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Exhaust Shaft Phase III Hydraulic Assessment Data Report October 1997-October1998

March, 2000

DOE-WIPP 99-2302

EXHAUST SHAFT PHASE III

HYDRAULIC ASSESSMENT DATA REPORT

OCTOBER 1997 – OCTOBER 1998

MARCH 2000

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Waste Isolation Pilot Plant
Carlsbad, New Mexico

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1.0 INTRODUCTION

This report presents data collected between October 1997 and October 1998 as part of the ongoing Exhaust Shaft Hydraulic Assessment Program at the Waste Isolation Pilot Plant (WIPP) in southeastern New Mexico (Figure 1.1). This program was implemented in an effort to monitor and characterize source(s) of fluid leaking into the upper 85 feet of the Exhaust Shaft at WIPP for the past several years. Though leakage into the shaft is small in volume, an assessment program was implemented to characterize the near-surface hydrology in an effort to understand the origin of the leaking fluid. This program has used a phased approach involving drilling, core descriptions, well completions, water-level monitoring, hydrologic testing, and water-quality sampling and analysis. This study is confined to the surface-facility area at WIPP.

In Phase One, three wells were drilled in 1996 near the Exhaust Shaft. Drilling and testing indicated that groundwater was not confined to the immediate Exhaust Shaft area and that the water occurred in a perched water-bearing horizon in the Santa Rosa Formation at or near the contact of the Santa Rosa with the underlying Dewey Lake Formation. In addition, hydraulic tests indicated that the wells yield no more than 1.0 gallons per minute (GPM) for extended periods of pumping. In Phase Two, twelve piezometers were drilled, expanding the area of investigation for water-quality sampling and testing. Drilling and testing indicated that the areal extent of the water in the Santa Rosa extends beyond the present 80-acre investigation, though bounded to the southeast by a dry hole, piezometer PZ-8 (Figure 1.2). Water-level data indicates that there is a potentiometric high near PZ-7 in the northwestern portion of the site. Based on the potientiometric surface data, water appears to flow from west to east in the northern portion of the site, and from northwest to southeast and south in the southern portion of the site (U.S. Department of Energy [DOE], Dec. 1997).

Water-quality sampling data collected from the wells and piezometers was categorized into three groups based on total dissolved solids (TDS). The first group consists of high TDS (greater than 70,000 mg/L [milligrams per liter]), and represents water found in the central and northeastern section of the site near the north salt pile and a previously existing drilling pit used during construction of the Salt Shaft. The second group, consisting of intermediate TDS (20,000 - 70,000 mg/L), represents an area in the northwest WIPP site area near the north salt pile retention pond, a suspected recharge area, and central portion of the site. The third group, consisting of low TDS (less than 20,000 mg/L), is in the southern portion of the site near several rainfall runoff retention ponds.

This assessment updates previous reports and is based on data collected from October 1997 through October 1998 from wells and piezometers completed in the perched water-bearing horizon in the Santa Rosa Formation at WIPP (Figure 1.3). In addition, other data such as rainfall precipitation and Exhaust Shaft flow and pressure data are examined to identify possible trends affecting the hydrology within the Santa Rosa Formation.

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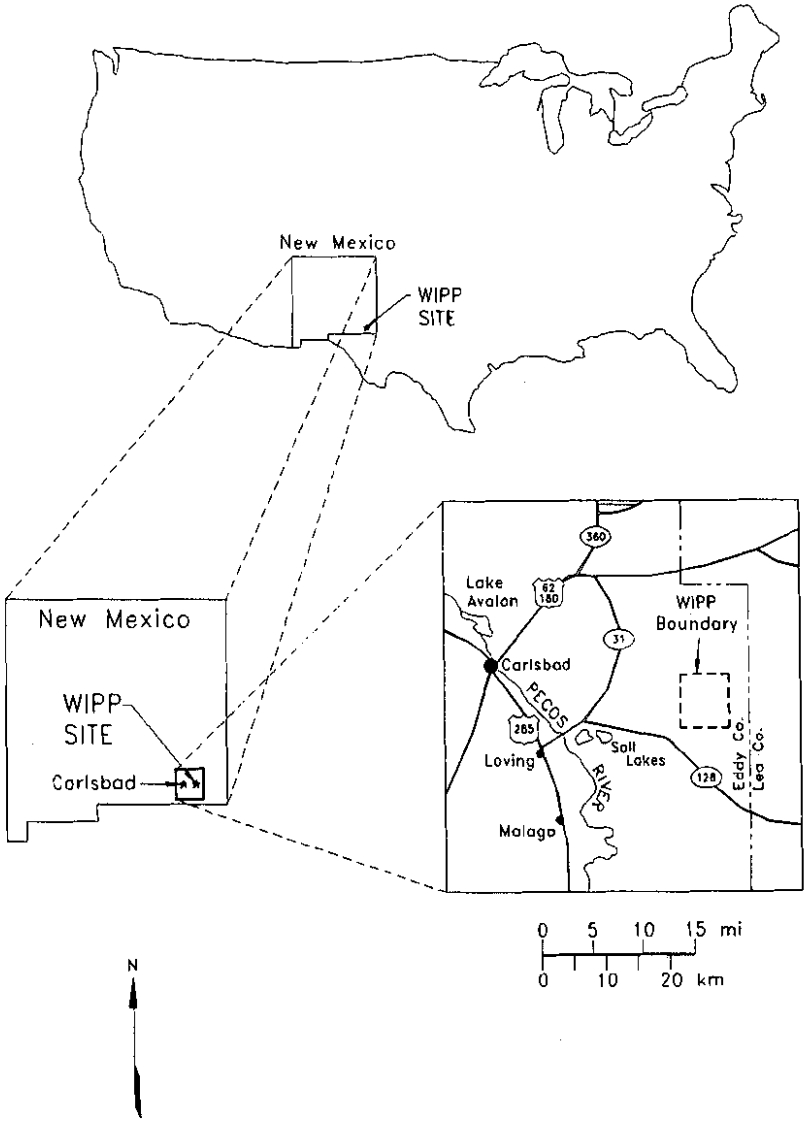

Figure 1.1 -Location of the WIPP Site

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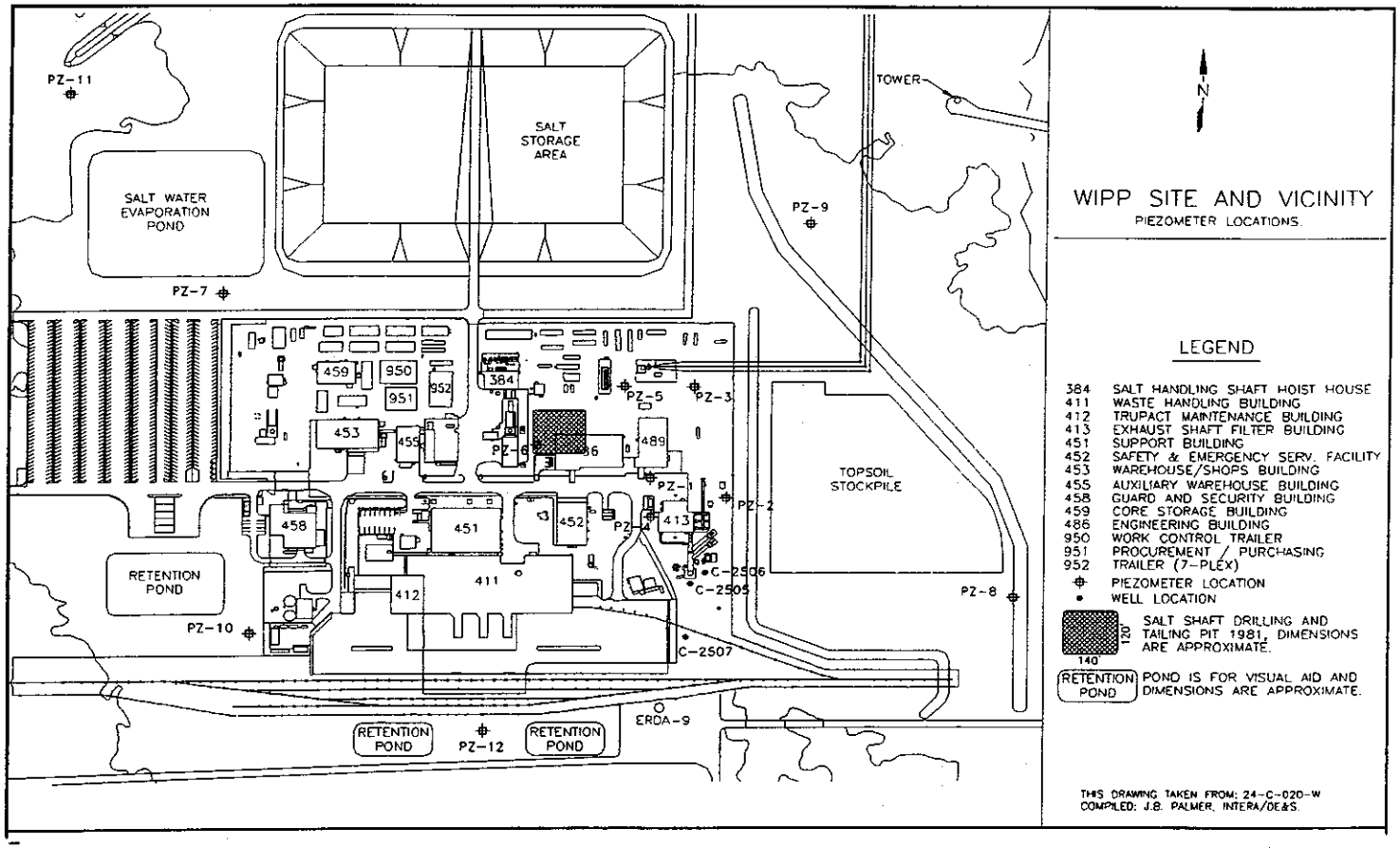

Figure 1.2 -Location of Piezometers PZ-1 through PZ-12 and Wells C-2505, C-2506, and C-2507

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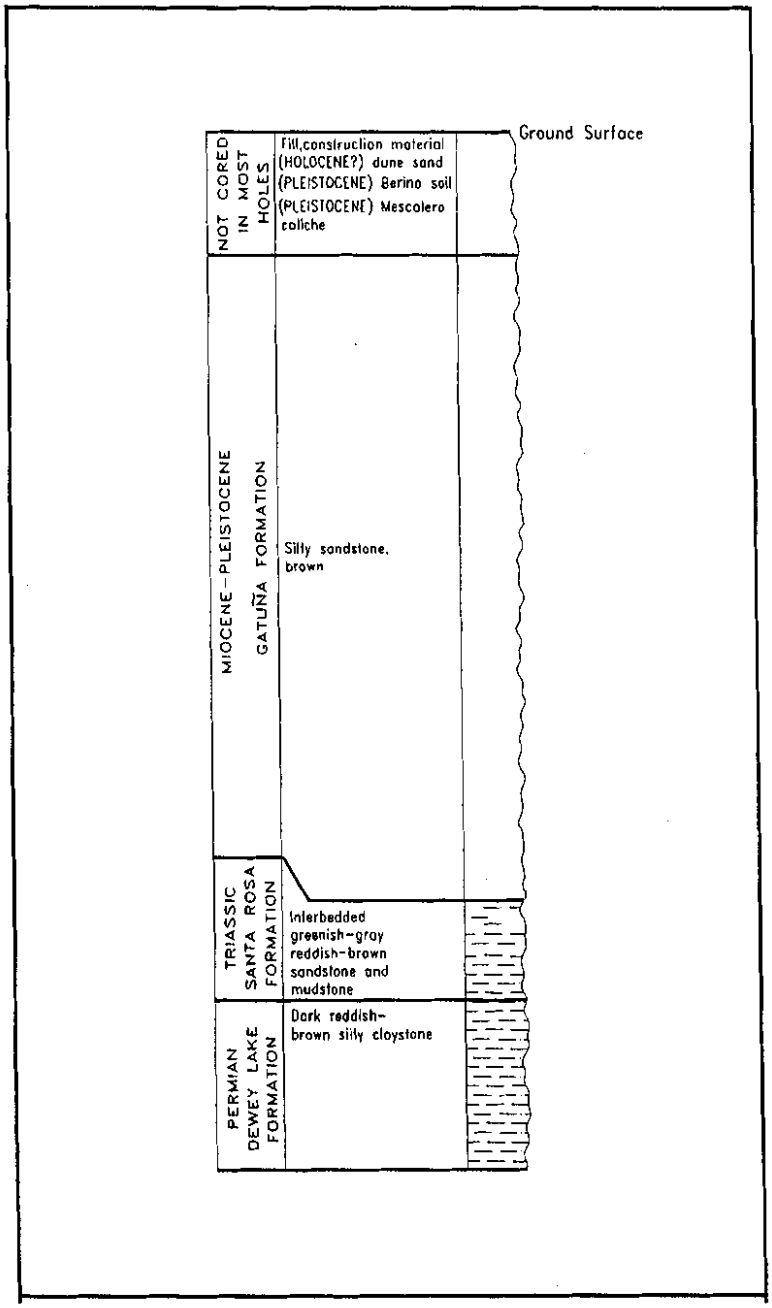

Figure 1.3 -Units Commonly Encountered During Shallow Drilling at WIPP

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1.1 Background

Fluid migrating into the Exhaust Shaft at the WIPP site was first documented during a May 1995 shaft video inspection. Fluid was observed flowing from cracks in the Exhaust Shaft concrete liner at depths of 55 to 85 feet below ground surface (bgs).

Surface geophysical investigations noted possible fluid-conductive zones in the shallow soil and bedrock in the vicinity of the Exhaust Shaft and as the results were reported in Exhaust Shaft: Hydraulic Assessment Data Report (DOE, Jan. 1997). Four boreholes were drilled in September and October 1996 to depths of up to 100 feet bgs to evaluate near surface formations as potential sources of the fluid seeping into the Exhaust Shaft. Four boreholes (C-2505, C-2506, C-2507, and ES-001) penetrated water-bearing horizons between 48 and 63 feet bgs in the sandstone of the lower Santa Rosa and mudstone of the upper Dewey Lake Formations. Three boreholes (C-2505, C-2506, and C-2507) were drilled and selectively cored to determine the stratigraphic horizons producing fluid and were then completed as monitoring wells (Figure 1.2). The Dewey Lake Formation appears to act as an impermeable layer, though a thin weathered zone (~1-2 feet thick) at the top of the Dewey Lake may also be saturated. Drilling continued into the Dewey Lake until penetration slowed and it became dry in appearance. The screened intervals were selected to best cover the likely saturated horizon, but it is not possible to determine the extent to saturate in the weathered horizon of the Dewey Lake.

During drilling of C-2505, C-2506, and C-2507, the base of the Santa Rosa Formation was first estimated to be at depths of 48.8, 48.2, and 39.5 feet bgs, respectively (DOE, Jan. 1997). However, based on the core samples recovered from C-2505 and subsequent drilling of the PZ holes at the site (DOE, Dec. 1997), the top of the Santa Rosa is probably 39.6 feet bgs in drillhole C-2505 (personal communication Powers, 1999, see Appendix 1). This depth is more consistent with observations in the Exhaust Shaft (Holt and Powers, 1986) as well. For C-2506 and C-2507, the top of the Santa Rosa appears to be above the initial coring depths of each drillhole. Please refer to Figures 1.4, 1.5, and 1.6 for revisions to the well completion diagrams for C-2505, C-2506 and C-2507 relative to earlier reports.

As a result of these revisions, several figures in Powers (DOE, Dec. 1997) were modified. Figures 11 and 12, which show the elevation of the top of the Santa Rosa in detail, indicate a smaller area lower than 3365-ft amsl (above mean sea level) and the contour for 3370-ft amsl will be south of the exhaust-shaft area. Figures 12 and 13, which show the thickness of the Gatuña Formation will indicate corresponding changes around the shaft area, with thickness reduced by about 9 feet. The general shape of the contours is not changed, nor are any conclusions about the formation of these units changed. For convenience basic stratigraphic data for each drillhole in the PZ boreholes, C-wells, and the Exhaust Shaft are presented in Table 1.1.

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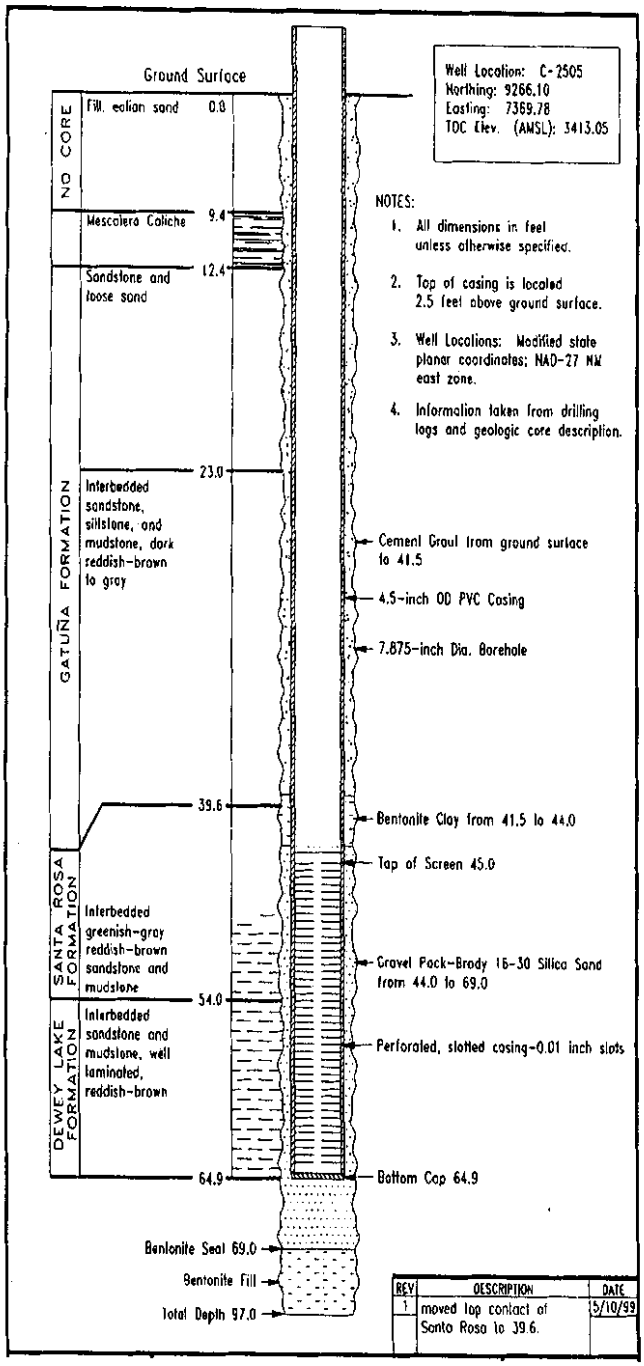

Figure 1.4 -C-2505 Well Completion Diagram

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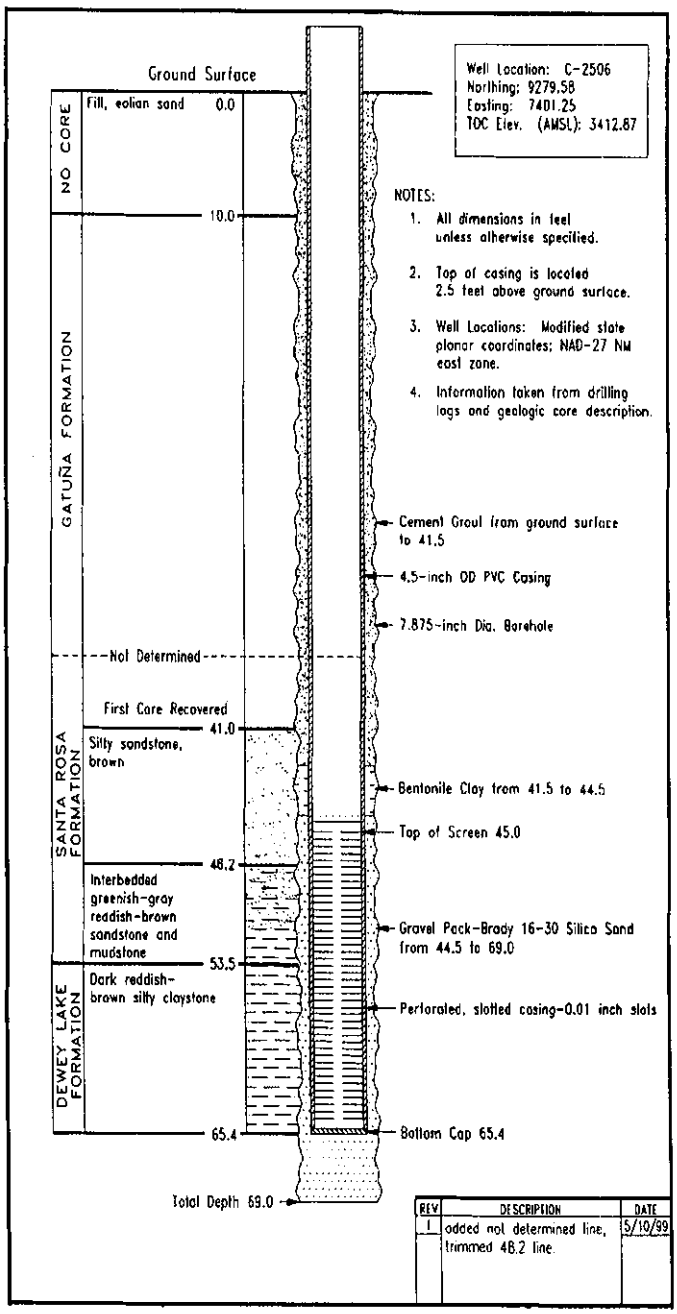

Figure 1.5 -C-2506 Well Completion Diagram

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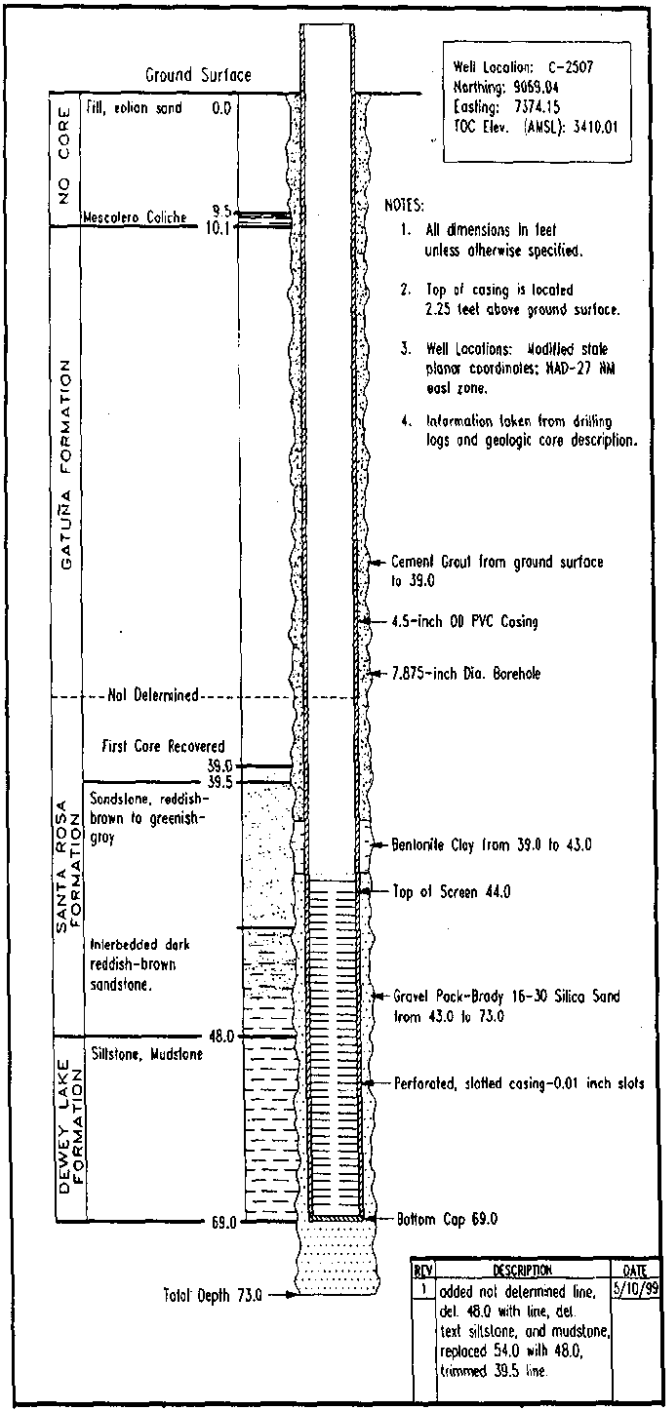

Figure 1.6 -C-2507 Well Completion Diagram

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Table 1.1 - Revised Depth Interval for Stratigraphic Units					
Drillhole	Fill, Dune Sand	Mescalero Caliche	Gatuña Formation	Santa Rosa Formation	Dewey Lake Formation
C-2505	ND[1]	ND-12.4	12.4-39.6	39.6-54	54-97 (TD)[2]
C-2506	ND	ND	ND	ND-53.5	53.5-69 (TD)
C-2507	ND	ND	ND	ND-48	48-63 (TD)
Ex Shaft	0-7.5	7.5-17	17-34	34-54	54-546
PZ-1	ND	ND	ND-40	40- ~56	~56-67.5 (TD)
PZ-2	0-9	9-12	12-39	39- ~57	~57-65 (TD)
PZ-3	0-8	8-10	10-38	38-63	63-70 (TD)
PZ-4	0-9	9-12	12-31	31-57	~57-65 (TD)
PZ-5	0-7	7-9	9-36	36-62.5	62.5-71.5 (TD)
PZ-6	0-7	7-9	9-32	32-55	55-66 (TD)
PZ-7	0-7.5	7.5-9.5	9.5-30	30-69	69-71.5 (TD)
PZ-8	0-6.5	6.5-9	9-31	31-60	60-67 (TD)
PZ-9	0-8	8-11	11-36	36-75	75-82.5 (TD)
PZ-10	0-6	6-9	9-28	28-46	46-57 (TD)
PZ-11	0-10	10-12.5	12.5-34	34-71	71-82 (TD)
PZ-12	0-6	6-8	8-39	39-62	62-77 (TD)

1. ND = Not determined. Depths are approximate (about ±1 ft). Some contacts to nearest 0.5 ft due to marked contrast. Where the Gatuña-Santa Rosa contact is difficult to identify; the Gatuña is incorporated with Santa Rosa.

2. TD = total depth

Hydraulic tests were conducted on wells C-2505, C-2506, and C-2507 in October 1996 to characterize the water-bearing horizons. Test data provided hydraulic conductivity values ranging from 5.5 x E-5 to 1.6 E-6 m/sec, with storativity values ranging from 1.1 x E-2 to 9.4 x E-3. Water-level data were used to calculate a hydraulic gradient of 0.0245 ft/ft in a south/southeasterly direction. Test data indicated that the wells nearest the Exhaust Shaft were capable of sustained water production rates of about to 0.6 GPM (DOE, Jan. 1997).

Water samples were collected from wells C-2505, C-2506, and C-2507 a few days after drilling. The water-quality data from these wells indicated that TDS were greatest near the Exhaust Shaft ranging from 11,500 mg/L in C-2506, to 8,500 mg/L in C-2505, and to 4,000 mg/L in C-2507, 200 feet to the south of the shaft.

Further hydrologic testing was conducted in February and March 1997. Testing consisted of a 72-hour pumping test in C-2506 and a 24-hour pumping test in C-2505, C-2506, and C-2505 were pumped at rates ranging from 0.5 to 1.0 GPM. In addition, water-quality samples were collected from each well at the completion of testing. Water-level data

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collected between October 1996 and March 1997 revealed that during that time water levels had risen from 1.6 to 2.6 feet in wells C-2505, C-2506 and C-2507. Water-level elevation data (not corrected for density) indicated a 6-foot difference between well C-2506 near the Exhaust Shaft and C-2507 to the south. Based on water-level measure ments collected on March 24, 1997, the hydraulic gradient increased to 0.032 ft/ft in a south/southeasterly direction.

Water-quality samples were collected upon the completion of the 72-hour pumping test in well C-2506 and upon completion of the 24-hour pumping test in C-2505. In both wells the total dissolved solids concentrations were less than observed in October 1996. In C-2506, the TDS decreased from about 11,500 to 6,000 mg/L, while in C-2505 the TDS decreased from about 8,500 to 4,500 mg/L.

In June and July 1997 twelve 6-5/8-inch boreholes were hollow-stem augered/cored and/or air-rotary drilled to depths of up to 82 feet bgs through the Santa Rosa Formation into the Dewey Lake Formation (Figure 1.2). Each borehole was completed with a 2-inch piezometer, packed with sand above the screened intervals, sealed with bentonite, and grouted to ground surface. The locations and elevations of each piezometer (PZ-1 through PZ-12) were surveyed immediately upon completion of each installation. Elevation data were then used with water-level measurement data to determine the location of succeeding piezometers which were used to define the hydraulic gradient, and to determine the areal and vertical extent of fluid within the Santa Rosa Formation.

Of the twelve piezometers and three wells installed at WIPP between September 1996 and August 1997, only PZ-8 was dry. Water was present in all other monitoring wells, indicating that the investigative area bounded by PZ-11 to the north and west, PZ-12 to the south, and PZ-9 to the east appears to contain a constant zone of saturation above the perching horizon (Figure 1-2).

Water-level measurements indicated that fluid levels in wells rose as much as 2.0 feet or more between October 1996 and September 1997. Water-level changes exhibit characteristics commonly associated with local recharge, such as an apparent response to local precipitation events. These responses suggest that area(s) of local recharge probably exist. Potential sources of recharge include features such as local precipitation captured by the north salt disposal mound, the retention ponds along the south border of the site, the salt evaporation pond west of the north disposal mound, or releases/leaks possibly from on-site water, drainage or sewage systems.

Equipotential surface maps of the water levels in the Santa Rosa suggest that a potientiometric high exists in the northwest corner of the 80-acre WIPP site investigative area at the salt evaporation pond west of the north salt disposal mound. Flow lines indicated that fluid flow in the Santa Rosa Formation is from the northwest to the east, and south and southeast across the site (DOE, Dec. 1997).

After installation, each piezometer was pumped to determine the hydraulic parameters of the perched-water zone. In addition, fluid samples were collected to characterize the areal water quality at the WIPP site. Hydraulic conductivity values for the tested piezometers ranged from 2.1 x E-5 to 2.6 x E-8 m/s. Table 1.2 lists the hydraulic conductivity values from tests performed on wells C-2505, C-2506, C-2507, and piezometers PZ-1 through PZ-12. The higher conductivity values are typically in the western and southern portion of the site, while the lower conductivity values are found in the northern and eastern portion of the site.

Table 1.2 - Hydraulic Conductivity Estimates

Well/Piezometer	Hydraulic Conductivity (m/s)
C-2505	7.8E-6
C-2506	2.0E-5
C-2507	6.0E-6
PZ-1	5.7E-8
PZ-2	2.6E-8
PZ-3	No Testing Performed
PZ-4	2.4E-6
PZ-5	1.4-E-7
PZ-6	3.8E-6
PZ-7	1.7E-6
PZ-8	Dry Hole
PZ-9	No Testing Performed
PZ-10	5.2E-6
PZ-11	3.3E-6
PZ-12	2.1E-5

Water-quality samples were collected from the wells and piezometers in July 1997. Analysis of samples indicated TDS values ranging from 3,700 to 155,000 (DOE, Dec. 1997). Data indicated an area of high TDS in the vicinity of PZ-3 and low TDS in the southern portion of the site. Plots of Cl/Br ratio versus location and potassium concentration versus location indicated three types of groundwater in the shallow aquifer beneath the WIPP site (DOE, Dec. 1997). One type is around the Exhaust Shaft:; a second type in the central and north central part of the site; and a third type in the west and southwest part of the site. Data also indicate that potassium-rich groundwater occurs in the central and the north-central WIPP site area.

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1.2 Objectives

A summary report, describing the investigations of Exhaust Shaft inflow was published in December 1997 and entitled Exhaust Shaft: Phase 2 Hydraulic Assessment Data Report: Involving Drilling, Installation, Water-Quality Sampling, and Testing of Piezometers 1-12 (DOE, Dec. 1997). Since that time water-level measurements and water-quality samples have been collected and periodically analyzed to establish and identify trends in order to improve understanding of the hydrologic conditions within the Santa Rosa Formation. This report has three objectives:

- To present and assess the hydrologic, chemical, and meteorological data collected between October 1997 and October 1998;
- To develop a conceptual model that describes the perched unconfined water-bearing horizon in the Santa Rosa; and
- Based on that model, identify those areas where ambiguities exist in the data or where there is insufficient data to define the hydrologic system.

1.3 Scope of Work

Water-level measurements and water-quality samples were collected periodically between October 1997 and October 1998 from fifteen well and piezometer locations across the WIPP site to characterize the extent and quality of water present in the Santa Rosa Formation. In addition, WIPP site precipitation data and Exhaust Shaft pressure and fluid-flow data were collected to identify trends concerning fluid-flow migration into the shaft.

2.0 CONSTRUCTION

Five boreholes were drilled in September and October 1996, three of which were completed as wells for the monitoring of water levels and water quality sampling. During the second phase, twelve boreholes were drilled and completed as piezometers providing additional information concerning the WIPP site hydro geology and water chemistry.

2.1 Wells C-2505, C-2506, and C-2507

Boreholes C-2505, C-2506, and C-2507 were drilled in September and October 1996 (DOE, Jan. 1997). The boreholes were drilled to depths of up to 97 feet bgs using either hollow-stem auger or air-rotary methods. The wells were screened and gravel packed through the Santa Rosa Formation and sealed with several feet of bentonite clay and grouted to the surface. Figure 2.1 is a diagram of a typical well completion for wells C-2505, C-2506, and C-2507.

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2.2 Piezometers PZ-1 through PZ-12

Twelve 6-5/8-inch diameter boreholes were hollow-stem augered/cored and or air-rotary drilled to depths of up to 82 feet bgs through the Santa Rosa Formation into the Dewey Lake Formation between June 23 and July 10, 1997 (DOE, Dec. 1997). As the boreholes were completed, 2-inch I.D. piezometers were installed, packed with sand above the screened intervals, sealed with bentonite, and grouted to ground surface. Figure 2.2 is a typical well completion diagram for the twelve piezometers installed at WIPP.

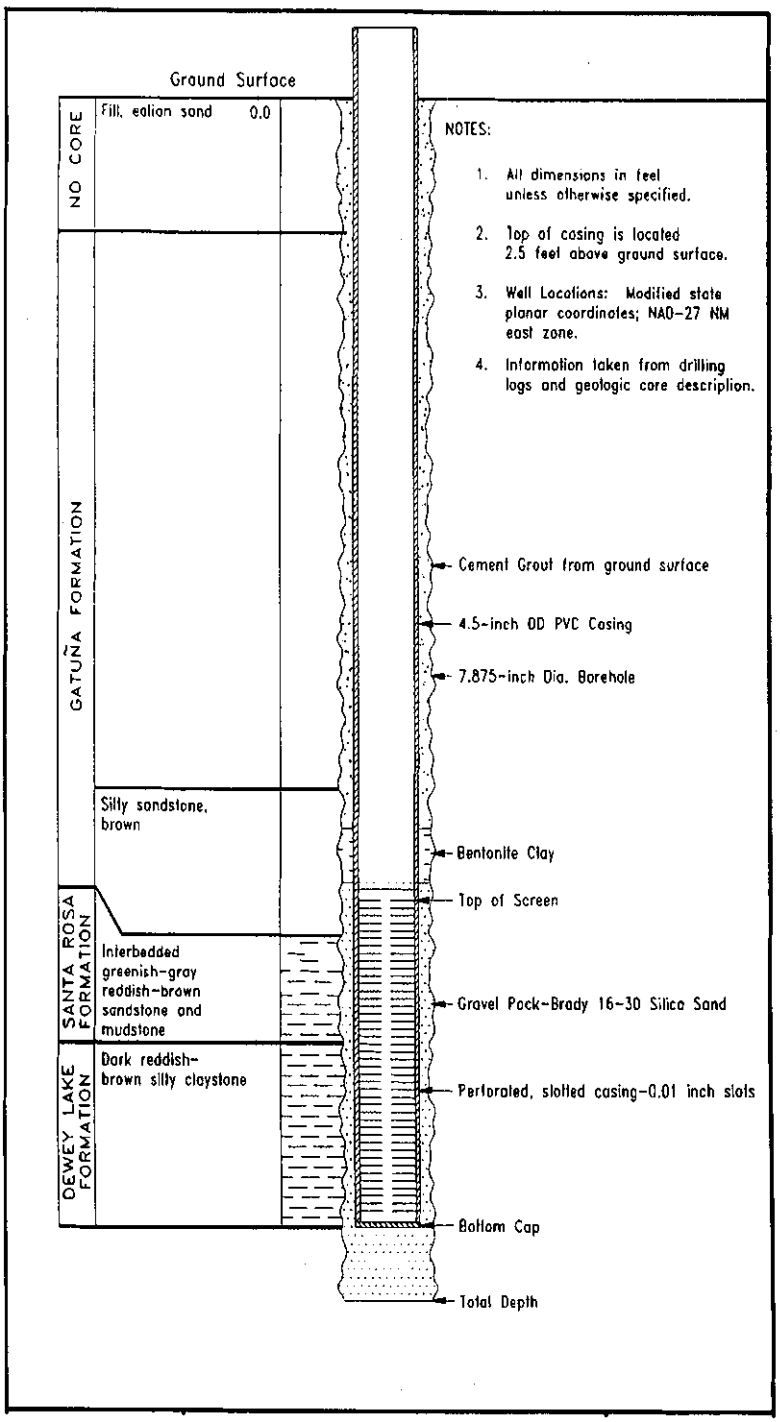

Figure 2.1 -Typical Well Completion Diagram

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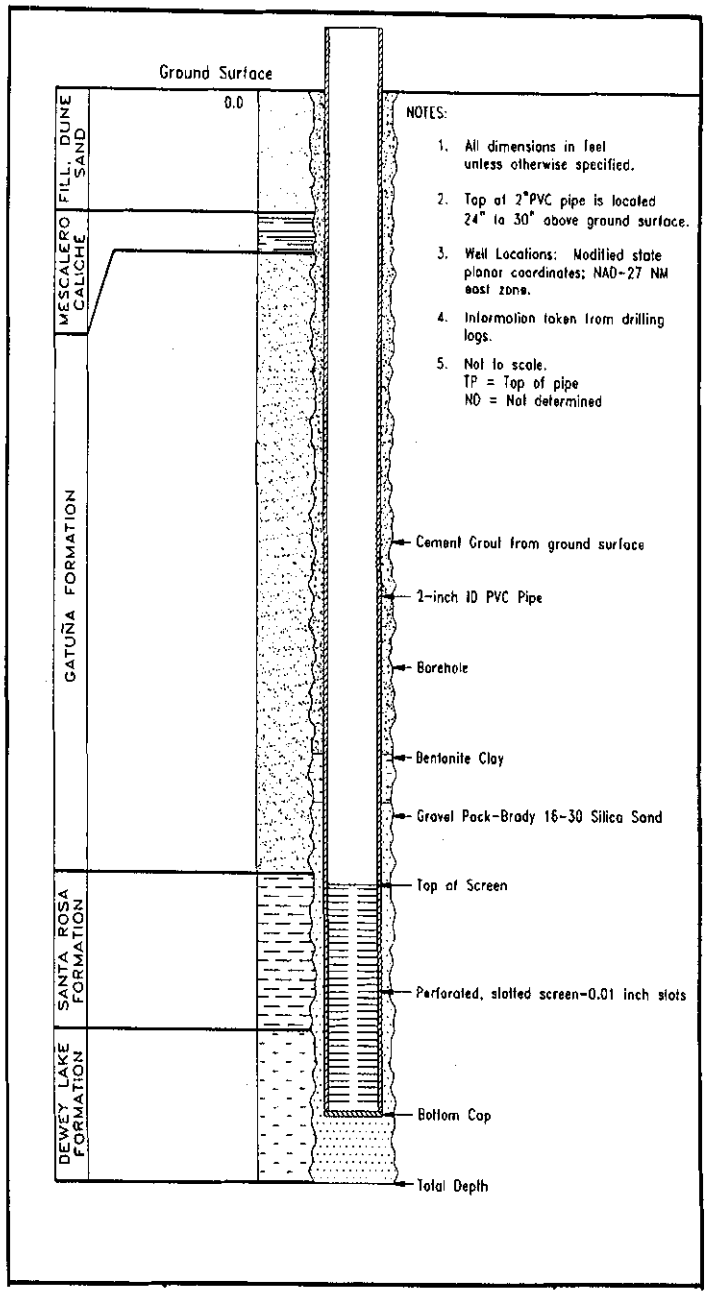

Figure 2.2 -Typical Piezometer Completion Diagram

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3.0 GEOLOGY

Cores and cuttings were collected from boreholes completed during Phase I and Phase II activities of the Exhaust Shaft Hydraulic Assessment Program. Descriptions and interpretation of cores, cuttings and geological data were performed by Dr. Dennis Powers. Powers identifies seven geologic units encountered during drilling and coring of the fifteen boreholes covered under this assessment program. From the surface down, these are:

- Fill - local units disturbed by construction or material brought in for construction,
- Holocene (?) dune sand,
- Pleistocene Berino soil
- Pleistocene Mescalero caliche
- Miocene - Pleistocene Gatuña Formation
- Triassic Santa Rosa Formation
- Permian Dewey Lake Formation

Fill, Construction Materials. Around the facilities, significant areas have been modified by construction activities. Much of the dune sand has been leveled in place, though some of the upper part has been removed as "soil" for later rehabilitation following decommissioning of the WIPP facility. Gravel from nearby caliche pits has been imported to stabilize the roadway and construction surfaces, and one hole, PZ-1, was drilled through asphalt surfacing. Another hole, PZ-7, was on top of a small berm, constructed of dune sand with caliche surfacing around an evaporation pond.

Holocene (?) Sand Dunes. The most recent widespread sedimentary deposit at the WIPP site is a thin blanket of windblown sand. The sand, known as the Mescalero sand, occurs as relatively inactive dunes, except in areas where local wind-related blowouts occur. Nearly 8 feet of unconsolidated sand occurs at the Exhaust Shaft. This sand is reddish-brown, silty, and poorly sorted.

Berino Soil. The Berino soil is a dark reddish brown siltstone to argillaceous sandstone that is partially lithified, mainly by accumulations of clay minerals. It is a fossil soil.

Mescalero Caliche. The Mescalero caliche in the area of WIPP is an informal stratigraphic unit designated by Bachman (1976) for the pedogenic carbonate deposits across the Mescalero plains. The unit is locally variable in thickness and disrupted by erosion/solution prior to the formation of the Berino soil. The upper one foot of the caliche is typically hard, and the hardness and overall degree of induration decreases with depth. It also becomes nodular with depth and the size of the nodules increase with depth. Locally, siltstones and sandstones are engulfed by the caliche. Chert and sandstone pebbles are engulfed higher in the section.

Miocene-Pleistocene Gatuña Formation. The Gatuña is a poorly sorted, fine to very fine grained, friable, calcareous sandstone. The lower 1.5 feet of the Gatuña contain angular

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debris from the underlying Santa Rosa Formation. The thickness of the unit can vary considerably over short distances. Several caliche quarries east of the WIPP withdrawal area expose well-lithified Santa Rosa under caliche. The Gatuña Formation is relatively thin across most of the site facility area at WIPP. The Gatuña thickens considerably to the west, especially along Nash Draw and nearer the present day Pecos River (Powers and Holt, 1993, 1995). It was deposited in localized fluvial channels caused by erosion.

Triassic Santa Rosa Formation. In the WIPP site area, the Santa Rosa Formation occurs as an erosional wedge that pinches out west of the WIPP site. It thickens rapidly to the east as a consequence of both eastward dip and eastward rise in the surface elevation. The Santa Rosa consists of calcareous reddish-brown siltstone and fine-grained sandstone and contains pebbles of chert.

Dewey Lake Formation. The Dewey Lake is characterized by its reddish-orange to reddish-brown color and varying sedimentary structures. In the Exhaust Shaft, the Dewey Lake consists almost entirely of mudstone, claystone, siltstone, and interbeded fine-grained sandstone.

4.0 HYDROLOGY

Section 4.0 examines hydrologic data collected over the past three years at the WIPP site as a part of the hydraulic characterization of water inflow to the Exhaust Shaft. Data includes water-level data, water-quality sampling data, Exhaust Shaft instrument pressure data, fluid data for water collected at the bottom of the Exhaust Shaft, and precipitation data collected at the WIPP site weather station.

4.1 Water-Level Data

Water-level measurements have been collected in wells C-2505, C-2506, and C-2507 since October 1996 and in PZ-1 through PZ-12 since July 1997. Water-level measurement data are used to determine the pressure head at a point, the regional hydraulic gradient, the direction of groundwater flow, and possible areas of recharge and discharge. Figure 4.1 is a linear plot of water-level measurements collected from the fifteen Santa Rosa monitoring wells and piezometers through October 1998. Note that water-level elevations are not corrected for density. There are indications of fluid density stratification and orders of magnitude variation in TDS. Corrected freshwater head values are possibly inaccurate and potentially misleading. Figure 4.1 shows that typically fluid levels rose in all wells until early 1998 when the pattern changed. In many wells fluid levels then became static or began to drop slightly. The highest pressure-head values were found in wells PZ-7 and PZ-11, in the northwestern portion of the WIPP site. The lowest head values are found at wells PZ-12 to the south, PZ-9 to the northeast, and C-2507 the southeast portion of the WIPP site. In addition, PZ-8 is a dry hole indicating that there is a saturation front somewhere west of PZ-8.

Figure 4.2 is an equipotential water-level surface map of the Santa Rosa Formation at WIPP as of October 1998. Flow lines indicate that water moves from the west to the east in the northern portion of the site, while fluid flows from the north to the south and southeast in the western and central portion of the site. The hydraulic gradient between PZ-7 (potentiometric high) and PZ-12 (potentiometric low) is about 0.014 ft/ft.

Based on Figures 4.1 and 4.2, wells PZ-7 and PZ-11, in the vicinity of the north salt pile retention pond appear to be in a recharge area. PZ-7 has a total head of 3,374.92 feet (amsl), at least 3.5 feet higher than the fluid level in any of the other wells and piezometers monitoring the Santa Rosa at WIPP. Areas of low total hydraulic head are primarily to the south and east. There is likely a saturation front, which extends radially outward from the WIPP site, as evidenced by an absence of water in PZ-8. Though there has been some change in the total head in each of the wells and piezometers over the past two years, there has been no significant change in the overall hydrology (i.e., gradient, flow direction, and areas of recharge and discharge).

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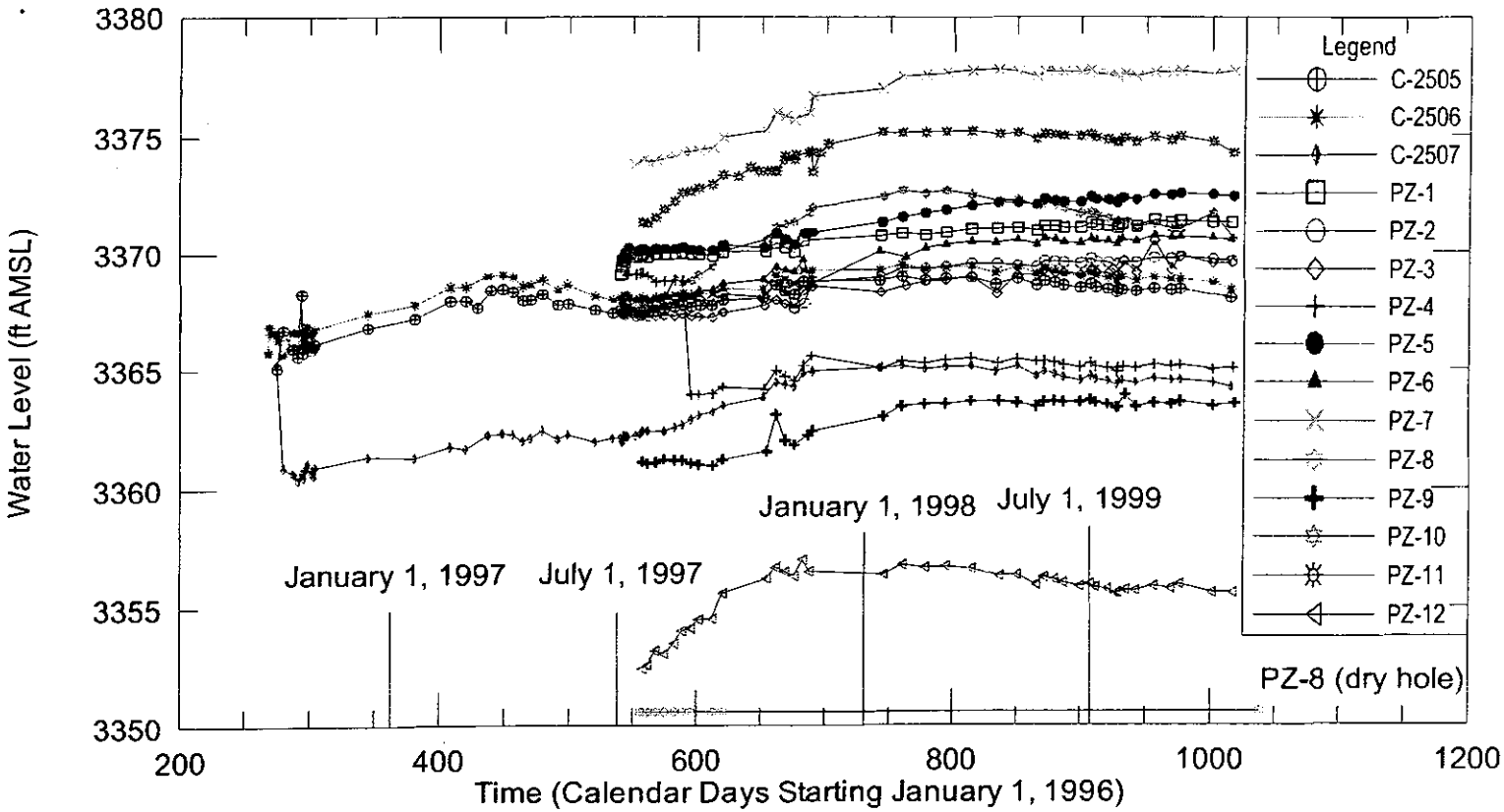

Figure 4.1 - Linear Plot of Water Levels for Wells and Piezometers Located in the Santa Rosa Formation as of October 1998

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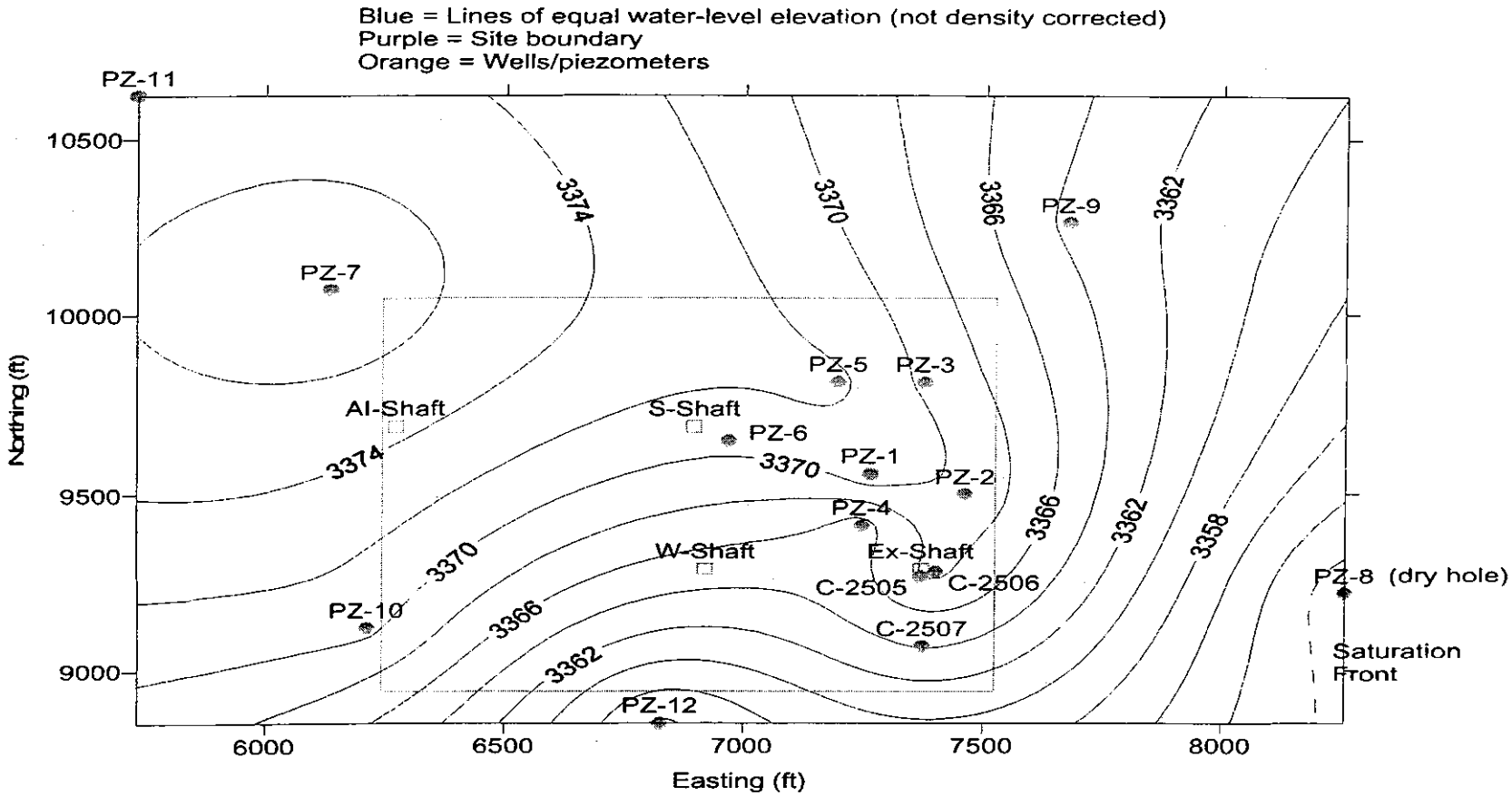

Figure 4.2 - Plot of Lines of Equal Water-Level Elevation for Wells and Piezometers Located in the Santa Rosa Formation as of October 1998

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4.2 Water Quality Data

Periodic water-quality samples have been collected from the fifteen well and piezometer locations monitoring the Santa Rosa Sandstone since July 1997. Samples were collected on a quarterly basis in order to establish trends, and to characterize and identify the origin(s) of the water (Appendix 2). Figure 4.3 is a plot of TDS versus time for samples collected from the fifteen wells and piezometers. This plot shows that, for the most part, TDS values have been relatively stable for the past 18 months. Based on the plots of TDS data, TDS can be grouped into three categories: high TDS (70,000 to 170,000 mg/L), intermediate TDS (20,000-70,000 mg/L), and low TDS (0-20,000 mg/L).

In Figure 4.4 TDS is plotted with equipotential freshwater head values for the Santa Rosa Formation. The plot clearly identifies a high TDS region in the northeastern portion of the site that includes PZ-1, PZ-3, PZ-5, and PZ-9. The intermediate TDS region includes the northwestern and central portion of the site including P-4, PZ-6, PZ-7, and PZ-11. The low TDS region includes PZ-2, PZ-10, PZ-12, C-2505, C-2506, and C-2507.

Given their terrigenous sedimentary composition, the Gatuña and Santa Rosa Formations have insufficient halite to support high levels of total dissolved solids. Therefore, the highly saline water does not represent original groundwater. The high total dissolved solids concentration in the Santa Rosa may be linked to localized surface recharge associated with site evaporation and retention ponds. Pumping test data indicates that the Santa Rosa is an unconfined aquifer (DOE, Dec. 1997) providing appropriate conditions for the migration of fluid from the surface. Table 4.1 lists the stratigraphic depths for the Gatuña, Santa Rosa, and the Dewey Lake Formations and the water level for each well. Given that the water is unconfined, localized saline water recharge is the most likely source of the high TDS fluid.

The first potential high TDS source is the North Salt Storage Area which contains material mined from the WIPP repository horizon in the predominantly halite Salado Formation. In addition to being highly soluble disaggregated salt, the moat along the south side of the North Salt Storage Area was also the area where saline-construction and sump-collection water removed from the WIPP repository horizon was discharged for several years. The North Salt Storage Area probably still serves as a major source of recharge to the shallow perched water-bearing horizon beneath the WIPP site.

A second potential source of saline fluid may be the drilling and cuttings pit used during the excavation of the Salt Shaft in 1981 (Figure 1.2). This approximately 200 ft x 300-ft pit was used to settle drill cuttings from the 12-ft diameter Salt Shaft. This waste-material area could serve as a source of the elevated concentrations of potassium found in piezometers in the northeastern portion of the site. Upon completion of drilling of the Salt Shaft in 1982, fluid was pumped from the pit liner leaving residuum (drill cuttings and nonpumpable sludge) in the pit to dry for several months before the pit was covered with fill. Approximately two years later, a series of holes were drilled through the liner and caliche to allow any remaining fluid to drain from the cuttings. The liner and drill cuttings were

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removed and the pit backfilled with caliche and compacted just prior to the construction of the Engineering Building in 1990. Another source of saline fluid into the Santa Rosa occurred during the installation of the steel liner in the Salt Shaft. During installation, brine was used to float and set the steel liner in the shaft. As the fluid level rose in the shaft, the brine overflowed the shaft collar at the surface and was conducted back to the tailings pit. During this time period of several weeks the drilling fluid could have infiltrated the more permeable Santa Rosa and Gutuña Formations creating a plume of brine around the Salt Shaft.

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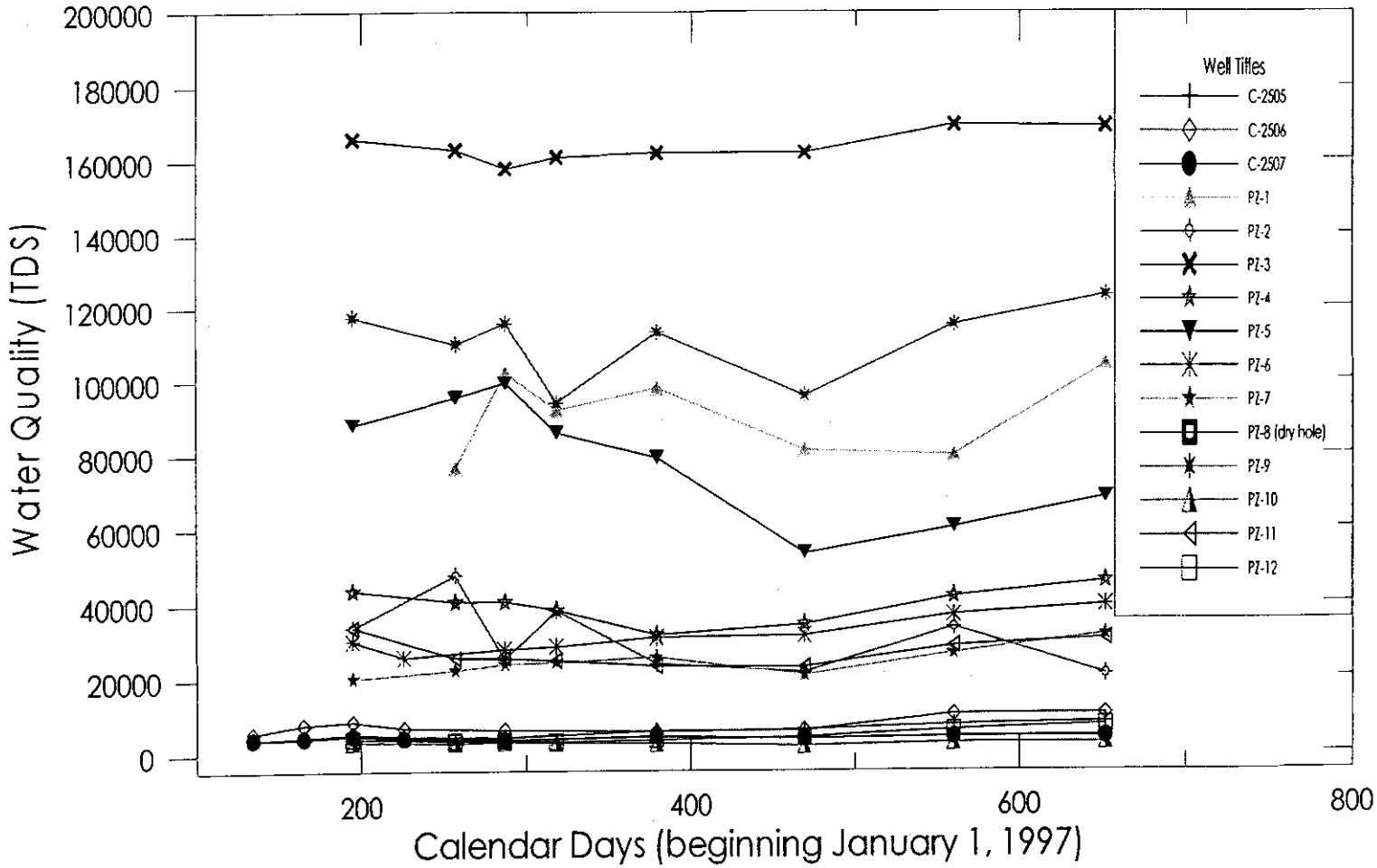

Figure 4.3 -Total Dissolved Solid Measurements as of October 1998

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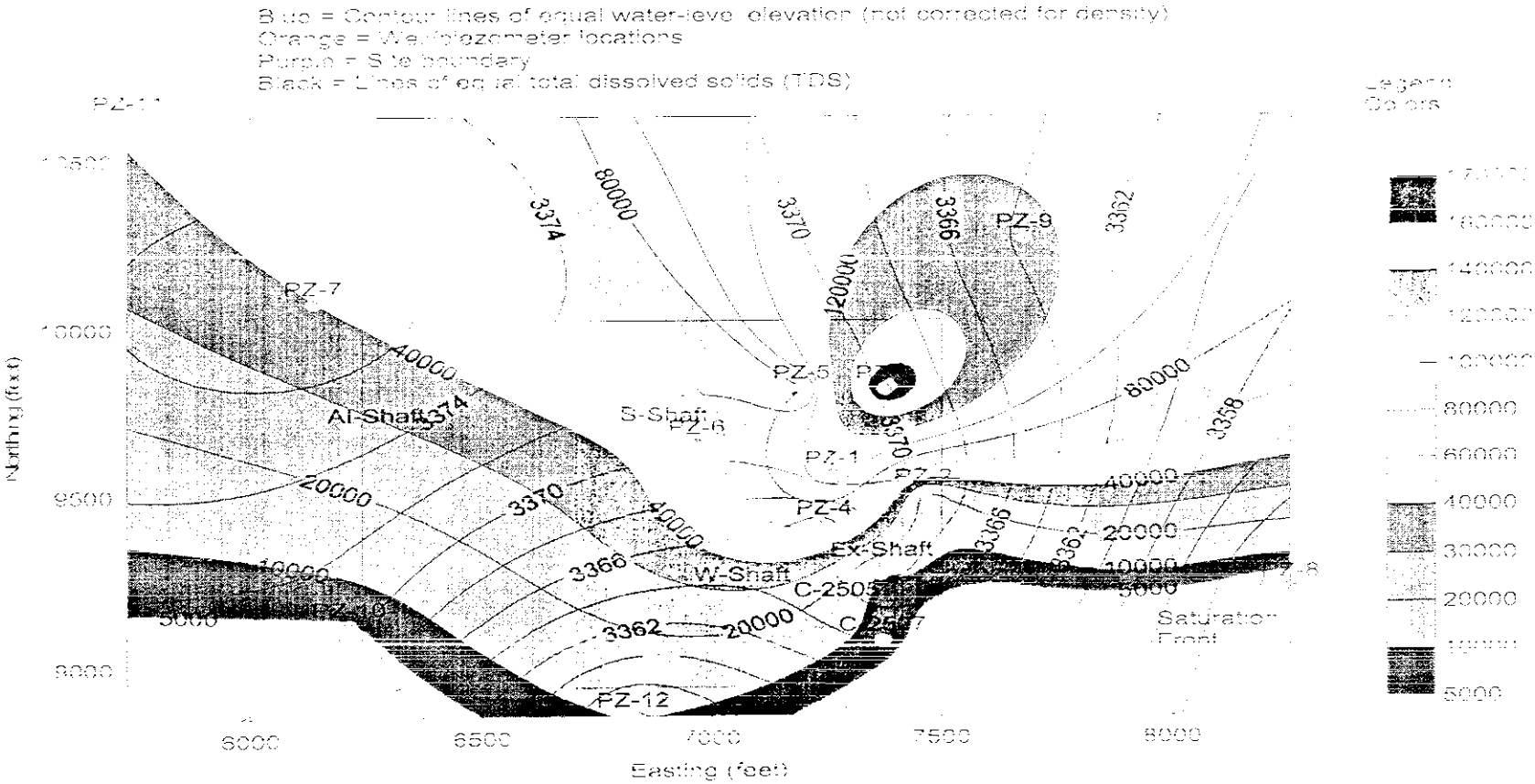

Figure 4.4 - Lines of Equal Water-Level Elevation and Total Dissolved Solids as of October 1998

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Table 4.1 - Stratigraphic and Water-Level Data for Wells and Piezometers at WIPP Completed in the Santa Rosa Formation

Drillhole	Gatuña (feet bgs)	Santa Rosa (feet bgs)	Dewey Lake (feet bgs)	Depth to Water (feet bgs) (Oct 98)
C-2505	12-4-39.6	39.6-54	54-97	45
C-2506	ND*	ND-53.5	53.5-69	44.5
C-2507	ND	ND-48	48-63	45.8
PZ-1	ND-40	40-56	56-67.5	42.1
PZ-2	12-39	39-57	57-65	43.8
PZ-3	10-38	38-63	63-70	46.6
PZ-4	12-31	31-57	57-65	47.1
PZ-5	9-36	36-62.5	62.5-71.5	43.0
PZ-6	9-32	32-55	55-66	43.0
PZ-7	9.5-30	30-69	69-71.5	36.3
PZ-8	9-31	31-60	60-67	Dry hole
PZ-9	11-36	36-75	75-82.5	57.7
PZ-10	28-46	28-46	46-57	35.3
PZ-11	34-71	34-71	71-82	44.7
PZ-12	8-39	38-62	62-77	53.4

*ND = Not determined (feet bgs)

4.3 Hydraulic Behavior of the Units Underlying the WIPP Site

The Exhaust Shaft was constructed and lined between 1983 and 1985. During that time, site investigations did not report the presence of groundwater within 1195 feet of the surface (Holt and Powers, 1986). During the sinking and mapping of the Exhaust Shaft the shallowest fluid production noted was from the Magenta and the Culebra Dolomite Members of the Rustler Formation. Both aquifers were instrumented with piezometers to monitor hydraulic heads. In addition, the Dewey Lake, the Tamarisk and the unnamed lower member of the Rustler Formation as well as the contact between the Rustler/Salado Formations were instrumented with piezometers to monitor the hydraulic heads in those stratigraphic units. Figure 4.5 provides a diagram of the location and depth of the gauges installed in the Exhaust Shaft in units of feet and meters below the top of the collar. For 1985 through 1993, the total head values in the Dewey Lake Formation, four members of the Rustler Formation, and the Rustler/Salado contact are all significantly lower than the Santa Rosa Formation (GAR 1998). The data indicate that neither the Dewey Lake Formation nor any member of the Rustler Formation is a source of the fluid in the Santa Rosa and that recharge of the Santa Rosa must be from above (i.e., a result of surface or near-surface events).

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During the mapping of the Air Intake Shaft late in 1988, Holt and Powers (1990) noted that the shaft walls were wet in the basal sandy siltstones of the Santa Rosa Formation at a depth of 51.5 feet (33 feet below plenum + 18.5 feet of plenum) (elevation of 3,358.5 feet amsl). They suggested that the water was accumulating in the Santa Rosa sandstones that were overlying the Dewey Lake siltstones. Powers (1986) did not report any water present in the Santa Rosa during mapping of the Exhaust Shaft in 1984 (DOE, Jan. 1997).

A series of boreholes were drilled in 1979 by Sergent, Hauskins & Beckwith (1979) for design of surface facilities. Fifty-four boreholes were drilled to depths of up to 902 feet for foundation and design evaluation of the near-surface stratigraphy at WIPP (Sergent, Hauskins & Beckwith, 1979). Fifty-two of the boreholes were drilled to depths of less than 100 feet. These drillholes intersect the area where water is presently found. No groundwater was found present in the Santa Rosa or in any of the shallow surface rock units. All these factors combine to provide strong evidence that the fluid in the vicinity of the Exhaust Shaft started to accumulate sometime between 1984 and 1988.

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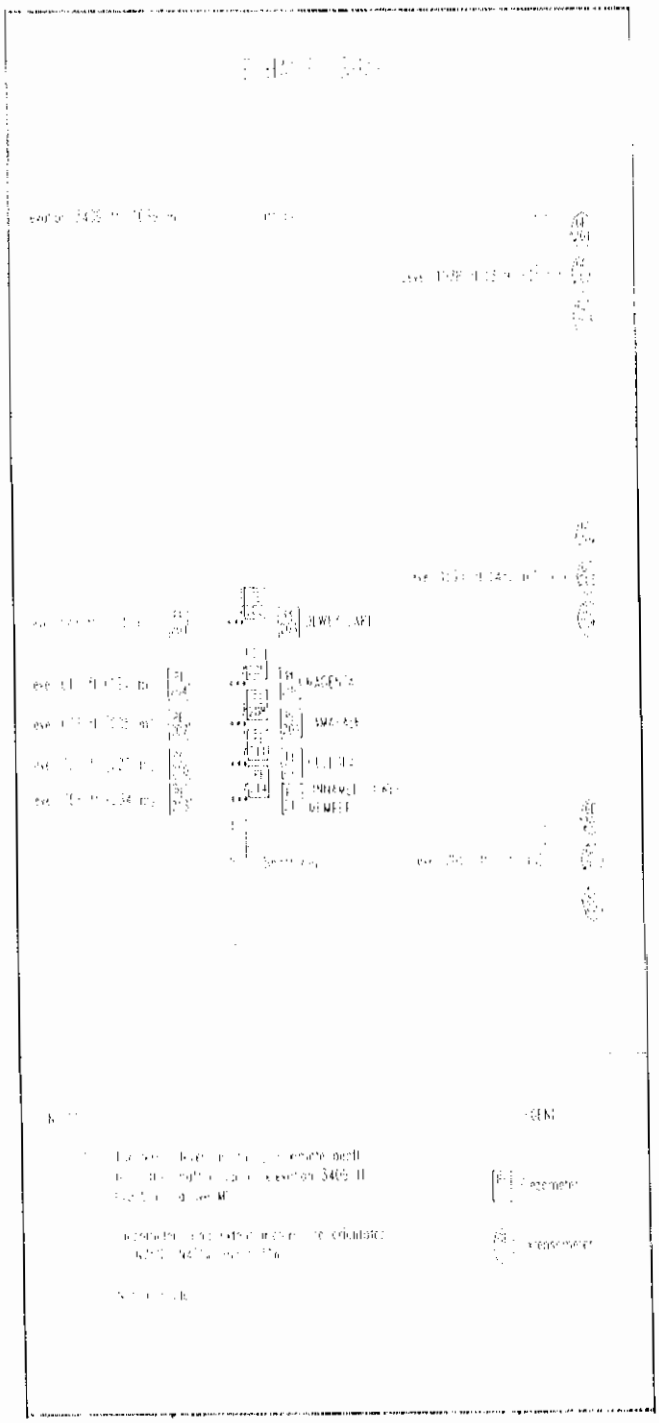

Figure 4.5 -Exhaust Shaft Instrumentation

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4.4 Exhaust Shaft Flow Data

Water enters the Exhaust Shaft through two paths. First, water may enter the Exhaust Shaft through cracks or construction joints in the shaft liner. Depending on operating conditions, this water can fall down the shaft into the catch basin, be absorbed into the shaft wall, or be captured in the airflow and expelled into the atmosphere through the fans. A second source of water in the shaft involves the cooling of warm moisture laden air from the WIPP underground facility as it rises up the Exhaust Shaft. As air is cooled to the dew point, water begins to precipitate. Again this water can flow down the shaft wall into the catch basin, be absorbed into the shaft wall, or carried by the ventilation system.

When fluid was detected leaking into the Exhaust Shaft in 1995 a catch basin was designed and installed at the base of the Exhaust Shaft to intercept and prevent water from draining into the Waste Shaft sump. The catch basin consisted of two 1' x 9' x 28' polyethylene reservoirs placed at the base of the Exhaust Shaft. Fluid has been removed on an as-needed basis from the Exhaust Shaft Catch Basin since March 1996. Figure 4.6 is a plot of the volume of water removed periodically from the catch basin. In some instances, due to the ventilation configuration and the relatively dry conditions and low humidity, no water may be pumped from the catch basin for several weeks or more. At other times as much as 1000 gallons or more may be pumped out during short periods. Figure 4.7 is a plot of the total volume of fluid removed from the Exhaust Shaft catch basin between March 1996 and October 1998. Based on the plot, approximately 40,000 gallons have been captured by the catch basin during the approximate 900-day monitoring period.

Figure 4.7 represents only that portion of fluid collected in the catch basin and not subsequently evaporated from the basin. It is important to understand that the 40,000 gallons of fluid that has been removed from the catch basin does not reflect the total quantity of water entering or created in the shaft. Airflow and evaporation can significantly affect the quantity of water carried out through the exhaust-ventilation system. Figure 4.8 illustrates the impact of reduced airflow on the accumulation of fluid in the catch basin. The normal operating mode for the ventilation system is two main fans operating at 425,000 cfm. The second mode is the reduced-mode operation, where only one main fan operates: 1-main fan at 260,000 cfm or 1-Exhaust Filter fan at 30,000 cfm. Reduced mode operation is most frequently used during weekend and nonwork hour operations. The third mode is the power outage mode during which time all the ventilation fans are off for a period of time. Figure 4.8 indicates that fluid flow into the catch basin is associated with power outages, when the fans are off and the airflow through the shaft is minimal. During this time, water drains into the shaft, down the shaft walls and into the catch basin unretarded. Figure 4.8 also indicates that there are periods during reduced-mode operations that fluid does not accumulate in the catch basin (Appendix 3).

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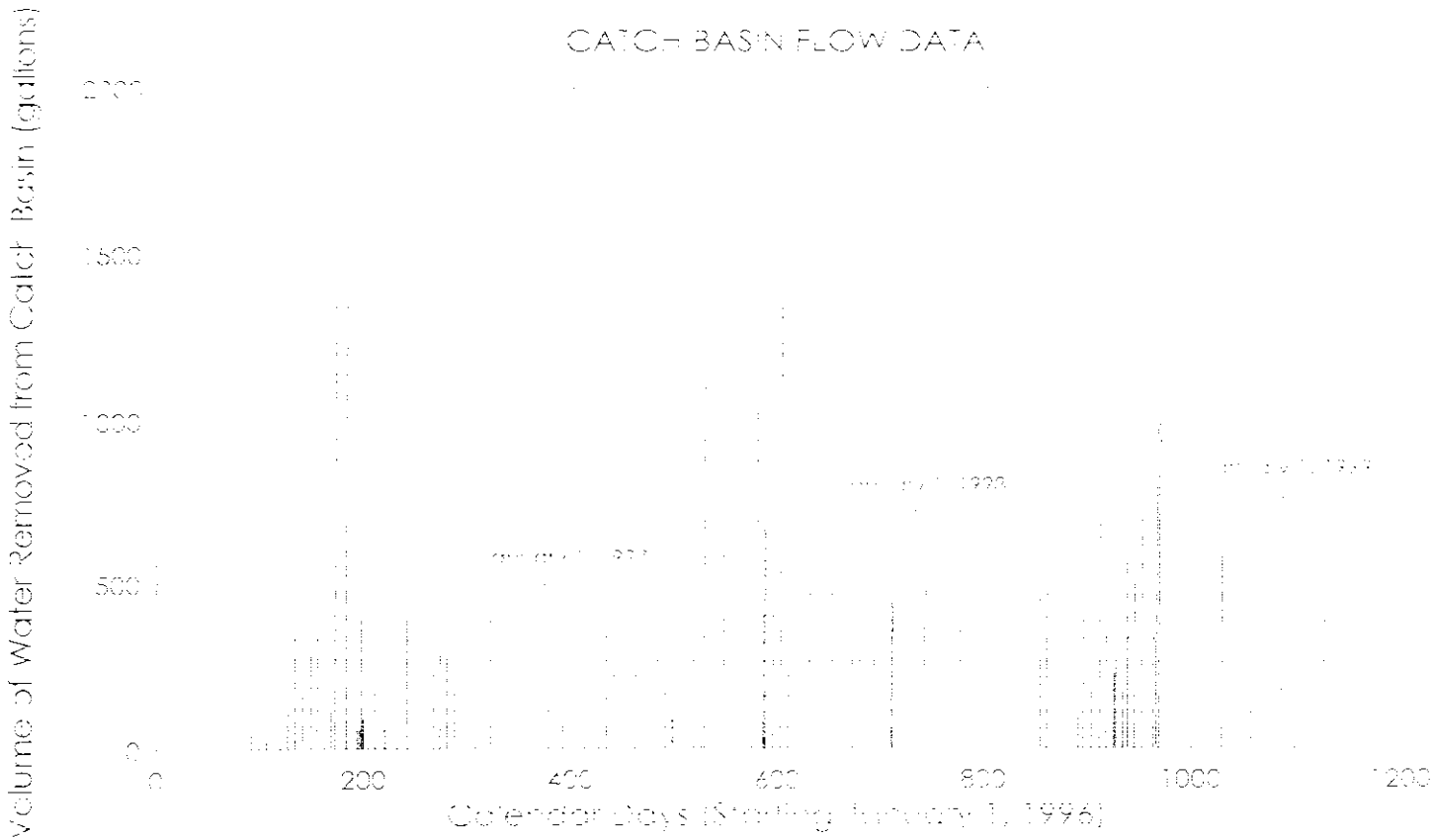

Figure 4.6 -Volume of Fluid Removed from the Catch Basin at the Base of the Exhaust Shaft as of October 1998

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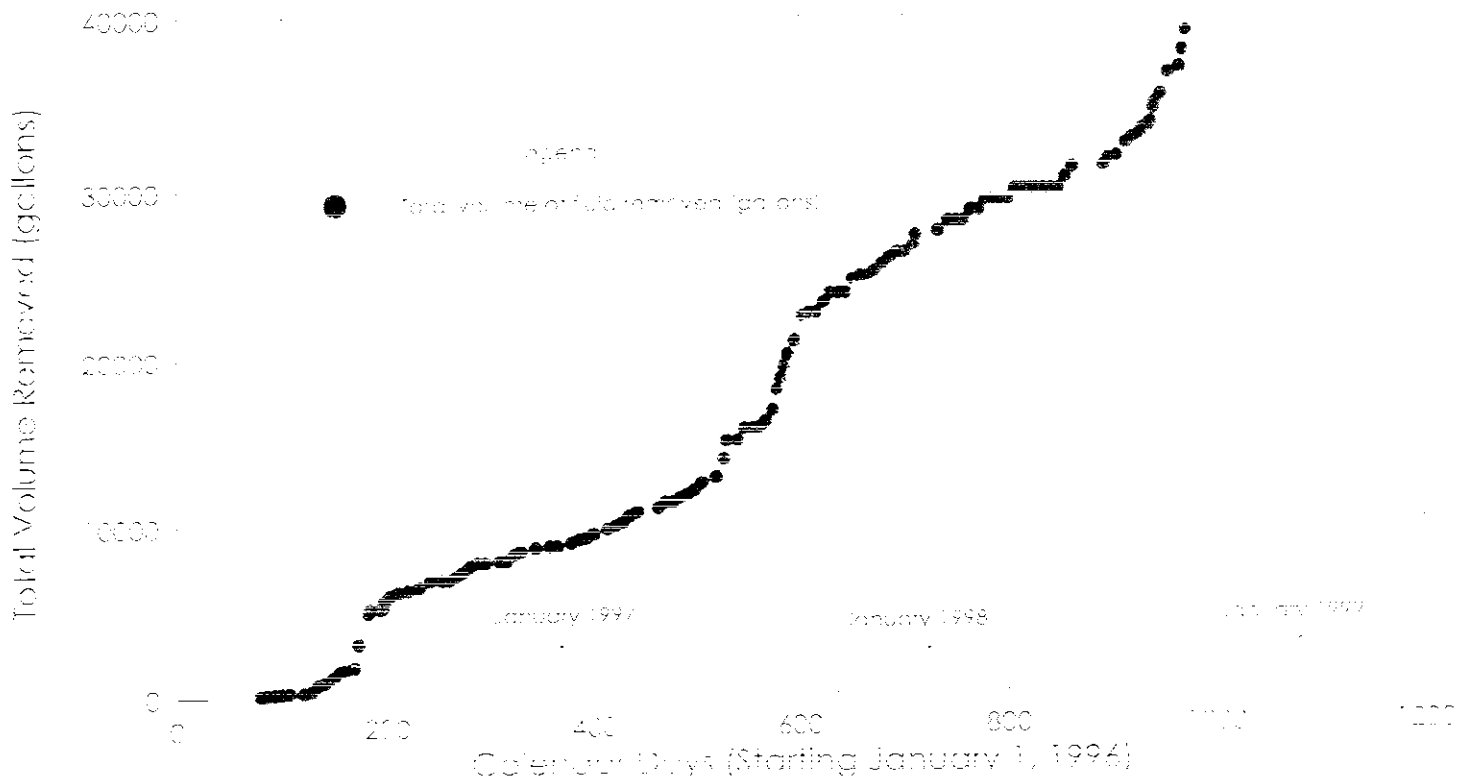

Figure 4.7 - Cumulative Volume Removed from Catch Basin at the Base of the Exhaust Shaft as of October 1998

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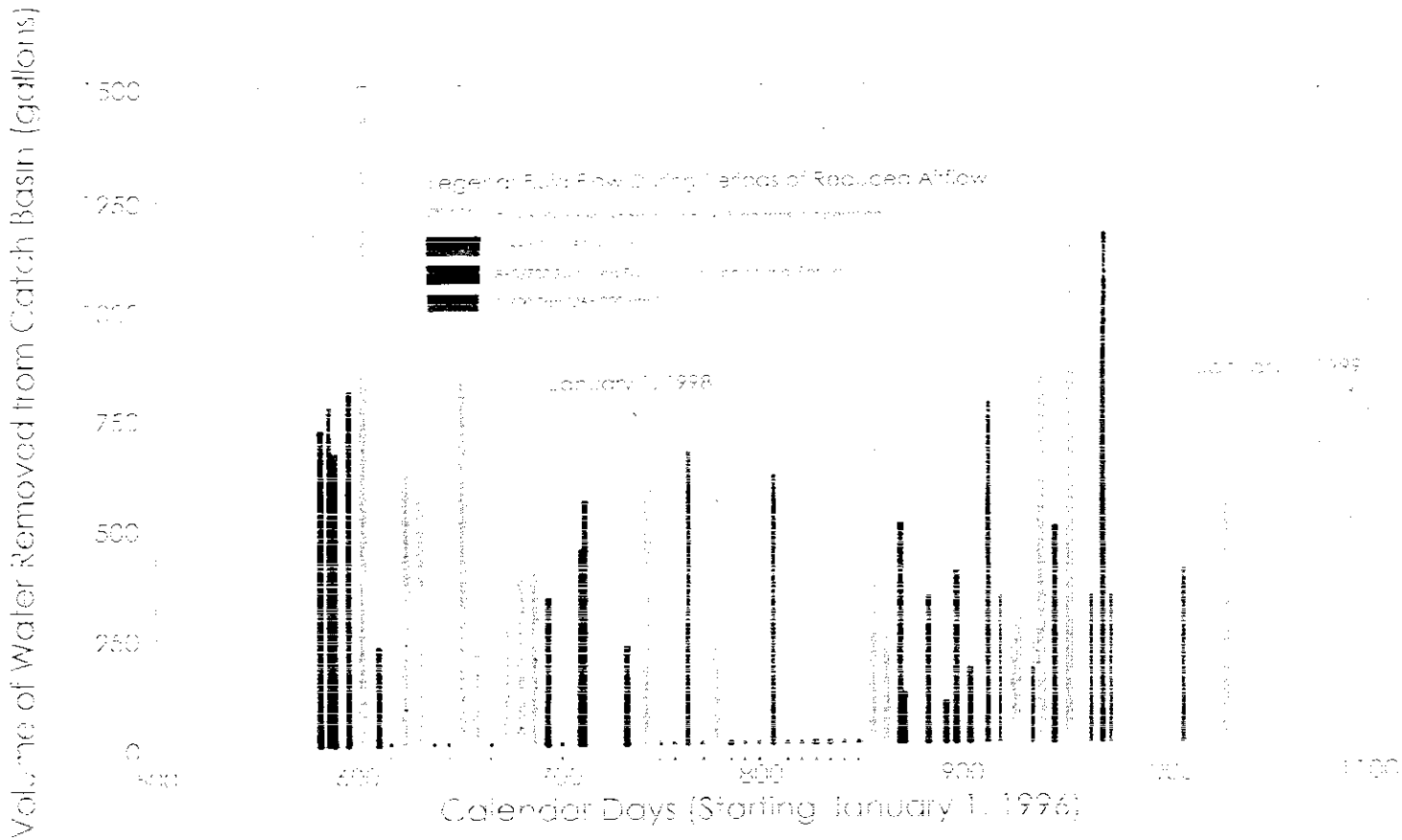

Figure 4.8 -Volume of Fluid Removed from the Catch Basic as a Function of Air Flow

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4.5 WIPP Site Precipitation Data

Figure 4.9 is a plot of precipitation data collected from the WIPP site weather station between January 1996 and October 1998. The WIPP site precipitation is highly variable. The data indicate that most commonly there are dry winters and wetter summers. Between January and December 1996, the total rainfall amounted to 11.32 inches, between January 1997 and December 1997, 20.80 inches, and between January 1998 and October 1998, 5.7 inches. The average rainfall for southeastern New Mexico is less than 10 inches per year (Appendix 4).

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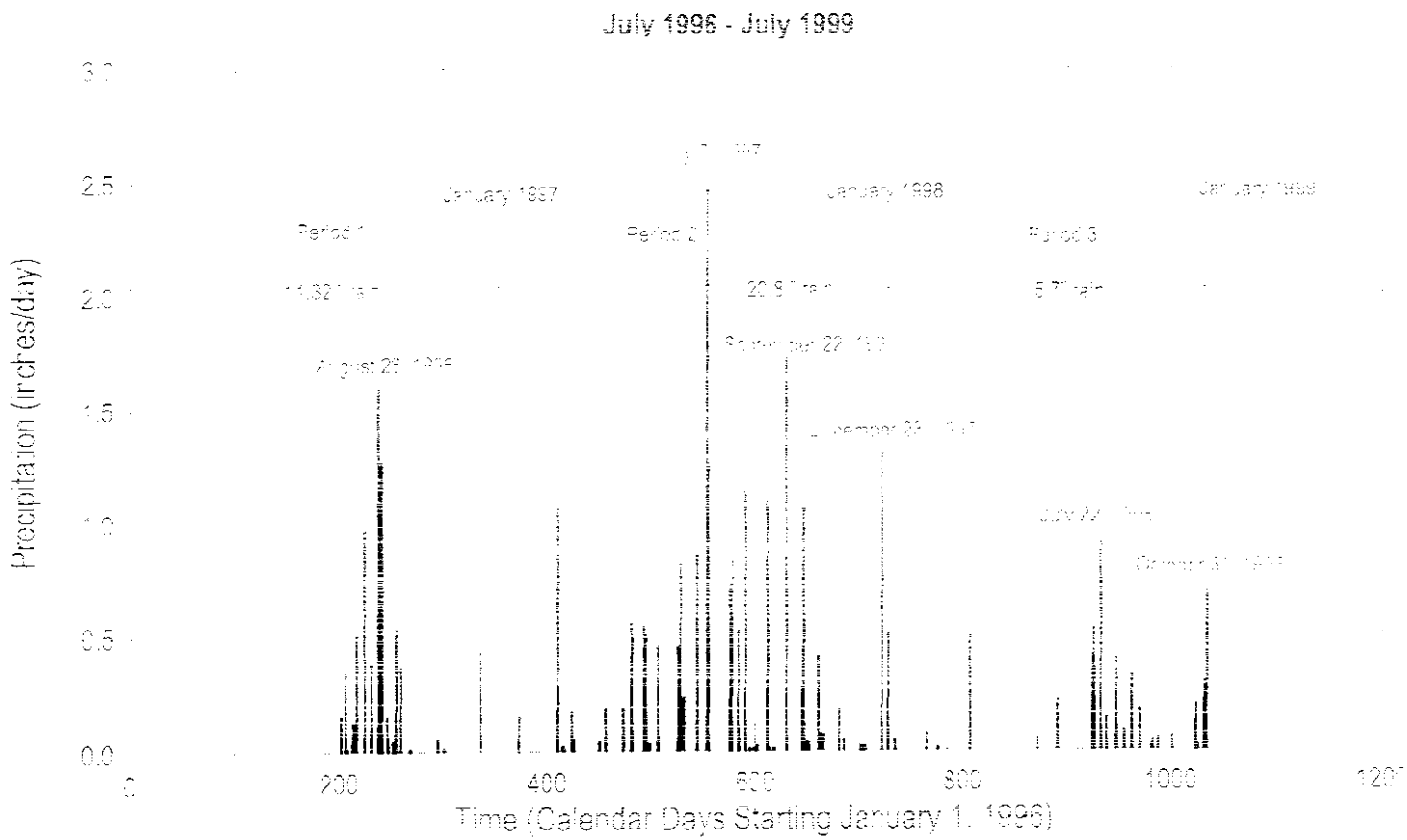

Figure 4.9 - Daily Precipitation Measured at the WIPP Site Weather Station

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5.0 DISCUSSION

This section summarizes the evidence concerning the original occurrence of perched water in the Santa Rosa Formation. As noted in Section 4.3 there were no reports of fluids in either the Santa Rosa or any other shallow surficial horizon during the drilling of the shallow drill holes reported by Sergent, Hauskins & Beckwith (1979) or during the mapping of the Exhaust Shaft by Holt and Powers in 1984. Further, there were no significant quantities of shallow groundwater noted at the WIPP site until the drilling and mapping of the Air Intake Shaft in 1988 (Holt & Powers, 1990). This implies that the water presently found in the Santa Rosa Formation is an artifact of post-1984 event(s). Recent recharge is supported by the extreme variability in salinity and the local potassium-rich waters. Due to the terrigenous nonevaporative sedimentary composition of the Santa Rosa and the overlying units, there is no mechanism for high-saline waters to occur naturally near the surface in this locality.

It is clear from examination of the pressure data collected from gauges installed in the Exhaust Shaft (Section 4.4) that none of the underlying water-bearing units in the Dewey Lake, Rustler, or Salado Formation contribute to the fluid in the Santa Rosa. The Dewey Lake Formation, the Magenta and Culebra dolomites (the principle water-bearing units in the Rustler Formation), and the Rustler-Salado contact all have lower head values than the groundwater in the Santa Rosa. Therefore, the water in the Santa Rosa Formation is most likely derived from some source(s) at or near the surface.

Water-level data (Section 4.1) indicates that water levels in the Santa Rosa Formation rose 2-4 feet between January and December 1997. During that time rainfall totals amounted to over 20 inches, twice the seasonal average. Water-level data also indicates that there were no significant changes in water levels between January and October 1998, a period during which WIPP site rainfall amounted to only 5.7 inches of rainfall, slightly more that ½ the seasonal average. These data are limited but are consistent with rainfall as a probable source of recharge to the Santa Rosa Formation in the WIPP locality.

The relationship of meteorological condition to precipitation in the Exhaust Shaft and the effect of this on the quantity of water accumulating in the catch basin is unclear. Figure 5.1 is a plot comparing precipitation and catch-basin flow data collected between March 1996 and October 1998. There is an indication that the volume of fluid removed from the catch basin is related to the amount and timing of precipitation and higher levels of relative humidity. However, this relationship is not clearly defined and will require additional data in order to establish statistically significant trends.

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DAILY PRECIPITATION AND EXHAUST SHAFT CATCH BASIN DATA AT THE WIPP SITE

July 1996 - October 1998

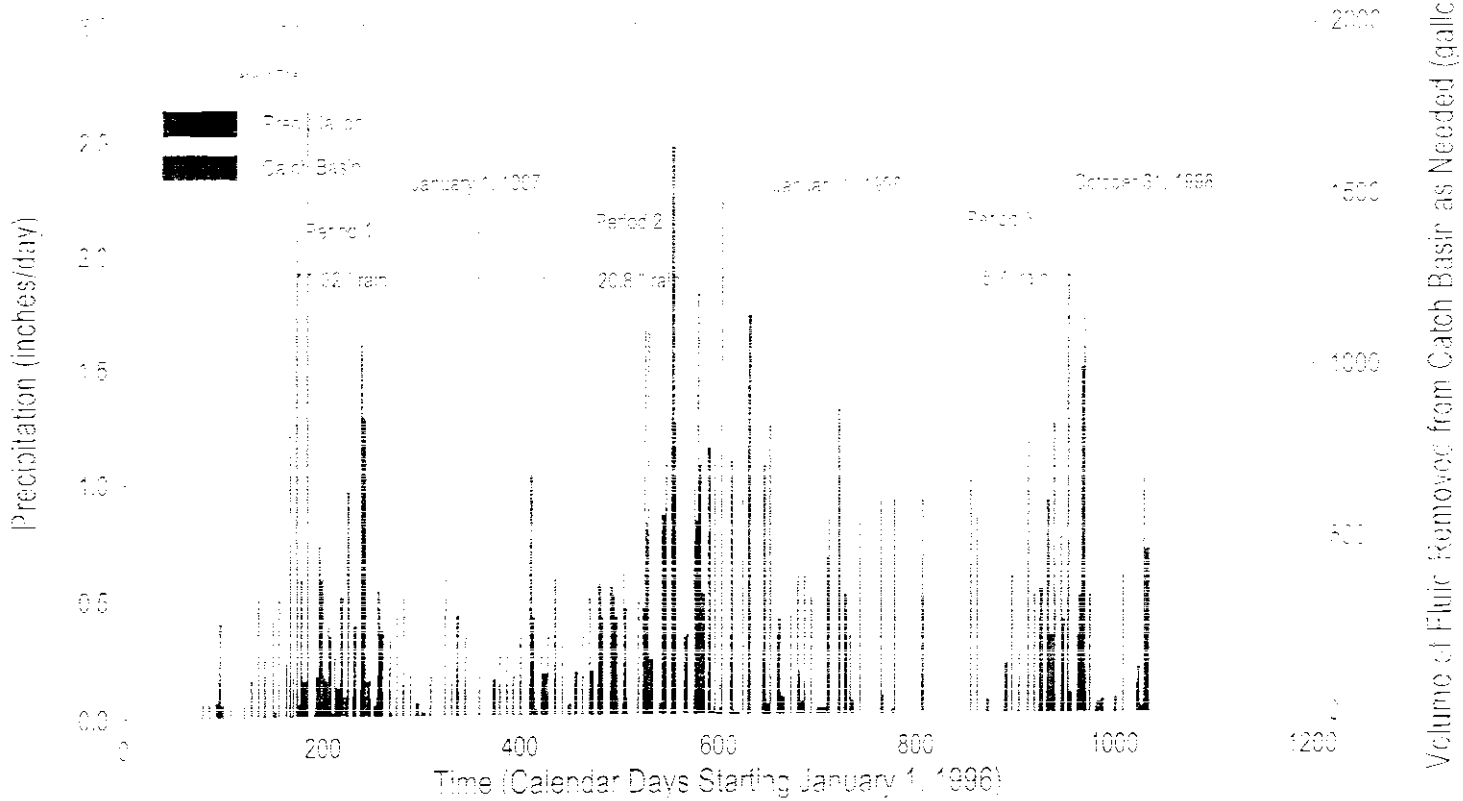

Figure 5.1 -Precipitation and Exhaust Shaft Catch Basin Flow Data

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The primary factor controlling fluid flow into the catch basin is Exhaust Shaft airflow as identified in Section 4.4. During power outages and reduced-mode operations, the volume of fluid draining into the catch basin increases. Over 70 percent of the volume of fluid collected in the catch basin can be attributed to power outages. Fluid does not necessarily accumulate in the catch basin during reduced-mode operations. There are numerous periods in which no fluid was collected during reduced mode (Section 4.4) suggesting that other factors, such as the shaft humidity, may also be significant contributors to the total volume of fluid accumulating in the catch basin.

Based on water quality, indicated by TDS, the Santa Rosa fluid can be characterized by three principle groupings. The first group is highly saline with TDS values ranging from 70,000-170,000 mg/L, includes piezometers PZ-3, PZ-5, PZ-9 and PZ-1, located in the northeastern and central section of the site. The second group, with TDS values ranging from 20,000 to 70,000 mg/L, includes piezometers PZ-2, PZ-4, PZ-6, PZ-7, and PZ-11 are located in the northwest and central section of the site. The third group, with TDS values ranging from 0-20,000 mg/L and consisting of wells C-2505, C-2506, and C-2507 and piezometers PZ-10 and PZ-12, is located in the southern section of the site.

Group 1 is highly saline, dominated by chloride and sodium ions and elevated potassium ions. The area represented by these piezometers are situated adjacent to the North Salt Storage Area, the Salt Shaft, and the former drilling and cuttings pit located just east of the Salt Shaft (Section 4.2). All three locations have readily available sources of sodium and chloride. Water affected by interaction with the Salt Shaft and the former drilling and cuttings pit is also likely to have elevated potassium concentrations.

The area represented by the Group 2 piezometers is located adjacent to the saltwater evaporation pond in the northwestern corner of the site. Piezometers PZ-4, PZ-6, PZ-7 and PZ-11 are located west and up-gradient from the central Group-1 piezometers. Rainfall runoff from the north salt storage area drains into the evaporation pond. The concentrations of salts in the retention ponds are more dilute due to sheet runoff effects in which there is little interaction between the water and the surrounding materials. In addition, a significant amount of runoff comes from areas without any available salt. It should also be noted that dilution may be a factor changing solutes in many places.

Group 3 piezometers are located next to three storm-water retention ponds on the south and southwestern portion of the site and adjacent to the Exhaust Shaft (Figure 1.2). The ponds receive runoff from the site. Analyses of samples collected from these basins indicate that these waters are low in TDS. The wells located in the southern portion of the site have significantly lower TDS than any other wells and piezometers.

The history of the drilling of the shafts, the construction of the retention ponds, and the salt storage area drilling and cuttings pit at WIPP provides important insight concerning the relationship between the hydrology and the water chemistry within the Santa Rosa Formation. Water-level data from the Santa Rosa (Figure 4.1) indicates that the Salt Water Evaporation Pond area has the highest recorded head values across the site facility

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area suggesting that the pond is a primary source of recharge to the Santa Rosa. Lines of equipotential water level (Figure 4.1) indicate that water moves radially away from the Evaporation Pond near PZ-7. The water quality and the equipotential water-level surface map (Figure 4.4), indicates that the highest head values are located in the northwest portion of the site, while the highest TDS values are located in the central and northeastern portion of the site. The high concentration of TDS in the central and northeastern portion of the site appears to be contrary to flow across the site suggesting that the high TDS concentrations are attributable to impacts other than the evaporation pond. The two most likely factors affecting the TDS concentrations in the Santa Rosa within the WIPP site facility area are the north salt storage area and the Salt Shaft drilling and cuttings pit. Salt concentrations appear to increase from the northwest to the central portion of the site as water in the Santa Rosa approaches the fringe of the Salt Shaft drilling and cuttings pit. As water in the Santa Rosa migrates further to the south it mixes with fresher water recharged by the three essentially fresh-water retention ponds located to the south. However, the order of magnitude difference in TDS from the center of the site to the southern-boundary area can not be achieved just by recharge from the retention ponds because there is no mechanism to reduce the total amount of chloride. Therefore, given the potential gradient, it can be assumed that the high TDS water that is migrating to the south and southeast will eventually flow into the area south of the Exhaust Shaft.

At WIPP, the Santa Rosa behaves as an unconfined aquifer. This is based on storativity values calculated from pumping test data collected from C-2505 and C-2506 ranging from 1.11 E-2 and 9.38 E-3 in February and March 1997 (Westinghouse, 1997). Unconfined aquifers typically have storativity values greater than 1.0 E-3.

Hydraulic tests were performed in every piezometer and well except PZ-3, and PZ-8 (dry hole). Results of those tests provided hydraulic conductivity values ranging from 2.11 E-5 to 5.88 E-8 m/s. Tests indicate that PZ-1, PZ-2, PZ-3, PZ-4, and PZ-5, C-2505 and C-2507 are capable of sustaining pumping rates of no more than 0.5 g.p.m for extended periods of time. On the other hand PZ-6, PZ-7, PZ-10, PZ-11, PZ-12, and C-2506 can sustain pumping rates of over 0.6 g.p.m. Some wells such as PZ-6, PZ-10, and PZ-12 can sustain pumping rates in excess of 1.0 g.p.m. for extended periods of time

6.0 CONCLUSIONS

6.1 Assessment: October 1997 through October 1998

During the twelve-month period extending from October 1997 through October 1998 water-level measurements in 15 wells monitoring the fluid level in the Santa Rosa Formation remained essentially unchanged. Drilling, pumping test, water quality, water level and precipitation data indicate that the Santa Rosa is an unconfined water-bearing horizon perched on top of the Dewey Lake Formation. Water level and precipitation data suggest that following extended periods of high rainfall, fluid levels in the Santa Rosa increase (October 1996-October 1997). However, during periods of low rainfall, fluid levels in the Santa Rosa either stabilized or decreased (October 1997-October 1998).

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Pressure data collected from piezometers located in the Exhaust Shaft from the Dewey Lake and Rustler Salado Formation indicate that there is no apparent hydrologic communication between the Santa Rosa Formation and water-bearing formations located stratigraphically below the Santa Rosa. Data suggest that rainfall runoff is a primary source of recharge to the Santa Rosa Formation.

An equipotential water level surface map of the Santa Rosa Formation at WIPP indicates that there is a potentiometric high located near the Salt Water Evaporation Pond in the vicinity of PZ-7. The water level at PZ-7 is approximately 3.5 feet higher than any other well monitoring the fluid levels in the Santa Rosa. Again flow from west to east isn't the only possibility across the northern part of the WIPP site surface facilities. Water flows radially from the PZ-7 area. In the northern portion of the site, fluid flows primarily from west to east. In the west and central portion of the site, fluid flows to the south and southeast. The areal extent of the fluid in the Santa Rosa at WIPP is significantly larger than the present 80-acre investigative area, but without drilling and additional testing there is no way of determining the areal extent of perched groundwater in the Santa Rosa.

Water-quality data indicates that the water chemistry in the Santa Rosa has been relatively stable over the past 12-month period. The water chemistry in the Santa Rosa appears to be dominated by two factors. The first factor involves rainfall runoff draining into retention ponds that provide a source of recharge to the Santa Rosa Formation. The second factor involves the introduction of salts from the Salt Storage Area, the Salt Shaft Drilling and Tailings Pit, and brine disposal in the Salt Storage Retention Pond and salt-disposal mound moat.

Exhaust Shaft flow data indicate that approximately 40,000 gallons of fluid was collected from the catch basin between April 1996, when the basin was installed, and October 1998. Examination of precipitation data and Exhaust Shaft basin collection data appears to show that as both precipitation event frequency and amount increase, flow into the catch basin increases. Since fluid quantities removed from the catch basin appear to depend on fluid leaking into the shaft, the condensation and evaporation of moisture laden air carried by the ventilation system, and ventilation system operation, fluctuations in quantity is probably a complex function of meteorological and operations factors.

6.2 Conceptual Model

In the facility operations area, the Santa Rosa Formation is a thin erosional wedge typically less than 40-feet thick that pinches out to the west of the WIPP site. The Santa Rosa consists of a reddish-brown siltstone and fine-grained sandstone. The Dewey Lake consists of reddish-brown mudstone, claystone and interbedded sandstone. The Santa Rosa Formation is overlain by the Gatuña Formation: a poorly sorted fine-grained sandstone.

Hydrologically the Santa Rosa Formation behaves as a low permeability unconfined aquifer perched on the Dewey Lake Formation. Hydraulic conductivity values for the 15

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wells drilled into the Santa Rosa ranges from 2.0 E-5 to 2.6 E-8 m/s. The wells are capable of producing at rates of about 0.3 to 1.0 GPM. The estimated storativity value is 1.0 E-2. This perched unconfined aquifer covers an area of at least 80 acres in size and is probably significantly larger. The Dewey Lake Formation locally is the lower confining unit. No water is present in the upper portions of the Dewey Lake at the site-facility area, although water can be found at the base of the Dewey Lake Formation in WQSP-6a located over a mile to the southwest of the WIPP site facility. The Gatuña is permeable, capable of transmitting significant quantities of water to the Santa Rosa from the surface.

The potentiometric fluid-pressure high is located in the northwest corner of the WIPP site at PZ-7 near the Salt Water Retention Pond. The Salt Water Retention Pond appears to be a primary recharge area draining an area approximately 15-18 acres in size (including the Salt Storage Area). During major rainfall events, significant quantities of water are available for infiltration from the surface through surficial materials and the Gatuña into the Santa Rosa. Two other areas of potential recharge are the retention pond at PZ-10 and two retention ponds adjacent to PZ-12 in the southern portion of the site facility area.

At present there are at least two boundary conditions. First, there is a no-flow boundary west of PZ-8 as evidenced by the dry hole in PZ-8 and the presence of fluid in PZ-9. And two, there is a sink at the Exhaust Shaft as fluid seeps into the shaft.

PZ-7 has a potentiometric head value of 3377.74 feet amsl, 3.5 feet higher than any other well location. The lowest potentiometric head value is found at PZ-12 with a head value of 3355.59 feet amsl, 22 feet lower than PZ-7. Fluid appears to move radially away from the Salt Water Retention Pond near PZ-7 toward the WIPP site. In the northern section of the site fluid moves to the east. In the western and central portion of the site fluid moves to the south and southeast.

6.3 Areas for Further Investigation

The conceptual model in section 6.2 appears to account for the pattern presented by the observed data. There are two areas however, where additional information would be of value. The first concerns hydrologic data in and near the Salt Storage Area, and the second concerns the definition of the areal extent of the water in the Santa Rosa Formation.

The majority of the salt mined and excavated from the underground has been deposited north of the WIPP site in the North Salt Storage Area. Data collected during drilling, testing, and water-quality sampling of wells penetrating the Santa Rosa indicate that the Salt Storage Area may have an impact on the site hydrology and groundwater quality. At this time, except for piezometer PZ-7, there are no wells present in or near the Salt Storage Area. Since changes within that area might impact site environmental performance, installation of one to two monitoring wells in and near the Salt Storage Area should be considered. Water-level data from the piezometers would provide data to refine the site hydrologic conceptual model. Water-chemistry data would be useful in delineating

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differences between waters dominated by interaction with the Salt Storage Area or the Salt Shaft and Drilling and Tailings Pit area.

If both the extent of the water present in the Santa Rosa and the flow dynamics were known on a larger scale, then the uncertainty in defining the boundary conditions at WIPP would be reduced. At present, there is a no-flow boundary near PZ-8 (dry hole). There is also a boundary condition at the Exhaust shaft. Several wells located north, south and west of the site would better define boundaries in those directions and aid in development of better numerical flow models.

Development of a numerical flow model of the Santa Rosa Formation near the WIPP Exhaust Shaft would be helpful for quantifying the effectiveness of any proposed schemes to stop or decrease the amount of fluid seeping into the shaft. One approach might be the use of the USGS MODFLOW model and the graphical user interface Groundwater Vistas. The areal extent of the model would be sufficient to reduce the effect of boundary conditions (at the edge of the model) on the results of the modeling. The model could be used to investigate the potential effects of seepage from salt piles and evaporation ponds, and would focus on evaluating proposed and potential remedies to reduce or stop inflow into the shaft. Proposed remedies might include installation of extraction wells near the shaft and for reduction of seepage from evaporation ponds. The model would focus on evaluating proposed and potential remedies to reduce or stop inflow into the shaft. The model would provide insight into the sensitivity of the infiltration components on the flow into the shaft. In addition, the model could be used to develop a potential understanding of overall flow dynamics in the Santa Rosa and may be helpful for identifying other potential remedial alternatives.

7.0 REFERENCES

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Appendix 1 - Personal Communication from Dr. Dennis Powers Concerning the Location of the Santa Rosa Sandstone in Boreholes C-2505, C-2506, and C-2507

During drilling of C-2505, C-2506, and C-2507, the top of the Santa Rosa Formation was placed at depths of 48.8, 48.2, and 39.5 feet below ground surface (bgs), respectively (Powers and Martin, 1996, *in* Intera, 1996). Based on the rocks recovered from C-2505 and subsequent drilling of the PZ holes at the site (Powers, 1997, *in* Intera, 1997), the top of Santa Rosa should better have been placed at 39.6 feet bgs in drillhole C-2505. This is more consistent with the record of the exhaust shaft (Bolt and Powers, 1986) as well. For C-2506 and C-2507, the top of Santa Rosa is likely above the initial coring depths for each drillhole.

As a consequence of these changes, several figures in Powers (1997, *in* Intera, 1997) will change modestly. Figures 11 and 12, mapping the elevation of the top of the Santa Rosa in detail, will show a smaller area lower than 3,365 feet msl and the contour for 3,370 feet msl will be south of the exhaust shaft area. Figures 13 and 14, mapping the thickness of the Gatuña Formation, will show some corresponding changes around the shaft area, with thickness reduced by about 9 feet. The general shape of the contours is not changed, nor are any conclusions about the formation of these units changed.

Basic stratigraphic data for each drillhole in the PZ series, C- series, and exhaust shaft are included in Table A1 for convenience.

Table A1 - Depth (ft) Interval for Stratigraphic Units

Drill Hole	Fill, Dune Sand	Mescalero Caliche	Gatuña Formation	Santa Rosa Formation	Dewey Lake Formation
C-2505	nd[3]	nd-12.4	12.4-39.6	39.6-54	54-97 (TD)
C-2506	nd	nd	nd	nd-53.5	53.5-69 (TD)
C-2507	nd	nd	nd	nd-48	48-63 (TD)
Ex Shaft	0-7.5	7.5-17	17-34	34-54	54-546
PZ-1	nd	nd	nd-40	40-56	~56-67.5 (TD)
PZ-2	0-9	9-12	12-39	39-57	~57-65 (TD)
PZ-3	0-8	8-10	10-38	38-53	63-70 (TD)
PZ-4	0-9	9-12	12-31	31-57	57-65 (TD)
PZ-5	0-7	7-9	9-36	36-62.5	62.5-71.5 (TD)
PZ-6	0-7	7-9	9-32	32-55	55-66 (TD)
PZ-7	0-7.5	7.5-9.5	9.5-30	30-69	69-71.5 (TD)
PZ-8	0-6.5	6.5-9	9-31	31-60	60-67 (TD)
PZ-9	0-8	8-11	11-36	36-75	75-82.5 (TD)
PZ-10	0-6	6-9	9-28	28-46	46-57 (TD)
PZ-11	0-10	10-12.5	12.5-34	34-71	71-82 (TD)
PZ-12	0-6	6-8	8-39	39-62	62-77 (TD)

[3]ND = Not determined. Depths are approximate (about ± 1 ft). Some contacts to nearest 0.5 ft due to marked contrast. Gatuña-Santa Rosa contact is difficult: the Gatuña incorporated Santa Rosa sediment.

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/l		mg/l		mg/l		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97047/048	3/6/97	C2505	0.0002	U	0.0011	U	0.069	B	0.0011	U	0.0032	B	0.0011	U	0.0883		0.0011	U
WST97049/050	3/6/97	C2505	0.0002	U	0.0011	U	0.071	B	0.0011	U	0.0027	B	0.0011	U	0.0807		0.0011	U
WST97083/084	5/14/97	C2505	0.0002	U	0.0028	B	0.066	B	0.0011	U	0.0034	B	0.0011	U	0.0829		0.0011	U
WST97086/87	5/14/97	C2505	0.0002	U	0.0029	B	0.068	B	0.0011	U	0.0093	B	0.0011	U	0.0807		0.0011	U
WST97134/135/136	6/18/97	C2505	0.0002	U	0.0024	B	0.069	B	0.0011	U	0.0011	U	0.0011	U	0.0853		0.0011	U
WST97137/138/139	6/18/97	C2505	0.0002	U	0.0022	B	0.068	B	0.0011	U	0.0011	U	0.0011	U	0.0811		0.0011	U
WST97198/199/200	7/16/97	C2505	0.0002	U	0.0023	B	0.070	B	0.0011	U	0.0022	B	0.0021	B	0.0877	N	0.0011	U
WST97201/202/203	7/16/97	C2505	0.0002	U	0.0023	B	0.073	B	0.0011	U	0.0017	B	0.0018	B	0.0837	N	0.0011	U
WST97337/338/339	8/25/97	C2505	0.0002	U	0.0019	B	0.060	B	0.0011	U	0.0040	B	0.0011	U	0.0827		0.0011	U
WST97442/443/444	10/13/97	C2505	0.0002	U	0.0022	B	0.067	B	0.0011	U	0.0032	B	0.0011	U	0.0697		0.0011	U
WST98003	1/13/98	C2505	0.0002	U	0.0024	BN	0.067	B	0.0011	U	0.0034	B	0.0011	U	0.0740		0.0011	U
WST98082	4/13/98	C2505	0.0002	U	0.0022	B	0.067	B	0.0011	U	0.0064	B	0.0023	B	0.0638		0.0011	U
WST98083	4/13/98	C2505	0.0002	B	0.0021	B	0.062	B	0.0011	U	0.0078	B	0.0011	U	0.0664		0.0011	U
[illegible]	[illegible]	[illegible]	0.0002	U	0.0019		0.085		0.0011	U	0.0053		0.0011	U	0.0850		0.0062	
WST98279	10/12/98	C2505	0.0002	U	0.0013		0.099		0.0010	U	0.0064		0.0010	U	0.0868		0.0010	U
Number of Samples			15		15		15		15		15		15		15		15	
MEAN			0.0002		0.0021		0.071		0.0011		0.0041		0.0013		0.0799		0.0014	
Standard Deviation			0.0000		0.0005		0.010		0.0000		0.0025		0.0004		0.0078		0.0013	
Minimum			0.0002		0.0011		0.060		0.0010		0.0011		0.0010		0.0638		0.0010	
Maximum			0.0002		0.0029		0.099		0.0011		0.0093		0.0023		0.0883		0.0062	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS	Cl	SO4	Br	NO3	NH4	TIC	TOC	Na
				mg/l	mg/l	mg/l	mg/l	mg/L	mg/l	mg/l	mg/l	mg/l	mg/L
Groundwater Samples													
WST97047/048	3/6/97	C2505	7.2	1.0	4440	1400	945	6.6	26.2	1.0000	87.2	8.0	337
WST97049/050	3/6/97	C2505	7.5	1.0	4510	1400	944	5.5	26.6	1.0000	88.7	2.0	337
WST97083/084	5/14/97	C2505	7.0	1.0	3820	1230	800	6.3	26.3	0.0079 B	94.8	6.0	292
WST97085/87	5/14/97	C2505	7.1	1.0	3910	1230	883	6.2	26.3	0.0070 B	95.1	7.1	294
WST97134/135/136	6/10/97	C2505	7.1	1.0	4320	1370	860	5.9	27.6	0.0070 B	70.6	8.5	330
WST97137/138/139	6/18/97	C2505	7.2	1.0	4510	1380	877	5.9	28.1	0.0089	88.1	6.9	334
WST97198/199/200	7/16/97	C2505	7.0	1.0	5280	1520	884	6.1	25.7	0.0074 B	87.4	8.0	356
WST97201/202/203	7/16/97	C2505	7.1	1.0	5290	1550	865	6.0	25.0	0.0074 B	88.3	7.0	368
WST97337/338/339	8/25/97	C2505	7.3	1.0	4520	1370	844	5.7	24.0	0.0148 B	78.8	12.5	327
WST97442/443/444	10/13/97	C2505	7.1	1.0	4280	1490	815	5.2	24.8	0.0098 B	64.1	10.4	347
WST98003	1/13/98	C2505	7.0	1.0	4210	1440	873	5.7	25.7	0.0182 B	72.0	6.6	340
WST98092	4/13/98	C2505	7.0	1.0	3780	1280	1070	7.1	27.3	0.0416	75.1	11.1 BN	336
WST98093	4/13/98	C2505	NA	1.0	NA	11290 R	768	5.0	27.2	0.0812	73.0	0.8 UN	337
WST98135	7/20/98	C2505	6.8	1.0	5080	1860	927	6.6	24.1	0.0545	84.2	3.7	465
WST98279	10/12/98	C2505	7.3	1.0	8360	2350	904	7.1	24.4	0.0064	58.3	3.5	546
Number of Samples			14	15	14	14	15	15	15	15	15	15	15
MEAN			7.1	1.0	5164	1543	894	6.1	26.1	0.1515	79.2	6.4	369
Standard Deviation			0.2	0.0	1273	291	68	0.6	1.3	0.3452	12.0	3.6	65
Minimum			6.8	1.0	3910	1230	768	5.0	24.0	0.0064	58.3	0.8	292
Maximum			7.5	1.0	8360	2350	1070	7.1	28.1	1.0000	95.1	12.5	546

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca	Fe		Zn		Si	Sum	Sum	CB
			mg/L		mg/l		mg/l		mg/l	mg/l		mg/L		mg/L	Cations	Anions	Percent
Groundwater Samples																	
WST97047/048	3/6/97	C2505	390		6.0	B	<1.00	U	508	2.9600		0.0200	U	NA	72	67	3.95
WST97049/050	3/6/97	C2505	392		6.0	B	<1.00	U	511	3.9800		0.0262	B	NA	73	67	4.28
WST97083/084	5/14/97	C2505	336		5.4	B	0.27	B	437	0.0010		0.0022	U	25.3	62	62	0.04
WST97086/87	5/14/97	C2505	331		5.5	B	0.27	B	434	0.0781		0.0022	U	25.4	62	61	0.61
WST97134/135/136	6/18/97	C2505	345		5.8		0.27	B	446	0.0943	C	0.0113	B	27.1	65	63	1.84
WST97137/138/139	6/18/97	C2505	348		5.9		0.26	B	444	0.0489	C	0.0086	B	27.1	65	65	0.97
WST97198/199/200	7/16/97	C2505	362		5.5	B	0.25	B	480	0.0587	B	0.0033	U	26.2	69	69	0.53
WST97201/202/203	7/16/97	C2505	372		6.1		0.26	B	487	0.0080	U	0.0033	U	26.5	71	69	1.33
WST97337/338/339	8/25/97	C2505	342		5.6		0.23	B	457	0.1200		0.0062	B	23.7	65	68	2.25
WST97442/443/444	10/13/97	C2505	332		5.9		0.24	B	425	0.0090	U	0.0056	U	23.8	64	64	-0.49
WST98003	1/13/98	C2505	343		5.9		0.22	B	444	0.0280	U	0.0069	U	25.1	65	65	0.35
WST98082	4/13/98	C2505	341		5.8		0.23	B	441	0.0122	U	0.0140	B	25.0	65	70	3.04
WST98083	4/13/98	C2505	347		5.9		0.23	B	453	0.0139	B	0.0128	B	24.7	66	59	5.99
WST98180	7/20/98	C2505	399		6.2		0.22		521	0.0130		0.0199		25.2	79	77	1.29
WST98279	10/12/98	C2505	462		6.6		0.22	B	610	0.0050	U	0.0311		23.6	92	91	0.93
Number of Samples			15		15		13		15	15		15		13			
MEAN			363		5.9		0.24		473	0.5014		0.0118		25.3	69	68	0.56
Standard Deviation			35		0.3		0.02		49	1.2911		0.0089		1.2			
Minimum			331		5.4		0.22		425	0.0050		0.0022		23.6			
Maximum			462		6.6		0.27		610	3.9800		0.0311		27.1			

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/l		mg/l		mg/l		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97029/030	2/28/97	C2506	0.0002	U	0.0014	B	0.074	B	0.0011	U	0.0026	B	0.0011	U	0.0869	B	0.0011	U
WST97031/032	2/28/97	C2506	0.0002	U	0.0013	B	0.073	B	0.0011	U	0.0032	B	0.0011	U	0.0860	B	0.0011	U
WST97065/066	5/13/97	C2506	0.0002	U	0.0028	B	0.064	B	0.0011	U	0.0040	B	0.0011	U	0.0767		0.0011	U
WST97068/069	5/13/97	C2506	0.0002	U	0.0030	B	0.064	B	0.0011	U	0.0039	B	0.0011	U	0.0773		0.0011	U
WST97140/141/142	6/18/97	C2506	0.0002	U	0.0025	B	0.075	B	0.0011	U	0.0019	B	0.0011	U	0.0834		0.0011	U
WST97143/144/145	6/18/97	C2506	0.0002	U	0.0022	B	0.073	B	0.0011	U	0.0019	B	0.0011	U	0.0838		0.0011	U
WST97204/205/206	7/16/97	C2506	0.0002	U	0.0024	B	0.081	B	0.0011	U	0.0033	B	0.0026	B	0.0907	N	0.0011	U
WST97207/208/209	7/16/97	C2506	0.0002	U	0.0021	B	0.082	B	0.0011	U	0.0033	B	0.0021	B	0.0916	N	0.0011	U
WST97340/341/342	8/25/97	C2506	0.0002	U	0.0023	B	0.069	B	0.0011	U	0.0030	B	0.0011	U	0.0847		0.0011	U
WST97445/446/447	10/13/97	C2506	0.0002	U	0.0023	B	0.065	B	0.0011	U	0.0043	B	0.0011	U	0.0710		0.0011	U
WST98004	1/12/98	C2506	0.0002	U	0.0025	BN	0.068	B	0.0011	U	0.0043	B	0.0011	U	0.0703		0.0011	U
WST98084	4/13/98	C2506	0.0009		0.0024	B	0.071	B	0.0011	U	0.0123		0.0011	U	0.0670		0.0011	U
WST98196	7/20/98	C2506	<0.0010	U	<0.0200	U	0.120		<0.0100	U	0.0344		<0.0100	U	0.1030		<0.0100	U
WST98299	10/12/98	C2506	<0.0010	U	0.0020	U	0.107		<0.0100	U	0.0100	U	<0.0100	U	0.1050		<0.0100	U
Number of Samples			12		13		14		12		14		12		14		14	
MEAN			0.0003		0.0022		0.078		0.0011		0.0067		0.0013		0.0842		0.0011	
Standard Deviation			0.0002		0.0005		0.016		0.0000		0.0085		0.0005		0.0112		0.0000	
Minimum			0.0002		0.0013		0.064		0.0011		0.0019		0.0011		0.0679		0.0011	
Maximum			0.0009		0.0030		0.120		0.0011		0.0344		0.0026		0.1050		0.0011	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS	Cl	SO4	Br	NO3	NH4	TIC	TOC	Na
				mg/L	mg/L	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/L
Groundwater Samples													
WST97029/030	2/28/97	C2506	7.1	1.0	6050	2130	926	6.8	23.9	1.0000	76.0	7.2	626
WST97031/032	2/28/97	C2506	7.2	1.0	5800	2140	928	6.8	10.8 R	0.5000	76.0	8.0	613
WST97065/066	5/13/97	C2506	7.1	1.0	5580	2220	904	5.8	27.6	0.0104 B	77.0	10.1	586
WST97068/069	5/13/97	C2506	7.1	1.0	5590	2180	894	6.2	22.9	0.0079 B	80.4	9.3	583
WST97140/141/142	6/18/97	C2506	7.1	1.0	8050	2840	909	6.8	22.0	0.0070 U	58.1	6.4	713
WST97143/144/145	6/18/97	C2506	7.0	1.0	7560	2860	907	6.7	22.1	0.0070 U	58.3	5.0	722
WST97204/205/206	7/16/97	C2506	7.0	1.0	8560	3240	913	7.4	20.5	0.0123 B	69.2	6.6	839
WST97207/208/209	7/16/97	C2506	7.0	1.0	8580	3250	903	7.2	20.7	0.0120 B	69.7	7.1	842
WST97340/341/342	8/25/97	C2506	7.2	1.0	6870	2940	825	6.8	12.2	0.0076 B	60.0	4.1	753
WST97445/446/447	10/13/97	C2506	7.1	1.0	6240	2620	756	5.7	16.8	0.0148	64.1	6.5	712
WST98004	1/12/98	C2506	7.2	1.0	6700	2450	776	6.2	17.3	0.0159 B	61.7	4.8	662
WST98084	4/13/98	C2506	7.3	1.0	8030	3070	811	7.3	18.8	0.0862	59.5	4.0 UN	772
WST98196	7/20/98	C2506	7.1	1.0	11200	3820	876	7.9	19.3	0.4820	54.2	4.3	1080
WST98280	10/12/98	C2506	7.1	1.0	10300	4480	874	8.2	22.4	0.0013 B	45.2	3.1	1000
Number of Samples			14	14	14	14	14	14	13	14	14	14	14
MEAN			7.1	1.0	7222	2862	893	6.9	20.5	0.1548	65.2	6.2	795
Standard Deviation			0.1	0.0	1872	692	65	0.7	2.4	0.2982	10.5	2.2	181
Minimum			7.0	1.0	5580	2130	756	5.7	16.8	0.0013	45.2	3.3	583
Maximum			7.3	1.0	10300	4480	876	8.2	23.9	1.0000	80.4	10.1	1080

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca		Fe		Zn		Si		Sum	Sum	CB
			mg/l		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		Cations	Anions	Percent
Groundwater Samples																			
WST97029/030	2/28/97	C2506	434	B	4.7	B	<1.00	U	580		3.1100		0.0655	B	NA		92	88	3.41
WST97031/032	2/28/97	C2506	430		5.2	B	<1.00	U	590		3.1600		0.0837	B	NA		92	89	3.21
WST97065/066	5/13/97	C2506	425		6.0		0.24	B	569		0.0539		0.0023	B	24.8		84	83	0.55
WST97068/069	5/13/97	C2506	425		6.6		0.24	B	568		0.0594		0.0022	U	24.7		89	87	1.08
WST97140/141/142	6/18/97	C2506	496		7.2		0.23	B	687		0.0371	B	0.0043	B	25.7		106	104	1.11
WST97143/144/145	6/18/97	C2506	498		7.2		0.23	B	682		0.0848	B	0.0033	U	25.6		107	104	1.00
WST97204/205/206	7/16/97	C2506	557		7.5		0.22	B	772		0.0277	B	0.0033	U	25.3		121	116	2.02
WST97207/208/209	7/16/97	C2506	563		7.4		0.22	B	781		0.0210	B	0.0033	U	25.3		122	116	2.41
WST97340/341/342	8/25/97	C2506	465		7.2		0.19	B	632		0.0380	B	0.0069	B	22.7		100	105	1.18
WST97445/446/447	10/13/97	C2506	399		6.9		0.20	B	529		0.0090	U	0.0056	U	22.3		90	95	-2.52
WST98004	1/12/98	C2506	403		7.0		0.19	B	537		0.0056	U	0.0029	U	23.3		89	91	-1.02
WST98084	4/13/98	C2506	481		7.1		0.19	B	651		0.0122	U	0.0069	B	23.3		104	111	-2.55
WST98196	7/20/98	C2506	659		6.2		<1.00	U	921		0.3570		0.0500	U	23.9		147	136	4.18
WST98200	10/10/98	C2506	656		6.7		<1.00	U	910		0.0500	U	0.0600	U	22.5		152	151	0.49
Number of Samples			14		14		10		14		14		14		12				
MEAN			491		6.8		0.21		673		0.5021		0.0225		24.2		107	105	0.91
Standard Deviation			87		1.0		0.02		130		1.1190		0.0299		1.4				
Minimum			399		4.7		0.18		529		0.0056		0.0022		22.3				
Maximum			659		9.0		0.24		921		3.1600		0.0837		26.3				

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97074/075	5/14/97	C2507	0.0002	U	0.0029	B	0.052	B	0.0011	U	0.0140		0.0011	U	0.0910		0.0011	U
WST97077/078	5/14/97	C2507	0.0002	U	0.0030	B	0.054	B	0.0011	U	0.0138		0.0011	U	0.0924		0.0011	U
WST97125/126/127	6/18/97	C2507	0.0002	U	0.0025	B	0.051	B	0.0011	U	0.0130		0.0030	B	0.0981		0.0011	U
WST97128/129/130	6/18/97	C2507	0.0002	U	0.0024	B	0.050	B	0.0011	U	0.0128		0.0011	U	0.1010		0.0011	U
WST97188/189/190	7/16/97	C2507	0.0002	U	0.0024	B	0.045	B	0.0011	U	0.0107	B	0.0019	B	0.0980	N	0.0011	U
WST97191/192/193	7/16/97	C2507	0.0002	U	0.0025	B	0.046	B	0.0011	U	0.0098	B	0.0021	B	0.0970	N	0.0011	U
WST97331/332/333	8/25/97	C2507	0.0002	U	0.0020	U	0.044	B	0.0011	U	0.0144		0.0011	U	0.0857		0.0011	U
WST97334/335/336	8/25/97	C2507	0.0002	U	0.0020	U	0.042	B	0.0011	U	0.0123		0.0011	U	0.0827		0.0011	U
WST97436/437/438	10/13/97	C2507	0.0002	U	0.0023	B	0.043	B	0.0011	U	0.0250	B	0.0011	U	0.0686		0.0011	U
WST97439/440/441	10/13/97	C2507	0.0002	U	0.0022	B	0.045	B	0.0011	U	0.0261		0.0014	B	0.0681		0.0011	U
WST98001	1/12/98	C2507	0.0002	U	0.0023	BN	0.049	B	0.0011	U	0.0215		0.0011	U	0.0686		0.0011	U
WST98002	1/12/98	C2507	0.0002	U	0.0025	BN	0.049	B	0.0011	U	0.0231		0.0011	U	0.0697		0.0011	U
WST98081	4/13/98	C2507	0.0002	U	0.0023	B	0.047	B	0.0011	U	0.0887		0.0011	U	0.0630		0.0011	U
WST98194	7/20/98	C2507	0.0002	U	0.0016		0.045		0.0011	U	0.1400		0.0011	U	0.0781		0.0096	
WST98278	10/12/98	C2507	0.0002	U	0.0013		0.044		0.0010	U	0.1330		0.0030		0.0751		0.0010	U
WST98278D	10/12/98	C2507	0.0002	U	0.0013		0.047		0.0010	U	0.1270		0.0010	U	0.0702		0.0010	U
Number of Samples			16		16		16		16		16		16		16		16	
MEAN			0.0002		0.0022		0.047		0.0011		0.0428		0.0015		0.0817		0.0016	
Standard Deviation			0.0000		0.0005		0.003		0.0000		0.0487		0.0007		0.0131		0.0021	
Minimum			0.0002		0.0013		0.042		0.0010		0.0098		0.0010		0.0630		0.0010	
Maximum			0.0002		0.0030		0.054		0.0011		0.1400		0.0030		0.1010		0.0096	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS		Cl		SO4		Br		NO3		NH4		TIC		TOC		Na	
				mg/L	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																						
WST97074/075	5/14/97	C2507	7.4	1.0	3930		1180		1080		8.3		17.4		0.0104	B	67.8		8.5		270	
WST97077/078	5/14/97	C2507	7.3	1.0	3930		1160		1060		8.4		17.5		0.0079	B	66.7		7.9		274	
WST97125/126/127	6/18/97	C2507	7.3	1.0	4110		1160		1050		7.8		19.0		0.0112		52.5		7.2		283	
WST97128/129/130	6/18/97	C2507	7.3	1.0	4180		1150		1050		7.9		19.0		0.0135		59.9		7.6		285	
WST97188/189/190	7/16/97	C2507	7.2	1.0	4940		1130		1020		7.8		18.4		0.0074	B	69.6		8.2		278	
WST97191/192/193	7/16/97	C2507	7.2	1.0	4720		1150		1030		7.8		18.3		0.0074	B	71.7		7.4		281	
WST97331/332/333	8/25/97	C2507	7.3	1.0	4020		1090		971		7.0		18.8		0.0070	U	62.2		8.6		262	
WST97334/335/336	8/25/97	C2507	7.4	1.0	4000		1110		984		7.2		18.8		0.0070	U	68.2		^13.2	R	259	
WST97436/437/438	10/13/97	C2507	7.2	1.0	3580		1130		963		7.2		21.1		0.0073	B	65.7		9.7		285	
WST97439/440/441	10/13/97	C2507	7.2	1.0	3580		1110		936		7.3		19.4		0.0123	B	68.8		9.7		277	
WST98001	1/12/98	C2507	7.1	1.0	4320		1320		1060		^9.6	R	18.0		0.0182	B	69.7		^10.2	R	330	
WST98002	1/12/98	C2507	7.1	1.0	4580		1320		1060		7.7		18.0		0.0090	B	80.3		7.0		332	
WST98081	4/13/98	C2507	7.3	1.0	3820		1440		1080		7.3		20.1		0.1070		72.4		4.3	N*	340	
WST98194	7/20/98	C2507	7.2	1.0	4230		1400		1030		6.8		20.8		0.1840		62.8		3.6		351	
WST98278	10/12/98	C2507	7.2	1.0	4220		1340		953		6.1		21.2		0.0064	B	68.7		3.7		326	
WST98278D	10/12/98	C2507	7.2	1.0	4200		1320		968		6.0		21.4		0.0064	B	64.0		3.4		322	
Number of Samples			16	16	16		16		16		15		16		16		16		14		16	
MEAN			7.2	1.0	4148		1219		1018		7.4		19.2		0.0264		66.9		6.9		297	
Standard Deviation			0.1	0.0	372		116		48		0.7		1.3		0.0487		6.1		2.2		31	
Minimum			7.1	1.0	3580		1090		936		6.0		17.4		0.0064		52.5		3.4		259	
Maximum			7.4	1.0	4940		1440		1080		8.4		21.4		0.1840		80.3		9.7		351	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca		Fe		Zn		Si		Sum	Sum	CB
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		Cations	Anions	Percent
Groundwater Samples																			
WST97074/075	5/14/97	C2507	332		5.6		0.23	B	449		0.2630		0.0022	U	23.2		62	62	0.08
WST97077/078	5/14/97	C2507	333		5.5	B	0.24	B	449		0.1880		0.0039	B	23.0		62	60	1.16
WST97125/126/127	6/18/97	C2507	330		5.7		0.24	B	436		0.3780	0	0.0033	U	24.9		61	59	1.92
WST97128/129/130	6/18/97	C2507	330		5.7		0.24	B	438		0.1890	0	0.0033	U	24.7		62	59	1.79
WST97188/189/190	7/16/97	C2507	319		5.5	B	0.24	B	436		0.2390		0.0079	B	24.6		60	59	1.04
WST97191/192/193	7/16/97	C2507	319		5.3	B	0.23	B	436		0.1790		0.0045	B	24.5		60	60	0.35
WST97331/332/333	8/25/97	C2507	310		5.4	B	0.23	B	426		0.1230		0.0215	B	23.1		58	56	1.81
WST97334/335/336	8/25/97	C2507	306		5.4	B	0.22	B	417		0.0969		0.0180	B	23.2		57	58	-0.15
WST97436/437/438	10/13/97	C2507	308		5.7		0.24	B	411		0.0438	B	0.0071	B	22.6		58	57	0.79
WST97439/440/441	10/13/97	C2507	302		5.8		0.24	B	401		0.1850		0.0078	B	22.5		57	57	0.39
WST98001	1/12/98	C2507	338		6.0		0.24	B	466		0.0334		0.0089	U	24.1		66	65	0.27
WST98002	1/12/98	C2507	340		6.0		0.23	B	464		0.0474	B	0.0089	U	24.5		66	66	-0.27
WST98081	4/13/98	C2507	347		5.9		0.25	B	476		0.0215	B	0.0136	B	24.4		67	69	-1.45
WST98194	7/20/98	C2507	356		6.2		0.25		464		0.0232		0.0092		24.0		68	66	1.21
WST98278	10/12/98	C2507	343		5.7		0.46	B	447		0.0243		0.0351		23.2		65	63	1.11
WST98278D	10/12/98	C2507	339		5.6		0.26	B	462		0.0050	U	0.0200		22.9		65	63	1.81
Number of Samples			16		16		16		16		16		16		16				
MEAN			328		5.7		0.25		442		0.1275		0.0110		23.7		62	61	0.72
Standard Deviation			16		0.2		0.06		21		0.1089		0.0088		0.8				
Minimum			302		5.3		0.22		401		0.0050		0.0022		22.5				
Maximum			356		6.2		0.46		476		0.3780		0.0351		24.9				

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97405/406/407	9/11/97	PZ-01	0.0020		0.0200	U	0.235		0.0100	U	0.0374	B	0.0100	U	0.0568	B	0.0100	U
WST97408/409/410	9/11/97	PZ-01	0.0025		0.0200	U	0.413		0.0100	U	0.1060		0.0165	B	0.0586	B	0.0100	U
WST97469	10/15/97	PZ-01	0.0010	U	0.0200	U	0.255	B	0.0100	U	0.0394	B	0.0185	B	0.0668	B	0.0100	U
WST97470	10/15/97	PZ-01	0.0010	U	0.0200	U	0.244	B	0.0100	U	0.0423	B	0.0108	B	0.0632	B	0.0100	U
WST97519	11/13/97	PZ-01	0.0014	B	0.0200	U	0.219	B	0.0100	U	0.0888	B	0.0100	U	0.0688	B	0.0100	U
WST98007	1/13/98	PZ-01	0.0021	N	0.0200	U	0.227	B	0.0100	U	0.0211	B	0.0159	B	0.0762	B	0.0100	U
WST98008	1/13/98	PZ-01	0.0019	BN	0.0200	U	0.233	B	0.0100	U	0.0200	U	0.0100	U	0.0734	B	0.0100	U
WST98087	4/14/98	PZ-01	0.0070		0.0200	U	0.195	B	0.0100	U	0.0455	B	0.0100	U	0.0744	B	0.0100	U
WST98200	7/21/98	PZ-01	0.0015		0.0200	U	0.203		0.0100	U	0.0802		0.0100	U	0.0854		0.0100	U
WST98283	10/13/98	PZ-01	0.0010	U	0.0020	U	0.211		0.0100	U	0.0680		0.0100	U	0.0777		0.0100	U
WST98283D	10/13/98	PZ-01	0.0010	U	0.0020	U	0.217		0.0100	U	0.0774		0.0100	U	0.0735		0.0100	U
Number of Samples			11		11		11		11		11		11		11		11	
MEAN			0.0020		0.0167		0.241		0.0100		0.0569		0.0120		0.0704		0.0100	
Standard Deviation			0.0017		0.0073		0.060		0.0000		0.0286		0.0033		0.0086		0.0000	
Minimum			0.0010		0.0020		0.195		0.0100		0.0200		0.0100		0.0568		0.0100	
Maximum			0.0070		0.0200		0.413		0.0100		0.1060		0.0185		0.0854		0.0100	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS		Cl		SO4		Br		NO3		NH4		TIC		TOC		Na	
				mg/L	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																						
WST97405/406/407	9/11/97	PZ-01	6.9	1.0	73400		41500		1110		17.3	B	5.6		0.9600		26.5		3.6		21800	
WST97408/409/410	9/11/97	PZ-01	6.9	1.0	79200		45200		1170		17.6	B	5.4		0.5250		26.6		3.9		23100	
WST97469	10/15/97	PZ-01	6.8	1.1	101000		58600		1450		14.2	B	5.8		0.0730	B	26.1		8.1	0	28400	
WST97470	10/15/97	PZ-01	6.8	1.1	103000		59400		1460		16.5	B	5.9		0.0730	B	25.1		8.1	0	28600	
WST97519	11/13/97	PZ-01	6.8	1.1	91900		53900		1410		18.6	B	5.6		22.2000		25.5		4.6		25600	
WST98007	1/13/98	PZ-01	6.8	1.1	98300		54700		1430		16.9	B	5.8	B	0.0070	U	23.5		4.4		25300	
WST98008	1/13/98	PZ-01	6.8	1.1	97200		53700		1420		16.3	B	5.8	B	0.0070	U	23.8		5.7		25300	
WST98087	4/14/98	PZ-01	7.0	1.1	80900		48200		1420		18.2	B	5.8		0.3070		25.2		8.4	B	22800	
WST98200	7/21/98	PZ-01	6.9	1.0	79600		43500		1330		15.8		8.0		0.8920		25.2		3.5		21600	
WST98283	10/13/98	PZ-01	6.7	1.1	100000		53400		1600		18.2	B	9.7		0.0013		22.1		2.2		24300	
WST98283D	10/13/98	PZ-01	6.7	1.1	108000		57900		1630		19.2	B	10.2		0.0097	B	21.6		4.1		28100	
Number of Samples			11	11	11		11		11		11		11		11		11		11		11	
MEAN			6.8	1.1	92045		51818		1403		17.2		6.7		2.2777		24.7		5.1		24991	
Standard Deviation			0.1	0.0	11728		6259		156		1.4		1.8		6.6172		1.7		2.1		2558	
Minimum			6.7	1.0	73400		41500		1110		14.2		5.4		0.0013		21.6		2.2		21600	
Maximum			7.0	1.1	108000		59400		1630		19.2		10.2		22.2000		26.6		8.4		28600	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca		Fe		Zn		Si		Sum	Sum	CB
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		Cations	Anions	Percent
Groundwater Samples																			
WST97405/406/407	9/11/97	PZ-01	2130		44.5	B	1.00	U	4100		2.5100		0.1390		14.5		1329	1196	5.27
WST97408/409/410	9/11/97	PZ-01	2080		48.2	B	1.00	U	4010		12.5000		0.1750		17.3		1377	1302	2.82
WST97469	10/15/97	PZ-01	2300		50.9		1.00	U	4390		0.0800	U	0.0500	U	13.1		1645	1685	-1.22
WST97470	10/15/97	PZ-01	2280		50.8		1.00	U	4340		0.0800	U	0.0500	U	13.1		1650	1708	-1.75
WST97519	11/13/97	PZ-01	2150		42.2	B	1.00	UN	4300		0.0830	B	0.0500	U*	13.9		1506	1552	-1.50
WST98007	1/13/98	PZ-01	2290		45.6	B	1.00	U	4590		0.5460	B	0.0800	U	13.8		1519	1575	-1.80
WST98008	1/13/98	PZ-01	2400		44.8	B	1.00	U	4800		0.1490	B	0.0800	U	14.2		1539	1546	-0.25
WST98087	4/14/98	PZ-01	2300		39.6		1.00	U	4490		0.1100	U	0.0300	U	15.0		1406	1391	0.52
WST98200	7/21/98	PZ-01	2280		35.2		1.00	U	4700		0.7710		0.0600	U	15.8		1363	1257	4.03
WST98283	10/13/98	PZ-01	2260		41.8		1.00	U	4580		0.0500	U	0.1090		14.9		1473	1542	-2.29
WST98283D	10/13/98	PZ-01	2240		44.4		1.00	U	4570		0.0500	U	0.1930		14.6		1636	1669	-1.01
Number of Samples			11		11		11		11		11		11		11				
MEAN			2246		44.4		1.00		4443		1.5390		0.0924		14.6		1495	1493	0.05
Standard Deviation			92		4.7		0.00		243		3.7074		0.0548		1.2				
Minimum			2080		35.2		1.00		4010		0.0500		0.0300		13.1				
Maximum			2400		50.9		1.00		4800		12.5000		0.1930		17.3				

INFORMATION ONLY

Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97216/217	7/17/97	PZ-02	0.0010	U	0.0200	U	0.268	B	0.0100	U	0.0160	B	0.0211	B	0.0840	B	0.0100	U
WST97369/370/371	9/8/97	PZ-02	0.0038		0.0200	U	0.470	B	0.0100	U	0.0668	B	0.0677		0.0802	B	0.0100	U
WST97460	10/14/97	PZ-02	0.0010	U	0.0200	U	0.134	B	0.0100	U	0.0121	B	0.0106	B	0.1350		0.0100	U
WST97461	10/14/97	PZ-02	0.0010	U	0.0200	U	0.137	B	0.0100	U	0.0100	U	0.0100	U	0.1320		0.0100	U
WST97526	11/14/97	PZ-02	0.0011	B	0.0200	U	0.208	B	0.0100	U	0.0390	B	0.0100	U	0.1180		0.0100	U
WST98009	1/13/98	PZ-02	0.0010	UN	0.0200	U	0.112	B	0.0164	B	0.0232	B	0.0100	U	0.1410		0.0100	U
WST98088	4/14/98	PZ-02	0.0004		0.0013		0.039		0.0011	U	0.0156		0.0011	U	0.1470		0.0011	U
WST98089	4/14/98	PZ-02	0.0012	B	0.0200	U	0.100	B	0.0100	U	0.0197	B	0.0100	U	0.1480		0.0100	U
WST98203	7/21/98	PZ-02	0.0010	U	0.0200	U	0.166		0.0100	U	0.0174		0.0100	U	0.1420		0.0100	U
WST98284	10/13/98	PZ-02	0.0010	U	0.0200	U	0.097		0.0100	U	0.0162		0.0100	U	^0.301	R	0.0100	U
Number of Samples			10		10		10		10		10		10		9		10	
MEAN			0.0013		0.0181		0.173		0.0097		0.0236		0.0161		0.1252		0.0091	
Standard Deviation			0.0009		0.0059		0.122		0.0036		0.0172		0.0188		0.0261		0.0028	
Minimum			0.0004		0.0013		0.039		0.0011		0.0100		0.0011		0.0802		0.0011	
Maximum			0.0038		0.0200		0.470		0.0164		0.0668		0.0677		0.1480		0.0100	

INFORMATION ONLY

Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS		Cl		SO4		Br		NO3		NH4		TIC		TOC		Na	
				mg/L	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																						
WST97216/217	7/17/97	PZ-02	7.1	1.0	33600		16700		997		10.4	B	10.9		0.0196	B	52.7		5.7		6840	
WST97369/370/371	9/8/97	PZ-02	6.8	1.0	47600		25100		1080		11.5	B	7.7		0.8100		36.4		8.0		11500	
WST97460	10/14/97	PZ-02	7.0	1.0	25000		12800		1350		12.4	B	4.9		0.0073	B	46.9		4.9	0	4380	
WST97461	10/14/97	PZ-02	7.0	1.0	25000		12800		1350		12.5	B	5.0		0.0098	B	47.6		6.1	0	4560	
WST97526	11/14/97	PZ-02	7.0	1.0	38000		21200		1230		11.4	B	6.5		12.6000		39.6		6.4		6270	
WST98009	1/13/98	PZ-02	7.1	1.0	23700		11800		1560		12.6	B	6.3		0.0090	B	46.3		5.4		4560	
WST98088	4/14/98	PZ-02	7.4	1.0	^8810	R	^3950	R	1900		12.3		3.5		0.0206		53.8		5.1	N*	^1360	R
WST98089	4/14/98	PZ-02	7.2	1.0	21500		^3950	R	1720		12.2	B	4.4		0.5050		48.2		7.4	B	3740	
WST98203	7/21/98	PZ-02	7.2	1.0	33400		14900		1560		11.0		4.9		0.5140		45.8		3.0	U	6210	
WST98284	10/13/98	PZ-02	7.0	1.0	20900		9140		1680		12.1		4.2		0.0097	B	45.8		5.5		3500	
Number of Samples			10	10	9		8		10		10		10		10		10		10		9	
MEAN			7.1	1.0	29856		15555		1443		11.8		5.8		1.4505		46.3		5.8		5729	
Standard Deviation			0.2	0.0	8964		5280		291		0.7		2.2		3.9285		5.2		1.4		2463	
Minimum			6.8	1.0	20900		9140		997		10.4		3.5		0.0073		36.4		3.0		3500	
Maximum			7.4	1.0	47600		25100		1900		12.6		10.9		12.6000		53.8		8.0		11500	

INFORMATION ONLY

Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca		Fe		Zn		Si		Sum	Sum	CB
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		Cations	Anions	Percent
Groundwater Samples																			
WST97216/217	7/17/97	PZ-02	1730		26.9	B	1.00	U	2580		0.0700	U	0.0300	U	17.3		569	496	6.85
WST97369/370/371	9/8/97	PZ-02	2290		35.5	B	1.00	U	3580		7.0300		0.0914	B	16.9		868	734	8.40
WST97460	10/14/97	PZ-02	1180		20.3		1.00	U	1720		0.0800	U	0.0500	U	17.1		374	393	-2.51
WST97461	10/14/97	PZ-02	1210		20.2	B	1.00	U	1750		0.0800	U	0.0500	U	35.6		386	393	-0.96
WST97526	11/14/97	PZ-02	1520		21.8	B	1.00	UN	2310		0.0800	U	0.0500	U*	17.6		514	627	-9.94
WST98009	1/13/98	PZ-02	1010		21.3	B	1.00	U	1550		0.6340	B	0.0800	U	16.3		359	369	-1.37
WST98088	4/14/98	PZ-02	^608	R	12.3		0.18		^858	R	0.0122	U	0.0136	B	18.1		152	156	-1.07
WST98089	4/14/98	PZ-02	970		15.4	B	1.00	U	1440		0.1100	U	0.0300	U	17.2		315	151	35.04
WST98203	7/21/98	PZ-02	1310		20.3		1.00	U	2110		0.1300		0.0600	U	19.1		484	457	2.87
WST98284	10/13/98	PZ-02	841		14.4		1.00	U	1330		0.0500	U	0.0600	U	18.6		288	297	-1.47
Number of Samples			9		10		10		9		10		10		10				
MEAN			1340		20.8		0.92		2041		0.8276		0.0515		19.4		431	407	2.81
Standard Deviation			451		6.6		0.26		710		2.1866		0.0234		5.8				
Minimum			841		12.3		0.18		1330		0.0122		0.0136		16.3				
Maximum			2290		35.5		1.00		3580		7.0300		0.0914		35.6				

INFORMATION ONLY

Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97218	7/17/97	PZ-03	0.0023		0.0200	U	0.287	B	0.0100	U	0.0552	B	0.0224	B	0.0460	B	0.0100	U
WST97360/361/362	9/8/97	PZ-03	0.0023		0.0200	U	0.303	B	0.0100	U	0.0647	B	0.0166	B	0.0476	B	0.0100	U
WST97363/364/365	9/8/97	PZ-03	0.0023		0.0200	U	0.282	B	0.0100	U	0.0382	B	0.0136	B	0.0460	B	0.0100	U
WST97456	10/14/97	PZ-03	0.0010	B	0.0200	U	0.300	B	0.0100	U	0.0761	B	0.0177	B	0.0500	B	0.0100	U
WST97523	11/13/97	PZ-03	0.0025		0.0200	U	0.283	B	0.0100	U	0.1430		0.0100	U	0.0458	B	0.0100	U
WST98010	1/13/98	PZ-03	0.0025	N	0.0200	U	0.294	B	0.0131	B	0.0781	B	0.0100	U	0.0472	B	0.0100	U
WST98090	4/14/98	PZ-03	0.0038		0.0200	U	0.263	B	0.0100	U	0.0747	B	0.0100	U	0.0454	B	0.0100	U
WST98205	7/22/98	PZ-03	0.0023		0.0200	U	0.279		0.0104	B	0.2080	N*	0.0100	U*	0.0428	B	0.0100	U
WST98206	7/22/98	PZ-03	0.0023		0.0200	U	0.277		0.0100	U	0.2020	N*	0.0100	U*	0.0432	B	0.0100	U
WST98285	10/13/98	PZ-03	0.0010	U	0.0020	U	0.254		0.0100	U	0.1110		0.0100	U	0.0481		0.0100	U
Number of Samples			10		10		10		10		10		10		10		10	
MEAN			0.0022		0.0182		0.282		0.0103		0.1051		0.0130		0.0462		0.0100	
Standard Deviation			0.0008		0.0057		0.015		0.0010		0.0601		0.0044		0.0022		0.0000	
Minimum			0.0010		0.0020		0.254		0.0100		0.0382		0.0100		0.0428		0.0100	
Maximum			0.0038		0.0200		0.303		0.0131		0.2080		0.0224		0.0500		0.0100	

INFORMATION ONLY

Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS		Cl		SO4		Br		NO3		NH4		TIC		TOC		Na
				mg/L	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L
Groundwater Samples																					
WST97218	7/17/97	PZ-03	6.4	1.1	166000		88200		2330		43.0	B	19.6		0.2540		74.4		5.6	B	50100
WST97360/361/362	9/8/97	PZ-03	6.5	1.1	162000		89600		2300		38.9	B	20.3		2.0000		31.7		5.3	B	48200
WST97363/364/365	9/8/97	PZ-03	6.4	1.1	164000		90200		2320		42.7	B	20.2		2.8200		32.6		5.8	B	47800
WST97456	10/14/97	PZ-03	6.5	1.1	158000		91800		2570		45.8		20.7		0.3740		32.1		3.1	B	50700
WST97523	11/13/97	PZ-03	6.3	1.1	161000		91000		2460		41.7	B	19.8		0.1970		29.2		5.2		51900
WST98010	1/13/98	PZ-03	6.5	1.1	162000		93600		2560		44.1	B	19.7		0.0963		29.8		4.2		50300
WST98090	4/14/98	PZ-03	6.7	1.1	162000		100000		2910		45.7	B	19.0		0.5820		31.6		4.9	B	52200
WST98205	7/22/98	PZ-03	6.4	1.1	169000		97100		2790		38.9	B	18.7		1.2700		34.4		6.5	B	52800
WST98206	7/22/98	PZ-03	6.7	1.1	170000		97700		2790		40.9		19.7		1.3300		31.0		4.4	B	52200
WST98285	10/13/98	PZ-03	6.4	1.1	169000		94900		2640		50.6	B	20.4		0.1980		29.1		4.0		50900
Number of Samples			10	10	10		10		10		10		10		10		10		10		10
MEAN			6.5	1.1	164300		93410		2567		43.2		19.8		0.9121		35.6		4.9		50710
Standard Deviation			0.1	0.0	4029		3917		217		3.5		0.6		0.9216		13.7		1.0		1686
Minimum			6.3	1.1	158000		88200		2300		38.9		18.7		0.0963		29.1		3.1		47800
Maximum			6.7	1.1	170000		100000		2910		50.6		20.7		2.8200		74.4		6.5		52800

INFORMATION ONLY

Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca		Fe		Zn		Si		Sum	Sum	CB
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		Cations	Anions	Percent
Groundwater Samples																			
WST97218	7/17/97	PZ-03	2850		236		1.00	U	4030		0.1740	B	0.0653	B	12.0		2621	2543	1.51
WST97360/361/362	9/8/97	PZ-03	2770		269		1.00	U	3870		4.1100		0.0533	B	12.1		2524	2578	-1.05
WST97363/364/365	9/8/97	PZ-03	2720		260		1.00	U	3800		1.8200		0.0906	B	11.8		2499	2596	-1.89
WST97456	10/14/97	PZ-03	2770		294		1.00	U	3790		0.0800	U	0.0500	U	11.5		2630	2646	-0.31
WST97523	11/13/97	PZ-03	2790		296		1.00	UN	4020		0.2780	B	0.0500	U	11.5		2695	2621	1.40
WST98010	1/13/98	PZ-03	2720		316		1.00	U	3970		0.4490	B	0.0800	U	11.3		2618	2696	-1.48
WST98090	4/14/98	PZ-03	2670		333		1.00	U	3670		0.1100	U	0.0300	U	11.4		2682	2884	-3.64
WST98205	7/22/98	PZ-03	2750		356		1.00	U	4020		0.2150	B	0.0600	U	11.5		2733	2800	-1.22
WST98206	7/22/98	PZ-03	2700		345		1.00	U	3930		0.1680	B	0.0600	U	11.7		2698	2817	-2.17
WST98285	10/13/98	PZ-03	2520		337		1.00	U	3680		0.0500	U	0.1490		11.4		2614	2735	-2.27
Number of Samples			10		10		10		10		10		10		10				
MEAN			2726		304		1.00		3878		0.7454		0.0688		11.6		2631	2692	-1.13
Standard Deviation			88		40		0.00		138		1.2933		0.0327		0.3				
Minimum			2520		236		1.00		3670		0.0500		0.0300		11.3				
Maximum			2850		356		1.00		4030		4.1100		0.1490		12.1				

INFORMATION ONLY

Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97222	7/18/97	PZ-04	0.0020		0.0200	U	0.207	B	0.0100	U	0.0131	B	0.0596		0.0454	B	0.0100	U
WST97372/373/374	9/8/97	PZ-04	0.0028		0.0200	U	0.221	B	0.0100	U	0.0215	B	0.0100	U	0.0570	B	0.0100	U
WST97462	10/14/97	PZ-04	0.0010	U	0.0200	U	0.208	B	0.0100	U	0.0162	U	0.0100	U	0.0542	B	0.0100	U
WST97463/464/465	10/14/97	PZ-04	0.0023	U	0.0200	U	0.221	B	0.0100	U	0.0100	U	0.0100	U	0.0556	B	0.0100	U
WST97518	11/13/97	PZ-04	0.0020		0.0200	U	0.222	B	0.0100	U	0.0543	B	0.0100	U	0.0628	B	0.0100	U
WST98013	1/14/98	PZ-04	0.0012	B	0.0200	U	0.172	B	0.0100	U	0.0161	B	0.0100	U	0.0530	B	0.0100	U
WST98014	1/14/98	PZ-04	0.0015	B	0.0200	U	0.181	B	0.0100	U	0.0134	B	0.0100	U	0.0528	B	0.0100	U
WST98094	4/15/98	PZ-04	0.0022		0.0200	U	0.175	B	0.0100	U	0.0220	B	0.0100	U	0.0558	B	0.0100	U
WST98201	7/21/98	PZ-04	0.0017		0.0200	U	0.201		0.0100	U	0.0482		0.0100	U	0.0624		0.0162	
WST98202	7/21/98	PZ-04	0.0018		0.0200	U	0.203		0.0100	U	0.0461		0.0100	U	0.0604		0.0100	U
WST98287	10/14/98	PZ-04	0.0010	U	0.0020	U	0.174		0.0100	U	0.0338		0.0100	U	0.0588		0.0100	U
Number of Samples			11		11		11		11		11		11		11		11	
MEAN			0.0018		0.0184		0.199		0.0100		0.0268		0.0145		0.0562		0.0106	
Standard Deviation			0.0006		0.0054		0.020		0.0000		0.0160		0.0150		0.0050		0.0019	
Minimum			0.0010		0.0020		0.172		0.0100		0.0100		0.0100		0.0454		0.0100	
Maximum			0.0028		0.0200		0.222		0.0100		0.0543		0.0596		0.0628		0.0162	

INFORMATION ONLY

Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS		Cl		SO4		Br		NO3		NH4		TIC		TOC		Na	
				mg/L	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																						
WST97222	7/18/97	PZ-04	7.1	1.0	43400		21800		980		8.5	B	22.5		0.0123	B	59.9		4.9		9290	
WST97372/373/374	9/8/97	PZ-04	7.0	1.0	40400		21600		1000		8.5	B	19.2		0.1260		39.9		4.3		9740	
WST97462	10/14/97	PZ-04	7.0	1.0	38500		22100		1030		7.4	B	20.2		0.0098	B	47.6		4.8	0	9170	
WST97463/464/465	10/14/97	PZ-04	7.0	1.0	42300		23600		1070		8.8	B	19.5		0.0198	B	40.2		6.8	0	9470	
WST97518	11/13/97	PZ-04	6.9	1.0	38200		21500		1030		8.4	B	19.6		0.0318		42.3		4.1		9330	
WST98013	1/14/98	PZ-04	7.2	1.0	30500		16500		955		6.8	B	21.7		0.0070	U	44.1		3.4		7170	
WST98014	1/14/98	PZ-04	7.1	1.0	32300		17700		970		7.4	B	20.9		0.0090	B	43.8		3.9		7710	
WST98094	4/15/98	PZ-04	7.0	1.0	34200		20400		1130		8.4	B	18.3		0.4120		43.7		3.0	U	9200	
WST98201	7/21/98	PZ-04	7.0	1.0	42100		21600		1030		8.1		18.0		^0.955	R	40.0		3.0	U	10600	
WST98202	7/21/98	PZ-04	7.0	1.0	41100		22000		1030		8.2		^30.7	R	0.6400		41.3		3.0	U	10500	
WST98287	10/14/98	PZ-04	7.6	1.0	45600		23600		1110		10.1	B	18.3		0.0013		30.3		2.0		10400	
Number of Samples			11	11	11		11		11		11		10		10		11		11		11	
MEAN			7.1	1.0	38964		21127		1030		8.2		19.8		0.1269		43.0		3.9		9325	
Standard Deviation			0.2	0.0	4805		2206		55		0.9		1.5		0.2201		7.1		1.3		1079	
Minimum			6.9	1.0	30500		16500		955		6.8		18.0		0.0013		30.3		2.0		7170	
Maximum			7.6	1.0	45600		23600		1130		10.1		22.5		0.6400		59.9		6.8		10600	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca		Fe		Zn		Si		Sum	Sum	CB
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		Cations	Anions	Percent
Groundwater Samples																			
WST97222	7/18/97	PZ-04	1260		21.2	B	1.00	U	2150		0.0800	U	0.0300	U	18.8		616	640	-1.97
WST97372/373/374	9/8/97	PZ-04	1300		22.3	B	1.00	U	2220		0.5290	B	0.0300	U	19.2		642	634	0.66
WST97462	10/14/97	PZ-04	1190		22.4	B	1.00	U	1990		0.0800	U	0.0500	U	18.5		597	649	-4.19
WST97463/464/465	10/14/97	PZ-04	1230		23.7	B	1.00	U	2060		0.3630	B	0.0500	U	18.7		617	691	-5.72
WST97518	11/13/97	PZ-04	1250		21.0	B	1.00	UN	2150		0.1040	B	0.0500	U*	19.8		617	632	-1.20
WST98013	1/14/98	PZ-04	960		19.2		1.00	U	1660		0.0500	U	0.0800	U	21.9		474	489	-1.54
WST98014	1/14/98	PZ-04	1000		20.4		1.00	U	1760		0.0500	U	0.0800	U	20.7		506	523	-1.67
WST98094	4/15/98	PZ-04	1170		19.8	B	1.00	U	1980		0.2240	B	0.0300	U	17.6		596	603	-0.58
WST98201	7/21/98	PZ-04	1220		20.5		1.00	U	2230		0.0500	U	0.0600	U	20.3		673	634	2.99
WST98202	7/21/98	PZ-04	1230		23.9		1.00	U	2230		0.4960		0.0600	U	19.4		670	646	1.85
WST98287	10/14/98	PZ-04	1110		23.2		1.00	U	1980		0.0500	U	0.1870		19.2		643	691	-3.62
Number of Samples			11		11		11		11		11		11		11				
MEAN			1175		21.6		1.00		2037		0.1887		0.0643		19.5		604	621	-1.35
Standard Deviation			109		1.6		0.00		190		0.1870		0.0444		1.2				
Minimum			960		19.2		1.00		1660		0.0500		0.0300		17.6				
Maximum			1300		23.9		1.00		2230		0.5290		0.1870		21.9				

INFORMATION ONLY

Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97223/224/225	7/18/97	PZ-05	0.0016	B	0.0200	U	0.201	B	0.0100	U	0.0328	B	0.0402		0.0676	B	0.0100	U
WST97226/227/228	7/18/97	PZ-05	0.0017	B	0.0200	U	0.199	B	0.0100	U	0.0358	B	0.0158		0.0710	B	0.0100	U
WST97366/367/368	9/8/97	PZ-05	0.0022		0.0200	U	0.178	B	0.0100	U	0.0297	B	0.0100	U	0.0688	B	0.0100	U
WST97457	10/14/97	PZ-05	0.0010	U	0.0200	U	0.186	B	0.0100	U	0.0507	B	0.0100	U	0.0660	B	0.0100	U
WST97524	11/14/97	PZ-05	0.0020		0.0200	U	0.173	B	0.0100	U	0.0885	B	0.0100	U	0.0670	B	0.0100	U
WST97525	11/14/97	PZ-05	0.0020		0.0200	U	0.176	B	0.0100	U	0.0909	B	0.0100	U	0.0680	B	0.0100	U
WST98012	1/14/98	PZ-05	0.0021		0.0200	U	0.165	B	0.0100	U	0.0203	B	0.0100	U	0.0766	B	0.0100	U
WST98092	4/15/98	PZ-05	0.0026		0.0200	U	0.122	B	0.0100	U	0.0356	B	0.0100	U	0.0806	B	0.0100	U
WST98093	4/15/98	PZ-05	0.0024		0.0200	U	0.119	B	0.0100	U	0.0301	B	0.0177	B	0.0830	B	0.0100	U
WST98207	7/22/98	PZ-05	0.0014	B	0.0200	U	0.119	B	0.0100	U	0.1020	N*	0.0113	B*	0.0824	B	0.0100	U
WST98288	10/14/98	PZ-05	0.0010	U	0.0020		0.121		0.0100	U	0.0474		0.0100	U	0.0922		0.0100	U
Number of Samples			11		11		11		11		11		11		11		11	
MEAN			0.0018		0.0184		0.160		0.0100		0.0513		0.0141		0.0748		0.0100	
Standard Deviation			0.0005		0.0054		0.033		0.0000		0.0287		0.0091		0.0087		0.0000	
Minimum			0.0010		0.0020		0.119		0.0100		0.0203		0.0100		0.0660		0.0100	
Maximum			0.0026		0.0200		0.201		0.0100		0.1020		0.0402		0.0922		0.0100	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS		Cl		SO4		Br		NO3		NH4		TIC		TOC		Na	
				mg/L	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																						
WST97223/224/225	7/18/97	PZ-05	6.9	1.1	84700		45800		1340		23.7	B	15.4		0.1050		29.3		3.9	B	22100	
WST97226/227/228	7/18/97	PZ-05	6.9	1.1	91800		48200		1400		25.6	B	15.5		0.0953		29.8		3.4	B	22600	
WST97366/367/368	9/8/97	PZ-05	6.7	1.1	95400		52600		1510		26.4	B	15.6		0.3860		31.1		4.0	B	22200	
WST97457	10/14/97	PZ-05	6.8	1.1	99300		54700		1630		26.0	B	16.0		0.1230	B	30.3		3.1	B	25800	
WST97524	11/14/97	PZ-05	6.7	1.1	84200		46700		1440		25.8	B	14.9		0.0749		29.3		5.2		25200	
WST97525	11/14/97	PZ-05	6.6	1.1	87300		48200		1480		26.4	B	15.9		0.0821		30.4		4.4		26500	
WST98012	1/14/98	PZ-05	6.8	1.0	79000		43200		1390		46.6	B	14.8		0.0526		29.4		3.2		20600	
WST98092	4/15/98	PZ-05	6.7	1.0	53400		36300		1370		23.8	B	12.7		0.4170		30.6		^12.7	R	15600	
WST98093	4/15/98	PZ-05	6.7	1.0	53100		36500		1370		22.8	B	12.6		0.3790		31.0		9.4	B	15500	
WST98207	7/22/98	PZ-05	6.7	1.0	60100		33400		1360		18.6	B	13.5		0.4200		31.0		3.0	U	15100	
WST98288	10/14/98	PZ-05	7.2	1.0	68100		37900		1450		25.1	B	13.5		0.0826		28.7		3.4		17000	
Number of Samples			11	11	11		11		11		11		11		11		11		10		11	
MEAN			6.8	1.1	77855		43955		1431		26.4		14.6		0.2016		30.1		4.3		20745	
Standard Deviation			0.2	0.1	16616		7071		85		7.1		1.3		0.1591		0.8		1.9		4311	
Minimum			6.6	1.0	53100		33400		1340		18.6		12.6		0.0526		28.7		3.0		15100	
Maximum			7.2	1.1	99300		54700		1630		46.6		16.0		0.4200		31.1		9.4		26500	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca		Fe		Zn		Si		Sum	Sum	CB
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		Cations	Anions	Percent
Groundwater Samples																			
WST97223/224/225	7/18/97	PZ-05	2260		93.9		1.00	U	3740		0.6180	B	0.0300	U	17.9		1336	1322	0.52
WST97226/227/228	7/18/97	PZ-05	2250		98.4		1.00	U	3700		1.0400		0.0300	U	18.7		1355	1391	-1.32
WST97366/367/368	9/8/97	PZ-05	2030		105.0		1.00	U	3280		0.7500	B	0.0583	B	16.1		1299	1518	-7.77
WST97457	10/14/97	PZ-05	2170		127.0		1.00	U	3400		0.0800	U	0.0591	B	15.7		1474	1580	-3.47
WST97524	11/14/97	PZ-05	2080		123.0		1.00	UN	3370		0.0800	U	0.0685	B	16.3		1439	1350	3.18
WST97525	11/14/97	PZ-05	2100		130.0		1.00	UN	3380		0.1690	B	0.0500	U*	15.9		1497	1393	3.61
WST98012	1/14/98	PZ-05	1850		112.0		1.00	U	3120		0.0500	U	0.0800	U	16.4		1207	1250	-1.78
WST98092	4/15/98	PZ-05	1700		75.5		1.00	U	2810		0.1100	U	0.0300	U	18.1		961	1055	-4.70
WST98093	4/15/98	PZ-05	1720		75.3		1.00	U	2830		0.1100	U	0.0300	U	17.6		959	1061	-5.05
WST98207	7/22/98	PZ-05	1680		76.3		1.00	U	2900		0.1060	B	0.0600	U	18.3		942	973	-1.65
WST98288	10/14/98	PZ-05	1650		98.5		1.00	U	2730		0.0500	U	0.0600	U	17.9		1014	1102	-4.16
Number of Samples			11		11		11		11		11		11		11				
MEAN			1954		101.4		1.00		3205		0.2875		0.0505		17.2		1226	1272	-1.87
Standard Deviation			238		20.3		0.00		354		0.3462		0.0179		1.1				
Minimum			1650		75.3		1.00		2730		0.0500		0.0300		15.7				
Maximum			2260		130.0		1.00		3740		1.0400		0.0800		18.7				

INFORMATION ONLY

Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97210/211/212	7/17/97	PZ-06	0.0010	U	0.0200	U	0.103	B	0.0100	U	0.0185	B	0.0496		0.0764	B	0.0100	U
WST97213/214/215	7/17/97	PZ-06	0.0010	U	0.0200	U	0.107	B	0.0100	U	0.0137	B	0.0161	B	0.0744	B	0.0413	B
WST97343/344/345	8/26/97	PZ-06	0.0010	U	0.0200	U	0.107	B	0.0100	U	0.0100	U	0.0100	U	0.0794	B	0.0100	U
WST97450/451/452	10/13/97	PZ-06	0.0010	B	0.0200	U	0.102	B	0.0011	U	0.0242	B	0.0100	U	0.0736	B	0.0100	U
WST97520	11/13/97	PZ-06	0.0010	U	0.0200	U	0.102	B	0.0100	U	0.0346	B	0.0100	U	0.0662	B	0.0100	U
WST97521	11/13/97	PZ-06	0.0010	U	0.0200	U	0.106	B	0.0100	U	0.0338	B	0.0100	U	0.0692	B	0.0100	U
WST98005	1/12/98	PZ-06	0.0010	UN	0.0200	U	0.113	B	0.0100	U	0.0164	B	0.0100	U	0.0720	B	0.0100	U
WST98085	4/13/98	PZ-06	0.0021		0.0200	U	0.107	B	0.0100	U	0.0298	B	0.0100	U	0.0658	B	0.0100	U
WST98197	7/20/98	PZ-06	0.0010	U	0.0200	U	0.135		0.0100	U	0.0498		0.0100	U	0.0654		^0.311	R
WST98198	7/20/98	PZ-06	0.0010	U	0.0200	U	0.126		0.0100	U	0.0475		0.0100	U	0.0668		0.0100	U
WST98281	10/12/98	PZ-06	0.0010	U	0.0020	U	0.098		0.0100	U	0.0284		0.0100	U	0.0672		0.0100	U
Number of Samples			11		11		11		11		11		11		11		10	
MEAN			0.0011		0.0184		0.110		0.0092		0.0279		0.0142		0.0706		0.0131	
Standard Deviation			0.0003		0.0054		0.011		0.0027		0.0131		0.0119		0.0048		0.0099	
Minimum			0.0010		0.0020		0.098		0.0011		0.0100		0.0100		0.0654		0.0100	
Maximum			0.0021		0.0200		0.135		0.0100		0.0498		0.0496		0.0794		0.0413	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS		Cl		SO4		Br		NO3		NH4		TIC		TOC		Na	
				mg/L	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																						
WST97210/211/212	7/17/97	PZ-06	6.9	1.0	30100		14700		1000		12.7	B	19.8		0.0196	B	43.4		3.3		5320	
WST97213/214/215	7/17/97	PZ-06	6.9	1.0	29900		14700		1000		12.7	B	19.8		0.0245		43.3		4.0		5280	
WST97343/344/345	8/26/97	PZ-06	6.8	1.0	25600		13600		1030		12.0	B	20.2		0.1070		43.9		8.4		4440	
WST97450/451/452	10/13/97	PZ-06	7.2	1.0	27700		15100		1040		13.1	B	20.8	U	0.0173	B	41.6		5.7		5220	
WST97520	11/13/97	PZ-06	6.8	1.0	28100		15300		1040		12.5	B	20.9		0.0126	B	34.8		5.9		5710	
WST97521	11/13/97	PZ-06	6.8	1.0	28800		15600		1050		12.6	B	21.3		0.0102	B	41.9		6.5		5860	
WST98005	1/12/98	PZ-06	6.9	1.0	30800		16300		1090		12.8	B	21.4		0.0070	U	40.7		4.6		6110	
WST98085	4/13/98	PZ-06	7.0	1.0	31300		19300		1250		14.6	B	21.0		0.3470		44.1		6.6	B	7350	
WST98197	7/20/98	PZ-06	6.8	1.0	36600		18300		1130		11.8		20.9		0.6080		42.2		3.0	U	8080	
WST98198	7/20/98	PZ-06	6.8	1.0	36800		18500		1140		12.4		20.6		0.5770		41.9		3.0	U	8150	
WST98281	10/12/98	PZ-06	6.8	1.0	39400		18400		1080		11.5	B	21.6		0.0013		38.4		6.2		7670	
Number of Samples			11	11	11		11		11		11		11		11		11		11		11	
MEAN			6.9	1.0	31373		16345		1077		12.6		20.8		0.1574		41.5		5.2		6290	
Standard Deviation			0.1	0.0	4353		1938		74		0.8		0.6		0.2374		2.7		1.8		1295	
Minimum			6.8	1.0	25600		13600		1000		11.5		19.8		0.0013		34.8		3.0		4440	
Maximum			7.2	1.0	39400		19300		1250		14.6		21.6		0.6080		44.1		8.4		8150	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca		Fe		Zn		Si		Sum	Sum	CB
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		Cations	Anions	Percent
Groundwater Samples																			
WST97210/211/212	7/17/97	PZ-06	1250		23.1	B	1.00	U	2190		0.1120	B	0.0300	U	23.3		444	439	0.56
WST97213/214/215	7/17/97	PZ-06	1230		21.9	B	1.00	U	2160		0.1450	B	0.0300	U	21.8		439	439	0.00
WST97343/344/345	8/26/97	PZ-06	1180		20.3	B	1.00	U	2100		0.0700	U	0.0423	B	21.1		396	409	-1.66
WST97450/451/452	10/13/97	PZ-06	1190		25.4	B	1.00	U	2070		0.0800	U	0.0500	U	20.4		429	451	-2.53
WST97520	11/13/97	PZ-06	1270		25.8	B	1.00	UN	2230		0.0800	U	0.2120	0	21.3		465	456	0.93
WST97521	11/13/97	PZ-06	1270		25.2	B	1.00	UN	2250		0.0800	U	0.2790	0	21.0		472	466	0.72
WST98005	1/12/98	PZ-06	1290		28.2	B	1.00	U	2290		0.0500	U	0.0800	U	20.4		487	486	0.09
WST98085	4/13/98	PZ-06	1310		30.5	B	1.00	U	2260		0.1140	B	0.0423	B	20.4		541	574	-2.98
WST98197	7/20/98	PZ-06	1380		32.6		1.00	U	2460		0.0582		0.0600	U	21.0		589	543	4.00
WST98198	7/20/98	PZ-06	1380		32.6		1.00	U	2490		^0.357	R	0.0703		21.1		593	549	3.85
WST98281	10/12/98	PZ-06	1250		37.0		1.00	U	2220		0.0500	U	0.0600	U	20.2		548	545	0.31
Number of Samples			11		11		11		11		10		11		11				
MEAN			1273		27.5		1.00		2247		0.0839		0.0869		21.1		491	487	0.42
Standard Deviation			66		5.2		0.00		131		0.0310		0.0813		0.9				
Minimum			1180		20.3		1.00		2070		0.0500		0.0300		20.2				
Maximum			1380		37.0		1.00		2490		0.1450		0.2790		23.3				

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97229/230/231	7/18/97	PZ-07	0.0010	U	0.0200	U	0.075	B	0.0100	U	0.0161	B	0.0118	B	0.1150		0.0100	
WST97232/233/234	7/18/97	PZ-07	0.0010	U	0.0200	U	0.074	B	0.0100	U	0.0196	B	0.0125	B	0.1120		0.0100	
WST97378/379/380	9/9/97	PZ-07	0.0010	U	0.0200	U	0.082	B	0.0100	U	0.0192	B	0.0100	U	0.1080		0.0100	
WST97381/382/383	9/9/97	PZ-07	0.0010	U	0.0200	U	0.079	B	0.0100	U	0.0224	B	0.0100	U	0.1140		0.0100	
WST97472/473/474	10/15/97	PZ-07	0.0010	U	0.0200	U	0.096	B	0.0100	U	0.0126	B	0.0100	U	0.1160		0.0100	
WST97475/476/477	10/15/97	PZ-07	0.0010	U	0.0200	U	0.095	B	0.0100	U	0.0112	B	0.0100	U	0.1110		0.0100	
WST97471	10/15/97	PZ-07	0.0010	U	0.0200	U	0.087	B	0.0100	U	0.0130	B	0.0100	U	0.1110		0.0100	
WST97528	11/17/97	PZ-07	0.0010	U	0.0200	U	0.094	B	0.0100	U	0.0297	B	0.0100	U	0.1080		0.0100	
WST98015	1/14/98	PZ-07	0.0010	B	0.0200	U	0.110	B	0.0100	U	0.0108	B	0.0100	U	0.1160		0.0100	
WST98095	4/15/98	PZ-07	0.0010	U	0.0200	U	0.086	B	0.0100	U	0.0230	B	0.0100	U	0.1130		0.0100	
WST98208	7/22/98	PZ-07	0.0010	U	0.0200	U	0.093	B	0.0100	U	0.0658	BN*	0.0205	B*	0.1080		0.0100	
WST98289	10/14/98	PZ-07	0.0010	U	0.0020	U	0.085		0.0100	U	0.0365		0.0100	U	0.1240		0.0100	
WST98289D	10/14/98	PZ-07	0.0010	U	0.0020	U	0.088		0.0100	U	0.0230		0.0100	U	0.1190		0.0100	
Number of Samples			13		13		13		13		13		13		13		13	
MEAN			0.0010		0.0172		0.088		0.0100		0.0233		0.0111		0.1135		0.0100	
Standard Deviation			0.0000		0.0068		0.010		0.0000		0.0148		0.0029		0.0047		0.0000	
Minimum			0.0010		0.0020		0.074		0.0100		0.0108		0.0100		0.1080		0.0100	
Maximum			0.0010		0.0200		0.110		0.0100		0.0658		0.0205		0.1240		0.0100	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS		Cl		SO4		Br		NO3		NH4		TIC		TOC		Na	
				mg/L	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																						
WST97229/230/231	7/18/97	PZ-07	7.0	1.0	20100		9170		1340		14.3	B	19.0		0.0245		43.6		5.4		1950	
WST97232/233/234	7/18/97	PZ-07	7.0	1.0	20100		9080		1330		12.8	B	19.0		0.0123	B	43.4		4.5		1920	
WST97378/379/380	9/9/97	PZ-07	6.8	1.0	21700		10400		1300		13.3	B	18.8		0.1120		39.2		6.2		2200	
WST97381/382/383	9/9/97	PZ-07	6.7	1.0	22700		10300		1300		13.8	B	18.7		0.2220		40.5		7.1		2210	
WST97472/473/474	10/15/97	PZ-07	6.8	1.0	24200		12100		1460		15.6	B	20.0		0.0123	B	41.2		10.3	0	2620	
WST97475/476/477	10/15/97	PZ-07	6.7	1.0	23600		11900		1510		16.0	B	19.8		0.0198	B	41.7		8.0	0	2530	
WST97471	10/15/97	PZ-07	6.8	1.0	23100		11700		1450		15.7	B	20.3		0.0148	B	41.2		11.2	0	2600	
WST97528	11/17/97	PZ-07	6.7	1.0	24200		12300		1460		14.9	B	20.7		0.0198		39.2		7.4		2890	
WST98015	1/14/98	PZ-07	6.9	1.0	25400		13000		1530		15.5	B	21.1		0.0070	U	42.1		5.3		3100	
WST98095	4/15/98	PZ-07	6.7	1.0	20700		12500		1660		15.7	B	19.1		0.3860		47.4		14.9		3230	
WST98208	7/22/98	PZ-07	6.8	1.0	26340		13100		1590		15.0	B	21.8	B	0.6400		43.5		7.1	B	3470	
WST98289	10/14/98	PZ-07	7.0	1.0	31400		15700		1690		17.3		18.6		0.0125	B	41.1		4.8		4410	
WST98289D	10/14/98	PZ-07	6.9	1.0	31300		15800		1710		17.2		18.5		0.0125	B	42.7		4.5		4470	
Number of Samples			13	13	13		13		13		13		13		13		13		13		13	
MEAN			6.8	1.0	24218		12081		1487		15.2		19.6		0.1150		42.1		7.4		2892	
Standard Deviation			0.1	0.0	3699		2095		145		1.4		1.1		0.1938		2.2		3.1		834	
Minimum			6.7	1.0	20100		9080		1300		12.8		18.5		0.0070		39.2		4.5		1920	
Maximum			7.0	1.0	31400		15800		1710		17.3		21.8		0.6400		47.4		14.9		4470	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca		Fe		Zn		Si		Sum	Sum	CB
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		Cations	Anions	Percent
Groundwater Samples																			
WST97229/230/231	7/18/97	PZ-07	1240		14.7	B	1.00	U	2320		0.5020	B	0.0300	U	23.1		303	290	2.13
WST97232/233/234	7/18/97	PZ-07	1220		15.9	B	1.00	U	2300		0.3710	B	0.0754	B	22.9		299	288	1.96
WST97378/379/380	9/9/97	PZ-07	1290		15.5	B	1.00	U	2400		0.4840	B	0.0300	U	21.4		322	324	-0.29
WST97381/382/383	9/9/97	PZ-07	1320		14.5	B	1.00	U	2430		0.3470	B	0.0300	U	21.2		326	321	0.81
WST97472/473/474	10/15/97	PZ-07	1410		18.3	B	1.00	U	2620		0.0800	U	0.0500	U	20.3		361	375	-1.92
WST97475/476/477	10/15/97	PZ-07	1370		18.1	B	1.00	U	2580		0.0800	U	0.0500	U	20.8		352	371	-2.60
WST97471	10/15/97	PZ-07	1400		17.9	B	1.00	U	2600		0.0800	U	0.3260		20.5		358	364	-0.74
WST97528	11/17/97	PZ-07	1440		16.8	B	1.00	UN	2790		0.0800	U	0.0500	U*	20.6		384	381	0.40
WST98015	1/14/98	PZ-07	1420		18.7	B	1.00	U	2850		0.0500	U	0.0800	U	20.3		394	402	-0.99
WST98095	4/15/98	PZ-07	1300		14.7	B	1.00	U	2600		0.1100	U	0.0300	U	21.2		378	391	-1.78
WST98208	7/22/98	PZ-07	1380		16.8	B	1.00	U	2760		0.1360	B	0.0600	U	20.1		403	406	-0.47
WST98289	10/14/98	PZ-07	1420		17.5		1.00	U	2770		0.0500	U	^0.219	R	20.8		447	482	-3.69
WST98289D	10/14/98	PZ-07	1430		17.8		1.00	U	2810		0.0500	U	0.0893		20.8		453	485	-3.44
Number of Samples			13		13		13		13		13		12		13				
MEAN			1357		16.7		1.00		2602		0.1862		0.0751		21.1		368	375	-1.03
Standard Deviation			75		1.5		0.00		190		0.1726		0.0817		0.9				
Minimum			1220		14.5		1.00		2300		0.0500		0.0300		20.1				
Maximum			1440		18.7		1.00		2850		0.5020		0.3260		23.1				

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97259/260/261	7/22/97	PZ-09	0.0013	B	0.0200	U	0.310	B	0.0100	U	0.0495	B	0.0173	B	0.0572	B	0.0100	U
WST97262/263/264	7/22/97	PZ-09	0.0017	B	0.0200	U	0.340	B	0.0100	U	0.0755	B	0.0154	B	0.0582	B	0.0100	U
WST97399/400/401	9/10/97	PZ-09	0.0014	B	0.0200	U	0.255	B	0.0100	U	0.0465	B	0.0152	B	0.0522	B	0.0100	U
WST97483	10/16/97	PZ-09	0.0010	U	0.0200	U	0.258	B	0.0100	U	0.0391	B	0.0100	U	0.0516	B	0.0100	U
WST97484/485/486	10/16/97	PZ-09	0.0170	B	0.0200	U	0.294	B	0.0100	U	0.0587	B	0.0100	U	0.0520	B	0.0100	U
WST97531	11/17/97	PZ-09	0.0026		0.0200	U	0.311	B	0.0100	U	0.1070		0.0100	U	0.0552	B	0.0100	U
WST98019	1/15/98	PZ-09	0.0020		0.0200	U	0.291	B	0.0100	U	0.0210	B	0.0100	U	0.0556	B	0.0100	U
WST98103	4/16/98	PZ-09	0.0030		0.0200	U	0.264	B	0.0100	U	0.0464	B	0.0170	B	0.0520	B	0.0100	U
WST98214	7/23/98	PZ-09	0.0022		0.0200	U	0.290	B	0.0100	U	0.1410	N*	0.0136	B*	0.0498	B	0.0100	U
WST98294	10/15/98	PZ-09	0.0014		0.0020	U	0.278		0.0100	U	0.0805		0.0100	U	0.0564		0.0100	U
Number of Samples			10		10		10		10		10		10		10		10	
MEAN			0.0034		0.0182		0.289		0.0100		0.0665		0.0129		0.0540		0.0100	
Standard Deviation			0.0048		0.0057		0.027		0.0000		0.0357		0.0032		0.0028		0.0000	
Minimum			0.0010		0.0020		0.255		0.0100		0.0210		0.0100		0.0498		0.0100	
Maximum			0.0170		0.0200		0.340		0.0100		0.1410		0.0173		0.0582		0.0100	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS		Cl		SO4		Br		NO3		NH4		TIC		TOC		Na	
				mg/L	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																						
WST97259/260/261	7/22/97	PZ-09	6.7	1.1	117000		61200		2250		62.2	B	18.3		0.1100		41.4		5.1	B	29300	
WST97262/263/264	7/22/97	PZ-09	6.7	1.1	118000		62200		2280		63.7	B	18.4		0.0880		40.6		6.1	B	29100	
WST97399/400/401	9/10/97	PZ-09	6.6	1.1	110000		61900		2260		60.3	B	20.3		1.9900		37.9		10.1	B	28200	
WST97483	10/16/97	PZ-09	6.6	1.1	114000		64400		2420		62.6	B	18.9		0.0980	B	43.0		6.2	B	29900	
WST97484/485/486	10/16/97	PZ-09	6.5	1.1	117000		65300		2460		65.6	B	19.1		0.3240		42.8		5.7	B	30600	
WST97531	11/17/97	PZ-09	6.4	1.1	93900		64300		2460		62.6	B	18.1		0.0462		40.5		5.7		30800	
WST98019	1/15/98	PZ-09	6.7	1.1	113000		62600		2470		63.2	B	18.5		0.0136	B	40.4		3.6		28800	
WST98103	4/16/98	PZ-09	6.4	1.1	95700		55400		2840		55.5		18.0		0.4580		45.4		8.8	B	29300	
WST98214	7/23/98	PZ-09	6.8	1.0	115000		62300		2850		54.8	B	18.5	B	1.1100		41.8		3.0	U	30200	
WST98294	10/15/98	PZ-09	6.8	1.1	123000		57600		2710		60.4	B	16.7		0.0181	B	43.1		4.4		29600	
Number of Samples			10	10	10		10		10		10		10		10		10		10		10	
MEAN			6.6	1.1	111660		61720		2500		61.1		18.5		0.4256		41.7		5.9		29580	
Standard Deviation			0.1	0.0	9529		3077		226		3.5		0.9		0.6436		2.0		2.2		811	
Minimum			6.4	1.0	93900		55400		2250		54.8		16.7		0.0136		37.9		3.0		28200	
Maximum			6.8	1.1	123000		65300		2850		65.6		20.3		1.9900		45.4		10.1		30800	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca		Fe		Zn		Si		Sum	Sum	CB
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		Cations	Anions	Percent
Groundwater Samples																			
WST97259/260/261	7/22/97	PZ-09	3650		140		1.00	U	4340		1.8300		0.0324	B	16.2		1795	1777	0.49
WST97262/263/264	7/22/97	PZ-09	3660		145		1.00	U	4360		4.1500		0.0590	B	19.5		1788	1806	-0.50
WST97399/400/401	9/10/97	PZ-09	3560		139		1.00	U	4160		2.8500		0.0627	B	15.0		1731	1797	-1.88
WST97483	10/16/97	PZ-09	3630		146		1.00	U	4130		0.1530	B	0.0500	U	11.6		1809	1871	-1.69
WST97484/485/486	10/16/97	PZ-09	3650		153		1.00	U	4130		0.5010	B	0.0500	U	12.5		1841	1897	-1.50
WST97531	11/17/97	PZ-09	3590		165		1.00	UN	4280		0.2190	B	0.0515	U	12.7		1853	1868	-0.41
WST98019	1/15/98	PZ-09	3470		176		1.00	U	4190		0.0500	U	0.0800	U	12.5		1752	1821	-1.92
WST98103	4/16/98	PZ-09	3440		189		1.00	U	3850		0.1100	U	0.0300	U	12.7		1754	1626	3.81
WST98214	7/23/98	PZ-09	3490		233		1.00	U	3990		0.1710	B	0.0600	U	13.5		1806	1820	-0.39
WST98294	10/15/98	PZ-09	3320		260		1.00	U	3750		0.0500	U	0.1790		13.2		1754	1685	2.03
Number of Samples			10		10		10		10		10		10		10				
MEAN			3546		175		1.00		4118		1.0084		0.0655		13.9		1788	1797	-0.22
Standard Deviation			113		42		0.00		201		1.4489		0.0424		2.4				
Minimum			3320		139		1.00		3750		0.0500		0.0300		11.6				
Maximum			3660		260		1.00		4360		4.1500		0.1790		19.5				

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97244/245/246	7/21/97	PZ-10	0.0002	U	0.0024	B	0.138	B	0.0011	U	0.0090	B	0.0039		0.0498	N	0.0011	U
WST97247/248/249	7/21/97	PZ-10	0.0002	U	0.0020	B	0.118	B	0.0011	U	0.0080	B	0.0038		0.0511	N	0.0011	U
WST97390/391/392	9/10/97	PZ-10	0.0002	U	0.0020	B	0.066	B	0.0011	U	0.0035	B	0.0011	U	0.0386		0.0011	U
WST97393/394/395	9/10/97	PZ-10	0.0002	U	0.0020	B	0.070	B	0.0011	U	0.0028	B	0.0011	U	0.0446		0.0011	U
WST97491	10/16/97	PZ-10	0.0002	U	0.0019	B	0.062	B	0.0011	U	0.0016	B	0.0015	B	0.0428		0.0011	U
WST97534	11/18/97	PZ-10	0.0002	U	0.0018	B	0.059	B	0.0011	U	0.0021	B	0.0011	U	0.0441		0.0011	U
WST97535	11/18/97	PZ-10	0.0002	U	0.0018	B	0.059	B	0.0011	U	0.0018	B	0.0011	U	0.0429		0.0011	U
WST98022	1/15/98	PZ-10	0.0002	U	0.0018	B	0.058	B	0.0011	U	0.0046	B	0.0011	U	0.0368		0.0011	U
WST98098	4/16/98	PZ-10	0.0002	U	0.0018	B	0.056	B	0.0011	U	0.0043	B	0.0011	U	0.0366		0.0011	U
WST98211	7/23/98	PZ-10	0.0003	B	0.0020	B	0.062	B	0.0011	U	0.0050	B	0.0011	U	0.0323		0.0011	U
WST98212	7/23/98	PZ-10	0.0002	U	0.0019	B	0.063	B	0.0011	U	0.0052	B	0.0011	U	0.0311		0.0011	U
WST98292	10/14/98	PZ-10	0.0002	U	0.0010		0.055		0.0014		0.0033		0.0010	U	0.0392		0.0010	U
Number of Samples			12		12		12		12		12		12		12.0000		12	
MEAN			0.0002		0.0019		0.072		0.0011		0.0043		0.0016		0.0408		0.0011	
Standard Deviation			0.0000		0.0003		0.027		0.0001		0.0023		0.0011		0.0062		0.0000	
Minimum			0.0002		0.0010		0.055		0.0011		0.0016		0.0010		0.0311		0.0010	
Maximum			0.0003		0.0024		0.138		0.0014		0.0090		0.0039		0.0511		0.0011	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS		Cl		SO4		Br		NO3		NH4		TIC		TOC		Na	
				mg/L	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																						
WST97244/245/246	7/21/97	PZ-10	7.3	1.0	3080		650		917		2.8		31.8		0.0070	U	83.2		10.0		204	
WST97247/248/249	7/21/97	PZ-10	7.3	1.0	3100		670		945		3.0		31.5		0.0070	U	82.1		8.7		202	
WST97390/391/392	9/10/97	PZ-10	7.2	1.0	2790		647		937		3.2		44.2		0.0335		65.1		11.5		214	
WST97393/394/395	9/10/97	PZ-10	7.2	1.0	2700		663		949		3.3		37.2		0.0280		44.9		12.2		215	
WST97491	10/16/97	PZ-10	7.2	1.0	2950		624		960		3.3	B	43.3		0.0073	B	70.6		8.5		219	
WST97534	11/18/97	PZ-10	7.2	1.0	2750		588		906		2.8		46.6		0.0102	B	83.0		5.9		215	
WST97535	11/18/97	PZ-10	7.2	1.0	2760		583		901		2.9		45.8		0.0078	B	82.8		6.1		217	
WST98022	1/15/98	PZ-10	7.4	1.0	2540		525		828		2.6		46.1		0.0070	U	81.1		6.8		204	
WST98098	4/16/98	PZ-10	7.1	1.0	1840		604		900		3.2		30.2		0.0742		82.1		3.9	N*	193	
WST98211	7/23/98	PZ-10	7.2	1.0	2655		543		803		2.8		27.4	B	0.0766		78.5		3.1		189	
WST98212	7/23/98	PZ-10	7.0	1.0	2612		536		789		2.8		27.0	B	0.0766		79.8		3.9		191	
WST98292	10/14/98	PZ-10	7.6	1.0	2750		585		828		3.1		22.2		0.0064	B	75.1		2.6		183	
Number of Samples			12	12	12		12		12		12		12		12		12		12		12	
MEAN			7.2	1.0	2711		602		889		3.0		36.1		0.0285		75.7		6.9		204	
Standard Deviation			0.2	0.0	324		50		60		0.2		8.8		0.0299		11.2		3.3		12	
Minimum			7.0	1.0	1840		525		789		2.6		22.2		0.0064		44.9		2.6		183	
Maximum			7.6	1.0	3100		670		960		3.3		46.6		0.0766		83.2		12.2		219	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca		Fe		Zn		Si		Sum	Sum	CB
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		Cations	Anions	Percent
Groundwater Samples																			
WST97244/245/246	7/21/97	PZ-10	230		7.0		0.26	B	338		4.7000		0.0180	B	27.8		45	44	0.51
WST97247/248/249	7/21/97	PZ-10	235		6.5		0.25	B	344		3.9100		0.0143	B	28.7		45	45	0.01
WST97390/391/392	9/10/97	PZ-10	201		4.5	B	0.27	B	302		0.6090		0.0317		22.6		41	43	-2.59
WST97393/394/395	9/10/97	PZ-10	226		4.3	B	0.25	B	331		0.1370		0.0045	B	20.8		45	42	2.69
WST97491	10/16/97	PZ-10	219		4.4	B	0.27	B	318		0.2000		0.0056	U	20.9		44	44	0.02
WST97534	11/18/97	PZ-10	205		4.2	B	0.28	B	309		0.0174	B	0.0065	B	22.6		42	42	-0.73
WST97535	11/18/97	PZ-10	203		4.4	B	0.28	B	305		0.0089	U	0.0100	B	22.7		41	42	-0.74
WST98022	1/15/98	PZ-10	184		4.6	B	0.26	B	282		0.0056	U	0.0089	U	23.7		38	39	-0.77
WST98098	4/16/98	PZ-10	205		4.0	B	0.25	B	299		0.0122	U	0.0033	U	22.1		40	43	-2.80
WST98211	7/23/98	PZ-10	208		4.0	B	0.28	B	302		0.0194	B	0.0251		22.3		41	39	2.45
WST98212	7/23/98	PZ-10	206		4.0	B	0.23	B	299		0.1240		0.0067	U	NA		40	38	2.67
WST98292	10/14/98	PZ-10	196		3.7	B	0.26	B	270		0.0050	U	0.0060	U	21.9		38	40	-3.01
Number of Samples			12		12		12		12		12		12		11				
MEAN			210		4.6		0.26		308		0.8124		0.0117		23.3		42	42	-0.16
Standard Deviation			15		1.0		0.02		22		1.6488		0.0089		2.6				
Minimum			184		3.7		0.23		270		0.0050		0.0033		20.8				
Maximum			235		7.0		0.28		344		4.7000		0.0317		28.7				

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97238/239/240	7/21/97	PZ-11	0.0010	U	0.0200	U	0.226	B	0.0100	U	0.0313	B	0.0143	B	0.0250	B	0.0100	U
WST97241/242/243	7/21/97	PZ-11	0.0010	U	0.0200	U	0.221	B	0.0100	U	0.0322	B	0.0140	B	0.0270	B	0.0100	U
WST97384/385/386	9/9/97	PZ-11	0.0010	U	0.0200	U	0.191	B	0.0100	U	0.0228	B	0.0100	U	0.0200	U	0.0100	U
WST97481	10/16/97	PZ-11	0.0010	U	0.0200	U	0.148	B	0.0100	U	0.0150	B	0.0179	B	0.0200	U	0.0100	U
WST97482	10/16/97	PZ-11	0.0010	U	0.0200	U	0.158	B	0.0100	U	0.0108	B	0.0198	B	0.0200	U	0.0100	U
WST97529	11/17/97	PZ-11	0.0010	U	0.0200	U	0.141	B	0.0100	U	0.0346	B	0.0100	U	0.0200	U	0.0100	U
WST97530	11/17/97	PZ-11	0.0010	U	0.0200	U	0.148	B	0.0100	U	0.0320	B	0.0100	U	0.0200	U	0.0100	U
WST98017	1/14/98	PZ-11	0.0010	U	0.0200	U	0.143	B	0.0100	U	0.0103	B	0.0100	U	0.0200	U	0.0100	U
WST98018	1/14/98	PZ-11	0.0010	U	0.0200	U	0.140	B	0.0100	U	0.0112	B	0.0100	U	0.0200	U	0.0100	U
WST98097	4/16/98	PZ-11	0.0010	U	0.0200	U	0.137	B	0.0100	U	0.0176	B	0.0100	U	0.0200	U	0.0100	U
WST98209	7/22/98	PZ-11	0.0010	U	0.0200	U	0.155	B	0.0100	U	0.0605	BN*	0.1220	0	0.0200	U	0.0100	U
WST98290	10/14/98	PZ-11	0.0010	U	<0.0020	U	0.158		0.0100	U	0.0244		0.0100	U	0.0217		0.0100	U
Number of Samples			12		11		12		12		12		12		12		12	
MEAN			0.0010		0.0200		0.164		0.0100		0.0252		0.0215		0.0211		0.0100	
Standard Deviation			0.0000		0.0000		0.031		0.0000		0.0143		0.0318		0.0024		0.0000	
Minimum			0.0010		0.0200		0.137		0.0100		0.0103		0.0100		0.0200		0.0100	
Maximum			0.0010		0.0200		0.226		0.0100		0.0605		0.1220		0.0270		0.0100	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS		Cl		SO4		Br		NO3		NH4		TIC		TOC		Na	
				mg/L	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																						
WST97238/239/240	7/21/97	PZ-11	6.9	1.0	33000		16000		1070		8.1	B	22.9		0.0294		44.6		6.1		5190	
WST97241/242/243	7/21/97	PZ-11	6.9	1.0	34300		16200		1080		8.3	B	22.8		0.0440		43.8		5.0		5110	
WST97384/385/386	9/9/97	PZ-11	6.9	1.0	25400		13200		703		5.7	B	16.4		0.1120		44.6		8.0		4900	
WST97481	10/16/97	PZ-11	6.9	1.0	25600		13800		763		5.3	B	17.6		0.0098	B	43.7		8.3		5160	
WST97482	10/16/97	PZ-11	6.9	1.0	25100		13900		777		4.4	B	17.5		0.0073	B	44.8		10.8		5180	
WST97529	11/17/97	PZ-11	6.9	1.0	24800		12800		736		5.2	B	16.4		0.0070	U	46.8		4.6		4990	
WST97530	11/17/97	PZ-11	6.9	1.0	24600		12700		734		5.0	B	16.4		0.0078	B	46.8		4.8		4980	
WST98017	1/14/98	PZ-11	7.0	1.0	23300		12400		756		5.6	B	17.0		0.0365		47.4		3.4		4510	
WST98018	1/14/98	PZ-11	7.0	1.0	22900		12500		756		5.0	B	17.0		0.0388		47.6		3.8		4600	
WST98097	4/16/98	PZ-11	6.8	1.0	22900		14200		893		5.4	B	^36.8	R	0.5030		50.4		8.2	B	5400	
WST98209	7/22/98	PZ-11	6.8	1.0	28420		15000		1000		5.9		19.1		0.4820		45.4		3.4	B	5240	
WST98290	10/14/98	PZ-11	7.1	1.0	30400		15900		1070		9.4	B	20.1		0.0125	B	39.4		2.4		5280	
Number of Samples			12	12	12		12		12		12		11		12		12		12		12	
MEAN			6.9	1.0	26727		14050		862		6.1		18.5		0.1075		45.4		5.7		5045	
Standard Deviation			0.1	0.0	3908		1417		151		1.6		2.5		0.1822		2.7		2.6		268	
Minimum			6.8	1.0	22900		12400		703		4.4		16.4		0.0070		39.4		2.4		4510	
Maximum			7.1	1.0	34300		16200		1080		9.4		22.9		0.5030		50.4		10.8		5400	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca		Fe		Zn		Si		Sum	Sum	CB
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		Cations	Anions	Percent
Groundwater Samples																			
WST97238/239/240	7/21/97	PZ-11	1490		25.6	B	1.00	U	2870		7.7100		0.0427	B	28.7		492	477	1.53
WST97241/242/243	7/21/97	PZ-11	1510		25.6	B	1.00	U	2890		8.3600		0.0300	U	32.1		491	483	0.84
WST97384/385/386	9/9/97	PZ-11	958		16.6	B	1.00	U	1890		1.5900		0.0300	U	19.7		387	391	-0.52
WST97481	10/16/97	PZ-11	948		18.1	B	1.00	U	1870		0.0800	U	0.0500	U	18.5		396	409	-1.57
WST97482	10/16/97	PZ-11	965		25.9	B	1.00	U	1910		0.0800	U	0.0500	U	18.2		401	412	-1.39
WST97529	11/17/97	PZ-11	868		17.3	B	1.00	UN	1740		0.1130	B	0.0500	U*	19.2		376	380	-0.60
WST97530	11/17/97	PZ-11	867		16.9	B	1.00	UN	1740		0.1070	B	0.0500	U*	19.0		375	377	-0.29
WST98017	1/14/98	PZ-11	840		18.9	B	1.00	U	1680		0.0500	U	0.0800	U	19.0		350	369	-2.76
WST98018	1/14/98	PZ-11	840		18.5	B	1.00	U	1700		0.0500	U	0.0800	U	19.0		355	372	-2.45
WST98097	4/16/98	PZ-11	981		16.0	B	1.00	U	1930		0.2220	B	0.0302	B	18.8		412	423	-1.32
WST98209	7/22/98	PZ-11	1140		17.6	B	1.00	U	2230		0.1040	B	0.0602	B	19.2		433	448	-1.62
WST98290	10/14/98	PZ-11	1240		18.0		1.00	U	2370		0.0500	U	0.0600	U	19.2		450	474	-2.55
Number of Samples			12		12		12		12		12		12		12				
MEAN			1054		19.6		1.00		2068		1.5430		0.0511		20.9		410	418	-0.98
Standard Deviation			240		3.8		0.00		432		3.0659		0.0171		4.5				
Minimum			840		16.0		1.00		1680		0.0500		0.0300		18.2				
Maximum			1510		25.9		1.00		2890		8.3600		0.0800		32.1				

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Hg		As		Ba		Cd		Cr		Pb		Se		Ag	
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																		
WST97250/251/252	7/21/97	PZ-12	0.0002	U	0.0029	B	0.269		0.0011	U	0.0083	B	0.0036		0.0256	N	0.0011	U
WST97253/254/255	7/21/97	PZ-12	0.0002	U	0.0028	B	0.249		0.0011	U	0.0061	B	0.0027	B	0.0260	N	0.0011	U
WST97396/397/398	9/10/97	PZ-12	0.0002	U	0.0022	B	0.135		0.0011	U	0.0039	B	0.0011	U	0.0262		0.0011	U
WST97487	10/16/97	PZ-12	0.0002	U	0.0019	B	0.127		0.0011	U	0.0029	B	0.0011	U	0.0315		0.0011	U
WST97488/489/490	10/16/97	PZ-12	0.0002	U	0.0024	B	0.134		0.0011	U	0.0034	B	0.0011	U	0.0304		0.0011	U
WST97533	11/18/97	PZ-12	0.0002	U	0.0020	B	0.127	B	0.0011	U	0.0020	B	0.0011	U	0.0314		0.0011	U
WST98020	1/15/98	PZ-12	0.0002	U	0.0020	B	0.137	B	0.0012	B	0.0035	B	0.0011	U	0.0332		0.0011	U
WST98021	1/15/98	PZ-12	0.0002	U	0.0020	B	0.138	B	0.0011	U	0.0047	B	0.0011	U	0.0323		0.0011	U
WST98100	4/16/98	PZ-12	0.0002	U	0.0018	B	0.121	B	0.0011	U	0.0076	B	0.0011	U	0.0310		0.0011	U
WST98102	4/16/98	PZ-12	0.0002	U	0.0020	B	0.118	B	0.0011	U	0.0075	B	0.0021	B	0.0313		0.0011	U
WST98213	7/23/98	PZ-12	0.0002	U	0.0018	B	0.148	B	0.0011	U	0.0101	B	0.0011	U	0.0294		0.0011	U
WST98293	10/15/98	PZ-12	0.0002	U	0.0011		0.151		0.0010	U	0.0054		0.0015		0.0380		0.0010	U
WST98293D	10/15/98	PZ-12	0.0002	U	0.0012		0.152		0.0010	U	0.0079		0.0010	U	0.0391		0.0010	U
Number of Samples			13		13		13		13		13		13		13		13	
MEAN			0.0002		0.0020		0.154		0.0011		0.0056		0.0015		0.0312		0.0011	
Standard Deviation			ERR		0.0005		0.048		0.0000		0.0025		0.0008		0.0041		0.0000	
Minimum			0.0002		0.0011		0.118		0.0010		0.0020		0.0010		0.0256		0.0010	
Maximum			0.0002		0.0029		0.269		0.0012		0.0101		0.0036		0.0391		0.0011	

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Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	pH	SG	TDS		Cl		SO4		Br		NO3		NH4		TIC		TOC		Na	
				mg/L	mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L	
Groundwater Samples																						
WST97250/251/252	7/21/97	PZ-12	7.3	1.0	4060		1540		404		3.6	B	21.0		0.0070	U	56.9		1.9		386	
WST97253/254/255	7/21/97	PZ-12	7.3	1.0	3860		1550		404		3.7	B	21.0		0.0070	U	55.4		2.1		388	
WST97396/397/398	9/10/97	PZ-12	7.2	1.0	3290		1430		448		3.2		14.9		0.0335		61.4		5.7		436	
WST97487	10/16/97	PZ-12	7.3	1.0	3400		1420		483		4.4		13.9		0.0070	U	53.5		6.4		410	
WST97488/489/490	10/16/97	PZ-12	7.2	1.0	3440		1420		481		4.3		13.8		0.0070	U	58.4		8.4		408	
WST97533	11/18/97	PZ-12	7.2	1.0	3140		1250		469		3.8		13.4		0.0102	B	62.8		4.3		354	
WST98020	1/15/98	PZ-12	7.5	1.0	3460		1370		500		3.8		15.7		0.0090	B	62.9		3.2		409	
WST98021	1/15/98	PZ-12	7.4	1.0	3510		1380		497		4.0		15.5		0.0136	B	64.2		3.3		409	
WST98100	4/16/98	PZ-12	7.0	1.0	3610		1720		578		4.3		20.0		0.0835		68.9		0.7	BN	544	
WST98102	4/16/98	PZ-12	7.0	1.0	4960		1790		577		4.2		20.0		0.0719		68.8		0.3	UN	549	
WST98213	7/23/98	PZ-12	6.7	1.0	5965		2620		595		^14.6	R	24.8		0.4200		67.5		2.3		812	
WST98293	10/15/98	PZ-12	7.4	1.0	7430		3320		686		6.1		25.6		0.0064	B	63.8		2.4		926	
WST98293D	10/15/98	PZ-12	7.4	1.0	7340		3340		694		6.2		25.6		0.0064	B	64.2		2.1		953	
Number of Samples			13	13	13		13		13		12		13		13		13		13		13	
MEAN			7.2	1.0	4420		1858		524		4.3		18.9		0.0525		62.2		3.3		537	
Standard Deviation			0.2	0.0	1528		738		95		0.9		4.6		0.1135		4.9		2.3		215	
Minimum			6.7	1.0	3140		1250		404		3.2		13.4		0.0064		53.5		0.3		354	
Maximum			7.5	1.0	7430		3340		694		6.2		25.6		0.4200		68.9		8.4		953	

INFORMATION ONLY

Appendix 2 - WIPP Site Water-Quality Data for Piezometers 1-12 and Wells C-2505, C-2506, and C-2507

Sample ID	Date	Location	Mg		K		B		Ca		Fe		Zn		Si		Sum	Sum	CB
			mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		mg/L		Cations	Anions	Percent
Groundwater Samples																			
WST97250/251/252	7/21/97	PZ-12	278		7.4		0.23	B	356		3.8000		0.0154	B	22.2		58	57	0.86
WST97253/254/255	7/21/97	PZ-12	280		6.4		0.23	B	359		2.0000		0.0101	B	22.1		58	57	1.05
WST97396/397/398	9/10/97	PZ-12	237		6.3		0.21	B	325		0.0933	B	0.0033	U	20.3		55	55	0.03
WST97487	10/16/97	PZ-12	233		6.4		0.21	B	313		0.0213	B	0.0056	U	20.2		53	55	-1.70
WST97488/489/490	10/16/97	PZ-12	233		6.2		0.22	B	316		0.1380		0.0056	U	20.3		53	55	-1.98
WST97533	11/18/97	PZ-12	223		5.7		0.22	B	303		0.0089	U	0.0066	B	21.3		49	50	-1.25
WST98020	1/15/98	PZ-12	229		6.3		0.21	B	320		0.0056	U	0.0143	B	21.3		53	54	-1.43
WST98021	1/15/98	PZ-12	230		6.7		0.20	B	325		0.0056	U	0.0104	B	21.3		53	55	-1.40
WST98100	4/16/98	PZ-12	271		7.3		0.21	B	376		0.0122	U	0.0033	U	21.1		65	66	-1.05
WST98102	4/16/98	PZ-12	271		7.4		0.21	B	378		0.0122	U	0.0033	U	21.0		65	68	-2.25
WST98213	7/23/98	PZ-12	357		9.5		0.22	B	497		0.0176	B	0.0067	U	21.2		90	92	-1.19
WST98293	10/15/98	PZ-12	406		10.8		0.23	B	557		0.0050	U	0.0060	U	20.6		102	113	-5.34
WST98293D	10/15/98	PZ-12	414		10.8		0.22	B	566		0.0050	U	0.0060	U	20.4		104	114	-4.57
Number of Samples			13		13		13		13		13		13		13				
MEAN			282		7.5		0.22		384		0.4711		0.0074		21.0		66	69	-1.93
Standard Deviation			67		1.7		0.01		93		1.1396		0.0040		0.7				
Minimum			223		5.7		0.20		303		0.0050		0.0033		20.2				
Maximum			414		10.8		0.23		566		3.8000		0.0154		22.2				

INFORMATION ONLY

Appendix 3 - Exhaust Shaft Catch Basin and Ventilation Conditions Between July 1997 and October 1998

Date (mm/dd/yy)	Volume Removed From Catch Basin	Comments
		Weekend Status
	(gal)	
7/14/97	0	1-700 fan this weekend
7/11/97	0	1-700 fan
7/18/97	275	1-700 fan
7/25/97	227	1-700 fan thru Sunday. From 2100 to this morning operated 1-860 fan
7/28/97	660	1-860 fan this weekend
8/1/97	1210	Power blip caused u/g power loss CMR reduced to 1-860 fan at 2045
8/4/97	715	1-860 fan
8/8/97	770	1-700 fan, 1-860 fan
8/11/97	660	1-860 fan to support installation of new duct
8/18/97	805	1-860 fan diesel work and new duct fabrication
8/25/97	1485	Friday afternoon 1-860 fan Saturday @1400 no fans Sunday @1200 1-860 fan
9/2/97	220	1-860 fan
9/8/97	0	1-700 fan
9/15/97	605	No fans Saturday, 1-860 fan rest of weekend
9/22/97	550	No fans 24 hrs, 1-860 fan u/g rest of weekend: construction work on 700c duct installation
9/29/97	0	1-700 fan
10/6/97	0	1-700 fan
10/13/97	825	No fan Saturday for outage 1-860 fan Sunday
10/20/97	220	1-860 fan except during outage on Saturday
10/27/97	0	1-700 fan
11/3/97	275	11/1/97 0500-1600 no fans, until Monday 1-860 fan
11/10/97	385	No fans Saturday 0730-1630, 1-860 fan remainder of weekend
11/17/97	385	No fans Saturday 12 hrs, 1-860 fan remainder of weekend
11/24/97	330	1-860 fan
12/1/97	0	1-700 fan

INFORMATION ONLY

Appendix 3 - Exhaust Shaft Catch Basin and Ventilation Conditions Between July 1997 and October 1998

Date (mm/dd/yy)	Volume Removed From Catch Basin	Comments Weekend Status
12/10/97	440	No fan Saturday for 12 hrs 1-860 fan remainder of weekend
12/12/97	550	1-860 fan
1/2/98	220	1-860 fan
1/12/98	605	Power outage Saturday, 1-860 fan Sunday
1/19/98	0	1-700 fan
1/26/98	0	1-700 fan
2/9/98	0	1-700 fan
2/16/98	605	Saturday outage 0530-1946. Except for 3 hours 1- 860 fan. Rest of weekend 1-860 fan
2/23/98	0	1-860 fan until 0810 then 1-700 fan
3/2/98	0	1-700 fan
3/9/98	0	1-700 fan
3/16/98	605	1-860 fan until 0723 then 1-700 fan rest of day
3/23/98	0	1-700 fan
3/30/98	0	1-700 fan
4/6/98	0	1-860 fan until 0733 then 1-700 fan
4/13/98	0	1-700 fan until 1130 then 2-860 fans until 1230 then 1-700 fan rest of day
4/20/98	0	1-700 fan
4/27/98	0	1-700 fan
5/4/98	660	Saturday 0600-1730 no fans. Rest of weekend 1-860 fan.
5/11/98	550	Saturday 9.5 hours no fans. Rest of weekend 1-860 fan.
5/18/98	495	1-860 fan. Work was being done on the new 700c fan connection
5/20/98	110	Flow reduced overnight to 1-860 fan
6/1/98	330	1-860 fan all weekend
6/10/98	90	1-860 fan overnight 6/9/98
6/15/98	385	1-860 fan all weekend

INFORMATION ONLY

Appendix 3 - Exhaust Shaft Catch Basin and Ventilation Conditions Between July 1997 and October 1998

Date (mm/dd/yy)	Volume Removed From Catch Basin	Comments Weekend Status
6/22/98	165	Sunday 1-860 fan in service 700b serviced 0335 for vibration alarms
7/1/98	770	1-860 fan until 0745, 1700 fan rest of day.
7/7/98	330	1-700 fan all weekend
7/14/98	220	Ventilation outages for 700 C installation
7/16/98	275	Ventilation outages for 700 C installation
7/23/98	165	Running 1-700. Extremely humid conditions.25% RH per CMR
7/24/98	220	Power outage to support 700c fan installation
7/27/98	825	Power outage to support 700c fan installation
7/28/98	330	Power outage to support 700c fan installation
8/3/98	495	1-860 fan for 700c fan installation
8/10/98	1265	Friday @ 1500 1-fan 860 Saturday at 0525, all fans secured, Sunday at 1600, 1-860 fan support for fan installation
8/24/98	990	8/22/98 700A fan secured at 0545, no fans running 8/22/98 until 1300. 860A was started, ran remainder of the weekend.
8/27/98	1155	On Wednesday, 8/26/98, 700B fan secured at 1800 for high vibration. 1-860 fan started shortly thereafter. At 0749 Thursday, 8/27/98, 700A fan started. Ran most of day except for some 700C tests. Humidity has been high.
9/1/98	330	1-700 fan operating except for short periods during testing of 700c. Weather conditions during this period have been extremely humid.
10/5/98	385	On Saturday 10/03/98, at 1400 flow was reduced to 1-860 fan by an unplanned shift to filtration. The remainder of the weekend was 1-860 fan. On Monday morning at approximately 0800, flow was reestablished with 1-700 fan.
10/26/98	660	On Friday, 10/23/98 at 2400 flow was reduced to 1-860 fan. The 860 fan was secured at 0800 on Saturday 10/24/98 until 1700. One fan was started at 0700 on Monday 10/26/98

INFORMATION ONLY

Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
1-Jan-96	0.00	0.00
2-Jan-96	0.01	0.01
3-Jan-96	0.00	0.01
4-Jan-96	0.00	0.01
5-Jan-96	0.00	0.01
6-Jan-96	0.00	0.01
7-Jan-96	0.00	0.01
8-Jan-96	0.00	0.01
9-Jan-96	0.00	0.01
10-Jan-96	0.00	0.01
11-Jan-96	0.00	0.01
12-Jan-96	0.00	0.01
13-Jan-96	0.00	0.01
14-Jan-96	0.00	0.01
15-Jan-96	0.00	0.01
16-Jan-96	0.00	0.01
17-Jan-96	0.00	0.01
18-Jan-96	0.00	0.01
19-Jan-96	0.00	0.01
20-Jan-96	0.00	0.01
21-Jan-96	0.00	0.01
22-Jan-96	0.00	0.01
23-Jan-96	0.00	0.01
24-Jan-96	0.00	0.01
25-Jan-96	0.00	0.01
26-Jan-96	0.00	0.01
27-Jan-96	0.00	0.01
28-Jan-96	0.00	0.01
29-Jan-96	0.00	0.01
30-Jan-96	0.00	0.01
31-Jan-96	0.00	0.01
1-Feb-96	0.00	0.01
2-Feb-96	0.00	0.01
3-Feb-96	0.00	0.01
4-Feb-96	0.00	0.01
5-Feb-96	0.00	0.01
6-Feb-96	0.00	0.01
7-Feb-96	0.00	0.01

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
8-Feb-96	0.00	0.01
9-Feb-96	0.00	0.01
10-Feb-96	0.00	0.01
11-Feb-96	0.00	0.01
12-Feb-96	0.00	0.01
13-Feb-96	0.00	0.01
14-Feb-96	0.00	0.01
15-Feb-96	0.00	0.01
16-Feb-96	0.00	0.01
17-Feb-96	0.00	0.01
18-Feb-96	0.00	0.01
19-Feb-96	0.00	0.01
20-Feb-96	0.00	0.01
21-Feb-96	0.00	0.01
22-Feb-96	0.00	0.01
23-Feb-96	0.00	0.01
24-Feb-96	0.00	0.01
25-Feb-96	0.00	0.01
26-Feb-96	0.00	0.01
27-Feb-96	0.00	0.01
28-Feb-96	0.00	0.01
29-Feb-96	0.00	0.01
1-Mar-96	0.00	0.01
2-Mar-96	0.00	0.01
3-Mar-96	0.00	0.01
4-Mar-96	0.00	0.01
5-Mar-96	0.00	0.01
6-Mar-96	0.00	0.01
7-Mar-96	0.00	0.01
8-Mar-96	0.00	0.01
9-Mar-96	0.00	0.01
10-Mar-96	0.00	0.01
11-Mar-96	0.00	0.01
12-Mar-96	0.00	0.01
13-Mar-96	0.00	0.01
14-Mar-96	0.00	0.01
15-Mar-96	0.00	0.01
16-Mar-96	0.00	0.01

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
17-Mar-96	0.00	0.01
18-Mar-96	0.00	0.01
19-Mar-96	0.00	0.01
20-Mar-96	0.00	0.01
21-Mar-96	0.00	0.01
22-Mar-96	0.00	0.01
23-Mar-96	0.00	0.01
24-Mar-96	0.00	0.01
25-Mar-96	0.00	0.01
26-Mar-96	0.00	0.01
27-Mar-96	0.00	0.01
28-Mar-96	0.00	0.01
29-Mar-96	0.00	0.01
30-Mar-96	0.00	0.01
31-Mar-96	0.00	0.01
1-Apr-96	0.00	0.01
2-Apr-96	0.00	0.01
3-Apr-96	0.00	0.01
4-Apr-96	0.16	0.17
5-Apr-96	0.40	0.57
6-Apr-96	0.00	0.57
7-Apr-96	0.00	0.57
8-Apr-96	0.00	0.57
9-Apr-96	0.00	0.57
10-Apr-96	0.00	0.57
11-Apr-96	0.00	0.57
12-Apr-96	0.00	0.57
13-Apr-96	0.00	0.57
14-Apr-96	0.00	0.57
15-Apr-96	0.00	0.57
16-Apr-96	0.00	0.57
17-Apr-96	0.00	0.57
18-Apr-96	0.00	0.57
19-Apr-96	0.00	0.57
20-Apr-96	0.00	0.57
21-Apr-96	0.00	0.57
22-Apr-96	0.00	0.57
23-Apr-96	0.00	0.57

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
24-Apr-96	0.00	0.57
25-Apr-96	0.00	0.57
26-Apr-96	0.00	0.57
27-Apr-96	0.00	0.57
28-Apr-96	0.00	0.57
29-Apr-96	0.00	0.57
30-Apr-96	0.00	0.57
1-May-96	0.00	0.57
2-May-96	0.00	0.57
3-May-96	0.00	0.57
4-May-96	0.00	0.57
5-May-96	0.00	0.57
6-May-96	0.00	0.57
7-May-96	0.00	0.57
8-May-96	0.00	0.57
9-May-96	0.00	0.57
10-May-96	0.00	0.57
11-May-96	0.00	0.57
12-May-96	0.00	0.57
13-May-96	0.00	0.57
14-May-96	0.00	0.57
15-May-96	0.00	0.57
16-May-96	0.00	0.57
17-May-96	0.00	0.57
18-May-96	0.00	0.57
19-May-96	0.00	0.57
20-May-96	0.00	0.57
21-May-96	0.00	0.57
22-May-96	0.00	0.57
23-May-96	0.00	0.57
24-May-96	0.00	0.57
25-May-96	0.00	0.57
26-May-96	0.00	0.57
27-May-96	0.00	0.57
28-May-96	0.00	0.57
29-May-96	0.00	0.57
30-May-96	0.02	0.59
31-May-96	0.00	0.59

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
1-Jun-96	0.00	0.59
2-Jun-96	0.00	0.59
3-Jun-96	0.23	0.82
4-Jun-96	0.00	0.82
5-Jun-96	0.00	0.82
6-Jun-96	0.00	0.82
7-Jun-96	0.00	0.82
8-Jun-96	0.00	0.82
9-Jun-96	0.00	0.82
10-Jun-96	0.00	0.82
11-Jun-96	0.00	0.82
12-Jun-96	0.00	0.82
13-Jun-96	0.00	0.82
14-Jun-96	1.20	2.02
15-Jun-96	0.00	2.02
16-Jun-96	0.00	2.02
17-Jun-96	0.00	2.02
18-Jun-96	0.00	2.02
19-Jun-96	0.00	2.02
20-Jun-96	0.00	2.02
21-Jun-96	0.00	2.02
22-Jun-96	0.00	2.02
23-Jun-96	0.00	2.02
24-Jun-96	0.05	2.07
25-Jun-96	0.58	2.65
26-Jun-96	0.10	2.75
27-Jun-96	0.15	2.90
28-Jun-96	0.15	3.05
29-Jun-96	0.00	3.05
30-Jun-96	0.00	3.05
1-Jul-96	0.00	3.05
2-Jul-96	0.00	3.05
3-Jul-96	0.00	3.05
4-Jul-96	0.00	3.05
5-Jul-96	0.00	3.05
6-Jul-96	0.00	3.05
7-Jul-96	0.00	3.05
8-Jul-96	0.00	3.05

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
9-Jul-96	0.01	3.06
10-Jul-96	0.17	3.23
11-Jul-96	0.00	3.23
12-Jul-96	0.00	3.23
13-Jul-96	0.72	3.95
14-Jul-96	0.00	3.95
15-Jul-96	0.11	4.06
16-Jul-96	0.01	4.07
17-Jul-96	0.00	4.07
18-Jul-96	0.00	4.07
19-Jul-96	0.00	4.07
20-Jul-96	0.15	4.22
21-Jul-96	0.00	4.22
22-Jul-96	0.00	4.22
23-Jul-96	0.00	4.22
24-Jul-96	0.00	4.22
25-Jul-96	0.34	4.56
26-Jul-96	0.00	4.56
27-Jul-96	0.01	4.57
28-Jul-96	0.00	4.57
29-Jul-96	0.00	4.57
30-Jul-96	0.00	4.57
31-Jul-96	0.00	4.57
1-Aug-96	0.12	4.69
2-Aug-96	0.00	4.69
3-Aug-96	0.00	4.69
4-Aug-96	0.00	4.69
5-Aug-96	0.50	5.19
6-Aug-96	0.00	5.19
7-Aug-96	0.00	5.19
8-Aug-96	0.00	5.19
9-Aug-96	0.00	5.19
10-Aug-96	0.00	5.19
11-Aug-96	0.00	5.19
12-Aug-96	0.96	6.15
13-Aug-96	0.00	6.15
14-Aug-96	0.00	6.15
15-Aug-96	0.00	6.15

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
16-Aug-96	0.00	6.15
17-Aug-96	0.00	6.15
18-Aug-96	0.00	6.15
19-Aug-96	0.38	6.53
20-Aug-96	0.10	6.63
21-Aug-96	0.00	6.63
22-Aug-96	0.00	6.63
23-Aug-96	0.00	6.63
24-Aug-96	0.00	6.63
25-Aug-96	0.00	6.63
26-Aug-96	1.59	8.22
27-Aug-96	0.00	8.22
28-Aug-96	0.20	8.42
29-Aug-96	1.27	9.69
30-Aug-96	0.00	9.69
31-Aug-96	0.00	9.69
1-Sep-96	0.00	9.69
2-Sep-96	0.00	9.69
3-Sep-96	0.15	9.84
4-Sep-96	0.06	9.90
5-Sep-96	0.00	9.90
6-Sep-96	0.00	9.90
7-Sep-96	0.00	9.90
8-Sep-96	0.00	9.90
9-Sep-96	0.04	9.94
10-Sep-96	0.00	9.94
11-Sep-96	0.00	9.94
12-Sep-96	0.53	10.47
13-Sep-96	0.00	10.47
14-Sep-96	0.00	10.47
15-Sep-96	0.00	10.47
16-Sep-96	0.36	10.83
17-Sep-96	0.00	10.83
18-Sep-96	0.00	10.83
19-Sep-96	0.00	10.83
20-Sep-96	0.00	10.83
21-Sep-96	0.00	10.83
22-Sep-96	0.00	10.83

INFORMATION ONLY

Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
23-Sep-96	0.00	10.83
24-Sep-96	0.00	10.83
25-Sep-96	0.01	10.84
26-Sep-96	0.00	10.84
27-Sep-96	0.00	10.84
28-Sep-96	0.00	10.84
29-Sep-96	0.00	10.84
30-Sep-96	0.00	10.84
1-Oct-96	0.00	10.84
2-Oct-96	0.00	10.84
3-Oct-96	0.00	10.84
4-Oct-96	0.00	10.84
5-Oct-96	0.00	10.84
6-Oct-96	0.00	10.84
7-Oct-96	0.00	10.84
8-Oct-96	0.00	10.84
9-Oct-96	0.00	10.84
10-Oct-96	0.00	10.84
11-Oct-96	0.00	10.84
12-Oct-96	0.00	10.84
13-Oct-96	0.00	10.84
14-Oct-96	0.00	10.84
15-Oct-96	0.00	10.84
16-Oct-96	0.00	10.84
17-Oct-96	0.00	10.84
18-Oct-96	0.00	10.84
19-Oct-96	0.00	10.84
20-Oct-96	0.00	10.84
21-Oct-96	0.00	10.84
22-Oct-96	0.05	10.89
23-Oct-96	0.00	10.89
24-Oct-96	0.00	10.89
25-Oct-96	0.00	10.89
26-Oct-96	0.00	10.89
27-Oct-96	0.00	10.89
28-Oct-96	0.01	10.90
29-Oct-96	0.00	10.90
30-Oct-96	0.00	10.90

INFORMATION ONLY

Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
31-Oct-96	0.00	10.90
1-Nov-96	0.00	10.90
2-Nov-96	0.00	10.90
3-Nov-96	0.00	10.90
4-Nov-96	0.00	10.90
5-Nov-96	0.00	10.90
6-Nov-96	0.00	10.90
7-Nov-96	0.00	10.90
8-Nov-96	0.00	10.90
9-Nov-96	0.00	10.90
10-Nov-96	0.00	10.90
11-Nov-96	0.00	10.90
12-Nov-96	0.00	10.90
13-Nov-96	0.00	10.90
14-Nov-96	0.00	10.90
15-Nov-96	0.00	10.90
16-Nov-96	0.00	10.90
17-Nov-96	0.00	10.90
18-Nov-96	0.00	10.90
19-Nov-96	0.00	10.90
20-Nov-96	0.00	10.90
21-Nov-96	0.00	10.90
22-Nov-96	0.00	10.90
23-Nov-96	0.00	10.90
24-Nov-96	0.00	10.90
25-Nov-96	0.00	10.90
26-Nov-96	0.00	10.90
27-Nov-96	0.00	10.90
28-Nov-96	0.00	10.90
29-Nov-96	0.00	10.90
30-Nov-96	0.00	10.90
1-Dec-96	0.00	10.90
2-Dec-96	0.42	11.32
3-Dec-96	0.00	11.32
4-Dec-96	0.00	11.32
5-Dec-96	0.00	11.32
6-Dec-96	0.00	11.32
7-Dec-96	0.00	11.32

INFORMATION ONLY

Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
8-Dec-96	0.00	11.32
9-Dec-96	0.00	11.32
10-Dec-96	0.00	11.32
11-Dec-96	0.00	11.32
12-Dec-96	0.00	11.32
13-Dec-96	0.00	11.32
14-Dec-96	0.00	11.32
15-Dec-96	0.00	11.32
16-Dec-96	0.00	11.32
17-Dec-96	0.00	11.32
18-Dec-96	0.00	11.32
19-Dec-96	0.00	11.32
20-Dec-96	0.00	11.32
21-Dec-96	0.00	11.32
22-Dec-96	0.00	11.32
23-Dec-96	0.00	11.32
24-Dec-96	0.00	11.32
25-Dec-96	0.00	11.32
26-Dec-96	0.00	11.32
27-Dec-96	0.00	11.32
28-Dec-96	0.00	11.32
29-Dec-96	0.00	11.32
30-Dec-96	0.00	11.32
31-Dec-96	0.00	11.32
1-Jan-97	0.00	0.00
2-Jan-97	0.00	0.00
3-Jan-97	0.00	0.00
4-Jan-97	0.00	0.00
5-Jan-97	0.00	0.00
6-Jan-97	0.00	0.00
7-Jan-97	0.00	0.00
8-Jan-97	0.15	0.15
9-Jan-97	0.00	0.15
10-Jan-97	0.00	0.15
11-Jan-97	0.00	0.15
12-Jan-97	0.00	0.15
13-Jan-97	0.00	0.15
14-Jan-97	0.00	0.15

INFORMATION ONLY

Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
15-Jan-97	0.00	0.15
16-Jan-97	0.00	0.15
17-Jan-97	0.00	0.15
18-Jan-97	0.00	0.15
19-Jan-97	0.00	0.15
20-Jan-97	0.00	0.15
21-Jan-97	0.00	0.15
22-Jan-97	0.00	0.15
23-Jan-97	0.00	0.15
24-Jan-97	0.00	0.15
25-Jan-97	0.00	0.15
26-Jan-97	0.00	0.15
27-Jan-97	0.00	0.15
28-Jan-97	0.00	0.15
29-Jan-97	0.00	0.15
30-Jan-97	0.00	0.15
31-Jan-97	0.00	0.15
1-Feb-97	0.00	0.15
2-Feb-97	0.00	0.15
3-Feb-97	0.00	0.15
4-Feb-97	0.00	0.15
5-Feb-97	0.00	0.15
6-Feb-97	0.00	0.15
7-Feb-97	0.00	0.15
8-Feb-97	0.00	0.15
9-Feb-97	0.00	0.15
10-Feb-97	0.00	0.15
11-Feb-97	0.00	0.15
12-Feb-97	0.00	0.15
13-Feb-97	0.00	0.15
14-Feb-97	1.06	1.21
15-Feb-97	0.00	1.21
16-Feb-97	0.00	1.21
17-Feb-97	0.00	1.21
18-Feb-97	0.00	1.21
19-Feb-97	0.02	1.23
20-Feb-97	0.01	1.24
21-Feb-97	0.00	1.24

INFORMATION ONLY

Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
22-Feb-97	0.00	1.24
23-Feb-97	0.00	1.24
24-Feb-97	0.00	1.24
25-Feb-97	0.00	1.24
26-Feb-97	0.00	1.24
27-Feb-97	0.00	1.24
28-Feb-97	0.17	1.41
1-Mar-97	0.00	1.41
2-Mar-97	0.05	1.46
3-Mar-97	0.00	1.46
4-Mar-97	0.00	1.46
5-Mar-97	0.00	1.46
6-Mar-97	0.00	1.46
7-Mar-97	0.00	1.46
8-Mar-97	0.00	1.46
9-Mar-97	0.00	1.46
10-Mar-97	0.00	1.46
11-Mar-97	0.00	1.46
12-Mar-97	0.00	1.46
13-Mar-97	0.00	1.46
14-Mar-97	0.00	1.46
15-Mar-97	0.00	1.46
16-Mar-97	0.00	1.46
17-Mar-97	0.00	1.46
18-Mar-97	0.00	1.46
19-Mar-97	0.00	1.46
20-Mar-97	0.00	1.46
21-Mar-97	0.00	1.46
22-Mar-97	0.00	1.46
23-Mar-97	0.00	1.46
24-Mar-97	0.00	1.46
25-Mar-97	0.00	1.46
26-Mar-97	0.04	1.50
27-Mar-97	0.00	1.50
28-Mar-97	0.00	1.50
29-Mar-97	0.00	1.50
30-Mar-97	0.00	1.50
31-Mar-97	0.00	1.50

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
1-Apr-97	0.18	1.68
2-Apr-97	0.00	1.68
3-Apr-97	0.00	1.68
4-Apr-97	0.00	1.68
5-Apr-97	0.00	1.68
6-Apr-97	0.00	1.68
7-Apr-97	0.00	1.68
8-Apr-97	0.00	1.68
9-Apr-97	0.00	1.68
10-Apr-97	0.00	1.68
11-Apr-97	0.00	1.68
12-Apr-97	0.00	1.68
13-Apr-97	0.00	1.68
14-Apr-97	0.00	1.68
15-Apr-97	0.00	1.68
16-Apr-97	0.00	1.68
17-Apr-97	0.00	1.68
18-Apr-97	0.18	1.86
19-Apr-97	0.00	1.86
20-Apr-97	0.00	1.86
21-Apr-97	0.00	1.86
22-Apr-97	0.00	1.86
23-Apr-97	0.00	1.86
24-Apr-97	0.00	1.86
25-Apr-97	0.55	2.41
26-Apr-97	0.50	2.91
27-Apr-97	0.00	2.91
28-Apr-97	0.00	2.91
29-Apr-97	0.00	2.91
30-Apr-97	0.00	2.91
1-May-97	0.00	2.91
2-May-97	0.00	2.91
3-May-97	0.00	2.91
4-May-97	0.00	2.91
5-May-97	0.00	2.91
6-May-97	0.00	2.91
7-May-97	0.54	3.45
8-May-97	0.00	3.45

INFORMATION ONLY

Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
9-May-97	0.50	3.95
10-May-97	0.00	3.95
11-May-97	0.00	3.95
12-May-97	0.03	3.98
13-May-97	0.00	3.98
14-May-97	0.00	3.98
15-May-97	0.00	3.98
16-May-97	0.00	3.98
17-May-97	0.00	3.98
18-May-97	0.00	3.98
19-May-97	0.00	3.98
20-May-97	0.04	4.02
21-May-97	0.45	4.47
22-May-97	0.06	4.53
23-May-97	0.00	4.53
24-May-97	0.00	4.53
25-May-97	0.00	4.53
26-May-97	0.00	4.53
27-May-97	0.00	4.53
28-May-97	0.00	4.53
29-May-97	0.00	4.53
30-May-97	0.00	4.53
31-May-97	0.00	4.53
1-Jun-97	0.00	4.53
2-Jun-97	0.00	4.53
3-Jun-97	0.00	4.53
4-Jun-97	0.00	4.53
5-Jun-97	0.00	4.53
6-Jun-97	0.00	4.53
7-Jun-97	0.00	4.53
8-Jun-97	0.00	4.53
9-Jun-97	0.45	4.98
10-Jun-97	0.00	4.98
11-Jun-97	0.00	4.98
12-Jun-97	0.81	5.79
13-Jun-97	0.00	5.79
14-Jun-97	0.00	5.79
15-Jun-97	0.00	5.79

INFORMATION ONLY

Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
16-Jun-97	0.23	6.02
17-Jun-97	0.00	6.02
18-Jun-97	0.00	6.02
19-Jun-97	0.00	6.02
20-Jun-97	0.00	6.02
21-Jun-97	0.00	6.02
22-Jun-97	0.00	6.02
23-Jun-97	0.00	6.02
24-Jun-97	0.00	6.02
25-Jun-97	0.00	6.02
26-Jun-97	0.00	6.02
27-Jun-97	0.85	6.87
28-Jun-97	0.00	6.87
29-Jun-97	0.00	6.87
30-Jun-97	0.00	6.87
1-Jul-97	0.00	6.87
2-Jul-97	0.00	6.87
3-Jul-97	0.00	6.87
4-Jul-97	0.00	6.87
5-Jul-97	0.00	6.87
6-Jul-97	0.00	6.87
7-Jul-97	2.46	9.33
8-Jul-97	0.00	9.33
9-Jul-97	1.25	10.58
10-Jul-97	0.00	10.58
11-Jul-97	0.00	10.58
12-Jul-97	0.00	10.58
13-Jul-97	0.00	10.58
14-Jul-97	0.00	10.58
15-Jul-97	0.00	10.58
16-Jul-97	0.00	10.58
17-Jul-97	0.00	10.58
18-Jul-97	0.00	10.58
19-Jul-97	0.00	10.58
20-Jul-97	0.00	10.58
21-Jul-97	0.00	10.58
22-Jul-97	0.00	10.58
23-Jul-97	0.00	10.58

INFORMATION ONLY

Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
24-Jul-97	0.00	10.58
25-Jul-97	0.00	10.58
26-Jul-97	0.00	10.58
27-Jul-97	0.00	10.58
28-Jul-97	0.00	10.58
29-Jul-97	0.72	11.30
30-Jul-97	0.09	11.39
31-Jul-97	0.82	12.21
1-Aug-97	0.00	12.21
2-Aug-97	0.00	12.21
3-Aug-97	0.00	12.21
4-Aug-97	0.00	12.21
5-Aug-97	0.00	12.21
6-Aug-97	0.51	12.72
7-Aug-97	0.11	12.83
8-Aug-97	0.00	12.83
9-Aug-97	0.00	12.83
10-Aug-97	0.00	12.83
11-Aug-97	0.00	12.83
12-Aug-97	0.00	12.83
13-Aug-97	1.14	13.97
14-Aug-97	0.00	13.97
15-Aug-97	0.00	13.97
16-Aug-97	0.00	13.97
17-Aug-97	0.00	13.97
18-Aug-97	0.01	13.98
19-Aug-97	0.00	13.98
20-Aug-97	0.00	13.98
21-Aug-97	0.00	13.98
22-Aug-97	0.01	13.99
23-Aug-97	0.00	13.99
24-Aug-97	0.00	13.99
25-Aug-97	0.02	14.01
26-Aug-97	0.00	14.01
27-Aug-97	0.00	14.01
28-Aug-97	0.00	14.01
29-Aug-97	0.00	14.01
30-Aug-97	0.00	14.01

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
31-Aug-97	0.00	14.01
1-Sep-97	0.00	14.01
2-Sep-97	0.00	14.01
3-Sep-97	0.00	14.01
4-Sep-97	1.08	15.09
5-Sep-97	0.01	15.10
6-Sep-97	0.00	15.10
7-Sep-97	0.00	15.10
8-Sep-97	0.00	15.10
9-Sep-97	0.00	15.10
10-Sep-97	0.01	15.11
11-Sep-97	0.00	15.11
12-Sep-97	0.00	15.11
13-Sep-97	0.00	15.11
14-Sep-97	0.00	15.11
15-Sep-97	0.00	15.11
16-Sep-97	0.00	15.11
17-Sep-97	0.00	15.11
18-Sep-97	0.00	15.11
19-Sep-97	0.00	15.11
20-Sep-97	0.00	15.11
21-Sep-97	0.00	15.11
22-Sep-97	1.72	16.83
23-Sep-97	0.00	16.83
24-Sep-97	0.00	16.83
25-Sep-97	0.00	16.83
26-Sep-97	0.00	16.83
27-Sep-97	0.00	16.83
28-Sep-97	0.00	16.83
29-Sep-97	0.00	16.83
30-Sep-97	0.00	16.83
1-Oct-97	0.00	16.83
2-Oct-97	0.00	16.83
3-Oct-97	0.00	16.83
4-Oct-97	0.00	16.83
5-Oct-97	0.00	16.83
6-Oct-97	0.00	16.83
7-Oct-97	0.27	17.10

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
8-Oct-97	1.06	18.16
9-Oct-97	0.00	18.16
10-Oct-97	0.04	18.20
11-Oct-97	0.00	18.20
12-Oct-97	0.00	18.20
13-Oct-97	0.04	18.24
14-Oct-97	0.00	18.24
15-Oct-97	0.00	18.24
16-Oct-97	0.00	18.24
17-Oct-97	0.00	18.24
18-Oct-97	0.00	18.24
19-Oct-97	0.00	18.24
20-Oct-97	0.00	18.24
21-Oct-97	0.00	18.24
22-Oct-97	0.00	18.24
23-Oct-97	0.40	18.64
24-Oct-97	0.00	18.64
25-Oct-97	0.00	18.64
26-Oct-97	0.00	18.64
27-Oct-97	0.07	18.71
28-Oct-97	0.00	18.71
29-Oct-97	0.00	18.71
30-Oct-97	0.00	18.71
31-Oct-97	0.00	18.71
1-Nov-97	0.00	18.71
2-Nov-97	0.00	18.71
3-Nov-97	0.00	18.71
4-Nov-97	0.00	18.71
5-Nov-97	0.00	18.71
6-Nov-97	0.00	18.71
7-Nov-97	0.00	18.71
8-Nov-97	0.00	18.71
9-Nov-97	0.00	18.71
10-Nov-97	0.00	18.71
11-Nov-97	0.00	18.71
12-Nov-97	0.18	18.89
13-Nov-97	0.00	18.89
14-Nov-97	0.00	18.89

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
15-Nov-97	0.00	18.89
16-Nov-97	0.00	18.89
17-Nov-97	0.05	18.94
18-Nov-97	0.00	18.94
19-Nov-97	0.00	18.94
20-Nov-97	0.00	18.94
21-Nov-97	0.00	18.94
22-Nov-97	0.00	18.94
23-Nov-97	0.00	18.94
24-Nov-97	0.00	18.94
25-Nov-97	0.00	18.94
26-Nov-97	0.00	18.94
27-Nov-97	0.00	18.94
28-Nov-97	0.00	18.94
29-Nov-97	0.00	18.94
30-Nov-97	0.00	18.94
1-Dec-97	0.00	18.94
2-Dec-97	0.02	18.96
3-Dec-97	0.00	18.96
4-Dec-97	0.02	18.98
5-Dec-97	0.00	18.98
6-Dec-97	0.00	18.98
7-Dec-97	0.02	19.00
8-Dec-97	0.00	19.00
9-Dec-97	0.00	19.00
10-Dec-97	0.00	19.00
11-Dec-97	0.00	19.00
12-Dec-97	0.00	19.00
13-Dec-97	0.00	19.00
14-Dec-97	0.00	19.00
15-Dec-97	0.00	19.00
16-Dec-97	0.00	19.00
17-Dec-97	0.00	19.00
18-Dec-97	0.00	19.00
19-Dec-97	0.00	19.00
20-Dec-97	0.00	19.00
21-Dec-97	0.00	19.00
22-Dec-97	0.00	19.00

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
23-Dec-97	1.30	20.30
24-Dec-97	0.00	20.30
25-Dec-97	0.00	20.30
26-Dec-97	0.00	20.30
27-Dec-97	0.00	20.30
28-Dec-97	0.00	20.30
29-Dec-97	0.50	20.80
30-Dec-97	0.00	20.80
31-Dec-97	0.00	20.80
1-Jan-98	0.00	0.00
2-Jan-98	0.00	0.00
3-Jan-98	0.00	0.00
4-Jan-98	0.00	0.00
5-Jan-98	0.05	0.05
6-Jan-98	0.00	0.05
7-Jan-98	0.00	0.05
8-Jan-98	0.00	0.05
9-Jan-98	0.00	0.05
10-Jan-98	0.00	0.05
11-Jan-98	0.00	0.05
12-Jan-98	0.00	0.05
13-Jan-98	0.00	0.05
14-Jan-98	0.00	0.05
15-Jan-98	0.00	0.05
16-Jan-98	0.00	0.05
17-Jan-98	0.00	0.05
18-Jan-98	0.00	0.05
19-Jan-98	0.00	0.05
20-Jan-98	0.00	0.05
21-Jan-98	0.00	0.05
22-Jan-98	0.00	0.05
23-Jan-98	0.00	0.05
24-Jan-98	0.00	0.05
25-Jan-98	0.00	0.05
26-Jan-98	0.00	0.05
27-Jan-98	0.00	0.05
28-Jan-98	0.00	0.05
29-Jan-98	0.00	0.05

INFORMATION ONLY

Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
30-Jan-98	0.00	0.05
31-Jan-98	0.00	0.05
1-Feb-98	0.00	0.05
2-Feb-98	0.00	0.05
3-Feb-98	0.00	0.05
4-Feb-98	0.07	0.12
5-Feb-98	0.00	0.12
6-Feb-98	0.00	0.12
7-Feb-98	0.00	0.12
8-Feb-98	0.00	0.12
9-Feb-98	0.00	0.12
10-Feb-98	0.00	0.12
11-Feb-98	0.00	0.12
12-Feb-98	0.00	0.12
13-Feb-98	0.00	0.12
14-Feb-98	0.00	0.12
15-Feb-98	0.01	0.13
16-Feb-98	0.00	0.13
17-Feb-98	0.00	0.13
18-Feb-98	0.00	0.13
19-Feb-98	0.00	0.13
20-Feb-98	0.00	0.13
21-Feb-98	0.00	0.13
22-Feb-98	0.00	0.13
23-Feb-98	0.00	0.13
24-Feb-98	0.00	0.13
25-Feb-98	0.00	0.13
26-Feb-98	0.00	0.13
27-Feb-98	0.00	0.13
28-Feb-98	0.00	0.13
1-Mar-98	0.00	0.13
2-Mar-98	0.00	0.13
3-Mar-98	0.00	0.13
4-Mar-98	0.00	0.13
5-Mar-98	0.00	0.13
6-Mar-98	0.00	0.13
7-Mar-98	0.00	0.13
8-Mar-98	0.00	0.13

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
9-Mar-98	0.00	0.13
10-Mar-98	0.00	0.13
11-Mar-98	0.00	0.13
12-Mar-98	0.00	0.13
13-Mar-98	0.00	0.13
14-Mar-98	0.00	0.13
15-Mar-98	0.00	0.13
16-Mar-98	0.00	0.13
17-Mar-98	0.49	0.62
18-Mar-98	0.00	0.62
19-Mar-98	0.00	0.62
20-Mar-98	0.00	0.62
21-Mar-98	0.00	0.62
22-Mar-98	0.00	0.62
23-Mar-98	0.00	0.62
24-Mar-98	0.00	0.62
25-Mar-98	0.00	0.62
26-Mar-98	0.00	0.62
27-Mar-98	0.00	0.62
28-Mar-98	0.00	0.62
29-Mar-98	0.00	0.62
30-Mar-98	0.00	0.62
31-Mar-98	0.00	0.62
1-Apr-98	0.00	0.62
2-Apr-98	0.00	0.62
3-Apr-98	0.00	0.62
4-Apr-98	0.00	0.62
5-Apr-98	0.00	0.62
6-Apr-98	0.00	0.62
7-Apr-98	0.00	0.62
8-Apr-98	0.00	0.62
9-Apr-98	0.00	0.62
10-Apr-98	0.00	0.62
11-Apr-98	0.00	0.62
12-Apr-98	0.00	0.62
13-Apr-98	0.00	0.62
14-Apr-98	0.00	0.62
15-Apr-98	0.00	0.62

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
16-Apr-98	0.00	0.62
17-Apr-98	0.00	0.62
18-Apr-98	0.00	0.62
19-Apr-98	0.00	0.62
20-Apr-98	0.00	0.62
21-Apr-98	0.00	0.62
22-Apr-98	0.00	0.62
23-Apr-98	0.00	0.62
24-Apr-98	0.00	0.62
25-Apr-98	0.00	0.62
26-Apr-98	0.00	0.62
27-Apr-98	0.00	0.62
28-Apr-98	0.00	0.62
29-Apr-98	0.00	0.62
30-Apr-98	0.00	0.62
1-May-98	0.00	0.62
2-May-98	0.00	0.62
3-May-98	0.00	0.62
4-May-98	0.00	0.62
5-May-98	0.00	0.62
6-May-98	0.00	0.62
7-May-98	0.00	0.62
8-May-98	0.00	0.62
9-May-98	0.00	0.62
10-May-98	0.00	0.62
11-May-98	0.00	0.62
12-May-98	0.00	0.62
13-May-98	0.00	0.62
14-May-98	0.00	0.62
15-May-98	0.00	0.62
16-May-98	0.00	0.62
17-May-98	0.00	0.62
18-May-98	0.00	0.62
19-May-98	0.00	0.62
20-May-98	0.00	0.62
21-May-98	0.00	0.62
22-May-98	0.05	0.67
23-May-98	0.00	0.67

INFORMATION ONLY

Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
24-May-98	0.00	0.67
25-May-98	0.00	0.67
26-May-98	0.00	0.67
27-May-98	0.00	0.67
28-May-98	0.00	0.67
29-May-98	0.00	0.67
30-May-98	0.00	0.67
31-May-98	0.00	0.67
1-Jun-98	0.00	0.67
2-Jun-98	0.00	0.67
3-Jun-98	0.00	0.67
4-Jun-98	0.00	0.67
5-Jun-98	0.00	0.67
6-Jun-98	0.00	0.67
7-Jun-98	0.00	0.67
8-Jun-98	0.00	0.67
9-Jun-98	0.00	0.67
10-Jun-98	0.21	0.88
11-Jun-98	0.00	0.88
12-Jun-98	0.00	0.88
13-Jun-98	0.00	0.88
14-Jun-98	0.00	0.88
15-Jun-98	0.00	0.88
16-Jun-98	0.00	0.88
17-Jun-98	0.00	0.88
18-Jun-98	0.00	0.88
19-Jun-98	0.00	0.88
20-Jun-98	0.00	0.88
21-Jun-98	0.00	0.88
22-Jun-98	0.00	0.88
23-Jun-98	0.00	0.88
24-Jun-98	0.00	0.88
25-Jun-98	0.00	0.88
26-Jun-98	0.00	0.88
27-Jun-98	0.00	0.88
28-Jun-98	0.00	0.88
29-Jun-98	0.00	0.88
30-Jun-98	0.00	0.88

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
1-Jul-98	0.00	0.88
2-Jul-98	0.00	0.88
3-Jul-98	0.00	0.88
4-Jul-98	0.00	0.88
5-Jul-98	0.00	0.88
6-Jul-98	0.00	0.88
7-Jul-98	0.00	0.88
8-Jul-98	0.00	0.88
9-Jul-98	0.00	0.88
10-Jul-98	0.00	0.88
11-Jul-98	0.00	0.88
12-Jul-98	0.00	0.88
13-Jul-98	0.00	0.88
14-Jul-98	0.40	1.28
15-Jul-98	0.52	1.80
16-Jul-98	0.35	2.15
17-Jul-98	0.00	2.15
18-Jul-98	0.00	2.15
19-Jul-98	0.00	2.15
20-Jul-98	0.00	2.15
21-Jul-98	0.00	2.15
22-Jul-98	0.90	3.05
23-Jul-98	0.00	3.05
24-Jul-98	0.00	3.05
25-Jul-98	0.00	3.05
26-Jul-98	0.00	3.05
27-Jul-98	0.00	3.05
28-Jul-98	0.14	3.19
29-Jul-98	0.00	3.19
30-Jul-98	0.00	3.19
31-Jul-98	0.00	3.19
1-Aug-98	0.00	3.19
2-Aug-98	0.00	3.19
3-Aug-98	0.00	3.19
4-Aug-98	0.00	3.19
5-Aug-98	0.06	3.25
6-Aug-98	0.39	3.64
7-Aug-98	0.00	3.64

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
8-Aug-98	0.00	3.64
9-Aug-98	0.00	3.64
10-Aug-98	0.00	3.64
11-Aug-98	0.00	3.64
12-Aug-98	0.00	3.64
13-Aug-98	0.08	3.72
14-Aug-98	0.00	3.72
15-Aug-98	0.00	3.72
16-Aug-98	0.00	3.72
17-Aug-98	0.00	3.72
18-Aug-98	0.00	3.72
19-Aug-98	0.00	3.72
20-Aug-98	0.00	3.72
21-Aug-98	0.32	4.04
22-Aug-98	0.00	4.04
23-Aug-98	0.00	4.04
24-Aug-98	0.00	4.04
25-Aug-98	0.00	4.04
26-Aug-98	0.00	4.04
27-Aug-98	0.00	4.04
28-Aug-98	0.17	4.21
29-Aug-98	0.00	4.21
30-Aug-98	0.00	4.21
31-Aug-98	0.00	4.21
1-Sep-98	0.00	4.21
2-Sep-98	0.00	4.21
3-Sep-98	0.00	4.21
4-Sep-98	0.00	4.21
5-Sep-98	0.00	4.21
6-Sep-98	0.00	4.21
7-Sep-98	0.00	4.21
8-Sep-98	0.00	4.21
9-Sep-98	0.02	4.23
10-Sep-98	0.04	4.27
11-Sep-98	0.00	4.27
12-Sep-98	0.00	4.27
13-Sep-98	0.00	4.27
14-Sep-98	0.00	4.27

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (inches)
15-Sep-98	0.05	4.32
16-Sep-98	0.00	4.32
17-Sep-98	0.00	4.32
18-Sep-98	0.00	4.32
19-Sep-98	0.00	4.32
20-Sep-98	0.00	4.32
21-Sep-98	0.00	4.32
22-Sep-98	0.00	4.32
23-Sep-98	0.00	4.32
24-Sep-98	0.00	4.32
25-Sep-98	0.00	4.32
26-Sep-98	0.00	4.32
27-Sep-98	0.00	4.32
28-Sep-98	0.06	4.38
29-Sep-98	0.00	4.38
30-Sep-98	0.00	4.38
1-Oct-98	0.00	4.38
2-Oct-98	0.00	4.38
3-Oct-98	0.00	4.38
4-Oct-98	0.00	4.38
5-Oct-98	0.00	4.38
6-Oct-98	0.00	4.38
7-Oct-98	0.00	4.38
8-Oct-98	0.00	4.38
9-Oct-98	0.00	4.38
10-Oct-98	0.00	4.38
11-Oct-98	0.00	4.38
12-Oct-98	0.00	4.38
13-Oct-98	0.00	4.38
14-Oct-98	0.00	4.38
15-Oct-98	0.00	4.38
16-Oct-98	0.00	4.38
17-Oct-98	0.00	4.38
18-Oct-98	0.00	4.38
19-Oct-98	0.00	4.38
20-Oct-98	0.12	4.50
21-Oct-98	0.19	4.69
22-Oct-98	0.01	4.70

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Appendix 4 - Precipitation Measured at the WIPP Site Weather Station Between January 1996 and October 1998

Date (mm/dd/yy)	Rainfall (inches)	Total Accumulative Rainfall (Inches)
23-Oct-98	0.02	4.72
24-Oct-98	0.00	4.72
25-Oct-98	0.00	4.72
26-Oct-98	0.00	4.72
27-Oct-98	0.00	4.72
28-Oct-98	0.29	5.01
29-Oct-98	0.00	5.01
30-Oct-98	0.00	5.01
31-Oct-98	0.69	5.70