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AIR DISPERSION MODELING AT THE WASTE ISOLATION PILOT PLANT

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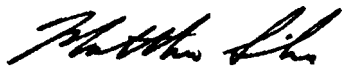
FOREWORD

The purpose of the New Mexico Environmental Evaluation Group (EEG) is to conduct an independent technical evaluation of the Waste Isolation Pilot Plant (WIPP) Project to ensure the protection of the public health and safety and the environment. The WIPP Project, located in southeastern New Mexico, became operational in March 1999 for the disposal of transuranic (TRU) radioactive wastes generated by the national defense programs. The EEG was established in 1978 with funds provided by the U. S. Department of Energy (DOE) to the State of New Mexico. Public Law 100-456, the National Defense Authorization Act, Fiscal Year 1989, Section 1433, assigned EEG to the New Mexico Institute of Mining and Technology and continued the original contract DE-AC04-79AL10752 through DOE contract DE-ACO4-89AL58309. The National Defense Authorization Act for Fiscal Year 1994, Public Law 103-160, and the National Defense Authorization Act for Fiscal Year 2000, Public Law 106-65, continued the authorization.

EEG performs independent technical analyses of the suitability of the proposed site; the design of the repository, its operation, and its long-term integrity; suitability and safety of the transportation systems; suitability of the Waste Acceptance Criteria and the compliance of the generator sites with them; and related subjects. These analyses include assessments of reports issued by the DOE and its contractors, other federal agencies and organizations, as they relate to the potential health, safety and environmental impacts from WIPP. Another important function of EEG is the independent environmental monitoring of radioactivity in air, water, and soil, both on-site and off-site.



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EXECUTIVE SUMMARY

One concern at the Waste Isolation Pilot Plant (WIPP) is the amount of alpha-emitting radionuclides or hazardous chemicals that can become airborne at the facility and reach the Exclusive Use Area boundary as the result of a release from the Waste Handling Building (WHB) or from the underground during waste emplacement operations. The WIPP Safety Analysis Report (SAR), WIPP RCRA Permit, and WIPP Emergency Preparedness Hazards Assessments include air dispersion calculations to address this issue. Meteorological conditions at the WIPP facility will dictate direction, speed, and dilution of a contaminant plume of respirable material due to chronic releases or during an accident. Due to the paucity of meteorological information at the WIPP site prior to September 1996, the Department of Energy (DOE) reports had to rely largely on unqualified climatic data from the site and neighboring Carlsbad, which is situated approximately 40 km (26 miles) to the west of the site.

This report examines the validity of the DOE air dispersion calculations using new meteorological data measured and collected at the WIPP site since September 1996. The air dispersion calculations in this report include both chronic and acute releases. Chronic release calculations were conducted with the EPA-approved code, CAP88PC and the calculations showed that in order for a violation of 40 CFR 61 (NESHAPS) to occur, approximately 15 mCi/yr of ^{239}Pu would have to be released from the exhaust stack or from the WHB. This is an extremely high value. Hence, it is unlikely that NESHAPS would be violated.

A site-specific air dispersion coefficient was evaluated for comparison with that used in acute dose calculations. The calculations presented in Section 3.2 and 3.3 show that one could expect a slightly less dispersive plume (larger air dispersion coefficient) given greater confidence in the meteorological data, i.e. 95% worst case meteorological conditions. Calculations show that dispersion will decrease slightly if a more stable wind class is assumed, where very little vertical mixing occurs.

It is recommended that previous reports which used fixed values for calculating the air dispersion coefficient be updated to reflect the new meteorological data, such as the WIPP Safety Analysis

Report and the WIPP Emergency Preparedness Hazards Assessment. It is also recommended that uncertainty be incorporated into the calculations so that a more meaningful assessment of risk during accidents can be achieved.

AIR DISPERSION MODELING AT WIPP

1.0 Introduction

The Waste Isolation Pilot Plant (WIPP) has been built by the Department of Energy (DOE) for the geologic disposal of transuranic (TRU) waste. It is located in the southeastern portion of New Mexico, approximately 40 km (26 miles) east of Carlsbad in the Delaware Basin. Figure 1.1 shows the site location. The repository is a mined room and pillar construction approximately 655 m (2150 ft) below the surface in the Salado Formation, which consists mainly of halite with alternating thin layers of anhydrite with clay seams. The Environmental Protection Agency (EPA) certified the facility as meeting the Standards for Disposal of TRU Waste (EPA 1993) in May 1998 (EPA 1998).

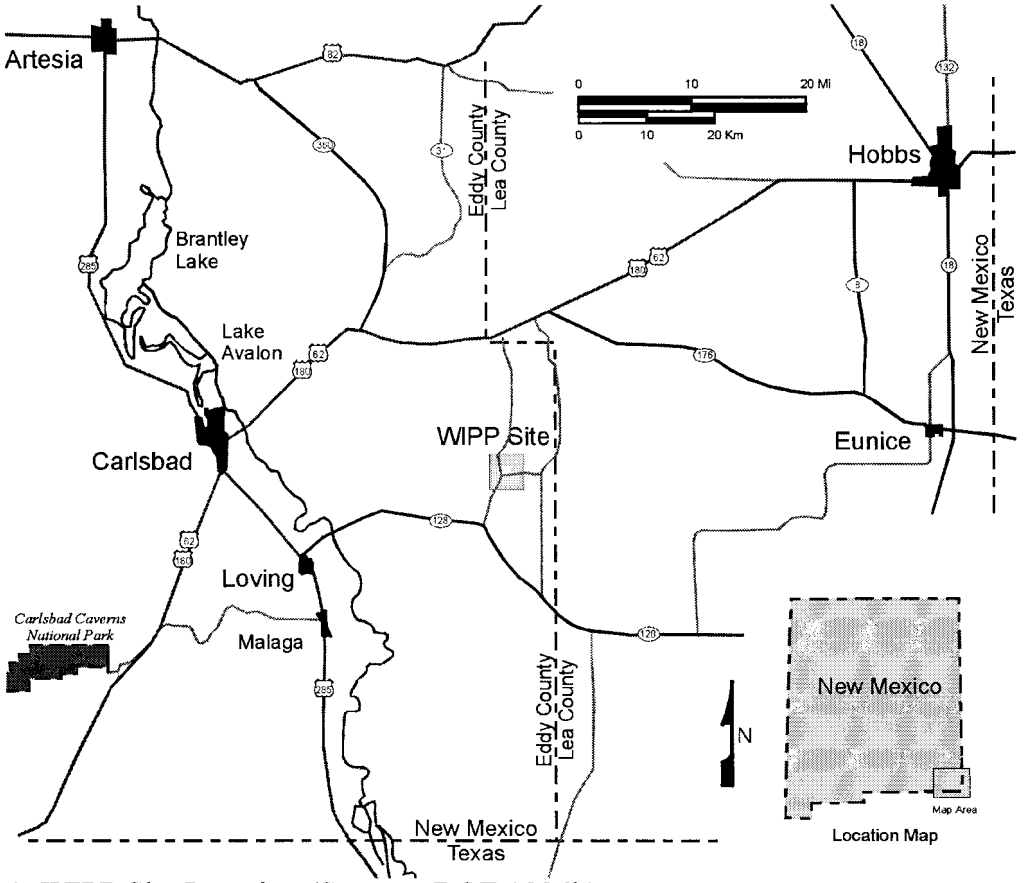

Figure 1.1 WIPP Site Location (Source: DOE 1996b)

With the EPA approval, WIPP has been receiving non-mixed TRU waste since March 1999. Additionally, a RCRA part B permit was issued in November 1999 and the first shipment of mixed TRU waste arrived at WIPP in March 2000.

TRU waste is defined as waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years. The waste inventory includes a long list of transuranic elements with ^{239}Pu as the major radionuclide. The facility is designed to dispose of 13 metric tons of ^{239}Pu. The DOE application, EPA certification, waste packaging practices, history of the Waste Acceptance Criteria, transportation requirements, design of the WIPP facility, and WIPP Safety Analysis Report clearly reflect recognition of the inhalation hazards associated with alpha-emitting particles.

The contact-handled (CH) TRU waste will be shipped primarily in 55 gallon drums or steel waste boxes. Much of the waste within the drums and boxes is surrounded by multiple layers of plastic bags intended to mitigate the release of respirable particles during packaging, handling, and storage. Moreover, each drum is fitted with one carbon filter and each box is fitted with two carbon filters designed to allow the release of flammable gas while preventing the release of alpha-emitting particles.

Historically, the WIPP Waste Acceptance Criteria, Revisions 0 through 4, included a specific limit of 1% by weight of respirable sized particles (10 micron) in CH-TRU waste. Particles less than 200 microns were limited to less than 15%. Revision 5 of the WAC (U.S. DOE, 1996a) removed the requirements, leaving an unlimited amount of respirable material as acceptable for handling and emplacement in the facility.

The WIPP Land Withdrawal Act (1996) requires shipment to WIPP in transportation containers certified by the Nuclear Regulatory Commission (NRC). NRC has certified the TRUPACT II, which is a right circular cylinder with a screw top lid. The TRUPACT II provides double containment and is non-vented and it was extensively tested to verify that the package would not be easily breached in a transportation accident. The DOE plans shipment of the TRU-PACT-II by truck, although shipment by rail is still an option.

Upon arrival at WIPP, the waste drums or boxes will be unloaded from the TRUPACT-II in the Waste Handling Building (WHB). The facility is equipped with alpha detecting continuous air monitors and in the event of a release, is also fitted with high efficiency particulate filtration. A description of the ventilation used in the WHB can be found in the WIPP Safety Analysis Report (SAR, DOE 1999). The SAR lists the accident scenarios, which could cause an uptake by workers in the WHB, underground, or in and around the above ground facilities. The scenarios and scenario designations are listed in Table 1.1.

For final disposal, the waste will be transported down to the mined out panels and emplaced. The mine ventilation system removes the large quantities of dust associated with the mining activity. As a result, during the normal mode of operation, air from the underground is unfiltered and returns to the surface through the exhaust shaft. The air is diverted through HEPA filters only when a release of radionuclides has been detected. Continuous air monitors are intended to provide the information to switch to HEPA filtration. Even if the monitoring system is functioning properly, it may take several minutes before a warning signal to notify the Central Monitoring Room (CMR) would result in the exhaust ventilation being switched to HEPA filtration. In such a case, the uptake of radioactivity by workers on the surface is dictated by the wind speed and stability conditions at the site.

Knowing the potential dose of radioactivity is an important regulatory concern for both normal operations and accidents. For normal operational procedures, 40 CFR 191, Subpart A sets a chronic release limit at the fence line (Exclusive Use Area) of 25 mrem in a year for whole body or 75 mrem in a year to a critical organs. The EPA, in their NESHAPS requirements, states that a chronic release of 10 mrem/yr shall not be exceeded.

Table 1.1 WIPP Operational Accident Scenarios

Scenario Description	Scenario Name
Spontaneous Ignition of Drum in WHB	CH1
Crane Failure in WHB	CH2
Puncture of Waste Container in WHB	CH3
Waste Container Drop in WHB	CH4
Waste Hoist Failure	CH5
Seismic Event	CH6
Spontaneous Ignition of Drum Underground	CH7
Aircraft Crash	CH8
Waste Container Drop Underground	CH9
Tornado Event	CH10
Underground Roof Fall	CH11

As stated in 10 CFR 50, App. I, 10 CFR 100, and summarized in ANSI ANS-51.1-1983 (or ANSI ANS-52.1-1983 - ANSI-ANS 1983) the Offsite Dose Criteria for accident releases is dependent upon the frequency of occurrence of the accident. Table 1.2 (replicated from Table 3-1 of ANSI ANS-51.1-1983) shows this relation. In addition to the offsite criteria, Onsite Dose Criteria are established for the public, which have a much higher threshold than for offsite. Once onsite, one assumes a higher risk, and therefore higher doses are allowed. These criteria are also summarized in Table 1.2.

By using the WIPP meteorological data as input to radiological dose models, calculations are made which would provide insight to the expected conditions for normal operations and accident analysis for both onsite workers and offsite public. Therefore, this report is meant to provide the meteorological data in a reduced, coherent format that could be easily input to such models, and to provide access to online sources for electronic format of the data. The report will discuss the overall meteorological conditions, show plots of the data, and discuss results of how meteorological data could affect radiological dose calculations from various models used in modeling WIPP in the past.

Table 1.2 Offsite Radiological Dose Criteria for WIPP

Best-Estimate Frequency of Occurrence (F) Per Year	**Offsite Radiological Dose Criteria**	**Onsite Radiological Dose Criteria**
$10^{-1} > F \geq 10^{-2}$	2.5 rem	5 rem
$10^{-2} > F \geq 10^{-4}$	6.5 rem	25 rem
$10^{-4} > F \geq 10^{-6}$	25 rem	100 rem

2.0 WIPP Meteorology and Data Collection

In September 1996 DOE established well-sited meteorological towers for measuring atmospheric conditions at WIPP. According to the draft ANSI standard, ANSI/ANS-3.11 (ANSI-ANS 1999), a well-sited meteorological tower should be in compliance with the design objectives stated in the standard. The main design objectives of the standard for a meteorological tower includes 1) the measurements of wind speed, wind direction, any combination of methods to calculate wind stability class, and precipitation as a minimum; 2) a redundant or backup data recording system; 3) installed lightning protection to minimize data loss; 4) the tower located at a sufficient distant as to minimize the effects of local topographic obstructions (including buildings, trees, parking lots, etc.); 5) periodic review of the meteorological program; and 6) the data should be reviewed and validated by qualified personnel. This review should include comparisons with the expected ranges of each measured parameter and inter-parameter checks. In addition, the tower's basic meteorological measurement sensors need to operate continuously, meeting accuracy and resolution values stipulated in the standard, and data recovery rates should be at least 90% for all measured parameters.

WIPP has two meteorological towers: a primary Meteorological Station and the WIPP Far Field (secondary meteorological monitoring station) (Westinghouse 1997). Figure 2.1 shows the proximity of the towers to WIPP boundaries. The primary station is located approximately 500 m (1640 ft) to the northeast of the exhaust shaft and houses a 50-meter (164-ft) instrument station. The secondary station is located approximately 1000 m to the northwest of the exhaust shaft and houses a 10-meter (32.8-ft) instrument station.

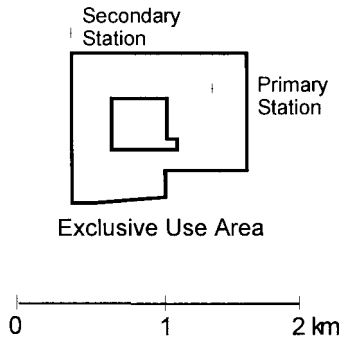

Figure 2.1. Location of WIPP Meteorological Towers.

The meteorological stations are equipped with instruments to measure wind speed, wind direction, air temperature, precipitation, barometric pressure, solar radiation, and relative humidity. These parameters are measured at 2, 10, and 50 m above ground surface at approximately 2.5 second intervals. A 15-minute average is then taken on the 360 data points obtained from the measured data.

Data accuracy is obtained by reviewing expected parameter ranges and performing parameter checks. If a parameter's measurement is outside of the expected range, the data are flagged and reviewed. Some examples of flags that would require additional review are

- Average wind direction is the same at all levels
- Average wind speed is less than threshold speed (0.45 m/s)
- Average wind speed changed by greater than 4 m/s
- Average wind speed is the same at all levels
- Average wind speed at higher level is less than wind speed at lower level
- Average wind speed has not changed in 4 hours

2.1 General Description of Meteorological Conditions at WIPP

The meteorological conditions at WIPP vary from day-to-day and from season-to-season. Prevailing winds are from the southeast (40% of frequency from south-southeast, southeast, and east-southeast). One could expect variable wind speeds with approximately 30.5 cm (12 inches) of precipitation per year. The region is characterized by an arid to semiarid climate, as is most of the southwestern United States. For a review of the paleoclimatic description of the area, consult the WIPP Compliance Certification Application (CCA – DOE 1996) or Swift (1992).

2.2 Wind Speed

The windspeed around the WIPP site generally varies between 0-8 m/s (0-16 knots), averaging approximately 4 m/s (8 knots), and rising as high as 17 m/s (34 knots). Spring is the windiest time in the region, with April and May having the highest wind speeds, whereas summertime brings about calmer winds. Figure 2.2 shows the average and maximum windspeeds for the

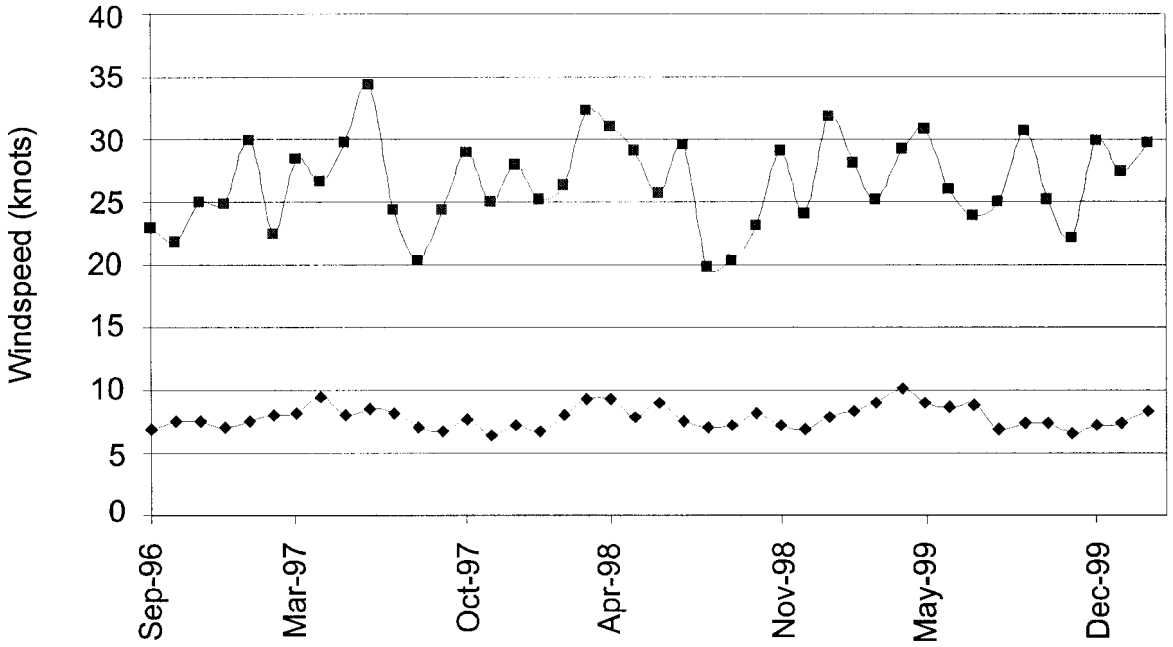

Figure 2.2 Maximum and Average Wind Speed at WIPP for the Period of September 1996 to February 2000.

period of September 1996 to February 2000. The breakdown of month-to-month wind speeds can be found in Appendix A.

Wind speed is important in three regards: dilution of a contaminant plume, which takes place in the direction of the plume transport; the transport time of the plume to the receptor (person or measuring device subjected to plume hazard); and buoyant plume rise – the stronger the wind the lower the plume.

2.3 Air Temperature

The air temperature at WIPP is temperate, rarely dropping below -6.7 °C (20 °F) in the winter months. The maximum air temperature can get quite hot, reaching as high as 48.9 °C (120 °F) in late summer. Figure 2.3 shows the minimum, average, and maximum monthly temperatures at WIPP for the months spanning September 1996 to February 2000. Appendix B lists a daily record of air temperatures.

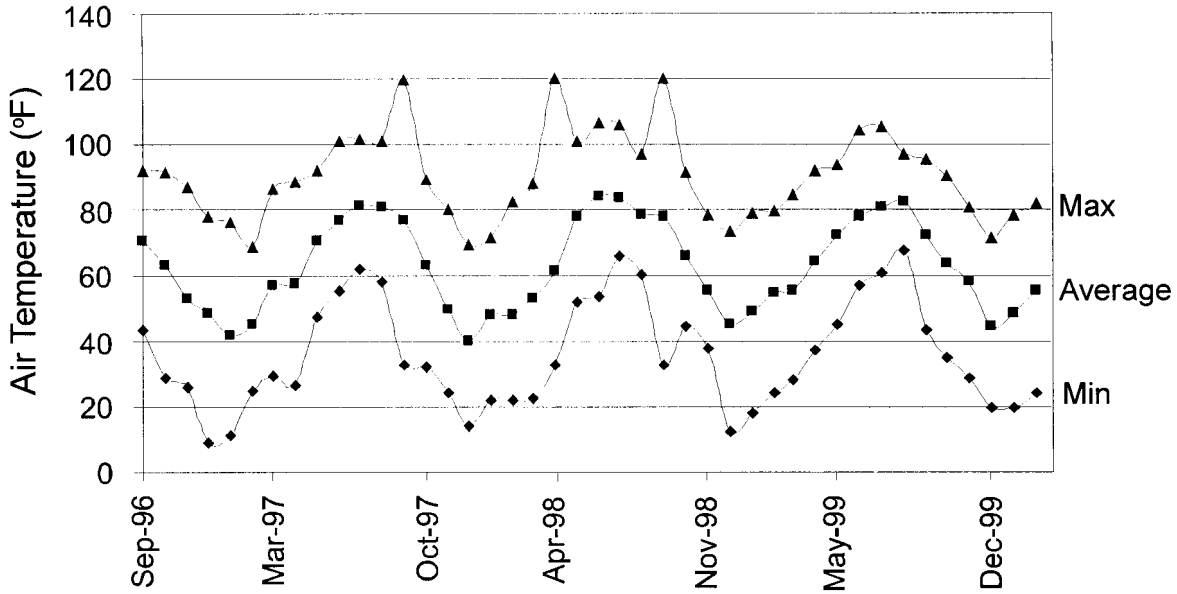

Figure 2.3 Monthly Minimum, Average, and Maximum Air Temperatures at WIPP for the Period of September 1996 to February 2000.

2.4 Wind Stability Class

The wind stability class is a measure of resistance to vertical mixing. The wind stability is usually classified by determining the change in temperature to the change in height (IAEA 1980, EPA 1987). Stability is ranked according to the Pasquill-Gifford Stability Class designation, in which classes range from A to F (DOE) or A to G (NOAA, NRC), with A being unstable (meaning very well mixed, vertically or very turbulent flow) and F and G being the most stable (laminar flow). Usually very stable air produces the most concentrated contamination; pollutants are not able to dilute through mixing and transport.

The designation of stability class is in accord with Table 2.1. A calculation is made, determining the change in temperature per 100 m. For the WIPP classification, the temperature difference was taken at 50 m and 10 m and the conversion is demonstrated in Equation 1.

$$\Delta T/\Delta z = (T_{50} - T_{10})*2.5 \qquad (1)$$

The stability class at WIPP spans the whole spectrum from A to G, but is usually in the extreme portions of stable or unstable, leaning to the more stable classes. Table 2.2 shows the percentage of time that the wind is in each category, and Appendix C shows a month-to-month break down of stability class designations.

Table 2.1 Classification of Atmospheric Stability (NRC 1972)

Stability Classification	**Category**	**$\Delta T/\Delta z$ (^{o}C/100 m)**
Extremely Unstable	A	< -1.9
Moderately Unstable	B	-1.9 to -1.7
Slightly Unstable	C	-1.7 to -1.5
Neutral	D	-1.5 to -0.5
Slightly Stable	E	-0.5 to 1.5
Moderately Stable	F	1.5 to 4.0
Extremely Stable	G	> 4.0

Table 2.2 WIPP Stability Class Designation for September 1996 to February 2000 by Percentage of Time

Stability Class	**Percentage of Time in Each Category**
A	22.11
B	5.26
C	4.88
D	15.68
E	17.89
F	13.50
G	20.67

2.5 Wind Direction

The wind direction is simply the direction from which the wind blows. The wind direction is usually designated into 16 categories, starting from N(orth) and going clockwise to NNE, NE, etc, as seen in Figure 2.4.

The polar plot of Figure 2.4 shows the direction from which direction the wind blows for all data between September 1996 and May 1999. In general the wind is from the southeast and east-southeast at the WIPP site. Appendix D tabulates wind direction on a month-to-month basis.

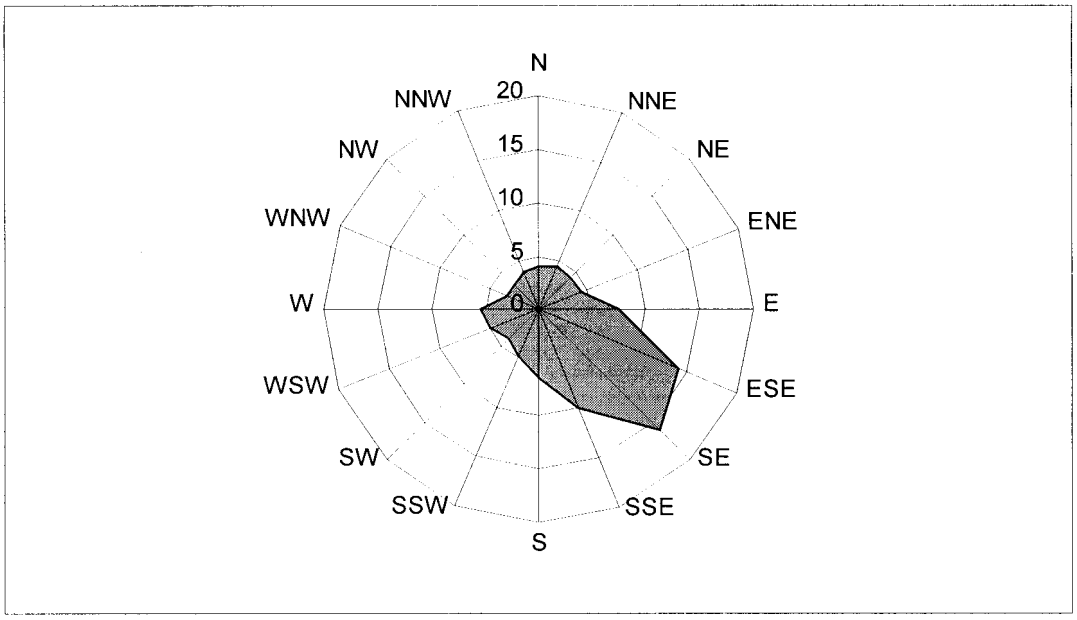

Figure 2.4 Percentage of Wind Direction (from Direction Indicated) for Meteorological Data of September 1996 to February 2000.

2.6 Precipitation

The amount of rainfall at the WIPP site varies significantly from month to month and year to year with 1997 being an extremely wet year at 60.7 cm (23.9 inches) and 1998 being an extremely dry year at 19.5 cm (7.7 inches). The average rainfall is about 25.4-30.5 cm (10-12 inches) per year. Figure 2.5 shows daily precipitation data for the period of September 1996 to February 2000. Appendix E lists the daily precipitation with a running yearly total in inches and millimeters.

2.7 Wind Rose Plots

A common method for displaying meteorological data is the wind rose plot, which summarizes both wind direction and speed by percentages. These are typically done for complete years, so

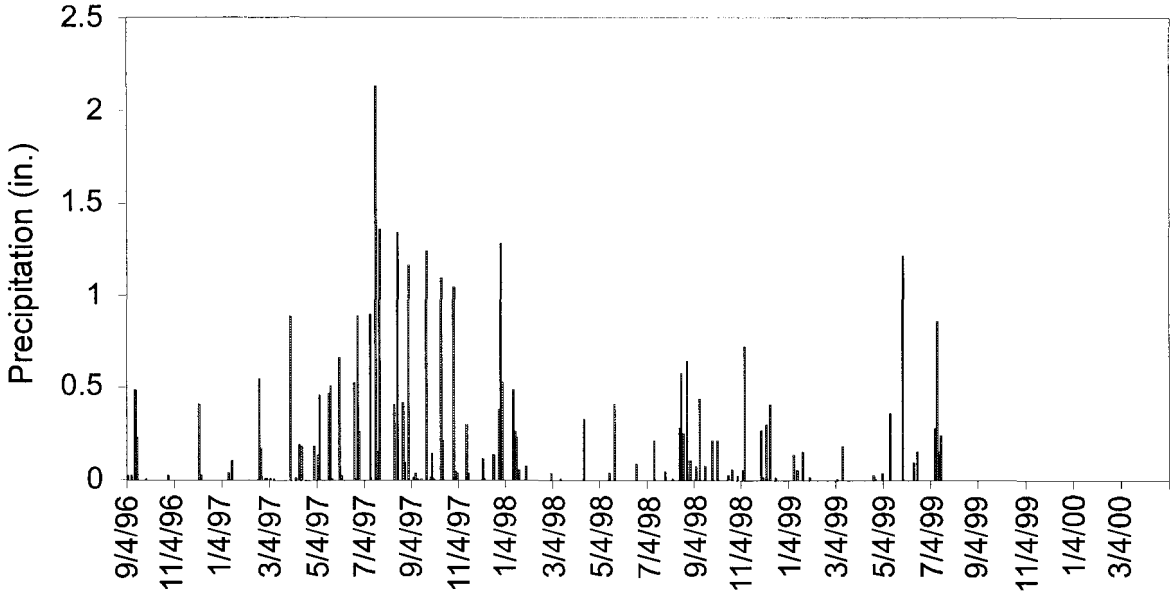

Figure 2.5 Daily Precipitation Record (in Inches) at WIPP from September 1996 to February 2000.

the partial data for 1996 and 2000 cannot be plotted. The plots for 1997, 1998 and 1999 can be seen in Figures 2.6 through 2.8, respectively.

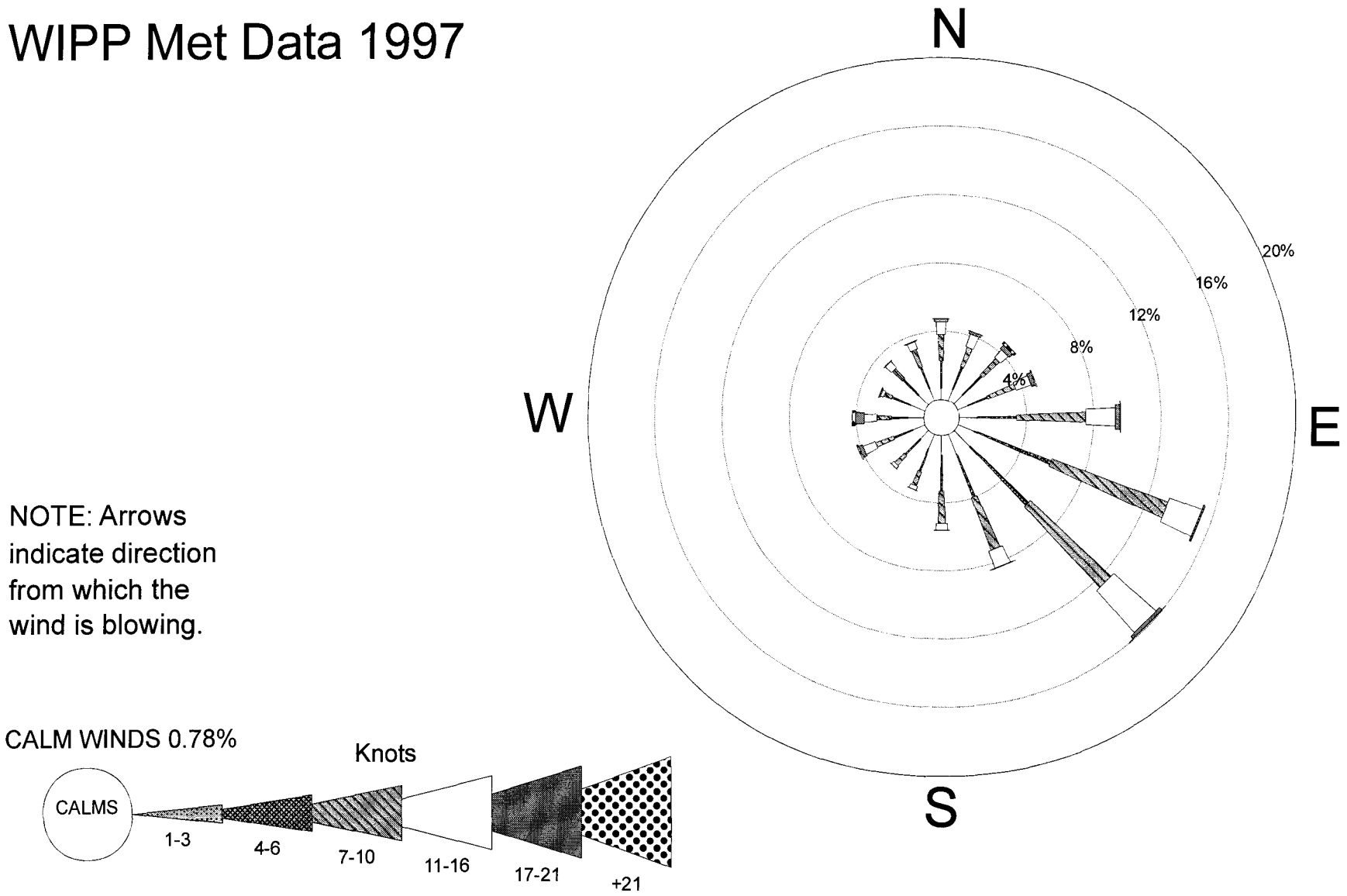

Figure 2.6 Wind Rose Plot for WIPP 1997 Data

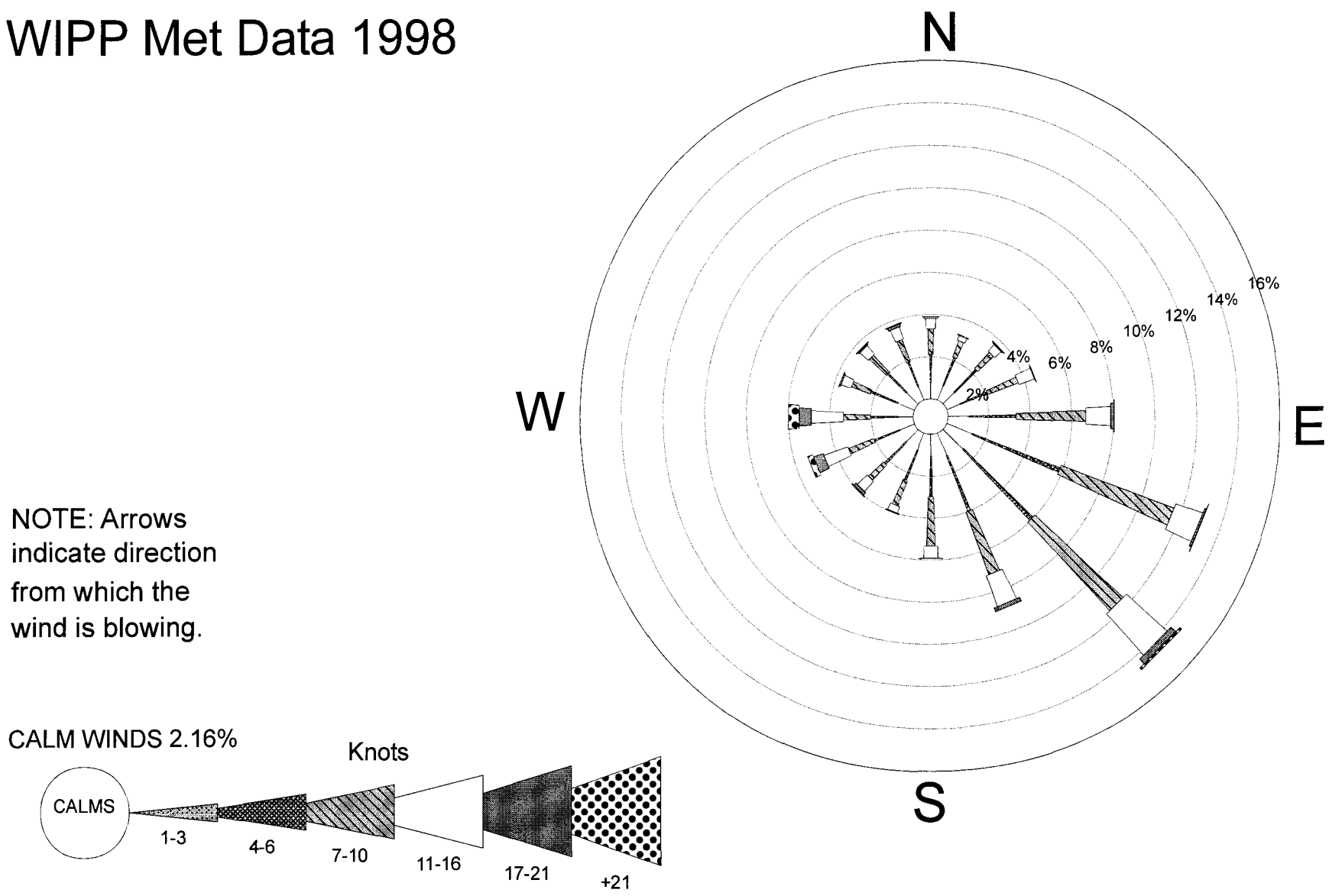

Figure 2.7 Wind Rose Plot for WIPP 1998 Data

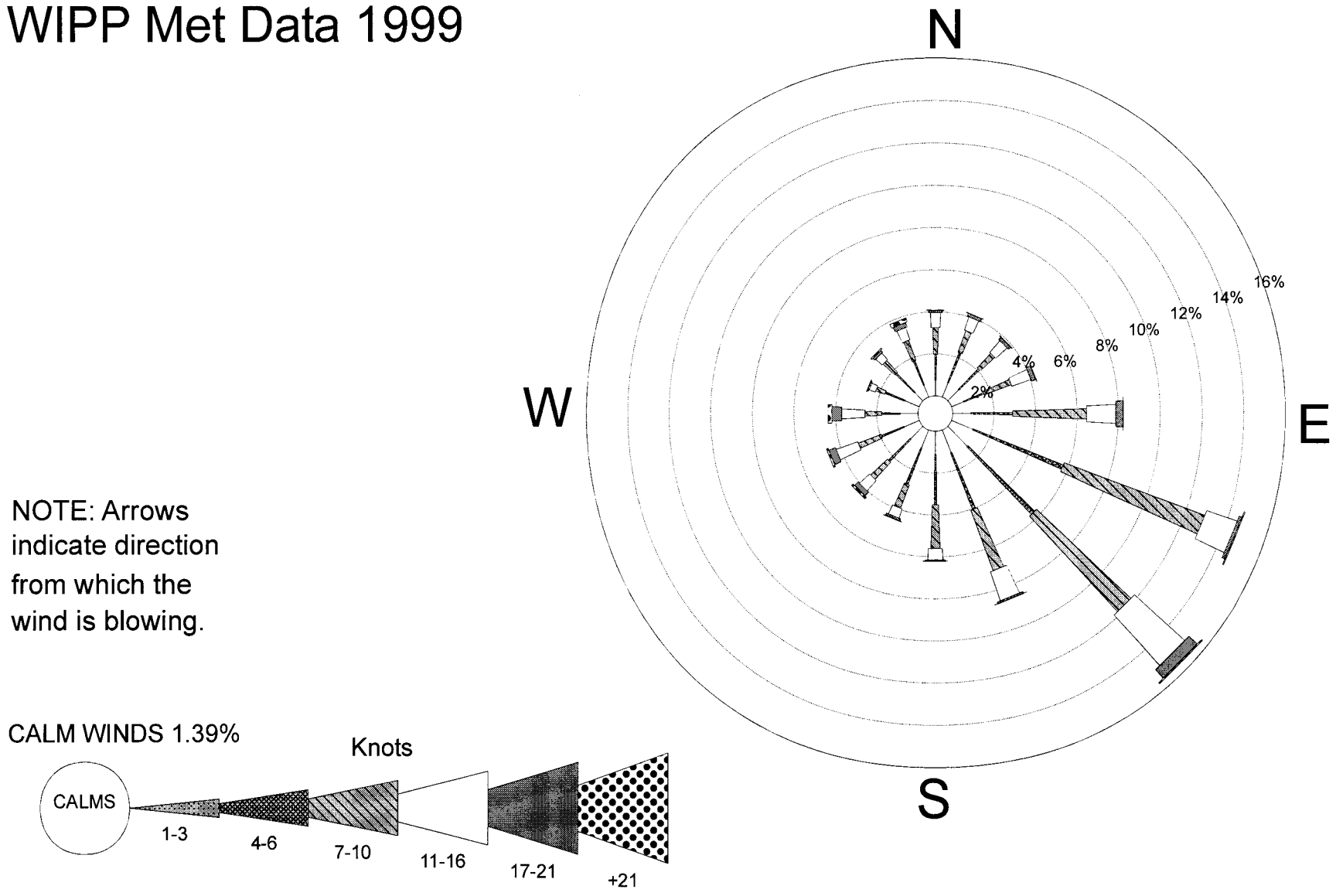

Figure 2.8 Wind Rose Plot for WIPP 1999 Data

3.0 Air Dispersion Calculations Using WIPP Meteorological Data

The most significant use of WIPP meteorological data, other than establishing ambient conditions, is modeling a plume release from the exhaust shaft during an underground accident and release of aerosolized radioactive particles. The models used in estimating the concentration of a contaminant at a given point typically employ the Gaussian straight-line continuous plume transport equation for air dispersion. The equation assumes the site-specific, relative concentration factor (χ/Q) in [T/L^3],

$$\frac{\chi}{Q} = \frac{f(y)\,g(z)}{2\pi\sigma_y\sigma_z u} \tag{2}$$

where u is the wind speed [L/T], σ_y is the lateral dispersion factor [L], σ_z is the vertical dispersion factor [L], and f(y) and g(z) are horizontal and vertical correction factors, respectively, and the equation is governed by the wind speed, wind stability class, and stack height exclusively. f(y) and g(z) are represented by

$$f(y) = \exp\left[-\frac{1}{2}\left(\frac{y}{\sigma_y}\right)^2\right] \tag{3}$$

$$g(z) = \exp\left[-\frac{1}{2}\left(\frac{h_e - z}{\sigma_z}\right)^2\right] \tag{4}$$

where h_e is the effective plume height. The effective plume height is equal to the stack height, h_s, plus any change in height, Δh, due either to plume rise, stack downwash or gravitational settling. Figure 3.1 graphically represents the model of Gaussian plume dispersion.

The Gaussian nature of the plume spread in either lateral or vertical direction is represented by a dispersion factor, σ. This dispersion factor accounts for plume spread by mechanical and/or chemical mixing from empirical fitting formulae based on Pasquill-Gifford-Turner curves (Hey 1994). The curves for dispersion factors σ_y and σ_z can be found in Appendix G and are represented by the equations below.

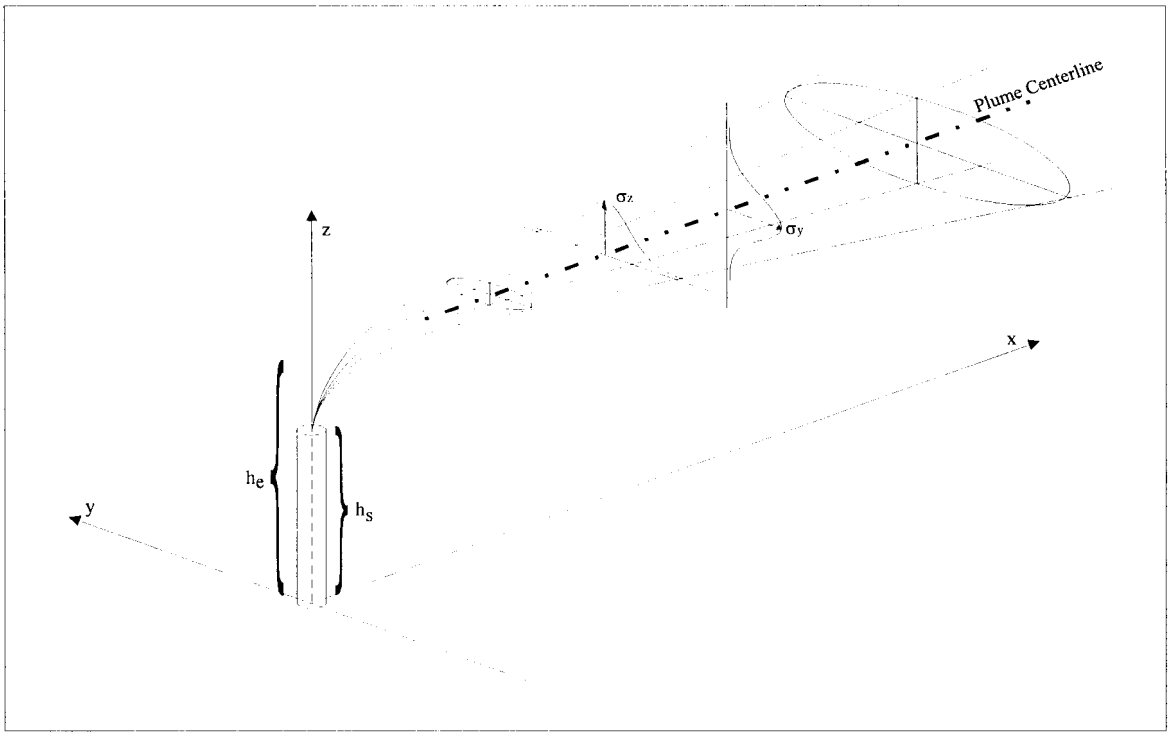

Figure 3.1 Gaussian Plume Dispersion Model

$$\sigma_y = A_y x^{0.9031} \tag{5}$$

$$\sigma_z = A_z x^{B_z} + C_z \tag{6}$$

where A,B,C are fitting coefficients and x is the downwind distance. The fitting coefficients are given in Table 3.1 for three distances: less than 100 m, 100 to 1000 m, and greater than 1000 m.

Table 3.1 Fitting Coefficients for Dispersion Factors

Stability Class	A_y	A_z			B_z			C_z		
		<100	100 to 1000 m	>1000m	<100m	100 to 1000 m	>1000m	<100m	100 to 1000 m	>1000m
A	0.3658	0.192	0.00066	0.00024	0.936	1.941	2.094	0	9.27	-9.6
B	0.2751	0.156	0.0382	0.055	0.922	1.149	1.098	0	3.3	2
C	0.2089	0.116	0.113	0.133	0.905	0.911	0.911	0	0	0
D	0.1471	0.079	0.222	1.26	0.881	0.725	0.516	0	-1.7	-13
E	0.1046	0.063	0.211	6.73	0.871	0.678	0.305	0	-1.3	-34
F	0.0722	0.053	0.086	18.05	0.814	0.74	0.18	0	-0.35	-48.6
G	0.0481	0.032	0.052	10.83	0.814	0.74	0.18	0	-0.21	-29.2

Several numerical codes use these equations or similar equations (which may account for building wake effects, plume meander, etc.) to compute the concentration of a contaminant to a receptor downwind from the release point. Many of these were developed to compare releases to various regulatory compliance standards established by the EPA or the Nuclear Regulatory Commission (NRC). Several codes were identified as being pertinent to WIPP releases and are presented in the sections below. Using the assumptions of release mechanisms found in the SAR (DOE 1999), calculations can be made to show compliance (or noncompliance) with 40 CFR 61 (National Emission Standards for Hazardous Air Pollutants – NESHAPS) and 40 CFR 191 Subpart A.

3.1 CAP88PC

To assess compliance with 40 CFR 61, the EPA uses an approved code called CAP88PC (which stands for Clean Air Act Assessment Package – 1988 located at www.epa.gov/rpdweb00/assessment/cap88.html) to model chronic releases of radioactivity from a release stack based on the Gaussian plume model. The code can be used to model both collective populations or maximally-exposed individuals (MEI) for a wide range of radionuclide and meteorological data. CAP88PC is only applicable to chronic exposure (Parks 1992).

CAPP88PC uses a standardized STAR format for meteorological data input. The STAR format is a frequency table, dividing windspeeds and wind directions for all atmospheric stability classes, as shown in Table 3.2. The STAR format for 1997, 1998, and 1999 for WIPP Meteorological Data can be found in Appendix F.

CAPP88PC is extremely simple to use, with dialog for input of data being straightforward. The grid can also be discretized as fine or course as needed. A relatively fine grid was used for WIPP calculations for plotting purposes.

The model was run to estimate the dose to a MEI at various distances from a ground release. The source was ^{239}Pu (all radioactive sources were normalized to ^{239}Pu, called a PE-Ci. The PE-Ci is derived by comparing the 50-year effective whole-body dose commitment due to inhalation

Table 3.2 STAR Format Example

Wind Direction	Stability Class			Wind Speed (knots) at 10 m Level			
		1-3	4-6	7-10	11-16	17-21	>21
N	A						
NNE	A						
NE	A						
ENE	A						
E	A						
ESE	A						
SE	A						
SSE	A						
S	A						
SSW	A						
SW	A						
WSW	A						
W	A						
WNW	A						
NW	A						
NNW	A						

of various radionuclides to that of ^{239}Pu), and the meteorological data used in the modeling were from 1997 through 1999. The results are shown in Figure 3.2 through 3.4. The figure also shows various property boundaries around WIPP for perspective, with the Exclusive Use Boundary Area used in regulatory compliance. The 'x' is the release point.

The code simulated a source of 15 mCi/yr and 16 mCi/yr for the meteorological data years of 1997 and 1998, respectively. The modeling philosophy was a trial-and-error approach to backtrack the 10 mrem/yr dose to a MEI at the Exclusive Use Boundary, which occurred at the southeastern corner of the site. This is the level established by NESHAPS for compliance of chronic release. 15 mCi/yr is a relatively high source release. It is unlikely that routine releases from normal operating procedures will exceed this value.

The most striking feature of the plume is its orientation. The wind direction is primarily from the southeast, spreading the plume to the northwest across the site. Since the exhaust stack is located in the southeast, the whole site can expect fumigation from the exhaust release. However, for higher releases the location minimizes the dose to the public outside of the Exclusive Use Boundary.

Further analysis with CAP88PC, by testing the sensitivity to certain parameters, reveals that the exhaust stack configuration is the most sensitive parameter. The non-vertical stack at WIPP,

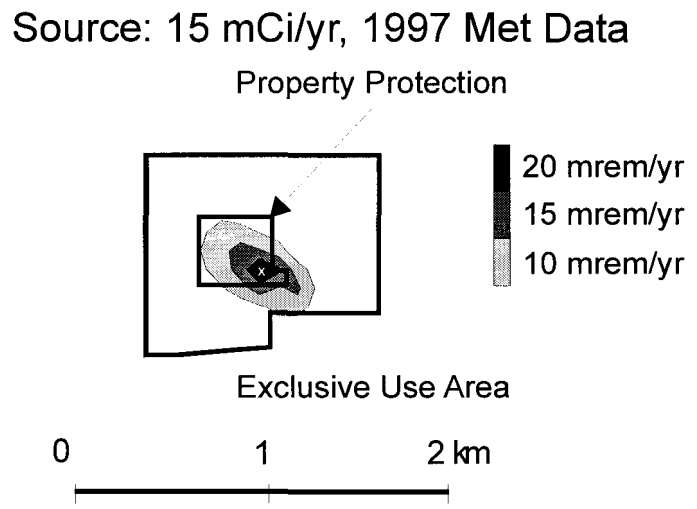

Figure 3.2 CAP88PC Plume Using 1997 WIPP Meteorological Data.

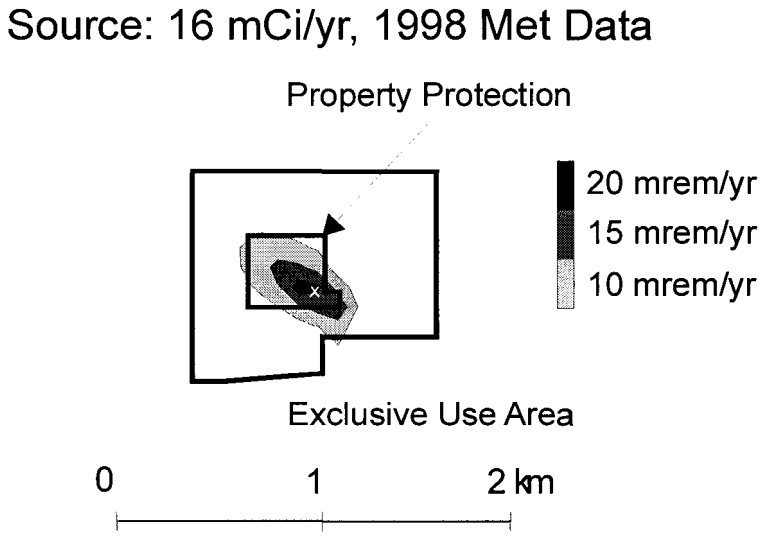

Figure 3.3 CAP88PC Plume Using 1998 WIPP Meteorological Data.

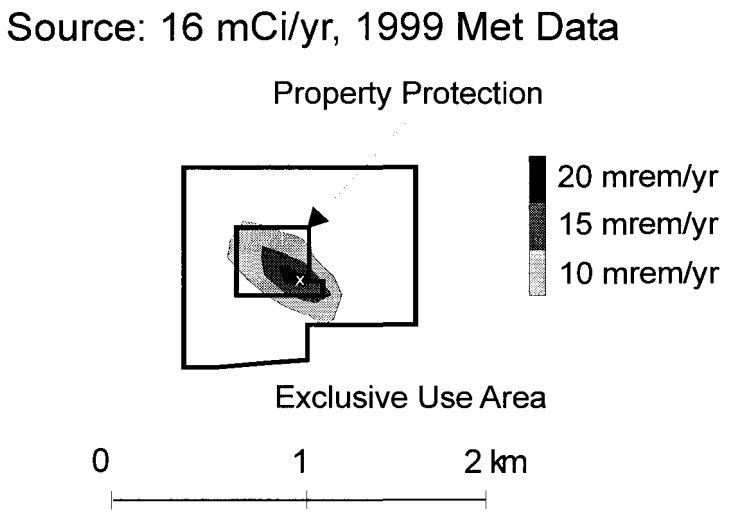

Figure 3.4 CAP88PC Plume Using 1999 WIPP Meteorological Data

configured at a 45° angle with the opening of the stack facing the site, presents an interesting problem. The momentum of the contaminant plume causes it to stay horizontal near the surface, and not disperse into the upper atmosphere. By changing the configuration to a vertical stack of the same height, the rising momentum of the plume pushes it upwards and disperses it effectively, and reducing on-site doses. Using the same assumptions that were used in the above example for Figure 3.2, the maximum dose to the MEI was less than 3 mrem/yr, at 100 m from the source and outward. Bartlett (1993) recommended that a new exhaust stack at WIPP should be modified from its original configuration to that of a vertical configuration. In 1996 another slanted stack was constructed, despite the recommendation.

3.2 SAR Dispersion Calculation

The dispersion calculations conducted in the SAR for nonroutine, accident release scenarios followed the format suggested in Nuclear Regulatory Guide (NRG) 1.145 "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants," Revision 1, November 1982 (NRC 1982). The guide suggests a site-specific relative concentration (χ/Q) be determined based on atmospheric conditions of the site. For neutral (D)

or stable (E, F, or G) atmospheric stability conditions for windspeeds less than 6 m/s (3.1 knots) the χ/Q value should follow the procedure described below.

$$\chi / Q = \frac{1}{\overline{U_{10}}(\pi\sigma_y\sigma_z + A/2)} \tag{7}$$

$$\chi / Q = \frac{1}{\overline{U_{10}}(3\pi\sigma_y\sigma_z)} \tag{8}$$

$$\chi / Q = \frac{1}{\overline{U_{10}}(\pi\Sigma_y\sigma_z)} \tag{9}$$

where,

χ/Q = relative concentration (s/m^3)

U_{10} = windspeed (m/s) at 10 m above surface

σ_y = lateral plume spread (m), a function of atmospheric stability and distance

σ_z = vertical plume spread (m), a function of atmospheric stability and distance

Σ_y = lateral plume spread with meander and building wake effects (m), a function of atmospheric stability and distance. For 800 m and less: $\Sigma_y = M\sigma_y$, where M is a correction factor determined from a lookup chart. For greater than 800 m: $\Sigma_y = (M\text{-}1)\sigma_{y800m} + \sigma_y$.

A = vertical plane cross-sectional area of release vent (m^2).

χ/Q should be calculated using all three equations. The values from Equation 7 should be compared to Equation 8, and the largest value selected. The result is then compared to Equation 9 and the smallest value selected. σ_y and σ_z are computed based on lookup charts in NRG 1.145 and are reproduced in Appendix G along with the lookup chart for M. For all other stability classes (A, B, and C) and windspeeds, the maximum χ/Q from Equation 7 and Equation 8 should be used.

The SAR reported a χ/Q value of 5.11×10^{-3} at 100 m for conditions of stability class F, windspeed =1.5m/s, σ_y = 4.62 m, σ_z = 2.25 m, M = 4 m, and A=117 m^2. The SAR stated,

> Consistent with DOE-STD-3009-94 and its draft appendix, the values for atmospheric conditions: Stability F, 4.9 ft/s (1.5 m/s) (wind speed and stability are assumed to remain constant in the direction of the receptor), were chosen due to the lack of reliable recorded WIPP specific meteorology data. Future SAR annual updates will include this analysis when data becomes available.

Hence, given the lack of reliable data, the SAR arbitrarily assumes Stability Class F.

It should be noted, however, that meteorological data at WIPP are reliable, and a new χ/Q should be determined based on these data. Figure 3.5a and 3.5b demonstrates how the reduced, onsite meteorological data would appear on a probability of exceedance graph, also known as a risk curve. The data was parsed into each stability class and ranked according to windspeed. Figure 3.5a shows the probability of exceedance for the windspeeds for the three stability classes of most interest: D, F, and G. To use the graph, find the desired probability level on the ordinate axis. Draw a horizontal line to the stability class of interest. Where these two lines intersect, draw a vertical line to the abscissa. The windspeed value on the abscissa will indicate that there is the chosen probability chance that the windspeed will be above this value. As an example, a line is drawn to the stability class D at the 75% probability of exceedance level. The windspeed corresponding to this probability is 2.42 m/s. Hence, there is a 75% probability that the recorded windspeed for stability class D is greater than 2.42 m/s.

Similarly, the χ/Q graph of Figure 3.5b can be used to determine the probability of exceedance of various air dispersion values. The χ/Q was calculated at 100 m from the source. Using the same technique described above, a 75% probability for stability class D indicates a log χ/Q of -3.07, or a 75% chance that the χ/Q is 8.51×10^{-4} s/m^3 or greater. A 75% χ/Q is obtained

from the 25% windspeed category due to the inverse relationship between windspeed and χ/Q. Table 3.3 lists the 50%, 75%, and 95% windspeed values for stability classes D, F, and G along with their corresponding 1-probability (complementary) χ/Q values.

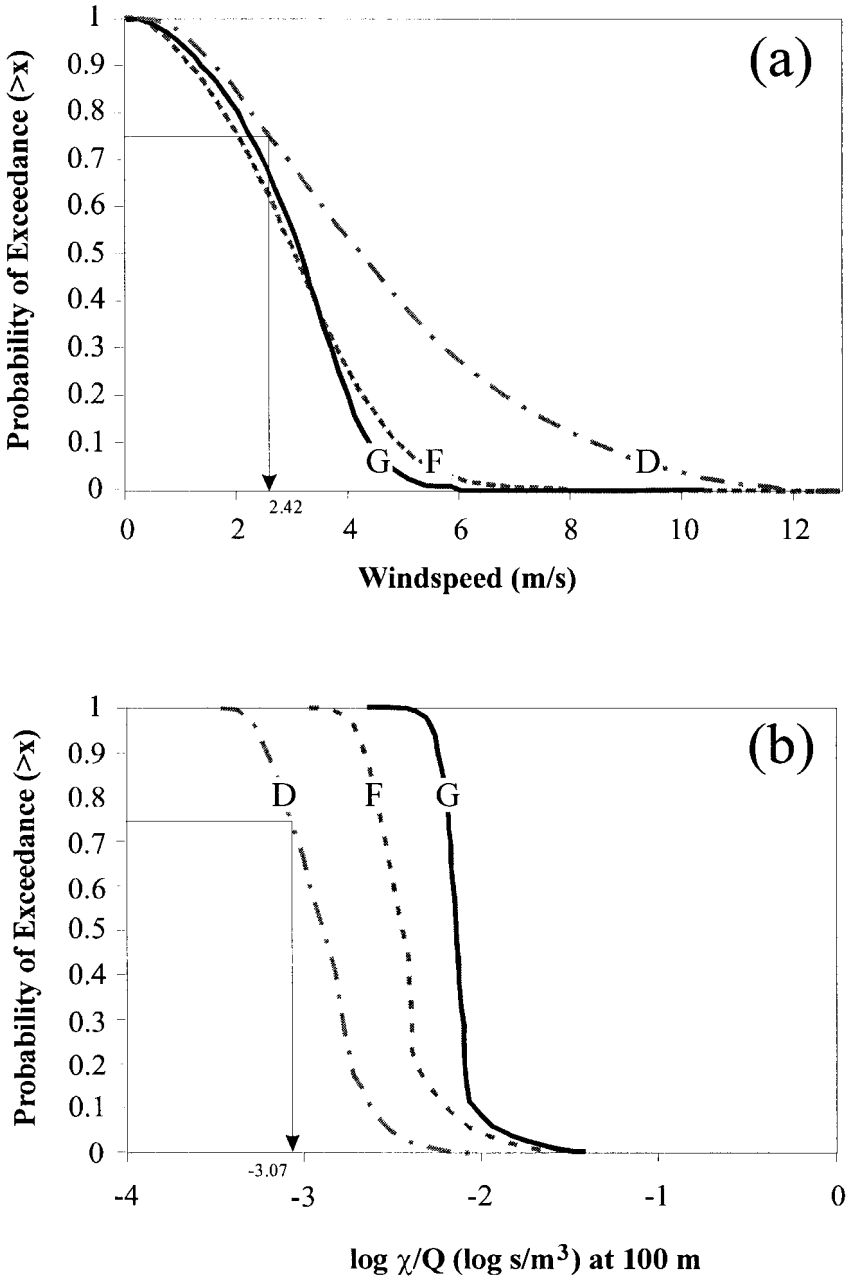

Figure 3.5. Probability of exceedance curves for a) windspeed and b) χ/Q at 100 m for the time period of September 1996 to February 2000.

Table 3.3 Windspeed and χ/Q Values at 100 m from Source from Figure 3.5a and 3.5b

Stability Class	**Probability of Exceedance (%)**	**Windspeed (m/s)**	**χ/Q (s/m^3)x10^3 (1-probability in percent)**
D	50	4.07	1.27 (50%)
D	75	2.42	1.72 (25%)
D	95	1.17	3.15 (5%)
F	50	2.05	3.60 (50%)
F	75	3.06	4.07 (25%)
F	95	0.83	9.18 (5%)
G	50	3.17	7.17 (50%)
G	75	2.27	7.85 (25%)
G	95	1.00	12.5 (5%)

In addition to the above regulations and standards, the DOE G 151-1.1 (DOE 1997b) for Hazards Surveys and Hazards Assessments suggests that two sets of dispersion calculations be conducted: 1) a 95 percent worst case scenario, which would include Stability Class F and wind speed of 1 m/s if such conditions have not been assessed for the site, and 2) a typical scenario, which would include Stability Class D and wind speed of 4.5 m/s if a typical condition has not been assessed for the site.

Since qualified meteorological data have been gathered for the WIPP site, it is suggested that for the worst case scenario, Stability Class G with wind speed of 1.00 m/s be used. However, EEG recognizes that the DOE does not use Stability Class G, and that Stability Class F is the most stable wind class considered. In this case, the 95% worst case windspeed for Stability Class F is 0.813 m/s, as shown in Table 3.3. The χ/Q for the 95% worst case is 9.18×10^{-3} s/m^3. For the typical case described in DOE G 151-1.1, it is unclear which probability level should be used. Due to safety considerations by taking a risk-adverse perspective, typical meteorological conditions could be represented by the 75% probability of exceedance for Stability Class D. The χ/Q for this probability level is 1.72×10^{-3} s/m^3.

The guidance document DOE G 151-1.1 is used to help facilitate DOE Order 151-1.1 (DOE 1995) for emergency preparedness, planning, readiness assurance, response, and recovery

actions. Emergency preparedness guidelines state that a radioactive dose should be less than the Protective Action Guidance (PAG) at 30 m or beyond. The PAG limit is 5 rem.

As an example of where actual meteorological data may change procedures for emergency preparedness, an unmitigated (without invoking HEPA filtration) underground drum drop (scenario CH9 in the SAR) CEDE dose would be changed from 3.8 rem to 5.2 rem for a 95% worst case by using meteorological data of Table 3.3. The dose value of 3.8 rem is from the *WIPP Emergency Management Program*, WP-12, Rev. 13, Appendix 3, Table 6.3 (Westinghouse 1999). The dose was calculated at 100 m from the exhaust shaft. In this example, emergency preparedness procedures would have to be in place.

3.3 Hanford's GXQ Model

GXQ v. 4.0 (Hey 1994) is a Gaussian straight-line model for both instantaneous and continuous release mechanisms for calculating the atmospheric dispersion from site specific meteorological data. GXQ can model plume meander, building wake effects, plume depletion, gravitational settling, and plume rise. The code was developed specifically for radiological releases at Hanford, but can be adapted to any site.

GXQ employs many different types of models to calculate the various aspects of plume transport. For example, two models are available to account for building wake effects: 1) NRC Regulatory Guide 1.145 model (as described above) and 2) MACCS (MELCOR Accident Consequence Code System) model (Hey 1994). The user has the option of choosing no wake effect, or from one of the two models listed. Plume meander is another example of multiple models used in assessing χ/Q, in which any one of three models can be chosen.

Meteorological data input is through a joint frequency distribution, and is set up similarly to the STAR format in Table 3.2. The joint frequency distribution allows for more flexible categories of wind speed and wind stability classes than the STAR format. GXQ also has the option of modeling in a single sector (wind direction), all sectors, or an average of all sectors combined. The NRC Regulatory Guide 1.145 stipulates that an average χ/Q for all sectors

should be used in assessing the site's 5% overall χ/Q. The 5% overall χ/Q refers to the χ/Q that is exceeded no more than 5% of the time (for the data set), and is determined by constructing a cumulative probability distribution function (CDF) by plotting the χ/Q versus probability of being exceeded. This is a built-in procedure for GXQ.

The WIPP Safety Analysis Team will be using GXQ in the future to determine the air dispersion coefficients for the SAR, and a draft report documenting their procedures with the code has been issued (Faulk 2000). The purpose of this exercise with GXQ, therefore, will be to verify the reproducibility of the joint frequency table and χ/Q used by the WIPP Safety Analysis Team, and to show the sensitivity of the model by using more stable wind class assumptions and by varying other key parameters. As mentioned above, DOE uses Stability Class F as the most stable wind class.

The joint frequency table from Faulk (2000) used 16 wind directions, 6 stability classes (A through F), and 8 wind speed categories (in m/s): 0-0.45, 0.45-1, 1-3, 3-6, 6-8, 8-10, 10-13, 13-greater. The raw meteorological data for the table in Faulk (2000) spanned from September 1, 1996 to October 25, 1999. Appendix H shows the joint frequency table created by EEG for confirmatory modeling. Appendix H also lists the input file used for running GXQ with the important parameters replicated in Table 3.4.

Table 3.4 Listing of Input Parameters for GXQ

Variable	**Confirmatory**	**Case 1**	**Case 2**	**Case 3**
Stability Classes	A-F	A-G	A-G	A-G
Data Range	9/96 - 10/99	9/96-2/00	9/96-2/00	9/96-2/00
Release Height (m)	0	0	0	0
Initial Plume Width (m)	27	27	27	27
Initial Plume Height (m)	7	7	7	7
Initial Plume Flow Rate (m^3/s)	1	1	125	1
Distance to Source (m)	100	100	100	1000
χ/Q (s/m^3) at 5% Exceedance	4.53×10^{-3}	1.27×10^{-2}	1.27×10^{-2}	2.61×10^{-4}

Table 3.4 shows that for the confirmatory modeling case, the χ/Q value of 4.53×10^{-3} s/m^3 is the same as presented in Faulk (2000). In addition, three other cases were run testing the sensitivity to increased wind stability (less mixing), plume flow rate, and the distance from the source to the receptor. These cases are also shown in Table 3.4.

The first case (Case 1) was modified from the confirmatory case by restructuring the joint frequency table to include Stability Class G and a few additional months of data. The ratio of χ/Q from Case 1 to the confirmatory is about 2.8, which is not a very large difference considering the great uncertainty in estimating the meteorological conditions at WIPP during an actual accident. The value of χ/Q from GXQ for Case 1 (12.7×10^{-3}) also compares very well with the 95% probability (5% exceedance) for Stability Class G of Table 3.3 (12.5×10^{-3}). The difference between the two are negligible. However, the χ/Q difference between the confirmatory case (4.53×10^{-3}) and 95% probability for Stability Class F of Table 3.3 (9.8×10^{-3}) is a factor of 2. This discrepancy is due to the χ/Q ranking of all stability classes in GXQ versus ranking of a single stability class in Table 3.3.

Case 2 was derived by considering the plume's exit flow rate as represented in the confirmatory case. Realistically, the plume will be exiting the exhaust shaft at a much higher rate than 1 m^3/s, given that the yearly average of underground mine ventilation must maintain a rate of 125 m^3/s (265,000 cfm). Case 1 was modified to test this parameter, and the results show that the code is insensitive to changes in plume exit flow rate. Table 3.4 shows the χ/Q value between Case 1 and Case 2 did not change.

Case 3 tested the sensitivity of the location of the receptor by changing the longitudinal distance between the source and the receptor. The distance was increased to 1000 m and the results show that the χ/Q value decreases by a factor of approximately 50.

As an added convenience of running GXQ, an option of creating a cumulative distribution function (CDF) of χ/Q can be turned on in the input file. The CDF, similar to the probability

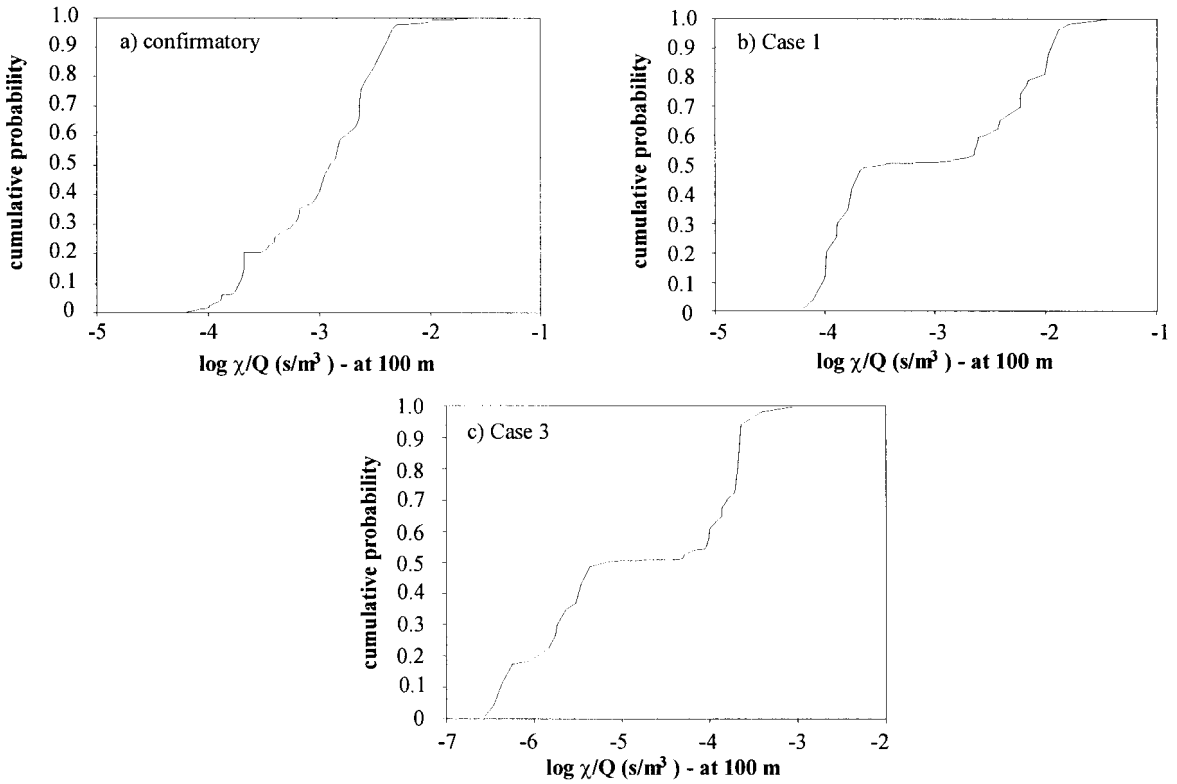

Figure 3.6. Cumulative distribution functions derived from GXQ for a) the confirmatory case, b) Case 1, and c) Case 3.

of exceedance curve of Figure 3.5, shows the probability of χ/Q being less than the value indicated on the abscissa. The probability of exceedance is actually a complementary cumulative distribution, or 1-CDF. The CDF for the four cases of Table 3.4 can be seen in Figure 3.6a through 3.6c, with Case 1 and Case 2 having an identical CDF.

3.4 Air Dispersion Modeling in the WIPP RCRA Application

For the RCRA Subpart B application (DOE 1997a), the DOE calculated the air dispersion factor (ADF) for releases of hazardous waste in risk calculations. The air dispersion factor, which is similar to χ/Q, was calculated using the EPA's Industrial Source Complex – Long Term Dispersion Model or ISCLT3 (EPA 1995). The code actually calculates the

concentration of the source at discrete locations, but values can be normalized to the source term to calculate the ADF by

$$ADF = C/C_o \quad (6)$$

where,

C is the ISCLT3 calculated concentration at discrete nodes

C_o is the source concentration

The EPA has specific requirements related to the ISCLT3 model calculations, and should include

1) estimate annual average concentrations using ISCLT3
2) use five years of preferable on-site meteorological data, evaluate one year at a time, and use the run that produces the maximum boundary conditions
3) include receptor up to 100 meters beyond the unit boundary to verify that the maximum concentration occurs at the boundary
4) include a fine resolution grid in the maximum concentration area
5) use Cartesian grid
6) correct for the vertical wind profile if the source is at ground level
7) specify receptor heights at 1.5 m

A receptor is a person receiving the inhalation hazard.

For the WIPP site calculations conducted for the RCRA permit, no EPA approved meteorological data existed, despite the onsite meteorological monitoring program. Approval is determined by completeness of the monitoring, which must be at least 90%, and various other objectives which are stated in ANSI/ANS-2.5-1984 "Standard for Determining Meteorological Information at Nuclear Power Sites"(ANSI-ANS 1984). The most complete

data set for the site was for year 1993 with 70% coverage, with other years only having approximately 50% coverage. As discussed in Chapter 2, the meteorological data did not have the benefit of a well sited meteorological tower until September 1996. The RCRA Subpart B (Revision 6) application was submitted in 1996. The gap was largely filled using climatic data from the city of Carlsbad for years 1990-1994.

Since three complete years of WIPP meteorological data does fall under EPA approval guidelines, the ISCLT3 model was rerun to include the data from the WIPP site for the later years and compared to the model submitted in the RCRA application. The model used the same input parameters as discussed in Appendix D-10 of the application, with the exception of gridding coordinate discretization and of course meteorological data.

The RCRA application used four points to assess the risk to the public from a hazardous waste release. For comparison with the present model, only two points will be used – the WIPP Site Boundary and the WIPP Property Protection Boundary. A third point, the maximum ADF, was also included for interest. The two additional points presented in the RCRA application– Livingston Ridge Allotment and Antelope Ridge Allotment – were not evaluated.

The results of the new modeling effort can be seen in Figures 3.7 through 3.10. Figure 3.7 is the outcome from course receptor grid with 1997 meteorological data showing the complete WIPP Site Boundary and various other boundaries for perspective. This run used a 400m x 400m grid. Figure 3.8 shows a fine-scaled grid of 25m x 25m, for the 1997 data. The onsite building schematic is used as an overlay for perspective. Figures 3.9 and 3.10 show the 1998 meteorological data for the course and fine discretization, respectively. Meteorological data for 1999 can be modeled in the same manner.

The heart of the modeling presented in Figures 3.7 through 3.10 was to compare the results at specific locations to that in the RCRA application. Table 3.5 lists the results from both efforts. In general, the two sets of model calculations produce the same results at the WIPP Site

Boundary. Appendix I shows the contoured results from the RCRA application for comparison.

The Property Protection Boundary shows a larger deviation in values. Use of the 1998 meteorological data results in a five-fold increase in the ADF. The 1997 data yields an ADF three times greater. The differences are similar for the maximum ADFs.

Table 3.5 ADFs at WIPP Site Locations

Model	**WIPP Site Boundary**	**WIPP Property Protection Boundary**	**Maximum ADF**
RCRA Application	1.2×10^{-4}	4×10^{-3}	1.2×10^{-2}
New - 1997 Data	1×10^{-4}	1×10^{-2}	5.2×10^{-2}
New - 1998 Data	1×10^{-4}	2×10^{-2}	4.3×10^{-2}

The results from modeling the ADF with new onsite meteorological data from 1997 and 1998 show that the new data are more conservative. However, the EPA's acceptable risk is several orders of magnitude greater than the calculated risk from the RCRA permit. Even with a 3- to 5-fold increase in the air dispersion factor, the facility remains in compliance with the permit.

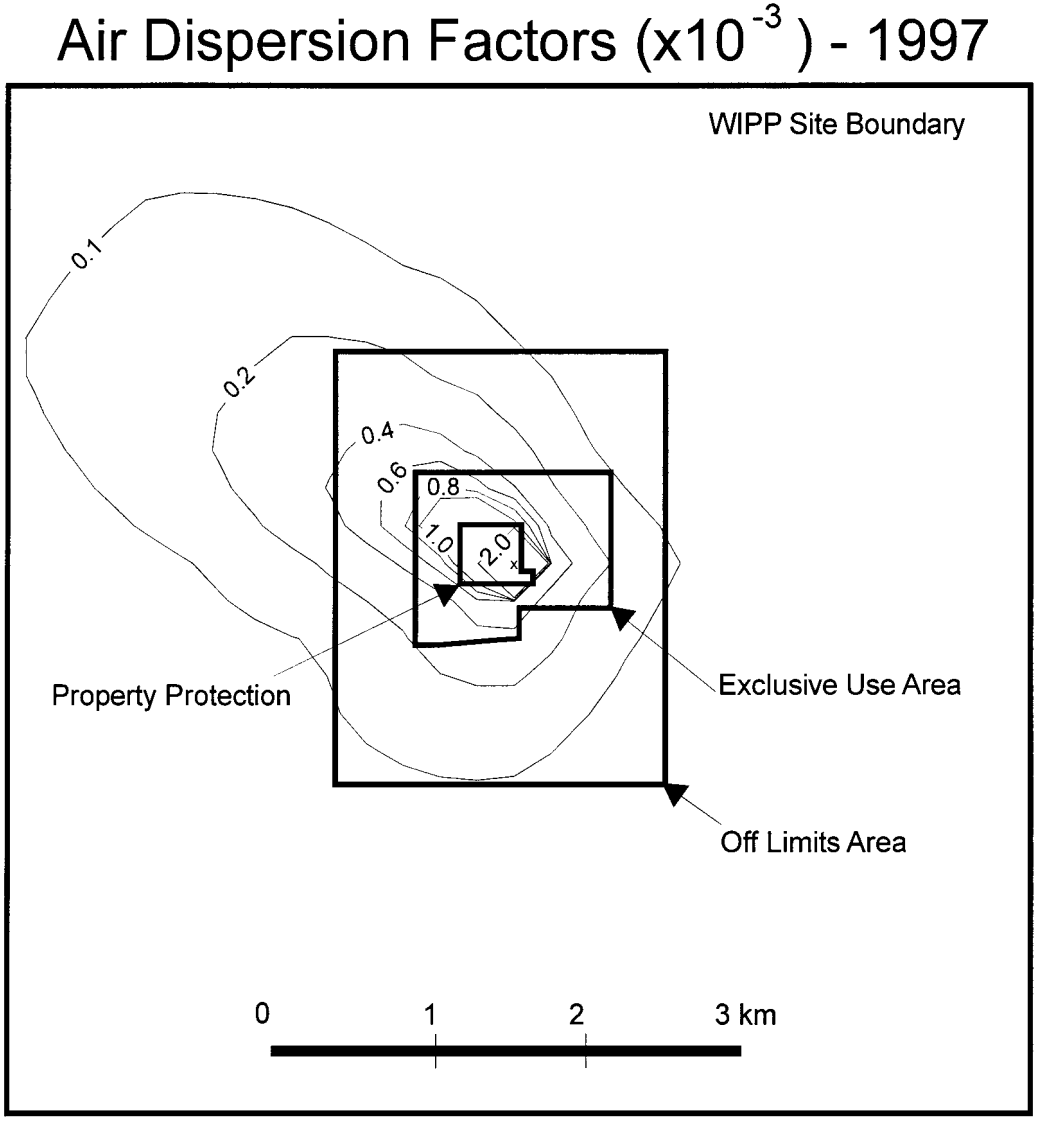

Figure 3.7 ADFs for 1997 WIPP Meteorological Data, Course Grid

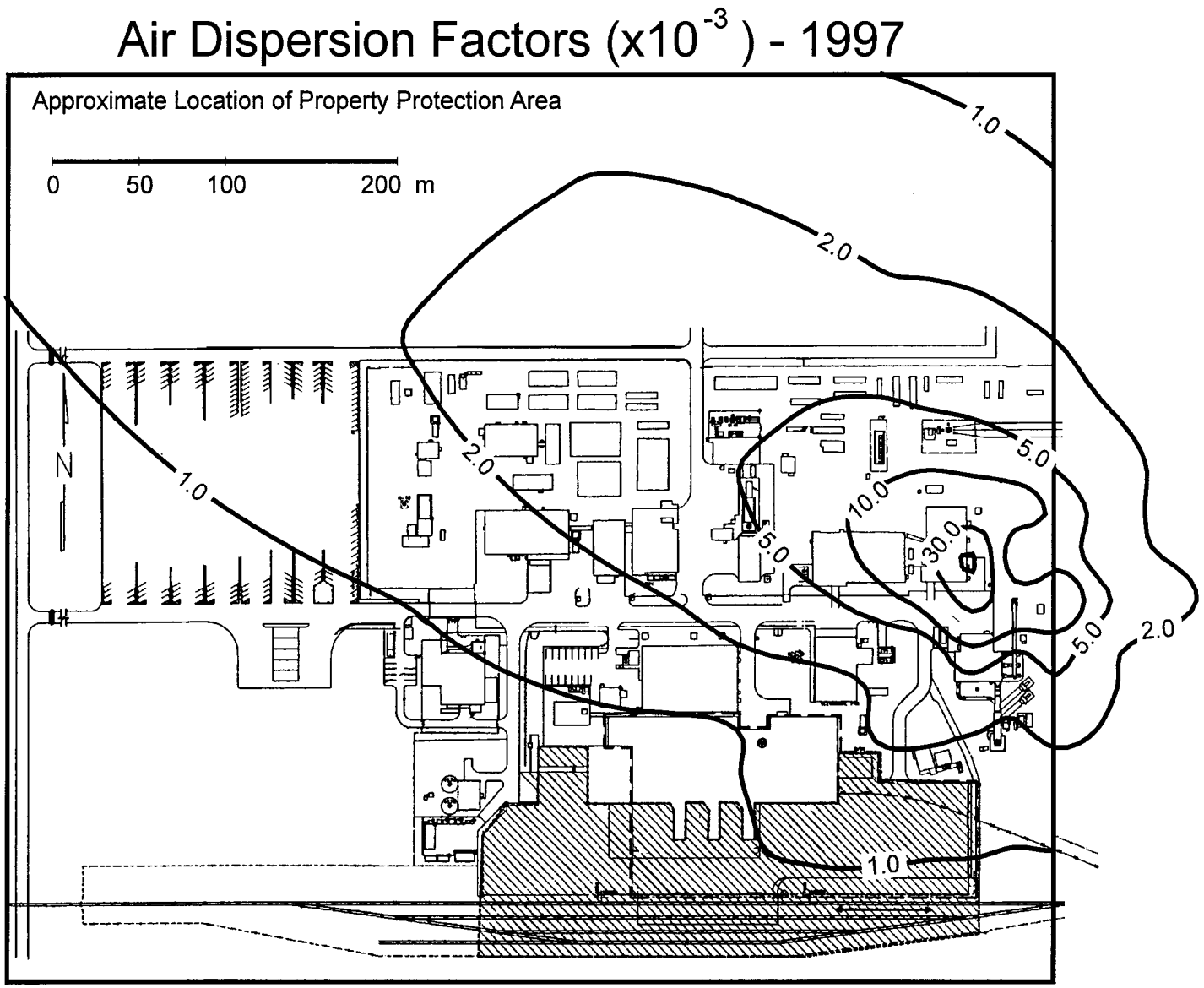

Figure 3.8 ADFs for 1997 WIPP Meteorological Data, Fine Grid

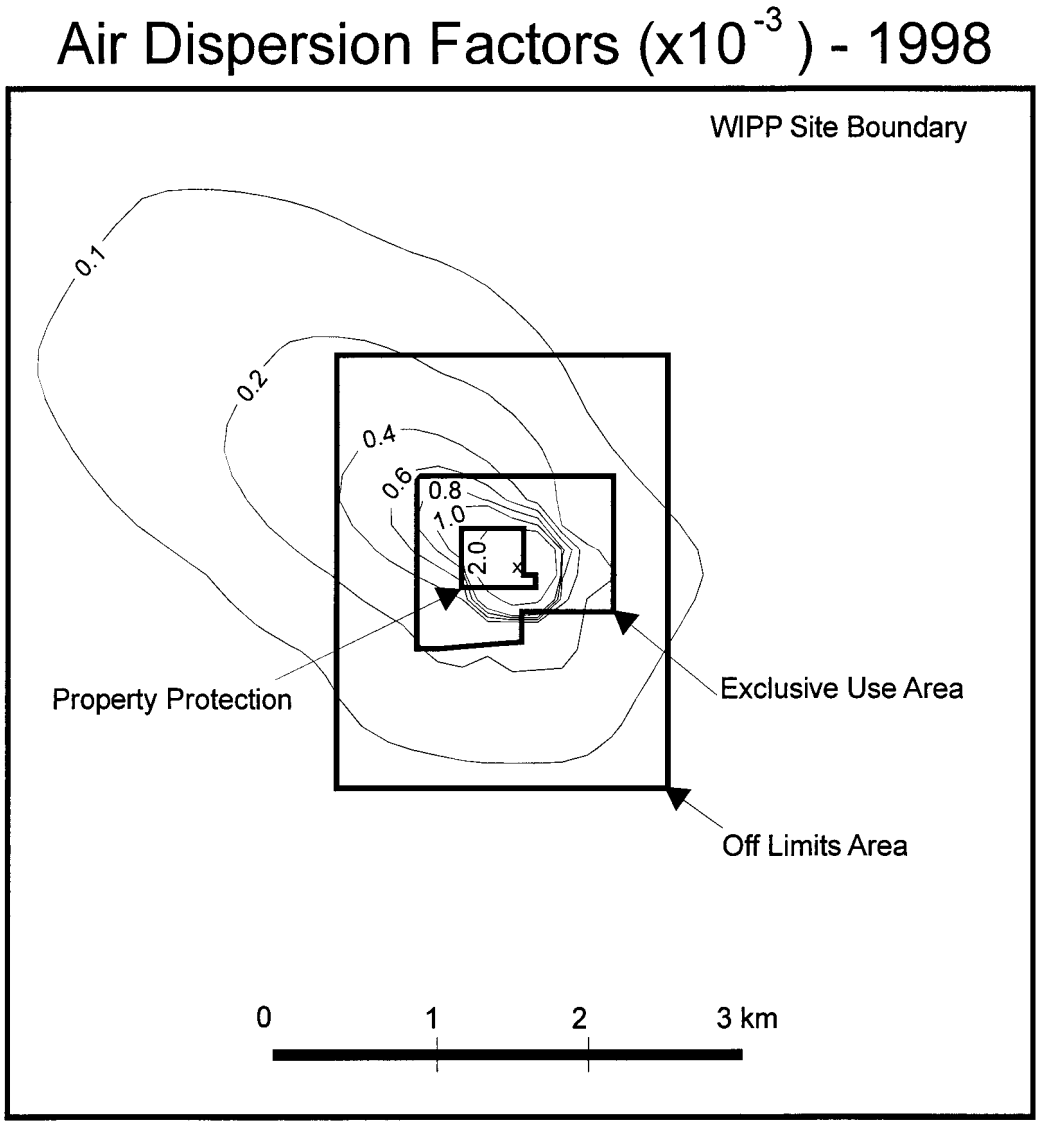

Figure 3.9 ADFs for 1998 WIPP Meteorological Data, Course Grid

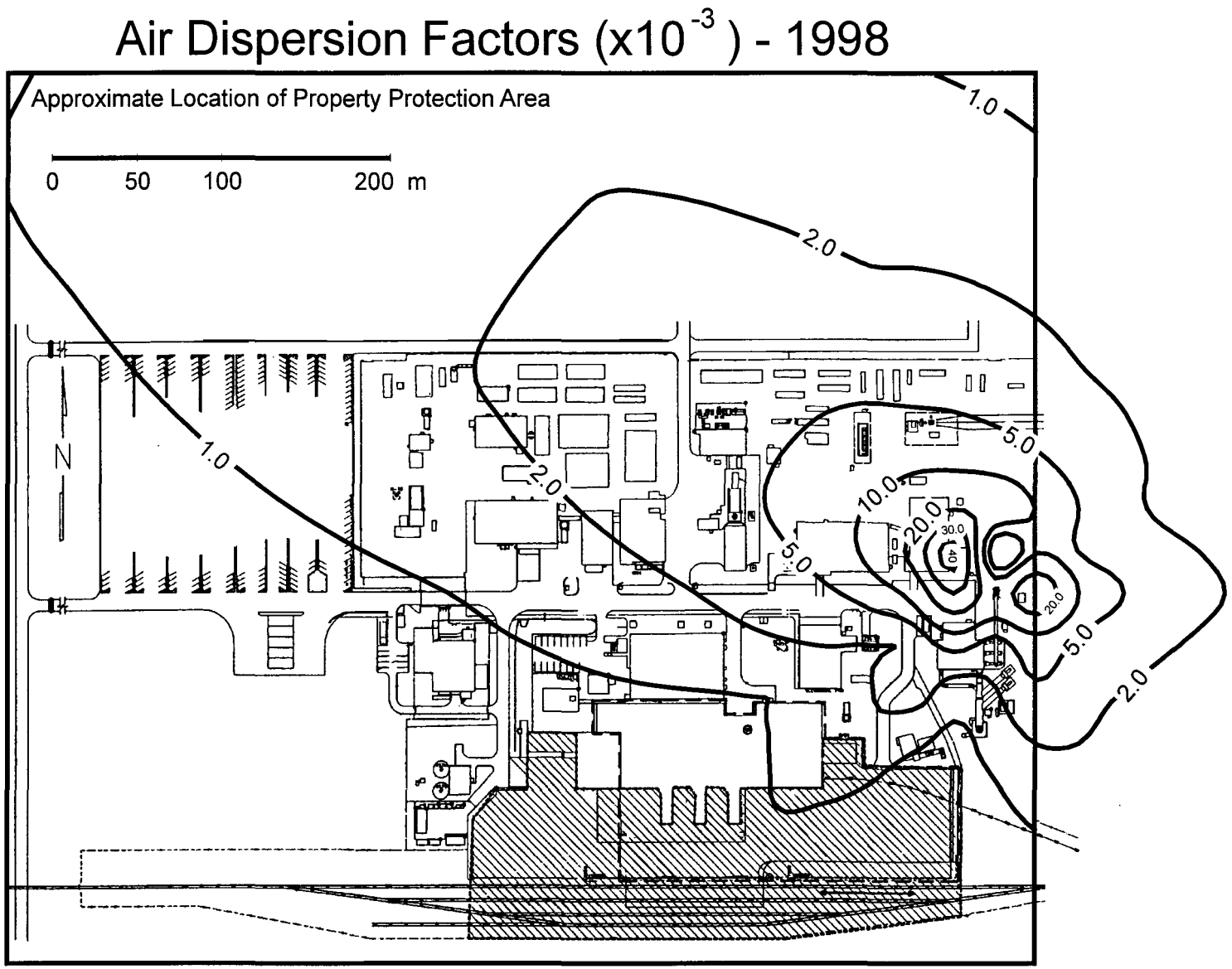

Figure 3.10 ADFs for 1998 WIPP Meteorological Data, Fine Grid

4.0 Electronic Access to WIPP Meteorological Data

EEG's hosted website at www.rt66.com/~eeg contains the electronic format of the meteorological data for downloading. Several formats of the data are available, including generic STAR format for 1997 through 1999, CAP88PC WND format for 1997 through 1999, ISCLT3 STAR format (which only includes stability classes A-F) for 1997 through 1999, and daily precipitation data. When more meteorological data becomes available, other years will be posted.

To access the data, click into the main page of EEG's web site and choose 'Data' on the left-hand-side menu. This should bring up the data web page for meteorological data, where any format and year listed above can be downloaded.

5.0 Discussion

The meteorological data from WIPP was critically examined and reduced to evaluate ambient conditions around the site and to estimate the reduction in contaminant concentration due to air dispersion. A more disperse plume reduces contaminant concentration after the discharge of actinides or hazardous chemicals from the underground. The dispersion was evaluated with several numerical codes, which mainly assess the compliance with federal regulations. These included:

1) CAPP88PC which calculated chronic (continuous) release dose from drums disposed underground.
2) The NRC Regulatory Guide 1.145 which calculated the air dispersion factor from acute releases of radioactivity during proposed accidents.
3) GXQ which also calculated the air dispersion factor from acute releases of radioactivity.
4) ISCLT3 which calculated the relative concentration factor for acute releases of hazardous chemicals.

CAP88PC was used to assess the dose from a release of radioactivity during routine operations to a maximally exposed individual at the regulatory boundary (Exclusive Use Area). With WIPP meteorological data used as the independent variable, approximately 15 mCi/yr of ^{239}Pu is needed to exceed the 10 mrem/yr regulatory limit for NESHAPS. This would require a relatively large release from the repository underground.

The relative concentration factors were also recalculated with site-specific data to compare with previous values computed in the SAR and RCRA Subpart B application. Each document relied largely on climatic data for the city of Carlsbad which is 40 km (26 mi.) to the west. The results showed that in the SAR's latest revision χ/Q was slightly less than calculated in this report. However, the study in this report assumed a wind Stability Class G, while the SAR used a Stability Class F. Future revisions of the SAR should include a quantification of uncertainty, which would most likely capture the value calculated in this report, which is only 1.8x that of the SAR at 100 m for the 95% probability (5% exceedance as shown in Table 3.3).

The National Council on Radiation Protection and Measurement (NCRP) also comments on the screening techniques and uncertainty in models when determining compliance with environmental standards (NCRP 1989; 1993). Model uncertainty was evaluated and the main components of model errors were identified as data input, stochastic fluctuations in the data, model physical errors, and lack of knowledge or data.

The estimated uncertainty associated with data input, for example, between observed air concentrations and predicted air concentrations (ratio) using the Gaussian dispersion model ranged from 0.01 to 100 under specific conditions. Therefore, it would be desirable to capture uncertainty using statistical methods by, say Monte Carlo analyses (IAEA 1989), to understand a more complete range of release risks. The International Commission of Radiological Protection (ICRP) also promotes probabilistic assessments to assess all potential pathways to a radiation exposure (ICRP 1993), which would most certainly cover meteorological data.

The RCRA Subpart B application, revised in 1997, included air dispersion factors (ADF) to evaluate risks from hazardous waste disposal at WIPP. The application used meteorological data from neighboring Carlsbad, NM and incomplete data from WIPP. The incomplete data was from 1993, where only 70% of the data was captured. EPA and the draft ANSI/ANS-3.11 recommends at least 90% coverage. The numerical code used to assess the ADF was re-examined with site specific data from 1997 and 1998. The results, shown in Figures 3.7 through 3.10, show the ADF factor to increase by a factor of 3 to 5, which subsequently increases the risk by a factor of 3 to 5. However, the risks are so low compared to regulatory limits and to radiological risks (Channell and Neill 1999), that the change is inconsequential.

These codes and results are not intended to assess the dispersion and consequently the dose during an actual accident at WIPP, should one occur. The calculations of Section 3 show the relevance of typical or worst case conditions to regulatory limits. As seen and summarized in Section 2 and in the appendices, meteorological conditions can change quite dramatically from day-to-day, month-to-month, or season-to-season. The conditions at the time and day of the accident will most likely not be the same as those presented in these or other calculations. Furthermore, NCRP Commentary No. 3 clearly specifies that the methods presented therein are

designed to be used for long-term releases, either intermittent or continuous, and should not be used to calculate radionuclide air concentrations resulting from short-term accidental releases (NCRP 1989). The NRC Regulatory Guide 1.145 suggests using the latest 1-hour average (assume to span over two hours) meteorological conditions for short-term release conditions, which would be taken from on-site measurements, making predictions impossible.

6.0 Conclusions and Recommendations

The analyses presented in Section 3 leads to the following conclusions:

1) A very large release is needed to exceed NESHAPS limits, as modeled by CAP88PC. A sustainable 15 mCi/yr release is the "breaking" flux of ^{239}Pu out of the exhaust stack to fail compliance.
2) The use of the arbitrary meteorological conditions (Stability Class F, 1.5 m/s windspeed) in the SAR is reasonable compared to actual data. Table 3.3 shows that the 95% probability of exceedance (95% worst case) for the χ/Q of Stability Class F is 9.18×10^{-3} s/m^3, compared to 5.11×10^{-3} s/m^3 presented in the SAR.
3) Incorporating a more stable wind class, Stability Class G, only increases the χ/Q moderately.
4) The use of GXQ for determining the site-specific air dispersion coefficient was found to be a useful tool. The code can present the results in a concise form (a CDF) and has many options.
5) Using site-specific meteorological data significantly changes the results of the air dispersion factor as compared to the modeling conducted in the RCRA Subpart B application. However, the risk factors are still below the EPA limits.

Several changes to the past air dispersion modeling methodologies are recommended:

1) Use site specific meteorological data for WIPP air dispersion modeling. This includes updating previous reports where Stability Class F was arbitrarily chosen as the meteorological condition, as in the WIPP Safety Analysis Report and the Emergency Preparedness Hazards Assessment.
2) Incorporate uncertainty into the air dispersion analyses. Presenting the data in a probability of exceedance curve or a CDF will facilitate more meaningful uses of the data. For example, confidence in χ/Q will give rise to confidence in accident dose calculations.
3) In safety assessments, it is often the case that a risk-adverse philosophy is taken. It is therefore recommended that the more stable wind class, Stability Class G, be used in future air dispersion calculations. Table 2.2 shows that this wind class exists at WIPP approximately 21% of the time.
4) Allow public access to the meteorological data by publishing it on the WIPP web site.

7.0 References

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8.0 List of Acronyms

ADF	Air Dispersion Factor
ANS	American Nuclear Society
ANSI	American National Standard Institute
CCA	Compliance Certification Application
CDF	Cumulative Distribution Function
CEDE	Committed Effective Dose Equivalent
CFR	Code of Federal Regulations
CH	Contact Handled
CMR	Central Monitoring Room
DOE	U.S. Department of Energy
EEG	Environmental Evaluation Group
EPA	U.S. Environmental Protection Agency
HEPA	High Efficiency Particulate
IAEA	International Atomic Energy Agency
ICRP	International Commission of Radiological Protection
LWB	Land Withdrawal Boundary
MEI	Maximally Exposed Individual
NCRP	National Council on Radiation Protection and Measurement
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NRC	Nuclear Regulatory Commission
PA	Performance Assessment
PAG	Protective Action Guide
RCRA	Resource Conservation and Recovery Act
RH	Remote Handled
SAR	Safety Analysis Report
TRU	Transuranic
WHB	Waste Handling Building
WIPP	Waste Isolation Pilot Plant

APPENDICES

Appendix A: Windspeed by Percentage

Class Distribution	September 1996	October 1996	November 1996	December 1996
Percentage of 0-2 knots	3.54	3.46	4.48	5.34
Percentage of 2-4 knots	12.15	13.88	16.11	17.54
Percentage of 4-6 knots	22.43	21.84	20.45	21.88
Percentage of 6-8 knots	29.65	23.32	22.29	23.52
Percentage of 8-10 knots	20.38	14.35	11.01	14.11
Percentage of 10-12 knots	6.94	10.58	8.89	6.22
Percentage of 12-14 knots	1.56	6.42	8.16	4.87
Percentage of 14-16 knots	1.25	3.39	4.58	2.52
Percentage of 16-18 knots	1.15	1.24	2.50	1.28
Percentage of 18-20 knots	0.80	1.24	0.90	1.08
Percentage of 20-22 knots	0.07	0.27	0.42	0.84
Percentage of 22-24 knots	0.07	0.00	0.07	0.57
Percentage of 24-26 knots	0.00	0.00	0.14	0.24
Percentage of >26 knots	0.00	0.00	0.00	0.00

Table A.1

Class Distribution	January 1997	February 1997	March 1997	April 1997
Percentage of 0-2 knots	5.51	1.50	3.49	2.71
Percentage of 2-4 knots	13.91	6.22	10.58	7.01
Percentage of 4-6 knots	20.83	12.32	17.27	12.19
Percentage of 6-8 knots	24.23	45.12	19.46	17.85
Percentage of 8-10 knots	12.43	12.32	26.78	17.19
Percentage of 10-12 knots	8.64	10.99	9.63	16.39
Percentage of 12-14 knots	5.48	6.53	5.56	11.70
Percentage of 14-16 knots	3.02	3.45	2.31	5.73
Percentage of 16-18 knots	1.68	1.15	1.35	3.61
Percentage of 18-20 knots	1.61	0.26	1.21	2.60
Percentage of 20-22 knots	1.28	0.12	0.69	2.19
Percentage of 22-24 knots	1.21	0.03	0.69	0.52
Percentage of 24-26 knots	0.13	0.00	0.66	0.24
Percentage of >26 knots	0.03	0.00	0.32	0.07

Table A.2

Class Distribution	May 1997	June 1997	July 1997	August 1997
Percentage of 0-2 knots	1.10	1.60	0.77	2.34
Percentage of 2-4 knots	6.63	9.10	6.22	10.09
Percentage of 4-6 knots	30.18	18.54	15.15	20.16
Percentage of 6-8 knots	19.52	17.92	27.02	27.42
Percentage of 8-10 knots	15.97	19.62	25.17	28.55
Percentage of 10-12 knots	12.63	15.10	15.66	7.90
Percentage of 12-14 knots	7.21	8.68	6.38	2.22
Percentage of 14-16 knots	2.65	5.00	2.08	0.75
Percentage of 16-18 knots	2.05	3.09	0.87	0.26
Percentage of 18-20 knots	1.30	0.66	0.34	0.29
Percentage of 20-22 knots	0.46	0.56	0.20	0.03
Percentage of 22-24 knots	0.20	0.07	0.10	0.00
Percentage of 24-26 knots	0.06	0.03	0.03	0.00
Percentage of >26 knots	0.06	0.03	0.00	0.00

Table A.3

Class Distribution	September 1997	October 1997	November 1997	December 1997
Percentage of 0-2 knots	3.05	2.79	5.51	5.81
Percentage of 2-4 knots	12.07	11.59	19.22	17.10
Percentage of 4-6 knots	19.48	19.69	22.21	23.62
Percentage of 6-8 knots	40.89	25.00	25.81	18.95
Percentage of 8-10 knots	12.28	17.44	14.28	14.01
Percentage of 10-12 knots	7.98	10.75	7.49	7.09
Percentage of 12-14 knots	1.93	5.85	3.36	5.51
Percentage of 14-16 knots	0.49	2.69	0.81	3.26
Percentage of 16-18 knots	0.63	2.05	0.24	2.12
Percentage of 18-20 knots	0.69	1.31	0.44	0.87
Percentage of 20-22 knots	0.20	0.54	0.27	0.44
Percentage of 22-24 knots	0.26	0.20	0.27	0.60
Percentage of 24-26 knots	0.03	0.07	0.10	0.47
Percentage of >26 knots	0.00	0.03	0.00	0.13

Table A.4

Class Distribution	January 1998	February 1998	March 1998	April 1998
Percentage of 0-2 knots	6.85	3.56	1.95	7.85
Percentage of 2-4 knots	16.90	14.30	8.37	7.92
Percentage of 4-6 knots	23.08	22.95	16.53	14.62
Percentage of 6-8 knots	21.20	20.11	18.11	16.91
Percentage of 8-10 knots	14.92	13.22	18.28	16.84
Percentage of 10-12 knots	7.69	6.93	11.96	9.65
Percentage of 12-14 knots	5.17	6.11	8.87	7.57
Percentage of 14-16 knots	2.22	4.13	6.85	5.42
Percentage of 16-18 knots	0.84	2.73	3.46	3.82
Percentage of 18-20 knots	0.54	2.55	1.34	2.57
Percentage of 20-22 knots	0.34	1.83	1.24	2.12
Percentage of 22-24 knots	0.20	1.26	1.18	2.08
Percentage of 24-26 knots	0.03	0.29	1.14	1.70
Percentage of >26 knots	0.00	0.04	0.71	0.94

Table A.5

Class Distribution	May 1998	June 1998	July 1998	August 1998
Percentage of 0-2 knots	3.66	2.19	1.99	1.65
Percentage of 2-4 knots	13.27	10.14	10.47	9.58
Percentage of 4-6 knots	20.90	16.91	21.46	22.24
Percentage of 6-8 knots	23.86	16.22	24.66	33.43
Percentage of 8-10 knots	15.19	16.42	23.77	21.74
Percentage of 10-12 knots	7.06	13.78	9.06	6.55
Percentage of 12-14 knots	6.15	9.69	5.11	2.76
Percentage of 14-16 knots	3.76	6.56	1.67	1.01
Percentage of 16-18 knots	2.96	4.34	0.58	0.77
Percentage of 18-20 knots	1.08	2.50	0.49	0.27
Percentage of 20-22 knots	1.01	0.90	0.37	0.00
Percentage of 22-24 knots	0.74	0.17	0.20	0.00
Percentage of 24-26 knots	0.30	0.17	0.06	0.00
Percentage of >26 knots	0.07	0.00	0.12	0.00

Table A.6

Class Distribution	September 1998	October 1998	November 1998	December 1998
Percentage of 0-2 knots	4.72	3.39	2.64	4.40
Percentage of 2-4 knots	10.03	11.09	12.01	16.33
Percentage of 4-6 knots	18.54	17.51	23.06	24.97
Percentage of 6-8 knots	28.65	20.73	25.83	22.65
Percentage of 8-10 knots	20.10	19.39	19.48	14.52
Percentage of 10-12 knots	9.03	11.36	10.21	8.13
Percentage of 12-14 knots	5.45	7.29	3.37	4.07
Percentage of 14-16 knots	2.33	5.17	1.08	2.08
Percentage of 16-18 knots	0.97	2.55	0.59	1.28
Percentage of 18-20 knots	0.14	1.08	0.59	0.50
Percentage of 20-22 knots	0.03	0.27	0.17	0.50
Percentage of 22-24 knots	0.00	0.17	0.52	0.54
Percentage of 24-26 knots	0.00	0.00	0.28	0.03
Percentage of >26 knots	0.00	0.00	0.17	0.00

Table A.7

Class Distribution	January 1999	February 1999	March 1999	April 1999
Percentage of 0-2 knots	4.54	4.32	2.28	1.98
Percentage of 2-4 knots	14.31	12.31	9.17	8.43
Percentage of 4-6 knots	21.47	17.11	15.76	15.33
Percentage of 6-8 knots	21.98	19.23	17.74	17.27
Percentage of 8-10 knots	12.30	16.78	17.07	15.33
Percentage of 10-12 knots	9.61	11.16	14.78	10.85
Percentage of 12-14 knots	4.84	6.73	9.38	7.42
Percentage of 14-16 knots	3.19	5.92	7.86	6.60
Percentage of 16-18 knots	2.22	2.57	3.13	5.52
Percentage of 18-20 knots	2.05	1.30	1.78	3.99
Percentage of 20-22 knots	1.55	0.89	0.67	4.18
Percentage of 22-24 knots	0.81	1.04	0.17	2.01
Percentage of 24-26 knots	0.47	0.48	0.20	0.75
Percentage of >26 knots	0.67	0.15	0.00	0.34

Table A.8

Class Distribution	May 1999	June 1999	July 1999	August 1999
Percentage of 0-2 knots	1.84	1.11	0.47	2.79
Percentage of 2-4 knots	6.72	7.78	4.54	12.84
Percentage of 4-6 knots	13.52	17.19	16.60	22.98
Percentage of 6-8 knots	30.59	21.22	25.07	29.54
Percentage of 8-10 knots	15.48	20.73	20.87	18.75
Percentage of 10-12 knots	10.52	13.92	14.89	8.30
Percentage of 12-14 knots	7.21	7.60	8.33	3.26
Percentage of 14-16 knots	5.28	4.93	4.77	0.91
Percentage of 16-18 knots	3.43	3.19	2.99	0.17
Percentage of 18-20 knots	2.36	1.35	1.18	0.17
Percentage of 20-22 knots	1.24	0.69	0.24	0.17
Percentage of 22-24 knots	0.61	0.21	0.07	0.10
Percentage of 24-26 knots	0.35	0.03	0.00	0.03
Percentage of >26 knots	0.86	0.03	0.00	0.00

Table A.9

Class Distribution	September 1999	October 1999	November 1999	December 1999
Percentage of 0-2 knots	3.02	4.44	4.64	5.44
Percentage of 2-4 knots	12.43	12.90	15.69	15.96
Percentage of 4-6 knots	24.48	19.35	22.54	22.95
Percentage of 6-8 knots	23.13	25.97	28.95	22.61
Percentage of 8-10 knots	14.17	18.04	19.02	13.94
Percentage of 10-12 knots	11.35	8.94	4.17	7.73
Percentage of 12-14 knots	6.08	4.00	2.51	3.60
Percentage of 14-16 knots	3.13	2.79	0.73	2.59
Percentage of 16-18 knots	1.35	1.24	0.35	2.25
Percentage of 18-20 knots	0.73	1.28	0.50	1.41
Percentage of 20-22 knots	0.07	0.77	0.81	0.60
Percentage of 22-24 knots	0.00	0.20	0.08	0.47
Percentage of 24-26 knots	0.00	0.07	0.00	0.20
Percentage of >26 knots	0.07	0.00	0.00	0.24

Table A.10

Class Distribution	January 2000	February 2000
Percentage of 0-2 knots	5.82	3.13
Percentage of 2-4 knots	15.88	11.49
Percentage of 4-6 knots	21.37	18.82
Percentage of 6-8 knots	21.53	20.04
Percentage of 8-10 knots	13.83	17.96
Percentage of 10-12 knots	7.17	10.17
Percentage of 12-14 knots	5.52	8.26
Percentage of 14-16 knots	3.40	3.95
Percentage of 16-18 knots	2.56	1.33
Percentage of 18-20 knots	1.28	1.47
Percentage of 20-22 knots	0.94	1.36
Percentage of 22-24 knots	0.44	1.08
Percentage of 24-26 knots	0.17	0.68
Percentage of >26 knots	0.10	0.25

Table A.11

Appendix B: Daily Temperatures

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
9/1/96	18.3	24.7	31.5	65.0	76.4	88.8
9/2/96	19.7	25.5	33.4	67.5	78.0	92.2
9/3/96	18.8	24.3	30.3	65.8	75.7	86.5
9/4/96	18.3	23.6	29.5	64.9	74.5	85.1
9/5/96	17.1	22.7	29.1	62.8	72.8	84.3
9/6/96	17.4	23.5	29.6	63.4	74.3	85.2
9/7/96	18.8	23.6	30.2	65.9	74.5	86.3
9/8/96	17.6	23.4	29.2	63.8	74.1	84.6
9/9/96	18.9	24.2	30.2	65.9	75.5	86.4
9/10/96	17.7	23.2	29.4	63.8	73.7	84.9
9/11/96	18.4	20.3	25.1	65.2	68.5	77.2
9/12/96	15.8	17.1	19.0	60.5	62.8	66.3
9/13/96	16.5	18.2	22.3	61.8	64.8	72.1
9/14/96	16.2	17.7	19.6	61.1	63.9	67.3
9/15/96	14.7	20.8	27.2	58.5	69.4	80.9
9/16/96	15.1	21.9	27.9	59.2	71.4	82.1
9/17/96	17.5	24.2	30.4	63.4	75.6	86.8
9/18/96	17.0	23.4	30.1	62.6	74.2	86.1
9/19/96	13.3	21.3	27.0	56.0	70.3	80.5
9/20/96	13.1	21.4	28.1	55.6	70.5	82.5
9/21/96	12.4	21.8	29.5	54.4	71.2	85.1
9/22/96	16.5	24.4	32.5	61.8	76.0	90.5
9/23/96	17.8	24.9	31.8	64.0	76.7	89.2
9/24/96	18.9	20.2	21.9	66.0	68.3	71.4
9/25/96	15.9	23.0	30.0	60.5	73.4	85.9
9/26/96	18.0	23.0	28.6	64.5	73.4	83.5
9/27/96	9.2	13.3	20.9	48.5	56.0	69.5
9/28/96	6.4	13.9	21.6	43.6	57.1	70.9
9/29/96	9.5	17.0	25.3	49.0	62.6	77.5
9/30/96	11.0	17.2	26.0	51.8	63.0	78.7
10/1/96	11.2	20.9	30.8	52.2	69.6	87.5
10/2/96	13.2	21.4	31.5	55.7	70.5	88.8
10/3/96	11.7	15.1	19.6	53.0	59.2	67.3
10/4/96	14.1	17.5	21.5	57.3	63.4	70.8
10/5/96	15.5	18.6	23.7	60.0	65.4	74.7
10/6/96	12.4	19.5	26.9	54.4	67.0	80.5
10/7/96	13.6	20.6	28.2	56.5	69.1	82.7
10/8/96	14.3	17.9	24.7	57.7	64.2	76.5
10/9/96	13.1	22.1	30.9	55.5	71.7	87.7
10/10/96	13.8	20.5	28.5	56.8	68.9	83.3
10/11/96	15.3	23.8	33.0	59.6	74.9	91.5
10/12/96	15.3	23.3	32.3	59.5	74.0	90.1
10/13/96	16.2	22.8	31.0	61.1	73.1	87.8
10/14/96	14.0	21.6	30.5	57.3	70.9	87.0
10/15/96	13.5	20.8	27.6	56.4	69.5	81.7
10/16/96	13.9	21.4	28.8	57.0	70.4	83.8
10/17/96	13.0	20.0	25.2	55.4	68.0	77.4
10/18/96	5.3	12.0	18.1	41.5	53.6	64.5
10/19/96	9.0	17.8	27.3	48.2	64.0	81.1
10/20/96	11.2	18.7	25.3	52.2	65.6	77.5
10/21/96	1.3	8.0	13.1	34.3	46.3	55.5
10/22/96	-1.8	6.3	14.0	28.8	43.4	57.2
10/23/96	1.7	10.8	18.8	35.0	51.5	65.8
10/24/96	8.6	15.2	23.2	47.4	59.4	73.8
10/25/96	8.3	16.7	23.7	46.9	62.0	74.7
10/26/96	6.8	15.6	23.5	44.3	60.0	74.4
10/27/96	4.8	9.6	20.0	40.6	49.4	68.0
10/28/96	5.1	7.6	10.8	41.1	45.7	51.5
10/29/96	8.5	13.7	20.2	47.3	56.6	68.3
10/30/96	5.4	15.0	24.4	41.7	59.0	75.8
10/31/96	15.0	19.4	27.3	59.0	67.0	81.1
11/1/96	5.4	8.3	14.0	41.7	47.0	57.1
11/2/96	1.2	8.9	15.0	34.1	48.0	59.0
11/3/96	8.7	12.3	17.6	47.7	54.2	63.7
11/4/96	5.0	13.5	21.1	41.0	56.3	70.0
11/5/96	8.1	15.6	22.2	46.7	60.1	71.9
11/6/96	6.3	15.6	22.0	43.3	60.0	71.6
11/7/96	2.3	10.1	17.1	36.1	50.2	62.8
11/8/96	2.7	8.8	14.5	36.9	47.8	58.0
11/9/96	2.2	12.1	21.3	36.0	53.7	70.3
11/10/96	6.7	15.4	23.3	44.0	59.7	74.0
11/11/96	7.1	14.9	25.1	44.8	58.8	77.2
11/12/96	5.7	13.2	20.7	42.3	55.7	69.3
11/13/96	10.2	15.5	23.8	50.4	60.0	74.8
11/14/96	10.1	16.1	24.0	50.2	60.9	75.2
11/15/96	11.8	16.2	21.3	53.3	61.1	70.4

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
11/16/96	7.8	15.2	19.6	46.1	59.3	67.2
11/17/96	3.0	10.3	17.3	37.3	50.6	63.1
11/18/96	6.0	14.8	23.6	42.8	58.7	74.6
11/19/96	10.2	19.2	29.2	50.3	66.6	84.6
11/20/96	13.3	21.1	30.5	55.9	69.9	87.0
11/21/96	7.8	16.2	23.2	46.0	61.2	73.8
11/22/96	5.1	11.3	20.3	41.2	52.3	68.6
11/23/96	4.8	13.7	20.9	40.7	56.6	69.6
11/24/96	1.3	4.8	11.2	34.4	40.7	52.1
11/25/96	-0.4	7.7	16.6	31.3	45.9	61.9
11/26/96	0.6	5.2	11.5	33.0	41.3	52.7
11/27/96	-3.3	0.6	3.6	26.0	33.0	38.4
11/28/96	1.9	2.8	3.7	35.4	37.0	38.7
11/29/96	2.3	7.9	14.2	36.1	46.2	57.6
11/30/96	3.0	5.5	9.3	37.3	42.0	48.7
12/1/96	-1.4	5.6	14.7	29.5	42.1	58.5
12/2/96	3.2	9.2	15.7	37.8	48.5	60.3
12/3/96	-1.5	6.4	12.7	29.3	43.5	54.9
12/4/96	1.7	9.5	18.9	35.1	49.1	66.0
12/5/96	-0.3	10.8	19.9	31.4	51.5	67.8
12/6/96	10.7	16.4	21.0	51.3	61.5	69.9
12/7/96	8.1	13.7	18.3	46.6	56.6	65.0
12/8/96	5.3	12.7	21.5	41.5	54.9	70.6
12/9/96	8.0	15.7	25.5	46.4	60.3	77.8
12/10/96	12.2	17.5	22.0	53.9	63.5	71.6
12/11/96	11.8	17.4	22.6	53.2	63.2	72.7
12/12/96	6.7	13.7	19.8	44.1	56.6	67.6
12/13/96	7.7	14.2	21.8	45.8	57.6	71.2
12/14/96	7.2	13.5	22.3	45.0	56.2	72.2
12/15/96	-3.1	3.0	7.0	26.3	37.4	44.6
12/16/96	-5.3	4.3	14.9	22.5	39.8	58.9
12/17/96	-8.6	-3.4	5.3	16.5	25.8	41.5
12/18/96	-12.9	-7.2	-2.9	8.8	19.0	26.7
12/19/96	-11.0	-2.4	6.2	12.2	27.7	43.2
12/20/96	-5.6	2.9	12.2	22.0	37.1	54.0
12/21/96	2.0	10.1	18.4	35.5	50.2	65.0
12/22/96	5.3	14.0	21.6	41.6	57.2	70.9
12/23/96	6.6	12.5	16.6	43.8	54.6	61.8
12/24/96	-4.6	1.8	7.6	23.8	35.3	45.7
12/25/96	-1.9	3.0	8.4	28.5	37.4	47.1
12/26/96	2.4	11.1	20.4	36.3	52.0	68.6
12/27/96	5.4	12.6	20.7	41.7	54.7	69.3
12/28/96	8.0	14.1	18.1	46.5	57.4	64.6
12/29/96	4.5	11.8	18.7	40.1	53.2	65.7
12/30/96	3.4	11.1	19.1	38.1	52.0	66.3
12/31/96	2.6	9.7	18.1	36.7	49.5	64.5
1/1/97	8.3	14.7	22.6	46.9	58.4	72.7
1/2/97	8.0	15.3	23.5	46.3	59.5	74.4
1/3/97	10.8	17.8	24.6	51.5	64.0	76.2
1/4/97	9.4	13.2	18.9	48.9	55.8	66.0
1/5/97	0.3	5.6	10.8	32.5	42.0	51.5
1/6/97	-5.0	-2.4	0.2	22.9	27.6	32.3
1/7/97	-4.9	-3.8	-2.5	23.2	25.2	27.5
1/8/97	-4.5	-2.8	-0.9	23.9	27.0	30.3
1/9/97	-4.8	1.7	9.0	23.4	35.0	48.2
1/10/97	-1.9	1.7	6.3	28.5	35.1	43.3
1/11/97	-7.4	-3.1	1.1	18.8	26.4	34.0
1/12/97	-10.1	-8.3	-6.9	13.9	17.0	19.6
1/13/97	-11.4	-9.9	-8.4	11.4	14.2	16.9
1/14/97	-9.5	-6.9	-2.6	14.9	19.6	27.4
1/15/97	-6.8	3.0	11.0	19.8	37.4	51.7
1/16/97	-2.0	1.8	6.9	28.4	35.2	44.4
1/17/97	-5.7	1.0	9.0	21.7	33.9	48.2
1/18/97	-4.4	3.8	13.3	24.2	38.9	55.9
1/19/97	1.6	7.4	13.4	34.8	45.3	56.1
1/20/97	5.6	11.3	18.4	42.0	52.3	65.0
1/21/97	6.0	12.0	18.8	42.8	53.7	65.8
1/22/97	3.6	10.6	16.2	38.5	51.0	61.1
1/23/97	6.0	12.4	18.0	42.8	54.3	64.4
1/24/97	5.3	10.9	15.7	41.6	51.7	60.2
1/25/97	1.4	11.9	20.5	34.5	53.5	68.8
1/26/97	9.9	14.6	19.0	49.8	58.2	66.2
1/27/97	-0.4	9.3	17.3	31.3	48.8	63.2
1/28/97	-6.5	0.6	6.9	20.2	33.0	44.4
1/29/97	-2.1	4.7	12.6	28.2	40.5	54.6
1/30/97	-2.9	6.8	15.4	26.9	44.3	59.7
1/31/97	4.4	12.4	23.6	40.0	54.4	74.5
2/3/97	8.8	15.6	20.5	47.8	60.0	69.0

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
2/4/97	2.8	7.9	12.1	37.1	46.2	53.7
2/5/97	2.3	5.4	8.9	36.2	41.7	48.1
2/6/97	1.6	4.4	8.1	34.9	40.0	46.6
2/7/97	0.8	3.9	8.0	33.4	39.0	46.3
2/8/97	-2.5	1.4	7.5	27.5	34.6	45.4
2/9/97	-2.3	0.7	6.6	27.9	33.2	43.9
2/10/97	-2.9	3.4	12.7	26.7	38.1	54.8
2/11/97	1.3	6.7	16.0	34.3	44.0	60.8
2/12/97	1.0	2.9	6.1	33.9	37.3	43.0
2/13/97	-0.6	0.3	1.7	31.0	32.6	35.1
2/14/97	-3.4	3.6	10.4	26.0	38.5	50.7
2/15/97	1.4	9.2	16.8	34.5	48.5	62.2
2/16/97	3.5	11.0	17.9	38.4	51.9	64.2
2/17/97	4.8	12.1	19.8	40.7	53.7	67.6
2/18/97	8.6	13.4	20.3	47.4	56.1	68.5
2/19/97	6.7	8.9	12.7	44.0	48.0	54.8
2/20/97	4.8	10.6	19.6	40.6	51.1	67.2
2/21/97	2.3	6.1	11.7	36.1	43.0	53.0
2/22/97	-0.6	4.9	10.0	31.0	40.9	50.0
2/23/97	1.1	6.4	11.3	34.0	43.5	52.3
2/24/97	-1.9	2.4	6.6	28.6	36.2	44.0
2/25/97	-2.8	-1.0	0.0	27.0	30.1	32.0
2/26/97	-4.0	3.5	10.4	24.7	38.2	50.7
2/27/97	-0.5	7.6	16.1	31.2	45.6	60.9
2/28/97	5.7	11.1	17.3	42.3	52.0	63.2
3/1/97	2.6	7.3	10.4	36.7	45.2	50.7
3/2/97	-1.4	7.8	16.5	29.5	46.1	61.8
3/3/97	6.5	15.5	24.2	43.7	59.9	75.6
3/4/97	11.2	17.6	24.4	52.1	63.7	75.9
3/5/97	-0.2	8.1	13.9	31.6	46.5	57.1
3/6/97	0.1	8.8	15.9	32.2	47.8	60.6
3/7/97	6.5	14.2	22.8	43.6	57.5	73.0
3/8/97	9.8	15.6	23.0	49.6	60.0	73.4
3/9/97	10.8	14.8	19.6	51.5	58.7	67.3
3/10/97	2.3	12.7	20.3	36.2	54.8	68.5
3/11/97	9.3	14.5	23.2	48.7	58.2	73.8
3/12/97	7.7	15.7	23.0	45.8	60.3	73.3
3/13/97	9.4	19.1	27.8	49.0	66.4	82.0
3/14/97	3.2	6.3	10.5	37.7	43.3	50.8
3/15/97	0.4	8.1	17.2	32.8	46.5	63.0
3/16/97	3.8	12.1	22.3	38.8	53.8	72.2
3/17/97	6.8	17.2	27.1	44.2	62.9	80.8
3/18/97	11.6	16.9	20.4	52.8	62.4	68.7
3/19/97	2.5	13.5	21.8	36.5	56.4	71.2
3/20/97	9.5	18.9	26.6	49.1	66.0	79.8
3/21/97	9.5	22.2	30.3	49.0	72.0	86.6
3/22/97	9.4	16.0	21.7	48.9	60.8	71.1
3/23/97	9.2	18.0	26.6	48.5	64.3	79.9
3/24/97	12.0	19.3	25.6	53.6	66.7	78.1
3/25/97	4.3	9.8	16.3	39.7	49.7	61.3
3/26/97	4.9	9.6	15.1	40.8	49.3	59.2
3/27/97	4.9	14.6	22.7	40.8	58.2	72.9
3/28/97	13.4	19.3	26.3	56.0	66.7	79.3
3/29/97	8.2	18.3	26.2	46.8	65.0	79.2
3/30/97	1.5	9.7	16.8	34.7	49.5	62.3
3/31/97	6.1	10.8	16.0	43.0	51.5	60.8
4/1/97	7.5	13.6	31.6	45.5	56.4	88.9
4/2/97	11.9	17.8	25.5	53.4	64.0	78.0
4/3/97	13.5	15.7	19.9	56.4	60.2	67.8
4/4/97	7.2	11.9	15.2	45.0	53.4	59.4
4/5/97	8.6	14.0	20.3	47.5	57.2	68.5
4/6/97	6.7	13.5	19.8	44.1	56.3	67.7
4/7/97	9.2	15.9	23.2	48.5	60.7	73.8
4/8/97	2.7	12.0	22.0	36.9	53.7	71.6
4/9/97	2.1	6.4	12.3	35.7	43.5	54.1
4/10/97	5.7	18.5	27.5	42.2	65.3	81.5
4/11/97	-1.5	4.0	10.5	29.2	39.1	50.9
4/12/97	-3.2	3.5	10.5	26.3	38.3	50.9
4/13/97	-1.4	5.6	12.5	29.5	42.1	54.4
4/14/97	3.0	12.0	20.6	37.4	53.7	69.0
4/15/97	7.6	17.0	25.4	45.7	62.6	77.8
4/16/97	9.7	16.2	22.5	49.5	61.1	72.4
4/17/97	12.0	15.9	21.0	53.7	60.6	69.9
4/18/97	10.2	12.8	17.1	50.4	55.1	62.7
4/19/97	9.3	18.6	27.9	48.7	65.5	82.1
4/20/97	13.3	22.8	30.3	55.9	73.1	86.5
4/21/97	16.1	24.4	30.2	61.0	75.9	86.4
4/22/97	10.0	16.7	23.3	49.9	62.0	73.9

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
4/23/97	11.0	15.5	20.7	51.7	59.9	69.3
4/24/97	8.5	14.9	24.0	47.3	58.7	75.2
4/25/97	3.9	5.7	8.4	39.1	42.3	47.0
4/26/97	4.1	5.6	7.6	39.3	42.1	45.6
4/27/97	2.8	11.4	18.0	37.0	52.6	64.5
4/28/97	8.8	19.5	28.1	47.9	67.1	82.6
4/29/97	14.0	23.4	30.1	57.2	74.1	86.3
4/30/97	15.4	21.1	25.6	59.7	69.9	78.1
5/2/97	12.8	20.8	25.5	55.0	69.5	77.8
5/3/97	8.5	16.7	24.3	47.2	62.0	75.7
5/4/97	12.2	20.0	27.8	54.0	68.1	82.0
5/5/97	14.9	23.9	32.3	58.8	75.0	90.1
5/6/97	15.7	21.4	30.0	60.3	70.5	85.9
5/7/97	16.3	24.2	32.9	61.3	75.5	91.3
5/8/97	13.8	21.2	28.1	56.9	70.1	82.6
5/9/97	11.3	14.6	18.2	52.3	58.3	64.8
5/10/97	9.4	15.8	21.3	48.9	60.4	70.4
5/11/97	12.6	18.3	24.8	54.7	64.9	76.7
5/12/97	12.2	14.8	16.9	54.0	58.6	62.4
5/13/97	10.6	20.7	29.8	51.0	69.3	85.6
5/14/97	14.9	22.6	30.1	58.7	72.7	86.2
5/15/97	16.8	21.6	27.7	62.2	70.9	81.9
5/16/97	15.5	21.2	27.2	59.8	70.2	80.9
5/17/97	16.1	24.0	30.7	61.0	75.2	87.2
5/18/97	16.9	25.4	33.4	62.4	77.7	92.1
5/19/97	13.4	17.8	22.5	56.1	64.0	72.5
5/20/97	11.1	17.0	22.5	51.9	62.6	72.4
5/21/97	15.1	17.6	21.8	59.1	63.7	71.3
5/22/97	13.3	19.7	26.4	55.9	67.4	79.6
5/23/97	14.8	21.9	28.8	58.7	71.5	83.8
5/24/97	15.9	24.4	31.5	60.5	76.0	88.7
5/25/97	16.2	24.8	30.2	61.2	76.7	86.3
5/26/97	18.2	25.2	31.3	64.8	77.3	88.4
5/27/97	15.1	21.5	27.6	59.2	70.7	81.7
5/28/97	15.9	22.2	30.5	60.7	72.0	86.9
5/29/97	17.0	24.2	32.8	62.7	75.6	91.0
5/30/97	18.0	23.2	29.6	64.4	73.7	85.4
5/31/97	15.9	19.7	25.3	60.5	67.5	77.5
6/1/97	16.5	25.2	32.9	61.6	77.3	91.3

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
6/2/97	17.3	19.7	23.4	63.2	67.5	74.0
6/1/97	16.5	25.2	32.9	61.6	77.3	91.3
6/2/97	17.3	28.6	38.3	63.2	83.5	100.9
6/3/97	19.0	26.6	33.2	66.1	80.0	91.8
6/4/97	18.1	25.3	31.6	64.7	77.6	88.8
6/5/97	17.4	24.6	31.3	63.3	76.3	88.3
6/6/97	18.3	23.7	28.5	64.9	74.7	83.2
6/7/97	15.8	21.0	26.2	60.5	69.9	79.1
6/8/97	16.3	19.3	23.2	61.4	66.8	73.8
6/9/97	16.2	21.2	27.5	61.2	70.1	81.5
6/10/97	17.6	22.5	27.6	63.8	72.6	81.7
6/11/97	18.6	23.4	33.6	65.4	74.2	92.5
6/12/97	16.0	25.3	34.2	60.8	77.5	93.6
6/13/97	17.3	26.5	32.8	63.2	79.8	91.0
6/14/97	17.2	21.9	29.9	63.0	71.5	85.8
6/15/97	17.3	21.9	28.6	63.1	71.4	83.5
6/16/97	14.9	22.2	30.0	58.8	71.9	85.9
6/17/97	13.0	23.0	31.3	55.4	73.4	88.4
6/18/97	19.5	28.0	35.2	67.0	82.4	95.3
6/19/97	20.2	28.6	36.2	68.3	83.5	97.1
6/20/97	20.4	27.9	36.8	68.8	82.2	98.3
6/21/97	17.7	26.9	36.0	63.9	80.4	96.8
6/22/97	18.5	23.6	28.9	65.3	74.4	83.9
6/23/97	17.8	27.0	36.9	64.0	80.6	98.5
6/24/97	19.4	27.1	36.6	66.9	80.8	98.0
6/25/97	16.4	23.1	29.8	61.5	73.6	85.6
6/26/97	17.7	24.1	30.6	63.9	75.3	87.0
6/27/97	16.5	23.5	30.9	61.6	74.3	87.7
6/28/97	19.8	27.7	35.3	67.6	81.8	95.6
6/29/97	21.5	29.6	37.3	70.6	85.3	99.2
6/30/97	21.6	30.2	38.3	70.8	86.3	100.9
7/1/97	20.9	30.1	38.6	69.7	86.2	101.5
7/2/97	20.8	29.1	36.0	69.4	84.3	96.9
7/3/97	21.2	28.6	36.6	70.2	83.6	97.8
7/4/97	17.3	23.4	28.5	63.1	74.1	83.4
7/5/97	18.0	25.1	32.5	64.4	77.2	90.4
7/6/97	16.8	24.1	31.4	62.2	75.4	88.6
7/7/97	20.2	27.0	33.1	68.4	80.7	91.6
7/8/97	18.6	26.4	33.6	65.5	79.5	92.5

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
7/9/97	19.6	25.2	32.2	67.3	77.4	89.9
7/10/97	21.1	24.5	28.5	70.0	76.1	83.3
7/11/97	19.9	25.9	31.4	67.9	78.6	88.5
7/12/97	19.0	28.3	35.1	66.2	82.9	95.3
7/13/97	21.1	28.9	35.6	70.0	84.1	96.1
7/14/97	23.0	29.1	34.4	73.4	84.4	94.0
7/15/97	22.6	28.4	34.4	72.6	83.1	93.9
7/16/97	21.2	28.3	34.8	70.2	83.0	94.7
7/17/97	21.8	29.4	35.9	71.2	85.0	96.6
7/18/97	22.4	29.5	35.9	72.3	85.2	96.7
7/19/97	22.6	28.8	35.2	72.6	83.9	95.4
7/20/97	21.0	28.2	34.3	69.8	82.7	93.7
7/21/97	21.2	27.5	33.5	70.2	81.5	92.4
7/22/97	20.6	26.6	32.0	69.1	79.9	89.7
7/23/97	19.5	25.9	32.5	67.1	78.7	90.5
7/24/97	21.7	27.2	33.9	71.0	80.9	93.0
7/25/97	21.3	26.9	34.4	70.3	80.4	93.9
7/26/97	21.3	28.5	34.5	70.4	83.3	94.1
7/27/97	21.8	28.6	34.5	71.2	83.5	94.2
7/28/97	23.6	28.8	34.5	74.4	83.8	94.2
7/29/97	20.7	26.1	33.1	69.3	79.1	91.5
7/30/97	20.5	27.3	33.1	68.8	81.1	91.5
7/31/97	22.4	27.1	33.4	72.3	80.8	92.1
8/1/97	20.5	26.8	32.5	68.9	80.2	90.5
8/2/97	21.9	28.2	33.8	71.3	82.7	92.9
8/3/97	22.8	29.0	34.7	73.1	84.3	94.5
8/4/97	23.1	27.1	32.1	73.6	80.7	89.8
8/5/97	21.8	25.2	30.7	71.2	77.3	87.2
8/6/97	18.1	24.9	32.6	64.5	76.8	90.7
8/7/97	15.5	18.1	20.6	60.0	64.5	69.1
8/8/97	14.6	22.1	29.9	58.2	71.9	85.8
8/9/97	19.3	27.8	34.8	66.8	82.1	94.6
8/10/97	21.3	27.4	33.6	70.3	81.2	92.5
8/11/97	20.6	28.0	35.2	69.1	82.4	95.3
8/12/97	20.2	25.3	34.5	68.4	77.6	94.1
8/13/97	19.6	24.8	32.3	67.3	76.7	90.2
8/14/97	20.8	26.9	33.2	69.5	80.4	91.8
8/15/97	20.7	29.2	38.2	69.3	84.5	100.7
8/16/97	21.7	30.4	38.3	71.0	86.7	101.0
8/17/97	21.8	28.1	37.0	71.2	82.7	98.7
8/18/97	20.8	26.4	34.2	69.4	79.4	93.6
8/19/97	20.4	27.8	35.3	68.8	82.0	95.6
8/20/97	21.1	27.8	35.0	69.9	82.0	95.1
8/21/97	21.5	29.0	36.5	70.7	84.2	97.7
8/22/97	21.3	27.6	36.7	70.4	81.7	98.0
8/23/97	20.4	23.5	28.4	68.8	74.3	83.1
8/24/97	19.1	25.1	31.0	66.5	77.1	87.7
8/25/97	18.5	25.4	32.0	65.3	77.7	89.7
8/26/97	19.6	26.0	31.6	67.3	78.8	88.9
8/27/97	19.7	26.1	32.6	67.5	78.9	90.7
8/28/97	21.2	28.1	34.9	70.2	82.5	94.9
8/29/97	21.8	28.3	34.8	71.2	82.9	94.6
8/30/97	21.4	27.5	34.1	70.6	81.5	93.3
8/31/97	20.1	26.1	32.4	68.1	79.0	90.3
9/1/97	19.4	26.1	32.7	67.0	78.9	90.8
9/2/97	20.4	25.2	32.4	68.8	77.3	90.4
9/1/97	19.4	26.1	32.7	67.0	78.9	90.8
9/2/97	20.4	26.8	33.2	68.8	80.2	91.7
9/3/97	18.0	23.8	31.9	64.4	74.8	89.5
9/4/97	20.3	22.5	26.7	68.5	72.6	80.0
9/5/97	18.8	24.0	30.4	65.9	75.3	86.8
9/6/97	19.2	25.3	31.4	66.5	77.5	88.4
9/7/97	18.4	25.3	31.8	65.1	77.6	89.2
9/8/97	19.4	25.8	32.8	66.9	78.4	91.0
9/9/97	20.6	25.5	33.6	69.0	77.9	92.4
9/10/97	18.5	21.9	27.1	65.3	71.4	80.7
9/11/97	17.9	24.6	31.0	64.2	76.3	87.9
9/12/97	19.5	24.8	31.8	67.1	76.7	89.3
9/13/97	20.0	25.9	33.4	68.0	78.7	92.0
9/14/97	20.9	26.2	32.3	69.5	79.2	90.1
9/15/97	20.1	27.6	34.6	68.2	81.6	94.2
9/16/97	20.5	28.1	34.7	68.9	82.6	94.5
9/17/97	21.1	29.3	36.8	69.9	84.8	98.2
9/18/97	23.1	29.2	36.9	73.5	84.6	98.4
9/19/97	20.4	27.5	34.8	68.7	81.4	94.7
9/20/97	15.9	23.2	29.6	60.6	73.8	85.2
9/21/97	13.6	15.2	18.6	56.5	59.4	65.4
9/22/97	15.2	18.1	22.8	59.4	64.6	73.0

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
9/23/97	15.3	18.3	21.7	59.6	65.0	71.0
9/24/97	0.3	18.3	48.8	32.5	64.9	119.8
9/25/97	13.2	20.1	26.1	55.7	68.1	79.1
9/26/97	16.1	22.9	30.1	60.9	73.3	86.1
9/27/97	17.1	25.3	32.8	62.7	77.6	91.0
9/28/97	18.3	22.6	27.5	64.9	72.7	81.5
9/29/97	14.4	22.9	31.2	57.9	73.2	88.2
9/30/97	17.9	26.2	33.5	64.2	79.1	92.4
10/1/97	19.2	24.0	31.8	66.6	75.1	89.2
10/2/97	16.8	24.2	30.5	62.2	75.5	87.0
10/3/97	16.9	24.7	31.9	62.4	76.5	89.5
10/4/97	15.4	23.3	30.3	59.7	74.0	86.6
10/5/97	17.5	23.4	30.8	63.5	74.2	87.4
10/6/97	14.8	20.8	27.7	58.7	69.4	81.9
10/7/97	15.4	20.3	27.7	59.8	68.5	81.8
10/8/97	16.4	21.5	26.6	61.5	70.8	79.9
10/9/97	14.4	20.4	26.5	57.9	68.6	79.8
10/10/97	18.4	20.5	24.2	65.2	69.0	75.6
10/11/97	18.0	20.9	26.6	64.3	69.7	79.9
10/12/97	8.7	16.7	20.5	47.6	62.0	68.9
10/13/97	5.3	11.7	17.8	41.6	53.0	64.1
10/14/97	7.3	12.6	19.0	45.2	54.7	66.2
10/15/97	7.0	13.9	21.5	44.7	57.1	70.7
10/16/97	6.8	14.9	21.4	44.2	58.9	70.5
10/17/97	10.0	15.9	22.9	50.0	60.7	73.3
10/18/97	10.9	19.3	26.9	51.6	66.7	80.3
10/19/97	12.1	21.1	28.3	53.8	69.9	82.9
10/20/97	9.0	13.9	19.0	48.3	57.0	66.1
10/21/97	10.5	12.1	14.2	50.8	53.8	57.6
10/22/97	10.2	12.7	17.2	50.3	54.8	62.9
10/23/97	10.5	15.5	22.0	51.0	59.9	71.6
10/24/97	8.2	17.7	23.2	46.8	63.9	73.8
10/25/97	2.5	7.9	11.9	36.5	46.1	53.4
10/26/97	0.2	7.2	13.4	32.3	45.0	56.2
10/27/97	3.1	11.7	19.8	37.6	53.1	67.7
10/28/97	7.6	15.1	22.4	45.7	59.3	72.3
10/29/97	3.6	14.1	23.4	38.5	57.5	74.1
10/30/97	9.1	17.6	24.8	48.3	63.6	76.6
10/31/97	9.4	18.6	28.4	48.8	65.5	83.1

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
11/1/97	6.0	14.3	20.3	42.8	57.8	68.5
11/2/97	3.3	11.5	17.7	38.0	52.7	63.9
11/3/97	4.4	11.5	18.2	40.0	52.7	64.8
11/4/97	8.1	17.3	26.8	46.6	63.1	80.3
11/5/97	4.7	13.4	20.3	40.5	56.1	68.5
11/6/97	3.4	12.2	19.0	38.1	54.0	66.1
11/7/97	7.9	14.1	22.3	46.2	57.4	72.1
11/8/97	8.9	16.3	24.4	48.0	61.3	75.9
11/9/97	3.3	6.9	10.8	37.9	44.5	51.4
11/10/97	1.1	3.0	6.4	33.9	37.4	43.6
11/11/97	0.8	5.6	12.1	33.4	42.1	53.7
11/12/97	3.5	4.5	5.1	38.3	40.2	41.2
11/13/97	4.6	9.3	16.4	40.2	48.7	61.5
11/14/97	-3.3	6.4	16.9	26.1	43.5	62.3
11/15/97	-3.8	-1.3	2.7	25.1	29.6	36.9
11/16/97	-4.4	0.9	6.7	24.1	33.6	44.1
11/17/97	-0.9	4.6	11.9	30.5	40.3	53.3
11/18/97	-0.6	9.3	16.8	30.9	48.7	62.2
11/19/97	2.7	12.0	19.8	36.8	53.6	67.6
11/20/97	8.8	14.6	20.6	47.8	58.2	69.0
11/21/97	2.5	8.5	13.2	36.4	47.2	55.8
11/22/97	0.7	9.5	15.4	33.3	49.1	59.7
11/23/97	4.1	11.4	19.5	39.3	52.5	67.2
11/24/97	5.6	14.0	23.0	42.1	57.2	73.3
11/25/97	4.3	15.0	24.7	39.7	59.0	76.5
11/26/97	9.3	14.1	19.3	48.8	57.5	66.7
11/27/97	10.4	14.5	20.8	50.7	58.2	69.4
11/28/97	3.9	10.2	15.5	39.0	50.4	59.8
11/29/97	-0.1	8.5	16.2	31.8	47.3	61.2
11/30/97	-0.4	8.4	15.4	31.3	47.1	59.7
12/1/97	5.4	8.8	13.2	41.8	47.8	55.8
12/2/97	4.0	8.0	13.1	39.1	46.4	55.6
12/3/97	-1.2	4.8	8.8	29.8	40.6	47.8
12/4/97	0.3	6.3	14.2	32.6	43.4	57.5
12/5/97	-1.6	5.2	13.2	29.2	41.3	55.8
12/6/97	-2.8	2.1	7.1	26.9	35.8	44.8
12/7/97	3.3	8.9	16.4	38.0	47.9	61.5
12/8/97	9.1	13.6	18.0	48.4	56.5	64.4
12/9/97	2.1	9.0	13.7	35.9	48.2	56.6

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
12/10/97	-5.0	0.9	4.7	23.0	33.6	40.4
12/11/97	-7.2	-2.6	0.6	19.0	27.3	33.0
12/12/97	-9.8	-2.5	5.6	14.4	27.6	42.0
12/13/97	-5.2	3.4	13.0	22.7	38.2	55.3
12/14/97	-2.5	7.7	16.6	27.4	45.9	61.8
12/15/97	2.6	10.3	19.3	36.8	50.6	66.7
12/16/97	-0.3	8.6	15.9	31.5	47.4	60.7
12/17/97	1.4	9.4	17.7	34.4	49.0	63.9
12/18/97	2.6	11.6	20.8	36.6	52.8	69.5
12/19/97	3.3	11.2	19.2	38.0	52.2	66.5
12/20/97	-1.6	0.8	5.1	29.1	33.4	41.3
12/21/97	-2.9	4.4	11.7	26.7	40.0	53.0
12/22/97	0.5	4.5	7.0	32.9	40.0	44.6
12/23/97	-1.9	0.4	2.3	28.5	32.7	36.1
12/24/97	-1.4	3.8	8.9	29.5	38.8	48.1
12/25/97	-3.9	-1.2	0.6	25.0	29.8	33.1
12/26/97	-9.6	-5.2	-1.9	14.6	22.7	28.7
12/27/97	-9.8	-1.7	5.9	14.4	28.9	42.5
12/28/97	-3.3	0.9	5.4	26.1	33.6	41.7
12/29/97	-5.2	2.5	11.4	22.7	36.5	52.6
12/30/97	-4.4	4.5	14.7	24.1	40.1	58.5
12/31/97	-2.2	3.6	10.0	28.0	38.4	50.1
1/1/98	0.8	7.7	17.4	33.5	45.9	63.3
1/2/98	3.1	11.4	21.2	37.5	52.4	70.2
1/3/98	4.7	11.4	19.5	40.5	52.5	67.1
1/4/98	3.6	9.3	14.5	38.5	48.8	58.1
1/5/98	6.7	10.1	14.4	44.1	50.2	57.9
1/6/98	0.5	5.9	11.0	32.9	42.7	51.8
1/7/98	0.2	3.5	8.8	32.4	38.3	47.8
1/8/98	-0.4	6.4	13.7	31.2	43.6	56.6
1/9/98	0.5	9.6	16.7	32.9	49.3	62.1
1/10/98	-5.5	3.9	15.2	22.0	39.0	59.3
1/11/98	5.0	10.5	16.7	41.0	50.8	62.1
1/12/98	2.7	10.8	18.6	36.9	51.4	65.6
1/13/98	-1.5	4.2	11.2	29.3	39.5	52.2
1/14/98	0.4	6.5	12.4	32.6	43.8	54.2
1/15/98	-2.1	6.1	13.8	28.2	42.9	56.9
1/16/98	5.5	10.7	17.2	41.9	51.2	63.0
1/17/98	3.9	12.3	22.0	39.1	54.1	71.5
1/18/98	7.0	12.0	17.6	44.7	53.7	63.7
1/19/98	3.3	11.2	18.3	38.0	52.2	64.9
1/20/98	9.8	14.5	19.2	49.6	58.1	66.6
1/21/98	2.6	6.7	11.0	36.7	44.0	51.8
1/22/98	-2.5	4.8	10.8	27.4	40.6	51.4
1/23/98	0.8	7.4	13.5	33.4	45.4	56.2
1/24/98	-2.2	6.9	16.4	28.0	44.5	61.4
1/25/98	2.0	10.5	19.3	35.7	50.8	66.8
1/26/98	1.1	8.2	14.8	34.0	46.7	58.7
1/27/98	4.0	12.4	20.7	39.3	54.2	69.3
1/28/98	5.2	12.1	17.7	41.3	53.7	63.9
1/29/98	0.2	9.9	17.2	32.4	49.8	62.9
1/30/98	5.1	12.6	19.8	41.1	54.7	67.7
1/31/98	5.2	10.7	16.4	41.3	51.3	61.5
2/1/98	0.1	7.2	13.3	32.3	44.9	56.0
2/2/98	3.7	10.6	18.3	38.6	51.1	64.9
2/3/98	0.6	8.7	17.6	33.0	47.7	63.6
2/4/98	1.8	3.7	6.5	35.3	38.7	43.7
2/5/98	1.2	5.2	10.3	34.1	41.4	50.6
2/6/98	1.1	5.3	12.2	34.0	41.6	53.9
2/7/98	-1.0	7.8	17.9	30.2	46.0	64.3
2/8/98	4.4	12.8	20.2	40.0	55.0	68.4
2/9/98	8.4	12.5	16.8	47.1	54.5	62.3
2/10/98	3.4	8.8	13.9	38.1	47.8	57.0
2/11/98	-0.8	7.7	14.4	30.5	45.8	57.9
2/12/98	-0.1	6.1	9.8	31.8	43.0	49.6
2/13/98	-2.5	7.5	16.1	27.6	45.5	61.0
2/14/98	5.7	11.5	18.7	42.2	52.6	65.7
2/15/98	6.1	9.4	16.0	42.9	48.9	60.7
2/16/98	2.7	7.6	13.3	36.9	45.7	55.9
2/17/98	-0.9	7.5	14.9	30.4	45.5	58.9
2/18/98	4.0	8.4	12.6	39.3	47.2	54.7
2/19/98	-0.8	6.4	12.3	30.6	43.6	54.2
2/20/98	3.7	10.3	16.8	38.7	50.5	62.2
2/21/98	5.3	10.2	15.4	41.5	50.3	59.7
2/22/98	2.6	12.0	21.2	36.7	53.7	70.1
2/23/98	6.7	15.3	22.7	44.0	59.6	72.8
2/24/98	10.3	18.8	28.1	50.5	65.9	82.6
2/25/98	6.2	11.6	15.8	43.2	52.9	60.4

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
2/26/98	2.3	7.5	13.0	36.2	45.5	55.4
2/27/98	1.0	5.8	10.5	33.7	42.5	51.0
2/28/98	-5.5	2.3	9.0	22.1	36.2	48.1
3/1/98	-1.3	5.2	10.8	29.7	41.4	51.4
3/2/98	-1.2	6.0	12.7	29.9	42.8	54.8
3/3/98	1.5	11.4	21.9	34.7	52.4	71.5
3/4/98	7.2	17.2	24.8	45.0	62.9	76.7
3/5/98	9.1	16.9	22.3	48.3	62.4	72.2
3/6/98	4.7	10.8	18.6	40.5	51.4	65.5
3/7/98	-1.0	8.8	15.4	30.2	47.9	59.7
3/8/98	-2.5	2.8	8.8	27.5	37.0	47.8
3/9/98	-3.7	3.0	10.4	25.3	37.4	50.6
3/10/98	-5.3	2.2	10.2	22.4	35.9	50.3
3/11/98	-2.2	4.5	11.0	28.0	40.1	51.7
3/12/98	-3.2	2.7	10.2	26.2	36.9	50.4
3/13/98	0.3	9.4	19.6	32.6	48.9	67.2
3/14/98	6.6	13.0	21.0	43.8	55.5	69.7
3/15/98	8.5	13.8	18.3	47.2	56.8	65.0
3/16/98	4.8	7.3	9.0	40.7	45.2	48.1
3/17/98	3.7	10.2	18.8	38.7	50.4	65.8
3/18/98	6.8	12.6	21.6	44.3	54.6	70.9
3/19/98	2.0	8.4	13.5	35.7	47.1	56.3
3/20/98	0.5	7.0	13.9	32.8	44.6	57.0
3/21/98	3.6	11.0	18.6	38.6	51.8	65.4
3/22/98	5.7	16.4	25.9	42.2	61.6	78.6
3/23/98	11.5	21.0	29.4	52.7	69.8	85.0
3/24/98	10.5	21.3	30.2	50.9	70.4	86.4
3/25/98	13.6	22.7	30.6	56.5	72.9	87.1
3/26/98	11.7	19.3	31.1	53.0	66.7	87.9
3/27/98	8.7	15.2	21.5	47.6	59.4	70.7
3/28/98	8.0	18.5	26.9	46.4	65.2	80.4
3/29/98	10.8	19.9	28.4	51.4	67.8	83.0
3/30/98	5.4	10.0	14.1	41.7	50.0	57.4
3/31/98	1.8	9.5	18.2	35.3	49.2	64.7
4/1/98	5.5	16.1	24.3	42.0	61.0	75.7
4/2/98	9.5	13.6	16.8	49.1	56.4	62.3
4/3/98	4.5	13.3	20.8	40.1	55.9	69.4
4/4/98	8.5	16.4	24.4	47.3	61.5	76.0
4/5/98	8.5	18.2	26.0	47.4	64.7	78.7
4/6/98	10.5	16.6	21.3	50.9	61.8	70.3
4/7/98	11.0	15.8	20.2	51.8	60.4	68.4
4/8/98	6.9	13.1	19.2	44.4	55.6	66.6
4/9/98	5.7	15.2	22.7	42.2	59.4	72.9
4/10/98	9.0	18.8	26.9	48.2	65.9	80.4
4/11/98	12.4	20.0	27.9	54.4	68.1	82.2
4/12/98	13.7	20.7	27.6	56.6	69.3	81.7
4/13/98	9.4	17.6	25.5	48.9	63.7	77.9
4/14/98	11.4	20.3	27.3	52.6	68.6	81.1
4/15/98	10.8	18.0	24.3	51.4	64.4	75.8
4/16/98	4.4	12.7	20.0	40.0	54.9	68.0
4/17/98	4.9	8.7	14.5	40.8	47.6	58.1
4/18/98	2.6	11.3	19.0	36.8	52.4	66.2
4/19/98	1.6	12.8	21.5	34.8	55.1	70.6
4/20/98	9.1	15.6	22.7	48.4	60.1	72.8
4/21/98	5.8	12.9	20.3	42.4	55.2	68.5
4/22/98	0.4	15.7	25.0	32.6	60.2	77.0
4/23/98	10.7	21.2	49.1	51.2	70.1	120.4
4/24/98	14.7	24.4	32.1	58.4	76.0	89.8
4/25/98	18.0	24.1	28.4	64.5	75.3	83.1
4/26/98	6.4	16.1	21.5	43.6	61.0	70.7
4/27/98	6.5	11.3	16.4	43.7	52.4	61.5
4/28/98	5.5	12.6	19.4	42.0	54.8	66.9
4/29/98	4.5	15.7	23.1	40.1	60.3	73.6
4/30/98	9.8	19.6	27.0	49.6	67.3	80.7
5/1/98	13.0	23.1	29.5	55.4	73.5	85.2
5/2/98	15.0	24.3	31.1	58.9	75.7	88.0
5/3/98	13.8	21.8	29.7	56.8	71.3	85.4
5/4/98	14.9	24.7	32.5	58.9	76.4	90.5
5/5/98	13.7	23.8	31.3	56.6	74.8	88.3
5/6/98	18.8	24.7	29.8	65.9	76.4	85.7
5/7/98	18.3	23.8	30.1	64.9	74.9	86.2
5/8/98	14.6	22.6	29.8	58.3	72.7	85.6
5/9/98	12.7	21.3	28.3	54.8	70.3	82.9
5/10/98	12.2	22.1	31.3	53.9	71.9	88.3
5/11/98	16.7	24.7	31.4	62.1	76.5	88.5
5/12/98	16.2	25.3	31.5	61.1	77.6	88.7
5/13/98	16.2	25.7	33.7	61.2	78.3	92.7
5/14/98	18.5	25.1	31.2	65.4	77.1	88.2

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
5/15/98	11.0	20.1	27.5	51.8	68.1	81.6
5/16/98	15.1	25.7	32.8	59.1	78.3	91.0
5/17/98	18.4	27.6	34.8	65.1	81.7	94.6
5/18/98	19.9	27.7	35.0	67.9	81.9	95.0
5/19/98	17.8	27.1	35.3	64.0	80.8	95.5
5/20/98	17.9	27.7	35.2	64.2	81.9	95.3
5/21/98	19.8	27.0	32.8	67.6	80.5	91.0
5/22/98	22.3	26.7	31.3	72.2	80.0	88.3
5/23/98	20.9	26.8	33.6	69.6	80.3	92.4
5/24/98	16.5	26.5	33.8	61.7	79.7	92.9
5/25/98	16.3	23.7	31.2	61.3	74.7	88.2
5/26/98	17.5	22.3	30.1	63.5	72.2	86.2
5/27/98	13.8	25.0	34.5	56.9	77.0	94.1
5/28/98	20.3	29.0	36.5	68.5	84.2	97.8
5/29/98	21.6	30.3	38.0	70.9	86.6	100.5
5/30/98	21.2	30.3	37.7	70.2	86.5	99.8
5/31/98	19.9	29.6	38.1	67.8	85.2	100.6
6/1/98	20.8	32.0	40.4	69.5	89.6	104.8
6/2/98	20.2	31.9	39.6	68.3	89.4	103.3
6/3/98	22.2	31.6	39.0	72.0	88.9	102.2
6/4/98	22.2	28.4	33.5	71.9	83.2	92.3
6/5/98	16.4	22.8	29.6	61.6	73.0	85.3
6/6/98	12.0	18.5	25.4	53.6	65.4	77.7
6/7/98	16.7	23.3	31.7	62.0	74.0	89.0
6/8/98	18.7	26.9	33.0	65.7	80.4	91.4
6/9/98	20.1	28.6	34.8	68.2	83.4	94.6
6/10/98	13.8	22.3	30.1	56.8	72.1	86.3
6/11/98	12.2	22.3	30.5	54.0	72.1	86.9
6/12/98	18.0	28.1	34.8	64.4	82.6	94.7
6/13/98	22.2	30.1	36.5	71.9	86.1	97.6
6/14/98	21.9	28.4	34.4	71.5	83.1	94.0
6/15/98	16.3	24.2	31.5	61.3	75.6	88.7
6/16/98	20.8	29.8	37.3	69.4	85.7	99.1
6/17/98	21.3	29.9	36.6	70.4	85.8	97.9
6/18/98	18.3	29.6	36.8	64.9	85.3	98.2
6/19/98	21.5	31.3	39.5	70.7	88.4	103.0
6/20/98	21.8	32.3	40.0	71.3	90.2	104.0
6/21/98	21.5	31.8	39.5	70.6	89.2	103.1
6/22/98	24.9	31.8	38.8	76.9	89.2	101.8
6/23/98	22.9	31.2	38.9	73.3	88.2	102.0
6/24/98	23.9	31.6	39.6	74.9	88.8	103.2
6/25/98	24.0	32.2	40.4	75.2	89.9	104.8
6/26/98	24.1	33.6	41.6	75.4	92.5	106.9
6/27/98	23.4	33.4	41.2	74.1	92.1	106.2
6/28/98	24.7	33.7	41.6	76.4	92.6	106.8
6/29/98	22.7	30.7	37.5	72.9	87.3	99.5
6/30/98	22.2	28.9	35.3	72.0	84.1	95.5
7/1/98	24.4	28.3	32.8	76.0	82.9	91.1
7/2/98	20.7	25.6	33.1	69.3	78.1	91.6
7/3/98	22.6	28.4	34.4	72.7	83.0	94.0
7/4/98	22.2	29.6	35.7	72.0	85.2	96.3
7/5/98	23.4	29.8	37.2	74.1	85.7	99.0
7/6/98	22.2	30.0	36.6	72.0	86.0	97.8
7/7/98	23.7	31.1	37.3	74.7	88.0	99.1
7/8/98	21.3	29.4	37.8	70.4	84.9	100.0
7/9/98	24.0	30.0	36.2	75.2	85.9	97.2
7/10/98	23.4	30.6	37.1	74.2	87.1	98.8
7/11/98	25.1	33.1	40.3	77.1	91.5	104.6
7/12/98	23.2	33.0	41.1	73.7	91.3	106.0
7/13/98	20.6	27.5	37.0	69.1	81.6	98.5
7/14/98	19.9	28.9	37.4	67.7	84.0	99.3
7/15/98	21.0	27.3	36.1	69.8	81.2	96.9
7/16/98	18.8	24.1	30.9	65.9	75.4	87.6
7/17/98	19.7	26.9	33.5	67.5	80.5	92.2
7/18/98	21.1	28.2	34.2	70.1	82.7	93.6
7/19/98	22.8	30.6	36.8	73.0	87.0	98.3
7/20/98	24.2	29.8	36.3	75.6	85.7	97.3
7/21/98	19.9	27.3	35.6	67.8	81.2	96.1
7/22/98	20.5	26.7	34.5	68.9	80.0	94.0
7/23/98	20.7	27.1	33.5	69.2	80.8	92.4
7/24/98	22.6	27.8	34.4	72.7	82.0	93.9
7/25/98	21.7	28.1	33.9	71.0	82.5	93.1
7/26/98	22.2	27.0	34.6	71.9	80.5	94.3
7/27/98	22.0	28.1	34.6	71.6	82.5	94.2
7/28/98	22.1	29.5	35.4	71.8	85.1	95.7
7/29/98	23.6	30.8	37.1	74.4	87.4	98.8
7/30/98	22.9	29.2	37.0	73.3	84.5	98.5
7/31/98	18.8	26.8	33.2	65.8	80.2	91.7

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
8/1/98	22.0	29.1	34.7	71.7	84.4	94.4
8/2/98	23.6	29.4	36.1	74.5	84.8	97.0
8/3/98	24.4	25.5	27.3	75.9	77.9	81.1
8/1/98	22.0	29.1	34.7	71.7	84.4	94.4
8/2/98	23.6	29.4	36.1	74.5	84.8	97.0
8/3/98	21.5	27.6	33.1	70.7	81.8	91.5
8/4/98	18.6	24.1	29.9	65.5	75.4	85.7
8/5/98	17.5	19.7	24.1	63.6	67.4	75.5
8/6/98	15.8	22.7	28.5	60.5	72.8	83.3
8/7/98	18.5	26.1	32.4	65.4	78.9	90.3
8/8/98	20.0	28.2	34.7	67.9	82.8	94.5
8/9/98	21.1	28.2	34.6	69.9	82.8	94.3
8/10/98	22.0	28.8	35.0	71.6	83.8	94.9
8/11/98	22.3	29.1	35.5	72.1	84.4	95.9
8/12/98	20.5	26.5	32.9	68.9	79.7	91.2
8/13/98	18.4	22.7	28.5	65.1	72.8	83.3
8/14/98	18.7	25.4	31.0	65.6	77.7	87.7
8/15/98	19.6	26.7	32.9	67.3	80.1	91.1
8/16/98	20.5	27.5	33.2	68.8	81.5	91.8
8/17/98	18.8	25.7	32.1	65.8	78.2	89.9
8/18/98	19.7	25.3	31.9	67.5	77.6	89.3
8/19/98	20.7	24.9	31.0	69.2	76.8	87.7
8/20/98	20.3	23.2	28.5	68.6	73.8	83.4
8/21/98	18.4	25.4	31.7	65.1	77.7	89.0
8/22/98	20.8	26.5	32.1	69.4	79.8	89.7
8/23/98	19.3	26.0	32.2	66.8	78.7	89.9
8/24/98	19.3	25.8	31.8	66.8	78.4	89.2
8/25/98	19.3	25.3	31.2	66.7	77.6	88.1
8/26/98	20.8	26.2	31.6	69.4	79.2	88.9
8/27/98	21.2	27.4	34.0	70.2	81.4	93.3
8/28/98	20.2	23.9	28.2	68.4	74.9	82.7
8/29/98	19.8	24.9	30.7	67.7	76.9	87.3
8/30/98	16.8	25.3	32.0	62.2	77.6	89.7
8/31/98	18.7	25.8	32.3	65.6	78.4	90.1
9/1/98	19.6	25.3	31.1	67.3	77.6	88.0
9/2/98	20.8	26.5	31.7	69.4	79.6	89.1
9/3/98	20.5	26.5	32.5	68.8	79.6	90.6
9/4/98	20.1	27.0	33.2	68.1	80.6	91.7
9/5/98	20.8	27.0	32.8	69.5	80.6	91.1

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
9/6/98	19.1	25.9	32.4	66.5	78.5	90.4
9/7/98	18.2	25.6	31.9	64.7	78.1	89.3
9/8/98	19.7	27.2	33.3	67.4	80.9	91.9
9/9/98	18.6	25.6	32.5	65.5	78.1	90.5
9/10/98	19.2	24.2	31.1	66.6	75.5	87.9
9/11/98	17.4	23.4	29.4	63.3	74.2	84.8
9/12/98	16.1	23.7	29.9	61.0	74.7	85.9
9/13/98	17.7	26.2	33.6	63.9	79.1	92.5
9/14/98	20.8	26.0	34.5	69.5	78.8	94.2
9/15/98	18.8	23.9	29.7	65.8	75.0	85.5
9/16/98	16.2	23.5	29.4	61.2	74.3	85.0
9/17/98	18.1	23.6	29.5	64.6	74.5	85.0
9/18/98	17.6	24.1	30.2	63.7	75.3	86.3
9/19/98	17.4	26.2	34.5	63.4	79.1	94.2
9/20/98	19.2	27.9	35.4	66.6	82.3	95.8
9/21/98	22.6	29.1	34.7	72.7	84.4	94.5
9/22/98	18.1	23.7	29.2	64.5	74.6	84.6
9/23/98	14.8	23.0	29.7	58.7	73.4	85.4
9/24/98	19.7	26.3	33.5	67.4	79.4	92.2
9/25/98	19.5	25.9	32.9	67.1	78.6	91.3
9/26/98	19.5	26.6	33.6	67.0	80.0	92.4
9/27/98	21.4	26.2	33.6	70.5	79.2	92.5
9/28/98	19.6	25.5	31.8	67.3	77.9	89.2
9/29/98	19.0	26.6	33.9	66.1	79.8	92.9
9/30/98	0.4	25.5	48.9	32.7	78.0	120.0
10/1/98	20.5	24.2	29.1	68.9	75.5	84.3
10/2/98	17.2	24.3	30.3	63.0	75.7	86.6
10/3/98	15.0	24.4	32.2	59.0	76.0	89.9
10/4/98	18.1	26.1	31.2	64.6	79.0	88.1
10/5/98	10.3	20.0	26.1	50.5	68.1	78.9
10/6/98	7.3	14.9	21.3	45.1	58.7	70.3
10/7/98	10.2	17.2	23.9	50.3	62.9	75.0
10/8/98	10.3	19.1	27.0	50.5	66.4	80.6
10/9/98	11.3	21.2	30.7	52.3	70.1	87.2
10/10/98	12.3	22.5	32.6	54.2	72.4	90.6
10/11/98	12.0	23.0	33.1	53.6	73.4	91.5
10/12/98	14.3	20.1	27.0	57.8	68.3	80.6
10/13/98	15.2	22.6	30.8	59.4	72.7	87.4
10/14/98	14.6	22.6	30.3	58.3	72.7	86.6

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
10/15/98	15.6	23.0	32.1	60.0	73.3	89.7
10/16/98	17.7	22.8	29.2	63.8	73.0	84.5
10/17/98	10.0	16.9	23.4	50.0	62.5	74.1
10/18/98	6.9	15.0	21.5	44.5	58.9	70.8
10/19/98	11.9	17.3	21.9	53.5	63.2	71.4
10/20/98	9.2	10.9	17.7	48.5	51.6	63.9
10/21/98	8.6	9.8	11.3	47.4	49.7	52.3
10/22/98	10.2	11.6	13.8	50.3	52.9	56.9
10/23/98	10.4	13.8	17.7	50.6	56.8	63.9
10/24/98	9.1	15.9	21.7	48.3	60.7	71.1
10/25/98	10.0	17.9	25.6	49.9	64.3	78.2
10/26/98	14.4	18.9	25.3	58.0	66.1	77.5
10/27/98	13.4	16.7	22.1	56.2	62.1	71.7
10/28/98	11.2	17.5	24.1	52.1	63.5	75.3
10/29/98	12.1	18.7	26.0	53.7	65.7	78.9
10/30/98	16.0	19.6	25.6	60.9	67.3	78.1
10/31/98	12.8	15.2	17.1	55.0	59.3	62.7
11/1/98	7.5	11.1	15.6	45.6	51.9	60.1
11/2/98	6.5	11.5	17.2	43.8	52.8	63.0
11/3/98	8.4	10.5	13.0	47.1	50.8	55.3
11/4/98	5.3	7.4	9.0	41.6	45.3	48.2
11/5/98	5.1	6.3	8.1	41.2	43.4	46.6
11/6/98	5.3	7.3	11.3	41.5	45.2	52.4
11/7/98	3.9	11.6	20.2	39.0	52.9	68.3
11/8/98	8.8	15.7	23.3	47.8	60.3	74.0
11/9/98	9.5	15.4	25.3	49.1	59.7	77.6
11/10/98	3.6	9.5	14.1	38.5	49.1	57.3
11/11/98	4.9	11.9	19.7	40.9	53.4	67.4
11/12/98	6.7	10.6	14.9	44.1	51.0	58.8
11/13/98	7.1	10.7	15.1	44.7	51.3	59.1
11/14/98	3.1	13.1	22.2	37.6	55.5	71.9
11/15/98	6.1	14.5	21.9	42.9	58.1	71.3
11/16/98	6.8	16.8	24.8	44.2	62.3	76.6
11/17/98	7.2	15.6	23.1	45.0	60.1	73.5
11/18/98	11.7	18.2	25.7	53.0	64.7	78.2
11/19/98	6.2	15.4	22.3	43.2	59.7	72.1
11/20/98	4.6	7.4	9.5	40.3	45.3	49.1
11/21/98	4.5	11.3	18.4	40.1	52.3	65.1
11/22/98	6.1	14.6	24.4	42.9	58.3	76.0
11/23/98	6.2	15.1	22.3	43.1	59.2	72.1
11/24/98	7.0	14.9	23.6	44.6	58.8	74.5
11/25/98	9.4	15.3	21.5	48.9	59.6	70.8
11/26/98	8.1	15.6	24.0	46.6	60.1	75.2
11/27/98	9.3	15.7	24.5	48.8	60.3	76.1
11/28/98	9.9	17.0	25.9	49.8	62.7	78.6
11/29/98	7.8	12.9	16.1	46.1	55.2	60.9
11/30/98	4.0	11.9	19.9	39.2	53.3	67.8
12/1/98	7.0	13.2	19.2	44.6	55.8	66.5
12/2/98	10.4	14.6	20.7	50.7	58.3	69.2
12/3/98	8.0	12.0	16.7	46.5	53.6	62.1
12/4/98	7.1	14.2	22.2	44.9	57.6	71.9
12/5/98	9.9	15.9	22.9	49.8	60.6	73.2
12/6/98	4.6	9.6	12.9	40.3	49.3	55.2
12/7/98	-1.9	4.7	9.0	28.5	40.5	48.2
12/8/98	-5.1	2.2	8.5	22.9	36.0	47.2
12/9/98	-1.0	5.0	11.3	30.3	41.0	52.4
12/10/98	1.0	2.2	3.0	33.7	36.0	37.3
12/11/98	-1.6	0.7	4.6	29.1	33.3	40.2
12/12/98	-2.2	4.6	11.2	28.0	40.3	52.1
12/13/98	-1.9	7.7	15.9	28.5	45.8	60.5
12/14/98	4.6	9.3	15.2	40.2	48.7	59.3
12/15/98	3.0	7.9	13.9	37.4	46.2	56.9
12/16/98	1.1	9.3	18.1	34.1	48.8	64.6
12/17/98	0.6	6.3	11.9	33.0	43.3	53.4
12/18/98	4.4	10.6	18.5	40.0	51.1	65.3
12/19/98	1.4	6.2	10.9	34.5	43.2	51.6
12/20/98	4.3	10.1	17.5	39.8	50.2	63.5
12/21/98	-8.7	6.7	21.0	16.4	44.0	69.8
12/22/98	-10.8	-7.8	-4.7	12.6	18.0	23.5
12/23/98	-10.4	-4.1	1.3	13.4	24.6	34.3
12/24/98	-5.6	-2.2	3.1	21.9	28.1	37.5
12/25/98	-5.4	3.7	14.1	22.2	38.7	57.4
12/26/98	0.9	10.6	17.8	33.6	51.0	64.0
12/27/98	4.3	11.6	18.1	39.8	52.9	64.6
12/28/98	1.3	10.0	19.7	34.3	50.0	67.5
12/29/98	7.2	12.1	17.8	44.9	53.7	64.0
12/30/98	3.8	10.1	18.9	38.8	50.2	66.1
12/31/98	2.2	5.9	11.1	35.9	42.6	51.9

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
1/1/99	3.1	8.9	17.1	37.6	48.0	62.8
1/2/99	-1.9	2.7	5.7	28.6	36.9	42.2
1/3/99	-5.5	-1.8	1.5	22.1	28.8	34.7
1/4/99	-7.9	-0.8	7.1	17.9	30.6	44.8
1/5/99	-0.2	9.5	20.3	31.6	49.1	68.5
1/6/99	3.3	11.3	18.6	37.9	52.4	65.5
1/7/99	6.7	13.8	21.5	44.0	56.9	70.7
1/8/99	0.8	10.8	19.1	33.4	51.4	66.4
1/9/99	-5.3	1.6	8.4	22.5	34.9	47.2
1/10/99	-1.7	8.2	18.2	29.0	46.8	64.8
1/11/99	2.8	11.2	21.7	37.0	52.2	71.1
1/12/99	8.8	14.5	19.7	47.9	58.2	67.5
1/13/99	0.5	8.0	14.6	33.0	46.3	58.2
1/14/99	-2.5	5.0	10.9	27.6	40.9	51.6
1/15/99	1.2	11.3	22.4	34.1	52.4	72.4
1/16/99	4.4	12.8	18.7	39.9	55.1	65.6
1/17/99	6.2	14.3	21.1	43.1	57.8	70.0
1/18/99	3.8	11.6	20.6	38.8	52.9	69.0
1/19/99	9.2	16.3	24.4	48.6	61.4	76.0
1/20/99	10.3	16.7	23.6	50.6	62.1	74.5
1/21/99	7.4	12.5	17.8	45.3	54.5	64.0
1/22/99	2.5	6.4	10.2	36.4	43.6	50.3
1/23/99	3.0	10.1	20.0	37.3	50.2	68.0
1/24/99	9.5	16.9	26.2	49.1	62.5	79.1
1/25/99	7.6	15.7	25.6	45.7	60.2	78.0
1/26/99	8.8	14.5	22.1	47.9	58.1	71.8
1/27/99	7.4	13.7	21.1	45.4	56.7	70.0
1/28/99	-0.8	5.5	11.0	30.6	41.8	51.7
1/29/99	-1.1	-0.3	1.6	30.1	31.5	34.9
1/30/99	-0.8	5.6	11.8	30.5	42.1	53.3
1/31/99	0.2	5.3	13.0	32.4	41.6	55.4
2/1/99	4.9	11.2	16.4	40.8	52.1	61.4
2/2/99	-1.0	7.0	13.8	30.2	44.5	56.8
2/3/99	4.1	12.3	22.6	39.4	54.1	72.6
2/4/99	1.4	10.9	17.5	34.6	51.6	63.6
2/5/99	9.9	16.5	24.4	49.7	61.7	75.9
2/6/99	9.1	13.8	19.0	48.4	56.8	66.1
2/7/99	5.5	14.3	22.8	42.0	57.7	73.1
2/8/99	10.1	15.9	23.1	50.2	60.6	73.5
2/9/99	6.7	15.7	23.6	44.0	60.2	74.4
2/10/99	11.2	18.9	26.4	52.1	66.0	79.6
2/11/99	-0.3	5.2	13.9	31.4	41.3	57.0
2/12/99	-4.4	3.4	10.8	24.0	38.0	51.5
2/13/99	-1.3	7.6	16.1	29.7	45.6	60.9
2/14/99	2.9	11.7	21.9	37.3	53.0	71.4
2/15/99	6.3	14.8	24.9	43.3	58.7	76.9
2/16/99	1.4	8.6	14.0	34.5	47.5	57.3
2/17/99	5.2	12.5	20.0	41.4	54.5	68.0
2/18/99	6.5	14.2	20.8	43.7	57.6	69.4
2/19/99	5.5	15.2	25.3	41.8	59.4	77.5
2/20/99	4.2	10.6	16.2	39.5	51.1	61.2
2/21/99	1.2	8.3	13.9	34.2	46.9	56.9
2/22/99	5.5	12.4	21.2	42.0	54.3	70.1
2/23/99	-0.9	10.7	20.4	30.3	51.3	68.7
2/24/99	7.5	15.5	24.2	45.6	59.9	75.6
2/25/99	4.3	17.2	25.1	39.7	62.9	77.2
2/26/99	12.9	18.4	23.9	55.3	65.1	75.1
2/27/99	8.1	14.3	20.9	46.6	57.8	69.7
2/28/99	7.6	15.4	25.9	45.7	59.8	78.6
3/1/99	7.9	17.2	25.4	46.1	63.0	77.8
3/2/99	8.5	15.8	21.8	47.3	60.4	71.3
3/3/99	2.8	10.9	18.6	37.1	51.7	65.4
3/4/99	5.6	16.0	25.2	42.2	60.8	77.3
3/5/99	13.8	18.2	23.8	56.9	64.8	74.8
3/6/99	5.8	11.1	15.4	42.5	52.0	59.7
3/7/99	5.6	7.9	9.7	42.1	46.1	49.4
3/8/99	5.8	13.0	19.1	42.4	55.5	66.4
3/9/99	4.1	14.4	23.0	39.3	58.0	73.4
3/10/99	9.4	17.9	24.7	49.0	64.2	76.5
3/11/99	4.2	10.0	14.4	39.5	49.9	57.9
3/12/99	2.2	8.0	17.4	35.9	46.5	63.3
3/13/99	-1.1	5.3	12.4	30.0	41.5	54.2
3/14/99	0.6	9.6	18.8	33.0	49.3	65.8
3/15/99	5.4	15.4	24.8	41.7	59.7	76.6
3/16/99	7.5	16.6	25.7	45.6	61.9	78.3
3/17/99	5.9	13.2	22.9	42.5	55.7	73.2
3/18/99	1.2	4.7	7.3	34.1	40.5	45.1
3/19/99	-2.1	5.8	13.2	28.2	42.5	55.8

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
3/20/99	3.0	11.6	20.2	37.4	52.8	68.3
3/21/99	8.7	16.7	24.9	47.7	62.0	76.7
3/22/99	10.0	20.2	29.1	50.0	68.4	84.5
3/23/99	6.7	14.2	21.8	44.1	57.6	71.3
3/24/99	7.0	15.2	24.5	44.6	59.3	76.0
3/25/99	7.7	12.1	17.4	45.9	53.7	63.4
3/26/99	9.9	11.5	13.5	49.7	52.6	56.3
3/27/99	7.5	12.4	17.6	45.5	54.4	63.6
3/28/99	4.6	12.5	19.3	40.4	54.5	66.7
3/29/99	8.9	13.4	18.9	48.0	56.0	66.0
3/30/99	7.6	13.6	21.0	45.7	56.4	69.8
3/31/99	8.2	17.6	27.1	46.7	63.6	80.9
4/1/99	12.4	19.5	25.5	54.2	67.1	77.8
4/2/99	10.7	18.4	27.9	51.3	65.2	82.1
4/3/99	6.3	11.7	16.5	43.3	53.0	61.7
4/4/99	6.9	16.3	26.6	44.4	61.3	80.0
4/5/99	4.8	12.9	20.4	40.6	55.2	68.8
4/6/99	9.2	19.2	28.0	48.5	66.6	82.4
4/7/99	14.8	22.9	30.0	58.6	73.2	86.0
4/8/99	16.0	21.2	24.4	60.8	70.1	75.9
4/9/99	14.6	21.3	27.4	58.2	70.3	81.3
4/10/99	8.1	16.5	24.1	46.6	61.7	75.4
4/11/99	7.8	15.0	21.3	46.0	59.0	70.3
4/12/99	13.2	17.9	25.2	55.7	64.2	77.3
4/13/99	15.6	17.3	22.5	60.1	63.1	72.6
4/15/99	6.5	11.2	13.9	43.6	52.1	57.0
4/16/99	2.9	7.8	13.1	37.3	46.1	55.6
4/17/99	4.4	10.2	15.4	39.9	50.4	59.7
4/18/99	5.8	16.8	26.4	42.5	62.2	79.6
4/19/99	11.1	21.5	30.3	52.1	70.7	86.5
4/20/99	13.6	23.6	33.0	56.4	74.5	91.4
4/21/99	16.4	24.3	30.8	61.6	75.7	87.4
4/22/99	20.2	27.0	33.3	68.3	80.5	91.9
4/23/99	11.6	19.5	25.2	52.9	67.1	77.3
4/24/99	6.2	8.6	10.9	43.2	47.5	51.7
4/25/99	8.4	15.7	24.1	47.1	60.2	75.5
4/26/99	9.4	18.3	26.8	48.8	65.0	80.3
4/27/99	13.8	22.4	29.0	56.8	72.4	84.1
4/28/99	16.7	22.8	30.1	62.0	73.1	86.1
4/29/99	15.7	18.3	21.2	60.3	65.0	70.2
4/30/99	15.1	18.4	20.9	59.2	65.1	69.6
5/1/99	12.8	18.5	25.9	55.1	65.2	78.6
5/2/99	9.9	18.5	26.6	49.9	65.3	79.8
5/3/99	14.0	21.8	27.9	57.2	71.2	82.2
5/4/99	15.5	21.5	25.4	59.9	70.7	77.7
5/5/99	8.8	16.2	23.2	47.9	61.2	73.7
5/6/99	7.3	14.6	21.5	45.1	58.2	70.6
5/7/99	9.9	19.0	27.8	49.8	66.2	82.0
5/8/99	15.4	25.1	33.6	59.7	77.2	92.5
5/9/99	17.1	24.9	32.2	62.8	76.9	90.0
5/10/99	16.1	23.7	30.4	60.9	74.6	86.8
5/11/99	11.3	18.6	23.9	52.4	65.5	75.1
5/12/99	10.1	18.0	24.5	50.2	64.4	76.1
5/13/99	15.8	24.5	33.6	60.5	76.1	92.6
5/14/99	17.0	25.8	32.7	62.6	78.5	90.9
5/15/99	16.5	25.9	32.8	61.7	78.7	91.0
5/16/99	15.9	25.6	32.5	60.7	78.1	90.5
5/17/99	14.0	22.1	28.0	57.2	71.8	82.5
5/18/99	12.9	20.5	27.9	55.3	68.9	82.2
5/19/99	16.3	23.1	31.0	61.3	73.5	87.8
5/20/99	15.8	25.4	33.7	60.5	77.8	92.7
5/21/99	15.7	23.6	31.8	60.3	74.5	89.3
5/22/99	17.0	22.8	30.5	62.6	73.1	86.9
5/23/99	15.1	23.3	30.1	59.1	74.0	86.3
5/24/99	15.1	21.9	28.5	59.2	71.4	83.4
5/25/99	15.3	22.1	31.0	59.5	71.8	87.8
5/26/99	13.9	18.9	25.1	57.1	66.0	77.2
5/27/99	14.9	19.1	24.5	58.8	66.4	76.1
5/28/99	12.7	19.5	26.6	54.9	67.2	80.0
5/29/99	13.7	20.5	27.8	56.7	69.0	82.0
5/30/99	18.0	24.9	32.0	64.4	76.8	89.5
5/31/99	20.1	27.4	34.4	68.1	81.2	93.9
6/1/99	20.5	26.5	32.0	69.0	79.7	89.5
6/2/99	21.5	26.8	33.6	70.6	80.2	92.4
6/3/99	19.1	27.7	35.0	66.4	81.8	95.0
6/4/99	21.1	27.7	34.4	70.1	81.8	94.0
6/5/99	19.7	26.0	29.9	67.4	78.7	85.9
6/6/99	15.9	24.6	32.6	60.6	76.3	90.6

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
6/7/99	18.0	25.1	33.1	64.4	77.1	91.5
6/8/99	19.0	25.5	33.9	66.2	78.0	92.9
6/9/99	17.3	24.7	32.5	63.1	76.5	90.4
6/10/99	19.4	27.3	35.0	66.9	81.1	95.0
6/11/99	19.6	26.2	32.8	67.3	79.1	91.0
6/12/99	17.5	21.9	26.2	63.6	71.5	79.1
6/13/99	14.1	19.0	22.6	57.3	66.1	72.6
6/14/99	17.0	19.5	22.7	62.5	67.2	72.8
6/15/99	14.1	21.5	26.5	57.4	70.8	79.6
6/16/99	17.4	23.5	29.0	63.2	74.2	84.2
6/17/99	14.2	19.3	24.4	57.5	66.8	75.9
6/18/99	19.2	23.4	28.5	66.5	74.1	83.4
6/19/99	19.0	22.4	29.2	66.1	72.4	84.6
6/20/99	17.7	21.9	28.0	63.9	71.4	82.5
6/21/99	19.5	23.4	28.6	67.1	74.2	83.5
6/22/99	17.9	24.3	31.5	64.1	75.8	88.6
6/23/99	20.3	27.5	33.8	68.5	81.6	92.8
6/24/99	20.3	26.9	33.5	68.6	80.3	92.4
6/25/99	18.9	26.7	33.3	66.0	80.1	92.0
6/26/99	21.9	30.3	37.7	71.3	86.5	99.9
6/27/99	23.0	31.2	38.3	73.4	88.2	101.0
6/28/99	23.5	30.1	38.9	74.4	86.2	101.9
6/29/99	23.6	28.8	33.9	74.4	83.9	93.0
6/30/99	23.4	30.6	39.9	74.1	87.1	103.8
7/1/99	24.6	32.9	40.9	76.2	91.1	105.7
7/2/99	23.9	29.9	37.1	75.0	85.8	98.8
7/3/99	22.5	28.0	34.4	72.5	82.4	93.8
7/4/99	20.8	26.3	31.8	69.4	79.4	89.3
7/5/99	18.9	25.1	31.4	65.9	77.1	88.6
7/6/99	20.8	26.6	32.2	69.4	79.8	90.0
7/7/99	20.7	26.8	32.6	69.3	80.2	90.6
7/8/99	22.0	28.2	34.5	71.6	82.8	94.1
7/9/99	22.9	28.5	35.8	73.2	83.3	96.4
7/10/99	19.7	21.1	23.2	67.4	69.9	73.7
7/11/99	18.7	22.5	27.3	65.6	72.5	81.1
7/12/99	16.0	23.3	29.1	60.8	74.0	84.3
7/13/99	19.3	25.5	31.1	66.7	77.9	88.1
7/14/99	20.4	26.8	34.0	68.7	80.3	93.3
7/15/99	22.3	27.2	32.5	72.1	81.0	90.5
7/16/99	21.7	27.0	32.6	71.0	80.6	90.7
7/17/99	22.2	26.7	32.3	72.0	80.0	90.1
7/18/99	21.3	25.9	31.3	70.3	78.7	88.4
7/19/99	20.1	25.2	31.6	68.3	77.4	88.9
7/20/99	20.5	25.3	31.8	68.9	77.6	89.2
7/21/99	20.1	26.4	32.1	68.1	79.5	89.7
7/22/99	20.8	26.3	32.6	69.5	79.3	90.6
7/23/99	19.4	27.8	34.6	66.8	82.1	94.3
7/24/99	22.6	28.6	34.3	72.6	83.4	93.7
7/25/99	22.2	29.3	35.4	72.0	84.7	95.7
7/26/99	22.4	28.7	34.1	72.3	83.7	93.3
7/27/99	22.5	28.1	33.0	72.4	82.6	91.5
7/28/99	22.0	27.4	34.8	71.6	81.4	94.6
7/29/99	21.6	29.1	36.1	71.0	84.4	97.1
7/30/99	23.6	30.5	36.7	74.5	86.9	98.0
7/31/99	23.0	28.2	35.0	73.4	82.8	95.0
8/1/99	20.1	26.3	33.0	68.2	79.4	91.4
8/2/99	20.5	24.2	29.2	68.9	75.6	84.6
8/3/99	19.9	26.1	31.7	67.9	79.0	89.1
8/4/99	20.9	26.2	31.9	69.6	79.1	89.4
8/5/99	20.4	26.6	32.7	68.7	79.9	90.9
8/6/99	20.1	27.4	33.7	68.1	81.3	92.7
8/7/99	22.4	28.8	35.7	72.3	83.8	96.2
8/8/99	22.8	29.0	35.7	73.0	84.3	96.3
8/9/99	19.8	27.3	34.0	67.7	81.2	93.1
8/10/99	23.7	29.9	36.0	74.6	85.9	96.8
8/11/99	23.0	29.0	34.7	73.4	84.2	94.5
8/12/99	21.1	29.5	36.0	70.0	85.1	96.7
8/13/99	21.8	28.4	36.3	71.2	83.1	97.3
8/14/99	23.4	29.8	35.5	74.1	85.6	95.9
8/15/99	21.9	29.9	36.3	71.5	85.8	97.4
8/16/99	22.8	29.9	35.9	73.1	85.8	96.7
8/17/99	23.6	30.1	36.0	74.4	86.1	96.8
8/18/99	21.9	28.5	33.9	71.4	83.2	93.0
8/19/99	23.4	29.1	34.6	74.0	84.4	94.3
8/20/99	23.0	29.2	34.9	73.3	84.6	94.8
8/21/99	21.6	29.7	35.8	70.9	85.4	96.4
8/22/99	21.5	29.6	35.5	70.6	85.3	95.9
8/23/99	21.2	26.8	34.1	70.2	80.2	93.3

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
8/24/99	20.3	24.9	31.8	68.6	76.9	89.2
8/25/99	20.1	25.8	31.7	68.1	78.5	89.1
8/26/99	20.2	26.7	32.6	68.4	80.1	90.7
8/27/99	20.9	28.2	35.1	69.5	82.8	95.3
8/28/99	21.2	29.0	35.1	70.2	84.2	95.3
8/29/99	21.5	28.4	34.7	70.7	83.1	94.5
8/30/99	22.1	28.8	34.9	71.8	83.8	94.9
8/31/99	21.8	27.6	34.5	71.2	81.6	94.0
9/1/99	21.6	27.8	33.2	70.9	82.0	91.8
9/2/99	20.5	26.1	31.2	68.9	78.9	88.1
9/3/99	20.3	25.7	32.7	68.6	78.3	90.9
9/4/99	18.5	25.8	33.0	65.3	78.4	91.4
9/5/99	19.3	23.9	31.8	66.8	75.0	89.3
9/6/99	16.7	24.0	29.8	62.1	75.1	85.7
9/7/99	18.9	26.0	32.4	66.0	78.8	90.3
9/8/99	19.6	24.7	29.6	67.3	76.4	85.3
9/9/99	18.2	22.2	27.9	64.7	72.0	82.2
9/10/99	18.5	24.5	32.0	65.2	76.1	89.6
9/11/99	20.0	26.9	34.3	68.0	80.5	93.8
9/12/99	19.7	24.5	29.2	67.4	76.2	84.6
9/13/99	15.6	18.8	23.5	60.1	65.8	74.3
9/14/99	15.7	22.2	29.1	60.2	72.0	84.4
9/15/99	19.5	24.0	30.0	67.2	75.1	86.0
9/16/99	16.1	19.9	26.2	61.0	67.9	79.1
9/17/99	15.7	19.7	25.0	60.3	67.4	77.0
9/18/99	15.1	22.0	28.3	59.2	71.6	82.9
9/19/99	16.9	25.0	32.5	62.5	76.9	90.5
9/20/99	14.5	20.0	26.8	58.1	68.1	80.2
9/21/99	13.5	14.8	16.3	56.4	58.6	61.4
9/22/99	11.2	17.7	24.6	52.2	63.9	76.3
9/23/99	14.2	22.3	30.3	57.5	72.1	86.5
9/24/99	16.7	25.3	32.9	62.0	77.5	91.1
9/25/99	16.1	24.9	32.1	61.0	76.8	89.9
9/26/99	20.5	27.4	35.1	69.0	81.4	95.1
9/27/99	16.1	22.5	29.5	60.9	72.5	85.2
9/28/99	10.5	16.4	21.7	50.9	61.6	71.1
9/29/99	6.3	11.7	18.9	43.3	53.0	65.9
9/30/99	9.4	16.7	28.7	48.9	62.1	83.6
10/1/99	12.7	22.4	31.7	54.8	72.3	89.1

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
10/2/99	11.9	18.1	24.7	53.4	64.6	76.5
10/3/99	10.8	22.0	32.3	51.4	71.6	90.2
10/4/99	10.2	15.8	22.6	50.4	60.4	72.6
10/5/99	11.7	20.8	29.8	53.0	69.4	85.7
10/6/99	14.9	22.9	29.7	58.9	73.2	85.4
10/7/99	17.2	22.9	30.5	63.0	73.1	87.0
10/8/99	10.7	16.9	22.5	51.2	62.5	72.5
10/9/99	8.6	16.6	25.2	47.6	61.9	77.3
10/10/99	13.0	20.2	28.2	55.5	68.4	82.8
10/11/99	14.3	20.4	26.5	57.7	68.7	79.7
10/12/99	14.8	20.7	27.2	58.7	69.3	81.0
10/13/99	14.2	22.3	30.4	57.6	72.1	86.7
10/14/99	15.5	21.6	28.3	59.8	70.9	82.9
10/15/99	13.7	22.7	31.7	56.7	72.8	89.0
10/16/99	10.9	17.7	21.7	51.6	63.9	71.0
10/17/99	2.3	5.3	12.4	36.1	41.5	54.4
10/18/99	1.5	6.8	12.2	34.7	44.3	54.0
10/19/99	2.6	10.2	16.9	36.6	50.3	62.4
10/20/99	6.2	13.1	20.7	43.1	55.5	69.2
10/21/99	9.0	16.9	24.7	48.1	62.5	76.4
10/22/99	10.0	19.0	27.2	50.0	66.2	81.0
10/23/99	13.3	18.6	25.2	55.9	65.5	77.3
10/24/99	9.6	18.2	26.4	49.2	64.8	79.6
10/25/99	8.7	17.9	27.1	47.7	64.3	80.8
10/26/99	10.1	17.9	26.7	50.2	64.2	80.0
10/27/99	12.2	19.4	27.1	54.0	66.9	80.8
10/28/99	10.8	16.5	23.0	51.5	61.7	73.4
10/29/99	11.0	18.4	28.2	51.8	65.2	82.7
10/30/99	5.4	11.9	18.0	41.7	53.4	64.4
10/31/99	3.1	11.0	20.3	37.6	51.8	68.5
11/1/99	7.8	10.9	14.6	46.1	51.6	58.4
11/4/99	13.3	20.4	25.6	55.9	68.8	78.0
11/5/99	8.5	17.5	27.1	47.2	63.5	80.7
11/6/99	10.0	17.5	25.9	50.0	63.5	78.7
11/7/99	11.1	15.6	21.5	52.0	60.1	70.8
11/8/99	9.8	16.5	24.3	49.7	61.7	75.7
11/9/99	11.2	17.9	26.0	52.2	64.2	78.9
11/10/99	9.5	17.6	26.7	49.0	63.6	80.0
11/11/99	11.2	16.2	22.6	52.2	61.1	72.7

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
11/12/99	11.5	16.2	22.2	52.7	61.1	72.0
11/13/99	11.5	17.0	23.5	52.8	62.6	74.4
11/14/99	9.0	16.9	24.6	48.2	62.4	76.3
11/15/99	7.1	14.9	21.4	44.8	58.8	70.5
11/16/99	11.2	16.7	23.4	52.1	62.1	74.2
11/17/99	8.4	16.5	25.6	47.1	61.6	78.0
11/18/99	12.8	19.2	25.8	55.1	66.6	78.4
11/19/99	8.1	12.7	17.4	46.5	54.8	63.3
11/20/99	6.8	15.6	24.9	44.2	60.1	76.9
11/21/99	10.6	16.8	23.3	51.1	62.3	73.9
11/22/99	5.8	13.3	18.3	42.5	56.0	64.9
11/23/99	1.3	6.7	12.0	34.4	44.1	53.6
11/24/99	-0.3	3.7	7.9	31.4	38.7	46.3
11/25/99	-1.7	6.9	14.7	28.9	44.4	58.5
11/26/99	4.3	12.8	21.2	39.8	55.0	70.1
11/27/99	8.6	17.2	25.3	47.5	62.9	77.5
11/28/99	5.8	14.6	22.9	42.5	58.3	73.1
11/29/99	2.7	9.6	16.7	36.8	49.3	62.1
11/30/99	4.4	9.8	17.0	39.9	49.6	62.7
12/1/99	8.1	13.5	22.1	46.5	56.4	71.7
12/2/99	7.4	13.6	19.4	45.3	56.4	66.9
12/3/99	4.2	12.9	19.7	39.5	55.3	67.5
12/4/99	-1.4	3.0	6.0	29.4	37.3	42.7
12/5/99	-4.0	3.7	11.5	24.7	38.7	52.6
12/6/99	1.0	7.5	14.5	33.7	45.4	58.0
12/7/99	2.4	11.3	19.8	36.3	52.4	67.6
12/8/99	3.9	12.1	21.3	39.0	53.9	70.3
12/9/99	-0.3	4.8	10.2	31.5	40.7	50.3
12/10/99	0.6	6.7	13.6	33.0	44.1	56.5
12/11/99	-1.1	5.3	11.0	30.1	41.6	51.8
12/12/99	0.3	4.8	10.9	32.5	40.7	51.7
12/13/99	-0.8	7.6	15.4	30.6	45.6	59.6
12/14/99	-1.2	6.0	9.1	29.9	42.8	48.4
12/15/99	-6.7	1.8	9.2	20.0	35.2	48.6
12/16/99	-2.5	6.7	14.9	27.6	44.1	58.8
12/17/99	-1.9	8.4	18.9	28.5	47.0	66.1
12/18/99	-2.7	6.6	15.8	27.1	43.9	60.5
12/19/99	4.5	9.1	13.2	40.0	48.5	55.7
12/20/99	-3.0	1.4	4.4	26.7	34.5	39.8

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
12/21/99	-5.4	0.1	5.0	22.3	32.2	41.0
12/22/99	-3.2	1.5	7.0	26.3	34.6	44.6
12/23/99	-4.1	4.2	11.3	24.6	39.6	52.3
12/24/99	1.3	5.5	8.9	34.4	41.9	48.0
12/25/99	2.9	4.8	6.5	37.2	40.6	43.6
12/26/99	3.7	6.6	10.4	38.7	44.0	50.8
12/27/99	-1.3	6.7	15.6	29.6	44.1	60.1
12/28/99	1.9	9.0	17.7	35.4	48.3	63.9
12/29/99	3.1	10.7	17.9	37.6	51.3	64.3
12/30/99	3.9	11.9	19.6	39.0	53.5	67.3
12/31/99	3.9	10.6	18.9	39.0	51.0	66.1
1/1/00	5.4	13.6	21.0	41.7	56.5	69.8
1/2/00	5.3	11.2	17.3	41.5	52.2	63.2
1/3/00	-2.0	4.4	7.8	28.4	40.0	46.1
1/4/00	-6.8	1.6	8.5	19.7	35.0	47.3
1/5/00	-0.2	7.6	17.2	31.6	45.7	63.0
1/6/00	-4.1	2.8	9.9	24.6	37.0	49.9
1/7/00	-3.5	0.1	5.1	25.8	32.2	41.1
1/8/00	-2.8	5.4	14.4	26.9	41.8	58.0
1/9/00	3.0	9.7	17.1	37.5	49.5	62.9
1/10/00	5.0	12.6	20.7	41.1	54.7	69.3
1/11/00	6.8	14.2	23.3	44.2	57.6	73.9
1/12/00	9.2	16.7	24.2	48.6	62.1	75.6
1/13/00	4.7	9.8	15.3	40.5	49.6	59.6
1/14/00	0.5	6.8	13.0	32.9	44.2	55.4
1/15/00	4.3	12.1	21.9	39.8	53.8	71.4
1/16/00	7.1	14.5	24.1	44.7	58.2	75.4
1/17/00	4.6	15.1	25.7	40.2	59.1	78.2
1/18/00	7.1	16.9	24.3	44.7	62.4	75.8
1/19/00	10.6	18.5	25.8	51.0	65.4	78.5
1/20/00	2.7	8.6	12.4	36.8	47.4	54.3
1/21/00	3.6	13.3	22.4	38.4	55.9	72.4
1/22/00	11.7	16.1	19.8	53.1	60.9	67.6
1/23/00	6.4	12.9	19.0	43.5	55.3	66.2
1/24/00	2.0	10.6	18.2	35.6	51.0	64.7
1/25/00	2.8	9.3	14.9	37.1	48.8	58.9
1/26/00	-0.5	6.1	14.6	31.0	42.9	58.4
1/27/00	-3.2	2.4	10.9	26.2	36.4	51.5
1/28/00	-5.0	-2.0	1.8	23.0	28.5	35.2

Date	Min (C)	Avg (C)	Max (C)	Min (F)	Avg (F)	Max (F)
1/29/00	-6.3	-0.1	7.5	20.6	31.8	45.6
1/30/00	-3.6	3.8	12.2	25.5	38.9	53.9
1/31/00	-0.9	5.6	14.4	30.3	42.1	57.9
2/1/00	2.1	4.5	7.0	35.8	40.1	44.6
2/2/00	-4.1	3.3	10.6	24.5	37.9	51.2
2/3/00	-2.6	9.5	21.1	27.4	49.1	69.9
2/4/00	0.9	5.4	9.7	33.6	41.7	49.5
2/5/00	-1.7	5.7	13.6	28.9	42.3	56.5
2/6/00	3.0	11.3	21.4	37.4	52.4	70.5
2/7/00	3.3	11.3	18.5	38.0	52.3	65.3
2/8/00	7.2	14.3	21.9	44.9	57.8	71.4
2/9/00	11.2	18.1	26.8	52.1	64.6	80.3
2/10/00	14.3	18.8	23.8	57.7	65.9	74.8
2/11/00	8.6	16.6	23.0	47.5	61.9	73.3
2/12/00	0.9	12.4	22.9	33.5	54.4	73.2
2/13/00	9.7	14.7	20.2	49.5	58.5	68.4
2/14/00	9.2	16.7	23.5	48.6	62.1	74.3
2/15/00	9.7	18.9	27.7	49.4	66.0	81.9
2/16/00	5.5	14.0	21.0	41.9	57.2	69.8
2/17/00	8.9	17.6	26.3	47.9	63.7	79.3
2/18/00	7.6	12.6	17.6	45.8	54.6	63.6
2/19/00	1.5	9.0	17.1	34.7	48.1	62.8
2/20/00	6.6	12.7	19.5	43.8	54.9	67.1
2/21/00	7.3	16.1	25.7	45.2	61.1	78.2
2/22/00	7.1	13.2	18.6	44.8	55.7	65.4
2/23/00	4.2	13.3	21.4	39.6	55.9	70.5
2/24/00	8.6	17.0	24.1	47.5	62.7	75.4
2/25/00	6.9	12.6	16.6	44.4	54.7	61.9
2/26/00	1.8	9.0	15.6	35.3	48.2	60.1
2/27/00	5.9	14.2	22.9	42.6	57.6	73.2
2/28/00	8.8	16.5	25.1	47.8	61.6	77.2
2/29/00	5.5	13.7	20.4	41.9	56.6	68.8

Appendix C: Atmospheric Stability Class by Percentage

Stability Class	September 1996	October 1996	November 1996	December 1996	January 1997	February 1997
A	21.68	20.64	14.84	11.68	11.95	15.19
B	5.37	5.57	4.17	4.96	5.06	4.06
C	4.63	5.87	5.26	5.84	5.63	4.71
D	17.40	17.14	21.33	13.65	29.80	33.58
E	19.99	19.08	17.01	11.74	11.47	19.43
F	13.57	13.82	14.00	18.87	13.58	9.48
G	17.36	17.89	23.40	33.27	22.51	13.54

Table C.1

Stability Class	March 1997	April 1997	May 1997	June 1997	July 1997	August 1997
A	25.21	26.55	27.22	24.27	24.27	26.55
B	4.88	4.24	6.11	8.18	8.18	4.24
C	4.54	5.09	6.04	6.11	6.11	5.09
D	14.83	25.39	19.30	13.75	13.75	25.39
E	16.45	22.52	24.50	29.50	29.50	22.52
F	14.69	7.30	9.53	10.96	10.96	7.30
G	19.40	8.91	7.22	7.23	7.23	8.91

Table C.2

Stability Class	September 1997	October 1997	November 1997	December 1997	January 1998	February 1998
A	20.77	20.57	13.34	10.90	16.29	18.51
B	5.68	5.57	6.01	5.13	4.82	5.52
C	4.93	4.24	6.18	6.21	4.31	5.44
D	16.19	15.58	19.38	18.47	10.73	13.75
E	20.94	18.06	11.07	16.02	11.00	20.68
F	12.46	14.60	14.70	15.89	18.91	18.76
G	19.03	21.32	29.33	27.36	33.94	17.34

Table C.3

Stability Class	March 1998	April 1998	May 1998	June 1998	July 1998	August 1998
A	27.83	30.52	29.90	35.92	29.56	26.61
B	4.75	5.02	4.85	4.67	4.47	5.19
C	3.19	3.16	4.28	3.61	4.97	5.36
D	18.16	9.26	10.86	10.52	12.63	16.87
E	17.48	21.40	12.32	18.80	23.16	19.11
F	12.59	12.38	12.86	9.47	13.84	13.07
G	15.99	18.24	24.92	17.01	11.37	13.78

Table C.4

Stability Class	September 1998	October 1998	November 1998	December 1998	January 1999	February 1999
A	28.27	22.17	13.75	9.98	12.83	21.95
B	4.21	4.14	5.30	5.84	5.26	3.65
C	3.93	3.90	5.51	5.43	5.70	3.46
D	10.21	14.56	18.38	19.04	13.17	9.58
E	21.19	28.82	14.59	13.65	13.68	14.69
F	14.07	13.65	11.33	16.46	15.31	15.26
G	18.13	12.76	31.11	29.60	34.05	31.42

Table C.5

Stability Class	March 1999	April 1999	May 1999	June 1999	July 1999	August 1999
A	25.42	28.47	31.74	26.58	35.87	30.07
B	6.96	4.26	4.77	6.90	4.92	5.63
C	3.84	4.22	3.70	5.85	3.83	4.10
D	15.41	14.88	13.57	19.18	20.67	11.13
E	16.23	16.38	21.20	27.70	19.58	15.98
F	14.19	11.56	9.98	7.19	10.45	16.83
G	17.96	20.23	15.05	6.55	4.65	16.19

Table C.6

Stability Class	September 1999	October 1999	November 1999	December 1999	January 2000	February 2000
A	25.99	22.16	15.61	12.83	13.66	21.62
B	5.50	5.77	6.24	5.36	4.72	4.42
C	5.85	5.39	5.46	4.92	5.77	3.99
D	17.01	13.98	9.01	14.01	14.10	9.43
E	20.30	11.60	10.42	15.41	15.39	17.59
F	12.06	10.38	15.53	18.16	17.53	13.86
G	13.25	30.68	37.64	29.29	28.78	29.06

Table C.7

Appendix D: Wind Direction by Percentage

Wind Direction	September 1996	October 1996	November 1996	December 1996	January 1997	February 1997
N	1.75	2.89	4.91	2.51	4.68	6.18
NNE	2.63	4.18	5.23	6.96	6.18	6.36
NE	3.26	3.46	5.12	5.40	5.36	3.81
ENE	5.58	4.04	4.42	2.99	6.62	3.34
E	9.12	6.18	5.65	4.14	10.05	9.81
ESE	21.54	12.19	13.43	10.29	8.04	17.56
SE	18.94	16.90	16.20	10.90	9.16	15.88
SSE	9.40	11.68	11.01	7.67	6.72	8.58
S	6.38	9.61	7.37	6.72	5.91	5.35
SSW	4.70	6.48	4.67	8.28	5.63	2.05
SW	3.33	4.24	2.81	7.50	3.80	2.12
WSW	4.00	4.82	4.67	8.49	5.67	2.26
W	3.82	5.36	5.44	8.55	8.32	1.36
WNW	2.10	3.46	3.47	3.67	5.06	3.05
NW	1.96	2.55	2.84	2.95	5.33	5.53
NNW	1.47	1.97	2.77	2.99	3.46	6.75

Table D.1

Wind Direction	March 1997	April 1997	May 1997	June 1997	July 1997	August 1997
N	4.38	7.93	2.58	2.28	0.71	7.93
NNE	5.21	4.74	4.46	2.10	0.85	4.74
NE	7.56	3.68	6.81	3.16	1.66	3.68
ENE	3.25	5.40	7.12	5.02	2.99	5.40
E	3.45	4.98	9.30	10.17	8.69	4.98
ESE	11.08	8.17	14.74	21.12	24.13	8.17
SE	16.25	17.75	17.32	17.36	29.70	17.75
SSE	11.94	9.33	10.57	11.93	14.05	9.33
S	6.63	5.68	6.68	6.63	7.13	5.68
SSW	3.45	3.58	3.69	4.14	4.41	3.58
SW	3.75	2.60	3.16	3.65	2.00	2.60
WSW	6.60	6.07	4.50	3.16	1.19	6.07
W	6.57	8.63	3.42	3.02	0.95	8.63
WNW	3.32	2.84	1.91	2.49	0.58	2.84
NW	3.52	3.26	1.51	2.28	0.37	3.26
NNW	3.05	5.37	2.15	1.51	0.58	5.37

Table D.2

Wind Direction	September 1997	October 1997	November 1997	December 1997	January 1998	February 1998
N	2.05	4.92	5.57	11.58	7.06	4.75
NNE	3.22	2.95	8.35	9.47	5.57	3.37
NE	5.58	3.26	4.75	6.08	5.09	2.54
ENE	5.78	4.38	3.02	5.16	4.51	2.69
E	10.34	5.50	8.45	5.87	5.80	4.93
ESE	19.78	14.39	13.82	7.43	10.93	9.58
SE	19.23	17.79	13.99	6.38	11.24	9.11
SSE	11.84	11.30	7.26	4.79	7.33	7.95
S	6.71	4.58	6.79	3.73	6.59	6.39
SSW	3.11	3.19	4.45	3.33	4.51	4.10
SW	2.57	3.12	3.73	2.82	4.48	4.25
WSW	2.50	3.09	3.97	5.23	3.77	4.46
W	1.44	8.59	5.19	6.01	6.65	13.97
WNW	1.13	4.55	3.77	5.23	4.89	8.31
NW	2.09	4.01	3.77	6.82	5.16	6.02
NNW	2.64	4.31	3.12	10.05	6.42	7.58

Table D.3

Wind Direction	March 1998	April 1998	May 1998	June 1998	July 1998	August 1998
N	4.45	5.44	2.51	2.49	2.47	3.67
NNE	1.29	3.61	1.90	2.35	2.78	5.33
NE	1.90	3.40	2.27	1.47	4.72	5.67
ENE	2.92	4.28	1.60	1.33	4.13	7.60
E	7.98	4.31	4.55	2.39	5.75	14.12
ESE	13.37	9.15	10.22	9.37	11.84	20.94
SE	10.83	9.89	11.51	17.36	19.59	21.05
SSE	7.74	7.58	9.30	14.56	16.66	8.66
S	7.16	4.59	7.06	5.05	9.19	4.11
SSW	4.01	4.03	6.69	4.77	6.38	1.87
SW	4.82	3.61	6.25	4.81	3.25	1.19
WSW	6.14	8.38	8.96	12.56	2.72	0.71
W	10.35	11.86	11.44	10.24	2.63	0.48
WNW	4.62	7.72	6.48	5.47	2.19	0.75
NW	6.35	5.09	5.77	3.40	2.47	1.22
NNW	6.08	7.02	3.50	2.39	3.25	2.65

Table D.4

Wind Direction	September 1998	October 1998	November 1998	December 1998	January 1999	February 1999
N	2.21	3.46	3.51	5.63	4.11	6.54
NNE	2.56	3.60	3.86	5.60	4.58	5.41
NE	4.17	4.41	3.44	6.35	4.72	2.44
ENE	6.84	4.96	5.23	5.13	2.17	2.59
E	13.43	5.74	11.50	5.30	4.58	5.19
ESE	18.77	12.93	15.96	13.85	8.89	10.37
SE	21.47	22.67	15.33	13.54	12.66	13.12
SSE	12.56	11.95	9.12	8.66	8.89	9.06
S	6.59	9.16	8.14	5.30	6.25	6.43
SSW	1.51	4.14	6.21	5.06	5.16	7.07
SW	1.26	4.24	3.19	4.62	6.45	5.90
WSW	2.03	4.28	3.16	5.33	6.92	8.19
W	1.61	2.31	2.10	5.36	7.54	6.99
WNW	2.14	1.73	1.54	2.99	4.89	2.93
NW	1.47	2.00	3.16	3.09	6.45	2.97
NNW	1.37	2.41	4.52	4.21	5.74	4.81

Table D.5

Wind Direction	March 1999	April 1999	May 1999	June 1999	July 1999	August 1999
N	4.48	2.86	3.46	2.87	0.47	2.41
NNE	4.38	4.14	3.66	3.40	0.91	2.24
NE	4.04	4.37	4.60	2.52	1.93	2.85
ENE	5.77	4.82	5.74	4.73	3.73	4.24
E	7.98	8.74	9.81	7.43	3.39	12.49
ESE	14.80	13.82	12.33	17.85	12.55	21.52
SE	13.68	9.23	13.60	23.88	33.53	19.85
SSE	8.72	4.67	7.69	13.78	21.18	12.93
S	4.99	5.27	4.50	8.03	9.06	4.92
SSW	3.63	6.85	5.04	4.10	4.31	3.25
SW	2.99	6.85	7.66	2.66	2.13	2.91
WSW	4.62	9.08	8.50	1.85	2.27	2.24
W	5.30	9.38	7.83	1.96	2.13	1.73
WNW	3.77	5.57	1.88	0.94	0.95	1.45
NW	4.79	2.49	1.01	1.71	0.78	2.34
NNW	6.08	1.85	2.69	2.20	0.61	2.54

Table D.6

Wind Direction	September 1999	October 1999	November 1999	December 1999	January 2000	February 2000
N	4.27	6.68	2.88	8.07	3.29	3.19
NNE	6.24	5.83	3.51	9.36	4.89	2.86
NE	7.57	3.69	2.81	7.50	5.81	3.04
ENE	7.26	2.13	2.18	3.49	2.99	3.88
E	8.34	3.12	10.54	6.04	9.78	5.40
ESE	13.25	18.66	20.77	7.84	12.57	13.35
SE	15.95	14.69	17.06	9.67	11.28	12.73
SSE	9.71	9.70	7.84	6.21	9.00	5.95
S	8.38	7.60	6.48	5.90	4.96	5.91
SSW	4.59	4.71	6.63	6.55	4.55	5.37
SW	2.10	2.61	3.86	3.83	5.13	5.37
WSW	2.17	2.88	3.27	3.97	6.32	7.76
W	2.63	2.71	5.38	4.00	6.18	11.42
WNW	2.49	2.98	2.06	3.15	4.72	4.97
NW	2.10	4.78	1.99	5.94	4.28	5.18
NNW	2.87	7.12	2.61	8.41	4.18	3.55

Table D.7

Appendix E: Daily Precipitation

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
9/1/96							
9/2/96							
9/3/96							
9/4/96	0.03				0.76		
9/5/96							
9/6/96							
9/7/96							
9/8/96	0.03				0.76		
9/9/96							
9/10/96							
9/11/96							
9/12/96	0.49				12.45		
9/13/96	0.46				11.68		
9/14/96							
9/15/96	0.23				5.84		
9/16/96							
9/17/96							
9/18/96							
9/19/96							
9/20/96							
9/21/96							
9/22/96							
9/23/96							
9/24/96							
9/25/96							
9/26/96							
9/27/96	0.01				0.25		
9/28/96							
9/29/96							
9/30/96		1.25				31.75	
10/1/96							
10/2/96							
10/3/96							

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
10/4/96							
10/5/96							
10/6/96							
10/7/96							
10/8/96							
10/9/96							
10/10/96							
10/11/96							
10/12/96							
10/13/96							
10/14/96							
10/15/96							
10/16/96							
10/17/96							
10/18/96							
10/19/96							
10/20/96							
10/21/96							
10/22/96	0.03				0.76		
10/23/96							
10/24/96							
10/25/96							
10/26/96							
10/27/96							
10/28/96							
10/29/96							
10/30/96							
10/31/96		0.03				0.76	
11/1/96							
11/2/96							
11/3/96							
11/4/96							
11/5/96							
11/6/96							
11/7/96							

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
11/8/96							
11/9/96							
11/10/96							
11/11/96							
11/12/96							
11/13/96							
11/14/96							
11/15/96							
11/16/96							
11/17/96							
11/18/96							
11/19/96							
11/20/96							
11/21/96							
11/22/96							
11/23/96							
11/24/96							
11/25/96							
11/26/96							
11/27/96							
11/28/96							
11/29/96	0.41				10.41		
11/30/96	0.05	0.46			1.27	11.68	
12/1/96	0.03				0.76		
12/2/96							
12/3/96							
12/4/96							
12/5/96							
12/6/96							
12/7/96							
12/8/96							
12/9/96							
12/10/96							
12/11/96							
12/12/96							

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
12/13/96							
12/14/96							
12/15/96							
12/16/96							
12/17/96							
12/18/96							
12/19/96							
12/20/96							
12/21/96							
12/22/96							
12/23/96							
12/24/96							
12/25/96							
12/26/96							
12/27/96							
12/28/96							
12/29/96							
12/30/96							
12/31/96		0.03				0.76	
1/1/97			0.00				0.00
1/2/97			0.00				0.00
1/3/97			0.00				0.00
1/4/97	0.04		0.04		1.02		1.02
1/5/97			0.04				1.02
1/6/97			0.04				1.02
1/7/97			0.04				1.02
1/8/97	0.11		0.15		2.79		3.81
1/9/97	0.02		0.17		0.51		4.32
1/10/97			0.17				4.32
1/11/97			0.17				4.32
1/12/97			0.17				4.32
1/13/97			0.17				4.32
1/14/97			0.17				4.32
1/15/97			0.17				4.32
1/16/97			0.17				4.32

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
1/17/97			0.17				4.32
1/18/97			0.17				4.32
1/19/97			0.17				4.32
1/20/97			0.17				4.32
1/21/97			0.17				4.32
1/22/97			0.17				4.32
1/23/97			0.17				4.32
1/24/97			0.17				4.32
1/25/97			0.17				4.32
1/26/97			0.17				4.32
1/27/97			0.17				4.32
1/28/97			0.17				4.32
1/29/97			0.17				4.32
1/30/97			0.17				4.32
1/31/97		0.17	0.17			4.32	4.32
2/3/97			0.17				4.32
2/4/97			0.17				4.32
2/5/97			0.17				4.32
2/6/97			0.17				4.32
2/7/97			0.17				4.32
2/8/97			0.17				4.32
2/9/97			0.17				4.32
2/10/97			0.17				4.32
2/11/97			0.17				4.32
2/12/97	0.55		0.72		13.97		18.29
2/13/97	0.18		0.90		4.57		22.86
2/14/97			0.90				22.86
2/15/97			0.90				22.86
2/16/97			0.90				22.86
2/17/97			0.90				22.86
2/18/97	0.01		0.91		0.25		23.11
2/19/97	0.01		0.92		0.25		23.37
2/20/97			0.92				23.37
2/21/97			0.92				23.37
2/22/97			0.92				23.37

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
2/23/97			0.92				23.37
2/24/97			0.92				23.37
2/25/97	0.01		0.93		0.25		23.62
2/26/97			0.93				23.62
2/27/97			0.93				23.62
2/28/97		0.76	0.93			19.30	23.62
3/1/97	0.01		0.94		0.25		23.88
3/2/97			0.94				23.88
3/3/97			0.94				23.88
3/4/97			0.94				23.88
3/5/97			0.94				23.88
3/6/97			0.94				23.88
3/7/97			0.94				23.88
3/8/97			0.94				23.88
3/9/97			0.94				23.88
3/10/97			0.94				23.88
3/11/97			0.94				23.88
3/12/97			0.94				23.88
3/13/97			0.94				23.88
3/14/97			0.94				23.88
3/15/97			0.94				23.88
3/16/97			0.94				23.88
3/17/97			0.94				23.88
3/18/97			0.94				23.88
3/19/97			0.94				23.88
3/20/97			0.94				23.88
3/21/97	0.89		1.83		22.61		46.49
3/22/97			1.83				46.49
3/23/97			1.83				46.49
3/24/97			1.83				46.49
3/25/97			1.83				46.49
3/26/97			1.83				46.49
3/27/97	0.02		1.85		0.51		46.99
3/28/97			1.85				46.99
3/29/97			1.85				46.99

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
3/30/97			1.85				46.99
3/31/97		0.92	1.85			23.37	46.99
4/1/97			1.85				46.99
4/2/97	0.20		2.05		5.08		52.07
4/3/97	0.19		2.24		4.83		56.90
4/4/97			2.24				56.90
4/5/97			2.24				56.90
4/6/97			2.24				56.90
4/7/97			2.24				56.90
4/8/97			2.24				56.90
4/9/97			2.24				56.90
4/10/97			2.24				56.90
4/11/97			2.24				56.90
4/12/97			2.24				56.90
4/13/97			2.24				56.90
4/14/97			2.24				56.90
4/15/97			2.24				56.90
4/16/97			2.24				56.90
4/17/97			2.24				56.90
4/18/97	0.19		2.43		4.83		61.73
4/19/97			2.43				61.73
4/20/97			2.43				61.73
4/21/97			2.43				61.73
4/22/97			2.43				61.73
4/23/97			2.43				61.73
4/24/97	0.14		2.57		3.56		65.28
4/25/97	0.46		3.03		11.68		76.96
4/26/97	0.19		3.22		4.83		81.79
4/27/97			3.22				81.79
4/28/97			3.22				81.79
4/29/97			3.22				81.79
4/30/97		1.37	3.22			34.79	81.79
5/2/97			3.22				81.79
5/3/97			3.22				81.79
5/4/97			3.22				81.79

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
5/5/97			3.22				81.79
5/6/97	0.47		3.69		11.94		93.73
5/7/97			3.69				93.73
5/8/97	0.51		4.20		12.95		106.68
5/9/97			4.20				106.68
5/10/97			4.20				106.68
5/11/97			4.20				106.68
5/12/97	0.01		4.21		0.25		106.93
5/13/97			4.21				106.93
5/14/97			4.21				106.93
5/15/97			4.21				106.93
5/16/97			4.21				106.93
5/17/97			4.21				106.93
5/18/97			4.21				106.93
5/19/97			4.21				106.93
5/20/97			4.21				106.93
5/21/97	0.66		4.87		16.76		123.69
5/22/97	0.03		4.90		0.76		124.45
5/23/97			4.90				124.45
5/24/97			4.90				124.45
5/25/97			4.90				124.45
5/26/97			4.90				124.45
5/27/97			4.90				124.45
5/28/97			4.90				124.45
5/29/97			4.90				124.45
5/30/97			4.90				124.45
5/31/97		1.68	4.90			42.67	124.45
6/1/97			4.90				124.45
6/2/97			4.90				124.45
6/3/97			4.90				124.45
6/4/97			4.90				124.45
6/5/97			4.90				124.45
6/6/97			4.90				124.45
6/7/97	0.53		5.43		13.46		137.91
6/8/97	0.01		5.44		0.25		138.17

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
6/9/97			5.44				138.17
6/10/97			5.44				138.17
6/11/97	0.89		6.33		22.61		160.78
6/12/97			6.33				160.78
6/13/97			6.33				160.78
6/14/97	0.26		6.59		6.60		167.38
6/15/97			6.59				167.38
6/16/97			6.59				167.38
6/17/97			6.59				167.38
6/18/97			6.59				167.38
6/19/97			6.59				167.38
6/20/97			6.59				167.38
6/21/97			6.59				167.38
6/22/97			6.59				167.38
6/23/97			6.59				167.38
6/24/97			6.59				167.38
6/25/97			6.59				167.38
6/26/97			6.59				167.38
6/27/97	0.90		7.49		22.86		190.24
6/28/97			7.49				190.24
6/29/97			7.49				190.24
6/30/97		2.59	7.49			65.79	190.24
7/1/97			7.49				190.24
7/2/97			7.49				190.24
7/3/97			7.49				190.24
7/4/97	2.13		9.62		54.10		244.34
7/5/97	0.10		9.72		2.54		246.88
7/6/97	0.16		9.88		4.06		250.95
7/7/97			9.88				250.95
7/8/97	1.36		11.24		34.54		285.49
7/9/97			11.24				285.49
7/10/97			11.24				285.49
7/11/97			11.24				285.49
7/12/97			11.24				285.49
7/13/97			11.24				285.49

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
7/14/97			11.24				285.49
7/15/97			11.24				285.49
7/16/97			11.24				285.49
7/17/97			11.24				285.49
7/18/97			11.24				285.49
7/19/97			11.24				285.49
7/20/97			11.24				285.49
7/21/97			11.24				285.49
7/22/97			11.24				285.49
7/23/97			11.24				285.49
7/24/97			11.24				285.49
7/25/97	0.41		11.65		10.41		295.90
7/26/97			11.65				295.90
7/27/97			11.65				295.90
7/28/97			11.65				295.90
7/29/97			11.65				295.90
7/30/97	0.02		11.67		0.51		296.40
7/31/97	1.34	5.52	13.01		34.04	140.20	330.44
8/1/97			13.01				330.44
8/2/97			13.01				330.44
8/3/97			13.01				330.44
8/4/97			13.01				330.44
8/5/97	0.42		13.43		10.67		341.11
8/6/97			13.43				341.11
8/7/97	0.10		13.53		2.54		343.65
8/8/97			13.53				343.65
8/9/97			13.53				343.65
8/10/97			13.53				343.65
8/11/97			13.53				343.65
8/12/97	1.16		14.69		29.46		373.11
8/13/97			14.69				373.11
8/14/97			14.69				373.11
8/15/97			14.69				373.11
8/16/97			14.69				373.11
8/17/97			14.69				373.11

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
8/18/97	0.02		14.71		0.51		373.62
8/19/97			14.71				373.62
8/20/97			14.71				373.62
8/21/97			14.71				373.62
8/22/97	0.04		14.75		1.02		374.64
8/23/97	0.01		14.76		0.25		374.89
8/24/97			14.76				374.89
8/25/97			14.76				374.89
8/26/97			14.76				374.89
8/27/97	0.01		14.77		0.25		375.15
8/28/97			14.77				375.15
8/29/97			14.77				375.15
8/30/97			14.77				375.15
8/31/97		1.76	14.77			44.70	375.15
9/1/97			14.77				375.15
9/2/97			14.77				375.15
9/3/97	1.24		16.01		31.50		406.65
9/4/97	0.01		16.02		0.25		406.90
9/5/97			16.02				406.90
9/6/97			16.02				406.90
9/7/97			16.02				406.90
9/8/97			16.02				406.90
9/9/97	0.02		16.04		0.51		407.41
9/10/97	0.15		16.19		3.81		411.22
9/11/97			16.19				411.22
9/12/97	0.01		16.20		0.25		411.47
9/13/97			16.20				411.47
9/14/97			16.20				411.47
9/15/97			16.20				411.47
9/16/97			16.20				411.47
9/17/97			16.20				411.47
9/18/97			16.20				411.47
9/19/97			16.20				411.47
9/20/97			16.20				411.47
9/21/97	0.71		16.91		18.03		429.50

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
9/22/97	1.09		18.00		27.69		457.19
9/23/97	0.21		18.21		5.33		462.53
9/24/97			18.21				462.53
9/25/97			18.21				462.53
9/26/97			18.21				462.53
9/27/97			18.21				462.53
9/28/97			18.21				462.53
9/29/97			18.21				462.53
9/30/97		3.44	18.21			87.38	462.53
10/1/97			18.21				462.53
10/2/97			18.21				462.53
10/3/97			18.21				462.53
10/4/97			18.21				462.53
10/5/97			18.21				462.53
10/6/97	0.24		18.45		6.10		468.62
10/7/97	1.04		19.49		26.42		495.04
10/8/97	0.01		19.50		0.25		495.30
10/9/97	0.05		19.55		1.27		496.57
10/10/97	0.01		19.56		0.25		496.82
10/11/97	0.04		19.60		1.02		497.84
10/12/97			19.60				497.84
10/13/97			19.60				497.84
10/14/97			19.60				497.84
10/15/97			19.60				497.84
10/16/97			19.60				497.84
10/17/97			19.60				497.84
10/18/97			19.60				497.84
10/19/97			19.60				497.84
10/20/97			19.60				497.84
10/21/97			19.60				497.84
10/22/97	0.30		19.90		7.62		505.46
10/23/97	0.01		19.91		0.25		505.71
10/24/97			19.91				505.71
10/25/97	0.04		19.95		1.02		506.73
10/26/97			19.95				506.73

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
10/27/97			19.95				506.73
10/28/97			19.95				506.73
10/29/97			19.95				506.73
10/30/97			19.95				506.73
10/31/97		1.74	19.95			44.20	506.73
11/1/97			19.95				506.73
11/2/97			19.95				506.73
11/3/97			19.95				506.73
11/4/97			19.95				506.73
11/5/97			19.95				506.73
11/6/97			19.95				506.73
11/7/97			19.95				506.73
11/8/97			19.95				506.73
11/9/97			19.95				506.73
11/10/97			19.95				506.73
11/11/97	0.12		20.07		3.05		509.77
11/12/97	0.08		20.15		2.03		511.81
11/13/97	0.01		20.16		0.25		512.06
11/14/97			20.16				512.06
11/15/97			20.16				512.06
11/16/97			20.16				512.06
11/17/97			20.16				512.06
11/18/97			20.16				512.06
11/19/97			20.16				512.06
11/20/97			20.16				512.06
11/21/97			20.16				512.06
11/22/97			20.16				512.06
11/23/97			20.16				512.06
11/24/97	0.14		20.30		3.56		515.62
11/25/97			20.30				515.62
11/26/97			20.30				515.62
11/27/97			20.30				515.62
11/28/97			20.30				515.62
11/29/97			20.30				515.62
11/30/97		0.35	20.30			8.89	515.62

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
12/1/97			20.30				515.62
12/2/97	0.38		20.68		9.65		525.27
12/3/97	0.35		21.03		8.89		534.16
12/4/97	1.28		22.31		32.51		566.67
12/5/97	0.53		22.84		13.46		580.13
12/6/97			22.84				580.13
12/7/97	0.03		22.87		0.76		580.89
12/8/97			22.87				580.89
12/9/97			22.87				580.89
12/10/97			22.87				580.89
12/11/97			22.87				580.89
12/12/97			22.87				580.89
12/13/97			22.87				580.89
12/14/97			22.87				580.89
12/15/97			22.87				580.89
12/16/97			22.87				580.89
12/17/97			22.87				580.89
12/18/97			22.87				580.89
12/19/97			22.87				580.89
12/20/97	0.49		23.36		12.45		593.34
12/21/97			23.36				593.34
12/22/97	0.26		23.62		6.60		599.94
12/23/97	0.23		23.85		5.84		605.78
12/24/97			23.85				605.78
12/25/97	0.06		23.91		1.52		607.31
12/26/97			23.91				607.31
12/27/97			23.91				607.31
12/28/97			23.91				607.31
12/29/97			23.91				607.31
12/30/97			23.91				607.31
12/31/97		3.61	23.91			91.69	607.31
1/1/98			0.00				0.00
1/2/98			0.00				0.00
1/3/98			0.00				0.00
1/4/98	0.08		0.08		2.03		2.03

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
1/5/98			0.08				2.03
1/6/98			0.08				2.03
1/7/98			0.08				2.03
1/8/98			0.08				2.03
1/9/98			0.08				2.03
1/10/98			0.08				2.03
1/11/98			0.08				2.03
1/12/98			0.08				2.03
1/13/98			0.08				2.03
1/14/98			0.08				2.03
1/15/98			0.08				2.03
1/16/98			0.08				2.03
1/17/98			0.08				2.03
1/18/98			0.08				2.03
1/19/98			0.08				2.03
1/20/98			0.08				2.03
1/21/98			0.08				2.03
1/22/98			0.08				2.03
1/23/98			0.08				2.03
1/24/98			0.08				2.03
1/25/98			0.08				2.03
1/26/98			0.08				2.03
1/27/98			0.08				2.03
1/28/98			0.08				2.03
1/29/98			0.08				2.03
1/30/98			0.08				2.03
1/31/98		0.08	0.08			2.03	2.03
2/1/98			0.08				2.03
2/2/98			0.08				2.03
2/3/98			0.08				2.03
2/4/98	0.04		0.12		1.02		3.05
2/5/98			0.12				3.05
2/6/98			0.12				3.05
2/7/98			0.12				3.05
2/8/98			0.12				3.05

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
2/9/98			0.12				3.05
2/10/98			0.12				3.05
2/11/98			0.12				3.05
2/12/98			0.12				3.05
2/13/98			0.12				3.05
2/14/98			0.12				3.05
2/15/98	0.01		0.13		0.25		3.30
2/16/98			0.13				3.30
2/17/98			0.13				3.30
2/18/98			0.13				3.30
2/19/98			0.13				3.30
2/20/98			0.13				3.30
2/21/98			0.13				3.30
2/22/98			0.13				3.30
2/23/98			0.13				3.30
2/24/98			0.13				3.30
2/25/98			0.13				3.30
2/26/98			0.13				3.30
2/27/98			0.13				3.30
2/28/98		0.05	0.13			1.27	3.30
3/1/98			0.13				3.30
3/2/98			0.13				3.30
3/3/98			0.13				3.30
3/4/98			0.13				3.30
3/5/98			0.13				3.30
3/6/98			0.13				3.30
3/7/98			0.13				3.30
3/8/98			0.13				3.30
3/9/98			0.13				3.30
3/10/98			0.13				3.30
3/11/98			0.13				3.30
3/12/98			0.13				3.30
3/13/98			0.13				3.30
3/14/98			0.13				3.30
3/15/98			0.13				3.30

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
3/16/98	0.33		0.46		8.38		11.68
3/17/98	0.02		0.48		0.51		12.19
3/18/98			0.48				12.19
3/19/98			0.48				12.19
3/20/98			0.48				12.19
3/21/98			0.48				12.19
3/22/98			0.48				12.19
3/23/98			0.48				12.19
3/24/98			0.48				12.19
3/25/98			0.48				12.19
3/26/98			0.48				12.19
3/27/98			0.48				12.19
3/28/98			0.48				12.19
3/29/98			0.48				12.19
3/30/98			0.48				12.19
3/31/98		0.35	0.48			8.89	12.19
4/1/98			0.48				12.19
4/2/98			0.48				12.19
4/3/98			0.48				12.19
4/4/98			0.48				12.19
4/5/98			0.48				12.19
4/6/98			0.48				12.19
4/7/98			0.48				12.19
4/8/98			0.48				12.19
4/9/98			0.48				12.19
4/10/98			0.48				12.19
4/11/98			0.48				12.19
4/12/98			0.48				12.19
4/13/98			0.48				12.19
4/14/98			0.48				12.19
4/15/98			0.48				12.19
4/16/98			0.48				12.19
4/17/98	0.04		0.52		1.02		13.21
4/18/98			0.52				13.21
4/19/98			0.52				13.21

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
4/20/98			0.52				13.21
4/21/98			0.52				13.21
4/22/98	0.34		0.86		8.64		21.85
4/23/98	0.41		1.27		10.41		32.26
4/24/98			1.27				32.26
4/25/98			1.27				32.26
4/26/98			1.27				32.26
4/27/98			1.27				32.26
4/28/98			1.27				32.26
4/29/98			1.27				32.26
4/30/98		0.79	1.27			20.07	32.26
5/1/98			1.27				32.26
5/2/98			1.27				32.26
5/3/98			1.27				32.26
5/4/98			1.27				32.26
5/5/98			1.27				32.26
5/6/98			1.27				32.26
5/7/98			1.27				32.26
5/8/98			1.27				32.26
5/9/98			1.27				32.26
5/10/98			1.27				32.26
5/11/98			1.27				32.26
5/12/98			1.27				32.26
5/13/98			1.27				32.26
5/14/98			1.27				32.26
5/15/98			1.27				32.26
5/16/98			1.27				32.26
5/17/98			1.27				32.26
5/18/98			1.27				32.26
5/19/98	0.09		1.36		2.29		34.54
5/20/98			1.36				34.54
5/21/98			1.36				34.54
5/22/98			1.36				34.54
5/23/98			1.36				34.54
5/24/98			1.36				34.54

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
5/25/98			1.36				34.54
5/26/98			1.36				34.54
5/27/98			1.36				34.54
5/28/98			1.36				34.54
5/29/98			1.36				34.54
5/30/98			1.36				34.54
5/31/98		0.09	1.36			2.29	34.54
6/1/98			1.36				34.54
6/2/98			1.36				34.54
6/3/98			1.36				34.54
6/4/98			1.36				34.54
6/5/98			1.36				34.54
6/6/98			1.36				34.54
6/7/98			1.36				34.54
6/8/98			1.36				34.54
6/9/98			1.36				34.54
6/10/98	0.21		1.57		5.33		39.88
6/11/98			1.57				39.88
6/12/98			1.57				39.88
6/13/98			1.57				39.88
6/14/98			1.57				39.88
6/15/98			1.57				39.88
6/16/98			1.57				39.88
6/17/98			1.57				39.88
6/18/98			1.57				39.88
6/19/98			1.57				39.88
6/20/98			1.57				39.88
6/21/98			1.57				39.88
6/22/98			1.57				39.88
6/23/98			1.57				39.88
6/24/98	0.05		1.62		1.27		41.15
6/25/98			1.62				41.15
6/26/98			1.62				41.15
6/27/98			1.62				41.15
6/28/98			1.62				41.15

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
6/29/98			1.62				41.15
6/30/98		0.26	1.62			6.60	41.15
7/1/98			1.62				41.15
7/2/98	0.01		1.63		0.25		41.40
7/3/98			1.63				41.40
7/4/98			1.63				41.40
7/5/98			1.63				41.40
7/6/98			1.63				41.40
7/7/98			1.63				41.40
7/8/98			1.63				41.40
7/9/98			1.63				41.40
7/10/98			1.63				41.40
7/11/98			1.63				41.40
7/12/98	0.01		1.64		0.25		41.65
7/13/98	0.28		1.92		7.11		48.76
7/14/98	0.58		2.50		14.73		63.49
7/15/98	0.20		2.70		5.08		68.57
7/16/98	0.25		2.95		6.35		74.92
7/17/98			2.95				74.92
7/18/98			2.95				74.92
7/19/98			2.95				74.92
7/20/98	0.02		2.97		0.51		75.43
7/21/98	0.64		3.61		16.26		91.69
7/22/98			3.61				91.69
7/23/98			3.61				91.69
7/24/98			3.61				91.69
7/25/98			3.61				91.69
7/26/98	0.11		3.72		2.79		94.49
7/27/98			3.72				94.49
7/28/98			3.72				94.49
7/29/98			3.72				94.49
7/30/98			3.72				94.49
7/31/98	0.08	2.18	3.80		2.03	55.37	96.52
8/1/98			3.80				96.52
8/2/98			3.80				96.52

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
8/3/98			3.80				96.52
8/4/98			3.80				96.52
8/5/98	0.44		4.24		11.18		107.70
8/6/98	0.01		4.25		0.25		107.95
8/7/98			4.25				107.95
8/8/98			4.25				107.95
8/9/98			4.25				107.95
8/10/98			4.25				107.95
8/11/98			4.25				107.95
8/12/98			4.25				107.95
8/13/98	0.08		4.33		2.03		109.98
8/14/98			4.33				109.98
8/15/98			4.33				109.98
8/16/98			4.33				109.98
8/17/98			4.33				109.98
8/18/98			4.33				109.98
8/19/98			4.33				109.98
8/20/98	0.21		4.54		5.33		115.32
8/21/98			4.54				115.32
8/22/98			4.54				115.32
8/23/98			4.54				115.32
8/24/98			4.54				115.32
8/25/98			4.54				115.32
8/26/98			4.54				115.32
8/27/98			4.54				115.32
8/28/98	0.21		4.75		5.33		120.65
8/29/98			4.75				120.65
8/30/98			4.75				120.65
8/31/98		0.95	4.75			24.13	120.65
9/1/98			4.75				120.65
9/2/98			4.75				120.65
9/3/98			4.75				120.65
9/4/98			4.75				120.65
9/5/98			4.75				120.65
9/6/98			4.75				120.65

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
9/7/98			4.75				120.65
9/8/98			4.75				120.65
9/9/98	0.03		4.78		0.76		121.41
9/10/98			4.78				121.41
9/11/98			4.78				121.41
9/12/98			4.78				121.41
9/13/98			4.78				121.41
9/14/98	0.06		4.84		1.52		122.94
9/15/98			4.84				122.94
9/16/98			4.84				122.94
9/17/98			4.84				122.94
9/18/98			4.84				122.94
9/19/98			4.84				122.94
9/20/98			4.84				122.94
9/21/98			4.84				122.94
9/22/98	0.03		4.87		0.76		123.70
9/23/98			4.87				123.70
9/24/98			4.87				123.70
9/25/98			4.87				123.70
9/26/98			4.87				123.70
9/27/98	0.06		4.93		1.52		125.22
9/28/98			4.93				125.22
9/29/98	0.19		5.12		4.83		130.05
9/30/98		0.37	5.12			9.40	130.05
10/1/98	0.72		5.84		18.29		148.34
10/2/98			5.84				148.34
10/3/98			5.84				148.34
10/4/98			5.84				148.34
10/5/98			5.84				148.34
10/6/98			5.84				148.34
10/7/98			5.84				148.34
10/8/98			5.84				148.34
10/9/98			5.84				148.34
10/10/98			5.84				148.34
10/11/98			5.84				148.34

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
10/12/98			5.84				148.34
10/13/98			5.84				148.34
10/14/98			5.84				148.34
10/15/98			5.84				148.34
10/16/98			5.84				148.34
10/17/98			5.84				148.34
10/18/98			5.84				148.34
10/19/98			5.84				148.34
10/20/98	0.27		6.11		6.86		155.20
10/21/98	0.11		6.22		2.79		157.99
10/22/98	0.02		6.24		0.51		158.50
10/23/98			6.24				158.50
10/24/98			6.24				158.50
10/25/98			6.24				158.50
10/26/98			6.24				158.50
10/27/98	0.30		6.54		7.62		166.12
10/28/98			6.54				166.12
10/29/98			6.54				166.12
10/30/98	0.37		6.91		9.40		175.52
10/31/98	0.41	2.20	7.32		10.41	55.88	185.93
11/1/98			7.32				185.93
11/2/98			7.32				185.93
11/3/98			7.32				185.93
11/4/98			7.32				185.93
11/5/98			7.32				185.93
11/6/98	0.02		7.34		0.51		186.44
11/7/98			7.34				186.44
11/8/98			7.34				186.44
11/9/98			7.34				186.44
11/10/98			7.34				186.44
11/11/98			7.34				186.44
11/12/98			7.34				186.44
11/13/98			7.34				186.44
11/14/98			7.34				186.44
11/15/98			7.34				186.44

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
11/16/98			7.34				186.44
11/17/98			7.34				186.44
11/18/98			7.34				186.44
11/19/98			7.34				186.44
11/20/98			7.34				186.44
11/21/98			7.34				186.44
11/22/98			7.34				186.44
11/23/98			7.34				186.44
11/24/98			7.34				186.44
11/25/98			7.34				186.44
11/26/98			7.34				186.44
11/27/98			7.34				186.44
11/28/98			7.34				186.44
11/29/98	0.14		7.48		3.56		189.99
11/30/98		0.16	7.48			4.06	189.99
12/1/98			7.48				189.99
12/2/98			7.48				189.99
12/3/98	0.06		7.54		1.52		191.52
12/4/98			7.54				191.52
12/5/98			7.54				191.52
12/6/98			7.54				191.52
12/7/98			7.54				191.52
12/8/98			7.54				191.52
12/9/98			7.54				191.52
12/10/98			7.54				191.52
12/11/98	0.16		7.70		4.06		195.58
12/12/98			7.70				195.58
12/13/98			7.70				195.58
12/14/98			7.70				195.58
12/15/98			7.70				195.58
12/16/98			7.70				195.58
12/17/98			7.70				195.58
12/18/98	0.02		7.72		0.51		196.09
12/19/98			7.72				196.09
12/20/98			7.72				196.09

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
12/21/98			7.72				196.09
12/22/98			7.72				196.09
12/23/98			7.72				196.09
12/24/98			7.72				196.09
12/25/98			7.72				196.09
12/26/98			7.72				196.09
12/27/98			7.72				196.09
12/28/98			7.72				196.09
12/29/98			7.72				196.09
12/30/98			7.72				196.09
12/31/98		0.24	7.72			6.10	196.09
1/1/99			0.00				0.00
1/2/99			0.00				0.00
1/3/99			0.00				0.00
1/4/99			0.00				0.00
1/5/99			0.00				0.00
1/6/99			0.00				0.00
1/7/99			0.00				0.00
1/8/99			0.00				0.00
1/9/99			0.00				0.00
1/10/99			0.00				0.00
1/11/99			0.00				0.00
1/12/99			0.00				0.00
1/13/99			0.00				0.00
1/14/99			0.00				0.00
1/15/99			0.00				0.00
1/16/99			0.00				0.00
1/17/99			0.00				0.00
1/18/99			0.00				0.00
1/19/99			0.00				0.00
1/20/99			0.00				0.00
1/21/99			0.00				0.00
1/22/99	0.01		0.01		0.25		0.25
1/23/99			0.01				0.25
1/24/99			0.01				0.25

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
1/25/99			0.01				0.25
1/26/99			0.01				0.25
1/27/99			0.01				0.25
1/28/99	0.19		0.20		4.83		5.08
1/29/99	0.06		0.26		1.52		6.60
1/30/99			0.26				6.60
1/31/99		0.26	0.26			6.60	6.60
2/1/99			0.26				6.60
2/2/99			0.26				6.60
2/3/99			0.26				6.60
2/4/99			0.26				6.60
2/5/99			0.26				6.60
2/6/99			0.26				6.60
2/7/99			0.26				6.60
2/8/99			0.26				6.60
2/9/99			0.26				6.60
2/10/99			0.26				6.60
2/11/99			0.26				6.60
2/12/99			0.26				6.60
2/13/99			0.26				6.60
2/14/99			0.26				6.60
2/15/99			0.26				6.60
2/16/99			0.26				6.60
2/17/99			0.26				6.60
2/18/99			0.26				6.60
2/19/99			0.26				6.60
2/20/99			0.26				6.60
2/21/99			0.26				6.60
2/22/99			0.26				6.60
2/23/99			0.26				6.60
2/24/99			0.26				6.60
2/25/99			0.26				6.60
2/26/99			0.26				6.60
2/27/99			0.26				6.60
2/28/99		0.00	0.26			0.00	6.60

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
3/1/99			0.26				6.60
3/2/99			0.26				6.60
3/3/99			0.26				6.60
3/4/99			0.26				6.60
3/5/99			0.26				6.60
3/6/99			0.26				6.60
3/7/99	0.03		0.29		0.76		7.37
3/8/99	0.01		0.30		0.25		7.62
3/9/99			0.30				7.62
3/10/99			0.30				7.62
3/11/99			0.30				7.62
3/12/99			0.30				7.62
3/13/99			0.30				7.62
3/14/99			0.30				7.62
3/15/99			0.30				7.62
3/16/99			0.30				7.62
3/17/99	0.04		0.34		1.02		8.64
3/18/99			0.34				8.64
3/19/99			0.34				8.64
3/20/99			0.34				8.64
3/21/99			0.34				8.64
3/22/99			0.34				8.64
3/23/99			0.34				8.64
3/24/99			0.34				8.64
3/25/99			0.34				8.64
3/26/99	0.36		0.70		9.14		17.78
3/27/99	0.03		0.73		0.76		18.54
3/28/99			0.73				18.54
3/29/99			0.73				18.54
3/30/99			0.73				18.54
3/31/99		0.47	0.73			11.93	18.54
4/1/99			0.73				18.54
4/2/99			0.73				18.54
4/3/99			0.73				18.54
4/4/99			0.73				18.54

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
4/5/99			0.73				18.54
4/6/99			0.73				18.54
4/7/99			0.73				18.54
4/8/99			0.73				18.54
4/9/99			0.73				18.54
4/10/99			0.73				18.54
4/11/99			0.73				18.54
4/12/99	1.21		1.94		30.73		49.27
4/13/99			1.94				49.27
4/14/99			1.94				49.27
4/15/99			1.94				49.27
4/16/99			1.94				49.27
4/17/99			1.94				49.27
4/18/99			1.94				49.27
4/19/99			1.94				49.27
4/20/99			1.94				49.27
4/21/99			1.94				49.27
4/22/99			1.94				49.27
4/23/99			1.94				49.27
4/24/99	0.10		2.04		2.54		51.81
4/25/99	0.01		2.05		0.25		52.06
4/26/99			2.05				52.06
4/27/99			2.05				52.06
4/28/99			2.05				52.06
4/29/99			2.05				52.06
4/30/99	0.16	1.48	2.21		4.06	37.59	56.13
5/1/99			2.21				56.13
5/2/99			2.21				56.13
5/3/99			2.21				56.13
5/4/99			2.21				56.13
5/5/99			2.21				56.13
5/6/99			2.21				56.13
5/7/99			2.21				56.13
5/8/99			2.21				56.13
5/9/99			2.21				56.13

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
5/10/99			2.21				56.13
5/11/99			2.21				56.13
5/12/99			2.21				56.13
5/13/99			2.21				56.13
5/14/99			2.21				56.13
5/15/99			2.21				56.13
5/16/99			2.21				56.13
5/17/99			2.21				56.13
5/18/99			2.21				56.13
5/19/99			2.21				56.13
5/20/99			2.21				56.13
5/21/99	0.28		2.49		7.11		63.24
5/22/99	0.08		2.57		2.03		65.27
5/23/99	0.03		2.60		0.76		66.03
5/24/99	0.86		3.46		21.84		87.87
5/25/99			3.46				87.87
5/26/99	0.16		3.62		4.06		91.93
5/27/99			3.62				91.93
5/28/99	0.17		3.79		4.32		96.25
5/29/99	0.24		4.03		6.10		102.35
5/30/99			4.03				102.35
5/31/99		1.82	4.03			46.22	102.35
6/1/99			4.03				102.35
6/2/99			4.03				102.35
6/3/99			4.03				102.35
6/4/99			4.03				102.35
6/5/99			4.03				102.35
6/6/99			4.03				102.35
6/7/99			4.03				102.35
6/8/99	0.59		4.62		14.99		117.34
6/9/99			4.62				117.34
6/10/99			4.62				117.34
6/11/99			4.62				117.34
6/12/99			4.62				117.34

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
6/13/99	0.23		4.85		5.84		123.18
6/14/99			4.85				123.18
6/15/99			4.85				123.18
6/16/99			4.85				123.18
6/17/99	0.68		5.53		17.27		140.45
6/18/99			5.53				140.45
6/19/99	0.19		5.72		4.83		145.28
6/20/99	0.27		5.99		6.86		152.13
6/21/99	0.10		6.09		2.54		154.67
6/22/99	0.02		6.11		0.51		155.18
6/23/99			6.11				155.18
6/24/99			6.11				155.18
6/25/99			6.11				155.18
6/26/99			6.11				155.18
6/27/99			6.11				155.18
6/28/99			6.11				155.18
6/29/99			6.11				155.18
6/30/99		2.08	6.11			52.83	155.18
7/1/99			6.11				155.18
7/2/99			6.11				155.18
7/3/99			6.11				155.18
7/4/99			6.11				155.18
7/5/99			6.11				155.18
7/6/99			6.11				155.18
7/7/99	0.05		6.16		1.27		156.45
7/8/99			6.16				156.45
7/9/99			6.16				156.45
7/10/99	0.21		6.37		5.33		161.79
7/11/99			6.37				161.79
7/12/99			6.37				161.79
7/13/99			6.37				161.79

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
7/14/99			6.37				161.79
7/15/99			6.37				161.79
7/16/99			6.37				161.79
7/17/99			6.37				161.79
7/18/99			6.37				161.79
7/19/99			6.37				161.79
7/20/99			6.37				161.79
7/21/99			6.37				161.79
7/22/99			6.37				161.79
7/23/99			6.37				161.79
7/24/99	0.44		6.81		11.18		172.97
7/25/99			6.81				172.97
7/26/99			6.81				172.97
7/27/99			6.81				172.97
7/28/99	0.16		6.97		4.06		177.03
7/29/99			6.97				177.03
7/30/99			6.97				177.03
7/31/99	0.17	1.03	7.14		4.32	26.17	181.35
8/1/99			7.14				181.35
8/2/99			7.14				181.35
8/3/99	0.01		7.15		0.25		181.60
8/4/99	0.03		7.18		0.76		182.36
8/5/99			7.18				182.36
8/6/99			7.18				182.36
8/7/99	0.55		7.73		13.97		196.33
8/8/99			7.73				196.33
8/9/99			7.73				196.33
8/10/99			7.73				196.33
8/11/99			7.73				196.33
8/12/99			7.73				196.33
8/13/99	0.02		7.75		0.51		196.84

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
8/14/99			7.75				196.84
8/15/99			7.75				196.84
8/16/99			7.75				196.84
8/17/99			7.75				196.84
8/18/99			7.75				196.84
8/19/99			7.75				196.84
8/20/99			7.75				196.84
8/21/99			7.75				196.84
8/22/99	0.01		7.76		0.25		197.10
8/23/99			7.76				197.10
8/24/99	0.08		7.84		2.03		199.13
8/25/99	0.14		7.98		3.56		202.68
8/26/99			7.98				202.68
8/27/99			7.98				202.68
8/28/99			7.98				202.68
8/29/99			7.98				202.68
8/30/99			7.98				202.68
8/31/99		0.84	7.98			21.34	202.68
9/1/99			7.98				202.68
9/2/99			7.98				202.68
9/3/99			7.98				202.68
9/4/99			7.98				202.68
9/5/99			7.98				202.68
9/6/99	0.35		8.33		8.89		211.57
9/7/99			8.33				211.57
9/8/99	0.03		8.36		0.762		212.34
9/9/99			8.36				212.34
9/10/99			8.36				212.34
9/11/99			8.36				212.34
9/12/99			8.36				212.34
9/13/99			8.36				212.34

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
9/14/99			8.36				212.34
9/15/99			8.36				212.34
9/16/99			8.36				212.34
9/17/99			8.36				212.34
9/18/99			8.36				212.34
9/19/99	0.22		8.58		5.588		217.92
9/20/99	0.01		8.59		0.254		218.18
9/21/99			8.59				218.18
9/22/99			8.59				218.18
9/23/99			8.59				218.18
9/24/99			8.59				218.18
9/25/99			8.59				218.18
9/26/99			8.59				218.18
9/27/99			8.59				218.18
9/28/99			8.59				218.18
9/29/99			8.59				218.18
9/30/99		0.61	8.59			15.49	218.18
10/1/99			8.59				218.18
10/2/99			8.59				218.18
10/3/99			8.59				218.18
10/4/99			8.59				218.18
10/5/99			8.59				218.18
10/6/99			8.59				218.18
10/7/99			8.59				218.18
10/8/99			8.59				218.18
10/9/99			8.59				218.18
10/10/99	0.04		8.63		1.016		219.19
10/11/99			8.63				219.19
10/12/99			8.63				219.19
10/13/99			8.63				219.19
10/14/99			8.63				219.19

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
10/15/99			8.63				219.19
10/16/99			8.63				219.19
10/17/99			8.63				219.19
10/18/99			8.63				219.19
10/19/99			8.63				219.19
10/20/99	0.05		8.68		1.27		220.46
10/21/99			8.68				220.46
10/22/99			8.68				220.46
10/23/99			8.68				220.46
10/24/99			8.68				220.46
10/25/99			8.68				220.46
10/26/99			8.68				220.46
10/27/99			8.68				220.46
10/28/99			8.68				220.46
10/29/99			8.68				220.46
10/30/99			8.68				220.46
10/31/99		0.09	8.68			2.29	220.46
11/1/99			8.68				220.46
11/2/99			8.68				220.46
11/3/99			8.68				220.46
11/4/99			8.68				220.46
11/5/99			8.68				220.46
11/6/99			8.68				220.46
11/7/99			8.68				220.46
11/8/99			8.68				220.46
11/9/99			8.68				220.46
11/10/99			8.68				220.46
11/11/99			8.68				220.46
11/12/99			8.68				220.46
11/13/99			8.68				220.46
11/14/99			8.68				220.46

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
11/15/99			8.68				220.46
11/16/99			8.68				220.46
11/17/99			8.68				220.46
11/18/99			8.68				220.46
11/19/99			8.68				220.46
11/20/99			8.68				220.46
11/21/99			8.68				220.46
11/22/99			8.68				220.46
11/23/99			8.68				220.46
11/24/99			8.68				220.46
11/25/99			8.68				220.46
11/26/99			8.68				220.46
11/27/99			8.68				220.46
11/28/99			8.68				220.46
11/29/99			8.68				220.46
11/30/99		0.00	8.68			0.00	220.46
12/1/99			8.68				220.46
12/2/99			8.68				220.46
12/3/99			8.68				220.46
12/4/99			8.68				220.46
12/5/99			8.68				220.46
12/6/99			8.68				220.46
12/7/99			8.68				220.46
12/8/99			8.68				220.46
12/9/99			8.68				220.46
12/10/99			8.68				220.46
12/11/99			8.68				220.46
12/12/99			8.68				220.46
12/13/99			8.68				220.46
12/14/99			8.68				220.46
12/15/99			8.68				220.46

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
12/16/99			8.68				220.46
12/17/99			8.68				220.46
12/18/99			8.68				220.46
12/19/99			8.68				220.46
12/20/99			8.68				220.46
12/21/99			8.68				220.46
12/22/99			8.68				220.46
12/23/99			8.68				220.46
12/24/99			8.68				220.46
12/25/99			8.68				220.46
12/26/99			8.68				220.46
12/27/99			8.68				220.46
12/28/99			8.68				220.46
12/29/99			8.68				220.46
12/30/99			8.68				220.46
12/31/99		0.00	8.68			0.00	220.46
1/1/00			0.00				0.00
1/2/00			0.00				0.00
1/3/00			0.00				0.00
1/4/00			0.00				0.00
1/5/00			0.00				0.00
1/6/00			0.00				0.00
1/7/00	0.01		0.01		0.254		0.25
1/8/00			0.01				0.25
1/9/00			0.01				0.25
1/10/00			0.01				0.25
1/11/00			0.01				0.25
1/12/00			0.01				0.25
1/13/00			0.01				0.25
1/14/00			0.01				0.25
1/15/00			0.01				0.25

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
1/16/00			0.01				0.25
1/17/00			0.01				0.25
1/18/00			0.01				0.25
1/19/00			0.01				0.25
1/20/00			0.01				0.25
1/21/00			0.01				0.25
1/22/00			0.01				0.25
1/23/00			0.01				0.25
1/24/00			0.01				0.25
1/25/00			0.01				0.25
1/26/00			0.01				0.25
1/27/00			0.01				0.25
1/28/00			0.01				0.25
1/29/00			0.01				0.25
1/30/00			0.01				0.25
1/31/00		0.01	0.01			0.25	0.25
2/1/00			0.01				0.25
2/2/00			0.01				0.25
2/3/00			0.01				0.25
2/4/00			0.01				0.25
2/5/00			0.01				0.25
2/6/00			0.01				0.25
2/7/00			0.01				0.25
2/8/00			0.01				0.25
2/9/00			0.01				0.25
2/10/00			0.01				0.25
2/11/00			0.01				0.25
2/12/00			0.01				0.25
2/13/00			0.01				0.25
2/14/00			0.01				0.25
2/15/00			0.01				0.25

Calendar Date	Rainfall	Monthly Totals	Running Yearly Total		Rainfall	Monthly Totals	Running Yearly Total
	(in)	(in)	(in)		(mm)	(mm)	(mm)
2/16/00			0.01				0.25
2/17/00			0.01				0.25
2/18/00			0.01				0.25
2/19/00			0.01				0.25
2/20/00			0.01				0.25
2/21/00			0.01				0.25
2/22/00			0.01				0.25
2/23/00			0.01				0.25
2/24/00			0.01				0.25
2/25/00			0.01				0.25
2/26/00			0.01				0.25
2/27/00			0.01				0.25
2/28/00			0.01				0.25
2/29/00		0.00	0.01			0.00	0.25

Appendix F: WIPP STAR Data

1997:

Direction	Class	1-3	4-6	7-10	11-16	17-21	>21
N	A	0.00006	0.00094	0.00318	0.0024	0.00017	0.00011
NNE	A	0.00003	0.00072	0.00232	0.00258	0.00069	0.00003
NE	A	0.00009	0.00069	0.00263	0.00183	0.00109	0.00066
ENE	A	0.00006	0.0008	0.00215	0.00186	0.00054	0.00026
E	A	0.00011	0.00086	0.00398	0.00326	0.00023	0.0002
ESE	A	0.00009	0.0016	0.00844	0.0051	0.00023	0
SE	A	0.00006	0.00301	0.01271	0.01134	0.00023	0
SSE	A	0.00003	0.00392	0.01546	0.01156	0.00009	0
S	A	0.00014	0.00352	0.01417	0.0051	0.00014	0
SSW	A	0.00006	0.00326	0.0081	0.00263	0.00014	0
SW	A	0.00029	0.00326	0.00595	0.00195	0.0002	0
WSW	A	0.00011	0.00364	0.0053	0.00335	0.00103	0.00043
W	A	0.00014	0.0016	0.00386	0.00378	0.00318	0.0026
WNW	A	0.00009	0.002	0.00286	0.00112	0.00054	0.00006
NW	A	0	0.00152	0.0026	0.00263	0.00034	0
NNW	A	0.00003	0.00123	0.0026	0.00306	0.00014	0
N	B	0	0.0008	0.00094	0.00057	0.00003	0
NNE	B	0	0.00034	0.00074	0.00043	0.00003	0
NE	B	0	0.0004	0.0008	0.00026	0.00006	0.00006
ENE	B	0.00003	0.00046	0.0008	0.00052	0.00011	0.00003
E	B	0.00006	0.00086	0.00215	0.00037	0.00006	0.00006
ESE	B	0.00009	0.00112	0.0024	0.00103	0.00003	0
SE	B	0.00009	0.00172	0.00358	0.00157	0.00006	0
SSE	B	0.00014	0.00203	0.00278	0.00112	0.00006	0
S	B	0.00011	0.00226	0.00186	0.00043	0	0
SSW	B	0.00009	0.00229	0.00126	0.0002	0	0
SW	B	0.00014	0.002	0.00103	0.0002	0	0
WSW	B	0.00017	0.00203	0.00086	0.00052	0.00017	0
W	B	0.00009	0.00157	0.00074	0.00052	0.00031	0.00029
WNW	B	0.00009	0.00209	0.00057	0.00009	0.00003	0.00003
NW	B	0.00003	0.00143	0.0014	0.00052	0.00014	0
NNW	B	0.00009	0.0008	0.00092	0.00052	0.00003	0
N	C	0.00003	0.00089	0.00089	0.00063	0.00029	0
NNE	C	0.00011	0.00089	0.00086	0.00046	0.00017	0.00003
NE	C	0.00006	0.00029	0.00049	0.00017	0.00011	0.00014
ENE	C	0.00006	0.00072	0.00077	0.00057	0.0002	0.00009
E	C	0.00011	0.0012	0.00155	0.00043	0.00009	0.00003
ESE	C	0.00017	0.00146	0.00229	0.00072	0.00006	0
SE	C	0.00017	0.00146	0.00266	0.00175	0.00009	0
SSE	C	0.00017	0.00157	0.00252	0.00083	0	0
S	C	0.00029	0.002	0.00126	0.00034	0.00009	0
SSW	C	0.00017	0.00189	0.00094	0.00011	0	0
SW	C	0.0004	0.00206	0.00037	0.00014	0	0
WSW	C	0.00031	0.002	0.0006	0.00029	0.00017	0.00011
W	C	0.0002	0.00198	0.00046	0.00029	0.0004	0.0004
WNW	C	0.00034	0.002	0.00069	0.00011	0	0
NW	C	0.00023	0.00198	0.00074	0.00049	0.00003	0
NNW	C	0.00017	0.00097	0.00077	0.00026	0.00003	0
N	D	0.0006	0.00295	0.00458	0.00364	0.00072	0

Direction	Class	1-3	4-6	7-10	11-16	17-21	>21
NNE	D	0.00069	0.00172	0.00504	0.00653	0.001	0.00003
NE	D	0.00094	0.00212	0.00369	0.00278	0.00109	0.00094
ENE	D	0.001	0.00252	0.00415	0.00398	0.00229	0.00066
E	D	0.00092	0.00303	0.00799	0.00647	0.00212	0.00026
ESE	D	0.00086	0.00421	0.00916	0.00678	0.00074	0
SE	D	0.00109	0.00467	0.00839	0.0073	0.00123	0.00011
SSE	D	0.00132	0.00409	0.00799	0.00358	0.00046	0
S	D	0.00112	0.00386	0.00426	0.00117	0.00006	0
SSW	D	0.00083	0.00226	0.00135	0.00083	0	0
SW	D	0.00163	0.00166	0.00077	0.00046	0.00009	0
WSW	D	0.00186	0.00255	0.00135	0.001	0.00052	0.00009
W	D	0.0018	0.00281	0.00077	0.00186	0.00149	0.00037
WNW	D	0.00209	0.00323	0.00077	0.00066	0.00023	0
NW	D	0.00163	0.00395	0.0022	0.00083	0.00011	0
NNW	D	0.00114	0.00283	0.00292	0.00252	0.00052	0
N	E	0.00066	0.00289	0.00338	0.00106	0.00011	0
NNE	E	0.00049	0.00189	0.00175	0.00135	0.00006	0.00003
NE	E	0.00083	0.00166	0.00192	0.00135	0.00034	0.00026
ENE	E	0.00049	0.0012	0.00281	0.00395	0.00026	0.0002
E	E	0.00146	0.00326	0.00547	0.0073	0.00103	0
ESE	E	0.00103	0.00404	0.01534	0.01351	0.00069	0.00003
SE	E	0.00106	0.00429	0.02038	0.02433	0.00106	0.00009
SSE	E	0.00089	0.00392	0.00822	0.0065	0.0004	0.00009
S	E	0.00132	0.00306	0.00229	0.00011	0	0
SSW	E	0.00074	0.00175	0.00103	0.00026	0	0
SW	E	0.00072	0.00126	0.00083	0.00029	0	0
WSW	E	0.00049	0.00072	0.00177	0.00146	0.00011	0
W	E	0.00092	0.00114	0.00157	0.00303	0.00083	0.00011
WNW	E	0.00092	0.00152	0.00106	0.0004	0.00006	0
NW	E	0.00066	0.00149	0.00135	0.0004	0	0
NNW	E	0.00052	0.00246	0.00203	0.00034	0.00011	0
N	F	0.00097	0.00266	0.00169	0.00023	0	0
NNE	F	0.00109	0.0024	0.0014	0.00017	0	0
NE	F	0.00083	0.00266	0.00157	0.0002	0	0
ENE	F	0.00086	0.00189	0.00198	0.00029	0	0
E	F	0.00137	0.00238	0.00469	0.00209	0.00009	0
ESE	F	0.00146	0.00518	0.01815	0.00218	0.00011	0
SE	F	0.00169	0.00716	0.01397	0.00097	0.00003	0
SSE	F	0.00175	0.00538	0.00329	0.00026	0.00006	0
S	F	0.0018	0.00235	0.00049	0.00003	0	0
SSW	F	0.00129	0.00155	0.00031	0.00003	0	0
SW	F	0.00074	0.00117	0.00052	0	0.00003	0
WSW	F	0.00074	0.00112	0.00186	0.0006	0	0
W	F	0.0008	0.00117	0.00175	0.00112	0	0
WNW	F	0.00126	0.0014	0.00052	0.00029	0	0
NW	F	0.00114	0.00135	0.00074	0.00009	0	0
NNW	F	0.00054	0.00278	0.00203	0.00043	0.00006	0
N	G	0.00106	0.00303	0.00358	0.00009	0	0
NNE	G	0.00152	0.00561	0.00472	0.00006	0	0
NE	G	0.0016	0.00621	0.00495	0	0	0
ENE	G	0.00114	0.00312	0.00452	0.00011	0	0
E	G	0.00183	0.00364	0.01002	0.00089	0.00003	0
ESE	G	0.00195	0.01108	0.03194	0.00026	0	0
SE	G	0.00272	0.01168	0.0142	0.00009	0.00003	0
SSE	G	0.00172	0.00564	0.00272	0	0	0

Direction	Class	1-3	4-6	7-10	11-16	17-21	>21
S	G	0.00192	0.00326	0.0006	0	0	0
SSW	G	0.00109	0.00152	0.00049	0	0	0
SW	G	0.00057	0.00094	0.00026	0	0	0
WSW	G	0.00063	0.00043	0.00086	0.00006	0	0
W	G	0.00074	0.00132	0.00052	0.00017	0	0
WNW	G	0.00097	0.001	0.00034	0	0	0
NW	G	0.00094	0.00097	0.00052	0.00003	0	0
NNW	G	0.00092	0.00092	0.00146	0	0.00003	0

1998:

Direction	Class	1-3	4-6	7-10	11-16	17-21	>21
N	A	0	0.00071	0.00263	0.0028	0.00077	0.00006
NNE	A	0	0.00077	0.00223	0.00091	0.00014	0
NE	A	0	0.00086	0.00251	0.00083	0.0002	0
ENE	A	0.00003	0.00106	0.00325	0.00126	0	0
E	A	0.00003	0.00114	0.00539	0.00206	0.00006	0
ESE	A	0.00003	0.00191	0.00819	0.0026	0	0
SE	A	0.00011	0.00305	0.01047	0.00631	0.00054	0.00046
SSE	A	0	0.00385	0.01299	0.01059	0.00157	0.00003
S	A	0.00009	0.00371	0.0163	0.00805	0.00026	0
SSW	A	0.00014	0.0036	0.01296	0.00391	0.00034	0.00003
SW	A	0.00006	0.00325	0.00756	0.00431	0.00126	0.00029
WSW	A	0.00006	0.00303	0.00739	0.00782	0.00351	0.00177
W	A	0.00009	0.00283	0.00568	0.00928	0.00428	0.00534
WNW	A	0	0.00297	0.00642	0.00294	0.0006	0.0002
NW	A	0	0.0016	0.00485	0.00268	0.0004	0
NNW	A	0.00003	0.001	0.00328	0.00351	0.00088	0.00054
N	B	0.00003	0.00083	0.00103	0.00049	0.00006	0.00006
NNE	B	0.00011	0.00091	0.00071	0.00006	0.00003	0
NE	B	0	0.00057	0.00083	0.00011	0.00003	0.00014
ENE	B	0.00003	0.00043	0.00054	0.00014	0	0
E	B	0	0.00097	0.0006	0.00043	0	0
ESE	B	0.00003	0.00106	0.00108	0.00017	0	0
SE	B	0	0.00166	0.00186	0.00086	0	0.00003
SSE	B	0	0.00151	0.00194	0.00134	0.00009	0
S	B	0	0.00174	0.00203	0.00054	0.00006	0
SSW	B	0.00003	0.00206	0.00128	0.00034	0.00006	0
SW	B	0.00017	0.00183	0.00106	0.00023	0.00009	0
WSW	B	0.00014	0.00168	0.00043	0.00083	0.00023	0.0002
W	B	0.00009	0.00166	0.00046	0.0006	0.00051	0.00054
WNW	B	0.00009	0.00188	0.0012	0.00006	0.00006	0.00003
NW	B	0.00003	0.00154	0.00106	0.00026	0.00006	0.00003
NNW	B	0.00006	0.00126	0.00083	0.00083	0.00003	0.00003
N	C	0.00009	0.0008	0.00074	0.00043	0.00009	0
NNE	C	0.00009	0.00069	0.00049	0.00011	0.00006	0
NE	C	0.00014	0.00063	0.00074	0.00006	0.00003	0.00006
ENE	C	0.00009	0.00103	0.00054	0.00026	0.00006	0
E	C	0.00009	0.00083	0.00069	0.00054	0.00006	0.00003
ESE	C	0.00006	0.00126	0.00103	0.00063	0.00003	0
SE	C	0.00011	0.00163	0.00148	0.0008	0.00009	0.00003
SSE	C	0.00011	0.0016	0.0018	0.0008	0.00006	0

Direction	Class	1-3	4-6	7-10	11-16	17-21	>21
S	C	0.00011	0.00134	0.00146	0.00037	0	0
SSW	C	0.0002	0.00131	0.00077	0.00014	0	0
SW	C	0.00031	0.00168	0.00046	0.0004	0	0
WSW	C	0.00014	0.00171	0.00043	0.00037	0.00031	0.00017
W	C	0.00029	0.00168	0.00049	0.00063	0.00034	0.00031
WNW	C	0.00014	0.00168	0.00046	0.0002	0.00003	0.00003
NW	C	0.00029	0.00157	0.00077	0.00026	0.00006	0.00003
NNW	C	0.00006	0.00146	0.0006	0.00026	0	0.00003
N	D	0.00069	0.00174	0.00231	0.00211	0.00031	0.00011
NNE	D	0.00088	0.00203	0.00191	0.00123	0.0004	0
NE	D	0.00063	0.00168	0.00251	0.00183	0.00083	0.00003
ENE	D	0.0004	0.00126	0.0022	0.0012	0.00049	0
E	D	0.00066	0.00254	0.00334	0.00331	0.00163	0.00037
ESE	D	0.00077	0.00303	0.00385	0.00271	0.00128	0.00006
SE	D	0.00088	0.00257	0.00591	0.00597	0.00194	0.00051
SSE	D	0.00117	0.00271	0.00448	0.00411	0.0018	0
S	D	0.00088	0.00217	0.00191	0.00083	0.00014	0
SSW	D	0.00097	0.00223	0.00111	0.00051	0.0002	0.00003
SW	D	0.00094	0.00228	0.00094	0.00083	0.00009	0
WSW	D	0.00108	0.00248	0.0014	0.00166	0.00077	0.00026
W	D	0.00137	0.00208	0.00071	0.00194	0.00234	0.00131
WNW	D	0.0012	0.00203	0.00046	0.00117	0.00063	0.00017
NW	D	0.0014	0.0026	0.00157	0.00134	0.00026	0.00011
NNW	D	0.00074	0.00194	0.00288	0.0028	0.00031	0.00011
N	E	0.00069	0.00251	0.00348	0.00103	0.00009	0
NNE	E	0.00074	0.00168	0.0022	0.00069	0.00003	0
NE	E	0.0008	0.00146	0.00163	0.0012	0.00006	0
ENE	E	0.0006	0.00183	0.00283	0.00511	0.0002	0
E	E	0.00128	0.00214	0.00534	0.00502	0.00074	0.00011
ESE	E	0.00168	0.00451	0.00808	0.00831	0.00051	0
SE	E	0.00197	0.00468	0.01892	0.01658	0.00137	0.00029
SSE	E	0.00171	0.00328	0.00879	0.00742	0.00097	0.00017
S	E	0.00325	0.00231	0.00251	0.0006	0.00003	0
SSW	E	0.00083	0.00171	0.0012	0.00031	0.00006	0
SW	E	0.00083	0.00168	0.00134	0.00046	0	0
WSW	E	0.00077	0.00143	0.0022	0.00157	0.00014	0
W	E	0.00049	0.00151	0.00251	0.00514	0.00051	0
WNW	E	0.00083	0.00123	0.00168	0.00188	0.00011	0
NW	E	0.00074	0.00163	0.00174	0.00106	0.00017	0
NNW	E	0.00283	0.002	0.00223	0.00103	0.00006	0
N	F	0.00123	0.00288	0.00191	0.00014	0	0
NNE	F	0.0016	0.00328	0.00143	0.00023	0.00003	0
NE	F	0.00186	0.0032	0.00134	0.00014	0	0
ENE	F	0.00151	0.00191	0.00225	0.00029	0.00006	0
E	F	0.00131	0.00274	0.00482	0.00106	0.00006	0.00003
ESE	F	0.00177	0.00631	0.01353	0.0034	0.00003	0.00009
SE	F	0.00168	0.00808	0.01282	0.00154	0.00003	0
SSE	F	0.00183	0.00605	0.0046	0.00057	0	0
S	F	0.0018	0.00382	0.00106	0.00011	0	0
SSW	F	0.00126	0.00211	0.0006	0.00017	0	0
SW	F	0.00106	0.00146	0.00074	0	0	0
WSW	F	0.00083	0.00188	0.00174	0.00029	0.00003	0
W	F	0.00094	0.00183	0.00217	0.00091	0	0
WNW	F	0.00108	0.0022	0.00168	0.00031	0.00003	0.00003
NW	F	0.00114	0.00248	0.00137	0.00037	0	0

Direction	Class	1-3	4-6	7-10	11-16	17-21	>21
NNW	F	0.00131	0.00231	0.00243	0.00026	0	0.00003
N	G	0.00106	0.00271	0.00283	0.0002	0	0
NNE	G	0.00114	0.00445	0.00357	0.00003	0	0
NE	G	0.00131	0.00559	0.0042	0.00006	0	0
ENE	G	0.00131	0.00431	0.00625	0.00003	0	0
E	G	0.00188	0.00602	0.01244	0.00168	0	0
ESE	G	0.00237	0.01367	0.03539	0.00137	0.00006	0
SE	G	0.0022	0.01367	0.02181	0.00066	0	0
SSE	G	0.00157	0.00776	0.00454	0.0004	0	0
S	G	0.00191	0.00514	0.0018	0.00003	0	0
SSW	G	0.0014	0.0022	0.00046	0.00006	0	0
SW	G	0.001	0.0012	0.00051	0	0	0
WSW	G	0.00054	0.00117	0.00128	0.00006	0	0
W	G	0.00094	0.00146	0.0018	0.00011	0	0
WNW	G	0.00106	0.00146	0.00206	0.00003	0	0
NW	G	0.00151	0.00151	0.00094	0.00009	0	0
NNW	G	0.00088	0.00177	0.00174	0.00023	0.00003	0.00003

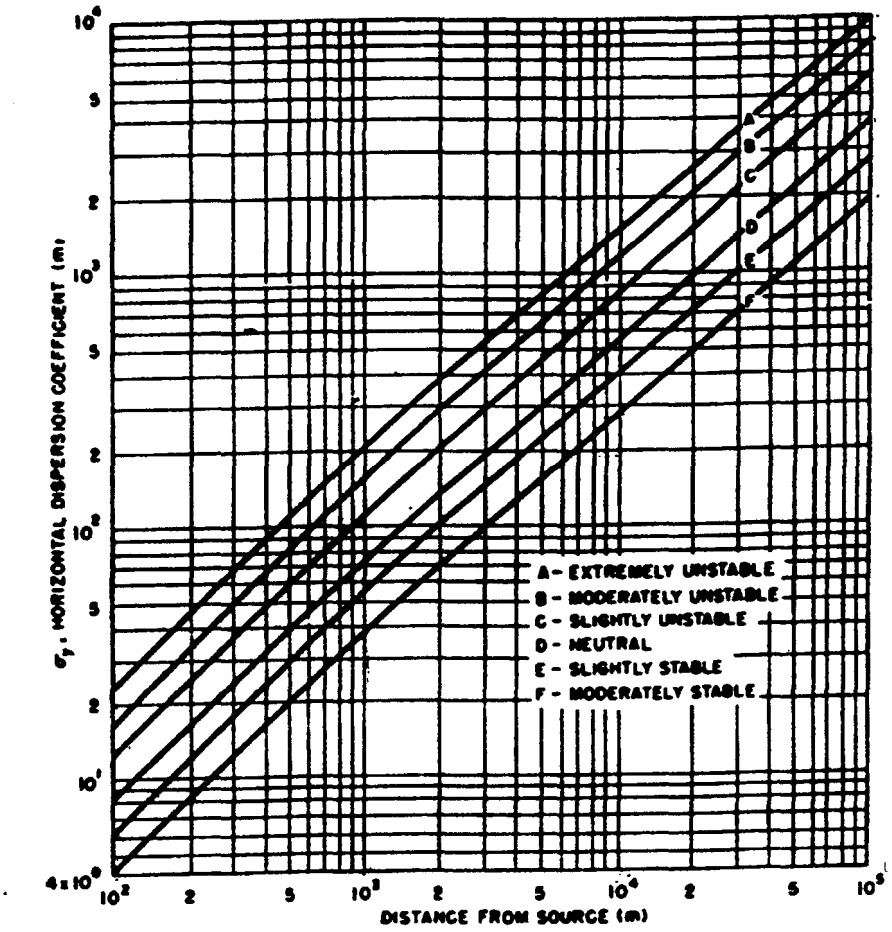
1999:

Direction	Class	1-3	4-6	7-10	11-16	17-21	>21
N	A	0	0.0012	0.00371	0.00348	0.00073	0.00023
NNE	A	0	0.00111	0.00251	0.00333	0.00035	0.00003
NE	A	0.00003	0.00111	0.00178	0.00263	0.0002	0.00003
ENE	A	0	0.00105	0.00248	0.00199	0.00023	0.00012
E	A	0	0.00096	0.00497	0.00199	0.00105	0.00023
ESE	A	0	0.00152	0.00681	0.00333	0.00041	0.00009
SE	A	0.00006	0.00254	0.01309	0.01247	0.00196	0.00023
SSE	A	0.00003	0.00356	0.01306	0.01294	0.00169	0.00003
S	A	0.00003	0.004	0.01551	0.00768	0.00064	0.00006
SSW	A	0.00012	0.00608	0.0123	0.00462	0.00108	0.00044
SW	A	0.00012	0.004	0.00692	0.00406	0.00184	0.00096
WSW	A	0.00006	0.00304	0.00657	0.00611	0.00307	0.00038
W	A	0.00006	0.00266	0.00374	0.00701	0.00272	0.00222
WNW	A	0.00003	0.00199	0.00272	0.00213	0.00012	0.00006
NW	A	0	0.00143	0.00283	0.0014	0.00012	0
NNW	A	0	0.00134	0.0031	0.00286	0.00079	0.00167
N	B	0	0.00111	0.00108	0.00047	0.00006	0.00003
NNE	B	0.00006	0.00082	0.00085	0.00035	0.00003	0
NE	B	0.00006	0.00061	0.00041	0.00035	0.00006	0
ENE	B	0.00006	0.00061	0.0005	0.00026	0.00012	0
E	B	0.00003	0.00056	0.00117	0.00026	0.00006	0.00006
ESE	B	0.00003	0.00082	0.00143	0.00093	0.00006	0.00009
SE	B	0.00006	0.00167	0.00213	0.00117	0.00029	0.00003
SSE	B	0.00006	0.00178	0.00187	0.00129	0.00012	0
S	B	0.00012	0.0026	0.00199	0.00096	0.00003	0
SSW	B	0.00012	0.00295	0.00158	0.00041	0.00003	0

Direction	Class	1-3	4-6	7-10	11-16	17-21	>21
SW	B	0.00029	0.00199	0.00105	0.00038	0.00015	0.00003
WSW	B	0.00029	0.00219	0.00073	0.00064	0.00023	0.00015
W	B	0.00018	0.00167	0.0007	0.00038	0.00047	0.00023
WNW	B	0.00015	0.00172	0.00061	0.0002	0.00009	0
NW	B	0.00003	0.00149	0.00099	0.0002	0	0.00003
NNW	B	0	0.00117	0.00079	0.00038	0.00018	0.00009
N	C	0.00006	0.00108	0.00044	0.00058	0.00009	0
NNE	C	0.00009	0.00085	0.00064	0.00056	0	0.00003
NE	C	0.00003	0.00091	0.00047	0.00067	0.00009	0.00003
ENE	C	0.00009	0.00053	0.00079	0.00018	0.00012	0
E	C	0.0002	0.00079	0.00079	0.00029	0.00009	0.00003
ESE	C	0.00003	0.00102	0.0012	0.00067	0.00006	0.00006
SE	C	0.0002	0.0014	0.00172	0.00117	0.00009	0
SSE	C	0.00029	0.00155	0.00152	0.0012	0	0
S	C	0.00006	0.00164	0.00134	0.00053	0	0
SSW	C	0.00032	0.00193	0.0007	0.00041	0.00003	0
SW	C	0.00015	0.00181	0.00061	0.00044	0.0002	0
WSW	C	0.00035	0.00143	0.00061	0.00047	0.00012	0.00006
W	C	0.00038	0.00149	0.00044	0.0005	0.00053	0.00035
WNW	C	0.0002	0.00117	0.00023	0.00006	0.00009	0.00006
NW	C	0.00006	0.00231	0.00047	0.0002	0.00023	0.00012
NNW	C	0.00009	0.00105	0.00047	0.00038	0.00009	0.00012
N	D	0.00082	0.00204	0.00204	0.00155	0.00035	0.00023
NNE	D	0.00058	0.00134	0.00207	0.00248	0.00079	0
NE	D	0.00047	0.00091	0.00275	0.00389	0.00091	0.00029
ENE	D	0.00044	0.00117	0.00216	0.00432	0.00251	0.00041
E	D	0.00026	0.00105	0.0028	0.00318	0.00204	0.0002
ESE	D	0.0007	0.00193	0.00505	0.00371	0.00079	0.00035
SE	D	0.00067	0.00225	0.00631	0.00856	0.00359	0.00056
SSE	D	0.00096	0.00254	0.00488	0.00368	0.00035	0.00003
S	D	0.00111	0.00242	0.0028	0.00079	0.00003	0.00006
SSW	D	0.00099	0.00219	0.00102	0.00053	0.00012	0
SW	D	0.00137	0.00169	0.00093	0.00108	0.00032	0
WSW	D	0.00102	0.0021	0.00143	0.00146	0.00067	0.00015
W	D	0.0014	0.00134	0.00099	0.00207	0.00158	0.00053
WNW	D	0.00161	0.00199	0.00058	0.00073	0.00099	0.0002
NW	D	0.00085	0.0026	0.00088	0.00102	0.00082	0.00035
NNW	D	0.00082	0.00254	0.00158	0.00149	0.00079	0.0007
N	E	0.00079	0.00175	0.00207	0.00175	0.00023	0.00003
NNE	E	0.00093	0.00216	0.00242	0.00079	0.00018	0
NE	E	0.00091	0.0014	0.00213	0.0014	0.00044	0
ENE	E	0.00067	0.00149	0.00286	0.0021	0.00018	0
E	E	0.00126	0.00181	0.00681	0.00856	0.00099	0.00003
ESE	E	0.00114	0.00307	0.0132	0.01011	0.00032	0
SE	E	0.00114	0.00362	0.01691	0.01502	0.00245	0.00041
SSE	E	0.0007	0.00342	0.00944	0.00628	0.00018	0.00006
S	E	0.00058	0.00266	0.00161	0.00029	0.00003	0
SSW	E	0.00064	0.00114	0.00085	0.00079	0	0

Direction	Class	1-3	4-6	7-10	11-16	17-21	>21
SW	E	0.00067	0.0012	0.00126	0.0005	0.0002	0
WSW	E	0.00047	0.00129	0.0014	0.0014	0.00018	0.00003
W	E	0.00064	0.00082	0.00093	0.00248	0.00058	0.00006
WNW	E	0.00058	0.0012	0.00067	0.0007	0.00012	0
NW	E	0.00061	0.00111	0.00117	0.00061	0.00023	0.0002
NNW	E	0.00067	0.00196	0.00167	0.00146	0.0005	0.00018
N	F	0.00137	0.00204	0.00222	0.00056	0.00006	0.00003
NNE	F	0.00172	0.00257	0.00137	0.00026	0.00003	0
NE	F	0.00134	0.00202	0.00114	0.00012	0	0
ENE	F	0.00123	0.00202	0.00161	0.00035	0.00015	0
E	F	0.00155	0.00251	0.00502	0.00213	0.00023	0
ESE	F	0.00184	0.0057	0.01431	0.00242	0.0002	0.00003
SE	F	0.00184	0.00806	0.013	0.00172	0	0
SSE	F	0.00196	0.00555	0.00397	0.00038	0	0.00003
S	F	0.00167	0.00307	0.00172	0.00009	0	0
SSW	F	0.00155	0.00213	0.00082	0.0002	0	0
SW	F	0.00064	0.00131	0.00131	0.00009	0	0
WSW	F	0.00096	0.00143	0.00178	0.00038	0	0
W	F	0.00105	0.00088	0.00093	0.00143	0	0
WNW	F	0.0007	0.0012	0.00088	0.0005	0	0
NW	F	0.00096	0.00134	0.00111	0.00029	0	0
NNW	F	0.00129	0.00155	0.00242	0.0002	0	0.00003
N	G	0.00114	0.0026	0.00263	0.00035	0	0
NNE	G	0.0014	0.00578	0.0059	0.00035	0	0.00003
NE	G	0.00149	0.00538	0.00462	0.00006	0	0
ENE	G	0.00096	0.00342	0.00342	0.00035	0	0
E	G	0.00292	0.0045	0.01025	0.00108	0	0
ESE	G	0.00248	0.01215	0.0428	0.00263	0	0
SE	G	0.00216	0.01338	0.02168	0.00111	0	0
SSE	G	0.00216	0.00806	0.00538	0.00003	0	0
S	G	0.00266	0.0052	0.00088	0	0	0
SSW	G	0.00146	0.00298	0.00058	0.00006	0.00003	0
SW	G	0.0014	0.00152	0.00091	0.00003	0	0
WSW	G	0.00079	0.00126	0.00155	0.00009	0	0
W	G	0.00102	0.00105	0.00167	0.00035	0	0
WNW	G	0.00126	0.00096	0.00088	0.00009	0	0
NW	G	0.00099	0.00167	0.00181	0.00082	0	0
NNW	G	0.00102	0.00152	0.00257	0.00044	0.00003	0

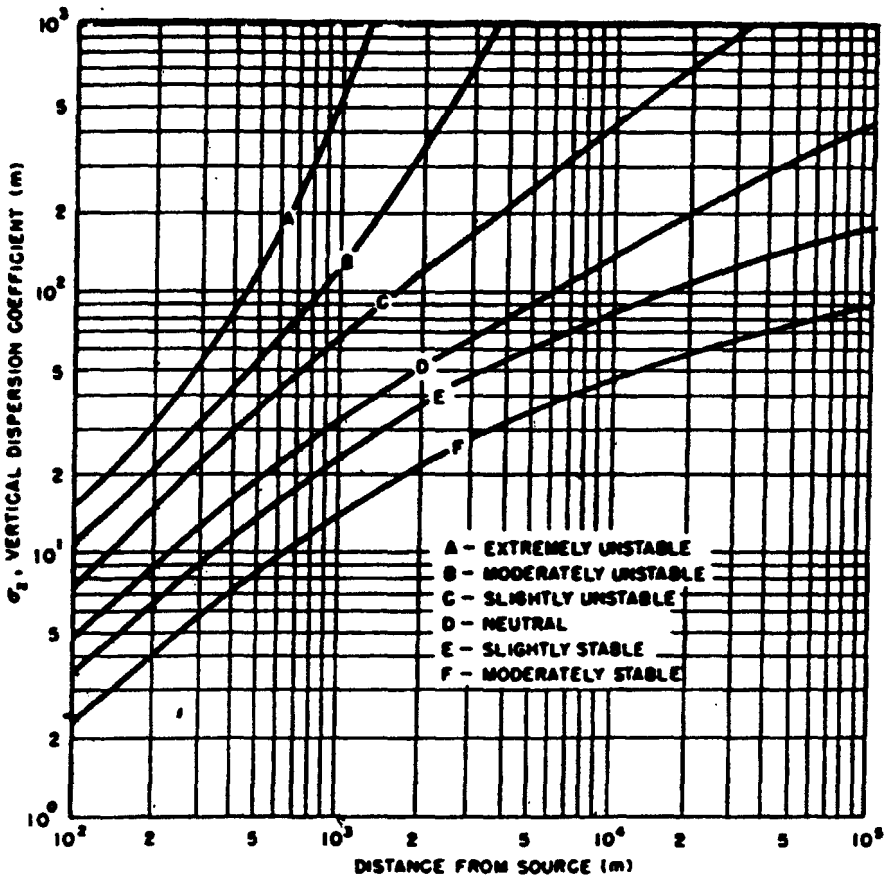
Appendix G: Dispersion Coefficients



Lateral diffusion without meander and building wake effects, σ_y vs. down-wind distance from source for pasquill's turbulance types (atmospheric stability).

For purposes of estimating σ_y during extremely stable (G) atmospheric conditions without plume meander or other lateral enhancements, the following approximation is appropriate:

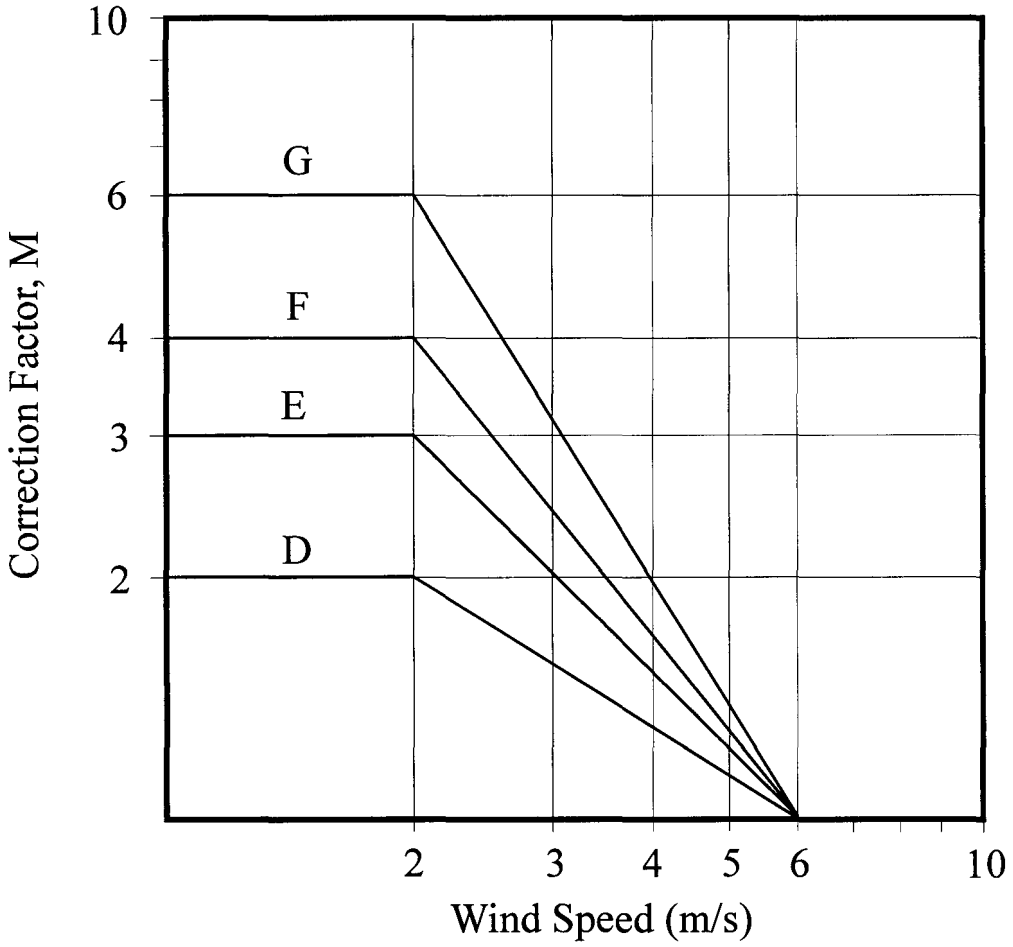
$$\sigma_y(G) = \frac{2}{3}\sigma_y(F)$$



Vertical diffusion without meander and building wake effects, σ_z vs. downwind distance from source for pasquill's turbulance types (atmospheric stability).

For purposes of estimating σ_z during extremely stable (G) atmospheric conditions without plume meander or other lateral enhancements, the following approximation is appropriate:

$$\sigma_z(G) = \frac{3}{5}\sigma_z(F)$$



Correction factors for σ_y values by atmsopheric stability class

Appendix H: Joint Frequency Table (jointfre.in) and GXQ Input Files (gxq.in)

1. Confirmation with Faulk (2000)

```
WIPP Data to Confirm Westinghouse Modeling
Created 6/5/00, DR 10M, A-F, 9/1/96 - 10/25/99
     8     6     1     1     10.000
    0.35   0.77    2.18    4.25    6.83    8.83    11.11    13.93
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.01  0.00  0.01  0.00  0.01  0.03  0.03  0.03  0.08  0.00  0.01  0.00  0.00  0.00  0.00  0.06
  0.01  0.02  0.02  0.02  0.03  0.02  0.02  0.02  0.02  0.02  0.02  0.01  0.01  0.02  0.02  0.02
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.00  0.01  0.00  0.00  0.00
  0.02  0.02  0.03  0.03  0.02  0.02  0.02  0.03  0.03  0.03  0.04  0.03  0.05  0.04  0.04  0.03
  0.02  0.02  0.03  0.02  0.05  0.03  0.04  0.02  0.04  0.03  0.02  0.01  0.02  0.03  0.01  0.02
  0.09  0.10  0.09  0.10  0.12  0.12  0.11  0.12  0.13  0.11  0.07  0.07  0.08  0.10  0.08  0.08
  0.09  0.08  0.07  0.08  0.09  0.15  0.26  0.34  0.36  0.37  0.32  0.30  0.23  0.20  0.15  0.11
  0.08  0.06  0.04  0.05  0.08  0.09  0.16  0.17  0.21  0.24  0.20  0.21  0.17  0.18  0.13  0.09
  0.08  0.08  0.06  0.07  0.10  0.12  0.16  0.17  0.18  0.20  0.21  0.21  0.19  0.18  0.20  0.12
  0.25  0.22  0.19  0.18  0.28  0.39  0.37  0.39  0.35  0.31  0.30  0.34  0.32  0.36  0.37  0.29
  0.25  0.22  0.16  0.17  0.29  0.45  0.48  0.39  0.32  0.20  0.18  0.15  0.16  0.17  0.18  0.22
  0.57  0.84  0.95  0.67  0.91  1.91  2.18  1.47  1.00  0.57  0.34  0.28  0.31  0.36  0.40  0.40
  0.42  0.35  0.29  0.34  0.59  1.00  1.73  1.96  1.98  1.33  0.87  0.91  0.70  0.53  0.44  0.41
  0.12  0.09  0.09  0.08  0.16  0.21  0.31  0.31  0.25  0.17  0.13  0.11  0.09  0.09  0.15  0.12
  0.09  0.09  0.07  0.09  0.13  0.19  0.26  0.27  0.17  0.10  0.07  0.08  0.06  0.06  0.08  0.07
  0.42  0.46  0.41  0.41  0.61  0.83  1.04  0.82  0.38  0.17  0.13  0.20  0.13  0.08  0.19  0.33
  0.34  0.25  0.26  0.42  0.87  1.83  2.81  1.19  0.26  0.15  0.15  0.28  0.31  0.15  0.16  0.23
  0.52  0.64  0.64  0.75  1.69  5.64  3.56  0.97  0.28  0.14  0.19  0.37  0.38  0.25  0.25  0.45
  0.16  0.12  0.10  0.09  0.12  0.14  0.51  0.60  0.26  0.15  0.18  0.36  0.45  0.11  0.12  0.16
  0.02  0.02  0.01  0.02  0.02  0.03  0.06  0.06  0.03  0.02  0.01  0.04  0.03  0.01  0.01  0.02
  0.03  0.02  0.02  0.02  0.02  0.03  0.06  0.04  0.02  0.01  0.01  0.03  0.04  0.01  0.02  0.02
  0.14  0.22  0.18  0.20  0.25  0.23  0.40  0.19  0.04  0.03  0.04  0.09  0.15  0.06  0.06  0.10
  0.06  0.06  0.07  0.25  0.42  0.52  0.97  0.33  0.02  0.02  0.02  0.08  0.24  0.06  0.04  0.04
  0.02  0.01  0.01  0.02  0.08  0.10  0.04  0.01  0.00  0.00  0.00  0.01  0.06  0.01  0.02  0.01
  0.05  0.04  0.04  0.02  0.03  0.02  0.09  0.11  0.04  0.04  0.12  0.22  0.29  0.05  0.03  0.05
  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.01  0.00  0.01  0.01  0.02  0.03  0.00  0.01  0.01
  0.01  0.01  0.01  0.01  0.01  0.00  0.01  0.00  0.00  0.00  0.01  0.02  0.03  0.00  0.01  0.00
  0.06  0.09  0.08  0.18  0.19  0.09  0.23  0.10  0.01  0.01  0.02  0.06  0.15  0.05  0.02  0.04
  0.01  0.01  0.03  0.04  0.11  0.06  0.19  0.05  0.00  0.00  0.01  0.02  0.08  0.01  0.01  0.01
  0.00  0.00  0.00  0.01  0.02  0.01  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.02  0.01  0.03  0.02  0.03  0.00  0.03  0.01  0.01  0.03  0.05  0.12  0.30  0.01  0.00  0.06
  0.00  0.00  0.01  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.04  0.00  0.00  0.00
  0.00  0.00  0.01  0.01  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.04  0.00  0.00  0.00
  0.00  0.02  0.08  0.07  0.05  0.03  0.07  0.01  0.00  0.00  0.00  0.02  0.11  0.03  0.01  0.02
  0.00  0.00  0.02  0.01  0.01  0.00  0.04  0.02  0.00  0.00  0.00  0.00  0.02  0.00  0.01  0.01
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.02  0.11  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.00  0.00  0.00  0.00  0.00  0.01  0.00  0.01  0.01
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
```

2. GXQ Input File

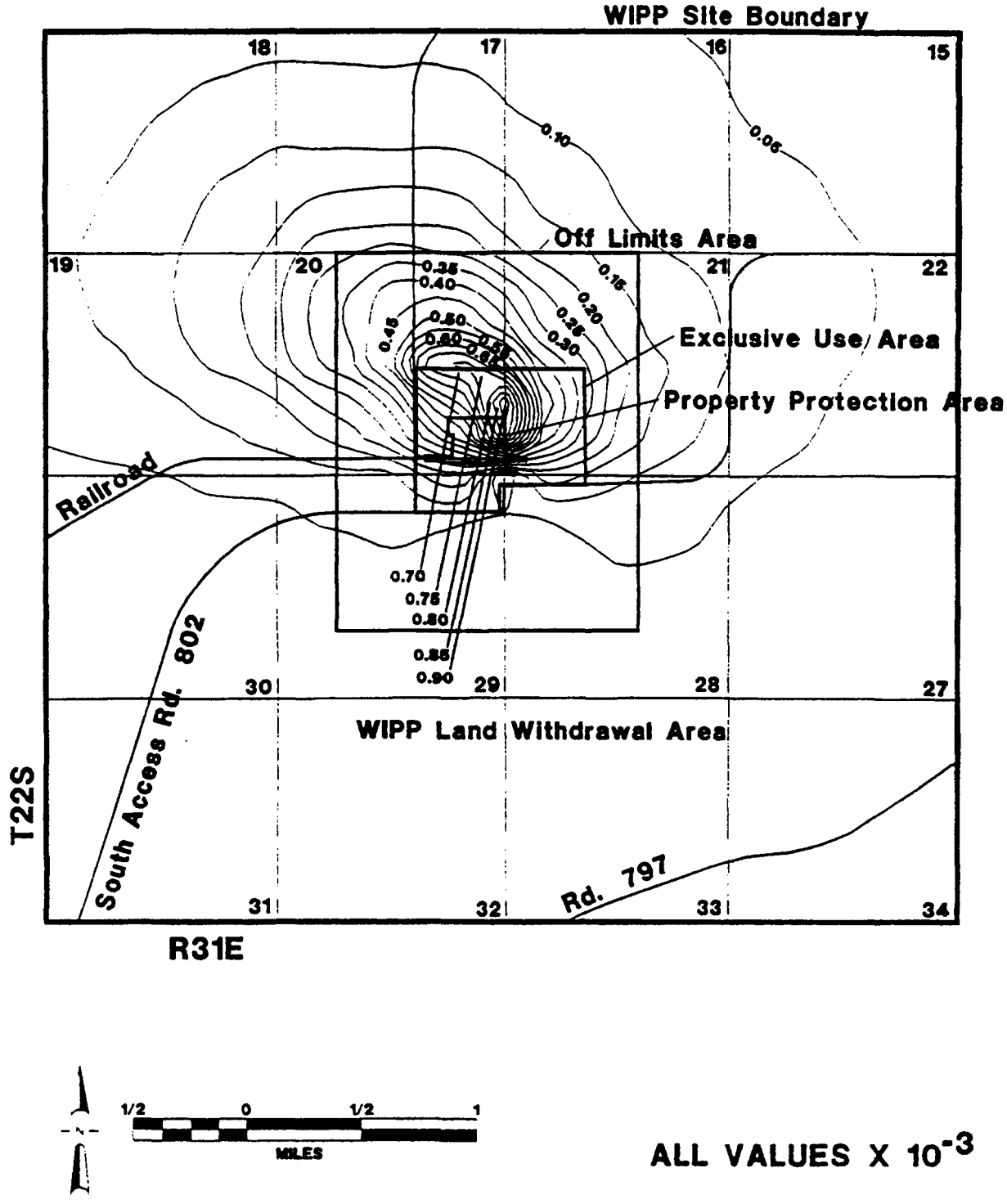
```
Input title line
c GXQ Version 4.0 Input File
c   mode
    1
c
c MODE CHOICE:
c mode = 1 then X/Q based on Hanford site specific meteorology
c mode = 2 then X/Q based on atmospheric stability class and wind speed
c mode = 3 then X/Q plot file is created
c
c LOGICAL CHOICES:
c   ifox  inorm icdf  ichk  isite ipop
    t     f     t     f     t     f
c ifox  = t then joint frequency used to compute frequency to exceed X/Q
c       = f then joint frequency used to compute annual average X/Q
c inorm = t then joint frequency data is normalized (as in GENII)
c       = f then joint frequency data is un-normalized
c icdf  = t then cumulative distribution file created (CDF.OUT)
c       = f then no cumulative distribution file created
c ichk  = t then X/Q parameter print option turned on
c       = f then no parameter print
c isite = t then X/Q based on joint frequency data for all 16 sectors
c       = f then X/Q based on joint frequency data of individual sectors
c ipop  = t then X/Q is population weighted
c       = f then no population weighting
c
c X/Q AND WIND SPEED ADJUSTMENT MODELS:
c   ipuff idep  isrc  iwind
    0     0     0     0
c DIFFUSION COEFFICIENT ADJUSTMENT MODELS:
c   iwake ipm   iflow ientr
    1     1     0     0
c EFFECTIVE RELEASE HEIGHT ADJUSTMENT MODELS:
c  (irise igrnd)iwash igrav
    0     0     0     0
c ipuff = 1 then X/Q calculated using puff model
c       = 0 then X/Q calculated using default continuous plume model
c idep  = 1 then plume depletion model turned on (Chamberlain model)
c isrc  = 1 then X/Q multiplied by scalar
c       = 2 then X/Q adjusted by wind speed function
c iwind = 1 then wind speed corrected for plume height
c iwake = 1 then NRC RG 1.145 building wake model turned on
c       = 2 then MACCS virtual distance building wake model turned on
c ipm   = 1 then NRC RG 1.145 plume meander model turned on
c       = 2 then 5th Power Law plume meander model turned on
c       = 3 then sector average model turned on
c iflow = 1 then sigmas adjusted for volume flow rate
c ientr = 1 then method of Pasquill used to account for entrainment
c irise = 1 then MACCS buoyant plume rise model turned on
c       = 2 then ISC2 momentum/buoyancy plume rise model turned on
c igrnd = 1 then Mills buoyant plume rise modification for ground effects
c iwash = 1 then stack downwash model turned on
c igrav = 1 then gravitational settling model turned on
c       = 0 unless specified otherwise, 0 turns model off
```

```
c
c PARAMETER INPUT:
c                  reference                          frequency
c   release        anemometer     mixing              to
c   height         height         height              exceed
c   hs(m)          ha(m)          hm(m)               Cx(%)
c   ____________   ____________   ____________        ____________
    0              10             1000                 5.0
c
c   initial        initial                                          gravitational
c   plume          plume          release             deposition    settling
c   width          height         duration            velocity      velocity
c   Wb(m)          Hb(m)          trd(hr)             vd(m/s)       vg(m/s)
c   ____________   ____________   ____________        ____________  ____________
    27             7              0                    0.001         0.001
c
c                  initial        initial                           convective
c   ambient        plume          plume               release       heat release
c   temperature    temperature    flow rate           diameter      rate(1)
c   Tamb(C)        T0(C)          V0(m3/s)            d(m)          qh(w)
c   ____________   ____________   ____________        ____________  ____________
    20             22             1                   1.00          0
c
c (1) If zero then buoyant flux based on plume/ambient temperature difference.
c
c   X/Q            Wind
c   scaling        Speed
c   factor         Exponent
c   c(?)           a(?)
c   ____________   ____________
    1              .78
c
c RECEPTOR DEPENDENT DATA (no line limit)
c FOR MODE     make          RECEPTOR DEPENDENT DATA
c 1 (site specific)          sector distance receptor-height
c 2 (by class & wind speed) class windspeed distance offset receptor-height
c 3 (create plot file)       class windspeed xmax imax ymax jmax xqmin power
c
c RECEPTOR PARAMETER DESCRIPTION
c sector = 0, 1, 2... (all, S, SSW, etc.)
c distance = receptor distance (m)
c receptor height = height of receptor (m)
c class = 1, 2, 3, 4, 5, 6, 7 (P-G stability class A, B, C, D, E, F, G)
c windspeed = anemometer wind speed (m/s)
c offset = offset from plume centerline (m)
c xmax = maximum distance to plot or calculate to (m)
c imax = distance intervals
c ymax = maximum offset to plot (m)
c jmax = offset intervals
c xqmin = minimum scaled X/Q to calculate
c power = exponent in power function step size
0  100   0
```

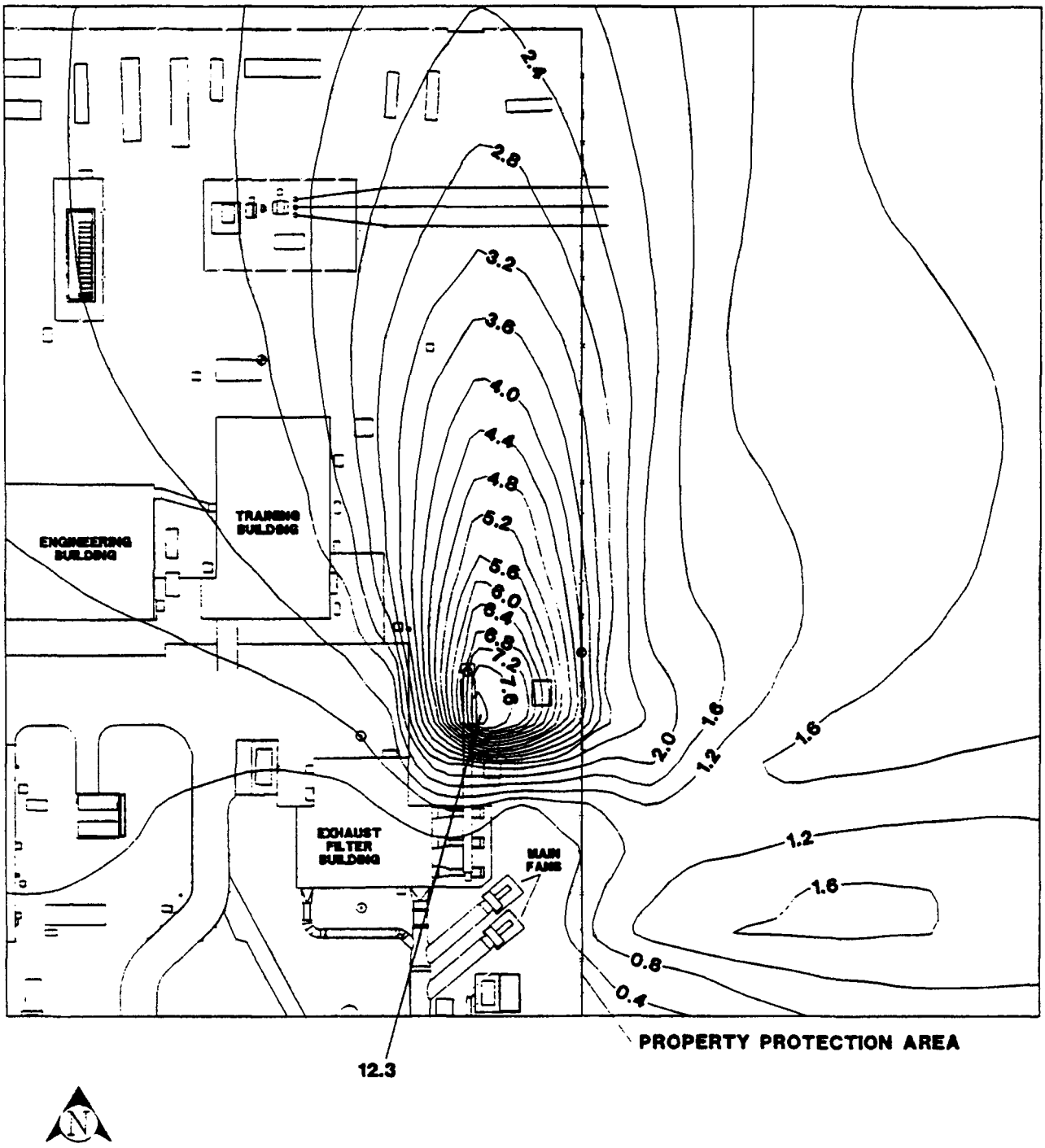
3. Joint Frequency Table for Modeling All Stability Classes

```
WIPP Data for modeling stability classes A-G
Created 6/5/00, DR 10M, A-G, 9/1/96 - 2/29/00
     8     7     1     1     10.000
    0.35   0.77    2.18    4.25    6.83    8.83    11.11    13.93
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.08  0.07  0.07  0.08  0.09  0.14  0.24  0.33  0.35  0.37  0.32  0.29  0.22  0.19  0.14  0.10
  0.41  0.33  0.27  0.32  0.56  0.94  1.61  1.85  1.93  1.37  0.88  0.89  0.69  0.53  0.44  0.41
  0.16  0.11  0.10  0.08  0.11  0.13  0.47  0.56  0.27  0.15  0.19  0.35  0.43  0.11  0.12  0.17
  0.05  0.04  0.04  0.02  0.03  0.02  0.09  0.11  0.03  0.04  0.11  0.22  0.29  0.06  0.03  0.05
  0.03  0.01  0.03  0.01  0.02  0.00  0.03  0.01  0.00  0.03  0.06  0.13  0.33  0.02  0.01  0.07
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.10  0.00  0.00  0.01
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.08  0.07  0.05  0.05  0.07  0.09  0.15  0.17  0.21  0.24  0.20  0.21  0.17  0.19  0.13  0.09
  0.12  0.09  0.08  0.08  0.15  0.20  0.30  0.29  0.25  0.19  0.14  0.11  0.09  0.09  0.16  0.13
  0.02  0.02  0.01  0.01  0.02  0.03  0.06  0.06  0.02  0.02  0.01  0.03  0.03  0.01  0.01  0.02
  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.01  0.00  0.00  0.01  0.03  0.04  0.00  0.00  0.01
  0.00  0.00  0.01  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.04  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.00  0.01  0.00  0.00  0.00
  0.08  0.09  0.06  0.08  0.10  0.12  0.16  0.16  0.18  0.20  0.21  0.20  0.19  0.19  0.21  0.12
  0.09  0.09  0.07  0.08  0.13  0.19  0.25  0.25  0.17  0.11  0.08  0.08  0.06  0.06  0.09  0.08
  0.03  0.02  0.02  0.02  0.02  0.03  0.05  0.04  0.02  0.01  0.01  0.03  0.04  0.01  0.01  0.01
  0.01  0.00  0.00  0.01  0.00  0.00  0.01  0.00  0.00  0.00  0.01  0.02  0.03  0.00  0.01  0.00
  0.00  0.00  0.01  0.01  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.04  0.00  0.00  0.01
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.02  0.02  0.02  0.03  0.02  0.02  0.02  0.03  0.03  0.03  0.04  0.04  0.04  0.04  0.04  0.03
  0.27  0.22  0.19  0.19  0.27  0.37  0.35  0.37  0.36  0.32  0.31  0.35  0.33  0.37  0.40  0.30
  0.40  0.43  0.38  0.39  0.59  0.78  0.97  0.78  0.37  0.18  0.13  0.19  0.14  0.08  0.18  0.32
  0.13  0.20  0.16  0.18  0.24  0.22  0.38  0.18  0.04  0.03  0.04  0.10  0.15  0.06  0.06  0.11
  0.06  0.08  0.08  0.16  0.18  0.08  0.21  0.09  0.01  0.01  0.02  0.06  0.16  0.05  0.03  0.05
  0.01  0.02  0.07  0.07  0.05  0.02  0.06  0.01  0.00  0.00  0.00  0.02  0.12  0.03  0.01  0.02
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.01  0.00
  0.01  0.00  0.01  0.00  0.01  0.02  0.02  0.03  0.07  0.00  0.01  0.00  0.00  0.00  0.00  0.06
  0.02  0.02  0.03  0.02  0.05  0.03  0.04  0.02  0.04  0.03  0.02  0.01  0.02  0.03  0.01  0.02
  0.25  0.22  0.18  0.17  0.28  0.42  0.46  0.38  0.31  0.20  0.19  0.16  0.15  0.17  0.19  0.23
  0.33  0.23  0.26  0.41  0.84  1.75  2.68  1.14  0.25  0.14  0.15  0.28  0.32  0.16  0.17  0.23
  0.06  0.06  0.08  0.24  0.45  0.53  0.94  0.30  0.02  0.02  0.02  0.09  0.26  0.07  0.04  0.05
  0.01  0.01  0.04  0.04  0.12  0.06  0.18  0.05  0.00  0.00  0.01  0.03  0.10  0.01  0.01  0.02
  0.00  0.00  0.02  0.01  0.01  0.00  0.03  0.02  0.00  0.00  0.00  0.00  0.02  0.00  0.01  0.01
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.01  0.01  0.01  0.01  0.01  0.01  0.01  0.02  0.01  0.01  0.01  0.01  0.01  0.01  0.01  0.01
  0.05  0.06  0.05  0.06  0.06  0.06  0.06  0.07  0.06  0.06  0.03  0.04  0.03  0.04  0.04  0.04
  0.30  0.33  0.33  0.25  0.32  0.61  0.85  0.66  0.42  0.28  0.17  0.17  0.17  0.19  0.23  0.25
  0.22  0.18  0.14  0.22  0.59  1.80  1.51  0.50  0.13  0.08  0.13  0.25  0.24  0.14  0.12  0.26
  0.01  0.01  0.01  0.01  0.08  0.09  0.02  0.01  0.00  0.00  0.00  0.01  0.06  0.01  0.01  0.01
  0.00  0.00  0.00  0.01  0.02  0.01  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.01  0.01  0.01  0.00  0.01  0.01  0.01  0.01  0.01  0.01  0.01  0.01  0.00  0.01  0.02  0.01
  0.05  0.05  0.05  0.04  0.07  0.07  0.07  0.06  0.07  0.05  0.04  0.04  0.05  0.06  0.05  0.05
  0.32  0.59  0.66  0.42  0.62  1.33  1.42  0.86  0.59  0.32  0.18  0.12  0.14  0.17  0.21  0.18
  0.33  0.56  0.58  0.52  1.18  3.95  2.17  0.53  0.14  0.06  0.07  0.13  0.16  0.11  0.14  0.23
  0.00  0.00  0.00  0.01  0.01  0.03  0.02  0.00  0.00  0.00  0.00  0.00  0.01  0.00  0.01  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
```

Appendix I: Air Dispersion Factors used in the WIPP RCRA Subpart B Application



Course Grid


2.4
2.8
3.2
3.6
4.0
4.4
4.8
5.2
5.6
6.0
6.4
6.8
7.2
7.6
2.0
1.6
1.2
1.6
1.2
1.6
0.8
0.4
ENGINEERING BUILDING
TRAINING BUILDING
EXHAUST FILTER BUILDING
MAIN FANS
PROPERTY PROTECTION AREA
12.3
N
50' 0 50' 100'
ALL VALUES X 10-3

Fine Grid

LIST OF EEG REPORTS

EEG-1 Goad, Donna, A Compilation of Site Selection Criteria Considerations and Concerns Appearing in the Literature on the Deep Disposal of Radioactive Wastes, June 1979.

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