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REPORTS

DATE:

PHASE II 9/95

PHASE II ENVIRONMENTAL INVESTIGATION

RICE ENGINEERING

SOUTH HOBBS BY-PASS
SALTWATER PIPELINE LEAK

Prepared For:

RICE ENGINEERING CORPORATION

Project Number 14131

Prepared by:

PHILIP ENVIRONMENTAL SERVICES CORPORATION
7904 Interstate 20 West
Midland, Texas 79706
(915) 563-0118

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EXECUTIVE SUMMARY

On July 17, 1995, Philip Environmental Services Corporation (Philip) initiated a Phase II Environmental Investigation at a site located on the South Hobbs By-Pass. This work was performed at the request of Rice Engineering Corporation following their discovery of a leak along a produced water line. Mr. Wayne Price of the New Mexico Oil Conservation Division was present and witnessed the Phase II Investigation Activities.

Prior to initiation of the Phase II Investigation, one monitor well had been drilled at the site. Groundwater samples obtained from the monitor well exhibited chlorides at a concentration of 14,091 parts per million (ppm). Additionally, a sample obtained from a nearby inactive water well exhibited a chloride concentration of 7,178 ppm.

Six monitor wells were drilled at the site by Environmental Spill Control, under contract with Rice Engineering Corporation, and sampled for laboratory analysis. A Philip representative was present at the site to oversee the drilling and sampling of the wells. Groundwater elevation data were obtained for use in evaluating the groundwater flow direction at the site. The depth to groundwater at the site ranges from 60.49 - 62.99 feet below ground surface. The local groundwater flow direction appears to be centered in the direction of Monitor Well #2.

The groundwater analytical results indicate the presence of chloride in concentrations exceeding the New Mexico Water Quality Control Commission (WQCC) standards of 250 milligrams per liter (mg/L) in four of the monitor wells and the inactive water well. Benzene was detected in concentrations above the WQCC drinking water standard of 0.01 mg/L in three of the monitor wells and the inactive water well. Toluene was detected in samples from two monitor wells, but concentrations did not exceed WQCC drinking water standards. Ethylbenzene was detected in samples from three monitor wells, but concentrations did not exceed WQCC drinking water standards. Total xylenes were detected in samples from two monitor wells and the inactive water well, but concentrations did not exceed WQCC drinking water standards. Polynuclear Aromatic Hydrocarbons were detected in concentrations above the WQCC drinking water standard of 0.03 mg/L in samples from one of the monitor wells, and was detected in concentrations below drinking water standards in a sample from the inactive water well.

Prior to drilling the six monitor wells, an Electromagnetic Conductivity (EM) Survey was conducted by Roberts/Schornick and Associates (RSA) on May 15 - 16, 1995. The EM survey was conducted using a depth of investigation of 50 and 100 feet below ground surface. Results of the EM survey were used to aid in the placement of the wells.

PHASE II ENVIRONMENTAL INVESTIGATION AT THE SOUTH HOBBS BY-PASS SITE

1.0 INTRODUCTION

In May and July of 1995, Philip Environmental Services Corporation (Philip) conducted a Phase II Environmental Investigation at a site located south of the Carlsbad Highway on West County Road (Figure 1). The Phase II investigation consisted of conducting an Electromagnetic Conductivity (EM) Survey, and drilling, sampling, and measuring water levels for six new monitor wells. A Philip representative was on-site to coordinate and oversee these activities.

The site is located along the highway in an area which consists predominantly of oil producing properties. In April 1994, a leak was discovered from a buried produced water line. The leak was repaired and soil samples were obtained from the pipeline ditch. Sample results indicated a Total Petroleum Hydrocarbon (TPH) concentration of 7,721 milligrams per kilogram (mg/kg) and a chloride concentration of 680 mg/kg. Two additional soil samples were obtained from the ditch bottom and ditch wall. The ditch bottom sample exhibited a TPH concentration of 17,817 mg/kg and a chloride concentration of 160 mg/kg. The wall sample concentrations were 16,665 mg/kg TPH and 3,278 mg/kg chlorides.

A 40-foot soil boring was drilled in this location and hydrocarbon odor and staining was observed. Additionally, the possible presence of groundwater was indicated by moisture in the drill cuttings. A 65-foot monitor well was drilled and installed 15 feet to the southeast of the borehole location. Groundwater was encountered at a depth of 41 feet below ground surface (bgs). Groundwater samples from this monitor well had a TPH concentration of 3.8 milligrams per liter (mg/L), chloride concentration of 17,495 mg/L and total dissolved solids (TDS) of 36,200 mg/L.

Two additional water samples were obtained and analyzed from nearby wells. A currently unused, domestic water well located 163 feet to the southeast of Monitor Well #1 (Figure 2) had a TPH concentration of 1.4 mg/L, chloride concentration of 4,879 mg/L, and a TDS concentration of 10,446 mg/L. A domestic well located approximately 450 east of Monitor Well #1 had TPH, chloride, and TDS concentrations of 0.3 mg/L, 36 mg/L and 440 mg/L, respectively.

Based on the results of the drilling and sampling, a workplan for a Phase II Environmental Investigation was developed and submitted by Rice Engineering Corporation to the New Mexico Oil Conservation Division (NMOCD). NMOCD approved the plan, requesting that the work be completed and a report submitted to NMOCD by June 30, 1995. Rice Engineering requested a ninety day extension for submittal of the report to allow sufficient time to gain surface owner approval for site

access. Copies of correspondence between Rice Engineering and the NMOCD are included in Appendix I.

2.0 ELECTROMAGNETIC CONDUCTIVITY SURVEY

An Electromagnetic Conductivity (EM) Survey was performed on July 15 - 16, 1995, by Roberts/Schornick and Associates (RSA) to evaluate the impacts to soil and/or groundwater near the produced water leak location. The purpose of the EM survey was to delineate the extent of impacts, and thereby aid in the placement of monitor wells. RSA's report of findings is included in the report in Appendix II.

The EM survey grid is approximately centered at the location of the pipeline leak. The area surveyed is approximately 700 feet (east to west) by 1,000 feet (north to south). The survey equipment was configured to allow a depth of investigation of 50 feet and 100 feet below ground surface (bgs). Both the 50 feet bgs and the 100 feet bgs surveys exhibit elevated conductivity in the location of the leak. Elevated conductivity measurements are also exhibited in an area northwest and an area southwest of the leak location. RSA interprets these elevated conductivity levels to possibly be associated with former reserve pits. Pit liner materials were observed at both of these locations. RSA concludes in their report that "the geometry of the overall conductivity anomaly generally conforms to the regional, southeasterly, groundwater flow direction."

Interpretation of the EM Survey results was used in selecting the locations of the monitor wells drilled at this site.

3.0 MONITOR WELL INSTALLATION

Six monitor wells were drilled by Environmental Spill Control using an air-rotary rig (Figure 2). Split-spoon samples were collected at five-foot intervals and logged by a Philip representative and an Environmental Spill Control representative (Appendix III). Drill cuttings were also collected during drilling, and changes in lithology indicated by the drill cuttings were noted on the driller's log.

One deep (155 feet bgs) and five shallow (55 - 57 feet bgs) monitor wells were drilled. The wells are constructed of flush-threaded, Schedule 40 polyvinyl chloride (PVC) riser and 0.020-inch, slotted, well screen. The shallow wells were constructed with 25 feet of screen, and the deep well (Monitor Well #3) was constructed with 50 feet of screen. Monitor Wells #6 and #7 are constructed with 2-inch inside diameter riser and screen, and Monitor Wells #2, #3, #4 and #5 are constructed with 4-inch inside diameter riser and screen. Monitor well completion diagrams are included in Appendix IV.

The gravel pack consisted of 10 - 20 grade, washed silica. Once the gravel pack was extended approximately one foot above the screen, a minimum 4-foot-thick bentonite plug was installed by hydrating bentonite pellets with potable water. The remaining annular space was then filled with a cement/bentonite grout containing a minimum of five percent bentonite. The drilling contractors installed a locking monitor well cap at each location.

Well development included pumping groundwater from each well until the pH, conductivity, and temperature had stabilized for three consecutive measurements and the water appeared clear and free of sediment. A minimum of three casing volumes of water were removed from each well.

Drilling equipment, sampling tools, and bailers were decontaminated prior to use at each monitor well location. Decontamination included cleaning all equipment with a high pressure steam or Alconox™ soap solution, followed by a potable water rinse.

4.0 RESULTS

4.1 Lithology

The lithology encountered in the monitor wells is generally consistent throughout the site investigated. Figure 3 shows the locations of an east-west cross section (Figure 4) and a north-south cross section (Figure 5). The cross sections display the general lithology at the site. The subsurface is characterized by an upper layer of white and brown indurated limestone (caliche). Underlying the limestone is a silty, fine grained, calcareous sandstone containing scattered limestone fragments. The thickness of this unit ranges from 30 - 40 feet thick throughout the site, and the unit locally contains a thin unit (3 - 6 feet) of fine grained and indurated siliceous sandstone. Fine grained, slightly calcareous sandstones underlie this unit. Drilling log diagrams showing the lithology of each monitor well are included in Appendix III.

4.2 Laboratory Analysis of Groundwater Samples

The results of the laboratory analyses of groundwater samples are presented in Table 1 and Appendix V.

Chloride concentrations above New Mexico Water Quality Control Commission (WQCC) standards of 250 milligrams per liter (mg/L) were detected in groundwater samples from Monitor Wells #1, #2, #3, #4, #7, and the Inactive Water Well (Figure 6). Total dissolved chloride concentrations ranged from 96 mg/L to 14,091 mg/L.

Total Dissolved Solids concentrations in groundwater samples ranged from 493 mg/L to 25,106 mg/L.

Benzene was detected in concentrations above the WQCC drinking water standard of 0.01 mg/L in samples from Monitor Wells #1, #2, #3, and the Inactive Water Well (Figure 7). Benzene concentrations ranged from not detected to 2,871 mg/L.

Toluene was detected in samples from Monitor Wells #2 and #3, but concentrations did not exceed the WQCC drinking water standard of 0.75 mg/L. Ethylbenzene was detected in samples from Monitor Wells #1, #2, and #3, but concentrations did not exceed the WQCC drinking water standard of 0.75 mg/L. Total xylenes were detected in samples from Monitor Wells #1, #3, and the Inactive Water Well, but concentrations did not exceed the WQCC drinking water standard of 0.62 mg/L.

Polynuclear Aromatic Hydrocarbons (PAHs) were detected above the WQCC drinking water standard of 0.03 mg/L in the sample from Monitor Well #1, and were detected below drinking water standards in the Inactive Water Well.

Phase-separated hydrocarbons were observed in Monitor Well #1. The thickness of the phase-separated hydrocarbons is 5.12 feet.

The analyses were conducted using USEPA Method 8020 for Volatile Organic Compounds (VOCs) and USEPA Method 8270 for PAHs. Chloride and TDS analyses were conducted using method SM 4500 CL-B and USEPA Method 160.1, respectively.

4.3 Laboratory Analysis of Soil Samples

The results of the laboratory analyses for VOCs are presented in Table 2 and Appendix V. TPH and chloride concentrations were measured in the field by an Environmental Spill Control representative, and are presented in Table 2.

TPH concentrations ranged from 26 parts per million (ppm) to 107 ppm in soil samples obtained from the borings emplaced prior to construction of the monitor wells. Chlorides were detected in the sample from Monitor Well #2 (at a depth of 15 - 16 feet bgs) at a concentration of 5,000 ppm, and at a concentration of 900 ppm at a depth of 30 -31 feet bgs.

Volatile organics were not detected in any of the soil samples submitted for analysis. VOCs were analyzed using USEPA Method 8020.

4.4 Hydrogeology

The Ogallala Formation is the principle source of groundwater in Lea County, New Mexico (Ash, 1963). Depth to groundwater in Lea County ranges from approximately 12 feet bgs to 300 feet bgs. At the site, the static depth to groundwater in the Ogallala ranged from 60.49 feet bgs to 62.90 feet bgs in the monitor wells present.

Regionally, groundwater occurs under unconfined conditions and the water table slopes towards the southeast at an average gradient of approximately 12 feet/mile. Water wells completed in the Ogallala exhibit yields ranging from 200 gallons per minute to greater than 1,000 gallons per minute.

The local hydraulic gradient at the site appears to slope in a direction centered towards Monitor Well #1 (Figure 8). At the site, groundwater is primarily encountered beneath an indurated, siliceous sand layer. The dip of this layer in the direction of Monitor Well #1 may contribute to the water table sloping in this direction.

Approximately 1,800 barrels of water was recovered in 24 hours from Monitor Well #1, indicating that good yields can be expected from the monitor wells at the site. A groundwater elevation measurement taken in the Inactive Water Well exhibited a 6-inch

drop in groundwater elevation subsequent to pumping Monitor Well #1 for 24 hours. No other pump test data were obtained.

5.0 CONCLUSIONS

Groundwater at the site has been impacted by hydrocarbon constituents and chlorides. Phase-separated hydrocarbons are present in Monitor Well #1. Benzene was detected in concentrations above the WQCC drinking water standard in samples from Monitor Wells #1, #2, #3, and the Inactive Water Well. PAHs were detected above drinking water standards in the groundwater sample from Monitor Well #1.

Chloride concentrations above WQCC standards were detected in samples from Monitor Wells #1, #3, #4, #7, and the Inactive Water Well.

The water table appears to slope in the direction of Monitor Well #2. Based on water level data, water quality data, and the results of the EM survey, the contaminant plume appears to be localized at the site.

The NMOCD is the regulatory agency with jurisdiction over the operations at this site. The NMOCD currently does not have standards for contaminants in groundwater, and will therefore likely enforce the WQCC drinking water standards.

6.0 REFERENCES

Ash, Sidney R., Groundwater Conditions in Northern Lea County, New Mexico, Dept. of the Interior, US Geological Survey, Hydrologic Atlas -62.

Fisher, W.L., 1990, Geologic Framework and Regional Hydrology: Upper Cenozoic Blackwater Draw and Ogallala Formations, Great Plains, Texas Bureau of Economic Geology, Austin, Texas

New Mexico Oil Conservation Division, 1993 Guidelines for Remediation of Leaks, Spills, and Releases

New Mexico Water Quality Control Commission Regulations, 1993, Part 3-Water Quality Control, Section 3-103

Roberts/Schornick and Associates, 1995, Report of Findings Electromagnetic Terrain Conductivity Survey; prepared for Rice Engineering, May, 1995

Appendices

I Correspondence

II Roberts/Schornick and Associates Report

III Driller's Lithology Logs

IV Monitor Well Completion Diagrams

V Analytical Data

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APPENDIX I

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION
2040 S. PACHECO
SANTA FE, NEW MEXICO 87505
(505) 827-7131

Bill Olsen
(505) 827-7154

March 8, 1995

CERTIFIED MAIL
RETURN RECEIPT NO. P-667-242-217

Mr. Jerry D. Hillard
Division Manager
Rice Engineering Corporation
122 West Taylor
Hobbs, New Mexico 88240

RE: GROUND WATER CONTAMINATION INVESTIGATION WORK PLAN
RICE ENGINEERING PRODUCED WATER GATHERING LINE
LEA COUNTY, NEW MEXICO

Dear Mr. Hillard:

The New Mexico Oil Conservation Division (OCD) has completed a review of Rice Engineering Corporation's (REC) January 13, 1995 "GROUNDWATER IMPACT, RICE ENGINEERING PRODUCED WATER GATHERING PIPELINE, LEA COUNTY, NEW MEXICO". This document contains REC's work plan for investigating the extent of ground water contamination related to a leak from a REC produced water gathering line in the SW/4, NW/4 of Section 5, T19S, R38E NMPM Lea County, New Mexico.

The above work plan is approved with the following conditions:

1. All monitor wells will be constructed as set out below:

   a. If the well is to be screened across the water table interface, a minimum of 15 feet of well screen will be installed with at least 10 feet of well screen below the water table and 5 feet of well screen above the water table.

   b. An appropriately sized gravel pack will be set around the well screen from the bottom of the hole to 2-3 feet above the top of the well screen.

   c. A 2-3 foot bentonite plug will be placed above the gravel pack.

d. The remainder of the hole will be sealed with cement containing 3-5 % bentonite.

2. REC will develop each well upon completion using EPA approved procedures.

3. REC will sample ground water from all monitor wells. Ground water from these monitor wells will be sampled and analyzed for concentrations of benzene, toluene, ethylbenzene, xylene (BTEX), major cations and anions, heavy metals and polynuclear aromatic hydrocarbons using EPA approved methods.

NOTE: The OCD will not require REC to analyze ground water samples for heavy metals and PAH's, if, REC can provide the OCD with an analysis of the produced water from this line showing that these constituents do not exceed New Mexico Water Quality Control Commission ground water standards.

One sample from pipeline

include cost of metals

4. REC will submit a report on the investigation to the OCD by June 30, 1995. The report will contain:

a. A description of all activities which occurred during the investigation, conclusions and recommendations.

b. A summary of the laboratory analytic results of water quality sampling of the monitor wells.

c. A water table elevation map using the water table elevation of the ground water in all monitor wells.

d. A geologic log and as built well completion diagram for each well.

5. REC will notify the OCD at least one week in advance of all scheduled activities such that the OCD has the opportunity to witness the events and or split samples.

6. All original documents submitted for approval will be submitted to the OCD Santa Fe Office with copies provided to the OCD Hobbs District Office.

Please be advised that OCD approval does not relieve REC of liability should the investigation activities determine that contamination exists which is beyond the scope of the work plan or

if the activities fail to adequately determine the extent of contamination related to REC's activities. In addition, OCD approval does not relieve REC of responsibility for compliance with any other federal, state or local laws and/or regulations.

If you have any questions, please call me at (505) 827-7154.

Sincerely,

William C. Olson
Hydrogeologist
Environmental Bureau

xc: Jerry Sexton, OCD Hobbs District Supervisor
Wayne Price , OCD Hobbs Office

RICE ENGINEERING CORPORATION

122 W. TAYLOR HOBBS NEW MEXICO

PHONE: (505) 393-9174 FAX: (505) 397-1471

DATE: 3-10-95 **TIME:** 11:30 A.M.

TO: Burlington Env. **ATTN:** Sharon Hall

FROM: Dave Abbott

SUBJECT: Remedial Plan Approval of West County Road Spill

NUMBER OF PAGES: (PLUS COVER PAGE) 4

DETAILS: For your review.

THANKS

DAVE

IF YOU DO NOT RECEIVE ALL PAGES INCLUDED, PLEASE CALL THE OFFICE PHONE NUMBER LISTED AT THE TOP OF THIS PAGE.

RICE Engineering Corporation
122 WEST TAYLOR TELEPHONE (505) 393-9174
HOBBS, NEW MEXICO 88240

June 5, 1995

Attn: Mr. Bill Olson
New Mexico Oil Conservation Division
P.O. Box 2088
Santa Fe, New Mexico 87504-2088

Dear Mr. Olson;

Our spill site phase II investigation of the plume of contamination, has not yet began due to surface owners issues that will not allow access on their properties. It is our position, at this time, to petition the Oil Conservation Division for a 90 day extension that will allow time for resolution of the issues with the surface owners. This extension would also allow ample time for the phase II completion and a completed Hydrological study. If you should have any further questions, please contact this office at your earliest convenience.

Sincerely,

Dave Abbott
Division Engineer

DA/lr

cc: LBG
JW Neal
Sharon Hall
File

RICE ENGINEERING CORPORATION

122 W. TAYLOR HOBBS NEW MEXICO

PHONE: (505) 393-9174 FAX: (505) 397-1471

DATE: 3/13/95 **TIME:** _____

TO: Burlington **ATTN:** Sharon Hall

FROM: Jeany Hilland

SUBJECT: Work plan as submitted to OCD

NUMBER OF PAGES:(PLUS COVER PAGE) _____

DETAILS: _____

IF YOU DO NOT RECEIVE ALL PAGES INCLUDED, PLEASE CALL THE OFFICE PHONE NUMBER LISTED AT THE TOP OF THIS PAGE.

RICE Engineering Corporation
122 WEST TAYLOR TELEPHONE (505) 393-9174
HOBBS, NEW MEXICO 88240

January 13, 1995

State of New Mexico
Energy, Minerals and Natural Resources Department
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87504

Attention: Roger C. Anderson

Re: Groundwater Impact
Rice Engineering Produced Water
Gathering Pipeline
Lea County, New Mexico

Dear Mr. Anderson:

Enclosed is the work plan for Site Assessment of the above referenced Groundwater Impact area. This area is located on the western edge of Section 5, T19S, R38E, NMPM, Lea County.

If there are any questions or additional information needed, please contact us at this office.

Yours very truly,

RICE ENGINEERING CORPORATION

Jerry Hillard
Division Manager

Enclosures

HOBBS SWD SYSTEM
SPILLSITE INVESTIGATION PLAN
SECTION 5 & 6, TOWNSHIP 19 SOUTH, RANGE 38 EAST
LEA COUNTY, NEW MEXICO

PHASE I - DISCOVERY AND DETERMINATION OF GROUNDWATER IMPACT

A leak was discovered April 29, 1994 on a buried produced water line, South of the Carlsbad Highway on West County Road, approximately 1/2 mile south of Walker Machine Shop. The line is an eight (8) inch poly line, buried at a depth of 2.5 feet at the bottom of the west borrow ditch, which runs under West County Road from the West to the East. The leak was located and repaired on the west side of the road. The impact from the leak was mostly on the east side of the road due to the drainage of the conduit installed in an eastward down slope. The leak appears to have been caused by heavy equipment when the borrow ditches were being excavated for storm water control.

A. Oral Notification of the Oil Conservation Division (OCD) 4-29-94 and written notice 5-3-94.

The OCD advised that samples should be taken on the impacted soil removed from the ditchline to make the repair. The soil was spread out along the ditchline, fertilized, watered and allowed to set for 6 days. A composite sample was taken and analyzed, showing TPH of 7,721 ppm and chlorides of 680 ppm. (Sample results indicated on attachment 1)

Two additional samples were taken following this analysis. One at the ditch bottom and the other approximately half-way down one ditch wall. These samples did have a hydrocarbon odor. The lab analyses showed TPH of 17,817 ppm bottom, 16,665 ppm wall, chlorides of 160 ppm bottom and 3,278 ppm wall. The OCD indicated they felt at this point there was a high possibility of deep chloride penetration. (Sample results indicated on attachment 1)

B. Per recommendation from the OCD, a bore hole was drilled to 40 feet from ground level using an auger rig to determine the extent of impacted area of the site. The bore hole was located next to the pipeline in the ditch bottom. The boring indicated moderate presence of hydrocarbons down to the 40 foot level and a shallow water groundwater zone was indicated by some moisture in the cuttings. This bore hole was plugged with cement and the ditchline backfilled.

C. In further consideration of the recommendation of the OCD, a monitor well was drilled using an air rig, 15 feet to the southeast of the first bore hole. (Well no. 1 on attached plat) A

4 3/4 inch hole was drilled to a total depth of 65 feet. At the top of the hole immediately under the cover soil unconsolidated rock materials were encountered down to around 10 feet. Sand and caliche was then drilled down to 35 feet where a hard sandstone layer was encountered. This layer extended about 6 feet upon which groundwater was incurred immediately below. Hydrogen sulfide was encountered at this point requiring proper safety equipment. Representatives from the OCD were present during drilling and took samples along with Environment Spill Control Incorporated.

The decision was made to ream out the hole to 6 1/2 inches in order to set 4 1/2 inch flush joint casing, which would allow for the installation of a downhole pump to test the water. The hole was reamed to 65 feet, casing set with 10 feet of screened slotted tailpipe in the water and 5 feet out. The bottom of the casing is at 55 feet, leaving 10 feet of rathole. Water level was gauged afterward standing at 37 feet, apparent fluid head of the Aquifer.

D. The State Engineer was consulted as to the designation of the groundwater. We were informed that this would be the expected top of the Ogallala Aquifer.

PHASE II - IMPACTED AREA ASSESSMENT

Currently, the information as to the extent of area coverage and depth of impact is from only two sources, the spillsite monitor well and a currently unused domestic water well 163 feet to the Southeast of the site monitor well. A sample taken from the one monitor well show TPH of 3.8 ppm, chlorides of 17,495 ppm and Total Dissolved Solids (TDS) of 36,200 ppm. A sample from the domestic well to the Southeast has a TPH of 1.4 ppm, chlorides of 4,879 ppm and TDS of 10,446. One other sampled domestic well, approximately 450 feet east, had TPH of 0.3 ppm, chlorides of 36 ppm and TDS of 440 ppm. (See Attachment no. 2 for all water analyses) Known hydrology and geology of the Ogallala aquifer of this area indicates a reservoir fluid movement to the southeast direction and a probable total thickness of the sand of around 150'. It is felt that the direction of search for the impacted area extent should concentrate mostly in this direction.

It is being considered to perform an Electromagnetis Survey of the area to help define the suspected direction and extent of impacted waters. If this survey is utilized, the below investigation well plan could be changed. The objective of wells at that point would be to confirm the areal extent of impact indicated by the Electromagnetic Survey. If this extent is confirmed, then subsequent well drilling would need to be only for contaminant removal and monitoring.

It is planned, at this time, to start the impacted area assessment by drilling the following monitor and/or test wells.

A) A well 100' to the east of Well no. 1 (plat well no. 2)

This well will be located 7' to 10' to the south of the direct easterly line due to back cover of the pipeline.

B) A well 100' to the south of Well no. 1 (plat well no. 3)

C) A well 175' to the west northwest of Well no. 1 This well will be located adjacent to the pipeline. (plat well no. 4)

D) A well 100' to the southeast of the existing domestic well that is 163' southeast of Well no. 1 (plat well no. 5)

E) a well 100' to the north of well no. 1 (Plat well no. 6)

Each well will be specifically drilled to a depth which indicates elevated levels of TPH and chlorides concentrations, then the well will be drilled 15 ft. deeper. The well will be drilled until elevated levels are reached or the well is at the bottom of the aquifer which is estimated to be 250 ft. in this particular area. If impacted waters are encountered in any well, additional wells will be drilled to define the extent of impact.

It is understood that past experience with impacted fluids entry of this type into the Ogallala has indicated the more dense waters move downward to the lower level of the aquifer. Rice has been informed that in some cases, though, there is an interval in the sand formation which effectively separates the sand into two or more layers.

ATTACHMENT 1

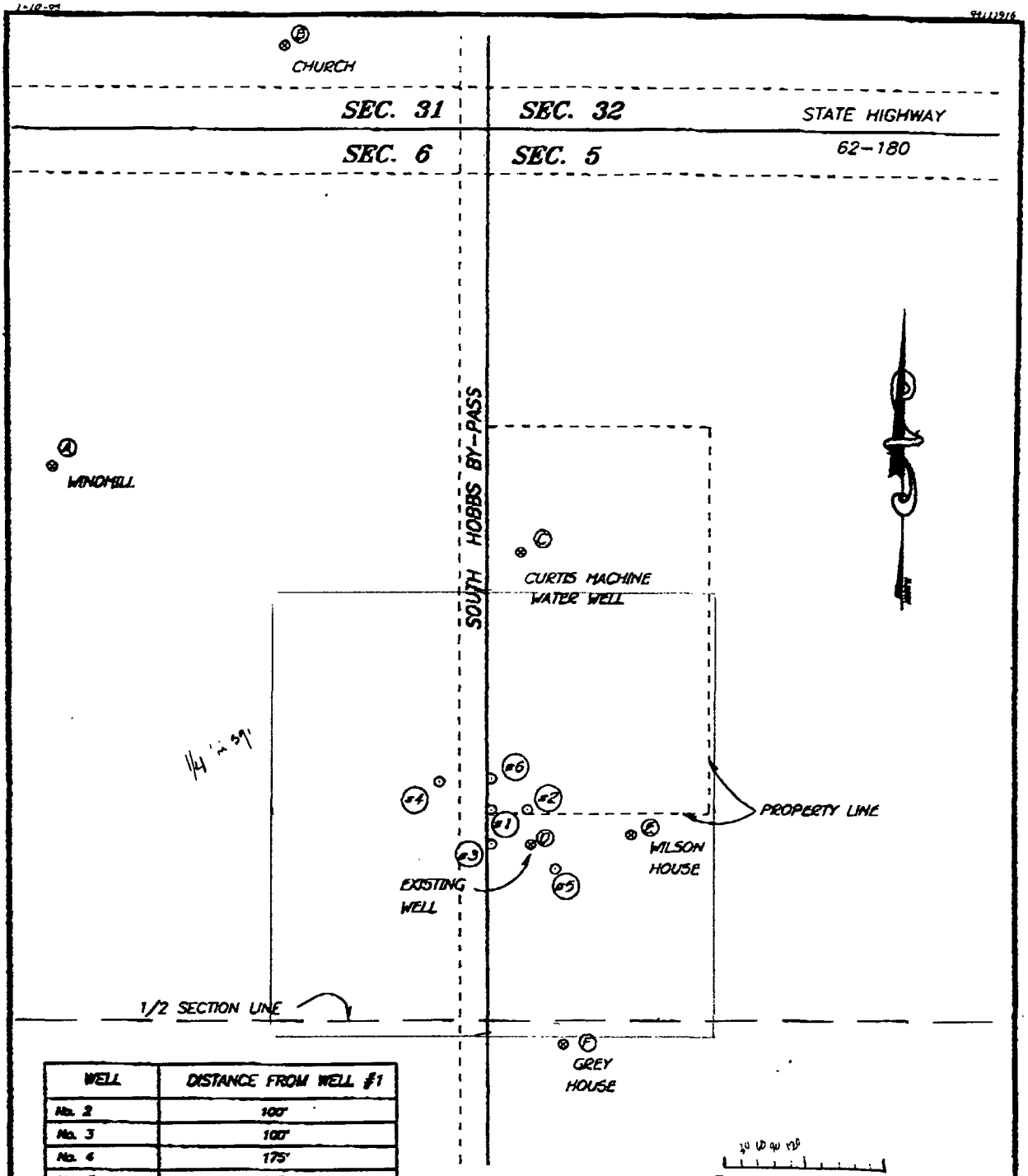
Soil and Well Cuttings Analysis

Date	Source	TRPHC ppm	CHLORIDES ppm
5/11/94	Ditch Cuttings	7,721	680
5/16/94	Ditch Bottom	17,817	160
5/16/94	Ditch Wall	16,665	3,278
5/18/94	Borehole-39' deep		2,359
	40' deep		2,479
5/23/94	Test Well-		
	Surface	2,610	
	10'	5,360	
	20'	14,400	
	30'	9,720	
	40'	4,870	
	50'	2,200	
5/23/94	West Side Road Auger Hole-8' deep	11,000	

ATTACHMENT 2

Water Analysis

Date	Source	TRPHC ppm	Chlorides ppm	TDS ppm
5/31/94	Well #1	3.8	17,494	36,200
6/1/94	Well A	2.8	68	898
6/1/94	Well B	0.1	204	1,026
6/1/94	Well C	0.3	52	490
5/31/94	Well D	1.4	4,878	10,446
5/31/94	Well E	0.3	36	440
6/7/94	Well F	<1	40	421



WELL	DISTANCE FROM WELL #1
No. 2	100'
No. 3	100'
No. 4	175'
No. 5	265'
No. 6	100'
A	1,682'
B	2,347'
C	770'
D	159'
E	424'
F	733'

DWN	SRT 6-94			APPROVED	

HOBBS SWD SYSTEM
PROPOSED MONITOR WELLS

RICE ENGINEERING CORPORATION
HOBBS, NEW MEXICO.

SCALE: 1" = 300'

DWG. No.

APPENDIX II

REPORT OF FINDINGS
ELECTROMAGNETIC TERRAIN CONDUCTIVITY SURVEY
RICE ENGINEERING
HOBBS, NEW MEXICO

Prepared for:

Philip Environmental Services Corp.
7904 Interstate 20 West
Midland, Texas 79706

Prepared by:

Roberts/Schornick & Associates, Inc.
Environmental Consultants
3700 W. Robinson, Suite 200
Norman, Oklahoma 73072
(405) 321-3895

May 31, 1995

9508901\r001

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Report of Findings
Electromagnetic Terrain Conductivity Survey
Rice Engineering
Hobbs, New Mexico

1.0 INTRODUCTION

Roberts/Schornick & Associates, Inc. (RSA) has been retained by Philip Environmental Services Corp., Midland, Texas to conduct an electromagnetic (EM) terrain conductivity survey to evaluate if impacts to soil and/or groundwater was present beneath portions of Sections 5 and 6, Township 19 South, Range 38 East, Lea County, New Mexico. The area surveyed was a rectangular area approximately 700 feet (east to west) by 1,000 feet (north to south). The survey area is located along the southwest corporate boundary of Hobbs, New Mexico (Figure 1). The survey area is approximately three (3) miles west of the intersection of U.S. Highway 62 and State Highway 18, and one quarter mile south of the intersection of U. S. Highway 62 and the South By-Pass. The EM survey grid was established by RSA personnel on May 15, 1995. An EM survey was then conducted by RSA on May 16, 1995.

The EM survey grid is approximately centered at the location of salt water release from a pipeline operated by Rice Engineering Corporation, Hobbs, New Mexico. The location of the reported leak is approximately 2,000 feet south of U.S. Highway 62 and adjacent to the west side of the South By-Pass.

2.0 HYDROGEOLOGY

The region is overlain by soils of the Kimbrough Association, which consists of nearly level to gently sloping, well-drained loams, or gravelly fine sandy loams overlying indurated caliche which occurs at a depth of 6 to 20 inches. Site-specific soil consist of a surface layer of dark, grayish-brown gravelly loam from 0 to 6 inches thick overlying a white caliche substratum. (Turner, Cox, Mickelson, Roath, and Wilson, 1974).

Soils in the survey area are underlain by rocks of the Pliocene-age Ogallala Formation. The Ogallala Formation is approximately 200 feet thick in the survey area and consists mostly of fine-to very-fine sand, but includes minor quantities of clay, silt, coarse sand, and gravel. Near the top of the Ogallala Formation, sediments have been cemented by calcium carbonate to form caliche. The caliche is reported to be approximately 20 feet thick in the area.

Groundwater occurs under unconfined conditions mainly in the unconsolidated sand and gravel of the Ogallala Formation, beneath the caliche cap rock. The hydraulic conductivity of the Ogallala Formation varies widely both vertically and laterally. Vertical variation is due chiefly to the amount of calcium carbonate cement present, which typically decreases downward. Lateral variation is generally the result of the coarseness and degree of sorting of the sediments. The Ogallala Formation is the principal source of groundwater in Lea County. Water wells completed in the Ogallala Formation display a wide range of yields (less than 200 gpm to greater than 1,000 gpm) of generally good quality water. The depth-to-groundwater ranges from less than 12 feet to almost 300 feet. The depth-to-groundwater in the survey area is reported to be about 45 feet. The water table slopes gently toward the southeast at an average gradient of approximately 12 feet/mile. Regionally, the saturated

thickness ranges from less than 25 feet to almost 250 feet (Ash, 1963). Rocks of the Ogallala Formation are underlain, unconformably, by Mesozoic-age rocks.

Mesozoic-age rocks in northern Lea County range in thickness from 1,400 to 2,100 feet and consist of Triassic-age shale and sandstone and Cretaceous-age siltstone and limestone.

3.0 ELECTROMAGNETIC (EM) TERRAIN CONDUCTIVITY SURVEY

The electromagnetic terrain conductivity survey was conducted by RSA utilizing a Geonics Limited EM-34XL Ground Conductivity Meter. The EM-34XL is a two-man portable ground conductance meter calibrated to read terrain conductivity in millimhos per meter (millimhos/m). The meter is equipped with two (2) coils, a transmitting coil and a receiving coil, separated by a coaxial cable. The transmitter coil energized with an alternating current at an audio frequency, is placed on the earth and a receiver coil is located a short distance away. The time-varying magnetic field arising from the alternating current in the transmitter coil induces very small currents in the earth. These currents generate a secondary magnetic field which is sensed, together with the primary field, by the receiver coil. The meter does have certain limitations which include:

- Mineralogical compositions of some soils result in unsatisfactory conductivity responses,

- If contaminants in the subsurface are being investigated, the constituent(s) of interest must raise or lower the conductivity of the groundwater appreciably to create an anomalous response measured by the instrument,

- Interference from electrical power lines, pipelines, fences, and buildings can cause erratic conductivity responses which are generally detectable by the operator, and

- Access restrictions due to terrain, heavy vegetation and/or water bodies.

The EM-34XL can be configured with the transmitting and receiving coils arranged in either the horizontal (coils perpendicular to the ground surface) or vertical dipole position (coils parallel to the ground surface). The distance between the coils, referred to as the intercoil separation or spacing, can also be varied from 10-, 20- and 40-meters. Using the different combinations of dipole orientations and intercoil separations, specific depth investigative objectives can be achieved. Using the horizontal dipole orientation and the three (3) different intercoil separations of 10-, 20- and 40-meters, the maximum effective depths of investigation are approximately 75% of the intercoil separation, or 25, 50 and 100 feet below ground surface (bgs), respectively. Using the vertical dipole orientation and the three (3) different intercoil separations of 10-, 20- and 40-meters, the maximum effective depths of investigation are approximately 150% of the intercoil separation, or 50, 100 and 200 feet bgs. The horizontal dipole orientation is generally preferred because it is less susceptible to interference.

4.0 EM-34XL SURVEY RESULTS

On May 16, 1995, RSA conducted an EM-34XL survey with the conductivity meter configured in the horizontal dipole orientation, at intercoil separations of 20-meters and 40-meters. Therefore, the maximum effective depths of investigation were 50 and 100 feet bgs, respectively. The reference point for the survey grid, 400 feet east and 600 feet north (400E/600N), is the west side of the pad of monitor well MW-1 (see Figures 2 and 3). Survey point 700E/0N is adjacent to a natural gas pipeline placard. Survey profile 300E is 14 feet west and parallel to the west edge of the asphalt shoulder of the South By-Pass.

4.1 EM-34XL Survey With 20-Meter Intercoil Separation

Figure 2 presents the results of the EM-34XL survey in the horizontal dipole orientation with a 20-meter intercoil separation. Background conductivity measurements ranged from approximately 8 millimhos/m to 17 millimhos/m. Electrical interference resulting from overhead power lines or pipelines is indicated on the survey figures by the symbol "I". Terrain conductivity values greater than 20 millimhos/m are considered to be above background and are potentially due to oil and natural gas production operations in the area.

Two (2) areas, which yielded elevated conductivity levels, are suspected of being associated with oil and gas production activities. These two (2) areas, one centered on survey point 200E/900N (Figure 2) and the other centered on survey point 200E/300N (Figure 2), are suspected of being previously closed reserve pits which were utilized during drilling operations of adjacent oil/gas wells. Visual inspection of the ground surface revealed the presence of a pit liner in each of these areas. Terrain conductivity values increase from background levels to 52 millimhos/m at the center of the conductivity anomaly in the northwestern portion of the grid (200E/900N). The anomaly measures

approximately 100 feet in both an east-west and north-south direction. Terrain conductivity values increase from background levels to 46 millimhos/m at the center of the conductivity anomaly in the southwestern portion of the grid (200E/300N). This anomaly measures about 100 feet in an northwest-southeast direction and about 250 feet in a northeast-southwest direction.

A third area which yielded elevated conductivity levels surrounds the location of the saltwater release. This area is centered on survey points 300E/600N and 400E/600N. Terrain conductivity values increase from background to 45 millimhos/m and 38 millimhos/m at survey points 300E/600N and 400E/600N, respectively. This conductivity anomaly measures about 480 feet in a northwest-southeast direction and 220 feet in a northeast-southwest direction. The geometry of the overall conductivity anomaly generally conforms to the regional, southeasterly, groundwater flow direction.

Electrical interference was observed in the southeastern portion of the grid adjacent to a metal barn (survey point 700E/300N). Interference was also observed along powerline (survey points 550E/50N and 550E/150N) and pipeline routes (survey points 650E/50N and 700E/0N).

4.2 EM-34XL Survey With 40-Meter Intercoil Separation

Figure 3 presents the results of the EM-34XL survey performed in the horizontal dipole orientation and at an intercoil separation of 40-meters. Background conductivity measurements for this configuration ranged from 13 millimhos/m to 19 millimhos/m. These background conductivity measurements are generally higher for the 40-meter intercoil separation, as compared to the 20-meter intercoil separation results. These deeper measurements are possibly influenced by natural changes in groundwater chemistry or a result of the depth-of-exploration encompassing more saturated thickness of the Ogallala

Formation. Conductivity values greater than 20 millimhos/m may be the result of impact due to oil and gas activity.

The two (2) areas suspected of being closed reserve pits, which yielded elevated conductivity levels with the 20-meter intercoil separation, also yielded elevated conductivity values with the 40-meter intercoil separation. Terrain conductivity values increase from background levels to 26 millimhos/m near the anomaly (200E/800N) in the northwestern portion of the grid. This anomaly measures about 100 feet in both an east-west and north-south direction. Terrain conductivity values increase from background levels to 32 millimhos/m at the center of the conductivity anomaly in the southwestern portion of the grid (200E/300N). This anomaly measures approximately 280 feet in an east-west direction and about 320 feet in a north-south direction.

The third EM anomaly, which yielded elevated conductivity levels with the 20-meter intercoil separation, surrounds the location of the saltwater release. The conductivity values increased from background to 68 millimohs/m at survey point 300E/600N. Terrain conductivity values were 60 millimohs/m for survey points 400E/500N and 500E/500N. The conductivity anomaly measures about 640 feet in a northwest-southeast direction and 480 feet in a northeast-southwest direction. The geometry of the conductivity anomaly generally conforms to the regional, southeasterly, groundwater flow direction.

Electrical interference was observed in the southeastern portion of the grid adjacent to a metal barn (survey points 700E/300N and 400N). Interference was also observed along powerline (survey points 550E/50N and 550E/150N) and pipeline (survey points 650E/50N and 700E/0N) routes.

5.0 CONCLUSIONS

The following conclusions were reached by RSA after assessing the results of the EM-34XL conductivity survey conducted May 16, 1995. These conclusions were also based upon information given to RSA through verbal communication with Rice Engineering.

- The EM-34XL survey data indicate that an increase in background conductivity is experienced at the site when the depths of investigation are increased from 50 feet bgs to 100 feet bgs. This increase is likely a result of natural change in groundwater chemistry or as a result of the depth-of-exploration encompassing more saturated thickness of the Ogallala Formation.

- Two (2) areas of elevated conductivity values, which are suspected of being associated with closed reserve pits, were observed while conducting the EM-34XL surveys using both the 20-meter and 40-meter intercoil separation. The two areas are located in the northwestern (approximately 200E/900N) and southwestern (approximately 200E/300N) portions of the grid.

- Pit liner material was observed at the surface in both areas suspected of being closed reserve pits.

- The EM-34XL survey data does indicate that groundwater of elevated conductivity is in close proximately to the point of saltwater release (300E/600N) from the pipeline operated by Rice Engineering.

- The geometric shapes of the 20- and 40-meter conductivity anomalies possibly associated with the saltwater pipeline release are generally oval, and are elongated in a northwest-southeast direction.

- Based upon the geometry of the conductivity anomaly associated with the saltwater pipeline release, the groundwater flow direction is likely from northwest to southeast.

- The conductivity anomaly associated with the saltwater pipeline release measures (based on the results of the 40-meter intercoil separation) about 640 feet in a northwest-southeast direction and 480 feet in a northeast-southwest direction extending to about survey point 500E/200N.

6.0 REFERENCES

Turner, Cox, Mickelson, Roath, and Wilson, 1974, Soil Survey, Lea County, New Mexico, Soil Conservation Service, U.S. Dept. of Agriculture.

Ash, Sidney R., 1963, Ground-Water Conditions in Northern Lea County, New Mexico, Dept. of the Interior, U.S. Geological Survey, Hydrologic Atlas-62.

APPENDIX III

Company Drilled for: Rice Engineering Corperation

Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

Drilling Log

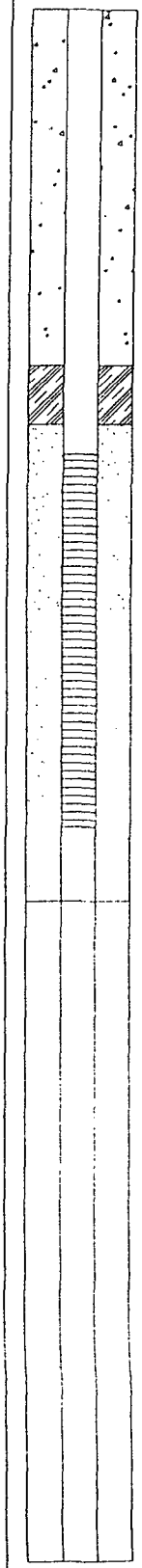
Well/Bore Number:	Date Drilled:	Driller:	Logged By:
MW-2	7-18-95	AH/BK	WR/JK

Drilling Method:	Depth of Boring:	Depth of Well:	Length of Casing:	Length of Screen:
Air Rotary	60 Feet	55 Feet	30 Feet	25 Feet

e Diameter:	Casing Diameter:	Screen Diameter	Slot Size:	Well Material:
8 Inch	4 Inch	4 Inch	0.02 Inch	Sch 40 PVC

Depth	Lithology	Sample Type	OVA (PPM)	Remarks
0				
	White and Brown Indurated Limestone.			
5	Light Brown Calcareous Sand (Caliche).	Split Spoon	<1	
10	Gray, Silty, Calcareous Fine-grain Sand (Caliche) Containing Scattered Limestone Stringers.	Split Spoon	>1000	Hydrocarbon Staining
15		Split Spoon	>1000	
20		Split Spoon	300	
	Gray, Silty Fine-grained Sand (SM).			
25		Split Spoon	>2	
30	White And Light Brown, Calcareous, Fine-grained Sand (caliche) Containing Scattered Limestone Stringers.	Split Spoon	110	
35				. Water Encountered During Drilling
40	Brown Slightly Calcareous to Calcareous Fine-grained Sand (SM) Containing Scattered Gravel.			
45				
50				
55				
60	Bottom of Boring.			
65				
70				
75				
80				
85				
90				
95				
100				
105				

Well Design



Depth

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105

Non-Shrinking Grout
Bentonite
Sand
Casing
Screen

Company Drilled for: Rice Engineering Corperation

Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

Drilling Log

Well/Bore Number:	Date Drilled:	Driller:	Logged By:
MW-3	7-17&19-95	AH/BK/JT	WR/JK

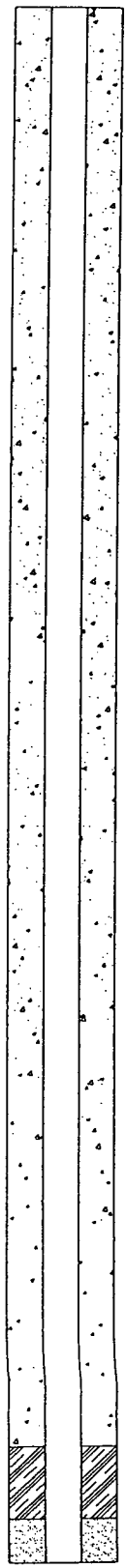
Drilling Method:	Depth of Boring:	Depth of Well:	Length of Casing:	Length of Screen:
Water Base Mud	160 Feet	155 Feet	105 Feet	50 Feet

re Diameter:	Casing Diameter:	Screen Diameter:	Slot Size:	Well Material:
8 Inch	4 Inch	4 Inch	0 02 Inch	Sch 40 PVC

Depth	Lithology	Sample Type	OVA (PPM)	Remarks
0				
	Removed Temporary Well MW-3A and Reamed Hole. See Drilling Log From MW-3A For Description.			
60	Gray Sandy Limestone.			
65	Red-brown Fine-grained Calcareous Sand (Caliche).	Cuttings	<1	
80	Mulli-colored Limestone Marl Containing Mudstone and Limestone Fragments	Cuttings	<1	
95		Cuttings	<1	
	Brown Interbedded Silicious Sandstone and Limestone Stringers.			
100		Cuttings	<1	
105				

Non-Shrinking Grout
Bentonite
Sand
Casing
Screen

Well Design



Depth: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105

Company Drilled for: Rice Engineering Corperation

Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

Drilling Log

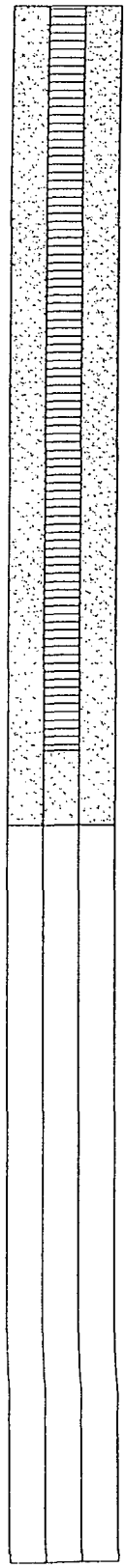
Well/Bore Number:	Date Drilled:	Driller	Logged By:
MW-3	7-17&19-95	AH/BK/JT	WR/JK

Drilling Method:	Depth of Boring:	Depth of Well:	Length of Casing:	Length of Screen:
Water Base Mud	160 Feet	155 Feet	105 Feet	50 Feet

Bore Diameter:	Casing Diameter:	Screen Diameter:	Slot Size:	Well Material:
8 Inch	4 Inch	4 Inch	0.02 Inch	Sch 40 PVC

Depth	Lithology	Sample Type	OVA (PPM)	Remarks
105	White and Light Brown Limestone (Caliche).	Cuttings	<1	
110	Red-brown Silty Slightly Calcareous to Calcareous Fine_grained Sand (Sm).			
115	Limestone Stringers			
120	Sand (SM).	Cuttings	<1	
125	Red-brown, Silty, Fine-grained Sand (SM).			
130				
135				
140		Split Spoon	<1	
145				
150				
155		Cuttings	<1	
160	Indurated Red-brown Siltstone Containing Clay and Scattered Gravel.	Cuttings	<1	Top of 'Red-bed' Drilled 0.5' in 10 Minutes. w/Rock Bit
165	Bottom of Boring.			
170				
175				
180				
185				
190				
195				
200				
205				
210				

Well Design



Non-Shrinking Grout
Bentonite
Sand
Casing
Screen

Company Drilled for: Rice Engineering Corperation

Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

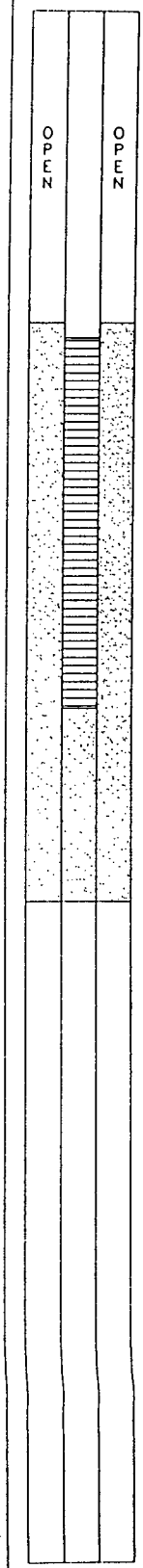
Drilling Log

Well/Bore Number:	Date Drilled:	Driller:	Logged By:
MW-3A	7-17-95	AH/BK	WR/JK

Drilling Method:	Depth of Boring:	Depth of Well:	Length of Casing:	Length of Screen:
Air Rotary	60 Feet	47 Feet	22 Feet	25 Feet

Bore Diameter:	Casing Diameter:	Screen Diameter:	Slot Size:	Well Material:
8 Inch	4 Inch	4 Inch	0.02 inch	Sch 40 PVC

Depth	Lithology	Sample Type	OVA (PPM)	Remarks
0				
	White and Light Brown Limestone (Caliche).			
5	Light Brown, Silty, Fine-grain Sand (Caliche) Containing Scattered Limestone Stringers.	Split Spoon	<1	
10		Split Spoon	>1	
15	White And Light Brown, Calcareous, Fine-grained Sand (Caliche).	Split Spoon	>1	
20	Limestone Stringer.	Split Spoon	>1	
25	Brown Calcareous, Fine-grained Sand (Caliche). Containing Scattered Limestone Stringers.	Split Spoon	2	
30		Split Spoon	–	No Recovery
35	Red-brown Indurated Silicious Sandstone.	Split Spoon	>1	Moisture in Sample
40	Brown Slightly Calcareous, Fine-grained Sand (SM) Containing Scattered Gravel.			. Water Encountered During Drilling
45				
50				
55				
60	Gray, Sandy, Limestone.			
65	Bottom of Boring. Set Temporary Well to Sample Shallow Groundwater.			
70				
75				
80				
85				
90				
95				
100				
105				



Company Drilled for: Rice Engineering Corperation

Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

Drilling Log

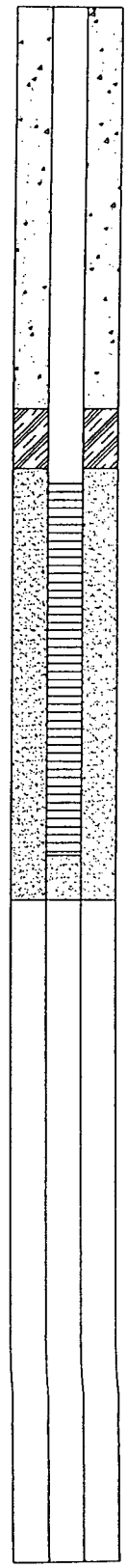
Well/Bore Number:	Date Drilled:	Driller:	Logged By:
MW-4	7-20-95	AH/JT	WR/JK

Drilling Method:	Depth of Boring:	Depth of Well:	Length of Casing:	Length of Screen:
Air Rotary	60 Feet	57 Feet	32 Feet	25 Feet

Bore Diameter:	Casing Diameter:	Screen Diameter:	Slot Size:	Well Material:
8 Inch	4 Inch	4 Inch	0.02 Inch	Sch 40 PVC

Depth	Lithology	Sample Type	OVA (PPM)	Remarks
0				
	White and Light Brown Limestone (Caliche).			
5	Light Brown And White Mottled Silty, Calcareous Fine-grain Sand (Caliche) Containing Scattered Limestone Stringers.	Cuttings	<1	
10		Cuttings	<1	
15		Split Spoon	<1	
20		Split Spoon	<1	
25	Brown Calcareous Fine-grained Sand (Caliche).	Cuttings	<1	
30		Split Spoon	<1	
35		Split Spoon	<1	
40				. Moisture
	Indurated Silicous Sandstone (Red-brown).			
45				
50	Brown Slightly Calcareous to Calcareous Fine-grained Sand (SM) Containing Scattered Gravel.			. Water Encountered During Drilling
55				
60				
	Bottom of Boring.			
65				
70				
75				
80				
85				
90				
95				
100				
105				

Well Design



Depth: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105

Company Drilled for: Rice Engineering Corperation

Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

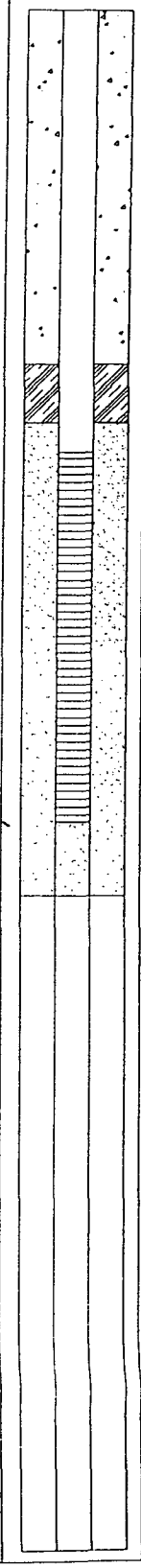
Drilling Log

Well/Bore Number:	Date Drilled:	Driller:	Logged By:
MW-5	7-21-95	AH/JT	WR/JK

Drilling Method:	Depth of Boring:	Depth of Well:	Length of Casing:	Length of Screen:
Air Rotary	60 Feet	55 Feet	30 Feet	25 Feet

Bore Diameter:	Casing Diameter:	Screen Diameter:	Slot Size:	Well Material:
8 Inch	4 Inch	4 Inch	0.02 Inch	Sch 40 PVC

Depth	Lithology	Sample Type	OVA (PPM)	Remarks
0				
	Light Gray Limestone (Caliche).			
5	Light Brown and White Mottled, Silty, Calcareous Fine-grain Sand (Caliche) Containing Scattered Limestone Stringers.	Split Spoon	<1	
10		Cuttings	<1	
15		Cuttings	<1	
20		Split Spoon	<1	
25		Cuttings	<1	
30	Brown Calcareous Fine-grained Sand (Caliche).	Split Spoon	<1	
35		Split Spoon	<1	
	Indurated Sandstone and Limestone Stringers.			. Moisture
40	Brown Slightly Calcareous to Calcareous Fine-grained Sand (SM) Containing Scattered Gravel.			. Water Encountered During Drilling
45				
50				
55				
60	Bottom of Boring.			
65				
70				
75				
80				
85				
90				
95				
100				
105				



Company Drilled for: Rice Engineering Corperation

Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

Drilling Log

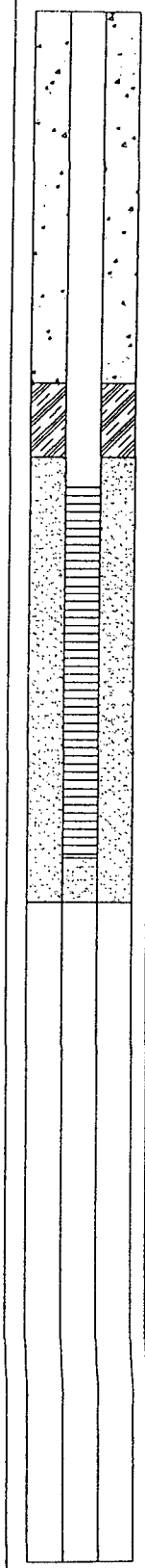
Well/Bore Number:	Date Drilled:	Driller:	Logged By:
MW-6	7-21-95	AH/JT	WR/JK

Drilling Method:	Depth of Boring:	Depth of Well:	Length of Casing:	Length of Screen:
Air Rotary	60 Feet	57 Feet	32 Feet	25 Feet

Bore Diameter:	Casing Diameter:	Screen Diameter:	Slot Size:	Well Material:
6 Inch	2 Inch	2 Inch	0.02 Inch	Sch 40 PVC

Depth	Lithology	Sample Type	OVA (PPM)	Remarks
0				
	White and Light Brown Limestone (Caliche).			
5	White and Light Brown Calcareous Sand (Caliche) Containing Scattered Limestone Stringers.	Cuttings	<1	
10		Cuttings	<1	
15		Cuttings	<1	
20		Split Spoon	<1	
	Brown Slightly Calcareous Fine-grained Sand (SM).			
25		Cuttings	<1	
30		Split Spoon	<1	
	Light Brown and Gray Interbedded Silicious Sandstone and Limestone Stringers.			
35		Split Spoon	-	No Recovery
		Split Spoon	<1	
40	Brown Slightly Calcareous to Calcareous Fine-grained Sand (SM) Containing Scattered Gravel.			
45				
50				
55				
60				
	Bottom of Boring.			
65				
70				
75				
80				
85				
90				
95				
100				
105				

Well Design



Depth

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105

Non-Shrinking Grout
Bentonite
Sand
Casing
Screen

Company Drilled for: Rice Engineering Corperation

Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

Drilling Log

Well/Bore Number:	Date Drilled:	Driller:	Logged By:
MW-7	7-21-95	AH/JT	WR/JK

Drilling Method:	Depth of Boring:	Depth of Well:	Length of Casing:	Length of Screen:
Air Rotary	57 Feet	56 Feet	31 Feet	25 Feet

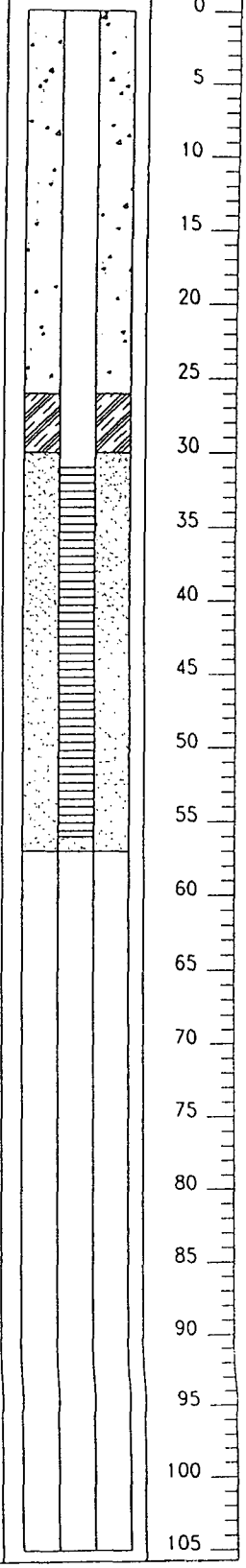
Bore Diameter:	Casing Diameter:	Screen Diameter:	Slot Size:	Well Material:
6 Inch	2 Inch	2 Inch	0.02 Inch	Sch 40 PVC

Depth	Lithology	Sample Type	OVA (PPM)
0			
	White and Gray Limestone (Caliche).		
5	Light Brown And White Mottled Silty, Calcareous Fine-grain Sand (Caliche) Containing Scattered Limestone Stringers.	Cuttings	<1
10		Cuttings	<1
15		Cuttings	<1
20		Cuttings	<1
25		Cuttings	<1
30		Cuttings	<1
	Brown Calcareous Sandstone.		
35	Light Brown Calcareous Sand (Caliche) Containing Limestone Fragments.	Split Spoon	<1
40	Red-brown Silicious Sandstone.		
	Light Brown, Slightly Calcareous Fine-grained Sand (SM).		
45			
50			
	Brown Indurated Sandstone and Limestone.		
55			
	Bottom of Boring.		
60			
65			
70			
75			
80			
85			
90			
95			
100			
105			

Remarks

. Water Encountered During Drilling

Well Design



Depth

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105

APPENDIX IV

Company Drilled for: Rice Engineering Corperation

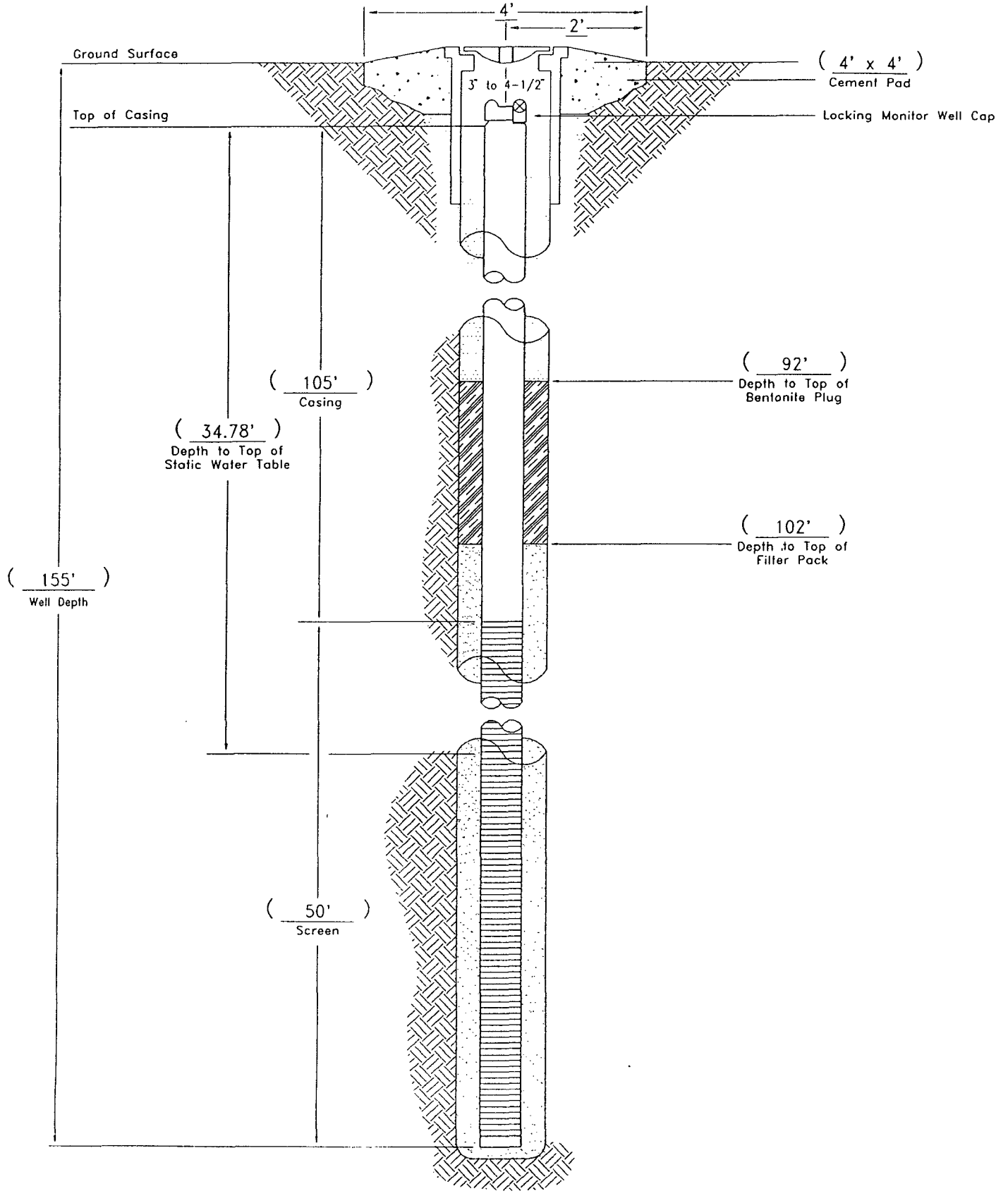
Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL
SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

Flush Mount Monitor Well Diagram

Job Number:	Installation Date:	Monitor Well Number:
129	7-19-95	MW-3

Depth:	Bore Size:	Casing Size:	Casing Elevation:	Screen Size:	Top of Water Elevation:
155 Feet	8 Inch	4 Inch	97.64 Feet	0.02 Inch	62.86 Feet



Company Drilled for: Rice Engineering Corperation

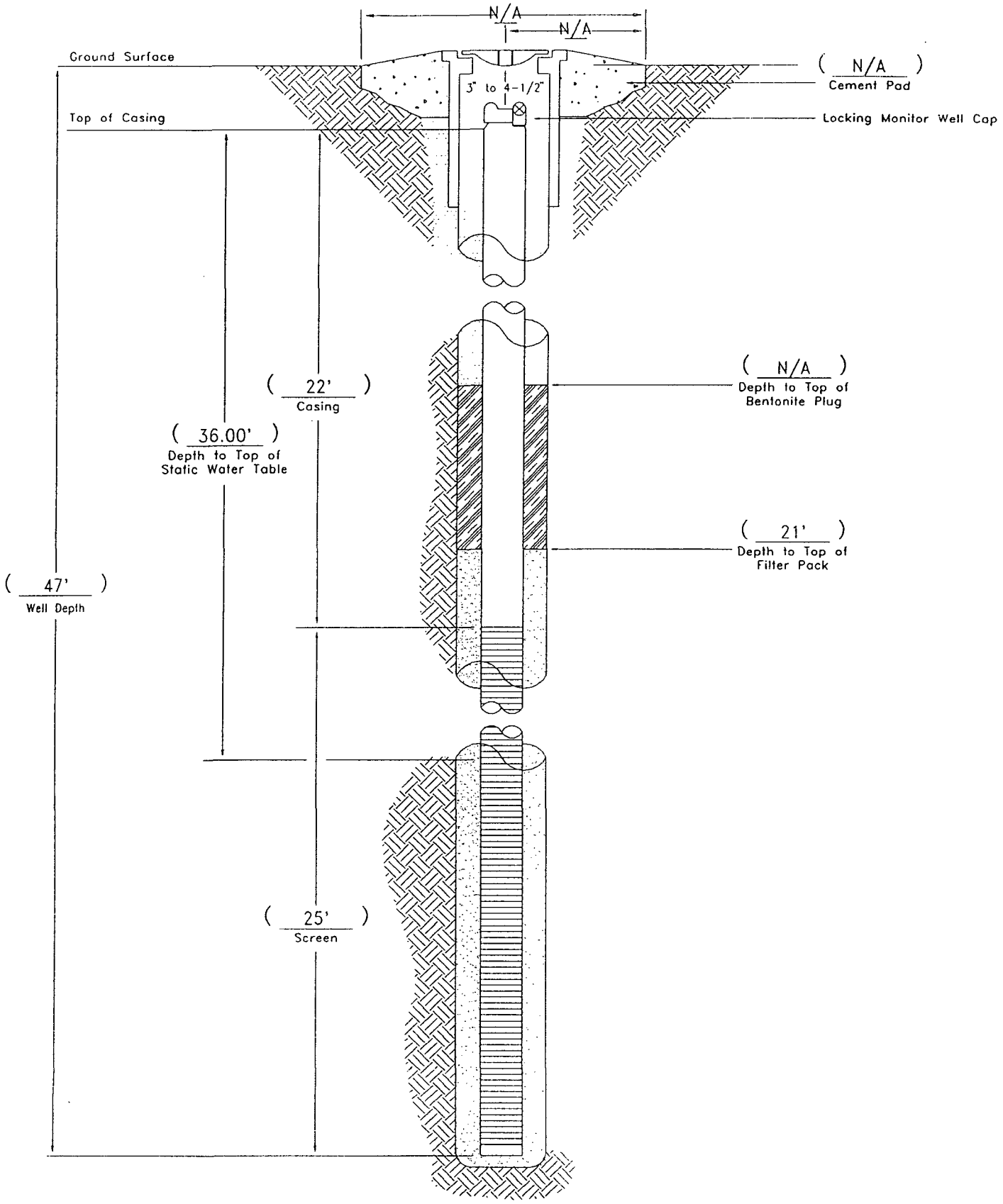
Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

Flush Mount Monitor Well Diagram

Job Number:	Installation Date:	Monitor Well Number:
129	7-17-95	MW-3A

Depth:	Bore Size:	Casing Size:	Casing Elevation:	Screen Size:	Top of Water Elevation:
47 Feet	8 Inch	4 Inch	N/A	0.02 Inch	62.53 Feet



Company Drilled for: Rice Engineering Corperation

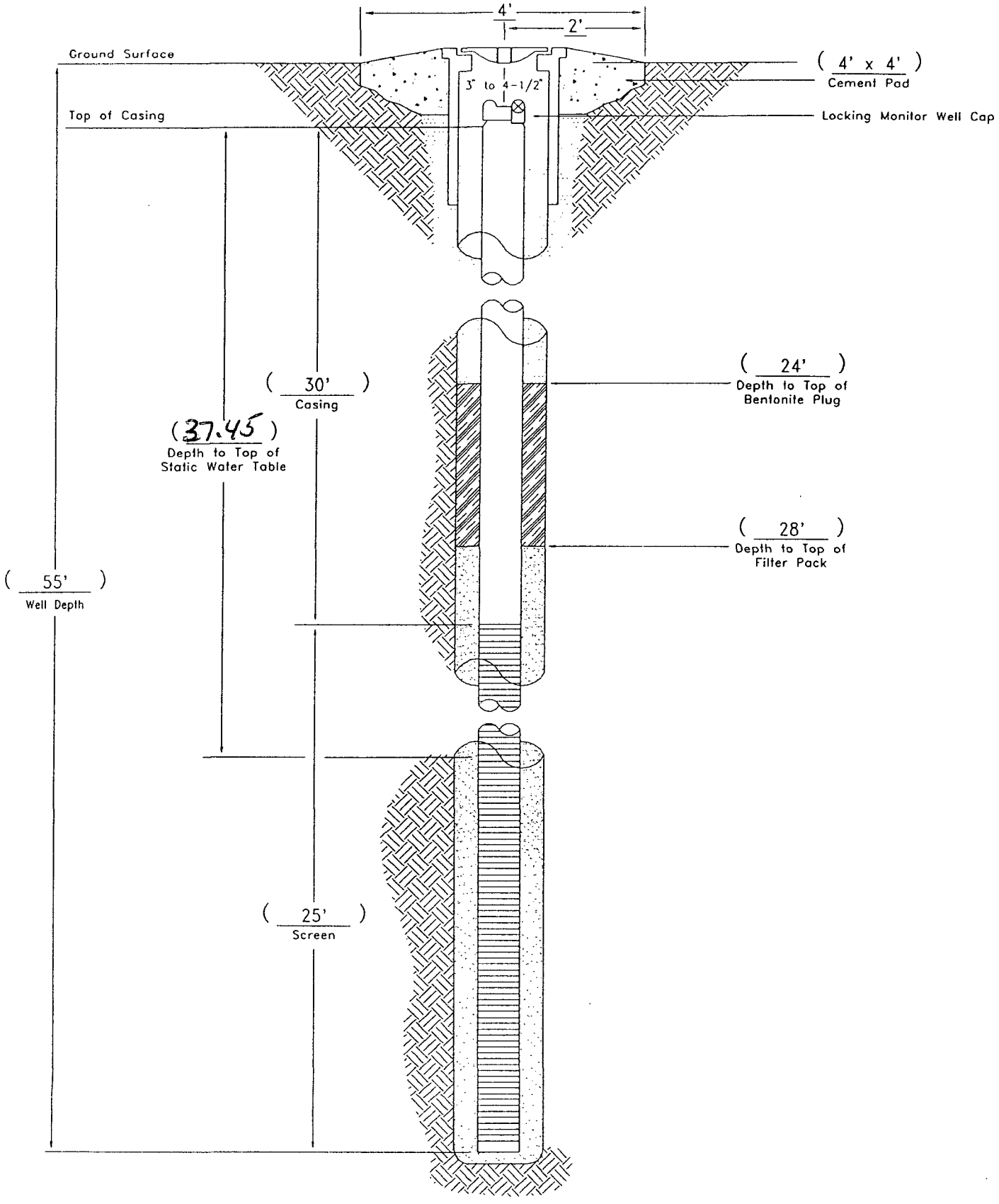
Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

Flush Mount Monitor Well Diagram

Job Number:	Installation Date:	Monitor Well Number:
129	7-18-95	MW-2

Depth:	Bore Size:	Casing Size:	Casing Elevation:	Screen Size:	Top of Water Elevation:
55 Feet	8 Inch	4 Inch	97.94	0.02 Inch	



Company Drilled for: Rice Engineering Corperation

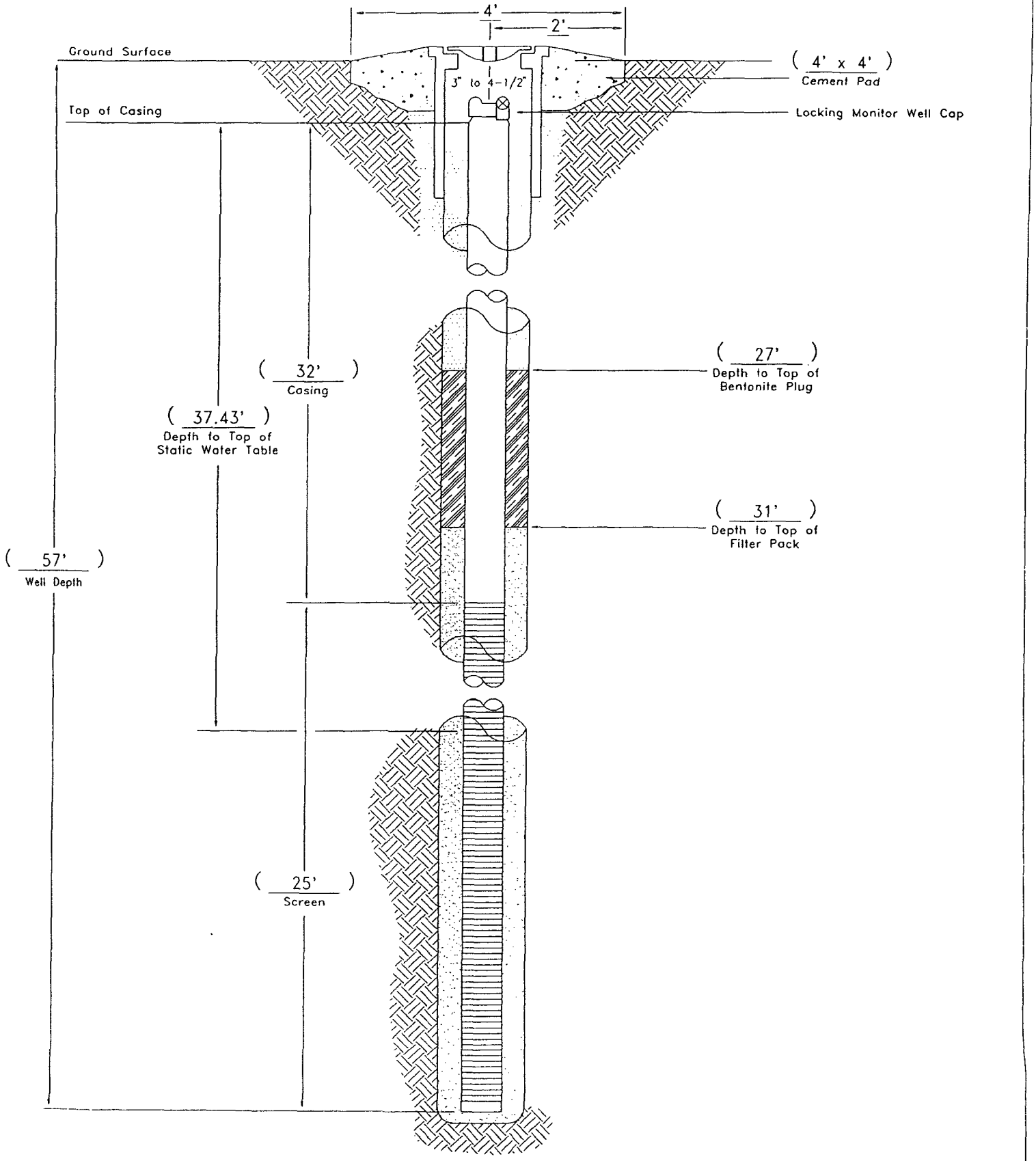
Location: Spill Site
N--6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-3085

Flush Mount Monitor Well Diagram

Job Number:	Installation Date:	Monitor Well Number.
129	7-20-95	MW-4

Depth:	Bore Size:	Casing Size:	Casing Elevation:	Screen Size:	Top of Water Elevation:
57 Feet	8 Inch	4 Inch	100.39 Feet	0.02 Inch	62.96 Feet



Company Drilled for: Rice Engineering Corperation

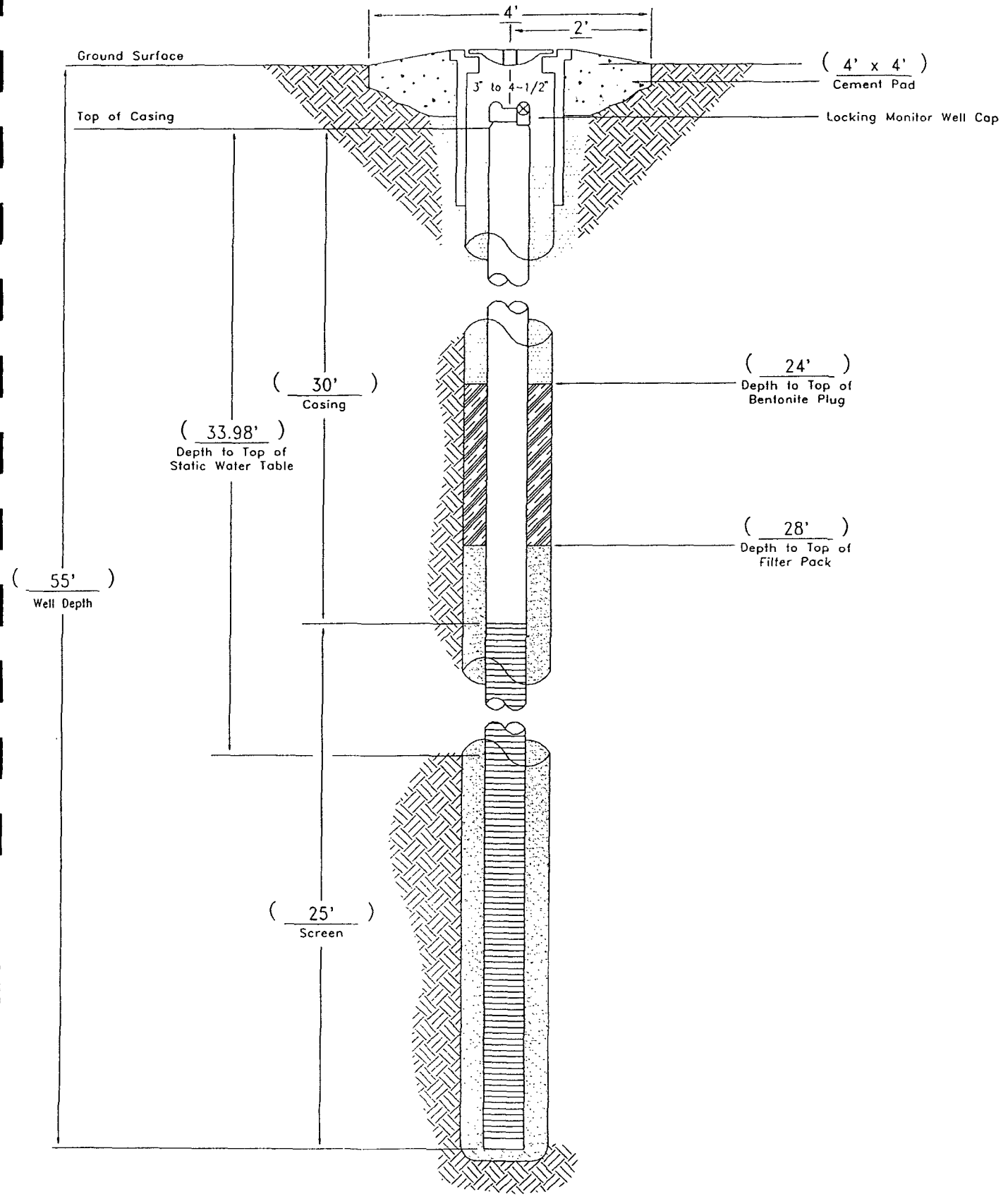
Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

Flush Mount Monitor Well Diagram

Job Number:	Installation Date:	Monitor Well Number:
129	7-21-95	MW-5

Depth:	Bore Size:	Casing Size:	Casing Elevation:	Screen Size:	Top of Water Elevation:
55 Feet	8 Inch	4 Inch	96.23 Feet	0.02 Inch	62.25 Feet



Company Drilled for: Rice Engineering Corperation

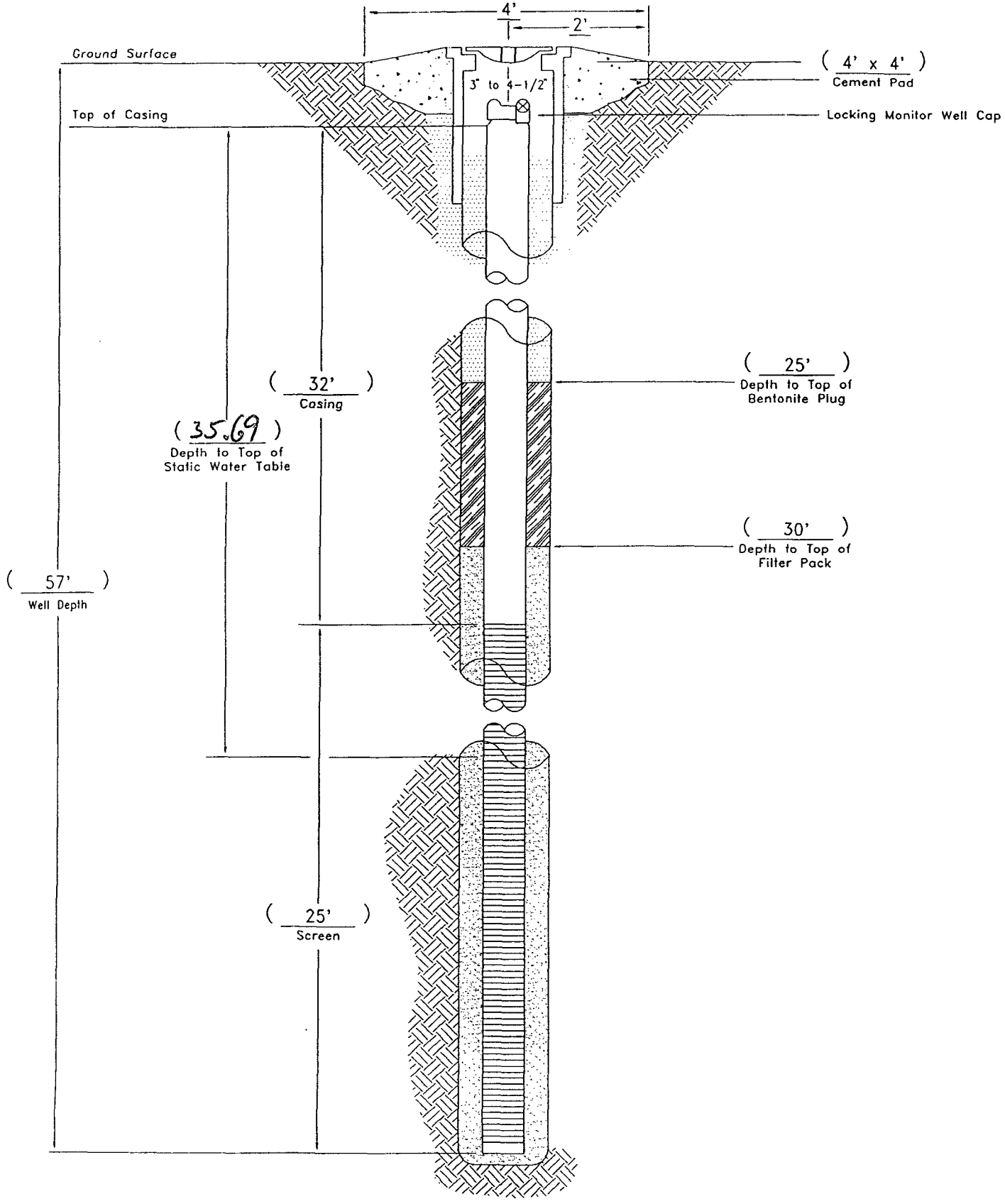
Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

Flush Mount Monitor Well Diagram

Job Number:	Installation Date:	Monitor Well Number:
129	7-21-95	MW-6

Depth:	Bore Size:	Casing Size:	Casing Elevation:	Screen Size:	Top of Water Elevation:
60 Feet	6 Inch	2 Inch		0.02 Inch	



Company Drilled for: Rice Engineering Corperation

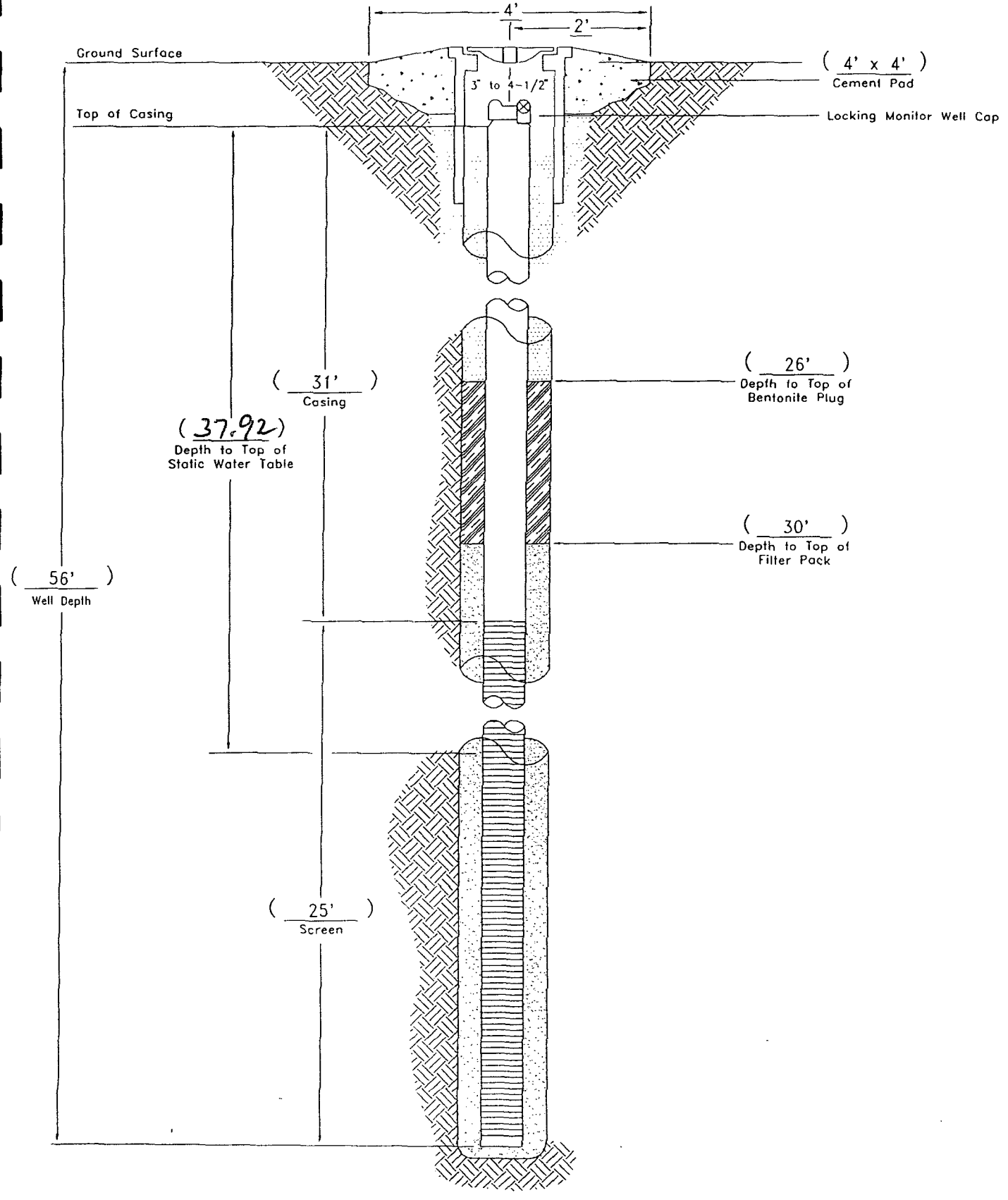
Location: Spill Site
N-6, Hobbs SWD System
Lea Co., New Mexico

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-8167
FAX (505) 397-5085

Flush Mount Monitor Well Diagram

Job Number:	Installation Date:	Monitor Well Number:
129	7-21-95	MW-7

Depth:	Bore Size:	Casing Size:	Casing Elevation:	Screen Size:	Top of Water Elevation:
56 Feet	6 Inch	2 Inch	98.50 Feet	0.02 Inch	



APPENDIX V

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240
PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

BTEX ANALYSIS REPORT

Company: Environmental Spill Control, Inc. Date: 7/24/95
Address: P.O. Box 5890 Lab #: H2097
City, State: Hobbs, NM 88241

Project Name: H-6, Rice Engineering
Location: 1/2 mile S. of Intersection of Marland and Loop Bypass
Sampled by: JK Date: 7/21/95 Time: not given
Analyzed by: LB Date: 7/21/95 Time: p.m.
Sample Type: Soil/Water Sample Condition: Intact Units: ppm

Samp #	Field Code	BENZENE	TOLUENE	ETHYL BENZENE	PARA-XYLENE	META-XYLENE	ORTHO-XYLENE	MTBE
1	MW-5 (35')Soil	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
2	MW-6 (H20)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
3	MW-6 (39')Soil	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
4	MW-2 (H20)	0.047	0.012	0.033	<0.001	<0.001	<0.001	<0.001
6	MW-3 (H20)	0.044	0.061	0.048	0.011	0.011	0.020	<0.001
	QC Recovery	0.757	0.820	0.878	0.855	0.854	0.828	0.708
	QC Spike	0.878	0.873	0.867	0.862	0.853	0.867	0.830
	Accuracy	86.2%	93.9%	101.3%	99.2%	100.1%	95.5%	85.3%
	Air Blank	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Methods - GAS CHROMOTOGRAPHY
- EPA SW-846; 8020

Manuel Garbalena

7-24-95
Date

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240
PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

CHEMICAL ANALYSIS OF WATER

Company : Environmental Spill Control, Inc. Lab #: H2092
City, St.: P.O. Box 5890 Date Received: 7/17/95
Proj.Name: MW #3 Rice Date Analyzed: 7/18/95
Location : not given

Sample 1 : MW #3 Units: mg/L

PARAMETER	RESULT 1
pH	7.01
Chloride (Cl^-)	182
Conductivity (umhos/Cm)	1,317

Larry L. Bailey

7/17/95
Date

CARDINAL LABORATORIES

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FINAL ANALYSIS REPORT

Company:	Environmental Spill Control, Inc.	Date:	7/26/95
Address:	P.O. Box 5890	Lab #:	H2097-4
City, State:	Hobbs, NM 88241		
Project Name:	H-6 Rice Engineering		
Location:	1/2 mile S. of Intersection of Marland and Loop Bypass		
Sampled by:	JK	Date:	7/21/95
Sample Type:	Water	Sample Condition:	
Sample ID:	MW-2	Units:	ppm

POLYNUCLEAR AROMATIC HYDROCARBONS

PARAMETER	RESULT
Acenapthene	<0.004
Acenaphthylene	<0.004
Anthracene	<0.004
Benzo(a)anthracene	<0.004
Benzo(a)pyrene	<0.004
Benzo(b)fluoranthene	<0.004
Benzo(k)fluoranthene	<0.004
Benzo(ghi)perylene	<0.004
Chrysene	<0.004
Dibenzo(a,h)anthracene	<0.004
Fluoranthene	<0.004
Fluorene	<0.004
Indeno(1,2,3-cd)pyrene	<0.004
Naphthalene	<0.004
Phenanthrene	<0.004
Pyrene	<0.004

METHODS- EPA SW 846-8270

Manuel Garbalena

7/26/95
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

FINAL ANALYSIS REPORT

Company:	Environmental Spill Control, Inc.	Date:	7/26/95
Address:	P.O. Box 5890	Lab #:	H2097-6
City, State:	Hobbs, NM 88241		
Project Name:	H-6 Rice Engineering		
Location:	1/2 mile S. of Intersection of Marland and Loop Bypass		
Sampled by:	JK	Date:	7/21/95
Sample Type:	Water	Sample Condition:	
Sample ID:	MW-3	Units:	ppm

POLYNUCLEAR AROMATIC HYDROCARBONS

PARAMETER	RESULT
Acenapthene	<0.004
Acenaphthylene	<0.004
Anthracene	<0.004
Benzo(a)anthracene	<0.004
Benzo(a)pyrene	<0.004
Benzo(b)fluoranthene	<0.004
Benzo(k)fluoranthene	<0.004
Benzo(ghi)perylene	<0.004
Chrysene	<0.004
Dibenzo(a,h)anthracene	<0.004
Fluoranthene	<0.004
Fluorene	<0.004
Indeno(1,2,3-cd)pyrene	<0.004
Naphthalene	<0.004
Phenanthrene	<0.004
Pyrene	<0.004

METHODS- EPA SW 846-8270

Manuel Garbalena

7/26/95
Date

CARDINAL LABORATORIES

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PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

FINAL ANALYSIS REPORT

Company:	Environmental Spill Control, Inc.	Date:	7/26/95
Address:	P.O. Box 5890	Lab #:	H2097-2
City, State:	Hobbs, NM 88241		
Project Name:	H-6 Rice Engineering		
Location:	1/2 mile S. of Intersection of Marland and Loop Bypass		
Sampled by:	JK	Date:	7/21/95
Sample Type:	Water	Sample Condition:	
Sample ID:	MW-6	Units:	ppm

POLYNUCLEAR AROMATIC HYDROCARBONS

PARAMETER	RESULT
Acenapthene	<0.004
Acenaphthylene	<0.004
Anthracene	<0.004
Benzo(a)anthracene	<0.004
Benzo(a)pyrene	<0.004
Benzo(b)fluoranthene	<0.004
Benzo(k)fluoranthene	<0.004
Benzo(ghi)perylene	<0.004
Chrysene	<0.004
Dibenzo(a,h)anthracene	<0.004
Fluoranthene	<0.004
Fluorene	<0.004
Indeno(1,2,3-cd)pyrene	<0.004
Naphthalene	<0.004
Phenanthrene	<0.004
Pyrene	<0.004

METHODS- EPA SW 846-8270

Manuel Garbalena

7/26/95
Date

CARDINAL LABORATORIES

PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603
PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240
PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

CHEMICAL ANALYSIS OF WATER

Company : Environmental Spill Control, Inc. Lab #: H2097
City, St.: P.O. Box 5890, Hobbs, NM Date Received: 7/21/95
Proj.Name: H-6, Rice Engineering Date Analyzed: 7/21/95
Location : 1/2 mile S. of Intersection of Marland and Loop Bypass

Sample 5 : MW-2 (H2O) Units: mg/L
Sample 7 : MW-6 (H2O)
Sample 8 : MW-1 (H2O)
Sample 9 : MW-3 (H2O)

PARAMETER	RESULT 5	RESULT 7	RESULT 8	RESULT 9
Chloride (Cl^-)	132	96	***	256
API Gravity	***	***	30.3	***

Manuel Garbalena

7-24-95
Date

Environmental Analytical Services

ARDINAL LABORATORIES

118 S. Commercial Ave.
Farmington, NM 87401
505-326-4669
FAX 505-326-4535

101 E. Marland
Hobbs, NM 88240
505-393-2326
FAX 505-393-2476

Chain of Custody Record

Project I.D. ESC Job No. 129
SPILL SITE N-6 HOBBS SWD SYSTEM
Project Location RICE ENGINEERING
Sampled By F. Wesley Root
Client Name Environmental Spill Control
Address 1203 West Dunnam
Hobbs, New Mexico 88240
Telephone 505-392-6167 FAX 392-5085

Sample Number	Date	Time	Composite	Grab	Sample Location	Number of Containers	Analysis Required: BTEX	Chloride	PAH	TDS				Remarks (Type sample, preservation, etc.)
1	8-10-95	18:30		✓	MW-4	1 40mL	✓							Liq
1	8-10-95	18:30		✓	MW-4	1 500mL		✓						
1	8-10-95	18:30		✓	MW-4	1 500mL				✓				
1	8-10-95	18:30		✓	MW-4	1 Ltr			✓					

Released by: (Signature)	Date	Time	Received by: (Signature)
F. Wesley Root	8-11-95	15:20	
Released by: (Signature)	Date	Time	Received by: (Signature)
	8/11/95	15:25	

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PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

FINAL ANALYSIS REPORT

Company:	Environmental Spill Control	Date:	8/17/95
Address:	1203 W. Dunnam	Lab #:	H2133
City, State:	Hobbs, NM		
Project Name:	ESC Job No. 129		
Location:	Spill Site N-6 SWD System Rice Engineering		
Sampled by:	FWR	Date:	8/10/95
Sample Type:	Liquid	Sample Condition:	Intact
Sample ID:	MW-4		

POLYNUCLEAR AROMATIC HYDROCARBONS

PARAMETER	RESULT	UNITS
Acenapthene	<0.004	mg/L
Acenaphthylene	<0.004	mg/L
Anthracene	<0.004	mg/L
Benzo(a)anthracene	<0.004	mg/L
Benzo(a)pyrene	<0.004	mg/L
Benzo(b)flouranthene	<0.004	mg/L
Benzo(k)flouranthene	<0.004	mg/L
Benzo(ghi)perylene	<0.004	mg/L
Chrysene	<0.004	mg/L
Dibenz(a,h)anthracene	<0.004	mg/L
Flouranthene	<0.004	mg/L
Fluorene	<0.004	mg/L
Indeno(1,2,3-cd)pyrene	<0.004	mg/L
Naphthalene	<0.004	mg/L
Phenanthrene	<0.004	mg/L
Pyrene	<0.004	mg/L

METHODS- EPA SW 846-8270

Gayle A. Potter

8/17/95
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

CHEMICAL ANALYSIS OF WATER

Company : Environmental Spill Control — Lab #: H2133
City, St.: Hobbs, NM — Date Received: 8/11/95
Proj.Name: ESC Job No. 129 — Date Analyzed: various
Location : Spill Site N-6 Hobbs SWD System Rice Engineering

Sample 1 : MW-4 — Units: mg/l

PARAMETER	RESULT 1
Chloride(ppm)	332
Total Dissolved Solids	983

Gayle A. Potter

6/19/95
Date

CARDINAL LABORATORIES

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PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

BTEX ANALYSIS REPORT

Company: Environmental Spill Control Date: 8/17/95
Address: 1203 W. Dunnam Lab #: H2133
City, State: Hobbs, NM

Project Name: ESC Job No. 129
Location: Spill Site N-6 Hobbs SWD System Rice Engineering
Sampled by: FWR Date: 8/10/95 Time: 18:30
Analyzed by: MG Date: 8/11/95 Time: 16:02
Sample Type: Liquid Sample Condition: Intact Units: ppm

Samp #	Field Code	BENZENE	TOLUENE	ETHYL BENZENE	PARA-XYLENE	META-XYLENE	ORTHO-XYLENE
1	MW-4	<0.001	<0.001	<0.001	<0.001	<0.001	0.067
QC Recovery		0.897	0.908	0.916	0.897	0.896	0.971
QC Spike		0.878	0.873	0.867	0.862	0.853	0.867
Accuracy		102.2%	104.0%	105.7%	104.1%	103.2%	112.0%
Air Blank		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Methods - GAS CHROMOTOGRAPHY
- EPA SW-846; 8020

Gayle A. Potter

8/17/95
Date

Environmental Analytical Services

ARDINAL LABORATORIES

118 S. Commercial Ave.
Farmington, NM 87401
505-326-4669
FAX 505-326-4535

101 E. Marland
Hobbs, NM 88240
505-393-2326
FAX 505-393-2476

Chain of Custody Record

Project I.D. H-6 Spill Site Rice Engineering
Project Location ½ mile South of Marland & West City
Sampled By Dave Abbott
Client Name ~~Rice Engineering~~ ESCI
Address ~~122 West Taylor~~ PO Box 5890, Hobbs
Telephone ~~505-393-9174~~ 2-6167

Sample Number	Date	Time	Composite	Grab	Sample Location	Number of Containers	Analysis Required: BTEX	DAH's	Chlorides	TDS	[redacted]			Remarks (Type sample, preservation, etc.)
1	7/24	15:00		✓	Existing Domestic Well		✓	✓	✓	✓				Liquid
2	7/24	15:00		✓	" " "									fax results to allen Hodges
3	7/24	15:15		✓	Monitor Well #1		✓	✓	✓	✓				397-5085
4	7/24	15:15		✓	" "					✓				
5	7/24	15:45		✓	Monitor Well #5		✓	✓	✓	✓				
6	7/24	15:45		✓	" " "									
7	7/24			✓	Monitor Well #8		✓	✓	✓	✓				
8	7/24			✓	" " "									

Released by: (Signature)	Date	Time	Received by: (Signature)
Released by: (Signature)	Date 7/24/95	Time 4:45	Received by: (Signature) intact

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BTEX ANALYSIS REPORT

Company: Environmental Spill Control, Inc. Date: 7/27/95
Address: P.O.Box 5890 Lab #: H2105
City, State: Hobbs, NM 88420

Project Name: H-6 Rice Engineering
Location: 1/2 mile S of Marland and Loop Bypass
Sampled by: DA Date: 7/24/95 Time: 1500
Analyzed by: LB Date: 7/27/95 Time: various
Sample Type: Liquid Sample Condition: Intact Units: ppm

Samp #	Field Code	BENZENE	TOLUENE	ETHYL BENZENE	PARA-XYLENE	META-XYLENE	ORTHO-XYLENE	MTBE
1	Existing Dom. Well	0.777	<0.020	<0.020	0.030	<0.020	<0.020	<0.020
2	Monitor Well #1	2.871	<0.020	0.121	0.245	<0.020	0.026	<0.020
3	Monitor Well #5	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
4	Monitor Well #8	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
	QC Recovery	0.112	0.105	0.108	0.099	0.106	0.097	0.093
	QC Spike	0.107	0.107	0.115	0.104	0.111	0.111	0.098
	Accuracy	104.7%	98.1%	93.9%	95.2%	95.5%	87.4%	94.9%
	Air Blank	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Methods - GAS CHROMOTOGRAPHY
- EPA SW-846; 8020

Manuel Garbalena

7/27/95
Date

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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

FINAL ANALYSIS REPORT

Company:	Environmental Spill Control	Date:	8/1/95
Address:	P.O. Box 5890	Lab #:	H2105-4
City, State:	Hobbs, NM		
Project Name:	H-6 Rice Engineering		
Location:	1/2 mile S of Marland and Loop Bypass		
Sampled by:	DA	Date:	7/24/95
Sample Type:	Liquid	Sample Condition:	intact
Sample ID:	Monitor Well #8		

POLYNUCLEAR AROMATIC HYDROCARBONS

PARAMETER	RESULT	UNITS
Acenapthene	<0.004	mg/L
Acenaphthylene	<0.004	mg/L
Anthracene	<0.004	mg/L
Benzo(a)anthracene	<0.004	mg/L
Benzo(a)pyrene	<0.004	mg/L
Benzo(b)flouranthene	<0.004	mg/L
Benzo(k)flouranthene	<0.004	mg/L
Benzo(ghi)perylene	<0.004	mg/L
Chrysene	<0.004	mg/L
Dibenz(a,h)anthracene	<0.004	mg/L
Flouranthene	<0.004	mg/L
Fluorene	<0.004	mg/L
Indeno(1,2,3-cd)pyrene	<0.004	mg/L
Naphthalene	<0.004	mg/L
Phenanthrene	<0.004	mg/L
Pyrene	<0.004	mg/L

METHODS- EPA SW 846-8270

Manuel Garbalena

8-7-95
Date

CARDINAL LABORATORIES

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PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

FINAL ANALYSIS REPORT

Company:	Environmental Spill Control	Date:	8/1/95
Address:	P.O. Box 5890	Lab #:	H2105-3
City, State:	Hobbs, NM		
Project Name:	H-6 Rice Engineering		
Location:	1/2 mile S of Marland and Loop Bypass		
Sampled by:	DA	Date:	7/24/95
Sample Type:	Liquid	Sample Condition:	intact
Sample ID:	Monitor Well #5		

POLYNUCLEAR AROMATIC HYDROCARBONS

PARAMETER	RESULT	UNITS
Acenapthene	<0.004	mg/L
Acenaphthylene	<0.004	mg/L
Anthracene	<0.004	mg/L
Benzo(a)anthracene	<0.004	mg/L
Benzo(a)pyrene	<0.004	mg/L
Benzo(b)flouranthene	<0.004	mg/L
Benzo(k)flouranthene	<0.004	mg/L
Benzo(ghi)perylene	<0.004	mg/L
Chrysene	<0.004	mg/L
Dibenz(a,h)anthracene	<0.004	mg/L
Flouranthene	<0.004	mg/L
Fluorene	<0.004	mg/L
Indeno(1,2,3-cd)pyrene	<0.004	mg/L
Naphthalene	<0.004	mg/L
Phenanthrene	<0.004	mg/L
Pyrene	<0.004	mg/L

METHODS- EPA SW 846-8270

M. L. Garbalena
Manuel Garbalena

8-7-95
Date

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FINAL ANALYSIS REPORT

Company:	Environmental Spill Control	Date:	8/1/95
Address:	P.O. Box 5890	Lab #:	H2105-2
City, State:	Hobbs, NM		
Project Name:	H-6 Rice Engineering		
Location:	1/2 mile S of Marland and Loop Bypass		
Sampled by:	DA	Date:	7/24/95
Sample Type:	Liquid	Sample Condition:	intact
Sample ID:	Monitor Well #1		

POLYNUCLEAR AROMATIC HYDROCARBONS

PARAMETER	RESULT	UNITS
Acenapthene	<0.004	mg/L
Acenaphthylene	<0.004	mg/L
Anthracene	<0.004	mg/L
Benzo(a)anthracene	<0.004	mg/L
Benzo(a)pyrene	<0.004	mg/L
Benzo(b)flouranthene	<0.004	mg/L
Benzo(k)flouranthene	<0.004	mg/L
Benzo(ghi)perylene	<0.004	mg/L
Chrysene	<0.004	mg/L
Dibenz(a,h)anthracene	<0.004	mg/L
Flouranthene	<0.004	mg/L
Fluorene	<0.004	mg/L
Indeno(1,2,3-cd)pyrene	<0.004	mg/L
Naphthalene	0.050	mg/L
Phenanthrene	<0.004	mg/L
Pyrene	<0.004	mg/L

METHODS- EPA SW 846-8270

Manuel Garbalena

8-7-95
Date

CARDINAL LABORATORIES

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FINAL ANALYSIS REPORT

Company:	Environmental Spill Control	Date:	8/1/95
Address:	P.O. Box 5890	Lab #:	H2105-1
City, State:	Hobbs, NM		
Project Name:	H-6 Rice Engineering		
Location:	1/2 mile S of Marland and Loop Bypass		
Sampled by:	DA	Date:	7/24/95
Sample Type:	Liquid	Sample Condition:	intact
Sample ID:	Existing Monitor Well		

POLYNUCLEAR AROMATIC HYDROCARBONS

PARAMETER	RESULT	UNITS
Acenapthene	<0.004	mg/L
Acenaphthylene	<0.004	mg/L
Anthracene	<0.004	mg/L
Benzo(a)anthracene	<0.004	mg/L
Benzo(a)pyrene	<0.004	mg/L
Benzo(b)flouranthene	<0.004	mg/L
Benzo(k)flouranthene	<0.004	mg/L
Benzo(ghi)perylene	<0.004	mg/L
Chrysene	<0.004	mg/L
Dibenz(a,h)anthracene	<0.004	mg/L
Flouranthene	<0.004	mg/L
Fluorene	<0.004	mg/L
Indeno(1,2,3-cd)pyrene	<0.004	mg/L
Naphthalene	0.017	mg/L
Phenanthrene	<0.004	mg/L
Pyrene	<0.004	mg/L

METHODS- EPA SW 846-8270

Manuel Garbalena

8-7-95
Date

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CHEMICAL ANALYSIS OF WATER

Company : Environmental Spill Control — Lab #: H2105
City, St.: Hobbs, NM — Date Received: 7/24/95
Proj.Name: H-6 Rice Engineering — Date Analyzed:
Location : 1/2 mile S of Marland and Loop Bypass

Sample 1 : Existing Domestic Well — Units: mg/l
Sample 2 : Monitor Well #1
Sample 3 : Monitor Well #5
Sample 4 : Monitor Well #8

PARAMETER	RESULT 1	RESULT 2	RESULT 3	RESULT 4
Chloride	7,178.6	14,091.4	106.35	382.9
Total Dissolved Solids	13,889	25,106	1,481	3,218

Manuel Garbalena

8/7/95
Date

CARDINAL LABORATORIES

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CHEMICAL ANALYSIS OF WATER

Company : Environmental Spill Control, Inc. Lab #: H2092
City, St.: P.O. Box 5890 Date Received: 7/17/95
Proj.Name: MW #3 Rice Date Analyzed: 7/18/95
Location : not given

Sample 1 : MW #3 Units: mg/L

PARAMETER	RESULT 1
pH	7.01
Chloride (Cl^-)	182
Conductivity (umhos/Cm)	1,317

Water well or Elevation ?

Inactive water well

Mobile (505) 370-4780

7/17/95
Date

CARDINAL LABORATORIES

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BTEX ANALYSIS REPORT

Company: Environmental Spill Control, Inc. Date: 7/24/95
Address: P.O. Box 5890 Lab #: H2097
City, State: Hobbs, NM 88241

Project Name: H-6, Rice Engineering
Location: 1/2 mile S. of Intersection of Marland and Loop Bypass
Sampled by: JK Date: 7/21/95 Time: not given
Analyzed by: LB Date: 7/21/95 Time: p.m.
Sample Type: Soil/Water Sample Condition: Intact Units: ppm

Samp #	Field Code	BENZENE	TOLUENE	ETHYL BENZENE	PARA-XYLENE	META-XYLENE	ORTHO-XYLENE	MTBE
1	MW-5 (35')Soil	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
2	MW-6 (H20)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
3	MW-6 (39')Soil	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
4	MW-2 (H20)	0.047	0.012	0.033	<0.001	<0.001	<0.001	<0.001
6	MW-3 (H20)	0.044	0.061	0.048	0.011	0.011	0.020	<0.001
	QC Recovery	0.757	0.820	0.878	0.855	0.854	0.828	0.708
	QC Spike	0.878	0.873	0.867	0.862	0.853	0.867	0.830
	Accuracy	86.2%	93.9%	101.3%	99.2%	100.1%	95.5%	85.3%
	Air Blank	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

Methods - GAS CHROMOTOGRAPHY
- EPA SW-846; 8020

Manuel Garbalena

7-24-95
Date

CARDINAL LABORATORIES

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PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

CHEMICAL ANALYSIS OF WATER

Company : Environmental Spill Control, Inc. Lab #: H2097
City, St.: P.O. Box 5890, Hobbs, NM Date Received: 7/21/95
Proj.Name: H-6, Rice Engineering Date Analyzed: 7/21/95
Location : 1/2 mile S. of Intersection of Marland and Loop Bypass

Sample 5 : MW-2 (H2O) Units: mg/L
Sample 7 : MW-6 (H2O)
Sample 8 : MW-1 (H2O)
Sample 9 : MW-3 (H2O)

PARAMETER	RESULT 5	RESULT 7	RESULT 8	RESULT 9
Chloride (Cl^-)	132	96	***	256
API Gravity	***	***	30.3	***

Manuel Garbalena

7-24-95
Date

CARDINAL LABORATORIES

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FINAL ANALYSIS REPORT

Company:	Environmental Spill Control, Inc.	Date:	7/26/95
Address:	P.O. Box 5890	Lab #:	H2097-2
City, State:	Hobbs, NM 88241		
Project Name:	H-6 Rice Engineering		
Location:	1/2 mile S. of Intersection of Marland and Loop Bypass		
Sampled by:	JK	Date:	7/21/95
Sample Type:	Water	Sample Condition:	
Sample ID:	MW-6	Units:	ppm

POLYNUCLEAR AROMATIC HYDROCARBONS

PARAMETER	RESULT
Acenapthene	<0.004
Acenaphthylene	<0.004
Anthracene	<0.004
Benzo(a)anthracene	<0.004
Benzo(a)pyrene	<0.004
Benzo(b)fluoranthene	<0.004
Benzo(k)fluoranthene	<0.004
Benzo(ghi)perylene	<0.004
Chrysene	<0.004
Dibenzo(a,h)anthracene	<0.004
Fluoranthene	<0.004
Fluorene	<0.004
Indeno(1,2,3-cd)pyrene	<0.004
Naphthalene	<0.004
Phenanthrene	<0.004
Pyrene	<0.004

METHODS- EPA SW 846-8270

Manuel Garbalena

7/26/95
Date

CARDINAL LABORATORIES

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PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

FINAL ANALYSIS REPORT

Company:	Environmental Spill Control, Inc.	Date:	7/26/95
Address:	P.O. Box 5890	Lab #:	H2097-6
City, State:	Hobbs, NM 88241		
Project Name:	H-6 Rice Engineering		
Location:	1/2 mile S. of Intersection of Marland and Loop Bypass		
Sampled by:	JK	Date:	7/21/95
Sample Type:	Water	Sample Condition:	
Sample ID:	MW-3	Units:	ppm

POLYNUCLEAR AROMATIC HYDROCARBONS

PARAMETER	RESULT
Acenapthene	<0.004
Acenaphthylene	<0.004
Anthracene	<0.004
Benzo(a)anthracene	<0.004
Benzo(a)pyrene	<0.004
Benzo(b)fluoranthene	<0.004
Benzo(k)fluoranthene	<0.004
Benzo(ghi)perylene	<0.004
Chrysene	<0.004
Dibenzo(a,h)anthracene	<0.004
Fluoranthene	<0.004
Fluorene	<0.004
Indeno(1,2,3-cd)pyrene	<0.004
Naphthalene	<0.004
Phenanthrene	<0.004
Pyrene	<0.004

METHODS- EPA SW 846-8270

Manuel Garbalena

7/26/95
Date

CARDINAL LABORATORIES

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FINAL ANALYSIS REPORT

Company:	Environmental Spill Control, Inc.	Date:	7/26/95
Address:	P.O. Box 5890	Lab #:	H2097-4
City, State:	Hobbs, NM 88241		
Project Name:	H-6 Rice Engineering		
Location:	1/2 mile S. of Intersection of Marland and Loop Bypass		
Sampled by:	JK	Date:	7/21/95
Sample Type:	Water	Sample Condition:	
Sample ID:	MW-2	Units:	ppm

POLYNUCLEAR AROMATIC HYDROCARBONS

PARAMETER	RESULT
Acenapthene	<0.004
Acenaphthylene	<0.004
Anthracene	<0.004
Benzo(a)anthracene	<0.004
Benzo(a)pyrene	<0.004
Benzo(b)fluoranthene	<0.004
Benzo(k)fluoranthene	<0.004
Benzo(ghi)perylene	<0.004
Chrysene	<0.004
Dibenzo(a,h)anthracene	<0.004
Fluoranthene	<0.004
Fluorene	<0.004
Indeno(1,2,3-cd)pyrene	<0.004
Naphthalene	<0.004
Phenanthrene	<0.004
Pyrene	<0.004

METHODS- EPA SW 846-8270

Manuel Garbalena

7/26/95
Date

CARDINAL LABORATORIES

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PHONE (505) 326-4669 • 118 S. COMMERCIAL AVE. • FARMINGTON, NM 87401

CHEMICAL ANALYSIS OF WATER

Company : Environmental Spill Control
City, St.: P.O. Box 5890, Hobbs, NM
Proj.Name: Rice Engineering H-6 System
Location : Hobbs, NM

Date : 9/14/95
Lab #: H2165
Date Received: 9/1/95
Date Analyzed: various

Units: mg/L

Sample 1 : WW Existing Water Well
Sample 2 : Monitor Well 2
Sample 3 : Monitor Well 3
Sample 4 : Monitor Well 4
Sample 5 : Monitor Well 6

PARAMETER	RESULT 1	RESULT 2	RESULT 3	RESULT 4	RESULT 5
Chloride	2,518	***	***	***	***
TDS	5,030	638	630	803	493

Methods: EPA 600/4-79-020, 325.3, 160.1

Gayle A. Potter

09/14/95
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

BTEX ANALYSIS REPORT

Company: Environmental Spill Control
Address: P.O. Box 5890
City, State: Hobbs, NM 88240

Date: 9/14/95
Lab #: H2165

Project Name: Rice Engineering H-6 System
Location: Hobbs, NM
Sampled by: WR Date: 8/31;9/1 Time: various
Analyzed by: MG,MR Date: various Time: various
Sample Type: Water Sample Condition: Intact Units: ppb

Samp #	Field Code	BENZENE	TOLUENE	ETHYL BENZENE	TOTAL XYLENES
1	WW (Existing Water Well)	181.0	73.5	89.9	68.2
	QC Recovery	103	100	112	344
	QC Spike	100	100	100	300
	Accuracy	103 %	100 %	112 %	114 %
	Air Blank	<0.001	<0.001	<0.001	<0.001

Methods - GAS CHROMOTOGRAPHY
- EPA SW-846; 8020

Gayle A. Potter

09/14/95
Date

FAX TRANSMISSION

ENVIRONMENTAL SPILL CONTROL, INC.

Phone (505) 392-6167
Fax (505) 397-5085
1203 West Dunnam
P.O. Box 5890
Hobbs, New Mexico 88241

Date 9-19 1995
Fax Number 915-563-9526
To Sharon Hall
With Phillips
From Wes
Page 1 of 3 Pages

Message Final results on Rice H-6 System

TABLES

TABLE 1
PRELIMINARY LABORATORY RESULTS
SOUTH HOBBS BY-PASS
RICE ENGINEERING
SUMMARY OF WATER SAMPLE ANALYTICAL RESULTS

Analytical Parameter	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	Inactive Water Well
Chloride	14,091	2,518	256	332	106	96	382	7,178
TDS	25,106	5,030	638	630	1,481	493	3,218	13,889
Volatile Organics (VOCs)								
Methyl Tertbutyl ether (MTBE)	<0.020	<0.001	<0.001	<0.001	<0.020	<0.001	<0.020	<0.020
Benzene	2.871	0.047	0.044	<0.001	<0.020	<0.001	<0.020	0.777
Toluene	<0.020	0.012	0.061	<0.001	<0.020	<0.001	<0.020	<0.020
Ethylbenzene	0.121	0.033	0.048	<0.001	<0.020	<0.001	<0.020	<0.020
Total Xylenes	0.271	<0.001	0.042	0.07	<0.020	<0.001	<0.020	0.030
Polynuclear Aromatic Hydrocarbons (PAHs)								
Naphthalene	0.050	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.017
Acenaphthylene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Acenaphthene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Fluorene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Phenanthrene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Anthracene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Fluoranthene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Pyrene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(a)anthracene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Chrysene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(b)fluoranthene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(k)fluoranthene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(a)pyrene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Indeno(1,2,3-cd)pyrene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Dibenz(a,h)anthracene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Benzo(g,h,i)perylene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004

Chloride, TDS, VOC, and PAH results reported in mg/L (parts per million (ppm)).
Analyses were conducted using EPA Method 8020 (VOCs) and EPA Method 8270 (PAH) by Cardinal Laboratories, Inc.

TABLE 2
PRELIMINARY LABORATORY RESULTS
SOUTH HOBBS BY-PASS
RICE ENGINEERING
SOIL ANALYTICAL RESULTS

Analytical Parameter	MW-2 (15' - 16')	MW-2 (30' - 31')	MW-2 (35' - 36')	MW-3 (103'-104')	MW-3 (162')	MW-5 (35')	MW-6 (39')
TPH (field) (in ppm)	107	69	26	46	35		
Chlorides (field) (in ppm)	5,000	900	<500	<500	<500		
Benzene	NA	NA	NA	NA	NA	<0.020	<0.020
Toluene	NA	NA	NA	NA	NA	<0.020	<0.020
Ethylbenzene	NA	NA	NA	NA	NA	<0.020	<0.020
Xylenes	NA	NA	NA	NA	NA	<0.020	<0.020
Total BTEX	NA	NA	NA	NA	NA	<0.020	<0.020
MTBE	NA	NA	NA	NA	NA	<0.020	<0.020

Units are reported in miligrams per liter (mg/l).
Volatile organics anylsis were conducted using USEPA Method 8020.

TABLE 3
HOBBS SWD SYSTEM
SUMMARY OF GROUNDWATER MEASUREMENTS

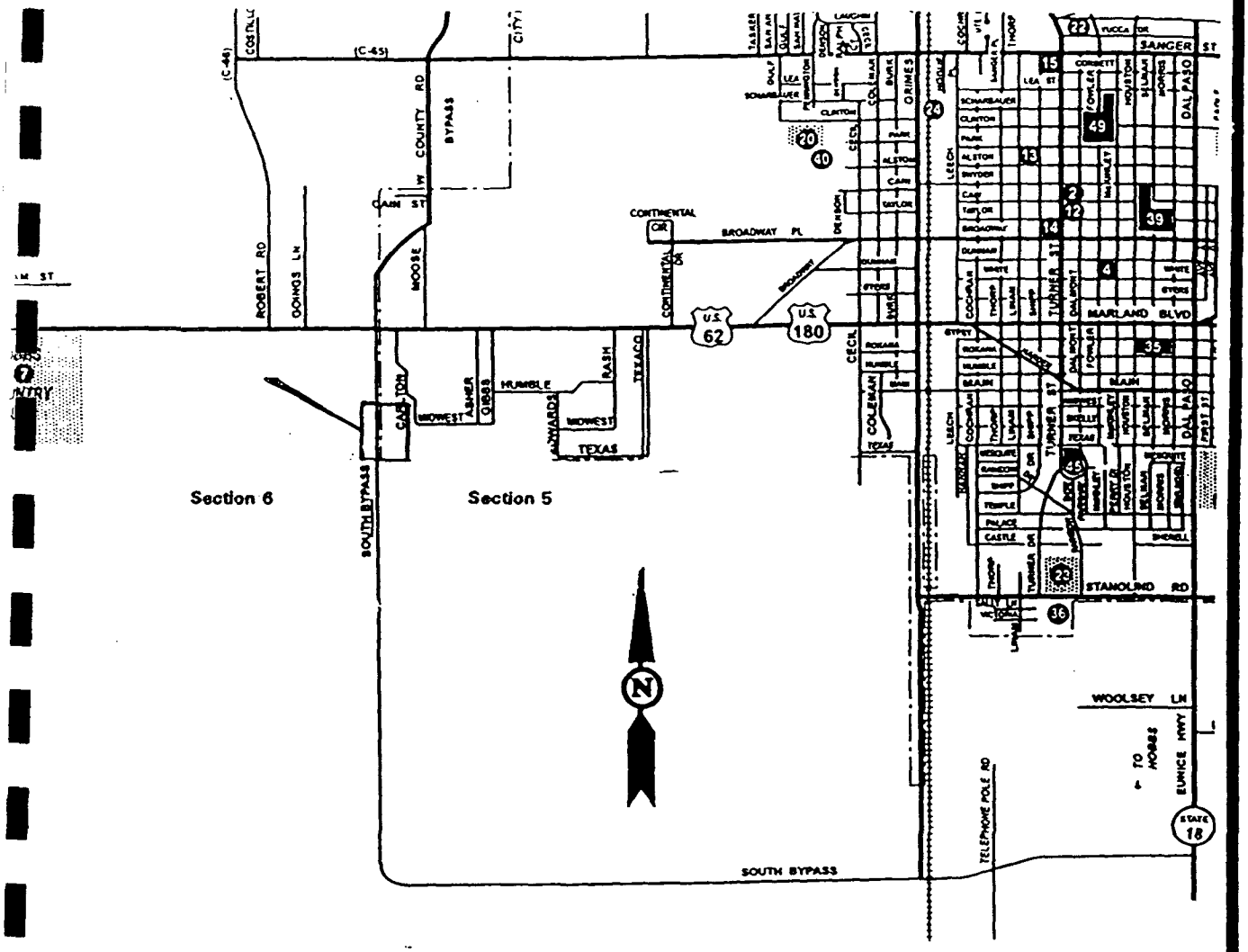
Monitor Well	Date Gauged	Top of Casing Elevation (feet)*	Ground Surface Elevation (feet)*	Depth to Water (feet)**	Corrected Groundwater Elevation (feet)***	Free-floating LNAPL Thickness (feet)
MW-1	7/26/95	100.00	99.30	42.09	57.91	5.12
MW-2	7/26/95	97.94	98.49	37.45	60.49	0
MW-3	7/26/95	97.64	98.08	34.97	62.67	0
MW-4	7/26/95	100.39	100.80	37.40	62.99	0
MW-5	7/26/95	96.23	96.00	33.91	62.32	0
MW-6	7/26/95	98.59	98.81	35.69	62.90	0
MW-7	7/26/95	98.50	98.78	37.92	60.58	0
Inactive Water Well	7/26/95	98.10	97.76	35.75	62.35	0

* Calculated from a relative datum using the top of casing of monitor well MW-1 as a benchmark (100.00 feet).

** Monitor well casings were marked to provide consistemt reference points for gauging operations.

*** Equation for the correction of the groundwater elevation suppression effect caused by the presence of free-floating LNAPLs: Corrected Groundwater Elevation = Elevation - (Depth to Water - (SG) (LNAPL Thickness)) where Specific Gravity (SG) = 0.85 for gasoline, 0.87 for diesel, and 0.9 for crude oil.

FIGURES



TER CHAMBER OF COMMERCE, HOBBS, NEW MEXICO

APPROX. SCALE IN MILES

0 1/4 1/2 1

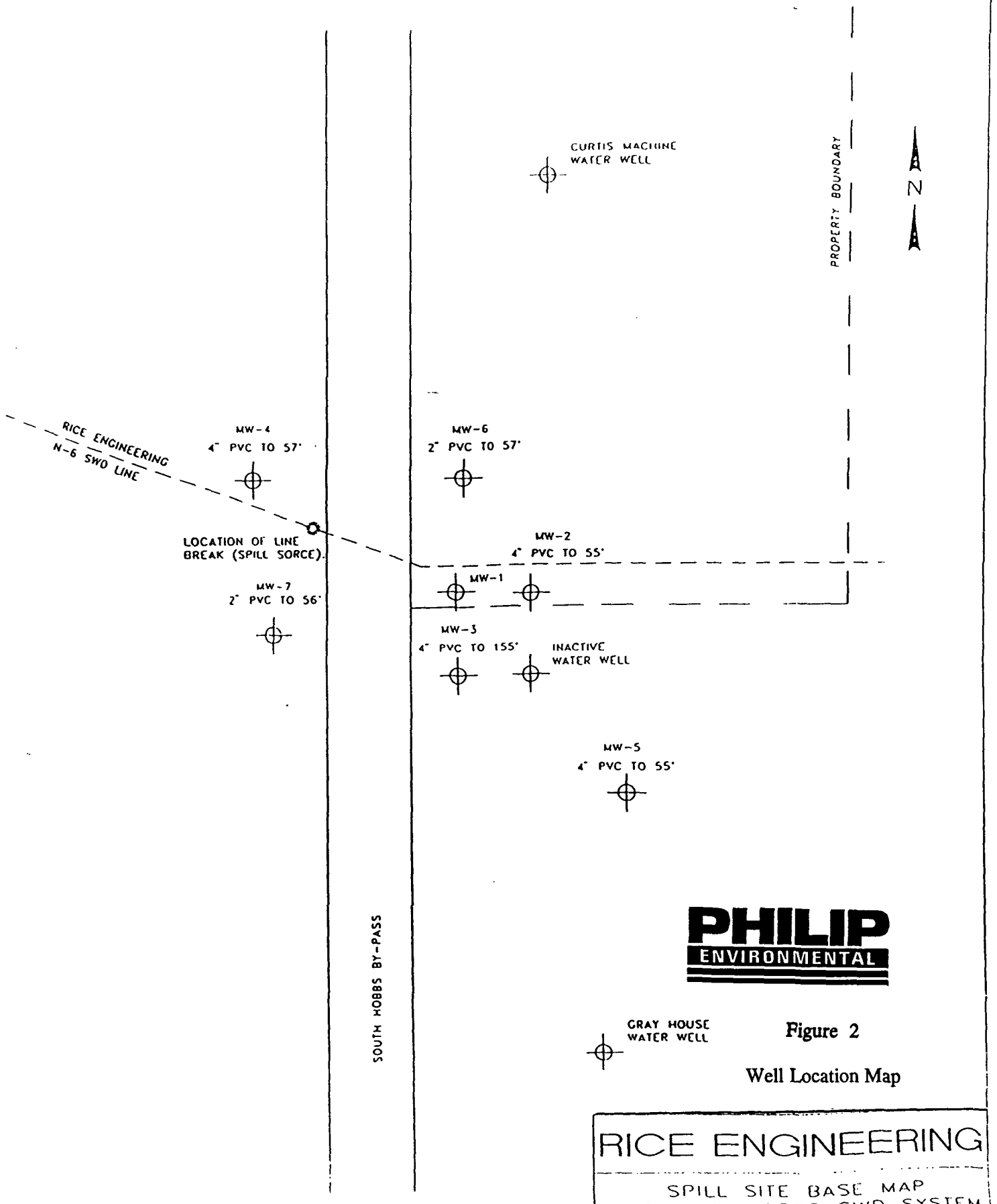
PHILIP ENVIRONMENTAL

Figure 1

re Title: Site Location Map	Client: PHILIP ENVIRONMENTAL SERVICES CORPORATION
ıment Title: ELECTROMAGNETIC (EM-34) TERRAIN CONDUCTIVITY SURVEY	Location: RICE ENGINEERING CORPORATION HOBBS, NEW MEXICO

ROBERTS/SCHORNICK & ASSOCIATES, INC.
Environmental Consultants
3700 West Robinson, Suite 200
Norman, Oklahoma 73072
(405) 321-3895

DATE: 5/24/95	PREPARED BY: D.C.
SCALE: NOTED	CHECKED BY: B.J.S.
	DRAFTED BY: RML
PROJECT NO: 95089.01 F01	FIGURE NO.: 1



PHILIP ENVIRONMENTAL

Figure 2

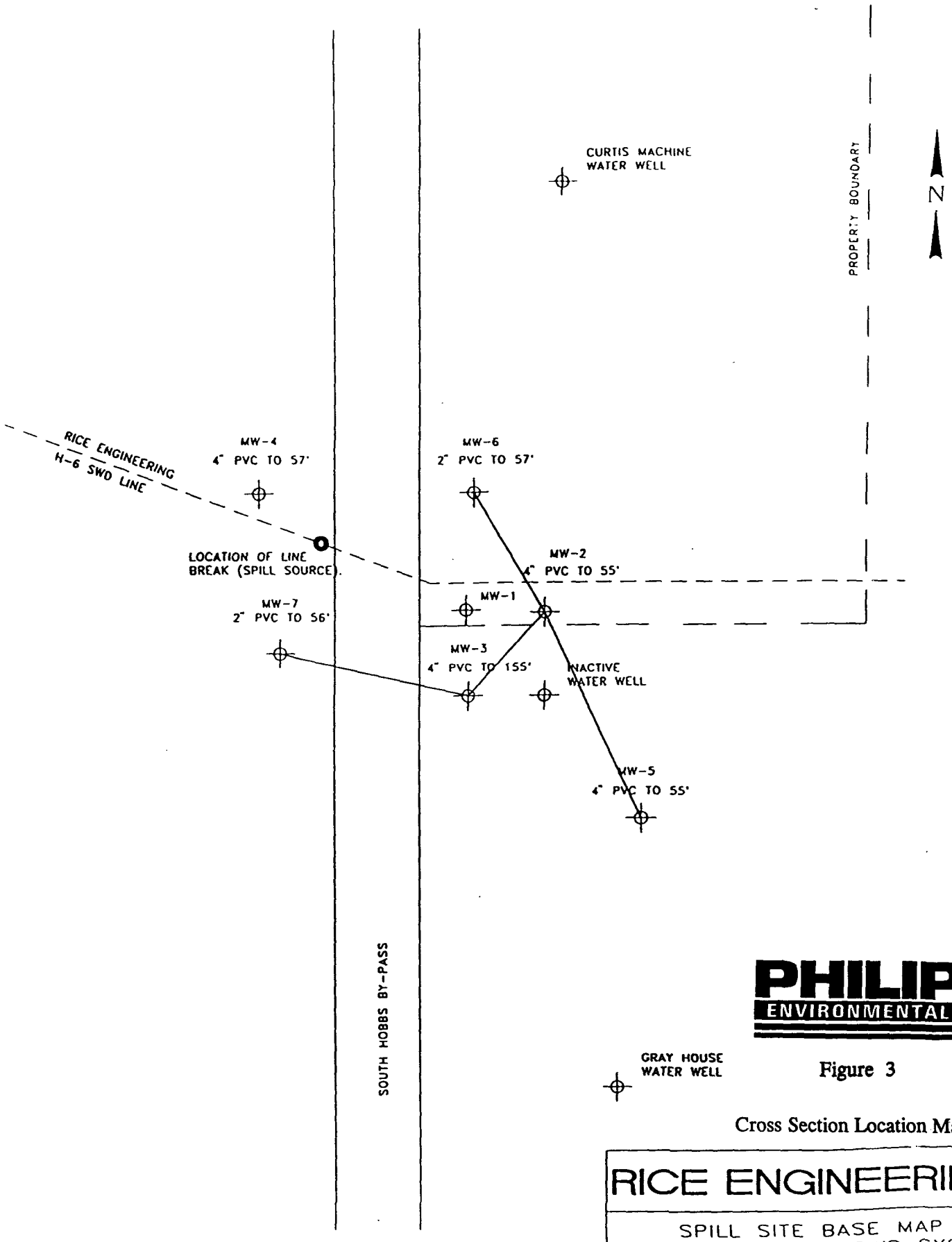
Well Location Map

RICE ENGINEERING

SPILL SITE BASE MAP
LINE N-6, HOBBS SWD SYSTEM
SEC 5 & 6, T19S, R38E
LEA Co., NEW MEXICO

DATE: 7-27-95	DRAWN M.E.G.	REV. DATE	DIV
SCALE: 1" = 200'		JOB # 129	
SHEET 1 OF 1		FILE:	

ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-3085



PHILIP ENVIRONMENTAL

Figure 3

Cross Section Location Map

RICE ENGINEERING

SPILL SITE BASE MAP
LINE H-6, HOBBS SWD SYSTEM
SEC 5 & 6, T19S, R38E
LEA Co., NEW MEXICO

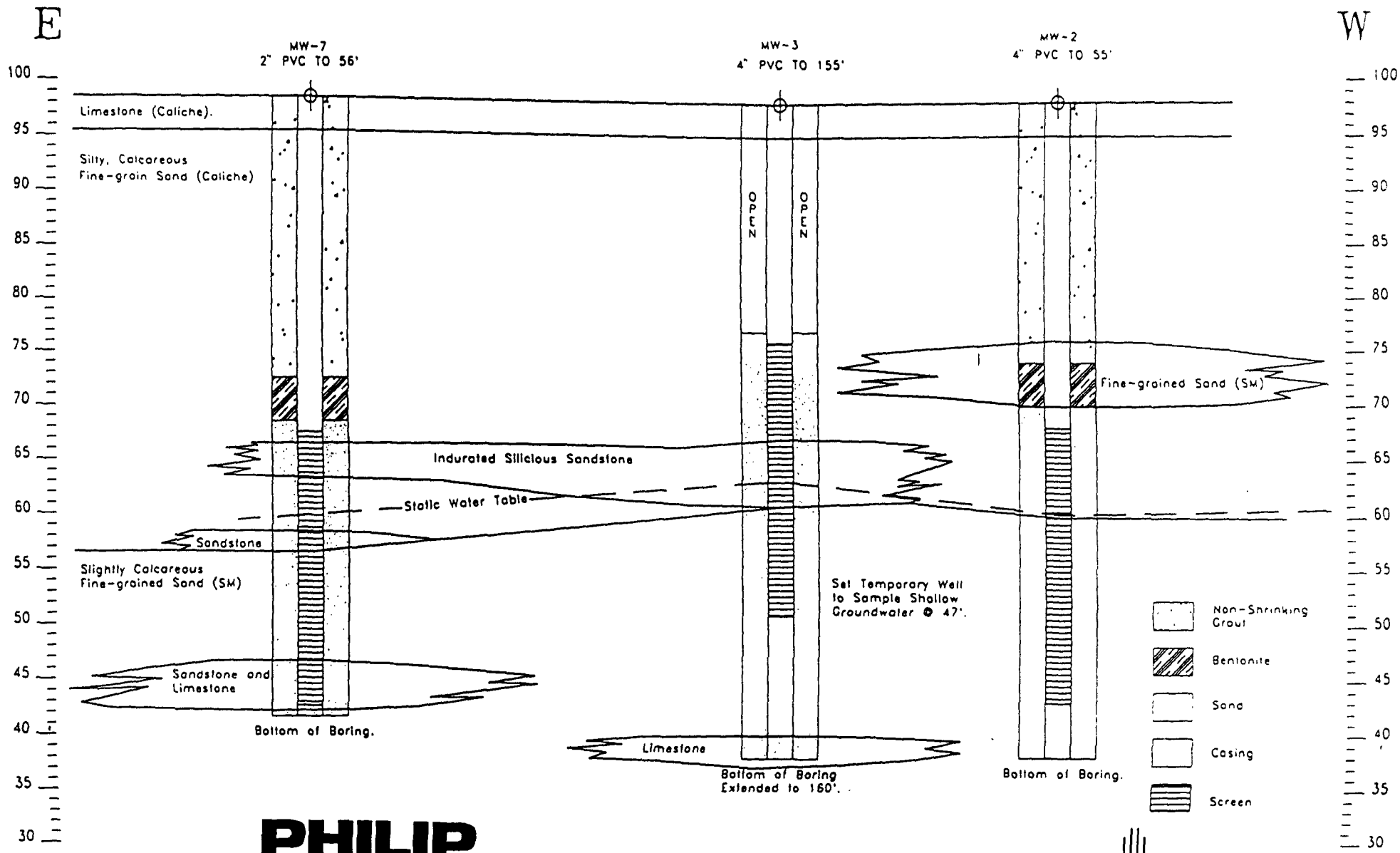
DATE:7-27-95	DRAWN M.F.G.	REV. DATE	DIV
SCALE: 1" = 200'		JOB # 129	
SHEET 1 OF 4		FILE:	

ENVIRONMENTAL
SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

Figure 4

Soil Cross-Section

HOBBS SWD SYSTEM



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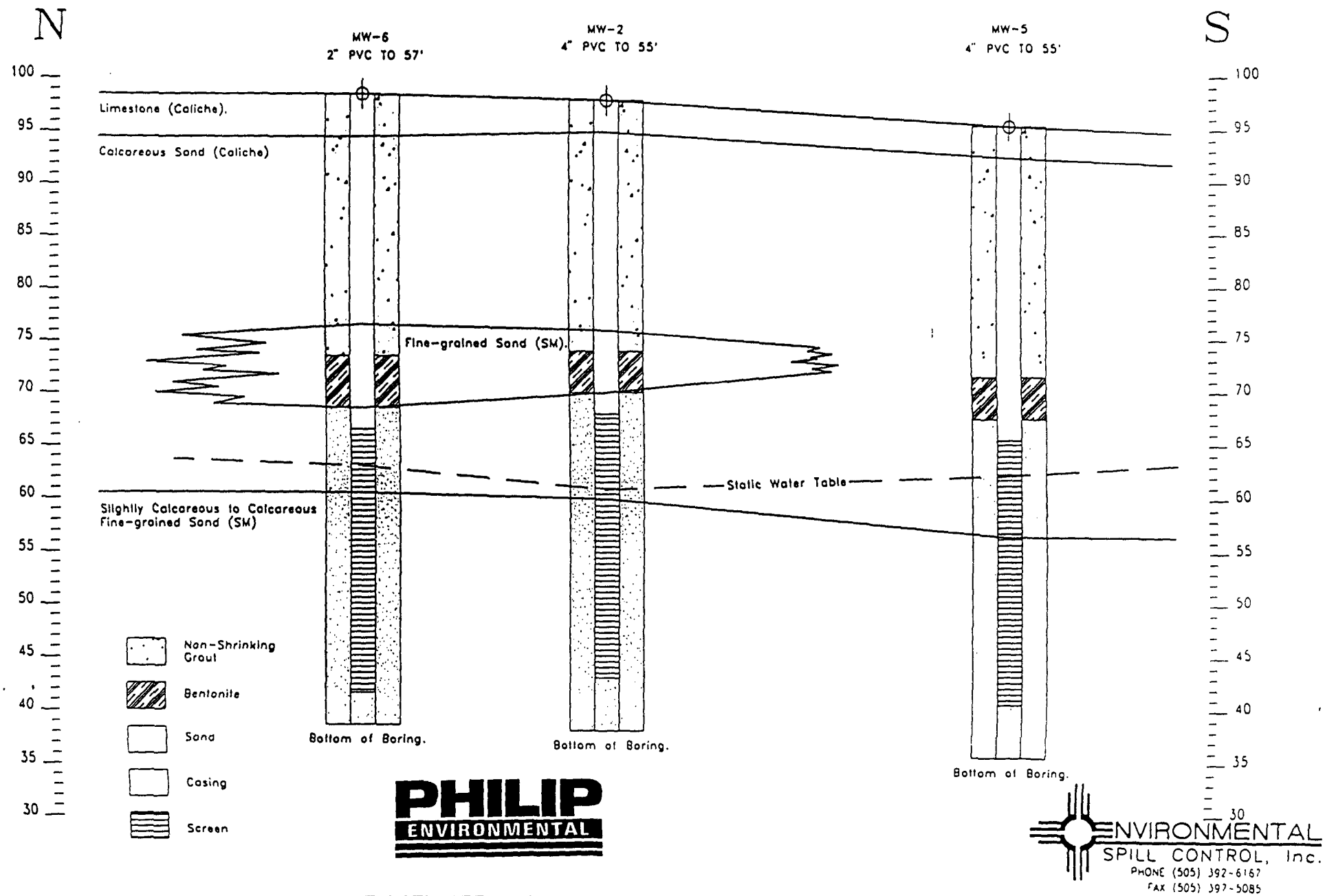
ENVIRONMENTAL SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5085

Figure 5

Soil Cross-Section

HOBBS SWD SYSTEM



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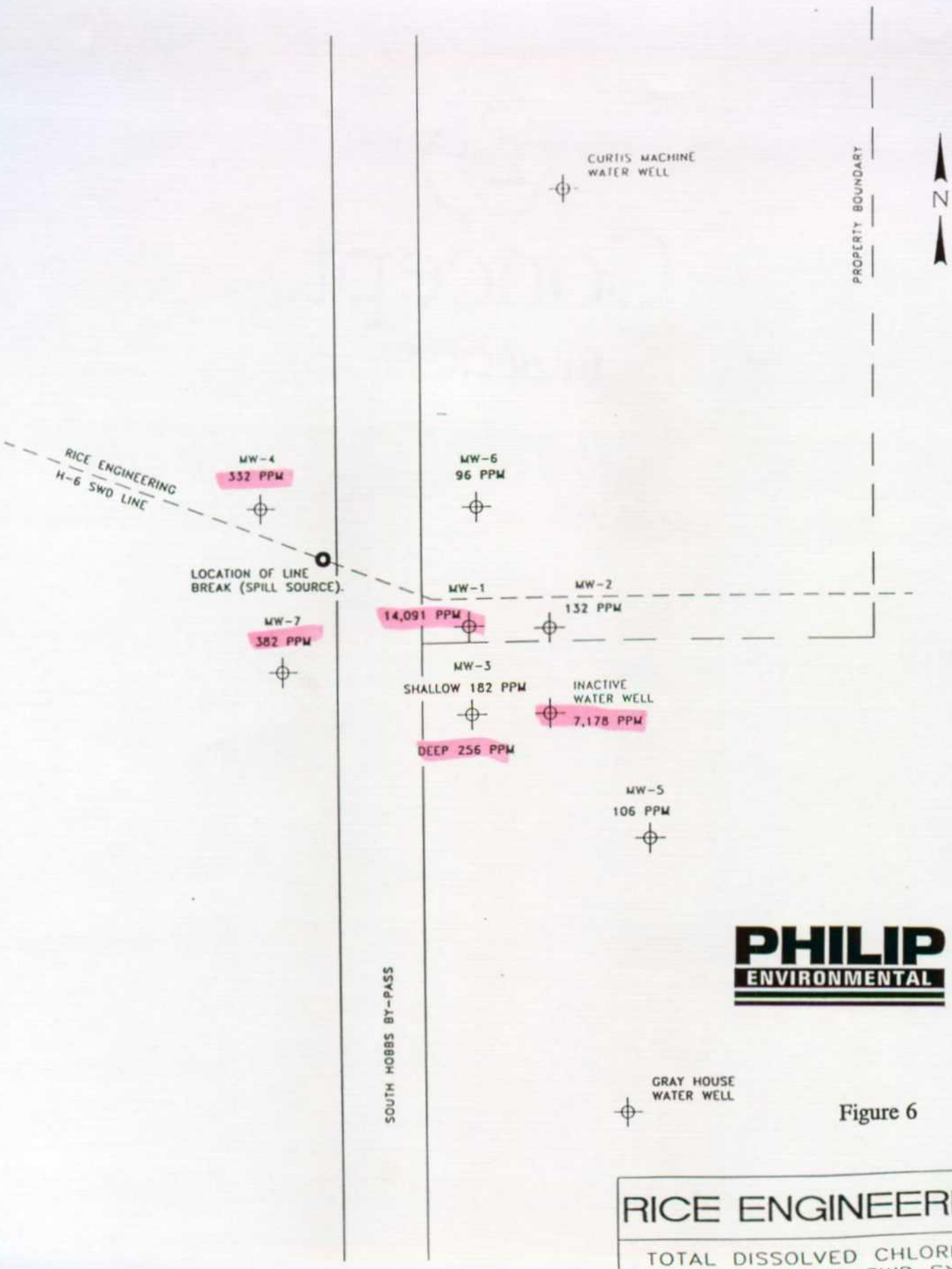
FAX (505) 397-5085



PHILIP ENVIRONMENTAL

Figure 6

RICE ENGINEERING

TOTAL DISSOLVED CHLORIDES
LINE H-6, HOBBS SWD SYSTEM
SEC 5 & 6, T19S, R38E
LEA Co., NEW MEXICO

DATE: 7-27-95	DRAWN M.F.G.	REV. DATE	DIV
SCALE: 1" = 200'		JOB # 129	
SHEET 3 OF 4		FILE:	

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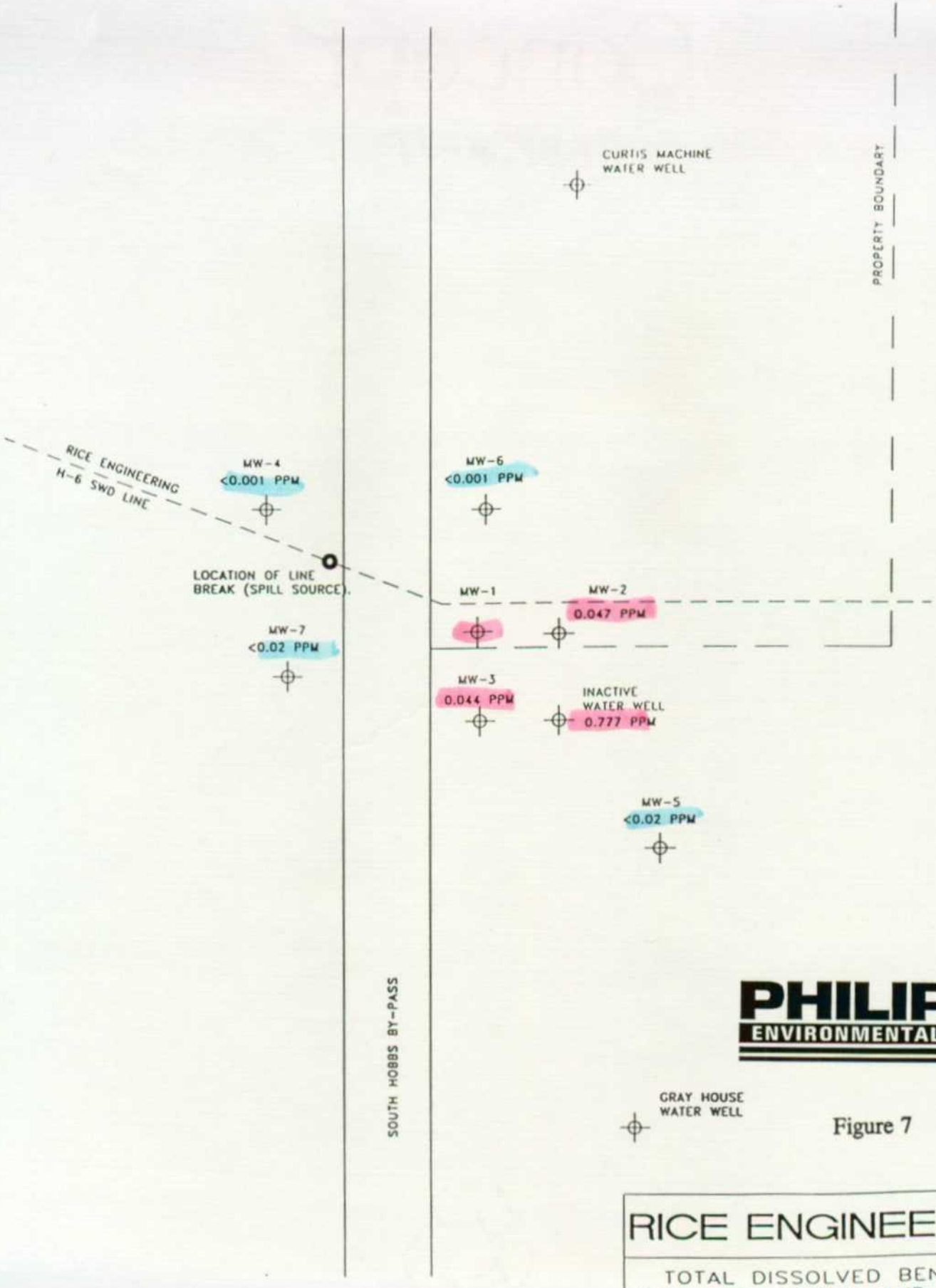
SPILL CONTROL, Inc.
PHONE (505) 392-6187
FAX (505) 397-5085



PHILIP ENVIRONMENTAL

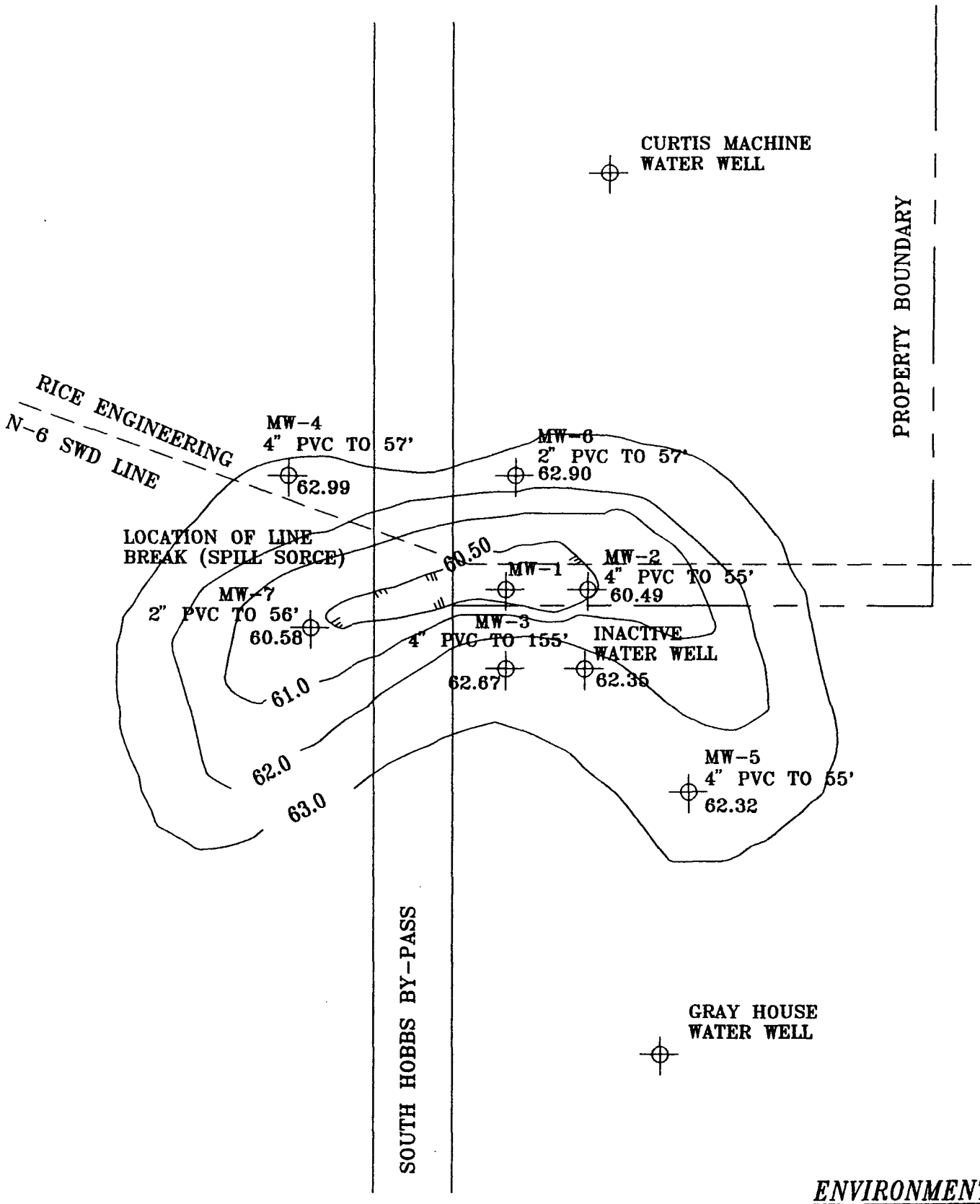
Figure 7

RICE ENGINEERING

TOTAL DISSOLVED BENZENE
LINE H-6, HOBBS SWD SYSTEM
SEC 5 & 6, T19S, R38E
LEA Co., NEW MEXICO

DATE:7-27-95	DRAWN M.F.G.	REV. DATE	DIV
SCALE: 1" = 200'		JOB # 129	
SHEET 4 OF 4		FILE:	

ENVIRONMENTAL
SPILL CONTROL, Inc.
PHONE (505) 392-6167
FAX (505) 397-5065



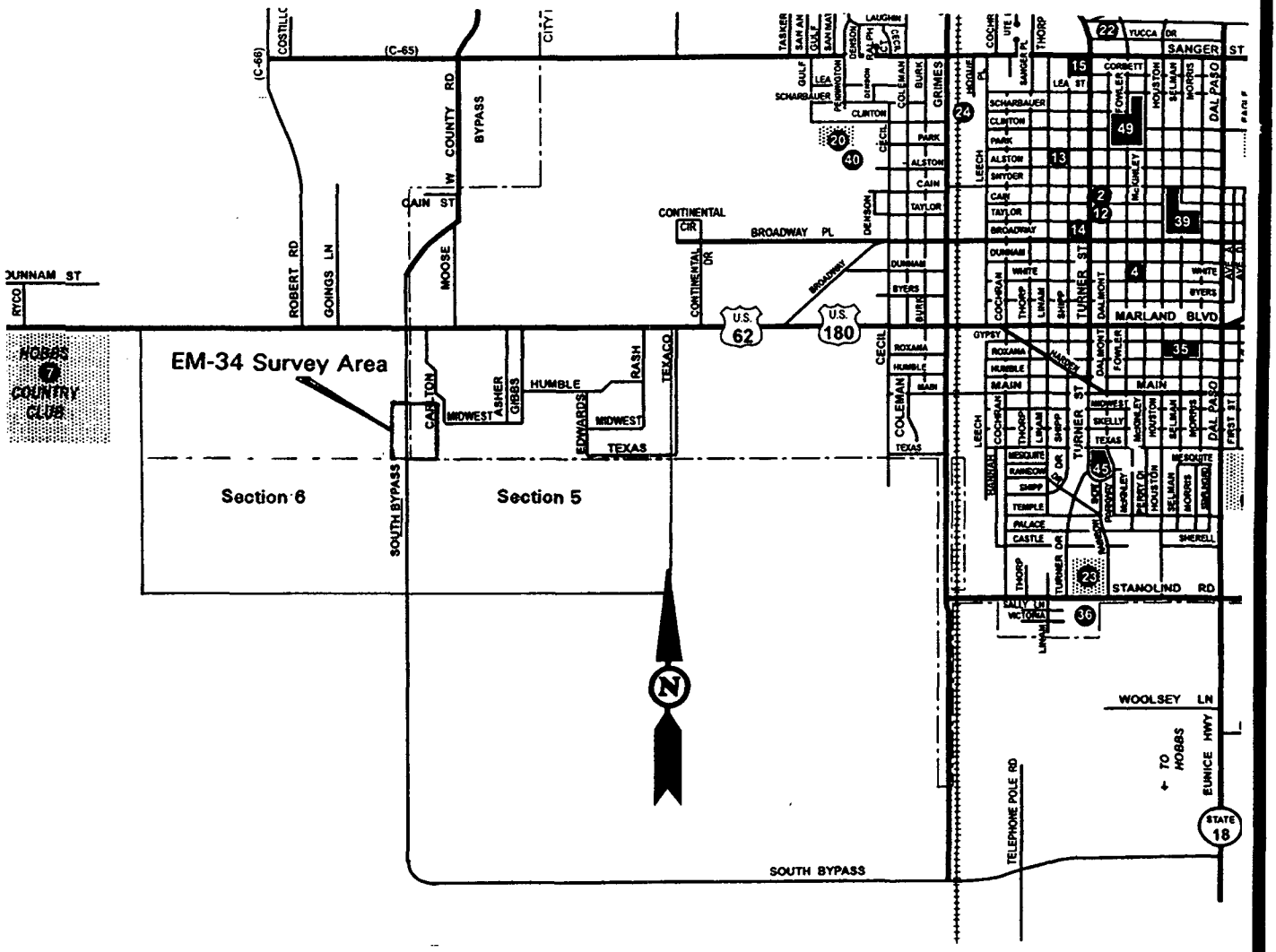
ENVIRONMENTAL
SPILL CONTROL INC.
Phone (505) 392-6167
Fax (505) 397-5085

PHILIP ENVIRONMENTAL

GROUNDWATER ELEVATION CONTOUR MAP
LINE N-6, HOBBS SWD SYSTEM
SEC 5 & 6, T19S, R38E
LEA Co., NEW MEXICO

Project:	DWN:	Revision:
Figure: 8	CHKD:	Date: 9/19/95

FIGURES



AFTER CHAMBER OF COMMERCE, HOBBS, NEW MEXICO

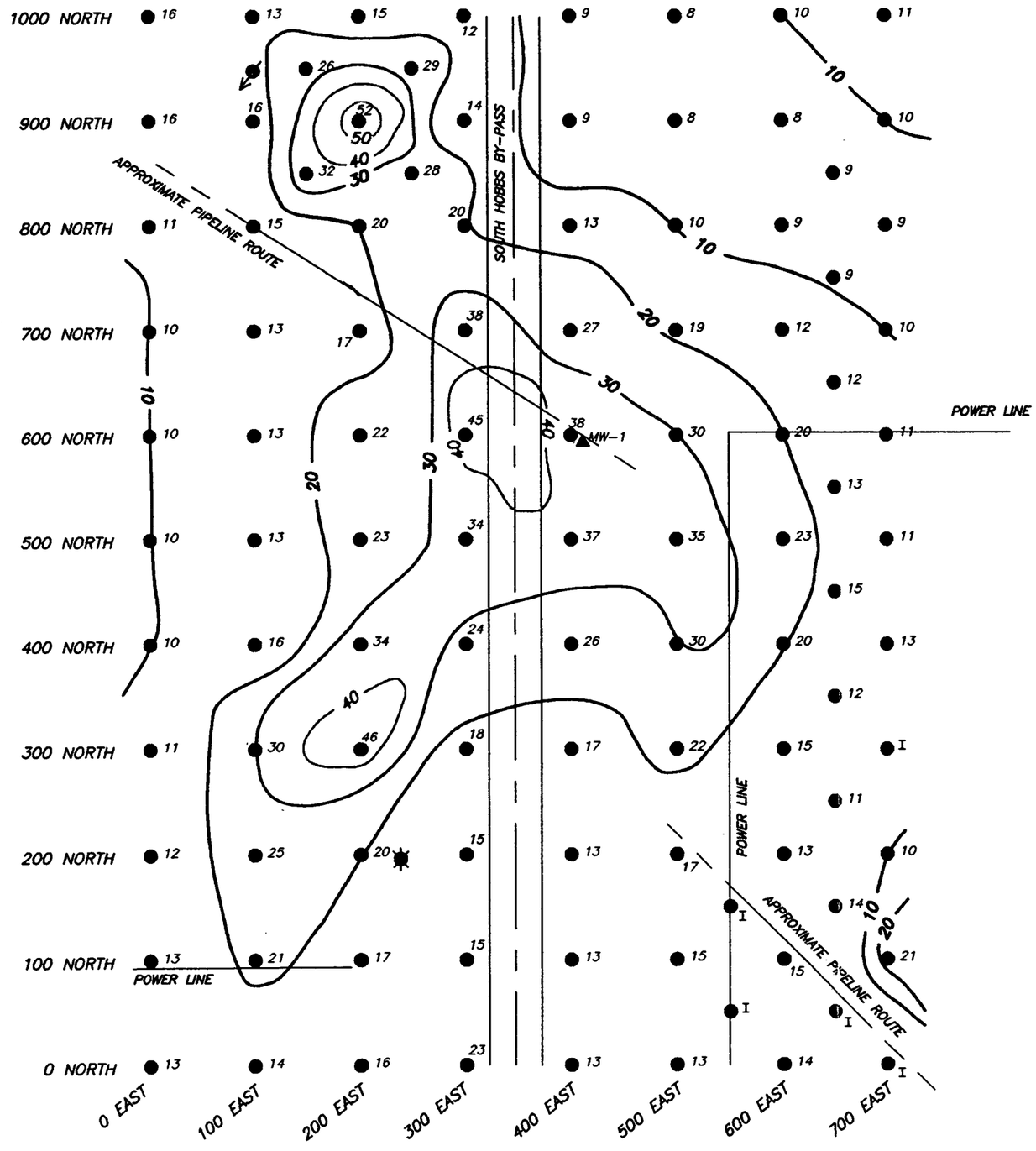
APPROX. SCALE IN MILES

0 1/4 1/2 1

Figure Title: SITE LOCATION	Client: PHILIP ENVIRONMENTAL SERVICES CORPORATION
Document Title: ELECTROMAGNETIC (EM-34) TERRAIN CONDUCTIVITY SURVEY	Location: RICE ENGINEERING CORPORATION HOBBS, NEW MEXICO

ROBERTS/SCHORNICK & ASSOCIATES, INC.
Environmental Consultants
3700 West Robinson, Suite 200
Norman, Oklahoma 73072
(405) 321-3895

DATE: 5/24/95	PREPARED BY: D.C.
SCALE: NOTED	CHECKED BY: B.J.S.
	DRAFTED BY: RML
PROJECT NO: 95089.01 F01	FIGURE NO.: 1



SCALE

0' 60' 120' 180'

LEGEND

- SALT WATER INJECTION WELL
- GAS WELL
- ▲MW-1 MONITOR WELL
- —20— CONTOUR INTERVAL: 10 MMHOS/M
- ● 9 EM-34 CONDUCTIVITY MEASURMENT STATION AND 20-METER INTERCOIL SPACING CONDUCTIVITY VALUE, MMHOS/M.

NOTES:

(1) MEASUREMENT STATION 600 NORTH-400 EAST IS LOCATED ON THE EAST SIDE OF MONITOR WELL MW-1 PAD.

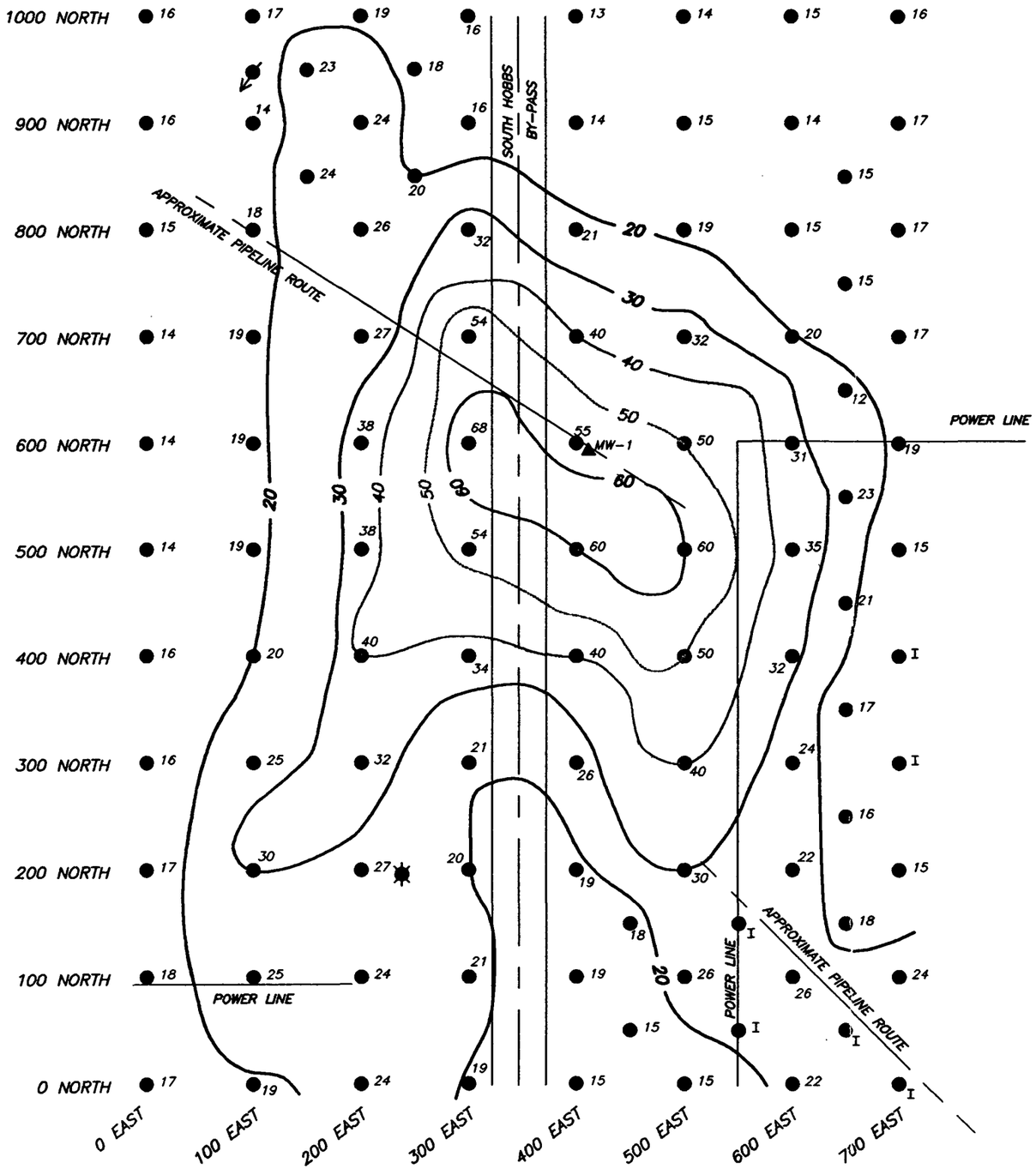
(2) MEASUREMENT STATION 0 NORTH-700 EAST IS ADJACENT TO A NATURAL GAS PIPELINE.

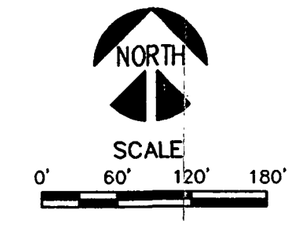
(3) VALUE OF " I " DENOTE INTERFERENCE.

(4) DEPTH OF INVESTIGATION APPROXIMATELY 50 FEET BELOW GROUND SURFACE.

Figure Title: TERRAIN CONDUCTIVITY SURVEY 20 METER INTERCOIL SPACING		Client: PHILIP ENVIRONMENTAL SERVICES CORP.	
Document Title: ELECTROMAGNETIC (EM-34) TERRAIN CONDUCTIVITY SURVEY		Location: RICE ENGINEERING CORP. HOBBS, NEW MEXICO	
ROBERTS/SCHORNICK & ASSOCIATES, INC. Environmental Consultants 3700 West Robinson, Suite 200 Norman, Oklahoma 73072 (405) 321-3693	DATE: 5/23/95	PREPARED BY: LLW	
	SCALE: 1" = 120	CHECKED BY: ÄJS	
	PROJECT NO: 95089.01 F01	DRAFTED BY: JRA	
		FIGURE NO.: 2	

DD7





LEGEND

- SALT WATER INJECTION WELL
- GAS WELL
- ▲MW-1 MONITOR WELL
- —20— CONTOUR INTERVAL: 10 MMHOS/M
- ● 9 EM-34 CONDUCTIVITY MEASURMENT STATION AND 40-METER INTERCOIL SPACING CONDUCTIVITY VALUE, MMHOS/M.

NOTES:
(1) MEASUREMENT STATION 600 NORTH-400 EAST IS LOCATED ON THE EAST SIDE OF MONITOR WELL MW-1 PAD.

(2) MEASURMENT STATION 0 NORTH-700 EAST IS ADJACENT TO A NATURAL GAS PIPELINE.

(3) VALUE OF " I " DENOTE INTERFERENCE.

(4) DEPTH OF INVESTIGATION APPROXIMATELY 100 FEET BELOW GROUND SURFACE.

Figure Title:	TERRAIN CONDUCTIVITY SURVEY 40 METER INTERCOIL SPACING	Client:	PHILIP ENVIRONMENTAL SERVICE CORP.
Document Title:	ELECTROMAGNETIC (EM-34) TERRAIN CONDUCTIVITY SURVEY	Location:	RICE ENGINEERING CORP. HOBBS, NEW MEXICO

ROBERTS/SCHORNICK & ASSOCIATES, INC.
Environmental Consultants
3700 West Robinson, Suite 200
Norman, Oklahoma 73072
(405) 321-3624

DATE: 5/23/95	PREPARED BY: LLW
SCALE: 1" = 120	CHECKED BY: BJS
PROJECT NO: 95089.01 F01	DRAFTED BY: JRA
	FIGURE NO.: 3

DGF