GW - 73

WORK PLANS

1994

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SITE INVESTIGATION
SOIL VAPOR EXTRACTION PILOT TEST
WORK PLAN
DOWELL SCHLUMBERGER, INCORPORATED
HOBBS, NEW MEXICO

May 25, 1994

Submitted To:

New Mexico Oil Conservation Division
Hobbs, New Mexico 88241

Submitted By:

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1.0 INTRODUCTION

1.0 INTRODUCTION

This document presents a work plan for proposed soil vapor extraction (SVE) pilot tests at the Dowell Schlumberger Incorporated (Dowell) facilities located at the intersection of Lovington Highway and Bender Boulevard, in Hobbs, New Mexico (Figure 1-1). Removal of underground storage tanks in 1989 and subsequent investigation by Reed and Associates, Inc. and recent closure of the acid collection system indicate the presence of volatile hydrocarbons in the soils. SVE systems have been shown to be very effective in removing volatile contaminants from unsaturated soils. To determine the feasibility and design parameters for final remedial system design it is necessary to conduct pilot scale tests.

Dowell proposes to perform a series of three SVE pilot tests at the Hobbs facility during the summer of 1994.

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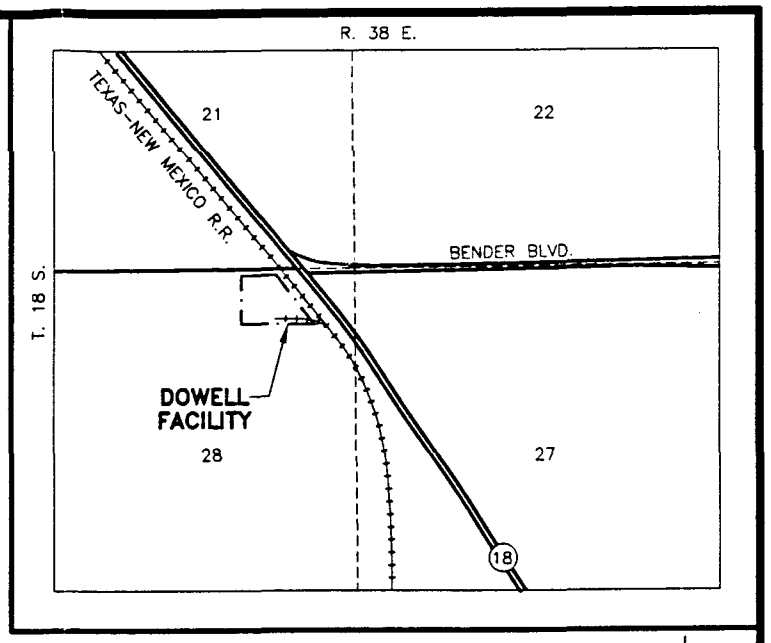
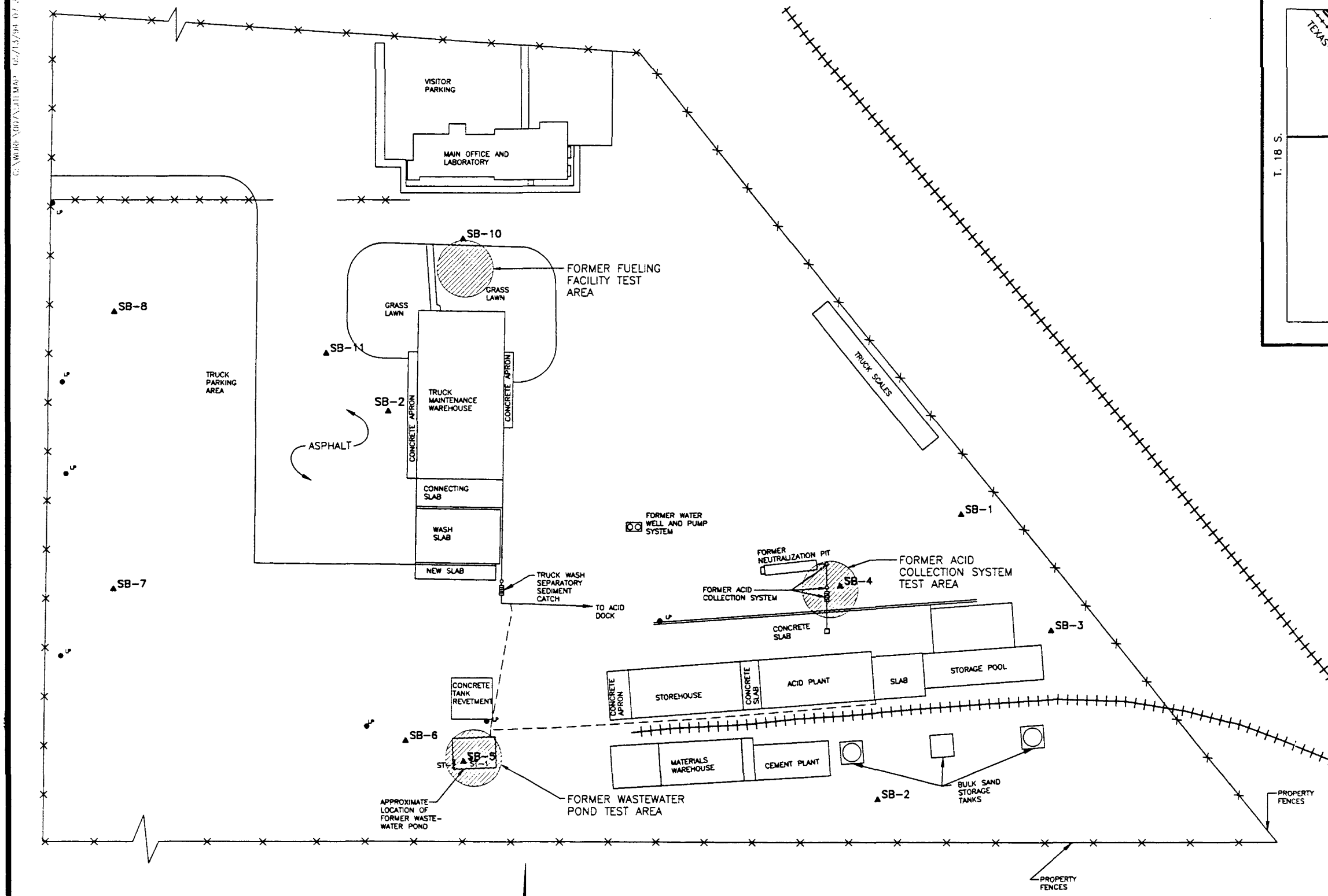


LOCATION MAP

0 2000'
SCALE



FACILITY MAP

0 30 60
APPROXIMATE SCALE

EXPLANATION

- LP — LIGHT POLE WITH OVERHEAD POWER LINES
- SB-1 — SOIL BORING LOCATIONS
- ST-1 — STRATIOGRAPHIC TEST HOLE

(FIGURE TAKEN FROM REED AND ASSOCIATES INC.)

FIGURE 1-1

SITE MAP

DOWELL SCHLUMBERGER INCORPORATED
HOBBS, NEW MEXICO

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2.0 WORK PLAN

2.0 WORK PLAN

Three localized areas within the site will be investigated. These areas are the former acid collection system, former wastewater disposal pond, and the former fueling facilities. Dowell proposes to evaluate the feasibility of SVE remedial systems at these areas by conducting SVE pilot tests at each location (Figure 1-1).

SVE has the potential to be an effective technique to remediate contaminated soil at the facility due to the geology of the area. Based on investigations by Reed and Associates, Inc. The geologic formation present at the ground is the Tertiary Ogallala Formation, which consists of unconsolidated sands, silts, clays, and gravel, capped by caliche. The caliche cap at the site is approximately 25 to 35 feet thick and is variable in composition and thickness. Beneath the caliche cap is a fine grained sand and sandstone with minor amounts of gravel. The water table is at 68 to 70 feet below ground surface.

To help determine the vertical variability of the unsaturated zone it is proposed to do the three pilot tests at different depths. These depths and locations are:

Shallow Caliche, 10-15 Ft., Former Acid Collection System Area;
Deep Caliche, 20-25 Ft., Former Wastewater Pond Area;
Unconsolidated Sand, 30-35 Ft., Former Fueling Area.

The SVE pilot tests will determine the permeability of the unsaturated soils, radius of influence, and contaminant concentrations in the extracted soil vapors. These parameters will be used to design a full-scale SVE system. The sections that follow describe the procedure, equipment, and data analysis associated with the pilot test.

2.1 Well Description, Layout, and Installation

Each pilot test will require the installation of an extraction well and a series of piezometers. At the extraction well, soil vapor is removed by the application of a vacuum (negative pressure) while the pressure response within the soil is monitored by piezometers. The proposed spatial arrangements of the extraction well and piezometers is shown on Figure 2-1. Monitoring the pressure response in the piezometers will define the radius of influence and identify the presence of horizontal anisotropy.

Extraction wells and piezometers will be drilled to varying depths, as shown on Figure 2-1, using an air rotary drill rig. Drilling personnel will have appropriate OSHA safety training. All cuttings generated during drilling will be containerized and properly disposed.

Typical extraction well and piezometer completion details are shown on Figures 2-2 and 2-3, respectively. The well bore and casing diameter of an extraction well and vent well will be larger than the piezometers as indicated on Figures 2-2 and 2-3. All extraction wells and piezometers will be sealed at the surface to prevent the flow of air into the subsurface.

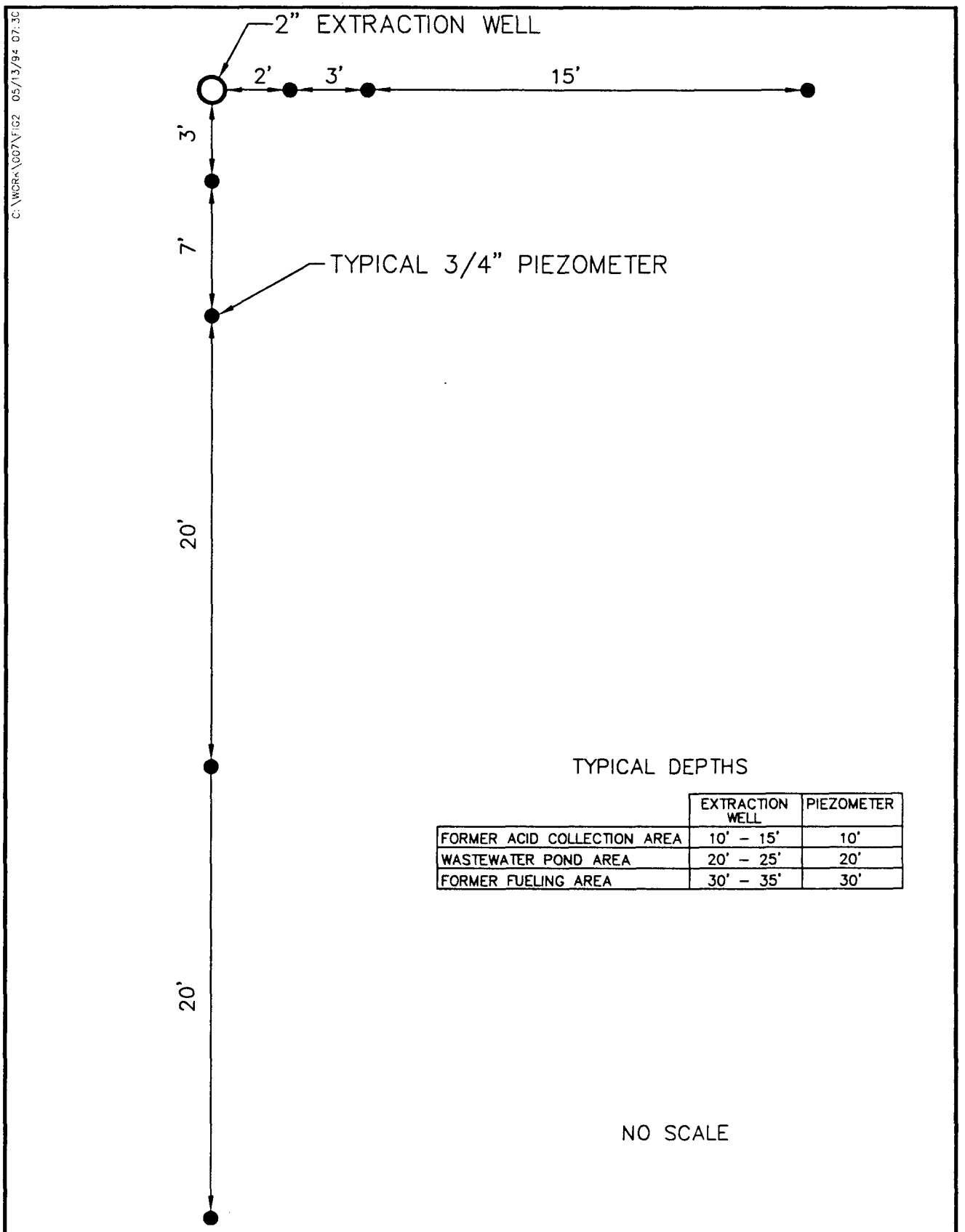
After completion of the SVE tests at all three locations, the piezometers will be abandoned. The casing will be removed and bentonite chips poured into the borehole to within 1 foot of the ground surface and hydrated. Gravel will be used to fill the upper 1 foot of the boreholes located in areas of existing gravel surface. Because the extraction wells have the potential to be used in a full-scale SVE system, these wells will not be abandoned after testing. The extraction wellheads will be finished at-grade, secured, and designed to allow modification for future use in an SVE system.

2.2 Test Equipment

The arrangement of the vacuum source (blower) and appurtenances is shown on Figure 2-4. This system collectively is referred to as the test unit. The appurtenances include a vacuum gauge near the blower, a particulate filter, a valved atmospheric air inlet, a flow meter, a moisture/particulate knockout pot, a vacuum gauge near the well head, and carbon canisters to treat the vapors.

Soil vapor from the extraction well is drawn out through a vertical leg where the vacuum is measured using a Bourdon tube vacuum gauge. The vapor then enters a moisture/particulate knockout pot where the flow velocity is reduced, allowing moisture to condense and particles to settle. The knockout pot, includes a particulate filter and an atmospheric air inlet valve to control the magnitude of vacuum. Another Bourdon tube vacuum gauge measures the vacuum at the blower inlet.

A Rotron regenerative blower will be used to provide the vacuum source for the SVE test unit. The blower is driven by a 3 hp, 240V, single phase, explosion proof motor. The capacity



TYPICAL DEPTHS

	EXTRACTION WELL	PIEZOMETER
FORMER ACID COLLECTION AREA	10' – 15'	10'
WASTEWATER POND AREA	20' – 25'	20'
FORMER FUELING AREA	30' – 35'	30'

NO SCALE

FIGURE 2–1: SOIL VAPOR EXTRACTION PILOT TEST, PIEZOMETER LAYOUT, DOWELL SCHLUMBERGER INCORPORATED, HOBBS, NEW MEXICO

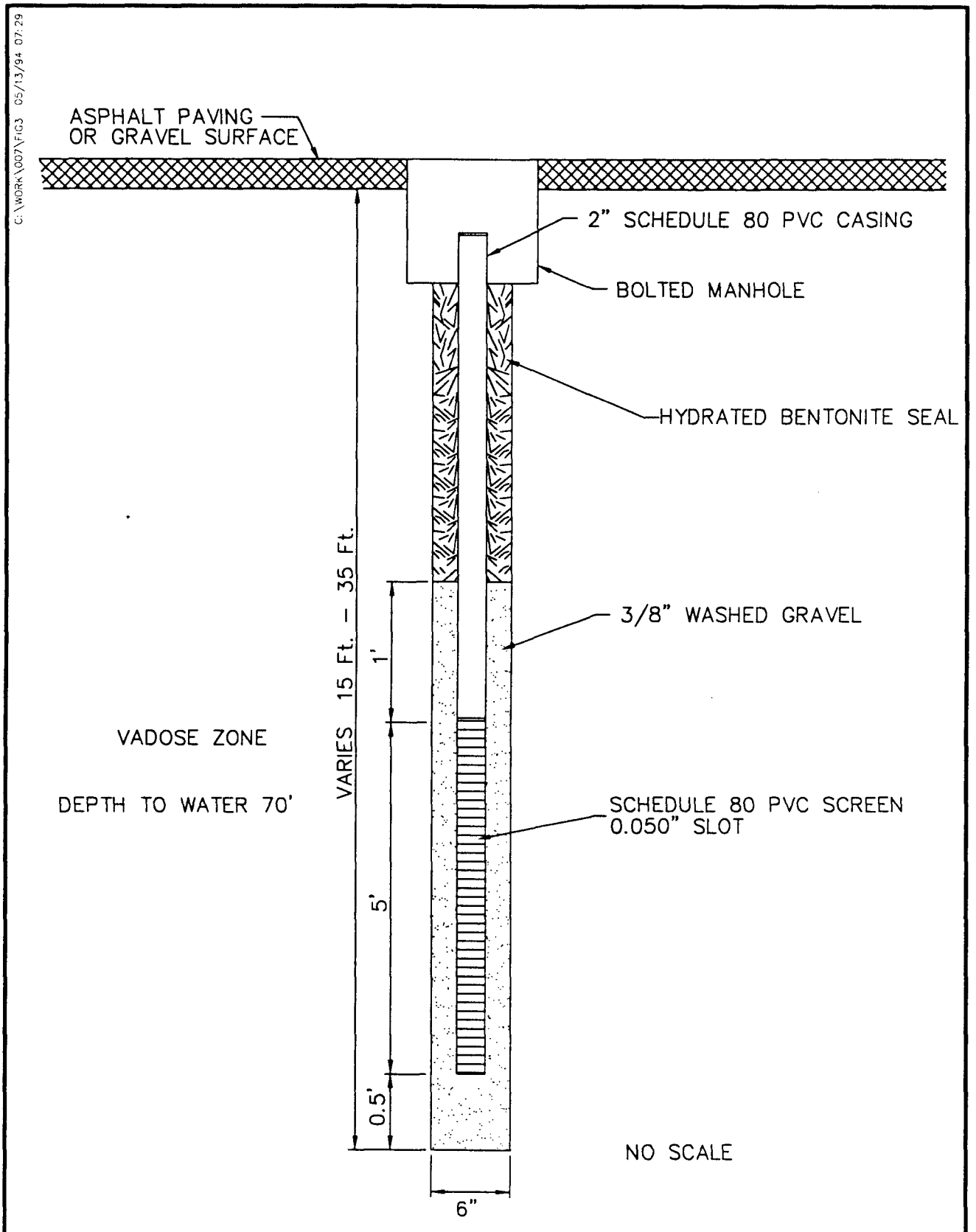


FIGURE 2-2: TYPICAL EXTRACTION WELL FOR SVE PILOT TEST, DOWELL SCHLUMBERGER INCORPORATED, HOBBS, NEW MEXICO

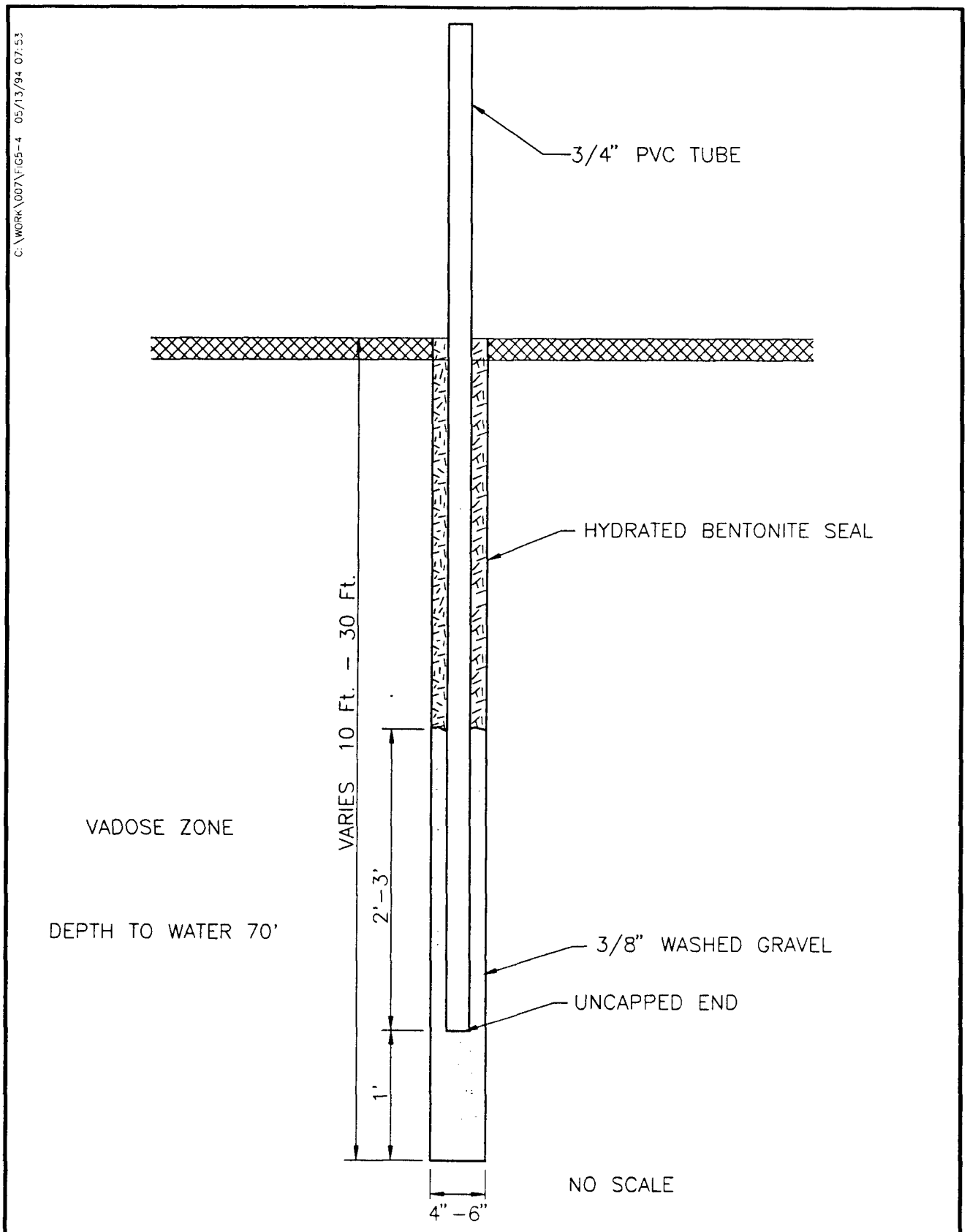


FIGURE 2-3: TYPICAL PIEZOMETER FOR PRESSURE MONITORING DURING SVE PILOT TEST, DOWELL SCHLUMBERGER INCORPORATED, HOBBS, NEW MEXICO

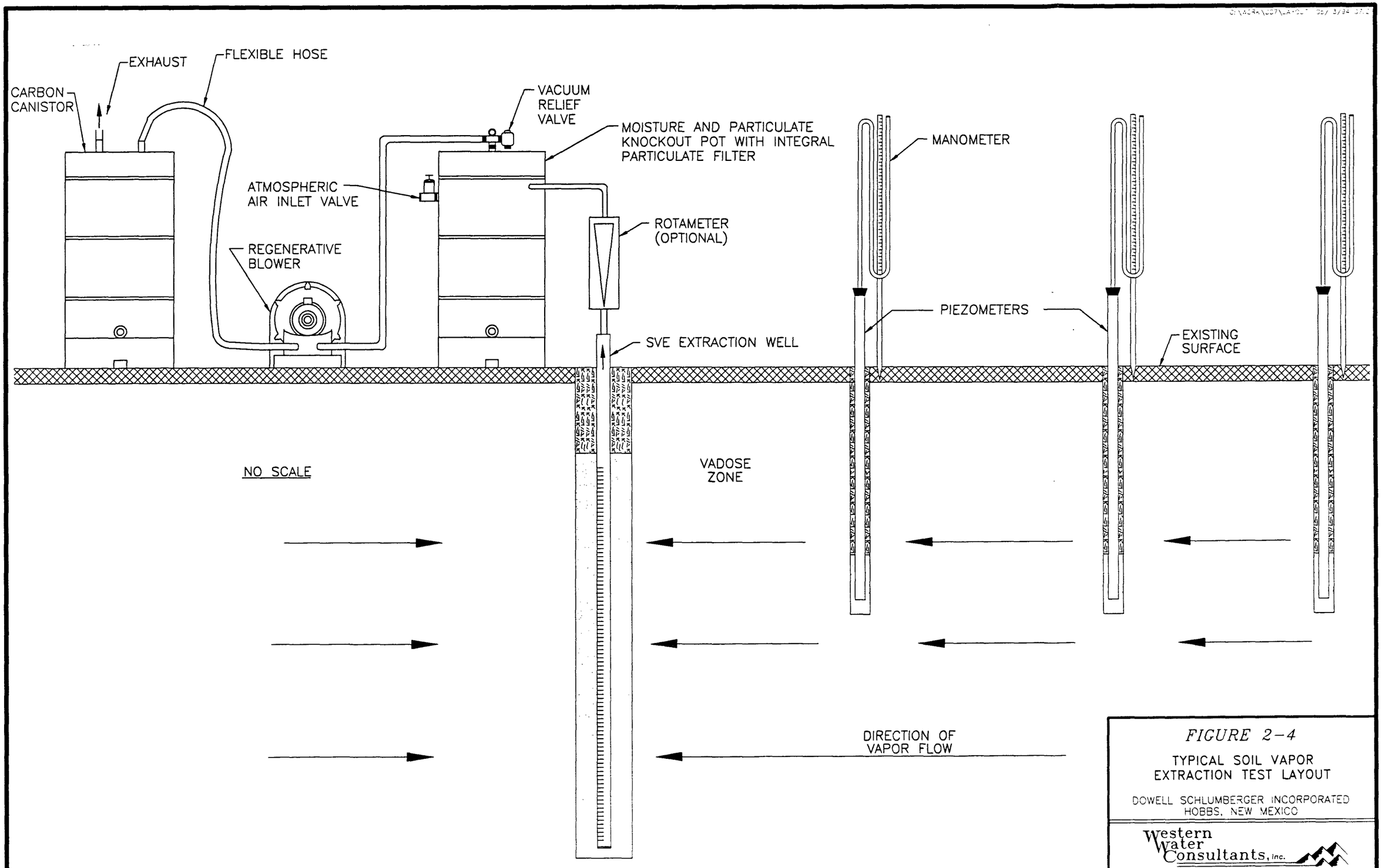


FIGURE 2-4

TYPICAL SOIL VAPOR EXTRACTION TEST LAYOUT

DOWELL SCHLUMBERGER INCORPORATED
HOBBS, NEW MEXICO

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of this blower is sufficient to accommodate all test requirements. After being drawn by the blower, the vapor will be treated by activated carbon canisters.

The vacuum monitoring equipment at the piezometers will consist of manometers constructed from Tygon tubing containing water as the manometer fluid. A scale will be attached to the manometer for reading differential pressure. For more rapid, automatic readings at certain piezometers, pressure transducers connected to a data logger will be used in manometers constructed from 1-inch PVC pipe.

2.3 Test Procedure and Monitoring

A series of tests will be performed at each area. Prior to these tests, a short duration test will be performed to adjust the test unit to a reasonable flow rate and well vacuum. After the extraction well head vacuum is properly adjusted, the blower will be shut off and the formation allowed to return to atmospheric pressure, as indicated by the manometers at vacuum monitoring points. A test is started by turning on the blower, and simultaneously starting a stop-watch and the data logger. To maintain a constant flow rate, the atmospheric air inlet valve will be adjusted as necessary. One person calls out times at specified intervals when manometer measurements are to be recorded. The test will continue until no increase in the vacuum in the piezometers is detected, indicating that air flow through the soil had reached equilibrium. At this point the test will be complete and the blower will be shut off. When the pressure in the formation returns to atmospheric, the sequence will be repeated.

At least four tests of 1-2 hours duration each, is anticipated at each area. Emissions of the SVE pilot test systems will be monitored using an Environmental Instruments 580D Photoionization Detector (PID). In addition to the PID readings, samples of the emissions will be captured in tedlar bags. Bag samples will then be subjected to gas chromatographic (GC) analysis using a Sentex Scentograph GC.

2.4 Data Analysis

The two primary physical parameters defined by the pilot tests are soil permeability and the radius of influence. Soil permeability is determined using the methods of Johnson et. al. (1990) as presented in Appendix A. For each test, the pressure changes recorded at a

piezometer are plotted against the natural log of elapsed time. Using values calculated from the plots and estimates of porosity and atmospheric pressure, the permeability can be calculated. With the piezometers arranged at right angles to the extraction well, permeability differences with respect to direction can be evaluated.

The radius of influence defines the area around the extraction well that experiences air flow, and represents the region that can be remediated by a single SVE well. The calculation of the radius of influence is described in Appendix A. The radius of influence is expected to be large because the vadose zone is likely to be highly permeable.

Contaminant concentrations determined in soil vapor will be used to estimate the rate and magnitude of contaminant removal from the vadose zone. These data will be used to determine appropriate treatment of the soil vapors and to obtain air emission permits for the operation of a full-scale SVE system.

3.0 AIR QUALITY

3.0 AIR QUALITY

During the SVE pilot tests air emission of contaminants will be negligible. The air emission rate will vary between 10 and 50 standard cubic feet per minute (scfm) depending on the permeability of the soils. The soil vapors measured by Reed and Associates, Inc. showed concentrations of volatile organic hydrocarbons up to 100 parts per million (ppm). However, these vapors will be treated with activated carbon. Removal of volatile contaminants is expected to be near 100% for such short duration tests.

The New Mexico Environmental Department, Air Quality Bureau has been notified of these tests. No formal permitting is required for the pilot tests since they are small and are for the purpose of gathering data for estimating emissions. The full-scale SVE system design will incorporate air quality data from the pilot test in planning for treatment of soil vapors and air quality permitting.

REFERENCES

REFERENCES

Johnson, P.C., C.C. Stanley, N.W. Kemblowski, D.L. Byers, and J.D. Colthart, 1990, a Practical Approach to the Design, Operation, and Monitoring of the Situ Soil-Venting Systems, Ground Water Monitoring Review, 10 (2), pp. 159-178.

Geraghty & Miller, Inc., "Underground Storage Tank Removal, Hobbs, New Mexico," Prepared for Dowell Schlumberger, Incorporated, 1989.

APPENDIX A

SVE PILOT TEST
PARAMETER CALCULATIONS

Permeability Calculations

Determining permeability of the formation from the SVE pilot test data will be accomplished using the methods of Johnson et al (1990). An approximate solution to a transient state equation for radial flow of gas through soil to a well was shown to be:

$$P' = \frac{Q}{4\pi m(k/\mu)}\left[-0.5772 - \ln\left(\frac{r^2 e\mu}{4ktP_{atm}}\right)\right] \quad (1)$$

Where:

P'	=	"gauge" pressure measured at a distance r and time t
m	=	formation thickness
r	=	radial distance
k	=	soil permeability
μ	=	absolute viscosity of vapor (assumed to be air)
e	=	vapor filled porosity
t	=	time
Q	=	volumetric flow rate from extraction well
P_{atm}	=	ambient atmospheric pressure

This solution is valid where the variable U is sufficiently small to minimize error in the truncation of the Taylor series approximation, such that:

$$U = \frac{r^2 e\mu}{4ktP_{atm}} < 0.1$$

The assumption used to develop these equations are similar to those made in many analyses of flow through a porous media and are presented in Johnson et al (1990).

Equation 1 can be rearranged as:

$$P' = \frac{Q}{4\pi m(k/\mu)}\left[-0.5772 - \ln\frac{r^2 e\mu}{4kP_{atm}}\right)\right] + \frac{Q}{4\pi m(k/\mu)}\ln t \qquad (2)$$

This equation is linear and it can be seen that a plot of pressure change versus the natural log of time should yield a straight line. Isolating the permeability and utilizing values from a plot of pressure change versus the natural log of time yields:

$$k = \frac{r^2 e\mu}{4P_{atm}} \exp^{\left(\frac{(y\text{-}intercept)}{(slope)} + 0.5772\right)} \qquad (3)$$

The first step in data analysis is the creation of plots of pressure drop versus the natural log of time for each test. Slopes and y-axis intercepts will be obtained from these plots either by direct measurement or performing a least-squares linear regression on the appropriate data. By utilizing these values for slope, y-axis intercept, and porosity along with distances between wells, an estimated atmospheric pressure, and the viscosity of air, the permeability will be calculated with Equation 3.

Radius of Influence

By examining Equation 2 it can be seen that if time is held constant, a plot of pressure drop versus the natural log of inverse radius squared should also yield a straight line. By utilizing a large time, after the effects of a recharge boundary are noticed, the point where this line crosses the x-axis indicates where there is no pressure drop. This distance is defined as the radius of influence.

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CLOSURE REPORT
FOR AN ACID COLLECTION SYSTEM
DOWELL SCHLUMBERGER INCORPORATED
HOBBS, NEW MEXICO

February 4, 1994

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1.0 PURPOSE

The purpose of this report is to document the closure of an acid collection system located at the Dowell Schlumberger Incorporated Facility in Hobbs, New Mexico. Western Water Consultants, Inc. (WWC) of Laramie, Wyoming directed the activities during the month of December 1993.

2.0 BACKGROUND

2.0 BACKGROUND

2.1 Site Description

The Dowell Schlumberger Incorporated (Dowell) Facility is located at 1105 West Bender Blvd., Hobbs, New Mexico. A site plan of the facility is shown on Figure 2-1.

The Dowell facility provides services for area oil and gas production wells. Services include well cementing, acidizing/stimulating and formation fracturing. The facility consists of a main office building and laboratory, truck maintenance building and wash bay, aboveground storage tanks, dry chemicals warehouse, acid plant and several other warehouses.

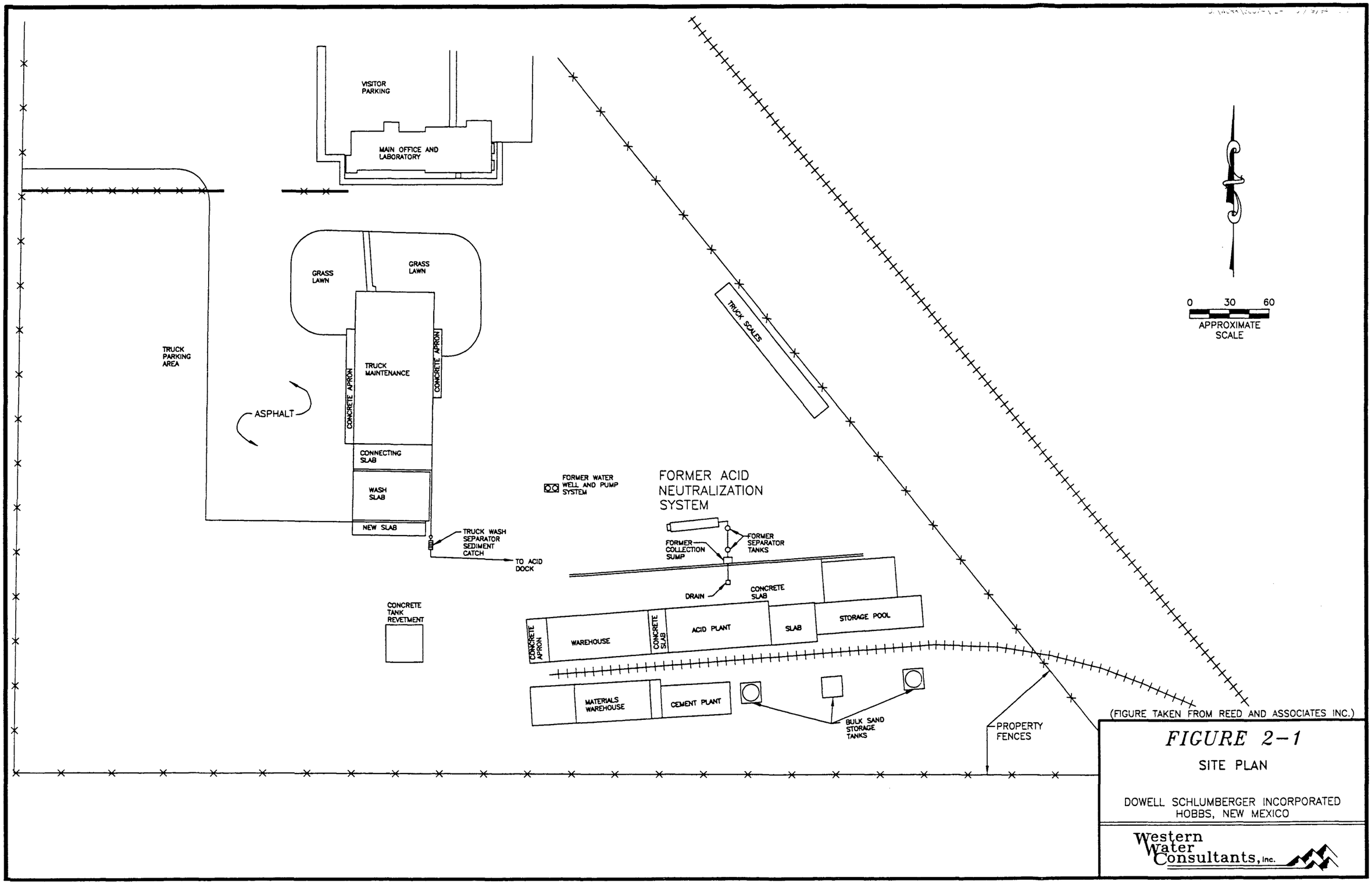
The former acid collection system is located in the south central portion of the facility. The system is comprised of a former acid neutralization pit, which was previously filled with concrete, two 1,000 gallon fiberglass separator tanks, a concrete collection sump, and a drain (Figure 2-2).

The former system received spent acid heels following well stimulating services provided by Dowell. The system also received storm water from the acid plant.

The collection sump and drain were the only components of the system still in use. When the sump became full, the contents were pumped into a 2,000 gallon holding tank. The contents of the tank were then disposed.

2.2 System Wastewater Characterization

Prior to initiating closure activities WWC obtained samples from each of the two 1,000 gallon separator tanks on April 13, 1993. Samples OW-N and OW-S were analyzed for Toxicity



(FIGURE TAKEN FROM REED AND ASSOCIATES INC.)

FIGURE 2-1

SITE PLAN

DOWELL SCHLUMBERGER INCORPORATED
HOBBS, NEW MEXICO

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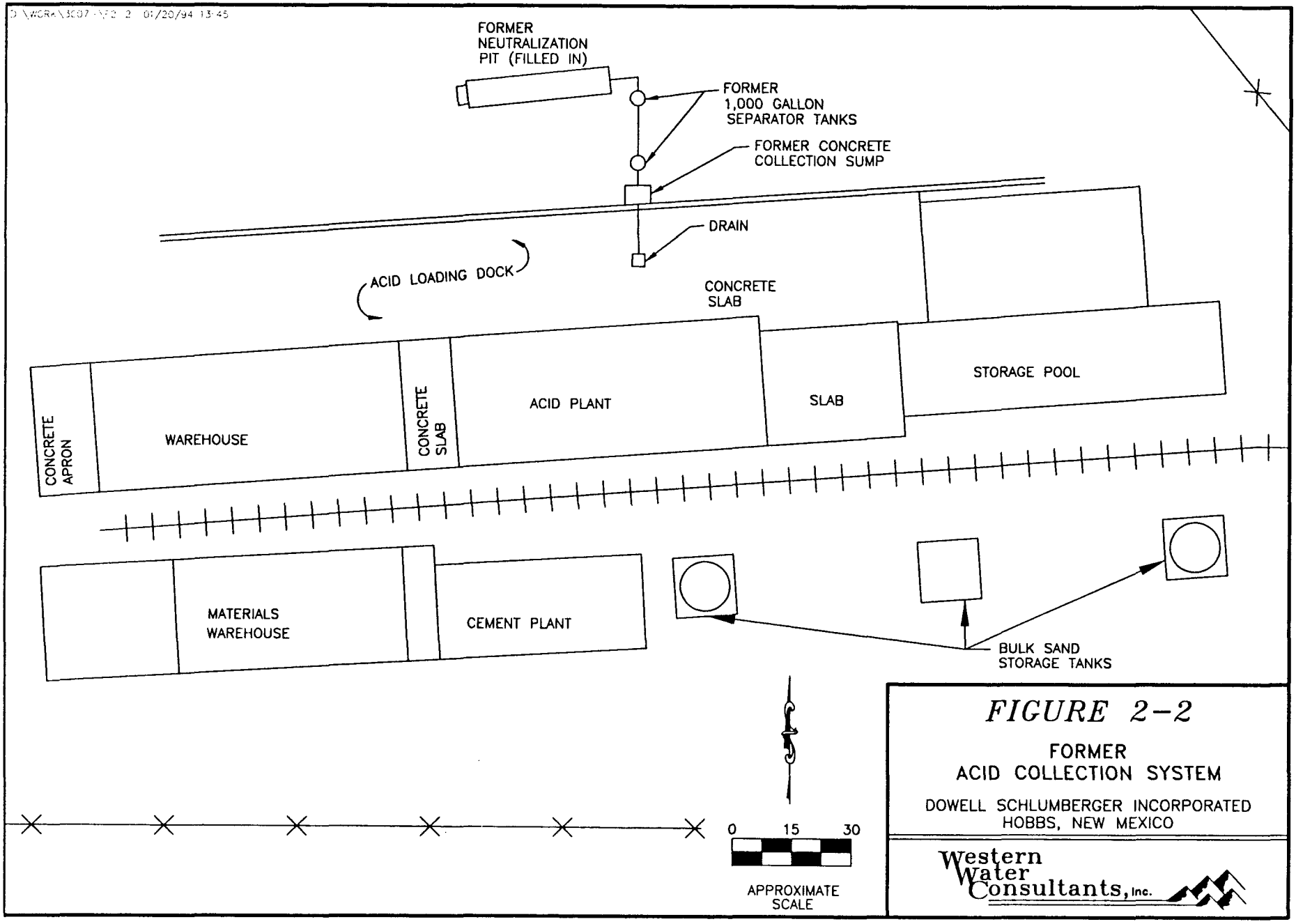

FIGURE 2-2

FORMER
ACID COLLECTION SYSTEM

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HOBBS, NEW MEXICO

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Characteristic Leaching Procedure (TCLP) volatile organics compounds (VOCs) and metals; total petroleum hydrocarbons (TPH) by modified method 8015; and for toxicity characteristics. The laboratory data reports from Cardinal Labs of Hobbs, New Mexico are contained in Appendix A. The wastewater was determined to be non-hazardous.

3.0 ACID COLLECTION AND NEUTRALIZATION SYSTEM CLOSURE

3.0 ACID COLLECTION AND NEUTRALIZATION SYSTEM CLOSURE

Closure of the system occurred during the month of December 1993.

3.1 System Wastewater

Fluids remaining in the system were neutralized using 30% Sodium Hydroxide (NaOH) supplied by Dowell. Approximately 115 gallons of NaOH were mixed with the 2,940 gallons (70 barrels at 42 gallons per barrel) of wastewater remaining in the system at the time of closure to achieve near neutral pH values.

Prior to evacuation from the system by I/W Inc. and disposal at their Loco Hills Disposal facility, pH of the wastewater was evaluated in the field using an Orion SA 230 pH meter. Recorded pH values ranged from 6.4 to 7.9 standard pH units at the time of disposal. Disposal receipts for the wastewater are contained in Appendix B.

3.2 1,000 Gallon Separator Tanks and Sump

The two 1,000 gallon fiberglass separator tanks and one concrete sump were excavated and removed from the ground on December 6 and 7, 1993. Excavated soil and debris adhering to the tanks and concrete were placed in a polyethylene lined, temporary revetment constructed adjacent to the excavation. Once clean, the concrete sump was demolished. The tanks and concrete sump pieces were placed on polyethylene sheeting and are being held pending proper disposal arrangements.

3.2.1 Debris Sample

A single composite sample representing the debris removed from the tanks and sump was obtained. Cardinal Labs Inc. analyzed the sample for hazardous characteristics (ignitability, reactivity, and corrosivity). The results of the laboratory analyses are shown in Table 3-1 below. The laboratory data reports are included in Appendix C.

Table 3-1

Hazardous Characteristics
Debris Sampling

Test Parameters	Concentration
Ignitability	> 140 degrees F.
Reactivity - S	1.33
Reactivity - CN	<1.0
Corrosivity	8.74 pH

3.3 Surrounding and Subsoil Excavation

3.3.1 Phase I Excavation Activities

An initial phase of excavation activities occurred simultaneously with the removal of the 1,000 gallon separator tanks and concrete collection sump (Figure 2-2). Soils exposed during excavation activities were screened in the field for total organic vapors (TOVs) using an Environmental Instruments 580D Photoionization Detector (PID), and for pH using an Orion SA 230 pH meter. Soils exhibiting either elevated TOVs and/or low/acidic pH values were excavated and placed on polyethylene sheeting within the temporary revetment. Excavation activities attempted to remove all soils exhibiting elevated TOVs and/or low pH values.

Concentrations of TOVs measured in the northern portion of the excavation were near background levels of 20 parts per million (ppm) and below. TOV concentrations increased in

the area surrounding the former collection sump and were highest directly beneath the sump. Concentrations in this area ranged to 2,000 ppm.

pH values measured during Phase I activities were all within the acceptable range of 4.5 to 8.0 standard pH unit.

Excavation activities were stopped on December 8, 1993 due to the potential of disrupting facility operations if excavation continued.

3.3.1.1 Phase I Soil Sampling

In order to evaluate the effectiveness of excavation during Phase I activities, two composite laboratory soil samples (Sump Ex. and South Wall) were obtained from the southern end of the excavation in the proximity of the former collection sump. These samples were analyzed for volatile organics in accordance with EPA Method 8240 by Cardinal Labs Inc. Table 3-2 below illustrates the compounds detected and their concentrations. The laboratory data reports for these samples are included in Appendix C.

Table 3-2

Phase I Soil Sample Results

Compounds Detected	Concentration in mg/kg	
	Sump Ex.	South Wall
Ethylbenzene	25.6	13.0
Methylene Chloride	19.6	17.0

3.3.2 Investigative Borehole Installation

In response to the concentrations detected in the samples Sump Ex. and South Wall, Eades Water Well and Pump Service Inc. of Hobbs, New Mexico was contracted to install investigative boreholes in the vicinity of the acid loading dock (Figure 3-1). Boreholes were installed under the direction of WWC personnel on December 16 and 17, 1993. This activity was intended to direct the need for further excavation.

Air rotary drilling techniques were used to install the boreholes to depths no greater than 20 feet below the acid loading dock surface. Soil samples were obtained using a split spoon sampler. Samples were screened in the field for TOVs using the 580D PID.

Field screening indicated elevated TOV concentrations existed in boreholes BH-10, and BH-12. Values ranged to 320 parts per million (ppm) in the 16 to 18 foot interval of BH-10 and 210 ppm in the 14 to 15.5 foot interval of BH-12. Boreholes BH-11 and BH-13 exhibited background TOV concentrations of below 20 ppm.

3.3.3 Phase II Excavation Activities

Based on the borehole TOV concentrations, a second phase of excavation activities were directed by WWC personnel on December 28 and 29, 1993. The second phase excavation objectives were to excavate within the limits of the acid loading dock collection sump to the south, BH-11, and BH-13 to the west and east, respectfully.

Excavated soils were screened in the field for TOVs and pH. All soils removed with elevated TOVs and/or low acidic pH values were placed within the temporary revetment adjacent

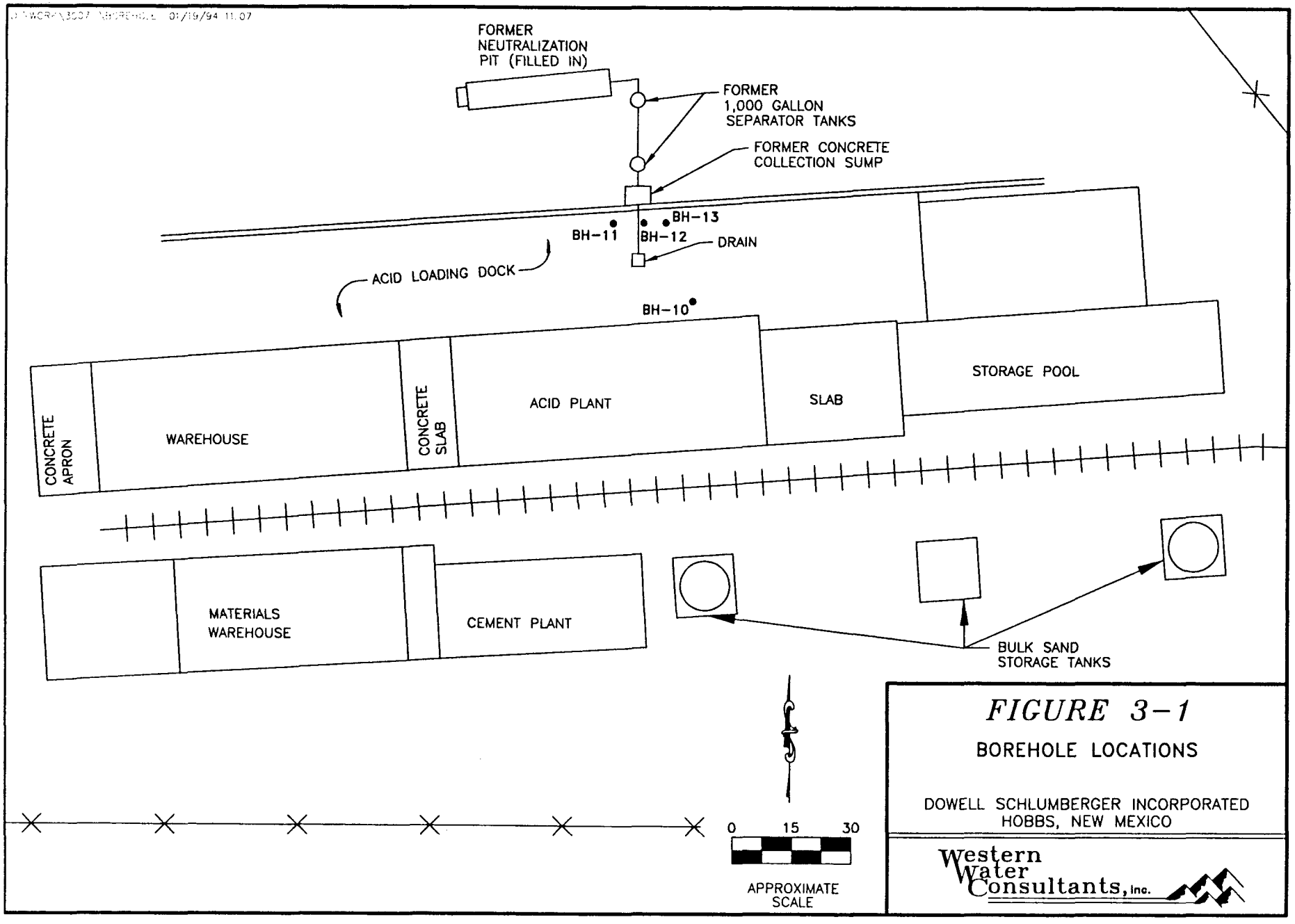

FIGURE 3-1

BOREHOLE LOCATIONS

DOWELL SCHLUMBERGER INCORPORATED
HOBBS, NEW MEXICO

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to the excavation. Excavation activities attempted to remove all soils exhibiting elevated TOVs or low/acidic pH values.

Soils removed during Phase II excavation activities revealed elevated TOV concentrations to the depth of 13 feet below the acid dock surface. TOV concentrations ranged to 1,600 ppm at this level. pH values of 5.0 to 8.0 were measured during Phase II activities.

3.4 Closure Soil Sampling

Once the excavation was complete, a single composite sample representing inplace material in the entire excavation (both phases) was collected. In addition, a single composite sample representing excavated material placed in the temporary revetment, approximate 100 cubic yards, was obtained for laboratory analysis. Cardinal Labs Inc. analyzed the samples for TCLP VOCs and metals; TPH by EPA Method 8015; and pH. The results of the analysis are shown on Table 3-3 and the laboratory data reports are included in Appendix C.

3.5 Material Disposal

Materials generated during closure activities awaiting disposal pending authorization from the NMOCD include the excavated soils, fiberglass tanks, and concrete pieces. Upon authorization, disposal of the excavated soils will occur at the East Carbon Development Corporation disposal facility in East Carbon City, Utah. The fiberglass tanks and concrete will be transported and disposed at the Lea County municipal landfill as routine construction debris.

Table 3-3: Acid Collection System Soil Analysis, Dowell Schlumberger Incorporated Facility Hobbs, New Mexico

		TCLP Organics (mg/L)									
Sample ID	Total Petroleum Hydrocarbon	Benzene	Carbon Tetrachloride	Chloro-benzene	Chloroform	1,2-Dichloro-ethane	1,1-Dichloro-ethene	Methyl Ethyl Ketone	Tetrachloro-ethene	Trichloro-ethene	Vinyl Chloride
TCLP limit	NA	0.5	0.5	100	6	0.5	0.7	200	0.7	0.5	0.2
Excavation	10,819	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.10)	ND(0.05)	ND(0.05)	ND(0.05)
Soil Pile	22,857	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	1.03	ND(0.05)	ND(0.05)	ND(0.05)

	Inorganics (mg/L)								
Sample ID	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	pH
TCLP limit	5	100	1	5	5	0.2	1	5	NA
Excavation	0.017	2.17	ND(0.002)	ND(0.02)	0.06	ND(0.0005)	0.012	0.027	7.6
Soil Pile	0.039	0.99	ND(0.002)	ND(0.02)	0.07	ND(0.0005)	0.007	0.031	7.8

Notes: TCLP - Toxicity Characteristic Leaching Procedure
ND - None detectable at the concentrations shown in parenthesis
NA - None applicable

APPENDIX A

Laboratory Results
Wastewater Characteristics

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TEXAS 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NEW MEXICO 88240

FINAL ANALYSIS REPORT

Company: Western Water Consultants, Inc. Date: 5/05/93
Address: 611 Skyline Rd. Lab#: H1200
City, State: Laramie, WY 82070

Project Name: 3007.1
Project Location:
Sampled by: SG Date: 4/13/93 Time:
Analyzed by: MF Date: 4/26/93 Time:
Type of Samples: H20 Sample Condition: GIST Units: mg/l

Samp #	Field Code	TRPHC	BENZENE	TOLUENE	ETHYL BENZENE	PARA-XYLENE	META-XYLENE	ORTHO-XYLENE	MTBE
1	OW-N	19.0	***	***	***	***	***	***	***
2	OW-S	7.0	***	***	***	***	***	***	***
	QC Recovery	***	***	***	***	***	***	***	***
	QC Spike	***	***	***	***	***	***	***	***
	Accuracy	***	***	***	***	***	***	***	***
	Air Blank	***	***	***	***	***	***	***	***

Methods - EPA METHOD 8015 MOD

Michael R. Fowler

Michael R. Fowler

Date 5/5/93

CARDINAL LABORATORIES

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TCLP ANALYSIS REPORT

Company: Western Water Consultants, Inc. Date: 5/05/93
Address: 611 Skyline Rd. Lab#: H1200-1
City, State: Laramie, WY 82070

Project Name: 3007.1
Project Location:
Sampled by: SG Date: 4/13/93
Type of Sample: Water Sample Condition: GIST

Sample ID: OW-N

TCLP INORGANICS (Leachate)

PARAMETER	RESULT	UNITS
Arsenic	<0.002	mg/L
Barium	<0.10	mg/L
Cadmium	<0.005	mg/L
Chromium	<0.05	mg/L
Lead	<0.10	mg/L
Mercury	<0.0002	mg/L
Selenium	<0.002	mg/L
Silver	<0.01	mg/L

TOXICITY CHARACTERISTICS

pH	0.76
Ignitability °F	134
Corrosivity	Yes (pH <2)
Reactivity-S	<5
Reactivity-CN	<0.01

Michael R. Fowler

Date 5/5/93

Michael R. Fowler

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FINAL ANALYSIS REPORT

Company: Western Water Consultants, Inc. Date: 05/14/93
Address: 611 Skyline road Lab # H1200-1
City, State: Laramie, WY 82070

Project Name: 3007.1
Project Location:
Sampled by: SG Date: 04/13/93
Type of Sample: Water Sample Condition: GIST
Sample ID: OW-N

TCLP VOLATILES

PARAMETER	RESULT	UNITS
Benzene	<0.835	mg/L
Carbon tetrachloride	<0.835	mg/L
Chlorobenzene	<0.835	mg/L
Chloroform	<0.835	mg/L
1,2-Dichloroethane	<0.835	mg/L
1,1-Dichloroethylene	<0.835	mg/L
Methyl ethyl ketone	<8.350	mg/L
Tetrachloroethene	<0.835	mg/L
Trichloroethene	<0.835	mg/L
Vinyl chloride	<1.670	mg/L

METHOD: TCLP VOLATILES - EPA 1311

Michael R. Fowler

Date 6/1/93

CARDINAL LABORATORIES

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PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NEW MEXICO 88240

TCLP ANALYSIS REPORT

Company: Western Water Consultants, Inc. Date: 5/05/93
Address: 611 Skyline Rd. Lab#: H1200-2
City, State: Laramie, WY 82070

Project Name: 3007.1
Project Location:
Sampled by: SG Date: 4/13/93
Type of Sample: Water Sample Condition: GIST

Sample ID: OW-S

TCLP INORGANICS (Leachate)

PARAMETER	RESULT	UNITS
Arsenic	<0.002	mg/L
Barium	<0.10	mg/L
Cadmium	<0.005	mg/L
Chromium	<0.05	mg/L
Lead	<0.10	mg/L
Mercury	<0.0002	mg/L
Selenium	<0.002	mg/L
Silver	<0.01	mg/L

TOXOCITY CHARACTERISTICS

pH	0.38
Ignitability	134
Corrosivity	Yes (pH <2)
Reactivity-S	32
Reactivity-CN	<0.01

Michael R. Fowler Date 5/5/93

Michael R. Fowler

CARDINAL LABORATORIES

PHONE (9 5) 673-7001 • 2111 BEECHWOOD • ABILENE, TEXAS 79603
PHONE (505) 393 2326 • 101 E. MARLAND • HOBBS, NEW MEXICO 88240

FINAL ANALYSIS REPORT

Company: Western Water Consultants, Inc. Date: 05/14/93
Address: 611 Skyline road Lab # H1200-2
City, State: Laramie, WY 82070

Project Name: 3007.1
Project Location:
Sampled by: SG Date: 04/13/93
Type of Sample: Water Sample Condition: GIST
Sample ID: OW-S

TCLP VOLATILES

PARAMETER	RESULT	UNITS
Benzene	(.500	mg/L
Carbon tetrachloride	(.500	mg/L
Chlorobenzene	(.500	mg/L
Chloroform	(.500	mg/L
1,2-Dichloroethane	(.500	mg/L
1,1-Dichloroethylene	(.500	mg/L
Methyl ethyl ketone	(5.000	mg/L
Tetrachloroethene	(.500	mg/L
Trichloroethene	(.500	mg/L
Vinyl chloride	(1.000	mg/L

METHOD: TCLP VOLATILES - EPA 1311

Michael R. Fowler

Date 6/1/93

APPENDIX B

Disposal Receipts

LOCO HILLS WATER DISPOSAL CO.

P.O. Box 68
Loco Hills, NM 88255

DISPOSAL—BRINE

Date 12/6/93 Time 4:30 PM

Company Name Linwell Trucking

Truck No. 21

No. of BBLs 65 & 5

Operator Kirk Byrd

Lease Laura Albaugh

Well No. Yard Supply

Signature Kirk Byrd 2929

APPENDIX C

Laboratory Data
Closure Product Characteristics

CARDINAL LABORATORIES

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PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NEW MEXICO 88240

EPA 8240 PRIORITY POLLUTANTS

Company: Western Water Consultants
Address: 611 Skyline
City, State: Laramie WY

Date: 12/13/93
Lab # H1448-1

Project Name: 3007
Project Location: Hobbs, NM
Sampled by: SG
Type of Sample: Soil
Sample ID: Sump Ex.

Date: 12/08/93
Sample Condition: GIST

VOLATILES

PARAMETER	RESULT	UNITS
Dichlorodifluormethane	<5000	ug/kg
Chloromethane	<10000	ug/kg
Vinyl Chloride	<10000	ug/kg
Bromomethane	<10000	ug/kg
Chloroethane	<10000	ug/kg
trans-1,2-Dichloroethene	<5000	ug/kg
1,1-Dichloroethene	<5000	ug/kg
Trichlorofluoromethane	<5000	ug/kg
Methylene Chloride	19,600	ug/kg
1,1-Dichloroethane	<5000	ug/kg
Methyl Ethyl Ketone	<100000	ug/kg
Chloroform	<5000	ug/kg
1,1,1-Trichloroethane	<5000	ug/kg
1,2-Dichloroethane	<5000	ug/kg
Benzene	<5000	ug/kg
Carbon Tetrachloride	<5000	ug/kg
1,2-Dichloropropane	<5000	ug/kg
Trichloroethene	<5000	ug/kg
Bromodichloromethane	<5000	ug/kg
2-Chloroethylvinylether	<10000	ug/kg
1,3-Dichloropropene	<5000	ug/kg
Toluene	<5000	ug/kg
1,1,2-Trichloroethane	<5000	ug/kg
Dibromochlormethane	<5000	ug/kg
Tetrachloroethene	<5000	ug/kg
Chlorobenzene	<5000	ug/kg
Ethylbenzene	25,600	ug/kg
Bromoform	<5000	ug/kg
1,1,2,2-Tetrachlorethane	<5000	ug/kg
1,3-Dichlorobenzene	<5000	ug/kg
1,4-Dichlorobenzene	<5000	ug/kg
1,2-Dichlorobenzene	<5000	ug/kg

METHOD: VOLATILES - EPA 8240

Michael R. Fowler

Date 12/13/93

Michael R. Fowler

CARDINAL LABORATORIES

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PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NEW MEXICO 88240

EPA 8240 PRIORITY POLLUTANTS

Company: Western Water Consultants
Address: 611 Skyline
City, State: Laramie WY

Date: 12/13/93
Lab # H1448-2

Project Name: 3007
Project Location: Hobbs, NM
Sampled by: SG
Type of Sample: Soil
Sample ID: South Wall

Date: 12/08/93
Sample Condition: GIST

VOLATILES

PARAMETER	RESULT	UNITS
Dichlorodifluormethane	<5000	ug/kg
Chloromethane	<10000	ug/kg
Vinyl Chloride	<10000	ug/kg
Bromomethane	<10000	ug/kg
Chloroethane	<10000	ug/kg
trans-1,2-Dichloroethene	<5000	ug/kg
1,1-Dichloroethene	<5000	ug/kg
Trichlorofluoromethane	<5000	ug/kg
Methylene Chloride	16,960	ug/kg
1,1-Dichloroethane	<5000	ug/kg
Methyl Ethyl Ketone	<100000	ug/kg
Chloroform	<5000	ug/kg
1,1,1-Trichloroethane	<5000	ug/kg
1,2-Dichloroethane	<5000	ug/kg
Benzene	<5000	ug/kg
Carbon Tetrachloride	<7,180	ug/kg
1,2-Dichloropropane	<5000	ug/kg
Trichloroethene	<5000	ug/kg
Bromodichloromethane	<5000	ug/kg
2-Chloroethylvinylether	<10000	ug/kg
1,3-Dichloropropene	<5000	ug/kg
Toluene	<5000	ug/kg
1,1,2-Trichloroethane	<5000	ug/kg
Dibromochlormethane	<5000	ug/kg
Tetrachloroethene	<5000	ug/kg
Chlorobenzene	<5000	ug/kg
Ethylbenzene	13,040	ug/kg
Bromoform	<5000	ug/kg
1,1,2,2-Tetrachlorethane	<5000	ug/kg
1,3-Dichlorobenzene	<5000	ug/kg
1,4-Dichlorobenzene	<5000	ug/kg
1,2-Dichlorobenzene	<5000	ug/kg

METHOD: VOLATILES - EPA 8240

Michael R. Fowler

Date 12/13/93

Michael R. Fowler

CARDINAL LABORATORIES

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FINAL ANALYSIS REPORT

Company: Western Water Consultants
Address: 611 Skyline
City, State: Laramie, WY 82070

Date: 1/11/94
Lab#: H1471

Project Name: 3007
Project Location:
Sampled by: SG Date: 12/28/93 Time: 1430;1730
Analyzed by: HM Date: 1/10/94 Time:
Type of Samples: Soil Sample Condition: GIST Units: mg/kg

Samp #	Field Code	TRPHC
1	Excavation	10,819
2	Soil Pile	22,857

Method: EPA 8015

Michael R. Fowler

Date 1-11-94

WESTERN WATER CONSULTANTS, INC.
RECEIVED
JAN 18 1994
LARAMIE, WY 82070

CARDINAL LABORATORIES

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TCLP ANALYSIS REPORT

Company: Western Water Consultants
Address: 611 Skyline
City, State: Laramie, WY 82070

Date: 1/11/94
Lab # H1471-1

Project Name: 3007
Project Location:
Sampled by: SG
Date: 12/28/93
Type of Sample: Soil
Sample Condition: GIST

Sample ID: Excavation

TCLP ORGANICS

PARAMETER	RESULT	UNITS
Benzene	<0.05	mg/L
Carbon Tetrachloride	<0.05	mg/L
Chlorobenzene	<0.05	mg/L
Chloroform	<0.05	mg/L
1,1-Dichloroethene	<0.05	mg/L
Tetrachloroethene	<0.05	mg/L
Trichloroethene	<0.05	mg/L
Vinyl Chloride	<0.05	mg/L
Methy Ethyl Ketone	<0.10	mg/L
1,2-Dichloroethane	<0.05	mg/L

TCLP INORGANICS (Leachate)

PARAMETER	RESULT	UNITS
Arsenic	0.017	mg/L
Barium	2.17	mg/L
Cadmium	<0.002	mg/L
Chromium	<0.02	mg/L
Lead	0.06	mg/L
Mercury	<0.0005	mg/L
Selenium	0.012	mg/L
Silver	0.027	mg/L

Corrosivity, (pH) 7.6

METHODS: TCLP ORGANICS - EPA 8015/8020/8080/8150
METHODS: TCLP INORGANICS (Leachate) - EPA 1311/6010/7471

Michael R. Fowler

1-11-94
Date

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TEXAS 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NEW MEXICO 88240

TCLP ANALYSIS REPORT

Company: Western Water Consultants
Address: 611 Skyline
City, State: Laramie, WY 82070

Date: 1/11/94
Lab # H1471-2

Project Name: 3007
Project Location:
Sampled by: SG
Type of Sample: Soil
Sample Condition: GIST

Date: 12/28/93

Sample ID: Soil Pile

TCLP ORGANICS

PARAMETER	RESULT	UNITS
Benzene	<0.05	mg/L
Carbon Tetrachloride	<0.05	mg/L
Chlorobenzene	<0.05	mg/L
Chloroform	<0.05	mg/L
1,1-Dichloroethene	<0.05	mg/L
Tetrachloroethene	<0.05	mg/L
Trichloroethene	<0.05	mg/L
Vinyl Chloride	<0.05	mg/L
Methy Ethyl Ketone	1.03	mg/L
1,2-Dichloroethane	<0.05	mg/L

TCLP INORGANICS (Leachate)

PARAMETER	RESULT	UNITS
Arsenic	0.039	mg/L
Barium	0.99	mg/L
Cadmium	<0.002	mg/L
Chromium	<0.02	mg/L
Lead	0.07	mg/L
Mercury	<0.0005	mg/L
Selenium	0.007	mg/L
Silver	0.031	mg/L

Corrosivity, (pH) 7.8

METHODS: TCLP ORGANICS - EPA 8015/8020/8080/8150
METHODS: TCLP INORGANICS (Leachate) - EPA 1311/6010/7471

Michael R. Fowler

1-11-94
Date

CARDINAL LABORATORIES

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PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240
PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

ANALYSIS OF SOIL

Company : Western Water Consultants
City, St.: 611 Skyline, Laramie, WY 82070
Proj.Name:
Location : Dowell Schlumberger
Sample 1 : Dirt Around Sump Tank

Date : 1/21/94
Lab #: H1483

PARAMETER	RESULT (mg/L) SAMPLE 1
Reactivity -S	1.33
Reactivity -CN	<1.0
Corrosivity	8.74
Ignitability (Deg. F)	>140

Methods: EPA SW-846, 1010, 1110, 9010, 9030

Michael R. Fowler

Date 1/21/94

Western Water Consultants, Inc.

CHAIN OF CUSTODY RECORD
AND SAMPLING SHIPPING PAPERS

PROJECT NO. PROJECT NAME: 3007

SAMPLERS: (signature) Scott Smith

SAMPLE I.D.	DATE	TIME	COMP.	GRAB	SAMPLE TYPE	NO. OF CONTAINERS	CONTAINER TYPE: 40z Jars						REMARKS
Excavation	12-28-93	1430	✓		soil	2	✓						Sample Analysis Requested For Both samples is as follows: 1) TCLP volatile organics 2) TCLP metals 3) TPH mod 8015 4) pH
Soil Pile	12-28-93	1730	✓		Soil	2	✓						

Relinquished by: (signature)	Date / Time	Received by: (signature)	Relinquished by: (signature)	Date / Time	Received by: (signature)
Scott Smith	12-28-93/1250	Hope L. Mizono			
Relinquished by: (signature)	Date / Time	Received by: (signature)	Relinquished by: (signature)	Date / Time	Received for Laboratory by: (signature)

DISTRIBUTION: White — ORIG. RETURN TO WWC

REMARKS: * Request rapid Turn around