GW - 2

REPORTS

YEAR(S):

1991 - 1988

Addendum to Phase IV
Report of Subsurface Investigation,
Phillips 66 Natural Gas Company,
Lee Gas Plant

September 24, 1991

Prepared for:

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MW-12

Volume	Temperature	Conductivity	pH	Time
13	24.1	1000	7.06	1307
25	21.1	980	7.03	1310
35	20.7	1010	7.16	1311
45	20.6	970	7.17	1312
55	20.6	1010	7.30	1313
65	20.5	990	7.20	1314
75	20.5	970	7.20	1315

Volume = Cumulative gallons
Temperature = Celsius
Conductivity = Micro ohms
Time = Hours on 6/26/91

MW-11

Volume	Temperature	Conductivity	pH	Time
10	22.8	1360	6.87	1410
20	21.7	1020	6.87	1413
30	21.4	860	6.90	1416
40	21.4	790	6.87	1419
50	21.4	750	6.90	1423
60	21.6	700	6.96	1427
70	21.9	500	6.95	1433

Volume = Cumulative gallons
Temperature = Celsius
Conductivity = Micro ohms
Time = Hours on 6/26/91

MW-13

Volume	Temperature	Conductivity	pH	Time
2	25.3	NA	6.94	1534
10	21.6	1100	6.97	1535
20	21.6	1210	6.91	1538
30	20.9	1150	6.93	1540
40	21.1	1050	6.94	1543
50	21.2	1070	6.92	1547

Volume = Cumulative gallons
Temperature = Celsius
Conductivity = Micro ohms
Time = Hours on 6/26/91
NA = Not Available

MW-14

Volume	Temperature	Conductivity	pH	Time
2	20.7	1100	6.86	0558
20	20.2	1050	6.83	0602
30	20.0	1100	6.87	0604
40	20.1	1110	6.86	0605
50	20.2	1100	6.82	0607

Volume = Cumulative gallons
Temperature = Celsius
Conductivity = Micro ohms
Time = Hours on 6/27/91

MW-5

Volume	Temperature	Conductivity	pH	Time
10	20.5	610	7.06	0726
20	21.0	500	7.04	0745
30	20.6	500	7.02	0817

Volume = Cumulative gallons
Temperature = Celsius
Conductivity = Micro ohms
Time = Hours on 6/27/91

MW-9

Volume	Temperature	Conductivity	pH	Time
10	21.7	1310	6.73	0911
20	21.1	1160	6.77	0912
30	21.0	1050	6.76	0913
40	21.0	1030	6.78	0915
50	20.9	1010	6.78	0916
60	21.0	1010	6.79	0917

Volume = Cumulative gallons
Temperature = Celsius
Conductivity = Micro ohms
Time = Hours on 6/27/91

WS-2

Volume	Temperature	Conductivity	pH	Time
5	22.6	900	7.60	1043
25	21.9	880	7.56	1045
75	21.9	800	7.51	1056
125	21.6	760	7.54	1104
175	21.7	760	7.58	1111
230	21.8	740	7.55	1119
285	21.7	745	7.57	1128

Volume = Cumulative gallons
Temperature = Celsius
Conductivity = Micro ohms
Time = Hours on 6/27/91

MW-3

Volume	Temperature	Conductivity	pH	Time
1	21.8	780	7.03	1330
2	21.2	780	7.06	1334
2.5	21.1	780	7.06	1337
3	21.0	740	7.00	1342
3.5	21.0	710	7.01	1346

Volume = Cumulative gallons
Temperature = Celsius
Conductivity = Micro ohms
Time = Hours on 6/27/91

MW-2

Volume	Temperature	Conductivity	pH	Time
.5	22.4	550	7.00	1452
1.5	21.2	560	7.03	1458
3	21.1	550	6.95	1501
3.5	21.2	550	6.97	1505

Volume = Cumulative gallons
Temperature = Celsius
Conductivity = Micro ohms
Time = Hours on 6/27/91

MW-1

Volume	Temperature	Conductivity	pH	Time
.5	22.0	590	7.10	1535
1	21.0	520	7.02	1538
1.25	20.7	500	6.76	NA
1.5	20.5	500	6.97	1542
2	20.5	490	6.98	1546

Volume = Cumulative gallons
Temperature = Celsius
Conductivity = Micro ohms
Time = Hours on 6/27/91
NA = Not available

MW-7

Volume	Temperature	Conductivity	pH	Time
5	21.5	900	6.82	1614
8	21.6	1020	6.28	1618
12	21.8	1060	6.96	1622
34.5	22.0	1100	6.85	1635
42	22.0	1080	6.91	1645

Volume = Cumulative gallons
Temperature = Celsius
Conductivity = Micro ohms
Time = Hours on 6/27/91

MW-10

Volume	Temperature	Conductivity	pH	Time
10	21.2	1480	6.80	1656
20	21.0	1450	6.80	1658
30	21.1	1470	6.81	1660
40	21.1	1440	6.81	1703

Volume = Cumulative gallons
Temperature = Celsius
Conductivity = Micro ohms
Time = Hours on 6/27/91

MW-8

Volume	Temperature	Conductivity	pH	Time
10	20.8	1390	7.17	1718
20	20.9	1240	7.19	1723
30	20.8	1200	7.16	1727
40	20.8	1200	7.18	1735

Volume = Cumulative gallons
Temperature = Celsius
Conductivity = Micro ohms
Time = Hours on 6/27/91

6/26/91

1325 Prepare to sample

Sample #
9106261325
Vol = 2 - 500 mL amber
2 - 40 mL VOAs
COC 4120

6/26/91

Purge Data MW-12

Vol	Temp	eC	pH	Time
13gal	24.1	1000	7.06	1307
25	21.1	980	7.03	1310
35	20.7,	1010,	7.16,	1311
45	20.6,	970,	7.17,	1312
55	20.6,	1010,	7.30,	1313
65	20.5,	990,	7.20	1314
75	20.5,	970,	7.20	1315

6/26/91

1408 MW-11 -pump set.
water starts out murkey.
Purge Data

$\forall$ (Gal)	Temp	Cond.	pH	time
10	22.8	1340	6.87	1410
20	21.7	1020	6.87	1413
30	21.4	860	6.90	1416
40	21.4	790	6.87	1419
50	21.4	750	6.90	1423
60	21.6	700	6.96	1427
70	21.9	570	6.95	1433

water very clear.
Cond meter batt. low.

Sample after pump pulled
Hnu background 1ppm
9106261440
TYPE Mod 8015 BTEX
ATI
2 - 500ml Amber
2 - 40ml Voa.
COC#

1451 Sampling finished
will take water levels
@ 11 & 12

6/26/91

MW-11 DTW= 98.13
MW-12 DTW = 98.63

1530 Pump set in MW-13
plug in cond. meter.

#	Temp	Cond	pH	time
2	25.3	—	6.94	1534
10	21.6	1100	6.97	1535
20	21.6	1210	6.91	1538
30	20.9	1150	6.93	1540
40	21.1	1050	6.94	1543
50	21.2	1070	6.92	1547

1549 pump pulled
Sample # 9106261550
Loc. MW-13
TYPE mod 8015 BTEX
2 - 500ml
2 - 40ml VOAs
COC#
FedX#
ATI Labs

KS

6/26/91

1602 MW-13 DTW-100.57
we will steam the
pump and leave
1618 Let Charlie know we're leaving
& head out.

KS

K. S 6/26/91

DATE 6/27/91
Clear 60° will be 100

K Summers D. Nee

Objectives: obtain all remaining
well samples. One round DTW.

Equip: rental van, submersible
misc. sample equip

K. S 6/27/91

6/27/91

550 Arrive onsite
have relocated to MW-14
pump has been set,
Hnu Background 0ppm
0556 will begin pumping

Purge Parameters

V	Temp	Cond	pH	Time
2	20.7	1100	6.86	0558
20	20.2	1050	6.83	0602
30	20.0	1100	6.87	0604
40	20.1	1110	6.86	0605
50	20.2	1100	6.82	0607

0608 Parameters & V good
stop purging

0615 Pump ~~plu~~ er) pulled
MW-14
Sample# 9106270615
TYPE Mod 8015 BTEX
2 500ml Amber
2 40ml VOA HCl

0636 Steam Pump.

K. 6/27/91

6/27/91

0641 Look for operator to move
tank to MW-5
0648 Waiting on operator.

0713 Operator Has moved tank to
MW-5 we will begin placing
pump. water is murkey gray
0725 Well apprs to be pumping down
and not recovering quickly

V	Temp	Cond ms	pH	Time
10	20.5	1.610	7.06	0726
20	21.0	500	7.04	0745
30	20.6	500	7.02	0817

total purged ~~V~~ 35gal
Hnu = 0ppm

0737 Well does not appear to be
properly developed. There is
a lot of silt - (when the pump
can get water). Going slow.
0759 Check TD of hole
Well is only open to ~98' or 99'
as opposed to original 110+

K. 6/27/91

(14)

6/27/91

~~reduces purge volume to~~ JCJ

hopefully pump is not just stuck

0800 pull pump

hole open to 112

pump was stuck.

casing may have collapsed.

purge volume is 30gal.

we have ~30gal. and

the pH cond. is stabilized

MW-5

Sample # 9106270820

mod. 8015 BTEX 2-500ml Amber

2-40ml VOA ATI Labs.

Hnu = 1ppm

0829 DTW = 98.20

0832 Go to steam pump.

Call office - Martin not

there, Spoke w/ Matt Lane

set up survey w/ WEST

will instruct Ray B on survey locations

+ mark w/ chalk.

KS

K. 6/27/91

6/27/91

(15)

0910 Pump in MW-9

Begin pumping

#	Temp	Cond	pH	Time
10	21.7	1310	6.73	0911
20	21.1	1160	6.77	0912
30	21.0	1050	6.76	0913
40	21.0	1030	6.78	0915
50	20.9	1010	6.78	0916
60	21.0	1010	6.79	0917

Hnu = 2ppm.

0918 65 gallons - purge complete

will pull pump

0921 Pump pulled.

MW-9

Sample # 9106270925

mod 8015 BTEX

2-500ml Amber

2-40ml VOA

ATI Labs

0947 MW-9 DTW = 99.71'

0955 Waiting for Cem. + truck to

leave steam pad.

0957 Steaming pump

K. 6/27/91

6/27/91

1009 Arrive WS-2
will take TO
and set pump.

137.60 TO
DTW 99.20

38.4' volume
~300 gallons to purge

1016 David & operator go to
~~purge~~ his empty tank to
oil/water seperator.
Hnu = 0 ppm.

1043 Begin purge WS-2
water murky

V	Temp	Cond	pH	time
5	22.6	900	7.60	1043
25	21.9	880	7.56	1045
75	21.9	800	7.51	1056
125	21.6	760	7.54	1104
175	21.7	760	7.58	1111
230	21.8	740	7.55	1119
285	21.7	745	7.57	1128

stabilized but murky

K. — 6/27/91

6/27/91

total purged volume 305

1143 done with submersible
WS-2
Sample # 9106271145
mod 8015 BTEX
2-500ml Amber
2-40ml VOA
ATI Labs COC#

1159 Done sampling will steam
pump & locate 5 gal bucket
for boiling

1230 Lunch

1300 Back on site

1320 Have found & steamed buckets,
are at MW-3 will find
T.D. - 108.25
DTW - 49.05
4.5 gal. = 3 casing volumes

Conductivity meter battery is
getting low, but consistency
will still be obtainable

K. 6/27/91

6/27/91

MW-3

#	Temp	Time	Cond	pH
1	21.8	1330	780	7.03
2	21.2	1334	780	7.06
2.5	21.1	1337	780	7.06
3	21.0	1342	740	7.00
3.5	21.0	1346	710	7.01

hole appears to be bailing
dry MW-3
Sample # 9106271350
mod 8015 BTEX
well gave us problems - wasn't actually
dry - parameters had stabilized
Field Blank # 9106271332
mod 8015 BTEX
2-500 ml ~~VOA~~ Ambers
2-40 ml VOAs
ATI LABS

1444 Finally got key to MW-2
& explained survey to Ray.
now at MW-2

99.15 = DTW
TD - 106.40

must purge
25 gal

6/27/91

6/27/91

MW-2

#	Temp	Cond	pH	time
.5	22.4	550	7.00	1452
1.5	21.2	560	7.03	1458
3	21.1	550	6.95	1501
3.5	21.2	550	6.97	1505

MW-2
Sample # 9106271520
mod 8015 BTEX
2-500 ml Amber
2-40 ml VOA

1521 Head for MW-1
MW-1
DTW - 97.02
TD - 100.75 - might be a problem
3.13 st water

~~#~~ KS 3X = 1.8 gal purge vol

Rinsate sample # 9106271525

6/27/91

6/27/91

MW-1

V	Temp	Cond	pH	time
.5	22.0	590	7.10	1535
1	21.0	520	7.02	1538
1.25	20.7	500	6.76	
1.50	20.5	500	~~7.01~~ KS 6.97	1542.
2.00	20.5	490	6.98	1546

Sample # 9106271550
mod 8015 BTEX
2-500ml ~~Ba~~ KS Amber
2-40ml VOA HCL

1604 we are now to the wells with dedicated pumps. Purge volumes are from 30-40 gallons in MW-7 thru 10 we will purge more ~~pumps are setup in bbls ~44 gal.~~ KS

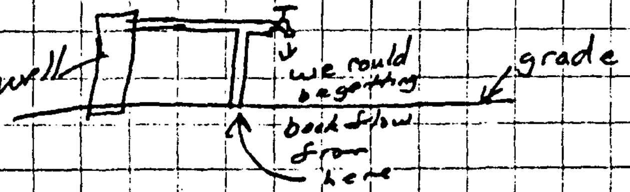
1606 MW-7

V	Temp.	Cond.	pH	Time
5	21.5	900	6.82	1614
8	21.6	1020	6.28	1618
12	21.8	1060	6.96	1622
18				

6/27/91

V	Temp	Cond.	pH	Time
345	22.0	1100	6.85	1635
420	22.0	1080	6.91	1645

1622 I question the integrity of the plumbing



This faucet will run when the meter says the pump isn't running.

1633 - Time the effluent the pump isn't reading ~.75 gpm
will adjust purge.

MW-7
~~1650~~ KS 9106271650
mod 8015 BTEX
2-500ml Amber
2-40ml VOAs HCL

6/27/91

1655 AT MW-10

Flows very well

V	Temp	Cond	Time	pH
10	21.2	1480	1656	6.80
20	21.0	1450	1658	6.80
30	21.1	1470	1640	6.81
40	21.1	1440	1703	6.81

total purge 48

Sample #~~TT~~ KJ 9106271710
mod 8015 BTEX
2-500 ml Amber
2-40 ml VOAs HCL
ATI LABs
COC#

1712 Go to MW-8
HU = 0ppm

V	Temp	Cond	pH	time
10	20.8	1390	7.17	1718
20	20.9	1240	7.19	1723
30	20.8	1200	7.16	1727
40	20.8	1200	7.18	1735

total purge 45

MW-8
Sample# 9106271735
mod 8015 BTEX
2-500 ml Amber
2-40 ml VOA HCL
ATI LABS COC#

1743 WS 1 is used frequently used, and was only turned off this morning. We will let the pump run for a few minutes and sample.

WS-1
Sample# 9106271755
mod 8015 BTEX.
total purged at this time
500+ gal.

1814 Have Ice
measuring DTW at MW-1
DTW = 97.02 ~~DRS~~ KJ Solinst
Decon

1818 MW-5 97.54 DTW Solinst
1822 DTW = 103.22 WS-1 D...
1825 DTW = 99.04 MW-3 Decon
1826 DTW = 99.17 MW-2 Decon

1655 AT MW-10

Flows very well

V	Temp	Cond	Time	pH
10	21.2	1480	1656	6.80
20	21.0	1450	1658	6.80
30	21.1	1470	1660	6.81
40	21.1	1440	1703	6.81

total purge 48

Sample #~~17~~ KS 9106271710
mod 8015 BTEX
2-500ml Amber
2-40ml VOAs HCL
ATI LABs
COC#

1712 Go to MW-8
HNu = 0ppm

V	Temp	Cond	pH	time
10	20.8	1390	7.17	1718
20	20.9	1240	7.19	1723
30	20.8	1200	7.16	1727
40	20.8	1200	7.18	1735

total purge 45

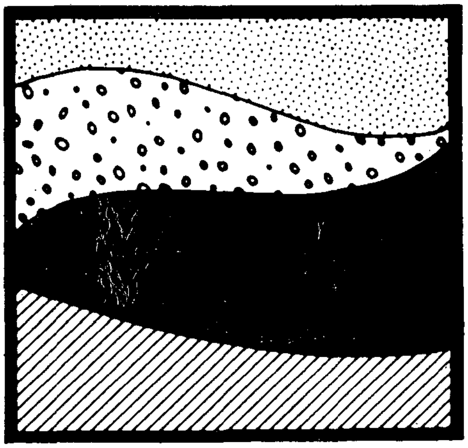
MW-8
Sample# 9106271735
mod 8015 BTEX
2-500ml Amber
2-40ml VOA HCL
ATI LABS COC#

1743 WS 1 is used frequently used, and was only turned off this morning. We will let the pump run for a few minutes and sample.

WS-1
Sample# 9106271755
mod 8015 BTEX.
total purged at this time
500+ gal.

1814 Have Ice
measuring DTW at MW-1
DTW = 97.02 ~~DRS~~ KS solinst
Decon
1818 MW-5 97.54 DTW solinst
1822 DTW = 103.22 WS-1 Decon
1825 DTW = 49.04 MW-3 Decon
1826 DTW = 49.17 MW-2 Decon

GCL



PHASE II
REPORT OF SUBSURFACE INVESTIGATION
PHILLIPS 66 NATURAL GAS COMPANY
LEE GAS PLANT

RECEIVED

OCT 22 1990

OIL CONSERVATION DIV.
SANTA FE

October 9, 1990

Prepared for:

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PHASE II
REPORT OF SUBSURFACE INVESTIGATION
PHILLIPS 66 NATURAL GAS COMPANY
LEE GAS PLANT

SUBMITTED BY:	DATE:
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SECTION 1.0

1.0 EXECUTIVE SUMMARY

In April and in October 1990, Geoscience Consultants, Ltd. (GCL) continued a subsurface investigation for Phillips 66 Natural Gas Company (Phillips) at the Lee Gas Plant, Buckeye, New Mexico. The investigation, initially required by the New Mexico Environmental Improvement Division (NMEID), is now under the jurisdiction of the New Mexico Oil Conservation Division (NMOCD). Eight monitor wells and one recovery well were installed at the site to define the limits of the plume of floating and dissolved-phase petroleum hydrocarbons and to begin recovery of the free-phase product. These wells modify an existing monitoring system that was installed in 1988.

Mud-rotary drilling techniques were used to install the eight new monitor wells and one recovery well. The ground water from the plant's process water supply well, twelve monitor wells (four 1988 and eight 1990 monitor wells) and the recovery well was sampled by GCL and analyzed by Radian Analytical Services for total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene and xylenes (BTEX) using modified EPA method 8015. In addition, Phillips' water supply well WS-1 was sampled for BTEX and TPH.

All of the monitor wells and the recovery well were inspected for free-phase hydrocarbon in May, August, September, and October of 1990. Free-phase hydrocarbon has accumulated above the ground water in monitor well MW-4 and recovery well RW-1, and total petroleum hydrocarbon constituents in the dissolved phase were found at all of the wells sampled. Water Quality Control Commission (WQCC) standards for benzene were exceeded at wells MW-7, MW-8, MW-10, and RW-1, all of which are located within or near the leading edge of the plume. WQCC standards for ethylbenzene were exceeded at MW-8. WQCC standards for toluene were exceeded at MW-7 and MW-8.

The free-phase product plume appears to be centered near recovery well RW-1. The dissolved-phase plume forms an northeast-southwest trending, elongate halo around the plume of free-floating product. Phillips has initiated remediation of the dissolved- and free-phase hydrocarbon by pumping ground-water/ product from recovery well RW-1 to the Lee Gas Plant waste-water treatment system.

One additional monitor well is recommended to further delineate the extent of the dissolved-phase hydrocarbon at the leading edge of the known hydrocarbon plume. Additional recommendations are to implement monthly water-level and product-thickness measurements and to initiate semiannual ground-water sampling of the proposed monitoring system.

SECTION 2.0

2.0 INTRODUCTION

In April 1988, Phillips was issued a compliance Order/Schedule by the New Mexico Environmental Improvement Division (NMEID) to install and sample four ground-water monitor wells at the Lee Gas Plant in southeastern New Mexico. The monitor wells were installed in early 1988 using rotary drilling techniques (GCL, 1988a). The monitor wells modify a ground-water monitoring system (pre-1988) that was previously installed around an abandoned waste-water evaporation pond. The four pre-1988 monitor wells were plugged with a cement/bentonite slurry and abandoned. The results of GCL's initial investigation indicated that both free-phase and dissolved-phase hydrocarbons occur in the saturated zone beneath the site.

In September 1988, a limited soil-vapor survey was conducted to determine potential sources of the hydrocarbons identified in GCL's initial investigation. Two potential sources were identified: the former evaporation pond located east of the main plant, and the small, former evaporation pond located north of the main plant (GCL, 1988b).

Jurisdiction of the Phillips' Lee Plant was transferred from NMEID to the New Mexico Oil Conservation Division (OCD) in January 1990, and on February 16, 1990, GCL submitted a work plan to the OCD for further investigation and implementation of remediation of free-phase product at the Lee Gas Plant. In April 1990, GCL installed four monitor wells and one recovery well at the site to define the limits of the plume of floating product and to begin recovery of the free-phase product.

The second phase of the 1990 subsurface investigation was designed to delineate the maximum lateral migration of the dissolved-phase hydrocarbon plume. Four additional monitor wells were installed in August of 1990 to achieve this objective. These wells further define aquifer conditions and dissolved-phase plume boundaries and could be modified into recovery wells should expansion of the recovery system be required.

SECTION 3.0

3.0 TECHNICAL APPROACH

Four monitoring wells (MW-5, -6, -7, and -8) and one recovery well (RW-1) were installed in April 1990 at locations that were selected to delineate the maximum extent of hydrocarbons floating on the ground water and to recover the free-phase hydrocarbon (plate 1). The first well, MW-5, was located near a plugged borehole where floating hydrocarbon had been observed during the 1988 investigation. The purpose of this well was to locate the plume boundary at the northern (upgradient) side of Phillips' property. MW-6 was placed south (downgradient) of the north evaporation pond to delineate any plume to the northwest and to determine if the pond (now closed) was a potential source of the hydrocarbons. MW-7 was located directly south (downgradient) of MW-4, where free-phase hydrocarbon has recently been observed. MW-7 was installed to delineate the southern boundary of the plume near MW-4. The recovery well RW-1 was sited downgradient of the former evaporation pond, approximately 60 feet due west of MW-4. The location of RW-1 is within the free-phase plume. Monitor well MW-8 was located approximately 150 feet west of the recovery well in order to delineate the western (downgradient) extent of the product plume. All well locations are shown on plate 1.

During the second phase of the 1990 investigation, four monitoring wells (MW-9, -10, -11 and -12) were installed at locations selected to more precisely delineate the extent of dissolved-phase hydrocarbons present in the ground water (plate 1). This phase of the investigation was conducted in August 1990. The first well, MW-9, was located approximately 150 feet east of MW-8. The purpose of this well was to locate the western dissolved-phase plume boundary. MW-11 was located approximately 165 feet south of MW-7 to define the plume limits to the southeast. Monitor wells MW-10 and MW-12 were located southwest and downgradient of the hydrocarbon plume. The objective of these wells was to determine the location of the leading edge of the plume (See plume diagram, plate 2).

Rotary drilling techniques were employed for drilling the boreholes. All down-hole drilling equipment and the entire drill rig were decontaminated using on-site steam cleaning facilities. Samples of rotary drilling cuttings were collected at 5-foot intervals from each borehole and logged on standard GCL lithologic log forms. The lithologic logs are presented in appendix A. Shallow pits were excavated and lined with plastic to collect the drilling fluid and cuttings that were circulated out of the boreholes during drilling operations. The boreholes were drilled to total depth using clean water as a drilling fluid. Then, guar gum (polymer) was introduced to the clean water and was circulated down-hole to hold back the fine-grained sand and keep the borehole open during well installation. After the monitor wells were installed and developed, the water from the pits was pumped to the plant waste water treatment system facility; the remaining cuttings were removed and the pits were backfilled with the original excavated material. Drilling fluid losses were calculated by comparing total volume of water used from the water truck to total volumes of water remaining in the pit after drilling was completed.

Completion diagrams for monitor wells MW-5, -6, -7, -8, and RW-1, which were installed in April, as well as those for wells MW-9, -10, -11 and MW-12, which were installed in August, are included in appendix B. All of the wells were constructed with a 5-foot blank PVC silt trap set beneath 15 feet of wire-wound PVC screen with schedule 40 PVC pipe extending from the top of the screen to above the ground surface. The well casing and screen were inserted through the open borehole, and 12/20 grade silica sand was placed in the borehole to a depth of approximately 3 to 5 feet above the top of screen. Following the installation of the 12/20 sand, approximately 100 gallons of water was bailed from each well to settle the filter pack. Approximately 2 to 3 feet of 20/40 grade silica sand was then placed on top of the 12/20 sand in wells MW-5 through MW-8 and RW-1 to prohibit infiltration of bentonite from above. One 5-gallon bucket of 1/4-inch bentonite pellets was placed above the sand pack in these wells to seal the borehole and to prevent fluids and/or grout from migrating downward and invading the filter pack. The borehole was then grouted to the surface by pumping a neat cement slurry containing 5% bentonite into the borehole annulus through a tremie pipe. A 5-foot long, steel, protective guard pipe was installed around the well casing and into the grout, and a 3-foot-long by 3-foot-wide concrete pad was constructed around the well head. The pad was sloped outward to direct rainfall away from the well head. A locking cover impervious to rainfall was installed on the protective guard pipe. A brass survey cap was set in each pad to mark the location of each well.

The grout in each well was allowed to cure for 24 hours before implementing development activities. Monitor wells MW-5, -6, and -7 were developed using an air-lift pump. This stainless-steel pump does not permit the introduction of air into the well casing and is capable of pumping 1 gpm against 80 feet of head. Monitor wells MW-8, -9, -10, -11 and -12 were developed using GCL's submersible pump. A dedicated submersible pump was installed at recovery well RW-1 for development and product recovery. Each well was periodically surged by moving the air-lift or submersible pump up and down in the well, causing the ground water to surge in and out of the filter pack and dislodge fine-grained particles from the formation wall. The fine-grained particles, along with formational water, were then removed from the well bore by pumping. Each well was developed until an equal volume or more of the drilling water lost to the aquifer during drilling was recovered and until the indicator parameters of pH, conductivity, and temperature had stabilized. The minimum amount of water developed from each well was approximately 2,500 gallons for wells installed in April and approximately 600 to 1,000 gallons for those installed in August.

During the month of April, ground-water samples were collected from all monitor wells as prescribed in the site sampling and analysis plan (GCL, 1988c). In August, monitor wells MW-9, -10, -11, -12, and WS-1 were sampled as recommended in the Report of Subsurface Investigation, Phillips 66 Natural Gas Company, Lee Gas Plant (GCL, 1990d). After these wells were developed, the ground water from each well was sampled for total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, and xylene (BTEX) and analyzed using modified EPA method 8015. For the April sampling event, ground-water samples were also collected from each of the four RCRA monitor wells that were installed in 1988. GCL's standard operating procedures for monitor well sampling were followed and the samples were maintained on ice and shipped to Radian Analytical Services in Sacramento, California, following strict chain-of-custody procedures.

Product-thickness and depth-to-water measurements were made one month following installation of the monitor and recovery wells, and these measurements were taken again in October 1990. Because drilling fluid losses may have moved the free-phase hydrocarbon temporarily away from the wells, a one month delay was necessary to allow the aquifer to equilibrate following drilling operations.

Wells were surveyed by Pettigrew & Associates. Standard 3-point surveying techniques were applied, and the wells were located using the Lee Gas Plant's Northing and Easting Coordinate System.

SECTION 4.0

4.0 RESULTS

No free-phase hydrocarbon was observed in any of the monitor wells that were installed in April and August either during installation or immediately following development and sampling. Return visits to the site were conducted one month following the sampling events to allow the aquifer to recover from well development and to allow potential hydrocarbons that may have been moved away from the boreholes during drilling operations to equilibrate. All of the monitor wells installed before and during April were checked for the presence of free-phase hydrocarbon on May 8, 1990. Hydrocarbons were observed in MW-4. No product had accumulated in any of the other monitor wells. The free-phase hydrocarbon in monitor well MW-4 was measured and found to be 4.52 feet thick. All existing monitor wells, including those installed in August, were again checked for floating product on September 5th and October 1st. Product was found to be present in MW-4 and RW-1 during both the September and October measurements. Product measured in MW-4 during the month of October was found to be 5.17 feet thick. Because RW-1 was and is currently pumping, an accurate product thickness could not be ascertained.

Analytical results for ground-water samples collected in April and August by GCL and analytical results for ground-water samples collected in March by Phillips are shown in tables 4-1, 4-2 and 4-3. The laboratory reports are included as appendix C. Total petroleum hydrocarbon (TPH) constituents were found at all of the wells sampled by GCL, during both sampling events. Phillips did not analyze ground water for TPH during their March 1990 sampling.

The Water Quality Control Commission (WQCC) standard for benzene is 10 micrograms per liter (µg/l). The concentration of benzene exceeded WQCC standards in ground-water samples collected in April at wells MW-7, MW-8 and RW-1; the concentrations found are 6,100 µg/l, 18,000 µg/l and 2,600 µg/l, respectively. The concentration of benzene in ground-water samples collected in March exceeded the WQCC standard at monitor well MW-3 and water well WS-1; the concentrations are 69 µg/l and 15 µg/l, respectively. The WQCC standard for ethylbenzene is 750 micrograms per liter (µg/l). The WQCC standard for ethylbenzene in ground water is exceeded at MW-8. The concentration of ethylbenzene found in the sample from MW-8 is 830 µg/l. The WQCC standard for toluene is 620 µg/l. The WQCC standard for toluene is exceeded at MW-7 and MW-8; the concentrations are 3,900 µg/l and 7,100 µg/l, respectively. The concentrations of BTEX and TPH constituents are shown on plate 3.

Results obtained from the August sampling event of MW-9, -10, -11, and WS-1, revealed that benzene concentrations at MW-10 (1300 µg/l) exceeded WQCC standards. The ground water sampled from each of the other wells did not exceed WQCC standards for benzene,

Table 4-1

Analytical Results from March 1990 Sampling Event

ANALYTE	MW-1	MW-2	MW-3	WS-1	WS-2
Benzene	4.1	ND	69	15	7.1
Ethylbenzene	ND	ND	1.9	4.3	ND
Toluene	.26	ND	1.4	1.8	.97
Total Xylenes	ND	ND	1.1	4.1	ND

Units for analysis are micrograms per liter (ug/l)

ND - Not detected

Table 4-2
Analytical Results from April 1990 Sampling Event

ANALYTE	MW-1	MW-2	MW-3	MW-4	MW-5
Benzene	2.4	1.8	ND	NA	ND
Ethylbenzene	ND	ND	ND	NA	98.0
Toluene	.38	ND	1.8	NA	ND
Total Xylenes	ND	ND	ND	NA	43
*TPH Gasoline	8500	5800	6500	NA	13000
TPH Diesel	ND	150	220	NA	ND
TPH Jet Fuel	ND	ND	ND	NA	ND
TPH Kerosene	ND	ND	ND	NA	990
TPH Lube Oil	ND	ND	ND	NA	ND

Units for analysis are micrograms per liter (ug/l)

ND - Not detected

TPH - Total petroleum hydrocarbons

* - TPH Gasoline - quantitates aggregate hydrocarbons with boiling points below approximately 200 degrees celsius

NA - Not available

Table 4-2 (cont'd)

Analytical Results from April 1990 Sampling Event

ANALYTE	MW-6	MW-7	MW-8	RW-1
Benzene	ND	6100	18000	2600
Ethylbenzene	ND	360	830	320
Toluene	ND	3900	7100	580
Total Xylenes	ND	260	290	190
*TPH Gasoline	1600	440000	1200000	160000
TPH Diesel	5600	200	9500	240
TPH Jet Fuel	ND	ND	ND	ND
TPH Kerosene	ND	ND	ND	ND
TPH Lubricating Oil	ND	ND	ND	ND

Units for analysis are micrograms per liter (ug/l)

ND - Not detected

TPH - Total petroleum hydrocarbons

* - TPH Gasoline - quantitates aggregate hydrocarbons with boiling points below approximately 200 degrees celsius

Table 4-3

Analytical Results from August 1990 Sampling Event

ANALYTE	MW-9	MW-10	MW-11	MW-12	WS-1
Benzene	6.0	1300	1.0	.86	9.7
Ethylbenzene	.88	50	1.6	.51	1.3
Toluene	1.2	34	2.8	.81	1.2
Total Xylenes	1.7	16	6.4	2.9	1.2
TPH	1230	22,000	690	610	280

Units for analysis are micrograms per liter (ug/l)

ND - Not detected

TPH - Total petroleum hydrocarbons

and samples collected from all five of the wells installed in August did not exceed standards for ethylbenzene, xylenes and toluene. Water supply well WS-1 was sampled for TPH and BTEX concentrations. The results from this sampling event did not reveal concentrations at or above action levels.

The recovery well RW-1 is now in operation and the total volume purged as of October 1, 1990, was 358,126 gallons. RW-1 is pumping ground water at an approximate rate of 4.457 gallons per minute into the Oil/Water separator. Over 14 feet of drawdown has been measured in RW-1.

SECTION 5.0

5.0 GEOLOGY

5.1 Regional Geology

As reported in June 1988 in GCL's "Report On The Installation Of A Ground-Water Monitoring System at Phillips 66 Natural Gas Company, Lee Plant," the Lee Gas Plant is located in southern Lea County, New Mexico, in the Llano Estacado (Staked Plains), which is part of the High Plains section of the Great Plains physiographic province (Fenneman, 1931). Shallow depressions and small sand dunes are the only significant topographic features in the otherwise flat, treeless plain. The depositional surface of the Llano Estacado exhibits low relief, sloping uniformly to the southeast at a topographic gradient of about .003. Total relief in Lea County is about 1,300 feet with an altitude ranging from 2,900 to 4,200 feet above sea level (Nicholson and Clebsch, 1961). Drainage patterns are poorly defined.

Rock exposures in the area are poor and range in age from Triassic to Quaternary. The region is covered by Quaternary-Age eolian deposits ranging in thickness from 1 to 5 feet. Beneath these windblown deposits, a layer of dense, well-developed caliche forms a cap over the Ogallala Formation. The caliche, which decreases in induration with depth (Nicholson and Clebsch, 1961), can range from several feet to up to 60 feet in thickness.

The Tertiary Ogallala Formation underlies the Llano Estacado in southeast New Mexico. It is composed of terrestrial sediments that unconformably overlay the Triassic section. Outcrops of the Ogallala occur along the face of Mescalero Ridge to the south of the Lee Gas Plant. The Ogallala ranges in thickness from several inches to up to 300 feet and is composed primarily of unconsolidated, calcareous sand, clay, silt and gravel.

Jurassic-Age rocks have not been observed in the area, and rocks of the Cretaceous Age have been almost completely removed by erosion (Nicholson and Clebsch, 1961). Rocks of the Triassic Dockum Group are the oldest rocks that crop out in the region. The Dockum Group may be divided into the Chinle Formation and the Santa Rosa Sandstone.

Southeastern New Mexico and west Texas are underlain by large subsurface structural basins with highly complex geology. Southern Lea County includes parts of the Delaware Basin and the Central Basin Platform. The northwestern edge of the Delaware Basin is coincident with the position of the reef-edge as it existed throughout Permian time. The Artesia-Vacuum arch reflects this ancient reef trend; the Lee Gas Plant site is located at the eastern limit of this trend. Triassic rocks in the area exhibit a regional dip of less than one degree to the southeast (Nicholson and Clebsch, 1961). Variations in this regional trend occur in the collapse structures and unconformities that are common to the area.

5.2 Site Geology

Lithologic logs (appendix A) for the installation of monitor wells MW-5 through MW-12 and RW-1 are consistent with the previous lithologic logs prepared by GCL in April 1988. Two primary lithologic sequences were encountered at the Phillips' Lee Gas Plant: an upper, caliche-cemented, fine-grained silty sand and sandy silt and an underlying coarser sand. A "topsoil," probably backfill material used during facility construction or modification, was also found during drilling (GCL, 1988a).

Surficial lithologies at the Lee Gas Plant are both natural and anthropogenic. Aeolian sheet sands consisting of poorly-sorted, fine sand are present and are typically less than 5 feet thick (GCL, 1988a). Backfill material consisting of poorly sorted, fine sand to fine pebble-sized sediment is present at most monitor well locations.

Beneath the thin surficial deposits, sediments characterized by highly variable clast size and poor sorting are present. Although the dominant sediment consists of fine-grained, poorly sorted sand, there are clay-, silt-, and gravel-rich sands that are present that have very limited lateral continuity. Caliche in this sedimentary sequence ranges from highly developed Stage IV in the upper horizon to Stage I at approximately 20 to 35 feet below the ground surface. Consolidation of the sediments in this sequence is related to the presence and degree of development of interstitial caliche and, to a lesser degree, the presence of interstitial clay. With few local exceptions, the degree of consolidation decreases with depth (GCL, 1988a).

The lower coarser-grained sand unit in which each of the monitor wells at the Lee Plant was completed comprises the second primary lithology. The coarser sand lacked notable silt and clay particle fractions. The contact between the two lithologies was sharp and occurred at a depth of 35 to 65 feet. The yellowish-brown to brown color, higher percentage of medium-grained sand, and the relative vertical homogeneity distinguished coarser-grained sand from the overlying sediments (GCL, 1988a). Hunt (1977) and Nicholson and Clebsch (1961) identified the outcrop in the Lee Gas Plant area as Tertiary Ogallala Formation. The description of the outcrop provided by Hunt (1977) correlates with observations recorded by GCL personnel during the investigation.

SECTION 6.0

6.0 HYDROGEOLOGY

6.1 Regional Hydrogeology

As reported in June 1988 in GCL's "Report On The Installation Of A Ground-Water Monitoring System at Phillips 66 Natural Gas Company, Lee Plant," recharge in the region occurs primarily as a result of infiltration of water from short drainages and temporary lakes that form as a result of heavy rainfall events (Nicholson and Clebsch, 1961). Discharge takes place principally in the form of evapo-transpiration and pumping of wells; very small volumes of ground water discharge at springs (GCL, 1988a).

Potable water supplies in the region are derived primarily from aquifers hosted by Quaternary alluvium and the Tertiary Ogallala Formation. Ground water occurring in Triassic sediments is potable but has a poorer quality and is hosted by lithologic units that produce lower well yields than younger formations in the area. The Ogallala Formation mantles the High Plains in the Lee Gas Plant area and has a saturated thickness ranging from 25 to 175 feet (Nicholson and Clebsch, 1961). Ground water in these shallow aquifers generally flows to the southeast at a low hydraulic gradient (GCL, 1988a).

6.2 Site Hydrogeology

Shallow ground water at the Lee Gas Plant is unconfined. The ground water beneath the site is found in unconsolidated, silty to fine-grained sand, which typically exhibits hydraulic conductivities of .001 to 100 gallons per day per square foot (GCL, 1988a). During development of the monitor wells, low well yields were observed. Monitor wells may yield a sustainable pumping rate of up to 2 gallons per minute. This pumping rate is consistent for the fine-grained sediments that occur beneath the site. During the development of RW-1, a sustained flow rate of 3 gallons per minute was achieved.

The potentiometric surface at the Lee Gas Plant is shown on plate 2. Ground water flows to the southwest in a direction of approximately 30 degrees west of due south. The direction of ground-water flow based on calculations from April and October 1990 water level elevations correlates very well with the flow direction calculated in 1988. The well casing elevations, depth to ground water, and water surface elevations are shown in tables 6-1 and 6-2.

Table 6-1

Well and Water Surface Elevation Data May 8, 1990

LOCATION	CASING ELEVATION	DEPTH TO WATER	DEPTH TO PRODUCT	WATER SURFACE ELEVATION
MW-1	3979.25	95.94	NF	3883.31
MW-2	3980.50	97.99	NF	3882.52
MW-3	3980.27	97.83	NF	3882.44
MW-4	3980.16	101.28	96.76	3882.04*
MW-5	3979.82	96.30	NF	3883.52
MW-6	3981.79	97.93	NF	3883.86
MW-7	3978.45	96.42	NF	3882.03
MW-8	3979.96	97.78	NF	3882.18
RW-1	3980.80	98.39	NF	3882.41

*** Water surface elevation corrected for floating product using a specific gravity for the product of approximately 0.8**

All data is in feet

NF - None found

Table 6-2

Well and Water Surface Elevation Data October 2, 1990

LOCATION	CASING ELEVATION	DEPTH TO WATER	DEPTH TO PRODUCT	WATER SURFACE ELEVATION
MW-1	3979.25	96.44	NF	3882.81
MW-2	3980.50	98.58	NF	3881.92
MW-3	3980.27	97.47	NF	3881.80
MW-4	3980.16	102.75	97.58	3881.55*
MW-5	3979.82	96.94	NF	3882.88
MW-6	3981.79	98.56	NF	3883.23
MW-7	3978.45	97.09	NF	3881.36
MW-8	3979.96	98.59	NF	3881.37
MW-9	3980.17	99.00	NF	3881.17
MW-10	3979.66	98.50	NF	3881.16
MW-11	3978.50	97.36	NF	3881.14
MW-12	3978.82	97.86	NF	3880.96
RW-1	3980.80	114.95	NM	3865.85

*** Water surface elevation corrected for floating product using a specific gravity for the product of approximately 0.8**

All data is in feet

NF - None found

NM - Product present but no measurement was obtainable

SECTION 7.0

7.0 CONCLUSIONS

The lateral extent of free-phase hydrocarbons that are floating on ground water beneath the site has been identified in the area below and around the south evaporation pond (plate 2). At the present time, the only wells in which the free-phase product has been found are MW-4 and RW-1. However, in 1988, the original, aborted borehole for MW-1 contained observable free-phase product. This aborted borehole was located approximately 15 to 20 feet south-southeast of MW-5. The plume boundaries were determined by product thickness measurements taken approximately 4 weeks after wells were installed in April. Those boundaries have been confirmed by similar measurements that were made after monitor wells MW-9, -10, -11 and -12 were installed in August. The measurements were not taken immediately after drilling was complete because it was believed that drilling fluid losses may have forced floating product away from the immediate vicinity of the borehole. Floating product was not observed in monitor well MW-6, which is located north of the plant and directly south (downgradient) from the north evaporation pond.

The results of the ground-water sampling program indicate that dissolved-phase hydrocarbons form an elongate halo around the free-phase plume. Dissolved hydrocarbons were identified in all of the monitor wells at the site. However, hydrocarbon concentrations that exceeded WQCC action levels were restricted to monitor wells MW-7, MW-8, and MW-10 and recovery well RW-1, which are all directly downgradient or crossgradient from the free-phase plume. Hydrocarbon concentrations in water collected from WS-1 were found to be below action levels in August. MW-4 was not sampled because the presence of floating product ensured that dissolved hydrocarbons would be present in the ground water at that location in high concentrations.

Monitor wells MW-9, -10, -11 and -12 installed in August 1990 have delineated the boundaries of the dissolved-phase hydrocarbon plume present beneath the site with the exception of a small area at the southwestern-most and leading edge of the plume. Further work will be required to determine the exact location of this portion of the plume boundary (plate 2).

The Lee Gas Plant is located in a producing oil field where improperly operating oil wells and/or improper oil field practices can result in extensive ground-water contamination. Dissolved phase TPH may be present in the ground water throughout the area where the Lee Gas Plant is located.

SECTION 8.0

8.0 RECOMMENDATIONS

The following recommended actions are based on the assumption that one additional monitor well (MW-13) will adequately delineate the leading edge of the plume. The recommended actions to complete this phase of the investigation and to complete the implementation of ground-water remediation at Phillips' Lee Gas Plant are:

- Install one additional ground-water monitor well (MW-13) downgradient (southwest) from monitor well MW-10 (plate 1). The purpose of this monitor well will be to complete the definition of the lateral extent of the dissolved-phase hydrocarbon plume.

- Continue recovering dissolved-phase and free-floating product from RW-1 following the approved discharge plan modification.

- Measure the depth to water and the product thickness in all monitor wells monthly for one year. After one year continue measurements on a quarterly basis.

- Initiate quarterly sampling of selected monitor wells for BTEX and TPH. The wells that will be sampled as part of the proposed monitoring plan will be MW-1 (upgradient), MW-9, MW-10, MW-12, and MW-13 (proposed).

- Submit a supplement to the Phase II Report after MW-13 has been installed and sampled. This report will present the results of laboratory analyses, depth-to-water and product-thickness measurements, and borehole and monitor well completion data. This report will be submitted within 10 days of receipt of the analytical results.

- Submit quarterly reports to NMOCD presenting the results of the quarterly sampling program.

- After one year of quarterly sampling of the monitoring system, the sampling program should be reevaluated. If recovery system efficacy is satisfactory, then semiannual sampling should be implemented after OCD approval and authorization.

- If monthly water-level and product-thickness measurements and quarterly ground-water sampling show that the one-recovery-well system is not capturing the plume, then an additional recovery well should be added to the existing recovery system.

If ground-water samples from the proposed additional monitor well, MW-13, do not yield analytical results that allow identification of the leading edge of the plume, then additional work will be required. If this is the case, then Phillips will submit recommendations and schedule for further investigation in the supplement to the Phase II Report.

SECTION 9.0

9.0 REFERENCES

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APPENDIX A

APPENDIX A

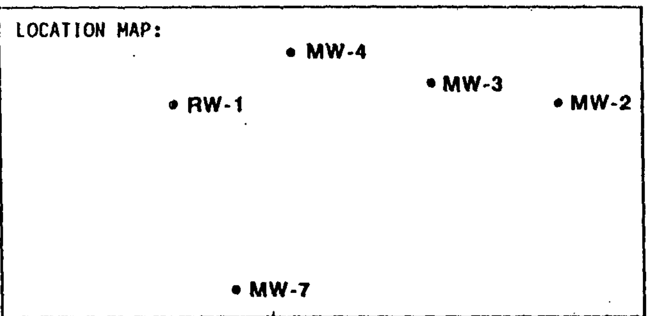
Lithologic Logs

≋	Caliche
▒	Caliche/Sand
░	Sand
░	Sandstone
▥	Siltysand
▨	Clayey Silty Sand
▒	Caliche/Sandstone
▨	Clay
▨	Clayey Sand
▩	Clay/Caliche

LITHOLOGIC LOG

Page 1 of 3

LOCATION MAP:

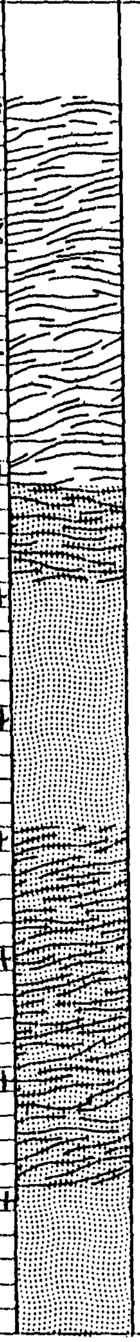


___1/4 ___1/4 ___1/4 ___1/4 S 31 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: BH-4 (RW-1)
SITE COORDINATES (ft.):
N N0+18.31 E E08+95.41
GROUND ELEVATION (ft. MSL): 3977.81
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY
DRILLING CONTR.: LARRY'S DRILLING, HOBBS
DATE STARTED: 3/27/90 DATE COMPLETED: 3/28/90
FIELD REP.: M. NEE
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
				0-2'	SOIL, cche Bld, heavily stained w/HC, stained soil is dusky brn 5 YR 2/2.
5	C C C C C C C C C C			5'	CALICHE, v pale orng 10 YR 8/2, v fn sand to fn Pbl size, clay fraction < 5%, org vapors @ 5 ppm from cuttings.
10	C C C C C C C C C X			10'	CALICHE, same as 5' w/10% Sst, Sst is lt brn 5 YR 6/4, v fn gr, tightly consol, 10% clay, 10% Sst, 80% cche.
15	C C C X + + + + + -			15'	CALICHE/SAND, v pale orng 10 YR 8/2, sand is v fn gr, unconsol, sbang mod sorted, cche is clay to fn Pbl Grv size, 50% sand, 30% cche, 10% clay, 10% Sst.
20	C C C C X X X + + +			20'	CALICHE/SANDSTONE/SAND, pale yelsh brn 10 YR 6/2, as above, 30% sand, 40% cche, 30% Sst.
25	C + + + + + + + + +			25'	SAND, pale yelsh brn 10 YR 6/2, v fn to fn gr, unconsol, mod well sorted, sbang to sbrndd, 90% sand, 10% cche.
30	C + + + + + + + + +			30'	SAND, same as 25', < 10% cche in cuttings.
35	C C X X X X X + + +			35'	SANDSTONE/CALICHE/SAND, same as 20', 30% sand, 50% Sst, 20% cche.
40	C C X X X X X + + +			40'	SANDSTONE/CALICHE/SAND, same as 35'.
45	C C X X X X X + + +			45'	SANDSTONE/CALICHE/SAND, same as 35'.
50	C C C C X X X X + +			50'	SANDSTONE/CALICHE/SAND, same as 35', 20% sand, 40% cche, 40% Sst.

LITHOLOGIC LOG

(Continued)

Page 2 of 3

Location ID BH-4

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50	CCCCXXXX++				
55	X++++++++–			55'	**SAND**, pale yelsh brn 10 YR 6/2, silt to fn sand, unconsol, sbrndd, well sorted, 90% sand, 10% silt.
60	+++++++++–			60'	**SAND**, same as 55'.
65	++++++++++			65'	**SAND**, mod yelsh brn 10 YR 5/4, v fn gr, well sorted, unconsol, sbrndd.
70	++++++++++			70'	**SAND**, same as 65', 90% sand, 5% cche, 5% Sst.
75	CCXX++++++			75'	**SANDSTONE/CALICHE/SAND**, same as 20', 60% sand, 20% cche, 20% Sst, hard drilling 72-78'.
80	CCCCCCCXX+			80'	**SANDSTONE/CALICHE**, pale yelsh brn 10 YR 6/2, 70% cche, 20% Sst, 10% sand, cche/Sst is v fn Pbl Grv size, sand is v fn to fn gr, poorly sorted, sbrndd.
85	CCCCCX++++			85'	**SANDSTONE/CALICHE**, same as 80', 40% sand, 10% Sst, 50% cche.
90	++++++++++			90'	**SAND**, dk yelsh brn 10 YR 4/2 to pale yelsh brn 10 YR 6/2 v fn to fn gr, unconsol, sbrndd, well sorted.
95	++++++++++			95'	**SAND**, same as 90'.
100	++++++++++			100'	**SAND**, same as 90'.
105	++++++++++			105'	**SAND**, same as 90', minor clay < 5%.
110	++++++++++			110'	**SAND**, same as 90', minor clay < 5%.
115	++++++++++			115'	**SAND**, same as 90'.

LITHOLOGIC LOG

(Continued)

Page 3 of 3

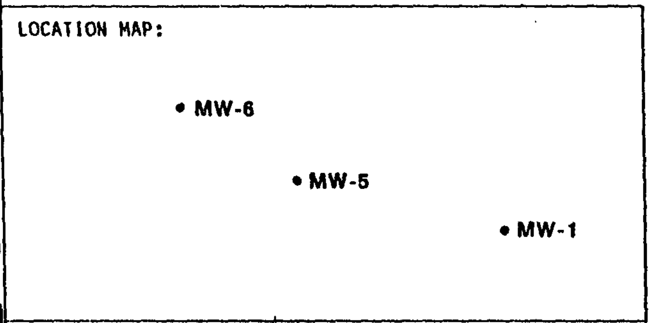
Location ID BH-4

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
115					
120				120′	<u>SAND</u>, same as 90′.
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

LITHOLOGIC LOG

Page 1 of 3

LOCATION MAP:

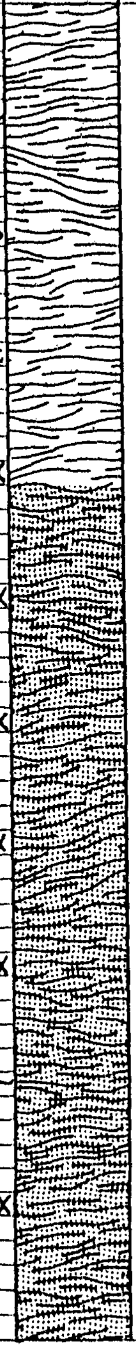


___1/4 ___1/4 ___1/4 ___1/4 S 30 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: BH-1, (MW-5)
SITE COORDINATES (ft.):
N N2+84.25 E E12+34.59
GROUND ELEVATION (ft. MSL): 3978.30
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY/WATER
DRILLING CONTR.: LARRY'S DRILLING, HOBBS
DATE STARTED: 3/21/90 DATE COMPLETED: 3/22/90
FIELD REP.: M. NEE
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay

LOCATION DESCRIPTION:



Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
				5'	CALICHE, v pale orng 10 YR 8/2 to grysh orng 10 YR 7/4, cche is fn sand to crs pebble Grv size, well consol, ang, poorly sorted, v fn gr sand is host for cche, <5% Sst, pale brn 5 YR 5/2.
5	C C C C C C C C C C				
10	C C C C C C C O O O			10'	CALICHE, as above, 70% cche, 30% clay.
15	C C C C C C C C C C			15'	CALICHE, same as 5'.
20	C C C C C C C C C X			20'	CALICHE/SANDSTONE, cche is same as 5', Sst is pale brn 5 YR 5/2, v fn to fn gr, v well to mod consol, sbang to sbrndd, mod well sorted, 90% cche, 10% Sst.
25	C C C C C C C C C X			25'	CALICHE/SANDSTONE, same as 20', 80% cche, 20% Sst.
30	C C X X X X X X X X			30'	CALICHE/SANDSTONE, same as 20', 20% cche, 80% Sst in cuttings.
35	C C X X X X X X X X			35'	CALICHE/SANDSTONE, same as 20', 80% Sst, 20% cche.
40	C C C C C X X X X X			40'	CALICHE/SANDSTONE, same as 20' 50% cche, 50% Sst.
45	C C C C X X X + + -			45'	CALICHE/SANDSTONE, same as 20', 40% cche, 30% Sst, 20% v fn to fn sand, 10% silt, sand & silt is pale yelsh brn 10 YR 6/2, unconsol, sbrndd, mod well sorted.
50	C C C C X X X X X X				

LITHOLOGIC LOG

(Continued)

Page 2 of 3

Location ID BH-1

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50	C C C C X X X X X X			50'	CALICHE/SANDSTONE, same as 20', 60% Sst, 40% cche.
55	C C C C X X X X X X			55'	CALICHE/SANDSTONE, same as 20' 60% Sst, 40% cche.
60	C C C C X X X X X X			60'	CALICHE/SANDSTONE, same as 20', 60% Sst, 40% cche.
65	C C C C X X X X X X			65'	CALICHE/SANDSTONE, same as 20', 60% Sst, 40% cche.
70	+ + + + + + + + + +			70'	SAND, mod yelsh brn 10 YR 5/4, v fn to fn gr, unconsol, sbrndd, v well sorted.
75	C C C C C C C X X +			75'	CALICHE/SANDSTONE, same as 20', 70% cche, 20% Sst, 10% v fn sand.
80	C C + + + O O O O O			80'	SANDY CLAY, grsh orng pink 5 YR 7/2 to mod orng pink 5 YR 8/4, 50% clay, 30% sand, 20% cche.
85	+ + + + + + + + + –			85'	SAND, pale yelsh brn 10 YR 6/2, v fn to fn sand, unconsol, sbrndd, well sorted.
90	+ + + + + + + + + –			90'	SAND, same as 85'.
95	+ + + + + + + + + –			95'	SAND, same as 85'.
100	+ + + + + + + + + –			100'	SAND, same as 85'.
105	+ + + + + + + + + +			105'	SAND, mod yelsh brn 10 YR 5/4, v fn to med size, unconsol, mod well sorted, sbrndd.
110	+ + + + + + + + + +			110'	SAND, same as 105'.
115	+ + + + + + + + + –			115'	SILTY SAND, pale yelsh brn 10 YR 6/2, silt to med sand, unconsol, mod well sorted, sbrndd, 85% sand, 15% silt.

LITHOLOGIC LOG

(Continued)

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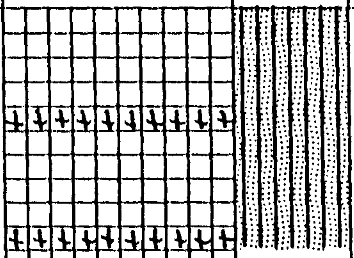
Location ID BH-1

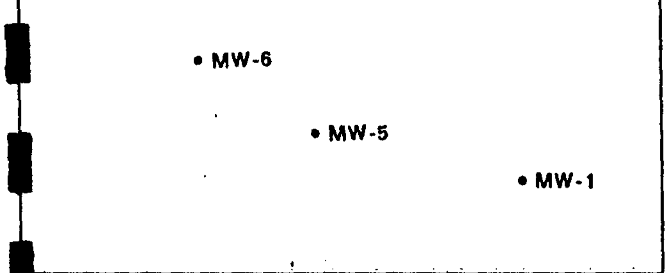


Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
115					
120				120'	SILTY SAND, same as 115'.
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

LITHOLOGIC LOG

Page 1 of 3

LOCATION MAP:



___1/4 ___1/4 ___1/4 ___1/4 S 31 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: BH-2 (MW-6)
SITE COORDINATES (ft.):
N N5+41.23 E E07+72.94
GROUND ELEVATION (ft. MSL): 3980.04
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY/WATER
DRILLING CONTR.: LARRY'S DRILLING, HOBBS
DATE STARTED: 3/22/90 DATE COMPLETED: 3/23/90
FIELD REP.: M. NEE
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
				0-1'	<u>SOIL</u>, pale yelsh brn, 10 YR 6/2, org rich.
5	C C C C X X X X X X			5'	<u>CALICHE/SANDSTONE</u>, cche is v pale orng 10 YR 8/2, clasts are med sand to Pbl Grv size, consol, ang, Sst is pale yelsh brn 10 YR 6/2 gr size is v fn to fn, cemented, consol, sbrndd, 40% cche, 60% Sst.
10	C C C C C C C C X X			10'	<u>CALICHE/SANDSTONE</u>, same as 5', 80% cche, 20% Sst.
15	C C C C C C C C X X			15'	<u>CALICHE/SANDSTONE</u>, same as 5' 80% cche, 20% Sst.
20	C C C C C C C X X O			20'	<u>CALICHE/SANDSTONE</u>, same as 5', 70% cche, 20% Sst, 5% silt, 5% v fn to fn sand.
25	C C C C C X X + + +			25'	<u>CALICHE/SANDSTONE/SAND</u>, 50% cche, 20% Sst, 30% sand, sand is grysh orng pink 5 YR 7/2, unconsol, sbrndd, mod well sorted, v fn to med size.
30	C C C C C X X + + +			30'	<u>CALICHE/SANDSTONE/SAND</u>, same as 25'.
35	C C C X X + + + - -			35'	<u>CALICHE/SANDSTONE/SAND/SILT</u>, same as 25', 20% Sst, 30% cche, 30% sand, 20% silt.
40	C C C X X + + + - -			40'	<u>CALICHE/SANDSTONE/SAND/SILT</u>, same as 35'.
45	+ + + + + + + - - -			45'	<u>SILTY SAND</u>, grysh orng pink 5 YR 7/2, silt to fn sand, unconsol, mod sorted, sbrndd, 70% v fn to fn sand, 30% silt.
50				50'	<u>SILTY SAND</u>, same as 45'.

LITHOLOGIC LOG

(Continued)

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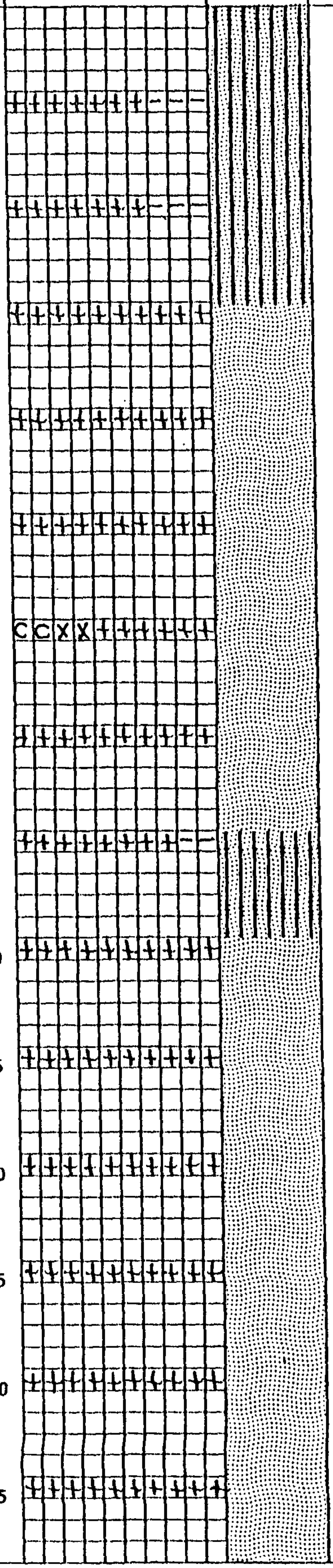
Location ID BH-2



Depth	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50			
55		55′	SILTY SAND, same as 45′.
60		60′	SAND, mod yelsh brn 10 YR 5/4, v fn to med size, unconsol, sbrndd, mod well sorted.
65		65′	SAND, same as 60′.
70		70′	SAND, same as 60′.
75		75′	CALICHE/SANDSTONE/SAND, pale yelsh brn 10 YR 6/2, 20% cche, 20% Sst, 60% v fn to fn sand.
80		80′	SAND, same as 60′.
85		85′	SILTY SAND, pale yelsh brn 10 YR 6/2, silt to fn sand, unconsol, mod sorted, sbrndd, 80% v fn to fn sand, 20% silt.
90		90′	SAND, pale yelsh brn 10 YR 6/2, v fn sand to med sand, unconsol, mod sorted, sbang to sbrndd.
95		95′	SAND, same as 90′.
100		100′	SAND, same as 90′.
105		105′	SAND, mod yelsh brn 10 YR 5/4, fn to v fn sand, unconsol, sbrndd, mod well sorted.
110		110′	SAND, same as 105′.
115		115′	SAND, same as 105′.

LITHOLOGIC LOG
(Continued)

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Location ID BH-2

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
115					
120				120'	<u>SAND</u>, same as 105'.
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

LITHOLOGIC LOG

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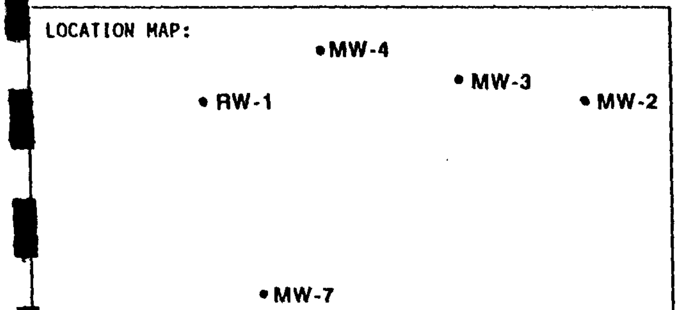
LOCATION MAP:



___1/4 ___1/4 ___1/4 ___1/4 S 31 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: BH-3 (MW-7)
SITE COORDINATES (ft.):
S0+04.31 E E10+27.31
GROUND ELEVATION (ft. MSL): 3977.20
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY/WATER
DRILLING CONTR.: LARRY'S DRILLING, HOBBS
DATE STARTED: 3/25/90 DATE COMPLETED: 3/25/90
FIELD REP.: M. NEE
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
				0-1'	SOIL, grysh brn 5 YR 8/2, to appears to be HC stained.
5	C C C C C C C C C X			5'	CALICHE, mod orng pink 5 YR 8/4, cuttings are v fn to fn Pbl Grv size, v well consol, 90% cche, 10% Sst, v hard drilling to 5'.
10	C C C C C C C O O O			10'	CALICHE, as above except poorly consol, 70% cche, 30% clay.
15	C C + + + + + + + +			15'	SAND, grysh orng pink 5 YR 7/2, v fn to fn gr sand, unconsol, sbang to sbrndd, well sorted, 80% sand, 20% cche.
20	C C + + + + + + + +			20'	SAND, same as 15'.
25	C + + + + + + + + -			25'	SILTY SAND, pale yelsh brn 10 YR 6/2, silt to fn sand, unconsol, sbang to sbrndd, 80% sand, 10% silt, 10% cche.
30	+ + + + + + + + - -			30'	SILTY SAND, same as 25', 20% silt, 80% sand.
35	C + + + + + + + + -			35'	SILTY SAND, same as 25', 10% silt, 10% cche, 80% sand.
40	+ + + + + + + + - -			40'	SILTY SAND, same as 25', 20% silt, 80% sand.
45	+ + + + + + + + - -			45'	SILTY SAND, same as 25', 20% silt, 80% v fn sand.
50	C + + + + + + + - -			50'	SILTY SAND, same as 25', 20% silt, 10% cche, 70% sand.

LITHOLOGIC LOG
(Continued)

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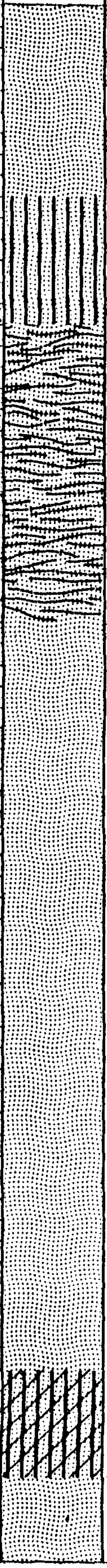
Location ID BH-3



Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50	C + + + + + + + - -				
55	+ + + + + + + - - -			55′	SILTY SAND, same as 25′, 30% silt, 70% v fn sand.
60	C C C C X X X X X X			60′	CALICHE/SANDSTONE, cche is v pale orng 10 YR 8/2, clasts are med sand to fn Pbl Grv size, 40% cche, 60% Sst, Sst is pale yelsh brn 10 YR 6/2, gr size is v fn to fn, cemented, consol, sbrndd.
65	C C C C X X X X X X			65′	CALICHE/SANDSTONE, same as 60′.
70	C C C X X X X X + -			70′	CALICHE/SANDSTONE, same as 60′, 50% Sst, 30% cche, 10% silt, 10% v fn sand.
75	+ + + + + + + - - -			75′	SILTY SAND, pale yelsh brn 10 YR 6/2, unconsol, well sorted, sbang to sbrndd, 30% silt, 70% v fn to fn sand.
80	+ + + + + + + - - -			80′	SILTY SAND, same as 75′
85	+ + + + + + + + + -			85′	SAND, same as 75′, 80% v fn sand, 10% fn sand, 10% silt.
90	+ + + + + + + + + -			90′	SAND, same as 85′.
95	+ + + + + + + + + -			95′	SAND, same as 85′.
100	+ + + + + + + + + +			100′	SAND, mod yelsh brn 10 YR 5/4, unconsol, well sorted, sbang to sbrndd, v fn to fn sand.
105	+ + + + + + + + + +			105′	SAND, same as 100′.
110	+ + + + + + + + - o			110′	CLAYEY SILTY SAND, pale yelsh brn 10 YR 6/2, clay to fn sand, unconsol, mod sorted, sbang to sbrndd, 10% clay, 10% silt, 80% v fn to fn sand.
115	+ + + + + + + + + +			115′	SAND, same as 100′.

LITHOLOGIC LOG

(Continued)

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Location ID BH-3

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
115		▨			
120		▨		120'	SAND, same as 100'.
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

LITHOLOGIC LOG

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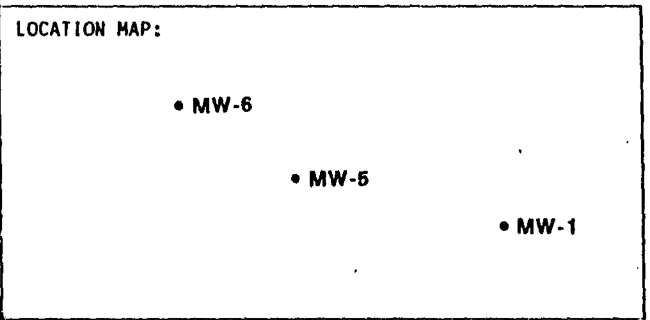
LOCATION MAP:



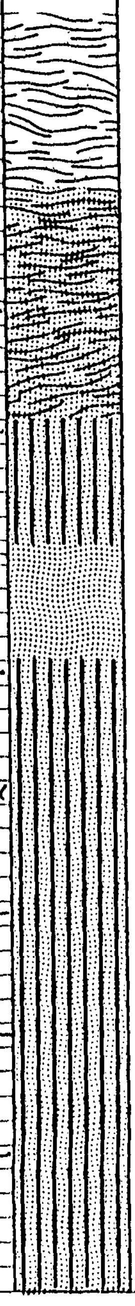
___1/4 ___1/4 ___1/4 ___1/4 S 30 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: BH-5 (MW-8)
SITE COORDINATES (ft.):
N N3+60.51 E E09+40.70
GROUND ELEVATION (ft. MSL): 3978.79
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY/WATER
DRILLING CONTR.: LARRY'S DRILLING HOBBS
DATE STARTED: 4/03/90 DATE COMPLETED: 4/04/90
FIELD REP.: M. NEE
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
				0-2'	BACKFILL/SOIL, grysh blk N2, fn Pbl to lrg Cbl of cche w/soil, org & trash present.
5	CCCCCCCCCC			5'	CALICHE, yelsh gry 5 Y 7/2, cuttings are fn sand to med Pbl Grv size, strong HC odor.
10	CCCCXXXXXX			10'	CALICHE/SANDSTONE, Sst is mod yelsh brn 10 YR 5/4, v fn gr, well consol, sbang, well sorted, cche is same as 5' 40% cche, 60% Sst.
15	CCCCCXXXX-			15'	CALICHE/SANDSTONE, same as 10' w/40% Sst, 50% cche, 10% clay.
20	+ooo------		1355	20'	CLAYEY, SILTY SAND, v pale orng 10 YR 8/2, clay to v fn sand, mod consol, poorly sorted, sand grains are sbang, 10% sand, 30% silt, 60% clay.
25	++++++++++			25'	SAND, pale yelsh brn 10 YR 6/2, v fn gr, unconsol, sbang to sbrndd, v well sorted. 27-34' SILTY SAND
30	++++++++--			30'	SILTY SAND, pale yelsh brn 10 YR 6/2, silt to sand, unconsol, mod well sorted, sbang to sbrndd, 20% silt, 80% sand.
35	XXXXXXXXXX			35'	SANDSTONE, pale brn 5 YR 5/2 pred med Pbl Grv size Frag, v well consol, sand grains are v fn in size, sbrndd.
40	XXX++++++-		1412	40'	SANDSTONE/SAND, pale yelsh brn 10 YR 6/2, Sst is the same as 35', sand is the same as 30', 30% Sst, 60% sand, 10% silt.
45	++++++++--			45'	SILTY SAND, same as 30'.
50	++++++++--			50'	SILTY SAND, same as 30'.



LITHOLOGIC LOG
(Continued)

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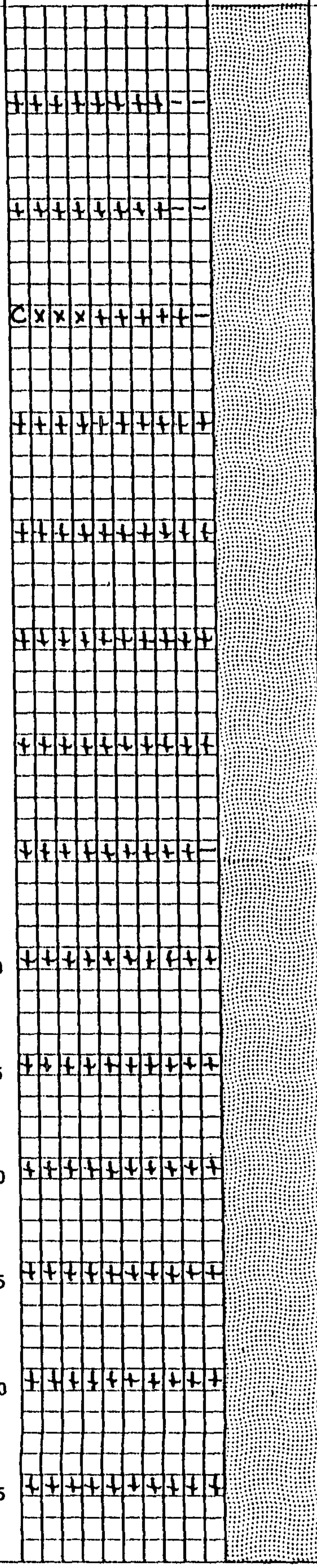
Location ID BH-5



Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50					
55				55′	SILTY SAND, same as 30′.
60				60′	SILTY SAND, grysh orng pink, 5 YR 7/2, 10% silt, 60% sand, 10% cche, 20% Sst.
65				65′	SAND, mod yelsh brn 10 YR 5/4, v fn to fn gr, unconsol, well sorted, sbang to sbrndd.
70			1440	70′	Same as 65′.
75				75′	SAND, pale yelsh brn 10 YR 6/2, w/<5% v pale orng 10 YR 8/2 clay/cche, v fn gr, unconsol, mod well sorted, sbang.
80				80′	SAND, same as 75′ w/ no clay.
85			0750	85′	SAND, same as 75′ w/≈10% clay, clay may be from higher in borehole.
90			0756	90′	SAND, same as 75′, no clay frac.
95				95′	SAND, same as 75′, no clay frac.
100				100′	SAND, same as 75′, no clay.
105				105′	SAND, same as 75′, no clay.
110				110′	SAND, same as 75′, no clay.
115				115′	SAND, same as 75′, no clay.

LITHOLOGIC LOG

(Continued)

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Location ID BH-5

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
		▨			
115		▨			
120			0815	120′	**SAND**, same as 75′, no clay.
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

LITHOLOGIC LOG

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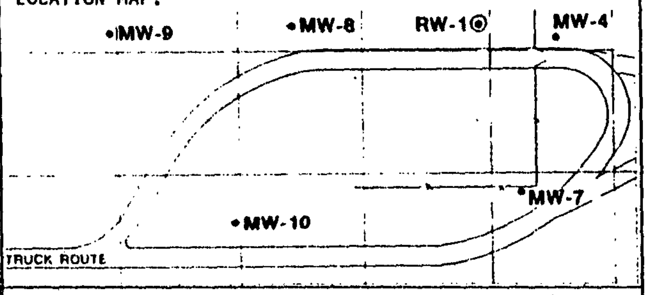
LOCATION MAP:



___1/4 ___1/4 ___1/4 ___1/4 S 30 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: P9 (MW-9)
SITE COORDINATES (ft.):
N N0+18.39 E E05+92.93
GROUND ELEVATION (ft. MSL): 3979.12
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY/WATER
DRILLING CONTR.: LARRY'S DRILLING & PUMP
DATE STARTED: 8/9/90 DATE COMPLETED: 8/10/90
FIELD REP.: K. SUMMERS
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay
z quartzite

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
	o o o o o o o o c c			0-1	Clay, mod brn 5 YR 3/4. Clay 80%. Various sized cche cobbles 20%. Cche cuttings are slt to crs grv sized.
5	+ c c c c c c c c c			5	Caliche, v pale or 10 YR 8/2 to grysh or 10 YR 7/4. <5% sd mixed in. Sand is subrounded and fine.
10	+ + c c c c c c c c			10	Sandy caliche, v pale or 10 YR 8/2. 20% v f to med sands. Cche cuttings are clay/slt size to sml pebble size. 60% slt size cuttings. 20% sml pebble size.
15	+ + + c c c c c c c			15	Sandy caliche, grysh or 10 YR 3/4. Sd is f, subangular to subrounded. Very hard paleocaliche from 14' to 16'.
20	- - x x + + + + + +			20	Sandstone, grysh or to mod ylsh brn 10YR 5/4. Slt size <20%. V f to f sands 80%, sands are subangular to subrounded and range from poorly to mod consolidated.
25	- + x x x x x x x x			25	Sandstone, v pale or 10YR 8/2 to grysh or 10YR 7/4. 15% slt size. 85% v f, subrounded to well rounded, well sorted sds.
30	- + x x x x x x x x			30	Sandstone, grysh or 10YR 7/4 to dk ylsh or 10YR 6/6. Same as 25' but harder, better consolidated and slightly darker.
35	- x x x x + + + + +			35	Silty sandstone, pale ylsh brn 10YR 6/2. Consolidated quite well at some intervals, while not at all in others. 10% slt size. 90% v fine to fine, subrounded to well rounded.
40	- + + + + x x x x x			40	Sandstone, grysh org 10YR 3/4. Loosly consolidated sst with interbedded sands. <10% slt, v fine to fine sands ~90%, sands are well sorted, subrounded.
45	- + + x x x x x x x			45	Sandstone, mod ylsh brn 10YR 5/4. V fine to fine, subrounded to well rounded, well sorted sand >90%. Silt <10%. 41'-42' very loose zone.
50	o + + + + + + + + +			50	Sand, pale ylsh brn 10YR 6/2 to lt brn 5YR 6/4. Poorly consolidated, well sorted v fine to fine, subrounded sands 90%, clay to silt 10%.

LITHOLOGIC LOG

Page 2 of 3

(Continued)

Location ID P9 (MW-9)

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50	- C + + + X X X X X	░			
55	- C + + + X X X X X	░		55	<u>Sandstone</u>, grysh or 10YR 7/4 to pale ylsh brn 10YR 6/2. Slt size 10%. V fine sand 85%. Paleocaliche layer at 54".
60	- + + + X X X X X X	░		60	<u>Sandstone</u>, grysh or 10YR 7/4. Moderately consolidated. <5% slt size. V fine to fine, subangular to subrounded, moderately well sorted sands 95%.
65	C C + + + + X X X X	░		65	<u>Sand/sandstone</u>, mod ylsh brn 10YR 5/4. 15% caliche. 85% loose to moderately consolidated, subrounded, well sorted sand. Color transition is obvious. Fast drilling.
70	C C + + + + X X X X	░		70	<u>Sand/sandstone</u>, mod ylsh brn 10YR 5/4. 15% caliche. 85% loose to moderately consolidated, subrounded, well sorted sand. Color transition is obvious. Fast drilling.
75	⊖ + + + + + + + + +	░		75	<u>Sand</u>, mod ylsh brn 10YR 5/4. 95% v fine to fine sand, well sorted, unconsolidated. 5% white clay balls (kaolinitic?).
80	O ⊖ + + + + + + + +	░		80	<u>Sand</u>, same as 75' but slightly lighter color due to increased clay content. Clay 15%.
85	- O X + + + + + + +	░		85	<u>Sand</u>, mod ylsh brn 10YR 5/4. 5% clay. Slt 10%. V fine to fine sand 85%, 2" of v pale or sst at 84'. Sand is well rounded, well sorted primarily unconsolidated.
90	- - - X X X + + + +	░		90	<u>Sand</u>, pale ylsh brn to pale ylsh or 10YR 8/6. Loose to semi-consolidated silt 30%. V fine to fine sand 70%. Sand is sub to well rounded, well sorted.
95	- - O X X X + + + +	░		95	<u>Sand/sandstone</u>, v pale or 10YR 8/2 to pale ylsh brn 10 YR 6/2. Clay 15%. Silt 15%. V fine well rounded sand 70%. Mod well sorted, loose to well consolidated. Well consolidated layers are thin.
100	- X X X + + + + + +	░		100	<u>Sand</u>, pale ylsh brn 10YR 6/2. Clay to silt size 5%. V fine sand 90%, loose to mod consolidated, subangular to well rounded, well sorted sands.
105	- X + + + + + + + +	▨		105	<u>Clayey sand</u>, mod ylsh brn 10YR 5/4 to grysh or 10 YR 7/4. White clay balls present ~5%. Silt 5%. V fine to fine sand 85%. Sand is subrounded, well sorted, poorly consolidated.
110	- X + + + + + + + +	▨		110	<u>Clayey sand</u>, mod yl brn 10YR 5/4 to grysh or 10 YR 7/4. White clay balls present ~5%. Clay 5%. Silt 5%. V fine to fine sand 85%. Sand is subrounded, well sorted, poorly consolidated.
115	+ + + + + + + + + +	▨		115	<u>Sand</u>, mod yl brn 10 YR 5/4. V fine to fine, subrounded to well rounded, well sorted, unconsolidated "flowing sands".

LITHOLOGIC LOG
(Continued)

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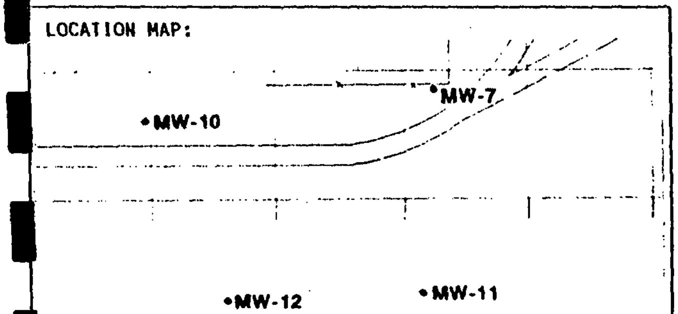
Location ID P9 (MW-9)

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
115					
				118 118	<u>Sand</u>, same as 115' but with 5% silt. TD
120					
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

LITHOLOGIC LOG

Page 1 of 3

LOCATION MAP:

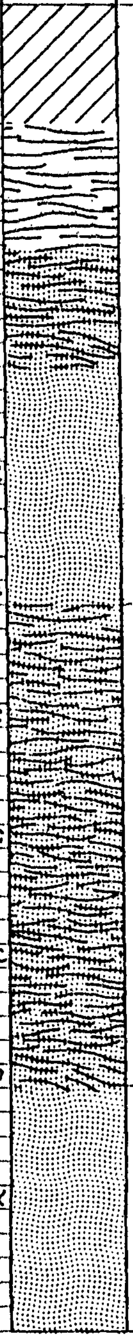


___1/4 ___1/4 ___1/4 ___1/4 S 30 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: P10 (MW-10)
SITE COORDINATES (ft.):
N S1+37.89 E E06+97.32
GROUND ELEVATION (ft. MSL): 3978.0
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY/WATER
DRILLING CONTR.: LARRY'S DRILLING & PUMP
DATE STARTED: 8/8/90 DATE COMPLETED: 8/10/90
FIELD REP.: K. SUMMERS
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay
z quartzite

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
	o o o o o o o c c c			0-2	Clay/Topsoil, mod brn 5YR 4/4. 70% clay/topsoil. Various sized caliche cobbles present at 30%.
5	c c c c c c c c c c			5	Caliche, grysh or to v pale or 10YR 8/2. Cuttings are sand to small pebble sized, with clay size particles washed away.
10	+ + + + + c c c c c			10	Caliche/Sand, grysh or 10YR 7/4. Cche to 8', then unconsolidated sands to 10'. Cuttings show 50% v fine to fine, subangular to subrounded, well-sorted sand. Caliche cuttings are crs sand size to small pebble size.
15	- + + x x x x x x x			15	Sandstone, grysh or to mod ylsh brn 10YR 5/4. <5% qtzt fragments which are crs sd size to med pbl size (wh, semi-vit, scratches glass, does not effervesce in HCl). F sd 60%. V f sd 10%. Slt <5%. Cuttings are primarily v crs sd size to sml pebble size.
20	- + + + + x x x x z			20	Sandstone, grysh or 10YR 7/4 to mod ylsh brn 10YR 5/4. Same as 15' but not as well-consolidated. Interval of very hard qtzt as above.
25	x x x x x x x c c c			25	Sandstone/caliche, pale ylsh brn 10YR 6/2. V f to f sd 70%. 5% slt size. Sands are well to subrounded, well-sorted, well consolidated, except from 20-21 unconsol. 25% paleocaliche fragments showing good conchoidal fracture.
30	+ + x x x x x c c c			30	Sandstone/caliche, same as 25' with v fine grained, well-sorted subrounded "flowing" sands interbedded in thin layers.
35	+ + x x x x x c c c			35	Sandstone/caliche, same as 25' but cutting size is smaller for the cche - 1/16" to 5/8". Predominant sized sst fragments are crs sd size to v crs sd size.
40	+ + x x x x x c c c			40	Sandstone/caliche, same as 35'.
45	+ + x x x x x c c o			45	Sandstone, pale ylsh brn 10YR 6/2. Slt to fine sd. Well consolidated, subrounded to well rounded, well sorted, caliche cement. Cuttings are v coarse sand size to small pebble size.
50	+ + x x x x x x x x			50	Sandstone, same as 45'.

LITHOLOGIC LOG
(Continued)

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Location ID P10

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50	+ + X X X X X X X X				
55	+ + X X X X X X X X			55	Sandstone, same as 45'.
60	+ X X X X X X X X G			60	Sand/sandstone, pale ylsh brn 10YR 6/2 to mod ylsh brn 10YR 5/4. Moderately unconsolidated. Paleocaliche <5%. Silt <5%. V fine to fine sand >90%. Sand is subrounded to well rounded, well-sorted. One foot of loose sand at 58'.
65	+ X X X X X X X X G			65	Sandstone, same as 55-60', but with better consolidation.
70	X X X X X X X X X C			70	Sandstone, mod brn 5YR 3/4. Definite color change. Paleo cche fragments ~1/4" 10%. Sands are v fine to fine, well rounded, well-sorted and well consolidated. Very fine to fine sands 90%. Fragments are approximately 55% small pebble size.
75	X X X X X X X X X C			75	Sandstone, same as 70'.
80	- X X X X X X X X X			80	Sand, mod brn 5YR 4/4. Sand is unconsolidated, well rounded to subrounded, well sorted. 85% v fine sand. 15% silt.
85	- X X X X X X X X X			85	Sand, same as 80'.
90	- X + + + + + + + +			90	Sand, mod brn 5YR 4/4 to mod ylsh brn 10YR 5/4. Sand is same as 80', only slight color change.
95	- X X X + + + + + +			95	Sand, same as 90' but slightly tighter.
100	- + + + + + + + + +			100	Sand, mod brn 5YR 4/4. Silt <10%. V fine to fine sand 90%. Sands are subrounded to rounded, unconsolidated and well sorted.
105	- ⊖ + + + + + + + +			105	Sand, mod brn 5YR 4/4. Same as 100', but presence of white clay balls <5%.
110	⊖ - + + + + + + + +			110	Sand, same as 105', but 5% white clay balls.
115	+ + + + X X X X X Z			115	Sand/sandstone, mod brn 5YR 4/4. Silt <5%. Qtzt fragments <5%. V f to f sds 90%. Sds are well rndd, well srtd. Sds and sst interbedded. Sst are mod consolidated.

LITHOLOGIC LOG

(Continued)

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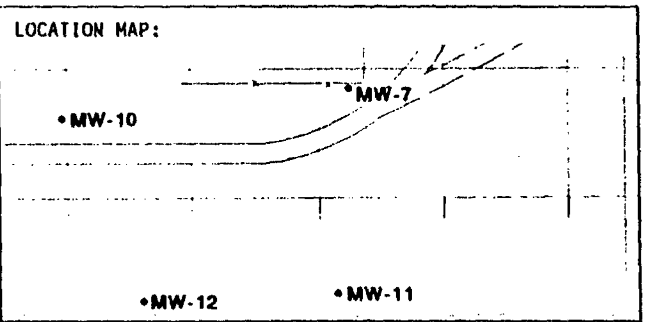
Location ID P10

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
115	+ + + + X X X X X Z	░			
	+ + + + X X X X X Z	░		118	Sand/sandstone, same as 115'.
				118	TD
120					
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

LITHOLOGIC LOG

Page 1 of 3

LOCATION MAP:



___1/4 ___1/4 ___1/4 ___1/4 S 31 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: P11 (MW-11)
SITE COORDINATES (ft.):
N S2+76.98 E E09+14.32
GROUND ELEVATION (ft. MSL): 3977.44'
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY/WATER
DRILLING CONTR.: LARRY'S DRILLING & PUMP CO.
DATE STARTED: 8/07/90 DATE COMPLETED: 8/10/90
FIELD REP.: K. SUMMERS, M. NEE
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay

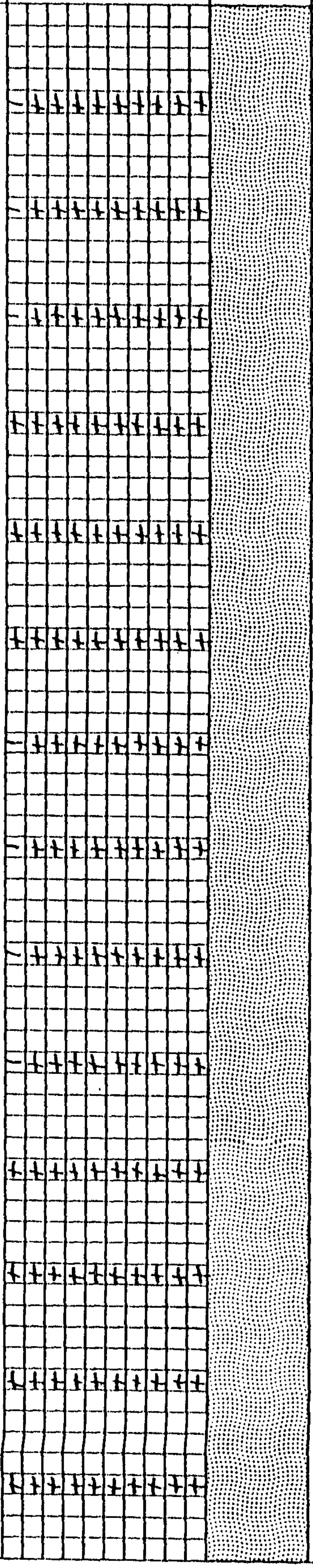
LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
	c + o o o o o o o o			0-2'	Clay, dark ylsh brn 10YR 4/2. Clay 85%. Silt to fine sand and caliche gravel 15%.
5	o + c c c c c c c c			5'	Sandy caliche, grysh or 10YR 7/4. 80% caliche. 20% clay to fine sand. Sands in clays are subangular to subrounded.
10	o + c c c c c c c c			10'	Sandy caliche, same as 5'.
15	o + c c c c c c c c			15'	Sandy caliche, same as 5'.
20	o + c c c c c c c c			20'	Sandy caliche, same as 5'.
25	+ + + + c c c c c c			25'	Sand/caliche, grysh or 10YR 7/4. 40% v fine to fine sand. Sands are subangular to subrounded, poorly consolidated, well-sorted. 60% tight caliche. Fragments are from medium sand size to v coarse sand size.
30	- + + + + + + + + +			30'	Sand, mod ylsh brn 10YR 5/4. <5% silt, >95% v fine to fine sands. Sands are sub to well-rounded, well-sorted and poorly consolidated.
35	+ + + + x x x x x x			35'	Sandstone, pale ylsh brn 10YR 6/2. <5% silt size. Sand is v fine to fine, well rounded, well-sorted. Very well consolidated from 32-35'.
40	+ + + + x x x x x x			40'	Sand/sandstone, same as 30-35', but not as well consolidated.
45	+ + + + + x x x x x			45'	Sand, mod ylsh brn 10YR 5/4 to grysh or 10YR 7/4. Mod consolidated sands interbedded with sandstone layers. Sandstones compose 30% of cuttings at 1/32" size.
50	+ + + + + + + x x x			50'	Sand, same as 45'.

LITHOLOGIC LOG
(Continued)

Page 2 of 3

Location ID P11



Depth	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50			
55		55′	<u>Sand</u>, mod ylsh brn 10YR 5/4 to grysh or 10YR 7/4. 90% v fine to fine sands. <10% silt size. Some dark clay showing, probably from up hole.
60		60′	<u>Sand</u>, pale ylsh brn 10YR 6/2 to mod ylsh brn 10YR 5/4. >90% v fine to fine sands. <10% silt size. Sands are well-rounded, well-sorted & poorly consolidated.
65		65′	<u>Sand</u>, same as 60′, but less silt.
70		70′	<u>Sand</u>, same as 65′.
75		75′	<u>Sand</u>, same as 65′, but even less silt.
80		80′	<u>Sand</u>, mod ylsh brn 10YR 5/4. 90% v fine to fine sands. 10% silt. Sands are unconsolidated, very well-sorted, well-rounded "flowing sands".
85		85′	<u>Sand</u>, same as 80′.
90		90′	<u>Sand</u>, same as 80′, but lighter. Not enough change to change color on chart.
95		95′	<u>Sand</u>, pale ylsh brn 10YR 6/2. 10% silt size. 90% v fine to fine sands. Sands are well to subrounded, well-sorted and poorly consolidated.
100		100′	<u>Sand</u>, same as 95′.
105		105′	<u>Sand</u>, same as 95′.
110		110′	<u>Sand</u>, same as 95′.
115		115′	<u>Sand</u>, same as 95′.

LITHOLOGIC LOG

(Continued)

Page 3 of 3

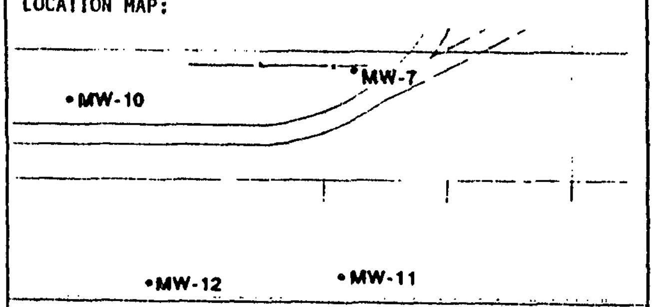
Location ID P11

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
115					
120				120'	**Sand**, mod ylsh brn 10YR 5/4. 95% v fine to fine sand. 5% silt. Sands are unconsolidated, well-sorted, sub to well-rounded.
				120'	TD
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

LITHOLOGIC LOG

Page 1 of 3

LOCATION MAP:

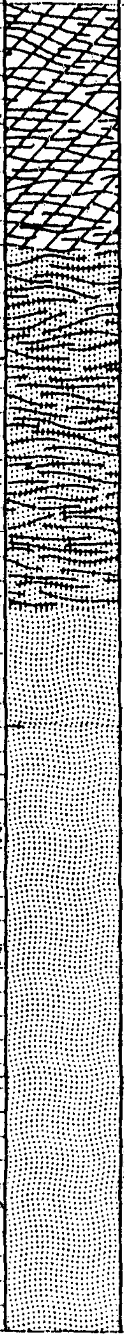


___1/4 ___1/4 ___1/4 ___1/4 S 30 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: P12 (MW-12)
SITE COORDINATES (ft.):
N S2+80.20 E E07+60.87
GROUND ELEVATION (ft. MSL): 3977.3
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY/WATER
DRILLING CONTR.: LARRY'S DRILLING & PUMP CO.
DATE STARTED: 8/07/90 DATE COMPLETED: 8/10/90
FIELD REP.: K. SUMMERS, M. NEE
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay
z quartzite

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5	o o c c c c c c c c			5'	Clay/caliche, v pale or 10YR 8/2. 80% caliche. 20% clay to v fine sand. First 2 feet primarily clay with caliche cobbles.
10	- + + c c c c c c c			10'	Sandy caliche, grysh or 10YR 7/4. 70% caliche. 10% cl, slt. Approx 20% v fine sand. Sand is well-rounded to subrounded, well-sorted and unconsolidated.
15	- + + c c c c c c c			15'	Sand/caliche, same as 10'.
20	+ + + c c c c c c c			20'	Sand/caliche, grysh or 10YR 7/4. Approx 3' sand and then back to caliche. 80% caliche in cuttings. Sand is subrounded, unconsolidated, well-sorted, v fine to fine. Some quartzite fragments 5%.
25	c c + + + + + + + +			25'	Sand, mod ylsh brn 10YR 5/4. 80% v fine to fine sand. 20% caliche. Sand is well-sorted, well-rounded, semi consolidated.
30	- - - + + x x x x x			30'	Sandstone, mod ylsh brn 10YR 5/4 to dk ylsh brn 10 YR 6/6. Poorly to well consolidated at 29' 70% sand. 30% silt size. Sand is v fine, well-rounded, well-sorted.
35	- + + + x x x x x x			35'	Sandstone, mod ylsh brn 10YR 5/4, 90% v fine to fine, well consolidated, well-sorted & well-rounded sand. 10% caliche fragments.
40	- + + x x x x x x x			40'	Sandstone, mod ylsh brn 10YR 5/4, silt to fine sand. Semi-consolidated, well-rounded, well-sorted sand 90%. 10% silt.
45	- x x x + + + + + +			45'	Sandstone, mod ylsh brn 10YR 5/4 to grysh or 10 YR 7/4. 60% sand. 30% sandstone fragments 1/16". V hard layer at 42'. Sand is v fine, well-sorted, well-rounded.
50	c c c + + + x x x x			50'	Sand/sandstone, mod ylsh brn 10YR 5/4. 75% sand/sandstone 25% caliche. Sand is v fine, well-rounded, well-sorted, moderately consolidated. Caliche is very tight.

LITHOLOGIC LOG

(Continued)

Page 2 of 3

Location ID P12

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50					
55	X X X X + + + + + +			55′	Sand/sandstone, pale ylsh brn 10YR 6/2. Thin layers of v light colored sandstone. Sandstone v fine, well-sorted, sub to well-rounded. Some layers are very well-consolidated. >90% sand. <20% silt size.
60	X X X X + + + + + +			60′	Sand/sandstone, mod ylsh brn 10YR 5/4 to mod brn 5YR 4/4. Other than color change, sands are same as 55′.
65	X X X + + + + + + +			65′	Sand/sandstone, same as 60′, but slightly less consolidated.
70	C X X X + + + + + +			70′	Sand, mod brn 5YR 5/4. Same as 60′. 6" of tight caliche at 69′.
75	C X X X + + + + + +			75′	Sand, same as 70′ with some caliche fragments.
80	- X + + + + + + + +			80′	Sand, mod ylsh brn 10YR 5/4. 90% v fine to fine sandstones. 10% silt size materials. Sands are well-sorted, sub to well-rounded. Mostly unconsolidated. Distinctive color change.
85	Z X + + + + + + + +			85′	Sand, same as 80′, but small quartzite fragments <5%.
90	Z X + + + + + + + +			90′	Sand, same as 80′.
95	- X + + + + + + + +			95′	Sand, mod ylsh brn 10YR 5/4. 90% v fine to fine, sub-rounded, well-sorted, mostly unconsolidated. Sandstones at 93′, but very thin. 10% silt size particles.
100	- X + + + + + + + +			100′	Sand, same as 95′, without sandstone.
105	- + + + + + + + + +			105′	Sand, mod ylsh brn 10YR 5/4 to mod brn 5YR 4/4. Sub to well-rounded, well-sorted quartz sands. Sands are v fine to fine and unconsolidated at 95%. 5% silt size.
110	- + + + + + + + + +			110′	Sand, same as 105′.
115	+ + + + + + + + + +			115′	Sand, same as 105′.

LITHOLOGIC LOG
(Continued)

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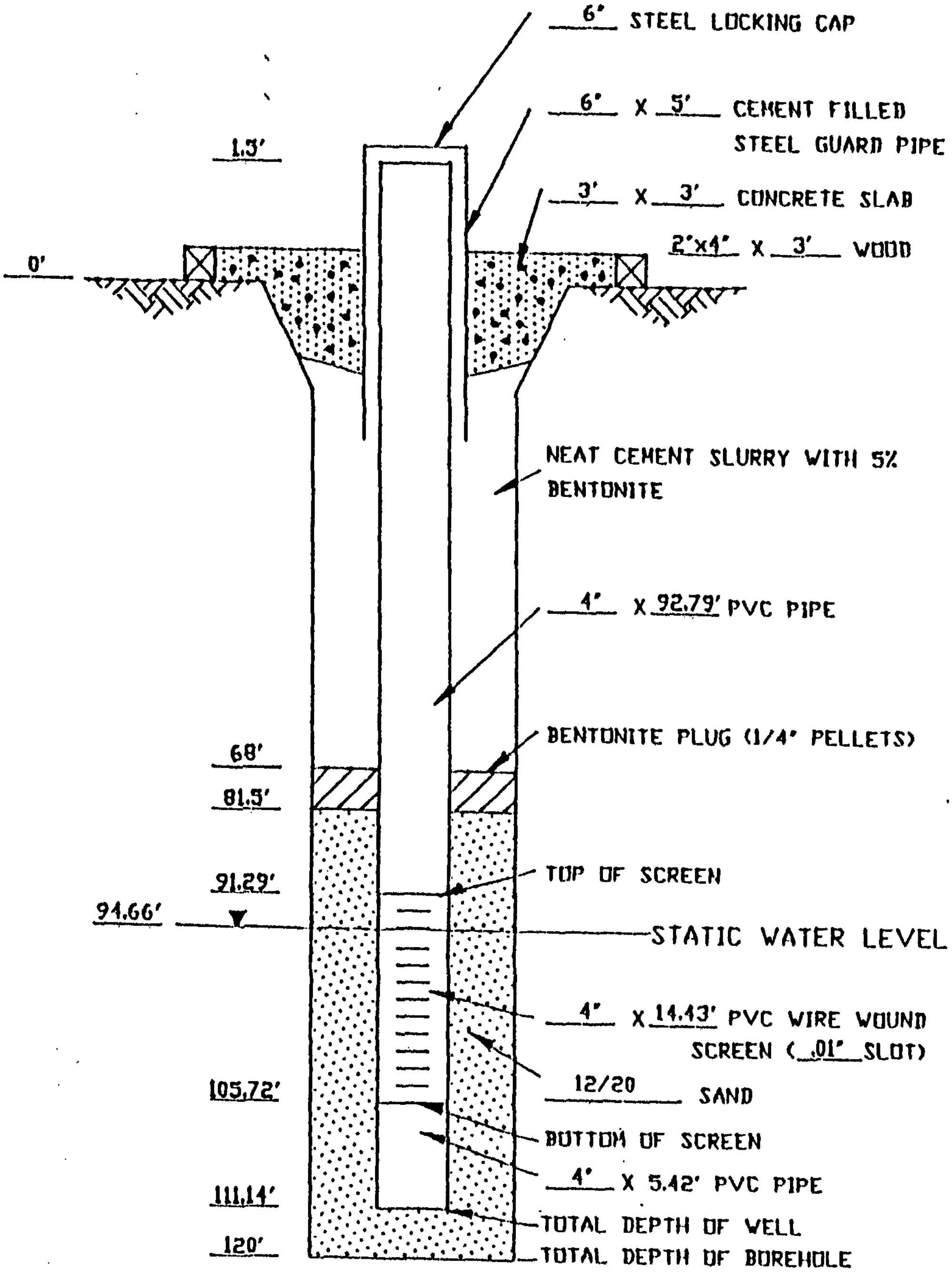
Location ID P12

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
115					
120				119' 119'	Sand, same as 105'. TD
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

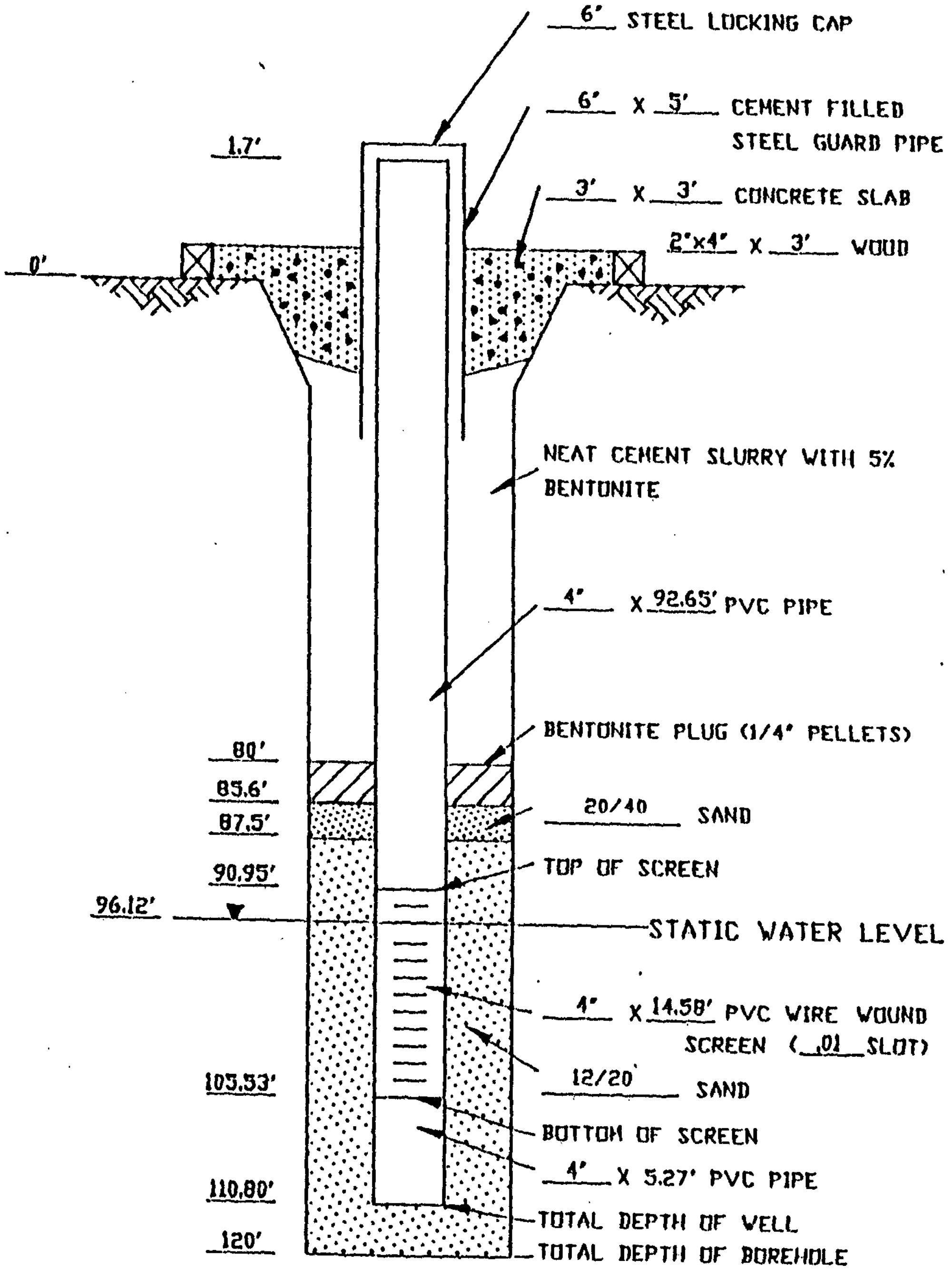
APPENDIX B

APPENDIX B

Monitor Well Completion Diagrams

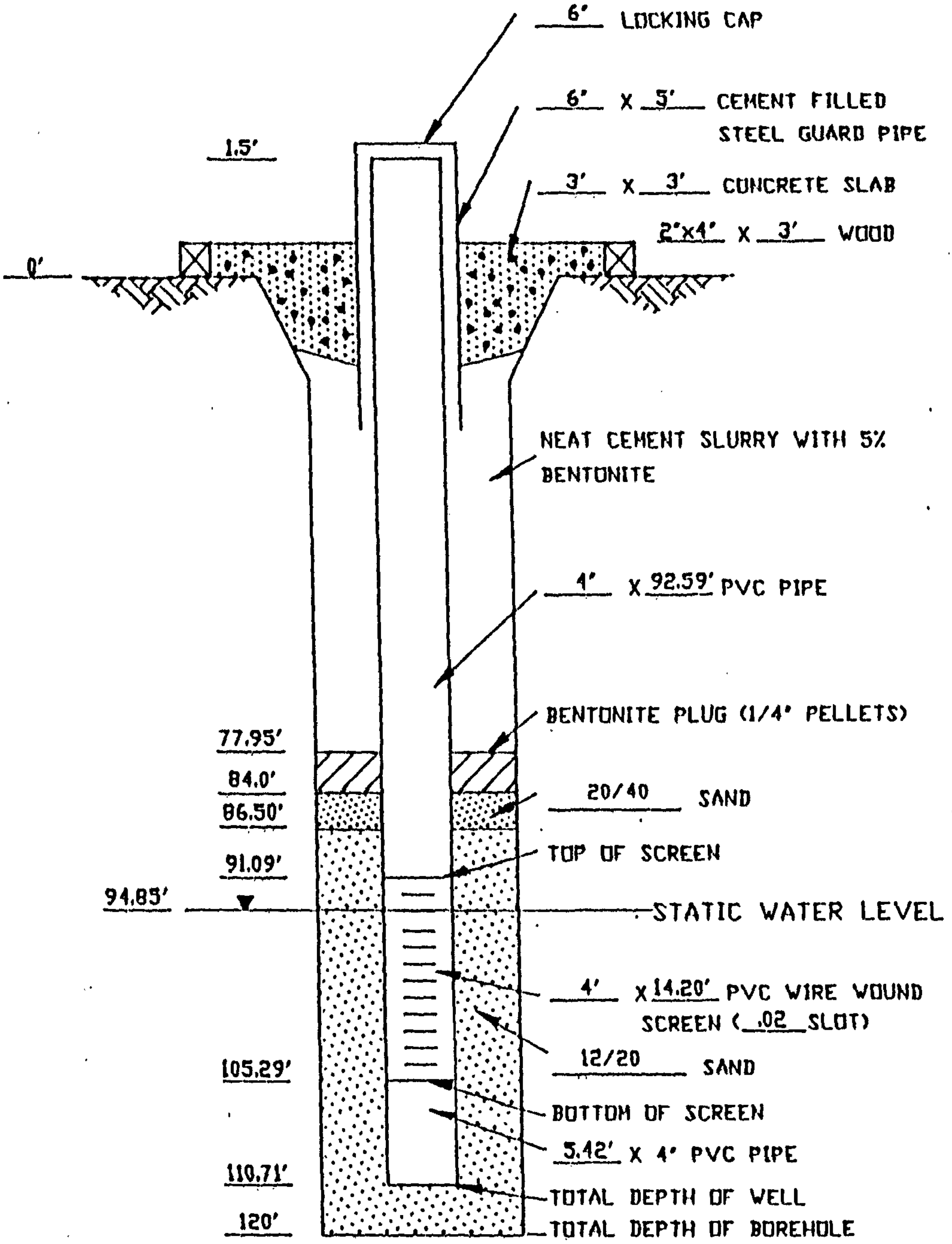


MONITOR WELL MW-5
PHILLIIPS LEE PLANT

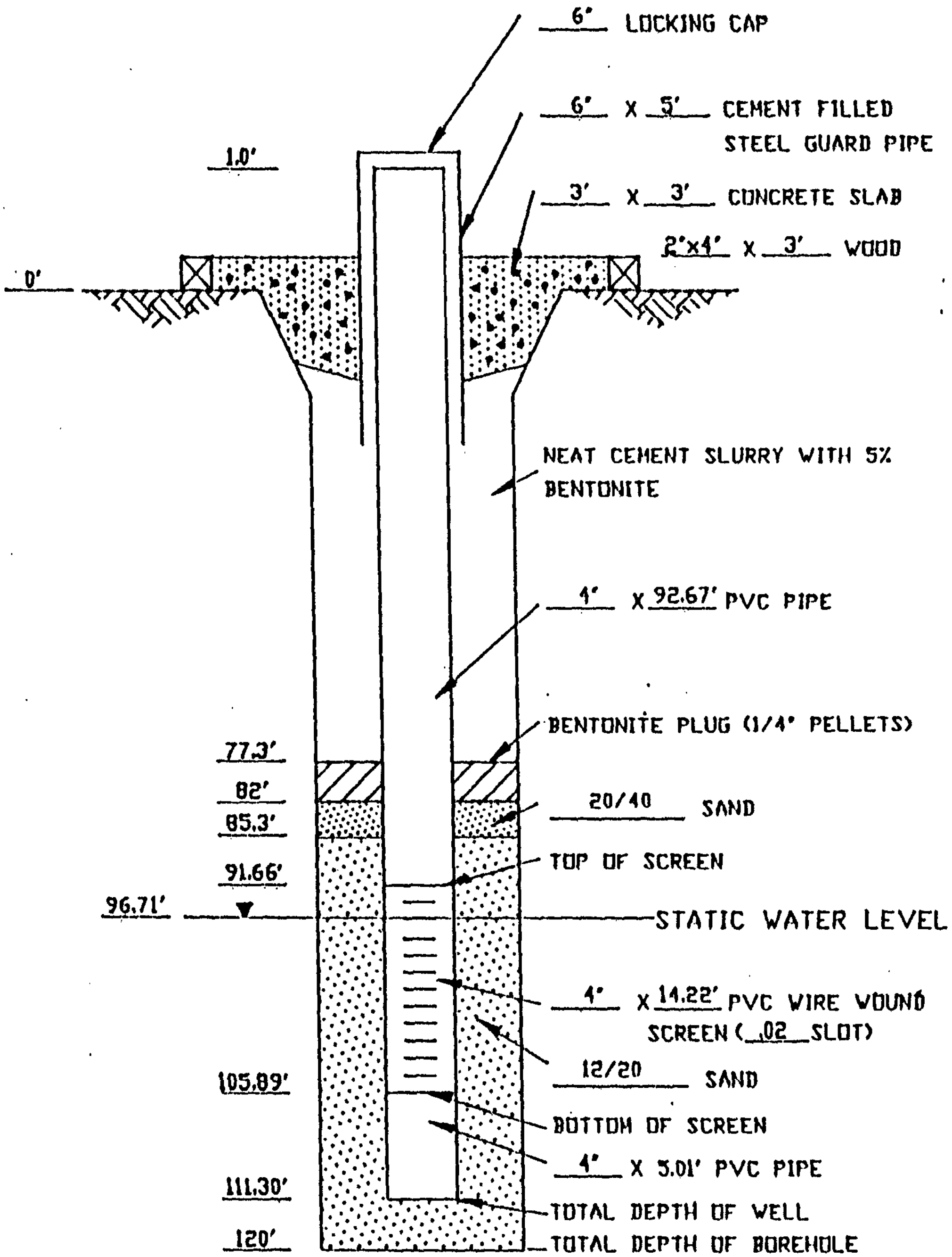


MONITOR WELL MW-6

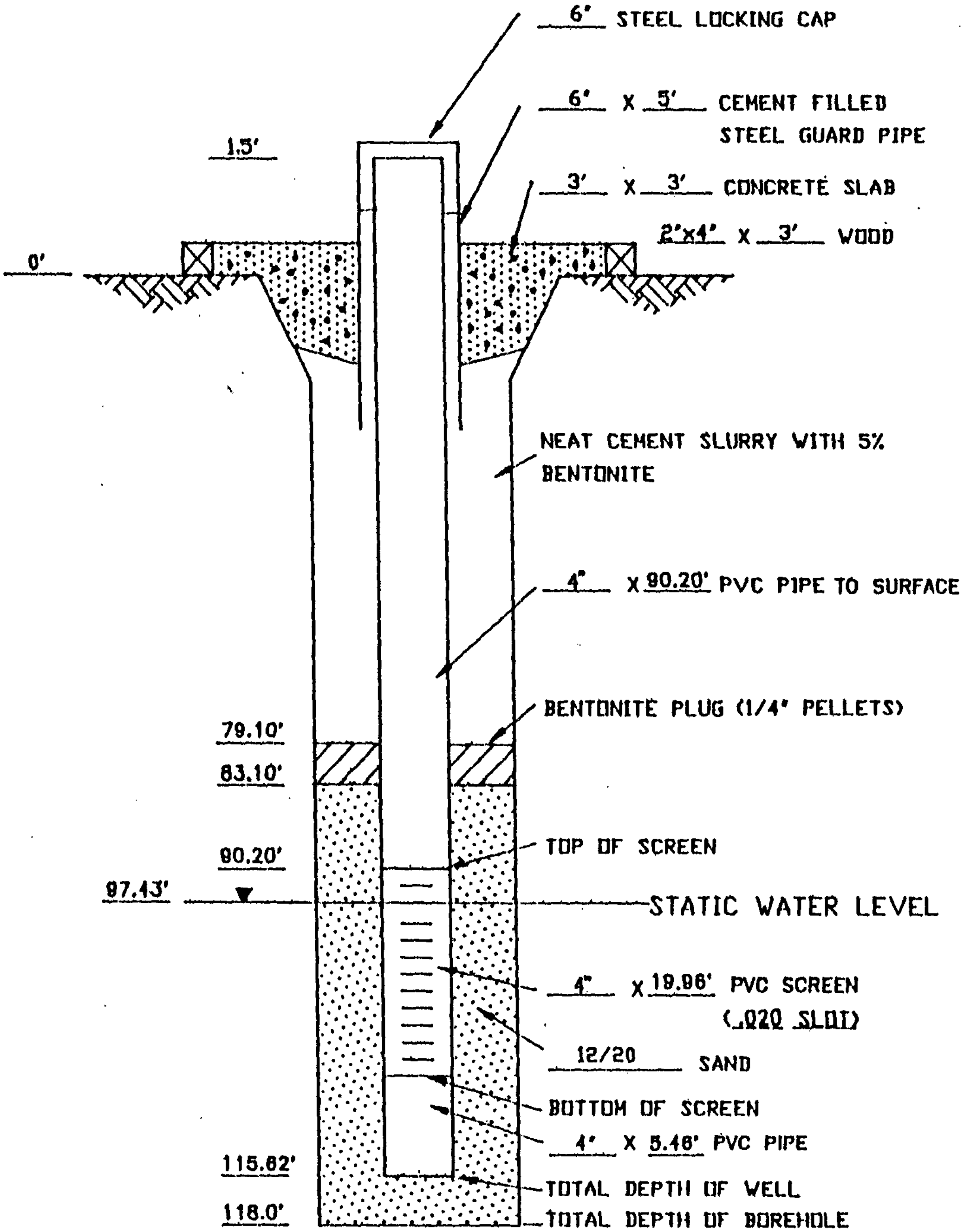
PHILLIPS LEE PLANT



MONITOR WELL MW-7
PHILLIIPS LEE PLANT

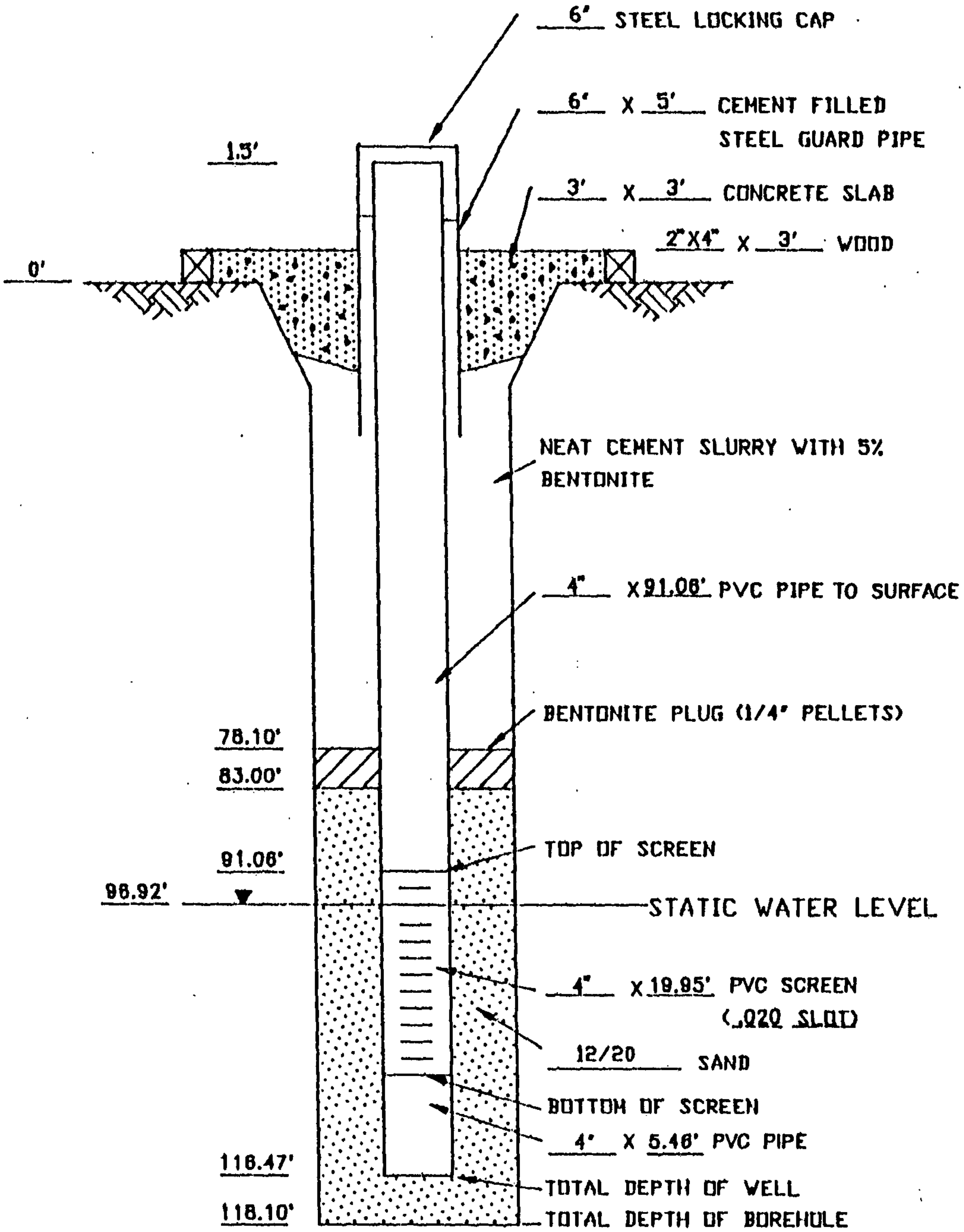


MONITOR WELL MW-8
PHILLIIPS LEE PLANT



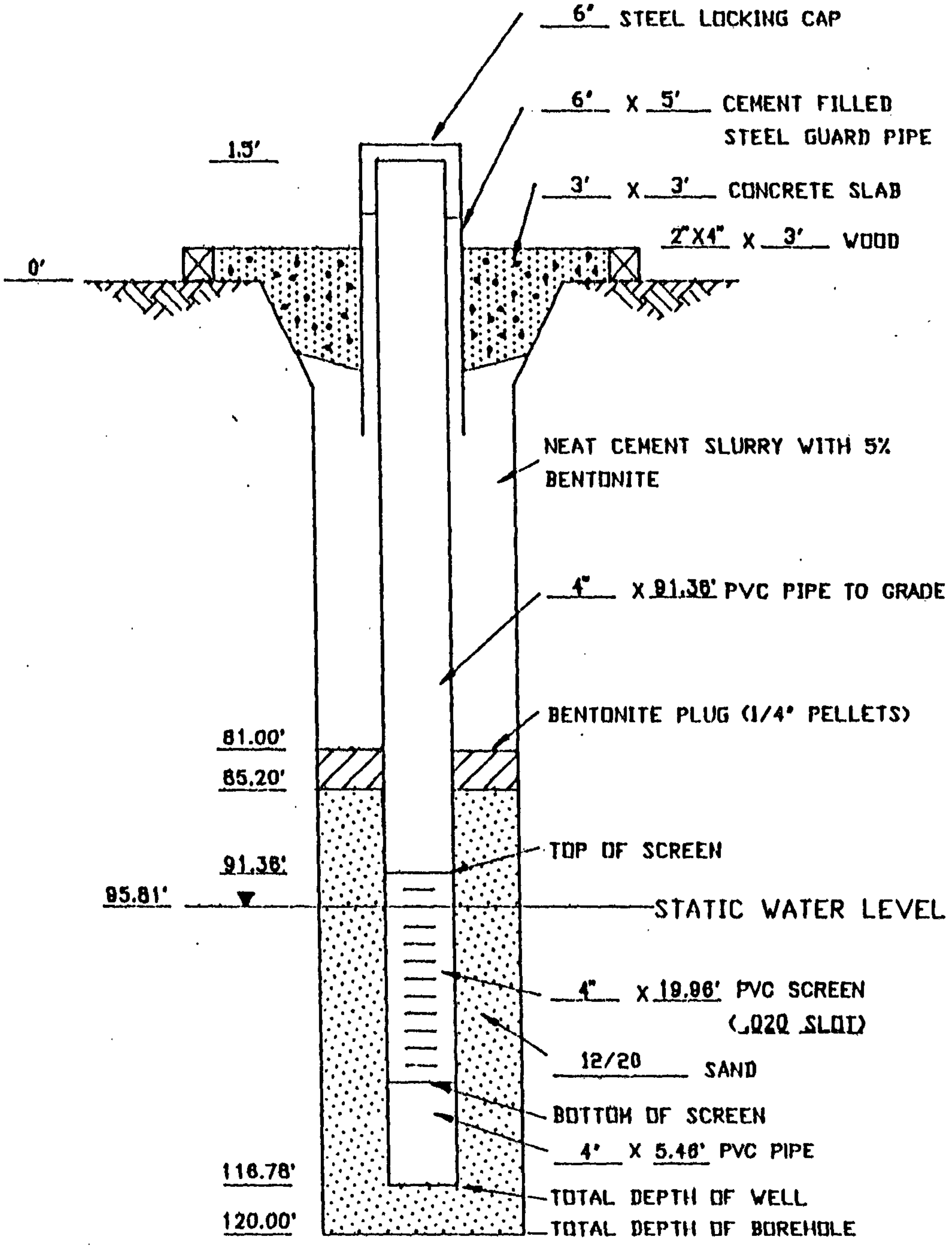
MONITOR WELL MW-9 COMPLETION DIAGRAM

PHILLIIPS LEE PLANT

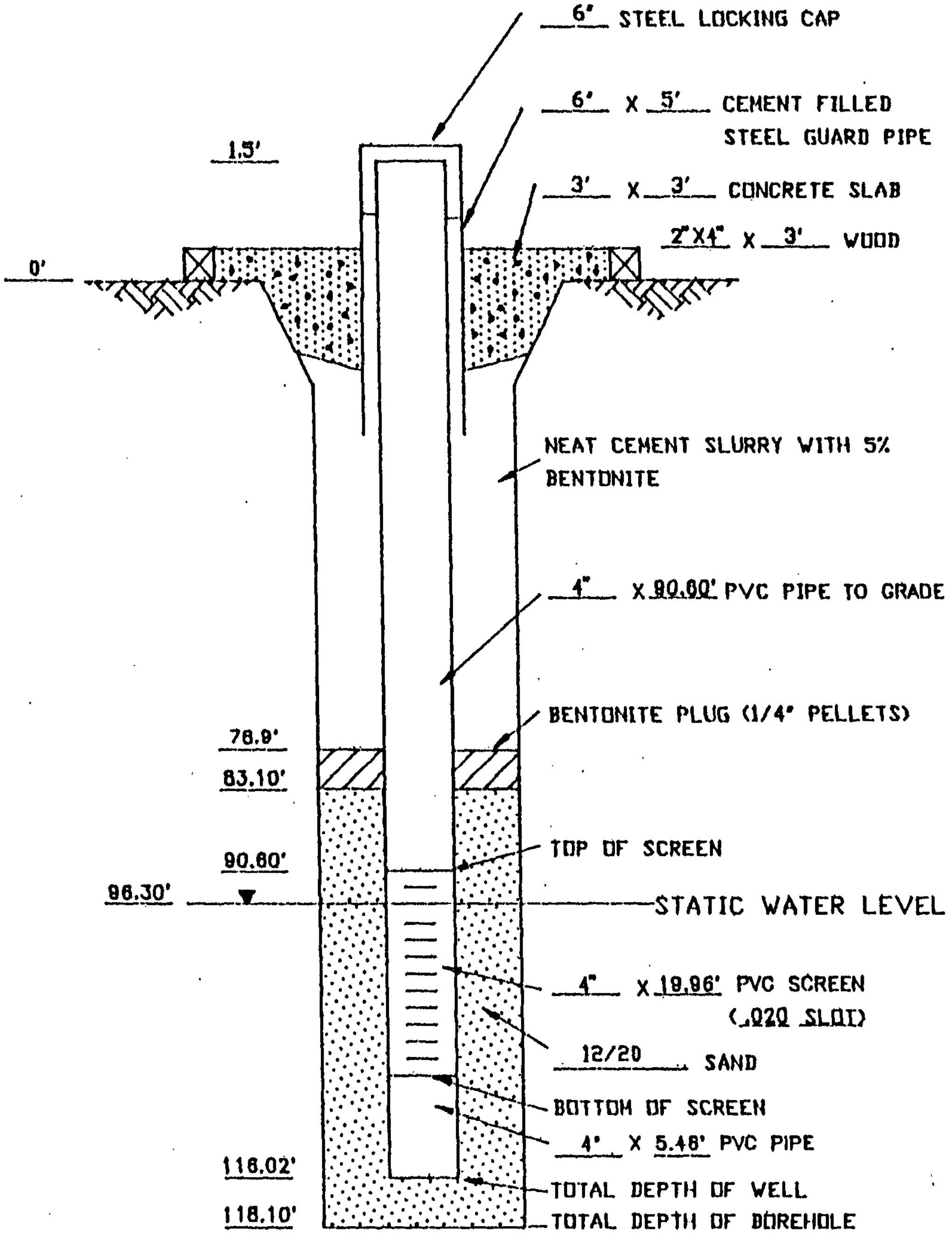


MONITOR WELL MW-10 COMPLETION DIAGRAM

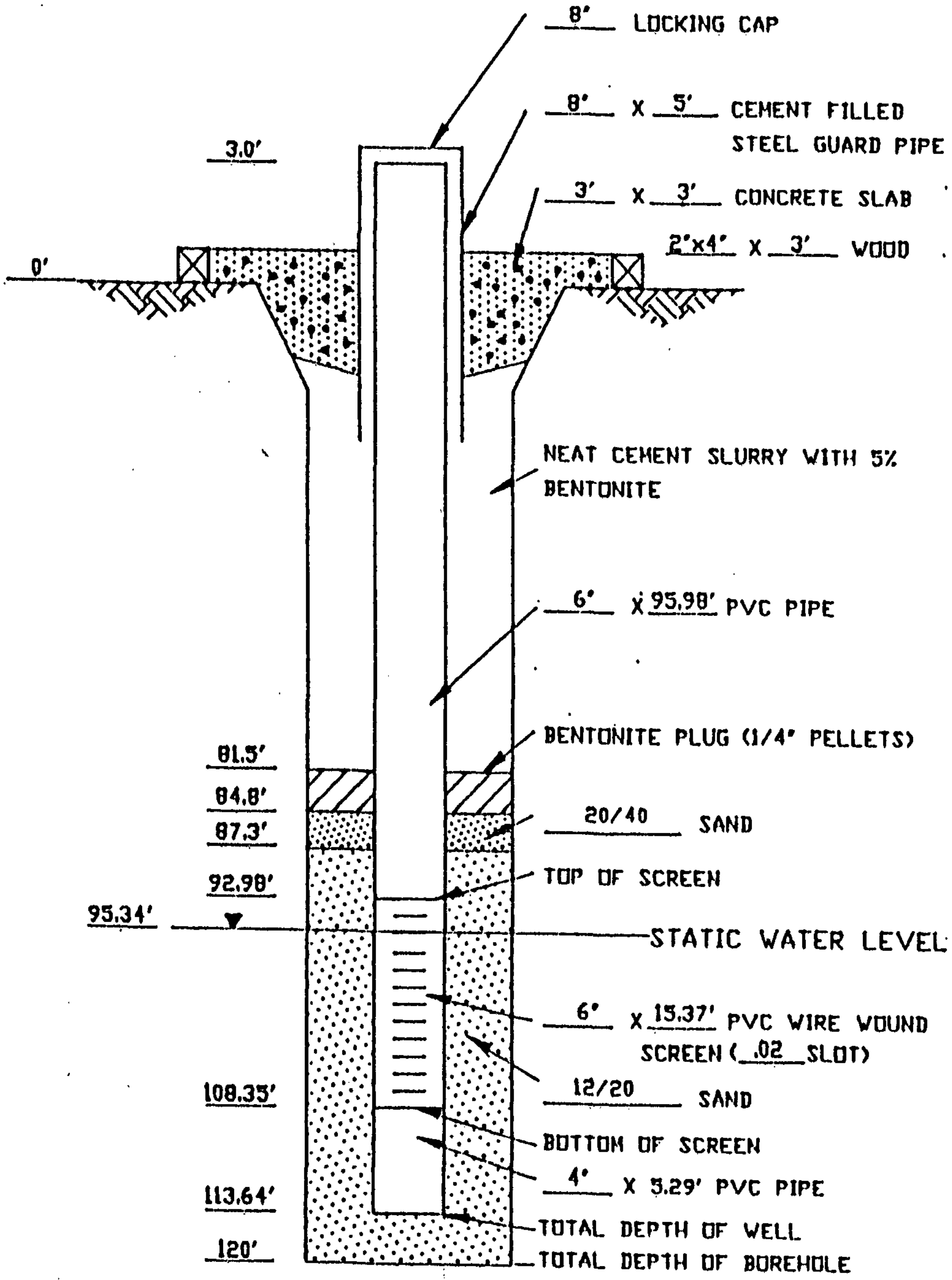
PHILLIIPS LEE PLANT



MONITOR WELL MW-11 COMPLETION DIAGRAM
PHILLIIPS LEE PLANT



MONITOR WELL MW-12 COMPLETION DIAGRAM
PHILLIIPS LEE PLANT



RECOVERY WELL RW-1
PHILLIIPS LEE PLANT

APPENDIX C

APPENDIX C

Laboratory Reports

GCL

Geoscience Consultants, Ltd.

☑ Albuquerque
500 Copper N.W.
Suite 200
Albuquerque, NM 87102
(505) 842-0001

☐ Silver Spring
1109 Spring St.
Suite 706
Silver Spring, MD 20910
(301) 587-2088

☐ Newport Beach
1400 Quail Street
Suite 140
Newport Beach, CA 92660
(714) 724-0536

☐ Las Cruces
P.O. Drawer MM
Las Cruces, NM 88004
(505) 524-5364

№ 3462

Chain of Custody

DATE 03/27/90 PAGE 1 OF

LAB NAME RADIAN ANALYTICAL
ADDRESS 10395 Old Placerville Rd.
SACRAMENTO, CA
95827
TELEPHONE
SAMPLERS (SIGNATURE) D—

ANALYSIS REQUEST

SAMPLE NUMBER	MATRIX	LOCATION	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418.1	TPH MODIFIED 8015		PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX METALS (8)	SDWA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE				NUMBER OF CONTAINERS
9003271300	H2O	MW5										X	X										
9003280950	H2O	MW3										X	X										
9003281130	H2O	MW2										X	X										
9003281215	H2O	MW1										X	X										

PROJECT INFORMATION
PROJECT: PHILLIPS
PROJECT DIRECTOR M. NEE
CHARGE CODE NO. 349-000
SHIPPING ID. NO. 6211869694
VIA: FED X

SAMPLE RECEIPT
TOTAL NO. OF CONTAINERS
CHAIN OF CUSTODY SEALS
REC'D GOOD CONDITION/COLD
CONFORMS TO RECORD
LAB NO. 50-03-244
50-03-245

SPECIAL INSTRUCTIONS/COMMENTS:
Rc'd @ 10C

RELINQUISHED BY 1.
D. Nee
(Signature) (Time) DAVID NEE 1500
(Printed Name) (Date) 03/28/90
GCL
(Company)

RELINQUISHED BY 2.
Timothy H. Kersh
(Signature) (Time) Tim Kersh 3-27-90
(Printed Name) (Date)
GCL
(Company)

RELINQUISHED BY 3.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY 1. 0840
Timothy H. Kersh
(Signature) (Time) Tim Kersh 3-29-90
(Printed Name) GCL (Date)
(Company)

RECEIVED BY 2.
~~R. Ristow~~
(Signature) (Time) ~~RISTOW 3/30~~
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY) 3.
Rhonda Ristow
(Signature) (Time) R. RISTOW 2:45
(Printed Name) RADIAN
(Company)

New Shipping ID# 6211869591

RECEIVED APR 2 0 1990

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GEOSCIENCE CONSULTANTS, LTD.

RADIAN
CORPORATION

Radian Work Order S0-03-244

Analytical Report
04/17/90

RECEIVED APR 2 0 1990

Geoscience Consultants,Ltd.

Geoscience Consultants, Ltd.
500 Copper N.W. Ste 200
Albuquerque, NM., 87102
(505) 842-0595
Sample Manager

Customer Work Identification Phillips
Purchase Order Number

Contents;

Radian Analytical Services
10395 Old Placerville Road
Sacramento, CA 95827

916-362-5332

Client Services Coordinator: LWKELLY

Certified by: Paul H Tale

Geoscience Consultants, Ltd.
Radian Work Order: S0-03-244

Method: TPH-Diesel by mod. SW8015 (1)
List: Complete analyte list

Sample ID:	9003271300	9003280950	9003281130	9003281215
Factor:	1	1	1	1
Results in:	ug/L	ug/L	ug/L	ug/L
	01A	02A	03A	04A
Matrix:	water	water	water	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Diesel (2)	ND	50	220 @	50	150 @	50	ND	50
Jet fuel (2)	ND	100	ND	100	ND	100	ND	100
Kerosene (2)	990	100	ND	100	ND	100	ND	100
Lubricating oil (2)	ND	100	ND	100	ND	100	ND	100

ND Not detected at specified detection limit @ Est. result less that 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) Extraction By SW3520 (continuous liquid/liquid) or SW3550 (sonication) followed by GC analysis with FID detectors.

Analytical Data Summary

Geoscience Consultants,Ltd.
Radian Work Order: S0-03-244

Method:TPH-Diesel by mod. SW8015 (1)
List:Complete analyte list

Sample ID:	REAGENT BLANK
Factor:	1
Results in:	ug/L
	05A
Matrix:	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Diesel (2)	ND	50						
Jet fuel (2)	ND	100						
Kerosene (2)	ND	100						
Lubricating oil (2)	ND	100						

ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

(2) Extraction By SW3520 (continuous liquid/liquid) or SW3550 (sonication) followed by GC analysis with FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-03-244

Method:TPH-Gasoline by mod.SW8015 (1)
List:Gasoline and BTEX list

Sample ID:	9003271300	9003280950	9003281130	9003281215
Factor:	5	1	1	1
Results in:	ug/L	ug/L	ug/L	ug/L
	01B	02B	03B	04B
Matrix:	water	water	water	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	ND	1.5	ND	0.30	1.8 C	0.30	2.4 C	0.30
Ethylbenzene (2)	98 C	1.5	ND	0.30	ND	0.30	ND	0.30
Gasoline (2)	13000	250	6500	50	5800	50	8500	50
Toluene (2)	ND	1.5	1.8 C	0.30	ND	0.30	0.38 C@	0.30
Xylenes (total) (2)	43 C	2.5	ND	0.50	ND	0.50	ND	0.50

ND Not detected at specified detection limit

C Confirmed on second column or by GC/MS

@ Est. result less that 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

(2) SW5030 (purge & trap) followed by GC analysis with PID/
FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-03-244

Method:TPH-Gasoline by mod.SW8015 (1)
List:Gasoline and BTEX list

Sample ID:	REAGENT BLANK	REAGENT BLANK
Factor:	1	1
Results in:	ug/L	ug/L
	05A	05B
Matrix:	water	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	ND	0.30	ND	0.30				
Ethylbenzene (2)	ND	0.30	ND	0.30				
Gasoline (2)	ND	50	ND	50				
Toluene (2)	ND	0.30	ND	0.30				
Xylenes (total) (2)	ND	0.50	ND	0.50				

ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) SW5030 (purge & trap) followed by GC analysis with PID/
FID detectors.

Sample History

Geoscience Consultants,Ltd.
Radian Work Order: S0-03-244

Sample Identifications and Dates

Sample ID	9003271300	9003280950	9003281130	9003281215	REAGENT BLANK
Date Sampled	03/27/90	03/27/90	03/27/90	03/27/90	
Date Received	03/30/90	03/30/90	03/30/90	03/30/90	03/30/90
Matrix	water	water	water	water	water
	01	02	03	04	05
TPH-Diesel by mod. SW8015					
Prepared	04/01/90	04/01/90	04/01/90	04/01/90	04/01/90
Analyzed	04/09/90	04/09/90	04/09/90	04/09/90	04/09/90
Analyst	JM	JM	JM	JM	JM
File ID	820040917	82004097	82004098	820040916	82004094
Blank ID	82004094	82004094	82004094	82004094	
Instrument	8	8	8	8	8
Report as	received	received	received	received	received
TPH-Gasoline by mod. SW8015					
Prepared					
Analyzed	04/02/90	04/01/90	04/01/90	04/01/90	04/01/90
Analyst	BSJ	BSJ	BSJ	BSJ	BSJ
File ID	—A20040213	A20040116	A20040117	A20040118	A2004011
Blank ID	A2004021	A2004011	A2004011	A2004011	
Instrument	A	A	A	A	A
Report as	received	received	received	received	received
TPH-Gasoline by mod SW8015					
Prepared					
Analyzed					04/02/90
Analyst					BSJ
File ID					A2004021
Blank ID					
Instrument					A
Report as					received

Appendix A

Comments, Notes and Definitions

@ ALL METHODS EXCEPT CLP

The results which are less than five times the method specified detection limit.

EXPLANATION

Uncertainty of the analysis will increase as the method detection limit is approached. These results should be considered approximate.

C ORGANIC CLP

pesticides require that single component results > 10ng/uL in the final extract be confirmed by GC/MS.

OTHER ORGANIC METHODS

This analysis has been confirmed on a second column or by GC/MS.

EXPLANATION

Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation.

ND ALL METHODS EXCEPT CLP

This flag is used to denote analytes which are not detected at or above the specified detection limit.

EXPLANATION

The value to the right of the < symbol is the method specified detection limit for the analyte.

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. The detection limits for EPA CLP (Contract Laboratory Program) methods are CRQLs (contract required quantitation limits) for organics and CRDLs (contract required detection limits) for inorganics. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), reporting units, use of cleanup procedures, or dilution of extracts/digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -	ug/L	micrograms per liter (parts per billion); liquids/water
	ug/kg	micrograms per kilogram (parts per billion); soils/solids
	ug/M3	micrograms per cubic meter; air samples
	mg/L	milligrams per liter (parts per million); liquids/water
	mg/kg	milligrams per kilogram (parts per million); soils/solids
	%	percent; usually used for percent recovery of QC standards
	US/cm	conductance unit; microSiemans/centimeter
	mL/hr	milliliters per hour; rate of settlement of matter in water
	NTU	turbidity unit; nephelometric turbidity unit
	CU	color unit; equal to 1 mg/L of chloroplatinate salt

Geoscience Consultants, Ltd.

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☐ Newport Beach
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(714) 724-0536

☐ Las Cruces
P.O. Drawer MM
Las Cruces, NM 88004
(505) 524-5364

№ 3460

Chain of Custody

DATE 04/06/90 PAGE 1 OF 1

LAB NAME Radian Analytical
ADDRESS 10395 Old Placerville
Sacramento
TELEPHONE
SAMPLERS (SIGNATURE) D N

ANALYSIS REQUEST

SAMPLE NUMBER	MATRIX	LOCATION	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418.1	TPH MODIFIED 8015		PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX METALS (8)	SDWA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE				NUMBER OF CONTAINERS
9004061130	H2O	MW 8										X	X										
9004061135	H2O												X										
TRIP BLANK	H2O												X										

PROJECT INFORMATION
PROJECT: AA PHILLIPS
PROJECT DIRECTOR M. Nee
CHARGE CODE NO. 439 000
SHIPPING ID. NO 6211869650
VIA: Fed X

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS	7
CHAIN OF CUSTODY SEALS	Yes
REC'D GOOD CONDITION/COLD	Yes
CONFORMS TO RECORD	Yes

LAB NO. 50-04-077, 78

SPECIAL INSTRUCTIONS/COMMENTS:
Rec'd @ 6 °C

RELINQUISHED BY 1.
D N
(Signature) (Time) 1200
DAVID NEE
(Printed Name) (Date) 04/06/90
GCL
(Company)

RELINQUISHED BY 2.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RELINQUISHED BY 3.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY 1.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY 2.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY) 3. 4/7/92
R. Ristow 4:35
(Signature) (Time)
R RISTOW
(Printed Name)
RADIAN
(Company)

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GEOSCIENCE CONSULTANTS, LTD. RECEIVED APR 2 7 1990

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Radian Work Order SO-04-077

RECEIVED APR 2 7 1990

Analytical Report
04/26/90

Geoscience Consultants,Ltd.

Geoscience Consultants, Ltd.
500 Copper N.W. Ste 200
Albuquerque, NM., 87102
(505) 842-0595
Sample Manager

Customer Work Identification TPH COC:3460
Purchase Order Number

Contents:

Radian Analytical Services
10395 Old Placerville Road
Sacramento, CA 95827

916-362-5332

Client Services Coordinator: LWKELLY

Certified by: Sharon K. Person

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-077

Method:TPH-Diesel by mod. SW8015 (1)
List:Complete analyte list

Sample ID:	9004061130		REAGENT BLANK			
Factor:	9.5		1			
Results in:	ug/L		ug/L			
	01A		04A			
Matrix:	water		water			
	Result	Det. Limit	Result	Det. Limit		
Diesel (2)	9500 G	480	ND	50		
Jet fuel (2)	ND	950	ND	100		
Kerosene (2)	ND	950	ND	100		
Lubricating oil (2)	ND	950	ND	100		

G Indicates an estimated GC value due to interferences. ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

(2) Extraction By SW3520 (continuous liquid/liquid) or SW3550 (sonication) followed by GC analysis with FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-077

Method:TPH-Gasoline by mod.SW8015 (1)
List:Gasoline and BTEX list

Sample ID:	9004061130		9004061135		TRIP BLANK		REAGENT BLANK	
Factor:	200		1		1		1	
Results in:	ug/L		ug/L		ug/L		ug/L	
	01B		02A		03A		04A	
Matrix:	water		water		water		water	
	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	18000 C	60	1.5 C	0.30	ND	0.30	ND	0.30
Ethylbenzene (2)	830 C	60	1.8 C	0.30	ND	0.30	ND	0.30
Gasoline (2)	1200000	10000	180 @	50	58 @	50	ND	50
Toluene (2)	7100 C	60	1.5 C	0.30	ND	0.30	ND	0.30
Xylenes (total) (2)	290 C@	100	3.8 C	0.50	ND	0.50	ND	0.50

C Confirmed on second column or by GC/MS
ND Not detected at specified detection limit
@ Est. result less that 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) SW5030 (purge & trap) followed by GC analysis with PID/FID detectors.

Geoscience Consultants, Ltd.
Radian Work Order: S0-04-077

Method: TPH-Gasoline by mod. SW8015 (1)
List: Gasoline and BTEX list

Sample ID:	REAGENT BLANK
Factor:	1
Results in:	ug/L
	04B
Matrix:	Water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	ND	0.30						
Ethylbenzene (2)	ND	0.30						
Gasoline (2)	ND	50						
Toluene (2)	ND	0.30						
Xylenes (total) (2)	ND	0.50						

ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) SW5030 (purge & trap) followed by GC analysis with PID/FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-077

Sample Identifications and Dates

Sample ID	9004061130	9004061135	TRIP BLANK	REAGENT BLANK		
Date Sampled	04/06/90	04/06/90	04/06/90			
Date Received	04/07/90	04/07/90	04/07/90	04/07/90		
Matrix	water	water	water	water		
	01	02	03	04		
TPH-Diesel by mod. SW8015						
Prepared	04/11/90			04/11/90		
Analyzed	04/19/90			04/19/90		
Analyst	JM			JM		
File ID	8-2-00419-50			8-2-00419-42		
Blank ID	8-2-00419-42					
Instrument	8			8		
Report as	received			received		
TPH-Gasoline by mod.SW8015						
Prepared						
Analyzed	04/11/90	04/09/90	04/09/90	04/09/90		
Analyst	BSJ	BSJ	BSJ	BSJ		
File ID	A-2-00411-10	A-2-00409-19	A-2-00409-20	A-2-00409-1		
Blank ID	A-2-00411-1	A-2-00409-1	A-2-00409-1			
Instrument	A	A	A	A		
Report as	received	received	received	received		
TPH-Gasoline by mod.SW8015						
Prepared						
Analyzed				04/11/90		
Analyst				BSJ		
File ID				A-2-00411-1		
Blank ID						
Instrument				A		
Report as				received		

RADIAN
CORPORATION

Appendix A

Comments, Notes and Definitions

General Comments

Sample #9004061130 contains an unidentified mid-boiling hydrocarbon. This was quantitated from a diesel standard and the result reported as an estimated value.

a ALL METHODS EXCEPT CLP
The results which are less than five times the method specified detection limit.
EXPLANATION
Uncertainty of the analysis will increase as the method detection limit is approached. These results should be considered approximate.

C ORGANIC CLP
pesticides require that single component results > 10ng/uL in the final extract be confirmed by GC/MS.
OTHER ORGANIC METHODS
This analysis has been confirmed on a second column or by GC/MS.
EXPLANATION
Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation.

G ALL ORGANIC GC METHODS EXCEPT CLP
Indicates an estimated GC value due to interferences.

ND ALL METHODS EXCEPT CLP
This flag is used to denote analytes which are not detected at or above the specified detection limit.
EXPLANATION
The value to the right of the < symbol is the method specified detection limit for the analyte.

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-077

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. The detection limits for EPA CLP (Contract Laboratory Program) methods are CRQLs (contract required quantitation limits) for organics and CRDLs (contract required detection limits) for inorganics. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), reporting units, use of cleanup procedures, or dilution of extracts/ digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -	ug/L	micrograms per liter (parts per billion);liquids/water
	ug/kg	micrograms per kilogram (parts per billion); soils/solids
	ug/M3	micrograms per cubic meter; air samples
	mg/L	milligrams per liter (parts per million);liquids/water
	mg/kg	milligrams per kilogram (parts per million);soils/solids
	%	percent; usually used for percent recovery of QC standards
	uS/cm	conductance unit; microSiemans/centimeter
	mL/hr	milliliters per hour; rate of settlement of matter in water
	NTU	turbidity unit; nephelometric turbidity unit
	CU	color unit; equal to 1 mg/L of chloroplatinate salt

Geoscience Consultants, Ltd.

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(505) 842-0001

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☐ Las Cruces
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Las Cruces, NM 88004
(505) 524-5364

3461

Chain of Custody

DATE 04/04/90 PAGE 1 OF 1

LAB NAME Radian Analytical
ADDRESS 10395 Old placerville Rd
Sacramento CA 95827
TELEPHONE
SAMPLERS (SIGNATURE)

ANALYSIS REQUEST

SAMPLE NUMBER	MATRIX	LOCATION	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418.1	TPH MODIFIED 8015		PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX METALS (8)	SDWA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE				NUMBER OF CONTAINERS
9004031400	H2O	MW6										X	X										
9004031600	H2O	MW7										X	X										
900404140	H2O	RW1										X	X										

PROJECT INFORMATION
PROJECT: PHILLIPS
PROJECT DIRECTOR M. NEE
CHARGE CODE NO. 349-000
SHIPPING ID NO. 8211869683
VIA: FED X

SAMPLE RECEIPT
TOTAL NO. OF CONTAINERS 9
CHAIN OF CUSTODY SEALS yes
REC'D GOOD CONDITION/COLD yes
CONFORMS TO RECORD yes
LAB NO. 90-04-075
90-04-076

SPECIAL INSTRUCTIONS/COMMENTS:
Rec'd @ 3°C

RELINQUISHED BY 1.
(Signature) (Time) DAVID NEE 1800
(Printed Name) (Date) GCL 04/04/90
(Company)

RECEIVED BY 1.
Timothy H Kersh 0845
(Signature) (Time) Tim Kersh 4-5-90
(Printed Name) GCL (Date)
(Company)

RELINQUISHED BY 2.
Tim Kersh
(Signature) (Time) Tim Kersh 4-5-90
(Printed Name) GCL (Date)
(Company)

RECEIVED BY 2.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RELINQUISHED BY 3.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY) 3.
R. Ristow 4/7
(Signature) (Time) R. RISTOW
(Printed Name) RADIAN
(Company)

GEOSCIENCE CONSULTANTS, LTD.

RECEIVED MAY 1 1990

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RADIAN
CORPORATION

Radian Work Order 50-04-075

RECEIVED MAY 1 1990

Analytical Report
04/30/90

Geoscience Consultants,Ltd.

Geoscience Consultants, Ltd.
500 Copper N.W. Ste 200
Albuquerque, NM., 87102
(505) 842-0595
Sample Manager

Customer Work Identification TPH COC:3461
Purchase Order Number

Contents:

Radian Analytical Services
10395 Old Placerville Road
Sacramento, CA 95827

916-362-5332

Client Services Coordinator: LWKELLY

Certified by:

RADIAN
CORPORATION

Analytical Data Summary

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-075

Method:TPH-Diesel by mod. SW8015 (1)
List:Complete analyte list

Sample ID:	9004031400	9004031600 ✓	900404140 ✓	REAGENT BLANK
Factor:	1	0.95	1	1
Results in:	ug/L	ug/L	ug/L	ug/L
	01A	02A	03A	04A
Matrix:	water	water	water	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Diesel (2)	5600 G	50	200 G@	48	240 G@	50	ND	50
Jet fuel (2)	ND	100	ND	95	ND	100	ND	100
Kerosene (2)	ND	100	ND	95	ND	100	ND	100
Lubricating oil (2)	ND	100	ND	95	ND	100	ND	100

G Indicates an estimated GC value due to interferences. ND Not detected at specified detection limit
@ Est. result less that 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) Extraction By SW3520 (continuous liquid/liquid) or
SW3550 (sonication) followed by GC analysis with FID
detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-075

Method:TPH-Gasoline by mod.SW8015 (1)
List:Gasoline and BTEX list

Sample ID:	9004031400	9004031600	900404140	REAGENT BLANK
Factor:	1	50	10	1
Results in:	ug/L	ug/L	ug/L	ug/L
	01B	02B	03B	04A
Matrix:	water	water	water	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	ND	0.30	6100 C	15	2600 C	3.0	ND	0.30
Ethylbenzene (2)	ND	0.30	360 C	15	320 C	3.0	ND	0.30
Gasoline (2)	1600 G	50	440000	2500	160000	500	ND	50
Toluene (2)	ND	0.30	3900 C	15	580 C	3.0	ND	0.30
Xylenes (total) (2)	ND	0.50	260 C	25	190 C	5.0	ND	0.50

ND Not detected at specified detection limit

C Confirmed on second column or by GC/MS

G Indicates an estimated GC value due to interferences.

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

(2) SW5030 (purge & trap) followed by GC analysis with PID/
FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-075

Method:TPH-Gasoline by mod.SW8015 (1)
List:Gasoline and BTEX list

Sample ID:	REAGENT BLANK
Factor:	1
Results in:	ug/L
	04B
Matrix:	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	ND	0.30						
Ethylbenzene (2)	ND	0.30						
Gasoline (2)	ND	50						
Toluene (2)	ND	0.30						
Xylenes (total) (2)	ND	0.50						

ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) SW5030 (purge & trap) followed by GC analysis with PID/
FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-075

Sample Identifications and Dates

Sample ID	9004031400	9004031600	900404140	REAGENT BLANK
Date Sampled	04/04/90	04/04/90	04/04/90	
Date Received	04/06/90	04/06/90	04/06/90	04/06/90
Matrix	water	water	water	water
	01	02	03	04

TPH-Diesel by mod. SW8015						
Prepared	04/11/90	04/11/90	04/11/90	04/11/90		
Analyzed	04/19/90	04/19/90	04/19/90	04/19/90		
Analyst	JM	JM	JM	JM		
File ID	820041947	820041948	820041949	820041942		
Blank ID	820041942	820041942	820041942			
Instrument	8	8	8	8		
Report as	received	received	received	received		
TPH-Gasoline by mod.SW8015						
Prepared						
Analyzed	04/08/90	04/09/90	04/09/90	04/08/90		
Analyst	BSJ	BSJ	BSJ	BSJ		
File ID	A20040814	A20040917	A20040816	A2004081		
Blank ID	A2004081	A2004091	A2004081			
Instrument	A	A	A	A		
Report as	received	received	received	received		
TPH-Gasoline by mod.SW8015						
Prepared						
Analyzed				04/09/90		
Analyst				BSJ		
File ID				A2004091		
Blank ID						
Instrument				A		
Report as				received		

Appendix A

Comments, Notes and Definitions

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-075

Diesel samples #9004031400,9004031600 and 900404140 contain unidentifed mid-boiling hydrocarbons. These were quanitated on a diesel standard and are reported as estimated values.

BTXE/Gas sample #90040031400 reported as estimate value because the profile did not match the gasoline standard.

Notes and Definitions

@ ALL METHODS EXCEPT CLP
The results which are less than five times the method specified detection limit.
EXPLANATION
Uncertainty of the analysis will increase as the method detection limit is approached. These results should be considered approximate.

C ORGANIC CLP
pesticides require that single component results > 10ng/uL in the final extract be confirmed by GC/MS.
OTHER ORGANIC METHODS
This analysis has been confirmed on a second column or by GC/MS.
EXPLANATION
Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation.

G ALL ORGANIC GC METHODS EXCEPT CLP
Indicates an estimated GC value due to interferences.

ND ALL METHODS EXCEPT CLP
This flag is used to denote analytes which are not detected at or above the specified detection limit.
EXPLANATION
The value to the right of the < symbol is the method specified detection limit for the analyte.

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. The detection limits for EPA CLP (Contract Laboratory Program) methods are CRQLs (contract required quantitation limits) for organics and CRDLs (contract required detection limits) for inorganics. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), reporting units, use of cleanup procedures, or dilution of extracts/digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -	ug/L	micrograms per liter (parts per billion);liquids/water
	ug/kg	micrograms per kilogram (parts per billion); soils/solids
	ug/M3	micrograms per cubic meter; air samples
	mg/L	milligrams per liter (parts per million);liquids/water
	mg/kg	milligrams per kilogram (parts per million);soils/solids
	%	percent; usually used for percent recovery of QC standards
	uS/cm	conductance unit; microSiemans/centimeter
	mL/hr	milliliters per hour; rate of settlement of matter in water
	NTU	turbidity unit; nephelometric turbidity unit
	CU	color unit; equal to 1 mg/L of chloroplatinate salt

RADIAN
CORPORATION

Radian Work Order 90-03-105

Analytical Report
03/16/90

Phillips Petroleum

Phillips Petroleum
4001 Penbrook
Odessa, TX 79762

Michael D. Ford

Customer Work Identification Lee Screen
Purchase Order Number

Contents:

Radian Analytical Services
8501 Mo-Pac Boulevard
P. O. Box 201088
Austin, TX 78720-1088

512/454-4797

Client Services Coordinator: LABENDELE

Certified by:

Phillips Petroleum
Radian Work Order: 90-03-105

Method:Volatile aromatics (1)
List:BTEX

Sample ID:	MW-1		MW-2		MW-3		WS-1	
Factor:	1		1		1		1	
Results in:	ug/L		ug/L		ug/L		ug/L	
	01A		02A		03A		04A	
Matrix:	water		water		water		water	
	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene	4.1	0.20	ND	0.20	69	0.20	15	0.20
Ethylbenzene	ND	0.20	ND	0.20	1.9	0.20	4.3	0.20
Toluene	0.26 *	0.20	ND	0.20	1.4	0.20	1.8	0.20
Total xylenes	ND	0.20	ND	0.20	1.1	0.20	4.1	0.20
Surrogate Recovery(%)								
1-Bromo-4-fluorobenzene	98		110		102		104	
Control Limits: 76 to 140								

ND Not detected at specified detection limit

* Est. result less than 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

Phillips Petroleum
Radian Work Order: 90-03-105

Method:Volatile aromatics (1)
List:BTEX

Sample ID:	WS-2		Trip Blank		Reagent Blank			
Factor:	1		1		1			
Results in:	ug/L		ug/L		ug/L			
	05A		06A		07A			
Matrix:	water		water		water			
	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene	7.1	0.20	ND	0.20	ND	0.20		
Ethylbenzene	ND	0.20	ND	0.20	ND	0.20		
Toluene	0.97 *	0.20	0.27 *	0.20	ND	0.20		
Total xylenes	ND	0.20	ND	0.20	ND	0.20		
Surrogate Recovery(%)								
1-Bromo-4-fluorobenzene	98		96		105			
Control Limits: 76 to 140								

ND Not detected at specified detection limit

* Est. result less than 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

RADIAN
CORPORATION

Sample History

Phillips Petroleum
Radian Work Order: 90-03-105

Sample Identifications and Dates

Sample ID	MW-1	MW-2	MW-3	WS-1	WS-2	Trip Blank
Date Sampled	03/07/90	03/07/90	03/07/90	03/07/90	03/07/90	
Date Received	03/09/90	03/09/90	03/09/90	03/09/90	03/09/90	03/09/90
Matrix	water	water	water	water	water	water
	01	02	03	04	05	06
Volatile aromatics						
Prepared						
Analyzed	03/15/90	03/12/90	03/15/90	03/15/90	03/15/90	03/15/90
Analyst	BM	BM	BM	BM	BM	BM
File ID	dd031517	dd03129	dd031516	dd031518	dd031515	dd031519
Blank ID						
Instrument	d	d	d	d	d	d
Report as	received	received	received	received	received	received

Phillips Petroleum
Radian Work Order: 90-03-105

Sample Identifications and Dates

Sample ID	Reagent Blank						
Date Sampled							
Date Received	03/09/90						
Matrix	water						
	07						
Volatile aromatics							
Prepared							
Analyzed	03/15/90						
Analyst	JB						
File ID	dd03155						
Blank ID							
Instrument	d						
Report as	received						

Appendix A

Comments, Notes and Definitions

General Comments

M-xylene and chlorobenzene coelute.

Notes and Definitions

Phillips Petroleum
Radian Work Order: 90-03-105

ND This flag (or <) is used to denote analytes which are not detected at or above the specified detection limit. The value to the right of the < symbol is the method specified detection limit for the sample.

* The asterisk(*) is used to flag results which are less than five times the method specified detection limit. Studies have shown that the uncertainty of the analysis will increase exponentially as the method detection limit is approached. These results should be considered approximate.

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), use of cleanup procedures, or dilution of extracts/digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -	ug/L	micrograms per liter (parts per billion);liquids/water
	ug/Kg	micrograms per kilogram (parts per billion); soils/solids
	ug/M3	micrograms per cubic meter; air samples
	mg/L	milligrams per liter (parts per million);liquids/water
	mg/Kg	milligrams per kilogram (parts per million);soils/solids
	%	percent; usually used for percent recovery of QC standards
	uS/cm	conductance unit; microSiemans/centimeter
	mL/hr	milliliters per hour; rate of settlement of matter in water
	NTU	turbidity unit; nephelometric turbidity unit
	CU	color unit; equal to 1 mg/L of chloroplatinate salt

Geoscience Consultants, Ltd.

☒ Albuquerque
500 Copper N.W.
Suite 200
Albuquerque, NM 87102
(505) 842-0001

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1109 Spring St.
Suite 706
Silver Spring, MD 20910
(301) 587-2088

☐ Newport Beach
1400 Quail Street
Suite 140
Newport Beach, CA 92660
(714) 724-0536

☐ Las Cruces
P.O. Drawer MM
Las Cruces, NM 88004
(505) 524-5364

6/13
Nº 3490

Chain of Custody

DATE 08/11/90 PAGE 1 OF 1

LAB NAME Radian Analytical
ADDRESS 10395 Old Placerville Rd.
Sacramento, CA 95827
TELEPHONE 916/362-5332

SAMPLERS (SIGNATURE) D. Nee

ANALYSIS REQUEST

SAMPLE NUMBER	MATRIX	LOCATION	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418.1	TPH MODIFIED 8015		PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX METALS (8)	SDWA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE				NUMBER OF CONTAINERS
9008100730	H2O	MW18											X										3
9008110900	H2O	Waterwell											X										3
9008111000	H2O	MW9											X										3
9008101430	H2O	MW11											X										3
9008101830	H2O	MW10											X										3

PROJECT INFORMATION
PROJECT: Phillips
PROJECT DIRECTOR: M. Nee
CHARGE CODE NO. 439-000
SHIPPING ID. NO. 7935 933526
VIA: Fed X

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS	15
CHAIN OF CUSTODY SEALS	yes
REC'D GOOD CONDITION/COLD	6C
CONFORMS TO RECORD	yes

LAB NO. 500'8113

SPECIAL INSTRUCTIONS/COMMENTS: Voa's Perserved HCL

RELINQUISHED BY 1.	RELINQUISHED BY 2.	RELINQUISHED BY 3.
D. Nee (Signature) 2000 (Time)	(Signature) (Time)	(Signature) (Time)
DAVID Nee (Printed Name) 08/11 (Date)	(Printed Name) (Date)	(Printed Name) (Date)
GCI (Company)	(Company)	(Company)

RECEIVED BY 1.	RECEIVED BY 2.	RECEIVED BY (LABORATORY) 3.
(Signature) (Time)	(Signature) (Time)	(Signature) 8/15/90 (Time)
(Printed Name) (Date)	(Printed Name) (Date)	CHRIS PAYNE (Printed Name)
(Company)	(Company)	RADIAN (Company)

RECEIVED SEP 1 1 1990

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CORPORATION

RECEIVED SEP 1 1 1990

Radian Work Order S0-08-113

Analytical Report
09/06/90

Geoscience Consultants,Ltd.

Geoscience Consultants, Ltd.
500 Copper N.W. Ste 200
Albuquerque, NM., 87102
(505) 842-0595
Sample Manager

Customer Work Identification Phillips / COC # 3490
Purchase Order Number 439-000

Contents:

Radian Analytical Services
10395 Old Placerville Road
Sacramento, CA 95827

916-362-5332

Client Services Coordinator: LWKELLY

Certified by: ______________

Geoscience Consultants,Ltd.
Radian Work Order: 50-08-113

Method:TPH-Diesel by mod. SW8015 (1)
List:Complete analyte list

Sample ID:	9008100730/MW-12		9008110900/WA-TERWELL		9008111000/MW9		9008101430/MW-11	
Factor:	1		1		1		1	
Results in:	ug/L		ug/L		ug/L		ug/L	
	01A		02A		03A		04A	
Matrix:	Water		Water		Water		Water	
	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Diesel (2)	180 G@	50	ND	50	230 G@	50	240 G@	50
Jet fuel (2)	ND	100	ND	100	ND	100	ND	100
Kerosene (2)	ND	100	ND	100	ND	100	ND	100
Lubricating oil (2)	ND	100	ND	100	ND	100	ND	100

G Indicates an estimated GC value due to interferences.
@ Est. result less that 5 times detection limit
ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) Extraction By SW3520 (continuous liquid/liquid) or SW3550 (sonication) followed by GC analysis with FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-08-113

Method:TPH-Diesel by mod. SW8015 (1)
List:Complete analyte list

Sample ID:	9008101830/MW-10	REAGENT BLANK
Factor:	1	1
Results in:	ug/L	ug/L
	05A	06A
Matrix:	water	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Diesel (2)	3000 G	50	ND	50				
Jet fuel (2)	ND	100	ND	100				
Kerosene (2)	ND	100	ND	100				
Lubricating oil (2)	ND	100	ND	100				

G indicates an estimated GC value due to interferences. ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

(2) Extraction By SW3520 (continuous liquid/liquid) or SW3550 (sonication) followed by GC analysis with FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: 50-08-113

Method:TPH-Gasoline by mod.SW8015 (1)
List:Gasoline and BTEX list

Sample ID:	9008100730/MW-12	9008110900/WA-TERWELL	9008111000/MW9	9008101430/MW-11
Factor:	1	1	1	1
Results in:	ug/L	ug/L	ug/L	ug/L
	01B	02B	03B	04B
Matrix:	water	water	water	water

	01B		02B		03B		04B	
	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	0.86 C@	0.30	9.7 C	0.30	6.0 C	0.30	1.0 C@	0.30
Ethylbenzene (2)	0.51 G@	0.30	1.3 C@	0.30	0.88 C@	0.30	1.6 C	0.30
Gasoline (2)	430	50	280	50	1000	50	450	50
Toluene (2)	0.81 C@	0.30	1.2 C@	0.30	1.2 C@	0.30	2.8 C	0.30
Xylenes (total) (2)	2.9 C	0.50	1.2 C@	0.50	1.7 C@	0.50	6.4 C	0.50

C Confirmed on second column or by GC/MS

@ Est. result less that 5 times detection limit

G Indicates an estimated GC value due to interferences.

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

(2) SW5030 (purge & trap) followed by GC analysis with PID/ FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-08-113

Method:TPH-Gasoline by mod.SW8015 (1)
List:Gasoline and BTEX list

Sample ID:	9008101830/MW-10	REAGENT BLANK
Factor:	1	1
Results in:	ug/L 05B	ug/L 06B
Matrix:	water	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	1300 CE	0.30	ND	0.30				
Ethylbenzene (2)	50 C	0.30	ND	0.30				
Gasoline (2)	19000	50	ND	50				
Toluene (2)	34 C	0.30	ND	0.30				
Xylenes (total) (2)	16 C	0.50	ND	0.50				

C Confirmed on second column or by GC/MS
E Inorg-est. due to interference/Org-exceeds calib. range
ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) SW5030 (purge & trap) followed by GC analysis with PID/FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-08-113

Sample Identifications and Dates

Sample ID	9008100730/MW-12	9008110900/WA-TERWELL	9008111000/MW9	9008101430/MW-11	9008101830/MW-10	REAGENT BLANK
Date Sampled	08/10/90	08/11/90	08/11/90	08/10/90	08/10/90	
Date Received	08/15/90	08/15/90	08/15/90	08/15/90	08/15/90	08/15/90
Matrix	water	water	water	water	water	water
	01	02	03	04	05	06
TPH-Diesel by mod. SW8015						
Prepared	08/16/90	08/16/90	08/16/90	08/16/90	08/16/90	08/16/90
Analyzed	08/23/90	08/24/90	08/24/90	08/24/90	08/24/90	08/23/90
Analyst	JH	JH	JH	JH	JH	JH
File ID	820082314	820082315	820082316	820082317	820082318	820082311
Blank ID	820082311	820082311	820082311	820082311	820082311	
Instrument	8	8	8	8	8	8
Report as	received	received	received	received	received	received
TPH-Gasoline by mod.SW8015						
Prepared						
Analyzed	08/24/90	08/24/90	08/24/90	08/24/90	08/24/90	08/24/90
Analyst	JH	JH	JH	JH	JH	JH
File ID	A20082410	A20082411	A20082412	A20082413	A20082414	A2008242
Blank ID	A2008242	A2008242	A2008242	A2008242	A2008242	
Instrument	A	A	A	A	A	A
Report as	received	received	received	received	received	received

Appendix A

Comments, Notes and Definitions

Ethylbenzene is reported as an estimated value in TPH-Gasoline sample 9008100730/MW12 due to differences between the primary and the confirmation analyses. The value obtained on our confirmation column was 1.9 ppb.

Diesel is reported as an estimated value in all of the samples except sample 9008110900/WATERWELL. The samples did not match our pattern for diesel.

a ALL METHODS EXCEPT CLP
The results which are less than five times the method specified detection limit.
EXPLANATION
Uncertainty of the analysis will increase as the method detection limit is approached. These results should be considered approximate.

C ORGANIC CLP
pesticides require that single component results > 10ng/uL in the final extract be confirmed by GC/MS.
OTHER ORGANIC METHODS
This analysis has been confirmed on a second column or by GC/MS.
EXPLANATION
Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation.

E INORGANIC METHODS INCLUDING CLP
Indicates an estimated value due to interferences.
ORGANIC METHODS INCLUDING CLP
This flag is applied to identify a GC/MS compound whose concentration exceeds the calibration range for that specific analysis.
ORGANIC EXPLANATION
Usually, if one or more compounds have a response greater than full scale, the sample or extract is diluted and re-analyzed.

G ALL ORGANIC GC METHODS EXCEPT CLP
Indicates an estimated GC value due to interferences.

ND ALL METHODS EXCEPT CLP
This flag is used to denote analytes which are not detected at or above the specified detection limit.
EXPLANATION
The value to the right of the < symbol is the method specified detection limit for the analyte.

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. The detection limits for EPA CLP (Contract Laboratory Program) methods are CRQLs (contract required quantitation limits) for organics and CRDLs (contract required detection limits) for inorganics. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), reporting units, use of cleanup procedures, or dilution of extracts/digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -	ug/L	micrograms per liter (parts per billion); liquids/water
	ug/kg	micrograms per kilogram (parts per billion); soils/solids
	ug/M3	micrograms per cubic meter; air samples
	mg/L	milligrams per liter (parts per million); liquids/water
	mg/kg	milligrams per kilogram (parts per million); soils/solids
	%	percent; usually used for percent recovery of QC standards
	uS/cm	conductance unit; microSiemans/centimeter
	mL/hr	milliliters per hour; rate of settlement of matter in water
	NTU	turbidity unit; nephelometric turbidity unit
	CU	color unit; equal to 1 mg/L of chloroplatinate salt

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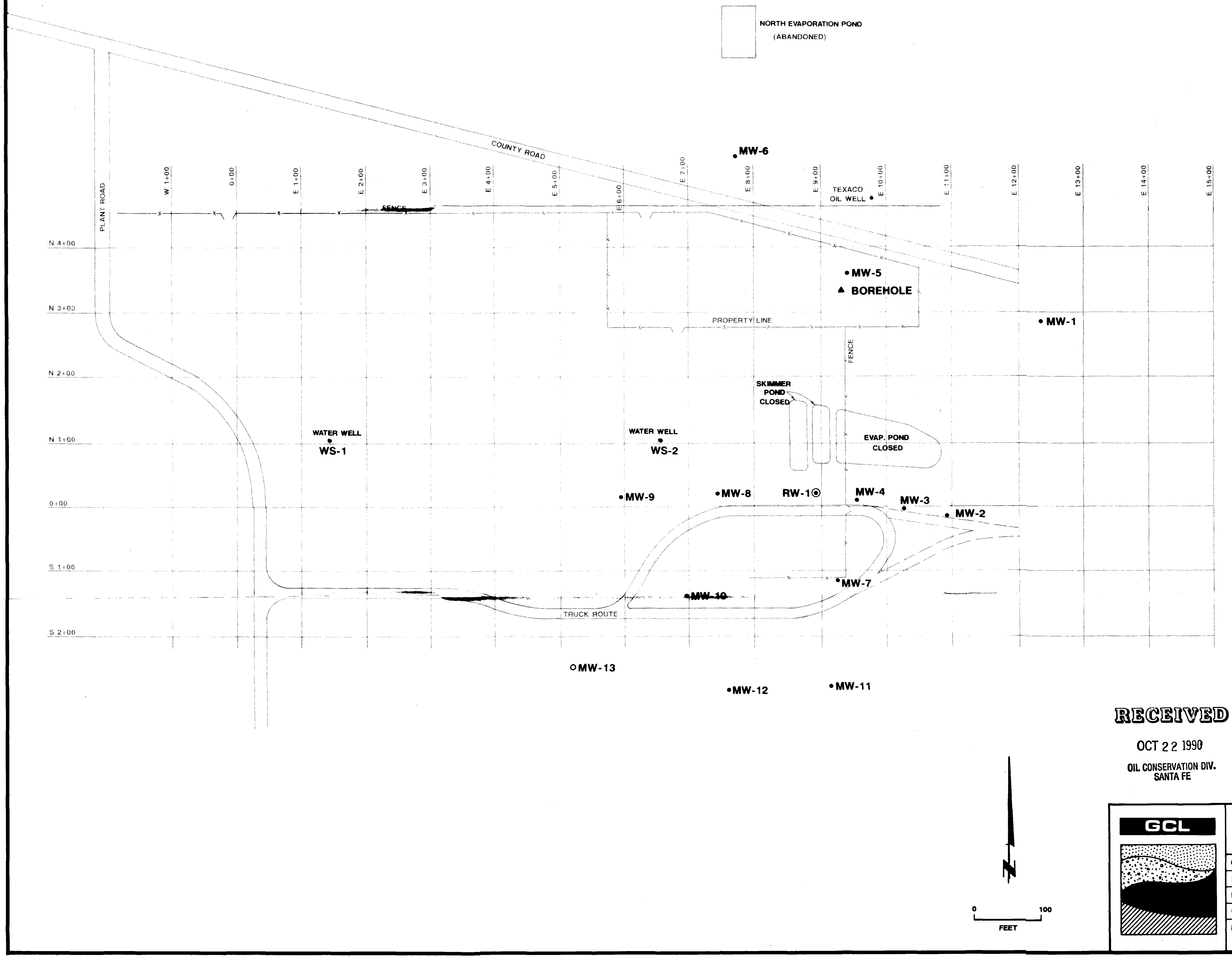

LEGEND

●	MONITOR WELL
◉	RECOVERY WELL
○	PROPOSED MONITOR WELL
▲	LOCATION OF ORIGINAL MW-1 BOREHOLE WHERE FLOATING PRODUCT WAS FOUND

RECEIVED
OCT 22 1990
OIL CONSERVATION DIV.
SANTA FE

GCL

PLATE 1
MONITOR WELL LOCATION MAP

CLIENT: PHILLIPS PETROLEUM COMPANY
DATE: OCT. 8, 1990
DRAWN BY: M. KOCON
CHECKED BY: M. NEE
DWG. NO. 439-000

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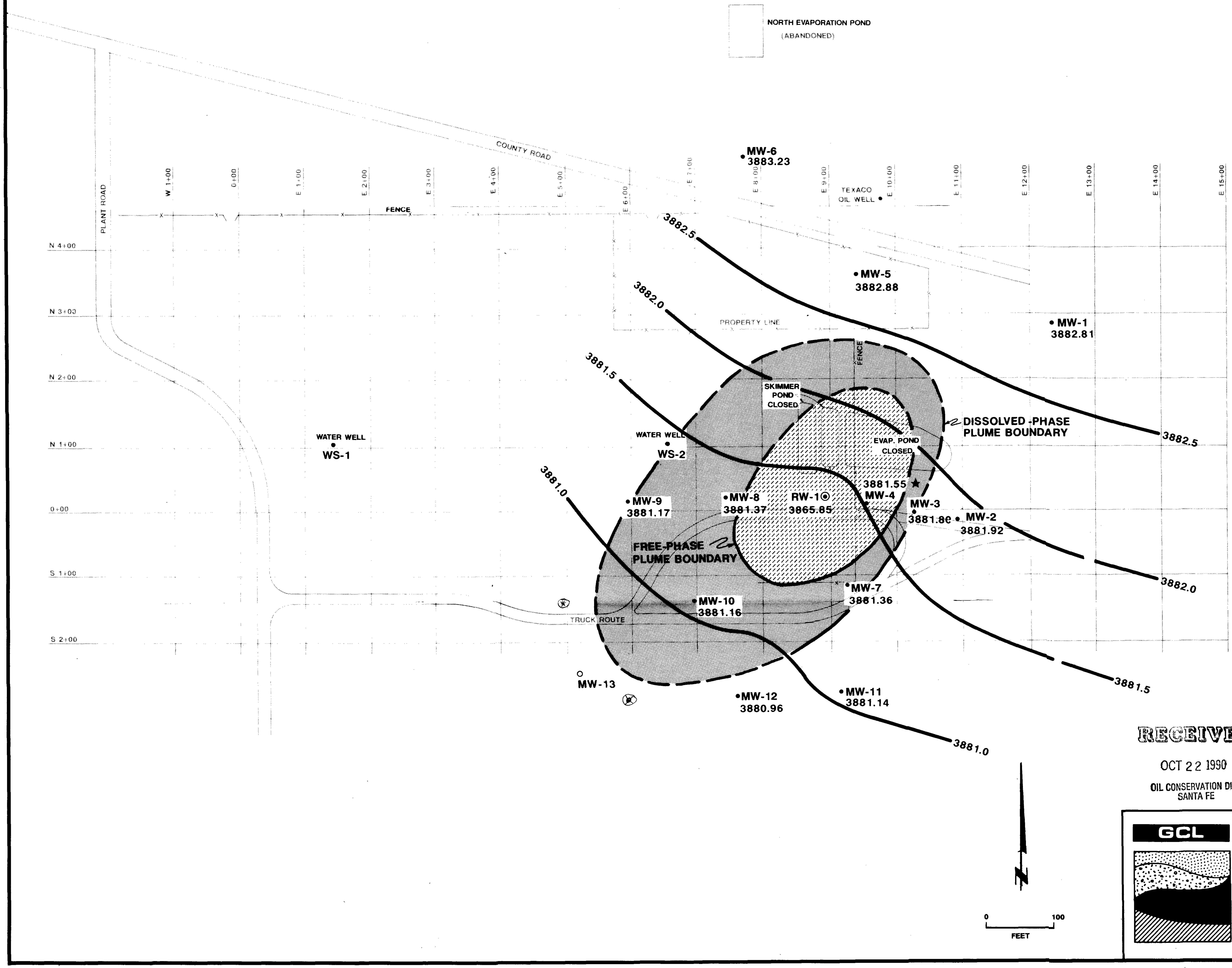

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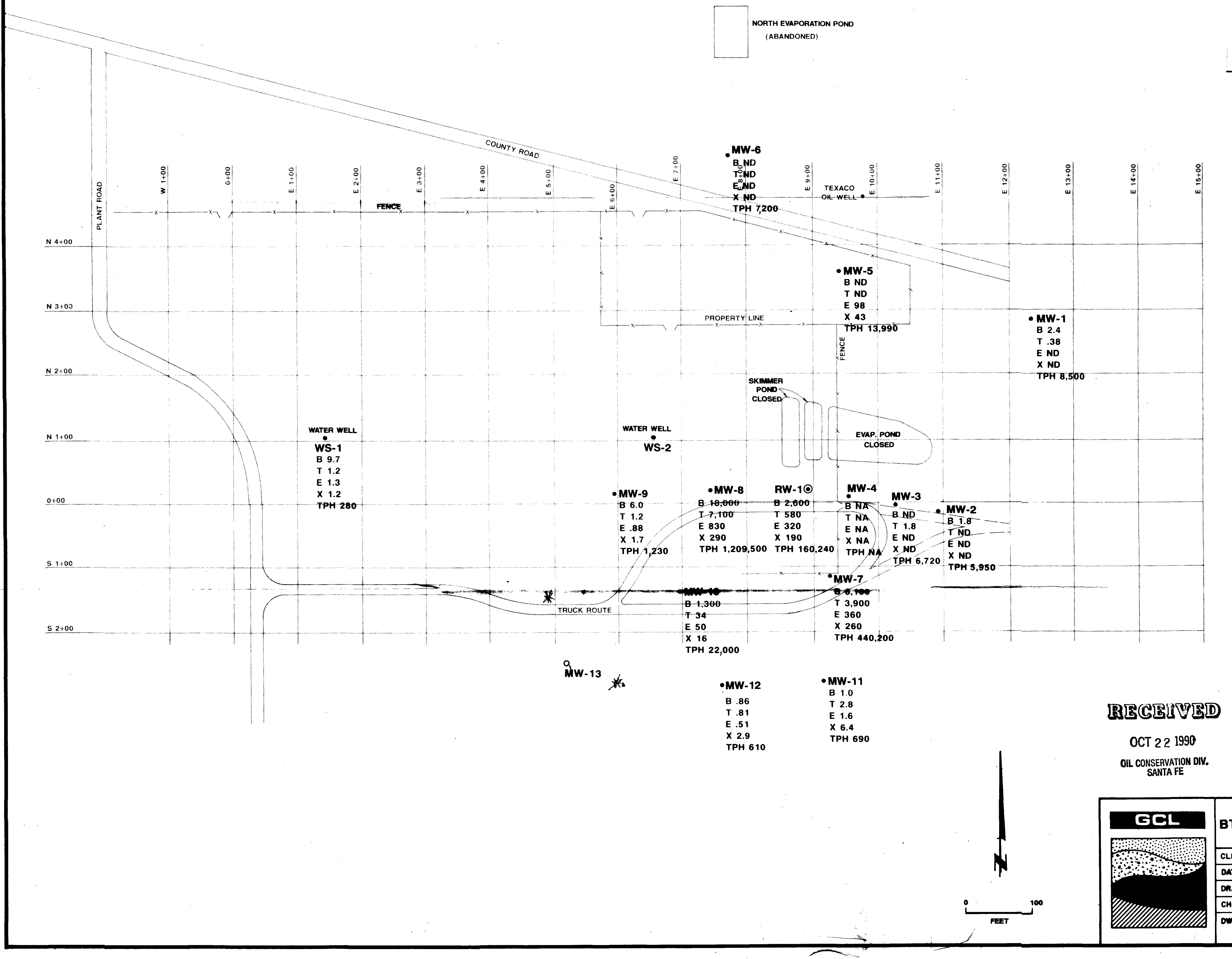
LEGEND

★	WATER SURFACE ELEVATION ADJUSTED FOR PRESENCE OF PRODUCT
3881.92	WATER SURFACE ELEVATION
●	MONITOR WELL
◉	RECOVERY WELL
○	PROPOSED MONITOR WELL
⁓	CONTOUR INTERVAL .5 FEET

GCL

PLATE 2
POTENTIOMETRIC WATER SURFACE MAP

CLIENT: PHILLIPS PETROLEUM COMPANY
DATE: OCT. 8, 1990
DRAWN BY: M. KOCON
CHECKED BY: M. NEE
DWG. NO. 439-000



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SANTA FE

LEGEND

NA	NOT AVAILABLE
ND	NO DETECTION
B	BENZENE
T	TOLUENE
E	ETHYLBENZENE
X	TOTALXYLENES
•	MONITOR WELL
◉	RECOVERY WELL
○	PROPOSED MONITOR WELL
TPH	TOTAL PETROLEUM HYDROCARBONS

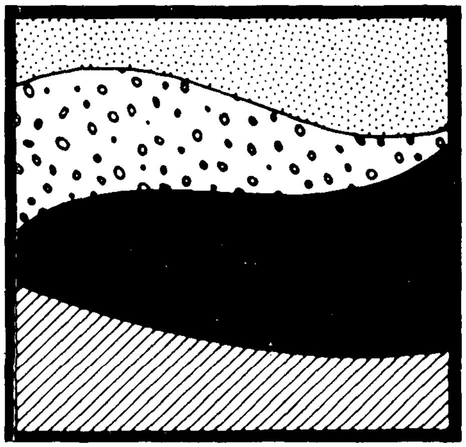
(ALL CONCENTRATIONS GIVEN IN MICROGRAMS PER LITER)

GCL

PLATE 3
BTEX AND TPH CONCENTRATION MAP
APRIL AND OCTOBER DATA

CLIENT: PHILLIPS PETROLEUM COMPANY
DATE: OCT. 8, 1990
DRAWN BY: M. KOCON
CHECKED BY: M. NEE
DWG. NO. 439-000

GCL



REPORT OF SUBSURFACE INVESTIGATION
PHILLIPS 66 NATURAL GAS COMPANY
LEE GAS PLANT

File copy

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MAY 30 1990

OIL CONSERVATION DIV.
SANTA FE

May 30, 1990

Prepared for:

Mr. Mike Ford
PHILLIPS PETROLEUM COMPANY
12 B2 Phillips Building
Bartlesville, Oklahoma

Prepared by:

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GCL

REPORT OF SUBSURFACE INVESTIGATION
PHILLIPS 66 NATURAL GAS COMPANY
LEE GAS PLANT

SUBMITTED BY: DATE:

GCL Project Director — May 29 1990

GCL Senior Advisory Committee — 5/29/90

Randall Hick

GCL Principal-In-Charge — May 29 1990

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SECTION 1.0

1.0 EXECUTIVE SUMMARY

In April 1990, Geoscience Consultants (GCL) continued a subsurface investigation for Phillips 66 Natural Gas Company (Phillips) at the Lee Gas Plant, Buckeye, New Mexico. The investigation, initially required by the New Mexico Environmental Improvement Division (NMEID), is now under the jurisdiction of the New Mexico Oil Conservation Division (NMOCD). Four monitor wells and one recovery well were installed at the site to define the limits of the plume of floating product and to begin recovery of the free-phase product. These wells modify an existing monitoring system that was installed in 1988.

Mud-rotary drilling techniques were used to install the four new monitor wells and one recovery well. The ground water from eight monitor wells (four 1988 and four 1990 monitor wells) and the recovery well was sampled and analyzed by Radian Analytical Services for total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene and xylenes (BTEX) using modified EPA method 8015.

All of the monitor wells and the recovery well were inspected for free-phase hydrocarbon one month following installation of the new wells. Free-phase hydrocarbon has accumulated above the ground water in monitor well MW-4 and total petroleum hydrocarbon constituents were found at all of the wells sampled. Water Quality Control Commission (WQCC) standards for benzene were exceeded at MW-7, MW-8 and RW-1, all of which are located near the leading edge of the plume. WQCC standards for ethylbenzene were exceeded at MW-8. WQCC standards for toluene were exceeded at MW-7 and MW-8.

The free-phase product plume at monitor well MW-4 extends less than 100-feet from monitor well MW-4 to the south, east and west and approximately 300-feet to the north. Phillips will initiate remediation of the free-phase hydrocarbon by pumping ground-water/product from the recovery well to the Lee Gas Plant waste-water treatment system.

Three additional monitor wells are recommended to further delineate the extent of the dissolved-phase hydrocarbon.

SECTION 2.0

2.0 INTRODUCTION

In April 1988, Phillips was issued a compliance Order/Schedule by the New Mexico Environmental Improvement Division (NMEID) to install and sample four ground-water monitor wells at the Lee Gas Plant in southeastern New Mexico. The monitor wells were installed in early 1988 using rotary drilling techniques (GCL, 1988a). The monitor wells modify a former ground-water monitoring system (pre-1988) that was previously installed around an abandoned waste-water evaporation pond. The four pre-1988 monitor wells were plugged with a cement/bentonite slurry and abandoned. The results of GCL's initial investigation indicated that both free-phase and dissolved-phase hydrocarbons occur in the saturated zone beneath the site.

In September 1988, a limited soil vapor survey was conducted to determine potential sources of the hydrocarbons identified in GCL's initial investigation. Two potential sources were identified: the former evaporation pond located east of the main plant, and the small, former evaporation pond located north of the main plant (GCL, 1988b).

Jurisdiction of the Phillip's Lee Plant was transferred from NMEID to the New Mexico Oil Conservation Division (OCD), and on February 16, 1990, GCL submitted a work plan to the OCD for further investigation and implementation of remediation of free-phase product at the Lee Gas Plant. In April 1990 GCL installed four monitor wells and one recovery well at the site to define the limits of the plume of floating product and to begin recovery of the free-phase product.

SECTION 3.0

3.0 TECHNICAL APPROACH

Four monitoring wells (MW-5, -6, -7, and -8) and one recovery well (RW-1) were installed at locations that were selected to delineate the maximum extent of hydrocarbons floating on the ground water and to recover the free-phase hydrocarbon (Plate 1). The first well, MW-5, was located near where floating hydrocarbon had been observed in an aborted borehole during the 1988 investigation. The purpose of this well was to locate the plume boundary at the northern (upgradient) side of Phillip's property. MW-6 was placed south (downgradient) of the north evaporation pond to delineate the plume to the northwest and to determine if the pond (now closed) was a potential source of the hydrocarbons. MW-7 was located directly south (downgradient) of MW-4 where free-phase hydrocarbon has recently been observed. MW-7 was installed to delineate the southern boundary of the plume at MW-4. The recovery well, RW-1, was sited downgradient of the former evaporation pond, approximately 60 feet due west of MW-4. The location of RW-1 is within, or near the leading edge of the free-phase plume. Monitor well MW-8 was located approximately 150 feet west of the recovery well. MW-8 was placed west of the recovery well and was intended to delineate the western (downgradient) extent of the product plume. All well locations are shown on Plate 1.

Rotary drilling techniques were employed for drilling the boreholes. All down-hole drilling equipment and the entire drill rig was decontaminated using on-site steam cleaning facilities. Samples of rotary drilling cuttings were collected at 5-foot intervals from each borehole and logged on standard GCL lithologic log forms. The Lithologic Logs are presented in Appendix A. Shallow pits were excavated and lined with plastic to collect the drilling fluid and cuttings that were circulated out of the boreholes during drilling operations. The boreholes were drilled to total depth using clean water as a drilling fluid. Then, guar gum (polymer) was introduced to the clean water and was circulated down-hole to hold back the fine-grained sand, keeping the borehole open during well installation. After the monitor wells were installed and developed, the water from the pits was pumped to the plant waste water treatment system facility; the remaining cuttings removed and the pits backfilled with the original excavated material.

Completion diagrams for monitor wells MW-5, -6, -7, -8 and RW-1 are included in Appendix B. All of the wells are constructed of a 5-foot blank PVC silt trap set beneath 15 feet of wire-wound PVC screen with schedule 40 PVC extending from the top of the screen to the ground surface. The well casing and screen were inserted through the open borehole, and 12/20 grade silica sand was placed in the borehole to approximately 3 to 5 feet above the top of screen. Following the installation of the 12/20 sand, approximately 100 gallons of water was bailed from each well to set the filter pack. Approximately 2 to 3 feet of 20/40 grade silica sand was then placed on top of the 12/20 sand to prohibit infiltration of bentonite from above. One 5 gallon bucket of 1/4-inch bentonite pellets was placed above the 20/40 sand to seal the borehole and to prevent fluids and/or grout from migrating downward from above and invading the filter pack. The borehole was then grouted to the surface by pumping a neat cement slurry containing 5% bentonite into the borehole annulus through a tremie pipe. A 5-foot long steel protective guard pipe was installed around the well casing and into the grout, and a 3 foot by 3 foot cement pad was constructed around the well head. The pad is sloped outward to direct rainfall away from the well head. The protective guard pipe has a locking cover and is impervious to rainfall. A brass survey cap was set in each pad to provide a reference location for each well.

The grout in each well was allowed to cure for 24 hours before implementing development activities. Monitor wells MW-5, -6, and -7 were developed using an air-lift pump. This stainless-steel pump does not permit the introduction of air into the well casing and is capable of pumping 1 gpm against 80 feet of head. Each well was periodically surged by moving the air-lift pump up and down in the well, forcing the ground water in and out of the filter pack, dislodging fine grained particles from the formation wall, and allowing them to be removed by pumping along with formational water. A dedicated submersible pump was installed at recovery well RW-1 and GCL's submersible pump was temporarily installed at monitor well MW-8 and used for development at these locations. Each well was developed until an equal volume or more of the drilling water lost to the aquifer during drilling was recovered and until the indicator parameters of pH, conductivity, and temperature had stabilized. The minimum amount of water developed from each well was approximately 2,500 gallons.

Ground-water samples were collected from all monitor wells as prescribed in the site sampling and analysis plan (GCL, 1988c). Immediately upon completion of development, the ground water from each well was sampled for total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene and xylene (BTEX) using modified EPA method 8015. Ground-water samples were also collected from each of the four RCRA monitor wells that were installed in 1988. The ground water from monitor wells MW-1, -2, -3, and -4 was also sampled for TPH and BTEX constituents using modified EPA method 8015. GCL's standard operating procedures for monitor well sampling were followed and the samples were maintained on ice and shipped to Radian Analytical Services in Sacramento, California, following strict chain of custody procedures.

Product thickness and depth to water measurements were made one month following installation of the monitor and recovery wells. The one month delay allowed for equilibration of the aquifer following drilling operations, which may have moved the free-phase hydrocarbon away from the wells.

SECTION 4.0

4.0 RESULTS

No free-phase hydrocarbon was observed in any of the new monitor wells during installation or immediately following development and sampling. A return visit to the site was conducted one month following the sampling event, allowing time for the aquifer to recover from well development, and allowing time for potential hydrocarbons that may have been moved during drilling operations to equilibrate. All of the monitor wells were checked for the presence of free-phase hydrocarbon on May 8, 1990. No product had accumulated in any of the monitor wells, except monitor well MW-4, where product had already been observed to occur. The free-phase hydrocarbon in monitor well MW-4 was measured and found to be 4.52 feet thick.

Analytical results for ground-water samples collected in April by GCL and analytical results for ground-water samples collected in March by Phillips are shown in Tables 3-1 and 3-2. The laboratory reports are included as Appendix C. Total petroleum hydrocarbon (TPH) constituents were found at all of the wells sampled by GCL. The ground water was not analyzed for TPH by Phillips during their March 1990 sampling.

The Water Quality Control Commission (WQCC) standard for benzene is 10 parts per billion (ppb). The concentration of benzene exceeded WQCC standards in ground-water samples collected in April at wells MW-7, MW-8 and RW-1; the concentrations found are 6,100 ppb, 18,000 ppb and 2,600 ppb, respectively. The concentration of benzene in ground-water samples collected in March exceeded the WQCC standard at monitor well MW-3 and water well WS-1; the concentrations are 69 ppb and 15 ppb, respectively. The WQCC standard for ethylbenzene is 750 parts per billion (ppb). The WQCC standard for ethylbenzene in ground water is exceeded at MW-8. The concentration of ethylbenzene found in the sample from MW-8 is 830 ppb. The WQCC standard for toluene is 620 ppb. The WQCC standard for toluene is exceeded at MW-7 and MW-8; the concentrations are 3,900 ppb and 7,100 ppb, respectively. The concentrations of BTEX and TPH constituents are shown on Figure 3-1.

SECTION 5.0

5.0 GEOLOGY

5.1 REGIONAL GEOLOGY

As reported in June 1988 in GCL's "Report On The Installation Of A Ground Water Monitoring System at Phillips 66 Natural Gas Company, Lee Plant," the Lee Gas Plant is located in southern Lea County, New Mexico, in the Llano Estacado (Staked Plains) which is part of the High Plains section of the Great Plains physiographic province (Fenneman, 1931). Shallow depressions and small sand dunes are the only significant topographic features in the otherwise flat, treeless plain. The depositional surface of the Llano Estacado exhibits low relief, sloping uniformly to the southeast at a topographic gradient of about .003. Total relief in Lea County is about 1,300 feet with an altitude ranging from 2,900 to 4,200 feet above sea level (Nicholson and Clebsch, 1961). Drainage patterns are poorly defined.

Rock exposures in the area are poor and range in age from Triassic to Quaternary. The region is covered by Quaternary-Age eolian deposits ranging in thickness from 1 to 5 feet. Beneath these windblown deposits, a layer of dense, well developed caliche forms a cap over the Ogallala Formation. The caliche, which decreases in induration with depth (Nicholson and Clebsch, 1961), can range from several feet to up to 60 feet in thickness.

The Tertiary Ogallala Formation underlies the Llano Estacado in southeast New Mexico. It is composed of terrestrial sediments that unconformably overlay the Triassic section. Outcrops of the Ogallala occur along the face of Mescalero Ridge to the south of the Lee Gas Plant. The Ogallala ranges in thickness from several inches to up to 300 feet and is composed primarily of unconsolidated, calcareous sand, clay, silt and gravel.

Jurassic-Age rocks have not been observed in the area, and rocks of the Cretaceous Age have been almost completely removed by erosion (Nicholson and Clebsch, 1961). Rocks of the Triassic Dockum Group are the oldest rocks that crop out in the region. The Dockum Group may be divided into the Chinle Formation and the Santa Rosa Sandstone.

Southeastern New Mexico and west Texas are underlain by large subsurface structural basins with highly complex geology. Southern Lea County includes parts of the Delaware Basin and the Central Basin Platform. The northwestern edge of the Delaware Basin is coincident with the position of the reef-edge as it existed throughout Permian time. The Artesia-Vacuum arch reflects this ancient reef trend; the Lee Gas Plant site is located at the eastern limit of this trend. Triassic rocks in the area exhibit a regional dip of less than one degree to the southeast (Nicholson and Clebsch, 1961). Variations in this regional trend occur in the collapse structures and unconformities, which are common to the area.

5.2 SITE GEOLOGY

Lithologic logs (Appendix A) for the installation of monitor wells MW-5, -6, -7, -8 and RW-1 are consistent with the previous lithologic logs prepared by GCL in April 1988. Two primary lithologic sequences were encountered at the Phillip's Lee Gas Plant: an upper, caliche-cemented fine-grained silty sand and sandy silt and an underlying coarser sand. A "topsoil", probably backfill material used during facility construction or modification, was also found during drilling (GCL, 1988a).

Surficial lithologies at the Lee Gas Plant are both natural and anthropogenic. Aeolian sheet sands consisting of poorly-sorted fine sand are present and are typically less than 5 feet thick (GCL, 1988a). Backfill material consisting of poorly sorted fine sand to fine pebble-sized sediment was present at most monitor well locations.

Beneath the thin surficial deposits, sediments characterized by highly variable clast size and poor sorting are present. Although the dominant sediment consists of fine-grained, poorly sorted sand, clay-, silt-, and gravel-rich sands are present that have very limited lateral continuity. Caliche in this sedimentary sequence ranges from highly developed stage IV in the upper horizon to stage I at approximately 20 to 35 feet below the ground surface. Consolidation of the sediments in this sequence was related to the presence and degree of development of interstitial caliche and, to a lesser degree, the presence of interstitial clay. With few local exceptions, the degree of consolidation decreased with depth (GCL, 1988a).

The lower coarser grained sand unit in which each of the monitor wells at the Lee Plant was completed comprised the second primary lithology. The coarser sand lacked notable silt and clay particle fractions. The contact between the two lithologies was sharp and occurred at a depth of 35-65 feet. The yellowish-brown to brown color, higher percentage of medium-grained sand, and the relative vertical homogeneity distinguished coarser-grained sand from the overlying sediments (GCL, 1988a). Hunt (1977) and Nicholson and Clebsch (1961) identified the outcrop in the Lee Gas Plant area as Tertiary Ogallala Formation. The description of the outcrop provided by Hunt (1977) correlates particularly well with observations recorded by GCL personnel during the investigation.

SECTION 6.0

6.0 HYDROGEOLOGY

6.1 REGIONAL HYDROGEOLOGY

As reported in June 1988 in GCL's "Report On The Installation Of A Ground Water Monitoring System at Phillips 66 Natural Gas Company, Lee Plant", recharge in the region occurs primarily as a result of infiltration of water from short drainages and temporary lakes that form as a result of heavy rainfall events (Nicholson and Clebsch, 1961). Discharge takes place principally in the form of evapo-transpiration and pumping from wells; very small volumes of ground water discharge at springs (GCL, 1988a).

Potable water supplies in the region are derived primarily from aquifers hosted by Quaternary alluvium and the Tertiary Ogallala Formation. Ground water occurring in Triassic sediments is potable, but has a poorer quality and is hosted on lithologic units that produce lower well yields than younger formations in the area. The Ogallala Formation mantles the High Plains in the Lee Gas Plant area and has a saturated thickness ranging from 25 to 175 feet (Nicholson and Clebsch, 1961). Ground water in these shallow aquifers generally flows to the southeast at a low hydraulic gradient (GCL, 1988a).

6.2 SITE HYDROGEOLOGY

Shallow ground water at the Lee Gas Plant is unconfined. The ground water beneath the site is found in unconsolidated, silty to fine-grained sand, which typically exhibits hydraulic conductivities of .001 to 100 gallons per day per square foot (GCL, 1988a). During development of the monitor wells, low well yields were observed. Monitor wells may yield a sustainable pumping rate of up to 2 gallons per minute. This pumping rate is consistent for the fine-grained sediments that occur beneath the site. During the development of RW-1 a sustained flow rate of 3 gallons per minute was achieved.

The potentiometric surface at the Lee Gas Plant is shown on Plate 2. Ground water flows to the southwest in a direction of approximately 30 degrees west of due south. The direction of ground-water flow based on calculations from April, 1990 water level elevations correlates very well with the flow direction calculated in 1988. The well casing elevations, depth to ground water, and water surface elevations are shown in Table 6-1.

SECTION 7.0

7.0 CONCLUSIONS

The lateral extent of free-phase hydrocarbons that are floating on ground water beneath the site has been identified in the area below and around the evaporation pond (Figure 7-1). At the present time, the only monitor well in which the free-phase product has been found is MW-4. However, in 1988, the original, aborted borehole for MW-1 contained observable free-phase product. This aborted borehole was located approximately 15 to 20 feet south-southeast of MW-5. The plume boundaries were determined by product thickness measurements taken approximately 4 weeks after the wells were installed. The measurements were not taken immediately after drilling was complete because it was believed that drilling fluid losses may have forced floating product away from the immediate vicinity of the borehole. Although it is believed that there is potential for product to accumulate in other downgradient wells after they have fully equilibrated, it is probable that only RW-1, which is located directly downgradient from the free-phase plume, will contain free-phase hydrocarbons. Floating product was not observed in monitor well MW-6, which is located north of the plant and directly south (down-gradient) from the north evaporation pond.

The results of the ground-water sampling program indicate that dissolved-phase hydrocarbons form a halo around the free-phase plume. Dissolved hydrocarbons were identified in all of the monitor wells at the site. However, hydrocarbon concentrations that exceeded WQCC action levels were restricted to monitor wells MW-7 and MW-8 and recovery well RW-1, which are all directly downgradient from the free-phase plume. MW-4 was not sampled because the presence of floating product ensured that dissolved hydrocarbons would be present in the ground water at that location in high concentrations.

The Lee Gas Plant is located in a producing oil field where improperly operating oil wells and/or improper oil field practices can result in extensive ground-water contamination. Dissolved phase TPH may be present in the ground water throughout the area where the Lee Gas Plant is located.

Further work will be required to identify the complete lateral extent of dissolved-phase hydrocarbons in ground water below the site. There are two areas of concern. The area south and west of the free-phase plume needs further investigation to define the limits of dissolved hydrocarbons. In addition, the area southwest of MW-6 and the north evaporation pond may need further investigation if dissolved hydrocarbons are found above regulatory action levels to the west of the evaporation pond and under the main plant facilities.

SECTION 8.0

8.0 RECOMMENDATIONS

The following actions are recommended to complete the next phase of the investigation and initiate the remediation of ground water beneath Phillip's Lee Gas Plant:

- Submit draft supplement for the existing site discharge plan.
- Begin recovering free-floating product as soon as final approval is received for the recovery system.
- Conduct an additional investigation to identify the lateral extent of dissolved-phase hydrocarbons in ground water, in the area southwest (downgradient) from the plume of floating product.

A supplement to Discharge Plan GW-2 for Phillips Lee Gas Plant has been drafted for NMOCD review. The draft supplement will be submitted along with this report.

Phillips will pump approximately 3 gallons per minute of water/product from recovery well RW-1 into the plant waste water treatment system. The water/product recovered from RW-1 will be pumped to the oil/water separator. Following separation the oil will be piped to the slop oil tank and the water will be piped to the waste water tanks. The recovery system operation should be started immediately.

Three additional monitor wells should be installed and the ground water sampled to determine the extent of the dissolved-phase plume. The following locations are recommended:

- One monitor well should be installed at location P9, shown on Plate 1, to the west of monitor well MW-8. This location will determine the extent of westward lateral migration of the dissolved phase plume.
- Monitor wells should be installed downgradient of monitor wells MW-8 and MW-7, locations P10 and P11 (Plate 1). The purpose of these wells is to identify downgradient extent of the dissolved-phase plume to the southwest and south of the known hydrocarbon plume. The well at location P10 may be installed as a 6-inch recovery well.

If substantial hydrocarbons are found in the ground-water at locations P9, P10 and P11, additional monitor wells may be required. If the ground-water at locations P9, P10 and P11 are hydrocarbon free, they will be proposed as the three downgradient monitoring compliance points.

In addition, water supply well WS-1 should be re-sampled to verify the presence of hydrocarbons that were found as a result of a previous sampling event.

SECTION 9.0

9.0 REFERENCES

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Hunt, C.B., 1977, Surficial Geology of Southeast New Mexico, Geologic map 41, N.M. Bureau of Mines and Mineral Resources.

Nicholson, A., and Clebsch, A., 1961. "Geology and Ground-Water Conditions in Southern Lea County, New Mexico", Ground-Water Report 6, New Mexico Institute of Mining & Technology, State Bureau of Mines and Mineral Resources, Socorro, New Mexico.

FIGURES

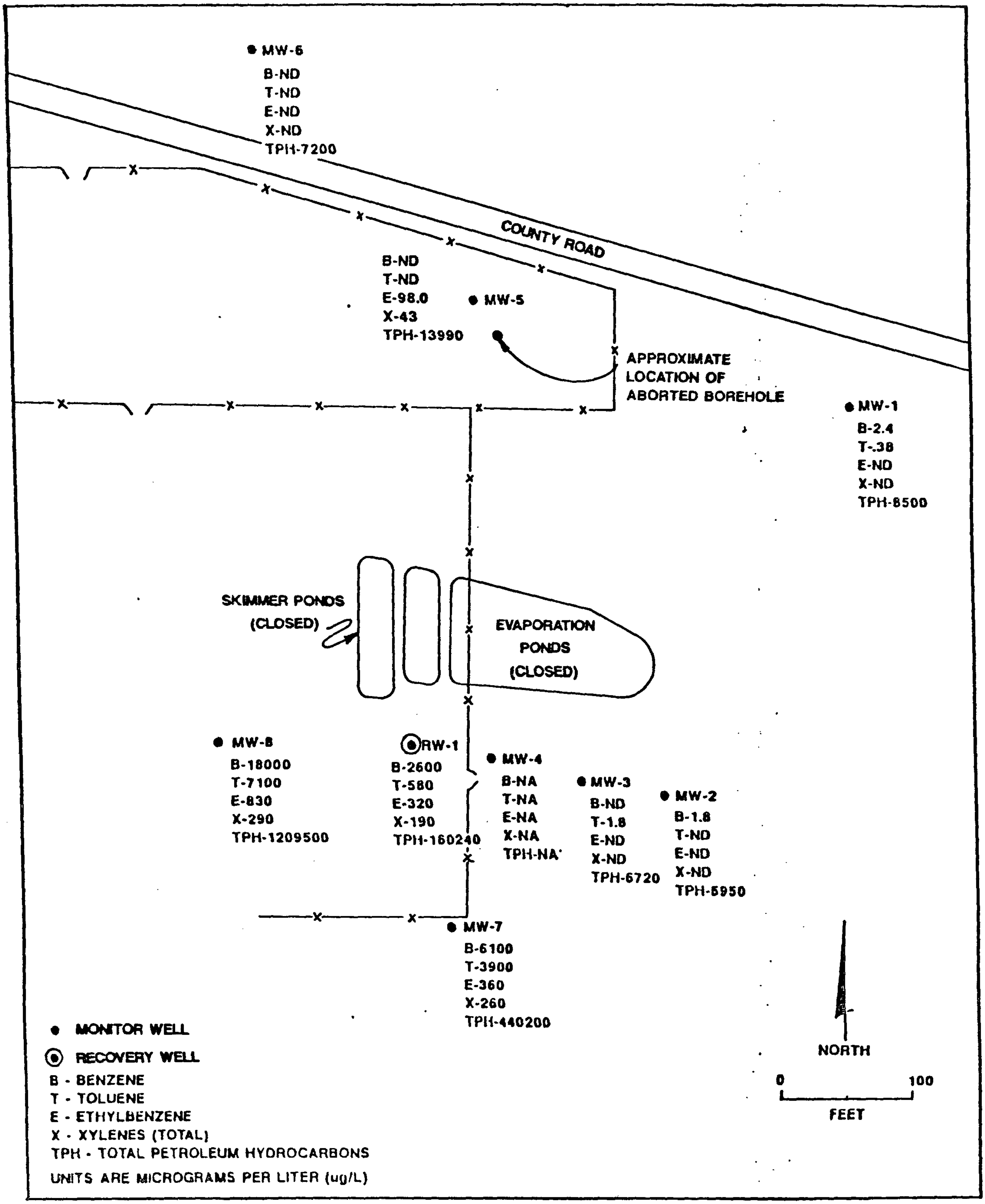


FIGURE 3-1

RELATIVE WELL POSITIONS AND CORRESPONDING BTEX AND TPH CONCENTRATIONS IN GROUNDWATER SAMPLES COLLECTED APRIL 1990

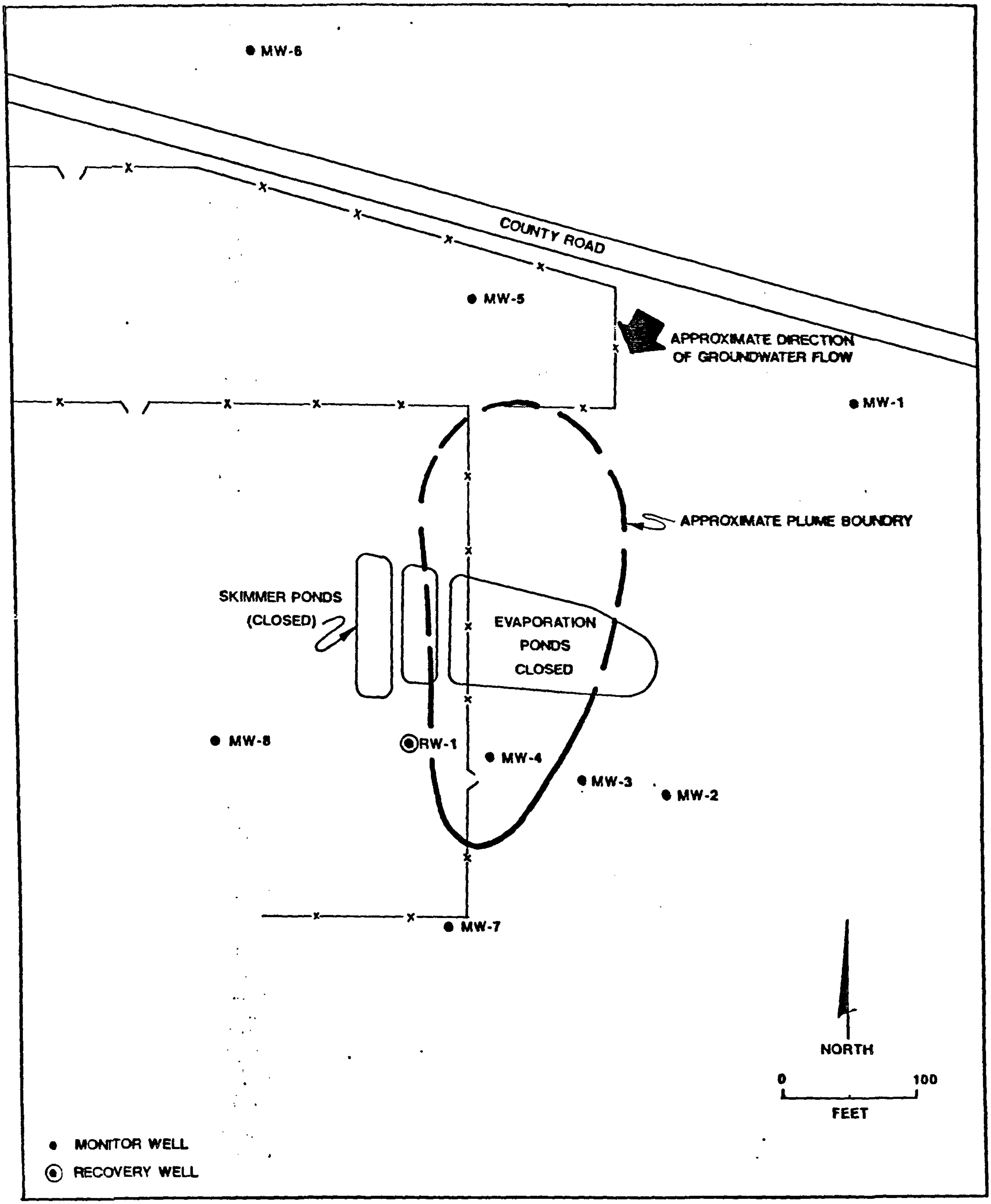


FIGURE 7-1
APPROXIMATE BOUNDARY OF FREE-PHASE HYDROCARBON
ON GROUNDWATER SURFACE

TABLES

TABLE 3-1
ANALYTICAL RESULTS FROM APRIL 1990

	ANALYTE	MW-1	MW-2	MW-3	MW-4	MW-5
	BENZENE	2.4	1.8	ND	NA	ND
	ETHYLBENZENE	ND	ND	ND	NA	98.0
	TOLUENE	.38	ND	1.8	NA	ND
	TOTAL XYLENES	ND	ND	ND	NA	43
*	TPH GASOLINE	8500	5800	6500	NA	13000
	TPH DIESEL	ND	150	220	NA	ND
	TPH JET FUEL	ND	ND	ND	NA	ND
	TPH KEROSENE	ND	ND	ND	NA	990
	TPH LUBE OIL	ND	ND	ND	NA	ND

UNITS FOR ANALYSIS ARE MICROGRAMS PER LITER (ug/L)

ND - NOT DETECTED

TPH - TOTAL PETROLEUM HYDROCARBONS

* - TPH GASOLINE - QUANTITATES AGGREGATE HYDROCARBONS WITH BOILING POINTS BELOW APPROXIMATELY 200 DEGREES CELSIUS

TABLE 3-1 (cont'd)
ANALYTICAL RESULTS FROM APRIL 1990

ANALYTE	MW-6	MW-7	MW-8	RW-1
BENZENE	ND	6100	18000	2600
ETHYLBENZENE	ND	360	830	320
TOLUENE	ND	3900	7100	580
TOTAL XYLENES	ND	260	290	190
* TPH GASOLINE	1600	440000	1200000	160000
TPH DIESEL	5600	200	9500	240
TPH JET FUEL	ND	ND	ND	ND
TPH KEROSENE	ND	ND	ND	ND
TPH LUBRICATING OIL	ND	ND	ND	ND

UNITS FOR ANALYSIS ARE MICROGRAMS PER LITER (ug/L)

ND - NOT DETECTED

TPH - TOTAL PETROLEUM HYDROCARBONS

* - TPH GASOLINE - QUANTITATES AGGREGATE HYDROCARBONS WITH BOILING POINTS BELOW APPROXIMATELY 200 DEGREES CELSIUS

TABLE 3-2
ANALYTICAL RESULTS FROM MARCH 1990

ANALYTE	MW-1	MW-2	MW-3	WS-1	WS-2
BENZENE	4.1	ND	69	15	7.1
ETHYLBENZENE	ND	ND	1.9	ND	ND
TOLUENE	.26	ND	1.4	1.8	.97
TOTAL XYLENES	ND	ND	1.1	4.1	ND

UNITS FOR ANALYSIS ARE MICROGRAMS PER LITER (ug/L)

ND - NOT DETECTED

TABLE 6-1
WELL AND WATER SURFACE ELEVATION DATA
MAY 8, 1990

LOCATION	CASING ELEVATION	DEPTH TO WATER	DEPTH TO PRODUCT	WATER SURFACE ELEVATION
MW-1	3979.25	95.94	NF	3883.31
MW-2	3980.50	97.99	NF	3882.52
MW-3	3980.27	97.83	NF	3882.44
MW-4	3980.16	101.28	96.76	3882.04 *
MW-5	3979.82	96.30	NF	3883.52
MW-6	3981.79	97.93	NF	3883.86
MW-7	3978.45	96.42	NF	3882.03
MW-8	3979.96	97.78	NF	3882.18
RW-1	3980.80	98.39	NF	3882.41

* WATER SURFACE ELEVATION CORRECTED FOR FLOATING PRODUCT

ALL DATA IS IN FEET

NF - NONE FOUND

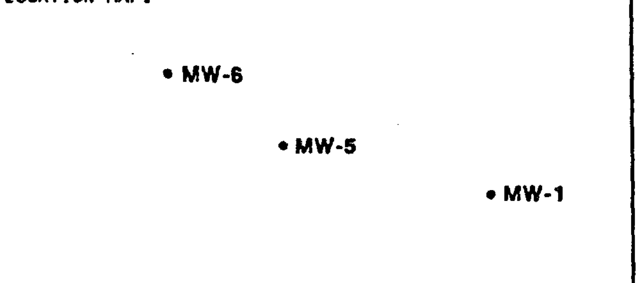
APPENDIX A

APPENDIX A
LITHOLOGIC LOGS

LITHOLOGIC LOG

Page 1 of 3

LOCATION MAP:



1/4 1/4 1/4 1/4 S 30 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: BH-1, (MW-5)
SITE COORDINATES (ft.):
N N2+84.25 E E12+34.59
GROUND ELEVATION (ft. MSL): 3978.30
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY/WATER
DRILLING CONTR.: LARRY'S DRILLING, HOBBS
DATE STARTED: 3/21/90 DATE COMPLETED: 3/22/90
FIELD REP.: M. NEE
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay

LOCATION DESCRIPTION:

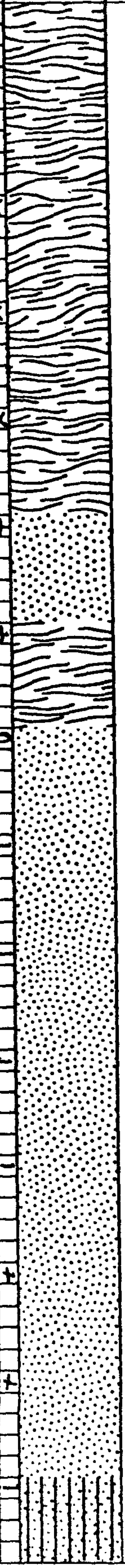
Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
5	C C C C C C C C C C			5'	CALICHE, v pale orng 10 YR 8/2 to grysh orng 10 YR 7/4, cche is fn sand to crs pebble Grv size, well consol, ang, poorly sorted, v fn gr sand is host for cche, <5% Sst, pale brn 5 YR 5/2.
10	C C C C C C C o o o			10'	CALICHE, as above, 70% cche, 30% clay.
15	C C C C C C C C C C			15'	CALICHE, same as 5'.
20	C C C C C C C C C X			20'	CALICHE/SANDSTONE, cche is same as 5', Sst is pale brn 5 YR 5/2, v fn to fn gr, v well to mod consol, sbang to sbrndd, mod well sorted, 90% cche, 10% Sst.
25	C C C C C C C C X X			25'	CALICHE/SANDSTONE, same as 20', 80% cche, 20% Sst.
30	C C X X X X X X X X			30'	CALICHE/SANDSTONE, same as 20', 20% cche, 80% Sst in cuttings.
35	C C X X X X X X X X			35'	CALICHE/SANDSTONE, same as 20', 80% Sst, 20% cche.
40	C C C C C X X X X X			40'	CALICHE/SANDSTONE, same as 20' 50% cche, 50% Sst.
45	C C C C X X X + + -			45'	CALICHE/SANDSTONE, same as 20', 40% cche, 30% Sst, 20% v fn to fn sand, 10% silt, sand & silt is pale yelsh brn 10 YR 6/2, unconsol, sbrndd, mod well sorted.
50	C C C C X X X X X X				

LITHOLOGIC LOG

(Continued)

Page 2 of 3

Location ID BH-1



Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50	CCCCXXXXXX			50'	<u>CALICHE/SANDSTONE</u>, same as 20', 60% Sst, 40% cche.
55	CCCCXXXXXX			55'	<u>CALICHE/SANDSTONE</u>, same as 20' 60% Sst, 40% cche.
60	CCCCXXXXXX			60'	<u>CALICHE/SANDSTONE</u>, same as 20', 60% Sst, 40% cche.
65	CCCCXXXXXX			65'	<u>CALICHE/SANDSTONE</u>, same as 20', 60% Sst, 40% cche.
70	++++++++++			70'	<u>SAND</u>, mod yelsh brn 10 YR 5/4, v fn to fn gr, unconsol, sbrndd, v well sorted.
75	CCCCCCCXX+			75'	<u>CALICHE/SANDSTONE</u>, same as 20', 70% cche, 20% Sst, 10% v fn sand.
80	CC+++ooooo			80'	<u>SANDY CLAY</u>, grsh orng pink 5 YR 7/2 to mod orng pink 5 YR 8/4, 50% clay, 30% sand, 20% cche.
85	+++++++++–			85'	<u>SAND</u>, pale yelsh brn 10 YR 6/2, v fn to fn sand, unconsol, sbrndd, well sorted.
90	+++++++++–			90'	<u>SAND</u>, same as 85'.
95	+++++++++–			95'	<u>SAND</u>, same as 85'.
100	+++++++++–			100'	<u>SAND</u>, same as 85'.
105	++++++++++			105'	<u>SAND</u>, mod yelsh brn 10 YR 5/4, v fn to med size, unconsol, mod well sorted, sbrndd.
110	++++++++++			110'	<u>SAND</u>, same as 105'.
115	+++++++++–			115'	<u>SILTY SAND</u>, pale yelsh brn 10 YR 6/2, silt to med sand, unconsol, mod well sorted, sbrndd, 85% sand, 15% silt.

LITHOLOGIC LOG

(Continued)

Page 3 of 3

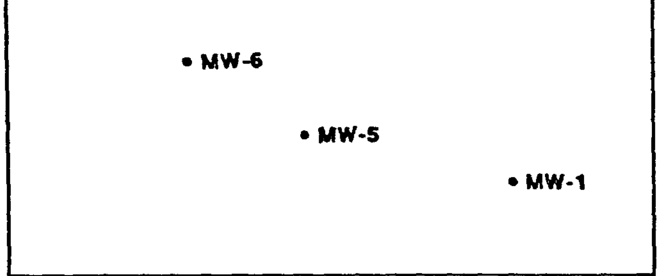
Location ID BH-1

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
115					
120				120'	SILTY SAND, same as 115'.
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

LITHOLOGIC LOG

Page 1 of 3

LOCATION MAP:

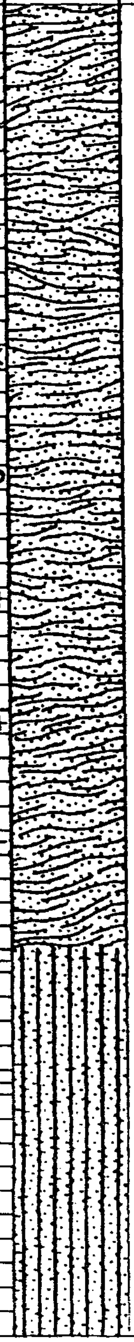


___1/4 ___1/4 ___1/4 ___1/4 S 31 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: BH-2 (MW-6)
SITE COORDINATES (ft.):
N N5+41.23 E E07+72.94
GROUND ELEVATION (ft. MSL): 3980.04
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY/WATER
DRILLING CONTR.: LARRY'S DRILLING, HOBBS
DATE STARTED: 3/22/90 DATE COMPLETED: 3/23/90
FIELD REP.: M. NEE
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay

LOCATION DESCRIPTION:

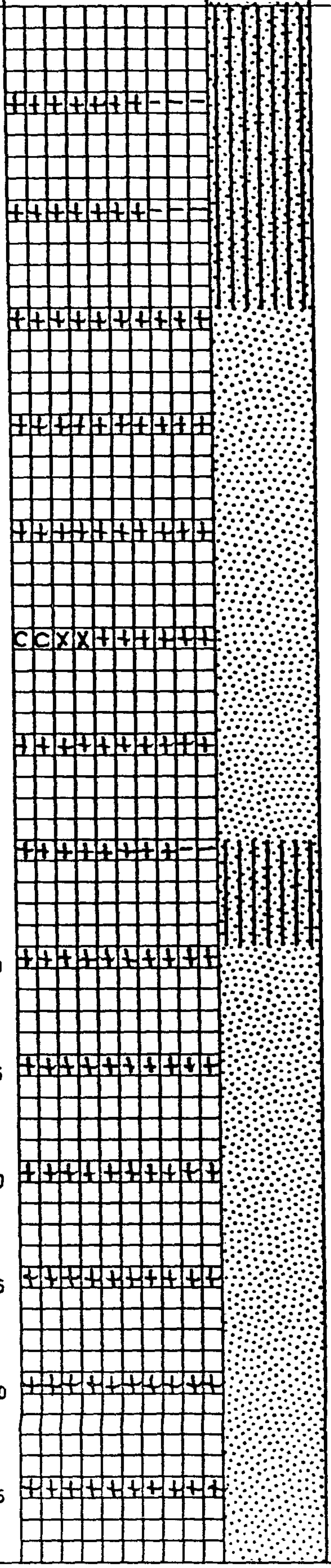
Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
				0-1'	SOIL, pale yelsh brn, 10 YR 6/2, org rich.
5	C C C C X X X X X X			5'	CALICHE/SANDSTONE, cche is v pale orng 10 YR 8/2, clasts are med sand to Pbl Grv size, consol, ang, Sst is pale yelsh brn 10 YR 6/2 gr size is v fn to fn, cemented, consol, sbrndd, 40% cche, 60% Sst.
10	C C C C C C C C X X			10'	CALICHE/SANDSTONE, same as 5', 80% cche, 20% Sst.
15	C C C C C C C C X X			15'	CALICHE/SANDSTONE, same as 5' 80% cche, 20% Sst.
20	C C C C C C C X X O			20'	CALICHE/SANDSTONE, same as 5', 70% cche, 20% Sst, 5% silt, 5% v fn to fn sand.
25	C C C C C X X + + +			25'	CALICHE/SANDSTONE/SAND, 50% cche, 20% Sst, 30% sand, sand is grysh orng pink 5 YR 7/2, unconsol, sbrndd, mod well sorted, v fn to med size.
30	C C C C C X X + + +			30'	CALICHE/SANDSTONE/SAND, same as 25'.
35	C C C X X + + + - -			35'	CALICHE/SANDSTONE/SAND/SILT, same as 25', 20% Sst, 30% cche, 30% sand, 20% silt.
40	C C C X X + + + - -			40'	CALICHE/SANDSTONE/SAND/SILT, same as 35'.
45	+ + + + + + + - - -			45'	SILTY SAND, grysh orng pink 5 YR 7/2, silt to fn sand, unconsol, mod sorted, sbrndd, 70% v fn to fn sand, 30% silt.
50				50'	SILTY SAND, same as 45'.

LITHOLOGIC LOG

(Continued)

Page 2 of 3

Location ID BH-2



Depth	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50			
55		55'	<u>SILTY SAND</u>, same as 45'.
60		60'	<u>SAND</u>, mod yelsh brn 10 YR 5/4, v fn to med size, unconsol, sbrndd, mod well sorted.
65		65'	<u>SAND</u>, same as 60'.
70		70'	<u>SAND</u>, same as 60'.
75		75'	<u>CALICHE/SANDSTONE/SAND</u>, pale yelsh brn 10 YR 6/2, 20% cche, 20% Sst, 60% v fn to fn sand.
80		80'	<u>SAND</u>, same as 60'.
85		85'	<u>SILTY SAND</u>, pale yelsh brn 10 YR 6/2, silt to fn sand, unconsol, mod sorted, sbrndd, 80% v fn to fn sand, 20% silt.
90		90'	<u>SAND</u>, pale yelsh brn 10 YR 6/2, v fn sand to med sand, unconsol, mod sorted, sbang to sbrndd.
95		95'	<u>SAND</u>, same as 90'.
100		100'	<u>SAND</u>, same as 90'.
105		105'	<u>SAND</u>, mod yelsh brn 10 YR 5/4, fn to v fn sand, unconsol, sbrndd, mod well sorted.
110		110'	<u>SAND</u>, same as 105'.
115		115'	<u>SAND</u>, same as 105'.

LITHOLOGIC LOG

(Continued)

Page 3 of 3

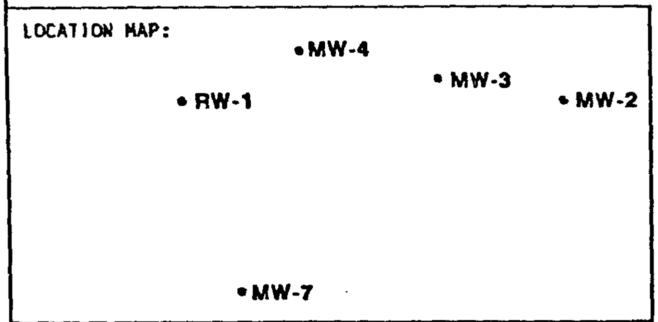
Location ID BH-2

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
115					
120				120'	SAND, same as 105'.
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

LITHOLOGIC LOG

Page 1 of 3

LOCATION MAP:



___1/4 ___1/4 ___1/4 ___1/4 S 31 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: BH-3,(MW-7)
SITE COORDINATES (ft.):
S0+04.31 E E10+27.31
GROUND ELEVATION (ft. MSL): 3977.20
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY/WATER
DRILLING CONTR.: LARRY'S DRILLING, HOBBS
DATE STARTED: 3/25/90 DATE COMPLETED: 3/25/90
FIELD REP.: M. NEE
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay

LOCATION DESCRIPTION:

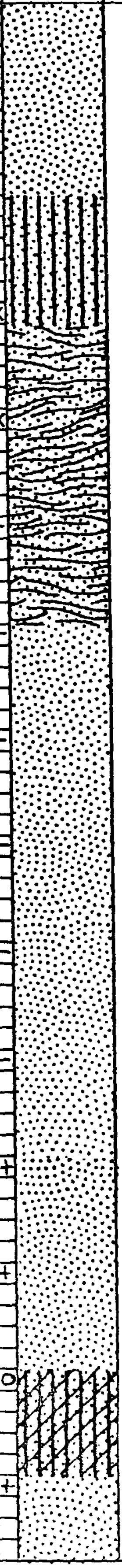
Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
				0-1'	SOIL, grysh brn 5 YR 8/2, to appears to be HC stained.
5	CCCCCCCCCX			5'	CALICHE, mod orng pink 5 YR 8/4, cuttings are v fn to fn Pbl Grv size, v well consol, 90% cche, 10% Sst, v hard drilling to 5'.
10	CCCCCCCooo			10'	CALICHE, as above except poorly consol, 70% cche, 30% clay.
15	CC++++++++			15'	SAND, grysh orng pink 5 YR 7/2, v fn to fn gr sand, unconsol, sbang to sbrndd, well sorted, 80% sand, 20% cche.
20	CC++++++++			20'	SAND, same as 15'.
25	C++++++++-			25'	SILTY SAND, pale yelsh brn 10 YR 6/2, silt to fn sand, unconsol, sbang to sbrndd, 80% sand, 10% silt, 10% cche.
30	++++++++--			30'	SILTY SAND, same as 25', 20% silt, 80% sand.
35	C++++++++-			35'	SILTY SAND, same as 25', 10% silt, 10% cche, 80% sand.
40	++++++++--			40'	SILTY SAND, same as 25', 20% silt, 80% sand.
45	++++++++--			45'	SILTY SAND, same as 25', 20% silt, 80% v fn sand.
50	C+++++++--			50'	SILTY SAND, same as 25', 20% silt, 10% cche, 70% sand.

LITHOLOGIC LOG

(Continued)

Page 2 of 3

Location ID BH-3



Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50	C + + + + + + + - -				
55	+ + + + + + + - - -			55'	<u>SILTY SAND</u>, same as 25', 30% silt, 70% v fn sand.
60	C C C C X X X X X X			60'	<u>CALICHE/SANDSTONE</u>, cche is v pale orng 10 YR 8/2, clasts are med sand to fn Pbl Grv size, 40% cche, 60% Sst, Sst is pale yelsh brn 10 YR 6/2, gr size is v fn to fn, cemented, consol, sbrndd.
65	C C C C X X X X X X			65'	<u>CALICHE/SANDSTONE</u>, same as 60'.
70	C C C X X X X X + -			70'	<u>CALICHE/SANDSTONE</u>, same as 60', 50% Sst, 30% cche, 10% silt, 10% v fn sand.
75	+ + + + + + + - - -			75'	<u>SILTY SAND</u>, pale yelsh brn 10 YR 6/2, unconsol, well sorted, sbang to sbrndd, 30% silt, 70% v fn to fn sand.
80	+ + + + + + + - - -			80'	<u>SILTY SAND</u>, same as 75'
85	+ + + + + + + + + -			85'	<u>SAND</u>, same as 75', 80% v fn sand, 10% fn sand, 10% silt.
90	+ + + + + + + + + -			90'	<u>SAND</u>, same as 85'.
95	+ + + + + + + + + -			95'	<u>SAND</u>, same as 85'.
100	+ + + + + + + + + +			100'	<u>SAND</u>, mod yelsh brn 10 YR 5/4, unconsol, well sorted, sbang to sbrndd, v fn to fn sand.
105	+ + + + + + + + + +			105'	<u>SAND</u>, same as 100'.
110	+ + + + + + + + - O			110'	<u>CLAYEY SILTY SAND</u>, pale yelsh brn 10 YR 6/2, clay to fn sand, unconsol, mod sorted, sbang to sbrndd, 10% clay, 10% silt, 80% v fn to fn sand.
115	+ + + + + + + + + +			115'	<u>SAND</u>, same as 100'.

LITHOLOGIC LOG

(Continued)

Page 3 of 3

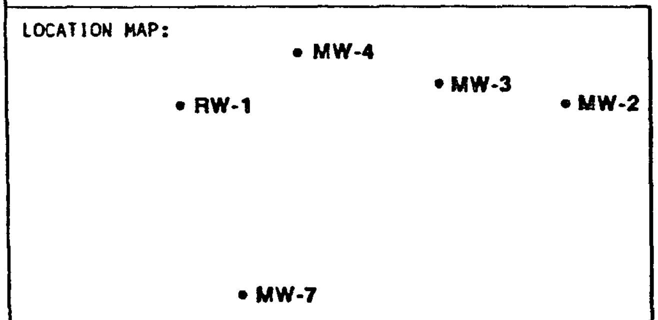
Location ID BH-3

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
115					
120				120'	SAND, same as 100'.
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

LITHOLOGIC LOG

Page 1 of 3

LOCATION MAP:



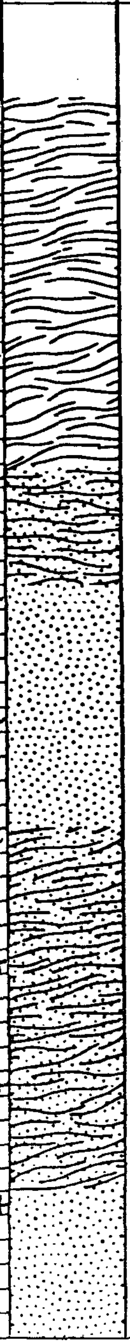
___1/4 ___1/4 ___1/4 ___1/4 S 31 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: BH-4 (RW-1)
SITE COORDINATES (ft.):
N N0+18.31 E E08+95.41
GROUND ELEVATION (ft. MSL): 3977.81
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY
DRILLING CONTR.: LARRY'S DRILLING, HOBBS
DATE STARTED: 3/27/90 DATE COMPLETED: 3/28/90
FIELD REP.: M. NEE
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay

LOCATION DESCRIPTION:

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
				0-2'	SOIL, cche Bld, heavily stained w/HC, stained soil is dusky brn 5 YR 2/2.
5	CCCCCCCCCC			5'	CALICHE, v pale orng 10 YR 8/2, v fn sand to fn Pbl size, clay fraction < 5%, org vapors @ 5 ppm from cuttings.
10	CCCCCCCCCX			10'	CALICHE, same as 5' w/10% Sst, Sst is lt brn 5 YR 6/4, v fn gr, tightly consol, 10% clay, 10% Sst, 80% cche.
15	CCCX+++++-			15'	CALICHE/SAND, v pale orng 10 YR 8/2, sand is v fn gr, unconsol, sbang mod sorted, cche is clay to fn Pbl Grv size, 50% sand, 30% cche, 10% clay, 10% Sst.
20	CCCCXXX+++			20'	CALICHE/SANDSTONE/SAND, pale yelsh brn 10 YR 6/2, as above, 30% sand, 40% cche, 30% Sst.
25	C+++++++++			25'	SAND, pale yelsh brn 10 YR 6/2, v fn to fn gr, unconsol, mod well sorted, sbang to sbrndd, 90% sand, 10% cche.
30	C+++++++++			30'	SAND, same as 25', < 10% cche in cuttings.
35	CCXXXXX+++			35'	SANDSTONE/CALICHE/SAND, same as 20', 30% sand, 50% Sst, 20% cche.
40	CCXXXXX+++			40'	SANDSTONE/CALICHE/SAND, same as 35'.
45	CCXXXXX+++			45'	SANDSTONE/CALICHE/SAND, same as 35'.
50	CCCCXXXX++			50'	SANDSTONE/CALICHE/SAND, same as 35', 20% sand, 40% cche, 40% Sst.

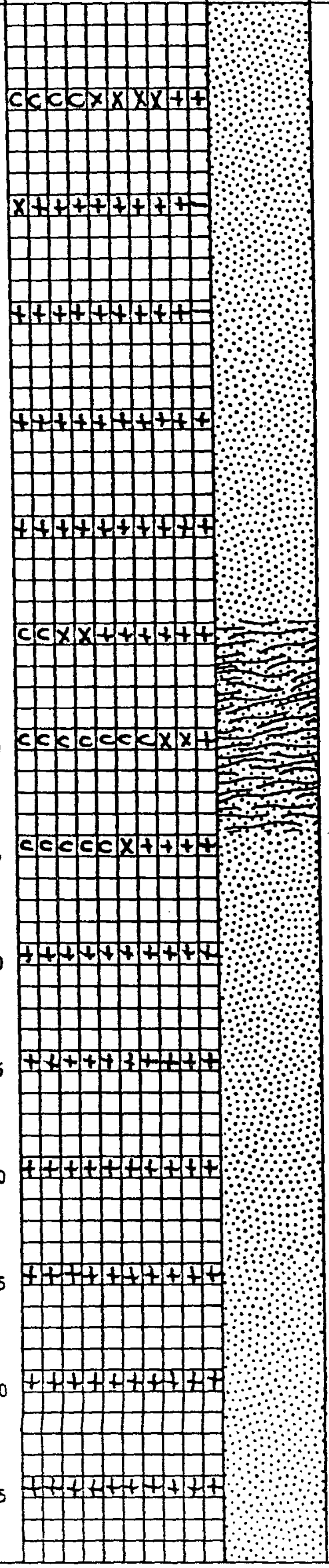


LITHOLOGIC LOG

(Continued)

Page 2 of 3

Location ID BH-4



Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50	CCCCXXXX++				
55	X+++++++++			55′	**SAND**, pale yelsh brn 10 YR 6/2, silt to fn sand, unconsol, sbrndd, well sorted, 90% sand, 10% silt.
60	++++++++++			60′	**SAND**, same as 55′.
65	++++++++++			65′	**SAND**, mod yelsh brn 10 YR 5/4, v fn gr, well sorted, unconsol, sbrndd.
70	++++++++++			70′	**SAND**, same as 65′, 90% sand, 5% cche, 5% Sst.
75	CCXX++++++			75′	**SANDSTONE/CALICHE/SAND**, same as 20′, 60% sand, 20% cche, 20% Sst, hard drilling 72-78′.
80	CCCCCCCXX+			80′	**SANDSTONE/CALICHE**, pale yelsh brn 10 YR 6/2, 70% cche, 20% Sst, 10% sand, cche/Sst is v fn Pbl Grv size, sand is v fn to fn gr, poorly sorted, sbrndd.
85	CCCCCX++++			85′	**SANDSTONE/CALICHE**, same as 80′, 40% sand, 10% Sst, 50% cche.
90	++++++++++			90′	**SAND**, dk yelsh brn 10 YR 4/2 to pale yelsh brn 10 YR 6/2 v fn to fn gr, unconsol, sbrndd, well sorted.
95	++++++++++			95′	**SAND**, same as 90′.
100	++++++++++			100′	**SAND**, same as 90′.
105	++++++++++			105′	**SAND**, same as 90′, minor clay < 5%.
110	++++++++++			110′	**SAND**, same as 90′, minor clay < 5%.
115	++++++++++			115′	**SAND**, same as 90′.

LITHOLOGIC LOG

(Continued)

Page 3 of 3

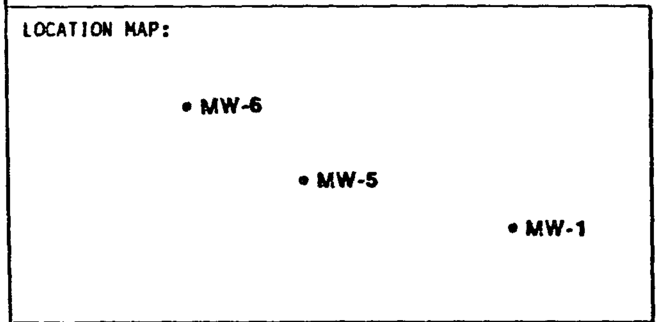
Location ID BH-4

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
115		░			
120		░		120'	<u>SAND</u>, same as 90'.
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

LITHOLOGIC LOG

Page 1 of 3

LOCATION MAP:

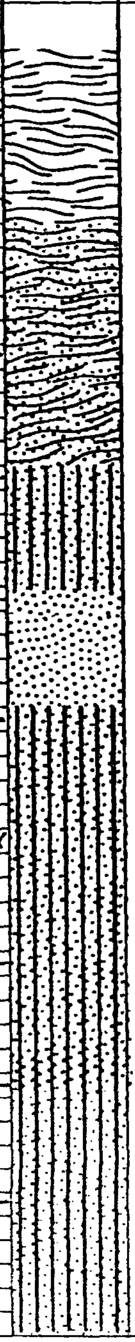


___1/4 ___1/4 ___1/4 ___1/4 S 30 T 17 R 35

SITE ID: PHILLIPS LEE PLANT LOCATION ID: BH-5 (MW-8)
SITE COORDINATES (ft.):
N N3+60.51 E E09+40.70
GROUND ELEVATION (ft. MSL): 3978.79
STATE: NEW MEXICO COUNTY: LEA
DRILLING METHOD: ROTARY/WATER
DRILLING CONTR.: LARRY'S DRILLING HOBBS
DATE STARTED: 4/03/90 DATE COMPLETED: 4/04/90
FIELD REP.: M. NEE
COMMENTS:

c caliche, x sandstone, + sand, - silt, o clay

LOCATION DESCRIPTION:

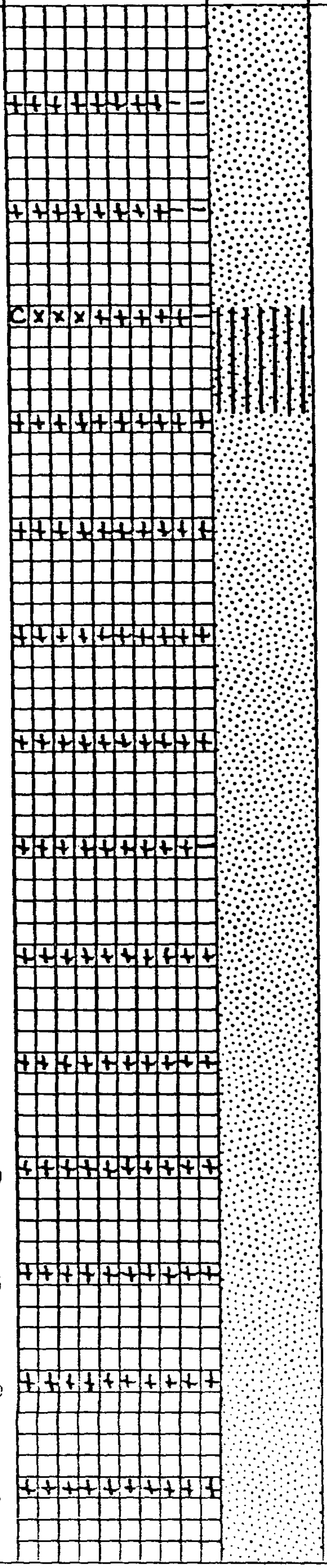


Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
				0-2'	BACKFILL/SOIL, grysh blk N2, fn Pbl to lrg Cbl of cche w/soil, org & trash present.
5	CCCCCCCCCC			5'	CALICHE, yelsh gry 5 Y 7/2, cuttings are fn sand to med Pbl Grv size, strong HC odor.
10	CCCCXXXXXX			10'	CALICHE/SANDSTONE, Sst is mod yelsh brn 10 YR 5/4, v fn gr, well consol, sbang, well sorted, cche is same as 5' 40% cche, 60% Sst.
15	CCCCCXXXX-			15'	CALICHE/SANDSTONE, same as 10' w/40% Sst, 50% cche, 10% clay.
20	+ooo------		1355	20'	CLAYEY, SILTY SAND, v pale orng 10 YR 8/2, clay to v fn sand, mod consol, poorly sorted, sand grains are sbang, 10% sand, 30% silt, 60% clay.
25	++++++++++			25'	SAND, pale yelsh brn 10 YR 6/2, v fn gr, unconsol, sbang to sbrndd, v well sorted. 27-34' SILTY SAND
30	++++++++--			30'	SILTY SAND, pale yelsh brn 10 YR 6/2, silt to sand, unconsol, mod well sorted, sbang to sbrndd, 20% silt, 80% sand.
35	XXXXXXXXXX			35'	SANDSTONE, pale brn 5 YR 5/2 pred med Pbl Grv size Frag, v well consol, sand grains are v fn in size, sbrndd.
40	XXX++++++-		1412	40'	SANDSTONE/SAND, pale yelsh brn 10 YR 6/2, Sst is the same as 35', sand is the same as 30', 30% Sst, 60% sand, 10% silt.
45	++++++++--			45'	SILTY SAND, same as 30'.
50	++++++++--			50'	SILTY SAND, same as 30'.

LITHOLOGIC LOG
(Continued)

Page 2 of 3

Location ID BH-5



Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
50					
55				55′	SILTY SAND, same as 30′.
60				60′	SILTY SAND, grysh orng pink, 5 YR 7/2, 10% silt, 60% sand, 10% cche, 20% Sst.
65				65′	SAND, mod yelsh brn 10 YR 5/4, v fn to fn gr, unconsol, well sorted, sbang to sbrndd.
70			1440	70′	Same as 65′.
75				75′	SAND, pale yelsh brn 10 YR 6/2, w/<5% v pale orng 10 YR 8/2 clay/cche, v fn gr, unconsol, mod well sorted, sbang.
80				80′	SAND, same as 75′ w/ no clay.
85			0750	85′	SAND, same as 75′ w/≈10% clay, clay may be from higher in borehole.
90			0756	90′	SAND, same as 75′, no clay frac.
95				95′	SAND, same as 75′, no clay frac.
100				100′	SAND, same as 75′, no clay.
105				105′	SAND, same as 75′, no clay.
110				110′	SAND, same as 75′, no clay.
115				115′	SAND, same as 75′, no clay.

LITHOLOGIC LOG

(Continued)

Page 3 of 3

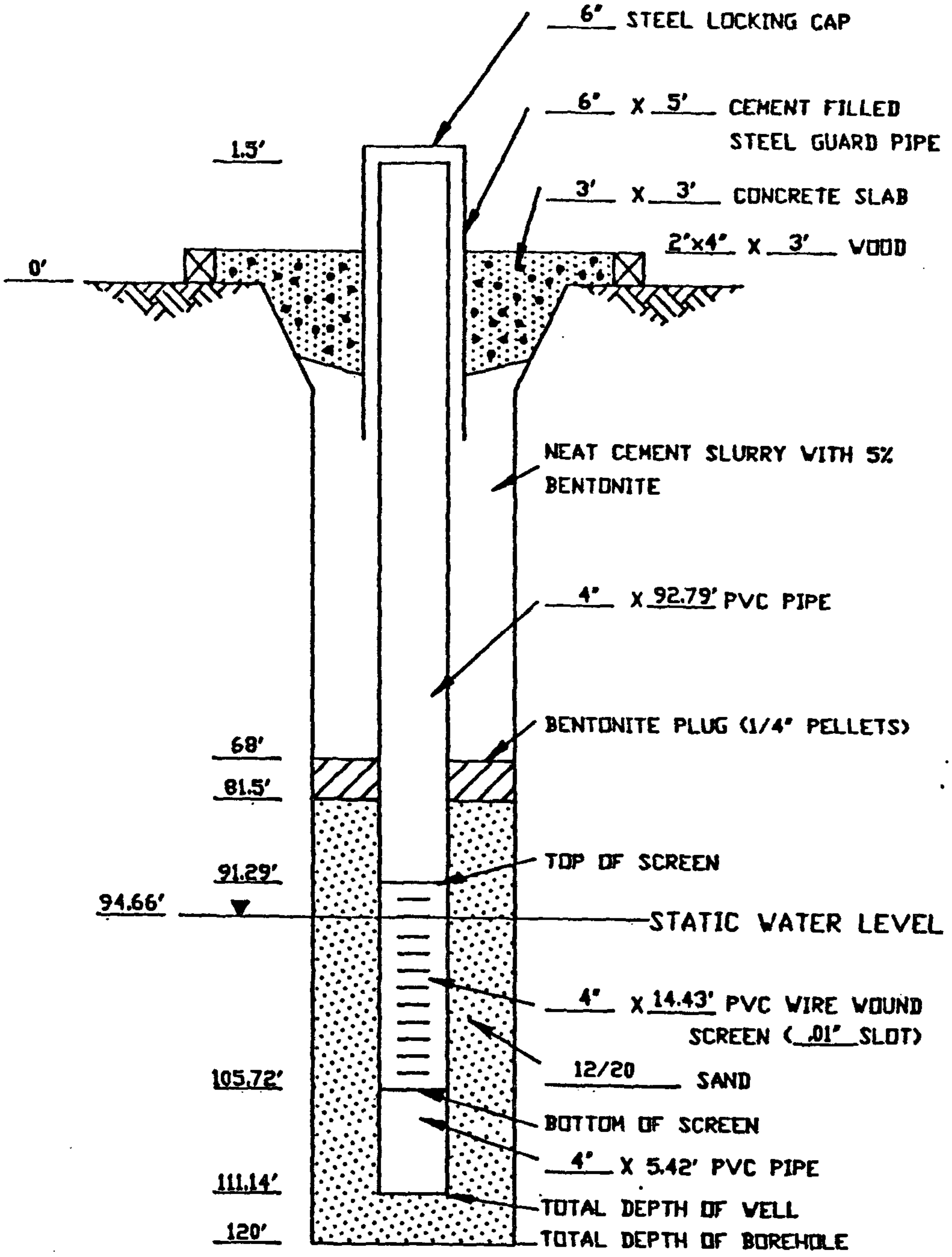
Location ID BH-5

Depth	Visual %	Lith	Drilling Time Scale:	Sample Type and Interval	Lithologic Description
115					
120			0815	120'	SAND, same as 75', no clay.
125					
130					
135					
140					
145					
150					
155					
160					
165					
170					
175					
180					

APPENDIX B

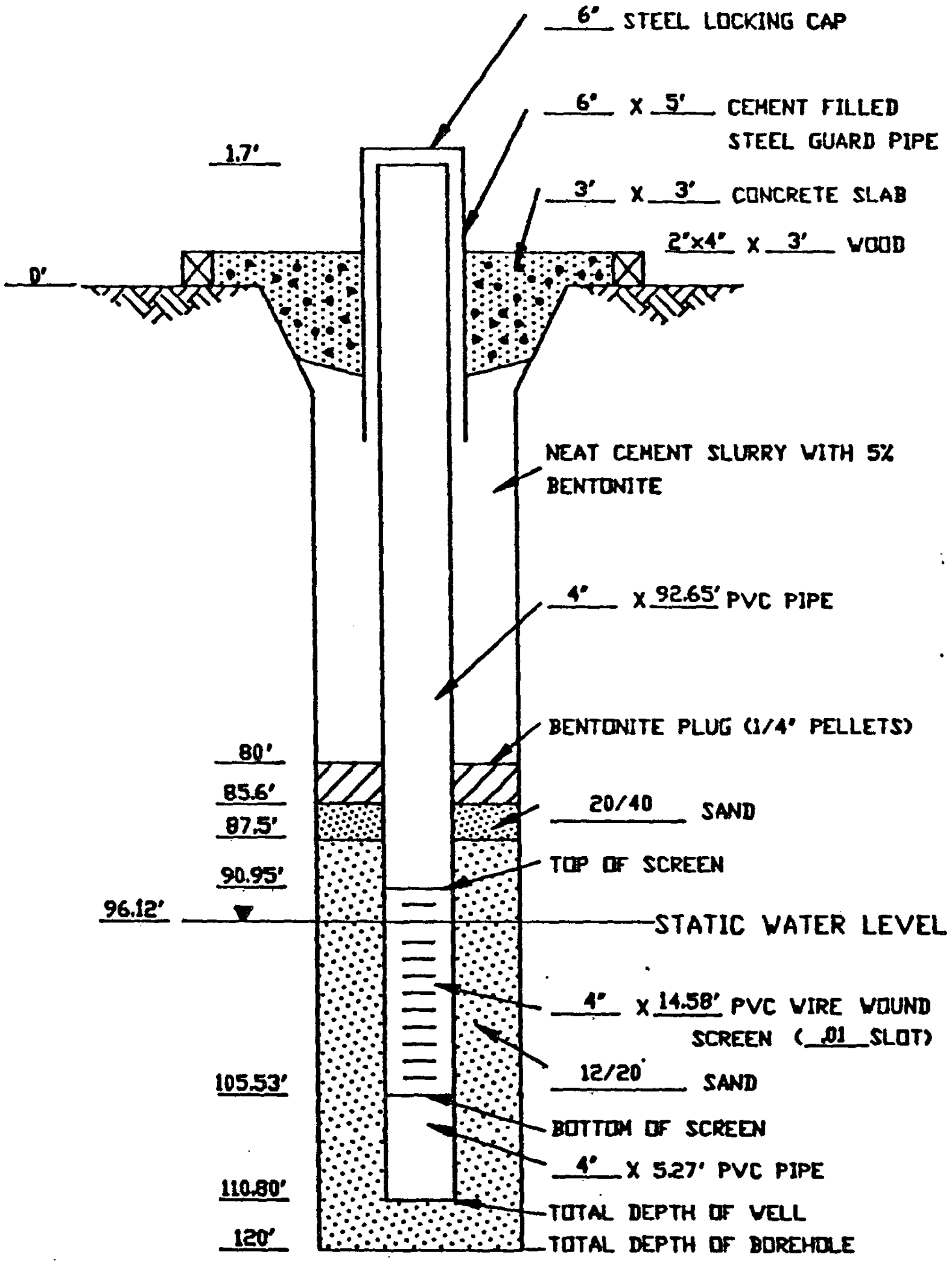
APPENDIX B

MONITOR WELL COMPLETION DIAGRAMS



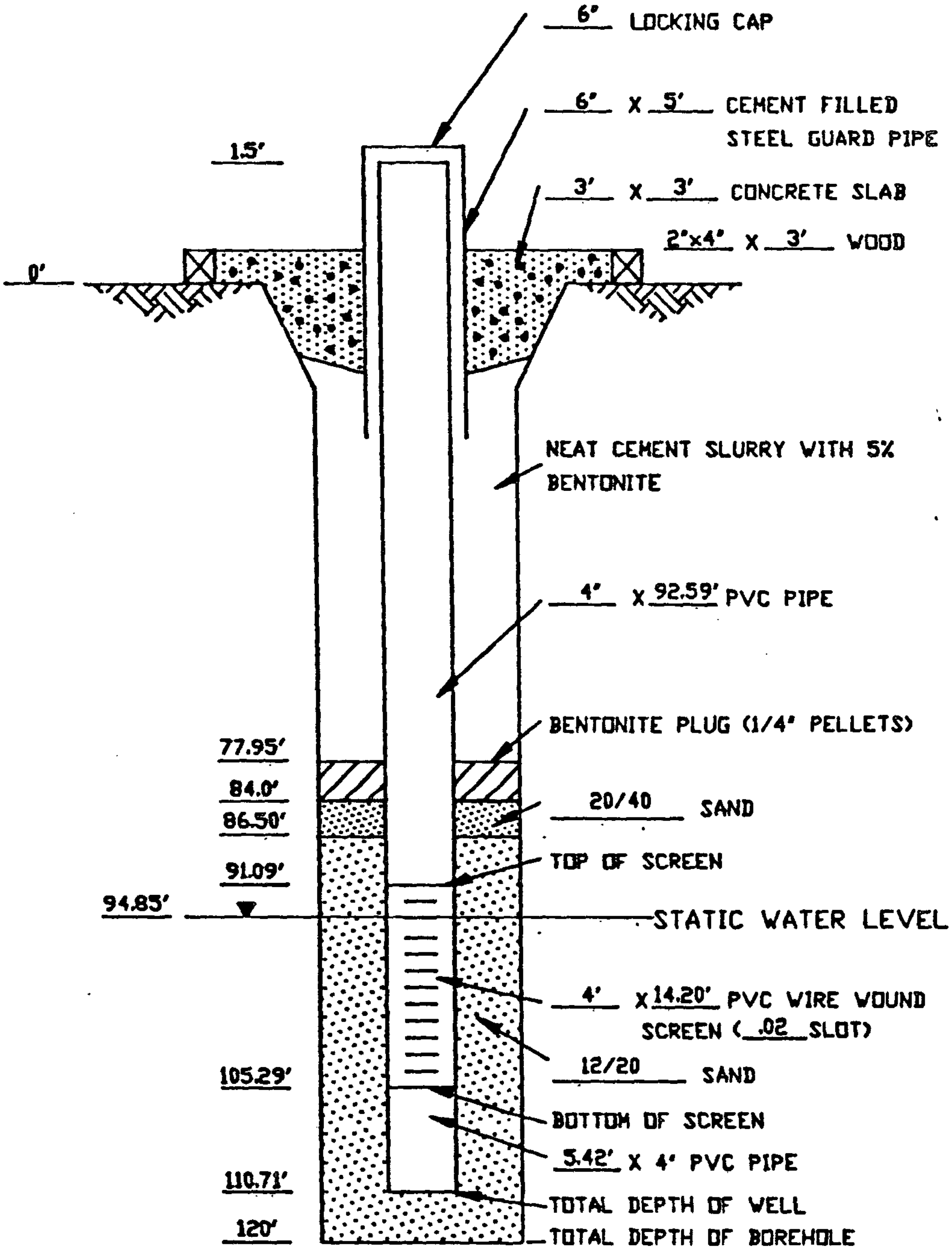
MONITOR WELL MW-5

PHILLIIPS LEE PLANT

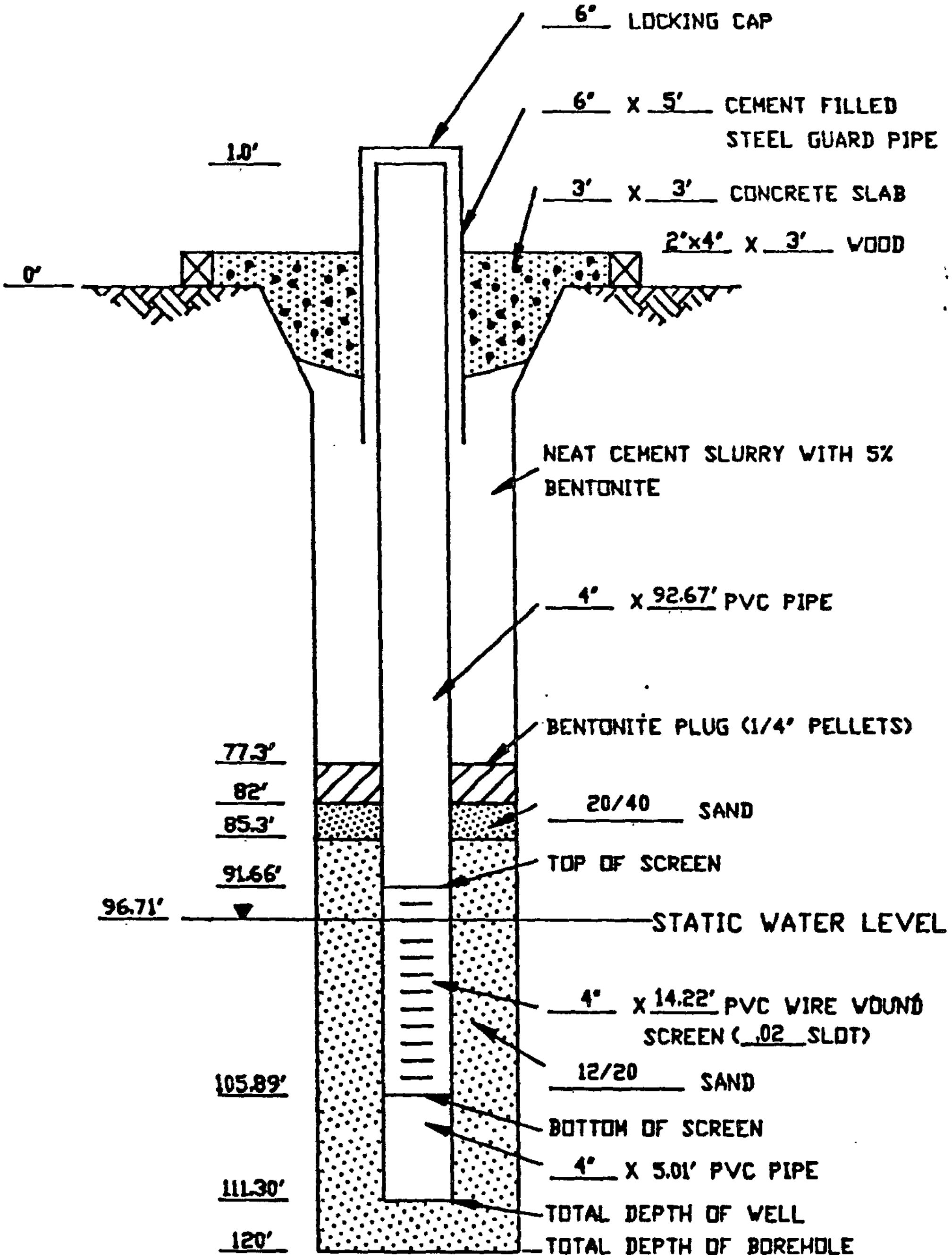


MONITOR WELL MW-6

PHILLIIPS LEE PLANT

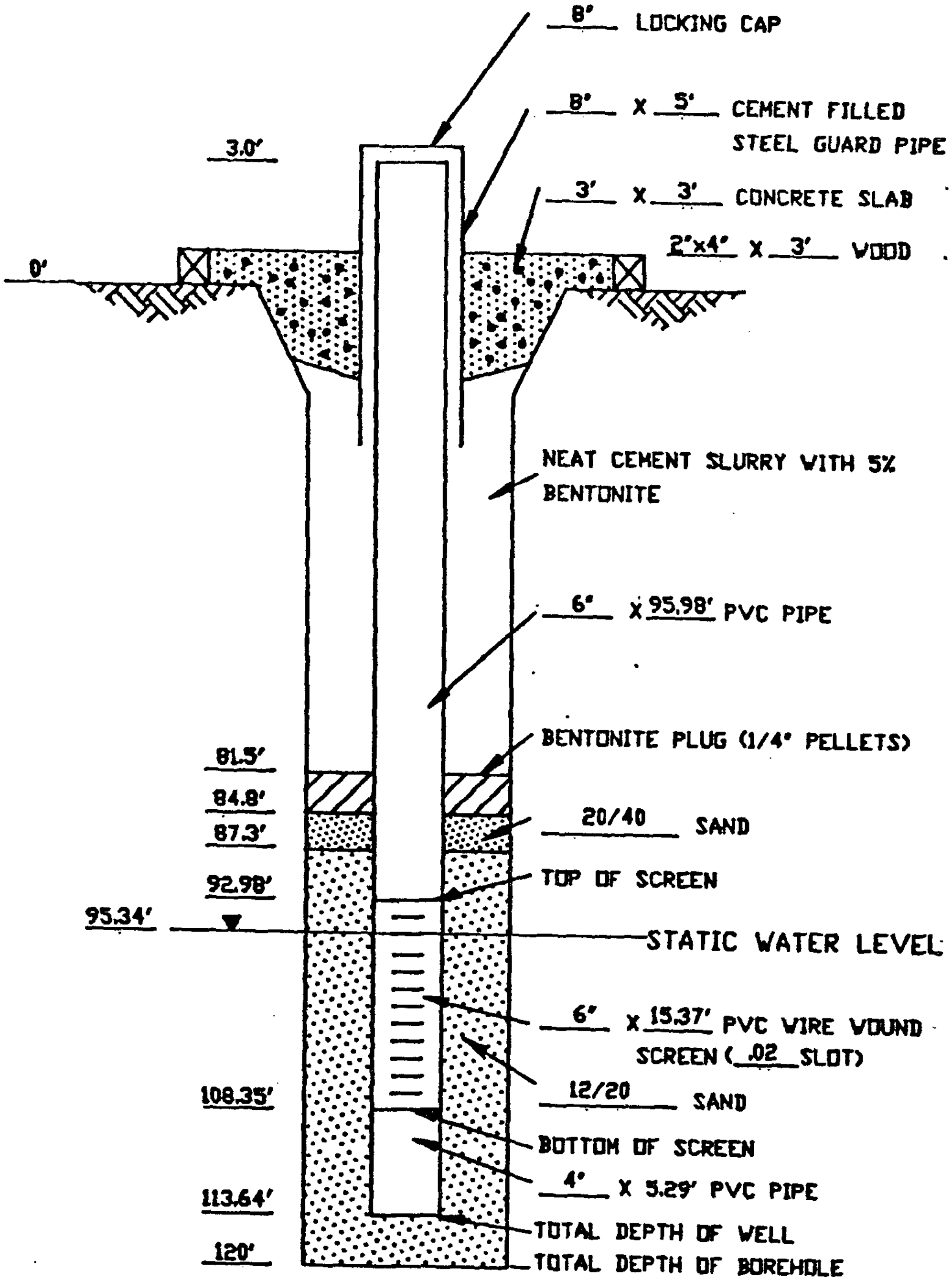


MONITOR WELL MW-7
PHILLIPS LEE PLANT



MONITOR WELL MW-8

PHILLIIPS LEE PLANT



RECOVERY WELL RW-1
PHILLIIPS LEE PLANT

APPENDIX C

APPENDIX C

LABORATORY REPORTS

RADIAN
CORPORATION

Radian Work Order S0-03-244

Analytical Report
04/17/90

RECEIVED APR 2 0 1990

Geoscience Consultants,Ltd.

Geoscience Consultants, Ltd.
500 Copper N.W. Ste 200
Albuquerque, NM., 87102
(505) 842-0595
Sample Manager

Customer Work Identification Phillips
Purchase Order Number

Contents:

Radian Analytical Services
10395 Old Placerville Road
Sacramento, CA 95827

916-362-5332

Client Services Coordinator: LWKELLY

Certified by:

RADIAN CORPORATION

Analytical Data Summary

Geoscience Consultants,Ltd.
Radian Work Order: S0-03-244

Method:TPH-Diesel by mod. SW8015 (1)
List:Complete analyte list

Sample ID:	9003271300		9003280950		9003281130		9003281215	
Factor:	1		1		1		1	
Results in:	ug/L		ug/L		ug/L		ug/L	
	01A		02A		03A		04A	
Matrix:	water		water		water		water	
	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Diesel (2)	ND	50	220 @	50	150 @	50	ND	50
Jet fuel (2)	ND	100	ND	100	ND	100	ND	100
Kerosene (2)	990	100	ND	100	ND	100	ND	100
Lubricating oil (2)	ND	100	ND	100	ND	100	ND	100

ND Not detected at specified detection limit

@ Est. result less that 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

(2) Extraction By SW3520 (continuous liquid/liquid) or SW3550 (sonication) followed by GC analysis with FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-03-244

Method:TPH-Diesel by mod. SW8015 (1)
List:Complete analyte list

Sample ID:	REAGENT BLANK
Factor:	1
Results in:	ug/L
	05A
Matrix:	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Diesel (2)	ND	50						
Jet fuel (2)	ND	100						
Kerosene (2)	ND	100						
Lubricating oil (2)	ND	100						

ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) Extraction By SW3520 (continuous liquid/liquid) or SW3550 (sonication) followed by GC analysis with FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: 50-03-244

Method:TPH-Gasoline by mod.SW8015 (1)
List:Gasoline and BTEX list

Sample ID:	9003271300	9003280950	9003281130	9003281215
Factor:	5	1	1	1
Results in:	ug/L	ug/L	ug/L	ug/L
	01B	02B	03B	04B
Matrix:	water	water	water	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	ND	1.5	ND	0.30	1.8 C	0.30	2.4 C	0.30
Ethylbenzene (2)	98 C	1.5	ND	0.30	ND	0.30	ND	0.30
Gasoline (2)	13000	250	6500	50	5800	50	8500	50
Toluene (2)	ND	1.5	1.8 C	0.30	ND	0.30	0.38 C@	0.30
Xylenes (total) (2)	43 C	2.5	ND	0.50	ND	0.50	ND	0.50

ND Not detected at specified detection limit
C Confirmed on second column or by GC/MS
@ Est. result less that 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) SW5030 (purge & trap) followed by GC analysis with PID/
FID detectors.

Analytical Data Summary

Geoscience Consultants, Ltd.
Radian Work Order: S0-03-244

Method:TPH-Gasoline by mod.SW8015 (1)
List:Gasoline and BTEX list

Sample ID:	REAGENT BLANK		REAGENT BLANK					
Factor:	1		1					
Results in:	ug/L		ug/L					
	05A		05B					
Matrix:	water		water					
	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	ND	0.30	ND	0.30				
Ethylbenzene (2)	ND	0.30	ND	0.30				
Gasoline (2)	ND	50	ND	50				
Toluene (2)	ND	0.30	ND	0.30				
Xylenes (total) (2)	ND	0.50	ND	0.50				

ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) SW5030 (purge & trap) followed by GC analysis with PID/FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-03-244

Sample Identifications and Dates

Sample ID	9003271300	9003280950	9003281130	9003281215	REAGENT BLANK
Date Sampled	03/27/90	03/27/90	03/27/90	03/27/90	
Date Received	03/30/90	03/30/90	03/30/90	03/30/90	03/30/90
Matrix	water	water	water	water	water
	01	02	03	04	05
TPH-Diesel by mod. SW8015					
Prepared	04/01/90	04/01/90	04/01/90	04/01/90	04/01/90
Analyzed	04/09/90	04/09/90	04/09/90	04/09/90	04/09/90
Analyst	JM	JM	JM	JM	JM
File ID	820040917	82004097	82004098	820040916	82004094
Blank ID	82004094	82004094	82004094	82004094	
Instrument	8	8	8	8	8
Report as	received	received	received	received	received
TPH-Gasoline by mod.SW8015					
Prepared					
Analyzed	04/02/90	04/01/90	04/01/90	04/01/90	04/01/90
Analyst	BSJ	BSJ	BSJ	BSJ	BSJ
File ID	~~A20040215~~	A20040116	A20040117	A20040118	A2004011
Blank ID	A2004021	A2004011	A2004011	A2004011	
Instrument	A	A	A	A	A
Report as	received	received	received	received	received
TPH-Gasoline by mod.SW8015					
Prepared					
Analyzed					04/02/90
Analyst					BSJ
File ID					A2004021
Blank ID					
Instrument					A
Report as					received

Appendix A

Comments, Notes and Definitions

a ALL METHODS EXCEPT CLP
The results which are less than five times the method specified detection limit.
EXPLANATION
Uncertainty of the analysis will increase as the method detection limit is approached. These results should be considered approximate.

C ORGANIC CLP
pesticides require that single component results > 10ng/uL in the final extract be confirmed by GC/MS.
OTHER ORGANIC METHODS
This analysis has been confirmed on a second column or by GC/MS.
EXPLANATION
Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation.

ND ALL METHODS EXCEPT CLP
This flag is used to denote analytes which are not detected at or above the specified detection limit.
EXPLANATION
The value to the right of the < symbol is the method specified detection limit for the analyte.

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. The detection limits for EPA CLP (Contract Laboratory Program) methods are CRQLs (contract required quantitation limits) for organics and CRDLs (contract required detection limits) for inorganics. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), reporting units, use of cleanup procedures, or dilution of extracts/digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -	ug/L	micrograms per liter (parts per billion);liquids/water
	ug/kg	micrograms per kilogram (parts per billion); soils/solids
	ug/M3	micrograms per cubic meter; air samples
	mg/L	milligrams per liter (parts per million);liquids/water
	mg/kg	milligrams per kilogram (parts per million);soils/solids
	%	percent; usually used for percent recovery of QC standards
	uS/cm	conductance unit; microSiemans/centimeter
	mL/hr	milliliters per hour; rate of settlement of matter in water
	NTU	turbidity unit; nephelometric turbidity unit
	CU	color unit; equal to 1 mg/L of chloroplatinate salt

Geoscience Consultants, Ltd.

☑ Albuquerque
500 Copper N.W.
Suite 200
Albuquerque, NM 87102
(505) 842-0001

☐ Silver Spring
1109 Spring St.
Suite 706
Silver Spring, MD 20910
(301) 587-2088

☐ Newport Beach
1400 Quail Street
Suite 140
Newport Beach, CA 92660
(714) 724-0536

☐ Las Cruces
P.O. Drawer MM
Las Cruces, NM 88004
(505) 524-5364

№ 3462

Chain of Custody

DATE 03/27/90 PAGE 1 OF

LAB NAME Radian Analytical
ADDRESS 10395 Old Placerville Rd.
Sacramento, CA 95827
TELEPHONE

SAMPLERS (SIGNATURE) D Nee

ANALYSIS REQUEST

SAMPLE NUMBER	MATRIX	LOCATION	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418.1	TPH MODIFIED 8015		PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX METALS (8)	SDWA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE				NUMBER OF CONTAINERS
9003271300	H2O	MW5										X	X										
9003280950	H2O	MW3										X	X										
9003281130	H2O	MW2										X	X										
9003281215	H2O	MW1										X	X										

PROJECT INFORMATION

PROJECT: PHILLIPS
PROJECT DIRECTOR M. NEE
CHARGE CODE NO. 349-000
SHIPPING ID. NO. 6211869694
VIA: FED X

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS
CHAIN OF CUSTODY SEALS
REC'D GOOD CONDITION/COLD
CONFORMS TO RECORD
LAB NO. 50-03-244
50-03 245

RELINQUISHED BY 1.
D Nee
(Signature) (Time) 1500
DAVID NEE
(Printed Name) (Date) 03/28/90
GCL
(Company)

RELINQUISHED BY 2.
Timothy H. Kersh
(Signature) (Time)
Tim Kersh 3-27-90
(Printed Name) (Date)
GCL
(Company)

RELINQUISHED BY 3.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY 1.
0840
Timothy H. Kersh
(Signature) (Time)
Tim Kersh 3-29-90
(Printed Name) (Date)
GCL
(Company)

RECEIVED BY 2.
R. Ristow
(Signature) (Time)
RISTOW 3/30 P.
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY) 3.
Rhonda Ristow
(Signature) (Time) 2:45
R. RISTOW
(Printed Name)
RADIAN
(Company)

SPECIAL INSTRUCTIONS/COMMENTS:
Rec'd @ 10C

New Shipping ID# 6211869591

RECEIVED APR 20 1990

DISTRIBUTION: WHITE, CANARY - LABORATORY • PINK - GEOSCIENCE CONSULTANTS, LTD.

RADIAN
CORPORATION

Radian Work Order S0-04-077

RECEIVED APR 2 7 1990

Analytical Report
04/26/90

Geoscience Consultants,Ltd.

Geoscience Consultants, Ltd.
500 Copper N.W. Ste 200
Albuquerque, NM., 87102
(505) 842-0595
Sample Manager

Customer Work Identification TPH COC:3460
Purchase Order Number

Contents:

Radian Analytical Services
10395 Old Placerville Road
Sacramento, CA 95827

916-362-5332

Client Services Coordinator: LWKELLY

Certified by: Sharon K. Parson

Analytical Data Summary

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-077

Method:TPH-Diesel by mod. SW8015 (1)
List:Complete analyte list

Sample ID:	9004061130	REAGENT BLANK
Factor:	9.5	1
Results in:	ug/L	ug/L
	01A	04A
Matrix:	water	water

	Result	Det. Limit	Result	Det. Limit		
Diesel (2)	9500 G	480	ND	50		
Jet fuel (2)	ND	950	ND	100		
Kerosene (2)	ND	950	ND	100		
Lubricating oil (2)	ND	950	ND	100		

G Indicates an estimated GC value due to interferences.

ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

(2) Extraction By SW3520 (continuous liquid/liquid) or SW3550 (sonication) followed by GC analysis with FID detectors.

Geoscience Consultants, Ltd.
Radian Work Order: S0-04-077

Method: TPH-Gasoline by mod. SW8015 (1)
List: Gasoline and BTEX list

Sample ID:	9004061130	9004061135	TRIP BLANK	REAGENT BLANK
Factor:	200	1	1	1
Results in:	ug/L	ug/L	ug/L	ug/L
	01B	02A	03A	04A
Matrix:	water	water	water	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	18000 C	60	1.5 C	0.30	ND	0.30	ND	0.30
Ethylbenzene (2)	830 C	60	1.8 C	0.30	ND	0.30	ND	0.30
Gasoline (2)	1200000	10000	180 @	50	58 @	50	ND	50
Toluene (2)	7100 C	60	1.5 C	0.30	ND	0.30	ND	0.30
Xylenes (total) (2)	290 C@	100	3.8 C	0.50	ND	0.50	ND	0.50

C Confirmed on second column or by GC/MS
@ Est. result less that 5 times detection limit
ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) SW5030 (purge & trap) followed by GC analysis with PID/FID detectors.

Analytical Data Summary

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-077

Method:TPH-Gasoline by mod.SW8015 (1)
List:Gasoline and BTEX list

Sample ID:	REAGENT BLANK
Factor:	1
Results in:	ug/L
	04B
Matrix:	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	ND	0.30						
Ethylbenzene (2)	ND	0.30						
Gasoline (2)	ND	50						
Toluene (2)	ND	0.30						
Xylenes (total) (2)	ND	0.50						

ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) SW5030 (purge & trap) followed by GC analysis with PID/ FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-077

Sample Identifications and Dates

Sample ID	9004061130	9004061135	TRIP BLANK	REAGENT BLANK		
Date Sampled	04/06/90	04/06/90	04/06/90			
Date Received	04/07/90	04/07/90	04/07/90	04/07/90		
Matrix	water	water	water	water		
	01	02	03	04		
TPH-Diesel by mod. SW8015						
Prepared	04/11/90			04/11/90		
Analyzed	04/19/90			04/19/90		
Analyst	JM			JM		
File ID	8-2-00419-50			8-2-00419-42		
Blank ID	8-2-00419-42					
Instrument	8			8		
Report as	received			received		
TPH-Gasoline by mod.SW8015						
Prepared						
Analyzed	04/11/90	04/09/90	04/09/90	04/09/90		
Analyst	BSJ	BSJ	BSJ	BSJ		
File ID	A-2-00411-10	A-2-00409-19	A-2-00409-20	A-2-00409-1		
Blank ID	A-2-00411-1	A-2-00409-1	A-2-00409-1			
Instrument	A	A	A	A		
Report as	received	received	received	received		
TPH-Gasoline by mod.SW8015						
Prepared						
Analyzed				04/11/90		
Analyst				BSJ		
File ID				A-2-00411-1		
Blank ID						
Instrument				A		
Report as				received		

Appendix A

Comments, Notes and Definitions

General Comments
Sample #9004061130 contains an unidentified mid-boiling hydrocarbon. This was quantitated from a diesel standard and the result reported as an estimated value.

a ALL METHODS EXCEPT CLP
The results which are less than five times the method specified detection limit.
EXPLANATION
Uncertainty of the analysis will increase as the method detection limit is approached. These results should be considered approximate.

C ORGANIC CLP
pesticides require that single component results > 10ng/uL in the final extract be confirmed by GC/MS.
OTHER ORGANIC METHODS
This analysis has been confirmed on a second column or by GC/MS.
EXPLANATION
Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation.

G ALL ORGANIC GC METHODS EXCEPT CLP
Indicates an estimated GC value due to interferences.

ND ALL METHODS EXCEPT CLP
This flag is used to denote analytes which are not detected at or above the specified detection limit.
EXPLANATION
The value to the right of the < symbol is the method specified detection limit for the analyte.

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. The detection limits for EPA CLP (Contract Laboratory Program) methods are CRQLs (contract required quantitation limits) for organics and CRDLs (contract required detection limits) for inorganics. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), reporting units, use of cleanup procedures, or dilution of extracts/digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -	ug/L	micrograms per liter (parts per billion);liquids/water
	ug/kg	micrograms per kilogram (parts per billion); soils/solids
	ug/M3	micrograms per cubic meter; air samples
	mg/L	milligrams per liter (parts per million);liquids/water
	mg/kg	milligrams per kilogram (parts per million);soils/solids
	%	percent; usually used for percent recovery of QC standards
	uS/cm	conductance unit; microSiemans/centimeter
	mL/hr	milliliters per hour; rate of settlement of matter in water
	NTU	turbidity unit; nephelometric turbidity unit
	CU	color unit; equal to 1 mg/L of chloroplatinate salt

Geoscience Consultants, Ltd.

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(714) 724-0536

☐ Las Cruces
P.O. Drawer MM
Las Cruces, NM 88004
(505) 524-5364

№ 3460

Chain of Custody

DATE 04/06/90 PAGE 1 OF 1

LAB NAME Radian Analytical
ADDRESS 10395 Old Placerville
Sacramento
TELEPHONE
SAMPLERS (SIGNATURE) D N

ANALYSIS REQUEST

SAMPLE NUMBER	MATRIX	LOCATION	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418.1	TPH MODIFIED 8015		PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX METALS (8)	SDWA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE				NUMBER OF CONTAINERS
9004061130	H2O	MW 8										X	X										
9004061135	H2O												X										
TRIP BLANK	H2O												X										

PROJECT INFORMATION

PROJECT: ~~AA~~ PHILLIPS
PROJECT DIRECTOR M. Nee
CHARGE CODE NO. 439000
SHIPPING ID. NO. 6211869650
VIA Fed X

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS	7
CHAIN OF CUSTODY SEALS	Yes
REC'D GOOD CONDITION/COLD	Yes
CONFORMS TO RECORD	Yes

LAB NO. 50-04-077,78

SPECIAL INSTRUCTIONS/COMMENTS:
Rec'd @ 6°C

RELINQUISHED BY 1.
D Nee
(Signature) (Time) 1200
(Printed Name) DAVID NEE (Date) 04/06/90
(Company) GCL

RELINQUISHED BY 2.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RELINQUISHED BY 3.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY 1.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY 2.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY) 3.
R. Ristow /7/9 4:35
(Signature) (Time)
R. RISTOW
(Printed Name)
RADIAN
(Company)

DISTRIBUTION: WHITE, CANARY - LABORATORY • PINK - GEOSCIENCE CONSULTANTS, LTD.

GEOSCIENCE CONSULTANTS, LTD. RECEIVED APR 2 7 1990

RADIAN
CORPORATION

RECEIVED MAY 1 1990

Radian Work Order S0-04-075

Analytical Report
04/30/90

Geoscience Consultants,Ltd.

Geoscience Consultants, Ltd.
500 Copper N.W. Ste 200
Albuquerque, NM., 87102
(505) 842-0595
Sample Manager

Customer Work Identification TPH COC:3461
Purchase Order Number

Contents:

Radian Analytical Services
10395 Old Placerville Road
Sacramento, CA 95827

916-362-5332

Client Services Coordinator: LWKELLY

Certified by: Rand HVale

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-075

Method:TPH-Diesel by mod. SW8015 (1)
List:Complete analyte list

Sample ID:	9004031400		9004031600 ✓		900404140 ✓		REAGENT BLANK	
Factor:	1		0.95		1		1	
Results in:	ug/L		ug/L		ug/L		ug/L	
	01A		02A		03A		04A	
Matrix:	water		water		water		water	
	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Diesel (2)	5600 G	50	200 G@	48	240 G@	50	ND	50
Jet fuel (2)	ND	100	ND	95	ND	100	ND	100
Kerosene (2)	ND	100	ND	95	ND	100	ND	100
Lubricating oil (2)	ND	100	ND	95	ND	100	ND	100

G Indicates an estimated GC value due to interferences.

ND Not detected at specified detection limit

@ Est. result less that 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

(2) Extraction By SW3520 (continuous liquid/liquid) or SW3550 (sonication) followed by GC analysis with FID detectors.

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-075

Method:TPH-Gasoline by mod.SW8015 (1)
List:Gasoline and BTEX list

Sample ID:	9004031400	9004031600	900404140	REAGENT BLANK
Factor:	1	50	10	1
Results in:	ug/L	ug/L	ug/L	ug/L
	01B	02B	03B	04A
Matrix:	water	water	water	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	ND	0.30	6100 C	15	2600 C	3.0	ND	0.30
Ethylbenzene (2)	ND	0.30	360 C	15	320 C	3.0	ND	0.30
Gasoline (2)	1600 G	50	440000	2500	160000	500	ND	50
Toluene (2)	ND	0.30	3900 C	15	580 C	3.0	ND	0.30
Xylenes (total) (2)	ND	0.50	260 C	25	190 C	5.0	ND	0.50

ND Not detected at specified detection limit
C Confirmed on second column or by GC/MS

G Indicates an estimated GC value due to interferences.

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) SW5030 (purge & trap) followed by GC analysis with PID/
FID detectors.

Analytical Data Summary

Geoscience Consultants,Ltd.
Radian Work Order: S0-04-075

Method:TPH-Gasoline by mod.SW8015 (1)
List:Gasoline and BTEX list

Sample ID:	REAGENT BLANK
Factor:	1
Results in:	ug/L
	04B
Matrix:	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene (2)	ND	0.30						
Ethylbenzene (2)	ND	0.30						
Gasoline (2)	ND	50						
Toluene (2)	ND	0.30						
Xylenes (total) (2)	ND	0.50						

ND Not detected at specified detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.
(2) SW5030 (purge & trap) followed by GC analysis with PID/
FID detectors.

RADIAN CORPORATION

Sample History

Geoscience Consultants, Ltd.
Radian Work Order: SO-04-075

Sample Identifications and Dates

Sample ID	9004031400	9004031600	900404140	REAGENT BLANK		
Date Sampled	04/04/90	04/04/90	04/04/90			
Date Received	04/06/90	04/06/90	04/06/90	04/06/90		
Matrix	water	water	water	water		
	01	02	03	04		
TPH-Diesel by mod. SW8015						
Prepared	04/11/90	04/11/90	04/11/90	04/11/90		
Analyzed	04/19/90	04/19/90	04/19/90	04/19/90		
Analyst	JM	JM	JM	JM		
File ID	820041947	820041948	820041949	820041942		
Blank ID	820041942	820041942	820041942			
Instrument	8	8	8	8		
Report as	received	received	received	received		
TPH-Gasoline by mod.SW8015						
Prepared						
Analyzed	04/08/90	04/09/90	04/09/90	04/08/90		
Analyst	BSJ	BSJ	BSJ	BSJ		
File ID	A20040814	A20040917	A20040816	A2004081		
Blank ID	A2004081	A2004091	A2004081			
Instrument	A	A	A	A		
Report as	received	received	received	received		
TPH-Gasoline by mod.SW8015						
Prepared						
Analyzed				04/09/90		
Analyst				BSJ		
File ID				A2004091		
Blank ID						
Instrument				A		
Report as				received		

Appendix A

Comments, Notes and Definitions

Geoscience Consultants, Ltd.
Radian Work Order: S0-04-075

Diesel samples #9004031400,9004031600 and 900404140 contain unidentifed mid-boiling hydrocarbons. These were quanitated on a diesel standard and are reported as estimated values.

BTXE/Gas sample #90040031400 reported as estimate value because the profile did not match the gasoline standard.

a	ALL METHODS EXCEPT CLP The results which are less than five times the method specified detection limit. EXPLANATION Uncertainty of the analysis will increase as the method detection limit is approached. These results should be considered approximate.
C	ORGANIC CLP pesticides require that single component results > 10ng/uL in the final extract be confirmed by GC/MS. OTHER ORGANIC METHODS This analysis has been confirmed on a second column or by GC/MS. EXPLANATION Most methods of analysis by gas chromatography recommend reanalysis on a second column of dissimilar phase to resolve compounds of interest from interferences that may occur and for analyte confirmation.
G	ALL ORGANIC GC METHODS EXCEPT CLP Indicates an estimated GC value due to interferences.
ND	ALL METHODS EXCEPT CLP This flag is used to denote analytes which are not detected at or above the specified detection limit. EXPLANATION The value to the right of the < symbol is the method specified detection limit for the analyte.

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. The detection limits for EPA CLP (Contract Laboratory Program) methods are CRQLs (contract required quantitation limits) for organics and CRDLs (contract required detection limits) for inorganics. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), reporting units, use of cleanup procedures, or dilution of extracts/ digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -	ug/L	micrograms per liter (parts per billion);liquids/water
	ug/kg	micrograms per kilogram (parts per billion); soils/solids
	ug/M3	micrograms per cubic meter; air samples
	mg/L	milligrams per liter (parts per million);liquids/water
	mg/kg	milligrams per kilogram (parts per million);soils/solids
	%	percent; usually used for percent recovery of QC standards
	uS/cm	conductance unit; microSiemans/centimeter
	mL/hr	milliliters per hour; rate of settlement of matter in water
	NTU	turbidity unit; nephelometric turbidity unit
	CU	color unit; equal to 1 mg/L of chloroplatinate salt

Geoscience Consultants, Ltd.

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(714) 724-0536

☐ Las Cruces
P.O. Drawer MM
Las Cruces, NM 88004
(505) 524-5364

No 3461

Chain of Custody

DATE 04/04/90 PAGE 1 OF 1

LAB NAME RADIAN ANALYTICAL
ADDRESS 10395 Old placerville Rd
Sacramento, CA 95827
TELEPHONE
SAMPLERS (SIGNATURE)

ANALYSIS REQUEST

SAMPLE NUMBER	MATRIX	LOCATION	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418.1	TPH MODIFIED 8015		PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX METALS (8)	SDWA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE				NUMBER OF CONTAINERS
900403140D	H2O	MW 6										X	X										
9004031600	H2O	MW7										X	X										
900404140	H2O	RW1										X	X										

PROJECT INFORMATION

PROJECT: PHILLIPS
PROJECT DIRECTOR M. NEE
CHARGE CODE NO. 349-000
SHIPPING ID. NO. 8211869683
VIA FED X

SAMPLE RECEIPT

TOTAL NO. OF CONTAINERS	9
CHAIN OF CUSTODY SEALS	yes
REC'D GOOD CONDITION/COLD	yes
CONFORMS TO RECORD	yes

LAB NO. 90-04-075
90-04-076

RELINQUISHED BY 1.
(Signature) (Time) DAVID NEE 1800
(Printed Name) (Date) GCL 04/04/90
(Company)

RELINQUISHED BY 2.
(Signature) (Time) Tim Kersh 4-5-90
(Printed Name) (Date) GCL
(Company)

RELINQUISHED BY 3.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY 1.
Timothy H Kersh 0845
(Signature) (Time) Tim Kersh 4-5-90
(Printed Name) GCL (Date)
(Company)

RECEIVED BY 2.
(Signature) (Time)
(Printed Name) (Date)
(Company)

RECEIVED BY (LABORATORY) 3.
R. Ristow 4/7
(Signature) (Time) R. RISTOW
(Printed Name) RADIAN
(Company)

SPECIAL INSTRUCTIONS/COMMENTS:
Rec'd @ 3°C

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RADIAN
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Radian Work Order 90-03-105

Analytical Report
03/16/90

Phillips Petroleum

Phillips Petroleum
4001 Penbrook
Odessa, TX 79762

Michael D. Ford

Customer Work Identification Lee Screen
Purchase Order Number

Contents:

Radian Analytical Services
8501 Mo-Pac Boulevard
P. O. Box 201088
Austin, TX 78720-1088

512/454-4797

Client Services Coordinator: LABENDELE

Certified by:

Phillips Petroleum
Radian Work Order: 90-03-105

Method:Volatile aromatics (1)
List:BTEX

Sample ID:	MW-1		MW-2		MW-3		WS-1	
Factor:	1		1		1		1	
Results in:	ug/L		ug/L		ug/L		ug/L	
	01A		02A		03A		04A	
Matrix:	water		water		water		water	
	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene	4.1	0.20	ND	0.20	69	0.20	15	0.20
Ethylbenzene	ND	0.20	ND	0.20	1.9	0.20	4.3	0.20
Toluene	0.26 *	0.20	ND	0.20	1.4	0.20	1.8	0.20
Total xylenes	ND	0.20	ND	0.20	1.1	0.20	4.1	0.20
Surrogate Recovery(%)								
1-Bromo-4-fluorobenzene	98		110		102		104	
Control Limits: 76 to 140								

ND Not detected at specified detection limit

* Est. result less than 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

Phillips Petroleum
Radian Work Order: 90-03-105

Method:Volatile aromatics (1)
List:BTEX

Sample ID:	WS-2	Trip Blank	Reagent Blank
Factor:	1	1	1
Results in:	ug/L	ug/L	ug/L
	05A	06A	07A
Matrix:	water	water	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene	7.1	0.20	ND	0.20	ND	0.20		
Ethylbenzene	ND	0.20	ND	0.20	ND	0.20		
Toluene	0.97 *	0.20	0.27 *	0.20	ND	0.20		
Total xylenes	ND	0.20	ND	0.20	ND	0.20		
Surrogate Recovery(%)								
1-Bromo-4-fluorobenzene	98		96		105			
Control Limits: 76 to 140								

ND Not detected at specified detection limit

* Est. result less than 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

Sample History

Phillips Petroleum
Radian Work Order: 90-03-105

Sample Identifications and Dates

Sample ID	MW-1	MW-2	MW-3	WS-1	WS-2	Trip Blank
Date Sampled	03/07/90	03/07/90	03/07/90	03/07/90	03/07/90	
Date Received	03/09/90	03/09/90	03/09/90	03/09/90	03/09/90	03/09/90
Matrix	water	water	water	water	water	water
	01	02	03	04	05	06
Volatile aromatics						
Prepared						
Analyzed	03/15/90	03/12/90	03/15/90	03/15/90	03/15/90	03/15/90
Analyst	BM	BM	BM	BM	BM	BM
File ID	dd031517	dd03129	dd031516	dd031518	dd031515	dd031519
Blank ID						
Instrument	d	d	d	d	d	d
Report as	received	received	received	received	received	received

Sample History

Phillips Petroleum
Radian Work Order: 90-03-105

Sample Identifications and Dates

Sample ID	Reagent Blank						
Date Sampled							
Date Received	03/09/90						
Matrix	water						
	07						
Volatile aromatics							
Prepared							
Analyzed	03/15/90						
Analyst	JB						
File ID	dd03155						
Blank ID							
Instrument	d						
Report as	received						

Appendix A

Comments, Notes and Definitions

General Comments
M-xylene and chlorobenzene coelute.

Notes and Definitions

ND This flag (or <) is used to denote analytes which are not detected at or above the specified detection limit. The value to the right of the < symbol is the method specified detection limit for the sample.

* The asterisk(*) is used to flag results which are less than five times the method specified detection limit. Studies have shown that the uncertainty of the analysis will increase exponentially as the method detection limit is approached. These results should be considered approximate.

Notes and Definitions

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

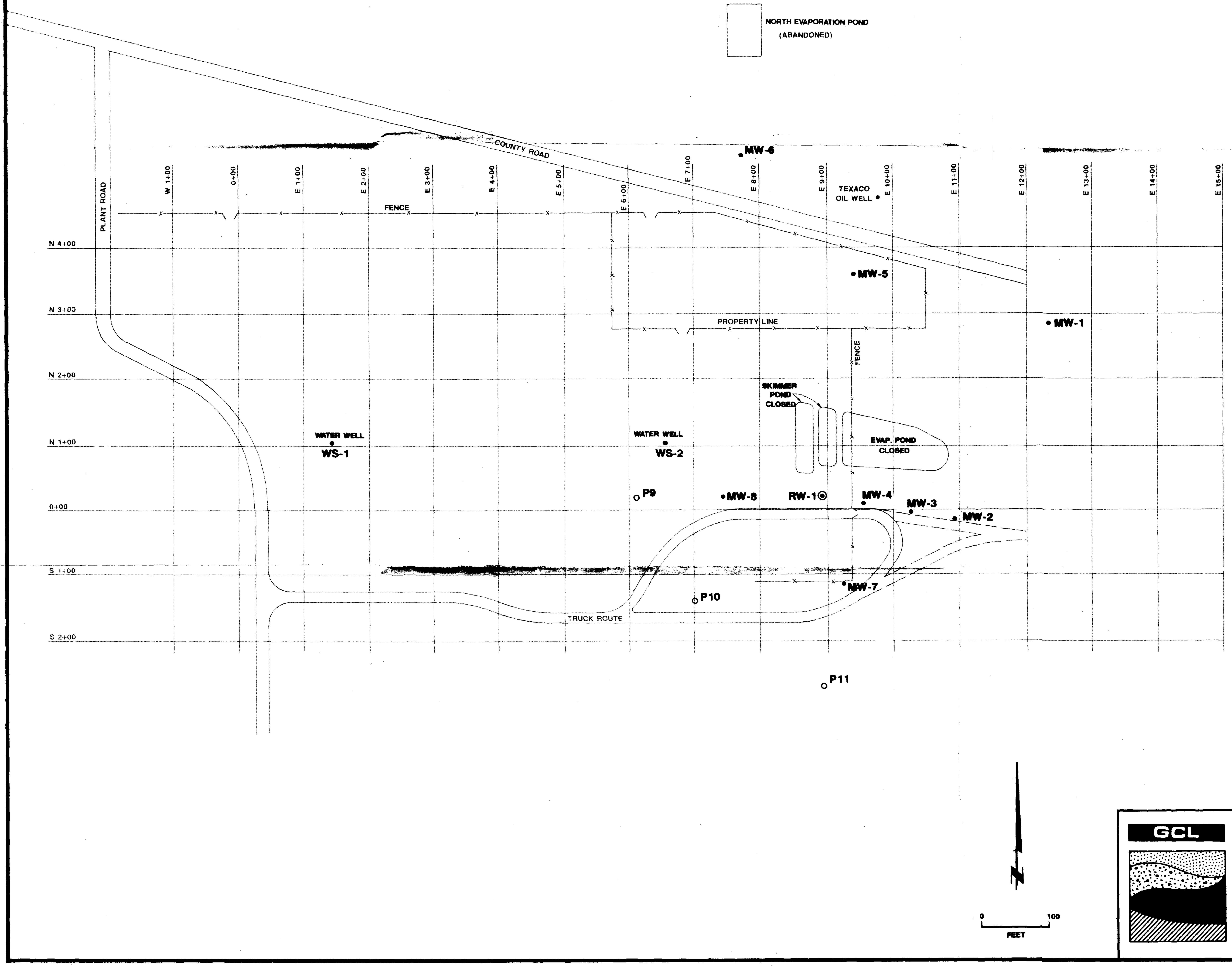
EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), use of cleanup procedures, or dilution of extracts/ digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -	ug/L	micrograms per liter (parts per billion);liquids/water
	ug/Kg	micrograms per kilogram (parts per billion); soils/solids
	ug/M3	micrograms per cubic meter; air samples
	mg/L	milligrams per liter (parts per million);liquids/water
	mg/Kg	milligrams per kilogram (parts per million);soils/solids
	%	percent; usually used for percent recovery of QC standards
	uS/cm	conductance unit; microSiemans/centimeter
	mL/hr	milliliters per hour; rate of settlement of matter in water
	NTU	turbidity unit; nephelometric turbidity unit
	CU	color unit; equal to 1 mg/L of chloroplatinate salt



LEGEND

● MONITOR WELL

◉ RECOVERY WELL

○ PROPOSED MONITOR WELL

GCL

PLATE 1
MONITOR WELL LOCATION MAP LEE PLANT

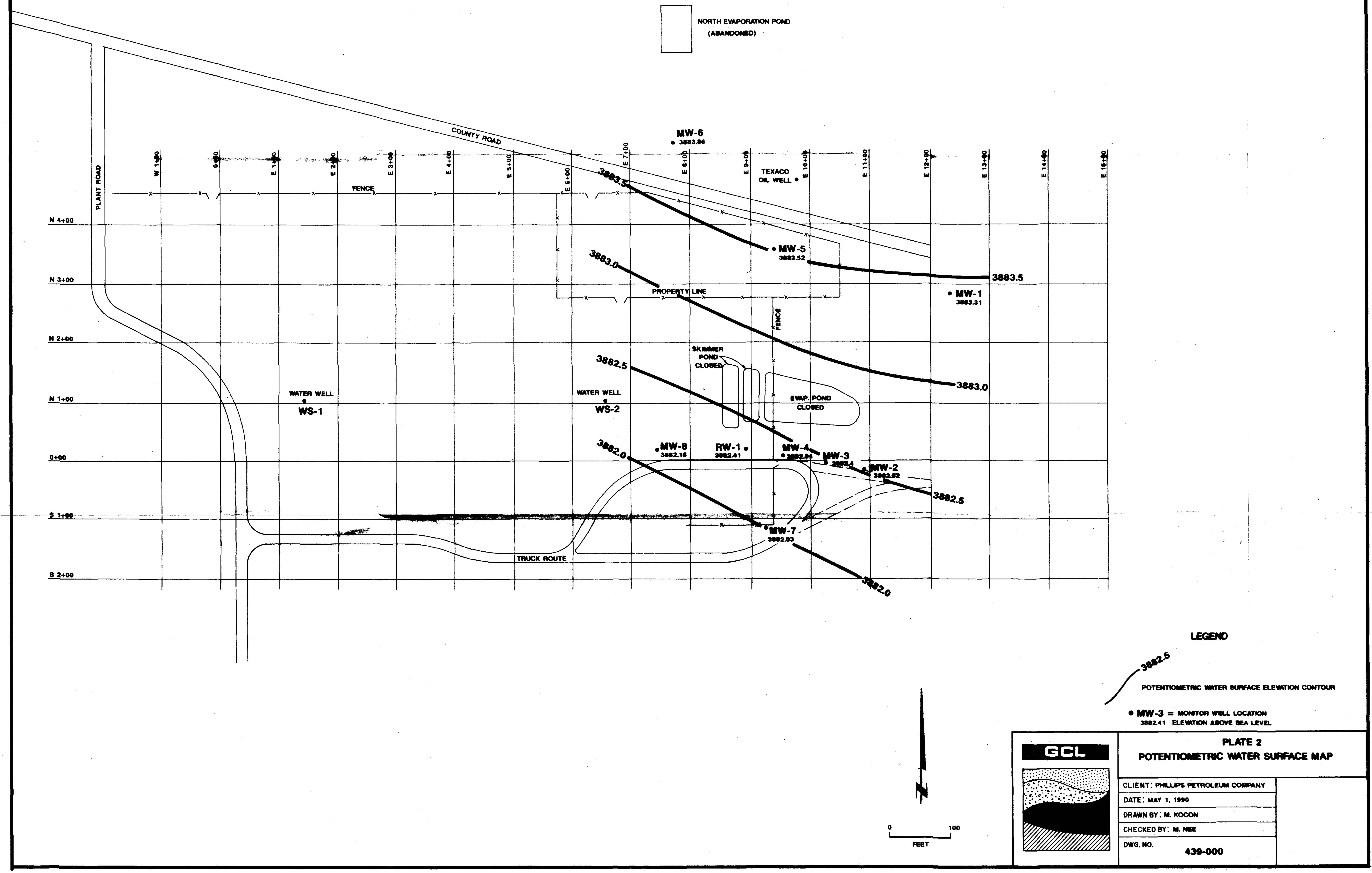
CLIENT: PHILLIPS PETROLEUM COMPANY

DATE: MAY 1, 1990

DRAWN BY: M. KOCON

CHECKED BY: M. NEE

DWG. NO. 439-000



GCL

PLATE 2
POTENTIOMETRIC WATER SURFACE MAP

CLIENT: PHILLIPS PETROLEUM COMPANY	
DATE: MAY 1, 1990	
DRAWN BY: M. KOCON	
CHECKED BY: M. NEE	
DWG. NO. 439-000	

PHILLIPS PETROLEUM COMPANY
BARTLESVILLE, OKLAHOMA 74004

QUALITY, ENVIRONMENT AND SAFETY

'90 MAY 18 AM 8 47

May 16, 1990

Requested Information
Groundwater Remediation Action
Lee Gasoline Plant
Discharge Plan No. GWR-2

REGISTERED MAIL
RETURN RECEIPT NO. P-06

Mr. William C. Olson
New Mexico Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87504

Dear Mr. Olson:

We received your letters containing requirements and requesting additional information regarding the groundwater remediation action at our Lee Plant. A list of the items contained in your letters with our responses follows:

1. Water levels must be measured prior to all samplings to determine hydraulic gradient.

Response: Water levels have been measured in the monitor wells prior to each sampling event. Attachment 1 contains a table which shows the water elevation data to date. Water level data for the additional monitoring/recovery wells recently installed will be provided in the technical report.

2. A plot plan is to be submitted that includes the monitor well locations, and that includes the evaporation pond and other topographic features immediately north of the plant.

Response: A plot plan which shows the above mentioned features has been provided to your office. This plot plan will be updated to show the location of the additional monitoring/recovery wells recently installed. The updated plot plan will be provided in the technical report detailing installation of the additional wells.

3. Plant water well #2 is to be sampled after purging sufficient water to obtain a representative aquifer sample. Information as to depth, construction details, screen placement, etc., shall be provided in the May 30th technical report.

Response: Plant water well #2 was purged of 3 casing volumes of water and sampled on 3/7/90. Samples were analyzed for benzene, ethylbenzene, toluene and total xylenes. The results of these samples are contained in Attachment 2. It should be noted the existing monitor wells and plant water well #1 were also sampled at this time for the same constituents. These analyses are also contained in Attachment 2.

Plant water well #2 was installed in 1944. The drillers log for this well indicates caliche from the surface to a depth of 24 feet and sand from a depth of 24 feet to the total depth of the well (147 feet). The total depth of the well at the time of the recent sampling was measured at 140 feet. Depth to water was 97.5 feet. The well is constructed of 8" steel casing. There was no information available in our files regarding the wells screened length or screened interval.

4. Analysis results from sampling of the plant water wells from November, 1988, to the present shall be provided to the OCD.

Response: All analyses from sampling of the plant water wells from November, 1988, to the present are contained in Attachment 3.

5. Please provide the OCD a copy of the following documents that were produced pursuant to investigations that Phillips performed as required by the New Mexico Environmental Improvement Division (NMEID):

   A. July 24, 1984, "Report of Samples Taken at Phillips Lee".

   B. July 24, 1984, "Geology Report".

   C. July 30, 1984, "Chemical and Physical Analyses for Water Samples".

   D. The results of the September 1988 Soil Vapor Survey.

Response: The information contained in the above named documents is available in the Closure & Post-Closure Plan Sampling & Analysis Report submitted to the NMEID for this facility. A copy of this report is found in Attachment 4. A copy of the September 1988 Soil Vapor Survey report is found in Attachment 5.

6. Please provide the OCD with any documentation of the presence of free-phase hydrocarbons in the saturated zone underlying the facility. The work plan states on page 1 that "the results of the initial investigation indicated that both free-phase and dissolved phase hydrocarbons occurred in the saturated zone beneath the site". Although OCD files contain the results of water quality analyses showing the presence of dissolved phase hydrocarbons in groundwater samples from Phillips monitor wells, no documentation can be found regarding the presence of free-phase hydrocarbons.

Response: During the drilling of the second set of monitor wells required by the NMEID, we discovered some free-phase hydrocarbon material in what was to be the upgradient well. We secured a sample of this hydrocarbon material for analysis and then plugged the well since it could not be used for upgradient monitoring purposes. Mr. Dave Boyer of your office was then notified in a letter dated August 11, 1988 of a discharge of hydrocarbon material to the uppermost aquifer at Lee Plant. A copy of the analysis of this hydrocarbon material is found in Attachment 6.

Free-phase hydrocarbon material was also discovered in the No. 4 monitoring well at the site during sampling conducted on 3/7/90. Mr. Roger Anderson of your office was notified by phone the same date of this problem. Analysis of the hydrocarbon material from the No. 4 monitoring well is found in Attachment 7.

7. Please provide the OCD with documentation about the modified EPA Method 8015 analytical technique.

Response: Documentation regarding the modified EPA Method 8015 analytical technique will be provided in the technical report.

We appreciate your cooperation in this matter. If you should have any questions regarding this information, please contact me at (918) 661-0478.

Very truly yours,

Michael D. Ford

Michael D. Ford
Environmental Scientist

MDF:LEEGWREM

Attachments

cc: Mr. Mike Selke - GCL, Albuquerque

ATTACHMENT 1

Groundwater Monitor Wells

Static Water Levels

Plant LEE

monitor well Number	MW-1	MW-2	MW-3	MW-4			
Elev. to top of casing (2")	3979.27	3980.59	3980.37	3980.29			
8/29/88	3884.69	3883.77	3883.75	3883.75			
10/31/88	3884.43	3883.57	3883.56	3883.57			
1/30/89	3885.24	3883.52	3883.50	3883.51			
3/7/90	3883.49	3882.81	3882.79	3883.72			

ATTACHMENT 2

RADIAN
CORPORATION

Radian Work Order 90-03-105

Analytical Report
03/16/90

Phillips Petroleum

Phillips Petroleum
4001 Penbrook
Odessa, TX 79762

Michael D. Ford

Customer Work Identification Lee Screen
Purchase Order Number

Contents:

Radian Analytical Services
8501 Mo-Pac Boulevard
P. O. Box 201088
Austin, TX 78720-1088

512/454-4797

Client Services Coordinator: LABENDELE

Certified by: ______________________

RADIAN
CORPORATION

Analytical Data Summary

Phillips Petroleum
Radian Work Order: 90-03-105

Method:Volatile aromatics (1)
List:BTEX

Sample ID:	MW-1	MW-2	MW-3	~~WS-1~~ DW-1
Factor:	1	1	1	1
Results in:	ug/L	ug/L	ug/L	ug/L
	01A	02A	03A	04A
Matrix:	water	water	water	water

	MW-1 Result	MW-1 Det. Limit	MW-2 Result	MW-2 Det. Limit	MW-3 Result	MW-3 Det. Limit	DW-1 Result	DW-1 Det. Limit
Benzene	4.1	0.20	ND	0.20	69	0.20	15	0.20
Ethylbenzene	ND	0.20	ND	0.20	1.9	0.20	4.3	0.20
Toluene	0.26 *	0.20	ND	0.20	1.4	0.20	1.8	0.20
Total xylenes	ND	0.20	ND	0.20	1.1	0.20	4.1	0.20
Surrogate Recovery(%)								
1-Bromo-4-fluorobenzene	98		110		102		104	
Control Limits: 76 to 140								

ND Not detected at specified detection limit

* Est. result less than 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

Phillips Petroleum
Radian Work Order: 90-03-105

Method:Volatile aromatics (1)
List:BTEX

	DW-2		
Sample ID:	W6-2	Trip Blank	Reagent Blank
Factor:	1	1	1
Results in:	ug/L	ug/L	ug/L
	05A	06A	07A
Matrix:	water	water	water

	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit	Result	Det. Limit
Benzene	7.1	0.20	ND	0.20	ND	0.20		
Ethylbenzene	ND	0.20	ND	0.20	ND	0.20		
Toluene	0.97 *	0.20	0.27 *	0.20	ND	0.20		
Total xylenes	ND	0.20	ND	0.20	ND	0.20		
Surrogate Recovery(%)								
1-Bromo-4-fluorobenzene	98		96		105			
Control Limits: 76 to 140								

ND Not detected at specified detection limit

* Est. result less than 5 times detection limit

(1) For a detailed description of flags and technical terms in this report refer to Appendix A in this report.

RADIAN
CORPORATION

Phillips Petroleum
Radian Work Order: 90-03-105

Sample History

Sample Identifications and Dates

Sample ID	MW-1	MW-2	MW-3	DW-1 W6-1	DW-2 W6-2	Trip Blank
Date Sampled	03/07/90	03/07/90	03/07/90	03/07/90	03/07/90	
Date Received	03/09/90	03/09/90	03/09/90	03/09/90	03/09/90	03/09/90
Matrix	water	water	water	water	water	water
	01	02	03	04	05	06
Volatile aromatics						
Prepared						
Analyzed	03/15/90	03/12/90	03/15/90	03/15/90	03/15/90	03/15/90
Analyst	BM	BM	BM	BM	BM	BM
File ID	dd031517	dd03129	dd031516	dd031518	dd031515	dd031519
Blank ID						
Instrument	d	d	d	d	d	d
Report as	received	received	received	received	received	received

Phillips Petroleum
Radian Work Order: 90-03-105

Sample Identifications and Dates

Sample ID	Reagent Blank					
Date Sampled						
Date Received	03/09/90					
Matrix	water					
	07					
Volatile aromatics						
Prepared						
Analyzed	03/15/90					
Analyst	JB					
File ID	dd03155					
Blank ID						
Instrument	d					
Report as	received					

Appendix A

Comments, Notes and Definitions

General Comments

M-xylene and chlorobenzene coelute.

ND This flag (or <) is used to denote analytes which are not detected at or above the specified detection limit. The value to the right of the < symbol is the method specified detection limit for the sample.

* The asterisk(*) is used to flag results which are less than five times the method specified detection limit. Studies have shown that the uncertainty of the analysis will increase exponentially as the method detection limit is approached. These results should be considered approximate.

TERMS USED IN THIS REPORT:

Analyte - A chemical for which a sample is to be analyzed. The analysis will meet EPA method and QC specifications.

Compound - See Analyte.

Detection Limit - The method specified detection limit, which is the lower limit of quantitation specified by EPA for a method. Radian staff regularly assess their laboratories' method detection limits to verify that they meet or are lower than those specified by EPA. Detection limits which are higher than method limits are based on experimental values at the 99% confidence level. Note, the detection limit may vary from that specified by EPA based on sample size, dilution or cleanup. (Refer to Factor, below)

EPA Method - The EPA specified method used to perform an analysis. EPA has specified standard methods for analysis of environmental samples. Radian will perform its analyses and accompanying QC tests in conformance with EPA methods unless otherwise specified.

Factor - Default method detection limits are based on analysis of clean water samples. A factor is required to calculate sample specific detection limits based on alternate matrices (soil or water), use of cleanup procedures, or dilution of extracts/ digestates. For example, extraction or digestion of 10 grams of soil in contrast to 1 liter of water will result in a factor of 100.

Matrix - The sample material. Generally, it will be soil, water, air, oil, or solid waste.

Radian Work Order - The unique Radian identification code assigned to the samples reported in the analytical summary.

Units -	ug/L	micrograms per liter (parts per billion);liquids/water
	ug/Kg	micrograms per kilogram (parts per billion); soils/solids
	ug/M3	micrograms per cubic meter; air samples
	mg/L	milligrams per liter (parts per million);liquids/water
	mg/Kg	milligrams per kilogram (parts per million);soils/solids
	%	percent; usually used for percent recovery of QC standards
	uS/cm	conductance unit; microSiemans/centimeter
	mL/hr	milliliters per hour; rate of settlement of matter in water
	NTU	turbidity unit; nephelometric turbidity unit
	CU	color unit; equal to 1 mg/L of chloroplatinate salt

ATTACHMENT 3

Page 1 RAS - Austin REPORT Work Order # 89-06-148
Received: 06/15/89 06/19/89 17:11:43

REPORT TO Phillips Petroleum
Radian
Bl.1
Austin
ATTEN Linda Bendele

PREPARED BY Radian Analytical Services
8501 Mo-pac Bl.
Box 201088
Austin, TX 78720-1088
ATTEN
PHONE 512-454-4797

CERTIFIED BY
CONTACT LABENDELE

CLIENT PHILLIPS P SAMPLES 5

COMPANY Phillips Petroleum
FACILITY Odessa, TX

P-xylene and chlorobenzene coelute.

WORK ID BTEX
TAKEN MF
TRANS UPS
TYPE
INVOICE under separate cover

SAMPLE IDENTIFICATION
01 DW-1 OR WS-1
02 DW-3 or WS-3
03 DW-4 or WS-4
04 trip blank
05 reagent blank

TEST CODES and NAMES used on this report
802SWN00 Halogenated aromatics

Received: 06/15/89
Results by Sample

SAMPLE ID DW-1 or WS-1 FRACTION 01A TEST CODE 802SWN00 NAME Halogenated aromatics (1)
LIST
Date & Time Collected 06/13/89 Category

Analyst BM Date Prepared File ID VER dmv
Instrument d Date Analyzed 06/15/89 Blank ID Units ug/L
Matrix water Factor 1 Report as received

Alt ID	ANALYTE	Result	Det Lim	Factor
71-43-2	Benzene	15	0.20	1
108-90-7	Chlorobenzene	<0.20	0.20	1
95-50-1	1,2-Dichlorobenzene	<0.40	0.40	1
541-73-1	1,3-Dichlorobenzene	<0.40	0.40	1
106-46-7	1,4-Dichlorobenzene	<0.30	0.30	1
100-41-4	Ethylbenzene	1.1	0.20	1
108-88-3	Toluene	1.1	0.20	1
1330-20-7	Total xylenes	1.0	0.20	1

Surrogates	% Recovery	Surrogate Limits
1-Bromo-4-fluorobenzene	99	76 - 140

(1) See Appendix A for glossary of report and data flag definitions

Received: 06/15/89

RAS - Austin REPORT
Results by Sample

Work Order # 89-06-148

SAMPLE ID DW-3 or WS-3

FRACTION 02A

TEST CODE 802SWN00

NAME Halogenated aromatics (1)

LIST

Date & Time Collected 06/13/89

Category

Analyst	BM	Date Prepared		File ID		VER	dmv
Instrument	d	Date Analyzed	06/15/89	Blank ID		Units	ug/L
Matrix	water	Factor	1	Report as	received		

Alt ID	ANALYTE	Result	Det Lim	Factor
71-43-2	Benzene	<0.20	0.20	1
108-90-7	Chlorobenzene	<0.20	0.20	1
95-50-1	1,2-Dichlorobenzene	<0.40	0.40	1
541-73-1	1,3-Dichlorobenzene	<0.40	0.40	1
106-46-7	1,4-Dichlorobenzene	<0.30	0.30	1
100-41-4	Ethylbenzene	<0.20	0.20	1
108-88-3	Toluene	<0.20	0.20	1
1330-20-7	Total xylenes	<0.20	0.20	1

Surrogates	% Recovery	Surrogate Limits
1-Bromo-4-fluorobenzene	98	76 - 140

(1) See Appendix A for glossary of report and data flag definitions

RAS - Austin REPORT Work Order # 89-06-148

Received: 06/15/89

Results by Sample

SAMPLE ID DW-4 or WS-4 FRACTION 03A TEST CODE 802SWN00 NAME Halogenated aromatics (1)

LIST

Date & Time Collected 06/13/89 Category

Analyst	BM	Date Prepared		File ID		VER	dmv
Instrument	d	Date Analyzed	06/15/89	Blank ID		Units	ug/L
Matrix	water	Factor	1	Report as	received		

Alt ID	ANALYTE	Result	Det Lim	Factor
71-43-2	Benzene	19	0.20	1
108-90-7	Chlorobenzene	<0.20	0.20	1
95-50-1	1,2-Dichlorobenzene	<0.40	0.40	1
541-73-1	1,3-Dichlorobenzene	<0.40	0.40	1
106-46-7	1,4-Dichlorobenzene	<0.30	0.30	1
100-41-4	Ethylbenzene	<0.20	0.20	1
108-88-3	Toluene	<0.20	0.20	1
1330-20-7	Total xylenes	<0.20	0.20	1

Surrogates	% Recovery	Surrogate Limits
1-Bromo-4-fluorobenzene	99	76 - 140

(1) See Appendix A for glossary of report and data flag definitions

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

DSS
Wex

88-1935-C

REPORT TO:
MIKE FORD
PHILLIPS PETROLEUM CO.
4001 PENBROOK ROOM 443
★ ODESSA, TX. 79762

S.L.D. No. OR-
DATE REC. 11/22/88
PRIORITY III
PHONE(S): (915) 367-1316

COLLECTION CITY: PHILLIPS PETROLEUM BUCKEYE PLANT; COUNTY: LEA

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 8 8 1 1 1 5 1 1 1 5

LOCATION CODE: (Township-Range-Section-Tracts) 17S + 35E + 30 + (10N06E24342)

USER CODE: 6 2 0 0 0 SUBMITTER: M. WEBER CODE:

SAMPLE TYPE: WATER ☑, SOIL ☐, FOOD ☐, OTHER:

This form accompanies ____ Septum Vials, 2 Glass Jugs, and/or

Samples were preserved as follows:

- ☐ NP: No Preservation; Sample stored at room temperature.
- ☑ P-Ice Sample stored in an ice bath (Not Frozen).
- ☐ P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
- ☐ P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☐ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes
- ☐ (774) SDWA VOC's I (8 Regulated +)
- ☐ (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- ☐
- ☐

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☑ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

Remarks: BENZENE SUSPECTED

★ BILL PHILLIPS - CC: RESULTS TO ROSWELL EID

FIELD DATA:

pH=____; Conductivity=____ umho/cm at ____ °C; Chlorine Residual=____ mg/l

Dissolved Oxygen=____ mg/l; Alkalinity=____ mg/l; Flow Rate ____ ____/____

Depth to water ____ ft.; Depth of well ____ ft.; Perforation Interval ____-____ ft.; Casing:

Sampling Location, Methods and Remarks (i.e. odors, etc.) WS-1

PHILLIPS BUCKEYE SITE WELL # 1 SAMPLE TAKEN FROM TAP AT WELLHEAD

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): Weber Method of Shipment to the Lab: UPS

CHAIN OF CUSTODY

I certify that this sample was transferred from ____ to ____

at (location) ____ on ____/____/____ - ____:____ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

Signatures ____ ____

ANALYSES PERFORMED

LAB. No.: CR- 1935

THIS PAGE FOR LABORATORY RESULTS ONLY

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

☐ (753) Aliphatic Headspace (1-5 Carbons)
☐ (754) Aromatic & Halogenated Purgeables
☐ (765) Mass Spectrometer Purgeables
☐ (766) Trihalomethanes
☐ (774) SDWA VOC's I (8 Regulated +)
☐ (775) SDWA VOC's II (EDB & DBCP)
Other Specific Compounds or Classes
☐ ______
☐ ______

EXTRACTABLE SCREENS

☐ (751) Aliphatic Hydrocarbons
☑ (755) Base/Neutral Extractables
☐ (758) Herbicides, Chlorophenoxy acid
☐ (759) Herbicides, Triazines
☐ (760) Organochlorine Pesticides
☐ (761) Organophosphate Pesticides
☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
Base/Neutrals			
Gasoline MDL = 250	ND < 250		
Kerosene MDL = 250	ND < 250		
Diesel MDL = 250	ND < 250		
Lub oil MDL = 2500	ND < 2500		
PNA's MDL = 5	ND < 5		
other unusual B/N's MDL = 5	ND < 5		
PCB's MDL = 1000	ND < 1000		
Chlordane MDL = 1000	ND < 1000		
• DETECTION LIMIT • *		+ DETECTION LIMIT + †	

ABBREVIATIONS USED:

N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT
T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)
[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

A ml - 950   B - 925 ml

BORATORY REMARKS: ______

CERTIFICATE OF ANALYTICAL PERSONNEL

l(s) Not Sealed ☑ Intact: Yes ☐ No ☐. Seal(s) broken by: ______ date: ______
ertify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and
t the statements on this page accurately reflect the analytical results for this sample.
te(s) of analysis: 11/20/85. Analyst's signature: ______
ertify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.
viewers signature: ______

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

774
wp4

88-1938-C

REPORT TO:

MIKE FORD
PHILLIPS PETROLEUM CO.
4001 PENBROOK, ROOM 443
★ ODESSA, TX. 79762

S.L.D. No. OR-
DATE REC. 11/22/88
PRIORITY III
PHONE(S): (915) 367-1316

COLLECTION CITY: PHILLIPS PETROLEUM BUCKEYE SITE ; COUNTY: LEA

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 88 11 15 11 13

LOCATION CODE: (Township-Range-Section-Tracts) 17S + 35E + 30 + (10N06E24342)

USER CODE: 62000 SUBMITTER: M. WEBER CODE:

SAMPLE TYPE: WATER ☑, SOIL ☐, FOOD ☐, OTHER:

This form accompanies 2 Septum Vials, ____ Glass Jugs, and/or ____

Samples were preserved as follows:

- ☐ NP: No Preservation; Sample stored at room temperature.
- ☑ P-Ice Sample stored in an ice bath (Not Frozen).
- ☐ P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
- ☐ P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☐ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes
- ☑ (774) SDWA VOC's I (8 Regulated +)
- ☐ (775) SDWA VOC's II (EDB & DBCP)
- Other Specific Compounds or Classes
- ☐ ____
- ☐ ____

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☐ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

Remarks: BENZENE SUSPECTED
★ BILL PHILLIPS - cc: ROSWELL EID ON RESULTS

FIELD DATA:

pH=____; Conductivity=____ umho/cm at ____°C; Chlorine Residual=____ mg/l

Dissolved Oxygen=____ mg/l; Alkalinity=____ mg/l; Flow Rate____ ____/____

Depth to water ____ ft.; Depth of well____ ft.; Perforation Interval ____-____ ft.; Casing:____

Sampling Location, Methods and Remarks (i.e. odors, etc.) WS-1
PHILLIPS BUCKEYE SITE WELL # 1 SAMPLE TAKEN FROM TAP AT WELLHEAD

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): Mary Weber Method of Shipment to the Lab: UPS

CHAIN OF CUSTODY

I certify that this sample was transferred from ____ to ____
at (location) ____ on ___/___/___ - ___:___ and that the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

Signatures ____ ____

ANALYSES PERFORMED

LAB. No.: OR-

THIS PAGE FOR LABORATORY RESULTS ONLY

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☐ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes
- ☐ (774) SDWA VOC's I (8 Regulated +)
- ☐ (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- ☐ ______________________________
- ☐ ______________________________

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☐ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
* DETECTION LIMIT * *		+ DETECTION LIMIT + +	

ABBREVIATIONS USED:

N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT

T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)

[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

ABORATORY REMARKS: ______________________________

____

____

____

____

CERTIFICATE OF ANALYTICAL PERSONNEL

eal(s) Not Sealed ☐ Intact: Yes ☐ No ☐. Seal(s) broken by: ______________________ date: __________

certify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and ıat the statements on this page accurately reflect the analytical results for this sample.

ate(s) of analysis: ______________. Analyst's signature: ______________________________

certify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

eviewers signature: ______________________________

STATE OF NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT

SCIENTIFIC LABORATORY DIVISION
700 Camino de Salud, NE
Albuquerque, NM 87106 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

February 20, 1989

ANALYTICAL REPORT
SLD Accession No. OR-88-1938

Distribution
(☒) User
(☒) Submitter
(■) Client
(☒) SLD Files

To:

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A purgeable water sample submitted to this laboratory on November 22, 1988**

User:
EID-Drinking Water Section
Room South 2058
1190 St. Francis Dr.
Santa Fe, NM 87503

Submitter:
EID Dist. #4 Office, Roswell
200 East 5th Street
Roswell, NM 88201

DEMOGRAPHIC DATA

COLLECTION		LOCATION	
On: 15-Nov-88	*By:* Web . . .	*Township:* 17S	*Section:* 30
At: 11:13 hrs.	*In/Near:* other	*Range:* 35E	*Tract:*

ANALYTICAL RESULTS: SDWA VOC's I Screen

Parameter	Value	Note	MDL	Units
Aromatic Purgeables (6)	0.00	N	0.50	ppb
Halogenated Purgeables (33)	0.00	N	0.50	ppb

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Seals: Not Sealed☒; Intact: No☐, Yes☐ & Broken By: ______________________ Date: ____________

WS-1

Laboratory Remarks: Phillips Buckeye Site Well #1

Analyst: ______________________ 11/28/89 **Reviewed By:** ______________________
Michael J. Owen — Analysis Date — Richard F. Meyerhein 01/24/89
Analyst, Organic Chemistry — *Supervisor, Organic Chemistry Section*

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

775
wp4

88-1941-C

REPORT TO:
MIKE FORD
PHILLIPS PETROLEUM CO.
4001 PENBROOK ROOM 443
★ ODESSA, TX. 79762

S.L.D. No. OR-
DATE REC. 11/22/88
PRIORITY
PHONE(S): (915) 367-1316

COLLECTION CITY: PHILLIPS PETROLEUM BUCKEYE PLANT; COUNTY: LEA

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 8 8 1 1 1 5 1 1 1 3

LOCATION CODE: (Township-Range-Section-Tracts) 1 17 S + 3 5 E + 3 0 + (10N06E24342)

USER CODE: 6 2 0 0 0 SUBMITTER: M. WEBER CODE:

SAMPLE TYPE: WATER ☑, SOIL ☐, FOOD ☐, OTHER:

This form accompanies 2 Septum Vials, ____ Glass Jugs, and/or ____

Samples were preserved as follows:

- ☐ NP: No Preservation; Sample stored at room temperature.
- ☑ P-Ice Sample stored in an ice bath (Not Frozen).
- ☐ P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
- ☐ P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☐ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes
- ☐ (774) SDWA VOC's I (8 Regulated +)
- ☑ (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- ☐
- ☐

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☐ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

Remarks: BENZENE SUSPECTED
★ BILL PHILLIPS - CC: RESULTS TO ROSWELL EID

FIELD DATA:

pH= ____; Conductivity= ____ umho/cm at ____ °C; Chlorine Residual= ____ mg/l

Dissolved Oxygen= ____ mg/l; Alkalinity= ____ mg/l; Flow Rate ____ ____/____

Depth to water ____ ft.; Depth of well ____ ft.; Perforation Interval ____-____ ft.; Casing: ____

Sampling Location, Methods and Remarks (i.e. odors, etc.) WS-1
PHILLIPS BUCKEYE SITE WELL #1 SAMPLE TAKEN FROM TAP AT WELLHEAD

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): Mary Weber Method of Shipment to the Lab: UPS

CHAIN OF CUSTODY

I certify that this sample was transferred from ____ to ____

at (location) ____ on ___/___/___ - ___:___ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

Signatures ____ ____

ANALYSES PERFORMED

LAB. No.: CR- 88-1941

THIS PAGE FOR LABORATORY RESULTS ONLY

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☐ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes
- ☐ (774) SDWA VOC's I (8 Regulated +)
- ☑ (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- ☐ ______
- ☐ ______

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☐ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
• DETECTION LIMIT • *		+ DETECTION LIMIT + †	

ABBREVIATIONS USED:

N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT

T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)

[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

BORATORY REMARKS: Refer to computer generated result for report.

CERTIFICATE OF ANALYTICAL PERSONNEL

l(s) Not Sealed ☐ Intact: Yes ☐ No ☐. Seal(s) broken by: ______ date: ______

ertify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and t the statements on this page accurately reflect the analytical results for this sample.

te(s) of analysis: ______. Analyst's signature: ______

ertify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

iewers signature: ______

STATE OF NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT

SCIENTIFIC LABORATORY DIVISION

700 Camino de Salud, NE
Albuquerque, NM 87106 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

December 20, 1988

ANALYTICAL REPORT
SLD Accession No. OR-88-1941

Distribution
(☒) User
(☒) Submitter
(■) Client
(☒) SLD Files

To: Mike Ford
Phillips Petroleum Co.
4001 Penbrook Room 443
Odessa, Texas 79762

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A purgeable water sample submitted to this laboratory on November 22, 1988**

User:
EID-Drinking Water Section
Room South 2058
1190 St. Francis Dr.
Santa Fe, NM 87503

Submitter:
EID Dist. #4 Office, Roswell
200 East 5th Street
Roswell, NM 88201

DEMOGRAPHIC DATA

COLLECTION		*LOCATION*	
On: 15-Nov-88	*By:* Web . . .	*Township:* 17S	*Section:* 30
At: 11:13 hrs.	*In/Near:* other	*Range:* 35E	*Tract:*

ANALYTICAL RESULTS: SDWA VOC's II Screen

Parameter	Value	Note	MDL	Units
1,2-Dibromoethane (EDB)	0.00	N	0.03	ppb
1,2-Dibromo-3-chloropropane	0.00	N	0.03	ppb

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Seals: Not Sealed☑; Intact: No☐, Yes☐ & Broken By: ______________ Date: __________

WS-1

Laboratory Remarks: Buckeye Site- Well #1

Analyst: ______________ 11/29/88 **Reviewed By:** ______________

K. D. Sherrell
Analyst, Organic Chemistry

Analysis Date

Richard F. Meyerhein 12/20/88
Supervisor, Organic Chemistry Section

please send copy stat.

SCIENTIFIC LABORATORY DIVISION

700 Camino de Salud NE
Albuquerque, NM 87106 841-2570

COPY

88-1850-C

REPORT TO: E.I.D
2120 N Alto
Hobbs, NM 88240

S.L.D. No. OR-________
DATE REC. 11/7/88
PRIORITY 02
PHONE(S): (505)397-5250

COLLECTION CITY: Buckeye.; COUNTY: Lea

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) |1|1|0|3|8|8|1|0|1|0| am

LOCATION CODE: (Township-Range-Section-Tracts) |T|1|7s + R|3|5E + S|3|1 + -|_|_|(10N06E24342)

USER CODE: |5|9|3|0|0| SUBMITTER: Charles Ajuzlem CODE:|_|_|_|

SAMPLE TYPE: WATER ☒, SOIL ☐, FOOD ☐, OTHER:________

This form accompanies 2 Septum Vials, ____ Glass Jugs, and/or ____ ________

Samples were preserved as follows:

- ☐ NP: No Preservation; Sample stored at room temperature.
- ☒ P-Ice Sample stored in an ice bath (Not Frozen).
- ☐ P-$Na_2S_2O_3$ Sample Preserved with Sodium Thiosulfate to remove chlorine residual.

RECEIVED
NOV 17 1988
HOBBS OFFICE

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☑ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes

Other Specific Compounds or Classes

- ☐ ________
- ☒ Benzene.
- ☐ ________
- ☐ ________
- ☐

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☐ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

Remarks: * Benzene detected in H2O

FIELD DATA:

pH=____; Conductivity=____umho/cm at ____°C; Chlorine Residual=____mg/l

Dissolved Oxygen=____mg/l; Alkalinity=____mg/l; Flow Rate____ ____/____

Depth to water ____ft.; Depth of well____ft.; Perforation Interval ____-____ft.; Casing:________

Sampling Location, Methods and Remarks (i.e. odors, etc.) WS-1

Phillips petroleum - buckeye yard well #1 [well head]

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector):________ Method of Shipment to the Lab:________

CHAIN OF CUSTODY

I certify that this sample was transferred from ________ to ________

at (location) ________ on ____/____/____ - ____:____ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

WS-1

THIS PAGE FOR LABORATORY RESULTS ONLY 1850

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

☐ (753) Aliphatic Headspace (1-5 Carbons)
☒ (754) Aromatic & Halogenated Purgeables
☐ (765) Mass Spectrometer Purgeables
☐ (766) Trihalomethanes
Other Specific Compounds or Classes
☐ ____________________
☐ ____________________
☐ ____________________
☐ ____________________

EXTRACTABLE SCREENS

☐ (751) Aliphatic Hydrocarbons
☐ (755) Base/Neutral Extractables
☐ (758) Herbicides, Chlorophenoxy acid
☐ (759) Herbicides, Triazines
☐ (760) Organochlorine Pesticides
☐ (761) Organophosphate Pesticides
☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
halogenated purgeables	N.D.		
aromatic purgeables			
benzene	50		
* DETECTION LIMIT *	.5 ug/L	+ DETECTION LIMIT +	

ABBREVIATIONS USED:
N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT
T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)
[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

LABORATORY REMARKS: ____________________

CERTIFICATE OF ANALYTICAL PERSONNEL

Seal(s) Not Sealed ☐ Intact: Yes ☐ No ☑ Seal(s) broken by: not sealed date: ________

I certify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and that the statements on this page accurately reflect the analytical results for this sample.

Date(s) of analysis: 11/7/88. Analyst's signature: ____________

I certify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

Reviewers signature: R Meyerhein

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

755
WRX

88-1936-C

REPORT TO: MIKE FORD
PHILLIPS PETROLEUM CO.
4001 PENBROOK ROOM 443
★ ODESSA, TX. 79762

S.L.D. No. OR-
DATE REC. 11/22/88
PRIORITY III
PHONE(S): (915) 367-1316

COLLECTION CITY: PHILLIPS PETROLEUM BUCKEYE PLANT; COUNTY: LEA

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 8 8 1 1 1 5 1 1 4 5

LOCATION CODE: (Township-Range-Section-Tracts) 1 7 S + 3 5 E + 3 1 + (10N06E24342)

USER CODE: 6 2 0 0 0 SUBMITTER: M. WEBER CODE:

SAMPLE TYPE: WATER ☑, SOIL ☐, FOOD ☐, OTHER:

This form accompanies ______ Septum Vials, 2 Glass Jugs, and/or ______

Samples were preserved as follows:

- ☐ NP: No Preservation; Sample stored at room temperature.
- ☑ P-Ice Sample stored in an ice bath (Not Frozen).
- ☐ P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
- ☐ P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
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- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes
- ☐ (774) SDWA VOC's I (8 Regulated +)
- ☐ (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- ☐ ______
- ☐ ______

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☑ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

Remarks:

★ BILL PHILLIPS - CC: RESULTS TO ROSWELL EID

FIELD DATA:

pH=______; Conductivity=______ umho/cm at ______ °C; Chlorine Residual=______ mg/l

Dissolved Oxygen=______ mg/l; Alkalinity=______ mg/l; Flow Rate ______ ____/____

Depth to water ______ ft.; Depth of well ______ ft.; Perforation Interval ____-____ ft.; Casing: ______

Sampling Location, Methods and Remarks (i.e. odors, etc.) WS-3

PHILLIPS PETROLEUM BUCKEYE PLANT WELL #3. SAMPLE TAKEN FROM HOSE AT WELLHEAD (EXTREME WIND MADE DIRECT TAP SAMPLING IMPOSSIBLE).

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): Weber Method of Shipment to the Lab: UPS

CHAIN OF CUSTODY

I certify that this sample was transferred from ______ to ______

at (location) ______ on ____/____/____ - ____:____ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

Signatures ______ ______

ANALYSES PERFORMED

LAB. No.: OR- 1936

THIS PAGE FOR LABORATORY RESULTS ONLY

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

☐ (753) Aliphatic Headspace (1-5 Carbons)
☐ (754) Aromatic & Halogenated Purgeables
☐ (765) Mass Spectrometer Purgeables
☐ (766) Trihalomethanes
☐ (774) SDWA VOC's I (8 Regulated +)
☐ (775) SDWA VOC's II (EDB & DBCP)
Other Specific Compounds or Classes
☐ ______
☐ ______

EXTRACTABLE SCREENS

☐ (751) Aliphatic Hydrocarbons
☐ (755) Base/Neutral Extractables
☐ (758) Herbicides, Chlorophenoxy acid
☐ (759) Herbicides, Triazines
☐ (760) Organochlorine Pesticides
☐ (761) Organophosphate Pesticides
☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
Base/Neutrals			
Gasoline MDL = 250	ND < 250		
Kerosine MDL = 250	ND < 250		
Diesel MDL = 250	ND < 250		
Lube Oil MDL = 2500	ND < 2500		
PNA's MDL = 5	ND < 5		
Other non-target B/N's MDL = 5	ND < 5		
PCB's MDL = 1000	ND < 1000		
Chlordane MDL = 1000	ND < 1000		
• DETECTION LIMIT • *		+ DETECTION LIMIT + +	

ABBREVIATIONS USED:

N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT
T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)
[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

A - 960 ml B - 905 ml

BORATORY REMARKS: ______

CERTIFICATE OF ANALYTICAL PERSONNEL

l(s) Not Sealed ☑ Intact: Yes ☐ No ☐. Seal(s) broken by: ______ date: ______

ertify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and t the statements on this page accurately reflect the analytical results for this sample.

te(s) of analysis: 11/28/88 . Analyst's signature: ______

ertify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

viewers signature: ______

774
WP4

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

88- 1939 C

REPORT TO: MIKE FORD
PHILLIPS PETROLEUM CO.
4001 PENBROOK ROOM 443
★ ODESSA, TX. 79762

S.L.D. No. OR-
DATE REC. 11/22/88
PRIORITY III
PHONE(S): (915) 367-1316

COLLECTION CITY: PHILLIPS PETROLEUM - BUCKEYE PLANT; COUNTY: LEA

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 8|8|1|1|1|5|1|1|4|2

LOCATION CODE: (Township-Range-Section-Tracts) 1|7|S + 3|5|E + 3|1 + | | (10N06E24342)

USER CODE: 6|2|0|0|0 SUBMITTER: M. WEBER CODE: | | |

SAMPLE TYPE: WATER ☑, SOIL ☐, FOOD ☐, OTHER:

This form accompanies 2 Septum Vials, ____ Glass Jugs, and/or ____

Samples were preserved as follows:

- ☐ NP: No Preservation; Sample stored at room temperature.
- ☑ P-Ice Sample stored in an ice bath (Not Frozen).
- ☐ P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
- ☐ P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☐ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes
- ☑ (774) SDWA VOC's I (8 Regulated +)
- ☐ (775) SDWA VOC's II (EDB & DBCP)
- Other Specific Compounds or Classes
- ☐
- ☐

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☐ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

Remarks:
★ BILL PHILLIPS - CC: RESULTS TO ROSWELL EID

FIELD DATA:

pH= ____; Conductivity= ____ umho/cm at ____ °C; Chlorine Residual= ____ mg/l

Dissolved Oxygen= ____ mg/l; Alkalinity= ____ mg/l; Flow Rate ____ ____/____

Depth to water ____ ft.; Depth of well ____ ft.; Perforation Interval ____ - ____ ft.; Casing:

Sampling Location, Methods and Remarks (i.e. odors, etc.) WS-3
PHILLIPS PETROLEUM BUCKEYE PLANT WELL #3. SAMPLE TAKEN FROM HOSE AT WELLHEAD (EXTREME WIND MADE DIRECT TAP SAMPLING IMPOSSIBLE).

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): Weber Method of Shipment to the Lab: UPS

CHAIN OF CUSTODY

I certify that this sample was transferred from ____ to ____

at (location) ____ on ____/____/____ - ____:____ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

Signatures ____ ____

ANALYSES PERFORMED

LAB. No.: OR-

THIS PAGE FOR LABORATORY RESULTS ONLY

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☐ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes
- ☐ (774) SDWA VOC's I (8 Regulated +)
- ☐ (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- ☐ ______________________________
- ☐ ______________________________

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☐ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
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- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
* DETECTION LIMIT * *		+ DETECTION LIMIT + +	

ABBREVIATIONS USED:

N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT
T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)
[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

BORATORY REMARKS: ______________________________

____

____

____

____

CERTIFICATE OF ANALYTICAL PERSONNEL

al(s) Not Sealed ☐ Intact: Yes ☐ No ☐. Seal(s) broken by: ____________________ date: __________

certify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and at the statements on this page accurately reflect the analytical results for this sample.

te(s) of analysis: ______________. Analyst's signature: ______________________________

certify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

viewers signature: ______________________________

STATE OF NEW MEXICO **HEALTH AND ENVIRONMENT DEPARTMENT**

SCIENTIFIC LABORATORY DIVISION

700 Camino de Salud, NE
Albuquerque, NM 87106 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

February 20, 1989

ANALYTICAL REPORT
SLD Accession No. OR-88-1939

Distribution
(☒) User
(☒) Submitter
(■) Client
(☒) SLD Files

To:

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A purgeable water sample submitted to this laboratory on November 22, 1988**

User:
EID-Drinking Water Section
Room South 2058
1190 St. Francis Dr.
Santa Fe, NM 87503

Submitter:
EID Dist. #4 Office, Roswell
200 East 5th Street
Roswell, NM 88201

DEMOGRAPHIC DATA

COLLECTION
On: 15-Nov-88 *By:* Web . . .
At: 11:42 hrs. *In/Near:* other

LOCATION
Township: 17S *Section:* 31
Range: 35E *Tract:*

ANALYTICAL RESULTS: SDWA VOC's I Screen

Parameter	Value	Note	MDL	Units
Bromodichloromethane	0.00	T	0.50	ppb
Dibromochloromethane	4.00		0.50	ppb
Bromoform	21.00		0.50	ppb
Aromatic Purgeables (6)	0.00	N	0.50	ppb

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified; T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Seals: Not Sealed☑; Intact: No☐, Yes☐ & Broken By: ______________ Date: __________

WS-3

Laboratory Remarks: Phillips Buckeye Site Well #3

Analyst: ______________ 11/28/89 **Reviewed By:** ______________
Michael J. Owen
Analyst, Organic Chemistry
Analysis Date

Richard F. Meyerhein 01/24/89
Supervisor, Organic Chemistry Section

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

775
WP4

88- 1942-C

REPORT TO:
MIKE FORD
PHILLIPS PETROLEUM CO.
4001 PENBROOK ROOM 443
★ ODESSA, TX. 79762

S.L.D. No. OR-
DATE REC. 11/22/88
PRIORITY III
PHONE(S): (915) 367- 1316

COLLECTION CITY: PHILLIPS PETROLEUM; COUNTY: LEA

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 8 8 1 1 1 5 1 1 4 2

LOCATION CODE: (Township-Range-Section-Tracts) 17S + 35E + 31 + (10N06E24342)

USER CODE: 6 2 0 0 0 SUBMITTER: M. WEBER CODE:

SAMPLE TYPE: WATER ☑, SOIL ☐, FOOD ☐, OTHER:

This form accompanies 2 Septum Vials, ___ Glass Jugs, and/or ___

Samples were preserved as follows:

☐ NP: No Preservation; Sample stored at room temperature.
☑ P-Ice Sample stored in an ice bath (Not Frozen).
☐ P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
☐ P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

☐ (753) Aliphatic Headspace (1-5 Carbons)
☐ (754) Aromatic & Halogenated Purgeables
☐ (765) Mass Spectrometer Purgeables
☐ (766) Trihalomethanes
☐ (774) SDWA VOC's I (8 Regulated +)
☑ (775) SDWA VOC's II (EDB & DBCP)
Other Specific Compounds or Classes
☐
☐

EXTRACTABLE SCREENS

☐ (751) Aliphatic Hydrocarbons
☐ (755) Base/Neutral Extractables
☐ (758) Herbicides, Chlorophenoxy acid
☐ (759) Herbicides, Triazines
☐ (760) Organochlorine Pesticides
☐ (761) Organophosphate Pesticides
☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

Remarks:
★ BILL PHILLIPS - CC: RESULTS TO ROSWELL EID

FIELD DATA:

pH=___; Conductivity=___ umho/cm at ___ °C; Chlorine Residual=___ mg/l

Dissolved Oxygen=___ mg/l; Alkalinity=___ mg/l; Flow Rate ___ ___/___

Depth to water ___ ft.; Depth of well ___ ft.; Perforation Interval ___-___ ft.; Casing:

Sampling Location, Methods and Remarks (i.e. odors, etc.) WS-3
PHILLIPS PETROLEUM BUCKEYE PLANT WELL #3. SAMPLE TAKEN FROM HOSE AT WELLHEAD (EXTREME WIND MADE DIRECT TAP SAMPLING IMPOSSIBLE)

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): Terry Weber Method of Shipment to the Lab: UPS

CHAIN OF CUSTODY

I certify that this sample was transferred from ___ to ___

at (location) ___ on ___/___/___ - ___:___ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

Signatures

ANALYSES PERFORMED

LAB. No.: U[illegible]- 88-1892

THIS PAGE FOR LABORATORY RESULTS ONLY

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

☐ (753) Aliphatic Headspace (1-5 Carbons)
☐ (754) Aromatic & Halogenated Purgeables
☐ (765) Mass Spectrometer Purgeables
☐ (766) Trihalomethanes
☐ (774) SDWA VOC's I (8 Regulated +)
☑ (775) SDWA VOC's II (EDB & DBCP)
Other Specific Compounds or Classes
☐ ______
☐ ______

EXTRACTABLE SCREENS

☐ (751) Aliphatic Hydrocarbons
☐ (755) Base/Neutral Extractables
☐ (758) Herbicides, Chlorophenoxy acid
☐ (759) Herbicides, Triazines
☐ (760) Organochlorine Pesticides
☐ (761) Organophosphate Pesticides
☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
* DETECTION LIMIT * *		+ DETECTION LIMIT + +	

ABBREVIATIONS USED:

N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT
T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)
[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

BORATORY REMARKS: Refer to computer generated result For report

CERTIFICATE OF ANALYTICAL PERSONNEL

al(s) Not Sealed ☐ Intact: Yes ☐ No ☐. Seal(s) broken by: ______ date: ______

certify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and at the statements on this page accurately reflect the analytical results for this sample.

te(s) of analysis: ______. Analyst's signature: ______

certify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

viewers signature: ______

STATE OF NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT

SCIENTIFIC LABORATORY DIVISION

700 Camino de Salud, NE
Albuquerque, NM 87106 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

December 20, 1988

ANALYTICAL REPORT
SLD Accession No. OR-88-1942

Distribution
(⊠) User
(⊠) Submitter
(■) Client
(⊠) SLD Files

To:
Mike Ford
Phillips Petroleum Co.
4001 Penbrook Room 443
Odessa, Texas 79762

From:
Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: A purgeable water sample submitted to this laboratory on November 22, 1988

User:
EID-Drinking Water Section
Room South 2058
1190 St. Francis Dr.
Santa Fe, NM 87503

Submitter:
EID Dist. #4 Office, Roswell
200 East 5th Street
Roswell, NM 88201

DEMOGRAPHIC DATA

COLLECTION
On: 15-Nov-88 *By:* Web . . .
At: 11:42 hrs. *In/Near:* other

LOCATION
Township: 17S *Section:* 31
Range: 35E *Tract:*

ANALYTICAL RESULTS: SDWA VOC's II Screen

Parameter	Value	Note	MDL	Units
1,2-Dibromoethane (EDB)	0.00	N	0.03	ppb
1,2-Dibromo-3-chloropropane	0.00	N	0.03	ppb

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Seals: Not Sealed☑; Intact: No☐, Yes☐ & Broken By: ____________ Date: ________

WS-3

Laboratory Remarks: Buckeye Site- Well #3

Analyst: ____________ 11/29/88 Reviewed By: ____________
K. D. Sherrell
Analyst, Organic Chemistry
Analysis Date
Richard F. Meyerhein 12/20/88
Supervisor, Organic Chemistry Section

To Schn [illegible]

Please send copy to [illegible]

COPY

wpu

SCIENTIFIC LABORATORY DIVISION

700 Camino de Salud NE
Albuquerque, NM 87106 841-2570

88-1849-C

REPORT TO: Environmental Improvement Div.
2120 N ALTO
Hobbs, NM 88240

S.L.D. No. OR-
DATE REC. 11/7/88
PRIORITY ~~0~~ 2
PHONE(S): (505) 397-5250

COLLECTION CITY: Buckeye; COUNTY: Lea

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 1 1 0 3 8 8 1 0 0 5 am

LOCATION CODE: (Township-Range-Section-Tracts) T 1 7S+ R 3 5E+ S 3 1+ - (10N06E24342)

USER CODE: 5 9 3 0 0 SUBMITTER: Charles [illegible] CODE:

SAMPLE TYPE: WATER ☒, SOIL ☐, FOOD ☐, OTHER:

RECEIVED
NOV 17 1988
HOBBS OFFICE

This form accompanies 2 Septum Vials, ____ Glass Jugs, and/or ____

Samples were preserved as follows:

☐ NP: No Preservation; Sample stored at room temperature.
☒ P-Ice Sample stored in an ice bath (Not Frozen).
☐ P-$Na_2S_2O_3$ Sample Preserved with Sodium Thiosulfate to remove chlorine residual.

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

☐ (753) Aliphatic Headspace (1-5 Carbons)
☒ (754) Aromatic & Halogenated Purgeables
☐ (765) Mass Spectrometer Purgeables
☐ (766) Trihalomethanes

Other Specific Compounds or Classes

☐
☒ Benzene.
☐
☐
☐

EXTRACTABLE SCREENS

☐ (751) Aliphatic Hydrocarbons
☐ (755) Base/Neutral Extractables
☐ (758) Herbicides, Chlorophenoxy acid
☐ (759) Herbicides, Triazines
☐ (760) Organochlorine Pesticides
☐ (761) Organophosphate Pesticides
☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

Remarks:

FIELD DATA:

pH= ____; Conductivity= ____ umho/cm at ____ °C; Chlorine Residual= ____ mg/l

Dissolved Oxygen= ____ mg/l; Alkalinity= ____ mg/l; Flow Rate ____ ____/____

Depth to water ____ ft.; Depth of well ____ ft.; Perforation Interval ____-____ ft.; Casing:

Sampling Location, Methods and Remarks (i.e. odors, etc.) WS-3

Phillips petroleum - Buckeye yard - Conference room [well #3]

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): ____ Method of Shipment to the Lab: ____

CHAIN OF CUSTODY

I certify that this sample was transferred from ____ to ____

at (location) ____ on ____/____/____ - ____:____ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

WS-3

THIS PAGE FOR LABORATORY RESULTS ONLY

1849

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

☐ (753) Aliphatic Headspace (1-5 Carbons)
☑ (754) Aromatic & Halogenated Purgeables
☐ (765) Mass Spectrometer Purgeables
☐ (766) Trihalomethanes
Other Specific Compounds or Classes
☐ ______
☐ ______
☐ ______
☐ ______

EXTRACTABLE SCREENS

☐ (751) Aliphatic Hydrocarbons
☐ (755) Base/Neutral Extractables
☐ (758) Herbicides, Chlorophenoxy acid
☐ (759) Herbicides, Triazines
☐ (760) Organochlorine Pesticides
☐ (761) Organophosphate Pesticides
☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
halogenated purgeables			
chloroform	1.5		
bromodichloromethane	3.5		
dibromochloromethane	9		
bromoform	22		
aromatic purgeables	N.D.		
* DETECTION LIMIT *	.5 ug/l	+ DETECTION LIMIT +	

ABBREVIATIONS USED:

N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT
T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)
[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

LABORATORY REMARKS: ______

CERTIFICATE OF ANALYTICAL PERSONNEL

Seal(s) Not Sealed ☐ Intact: Yes ☐ No ☑ Seal(s) broken by: not sealed date: ______

I certify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and that the statements on this page accurately reflect the analytical results for this sample.

Date(s) of analysis: 11/7/88. Analyst's signature: ______

I certify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

Reviewers signature: ______

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

755
wet

88- 1937-C

REPORT TO: MIKE FORD
PHILLIPS PETROLEUM CO.
4001 PENBROOK ROOM 443
★ ODESSA, TX. 79762

S.L.D. No. OR- 88- 1937-C
DATE REC. 11/22/88
PRIORITY III
PHONE(S): (915) 367-1316

COLLECTION CITY: PHILLIPS PETROLEUM BUCKEYE PLANT; COUNTY: LEA

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) |8|8|1|1|1|5|1|1|5|7|

LOCATION CODE: (Township-Range-Section-Tracts) |_|1|7|S| + |3|5|E| + |3|1| + |_|_|_| (10N06E24342)

USER CODE: |6|2|0|0|0|0| SUBMITTER: M. WEBER CODE: |_|_|_|

SAMPLE TYPE: WATER ☑, SOIL ☐, FOOD ☐, OTHER: ______

This form accompanies ____ Septum Vials, 2 Glass Jugs, and/or ____ ______

Samples were preserved as follows:

- ☐ NP: No Preservation; Sample stored at room temperature.
- ☑ P-Ice Sample stored in an ice bath (Not Frozen).
- ☐ P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
- ☐ P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☐ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes
- ☐ (774) SDWA VOC's I (8 Regulated +)
- ☐ (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- ☐ ______
- ☐ ______

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☑ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

Remarks: ______

★ BILL PHILLIPS - CC: RESULTS TO ROSWELL EID

FIELD DATA:

pH=____; Conductivity=____ umho/cm at ____ °C; Chlorine Residual=____ mg/l

Dissolved Oxygen=____ mg/l; Alkalinity=____ mg/l; Flow Rate ____ ____/____

Depth to water ____ ft.; Depth of well ____ ft.; Perforation Interval ____-____ ft.; Casing: ____

Sampling Location, Methods and Remarks (i.e. odors, etc.) WS-4

PHILLIPS BUCKEYE SITE WELL # 4. SAMPLE TAKEN FROM TAP AT WELLHEAD

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): [illegible] Weber Method of Shipment to the Lab: UPS

CHAIN OF CUSTODY

I certify that this sample was transferred from ______ to ______

at (location) ______ on ___/___/___ - ___:___ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

Signatures ______ ______

ANALYSES PERFORMED

LAB. No.: OR- 1937

THIS PAGE FOR LABORATORY RESULTS ONLY

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☐ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes
- ☐ (774) SDWA VOC's I (8 Regulated +)
- ☐ (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- ☐ ____________________
- ☐ ____________________

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☐ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
Base/Neutrals			
Gasoline MDL = 250	ND <250		
Kerosine MDL = 250	ND <250		
Diesel MDL = 250	ND <250		
Lube Oil MDL = 2500	ND <2500		
PNAs MDL = 5	ND < 5		
Other individual B/NA MDL=5	ND < 5		
PCBs MDL = 1000	ND <1000		
Chlordane MDL = 1000	ND < 1000		
• DETECTION LIMIT • *		+ DETECTION LIMIT + †	

ABBREVIATIONS USED:

N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT
T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)
[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

B - 880

BORATORY REMARKS: ____________________

CERTIFICATE OF ANALYTICAL PERSONNEL

l(s) Not Sealed ☑ Intact: Yes ☐ No ☐. Seal(s) broken by: ____________ date: ________

ertify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and t the statements on this page accurately reflect the analytical results for this sample.

e(s) of analysis: 11/28/88. Analyst's signature: ____________

ertify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

iewers signature: ____________

774
WP4

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

88-1940 C

REPORT TO:
MIKE FORD
PHILLIPS PETROLEUM CO.
4001 PENBROOK ROOM 443
★ ODESSA, TX. 79762

S.L.D. No. OR-
DATE REC. 11/22/88
PRIORITY III
PHONE(S): (915) 367-1316

COLLECTION CITY: PHILLIPS PETROLEUM BUCKEYE PLANT; COUNTY: LEA

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 8 8 1 1 1 5 1 1 5 5

LOCATION CODE: (Township-Range-Section-Tracts) 1 7 S + 3 5 E + 3 1 + (10N06E24342)

USER CODE: 6 2 0 0 0 SUBMITTER: M. WEBER CODE:

SAMPLE TYPE: WATER ☑, SOIL ☐, FOOD ☐, OTHER:

This form accompanies 2 Septum Vials, ____ Glass Jugs, and/or ____

Samples were preserved as follows:

- ☐ NP: No Preservation; Sample stored at room temperature.
- ☑ P-Ice Sample stored in an ice bath (Not Frozen).
- ☐ P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
- ☐ P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS	EXTRACTABLE SCREENS
☐ (753) Aliphatic Headspace (1-5 Carbons)	☐ (751) Aliphatic Hydrocarbons
☐ (754) Aromatic & Halogenated Purgeables	☐ (755) Base/Neutral Extractables
☐ (765) Mass Spectrometer Purgeables	☐ (758) Herbicides, Chlorophenoxy acid
☐ (766) Trihalomethanes	☐ (759) Herbicides, Triazines
☑ (774) SDWA VOC's I (8 Regulated +)	☐ (760) Organochlorine Pesticides
☐ (775) SDWA VOC's II (EDB & DBCP)	☐ (761) Organophosphate Pesticides
Other Specific Compounds or Classes	☐ (767) Polychlorinated Biphenyls (PCB's)
☐	☐ (764) Polynuclear Aromatic Hydrocarbons
☐	☐ (762) SDWA Pesticides & Herbicides

Remarks:
★ BILL PHILLIPS - CC: RESULTS TO ROSWELL EID

FIELD DATA:

pH=____; Conductivity=____ umho/cm at ____ °C; Chlorine Residual=____ mg/l

Dissolved Oxygen=____ mg/l; Alkalinity=____ mg/l; Flow Rate ____ ____/____

Depth to water ____ ft.; Depth of well ____ ft.; Perforation Interval ____-____ ft.; Casing:

Sampling Location, Methods and Remarks (i.e. odors, etc.) WS-4
PHILLIPS BUCKEYE SITE WELL #4. SAMPLE TAKEN FROM TAP AT WELLHEAD

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): Gary Weber Method of Shipment to the Lab: UPS

CHAIN OF CUSTODY

I certify that this sample was transferred from ____ to ____

at (location) ____ on ____/____/____ - ____:____ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

Signatures

ANALYSES PERFORMED

LAB. No.: OR-

THIS PAGE FOR LABORATORY RESULTS ONLY

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☐ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes
- ☐ (774) SDWA VOC's I (8 Regulated +)
- ☐ (775) SDWA VOC's II (EDB & DBCP)

Other Specific Compounds or Classes

- ☐ ______________________
- ☐ ______________________

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☐ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
* DETECTION LIMIT *	*	+ DETECTION LIMIT +	†

ABBREVIATIONS USED:

N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT

T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)

[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

BORATORY REMARKS: ______________________

____

____

____

____

CERTIFICATE OF ANALYTICAL PERSONNEL

al(s) Not Sealed ☐ Intact: Yes ☐ No ☐. Seal(s) broken by: ______________ date: __________

certify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and at the statements on this page accurately reflect the analytical results for this sample.

te(s) of analysis: __________. Analyst's signature: ______________________

certify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

viewers signature: ______________________

STATE OF NEW MEXICO **HEALTH AND ENVIRONMENT DEPARTMENT**

SCIENTIFIC LABORATORY DIVISION

700 Camino de Salud, NE
Albuquerque, NM 87106 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

February 20, 1989

ANALYTICAL REPORT
SLD Accession No. OR-88-1940

Distribution
☒ User
☒ Submitter
■ Client
☒ SLD Files

To:

From: Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A purgeable water sample submitted to this laboratory on November 22, 1988**

User:
EID-Drinking Water Section
Room South 2058
1190 St. Francis Dr.
Santa Fe, NM 87503

Submitter:
EID Dist. #4 Office, Roswell
200 East 5th Street
Roswell, NM 88201

DEMOGRAPHIC DATA

COLLECTION		LOCATION	
On: 15-Nov-88	*By:* Web . . .	*Township:* 17S	*Section:* 31
At: 11:55 hrs.	*In/Near:* other	*Range:* 35E	*Tract:*

ANALYTICAL RESULTS: SDWA VOC's I Screen

Parameter	Value	Note	MDL	Units
Aromatic Purgeables (6)	0.00	N	0.50	ppb
Halogenated Purgeables (33)	0.00	N	0.50	ppb

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Seals: Not Sealed ☒; Intact: No ☐, Yes ☐ & Broken By: ________ Date: ________

WS-4

Laboratory Remarks: Phillips Buckeye Site Well #4

Analyst: Michael J. Owen 1/28/89
Michael J. Owen
Analyst, Organic Chemistry
Analysis Date

Reviewed By: R Meyerhein
Richard F. Meyerhein 01/24/89
Supervisor, Organic Chemistry Section

SCIENTIFIC LABORATORY DIVISION
ORGANIC ANALYSIS REQUEST FORM
Organic Section - Phone: 841-2570

775
WP4

88-1943-C

REPORT TO:
MIKE FORD
PHILLIPS PETROLEUM CO.
4001 PENBROOK ROOM 443
★ ODESSA, TX. 79762

S.L.D. No. OR-
DATE REC. 11/22/88
PRIORITY III
PHONE(S): (915) 367-1316

COLLECTION CITY: PHILLIPS PETROLEUM BUCKEYE PLANT; COUNTY: LEA

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 8 8 1 1 1 5 1 1 5 5

LOCATION CODE: (Township-Range-Section-Tracts) 1 1 7 S + 3 5 E + 3 1 + (10N06E24342)

USER CODE: 6 2 0 0 0 SUBMITTER: M. WEBER CODE:

SAMPLE TYPE: WATER ☑, SOIL ☐, FOOD ☐, OTHER:

This form accompanies 2 Septum Vials, ____ Glass Jugs, and/or ____

Samples were preserved as follows:

☐ NP: No Preservation; Sample stored at room temperature.
☑ P-Ice Sample stored in an ice bath (Not Frozen).
☐ P-AA Sample Preserved with Ascorbic Acid to remove chlorine residual.
☐ P-HCl Sample Preserved with Hydrochloric Acid (2 drops/40 ml)

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

☐ (753) Aliphatic Headspace (1-5 Carbons)
☐ (754) Aromatic & Halogenated Purgeables
☐ (765) Mass Spectrometer Purgeables
☐ (766) Trihalomethanes
☐ (774) SDWA VOC's I (8 Regulated +)
☑ (775) SDWA VOC's II (EDB & DBCP)
Other Specific Compounds or Classes
☐ ____
☐ ____

EXTRACTABLE SCREENS

☐ (751) Aliphatic Hydrocarbons
☐ (755) Base/Neutral Extractables
☐ (758) Herbicides, Chlorophenoxy acid
☐ (759) Herbicides, Triazines
☐ (760) Organochlorine Pesticides
☐ (761) Organophosphate Pesticides
☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

Remarks: ★ BILL PHILLIPS - CC: RESULTS TO ROSWELL EID

FIELD DATA:

pH=____; Conductivity=____umho/cm at ____°C; Chlorine Residual=____mg/l

Dissolved Oxygen=____mg/l; Alkalinity=____mg/l; Flow Rate____ ____/____

Depth to water ____ft.; Depth of well____ft.; Perforation Interval ____-____ft.; Casing:____

Sampling Location, Methods and Remarks (i.e. odors, etc.) WS-4

PHILLIPS BUCKEYE SITE WELL #4. SAMPLE TAKEN FROM TAP AT WELLHEAD

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): Weber Method of Shipment to the Lab: UPS

CHAIN OF CUSTODY

I certify that this sample was transferred from ____ to ____

at (location) ____ on ___/___/___ - ___:___ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

Signatures ____ ____

ANALYSES PERFORMED

LAB. No.: GR-88-1893

THIS PAGE FOR LABORATORY RESULTS ONLY

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

☐ (753) Aliphatic Headspace (1-5 Carbons)
☐ (754) Aromatic & Halogenated Purgeables
☐ (765) Mass Spectrometer Purgeables
☐ (766) Trihalomethanes
☐ (774) SDWA VOC's I (8 Regulated +)
☑ (775) SDWA VOC's II (EDB & DBCP)
Other Specific Compounds or Classes
☐ ______________________
☐ ______________________

EXTRACTABLE SCREENS

☐ (751) Aliphatic Hydrocarbons
☐ (755) Base/Neutral Extractables
☐ (758) Herbicides, Chlorophenoxy acid
☐ (759) Herbicides, Triazines
☐ (760) Organochlorine Pesticides
☐ (761) Organophosphate Pesticides
☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
* DETECTION LIMIT * *		+ DETECTION LIMIT + †	

ABBREVIATIONS USED:
N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT
T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)
[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

BORATORY REMARKS: Refer to computer generated form for result.

CERTIFICATE OF ANALYTICAL PERSONNEL

al(s) Not Sealed ☐ Intact: Yes ☐ No ☐. Seal(s) broken by: ______________ date: __________

certify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and at the statements on this page accurately reflect the analytical results for this sample.

te(s) of analysis: ____________. Analyst's signature: ______________________

certify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

viewers signature: ______________________

STATE OF NEW MEXICO **HEALTH AND ENVIRONMENT DEPARTMENT**

SCIENTIFIC LABORATORY DIVISION
700 Camino de Salud, NE
Albuquerque, NM 87106 [505]-841-2500
ORGANIC CHEMISTRY SECTION [505]-841-2570

December 20, 1988

ANALYTICAL REPORT
SLD Accession No. OR-88-1943

Distribution
(☒) User
(☒) Submitter
(■) Client
(☒) SLD Files

To:
Mike Ford
Phillips Petroleum Co.
4001 Penbrook Room 443
Odessa, Texas 79762

From:
Organic Chemistry Section
Scientific Laboratory Div.
700 Camino de Salud, NE
Albuquerque, NM 87106

Re: **A purgeable water sample submitted to this laboratory on November 22, 1988**

User:
EID-Drinking Water Section
Room South 2058
1190 St. Francis Dr.
Santa Fe, NM 87503

Submitter:
EID Dist. #4 Office, Roswell
200 East 5th Street
Roswell, NM 88201

DEMOGRAPHIC DATA

COLLECTION		LOCATION	
On: 15-Nov-88	*By:* Web . . .	*Township:* 17S	*Section:* 31
At: 11:55 hrs.	*In/Near:* other	*Range:* 35E	*Tract:*

ANALYTICAL RESULTS: SDWA VOC's II Screen

Parameter	Value	Note	MDL	Units
1,2-Dibromoethane (EDB)	0.00	N	0.03	ppb
1,2-Dibromo-3-chloropropane	0.00	N	0.03	ppb

Notations & Comments:

MDL = Minimal Detectable Level.

A = Approximate Value; N = None Detected above Detection Limit; P = Compound Present, but not quantified;
T = Trace (<Detection Limit); U = Compound Identity Not Confirmed.

Seals: Not Sealed ☑; Intact: No ☐, Yes ☐ & Broken By: ______ Date: ______

WS-4

Laboratory Remarks: Buckeye Site- Well #4

Analyst: 11/29/88 **Reviewed By:**

K. D. Sherrell
Analyst, Organic Chemistry

Analysis
Date

Richard F. Meyerhein 12/20/88
Supervisor, Organic Chemistry Section

File Copy
[illegible]

ATTACHMENT 3

MONITORING WELL IDENTIFICATION REPORT

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME LEE GASOLINE PLANT

EPA I.D. NUMBER NMD000709659

COUNTY LEA

WELL NUMBER #1 UPGRADIENT

WELL LOCATION (LONGITUDE) 103° 29' 33''

WELL LOCATION (LATITUDE) 32° 47' 58''

AQUIFER NAME OGALLALA FORMATION

AQUIFER CONFINED ____ UNCONFINED X

WELL INSTALLATION DATE 4/25/88

DRILLING METHOD AIRRT

INNER CASING DIAMETER 2.25"

BOREHOLE DIAMETER 6.50"

CASING MATERIAL SS316 & PVC

METHOD OF DEVELOPMENT PUMPD

ELEV BOTTOM OF BOREHOLE 3862.51

ELEV BOTTOM OF WELL CASING 3872.15

ELEV BOTTOM OF SCREENED INT 3874.73

ELEVATION OF SCREENED INT 3890.06

SURVEYED ELEV OF CASING TOP 3979.27

DATE OF REPORT 2/23/89 SIGNATURE Michael D. Ford

NAME (TYPED) Mike Ford

b:wellid/bms

ANNUAL SUMMARY OF MONITOR WELL DATA
BACKGROUND BACKGROUND MONITORING

This form is to be used by facilities currently establishing their background monitoring well values or which have just completed their first year of data collection. This form must be submitted to NMEID before March 1. The annual report should be filled out by all facilities wit RCRA monitoring wells as per HWMR-5, Part VI, Section 265.94(a) and (b).

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant

EPA I.D. NUMBER NMC000709659

WELL NUMBER 1

SAMPLE DATES

		5/13/88	8/30/88	11/1/88	
PARAMETERS	**UNITS**		**VALUE**		
Elev. of G.Water	ft.	3885.10	3884.69	3884.43	
pH (Avg)	S.U.	7.53	7.21	7.24	
Spec Cond (Avg)	umhos/cm	470	508	543	
T.O.X. (Avg)	ug/l	5	<10	154	
T.O.C. (Avg)	mg/l	.5	32	.5	
Chloride	mg/l	28	27	27	
Iron	ug/l	37	<40	<40	
Manganese	ug/l	120	190	120	
Phenols	ug/l	<5	<5	<5	
Sodium	mg/l	16	16	19	
Sulfate	mg/l	35	35	34	

PARAMETERS	UNITS	VALUE			
Arsenic	ug/l	4	<4	<2	
Barium	ug/l	220	120	190	
Cadmium	ug/l	<5	<5	<5	
Chromium	ug/l	<30	<30	<30	
Lead	ug/l	<2	<2	<2	
Mercury	ug/l	<.12	<.18	<.20	
Selenium	ug/l	<3	<4	<4	
Silver	ug/l	<3	<30	<30	
Fluoride	mg/l	< .2	< 20	<.20	
Nitrate	mg/l	2.1	1.7	2.3	
Total Coliform	col/100ml	724000	4100	2700	
Turbidity	T.U.	8.8	22	27	
Radium 226	pCi/l	0.6	1.6	1.7	
Radium 228	pCi/l	—	—	—	
Gross Alpha	pCi/l	<4.6	39	6	
Gross Beta	pCi/l	<9.6	162	13	
Endrin	ug/l	<.010	<.010	<.010	
Lindane	ug/l	.12	<.010	<.010	
Methoxychlor	ug/l	<.050	<.050	<.050	
Toxaphene	ug/l	<.50	<.50	<.50	
2,4-D	ug/l	<.50	<.50	<.50	
2,4,5-TP	ug/l	<.15	<.15	<.15	

DATE OF REPORT: 2/23/89

SIGNATURE: Michael D. Ford

NAME (TYPED): Mike Ford

b:backgr.2/bes

INTERIM STATUS MONITORING WELL
SAMPLING AND DATA SHEETS

BACKGROUND QUARTERLY REPORTS

This set of forms is to be completed for each of your facility's quarterly evaluations during establishment of the background data for each well. The forms are to be submitted in addition to the raw data sheets provided by your laboratory. In order to be acceptable, the raw lab data sheets must include 1) the date the sample was taken, 2) the extraction date, if any, and 3) the date of analysis.

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant EPA I.D. # NMD000709659

WELL NUMBER 1 SAMPLE COLLECTION BY W.S. DUBYK

LABORATORY NAME [illegible] Corp DATE SAMPLED 5/13/88

LABORATORY SAMPLE I.D. # 880513I430 TIME SAMPLED 2:30

DATE RECIEVED BY LAB. 5/14/88

PARAMETERS	STORET CODE	UNITS	VALUE	DATE ANALYZED
Elevation of G.Water	71993	ft.	3885.10	5/13/88
Well Depth	-----	ft.	105.36	"
Well Casing Volume	-----	gal.	2.11	"
Pump Rate	-----	gal/min	0.20	"
Pump Period	72004	min.	8000	"
Volume Evacuated	73675	gal.	1600	"
Sampler Material	-----	---	SS	N/A

Well Sampling Method: BFB

INDICATOR PARAMETERS [HWMR-5 Part VI, Section 265.92(b)(3)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
pH	00400	S.U.	7.55	N/A	5/14/88	EPA 150.1
	00400	S.U.	7.53	N/A	〃	
	00400	S.U.	7.50	N/A	〃	
	00400	S.U.	7.55	N/A	〃	
Specific Conductivity	00095	umhos/cm	470	0	5/14/88	EPA 120.1
	00095	umhos/cm	470	0	〃	
	00095	umhos/cm	470	0	〃	
	00095	umhos/cm	470	0	〃	
T.O.X.	70354	ug/l	<20	10	5/14/88	9020 (SW 846)
	70354	ug/l	<20	10	〃	
	70354	ug/l	<20	10	〃	
	70354	ug/l	5	10	〃	
T.O.C.	00680	mg/l	.5	1	5/14/88	EPA 415.1
	00680	mg/l	.5	1	〃	
	00680	mg/l	.5	1	〃	
	00680	mg/l	.5	1	〃	

GROUND WATER QUALITY STANDARDS [HWMR-5 Part VI Section 265.92(b)(2)]

(Values for metals must be for total metals.)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Chloride	00940	mg/l	28	.5	5/14/88	EPA 300.0
Iron	01045	ug/l	37	40	5/23/88	EPA 200.7
Manganese	71883	ug/l	120	10	5/23/88	EPA 200.7
Phenols	32730	ug/l	<5	5	5/14/88	EPA 420.2
Sodium	00929	mg/l	16	1	5/14/88	EPA 200.7
Sulfate	00945	mg/l	35	2	5/14/88	EPA 300.0

PRIMARY DRINKING WATER STANDARDS [HWMR-5 Part VI, Appendix III]

(Values for metals must be for total metals)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Arsenic	01002	ug/l	4	4	5/16/88	EPA 206.2
Barium	01007	ug/l	220	10	5/23/88	EPA 200.7
Cadmium	01027	ug/l	<5	5	5/23/88	EPA 200.7
Chromium	01034	ug/l	<30	30	5/23/88	EPA 200.7
Lead	01051	ug/l	<2	2	5/16/88	EPA 239.2
Mercury	71900	ug/l	<.12	.12	5/23/88	EPA 245.1
Selenium	01149	ug/l	<3	5	5/16/88	EPA 270.2
Silver	01077	ug/l	<3	30	5/23/88	EPA 200.7
Fluoride	00950	mg/l	<.2	.2	5/14/88	EPA 300.0
Nitrate	00620	mg/l	2.1	.02	5/14/88	EPA 353.1
Total Coliform	31501	col/100ml	>24,000	20/100 ml.	5/14/88	SM 908A

PRIMARY DRINKING WATER STANDARDS (continued)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Turbidity	00076	T.U.	8.8	1 NTU	5/14/88	EPA 180.1
Radium 226	09501	pCi/l	0.6	1 pCi/L	5/14/88	EPA 903.0
Radium 228	11501	pCi/l	—	—	—	—
Gross Alpha	01501	pCi/l	<4.6	3 pCi/L	5/14/88	EPA 900.0
Gross Beta	03501	pCi/l	<9.6	4 pCi/L	5/14/88	EPA 900.0

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED
Endrin	39390	ug/l	<.010	0.010	5/16/88	6/5/88
Lindane	39782	ug/l	.12	0.010	5/16/88	6/5/88
Methoxychlor	39480	ug/l	<.050	.050	5/16/88	6/5/88
Toxaphene	39400	ug/l	<.50	0.50	5/16/88	6/5/88
2,4-D	39730	ug/l	<.50	0.50	5/20/88	5/26/88
2,4,5-TP	39045	ug/l	<.15	0.15	5/20/88	5/26/88

Analytical method used for the above six parameters: SW 846

DATE OF REPORT 2/16/89

SIGNATURE: Michael D. Ford

NAME (PRINTED): MICHAEL D. FORD

INTERIM STATUS MONITORING WELL
SAMPLING AND DATA SHEETS

BACKGROUND QUARTERLY REPORTS

This set of forms is to be completed for each of your facility's quarterly evaluations during establishment of the background data for each well. The forms are to be submitted in addition to the raw data sheets provided by your laboratory. In order to be acceptable, the raw lab data sheets must include 1) the date the sample was taken, 2) the extraction date, if any, and 3) the date of analysis.

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant EPA I.D. # NMD000709659

WELL NUMBER #1 SAMPLE COLLECTION BY M Ford

LABORATORY NAME [illegible] Corp DATE SAMPLED 8/30/88

LABORATORY SAMPLE I.D. # 880830/1036-1050 TIME SAMPLED 10:00 A.M.

DATE RECIEVED BY LAB. 9/1/88

PARAMETERS	STORET CODE	UNITS	VALUE	DATE ANALYZED
Elevation of G.Water	71993	ft.	3884.69	8/29/88
Well Depth	-----	ft.	105.36	8/29/88
Well Casing Volume	-----	gal.	2.22	8/29/88
Pump Rate	-----	gal/min	—	—
Pump Period	72004	min.	—	—
Volume Evacuated	73675	gal.	7.00	8/29/88
Sampler Material	-----	---	TEFLN	N/A

Well Sampling Method: BAIL

INDICATOR PARAMETERS [HWMR-5 Part VI, Section 265.92(b)(3)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
pH	00400	S.U.	7.22	N/A	9/1/88	EPA 150.1
	00400	S.U.	7.21	N/A	"	
	00400	S.U.	7.19	N/A	"	
	00400	S.U.	7.21	N/A	"	
Specific Conductivity	00095	umhos/cm	514	0	9/1/88	EPA 120.1
	00095	umhos/cm	510	0	"	
	00095	umhos/cm	502	0	"	
	00095	umhos/cm	504	0	"	
T.O.X.	70354	ug/l	<10	10	9/1/88	9020 (SW 846)
	70354	ug/l	<10	10	"	
	70354	ug/l	<10	10	"	
	70354	ug/l	<10	10	"	
T.O.C.	00680	mg/l	14	1	9/1/88	EPA 415.1
	00680	mg/l	34	1	"	
	00680	mg/l	39	1	"	
	00680	mg/l	42	1	"	

GROUND WATER QUALITY STANDARDS [HWMR-5 Part VI Section 265.92(b)(2)]

(Values for metals must be for total metals.)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Chloride	00940	mg/l	27	.5	9/1/88	EPA 300.0
Iron	01045	ug/l	<40	40	9/16/88	EPA 200.7
Manganese	71883	ug/l	190	10	9/16/88	EPA 200.7
Phenols	32730	ug/l	<5	5	9/1/88	EPA 420.2
Sodium	00929	mg/l	16	1	9/1/88	EPA 200.7
Sulfate	00945	mg/l	35	2	9/1/88	EPA 300.0

PRIMARY DRINKING WATER STANDARDS [HWMR-5 Part VI, Appendix III]

(Values for metals must be for total metals)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Arsenic	01002	ug/l	<4	4	9/6/88	EPA 206.2
Barium	01007	ug/l	120	10	7/16/88	EPA 200.7
Cadmium	01027	ug/l	<5	5	9/16/88	EPA 200.7
Chromium	01034	ug/l	<30	30	9/16/88	EPA 200.7
Lead	01051	ug/l	<2	2	9/6/88	EPA 239.2
Mercury	71900	ug/l	<.18	.18	9/14/88	EPA 245.1
Selenium	01149	ug/l	<4	5	9/6/88	EPA 270.2
Silver	01077	ug/l	<30	30	9/16/88	EPA 200.7
Fluoride	00950	mg/l	<.20	.20	9/1/88	EPA 300.0
Nitrate	00620	mg/l	1.7	.02	9/1/88	EPA 353.1
Total Coliform	31501	col/100ml	4/00	20/100 ml.	9/1/88	SM908A

PRIMARY DRINKING WATER STANDARDS (continued)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Turbidity	00076	T.U.	22	1.0 NTU	9/1/88	EPA 180.1
Radium 226	09501	pCi/l	1.6	1 pCi/L	9/1/88	EPA 903.0
Radium 228	11501	pCi/l	—	—	—	—
Gross Alpha	01501	pCi/l	39	3 pCi/L	9/1/88	EPA 900.0
Gross Beta	03501	pCi/l	162	4 pCi/L	9/1/88	EPA 900.0

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED
Endrin	39390	ug/l	< .010	.010	10/3/88	10/3/88
Lindane	39782	ug/l	< .010	.010	10/3/88	10/3/88
Methoxychlor	39480	ug/l	< .050	.050	10/3/88	10/3/88
Toxaphene	39400	ug/l	< .50	.50	10/3/88	10/3/88
2,4-D	39730	ug/l	< .50	.50	10/3/88	10/3/88
2,4,5-TP	39045	ug/l	< .15	.15	10/3/88	10/3/88

Analytical method used for the above six parameters: SW 846

DATE OF REPORT 2/20/89

SIGNATURE: Michael D. Ford

NAME (PRINTED): MICHAEL D. FORD

INTERIM STATUS MONITORING WELL SAMPLING AND DATA SHEETS

BACKGROUND QUARTERLY REPORTS

This set of forms is to be completed for each of your facility's quarterly evaluations during establishment of the background data for each well. The forms are to be submitted in addition to the raw data sheets provided by your laboratory. In order to be acceptable, the raw lab data sheets must include 1) the date the sample was taken, 2) the extraction date, if any, and 3) the date of analysis.

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant EPA I.D. # NMD000709659

WELL NUMBER #1 SAMPLE COLLECTION BY M. Ford

LABORATORY NAME Radian Corp. DATE SAMPLED 11/1/88

LABORATORY SAMPLE I.D. # 8811011016 - 1031 TIME SAMPLED 10:00 A.M.

DATE RECIEVED BY LAB. 11/3/88

PARAMETERS	STORET CODE	UNITS	VALUE	DATE ANALYZED
Elevation of G.Water	71993	ft.	3884.43	10/31/88
Well Depth	-----	ft.	105.36	10/31/88
Well Casing Volume	-----	gal.	2.17	10/31/88
Pump Rate	-----	gal/min	—	—
Pump Period	72004	min.	—	—
Volume Evacuated	73675	gal.	7.00	10/31/88
Sampler Material	-----	---	TEFLN	N/A

Well Sampling Method: BAIL

INDICATOR PARAMETERS [HWMR-5 Part VI, Section 265.92(b)(3)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
pH	00400	S.U.	7.28	N/A	11/3/88	EPA 150.1
	00400	S.U.	7.24	N/A	"	
	00400	S.U.	7.20	N/A	"	
	00400	S.U.	7.24	N/A	"	
Specific Conductivity	00095	umhos/cm	540	0	11/3/88	EPA 120.1
	00095	umhos/cm	540	0	"	
	00095	umhos/cm	550	0	"	
	00095	umhos/cm	540	0	"	
T.O.X.	70354	ug/l	450	10	11/3/88	9020 (SW846)
	70354	ug/l	50	10	"	
	70354	ug/l	5.	10	"	
	70354	ug/l	70	10	"	
T.O.C.	00680	mg/l	.5	1	11/3/88	EPA 415.1
	00680	mg/l	.5	1	"	
	00680	mg/l	.5	1	"	
	00680	mg/l	.5	1	"	

GROUND WATER QUALITY STANDARDS [HWMR-5 Part VI Section 265.92(b)(2)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
(Values for metals must be for total metals.)						
Chloride	00940	mg/l	27	.5	11/3/88	EPA 300.0
Iron	01045	ug/l	<40	40	11/11/88	EPA 200.7
Manganese	71883	ug/l	120	10	11/11/88	EPA 200.7
Phenols	32730	ug/l	<5	5	11/3/88	EPA 420.2
Sodium	00929	mg/l	19	1	11/3/88	EPA 200.7
Sulfate	00945	mg/l	34	2	11/3/88	EPA 300.0

PRIMARY DRINKING WATER STANDARDS [HWMR-5 Part VI, Appendix III]

(Values for metals must be for <u>total</u> metals)

Arsenic	01002	ug/l	<2	4	11/14/88	EPA 206.2
Barium	01007	ug/l	190	10	11/11/88	EPA 200.7
Cadmium	01027	ug/l	<5	5	11/11/88	EPA 200.7
Chromium	01034	ug/l	<30	30	11/11/88	EPA 200.7
Lead	01051	ug/l	<2	2	11/14/88	EPA 239.2
Mercury	71900	ug/l	<.20	.20	11/16/88	EPA 245.1
Selenium	01149	ug/l	<4	5	11/14/88	EPA 270.2
Silver	01077	ug/l	<30	30	11/11/88	EPA 200.7
Fluoride	00950	mg/l	<.20	.20	11/3/88	EPA 300.0
Nitrate	00620	mg/l	2.3	.02	11/3/88	EPA 353.1
Total Coliform	31501	col/100ml	2700	20/100ml.	11/3/88	SM908A

PRIMARY DRINKING WATER STANDARDS (continued)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Turbidity	00076	T.U.	27	1.0	11/3/88	EPA 180.1
Radium 226	09501	pCi/l	1.7	1pCi/L	11/3/88	EPA 903.0
Radium 228	11501	pCi/l	—	—	—	—
Gross Alpha	01501	pCi/l	6	3pCi/L	11/3/88	EPA 900.0
Gross Beta	03501	pCi/l	13	4pCi/L	11/3/88	EPA 900.0

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED
Endrin	39390	ug/l	<.010	.010	12/2/88	12/7/88
Lindane	39782	ug/l	<.010	.010	12/2/88	12/7/88
Methoxychlor	39480	ug/l	<.050	.050	12/2/88	12/7/88
Toxaphene	39400	ug/l	<.50	.50	12/2/88	12/7/88
2,4-D	39730	ug/l	<.50	.50	12/6/88	12/6/88
2,4,5-TP	39045	ug/l	<.15	.15	12/6/88	12/6/88

Analytical method used for the above six parameters: SW846

DATE OF REPORT 2/22/89

SIGNATURE: Michael D. Ford

NAME (PRINTED): MICHAEL D. FORD

MONITORING WELL IDENTIFICATION REPORT

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME LEE GASOLINE PLANT

EPA I.D. NUMBER NMD000709659

COUNTY LEA

WELL NUMBER #2 DOWNGRADIENT

WELL LOCATION (LONGITUDE) 103° 29' 35''

WELL LOCATION (LATITUDE) 32° 47' 55''

AQUIFER NAME OGALLALA FORMATION

AQUIFER CONFINED ______ UNCONFINED X

WELL INSTALLATION DATE 4/26/88

DRILLING METHOD AIRRT

INNER CASING DIAMETER 2.25"

BOREHOLE DIAMETER 6.50"

CASING MATERIAL SS316 & PVC

METHOD OF DEVELOPMENT PUMPD

ELEV BOTTOM OF BOREHOLE 3862.63

ELEV BOTTOM OF WELL CASING 3868.53

ELEV BOTTOM OF SCREENED INT 3870.78

ELEVATION OF SCREENED INT 3886.44

SURVEYED ELEV OF CASING TOP 3980.59

DATE OF REPORT 2/22/89

SIGNATURE Michael D. Ford

NAME (TYPED) Mike Ford

b:wellid/bms

ANNUAL SUMMARY OF MONITOR WELL DATA
BACKGROUND BACKGROUND MONITORING

This form is to be used by facilities currently establishing their background monitoring well values or which have just completed their first year of data collection. This form must be submitted to NMEID before March 1. The annual report should be filled out by all facilities wit RCRA monitoring wells as per HWMR-5, Part VI, Section 265.94(a) and (b).

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant

EPA I.D. NUMBER NML000709659

WELL NUMBER 2

		SAMPLE DATES			
		5/13/88	8/30/88	11/1/88	
PARAMETERS	**UNITS**	**VALUE**			
Elev. of G.Water	ft.	3884.38	3883.77	3883.57	
pH (Avg)	S.U.	7.21	6.81	7.10	
Spec Cond (Avg)	umhos/cm	1175	2238	2250	
T.O.X. (Avg)	ug/l	5	55	170	
T.O.C. (Avg)	mg/l	64	29	26	
Chloride	mg/l	190	580	480	
Iron	ug/l	100	< 40	< 40	
Manganese	ug/l	400	1000	930	
Phenols	ug/l	< 5	< 5	< 5	
Sodium	mg/l	64	120	84	
Sulfate	mg/l	40	20	22	

PARAMETERS	UNITS	VALUE			
Arsenic	ug/l	13	10	< 4	
Barium	ug/l	260	570	570	
Cadmium	ug/l	< 3	<5	< 5	
Chromium	ug/l	< 30	< 30	< 30	
Lead	ug/l	< 2	< 2	< 2	
Mercury	ug/l	< .12	<18	< .20	
Selenium	ug/l	< 3	< 4	< 4	
Silver	ug/l	< 3	< 30	< 30	
Fluoride	mg/l	< .2	1.4	< .20	
Nitrate	mg/l	0.37	.14	.15	
Total Coliform	col/100ml	930	2900	800	
Turbidity	T.U.	2.13	12	10	
Radium 226	pCi/l	0.3	0.7	.95	
Radium 228	pCi/l	—	—	—	
Gross Alpha	pCi/l	3.1	17	2.6	
Gross Beta	pCi/l	8.8	19	14	
Endrin	ug/l	<.010	<.010	<.010	
Lindane	ug/l	<.010	< .010	<.010	
Methoxychlor	ug/l	<.050	< .050	< .050	
Toxaphene	ug/l	<.50	< .50	<.50	
2,4-D	ug/l	2.7	<.50	< .50	
2,4,5-TP	ug/l	0.67	< .15	<.15	

DATE OF REPORT: 2/23/89

SIGNATURE: Michael D. Ford

NAME (TYPED): Mike Ford

b:backgr.2/bas

INTERIM STATUS MONITORING WELL
SAMPLING AND DATA SHEETS

BACKGROUND QUARTERLY REPORTS

This set of forms is to be completed for each of your facility's quarterly evaluations during establishment of the background data for each well. The forms are to be submitted in addition to the raw data sheets provided by your laboratory. In order to be acceptable, the raw lab data sheets must include 1) the date the sample was taken, 2) the extraction date, if any, and 3) the date of analysis.

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant EPA I.D. # NMD000709659

WELL NUMBER 2 SAMPLE COLLECTION BY W.S. DUBYK

LABORATORY NAME [illegible] Corp DATE SAMPLED 5/13/88

LABORATORY SAMPLE I.D. # 880513900 TIME SAMPLED 9:00 A.M.

DATE RECIEVED BY LAB. 5/14/88

PARAMETERS	STORET CODE	UNITS	VALUE	DATE ANALYZED
Elevation of G.Water	71993	ft.	3884.38	5/13/88
Well Depth	-----	ft.	109.10	"
Well Casing Volume	-----	gal.	2.59	"
Pump Rate	-----	gal/min	0.20	"
Pump Period	72004	min.	4300	"
Volume Evacuated	73675	gal.	860	"
Sampler Material	-----	---	SS	N/A

Well Sampling Method: BFB

INDICATOR PARAMETERS [HWMR-5 Part VI, Section 265.92(b)(3)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
pH	00400	S.U.	7.26	N/A	5/14/88	EPA 150.1
	00400	S.U.	7.19	N/A	"	
	00400	S.U.	7.18	N/A	"	
	00400	S.U.	7.19	N/A	"	
Specific Conductivity	00095	umhos/cm	1170	0	5/14/88	EPA 120.1
	00095	umhos/cm	1170	0	"	
	00095	umhos/cm	1180	0	"	
	00095	umhos/cm	1180	0	"	
T.O.X.	70354	ug/l	5	10	5/14/88	9020 (SW 846)
	70354	ug/l	5	10	"	
	70354	ug/l	5	10	"	
	70354	ug/l	< 20	10	"	
T.O.C.	00680	mg/l	60	1	5/14/88	EPA 415.1
	00680	mg/l	65	1	"	
	00680	mg/l	60	1	"	
	00680	mg/l	70	1	"	

GROUND WATER QUALITY STANDARDS [HWMR-5 Part VI Section 265.92(b)(2)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
(Values for metals must be for total metals.)						
Chloride	00940	mg/l	190	.5	5/14/88	EPA 300.0
Iron	01045	ug/l	100	40	5/23/88	EPA 200.7
Manganese	71883	ug/l	400	10	5/23/88	EPA 200.7
Phenols	32730	ug/l	<5	5	5/14/88	EPA 420.2
Sodium	00929	mg/l	64	1	5/14/88	EPA 200.7
Sulfate	00945	mg/l	40	2	5/14/88	EPA 300.0

PRIMARY DRINKING WATER STANDARDS [HWMR-5 Part VI, Appendix III]

(Values for metals must be for total metals)

Arsenic	01002	ug/l	13	4	5/16/88	EPA 206.2
Barium	01007	ug/l	260	10	5/23/88	EPA 200.7
Cadmium	01027	ug/l	<3	5	5/23/88	EPA 200.7
Chromium	01034	ug/l	<30	30	5/23/88	EPA 200.7
Lead	01051	ug/l	<2	2	5/16/88	EPA 239.2
Mercury	71900	ug/l	<.12	.12	5/28/88	EPA 245.1
Selenium	01149	ug/l	<3	5	5/16/88	EPA 270.2
Silver	01077	ug/l	<3	30	5/23/88	EPA 200.7
Fluoride	00950	mg/l	<.2	.2	5/14/88	EPA 300.0
Nitrate	00620	mg/l	0.37	.02	5/14/88	EPA 353.1
Total Coliform	31501	col/100ml	930	20/100ml	5/14/88	SM 908A

PRIMARY DRINKING WATER STANDARDS (continued)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Turbidity	00076	T.U.	2.13	1 NTU	5/14/88	EPA 180.1
Radium 226	09501	pCi/l	0.3	1pCi/L	5/14/88	EPA 903.0
Radium 228	11501	pCi/l	—	—	—	—
Gross Alpha	01501	pCi/l	3.1	3pCi/L	5/14/88	EPA 900.0
Gross Beta	03501	pCi/l	8.8	4pCi/L	5/14/88	EPA 900.0

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED
Endrin	39390	ug/l	<.010	.010	5/16/88	6/5/88
Lindane	39782	ug/l	<.010	.010	5/16/88	6/5/88
Methoxychlor	39480	ug/l	<.050	.050	5/16/88	6/5/88
Toxaphene	39400	ug/l	<.50	.50	5/16/88	6/5/88
2,4-D	39730	ug/l	7.7	.50	5/20/88	5/26/88
2,4,5-TP	39045	ug/l	0.67	.15	5/20/88	5/26/88

Analytical method
used for the above
six parameters: SW 846

DATE OF REPORT 2/16/89

SIGNATURE: Michael D. Ford

NAME (PRINTED): MICHAEL D. FORD

INTERIM STATUS MONITORING WELL SAMPLING AND DATA SHEETS

BACKGROUND QUARTERLY REPORTS

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ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant EPA I.D. # NMD000709659

WELL NUMBER #2 SAMPLE COLLECTION BY M. Ford

LABORATORY NAME Kelvin Corp DATE SAMPLED 8/30/88

LABORATORY SAMPLE I.D. # 880830220-1234 TIME SAMPLED 12:00 P.M.

DATE RECIEVED BY LAB. 9/1/88

PARAMETERS	STORET CODE	UNITS	VALUE	DATE ANALYZED
Elevation of G.Water	71993	ft.	3883.77	8/29/88
Well Depth	-----	ft.	109.10	8/29/88
Well Casing Volume	-----	gal.	2.54	8/29/88
Pump Rate	-----	gal/min	—	—
Pump Period	72004	min.	—	—
Volume Evacuated	73675	gal.	8.00	8/29/88
Sampler Material	-----	---	TEFLN	N/A

Well Sampling Method: BAIL

INDICATOR PARAMETERS [HWMR-5 Part VI, Section 265.92(b)(3)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
pH	00400	S.U.	6.85	N/A	9/1/88	EPA 150.1
	00400	S.U.	6.80	N/A	"	
	00400	S.U.	6.80	N/A	"	
	00400	S.U.	6.78	N/A	"	
Specific Conductivity	00095	umhos/cm	2240	0	9/1/88	EPA 120.1
	00095	umhos/cm	2210	0	"	
	00095	umhos/cm	2270	0	"	
	00095	umhos/cm	2230	0	"	
T.O.X.	70354	ug/1	60	10	9/1/88	9020 (SW846)
	70354	ug/1	50	10	"	
	70354	ug/1	50	10	"	
	70354	ug/1	60	10	"	
T.O.C.	00680	mg/1	25	1	9/1/88	EPA 415.1
	00680	mg/1	27	1	"	
	00680	mg/1	33	1	"	
	00680	mg/1	30	1	"	

GROUND WATER QUALITY STANDARDS [HWMR-5 Part VI Section 265.92(b)(2)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
(Values for metals must be for <u>total</u> metals.)						
Chloride	00940	mg/l	580	.5	9/1/88	EPA 300.0
Iron	01045	ug/l	<40	40	9/16/88	EPA 200.7
Manganese	71883	ug/l	1000	10	9/16/88	EPA 200.7
Phenols	32730	ug/l	<5	5	9/1/88	EPA 420.2
Sodium	00929	mg/l	120	1	9/1/88	EPA 200.7
Sulfate	00945	mg/l	20	2	9/1/88	EPA 300.0

PRIMARY DRINKING WATER STANDARDS [HWMR-5 Part VI, Appendix III]

(Values for metals must be for <u>total</u> metals)

Arsenic	01002	ug/l	10	4	9/6/88	EPA 206.2
Barium	01007	ug/l	570	10	9/16/88	EPA 200.7
Cadmium	01027	ug/l	<5	5	9/16/88	EPA 200.7
Chromium	01034	ug/l	<30	30	9/16/88	EPA 200.7
Lead	01051	ug/l	<2	2	9/6/88	EPA 239.2
Mercury	71900	ug/l	<.18	.18	9/14/88	EPA 245.1
Selenium	01149	ug/l	<4	5	9/6/88	EPA 270.2
Silver	01077	ug/l	<30	30	9/16/88	EPA 200.7
Fluoride	00950	mg/l	1.4	.2	9/1/88	EPA 300.0
Nitrate	00620	mg/l	0.14	.02	9/1/88	EPA 353.1
Total Coliform	31501	col/100ml	2900	20/100 ml.	9/1/88	SM908A

PRIMARY DRINKING WATER STANDARDS (continued)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Turbidity	00076	T.U.	12	1.0 NTU	9/1/88	EPA 180.1
Radium 226	09501	pCi/l	0.7	1pCi/L	9/1/88	EPA 903.0
Radium 228	11501	pCi/l	—	—	—	—
Gross Alpha	01501	pCi/l	17	3pCi/L	9/1/88	EPA 900 0
Gross Beta	03501	pCi/l	19	4pCi/L	9/1/88	EPA 900.0

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED
Endrin	39390	ug/l	<.010	.010	10/3/88	10/3/88
Lindane	39782	ug/l	<.010	.010	10/3/88	10/3/88
Methoxychlor	39480	ug/l	<.050	.050	10/3/88	10/3/88
Toxaphene	39400	ug/l	<.50	.50	10/3/88	10/3/88
2,4-D	39730	ug/l	<.50	.50	10/3/88	10/3/88
2,4,5-TP	39045	ug/l	<.15	.15	10/3/88	10/3/88

Analytical method used for the above six parameters: SW846

DATE OF REPORT 2/20/89

SIGNATURE: Michael D. Ford

NAME (PRINTED): MICHAEL D. FORD

INTERIM STATUS MONITORING WELL SAMPLING AND DATA SHEETS

BACKGROUND QUARTERLY REPORTS

This set of forms is to be completed for each of your facility's quarterly evaluations during establishment of the background data for each well. The forms are to be submitted in addition to the raw data sheets provided by your laboratory. In order to be acceptable, the raw lab data sheets must include 1) the date the sample was taken, 2) the extraction date, if any, and 3) the date of analysis.

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant EPA I.D. # NMD000709659

WELL NUMBER #2 SAMPLE COLLECTION BY M. Ford

LABORATORY NAME Radian Corp. DATE SAMPLED 11/1/88

LABORATORY SAMPLE I.D. # 8811011155-1211 TIME SAMPLED 12:00P.M.

DATE RECIEVED BY LAB. 11/3/88

PARAMETERS	STORET CODE	UNITS	VALUE	DATE ANALYZED
Elevation of G.Water	71993	ft.	3883.57	10/31/88
Well Depth	-----	ft.	109.10	10/31/88
Well Casing Volume	-----	gal.	2.49	10/31/88
Pump Rate	-----	gal/min	—	—
Pump Period	72004	min.	—	—
Volume Evacuated	73678	gal.	8.00	10/31/88
Sampler Material	-----	---	TEFLN	N/A

Well Sampling Method: BAIL

INDICATOR PARAMETERS [HWMR-5 Part VI, Section 265.92(b)(3)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
pH	00400	S.U.	6.92	N/A	11/3/88	EPA 150.1
	00400	S.U.	7.80	N/A	"	
	00400	S.U.	6.81	N/A	"	
	00400	S.U.	6.86	N/A	"	
Specific Conductivity	00095	umhos/cm	2300	0	11/3/88	EPA 120.1
	00095	umhos/cm	2300	0	"	
	00095	umhos/cm	2200	0	"	
	00095	umhos/cm	2200	0	"	
T.O.X.	70354	ug/l	130	10	11/3/88	9020 (SW846)
	70354	ug/l	210	10	"	
	70354	ug/l	240	10	"	
	70354	ug/l	100	10	"	
T.O.C.	00680	mg/l	25	1	11/3/88	EPA 415.1
	00680	mg/l	28	1	"	
	00680	mg/l	24	1	"	
	00680	mg/l	28	1	"	

GROUND WATER QUALITY STANDARDS [HWMR-5 Part VI Section 265.92(b)(2)]

(Values for metals must be for total metals.)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Chloride	00940	mg/l	480	.5	11/3/88	EPA 300.0
Iron	01045	ug/l	<40	40	11/11/88	EPA 200.7
Manganese	71883	ug/l	930	10	11/11/88	EPA 200.7
Phenols	32730	ug/l	<5	5	11/3/88	EPA 420.2
Sodium	00929	mg/l	84	1	11/3/88	EPA 200.7
Sulfate	00945	mg/l	22	2	11/3/88	EPA 300.0

PRIMARY DRINKING WATER STANDARDS [HWMR-5 Part VI, Appendix III]

(Values for metals must be for total metals)

Arsenic	01002	ug/l	<4	4	11/14/88	EPA 206.2
Barium	01007	ug/l	570	10	11/11/88	EPA 200.7
Cadmium	01027	ug/l	<5	5	11/11/88	EPA 200.7
Chromium	01034	ug/l	<30	30	11/11/88	EPA 200.7
Lead	01051	ug/l	<2	2	11/14/88	EPA 239.2
Mercury	71900	ug/l	<.20	.20	11/10/88	EPA 245.1
Selenium	01149	ug/l	<4	5	11/14/88	EPA 270.2
Silver	01077	ug/l	<30	30	11/11/88	EPA 200.7
Fluoride	00950	mg/l	<.20	.20	11/3/88	EPA 300.0
Nitrate	00620	mg/l	0.15	.02	11/3/88	EPA 353.1
Total Coliform	31501	col/100ml	800	20/100ml.	11/3/88	SM908A

PRIMARY DRINKING WATER STANDARDS (continued)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Turbidity	00076	T.U.	10	1.0	11/3/88	EPA 180.1
Radium 226	09501	pCi/l	0.95	1pCi/L	11/3/88	EPA 903.0
Radium 228	11501	pCi/l	—	—	—	—
Gross Alpha	01501	pCi/l	2.6	3pCi/L	11/3/88	EPA 900.0
Gross Beta	03501	pCi/l	14	4pCi/L	11/3/88	EPA 900.0

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED
Endrin	39390	ug/l	<.010	.010	12/2/88	12/7/88
Lindane	39782	ug/l	<.010	.010	12/2/88	12/7/88
Methoxychlor	39480	ug/l	<.050	.050	12/2/88	12/7/88
Toxaphene	39400	ug/l	<.50	.50	12/2/88	12/7/88
2,4-D	39730	ug/l	<.50	.50	12/6/88	12/6/88
2,4,5-TP	39045	ug/l	<.15	.15	12/6/88	12/6/88

Analytical method used for the above six parameters: SW846

DATE OF REPORT 2/22/89

SIGNATURE: Michael D. Ford

NAME (PRINTED): MICHAEL D. FORD

MONITORING WELL IDENTIFICATION REPORT

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME LEE GASOLINE PLANT

EPA I.D. NUMBER NMD000709659

COUNTY LEA

WELL NUMBER #3, DOWNGRADIENT

WELL LOCATION (LONGITUDE) 103° 29' 36"

WELL LOCATION (LATITUDE) 32° 47' 55"

AQUIFER NAME OGALLALA FORMATION

AQUIFER CONFINED ______ **UNCONFINED** X

WELL INSTALLATION DATE 4/27/88

DRILLING METHOD AIRRT

INNER CASING DIAMETER 2.25"

BOREHOLE DIAMETER 6.50"

CASING MATERIAL SS316 & PVC

METHOD OF DEVELOPMENT PUMPD

ELEV BOTTOM OF BOREHOLE 3862.88

ELEV BOTTOM OF WELL CASING 3871.27

ELEV BOTTOM OF SCREENED INT 3873.85

ELEVATION OF SCREENED INT 3889.18

SURVEYED ELEV OF CASING TOP 3980.37

DATE OF REPORT 2/23/89 **SIGNATURE** Michael D. Ford

NAME (TYPED) Mike Ford

b:wellid/bms

ANNUAL SUMMARY OF MONITOR WELL DATA
BACKGROUND BACKGROUND MONITORING

This form is to be used by facilities currently establishing their background monitoring well values or which have just completed their first year of data collection. This form must be submitted to NMEID before March 1. The annual report should be filled out by all facilities wi RCRA monitoring wells as per HWMR-5, Part VI, Section 265.94(a) and (b).

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant

EPA I.D. NUMBER NM0000709659

WELL NUMBER 3

		SAMPLE DATES			
		5/12/88	8/30/88	11/1/88	
PARAMETERS	**UNITS**	**VALUE**			
Elev. of G.Water	ft.	3884.15	3883.75	3883.56	
pH (Avg)	S.U.	8.08	7.61	7.45	
Spec Cond (Avg)	umhos/cm	810	822	843	
T.O.X. (Avg)	ug/l	5	5	34	
T.O.C. (Avg)	mg/l	133	.5	11	
Chloride	mg/l	60	83	180	
Iron	ug/l	46	< 40	< 40	
Manganese	ug/l	17	< 10	< 10	
Phenols	ug/l	< 5	< 5	90	
Sodium	mg/l	170	160	130	
Sulfate	mg/l	46	42	34	

PARAMETERS	UNITS	VALUE			
Arsenic	ug/l	130	336	310	
Barium	ug/l	60	70	72	
Cadmium	ug/l	< 2	< 5	< 5	
Chromium	ug/l	< 30	< 30	< 30	
Lead	ug/l	< 2	< 2	< 2	
Mercury	ug/l	<.12	.09	<.20	
Selenium	ug/l	< 3	< 4	< 4	
Silver	ug/l	< 3	< 30	< 30	
Fluoride	mg/l	<.2	< .2	<.20	
Nitrate	mg/l	0.2	0.10	.13	
Total Coliform	col/100ml	240	8700	200	
Turbidity	T.U.	5.2	46	8	
Radium 226	pCi/l	0.11	0.6	.36	
Radium 228	pCi/l	—	—	—	
Gross Alpha	pCi/l	< 1.4	5	3.5	
Gross Beta	pCi/l	33	11	5	
Endrin	ug/l	<.010	< .010	<.010	
Lindane	ug/l	<.010	< .010	<.010	
Methoxychlor	ug/l	<.050	< .050	<.050	
Toxaphene	ug/l	<.50	< .50	<.50	
2,4-D	ug/l	1.1	< .50	<.50	
2,4,5-TP	ug/l	<.10	< .15	<.15	

DATE OF REPORT: 2/23/89

SIGNATURE: Michael D. Ford

NAME (TYPED): Mike Ford

b:backgr.2/bes

INTERIM STATUS MONITORING WELL SAMPLING AND DATA SHEETS

BACKGROUND QUARTERLY REPORTS

This set of forms is to be completed for each of your facility's quarterly evaluations during establishment of the background data for each well. The forms are to be submitted in addition to the raw data sheets provided by your laboratory. In order to be acceptable, the raw lab data sheets must include 1) the date the sample was taken, 2) the extraction date, if any, and 3) the date of analysis.

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant EPA I.D. # NMD000709659

WELL NUMBER 3 SAMPLE COLLECTION BY W. S. DUBYK

LABORATORY NAME Radian Corp. DATE SAMPLED 5/12/88

LABORATORY SAMPLE I.D. # 8805121850 TIME SAMPLED 7:00 P.M.

DATE RECIEVED BY LAB. 5/14/88

PARAMETERS	STORET CODE	UNITS	VALUE	DATE ANALYZED
Elevation of G.Water	71993	ft.	3884.15	5/12/88
Well Depth	-----	ft.	106.61	"
Well Casing Volume	-----	gal.	2.10	"
Pump Rate	-----	gal/min	0.20	"
Pump Period	72004	min.	2750	"
Volume Evacuated	73675	gal.	550	"
Sampler Material	-----	---	SS	N/A

Well Sampling Method: BFB

INDICATOR PARAMETERS [HWMR-5 Part VI, Section 265.92(b)(3)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
pH	00400	S.U.	8.13	N/A	5/14/88	EPA 150.1
	00400	S.U.	8.08	N/A	"	
	00400	S.U.	8.06	N/A	"	
	00400	S.U.	8.05	N/A	"	
Specific Conductivity	00095	umhos/cm	810	0	5/14/88	EPA 120.1
	00095	umhos/cm	810	0	"	
	00095	umhos/cm	810	0	"	
	00095	umhos/cm	810	0	"	
T.O.X.	70354	ug/l	< 20	10	5/14/88	9020 (SW 846)
	70354	ug/l	< 20	10	"	
	70354	ug/l	5	10	"	
	70354	ug/l	< 20	10	"	
T.O.C.	00680	mg/l	160	1	5/14/88	EPA 415.1
	00680	mg/l	115	1	"	
	00680	mg/l	120	1	"	
	00680	mg/l	135	1	"	

GROUND WATER QUALITY STANDARDS [HWMR-5 Part VI Section 265.92(b)(2)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
(Values for metals must be for <u>total</u> metals.)						
Chloride	00940	mg/l	60	.5	5/14/88	EPA 300.0
Iron	01045	ug/l	46	40	5/23/88	EPA 200.7
Manganese	71883	ug/l	17	10	5/23/88	EPA 200.7
Phenols	32730	ug/l	< 5	5	5/14/88	EPA 420.2
Sodium	00929	mg/l	170	1	5/14/88	EPA 200.7
Sulfate	00945	mg/l	46	2	5/14/88	EPA 300.0

PRIMARY DRINKING WATER STANDARDS [HWMR-5 Part VI, Appendix III]
(Values for metals must be for <u>total</u> metals)

Arsenic	01002	ug/l	130	4	5/16/88	EPA 206.2
Barium	01007	ug/l	60	10	5/23/88	EPA 200.7
Cadmium	01027	ug/l	< 3	5	6/23/88	EPA 200.7
Chromium	01034	ug/l	<30	30	5/23/88	EPA 200.7
Lead	01051	ug/l	<2	2	5/16/88	EPA 239.2
Mercury	71900	ug/l	<.12	.12	5/23/88	EPA 245.1
Selenium	01149	ug/l	<3	5	5/16/88	EPA 270.2
Silver	01077	ug/l	< 3	30	5/23/88	EPA 200.7
Fluoride	00950	mg/l	<.2	.2	5/14/88	EPA 300.0
Nitrate	00620	mg/l	0.2	.02	5/14/88	EPA 353.1
Total Coliform	31501	col/100ml	240	20/100 ml	5/14/88	SM 908A

PRIMARY DRINKING WATER STANDARDS (continued)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Turbidity	00076	T.U.	5.2	1 NTU	5/14/88	EPA 180.1
Radium 226	09501	pCi/l	0.11	1pCi/L	5/14/88	EPA 903.0
Radium 228	11501	pCi/l	—	—	—	—
Gross Alpha	01501	pCi/l	<1.4	3pCi/L	5/14/88	EPA 900.0
Gross Beta	03501	pCi/l	3.3	4pCi/L	5/14/88	EPA 900.0

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED
Endrin	39390	ug/l	<.010	0.010	5/16/88	6/5/88
Lindane	39782	ug/l	<.010	0.010	5/16/88	6/5/88
Methoxychlor	39480	ug/l	<.050	.050	5/16/88	6/5/88
Toxaphene	39400	ug/l	<.50	0.50	5/16/88	6/5/88
2,4-D	39730	ug/l	1.1	0.50	5/18/88	5/26/88
2,4,5-TP	39045	ug/l	<.10	0.10	5/18/88	5/26/88

Analytical method used for the above six parameters: SW 846

DATE OF REPORT 2/16/89

SIGNATURE: Michael D. Ford

NAME (PRINTED): MICHAEL D. FORD

INTERIM STATUS MONITORING WELL
SAMPLING AND DATA SHEETS

BACKGROUND QUARTERLY REPORTS

This set of forms is to be completed for each of your facility's quarterly evaluations during establishment of the background data for each well. The forms are to be submitted in addition to the raw data sheets provided by your laboratory. In order to be acceptable, the raw lab data sheets must include 1) the date the sample was taken, 2) the extraction date, if any, and 3) the date of analysis.

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant EPA I.D. # NMD000709659

WELL NUMBER #3 SAMPLE COLLECTION BY M. Ford

LABORATORY NAME Radian Corp DATE SAMPLED 8/30/88

LABORATORY SAMPLE I.D. # 880830216-231 TIME SAMPLED 2:00 P.M.

DATE RECIEVED BY LAB. 9/1/88

PARAMETERS	STORET CODE	UNITS	VALUE	DATE ANALYZED
Elevation of G.Water	71993	ft.	3883.75	8/29/88
Well Depth	-----	ft.	106.61	8/29/88
Well Casing Volume	-----	gal.	2.06	8/29/88
Pump Rate	-----	gal/min	—	—
Pump Period	72004	min.	—	—
Volume Evacuated	73675	gal.	7.00	8/29/88
Sampler Material	-----	---	TEFLN	N/A

Well Sampling Method: BAIL

INDICATOR PARAMETERS [HWMR-5 Part VI, Section 265.92(b)(3)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
pH	00400	S.U.	7.60	N/A	9/1/88	EPA 150.1
	00400	S.U.	7.55	N/A	"	
	00400	S.U.	7.66	N/A	"	
	00400	S.U.	7.61	N/A	"	
Specific Conductivity	00095	umhos/cm	833	0	9/1/88	EPA 120.1
	00095	umhos/cm	847	0	"	
	00095	umhos/cm	812	0	"	
	00095	umhos/cm	834	0	"	
T.O.X.	70354	ug/l	5	10	9/1/88	9020 (SW846)
	70354	ug/l	5	10	"	
	70354	ug/l	5	10	"	
	70354	ug/l	5	10	"	
T.O.C.	00680	mg/l	.5	1	9/1/88	EPA 415.1
	00680	mg/l	.5	1	"	
	00680	mg/l	.5	1	"	
	00680	mg/l	.5	1	"	

GROUND WATER QUALITY STANDARDS [HWMR-5 Part VI Section 265.92(b)(2)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
(Values for metals must be for <u>total</u> metals.)						
Chloride	00940	mg/l	83	.5	9/1/88	EPA 300.0
Iron	01045	ug/l	<40	40	9/16/88	EPA 200.7
Manganese	71883	ug/l	<10	10	9/16/88	EPA 200.7
Phenols	32730	ug/l	<5	5	9/1/88	EPA 420.2
Sodium	00929	mg/l	160	1	9/1/88	EPA 200.7
Sulfate	00945	mg/l	42	2	9/1/88	EPA 300.0

PRIMARY DRINKING WATER STANDARDS [HWMR-5 Part VI, Appendix III]
(Values for metals must be for <u>total</u> metals)

Arsenic	01002	ug/l	336	4	9/6/88	EPA 206.2
Barium	01007	ug/l	70	10	9/16/88	EPA 200.7
Cadmium	01027	ug/l	<5	5	9/16/88	EPA 200.7
Chromium	01034	ug/l	<30	30	9/16/88	EPA 200.7
Lead	01051	ug/l	<2	2	9/6/88	EPA 239.2
Mercury	71900	ug/l	.09	.18	9/14/88	EPA 245.1
Selenium	01149	ug/l	<4	5	9/6/88	EPA 270.2
Silver	01077	ug/l	<30	30	9/16/88	EPA 200.7
Fluoride	00950	mg/l	<.2	.2	9/1/88	EPA 300.0
Nitrate	00620	mg/l	0.10	.02	9/1/88	EPA 353.1
Total Coliform	31501	col/100ml	8700	20/100ml.	9/1/88	SM908A

PRIMARY DRINKING WATER STANDARDS (continued)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Turbidity	00076	T.U.	46	1.0 NTU	9/1/88	EPA 180.1
Radium 226	09501	pCi/l	0.6	1pCi/L	9/1/88	EPA 903.0
Radium 228	11501	pCi/l	—	—	—	—
Gross Alpha	01501	pCi/l	5	3pCi/L	9/1/88	EPA 900.0
Gross Beta	03501	pCi/l	11	4pCi/L	9/1/88	EPA 900.0

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED
Endrin	39390	ug/l	<.010	.010	10/3/88	10/3/88
Lindane	39782	ug/l	<.010	.010	10/3/88	10/3/88
Methoxychlor	39480	ug/l	<.050	.050	10/3/88	10/3/88
Toxaphene	39400	ug/l	<.50	.50	10/3/88	10/3/88
2,4-D	39730	ug/l	<.50	.50	10/3/88	10/3/88
2,4,5-TP	39045	ug/l	<.15	.15	10/3/88	10/3/88

Analytical method used for the above six parameters: SW 846

DATE OF REPORT 2/20/89

SIGNATURE: Michael D. Ford

NAME (PRINTED): MICHAEL D. FORD

INTERIM STATUS MONITORING WELL
SAMPLING AND DATA SHEETS

BACKGROUND QUARTERLY REPORTS

This set of forms is to be completed for each of your facility's quarterly evaluations during establishment of the background data for each well. The forms are to be submitted in addition to the raw data sheets provided by your laboratory. In order to be acceptable, the raw lab data sheets must include 1) the date the sample was taken, 2) the extraction date, if any, and 3) the date of analysis.

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant EPA I.D. # NMD000709659

WELL NUMBER #3 SAMPLE COLLECTION BY M. Ford

LABORATORY NAME Radian Corp DATE SAMPLED 11/1/88

LABORATORY SAMPLE I.D. # 881101/20 -135 TIME SAMPLED 1:00 P.M.

DATE RECIEVED BY LAB. 11/3/88

PARAMETERS	STORET CODE	UNITS	VALUE	DATE ANALYZED
Elevation of G.Water	71993	ft.	3883.56	10/31/88
Well Depth	-----	ft.	107.50	10/31/88
Well Casing Volume	-----	gal.	2.21	11/31/88
Pump Rate	-----	gal/min	—	—
Pump Period	72004	min.	—	—
Volume Evacuated	73675	gal.	7.00	10/31/88
Sampler Material	-----	---	TEFLN	N/A

Well Sampling Method: BAIL

INDICATOR PARAMETERS [HWMR-5 Part VI, Section 265.92(b)(3)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
pH	00400	S.U.	7.06	N/A	11/3/88	EPA 150.1
	00400	S.U.	7.59	N/A	"	
	00400	S.U.	7.66	N/A	"	
	00400	S.U.	7.48	N/A	"	
Specific Conductivity	00095	umhos/cm	1300	0	11/3/88	EPA 120.1
	00095	umhos/cm	690	0	"	
	00095	umhos/cm	680	0	"	
	00095	umhos/cm	700	0	"	
T.O.X.	70354	ug/l	120	10	11/3/88	9020 (SW846)
	70354	ug/l	5	10	"	
	70354	ug/l	5	10	"	
	70354	ug/l	5	10	"	
T.O.C.	00680	mg/l	17	1	11/3/88	EPA 415.1
	00680	mg/l	10	1	"	
	00680	mg/l	8	1	"	
	00680	mg/l	9	1	"	

GROUND WATER QUALITY STANDARDS [HWMR-5 Part VI Section 265.92(b)(2)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
(Values for metals must be for <u>total</u> metals.)						
Chloride	00940	mg/l	180	.5	11/3/88	EPA 300.0
Iron	01045	ug/l	<40	40	11/11/88	EPA 200.7
Manganese	71883	ug/l	<10	10	11/11/88	EPA 200.7
Phenols	32730	ug/l	90	5	11/3/88	EPA 420.2
Sodium	00929	mg/l	130	1	11/3/88	EPA 200.7
Sulfate	00945	mg/l	34	2	11/3/88	EPA 300.0

PRIMARY DRINKING WATER STANDARDS [HWMR-5 Part VI, Appendix III]

(Values for metals must be for <u>total</u> metals)

Arsenic	01002	ug/l	310	4	11/14/88	EPA 206.2
Barium	01007	ug/l	72	10	11/11/88	EPA 200.7
Cadmium	01027	ug/l	<5	5	11/11/88	EPA 200.7
Chromium	01034	ug/l	<30	30	11/11/88	EPA 200.7
Lead	01051	ug/l	<2	2	11/14/88	EPA 239.2
Mercury	71900	ug/l	<.20	,20	11/16/88	EPA 245.1
Selenium	01149	ug/l	<4	5	11/14/88	EPA 270.2
Silver	01077	ug/l	< 30	30	11/11/88	EPA 200.7
Fluoride	00980	mg/l	2,20	.20	11/3/88	EPA 300.0
Nitrate	00620	mg/l	.13	,02	11/3/88	EPA 353.1
Total Coliform	31501	col/100ml	200	20/100ml.	11/3/88	SM908A

PRIMARY DRINKING WATER STANDARDS (continued)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Turbidity	00076	T.U.	2	1.0	11/3/88	EPA 180.1
Radium 226	09501	pCi/l	0.36	1pCi/L	11/3/88	EPA 903.0
Radium 228	11501	pCi/l	—	—	—	—
Gross Alpha	01501	pCi/l	3.5	3pCi/L	11/3/88	EPA 900.0
Gross Beta	03501	pCi/l	5	4pCi/L	11/3/88	EPA 900.0

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED
Endrin	39390	ug/l	< .010	.010	12/2/88	12/7/88
Lindane	39782	ug/l	< .010	.010	12/2/88	12/7/88
Methoxychlor	39480	ug/l	< .050	.050	12/2/88	12/7/88
Toxaphene	39400	ug/l	< .50	.50	12/2/88	12/7/88
2,4-D	39730	ug/l	< .50	.50	12/6/88	12/6/88
2,4,5-TP	39045	ug/l	< .15	.15	12/6/88	12/6/88

Analytical method used for the above six parameters: SW846

DATE OF REPORT 2/22/89

SIGNATURE: Michael D. Ford

NAME (PRINTED): MICHAEL D. FORD

MONITORING WELL IDENTIFICATION REPORT

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME LEE GASOLINE PLANT

EPA I.D. NUMBER NMD000709659

COUNTY LEA

WELL NUMBER #4, DOWNGRADIENT

WELL LOCATION (LONGITUDE) 103° 29' 37''

WELL LOCATION (LATITUDE) 32° 47' 55''

AQUIFER NAME OGALLALA FORMATION

AQUIFER CONFINED ____ UNCONFINED X

WELL INSTALLATION DATE 4/28/88

DRILLING METHOD AIRRT

INNER CASING DIAMETER 2.25"

BOREHOLE DIAMETER 6.50"

CASING MATERIAL SS316 & PVC

METHOD OF DEVELOPMENT PUMPD

ELEV BOTTOM OF BOREHOLE 3862.86

ELEV BOTTOM OF WELL CASING 3871.04

ELEV BOTTOM OF SCREENED INT 3873.62

ELEVATION OF SCREENED INT 3888.95

SURVEYED ELEV OF CASING TOP 3980.29

DATE OF REPORT 2/23/89

SIGNATURE Michael D. Ford

NAME (TYPED) Mike Ford

b:wellid/bms

ANNUAL SUMMARY OF MONITOR WELL DATA
BACKGROUND BACKGROUND MONITORING

This form is to be used by facilities currently establishing their background monitoring well values or which have just completed their first year of data collection. This form must be submitted to NMEID before March 1. The annual report should be filled out by all facilities wi RCRA monitoring wells as per HWMR-5, Part VI, Section 265.94(a) and (b).

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant

EPA I.D. NUMBER NMD000709659

WELL NUMBER 4

		SAMPLE DATES			
		5/13/88	8/30/88	11/1/88	
PARAMETERS	**UNITS**	**VALUE**			
Elev. of G.Water	ft.	3884.00	3883.75	3883.57	
pH (Avg)	S.U.	7.47	7.02	7.21	
Spec Cond (Avg)	umhos/cm	1240	1260	1133	
T.O.X. (Avg)	ug/l	5	5	40	
T.O.C. (Avg)	mg/l	.5	7	11	
Chloride	mg/l	180	190	28	
Iron	ug/l	1300	1700	2200	
Manganese	ug/l	570	620	790	
Phenols	ug/l	<5	<5	60	
Sodium	mg/l	161	150	130	
Sulfate	mg/l	34	28	44	

PARAMETERS	UNITS	VALUE			
Arsenic	ug/l	130	156	140	
Barium	ug/l	380	410	500	
Cadmium	ug/l	< 3	< 5	< 5	
Chromium	ug/l	< 24	< 30	< 30	
Lead	ug/l	10	< 2	< 2	
Mercury	ug/l	< .12	.09	< .20	
Selenium	ug/l	< 3	< 4	< 4	
Silver	ug/l	< 3	< 30	< 30	
Fluoride	mg/l	< .20	< .2	< .20	
Nitrate	mg/l	< 0.1	0.12	< .02	
Total Coliform	col/100ml	2100	88	100	
Turbidity	T.U.	18	12	22	
Radium 226	pCi/l	0.24	0.5	.65	
Radium 228	pCi/l	—	—	—	
Gross Alpha	pCi/l	< 1.9	17	4	
Gross Beta	pCi/l	7.1	19	8	
Endrin	ug/l	< .010	< .010	< .010	
Lindane	ug/l	< .010	< .010	< .010	
Methoxychlor	ug/l	< .050	< .050	< .050	
Toxaphene	ug/l	< .50	< .50	< .50	
2,4-D	ug/l	< .50	< .50	< .50	
2,4,5-TP	ug/l	< .15	< .15	< .15	

DATE OF REPORT: 2/23/89

SIGNATURE: Mike P. Ford

NAME (TYPED): Mike Ford

INTERIM STATUS MONITORING WELL
SAMPLING AND DATA SHEETS

BACKGROUND QUARTERLY REPORTS

This set of forms is to be completed for each of your facility's quarterly evaluations during establishment of the background data for each well. The forms are to be submitted in addition to the raw data sheets provided by your laboratory. In order to be acceptable, the raw lab data sheets must include 1) the date the sample was taken, 2) the extraction date, if any, and 3) the date of analysis.

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant EPA I.D. # NMD000709659

WELL NUMBER 4 SAMPLE COLLECTION BY W.S. DUBYK

LABORATORY NAME Radian Corp DATE SAMPLED 5/13/88

LABORATORY SAMPLE I.D. # 8805132150 TIME SAMPLED 10:00 P.M.

DATE RECIEVED BY LAB. 5/14/88

PARAMETERS	STORET CODE	UNITS	VALUE	DATE ANALYZED
Elevation of G.Water	71993	ft.	3884.00	5/13/88
Well Depth	-----	ft.	106.82	"
Well Casing Volume	-----	gal.	212	"
Pump Rate	-----	gal/min	2.0	"
Pump Period	72004	min.	425	"
Volume Evacuated	73675	gal.	850	"
Sampler Material	-----	---	SS	N/A

Well Sampling Method: BFB

INDICATOR PARAMETERS [HWMR-5 Part VI, Section 265.92(b)(3)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
pH	00400	S.U.	7.52	N/A	5/14/88	EPA 150.1
	00400	S.U.	7 50	N/A	"	
	00400	S.U.	7.43	N/A	"	
	00400	S.U.	7.43	N/A	"	
Specific Conductivity	00095	umhos/cm	1230	0	5/14/88	EPA 120.1
	00095	umhos/cm	1250	0	"	
	00095	umhos/cm	1240	0	"	
	00095	umhos/cm	1240	0	"	
T.O.X.	70354	ug/l	5	10	5/14/88	9020 (SW 846)
	70354	ug/l	<20	10	"	
	70354	ug/l	5	10	"	
	70354	ug/l	<20	10	"	
T.O.C.	00680	mg/l	.5	1	5/14/88	EPA 415.1
	00680	mg/l	.5	1	"	
	00680	mg/l	.5	1	"	
	00680	mg/l	.5	1	"	

GROUND WATER QUALITY STANDARDS [HWMR-5 Part VI Section 265.92(b)(2)]

(Values for metals must be for total metals.)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Chloride	00940	mg/1	180	.5	5/14/88	EPA 300.0
Iron	01045	ug/1	1300	40	5/23/88	EPA 200.7
Manganese	71883	ug/1	570	10	5/23/88	EPA 200.7
Phenols	32730	ug/1	<5	5	5/14/88	EPA 420.2
Sodium	00929	mg/1	161	1	5/14/88	EPA 200.7
Sulfate	00945	mg/1	34	2	5/14/88	EPA 300.0

PRIMARY DRINKING WATER STANDARDS [HWMR-5 Part VI, Appendix III]

(Values for metals must be for total metals)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Arsenic	01002	ug/1	130	4	5/16/88	EPA 206.2
Barium	01007	ug/1	380	10	5/23/88	EPA 200.7
Cadmium	01027	ug/1	< 3	5	5/23/88	EPA 200.7
Chromium	01034	ug/1	<28	30	5/23/88	EPA 200.7
Lead	01051	ug/1	10	2	5/16/88	EPA 239.2
Mercury	71900	ug/1	<.12	.12	5/23/88	EPA 245.1
Selenium	01149	ug/1	<3	5	5/16/88	EPA 270.2
Silver	01077	ug/1	<3	30	5/23/88	EPA 200.7
Fluoride	00950	mg/1	<.20	.2	5/14/88	EPA 300.0
Nitrate	00620	mg/1	<0.1	.02	5/14/88	EPA 353.1
Total Coliform	31501	col/100ml	2100	20/100 ml	5/14/88	SM 908A

PRIMARY DRINKING WATER STANDARDS (continued)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Turbidity	00076	T.U.	18	1NTU	5/14/88	EPA 180.1
Radium 226	09501	pCi/l	0.24	1pCi/L	5/14/88	EPA 903.0
Radium 228	11501	pCi/l	—	—	—	—
Gross Alpha	01501	pCi/l	<1.9	3pCi/L	5/14/88	EPA 900.0
Gross Beta	03501	pCi/l	7.1	4pCi/L	5/14/88	EPA 900.0

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED
Endrin	39390	ug/l	<.010	.010	5/16/88	6/5/88
Lindane	39782	ug/l	<.010	.010	5/16/88	6/5/88
Methoxychlor	39480	ug/l	<.050	.050	5/16/88	6/5/88
Toxaphene	39400	ug/l	<.50	.50	5/16/88	6/5/88
2,4-D	39730	ug/l	<.50	0.50	5/20/88	5/26/88
2,4,5-TP	39045	ug/l	<.15	0.15	5/20/88	5/26/88

Analytical method used for the above six parameters: SW 846

DATE OF REPORT 2/16/89

SIGNATURE: Michael D. Ford

NAME (PRINTED): MICHAEL D. FORD

INTERIM STATUS MONITORING WELL SAMPLING AND DATA SHEETS

BACKGROUND QUARTERLY REPORTS

This set of forms is to be completed for each of your facility's quarterly evaluations during establishment of the background data for each well. The forms are to be submitted in addition to the raw data sheets provided by your laboratory. In order to be acceptable, the raw lab data sheets must include 1) the date the sample was taken, 2) the extraction date, if any, and 3) the date of analysis.

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant EPA I.D. # NMD000709659

WELL NUMBER #4 SAMPLE COLLECTION BY M. Ford

LABORATORY NAME [illegible] Corp. DATE SAMPLED 8/30/88

LABORATORY SAMPLE I.D. # 880830326 - 341 TIME SAMPLED 3:00P.M.

DATE RECIEVED BY LAB. 9/1/88

PARAMETERS	STORET CODE	UNITS	VALUE	DATE ANALYZED
Elevation of G.Water	71993	ft.	3883.75	8/29/88
Well Depth	-----	ft.	106.82	8/29/88
Well Casing Volume	-----	gal.	2.12	8/29/88
Pump Rate	-----	gal/min	—	—
Pump Period	72004	min.	—	—
Volume Evacuated	73675	gal.	7.00	8/29/88
Sampler Material	-----	---	TEFLN	N/A

Well Sampling Method: BAIL

INDICATOR PARAMETERS [HWMR-5 Part VI, Section 265.92(b)(3)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
pH	00400	S.U.	7.06	N/A	9/1/88	EPA 150.1
	00400	S.U.	7.01	N/A	"	
	00400	S.U.	7.00	N/A	"	
	00400	S.U.	7.02	N/A	"	
Specific Conductivity	00095	umhos/cm	1270	0	9/1/88	EPA 120.1
	00095	umhos/cm	1280	0	"	
	00095	umhos/cm	1250	0	"	
	00095	umhos/cm	1240	0	"	
T.O.X.	70354	ug/l	5	10	9/1/88	9020 (SW 846)
	70354	ug/l	5	10	"	
	70354	ug/l	5	10	"	
	70354	ug/l	5	10	"	
T.O.C.	00680	mg/l	6	1	9/1/88	EPA 415.1
	00680	mg/l	7	1	"	
	00680	mg/l	8	1	"	
	00680	mg/l	8	1	"	

GROUND WATER QUALITY STANDARDS [HWMR-5 Part VI Section 265.92(b)(2)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
(Values for metals must be for total metals.)						
Chloride	00940	mg/l	190	.5	9/1/88	EPA 300.0
Iron	01045	ug/l	1700	40	9/16/88	EPA 200.7
Manganese	71883	ug/l	620	10	9/16/88	EPA 200.7
Phenols	32730	ug/l	<5	5	9/1/88	EPA 420.2
Sodium	00929	mg/l	150	1	9/1/88	EPA 200.7
Sulfate	00945	mg/l	28	2	9/1/88	EPA 300.0

PRIMARY DRINKING WATER STANDARDS [HWMR-5 Part VI, Appendix III]

(Values for metals must be for total metals)

Arsenic	01002	ug/l	156	4	9/6/88	EPA 206.2
Barium	01007	ug/l	410	10	9/16/88	EPA 200.7
Cadmium	01027	ug/l	<5	5	9/16/88	EPA 200.7
Chromium	01034	ug/l	<30	30	9/16/88	EPA 200.7
Lead	01051	ug/l	<2	2	9/6/88	EPA 239.2
Mercury	71900	ug/l	.09	.18	9/14/88	EPA 245.1
Selenium	01149	ug/l	<4	5	9/6/88	EPA 270.2
Silver	01077	ug/l	<30	30	9/16/88	EPA 200.7
Fluoride	00950	mg/l	<.2	.2	9/1/88	EPA 300.0
Nitrate	00620	mg/l	0.12	.02	9/1/88	EPA 353.1
Total Coliform	31501	col/100ml	80	20/100ml.	9/1/88	SM 908A

PRIMARY DRINKING WATER STANDARDS (continued)

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Turbidity	00076	T.U.	12	1.0 NTU	9/1/88	EPA 180.1
Radium 226	09501	pCi/l	0.5	1pCi/L	9/1/88	EPA 903.0
Radium 228	11501	pCi/l	—	—	—	—
Gross Alpha	01501	pCi/l	17	3pCi/L	9/1/88	EPA 900.0
Gross Beta	03501	pCi/l	19	4pCi/L	9/1/88	EPA 900.0

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED
Endrin	39390	ug/l	< .010	.010	10/3/88	10/3/88
Lindane	39782	ug/l	< .010	.010	10/3/88	10/3/88
Methoxychlor	39480	ug/l	< .050	.050	10/3/88	10/3/88
Toxaphene	39400	ug/l	< .50	.50	10/3/88	10/3/88
2,4-D	39730	ug/l	< .50	.50	10/3/88	10/3/88
2,4,5-TP	39045	ug/l	< .15	.15	10/3/88	10/3/88

Analytical method used for the above six parameters: SW846

DATE OF REPORT 2/20/89

SIGNATURE: Michael D. Ford

NAME (PRINTED): MICHAEL D. FORD

INTERIM STATUS MONITORING WELL
SAMPLING AND DATA SHEETS

BACKGROUND QUARTERLY REPORTS

This set of forms is to be completed for each of your facility's quarterly evaluations during establishment of the background data for each well. The forms are to be submitted in addition to the raw data sheets provided by your laboratory. In order to be acceptable, the raw lab data sheets must include 1) the date the sample was taken, 2) the extraction date, if any, and 3) the date of analysis.

ENVIRONMENTAL IMPROVEMENT DIVISION
HAZARDOUS WASTE SECTION
1190 ST. FRANCIS DR./HAROLD RUNNELS BLDG.
SANTA FE, NEW MEXICO 87503

FACILITY NAME Lee Plant EPA I.D. # NMD000709659

WELL NUMBER #4 SAMPLE COLLECTION BY M. Ford

LABORATORY NAME Radian Corp. DATE SAMPLED 11/1/88

LABORATORY SAMPLE I.D. # 8110/323 - 339 TIME SAMPLED 3:00 P.M.

DATE RECIEVED BY LAB. 11/3/88

PARAMETERS	STORET CODE	UNITS	VALUE	DATE ANALYZED
Elevation of G.Water	71993	ft.	3883.57	10/31/88
Well Depth	-----	ft.	106.82	10/31/88
Well Casing Volume	-----	gal.	2.08	10/31/88
Pump Rate	-----	gal/min	—	—
Pump Period	72004	min.	—	—
Volume Evacuated	73675	gal.	7.00	10/31/88
Sampler Material	-----	---	TEFLN	N/A

Well Sampling Method: BAIL

INDICATOR PARAMETERS [HWMR-5 Part VI, Section 265.92(b)(3)]

PARAMETERS	[illegible]	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
pH	00400	S.U.	7.41	N/A	11/3/88	EPA 150.1
	00400	S.U.	7.18	N/A	11	
	00400	S.U.	7.12	N/A	11	
	00400	S.U.	7.13	N/A	11	
Specific Conductivity	00095	umhos/cm	730	0	11/3/88	EPA 120.1
	00095	umhos/cm	1200	0	11	
	00095	umhos/cm	1300	0	11	
	00095	umhos/cm	1300	0	11	
T.O.X.	70354	ug/l	80	10	11/3/88	9020 (SW846)
	70354	ug/l	5	10	11	
	70354	ug/l	70	10	11	
	70354	ug/l	5	10	11	
T.O.C.	00680	mg/l	9	1	11/3/88	EPA 415.1
	00680	mg/l	12	1	11	
	00680	mg/l	12	1	11	
	00680	mg/l	10	1	11	

GROUND WATER QUALITY STANDARDS [HWMR-5 Part VI Section 265.92(b)(2)]

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
(Values for metals must be for total metals.)						
Chloride	00940	mg/l	28	.5	11/3/88	EPA 300.0
Iron	01045	ug/l	2200	40	11/11/88	EPA 200.7
Manganese	71883	ug/l	790	10	11/11/88	EPA 200.7
Phenols	32730	ug/l	60	5	11/3/88	EPA 420.2
Sodium	00929	mg/l	130	1	11/3/88	EPA 200.7
Sulfate	00945	mg/l	44	2	11/3/88	EPA 300.0

PRIMARY DRINKING WATER STANDARDS [HWMR-5 Part VI, Appendix III]
(Values for metals must be for total metals)

Arsenic	01002	ug/l	140	4	11/14/88	EPA 206.2
Barium	01007	ug/l	500	10	11/11/88	EPA 200.7
Cadmium	01027	ug/l	<5	5	11/11/88	EPA 200.7
Chromium	01034	ug/l	<30	30	11/11/88	EPA 200.7
Lead	01051	ug/l	<2	2	11/14/88	EPA 239.2
Mercury	71900	ug/l	<.20	.20	11/16/88	EPA 245.1
Selenium	01149	ug/l	<4	5	11/14/88	EPA 270.2
Silver	01077	ug/l	<30	30	11/11/88	EPA 200.7
Fluoride	00950	mg/l	<.20	.20	11/3/88	EPA 300.0
Nitrate	[illegible]620	mg/l	<.02	.02	11/3/88	EPA 353.1
Total Coliform	31501	col/100ml	100	20/100 ml.	11/3/88	SM908A

PRIMARY DRINKING WATER STANDARDS (continued)

PARAMETERS	[illegible]	UNITS	VALUE	DETECTION LIMIT	DATE ANALYZED	METHOD USED
Turbidity	00076	T.U.	2v	1.0	11/3/88	EPA 180.1
Radium 226	09501	pCi/l	0.65	1pCi/L	11/3/88	EPA 903.0
Radium 228	11501	pCi/l	—	—	—	—
Gross Alpha	01501	pCi/l	4	3pCi/L	11/3/88	EPA 900.0
Gross Beta	03501	pCi/l	8	4pCi/L	11/3/88	EPA 900.0

PARAMETERS	STORET CODE	UNITS	VALUE	DETECTION LIMIT	DATE EXTRACTED	DATE ANALYZED
Endrin	39390	ug/l	< .010	.010	12/2/88	12/7/88
Lindane	39782	ug/l	< .010	.010	12/2/88	12/7/88
Methoxychlor	39480	ug/l	< .050	.050	12/2/88	12/7/88
Toxaphene	39400	ug/l	< .50	.50	12/2/88	12/7/88
2,4-D	39730	ug/l	< .50	.50	12/6/88	12/6/88
2,4,5-TP	39045	ug/l	< .15	.15	12/6/88	12/6/88

Analytical method used for the above six parameters: SW846

DATE OF REPORT 2/22/89

SIGNATURE: Michael D. Ford

NAME (PRINTED): MICHAEL D. FORD

ATTACHMENT 4

bcc: W. J. Woodruff
R. B. Copeland
J. J. Moon
(r) File 388(RC)

October 29, 1984

Lee Plant RCRA Closure
EPA ID NMD000709659

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Raymond R. Sisneros, Manager
Hazardous Waste Section
New Mexico Environmental Improvement Division
725 St. Michael's Drive (Crown Bldg.)
Santa Fe, NM 87504-0968

Dear Mr. Sisneros:

Phillips Petroleum Company is in the process of closing a surface impoundment at the Lee Natural Gasoline Plant with respect to the RCRA and New Mexico Hazardous Waste Management Regulations. Mr. Reese B. Copeland's August 3, 1984 letter to Mr. Greg Mello had attached a copy of the amended Lee Plant closure and post closure plan. The Lee Plant closure and post-closure plan described a sampling and analysis program which, when effectuated, would determine, by the use of the EP toxicity test, the chromium concentration of the impoundment sludge and underlying soil. (The Lee Plant impoundment is no longer in service; there is no standing liquid in the Lee impoundment.) In addition, the chromium concentration of the water in the uppermost water-bearing formation and the total chromium concentration of the impoundment sludge and soil would be determined. The Lee Plant sampling and analysis program has been completed and the report presenting the results is attached.

The New Mexico EID should now have all the information needed to commence the formal Lee Plant closure and post-closure plan review process as described in 40 CFR 265 Subpart G and NM EIB/HWMR-2, 206.C.2. When the Lee Plant closure and post-closure plan is successfully processed by the NM EID, the Lee Plant's Interim Status (Part A Permit) will be withdrawn. The Lee Plant will remain in operation as a natural gasoline processing facility.

Phillips requests that the Lee Plant Notification of Hazardous Waste Activity be kept on file after Interim Status is withdrawn so the EPA ID number for the facility will be retained. The Lee Plant should be considered as a "non-handler" of hazardous waste.

I would appreciate being kept informed of the progress made in the processing of the Lee Plant closure and post-closure plan. If any questions arise or if you require any additional information concerning the Lee Plant, please call Frank P. Collis at (918) 661-1063.

Very truly yours,
Original Signed
By
B. F. Ballard, Director
Environment Control
7 Phillips Building

BFB:FPC:dsg/CE-415A
Attachments
cc: Mr. Peter H. Pache - NM EID
Mr. E. E. Clark - Odessa
Ms. Joyce Stubblefield - EPA Region VI

PHILLIPS PETROLEUM COMPANY
LEE NATURAL GASOLINE PLANT
CLOSURE & POST-CLOSURE PLAN
SAMPLING & ANALYSIS REPORT

Lee Plant Impoundment Sampling and Analysis Report
TABLE OF CONTENTS

CERTIFICATION OF CLOSURE

Pursuant to 40 CFR 265.115 and the New Mexico Hazardous Waste Management Regulations (106.C.2.f), this is to certify that the Lee Natural Gasoline Plant has been closed in accordance with the specifications contained in that document titled "Closure & Post-Closure Plan For Hazardous Waste Facility (Updated July 27, 1984), Phillips Petroleum Company Lee Natural Gasoline Plant, West Star Route, Lovington, NM."

Authorized Representative of Phillips Petroleum Company

Signature: Date: October 22, 1984

Name (typed): E. E. Clark

Title: Authorized Agent, Phillips Petroleum Co.

Independent registered professional engineer

Signature: Ed L Reed Date: 10-18-84

Name (typed):

P.E. Registration Number: 16097 (Tx)

Sworn to before me this 30th day of October, 1984.

Notary public signature: Audrey J. Jacks (Audrey J. Jacks)

in and for Ector County.

My commission expires November 30, 1984.

CE/415A

INTRODUCTION

This report describes the sampling and analysis program Phillips has undertaken to demonstrate the closure of the Lee Natural Gasoline Plant surface impoundment which had previously received a potentially hazardous waste (cooling tower blowdown containing chromium). The sampling and analysis program undertaken at the Lee Plant is completely described in the Lee Plant closure and post-closure plan (updated July 27, 1984). A copy of the Lee closure and post-closure plan is included in APPENDIX 4 of this report.

Results

In TABLE 1 the "RCRA Impoundment Sampling Results Summary" for the Lee Natural Gasoline Plant is presented. ATTACHMENT 1 shows the locations in the Lee impoundment where sludge and soil samples were procured. The five sludge samples and the five soil samples from each quadrant were combined to form one composite sludge and one composite soil sample from each quadrant.

Phillips is demonstrating the closure of the Lee surface impoundment as specified in 40 CFR 265.228(b) (and EIB/HWMR-2, 206.C.6.f(2)). If it is demonstrated (under 40 CFR 261.3(c) and (d) and EIB/HWMR 201.B.2.c) that none of the sludge and underlying soil remaining at any stage of removal are hazardous wastes, then the impoundment is not subject to the requirements of 40 CFR 265 (and of EIB/HWMR-2, 106.). The results of the sampling performed on the Lee Plant surface impoundment shows that none of the sludge or soil samples from the Lee Plant surface impoundment exhibit the characteristic of EP toxicity for chromium. Since the sampling plan was carefully designed so that representative sampling would be achieved, it is concluded that none of the sludge or soil comprising the Lee Plant surface impoundment exhibits the characteristic of EP Toxicity for chromium.

TABLE 1

Lee Natural Gasoline Plant

RCRA Impoundment Sampling Results Summary

Sample	Analysis of Composite Samples from Quadrant I	II	III	IV
Impoundment Sludge Chromium (mg/l) (EP Toxicity Test)	< 0.2	< 0.2	< 0.2	< 0.2
Impoundment Sludge Total Available Chromium (PPM)	194	6.8	27.5	1.6
Impoundment Soil Chromium (mg/l) (EP Toxicity Test)	< 0.2	< 0.2	< 0.2	< 0.2
Impoundment Soil Total Available Chromium (PPM)	390	140	115	2.4

(See ATTACHMENT 1 for the sludge and soil sampling locations within Quadrants).

ATTACHMENT 1

LEE PLANT EVAPORATION IMPOUNDMENT

Sludge and Soil Sampling Points

E

Quad 2 | Quad 4

1										11	1										11
12										22	12										22
23										33	23										33
34										44	34					#4		#5			44
45										55	45										#3
56										66	56										66
67							#4			77	67										77
78										88	78			#1	#2						88
89										99	89										99
#1									#2	110	100										110
111										121	111										121
122				#5						132	122										132
133										143	133										143
144					#3					154	144										154
155										165	155										165
1										11	1										11
12										#1	12									#5	22
23										33	23										33
34						#4				44	34										44
45										55	45									#1	55
56										66	56						#4				66
67										77	67										77
78										88	78					#3					88
89					#5					99	89								#2		99
100										110	100										110
111		#3								121	111										121
122			#2							132	122										132
133										143	133										143
144										154	144										154
155										165	155										165

N | S

Quad 1 | Quad 3

W

Fate of the Chromium in the Impoundment

The unlined surface impoundment at the Lee Plant consists of sludge and soil. The impoundment is no longer in service; the use of chromium-containing corrosion inhibitor chemicals in the Lee Plant cooling tower was discontinued on October 4, 1983. The Lee Plant was built around 1932. Based on data available since 1980, it is estimated that approximately 447 kilograms of chromium per year was discharged to the Lee surface impoundment. It should be noted that this estimate of chromium discharged to the impoundment was computed from field water treatment tests which measured the oxidizable substances present in the cooling tower water, so it is only an estimate. There is no data available to meaningfully estimate the amount of chromium discharged to the Lee impoundment prior to 1980.

Since chromium-containing corrosion inhibitor chemicals have been discharged to the Lee Plant surface impoundment for some time, it is reasonable to inquire about the ultimate fate of the chromium. Referring to TABLE 1, although the EP Toxicity Test has shown that the chromium in both the impoundment sludge and soil is well below the EP Toxicity threshold of 5 parts per million for chromium, the total available chromium is higher. (A portion of all composite sludge and soil samples were ashed with nitric acid and hydrogen peroxide to dissolve all chromium. The leachate from this ashing was analysed by atomic absorption.)

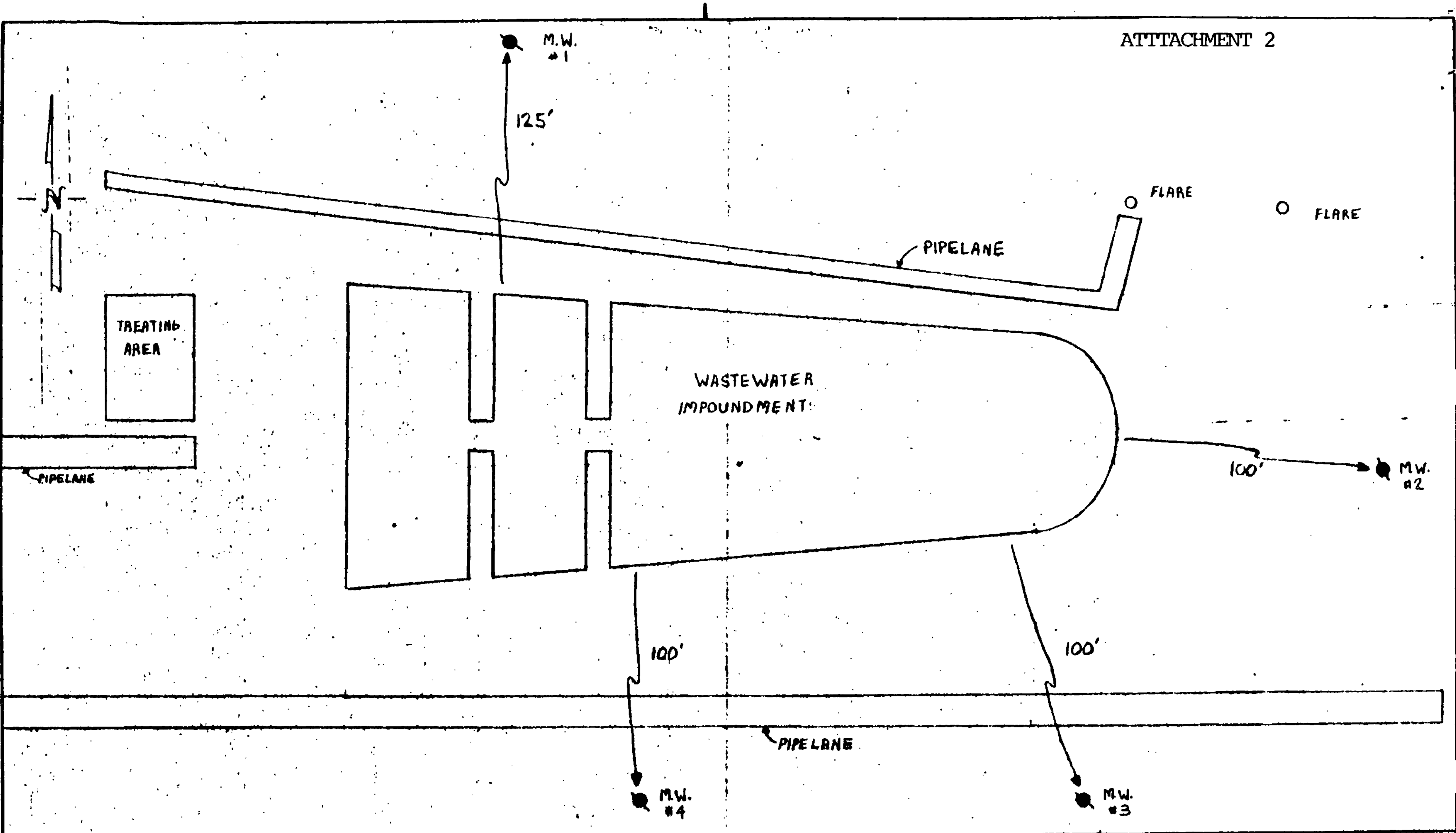
It appears that any Cr^{+6} in the Lee surface impoundment is naturally reduced to the less leachable Cr^{+3} state. The mechanism(s) for this chemical reduction has (have) not been established. Based on a comparison of EP toxicity test chromium levels and the total chromium analysis (ashing) of the Lee Plant impoundment sludge and soil samples, it appears the chromium has settled in the impoundment sludge layer and in the underlying impoundment soil in a stable Cr^{+3} state. Since representative sampling has shown that the Lee Plant impoundment sludge and soil do not exhibit the characteristic of EP Toxicity for chromium, none of the material in the impoundment has to be removed and disposed of as a hazardous waste.

Groundwater Sampling

To further demonstrate that the chromium in the Lee Plant impoundment remains complexed in the impoundment sludge and soil in a non-hazardous state, four groundwater sampling wells were installed as described in the Lee Plant closure and post-closure plan. ATTACHMENT 2 shows the location of the groundwater sampling wells that were installed around the Lee Plant impoundment.

The results of the groundwater sampling are presented in TABLE 2. The results indicate that no groundwater contamination has occurred.

ATTACHMENT 2



NO.	REVISION	BY CHKD	DATE APP'D

FOR BIDS
FOR APPN
FOR CONST
DRAWN
CHECKED
APP'D

BARTLESVILLE, OKLAHOMA

LEE PLANT
IMPOUNDMENT SYSTEM
SECT. 30 + 31, T-17-S, R-36-E, LEA CO. NEW MEXICO

AFE NO.
SCALE 1" = 30.0'
UNLESS OTHERWISE NOTED
DWG NO.
SH NO.

FORM 1761-S 3-79

PRINTED IN U.S.A.

TABLE 2

Lee Natural Gasoline Plant

RCRA Groundwater Sampling Results Summary

	Chromium (mg/1) in Water Well Number			
	I	II	III	IV
Sample at Well Completion	< 0.05	< 0.05	< 0.05	< 0.05
Sample Point 1*	< 0.05	< 0.05	< 0.05	< 0.05
Sample Point 2	< 0.05	< 0.05	< 0.05	< 0.05
Sample Point 3	< 0.05	< 0.05	< 0.05	< 0.05
Sample Point 4	< 0.05	< 0.05	< 0.05	< 0.05
Drilling Water	< 0.05	< 0.05	< 0.05	< 0.05

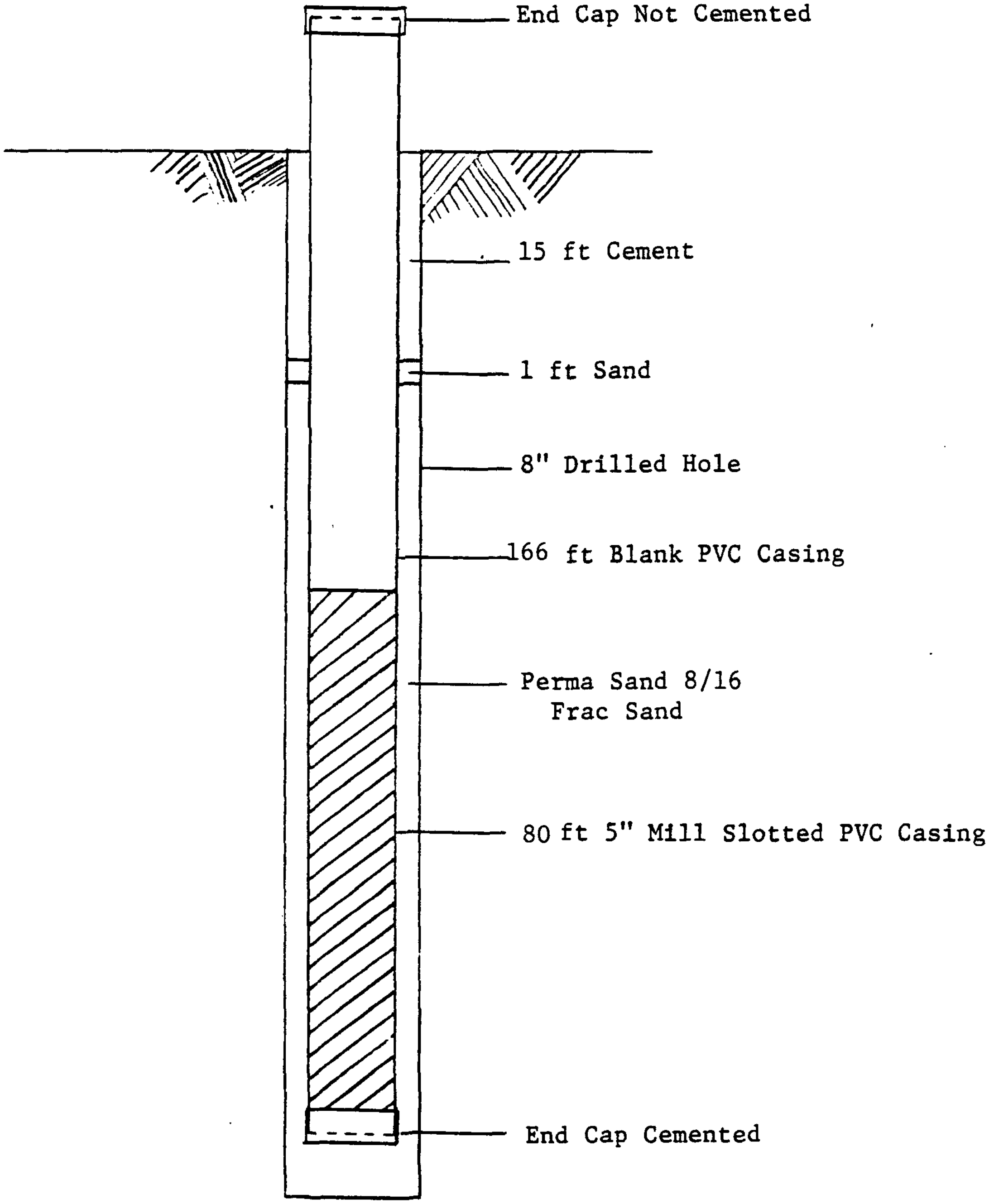
*Sample points numbered from bottom to top with sample point number 1 being at the bottom.

dsg/CE-415A

APPENDIX 1

- Lee Plant Groundwater Sampling Well Details

Lee Gasoline Plant
Groundwater Sampling Well #1



THE LOFTIS COMPANY
P.O. Box 7847 • Midland, Texas 79708-0847

COMPANY: Phillips Petroleum Company

DATE: June 5, 1984

ORDER NO.: Verbal / Robert G. Stubbs

LOCATION: Buckeye Gasoline Plant

COUNTY: Lea

STATE: New Mexico

PROPOSED USE: Monitor Well #1

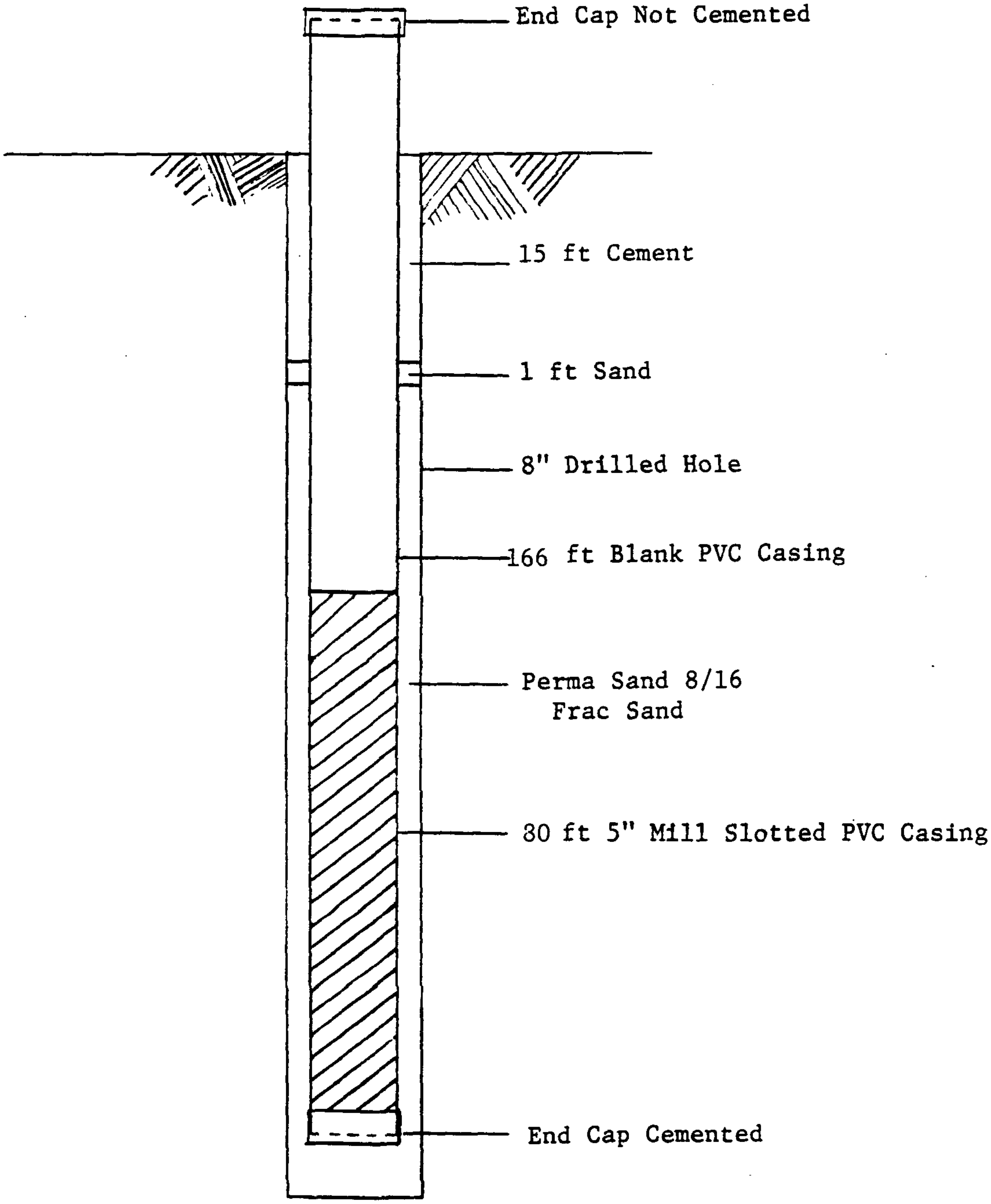
DIAMETER: 8"

DEPTH: 250'

DRILLER: Roger Smith

DEPTH FT.	DRILLER'S LOG
5	Limestone
10	↑
15	
20	
25	↓
30	Limestone
35	Sand
40	↑
45	
50	
55	
60	
65	
70	
75	
80	
85	
90	
95	
100	
105	
110	
115	
120	
125	
130	
135	
140	
145	
150	
155	
160	
165	
170	
175	
180	
185	
190	
195	
200	
205	↓
210	Sand
215	Sand & Gravel
220	↑
225	↓
230	Sand & Gravel
235	Red Clay & Gravel
240	Red Clay
245	Red Clay
250	Red Clay

Lee Gasoline Plant
Groundwater Sampling Well #2



THE LOFTIS COMPANY
Box 7847 ● Midland, Texas 79708-0847

COMPANY: Phillips Petroleum Company

DATE: June 6, 1984

ORDER NO.: Verbal / Robert G. Stubbs

LOCATION: Buckeye Gasoline Plant

COUNTY: Lea

STATE: New Mexico

PROPOSED USE: Monitor Well #2

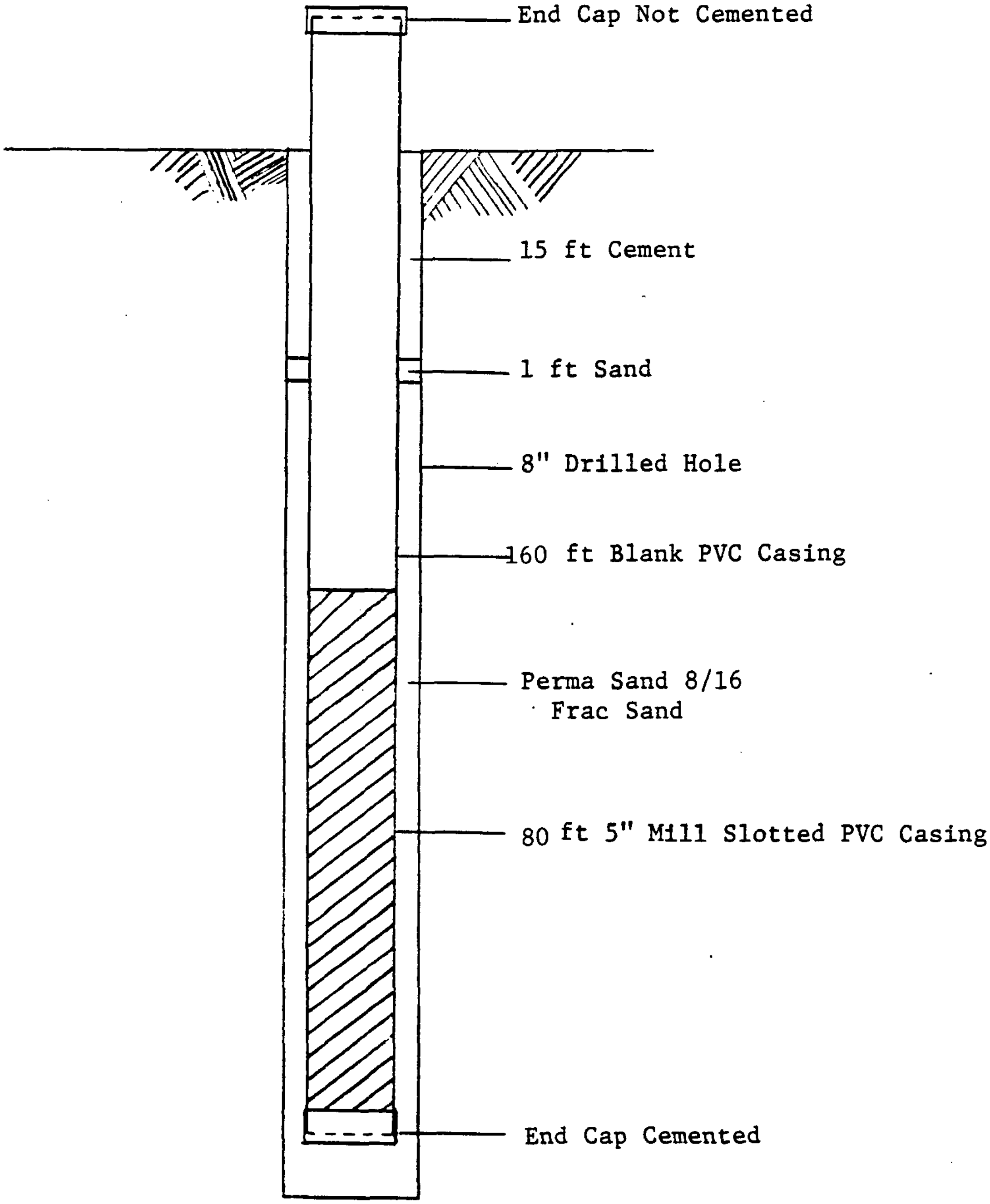
DIAMETER: 8"

DEPTH: 250'

DRILLER: Roger Smith

DEPTH FT.	DRILLER'S LOG
5	Limestone
10	
15	
20	
25	
30	Limestone
35	Sand
40	
45	
50	
55	
60	
65	
70	
75	
80	
85	
90	
95	
100	
105	
110	
115	
120	
125	
130	
135	
140	
145	
150	
155	
160	
165	
170	
175	
180	
185	
190	
195	
200	
205	
210	Sand
215	Sand & Gravel
220	
225	
230	Sand & Gravel
235	Red Clay & Gravel
240	Red Clay & Gravel
245	Red Clay
250	Red Clay

Lee Gasoline Plant
Groundwater Sampling Well #3



THE LOFTIS COMPANY
P. O. Box 7847 • Midland, Texas 79708-0847

COMPANY: Phillips Petroleum Company

DATE: June 6, 1984

ORDER NO.: Verbal / Robert G. Stubbs

LOCATION: Buckeye Gasoline Plant

COUNTY: Lea

STATE: New Mexico

PROPOSED USE: Monitor Well #3

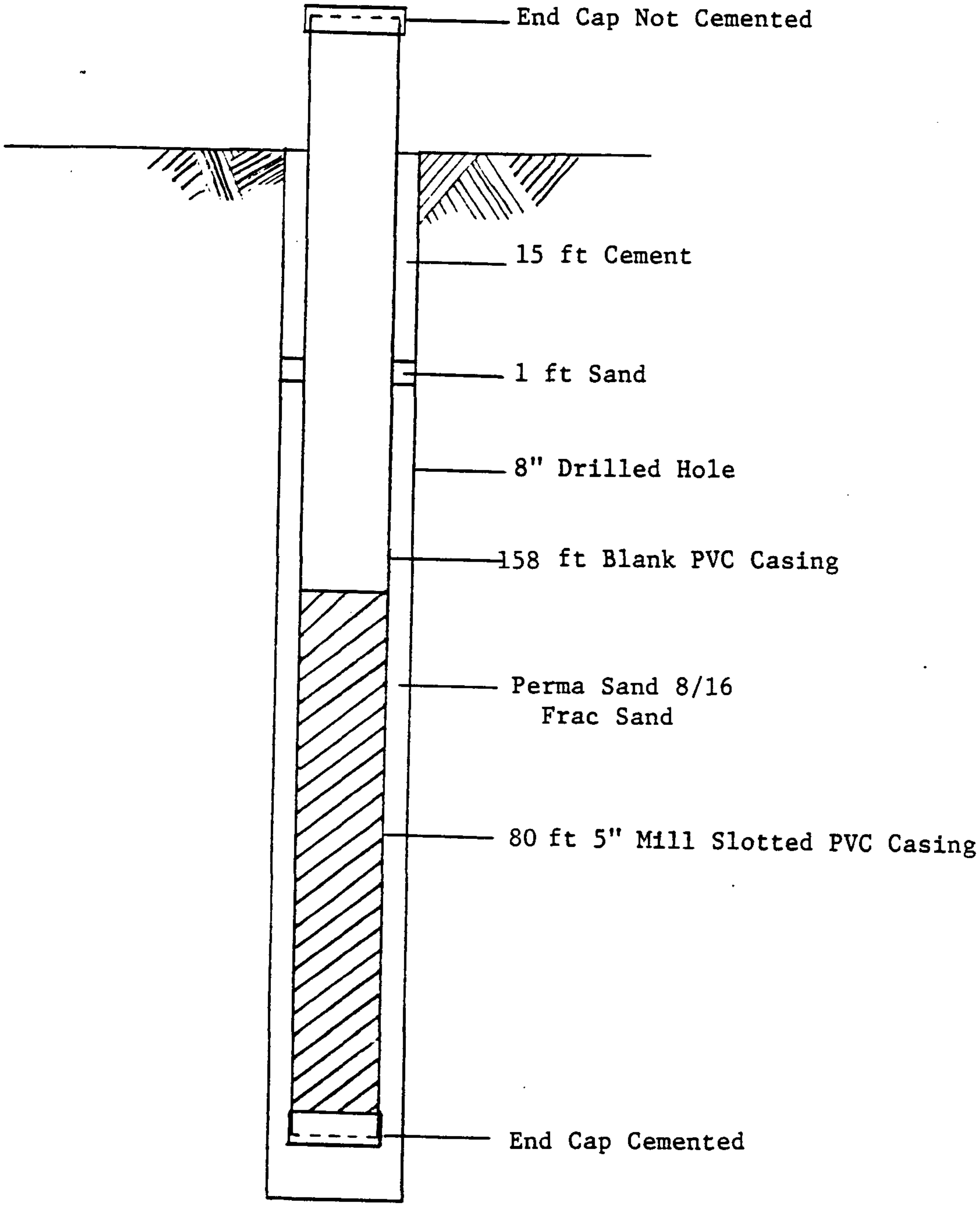
DIAMETER: 8"

DEPTH: 250'

DRILLER: Roger Smith

DEPTH FT.	DRILLER'S LOG
5	Limestone
10	↑
15	
20	
25	↓
30	Limestone
35	Sand
40	↑
45	
50	
55	
60	
65	
70	
75	
80	
85	
90	
95	
100	
105	
110	
115	
120	
125	
130	
135	
140	
145	
150	
155	
160	
165	
170	
175	
180	
185	
190	
195	
200	
205	↓
210	Sand
215	Sand & Gravel
220	↑
225	↓
230	Sand & Gravel
235	Red Clay & Gravel
240	Red Clay & Gravel
245	Red Clay
250	Red Clay

Lee Gasoline Plant
Groundwater Sampling Well #4



THE LOFTIS COMPANY

P. O. Box 7847 ● Midland, Texas 79708-0847

COMPANY: Phillips Petroleum Company

DATE: June 7, 1984

ORDER NO.: Verbal / Robert G. Stubbs

LOCATION: Buckeye Gasoline Plant

COUNTY: Lea

STATE: New Mexico

PROPOSED USE: Monitor Well #4

DIAMETER: 8"

DEPTH: 250'

DRILLER: Roger Smith

DEPTH FT.	DRILLER'S LOG
5	Limestone
10	↑
15	
20	
25	↓
30	Limestone
35	Sand
40	↑
45	
50	
55	
60	
65	
70	
75	
80	
85	
90	
95	
100	
105	
110	
115	
120	
125	
130	
135	
140	
145	
150	
155	
160	
165	
170	
175	
180	
185	
190	↓
195	Sand
200	Sand & Gravel
205	Sand & Gravel
210	Sand & Gravel
215	Red Clay & Gravel
220	Red Clay & Gravel
225	Red Clay & Gravel
230	Sand & Gravel
235	Sand & Gravel
240	Sand & Gravel
245	Red Clay
250	Red Clay

APPENDIX 2

- Laboratory Reports

SwL **SOUTHWESTERN LABORATORIES**

Materials, environmental and geotechnical engineering, nondestructive, metallurgical and analytical services

1703 W. Industrial Avenue (915-683-3348) • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-W
Customer No. 3355796
Report No. 35560
Report Date 6-14-84
Date Received 6-11-84

Report of tests on: Water

Client: Phillips Petroleum Company

Identification: Lee Plant, Formation water sampled at completion of Monitor Well No. 1

Chromium------------------------------Less Than 0.05 mg/L

Technician: GMB

Copies 3 cc: Phillips Petroleum Company
Attn: Mike Ford

SOUTHWESTERN LABORATORIES
Gary M. Burch

119904

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1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-W
Customer No. 3355796
Report No. 35556

Report Date 6-14-84

Report of tests on: Water

Date Received 6-11-84

Client: Phillips Petroleum Company

Identification: Lee Plant, Monitor Well No. 1, as shown

Sample Point No.	Chromium, mg/L
1	* 0.05
2	* 0.05
3	* 0.05
4	* 0.05

*designates "less than"

Technician: GMB

Copies 3 cc: Phillips Petroleum Company
Attn: Mike Ford

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1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-W
Customer No. 3355796
Report No. 35561
Report Date 6-14-84
Date Received 6-11-84

Report of tests on: Water
Client: Phillips Petroleum Company
Identification: Lee Plant, Formation water sampled at completion of Monitor Well No. 2

Chromium-----------------------------Less Than 0.05 mg/L

Technician: GMB

Copies 3 cc: Phillips Petroleum Company
Attn: Mike Ford

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1703 W. Industrial Avenue (915-683-3348) • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-W
Customer No. 3355796
Report No. 35557
Report Date 6-14-84
Date Received 6-11-84

Report of tests on: Water
Client: Phillips Petroleum Company
Identification: Lee Plant, Monitor Well No. 2, as shown

Sample Point No.	Chromium, mg/L
1	* 0.05
2	* 0.05
3	* 0.05
4	* 0.05

*designates "less than"

Technician: GMB

Copies 3 cc: Phillips Petroleum Company
Attn: Mike Ford

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1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-W
Customer No. 3355796
Report No. 35562

Report Date 6-14-84

Report of tests on: Water

Date Received 6-11-84

Client: Phillips Petroleum Company

Identification: Lee Plant, Formation water sampled at completion of Monitor Well No. 3

Chromium-----------------------------Less Than 0.05 mg/L

Technician: GMB

Copies 3 cc: Phillips Petroleum Company
Attn: Mike Ford

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1703 W. Industrial Avenue (915-683-3348) • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-W
Customer No. 3355796
Report No. 35558
Report Date 6-14-84
Date Received 6-11-84

Report of tests on: Water

Client: Phillips Petroleum Company

Identification: Lee Plant, Monitor Well No. 3, as shown

Sample Point No.	Chromium, mg/L
1	* 0.05
2	* 0.05
3	* 0.05
4	* 0.05

*designates "less than"

Technician: GMB

Copies 3 cc: Phillips Petroleum Company
Attn: Mike Ford

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1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-W
Customer No. 3355796
Report No. 35563

Report Date 6-14-84

Date Received 6-11-84

Report of tests on: Water

Client: Phillips Petroleum Company

Identification: Lee Plant, Formation water sampled at completion of Monitor Well No. 4

Chromium----------------------------Less Than 0.05 mg/L

Technician: GMB

Copies 3 cc: Phillips Petroleum Company
Attn: Mike Ford

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File No. C-1950-W
Customer No. 3355796
Report No. 35559

Report Date 6-14-84

Report of tests on: Water

Date Received 6-11-84

Client: Phillips Petroleum Company

Identification: Lee Plant, Monitor Well No. 4, as shown

Sample Point No.	Chromium, mg/L
1	* 0.05
2	* 0.05
3	* 0.05
4	* 0.05

*designates "less than"

Technician: GMB

Copies 3 cc: Phillips Petroleum Company
Attn: Mike Ford

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1703 W. Industrial Avenue [915 - 683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-W
Customer No. 3355796
Report No. 35564

Report Date 6-14-84

Report of tests on: Water

Date Received 6-11-84

Client: Phillips Petroleum Company

Identification: Lee Plant, Water used to drill monitor wells

Chromium----------------------------Less Than 0.05 mg/L

Technician: GMB

Copies 3 cc: Phillips Petroleum Company
Attn: Mike Ford

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1703 W. Industrial Avenue [915 - 683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-X
Customer No. 3355796
Report No. 26949

Report Date 6-1-84

Date Received 5-16-84

Report of tests on: Soil

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 1,
Sampled 5-16-84 @ 1:00 p.m. by Mike Ford

EPA Hazardous Waste Number	Contaminant	Detected, mg/L	EPA Max. Conc. Limits, mg/L
D007	Chromium	* 0.2	5.0

*designates "less than"

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Company
Attn: Mike Ford

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1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-X
Customer No. 3355796
Report No. 26949

Report Date 6-1-84

Report of tests on: Soil

Date Received 5-16-84

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 1,
Sampled 5-16-84 @ 1:00 p.m. by Mike Ford

Total Available Chromium------------------------ 390 p.p.m.

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Company
Attn: Mike Ford

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File No. C-1950-X
Customer No. 3355796
Report No. 26950
Report Date 6-1-84
Date Received 5-16-84

Report of tests on: Soil

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 2,
Sampled 5-16-84 @ 1:00 p.m. by Mike Ford

EPA Hazardous Waste Number	Contaminant	Detected, mg/L	EPA Max. Conc. Limits, mg/L
D007	Chromium	* 0.2	5.0

*designates "less than"

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Company
Attn: Mike Ford

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1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-X
Customer No. 3355796
Report No. 26950

Report Date 6-1-84

Report of tests on: Soil

Date Received 5-16-84

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 2,
Sampled 5-16-84 @ 1:00 p.m. by Mike Ford

Total Available Chromium-------------------------- 140 p.p.m.

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Co.
Attn: Mike Ford

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1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-X
Customer No. 3355796
Report No. 26951

Report Date 6-1-84

Report of tests on: Soil

Date Received 5-16-84

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 3,
Sampled 5-16-84 @ 1:00 p.m. by Mike Ford

EPA Hazardous Waste Number	Contaminant	Detected, mg/L	EPA Max. Conc. Limits, mg/L
D007	Chromium	* 0.2	5.0

*designates "less than"

Technician: SAM, KLH, GMB

Copies 3 cc: Phillips Petroleum Co.
Attn: Mike Ford

SOUTHWESTERN LABORATORIES

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Materials, environmental and geotechnical engineering, nondestructive, metallurgical and analytical services

1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-X
Customer No. 3355796
Report No. 26951

Report Date 6-1-84

Report of tests on: Soil

Date Received 5-16-84

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 3,
Sampled 5-16-84 @ 1:00 p.m. by Mike Ford

Total Available Chromium-------------------------- 115 p.p.m.

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Co.
Attn: Mike Ford

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1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-X
Customer No. 3355796
Report No. 26952

Report Date 6-1-84

Date Received 5-16-84

Report of tests on: Soil

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 4,
Sampled 5-16-84 @ 1:00 p.m. by Mike Ford

EPA Hazardous Waste Number	Contaminant	Detected, mg/L	EPA Max. Conc. Limits, mg/L
D007	Chromium	* 0.2	5.0

*designates "less than"

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Company
Attn: Mike Ford

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1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-X
Customer No. 3355796
Report No. 26952

Report Date 6-1-84

Date Received 5-16-84

Report of tests on: Soil

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 4,
Sampled 5-16-84 @ 1:00 p.m. by Mike Ford

Total Available Chromium------------------------ 2.4 p.p.m.

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Co.
Attn: Mike Ford

SOUTHWESTERN LABORATORIES

Gary M. Burch

SwL **SOUTHWESTERN LABORATORIES**

Materials, environmental and geotechnical engineering, nondestructive, metallurgical and analytical services

1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-X
Customer No. 3355796
Report No. 26953

Report Date 6-1-84

Report of tests on: Sludge

Date Received 5-16-84

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 1,
Sampled 5-16-84 @ 11:00 a.m. by Mike Ford

EPA Hazardous Waste Number	Contaminant	Detected, mg/L	EPA Max. Conc. Limits, mg/L
D007	Chromium	* 0.2	5.0

*designates "less than"

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Co.
Attn: Mike Ford

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119904

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File No. C-1950-X
Customer No. 3355796
Report No. 26953

Report Date 6-1-84

Report of tests on: Sludge

Date Received 5-16-84

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 1,
Sampled 5-16-84 @ 11:00 a.m. by Mike Ford

Total Available Chromium-------------------------- 194 p.p.m.

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Co.
Attn: Mike Ford

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File No. C-1950-X
Customer No. 3355796
Report No. 26954

Report Date 6-1-84

Report of tests on: Sludge

Date Received 5-16-84

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 2,
Sampled 5-16-84 @ 11:00 a.m. by Mike Ford

EPA Hazardous Waste Number	Contaminant	Detected, mg/L	EPA Max. Conc. Limits, mg/L
D007	Chromium	* 0.2	5.0

*designates "less than"

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Co.
Attn: Mike Ford

SOUTHWESTERN LABORATORIES
Gary M. Burch

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Materials, environmental and geotechnical engineering, nondestructive, metallurgical and analytical services

1703 W. Industrial Avenue [915 - 683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-X
Customer No. 3355796
Report No. 26954

Report Date 6-1-84

Report of tests on: Sludge

Date Received 5-16-84

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 2,
Sampled 5-16-84 @ 11:00 a.m. by Mike Ford

Total Available Chromium-------------------------- 6.8 p.p.m.

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Co.
Attn: Mike Ford

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Gary M. Bunch

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1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-X
Customer No. 3355796
Report No. 26955

Report Date 6-1-84

Date Received 5-16-84

Report of tests on: Sludge

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 3
Sampled 5-16-84 @ 11:00 a.m. by Mike Ford

EPA Hazardous Waste Number	Contaminant	Detected, mg/L	EPA Max. Conc. Limits, mg/L
D007	Chromium	* 0.2	5.0

*designates "less than"

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Co.
Attn: Mike Ford

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Gary M. Burch

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File No. C-1950-X
Customer No. 3355796
Report No. 26955

Report Date 6-1-84

Report of tests on: Sludge

Date Received 5-16-84

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 3,
Sampled 4-16-84 @ 11:00 a.m. by Mike Ford

Total Available Chromium--------------------------	27.5 p.p.m.

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Co.
Attn: Mike Ford

SOUTHWESTERN LABORATORIES

Gary M. Burch

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1703 W. Industrial Avenue [915 - 683-3348] • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-X
Customer No. 3355796
Report No. 26956

Report Date 6-1-84

Report of tests on: Sludge

Date Received 5-16-84

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 4
Sampled 5-16-84 @ 11:00 a.m. by Mike Ford

EPA Hazardous Waste Number	Contaminant	Detected, mg/L	EPA Max. Conc. Limits, mg/L
D007	Chromium	* 0.2	5.0

*designates "less than"

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Co.
Attn: Mike Ford

SOUTHWESTERN LABORATORIES
Gary M. Bunch

SwL SOUTHWESTERN LABORATORIES

Materials, environmental and geotechnical engineering, nondestructive, metallurgical and analytical services

1703 W. Industrial Avenue (915 - 683-3348) • P.O. Box 2150 • Midland, Texas 79701

File No. C-1950-X
Customer No. 3355796
Report No. 26956

Report Date 6-1-84

Date Received 5-16-84

Report of tests on: Sludge

Client: Phillips Petroleum Company

Identification: Lee Plant Pit, Quad No. 4,
Sampled 5-16-84 @ 11:00 a.m. by Mike Ford

Total Available Chromium------------------------ 1.6 p.p.m.

Technician: SAM,KLH,GMB

Copies 3 cc: Phillips Petroleum Co.
Attn: Mike Ford

SOUTHWESTERN LABORATORIES
Gary M. Burch

APPENDIX 3

- Chain of Custody Manifests

Collectors Sample No. ______

CHAIN OF CUSTODY RECORD

Sample Description WATER SAMPLES FROM LEE PLANT WELLS

Collector's Name MICHAEL D. FORD Signature Michael D. Ford

Date Sampled JUNE 9, 1984 Time Sampled 9:30 - 11:30 A.M. Hou

Field Imformation

SAMPLES ARE FROM MONITORING WELLS

Chain of Possessions:

1. PHILLIPS PETROLEUM
Name of Organization

Signature	Title	Inclusive	Dates
Michael D. Ford	ENVIRONMENTAL ANALYST	6/9/84	6/11/84

2. **Southwestern Laboratories**
P. O. Box 2150
Midland, Texas 79702
Name of Organization

Signature	Title	Inclusive	Dates
Gary M. Burch	Chem. Dept Mngr	6-11-84	6-14-84

3. ______
Name of Organization

Signature	Title	Inclusive	Dates

4. ______
Name of Organization

Signature	Title	Inclusive Dates

5. ______
Name of Organization

Signature	Title	Inclusive Dates

Collectors Sample No.

CHAIN OF CUSTODY RECORD

Sample Description 4 COMPOSITE SOIL SAMPLES, LEE PIT

Collector's Name MIKE FORD Signature Michael D. Ford

Date Sampled 5/16/84 Time Sampled 1:00 P.M. Hou

Field Information

Chain of Possessions:

1. PHILLIPS PETROLEUM COMPANY
Name of Organization

Signature	Title	Inclusive	Dates
Michael D. Ford	ENVIRONMENTAL ANALYST	5/16/84	5/16/8

2. Southwestern Laboratories
P. O. Box 2150
Midland, Texas 79702
Name of Organization

Signature	Title	Inclusive	Dates
Gary M. Bunch	Chem Dept Mngr	5-16-84	5-30-84

3.
Name of Organization

Signature Title Inclusive Dates

Name of Organization

Signature Title Inclusive Dates

Name of Organization

Signature Title Inclusive Dates

Collectors Sample No. ______

CHAIN OF CUSTODY RECORD

ample Description 4 COMPOSITE SLUDGE SAMPLES, LEE PIT

ollector's Name MIKE FORD Signature Michael P. Ford

ate Sampled 5/16/84 Time Sampled 11:00 A.M. Ho

ield Information

hain of Possessions:

PHILLIPS PETROLEUM COMPANY
Name of Organization

Michael D. Ford	ENVIRONMENTAL ANALYST	5/16/84	5/16/8
Signature	Title	Inclusive	Date

Southwestern Laboratories
P. O. Box 2150
Midland, Texas 79702
Gary M. Burch
Name of Organization

Gary M. Burch	Chem Dept Mngr	5-16-84	5-30-8
Signature	Title	Inclusive	Dates

Name of Organization

Signature Title Inclusive Dates

Name of Organization

Signature Title Inclusive Dates

Name of Organization

Signature Title Inclusive Dates

APPENDIX 4

- Lee Natural Gasoline Plant Closure and Post-Closure Plan (Updated July 27, 1984)

CLOSURE AND POST-CLOSURE PLAN FOR HAZARDOUS WASTE FACILITY

July 27, 1984

PHILLIPS PETROLEUM COMPANY
(Phillips)

LEE NATURAL GASOLINE PLANT

WEST STAR ROUTE

LOVINGTON, NM 88260

EPA ID Number NMD 000709659

This document must be kept on file

at the above facility.

PHILLIPS PETROLEUM COMPANY
LEE PLANT CLOSURE PLAN

This Closure Plan addresses the general Closure and Post-Closure requirements in 40 CFR 265 Subpart G (and NM/HWMR 206.C.2) and the specific Surface Impoundment Closure and Post-Closure requirements in 40 CFR 265.228 (and NM/HWMR 206.C.6.f). This plan is submitted to effect a settlement reached with EPA. Phillips does not admit that the wastes sent to the impoundment were hazardous wastes as that term is defined by the statute nor does it admit these wastes were hazardous as that term is commonly understood. For purposes of closing the impoundment only Phillips will treat the contents of the impoundment as if it were a hazardous waste.

The New Mexico Environmental Improvement Board (EIB) Hazardous Waste Management Regulations are essentially equivalent to those promulgated by the EPA. In this document when reference is made to a federal regulation, the corresponding New Mexico EIB regulation is also cited for the convenience of the reader.

As required by 40 CFR 265.112 (and NM/HWMR 206.C.2.c(1)), a copy of this closure plan and all revisions to the plan is to be kept at the facility until closure is completed and certified in accordance with 40 CFR 265.115 (and NM/HWMR 206.C.2.f).

In connection with the closure of the Lee Plant surface impoundment, this closure plan will be submitted to the EPA Regional Administrator and the Director of The New Mexico Environmental Improvement Division in accordance with 40 CFR 265.112(c) (and NM/HWMR 206.C.2.c.(3)). This submittal will commence a series of events, delineated in 40 CFR 265.112(d) (and NM/HWMR 206.C.2.c.(4)), which will result in an approved closure plan.

A demonstration of compliance with the requirements for financial responsibility for closure and post-closure care and sudden and nonsudden occurrence liability for the Lee Plant hazardous waste management facility (as required by 40 CFR 265, Subpart H and NM/HWMR 206.C.3.) was submitted in a 3-28-84 letter to Mr. Raymond Sisneros, Director, NM Environmental Improvement Division from B. F. Ballard (Director, Phillips Petroleum Company Environment Control).

PHILLIPS PETROLEUM COMPANY
LEE PLANT CLOSURE PLAN

The facility to be closed at the Lee Plant consists of a surface impoundment which was used for treatment and disposal of chromium containing cooling tower blowdown water.

The generation of chromium containing cooling tower blowdown water at the Lee Plant has been discontinued. Phillips has decided to withdraw the Interim Status Authorization for the Lee Plant. Approval of this closure and post-closure plan will come from the New Mexico Environmental Improvement Division (NMEID). EPA Region VI will also review the plan but approval will come from the NMEID.

The following list of wastes was included in the Lee Plant Part A Application filed with the EPA. The discussion following each listed waste category indicates the only hazardous waste generation, if any, at the Lee Plant was limited to chromium.

D007 Chromium. On 3/31/83 a letter was sent to Mr. Allyn M. Davis, Director, U.S. EPA Air and Waste Management Division, discussing the RCRA activities at the Lee Plant. In this letter, it was requested that Interim Status be retained for the Lee Plant (a request to withdraw the Part A Application, based on the belief that there was no hazardous waste generated at the Lee Plant, had been made in a 6/16/82 letter) because it was discovered that blowdown from a cooling tower sent to the impoundment may have exceeded the EP Toxicity characteristic chromium level from time to time.

The use of chromium-containing cooling tower chemicals was discontinued at the Lee Plant on October 4, 1983.

F001 Halogenated Solvent. This waste was originally included to cover the use of degreasing agents which were thought to contain halogenated solvents. These materials have been investigated and found to be water soluble detergents, and not halogenated solvents.

D001 Ignitable. This waste description was included to cover an iron sulfide-bearing material periodically removed from pipes and heat exchangers.

This solid waste does not exhibit the RCRA characteristic of ignitability because it does not "...when ignited, burn so vigorously and persistently that it creates a hazard."

D002 Corrosive. This waste description was included to accomodate occasional acid cleaning of selected lines and vessels. It has been found that during the cleaning process, the acid can be circulated, and the solution adjusted to a pH between 2.0 and 12.5. Therefore, a corrosive hazardous waste is not generated.

U013 Asbestos. Asbestos is no longer a RCRA hazardous waste.

As required by 40 CFR 265.112(a(2)) (and NM/HWMR 206.C.2.c.1(b)), an estimate of the maximum inventory of wastes in storage and in treatment at any time during the life of the facility must be made. The maximum inventory of waste in the Lee Plant surface impoundment at any one time is estimated to be less than 1688 tons (based on an average impoundment depth of 3 feet: (165 ft, length) x (110 ft, width) x 3 ft, depth) x (62 lb/ft^3, density) x (1 ton/2000 lb) = 1688 tons).

It is Phillips' intention to demonstrate the closure of the Lee Plant surface impoundment as specified in 40 CFR 265.228(b) and NM/HWMR 206.C.6.f.(2). If in closing a surface impoundment the facility can demonstrate (under 40 CFR 261.3(c) and (d) and NM/HWMR 201.B.2.c) that none of the standing liquids, waste and waste residues, the liner (if any) and underlying and surrounding contaminated soil remaining at any stage of removal are hazardous wastes, the impoundment is no longer subject to the requirements of 40 CFR 265 (and of NM/HWMR 206.).

The following course of action will serve to remove the Lee Plant from the EPA's and NMEID's Hazardous Waste Program:

(1) Phillips submits this amended Lee Plant closure and post-closure plan to the EPA and the New Mexico EID.

(2) Phillips obtains approval of the Lee Plant closure and post-closure plan from the NMEID.

(3) Phillips demonstrates closure of the Lee Plant surface impoundment under 40 CFR 265.228(b) (and NM/HWMR 206.C.6.f.(2)) and 40 CFR 265 Subpart G (and NM/HWMR 206.C.2).

(4) After the Lee Plant surface impoundment has been formally closed interim status will be withdrawn. The Notification of Hazardous Waste Activity for the Lee Plant will remain on file, whereby the EPA identification number for the Lee Plant will be retained.

The following sampling and analysis program will effectuate the demonstration of closure of the Lee Plant unlined surface impoundment (under 40 CFR 265.228(b) and NM/HWMR-2, 206.C.6.f(2)):

(1) Intent

The Lee Plant surface impoundment is no longer in use. The liquid that was in the impoundment evaporated, leaving only sludge and soil. This sampling and analysis program is designed to determine the chromium level, via the use of the EP toxicity test, of the impoundment sludge and underlying soil. The chromium concentration of the water that may be present in the uppermost water-bearing formation will also be determined.

The determination of whether the impoundment's sludge, soil or groundwater exhibits the characteristic of EP toxicity for chromium will be done in accordance with 40 CFR 261.24 (and NM/HWMR-2, 201.B.5.). The sampling program and analytical procedures will follow methods established in the publications "Test Methods for Evaluating Solid Waste" (EPA Publication SW-846, Second Edition), "Samplers and Sampling Procedures for Hazardous Waste Streams" (EPA Publication 600/2-80/018), "Characteristics of EP Toxicity" (Federal Register, Vol. 45, No. 98) and "Thin-Walled Tube Sampling of Soils" (ASTM Publication D1587-74). All sampling will be performed by persons knowledgeable of analytical sampling techniques and all analytical work will be done by a qualified, independent laboratory. All samples will be appropriately labeled and chain of custody manifests will document the movement of all samples.

(2) Selection of Sampling Locations

A stochastic approach will be used to select impoundment sludge and soil sampling locations. The dimensions of the Lee Plant surface impoundment are 250 by 100 feet. The impoundment is divided into four quadrants, and a grid system will be conceptually overlaid on each quadrant, with each grid dimension scaled to represent a certain distance. For example, if each grid represents an area 8 by 4.5 feet, there would be 15 by 11 grid elements in each quadrant (assuming a 250 by 100 feet impoundment), or 165 grid-elements in each quadrant. Sample locations within each grid will be determined by selecting random numbers corresponding to grid locations. Samples will then be taken from each quadrant in the area corresponding to the chosen grid locations. (Attachment 1 illustrates the Lee impoundment grid system.)

(3) Impoundment Sludge Sampling

Impoundment sludge at the Lee Plant will be sampled at five randomly selected locations within each quadrant. As this impoundment has already been backfilled, an auger type bit will be used to drill through the backfill, at each location, until the impoundment's sludge layer is encountered at which time a sludge sample will be taken. The five samples from each quadrant will be combined to produce one composite sample per quadrant. The sample containers will be sealed, labeled and transported to a commercial laboratory and an Extraction Procedure Toxicity Test for chromium will be performed on the composite sludge samples in accordance with 40 CFR 261, Appendix II (and NM/HWMR-2, 201.C, Appendix II). Chain of custody manifests will document the movement of all samples.

(4) Impoundment Soil Sampling

The Lee impoundment soil will be sampled at five randomly selected locations within each quadrant at a depth of six inches. As this impoundment has already been backfilled, an auger type bit will be used, at each location, to drill through the backfill, sludge and six inches into the soil at which time a soil sample will be taken. (A depth of six inches was chosen as the majority of this pit is underlain with hard caliche and shale rock with little or no soil.) The five samples will be combined to form one composite sample per quadrant for analysis. The composite samples will be labeled and transported to a commercial laboratory and an Extraction Procedure Toxicity Test for chromium will be performed in accordance with 40 CFR 261, Appendix II (and NM/HWMR-2, 201.C, Appendix II). Chain of custody manifests will document the movement of all samples.

(5) Total Chromium Content

A portion of all composite sludge and soil samples will be ashed with nitric acid and hydrogen peroxide to dissolve all chromium which might be present. The leachate from this ashing will be analyzed by atomic absorption to determine the total chromium content.

(6) Groundwater Sampling

Four water sampling wells, one up-gradient and three down-gradient, will be drilled to determine the chromium concentrations, as per the EP toxicity test, of any groundwater that may be present in the uppermost water-bearing formation. Independent hydrogeologist Ed L. Reed and Associates have prepared the completion procedures for these sampling wells and chosen their locations. Attachment 2 is a report from Ed L. Reed detailing the reasons for choosing the well sites as well as a discussion of the drilling and well completion procedures that will be used. A schematic of a completed well (Attachment 3) and a plot plan showing the location of the monitoring wells (Attachment 4) were also prepared by Ed L. Reed and Associates.

During the drilling of the wells, a water sample will be taken at the point that water is first encountered. After completion of the well, the well will be bailed until clean water is present, then two casing volumes of water will be pumped from the well before further sampling.

If during the drilling of a well it is found that the well cannot be drilled with air due to poor hole conditions (sluffing of the well bore), it will be drilled with water. A sample of the water used for drilling will be taken and analyzed for chromium. A water sample will also be taken from the well immediately after it has been bailed instead of at first contact. Two casing volumes will then be pumped from the well before taking further samples.

Four samples will be taken from each well, spaced in such a manner that will allow one sample to be taken one foot from the bottom of the well and the rest at equal distances from each other further up the well. The groundwater samples will be labeled (including the well number and the depth at which sampling occurred), numbered, refrigerated and transported to a commercial laboratory and analyzed by atomic absorption for their chromium content. Chain of custody manifests will document the movement of all samples.

(7) Results of Analyses

Since the impoundment no longer receives chromium containing cooling tower blowdown water (the Lee Plant impoundment no longer receives any waste), if the laboratory results indicate that none of the matter in and around the Lee Plant surface impoundment is hazardous, the Lee Plant surface impoundment will not be subject to the requirements of 40 CFR 265 Subpart G and 40 CFR 265 Subpart K (and NM/HWMR-2, 206.C.2. and 206.C.6.). If any of the material in the impoundment is determined to be hazardous, the material will be removed and disposed of as a hazardous waste in accordance with all applicable requirements of 40 CFR 262, 263, and 265 (and EIB/HWMR-2, 204., 205., and 206.). Once any material found to be hazardous is removed from the surface impoundment, the impoundment will be retested in accordance with the plan discussed above.

The total chromium content testing is expected to show that although EP-toxic concentrations of chromium are not present in the impoundment sludge and soil, the total chromium concentrations are considerably higher because the chromium has been stabilized in a non-leachable form. This testing will answer the question "where did the chromium go?"

The groundwater sampling is expected to show chromium levels no higher than the naturally-occurring background concentration. This testing should demonstrate that no chromium has leached from the surface impoundment into the groundwater.

(8) Revert to Generator-only Status

When Phillips demonstrates closure of the Lee Plant impoundment in accordance with this closure plan, it will be requested that the facility retain its EPA identification number.

As required by 40 CFR 165.112(a)(4) (and NM/HWMR 206.C.2.c.(1)(d)), an estimate of the expected year of closure and a schedule for final closure must be made. Closure is anticipated to occur in 1984. Once the closure plan submitted by Phillips is approved by the New Mexico EID, the sampling program discussed in this closure plan will have begun before the expiration of 90 days as required by 40 CFR 265.113(a) (and NM/HWMR 206.C.2.d.(1)). Initial sampling and analysis is expected to take approximately 30 days. If the results of testing indicate some of the liquid or sludge or soil from the impoundment is hazardous, it will be removed and disposed of as a hazardous waste in accordance with all applicable requirements of 40 CFR 262, 263 and 265 (and NM/HWMR 204., 205. and 206.). This activity, if it must be executed, is estimated to take approximately an additional 30 days.

The closure activities are anticipated to be completed within 180 days after the approval of the closure plan, as required by 40 CFR 265.113(b) (and NM/HWMR 206.C.2.d.(2)). If for some hitherto unknown reason closure cannot be achieved within 180 days of receiving the approved closure plan, the New Mexico EID Director and The EPA Regional Administrator will be contacted and a revised time schedule will be negotiated.

An "Activity Matrix" for the Lee Plant, outlining the events comprising the impoundment closure, is presented on the following page.

As required by 40 CFR 265.114 (and NM/HWMR 206.C.2.e.), when closure is completed, any facility equipment used in handling hazardous waste will be disposed or decontaminated by removing any hazardous waste or residues.

As required by 40 CFR 265.115 (and NM/HWMR 206.C.2.f.), after the closure is completed, Phillips will submit to the New Mexico EID certification by Phillips and an independent registered professional engineer that the facility has been closed in accordance with the specifications in the approved closure plan.

Since there will be no hazardous waste at the Lee Plant once Closure is effected, the facility should not be subject to the Post-Closure requirements of 40 CFR 265.117, 265.118, 265.110 and 265.120 (and NM/HWMR 206.C.2.g,h,i and j), and not subject to provide post-closure care under 40 CFR 265 Subpart G and Section 265.310 (and NM/HWMR 206.C.9.d.).

LEE PLANT
CLOSURE ACTIVITY MATRIX

Action by Phillips	Action by EPA	Action by NM EID
Submit amended closure plan to EPA and NM EID.	Review plan for regulatory compliance.	Review closure plan; notify Phillips as to the acceptability of the plan.
Commence impoundment and ground-water sampling described in plan, and submit results to NMEID with the required certifications by Phillips and a registered professional engineer.		
		Commence formal closure and post-closure plan review process.
		Certify Lee Plant is closed with respect to the EPA and NM hazardous waste management regulations.

Questions concerning this closure plan should be directed to either the facility's Corporate Environmental Contact:

B. F. Ballard, Director
Environment Control
7 A4 PB
Bartlesville, OK 74004
918-661-5330

or the facility's Regional Manager:

E. E. Clark
Regional Operations Manager
4001 Penbrook
Odessa, TX 79762
915-367-1266

FPC:dsg-CE:421

ATTACHMENT 1

LEE PLANT EVAPORATION IMPOUNDMENT

Sludge and Soil Sampling Points

E

	1									11	1									11	
	12									22	12									22	
	23									33	23									33	
	34									44	34					#4		#5			44	
	45									55	45									#3	
Quad 2	56									66	56									66	Quad 4
	67							#4			77	67									77	
	78									88	78			#1	#2						88	
	89									99	89									99	
	#1								#2	110	100									110	
	111									121	111									121	
	122				#5						132	122									132	
	133									143	133									143	
	144					#3					154	144									154	
	155									165	155									165	
N	1									11	1									11	S
	12									#1	12								#5	22	
	23									33	23									33	
	34						#4				44	34									44	
	45									55	45								#1	55	
	56									66	56						#4				66	
	67									77	67									77	
	78									88	78					#3					88	
	89					#5					99	89							#2		99	
	100									110	100									110	
Quad 1	111		#3								121	111									121	Quad 3
	122			#2							132	122									132	
	133									143	133									143	
	144									154	144									154	
	155									165	155									165	

W

ATTACHMENT 2

Ed L. Reed and Associates, Inc.
Consulting Hydrologists
MIDLAND · CORPUS CHRISTI
TEXAS

ED L. REED, P.E.
CHAIRMAN OF THE BOARD
A. JOSEPH REED
PRESIDENT
CHESTER F. SKRABACZ
VICE PRESIDENT FIELD OPERATIONS
1109 N. BIG SPRING
MIDLAND, TEXAS 79701
915 682-0556

V. STEVE REED
EXECUTIVE VICE PRESIDENT
708 GUARANTY PLAZA
CORPUS CHRISTI, TEXAS 78475
512-883-1353

April 3, 1984

Mr. J. W. Maharg
Engineering Director, PBR
Phillips Petroleum Company
4001 Penbrook
Odessa, Texas 79762

RE: Lee Plant
Ground Water Monitoring

Dear Mr. Maharg:

Attached please find locations for 3 ground water sampling wells whose water should contain chromium from the past impoundment if infiltration has occurred. On the same map is a location which should provide a representative sample of native ground water unaffected by the impoundment. The data which we have available indicates that the hydraulic gradient in the area should be to the southeast.

These wells should be completed by drilling an 8-inch hole to the top of the Triassic red beds (expected to occur at a depth of about 250 feet). Four-inch PVC casing should be set to the top of the Triassic with the entire saturated interval of the well screened using mill slotted 4-inch PVC. We recommend 30 thousandths mill slotting with the annular space between the drilled hole and the well casing being gravel packed with Perma-sand 8/16 frac sand. The gravel should be brought to within 15 feet of the surface and the annular space between the gravel and the top of the hole filled with neat cement. We would advise about a one-foot layer of sand be placed on top of the gravel before the neat cement is placed in the annular space in order to prevent the slurry from penetrating into the gravel.

Following completion of the well, a pump should be placed in the casing and the water in the well pumped until clear water is obtained. A water sample can be collected at that time to establish the base line conditions. Samples collected subsequent to this initial sampling should be taken only after two casing volumes of water have been removed from the monitor well immediately prior to sampling.

If you should have any questions regarding these recommendations please advise.

Very truly yours,

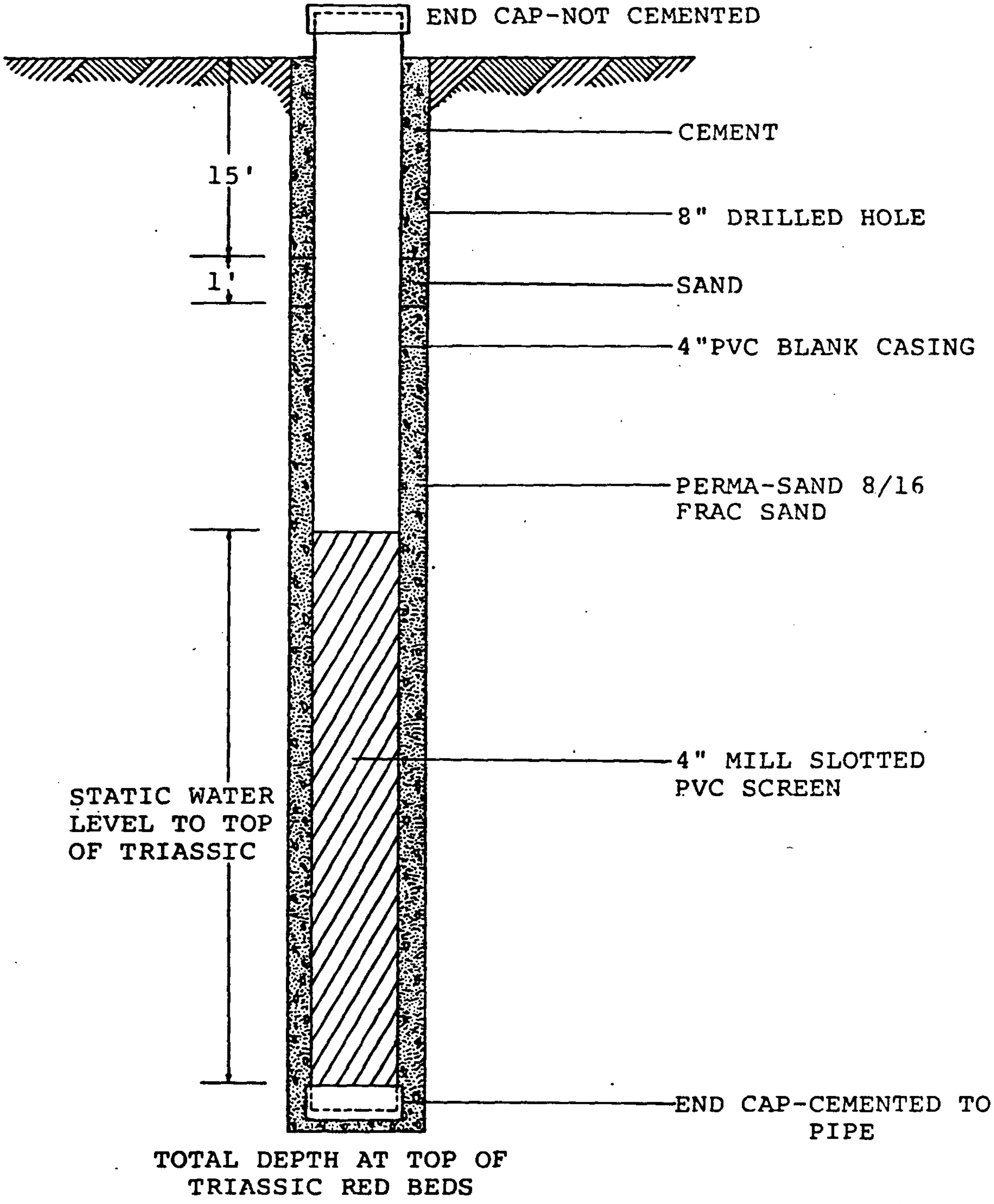
ED L. REED & ASSOCIATES, INC.

A. Joseph Reed

A. Joseph Reed

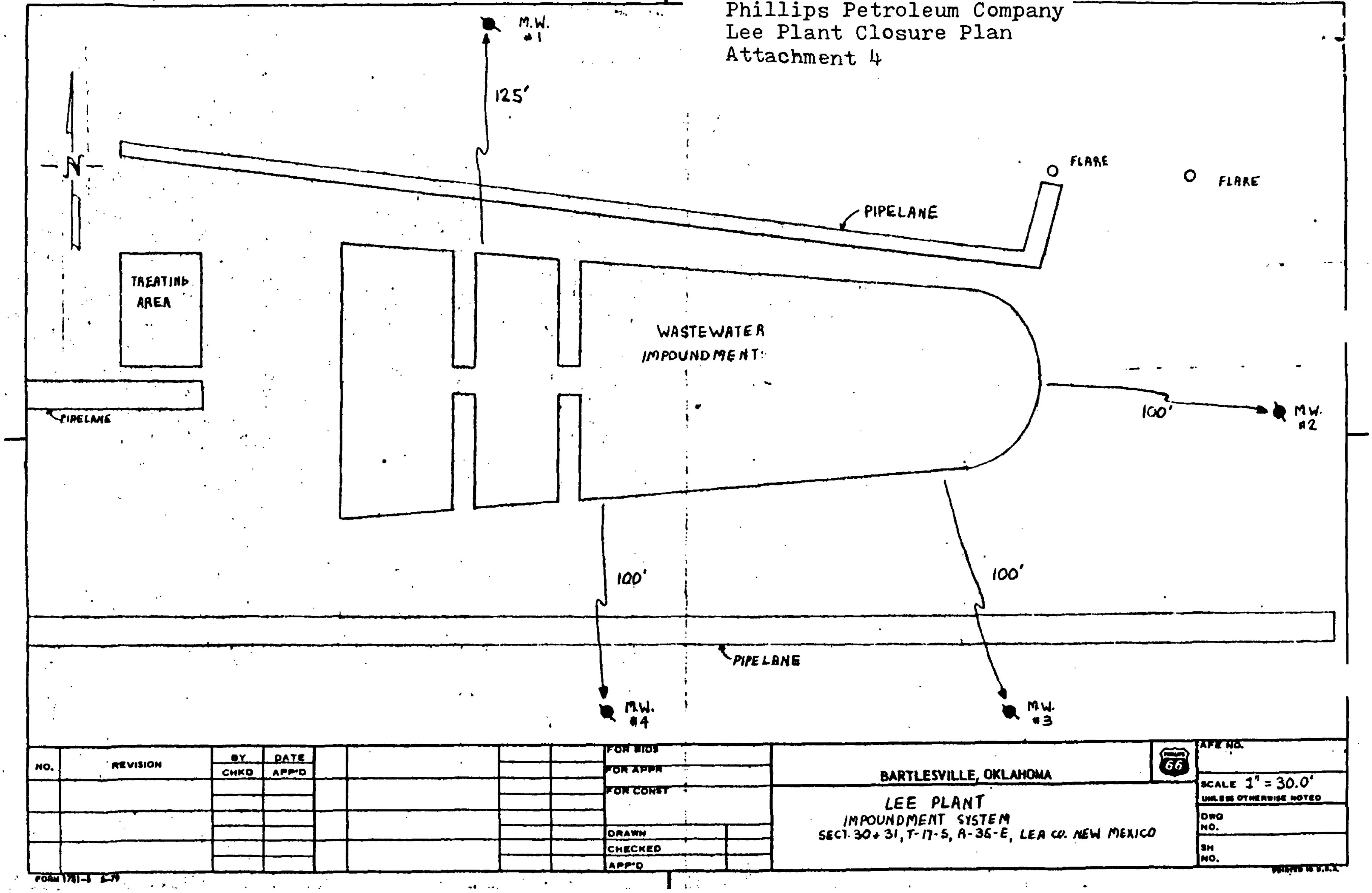
AJR:lb

ATTACHMENT 3



LEA COUNTY, NEW MEXICO
PHILLIPS PETROLEUM COMPANY
LEE PLANT
MONITOR WELL DESIGN

Phillips Petroleum Company
Lee Plant Closure Plan
Attachment 4



APPENDIX 5

- Copy of Mr. William H. Taylor, Jr.'s February 15, 1984 letter to Mr. Frank Collis, discussing the roles of the U.S. EPA and the New Mexico Environmental Improvement Division in reviewing and approving closure and post-closure plans.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
INTERFIRST TWO BUILDING. 1201 ELM STREET
DALLAS. TEXAS 75270

February 15, 1984

Mr. Frank Collis
Phillips Petroleum Company
7 A3 PB
Bartlesville, Oklahoma 74004

Dear Mr. Collis:

Pursuant to your request, we are providing the following summary of the respective responsibilities and authorities of the Environmental Protection Agency (EPA) and the New Mexico Environmental Improvement Division (NMEID) with regard to the administration of the hazardous waste management program. We have emphasized the review and approval of closure and post-closure plans which we understand to be your particular concern.

On September 30, 1983, the State of New Mexico received Interim Authorization from the EPA to administer the hazardous waste management program under the authority of the Resource Conservation and Recovery Act (RCRA). NMEID has been granted authorization for Phase I and Phase II, Components A and B, which means NMEID has authority for primary enforcement responsibility of the federal hazardous waste program interim status standards for facilities in existence as of November 19, 1980 (Phase I), authority to issue permits for tanks and containers (Phase II A) and authority to permit hazardous waste incinerators (Phase II B).

The Phase I Authorization gives the State primary enforcement authority over the RCRA-regulated community. New Mexico's responsibilities include the identification and listing of hazardous waste, enforcement of the standards for generators and transporters of hazardous waste and enforcement of the interim status standards for owners and operators of treatment, storage, and disposal facilities.

However, EPA and NMEID have agreed that any enforcement action commenced by EPA prior to the date of the State's Interim Authorization will remain the responsibility of EPA to conclude. It was also agreed that EPA may take enforcement action based on a violation detected prior to the date of the State's Interim Authorization.

The Phillips Petroleum - Lusk Plant closure and post-closure plans were required under a compliance order issued September 9, 1983, prior to the authorization of NMEID. Therefore, under the above mentioned agreement, EPA will continue its enforcement action and it will be necessary for EPA to approve the closure and post-closure plans based on a review of their adequacy before the order can be settled and the final order issued. However, EPA has delegated the authority to approve and give public notice of closure plans for interim status closures to NMEID as part of the Phase I Interim Authorization. EPA is obligated to review the closure plan to verify compliance with the 40 CFR Part 265 regulations in order to conclude the enforcement action; at the same time NMEID has the responsibility for reviewing the closure plan for detailed and specific technical adequacy in light of the impending closure. The State must subsequently give public notice of the approved closure plan and be prepared to discuss and possibly defend the plan in the course of a public hearing.

As mentioned above, New Mexico has not yet applied for Phase II, Component C; therefore EPA retains the permitting authority for hazardous waste land disposal facilities including waste piles, surface impoundments, landfills, and land treatment units. Consequently, EPA retains permitting authority for any permits currently issued for post-closure care of such land disposal facilities. The authority to terminate interim status also rests with the permitting authority. In the case of land disposal units, such as surface impoundments, this authority rests with EPA - until such time as New Mexico receives Phase II, Component C Interim Authorization or Final Authorization.

If you have any questions or if we can be of further assistance, please contact me or Harriet Tregoning at 214/767-9727

Sincerely yours,

William H. Taylor, Jr.

William H. Taylor, Jr., Chief
Hazardous Materials Enforcement Section

cc: Raymond Sisneros
New Mexico Environmental Improvement Division

TABLE 3-1

SOIL VAPOR RESULTS, LEE PLANT
SEPTEMBER,1988

		Constituent Concentration (uL/L)				
Point	Location	Benzene	Toluene	Ethylbenzene	P,M-Xylene	O-Xylene
1	N700 E800	ND	13.0	48.8	14.3	10.9
2	N750 E800	ND	ND	ND	ND	ND
A	N700 E850	ND	ND	ND	ND	ND
B	N650 E800	ND	ND	ND	ND	ND
C	N700 E850	ND	0.07	ND	ND	ND
7	N400 E1100	ND	ND	ND	ND	ND
8	N100 E1000	ND	224	ND	91.0	ND
9	N100 E900	41.9	23.7	17.4	1.63	6.26
11	N100 E800	19.6	8.30	ND	ND	20.3
13	N250 E1000	ND	ND	ND	ND	ND
14	N250 E900	ND	ND	ND	ND	ND
15	N250 E800	ND	ND	179	663	ND
16	N000 E1000	ND	ND	ND	ND	ND
17	N000 E1100	ND	ND	40.1	14.7	1.80
18	N000 E900	1.14	37.4	ND	113	157
Detection Limit		0.01	0.01	0.01	0.01	0.01

Points 3,4,5,6,10 and 12 could not be sampled due to probe refusal by caliche layer.

ND = Not Detected

but the medium and heavier molecular weight unknowns were present in relatively higher concentrations than the low molecular weight unknowns.

Points 8 and 9 were located in the evaporation pond and point 11 was located directly to the west. The vapor sample from point 9 resulted in the highest observed concentration of benzene (41.9 uL/L) for any point analyzed; with toluene, ethylbenzene and xylene all present but at lower levels than benzene. Results from the point 8 sample showed the highest concentration of toluene (224 uL/L) for any point analyzed, while the sample from point 11 resulted in a benzene concentration of 19.6 uL/L and o-xylene of 20.3 uL/L.

Results from points 17 and 18, south of the evaporation ponds, indicate elevated levels of toluene (37.4 uL/L in 18), ethylbenzene (40.1 uL/L in 17), p-, m-xylene (113 uL/L in 18) and o-xylene (157 uL/L in 18). Chromatograms from both samples show a very similar qualitative match with respect to low and medium molecular weight unknowns.

A headspace analysis was run on water collected from MW-4. The results show that significant concentrations of toluene (21.2 uL/L), ethylbenzene (37.7 uL/L)and xylenes (32.2 uL/L) are present in the water. The water also contains low and some medium, molecular weight unknown hydrocarbons.

Quantitative analysis of BTEX was performed by daily calibrations and peak identification/integration by the Photovac 10550 computer. The qualitative analysis of the sample chromatograms were performed by matching the retention times and shape of prominent compound peaks, or group of compound peaks, to each other.

APPENDIX A
EQUIPMENT SPECIFICATION

EQUIPMENT SPECIFICATION

Chromatograms were obtained using a Photovac 10S50 Portable Photoionization GC and Integrator. Portable 12V DC batteries and ultra-pure carrier air were used for field operation. Constituents in the soil vapor were separated by a 530 micron wide-bore fused silica capillary column, which gives excellent resolution of petroleum hydrocarbons at lower temperatures. An isothermal oven temperature of 30 degrees C and a column flow rate of 10 mh/min. were maintained for stable column operation. The gain and sample volumes were adjusted, depending on the concentration of the soil vapor, to give consistent on-scale peaks.

A 12V DC Air-Cadet diaphragm vacuum pump was used to evacuate the vapors from the soil at approximately 700-900 cu. in./min. (at 5 in. Hg). The pumps maximum air capacity is 1150 cu. in./min. with a maximum vacuum of 1 in. Hg.

APPENDIX B

GAS CHROMATOGRAPH DATA SHEETS

GC DATA SHEET

SITE LEE
DATE September 7, 1988

PAGE 1

GEOSCIENCE CONSULTANTS

Compound	Benzene	Toluene	Ethylbenz	p,m-Xylene	o-Xylene
Standard Conc. (ul/1)	1.92	1.75	1.72	3.88	2.12
Retention Time (window)	76.6 ( )	186.2 ( )	430.0 ( )	468.8 ( )	563.8 ( )
Response for 500 ul injection (VS) @ a Gain of 20	5.3 area	2.3 area	1.0 area	1.8 area	0.981 area
	area	area	area	area	area
RF for compound (ppm/area)					

SAMPLE	ANALYSIS#	TYPE	INJ VOL	GAIN	Benzene area	Benzene ul/1	Toluene area	Toluene ul/1	Ethylbenz area	Ethylbenz ul/1	p,m-Xylene area	p,m-Xylene ul/1	o-Xylene area	o-Xylene ul/1
Packard		Soil VAPOR	500 µl	20		ND		ND		ND		ND		ND
N700 E800		"	"	20		ND	CWO ~~79.7~~	79.7		50.5		18.2		18.4 ~~27.70~~
"		"	"	5		ND		13.0		48.8		14.3		10.9
N750 E800		"	"	5		ND		ND		ND		ND		ND
N700 E750		"	"	20		ND		ND		ND		ND		ND
N650 E800		"	"	20		ND		ND		ND		ND		ND
N700 E850		"	"	20		ND		0.067		ND		ND		ND
N100 E1000 (10 FT)	# 14	"	"	2		ND		223.6		ND		91		ND
N100 E1000 (10 FT)		"	50 µl	2		114		ND		ND		ND		ND
N100 E900		"	500 µl	2		41.9		23.7		17.4		1.63		6.26
N100 E800		"	100 µl	2		19.6 ~~3.92~~		8.30 ~~[illegible]~~		ND		ND		20.3 ~~4.05~~
N250 E800		"	50 µl	50		ND		ND		179		663		ND

I=Interference D=Duplicate
J=Estimated MS=Matrix Spike

ul/l=A*DF*500/V

Analyst Connie Schrandt

DRAFT

GC DATA SHEET

SITE LEE
DATE September 8, 1988

PAGE 1

GEOSCIENCE CONSULTANTS

Compound	Benzene	Toluene	Ethylbenz	p,m-Xylene	o-Xylene
Standard Conc. (ul/l)	1.92	1.75	1.72	3.88	2.12
Retention Time (window)	79.1 ( )	191.7 ( )	444.8 ( )	483.6 ( )	581.8 ( )
Response for 500 ul injection (VS) @ a Gain of 20	— area — area	— area — area	— area — area	— area — area	— area — area
RF for compound (ppm/area)					

SAMPLE	ANALYSIS#	TYPE	INJ VOL	GAIN	Benzene area	Benzene ul/l	Toluene area	Toluene ul/l	Ethylbenz area	Ethylbenz ul/l	p,m-Xylene area	p,m-Xylene ul/l	o-Xylene area	o-Xylene ul/l
N400 E1100	2	Soil VAPOR	500 µl	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N250 E900	3	"	"	"	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N250 E1000	4	"	"	"	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
~~N250~~ MW-4	5	Water headspace	500 µl	2	ND	ND		21.2		37.7		15.6		16.6
~~N0 E1100~~	~~7~~	~~soil VAPOR~~	~~500 µl~~	~~2~~	~~ND~~	~~ND~~	~~ND~~	ND ~~0.344~~		~~11.6~~		~~0.797~~		~~17.3~~
N00 E1100	8	soil VAPOR	500 µl	20	ND	ND	ND	ND		40.1		14.7		1.80
N00 E1000	9	Soil VAPOR	500 µl	10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N00 E900	10	"	"	2		1.14		37.4	ND	ND		113		157
Rocket HS	12	qual std headspace	"	20		4.61	ND	ND		0.332	ND	ND	ND	ND
Product HS	13	qual std headspace	"	"		3.89	ND	ND		0.165	ND	ND	ND	ND
Stoddard HS	14	"	100 µl	2		3.46		11.6		46.5	ND	ND		447
Stoddard/oil HS	15	"	"	"		5.51	ND	ND		54.6		282		762

~~No spl~~ * cells

I=Interference D=Duplicate
J=Estimated MS=Matrix Spike

ul/l=A*DF*500/V

Analyst C. Schrandt

DRAFT

*point stuck in end of probe - resam

Geoscience Consultants, Ltd. (GCL) is a multidisciplinary firm offering a wide range of environmental, geotechnical and engineering services to clients throughout the United States. GCL is headquartered in Albuquerque, New Mexico and has eastern regional offices in the Washington, D.C. area. The firm's professional staff has expertise in hazardous waste management, hydrogeology, environmental, chemical and civil engineering, permitting and regulatory compliance, and air quality studies.

GCL

For more information, contact:
Geoscience Consultants, Ltd.
500 Copper Avenue, N.W., Suite 200, Albuquerque, New Mexico 87102, (505) 842-0001

ATTACHMENT 5

Geoscience Consultants, Ltd. GCL

500 Copper Avenue NW, Suite 200
Albuquerque, New Mexico 87102
(505) 842-0001 FAX (505) 842-0595

1109 Spring Street, Suite 706
Silver Spring, Maryland 20910
(301) 587-2088

September 20, 1988

Ms. Cindy Smith
Process and Environment
Phillips Petroleum Company
Bartlesville, Oklahoma 74004

RE: RESULTS OF THE SOIL VAPOR SURVEY CONDUCTED AT PHILLIPS LEE GAS PLANT

Dear Ms. Smith:

Geoscience Consultants, Ltd. (GCL) is pleased to submit the Draft Report on the Soil Vapor Survey at Phillips Lee Gas Plant, which was conducted on September 6, 7 and 8, 1988.

Eighteen grid points (see the enclosed copy of Figure 3-1 of the draft report), one background location and water collected from MW-4 were surveyed by headspace analysis for benzene, toluene, ethylbenzene and xylenes (BTEX) with GCL's portable gas chromatograph (GC). In addition, several products that are present at the site were analyzed for comparison with the results of the soil samples. In general, the signatures of the chromatograms for the sample points could not be positively correlated because of the presence of light, medium and heavy compounds. However, the following relationships have been interpreted to occur based on the results of the survey:

- o The chromatograms from grid point 1, located in the center of the "rocket pit", and MW-4, located downgradient from the evaporation pond correlate very well (Figure 1).
- o It is possible that the chromatograms from grid points 8 and 9, located within the evaporation pond, also correlate with MW-4, but the relationship is not clearly identified because of the presence of numerous unknown compounds (Figure 2).
- o The chromatograms from grid points 1, 8 and 9 correlate well with the early peaks, but not with the late peaks (Figure 3).
- o The chromatograms for grid points 1, 17 and possibly 18 correlate with the late peaks, but not with the early peaks (Figure 4).
- o The chromatograms for grid points 15, 17 and 18 are roughly similar (Figure 5).

- A chromatogram of a sample of "stoddard solvent" which is used at the site, and grid point 15 correlate (Figure 6); grid points 17 and 18 roughly correlated (Figure 7).

- A sample of natural gas product collected at the site was too volatile for the sampling equipment to retain and could not be analyzed, and can probably be eliminated as comparison product.

Based on the data presented in the report, and summarized above, several general conclusions can be made. The "rocket pit", which is roughly upgradient from the evaporation pond, is a potential and probable source for the hydrocarbons found in MW-1 and MW-4 during GCL's initial ground-water investigation. Hydrocarbons identified in and around the evaporation pond, by the soil vapor survey, cannot be confirmed or eliminated as a source for the hydrocarbons which occur in ground water beneath the pond. The "stoddard solvent" found in grid points 15, 17 and 18 is probably a result of a pipe rupture which occurred and may or may not relate to the ground water problem at the site.

Upon receipt of your verbal or written comments, we will finalize the report for transmittal to the Oil Conservation Division (OCD) and the New Mexico Environmental Improvement Division (NMEID). We should continue to approach the investigation and remedial action under the jurisdiction of OCD. We recommend that a meeting be scheduled as soon as practicable with the OCD to discuss the results of the investigation, submit an amended work plan and to obtain approval to proceed with the remaining tasks of the work plan. It is GCL's experience is that OCD is very cooperative if a proactive strategy is actively pursued once a release of "raw" product has been detected. Should EID become involved, all tasks proposed would still be required but it is likely that a more complete plume definition would also be required before recovery of product could begin.

If you have any questions regarding this transmittal letter or the draft Soil Vapor Report, please contact me at (505) 842-0001. We look forward to your review of the report.

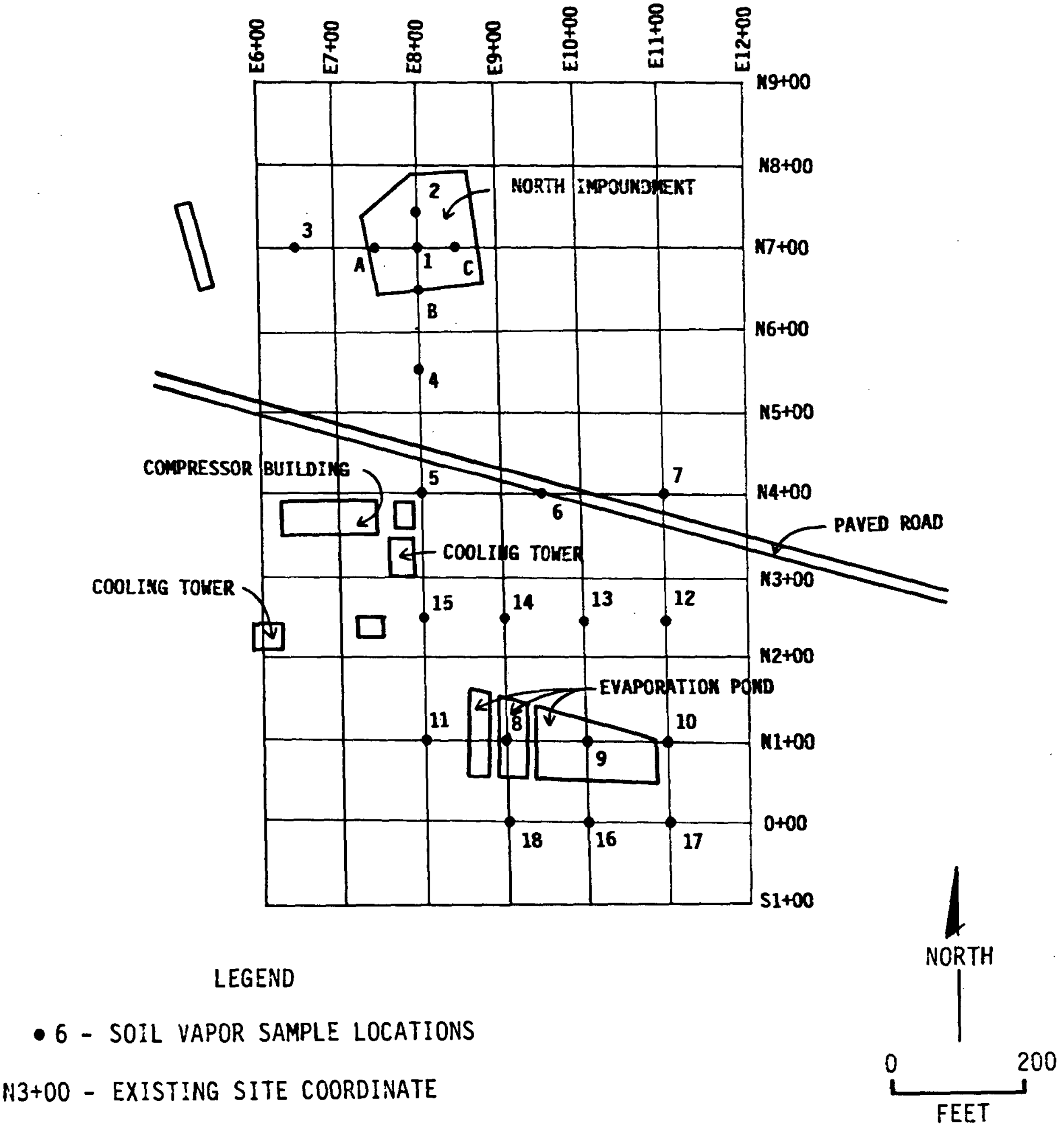
Yours very truly,
GEOSCIENCE CONSULTANTS, LTD.

Carol Wilson Hodges

Carol Wilson Hodges
Program Manager

CWH/PHIL/SMITH01.LTR

Enclosure



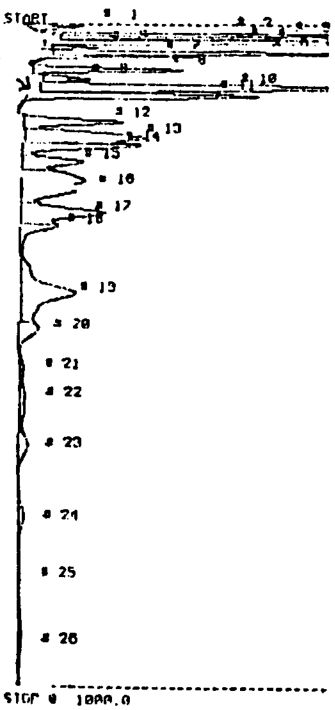
LEGEND

● 6 - SOIL VAPOR SAMPLE LOCATIONS

N3+00 - EXISTING SITE COORDINATE

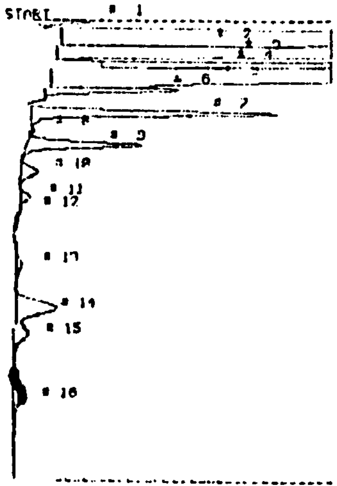
FIGURE 3-1

SOIL VAPOR SAMPLE LOCATIONS



```
STOP @  1000.0
SAMPLE LIBRARY 1  SEP  7 1988  10:58
ANALYSIS #     8   N700 E900 QUAL
INTERNAL TEMP 25   10 mL-min
GAIN           5   OVEN TEMP 30°C

COMPOUND NAME   PEAK  R.T.  AREA/PPM

UNKNOWN            1    3.9 700.2 mUS
UNKNOWN            2   15.1   3.0  US
UNKNOWN            3   18.8   5.1  US
UNKNOWN            4   27.3  11.3  US
UNKNOWN            5   37.1 544.1 mUS
UNKNOWN            6   45.0   5.1  US
UNKNOWN            7   58.9   1.7  US
UNKNOWN            8   71.9   3.3  US
UNKNOWN            9   88.0   1.3  US
UNKNOWN           10   97.9  16.0  US
UNKNOWN           11  112.0   5.5  US
UNKNOWN           12  153.2   3.4  US
TOLUENE           13  172.7 18.76 PPM
TOLUENE           14  183.7 17.32 PPM
UNKNOWN           15  216.0   2.0  US
UNKNOWN           16  245.1   6.0  US
UNKNOWN           17  289.1   5.0  US
UNKNOWN           18  309.1   2.3  US
ETHYLBENZ         19  411.3 48.07 PPM
P,M-XYLENE        20  467.0 14.23 PPM
UNKNOWN           21  520.5 552.0 mUS
O-XYLENE          22  572.0 18.34 PPM
UNKNOWN           23  648.5   1.1  US
UNKNOWN           24  758.0 594.9 mUS
UNKNOWN           25  815.1  67.3 mUS
UNKNOWN           26  946.0 470.3 mUS
```

Point # 1

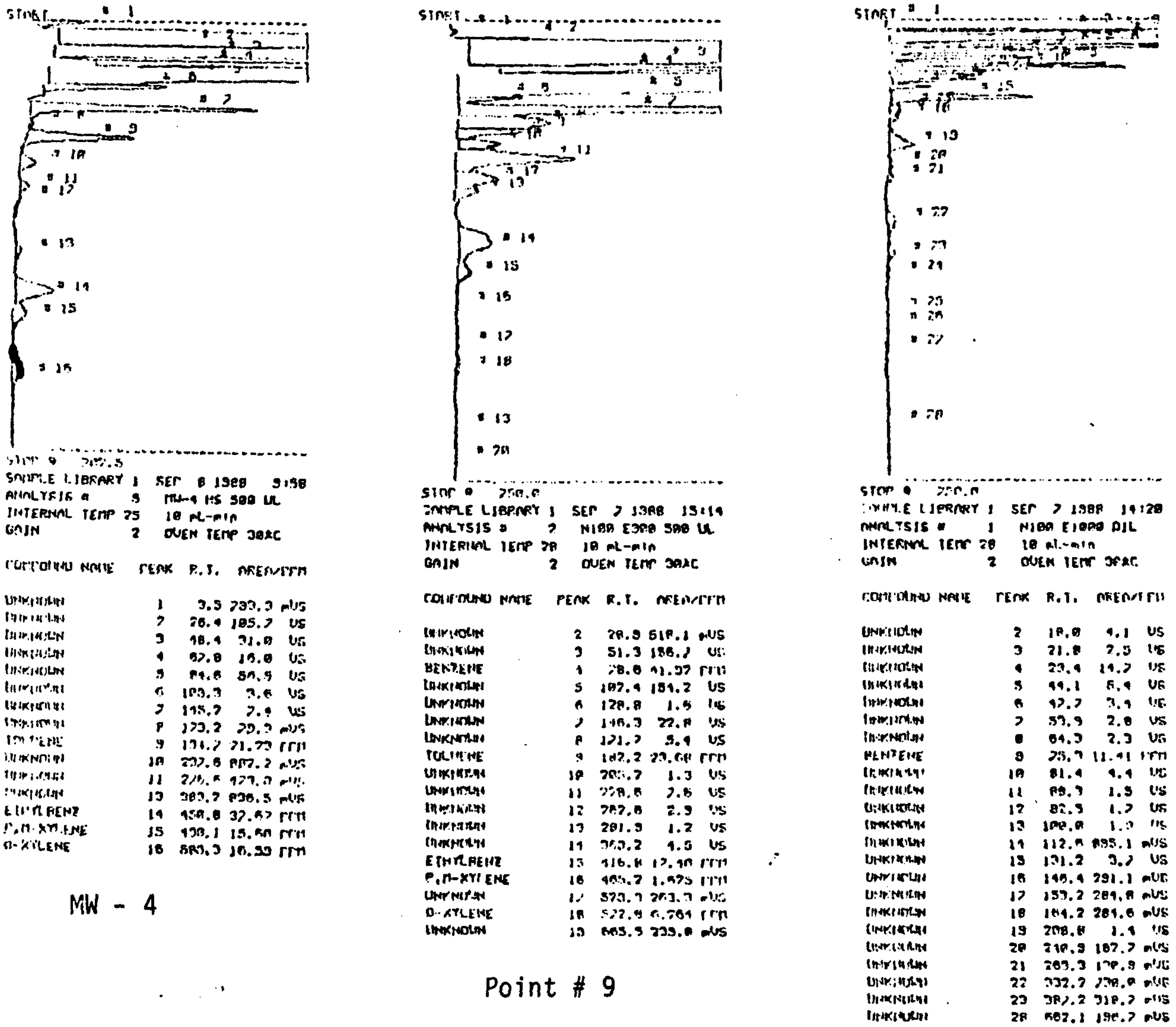


```
STOP @  707.5
SAMPLE LIBRARY 1  SEP  8 1988   9:58
ANALYSIS #     5   MW-4 HS 500 UL
INTERNAL TEMP 25   10 mL-min
GAIN           2   OVEN TEMP 30°C

COMPOUND NAME   PEAK  R.T.  AREA/PPM

UNKNOWN            1    3.5 797.3 mUS
UNKNOWN            2   26.4 105.7  US
UNKNOWN            3   48.4  31.0  US
UNKNOWN            4   67.8  16.0  US
UNKNOWN            5   84.6  59.5  US
UNKNOWN            6  103.3   3.6  US
UNKNOWN            7  145.2   2.4  US
UNKNOWN            8  173.2  29.3 mUS
TOLUENE            9  191.7 21.73 PPM
UNKNOWN           10  232.6 887.2 mUS
UNKNOWN           11  270.6 473.0 mUS
UNKNOWN           12  383.7 836.5 mUS
ETHYLBENZ         14  450.8 32.62 PPM
P,M-XYLENE        15  490.1 15.80 PPM
O-XYLENE          16  680.3 16.53 PPM
```

MW-4

FIGURE 1

Chromatograms from Point #1 and MW-4



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STOP @   707.5
SAMPLE LIBRARY 1  SEP  8 1988   9:58
ANALYSIS #      5   MW-4 HS 500 UL
INTERNAL TEMP 25   10 mL-min
GAIN            2   OVEN TEMP 30AC

COMPOUND NAME   PEAK  R.T.  AREA/PPM

UNKNOWN            1    3.5 733.3 mVS
UNKNOWN            2   26.4 105.7  VS
UNKNOWN            3   48.4  31.0  VS
UNKNOWN            4   62.8  16.0  VS
UNKNOWN            5   84.6  84.9  VS
UNKNOWN            6  103.3   3.6  VS
UNKNOWN            7  115.7   7.4  VS
UNKNOWN            8  173.2  79.3 mVS
TOLUENE            9  191.7 71.73 PPM
UNKNOWN           10  232.6 887.2 mVS
UNKNOWN           11  276.5 477.0 mVS
UNKNOWN           13  303.7 836.5 mVS
ETHYLBENZ         14  450.8 32.67 PPM
P,M-XYLENE        15  490.1 15.60 PPM
O-XYLENE          16  680.3 10.53 PPM
```

MW - 4

```
STOP @   750.0
SAMPLE LIBRARY 1  SEP  7 1988  15:14
ANALYSIS #      2   N100 E300 500 UL
INTERNAL TEMP 28   10 mL-min
GAIN            2   OVEN TEMP 30AC

COMPOUND NAME   PEAK  R.T.  AREA/PPM

UNKNOWN            2   28.9 618.1 mVS
UNKNOWN            3   51.3 156.7  VS
BENZENE            4   78.6 41.07 PPM
UNKNOWN            5  107.4 154.2  VS
UNKNOWN            6  128.8   1.6  VS
UNKNOWN            7  146.3  22.8  VS
UNKNOWN            8  171.7   5.4  VS
TOLUENE            9  182.2 23.68 PPM
UNKNOWN           10  205.7   1.3  VS
UNKNOWN           11  228.6   2.6  VS
UNKNOWN           12  262.6   2.9  VS
UNKNOWN           13  281.9   1.2  VS
UNKNOWN           14  363.2   4.5  VS
ETHYLBENZ         15  416.8 12.40 PPM
P,M-XYLENE        16  465.7 1.575 PPM
UNKNOWN           17  573.7 263.3 mVS
O-XYLENE          18  577.9 6.764 PPM
UNKNOWN           19  665.5 335.0 mVS
```

Point # 9

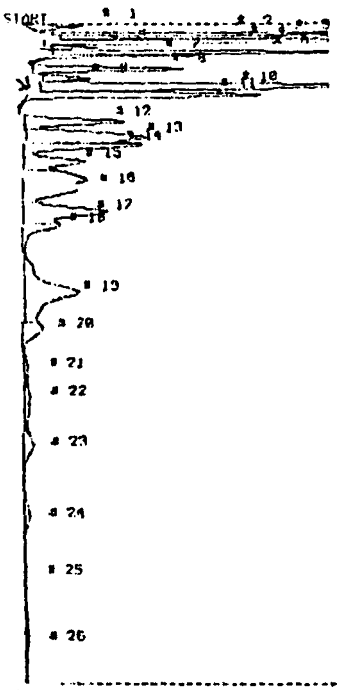
```
STOP @   750.0
SAMPLE LIBRARY 1  SEP  7 1988  14:20
ANALYSIS #      1   N100 E1000 DIL
INTERNAL TEMP 28   10 mL-min
GAIN            2   OVEN TEMP 30AC

COMPOUND NAME   PEAK  R.T.  AREA/PPM

UNKNOWN            2   18.0   4.1  VS
UNKNOWN            3   21.8   2.5  VS
UNKNOWN            4   23.4  14.7  VS
UNKNOWN            5   44.1   6.4  VS
UNKNOWN            6   47.7   3.4  VS
UNKNOWN            7   53.9   2.8  VS
UNKNOWN            8   64.3   2.3  VS
BENZENE            9   75.7 11.41 PPM
UNKNOWN           10   81.4   4.4  VS
UNKNOWN           11   88.9   1.5  VS
UNKNOWN           12   92.5   1.7  VS
UNKNOWN           13  100.0   1.0  VS
UNKNOWN           14  112.8 895.1 mVS
UNKNOWN           15  131.2   3.7  VS
UNKNOWN           16  146.4 291.1 mVS
UNKNOWN           17  153.2 284.8 mVS
UNKNOWN           18  164.2 281.6 mVS
UNKNOWN           19  208.8   1.4  VS
UNKNOWN           20  218.9 187.7 mVS
UNKNOWN           21  263.3 179.9 mVS
UNKNOWN           22  332.7 738.0 mVS
UNKNOWN           23  387.2 318.7 mVS
UNKNOWN           28  687.1 198.7 mVS
```

Point # 8

FIGURE 2
Chromatograms from Point #8, Point #9 and MW-4



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STOP @  1000.0
SAMPLE LIBRARY 1  SEP  7 1988  10:56
ANALYSIS #      6   N700 E000 QUAL
INTERNAL TEMP 25   10 mL-min
GAIN            5   OVEN TEMP 30AC

COMPOUND NAME   PEAK  R.T.  AREA/PPM

UNKNOWN           1    3.9 788.2 mVS
UNKNOWN           2   15.1   3.8  VS
UNKNOWN           3   19.0   5.1  VS
UNKNOWN           4   22.3  11.3  VS
UNKNOWN           5   37.1 544.1 mVS
UNKNOWN           6   43.0   5.1  VS
UNKNOWN           7   58.9   1.7  VS
UNKNOWN           8   71.9   3.3  VS
UNKNOWN           9   88.0   1.5  VS
UNKNOWN          10   97.9  16.8  VS
UNKNOWN          11  112.0   5.5  VS
UNKNOWN          12  153.2   3.4  VS
TOLUENE          13  177.7 18.76 PPM
TOLUENE          14  183.7 17.32 PPM
UNKNOWN          15  216.0   7.8  VS
UNKNOWN          16  245.1   6.8  VS
UNKNOWN          17  285.1   5.8  VS
UNKNOWN          18  305.1   2.9  VS
ETHYLBENZ        19  411.3 48.82 PPM
P,M-XYLENE       20  467.6 14.29 PPM
UNKNOWN          21  528.5 552.9 mVS
O-XYLENE         22  577.8 18.94 PPM
UNKNOWN          23  698.5   1.1  VS
UNKNOWN          24  758.8 394.9 mVS
UNKNOWN          25  845.1  67.9 mVS
UNKNOWN          26  946.0 478.3 mVS
```
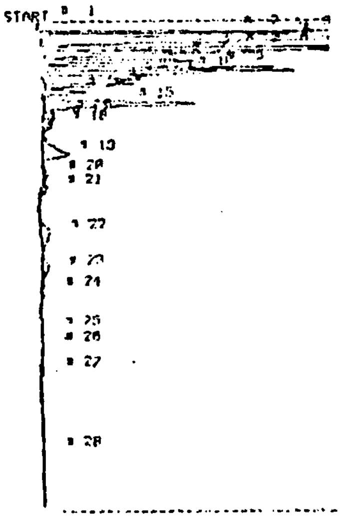
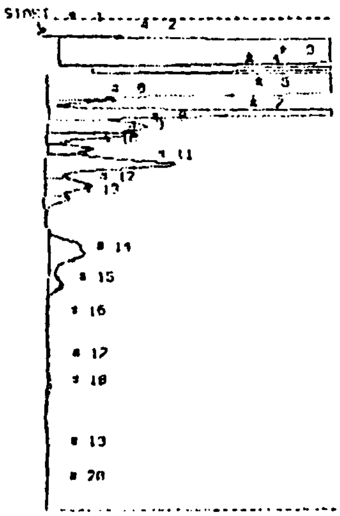

Point # 1



```
STOP @   250.0
SAMPLE LIBRARY 1  SEP  7 1988  14:20
ANALYSIS #      1   N100 E1000 DIL
INTERNAL TEMP 28   10 mL-min
GAIN            2   OVEN TEMP 30AC

COMPOUND NAME   PEAK  R.T.  AREA/PPM

UNKNOWN           2   18.0   4.1  VS
UNKNOWN           3   21.8   2.9  VS
UNKNOWN           4   23.4  14.7  VS
UNKNOWN           5   44.1   5.4  VS
UNKNOWN           6   47.2   3.4  VS
UNKNOWN           7   53.9   2.8  VS
UNKNOWN           8   64.3   2.3  VS
BENZENE           9   78.7 11.41 PPM
UNKNOWN          10   81.4   4.4  VS
UNKNOWN          11   88.7   1.5  VS
UNKNOWN          12   92.5   1.7  VS
UNKNOWN          13  100.0   1.1  VS
UNKNOWN          14  112.8 895.1 mVS
UNKNOWN          15  131.2   3.7  VS
UNKNOWN          16  148.4 291.1 mVS
UNKNOWN          17  153.2 784.8 mVS
UNKNOWN          18  164.2 284.6 mVS
UNKNOWN          19  208.8   1.4  VS
UNKNOWN          20  210.3 167.7 mVS
UNKNOWN          21  263.3 170.9 mVS
UNKNOWN          22  332.7 270.0 mVS
UNKNOWN          23  387.2 310.2 mVS
UNKNOWN          28  682.1 190.7 mVS
```

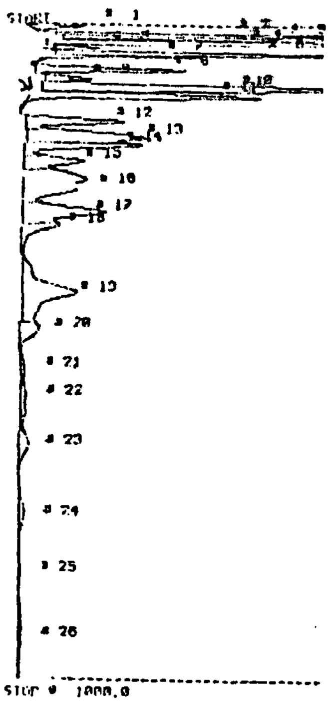
Point # 8



```
STOP @   250.0
SAMPLE LIBRARY 1  SEP  7 1988  15:14
ANALYSIS #      2   N100 E300 500 UL
INTERNAL TEMP 28   10 mL-min
GAIN            2   OVEN TEMP 30AC

COMPOUND NAME   PEAK  R.T.  AREA/PPM

UNKNOWN           2   28.9 518.1 mVS
UNKNOWN           3   51.3 156.7  VS
BENZENE           4   78.8 41.92 PPM
UNKNOWN           5  107.4 154.2  VS
UNKNOWN           6  128.8   1.6  VS
UNKNOWN           7  146.3  22.8  VS
UNKNOWN           8  171.7   5.4  VS
TOLUENE           9  187.2 23.68 PPM
UNKNOWN          10  205.7   1.3  VS
UNKNOWN          11  229.8   2.6  VS
UNKNOWN          12  262.6   2.9  VS
UNKNOWN          13  281.9   1.2  VS
UNKNOWN          14  363.2   4.5  VS
ETHYLBENZ        15  416.8 17.48 PPM
P,M-XYLENE       16  465.7 1.675 PPM
UNKNOWN          17  529.9 263.3 mVS
O-XYLENE         18  572.8 6.261 PPM
UNKNOWN          19  685.9 739.0 mVS
```

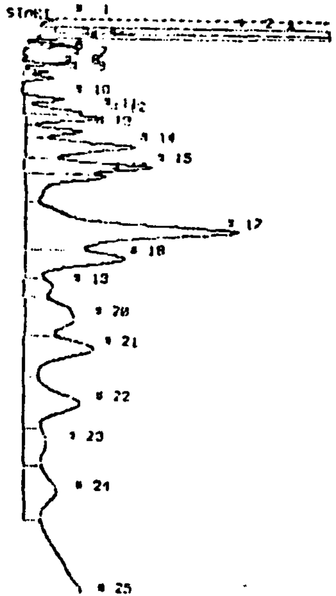
Point # 9

FIGURE 3



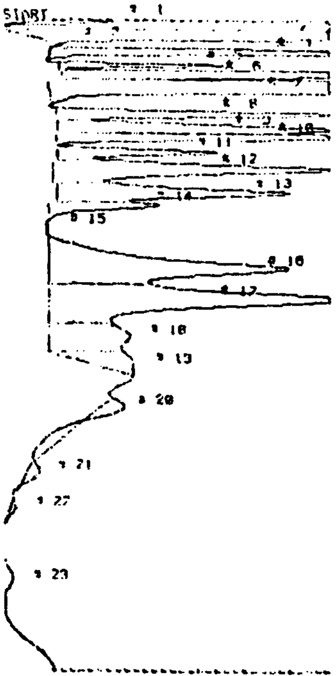
```
STOP @  1000.0
SAMPLE LIBRARY 1  SEP  7 1988  10:56
ANALYSIS #     6   N700 E000 QUAL
INTERNAL TEMP 25   10 mL-min
GAIN           5   OVEN TEMP 30C

COMPOUND NAME   PEAK  R.T.  AREA/PPM

UNKNOWN           1     3.9 280.2 mUS
UNKNOWN           2    13.1   3.8  US
UNKNOWN           3    19.8   5.1  US
UNKNOWN           4    27.3  13.3  US
UNKNOWN           5    37.1 [illegible] mUS
UNKNOWN           6    45.0   5.1  US
UNKNOWN           7    58.9   1.7  US
UNKNOWN           8    71.9   3.3  US
UNKNOWN           9    88.0   1.5  US
UNKNOWN          10    97.9  16.0  US
UNKNOWN          11   112.0   5.5  US
UNKNOWN          12   153.2   3.4  US
TOLUENE          13   177.7 .8876 PPM
TOLUENE          14   189.7 22.97 PPM
UNKNOWN          15   216.0   7.0  US
UNKNOWN          16   245.1   9.0  US
UNKNOWN          17   285.1  35.0  US
UNKNOWN          18   305.1  22.9  US
ETHYLBENZ        19   411.3 40.82 PPM
P,M-XYLENE       20   467.6 14.23 PPM
UNKNOWN          21   522.5 527.9 mUS
O-XYLENE         22   572.0 18.94 PPM
UNKNOWN          23   648.5  11.1  US
UNKNOWN          24   758.0 554.9 mUS
UNKNOWN          25   845.1 497.8 mUS
UNKNOWN          26   940.0 428.3 mUS
```

Point # 1



```
STOP @   800.0
SAMPLE LIBRARY 1  SEP  8 1988  12:23
ANALYSIS #    10   NO E900 500 UL
INTERNAL TEMP 29   10 mL-min
GAIN           2   OVEN TEMP 30C

COMPOUND NAME   PEAK  R.T.  AREA/PPM

UNKNOWN           1     3.3 160.2 mUS
UNKNOWN           2    18.0  15.0  US
UNKNOWN           3    25.4   6.0  US
UNKNOWN           4    33.0 372.1 mUS
UNKNOWN           5    41.0 551.1 mUS
UNKNOWN           6    60.7  81.2 mUS
UNKNOWN           7    70.9 628.6 mUS
BENZENE           8    83.1 1.173 PPM
UNKNOWN           9    97.3 956.1 mUS
UNKNOWN          10   126.8   1.1  US
UNKNOWN          11   146.6   1.5  US
UNKNOWN          12   155.0   7.5  US
UNKNOWN          13   175.4   2.3  US
TOLUENE          14   198.8 32.32 PPM
UNKNOWN          15   230.1   0.5  US
UNKNOWN          16   249.3   5.2  US
UNKNOWN          17   328.7  71.2  US
UNKNOWN          18   372.6   8.5  US
UNKNOWN          19   416.0   2.6  US
P,M-XYLENE       20   466.8 113.4 PPM
UNKNOWN          21   517.1   6.3  US
O-XYLENE         22 [illegible] 157.4 PPM
UNKNOWN          23   658.5   3.3  US
UNKNOWN          24   772.0   6.0  US
```

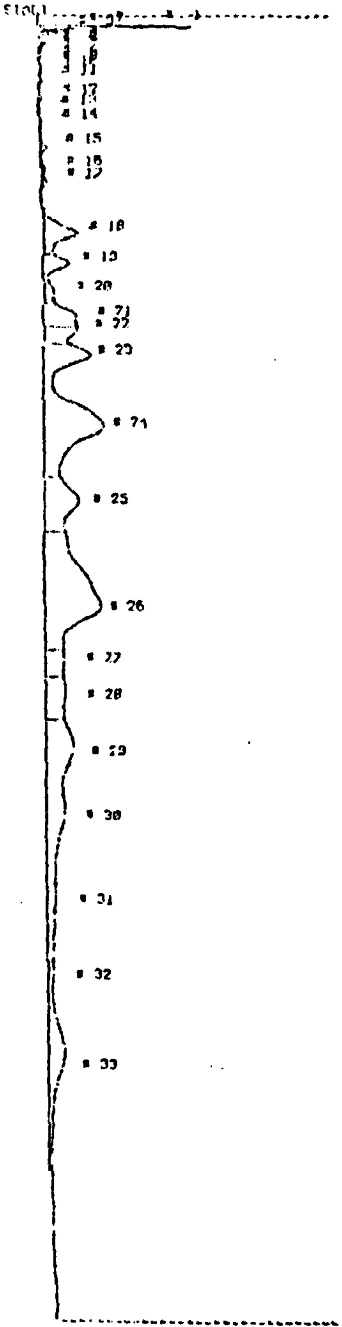
Point # 18



```
STOP @  1000.0
SAMPLE LIBRARY 1  SEP  8 1988  11:39
ANALYSIS #     8   NO E1100 500 UL
INTERNAL TEMP 29   10 mL-min
GAIN          20   OVEN TEMP 30C

COMPOUND NAME   PEAK  R.T.  AREA/PPM

UNKNOWN           1     3.6   1.4  US
UNKNOWN           2    23.3  20.2  US
UNKNOWN           4    50.0  15.3  US
UNKNOWN           5    71.8   3.3  US
UNKNOWN           6    83.3  28.3  US
UNKNOWN           7   103.6  62.6  US
UNKNOWN           8   145.7  10.3  US
UNKNOWN           9   170.3  12.8  US
UNKNOWN          10   181.7  11.4  US
UNKNOWN          11   202.7   6.1  US
UNKNOWN          12   232.7  12.4  US
UNKNOWN          13   271.8  17.4  US
UNKNOWN          14   278.8   4.5  US
UNKNOWN          16   388.7  24.2  US
ETHYLBENZ        17   431.7 40.13 PPM
P,M-XYLENE       18   495.0 14.55 PPM
UNKNOWN          19   537.3   4.6  US
O-XYLENE         20   587.5 1.292 PPM
UNKNOWN          21   707.3   1.0  US
UNKNOWN          22   758.8 277.8 mUS
UNKNOWN          23   871.5   1.2  US
```

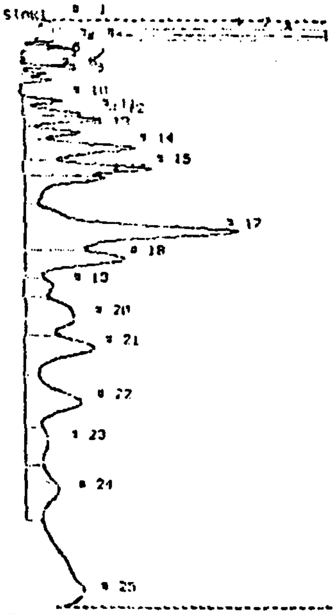
Point # 17

FIGURE 4



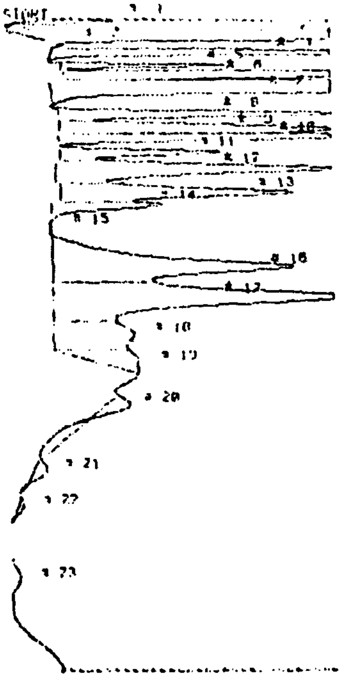
```
STOP @  2000.0
SAMPLE LIBRARY 1  SEP  7 1988  10:49
ANALYSIS #     4   N250 E800 50 UL
INTERNAL TEMP 23   10 mL-min
GAIN           2   OVEN TEMP 30*C

COMPOUND NAME  PEAK  R.T.  AREA/PPM

UNKNOWN          1    12.3    1.1  US
UNKNOWN          2    21.2  241.0 mUS
UNKNOWN          3    26.9  115.5 mUS
UNKNOWN         12   173.0   60.7 mUS
UNKNOWN         15   202.0  263.7 mUS
UNKNOWN         16   210.2  110.3 mUS
UNKNOWN         17   260.5  141.0 mUS
UNKNOWN         18   342.1    3.7  US
UNKNOWN         19   383.2    7.1  US
ETHYLPENZ       20   435.5  12.83 PPM
P,M-XYLENE      21   473.6  66.31 PPM
P,M-XYLENE      22   482.7  36.01 PPM
UNKNOWN         23   574.1    5.3  US
UNKNOWN         24   646.8   14.6  US
UNKNOWN         25   764.6    6.3  US
UNKNOWN         26   876.8   20.7  US
UNKNOWN         27  1005.0    2.3  US
UNKNOWN         28  1081.3    3.8  US
UNKNOWN         29  1148.6    8.1  US
UNKNOWN         30  1216.1    6.0  US
UNKNOWN         31  1327.8    7.3  US
UNKNOWN         32  1400.2    1.3  US
UNKNOWN         33  1626.8    2.2  US
```

Point # 15



```
STOP @   200.0
SAMPLE LIBRARY 1  SEP  8 1988  12:23
ANALYSIS #    10   NO E300 500 UL
INTERNAL TEMP 23   10 mL-min
GAIN           2   OVEN TEMP 30*C

COMPOUND NAME  PEAK  R.T.  AREA/PPM

UNKNOWN          1     3.3  103.2 mUS
UNKNOWN          2    18.0   15.0  US
UNKNOWN          3    25.4    6.8  US
UNKNOWN          4    39.8  322.1 mUS
UNKNOWN          5    41.0  551.1 mUS
UNKNOWN          6    62.7   51.2 mUS
UNKNOWN          7    70.3  620.0 mUS
BENZENE          8    83.1  1.133 PPM
UNKNOWN          9    97.9  666.1 mUS
UNKNOWN         10   128.8    1.1  US
UNKNOWN         11   140.0    1.3  US
UNKNOWN         12   155.0    7.5  US
UNKNOWN         13   175.4    2.3  US
TOLUENE         14   198.9  37.32 PPM
UNKNOWN         15   220.1    6.5  US
UNKNOWN         16   218.7    5.2  US
UNKNOWN         17   328.2   21.2  US
UNKNOWN         18   372.0    8.5  US
UNKNOWN         19   416.0    7.8  US
P,M-XYLENE      20   456.8  113.4 PPM
UNKNOWN         21   517.1    8.3  US
O-XYLENE        22   596.1  152.1 PPM
UNKNOWN         23   650.5    3.3  US
UNKNOWN         24   732.0    4.8  US
```

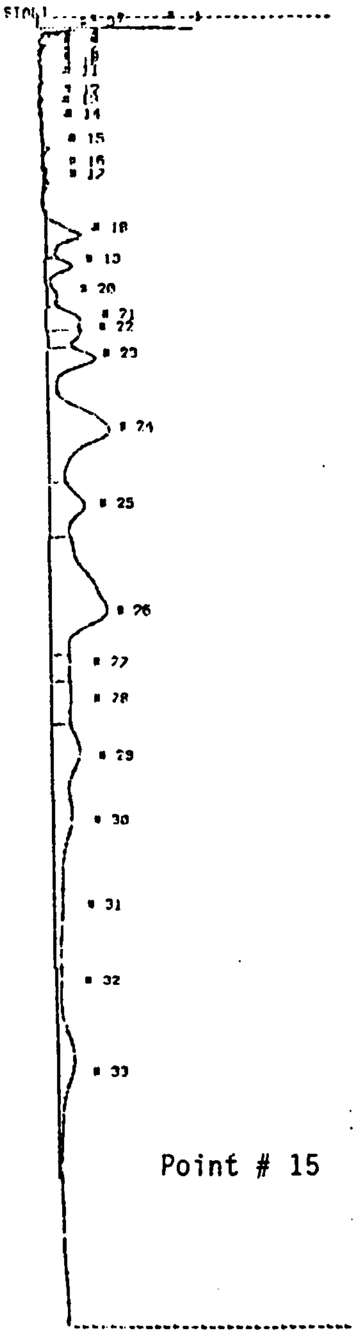
Point # 18



```
STOP @  1000.0
SAMPLE LIBRARY 1  SEP  8 1988  11:39
ANALYSIS #     8   NO E1100 500 UL
INTERNAL TEMP 23   10 mL-min
GAIN          20   OVEN TEMP 30*C

COMPOUND NAME  PEAK  R.T.  AREA/PPM

UNKNOWN          1     3.5    1.4  US
UNKNOWN          2    23.3   20.7  US
UNKNOWN          4    50.0   15.3  US
UNKNOWN          5    71.5    3.3  US
UNKNOWN          6    83.3   25.3  US
UNKNOWN          7   103.6    8.6  US
UNKNOWN          8   116.2   18.7  US
UNKNOWN          9   170.3   12.8  US
UNKNOWN         10   181.2   11.4  US
UNKNOWN         11   202.2    6.1  US
UNKNOWN         12   232.2   12.4  US
UNKNOWN         13   271.8   13.4  US
UNKNOWN         14   290.8    4.4  US
UNKNOWN         16   360.2   21.2  US
ETHYLBENZ       17   431.2  40.13 PPM
P,M-XYLENE      18   455.0  14.95 PPM
UNKNOWN         19   532.3    4.6  US
O-XYLENE        20   603.5  1.202 PPM
UNKNOWN         21   707.3    1.0  US
UNKNOWN         22   750.8  272.6 mUS
UNKNOWN         23   871.5    1.2  US
```

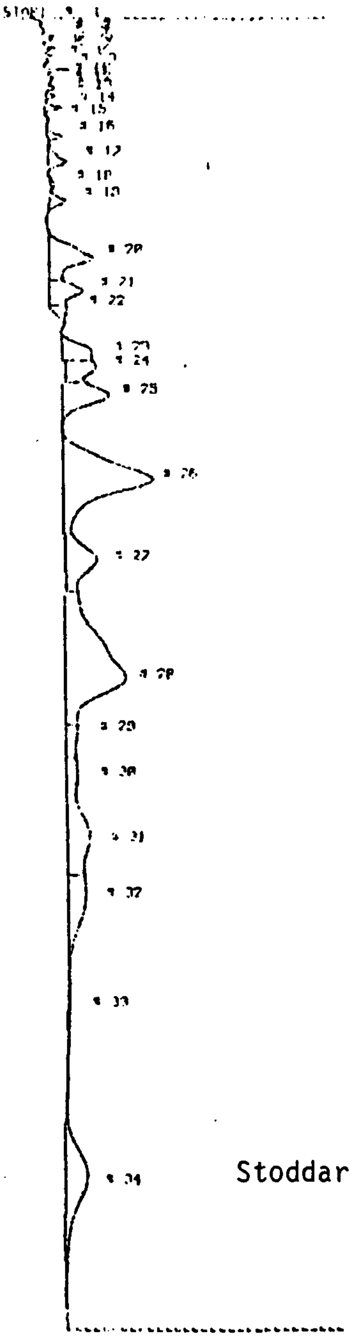
Point # 17

FIGURE 5



Point # 15

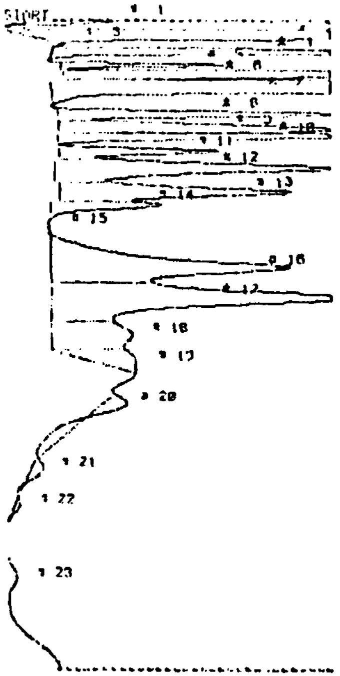
```
STOP @  2000.0
SAMPLE LIBRARY 1  SEP  7 1988  16:49
ANALYSIS #     4   H250 E800 50 UL
INTERNAL TEMP 23   10 mL-min
GAIN           2   OVEN TEMP 30°C

COMPOUND NAME   PEAK  R.T.  AREA/PPM

UNKNOWN           1   12.3    1.1  VS
UNKNOWN           2   21.2  241.6 mVS
UNKNOWN           3   26.9  113.5 mVS
UNKNOWN          13  123.6   60.7 mVS
UNKNOWN          15  207.0  203.7 mVS
UNKNOWN          16  218.2  110.3 mVS
UNKNOWN          17  250.5  141.0 mVS
UNKNOWN          18  342.1    3.7  VS
UNKNOWN          19  383.2    2.1  VS
ETHYLBENZ        20  435.5  12.03 PPM
P,M-XYLENE       21  473.6  66.31 PPM
P,M-XYLENE       22  492.7  36.01 PPM
UNKNOWN          23  534.1    5.3  VS
UNKNOWN          24  615.0   14.6  VS
UNKNOWN          25  764.6    6.9  VS
UNKNOWN          26  876.0   20.2  VS
UNKNOWN          27 1005.0    2.7  VS
UNKNOWN          28 1081.3    3.0  VS
UNKNOWN          29 1148.6    0.7  VS
UNKNOWN          30 1216.1    6.0  VS
UNKNOWN          31 1272.8    7.3  VS
UNKNOWN          32 1400.7    1.3  VS
UNKNOWN          33 1626.0    2.2  VS
```



Stoddard Solvent

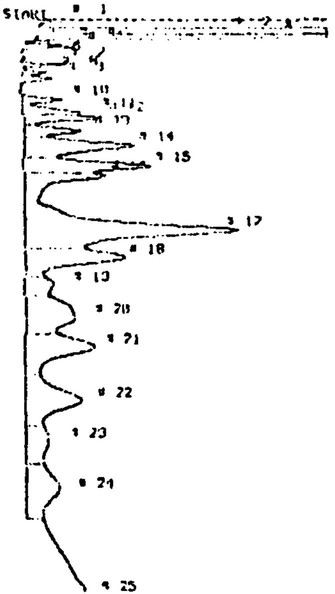
```
STOP @  2000.0
SAMPLE LIBRARY 1  SEP  8 1988  14:13
ANALYSIS #    14   500 UL STODD SOL
INTERNAL TEMP 20   10 mL-min
GAIN           2   OVEN TEMP 30°C

COMPOUND NAME   PEAK  R.T.  AREA/PPM

UNKNOWN           1   11.1  113.0 mVS
UNKNOWN           5   46.7   21.6 mVS
BENZENE           9   92.2  600.3 PPB
UNKNOWN          10   97.9   31.7 mVS
UNKNOWN          12  108.7   29.0 mVS
UNKNOWN          13  121.1  120.0 mVS
UNKNOWN          14  140.0  341.7 mVS
UNKNOWN          15  159.6   75.6 mVS
TOLUENE          16  185.7  2.376 PPM
UNKNOWN          17  224.5  277.0 mVS
UNKNOWN          18  250.3  141.5 mVS
UNKNOWN          19  285.3  206.3 mVS
UNKNOWN          20 [illegible]   5.1  VS
UNKNOWN          21  427.0    9.0  VS
ETHYLBENZ        22  452.4  3.233 PPM
UNKNOWN          23  520.7    2.1  VS
UNKNOWN          24  547.1    3.1  VS
O-XYLENE         25  585.1  89.34 PPM
UNKNOWN          26  714.0   12.7  VS
UNKNOWN          27  810.0    8.9  VS
UNKNOWN          28 1070.6   70.4  VS
UNKNOWN          29 [illegible]   1.7  VS
UNKNOWN          30 1163.0    2.7  VS
UNKNOWN          31 [illegible]   6.7  VS
UNKNOWN          32 1351.7    5.0  VS
UNKNOWN          33 1512.5 [illegible]
UNKNOWN          34 1699.7    6.6  VS
```

FIGURE 6



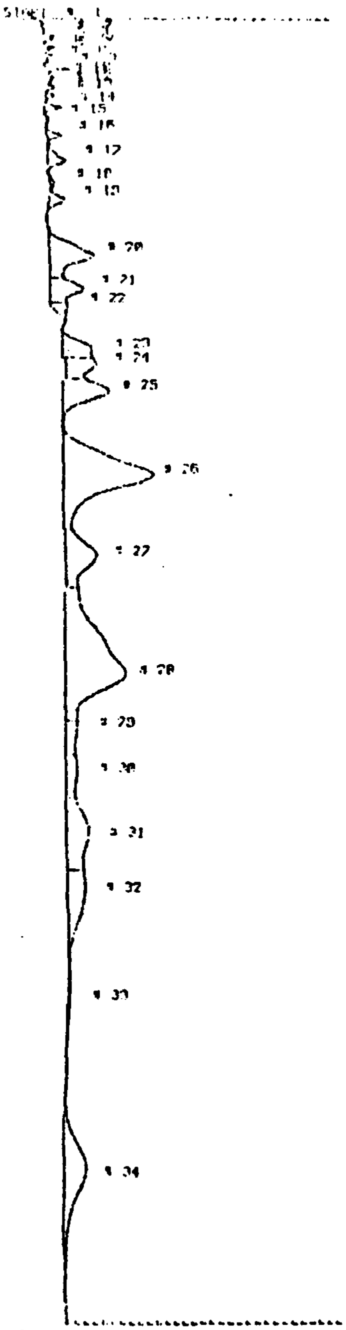
```
STOP @  1000.0
SAMPLE LIBRARY 1  SEP  8 1988  11:39
ANALYSIS #     8   NO E1100 500 UL
INTERNAL TEMP 29   10 mL-min
GAIN          20   OVEN TEMP 30°C

COMPOUND NAME   PEAK  R.T.   AREA/PPM

UNKNOWN           1     3.5    1.4  US
UNKNOWN           2    23.3   20.7  US
UNKNOWN           4    50.0   15.3  US
UNKNOWN           5    71.5    3.3  US
UNKNOWN           6    87.3   25.9  US
UNKNOWN           7   103.6   67.6  US
UNKNOWN           8   145.2   10.3  US
UNKNOWN           9   170.3   12.8  US
UNKNOWN          10   181.2   11.4  US
UNKNOWN          11   202.2    6.1  US
UNKNOWN          12   232.2   12.4  US
UNKNOWN          13   271.8   13.4  US
UNKNOWN          14   290.8    4.5  US
UNKNOWN          16   388.2   24.2  US
ETHYL BENZ       17   431.7  40.13 PPM
P,M-XYLENE       18   435.0  14.85 PPM
UNKNOWN          19   537.3    4.6  US
O-XYLENE         20   583.5  1.797 PPM
UNKNOWN          21   707.3    1.0  US
UNKNOWN          22   758.0  222.0 mUS
UNKNOWN          23   871.5    1.2  US
```

Point # 17



```
STOP @   900.0
SAMPLE LIBRARY 1  SEP  8 1988  12:23
ANALYSIS #    10   NO E300 500 UL
INTERNAL TEMP 29   10 mL-min
GAIN           2   OVEN TEMP 30°C

COMPOUND NAME   PEAK  R.T.   AREA/PPM

UNKNOWN           1     3.3  163.2 mUS
UNKNOWN           2    18.0   15.9  US
UNKNOWN           3    25.4    6.8  US
UNKNOWN           4    33.0  322.1 mUS
UNKNOWN           5    41.0  551.1 mUS
UNKNOWN           6    60.2   51.2 mUS
UNKNOWN           7    70.3  620.6 mUS
BENZENE           8    83.1  1.179 PPM
UNKNOWN           9    92.9  666.1 mUS
UNKNOWN          10   120.0    1.1  US
UNKNOWN          11   146.0    1.5  US
UNKNOWN          12   135.0    7.5  US
UNKNOWN          13   175.4    2.3  US
TOLUENE          14   190.0  37.32 PPM
UNKNOWN          15   230.1    0.5  US
UNKNOWN          16   248.3    5.2  US
UNKNOWN          17   320.7   21.2  US
UNKNOWN          18   372.6    8.5  US
UNKNOWN          19   418.0    2.6  US
P,M-XYLENE       20   466.8  113.4 PPM
UNKNOWN          21   512.1    6.9  US
O-XYLENE         22   [illegible]  152.1 PPM
UNKNOWN          23   650.5    3.3  US
UNKNOWN          24   732.0    4.8  US
```

Point # 18

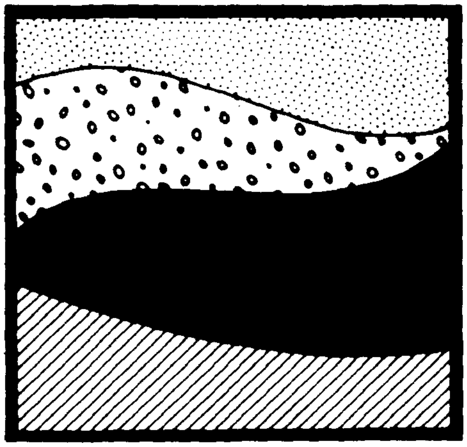


```
STOP @  2000.0
SAMPLE LIBRARY 1  SEP  8 1988  14:13
ANALYSIS #    14   500 UL STORD SOL
INTERNAL TEMP 28   10 mL-min
GAIN           2   OVEN TEMP 30°C

COMPOUND NAME   PEAK  R.T.   AREA/PPM

UNKNOWN           1    11.1  117.0 mUS
UNKNOWN           5   [illegible]   21.6 mUS
BENZENE           9    92.2  693.0 PPB
UNKNOWN          10    99.9   31.2 mUS
UNKNOWN          12   109.2   39.0 mUS
UNKNOWN          13   121.1  120.0 mUS
UNKNOWN          14   140.0  711.2 mUS
UNKNOWN          15   159.6   25.6 mUS
TOLUENE          16   185.[illegible]  2.328 PPM
UNKNOWN          17   221.5  [illegible] mUS
UNKNOWN          18   250.3  [illegible] mUS
UNKNOWN          19   285.2  201.3 mUS
UNKNOWN          20   [illegible]    8.1  US
UNKNOWN          21   423.5   [illegible]  US
ETHYL BENZ       22   452.4  3.797 PPM
UNKNOWN          23   520.2    7.1  US
UNKNOWN          24   547.1    7.1  US
O-XYLENE         25   [illegible]  80.34 PPM
UNKNOWN          26   714.0   17.7  US
UNKNOWN          27   840.0    5.9  US
UNKNOWN          28  1070.6   20.4  US
UNKNOWN          29  1092.1    1.2  US
UNKNOWN          30  1163.0    2.7  US
UNKNOWN          31  1266.5    6.2  US
UNKNOWN          32  1301.2    5.0  US
UNKNOWN          33  1312.5  [illegible]  US
UNKNOWN          34  1389.7    6.6  US
```

Stoddard Solvent ------

FIGURE 7

GCL



DRAFT REPORT
LIMITED SOIL VAPOR SURVEY
PHILLIPS LEE GAS PLANT
LEA COUNTY, NEW MEXICO

September 20, 1988

Prepared for:

Cindy Smith
Process and Environment
Phillips Petroleum Company
Bartlesville, Oklahoma 74004

Prepared by:

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GCL

DRAFT REPORT
LIMITED SOIL VAPOR SURVEY
PHILLIPS LEE GAS PLANT
LEA COUNTY, NEW MEXICO

SUBMITTED BY: DATE:

Carol Wilson Hodges 9-20-88
GCL Program Manager

9-20-88
GCL Project Director

FORM/REPTSIGN.FRM

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1.0 EXECUTIVE SUMMARY

On September 6 through September 8, 1988, Geoscience Consultants Ltd. (GCL) conducted a limited soil vapor survey at Phillips Lee Plant near Hobbs, New Mexico. The survey was requested by Phillips Petroleum Company after ground-water samples from four monitor wells installed by GCL at the plant revealed the presence of hydrocarbons. The purpose of the survey was to identify potential sources of these hydrocarbons.

The limited soil vapor survey consisted of 18 sample points located on and adjacent to two surface impoundments (one located north of the plant and referred to as the north impoundment, and one located east of the plant referred to as the evaporation pond) and one background point located off-site. Probe refusal was encountered at six points. One sample of ground water and two samples of natural gas liquids were obtained from Phillips and prepared by GCL personnel for qualitative gas chromatography comparison with shallow soil vapor samples. Chemical analyses for benzene, toluene, ethylbenzene and xylene (BTEX) were made using a Photovac Model 10S50 Portable Gas Chromatograph (GC).

Samples analyzed from points 2, A, B and C near the north impoundment and points 7, 13, 14 and 16 near the evaporation pond indicated that nominal background levels of hydrocarbons are present in the soils at these locations. Concentrations of toluene, ethylbenzene, p-,m-xylene and o-xylene ranging from approximately 10 to 50 microliters per liter (uL/L) and unknown compounds of low to medium molecular weight (relative to BTEX) were identified in the north impoundment. The highest concentrations of benzene (41.9 uL/L) and toluene (224 uL/L) were identified in the evaporation pond. Vapor analyzed from a point northwest of the evaporation pond showed high concentrations of ethylbenzene (40.1 uL.L) and p, m-xylene (113 uL/L). Points located west and south of the evaporation pond also indicated the presence of hydrocarbons at low uL/L levels.

2.0 INTRODUCTION

Site hydrogeology, water levels, ground-water gradient and subsurface lithology was characterized at the Phillips Lee Plant when four ground-water monitoring wells were installed by GCL in April, 1988. Based upon analytical and related field data obtained from the monitor wells, it became evident that free-phase petroleum products occurred in the unconfined alluvial aquifer underlying the Lee Plant. In accordance with Section 1-203 of the New Mexico Water Quality Control Commission Regulations, Phillips Petroleum Company notified the New Mexico Oil Conservation Division (NMOCD) and authorized GCL to identify potential sources of hydrocarbons in the unsaturated and saturated zone through a limited soil vapor investigation. The soil vapor grid was developed to center on two impoundments; the north impoundment and the evaporation pond.

3.0 TECHNICAL APPROACH

The following sections describe in detail the technical procedure GCL followed in performing the soil vapor survey at the Phillips Lee Plant.

3.1 FIELD INVESTIGATION

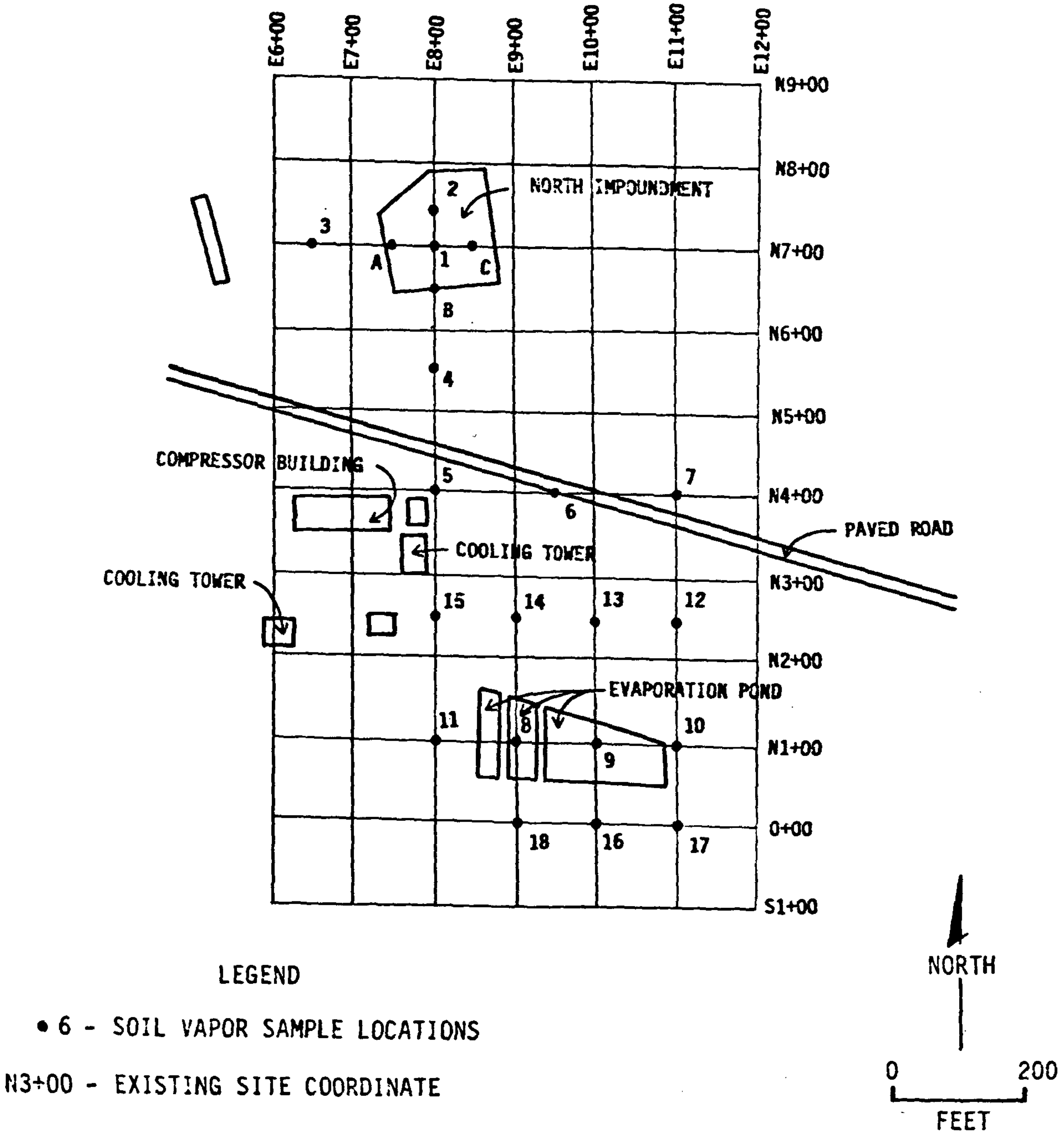
3.1.1 Sample Locations

GCL utilized a grid system based on a modification of the site's existing 100-foot coordinate system to locate sample points (Figure 3-1). Sample points were centered around two former evaporation ponds. Soil vapor samples were collected at locations as near to the 100-foot centers as possible, but the presence of an impenetrable caliche horizon just below the surface necessitated that samples be taken where probe-penetration was possible. A background sample was collected from a location approximately one-quarter mile northeast of the plant. One water sample was collected from MW-4, and two natural gas liquids were obtained from Phillips and prepared by GCL personnel for qualitative gas chromatography comparison with shallow soil vapor samples.

3.1.2 Sampling and Analysis

At each sampling point, a 0.75-inch diameter by seven-foot long, decontaminated steel probe was driven with a hand-operated, slide hammer to a depth of 3-4 feet. Thick layers of caliche were encountered at points 3, 4, 5, 6, 10, and 12. These points could not be sampled because the shallow probe refusal would not allow a tight enough seal between the soil and the probe to result in a depth-discrete vapor sample. Without a tight seal, air from the surface could be included in the sample via the drive-hole annulus, and distort analytical results.

A diaphragm vacuum pump was attached to the probe after it penetrated to the target depth, via an adapter tube. The probe was then raised until an in-line vacuum gauge read approximately 5-inches of mercury (Hg), to ensure that the probe had lifted off the drive-point. During evacuation, an H-Nu photoionization detector (H-Nu) was used to monitor vacuum pump



LEGEND

• 6 - SOIL VAPOR SAMPLE LOCATIONS

N3+00 - EXISTING SITE COORDINATE

FIGURE 3-1

SOIL VAPOR SAMPLE LOCATIONS

exhaust and confirm that organic vapors were being evacuated from the soil. Vapor samples were withdrawn from the probe using a clean gas-tight syringe after the probes were evacuated for a predetermined length of time. Based on field experience, samples with vacuum pressures of 5- to 10-inches of Hg were evacuated for 30 seconds, while samples with vacuum pressures of 10- to 15-inches of Hg were evacuated for one minute.

After the sample was collected, it was injected into GCL's portable GC (Appendix A) for analysis of organic compounds and a printout of the results. Standards for benzene, toluene, ethylbenzene and xylene (BTEX) were injected at the beginning of each day for calibration of the GC. Soil vapor concentrations for BTEX were recorded on data sheets as the results were generated.

4.0 RESULTS

The data that was obtained during the survey is summarized below. Three general conditions were identified: points that could not be sampled, points that were sampled but resulted in nominal "background" values of hydrocarbons, and points that resulted in chromatograms with concentrations of hydrocarbons above background levels. Results of the survey are located in Appendix B.

After several attempts, probe refusal was encountered for points 3, 4, 5 and 6 in the area north of the plant and downgradient from the north impoundment, and points 10 and 12 located east and northeast of the evaporation pond. Consequently, the soil vapor for these sample points could not be collected and analyzed.

Samples injected from points 2, A, B and C, from immediately around the north impoundment, and points 7, 13, 14 and 16, from around the evaporation pond, all resulted in a similar flat chromatogram. These results indicate that nominal background levels of hydrocarbons are present in the soil at these points. The aromatic compounds benzene, toluene, ethylbenzene and xylene were also not detected at the above points (Table 3-1).

The sample taken from point 1, in the north impoundment, identified concentrations of toluene, ethylbenzene, p-, m-xylene and o-xylene in the range of 10 to 50 uL/L. Low to medium molecular weight unknown compounds (relative to BTEX) were also present but could be quantitatively identified.

Vapor analyzed from point 15, located northwest of the evaporation pond, shows the highest concentration of ethylbenzene (179 uL/L) and p, m-xylene (663 uL/L) observed for any point analyzed. Benzene and toluene were not detected. The chromatogram identified low molecular weight unknowns, as well as medium and heavier molecular weight unknowns. Concentrations of these unknowns could not be quantitatively determined,

ATTACHMENT 6

TABLE I

Compositional Analyses of Lee Plant Sample

Component	Weight %
C3-	0.00
i-C4	0.02
n-C4	0.26
i-C5	1.74
n-C5	3.43
C6	14.35
C7	31.67
C8	27.74
C9	9.22
C10	3.33
C11	1.26
C12	0.72
C13	0.56
C14	0.47
C15	0.48
C16	0.43
C17	0.41
C18	0.43
C19	0.41
C20	0.38
C21	0.35
C22	0.25
C23	0.26
C24	0.23
C25	0.23
C26	0.15
C27	0.19
C28	0.18
C29	0.15
C30	0.14
C31	0.15
C32	0.12
C33	0.10
C34	0.08
C35	0.05
C36	0.04
C37	0.02

ATTACHMENT 7

****

MOBILE ANALYTICAL LABS, INC.
P.O. BOX 69210
ODESSA, TEXAS 79769-9210

****

3/15/90 LIQUID EXTENDED ANALYSIS LAB # 682

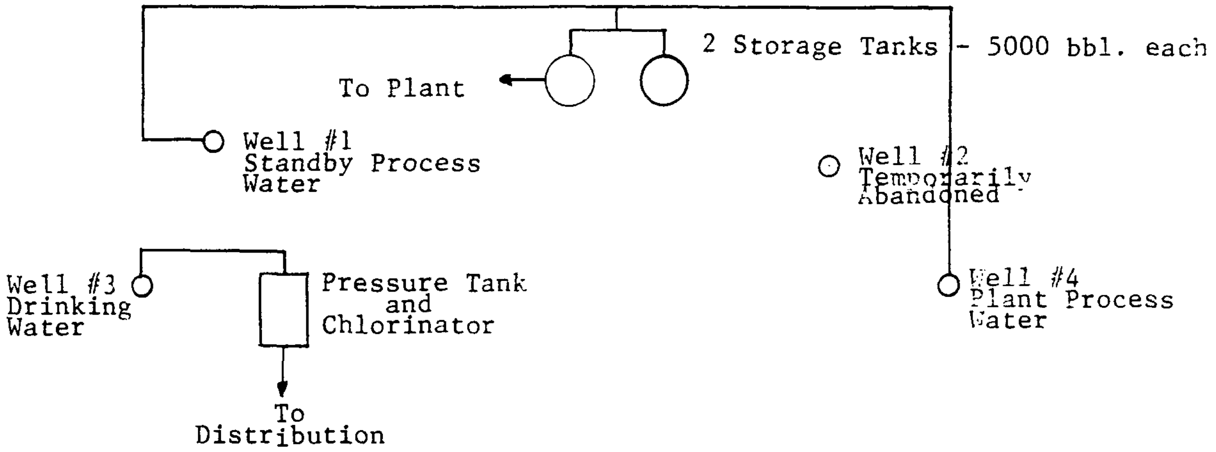
PHILLIPS 66
OIL SAMPLE-LEE PLANT
SAMPLE RECEIVED 3/13/90

	MOL %	LV %	WT %
NITROGEN	0.23	0.06	0.07
METHANE	0.00	0.00	0.00
CARBON DIOXIDE	0.00	0.00	0.00
ETHANE	0.00	0.00	0.00
PROPANE	24.27	16.12	11.82
ISO-BUTANE	0.42	0.33	0.27
N-BUTANE	1.06	0.80	0.68
ISO-PENTANE	4.18	3.67	3.32
N-PENTANE	9.80	8.51	7.78
NEOPENTANE	0.00	0.00	0.00
NEOHEXANE	0.02	0.02	0.02
CYCLOPENTANE	0.34	0.29	0.32
2-METHYLPENTANE	1.45	1.45	1.38
3-METHYLPENTANE	1.13	1.10	1.07
N-HEXANE	3.03	2.99	2.87
METHYLCYCLOPENTANE	2.41	2.04	2.23
BENZENE	1.55	1.04	1.33
CYCLOHEXANE	3.97	3.24	3.68
2-METHYLHEXANE	1.84	2.04	2.02
3-METHYLHEXANE	2.03	2.23	2.23
DIMETHYLCYCLOPENTANES	3.04	3.01	3.28
N-HEPTANE	3.73	4.12	4.11
METHYLCYCLOHEXANE	6.40	6.16	6.91
TRIMETHYLCYCLOPENTANES	1.78	1.99	2.20
TOLUENE	3.91	3.14	3.96
2-METHYLHEPTANE	1.56	1.93	1.97
3-METHYLHEPTANE	0.97	1.19	1.22
DIMETHYLCYCLOHEXANES	2.25	2.47	2.77
N-OCTANE	2.26	2.77	2.84
C8 AROMATICS	0.00	0.00	0.00
C9 NAPTHENES	0.00	0.00	0.00
C9 PARAFFINS	4.26	5.77	6.02
N-NONANE	2.65	3.59	3.75
N-DECANE	2.81	4.13	4.39
UNDECANE PLUS	6.65	13.80	15.49
TOTALS	100.00	100.00	100.00

SPECIFIC GRAVITY	0.691
POUNDS/GALLON	5.757
POUNDS/GALLON C5+	6.067
VAPOR PRESSURE	37.5
MOL. WT. C6+	115.37
SP. GR. C6+	0.745
MOL. WT. C7+	124.49
SP. GR. C7+	0.747
API GRAVITY	73.4
NSITY (GM/CC)	0.690

MR. DAVE ROCKEY

Remediation
File



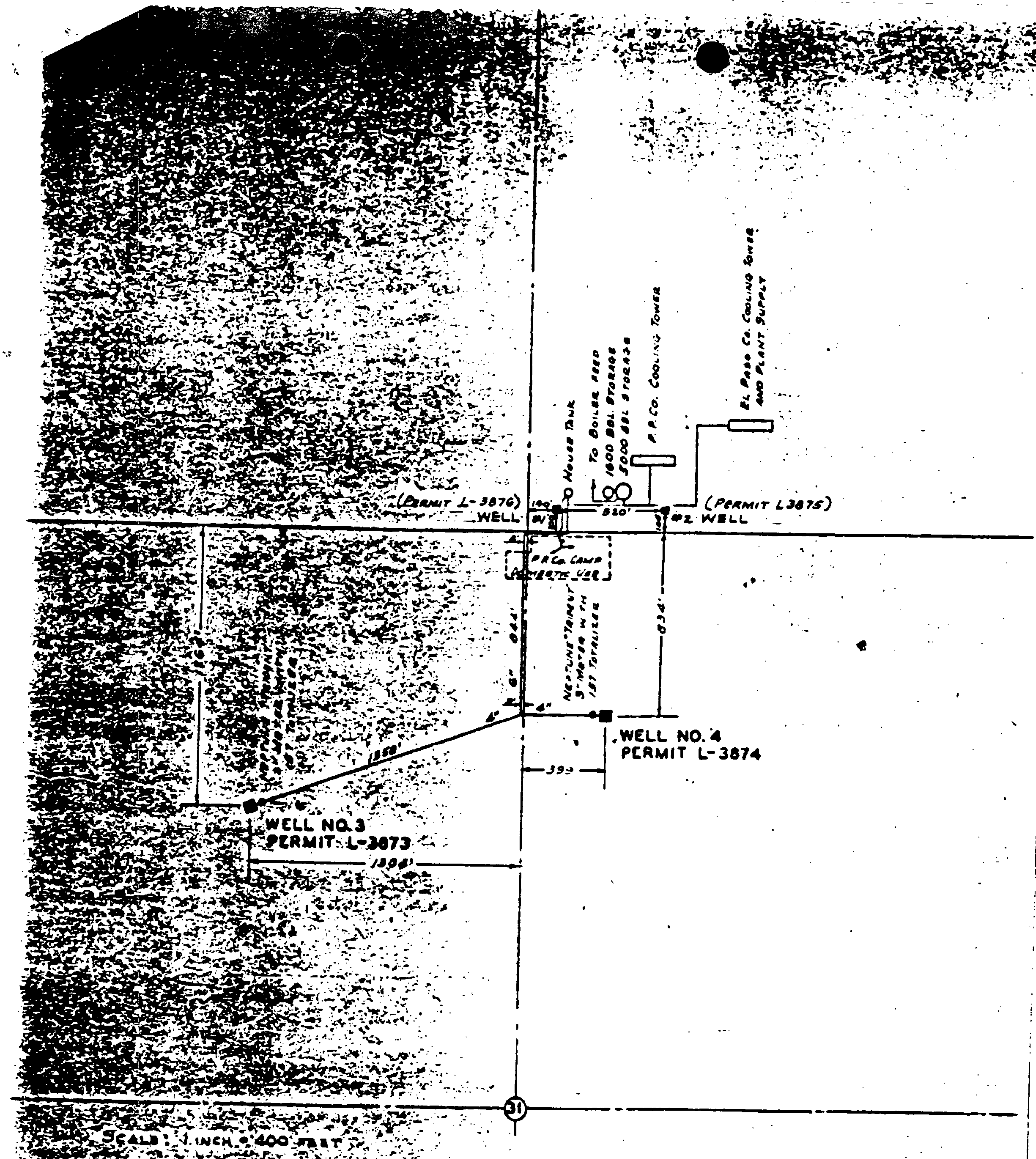
NO.	REVISION	BY	DATE	CHKD	APP'D

FOR BIDS	
FOR APPR	
FOR CONST	
DRAWN 11-9-88	FORD
CHECKED	
APP'D	

PHILLIPS PETROLEUM COMPANY
BARTLESVILLE, OKLAHOMA

WATER SYSTEMS
LEE PLANT

JA NO.	FILE CODE
AFE NO.	SCALE NONE
DWG NO.	
SH NO.	



SURVEYOR'S CERTIFICAT

I, M. E. Spry, hereby certify that I
Registered Land Surveyor of New
who prepared the above map and
from field notes of actual survey
on January 8, 1969, by me or unc
direction, and that the same are tru
to the best of my knowledge and

M. E. Spry

REGISTERED LAND SURVEYOR

LICENSE NO. 679

JANUARY 20, 1969

STATEMENT

Water from the wells shown on this plat has been beneficially applied in operation of Phillips Petroleum Company Gasoline Plant and Domestic Camp use also in operation of combined El Paso Natural Gas Company Booster Station. The plant and station are in the SW¼/SE¼ Section 36, and the Camp is in the NW¼/NE¼ and NE¼/NW¼

SwL **SOUTHWESTERN LABORATORIES**

Materials, environmental and geotechnical engineering, nondestructive, metallurgical and analytical services

1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79702

File No. 6705900

Report No. 40567

Report Date 8-9-88

Date Received 6-30-88

Delivered By M.Ford

Report of tests on: Water

Client: Phillips 66 Natural Gas Company

Identification: Lee Plant Water Supply Well

	mg/L
Arsenic	*0.05
Barium	*0.5
Cadmium	*0.01
Chromium	*0.05
Lead	*0.02
Mercury	*0.002
Selenium	*0.01
Silver	*0.05
Nitrate, as N	0.6
Endrin	*0.0002
Lindane	*0.0001
Methoxychlor	*0.0003
Toxaphene	*0.003
2,4-D	*0.005
2,4,5-TP Silvex	*0.001

* Denotes "less than"
EPA SW-846

Technician: LLC,LYN,GMB,CB,GM

Copies
Phillips 66 Natural Gas Company
ATTN: Mike Ford

SOUTHWESTERN LABORATORIES
Gary M. Burch

RADIAN
CORPORATION

age 1
eceived: 09/20/88

RAS - Austin REPORT
09/23/88 14:12:15

Work Order # 88-09-086

REPORT TO Radian
Bl. 1
Austin

ATTEN Linda Bendele

CLIENT PHILLIPS P
SAMPLES 5
COMPANY Phillips Petroleum
ACILITY Odessa, TX

WORK ID BTEX, Lee
TAKEN MF
TRANS UPS
TYPE
P.O. #
INVOICE under separate cover

PREPARED BY Radian Analytical Services
8501 Mo-pac Bl.
PO Box 201088
Austin, TX 78720-1088
ATTEN
PHONE 512-454-4797

CERTIFIED BY

CONTACT BENDELE

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

SAMPLE IDENTIFICATION

1 WS-1 Lee Well No. 1
2 WS-3 Lee Well No. 3
3 WS-4 Lee Well No. 4
–
–

TEST CODES and NAMES used on this report

EPA602 EPA method 602
XYLENE Xylenes, EPA 602

RADIAN CORPORATION

Received: 09/20/88

RAS - Austin REPORT
Results by Sample

Work Order # 88-09-086

SAMPLE ID WS-1

FRACTION 01A TEST CODE EPA602 NAME EPA method 602

Date & Time Collected 09/19/88 Category ____

VERIFIED CL

ANALYST CL
INSTRMT D

INJECTED 09/22/88

FILE # ____

UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	48	0.40
108-88-3	Toluene	ND	0.40
100-41-4	Ethylbenzene	ND	0.60
108-90-7	Chlorobenzene-A	ND	0.60
106-46-7	1,4-Dichlorobenzene	ND	0.60
541-73-1	1,3-Dichlorobenzene	ND	0.80
95-50-1	1,2-Dichlorobenzene	ND	0.80

ug/liter ÷ 1000
= ppm
= mg/liter

5 is limit for drinking water

SURROGATES

CAS#	COMPOUND	RESULT
98-08-8	a,a,a-Trifluorotoluene	101% recovery

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available
Second column confirmation NOT performed
unless otherwise noted.

RADIAN
CORPORATION

Received: 09/20/88

RAS - Austin REPORT
Results by Sample

Work Order # 88-09-086

SAMPLE ID WS-1

FRACTION 01A TEST CODE XYLENE NAME Xylenes, EPA 602
Date & Time Collected 09/19/88 Category

VERIFIED CL

ANALYST CL
INSTRMT D

INJECTD 09/22/88

FILE #

UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
106-42-3	p-Xylene	ND, Q, @	0.40
108-38-3	m-Xylene-A	ND	0.40
95-47-6	o-Xylene	ND	0.20

SURROGATES

98-08-8 a,a,a-Trifluorotoluene 101% recovery

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available
Second column confirmation NOT performed unless otherwise noted.
Q = daily EPA standard recovery outside 95% confidence interval.
Chlorobenzene and p-xylene co-elute. Quantitated as chlorobenzene unless otherwise noted.

Page 5 RAS - Austin **REPORT** Work Order # 88-09-086
Received: 09/20/88 Results by Sample

SAMPLE ID WS-3 FRACTION 02A TEST CODE EPA602 NAME EPA method 602
Date & Time Collected 09/19/88 Category

VERIFIED CL

ANALYST CL FILE #
INSTRMT D INJECTED 09/22/88 UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	ND	0.20
108-88-3	Toluene	ND	0.20
100-41-4	Ethylbenzene	ND	0.30
108-90-7	Chlorobenzene-A	ND	0.30
106-46-7	1,4-Dichlorobenzene	ND	0.30
541-73-1	1,3-Dichlorobenzene	ND	0.40
95-50-1	1,2-Dichlorobenzene	ND	0.40

SURROGATES

98-08-8	a,a,a-Trifluorotoluene	98% recovery	

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available
Second column confirmation NOT performed
unless otherwise noted.

RADIAN CORPORATION

Received: 09/20/88

RAS - Austin REPORT
Results by Sample

Work Order # 88-09-086

SAMPLE ID WS-3

FRACTION 02A TEST CODE XYLENE NAME Xylenes, EPA 602
Date & Time Collected 09/19/88 Category

VERIFIED CL

ANALYST CL
INSTRMT D

INJECTD 09/22/88

FILE #

UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
106-42-3	p-Xylene	ND,Q	0.20
108-38-3	m-Xylene-A	ND	0.20
95-47-6	o-Xylene	ND	0.10

SURROGATES

98-08-8 a,a,a-Trifluorotoluene 98% recovery

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available
Second column confirmation NOT performed unless otherwise noted.
Q = daily EPA standard recovery outside 95% confidence interval.
Chlorobenzene and p-xylene co-elute. Quantitated as chlorobenzene unless otherwise noted.

RADIAN CORPORATION

Received: 09/20/88

RAS - Austin REPORT
Results by Sample

Work Order # 88-09-086

SAMPLE ID WS-4

FRACTION 03A TEST CODE EPA602 NAME EPA method 602
Date & Time Collected 09/19/88 Category ____

VERIFIED CL

ANALYST CL
INSTRMT D

INJECTED 09/22/88

FILE # ____

UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	8.5	0.20
108-88-3	Toluene	ND	0.20
100-41-4	Ethylbenzene	ND	0.30
108-90-7	Chlorobenzene-A	ND	0.30
106-46-7	1,4-Dichlorobenzene	ND	0.30
541-73-1	1,3-Dichlorobenzene	ND	0.40
95-50-1	1,2-Dichlorobenzene	ND	0.40

SURROGATES

98-08-8	a,a,a-Trifluorotoluene	102% recovery	

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available
Second column confirmation NOT performed
unless otherwise noted.

RAS - Austin REPORT Work Order # 88-09-086

Received: 09/20/88 Results by Sample

SAMPLE ID WS-4 FRACTION 03A TEST CODE XYLENE NAME Xylenes, EPA 602

Date & Time Collected 09/19/88 Category

VERIFIED CL

ANALYST CL

INSTRMT D

FILE #

INJECTD 09/22/88

UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
106-42-3	p-Xylene	ND, Q	0.20
108-38-3	m-Xylene-A	ND	0.20
95-47-6	o-Xylene	ND	0.10

SURROGATES

98-08-8 a, a, a-Trifluorotoluene 102% recovery

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT

ND = not detected at detection limit

NA = not analyzed

* = less than 5 times the detection limit

N\A = not available

Second column confirmation NOT performed unless otherwise noted.

Q = daily EPA standard recovery outside 95% confidence interval.

Chlorobenzene and p-xylene co-elute. Quantitated as chlorobenzene unless otherwise noted.

please send copy stau.

COPY

HEALTH ENVIRONMENT

SCIENTIFIC LABORATORY DIVISION

700 Camino de Salud NE
Albuquerque, NM 87106 841-2570

88-1850-C

REPORT TO: E.I.D
2120 N ALTO
Hobbs, NM 88240

S.L.D. No. OR-
DATE REC. 11/7/88
PRIORITY ~~0~~ 2
PHONE(S): (505)397-5250

COLLECTION CITY: Buckeye; COUNTY: Lea

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 1 1 0 3 8 8 1 0 1 0 am

LOCATION CODE: (Township-Range-Section-Tracts) T 1 7s + R 3 5E + S 3 1 + - (10N06E24342)

USER CODE: 5 9 3 0 0 SUBMITTER: Charles Ajuzlem CODE:

SAMPLE TYPE: WATER ☒, SOIL ☐, FOOD ☐, OTHER:

This form accompanies 2 Septum Vials, ____ Glass Jugs, and/or ____

RECEIVED
NOV 17 1988
HOBBS OFFICE

Samples were preserved as follows:

☐ NP: No Preservation; Sample stored at room temperature.
☒ P-Ice Sample stored in an ice bath (Not Frozen).
☐ P-$Na_2S_2O_3$ Sample Preserved with Sodium Thiosulfate to remove chlorine residual.

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

☐ (753) Aliphatic Headspace (1-5 Carbons)
☑ (754) Aromatic & Halogenated Purgeables
☐ (765) Mass Spectrometer Purgeables
☐ (766) Trihalomethanes

Other Specific Compounds or Classes

☐
☒ Benzene.
☐
☐
☐

EXTRACTABLE SCREENS

☐ (751) Aliphatic Hydrocarbons
☐ (755) Base/Neutral Extractables
☐ (758) Herbicides, Chlorophenoxy acid
☐ (759) Herbicides, Triazines
☐ (760) Organochlorine Pesticides
☐ (761) Organophosphate Pesticides
☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

Remarks: * Benzene detected in H2O

FIELD DATA:

pH=____; Conductivity=____ umho/cm at ____ °C; Chlorine Residual=____ mg/l

Dissolved Oxygen=____ mg/l; Alkalinity=____ mg/l; Flow Rate ____ ____/____

Depth to water ____ ft.; Depth of well ____ ft.; Perforation Interval ____-____ ft.; Casing:

Sampling Location, Methods and Remarks (i.e. odors, etc.)

Phillips petroleum - Buckeye yard well #1 [well head]

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): ____ Method of Shipment to the Lab: ____

CHAIN OF CUSTODY

I certify that this sample was transferred from ____ to ____

at (location) ____ on ____/____/____ - ____:____ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

THIS PAGE FOR LABORATORY RESULTS ONLY 1850

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☒ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes

Other Specific Compounds or Classes

- ☐ ______
- ☐ ______
- ☐ ______
- ☐ ______

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☐ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
halogenated purgeables	N.D.		
aromatic purgeables			
benzene	50		
* DETECTION LIMIT *	.5 ug/l	+ DETECTION LIMIT +	

ABBREVIATIONS USED:

N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT

T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)

[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

LABORATORY REMARKS:

CERTIFICATE OF ANALYTICAL PERSONNEL

Seal(s) Not Sealed ☐ Intact: Yes ☐ No ☑ Seal(s) broken by: not sealed date:

I certify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and that the statements on this page accurately reflect the analytical results for this sample.

Date(s) of analysis: 11/7/88 Analyst's signature: Harry C. Elden

I certify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

Reviewers signature: K Meyerhein

To Submit for

Please send copy to [illegible] Castle

COPY

wpu &

SCIENTIFIC LABORATORY DIVISION

700 Camino de Salud NE
Albuquerque, NM 87106 841-2570

88-1849-C

REPORT TO: Environmental Improvement Div.
2120 N ALTO
Hobbs, NM 88240

S.L.D. No. OR-
DATE REC. 11/7/88
PRIORITY 2
PHONE(S): (505) 397-5250

COLLECTION CITY: Buckeye; COUNTY: Lea

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 1 1 0 3 8 8 1 0 0 5 am

LOCATION CODE: (Township-Range-Section-Tracts) T 1 7s + R 3 5E + S 3 1 + - (10N06E24342)

USER CODE: 5 9 3 0 0 SUBMITTER: Charles [illegible] CODE:

SAMPLE TYPE: WATER ☒, SOIL ☐, FOOD ☐, OTHER:

RECEIVED
NOV 17 1988
HOBBS OFFICE

This form accompanies 2 Septum Vials, ____ Glass Jugs, and/or ____

Samples were preserved as follows:

- ☐ NP: No Preservation; Sample stored at room temperature.
- ☒ P-Ice Sample stored in an ice bath (Not Frozen).
- ☐ P-$Na_2S_2O_3$ Sample Preserved with Sodium Thiosulfate to remove chlorine residual.

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☒ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes

Other Specific Compounds or Classes

- ☐
- ☒ Benzene.
- ☐
- ☐
- ☐

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☐ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

Remarks:

FIELD DATA:

pH=____; Conductivity=____ umho/cm at ____ °C; Chlorine Residual=____ mg/l

Dissolved Oxygen=____ mg/l; Alkalinity=____ mg/l; Flow Rate ____ ____/____

Depth to water ____ ft.; Depth of well ____ ft.; Perforation Interval ____-____ ft.; Casing:

Sampling Location, Methods and Remarks (i.e. odors, etc.)

Phillips petroleum - Buckeye yard - Conference room [Well #3]

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector): ____ Method of Shipment to the Lab: ____

CHAIN OF CUSTODY

I certify that this sample was transferred from ____ to ____

at (location) ____ on ____/____/____ - ____:____ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

THIS PAGE FOR LABORATORY RESULTS ONLY 1849

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

☐ (753) Aliphatic Headspace (1-5 Carbons)
☑ (754) Aromatic & Halogenated Purgeables
☐ (765) Mass Spectrometer Purgeables
☐ (766) Trihalomethanes
Other Specific Compounds or Classes
☐ ______
☐ ______
☐ ______
☐ ______

EXTRACTABLE SCREENS

☐ (751) Aliphatic Hydrocarbons
☐ (755) Base/Neutral Extractables
☐ (758) Herbicides, Chlorophenoxy acid
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☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
halogenated purgeables			
chloroform	1.5		
bromodichloromethane	3.5		
dibromochloromethane	9		
bromoform	22		
aromatic purgeables	N.D.		
* DETECTION LIMIT *	.5 ppb	+ DETECTION LIMIT +	

ABBREVIATIONS USED:

N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT
T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)
[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

LABORATORY REMARKS:

CERTIFICATE OF ANALYTICAL PERSONNEL

Seal(s) Not Sealed ☐ Intact: Yes ☐ No ☑ Seal(s) broken by: not sealed date:

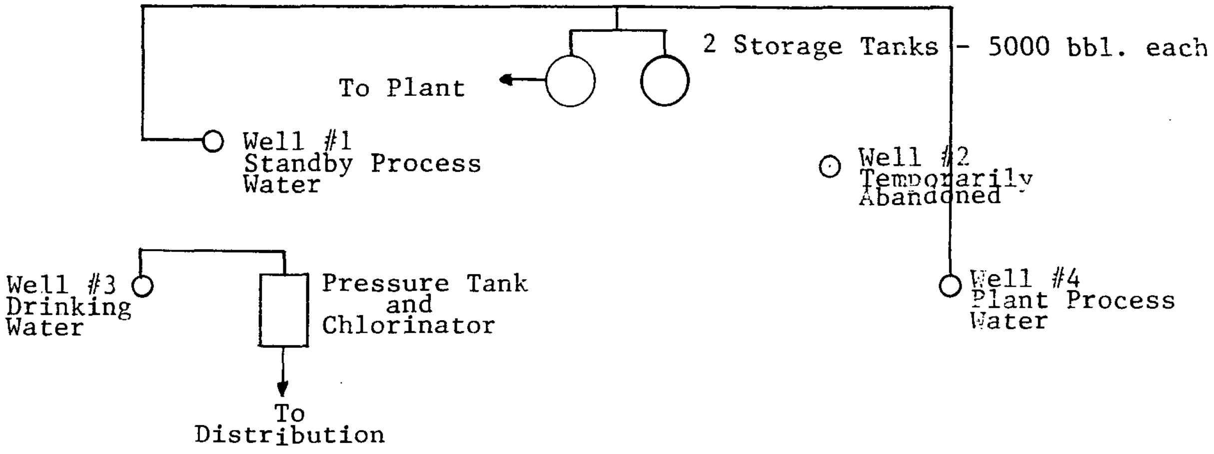
I certify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and that the statements on this page accurately reflect the analytical results for this sample.

Date(s) of analysis: 11/7/88 . Analyst's signature:

I certify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

Reviewers signature:

File



NO.	REVISION	BY	DATE	CHKD	APP'D

FOR BIDS

FOR APPR

FOR CONST

DRAWN 11-9-88 FORD

CHECKED

APP'D

PHILLIPS PETROLEUM COMPANY

BARTLESVILLE, OKLAHOMA

WATER SYSTEMS
LEE PLANT

JA NO.

FILE CODE

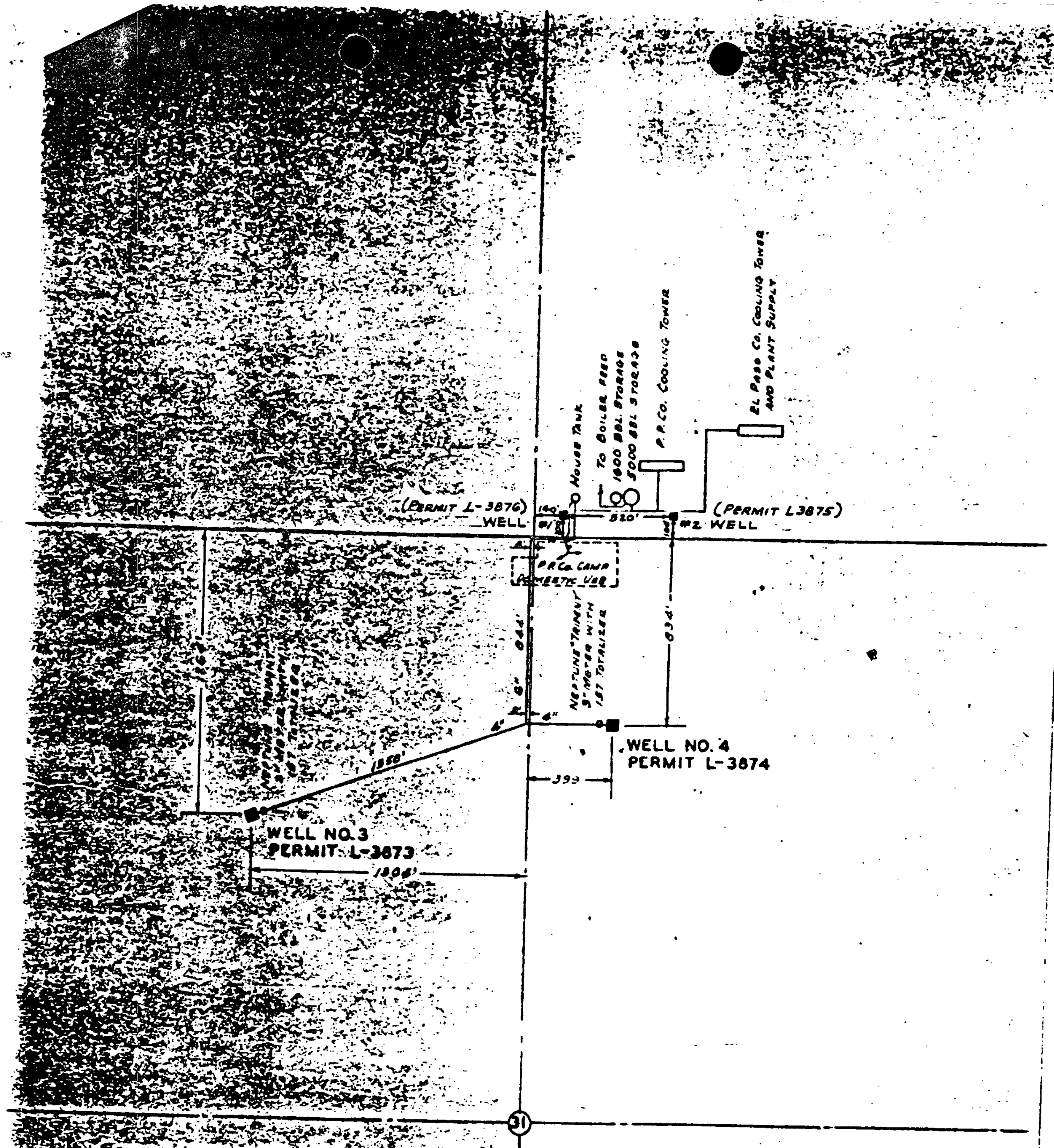
AFE NO.

SCALE NONE

DWG NO.

SH NO.

FORM 1779-S 8-81



SCALE: 1 INCH = 400 FEET

SURVEYOR'S CERTIFICAT

I, M. E. Spry, hereby certify that I
Registered Land Surveyor of New
who prepared the above map and
from field notes of actual survey
on January 8, 1959, by me or unc
direction, and that the same are tru
to the best of my knowledge and

M. E. Spry
REGISTERED LAND SURVEYOR
LICENSE NO. 679
JANUARY 20, 1959

STATEMENT

Water from the wells shown on this plat has been beneficially applied in operation of Phillips Petroleum Company Gasoline Plant and Domestic Camp use also in operation of combined El Paso Natural Gas Company Booster Station. The plant and station are in the SW¼/SE¼ Section 30, and the Camp is in the NW¼/NE¼ and NE¼/NW¼

119904

SwL **SOUTHWESTERN LABORATORIES**

Materials, environmental and geotechnical engineering, nondestructive, metallurgical and analytical services

1703 W. Industrial Avenue [915-683-3348] • P.O. Box 2150 • Midland, Texas 79702

File No. 6705900

Report No. 40567

Report Date 8-9-88

Date Received 6-30-88

Delivered By M.Ford

Report of tests on: Water

Client: Phillips 66 Natural Gas Company Which well?

Identification: Lee Plant Water Supply Well

	mg/L
Arsenic	*0.05
Barium	*0.5
Cadmium	*0.01
Chromium	*0.05
Lead	*0.02
Mercury	*0.002
Selenium	*0.01
Silver	*0.05
Nitrate, as N	0.6
Endrin	*0.0002
Lindane	*0.0001
Methoxychlor	*0.0003
Toxaphene	*0.003
2,4-D	*0.005
2,4,5-TP Silvex	*0.001

* Denotes "less than"
EPA SW-846

Technician: LLC,LYN,GMB,CB,GM

Copies Phillips 66 Natural Gas Company
ATTN: Mike Ford

SOUTHWESTERN LABORATORIES
Gary M. Burch

RADIAN CORPORATION

Page 1
Received: 09/20/88

RAS - Austin REPORT
09/23/88 14:12:15

Work Order # 88-09-086

REPORT TO Radian
Bl. 1
Austin

ATTEN Linda Bendele

CLIENT PHILLIPS P SAMPLES 5
COMPANY Phillips Petroleum
FACILITY Odessa, TX

WORK ID BTEX, Lee
TAKEN MF
TRANS UPS
TYPE
P.O. #
INVOICE under separate cover

PREPARED BY Radian Analytical Services
8501 Mo-pac Bl.
PO Box 201088
Austin, TX 78720-1088
ATTEN
PHONE 512-454-4797

CERTIFIED BY

CONTACT BENDELE

Footnotes and Comments

* Indicates a value less than 5 times the detection limit. Potential error for such low values ranges between 50 and 100%.

@ Indicates that spike recovery for this analysis on the specific matrix was not within acceptable limits indicating an interferent present.

SAMPLE IDENTIFICATION

1 WS-1 Lee Well No. 1
2 WS-3 Lee Well No. 3
3 WS-4 Lee Well No. 4

TEST CODES and NAMES used on this report

EPA602 EPA method 602
XYLENE Xylenes, EPA 602

RADIAN
CORPORATION

Page 2 RAS - Austin REPORT Work Order # 88-09-086
Received: 09/20/88 Results by Sample

SAMPLE ID WS-1 FRACTION 01A TEST CODE EPA602 NAME EPA method 602
Date & Time Collected 09/19/88 Category ____

VERIFIED CL

ANALYST CL FILE # ____
INSTRMT D INJECTED 09/22/88 UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	48	0.40
108-88-3	Toluene	ND	0.40
100-41-4	Ethylbenzene	ND	0.60
108-90-7	Chlorobenzene-A	ND	0.60
106-46-7	1,4-Dichlorobenzene	ND	0.60
541-73-1	1,3-Dichlorobenzene	ND	0.80
95-50-1	1,2-Dichlorobenzene	ND	0.80

ug/liter ÷ 1000
= ppm
= mg./liter

5 IS LIMIT FOR DRINKING WATER

SURROGATES

98-08-8	a,a,a-Trifluorotoluene	101% recovery

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available
Second column confirmation NOT performed unless otherwise noted.

RADIAN CORPORATION

Page 4
Received: 09/20/88

RAS - Austin REPORT
Results by Sample

Work Order # 88-09-086

SAMPLE ID WS-1

FRACTION 01A TEST CODE XYLENE NAME Xylenes, EPA 602
Date & Time Collected 09/19/88 Category

VERIFIED CL

ANALYST CL
INSTRMT D

INJECTD 09/22/88

FILE #

UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
106-42-3	p-Xylene	ND, Q, @	0.40
108-38-3	m-Xylene-A	ND	0.40
95-47-6	o-Xylene	ND	0.20

SURROGATES

98-08-8 a, a, a-Trifluorotoluene 101% recovery

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available
Second column confirmation NOT performed unless otherwise noted.
Q = daily EPA standard recovery outside 95% confidence interval.
Chlorobenzene and p-xylene co-elute. Quantitated as chlorobenzene unless otherwise noted.

RADIAN
CORPORATION

Received: 09/20/88

RAS - Austin REPORT
Results by Sample

Work Order # 88-09-086

SAMPLE ID WS-3

FRACTION 02A TEST CODE EPA602 NAME EPA method 602
Date & Time Collected 09/19/88 Category ______

VERIFIED CL

ANALYST CL
INSTRMT D

INJECTED 09/22/88

FILE # ______

UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	ND	0.20
108-88-3	Toluene	ND	0.20
100-41-4	Ethylbenzene	ND	0.30
108-90-7	Chlorobenzene-A	ND	0.30
106-46-7	1,4-Dichlorobenzene	ND	0.30
541-73-1	1,3-Dichlorobenzene	ND	0.40
95-50-1	1,2-Dichlorobenzene	ND	0.40

SURROGATES

98-08-8	a,a,a-Trifluorotoluene	98% recovery

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available
Second column confirmation NOT performed
unless otherwise noted.

RADIAN
CORPORATION

Received: 09/20/88

RAS - Austin REPORT
Results by Sample

Work Order # 88-09-086

SAMPLE ID WS-3

FRACTION 02A TEST CODE XYLENE NAME Xylenes, EPA 602
Date & Time Collected 09/19/88 Category ______

VERIFIED CL

ANALYST CL
INSTRMT D

INJECTD 09/22/88

FILE # ______

UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
106-42-3	p-Xylene	ND, Q	0.20
108-38-3	m-Xylene-A	ND	0.20
95-47-6	o-Xylene	ND	0.10

SURROGATES

98-08-8 a, a, a-Trifluorotoluene 98% recovery

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
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* = less than 5 times the detection limit
N\A = not available
Second column confirmation NOT performed unless otherwise noted.
Q = daily EPA standard recovery outside 95% confidence interval.
Chlorobenzene and p-xylene co-elute. Quantitated as chlorobenzene unless otherwise noted.

RADIAN
CORPORATION

Received: 09/20/88

RAS - Austin REPORT Work Order # 88-09-086

Results by Sample

SAMPLE ID WS-4

FRACTION 03A TEST CODE EPA602 NAME EPA method 602

Date & Time Collected 09/19/88 Category ____

VERIFIED CL

ANALYST CL

INSTRMT D

INJECTED 09/22/88

FILE # ____

UNITS ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	8.5	0.20
108-88-3	Toluene	ND	0.20
100-41-4	Ethylbenzene	ND	0.30
108-90-7	Chlorobenzene-A	ND	0.30
106-46-7	1,4-Dichlorobenzene	ND	0.30
541-73-1	1,3-Dichlorobenzene	ND	0.40
95-50-1	1,2-Dichlorobenzene	ND	0.40

SURROGATES

98-08-8	a,a,a-Trifluorotoluene	102% recovery

NOTES AND DEFINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT

ND = not detected at detection limit

NA = not analyzed

* = less than 5 times the detection limit

N\A = not available

Second column confirmation NOT performed unless otherwise noted.

RADIAN
CORPORATION

Received: 09/20/88

RAS - Austin REPORT
Results by Sample

Work Order # 88-09-086

SAMPLE ID WS-4
FRACTION 03A TEST CODE XYLENE NAME Xylenes, EPA 602
Date & Time Collected 09/19/88 Category ______

VERIFIED CL

ANALYST CL
INSTRMT D
INJECTD 09/22/88
FILE # ______
UNITS ug/L

CAS #	COMPOUND	RESULT	DET LIMIT
106-42-3	p-Xylene	ND, Q	0.20
108-38-3	m-Xylene-A	ND	0.20
95-47-6	o-Xylene	ND	0.10
	SURROGATES		
98-08-8	a, a, a-Trifluorotoluene	102% recovery	

NOTES AND DEFINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
ND = not detected at detection limit
NA = not analyzed
* = less than 5 times the detection limit
N\A = not available
Second column confirmation NOT performed unless otherwise noted.
Q = daily EPA standard recovery outside 95% confidence interval.
Chlorobenzene and p-xylene co-elute. Quantitated as chlorobenzene unless otherwise noted.

Please send copy to [illegible] [illegible]

COPY

wpu

To Submittor

HEALTH ENVIRONMENT

SC NTIFIC LABORATORY D ISION

700 Camino de Salud NE
Albuquerque, NM 87106 841-2570

88-1849-C

REPORT TO: Environmental Improvement Div.
2120 N ALTO
Hobbs, NM 88240

S.L.D. No. OR-
DATE REC. 11/7/88
PRIORITY 2
PHONE(S): (505) 397-5250

COLLECTION CITY: Buckeye; COUNTY: Lea

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 11 03 88 10 05 am

LOCATION CODE: (Township-Range-Section-Tracts) T 17s+ R 35E+ S 31+ - (10N06E24342)

USER CODE: 59300 SUBMITTER: Charles [illegible] CODE:

SAMPLE TYPE: WATER ☒, SOIL ☐, FOOD ☐, OTHER:

RECEIVED
NOV 17 1988
HOBBS OFFICE

This form accompanies 2 Septum Vials, ____ Glass Jugs, and/or ____

Samples were preserved as follows:

- ☐ NP: No Preservation; Sample stored at room temperature.
- ☒ P-Ice Sample stored in an ice bath (Not Frozen).
- ☐ P-$Na_2S_2O_3$ Sample Preserved with Sodium Thiosulfate to remove chlorine residual.

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

PURGEABLE SCREENS

- ☐ (753) Aliphatic Headspace (1-5 Carbons)
- ☒ (754) Aromatic & Halogenated Purgeables
- ☐ (765) Mass Spectrometer Purgeables
- ☐ (766) Trihalomethanes

Other Specific Compounds or Classes

- ☐
- ☒ Benzene.
- ☐
- ☐
- ☐

EXTRACTABLE SCREENS

- ☐ (751) Aliphatic Hydrocarbons
- ☐ (755) Base/Neutral Extractables
- ☐ (758) Herbicides, Chlorophenoxy acid
- ☐ (759) Herbicides, Triazines
- ☐ (760) Organochlorine Pesticides
- ☐ (761) Organophosphate Pesticides
- ☐ (767) Polychlorinated Biphenyls (PCB's)
- ☐ (764) Polynuclear Aromatic Hydrocarbons
- ☐ (762) SDWA Pesticides & Herbicides

Remarks:

FIELD DATA:

pH=____; Conductivity=____umho/cm at ____°C; Chlorine Residual=____mg/l

Dissolved Oxygen=____mg/l; Alkalinity=____mg/l; Flow Rate____ ____/____

Depth to water ____ft.; Depth of well____ft.; Perforation Interval ____-____ft.; Casing:

Sampling Location, Methods and Remarks (i.e. odors, etc.)

Phillips petroleum - Buckeye yard - Conference room [well #3]

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector):____ Method of Shipment to the Lab:____

CHAIN OF CUSTODY

I certify that this sample was transferred from ____ to ____ at (location) ____ on __/__/__ - __:__ and that the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

THIS PAGE FOR LABORATORY RESULTS ONLY

1849

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

☐ (753) Aliphatic Headspace (1-5 Carbons)
☑ (754) Aromatic & Halogenated Purgeables
☐ (765) Mass Spectrometer Purgeables
☐ (766) Trihalomethanes

Other Specific Compounds or Classes

☐ __________
☐ __________
☐ __________
☐ __________

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☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
halogenated purgeables			
chloroform	1.5		
bromodichloromethane	3.5		
dibromochloromethane	9		
bromoform	22		
aromatic purgeables	N.D.		
* DETECTION LIMIT *	.5 ppb	+ DETECTION LIMIT +	

ABBREVIATIONS USED:

N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT
T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)
[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

LABORATORY REMARKS: __________

CERTIFICATE OF ANALYTICAL PERSONNEL

Seal(s) Not Sealed ☐ Intact: Yes ☐ No ☑ Seal(s) broken by: not sealed date: ______

I certify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and that the statements on this page accurately reflect the analytical results for this sample.

Date(s) of analysis: 11/7/88. Analyst's signature: Mary C. Ell

I certify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

Reviewers signature: L Meyerhu

please send copy

COPY

SCIENTIFIC LABORATORY DIVISION

700 Camino de Salud NE
Albuquerque, NM 87106 841-2570

88-1850-C

REPORT TO: E.I.D
2120 N Alto
Hobbs, NM 88240

S.L.D. No. OR-

DATE REC. 11/7/88

PRIORITY 02

PHONE(S): (505) 397-5250

COLLECTION CITY: Buckeye ; COUNTY: Lea

COLLECTION DATE/TIME CODE: (Year-Month-Day-Hour-Minute) 1 1 0 3 8 8 1 0 1 0 am

LOCATION CODE: (Township-Range-Section-Tracts) T 1 7s + R 3 5E + S 3 1 + - (10N06E24342)

USER CODE: 5 9 3 0 0 SUBMITTER: Charles Ajuzlem CODE:

SAMPLE TYPE: WATER ☒, SOIL ☐, FOOD ☐, OTHER:

This form accompanies 2 Septum Vials, ____ Glass Jugs, and/or ____

RECEIVED
NOV 17 1988
HOBBS OFFICE

Samples were preserved as follows:

☐ NP: No Preservation; Sample stored at room temperature.
☒ P-Ice Sample stored in an ice bath (Not Frozen).
☐ P-$Na_2S_2O_3$ Sample Preserved with Sodium Thiosulfate to remove chlorine residual.

ANALYSES REQUESTED: Please check the appropriate box(es) below to indicate the type of analytical screens required. Whenever possible list specific compounds suspected or required.

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☐ (753) Aliphatic Headspace (1-5 Carbons)
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Other Specific Compounds or Classes

☐
☒ Benzene.
☐
☐
☐

EXTRACTABLE SCREENS

☐ (751) Aliphatic Hydrocarbons
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☐ (760) Organochlorine Pesticides
☐ (761) Organophosphate Pesticides
☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

Remarks: * Benzene detected in H_2O

FIELD DATA:

pH=____; Conductivity=____umho/cm at ____°C; Chlorine Residual=____mg/l

Dissolved Oxygen=____mg/l; Alkalinity=____mg/l; Flow Rate____ ____/____

Depth to water ____ft.; Depth of well____ft.; Perforation Interval ____-____ft.; Casing:____

Sampling Location, Methods and Remarks (i.e. odors, etc.)

Phillips petroleum - Buckeye yard well #1 [well head]

I certify that the results in this block accurately reflect the results of my field analyses, observations and activities.(signature collector):____ Method of Shipment to the Lab:____

CHAIN OF CUSTODY

I certify that this sample was transferred from ____ to ____

at (location) ____ on ____/____/____ - ____:____ and that

the statements in this block are correct. Evidentiary Seals: Not Sealed ☐ OR Seals Intact: Yes ☐ No ☐

THIS PAGE FOR LABORATORY RESULTS ONLY 1850

This sample was tested using the analytical screening method(s) checked below:

PURGEABLE SCREENS

☐ (753) Aliphatic Headspace (1-5 Carbons)
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☐ (765) Mass Spectrometer Purgeables
☐ (766) Trihalomethanes

Other Specific Compounds or Classes

☐ ____________________
☐ ____________________
☐ ____________________
☐ ____________________

EXTRACTABLE SCREENS

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☐ (767) Polychlorinated Biphenyls (PCB's)
☐ (764) Polynuclear Aromatic Hydrocarbons
☐ (762) SDWA Pesticides & Herbicides

ANALYTICAL RESULTS

COMPOUND(S) DETECTED	CONC. [PPB]	COMPOUND(S) DETECTED	CONC. [PPB]
halogenated purgeables	N.D.		
aromatic purgeables			
benzene	50		
* DETECTION LIMIT *	.5ug/l	+ DETECTION LIMIT +	

ABBREVIATIONS USED:

N D = NONE DETECTED AT OR ABOVE THE STATED DETECTION LIMIT
T R = DETECTED AT A LEVEL BELOW THE STATED DETECTION LIMIT (NOT CONFIRMED)
[RESULTS IN BRACKETS] ARE UNCONFIRMED AND/OR WITH APPROXIMATE QUANTITATION

LABORATORY REMARKS:

CERTIFICATE OF ANALYTICAL PERSONNEL

Seal(s) Not Sealed ☐ Intact: Yes ☐ No ☑ Seal(s) broken by: not sealed date:

I certify that I followed standard laboratory procedures on handling and analysis of this sample unless otherwise noted and that the statements on this page accurately reflect the analytical results for this sample.

Date(s) of analysis: 11/7/88. Analyst's signature: Harry C. Elden

I certify that I have reviewed and concur with the analytical results for this sample and with the statements in this block.

Reviewers signature: K Meyerhein

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VI
1445 ROSS AVENUE, SUITE 1200
DALLAS, TEXAS 75202

RECEIVED
JUL 11 1988
HAZARDOUS WASTE SECTION

JUL 07 1988

Mr. Jack Ellvinger, Chief
Hazardous Waste Bureau
Environmental Improvement Division
New Mexico Health and Environment Department
P. O. Box 968
Santa Fe, New Mexico 87504-0968

Dear Mr. Ellvinger:

Enclosed you will find a copy of the following RCRA Facility Assessment (RFA) report:

° Facility Name: Phillips - Lee
° EPA ID Number: NMD000709659

Additional information will be forwarded to you as it becomes available. If you have any questions, please contact me or have your staff contact Lydia Boada Clista at (214) 655-6790.

Sincerely yours,

Sam Becker

Sam Becker, P.E.
Chief
Hazardous Waste Compliance Branch

Enclosure

A.T. Kearney, Inc.
222 South Riverside Plaza
Chicago, Illinois 60606
312 648 0111

Management
Consultants

ATKEARNEY

JUN 24 REC'D

June 24, 1988

Mr. Tom Clark
Regional Project Officer
U.S. Environmental Protection Agency
Region VI
1445 Ross Avenue
Dallas, Texas 75202-2733

Reference: EPA Contract No. 68-01-7374; Work Assignment No. R26-05-40; Phillips, Lee; EPA I.D. No. NMD000709659, PR/VSI Report

Dear Mr. Clark:

Enclosed is the PR/VSI report for Phillips Petroleum Company, Lee Natural Gas Plant located in Buckeye, New Mexico. The Preliminary Review (PR) and Visual Site Inspection (VSI) resulted in the identification of twenty-six Solid Waste Management Units (SWMUs).

No further action appears warranted for this facility at this time. The RCRA-regulated Surface Impoundment (SWMU #18) is currently undergoing closure with the New Mexico Environmental Improvement Department.

A Former Landfill (SWMU #24) was identified prior to the VSI from the facility's Part A application. The facility representatives had no knowledge of the unit, and its boundaries, if existent, were not discernible at the time of the VSI. No information was available on the design of the unit or the type of wastes managed, although facility representatives surmised that the area may have been a scrap metal storage area rather than a landfill. Therefore, there is insufficient evidence to compel a sampling visit or an RFI. We have suggested that further information be requested from the facility so that release potentials may be evaluated further to determine if an RFI is warranted.

RECEIVED
JUN 24 1988
HAZARDOUS WASTE COMPLIANCE
TECHNICAL SECTION

If you have any questions, please feel free to call me or Chris Nelson, the Work Assignment Manager, who can be reached at (415) 595-4300.

Sincerely,

Ann L. Anderson

Ann L. Anderson
Assistant Technical Director

Enclosure

cc: W. Luthans, EPA Region VI (two copies)
L. Boada, EPA Region VI
J. Grieve
J. Levin
A. Schaffer (w/o attachment)
A. Williams (w/o attachment)
C. Nelson
B. Morson, SAIC

1207T

PR/VSI REPORT

PHILLIPS PETROLEUM COMPANY
LEE NATURAL GAS PLANT
BUCKEYE, NEW MEXICO
EPA I.D. Number NMD000709659

Prepared for:

EPA Region VI
1445 Ross Avenue
Dallas, Texas 75202-2733

Prepared by:

A. T. Kearney, Inc.
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and

Science Applications International Corporation
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Los Altos, California 94022

EPA Contract Number 68-01-7374
Work Assignment Number R26-05-40

June 1988

0050W-RC

DISCLAIMER

This report was prepared for the U. S. Environmental Protection Agency, Region VI (EPA) by A. T. Kearney, Incorporated in fulfillment of Contract No. 68-01-7374, Work/Project Assignment No. R26-05-40. The opinions, findings, and conclusions expressed herein are those of the contractor and not necessarily those of the EPA or other cooperating agencies. Mention of company or product names is not to be considered an endorsement by the EPA.

This document is intended to assist EPA and State personnel in exercising the discretion conferred by regulation in developing requirements for an owner/operator to conduct the RCRA Facility Investigation (RFI) pursuant to 40 CFR 264. EPA will not necessarily limit RFI or other requirements to those that correspond with the recommendations set forth herein. EPA and State personnel must exercise their technical judgement in using the RCRA Facility Assessment report as well as other relevant information in determining what RFI or other requirements to include in a permit or an order.

TABLE OF CONTENTS

LIST OF EXHIBITS

1.0 INTRODUCTION

This section of the PR/VSI report covers the purpose and scope of the RFA program. The contents of the other sections of this report also are described.

1.1 Purpose and Scope of the RFA Program

The 1984 Hazardous and Solid Waste Amendments (HSWA) provide new authority to EPA to require comprehensive corrective actions on solid waste management units (SWMUs) and other areas of concern at interim status hazardous waste management facilities, particularly those applying for RCRA permits. These corrective actions are intended to address unregulated releases of hazardous constituents to air, surface water, soil, and ground water, as well as the generation of subsurface gas.

One of the major segments of EPA's corrective action program consists of RCRA Facility Assessments (RFAs) to identify releases, potential releases, or potential releases requiring further investigation. According to EPA's RCRA Facility Assessment Guidance Document, the four purposes of an RFA are to:

1. Identify and gather information on releases at RCRA-regulated facilities;

2. Evaluate solid waste management units and other areas of concern for releases to all media and regulated units for releases other than ground water;

3. Make preliminary determinations regarding releases of concern and the need for further actions and interim measures at the facility; and

4. Screen from further investigation those SWMUs which do not pose a threat to human health and the environment.

The three basic steps of an RFA consist of a preliminary review (PR) of available information, a visual site inspection (VSI) to obtain additional information on releases and a sampling visit (SV) to fill data gaps by obtaining field and analytical data.

1.2 Contents of This Report

This report presents the results of the PR and VSI of the Phillips 66 Company Lee Natural Gas Plant (EPA I.D. No. NMD 000709659) near Buckeye, New Mexico. The principal sources of information included the facility's Part A Application, RCRA closure documents, air emissions documents, inspection reports, correspondence, contractor reports, and facility personnel interviews. These documents were obtained during a search of relevant files at the EPA Region VI Office in Dallas, Texas and the office of the New Mexico Environmental Improvement Division in Albuquerque, New Mexico. File material encompassed RCRA, CERCLA, and the Clean Air Act.

The VSI was conducted May 4, 1988. The Phillips representatives present during the VSI were Charlie Thompson and Mike Ford. The A. T. Kearney inspection team conducting the VSI was composed of Christopher Nelson and Gary Walvatne.

Section 2.0 of this report contains a description of the Phillips facility, including its historical and current operations. Individual SWMUs are also identified in Section 2.0 along with a summary description of the wastes managed by the facility. Section 3.0 provides an overview of the environmental setting at the facility, comprising meteorology, floodplain, surface water, geology, ground water, and receptor information. In Section 4.0, a broad assessment of release pathways is made, covering the potential for releases to soil, ground water, surface water, air, and the generation of subsurface gas. Section 5.0 contains detailed discussions of each SWMU. Section 7.0 presents conclusions and recommendations. References used in preparing this report are provided at the end of the document. The VSI photograph log is presented as Appendix A to this report.

2.0 FACILITY DESCRIPTION

2.1 Location

The Phillips 66 Company owns and operates a natural gas plant located at Buckeye, New Mexico, approximately one-half mile east of Highway 238 (formerly Highway 8); Buckeye is located approximately 12 miles southwest of Lovington, New Mexico (see Exhibit 2-1). The geographical coordinates of the facility are latitude 32°48'N, longitude 103°29'W. [Ref. 1]

2.2 Historical and Current Operations

The Lee Plant processes raw natural gas from several production fields into residue gas and natural gas liquids. According to facility representatives, the Lee Plant began operations in 1937 as a booster plant. In 1941, the facility began treating natural gas using the absorption process. The facility expanded its operations in 1958 and 1963 and presently uses a cryogenic process to process natural gas. The residue gas (saleable natural gas) is sold to the El Paso Natural Gas Company, which operates a pipeline booster plant on property contiguous with the Lee Plant. [Ref. 7]

The Lee Plant's basic function is to remove the ethane and heavier hydrocarbon fractions from casinghead and gas well gas. The plant receives sour hydrocarbon gas streams from 5- and 250-psig gathering systems (see Exhibit 2-2). The gas from the 5-psig system is compressed to 250 psig in order that the gas streams from both gathering systems enter the plant's amine contactor at 250 psig. The amine contactor uses monoethanolamine to remove the hydrogen

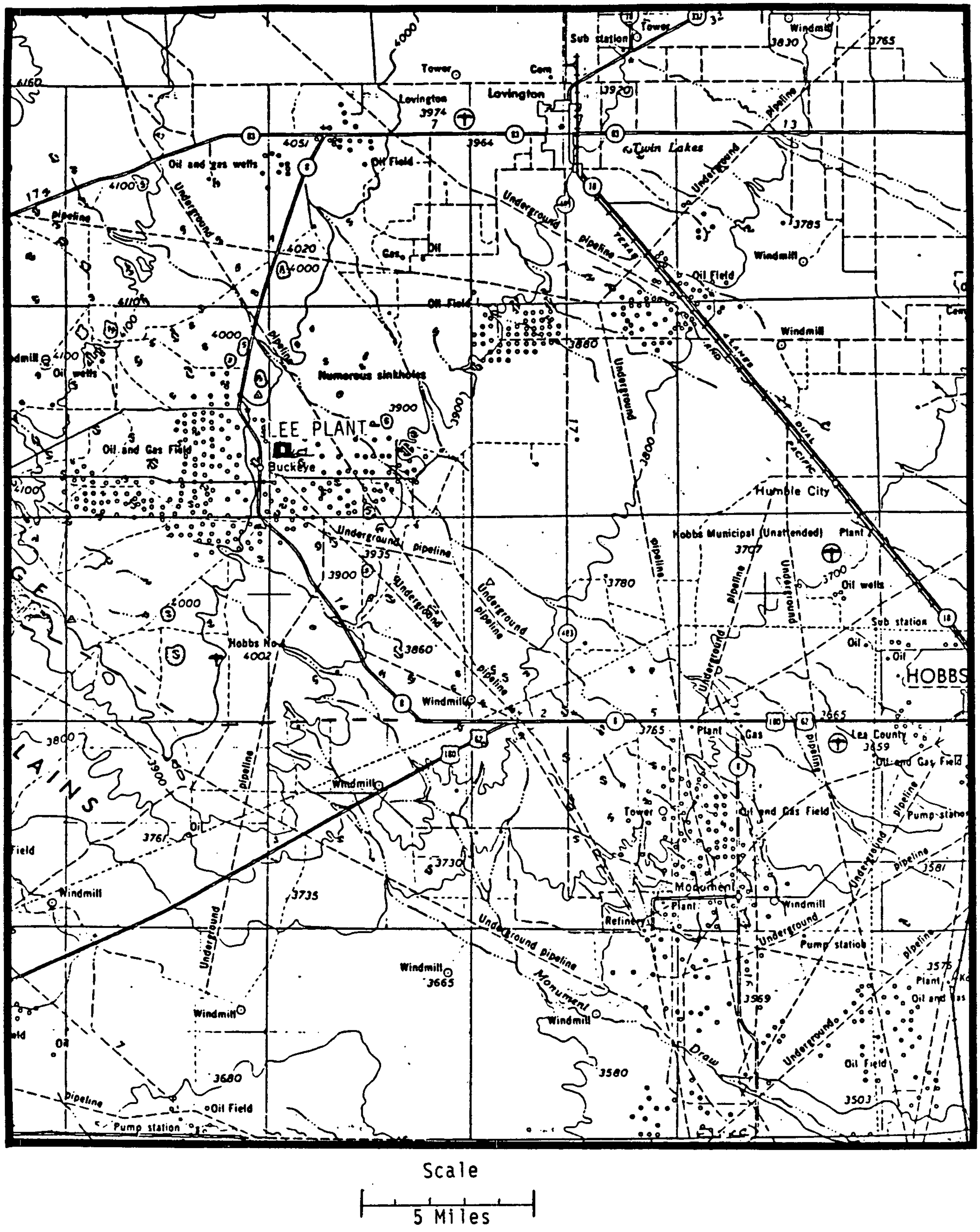


Exhibit 2-1. Location Map for Phillips Lee Plant.
Source: Reference 5

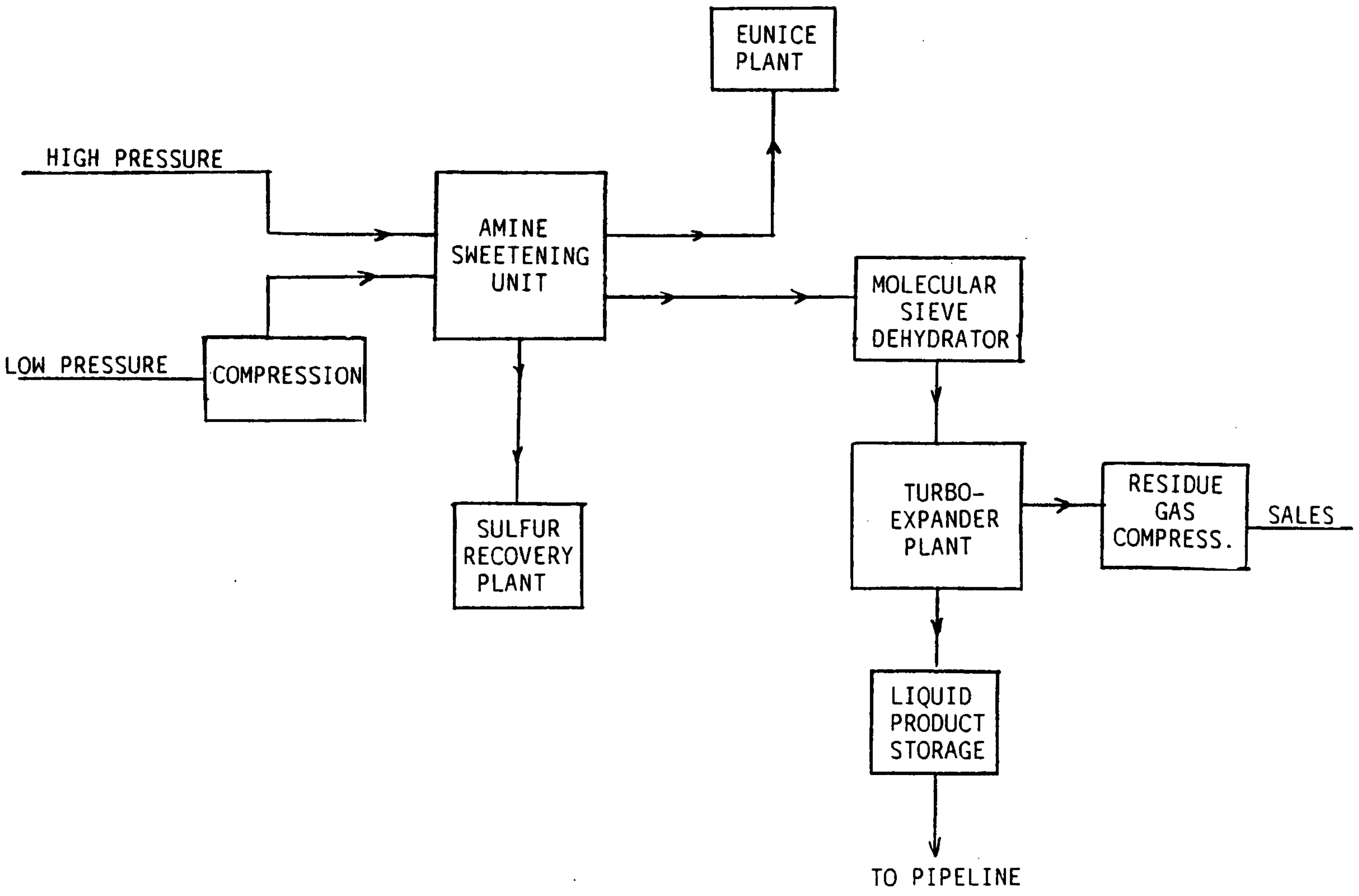


Exhibit 2-2. Lee Gasoline Plant Process Flow. Source: Reference 2.

sulfide and carbon dioxide from the inlet gas stream. The hydrogen sulfide and carbon dioxide removed in the sweetening process is sent to the plant's sulfur recovery unit. The sweet gas from the amine contactor is split into two streams. One stream is sent via pipeline to the Phillips Eunice Plant near Oil Center, New Mexico. The second stream is compressed from 250 to 750 psig and is then routed to a molecular sieve dehydrator where the gas is dehydrated to a water content of less than 1 ppmv. From the dehydrator the gas stream flows to a turboexpander (cryogenic) plant where it is cooled by propane refrigeration and expansion to a temperature of approximately -140°F. The turboexpander plant produces two hydrocarbon streams, the first being a liquid hydrocarbon stream comprised of approximately 85 percent of the ethane and all of the propane and heavier hydrocarbons that entered the plant. The liquid hydrocarbon stream has a vapor pressure of approximately 500 psig and is sent to a stainless steel pressure vessel for temporary storage before it is delivered to a pipeline for sale. The second hydrocarbon stream produced from the turboexpander is comprised primarily of methane gas, which is compressed to 750 psig before it is sold to the El Paso Natural Gas Company. [Ref. 2]

The facility filed a Hazardous Waste Notification (dated August 15, 1980) and Part A of its RCRA permit application (dated November 19, 1980) to operate under interim status; however, the facility withdrew its RCRA Hazardous Waste Notification and Part A on June 16, 1982 stating that it incorrectly notified or applied for a RCRA permit [Ref. 4, 5, and 8]. The facility, however, operated Cooling Towers (SWMUs #15-17) that discharged chromium-containing blowdown to an unlined Surface Impoundment (SWMU #18). A compliance order was issued against the facility on September 29, 1983 for operating without interim status and failure to determine that chromium-containing blowdown was a hazardous waste. [Ref. 10] EPA issued the compliance order when it learned that the blowdown may have occasionally exceeded the EP Toxicity level for chromium. The facility failed to determine that the blowdown was a characteristic hazardous waste and, since the facility withdrew its Part A, was operating without interim status. The compliance order required the facility to test all solid wastes on-site, to re-file a Part A to regain interim status, and submit closure and post-closure plans for the Surface Impoundment. A civil penalty of $17,600 was also assessed against the facility for operating without a permit and failure to perform hazardous waste determination. [Ref. 10]

The New Mexico Environmental Improvement Division filed a Notice of Violation against the facility on June 15, 1984 for violations determined during a hazardous waste compliance inspection performed on May 8, 1984. These violations were for improper recordkeeping and operation of the Surface Impoundment (SWMU #18). [Ref. 13] Phillips responded to the NOV on July 18, 1984 [Ref. 15].

Phillips submitted closure and post-closure plans for the Surface Impoundment (SWMU #18) to EPA on June 28, 1984 [Ref. 19]. Revised plans were submitted on August 3, 1984 [Ref. 16]. Phillips submitted a certification of closure for the Surface Impoundment to the New Mexico Environmental Improvement Division in a letter dated October 29, 1984; the certification of closure was signed by an independent registered professional engineer [Ref. 18].

On August 27, 1984, EPA issued a Consent Agreement and Final Order pursuant to the Compliance Order issued on September 29, 1983. [Ref. 17]

Harding Lawson Associates reviewed the Closure and Post-Closure Plan for the Lee Plant and presented a summary report and a checklist of its findings; several deficiencies were noted [Ref. 19]. Jacobs Engineering Group Inc. also reviewed the Closure and Post-Closure Plan and noted deficiencies in it, which were presented in its summary report dated May 13, 1986 [Ref. 25].

On August 4, 1987, the New Mexico Health and Environment Department issued a Notice of Violation to Phillips Petroleum Company since the annual ground-water monitoring report was not submitted for the Phillips Lee Plant [Ref. 27]. Phillips responded to the NOV on August 24, 1987 requesting a meeting to discuss ground-water monitoring at the facility [Ref. 28]. In addition, Phillips submitted analyses of ground-water samples collected from the facility in August 1985; chromium was not detected in any of the monitoring wells, but organics were detected in all four monitoring wells at part per billion levels. The greatest concentrations of volatile organics were found in Monitoring Well No. 1 and are provided below. (The results for tetrahydrofuran and butanone are tentative.) [Ref. 24]

Benzene	47 ppb
m-Xylene	1 ppb
o-Xylene	6 ppb
Toluene	17 ppb
Tetrahydrofuran	>500 ppb
Butanone	>500 ppb

The New Mexico Environmental Improvement Division conducted an inspection at the facility on September 15, 1987 and noted that the presence of tetrahydrofuran, which was detected in all four monitoring wells, may be from the adhesive used to install the PVC monitoring wells [Ref. 29]

On October 27, 1987, the New Mexico Health and Environmental Department issued a Notice of Violation to the Phillips Lee Plant for four violations of the Hazardous Waste Management Regulations [Ref. 31]. According to a letter dated February 2, 1988, the facility satisfactorily addressed the first and second violations (inclusion of the addresses of all emergency coordinators in the contingency plan and an evacuation plan in the contingency plan, respectively). The third violation concerning the failure to perform required ground-water sampling was readdressed by the state in a second NOV issued on January 25, 1988. The fourth violation, regarding the failure to close the Surface Impoundment (SWMU #18), was not resolved. [Ref. 32] Phillips responded on February 17, 1988 to the NOV issued on January 25, 1988 for ground-water sampling; on February 26, 1988, the New Mexico Environmental Improvement Division approved Phillips' proposed schedule for compliance with the NOV [Ref. 33].

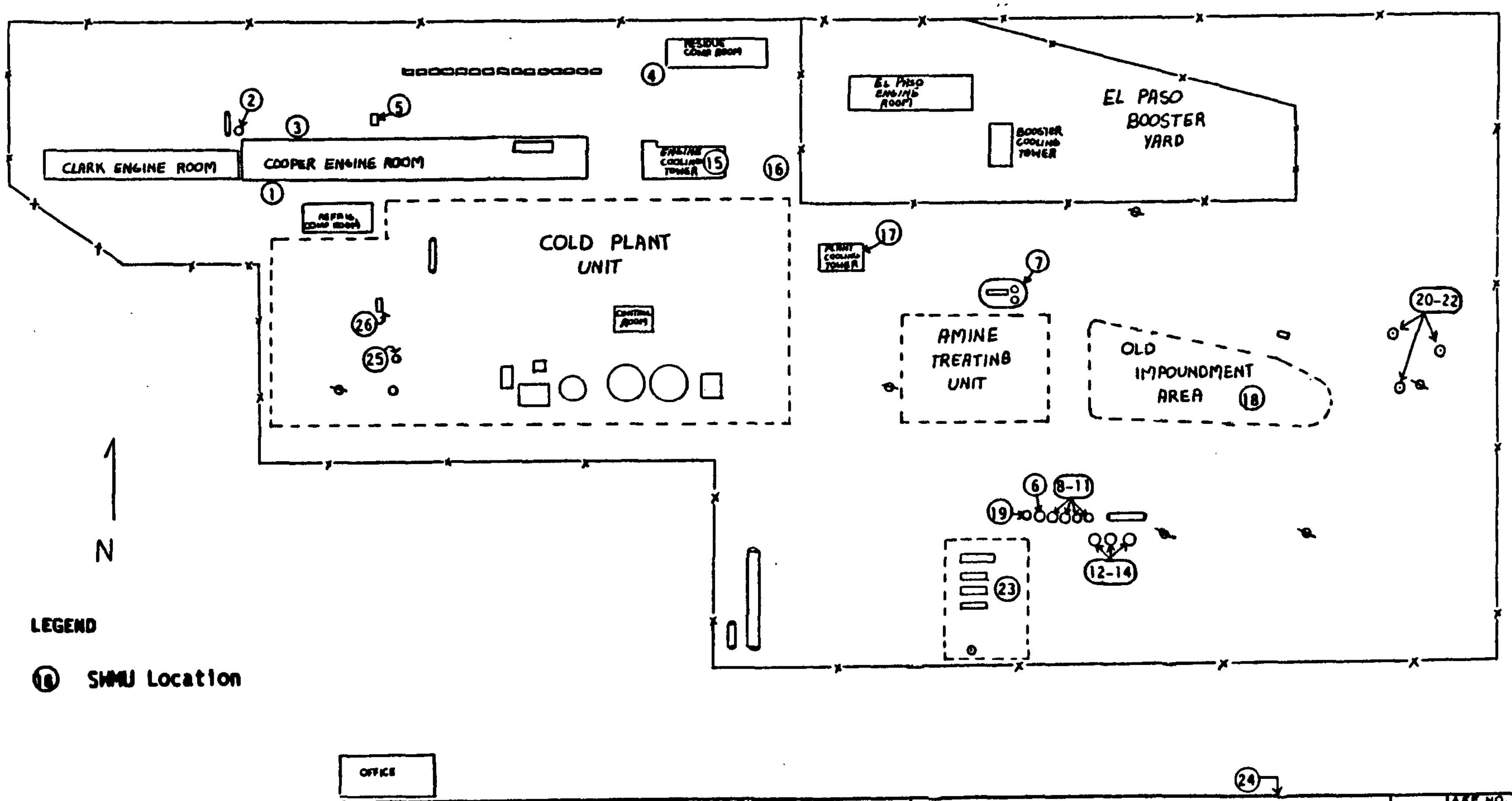
2.3 Identification of Solid Waste Management Units

The following section describes the various processes at the Phillips Lee Plant and waste streams associated with each process. The processes and associated waste streams are discussed in the general order of the overall natural gas treatment process at the Lee Plant: compression of natural gas, monoethanolamine sweeting, molecular sieve dehydration, sulfur recovery, and other general wastes. This section includes an introduction to the solid waste management units (SWMUs) identified during this assessment and their relation to the overall process flow. A total of 26 SWMUs were identified during the PR and VSI. The SWMUs are listed in Exhibit 2-3 and their locations are presented in Exhibit 2-4.

EXHIBIT 2-3

SOLID WASTE MANAGEMENT UNITS AT THE PHILLIPS EUNICE PLANT

SWMU No.	Name	RCRA-Regulated SWMU
1-4	Engine Drain Tanks (4)	No
5	Steel Collection Tank	No
6	Gunbarrel (Separator)	No
7	Oil-Water Separator	No
8-11	Slop Oil Tanks (4)	No
12-14	Wastewater Tanks (3)	No
15-17	Cooling Towers (3)	No
18	Surface Impoundment	Yes
19	Precoat Slop Water Tank	No
20-22	Flares (3)	No
23	Sulfur Incinerator	No
24	Former Landfill	No
25	Closed Drain Separator	No
26	Cold Drain Vaporizing Tank	No



NO.	REVISION	BY CHKD	DATE APP'D	

FOR BIDS
FOR APPR
FOR CONST
DRAWN FORD 2-11-86
CHECKED
APP'D

BARTLESVILLE, OKLAHOMA

Exhibit 2-4. Lee Plant: SWMU Location Map.

AFE NO.
Scale: Unknown
DWG NO.
SH NO.

Three Cooling Towers (SWMUs #15-17) are operated at the plant to cool engine jacket water and process cooling water. The Cooling Towers provide noncontact cooling water for the engine jacket water and process cooling water; however, a chromium-containing corrosion inhibitor was used in the noncontact cooling water until October 4, 1983 when its use ceased due to its potential to make the blowdown a characteristic hazardous waste [Ref. 16]. An aqueous mixture of an aromatic nitrogen heterocycle and sodium hydroxide has since been used as a corrosion inhibitor in the noncontact cooling water [Ref. 2]. The chromium-containing blowdown was discharged to the Surface Impoundment (SWMU #18) [Ref. 16]. The cooling tower blowdown is presently discharged to the Wastewater Tanks (SWMUs #12-14), which discharge to a pipeline in Rice Engineering's Vacuum Salt Water Disposal System (see Exhibit 2-5); Rice Engineering operates a Class II injection well offsite [Ref. 2].

Oil that leaks from the engines is collected by the Engine Drain Tanks (SWMUs #1-4). These units discharge the oil via the open drain system to the belowground Oil-Water Separator (SWMU #7), which has two discharge streams. The aqueous stream is sent to the Wastewater Tanks (SWMUs #12-14) and the oil stream is sent to the Slop Oil Tanks (SWMUs #8-11). [Ref. 2] The slop oil is trucked offsite to a heater treater in Hobbs and then delivered to the Phillips sales pipeline [Ref. 7].

The Gunbarrel (SWMU #6) collects hydrocarbon liquids separated from the inlet gas. The Gunbarrel separates the oil-water mixture and discharges the oil component to the Slop Oil Tanks (SWMUs #8-11) and the aqueous component to the Wastewater Tanks (SWMUs #12-14). [Ref. 2]

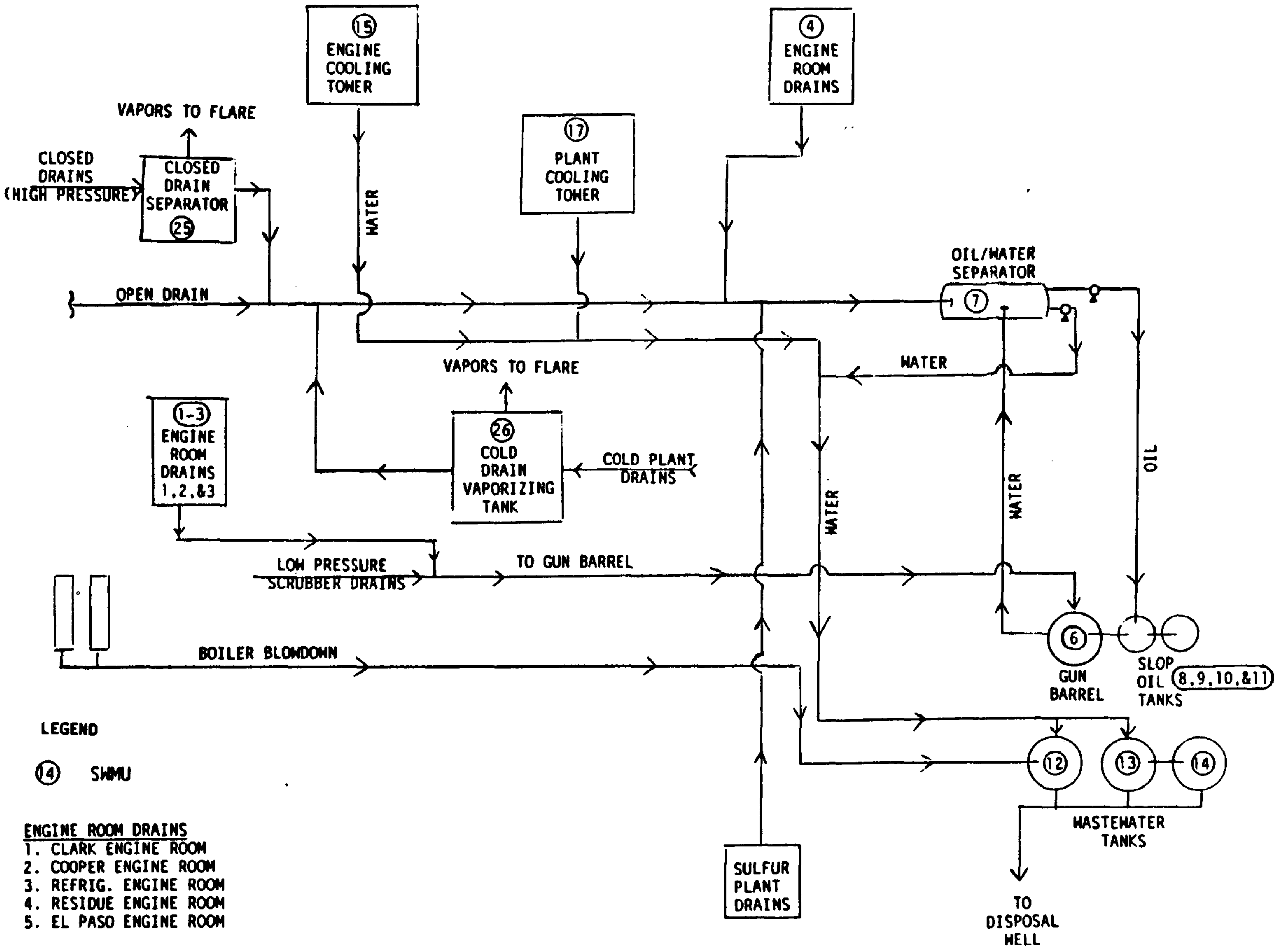


Exhibit 2-5. Lee Plant Wastewater System. Source: Reference 2.

The monoethanolamine sweetening process employs diatomaceous earth to remove fine particulate matter that the monoethanolamine solution removes from the inlet gas. The diatomaceous earth is backwashed to the Precoat Slop Water Tank (SWMU #19) where the solids settle out. The slop water is discharged from the tank and trucked offsite to an injection well located 9 to 10 miles from the plant. The diatomaceous earth is removed from the tank and transported offsite by INW of Lubbock, Texas. [Ref. 7]

The molecular sieve dehydrators (commonly known as mole sieves) employ an alkali aluminosilicate material in pellet form to dry the sweet inlet gas. The aluminosilicate pellets act as a dessicant removing water from the natural gas. Approximately every three to four years the molecular sieve dehydrators are recharged. The spent pellets, or molecular sieve, are disposed in a caliche pit on nearby property owned by Texaco; this pit is also known as the Texaco landfill. Approximately 28,000 pounds of this material is disposed each time the beds are recharged. [Ref. 2 and 7]

The hydrogen sulfide and carbon dioxide removed from the acid inlet gas during the monoethanolamine sweetening process are piped to the sulfur recovery plant. The recovered sulfur is collected and sold off-site; all of the gases (primarily hydrogen sulfide and sulfur dioxide) produced during the sulfur recovery process are burned in the Sulfur Incinerator (SWMU #23). [Ref. 7] Approximately once every five years the catalyst in the sulfur recovery unit converter beds are recharged. The spent catalyst is disposed of in the Texaco landfill. Approximately 29,000 pounds of this material are disposed each time the beds are recharged. [Ref. 2]

All Class II wastes are hauled to an off-site landfill by Waste Control of New Mexico, which is based in Hobbs. The Class II wastes include paper towels, sacks, and spent air and oil filters from the engines. Large pieces of pipe and concrete are disposed in the Texaco landfill. [Ref. 2 and 7]

2.4 Summary of Wastes Handled

This section summarizes the wastes generated during the refining of acid field gas to produce sweet residue gas for sale. The waste streams are discussed in the general order of the overall natural gas treatment process at the Lee Plant: compression of natural gas, diethanolamine sweeting, molecular sieve dehydration, sulfur recovery, and other general wastes.

A chromium-containing corrosion inhibitor was used in the noncontact cooling tower water until October 4, 1983. This noncontact water (blowdown) was discharged from the Cooling Towers (SWMU #15-17) to the Surface Impoundment (SWMU #18). The blowdown may have exceeded the EP Toxicity characteristic chromium level from time to time and the Surface Impoundment is now going through closure due to the presence of chromium in the soil within the unlined unit. [Ref. 18] A closure and post-closure plan for the Surface Impoundment was submitted to the New Mexico Environmental Improvement Division and EPA Region VI. [Ref. 16]

An aqueous mixture of an aromatic nitrogen heterocycle and sodium hydroxide has been used as a corrosion inhibitor in the Cooling Tower water since October 4, 1983. When operation of the Surface Impoundment ceased, the blowdown was discharged to Rice Engineering's Vacuum system for disposal in an injection well. [Ref. 2]

Liquids collected by the open-drain and closed-drain systems are treated by the Gunbarrel (SWMU #6) and the Oil-Water Separator (SWMU #7). The slop oil is collected and stored in the Slop Oil Tanks (SWMUs #8-11) on-site until it is trucked to Hobbs for treatment and delivery to a sales pipeline. The aqueous portion of the treated liquid is discharged to Rice Engineering's injection well. [Ref. 2]

The monoethanolamine sweetening process generates diatomaceous earth and slop water that are sent off-site for disposal. The diatomaceous earth is disposed by INW and the slop water is disposed in an injection well. [Ref. 2 and 7]

The molecular sieve dehydrators employ alkali aluminosilicate filter pellets that are replaced every three to four years. The spent pellets, or molecular sieve, are disposed in the Texaco landfill located several miles to the west of the facility. [Ref. 2 and 7]

Gases generated during the sulfur recovery process are burned in the Sulfur Incinerator (SWMU #23). These gases are primarily hydrogen sulfide and sulfur dioxide. [Ref. 7]

Waste Control of New Mexico hauls all Class II wastes to an off-site landfill. The Class II wastes include paper towels, sacks, and spent air and oil filters from the engines. [Ref. 2 and 3]

3.0 ENVIRONMENTAL SETTING

3.1 Meteorology and Climate

The Phillips Lee Plant is located in central Lea County, which has a semiarid, continental climate with warm summers and cool dry winters. The primary source of rainfall is moisture from the Gulf of Mexico. The northern part of the county receives greater amounts of rain because the moist air moves upslope. Strong surface heating in the summer contributes to brief, heavy thunderstorms that are responsible for most of the yearly rainfall. Blizzards are rare and snow generally melts soon after falling. [Ref. 34]

Lea County is located in one of the warmer areas of New Mexico, with temperatures a little warmer in the southern and western parts of the county and a little cooler in the north. Summer temperatures of 90 degrees or more occur about 66 percent of the time. Temperatures reach or exceed the freezing point on about 66 days during the winter months and seldom drop below zero. [Ref. 34]

Average annual precipitation in Lea County ranges from about 16 inches in the northern part to about 12 inches in the southern part. Approximately 80 percent of the annual rainfall occurs from May through October, much of it in thunderstorms. Average annual snowfall ranges from about 4 inches in the southern part of the county to about 10 inches in the north. Nearly half the months, on the average, have no measurable snowfall. [Ref. 34]

Surface winds are primarily from the southwest from November through April and the southeast from May through October. The direction of the wind is determined by the general circulation around the Bermuda high pressure area and is modified by the low pressure over Arizona in summer. The average annual wind velocity is 12.2 miles per hour, with monthly averages ranging from 10.0 miles per hour in October to 15.0 miles per hour in March. The winds generally have higher velocities in the spring and lower velocities in the fall. Winds in excess of 46 miles per hour are mostly from the west and usually occur about twice a year. Tornadoes or funnel clouds occur about once or twice a year in Lea County and may be accompanied by hail storms. [Ref. 34]

Evaporation from a Class A measuring pan ranges from 105 to 110 inches a year and from a lake surface from 45 to 49 inches. Sixty-seven percent of the evaporation takes place from May through October. The average annual relative humidity of the county is 45 to 50 percent. [Ref. 34]

An average of about 75 percent of the possible sunshine may be expected during the year. The percentage is higher in June and during fall, and lower in winter. Similarly, the average cloud cover is four-tenths and is less in June and during fall and greater in winter. [Ref. 34]

3.2 Topography, Floodplain and Surface Water

The Phillips Lee Plant is located in central Lea County near the southwestern edge of the Llano Estacado, or Staked Plains, which is a remnant of the southern extension of the Southern High Plains. The Southern High Plains are remnants of a vast debris apron spread along the eastern front of the mountains of Central New Mexico by streams flowing eastward and southeastward during the Tertiary period. This southeastward movement of debris is reflected in the present-day topography. With the exception of the sandy undulating areas along the eastern and northern edges of the county, the Llano Estacado in Lea County has a nearly flat surface. It has a gradient to the east and southeast of about 10 to 15 feet to the mile. Elevations on the Southern High Plains are 4,000 to 4,400 feet along the west side to 3,600 to 3,900 feet along the Texas line. [Ref. 34]

There are no perennial streams on the Southern High Plains and, hence, the Phillips Lee Plant is not located on a floodplain. Rainfall is disposed by seepage, evaporation, or incipient stream channels that fade out within a few miles or terminate in closed depressions, or playas. Other common features of the Southern High Plains are undrained depressions called "buffalo wallows." These depressions are believed to have formed by leaching of the caliche cap and the calcareous cement of the underlying sandstone of the Ogallala Formation followed by subsequent removal of the loosened material by winds. [Ref. 34]

3.3 Geology and Soils

Southern Lea County includes a part of a large subsurface structural feature known as the Permian basin, which underlies southeastern New Mexico and a large part of western Texas. Exploration for oil has revealed a highly complex subsurface geology which involves rocks ranging from Precambrain and early Paleozoic to Permian in age. The oldest rocks exposed in the area are Triassic in age. Cretaceous rocks have been uncovered in a gravel pit near

Eunice, but the unit is apparently of very limited extent. The only other rocks exposed at the surface are Tertiary and Quaternary in age. In general, rock exposures are poor; nowhere in the area is there a complete section of the Triassic or Cretaceous rocks and large areas are covered by drift sand. [Ref. 35]

Southern Lea County includes parts of the Delaware basin, the back-reef or shelf area, and the Central basin platform of the Permian basin. The southwestern part of the county overlies the Delaware basin and the eastern part overlies the Central basin platform; the back-reef or shelf area lies between these two areas and also extends northward to central Lea County to the area where the Phillips Lee Plant is located. These general areas are defined by different sedimentary depositional environments that existed during Permian time. The sharp boundary between the basin and shelf areas is marked by a complex of reef deposits; the boundary between the shelf area and the platform is transitional. The total thickness of the Paleozoic and younger rocks in these provinces ranges from about 8,000 feet in the Central basin platform to more than 17,000 feet in the deepest part of the basin. [Ref. 35]

The Precambrian rocks in Lea County consist primarily of granitic igneous rocks that intruded older igneous and metamorphosed sedimentary rocks over a vast area in western Texas and eastern New Mexico during middle Precambrian time. The known depth to the Precambrian basement rocks ranges in this area ranges from 7,600 feet on the east side to 16,800 feet on the west side. [Ref. 35]

A thick section of Paleozoic sedimentary rocks overlies the Precambrian basement rocks. The rocks of Ordovician through Pennsylvanian age consist of interbedded limestones, dolomites, cherts, and shales. The rocks of Permian age in the area were deposited on an irregular surface formed by Late Pennsylvanian folding. The basins subsided more rapidly than the Central basin platform and continued to accept sediments at times when there was little or no deposition on the platform. The Permian rocks include interbedded limestones, dolomites, conglomerates, sandstones, shales, cherts, and evaporite deposits that are divided into four series: Wolfcamp, Leonard, Guadalupe, and Ochoa. [Ref. 35]

Overlying the Rustler formation of the Ochoa series is a sequence of red beds consisting of micaceous red siltstone, shale, and sandstone that are commonly cemented with gypsum. These red beds are known by various names including the Dewey Lake, Tecovas, and Pierce Canyon formations. These rocks are classed as Permian or Triassic, undifferentiated. [Ref. 35]

The Mesozoic era is represented in the area only by Upper Triassic rocks of the Dockum group and by a small exposure of Cretaceous rocks near the eastern margin of the county. The Dockum group consists of a sequence of red beds including the Santa Rosa sandstone and the Chinle formation. The Santa Rosa is a fine- to coarse-grained sandstone with minor shale layers. The Chinle is dominantly red and green claystone with minor fine-grained sandstone and siltstone. [Ref. 35] The depth to the Triassic red beds at the Phillips Lee Plant is 230 to 240 feet, according to facility representatives [Ref. 7]

Rocks of Jurassic age have not been found in southern Lea County. Rocks of Cretaceous age were deposited, but have been almost entirely removed by erosion. [Ref. 35]

The Cenozoic formations include the Tertiary Ogallala formation of Pliocene age and Quaternary deposits. The Ogallala formation underlies the High Plains and is a heterogeneous complex of terrestrial sediments, which mantles an irregular erosion surface cut into the Triassic rocks. The Ogallala crops out along the face of Mescalero Ridge about six miles south of the Phillips Lee Plant. The Ogallala formation ranges in thickness from a few inches to about 300 feet. It is chiefly a calcareous, unconsolidated sand, but it contains clay, silt, and gravel. The Ogallala on the Llano Estacado is capped by a layer of dense caliche, which ranges in thickness from a few feet to as much as 60 feet. The caliche was formed after the end of Ogallala deposition and is probably late Pliocene in age. [Ref. 35]

Sediments of Quaternary age are present in Lea County in the form of alluvial deposits, probably of both Pleistocene and Recent age, and dune sands of Recent age. The alluvium was deposited in topographically low areas, such as the Querecho Plains and Laguna Valley, where the Ogallala formation was eroded away. The alluvium ranges in thickness from a few inches to more than 400 feet, but it is generally less than 100 feet thick. The dune sands, where present, overlie the older alluvium and the Ogallala formation. [Ref. 35, 37]

Well logs for the three ground-water wells located at the Phillips Lee Plant are presented in Exhibit 3-1. The logs indicate that the subsurface is comprised of interbedded sands, gravels, clays, and caliche to a depth of approximately 225 feet. These deposits overlie Triassic red beds. [Ref. 36]

EXHIBIT 3-1

Well Logs of the Ground-Water Wells Located at the Phillips Lee Plant (Source: Reference 36)

Lee Well No. 1:	0 - 1'	Top Soil
	1' - 24'	Caliche
SE/4 Sec. 30, T-17-S, R-35-E	24' - 55'	Firm Sand
	55' - 80'	Soft Sand
	80' - 153'	Water Sand

Lee Wells	No. 3	No. 4	
	0 - 1'	0 - 1'	Soil
N/2 Sec. 31, T-17-S, R-35-E	1' - 8'	1' - 14'	Caliche
	8' - 16'	14' - 18'	Boulder
	16' - 25'	18' - 25'	Caliche and Sand
		25' - 31'	Boulder
	25' - 40'	31' - 40'	Sand
	40' - 70'	40' - 77'	Sandy Clay
	70' - 75'		Sand Rock
	75' - 88'	77' - 90'	Sand - Top of Water
		90' - 112'	Sandy Clay
	88' - 95'	112' - 132'	Sand, Dry White
	95' - 115'	132' - 155'	Sandy Clay
	115' - 135'	155' - 162'	Sand
	135' - 142'	162' - 178'	Sandy Gravel and Clay
	142' - 146'	178' - 182'	Red Clay
	146' - 165'	182' - 198'	Sandy Clay
	165' - 172'	198' - 208'	Sand
	172' - 200'	208' - 214'	Sandy Clay
	200' - 202'		Red Clay
		214' - 225'	Gravel and Sand
	202' - 212'		Sandy Clay
	212' - 227'		Gravel and Sand
	227' - 230'	225' - 229'	Red Bed

Note: Well Nos. 3 and 4 were installed in 1959. The completion date for Well No. 1 is not known.

Soils at the Phillips Lee Plant belong to the Kimbrough-Lea association. The soils in the plant area are gravelly and loamy overlying indurated caliche. The surface of this soil association is nearly level to gently sloping. The soils have a loam and gravelly loam surface layer over a heavy loam subsoil or indurated caliche. They formed in wind-laid and alluvial deposits over indurated caliche. [Ref. 34]

Typically, Kimbrough soils have a dark grayish-brown gravelly loam surface layer that is underlain by indurated caliche at a depth of about 6 inches. Lea soils have a dark grayish-brown to brown loam surface layer, a grayish-brown heavy loam subsoil, and indurated caliche at a depth of about 26 inches. [Ref. 34]

Kimbrough soils occur in an intricate pattern with Lea soils. They are on low broad ridges and plains while Lea soils occur in swales. [Ref. 34]

3.4 Ground Water

The High Plains aquifer in southeastern New Mexico is part of a regional aquifer system extending from South Dakota on the north through Wyoming, Colorado, Nebraska, Kansas, and Oklahoma, to Texas and New Mexico on the south. The principal aquifer, the Ogallala Formation of Tertiary age, is hydraulically connected with other unconsolidated deposits, principally of Quaternary age. Alluvium and terrace deposits hydraulically connected with the Ogallala are included in the High Plains aquifer in New Mexico. [Ref. 37]

The High Plains aquifer is the principal source of water in southeastern New Mexico because of its areal extent and the relatively large yields of water to wells completed in the aquifer. The aquifer commonly yields 250 to 800 gallons per minute and locally yields as much as 1,000 gallons per minute to wells. The agricultural economy that exists in the semiarid climate of southeastern New Mexico has expanded significantly because of this major source of water. [Ref. 37]

The Triassic, Jurassic, and Cretaceous rocks that directly underlie the High Plains aquifer in southeastern New Mexico are composed primarily of shale, mudstone, siltstone, and fine-grained sandstone. In addition, there are some lithologic units composed of medium- to very coarse-grained sandstone, conglomerate, limestone, and dolomite. [Ref. 37]

The High Plains aquifer consists of one or more hydraulically connected geologic units of the late Tertiary or Quaternary age. The rocks of late Tertiary age consist of the Ogallala Formation, and the Quaternary deposits consist of alluvial, dune sand, and valley-fill deposits. The thickness of the High Plains aquifer ranges from 0 to about 500 feet. The Ogallala is the principal geology unit in the High Plains aquifer. [Ref. 37]

The Ogallala Formation is mostly unconsolidated clay, silt, fine- to coarse-grained sand, and gravel. Some caliche is present near the top and locally within the formation. When the Ogallala was deposited, aggrading streams filled valleys eroded deep into pre-Ogallala rocks. Braided streams flowed eastward from the mountains in central and southern New Mexico transporting rock debris, which was deposited as a heterogenous sequence of unconsolidated material. The upper part of the Ogallala in southern New Mexico may contain a considerable thickness of windblown sediments. [Ref. 37]

The unconsolidated Quaternary alluvial and valley-fill deposits consist of clay, silt, sand, and gravel. These rocks are primarily derived from reworked Ogallala material. [Ref. 37]

The configuration of the water table in the High Plains aquifer in the Phillips Lee Plant area is shown in Exhibit 3-2. The aquifer boundary on the map is the physical limit of the various geologic units comprising the High Plains aquifer. Water-level data for this map were obtained during the winter of 1978, when the effects of seasonal pumping for irrigation were at a minimum. [Ref. 37]

Hydraulic interconnection between geologic units that comprise the High Plains aquifer is sufficient to permit contouring a continuous water table throughout most of the area. The degree of hydraulic interconnection may vary from place to place and, locally, some water-yielding beds may have a water level representative of an artesian-pressure surface because of clay lenses within the aquifer. However, from a regional aspect, water-table conditions prevail in the aquifer. [Ref. 37]

The water-table map shows a general east-southeastward slope of the water table across the High Plains. The general direction of ground-water movement is at right angles to the water-table contours, in the down-gradient direction. Typically, the slope of the water table is between 10 and 15 feet per mile. [Ref. 37] The local hydraulic gradient at the Phillips Lee Plant,

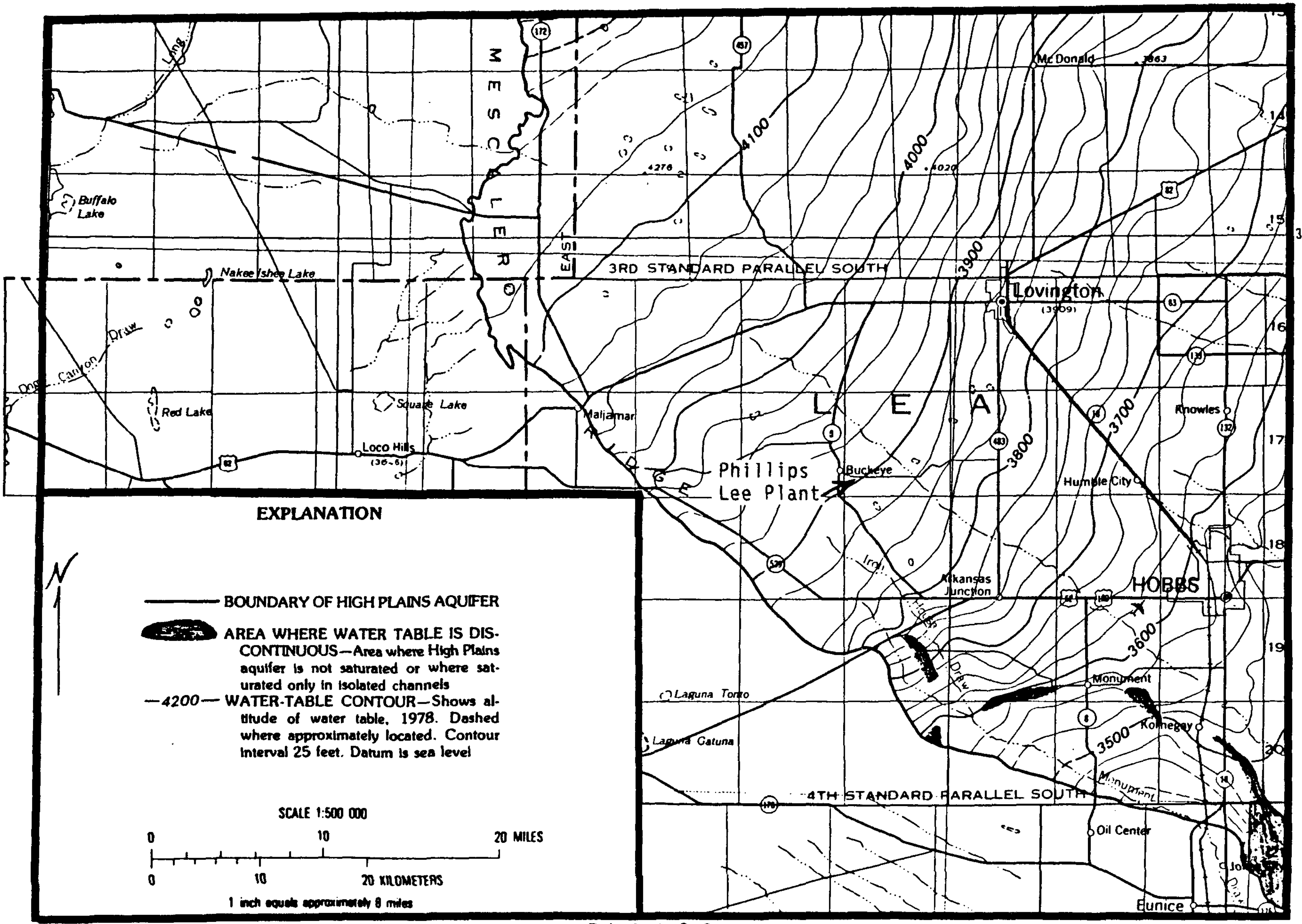


Exhibit 3-2

MAP SHOWING ALTITUDE AND CONFIGURATION OF THE WATER TABLE FOR THE HIGH PLAINS AQUIFER, 1978

Source: Reference 37.

however, is in a northerly direction. This was determined from monitoring wells at the Surface Impoundment (SWMU 20). [Ref. 18]

The saturated thickness in the High Plains aquifer ranges from 0 to slightly more than 200 feet. [Ref. 37] Well logs in the area of the Phillips Lee Plant indicate that the water table occurs at a depth of approximately 85 feet. [Ref. 38]

The quantity of natural recharge to the aquifer from precipitation is less than 0.5 inch per year. Only 3 to 4 percent of the precipitation falling on the High Plains reaches the water table; the remainder is returned to the atmosphere by evapotranspiration. [Ref. 37]

Prior to large-scale development of irrigation, the High Plains ground-water system was in a state of dynamic equilibrium, with long-term recharge equal to long-term discharge. Irrigated farming on the High Plains has significantly increased the quantity of water discharged from the system. Increased discharge has resulted in a lowering of the water level as water is removed from storage in the aquifer. The removal of water from storage, or ground-water mining, is most evident in three general areas of southeastern New Mexico where irrigation wells are numerous and relatively concentrated: (1) Eastern Lea County; (2) Portales Valley; and (3) southeastern Curry County. [Ref. 37]

Water levels in eastern Lea County locally have declined more than 60 feet. Water-level declines of 20 to 60 feet are common in areas where irrigation wells are concentrated. The water level in eastern Lea County has been declining as much as 2 feet per year and is declining at an average rate of 1 foot per year. [Ref. 37]

Water in the High Plains aquifer generally is suitable for domestic, municipal, and irrigation use, but the water typically has large concentrations of calcium, magnesium, and bicarbonate and in some areas may contain high concentrations of fluoride or chloride. [Ref. 37] There are no known public drinking water well in the immediate area surrounding the facility [Ref. 7]

3.5 Receptor Information

The area surrounding the Lee Plant is used primarily for oil production and cattle ranching. The nearest town is Buckeye, which is located approximately one-half mile west of the plant. At the time of the VSI, Buckeye appeared to consist of only one building, a grocery store. The nearest city is Lovington, which is located approximately 12 miles northeast of the facility. [Ref. 7]

Two private residences are located on property adjacent to the southwest corner of the Lee Plant. The homes are located approximately 150 feet west of the plant office. Facility representatives reported that one family lives in each home. [Ref. 7]

A CERCLA Preliminary Assessment/Site Investigation (PA/SI) was performed at the Lee Plant on September 10, 1985. The PA/SI report indicates that approximately six people lived within one-half mile of the plant, presumably in the two homes mentioned above; approximately 19 people worked within one-half mile of the plant. [Ref. 38]

Wildlife living in the semiarid environment surrounding the Eunice Plant includes mourning doves, scaled quail, roadrunners, jackrabbits, desert mule deer, and antelope.

4.0 RELEASE PATHWAYS

This section provides an overview of the potential for the release of hazardous constituents to the various environmental media. This potential is based on the combination of waste characteristics, facility characteristics and environmental setting.

4.1 Air Release Pathway

There are numerous compressor engines, boilers, heaters, a Sulfur Incinerator (SWMU #23), and three Flares (SWMUs #20-22) which have air release pathways at the Phillips Lee Plant permitted under Air Quality Permit No. 276 [Ref. 40].

4.2 Surface Water Release Pathway

There are no significant bodies of surface water within at least fifteen miles of the Eunice Plant. Due to this distance, the release potential to surface water is not considered to be significant.

4.3 Soil Release Pathway

Two land-based units manage or have managed wastes without using liner systems. These units include the Surface Impoundment (SWMU #18) and the Former Landfill (SWMU #24). Given the unlined construction of these units, there is a significant potential for release to soil.

4.4 Ground-water Release Pathway

Ground-water contamination from organics was reported from samples taken from monitoring wells located near the Surface Impoundment (SWMU #18) [Ref. 24]. Due to the sandy nature of the subsurface layers, wastes released to the soil may migrate to ground-water even though it is located approximately 85 feet below the surface. Since there is no information on wastes managed by the Former Landfill (SWMU #24), it is not known if it has released to ground water. Due to documented contamination in the area of the Surface Impoundment, there is a significant potential for release to ground water.

5.0 DESCRIPTION OF SOLID WASTE MANAGEMENT UNITS

5.1 SWMUs #1-4 - Engine Drain Tanks (4) (Photos 1-3, 6)

5.1.1 Information Summary

Unit Description: These units are small underground collection tanks located near the various engine rooms. Engine Drain Tanks Nos. 1,3, and 4 are steel tanks measuring 36 inches in diameter by 6 feet long and have a capacity of 300 gallons. Engine Drain Tank No. 2 is a steel tank of unknown dimensions. Engine Drain Tank No. 3 replaced Tank No. 2. These units receive oil that drips from compressor engines; the oil gravity-flows via pipelines to the tanks. [Ref. 7] The units discharge the oil via the open drain system to the belowground Oil-Water Separator (SWMU #7). [Ref. 2]

Dates of Operation: Engine Drain Tanks Nos. 1, 3, and 4 were installed in 1987 and are currently in service. The start-up date for Engine Drain Tank No. 2 is not known and it is no longer in service. [Ref. 7]

Wastes Managed: These units collect oil that drips from the compressor engines. [Ref. 2] The wastes are expected to contain 40 CFR Part 261 Appendix VIII constituents including complex hydrocarbons and heavy metals.

Release Controls: These units gravity-flow to the Oil-Water Separator (SWMU #7); there are no other release controls for these units.

History of Releases: There is no documented release history for these units. These units were not visible during the VSI due to their below-grade location.

5.1.2 Release Potential

- Soil/Ground Water: The release potential to soil and ground water is unknown due to the below grade location and unknown integrity of the units.

- Surface Water: There is no potential for release to surface water due to the absence of nearby bodies of surface water.

- Air: The release potential to air is low due to the enclosed construction of the unit and the nonvolatile nature of the waste.

- Subsurface Gas: There is a potential for subsurface gas generation due to the unknown integrity of the tanks.

5.2 SWMU #5 - Steel Collection Tank (Photo 4)

5.2.1 Information Summary

Unit Description: This unit is located on a concrete pad adjacent to and east of a shed that is located north of the Cooper Engine Room. This aboveground unit is a horizontal steel tank measuring 30 inches in diameter by 5 feet long. The unit stands on short metal legs and has a capacity of 150 gallons. This unit was used to store Stoddard solvent prior to discharging it to the open drain system. [Ref. 7]

Dates of Operation: The start-up date of this unit was not known by facility representatives. It was taken out of service in 1987. [Ref. 7]

Wastes Managed: This unit collected Stoddard solvent used to wash down the floor of the Cooper Engine Room [Ref. 7]. This unit discharged the solvent via the open drain system to the belowground Oil-Water Separator (SWMU #7). [Ref. 2]

Release Controls: The unit is situated on a concrete pad without curbing. It discharges by gravity flow to the Oil-Water Separator (SWMU #7).

History of Releases: There is no documented release history for this unit. The unit appeared to be in good condition during the VSI with no visible signs of past releases.

5.2.2 Release Potential

- Soil/Ground Water: The potential for release to soil and ground water is low due to the observed integrity of the unit.
- Surface Water: There is no potential for release to surface water due to the absence of nearby bodies of surface water.
- Air: The potential for release to air is low due to the enclosed construction of the unit and it discharges via a pipe.
- Subsurface Gas: There is no potential for generation of subsurface gas due to the aboveground location and observed integrity of the unit.

5.3 SWMU #6 - Gunbarrel (Photo 12)

5.3.1 Information Summary

Unit Description: This aboveground unit is a closed-top steel tank measuring approximately 10 feet in diameter by 20 feet high. It has a capacity of about 300 barrels. The unit is located inside an unlined containment basin constructed of native caliche; a 3-foot dike surrounds the containment basin. The Slop Oil Tanks (SWMUs #8-11) and the Precoat Slop Water Tank (SWMU #19) are also located in the containment area. This unit separates the oil and water components of the hydrocarbon liquids separated from inlet gas. [Ref. 7]

Dates of Operation: The start-up date for this unit is unknown; it is currently in service [Ref. 7].

Wastes Managed: This unit collects hydrocarbon liquids separated from the inlet gas. The Gunbarrel separates the oil-water mixture and discharges the oil component to the Slop Oil Tanks (SWMUs #8-11) and the aqueous component to the Oil-Water Separator (SWMU #7). [Ref. 2]

Release Controls: The unit is located inside an unlined containment basin constructed of native caliche. The dike is approximately 3 feet high. [Ref. 7]

History of Releases: There is no documented release history for this unit. The unit appeared to be in good condition during the VSI with no visible signs of past releases.

5.3.2 Release Potential

- Soil/Ground water: The release potential to soil and ground water is low due to the observed integrity of the unit.

- Surface Water: There is no potential for release to surface water due to the absence of nearby bodies of surface water.

- Air: The release potential to air is low due to the enclosed construction of the unit.

- Subsurface Gas: There is a low potential for subsurface gas generation due to the observed integrity and aboveground location of the tank.

5.4 SWMU #7 - Oil-Water Separator (Photo 10)

5.4.1 Information Summary

Unit Description: This unit is an underground steel tank measuring approximately 6 feet in diameter by 20 feet long. The tank has a capacity of 3000 gallons. This unit also includes two sumps located at the east end of the tank. Each sump is approximately 3 feet in diameter by 10 to 12 feet deep and has a 500-gallon capacity. [Ref. 7] The unit separates the oil and water components of wastewater and sends each component to the appropriate sump for delivery to storage tanks. The aqueous stream is sent to the Wastewater Tanks (SWMUs #12-14) and the oil stream is sent to the Slop Oil Tanks (SWMUs #8-11). [Ref. 2]

Dates of Operation: This unit was installed in 1980 or 1981 and is currently in operation. [Ref. 7]

Wastes Managed: This unit receives oil, via the open drain system, discharged by the Engine Drain Tanks (SWMUs #1-4), other hydrocarbon liquids separated from inlet gas, and the separated aqueous component from the Gunbarrel (SWMU #6). [Ref. 2] The wastes are expected to contain 40 CFR Part 261 Appendix VIII constituents including complex hydrocarbons and heavy metals.

Release Controls: There are no identified release controls to prevent overflow of this unit.

History of Releases: There is no documented release history for this unit. The unit appeared to be in good condition during the VSI with no visible signs of past releases.

5.4.2 Release Potential

- Soil/Ground Water: The potential for release to soil and ground water is unknown since the integrity of the underground unit could not be verified during the VSI.
- Surface Water: There is no potential for release to surface water due to the absence of nearby bodies of surface water.
- Air: The potential for release to air is low due to the enclosed construction of the unit.
- Subsurface Gas: The potential for generation of subsurface gas is unknown since the integrity of the underground unit could not be verified during the VSI.

5.5 SWMUs #8-11 - Slop Oil Tanks (4) (Photos 12 and 15)

5.5.1 Information Summary

Unit Description: These aboveground units are closed-top steel tanks of two different sizes. Two of the tanks measure approximately 10 feet in diameter by 15 feet tall and have a capacity of 210 bbl. The other two tanks are about 15 feet in diameter by 15 feet tall. The tanks are located inside an unlined containment basin constructed of native caliche; a 3-foot dike surrounds the containment. These units store slop oil before it is trucked offsite for treatment and sale. The Gunbarrel (SWMU #6) and the Precoat Slop Water Tank (SWMU #19) are also located in the containment area. [Ref. 7]

Dates of Operation: The start-up dates for these units is unknown, but they are currently in service. [Ref. 7]

Wastes Managed: These tanks receive the separated oil components from the Gunbarrel (SWMU #6) and the Oil-Water Separator (SWMU #7). The oil is stored until it is trucked to the heater treater in Hobbs for treatment and then delivery to a Phillips sales pipeline. [Ref. 7] The wastes are expected to contain 40 CFR Part 261 Appendix VIII constituents including complex hydrocarbons and heavy metals.

Release Controls: These units are located inside an unlined containment basin constructed of native caliche. The dike is approximately 3 feet high. [Ref. 7]

History of Releases: There is no documented release history for these units. The units appeared to be in good condition during the VSI with no visible signs of past releases.

5.5.2 Release Potential

- Soil/Ground water: The release potential to soil and ground water is low due to the observed integrity of the units.
- Surface Water: There is no potential for release to surface water due to the absence of nearby bodies of surface water.
- Air: The release potential to air is low due to the enclosed construction of the units.
- Subsurface Gas: There is a low potential for subsurface gas generation due to the observed integrity and aboveground location of the tanks.

5.6 SWMUs #12-14 - Wastewater Tanks (3) (Photos 13 and 15)

5.6.1 Information Summary

Unit Description: These aboveground units are closed-top steel tanks situated on individual concrete pads. Each tank measures approximately 12 feet in diameter by 20 feet high with a capacity of 750 barrels. The tanks store wastewater before it is discharged to an offsite injection well. The tanks are connected to each other by overhead and underground pipelines. The wastewater is received by Wastewater Tank No. 1, where solids settle out. The solids are pumped out of the tank by vacuum truck and transported to a disposal pit at an offsite injection well located 9 to 10 miles northeast of the plant. The aqueous component in Tank No. 1 flows by overhead pipeline to Tank No. 2, which discharges the water to the Rice Engineering Vacuum Salt Water Disposal System. The discharged wastewater is sent by pipeline to an offsite Class II injection well. Tank No. 3 is connected by underground pipeline to Tank No. 2; Tank No. 3 is only used as a back-up for Tank No. 2. [Ref. 2 and 7]

Dates of Operation: The start-up date for these units is unknown, but they are currently in service. [Ref. 7]

Wastes Managed: These units receive wastewater from the Oil-Water Separator (SWMU #7) and blowdown from the Cooling Towers (SWMUs #15-17) and boilers. [Ref. 2 and 7]

Release Controls: The tanks are connected by pipelines allowing them to overflow in series to the next in line. [Ref. 7]

History of Releases: There is no documented release history for these units. The units appeared to be in good condition during the VSI with no visible signs of past releases.

5.6.2 Release Potential

- Soil/Ground Water: The potential for release to soil and ground water is low due to the observed integrity of the units during the VSI and the overflow release controls.
- Surface Water: There is no potential for release to surface water due to the absence of nearby bodies of surface water.
- Air: There is a low potential for release to air due to the enclosed construction of the unit.
- Subsurface Gas: The potential for generation of subsurface gas is low due to the observed integrity of the units during the VSI and the overflow release controls.

5.7 SWMUs #15-17 - Cooling Towers (3) (Photos 7-9)

5.7.1 Information Summary

Unit Description: There are three Cooling Towers at the Lee Plant. The Cooling Towers provided noncontact cooling water for the engine jacket water and process cooling water. All of the units are open recirculating cooling towers constructed over concrete containment basins and are called the Engine Cooling Tower (SWMU #15), the Refrigeration Cooling Tower (SWMU #16), and the Plant Cooling Tower (SWMU #17). The Engine Cooling Tower had a recirculation rate of 1860 gpm with an approximate raw water make-up rate of 28 gpm. The Plant Cooling Tower had a recirculation rate of 3500 gpm with an approximate raw water make-up rate of 63 gpm. The Refrigeration Cooling Tower was dismantled prior to the VSI; only the concrete containment basin remained at the time of the VSI. [Ref. 2 and 7]

Dates of Operation: The start-up dates for these units is unknown; these cooling towers were not active at the time of the VSI (see Photos 7-9).

Wastes Managed: This unit manages cooling water blowdown from the Cooling Towers. The raw water in these units is recirculated until the impurities in the water are concentrated to five times their inlet concentrations and then piped directly to the Wastewater Tanks (SWMUs #12-14), which discharge to a pipeline in Rice Engineering's Vacuum Salt Water Disposal System. Rice Engineering operates a Class II injection well offsite [Ref. 2].

A chromium-containing corrosion inhibitor was used in the noncontact cooling water until October 4, 1983 when its use ceased due to its potential to make the blowdown a characteristic hazardous waste. The chromium-containing blowdown was discharged to the Surface Impoundment (SWMU #18). [Ref. 16]. An aqueous mixture of an aromatic nitrogen heterocycle and sodium hydroxide has since been used as a corrosion inhibitor in the noncontact cooling water [Ref. 2].

Release Controls: These units are set in concrete basins [Ref. 7].

History of Releases: There is no documented history of releases for these units. The units appeared to be in good condition during the VSI with no visible signs of past releases.

5.7.2 Release Potential

- Soil/Ground Water: The release potential to soil and ground water is low due to the concrete basins associated with these units.
- Surface Water: There is no potential for release to surface water due to the absence of nearby bodies of surface water.
- Air: There is a low potential for release to air due to the non-hazardous nature of the wastes.
- Subsurface Gas: There is no potential for the generation of subsurface gas due to the aboveground location and the observed integrity of the units.

5.8 SWMU #18 - Surface Impoundment (Photo 11)

5.8.1 Information Summary

Unit Description: This RCRA-regulated unit is located at the east end of the facility and is going through closure. The unit received chromium-containing blowdown from the Cooling Towers (SWMUs #15-17). The unit was filled with caliche in 1984 and was certified closed by an independent professional engineer; however, the New Mexico Environmental Improvement Agency has not approved the closure and post-closure plan for the unit and continues to negotiate with the facility on closure requirements. The Surface Impoundment was comprised of three interconnected and unlined pits excavated into the native caliche. [Ref. 7] The dimensions of the three pits were (from west to east) 110 feet by 30 feet, 120 feet by 30 feet, and 110 feet by 165 feet [Ref. 5]. A ground-water monitoring system was installed around the unit based on regional ground-water flow, which is to the southeast. A new system, however, was installed shortly before the VSI since water levels in the first set of wells indicated that local ground-water flow was to the north. [Ref. 18]

Dates of Operation: The facility representatives stated that the unit was probably built in 1953. The unit is going through closure and was filled with caliche in 1984.

Wastes Managed: This unit received cooling tower blowdown from the Cooling Towers, which used a chromium-containing corrosion inhibitor in its cooling water that may have occasionally exceeded EP Toxicity limits for chromium. [Ref. 16] Analyses of ground-water samples collected in August 1985 from the old ground-water monitoring system for the unit indicated that chromium was not detected in any of the monitoring wells; however, volatile organics from an unconfirmed source were found in all four monitoring wells [Ref. 24].

<u>Release Controls</u>: There are no release controls for this unit.

<u>History of Releases</u>: There is no documented release history for this unit.

5.8.2 <u>Release Potential</u>

- <u>Soil/Ground Water</u>: The release potential to soil and ground water is high due to the unlined construction of the unit and the burial of the chromium-containing wastes in place.
- <u>Surface Water</u>: There is no potential for release to surface water due to the absence of nearby bodies of surface water.
- <u>Air</u>: There is a low potential for release to air from this unit due to the covered construction of the unit.
- <u>Subsurface Gas</u>: There is a low potential for subsurface gas generation due to the reported inorganic nature of the wastes.

5.9 SWMU #19 - Precoat Slop Water Tank (Photo 12)

5.9.1 Information Summary

Unit Description: This aboveground unit is a closed-top steel tank measuring approximately 10 feet in diameter by 15 feet high. It has a capacity of about 210 barrels. The unit is located inside an unlined containment basin constructed of native caliche; a 3-foot dike surrounds the containment. The unit stores slop water generated while backwashing diatomaceous earth filters used in the monoethanolamine sweetening process. The Slop Oil Tanks (SWMUs #8-11) and the Gunbarrel (SWMU #6) are also located in the containment area. [Ref. 7]

Dates of Operation: The start-up date for this unit is unknown, but it is currently in service.

Wastes Managed: The monoethanolamine sweetening process employs diatomaceous earth to remove fine particulate matter that the monoethanolamine solution removes from the inlet gas. The diatomaceous earth is backwashed to the Precoat Slop Water Tank where the solids settle out. The slop water is discharged from the tank and trucked offsite to an injection well located 9 to 10 miles from the plant. The diatomaceous earth is removed from the tank and transported offsite by INW of Lubbock, Texas. [Ref. 7]

Release Controls: The unit is located inside an unlined containment basin constructed of native caliche. The dike is approximately 3 feet high. [Ref. 7]

History of Releases: There is no documented release history for this unit. The unit appeared to be in good condition during the VSI with no visible signs of past releases.

5.9.2 Release Potential

- Soil/Ground water: The release potential to soil and ground water is low due to the observed integrity of the unit.

- Surface Water: There is no potential for release to surface water due to the absence of nearby bodies of surface water.

- Air: There is no potential for release to air due to the enclosed construction of the unit and nonvolatile nature of the waste.

- Subsurface Gas: There is no potential for subsurface gas generation due to the closed construction and aboveground location of the tank.

5.10 SWMUs #20-22 - Flares (3) (Photo 11)

5.10.1 Information Summary

Unit Description: There are a total of three Flares at the facility: the Acid Gas Flare (SWMU #20), the Process Flare (SWMU #21), and the Field Gas Flare (SWMU #22). These units are located at the east end of the plant, just east of the Surface Impoundment (SWMU #18). All of the flares are at least 50 feet tall. The units are used to burn field, inlet, and process gases. [Ref. 7]

Dates of Operation: The start-up dates of these units is unknown, but they are currently in operation. [Ref. 7]

Wastes Managed: The Flares are used to burn off field gas during a plant upset, inlet gas, and process gases. The Process Flare receives gases from the Closed Drain Separator (SWMU #25) and the Cold Drain Vaporizing Tank (SWMU #26). The units discharge to the atmosphere under permit. [Ref. 7]

Release Controls: There are no release controls for these units.

History of Releases: There is no documented unregulated release history for these units.

5.10.2 Release Potential

- Soil/Ground Water: There is a low potential for release to soil and ground water since the gas is flared off to the atmosphere.

- Surface Water: There is no potential for release to surface water due to the absence of nearby bodies of surface water.

- Air: The units discharge to the atmosphere under permit.

- Subsurface Gas: There is a low potential for generation of subsurface gas since the gas is flared off to the atmosphere.

5.11 SWMU #23 - Sulfur Incinerator (Photos 16-18)

5.11.1 Information Summary

Unit Description: This unit is located at the sulfur recovery plant, which employs a three-stage Claus sulfer recovery process. The Sulfur Incinerator burns Claus tail gas from the sulfur recovery unit and discharges 4.2 MCF/hr through its 100-foot stack to the atmosphere. The incineration temperature of the unit is 1200°F and it is fueled by sweet natural gas. [Ref. 39 and 40]

Dates of Operation: The unit began operation on March 21, 1981 and is currently in service [Ref. 7 and 41].

Wastes Managed: The unit burns waste gases from the sulfur recovery unit. The waste composition is 0.40 percent hydrogen sulfide, 0.38 percent sulfur dioxide, 0.13 percent sulfur, 28.67 percent carbon dioxide, 62.46 percent nitrogen, and 7.96 percent water. [Ref. 40] The unit operates under Air Quality Permit No. 276 [Ref. 41]

Release Controls: The unit is operated to minimize the formation of incomplete combustion products.

History of Releases: There is no documented history of nonpermitted releases from this unit.

5.11.2 Release Potential

- o Soil/Ground Water: There is a low potential for release to soil and ground water since the unit discharges to the atmosphere.
- o Surface Water: There is no potential for release to surface water due to the absence of nearby bodies of surface water and the gaseous nature of the waste.
- o Air: Releases to air from this unit are regulated by the New Mexico Environmental Improvement Division.
- o Subsurface Gas: There is a low potential for subsurface gas generation since the unit discharges to the atmosphere.

5.12 SWMU #24 - Former Landfill (Photo 14)

5.12.1 Information Summary

Unit Description: This unit was initially identified prior to the VSI from the facility drawing provided with the facility's Part A application [Ref. 5]. Following the VSI, the unit was also identified from the files in a Phillips plot plan for the Lee Plant, as well as in a Phillips surveyed plat of the Lee Plant. Both the plot plan and the plat indicate an area of 4.14 acres at the southeast corner of the Lee Plant as a disposal area; the dimensions of the rectangular disposal area are reported as 250 feet from north to south and 722 feet from east to west. The plat identifies the disposal area as Tract #3 of four making up the contiguous property of the Lee Plant. [Ref. 42] The Part A application facility drawing identifies the location of the unit as being smaller and a little north of the location shown in both the surveyed plat and the plot plan [Ref. 5].

The facility representatives had no knowledge of the unit and the area showed no distinguishing features at the time of the VSI. The facility representatives stated that scrap metal may have been accumulated on the ground and mistakenly identified as a landfill at the time the drawing was made in 1980. During the VSI, only an out-of-service process tank was seen in the general area of the unit (see Photo 14). [Ref. 3]

Dates of Operation: The dates of operation for this unit are unknown.

Wastes Managed: The wastes, if any, managed by this unit are unknown.

Release Controls: Release controls for this unit are unknown.

History of Releases: There is no documented history of releases for this unit.

5.12.2 Release Potential

- Soil/Ground Water: The release potential to soil and ground water is unknown since there is little information on the unit.

- Surface Water: There is no potential for release to surface water due to the absence of nearby bodies of surface water.

- Air: The release potential to air is unknown since there is little information on the unit.

- Subsurface Gas: The potential for generation of subsurface gas is unknown since there is little information on the unit.

5.13 SWMU #25 - Closed Drain Separator (No photo)

5.13.1 Information Summary

Unit Description: This unit was identified following the VSI during a detailed review of information provided by Phillips during the VSI. The unit is located aboveground in the process area of the facility. It receives liquids from the closed drain system, which is associated with process units. Liquids with low specific gravities evaporate off in the separator and are discharged to the Process Flare (SWMU #21) where they are burned. Liquids that do not volatize in the separator flow into the open drain system to the Oil-Water Separator (SWMU #7). [Ref. 2]

Dates of Operation: The start-up date for this unit is not known; the unit is currently in use [Ref. 2].

Wastes Managed: This unit receives liquids from the closed drain system, which is a high-pressure drain system associated with the process units [Ref. 2].

Release Controls: The unit discharges by gravity flow to the Oil-Water Separator (SWMU #7) [Ref. 2].

History of Releases: There is no documented history of releases from this unit.

5.13.2 Release Potential

- Soil/Ground Water: The potential for release to soil and ground water is unknown since the unit was not observed during the VSI.

- Surface Water: There is no potential for release to surface water due to the absence of nearby bodies of surface water.

- Air: The potential for release to air is unknown since the unit was not observed during the VSI.

- Subsurface Gas: The potential for generation of subsurface gas is unknown since the unit was not observed during the VSI.

5.14 SWMU #26 - Cold Drain Vaporizing Tank (No photo)

5.14.1 Information Summary

Unit Description: This unit was identified following the VSI during a detailed review of information provided by Phillips during the VSI. The unit is located aboveground in the process area of the facility. It receives liquids from the cold drain system, which is associated with process units. Drain liquids from the turboexpander (cryogenic plant) flow to the unit where they are heated. Vapors produced by heating the drain liquids are discharged from the tank to the Process Flare (SWMU #21). Liquids that do not volatize in the tank flow into the open drain system to the Oil-Water Separator (SWMU #7). [Ref. 2]

Dates of Operation: The start-up date for this unit is not known; the unit is currently in use [Ref. 2].

Wastes Managed: This unit receives liquids from the cold drain system, which is an atmospheric drain system associated with the process units [Ref. 2].

Release Controls: The unit discharges by gravity flow to the Oil-Water Separator (SWMU #7) [Ref. 2].

History of Releases: There is no documented history of releases from this unit.

5.14.2 Release Potential

- Soil/Ground Water: The potential for release to soil and ground water is unknown since the unit was not observed during the VSI.

- Surface Water: There is no potential for release to surface water due to the absence of nearby bodies of surface water.

- Air: The potential for release to air is unknown since the unit was not observed during the VSI.

- Subsurface Gas: The potential for generation of subsurface gas is unknown since the unit was not observed during the VSI.

6.0 AREAS OF CONCERN

There were no areas of concern observed during the VSI.

7.0 CONCLUSIONS

7.1 SWMUs #1-4 - Engine Drain Tanks (4)

Suggested Action: No further action is suggested at this time.

Reasons: Engine Drain Tanks Nos. 1, 3, and 4 were recently installed in 1987; Engine Drain Tank No. 2 is no longer in service. All four tanks are of closed construction, located below grade, and receive and discharge waste oil via pipelines. No evidence of release was discovered in reviewing the files during the PR or observed during the VSI.

Supplemental Information: Routine inspection to verify the structural integrity of the units is recommended.

7.2 SWMU #5 - Steel Collection Tank

Suggested Action: No further action is suggested at this time.

Reasons: This unit is an aboveground tank constructed of steel and is located on a concrete pad. This unit was used to store Stoddard solvent prior to discharging it to the open drain system. The tank is no longer in service and was observed to be in good condition during the VSI. No evidence of release was discovered in reviewing the files during the PR or observed during the VSI.

7.3 SWMU #6 - Gunbarrel

Suggested Action: No further action is suggested at this time.

Reasons: This unit is an aboveground closed-top tank constructed of steel. This unit separates the oil and water components of the hydrocarbon liquids separated from inlet gas. It was observed to be in good condition during the VSI. No evidence of release was discovered in reviewing the files during the PR or observed during the VSI.

7.4 SWMU #7 - Oil-Water Separator

Suggested Action: No further action is suggested at this time.

Reasons: This unit is of closed construction, located below grade, and receives and discharges oil and aqueous components of wastewater via pipelines. The unit receives wastewater from the open drain system, hydrocarbon liquids separated from inlet gas, and the separated aqueous component from the Gunbarrel (SWMU #6). No evidence of release was discovered in reviewing the files during the PR or observed during the VSI.

Supplemental Information: Routine inspection to verify the structural integrity of the unit is recommended.

7.5 SWMUs #8-11 - Slop Oil Tanks (4)

Suggested Action: No further action is suggested at this time.

Reasons: These units are aboveground steel tanks located in an unlined containment basin. These units store slop oil before it is trucked offsite for treatment and sale. They were observed to be in good condition during the VSI. No evidence of release was discovered in reviewing the files during the PR or observed during the VSI.

7.6 SWMUs #12-14 - Wastewater Tanks (3)

Suggested Action: No further action is suggested at this time.

Reasons: These units are aboveground tanks constructed of steel. These tanks store wastewater before it is discharged to an offsite injection well. They were observed to be in good condition during the VSI. No evidence of release was discovered in reviewing the files during the PR or observed during the VSI.

7.7 SWMUs #15-17 - Cooling Towers (3)

Suggested Action: No further action is suggested at this time.

Reasons: These units are open recirculating cooling towers constructed above concrete basins, which were observed to be in good condition during the VSI. The Cooling Towers provided noncontact cooling water for the engine jacket water and process cooling water. A chromium containing corrosion inhibitor was formerly used in the noncontact cooling water; the blowdown was discharged to the Surface Impoundment (SWMU #18). All three cooling towers are no longer in service. No evidence of release was discovered in reviewing the files during the PR or observed during the VSI.

7.8 SWMU #18 - Surface Impoundment

Suggested Action: No further action is suggested for this unit.

Reasons: This RCRA-regulated unit is unlined and was closed with chromium-containing wastes buried in-place. The unit was filled with caliche in 1984 and certified closed by an independent professional engineer. The unit received chromium-containing blowdown from the Cooling Towers (SWMUs #15-17). There is no documented evidence of a release from the unit. Closure of this unit is being coordinated with the New Mexico Environmental Improvement Division.

Supplemental Information: Future closure activities should be coordinated with the New Mexico Environmental Improvement Division.

7.9 SWMU #19 - Precoat Slop Water Tank

Suggested Action: No further action is suggested at this time.

Reasons: This unit is an aboveground tank constructed of steel and located in an unlined containment basin. The unit stores slop water generated while backwashing diatomaceous earth filters used in the monoethanolamine sweetening process. It was observed to be in good condition during the VSI. No evidence of release was discovered in reviewing the files during the PR or observed during the VSI.

7.10 SWMUs #20-22 - Flares (3)

Suggested Action: No further action is suggested at this time.

Reasons: These units are located aboveground and discharge to the atmosphere under permit. The units are used to burn field, inlet, and process gases. No evidence of a nonpermitted release was discovered in reviewing the files during the PR or observed during the VSI.

7.11 SWMU #23 - Sulfur Incinerator

Suggested Action: No further action is suggested at this time.

Reasons: This unit is located aboveground and discharges to the atmosphere under permit. The incineration temperature of the unit is 1200°F and it is fueled by sweet natural gas. It burns Claus tail gas from the sulfur recovery unit. No evidence of a nonpermitted release was discovered in reviewing the files during the PR or observed during the VSI.

7.12 SWMU #24 - Former Landfill

Suggested Action: No further action is suggested for this unit at this time.

Reasons: No evidence of the unit was observed during the VSI.

Supplemental Information: Although there is not sufficient evidence to compel a sampling visit or an RFI, the facility should provide documentation confirming the location of the unit, the construction of this unit, and the nature of the wastes managed. If the wastes are found to have contained hazardous constituents, then an RFI may be warranted.

7.13 SWMU #25 - Closed Drain Separator

Suggested Action: No further action is suggested at this time.

Reasons: This unit is located aboveground in the process area of the facility. It receives liquids from the closed drain system. Liquids with low specific gravities evaporate off in the separator and are discharged to the Process Flare (SWMU #21). It discharges the remaining liquids by gravity flow to the Oil-Water Separator. No evidence of release was discovered in reviewing the files during the PR.

7.14 SWMU #26 - Cold Drain Vaporizing Tank

Suggested Action: No further action is suggested at this time.

Reasons: This unit is located aboveground in the process area of the facility. The unit receives drain liquids from the turboexpander (cryogenic plant) and heats the liquids, which produce vapors that are discharged to the Process Flare (SWMU #21). It discharges the remaining liquids by gravity flow to the Oil-Water Separator [SWMU #7] and vapors to the Process Flare (SWMU #21). No evidence of release was discovered in reviewing the files during the PR.

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10. EPA Region VI, Compliance Order and Notice of Opportunity for Hearing for Lee Plant, September 29, 1983.

11. Phillips Petroleum Company, Letter to EPA Region VI submitting Answer and Request for Hearing, October 27, 1983.

12. Phillips Petroleum Company, Letter to EPA Region VI regarding Compliance Order for Lee Plant, December 15, 1983.

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14. EPA Region VI, Letter to New Mexico Environmental Improvement Division regarding May 8, 1984 inspection of Lee Plant, July 16, 1984.

15. Phillips Petroleum Company, Letter to New Mexico Environmental Improvement Division regarding violations found during the May 8, 1984 inspection of the Lee Plant, July 18, 1984.

16. Phillips Petroleum Company, Closure and Post-Closure Plan for Hazardous Waste Facility at Lee Natural Gasoline Plant, July 27, 1984.

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18. Phillips Petroleum Company, Closure and Post-Closure Plan Sampling and Analysis Report for the Lee Plant, October 29, 1984.

19. Harding Lawson Associates, Closure and Post-Closure Plan Review, no date.

20. New Mexico Environmental Improvement Division, Letter to Phillips Petroleum Company with August 27, 1985 inspection report for the Lee Plant, September 26, 1985.

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22. Phillips Petroleum Company, Letter to EPA Region VI, November 12, 1985.

23. Phillips Petroleum Company, Letter to New Mexico Environmental Improvement Division with attached supplemental sampling results, March 21, 1986.

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30. New Mexico Environmental Improvement Division, Letter to Phillips Petroleum Company regarding September 23, 1987 meeting, October 13, 1987.

31. New Mexico Health and Environment Department, Notice of Violation for the Lee Plant, October 27, 1987.

32. New Mexico Health and Environment Department, Letter to Phillips Petroleum Company regarding October 27, 1987 and January 25, 1988 Notices of Violation, February 2, 1988.

33. New Mexico Environmental Improvement Division, Letter to Phillips Petroleum Company accepting proposed schedule for compliance with January 25, 1988 Notice of Violation, February 26, 1988.

34. Soil Conservation Service, Soil Survey, Lea County, New Mexico, January 1974.

35. Alexander Nicholson, Jr. and Alfred Clebsch, Jr., Geology and Ground-Water Conditions in Southern Lea County, New Mexico, Ground-Water Report 6, New Mexico State Bureau of Mines and Mineral Resources, 1961.

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40. Phillips Petroleum Company, Letter to New Mexico Environmental Improvement Division regarding installation of an amine treater and a sulfur recovery plant at the Lee Plant, November 27, 1979.

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42. Phillips Petroleum Company, Plot plan and surveyed plat for the Lee Plant, no date.

APPENDIX A

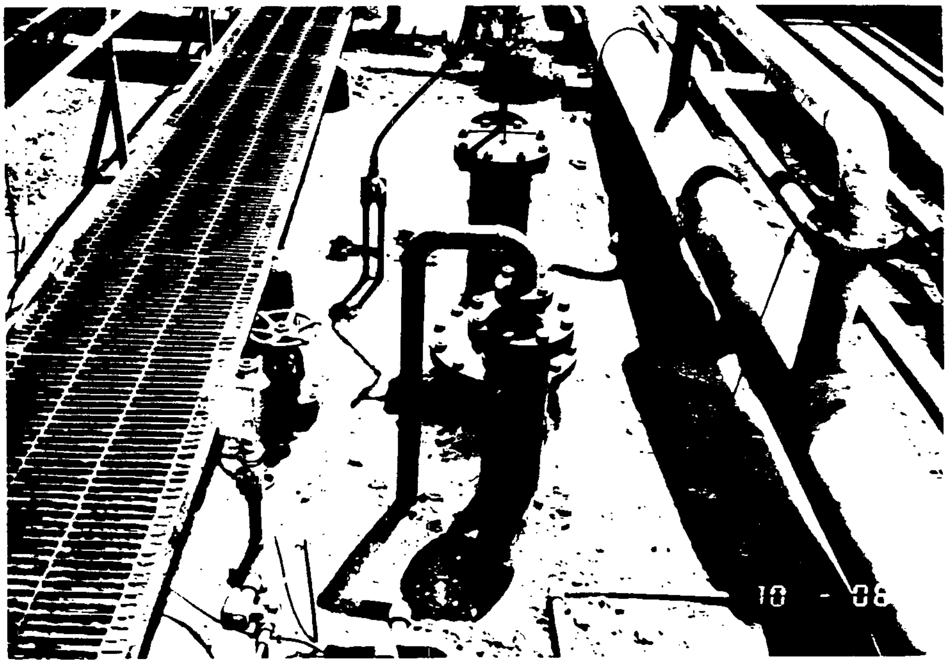
VSI SUMMARY TRIP REPORT AND PHOTOGRAPH LOG

VSI SUMMARY TRIP REPORT
Lee Natural Gas Plant, Phillips Petroleum Company
May 4, 1988

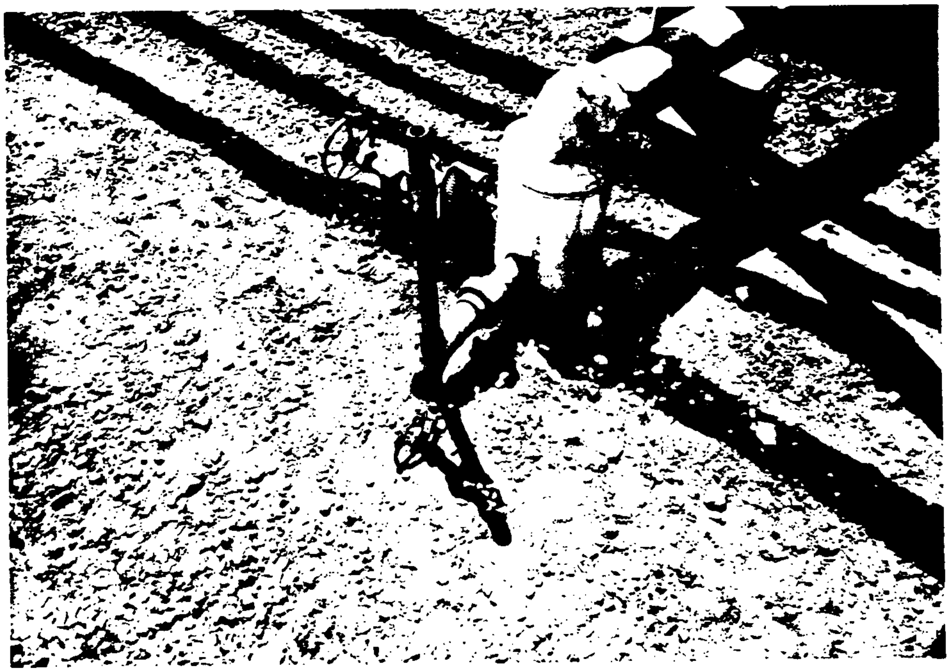
This appendix presents 18 photographs that were taken at the Phillips Petroleum Company Lee Plant near Buckeye, New Mexico. These photographs were taken during a Visual Site Inspection (VSI) conducted by A. T. Kearney on May 4, 1988.

May 4, 1988 was a partly cloudy day. The temperatures were in the lower 70s (°F) and a steady breeze blew from the south throughout the day. After a brief meeting in the office area, a tour of the facility was taken during which photographs were taken. The tour was followed by an indoor question and answer and information review session with Phillips Petroleum representatives.

The team conducting the VSI consisted of Christopher Nelson and Gary Walvatne of A. T. Kearney, Inc. Representing Phillips Petroleum were Michael T. Ford, Environmental Analyst, and Charlie Thompson, Lee Plant Superintendent.

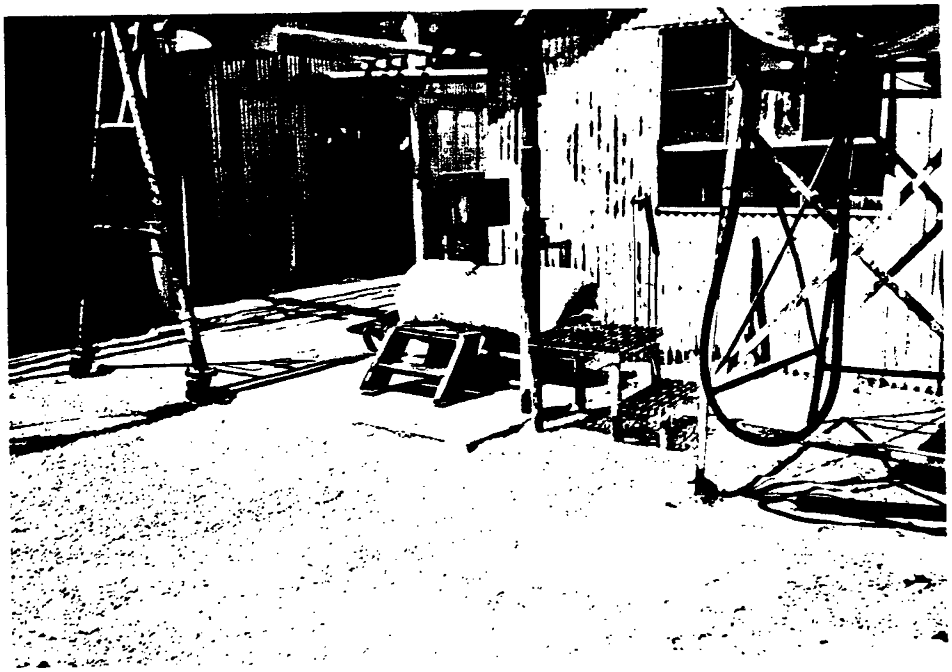


1. View of Engine Drain Tank No. 1 (SWMU #1).

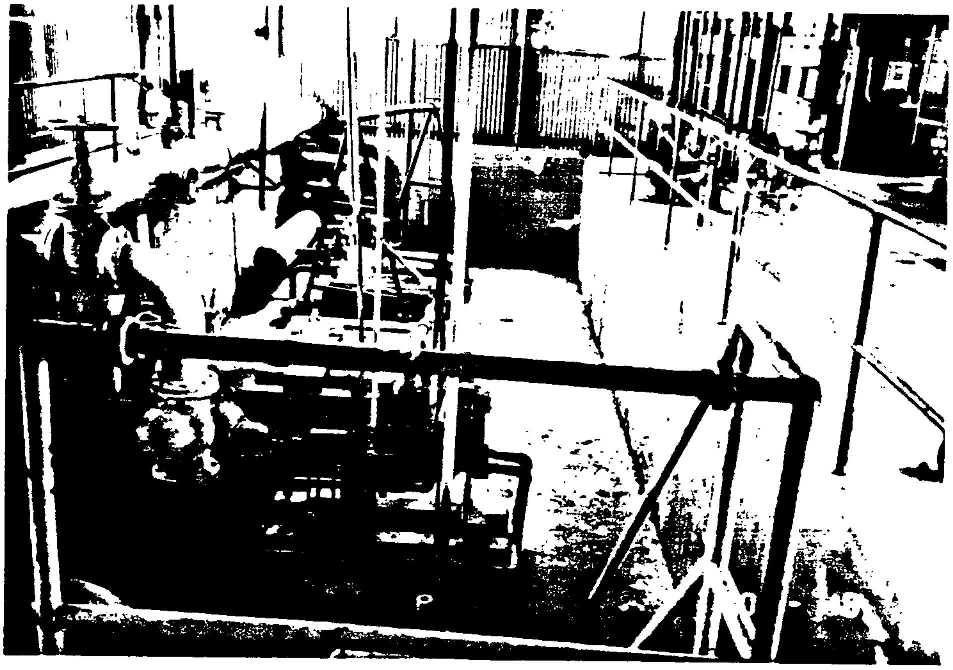


2. View of Engine Drain Tank No. 2 (SWMU #2).

3. View of Engine Drain Tank No. 3 (SWMU #3).

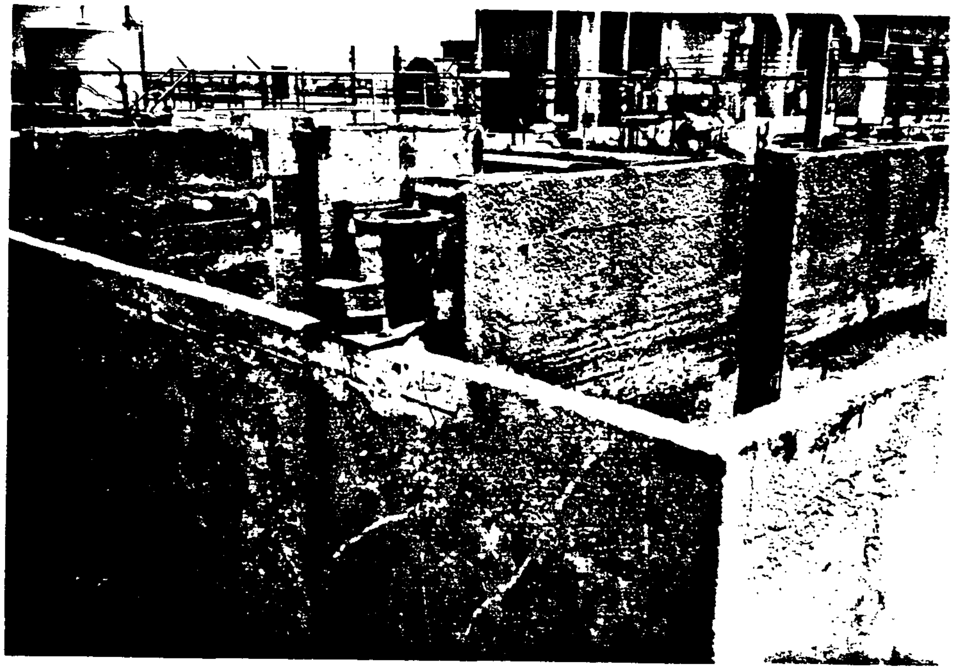


4. View of Steel Collection Tank (SWMU #5).

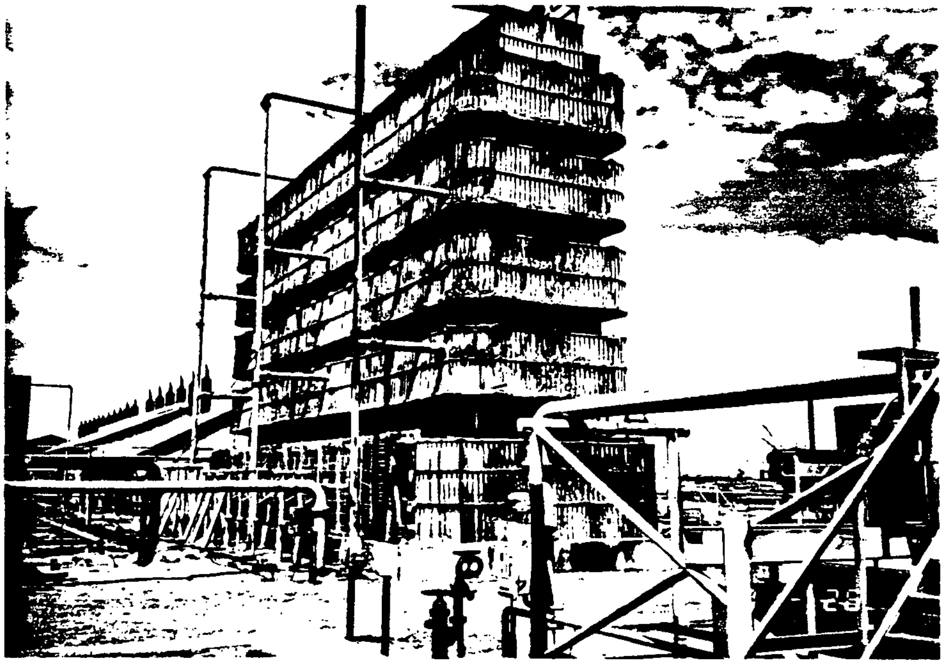


5. View of engine jacket water sump.

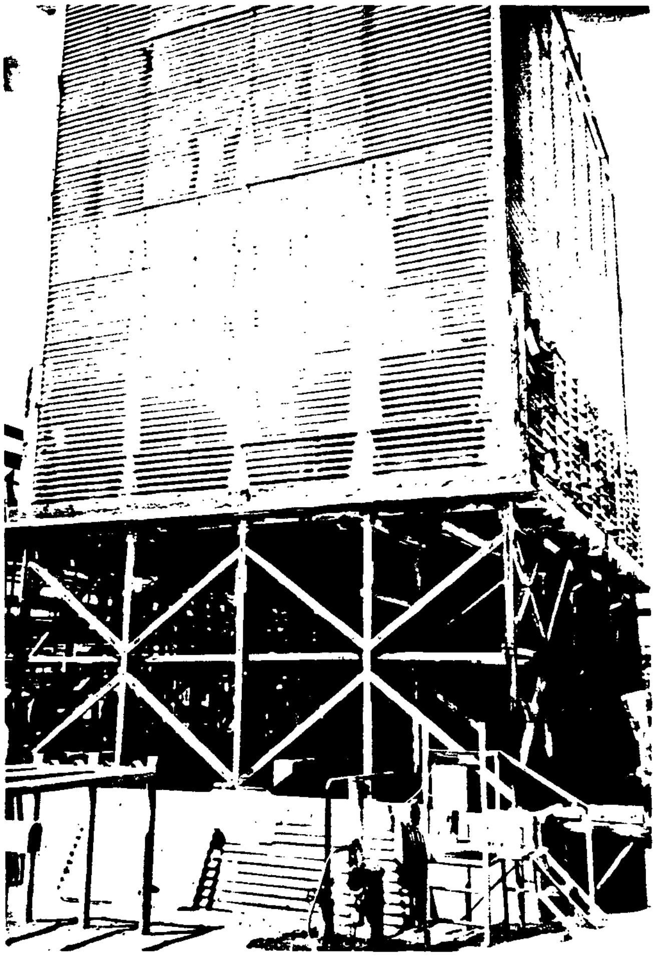
6. View of Engine Drain Tank No. 4 (SWMU #4).



7. View looking northeast of Refrigeration Cooling Tower basin (SWMU #16).



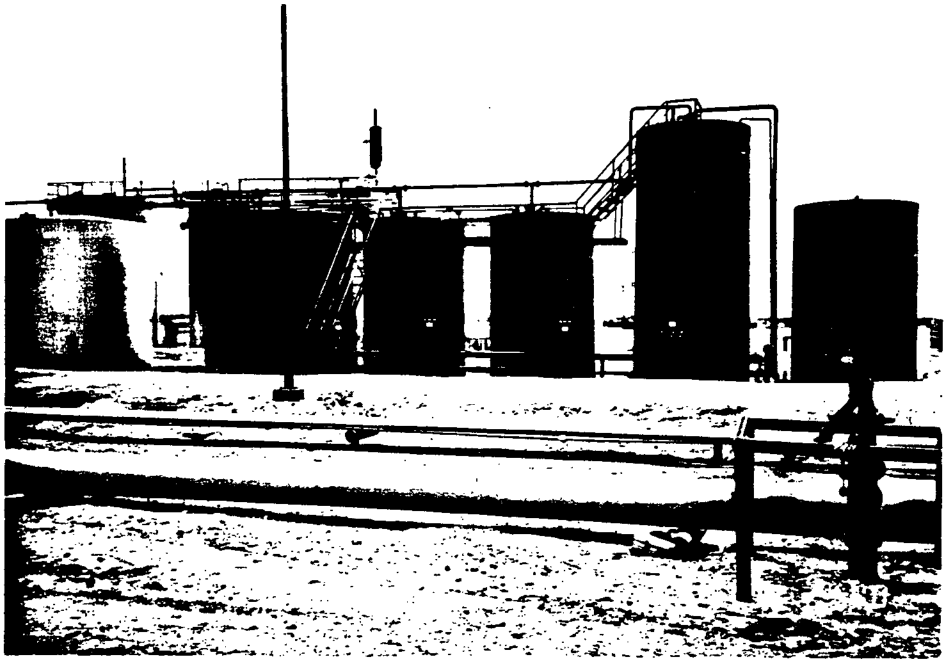
8. View looking northwest of Engine Cooling Tower (SWMU #15).



9. View looking south southeast of Plant Cooling Tower (SWMU #17).

10. View looking east of Oil-Water Separator (SWMU #7). Note the associated sumps in the upper right of the photo; the Oil Sump with pump is to the left and in back of the plant superintendent and the Water Sump is to his right.

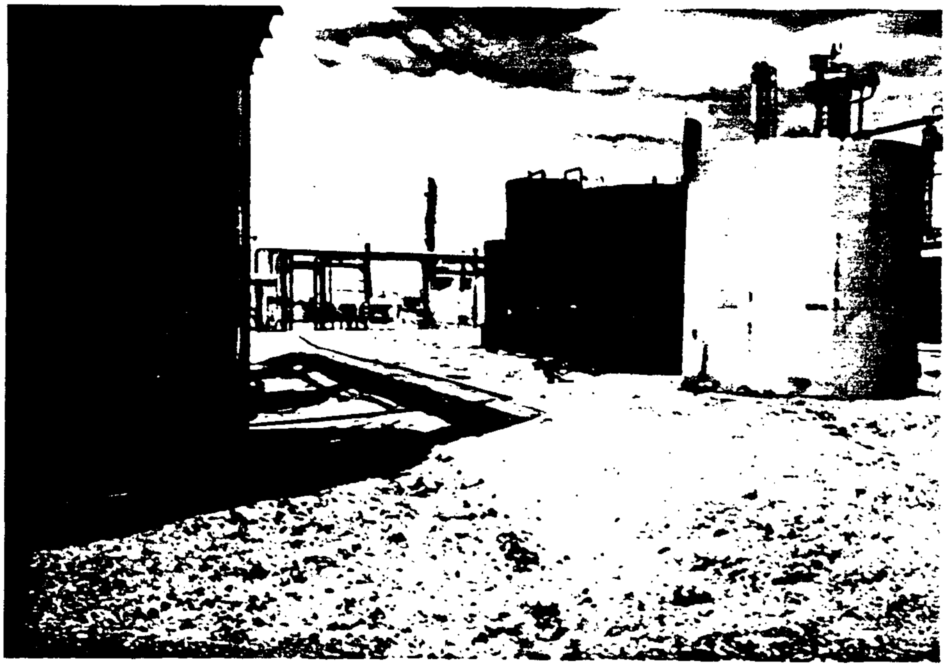
11. View looking east of the filled Surface Impoundment (SWMU #18). Note the Flares (SWMUs #20-22) in the background.



12. View looking south of (from left to right) four Slop Oil Tanks (SWMUs #8-11), the Gunbarrel (SWMU #6), and the Precoat Slop Water Tank (SWMU #19).

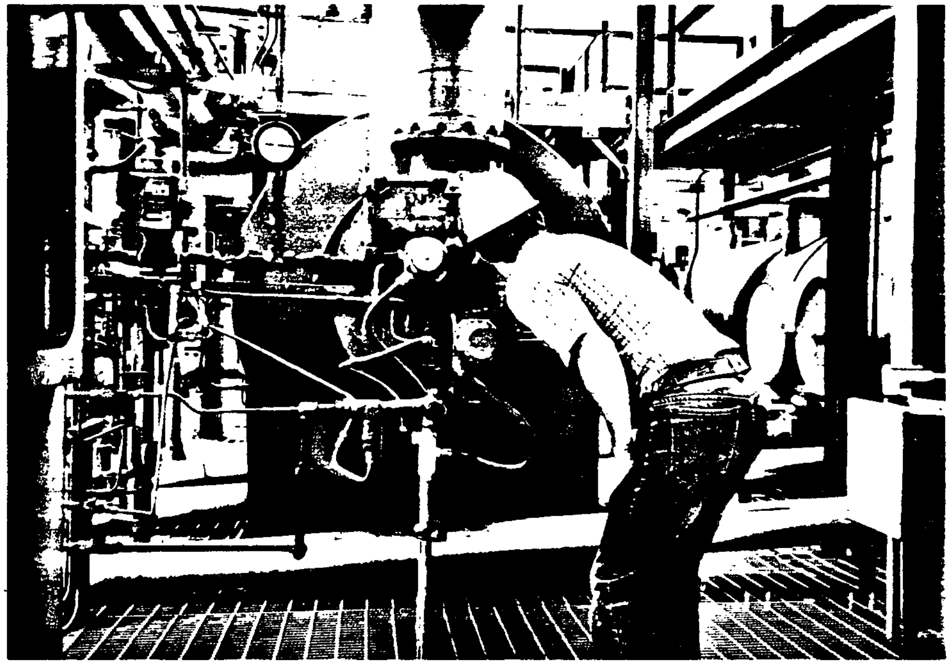
13. View looking northeast of the Wastewater Tanks (SWMUs #12-14). Tank No. 1 is on the left, Tank No. 2 is in the center, and Tank No. 3 is on the right.

14. View looking south in the general direction of the Former Landfill (SWMU #24). Note the empty process tank in the background.

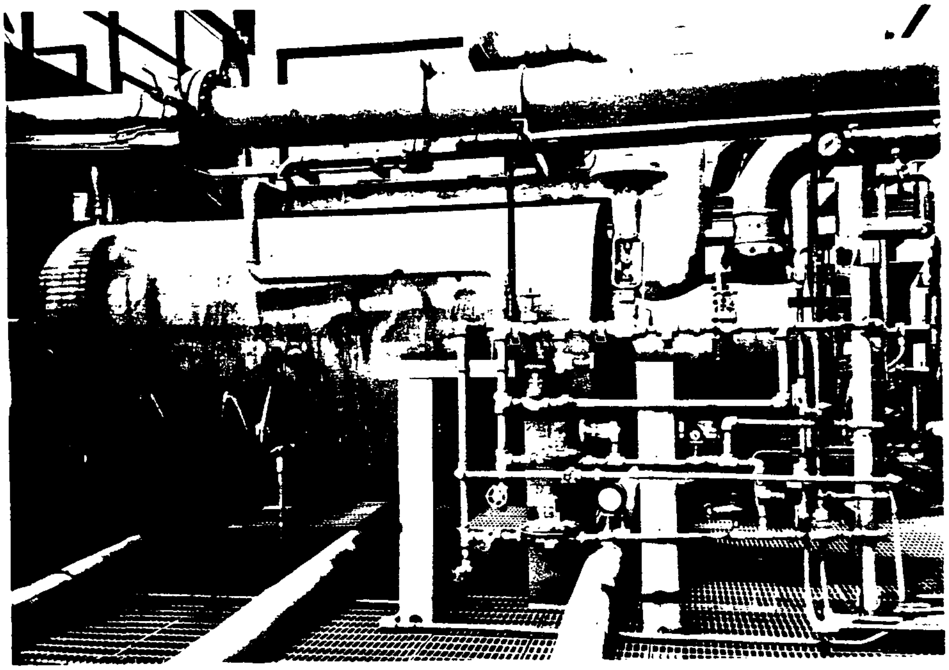


15. View looking west of the Wastewater Tanks (SWMUs 12-14) on the left and the Slop Oil Tanks (SWMUs #8-11) on the right.

16. View looking east of the sulfur recover plant. Note the Sulfur Incinerator stack (SWMU #23) on the left.

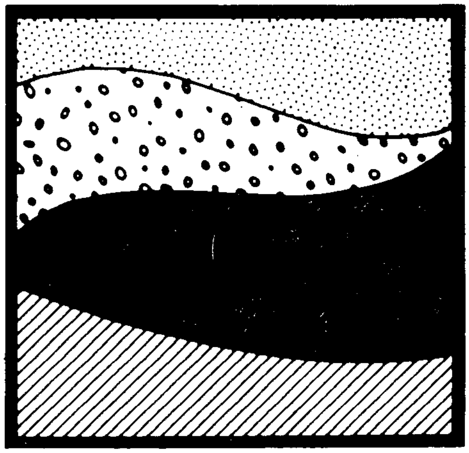


17. View looking south of the end of the Sulfur Incinerator (SWMU #23).



18. View looking east of the side of the Sulfur Incinerator (SWMU #23).

GCL



Received June 6, 1988
Cover letter is located
in Artesia, Eunice,
Lee & Lusk Enforcement
Files, dated June 6, 1988.

SAMPLING AND ANALYSIS PLAN FOR PHILLIPS 66 NATURAL GAS COMPANY ARTESIA, EUNICE, LEE AND LUSK GASOLINE PLANTS

June 3, 1988

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SAMPLING AND ANALYSIS PLAN FOR
PHILLIPS 66 NATURAL GAS COMPANY
ARTESIA, EUNICE, LEE AND LUSK
GASOLINE PLANTS

AMERICAN INSTITUTE OF PROFESSIONAL GEOLOGISTS
CERTIFICATE NUMBER
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CERTIFIED PROFESSIONAL GEOLOGIST

SUBMITTED BY: DATE:

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GCL Program Manager

______ 6-3-88
GCL Project Director

FORM/REPTSIGN.FRM

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SECTION 1.0

1.0 EXECUTIVE SUMMARY

A program of ground water sampling and analysis, including a written Sampling and Analysis Plan, is often required by State and Federal regulatory agencies. This manual is the Ground Water Sampling and Analysis Plan for the Phillips Natural Gas Company (Phillips) Artesia, Eunice, Lea and Lusk Gasoline Plants. Adherence to the procedures described herein will ensure the collection and analysis of ground-water samples which are:

- Free of contamination from any possible borehole effects;
- Representative of the physical and chemical characteristics of ground water in the uppermost aquifer;
- Consistent with procedures for collection, preservation, handling and analyses outlined in appropriate regulations and accepted published literature; and
- Collected in an efficient and cost-effective fashion.

This manual prescribes specific procedures for use at the Phillips sites, but is flexible enough to allow alternate procedures of equal environmental soundness when required by field conditions. The Sampling and Analysis Plan may be modified if necessary due to future changes in the hydrologic or environmental conditions at the sites.

Copies of this manual will be retained at each of the four sites throughout the period during which ground-water sampling will be required.

SECTION 2.0

2.0 PURPOSE, SCOPE AND REGULATORY BACKGROUND

2.1 PURPOSE

This manual is written as a practical guide for technical personnel engaged in ground-water sampling at the four Phillips sites in southeastern New Mexico. It describes in detail the necessary equipment, operational requirements and handling procedures for collecting ground-water samples. Procedures outlined herein are consistent with those specified for use at sites subject to the requirements of the Resource Conservation and Recovery Act (RCRA), and have been adapted to meet the specific requirements of ground-water monitoring at Phillips sites.

2.2 SCOPE

This manual is intended to be used both as an aid for training technical staff, and as a reference source for trained personnel. By careful adherence to the protocols described in this document, operators of the Phillips ground-water monitoring network can be assured that their water samples are uncontaminated by borehole effects and handling methods, and are representative of the ground-water quality in the uppermost aquifer.

In most circumstances, a program of ground-water monitoring and analysis is required as a condition of permit issuance. To comply with the language and intent of the regulations the ground water samples must:

- be collected according to a consistent sampling plan,
- be collected and transported in a manner which assures that no contaminants can be added to or removed from them,
- be transported to an appropriate laboratory under strict chain-of-custody procedures,
- accurately represent the condition and composition of ground water in the "uppermost aquifer",
- be analyzed according to a detailed analytical plan, including quality assurance/quality control steps.

Modern analytical techniques are capable of detecting many contaminants at levels of less than 1.0 part per billion (ppb). Since any statistically significant deviation from "background" may require an extensive assessment program, it is important that samples be collected in a clean, consistent and scientifically valid manner.

SECTION 3.0

3.0 DESIGN AND MAINTENANCE OF RCRA MONITOR WELLS

Geoscience Consultants, Ltd. (GCL) has installed a system of 4 monitor wells at each of the four Phillips sites. The wells are arranged so as to provide one upgradient well and three downgradient wells at each site to immediately detect any potential release of contaminants to ground water beneath the evaporation ponds. Monitor-well location maps are located in Appendix A, along with well completion diagrams for each monitor well.

3.1 DESIGN OF THE RCRA MONITOR WELLS

The monitor wells are constructed of 2-inch diameter PVC and stainless steel casing, and are screened at and below the water table with 0.020-inch slot, stainless steel screen. Construction details of the wells are shown in Appendix A.

3.2 WELL MAINTENANCE

The monitor wells are designed to require a minimum of maintenance. As with any well completed in fine-grained material, however, occasional re-development of the wells may be necessary. Regular monitoring of total depth and recovery time after pumping, performed at the same time as sampling, will determine when or if re-development becomes necessary. Re-development will be considered if a significant portion of the well bore (> about 5 feet) becomes filled by silt, or if recovery time after pumping increases significantly (by a factor of about 2 or more) over recovery times observed during initial well development.

3.3 WELL SECURITY

The monitor wells are provided with locking caps, which must be in place and locked at all times when the well is unattended. Caps should be removed only as necessary for sampling and analysis procedures conducted in accordance with this manual. Keys are issued to sampling technicians or other personnel on an as-needed basis. A log is maintained of all well access, including the persons involved, dates, times and purpose of opening the wells.

SECTION 4.0

4.0 SAMPLING EQUIPMENT AND SUPPLIES

Equipment needed for purging and sampling the ground-water monitor wells at the Phillips Artesia, Eunice, Lea and Lusk sites includes a bailer, pH and electrical conductance meters, a field logbook, and other miscellaneous supplies which are detailed below.

4.1 BAILER

A bailer with removable top and bottom check valves will be used for sampling the wells. The bailer will be constructed entirely of stainless steel and/or Teflon with an outer diameter less than two inches. The bailer will be equipped with a rope or cable with a minimum length capable of reaching the bottom of the deepest well at each site. Any rope that has contacted ground water will be cut off and discarded before use in bailing another well.

An optimal bailer size for sampling 2-inch wells is 5 feet in length with an inner diameter of 1.25 inches. Because several of the 16 wells installed at the four sites are not perfectly aligned, or have constricted zones, a 5-foot long bailer may not pass unrestricted through the entire depth of the well. In wells where this is the case, a 3-foot long bailer or shorter of the same diameter, or a 5-foot long bailer with a smaller diameter may be necessary to permit water sampling.

4.2 FIELD ANALYTICAL EQUIPMENT

Equipment necessary for field analyses includes a thermometer, specific conductance meter, pH meter, and spare batteries for the meters. Standard solutions must be included for field calibration of the pH meter.

4.3 FIELD LOGBOOK

All field activities, observations and measurements will be recorded in a field logbook. Items which should be recorded in the field logbook each time sampling is conducted include:

- Identification of well

- Well depth
- Static water level depth and measurement technique
- Purge volume and pumping rate
- Time required for purging
- Sample withdrawal procedure/equipment
- Date and time of collection and purging
- Well sampling sequence
- Types of sample containers used and sample identification numbers
- Preservative(s) used
- Field analysis data and method(s) (i.e., temperature, pH, electrical conductance)
- Sample distribution and transporter
- Field observations on sampling event
- Name of collector
- Climatic conditions

4.4 OTHER EQUIPMENT AND SUPPLIES

A list of other equipment and supplies needed for sampling is included in Section 3.1 of the Procedures for Purging and Sampling Wells, included as Appendix B of this manual.

4.5 EQUIPMENT CLEANING AND PREVENTION OF CONTAMINATION

Equipment used for monitor well sampling shall be decontaminated using Level 2 Decontamination prior to each use (Appendix C). In some cases, it may be impractical for logistical reasons to decontaminate equipment in accordance with Appendix C. In these cases, the equipment shall be steam cleaned and rinsed as described in Appendix D. At least one equipment blank for each site where steam cleaning is the selected method for decontamination shall be taken by running distilled water over or through the steam cleaned equipment after steam cleaning is performed, and collecting the water in 40-ml septum vials, which shall then be carefully capped so that no air bubbles or headspace remain. The equipment blanks shall be labeled, assigned sample numbers, and handled identically with other samples collected during the sampling program and analyzed for BTEX. This will allow identification of any analytical irregularities that might occur due to incomplete decontamination of the equipment.

SECTION 5.0

5.0 SAMPLING PROCEDURES

The complete sampling procedure includes measurement of water level and total well depth, purging and sample withdrawal from the well, field analyses for temperature, specific conductance, pH, and sample preservation and storage. These procedures are described in detail in the accompanying texts of standard operating procedures (Appendix B through H). Their specific applications at the Phillips sites are discussed in this section.

5.1 SAMPLING SEQUENCE

The sequence in which the 4 wells at each site are sampled is not critical. However, to minimize the possibility of cross-contamination in the event of equipment failure or other contingency leading to use of some equipment at more than one well, the wells should preferably be sampled in sequence from the least to the most contaminated. If no contamination is known to exist at the site, the upgradient well should be sampled before the downgradient wells. This sequence places the wells that are most likely to show contamination last in the sampling sequence. Thus, the likelihood of inadvertently introducing significant contaminants to the ground water or to any of the samples will be minimized.

5.2 WATER LEVEL MEASUREMENT

Before purging and sampling, measure the depth to water, to the nearest 0.01 foot, using a clean electronic water-level indicator. Record this measurement in the field logbook. Depth measurements are made from the measuring point at the top, and on the north side, of each two-inch well casing. Detailed procedures for the measurements are described in Appendix E.

Since the elevations of the measuring points have been surveyed into a known datum, the elevation of the water table can be determined by subtracting the depth to water from the known elevation at the measuring point.

5.3 WELL PURGING

Purge the well using a stainless steel bailer or a stainless steel air-ejector pump operated at a speed slow enough to prevent cascading of water down the sides of the well. Bail or pump until 3 casing volumes have been purged from the well, or, if recovery is too slow to allow this, purge the well to dryness once and allow it to recover before sampling. Record the volume of water purged, rate of pumping, and any other pertinent data in the field logbook.

Detailed procedures for determining the volume to be purged and for the purging process are included in Appendix B.

5.4 SAMPLE COLLECTION

Collect the sample using the bailer described in Section 4.1 and decontamination procedures outlined in Appendices C and D. Table 5-1 lists the sample volumes, types of containers, and preservatives to be used. Sample containers and preservatives will be supplied by the independent analytical laboratory conducting the analyses.

At all times during sampling, take care to minimize agitation of the samples and limit sample contact with the atmosphere as much as possible, particularly while collecting samples for analysis of volatiles.

Record the well number, date and time of sampling, and sample number(s) in the field logbook. Measure the total depth of the well at this time. Further discussion of standard sampling procedures will be found in Appendix B.

5.5 FIELD ANALYSES

Both the first and last samples collected at each well will be reserved for field determination of temperature, specific conductance, and pH. Detailed procedures for making these field analyses are described in Appendix F.

TABLE 5-1
SAMPLING MATERIALS

Parameters	Container	Preservative
Trace Metals, Cations	1-500 mL Plastic*	HNO_3, pH<2
Fluoride, Chloride, Sulfate, Turbidity, pH, Conductivity	1-500 mL Plastic	None
pH, Conductivity (3 remaining of quad)	3-250 mL Plastic	None
Nitrate, Phenols, TOC, TOX	1-500 mL Amber Glass	H_2SO_4, pH<2; no headspace or bubbles
TOC & TOX (3 remaining of quad)	3-500 mL Amber Glass	H_2SO_4, pH<2, no headspace or bubbles
Radiochemistry	2-1 Liter Plastic	HNO_3, pH<2
Total Coliform	1 - specimen cup	None
BTEX	2-40 mL vials*	HCl, pH<2; no headspace or bubbles
Pesticides & Herbicides	2-1 Liter Amber Glass	None

* For those sets requiring an extra sample for BTEX and RCRA metals, fill an extra 500 mL plastic and 2 extra 40 mL vials.

Record the results of the field analyses (2 replicates for each well) in the field logbook.

5.6 SAMPLE PRESERVATION AND STORAGE

Samples will be preserved in accordance with the methods shown in Table 5-1.

Promptly after labeling and sealing each sample container, place it on ice in a suitable closed container (ice chest) for transportation to the laboratory at the end of each day of sampling.

5.7 QA/QC SPLITS AND BLANKS

Quality Analysis/Quality Control (QA/QC) is a critical part of any ground water sampling program. The QA/QC program for each of the four sites will include trip blanks, equipment blanks as needed, and sample splits for duplicate analyses. Equipment blanks are discussed in Section 4.5. Other field QA/QC procedures are described in the following sections.

5.7.1 Trip Blanks

Before conducting each sampling event, fill four 40-ml septum vials with deionized water, or have them provided by the chemical laboratory which will be analyzing the samples. Carry these blanks to the site, assign a sample number to each in the same manner as the ground water samples, and submit them to the analytical laboratory with labels and chain-of-custody seals identical to those used for the ground water samples. Record the sample number as "trip blank" in the field logbook, but do not indicate to the laboratories which samples are blanks. Request analyses for benzene, toluene, ethyl benzene and xylenes (BTEX).

5.7.2 Sample Splits

Duplicate samples will be taken for BTEX and chromium from one monitor well at each of the four sites. The samples will be given (individual) sample numbers and be submitted with full chain-of-custody documentation to the lab for analysis. Comparison of the results of the duplicates will permit evaluation of the quality of laboratory analytical data.

SECTION 6.0

6.0 PACKING AND SHIPPING OF SAMPLES

Store all samples on ice in appropriate containers until delivery to the analytical laboratory. Samples sent to the independent laboratory will be shipped promptly by a rapid (next-day) delivery service, or will be delivered directly to the laboratory by the sampling personnel, if feasible.

Complete procedures for labeling, packing and shipping of water samples are included in Appendix G.

SECTION 7.0

7.0 CHAIN-OF-CUSTODY PROCEDURES

Follow chain-of-custody procedures at all times during sample collection, transportation, and delivery to the analytical laboratory. Chain-of-custody procedures are described in detail in Appendix H.

SECTION 8.0

8.0 ANALYTICAL METHODS AND QA/QC

All ground-water samples will be analyzed by a qualified independent analytical laboratory. The samples will be analyzed in accordance with Section 206.C.1 of the New Mexico Hazardous Waste Management Regulations Fourth Edition (HWMR-4). Additional samples will be analyzed for BTEX.

8.1 ANALYTICAL PARAMETERS AND METHODS

Ground water samples will be analyzed for the contaminants cited above. All parameters will be determined in accordance with standard methods approved by the EPA. Sample parameters and sampling frequency are listed in Table 8-1. Analytical methods are listed in Table 8-2.

8.2 LABORATORY QA/QC PROCEDURES

Laboratory QA/QC procedures will include the use of:

- Standard samples
- Laboratory blanks
- Spiked samples
- Field blanks (as described in Sections 4.5 and 5.7.1)
- Sample splits (as described in Section 5.7.2)

The analytical laboratories will be required to maintain logbooks or similar records listing the sample preparation techniques, analytical methods, and experimental conditions applied to each sample, and the date, time, and person performing each processing step. The laboratories shall adhere to the standards and procedures set forth in Sections 1.2 through 1.5 of EPA Manual SW-846, Test Methods for Evaluating Solid Waste, which are included in this manual as Appendix I.

Units of measure shall be reported with all analytical results. Units of concentration normally will be milligrams per liter (mg/l) or micrograms per liter (ug/l). Gross alpha and beta will normally be reported in picocuries per liter (pCi/l), coliform bacteria in most probable number per 100 milliliters of sample (MPN), and turbidity in standard nephelometric units (turbidity units). Other units of measure must be justified and approved in advance by the person requesting the analyses.

TABLE 8-1

PARAMETERS AND SAMPLING FREQUENCY

PARAMETERS	FIRST YEAR	SUBSEQUENT YEARS
Drinking Water Parameters		
Arsenic	Quarterly	Semi-annually
Barium		
Cadmium		
Chromium		
Fluoride		
Lead		
Mercury		
Nitrate (as N)		
Selenium		
Silver		
Endrin		
Lindane		
Methoxychlor		
Toxaphene		
2, 4-D		
2,4,5-IP Silvax		
Radium		
Gross Alpha		
Gross Beta		
Coliform Bacteria		
Turbidity		
Ground-Water Quality Parameters		
Chloride	Quarterly	Annually
Iron		
Manganese		
Phenols		
Sodium		
Sulfate		
Indicators of Ground-Water Contamination		
pH	*Quarterly	**Semi-annually
Specific conductance		
Total organic carbon		
Total organic halogen		
Detection Parameters		
BTEX	As required	As required
Ground-Water Elevation	Quarterly	Semi-annually

* During the first year, four replicate measurements will be made on the samples from the upgradient wells.

** During subsequent years, four replicate measurements will be made on samples from all wells.

TABLE 8-2
ANALYTICAL METHODS

PARAMETER	EPA METHOD NO.
Trace Metals	E200.7/E200AAS
Cations	E200.7
Fluoride	E340.2
Chloride	E325.3
Sulfate	E375.4
Turbidity	E180.1
pH	E150.1
Conductivity	E120.1
Nitrate	E353.1
Phenols	E420.2
TOC	E415.1
TOX	E450.1
Radiochemistry	E900.0
Total Coliform	SM908C
BTEX	E602
Pesticides	E608
Herbicides	SW 8150

APPENDIX A

APPENDIX A

MONITOR WELL LOCATION MAPS AND COMPLETION DIAGRAMS FOR PHILLIPS ARTESIA, EUNICE, LEA AND LUSK GASOLINE PLANTS

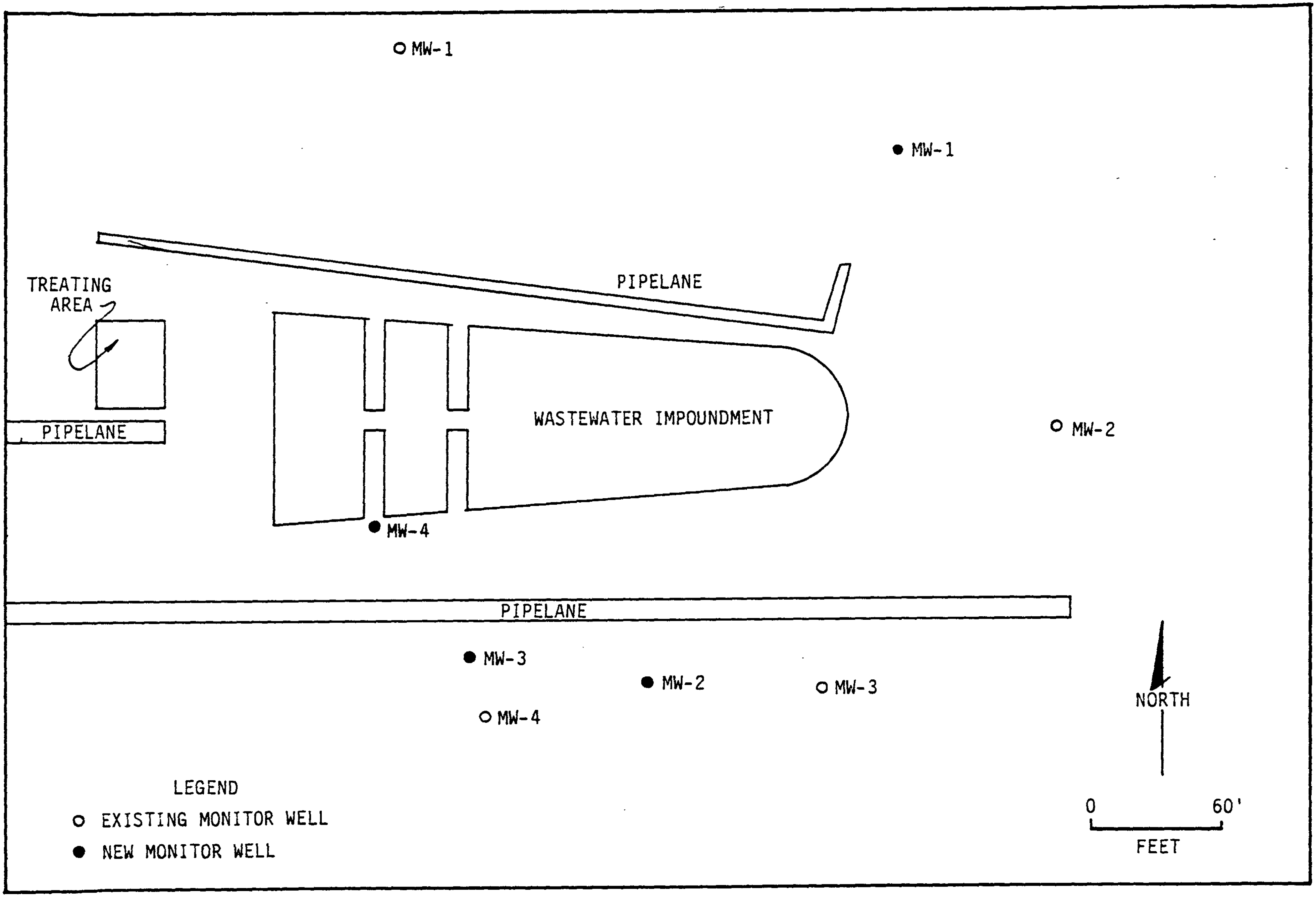


FIGURE 2-1

SITE MAP SHOWING EXISTING AND NEW GROUND WATER MONITORING SYSTEMS

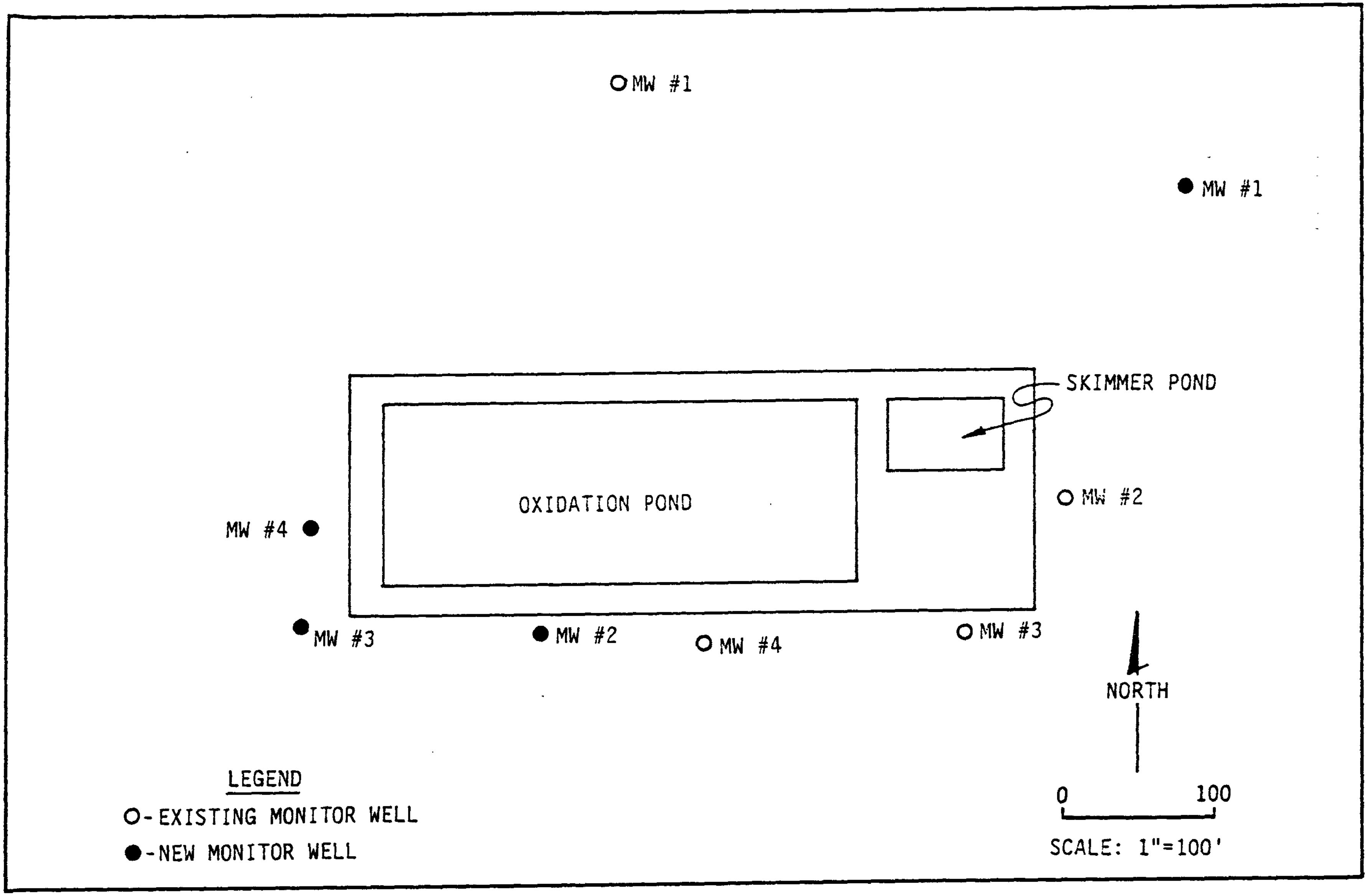


FIGURE 2-1

SITE MAP SHOWING EXISTING AND NEW GROUND-WATER MONITORING SYSTEMS

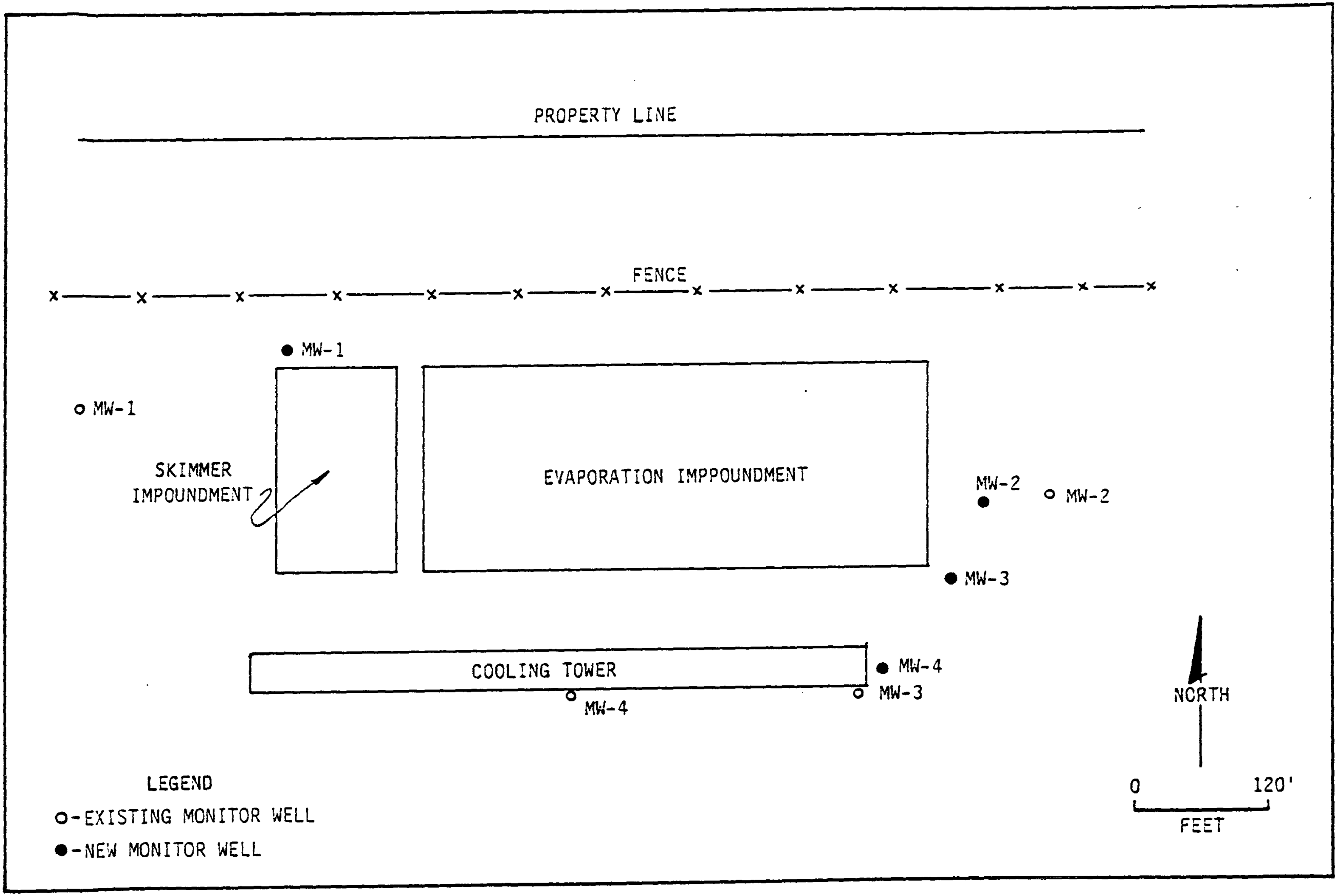


FIGURE 2-1

SITE MAP SHOWING EXISTING AND NEW GROUND WATER MONITORING SYSTEMS

APPENDIX B

APPENDIX B

PROCEDURES FOR PURGING AND SAMPLING WELLS

Procedures for Purging and Sampling Wells

1.0 PURPOSE

To describe the Standard Operating Procedures (SOP) for purging and sampling wells.

2.0 SCOPE

This document describes procedures to be used in purging and sampling wells for determination of water quality and potential contamination. The procedures described in this document are consistent with the requirements of all Federal regulations, and are specifically designed to comply with ground-water monitoring requirements under RCRA.

3.0 PROCEDURES

3.1 PREPARATIONS FOR SAMPLING

Before proceeding to the field area, be sure that all necessary equipment and supplies are on hand. To the extent possible, all equipment and supplies should be decontaminated in the laboratory before proceeding to the field area. Equipment decontamination procedures are described in a separate SOP.

Equipment and supplies needed for collecting representative ground-water samples include:

- An electronic water-level indicator or steel tape and chalk,
- Distilled water and wash bottles,
- Brushes and laboratory soap,
- Heavy plastic bags,
- Paper towels or clean rags,
- Zip-lock plastic bags,
- Rubber gloves,
- Several 500 ml beakers,
- A submersible pump (at some sites there is a dedicated pump or bailer for each well) with appropriate attachments to enable purging and sampling the well,

- A hose to direct any pump discharge several feet away from the well, and containers to receive the discharge if it is contaminated,
- Plastic sheet film,
- A graduated bucket,
- A bottom-filling teflon or stainless steel bailer with sufficient cord and/or cable,
- All necessary sample containers with the appropriate volume of preservatives added to the containers by the laboratory,
- pH meter,
- Thermometers,
- Specific conductance meter,
- Field log book and sample forms,
- Ice and ice chest for samples,
- Strapping tape and shipping labels,
- Waterproof marking pen,
- Chain-of-Custody labels,
- Watch or stopwatch for use in determining pumping rates.

A nearby location of a steam cleaner is desirable in order to avoid long delays for cleaning of equipment, if necessary, between sampling of individual wells.

3.2 DETERMINE WATER LEVEL

Using an electronic sounder ("water level probe") or other suitable device, measure the depth to water (DTW) in the well. If approximate total depth (TD) of the well is not known, it will also be necessary to measure total depth with the sounder. If approximate total depth is known, defer the measurement until after sampling has been completed. Use of the electronic sounder is described in a separate SOP.

3.3 DETERMINE THE VOLUME OF WATER TO BE PURGED FROM THE WELL

This normally is at least 3 casing volumes, determined as follows:

- Measure the true inside diameter of the casing, using a steel tape or ruler; convert to feet.
- Find the true inside radius (r) of the casing by dividing the diameter by 2.

- Determine 1 casing volume in cubic feet (V_{cf}) by calculating:

$$V_{cf} = 3.14 \times (r)^2 \times (TD - DTW).$$

- Determine 1 casing volume in gallons by multiplying V_{cf} x 7.48 gals/ft^3.

- Multiply by 3 to determine total volume of water to be pumped from the well.

The exception to this standard (other than program requirements) is in the case of low yield wells. When purging low yield wells, pump the well once to dryness. Samples should be collected as soon as the well recovers. When full recovery exceeds three hours, samples should be collected as soon as sufficient water volume is available.

3.4 PURGE THE WELL

Currently, standards allow for several options for purging wells. They are:

- Teflon or stainless steel bailers

- Existing dedicated equipment - Use of these devices must be approved by On-Site Representatives.

- Peristaltic pumps - Use of these devices, suitable for shallow wells only, must be approved by the On-Site Representative.

- Positive displacement bladder pump or air lift pump, capable of being completely disassembled and cleaned before use in each well. Air must not contact ground water.

At no time during purging should the evacuation rate be high enough to cause the ground water to cascade back into the well thus causing excessive aeration and potential stripping of volatile constituents.

The actual volume of purged water can be measured by several acceptable methods.

- When bailers are used to purge, the actual volume of each bailer's contents can be measured using a calibrated bucket.

- If a pump is used for purging, the pump rate can be determined by using a bucket and stopwatch, and the duration of pumping timed until the necessary volume is purged. A totalizing flow meter may be used, if available.

Monitor the pH, temperature, and specific conductance of the water purged to ensure that these parameters have stabilized by the time three casing volumes have been withdrawn. If stabilization has not been achieved at that time, continue purging until it is achieved.

3.5 DISPOSAL OF PURGED WATER

Dispose of pumped water in a manner which poses no threat of contamination to any surface or ground water in the vicinity. If the water is determined to be hazardous, it must be contained and disposed of according to appropriate regulations.

3.6 INITIAL SAMPLING FOR FIELD PARAMETERS

Begin sampling by withdrawing water from the well in accordance with the procedures of Section 3.8. Place the first water withdrawn in a 500 ml or larger flask or beaker which has been properly cleaned, then rinsed three times with the well water being recovered. Use this sample for field measurement of temperature, specific conductance, and pH. Procedures for these field measurements are described in a separate SOP document.

3.7 SAMPLE COLLECTION

3.7.1 General Considerations

The technique used to withdraw a ground-water sample from a well should be selected based on a consideration of the parameters which will be analyzed. To ensure the ground-water samples' representativeness, it is important to avoid physically altering or chemically contaminating the samples during collection, withdrawal, and containerization.

The preferred sampling device for all parameters is a double check valve stainless steel or Teflon bailer.

To the extent possible, no sampling device constructed of or containing neoprene, PVC, Tygon, silicone, polyethylene, or Viton will be used to collect ground-water samples.

In some cases, it may be necessary to use equipment already in the well to collect samples. This is particularly true of high volume, deep wells (>150 feet) where purging pumps are ineffective, and bailing is impractical. If existing equipment must be used, determine the make and model of the pump and check with the manufacturer concerning component construction materials.

General sampling procedures include the following:

- Clean sampling equipment should not be placed directly on the ground. Use a drop cloth or feed line from clean reels. If reels are used, avoid placing contaminated lines back on reels.
- Lower sampling equipment slowly into the well to avoid degassing of the water and damage to the equipment.
- If bailer cable is to be decontaminated and reused, it must be Teflon-coated or made of stainless steel. Braided polypropylene is also acceptable.
- Check the operation of bailer check valve assemblies to confirm free operation.

- Bladder Pump flow rates should be adjusted to eliminate intermittent or pulsed flow. The settings should be determined during the purging operations. Flow rate should be less than 100 ml/minute when sampling for volatile organic compounds (VOC's). Air-lift pumps <u>should not</u> be used for sample collection.

- Samples should be collected and containerized in the order of the parameters volatilization sensitivity. Table 3-1 lists the preferred collection order for some common ground-water parameters.

3.7.2 Collection of Volatile Organics Samples (VOAs)

VOAs should be collected from the first bailer removed from the well after purging, immediately following collection of the sample for field analyses. The most effective means of controlled collection of the sample is by employing two people. One person should retrieve the bailer from the well and place the bottom over a VOA container (40-ml septum vial) held by the second person. The second person should insert the Teflon bottom-emptying device into the bailer, bring the vial to the tip of the bottom-emptying device, and tilt the vial to approximately 60° from the vertical.

Delivery of the sample from the bailer down the edge of the vial is accomplished when the person holding the bailer slowly opens the top check valve with a Teflon, glass, or stainless steel insert. As the vial is filled, the second person should return the sample vial to the vertical position.

Fill the septum vial until it is just overflowing. Cap the vial and invert. If a bubble exists, discard and repeat. Do not reopen the vial and add additional sample.

If an approved pump is used, reduce the flow to less than 100 ml per minute prior to sample collection.

3.8 CONTAINERS

Collect all samples using the standard methods described in the Sampling and Analysis Plan for the project, and preserve all samples in approved containers. The specific containers and preservatives used for each analyte may vary among laboratories. The standard methods of the laboratory selected for analysis will be followed in each project Sampling and Analysis Plan. Handle all samples in accordance with the procedures described in the SOP documents "Procedures for Packing and Shipping of Samples" and "Chain-of-Custody Procedures."

3.9 FINAL FIELD ANALYSES

Immediately after collection of all samples required in the Sampling and Analysis Plan, collect a final sample for field analyses, as described in Section 3.7 above. The purpose of these repeat analyses is to check for possible changes in water quality during the time of sampling. Samples

TABLE 3-1

PREFERRED ORDER OF SAMPLE COLLECTION

1. Volatile organics (VOA)
2. Total metals
3. Purgeable organic carbon (POC)
4. Purgeable organic halogens (POX)
5. Extractable organics
6. Dissolved metals
7. Total organic carbon (TOC)
8. Total organic halogens (TOX)
9. Phenols
10. Cyanide
11. Sulfate and chloride
12. Nitrate and ammonia
13. Radionuclides

used for field analyses should be discarded in an approved and safe manner when the analyses are complete.

3.10 MEASURE TOTAL DEPTH OF WELL

After collection and preservation of all samples and completion of final field analyses, measure the depth to bottom of the well, using the electronic sounder. Use of the sounder is described in a separate SOP.

4.0 REFERENCES

U.S. Code of Federal Regulations, 1983, 40 CFR 264.97.

U.S. Environmental Protection Agency, 1986a, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, p. 97-114.

U.S. Environmental Protection Agency, 1986b, Test Methods for Evaluating Solid Waste: EPA Report SW-846; Volume I: Physical/Chemical Methods.

Prepared By: 5/26/88

Reviewed By: 5/26/88

APPENDIX C

APPENDIX C

PROCEDURES FOR DECONTAMINATION OF GROUND-WATER SAMPLING EQUIPMENT

Procedures for Decontamination of Sampling Equipment

1.0 PURPOSE

To describe the Standard Operating Procedures used for decontamination of ground-water sampling equipment prior to field use.

2.0 SCOPE

To prevent contamination of samples or monitor wells, all sampling equipment must be thoroughly cleaned prior to each use. This document describes the recommended procedures for cleaning of equipment and tools before a sampling program.

Sampling equipment dedicated to a particular well will be cleaned prior to installation and after any maintenance requiring its removal from the well. Other equipment will be cleaned prior to each use.

Equipment used in each of several wells or sites will be cleaned prior to use at each individual site.

These procedures are designed to comply fully with the requirements of RCRA ground-water monitoring.

3.0 PROCEDURES

3.1 EQUIPMENT PREPARATION

Any equipment, either new or previously used, should be assumed to be contaminated and should undergo the level of decontamination appropriate to its intended use and construction. The following sections detail the various decontamination procedures to be used.

3.2 GENERAL LEVELS OF DECONTAMINATION

Level 1 Laboratory Decontamination

Applicability - (1) All glassware and (2) stainless steel equipment whose construction will tolerate high temperatures of the muffle furnace and that will be used in collection and containerization of organic samples.

1. Thoroughly wash with nonphosphate detergent in hot water.
2. Rinse several times with tap water.
3. Rinse several times with deionized water.
4. Rinse once with acetone or methanol.
5. Rinse once with pesticide grade hexane.

6. Place in muffle furnace, or other equivalent furnace, at 450°C for 15 to 30 minutes.

7. Allow to cool, protect from dust and other contaminants by sealing or covering with aluminum foil.

Level 2 Laboratory Decontamination

Applicability (for organic samples) - All Teflon equipment and stainless equipment with components which would be damaged by high temperatures of the muffle furnace should be treated as follows. This procedure is also applicable where a muffle furnace is not available.

1. Thoroughly wash with nonphosphate detergent in hot water.

2. Rinse several times with tap water.

3. Rinse once with acetone or methanol.

4. Rinse several times with deionized water.

5. Air dry in a dust free environment.

7. Cap or cover after drying; Teflon bailers and other applicable equipment should be sealed in plastic bags.

NOTE: Chromic acid can be used to remove persistent organic deposits.

Level 3 Laboratory or Field Decontamination

Applicability - Safety equipment such as respirators, boots, gloves, equipment susceptible to degradation by solvent rinsing.

1. Brush off loose dirt with soft bristle brush or cloth.

2. Rinse thoroughly with tap water.

3. Wash in nonphosphate detergent in warm water.

4. Rinse thoroughly with tap water.

5. Rinse thoroughly with deionized water.

6. Air dry in dust free environment; keep articles out of the sun.

7. Store in plastic bags.

Level 4 Laboratory or Field Decontamination

Applicability - Ancillary equipment such as ropes, extension cords, generators, hand carts.

1. Brush off loose dirt with stiff bristle brush.
2. Rinse off with high pressure water.
3. Air dry.

Once equipment has been allowed to dry, package the equipment to protect it from dust. Plastic bags are appropriate for larger items such as bailers and purging pumps; aluminum foil is preferred for glassware openings.

3.3 PROCEDURES FOR FIELD DECONTAMINATION OF SAMPLING EQUIPMENT

3.3.1 General Considerations

Field decontamination of equipment used for well purging, sample collection, and sample compositing is not to be considered a procedure of preference; rather it should be viewed as a last resort where logistical considerations and practical concerns outweigh the preferred use of dedicated equipment.

When field decontamination cannot be avoided, the following general rules should be adhered to:

1. Unless it is absolutely necessary, no equipment should be field decontaminated more than once between laboratory decontaminations.
2. Equipment used to collect hazardous waste samples prior to decontamination should not subsequently be used for collection of environmental samples. In general, any equipment to be decontaminated should then be reused to collect samples of "lower quality" than the first sample collected.
3. All decontamination and subsequent use of decontaminated equipment should be documented in a field logbook.
4. Never reuse equipment if visual signs, such as discoloration, indicate that decontamination was insufficient.

3.3.2 Decontamination of Bailers

1. Disassemble both top and bottom check valve assemblies.
2. Clean all component parts with hot, high pressure tap water.
3. Rinse all surfaces twice with methanol.
4. Rinse all surfaces three times with deionized water.
5. Place all components on rack or clean surface and allow to air dry.
6. Wearing clean cotton gloves (powderless), reassemble bailer.

7. Use immediately or place bailer in plastic bag, seal the bag, and label the bag indicating date of decontamination.

When used equipment is to be returned to GCL for thorough decontamination, Level 4 decontamination should be performed in the field. The equipment should then be sealed in a plastic bag and segregated from unused equipment.

4.0 REFERENCES

U.S Environmental Protection Agency, 1986, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, p. 106-107.

Prepared By: ______________ 5-26-88
Reviewed By: ______________ 5-26-88

APPENDIX D

GCL

APPENDIX D

PROCEDURES FOR STEAM CLEANING OF SAMPLING EQUIPMENT

GCL

MANUAL OF STANDARD OPERATING PROCEDURES DATE: December 23, 1987

Procedures for Steam Cleaning of Sampling Equipment

1.0 PURPOSE

To describe the Standard Operating Procedures used in steam cleaning of sampling equipment.

2.0 SCOPE

To prevent contamination of samples or monitor wells, all sampling equipment must be thoroughly cleaned prior to each use. Steam cleaning is commonly the most efficient method of accomplishing this in the field.

This document describes procedures to be used in steam cleaning sampling equipment. Sampling equipment dedicated to a particular well will be cleaned prior to installation and after any maintenance requiring removal from the well. Other equipment will be cleaned prior to each use. Equipment used in each of several wells will be cleaned prior to use at each individual well.

The procedures described in this SOP are intended to be used only when the more rigorous decontamination methods described in the SOP "Procedures for Decontamination of Sampling Equipment" are impracticable for technical or logistical reasons.

3.0 PROCEDURES

Always wear gloves and safety glasses when operating the steam cleaner.

3.1 Disassemble any equipment, such as pumps, which cannot be thoroughly cleaned in an assembled condition.

3.2 Remove any obvious dirt or other foreign substances from all tools and equipment to be cleaned, using tap water, a brush, and soap if necessary. Arrange the tools and equipment on a clean, hard surface. Have heavy plastic bags in readiness to receive the cleaned tools and equipment.

3.3 Read the steam cleaner's operating instructions, and be certain that they are completely understood. Inspect the steam cleaner to ensure that it is properly fueled and in good working order, and that there are no solvents, detergents, or other foreign substances in the machine. Clean the steam cleaner, if necessary.

3.4 Thoroughly steam clean all equipment and tools, and rinse with distilled water. Be certain to measure and record the temperature of the steam cleaner discharge.

3.5 Using an appropriate item of equipment (e.g., a bailer or a glass sample container) take an "equipment blank" sample by running distilled, deionized water over or through the equipment and collecting it in 2 40-ml septum vials. Close the vials securely, ensuring that no air or headspace remains in the vials. Assign sample numbers and store, transport, and analyze the equipment blanks in the same manner as other samples collected in the program. An equipment blank should be taken at each steam cleaning event.

3.6 Wearing clean disposable rubber gloves, reassemble any equipment that was disassembled for cleaning. Transfer all of the cleaned tools and equipment to clean plastic bags and secure the bags.

3.7 After cleaning, handle equipment no more than is essential for conducting the sampling procedure. Always wear clean, disposable rubber or cotton gloves when handling the clean equipment.

4.0 REFERENCES

U.S. Environmental Protection Agency, 1986, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, p. 106-107.

Prepared By: 5-26-88

Reviewed By: 5-26-88

APPENDIX E

GCL

APPENDIX E

PROCEDURES FOR WATER LEVEL MEASUREMENT IN WELLS, USING AN ELECTRONIC SOUNDER

Procedures for Water Level Measurement in Wells, Using an Electronic Sounder

1.0 PURPOSE

To describe the Standard Operating Procedures for measurement of water level in wells, using an electronic sounder ("probe").

2.0 SCOPE

Water level measurements are required prior to pumping and sampling of monitor wells, and are commonly made under many other circumstances where data on water table or potentiometric surface elevations are needed.

This document describes procedures for water level measurement using an electronic indicator, commonly referred to as a "water level probe." The probe is designed so that, when it reaches ground water, a circuit is closed, resulting in an audible or visible response or in a strong reading on an ammeter. The depth to water from a surface reference point of known elevation is measured using a graduated tape attached to the sounder.

3.0 PROCEDURES

3.1 Prior to each measurement, clean the probe with distilled water and dry it with a clean paper towel. Place clean plastic sheeting around the well head to assure that the sounder does not become contaminated by contact with the ground during the measurement procedures.

3.2 Remove the cap (if so equipped) from the well head and set it aside. If the casing cap is unvented, allow about 10 minutes for water level in the well to equilibrate to atmospheric pressure.

3.3 Each well should have a measuring point which is accurately surveyed so that its exact elevation is known. (Commonly, this point is the top of the casing.) At RCRA sites, this point will be described in the Sampling and Analysis Plan. Be sure that the measuring point is known.

In some cases (e.g., regional ground water studies) the well being measured may not be surveyed accurately with respect to a known datum. In these cases, the depth measurement should be made from the top of the casing. Additionally, measure the "stick-up," i.e., the length of casing above the ground level, using a ruler or steel tape. Record this information to permit determination of water level based on the known ground surface elevation (from a topographic map or similar source).

3.4 Ensure that the probe is turned on. Insert the probe slowly into the well until a "beep" is heard (or a strong ammeter reading is observed). Using the graduated tape attached to the sounder, measure the depth to water from the measuring point, to the nearest 0.01 inch, and record it in the field log book.

3.5 The total depth of the well should also be determined (after sampling). Turn the probe off and insert it slowly into the well until the probe reaches the bottom of the well, which will be observed by the sudden reduction of tension on the tape. Jostle the tape slightly (up and down) to be certain that the probe has reached the bottom of the well, rather than being hung up on a casing joint, pump or similar irregularity. Measure total depth from the measuring point to the nearest 0.01 inch and record it in the field log book. Prior to measuring total depth be certain that pumps, wires, tubing or other obstructions will not tangle the probe and prevent probe removal. Note that the "zero point" on most probes is at the electrical contacts, which may not be at the bottom of the probe, so total depth measurements may have to be adjusted to reflect the additional probe length below the contacts.

3.6 Remove the probe from the well and be certain that it is turned off and cleaned before storage or reuse.

3.7 Replace and lock the well cap (if so equipped).

4.0 REFERENCES

U.S. Code of Federal Regulations, 1983, 40 CFR 264.97 (f).

U.S. Environmental Protection Agency, 1986, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, p. 99-100.

Prepared By: 5-26-88

Reviewed By: Randall 5-26-88

APPENDIX F

APPENDIX F

PROCEDURES FOR FIELD MEASUREMENT OF TEMPERATURE, SPECIFIC CONDUCTANCE, AND pH

Procedures for Field Measurement of Temperature, Specific Conductance, and pH

1.0 PURPOSE

To describe the Standard Operating Procedures for field measurement of temperature, specific conductance, and pH of water samples.

2.0 SCOPE

Water quality parameters which are physically or chemically unstable must be measured in the field immediately after collection of samples. Unstable parameters include temperature, specific conductance, and pH.

This document describes approved methods of measuring temperature, specific conductance, and pH in the field.

3.0 PROCEDURES FOR FIELD MEASUREMENTS

3.1 TEMPERATURE

3.1.1 Equipment

A mercury-filled thermometer or thermistor with accuracy to 0.1°C, should be used.

3.1.2 General Considerations

1. When possible, temperature measurements should be taken at the source; otherwise, an intermediate container may be used. When an intermediate container is used, fill the container with sample and allow the container temperature to equilibrate with that of the sample source. Dispose of the sample and draw a new sample, transfer the sample to the equilibrated container and measure.

2. Check the thermometer for separations in the mercury prior to each reading. These can be remedied by gently shaking the thermometer.

3. When taking a reading, hold the thermometer away from any surface, such as the sides or bottom of a container or stream.

3.1.3 Calibration

Thermometer should be checked monthly or before each sampling period against a National Bureau of Standards (NBS) certified thermometer.

3.1.4 Procedure

1. Take temperature reading by immersing the thermometer in the solution to be measured to the manufacturer's indicated immersion level.

2. Read the temperature to the nearest 0.1°C.

3. Record measurement on the Field Analysis Sheet (Figure 3-1) or a field notebook.

FIGURE 3-1
FIELD ANALYSIS SHEET

Site ____

Date ____

Time of Sample Collection ________________________

Time of Reading __________________________________

Site No. ____

In-Situ* Temperature (°C) ________________________

Sample Temperature (°C) __________________________

Initial Sample pH Reading ________________________

Uncorrected Conductivity Reading (UMHOS/CM) _______

Correction Factor ________________________________

Corrected Conductivity reading (umhos/cm) _________

*If sample is retained for pH measurement independent of field conditions, in-situ temperature measurement must still be taken.

3.2 SPECIFIC CONDUCTANCE

The procedures described below apply to the SI Model 33 S-C-T Meter. GCL employs several different types of conductance meters. The manufacturer's instructions should be consulted to determine the specific calibration procedures required for the meter being used.

3.2.1 Equipment

1. Conductivity Meter
2. Conductivity Cell
3. Standard 0.01N KCl Solution
4. NBS Standardized Thermometer, accuracy to 0.1°C.

3.2.2 Preparation of 0.01N KCl Solution

1. Use anhydrous KCl crystals; desiccated for 24 hours or baked at 100°C for two hours.
2. Weigh out 0.744 grams of KCl and place in a 1,000-milliliter volumetric flask.
3. Using high grade distilled water at 25 ± 2°C, bring to full volume and mix well to dissolve all KCl crystals.
4. Store in glass bottle(s), and label with the date prepared.
5. Measure the conductivity of the distilled water used to prepare the solution. If any conductivity is present, this value must be corrected to 25°C and added to the value of the solution. The base conductivity value of the prepared solution using 0.744 grams of KCl is 1408.8 umhos/cm. Label the prepared solution as to the final conductivity value at 25°C.

3.2.3 General Considerations

A Salinity-Conductivity-Temperature Meter is the field instrument normally used for specific conductance determinations. Instructions which follow describe the use of this instrument. Other types of conductivity meters are available and commonly used. If another type of meter is used, these instructions should be modified as needed in accordance with the manufacturer's recommendations for the type of meter in use.

In general, the meter should be used in the following manner when taking all readings:

1. Adjust meter zero (if necessary) by turning the bakelite screw on the meter face so that the needle coincides with the zero on the conductivity scale.

2. Turn the mode control to redline and adjust the redline control knob so that the meter needle lines up with the redline painted on the meter face. If this cannot be accomplished, the batteries must be replaced. (This step may be performed without the probe plugged into the meter.)
3. Rinse the probe with deionized water before and after each reading.
4. When taking a reading, immerse the probe in the sample solution and move the probe up and down a few times to ensure proper circulation through the cell electrodes. Hold the probe steady and away from the sides and bottom of the container and read the measurement.
5. Read the meter needle to the nearest 1/4 of the scale graduations. Always estimate to the next higher 1/4 graduation, rather than "dropping" any value. All results are expressed in umhos/cm.
6. Conductance measurements should always be taken in an intermediate container, rather than a sample container.
7. The thermocouple in the probe does not measure temperature to the required accuracy, so an NBS standardized thermometer with an accuracy of 0.1°C is necessary for all temperature measurements.

3.2.4 Determination of Cell Constant

The cell constant is used to evaluate the proper functioning of the instrument probe. The cell constant will be calculated on a daily basis prior to any field measurements.

1. Measure the temperature of the 0.01N KCl standard solution to the nearest 0.1°C.
2. Turn the meter on to the X10 scale and measure the conductance of the standard 0.01N KCl solution. (Multiply the observed value by 10 to obtain the final result.)
3. Press the cell test button. The meter needle should not deflect more than 2 percent of the observed value. If deflection is >2 percent, the probe is fouled and requires cleaning before use.

4. Calculate the cell constant using the following formula:

$$C = \frac{K_m}{K_s} \times 100$$

where

C = Cell constant

K_m = Measured conductance of 0.01N KCl solution at measured temperature
K_s = Actual conductance of 0.01N KCl solution at measured temperature

The cell constant must be between 0.95 and 1.05. If not, the cell should be cleaned and the constant rechecked before use.

The following formula can be used to calculate K_s values:

$$K_s = 1408.8 + 26.9019\ (T-25)$$

T = Temperature (°C)

5. Record all data and calculation on the specific conductance calibration log (Figure 3-2).

3.2.5 Field Measurements

1. Measure the temperature of the sample to the nearest 0.1°C, using an NBS standardized thermometer.

2. Measure the specific conductance of the sample. Remember to multiply the meter scale factor (X1, X10, X100) when calculating results.

3. Obtain the temperature correction factor for the sample temperature measure in Step 1.

4. Multiply the specific conductance measured in Step 2 by the temperature correction factor to obtain the corrected specific conductance value.

5. Record all data and calculations on the specific conductance data sheet (Figure 3-1).

3.3 pH FIELD MEASUREMENT PROCEDURE

3.3.1 Required Equipment

1. pH meter and manufacturer's Manual of Operation

2. NBS standardized thermometer, accuracy to 0.1°C

3. Standard buffer solutions: 4.0, 7.0, 10.0

4. Saturated KCl with AgCl solution (optional)

FIGURE 3-2
SPECIFIC CONDUCTANCE CALIBRATION LOG

SITE ____________________________

DATE ____________________________

TIME ____________________________

PERFORMED BY ____________________

YSI Model 33 S-C-T Meter

Serial No. ____________

Date of 0.01N KCl Standard Preparation ______________

______________ Changed KCl solution in Calibration Jar

Measurements

Temperature of Standard (°C) ______________

Uncorrected Reading (umhos/cm) ____________

Correction Factor __________________________

Corrected Reading (umhos/cm) ______________

Calibration Verification

Cell Test Deflection (umhos/cm) ____________

Cell Constant ______________________________

NOTES:

a. Cell Constant = $\frac{\text{Corrected Reading umhos/cm}}{\text{1408.8 umhos/cm}}$

b. Cell constant must be between 0.95 and 1.05. If not, probe is fouled and requires cleaning.

c. Cell test deflection must be 2 percent of uncorrected reading.

Procedure performed as per Minimum Standards and Guidelines of Operation, Process and Wastewater Sampling Standards, Section 1.1.2.

____________ Initial

____________ QA/QC

3.3.2 General Considerations

Several types of pH meters are available for use. For differences in operation between meters, consult the appropriate manufacturer's manual of operation. In general, all meters should be used in the following manner:

1. Store electrode in saturated KCl solution or in 4.0 buffer when not in use.

2. Rinse the electrode with deionized water before and after each use.

3. When taking a reading, immerse the electrode in the solution fluid, stir gently for a few seconds. Hold the electrode steady and away from the sides and bottom of the container and read the measurement. Always record measurements to the nearest 0.1 unit.

4. pH readings should always be taken in an intermediate container, rather than a sample container.

5. Store the meter with the electrode disconnected, taking care not to soil or damage connections.

3.3.3 Operation Check Procedure

Each day prior to use, the pH meter will be checked and calibrated to ensure proper operation.

1. Check expiration dates on buffers. Discard and replace if expired.

2. Check batteries in pH meter. Replace if necessary.

3. Check condition of electrode solution. If solution or gel is separated, gently shake electrode to consolidate solution, in KCl-filled probes, add solution if necessary.

4. Measure the temperature of the buffer(s) to the nearest 1.0°C with an NBS standardized thermometer. (Note: It is assumed that all buffer temperatures are equal if stored together.)

5. Set the temperature compensation dial to the buffer temperature measured in Step 4. (Note: For automatic temperature compensating meters, disregard this step.)

6. Using Table 3-1, find the corresponding buffer values for the measured temperature in Step 5. For this comparison estimate measured temperatures to the nearest 5°C.

7. Measure the pH of the 7.0 buffer solution.

TABLE 3-1
pH BUFFER TEMPERATURE CORRECTIONS

Temperature	Buffer Values		
°C	4.0	7.0	10.0
0	4.01	7.13	10.34
5	3.99	7.10	10.26
10	4.00	7.07	10.19
15	3.99	7.05	10.12
20	4.00	7.02	10.06
25	4.00	7.00	10.00
30	4.01	6.99	9.94

8. Adjust the calibration control knob until the meter reading corresponds to the appropriate value in Table 3-2.

9. Repeat Steps 6 and 7 using the 4.0 or 10.0 buffer solution. When the pH is measured with the 4.0 or 10.0 buffer solution, continue with the next step (No. 10). The choice of buffer solution depends on the range of pH anticipated in the material to be tested. If acidic material is expected, calibrate using 4.0 buffer; if basic material is expected, calibrate using 10.0 buffer. A 3-point calibration using all 3 buffers should be done if the approximate pH of the analyte is not known in advance.

10. Record all measurements on the pH calibration log (see Figure 3-4).

11. If measurements obtained are within 0.2 or the appropriate table values, the meter is functioning properly.

3.3.4 Sample pH Measurement Procedure

1. Measure the temperature of the sample to the nearest 1.0°C. When taking a pH measurement of a sample, set the temperature compensation dial to the measured temperature.

2. Take the "initial" sample reading. The purpose of this reading is to determine approximate pH of sample for calibration purposes.

3. You may need to recalibrate the pH meter to standards within 2 pH units of the "initial" sample reading following the procedures in Section 3.3.3, Operation Check Procedure Steps 3-9. Use an additional calibration form or equivalent page in a field book.

4. Measure the pH of the two other buffers.

5. Measure the pH of the sample.

6. Recheck the meter by measuring the pH of the two buffers (4.0 and 7.0).

7. Record all measurements on the field data sheet (see Figure 3-1) or equivalent format in field notebook.

FIGURE 3-4
pH CALIBRATION LOG

Site
Date Time
Performed by

Instrument:

_______ Digi-Sense Model 5985-20
_______ Digi-Sense Model 5986-10
_______ Presto-Tek PA-11A
_______ Cole Parmer pH Wand Model No. 5985-75
_______ Nester pH pen*

Serial Number

________ Changed buffers in pH kit
Temperature of Buffers (°C) _________
pH of buffers at measured temperature:
7=______ 4=______ 10=______
(See Table A3-2)

________ Calibrated at 7.0 buffer value from Table C1-1.

Readings of other buffers: 4=______ 10=______

pH readings must be ± 0.2 units from table values for proper operation of meter.

*Nester pH pens are not temperature compensating instruments. Sample and buffer temperatures must be equal when using these units.

Procedure performed as per Minimum Standards and Guidelines of Operation, Process and Wastewater Sampling Standards, Section 1.1.3.

__________ Initial __________ QA/QC

4.0 REFERENCES

U.S. Environmental Protection Agency, 1986a, RCRA Grand-Water Monitoring Technical Enforcement Guidance Document, p. 107-108.

U.S. Environmental Protection Agency, 1986b, Test Methods for Evaluating Solid Waste: EPA Report SW-k846; Volume I: Physical/Chemical Methods, Methods 9040 and 9050.

Prepared By: ____________________

Reviewed By: ____________________

APPENDIX G

APPENDIX G

PROCEDURES FOR LABELING, PACKING AND SHIPPING OF WATER SAMPLES

Procedures for Labeling, Packing and Shipping of Water Samples

1.0 PURPOSE

To describe the Standard Operating Procedures for the packing and shipping of water samples.

2.0 SCOPE

Proper handling of water samples between the time of field collection and that of laboratory analysis is critical in preserving the validity of analytical data. This document describes procedures to be used in labeling, packing, shipping, and storage of water samples.

These procedures are consistent with the requirements of all state and Federal regulations, including those for ground water monitoring programs under RCRA.

3.0 PROCEDURES

3.1 All samples will be collected and placed in tightly sealed glass or polyethylene containers, as appropriate, and preserved in accordance with the requirements of EPA document SW-846 and the standard practices of the laboratory which is to do the analyses. The specific containers and preservation techniques required will be included in the Sampling and Analysis Plan for each project. Table 3-1 is to be utilized as guidance in the absence of specific instructions in a site-specific plan.

3.2 Immediately upon collection, label each sample container with an adhesive label clearly indicating, in waterproof ink:

- Project and site identification
- Sample number
- Sample preservation (e.g., H_2SO_4, $Na_2S_2O_3$)
- Date and time of sampling
- Name of sample collector

Standard practice is to assign a sample number of 10 digits, indicating the date and time of sampling, as follows:

- Year (2 digits)
- Month (2 digits)
- Day (2 digits)
- Time (24-hour clock; 4 digits)

TABLE 3-1 REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES

Name	Container[1]	Preservation	Maximum holding time
Bacterial Tests:			
Coliform, fecal and total	P, G	Cool, 4°C, 0.008% $Na_2S_2O_3$	6 hours
Fecal streptococci	P, G	Cool, 4°C, 0.008% $Na_2S_2O_3$	6 hours
Inorganic Tests:			
Acidity	P, G	Cool, 4°C	14 days
Alkalinity	P, G	Cool, 4°C	14 days
Ammonia	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Biochemical oxygen demand	P, G	Cool, 4°C	48 hours
Bromide	P, G	None required	28 days
Biochemical oxygen demand, carbonaceous	P, G	Cool, 4°C	48 hours
Chemical oxygen demand	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Chloride	P, G	None required	28 days
Chlorine, total residual	P, G	None required	Analyze immediately
Color	P, G	Cool, 4°C	48 hours
Cyanide, total and amenable to chlorination	P, G	Cool, 4°C, NaOH to pH>12, 0.6g ascorbic acid	14 days
Fluoride	P	None required	28 days
Hardness	P, G	HNO_3 to pH<2, H_2SO_4 to pH<2	6 months
Hydrogen ion (pH)	P, G	None required	Analyze immediately
Kjeldahl and organic nitrogen	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Metals:			
Chromium VI	P, G	Cool, 4°C	24 hours
Mercury	P, G	HNO_3 to pH<2	28 days
Metals, except chromium VI and mercury	P, G	HNO_3 to pH<2	6 months
Nitrate	P, G	Cool, 4°C	48 hours
Nitrate-nitrite	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Nitrite	P, G	Cool, 4°C	48 hours
Oil and grease	G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Organic carbon	P, G	Cool, 4°C, HCl or H_2SO_4 to pH<2	28 days
Orthophosphate	P, G	Filter immediately, cool, 4°C	48 hours
Oxygen, Dissolved Probe	G Bottle and top	None required	Analyze immediately
Winkler	do	Fix on site and store in dark	8 hours
Phenols	G only	Cool, 4°C, H_2SO_4 to pH<2	28 days
Phosphorus (elemental)	G	Cool, 4°C	48 hours
Phosphorus, total	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Residue, total	P, G	Cool, 4°C	7 days
Residue, Filterable	P, G	Cool, 4°C	7 days
Residue, Nonfilterable (TSS)	P, G	Cool, 4°C	7 days
Residue, Settleable	P, G	Cool, 4°C	48 hours
Residue, volatile	P, G	Cool, 4°C	7 days
Silica	P	Cool, 4°C	28 days
Specific conductance	P, G	Cool, 4°C	28 days

TABLE 3-1 REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES (CONTINUED)

Name	Container[1]	Preservation	Maximum holding time
Sulfate	P, G	Cool, 4°C	28 days
Sulfide	P, G	Cool, 4°C, add zinc acetate plus sodium hydroxide to $pH > 9$	7 days
Sulfite	P, G	None required	Analyze immediately
Surfactants	P, G	Cool, 4°C	48 hours
Temperature	P, G	None required	Analyze
Turbidity	P, G	Cool, 4°C	48 hours
Organic Tests:			
Purgeable Halocarbons	G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$	14 days
Purgeable aromatic hydrocarbons	G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$, HCl to pH2	14 days
Acrolein and acrylonitrile	G, Teflon-lined septum	Cool, 4°C, 0.008% $Na_2S_2O_3$, Adjust pH to 4-5	14 days
Phenols	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$	7 days until extraction, 40 days after extraction
Benzidines	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$	7 days until extraction
Phthalate esters	G, Teflon-lined cap	Cool, 4°C	7 days until extraction 40 days after extraction
Nitrosamines	G, Teflon-lined cap	Cool, 4°C, store in dark, 0.008% $Na_2S_2O_3$	40 days after extraction
PCBs, acrylonitrile	G, Teflon-lined cap	Cool, 4°C	40 days after extraction
Nitroaromatics and isophorone	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$ store in dark	40 days after extraction
Polynuclear aromatic hydrocarbons	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$ store in dark	40 days after extraction
Haloethers	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$	40 days after extraction
Chlorinated hydrocarbons	G, Teflon-lined cap	Cool, 4°C	40 days after extraction
TCDD	G, Teflon-lined cap	Cool, 4°C, 0.008% $Na_2S_2O_3$	40 days after extraction
Total organic halogens	G, Teflon-lined cap	Cool, 4°C, H_2SO_4 to $pH < 2$	7 days
Pesticides Tests:			
Pesticides	G, Teflon-lined cap	Cool, 4°C, pH 5-9	40 days after extraction
Radiological Tests:			
Alpha, beta and radium	P, G	HNO_3 to $pH < 2$	6 months

[1] Polyethylene (P) or Glass (G)

Source:
U.S. Environmental Protection Agency, 1986,
Test Methods for Evaluating Solid Waste:
EPA Report SW-846; Volume I: Physical/Chemical
Methods

Thus, for example, a sample collected at 2:45 p.m. (14:45 on the 24-hour clock) on May 15, 1987, would be assigned the sample number: 8705151445. Other systems of identifying samples may be used for certain projects, if desired.

Sample splits, spikes, and blanks required for QA/QC analysis will be labeled and given sample numbers according to the same scheme. All sample numbers and the source of the associated samples will be recorded in the Field Logbook.

Seal each sample container with a chain-of-custody seal, which is an adhesive seal clearly indicating, in waterproof ink:

- Sample number
- Project and site identification
- Date
- Signature and printed name of individual responsible for sampling.

These seals are not to be removed from the containers except by laboratory personnel. Complete Chain-of-Custody procedures are described in a separate SOP.

3.3 Since the great majority of analytes require preservation at low temperatures (4°C), it will be the normal policy to preserve <u>all</u> samples in ice chests at 4°C, unless specifically stated otherwise in the Sampling and Analysis Plan.

Immediately after affixing labels and chain-of-custody seals to the sample containers, place them on ice in an ice chest. During subsequent handling and shipping, ensure that enough ice remains in the chest to keep the samples at a temperature no greater than 4°C.

3.4 Ideally, samples will be directly delivered to the analytical laboratory by the person responsible for the sampling. If this is not possible, arrange for transportation by common carrier. Record each transfer of sample custody on the chain-of-custody form.

3.5 If shipping by common carrier is necessary, pack the samples securely, using clean paper, styrofoam beads, or similar clean material, so that there is no likelihood of breakage during transit. Seal each shipping container (ice chest or similar unit) with a chain-of-custody seal, and clearly label the package "FRAGILE-GLASSWARE" or with other appropriate indications of package contents. Include chain-of-custody documentation within the sealed container, as described in the chain-of-custody SOP.

Maintain full chain-of-custody records (as described in a separate SOP) showing all transfers of sample custody between the sampling point and the analytical laboratory.

4.0 REFERENCES

U.S. Code of Federal Regulations, 1983, 40 CFR 264.97.

U.S. Environmental Protection Agency, 1986a, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, p. 11-117.

U.S. Environmental Protection Agency, 1986b, Test Methods for Evaluating Solid Waste: EPA Report SW-846; Volume I: Physical/Chemical Methods.

Prepared By: ______________________

Reviewed By: ______________________

APPENDIX H

APPENDIX H

CHAIN-OF-CUSTODY PROCEDURES

Chain-of-Custody Procedures

1.0 PURPOSE

To describe Standard Operating Procedures used to ensure complete chain-of-custody recording for all samples.

2.0 SCOPE

Formal chain-of-custody procedures are required for documentation of sample possession from time of collection to time of analysis on most projects.

The procedures described in this document are designed to meet all legal accountability requirements, including specifically those for sample documentation under RCRA.

3.0 PROCEDURES

3.1 The chain-of-custody program allows for the tracing of possession and handling of individual samples from the time of field collection through laboratory analysis. Elements of the chain-of-custody program include:

- Sample labels, which prevent misidentification of samples;
- Sample seals to preserve the integrity of the sample from the time it is collected until it is opened in the laboratory;
- Field logbook to record information about each sample collection during the monitoring program;
- Chain-of-custody record to establish the documentation necessary to trace sample possession from the time of collection to analysis;
- Sample analysis request sheets, which serve as official communication to the laboratory of the particular analysis(es) required for each sample and provide further evidence that the chain of custody is complete; and
- Laboratory logbook and analysis notebooks, which are maintained at the laboratory and record all pertinent information about the sample.

3.2 Immediately after sample collection, label each sample container with an adhesive label containing the information needed to positively identify the sample and the treatment appropriate for it. Labels are usually supplied by the laboratory which will perform the analyses, and in some cases may already be affixed to the sample containers. Mark the labels with a waterproof ink.

Include on the label:

- Project and site identification
- Sample number
- Sample preservation (e.g., H_2SO_4, $Na_2S_2O_3$)
- Date and time of sampling
- Any other information needed for sample analysis.

Standard practice is to assign a sample number of 10 digits, indicating the date and time of sampling, as follows:

- Year (2 digits)
- Month (2 digits)
- Day (2 digits)
- Time (24-hour clock; 4 digits)

Thus, for example, a sample collected at 2:45 p.m. (14:45 on the 24-hour clock) on May 15, 1987, would be assigned the sample number: 8705151445. Other systems of identifying samples may be used for certain projects, if desired by the client.

Sample splits, spikes, and blanks required for QA/QC analysis will be labeled and given sample numbers according to the same scheme. Record all sample numbers and the source of the associated samples in the Field Logbook.

3.3 Seal each sample container with a chain-of-custody seal. The chain-of-custody seal is an adhesive seal with spaces for recording the following information:

- Sample number
- Project and site identification
- Date
- Signature and printed name of individual responsible for sampling.

Record this information on the seal, using a waterproof ink, and affix the seal over the lid of the sampling container so that the container cannot be opened until the seal is broken. The seal is not to be broken except by laboratory personnel at the time the sample container is opened for analysis. A typical chain-of-custody seal is shown in Figure 3-1.

3.4 Record the sample number, date and time of sampling, and any other pertinent information in the Field Logbook.

3.5 Before delivering samples to the analytical laboratory or relinquishing possession to another person for delivery, fill out a chain-of-custody record. The chain-of-custody record must accompany the sample to the laboratory, and must record each change in sample custody from the person collecting the sample to the receiving party at the analytical laboratory. It must be signed by every person who has custody of the sample at any time.

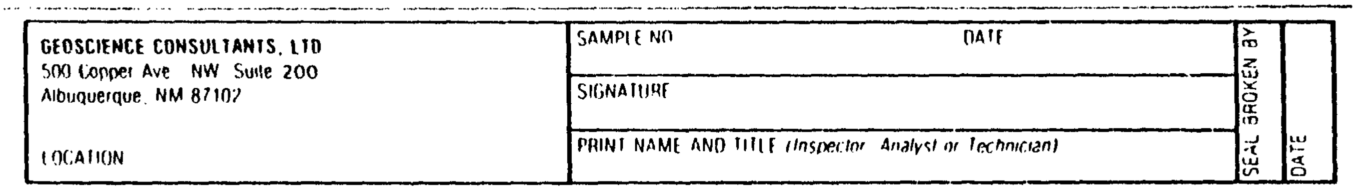
The chain-of-custody record should contain:

- Sample number(s)
- Signature of collector
- Date and time of collection
- Sample type (e.g., ground water, immiscible layer)
- Identification of sample site (well, spring, soil boring, etc.)
- Number of containers
- Signature of person(s) involved in the chain of possession
- Inclusive dates of possession
- Date of sample receipt by the laboratory

3.6 Before delivering samples to the analytical laboratory, fill out a Sample Analysis Request Form. A typical chain-of-custody record and Sample Analysis Form is shown in Figure 3-2. The Sample Analysis Request Form provides the analytical laboratory with information and instructions as to the types of samples received, preservation techniques used, and types of analyses to be performed.

The Sample Analysis Request Form should contain the following information:

- Company and person requesting analyses
- Sample number



GEOSCIENCE CONSULTANTS, LTD
500 Copper Ave. NW Suite 200
Albuquerque, NM 87102

LOCATION

SAMPLE NO DATE

SIGNATURE

PRINT NAME AND TITLE *(Inspector, Analyst or Technician)*

SEAL BROKEN BY

DATE

FIGURE 3-1

CHAIN-OF-CUSTODY SEAL

FIGURE 3-2

CHAIN-OF-CUSTODY RECORD/SAMPLE ANALYSIS FORM

Geoscience Consultants, Ltd.

☐ Albuquerque
500 Copper N.W.
Suite 200
Albuquerque, NM 87102
(505) 842-0001

☐ Silver Spring
1109 Spring St.
Suite 706
Silver Spring, MD 20910
(301) 587-2088

☐ Newport Beach
5000 Birch Street
West Tower, Suite 3000
Newport Beach, CA 92660
(714) 476-3650

☐ Las Cruces
P.O. Drawer MM
Las Cruces, NM 88004
(505) 524-5364

№ 00070

Chain of Custody

DATE ______ PAGE ______ OF ______

LAB NAME ______

ADDRESS ______

TELEPHONE ______

SAMPLERS (SIGNATURE)

			ANALYSIS REQUEST																				
SAMPLE NUMBER	MATRIX	LOCATION	BASE/NEU/ACID CMPDS. GC/MS/ 625/8270	VOLATILE CMPDS. GC/MS/ 624/8240	PESTICIDES/PCB 608/8080	POLYNUCLEAR AROMATIC 610/8310	PHENOLS, SUB PHENOLS 604/8040	HALOGENATED VOLATILES 601/8010	AROMATIC VOLATILES 602/8020	TOTAL ORGANIC CARBON 415/9060	TOTAL ORGANIC HALIDES 9020	PETROLEUM HYDROCARBONS 418			PRIORITY POLLUTANT METALS (13)	CAM METALS (18) TTLC/STLC	EP TOX METALS (8)	SWDA-INORGANICS PRIMARY/SECONDARY	HAZARDOUS WASTE PROFILE				NUMBER OF CONTAINERS

PROJECT INFORMATION	SAMPLE RECEIPT	
PROJECT:	TOTAL NO. OF CONTAINERS	
PROJECT MANAGER	CHAIN OF CUSTODY SEALS	
CHARGE CODE NO.	REC'D GOOD CONDITION/COLD	
SHIPPING ID. NO.	CONFORMS TO RECORD	
VIA:	LAB NO.	

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY 1.	RELINQUISHED BY 2.	RELINQUISHED BY 3.
(Signature) (Time)	(Signature) (Time)	(Signature) (Time)
(Printed Name) (Date)	(Printed Name) (Date)	(Printed Name) (Date)
(Company)	(Company)	(Company)
RECEIVED BY 1.	RECEIVED BY 2.	RECEIVED BY (LABORATORY) 3.
(Signature) (Time)	(Signature) (Time)	(Signature) (Time)
(Printed Name) (Date)	(Printed Name) (Date)	(Printed Name)
(Company)	(Company)	(Company)

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- Date of sampling
- Project and job number or billing code
- Type of sample
- Number and type of sample containers
- Preservation methods
- Number and type of analyses requested

3.7 At time of sample delivery to the analytical laboratory, obtain signed copy of the Chain-of-Custody Record/Sample Analysis Request Form for client files and in case of any subsequent questions regarding the types of analyses requested.

3.8 If it is necessary to ship the samples to the analytical laboratory via commercial or common carrier (including truck, bus, plane, train, or other parcel delivery service), the following procedures will be followed.

Retain one copy of the chain-of-custody form, and seal the other copy or copies in a watertight pouch. Place the pouch inside the container containing the samples, and seal the entire container with a completed chain-of-custody seal and strapping tape so that it cannot be opened without breaking the seal. Record the name of the shipping company and the date, time, and place of delivery to the shipping company on the retained copy of the chain-of-custody form, signed by the person relinquishing the package to the shipping company. Instruct the receiving laboratory to verify the integrity of the package on arrival, and to certify the date, time, and place of delivery and the company making the delivery to the laboratory or to the location where the package is picked up by laboratory personnel. A copy of the chain-of-custody form containing the certification of delivery to the laboratory will be returned to GCL and retained, along with the copy certifying GCL relinquishment of the package to the shipping company.

4.0 REFERENCES

U.S. Code of Federal Regulations, 1983, 40 CFR 264.97.

U.S. Environmental Protection Agency, 1986a, RCRA Ground-Water Monitoring Technical Enforcement Guidance Document, p. 114-117.

Prepared by: ______________________

Reviewed by: ______________________

APPENDIX I

APPENDIX I

ANALYTICAL QUALITY CONTROL PROCEDURES

"TAKEN DIRECTLY FROM EPA SW-846,
TEST METHODS FOR EVALUATING SOLID WASTE."

WATER: Reagent, analyte-free, or laboratory pure water means distilled or deionized water or Type II reagent water which is free of contaminants that may interfere with the analytical test in question.

1.2 QUALITY CONTROL

The procedures indicated below are to be performed for all analyses. Specific instructions relevant to particular analyses are given in the pertinent analytical procedures.

1.2.1 Field Quality Control

The sampling component of the Quality Assurance Project Plan (QAPP) shall include:

Reference to or incorporation of accepted sampling techniques in the sampling plan;

Procedures for documenting and justifying any field actions contrary to the QAPP;

Documentation of all pre-field activities such as equipment check-out, calibrations, and container storage and preparation;

Documentation of field measurement quality control data (quality control procedures for such measurements shall be equivalent to corresponding laboratory QC procedures);

Documentation of field activities;

Documentation of post-field activities including sample shipment and receipt, field team de-briefing and equipment check-in;

Generation of quality control samples including duplicate samples, field blanks, equipment blanks, and trip blanks; and

The use of these samples in the context of data evaluation, with details of the methods employed (including statistical methods) and of the criteria upon which the information generated will be judged.

1.2.2 Analytical Quality Control

A quality control operation or component is only useful if it can be measured or documented. The following components of analytical quality control are related to the analytical batch. The procedures described are intended to be applied to chemical analytical procedures; although the principles are applicable to radio-chemical or biological analysis, the procedures may not be directly applicable to such techniques.

All quality control data and records required by this section shall be retained by the laboratory and shall be made available to the data requestor as appropriate. The frequencies of these procedures shall be as stated below or at least once with each analytical batch.

1.2.2.1 Spikes, Blanks and Duplicates

General Requirements

These procedures shall be performed at least once with each analytical batch with a minimum of once per twenty samples.

1.2.2.1.1 Duplicate Spike

A split/spiked field sample shall be analyzed with every analytical batch or once in twenty samples, whichever is the greater frequency. Analytes stipulated by the analytical method, by applicable regulations, or by other specific requirements must be spiked into the sample. Selection of the sample to be spiked and/or split depends on the information required and the variety of conditions within a typical matrix. In some situations, requirements of the site being sampled may dictate that the sampling team select a sample to be spiked and split based on a pre-visit evaluation or the on-site inspection. This does not preclude the laboratory's spiking a sample of its own selection as well. In other situations the laboratory may select the appropriate sample. The laboratory's selection should be guided by the objective of spiking, which is to determine the extent of matrix bias or interference on analyte recovery and sample-to-sample precision. For soil/sediment samples, spiking is performed at approximately 3 ppm and, therefore, compounds in excess of this concentration in the sample may cause interferences for the determination of the spiked analytes.

1.2.2.1.2 Blanks

Each batch shall be accompanied by a reagent blank. The reagent blank shall be carried through the entire analytical procedure.

1.2.2.1.3 Field Samples/Surrogate Compounds

Every blank, standard, and environmental sample (including matrix spike/matrix duplicate samples) shall be spiked with surrogate compounds prior to purging or extraction. Surrogates shall be spiked into samples according to the appropriate analytical methods. Surrogate spike recoveries shall fall within the control limits set by the laboratory (in accordance with procedures specified in the method or within ±20%) for samples falling within the quantification limits without dilution. Dilution of samples to bring the analyte concentration into the linear range of calibration may dilute the surrogates below the quantification limit; evaluation of analytical quality then will rely on the quality control embodied in the check, spiked and duplicate spiked samples.

1.2.2.1.4 Check Sample

Each analytical batch shall contain a check sample. The analytes employed shall be a representative subset of the analytes to be determined. The concentrations of these analytes shall approach the estimated quantification limit in the matrix of the check sample. In particular, check samples for metallic analytes shall be matched to field samples in phase and in general matrix composition.

1.2.2.2 Clean-Ups

Quality control procedures described here are intended for adsorbent chromatography and back extractions applied to organic extracts. All batches of adsorbents (Florisil, alumina, silica gel, etc.) prepared for use shall be checked for analyte recovery by running the elution pattern with standards as a column check. The elution pattern shall be optimized for maximum recovery of analytes and maximum rejection of contaminants.

1.2.2.2.1 Column Check Sample

The elution pattern shall be reconfirmed with a column check of standard compounds after activating or deactivating a batch of adsorbent. These compounds shall be representative of each elution fraction. Recovery as specified in the methods is considered an acceptable column check. A result lower than specified indicates that the procedure is not acceptable or has been misapplied.

1.2.2.2.2 Column Check Sample Blank

The check blank shall be run after activating or deactivating a batch of adsorbent.

1.2.2.3 Determinations

1.2.2.3.1 Instrument Adjustment: Tuning, Alignment, etc.

Requirements and procedures are instrument- and method-specific. Analytical instrumentation shall be tuned and aligned in accordance with requirements which are specific to the instrumentation procedures employed. Individual determinative procedures shall be consulted. Criteria for initial conditions and for continuing confirmation conditions for methods within this manual are found in the appropriate procedures.

1.2.2.3.2 Calibration

Analytical instrumentation shall be calibrated in accordance with requirements which are specific to the instrumentation and procedures employed. Introductory Methods 7000 and 8000 and appropriate analytical procedures shall be consulted for criteria for initial and continuing calibration.

1.2.2.3.3 Additional QC Requirements for Inorganic Analysis

Standard curves used in the determination of inorganic analytes shall be prepared as follows:

Standard curves derived from data consisting of one reagent blank and four concentrations shall be prepared for each analyte. The response for each prepared standard shall be based upon the average of three replicate readings of each standard. The standard curve shall be used with each subsequent analysis provided that the standard curve is verified by using at least one reagent blank and one standard at a level normally encountered or expected in such samples. The response for each standard shall be based upon the average of three replicate readings of the standard. If the results of the verification are not within +10% of the original curve, a new standard shall be prepared and analyzed. If the results of the second verification are not within +10% of the original standard curve, a reference standard should be employed to determine if the discrepancy is with the standard or with the instrument. New standards should also be prepared on a quarterly basis at a minimum. All data used in drawing or describing the curve shall be so indicated on the curve or its description. A record shall be made of the verification.

Standard deviations and relative standard deviations shall be calculated for the percent recovery of analytes from the spiked sample duplicates and from the check samples. These values shall be established for the twenty most recent determinations in each category.

1.2.2.3.4 Additional Quality Control Requirements for Organic Analysis

The following requirements shall be applied to the analysis of samples by gas chromatography, liquid chromatography and gas chromatography/mass spectrometry.

The calibration of each instrument shall be verified at frequencies specified in the methods. A new standard curve must be prepared as specified in the methods.

The tune of each GC/MS system used for the determination of organic analytes shall be checked with 4-bromofluorobenzene (BFB) for determinations of volatiles and with decafluorotriphenylphosphine (DFTPP) for determinations of semi-volatiles. The required ion abundance criteria shall be met before determination of any analytes. If the system does not meet the required specification for one or more of the required ions, the instrument must be retuned and rechecked before proceeding with sample analysis. The tune performance check criteria must be achieved daily or for each 12 hour operating period, whichever is more frequent.

Background subtraction should be straightforward and designed only to eliminate column bleed or instrument background ions. Background subtraction actions resulting in spectral distortions for the sole purpose of meeting special requirements are contrary to the objectives of Quality Assurance and are unacceptable.

For determinations by HPLC or GC, the instrument calibration shall be verified as specified in the methods.

1.2.2.3.5 Identification

Identification of all analytes must be accomplished with an authentic standard of the analyte. When authentic standards are not available, identification is tentative.

For gas chromatographic determinations of specific analytes, the relative retention time of the unknown must be compared with that of an authentic standard. For compound confirmation, a sample and standard shall be re-analyzed on a column of different selectivity to obtain a second characteristic relative retention time. Peaks must elute within daily retention time windows to be declared a tentative or confirmed identification.

For gas chromatographic/mass spectrometric determinations of specific analytes, the spectrum of the analyte should conform to a literature representation of the spectrum or to a spectrum of the authentic standard obtained after satisfactory tuning of the mass spectrometer and within the same twelve-hour working shift as the analytical spectrum. The appropriate analytical methods should be consulted for specific criteria for matching the mass spectra, relative response factors, and relative retention times to those of authentic standards.

1.2.2.3.6 Quantification

The procedures for quantification of analytes are discussed in the appropriate general procedures (7000, 8000) and the specific analytical methods.

In some situations in the course of determining metal analytes, matrix-matched calibration standards may be required. These standards shall be composed of the pure reagent, approximation of the matrix, and reagent addition of major interferents in the samples. This will be stipulated in the procedures.

Estimation of the concentration of an organic compound not contained within the calibration standard may be accomplished by comparing mass spectral response of the compound with that of an internal standard. The procedure is specified in the methods.

1.3 DETECTION LIMIT AND QUANTIFICATION LIMIT

The detection limit and quantification limit of analytes shall be evaluated by determining the noise level of response for each sample in the batch. If analyte is present, the noise level adjacent in retention time to the analyte peak may be used. For wave-length dispersive instrumentation, multiple determinations of digestates with no detectable analyte may be used to establish the noise level. The method of standard additions should then be used to determine the calibration curve using one digestate or extracted sample in which the analyte was not detected. The slope of the calibration curve, m, should be calculated using the following relations:

m = slope of calibration line

S_B = standard deviation of the average noise level

$MDL = KS_B/m$

For $K = 3$; MDL = method detection limit.

For $K = 5$; MQL = method quantitation limit.

1.4 DATA REPORTING

The requirement of reporting analytical results on a wet-weight or a dry-weight basis is dictated by factors such as: sample matrix; program or regulatory requirement; and objectives of the analysis.

Analytical results shall be reported with the percent moisture or percent solid content of the sample.

1.5 QUALITY CONTROL DOCUMENTATION

The following sections list the QC documentation which comprises the complete analytical package. This package should be obtained from the data generator upon request. These forms, or adaptations of these forms, shall be used by the data generator/reportor for inorganics (I), or for organics (O) or both (I/O) types of determinations.

1.5.1 Analytical Results (I/O: Form I)

Analyte concentration.

Sample weight.

Percent water (for non-aqueous samples when specified).

Final volume of extract or diluted sample.

Holding times (I: Form X).

1.5.2 Calibration (I: Form II; O: Form V, VI, VII, IX)

Calibration curve or coefficients of the linear equation which describes the calibration curve.

Correlation coefficient of the linear calibration.

Concentration/response data (or relative response data) of the calibration check standards, along with dates on which they were analytically determined.

1.5.3 Column Check (O: Form X)

Results of column chromatography check, with the chromatogram.

1.5.4 Extraction/Digestion (I/O: Form I)

Date of the extraction for each sample.

1.5.5 Surrogates (O: Form II)

Amount of surrogate spiked, and percent recovery of each surrogate.

1.5.6 Matrix/Duplicate Spikes (I: Form V, VI; O: Form III)

Amount spiked, percent recovery, and relative percent difference for each compound in the spiked samples for the analytical batch.

1.5.7 Check Sample (I: Form VII; O: Form VIII)

Amount spiked, and percent recovery of each compound spiked.

1.5.8 Blank (I: Form III; O: Form IV)

Identity and amount of each constituent.

1.5.9 Chromatograms (for organic analysis)

All chromatograms for reported results, properly labeled with:

- Sample identification
- Method identification
- Identification of retention time of analyte on the chromatograms.

1.5.10 Quantitative Chromatogram Report (O: Forms VIII, IX, X)

Retention time of analyte.

Amount injected.

Area of appropriate calculation of detection response.

Amount of analyte found.

Date and time of injection.

1.5.11 Mass Spectrum

Spectra of standards generated from authentic standards (one for each report for each compound detected).

Spectra of analytes from actual analyses.

Spectrometer identifier.

1.5.12 Metal Interference Check Sample Results (I: Form IV)

1.5.13 Detection Limit (I: Form VII; O: Form I)

Analyte detection limits with methods of estimation.

1.5.14 Results of Standard Additions (I: Form VIII)

1.5.15 Results of Serial Dilutions (I: Form IX)

1.5.16 Instrument Detection Limits (I: Form XI)

1.5.17 ICP Interelement Correction Factors and ICP Linear Ranges (when applicable) (I: Form XII, Form XIII).

1.6 REFERENCES

1. Guidelines and Specifications for Preparing Quality Assurance Program Plans, September 20, 1980, Office of Monitoring Systems and Quality Assurance, ORD, U.S. EPA, QAMS-004/80, Washington, DC 20460.

2. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, December 29, 1980, Office of Monitoring Systems and Quality Assurance, ORD, U.S. EPA, QAMS-005/80, Washington, DC 20460.