CHAPTER 5 - ENVIRONMENTAL NONRADIOLOGICAL PROGRAM INFORMATION

This chapter discusses nonradiological environmental surveillance data collected between January 1 and December 31, 2001. Nonradiological programs at WIPP include wildlife population monitoring, meteorological monitoring, and seismic monitoring. In addition, VOCs were monitored to comply with the provisions of WIPP's hazardous waste permit, and liquid effluent monitoring was conducted in accordance with WIPP's Discharge Plan (DP-831).

5.1 Principal Functions of Nonradiological Sampling

The principal functions of the nonradiological environmental surveillance program are to:

- Assess the impacts of WIPP operations on the surrounding ecosystem;
- Monitor ecological conditions in the Los Medaños region;
- Investigate unusual or unexpected elements in the ecological databases;
- Provide environmental data which are important to the mission of the WIPP project, but which have not or will not be acquired by other programs; and
- Comply with applicable commitments identified with existing agreements (e.g., BLM/DOE MOU, Interagency Agreements, Agreements in Principle, etc.).

5.2 WIPP Raptor Program

WIPP, and the region surrounding it, is widely recognized for its concentration and diversity of raptors. The area is home to several raptor species of special concern, including Harris' hawks, Swainson's hawks, burrowing owls, and barn owls, as well as other species.

The DOE, the BLM, and other government agencies are aware of the value and importance of protecting and monitoring raptor populations. To assist in this effort at WIPP, the BLM and the DOE established the WRP in the early 1990s to monitor and protect raptors on the WIPP site, and to educate site workers and the public about these birds. The WRP is administrated by the WIPP Environmental Monitoring Program with input from the BLM and others. Scientific consultation, research direction, and field operations are conducted by scientists from the Department of Biology at Rocky Mountain College (Restani, 2001).

Raptor research at WIPP began in 1981 when the DOE initiated a study of the social behavior of Harris' hawks conducted by the University of New Mexico. Research results revealed the extent of the overall raptor population, and provided new information about raptor species in the area. In the late 1980s, the BLM designated the Los Medaños Raptor Area, which included the WIPP site, as a National Key Raptor Area. This designation served as a catalyst for the development of the WRP. Simultaneously, the DOE reorganized its program to encompass expanded objectives.

The WRP presently serves four significant functions:

- Wildlife Monitoring. The WRP provides the DOE, the BLM, and other agencies with current information about the status of raptor populations in and around WIPP.

- Scientific Research. WRP staff conduct research on topics that contribute to the understanding of raptors in the desert southwest.

- Interagency Cooperation. The WRP is funded by the DOE, but works closely with several other federal and state agencies.

In 2001, long-term studies of productivity and population demographics of the raptor community in and around WIPP continued. The primary objective for the 2001 nesting season was to locate all raptor and raven nests within the 3000 km^2 study area, centered on WIPP. Secondary objectives were to estimate raptor productivity in the area and to determine causes of raptor mortality.

Research ornithologists located 98 raptor territories in 2001. As in CY 2000, the number of nests far surpassed those found in previous years' studies.

Electrocution by power poles continues to be an important cause of raptor mortality and is predicted to increase as oil and gas exploration increases in the area. In one case, however, a nest was deliberately destroyed by an unknown person or persons. For more information on the WRP, see the Waste Isolation Pilot Plant WIPP Raptor Program 2001 Annual Report (Restani, 2001).

5.3 Meteorology

The primary WIPP meteorological station is located 600 m (1,970 ft) northeast of the Waste Handling Building. The main function of the station is to provide data for atmospheric dispersion modeling. The station measures and records wind speed, wind direction, and temperature at elevations of 2,10, and 50 m (6.5, 33, and 165 ft). The station records ground-level measurements of barometric pressure, relative humidity, precipitation, and solar radiation.

In addition to the primary meteorological station, the WIPP Far Field Station is located 1,000 m (3,300 ft) northwest of the Waste Handling Building. At the WIPP Far Field Station, a secondary meteorological station measures and records temperature and atmospheric pressure at ground level and wind speed and wind direction at 10 m (33 ft).

5.3.1 Climatic Data

The annual precipitation at the WIPP site for 2001 was 240 mm (9.5 in), which was 65 mm (2.5 in) less than the previous year's rainfall. Figure 5.1 displays the monthly precipitation at WIPP.

The mean annual temperature for the WIPP area in 2001 was 17°C (64°F). The mean monthly temperatures for the WIPP area ranged from 10°C (50°F) during December to 25°C (78°F) in July. Generally, maximum temperatures occurred from May through September, while minimum temperatures occurred in January, November, and December, as illustrated in Figures 5.2, 5.3, and 5.4 and Tables 5.1, 5.2, and 5.3. The lowest recorded temperature was -9°C (16°F) in January. The maximum recorded temperature was 40°C (105°F) in May.

5.3.2 Wind Direction and Wind Speed

Winds in the WIPP area in 2001 blew predominantly from the southeast (135°). Seasonal weather systems move through this area, briefly altering the predominant southeasterly winds and sometimes resulting in violent convectional storms. Wind speed measured at the 10-m (33-ft) level were calm (less than 0.5 meters per second [m/s]) (1.1 miles per hour [mph]) about 0.5 percent of the time. At the 10-m level, winds of 3.7 through 6.3 m/s (8.3 to 14.1 mph) were the most prevalent over 2001, occurring 40 percent of the time. Figures 5.5, 5.6, and 5.7 and Tables 5.4, 5.5, and 5.6 display the annual wind data at WIPP for 2001.

5.4 Volatile Organic Compound Monitoring

Volatile organic compound monitoring was implemented on April 21, 1997, in accordance with WP12-VC.01, Confirmatory Volatile Organic Compound Monitoring Program. This program was implemented as a requirement of the HWFP, Module IV, Section D and Attachment N, and is intended to demonstrate that regulated VOCs are not being emitted by the waste at concentrations in excess of concentrations of concern as prescribed in the permit.

Nine target compounds, which contribute approximately 99 percent of the calculated human health risks from RCRA constituents, were chosen for monitoring. These target compounds are 1,1-dichloroethylene, methylene chloride, chloroform, 1,1,1-trichloroethane, carbon tetrachloride, 1,2-dichloroethane, toluene, chlorobenzene, and 1,1,2,2-tetrachloroethane.

Sampling for target compounds is done at two air monitoring stations. The stations are identified as VOC-A, located downstream from hazardous waste disposal unit Panel 1 in Drift E300, and VOC-B, located upstream from Panel 1. In 2001, VOC-B was located in Drift S1950. As waste is placed in new panels, VOC-B will be relocated to ensure that it samples underground air before it passes the waste panels. The location of VOC-A is not anticipated to change.

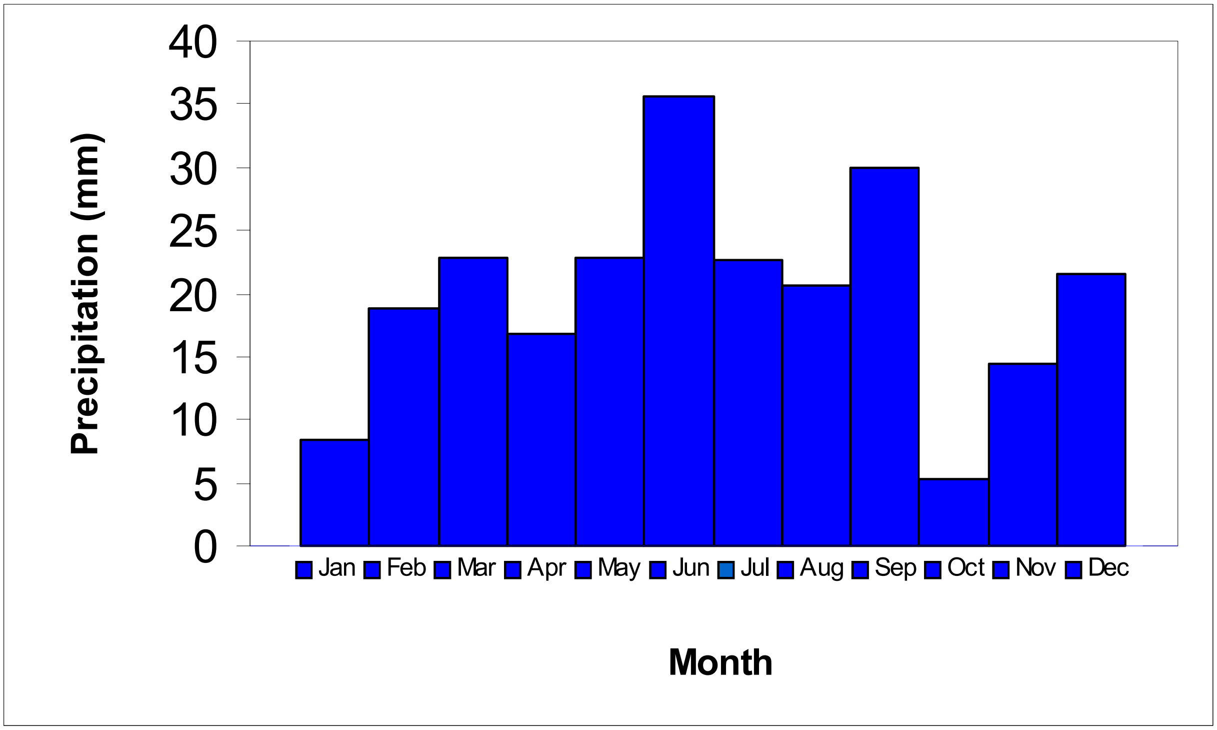


Figure 5.1 - 2001 Precipitation at WIPP

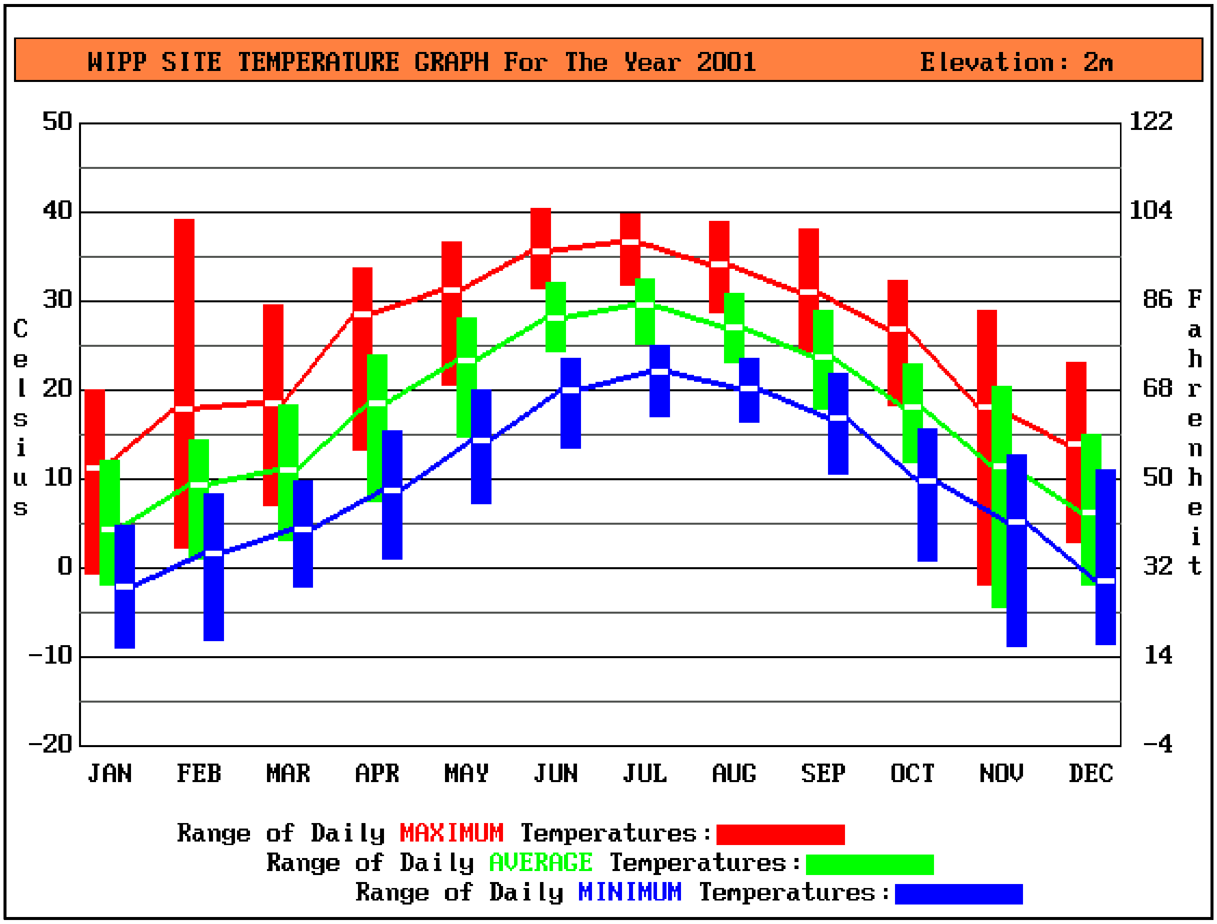


Figure 5.2 - 2001 WIPP Site Temperature at 2-Meter Height

Table 5.1 - A Summary of 2001 Temperature Observations at 2-Meter Height

Month	Max of Daily Highs (°C)	Avg of Daily Highs (°C)	Min of Daily Highs (°C)	Max of Daily Averages (°C)	Avg of Daily Averages (°C)	Min of Daily Averages (°C)	Max of Daily Lows (°C)	Avg of Daily Lows (°C)	Min of Daily Lows (°C)
Jan	19.97	11.24	-0.68	12.15	4.43	-1.96	4.81	-2.08	-8.93
Feb	39.15	17.99	2.34	14.47	9.28	0.95	8.24	1.69	-8.16
Mar	29.51	18.63	7.04	18.30	11.13	3.14	9.87	4.44	-2.06
Apr	33.77	28.50	13.40	23.87	18.63	7.56	15.39	8.83	0.94
May	36.76	31.29	20.56	28.10	23.23	14.84	19.98	14.31	7.22
Jun	40.47	35.58	31.53	32.02	28.14	24.36	23.51	19.98	13.49
Jul	39.85	36.66	31.88	32.47	29.68	25.23	25.09	22.17	17.17
Aug	39.04	34.23	28.66	30.84	27.09	23.15	23.49	20.16	16.56
Sep	38.20	31.08	24.28	28.87	23.74	17.89	21.79	16.84	10.65
Oct	32.20	26.79	18.23	22.86	18.18	11.82	15.67	9.81	0.87
Nov	28.96	18.16	-1.84	20.35	11.49	-4.39	12.81	5.18	-8.69
Dec	23.20	14.00	2.94	15.02	6.17	-1.97	10.95	-1.47	-8.60
Annual	40.47	25.35	-1.84	32.47	17.60	-4.39	25.09	9.99	-8.93

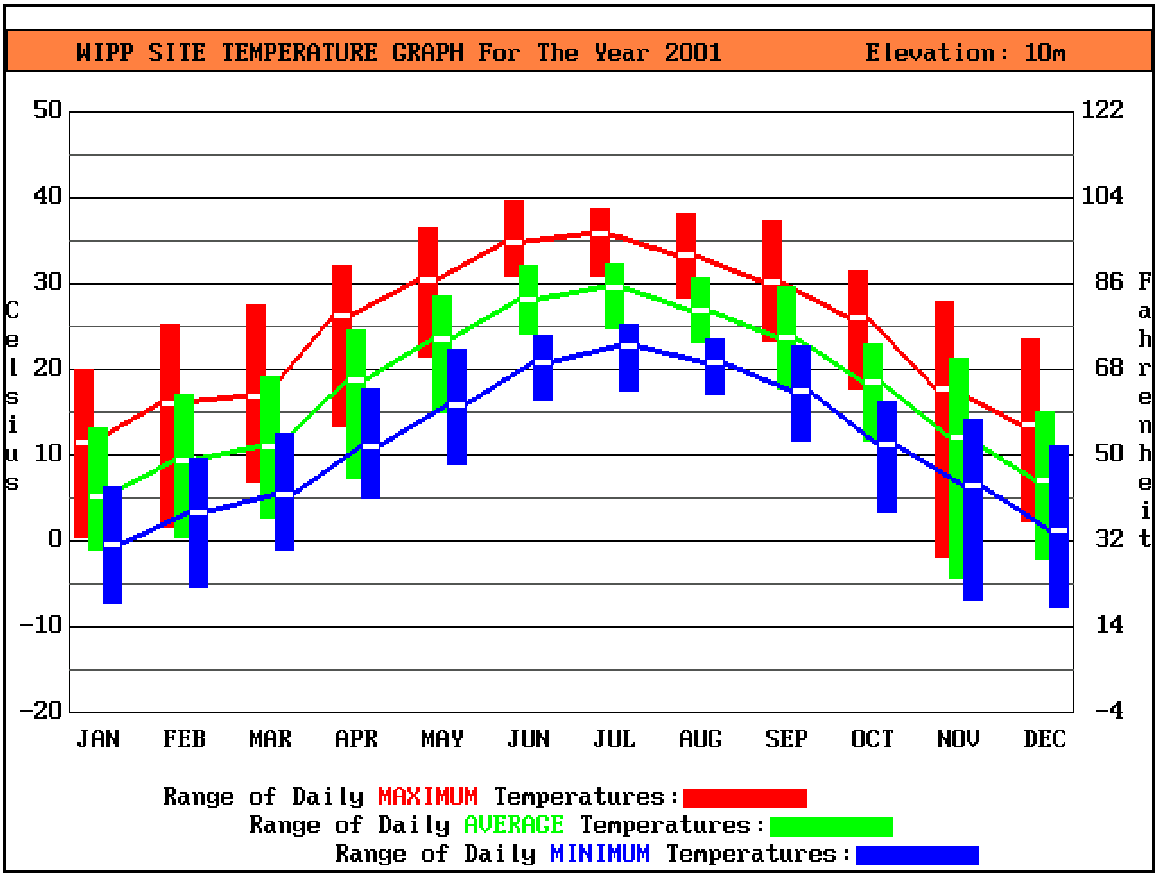


Figure 5.3 - 2001 WIPP Site Temperature at 10-Meter Height

Table 5.2 - A Summary of 2001 Temperature Observations at 10-Meter Height

Month	Max of Daily Highs (°C)	Avg of Daily Highs (°C)	Min of Daily Highs (°C)	Max of Daily Averages (°C)	Avg of Daily Averages (°C)	Min of Daily Averages (°C)	Max of Daily Lows (°C)	Avg of Daily Lows (°C)	Min of Daily Lows (°C)
Jan	20.02	11.43	0.37	13.10	5.20	-1.02	6.28	-.36	-7.32
Feb	25.19	16.00	1.71	17.11	9.42	0.52	9.51	3.23	-5.42
Mar	27.55	16.88	6.90	19.18	11.01	2.64	12.46	5.47	-1.10
Apr	32.16	26.31	13.27	24.67	18.79	7.26	17.77	10.95	4.99
May	36.41	30.50	21.55	28.60	23.55	14.98	22.23	15.82	9.03
Jun	39.53	34.74	30.75	32.02	28.09	24.26	24.05	20.76	16.38
Jul	38.77	35.80	30.90	32.29	29.54	24.78	25.30	22.81	17.54
Aug	38.14	33.34	28.42	30.53	26.97	23.06	23.62	20.88	17.11
Sep	37.27	30.27	23.40	29.50	23.74	17.81	22.72	17.42	11.62
Oct	31.37	25.98	17.79	22.82	18.51	11.66	16.19	11.26	3.34
Nov	27.89	17.80	-.92	21.18	12.04	-.37	14.10	6.45	-6.84
Dec	23.59	13.56	2.21	14.95	7.18	-2.08	10.97	1.23	-7.77
Annual	39.53	24.38	-1.92	32.29	17.84	-4.37	25.30	11.33	-7.77

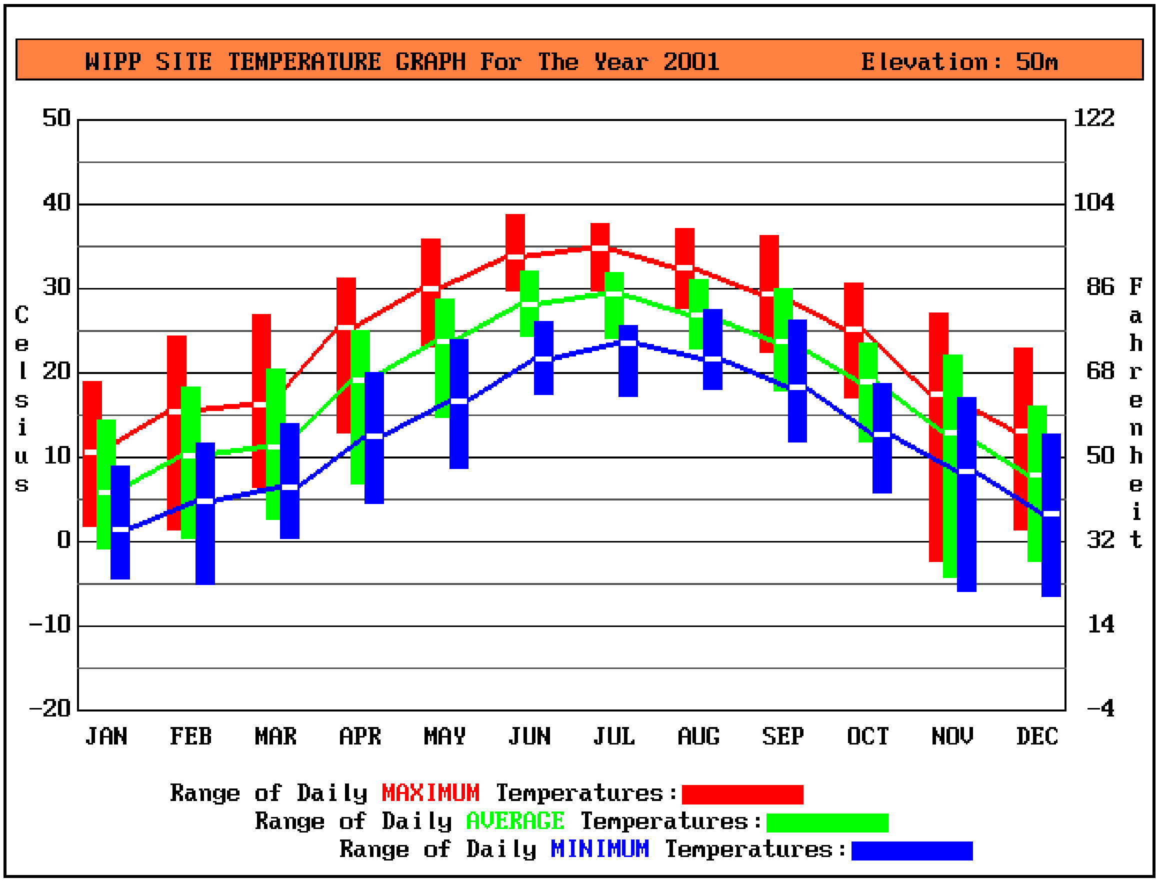


Figure 5.4 - 2001 WIPP Site Temperature at 50-Meter Height

Table 5.3 - A Summary of 2001 Temperature Observations at 50-Meter Height

Month	Max of Daily Highs (°C)	Avg of Daily Highs (°C)	Min of Daily Highs (°C)	Max of Daily Averages (°C)	Avg of Daily Averages (°C)	Min of Daily Averages (°C)	Max of Daily Lows (°C)	Avg of Daily Lows (°C)	Min of Daily Lows (°C)
Jan	19.02	10.60	1.93	14.37	5.82	-0.88	8.89	1.42	-4.45
Feb	24.38	15.43	1.45	18.33	10.12	0.43	11.75	4.76	-4.98
Mar	26.87	16.31	6.50	20.45	11.21	2.61	14.06	6.44	0.42
Apr	31.29	25.51	12.82	24.95	19.12	6.83	19.93	12.57	4.64
May	35.83	29.91	23.20	28.84	23.69	14.79	23.93	16.67	8.68
Jun	38.65	33.79	29.87	32.02	28.03	24.46	26.03	21.64	17.53
Jul	37.70	34.79	29.85	31.93	29.36	24.23	25.67	23.50	17.35
Aug	37.16	32.42	27.79	31.05	26.91	22.87	27.40	21.68	18.04
Sep	36.27	29.42	22.58	30.09	23.82	17.88	26.18	18.37	11.96
Oct	30.63	25.26	17.00	23.53	18.95	11.97	18.82	12.79	5.86
Nov	27.01	17.44	-2.26	22.10	12.91	-4.16	17.00	8.41	-5.73
Dec	22.98	13.13	1.44	16.00	7.99	-2.35	12.79	3.29	-6.43
Annual	38.65	23.67	-2.26	32.02	18.16	-4.16	27.40	12.63	-6.43

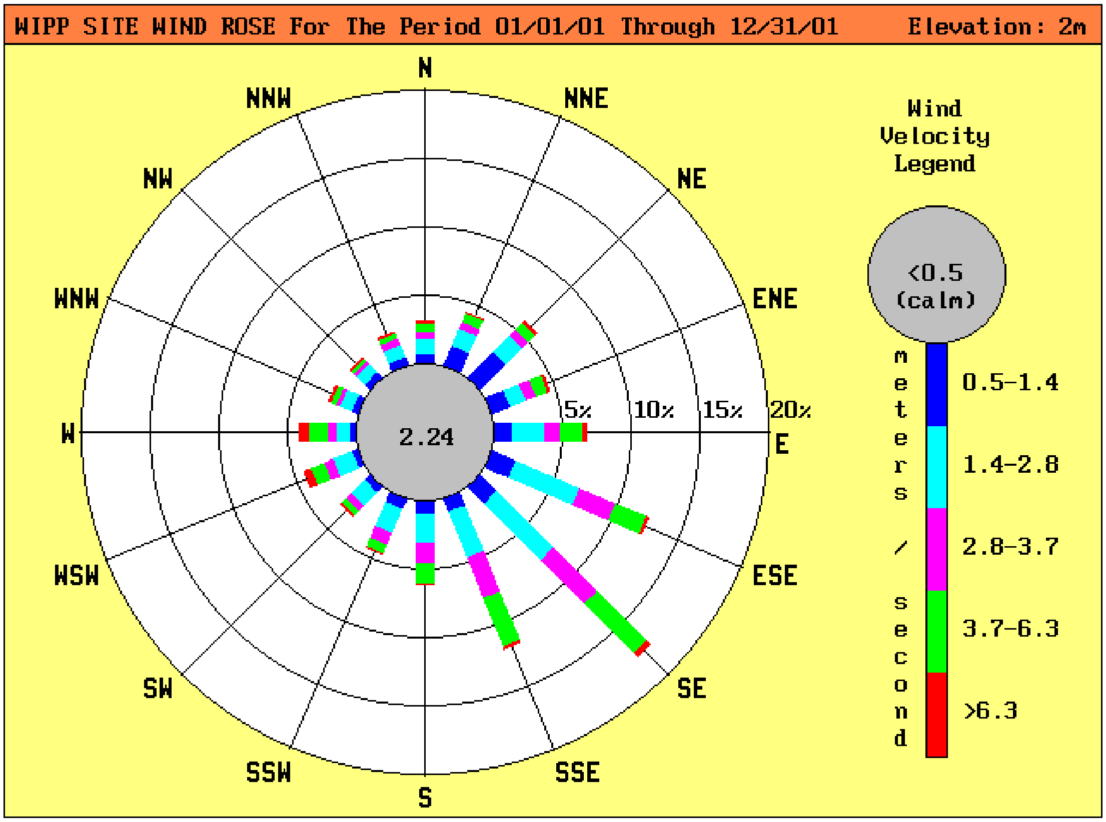


Figure 5.5 - 2001 WIPP Site Wind Rose at 2-Meter Height

Table 5.4 - 2001 Wind Frequencies at 2-Meter Height, Stratified by Direction and Speed (%)

Direction	Wind Speed Range, Meters/Second						Totals
	<0.5	0.5-1.4	1.4-2.8	2.8-3.7	3.7-6.3	>6.3	
N	0.123[a]	0.679	1.224	0.557	0.722	0.243	3.547
NNE	0.171	1.590	1.404	0.517	0.779	0.103	4.563
NE	0.217	2.506	1.784	0.659	0.811	0.228	6.204
ENE	0.268	1.393	1.370	0.759	0.962	0.168	4.920
E	0.297	1.310	2.392	1.233	1.681	0.288	7.200
ESE	0.265	1.809	5.186	2.780	2.551	0.223	12.814
SE	0.231	1.652	5.965	4.566	5.126	0.251	17.791
SSE	0.166	1.082	3.647	3.193	3.981	0.245	12.314
S	0.091	0.885	2.178	1.530	1.612	0.111	6.407
SSW	0.083	0.788	1.895	1.005	0.674	0.054	4.498
SW	0.057	0.517	1.484	0.591	0.545	0.154	3.348
WSW	0.026	0.494	1.601	0.759	1.110	0.511	4.501
W	0.071	0.491	1.124	0.628	1.416	0.625	4.355
WNW	0.049	0.534	0.933	0.283	0.502	0.160	2.460
NW	0.051	0.531	0.876	0.342	0.371	0.051	2.223
NNW	0.071	0.537	1.053	0.531	0.497	0.166	2.854
Total	2.237	16.795	34.115	19.932	23.339	3.582	100.000

[a] Percentage of time in which wind blew from this direction at this speed

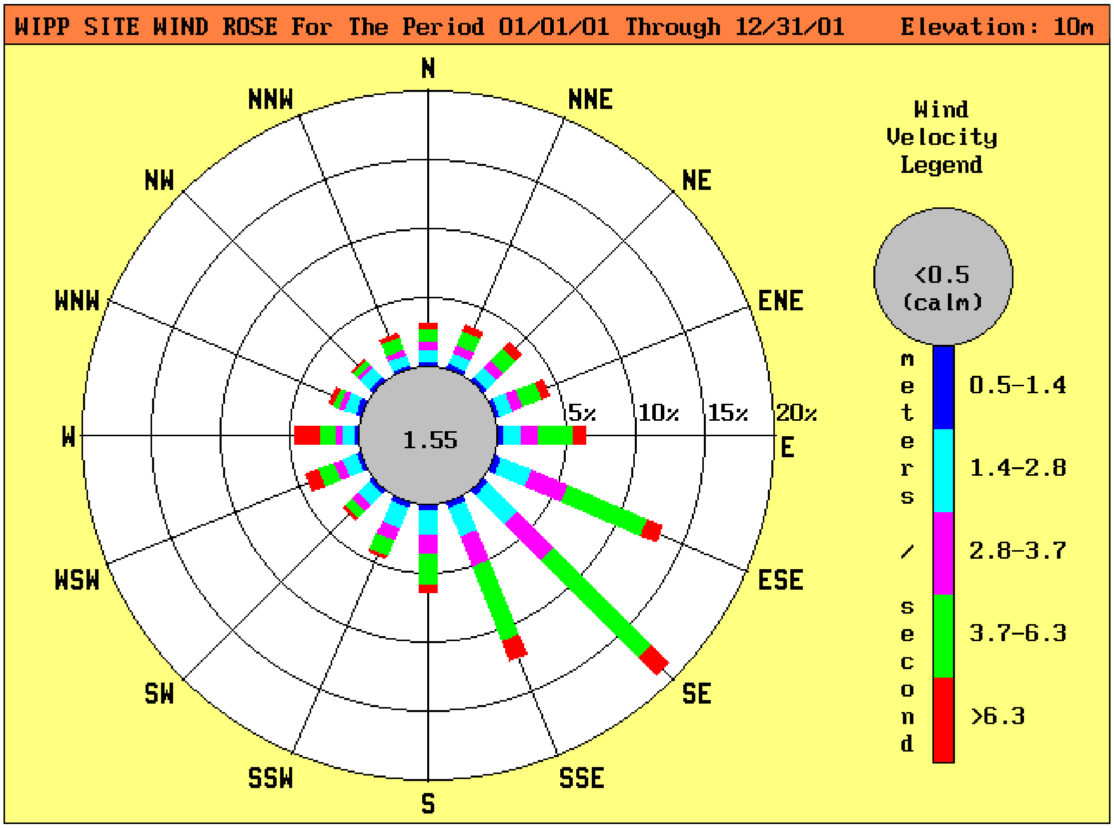


Figure 5.6 - 2001 WIPP Site Wind Rose at 10-Meter Height

Table 5.5 - 2001 Wind Frequencies at 10-Meter Height, Stratified by Direction and Speed (%)

	Wind Speed Range, Meters/Second						
Direction	**<0.5**	**0.5-1.4**	**1.4-2.8**	**2.8-3.7**	**3.7-6.3**	**>6.3**	**Totals**
N	0.037	0.263	0.928	0.645	0.902	0.454	3.228
NNE	0.108	0.342	0.962	0.736	1.150	0.411	3.710
NE	0.108	0.311	1.119	0.773	1.264	0.585	4.161
ENE	0.057	0.365	1.124	0.839	1.564	0.528	4.478
E	0.180	0.425	1.327	1.293	2.566	0.993	6.784
ESE	0.154	0.454	2.417	2.897	6.318	1.236	13.476
SE	0.214	0.491	3.045	3.776	10.017	1.718	19.261
SSE	0.205	0.494	2.266	2.397	5.796	1.581	12.740
S	0.077	0.471	1.818	1.413	2.334	0.594	6.707
SSW	0.054	0.368	1.630	1.005	1.341	0.228	4.626
SW	0.040	0.317	1.247	0.748	0.868	0.294	3.513
WSW	0.063	0.311	1.144	0.722	1.341	0.970	4.552
W	0.051	0.317	0.910	0.531	1.233	1.781	4.823
WNW	0.103	0.408	0.930	0.414	0.591	0.348	2.794
NW	0.071	0.357	1.005	0.340	0.557	0.097	2.426
NNW	0.031	0.237	0.762	0.528	0.905	0.260	2.723
Total	1.555	5.930	22.634	19.055	38.747	12.078	100.000

[a] Percentage of time in which wind blew from this direction at this speed

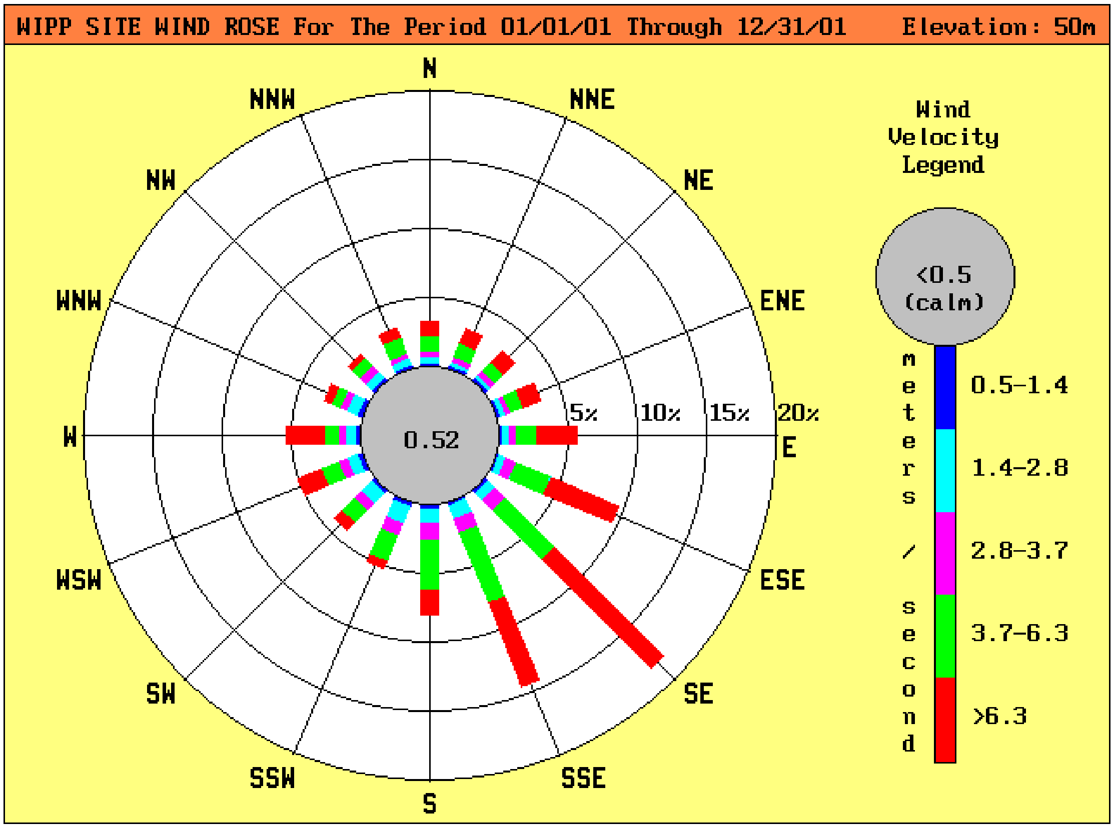


Figure 5.7 - 2001 WIPP Site Wind Rose at 50-Meter Height

Table 5.6 - 2001 Wind Frequencies at 50-Meter Height, Stratified by Direction and Speed (%)

	Wind Speed Range, Meters/Second						
Direction	**<0.5**	**0.5-1.4**	**1.4-2.8**	**2.8-3.7**	**3.7-6.3**	**>6.3**	**Totals**
N	0.023	0.188	0.554	0.471	1.224	1.025	3.485
NNE	0.014	0.134	0.431	0.422	1.093	1.144	3.239
NE	0.006	0.171	0.442	0.385	0.965	1.273	3.242
ENE	0.026	0.151	0.411	0.328	1.142	1.444	3.502
E	0.014	0.137	0.548	0.568	1.535	2.894	5.696
ESE	0.063	0.103	0.696	0.773	2.837	5.283	9.755
SE	0.111	0.163	0.816	1.053	5.186	11.184	18.513
SSE	0.091	0.191	1.130	1.110	5.562	6.501	14.586
S	0.031	0.263	1.062	1.284	3.627	1.809	8.076
SSW	0.026	0.300	1.318	1.062	2.103	0.585	5.394
SW	0.009	0.254	1.019	0.671	1.473	0.848	4.272
WSW	0.020	0.280	0.890	0.628	1.464	1.835	5.117
W	0.031	0.305	0.848	0.539	1.093	2.768	5.585
WNW	0.023	0.277	0.953	0.545	0.819	0.611	3.228
NW	0.034	0.191	0.865	0.508	0.928	0.445	2.971
NNW	0.003	0.148	0.594	0.468	1.267	0.859	3.339
Total	0.525	3.256	12.577	10.816	32.317	40.508	100.000

[a] Percentage of time in which wind blew from this direction at this speed

Target compounds found in VOC-B represent air found in the underground before the air passes through the panels containing waste. The VOC concentrations measured at this location are the sum of background concentrations entering the mine through the air intake shaft plus additional concentrations contributed by facility operations upstream of the waste panels. Concentrations measured at VOC-A will be equal to those found at VOC-B plus any contributions from the waste panels. Differences measured between the two stations will then represent any VOC contributions from the waste panels. Any concentration differences between the two stations must be less than the concentrations of concern listed in Attachment N of the HWFP (Table 5.7).

Table 5.7 - Concentrations of Concern for Volatile Organic Compounds, from Attachment N of the HWFP (No. NM4890139088)

Compound	Concentration of Concern ppbv[a]
1,1,1-Trichloroethane	590
1,1,2,2-Tetrachloroethane	50
1,1-Dichloroethylene	100
1,2-Dichloroethane	45
Carbon tetrachloride	165
Chlorobenzene	220
Chloroform	180
Methylene chloride	1,930
Toluene	190

[a] Parts per billion by volume

Sample pair differences are calculated by subtracting the concentration of a compound of interest observed at VOC-B from that measured at VOC-A for the given sampling period (Table 5.8). Negative values indicate ambient air concentrations of a compound (VOC-B) were greater than concentrations in the air passing out of the panel (VOC-A). Negative values could be caused by emissions from normal mining activities near VOC-B which quickly dispersed in the mine ventilation flow and were not detected at VOC-A. The annual averages shown in Table 5.8 were calculated by averaging all sample pair differences from January 1, 2001, to December 31, 2001. Samples in which a compound of interest was non-detectable (less than the 0.5 parts per billion by volume [ppbv] minimum detection limit [MDL]) were assigned a value of zero for the purposes of computing this average.

During 2001, four of the nine target compounds (1,2-dichloroethane, chloroform, methylene chloride, and toluene) were measured above the 0.5 ppbv MDL. For each of the detected target compounds, the annual average was less than 0.5 percent of the respective concentration of concern listed in Table 5.7 and were, therefore, at insignificant levels with respect to human health and the environment.

Positive sample pair differences for methylene chloride were found in 16 of 103 sample pairs. The 2001 annual average sample pair difference for methylene chloride was 0.0 ppbv, with a minimum difference value of -2.76 ppbv and a maximum value of 5.23 ppbv. Methylene chloride, a common laboratory contaminant, can also be found in paint remover, aerosol propellant, degreasing and metal cleaning agents, and adhesives.

Positive sample pair differences for toluene were found in 31 of the 103 sample pairs. The overall 2001 average for toluene sample pair differences was 0.97 ppbv, with a minimum difference value of -1.45 and a maximum difference value of 75.16 ppbv. Possible sources of toluene contamination could be products of incomplete combustion of diesel fuel, cleaning solvents, or paint. The maximum toluene concentration measured in 2001occurred on August 14. On that day, Underground Operations was painting some equipment located in Panel II, Room 7, using a paint with a very high toluene concentration. The painting location is upstream in the ventilation air flow from VOC Sampling Station A.

One negative sample pair difference for 1,2-dichloroethane was found out of 103 sample pairs in 2001. The overall 2001 average for 1,2-dichloroethane sample differences was 0.00 ppbv, with a minimum difference of -0.78 and a maximum difference value of 0.00 ppbv. This compound has not been detected previously. The 1,2-dichloroethane can be found as a tar and grease remover in cleaning and degreasing operations and is used in paint and varnish removers.

One positive sample pair difference was observed for chloroform in 2001. The overall 2001 average sample difference for this compound was 0.00 ppbv, with a minimum difference of 0.00 ppbv, and a maximum difference of 0.94 ppbv. Chloroform was not detected in 2000. This compound can be found in electronics and metals cleaning solvent solutions and insecticides.

The routine laboratory reporting limit was 5.0 ppbv for 1,1,1-trichloroethane, 1,1-dichloroethylene, methylene chloride, and toluene and 2.0 ppbv for 1,1,2,2-tetrachloroethane, 1,2-dichloroethane, carbon tetrachloride, chlorobenzene, and chloroform. For dilution factors greater than one, the 5.0 ppbv and 2.0 ppbv values are multiplied by the dilution factor to calculate the laboratory reporting limits for the diluted sample.

The MDL is defined as the minimum concentration of a substance that can be measured and reported with a 99 percent confidence to be greater than zero. Values were estimated for constituents detected at concentrations less than the laboratory reporting limits but above the 0.5 ppbv MDL.

Volatile organic compound sampling reported in this section was performed using guidance included in Compendium Method TO-14A, *Determination of Volatile Organic Compounds (Volatile organic compounds) in Ambient Air Using Specially Prepared Canisters with Subsequent Analysis By Gas Chromatography* (EPA 1997). The samples were analyzed using gas chromatography/mass spectrometry under an established QA/QC program. Laboratory analytical procedures were developed based on the concepts contained in both TO-14A and the draft *EPA Contract Laboratory Program Volatile Organics Analysis of Ambient Air in Canisters* (EPA 1994). The results of year 2001 VOC monitoring did not indicate a noticeable increase in VOCs in air downstream of Panel I. The only measurement of significance occurred on August 14 for toluene, the same day that a high toluene spray paint was being used in the underground. Thus, waste stored at WIPP did not release significant amounts of VOCs.

Table 5.8 - Volatile Organic Compound Sample Pair Differences Measured at WIPP in 2001

Compound	No. of Sample Pairs (A and B)	2001 Annual Average of Sample Pair Differences (ppbv[a])	Minimum of Sample Pair Differences (ppbv[a])	Maximum of Sample Pair Differences (ppbv[a])
1,1,1-Trichloroethane	103	0	0	0
1,1,2,2-Tetrachloroethane	103	0	0	0
1,1-Dichloroethylene	103	0	0	0
1,2-Dichloroethane	103	0	-0.78	0
Carbon Tetrachloride	103	0	0	0
Chlorobenzene	103	0	0	0
Chloroform	103	0	0	0.94
Methylene Chloride	103	0	-2.76	5.23
Toluene	103	0.97	-1.45	75.16

[a] Parts per billion by volume

5.5 Seismic Activity

WIPP is located about 60 miles east of the western margin of the Permian Basin. The geologic structure and tectonic pattern of the Permian Basin are chiefly the result of large-scale subsidence and uplift during the Paleozoic era. The broad basin is divided into a series of sub-basins which passed through their last stage of significant subsidence during the Late Permian age. The Delaware sub-basin occupies the southwestern portion of the Permian Basin and hosts the WIPP site. It is bordered by the Roosevelt Uplift to the north, the Marathon Thrust Belt to the south, the Central (Permian) Basin Platform to the east, and the Sierra Diablo Platform and Guadalupe and Sacramento Mountains to the west. The Delaware Basin contains a thick sequence of evaporite layers.

All major tectonic elements of the Delaware Basin were essentially formed before deposition of the Permian evaporites, and the region has been relatively stable since then. Deep-seated faults are rare, except along the western and eastern basin margins, and there is no evidence of young, deep-seated faults inside the basin.

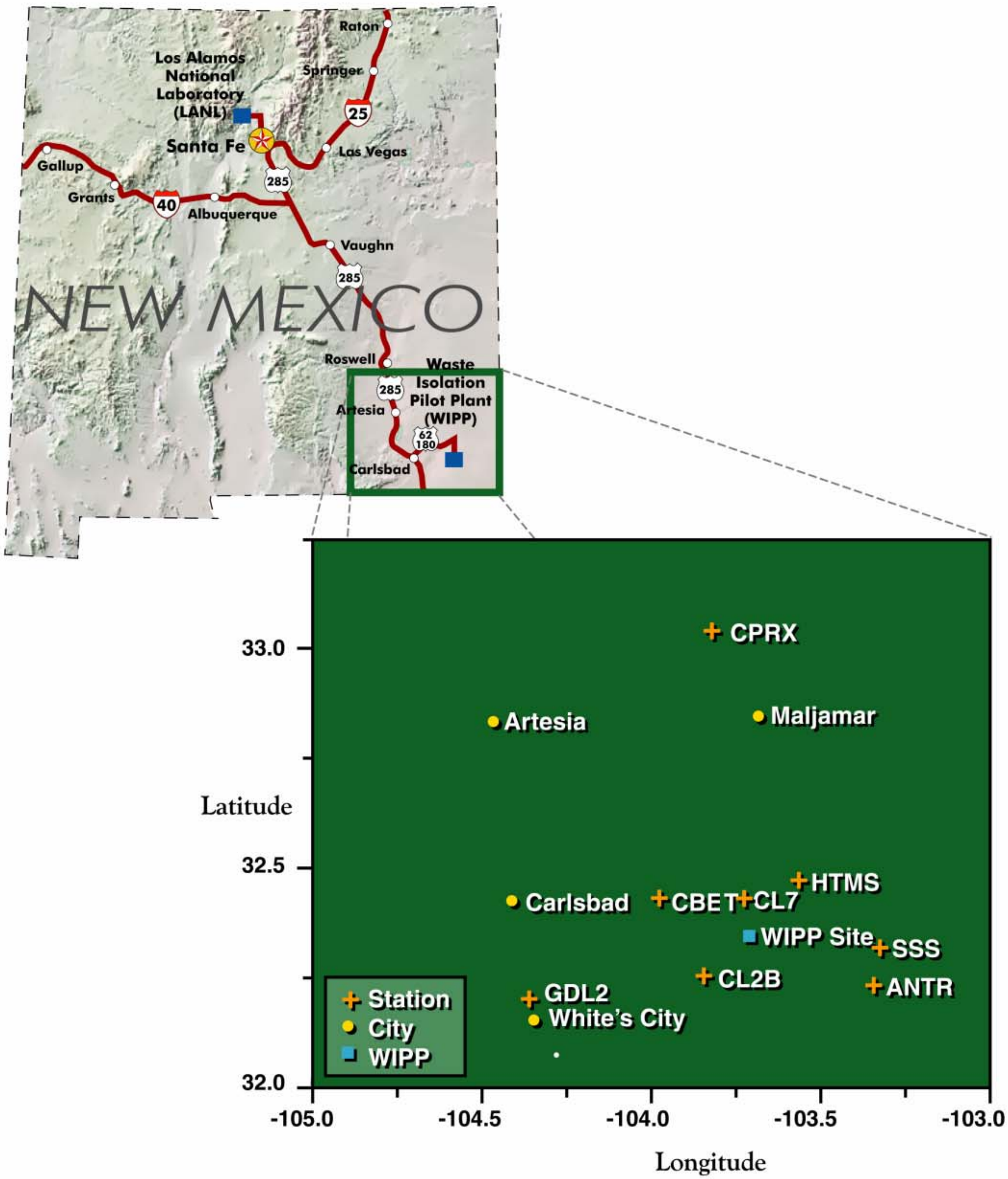
Researchers suspect that some low-magnitude earthquakes may result from secondary oil recovery (water flooding). Their foci are about as deep as the bottom of relatively shallow hydrocarbon wells.

Significant recent seismic events near WIPP on January 2, 1992, and April 14, 1995, had magnitudes of 5.0 and 5.3 respectively. The January 2, 1992, Rattlesnake Canyon earthquake had an epicenter 60 km (36 mi) east-southeast of the WIPP site, while an April 14, 1995, event's epicenter was located about 240 km (144 mi) southwest of WIPP, near Alpine, Texas. Neither earthquake had any effect on WIPP structures, as documented by post-event inspections by WIPP staff and the NMED. The magnitudes of both events were within the parameters used to develop the seismic risk assessment of the WIPP structures.

Seismic information for the WIPP region before 1962 was derived from chronicles of the effects of those tremors on people, structures, and surface features. Seismicity in New Mexico reported prior to 1962 was mostly limited to the corridor between Albuquerque and Socorro, part of a structure known as the Rio Grande Rift. Since 1962, most seismic information has been based on instrumental data recorded at various seismograph stations.

Currently, seismicity within 300 km (186 mi) of the WIPP site is being monitored by the New Mexico Institute of Mining and Technology (NMIMT), in Socorro, New Mexico, using data from a seven-station network approximately centered on the site (Figure 5.8). Station signals are transmitted to the NMIMT Seismological Observatory in Socorro. When appropriate, readings from the WIPP network stations are combined with readings from an additional NMIMT network in the central Rio Grande Rift. Occasionally, data are also exchanged with the University of Texas at El Paso and Texas Tech University in Lubbock, both of which operate stations in west Texas.

The mean operational efficiency of the WIPP seismic monitoring stations during 2001 was approximately 96.2 percent. From January 1 through December 31, 2001, locations for 129 seismic events were recorded within 300 km (186 mi) of WIPP. These data included origin times, epicenter coordinates, and magnitudes. The strongest recorded event (magnitude 3.1) occurred on June 2 and was located approximately 65 km (40 mi) east of the site. The event closest to the site occurred on September 21, and was probably an aftershock of the June 2 event. This event had a magnitude of 1.6 and was located about 61 km (38 mi) east of the site. These events had no effect on WIPP structures.



Definitions of Abbreviations

SSS - San Simon Swale	CL2B - Carlsbad Station	CPRX - Caprock	HTMS - Hat Mesa
CBET - Carlsbad East Tower	CL7 - Carlsbad Station 7	GDL2 - Guadalupe Mountains	ANTR - Antelope Ridge

Figure 5.8 - WIPP Seismograph Station Locations

5.6 Liquid Effluent Monitoring

The WIPP sewage lagoon system is a zero-discharge facility consisting of two primary settling lagoons, two polishing lagoons, a chlorination system, and three evaporation basins. The entire facility is lined with 30-mil synthetic liners and is designed to dispose of domestic sewage as well as site-generated brine waters from observation well pumping and underground dewatering activities at the site.

The WIPP sewage facility is operated under Discharge Permit No. 831 (DP-831), issued by the state of New Mexico in accordance with the Clean Water Act, and is managed in accordance with EPA sewage sludge regulations (40 CFR Part 503), New Mexico Water Quality Control Regulations (20.6.2.3 NMAC), and applicable WIPP controlled procedures. These requirements provide the framework for disposal of domestic sewage, site-generated brine waters, and non-hazardous waste waters.

DP-831 allows for the disposal of 7,570 l (2,000 gal) per day of nonhazardous brines to H-19 pond. Nonhazardous brines are discharged only to Evaporation Pond B of the Sewage Lagoon System. The DOE submits quarterly discharge monitoring reports to NMED to demonstrate compliance with the inspection, monitoring, and reporting requirements identified in the plan. Because effluent is not discharged from the facility, no effluent limits were established in DP-831. The NMED Groundwater Protection and Remediation Bureau established a list of analytes to be sampled on a quarterly basis as indicators of sewage system performance.