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**Civilian Radioactive Waste Management System  
Management and Operating Contractor**

**Meteorological Monitoring Program  
1996 Summary Report**

**B00000000-01717-5705-00072 REV 00**

**October 28, 1997**

**Prepared for:**

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Management and Operating Contractor**

**Meteorological Monitoring Program  
1996 Summary Report**

**(SCPB: 8.3.1.12.2.1)**

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**October 28, 1997**

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## **EXECUTIVE SUMMARY**

Meteorological monitoring in the Environmental Field Programs Division's (EFPD) network of nine stations on and around Yucca Mountain continues to add to the knowledge on airflow, atmospheric dispersion, and local weather conditions necessary to support various performance assessment, design, licensing, and environmental analysis tasks. Portions of the data collected are reported to the State of Nevada to fulfill monitoring requirements stated in attachments to the air quality operating permit covering site characterization work.

The results from 1996 show both similarities and differences compared to results from previous years. The distinctive general diurnal airflow cycle of daytime winds from the south and nighttime downslope winds generally from the north or northwest directions prevailed. The frequency of the north and south winds varied from 1995, as did the 1995 winds from the 1994 winds. The temperature results were similar to previous years. The 1996 precipitation totals were near the site average, which was significantly less than the 1995 totals.

Atmospheric dispersion, precipitation, and general weather characteristics in the Yucca Mountain area are complex products of regional-scale weather conditions and influences of local topography. Frequent abundant sunshine and moderate wind speeds cause the usual daytime atmospheric dispersion pattern to be toward the north with very strong atmospheric mixing conditions. Typical surface layer nighttime airflow is a complex structure of stable atmospheric conditions and winds generally blowing from higher to lower elevation terrain. This pattern causes airflow with less atmospheric mixing blowing from Midway Valley toward the south into Amargosa Valley.

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## 1. INTRODUCTION

The U.S. Department of Energy (DOE) Yucca Mountain Site Characterization Project (YMP) has been collecting meteorological data in an environmental monitoring program since December 1985. The monitoring methods conform to the requirements and guidance provided by the U.S. Nuclear Regulatory Commission (NRC), and the U.S. Environmental Protection Agency (EPA). The monitoring program also complies with YMP requirements, including the *Quality Assurance Requirements and Description* (DOE 1997). The monitoring program subsequently expanded coverage to improve understanding of local airflow in the area around the Exploratory Studies Facility (ESF) and at the southern boundary of the Nevada Test Site (NTS) near Amargosa Valley. The monitoring program purposes include:

- Characterizing local atmospheric dispersion to support preclosure radiological dose assessments to on-site workers and the public.
- Characterizing local meteorological conditions to support geohydrology, surface facility and repository ventilation system design activities, and environmental studies.
- Complying with the State of Nevada air quality operating permit conditions related to site characterization field activities.

This summary report covers the tenth year of the program, from January 1996 through December 1996. Subsequent sections of this report describe the program, list program events, show data recovery rates, and discuss the results. Some data summaries are presented in tabular and graphical format within text sections; other tables are included in appendices.

### 1.1 SITE DESCRIPTIONS

The monitoring network consists of nine sites. Eight sites have towers with instruments mounted 10 meters above ground level (10-m), and one has a tower with instruments mounted 60 meters above ground level (60-m). Site locations range from Gate-510 on the southern boundary of the NTS near Amargosa Valley to well pad WT-6, which is 25 km (15.5 miles) northwest of Gate-510 along the western NTS boundary in Yucca Wash. Site elevations range from 838 m (2,750 ft) above mean sea level (MSL) at Gate-510 to 1,478 m (4,850 ft) MSL on top of the Yucca Mountain ridge. The site locations and instruments were chosen primarily to characterize airflow and atmospheric dispersion near potential emission sources in Midway Valley and the east side of Yucca Mountain, and along potential airflow pathways toward Amargosa Valley. Since topographic features such as hills and valleys have significant influence on local airflow and related dispersion characteristics, the sites were located in a variety of topography and over a wide area. Airflow studies (Blumen 1990) in areas with similar topography to that of Yucca Mountain have demonstrated complicated airflow and dispersion patterns.

The varied geographic and elevation coverage of the monitoring sites also provides additional locations which are key to monitoring meteorological conditions significant to geohydrologic studies. The network coverage provides data relevant to the engineering design of proposed surface facilities and repository ventilation systems. Figure 1-1 is a map showing site locations, and Table 1-1 is a list of the geographic coordinates and elevation of each site.

#### **1.1.1 Site 1 (NTS-60)**

Site 1 is at an elevation of 1,143 m (3,750 ft) MSL. It is located in western Midway Valley, an area bounded on the west by Yucca Mountain, a north-south narrow ridge with a maximum elevation of 1,523 m (4,997 ft) MSL; on the east by Fran Ridge; and on the south by a saddle between Fran Ridge and Yucca Mountain, with elevations up to approximately 1,220 m (4,000 ft) MSL. This site has a multi-level meteorological tower that makes continuous wind and temperature measurements at 60-m and 10-m heights typically required by the NRC for dispersion analyses. The atmospheric profile information helps define both the vertical temperature and wind layer structures. Of the network sites, this is the closest to the ESF and proposed surface facilities. Data collected at this site will be used to evaluate the ambient environment representative of the ESF.

#### **1.1.2 Site 2 (Yucca Mountain)**

Site 2 is near the northern end of the Yucca Mountain ridge, approximately 3.4 km (2.1 miles) west-northwest of Site 1 at an elevation of 1,478 m (4,850 ft) MSL. Data from this ridgetop site will provide information about airflow and other meteorological conditions along the Yucca Mountain ridge, and airflow above Midway Valley.

#### **1.1.3 Site 3 (Coyote Wash)**

Site 3 is midway up Coyote Wash, 2.3 km (1.4 miles) west-northwest of Site 1 at an elevation of 1,279 m (4,195 ft) MSL. This site is in one of the many canyon drainages that dominate the eastern slope of Yucca Mountain. Data from this site will be used to assess atmospheric conditions typical of these canyons which could transport emissions from vents proposed in repository designs.

#### **1.1.4 Site 4 (Alice Hill)**

This tower is on Alice Hill, in the northeastern portion of Midway Valley near the junction of Yucca Wash and Fortymile Canyon. It is 3.4 km (2.1 miles) northeast of Site 1 at an elevation of 1,234 m (4,050 ft) MSL. Data from this exposed hilltop location will be compared with that from Site 1, in Midway Valley, and Site 7, in Sever Wash, to study the vertical structure of the airflow along this likely pathway from the proposed repository in Midway Valley toward the nearest populated area in Amargosa Valley.

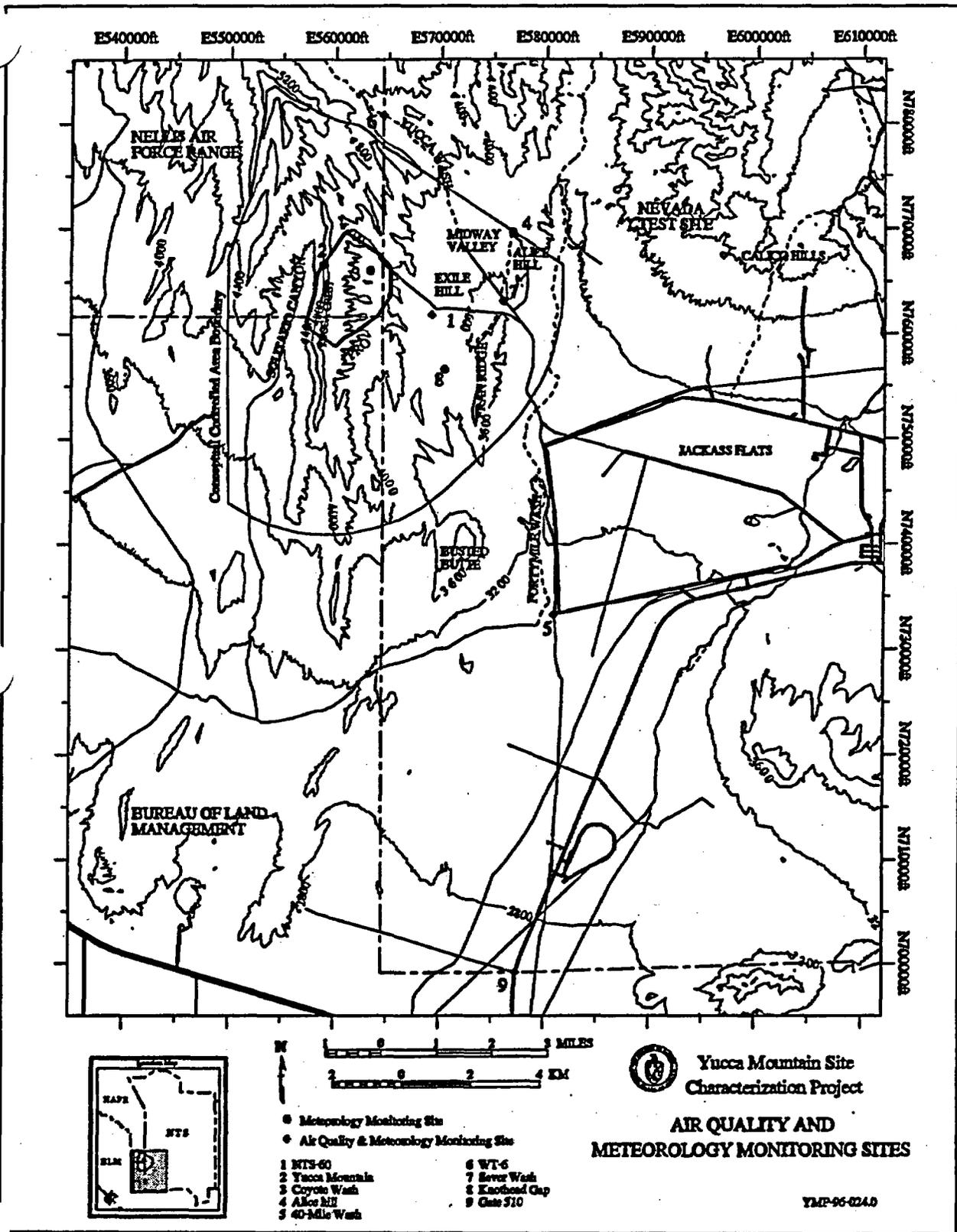


Figure 1-1. Locations of the Meteorological Monitoring Sites

Table 1-1. Coordinates of the Meteorological Monitoring Sites

Site	UTM Coordinates Zone 11 (meters)	Nevada Coordinance System Central Zone (feet)	Latitude- Longitude <sup>1</sup> (deg° min' sec")	Elevation (above mean sea level)
Site 1 (NTS-60)	550,784E 4,077,374N	569,126E 761,795N	116°25'50"W 36°50'34"N	3750 ft 1143 m
Site 2 (Yucca Mountain)	547,646E 4,078,753N	558,844E 766,356N	116°27'56"W 36°51'19"N	4850 ft 1478 m
Site 3 (Coyote Wash)	548,874E 4,078,701N	562,874E 766,171N	116°27'06"W 36°51'17"N	4195 ft 1279 m
Site 4 (Alice Hill)	553,117E 4,079,779N	576,810E 769,661N	116°24'15"W 36°51'51"N	4050 ft 1234 m
Site 5 (Fortymile Wash)	554,385E 4,068,727N	580,843E 733,378N	116°23'28"W 36°45'52"N	3125 ft 953 m
Site 6 (WT-6)	549,388E 4,083,097N	564,612E 780,592N	116°26'45"W 36°53'40"N	4315 ft 1315 m
Site 7 (Sever Wash)	552,800E 4,077,847N	575,747E 763,324N	116°24'28"W 36°50'49"N	3545 ft 1081 m
Site 8 (Knothead Gap)	551,161E 4,075,773N	570,344E 756,538N	116°25'35"W 36°49'42"N	3710 ft 1131 m
Site 9 (Gate-510)	553,418E 4,058,398N	577,554E 699,491N	116°24'08"W 36°40'17"N	2750 ft 838 m

<sup>1</sup> NAD27 (North American Datum of 1927)

### **1.1.5 Site 5 (Fortymile Wash)**

Site 5 is in the broad valley of lower Jackass Flats, and overlooks the eastern edge of Fortymile Wash, about midway between Yucca Wash to the north and Amargosa Valley to the south. The site is 9.4 km (5.8 miles) southeast of Site 1 at an elevation of 953 m (3,125 ft) MSL. Data from this site will be used to study airflow between Midway Valley and Amargosa Valley through this portion of Jackass Flats.

### **1.1.6 Site 6 (WT-6)**

This northern-most tower in the network is at well pad WT-6 on the western border of the NTS, adjacent to the Nellis Air Force Gunnery Range, in the northern portion of Yucca Wash. It is 6.1 km (3.8 miles) northwest of Site 1 at an elevation of 1,315 m (4,315 ft) MSL. This site monitors the southerly daytime airflow exiting the northern end of Midway Valley. It also monitors the nighttime northerly drainage winds entering Midway Valley through Yucca Wash. This site's data will be used to characterize the potential pathway of possible daytime emissions from Midway Valley and the initiation of the nighttime drainage wind into Midway Valley.

### **1.1.7 Site 7 (Sever Wash)**

Site 7 is in the gap between Fran Ridge and Alice Hill on the east side of Midway Valley, 2.1 km (1.3 miles) east-northeast of Site 1 at an elevation of 1,081 m (3,545 ft) MSL. The site is near the lowest elevation in Midway Valley and is on a surface pathway of diurnal airflow that enters and exits Midway Valley through this gap. Comparisons between conditions at this site and Site 4, which is 2 km north-northeast of Site 7 and 153 m (approximately 505 ft) higher in elevation on the top of Alice Hill, will provide insight into the vertical structure of airflow in this area.

### **1.1.8 Site 8 (Knothead Gap)**

Site 8 is in the southern portion of Midway Valley in the saddle between the Yucca Mountain ridge and Fran Ridge. It is 1.7 km (1.1 miles) south of Site 1 at an elevation of 1,131 m (3,710 ft) MSL. The site is east of the ESF south portal. This location was chosen primarily to determine nighttime airflow in this portion of Midway Valley. This determination is important to assess possible impacts of airborne releases near the south portal.

### **1.1.9 Site 9 (Gate-510)**

This site, near the southwest corner of the NTS, marks the southernmost extent of the network. It is 19.2 km (11.9 miles) south of Site 1 at an elevation of 838 m (2,750 ft) MSL, between Jackass Flats and Amargosa Valley. The site monitors near-surface airflow between the NTS portion of the site characterization area and the community of Amargosa Valley, the populated area nearest the proposed repository location. Monitoring meteorological conditions in this area is critical to assessing potential impact of airborne contaminants to this community.

## 1.2 MEASUREMENTS

The meteorological monitoring equipment and methods used throughout the monitoring program comply with NRC regulations (AEC 1972; NRC 1977), the EPA Prevention of Significant Deterioration (PSD) (EPA 1987a) and monitoring for regulatory modeling applications (EPA 1987b) guidelines. Although PSD regulations do not apply to the site characterization activities, meeting these requirements significantly increases the probability that the data collected can meet future dispersion modeling requirements. In addition, the State of Nevada air quality operating permit stipulates that equipment and methods must comply with the PSD guidance.

The monitoring station equipment was purchased as systems and was installed and operated by the EFPD. The sensors were calibrated using Measuring and Test Equipment that were calibrated traceable to the National Institute of Standards and Technology, or other approved standards organizations. Table 1-2 shows the equipment descriptions. The following is a summary of these elements:

- All nine sites have horizontal wind direction, and both horizontal and vertical speed, measured at 10-m above ground level. This is a standard height for wind measurements in dispersion studies. The tower at Site 1 is instrumented with additional horizontal wind and temperature sensors at 60-m. The taller tower monitors conditions aloft near the proposed surface facilities. This is particularly relevant if there are emissions from elevated sources, such as stacks.
- Air temperature, incoming solar radiation, and relative humidity (Sites 2 through 9) or dew-point temperature (Site 1) are measured at 2-m. Air temperature is also measured at 10-m, providing a delta-temperature (an indicator of atmospheric stability) difference between the 10-m and 2-m levels. Temperature is also measured at 60-m at Site 1 to calculate the difference between the 60-m and 10-m levels.
- Precipitation and barometric pressure are measured near the surface. Precipitation is measured by tipping bucket gauges to document the times and intensities of precipitation events. Standardized storage gauges were added during 1995 to measure precipitation totals by this method. The gauges at Sites 1 through 4 and 6 through 8 are heated to ensure that frozen precipitation can be measured as it falls. Sites 5 and 9 rarely receive measurable frozen precipitation. Precipitation is relevant for geohydrological and facility design studies. Barometric pressure measurements are relevant to local airflow and natural radon emission studies.
- In addition to the measured parameters, the parameters of standard deviation of horizontal wind direction ( $\sigma$ - $\theta$  [ $\sigma$ -A]), vertical wind speed ( $\sigma$ -w), and horizontal wind speed ( $\sigma$ -u) are also reported. These are additional indicators of atmospheric stability.

The on-site dataloggers sample each measurement channel once per second and process the 1-second data to obtain hourly values at all sites. The dataloggers also calculate the 3-second horizontal wind speed, the fastest 1-minute wind speed with corresponding direction, and the 1-minute temperature average. Some data are recorded in 10-minute intervals. Section 1.4 gives the specifics on data recording.

Table 1-2. Equipment Descriptions

Parameter	Measurement or Calculation
Wind speed	Cup anemometer with photochopper
Wind direction	Vane, with potentiometer at Sites 2 through 9 and resolver at Site 1
Temperature and Delta-temperature	Mechanically aspirated shields with thermistor (Sites 2 through 9) or platinum wires (Site 1)
Relative humidity	Capacitance sensors at Sites 2 through 9
Dew point	Chilled mirror at Site 1
Barometric pressure	Aneroid wafer
Precipitation	Tipping bucket, 0.01-inch tip
Solar radiation	Pyranometer
Vertical wind speed	Propeller anemometer with generator or optical chopper

### 1.3 QUALITY ASSURANCE ACTIVITIES

The meteorological monitoring program includes quality assurance and quality control (QA/QC) activities that ensure the program collects documented, valid data. Work instructions control the QA/QC activities based on a combination of NRC and PSD monitoring guidelines and the DOE Office of Civilian Radioactive Waste Management Quality Assurance program presented in the *Quality Assurance Requirements and Description*, DOE/RW-0333P.

The on-site activities include system checks at the sites by the EFPD operations staff. Technical and scientific staff track equipment usage and identify and resolve out-of-tolerance operating conditions. Data were downloaded from electronic storage media from the sites at least monthly, and sent to the EFPD data processing staff to begin the validation process. Data files were imported into a database, during which unusual values were listed for examination by data staff. Objective data processing routines, supplemented by professional judgement and multiple reviews, are used to validate the database. The data were given technical reviews by field meteorologists and technical staff as part of the routine validation process controlled by Nevada Work Instruction procedures.

The active monitoring systems were given periodic performance audits by independent contractors, following EPA monitoring guidance. Other project conformance audits were performed by Management and Operating Contractors, YMP and other DOE organizations.

## 1.4 DATABASE

The monitoring program produces a database of valid, qualified data for each site. Tables 1-3 through 1-5 are descriptions of the parameters in this database. Data Tracking Numbers have been assigned to annual summary reports since 1993, in accordance with YAP-SIII.3Q, *Processing of Technical Data on the Yucca Mountain Site Characterization Project*. Data prior to 1993 were tracked by the records package accession number. This report is identified through Data Tracking Number TM000000000001.103, which in turn identifies source data. Portions of this report utilize summary data from previous years. The Data Tracking Numbers for the 1993, 1994, and 1995 reports are: TM000000000001.063, TM000000000001.081 and, TM000000000001.087 respectively.

Table 1-3. Reported Data - Hourly

Parameter	Calculation Method	Units
Wind speed	scalar average	meters per second
	maximum of 1-second averages	
	maximum of 3-second averages	
Wind direction	average (unit vector)	degrees
Sigma-A	root-mean-square of 15-minute standard deviation of horizontal wind direction	degrees
Sigma-w	standard deviation of vertical wind speed	meters per second
Temperature	average	degrees Celsius
Delta-temperature	average of differences: 10m - 2m at Sites 1 through 9; and 60m - 10m at Site 1	Celsius degrees
Barometric pressure	average	millibars
Relative humidity	average: measured at Sites 2 through 9; calculated for Site 1	percent
Solar radiation	average	Watts per square meter
Precipitation	total	inches
Dew point	average: measured at Site 1; calculated for Sites 2 through 9	degrees Celsius

Table 1-4. Reported Data - 10-minute

Parameter	Calculation Method	Units
Wind speed	scalar average	meters per second
	maximum of 3-second running averages	
	maximum 1-minute average	
Sigma-u	standard deviation of horizontal wind speed	meters per second
Wind direction	average (unit vector)	degrees
	1-minute average direction during 1-minute maximum wind speed	
Sigma-A	standard deviation of wind direction	degrees
Vertical wind speed	average	meters per second
Sigma-w	standard deviation of vertical wind speed	meters per second
Temperature	average	degrees Celsius
Relative Humidity	average: measured at Sites 2 through 9; calculated for Site 1	percent
Dew point	average: measured at Site 1; calculated for Sites 2 through 9	degrees Celsius
Barometric Pressure	average	millibars
Delta-temperature	average of difference: 10m - 2m temperatures.	Celsius degrees
Solar radiation	average	Watts per square meter

Table 1-5. Reported Data - Daily

Parameter	Calculation Method	Units
Wind speed	maximum 3-second running average	meters per second
	maximum 1-minute average	
Temperature	maximum 1-minute average	degrees Celsius
	minimum 1-minute average	degrees Celsius

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## 2. PROGRAM CHANGES AND DATA RECOVERY RATES

Significant changes in site equipment configurations and data sampling are discussed in this section, followed by a discussion of the data recovery rates.

### 2.1 PROGRAM CHANGES

The datalogger processing routines used at Sites 2 through 9 were revised to include average relative humidity, barometric pressure, total precipitation, and system battery voltage in the 10-minute data. This change was made to increase the time resolution of the data record, to improve both techniques to identify periods of invalid data, and characterization of extreme values by recording shorter-period meteorological events. The wind direction corresponding to the maximum one-minute average wind speed was added to the daily summary data; the 10-minute data already included the wind direction associated with the maximum one-minute speed during the 10-minute period.

A new primary datalogger, the Campbell Scientific 21X, was installed at Site 1 at the beginning of 1996. This change enabled recording the same parameters being recorded at Sites 2 through 9, except that Site 1 records dew-point temperature instead of relative humidity, has winds measured at 60 m-agl in addition to 10 m-agl, and a delta-temperature between 10 and 60 m-agl.

### 2.2 DATA RECOVERY RATES

Table 2-1 shows the overall data recovery rates for each parameter at Site 1, and Table 2-2 shows the rates for the other eight sites. The rates are percentages of the valid hourly data divided by the total possible hourly data (8,784 hours). Guidelines from the EPA recommend a minimum recovery rate of 90 percent. This guideline value currently applies only to the hourly 10-m wind and 2-m temperature data, since these data are reported to the State of Nevada in compliance with air quality operating permit requirements.

The 90 percent guideline was met for every parameter at each site. However, equipment problems caused lower system average recovery rates for some items. Delta temperature from 10 m to 60 m at Site 1 (NTS-60) had a data recovery rate for the year of 92.38 percent. There was a problem with a faulty temperature probe which caused a loss of about 568 hours of data, from May 21 through June 11, 1996.

The other relatively low recovery rate was 97.89% for the sigma-w at Site 9. The vertical wind speed sensor failed on November 7 and was replaced by a new calibrated sensor on November 14, 1996.

The performance checks and performance audits account for most of the missing data periods. The checks and audits at Site 1 typically require at least four hours, because of the configuration of the 60-m tower. The 10-m tower checks and audits typically take only one or two hours.

Table 2-1. Data Recovery Rates for 1996 at Site 1

Parameter	% Recovery
10-m Wind speed	98.25
10-m Wind direction	98.25
10-m Sigma-A	98.25
60-m Wind speed	98.25
60-m Wind direction	98.25
60-m Sigma-A	98.25
Temperature	98.24
Delta-temperature, 2-m to 10-m	98.20
Delta-temperature, 10-m to 60-m	92.38
Dew point	96.94
Precipitation	99.49
Barometric pressure	98.21
Solar radiation	98.21
Sigma-w	98.06
Total System	97.43

Table 2-2. Data Recovery Rate for 1996 at Sites 2 through 9

	Site 2 % Rec	Site 3 % Rec	Site 4 % Rec	Site 5 % Rec	Site 6 % Rec	Site 7 % Rec	Site 8 % Rec	Site 9 % Rec
Wind speed	99.82	99.51	99.67	99.54	99.83	99.82	99.81	99.84
Wind direction	99.82	99.51	99.67	99.54	99.83	99.82	99.81	99.84
Sigma-A	99.82	99.51	99.67	99.54	99.83	99.82	99.81	99.84
Temperature	99.35	99.51	99.67	99.54	99.83	99.66	99.81	99.84
Delta-temperature	98.91	99.51	99.67	99.54	99.83	99.64	99.81	99.84
Barometric pressure	99.82	99.51	99.67	99.53	99.83	99.82	99.81	99.83
Relative humidity	99.82	99.51	99.67	99.54	99.83	99.82	99.81	99.84
Solar radiation	99.68	99.51	99.61	99.54	99.83	99.82	99.81	99.84
Precipitation	99.95	99.65	99.95	99.66	100.00	99.99	99.99	100.00
Sigma-w	99.82	99.51	99.67	99.54	99.83	99.82	99.81	97.89
Total system	99.68	99.52	99.69	99.55	99.85	99.80	99.82	99.66

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### 3. RESULTS OF THE METEOROLOGICAL MONITORING PROGRAM

This section presents 1996 meteorological data in tabular format with discussions of specific topics such as wind, precipitation, temperature, and atmospheric stability. Further discussions include the 1996 temperature and precipitation results compared to the results from previous years in a discussion of annual trends.

#### 3.1 SUMMARY OF 1996 DATA

Appendix B presents the summaries of typical climatological data, including explanations of the individual statistics. Annual values are the means or extremes of the monthly values. The tables in Appendix B can be useful information resources regarding weather conditions in the Yucca Mountain area during 1996.

The supplementary summary statistics reported in Appendix C also include monthly values. These were calculated according to the methods shown in the appendix. As in Appendix B, annual values are the means or extremes of the monthly values. Prior to 1994, temperature data were derived from hourly averages. Therefore, the tables in Appendix C present temperature statistics based on hourly averages for comparisons with earlier reports. The tables also present limited summary statistics for some atmospheric stability parameters.

##### 3.1.1 Wind

Wind is the dominant meteorological parameter related to the primary purpose of the monitoring network, characterizing atmospheric dispersion. Airflow controls the transport pathway and dilution of airborne material. Wind is also a critical parameter in designing surface facilities and performing many site characterization operations. Wind data discussions involve three basic elements: mean and extreme wind speeds, diurnal cycles of wind directions and related topographic influences, and wind fluctuations as a measure of turbulence or atmospheric stability. The 1996 network data continue to demonstrate the broad diversity of wind conditions within the network study area related to local and regional topography. Appendices B and C include monthly summaries of mean and extreme wind speeds for each site.

Figure 3-1 is a graph of network average wind speed data. The bold center graph line is the network average; the other lines are the highest and lowest monthly average speeds that occurred at individual sites. The average network wind speeds were highest during April and lowest during January. The highest monthly average speed by site was 6.6 meters per second (m/s), which occurred at Site 4 in April. The lowest monthly average was 2.4 m/s, which occurred at Site 3 during January.

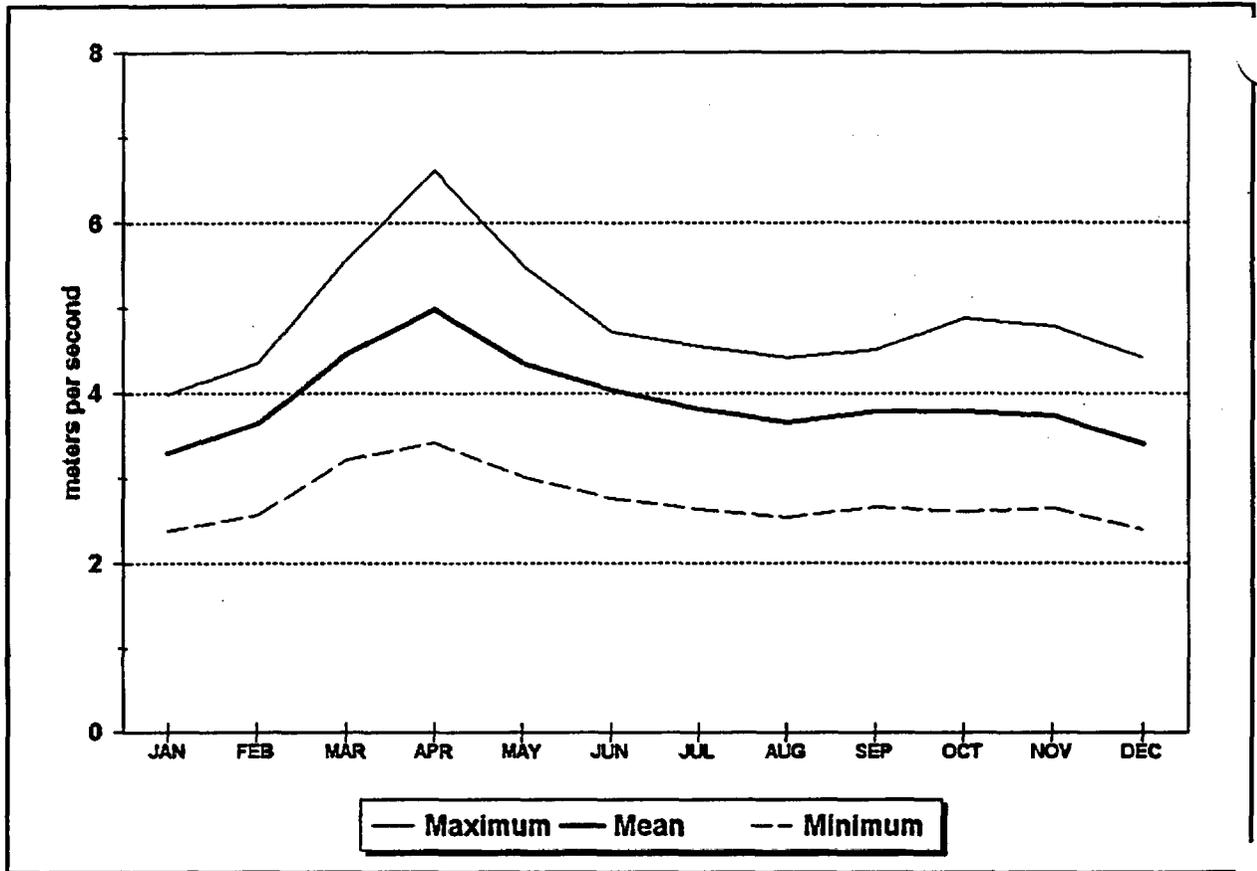


Figure 3-1. 1996 Monthly Network Average Wind Speeds

The lowest annual average speed by site was 2.7 m/s, which occurred at Site 3, and this site had the lowest monthly average speed for all twelve months. Site 3 has the most protected exposure in the network. Although Site 3 can experience peak winds comparable to the other sites, frequent low speeds contributed to the lowest annual average speed in the network.

The highest annual average speed was 4.8 m/s, which occurred at Site 4. Sites 2, 5, and 9) were very close with 4.5 m/s. Sites 2 and 4 have the most open exposures with hilltop locations. Sites 5 and 9 are near the mid-line of the broad valley of lower Jackass Flats. Peak winds at these valley floor sites were less than the hilltop locations, but the persistence of moderate wind speeds in the valley kept the averages the same as the hilltop sites.

Figure 3-2 is a graph of monthly peak 3-second wind gusts and the fastest 1-minute wind speeds for all the sites. Both the monthly maximum and the network average (the average of a value for all sites in the network) fastest 1-minute speeds are shown in the figure. The peak 3-second gusts are shown as the uppermost line in the figure. As opposed to 1995 when the highest gusts occurred at the end of the storm season in April, the 1996 highest gusts occurred in the beginning of the storm season in October. The highest peak gust was 37.2 m/s, which occurred at Site 4 on October 25 between 0500 and 0510 Pacific Standard Time (PST). The next highest peak gust at another site was

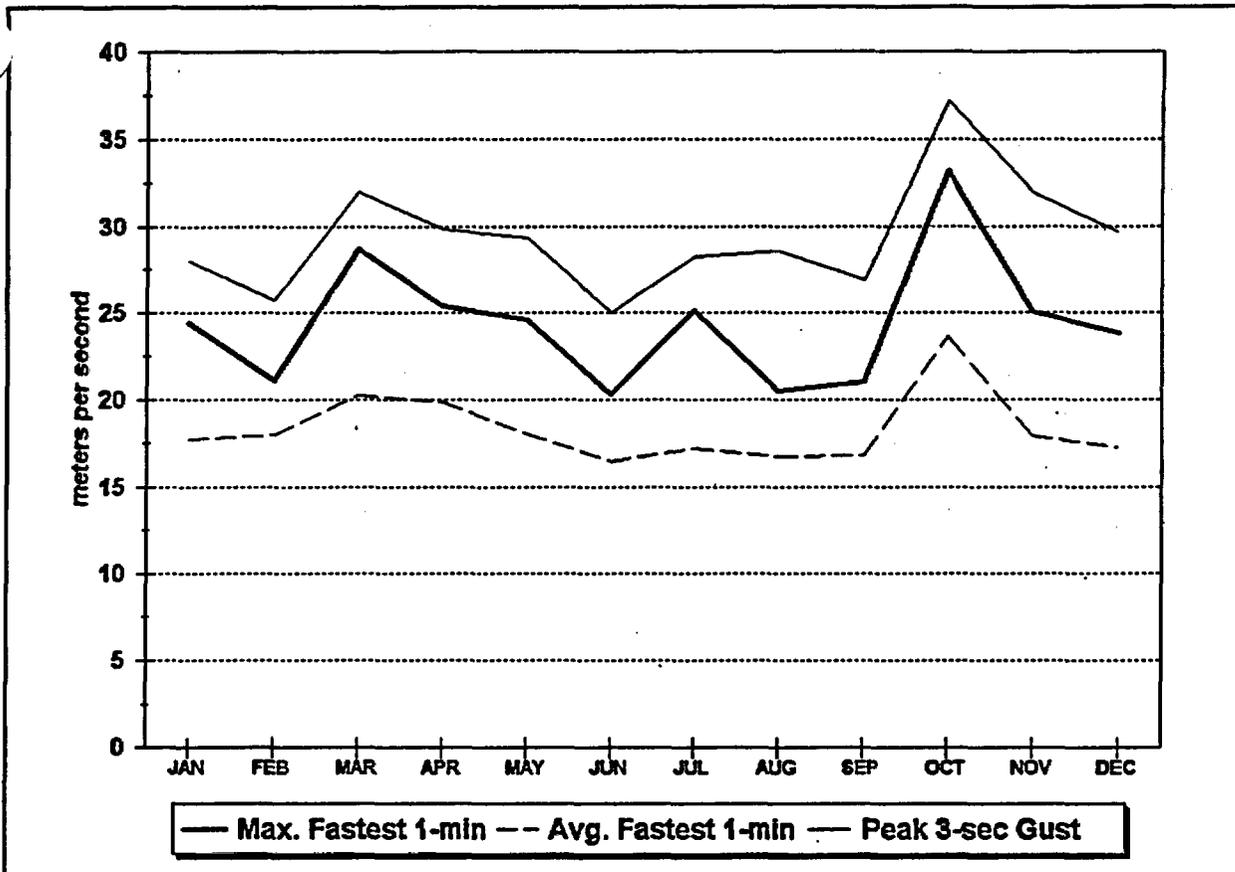


Figure 3-2. 1996 Monthly Peak 3-Second Gust and Fastest 1-Minute Wind Speeds at Sites 2 - 9

33.3 m/s at Site 2, which occurred on the same day between 0440 and 0450 PST. Site 3 had the lowest annual peak gust, with 26.2 m/s.

The fastest 1-minute speeds occur in a similar annual trend as the peak 3-second gusts. The fastest 1-minute speed recorded in the network was 33.2 m/s; the associated wind direction was from 345 degrees. This occurred at Site 4 during the same time as the peak 3-second wind gust, October 25 between 0500 and 0510 Pacific Standard Time (PST). The next fastest 1-minute speed and direction at another site at Site 2 at 29.4 m/s from 325 degrees on the same day, October 25, between 1820 and 1830 PST.

Winds were further characterized as annual day and night joint frequency distributions of wind speed and direction. The wind direction categories are centered on the sixteen compass points, north (N), north-northeast (NNE), northeast (NE), etc. The wind speed categories correspond to the stability array (STAR) format summaries typical of climatological summaries. The day and night (diurnal) format was chosen because these differences were seen to be greater than those observed during seasonal periods. Tables of the joint frequency distributions are presented in Appendix D.

Figure 3-3 shows the frequencies of daytime wind speeds in the STAR speed categories as averages of site groups showing similar results. The wind speeds at Sites 2, 4, 5, 6, and 9 were in the first

speed category (speeds up to 1.8 m/s) an average of 7.6 percent of the time, followed by 33 percent of the time in the second category (1.8 to less than 3.3 m/s), and 34 percent in the third category (3.3 to less than 5.4 m/s), and 19.6 percent in the fourth category (5.4 to less than 8.5 m/s). Only 5.5 percent of the hours had winds in the fifth category (8.5 to less than 11.0 m/s), and only 3.0 percent of the hours were in the sixth category (at least 11.0 m/s).

The second site group plot shown in Figure 3-3 is the average daytime wind speeds from the 10-m and 60-m levels at Site 1, and the 10-m level at Sites 7 and 8. Results are similar to the first group, except the first speed category occurred more frequently with 20.7 percent, compared to 7.6 percent for the first group of sites (Sites 2, 4, 5, 6 and 9). This difference was balanced by lower frequencies in the remaining speed categories.

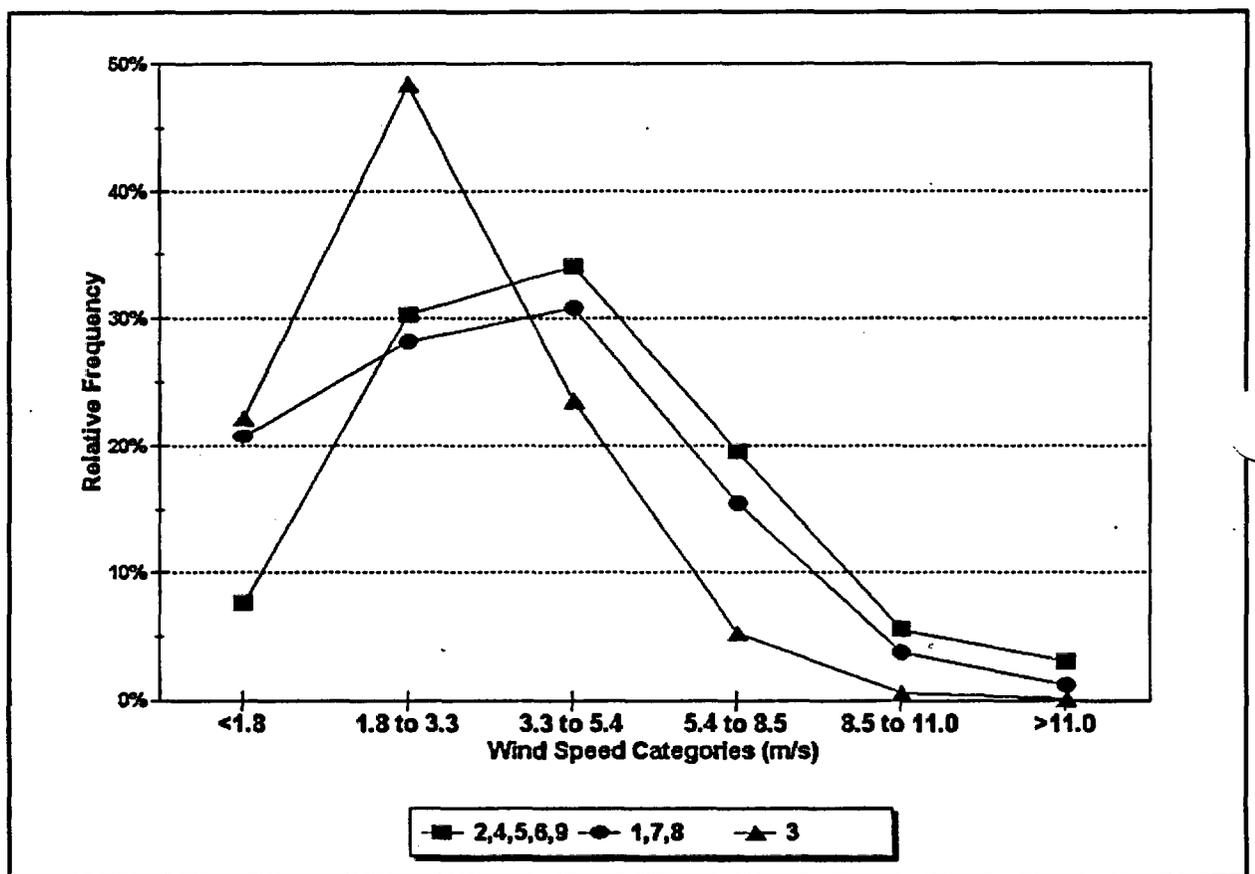


Figure 3-3. 1996 Occurrences of Daytime Wind Speeds by Site Groups

The last daytime site group plot shown in Figure 3-3 includes only Site 3, because it differs notably from the first two groups. The frequency at this site was similar to the second group in the lowest speed category, but the second category was 48.4 percent, compared to approximately 30 percent for the other two groups. There were considerably fewer occurrences of speeds at least 3.3 m/s at Site 3 than at the other sites. The protected exposure in the narrow canyon at Site 3 reduced the sustained high wind speeds.

In summary, the distribution of daytime speeds shows that the network area typically experiences wind speeds at least 1.8 m/s, frequently at least 5.4 m/s. These wind speeds show relatively good atmospheric dispersion conditions, since higher wind speeds correspond to greater dilution of potential airborne emissions. Good dispersion conditions reduce the health risk from airborne emissions.

Figure 3-4 shows the frequencies of nighttime wind speeds in the same speed categories in three site groups. The groups are not the same as those used for the presentation of daytime winds in Figure 3-3. The first group includes the 60-m level at Site 1, and the 10-m level at Sites 7 and 8. Hourly averages of wind speeds in this group were in the lowest speed category (speeds less than 1.8 m/s) an average of 43.7 percent of the time. Speeds were in the second category an average of 28.6 percent of the time, with decreasing frequencies in the higher speed categories.

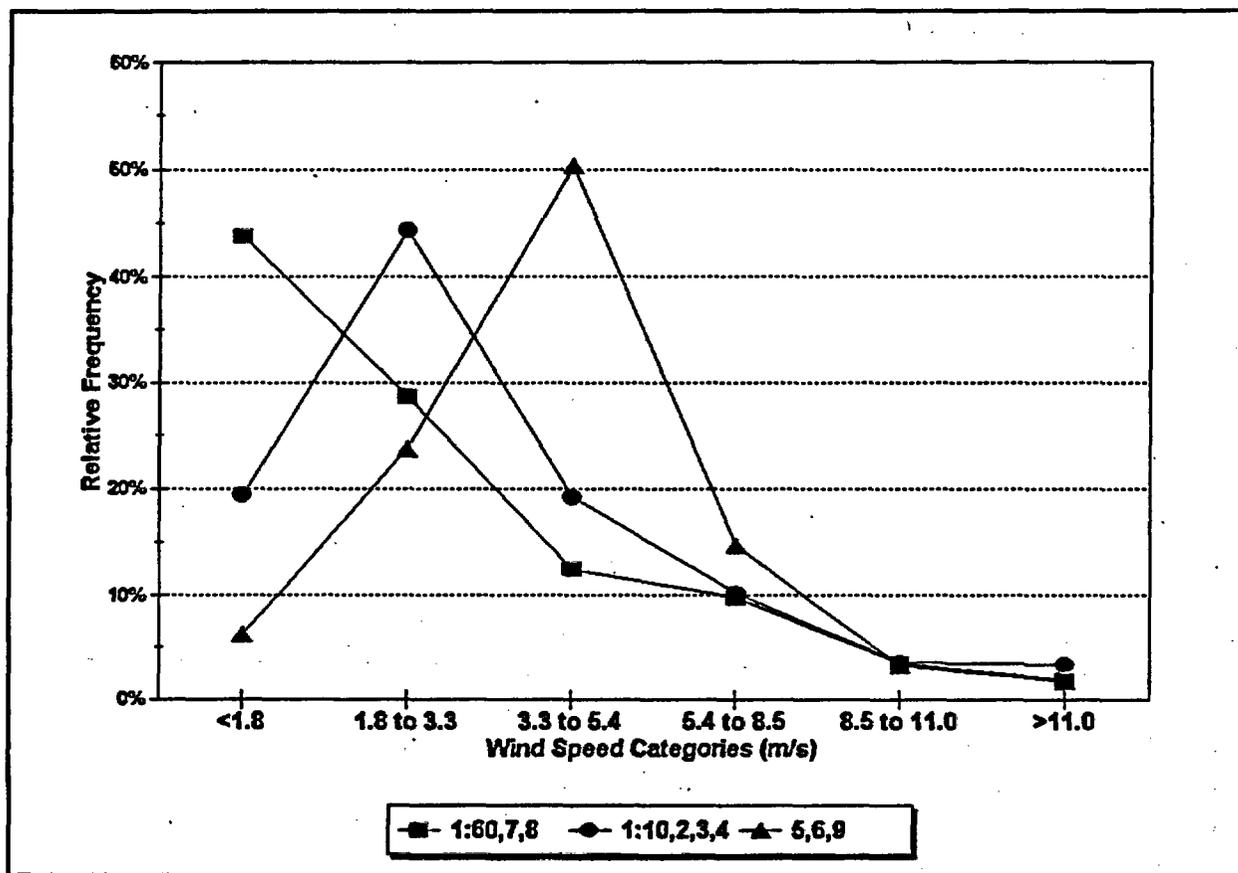


Figure 3-4. 1996 Occurrences of Nighttime Wind Speeds by Site Groups

Considering site exposures, the second nighttime group shown in Figure 3-4 includes an unusual combination of sites: the 10-m level at Site 1, and Sites 2, 3 and 4. This group had the most frequent occurrences of wind speeds in the second category (1.8 to less than 3.3 m/s). On the average, winds

were in the first category 19.4 percent of the time and the second category 44.2 percent of the time with rapidly decreasing frequencies for the progressively higher speed categories.

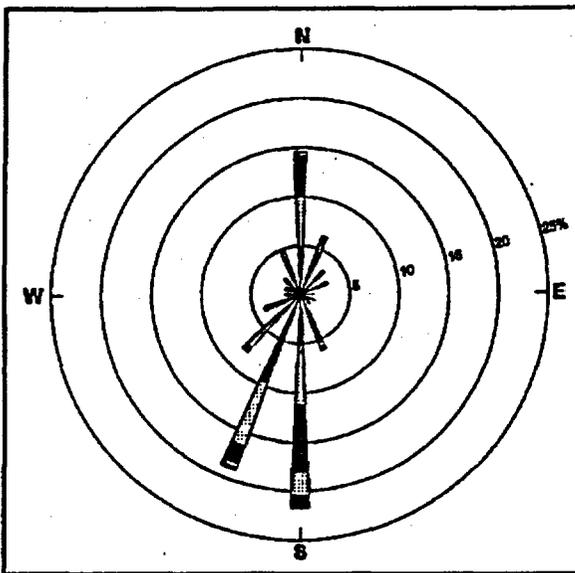
The third nighttime group shown in Figure 3-4 includes Sites 5, 6 and 9. These sites had the most frequent occurrences of wind speeds in the third category (3.3 to less than 5.4 m/s), with 50.3 percent of the time. Speeds were in the lowest category an average of 6.2 percent of the time. Sites 5 and 9 are in lower Jackass Flats, and Site 6 is in upper Yucca Wash. The wind direction data indicate nighttime downslope winds along the valley orientations at these sites. These three sites have the greatest distances in the network of upslope hillsides for drainage winds to become established, which may account for the high frequency of wind speeds in the third category.

The most popular graphical depiction of the joint frequency distributions of wind speed and wind direction data is the wind rose. Wind rose figures are histograms by direction categories, arranged in a circular pattern around a central circle, with each histogram bar corresponding to the direction from which the wind is blowing; north is at the top of the circle. The histograms are shown as segments corresponding to the wind speed occurrences within each direction category.

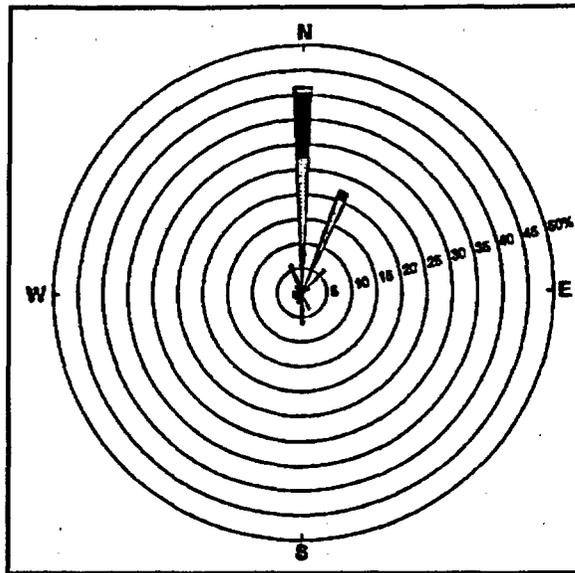
The wind direction portions of the joint frequency distributions show the dominance at most sites of directions related to surrounding topography. Further analyses show distinctive patterns occurring for daytime compared to nighttime periods. During daytime, most sites recorded generally southerly winds, while generally northerly winds dominated at night. Specific directions for the general directions depend on topography near the specific sites. These wind data summaries are the primary tools in determining the typical airflow pathways in the vicinity of Yucca Mountain.

Based on previous results, this pattern of diurnal, mountain-valley winds is typical of the Yucca Mountain area. Occasional larger-scale weather patterns, such as strong frontal passages, can cause the winds to depart from the typical diurnal cycle. The minor histogram bars represent these infrequent events. The diurnal pattern is also typical of other desert complex terrain environments.

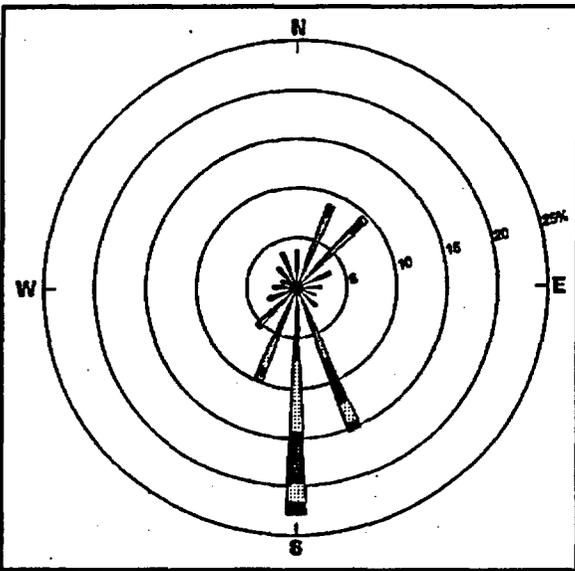
Figure 3-5 shows the day and night wind roses for Sites 5 and 9, the sites in Jackass Flats. Each site had southerly (SSE through SSW) winds during about 47 percent of the daytime hours. Winds were northerly during 16.5 percent of the daytime hours at Site 9 and 25.9 percent at Site 5. Though generally similar, there were some differences in the nighttime winds at the two sites. Night winds were from the N through NE during 69.9 and 59.2 percent of the hours at Sites 5 and 9, respectively. Southerly winds occurred 22.7 percent of the night hours at Site 9, but only 12.5 percent at Site 5. This greater frequency of southerly winds at Site 9 is associated with the relative positions of the two sites. Site 5 is within a distinct valley setting, while Site 9 is south of Site 5 in the open portion of Amargosa Valley. Site 9 is often the last valley site to experience northerly drainage winds at night, and could be the first to experience up valley southerly winds in the morning.



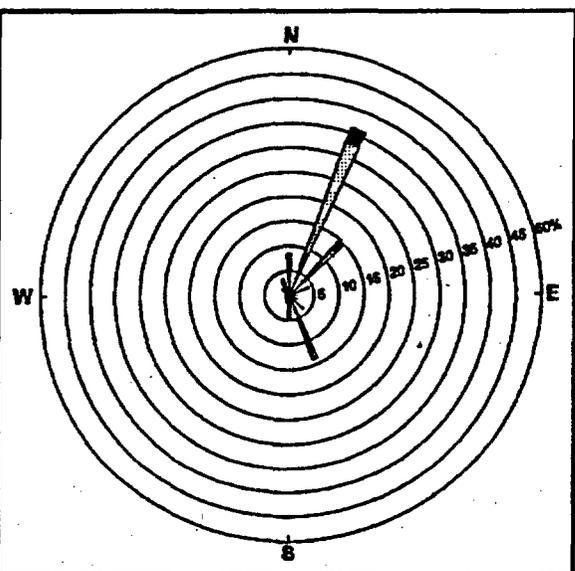
(a) Site 5 Day



(b) Site 5 Night



(c) Site 9 Day



(d) Site 9 Night



Note: The diagram is the frequency of occurrence for each wind direction from which the wind is blowing.

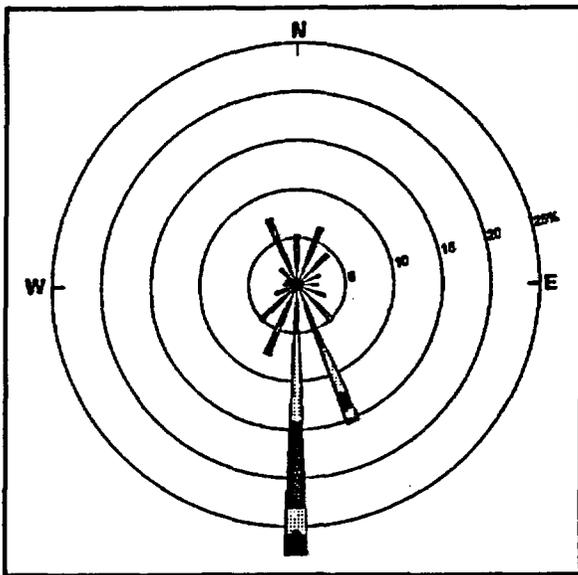
Figure 3-5. 1996 Day and Night Wind Rose Plots for Sites 5 and 9

Figure 3-6 shows the wind roses for both the 10-m and 60-m levels at Site 1. Site 1 had daytime winds from the SSE through SSW 49.8 percent at the 10-m level and 51.0 percent at the 60-m level. Daytime winds were northerly at the 10-m level 16.3 percent of the hours and 19.2 percent at the 60-m level. Nighttime winds at the 10-m level were from the NW through N directions 63.0 percent of the hours and from the S through SW during 15.7 percent of the hours. The corresponding winds at the 60-m level were northerly (NNW through NNE) during 50.9 percent of the hours and southerly (S through SW) for 23.2 percent of the hours. The nighttime northwesterly winds at the 10-m level correspond to the orientation of the canyon leading into Drillhole Wash. The northerly winds at the 60-m level indicate airflow that apparently originates in the higher terrain to the north and northeast of Midway Valley. The nighttime southerly winds generally corresponded to wind speeds greater than 3.3 m/s, showing regional scale winds overpowering the drainage wind forces.

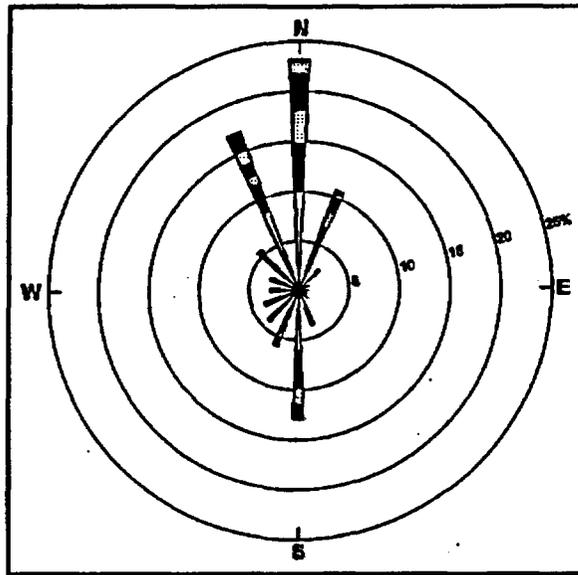
Figure 3-7 contains the wind rose figures for Site 8. The Site 8 wind roses are similar to the figures for the 10-m level at Site 1. Winds were from the SSE through SSW during 52.3 percent of the daytime hours, and from the NW through N during 18.9 percent of the hours. Nighttime winds were from the NW through N during 66.6 percent of the hours, and from the S through SSW directions during 16.5 percent of the hours. The nighttime northerly winds were typically at speeds less than 3.3 m/s. This dominance of nighttime drainage winds being northerly indicates that drainage winds at this Site are typically toward the south over the saddle between Fran Ridge and Yucca Mountain, rather than toward the northeast along the immediate surface drainage toward Sever Wash.

The Site 2 wind roses also shown in Figure 3-7 indicate that daytime winds on Yucca Mountain are less channeled by topography than at the other sites. The directions are spread from east around through south to southwest. The slight dominance of southeasterly directions appears to be related to upslope winds along the east-facing slopes of Yucca Mountain. The less frequent occurrences of westerly winds is due to the steepness of the ridge on the west side, which is less likely to cause slope winds than the spread-out canyon structure of the east side. The night wind rose figure for Site 2 shows mostly easterly and southeasterly winds. The occurrences of northeasterly winds may be related to airflow from the higher terrain to the northeast.

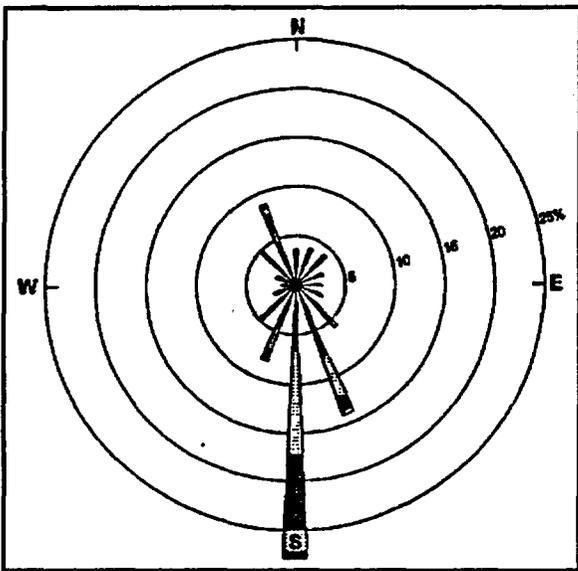
Figure 3-8 includes the wind rose figures for Site 3. The canyon walls immediately north and south of Site 3, combined with the proximity of the steep rise of Yucca Mountain toward the west, make this location the most confined terrain in the network. The wind roses indicate the strong topographic channeling in confined terrain during day and night; more than three-fourths of all hours had winds oriented along the canyon directions. Daytime winds were up the canyon (ESE through SSE) during 48.2 percent of the hours and were down the canyon during 18.5 percent of the hours. Nighttime winds were down the narrow canyon west of Site 3 (W through NW) during 54.5 percent of the hours and were up the canyon (ESE through SSE) during 13.1 percent of the hours.



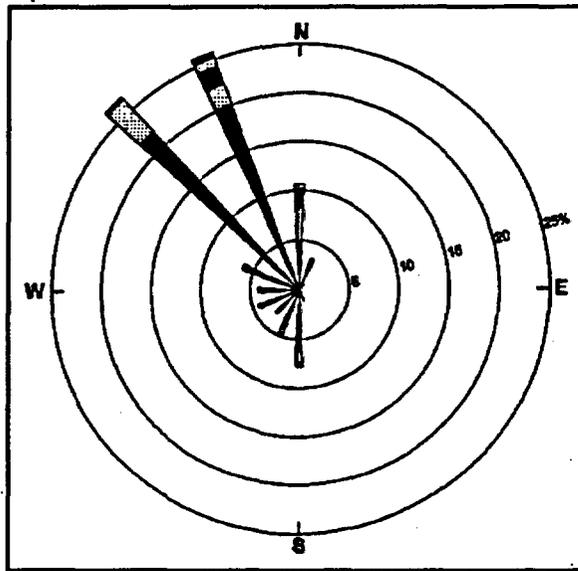
(a) Site 1 60m Day



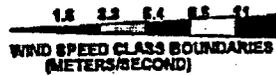
(b) Site 1 60m Night



(c) Site 1 10m Day



(d) Site 1 10m Night



Note: The diagram is the frequency of occurrence for each wind direction from which the wind is blowing.

Figure 3-6. 1996 Day and Night Wind Rose Plots for Site 1

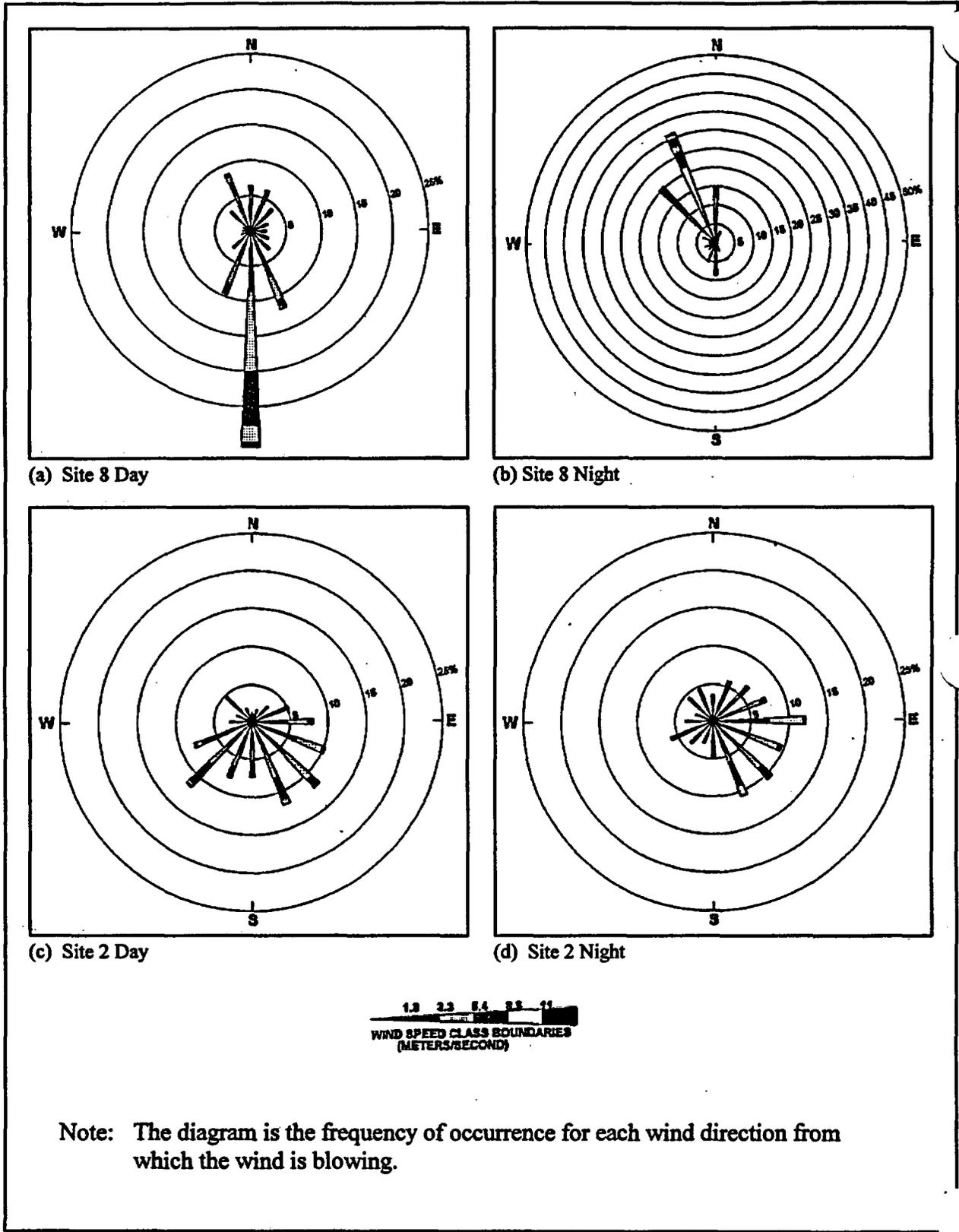
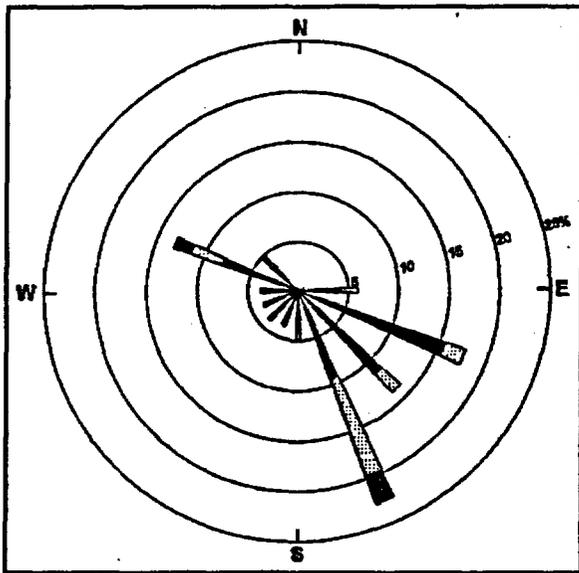
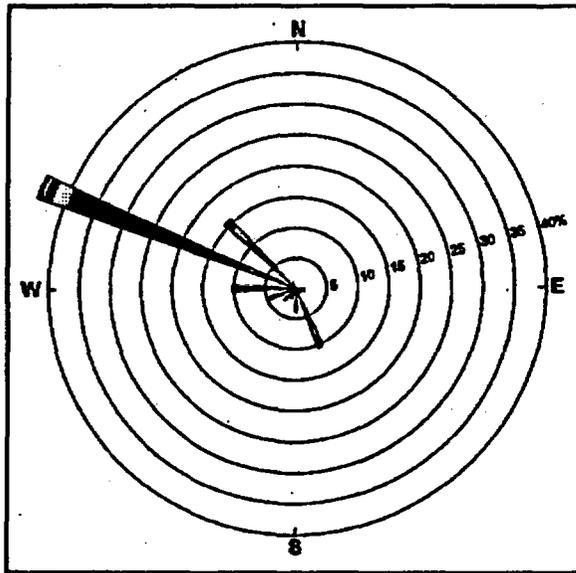


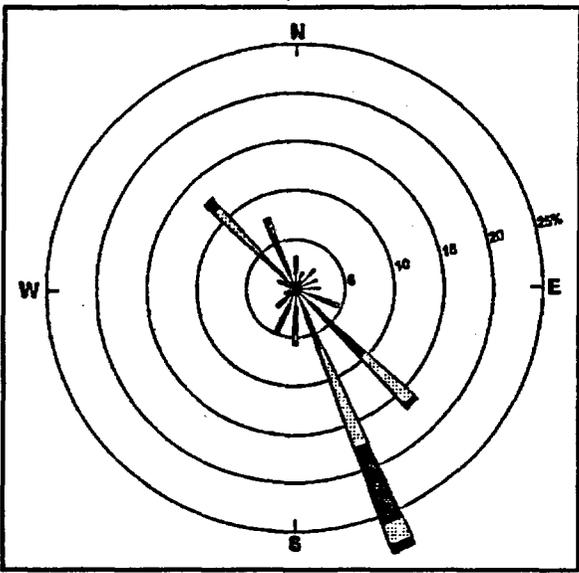
Figure 3-7. 1996 Day and Night Wind Rose Plots for Sites 8 and 2



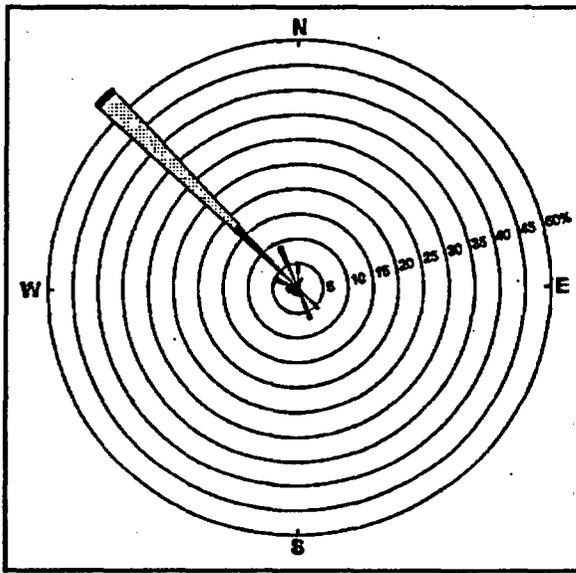
(a) Site 3 Day



(b) Site 3 Night



(c) Site 6 Day



(d) Site 6 Night



Note: The diagram is the frequency of occurrence for each wind direction from which the wind is blowing.

Figure 3-8. 1996 Day and Night Wind Rose Plots for Sites 3 and 6

Figure 3-8 also includes the wind rose figures for Site 6 (in upper Yucca Wash). The topography near Site 6 is a northwest to southeast oriented wash. Daytime winds were from Midway Valley flowing up Yucca Wash (SE and SSE) during 45.8 percent of the hours, and were down the wash (NW and NNW) during 20.3 percent of the hours. The nighttime winds were down the wash during 64.3 percent of the hours, and were up the wash during 12.3 percent of the hours. Over 55 percent of the nighttime hours at Site 6 were from the NW alone, mostly with speeds between 1.8 and 5.4 m/s. This indicates the strong dominance of nocturnal drainage winds.

One would expect data from the hilltop location of Site 4 to be an opposite contrast to data from the confined topography of Sites 3 and 6. Yet the wind rose figures from Site 4, shown in Figure 3-9, indicate that the higher terrain surrounding Midway Valley still channels winds through the area at the level of the top of Alice Hill. Daytime winds were from the SSE through SSW during 49.7 percent of the hours, and from the NNE and NE during 19.7 percent of the hours. Nighttime winds were from the N through NE during 57.4 percent of the hours and from the S through SW during 15.2 percent of the hours.

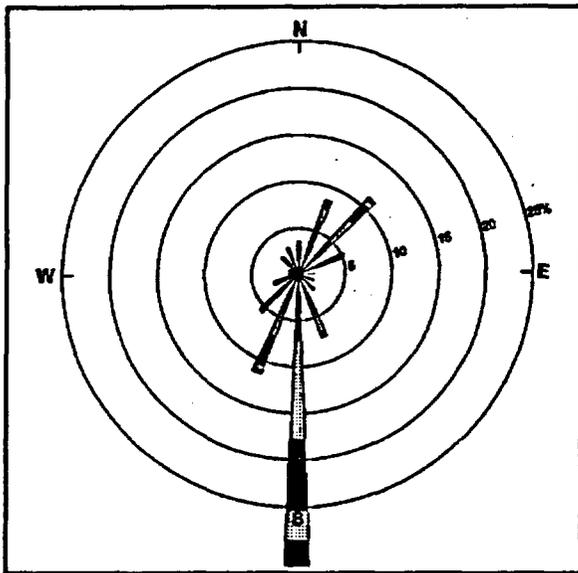
Wind roses shown in Figure 3-9 from Site 7 (between Alice Hill and Fran Ridge) show topographic channeling of winds through the gap between Alice Hill and Fran Ridge. Daytime winds are from the SSE through SSW during 49.2 percent of the hours, and from the WNW through N during 22.2 percent of the hours. The nighttime winds were from the downslope directions through Midway Valley, WNW through N during 75.0 percent of the hours and SSE through SSW during 10.7 percent of the hours.

The significant differences between nighttime wind roses for Site 4 (on top of Alice Hill) and Site 7 (at the foot of Alice Hill, in Sever Wash) show the extent of airflow differences between vertical layers in Midway Valley. Night winds at Site 7 usually originate northwest of the site and are manifested in a northwesterly near-surface drainage flow. However, night winds at Site 4 generally flow from the north-northwest through northeast. The slight favoring of generally downslope airflow at Site 7 compared to Site 4 may be due to the earlier onset of drainage winds at Site 7.

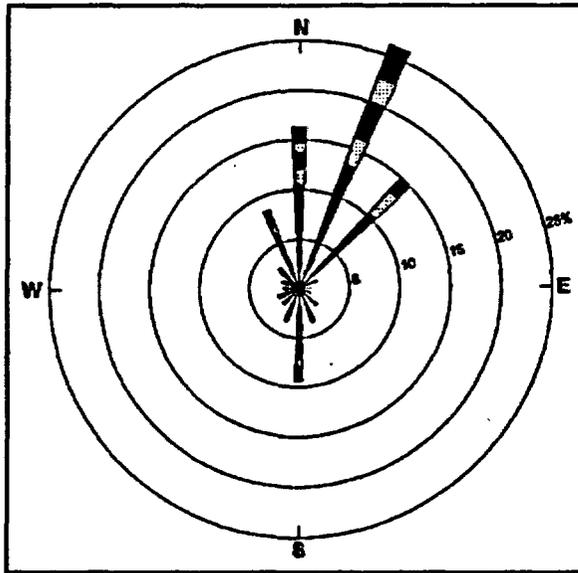
### 3.1.2 Temperature

Figure 3-10 is a graph showing a summary of network temperature data, summarized by monthly values. It includes the extreme maximum and minimum temperatures recorded by individual sites, and the network averages of monthly mean maximum, mean, and mean minimum temperatures. The extreme and mean of the extreme temperatures are calculated from 1-minute averages. A datalogger program change made at the end of 1995 added 1-minute averages to the data available for Site 1 beginning in 1996.

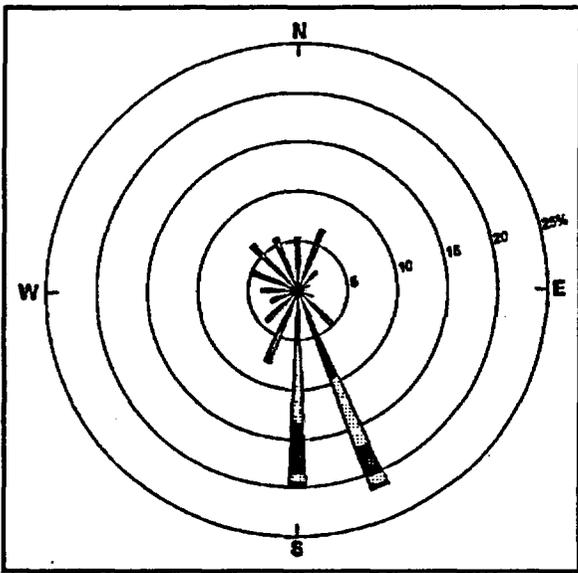
The extreme maximum and minimum temperature values shown in Figure 3-10 bound the range of temperatures experienced within the entire network. The highest extreme maximum values occurred in July at all sites. The extreme maximum 1-minute temperatures by site ranged from 39.3 Celsius (C) at Site 6 to 43.9C at Site 9. The extreme minimums for the network ranged from -10.8C at Site 2 to -6.8C at Site 7.



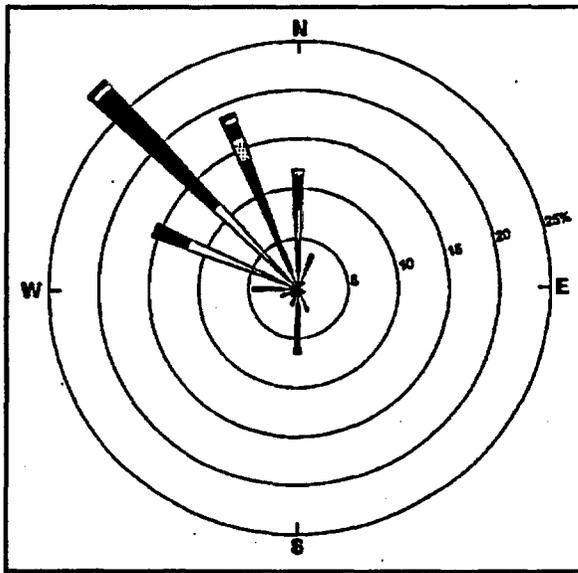
(a) Site 4 Day



(b) Site 4 Night



(c) Site 7 Day



(d) Site 7 Night



Note: The diagram is the frequency of occurrence for each wind direction from which the wind is blowing.

Figure 3-9. 1996 Day and Night Wind Rose Plots for Sites 4 and 7

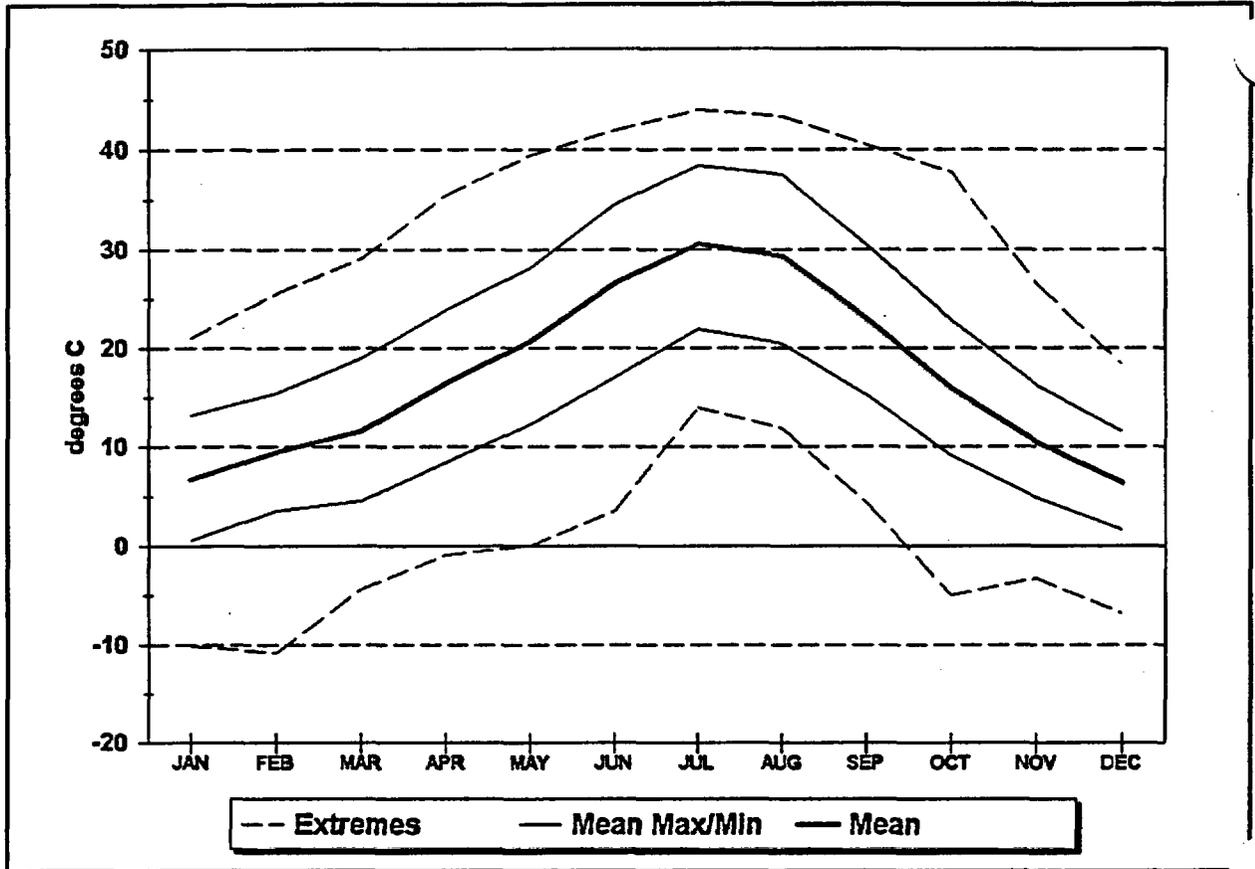


Figure 3-10. 1996 Monthly Extreme and Mean Temperatures

In addition to monthly extreme temperatures, the monthly mean maximum and mean minimum temperatures were also calculated by site from the daily extreme values. The highest mean maximum monthly average at an individual site was 41.2C in July at Site 9. The July network average mean maximum temperature was 38.4C. The lowest monthly mean minimum temperature at an individual site was -3.3C, which occurred in January at Site 7. The January network average mean minimum temperature was 0.5C.

The mean temperatures shown in the graph (and tables) are calculated from hourly averages. They follow the annual trends seen in the extreme temperatures. The monthly mean temperatures ranged from 5.3C at Site 6 in December, to 32.8 at Site 9 in July.

### 3.1.3 Precipitation

Three aspects of precipitation events are reported: the frequency of measurable precipitation monthly and annual precipitation totals, and maximum precipitation rates. Measurable precipitation is the resolution of a single tip of the tipping bucket gauges, which is 0.01 inch or 0.254 mm.

During the year, the network averaged 25 days on which measurable precipitation (at least 0.01 inch) occurred. At individual sites, the number of precipitation days ranged from 20 at Site 9 to 28 at Site 3. Figure 3-11 is a graph of the network average of total precipitation by month.

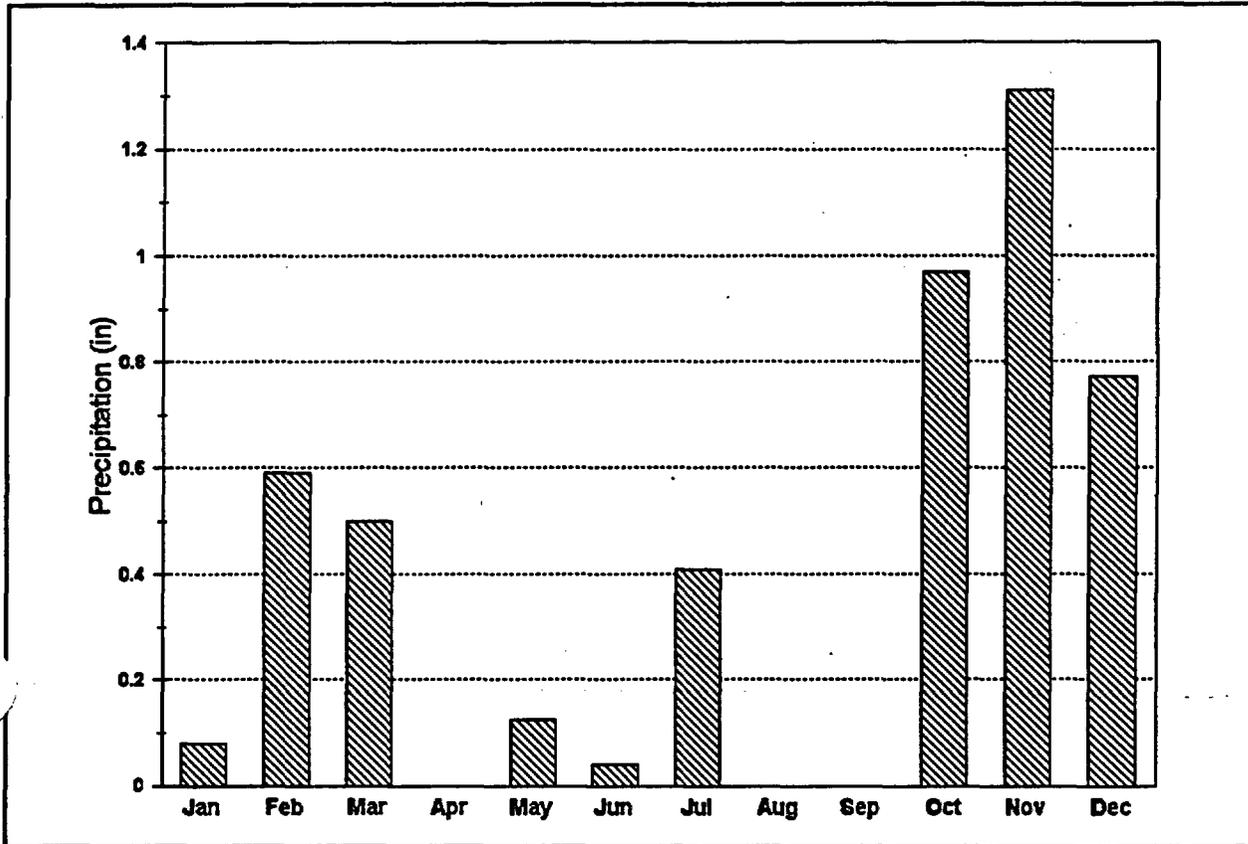


Figure 3-11. 1996 Monthly Network Average Precipitation

Figure 3-12 is a graph of the annual precipitation totals at each site, arranged by descending elevation. The network average annual precipitation total was 4.79 inches. The precipitation totals by site ranged from 5.74 inches (145.8 mm) at Site 6, the wettest location in the network in previous years, to 2.78 inches (70.6 mm) at Site 9, typically the driest location. The graph shows a tendency for greater precipitation to occur at higher elevations, though the combination of measurement uncertainties in exposed locations plus the complex influences of local terrain on precipitation complicates the relationship between elevation and precipitation.

The most significant precipitation event began on November 21 and lasted about 20 hours. The maximum total rainfall from this storm was 1.60 inches (40.6 mm) at Site 3; the lowest total was .63 inch (16.0 mm) at Site 9. Figure 3-13 is a graph of the precipitation from this storm at each site, in order of descending elevation. It follows the annual totals pattern by elevation depicted in Figure 3-12.

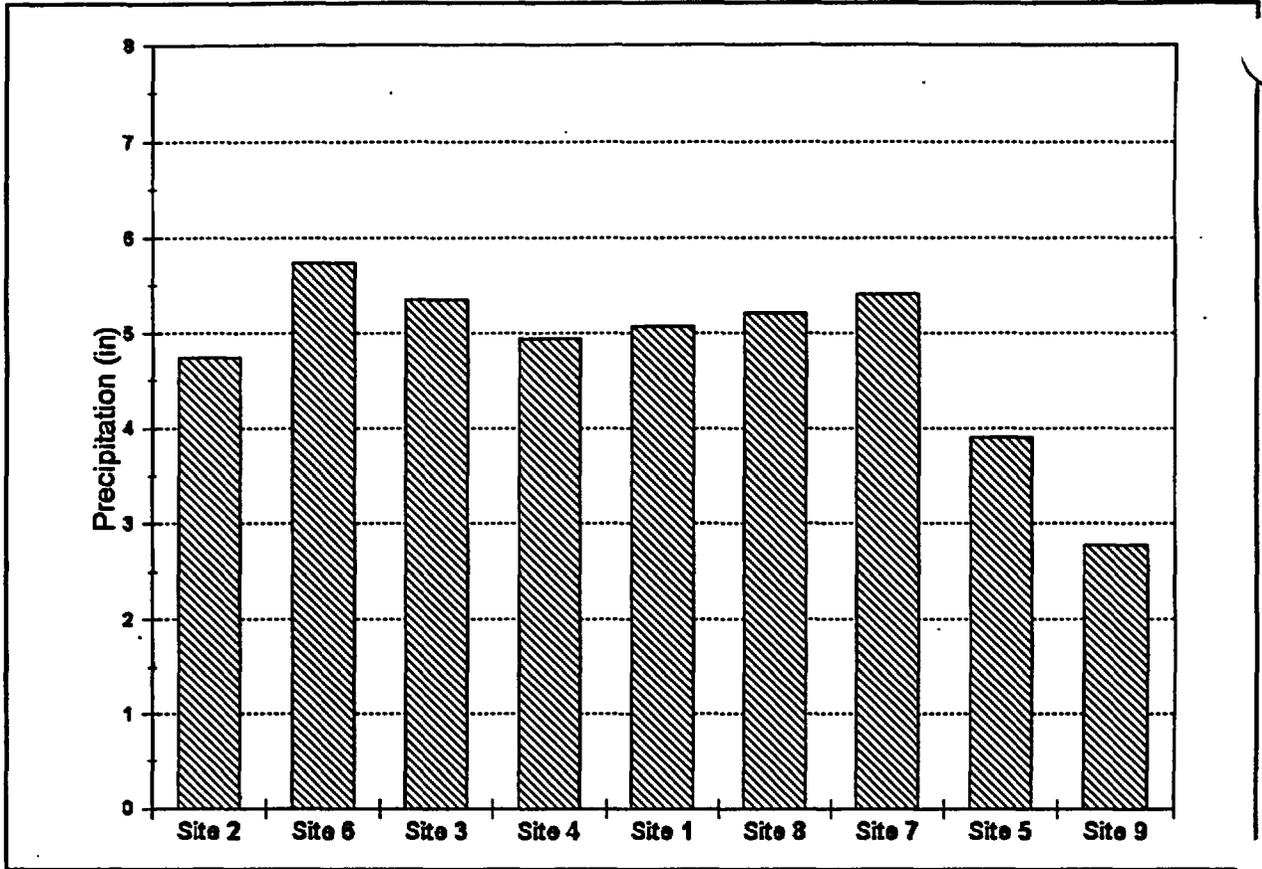


Figure 3-12. 1996 Annual Precipitation Ordered by Descending Site Elevation

The highest 24-hour precipitation total for the year was 1.60 inches (40.6 mm), which fell at Site 3 between 0900 PST on November 21 through 0500 PST on November 22. The highest 6-hour maximum precipitation amount recorded was 0.85 inch (21.6 mm) at Site 6 during the same storm. The greatest 1-hour amount was 0.59 inch (15.0 mm). This was measured at Site 7 on July 12 during an afternoon storm that brought similar totals to some of the other sites around Yucca Mountain and Midway Valley.

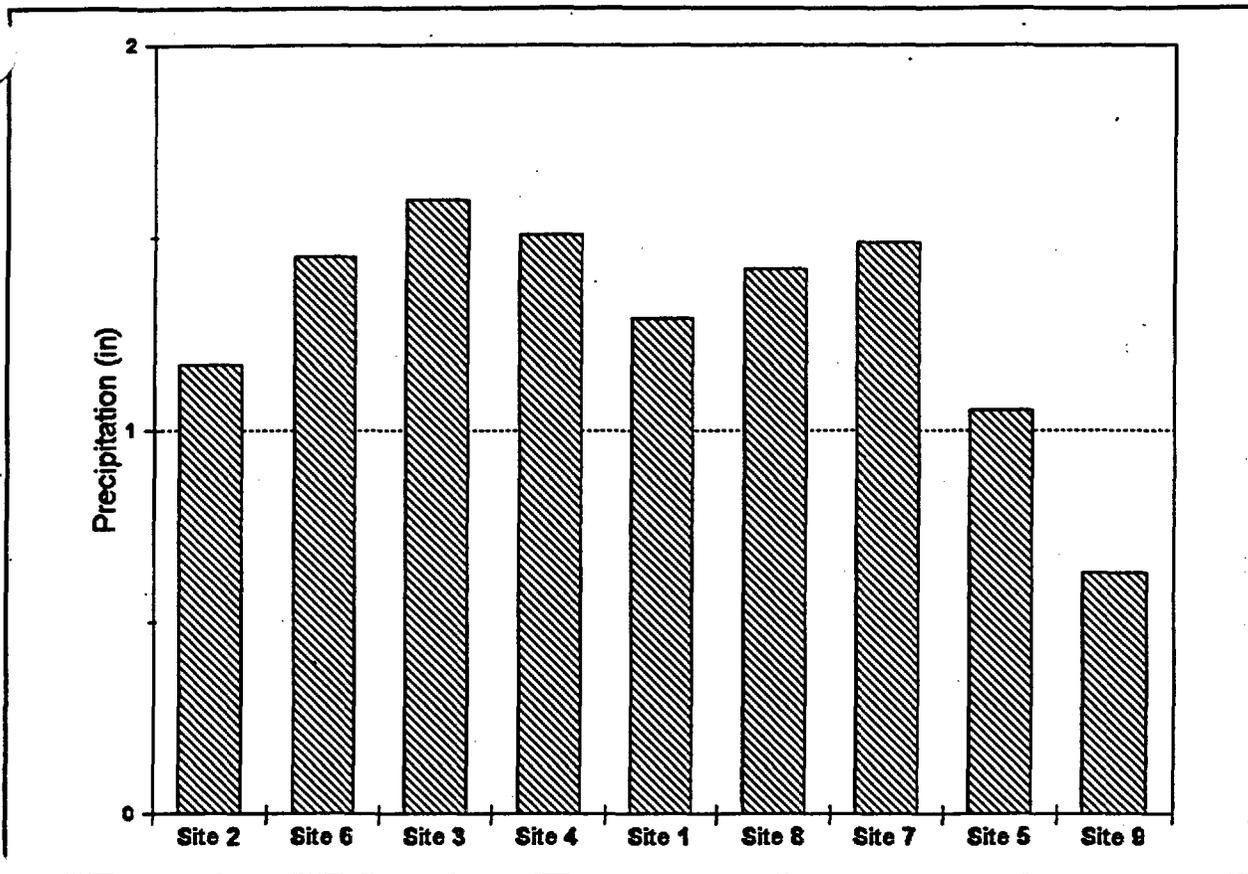


Figure 3-13. Precipitation from Storm of November 21-22, 1996 Ordered by Descending Site Elevation

### 3.1.4 Atmospheric Moisture

Relative humidity measurements are made at Sites 2 through 9 and dew-point temperature (or simply dew point) is measured at Site 1. Relative humidity is the ratio, expressed as a percent, of the atmospheric moisture content of an air parcel to the moisture content the air would contain at the same temperature if saturated. Because air can hold more moisture at higher temperatures, relative humidity decreases with increasing temperature for the same amount of water vapor. The dew point is temperature to which a given parcel of air must be cooled at constant pressure and water-vapor content in order for saturation to occur. Thus, the dew point is directly related to atmospheric moisture content.

To facilitate comparisons, calculations were made of dew point at Sites 2 through 9 and relative humidity at Site 1 using the measured moisture values. The calculations are sensitive to temperature at low levels of relative humidity, so very low dew point values reported for Sites 2 through 9 need to be interpreted with caution.

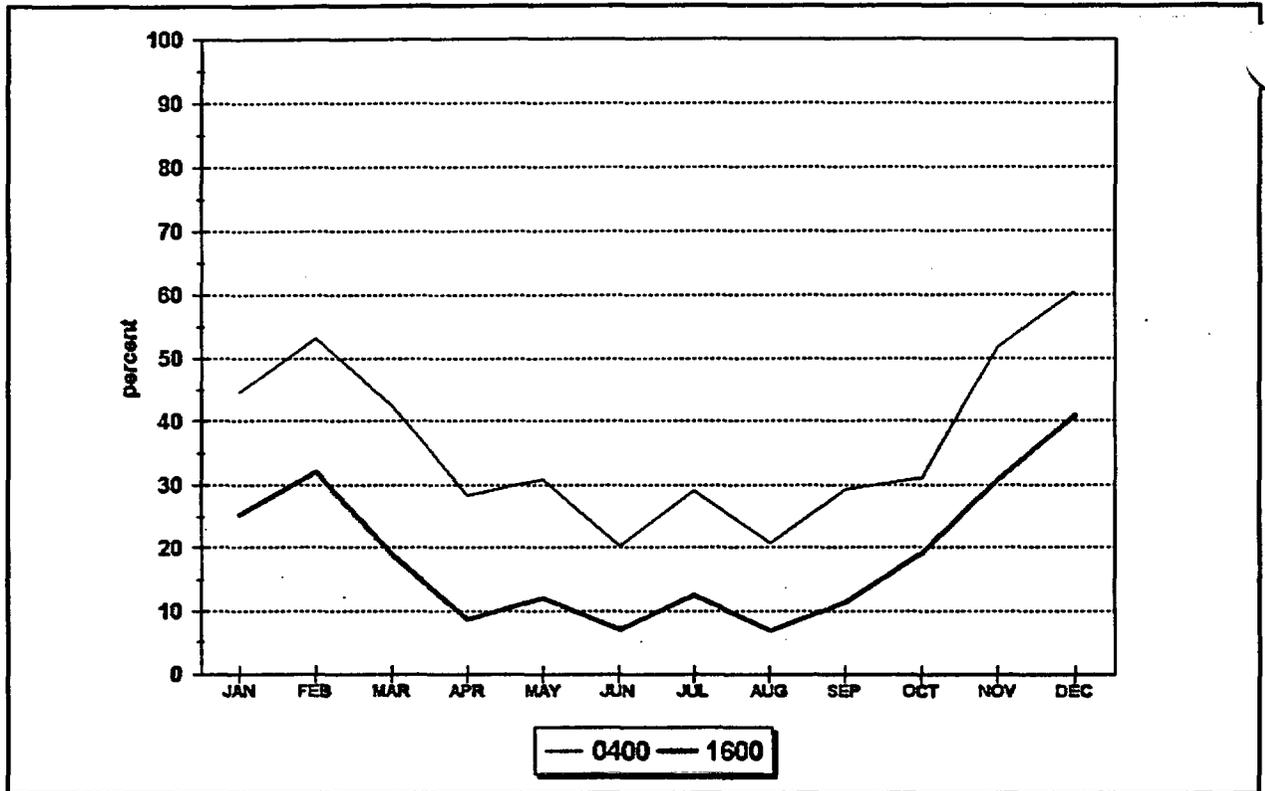


Figure 3-14. 1996 Monthly Network Average Relative Humidity at 0400 and 1600 PST

Tables B-1 through B-9 in Appendix B include monthly averages of relative humidity at four times of the day (0400, 1000, 1600, and 2200 PST). These times were chosen to match the typical extremes and mid-points of the typical relative humidity diurnal cycle, and because they are used in many climatological analyses. With increasing temperature typically causing decreasing relative humidity, relative humidity usually reaches the daily maximum at about 0400, when the lowest temperature of the day occurs, and the daily minimum at about 1600, when the highest temperatures typically occur.

Figure 3-14 is a graph of the monthly network average relative humidity for 0400 and 1600 PST, the times of the highest and lowest values. The network averages range from 60.5 percent and 40.9 percent in December, to 20.2 percent and 7.1 percent in June.

The monthly network average dew points are depicted in Figure 3-15. The highest monthly network average dew point was 1.9C, which occurred in July, and the lowest was -10.9C in April.

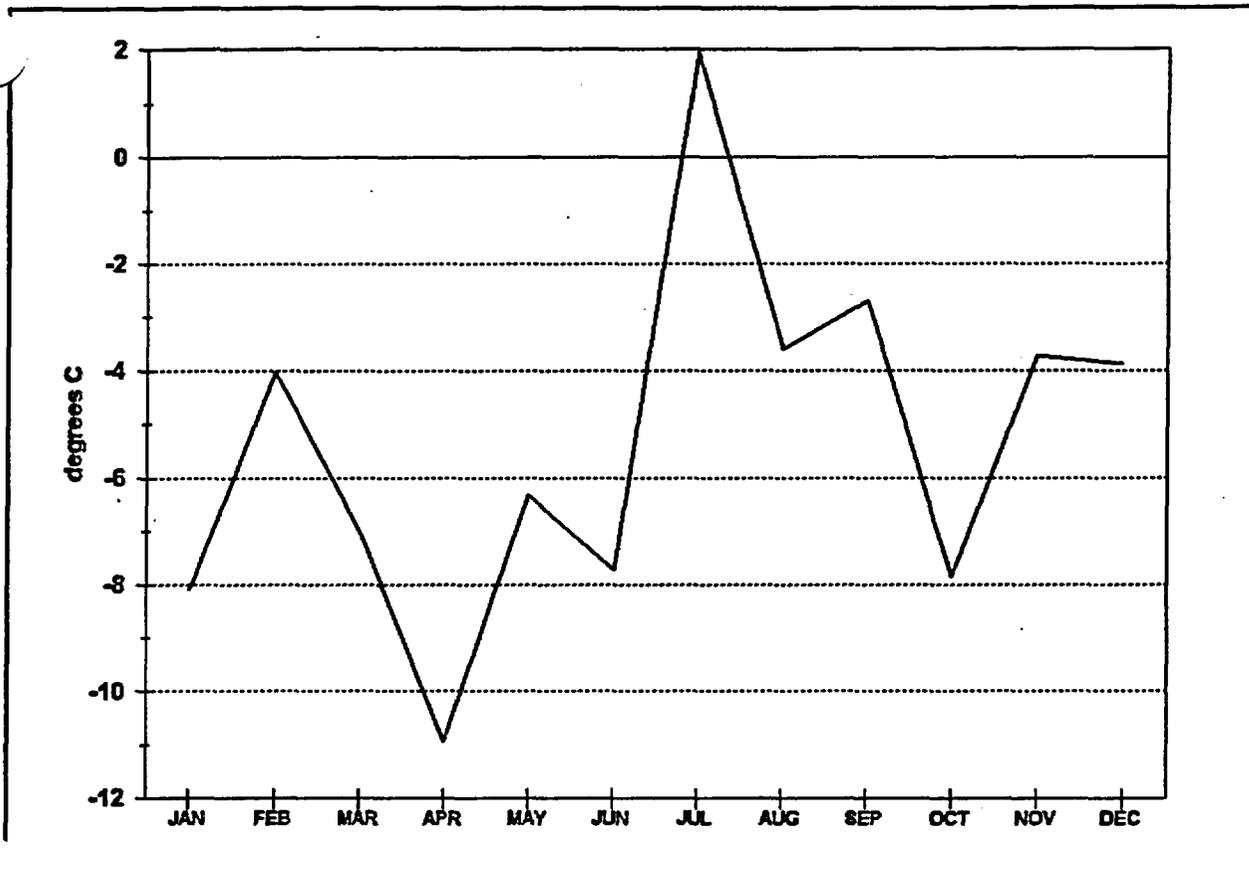


Figure 3-15. 1996 Monthly Network Average Dew Point

### 3.1.5 Barometric Pressure

Barometric pressure is measured at all sites in the network, partly to help study airflow dynamics. In terms of reporting routine results, the monthly average values are reported for each site in the tables in Appendix B. These values are representative of the elevations of the sites. The potentially more useful results for airflow studies are summarized in the tables in Appendix C, which show the monthly mean diurnal range of barometric pressure by site. Figure 3-16 shows the network average monthly mean diurnal barometric pressure ranges. The annual average ranges by site were between 4.5 millibars at Site 1 and 5.5 millibars at Site 9. The highest monthly average was 6.8 millibars, which occurred at Site 9 during January. The lowest monthly average was 3.3 millibars, which occurred at both Sites 1 in June and Site 2 in July.

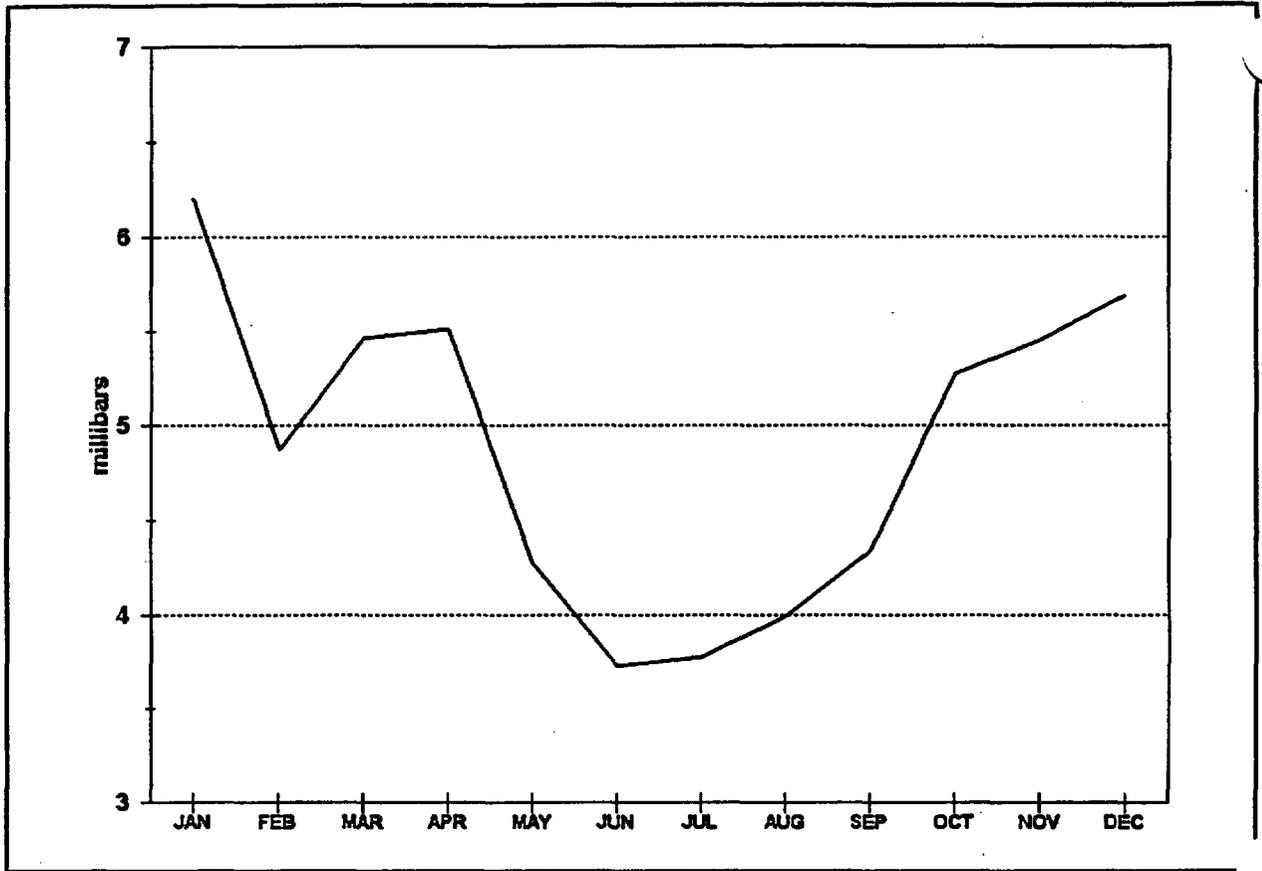


Figure 3-16. 1996 Monthly Network Average Diurnal Pressure Range

### 3.1.6 Solar Radiation

Solar radiation measurements were taken using horizontally mounted pyranometers. One application of the data is consideration of total daily incoming solar energy, which is known as irradiance, or radiant flux density. Irradiance can be presented in joules per square meter per day. The conversion from Watts per square meter utilizes one Watt-second equivalent to one joule.

Figure 3-17 shows the network average total monthly irradiance. Monthly network averages ranged from 8.3 megajoules ( $8.3 \times 10^6$  joules) per square meter per day in December to 31.6 megajoules per square meter per day in June. The annual average at all sites was 20.4 megajoules per square meter per day.

Differences in irradiance between sites were small during most months, except for July. Site 1 had a mean daily irradiance of 28.3 megajoules per square meter per day compared to 29.7 megajoules per square meter per day at Site 9, which is in Jackass Flats on the southern border of the NTS near Amargosa Valley. This indicates less cloudiness in the open areas away from the ridges.

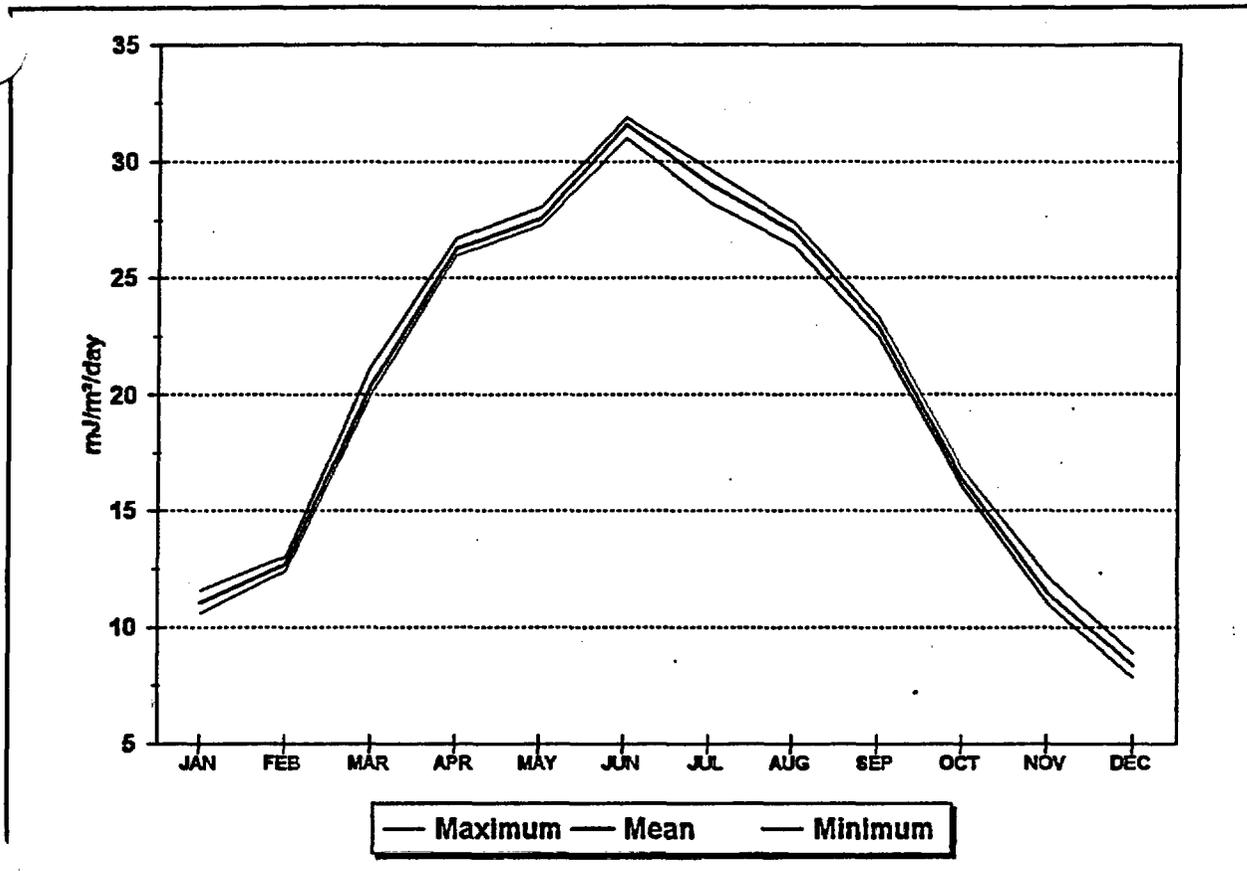


Figure 3-17. 1996 Monthly Network Daily Average Total Incoming Solar Irradiance

### 3.1.7 Atmospheric Stability

Atmospheric stability is a measure of the mixing potential of the atmosphere. Stability can be indicated by direct turbulence measures, such as the standard deviation of a wind measurement, or by indirect means, such as solar radiation intensity (which is related to convection) or delta-temperature (which is related to thermal stability). Stability determinations, for dispersion modeling purposes, include an initial classification based on a turbulence indicator, followed by adjustments for the time of day, wind speed, and nearby surface roughness (terrain characteristics). The scope of the data collection program does not include calculating atmospheric stability, therefore, the following sections discuss only the initial classification step.

In general, the results show frequent occurrences of neutral and unstable (good mixing or dispersion) conditions during daytime hours. Stable (less mixing or dispersion) conditions occur during most nighttime hours. This stability cycle typically occurs in the arid, clear sky conditions at Yucca Mountain. In the daytime, strong solar radiation heats the ground surface, promoting strong convective vertical mixing and relatively higher average wind speeds; both factors contribute to good atmospheric dispersion conditions. At night, the clear sky conditions allow the ground to cool rapidly, creating very stable conditions in the surface layers and allowing drainage wind patterns to

be established. Temperature inversions suppress vertical motion, contributing to poor dispersion but the drainage winds tend to minimize stagnation in any one area. The orientation of topography in the area directs nocturnal airflow from the Midway Valley area toward the south, through the lower portions of Jackass Flats near Fortymile Wash, and onward to Amargosa Valley, the nearest populated region. A special study performed in 1993 (DOE 1995) discusses nocturnal stable airflow for Yucca Mountain. Also, the wind data presented in Paragraph 3.1.1 includes discussions of drainage wind occurrences and characteristics.

### **3.1.7.1 Sigma-A**

Sigma-A is the standard deviation of the horizontal wind direction, or, a measure of turbulence. The hourly sigma-A values are calculated following EPA guidance (EPA 1987b) and are root-mean-square derivations of 15-minute standard deviation calculations. Lesser sigma-A values indicate a more stable (less mixing) atmosphere. Daytime greater values indicate more mixing, typically associated with neutral or unstable conditions. However, nighttime large sigma-A values can indicate a slight amount of vertical mixing during low wind speed conditions when the wind direction meanders, or slowly undergoes large changes in direction.

Figure 3-18 is a graph of sigma-A data for the 10-m level at each site presented as histograms. The sigma-A ranges used in this analysis correspond to the numerical ranges given in EPA monitoring guidance for atmospheric stability classifications (EPA 1987b). The figure shows the occurrences of each numerical sigma-A range for each of the monitoring sites. The sigma-A values of at least 22.5 degrees are shown in the uppermost segment of the bar graph, continuing to the lowest bar segment corresponding to values less than 3.8 degrees. The highest class occurred most frequently at four of the sites with frequency ranging from 2,076 hours at Site 9 to 4,673 hours at Site 7. The next most frequent class, corresponding to values between 7.5 and 12.5 degrees, ranged from 3,129 hours at Site 5 to only 538 hours at Site 3. The least frequent class, corresponding to values less than 3.8 degrees, occurred at Site 6 for 821 hours, but less than twenty hours at Sites 4, 5, 7 and 8.

### **3.1.7.2 Solar Radiation and Delta-Temperature (SRDT)**

The SRDT stability method uses incoming solar radiation for daytime and 2- to 10-m delta-temperature for nighttime. Both measurements are related to thermal stability conditions. Greater solar radiation values indicate a greater potential for surface heating, which in turn leads to thermally unstable conditions and strong convective vertical motion. Positive delta-temperature values indicate temperature "inversion" conditions, which are very stable. Negative delta-temperature values indicate slightly stable to unstable conditions. The EPA guidance uses only the positive or negative distinction for nighttime stability classification. This section presents the delta-temperature values with more resolution, so as to distinguish between more stable (greater positive) and more unstable (greater negative) delta-temperature values.

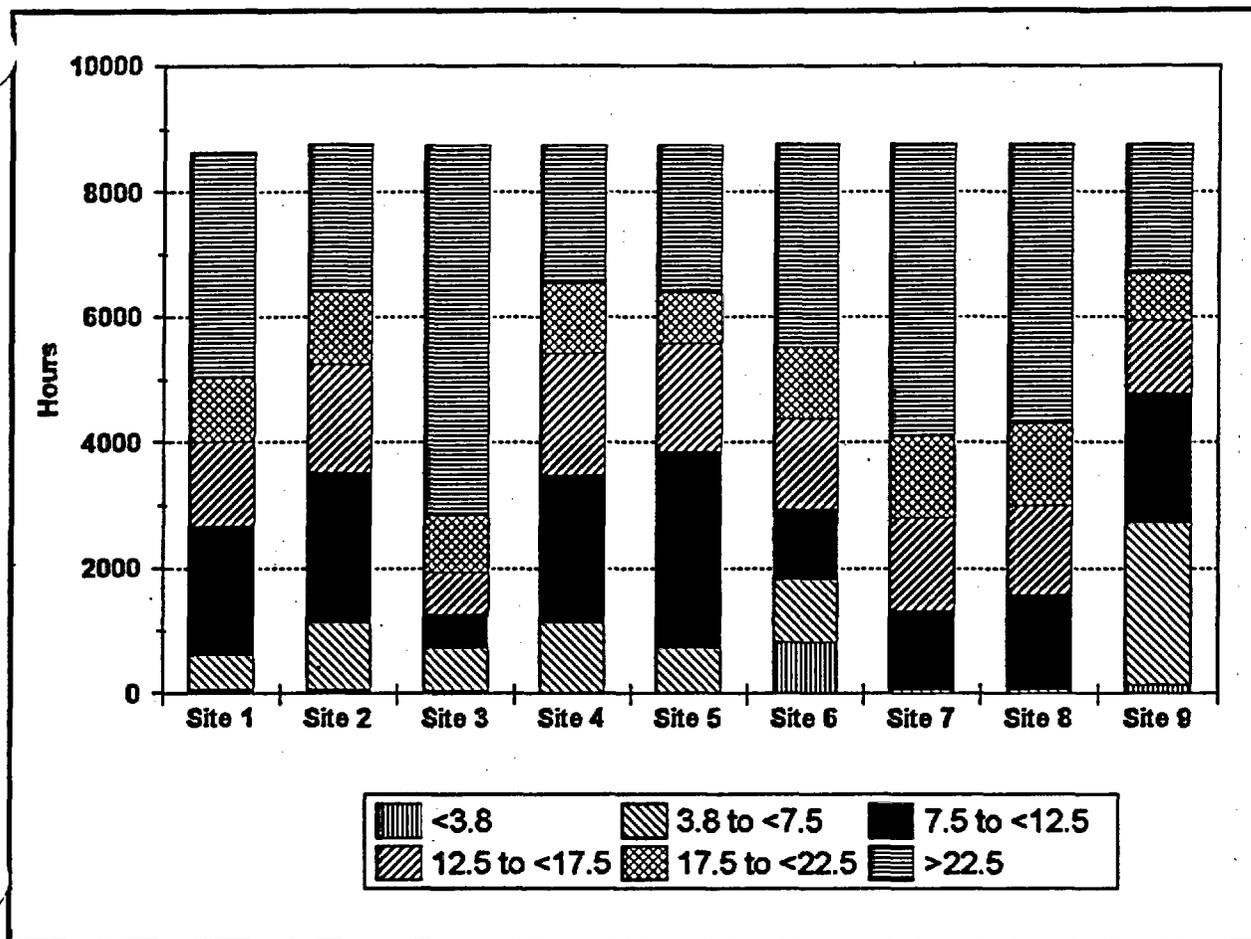


Figure 3-18. 1996 Occurrences of Sigma-A Categories by Site (degrees)

Figure 3-19 is a graph of the solar radiation data as network averages in four neutral and unstable stability categories. The number of hours per month with solar radiation less than 175 watts per square meter ( $W/m^2$ ) averaged about 100 hours, and between 150 to 200 hours in the next category, 175 to 675  $W/m^2$ . The next category, 675 to 925  $W/m^2$ , became more common during March through October, and the highest category, greater than 925  $W/m^2$ , occurred more frequently between April through August. Note that the graph shows monthly network averages, rather than the annual average by site format used in many other presentations, because the monthly data summaries from individual sites were very similar. However, summaries would not be adequate for dispersion modeling purposes because the differences between hourly results at individual sites are important in assigning stability classes.

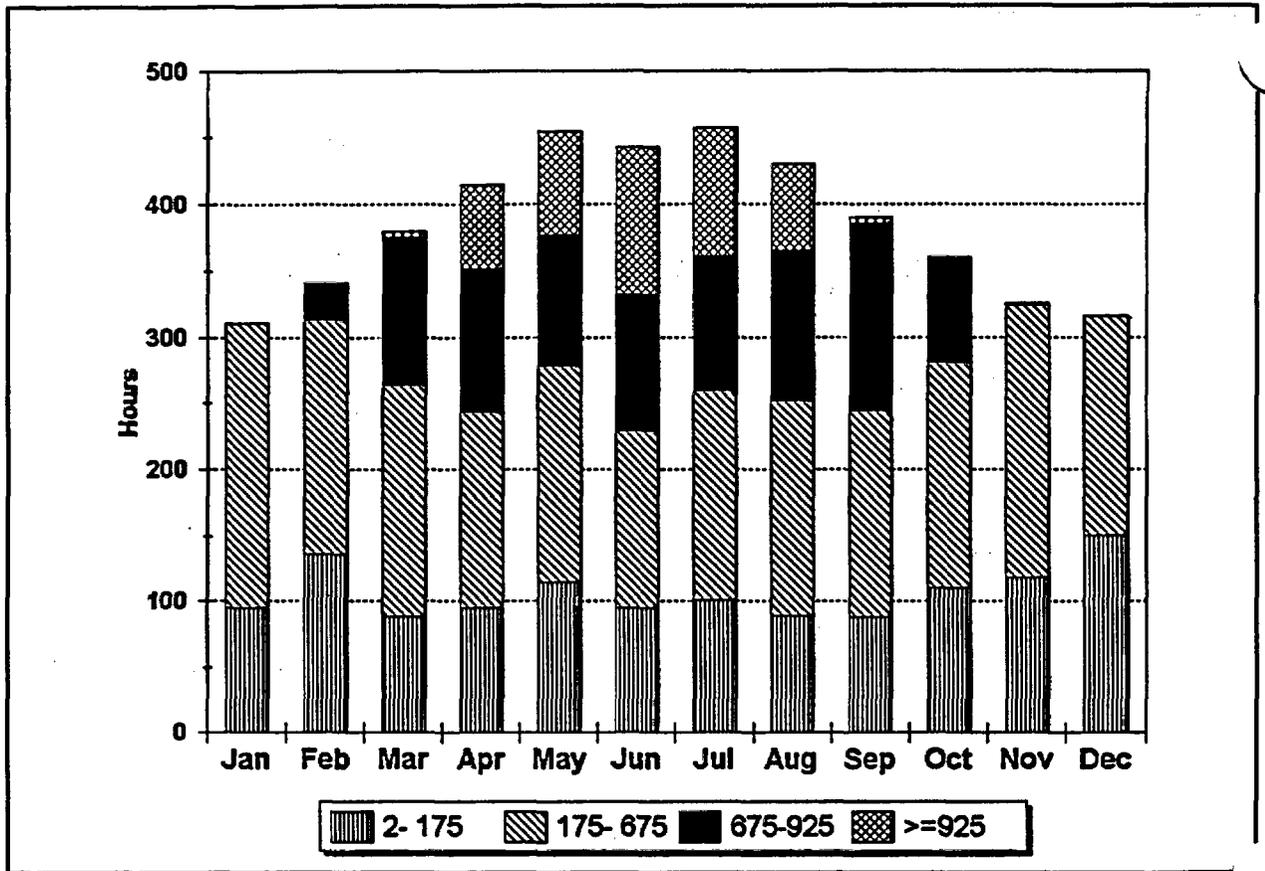


Figure 3-19. 1996 Monthly Network Average Occurrences of Solar Radiation Categories ( $W/m^2$ )

Figure 3-20 is a graph of the occurrences of delta-temperature data in four positive categories at all sites. The total number of hours in the major categories, positive and negative, delta-temperatures, were similar at most of the sites: nearly 5,000 hours of positive and less than 4,000 hours of negative. At least 1,500 hours of delta-temperature values in the first positive category, 0 to +1C, occurred at all sites. The two hilltop sites experienced considerably more hours in the first positive category; approximately 3,750 hours at Site 4 and 4,500 at Site 2. All sites, except Site 2, experienced at least 900 hours in the next delta-temperature range, +1 to +2C. The sites located near steeply rising terrain, Sites 1, 6, 7, and 8 showed more than 1,000 hours in the third category, +2 to +4C. Only Sites 6, 8, and 9 had notable numbers of hours with delta-temperature values greater than +4C.

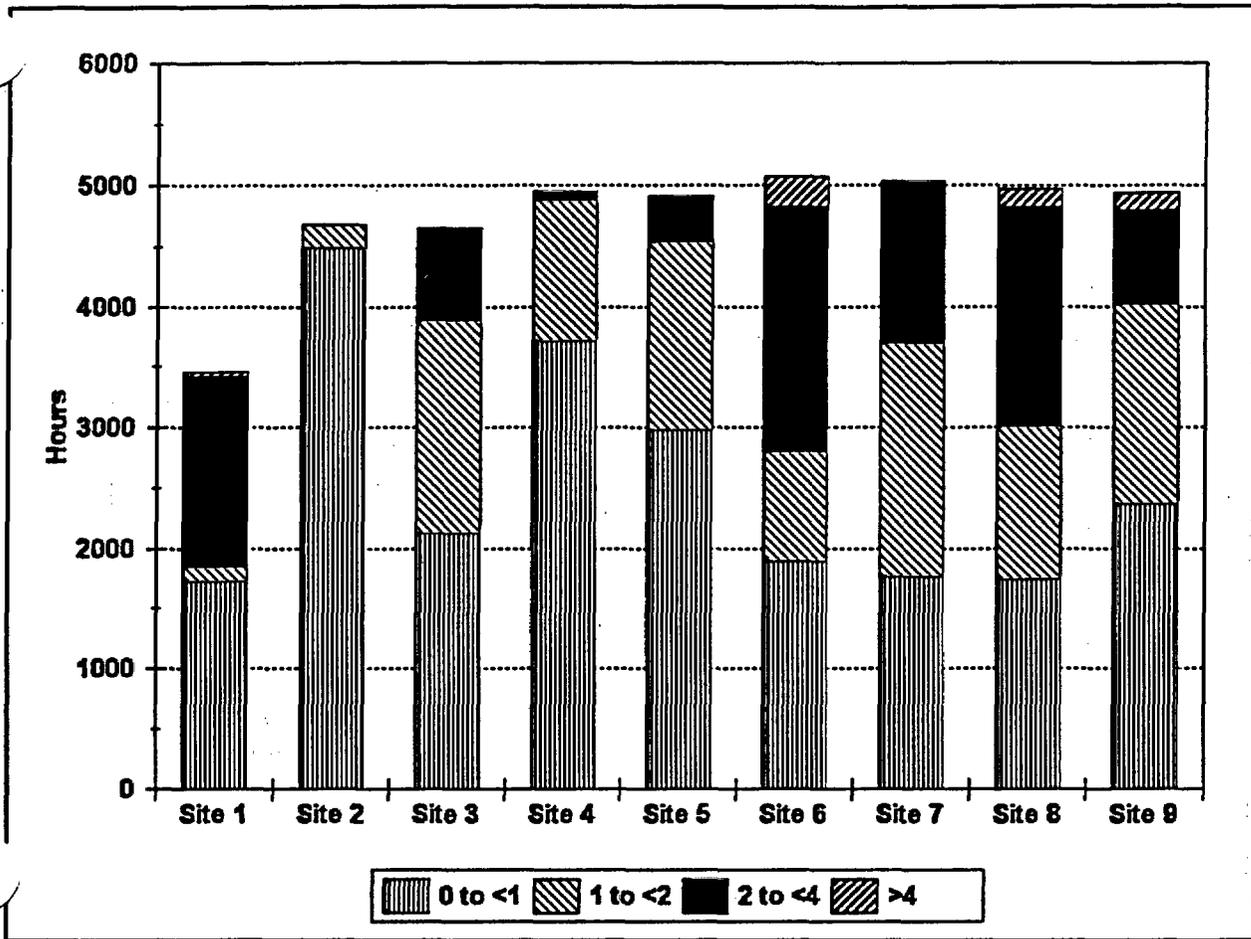


Figure 3-20. 1996 Occurrences of Positive 2-m to 10-m Delta-Temperature Categories by Site (degrees C)

Figure 3-21 is a graph of the three negative delta-temperature categories at all sites. All the sites had at least 2,000 hours in the first negative category, 0 to -1C. All sites except Site 3 had more than 900 hours in the second category, -1 to -2C. Only the two hilltop sites, Sites 2 and 4, and Site 7, experienced many hours with delta-temperature values less than -2C. This condition occurs at the hilltop sites during moderately strong wind periods. The occurrences at Site 7 tend to be during strong incoming solar radiation and lesser wind speeds.

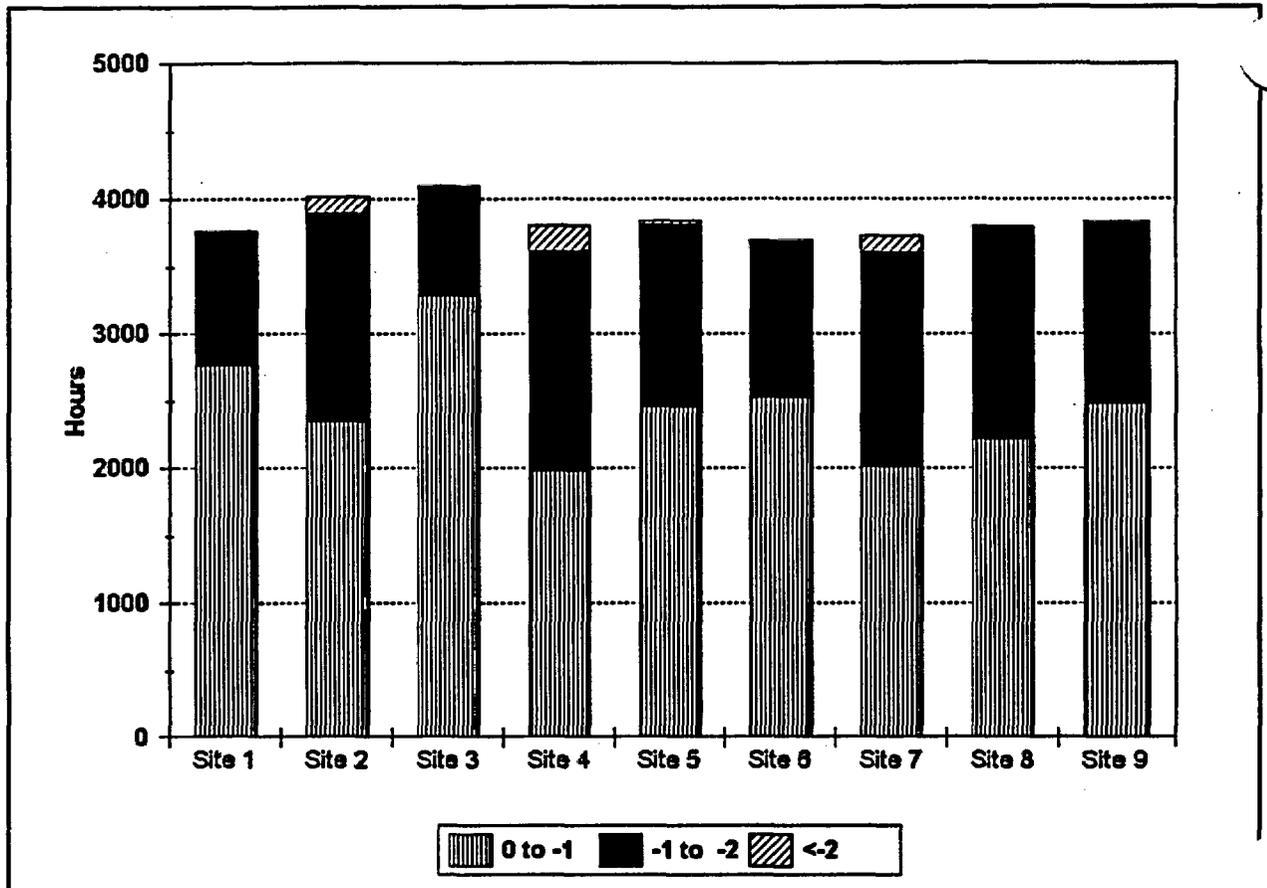


Figure 3-21. 1996 Occurrences of Negative 2-m to 10-m Delta-Temperature Categories by Site (degrees C)

### 3.1.7.3 Sigma-w and Sigma-u

Sigma-w, the standard deviation of the vertical wind speed, does not directly indicate stability by an approved EPA method. When divided by the average wind speed, it provides an estimate of sigma-E, the standard deviation of the vertical wind direction. The data were summarized by site for the annual period in five categories: 0 - 0.1, 0.1 - 0.2, 0.2 - 0.4, 0.4 - 0.6, and greater than 0.6 meters per second. The results, presented graphically in Figure 3-22, shows the categories provided similar distributions at most sites with a few exceptions. Site 4 had fewer hours in the lowest category than any other site. Sites 2 and 3, followed by Site 6, had the most occurrences of values in the highest category.

Sigma-u, the 10-minute standard deviation of horizontal wind speed, is not currently an EPA-recommended stability indicator. Monthly and annual values of mean daily maximum, mean, and mean daily minimum values are reported in Appendix C. Daily maximum values range from about 1.3 to 2.9 m/s and are greater in summer than winter. Daily minimum values are usually about 0.1 to 0.2 m/s, and the daily means range from about 0.5 m/s in winter to 1.0 m/s in summer.

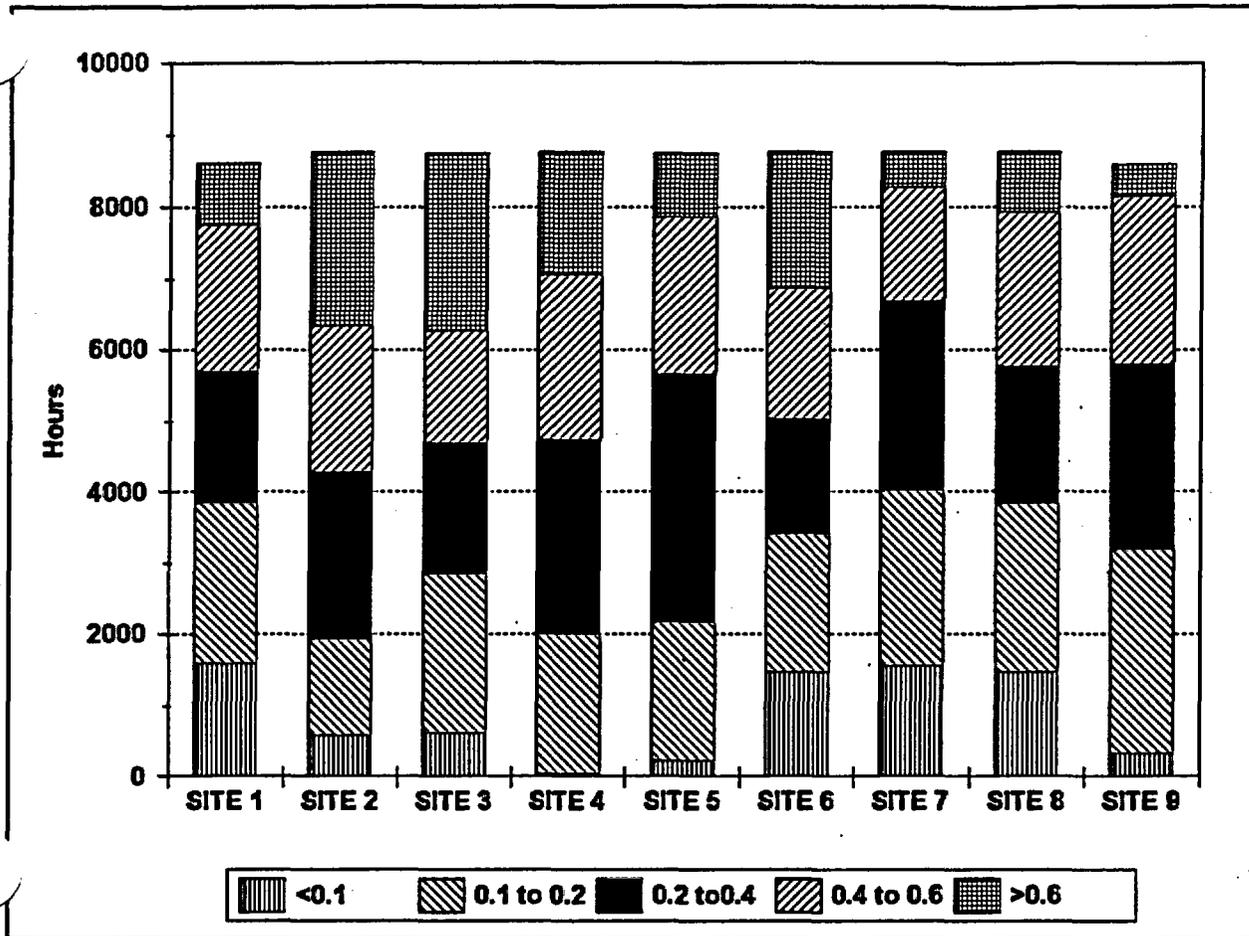


Figure 3-22. 1996 Occurrences of Sigma-w Categories by Site (m/s)

## 3.2 ANNUAL TRENDS

The 1996 wind, temperature, and precipitation results are discussed in this section compared to results from previous years.

### 3.2.1 Wind

Summaries of 1996 wind data compared to summaries from previous years continue to show similar dominant wind patterns. The overall consistency from year to year is due to the influence of local winds by surrounding topography. Daytime southerly winds occurred approximately 8 to 10 percent more in 1996 than in 1995. This contrasts with the 8 to 10 percent decrease from 1994 to 1995. The frequency of daytime northerly winds from 1995 to 1996 decreased approximately 15 percent. The 1996 nighttime northerly wind increased approximately 10 percent from 1995. The nighttime southerly winds decreased by 10 percent from 1995 to 1996. From 1994 to 1995, the nighttime northerly winds decreased approximately 7 percent, with corresponding increases in southerly winds

of approximately 3 percent. These differences may be related to changes in regional scale airflow patterns from year to year.

### 3.2.2 Temperature

Prior to mid-1993, air temperature measurements were made at 10-m, following then current regulatory monitoring guidance. This guidance changed to 2-m to match the standard climatological measurements. Because the temperature differences between the two levels can typically range between -1.5C and +3C, no inter-annual temperature comparisons are made between the 1996 data and data prior to 1994.

The monthly network average mean temperatures from 1996, 1995, and 1994 are plotted in Figure 3-23. The 1996 network average mean temperatures were similar to the results from 1995 and 1994. The 1996 and 1994 network averages were very similar for June through October.

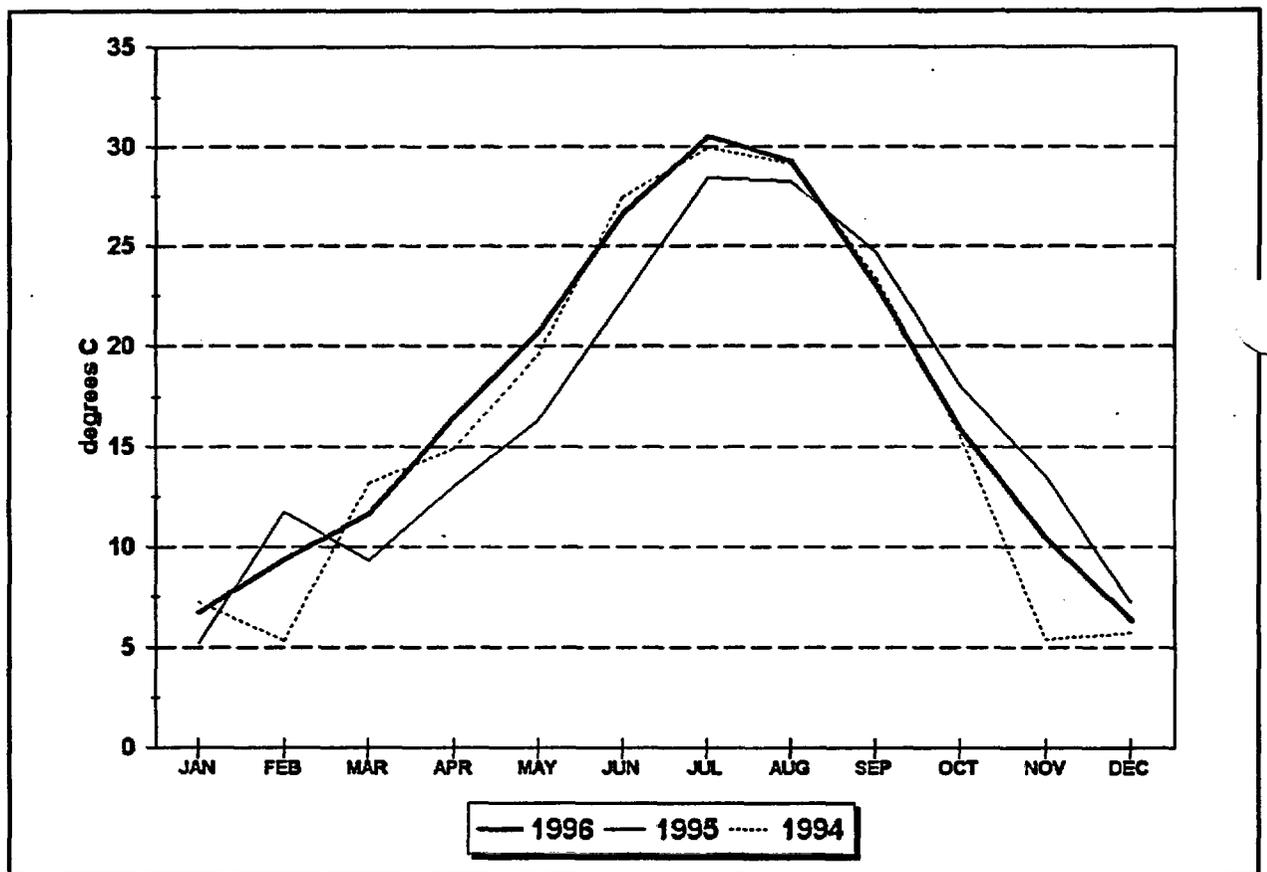


Figure 3-23. 1994, 1995 and 1996 Monthly Network Average Temperatures

### 3.2.3 Precipitation

Figure 3-24 shows the 11-year annual precipitation record at Site 1, which has the longest precipitation record within the current network. The 1996 total amount of 5.07 inches (128.8 mm) slightly exceeded the 11-year average of 4.92 inches (125.0 mm).

The annual total precipitation for each site is compared for 1993 through 1996 in Figure 3-25. The sites are arranged by descending elevation, as in Figure 3-12. The network average for 1996 was 4.79 inches (121.7 mm), which is similar to the 1994 average.

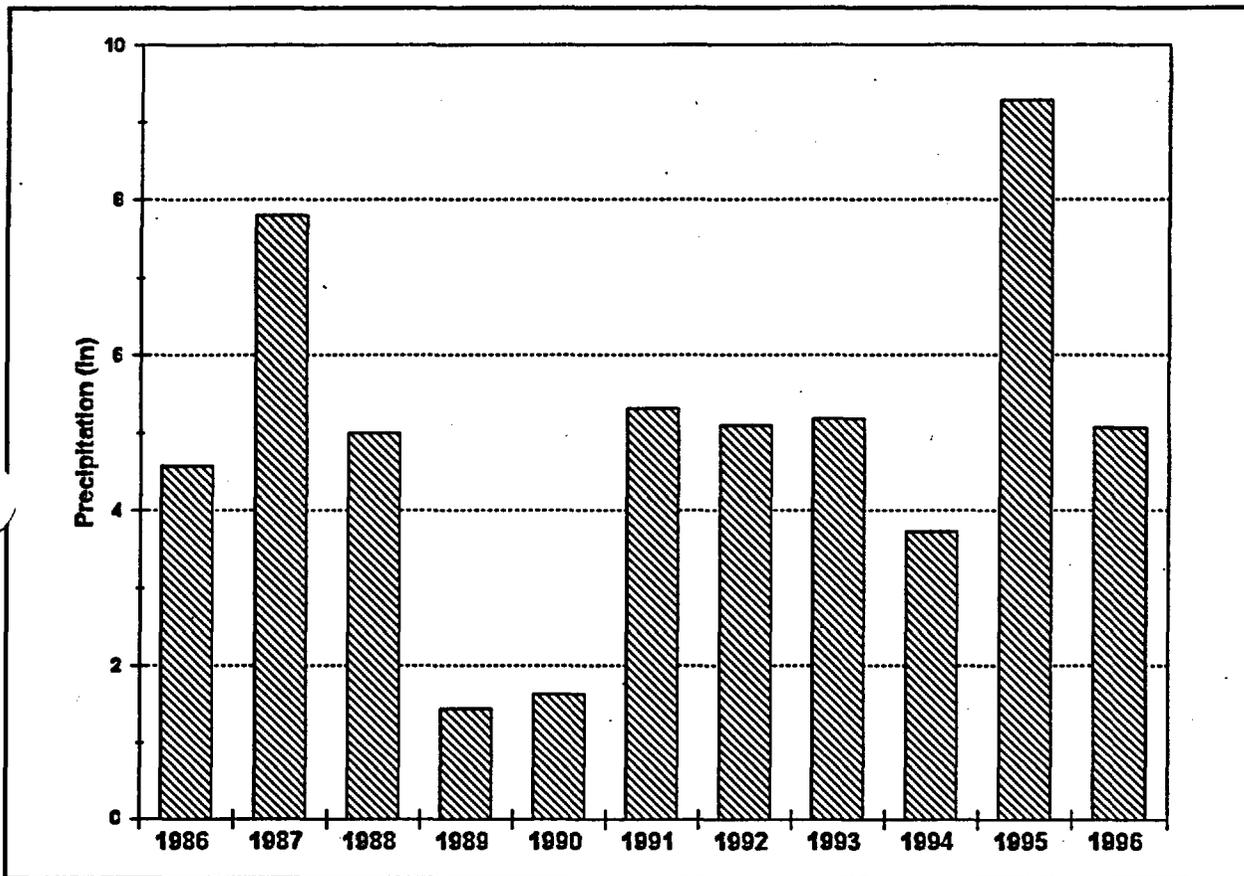


Figure 3-24. 1986 through 1996 Annual Precipitation at Site 1

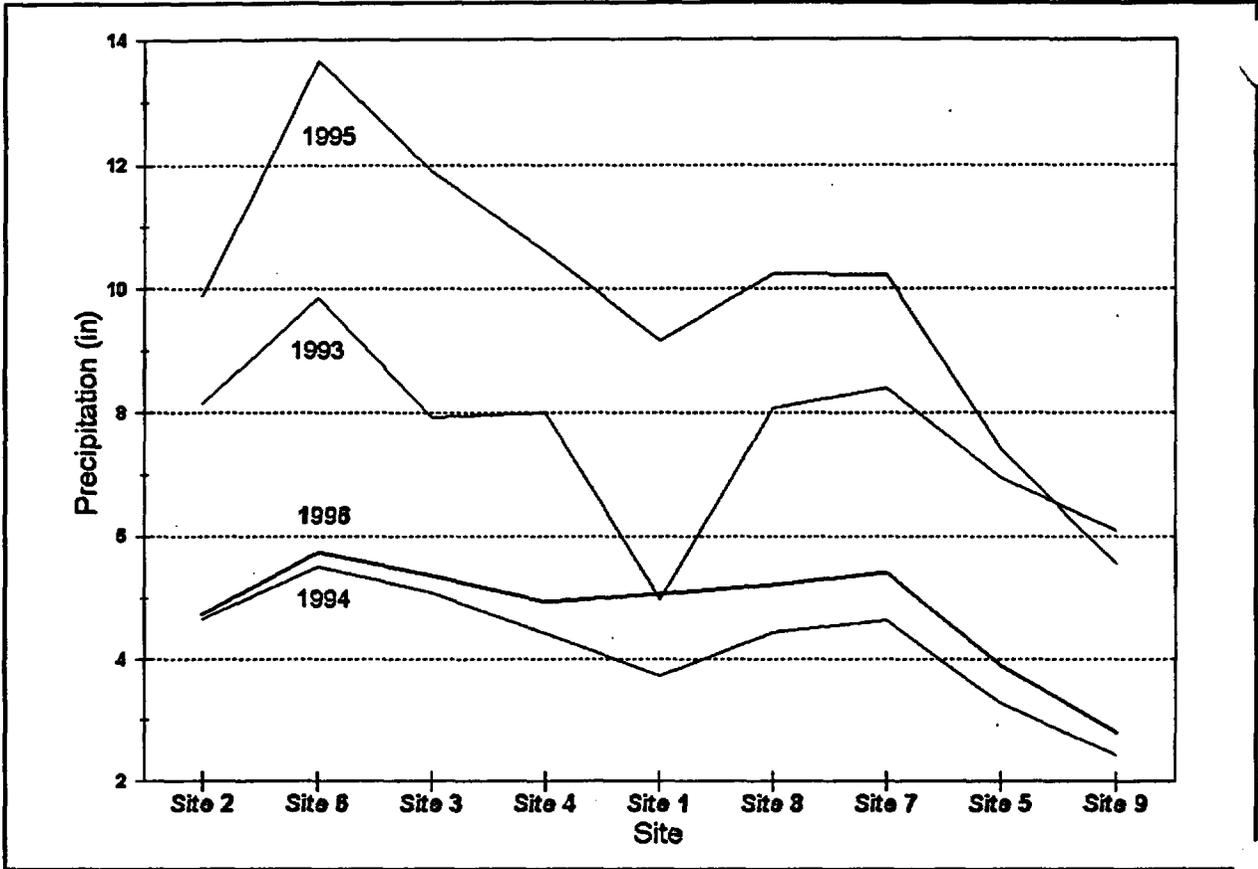


Figure 3-25. 1993 through 1996 Annual Precipitation Ordered by Descending Site Elevation

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**APPENDIX A**  
**GLOSSARY OF ACRONYMS AND TERMS**



## APPENDIX A

### GLOSSARY OF ACRONYMS AND TERMS

<b>C</b>	<b>Celsius</b>
<b>Delta-Temperature</b>	<b>Difference in temperature between two vertical levels</b>
<b>Dew Point</b>	<b>The temperature to which a given parcel of air must be cooled at constant pressure and water-vapor content in order for saturation to occur</b>
<b>DOE</b>	<b>U.S. Department of Energy</b>
<b>Drainage Wind</b>	<b>Nocturnal downslope wind caused by surface cooling in valleys and canyon areas</b>
<b>EFPD</b>	<b>Environmental Field Programs Division</b>
<b>EPA</b>	<b>U.S. Environmental Protection Agency</b>
<b>ESF</b>	<b>Exploratory Studies Facility</b>
<b>km</b>	<b>kilometers</b>
<b>n</b>	<b>meters</b>
<b>-m</b>	<b>meters above ground level</b>
<b>mm</b>	<b>millimeters</b>
<b>m/s</b>	<b>meters per second</b>
<b>MSL</b>	<b>mean sea level</b>
<b>NRC</b>	<b>U.S. Nuclear Regulatory Commission</b>
<b>NTS</b>	<b>Nevada Test Site</b>
<b>PSD</b>	<b>Prevention of Significant Deterioration</b>
<b>PST</b>	<b>Pacific Standard Time</b>
<b>QA</b>	<b>quality assurance</b>
<b>QC</b>	<b>quality control</b>
<b>Relative humidity</b>	<b>The ratio, expressed as a percent, of the atmospheric moisture content of an air parcel to the moisture content the air would contain at the same temperature if saturated.</b>
<b>Sigma-e</b>	<b>Standard deviation of the vertical wind direction</b>
<b>Sigma-theta (sigma-A)</b>	<b>Standard deviation of the horizontal wind direction</b>
<b>Sigma-u</b>	<b>Standard deviation of the horizontal wind speed</b>
<b>Sigma-w</b>	<b>Standard deviation of the vertical wind speed</b>

<b>SRDT</b>	<b>Solar radiation and delta-temperature; an atmospheric stability measure</b>
<b>STAR</b>	<b>Stability Array</b>
<b>Unit vector</b>	<b>vector having a magnitude of one unit</b>
<b>UTM</b>	<b>Universal Transverse Mercator</b>
<b>YMP</b>	<b>Yucca Mountain Site Characterization Project</b>

**APPENDIX B**  
**CLIMATOLOGICAL SUMMARIES FOR 1996**



## **APPENDIX B**

### **CLIMATOLOGICAL SUMMARIES FOR 1996**

Statistical terms used in Appendix B are defined as follows:

1. **Extreme maximum** - The absolute highest daily value
2. **Mean maximum** - The average of the highest values
3. **Mean** - The average of all values taken over a given period of time
4. **Mean minimum** - The average of the lowest values
5. **Extreme minimum** - The absolute lowest daily value
6. **Fastest 1-minute** - The highest wind speed measured over any 1-minute period, with the associated wind direction
7. **Peak 3-second wind speed** - The highest 3-second running average wind speed

Table B-1. Site 1 (NTS-60) 1996 Climatological Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C)</b>													
Extreme Maximum (2)	20.1	23.8	25.2	31.7	36.0	38.5	40.9	40.3	37.3	34.7	24.6	17.4	40.9
Mean Maximum (2)	13.3	15.2	18.8	23.5	27.8	33.6	37.8	38.9	29.9	22.8	16.5	11.6	24.0
Mean (1)	6.9	9.5	11.7	16.6	20.7	26.3	30.4	29.3	23.1	16.1	10.7	6.5	17.3
Mean Minimum (2)	0.7	3.4	4.6	8.6	12.5	16.8	22.1	20.8	15.6	9.2	4.7	1.9	10.1
Extreme Minimum (2)	-5.1	-10.1	-0.8	1.3	7.3	6.7	16.9	15.9	7.4	-0.3	-1.4	-3.6	-10.1
<b>Number of Days</b>													
Precipitation													
0.01 inch or more	2	4	3	0	2	1	4	0	0	3	4	3	26
Temperature (2)													
32C (90F) and above	0	0	0	0	4	21	31	30	8	5	0	0	99
0C (32F) and below	10	8	3	0	0	0	0	0	0	1	3	11	36
<b>Barometric Pressure (mb)</b>													
Mean (1)	887.7	886.8	885.8	887.0	883.7	884.9	886.6	886.7	885.1	886.7	888.5	889.0	886.5
<b>Mean Relative Humidity (%)</b>													
Hour 0400 (PST) (1)	45.0	52.5	41.6	28.3	23.7	25.9	28.5	20.7	28.3	30.9	49.8	57.8	36.1
Hour 1000 (1)	34.6	41.8	32.6	17.1	17.3	32.2	17.6	13.9	22.3	24.3	37.3	47.7	28.2
Hour 1600 (1)	26.4	31.9	20.3	10.9	14.5	17.4	14.3	8.7	12.7	20.1	35.3	39.3	21.0
Hour 2200 (1)	42.2	49.8	32.7	19.2	17.4	18.0	22.0	14.5	20.0	28.5	43.4	54.7	30.2
<b>Precipitation (In)</b>													
Max 1-hour total	0.02	0.10	0.14	0.00	0.03	0.04	0.47	0.00	0.00	0.11	0.40	0.22	0.47
Max 6-hour total (3)	0.03	0.21	0.34	0.00	0.06	0.04	0.48	0.00	0.00	0.42	0.66	0.70	0.70
Max 24-hour total (3)	0.06	0.22	0.53	0.00	0.08	0.04	0.48	0.00	0.00	0.62	1.29	0.74	1.29
Total	0.07	0.65	0.56	0.00	0.10	0.04	0.73	0.00	0.00	0.82	1.31	0.79	5.07
<b>Wind</b>													
Mean Speed (m/s) (1)	2.8	3.2	4.1	4.6	4.0	3.8	3.5	3.3	3.5	3.4	3.3	3.0	3.5
Fastest 1-minute (2)													
Speed (m/s)	15.0	17.5	17.4	19.3	16.7	15.5	14.9	18.7	16.4	23.3	16.2	15.6	23.3
Direction (deg)	348.9	186.5	341.3	184.6	176.2	158.7	94.6	251.7	163.5	338.1	4.3	182.6	338
Peak 3-sec Gust (m/s)	18.5	22.9	21.7	23.2	20.6	19.3	18.4	22.9	18.9	27.1	21.1	21.1	27.1

Note 1: Values derived from 1-second data averaged over 1 hour.

Note 2: Values derived from 1-second data averaged over 1 minute.

Note 3: Continuous running period which may encompass more than one calendar day.

Table B-2. Site 2 (Yucca Mountain) 1996 Climatological Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C)</b>													
Extreme Maximum (2)	17.2	21.7	23.9	29.8	34.2	37.2	39.7	38.9	36.1	33.5	22.0	15.3	39.7
Mean Maximum (2)	10.9	12.9	16.7	21.7	26.1	32.6	36.6	35.5	28.3	20.4	13.8	9.1	22.1
Mean (1)	6.6	8.6	10.6	15.1	19.3	25.8	29.4	28.6	22.1	15.3	9.8	5.7	16.4
Mean Minimum (2)	3.3	5.5	5.8	9.4	13.8	19.8	23.8	23.2	17.2	11.4	6.4	2.9	11.9
Extreme Minimum (2)	-2.8	-6.8	-1.7	3.9	5.8	8.7	17.4	17.7	8.8	-0.4	-2.1	-3.1	-6.8
<b>Number of Days</b>													
Precipitation													
0.01 inch or more	1	6	3	0	2	1	4	0	0	3	3	4	27
Temperature (2)													
32C (90F) and above	0	0	0	0	3	21	30	29	7	2	0	0	92
0C (32F) and below	8	7	2	0	0	0	0	0	0	1	4	4	26
<b>Barometric Pressure (mb)</b>													
Mean (1)	850.5	850.0	849.4	851.0	848.5	851.1	853.4	853.3	850.4	850.7	851.9	851.1	850.9
<b>Mean Relative Humidity (%)</b>													
Hour 0400 (PST) (1)	39.1	49.1	37.2	27.2	29.3	17.5	25.2	18.8	27.4	29.1	44.8	54.1	33.2
Hour 1000 (1)	35.9	45.4	31.2	17.4	20.9	14.3	17.9	13.9	20.7	26.6	40.2	50.0	27.9
Hour 1600 (1)	27.4	36.4	21.3	9.3	13.1	6.8	13.7	7.9	12.5	21.0	33.8	45.9	20.8
Hour 2200 (1)	37.8	47.1	29.5	18.3	24.0	11.4	21.5	13.2	19.1	27.4	40.3	52.8	28.5
<b>Precipitation (in)</b>													
Max 1-hour total	0.03	0.11	0.14	0.00	0.05	0.08	0.10	0.00	0.00	0.12	0.26	0.22	0.26
Max 6-hour total (3)	0.05	0.22	0.34	0.00	0.11	0.10	0.10	0.00	0.00	0.42	0.71	0.75	0.75
Max 24-hour total (3)	0.08	0.22	0.49	0.00	0.15	0.10	0.12	0.00	0.00	0.75	1.17	0.79	1.17
Total	0.08	0.57	0.52	0.00	0.18	0.10	0.21	0.00	0.00	1.00	1.20	0.87	4.73
<b>Wind</b>													
Mean Speed (m/s) (1)	3.9	4.0	5.4	6.1	5.1	4.4	4.1	4.4	4.1	4.0	4.5	4.4	4.5
Fastest 1-minute (2)													
Speed (m/s)	23.2	20.7	28.7	24.9	20.7	14.8	18.7	19.7	19.3	29.4	25.0	23.8	29.4
Direction (deg)	325.6	232.0	306.9	320.2	318.9	247.9	95.6	267.9	241.9	324.8	268.5	235.4	325
Peak 3-sec Gust (m/s)	26.9	25.5	32.0	29.1	27.2	20.8	21.1	25.2	24.1	33.3	31.9	29.7	33.3

Note 1: Values derived from 1-second data averaged over 1 hour

Note 2: Values derived from 1-second data averaged over 1 minute.

Note 3: Continuous running period which may encompass more than one calendar day.

Table B-3. Site 3 (Coyote Wash) 1996 Climatological Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C)</b>													
Extreme Maximum (2)	18.6	22.6	23.9	30.9	34.6	39.1	39.6	39.4	36.6	33.6	23.0	16.5	39.6
Mean Maximum (2)	11.8	13.9	17.2	22.1	26.4	33.0	36.8	35.8	28.7	21.3	14.9	10.4	22.7
Mean (1)	7.1	9.2	11.4	16.1	20.0	26.4	30.1	29.1	22.8	15.8	10.5	6.3	17.1
Mean Minimum (2)	2.5	4.9	5.8	9.5	13.0	18.6	23.0	22.1	16.7	10.5	6.0	2.5	11.3
Extreme Minimum (2)	-3.9	-7.6	0.2	2.9	6.2	8.2	17.3	17.1	8.8	0.3	-1.8	-3.5	-7.6
<b>Number of Days</b>													
Precipitation													
0.01 inch or more	1	6	3	0	3	1	4	0	0	3	3	4	28
Temperature (2)													
32C (90F) and above	0	0	0	0	2	23	29	29	7	3	0	0	93
0C (32F) and below	9	8	0	0	0	0	0	0	0	0	2	5	24
<b>Barometric Pressure (mb)</b>													
Mean (1)	872.0	871.3	870.6	871.9	868.8	870.7	872.6	872.7	870.5	871.4	872.9	872.5	871.5
<b>Mean Relative Humidity (%)</b>													
Hour 0400 (PST) (1)	41.5	51.6	39.2	27.5	30.8	18.6	27.4	20.3	28.8	29.9	48.7	58.0	35.2
Hour 1000 (1)	32.9	41.1	27.7	15.8	19.4	12.6	16.0	12.6	18.7	23.8	36.3	46.8	25.3
Hour 1600 (1)	27.3	33.6	20.2	9.2	12.5	6.2	12.8	7.0	11.9	19.8	32.3	45.1	19.8
Hour 2200 (1)	39.5	49.9	30.9	17.7	24.0	11.7	20.9	13.3	19.4	27.9	43.1	55.8	29.5
<b>Precipitation (In)</b>													
Max 1-hour total	0.03	0.11	0.23	0.00	0.04	0.08	0.10	0.00	0.00	0.14	0.57	0.23	0.57
Max 6-hour total (3)	0.06	0.19	0.46	0.00	0.09	0.08	0.10	0.00	0.00	0.53	0.77	0.77	0.77
Max 24-hour total (3)	0.09	0.21	0.66	0.00	0.14	0.08	0.10	0.00	0.00	0.79	1.60	0.81	1.60
Total	0.09	0.58	0.68	0.00	0.18	0.08	0.22	0.00	0.00	1.03	1.61	0.88	5.35
<b>Wind</b>													
Mean Speed (m/s) (1)	2.4	2.6	3.2	3.4	3.0	2.8	2.6	2.5	2.7	2.6	2.6	2.4	2.7
Fastest 1-minute (2)													
Speed (m/s)	14.3	12.3	16.0	16.3	12.7	11.2	12.2	11.7	12.3	18.0	15.2	11.4	18.0
Direction (deg)	306.7	150.1	309.2	302.1	166.9	168.3	103.8	294.3	151.6	307.4	309.7	294.6	307
Peak 3-sec Gust (m/s)	21.4	18.9	25.2	22.9	19.1	19.4	16.5	16.9	19.1	26.2	21.3	17.4	26.2

Note 1: Values derived from 1-second data averaged over 1 hour

Note 2: Values derived from 1-second data averaged over 1 minute.

Note 3: Continuous running period which may encompass more than one calendar day.

Table B-4. Site 4 (Alice Hill) 1996 Climatological Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C)</b>													
Extreme Maximum (2)	19.5	23.7	26.5	32.3	36.8	39.6	41.2	41.0	38.0	34.8	23.9	16.2	41.2
Mean Maximum (2)	12.6	15.1	18.7	23.5	28.1	34.5	38.2	37.3	30.0	22.3	15.7	11.0	23.9
Mean (1)	7.6	9.7	11.8	16.5	20.9	27.0	30.8	29.7	23.4	16.1	10.8	6.8	17.6
Mean Minimum (2)	2.8	4.8	5.6	9.4	14.0	18.9	23.3	22.2	16.9	10.2	5.9	2.9	11.4
Extreme Minimum (2)	-4.0	-7.9	-0.3	3.5	7.8	9.5	18.5	18.0	8.4	0.0	-0.2	-2.2	-7.9
<b>Number of Days</b>													
Precipitation													
0.01 inch or more	1	5	3	0	2	1	3	0	0	3	2	3	23
Temperature (2)													
32C (90F) and above	0	0	0	1	4	24	30	31	10	5	0	0	105
0C (32F) and below	8	6	2	0	0	0	0	0	0	1	1	6	24
<b>Barometric Pressure (mb)</b>													
Mean (1)	877.2	876.5	875.5	876.4	873.2	875.1	877.1	877.2	875.0	876.1	877.9	877.6	876.2
<b>Mean Relative Humidity (%)</b>													
Hour 0400 (PST) (1)	40.3	51.1	39.6	27.3	29.8	17.5	27.1	18.7	27.8	29.5	46.5	55.3	34.2
Hour 1000 (1)	35.1	43.1	28.8	16.1	19.8	13.4	17.0	13.3	19.5	24.7	36.4	48.7	26.3
Hour 1600 (1)	26.2	33.0	20.0	9.2	12.3	6.3	13.5	7.2	11.9	20.1	30.8	42.9	19.5
Hour 2200 (1)	39.0	48.9	30.8	18.4	23.1	11.8	21.7	13.5	19.6	27.6	40.4	54.6	29.1
<b>Precipitation (In)</b>													
Max 1-hour total	0.02	0.09	0.13	0.00	0.03	0.01	0.33	0.00	0.00	0.11	0.42	0.23	0.42
Max 6-hour total (3)	0.02	0.18	0.30	0.00	0.04	0.02	0.36	0.00	0.00	0.43	0.81	0.76	0.81
Max 24-hour total (3)	0.04	0.20	0.44	0.00	0.06	0.02	0.36	0.00	0.00	0.74	1.51	0.81	1.51
Total	0.04	0.48	0.51	0.00	0.07	0.02	0.38	0.00	0.00	1.07	1.51	0.86	4.94
<b>Wind</b>													
Mean Speed (m/s) (1)	3.9	4.3	5.6	6.6	5.5	4.6	4.5	4.1	4.4	4.9	4.8	3.7	4.8
Fastest 1-minute (2)	24.4	21.1	27.8	25.3	24.6	20.3	25.1	19.8	21.0	33.2	22.8	19.5	33.2
Speed (m/s)													
Direction (deg)	340.4	180.3	2.4	337.0	9.8	188.7	37.2	298.8	20.6	344.7	338.9	181.3	345
Peak 3-sec Gust (m/s)	28.0	25.0	31.4	29.9	29.3	23.6	28.3	28.5	24.1	37.2	26.8	23.2	37.2

Note 1: Values derived from 1-second data averaged over 1 hour.

Note 2: Values derived from 1-second data averaged over 1 minute.

Note 3: Continuous running period which may encompass more than one calendar day.

Table B-5. Site 5 (Fortymile Wash) 1996 Climatological Data Summary

	JAN.	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C)</b>													
Extreme Maximum (2)	21.0	25.4	28.6	34.6	38.8	41.6	43.1	42.3	39.9	36.9	26.0	17.9	43.1
Mean Maximum (2)	14.9	17.3	21.0	25.7	30.1	36.7	40.5	39.4	32.4	24.8	18.0	13.2	26.2
Mean (1)	7.6	10.6	12.9	17.8	21.9	27.8	32.0	30.4	24.2	17.0	11.5	7.3	18.4
Mean Minimum (2)	0.2	3.9	5.2	9.4	12.3	17.0	22.5	20.8	15.5	9.5	5.2	1.6	10.3
Extreme Minimum (2)	-7.1	-6.7	-0.9	2.2	6.7	8.0	16.1	14.9	7.6	-0.2	-1.6	-4.7	-7.1
<b>Number of Days</b>													
<b>Precipitation</b>													
0.01 inch or more	2	4	3	0	2	1	2	0	0	3	3	3	23
<b>Temperature (2)</b>													
32C (90F) and above	0	0	0	4	10	25	31	31	20	8	0	0	129
0C (32F) and below	14	8	3	0	0	0	0	0	0	1	2	12	40
<b>Barometric Pressure (mb)</b>													
Mean (1)	907.4	906.4	905.4	906.1	902.6	903.9	905.6	905.7	904.0	905.8	907.9	908.0	905.7
<b>Mean Relative Humidity (%)</b>													
Hour 0400 (PST) (1)	43.2	51.3	41.2	26.3	31.1	18.1	26.8	18.5	27.0	29.4	50.8	60.6	35.4
Hour 1000 (1)	31.5	39.8	24.6	13.3	18.2	11.2	14.0	11.1	16.9	20.6	33.9	43.9	23.2
Hour 1600 (1)	22.3	29.6	16.4	7.1	10.2	4.7	9.6	5.5	9.6	17.3	27.5	36.2	16.3
Hour 2200 (1)	40.3	50.3	32.4	17.8	22.3	11.2	20.3	13.3	20.2	28.0	46.2	59.6	30.2
<b>Precipitation (in)</b>													
Max 1-hour total	0.08	0.22	0.09	0.00	0.05	0.01	0.03	0.00	0.00	0.25	0.16	0.15	0.25
Max 6-hour total (3)	0.12	0.31	0.20	0.00	0.06	0.02	0.03	0.00	0.00	0.49	0.70	0.53	0.70
Max 24-hour total (3)	0.13	0.31	0.22	0.00	0.10	0.02	0.03	0.00	0.00	0.97	1.05	0.53	1.05
Total	0.14	0.59	0.24	0.00	0.12	0.02	0.05	0.00	0.00	1.08	1.09	0.57	3.90
<b>Wind</b>													
Mean Speed (m/s) (1)	4.0	4.3	5.0	5.5	4.8	4.7	4.5	4.4	4.5	4.6	4.3	4.1	4.5
<b>Fastest 1-minute (2)</b>													
Speed (m/s)	16.2	19.7	19.7	20.1	18.1	17.3	18.4	15.3	16.7	25.3	15.7	17.1	25.3
Direction (deg)	339.7	185.2	349.1	340.0	73.5	180.5	81.8	133.1	177.7	336.9	314.9	170.0	337
Peak 3-sec Gust (m/s)	19.2	23.1	23.6	24.6	22.8	20.1	21.7	20.0	20.7	30.4	19.2	22.1	30.4

Note 1: Values derived from 1-second data averaged over 1 hour.

Note 2: Values derived from 1-second data averaged over 1 minute.

Note 3: Continuous running period which may encompass more than one calendar day.

Table B-6. Site 6 (WT-6) 1996 Climatological Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C)</b>													
Extreme Maximum (2)	19.0	22.5	24.1	30.4	34.7	38.0	39.2	39.3	36.3	33.7	23.4	16.4	39.3
Mean Maximum (2)	12.0	14.0	17.4	22.0	26.3	32.7	36.5	35.7	28.6	21.1	14.9	10.2	22.6
Mean (1)	5.6	8.2	10.2	15.2	19.3	25.1	28.9	27.7	21.5	14.6	9.3	5.3	15.9
Mean Minimum (2)	-0.2	2.6	3.4	7.5	11.4	15.6	20.2	19.0	14.1	8.0	4.0	0.6	8.8
Extreme Minimum (2)	-7.1	-9.9	-1.8	0.4	6.8	5.2	14.4	13.1	6.6	-1.0	-2.9	-5.1	-9.9
<b>Number of Days</b>													
Precipitation													
0.01 inch or more	1	6	3	0	2	1	3	0	0	3	3	4	26
Temperature (2)													
32C (90F) and above	0	0	0	0	3	22	28	29	7	4	0	0	93
0C (32F) and below	16	8	4	0	0	0	0	0	0	2	3	16	49
<b>Barometric Pressure (mb)</b>													
Mean (1)	867.3	866.7	865.9	867.3	864.5	866.7	868.9	868.9	866.4	867.1	868.4	868.0	867.2
<b>Mean Relative Humidity (%)</b>													
Hour 0400 (PST) (1)	47.8	55.8	46.7	30.7	34.3	22.3	33.6	23.6	32.8	33.4	54.0	63.4	39.9
Hour 1000 (1)	34.1	41.7	29.3	16.9	19.3	14.1	17.8	13.9	20.3	25.1	37.5	46.7	26.4
Hour 1600 (1)	27.9	34.2	20.9	10.0	13.7	7.3	15.1	8.2	13.1	20.7	33.0	44.1	20.7
Hour 2200 (1)	44.8	54.2	36.1	20.6	26.8	14.7	25.1	16.3	23.1	31.2	48.3	61.9	33.6
<b>Precipitation (in)</b>													
Max 1-hour total	0.08	0.12	0.22	0.00	0.04	0.04	0.31	0.00	0.00	0.11	0.25	0.24	0.31
Max 6-hour total (3)	0.09	0.19	0.41	0.00	0.07	0.04	0.40	0.00	0.00	0.33	0.87	0.74	0.87
Max 24-hour total (3)	0.13	0.19	0.68	0.00	0.11	0.04	0.40	0.00	0.00	0.76	1.45	0.81	1.45
Total	0.13	0.55	0.80	0.00	0.15	0.04	0.63	0.00	0.00	1.06	1.51	0.87	5.74
<b>Wind</b>													
Mean Speed (m/s) (1)	3.7	3.9	4.6	4.9	4.3	4.2	3.9	3.8	4.1	4.1	4.0	3.5	4.1
Fastest 1-minute (2)													
Speed (m/s)	17.6	18.1	20.2	18.1	17.5	19.2	17.0	15.9	15.1	19.8	16.6	16.4	20.2
Direction (deg)	335.5	154.4	346.2	349.3	354.1	142.8	158.5	164.4	148.9	345.1	337.1	154.4	346
Peak 3-sec Gust (m/s)	21.2	25.7	26.1	26.6	24.1	25.0	23.4	21.1	20.1	27.0	23.0	23.0	27.0

Note 1: Values derived from 1-second data averaged over 1 hour.

Note 2: Values derived from 1-second data averaged over 1 minute.

Note 3: Continuous running period which may encompass more than one calendar day.

Table B-7. Site 7 (Sever Wash) 1996 Climatological Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C)</b>													
Extreme Maximum (2)	20.7	24.5	27.1	33.3	37.8	40.4	42.5	42.3	39.3	36.1	25.6	17.3	42.5
Mean Maximum (2)	14.1	16.5	20.1	24.8	29.2	35.7	39.4	38.5	31.4	23.8	17.2	12.1	25.2
Mean (1)	5.6	8.8	11.3	16.4	20.4	26.1	30.2	28.6	22.4	15.1	9.9	5.7	16.7
Mean Minimum (2)	-3.3	0.6	2.2	5.9	9.8	13.4	19.0	16.8	12.1	6.1	2.4	-0.6	7.0
Extreme Minimum (2)	-10.2	-10.8	-4.4	-0.9	6.0	3.5	13.9	11.9	4.2	-5.0	-3.3	-6.8	-10.8
<b>Number of Days</b>													
Precipitation													
0.01 inch or more	1	5	3	0	3	1	3	0	0	4	3	4	27
Temperature (2)													
32C (90F) and above	0	0	0	2	7	25	31	29	12	7	0	0	113
0C (32F) and below	26	11	8	1	0	0	0	0	0	2	7	19	74
<b>Barometric Pressure (mb)</b>													
Mean (1)	892.8	892.1	891.3	892.5	889.4	891.2	893.2	893.3	891.1	892.2	894.0	893.8	892.2
<b>Mean Relative Humidity (%)</b>													
Hour 0400 (PST) (1)	51.6	57.6	48.3	31.0	35.1	22.9	34.5	23.9	32.9	34.6	60.1	69.6	41.8
Hour 1000 (1)	32.4	39.7	25.8	14.0	17.8	11.6	15.0	11.4	17.3	21.9	34.8	46.4	24.0
Hour 1600 (1)	24.2	30.1	18.4	8.0	10.9	5.3	12.1	6.1	10.4	18.0	28.9	39.1	17.6
Hour 2200 (1)	45.6	53.8	36.3	19.9	24.9	13.6	23.6	15.6	22.6	30.1	52.2	66.2	33.7
<b>Precipitation (in)</b>													
Max 1-hour total	0.02	0.13	0.17	0.00	0.03	0.01	0.59	0.00	0.00	0.11	0.40	0.23	0.59
Max 6-hour total (3)	0.02	0.22	0.31	0.00	0.04	0.02	0.60	0.00	0.00	0.48	0.81	0.74	0.81
Max 24-hour total (3)	0.04	0.22	0.46	0.00	0.07	0.02	0.60	0.00	0.00	0.73	1.49	0.79	1.49
Total	0.04	0.62	0.52	0.00	0.10	0.02	0.75	0.00	0.00	1.00	1.50	0.86	5.41
<b>Wind</b>													
Mean Speed (m/s) (1)	2.7	3.0	3.9	4.4	3.9	3.6	3.4	3.2	3.3	3.2	3.1	2.6	3.3
Fastest 1-minute (2)													
Speed (m/s)	15.8	16.4	18.1	18.0	17.0	16.8	15.6	15.2	16.9	23.2	17.5	17.1	23.2
Direction (deg)	319.9	161.5	328.5	190.2	165.8	160.8	164.8	151.6	217.8	331.3	338.9	161.9	331
Peak 3-sec Gust (m/s)	20.5	20.7	21.1	23.3	23.0	23.1	19.1	18.6	26.9	27.7	20.7	20.6	27.7

Note 1: Values derived from 1-second data averaged over 1 hour.

Note 2: Values derived from 1-second data averaged over 1 minute.

Note 3: Continuous running period which may encompass more than one calendar day.

Table B-8. Site 8 (Knothead Gap) 1996 Climatological Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C)</b>													
Extreme Maximum (2)	20.3	24.1	26.1	32.8	37.1	39.9	41.7	41.3	38.2	35.6	24.8	16.7	41.7
Mean Maximum (2)	13.5	15.8	19.3	24.2	28.6	34.9	38.7	37.7	30.7	23.1	16.6	11.8	24.6
Mean (1)	6.1	9.0	11.4	16.3	20.6	26.4	30.2	28.8	22.6	15.3	10.0	6.0	16.9
Mean Minimum (2)	-1.3	1.9	3.2	7.1	10.8	15.2	20.1	18.4	13.5	7.3	3.5	0.3	8.3
Extreme Minimum (2)	-7.1	-9.5	-2.3	0.9	0.0	6.6	14.6	13.7	5.9	-3.1	-2.6	-5.4	-9.5
<b>Number of Days</b>													
Precipitation													
0.01 inch or more	1	4	3	0	2	1	4	0	0	3	3	4	25
Temperature (2)													
32C (90F) and above	0	0	0	1	5	25	31	31	9	6	0	0	108
0C (32F) and below	18	8	7	0	1	0	0	0	0	2	5	15	56
<b>Barometric Pressure (mb)</b>													
Mean (1)	887.8	887.0	886.1	887.3	884.0	885.8	887.8	887.8	885.7	886.9	888.6	888.5	886.9
<b>Mean Relative Humidity (%)</b>													
Hour 0400 (PST) (1)	47.9	56.5	46.6	29.5	33.0	21.0	32.6	23.0	31.3	33.0	56.9	64.4	39.6
Hour 1000 (1)	31.8	39.8	25.9	14.0	17.9	11.7	15.1	11.3	17.3	21.8	34.8	44.8	23.9
Hour 1600 (1)	24.1	30.6	18.2	7.9	10.9	5.2	12.4	6.1	10.5	18.1	29.3	40.8	17.8
Hour 2200 (1)	44.0	54.0	34.9	18.7	24.3	12.6	23.6	14.6	21.4	29.5	49.3	61.7	32.4
<b>Precipitation (In)</b>													
Max 1-hour total	0.02	0.17	0.13	0.00	0.03	0.04	0.29	0.00	0.00	0.13	0.40	0.22	0.40
Max 6-hour total (3)	0.03	0.21	0.30	0.00	0.07	0.05	0.31	0.00	0.00	0.53	0.76	0.73	0.76
Max 24-hour total (3)	0.05	0.21	0.48	0.00	0.10	0.05	0.31	0.00	0.00	0.84	1.42	0.76	1.42
Total	0.05	0.67	0.51	0.00	0.13	0.05	0.66	0.00	0.00	0.87	1.43	0.84	5.21
<b>Wind</b>													
Mean Speed (m/s) (1)	2.5	2.9	3.7	4.3	3.7	3.5	3.2	2.9	3.1	3.0	2.8	2.7	3.2
Fastest 1-minute (2)													
Speed (m/s)	16.6	17.0	16.9	17.8	17.1	15.8	14.0	14.3	16.7	21.3	16.4	17.1	21.3
Direction (deg)	327.9	181.1	353.1	346.3	180.4	179.6	164.1	184.7	167.4	332.3	4.1	200.7	332
Peak 3-sec Gust (m/s)	20.5	21.3	25.0	21.9	20.7	19.7	20.5	18.9	21.4	27.3	21.9	20.8	27.3

Note 1: Values derived from 1-second data averaged over 1 hour.

Note 2: Values derived from 1-second data averaged over 1 minute.

Note 3: Continuous running period which may encompass more than one calendar day.

Table B-9. Site 9 (Gate 510) 1996 Climatological Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C)</b>													
Extreme Maximum (2)	20.6	25.5	29.0	35.4	39.5	42.0	43.9	43.2	40.4	37.8	26.4	18.3	43.9
Mean Maximum (2)	15.5	18.0	21.8	26.7	31.0	37.4	41.2	40.1	33.1	25.4	18.7	14.0	26.9
Mean (1)	7.5	10.9	13.4	18.2	22.6	28.5	32.8	31.0	24.7	17.2	11.6	7.5	18.8
Mean Minimum (2)	-0.1	4.1	5.3	8.9	12.6	17.4	22.9	20.8	15.7	9.3	5.0	2.1	10.3
Extreme Minimum (2)	-7.6	-4.9	-1.3	2.7	7.9	8.4	16.1	14.5	8.4	1.1	-3.0	-3.9	-7.6
<b>Number of Days</b>													
<b>Precipitation</b>													
0.01 inch or more	2	4	2	0	2	0	2	0	0	3	2	3	20
<b>Temperature (2)</b>													
32C (90F) and above	0	0	0	5	13	27	31	31	21	8	0	0	136
0C (32F) and below	13	6	2	0	0	0	0	0	0	0	3	10	34
<b>Barometric Pressure (mb)</b>													
Mean (1)	887.7	886.8	885.8	887.0	883.7	884.9	886.6	886.7	885.1	886.7	888.5	889.0	886.5
<b>Mean Relative Humidity (%)</b>													
Hour 0400 (PST) (1)	45.0	53.5	41.9	26.2	30.8	18.1	25.6	19.0	27.2	29.7	54.4	60.8	38.0
Hour 1000 (1)	30.9	41.0	24.3	12.6	17.6	10.2	13.4	10.3	16.2	19.5	33.5	44.0	22.8
Hour 1600 (1)	21.5	28.6	15.7	6.7	9.6	4.4	8.5	5.3	9.1	16.6	26.4	35.0	15.6
Hour 2200 (1)	39.8	50.6	31.0	16.9	20.4	9.7	18.2	12.0	18.9	26.8	46.3	58.6	29.1
<b>Precipitation (in)</b>													
Max 1-hour total	0.02	0.19	0.07	0.00	0.03	0.00	0.02	0.00	0.00	0.10	0.16	0.13	0.19
Max 6-hour total (3)	0.03	0.31	0.08	0.00	0.05	0.00	0.03	0.00	0.00	0.44	0.50	0.36	0.50
Max 24-hour total (3)	0.06	0.31	0.08	0.00	0.08	0.00	0.04	0.00	0.00	0.63	0.63	0.36	0.63
Total	0.07	0.60	0.16	0.00	0.09	0.00	0.04	0.00	0.00	0.79	0.63	0.40	2.78
<b>Wind</b>													
Mean Speed (m/s) (1)	3.8	4.4	4.7	5.3	4.7	4.7	4.5	4.2	4.4	4.3	4.1	4.3	4.5
Fastest 1-minute (2)													
Speed (m/s)	16.5	19.3	17.7	18.8	18.2	17.5	19.2	20.5	16.8	19.1	15.7	17.5	20.5
Direction (deg)	319.9	181.5	204.4	337.9	55.9	171.0	85.3	137.4	163.8	334.9	324.5	165.4	137
Peak 3-sec Gust (m/s)	20.2	24.7	21.8	23.2	21.9	20.5	23.2	25.1	19.8	23.0	18.1	21.0	25.1

Note 1: Values derived from 1-second data averaged over 1 hour.

Note 2: Values derived from 1-second data averaged over 1 minute.

Note 3: Continuous running period which may encompass more than one calendar day.

**APPENDIX C**

**SUPPLEMENTARY DATA TABLES FOR 1996**



## **APPENDIX C**

### **SUPPLEMENTARY DATA TABLES FOR 1996**

Statistical terms used in Appendix C are defined as follows:

1. **Extreme maximum** - The absolute highest daily value
2. **Mean maximum** - The average of the highest values
3. **Mean** - The average of all values taken over a given period of time
4. **Mean minimum** - The average of the lowest values
5. **Extreme minimum** - The absolute lowest daily value
6. **Fastest 1-minute** - The highest wind speed measured over any 1-minute period, with the associated wind direction
7. **Peak 3-second wind speed** - The highest 3-second running average wind speed
8. **Mean diurnal range** - The average of the differences between the highest daily value and the lowest daily value
9. **Sigma** - The standard deviation of a variable

Table C-1. Site 1 (NTS-60) 1996 Supplemental Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C) (1)</b> (from hourly averaged data)													
Extreme Maximum	19.5	23.3	24.7	30.8	35.1	37.6	39.8	39.1	36.7	34.1	24.1	15.9	39.8
Mean Maximum	12.7	14.9	18.0	22.8	26.9	32.7	36.8	35.9	29.3	22.1	15.7	11.1	23.2
Mean	6.9	9.5	11.7	16.6	20.7	26.3	30.4	29.3	23.1	16.1	10.7	6.5	17.3
Mean Minimum	2.1	4.7	5.9	9.8	13.8	19.0	23.2	22.2	16.9	10.5	6.4	2.8	11.4
Extreme Minimum	-4.1	-8.8	0.0	3.3	7.7	8.2	17.9	17.2	9.3	1.3	0.0	-2.9	-8.8
<b>Delta Temperature(C) (1)</b>													
Mean Maximum Positive Values	3.0	2.5	2.6	2.6	2.6	3.2	2.8	3.1	3.0	2.8	2.5	2.4	2.8
Mean Positive Values	1.8	1.5	1.4	1.3	1.4	1.8	1.5	1.8	1.6	1.5	1.3	1.3	1.5
Mean Negative Values	-0.6	-0.5	-0.7	-0.8	-0.8	-0.9	-0.9	-0.9	-0.8	-0.6	-0.5	-0.3	-0.7
Mean Minimum Negative Values	-0.9	-0.8	-1.1	-1.3	-1.3	-1.3	-1.3	-1.3	-1.2	-1.0	-0.7	-0.5	-1.1
<b>Horizontal Wind (1)</b>													
Mean Daily Maximum Sigma-A	84.3	78.7	68.1	77.3	84.3	80.1	83.0	86.2	86.7	83.0	78.9	80.9	81.0
Mean Daily Sigma-A	18.7	18.3	16.6	17.7	19.4	19.1	19.6	20.1	18.5	19.4	17.5	18.1	18.6
Mean Daily Minimum Sigma-A	2.8	3.0	3.6	3.4	3.2	3.2	3.0	2.3	2.8	3.1	3.1	3.1	3.0
Mean Daily Maximum Sigma u	1.5	1.7	2.1	2.3	2.2	2.2	2.4	2.2	2.1	1.8	1.6	1.4	2.0
Mean Daily Sigma u	0.6	0.6	0.9	1.0	0.9	0.9	0.8	0.8	0.8	0.7	0.6	0.6	0.8
Mean Daily Minimum Sigma u	0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.2
<b>Vertical Wind (m/s) (1)</b>													
Mean Positive Values	0.08	0.15	0.15	0.16	0.16	0.20	0.13	0.12	0.12	0.12	0.11	0.12	0.14
Mean Motion	0.04	0.10	0.06	0.06	0.09	0.14	0.09	0.08	0.08	0.09	0.03	0.03	0.08
Mean Negative Values	-0.06	-0.05	-0.10	-0.09	-0.08	-0.06	-0.05	-0.06	-0.06	-0.05	-0.09	-0.08	-0.07
Mean Daily Maximum Sigma w	0.57	0.62	0.79	0.82	0.72	0.75	0.74	0.72	0.71	0.68	0.59	0.58	0.69
Mean Daily Sigma w	0.20	0.24	0.36	0.37	0.32	0.33	0.32	0.30	0.30	0.28	0.27	0.24	0.29
Mean Daily Minimum Sigma w	0.01	0.02	0.05	0.03	0.01	0.02	0.01	0.01	0.01	0.02	0.03	0.04	0.02
<b>Barometric Pressure (mb) (1)</b>													
Mean Diurnal Range	5.6	4.8	5.3	5.2	4.0	3.3	3.6	3.7	4.0	4.9	4.9	5.4	4.5
<b>Dew Point (C) (1)</b>													
Mean	-7.4	-3.7	-6.3	-9.0	-4.8	-5.6	3.1	-1.9	-2.0	-6.5	-4.5	-4.0	-4.4
<b>Solar Radiation (MJ/m<sup>2</sup>/day) (1)</b>													
Mean Daily	10.8	12.4	20.0	26.0	27.6	31.0	28.3	26.3	22.5	16.1	11.2	8.3	20.0

Note 1: Values derived from 1-second data averaged over 1 hour.

Note 2: Values derived from 1-second data averaged over 10 minutes.

Table C-2. Site 2 (Yucca Mountain) 1996 Supplemental Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C) (1)</b> (from hourly averaged data)													
Extreme Maximum	16.5	21.0	23.0	29.0	33.3	35.9	38.2	37.2	35.0	32.3	21.4	14.7	38.2
Mean Maximum	10.1	12.1	15.7	20.6	25.0	31.4	35.3	34.1	27.2	19.4	12.9	8.6	21.0
Mean	6.6	8.6	10.6	15.1	19.3	25.8	29.4	28.6	22.1	15.3	9.8	5.7	16.4
Mean Minimum	4.0	6.1	6.4	10.0	14.4	20.4	24.4	23.9	17.7	11.9	7.0	3.4	12.5
Extreme Minimum	-2.2	-6.6	-1.4	4.5	6.0	9.5	17.9	18.7	9.4	0.2	-0.9	-1.5	-6.6
<b>Delta Temperature(C) (1)</b>													
Mean Maximum Positive Values	0.8	0.8	0.8	0.8	0.8	0.7	1.0	0.9	0.9	0.8	0.9	0.7	0.8
Mean Positive Values	0.5	0.5	0.5	0.4	0.4	0.6	0.5	0.5	0.5	0.5	0.4	0.4	0.5
Mean Negative Values	-0.6	-0.6	-0.9	-1.1	-1.1	-1.2	-1.2	-1.1	-1.0	-0.7	-0.5	-0.4	-0.9
Mean Minimum Negative Values	-1.0	-1.0	-1.4	-1.8	-2.0	-1.9	-2.0	-1.8	-1.7	-1.2	-0.8	-0.6	-1.4
<b>Horizontal Wind (2)</b>													
Mean Daily Maximum Sigma-A	74.4	66.3	62.0	66.0	75.6	59.7	68.2	70.2	59.0	60.4	65.5	63.7	65.9
Mean Daily Sigma-A	15.4	14.0	15.1	15.6	17.7	16.8	17.3	17.1	15.1	14.2	14.0	14.5	15.6
Mean Daily Minimum Sigma-A	2.9	3.2	3.4	3.9	4.1	3.5	3.7	3.2	3.1	3.0	3.3	3.6	3.4
Mean Daily Maximum Sigma u	1.7	1.7	2.3	2.8	2.8	2.5	2.6	2.5	2.3	2.0	1.8	1.8	2.2
Mean Daily Sigma u	0.7	0.7	0.9	1.2	1.0	0.9	0.9	0.8	0.9	0.8	0.7	0.7	0.9
Mean Daily Minimum Sigma u	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2
<b>Vertical Wind (m/s) (2)</b>													
Mean Positive Values	0.33	0.44	0.56	0.64	0.64	0.61	0.52	0.46	0.48	0.44	0.40	0.33	0.49
Mean Motion	0.28	0.40	0.51	0.55	0.57	0.57	0.47	0.37	0.39	0.37	0.32	0.26	0.42
Mean Negative Values	-0.04	-0.04	-0.05	-0.06	-0.05	-0.03	-0.04	-0.08	-0.05	-0.06	-0.04	-0.05	-0.05
Mean Daily Maximum Sigma w	0.73	0.73	0.96	1.20	1.12	0.97	0.96	1.20	1.03	0.93	0.83	0.81	0.96
Mean Daily Sigma w	0.3	0.3	0.4	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.41
Mean Daily Minimum Sigma w	0.04	0.05	0.08	0.08	0.05	0.05	0.05	0.08	0.10	0.09	0.10	0.12	0.07
<b>Barometric Pressure (mb) (1)</b>													
Mean Diurnal Range	5.8	4.7	5.2	5.2	4.0	3.4	3.3	3.6	3.9	4.9	5.3	5.4	4.6
<b>Dew Point (C) (1)</b>													
Mean	-8.9	-5.0	-8.3	-11.9	-7.0	-8.1	1.3	-3.8	-3.1	-8.4	-5.6	-5.6	-6.2
<b>Solar Radiation (MJ/m<sup>2</sup>/day) (1)</b>													
Mean Daily	11.6	12.8	21.2	26.6	27.6	31.8	29.3	27.3	23.3	16.5	11.4	8.2	20.6

Note 1: Values derived from 1-second data averaged over 1 hour.

Note 2: Values derived from 1-second data averaged over 10 minutes.

Table C-3. Site 3 (Coyote Wash) 1996 Supplemental Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C) (1)</b> (from hourly averaged data)													
Extreme Maximum	18.0	21.8	23.3	29.7	33.9	37.3	38.7	38.3	35.8	32.9	22.6	16.0	38.7
Mean Maximum	11.3	13.4	16.6	21.4	25.5	32.0	35.9	34.9	28.0	20.6	14.4	9.9	22.0
Mean	7.1	9.2	11.4	16.1	20.0	26.4	30.1	29.1	22.8	15.8	10.5	6.3	17.1
Mean Minimum	3.3	5.5	6.4	10.1	14.2	19.4	23.6	22.9	17.4	11.0	6.7	3.1	12.0
Extreme Minimum	-3.2	-7.1	1.1	3.7	7.3	8.8	18.2	18.1	10.1	0.6	-1.0	-2.9	-7.1
<b>Delta Temperature(C) (1)</b>													
Mean Maximum Positive Values	1.8	1.7	1.8	1.8	1.6	2.3	2.0	2.3	2.0	1.9	2.0	1.7	1.9
Mean Positive Values	1.1	1.1	1.0	0.9	1.0	1.4	1.1	1.4	1.1	1.2	1.1	1.0	1.1
Mean Negative Values	-0.4	-0.3	-0.5	-0.6	-0.7	-0.9	-0.8	-0.8	-0.8	-0.6	-0.4	-0.3	-0.6
Mean Minimum Negative Values	-0.6	-0.6	-0.8	-1.0	-1.2	-1.5	-1.4	-1.4	-1.2	-0.9	-0.7	-0.5	-1.0
<b>Horizontal Wind (2)</b>													
Mean Daily Maximum Sigma-A	89.9	90.3	85.1	90.9	92.0	87.4	89.3	88.0	87.2	90.3	88.8	85.5	88.7
Mean Daily Sigma-A	25.1	25.2	27.6	31.0	32.8	29.7	30.6	29.0	29.2	28.7	25.7	26.5	28.4
Mean Daily Minimum Sigma-A	4.4	4.5	5.4	5.8	5.8	4.8	4.5	3.4	4.2	4.8	4.7	5.6	4.8
Mean Daily Maximum Sigma u	1.5	1.6	2.1	2.3	2.0	2.2	2.2	2.1	1.9	1.8	1.7	1.6	1.9
Mean Daily Sigma u	0.6	0.7	0.9	1.0	0.9	0.9	0.8	0.7	0.8	0.7	0.7	0.6	0.8
Mean Daily Minimum Sigma u	0.1	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
<b>Vertical Wind (m/s) (2)</b>													
Mean Positive Values	0.10	0.12	0.12	0.11	0.21	0.27	0.27	0.25	0.24	0.22	0.20	0.19	0.19
Mean Motion	-0.04	0.00	-0.07	-0.06	-0.03	0.09	0.08	0.05	0.01	-0.03	-0.05	0.02	0.00
Mean Negative Values	-0.13	-0.10	-0.19	-0.17	-0.21	-0.13	-0.15	-0.14	-0.20	-0.22	-0.22	-0.14	-0.17
Mean Daily Maximum Sigma w	0.84	0.85	1.06	0.98	1.12	1.21	1.22	1.11	1.12	1.02	0.93	0.86	1.03
Mean Daily Sigma w	0.3	0.3	0.4	0.4	0.5	0.5	0.5	0.4	0.5	0.4	0.4	0.3	0.41
Mean Daily Minimum Sigma w	0.02	0.04	0.06	0.07	0.06	0.05	0.04	0.05	0.05	0.06	0.06	0.07	0.05
<b>Barometric Pressure (mb) (1)</b>													
Mean Diurnal Range	6.1	4.8	5.3	5.3	3.9	3.5	3.6	3.7	4.1	5.1	5.4	5.6	4.7
<b>Dew Point (C) (1)</b>													
Mean	-8.2	-4.3	-7.4	-11.3	-6.6	-8.1	1.4	-3.9	-2.8	-8.0	-4.1	-4.2	-5.6
<b>Solar Radiation (MJ/m<sup>2</sup>/day) (1)</b>													
Mean Daily	10.8	12.4	20.0	26.0	27.3	31.7	29.1	26.8	22.7	16.1	11.0	7.8	20.1

Note 1: Values derived from 1-second data averaged over 1 hour.  
 Note 2: Values derived from 1-second data averaged over 10 minutes.

Table C-4. Site 4 (Alice Hill) 1996 Supplemental Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C) (1)</b> (from hourly averaged data)													
Extreme Maximum	18.8	22.8	24.8	30.7	35.2	38.0	39.8	39.1	36.7	33.9	23.5	15.6	39.8
Mean Maximum	11.9	14.3	17.7	22.3	26.8	33.2	36.9	36.0	28.9	21.4	14.9	10.4	22.9
Mean	7.6	9.7	11.8	16.5	20.9	27.0	30.6	29.7	23.4	16.1	10.8	6.8	17.6
Mean Minimum	4.0	5.8	6.5	10.3	14.9	20.2	24.4	23.3	18.0	11.2	7.0	3.8	12.4
Extreme Minimum	-2.1	-7.0	0.8	4.9	8.0	10.6	19.3	18.9	9.6	0.5	0.1	-1.5	-7.0
<b>Delta Temperature(C) (1)</b>													
Mean Maximum Positive Values	1.2	1.3	1.2	1.2	1.1	1.5	1.3	1.4	1.3	1.4	1.5	1.2	1.3
Mean Positive Values	0.7	0.7	0.7	0.6	0.6	0.9	0.7	0.8	0.7	0.8	0.8	0.6	0.7
Mean Negative Values	-0.6	-0.6	-0.9	-1.2	-1.2	-1.4	-1.3	-1.2	-1.1	-0.8	-0.5	-0.5	-0.9
Mean Minimum Negative Values	-1.0	-1.1	-1.5	-1.9	-2.0	-2.2	-2.1	-2.0	-1.7	-1.3	-0.8	-0.7	-1.5
<b>Horizontal Wind (2)</b>													
Mean Daily Maximum Sigma-A	77.5	68.6	71.2	69.9	75.2	77.8	74.8	71.7	71.1	72.1	64.3	80.4	72.9
Mean Daily Sigma-A	15.2	14.3	14.1	14.1	15.8	16.1	16.2	16.2	15.2	14.6	13.4	16.7	15.2
Mean Daily Minimum Sigma-A	3.1	3.3	3.3	3.4	3.4	3.4	3.4	3.4	3.5	3.4	3.2	3.5	3.4
Mean Daily Maximum Sigma u	1.8	1.9	2.5	2.8	2.9	2.6	2.9	2.7	2.4	2.2	1.9	1.7	2.4
Mean Daily Sigma u	0.6	0.7	0.9	1.1	1.0	0.9	0.9	0.8	0.8	0.8	0.7	0.6	0.8
Mean Daily Minimum Sigma u	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.2
<b>Vertical Wind (m/s) (2)</b>													
Mean Positive Values	0.39	0.37	0.56	0.66	0.45	0.27	0.32	0.25	0.31	0.46	0.50	0.31	0.41
Mean Motion	0.26	0.20	0.45	0.59	0.36	0.21	0.26	0.19	0.24	0.36	0.38	0.18	0.31
Mean Negative Values	-0.06	-0.16	-0.06	-0.06	-0.06	-0.05	-0.05	-0.06	-0.05	-0.06	-0.06	-0.05	-0.07
Mean Daily Maximum Sigma w	0.66	0.69	0.83	0.93	0.88	0.82	0.85	0.84	0.81	0.79	0.71	0.62	0.79
Mean Daily Sigma w	0.3	0.3	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.37
Mean Daily Minimum Sigma w	0.10	0.08	0.13	0.13	0.10	0.10	0.10	0.09	0.09	0.10	0.10	0.08	0.10
<b>Barometric Pressure (mb) (1)</b>													
Mean Diurnal Range	6.0	4.7	5.3	5.4	4.2	3.6	3.7	3.9	4.2	5.1	5.3	5.6	4.7
<b>Dew Point (C) (1)</b>													
Mean	-7.8	-4.0	-7.0	-10.6	-5.9	-7.4	2.4	-3.2	-2.2	-7.7	-3.9	-3.9	-5.1
<b>Solar Radiation (MJ/m<sup>2</sup>/day) (1)</b>													
Mean Daily	11.1	13.0	20.8	26.7	27.5	31.9	29.0	27.4	23.3	16.8	12.2	8.4	20.7

Note 1: Values derived from 1-second data averaged over 1 hour.  
 Note 2: Values derived from 1-second data averaged over 10 minutes.

Table C-5. Site 5 (Fortymile Wash) 1996 Supplemental Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C) (1)</b> (from hourly averaged data)													
Extreme Maximum	20.1	24.6	27.2	33.2	37.7	40.3	42.1	41.5	39.1	35.9	25.4	17.3	42.1
Mean Maximum	14.3	16.6	20.2	24.7	28.9	35.6	39.4	38.3	31.4	23.9	17.4	12.7	25.3
Mean	7.6	10.6	12.9	17.8	21.9	27.8	32.0	30.4	24.2	17.0	11.5	7.3	18.4
Mean Minimum	1.9	5.3	6.4	10.6	13.9	18.8	24.0	22.4	16.9	11.0	6.6	3.0	11.7
Extreme Minimum	-4.9	-5.8	0.7	4.0	7.6	9.2	18.4	15.9	9.4	1.9	0.5	-3.0	-5.8
<b>Delta Temperature(C) (1)</b>													
Mean Maximum Positive Values	2.2	1.7	1.9	1.9	2.1	2.3	1.8	2.2	2.1	1.9	1.9	1.7	2.0
Mean Positive Values	1.1	0.8	0.8	1.1	1.2	0.8	1.0	1.0	0.8	0.8	0.8	2.0	1.0
Mean Negative Values	-0.5	-0.5	-0.7	-0.9	-0.9	-1.2	-1.1	-1.1	-1.0	-0.7	-0.5	-0.4	-0.8
Mean Minimum Negative Values	-0.8	-0.9	-1.2	-1.4	-1.6	-1.9	-1.8	-1.7	-1.6	-1.1	-0.8	-0.7	-1.3
<b>Horizontal Wind (2)</b>													
Mean Daily Maximum Sigma-A	71.3	73.5	75.2	67.2	77.8	79.0	74.3	81.3	75.1	77.6	68.3	72.1	74.4
Mean Daily Sigma-A	14.8	14.3	15.6	15.4	17.2	16.8	17.2	17.6	16.4	16.0	14.0	14.5	15.8
Mean Daily Minimum Sigma-A	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Mean Daily Maximum Sigma u	1.4	1.7	2.1	2.3	2.4	2.4	2.4	2.3	2.1	1.8	1.5	1.4	2.0
Mean Daily Sigma u	0.6	0.7	0.8	1.0	0.9	0.9	0.8	0.8	0.8	0.7	0.6	0.6	0.8
Mean Daily Minimum Sigma u	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2	0.2
<b>Vertical Wind (m/s) (2)</b>													
Mean Positive Values	0.20	0.24	0.34	0.38	0.25	0.19	0.19	0.18	0.20	0.17	0.14	0.24	0.23
Mean Motion	0.05	0.08	0.20	0.21	0.21	0.18	0.17	0.16	0.17	0.14	0.11	0.08	0.15
Mean Negative Values	-0.19	-0.18	-0.19	-0.25	-0.10	-0.03	-0.04	-0.04	-0.05	-0.04	-0.05	-0.08	-0.10
Mean Daily Maximum Sigma w	0.57	0.69	0.78	0.86	0.78	0.77	0.74	0.70	0.70	0.67	0.57	0.56	0.70
Mean Daily Sigma w	0.3	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.33
Mean Daily Minimum Sigma w	0.03	0.04	0.08	0.09	0.05	0.04	0.04	0.04	0.05	0.05	0.04	0.07	0.05
<b>Barometric Pressure (mb) (1)</b>													
Mean Diurnal Range	6.6	5.0	5.7	5.9	4.5	4.1	4.1	4.3	4.6	5.5	5.6	5.9	5.2
<b>Dew Point (C) (1)</b>													
Mean	-8.0	-3.6	-6.8	-11.2	-6.2	-8.5	1.4	-4.5	-2.9	-8.2	-2.9	-3.2	-5.4
<b>Solar Radiation (MJ/m<sup>2</sup>/day) (1)</b>													
Mean Daily	11.2	13.0	20.9	26.1	27.7	31.8	29.5	27.1	23.2	16.5	11.7	8.8	20.6

Note 1: Values derived from 1-second data averaged over 1 hour.

Note 2: Values derived from 1-second data averaged over 10 minutes.

Table C-6. Site 6 (WT-6) 1996 Supplemental Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C) (1)</b> (from hourly averaged data)													
Extreme Maximum	18.4	21.7	23.2	29.5	33.8	36.6	38.5	37.6	35.5	32.9	22.8	15.9	38.5
Mean Maximum	11.3	13.3	16.6	21.1	25.4	31.7	35.5	34.7	27.8	20.4	14.2	9.8	21.8
Mean	5.6	8.2	10.2	15.2	19.3	25.1	28.9	27.7	21.5	14.6	9.3	5.3	15.9
Mean Minimum	0.7	3.3	4.2	8.5	12.3	16.5	20.9	20.0	14.9	8.9	4.8	1.4	9.7
Extreme Minimum	-6.4	-9.5	-0.9	2.4	7.2	5.6	14.8	14.6	8.1	0.2	-2.2	-3.9	-9.5
<b>Delta Temperature(C) (1)</b>													
Mean Maximum Positive Values	3.4	2.9	3.0	2.6	3.0	3.9	3.4	3.9	3.5	3.4	3.0	2.6	3.2
Mean Positive Values	2.0	1.7	1.7	1.3	1.6	2.2	1.8	2.3	2.0	1.9	1.6	1.4	1.8
Mean Negative Values	-0.5	-0.5	-0.7	-0.8	-0.8	-1.1	-1.0	-1.0	-0.9	-0.7	-0.5	-0.4	-0.7
Mean Minimum Negative Values	-0.9	-0.9	-1.2	-1.3	-1.4	-1.7	-1.6	-1.6	-1.4	-1.1	-0.8	-0.6	-1.2
<b>Horizontal Wind (2)</b>													
Mean Daily Maximum Sigma-A	82.7	78.8	79.7	79.0	85.8	82.9	81.8	80.8	81.0	83.3	75.2	85.2	81.3
Mean Daily Sigma-A	16.2	15.5	17.5	19.1	20.8	19.1	19.2	18.4	17.3	17.0	15.1	18.0	17.8
Mean Daily Minimum Sigma-A	2.3	2.3	2.7	3.4	2.9	2.3	2.1	1.8	1.9	2.9	2.7	3.1	2.5
Mean Daily Maximum Sigma u	1.6	1.8	2.3	2.6	2.6	2.7	2.7	2.6	2.3	2.1	1.8	1.8	2.2
Mean Daily Sigma u	0.6	0.7	1.0	1.1	1.0	1.0	0.9	0.9	0.9	0.8	0.7	0.7	0.9
Mean Daily Minimum Sigma u	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
<b>Vertical Wind (m/s) (2)</b>													
Mean Positive Values	0.18	0.23	0.25	0.30	0.23	0.18	0.17	0.16	0.18	0.22	0.19	0.15	0.21
Mean Motion	0.06	0.10	0.10	0.15	0.08	0.08	0.08	0.05	0.08	0.11	0.10	0.08	0.09
Mean Negative Values	-0.06	-0.07	-0.08	-0.10	-0.10	-0.07	-0.06	-0.06	-0.06	-0.05	-0.04	-0.03	-0.07
Mean Daily Maximum Sigma w	0.72	0.83	0.96	1.07	0.97	1.04	0.96	0.91	0.90	0.82	0.73	0.75	0.89
Mean Daily Sigma w	0.3	0.3	0.4	0.5	0.4	0.4	0.4	0.3	0.4	0.3	0.3	0.3	0.36
Mean Daily Minimum Sigma w	0.03	0.05	0.05	0.07	0.03	0.02	0.02	0.01	0.02	0.03	0.03	0.02	0.03
<b>Barometric Pressure (mb) (1)</b>													
Mean Diurnal Range	6.0	4.7	5.3	5.2	4.0	3.5	3.4	3.7	4.1	5.0	5.4	5.5	4.6
<b>Dew Point (C) (1)</b>													
Mean	-8.1	-4.3	-6.9	-10.5	-5.7	-6.7	2.8	-2.6	-2.2	-7.3	-3.7	-4.0	-4.9
<b>Solar Radiation (MJ/m<sup>2</sup>/day) (1)</b>													
Mean Daily	10.6	12.5	20.0	26.1	27.4	31.6	28.7	26.9	22.8	16.2	11.2	8.0	20.2

Note 1: Values derived from 1-second data averaged over 1 hour.  
 Note 2: Values derived from 1-second data averaged over 10 minutes.

Table C-7. Site 7 (Sever Wash) 1996 Supplemental Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C) (1)</b> (from hourly averaged data)													
Extreme Maximum	20.3	23.8	26.1	32.0	36.5	39.3	41.3	40.6	38.1	35.3	24.9	16.6	41.3
Mean Maximum	13.3	15.7	19.1	23.9	28.2	34.6	38.3	37.4	30.4	23.0	16.4	11.6	24.3
Mean	5.6	8.8	11.3	16.4	20.4	26.1	30.2	28.6	22.4	15.1	9.9	5.7	16.7
Mean Minimum	-1.6	1.9	3.7	7.6	11.2	15.2	20.3	18.5	13.6	7.5	3.8	0.5	8.5
Extreme Minimum	-8.4	-10.2	-3.1	1.5	7.6	4.8	15.4	13.4	6.3	-2.1	-2.0	-5.3	-10.2
<b>Delta Temperature(C) (1)</b>													
Mean Maximum Positive Values	2.9	2.3	2.3	2.5	2.6	2.8	2.3	2.7	2.7	2.6	2.3	2.1	2.5
Mean Positive Values	1.7	1.4	1.3	1.3	1.4	1.7	1.3	1.6	1.6	1.5	1.3	1.1	1.4
Mean Negative Values	-0.6	-0.6	-0.9	-1.1	-1.1	-1.3	-1.2	-1.2	-1.2	-0.8	-0.6	-0.5	-0.9
Mean Minimum Negative Values	-1.0	-1.0	-1.5	-1.8	-1.9	-2.1	-2.0	-1.9	-1.8	-1.4	-0.9	-0.8	-1.5
<b>Horizontal Wind (2)</b>													
Mean Daily Maximum Sigma-A	83.7	80.5	80.9	81.9	82.7	84.5	84.7	84.5	84.9	81.2	76.7	84.0	82.5
Mean Daily Sigma-A	22.4	22.4	20.9	20.9	21.9	23.1	23.5	24.2	22.8	22.7	21.0	22.0	22.3
Mean Daily Minimum Sigma-A	5.0	5.1	5.1	5.2	5.3	4.9	4.9	5.1	4.6	4.7	4.6	4.6	4.9
Mean Daily Maximum Sigma u	1.5	1.8	2.1	2.2	2.4	2.3	2.5	2.3	2.1	1.9	1.6	1.4	2.0
Mean Daily Sigma u	0.6	0.6	0.8	1.0	0.9	0.9	0.8	0.8	0.8	0.7	0.6	0.5	0.8
Mean Daily Minimum Sigma u	0.1	0.1	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.1	0.2
<b>Vertical Wind (m/s) (2)</b>													
Mean Positive Values	0.09	0.19	0.17	0.18	0.19	0.15	0.15	0.13	0.14	0.10	0.08	0.10	0.14
Mean Motion	0.06	0.13	0.13	0.13	0.14	0.12	0.12	0.10	0.11	0.07	0.06	0.06	0.10
Mean Negative Values	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.03	-0.03	-0.02	-0.03	-0.02	-0.02	-0.03
Mean Daily Maximum Sigma w	0.55	0.72	0.77	0.87	0.84	0.67	0.68	0.58	0.58	0.60	0.51	0.45	0.65
Mean Daily Sigma w	0.2	0.3	0.3	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.26
Mean Daily Minimum Sigma w	0.01	0.01	0.02	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
<b>Barometric Pressure (mb) (1)</b>													
Mean Diurnal Range	6.6	5.2	5.7	5.8	4.6	4.1	3.9	4.3	4.8	5.7	5.8	5.8	5.2
<b>Dew Point (C) (1)</b>													
Mean	-8.2	-4.0	-6.5	-10.8	-6.2	-8.0	2.2	-3.8	-2.8	-8.0	-3.1	-3.1	-5.2
<b>Solar Radiation (MJ/m<sup>2</sup>/day) (1)</b>													
Mean Daily	10.9	12.7	20.1	26.0	27.3	31.3	28.9	26.8	22.6	16.1	11.1	8.3	20.2

Note 1: Values derived from 1-second data averaged over 1 hour.

Note 2: Values derived from 1-second data averaged over 10 minutes.

Table C-8. Site 8 (Knothead Gap) 1996 Supplemental Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C) (1)</b> (from hourly averaged data)													
Extreme Maximum	19.6	23.4	25.4	31.5	36.0	38.9	40.8	40.0	37.4	34.6	24.1	15.7	40.8
Mean Maximum	12.9	15.1	18.5	23.3	27.6	34.0	37.7	36.7	29.8	22.3	15.9	11.2	23.8
Mean	6.1	9.0	11.4	16.3	20.6	26.4	30.2	28.8	22.6	15.3	10.0	6.0	16.9
Mean Minimum	0.4	3.2	4.5	8.5	12.5	16.7	21.5	20.0	14.9	8.7	4.8	1.6	9.8
Extreme Minimum	-5.9	-8.9	-0.9	2.7	7.4	7.4	16.7	16.1	6.9	-0.9	-0.9	-3.4	-8.9
<b>Delta Temperature(C) (1)</b>													
Mean Maximum Positive Values	3.5	2.8	2.8	2.8	2.9	3.3	2.9	3.2	3.0	3.2	2.9	2.4	3.0
Mean Positive Values	2.0	1.7	1.5	1.4	1.6	1.9	1.5	1.9	1.7	1.8	1.6	1.3	1.7
Mean Negative Values	-0.6	-0.6	-0.8	-1.0	-1.0	-1.2	-1.1	-1.1	-1.0	-0.7	-0.6	-0.4	-0.9
Mean Minimum Negative Values	-0.9	-1.0	-1.3	-1.6	-1.7	-1.9	-1.8	-1.7	-1.6	-1.2	-0.9	-0.7	-1.4
<b>Horizontal Wind (2)</b>													
Mean Daily Maximum Sigma-A	86.0	82.1	78.4	77.7	85.6	84.9	86.9	88.8	86.4	83.7	82.1	85.2	84.0
Mean Daily Sigma-A	22.0	20.9	20.4	19.9	22.8	22.3	23.1	23.7	22.2	21.3	20.3	22.9	21.8
Mean Daily Minimum Sigma-A	3.9	4.1	4.4	4.6	4.8	4.7	4.3	4.1	4.3	4.4	4.3	4.2	4.3
Mean Daily Maximum Sigma u	1.4	1.5	2.0	2.2	2.3	2.3	2.2	2.3	2.1	1.8	1.5	1.3	1.9
Mean Daily Sigma u	0.5	0.6	0.8	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.6	0.6	0.7
Mean Daily Minimum Sigma u	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<b>Vertical Wind (m/s) (2)</b>													
Mean Positive Values	0.17	0.12	0.27	0.34	0.24	0.09	0.12	0.09	0.14	0.25	0.19	0.14	0.18
Mean Motion	0.09	0.01	0.11	0.15	0.02	-0.06	-0.03	-0.04	0.00	0.12	0.11	0.10	0.05
Mean Negative Values	-0.09	-0.14	-0.17	-0.19	-0.18	-0.18	-0.16	-0.16	-0.15	-0.12	-0.10	-0.04	-0.14
Mean Daily Maximum Sigma w	0.55	0.62	0.76	0.82	0.79	0.79	0.76	0.73	0.71	0.68	0.57	0.56	0.70
Mean Daily Sigma w	0.2	0.2	0.3	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.29
Mean Daily Minimum Sigma w	0.01	0.01	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.02	0.07	0.02
<b>Barometric Pressure (mb) (1)</b>													
Mean Diurnal Range	6.3	4.9	5.5	5.6	4.3	3.8	3.7	4.0	4.4	5.4	5.6	5.8	4.9
<b>Dew Point (C) (1)</b>													
Mean	-8.2	-4.0	-7.0	-11.4	-6.7	-8.5	1.7	-4.1	-3.1	-8.2	-3.3	-3.6	-5.5
<b>Solar Radiation (MJ/m<sup>2</sup>/day) (1)</b>													
Mean Daily	10.9	12.7	20.0	26.3	27.7	31.6	29.0	26.9	22.8	16.6	11.2	8.3	20.3

Note 1: Values derived from 1-second data averaged over 1 hour.  
 Note 2: Values derived from 1-second data averaged over 10 minutes.

Table C-9. Site 9 (Gate 510) 1996 Supplemental Data Summary

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
<b>Temperature (C) (1)</b> (from hourly averaged data)													
Extreme Maximum	20.2	25.0	28.3	34.4	38.7	41.0	43.2	42.4	39.8	36.8	25.7	17.8	43.2
Mean Maximum	15.0	17.3	21.0	25.8	30.1	36.5	40.2	39.1	32.3	24.7	18.2	13.4	26.1
Mean	7.5	10.9	13.4	18.2	22.6	28.5	32.8	31.0	24.7	17.2	11.6	7.5	18.8
Mean Minimum	1.0	4.9	6.2	10.0	13.6	18.6	24.0	22.0	16.7	10.2	5.9	2.9	11.3
Extreme Minimum	-6.8	-4.2	0.7	4.5	8.5	9.1	16.8	15.9	9.3	2.1	-2.1	-3.2	-6.8
<b>Delta Temperature(C) (1)</b>													
Mean Maximum Positive Values	3.5	2.8	3.2	3.1	3.0	3.4	2.3	3.4	3.7	2.9	2.9	2.7	3.1
Mean Positive Values	1.5	1.1	1.2	1.4	1.3	1.4	1.1	1.4	1.6	1.3	1.2	1.1	1.3
Mean Negative Values	-0.5	-0.5	-0.8	-1.0	-1.0	-1.1	-1.0	-0.9	-0.9	-0.7	-0.5	-0.4	-0.8
Mean Minimum Negative Values	-0.8	-0.9	-1.3	-1.5	-1.6	-1.7	-1.7	-1.5	-1.4	-1.1	-0.7	-0.6	-1.2
<b>Horizontal Wind (2)</b>													
Mean Daily Maximum Sigma-A	72.4	63.7	76.6	64.2	75.8	62.8	67.6	74.9	60.4	69.5	71.0	66.9	68.8
Mean Daily Sigma-A	12.6	12.1	14.5	14.1	16.6	14.6	15.5	15.6	13.6	13.1	12.5	11.6	13.9
Mean Daily Minimum Sigma-A	2.4	2.8	3.0	2.9	3.3	2.9	3.2	2.6	2.6	2.5	2.7	2.6	2.8
Mean Daily Maximum Sigma u	1.4	1.6	2.0	2.3	2.3	2.3	2.3	2.1	2.1	1.6	1.4	1.4	1.9
Mean Daily Sigma u	0.5	0.6	0.8	0.9	0.9	0.9	0.9	0.7	0.7	0.6	0.6	0.9	0.8
Mean Daily Minimum Sigma u	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2
<b>Vertical Wind (m/s) (2)</b>													
Mean Positive Values	0.24	0.20	0.25	0.29	0.21	0.16	0.18	0.25	0.26	0.21	0.20	0.27	0.23
Mean Motion	0.21	0.17	0.22	0.26	0.17	0.13	0.16	0.24	0.26	0.20	0.18	0.25	0.21
Mean Negative Values	-0.04	-0.05	-0.05	-0.07	-0.06	-0.05	-0.05	-0.05	-0.04	-0.05	-0.05	-0.05	-0.05
Mean Daily Maximum Sigma w	0.55	0.60	0.71	0.72	0.74	0.67	0.68	0.71	0.65	0.61	0.53	0.53	0.64
Mean Daily Sigma w	0.22	0.27	0.32	0.35	0.35	0.31	0.31	0.32	0.31	0.28	0.27	0.26	0.30
Mean Daily Minimum Sigma w	0.02	0.03	0.03	0.05	0.04	0.03	0.05	0.08	0.09	0.08	0.08	0.08	0.06
<b>Barometric Pressure (mb) (1)</b>													
Mean Diurnal Range	6.8	5.2	6.0	6.0	4.9	4.5	4.7	4.7	4.9	5.8	5.9	6.2	5.5
<b>Dew Point (C) (1)</b>													
Mean	-8.0	-3.2	-6.7	-11.7	-6.6	-8.9	1.0	-4.9	-3.2	-8.5	-2.6	-3.3	-5.5
<b>Solar Radiation (MJ/m<sup>2</sup>/day) (1)</b>													
Mean Daily	11.3	13.0	20.8	26.6	28.1	31.8	29.7	27.3	23.4	16.8	11.9	8.8	20.8

Note 1: Values derived from 1-second data averaged over 1 hour.

Note 2: Values derived from 1-second data averaged over 10 minutes.

**APPENDIX D**  
**JOINT WIND FREQUENCY DISTRIBUTION**  
**TABLES FOR 1996**



## APPENDIX D

### JOINT WIND FREQUENCY DISTRIBUTION TABLES FOR 1996

**Note:** The wind speed classes used in this report are the same as those used by the National Climatic Data Center for STAR programs. These classes are:

- Class 1 = 0.0 to less than 1.8 m/s (0 - 3 knots)
- Class 2 = 1.8 to less than 3.3 m/s (4 - 6 knots)
- Class 3 = 3.3 to less than 5.4 m/s (7 - 10 knots)
- Class 4 = 5.4 to less than 8.5 m/s (11 - 16 knots)
- Class 5 = 8.5 to less than 11.0 m/s (17 - 21 knots)
- Class 6 = Greater than or equal to 11.0 m/s (greater than or equal to 21 knots)

**Table D-1. Site 1 (NTS-60) 10m Joint Frequency Wind Distributions  
for 1996 Daylight Hours**

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.00936	0.00799	0.00868	0.00845	0.00114	0.00068	0.036
North-Northeast	0.00982	0.00708	0.01096	0.01073	0.00068	0.00000	0.039
Northeast	0.01621	0.00890	0.01164	0.00502	0.00000	0.00000	0.042
East-Northeast	0.01416	0.00845	0.00479	0.00205	0.00000	0.00000	0.029
East	0.01416	0.00822	0.00320	0.00046	0.00000	0.00000	0.026
East-Southeast	0.01324	0.01256	0.00251	0.00023	0.00000	0.00000	0.029
Southeast	0.01918	0.03174	0.00685	0.00000	0.00000	0.00000	0.058
South-Southeast	0.01781	0.05890	0.04452	0.01461	0.00365	0.00046	0.140
South	0.01416	0.05114	0.10594	0.07808	0.02123	0.00731	0.278
South-Southwest	0.00753	0.02032	0.04064	0.01027	0.00160	0.00000	0.080
Southwest	0.00571	0.01005	0.02740	0.00457	0.00046	0.00000	0.048
West-Southwest	0.00594	0.00685	0.00936	0.00137	0.00000	0.00000	0.024
West	0.00411	0.00457	0.00502	0.00068	0.00000	0.00000	0.014
West-Northwest	0.01119	0.00411	0.00388	0.00160	0.00023	0.00000	0.021
Northwest	0.01553	0.01872	0.00594	0.00616	0.00160	0.00000	0.048
North-Northwest	0.01621	0.03082	0.01187	0.01758	0.00776	0.00342	0.088
<b>Sums</b>	<b>0.194</b>	<b>0.290</b>	<b>0.303</b>	<b>0.162</b>	<b>0.038</b>	<b>0.012</b>	<b>1.000</b>

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

Table D-2. Site 1 (NTS-60) 60m Joint Frequency Wind Distributions  
for 1996 Daylight Hours

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.02306	0.00845	0.00845	0.00822	0.00411	0.00091	0.053
North-Northeast	0.01690	0.01690	0.01256	0.01210	0.00479	0.00091	0.064
Northeast	0.01438	0.01050	0.00868	0.00959	0.00160	0.00000	0.045
East-Northeast	0.01027	0.00822	0.00274	0.00320	0.00046	0.00000	0.025
East	0.01027	0.00799	0.00320	0.00068	0.00000	0.00000	0.022
East-Southeast	0.01210	0.01461	0.00388	0.00046	0.00000	0.00000	0.031
Southeast	0.01119	0.03014	0.01005	0.00000	0.00000	0.00000	0.051
South-Southeast	0.01667	0.05388	0.05228	0.01667	0.01050	0.00388	0.154
South	0.01164	0.03813	0.09155	0.08950	0.02694	0.02100	0.279
South-Southwest	0.00799	0.01553	0.03105	0.01986	0.00274	0.00023	0.077
Southwest	0.00571	0.00868	0.02420	0.01142	0.00091	0.00068	0.052
West-Southwest	0.00571	0.00434	0.00936	0.00365	0.00023	0.00000	0.023
West	0.00502	0.00228	0.00365	0.00160	0.00046	0.00000	0.013
West-Northwest	0.00434	0.00114	0.00365	0.00228	0.00046	0.00023	0.012
Northwest	0.01005	0.00160	0.00251	0.00685	0.00114	0.00137	0.024
North-Northwest	0.02374	0.00616	0.00708	0.01781	0.00936	0.01073	0.075
Sums	0.189	0.229	0.275	0.204	0.064	0.040	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

**Table D-3. Site 2 (Yucca Mountain) Joint Frequency Wind Distributions  
for 1996 Daylight Hours**

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.00067	0.00201	0.00447	0.00469	0.00067	0.00000	0.013
North-Northeast	0.00045	0.00447	0.00648	0.00491	0.00134	0.00000	0.018
Northeast	0.00134	0.00692	0.01005	0.01005	0.00067	0.00000	0.029
East-Northeast	0.00268	0.01943	0.01787	0.00960	0.00134	0.00022	0.051
East	0.00536	0.04132	0.02725	0.00670	0.00045	0.00000	0.081
East-Southeast	0.00670	0.05539	0.03507	0.00491	0.00022	0.00000	0.102
Southeast	0.00849	0.05137	0.04557	0.01407	0.00089	0.00000	0.120
South-Southeast	0.00558	0.03038	0.04378	0.03105	0.00715	0.00000	0.118
South	0.00603	0.01966	0.02591	0.01809	0.00313	0.00022	0.073
South-Southwest	0.00581	0.02033	0.03775	0.01363	0.00112	0.00067	0.079
Southwest	0.00715	0.02100	0.04959	0.03440	0.00335	0.00246	0.118
West-Southwest	0.00380	0.00916	0.02144	0.03841	0.00670	0.00402	0.082
West	0.00313	0.00469	0.00558	0.01117	0.00380	0.00022	0.029
West-Northwest	0.00134	0.00268	0.00424	0.00849	0.00246	0.00223	0.021
Northwest	0.00134	0.00201	0.00514	0.01541	0.00916	0.01385	0.047
North-Northwest	0.00022	0.00223	0.00380	0.00670	0.00290	0.00335	0.019
Sums	0.060	0.293	0.344	0.230	0.045	0.027	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

Table D-4. Site 3 (Coyote Wash) Joint Frequency Wind Distributions  
for 1996 Daylight Hours

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.00179	0.00090	0.00000	0.00000	0.00000	0.00000	0.003
North-Northeast	0.00157	0.00045	0.00022	0.00000	0.00000	0.00000	0.002
Northeast	0.00202	0.00022	0.00045	0.00000	0.00000	0.00000	0.003
East-Northeast	0.00291	0.00179	0.00090	0.00000	0.00000	0.00000	0.006
East	0.01861	0.02377	0.01637	0.00090	0.00000	0.00000	0.060
East-Southeast	0.04283	0.11323	0.02040	0.00045	0.00000	0.00000	0.177
Southeast	0.03520	0.07825	0.02444	0.00000	0.00000	0.00000	0.138
South-Southeast	0.01614	0.07758	0.10359	0.02848	0.00112	0.00000	0.227
South	0.01233	0.02780	0.00852	0.00022	0.00000	0.00000	0.049
South-Southwest	0.00874	0.02489	0.00314	0.00022	0.00000	0.00000	0.037
Southwest	0.00830	0.02825	0.00336	0.00045	0.00000	0.00000	0.040
West-Southwest	0.00807	0.02623	0.00291	0.00000	0.00000	0.00000	0.037
West	0.01144	0.01896	0.00538	0.00000	0.00000	0.00000	0.037
West-Northwest	0.03072	0.04888	0.03318	0.01457	0.00314	0.00067	0.131
Northwest	0.01816	0.01099	0.01166	0.00762	0.00157	0.00045	0.050
North-Northwest	0.00269	0.00045	0.00045	0.00000	0.00000	0.00000	0.004
Sums	0.222	0.484	0.235	0.053	0.006	0.001	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

**Table D-5. Site 4 (Alice Hill) Joint Frequency Wind Distributions  
for 1996 Daylight Hours**

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.00559	0.00961	0.00425	0.00626	0.00447	0.00492	0.035
North-Northeast	0.00827	0.02213	0.01028	0.01900	0.01766	0.00782	0.085
Northeast	0.00715	0.03689	0.03622	0.02280	0.00514	0.00380	0.112
East-Northeast	0.00715	0.03040	0.01006	0.00425	0.00067	0.00000	0.053
East	0.00671	0.00693	0.00268	0.00134	0.00045	0.00000	0.018
East-Southeast	0.00425	0.00894	0.00402	0.00022	0.00000	0.00000	0.017
Southeast	0.00447	0.01207	0.00693	0.00022	0.00000	0.00000	0.024
South-Southeast	0.00581	0.03242	0.02862	0.00402	0.00156	0.00000	0.072
South	0.00537	0.06461	0.10798	0.07489	0.03197	0.02660	0.311
South-Southwest	0.00559	0.02437	0.04225	0.03309	0.00469	0.00402	0.114
Southwest	0.00358	0.01051	0.02034	0.01811	0.00246	0.00089	0.056
West-Southwest	0.00313	0.00380	0.00760	0.01140	0.00134	0.00022	0.028
West	0.00201	0.00313	0.00112	0.00291	0.00022	0.00022	0.010
West-Northwest	0.00268	0.00291	0.00112	0.00246	0.00045	0.00000	0.010
Northwest	0.00380	0.00313	0.00335	0.00827	0.00469	0.00156	0.025
North-Northwest	0.00201	0.00380	0.00201	0.00537	0.00848	0.01095	0.031
<b>Sums</b>	<b>0.078</b>	<b>0.276</b>	<b>0.289</b>	<b>0.215</b>	<b>0.082</b>	<b>0.061</b>	<b>1.000</b>

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

Table D-6. Site 5 (Fortymile Wash) Joint Frequency Wind Distributions  
for 1996 Daylight Hours

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.00448	0.02801	0.06789	0.04078	0.00381	0.00067	0.146
North-Northeast	0.00314	0.02285	0.03070	0.00627	0.00022	0.00000	0.063
Northeast	0.00493	0.01188	0.00717	0.00650	0.00269	0.00022	0.033
East-Northeast	0.00359	0.00695	0.00762	0.00941	0.00090	0.00067	0.029
East	0.00314	0.00314	0.00650	0.00112	0.00000	0.00000	0.014
East-Southeast	0.00336	0.00896	0.00269	0.00022	0.00000	0.00000	0.015
Southeast	0.00134	0.00874	0.00224	0.00090	0.00000	0.00000	0.013
South-Southeast	0.00493	0.01949	0.01188	0.01546	0.00583	0.00269	0.060
South	0.00605	0.04392	0.06184	0.06812	0.02420	0.01255	0.217
South-Southwest	0.01143	0.08402	0.06767	0.01949	0.00381	0.00246	0.189
Southwest	0.00829	0.02756	0.03675	0.00605	0.00022	0.00000	0.079
West-Southwest	0.00560	0.01031	0.01636	0.00560	0.00090	0.00022	0.039
West	0.00448	0.00560	0.00269	0.00202	0.00022	0.00000	0.015
West-Northwest	0.00538	0.00583	0.00224	0.00202	0.00022	0.00000	0.016
Northwest	0.00605	0.00381	0.00515	0.00493	0.00224	0.00022	0.022
North-Northwest	0.00336	0.01300	0.00807	0.01501	0.00650	0.00359	0.050
Sums	0.080	0.304	0.337	0.204	0.052	0.023	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

**Table D-7. Site 6 (WT-6) Joint Frequency Wind Distributions  
for 1996 Daylight Hours**

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.00402	0.00828	0.00804	0.00916	0.00223	0.00067	0.032
North-Northeast	0.00246	0.00558	0.00581	0.00424	0.00022	0.00000	0.018
Northeast	0.00246	0.00916	0.01228	0.00335	0.00000	0.00000	0.027
East-Northeast	0.00380	0.00871	0.00983	0.00089	0.00000	0.00000	0.023
East	0.00828	0.01228	0.00313	0.00022	0.00000	0.00000	0.024
East-Southeast	0.00960	0.03193	0.00491	0.00022	0.00000	0.00000	0.047
Southeast	0.01117	0.08553	0.06588	0.00447	0.00112	0.00000	0.168
South-Southeast	0.00603	0.05695	0.11188	0.08419	0.02233	0.00849	0.290
South	0.00402	0.01831	0.03216	0.00290	0.00000	0.00000	0.057
South-Southwest	0.00335	0.01273	0.02814	0.00357	0.00000	0.00000	0.048
Southwest	0.00134	0.00938	0.01452	0.00067	0.00000	0.00000	0.028
West-Southwest	0.00290	0.00380	0.00538	0.00045	0.00000	0.00000	0.013
West	0.00134	0.00201	0.00201	0.00000	0.00000	0.00000	0.005
West-Northwest	0.00469	0.00558	0.00737	0.00112	0.00022	0.00000	0.019
Northwest	0.00938	0.03888	0.06478	0.01117	0.00134	0.00000	0.126
North-Northwest	0.00670	0.01452	0.01608	0.02233	0.01228	0.00491	0.077
<b>Sums</b>	<b>0.082</b>	<b>0.324</b>	<b>0.392</b>	<b>0.149</b>	<b>0.040</b>	<b>0.014</b>	<b>1.000</b>

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

Table D-8. Site 7 (Sever Wash) Joint Frequency Wind Distributions  
for 1996 Daylight Hours

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.00469	0.01340	0.01854	0.01519	0.00156	0.00000	0.053
North-Northeast	0.00335	0.01474	0.03172	0.01474	0.00045	0.00022	0.065
Northeast	0.00290	0.01139	0.01161	0.00067	0.00022	0.00000	0.027
East-Northeast	0.00268	0.00737	0.00268	0.00022	0.00000	0.00000	0.013
East	0.00357	0.00357	0.00179	0.00045	0.00000	0.00000	0.009
East-Southeast	0.00536	0.00737	0.00268	0.00022	0.00000	0.00000	0.016
Southeast	0.01094	0.02703	0.00983	0.00022	0.00000	0.00000	0.048
South-Southeast	0.01363	0.08108	0.07572	0.03149	0.01117	0.00335	0.216
South	0.01072	0.04289	0.07952	0.05204	0.00938	0.00313	0.198
South-Southwest	0.00737	0.02010	0.04088	0.00826	0.00156	0.00000	0.078
Southwest	0.00648	0.01229	0.01966	0.00424	0.00045	0.00000	0.043
West-Southwest	0.01117	0.00536	0.01072	0.00134	0.00000	0.00000	0.029
West	0.02814	0.00268	0.00357	0.00156	0.00000	0.00000	0.036
West-Northwest	0.03484	0.00893	0.00402	0.00045	0.00000	0.00000	0.048
Northwest	0.03015	0.01497	0.00692	0.00893	0.00246	0.00045	0.064
North-Northwest	0.01161	0.01519	0.00536	0.01340	0.00648	0.00447	0.057
Sums	0.188	0.288	0.325	0.153	0.034	0.012	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

**Table D-9. Site 8 (Knothead Gap) Joint Frequency Wind Distributions  
for 1996 Daylight Hours**

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.03596	0.00826	0.00759	0.01072	0.00201	0.00000	0.065
North-Northeast	0.02837	0.00983	0.01318	0.01072	0.00022	0.00000	0.062
Northeast	0.02077	0.00804	0.01050	0.00357	0.00022	0.00000	0.043
East-Northeast	0.01430	0.00849	0.00268	0.00067	0.00000	0.00000	0.026
East	0.01139	0.00692	0.00246	0.00067	0.00000	0.00000	0.021
East-Southeast	0.01161	0.01184	0.00313	0.00000	0.00000	0.00000	0.027
Southeast	0.01296	0.02033	0.00313	0.00000	0.00000	0.00000	0.036
South-Southeast	0.01407	0.05608	0.03574	0.00983	0.00357	0.00067	0.120
South	0.01161	0.07393	0.11481	0.07550	0.02278	0.00759	0.306
South-Southwest	0.00737	0.02256	0.05249	0.01251	0.00179	0.00022	0.097
Southwest	0.00424	0.01005	0.01787	0.00223	0.00000	0.00000	0.034
West-Southwest	0.00179	0.00447	0.00670	0.00089	0.00000	0.00000	0.014
West	0.00357	0.00380	0.00380	0.00045	0.00000	0.00000	0.012
West-Northwest	0.00447	0.00268	0.00357	0.00089	0.00000	0.00000	0.012
Northwest	0.01854	0.01005	0.00558	0.00335	0.00067	0.00022	0.038
North-Northwest	0.03820	0.00737	0.01117	0.01765	0.00871	0.00335	0.086
<b>Sums</b>	<b>0.239</b>	<b>0.265</b>	<b>0.294</b>	<b>0.150</b>	<b>0.040</b>	<b>0.012</b>	<b>1.000</b>

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

Table D-10. Site 9 (Gate 510) Joint Frequency Wind Distributions  
for 1996 Daylight Hours

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.00357	0.01228	0.01228	0.00804	0.00134	0.00022	0.038
North-Northeast	0.00313	0.02456	0.04956	0.01005	0.00134	0.00000	0.089
Northeast	0.00268	0.02478	0.04823	0.01608	0.00335	0.00067	0.096
East-Northeast	0.00603	0.01407	0.01250	0.00313	0.00022	0.00022	0.036
East	0.00558	0.01206	0.00424	0.00268	0.00000	0.00000	0.025
East-Southeast	0.00670	0.01094	0.00201	0.00067	0.00000	0.00000	0.020
Southeast	0.00402	0.01384	0.00647	0.00201	0.00000	0.00022	0.027
South-Southeast	0.00938	0.02947	0.03840	0.04577	0.02210	0.00759	0.153
South	0.00826	0.06251	0.07256	0.05403	0.01942	0.01183	0.229
South-Southwest	0.00938	0.04309	0.03327	0.00804	0.00380	0.00156	0.099
Southwest	0.00647	0.02746	0.01942	0.00112	0.00022	0.00000	0.055
West-Southwest	0.00402	0.01228	0.01250	0.00134	0.00022	0.00000	0.030
West	0.00313	0.00960	0.00893	0.00156	0.00022	0.00000	0.023
West-Northwest	0.00246	0.00670	0.00491	0.00246	0.00000	0.00000	0.017
Northwest	0.00290	0.00647	0.00580	0.00938	0.00201	0.00045	0.027
North-Northwest	0.00290	0.00558	0.00692	0.01429	0.00536	0.00268	0.038
Sums	0.081	0.316	0.338	0.181	0.060	0.025	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

**Table D-11. Site 1 (NTS-60) 10m Joint Frequency Wind Distributions  
for 1996 Nighttime Hours**

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.01388	0.02753	0.04094	0.01976	0.00353	0.00000	0.108
North-Northeast	0.00494	0.00988	0.01012	0.00659	0.00188	0.00000	0.033
Northeast	0.00188	0.00282	0.00094	0.00165	0.00000	0.00000	0.007
East-Northeast	0.00094	0.00047	0.00118	0.00024	0.00000	0.00000	0.003
East	0.00047	0.00047	0.00047	0.00047	0.00024	0.00000	0.002
East-Southeast	0.00047	0.00118	0.00047	0.00000	0.00000	0.00000	0.002
Southeast	0.00141	0.00212	0.00047	0.00000	0.00000	0.00000	0.004
South-Southeast	0.00212	0.00471	0.00447	0.00141	0.00000	0.00000	0.013
South	0.00471	0.01176	0.02094	0.02424	0.01224	0.00329	0.077
South-Southwest	0.00518	0.02259	0.01788	0.00376	0.00094	0.00000	0.050
Southwest	0.00941	0.01694	0.00400	0.00118	0.00000	0.00000	0.032
West-Southwest	0.01176	0.02471	0.00682	0.00094	0.00000	0.00000	0.044
West	0.01388	0.02259	0.00424	0.00071	0.00000	0.00000	0.041
West-Northwest	0.02918	0.02965	0.00212	0.00024	0.00000	0.00000	0.061
Northwest	0.04000	0.17859	0.04471	0.00259	0.00047	0.00024	0.267
North-Northwest	0.03976	0.16141	0.02165	0.01976	0.00894	0.00588	0.257
<b>Sums</b>	<b>0.180</b>	<b>0.517</b>	<b>0.181</b>	<b>0.084</b>	<b>0.028</b>	<b>0.009</b>	<b>1.000</b>

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

Table D-12. Site 1 (NTS-60) 60m Joint Frequency Wind Distributions  
for 1996 Nighttime Hours

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.10071	0.04682	0.03365	0.03600	0.01224	0.00282	0.232
North-Northeast	0.03859	0.02871	0.01788	0.01482	0.00353	0.00353	0.107
Northeast	0.01576	0.00659	0.00282	0.00165	0.00118	0.00024	0.028
East-Northeast	0.00682	0.00282	0.00071	0.00047	0.00024	0.00000	0.011
East	0.00612	0.00259	0.00024	0.00094	0.00024	0.00024	0.010
East-Southeast	0.00518	0.00188	0.00094	0.00024	0.00000	0.00000	0.008
Southeast	0.00612	0.00400	0.00188	0.00000	0.00000	0.00000	0.012
South-Southeast	0.01059	0.01318	0.00612	0.00541	0.00212	0.00047	0.038
South	0.01365	0.02447	0.02329	0.03624	0.01624	0.01576	0.130
South-Southwest	0.01624	0.01953	0.01482	0.00706	0.00118	0.00071	0.060
Southwest	0.01647	0.01365	0.00965	0.00141	0.00071	0.00000	0.042
West-Southwest	0.01435	0.00824	0.01106	0.00329	0.00024	0.00000	0.037
West	0.01882	0.00494	0.00353	0.00094	0.00000	0.00000	0.028
West-Northwest	0.02259	0.00518	0.00188	0.00118	0.00000	0.00000	0.031
Northwest	0.04118	0.00918	0.00118	0.00141	0.00212	0.00047	0.056
North-Northwest	0.08588	0.02918	0.00894	0.01318	0.01388	0.01906	0.170
Sums	0.419	0.221	0.139	0.124	0.054	0.043	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

Table D-13. Site 2 (Yucca Mountain) Joint Frequency Wind Distributions  
for 1996 Nighttime Hours

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.00188	0.00350	0.00979	0.01515	0.00468	0.00093	0.038
North-Northeast	0.00233	0.01025	0.01958	0.02051	0.00398	0.00093	0.058
Northeast	0.00559	0.01258	0.03008	0.01445	0.00258	0.00000	0.065
East-Northeast	0.01025	0.02960	0.02703	0.00583	0.00163	0.00070	0.075
East	0.01258	0.06038	0.04568	0.00233	0.00023	0.00070	0.122
East-Southeast	0.01072	0.04008	0.04008	0.00559	0.00000	0.00000	0.098
Southeast	0.01142	0.03838	0.03892	0.01771	0.00188	0.00000	0.108
South-Southeast	0.00979	0.02144	0.02820	0.03239	0.01468	0.00047	0.107
South	0.00839	0.01328	0.01258	0.01352	0.00140	0.00070	0.050
South-Southwest	0.00769	0.01095	0.00792	0.00419	0.00047	0.00047	0.032
Southwest	0.01119	0.01515	0.00909	0.00350	0.00140	0.00070	0.041
West-Southwest	0.01235	0.02028	0.01422	0.01025	0.00117	0.00140	0.060
West	0.01189	0.01445	0.00699	0.00210	0.00047	0.00047	0.038
West-Northwest	0.00583	0.00769	0.00513	0.00233	0.00140	0.00163	0.024
Northwest	0.00328	0.00373	0.00678	0.00653	0.00559	0.01888	0.045
North-Northwest	0.00303	0.00608	0.00769	0.01002	0.01119	0.00932	0.047
Sums	0.128	0.308	0.310	0.168	0.053	0.037	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

**Table D-14. Site 3 (Coyote Wash) Joint Frequency Wind Distributions  
for 1996 Nighttime Hours**

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.00164	0.00093	0.00000	0.00000	0.00000	0.00000	0.003
North-Northeast	0.00210	0.00070	0.00023	0.00000	0.00000	0.00000	0.003
Northeast	0.00164	0.00023	0.00023	0.00000	0.00000	0.00000	0.002
East-Northeast	0.00164	0.00140	0.00093	0.00000	0.00000	0.00000	0.004
East	0.00444	0.00584	0.00327	0.00117	0.00000	0.00000	0.015
East-Southeast	0.00607	0.00584	0.00327	0.00023	0.00000	0.00000	0.015
Southeast	0.00537	0.00631	0.00070	0.00000	0.00000	0.00000	0.012
South-Southeast	0.01168	0.03621	0.03761	0.01729	0.00117	0.00000	0.104
South	0.01962	0.01682	0.00210	0.00023	0.00000	0.00000	0.039
South-Southwest	0.01448	0.00350	0.00093	0.00000	0.00000	0.00000	0.019
Southwest	0.02102	0.00444	0.00093	0.00000	0.00000	0.00000	0.026
West-Southwest	0.03294	0.01051	0.00140	0.00000	0.00000	0.00000	0.045
West	0.06284	0.03481	0.00327	0.00023	0.00000	0.00000	0.101
West-Northwest	0.08176	0.31184	0.02593	0.01402	0.00677	0.00350	0.444
Northwest	0.04555	0.06424	0.03060	0.01285	0.00234	0.00093	0.157
North-Northwest	0.00724	0.00350	0.00070	0.00000	0.00000	0.00000	0.011
Sums	0.320	0.507	0.112	0.046	0.010	0.004	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

**Table D-15. Site 4 (Alice Hill) Joint Frequency Wind Distributions  
for 1996 Nighttime Hours**

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.02359	0.08150	0.01541	0.01728	0.00911	0.01565	0.163
North-Northeast	0.03176	0.10112	0.02896	0.03970	0.02452	0.03456	0.261
Northeast	0.01705	0.08641	0.02943	0.01308	0.00183	0.00280	0.150
East-Northeast	0.00584	0.01004	0.00187	0.00117	0.00000	0.00023	0.019
East	0.00584	0.00397	0.00093	0.00140	0.00000	0.00093	0.013
East-Southeast	0.00514	0.00607	0.00140	0.00023	0.00000	0.00000	0.013
Southeast	0.00467	0.01471	0.00444	0.00023	0.00000	0.00000	0.024
South-Southeast	0.00444	0.01635	0.01471	0.00093	0.00000	0.00000	0.036
South	0.00374	0.01798	0.02592	0.02335	0.00887	0.01425	0.094
South-Southwest	0.00420	0.01074	0.01261	0.00537	0.00163	0.00117	0.036
Southwest	0.00467	0.01004	0.00584	0.00093	0.00023	0.00023	0.022
West-Southwest	0.00537	0.00771	0.00607	0.00234	0.00070	0.00047	0.023
West	0.00327	0.00747	0.00350	0.00117	0.00000	0.00000	0.015
West-Northwest	0.00701	0.00724	0.00163	0.00163	0.00023	0.00000	0.018
Northwest	0.00934	0.01261	0.00257	0.00163	0.00117	0.00070	0.028
North-Northwest	0.01261	0.04694	0.00864	0.00397	0.00280	0.01028	0.085
<b>Sums</b>	<b>0.149</b>	<b>0.441</b>	<b>0.164</b>	<b>0.114</b>	<b>0.051</b>	<b>0.081</b>	<b>1.000</b>

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

Table D-16. Site 5 (Fortymile Wash) Joint Frequency Wind Distributions  
for 1996 Nighttime Hours

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.00631	0.04859	0.21957	0.12894	0.00934	0.00187	0.415
North-Northeast	0.00327	0.03340	0.16748	0.01542	0.00047	0.00023	0.220
Northeast	0.00187	0.01658	0.04088	0.00397	0.00047	0.00023	0.064
East-Northeast	0.00140	0.00491	0.00724	0.00280	0.00047	0.00047	0.017
East	0.00187	0.00304	0.00187	0.00093	0.00000	0.00000	0.008
East-Southeast	0.00070	0.00304	0.00093	0.00047	0.00000	0.00000	0.005
Southeast	0.00070	0.00280	0.00280	0.00023	0.00000	0.00000	0.007
South-Southeast	0.00210	0.00514	0.01051	0.01331	0.00584	0.00117	0.038
South	0.00234	0.00888	0.01588	0.01775	0.00841	0.01168	0.065
South-Southwest	0.00187	0.00958	0.00724	0.00280	0.00047	0.00000	0.022
Southwest	0.00514	0.00911	0.00210	0.00023	0.00047	0.00000	0.017
West-Southwest	0.00584	0.00701	0.00374	0.00140	0.00000	0.00000	0.018
West	0.00561	0.00631	0.00444	0.00093	0.00000	0.00000	0.017
West-Northwest	0.00397	0.00304	0.00093	0.00023	0.00000	0.00000	0.008
Northwest	0.00467	0.00911	0.00000	0.00187	0.00070	0.00047	0.017
North-Northwest	0.00514	0.02196	0.01168	0.01121	0.00771	0.00444	0.062
Sums	0.053	0.192	0.497	0.203	0.034	0.021	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

**Table D-17. Site 6 (WT-6) Joint Frequency Wind Distributions  
for 1996 Nighttime Hours**

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.00210	0.00886	0.00979	0.01911	0.00769	0.00350	0.051
North-Northeast	0.00186	0.00419	0.00886	0.00629	0.00140	0.00000	0.023
Northeast	0.00070	0.00210	0.00373	0.00280	0.00000	0.00000	0.009
East-Northeast	0.00070	0.00140	0.00140	0.00000	0.00000	0.00000	0.004
East	0.00186	0.00070	0.00047	0.00047	0.00000	0.00000	0.004
East-Southeast	0.00326	0.00419	0.00163	0.00023	0.00000	0.00000	0.009
Southeast	0.00722	0.01398	0.02097	0.01119	0.00350	0.00023	0.057
South-Southeast	0.00536	0.01561	0.01655	0.01701	0.00955	0.00233	0.066
South	0.00419	0.00839	0.00280	0.00000	0.00000	0.00000	0.015
South-Southwest	0.00419	0.00816	0.00093	0.00023	0.00000	0.00000	0.014
Southwest	0.00373	0.00932	0.00070	0.00000	0.00000	0.00000	0.014
West-Southwest	0.00559	0.00955	0.00350	0.00023	0.00000	0.00000	0.019
West	0.00862	0.01142	0.00256	0.00000	0.00000	0.00000	0.023
West-Northwest	0.01165	0.02517	0.01189	0.00117	0.00000	0.00000	0.050
Northwest	0.02330	0.15218	0.36402	0.01142	0.00023	0.00023	0.551
North-Northwest	0.00746	0.02051	0.02191	0.02167	0.01119	0.00909	0.092
Sums	0.092	0.296	0.472	0.092	0.034	0.015	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

Table D-18. Site 7 (Sever Wash) Joint Frequency Wind Distributions  
for 1996 Nighttime Hours

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.01282	0.03030	0.03659	0.03333	0.00583	0.00023	0.119
North-Northeast	0.00466	0.00583	0.01328	0.01002	0.00233	0.00047	0.037
Northeast	0.00186	0.00373	0.00256	0.00093	0.00000	0.00000	0.009
East-Northeast	0.00140	0.00163	0.00000	0.00000	0.00000	0.00000	0.003
East	0.00326	0.00186	0.00000	0.00000	0.00000	0.00000	0.005
East-Southeast	0.00326	0.00326	0.00070	0.00047	0.00023	0.00000	0.008
Southeast	0.00326	0.00303	0.00117	0.00000	0.00000	0.00000	0.007
South-Southeast	0.00513	0.00932	0.00536	0.00303	0.00117	0.00023	0.024
South	0.00303	0.01212	0.02540	0.01934	0.00536	0.00023	0.065
South-Southwest	0.00489	0.00816	0.00303	0.00140	0.00023	0.00000	0.018
Southwest	0.00350	0.00536	0.00047	0.00093	0.00000	0.00000	0.010
West-Southwest	0.01212	0.00443	0.00140	0.00047	0.00000	0.00000	0.018
West	0.04172	0.00233	0.00117	0.00000	0.00000	0.00000	0.045
West-Northwest	0.11815	0.03589	0.00093	0.00070	0.00000	0.00000	0.156
Northwest	0.11582	0.16057	0.00583	0.00373	0.00093	0.00000	0.287
North-Northwest	0.04265	0.09485	0.02494	0.01585	0.00583	0.00373	0.188
Sums	0.378	0.383	0.123	0.090	0.022	0.005	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

**Table D-19. Site 8 (Knothead Gap) Joint Frequency Wind Distributions  
for 1996 Nighttime Hours**

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.06504	0.02587	0.03030	0.02075	0.00468	0.00000	0.147
North-Northeast	0.01795	0.00443	0.00490	0.00350	0.00000	0.00023	0.031
Northeast	0.00699	0.00140	0.00140	0.00093	0.00000	0.00000	0.011
East-Northeast	0.00373	0.00117	0.00117	0.00023	0.00000	0.00000	0.008
East	0.00210	0.00117	0.00047	0.00000	0.00023	0.00000	0.004
East-Southeast	0.00210	0.00070	0.00023	0.00000	0.00000	0.00000	0.003
Southeast	0.00443	0.00140	0.00070	0.00000	0.00000	0.00000	0.007
South-Southeast	0.00769	0.00746	0.00583	0.00303	0.00023	0.00023	0.024
South	0.01002	0.01935	0.01911	0.02378	0.01259	0.00258	0.087
South-Southwest	0.01562	0.01678	0.01515	0.00466	0.00070	0.00000	0.053
Southwest	0.01072	0.01049	0.00326	0.00070	0.00000	0.00000	0.025
West-Southwest	0.01166	0.01119	0.00420	0.00047	0.00000	0.00000	0.028
West	0.01142	0.00583	0.00256	0.00023	0.00000	0.00000	0.020
West-Northwest	0.02494	0.01026	0.00047	0.00000	0.00000	0.00000	0.036
Northwest	0.10373	0.09627	0.00350	0.00140	0.00023	0.00000	0.205
North-Northwest	0.21748	0.04196	0.01958	0.01958	0.00956	0.00536	0.314
Sums	0.516	0.256	0.113	0.079	0.028	0.008	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.

Table D-20. Site 9 (Gate 510) Joint Frequency Wind Distributions  
for 1996 Nighttime Hours

Wind Directions	Speed Categories (m/s)						Sums
	0 to <1.8	1.8 to <3.3	3.3 to <5.4	5.4 to <8.5	8.5 to <11.0	≥11.0	
North	0.00350	0.02051	0.03705	0.01818	0.00443	0.00093	0.085
North-Northeast	0.00326	0.04078	0.28525	0.03030	0.00163	0.00023	0.361
Northeast	0.00443	0.03869	0.08366	0.01841	0.00117	0.00000	0.146
East-Northeast	0.00396	0.01981	0.01538	0.00419	0.00000	0.00000	0.043
East	0.00303	0.01142	0.00256	0.00070	0.00000	0.00093	0.019
East-Southeast	0.00303	0.01142	0.00303	0.00000	0.00000	0.00000	0.017
Southeast	0.00326	0.01212	0.02074	0.00326	0.00047	0.00000	0.040
South-Southeast	0.00303	0.01701	0.05546	0.04801	0.01119	0.00443	0.139
South	0.00326	0.01445	0.00932	0.00699	0.00606	0.00746	0.048
South-Southwest	0.00210	0.00792	0.00326	0.00140	0.00047	0.00000	0.015
Southwest	0.00350	0.00466	0.00070	0.00000	0.00000	0.00023	0.009
West-Southwest	0.00163	0.00466	0.00140	0.00000	0.00000	0.00000	0.008
West	0.00093	0.00373	0.00186	0.00117	0.00000	0.00000	0.008
West-Northwest	0.00140	0.00559	0.00163	0.00023	0.00000	0.00000	0.009
Northwest	0.00070	0.00466	0.00653	0.00396	0.00093	0.00023	0.017
North-Northwest	0.00186	0.00653	0.01328	0.00979	0.00373	0.00093	0.036
Sums	0.043	0.224	0.541	0.147	0.030	0.015	1.000

Note: Table entries are the decimal fraction of the total number of observations that hourly average wind data occurred jointly in the speed and direction categories.