1R - 279

REPORTS

DATE:

1998

Highlander Environmental Corp.

Midland, Texas

October 14, 1998

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

RE: Groundwater Monitoring Report
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

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 notified of the elevated chloride levels. 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.

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.

Based on the investigation, a casing leak detected in producing well VGSAU #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 chloride plume area to remediate the groundwater impact. The details of this investigation are discussed in a report titled - "Groundwater Contamination Study of the Texaco CVUWSW #3 Vacuum Field, Buckeye, New Mexico" dated 1989-1990. Mr.Eddie W. Seay with the OCD Hobbs District prepared this 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 chloride concentrations detected during the development of the wells.

Unichem International sampled groundwater from the monitor wells during 1990. The sample results for these sampling events are also summarized in Table 2.

In May 1998, Highlander Environmental Corp., on behalf of Texaco E & P, Inc., submitted to the OCD, a the groundwater monitoring event summary report. In this report Highlander proposed to plug a total of 17 monitor wells based on results of previous monitoring events. Highlander also proposed to continue the monitoring of the remaining wells and discontinue pumping of the extraction wells. The OCD, through letter dated August 19, 1998, deferred to comment on the above proposals prior to sampling the wells for BTEX.

Groundwater Monitoring

On September 2, 1998 Highlander personnel initiated additional groundwater monitoring activities at the site which included sampling for BTEX. Prior to sampling, Highlander personnel gauged all monitor wells and extraction wells from the top of casing. The extraction wells were pumping at the time of gauging. A cumulative list of water level elevation data for the site is shown in Table 3. Figure 3 shows the groundwater table map for the September 2, 1998 gauging. The local direction of the groundwater flow is to the north. However, the general direction of the groundwater gradient is reported to be to the southeast.

A submersible pump was used to purge the groundwater from monitor wells. Approximately three casing volumes of water was pumped from each well prior to sampling. After three casing volumes were removed, a sample was collected from the pump discharge for chlorides. Samples for BTEX were collected using separate disposable bailers for each well. Between the monitor well purging, the submersible pump was decontaminated to prevent cross contamination. The purged water from the wells and water used for decontamination was contained and disposed of at Texaco's plant sump.

The groundwater samples were placed into laboratory prepared containers provided by the laboratory. The groundwater samples were shipped to Trace Analysis, Inc., Lubbock, Texas for chloride analysis by method EPA 300 and BTEX by EPA method 8021B. The chloride

results are summarized in Table 2 and the BTEX analytical results for the September 2, 1998 monitoring event are summarized in Table 4.

Results

Referring to Table 2 and Table 4, with the exception of TW-9 and TW-23, the chloride concentrations in the wells vary from 21 mg/l at well TW-21 to 200 mg/l at extraction well #2 for the September 1998 sampling event. Wells TW-9 and TW-23 showed a chloride of 410 mg/l and 870 mg/l respectively. The New Mexico Water Quality Control Commission (WQCC) standard for chloride is 250 mg/l. All of the samples showed non-detectable levels of BTEX except TW-2, TW-5 and TW-11 in which trace amounts of BTEX were found. The WQCC standard for benzene is 0.01 mg/l, toluene is 0.75 mg/l, ethylbenzene is 0.75 mg/l and xylenes is 0.62 mg/l. None of the BTEX results exceeded the WQCC standard.

A chloride concentration variation graph is shown in Figure 4 for the monitor wells onsite. Figure 4 compares results of a total of three monitoring events for 1998. An abrupt increase in chloride concentration from 130 mg/l to 410 mg/l was noted in TW-9 since the previous monitoring. The laboratory report copies along with the chain of custody documentation is enclosed.

Conclusions and Recommendations

1. Fresh groundwater in the area is obtained from the Ogallala formation. The local groundwater gradient appears to be influenced by the extraction well pumping, and is directed towards the north.
2. The benzene, toluene, ethylbenzene and total xylene (BTEX) concentrations were detected at trace concentrations or at concentrations below the method detection limit (MDL) for all of the monitor wells and extraction wells during the September 1998 sampling. None of the BTEX samples exceed the WQCC standard.
3. Chloride concentrations of less than the WQCC standard of 250 mg/l were detected in all of the monitor wells and extraction wells except wells TW-9 and TW-23. Chloride concentrations of 410 mg/l and 870 mg/l were detected in TW-9 and TW-23 respectively.
4. Based on the groundwater monitoring results review, it can be concluded that the chloride plume has been completely intercepted by the extraction wells. Elevated chloride concentrations observed at TW-9 and TW-23 may be due to salt residue in the saturated zone in the close vicinity of the wells.
5. Monitor wells TW-1 through TW-8, TW-10, TW-12, TW-13, TW-16, TW-18, TW-20, TW-21 and TW-22 have consistently shown chloride concentrations well below the WQCC standard of 250 mg/l. Highlander proposes to plug these 16 monitor wells as further monitoring data from these wells is no longer necessary.

6. Highlander proposes to continue to monitor TW-23 and surrounding wells, and TW-9 for a period of one year on a quarterly basis. Wells that will be monitored include: TW-9, TW-11, TW-14, TW-15, TW-17, TW-19, TW-23 and extraction wells #1 and #2.
7. Highlander requests permission to discontinue pumping of the two extraction wells #1 & #2 for groundwater remediation purposes. However, Texaco would like to keep the option of using these wells for makeup water if needed.
8. Future monitoring will consist of sampling for chlorides only for the 9 wells that will be retained. Sampling these wells for BTEX will not be required as none of the wells detected significant levels of BTEX.

If you have any questions or need more information please call.

Sincerely,
Highlander Environmental Corp.

Vijay K. Kurki, P.E., REP
Environmental Engineer

cc:
Mr. Wayne Price, OCD, Hobbs District
Mr. Rodney Bailey, Texaco E & P, Inc., Hobbs, NM.

encl.

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	3"	200	60	3987.50
TW- 2	3"	238	60	3986.40
TW- 3	3"	237	80	3987.30
TW- 4	3"	232	80	3985.50
TW- 5	3"	234	80	3986.80
TW- 6	3"	236	80	3987.30
TW- 7	3"	238	120	3986.10
TW- 8	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	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	3"	233	110	3987.00
TW- 17	3"	225	110	3984.30
TW- 18	3"	237	110	3989.40
TW- 19	3"	226	110	3984.20
TW- 20	3"	233	110	3987.80
TW- 21	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.
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	9-2-98
Well ID	*Chloride (mg/l)*							
TW- 1	100	90	76	68	55	-	60	47
TW- 2	100	166	64	60	49	-	73	59
TW- 3	71	166	100	94	27	-	44	110
TW- 4	70	100	32	30	42	-	26	95
TW- 5	71	32	44	40	75	-	65	68
TW- 6	56	122	78	44	39	-	28	29
TW- 7	5,325	60	60	47	41	-	30	32
TW- 8	142	78	50	36	25	-	25	41
TW- 9	13,845	36	32	22	35	-	130	410
TW- 10	28,986	36	44	26	29	-	28	38
TW-11	24,495	110	68	60	34	-	34	39
TW- 12	284	44	44	42	43	-	49	64
TW- 13	3,053	44	32	26	28	-	30	45
TW- 14	1,633	66	26	18	31	-	31	38
TW- 15	56	42	64	44	33	-	45	100
TW- 16	71	48	54	44	62	-	44	55
TW- 17	994	46	98	40	27	-	33	29
TW- 18	340	44	30	32	61	-	56	57
TW- 19	6,532	192	210	58	29	-	29	28
TW- 20	1,278	108	116	100	27	-	24	29
TW- 21	56.8	32	30	34	24	-	25	21
TW- 22	3,905	76	78	50	27	-	31	21
TW- 23	116,000	53,600	28,000	20,000	930	477	810	870
Extraction well #1	111,825	-	-	-	200	-	190	190
Extraction well #2	98,335	-	-	-	220	-	230	200

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

Well ID	Elevation of TOC ft.	01/07/98		09/02/98	
		Depth ft.	GW Elevation ft	Depth ft	GW Elevation ft
TW-1	3987.50	131.23	3856.27	131.50	3856.00
TW-2	3986.40	128.42	3857.98	128.75	3857.65
TW-3	3987.30	130.36	3856.94	130.68	3856.62
TW-4	3985.50	126.67	3858.83	127.10	3858.40
TW-5	3986.80	130.55	3856.25	130.68	3856.12
TW-6	3987.30	130.90	3856.40	131.11	3856.19
TW-7	3986.10	128.20	3857.90	128.60	3857.50
TW-8	3986.40	127.38	3859.02	127.78	3858.62
TW-9	3988.10	129.73	3858.37	130.35	3857.75
TW-10	3987.20	129.22	3857.98	129.95	3857.25
TW-11	3988.60	130.31	3858.29	130.51	3858.09
TW-12	3988.90	129.90	3859.00	130.06	3858.84
TW-13	3988.10	130.66	3857.44	130.84	3857.26
TW-14	3986.10	128.19	3857.91	128.48	3857.62
TW-15	3983.50	123.89	3859.61	124.23	3859.27
TW-16	3987.00	127.55	3859.45	127.94	3859.06
TW-17	3984.30	125.32	3858.98	125.45	3858.85
TW-18	3989.40	131.60	3857.80	131.77	3857.63
TW-19	3984.20	**	----	124.90	3859.30
TW-20	3987.80	130.41	3857.39	130.81	3856.99
TW-21	3986.50	129.04	3857.46	129.30	3857.20
TW-22	*	125.67	----	125.75	---
TW-23	*	125.72	----	126.04	---
Extraction Well #1	*	**	----	**	---
Extraction Well #2	*	**	----	137.90	---

* = TOC elevation not surveyed

** = Static water level not measured

Table 4

BTEX Analysis Results

Texaco Exploration and Production, Inc.

Vacuum Field Unit, Buckeye

Lea County, New Mexico

Concentrations in mg/l

Well ID	Sample Date	Benzene	Toluene	Ethyl-benzene	Xylenes
TW-1	9/2/98	<0.001	<0.001	<0.001	<0.001
TW-2	9/2/98	**0.002**	<0.001	**0.002**	**0.005**
TW-3	9/3/98	<0.001	<0.001	<0.001	<0.001
TW-4	9/3/98	<0.005	<0.005	<0.005	<0.005
TW-5	9/2/98	**0.002**	<0.001	<0.001	<0.001
TW-6	9/2/98	<0.001	<0.001	<0.001	<0.001
TW-7	9/3/98	<0.001	<0.001	<0.001	<0.001
TW-8	9/3/98	<0.001	<0.001	<0.001	<0.001
TW-9	9/2/98	<0.001	<0.001	<0.001	<0.001
TW-10	9/3/98	<0.005	<0.005	<0.005	<0.005
TW-11	9/3/98	**0.002**	<0.001	<0.001	<0.001
TW-12	9/3/98	<0.001	<0.001	<0.001	<0.001
TW-13	9/3/98	<0.001	<0.001	<0.001	<0.001
TW-14	9/4/98	<0.005	<0.005	<0.005	<0.005
TW-15	9/3/98	<0.001	<0.001	<0.001	<0.001
TW-16	9/2/98	<0.001	<0.001	<0.001	<0.001
TW-17	9/3/98	<0.001	<0.001	<0.001	<0.001
TW-18	9/3/98	<0.001	<0.001	<0.001	<0.001
TW-19	9/4/98	<0.001	<0.001	<0.001	<0.001
TW-20	9/2/98	<0.001	<0.001	<0.001	<0.001
TW-21	9/2/98	<0.001	<0.001	<0.001	<0.001
TW-22	9/4/98	<0.001	<0.001	<0.001	<0.001
TW-23	9/4/98	<0.001	<0.001	<0.001	<0.001
Extraction Well #1	9/4/98	<0.001	<0.001	<0.001	<0.001
Extraction Well #2	9/4/98	<0.001	<0.001	<0.001	<0.001

Table 5
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-9
TW- 2	TW-11
TW- 3	TW-14
TW- 4	TW-15
TW- 5	TW-17
TW- 6	TW-19
TW- 7	TW-23
TW- 8	Extraction well #1
TW- 10	Extraction well #2
TW- 12	
TW- 13	
TW- 16	
TW- 18	
TW- 20	
TW- 21	
TW- 22	

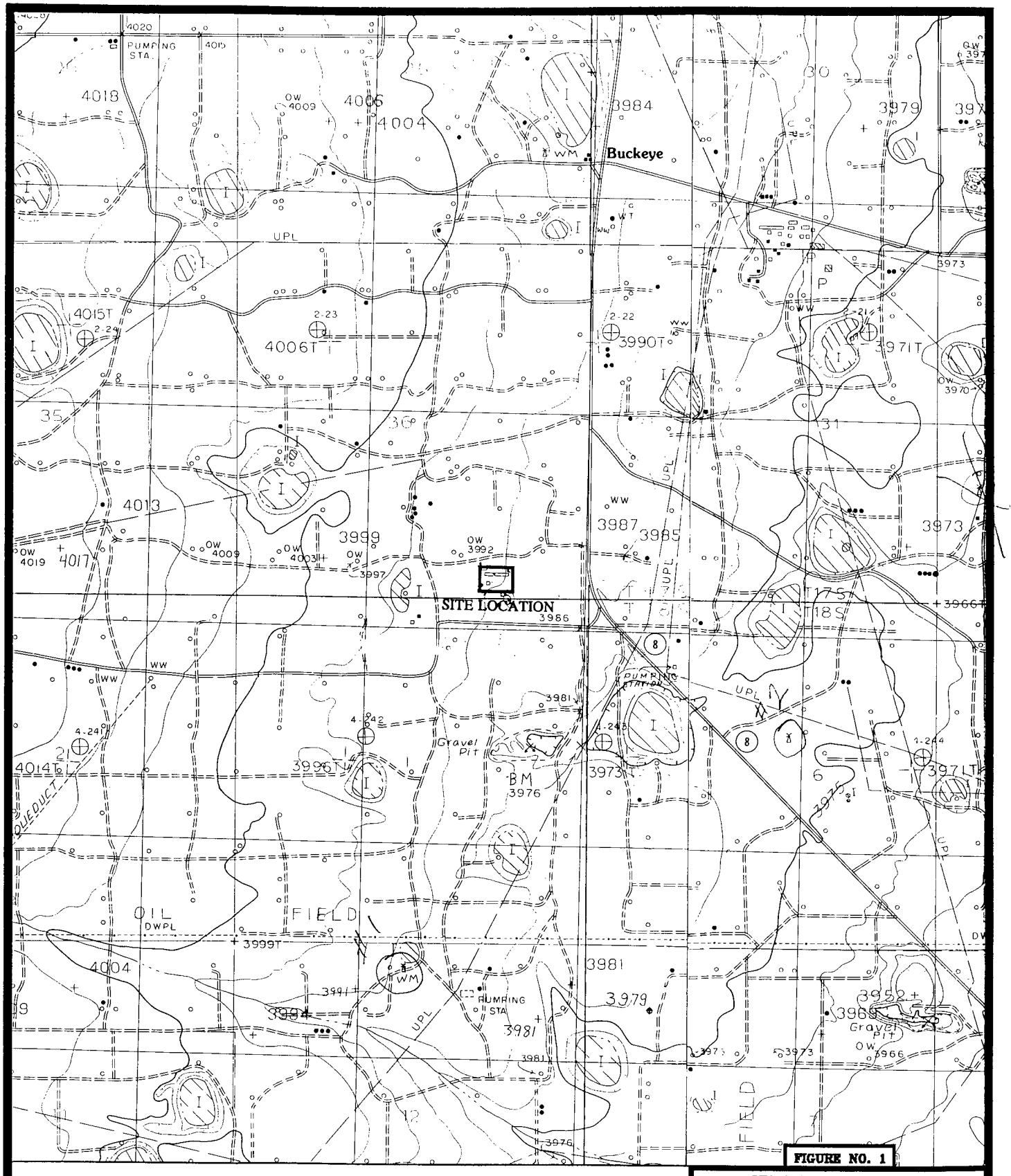


FIGURE NO. 1

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'

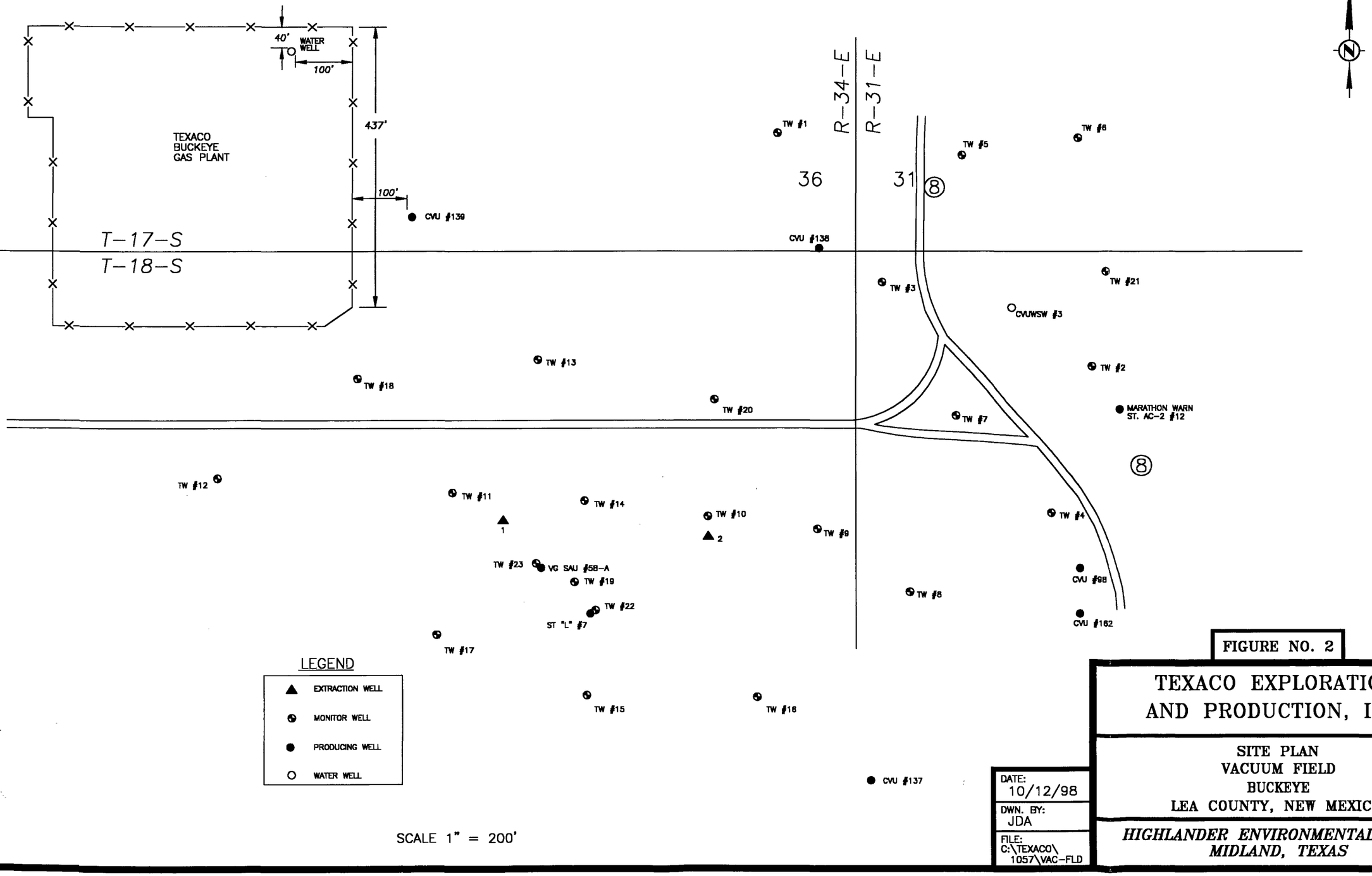
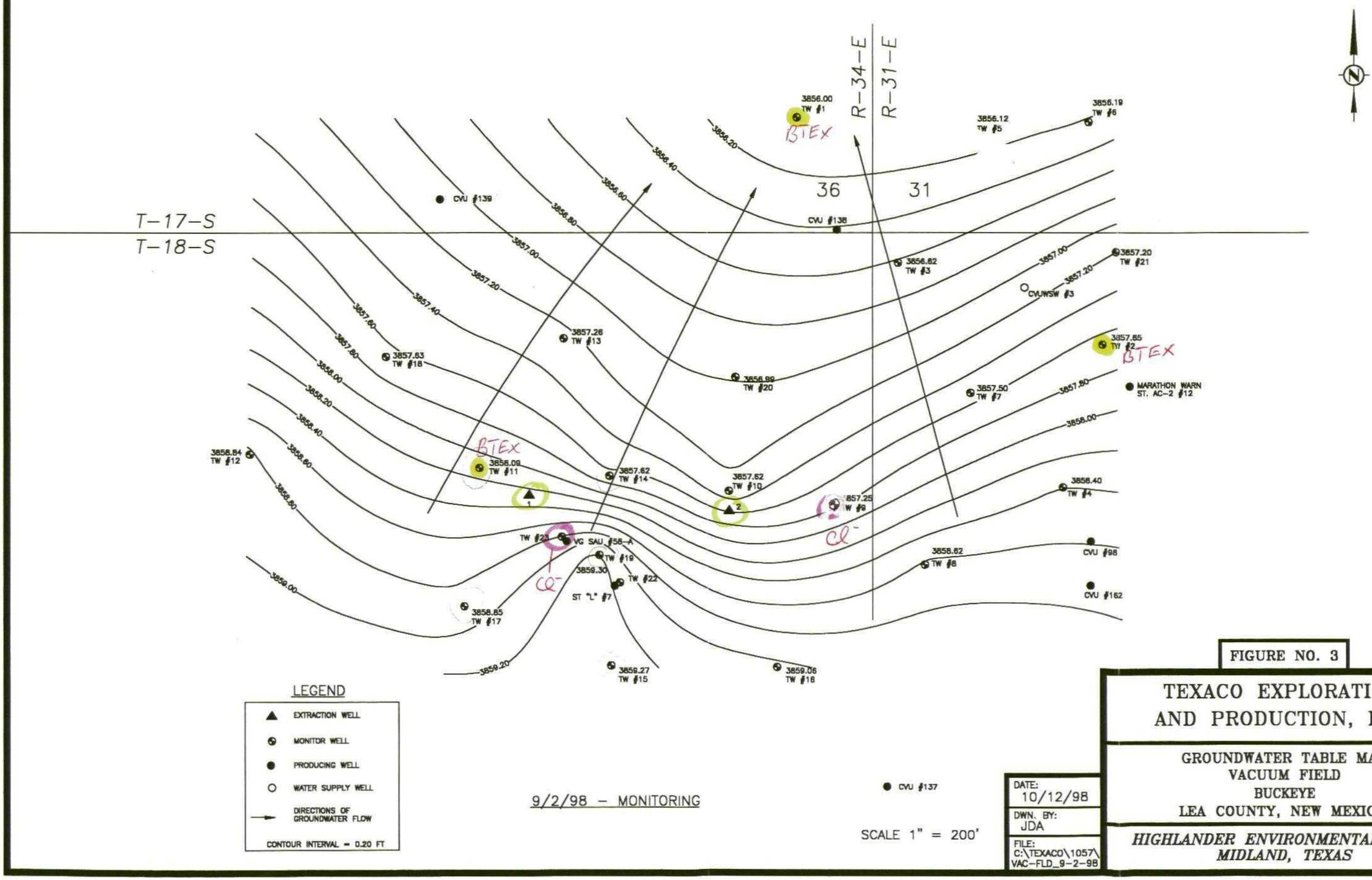


FIGURE NO. 2

TEXACO EXPLORATION AND PRODUCTION, INC.

SITE PLAN
VACUUM FIELD
BUCKEYE
LEA COUNTY, NEW MEXICO

HIGHLANDER ENVIRONMENTAL CORP.
MIDLAND, TEXAS



LEGEND

- EXTRACTION WELL
- MONITOR WELL
- PRODUCING WELL
- WATER SUPPLY WELL
- DIRECTIONS OF GROUNDWATER FLOW

CONTOUR INTERVAL = 0.20 FT

9/2/98 – MONITORING

SCALE 1" = 200'

DATE: 10/12/98
DWN. BY: JDA
FILE: C:\TEXACO\1057\VAC-FLD_9-2-98

FIGURE NO. 3

TEXACO EXPLORATION AND PRODUCTION, INC.

GROUNDWATER TABLE MAP
VACUUM FIELD
BUCKEYE
LEA COUNTY, NEW MEXICO

HIGHLANDER ENVIRONMENTAL CORP.
MIDLAND, TEXAS

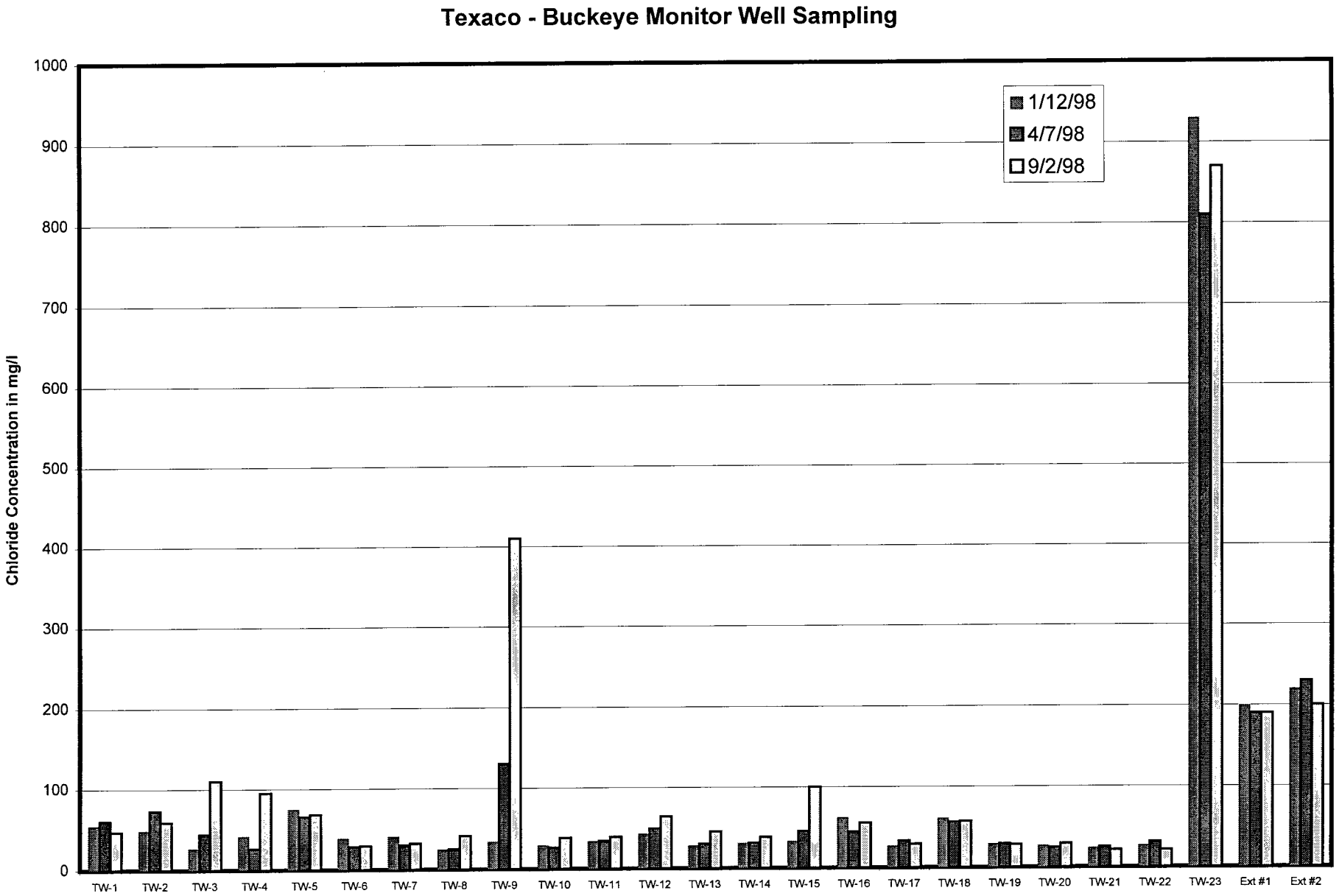


Figure 4 Chloride Concentration Bar Graph

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 SERVICES CORP.
Attention: Ike Tavarez
1910 N. Big Spring Street
Midland, Texas 79705

September 21, 1998
Receiving Date: 09/09/98
Sample Type: Water
Project No: 1057
Project Location: Texaco E & P Inc.

Prep Date: 09/16/98
Analysis Date: 09/16/98
Sampling Date: 09/2&3/98
Sample Condition: Intact & Cool
Sample Received by: VW
Project Name: Texaco-Vacuum Unit
Buckeye Lea County, NM

TA#	FIELD CODE	CHLORIDE (mg/L)
T107025	TW-1	47
T107026	TW-2	59
T107027	TW-3	110
T107028	TW-4	95
T107029	TW-5	68
T107030	TW-6	29
T107031	TW-7	32
T107032	TW-8	41
T107033	TW-9	410
T107034	TW-10	38
ICV		498
CCV		501
REPORTING LIMIT		2.0
RPD		2
% Extraction Accuracy		104
% Instrument Accuracy		100

METHODS: EPA SM 4500 Cl-B
CHEMIST: JS
CHLORIDE SPIKE: 2500 mg/L
CHLORIDE CV: 500 mg/L

Director, Dr. Blair Leftwich

9-21-98
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 SERVICES CORP.
Attention: Ike Tavarez
1910 N. Big Spring Street
Midland, Texas 79705

September 21, 1998
Receiving Date: 09/09/98
Sample Type: Water
Project No: 1057
Project Location: Texaco E & P Inc.

Prep Date: 09/16/98
Analysis Date: 09/16/98
Sampling Date: 09/2,3&4/98
Sample Condition: Intact & Cool
Sample Received by: VW
Project Name: Texaco-Vacuum Unit
Buckeye Lea County, NM

TA#	FIELD CODE	CHLORIDE (mg/L)
T107035	TW-11	39
T107036	TW-12	64
T107037	TW-13	45
T107038	TW-14	38
T107039	TW-15	100
T107040	TW-16	55
T107041	TW-17	29
T107042	TW-18	57
T107043	TW-19	28
ICV		494
CCV		503
REPORTING LIMIT		2.0
RPD		1
% Extraction Accuracy		115
% Instrument Accuracy		99

METHODS: EPA SM 4500 Cl-B
CHEMIST: JS
CHLORIDE SPIKE: 2500 mg/L
CHLORIDE CV: 500 mg/L

Director, Dr. Blair Leftwich

9-21-98
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 SERVICES CORP.
Attention: Ike Tavarez
1910 N. Big Spring Street
Midland, Texas 79705

September 21, 1998
Receiving Date: 09/09/98
Sample Type: Water
Project No: 1057
Project Location: Texaco E & P Inc.

Prep Date: 09/18/98
Analysis Date: 09/18/98
Sampling Date: 09/2,3&4/98
Sample Condition: Intact & Cool
Sample Received by: VW
Project Name: Texaco-Vacuum Unit
Buckeye Lea County, NM

TA#	FIELD CODE	CHLORIDE (mg/L)
T107044	TW-20	29
T107045	TW-21	21
T107046	TW-22	21
T107047	TW-23	870
T107048	TW-23-(duplicate)	866
T107049	RW-1 (Extraction well)	190
T107050	RW-1 (Extraction well) Duplicate	190
T107051	RW-2 (Extraction well)	200
ICV		500
CCV		500
REPORTING LIMIT		2.0
RPD		0
% Extraction Accuracy		105
% Instrument Accuracy		100

METHODS: EPA SM 4500 Cl-B
CHEMIST: SA/JS
CHLORIDE SPIKE: 2500 mg/L
CHLORIDE CV: 500 mg/L

Director, Dr. Blair Leftwich

9-21-98
DATE

TRACE ANALYSIS, INC.
6701 Aberdeen Avenue Lubbock, Texas 79424 806•794•1296 FAX 806•794•1298

ANALYTICAL RESULTS FOR
Highlander Environmental Services
Attention Ike Tavarez
1910 N. Big Spirng St.
Midland TX 79705

Date: Sep 11, 1998
Date Rec: 9/9/98
Project: 1057
Proj Name: Texaco/Texaco-Vacuum Field Bukeye
Proj Loc: Lea County,New Mexico

Lab Receiving # : 9809000170
Sampling Date: 9/2/98 - 9/3/98
Sample Condition: Intact and Cool
Sample Received By: VW

TA#	Field Code	MATRIX	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	M,P,O XYLENE (mg/L)	TOTAL BTEX (mg/L)
107025	TW-1	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107026	TW-2	Water	0.002	<0.001	0.002	0.005	0.009
107027	TW-3	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107028	TW-4	Water	<0.005	<0.005	<0.005	<0.005	<0.005
107029	TW-5	Water	0.002	<0.001	<0.001	<0.001	0.002
107030	TW-6	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107031	TW-7	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107032	TW-8	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107033	TW-9	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107035	TW-11	Water	0.002	<0.001	<0.001	<0.001	0.002
Method Blank			<0.001	<0.001	<0.001	<0.001	
Reporting Limit			0.001	0.001	0.001	0.001	
QC			0.109	0.104	0.105	0.324	
RPD			6	4	5	4	
% Extraction Accuracy			104	106	107	100	
% Instrument Accuracy			109	104	105	108	

TEST	PREP METHOD	PREP DATE	ANALYSIS METHOD	ANALYSIS COMPLETED	CHEMIST	QC: (mg/L)	SPIKE: (mg/L)
BTEX	EPA 5030	9/10/98	EPA 8021B	9/10/98	CS	0.100 ea	0.1 ea

Director, Dr. Blair Leftwich

9-11-98
Date

TRACE ANALYSIS, INC.
6701 Aberdeen Avenue Lubbock, Texas 79424 806•794•1296 FAX 806•794•1298

ANALYTICAL RESULTS FOR
Highlander Environmental Services
Attention Ike Tavarez
1910 N. Big Spirng St.
Midland TX 79705

Lab Receiving # : 9809000170
Sampling Date: 9/2/98 - 9/4/98
Sample Condition: Intact and Cool
Sample Received By: VW

Date: Sep 14, 1998
Date Rec: 9/9/98
Project: 1057
Proj Name: Texaco/Texaco-Vacuum Field Bukeye
Proj Loc: Lea County,New Mexico

TA#	Field Code	MATRIX	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	M,P,O XYLENE (mg/L)	TOTAL BTEX (mg/L)
107034	TW-10	Water	<0.005	<0.005	<0.005	<0.005	<0.005
107036	TW-12	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107037	TW-13	Water	<0.005	<0.005	<0.005	<0.005	<0.005
107038	TW-14	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107039	TW-15	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107040	TW-16	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107041	TW-17	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107042	TW-18	Water	<0.001	<0.001	<0.001	<0.001	<0.001
Method Blank			<0.001	<0.001	<0.001	<0.001	
Reporting Limit			0.001	0.001	0.001	0.001	
QC			0.107	0.087	0.088	0.271	
RPD			1	1	1	1	
% Extraction Accuracy			110	106	107	114	
% Instrument Accuracy			107	87	88	90	

TEST	PREP METHOD	PREP DATE	ANALYSIS METHOD	ANALYSIS COMPLETED	CHEMIST	QC: (mg/L)	SPIKE: (mg/L)
BTEX	EPA 5030	9/11/98	EPA 8021B	9/11/98	CS	0.100 ea	0.1 ea

Director, Dr. Blair Leftwich

9-14-98
Date

TRACE ANALYSIS, INC.
6701 Aberdeen Avenue Lubbock, Texas 79424 806•794•1296 FAX 806•794•1298

ANALYTICAL RESULTS FOR
Highlander Environmental Services
Attention Ike Tavarez
1910 N. Big Spirng St.
Midland TX 79705

Lab Receiving # : 9809000170
Sampling Date: 9/2/98 - 9/4/98
Sample Condition: Intact and Cool
Sample Received By: VW

Date: Sep 14, 1998
Date Rec: 9/9/98
Project: 1057
Proj Name: Texaco/Texaco-Vacuum Field Bukeye
Proj Loc: Lea County,New Mexico

TA#	Field Code	MATRIX	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	M,P,O XYLENE (mg/L)	TOTAL BTEX (mg/L)
107043	TW-19	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107044	TW-20	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107045	TW-21	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107046	TW-22	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107048	TW-23 (Duplicate)	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107049	RW-1 (Extraction Well)	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107050	RW-1 (Extraction Well), Duplic	Water	<0.001	<0.001	<0.001	<0.001	<0.001
107051	RW-2 (Extraction Well)	Water	<0.001	<0.001	<0.001	<0.001	<0.001
Method Blank			<0.001	<0.001	<0.001	<0.001	
Reporting Limit			0.001	0.001	0.001	0.001	
QC			0.107	0.087	0.088	0.271	
RPD			1	1	1	1	
% Extraction Accuracy			110	106	107	114	
% Instrument Accuracy			107	87	88	90	

TEST	PREP METHOD	PREP DATE	ANALYSIS METHOD	ANALYSIS COMPLETED	CHEMIST	QC: (mg/L)	SPIKE: (mg/L)
BTEX	EPA 5030	9/11/98	EPA 8021B	9/11/98	CS	0.100 ea	0.1 ea

Director, Dr. Blair Leftwich

9-14-98
Date

TRACE ANALYSIS, INC.
6701 Aberdeen Avenue Lubbock, Texas 79424 806•794•1296 FAX 806•794•1298

ANALYTICAL RESULTS FOR
Highlander Environmental Services
Attention Ike Tavarez
1910 N. Big Spirng St.
Midland TX 79705

Date: Sep 16, 1998
Date Rec: 9/9/98
Project: 1057
Proj Name: Texaco/Texaco-Vacuum Field Bukeye
Proj Loc: Lea County,New Mexico

Lab Receiving # : 9809000170
Sampling Date: 9/4/98
Sample Condition: Intact and Cool
Sample Received By: VW

TA#	Field Code	MATRIX	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL-BENZENE (mg/L)	M,P,O XYLENE (mg/L)	TOTAL BTEX (mg/L)
107047	TW-23	Water	<0.005	<0.005	<0.005	<0.005	<0.005
Method Blank			<0.001	<0.001	<0.001	<0.001	
Reporting Limit			0.001	0.001	0.001	0.001	
QC			0.109	0.104	0.105	0.327	
RPD			6	6	4	4	
% Extraction Accuracy			112	109	108	116	
% Instrument Accuracy			109	104	105	109	

TEST	PREP METHOD	PREP DATE	ANALYSIS METHOD	ANALYSIS COMPLETED	CHEMIST	QC: (mg/L)	SPIKE: (mg/L)
BTEX	EPA 5030	9/14/98	EPA 8021B	9/14/98	CS	0.100 ea	0.1 ea

Director, Dr. Blair Leftwich

9-16-98
Date

107025-51

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: 3

CLIENT NAME: Texaco E&P Inc. SITE MANAGER: Ike Tavarez

PROJECT NO.: 1057 PROJECT NAME: Texaco - Vacuum Unit Buckeye Lea County N.M.

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)	Chloride
107025	9/2/98					TW-1	3				1		X																X
26	9/2/98					TW-2	3				1		X																X
27	9/3/98					TW-3	3				1		X																X
28	9/3/98					TW-4	3				1		X																X
29	9/2/98					TW-5	3				1		X																X
30	9/2/98					TW-6	3				1		X																X
31	9/3/98					TW-7	3				1		X																X
32	9/3/98					TW-8	3				1		X																X
33	9/2/98					TW-9	3				1		X																X
34	9/3/98					TW-10	3				1		X																X

ANALYSIS REQUEST (Circle or Specify Method No.)

RELINQUISHED BY: (Signature) Richard Inman Date: 9-8-98 Time: 2:10 pm
RECEIVED BY: (Signature) Helen Williams Date: 9/8/98 Time: 2:10 PM

RELINQUISHED BY: (Signature) Helen Williams Date: 9/8/98 Time: 6:30 PM
RECEIVED BY: (Signature) Date: Time:

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

SAMPLED BY: (Print & Sign) IT/SA Date: Time:

SAMPLE SHIPPED BY: (Circle) FEDEX BUS UPS HAND DELIVERED AIRBILL # 159 384 369 1 OTHER:

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

RECEIVED BY: (Signature) Vicki Windham DATE: 9-9-98 TIME: 10:00 am

HIGHLANDER CONTACT PERSON: Ike Tavarez

Results by:

RUSH Charges Authorized: Yes No

SAMPLE CONDITION WHEN RECEIVED:

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

REMARKS: ANA

2° 9/16/98

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: IKE Tavarez

PROJECT NO.: 1057 PROJECT NAME: Texaco / Vacuum Field Unit - Buckeye, 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	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
107035	9/3/98					TW-11	3				/		X																	X
36	9/3/98					TW-12	3				/		X																	X
37	9/3/98					TW-13	3				/		X																	X
38	9/4/98					TW-14	3				/		X																	X
39	9/3/98					TW-15	3				/		X																	X
40	9/2/98					TW-16	3				/		X																	X
41	9/3/98					TW-17	3				/		X																	X
42	9/3/98					TW-18	3				/		X																	X
43	9/4/98					TW-19	3				/		X																	X
44	9/2/98					TW-20	3				/		X																	X

RELINQUISHED BY: (Signature) Vicki Lyman Date: 9-8-98 Time: 2:10 pm
RECEIVED BY: (Signature) Helen Shelton Date: 9/8/98 Time: 2:10 PM

RELINQUISHED BY: (Signature) Helen Shelton Date: 9/8/98 Time: 6:30 PM
RECEIVED BY: (Signature) Date: Time:

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

RECEIVING LABORATORY: Trace
ADDRESS:
CITY: STATE: ZIP:
CONTACT: PHONE:
RECEIVED BY: (Signature) Vicki Wyndham
DATE: 9-9-98 TIME: 10:00 am

SAMPLE CONDITION WHEN RECEIVED:

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

REMARKS: MD

SAMPLED BY: (Print & Sign) JT / JA Date: Time:

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

HIGHLANDER CONTACT PERSON: IKE Tavarez

Results by:

RUSH Charges Authorized: Yes No

ANALYSIS REQUEST (Circle or Specify Method No.)

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.

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: Ike Tavarez

PROJECT NO.: PROJECT NAME: Texaco/Vacuum Field Unit-Buckeye. 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	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
107045	9/2/98					TW-21	3				/		X																	X
46	9/4/98					TW-22	3				/		X																	X
47	9/4/98					TW-23	3				/		X																	X
48	9/4/98					TW-23 (Duplicate)	3				/		X																	X
49	9/4/98					RW-1 (Extraction well)	3				/		X																	X
50	9/4/98					RW-1 (Extraction well), Duplicate.	3				/		X																	X
51	9/3/98					RW-2 (extraction well)	3						X																	X

ANALYSIS REQUEST (Circle or Specify Method No.)

RELINQUISHED BY: (Signature) Vicki Inman Date: 9/8/98 Time: 2:10 pm
RECEIVED BY: (Signature) Helen Shelton Date: 9/8/98 Time: 2:10 PM

RELINQUISHED BY: (Signature) Helen Shelton Date: 9/8/98 Time: 6:30 PM
RECEIVED BY: (Signature) Date: Time:

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

SAMPLED BY: (Print & Sign) IKE Tavarez / JA Date: Time:

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

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

RECEIVED BY: (Signature) Vicki Windham
DATE: 9-9-98 TIME: 10:00 am

HIGHLANDER CONTACT PERSON: Ike Tavarez

Results by:

RUSH Charges Authorized: Yes No

SAMPLE CONDITION WHEN RECEIVED:

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

REMARKS: NVD

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.