2.2 | 1.6 | 1.8 | 2.8 | 3.7 | 0.0  | 43.9  |
| 8-12  | 2.6       | 1.0 | 0.3 | 0.1 | 0.3 | 0.3 | 0.4 | 0.5 | 1.2 | 2.9 | 5.9  | 2.7 | 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 | 1.0 | 2.3  | 1.3 | 0.4 | 0.2 | 1.3 | 1.0 | 0.0  | 8.8   |
| 19-24 | 0.1       | 0.0 | 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 | 0.3  | 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  | 0.1   |
| 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 | 8.4       | 3.9 | 2.0 | 1.5 | 2.0 | 3.5 | 7.2 | 7.2 | 7.7 | 9.6 | 14.4 | 7.8 | 4.3 | 4.0 | 7.5 | 8.5 | 0.6  | 100.0 |



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**Figure 5.2. Hanford Meteorological Monitoring Network Wind Roses at 60-Meter Level, 1986 through 2002 (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 2002****Tower: 100 Area**

Lower: 100 Area

|               |     |     |     |     |     |     |     |     |     |              |     |     |      |      |                     |     |      |       |  |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------------|-----|-----|------|------|---------------------|-----|------|-------|--|
| Begin: 1/1986 |     |     |     |     |     |     |     |     |     | End: 12/2002 |     |     |      |      | Total Hours: 143212 |     |      |       |  |
| 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 | 3.1 | 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 | 0.9 | 0.8          | 1.3 | 2.0 | 3.0  | 3.1  | 2.2                 | 1.4 | 0.0  | 32.0  |  |
| 8-12          | 0.7 | 1.0 | 0.8 | 0.4 | 0.5 | 0.7 | 1.2 | 0.6 | 0.5 | 0.5          | 1.0 | 1.4 | 2.7  | 2.6  | 0.9                 | 0.6 | 0.0  | 15.9  |  |
| 13-18         | 0.4 | 0.6 | 0.4 | 0.2 | 0.2 | 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  | 6.1   |  |
| 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  | 2.6   |  |
| 32-38         | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1          | 0.1 | 0.1 | 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 | 5.6 | 4.8 | 4.8 | 6.9 | 7.1 | 6.8 | 4.4 | 3.3 | 3.3          | 5.3 | 6.4 | 11.5 | 13.5 | 6.6                 | 4.1 | 0.7  | 100.0 |  |

**Tower: 200 Area**

Lower: 200 Area

| Begin: 1/1986 |     |     |     |     |     |     |     |     |     | End: 12/2002 |     |     |     |      | Total Hours: 148860 |     |      |       |  |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------------|-----|-----|-----|------|---------------------|-----|------|-------|--|
| 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 | 1.1 | 1.0 | 1.2 | 0.9 | 0.7 | 0.6          | 0.7 | 0.6 | 0.8 | 0.9  | 1.1                 | 1.3 | 0.0  | 15.2  |  |
| 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  | 4.1                 | 3.8 | 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 | 1.8 | 2.7 | 4.8  | 6.2                 | 2.3 | 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  | 17.8  |  |
| 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  | 7.3   |  |
| 25-31         | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.3          | 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 | 3.2 | 2.7 | 3.5 | 3.6 | 2.6 | 3.5          | 5.9 | 7.1 | 8.1 | 15.5 | 20.8                | 8.0 | 0.3  | 100.0 |  |

**Tower: 300 Area**

|       |  | Begin: 1/1986 |     |     |     |     |     |     |     |     |     | End: 12/2002 |     |     |     |     | Total Hours: 143342 |      |       |  |  |
|-------|--|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|---------------------|------|-------|--|--|
|       |  | 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  | 14.3  |  |  |
| 4-7   |  | 2.8           | 1.8 | 1.2 | 1.2 | 1.7 | 2.8 | 4.2 | 3.1 | 2.8 | 2.5 | 1.9          | 1.2 | 0.9 | 0.8 | 1.3 | 2.4                 | 0.0  | 33.0  |  |  |
| 8-12  |  | 3.3           | 2.1 | 0.9 | 0.4 | 0.4 | 1.3 | 2.7 | 1.4 | 1.9 | 3.4 | 3.3          | 1.6 | 0.7 | 0.6 | 1.1 | 2.6                 | 0.0  | 27.9  |  |  |
| 13-18 |  | 1.8           | 0.9 | 0.2 | 0.1 | 0.0 | 0.2 | 0.4 | 0.3 | 0.5 | 2.0 | 3.2          | 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 | 0.6 | 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 |  | 9.1           | 5.7 | 3.1 | 2.3 | 3.0 | 5.3 | 8.6 | 6.1 | 6.5 | 9.7 | 11.9         | 6.7 | 3.4 | 2.8 | 5.4 | 8.4                 | 0.6  | 100.0 |  |  |

**Tower: 400 Area**

|       |  | Begin: 1/1986 |     |     |     |     |     |     |     |     |      | End: 12/2002 |     |     |     |      | Total Hours: 143601 |      |       |  |  |
|-------|--|---------------|-----|-----|-----|-----|-----|-----|-----|-----|------|--------------|-----|-----|-----|------|---------------------|------|-------|--|--|
|       |  | 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           | 0.8 | 0.7 | 0.6 | 0.8 | 0.8 | 1.0 | 1.0 | 0.9 | 0.8  | 0.8          | 0.7 | 0.7 | 0.6 | 0.7  | 0.8                 | 0.0  | 12.3  |  |  |
| 4-7   |  | 2.2           | 2.0 | 1.6 | 1.1 | 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 | 1.1 | 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  | 27.3  |  |  |
| 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  | 8.2   |  |  |
| 25-31 |  | 0.0           | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.4  | 0.8          | 0.3 | 0.1 | 0.2 | 0.6  | 0.1                 | 0.0  | 2.9   |  |  |
| 32-38 |  | 0.0           | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2  | 0.3          | 0.1 | 0.0 | 0.0 | 0.1  | 0.0                 | 0.0  | 0.8   |  |  |
| 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  | 0.1          | 0.0 | 0.0 | 0.0 | 0.0  | 0.0                 | 0.0  | 0.1   |  |  |
| TOTAL |  | 5.7           | 5.3 | 3.8 | 2.2 | 2.2 | 2.5 | 4.9 | 7.0 | 9.4 | 12.5 | 9.4          | 4.5 | 3.9 | 6.1 | 12.4 | 7.9                 | 0.3  | 100.0 |  |  |

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## 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 2002 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 2002. 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:

| <u>Category</u> | <u>Average<br/>Sky Cover</u> |
|-----------------|------------------------------|
| Clear           | 0 - 3 tenths                 |
| Partly cloudy   | 4 - 7 tenths                 |
| Cloudy          | 8 - 10 tenths                |

During the period of record (1954 through 2002), an average of 202 sunny days (the sum of the clear and partly cloudy days) was recorded per year at the Hanford Meteorology Station.

### 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 2002, and Number of Days Clear, Partly Cloudy, and Cloudy, 1954 through 2002**

| Month  | Sky Cover (Scale 0-10) |     |                     |     |                     | Number of Clear Days |     |                     |     |                     | Number of Partly Cloudy Days | Number of Cloudy Days |     |                     |     |                     |
|--------|------------------------|-----|---------------------|-----|---------------------|----------------------|-----|---------------------|-----|---------------------|------------------------------|-----------------------|-----|---------------------|-----|---------------------|
|        | Avg                    | Max | Year                | Min | Year                | Avg                  | Max | Year                | Min | Year                |                              | Avg                   | Max | Year                | Min | Year                |
| Jan    | 7.9                    | 9.2 | 1978                | 4.3 | 1949                | 3.4                  | 9   | 1984                | 0   | 1955 <sup>(a)</sup> | 5.2                          | 22.4                  | 28  | 1978                | 17  | 1963                |
| Feb    | 7.5                    | 9.3 | 1980                | 5.9 | 1996                | 4.4                  | 9   | 2001 <sup>(a)</sup> | 0   | 1984 <sup>(a)</sup> | 5.4                          | 18.5                  | 26  | 1980 <sup>(a)</sup> | 11  | 2002                |
| Mar    | 6.8                    | 8.5 | 1978                | 4.9 | 1965                | 6.3                  | 12  | 1979 <sup>(a)</sup> | 1   | 1978 <sup>(a)</sup> | 8.3                          | 16.5                  | 24  | 1993                | 9   | 1979 <sup>(a)</sup> |
| Apr    | 6.4                    | 8.1 | 1963                | 3.7 | 1951                | 6.6                  | 12  | 1962                | 1   | 1963                | 9.1                          | 14.3                  | 21  | 1979 <sup>(a)</sup> | 6   | 1956                |
| May    | 5.9                    | 8.1 | 1993                | 3.6 | 1992                | 8.6                  | 18  | 1992                | 1   | 1977                | 10.3                         | 12.1                  | 19  | 1977 <sup>(a)</sup> | 3   | 1992                |
| Jun    | 5.2                    | 7.0 | 1950                | 2.8 | 1961                | 10.3                 | 21  | 1961                | 5   | 1972 <sup>(a)</sup> | 10.1                         | 9.6                   | 15  | 1983 <sup>(a)</sup> | 5   | 1979 <sup>(a)</sup> |
| Jul    | 3.0                    | 5.0 | 1983                | 0.9 | 1953                | 19.0                 | 26  | 1960                | 12  | 1987 <sup>(a)</sup> | 7.7                          | 4.3                   | 12  | 1976                | 0   | 2002 <sup>(a)</sup> |
| Aug    | 3.2                    | 5.9 | 1968                | 0.6 | 1955                | 18.8                 | 30  | 1955                | 9   | 1978                | 7.5                          | 4.8                   | 13  | 1983 <sup>(a)</sup> | 0   | 2000 <sup>(a)</sup> |
| Sep    | 3.9                    | 6.7 | 1978                | 1.4 | 1990 <sup>(a)</sup> | 15.7                 | 27  | 1975                | 6   | 1978                | 7.4                          | 6.9                   | 16  | 1977                | 0   | 1990                |
| Oct    | 5.6                    | 8.0 | 1975                | 3.3 | 1987                | 10.7                 | 25  | 2002                | 1   | 1975                | 7.8                          | 12.6                  | 22  | 1973                | 6   | 1986                |
| Nov    | 7.5                    | 9.1 | 1972                | 5.2 | 1993                | 4.7                  | 12  | 1993                | 1   | 1973 <sup>(a)</sup> | 5.8                          | 19.6                  | 25  | 1973 <sup>(a)</sup> | 13  | 1993                |
| Dec    | 8.1                    | 9.3 | 1985                | 6.4 | 1978                | 3.8                  | 9   | 1978                | 1   | 2002 <sup>(a)</sup> | 4.5                          | 22.8                  | 29  | 1985                | 17  | 1978                |
| Annual | 5.9                    | 6.6 | 1978 <sup>(a)</sup> | 5.1 | 1949                | 112.5                | 144 | 1998                | 80  | 1977                | 89.0                         | 163.9                 | 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 2002**

| Month  | Days with Fog (Visibility $\leq 6$ miles) |     |                     |     |                     | Days with Dense Fog (Visibility $\leq 0.25$ mile) |     |                     |     |                     |
|--------|---|-----|---------------------|-----|---------------------|---|-----|---------------------|-----|---------------------|
|        | Avg                                       | Max | Year                | Min | Year                | Avg   | Max | Year                | Min | Year                |
| Jan    | 11.7                                      | 25  | 1979                | 0   | 1949                | 6.2   | 15  | 1994 <sup>(a)</sup> | 0   | 1949                |
| Feb    | 6.6                                       | 20  | 1963                | 0   | 1988 <sup>(a)</sup> | 3.2   | 11  | 1963                | 0   | 1999 <sup>(a)</sup> |
| Mar    | 2.1                                       | 10  | 1993                | 0   | 1999 <sup>(a)</sup> | 0.8   | 5   | 1993 <sup>(a)</sup> | 0   | 2002 <sup>(a)</sup> |
| Apr    | 0.4                                       | 3   | 1992                | 0   | 2002 <sup>(a)</sup> | 0.1   | 1   | 1993 <sup>(a)</sup> | 0   | 2002 <sup>(a)</sup> |
| May    | 0.2                                       | 3   | 1948                | 0   | 2002 <sup>(a)</sup> | <0.1  | 1   | 1958                | 0   | 2002 <sup>(a)</sup> |
| Jun    | 0.1                                       | 2   | 1971                | 0   | 2002 <sup>(a)</sup> | <0.1  | 1   | 1971                | 0   | 2002 <sup>(a)</sup> |
| Jul    | <0.1                                      | 1   | 1966                | 0   | 2002 <sup>(a)</sup> | 0   | 0   | 0                   |     |                     |
| Aug    | 0.1                                       | 1   | 1985 <sup>(a)</sup> | 0   | 2002 <sup>(a)</sup> | <0.1  | 1   | 1985 <sup>(a)</sup> | 0   | 2002 <sup>(a)</sup> |
| Sep    | 0.3                                       | 2   | 1985 <sup>(a)</sup> | 0   | 2002 <sup>(a)</sup> | 0.1   | 1   | 1995 <sup>(a)</sup> | 0   | 2002 <sup>(a)</sup> |
| Oct    | 2.0                                       | 9   | 1962                | 0   | 1989 <sup>(a)</sup> | 1.1   | 7   | 1980                | 0   | 1998 <sup>(a)</sup> |
| Nov    | 9.9                                       | 19  | 1985 <sup>(a)</sup> | 0   | 1990                | 5.7   | 14  | 2001                | 0   | 1990 <sup>(a)</sup> |
| Dec    | 14.1                                      | 25  | 1989 <sup>(a)</sup> | 2   | 1968                | 7.5   | 17  | 1950                | 2   | 1996 <sup>(a)</sup> |
| 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 2002. These variables are collected hourly and are averaged on a monthly (as opposed to a daily) basis. Prior to 1975, wet bulb temperatures  $\geq 75^{\circ}\text{F}$  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  $\geq 75^{\circ}\text{F}$ .

## 6.4 Solar Radiation

Table 6.4 presents average and extreme daily solar radiation values by month for the period 1953 through 2002. These data are reported in langley (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 2002**

| Category <sup>(a)</sup>      | Monthly Averages |                     |                     |                     |      |                     |                     |                     |                     |      |                     |                     |        |
|------------------------------|------------------|---------------------|---------------------|---------------------|------|---------------------|---------------------|---------------------|---------------------|------|---------------------|---------------------|--------|
|                              | Jan              | Feb                 | Mar                 | Apr                 | May  | Jun                 | Jul                 | Aug                 | Sep                 | Oct  | Nov                 | Dec                 | Annual |
| Dry bulb                     | 31.3             | 37.6                | 45.1                | 53.2                | 62.2 | 69.9                | 77.3                | 75.7                | 66.5                | 53.0 | 40.2                | 32.6                | 53.7   |
| Wet bulb                     | 29               | 34                  | 38                  | 44                  | 50   | 55                  | 58                  | 58                  | 53                  | 45   | 37                  | 31                  | 44     |
| Rel. hum.                    | 77.4             | 70.5                | 56.7                | 47.3                | 42.9 | 39.6                | 33.4                | 35.6                | 42.1                | 56.2 | 73.8                | 80.2                | 54.6   |
| Dew point                    | 24.6             | 27.8                | 29.0                | 31.7                | 36.9 | 41.6                | 43.8                | 44.1                | 40.4                | 35.9 | 31.6                | 26.7                | 34.5   |
| Extremes of Monthly Averages |                  |                     |                     |                     |      |                     |                     |                     |                     |      |                     |                     |        |
| <u>Dry Bulb</u>              |                  |                     |                     |                     |      |                     |                     |                     |                     |      |                     |                     |        |
| 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   |
| <u>Wet Bulb</u>              |                  |                     |                     |                     |      |                     |                     |                     |                     |      |                     |                     |        |
| Highest                      | 39               | 41                  | 44                  | 47                  | 55   | 59                  | 63                  | 61                  | 56                  | 50   | 42                  | 36                  | 47     |
| Year                         | 1953             | 1956                | 1992                | 1992                | 1958 | 1992 <sup>(b)</sup> | 1998                | 1999 <sup>(b)</sup> | 1995 <sup>(b)</sup> | 1988 | 1999 <sup>(b)</sup> | 1991 <sup>(b)</sup> | 1992   |
| Lowest                       | 12               | 23                  | 33                  | 39                  | 45   | 51                  | 56                  | 55                  | 48                  | 40   | 24                  | 21                  | 41     |
| Year                         | 1950             | 1956                | 1955                | 1955                | 1959 | 1983 <sup>(b)</sup> | 1986 <sup>(b)</sup> | 1980 <sup>(b)</sup> | 1970                | 1984 | 1978                | 1985 <sup>(b)</sup> | 1985   |
| <u>Relative Humidity</u>     |                  |                     |                     |                     |      |                     |                     |                     |                     |      |                     |                     |        |
| 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   |
| <u>Dew Point</u>             |                  |                     |                     |                     |      |                     |                     |                     |                     |      |                     |                     |        |
| 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 <sup>(b)</sup> | 1986                | 1992 <sup>(b)</sup> | 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 <sup>(b)</sup> | 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 2002**

|         | Jan                 | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  | Annual   |
|---------|---------------------|------|------|------|------|------|------|------|------|------|------|------|----------|
| Average | 106                 | 184  | 318  | 447  | 548  | 604  | 628  | 536  | 403  | 253  | 123  | 83   | 353      |
| 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  | 104  | 61   | 33   | 13   | 6    | 6        |
| Year    | 1976 <sup>(a)</sup> | 1995 | 1979 | 1974 | 1962 | 1992 | 1972 | 1993 | 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 2002**

| Phenomenon           | Jan | Feb  | Mar  | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec  | Annual |
|----------------------|-----|------|------|-----|-----|-----|-----|-----|-----|-----|-----|------|--------|
| Thunderstorm         | 0   | ≤0.1 | 0.2  | 0.8 | 1.5 | 2.3 | 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                | 2.1 | 0.7  | ≤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 2002. 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 2002. 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 2002. 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 2002 (inches of mercury)**

| Month  | Station Pressure |       |                         |       |                     |                      | Sea-Level Pressure |                     |       |                     |
|--------|------------------|-------|-------------------------|-------|---------------------|----------------------|--------------------|---------------------|-------|---------------------|
|        | Average          | High  | Year                    | Low   | Year                | Greatest Daily Range | High               | Year                | Low   | Year                |
| Jan    | 29.32            | 30.23 | 1979 <sup>(a)</sup>     | 28.18 | 1980                | 0.77                 | 31.12              | 1979                | 28.94 | 1964                |
| Feb    | 29.27            | 30.08 | 1956                    | 28.23 | 1958 <sup>(a)</sup> | 0.86                 | 30.97              | 1956 <sup>(a)</sup> | 28.98 | 1958 <sup>(a)</sup> |
| 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 <sup>(a)</sup> | 0.81                 | 30.73              | 1999                | 29.26 | 1962                |
| May    | 29.16            | 29.68 | 1970 <sup>(a)</sup>     | 28.61 | 1999                | 0.47                 | 30.48              | 1970 <sup>(a)</sup> | 29.38 | 1999 <sup>(a)</sup> |
| Jun    | 29.14            | 29.60 | 1987 <sup>(a)</sup>     | 28.67 | 1992 <sup>(a)</sup> | 0.54                 | 30.40              | 1987                | 29.42 | 1992                |
| Jul    | 29.14            | 29.56 | 1993 <sup>(a)</sup>     | 28.80 | 2002 <sup>(a)</sup> | 0.48                 | 30.34              | 1993 <sup>(a)</sup> | 29.55 | 2002 <sup>(a)</sup> |
| Aug    | 29.14            | 29.55 | 1968                    | 28.75 | 1980                | 0.39                 | 30.32              | 1968                | 29.52 | 1980                |
| Sep    | 29.18            | 29.79 | 1983 <sup>(a)</sup>     | 28.48 | 1986 <sup>(a)</sup> | 0.56                 | 30.60              | 1983                | 29.25 | 1986                |
| Oct    | 29.25            | 29.86 | 1999                    | 28.39 | 1962                | 0.74                 | 30.68              | 1999 <sup>(a)</sup> | 29.15 | 1962                |
| Nov    | 29.28            | 30.06 | 1979 <sup>(a)</sup>     | 28.36 | 2002 <sup>(a)</sup> | 0.78                 | 30.90              | 1979 <sup>(a)</sup> | 29.13 | 2002 <sup>(a)</sup> |
| Dec    | 29.32            | 30.20 | 1978                    | 28.15 | 2002                | 1.02                 | 31.07              | 1978 <sup>(a)</sup> | 28.91 | 2002                |
| Annual | 29.22            | 30.23 | Jan 1979 <sup>(a)</sup> | 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**

| Day | Jan          |             | Feb          |             | Mar          |             | Apr          |             | May          |             | Jun          |             | Jul          |             | Aug          |             | Sep          |             | Oct          |             | Nov          |             | Dec          |             |
|-----|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
|     | Rise<br>a.m. | Set<br>p.m. | Rise<br>a.m. | Set<br>p.m. | Rise<br>a.m. | Set<br>p.m. | Rise<br>a.m. | Set<br>p.m. | Rise<br>a.m. | Set<br>p.m. | Rise<br>a.m. | Set<br>p.m. | Rise<br>a.m. | Set<br>p.m. | Rise<br>a.m. | Set<br>p.m. | Rise<br>a.m. | Set<br>p.m. | Rise<br>a.m. | Set<br>p.m. | Rise<br>a.m. | Set<br>p.m. | Rise<br>a.m. | Set<br>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        |

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## 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.

### 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

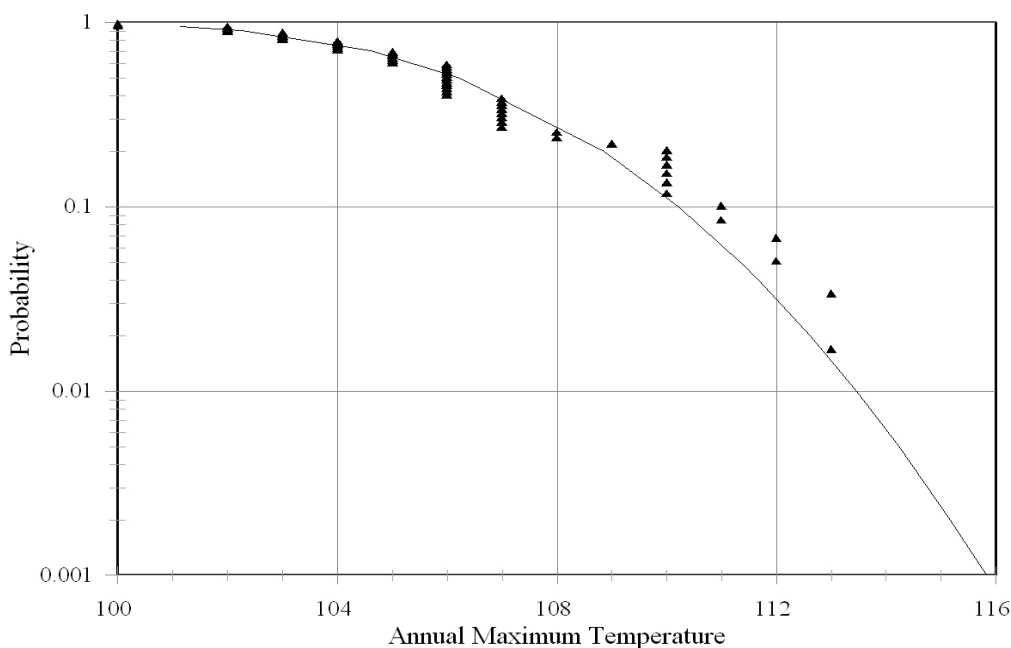
Peak wind gusts for return periods of 2 to 10,000 years are listed in Table 7.5 for heights of 30, 50, 200, and 400 feet above ground. The peak wind gust estimates are based on wind measurements made at the 50-, 200-, 400-foot levels of the tower at the Hanford Meteorology Station. The peak wind gusts 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.

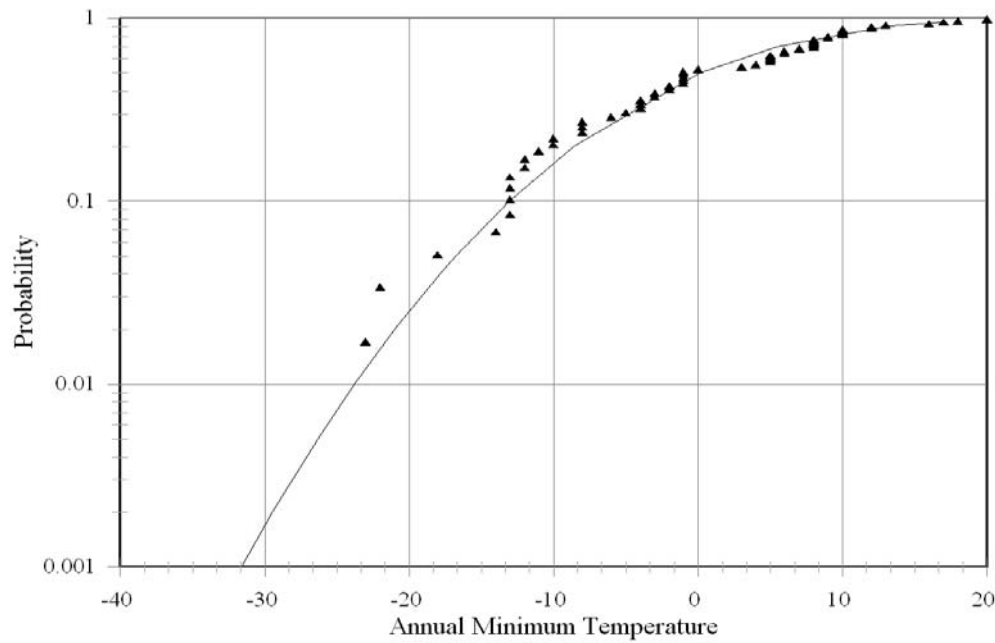
**Table 7.1. Return Periods<sup>(a)</sup> for Annual Maximum and Minimum Temperatures**

| Return Period<br>(years) | Maximum Temperature<br>(°F) | Minimum Temperature<br>(°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**



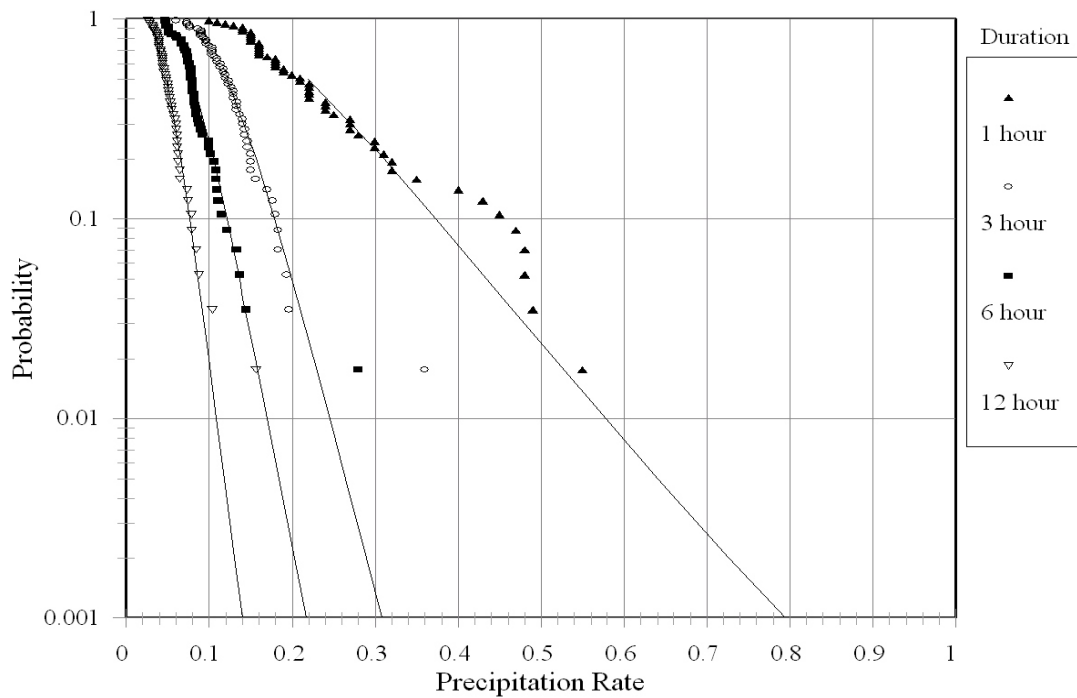
**Figure 7.2. Probability (1/yr) of an Annual Minimum Temperature (°F) Being Less Than a Given Value**

**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<br>(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     |

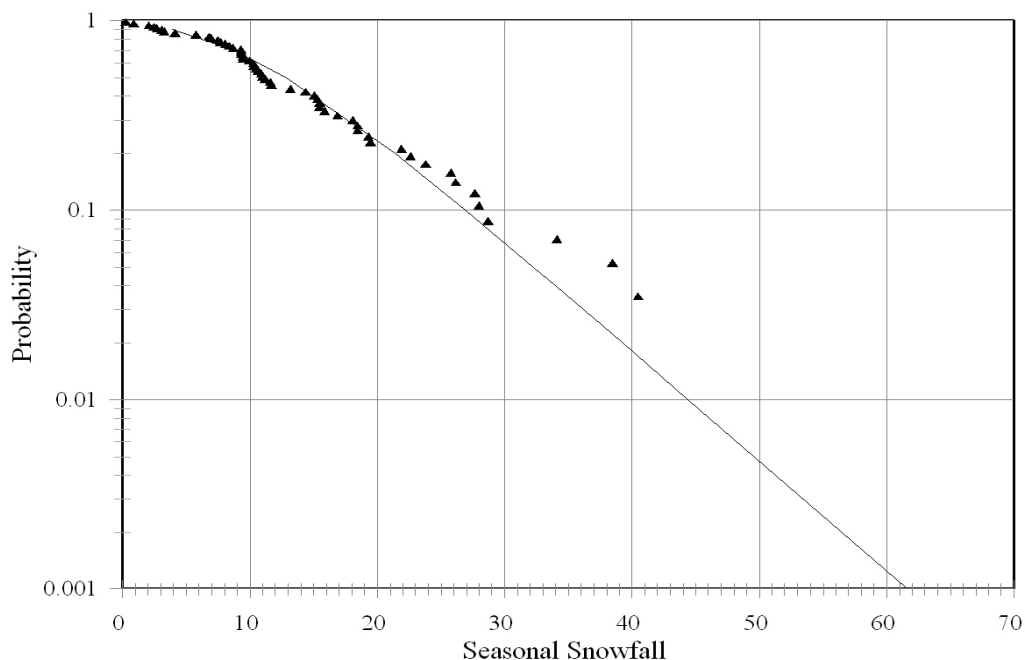
**Table 7.3. Precipitation Amounts (inches) for 1 to 24 Hours in Periods and Return Periods from 2 to 1,000 Years**

| Return Period<br>(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**

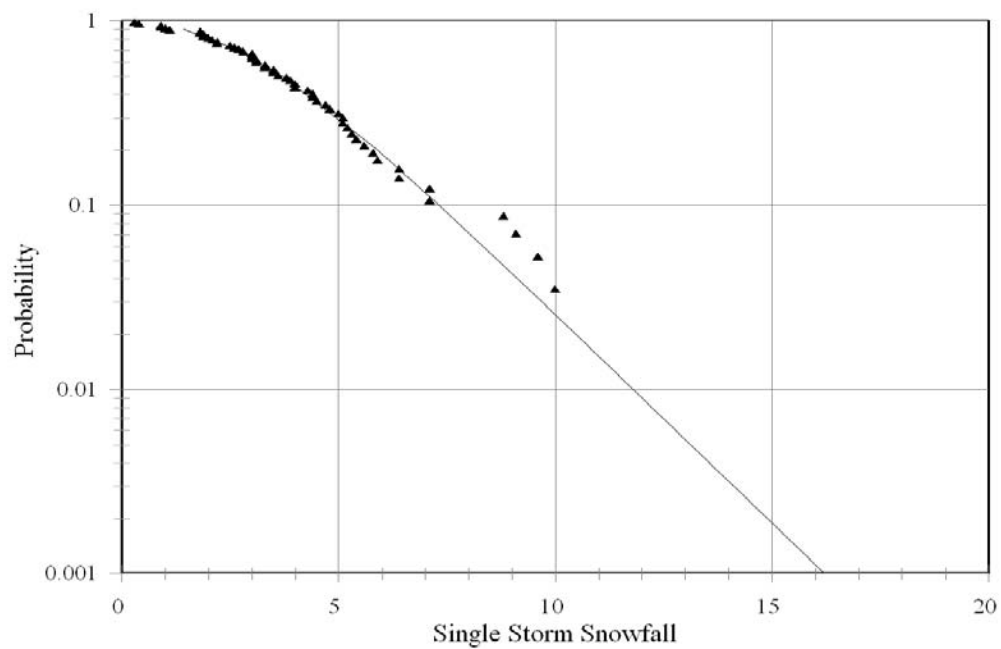
**Table 7.4. Snowfall Extremes for Return Periods from 2 to 1,000 Years**

| Return Period<br>(years) | Seasonal Total<br>(inches) | Single Storm<br>(inches) | Maximum on<br>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                          |

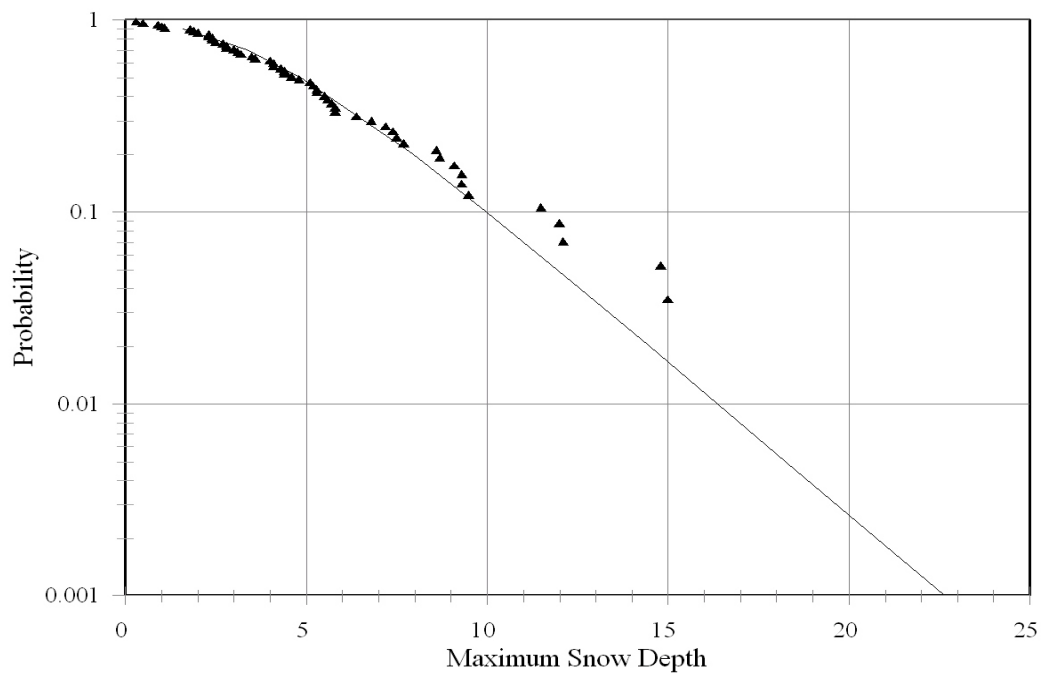


**Figure 7.4. Probability (1/yr) of Exceeding a Given Seasonal Snowfall (inches)**





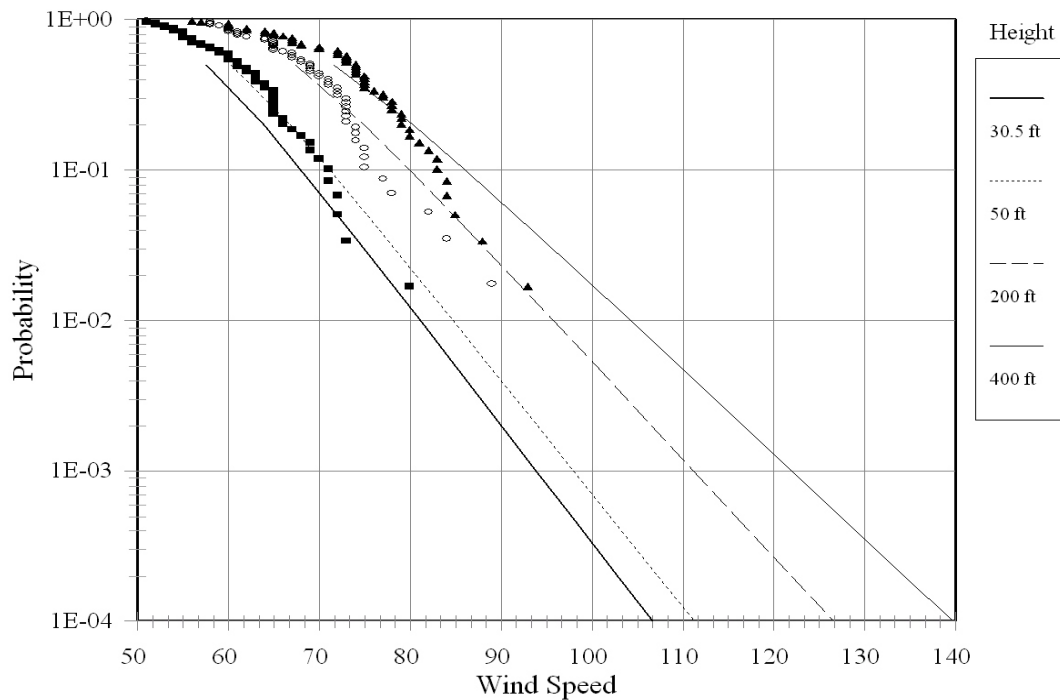
**Figure 7.5. Probability (1/yr) of Exceeding a Given Snowfall (inches) in a Single Storm**



**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<br>(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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## 8.0 References

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## **Appendix A**

### **2002 Wind Climatology**

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## Appendix A

### 2002 Wind Climatology

This appendix provides the 2002 station-specific wind roses (Figures A.1[a] and A.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 A.1[b] and A.2[b]) represent the proportional amount of time in each speed class.

Table A.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 A.2 lists joint frequency distributions (at 60 meters) for stations 9, 11, 13, and 21 (see Figure 2.2 in text for locations).

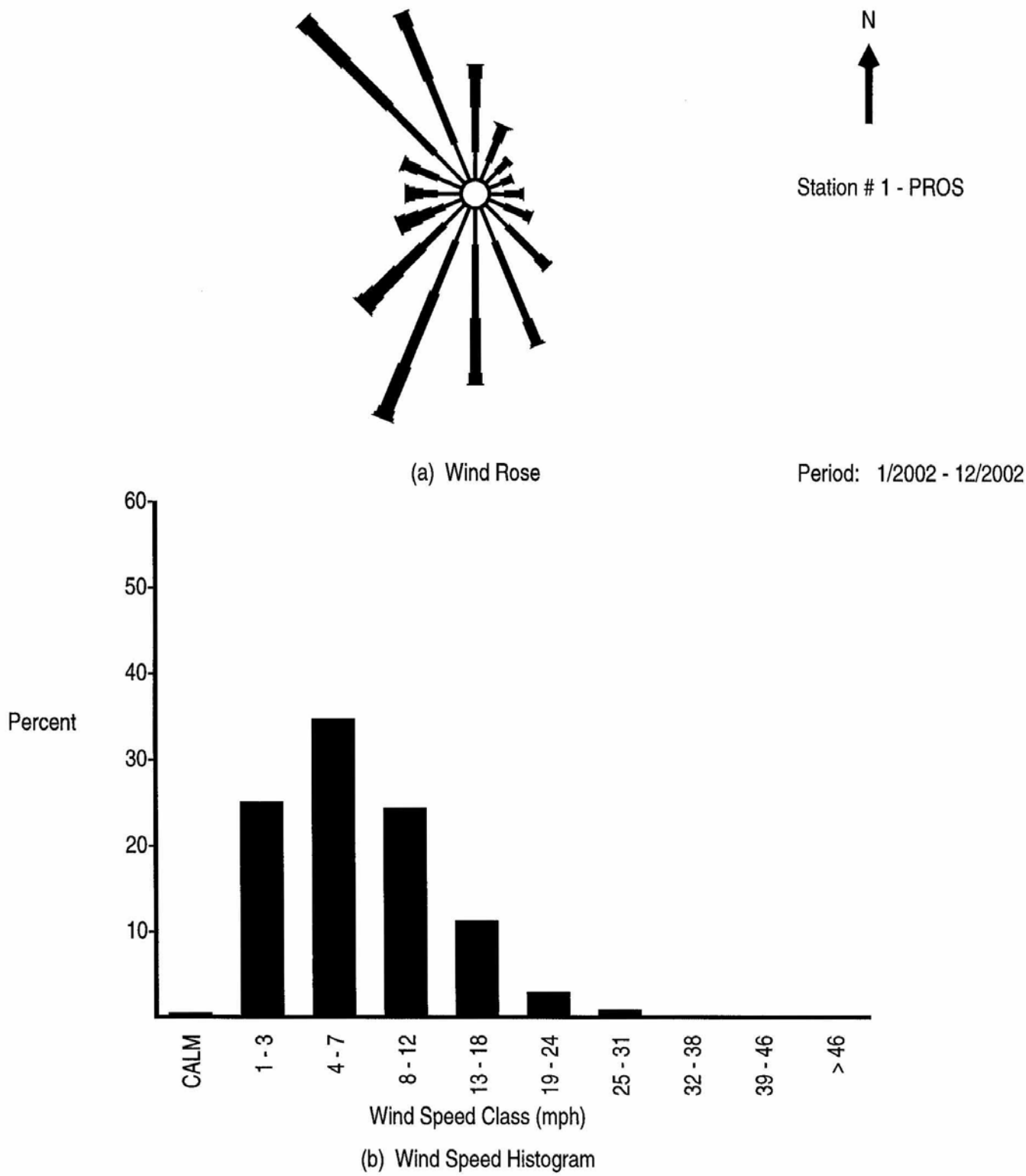


Figure A.1. Wind Rose and Wind Speed Histogram, 30 Feet

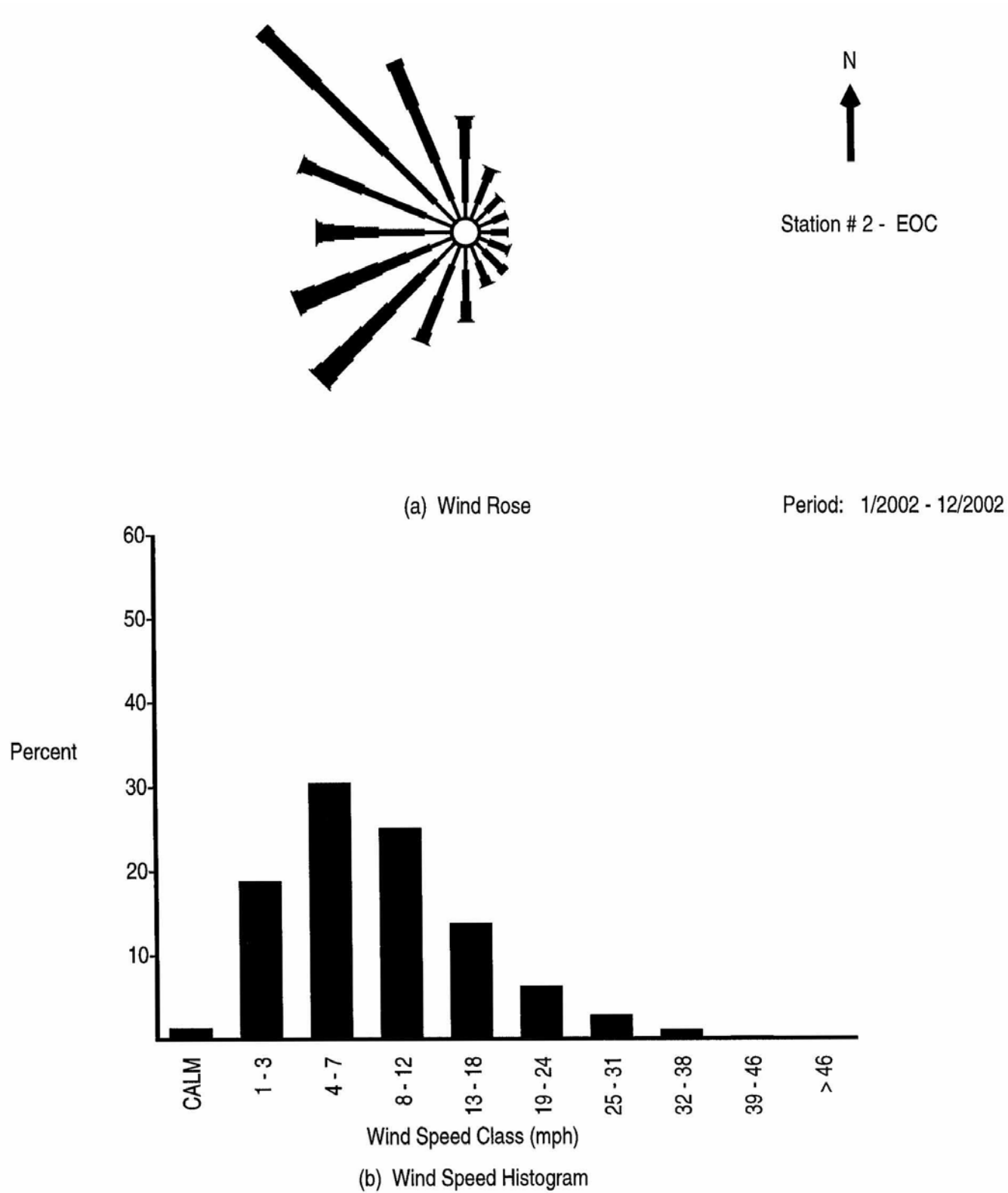
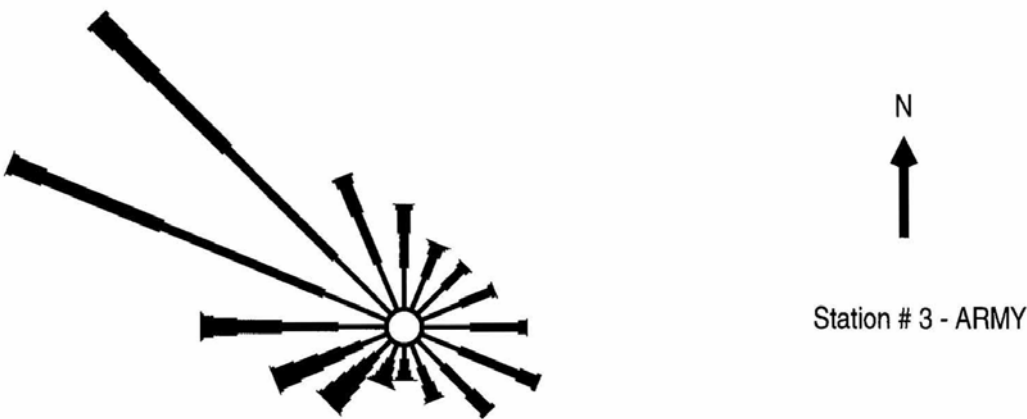


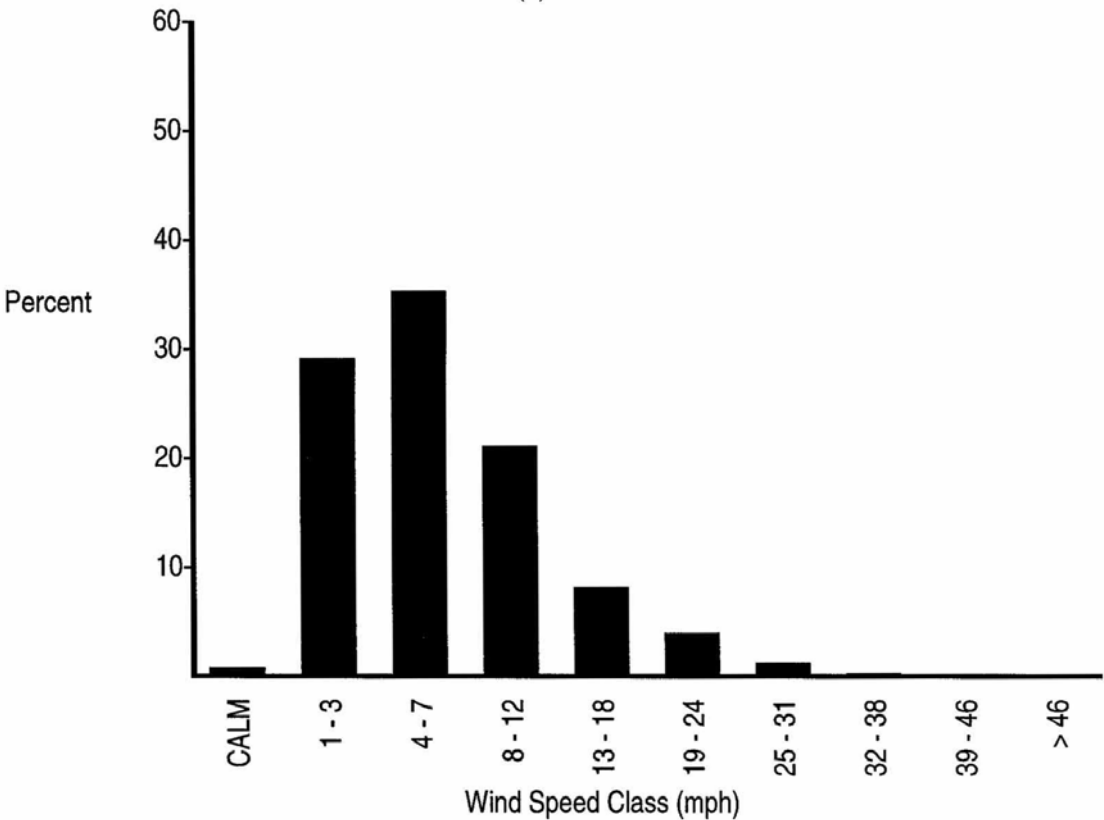
Figure A.1. (contd)





(a) Wind Rose

Period: 1/2002 - 12/2002



(b) Wind Speed Histogram

Figure A.1. (contd)

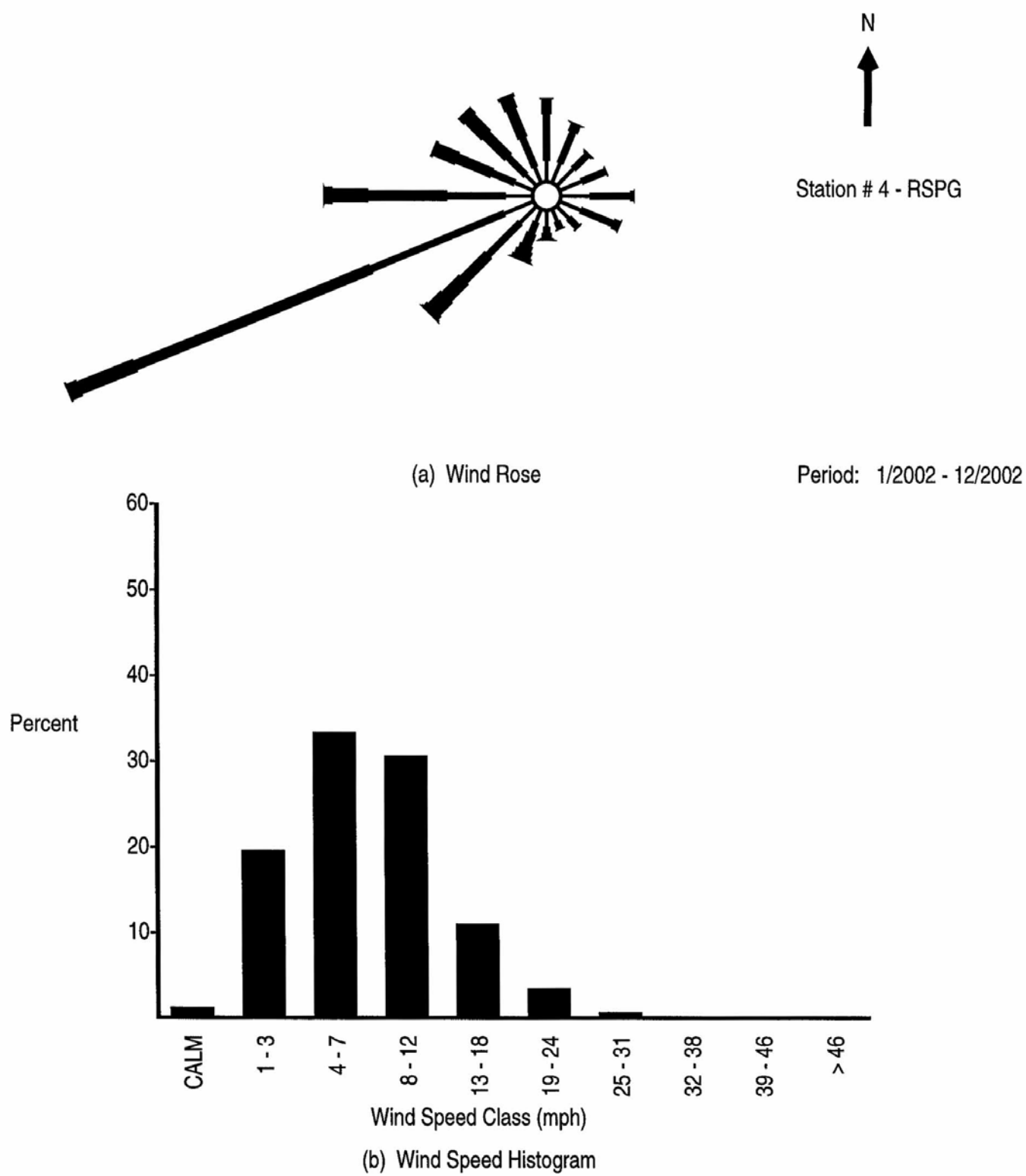
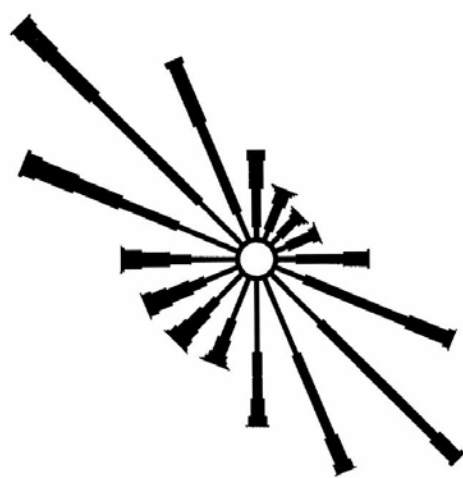


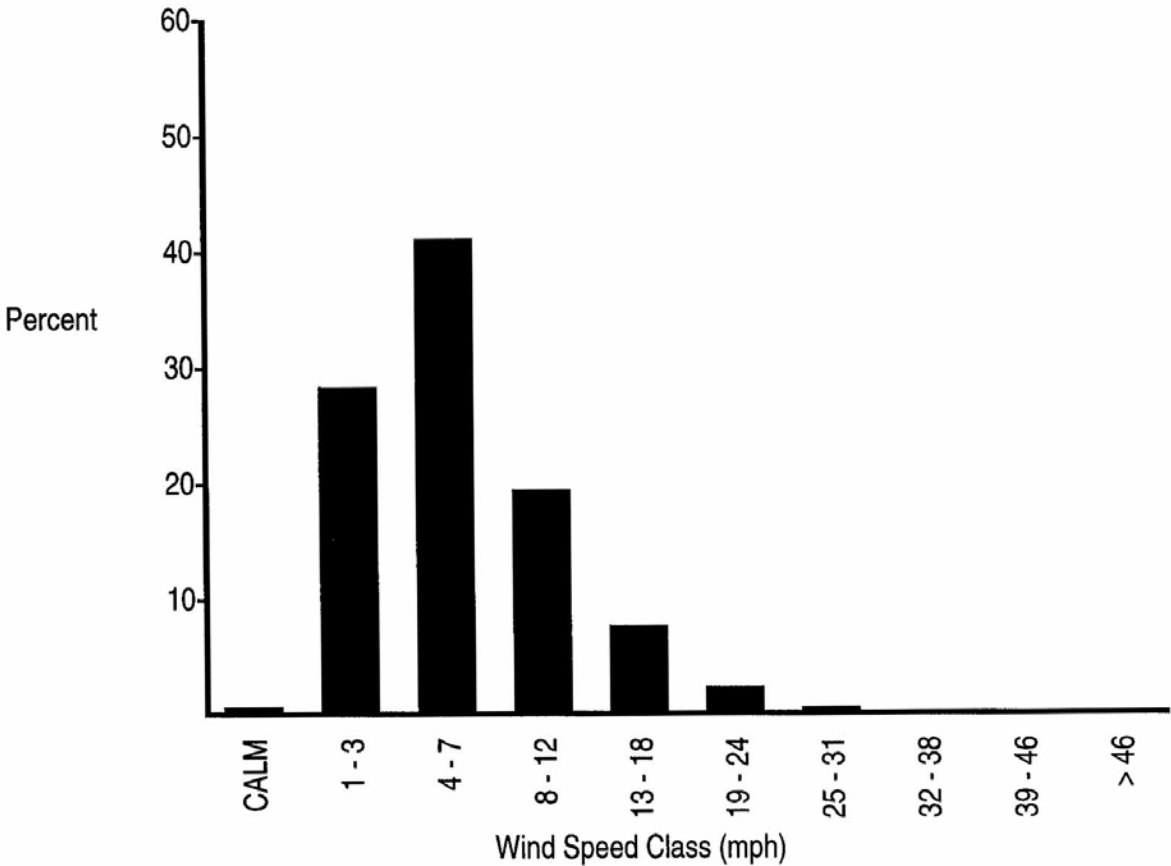
Figure A.1. (contd)



N  
↑  
Station # 5 - EDNA

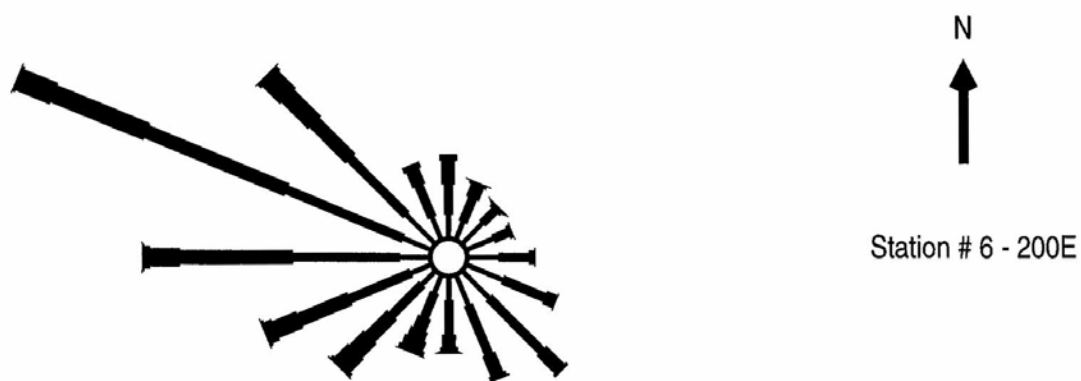
(a) Wind Rose

Period: 1/2002 - 12/2002



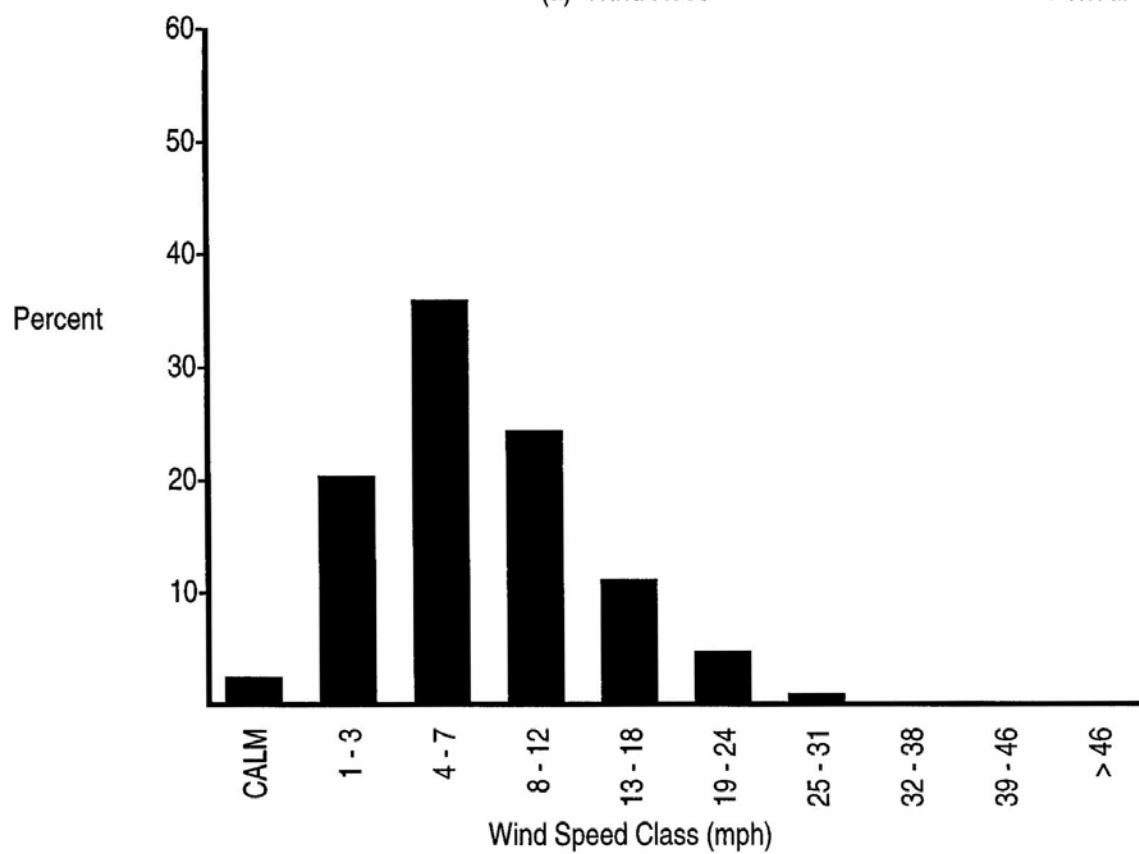
(b) Wind Speed Histogram

Figure A.1. (contd)



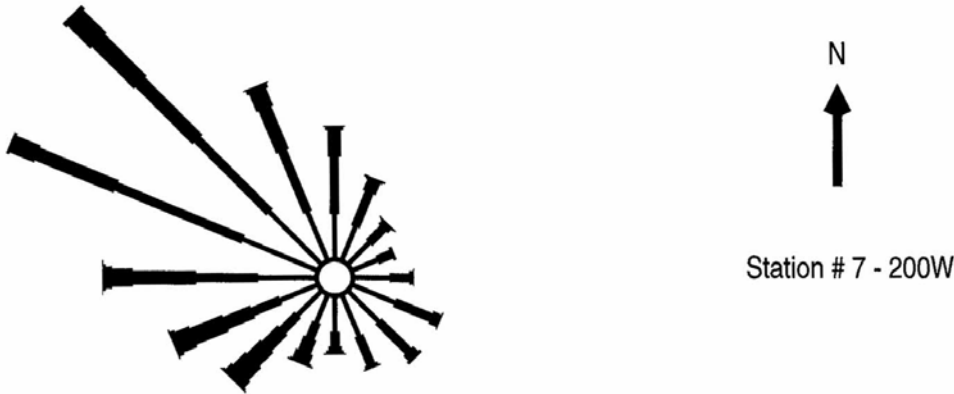
(a) Wind Rose

Period: 1/2002 - 12/2002



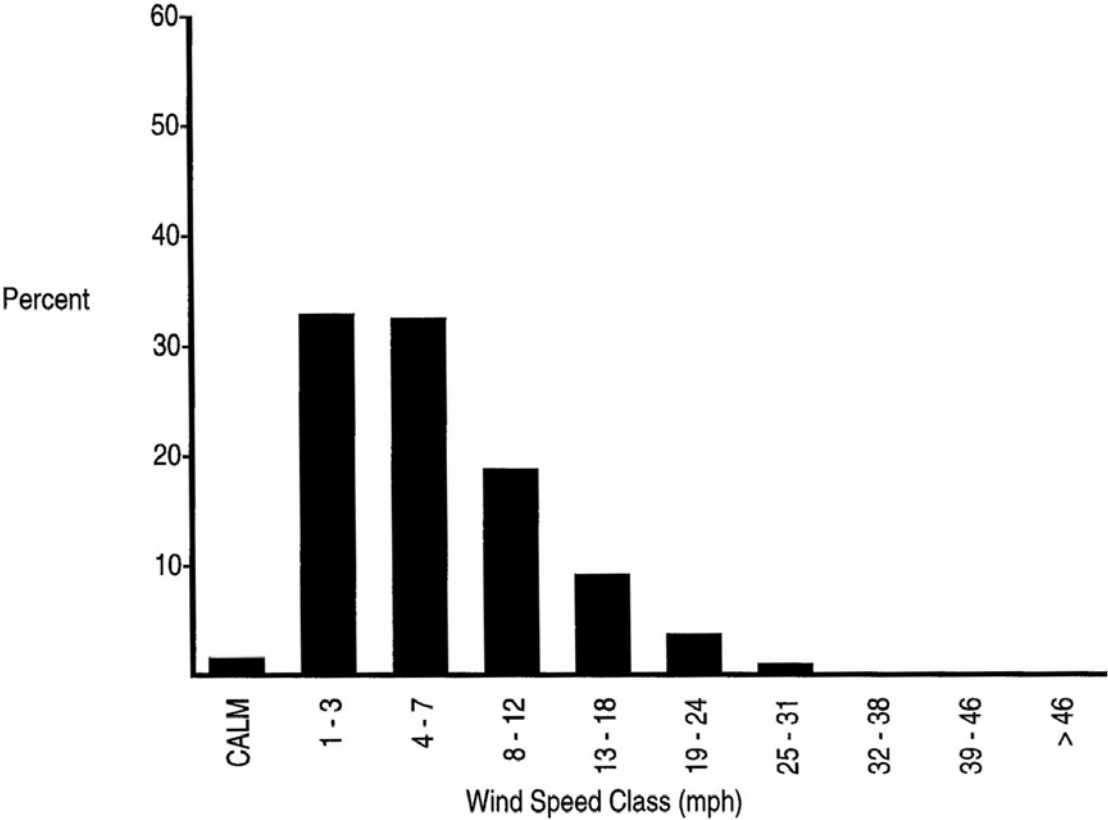
(b) Wind Speed Histogram

Figure A.1. (contd)



(a) Wind Rose

Period: 1/2002 - 12/2002



(b) Wind Speed Histogram

Figure A.1. (contd)

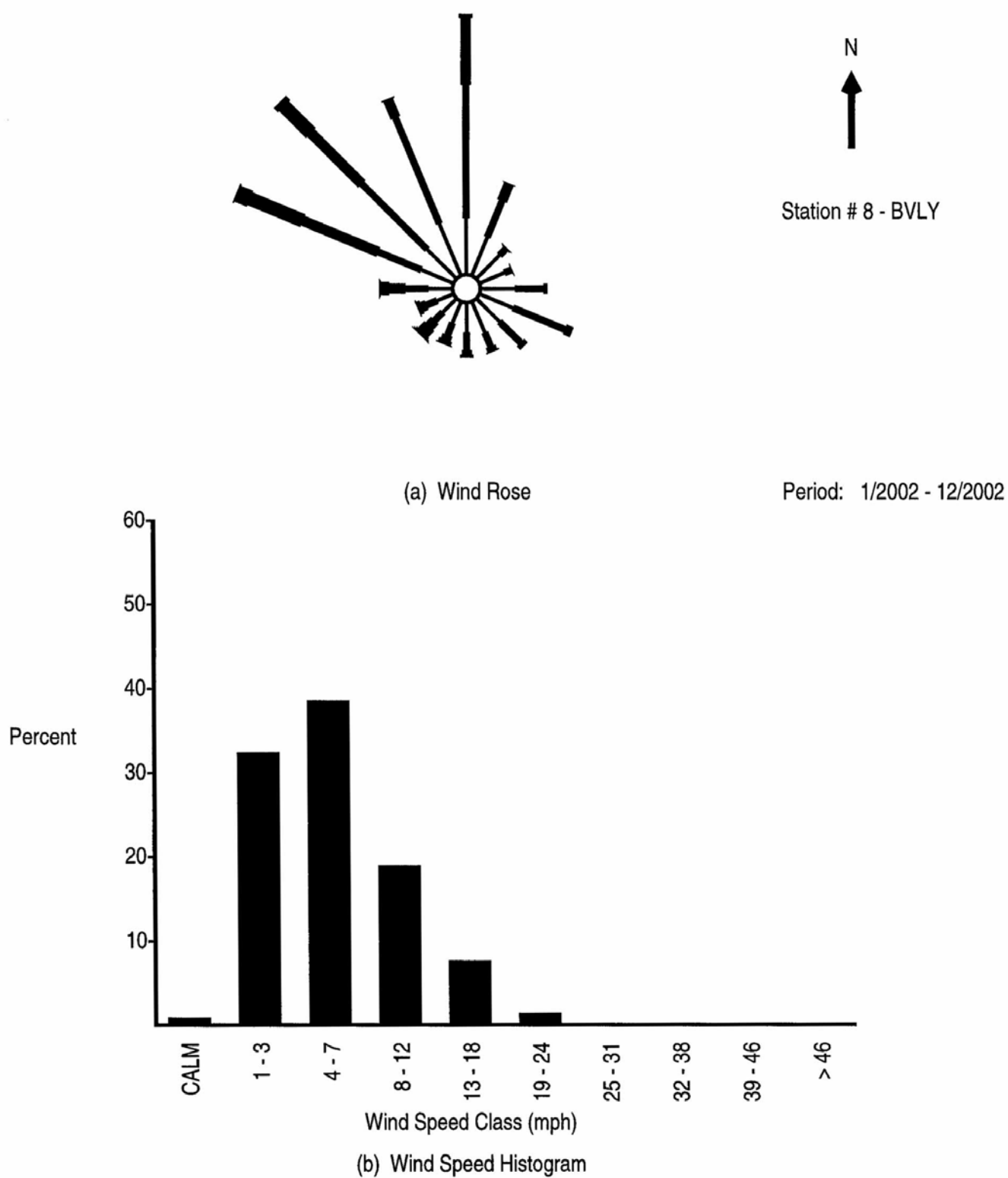


Figure A.1. (contd)

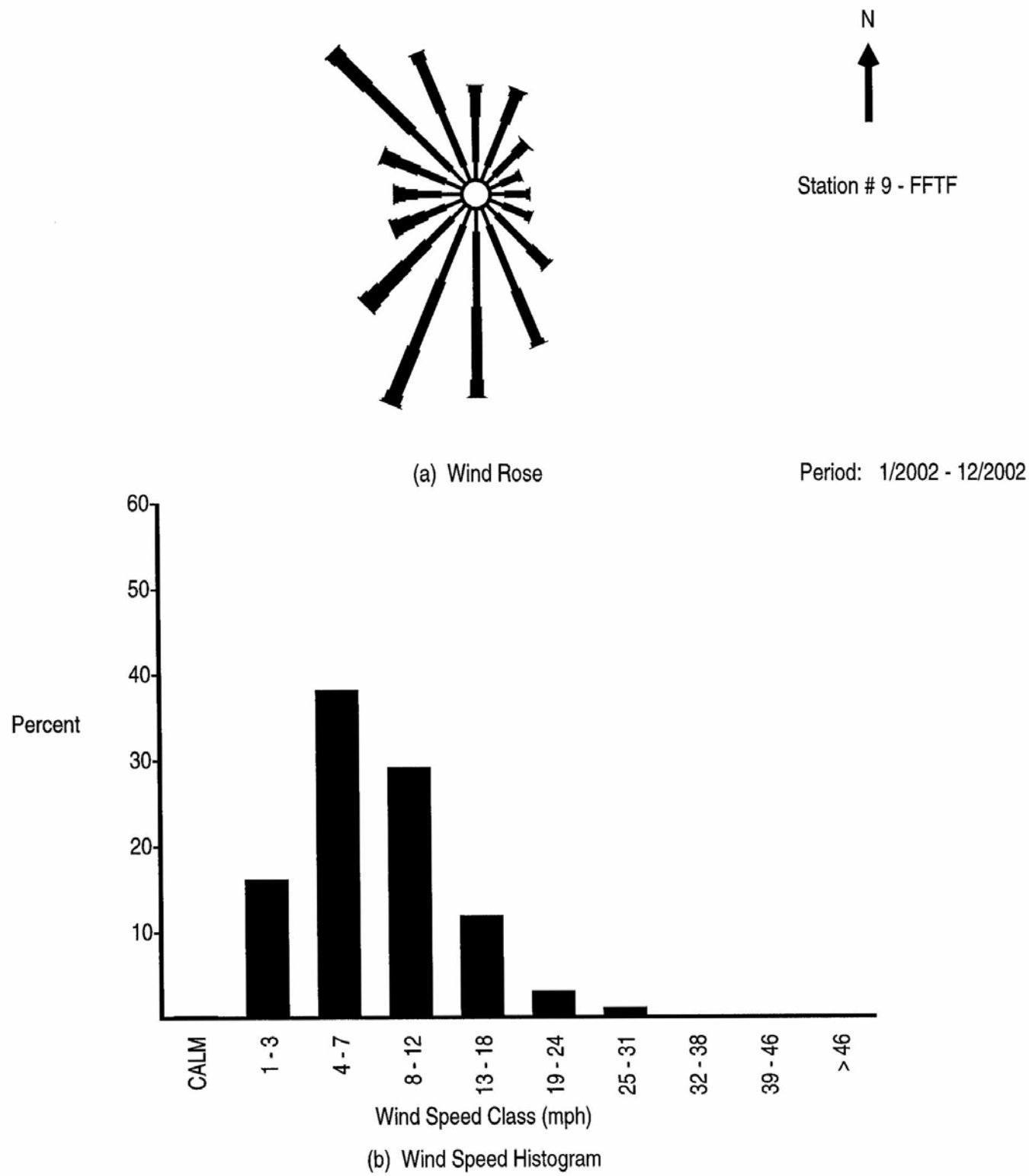
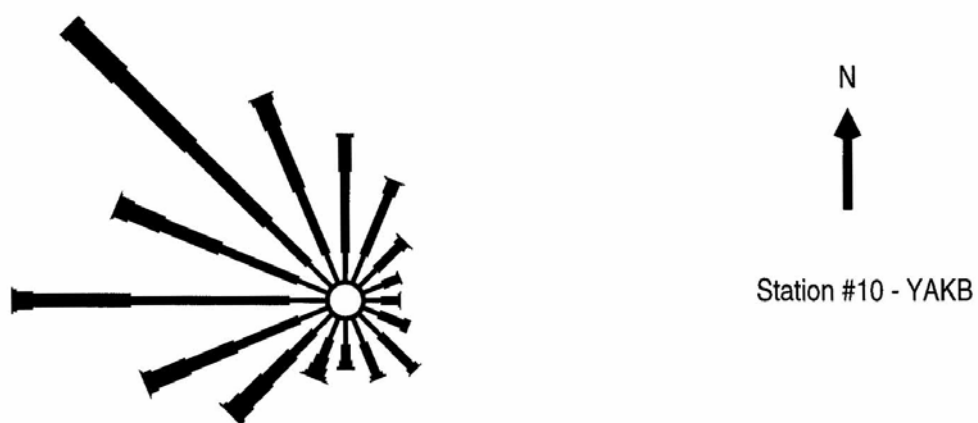
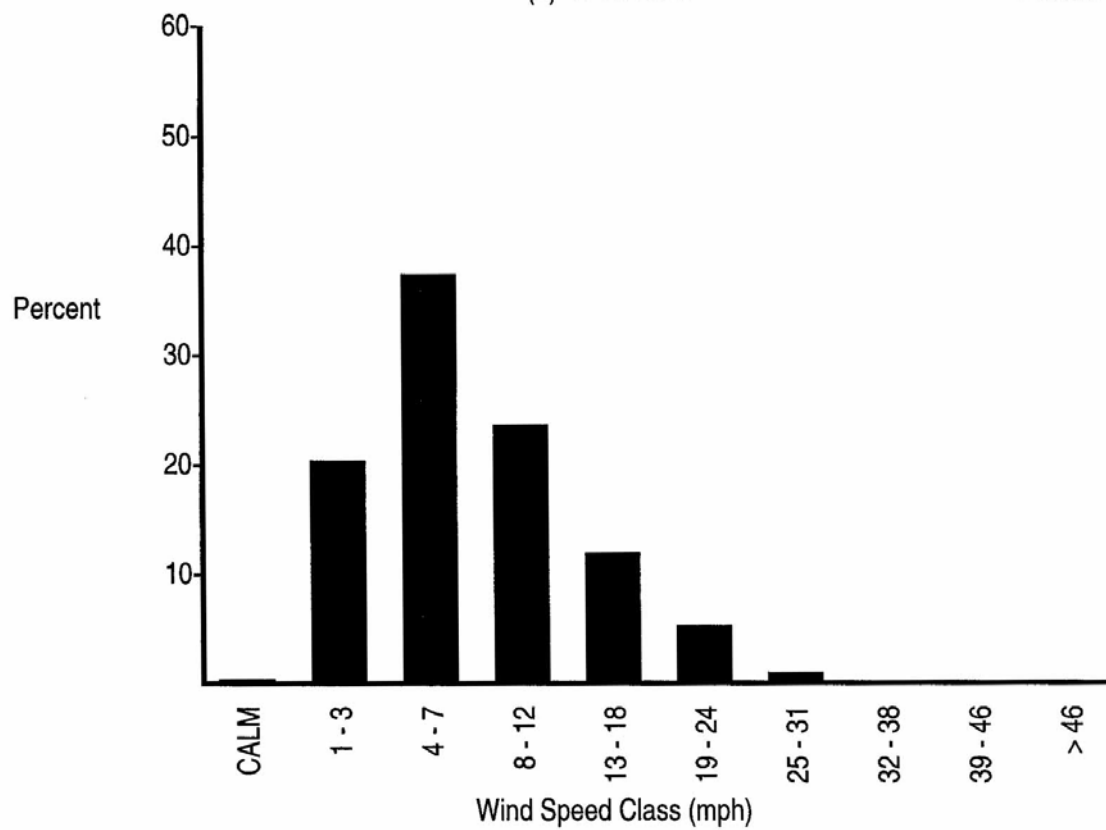


Figure A.1. (contd)



(a) Wind Rose

Period: 1/2002 - 12/2002



(b) Wind Speed Histogram

**Figure A.1.** (contd)



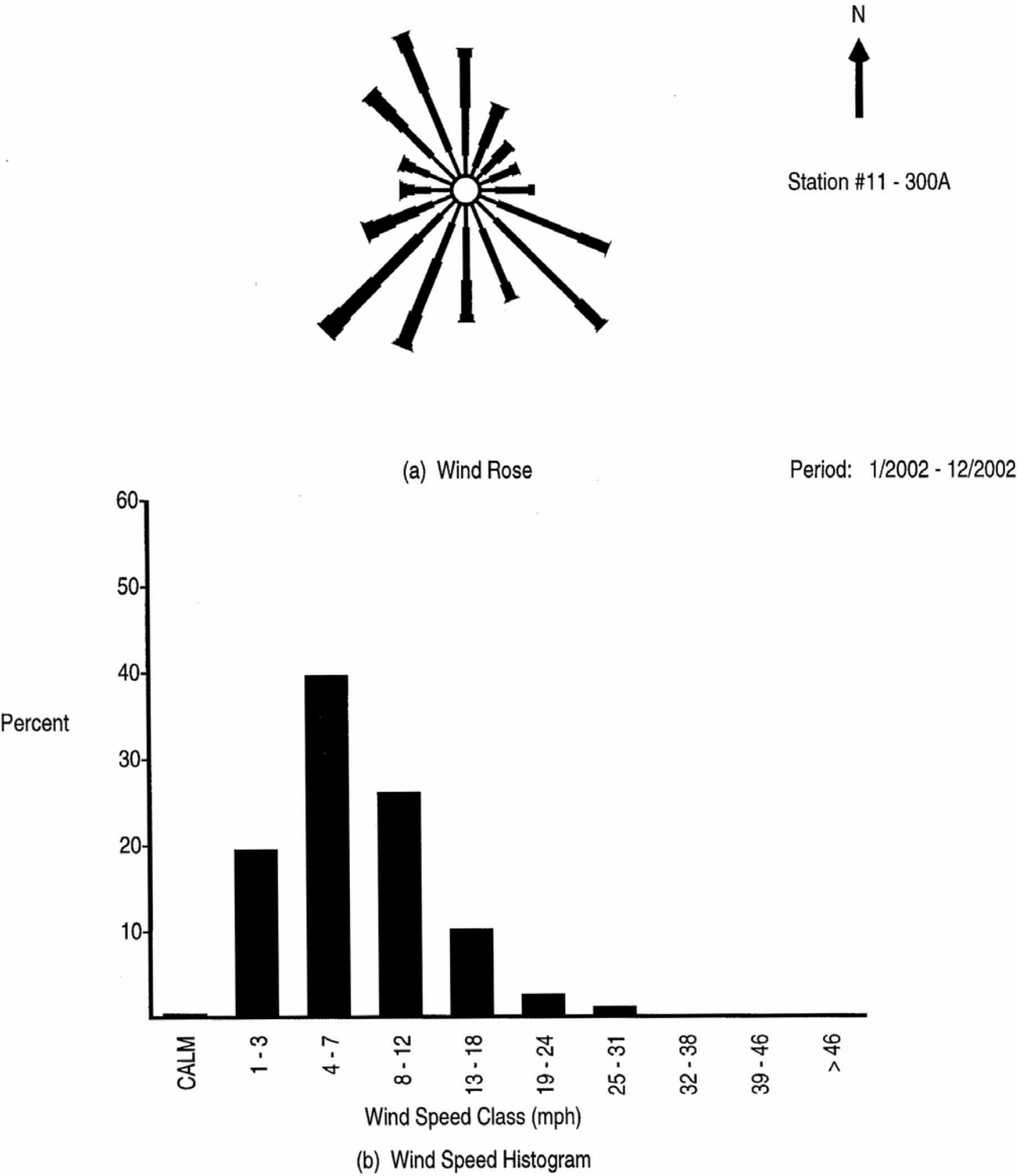


Figure A.1. (contd)

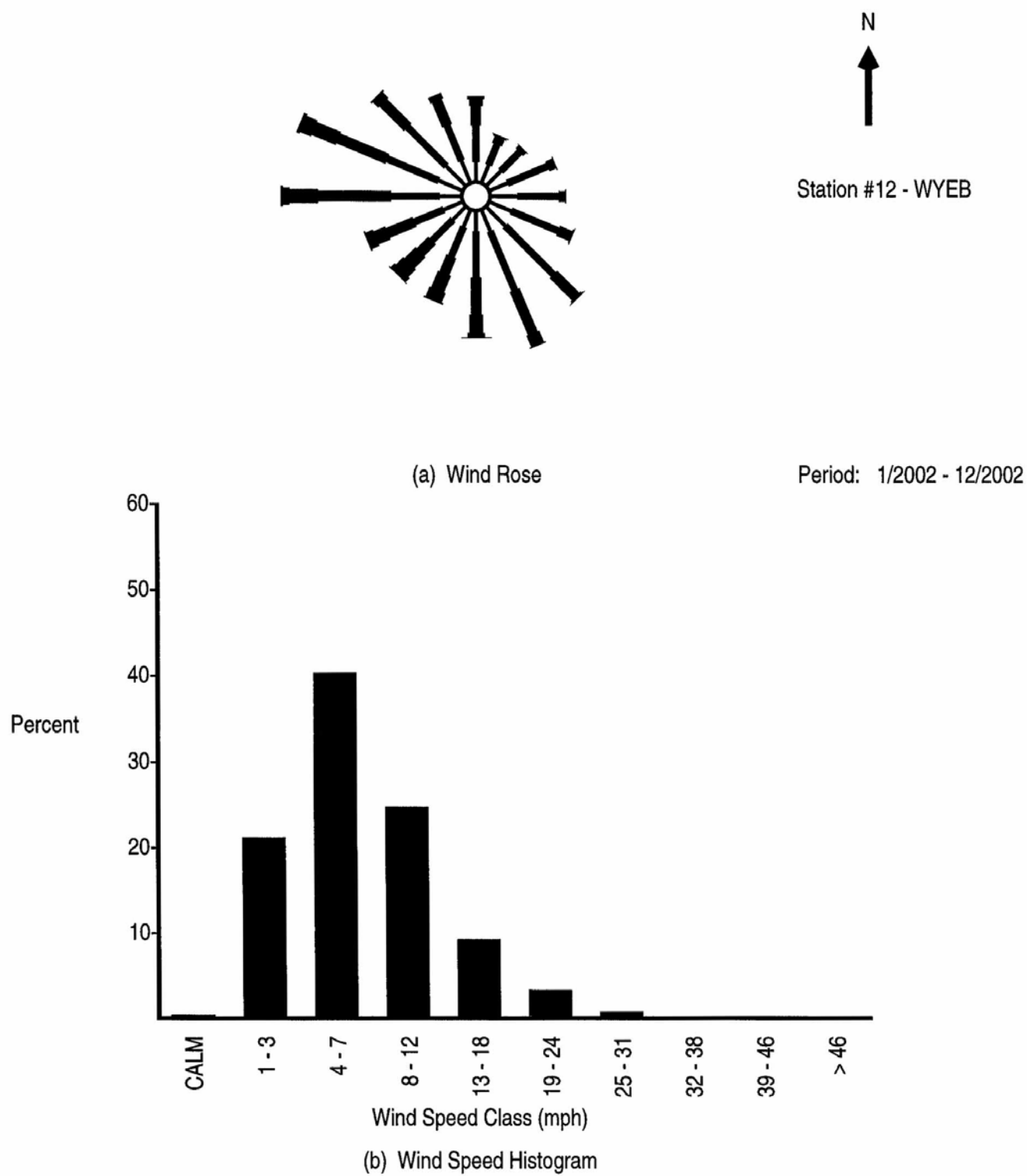


Figure A.1. (contd)

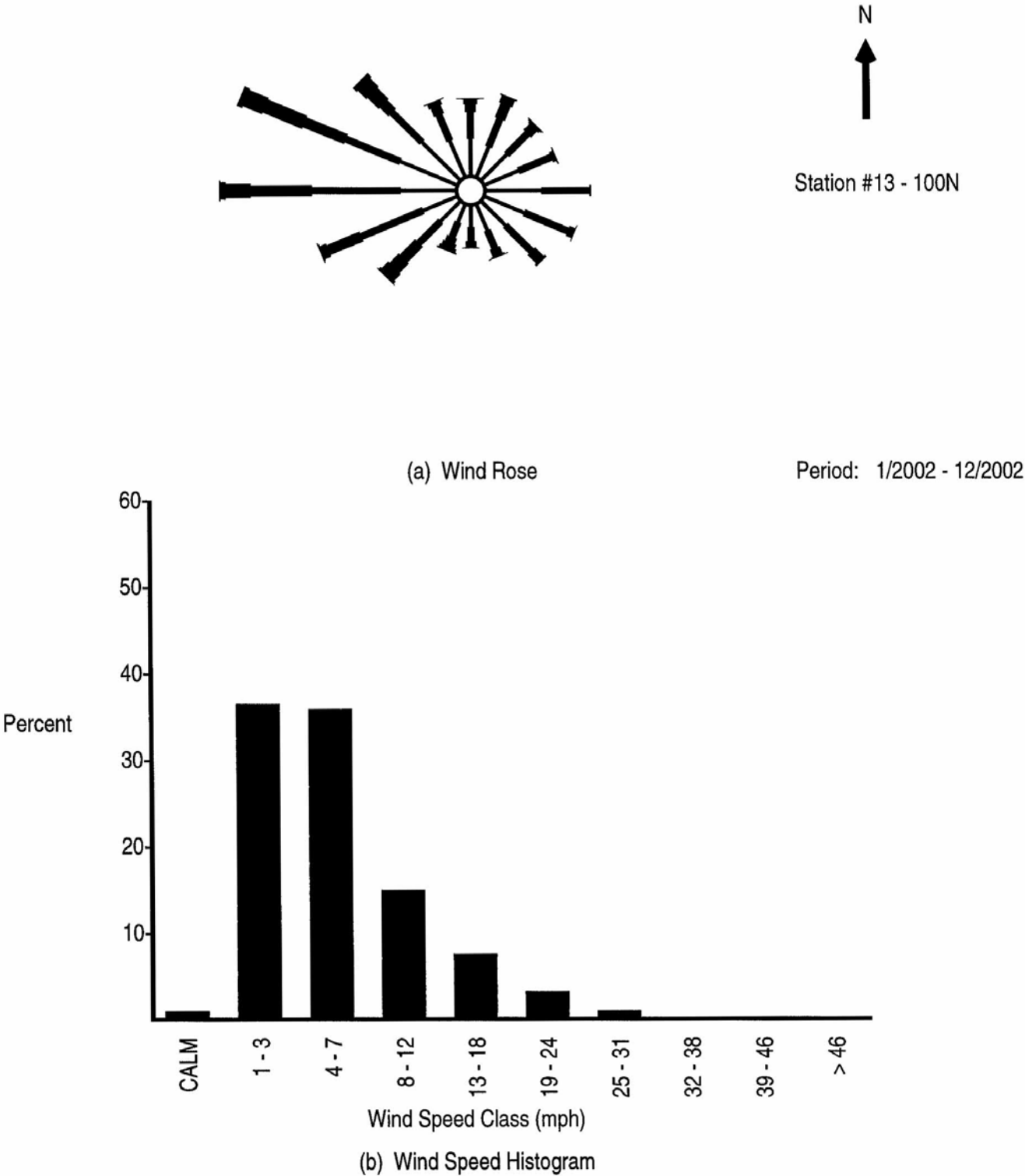


Figure A.1. (contd)

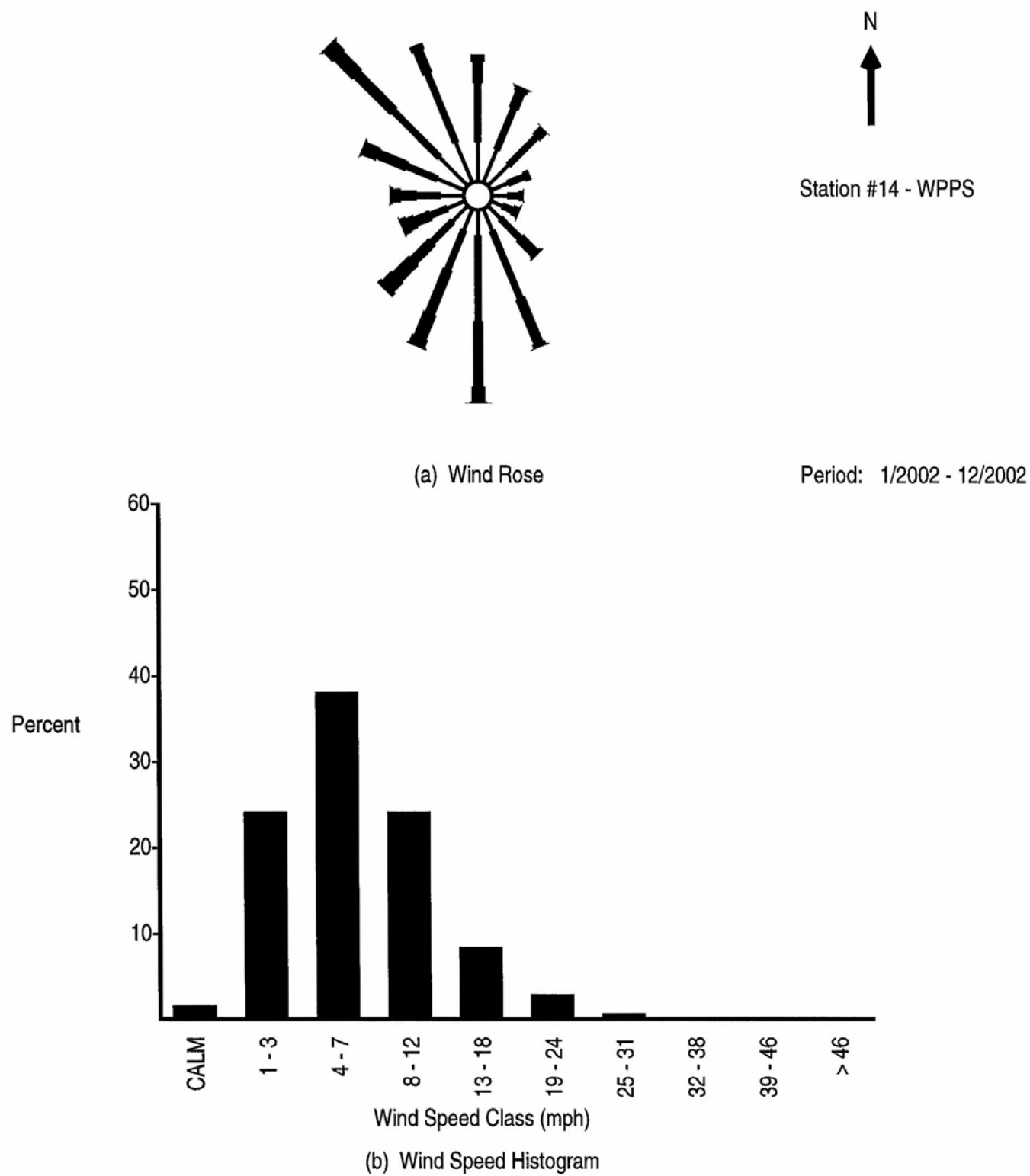


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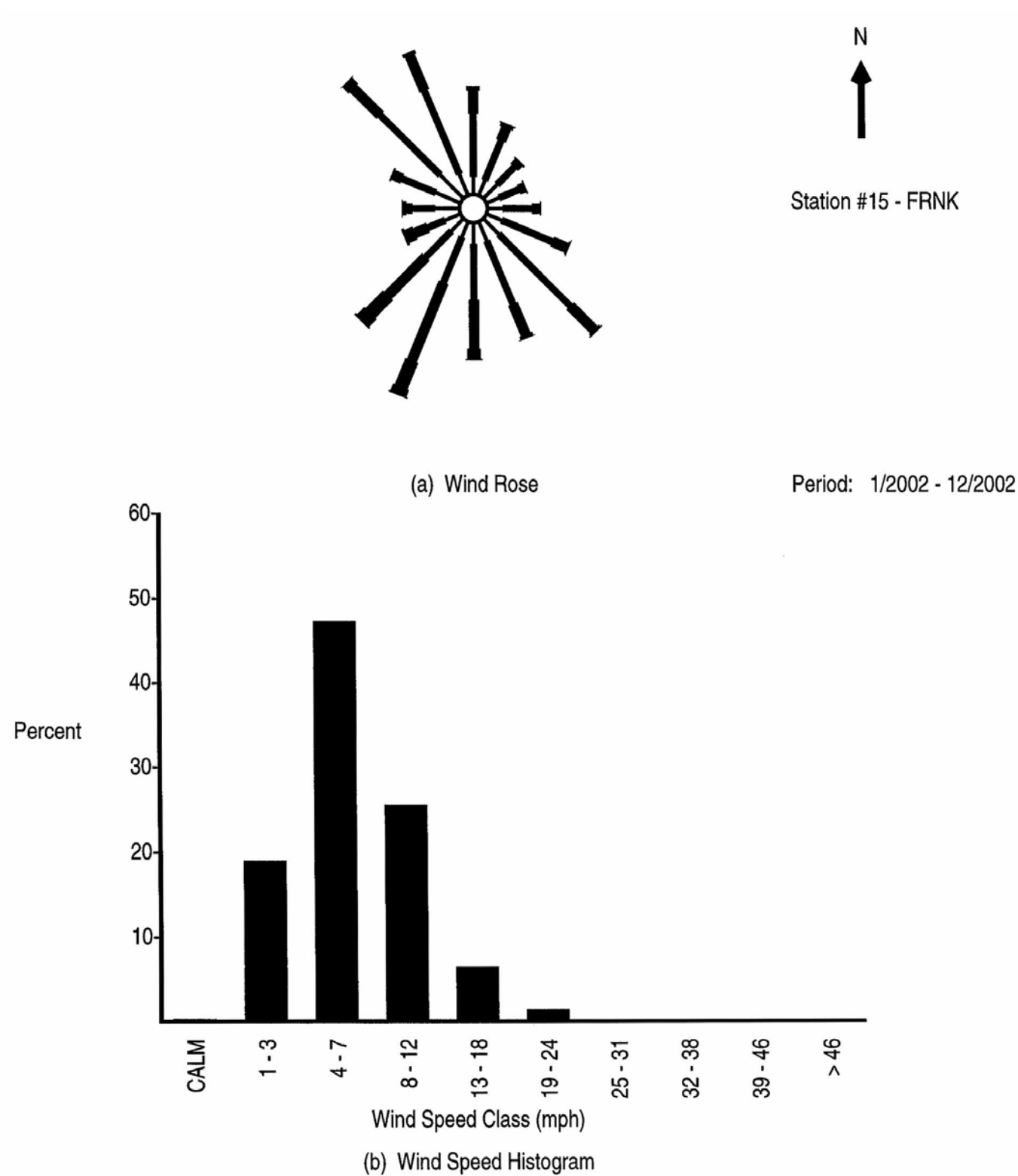


Figure A.1. (contd)

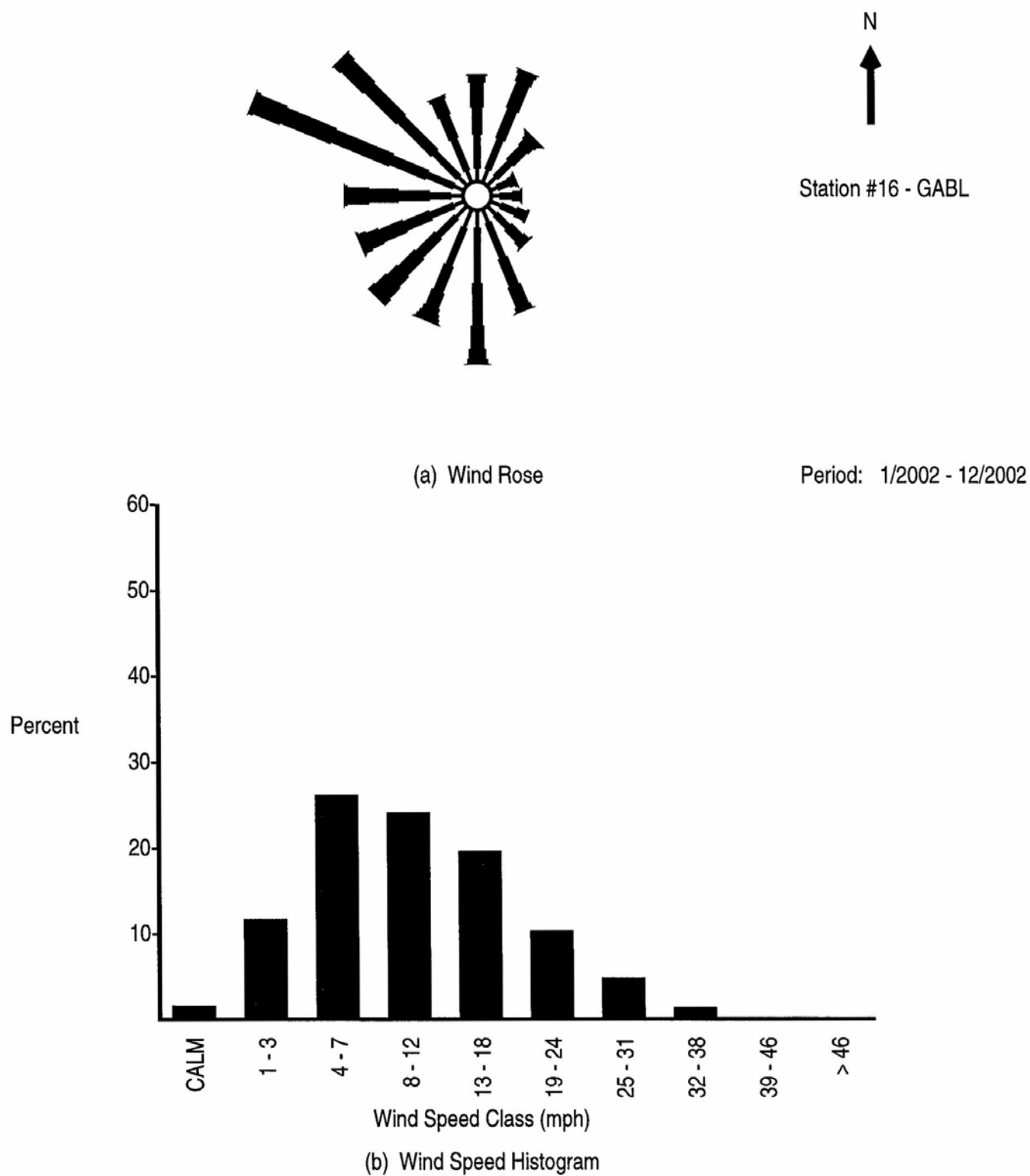


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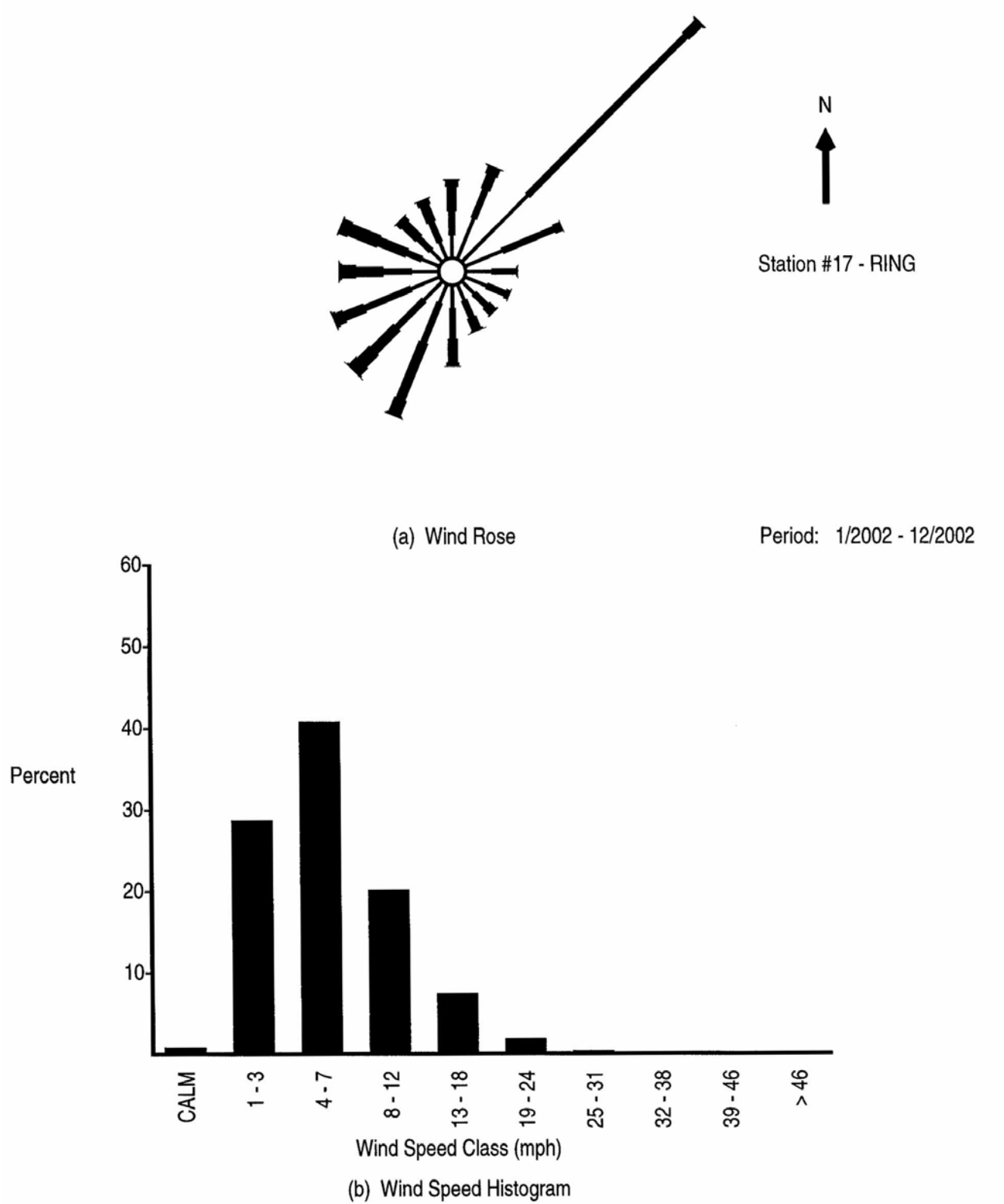


Figure A.1. (contd)

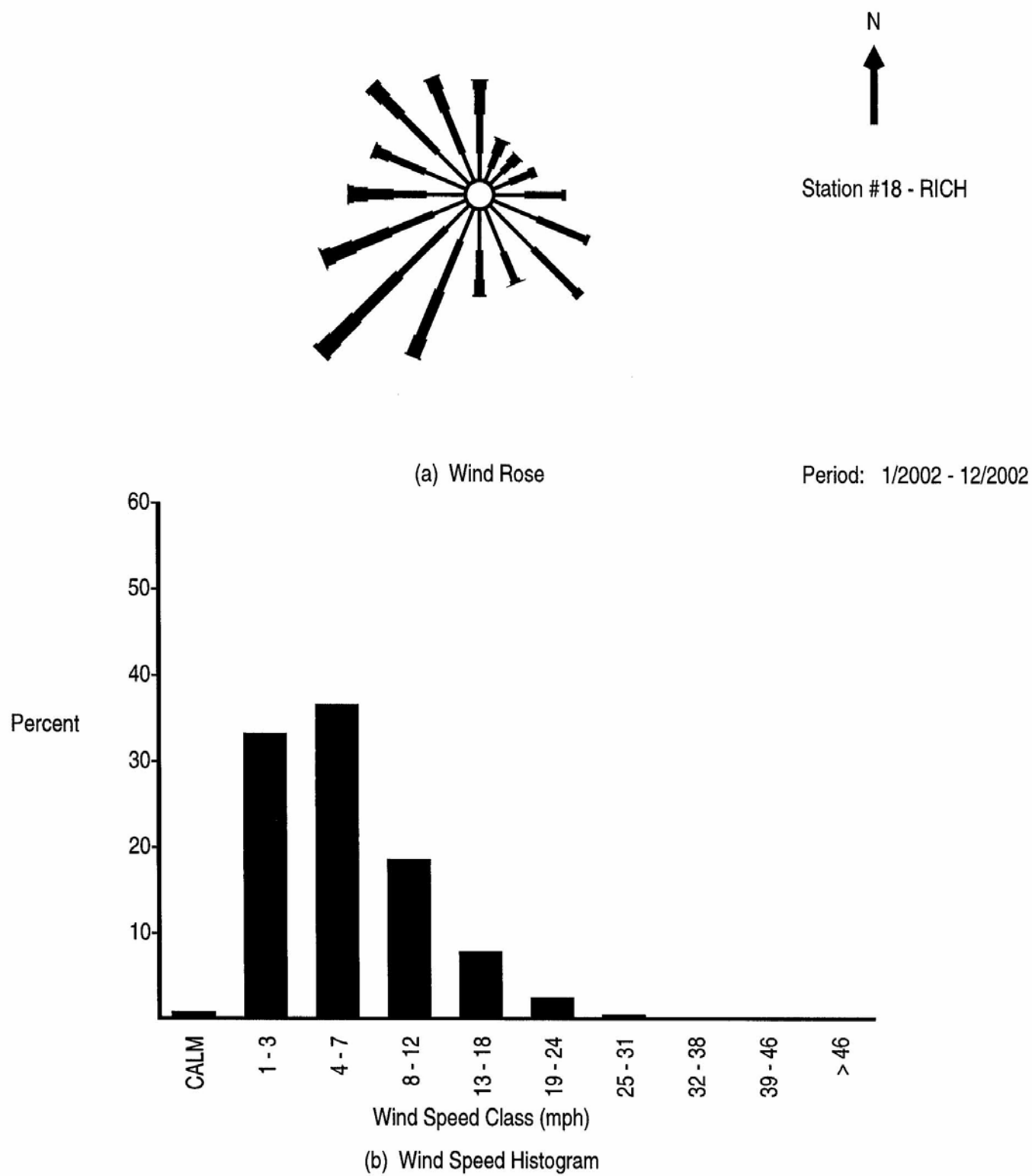


Figure A.1. (contd)



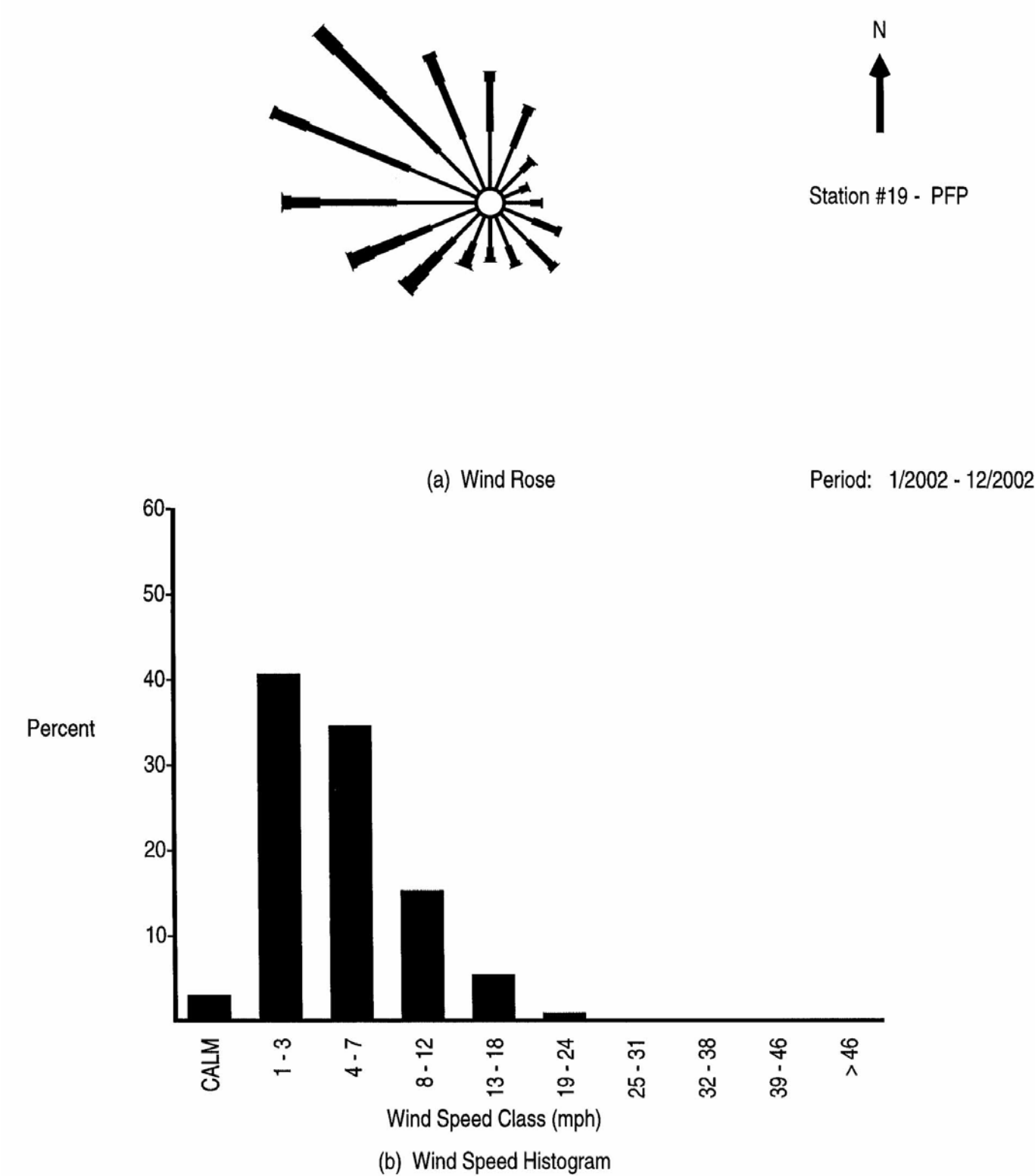


Figure A.1. (contd)

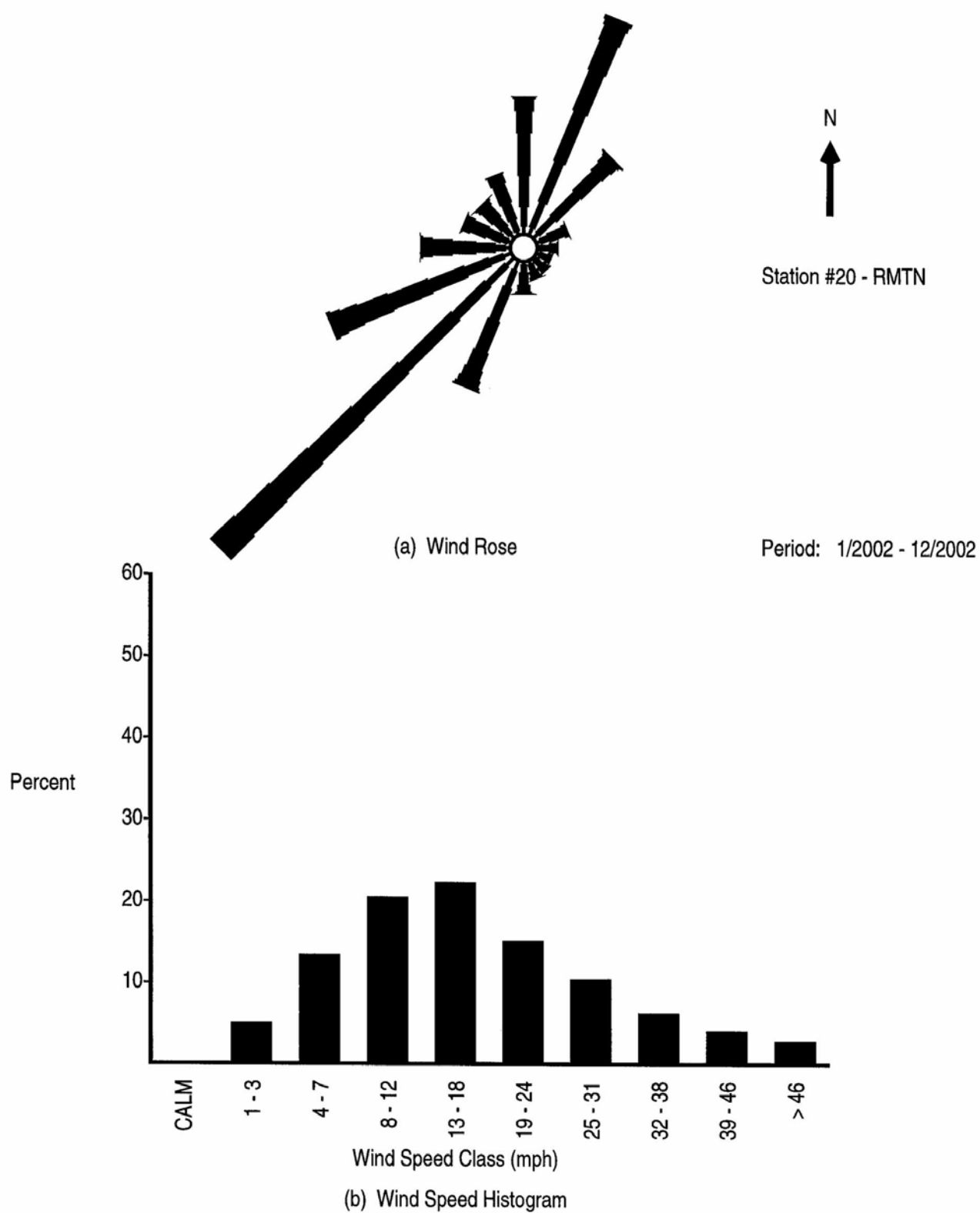


Figure A.1. (contd)

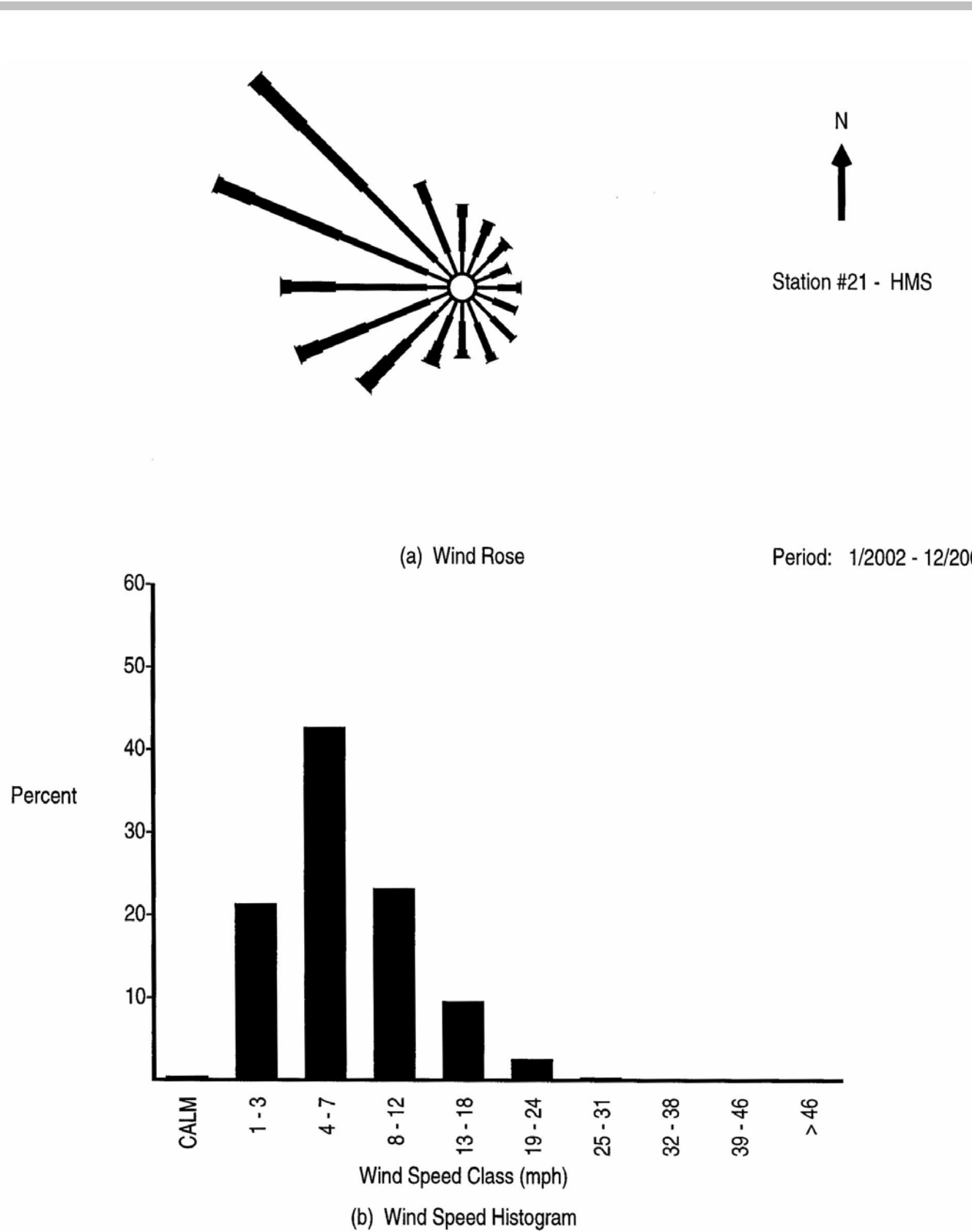


Figure A.1. (contd)

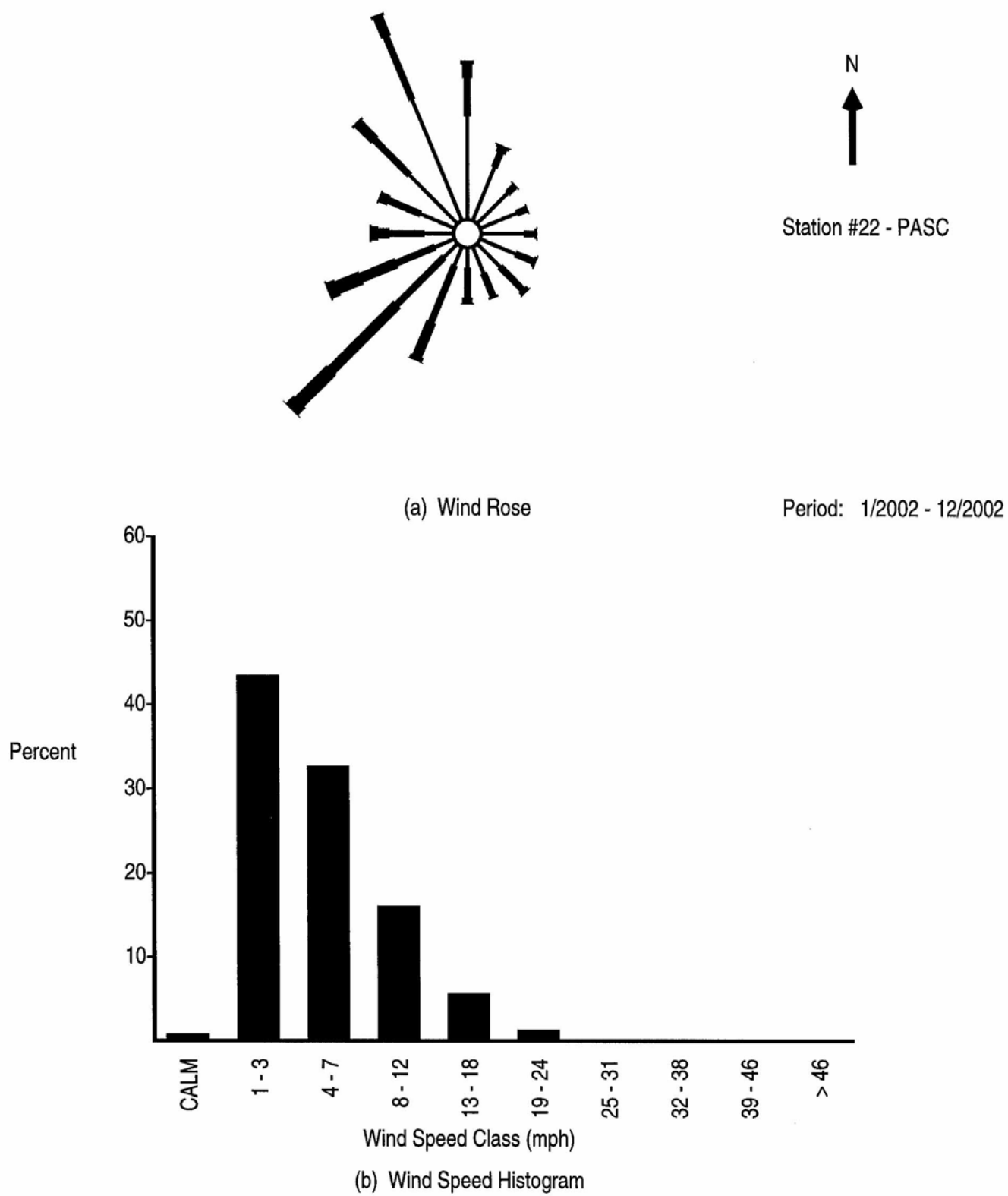


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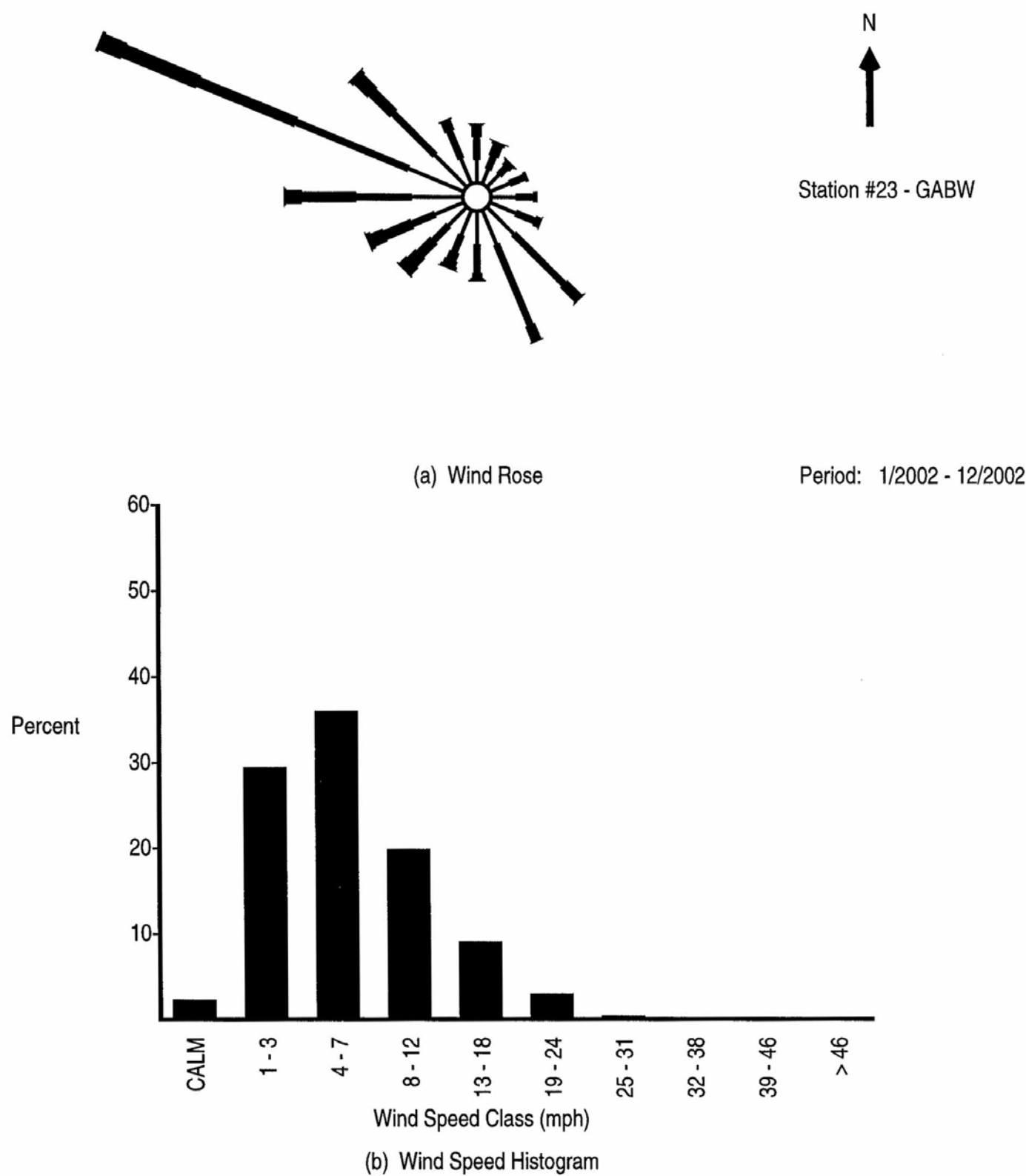


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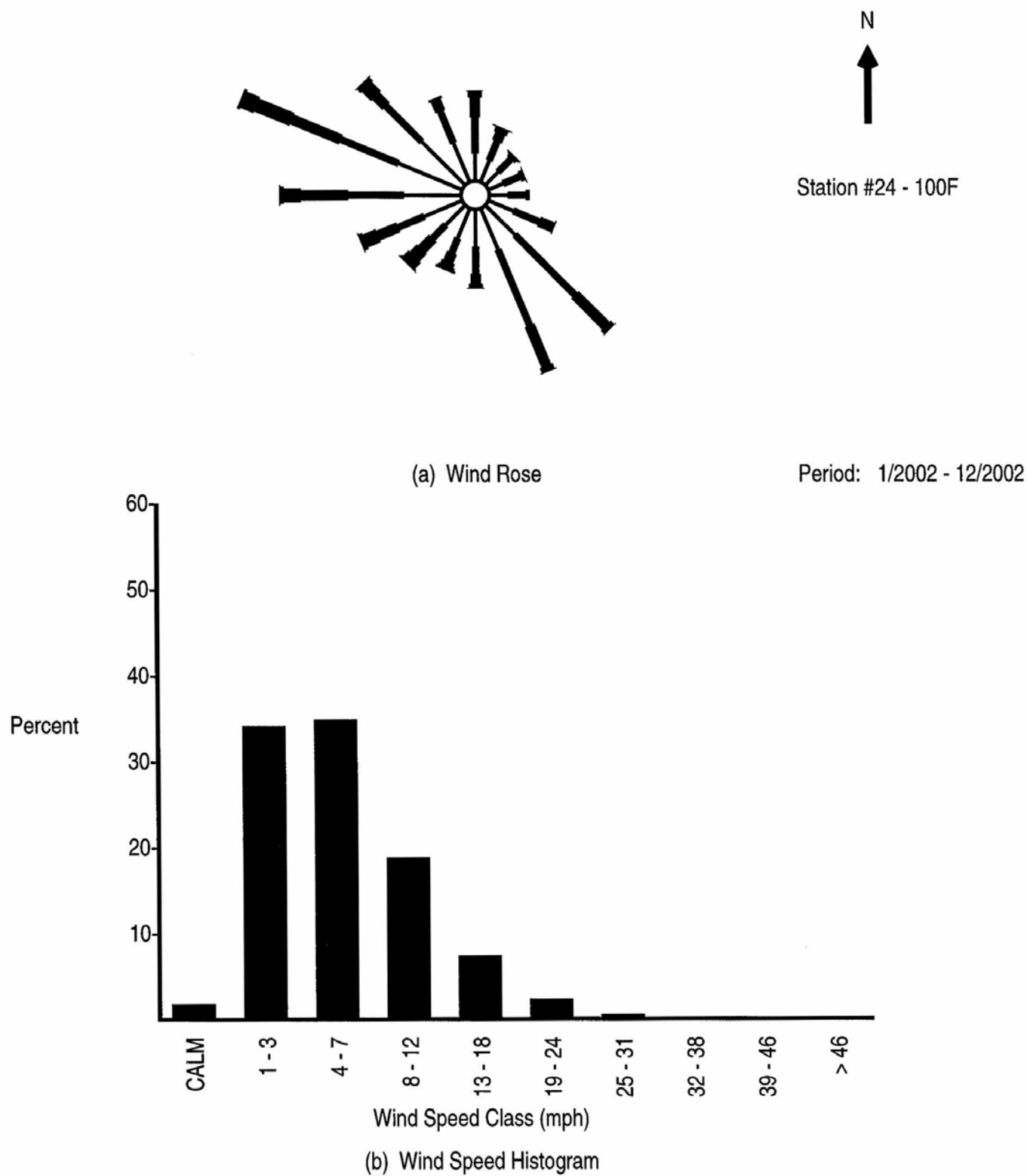
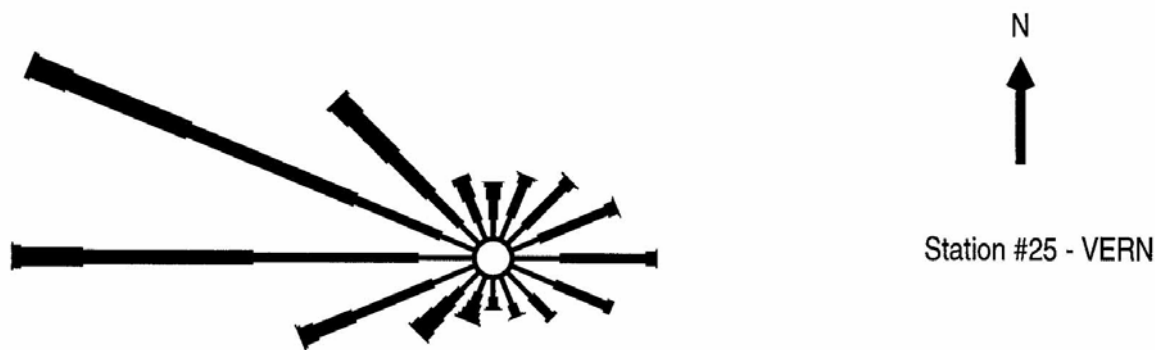
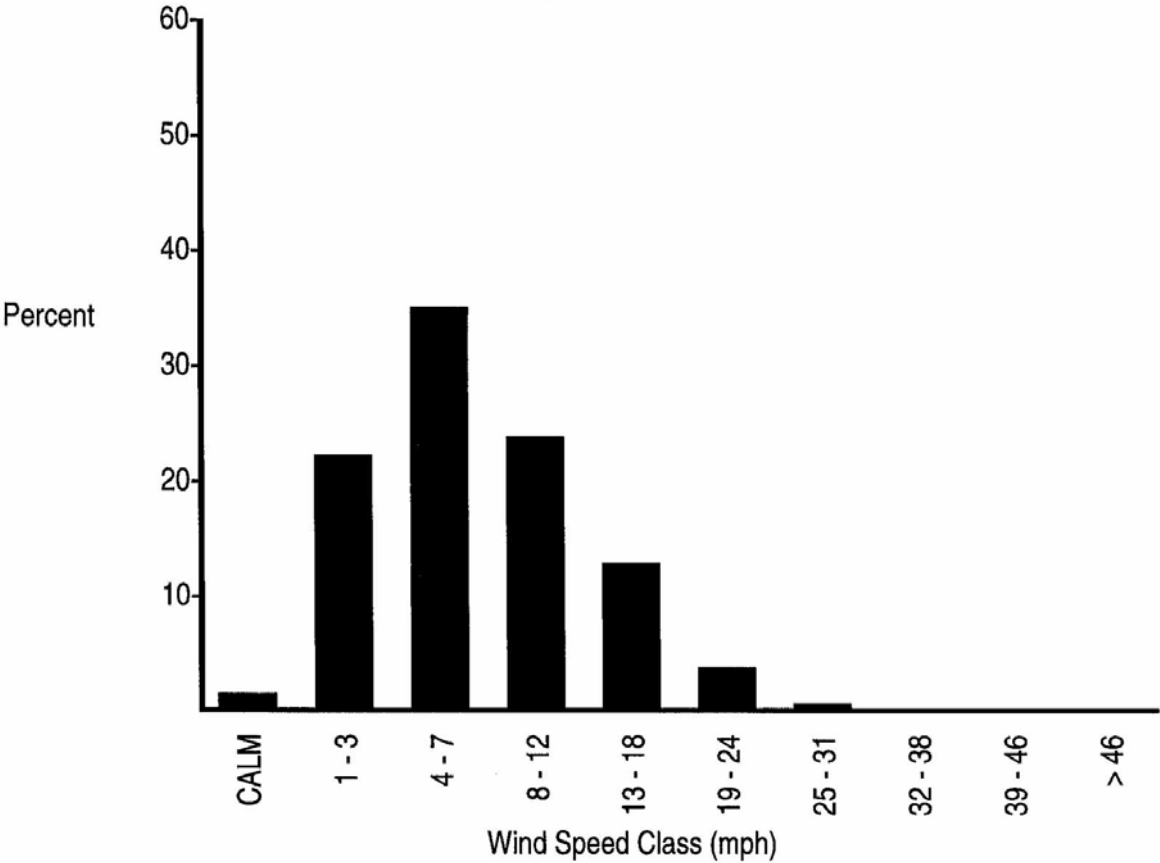


Figure A.1. (contd)



(a) Wind Rose

Period: 1/2002 - 12/2002



(b) Wind Speed Histogram

Figure A.1. (contd)

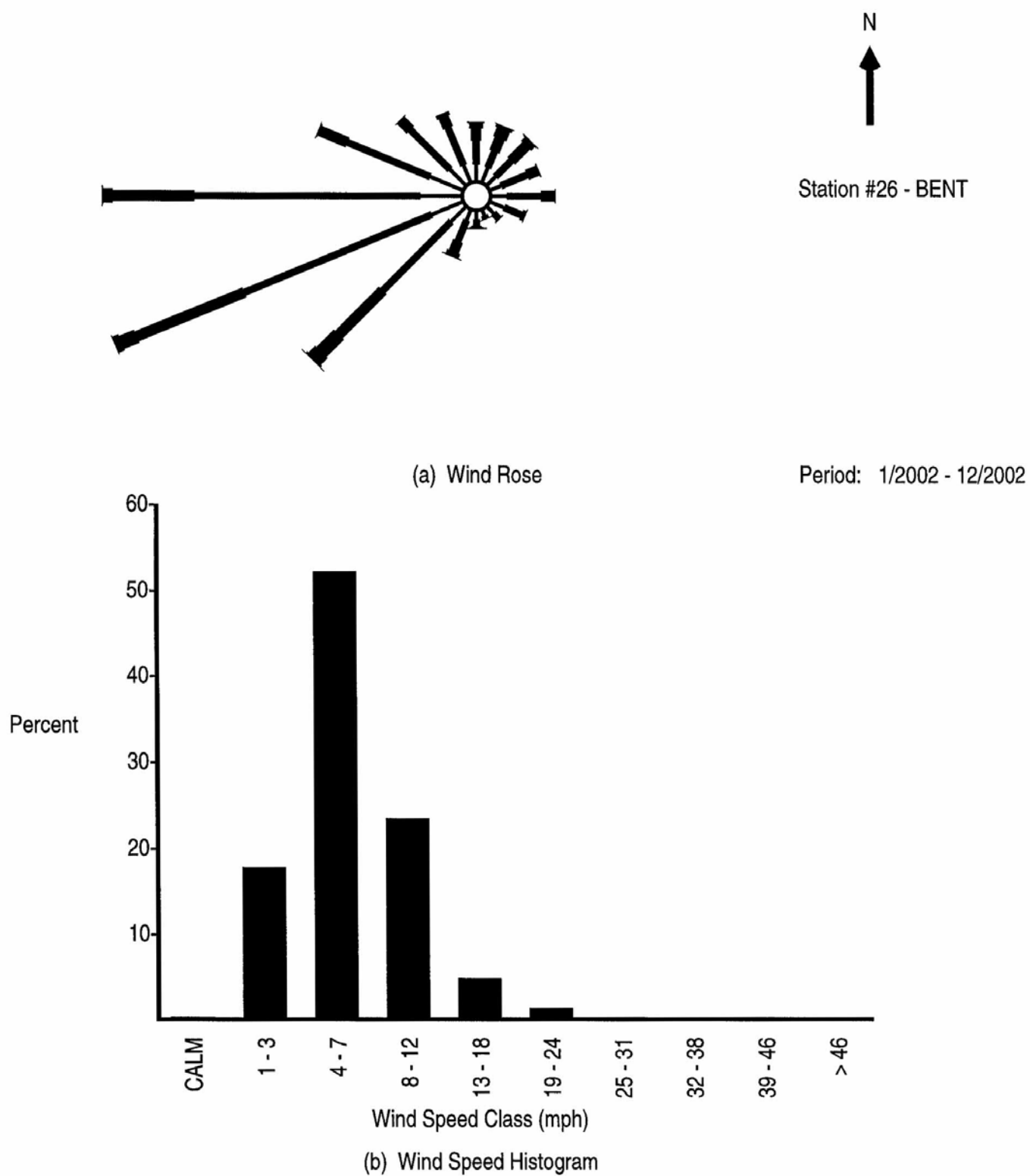


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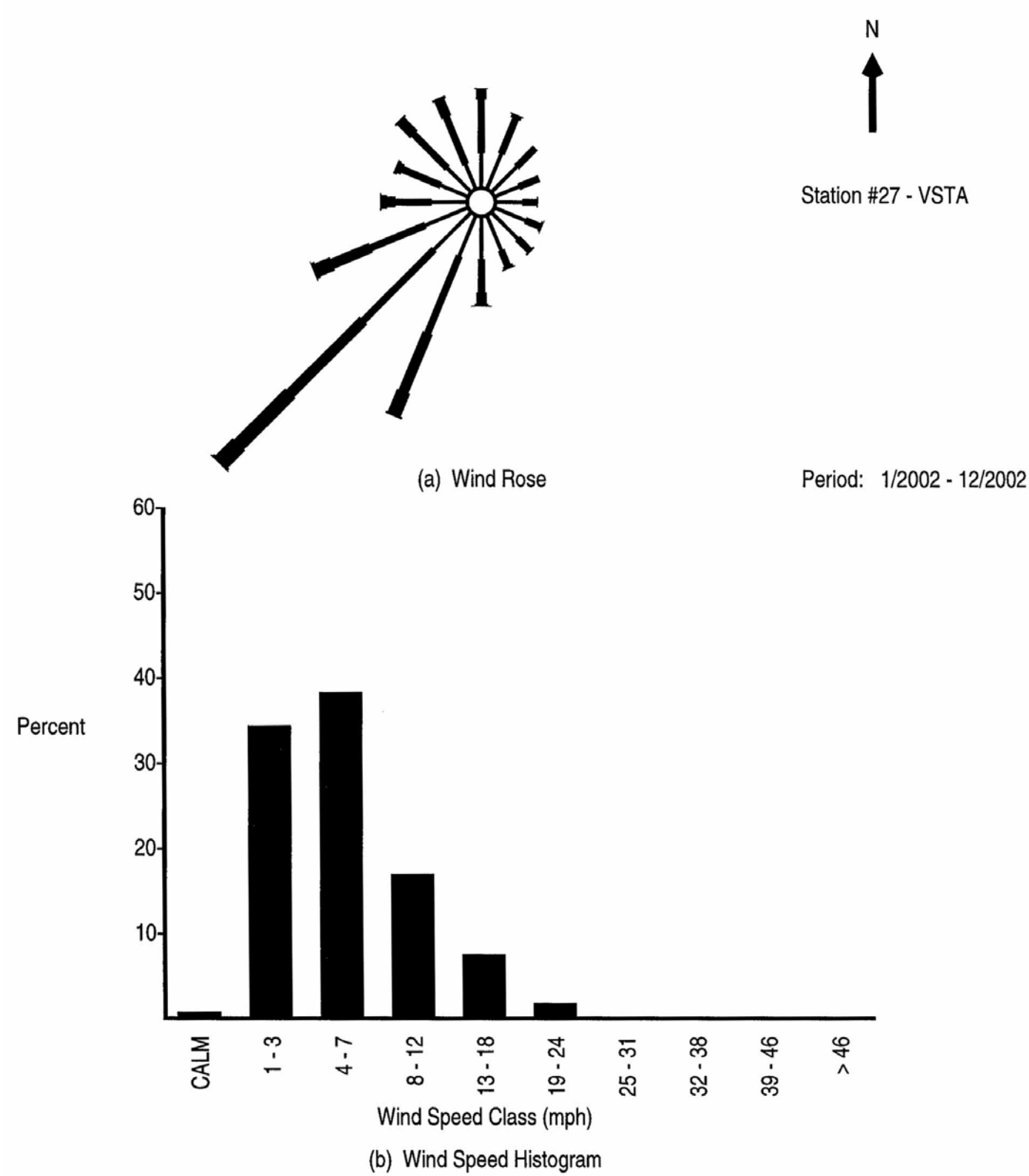
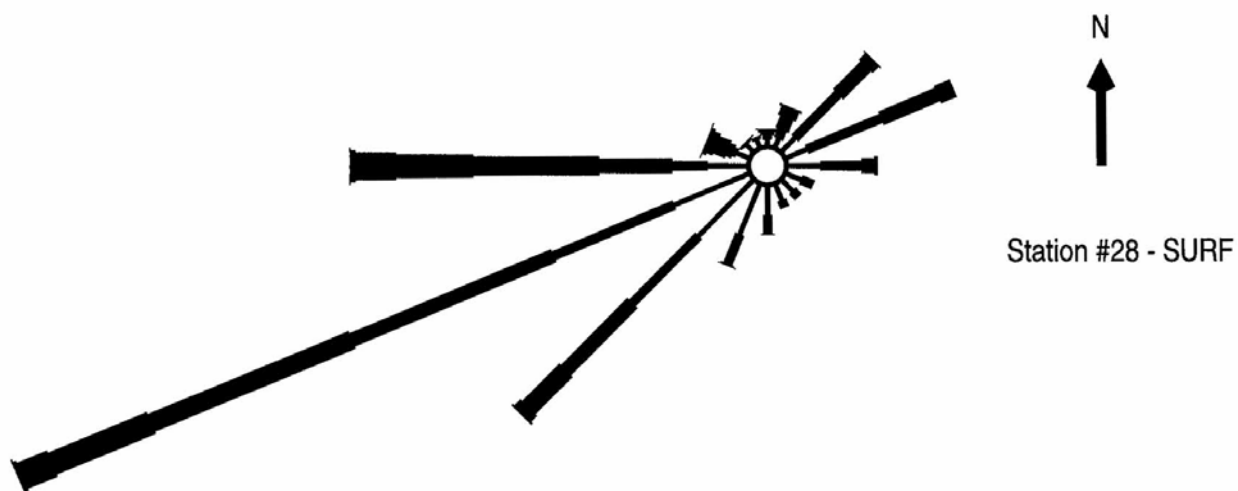
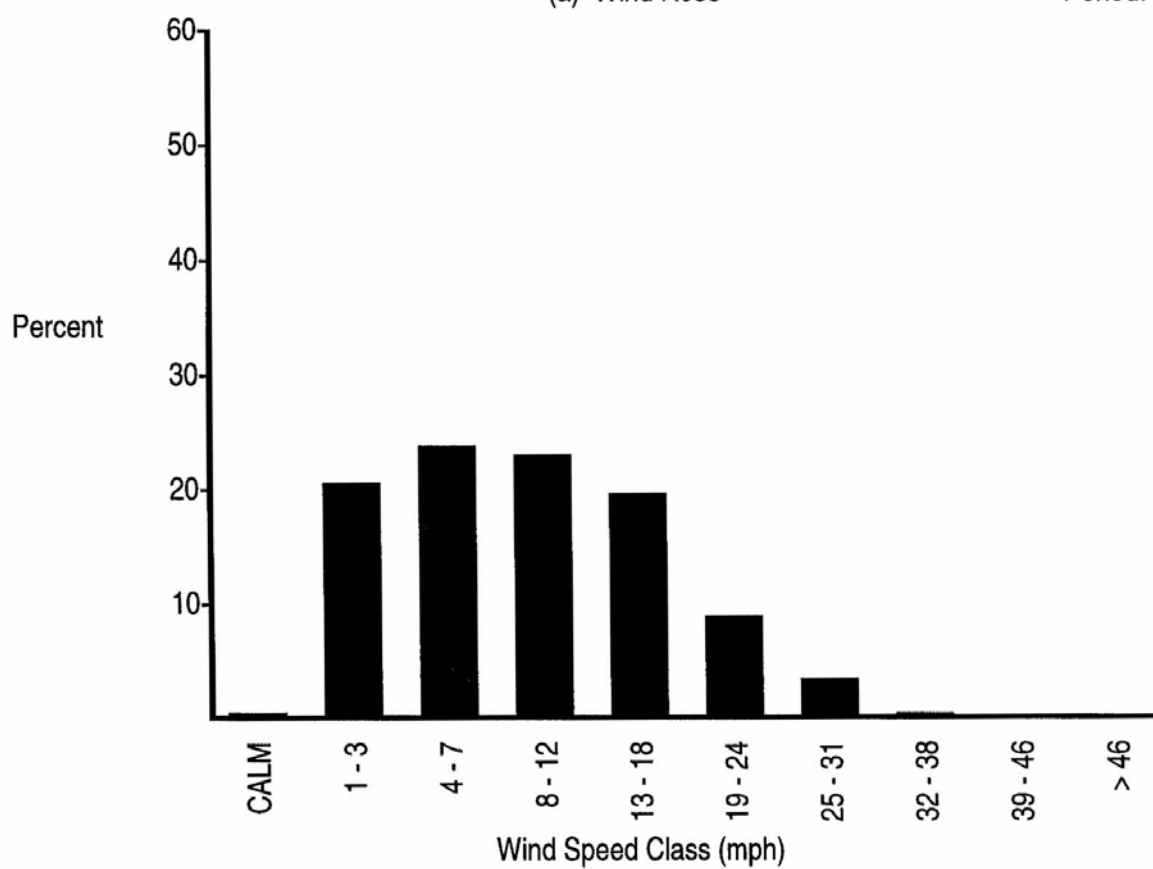


Figure A.1. (contd)



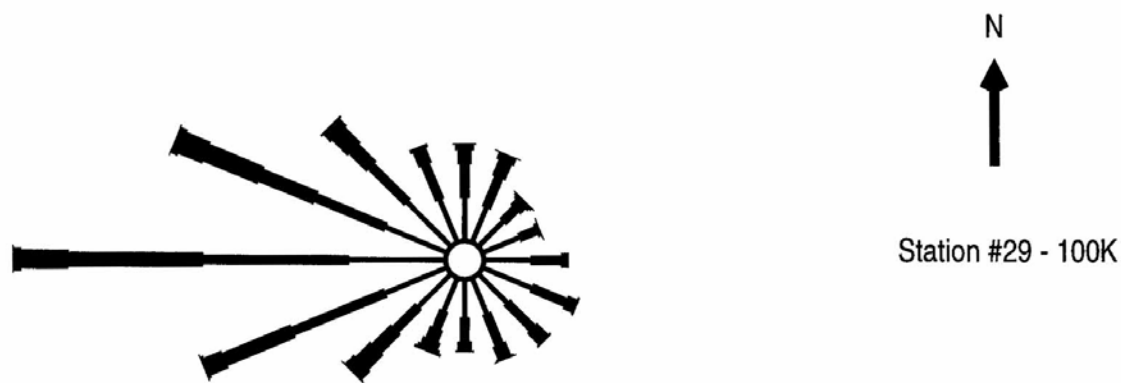
(a) Wind Rose

Period: 1/2002 - 12/2002



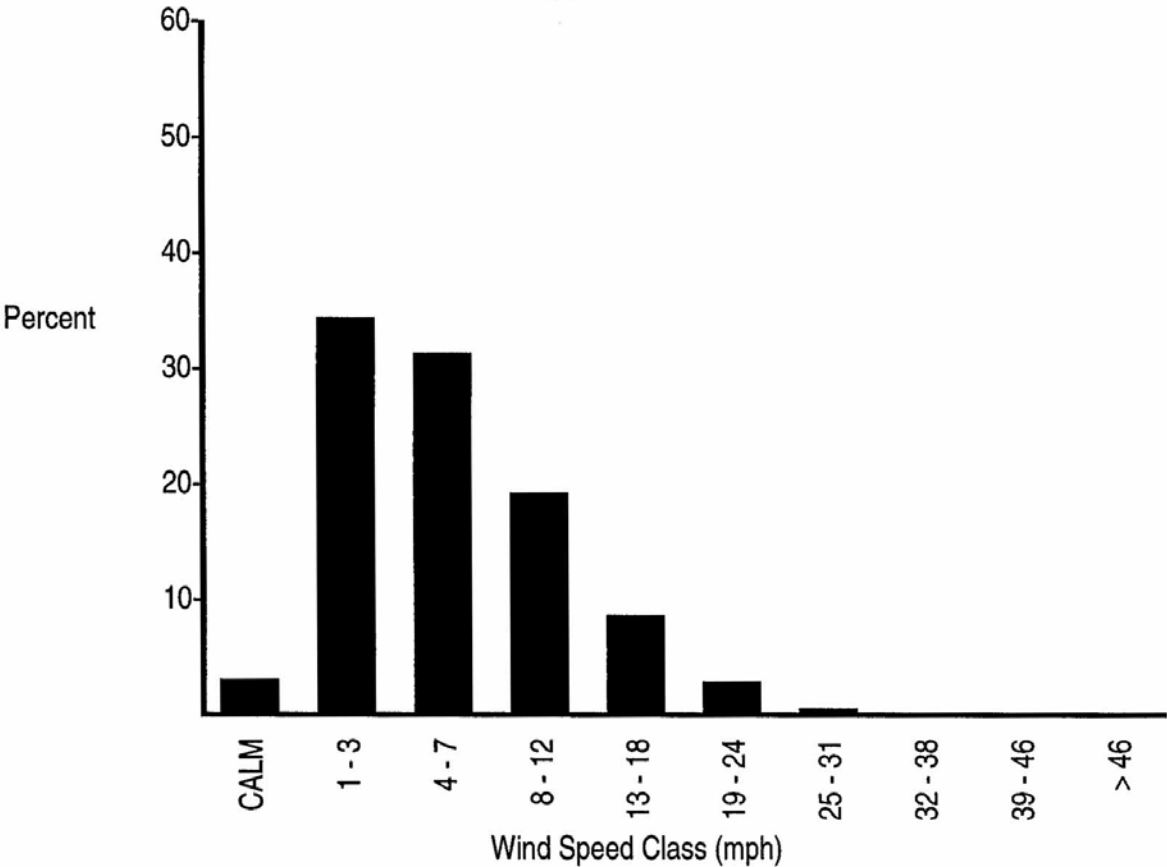
(b) Wind Speed Histogram

Figure A.1. (contd)



(a) Wind Rose

Period: 1/2002 - 12/2002



(b) Wind Speed Histogram

Figure A.1. (contd)

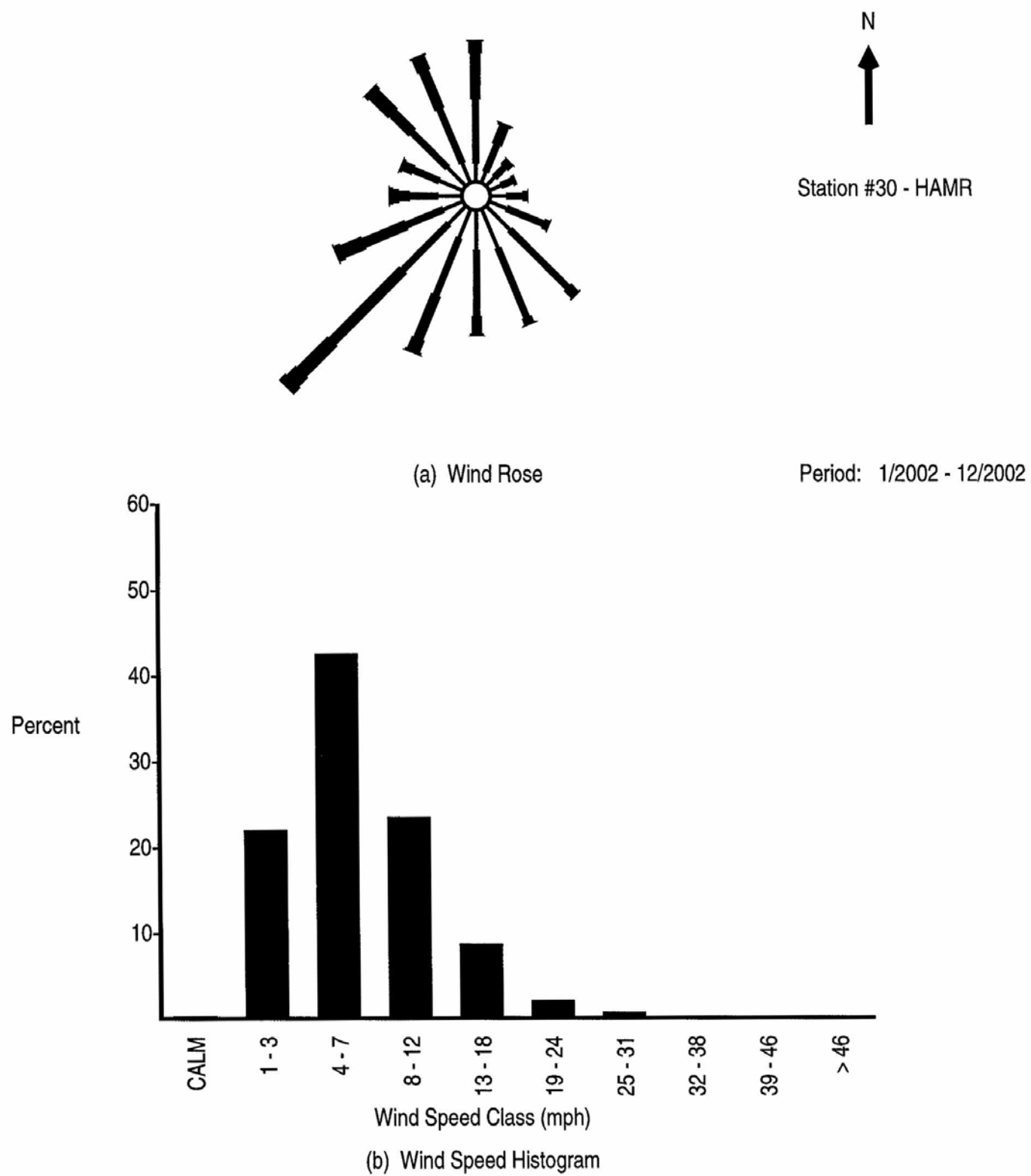


Figure A.1. (contd)

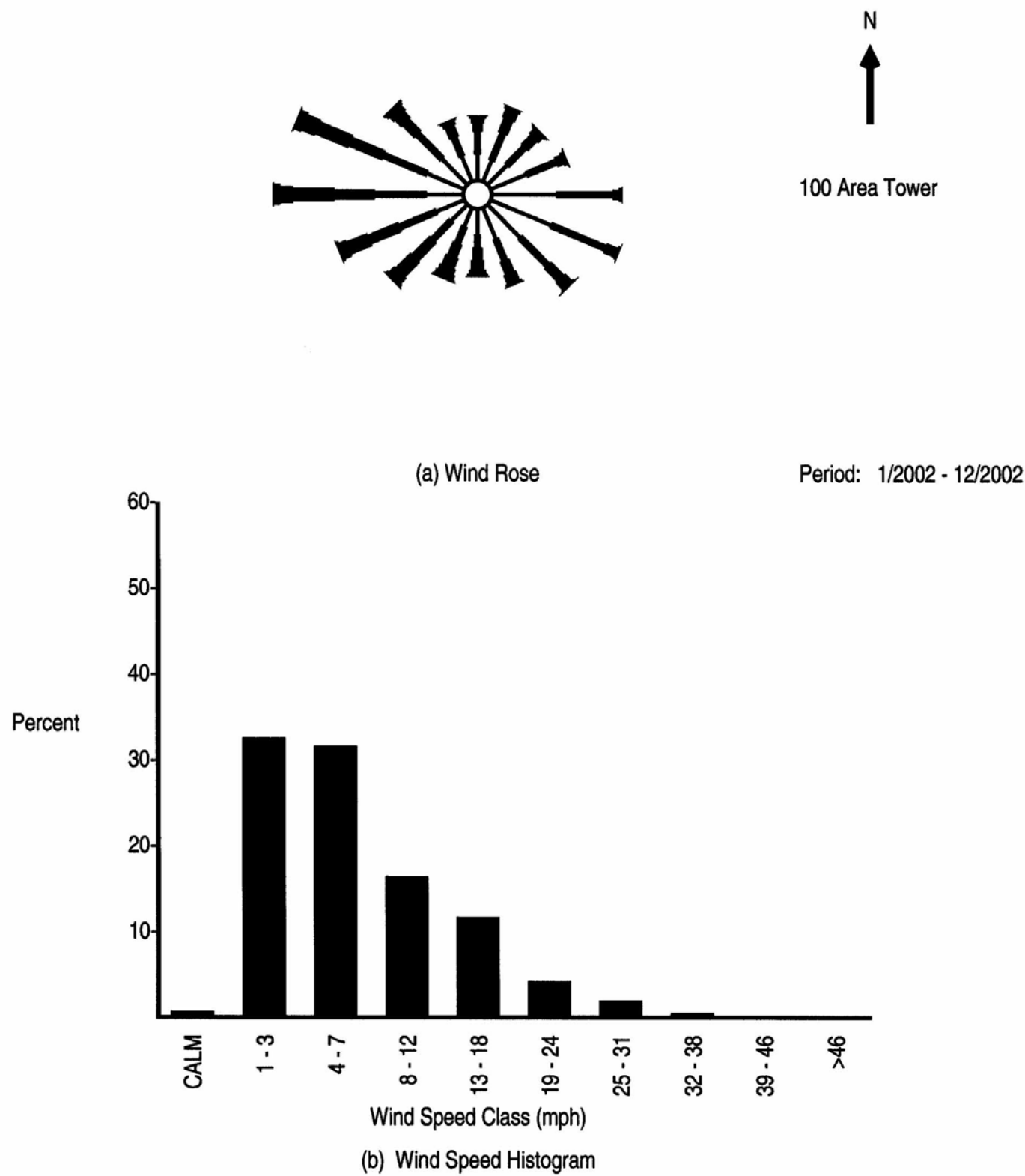


Figure A.2. Wind Rose and Wind Speed Histogram, 60 meters

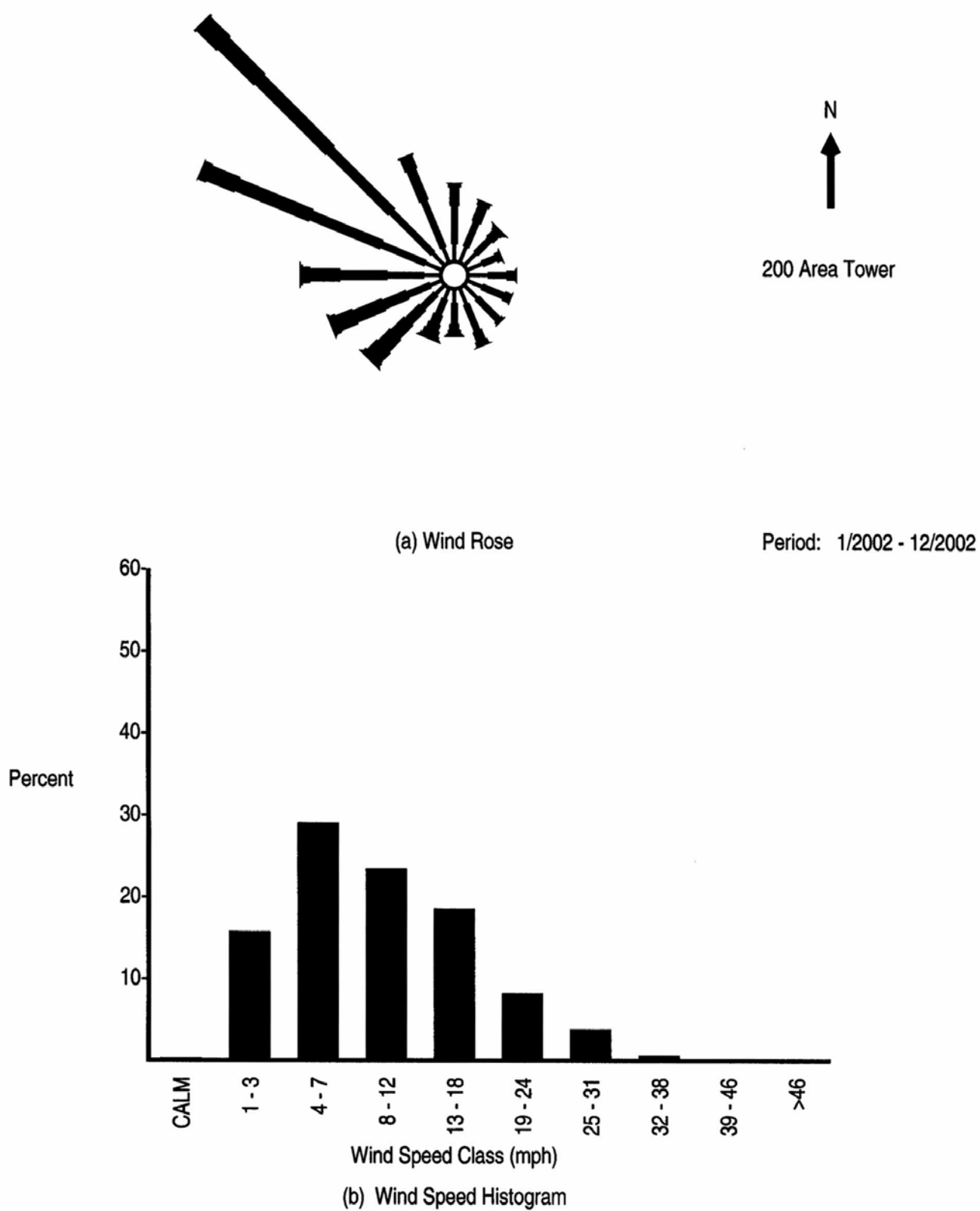


Figure A.2. (contd)

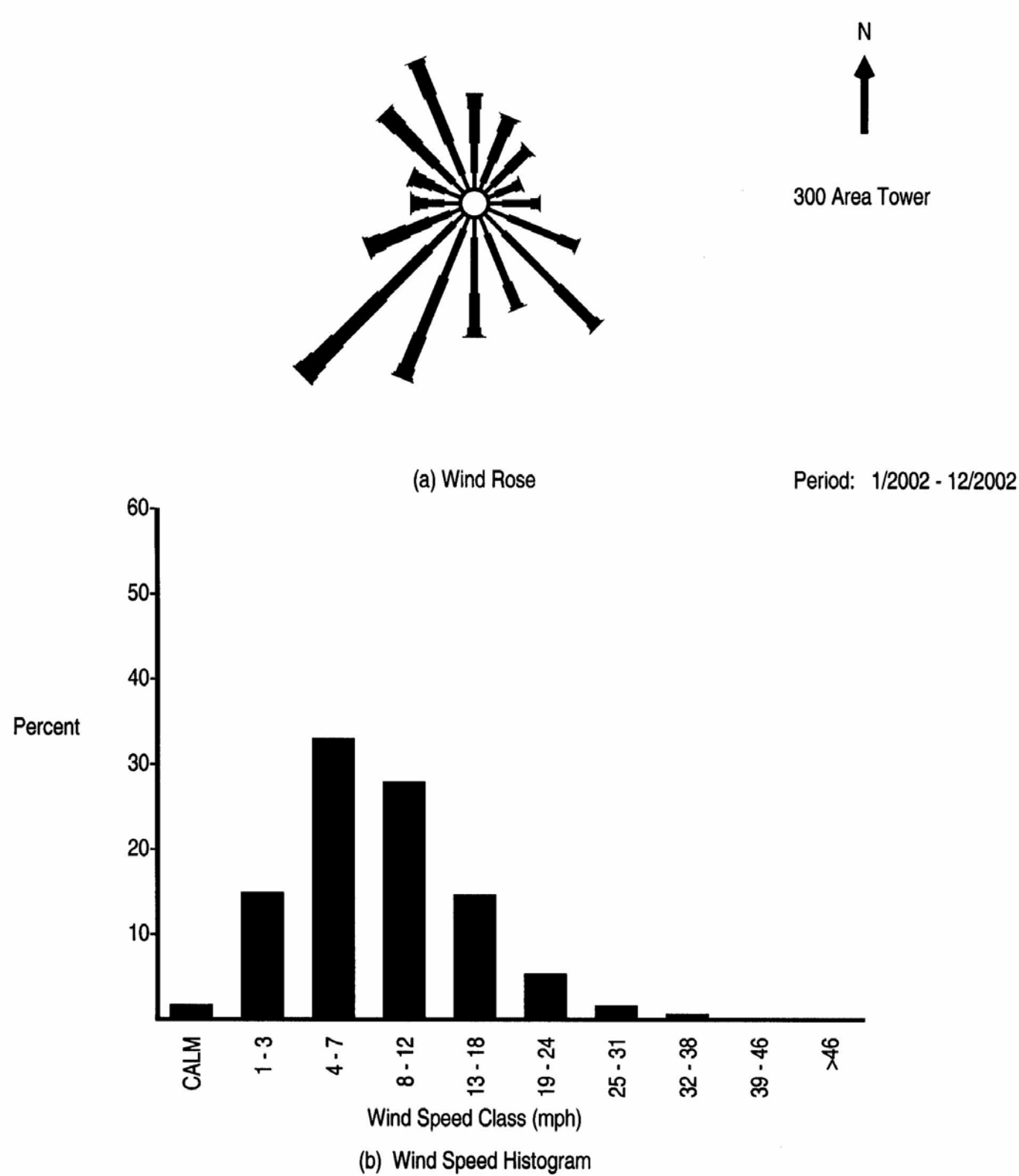


Figure A.2. (contd)

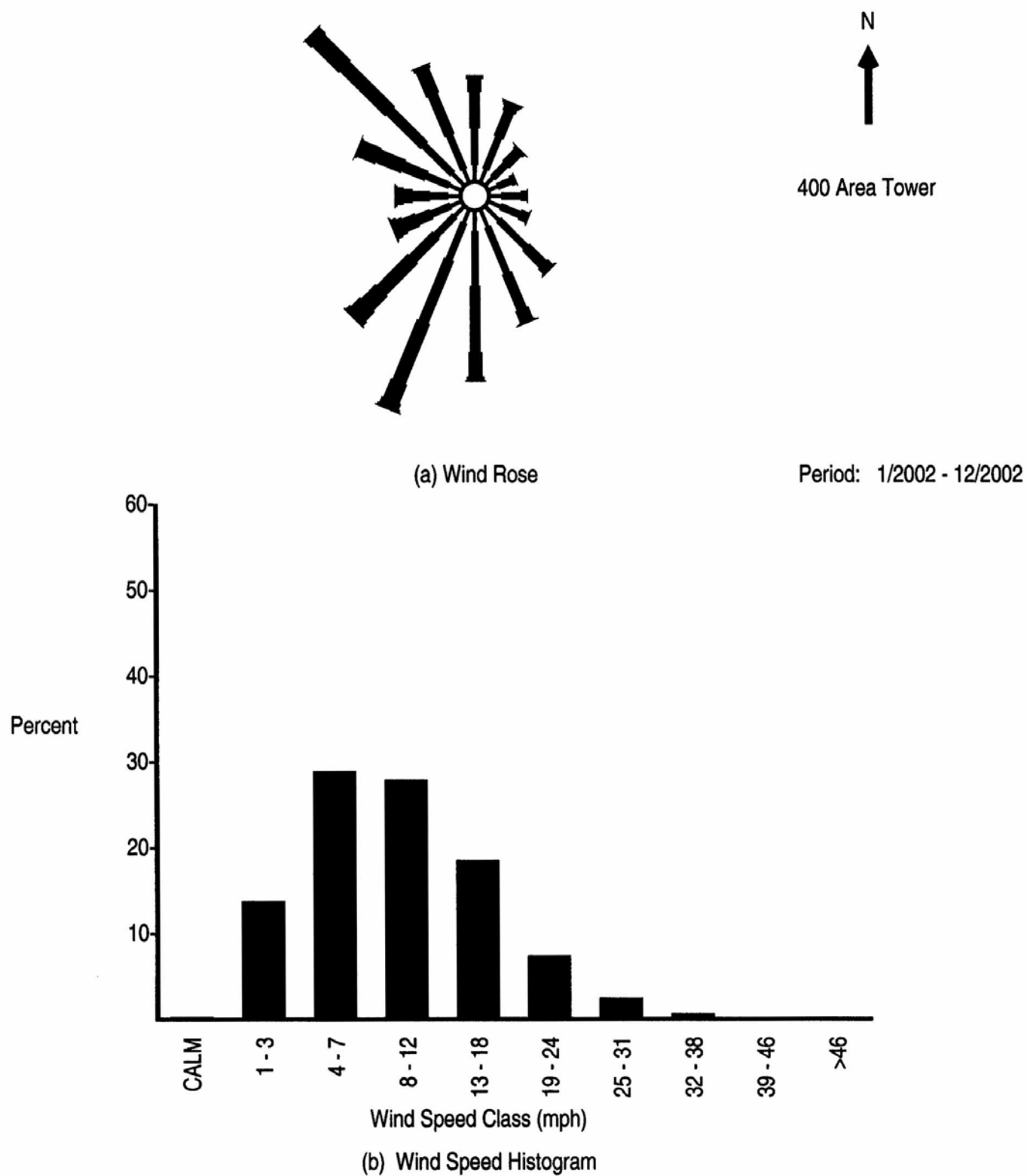


Figure A.2. (contd)



**Table A.1. Joint Frequency Distributions (%) for Hanford Meteorological Monitoring Network  
Wind Stations at 30 Feet, 2002****Station: ( 1 ) PROS**

Begin: 1/2002

End: 12/2002

Total Hours:

8706

| SPEED | DIRECTION |     |     |     |     |     |     |     |      |      |     |     |     |     |      |      | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|------|------|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S    | SSW  | SW  | WSW | W   | WNW | NW   | NNW  |      |       |
| 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   | 1.6       | 1.2 | 0.9 | 0.8 | 0.9 | 1.0 | 1.8 | 2.1 | 2.1  | 2.1  | 1.7 | 1.1 | 1.4 | 1.5 | 2.5  | 2.3  | 0.0  | 25.1  |
| 4-7   | 2.6       | 1.3 | 0.7 | 0.6 | 0.9 | 1.3 | 2.5 | 5.0 | 4.3  | 3.3  | 1.8 | 0.7 | 0.8 | 1.2 | 3.8  | 4.0  | 0.0  | 34.7  |
| 8-12  | 1.7       | 0.8 | 0.3 | 0.1 | 0.2 | 0.4 | 0.7 | 1.4 | 3.2  | 4.6  | 2.0 | 0.8 | 0.5 | 0.8 | 3.6  | 3.3  | 0.0  | 24.4  |
| 13-18 | 0.7       | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 | 0.7  | 2.7  | 1.7 | 0.8 | 0.3 | 0.2 | 2.8  | 0.9  | 0.0  | 11.3  |
| 19-24 | 0.1       | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1  | 0.4  | 0.7 | 0.5 | 0.2 | 0.1 | 0.7  | 0.1  | 0.0  | 2.9   |
| 25-31 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0  | 0.2  | 0.4 | 0.1 | 0.0 | 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 | 0.0 | 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       | 3.5 | 2.0 | 1.5 | 2.0 | 2.7 | 5.2 | 8.7 | 10.3 | 13.3 | 8.5 | 4.1 | 3.3 | 3.8 | 13.4 | 10.5 | 0.5  | 100.0 |

**Station: ( 2 ) EOC**

Begin: 1/2002

End: 12/2002

Total Hours:

8430

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |      |      |     |     |      |      | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|------|------|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW   | WSW  | W   | WNW | NW   | NNW  |      |       |
| 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  | 1.4  | 1.4   |
| 1-3   | 0.9       | 1.0 | 0.9 | 0.9 | 0.7 | 0.7 | 0.7 | 1.1 | 1.4 | 1.3 | 1.6  | 1.4  | 1.6 | 1.7 | 1.7  | 1.3  | 0.0  | 18.8  |
| 4-7   | 2.6       | 1.4 | 1.1 | 0.9 | 1.0 | 1.2 | 1.4 | 1.0 | 1.9 | 2.1 | 1.3  | 1.5  | 2.7 | 4.0 | 4.2  | 2.5  | 0.0  | 30.4  |
| 8-12  | 1.8       | 0.7 | 0.1 | 0.1 | 0.1 | 0.1 | 0.4 | 0.5 | 1.1 | 2.2 | 2.6  | 1.8  | 1.5 | 3.1 | 5.7  | 3.5  | 0.0  | 25.1  |
| 13-18 | 0.5       | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.7 | 2.1  | 1.8  | 1.2 | 0.7 | 4.0  | 2.5  | 0.0  | 13.8  |
| 19-24 | 0.2       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 1.7  | 2.2  | 0.7 | 0.2 | 0.6  | 0.5  | 0.0  | 6.3   |
| 25-31 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.5  | 1.0  | 0.3 | 0.0 | 0.0  | 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 | 0.7  | 0.3  | 0.1 | 0.0 | 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 | 0.0 | 0.1  | 0.1  | 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 | 6.1       | 3.3 | 2.1 | 1.9 | 1.7 | 2.0 | 2.5 | 2.6 | 4.5 | 6.2 | 11.5 | 10.1 | 8.1 | 9.8 | 16.2 | 10.2 | 1.4  | 100.0 |

**Station: ( 3 ) ARMY**

Begin: 1/2002

End: 12/2002

Total Hours:

8713

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |     |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W   | WNW  | NW   | NNW |      |       |
| 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   | 1.9       | 1.6 | 1.7 | 2.0 | 2.2 | 1.9 | 1.7 | 1.1 | 0.6 | 0.7 | 0.9 | 1.3 | 2.2 | 3.2  | 3.6  | 2.3 | 0.0  | 29.1  |
| 4-7   | 1.6       | 1.1 | 1.1 | 1.5 | 2.2 | 2.9 | 1.7 | 0.8 | 0.5 | 0.3 | 0.5 | 1.0 | 2.6 | 8.0  | 7.0  | 2.4 | 0.0  | 35.3  |
| 8-12  | 1.1       | 0.4 | 0.3 | 0.2 | 0.4 | 0.8 | 1.0 | 0.6 | 0.3 | 0.4 | 0.6 | 1.1 | 2.0 | 5.8  | 4.7  | 1.4 | 0.0  | 21.1  |
| 13-18 | 0.3       | 0.1 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 0.2 | 0.1 | 0.3 | 0.5 | 1.2 | 1.1 | 1.4  | 2.2  | 0.3 | 0.0  | 8.1   |
| 19-24 | 0.0       | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.7 | 0.9 | 0.5 | 0.3  | 1.3  | 0.1 | 0.0  | 4.0   |
| 25-31 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.6 | 0.2 | 0.1 | 0.0  | 0.2  | 0.0 | 0.0  | 1.3   |
| 32-38 | 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  | 0.0  | 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 | 4.8       | 3.3 | 3.2 | 3.7 | 4.8 | 5.8 | 4.7 | 2.8 | 1.6 | 2.0 | 4.1 | 5.6 | 8.5 | 18.7 | 19.0 | 6.6 | 0.8  | 100.0 |

**Station: ( 4 ) RSPG**

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |      |      |     |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW  | W    | WNW | NW  | NNW |      |       |
| 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       | 1.2 | 1.4 | 1.4 | 1.7 | 1.3 | 1.0 | 0.8 | 0.9 | 0.8 | 1.4 | 1.8  | 1.6  | 1.2 | 0.9 | 1.0 | 0.0  | 19.6  |
| 4-7   | 2.7       | 2.0 | 1.1 | 1.5 | 2.4 | 2.0 | 0.7 | 0.5 | 0.4 | 0.7 | 2.7 | 8.5  | 3.4  | 1.5 | 1.5 | 1.9 | 0.0  | 33.3  |
| 8-12  | 0.9       | 0.5 | 0.1 | 0.1 | 0.2 | 0.4 | 0.1 | 0.1 | 0.3 | 0.7 | 2.0 | 14.8 | 4.6  | 2.2 | 1.8 | 1.8 | 0.0  | 30.6  |
| 13-18 | 0.1       | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.3 | 1.4 | 3.5  | 2.1  | 1.4 | 1.3 | 0.6 | 0.0  | 11.0  |
| 19-24 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.3 | 1.0 | 0.6  | 0.5  | 0.2 | 0.5 | 0.2 | 0.0  | 3.4   |
| 25-31 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.3 | 0.1  | 0.0  | 0.0 | 0.0 | 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 | 0.1 | 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 | 4.9       | 3.7 | 2.7 | 3.0 | 4.3 | 3.8 | 1.8 | 1.3 | 1.8 | 3.2 | 8.9 | 29.3 | 12.3 | 6.4 | 6.0 | 5.5 | 1.2  | 100.0 |

Table A.1. (contd)

**Station: ( 5 ) EDNA**

Begin: 1/2002

End: 12/2002

Total Hours:

8747

| SPEED | DIRECTION |     |     |     |     |     |      |     |     |     |     |     |     |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE   | SSE | S   | SSW | SW  | WSW | W   | WNW  | NW   | NNW |      |       |
| 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 | 0.6 | 0.6 | 0.9 | 1.4 | 3.0  | 3.6 | 3.2 | 2.0 | 1.6 | 1.6 | 2.0 | 2.9  | 2.6  | 1.3 | 0.0  | 28.3  |
| 4-7   | 1.7       | 1.2 | 0.9 | 1.1 | 2.1 | 4.8 | 7.0  | 3.9 | 2.0 | 0.9 | 0.7 | 0.7 | 0.9 | 2.7  | 6.4  | 4.2 | 0.0  | 41.1  |
| 8-12  | 1.2       | 0.5 | 0.2 | 0.3 | 1.1 | 1.8 | 1.2  | 1.2 | 0.8 | 0.7 | 0.8 | 1.0 | 1.2 | 2.1  | 2.6  | 2.7 | 0.0  | 19.5  |
| 13-18 | 0.4       | 0.1 | 0.1 | 0.1 | 0.1 | 0.3 | 0.2  | 0.4 | 0.4 | 0.2 | 0.5 | 0.7 | 0.8 | 1.7  | 1.4  | 0.3 | 0.0  | 7.7   |
| 19-24 | 0.0       | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0  | 0.0 | 0.0 | 0.2 | 0.4 | 0.4 | 0.1 | 0.6  | 0.5  | 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 | 0.1  | 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  | 0.0   |
| 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 | 3.9       | 2.4 | 1.9 | 2.1 | 4.1 | 8.3 | 11.4 | 9.1 | 6.4 | 4.0 | 4.2 | 4.4 | 5.1 | 10.1 | 13.6 | 8.5 | 0.6  | 100.0 |

**Station: ( 6 ) 200E**

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |      |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW   | NNW |      |       |
| 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 | 2.4  | 2.4   |
| 1-3   | 1.1       | 0.9 | 1.3 | 1.3 | 1.4 | 1.8 | 1.7 | 1.5 | 1.1 | 0.9 | 0.9 | 1.0 | 1.4  | 1.4  | 1.8  | 1.1 | 0.0  | 20.3  |
| 4-7   | 1.3       | 1.1 | 0.8 | 0.7 | 1.4 | 2.0 | 3.3 | 2.3 | 1.5 | 1.2 | 1.9 | 3.0 | 4.8  | 5.6  | 3.5  | 1.5 | 0.0  | 35.9  |
| 8-12  | 1.0       | 0.6 | 0.1 | 0.2 | 0.2 | 0.5 | 1.1 | 1.0 | 0.6 | 0.6 | 1.4 | 2.4 | 5.0  | 6.7  | 2.3  | 0.7 | 0.0  | 24.4  |
| 13-18 | 0.3       | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.4 | 0.9 | 1.2 | 1.3  | 4.4  | 1.7  | 0.3 | 0.0  | 11.1  |
| 19-24 | 0.0       | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.4 | 0.8 | 0.3 | 0.3  | 1.6  | 1.1  | 0.0 | 0.0  | 4.7   |
| 25-31 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.2 | 0.1 | 0.1  | 0.1  | 0.2  | 0.0 | 0.0  | 1.0   |
| 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 | 3.7       | 2.7 | 2.3 | 2.2 | 3.0 | 4.3 | 6.3 | 5.0 | 3.4 | 3.7 | 6.1 | 8.0 | 12.8 | 19.8 | 10.6 | 3.6 | 2.4  | 100.0 |

**Station: ( 7 ) 200W**

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |     |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W   | WNW  | NW   | NNW |      |       |
| 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   | 2.1       | 1.7 | 1.4 | 1.3 | 1.7 | 2.1 | 2.0 | 2.0 | 1.6 | 1.4 | 1.6 | 1.9 | 2.7 | 3.7  | 3.4  | 2.4 | 0.0  | 32.9  |
| 4-7   | 2.6       | 1.7 | 0.9 | 0.7 | 0.9 | 1.8 | 1.9 | 1.4 | 0.7 | 0.8 | 1.0 | 1.4 | 2.8 | 6.2  | 4.6  | 3.0 | 0.0  | 32.5  |
| 8-12  | 1.2       | 0.5 | 0.2 | 0.1 | 0.2 | 0.4 | 0.3 | 0.1 | 0.2 | 0.7 | 1.0 | 1.3 | 2.9 | 3.9  | 3.7  | 2.1 | 0.0  | 18.8  |
| 13-18 | 0.2       | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 | 0.4 | 0.9 | 1.6 | 0.9 | 1.2  | 2.7  | 0.9 | 0.0  | 9.2   |
| 19-24 | 0.0       | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.8 | 0.7 | 0.3 | 0.1  | 1.5  | 0.2 | 0.0  | 3.8   |
| 25-31 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.4 | 0.2 | 0.1 | 0.0  | 0.2  | 0.0 | 0.0  | 1.0   |
| 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 | 6.0       | 4.0 | 2.6 | 2.1 | 2.8 | 4.4 | 4.4 | 3.6 | 2.7 | 3.4 | 5.8 | 7.2 | 9.8 | 15.1 | 16.0 | 8.6 | 1.6  | 100.0 |

**Station: ( 8 ) BVLY**

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |     |      |      |      | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W   | WNW  | NW   | NNW  |      |       |
| 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   | 3.4       | 2.5 | 2.0 | 1.6 | 2.1 | 2.2 | 2.0 | 2.0 | 1.8 | 1.4 | 1.2 | 1.1 | 1.4 | 2.1  | 2.5  | 3.3  | 0.0  | 32.4  |
| 4-7   | 7.9       | 2.3 | 0.5 | 0.4 | 1.7 | 3.3 | 1.7 | 0.9 | 1.1 | 0.8 | 0.7 | 0.7 | 1.4 | 2.8  | 5.5  | 6.8  | 0.0  | 38.6  |
| 8-12  | 4.0       | 1.1 | 0.1 | 0.0 | 0.2 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.5 | 0.3 | 1.0 | 4.8  | 4.3  | 1.1  | 0.0  | 18.9  |
| 13-18 | 0.2       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.2 | 0.5 | 0.2 | 0.5 | 3.4  | 2.2  | 0.1  | 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 | 0.1 | 0.0 | 0.1 | 0.8  | 0.3  | 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 | 0.1  | 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 | 15.5      | 5.9 | 2.6 | 2.1 | 4.0 | 5.9 | 4.0 | 3.2 | 3.2 | 2.7 | 3.1 | 2.3 | 4.4 | 13.9 | 14.8 | 11.4 | 0.9  | 100.0 |

Table A.1. (contd)

**Station: ( 9) FTFB**

Begin: 1/2002

End: 12/2002

Total Hours:

8666

| SPEED | DIRECTION |     |     |     |     |     |     |     |      |      |     |     |     |     |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S    | SSW  | SW  | WSW | W   | WNW | NW   | NNW |      |       |
| 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   | 1.0       | 0.9 | 0.7 | 0.7 | 0.8 | 0.9 | 0.9 | 1.1 | 1.3  | 1.1  | 1.1 | 1.1 | 1.2 | 1.1 | 1.2  | 0.9 | 0.0  | 16.2  |
| 4-7   | 2.6       | 2.7 | 1.7 | 1.0 | 1.2 | 1.4 | 2.7 | 4.0 | 4.4  | 3.5  | 2.0 | 1.2 | 1.4 | 1.7 | 3.2  | 3.4 | 0.0  | 38.2  |
| 8-12  | 1.4       | 1.5 | 0.8 | 0.2 | 0.2 | 0.3 | 1.3 | 3.2 | 4.2  | 4.2  | 1.8 | 0.9 | 0.7 | 1.3 | 3.7  | 3.2 | 0.0  | 29.2  |
| 13-18 | 0.4       | 0.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.3 | 1.0  | 2.8  | 1.9 | 0.8 | 0.4 | 0.8 | 2.2  | 0.5 | 0.0  | 11.9  |
| 19-24 | 0.0       | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1  | 0.5  | 0.8 | 0.4 | 0.2 | 0.1 | 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  | 0.2  | 0.6 | 0.1 | 0.1 | 0.0 | 0.1  | 0.0 | 0.0  | 1.2   |
| 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 | 5.6       | 5.8 | 3.4 | 2.0 | 2.3 | 2.7 | 5.0 | 8.6 | 11.0 | 12.4 | 8.3 | 4.5 | 4.0 | 5.1 | 11.0 | 8.1 | 0.3  | 100.0 |

**Station: (10) YAKB**

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |      |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW   | NNW |      |       |
| 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       | 1.4 | 1.2 | 1.0 | 0.8 | 0.8 | 1.4 | 1.3 | 1.2 | 1.1 | 1.2 | 1.5 | 1.7  | 1.5  | 1.5  | 1.5 | 0.0  | 20.4  |
| 4-7   | 3.7       | 3.0 | 1.5 | 0.8 | 0.8 | 1.1 | 2.0 | 1.5 | 0.7 | 0.8 | 1.4 | 3.2 | 7.2  | 3.8  | 2.6  | 3.2 | 0.0  | 37.4  |
| 8-12  | 1.6       | 0.6 | 0.3 | 0.1 | 0.1 | 0.3 | 0.3 | 0.2 | 0.3 | 0.5 | 1.7 | 2.3 | 4.4  | 2.9  | 5.0  | 3.1 | 0.0  | 23.6  |
| 13-18 | 0.2       | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.4 | 1.4 | 1.6 | 0.7  | 1.5  | 4.6  | 1.2 | 0.0  | 11.9  |
| 19-24 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.7 | 0.4 | 0.2  | 0.6  | 2.8  | 0.3 | 0.0  | 5.3   |
| 25-31 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.1 | 0.0  | 0.1  | 0.4  | 0.0 | 0.0  | 1.0   |
| 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       | 5.1 | 3.0 | 1.9 | 1.7 | 2.3 | 3.7 | 3.0 | 2.3 | 3.0 | 6.6 | 9.1 | 14.4 | 10.5 | 16.9 | 9.3 | 0.4  | 100.0 |

**Station: (11) 300A**

Begin: 1/2002

End: 12/2002

Total Hours:

8752

| SPEED | DIRECTION |     |     |     |     |     |      |     |     |     |      |     |     |     |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|------|-----|-----|-----|------|-----|-----|-----|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE   | SSE | S   | SSW | SW   | WSW | W   | WNW | NW  | NNW |      |       |
| 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   | 1.2       | 0.6 | 0.6 | 0.7 | 0.9 | 1.2 | 1.6  | 1.6 | 1.3 | 1.2 | 1.2  | 1.2 | 1.2 | 1.5 | 1.9 | 1.6 | 0.0  | 19.6  |
| 4-7   | 2.8       | 1.3 | 1.0 | 1.3 | 1.9 | 5.1 | 6.8  | 3.4 | 3.1 | 2.3 | 1.8  | 1.0 | 0.9 | 1.0 | 2.2 | 3.7 | 0.0  | 39.7  |
| 8-12  | 2.9       | 1.9 | 1.1 | 0.4 | 0.4 | 1.8 | 1.8  | 0.9 | 2.0 | 3.4 | 3.6  | 1.5 | 0.5 | 0.5 | 1.0 | 2.5 | 0.0  | 26.1  |
| 13-18 | 0.5       | 0.6 | 0.2 | 0.1 | 0.0 | 0.0 | 0.2  | 0.1 | 0.4 | 1.7 | 2.6  | 1.1 | 0.2 | 0.3 | 1.3 | 0.9 | 0.0  | 10.2  |
| 19-24 | 0.0       | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0  | 0.0 | 0.1 | 0.2 | 0.7  | 0.6 | 0.2 | 0.1 | 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 | 0.7  | 0.1 | 0.1 | 0.0 | 0.1 | 0.0 | 0.0  | 1.2   |
| 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 | 7.4       | 4.5 | 2.9 | 2.5 | 3.2 | 8.1 | 10.4 | 6.1 | 6.8 | 9.0 | 10.8 | 5.6 | 3.0 | 3.3 | 7.1 | 9.0 | 0.4  | 100.0 |

**Station: (12) WYEB**

Begin: 1/2002

End: 12/2002

Total Hours:

8750

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |      |      |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW  | NNW |      |       |
| 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   | 1.1       | 1.1 | 1.2 | 1.2 | 1.6 | 1.4 | 1.6 | 1.4 | 1.2 | 1.1 | 1.1 | 1.2 | 1.3  | 1.5  | 1.6 | 1.4 | 0.0  | 21.2  |
| 4-7   | 2.1       | 1.3 | 1.6 | 2.6 | 2.4 | 3.0 | 4.0 | 3.7 | 2.7 | 1.9 | 1.7 | 1.9 | 2.9  | 3.3  | 3.2 | 2.2 | 0.0  | 40.3  |
| 8-12  | 1.1       | 0.4 | 0.3 | 0.4 | 0.4 | 0.8 | 1.8 | 2.7 | 2.2 | 1.1 | 1.0 | 1.7 | 4.3  | 3.1  | 2.0 | 1.6 | 0.0  | 24.7  |
| 13-18 | 0.4       | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.7 | 1.1 | 1.1 | 0.9 | 0.7 | 1.7  | 1.5  | 0.4 | 0.3 | 0.0  | 9.2   |
| 19-24 | 0.1       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.6 | 0.6 | 0.5 | 0.4  | 0.7  | 0.1 | 0.0 | 0.0  | 3.3   |
| 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 | 0.1  | 0.2  | 0.0 | 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  | 0.0   |
| 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       | 2.9 | 3.1 | 4.2 | 4.4 | 5.3 | 7.6 | 8.6 | 7.4 | 5.8 | 5.6 | 6.0 | 10.6 | 10.3 | 7.4 | 5.5 | 0.4  | 100.0 |

Table A.1. (contd)

**Station: (13) 100N**

Begin: 1/2002

End: 12/2002

Total Hours:

8749

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |      |      |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW  | NNW |      |       |
| 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   | 2.2       | 1.9 | 2.1 | 2.2 | 3.3 | 2.5 | 2.0 | 1.7 | 1.3 | 1.1 | 1.7 | 2.2 | 3.2  | 3.6  | 3.2 | 2.3 | 0.0  | 36.5  |
| 4-7   | 1.5       | 1.8 | 1.7 | 2.1 | 2.8 | 2.7 | 2.1 | 1.1 | 0.8 | 0.9 | 1.8 | 3.9 | 5.1  | 3.4  | 2.4 | 1.6 | 0.0  | 35.8  |
| 8-12  | 0.4       | 0.9 | 0.5 | 0.2 | 0.1 | 0.4 | 0.7 | 0.4 | 0.3 | 0.3 | 1.3 | 2.1 | 3.5  | 2.6  | 0.7 | 0.5 | 0.0  | 15.0  |
| 13-18 | 0.3       | 0.4 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.3 | 0.8 | 0.4 | 1.5  | 2.5  | 0.9 | 0.3 | 0.0  | 7.6   |
| 19-24 | 0.0       | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.5 | 0.1 | 0.3  | 1.2  | 0.7 | 0.0 | 0.0  | 3.2   |
| 25-31 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.0 | 0.0  | 0.3  | 0.3 | 0.0 | 0.0  | 1.0   |
| 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       | 5.0 | 4.6 | 4.5 | 6.2 | 5.6 | 4.9 | 3.3 | 2.5 | 2.9 | 6.2 | 8.6 | 13.7 | 13.5 | 8.2 | 4.7 | 1.0  | 100.0 |

**Station: (14) WPPS**

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |     |     |     |     |     |     |     |      |     |     |     |     |     |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S    | SSW | SW  | WSW | W   | WNW | NW   | NNW |      |       |
| 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   | 2.3       | 2.1 | 1.7 | 1.1 | 0.9 | 0.7 | 1.0 | 1.4 | 1.5  | 1.3 | 1.3 | 1.1 | 1.3 | 1.7 | 2.3  | 2.5 | 0.0  | 24.1  |
| 4-7   | 3.4       | 2.6 | 2.3 | 1.0 | 0.7 | 0.6 | 1.6 | 4.2 | 5.0  | 2.5 | 1.7 | 1.1 | 1.4 | 1.9 | 3.8  | 4.3 | 0.0  | 38.1  |
| 8-12  | 1.2       | 1.0 | 0.6 | 0.3 | 0.3 | 0.3 | 1.2 | 2.8 | 3.8  | 2.8 | 1.5 | 1.0 | 0.9 | 1.8 | 3.0  | 1.4 | 0.0  | 24.1  |
| 13-18 | 0.4       | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.9  | 1.5 | 1.3 | 0.4 | 0.5 | 0.9 | 1.5  | 0.4 | 0.0  | 8.4   |
| 19-24 | 0.0       | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1  | 0.5 | 0.8 | 0.4 | 0.1 | 0.1 | 0.7  | 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  | 0.1 | 0.3 | 0.0 | 0.0 | 0.0 | 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 | 7.4       | 6.0 | 4.7 | 2.4 | 1.8 | 1.8 | 4.0 | 8.6 | 11.2 | 8.6 | 6.9 | 4.0 | 4.3 | 6.5 | 11.5 | 8.6 | 1.6  | 100.0 |

**Station: (15) FRNK**

Begin: 1/2002

End: 12/2002

Total Hours:

8752

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW  | SW  | WSW | W   | WNW | NW  | NNW |      |       |
| 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   | 1.0       | 1.0 | 1.2 | 0.8 | 0.9 | 1.0 | 1.3 | 1.2 | 1.2 | 1.0  | 1.0 | 1.0 | 1.4 | 1.6 | 2.0 | 1.4 | 0.0  | 19.0  |
| 4-7   | 3.7       | 2.5 | 1.4 | 1.3 | 1.7 | 3.3 | 6.0 | 4.0 | 3.3 | 2.9  | 2.2 | 1.1 | 1.3 | 2.2 | 5.0 | 5.3 | 0.0  | 47.3  |
| 8-12  | 1.4       | 0.8 | 0.4 | 0.4 | 0.5 | 0.9 | 2.0 | 1.9 | 2.9 | 5.0  | 3.2 | 0.8 | 0.4 | 0.6 | 2.2 | 2.2 | 0.0  | 25.5  |
| 13-18 | 0.3       | 0.2 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.2 | 0.6 | 1.7  | 1.5 | 0.5 | 0.2 | 0.1 | 0.5 | 0.2 | 0.0  | 6.4   |
| 19-24 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.4  | 0.6 | 0.1 | 0.0 | 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 | 0.1  | 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 | 6.4       | 4.5 | 3.1 | 2.5 | 3.2 | 5.3 | 9.4 | 7.4 | 8.1 | 11.0 | 8.6 | 3.6 | 3.4 | 4.4 | 9.7 | 9.2 | 0.3  | 100.0 |

**Station: (16) GABL**

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |     |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W   | WNW  | NW   | NNW |      |       |
| 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   | 0.8       | 0.8 | 0.7 | 0.4 | 0.5 | 0.7 | 0.7 | 0.8 | 1.0 | 1.1 | 0.9 | 0.6 | 0.7 | 0.6  | 0.7  | 0.7 | 0.0  | 11.7  |
| 4-7   | 2.0       | 1.9 | 1.2 | 0.7 | 0.7 | 0.9 | 1.1 | 2.2 | 3.2 | 2.4 | 1.5 | 1.5 | 1.2 | 1.7  | 2.0  | 2.0 | 0.0  | 26.2  |
| 8-12  | 1.6       | 1.9 | 1.1 | 0.3 | 0.5 | 0.6 | 0.9 | 1.7 | 2.5 | 1.6 | 1.6 | 1.6 | 1.8 | 2.3  | 2.8  | 1.4 | 0.0  | 24.2  |
| 13-18 | 1.5       | 1.7 | 0.4 | 0.1 | 0.1 | 0.1 | 0.4 | 1.2 | 1.4 | 1.0 | 1.4 | 1.5 | 1.7 | 3.6  | 2.6  | 1.0 | 0.0  | 19.6  |
| 19-24 | 0.4       | 0.5 | 0.3 | 0.0 | 0.0 | 0.0 | 0.1 | 0.3 | 0.6 | 0.3 | 0.8 | 0.8 | 1.3 | 3.1  | 1.8  | 0.2 | 0.0  | 10.3  |
| 25-31 | 0.1       | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.3 | 0.3 | 0.9 | 0.4 | 0.2 | 1.7  | 0.5  | 0.0 | 0.0  | 4.8   |
| 32-38 | 0.0       | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.5 | 0.1 | 0.0 | 0.3  | 0.0  | 0.0 | 0.0  | 1.3   |
| 39-46 | 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 | 0.0  | 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 | 6.2       | 7.0 | 3.9 | 1.6 | 1.8 | 2.3 | 3.1 | 6.4 | 9.0 | 7.0 | 7.5 | 6.6 | 6.9 | 13.3 | 10.4 | 5.3 | 1.6  | 100.0 |

Table A.1. (contd)

**Station: (17) RING**

Begin: 1/2002

End: 12/2002

Total Hours:

8749

| SPEED | DIRECTION |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     | CALM | TOTAL |
|-------|-----------|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-------|
|       | N         | NNE | NE   | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W   | WNW | NW  | NNW |      |       |
| 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   | 1.4       | 2.7 | 5.8  | 2.5 | 1.6 | 1.4 | 1.1 | 1.1 | 1.4 | 1.2 | 1.6 | 1.9 | 1.6 | 1.2 | 1.0 | 1.1 | 0.0  | 28.7  |
| 4-7   | 1.5       | 1.9 | 13.8 | 3.5 | 1.5 | 1.2 | 1.1 | 1.2 | 1.9 | 2.7 | 2.4 | 3.1 | 1.8 | 1.0 | 1.1 | 1.3 | 0.0  | 40.8  |
| 8-12  | 1.5       | 1.0 | 1.1  | 0.5 | 0.1 | 0.3 | 0.5 | 0.8 | 1.4 | 3.7 | 2.0 | 1.3 | 1.7 | 1.9 | 1.2 | 1.1 | 0.0  | 20.1  |
| 13-18 | 0.4       | 0.5 | 0.1  | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 | 1.0 | 1.0 | 0.5 | 0.9 | 1.9 | 0.4 | 0.3 | 0.0  | 7.4   |
| 19-24 | 0.1       | 0.1 | 0.1  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.6 | 0.2 | 0.1 | 0.6 | 0.0 | 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 | 0.1 | 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 | 4.9       | 6.1 | 20.8 | 6.5 | 3.2 | 3.0 | 2.7 | 3.1 | 5.0 | 8.7 | 7.8 | 7.0 | 6.1 | 6.6 | 3.7 | 3.9 | 0.8  | 100.0 |

**Station: (18) RICH**

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW   | WSW | W   | WNW | NW  | NNW |      |       |
| 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   | 1.6       | 0.8 | 1.0 | 1.1 | 1.8 | 2.8 | 3.6 | 2.8 | 2.4 | 2.1 | 1.9  | 2.1 | 2.3 | 2.6 | 2.6 | 1.8 | 0.0  | 33.2  |
| 4-7   | 2.2       | 0.8 | 0.6 | 1.2 | 2.2 | 3.0 | 3.5 | 1.7 | 1.7 | 3.2 | 3.8  | 2.7 | 1.9 | 2.2 | 3.0 | 2.7 | 0.0  | 36.6  |
| 8-12  | 1.4       | 0.8 | 0.6 | 0.4 | 0.2 | 0.2 | 0.4 | 0.2 | 0.9 | 2.9 | 3.5  | 2.3 | 1.5 | 0.7 | 1.3 | 1.2 | 0.0  | 18.6  |
| 13-18 | 0.5       | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 1.2 | 1.8  | 1.3 | 0.8 | 0.3 | 0.8 | 0.8 | 0.0  | 7.8   |
| 19-24 | 0.1       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.9  | 0.5 | 0.3 | 0.1 | 0.3 | 0.1 | 0.0  | 2.5   |
| 25-31 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3  | 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 | 5.9       | 2.6 | 2.3 | 2.7 | 4.2 | 6.0 | 7.5 | 4.7 | 5.1 | 9.4 | 12.3 | 9.0 | 6.9 | 5.9 | 8.1 | 6.5 | 0.8  | 100.0 |

**Station: (19) PFP**

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |      |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW   | NNW |      |       |
| 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 | 3.0  | 3.0   |
| 1-3   | 3.3       | 2.7 | 1.8 | 1.1 | 1.5 | 1.9 | 2.3 | 1.9 | 1.8 | 1.7 | 2.2 | 2.9 | 4.7  | 4.3  | 3.4  | 3.3 | 0.0  | 40.7  |
| 4-7   | 2.9       | 2.1 | 0.7 | 0.5 | 0.6 | 1.5 | 1.9 | 1.0 | 0.6 | 0.6 | 1.3 | 1.8 | 4.5  | 6.5  | 4.6  | 3.5 | 0.0  | 34.6  |
| 8-12  | 0.6       | 0.5 | 0.2 | 0.1 | 0.1 | 0.3 | 0.3 | 0.2 | 0.3 | 0.6 | 1.2 | 2.0 | 1.7  | 2.0  | 3.8  | 1.5 | 0.0  | 15.3  |
| 13-18 | 0.0       | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 1.1 | 1.1 | 0.4  | 0.2  | 1.6  | 0.4 | 0.0  | 5.4   |
| 19-24 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.4 | 0.3 | 0.1  | 0.0  | 0.0  | 0.0 | 0.0  | 0.9   |
| 25-31 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 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 | 6.9       | 5.3 | 2.7 | 1.6 | 2.3 | 3.6 | 4.6 | 3.2 | 2.6 | 3.2 | 6.3 | 8.1 | 11.4 | 13.0 | 13.5 | 8.6 | 3.0  | 100.0 |

**Station: (20) RMTN**

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |      |     |     |     |     |     |     |     |     |      |      |     |     |     |     | CALM | TOTAL |
|-------|-----------|------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|------|-------|
|       | N         | NNE  | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW   | WSW  | W   | WNW | NW  | NNW |      |       |
| 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 | 0.0  | 0.0   |
| 1-3   | 0.5       | 0.5  | 0.4 | 0.2 | 0.1 | 0.2 | 0.1 | 0.2 | 0.2 | 0.6 | 0.6  | 0.5  | 0.3 | 0.2 | 0.3 | 0.2 | 0.0  | 5.0   |
| 4-7   | 1.2       | 1.7  | 1.4 | 0.5 | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 | 1.2 | 1.7  | 0.9  | 0.6 | 0.4 | 0.5 | 0.7 | 0.0  | 13.4  |
| 8-12  | 1.9       | 2.7  | 2.1 | 1.0 | 0.5 | 0.3 | 0.4 | 0.3 | 0.8 | 2.2 | 2.8  | 1.6  | 1.2 | 1.0 | 0.7 | 1.1 | 0.0  | 20.5  |
| 13-18 | 2.6       | 3.3  | 1.7 | 0.3 | 0.1 | 0.1 | 0.1 | 0.2 | 0.4 | 2.1 | 4.5  | 2.4  | 1.5 | 1.0 | 0.9 | 1.2 | 0.0  | 22.3  |
| 19-24 | 1.3       | 2.7  | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 1.2 | 4.0  | 2.6  | 1.2 | 0.5 | 0.2 | 0.6 | 0.0  | 15.1  |
| 25-31 | 0.7       | 2.0  | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 | 3.7  | 2.0  | 0.6 | 0.1 | 0.1 | 0.1 | 0.0  | 10.4  |
| 32-38 | 0.2       | 1.0  | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 3.2  | 1.1  | 0.1 | 0.0 | 0.0 | 0.0 | 0.0  | 6.2   |
| 39-46 | 0.0       | 0.3  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 2.9  | 0.6  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0  | 4.1   |
| > 46  | 0.0       | 0.3  | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 2.0  | 0.3  | 0.0 | 0.0 | 0.0 | 0.0 | 0.0  | 2.8   |
| TOTAL | 8.5       | 14.4 | 6.9 | 2.1 | 1.3 | 1.0 | 1.1 | 1.2 | 2.0 | 8.5 | 25.4 | 12.0 | 5.6 | 3.2 | 2.9 | 4.0 | 0.0  | 100.0 |

Table A.1. (contd)

**Station: (21) HMS**

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |      |      |      |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW   | NNW |      |       |
| 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 | 1.5 | 1.0 | 1.3 | 1.2 | 1.7 | 1.5 | 1.2 | 1.0 | 1.4 | 1.3 | 1.3  | 1.4  | 1.4  | 1.4 | 0.0  | 21.3  |
| 4-7   | 2.1       | 1.4 | 1.1 | 1.0 | 1.2 | 1.4 | 1.8 | 2.0 | 1.7 | 1.8 | 2.5 | 4.1 | 5.5  | 5.7  | 6.1  | 3.3 | 0.0  | 42.7  |
| 8-12  | 0.8       | 0.7 | 0.3 | 0.1 | 0.3 | 0.1 | 0.1 | 0.4 | 0.3 | 0.7 | 1.5 | 3.1 | 2.7  | 5.7  | 5.3  | 1.1 | 0.0  | 23.2  |
| 13-18 | 0.0       | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.5 | 1.5 | 1.1 | 0.5  | 2.1  | 3.2  | 0.2 | 0.0  | 9.5   |
| 19-24 | 0.0       | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.7 | 0.3 | 0.1  | 0.3  | 0.9  | 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 | 0.1 | 0.1 | 0.0 | 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 | 4.2       | 3.4 | 3.0 | 2.3 | 2.8 | 2.7 | 3.6 | 4.0 | 3.4 | 4.2 | 7.6 | 9.9 | 10.2 | 15.3 | 16.9 | 6.0 | 0.4  | 100.0 |

**Station: (22) PASC**

Begin: 1/2002

End: 12/2002

Total Hours:

8752

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |      |     |     |     |     |      | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|------|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW   | WSW | W   | WNW | NW  | NNW  |      |       |
| 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   | 6.1       | 3.4 | 2.6 | 2.4 | 2.6 | 2.3 | 1.9 | 1.7 | 1.2 | 1.2 | 1.1  | 1.3 | 1.7 | 2.2 | 4.0 | 7.8  | 0.0  | 43.4  |
| 4-7   | 2.3       | 0.9 | 0.6 | 0.6 | 0.6 | 1.1 | 1.9 | 1.5 | 1.8 | 3.6 | 4.0  | 2.5 | 2.1 | 2.1 | 3.0 | 4.1  | 0.0  | 32.6  |
| 8-12  | 0.9       | 0.3 | 0.1 | 0.0 | 0.1 | 0.1 | 0.2 | 0.1 | 0.3 | 2.2 | 5.5  | 2.3 | 0.7 | 0.5 | 1.4 | 1.3  | 0.0  | 16.1  |
| 13-18 | 0.2       | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.3 | 2.7  | 1.5 | 0.4 | 0.1 | 0.1 | 0.2  | 0.0  | 5.6   |
| 19-24 | 0.0       | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6  | 0.5 | 0.1 | 0.0 | 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 | 0.0  | 0.1 | 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 | 9.5       | 4.8 | 3.2 | 3.1 | 3.3 | 3.6 | 4.1 | 3.3 | 3.4 | 7.3 | 14.0 | 8.2 | 5.0 | 4.9 | 8.5 | 13.2 | 0.8  | 100.0 |

**Station: (23) GABW**

Begin: 1/2002

End: 12/2002

Total Hours:

8753

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |      |      |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW  | NNW |      |       |
| 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 | 2.3  | 2.3   |
| 1-3   | 1.3       | 0.9 | 1.0 | 1.2 | 1.4 | 1.6 | 2.2 | 2.2 | 1.9 | 1.6 | 1.5 | 1.8 | 3.0  | 3.5  | 2.6 | 1.6 | 0.0  | 29.4  |
| 4-7   | 1.3       | 0.8 | 0.6 | 0.9 | 1.0 | 1.2 | 4.1 | 5.1 | 1.7 | 1.1 | 1.2 | 1.5 | 3.3  | 7.1  | 3.4 | 1.7 | 0.0  | 36.0  |
| 8-12  | 0.7       | 0.7 | 0.3 | 0.2 | 0.2 | 0.3 | 1.2 | 1.0 | 0.3 | 0.5 | 1.1 | 1.7 | 3.2  | 6.1  | 1.7 | 0.6 | 0.0  | 19.9  |
| 13-18 | 0.1       | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.3 | 0.7 | 0.8 | 0.9  | 4.6  | 1.1 | 0.1 | 0.0  | 9.1   |
| 19-24 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.6 | 0.3 | 0.1  | 1.3  | 0.3 | 0.0 | 0.0  | 3.0   |
| 25-31 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 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 | 3.5       | 2.6 | 2.0 | 2.4 | 2.7 | 3.2 | 7.6 | 8.3 | 4.1 | 3.7 | 5.2 | 6.1 | 10.4 | 22.9 | 9.2 | 4.0 | 2.3  | 100.0 |

**Station: (24) 100F**

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |     |     |     |     |     |      |      |     |     |     |     |      |      |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|------|------|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE   | SSE  | S   | SSW | SW  | WSW | W    | WNW  | NW  | NNW |      |       |
| 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   | 1.6       | 1.3 | 1.1 | 0.9 | 1.1 | 1.6 | 2.4  | 2.6  | 2.2 | 1.9 | 1.6 | 2.4 | 3.3  | 4.0  | 3.6 | 2.4 | 0.0  | 34.2  |
| 4-7   | 2.1       | 1.2 | 1.0 | 1.1 | 1.0 | 1.6 | 4.9  | 4.8  | 1.6 | 0.9 | 1.1 | 1.7 | 3.3  | 3.6  | 2.9 | 2.0 | 0.0  | 34.9  |
| 8-12  | 1.2       | 0.5 | 0.2 | 0.2 | 0.2 | 0.9 | 2.5  | 2.5  | 0.6 | 0.6 | 0.9 | 1.3 | 2.7  | 3.1  | 0.8 | 0.7 | 0.0  | 18.8  |
| 13-18 | 0.4       | 0.3 | 0.1 | 0.0 | 0.0 | 0.0 | 0.3  | 0.3  | 0.2 | 0.2 | 0.6 | 0.8 | 1.0  | 2.2  | 0.8 | 0.1 | 0.0  | 7.4   |
| 19-24 | 0.0       | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0  | 0.0  | 0.0 | 0.1 | 0.5 | 0.2 | 0.2  | 0.8  | 0.3 | 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  | 0.0 | 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 | 5.3       | 3.4 | 2.4 | 2.3 | 2.4 | 4.1 | 10.2 | 10.2 | 4.6 | 3.9 | 4.8 | 6.4 | 10.6 | 13.9 | 8.4 | 5.3 | 1.8  | 100.0 |

Table A.1. (contd)

**Station: (25) VERN**

Begin: 1/2002

End: 12/2002

Total Hours:

8753

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |     |      |      |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW | W    | WNW  | NW  | NNW |      |       |
| 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 | 1.5  | 1.5   |
| 1-3   | 0.8       | 1.1 | 1.1 | 1.3 | 2.1 | 2.1 | 1.5 | 1.3 | 0.9 | 0.8 | 1.1 | 2.0 | 2.4  | 1.6  | 1.2 | 0.9 | 0.0  | 22.3  |
| 4-7   | 0.9       | 1.5 | 2.4 | 3.2 | 3.7 | 2.4 | 1.2 | 0.5 | 0.4 | 0.5 | 0.6 | 3.7 | 7.2  | 4.0  | 1.8 | 1.0 | 0.0  | 35.1  |
| 8-12  | 0.5       | 0.3 | 0.4 | 0.4 | 0.4 | 0.3 | 0.2 | 0.1 | 0.1 | 0.3 | 0.8 | 1.8 | 7.3  | 7.8  | 2.3 | 0.7 | 0.0  | 23.9  |
| 13-18 | 0.2       | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.7 | 0.6 | 2.6  | 5.6  | 2.3 | 0.3 | 0.0  | 12.9  |
| 19-24 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.4 | 0.1 | 0.3  | 1.6  | 1.0 | 0.0 | 0.0  | 3.8   |
| 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  | 0.2 | 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 | 2.5       | 3.0 | 3.9 | 5.0 | 6.3 | 4.8 | 2.8 | 1.9 | 1.4 | 2.1 | 3.8 | 8.3 | 20.0 | 20.9 | 8.8 | 3.0 | 1.5  | 100.0 |

**Station: (26) BENT**

Begin: 1/2002

End: 12/2002

Total Hours:

8743

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |      |      |      |     |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW   | WSW  | W    | WNW | NW  | NNW |      |       |
| 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   | 1.0       | 0.9 | 0.8 | 0.7 | 0.9 | 0.9 | 0.6 | 0.4 | 0.5 | 0.7 | 1.3  | 2.0  | 2.4  | 2.1 | 1.4 | 1.1 | 0.0  | 17.8  |
| 4-7   | 1.4       | 1.0 | 1.3 | 1.6 | 2.0 | 1.1 | 0.4 | 0.2 | 0.4 | 1.3 | 5.7  | 11.8 | 13.1 | 5.2 | 3.2 | 2.4 | 0.0  | 52.2  |
| 8-12  | 0.7       | 0.8 | 1.2 | 0.7 | 0.8 | 0.2 | 0.0 | 0.0 | 0.1 | 0.7 | 3.6  | 6.7  | 4.7  | 1.7 | 0.8 | 0.7 | 0.0  | 23.4  |
| 13-18 | 0.3       | 0.6 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 1.5  | 0.9  | 0.5  | 0.1 | 0.0 | 0.2 | 0.0  | 4.8   |
| 19-24 | 0.1       | 0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5  | 0.4  | 0.0  | 0.0 | 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  | 0.2   |
| 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 | 3.5       | 3.5 | 3.7 | 3.1 | 3.8 | 2.2 | 1.1 | 0.6 | 1.1 | 3.0 | 12.7 | 21.8 | 20.8 | 9.1 | 5.4 | 4.3 | 0.3  | 100.0 |

**Station: (27) VSTA**

Begin: 1/2002

End: 12/2002

Total Hours:

8733

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |      |      |     |     |     |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|-----|-----|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW  | SW   | WSW | W   | WNW | NW  | NNW |      |       |
| 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   | 2.1       | 2.3 | 2.1 | 1.6 | 1.6 | 2.0 | 2.2 | 2.2 | 2.5 | 2.6  | 3.1  | 2.7 | 2.1 | 1.8 | 2.0 | 1.6 | 0.0  | 34.4  |
| 4-7   | 3.1       | 2.2 | 1.5 | 1.3 | 0.8 | 0.9 | 1.0 | 1.0 | 2.0 | 4.9  | 5.9  | 3.5 | 2.1 | 2.4 | 2.8 | 3.0 | 0.0  | 38.3  |
| 8-12  | 0.6       | 0.2 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.2 | 0.7 | 3.7  | 6.0  | 2.5 | 0.5 | 0.2 | 1.1 | 1.1 | 0.0  | 17.0  |
| 13-18 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 1.4  | 4.2  | 0.9 | 0.3 | 0.2 | 0.1 | 0.1 | 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  | 1.4  | 0.2 | 0.1 | 0.0 | 0.0 | 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  | 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 | 5.8       | 4.7 | 3.7 | 2.8 | 2.5 | 3.0 | 3.3 | 3.4 | 5.3 | 12.7 | 20.9 | 9.8 | 5.1 | 4.6 | 6.0 | 5.7 | 0.8  | 100.0 |

**Station: (28) SURF**

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |      |      |      |     |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW   | WSW  | W    | WNW | NW  | NNW |      |       |
| 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   | 0.3       | 0.4 | 0.9 | 1.1 | 1.5 | 0.8 | 0.7 | 0.8 | 1.3 | 2.4 | 3.5  | 3.6  | 1.8  | 0.6 | 0.4 | 0.4 | 0.0  | 20.5  |
| 4-7   | 0.2       | 0.4 | 2.7 | 3.5 | 1.8 | 0.6 | 0.3 | 0.3 | 0.8 | 1.4 | 4.1  | 5.7  | 1.6  | 0.2 | 0.0 | 0.1 | 0.0  | 23.8  |
| 8-12  | 0.1       | 0.6 | 1.7 | 2.7 | 0.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 4.1  | 9.6  | 3.2  | 0.2 | 0.1 | 0.0 | 0.0  | 23.0  |
| 13-18 | 0.1       | 0.4 | 0.4 | 0.7 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.3  | 9.4  | 5.5  | 0.6 | 0.0 | 0.0 | 0.0  | 19.6  |
| 19-24 | 0.0       | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.4  | 4.6  | 3.4  | 0.3 | 0.0 | 0.0 | 0.0  | 8.8   |
| 25-31 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1  | 1.4  | 1.8  | 0.2 | 0.0 | 0.0 | 0.0  | 3.4   |
| 32-38 | 0.0       | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0  | 0.1  | 0.2  | 0.0 | 0.0 | 0.0 | 0.0  | 0.4   |
| 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 | 0.8       | 1.9 | 5.7 | 8.0 | 4.0 | 1.3 | 1.1 | 1.1 | 2.2 | 3.9 | 14.5 | 34.5 | 17.5 | 2.0 | 0.6 | 0.5 | 0.5  | 100.0 |

Table A.1. (contd)

Station: (29) 100K

Begin: 1/2002

End: 12/2002

Total Hours:

8724

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |     |      |      |      |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW  | WSW  | W    | WNW  | NW  | NNW |      |       |
| 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 | 3.0  | 3.0   |
| 1-3   | 1.8       | 1.6 | 1.5 | 1.7 | 2.0 | 2.3 | 1.8 | 1.7 | 1.7 | 1.5 | 2.0 | 2.9  | 4.2  | 2.9  | 2.7 | 2.0 | 0.0  | 34.4  |
| 4-7   | 1.5       | 1.4 | 0.8 | 0.8 | 1.3 | 1.6 | 1.5 | 1.4 | 1.0 | 0.8 | 1.4 | 4.3  | 6.3  | 3.3  | 2.2 | 1.6 | 0.0  | 31.3  |
| 8-12  | 0.6       | 0.7 | 0.3 | 0.1 | 0.3 | 0.4 | 0.7 | 0.6 | 0.4 | 0.5 | 1.2 | 3.2  | 5.8  | 2.6  | 1.1 | 0.7 | 0.0  | 19.2  |
| 13-18 | 0.3       | 0.3 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.3 | 0.9 | 0.8  | 2.0  | 2.5  | 0.9 | 0.2 | 0.0  | 8.6   |
| 19-24 | 0.0       | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.5 | 0.1  | 0.3  | 1.1  | 0.4 | 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 | 0.1 | 0.0 | 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  | 0.0   |
| 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       | 4.1 | 2.8 | 2.7 | 3.7 | 4.4 | 4.1 | 3.8 | 3.1 | 3.4 | 6.0 | 11.4 | 18.6 | 12.7 | 7.4 | 4.5 | 3.0  | 100.0 |

Station: (30) HAMR

Begin: 1/2002

End: 12/2002

Total Hours:

8754

| SPEED | DIRECTION |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     | CALM | TOTAL |
|-------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|------|-------|
|       | N         | NNE | NE  | ENE | E   | ESE | SE  | SSE | S   | SSW | SW   | WSW | W   | WNW | NW  | NNW |      |       |
| 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       | 0.7 | 0.7 | 0.8 | 0.9 | 1.1 | 1.9 | 2.4 | 2.3 | 1.8 | 1.5  | 1.2 | 1.4 | 1.5 | 1.5 | 1.2 | 0.0  | 22.1  |
| 4-7   | 3.8       | 1.7 | 0.8 | 0.7 | 1.0 | 2.3 | 4.7 | 4.4 | 3.8 | 3.6 | 3.8  | 2.4 | 1.7 | 1.6 | 2.9 | 3.4 | 0.0  | 42.6  |
| 8-12  | 2.7       | 1.1 | 0.4 | 0.2 | 0.3 | 0.3 | 0.6 | 0.4 | 1.0 | 2.7 | 5.9  | 2.7 | 0.6 | 0.6 | 1.6 | 2.4 | 0.0  | 23.5  |
| 13-18 | 0.7       | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 | 0.7 | 2.5  | 1.3 | 0.3 | 0.2 | 1.6 | 0.9 | 0.0  | 8.7   |
| 19-24 | 0.1       | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.7  | 0.4 | 0.2 | 0.0 | 0.3 | 0.1 | 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 | 0.5  | 0.1 | 0.1 | 0.0 | 0.0 | 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 | 0.0  | 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       | 3.7 | 2.0 | 1.7 | 2.2 | 3.8 | 7.4 | 7.3 | 7.3 | 9.1 | 14.9 | 8.1 | 4.3 | 3.9 | 7.9 | 8.0 | 0.3  | 100.0 |



**Table A.2.** Joint Frequency Distributions (%) for Hanford Meteorological Monitoring Network  
Wind Stations at 60 Meters, 2002**Tower: 100 Area**

| Begin: 1/2002 |           |     |     |     |     |     |     |     |     | End: 12/2002 |     |     |      |      | Total Hours: |     |      | 8720  |  |
|---------------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|--------------|-----|-----|------|------|--------------|-----|------|-------|--|
| SPEED         | DIRECTION |     |     |     |     |     |     |     |     |              |     |     |      |      |              |     |      |       |  |
|               | 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  | .7   | .7    |  |
| 1-3           | 1.5       | 1.3 | 1.6 | 2.2 | 3.8 | 3.8 | 2.7 | 1.9 | 1.5 | 1.1          | 1.3 | 1.8 | 2.1  | 2.3  | 2.1          | 1.6 | .0   | 32.6  |  |
| 4-7           | 1.3       | 1.7 | 1.5 | 1.9 | 3.3 | 3.5 | 2.3 | 1.4 | .8  | 1.1          | 1.6 | 2.3 | 3.0  | 2.8  | 2.0          | 1.2 | .0   | 31.6  |  |
| 8-12          | .5        | .9  | .8  | .4  | .4  | .7  | 1.1 | .8  | .7  | .8           | 1.5 | 1.9 | 2.4  | 2.1  | 1.0          | .7  | .0   | 16.5  |  |
| 13-18         | .3        | .5  | .4  | .2  | .2  | .1  | .6  | .6  | .6  | .6           | 1.2 | 1.3 | 2.4  | 2.1  | .5           | .2  | .0   | 11.7  |  |
| 19-24         | .1        | .2  | .1  | .0  | .0  | .0  | .1  | .1  | .2  | .3           | .5  | .4  | .7   | .8   | .3           | .1  | .0   | 4.2   |  |
| 25-31         | .0        | .0  | .1  | .0  | .0  | .0  | .0  | .0  | .1  | .3           | .2  | .2  | .4   | .4   | .2           | .0  | .0   | 2.0   |  |
| 32-38         | .0        | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .1           | .0  | .0  | .1   | .1   | .1           | .0  | .0   | .5    |  |
| 39-46         | .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    |  |
| TOTAL         | 3.8       | 4.6 | 4.4 | 4.8 | 7.7 | 8.1 | 6.7 | 4.8 | 3.9 | 4.5          | 6.2 | 7.9 | 11.1 | 10.6 | 6.3          | 3.8 | .7   | 100.0 |  |

**Tower: 200 Area**

| Begin: 1/2002 |     |     |     |     |     |     |     |     |     |     |     |     |     |      |      |     |      | End: 12/2002 |  |  |  | Total Hours: |  | 8758 |  |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|-----|------|--------------|--|--|--|--------------|--|------|--|
| 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  | .3   | .3           |  |  |  |              |  |      |  |
| 1-3           | 1.1 | 1.0 | 1.0 | 1.0 | 1.2 | 1.0 | 1.1 | 1.1 | .9  | .7  | .8  | .8  | 1.0 | 1.1  | 1.0  | 1.0 | .0   | 15.7         |  |  |  |              |  |      |  |
| 4-7           | 2.3 | 1.6 | 1.2 | .9  | 1.1 | 1.4 | 1.8 | 1.8 | 1.3 | 1.0 | 1.2 | 1.5 | 2.2 | 2.9  | 3.6  | 3.1 | .0   | 29.0         |  |  |  |              |  |      |  |
| 8-12          | 1.2 | 1.0 | .5  | .3  | .5  | .4  | .2  | .6  | .4  | .6  | 1.2 | 1.6 | 2.9 | 4.7  | 5.3  | 2.0 | .0   | 23.4         |  |  |  |              |  |      |  |
| 13-18         | .2  | .3  | .2  | .1  | .1  | .1  | .0  | .3  | .3  | .4  | 1.1 | 1.9 | 1.8 | 4.9  | 6.1  | .8  | .0   | 18.6         |  |  |  |              |  |      |  |
| 19-24         | .0  | .0  | .1  | .0  | .0  | .0  | .0  | .0  | .1  | .3  | 1.0 | 1.1 | .4  | 1.8  | 3.1  | .1  | .0   | 8.3          |  |  |  |              |  |      |  |
| 25-31         | .0  | .0  | .1  | .0  | .0  | .0  | .0  | .0  | .1  | .2  | .9  | .3  | .1  | .5   | 1.7  | .0  | .0   | 3.8          |  |  |  |              |  |      |  |
| 32-38         | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .1  | .3  | .1  | .0  | .0   | .1   | .0  | .0   | .7           |  |  |  |              |  |      |  |
| 39-46         | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .1  | .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           |  |  |  |              |  |      |  |
| TOTAL         | 4.8 | 4.0 | 3.1 | 2.3 | 3.0 | 2.9 | 3.2 | 3.8 | 2.9 | 3.3 | 6.5 | 7.3 | 8.6 | 15.9 | 21.0 | 7.1 | .3   | 100.0        |  |  |  |              |  |      |  |

**Tower: 300 Area**

| Begin: 1/2002 |     |     |     |     |     |     |     |     |     | End: 12/2002 |      |     |     | 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  | 1.7  | 1.7   |  |
| 1-3           | 1.0 | .5  | .7  | .5  | .8  | 1.3 | 1.6 | 1.1 | 1.2 | .8           | .9   | .7  | 1.0 | 1.0          | .9  | 1.0 | .0   | 14.9  |  |
| 4-7           | 1.7 | 1.4 | 1.3 | 1.2 | 1.7 | 3.2 | 4.5 | 3.1 | 3.3 | 3.0          | 2.1  | 1.3 | 1.0 | .8           | 1.4 | 2.0 | .0   | 33.0  |  |
| 8-12          | 2.0 | 1.7 | 1.5 | .4  | .5  | 1.0 | 2.9 | 1.4 | 2.0 | 3.7          | 3.9  | 1.5 | .5  | .6           | 1.5 | 2.9 | .0   | 27.9  |  |
| 13-18         | .7  | .8  | .2  | .1  | .1  | .1  | .4  | .2  | .4  | 2.0          | 3.7  | 1.6 | .3  | .5           | 1.5 | 2.0 | .0   | 14.7  |  |
| 19-24         | .2  | .2  | .1  | .1  | .0  | .0  | .1  | .0  | .1  | .6           | 1.6  | .8  | .1  | .2           | 1.1 | .3  | .0   | 5.4   |  |
| 25-31         | .0  | .1  | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .2           | .8   | .2  | .0  | .1           | .2  | .0  | .0   | 1.6   |  |
| 32-38         | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0           | .5   | .1  | .0  | .0           | .0  | .0  | .0   | .7    |  |
| 39-46         | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0           | .1   | .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    |  |
| TOTAL         | 5.7 | 4.7 | 3.7 | 2.2 | 3.1 | 5.7 | 9.4 | 5.9 | 7.0 | 10.3         | 13.5 | 6.1 | 2.9 | 3.3          | 6.7 | 8.3 | 1.7  | 100.0 |  |

**Tower: 400 Area**

| Begin: 1/2002 |           |     |     |     |     |     |     |     |      | End: 12/2002 |     |     |     | Total Hours: |      |     |      | 8636  |  |
|---------------|-----------|-----|-----|-----|-----|-----|-----|-----|------|--------------|-----|-----|-----|--------------|------|-----|------|-------|--|
| SPEED         | DIRECTION |     |     |     |     |     |     |     |      |              |     |     |     |              |      |     |      |       |  |
|               | 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  | .3   | .3    |  |
| 1-3           | 1.0       | .8  | .7  | .6  | .7  | .8  | 1.1 | 1.1 | 1.2  | .8           | .8  | .7  | .7  | .8           | 1.0  | .8  | .0   | 13.8  |  |
| 4-7           | 2.1       | 2.0 | 1.1 | .8  | 1.1 | 1.2 | 2.2 | 2.9 | 3.2  | 2.3          | 1.6 | 1.2 | 1.1 | 1.5          | 2.3  | 2.2 | .0   | 28.9  |  |
| 8-12          | 2.1       | 1.6 | 1.0 | .3  | .3  | .5  | 1.4 | 2.3 | 3.9  | 3.9          | 1.9 | .9  | 1.0 | 1.5          | 2.8  | 2.6 | .0   | 27.9  |  |
| 13-18         | .8        | .3  | .2  | .0  | .0  | .1  | .4  | .8  | 1.4  | 3.8          | 2.6 | .8  | .5  | 1.6          | 3.7  | 1.5 | .0   | 18.5  |  |
| 19-24         | .2        | .1  | .0  | .0  | .0  | .0  | .1  | .1  | .3   | 1.2          | 1.2 | .3  | .4  | 1.2          | 2.2  | .2  | .0   | 7.4   |  |
| 25-31         | .0        | .2  | .0  | .0  | .0  | .0  | .0  | .0  | .0   | .4           | .7  | .3  | .1  | .1           | .5   | .0  | .0   | 2.4   |  |
| 32-38         | .0        | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0   | .1           | .3  | .1  | .0  | .0           | .0   | .0  | .0   | .6    |  |
| 39-46         | .0        | .0  | .0  | .0  | .0  | .0  | .0  | .0  | .0   | .0           | .1  | .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    |  |
| TOTAL         | 6.2       | 5.0 | 3.0 | 1.8 | 2.3 | 2.6 | 5.3 | 7.1 | 10.0 | 12.6         | 9.2 | 4.3 | 3.8 | 6.5          | 12.6 | 7.4 | .3   | 100.0 |  |

## **Appendix B**

### **Climate Classification of the Mid-Columbia Region**

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## Appendix B

### 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.

## B.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  $\bar{R}$  occurs in the six cooler months (October through March in the Northern Hemisphere), then the classification is given in terms of  $\bar{R}$  (cm) and the mean annual temperature  $\bar{T}$  (°C) as

$$\begin{array}{ll} \bar{T} \leq \bar{R} < 2\bar{T} & \text{station climate is steppe (BS)} \\ \bar{R} < \bar{T} & \text{station climate is desert (BW)} \end{array}$$

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

$$\begin{array}{ll} \bar{T} + 14 \leq \bar{R} < 2(\bar{T} + 14) & \text{station climate is BS} \\ \bar{R} < \bar{T} + 14 & \text{station climate is BW} \end{array}$$

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

$$\begin{array}{ll} \bar{T} + 7 \leq \bar{R} < 2(\bar{T} + 7) & \text{station climate is BS} \\ \bar{R} < \bar{T} + 7 & \text{station climate is BW} \end{array}$$

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:

$$TE = \frac{1}{4} \sum_{k=1}^{12} (\overline{T}_k - 32)$$

where  $\overline{T}_k$  is the mean temperature in  $^{\circ}F$  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 ( $16 \leq PE < 31$ ).

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.

## B.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 Thornthwaite 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.  
 $\sigma_r$  = 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.

### B.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.

### B.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 B.1 organizes the terminology discussed above.

**Table B.1.** Description of the Uses of the Terms “arid” and “semiarid” with Respect to Climate.

| <b>Arid Climate</b>                      |  |
|--|--|
| 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”   |
| <b>Semiarid Climate</b>                  | <b>Arid Climate</b>  |
| Conventional Boundary of Classification: | 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:                                  | 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:                        | Equivalent Term: desert  |
|  | steppe, shrub-steppe (if shrubs are present), semi-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.

## B.5 References

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## **Appendix C**

### **Hanford Meteorological Monitoring Network Description**

## Appendix C

### Hanford Meteorological Monitoring Network Description

This appendix provides a brief description of the Hanford Meteorological Monitoring Network using information extracted primarily from two previous documents: Glantz and Islam (1988) and Neitzel et al. (2001).

The network currently consists of 30 stations as shown in Figure C.1. Most stations are on the Hanford Site; however, eight are offsite, with Station 28 (at Roosevelt) being the most distant. All stations provide meteorological data every 15 minutes to a central computer located at the Hanford Meteorological Station. With the exception of Station 28 that relays information by telephone, all other stations report via radio telemetry.

Table C.1 lists the network stations and the meteorological information collected at each. As can be seen from this table, not all stations collect the same information, e.g., solar powered stations do not collect precipitation data.

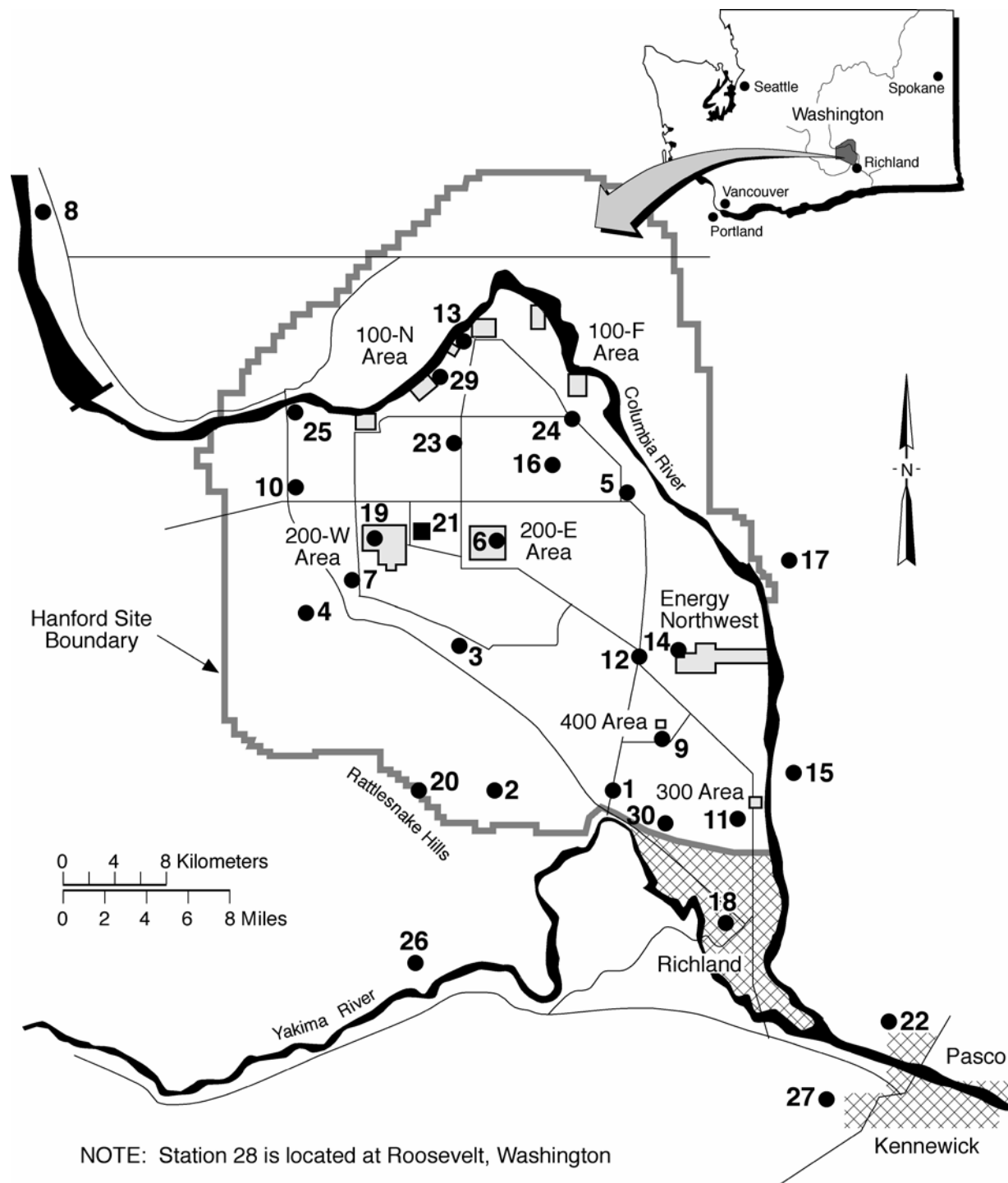
The brief station descriptions that follow pertain to 23 of the 30 network stations. Descriptions of the seven remaining stations will be included in the climatological summary for calendar year 2003.

#### C.1 Meteorological Monitoring Sites

Meteorological monitoring by the Hanford Meteorology Monitoring Program is conducted at the Hanford Meteorology Station and at twenty-nine other monitoring sites. The locations of the meteorological monitoring sites are depicted in Figure C.1. The following paragraphs briefly describe each monitoring site.

##### C.1.1 Site 1 – Prosser Barricade Monitoring Site (Pros)

The Prosser Barricade monitoring site is located near the old Prosser Barricade on Hanford Route 10 (near the southern boundary of the Hanford Site). The Prosser Barricade guardhouse is no longer present on Route 10, but its former location is roughly indicated by a parking area on the west side of road. The site is located to the west of the southern edge of the parking area about 0.9 mile up the road from Highway 240. The 30-foot instrumented tower is situated on a slight rise (a stabilized sand dune) about 160 feet west of the parking area. The topography near the Prosser Barricade is composed of low, rolling mounds and stabilized sand dunes. Slightly higher terrain is found to the west, north, and east of the site. The monitoring site is located at 46° 23' 31" N latitude and 119° 24' 40" W longitude. The elevation of the site is 480 feet above sea level.



**Figure C.1.** Map of the Hanford Site and Surrounding Areas Including Location of Hanford Meteorological Monitoring Network Stations (Refer to Table C.1 for the names of the numbered locations on this map.)

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**Table C.1.** Station Numbers, Names, and Instrumentation for Each Hanford Meteorological Monitoring Network Site (all stations are 30 feet tall unless otherwise indicated)

| Site Number       | Site Name                              | Instrumentation          |
|-------------------|--|--------------------------|
| 1                 | Prosser Barricade                      | WS, WD, T, P             |
| 2                 | EOC                                    | WS, WD, T, P             |
| 3                 | Army Loop Road                         | WS, WD, T, P             |
| 4                 | Rattlesnake Springs                    | WS, WD, T, P             |
| 5                 | Edna                                   | WS, WD, T                |
| 6                 | 200 East Area                          | WS, WD, T, P, AP         |
| 7                 | 200 West Area                          | WS, WD, T, P             |
| 8                 | Beverly                                | WS, WD, T, P             |
| 9                 | FFTF (200 feet)                        | WD, T, TD, DP, P, AP     |
| 10                | Yakima Barricade                       | WS, WD, T, P, AP         |
| 11                | 300 Area (200 feet)                    | WS, WD, T, TD, DP, P, AP |
| 12                | Wye Barricade                          | WS, WD, T, P             |
| 13                | 100-N Area (200 feet)                  | WS, WD, T, TD, DP, P, AP |
| 14                | Energy Northwest (Supply System)       | WS, WD, T, P             |
| 15                | Franklin County                        | WS, WD, T                |
| 16                | Gable Mountain                         | WS, WD, T                |
| 17                | Ringold                                | WS, WD, T, P             |
| 18                | Richland Airport                       | WS, WD, T, AP            |
| 19                | Plutonium Finishing Plant              | WS, WD, T, AP            |
| 20                | Rattlesnake Mountain                   | WS, WD, T, P             |
| 21                | Hanford Meteorology Station (410 feet) | WS, WD, T, P, AP         |
| 22                | Tri-Cities Airport                     | WS, WD, T, P             |
| 23                | Gable West                             | WS, WD, T                |
| 24                | 100-F Area                             | WS, WD, T, P             |
| 25                | Vernita Bridge                         | WS, WD, T                |
| 26                | Benton City                            | WS, WD, T, P             |
| 27                | Vista                                  | WS, WD, T, P             |
| 28 <sup>(a)</sup> | Roosevelt, Washington                  | WS, WD, T, P, AP         |
| 29                | 100-K Area                             | WS, WD, T, P, AP         |
| 30                | HAMMER                                 | WS, WD, T                |

(a) Roosevelt is located on the Columbia River west/southwest of the Hanford Site.

AP = Atmospheric pressure.

DP = Dewpoint temperature.

P = Precipitation.

T = Temperature.

TD = Temperature difference.

WD= Wind direction.

WS = Wind speed.

### **C.1.2 Site 2 – Emergency Operations Center Monitoring Site (EOC)**

The Emergency Operations Center (EOC) monitoring site is located in the old Ecology Reserve compound within the boundaries of the Arid Lands Ecology Reserve. The compound is on the east slope of Rattlesnake Mountain, downhill and to the east of the Rattlesnake Mountain Observatory. The monitoring site is situated in the northwest corner of the Ecology Reserve compound approximately 300 feet from a series of one-story buildings located in this portion of the compound. The elevation of the local topography decreases smoothly to the east-northeast, as the terrain slopes downward from Rattlesnake Mountain with a 5% grade. The monitoring site is at 46° 23' 33" N latitude and 119° 32' 10" W longitude. The elevation of the site is 1,240 feet above sea level.

### **C.1.3 Site 3 – Army Loop Road Monitoring Site (Army)**

The Army Loop Road monitoring site is located about 4 miles south of the 200 East Area and about 1 mile northeast of Highway 240. The 30-foot tower is positioned 100 feet south of Army Loop Road on flat terrain that slopes gradually toward the floor of the Cold Creek Valley to the southwest. The site is at 46° 29' 19" N latitude and 119° 32' 53" W longitude. The elevation of the site is 565 feet above sea level.

### **C.1.4 Site 4 – Rattlesnake Springs Monitoring Site (RSPG)**

The Rattlesnake Springs monitoring site is located east of Highway 240 on the Hanford Site's Arid Land Ecology Reserve. The site is 0.4 mile east of the eastern edge of the Yakima Ridge and 1.6 miles southwest of gate 218 on Highway 240. Topography should have a strong influence on the meteorological parameters measured at this site. The site is located about 300 feet south of Dry Creek, in a valley that descends from west to east between the Yakima Ridge (to the north) and the Rattlesnake Hills (to the south). The valley is not symmetrical; most of the valley is composed of a 2-degree slope that descends from the south to meet valley's steep northern slope. Dry Creek runs along the floor of the valley just south of the steep northern slope. Winds and temperatures at the site are affected by local drainage flows along the valley floor. The site is at 46° 30' 22" N latitude and 119° 41' 56" W longitude. The elevation of the site is 680 feet above sea level.

### **C.1.5 Site 5 – Edna Monitoring Site (EDNA)**

The Edna monitoring site is located just east of Highway 2N about 0.7 mile north of the intersection of Hanford Route 11-A. The site is about 0.5 mile west of the remains of the Hanford Townsite's old school. The name of the monitoring site is taken from the "Edna" railroad crossing, which is located about 0.6 mile west of the site. The topography of the area is flat. The site is at 46° 35' 15" N latitude and 119° 23' 50" W longitude. The elevation of the site is 410 feet above sea level.

### **C.1.6 Site 6 – 200 East Monitoring Site (200E)**

The 200 East monitoring site is located within the confines of the 200 East Area. The monitoring site is about 0.4 mile north of the Plutonium Uranium Extraction Plant (PUREX) and about 0.25 mile east of the Critical Mass Laboratory. The topography within the 200 East Area is flat. The impact of 200 East

buildings on the winds measured at the monitoring site should be negligible. The site is at 46° 33' 23" N latitude and 119° 31' 14" W longitude. The elevation of the site is 680 feet above sea level.

#### **C.1.7 Site 7 – 200 West Monitoring Site (200W)**

The 200 West monitoring site is currently located about 400 feet west of Hanford Route 6 and 2.4 miles south of Hanford Route 11-A. The site is several hundred meters outside the 200 West Area fence line. The monitoring site has been at its present location since 1988. From 1985 to 1988, the site was located several hundred meters north-northwest of its current location. The topography near the current and previous location of the monitoring site is level; there is only a 10-foot variation in elevation within a mile of the site. Before 1985, the site was located approximately 500 feet west of the 242-S Building within the 200 West Area. One reason for the site's removal from this location was the potential for local meteorological interference from nearby buildings and trees. The current location of the site is at 46° 32' 35" N latitude and 119° 39' 41" W longitude. The elevation of the site is 635 feet above sea level.

#### **C.1.8 Site 9 – Fast Flux Test Facility Monitoring Site (FFTF)**

The Fast Flux Test Facility (FFTF) monitoring site is located about 1,000 feet south of the FFTF fence line almost due south of the reactor dome. Measurements at this site are made using a 200-foot instrumented tower. The tower is situated on a large gravel pad on a stabilized sand dune at a slightly higher elevation than the surrounding terrain. The local topography is dominated by a series of low, stabilized sand dunes that are oriented along a southwest-northeast axis. The elevation of the local terrain changes dramatically along a lengthy north-south slope that approaches within 2,000 feet to the east of the monitoring site. At the bottom of this slope, the terrain elevation is more than 100 feet lower than at the base of the 200-foot tower. The site is at 46° 25' 49" N latitude and 119° 21' 31" W longitude. The elevation of the base of the tower is 570 feet above sea level.

Winds are measured at three levels on the towers: 30 feet, 82 feet, and 200 feet. Air temperatures are also measured at three levels on the tower: 5 feet, 30 feet, and 200 feet. The dew point temperature is also measured at the 5-foot level. Before 1983, a 30-foot tower was operated at a location about 0.8 mile to the north-northeast of the 200-foot tower.

#### **C.1.9 Site 10 – Yakima Barricade Monitoring Site (YAKB)**

The Yakima Barricade monitoring site is located by the Yakima Barricade guardhouse near the intersection of Hanford Route 11-A and State Highway 240 at the western edge of the Hanford Site. The 30-foot tower is located about 230 feet north-northeast of the guardhouse within the boundaries of the Hanford Site. This site is located on the 200 Area Plateau. The southern edge of the plateau is just over 0.6 mile south-southeast of the site. Higher terrain is located just over 0.6 mile to the west of the site. There are no major topographical features in the immediate vicinity of the site. The monitoring site is at 46° 34' 41" N latitude and 119° 43' 30" W longitude. The elevation of the site is 795 feet above sea level.

### **C.1.10 Site 11 – 300 Area Monitoring Site (300A)**

The 300 Area monitoring site is located about 1,300 feet southwest of the southwestern corner of the 300 Area. The site is about 800 feet west of Hanford Route 4S (Stevens Drive) and about 500 feet west of the railroad tracks that parallel Route 4S. Measurements at this site are made using a 200-foot instrumented tower. The tower is situated on a gravel pad at the top of partially stabilized sand dune. The dune appears to be one of several dunes in the area that are oriented along a southwest-northeast axis. The site is at 46° 21' 50" N latitude and 119° 17' 08" W longitude. The elevation of the base of the tower is 390 feet sea level.

Winds are measured at three levels on the towers: 30 feet, 82 feet, and 200 feet. Air temperatures are also measured at three levels on the tower: 5 feet, 30 feet, and 200 feet. The dew point temperature is also measured at the 5-foot level. Before 1983, meteorological measurements at this site were made on a 30-foot instrumented tower. The old 30-foot tower was located within 100 feet of the present tower.

### **C.1.11 Site 12 – Wye Barricade Monitoring Site (WYEB)**

The Wye Barricade monitoring site is located just west of the Wye Barricade guardhouse on Hanford Route 4S. The 30-foot tower is located about 260 feet west of the guardhouse on the top of a stabilized sand dune. Because of its position on top of a sand dune, the base of the 30-foot tower is about 10 to 13 feet above the base of the guardhouse. There are no significant terrain features in the vicinity of this monitoring site; however, low, stabilized sand dunes characterize the terrain to the southwest of the site. The monitoring site is at 46° 28' 56" N latitude and 119° 23' 34" W longitude. The elevation of the site is 550 feet above sea level.

### **C.1.12 Site 13 – 100-N Monitoring Site (100A)**

The 100-N monitoring site is located between the 100-N and 100-D Areas, just over 1,300 ft to the southwest of the Columbia River. The 100-N monitoring site is closer to the 100-D Area (0.5 mile from the reactor buildings) than to the 100-N Area (1.5 miles away). Measurements at this site are made using a 200-foot instrumented tower. The topography around the 200-foot tower is flat. The site is located at 46° 41' 16" N latitude and 119° 32' 58" W longitude. The elevation of the station is 460 feet above sea level.

Winds are measured at three levels on the towers: 30 feet, 82 feet, and 200 feet. Air temperatures are also measured at three levels on the tower: 5 feet, 30 feet, and 200 feet. The dew point temperature is also measured at the 5-foot level. Before 1983, a 30-foot tower was operated at a location much closer to the 100-N Area. This tower was on a rise about 0.3 mile east of the reactor building, at a point about 500 feet northeast of the 100-N Area's main access road.

### **C.1.13 Site 14 – WNP-2 Monitoring Site (WPPS)**

The Washington Nuclear Power Plant 2 (WNP-2) monitoring site is located about 0.4 mile west of the WNP-2 reactor building. The 30-foot tower at this site is located about 120 feet west of WNP's 200-foot instrumented tower, which is not part of the Hanford Meteorology Monitoring Network. The topography



in the immediate vicinity of the monitoring site is flat, but stabilized sand dunes are located within several hundred feet of the site. The monitoring site is at 46° 28' 12" N latitude and 119° 20' 34" W longitude. The elevation of the site is 450 feet above sea level.

#### **C.1.14 Site 15 – Franklin County Monitoring Site (FRNK)**

The Franklin County monitoring site is located outside of the Hanford Site on the east side of the Columbia River. The site is located just over 4 miles north-northeast of the 300 Area and about 1.2 miles east of the Columbia River. The topography near the site is flat, although the elevation of the terrain increases slightly to the west. Rankin Canyon is located about 0.3 mile to the west of the site, but the steep slope of the canyon's walls cannot be seen from the base of the 30-foot tower. This monitoring site is on a gravel road that runs through an apple orchard. The trees are currently about 9 to 13 feet tall. The trees might have some impact on the meteorological parameters measured on the tower in recent years. This impact should be greatest during the warm season when leaves are on the trees. The monitoring site is at 46° 25' 3" N latitude and 119° 14' 12" W longitude. The elevation of the terrain on the east side of the Columbia River is significantly higher than on the west side of the river; the elevation of the monitoring site is 875 feet above sea level.

#### **C.1.15 Site 16 – Gable Mountain Monitoring Site (GABL)**

The Gable Mountain monitoring site is located at the eastern summit of Gable Mountain. The summit contains various types of towers and power poles. The 30-foot instrumented meteorological tower is located about 30 feet to the west of the small (approximately 13 feet by 20 feet), low (10 feet), cinder-block building at the summit. A tall utility-type pole with a diameter of about 2 feet is located near the southwestern corner of the building. Under some conditions these structures may influence meteorological measurements at this site. The monitoring site is located at 46° 35' 53" N latitude and 119° 27' 36" W longitude. The elevation of the site is 1,085 feet above sea level.

#### **C.1.16 Site 17 – Ringold Monitoring Site (RING)**

The Ringold monitoring site is outside of the Hanford Site on the east side of the Columbia River. The site is located at the intersection of Rickert Road and Ranger Drive about 2.2 miles east of the Columbia River and 2.5 miles north-northeast of the Ringold fish hatchery. The local topography increases in elevation to the northeast (up-valley) and northwest (toward the valley rim). To the southwest, a hill in the middle of the valley splits the valley in half before it reaches the Columbia River. There are a few small-scale undulations in terrain height within the valley; however, changes in elevation are so gradual and uniform that the valley floor appears flat. The monitoring site is at 46° 32' 42" N latitude and 119° 14' 13" W longitude. The site is located in a northeast-southwest oriented valley at an elevation of 620 feet above sea level. The elevation of the terrain on the northwestern rim of the valley, 0.7 mile from the site, exceeds 900 feet above sea level. The elevation of the terrain on the southeastern rim of the valley, 1.5 miles from the site, exceeds 850 feet above sea level.

### **C.1.17 Site 18 – Richland Airport Monitoring Site (RICH)**

The monitoring site at the Richland Airport is on the roof of the old control tower on the south side of the airport. The wind sensors are mounted about 10 feet above the roof of the control tower at about 40 feet above the ground. Air temperature is measured at a height of 5.5 feet above the roof of the control tower on a short instrument tower at the northern edge of the roof. The topography of the surrounding area is relatively flat. The site is located at 46° 18' 04" N latitude and 119° 18' 01" W longitude. The elevation of the base of the control tower is 390 feet above sea level.

### **C.1.18 Site 20 – Rattlesnake Mountain Monitoring Site (RTMN)**

The Rattlesnake Mountain monitoring site is located near the Astronomical Observatory on the crest of Rattlesnake Mountain. The monitoring site is about 230 feet southeast of the southernmost observatory dome. Instruments at the site are mounted on a 15-foot pole that is sunk into a concrete support platform on the crest of Rattlesnake Mountain. This site is subjected to extreme winds and a much cooler temperature regime than the monitoring sites in the basin to the east. The site is located at 46° 23' 40" N latitude and 119° 24' 40" W longitude. The elevation of the site is 3,560 feet above sea level.

### **C.1.19 Site 21 – The Hanford Meteorology Station (HMS)**

Meteorological monitoring at the Hanford Meteorology Station is conducted on the station's 410-foot instrumented tower and at surface locations. The station is located between the 200 West and 200 East operating areas, about 0.6 mile north of the east gate to the 200 West Area and about 300 feet east of Hanford Route 3. At this site, wind measurements are made at seven heights, ranging from 7 feet to 400 feet above ground level, using near-surface monitoring equipment and instruments on the 410-foot tower. Similarly, air temperatures are measured at eight heights, ranging from 5 feet to 400 feet above ground level.

In addition to winds and air temperatures, a variety of other meteorological variables are measured or observed at the Hanford Meteorology Station. These parameters, including dew point, relative humidity, precipitation, atmospheric pressure, cloud cover, and visibility are also measured at the Hanford Meteorology Station (Glantz and Islam 1988). Winds aloft are also measured using a Doppler acoustic sounder.

### **C.1.20 Site 22 – Pasco Airport Monitoring Site (PASC)**

The monitoring site at the Pasco Airport is on the roof of the old control tower on the east side of the airport. The control tower is approximately five stories tall. The wind sensors are mounted at a height of about 5 feet above the roof of the control tower, roughly 70 feet above the ground. Air temperature is measured at a height of 5.5 feet above the ground on the north side of the control tower building. The topography near the monitoring site is relatively flat; however, large aircraft hangers are located to the south of the control tower. The size and location of these buildings could affect the winds measured on the control tower under some circumstances. The site is located at 46° 15' 48" N latitude and 119° 06' 18" W longitude. The elevation of the base of the control tower is 410 feet above sea level.

**C.1.21 Site 23 – 100-F Monitoring Site (100F)**

The 100-F monitoring site is located about 1.5 miles south of the 100-F Area, slightly southwest of the Junction of Hanford Route 1 and Hanford Route 2N, and east of the local railroad tracks. The monitoring site is about 1.5 miles west of the Columbia River. The station tower is situated in an area of relatively flat topography. The site is at 46° 38' 6" N latitude and 119° 27' 4" W longitude. The elevation of the site is 410 feet above sea level.

**C.1.22 Site 24 – Gable West Monitoring Site (GABW)**

The Gable West monitoring site is located about 0.4 mile west of the western edge of Sable Mountain at a point less than 230 feet west of Hanford Route 4N. The site is 2.2 miles north of the intersection of Hanford Route 4N and Route 11-A and about 1.6 miles south of the intersection of Hanford Route 4N and Route 1. The tower is situated in an area of relatively flat topography, approximately 0.6 mile north of the 200 Area Plateau. The site is at 46° 36' 35" N latitude and 119° 33' 23" W longitude. The elevation of the station is 490 feet above sea level.

**C.1.23 Site 25 – Vernita Bridge Monitoring Site (VERN)**

The Vernita Bridge monitoring site is located about 0.2 mile downriver (northeast) from the Vernita Bridge. The site is located about 400 feet south of the Columbia River and 50 feet west of the abandoned highway that runs north toward the Columbia River from Hanford Route 6. About 80 feet north of the tower, the local topography begins a 30-foot descent to the waters of the Columbia River. The terrain south of the monitoring site rises gradually in elevation but appears quite flat. The meteorology at this site should be strongly influenced by the Columbia River and surrounding terrain. The site is at 46° 38' 29" N latitude and 119° 43' 34" W longitude. The elevation of the site is 430 feet above sea level.

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