
6.1 Climate and Meteorology

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Meteorological measurements are taken to support 1) Hanford Site emergency preparedness and response, 2) Hanford Site operations, and 3) atmospheric dispersion calculations for dose assessments. Support is provided through weather forecasting and maintenance and distribution of climatological data. Forecasting is provided to help manage weather-dependent operations. Climatological data are provided to help plan weather-dependent activities and are used as a resource to assess the environmental effects of Hanford Site operations.

The Cascade Range to the west of Yakima greatly influences the climate of the Hanford Site. These mountains create a rain shadow effect and also serve as a source of cold air drainage, which significantly affects the wind regime.

The Hanford Meteorology Station is located on the 200 Areas plateau, where the prevailing wind direction is from the northwest during all months of the year. The secondary wind direction is from the southwest. Summaries of wind direction indicate that winds from the northwest quadrant occur most often during winter and summer. During spring and fall, the frequency of southwesterly winds increases, with a corresponding decrease in the northwesterly flow. Monthly average wind speeds are lowest during winter months, averaging 10 to 11 km/h (6 to 7 mph), and highest during summer, averaging 13 to 15 km/h (8 to 9 mph). Wind speeds that are well above average are usually associated with southwesterly winds. However, summertime drainage winds are generally northwesterly and frequently reach 50 km/h (30 mph). These winds are most prevalent over the northern portion of the site.

Daily and monthly averages and extremes of temperature, dew point temperature, and relative humidity for 1945 through 1996 are reported by Hoitink and Burk (1997). From 1945 through 1996, the record maximum temperature was 45°C (113°F) recorded in August 1961, and the record minimum temperature was -30.6°C (-23°F) in February 1950. Normal monthly temperatures ranged from a low of -0.4°C (31.3°F) in January to a high of

24.6°C (76.2°F) in July. During winter, the highest monthly average temperature at the Hanford Meteorology Station was 6.9°C (44.5°F) in February 1991, and the record lowest was -11.1°C (12.1°F) in January 1950. During summer, the record maximum monthly average temperature was 27.9°C (82.2°F) in July 1985, and the record minimum was 17.2°C (63.0°F) in June 1953. The annual average relative humidity at the Hanford Meteorology Station was 54%. Humidity was highest during winter, averaging approximately 76%, and lowest during summer, averaging approximately 36%. Average annual precipitation at the Hanford Meteorology Station was 15.9 cm (6.26 in.). The wettest year on record, 1995, received 31 cm (12.30 in.) of precipitation; the driest, 1976, received 8 cm (2.99 in.). Most precipitation occurred during winter, with more than half of the annual amount occurring from November through February.

Atmospheric dispersion is a function of wind speed, wind duration and direction, atmospheric stability, and mixing depth. Dispersion conditions are generally good if winds are moderate to strong, the atmosphere is of neutral or unstable stratification, and there is a deep mixing layer. Good conditions associated with neutral and unstable stratification exist approximately 57% of the time during summer. Less-favorable conditions may occur when wind speed is light and the mixing layer is shallow. These conditions are most common during winter, when moderately to extremely stable stratification exists approximately 66% of the time. Occasionally, there are extended periods of poor dispersion conditions, primarily during winter, which are associated with stagnant air in stationary high-pressure systems.

Results of 1996 Monitoring

1996 was cooler than normal and the second wettest year on record. The average temperature for 1996 was 11.3°C (52.4°F), which was 0.5°C (0.9°F) below normal (11.8°C [53.3°F]). Nine months during 1996 were cooler than normal, and three months were warmer than normal. July

had the highest positive departure, 1.8°C (3.3°F); February, at 2.9°C (5.2°F) below normal, had the largest negative departure. The minimum temperatures of -27.8°C (-18°F) on January 31 and February 1 were the coldest temperatures recorded at the Hanford Meteorology Station in more than 40 years since a low of -30.0°C (-22°F) recorded on January 26, 1957.

Precipitation for 1996 totaled 31.0 cm (12.19 in.), 195% of normal (15.9 cm [6.26 in.]), with 146.0 cm (57.5 in.) of snow (compared to an annual normal snowfall of 35.1 cm [13.8 in.]). This was the snowiest calendar year on record. The previous snowiest calendar year was 1985 with 94.2 cm (37.1 in.).

The average wind speed for 1996 was 12.9 km/h (8.0 mph), which was 0.5 km/h (0.3 mph) above normal, and the peak gusts for the year were 89 km/h (55 mph) on February 23 and again on April 23. Figure 6.1.1 shows the 1996 wind roses (diagrams showing direction and frequencies of wind) at 10 m (32.8 ft) for the 28 meteorological monitoring stations on and around the Hanford Site.

Table 6.1.1 provides monthly climatological data from the Hanford Meteorology Station for 1996.

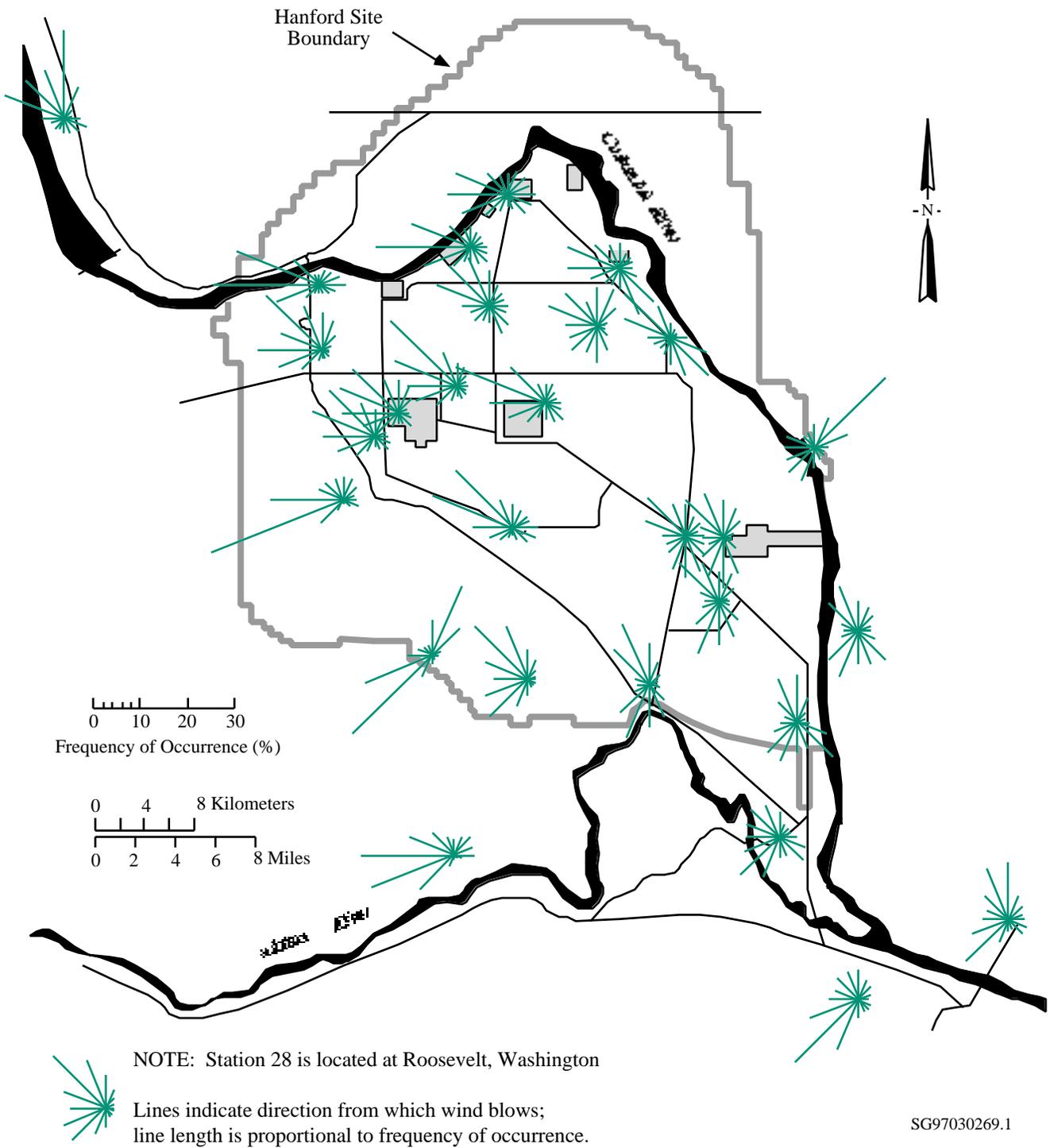


Figure 6.1.1. Hanford Meteorological Monitoring Network Wind Roses (at 10 m [32.8 ft]), 1996. Individual lines indicate direction from which wind blows. Length of line is proportional to frequency of occurrences from a particular direction.

Table 6.1.1. Monthly Climatological Data from the Hanford Meteorology Station, 1996

Hanford Meteorology Station, 40 km (25 mi) northwest of Richland, Washington, latitude 46° 34'N, longitude 119° 35'W, elevation 223 m (733 ft)

Month	Temperatures, °C					Precipitation (cm)			Relative Humidity (%)		15-m Wind ^(a)								
	Averages		Extremes			Total	Departure ^(b)	Snowfall	Average	Departure ^(b)	Average Speed, km/h	Departure ^(b)	Peak Gusts						
	Daily Maximum	Daily Minimum	Monthly	Departure ^(b)	Highest								Date	Lowest	Date	Speed, km/h	Direction	Date	
J	2.1	-5.7	-1.8	-1.4	14.4	15	-27.8	31	3.6	+1.6	42.4	+32.5	82.9	+6.5	10.5	0.0	87	WSW	3
F	6.3	-5.4	0.4	-2.9	17.2	8	-27.8	1	3.1	+1.5	15.0	+9.9	70.3	0.0	11.6	0.0	89	SSW	23
M	13.5	0.8	7.1	-0.4	20.0	14	-7.8	1	2.1	+0.9	1.0	+0.2	59.4	+3.5	12.4	-1.0	74	WNW	15
A	20.1	5.6	12.8	+1.3	27.8	8	-1.1	4	1.1	0	0	-T ^(c)	51.0	+3.8	14.8	+0.3	89	SW	23
M	21.9	7.1	14.5	-1.8	30.0	26+ ^(d)	-1.7	8	1.6	+0.3	0	0	47.4	+4.7	15.0	+0.3	68	NW	27+ ^(d)
J	29.2	11.9	20.6	-0.4	36.7	7	7.2	19	0.1	-0.8	0	0	36.3	-2.5	15.1	+0.3	69	SSW	23
J	35.7	17.0	26.4	+1.8	42.2	26+ ^(d)	9.4	18	0.4	-0.1	0	0	31.0	-2.5	14.3	+0.2	77	WNW	9
A	33.7	14.8	24.2	+0.3	42.8	10	8.9	19	0.1	-0.6	0	0	33.2	-2.6	15.3	+2.6	69	WSW	11
S	26.6	9.4	18.0	-0.7	34.4	11	1.1	25	0.6	-0.2	0	0	45.2	+2.5	12.9	+1.0	79	NW	21
O	18.0	4.7	11.3	-0.3	30.0	10	-4.4	21	2.2	+1.3	0	-T ^(c)	59.4	+4.2	11.6	+1.1	69	W	13
N	8.3	-1.2	3.6	-1.0	18.9	8	-8.3	24	6.8	+4.5	30.2	+25.6	78.4	+5.0	9.8	-0.5	71	SW	6
D	2.4	-4.8	-1.2	-0.9	11.1	31+ ^(d)	-21.1	28	9.4	+6.8	57.4	+42.9	81.2	+0.9	11.4	+1.9	71	S	2
Y ^(e)	18.2	4.5	11.3	-0.5	42.8	Aug	-27.8	Feb	31.0	+15.1	146.0	+111.0	56.3	+2.0	12.9	+0.5	89	SW	Apr 23+ ^(d)

NOTE: See conversion table in "Helpful Information."

(a) Measured on a tower 15 m (50 ft) above the ground.

(b) Departure columns indicate positive or negative departure of meteorological parameters from 30-year (1961-1990) climatological normals.

(c) Trace.

(d) + after date indicates latest of several occurrences.

(e) Yearly averages, extremes, and totals.