1R - 279

REPORTS

DATE:

1999

Highlander Environmental Corp.

Midland, Texas

April 14, 1999

Mr. William C. Olson, Hydrogeologist
Environmental Bureau
Oil Conservation Division
Energy, Minerals and Natural Resources Department
2040 S. Pacheco
Santa Fe, New Mexico 87505

Re: Workplan for Plugging of Monitor wells, Texaco Exploration and Production Inc., Vacuum Field Unit, Buckeye, Lea County, New Mexico

Dear Mr. Olson,

Highlander Environmental Corp. (Highlander) has been requested by Texaco Exploration and Production, Inc. (Texaco) to prepare a workplan for the plugging of selected monitor wells at the Vacuum Field Unit (Site) located in Buckeye, New Mexico. The Site is located approximately twenty-five (25) miles northwest of Hobbs, New Mexico. A total of twenty-three monitor wells and two extraction wells are present at the Site. The monitor wells and extraction wells are situated in Section 31, Township 17 South, Range 35 East, Section 36, Township 17 South, Range 34 East, Section 1, Township 18 South, Range 34 East, and Section 6, Township 17 South, Range 35 East, Lea County, New Mexico. Figure 1 shows the Site location and topographic map. Figure 2 presents a Site map.

Previous Investigation

On January 29, 1998, a Groundwater Monitoring Report was submitted to the NMOCD for review. The recommendations in the report included sampling selected monitor wells on a quarterly basis and plugging of the remaining monitor wells at the Site. NMOCD requested a work plan for the plugging and abandonment of the monitor wells. The NMOCD correspondence is shown in Appendix A.

Monitor well Plugging Activities

A total of 13 monitor wells will be plugged according to NMOCD guidelines. The completion details of the monitor wells are shown in Table 1. Table 2 lists the monitor wells to be plugged at the Site.

Prior to plugging each monitor well, an attempt will be made to remove the 3" casing from the well bore. If unsuccessful, the casing will be left in place and cut below ground

surface after grouting. A tremie line will be used to pump grout (3-5% cement/bentonite) from the bottom to the top of the well. The tremie line will consist of 1" diameter PVC pipe in 10' to 20' length sections. The bottom section of the tremie line will be placed near the bottom of the well. Once the bottom portion of the well is grouted, a 20' section will be removed and grouting continued up to the top of the casing. The surface will be capped with clean fill material.

Highlander appreciates the opportunity to support Texaco on the project. Please call if you have any questions.

Sincerely,
Highlander Environmental Corp.

Ike Tavarez
Project Manager/ Geologist

cc: Mr. Rodney Bailey, Texaco
Mr. Chris Williams, OCD-Hobbs District

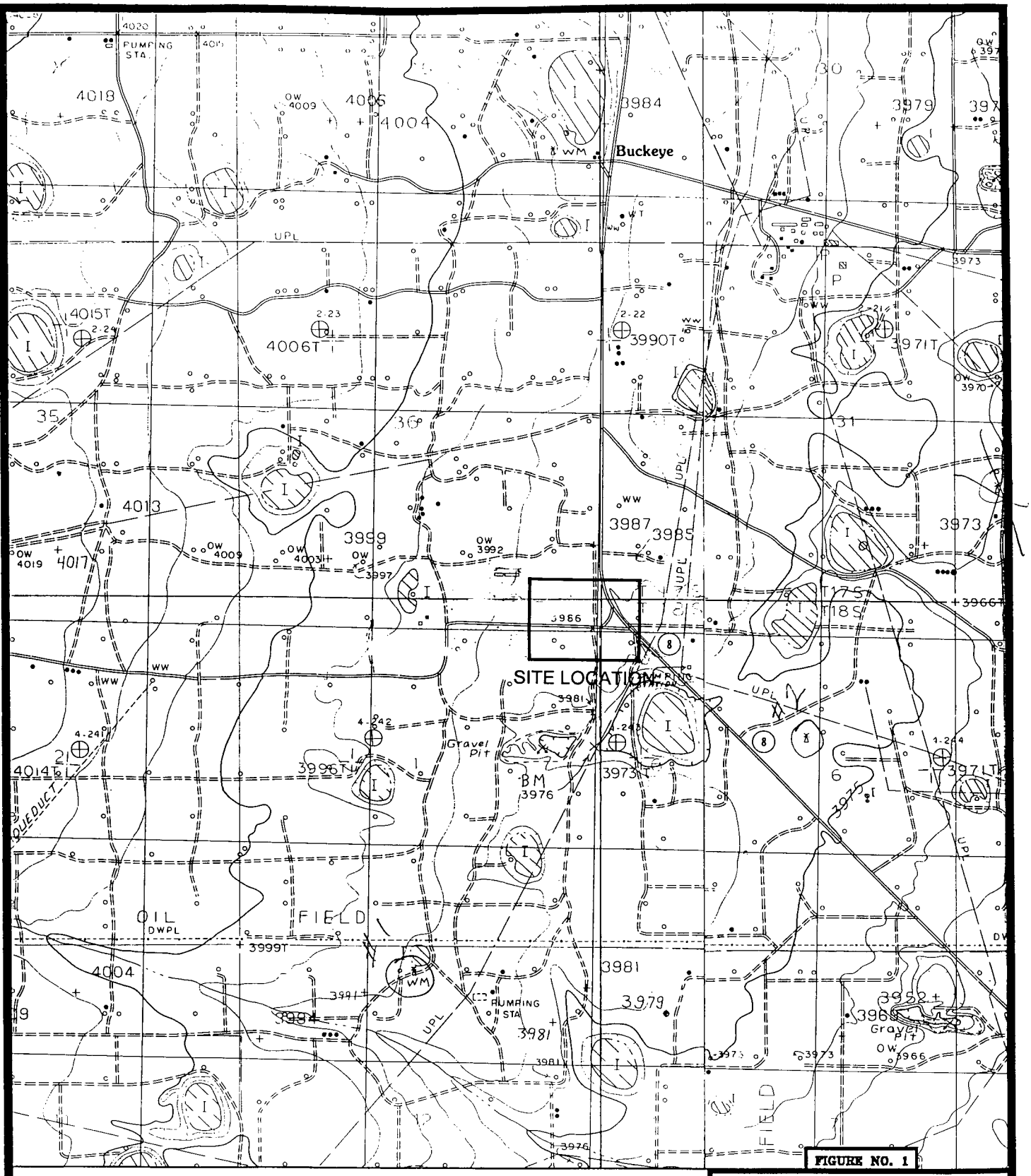


FIGURE NO. 1

LEA COUNTY, NEW MEXICO

TEXACO EXPLORATION AND PRODUCTION, INC.

TOPOGRAPHIC MAP

HIGHLANDER ENVIRONMENTAL MIDLAND, TEXAS

TAKEN FROM U.S.G.S.
BUCKEYE & LOVINGTON SW, NM
7.5' QUADRANGLES

LEGEND

☐ SITE LOCATION

SCALE: 1"=2,000'

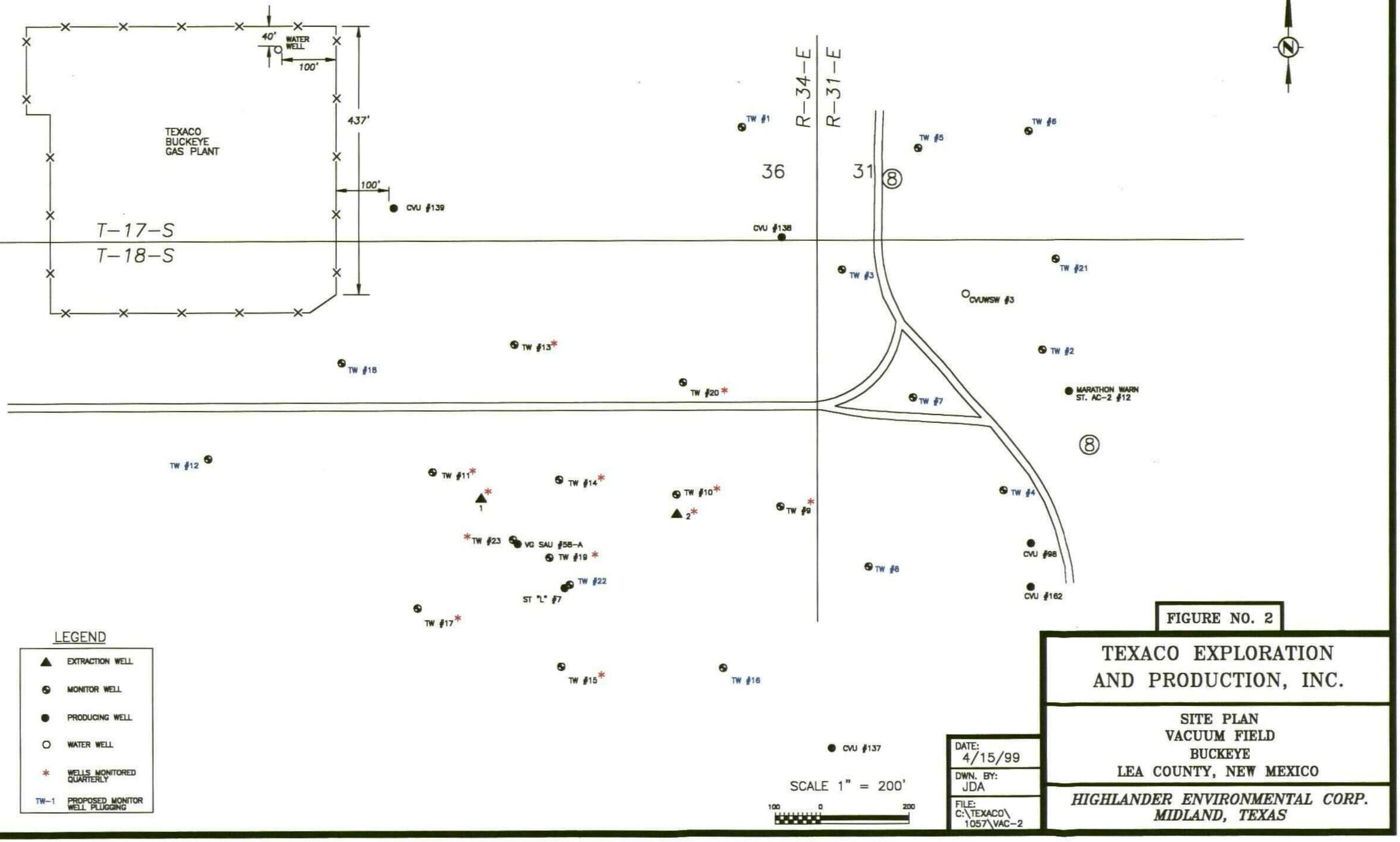


FIGURE NO. 2

TEXACO EXPLORATION AND PRODUCTION, INC.

SITE PLAN
VACUUM FIELD
BUCKEYE
LEA COUNTY, NEW MEXICO

HIGHLANDER ENVIRONMENTAL CORP.
MIDLAND, TEXAS

Table 1

Texaco Exploration and Production, Inc.
Well Completion Details
Vacuum Field Unit, Buckeye
Lea County, New Mexico

Well ID	Casing Size	Total Depth (ft)	Perforations (ft)	Elevation of Top of Casing (ft)
TW- 1 (Plugging)	3"	200	60	3987.50
TW- 2 (Plugging)	3"	238	60	3986.40
TW- 3 (Plugging	3"	237	80	3987.30
TW- 4 (Plugging	3"	232	80	3985.50
TW- 5 (Plugging)	3"	234	80	3986.80
TW- 6 (Plugging	3"	236	80	3987.30
TW- 7 (Plugging)	3"	238	120	3986.10
TW- 8 (Plugging)	3"	236	120	3986.40
TW- 9	3"	236	115	3988.10
TW- 10	3"	234	120	3987.20
TW-11	3"	241	120	3988.60
TW- 12 (Plugging)	3"	230	110	3988.90
TW- 13	3"	232	110	3988.10
TW- 14	3"	231	110	3986.10
TW- 15	3"	231	110	3983.50
TW- 16 (Plugging)	3"	233	110	3987.00
TW- 17	3"	225	110	3984.30
TW- 18 (Plugging)	3"	237	110	3989.40
TW- 19	3"	226	110	3984.20
TW- 20 (Plugging)	3"	233	110	3987.80
TW- 21 (Plugging)	3"	233	110	3986.50
TW- 22	3"	227	110	*
TW- 23	3"	226	110	*
Extraction well #1	6"	232	(20) 212-232	*
Extraction well #2	6"	234	(20) 214-234	*

TW (monitor wells) – Started drilling on 10-24-89
Extraction Wells Drilled - Well #1 (2-27-90), Well #2 (2-28-90)
* Not Surveyed

Table 2
Texaco Exploration and Production, Inc.
Vacuum Field Unit, Buckeye
Lea County, New Mexico

Proposed Monitorwells to be Plugged	Monitorwells Monitored
Well ID	**Well ID**
TW-1	TW-9
TW- 2	TW-10
TW- 3	TW-11
TW- 4	TW-13
TW- 5	TW-14
TW- 6	TW-15
TW- 7	TW-17
TW- 8	TW-19
TW-12	TW-20
TW- 16	TW-23
TW-18	Extraction well #1
TW-21	Extraction well #2
TW- 22	

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

January 29, 1999

CERTIFIED MAIL
RETURN RECEIPT NO. Z-274-520-606

Mr. Rodney Bailey
Texaco E&P Inc.
205 E. Bender
Hobbs, New Mexico 88240

RE: VACUUM FIELD UNIT
LEA COUNTY, NEW MEXICO

Dear Mr. Bailey:

The New Mexico Oil Conservation Division (OCD) has reviewed Texaco Exploration & Production Inc.'s (TEPI) October 14, 1998 "GROUNDWATER MONITORING REPORT, TEXACO EXPLORATION AND PRODUCTION INC., VACUUM FIELD UNIT, BUCKEYE, LEA COUNTY, NEW MEXICO" which was submitted on behalf of TEPI by their consultant Highlander Environmental Corp. This document contains the results of TEPI's monitoring of contaminated ground water at the Vacuum Field Unit site south of Buckeye, New Mexico. The document also contains TEPI's proposal for plugging and abandonment of a number of the monitoring wells and a work plan for additional ground water monitoring of the remaining monitor wells.

The above referenced plugging and ground water monitoring proposal is approved with the following conditions:

1. Monitor wells TW-10, TW-13 and TW-20 will not be plugged and will be included in the ground water monitoring plan.

2. Prior to conducting any plugging activities, TEPI will submit to the OCD for approval a monitor well plugging and abandonment work plan.

3. All ground water quality samples will be obtained and analyzed using EPA approved methods and procedures including use of appropriate quality assurance/quality control (QA/QC) methods.

4. TEPI will submit an annual report on ground water sampling to the OCD by February 2, 2000. The report will be submitted to the OCD Santa Fe Office with a copy provided to the OCD Hobbs District Office. The report will contain:

   a. A description and summary of all past and present remediation and monitoring activities including conclusions and recommendations.

   b. A summary of all past and present water quality sampling results including copies of the laboratory analytical data sheets and associated (QA/QC) data from the recent sampling events.

   c. A site map showing the location of all monitor wells , recovery wells and relevant site features.

   d. A water table elevation map constructed using the water table elevation of ground water in all site monitor and recovery wells. The map will show the direction and magnitude of the hydraulic gradient.

5. TEPI will notify the OCD at least 1 week in advance of all scheduled activities such that the OCD has the opportunity to witness the sampling events and split samples.

6. All wastes generated will be disposed of at an OCD approved facility.

Please be advised that OCD approval does not limit TEPI to the proposed work plan should the plan fail to adequately remediate or monitor contamination related to TEPI's activities, or if contamination exists which is outside the scope of the work plan. In addition, OCD approval does not relieve TEPI of responsibility for compliance with any other federal, state or local laws and regulations.

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

Sincerely,

William C. Olson
Hydrologist
Environmental Bureau

xc: Chris Williams, OCD Hobbs District Office
Vijay K. Kurki, Highlander Environmental Corp.

1R - 279

REPORTS

DATE:
1998

Highlander Environmental Corp.

Midland, Texas

May 1, 1998

RECEIVED

MAY 11 1998

Environmental Bureau
Oil Conservation Division

Mr. William C. Olson, Hydrogeologist
Environmental Bureau
Oil Conservation Division
Energy, Minerals and Natural Resources Department
2040 S. Pacheco
Santa Fe, New Mexico 87505

Re: Results of Groundwater Monitoring, Texaco Exploration and Production Inc., Vacuum Field Unit, Buckeye, Lea County, New Mexico

Dear Mr. Olson,

Highlander Environmental Corp. (Highlander) has been requested by Texaco Exploration and Production, Inc. (Texaco) to collect groundwater samples to evaluate current groundwater quality conditions at the Vacuum Field Unit Site located in Buckeye, New Mexico. The Site is located approximately twenty-five (25) miles northwest of Hobbs, New Mexico. A total of twenty-three monitor wells and two extraction wells were present at the Site. The monitor wells and extraction wells are situated in Section 31, Township 17 South, Range 35 East, Section 36, Township 17 South, Range 34 East, Section 1, Township 18 South, Range 34 East, and Section 6, Township 17 South, Range 35 East, Lea County, New Mexico. Figure 1 shows the Site location and topographic map. Figure 2 presents a Site map.

Background

In 1989, a total of twenty-three (23) monitor wells were installed at the Site to locate the source and delineate the extent of chloride in groundwater. The wells were drilled to the base of the Ogallala aquifer, which coincides with the top of the redbed. The well completion details are summarized in Table 1.

During routine testing of fresh water wells at the Vacuum Field Unit by Texaco, water supply well CVU #3 contained an elevated level of chloride. The New Mexico Oil Conservation Division (OCD), Hobbs District was contacted concerning the impact to the well. The water supply well CVU #3 is completed in the Pliocene Ogallala formation and is used for makeup water for Texaco's waterflood system. The study area was concentrated within ½ mile radius of the impacted water supply well. Texaco and OCD representatives performed the initial investigation.

Based on the investigation, a casing leak was detected in producing well VG SAU #58 was suspected to be the source for the chloride. The casing leak was detected at a depth of 59 feet below ground surface. The casing leak was repaired in 1990. Two (2) extraction wells #1 and #2 were installed in the plume area to remediate the groundwater impact. The details of this investigation are discussed in a report Title - "Groundwater Contamination Study of the Texaco CVU WSW #3 Vacuum Field, Buckeye, New Mexico" dated 1989-1990, Mr.Eddie W. Seay with the OCD Hobbs District prepared the report.

Groundwater samples were collected by the OCD during the development of the monitor wells. The wells were developed and sampled by jetting the wells with compressed air. Several groundwater samples were collected during the development phase and some wells showed elevated chlorides. Table 2 summaries the highest chloride level detected during the development of the wells.

Unichem International sampled groundwater from the wells during 1990. Monitoring data was only available for three Unichem performed sampling events. The results of the sampling data are summarized in Table 2.

Groundwater Monitoring Activities and Analysis

On January 12, 1998, Highlander personnel initiated groundwater monitoring activities at the Site. Prior to sampling, Highlander personnel collected a static water level from each monitor wells. The two-extraction wells (#1 and #2) were turned off before gauging. The elevation of top of casing and water level data for each well is shown in Table 1. A groundwater table map for January 12, 1998 is included in Figure 3. The direction of the groundwater flow is to the north for the study area. Generally groundwater direction in the Ogallala for the county is to the southeast.

A submergible pump was used to purge and sample the groundwater from monitor wells. Approximately three casing volumes of water was purged from each well prior to sampling. After three casing volumes were removed, a sample was collected from the pump discharge. After sampling event, pump was decontaminated to prevent cross contamination. The purged water from the wells was contained and disposed of at Texaco's plant sump.

The groundwater samples were placed into labeled and preserved containers provided by the laboratory. The ground water samples were shipped to Trace Analysis, Inc., Lubbock, Texas for chloride analysis by method EPA 300. The analytical results are summarized in Table 2.

Groundwater Sample Analysis

Referring to Table 2, with the exception of TW-23, the chloride concentrations in the wells ranged from 24 mg/l at well TW-21 to 230 mg/l at extraction well #2. Well TW-23 showed a chloride of 477mg/l, 930 mg/l and 810 mg/l. This monitor well is located near producing well VG SAU #58.

Recommendations

During development in 1989, groundwater for the wells TW-7, TW-9, TW-10, TW-11, TW-12, TW-13, TW-14, TW-17, TW-18, TW-19, TW-20, TW-22, TW-23, extraction wells #1 and extraction well #2 reported chloride in groundwater above the New Mexico Water Quality Central Commission (WQCC) standard of 250 mg/l.

The chloride levels in the groundwater from these wells ranged from 284 mg/l (TW-12) to 116,000 mg/l (TW-23). On February 1990, groundwater samples collected from TW-23 reported chloride above the WQCC standard of 53,600 mg/l. The extraction wells #1 and #2 were not sampled on February 19, 1990. Since February 1990, groundwater samples have been collected from the monitor wells at two occasions March 26, 1990 and May 1, 1990, based on available data. Extraction wells #1 and #2 were not sample during these periods, however, chloride concentrations in the groundwater from all the wells, except well TW-23, have remained below 250 mg/l.

Groundwater from well TW-23 has consistently reported decreasing chloride levels, beginning at 116,00 mg/l in 1989 to 477 mg/l in February 24,1998. Groundwater quality for the extraction wells #1 and #2 shows consistent improvement. The chloride level in the groundwater from the extraction wells has been below the WQCC standard for the past two-(2) sampling events for January 7, 1998 and April 7, 1998. The chloride level in the groundwater for well TW-23 (810 mg/l) is likely due to residue chloride present in the unsaturated zone soil.

At this time, Highlander requests permission to discontinue monitoring and plug selected monitor wells at the Site. All wells, except TW-11, TW-14, TW-15, TW-17, TW-19, TW-23, and extraction well #1 and #2 will be grouted to surface. A tremie line will be used to grout from the bottom to the top of the well.

Highlander proposes to discontinue pumping extraction wells #1 and #2 for a period of one year. After one year of cessation of pumping and monitoring activities, the extraction wells and remaining wells will be sampled for chlorides. If the chloride level remain consistent with the current levels in the groundwater from the wells, Highlander proposes to plug the remaining monitor wells and extraction wells.

Highlander appreciates the opportunity to support Texaco on the project. Please call if you have any questions.

Sincerely,
Highlander Environmental Corp.

Ike Tavarez
Project Manager/ Geologist

cc: Mr. Rodney Bailey, Texaco
Mr. Robert Browning, Texaco
Mr. Wayne Price, OCD-Hobbs District

Table 1
Texaco Exploration and Production, Inc.
Well Completion Details
Vacuum Field Unit, Buckeye
Lea County, New Mexico

Well ID	Casing Size	Total Depth (ft)	Perforations (ft)	Elevation of Top of Casing (ft)	Depth to Water (ft)	Groundwater Elevation (ft)
TW- 1	3"	200	60	3987.50	131.23	3856.27
TW- 2	3"	238	60	3986.40	128.42	3857.98
TW- 3	3"	237	80	3987.30	130.36	3856.94
TW- 4	3"	232	80	3985.50	126.67	3858.83
TW- 5	3"	234	80	3986.80	130.55	3856.25
TW- 6	3"	236	80	3987.30	130.90	3856.40
TW- 7	3"	238	120	3986.10	128.20	3857.90
TW- 8	3"	236	120	3986.40	127.38	3859.02
TW- 9	3"	236	115	3988.10	129.73	3858.37
TW- 10	3"	234	120	3987.20	129.22	3857.98
TW-11	3"	241	120	3988.60	130.31	3858.29
TW- 12	3"	230	110	3988.90	129.90	3859.00
TW- 13	3"	232	110	3988.10	130.66	3857.44
TW- 14	3"	231	110	3986.10	128.19	3857.91
TW- 15	3"	231	110	3983.50	123.89	3859.61
TW- 16	3"	233	110	3987.00	127.55	3859.45
TW- 17	3"	225	110	3984.30	125.32	3858.98
TW- 18	3"	237	110	3989.40	131.60	3857.80
TW- 19	3"	226	110	3984.20	-	-
TW- 20	3"	233	110	3987.80	130.41	3857.39
TW- 21	3"	233	110	3986.50	129.04	3857.46
TW- 22	3"	227	110	*	125.67	-
TW- 23	3"	226	110	*	125.72	-
Extraction well #1	6"	232	(20) 212-232	*	-	-
Extraction well #2	6"	234	(20) 214-234	*	-	-

TW (monitor wells) – Started drilling on 10-24-89
Extraction Wells Drilled - Well #1 (2-27-90), Well #2 (2-28-90)
* Not Surveyed

Table 2
Texaco Exploration and Production, Inc.
Cumulative Ground Water Sample Results
Vacuum Field Unit, Buckeye
Lea County, New Mexico

Sampled By:	OCD during Development	Unichem International			Highlander Environmental		
Sample Date	1989	2-19-90	3-26-90	5-1-90	1-7-98	2-24-98	4-7-98
Well ID	*Chloride (mg/l)*						
TW-1	100	90	76	68	55	-	60
TW-2	100	166	64	60	49	-	73
TW-3	71	166	100	94	27	-	44
TW-4	70	100	32	30	42	-	26
TW-5	71	32	44	40	75	-	65
TW-6	56	122	78	44	39	-	28
TW-7	5,325	60	60	47	41	-	30
TW-8	142	78	50	36	25	-	25
TW-9	13,845	36	32	22	35	-	130
TW-10	28,986	36	44	26	29	-	28
TW-11	24,495	110	68	60	34	-	34
TW-12	284	44	44	42	43	-	49
TW-13	3,053	44	32	26	28	-	30
TW-14	1,633	66	26	18	31	-	31
TW-15	56	42	64	44	33	-	45
TW-16	71	48	54	44	62	-	44
TW-17	994	46	98	40	27	-	33
TW-18	340	44	30	32	61	-	56
TW-19	6,532	192	210	58	29	-	29
TW-20	1,278	108	116	100	27	-	24
TW-21	56.8	32	30	34	24	-	25
TW-22	3,905	76	78	50	27	-	31
TW-23	116,000	53,600	28,000	20,000	930	477	810
Extraction well #1	111,825	-	-	-	200	-	190
Extraction well #2	98,335	-	-	-	220	-	230

Table 3
Texaco Exploration and Production, Inc.
Vacuum Field Unit, Buckeye
Lea County, New Mexico

Proposed Monitorwells to be Plugged	Monitorwells to be Monitored
Well ID	**Well ID**
TW-1	TW-11
TW- 2	TW-14
TW- 3	TW-15
TW- 4	TW-17
TW- 5	TW-19
TW- 6	TW-23
TW- 7	Extraction well #1
TW- 8	Extraction well #2
TW- 9	
TW- 10	
TW- 12	
TW- 13	
TW- 16	
TW- 18	
TW- 20	
TW- 21	
TW- 22	

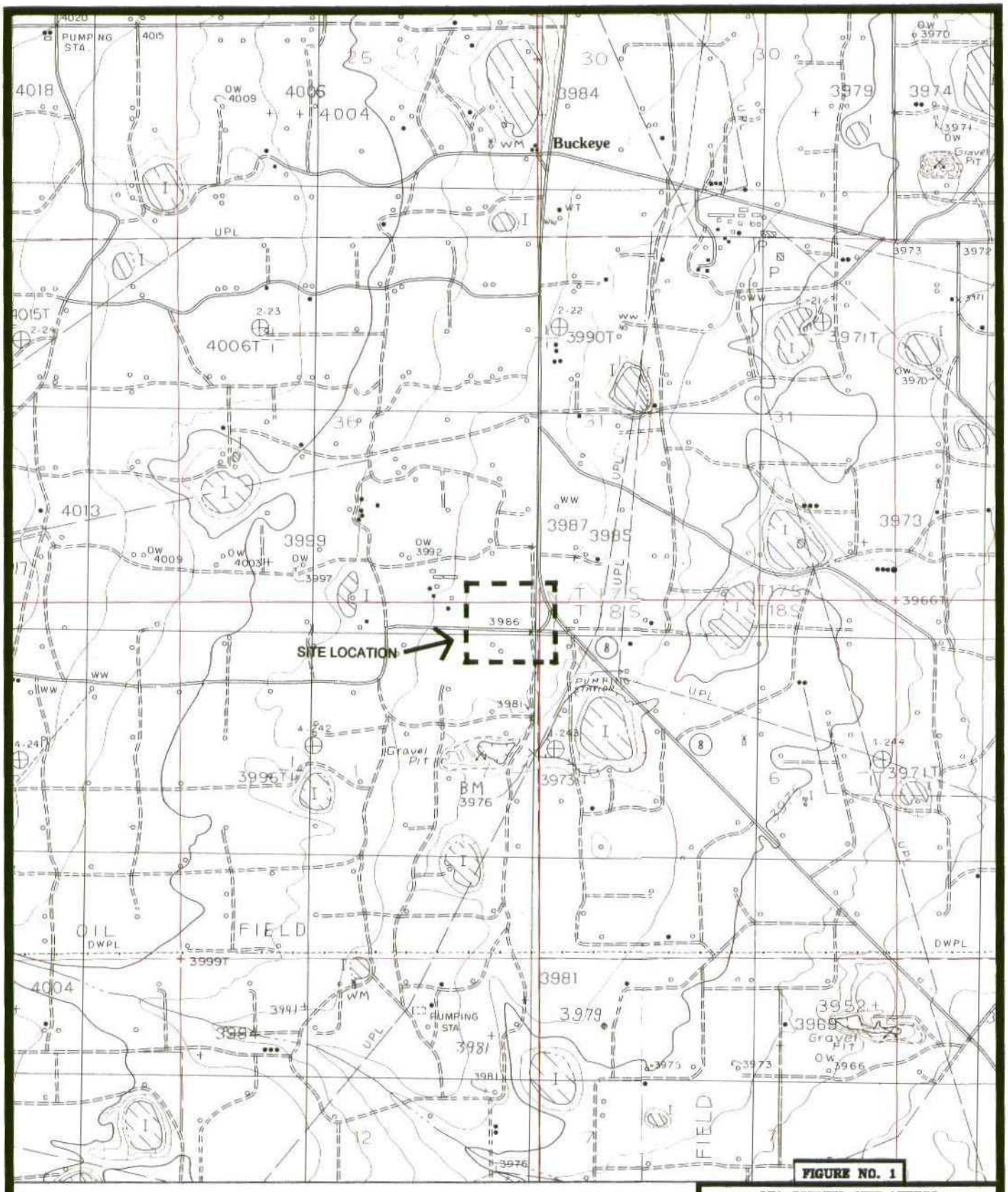


FIGURE NO. 1

LEA COUNTY, NEW MEXICO

TEXACO EXPLORATION AND PRODUCTION, INC.

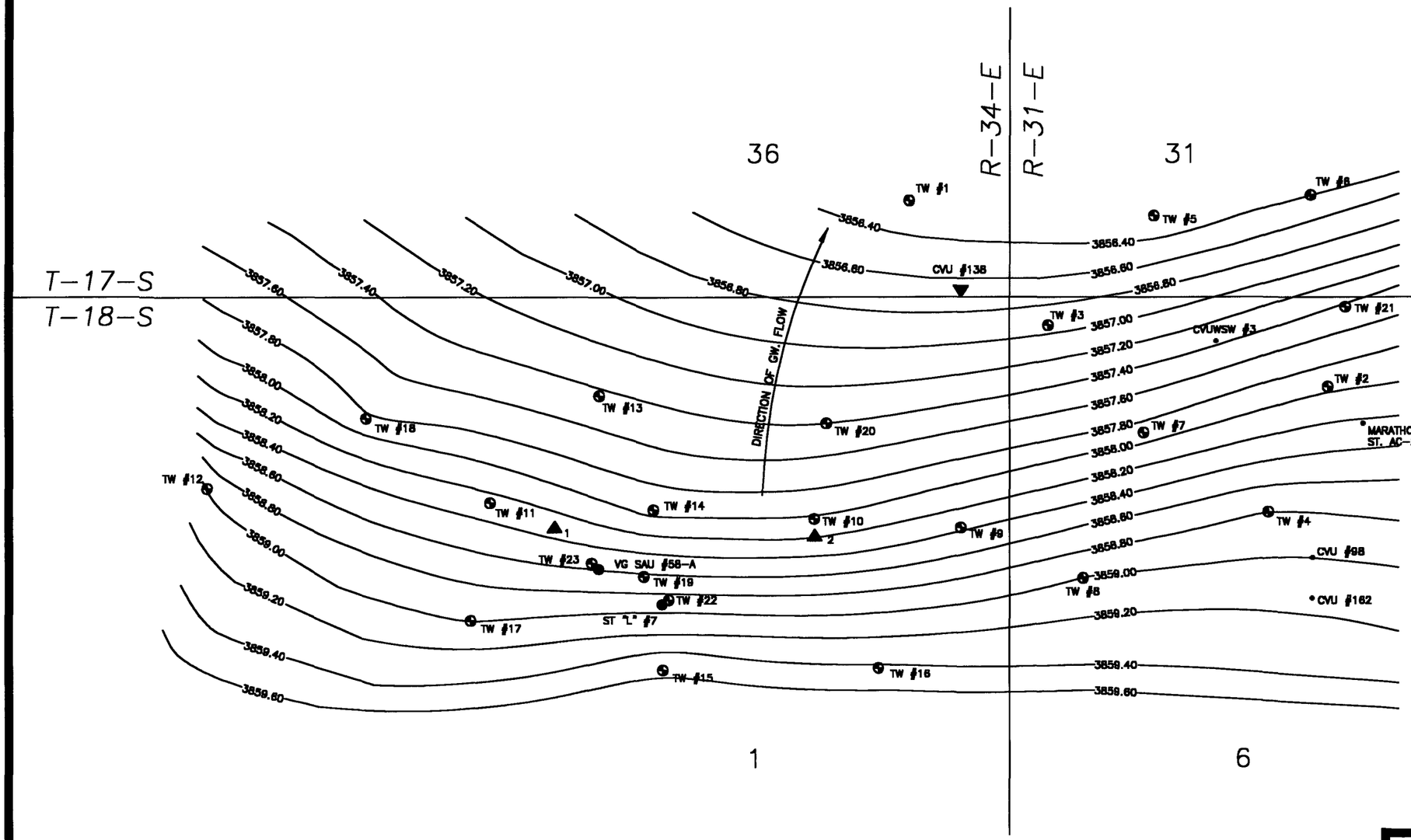
TOPOGRAPHIC MAP

HIGHLANDER ENVIRONMENTAL
MIDLAND, TEXAS

TAKEN FROM U.S.G.S.
BUCKEYE & LOVINGTON SW, NM
7.5' QUADRANGLES

LEGEND
— — SITE LOCATION

SCALE: 1"=2,000'



LEGEND

- ▲ EXTRACTION WELL
- ⊙ MONITOR WELL
- ● PRODUCING WELL

RECEIVED

MAY 11 1998

ENVIRONMENTAL BUREAU
OIL CONSERVATION DIVISION

Well ID	Elevation of TOC ft.	GW Elev. ft.
TW-1	3987.50	3856.27
TW-2	3986.40	3857.98
TW-3	3987.30	3856.94
TW-4	3985.50	3858.83
TW-5	3986.80	3856.25
TW-6	3987.30	3856.40
TW-7	3986.10	3857.90
TW-8	3986.40	3859.02
TW-9	3988.10	3856.37
TW-10	3987.20	3857.98
TW-11	3988.60	3858.29
TW-12	3988.90	3859.00
TW-13	3988.10	3857.44
TW-14	3986.10	3857.91
TW-15	3983.50	3859.61
TW-16	3987.00	3859.45
TW-17	3984.30	3858.98
TW-18	3989.40	3857.60
TW-19	3984.20	**
TW-20	3987.80	3857.39
TW-21	3986.50	3857.46
TW-22	*	---
TW-23	*	---

* – TOC ELEVATION NOT SURVEYED
** – STATIC WATER LEVEL NOT MEASURED

FIGURE 3

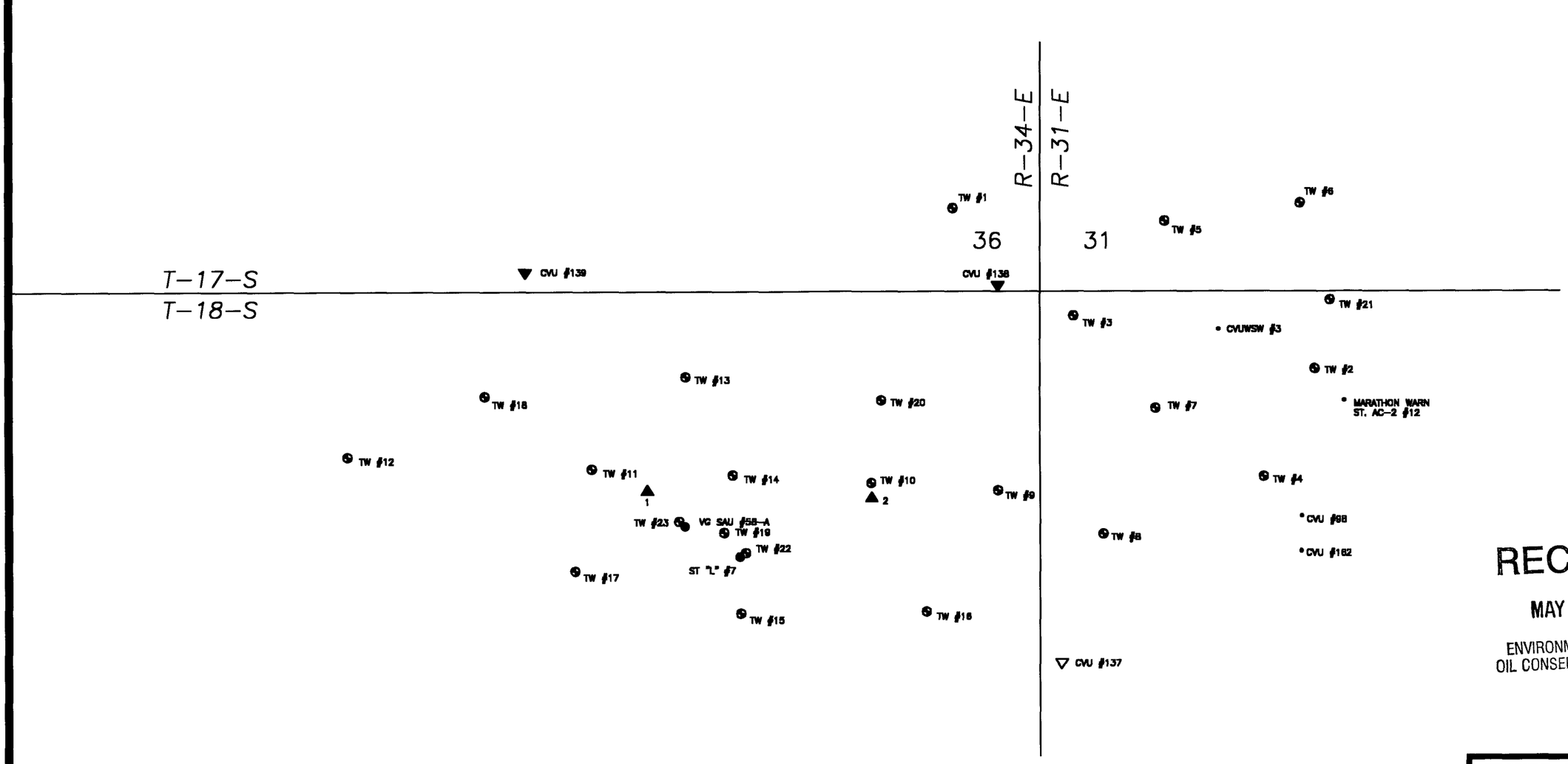
TEXACO EXPLORATION AND PRODUCTION, INC.

GROUNDWATER TABLE MAP
VACUUM FIELD

BUCKEYE
LEA COUNTY, NEW MEXICO

HIGHLANDER ENVIRONMENTAL CORP.
MIDLAND, TEXAS

DATE: 04/29/98
DWN. BY: JDA
FILE: C:\TEXACO\G_W_TABLE



LEGEND

- EXTRACTION WELL
- MONITOR WELL
- PRODUCING WELL

RECEIVED

MAY 11 1998

ENVIRONMENTAL BUREAU
OIL CONSERVATION DIVISION

FIGURE 2

TEXACO EXPLORATION AND PRODUCTION, INC.

SITE PLAN
VACUUM FIELD

BUCKEYE
LEA COUNTY, NEW MEXICO

HIGHLANDER ENVIRONMENTAL CORP.
MIDLAND, TEXAS

DATE: 04/17/98
DWN. BY: JDA
FILE: C:\TEXACO\1057\VAC-FLD

TRACE ANALYSIS, INC.

6701 Aberdeen Avenue, Suite 9 Lubbock, Texas 79424 800•378•1296 806•794•1296 FAX 806•794•1298
4725 Ripley Avenue, Suite A El Paso, Texas 79922 888•588•3443 915•585•3443 FAX 915•585•4944
E-Mail: lab@traceanalysis.com

ANALYTICAL RESULTS FOR
HIGHLANDER ENVIRONMENTAL SERVICES
Attention: Ike Tavarez
1910 N. Big Spring St.
Midland, TX

January 22, 1998
Receiving Date: 01/14/98
Sample Type: Water
Project No: 1057
Project Location: Lea County, New Mexico

Prep Date: 01/15/98
Analysis Date: 01/15/98
Sampling Date: 01/07-09, 12/98
Sample Condition: Intact & Cool
Sample Received by: VW
Client: Texaco
Project: Texaco - Vacuum Field,
Buckeye, Lea County, New Mexico

TA#	FIELD CODE	CHLORIDE (mg/L)
T88938	TW-1	55
T88939	TW-2	49
T88940	TW-3	27
T88941	TW-4	42
T88942	TW-5	75
T88943	TW-6	39
T88944	TW-7	41
T88945	TW-8	25
T88946	TW-9	34
T88947	TW-10	29
T88948	TW-11	34
T88949	TW-12	43
T88950	TW-13	28
T88951	TW-14	31
T88952	TW-15	33
T88953	TW-16	62
T88954	TW-17	27
T88955	TW-18	61
T88956	TW-19	29
T88957	TW-20	27
T88958	TW-21	24
T88959	TW-22	27
T88960	TW-23	930
T88961	Extraction Well #1	200
T88962	Extraction Well #2	220
ICV		18.4
CCV		20.1
REPORTING LIMIT		5.0
RPD		6
% Extraction Accuracy		88
% Instrument Accuracy		96

METHODS: EPA 300.0.
CHEMIST: AS
CHLORIDE SPIKE: 40 mg/L CHLORIDE.
CHLORIDE CV: 20 mg/L CHLORIDE.

Director, Dr. Blair Leftwich

1-22-98
DATE

TRACE ANALYSIS, INC.

6701 Aberdeen Avenue, Suite 9 Lubbock, Texas 79424 800•378•1296 806•794•1296 FAX 806•794•1298
4725 Ripley Avenue, Suite A El Paso, Texas 79922 888•588•3443 915•585•3443 FAX 915•585•4944
E-Mail: lab@traceanalysis.com

ANALYTICAL RESULTS FOR
HIGHLANDER ENVIRONMENTAL SERVICES
Attention: Ike Tavarez
1910 N. Big Spring St.
Midland, TX 79705

March 16, 1998
Receiving Date: 03/03/98
Sample Type: Water
Project No: 1057
Project Location: NA

Prep Date: 03/04/98
Analysis Date: 03/04/98
Sampling Date: 02/24/98
Sample Condition: Intact & Cool
Sample Received by: VW
Client Name: Texaco E & P, Inc.
Project Name: Texaco/Buckeye - Vaccum Unit Lea County, NM

TA#	FIELD CODE	CHLORIDE (mg/L)
T92332	TW-23	477
ICV		22
CCV		22
REPORTING LIMIT		0.5
RPD		0
% Extraction Accuracy		82
% Instrument Accuracy		96

METHODS: EPA 300.0.
CHEMIST: JS
CHLORIDE SPIKE: 25 mg/L CHLORIDE.
CHLORIDE CV: 5.0 mg/L CHLORIDE.

BL

Director, Dr. Blair Leftwich

3-16-98

DATE

TRACE ANALYSIS, INC.

6701 Aberdeen Avenue, Suite 9 Lubbock, Texas 79424 800•378•1296 806•794•1296 FAX 806•794•1298
4725 Ripley Avenue, Suite A El Paso, Texas 79922 888•588•3443 915•585•3443 FAX 915•585•4944
E-Mail: lab@traceanalysis.com

ANALYTICAL RESULTS FOR
HIGHLANDER ENVIRONMENTAL SERVICES
Attention: Vijay Kurki
1910 N. Big Spring St.
Midland, TX

April 15, 1998
Receiving Date: 04/09/98
Sample Type: Water
Project No: 1057
Project Location: NA

Prep Date: 04/12/98
Analysis Date: 04/12/98
Sampling Date: 04/02-03, 06-07/98
Sample Condition: Intact & Cool
Sample Received by: VW
Client Name: Texaco E & P, Inc.
Project Name: Texaco - Vacuum Field, Buckeye

TA#	FIELD CODE	CHLORIDE (mg/L)
T95841	TW-1	60
T95842	TW-2	73
T95843	TW-3	44
T95844	TW-4	26
T95845	TW-5	65
T95846	TW-6	28
T95847	TW-7	30
T95848	TW-8	25
T95849	TW-9	130
T95850	TW-10	26
T95851	TW-11	34
T95852	TW-12	49
T95853	TW-13	30
T95854	TW-14	31
T95855	TW-15	45
T95856	TW-16	44
T95857	TW-17	33
T95858	TW-18	56
T95859	TW-19	29
T95860	TW-20	24
T95861	TW-21	25
T95862	TW-22	31
T95863	TW-23	810
T95864	Extraction Well #1	190
T95865	Extraction Well #2	230
ICV		500
CCV		498
REPORTING LIMIT		2.0
RPD		1
% Extraction Accuracy		110
% Instrument Accuracy		100

METHODS: EPA SM 4500 Cl-B.
CHEMIST: JS
CHLORIDE SPIKE: 500 mg/L CHLORIDE.
CHLORIDE CV: 1,000 mg/L CHLORIDE.

Director, Dr. Blair Leftwich

4-15-98
DATE

179

Highlander Services Corp.

306 W. Wall • Suite 320 • Midland, TX 79701 • (915)682-4559

Analysis Request and Chain of Custody Record

Project No. 1057 | Client/Project: Texaco / Texaco-Vacuum Field, Buckeye, Lea County, New Mexico.

Field Sample No./ Identification		Date and Time	Grab	Comp.	Sample Type (Liquid Sludge, Ect.)	Preservative	ANALYSIS REQUESTED
TW-1	98938	7:35 1-8-98	X		water	NA	chloride
TW-2	39	12:50 1-8-98	X				
TW-3	40	2:00 1-8-98	X				
TW-4	41	4:35 1-8-98	X				
TW-5	42	5:50 1-7 98	X				
TW-6	43	11:30 1-8-98	X				
TW-7	44	3:15 1-8-98	X				
TW-8	45	2:00 1-9-98	X				
TW-9	46	3:00 1-9-98	X				
TW-10	47	4:10 1-9 98	X				

Samplers: (Print)

IKE Tavarez

V.J. Kurki

Results by: ASAP

Rush Charges Authorized

Yes ___ No X

Relinquished by: (Signature) [signature] Date: 1-[illegible]98 Time: 5:00

Relinquished by: (Signature) Helen Shelton Date: 1/13/98 Time: 6:30 PM

Relinquished by: (Signature) Date: Time:

Delivered To: Trace Lab.

REMARKS:

Recieved by: (Signature) Helen Shelton Date: 1/13/98 Time: 3:00PM

Recieved by: (Signature) Vicki Windham B Date: 1-14-98 Time: 10:00 am

Data Results To:

1. IKE Tavarez

2. [signature]

Please Fill out all copies – Deliverer retains White copy for file – Lab retains Yellow copy & Return Pink copy to Highlander Services Corp. at above address

Mixed Hydrocarbons 10 samples - HS - 0°C Q

Highlander Services Corp.

306 W. Wall • Suite 320 • Midland, TX 79701 • (915)682-4559

Analysis Request and Chain of Custody Record

Project No. 1057 | Client/Project Texaco / Texaco - Vacuum Field, Buckeye, Lea County, New Mexico.

Field Sample No./ Identification	Date and Time	Grab	Comp.	Sample Type (Liquid Sludge, Ect.)	Preservative	ANALYSIS REQUESTED
TW-11 889 48	2:35 1-12-98	X		water	NA	Chloride.
TW-12 5049	11:35 1-9-98	X				
TW-13 5050	9:15 1-9-98	X				
TW-14 5051	10:45 1-12-98	X				
TW-15 5052	11:50 1-12-98	X				
TW-16 5053	12:50 1-9-98	X				
TW-17 5054	4:45 1-12-98	X				
TW-18 5055	5:55 1-8-98	X				
TW-19 5056	1:05 1-12-98	X				
TW-20 5057	10:30 1-9-98	X				

Samplers: (Print) IKE Tavarez	Relinquished by: (Signature)	Date: 1-13-98 Time: 3:00	Recieved by: (Signature) Helen Shelton — Date: 1/13/98 Time: 3:00 PM
V.J. Hurtado.	Relinquished by: (Signature) Helen Shelton	Date: 1/13/98 Time: 6:30 PM	Recieved by: (Signature) Vicki Wyndham B — Date: 1-14-98 Time: 10:00 AM
Results by: ASAP	Relinquished by: (Signature)	Date: Time:	Data Results To: 1. IKE Tavarez
Rush Charges Authorized Yes ___ No X	Delivered To: Trace. Lab		2.
	REMARKS:		

Please Fill out all copies – Deliverer retains White copy for file – Lab retains Yellow copy & Return Pink copy to Highlander Services Corp. at above address

Shipped Overnight to sampler - HS 4°C.

Highlander Services Corp.

306 W. Wall • Suite 320 • Midland, TX 79701 • (915)682-4559

Analysis Request and Chain of Custody Record

Project No. 1057 | Client/Project Texaco / Texaco - Vacuum Field, Buckeye, Lea County, New Mexico

Field Sample No./ Identification		Date and Time	Grab	Comp	Sample Type(Liquid Sludge,Ect.)	Preser-vative	ANALYSIS REQUESTED
TW-21	88958	4:30 1-7-98	X		water	NA	Chloride
TW-22	~~88~~ 59	3:45 1-12-98	X		↓	↓	↓
TW-23	~~88~~ 60	5:55 1-12-98	X				
Extraction Well #1	~~88~~ 61	3:35 1-9-98	X				
Extraction Well #2	~~88~~ 62	3:30 1-9-98	X				

Samplers: (Print)	Relinquished by: (Signature)	Date: 1-13-98 Time: 3:00	Recieved by: (Signature) Helen Shelton — Date: 1/13/98 Time: 3:00PM
IKE Tovar	Relinquished by: (Signature) Helen Shelton	Date: 1/13/98 Time: 6:30PM	Recieved by: (Signature) Vicki Wyndham — Date: 1-14-98 Time: 10:00 AM
Lyn Ward.	Relinquished by: (Signature)	Date: Time:	Data Results To: 1. IKE Tovar
Results by: ASAP	Delivered To: Trace Lab.		2.
Rush Charges Authorized Yes ___ No X	REMARKS:		

Please Fill out all copies – Deliverer retains White copy for file – Lab retains Yellow copy & Return Pink copy to Highlander Services Corp. at above address

Hosted Greyhound — 5 samples - HS

92332

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Analysis Request and Chain of Custody Record

HIGHLANDER ENVIRONMENTAL CORP.

1910 N. Big Spring St.
Midland, Texas 79705

(915) 682-4559 Fax (915) 682-3946

PAGE: 1 OF: 1

CLIENT NAME: Texaco E&P, Inc.

SITE MANAGER: IKE Tavarez

PROJECT NO.: 1057

PROJECT NAME: Texaco/Buckeye-Vacuum Unit. Lea County NM.

LAB I.D. NUMBER	DATE	TIME	MATRIX	COMP.	GRAB	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS	FILTERED (Y/N)	PRESERVATIVE METHOD: HCL	HNO3	ICE	NONE
92332	2/24/98		W		✓	TW-23	1	N			X	X

ANALYSIS REQUEST (Circle or Specify Method No.)

BTEX 8020/602	MTBE 8020/602	TPH	PAH 8270	RCRA Metals Ag As Ba Cd Cr Pb Hg Se	TCLP Metals Ag As Ba Cd Cr Pd Hg Se	TCLP Volatiles	TCLP Semi Volatiles	RCI	GC.MS Vol. 8240/8260/624	GC.MS Semi. Vol. 8270/625	PCB's 8080/608	Pest. 808/608	BOD, TSS, pH, TDS, Chloride	Gamma Spec.	Alpha Beta (Air)	PLM (Asbestos)	Chloride
																	X

3-16

RELINQUISHED BY: (Signature) — Date: 3-2-98 Time: 3:00pm — RECEIVED BY: (Signature) Helen Shelton — Date: 3-2-98 Time: 3:00 PM

RELINQUISHED BY: (Signature) Helen Shelton — Date: 3-2-98 Time: 6:30 PM — RECEIVED BY: (Signature) — Date: Time:

RELINQUISHED BY: (Signature) — Date: Time: — RECEIVED BY: (Signature) — Date: Time:

RECEIVING LABORATORY: Trace. — RECEIVED BY: (Signature) Vida Wonatan

ADDRESS:

CITY: DALL STATE: ZIP:

CONTACT: PHONE: DATE: 3-3-98 TIME: 9:45 AM

SAMPLED BY: (Print & Sign) IKE Tavarez / V.J. Kurk. — Date: Time:

SAMPLE SHIPPED BY: (Circle) FEDEX (BUS) UPS HAND DELIVERED — AIRBILL #: 555758875 8 — OTHER:

HIGHLANDER CONTACT PERSON: IKE Tavarez

Results by: ASAP

RUSH Charges Authorized: Yes (No)

SAMPLE CONDITION WHEN RECEIVED:

MATRIX: (W-Water) A-Air SD-Solid S-Soil SL-Sludge O-Other

REMARKS: 3°

Please Fill out all required information. Laboratory retains yellow copy. Return original copy to Highlander Environmental Corp. Project Manager retains pink copy. Accounting receives Gold copy.

95841-65

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Analysis Request and Chain of Custody Record

HIGHLANDER ENVIRONMENTAL CORP.

1910 N. Big Spring St.
Midland, Texas 79705
(915) 682-4559 Fax (915) 682-3946

ANALYSIS REQUEST (Circle or Specify Method No.)

CLIENT NAME: Texaco E&P. Inc

SITE MANAGER: Vijay Kurki

PROJECT NO.: 1057

PROJECT NAME: Texaco - Vacuum Field, Buckeye

LAB I.D. NUMBER	DATE	TIME	MATRIX	COMP.	GRAB	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS	FILTERED (Y/N)	HCL	HNO3	ICE	NONE	BTEX 8020/602	MTBE 8020/602	TPH	PAH 8270	RCRA Metals Ag As Ba Cd Cr Pb Hg Se	TCLP Metals Ag As Ba Cd Cr Pd Hg Se	TCLP Volatiles	TCLP Semi Volatiles	RCI	GC.MS Vol. 8240/8260/624	GC.MS Semi. Vol. 8270/625	PCB's 8080/608	Pest. 808/608	BOD, TSS, pH, TDS, (Chloride)	Gamma Spec.	Alpha Beta (Air)	PLM (Asbestos)
95841	4/6/98	13:45		✓		TW-1	1				✓															✓			
42	4/7/98	10:45		✓		TW-2	1				✓															✓			
43	4/7/98	10:00		✓		TW-3	1				✓															✓			
44	4/7/98	-		✓		TW-4	1				✓															✓			
45	4/7/98	12:45		✓		TW-5	1				✓															✓			
46	4/7/98	12:05		✓		TW-6	1				✓															✓			
47	4/7/98	8:25		✓		TW-7	1				✓															✓			
48	4/6/98	14:35		✓		TW-8	1				✓															✓			
49	4/6/98	12:05		✓		TW-9	1				✓															✓			
50	4/6/98	9:50		✓		TW-10	1				✓															✓			

RELINQUISHED BY: (Signature) Vijay Kurki Date: 4/8/98 Time: 4:00 PM
RECEIVED BY: (Signature) Helen Skelton Date: 4/8/98 Time: 4:00 PM

RELINQUISHED BY: (Signature) Helen Skelton Date: 4/8/98 Time: 6:00 PM
RECEIVED BY: (Signature) Date: Time:

RELINQUISHED BY: (Signature) Date: Time:
RECEIVED BY: (Signature) Date: Time:

RECEIVING LABORATORY: Trace Analysis
ADDRESS:
CITY: Lubbock STATE: ZIP:
CONTACT: PHONE:

RECEIVED BY: (Signature) Vicki Wortham
DATE: 4-9-98 TIME: 10:30 AM

SAMPLED BY: (Print & Sign) Ike Tavarez, Vijay Kurki Date: 4/8/98 Time:

SAMPLE SHIPPED BY: (Circle) FEDEX (BUS) UPS HAND DELIVERED
AIRBILL # 155 7589023 OTHER:

HIGHLANDER CONTACT PERSON: Vijay Kurki

Results by:

RUSH Charges Authorized: Yes (No)

SAMPLE CONDITION WHEN RECEIVED: 2°

MATRIX: (W-Water) A-Air SD-Solid S-Soil SL-Sludge O-Other

REMARKS: Per

Please Fill out all copies - Laboratory retains yellow copy - Return original copy to Highlander Environmental Corp. - Project Manager retains pink copy - Accounting receives Gold copy

795

Analysis Request and Chain of Custody Record

HIGHLANDER ENVIRONMENTAL CORP.

1910 N. Big Spring St.
Midland, Texas 79705

(915) 682-4559 Fax (915) 682-3946

CLIENT NAME: Texaco Exp Inc.

SITE MANAGER: Vijay Kurki

PROJECT NO.: 1057

PROJECT NAME: Texaco-Vacuum Field, Buckeye

LAB I.D. NUMBER	DATE	TIME	MATRIX	COMP.	GRAB	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS	FILTERED (Y/N)	PRESERVATIVE METHOD: HCL	HNO3	ICE	NONE	BTEX 8020/602	MTBE 8020/602	TPH	PAH 8270	RCRA Metals Ag As Ba Cd Cr Pb Hg Se	TCLP Metals Ag As Ba Cd Cr Pd Hg Se	TCLP Volatiles	TCLP Semi Volatiles	RCI	GC.MS Vol. 8240/8260/624	GC.MS Semi. Vol. 8270/625	PCB's 8080/608	Pest. 808/608	BOD, TSS, pH, TDS, Chloride	Gamma Spec.	Alpha Beta (Air)	PLM (Asbestos)
95851	4/2/98	12:00		✓		TW-11	1				✓															✓			
52	4/2/98	9:30				TW-12	1				✓															✓			
53	4/3/98	10:20				TW-13	1				✓															✓			
54	4/2/98	13:45				TW-14	1				✓															✓			
55	4/3/98	12:05				TW-15	1				✓															✓			
56	4/6/98	-				TW-16	1				✓															✓			
57	4/3/98	11:10				TW-17	1				✓															✓			
58	4/3/98	9:35 ~~12:55~~				TW-18	1				✓															✓			
59	4/3/98	12:55				TW-19	1				✓															✓			
60	4/6/98	12:55				TW-20	1				✓															✓			

RELINQUISHED BY: (Signature) Vijay Kurki — Date: 4/8/98 Time: 4:00 PM

RECEIVED BY: (Signature) Ellen Skelton — Date: 4/8/98 Time: 4:00PM

SAMPLED BY: (Print & Sign) IKe Tavarez & Vijay Kurki — Date: 4/8/98 Time:

RELINQUISHED BY: (Signature) Ellen Skelton — Date: 4/8/98 Time: 6:00 PM

RECEIVED BY: (Signature) — Date: Time:

SAMPLE SHIPPED BY: (Circle) FEDEX HAND DELIVERED (BUS) UPS AIRBILL # OTHER:

RELINQUISHED BY: (Signature) — Date: Time:

RECEIVED BY: (Signature) — Date: Time:

RECEIVING LABORATORY: Trace Analysis

ADDRESS:

CITY: Lubbock STATE: ZIP:

CONTACT: PHONE:

RECEIVED BY: (Signature) Vicki Windham — DATE: 4-9-98 TIME: 10:30 AM

HIGHLANDER CONTACT PERSON: Vijay Kurki

Results by:

RUSH Charges Authorized: Yes (No)

SAMPLE CONDITION WHEN RECEIVED: 2°

MATRIX: (W-Water) A-Air SD-Solid S-Soil SL-Sludge O-Other

REMARKS:

Return original copy to Highlander Environmental Corp. - Project Manager retains pink copy - Accounting receives Gold copy.

Analysis Request and Chain of Custody Record

HIGHLANDER ENVIRONMENTAL CORP.

1910 N. Big Spring St.
Midland, Texas 79705

(915) 682-4559 Fax (915) 682-3946

CLIENT NAME: Texaco E&P Inc.

SITE MANAGER: Vijay Kurki

PROJECT NO.: 1057

PROJECT NAME: Texaco - Vacuum Field, Buckeye

ANALYSIS REQUEST (Circle or Specify Method No.)

LAB I.D. NUMBER	DATE	TIME	MATRIX	COMP.	GRAB	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS	FILTERED (Y/N)	PRESERVATIVE METHOD: HCL	HNO3	ICE	NONE	BTEX 8020/602	MTBE 8020/602	TPH	PAH 8270	RCRA Metals Ag As Ba Cd Cr Pb Hg Se	TCLP Metals Ag As Ba Cd Cr Pd Hg Se	TCLP Volatiles	TCLP Semi Volatiles	RCI	GC.MS Vol. 8240/8260/624	GC.MS Semi. Vol. 8270/625	PCB's 8080/608	Pest. 808/608	BOD, TSS, pH, TDS, Chloride	Gamma Spec.	Alpha Beta (Air)	PLM (Asbestos)
95861	4/7/98	11:25		✓		TW-21	1				✓															✓			
62	4/3/98	13:45		✓		TW-22	1				✓															✓			
63	4/2/98	14:00		✓		TW-23	1				✓															✓			
64	4/6/98	9:30		✓		Extraction Well #1	1				✓															✓			
65	4/6/98	9:40		✓		Extraction Well #2	1				✓															✓			

RELINQUISHED BY: (Signature) Vijay Kurki — Date: 4/8/98 Time: 4:00 PM

RECEIVED BY: (Signature) Helen Shelton — Date: 4/8/98 Time: 4:00PM

RELINQUISHED BY: (Signature) Helen Shelton — Date: 4/8/98 Time: 6:00 PM

RECEIVED BY: (Signature) — Date: Time:

RELINQUISHED BY: (Signature) — Date: Time:

RECEIVED BY: (Signature) — Date: Time:

SAMPLED BY: (Print & Sign) Ike Tavarez & Vijay Kurki — Date: 4/8/98 Time:

SAMPLE SHIPPED BY (Circle): FEDEX BUS UPS HAND DELIVERED AIRBILL # OTHER:

RECEIVING LABORATORY:
ADDRESS:
CITY: STATE: ZIP:
CONTACT: PHONE:

RECEIVED BY: (Signature) Vicki Wadham
DATE: 4-9-98 TIME: 10:30 am

HIGHLANDER CONTACT PERSON: Vijay Kurki

Results by:

RUSH Charges Authorized: Yes (No)

SAMPLE CONDITION WHEN RECEIVED: 2°

MATRIX: (W-Water) S-Soil A-Air SL-Sludge SD-Solid O-Other

REMARKS:

Project Manager retains pink copy - Accounting receives Gold copy.