GW - 72

MONITORING REPORTS

DATE: 1998

BROWN AND CALDWELL

Suite 2500, 1415 Louisiana, Houston, TX 77002
(713) 759-0952 • (713) 308-3886

TRANSMITTAL MEMORANDUM

To:	Date: 2/9/99	Job No: 12832-014
Mr. Wayne Price State of New Mexico Energy, Minerals, and Natural Resources Dept. Oil Conservation Division 2040 S. Pacheco St., State Land Office Bldg. Santa Fe, New Mexico 87505	Subject: Hobbs, New Mexico Facility	
	Contract No:	
	Equipment No:	
	Spec. Ref:	
	Submittal No:	

WE ARE SENDING:
☒ Attached ☐ Under separate cover via **1st Class Mail** the following items:
☐ Shop Drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change Order ☒ Other: Final Report

THESE ARE TRANSMITTED AS CHECKED BELOW:
- ☐ For approval
- ☒ For your use
- ☐ As requested
- ☐ For review and comment
- ☐ With submittal review action noted

SUBMITTAL REVIEW ACTIONS:
- ☐ No exceptions taken
- ☐ Make revisions
- ☐ Amend and resubmit
- ☐ Rejected--see Remarks
- ☐ None

Copies	Date	No.	Description
1	2/9/99	12832	December 1998 Groundwater Sampling Report, Hobbs, New Mexico Facility, BJ Services Company, U.S.A.

REMARKS:

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Environmental Bureau
Oil Conservation Division

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cc: Chris Williams, State of New Mexico
Jo Ann Cobb, BJ Services Company, U.S.A.
Roger Sullivan, BJ Services Company, U.S.A.(Hobbs)
Brown and Caldwell File
Transmittal File w/o attachment

Richard Rexroad

Richard Rexroad

If enclosures are not as noted, kindly notify us at once

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BROWN AND CALDWELL

DECEMBER 1998 GROUNDWATER SAMPLING REPORT HOBBS, NEW MEXICO FACILITY

BJ SERVICES COMPANY, U.S.A.

FEBRUARY 9, 1999

DECEMBER 1998 GROUNDWATER SAMPLING REPORT
HOBBS, NEW MEXICO FACILITY
BJ SERVICES COMPANY, U.S.A.

Prepared for

BJ Services Company, U.S.A.
8701 New Trails Drive
The Woodlands, Texas

BC Project Number: 12832.014

Richard L. Rexroad, P.G.
Principal Geologist

February 9, 1999

Brown and Caldwell
1415 Louisiana, Suite 2500
Houston, Texas 77002 - (713) 759-0999

Contents

CONTENTS

1.0 INTRODUCTION

Brown and Caldwell conducted field activities associated with the December 1998 quarterly groundwater sampling event at BJ Services Company, U.S.A. (BJ Services) facility located at 2708 West County Road, in Hobbs, New Mexico on December 9 and 10, 1998. The facility layout is shown in Figure 1.

The facility formerly operated an above-grade on-site fueling system. Subsurface impact near a diesel fueling system was first detected by the New Mexico Oil Conservation Division (NMOCD) during an on-site inspection on February 7, 1991. The fueling system was taken out of operation in July 1995. As the result of the diesel fuel release, the NMOCD has required a quarterly groundwater monitoring program to assess the concentration of hydrocarbon constituents in groundwater. A biosparging system was activated in November 1995 to remediate soil and groundwater at the facility. A site chronology detailing the history of the fueling system, the groundwater remediation system, and previous sampling events is presented on Table 1. Expansions of the biosparging system were performed in March/April 1997 and February/March 1998.

During the December 1998 sampling event, groundwater samples collected from all monitor wells were analyzed for gasoline and diesel range total petroleum hydrocarbons (TPH-G and TPH-D) and benzene, toluene, ethylbenzene, and total xylenes (BTEX). Additionally, samples from downgradient wells MW-10, MW-11A, and MW-12 were analyzed for sulfate, nitrate, and dissolved methane. This report presents the results of the groundwater sampling event, a description of the field activities, and a summary of the analytical results. A groundwater potentiometric surface map, a benzene concentration map, and a hydrocarbon distribution map are included.

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2.0 GROUNDWATER SAMPLING AND ANALYSES

Brown and Caldwell purged and sampled the groundwater monitoring wells at the facility on December 10, 1998 to determine concentrations of dissolved-phase hydrocarbons in groundwater. The following subsections describe the activities conducted during this sampling event and present the results of the groundwater analyses.

2.1 Groundwater Measurements and Sampling

Eleven monitor wells were sampled during the December 1998 sampling event. A site map depicting the locations of the monitor wells is presented as Figure 1. As noted in previous sampling reports, monitor well MW-2 can not be located and is assumed destroyed by facility activities such as grading.

Groundwater level measurements were obtained from the monitor wells prior to purging and sampling the wells. Groundwater levels were obtained with an oil/water interface probe and recorded to the nearest 0.01 foot. A cumulative table of groundwater elevation data is presented on Table 2. The groundwater elevation data indicates that the general groundwater flow direction is to the east with a hydraulic gradient of approximately 0.0066 foot/foot (ft/ft). A potentiometric surface map is presented in Figure 2. No phase-separated hydrocarbons or hydrocarbon sheens were observed in any of the monitor wells during the December 1998 groundwater sampling event.

Groundwater samples were collected after purging the wells by manual bailing to remove at least three well volumes of groundwater. Field parameter measurements for pH, conductivity, oxidation-reduction (redox) potential, dissolved oxygen (DO), and temperature were collected after each well volume was purged.

Additional groundwater parameters were measured during the purging and sampling activities to assess the potential for natural attenuation. These parameters were ferrous iron and alkalinity.

The field parameter readings were recorded in the field log book and are listed on the groundwater sampling forms included in Appendix A. The field screening results for groundwater samples are presented on Table 3.

Groundwater samples were collected directly after completion of purging operations. Each sample was transferred to laboratory-prepared, clean glass or plastic containers sealed with Teflon®-lined lids, labeled, and placed on ice in an insulated cooler for shipment via overnight courier to the analytical laboratory. Each cooler was accompanied by completed chain-of-custody documentation.

Field measurement equipment was decontaminated prior to and after each use. Decontamination procedures consisted of washing with fresh water and a non-phosphate detergent and rinsing with deionized (DI) water. Purged water and excess water generated by equipment cleaning operations were discharged to the on-site water reclamation system for re-use for other purposes by BJ Services.

2.2 Results of Groundwater Analyses

Groundwater samples collected during this sampling event were analyzed for TPH-D and TPH-G by EPA Method 8015 Modified and BTEX by EPA Method 8020. Additionally, three monitor wells (MW-10, MW-11A and MW-12) were sampled for methane, nitrate, and sulfate.

Current and cumulative analytical results for BTEX, TPH-D, and TPH-G are presented in Table 4. The analytical results for nitrate, sulfate, and dissolved methane analyses performed on groundwater samples from monitor wells MW-10, MW-11A, and MW-12 during this and preceding groundwater sampling events are presented in Table 5.

BTEX constituent concentrations in excess of applicable laboratory detection limits were reported in nine of the 12 groundwater samples collected during this sampling event. Benzene concentrations were below the New Mexico Water Quality Control Commission (WQCC) Standard

of 0.01 milligrams per liter (mg/L) in monitor wells MW-1, MW-5, MW-6, MW-7, MW-8, MW-9, and MW-11A. Figure 3 presents a benzene isoconcentration and total BTEX distribution map for the December 1998 sampling event. A total petroleum hydrocarbon distribution map for the December 1998 sampling event is presented in Figure 4. The laboratory analytical report and chain-of-custody record for the groundwater samples are included in Appendix B.

Benzene concentrations in monitor wells MW-1, MW-3 and MW-4, which are located near the former source area, have continued to decrease since the expansion of the biosparging system in February/March 1998. The benzene concentration in monitor well MW-1 is less than the New Mexico WQCC standard of 0.01 mg/L. The benzene concentration of 13 µg/L in monitor well MW-3 only slightly exceeds the New Mexico WQCC standard of 0.01 mg/L. Benzene concentrations in the off-site monitor well, MW-9, have not exceeded 0.01 mg/L since March 1997.

Total BTEX concentrations in monitor wells MW-1, MW-3, MW-4, and MW-6 have decreased during the time period between September 1998 and December 1998.

Concentrations of dissolved phase BTEX have displayed an overall decrease in the area of monitor wells MW-10 and MW-11/11A subsequent to removal of a field waste tank (see Figure 1) in March 1997. Benzene and total BTEX concentrations decreased in downgradient wells MW-10, MW-11A, and MW-12 between September 1998 and December 1998.

2.3 Natural Attenuation Evaluation

Natural attenuation is planned to be the primary remediation mechanism for the portion of the plume in the area of the former field waste tanks (see Figure 3).

The primary evidence of natural attenuation is plume behavior. Natural attenuation of hydrocarbons is occurring at a rate greater than hydrocarbon loading from the source area when a hydrocarbon plume is decreasing in size or concentration. Conversely, increases in size or hydrocarbon concentrations of a plume indicate that rates of hydrocarbon loading exceed the natural

attenuation capacity in the area. The observed decreases in benzene and total BTEX concentrations in monitor wells MW-10 and MW-11 following removal of the of the field waste tank on March 6-7, 1997 indicate a decreased rate of hydrocarbon loading in these areas. The observed decreases in benzene and total BTEX concentrations in monitor wells MW-10, MW-11A, and MW-12 during the time period between September 1998 and December 1998 indicate that the rate of losses due to natural attenuation mechanisms in the area currently exceeds hydrocarbon loading rates from residual impacted soil.

Secondary evidence of natural attenuation can be obtained by the collection and evaluation of data relating to the concentrations of indigenous electron acceptors such as dissolved oxygen, nitrates, ferric iron, sulfates, and carbon dioxide. The following lines of geochemical evidence suggest that intrinsic bioremediation (an important natural attenuation mechanism) is occurring:

1. Nitrate concentrations were measured at less than 0.01 mg/L in monitor wells MW-10 and MW-12 and at a concentration of 0.7 mg/L in MW-11A. These concentrations are less than the nitrate concentrations of 3.87 mg/L, 3.92 mg/L, and 1.84 mg/L measured in March 1998 in monitor wells MW-5, MW-7, and MW-8, respectively, which are believed to exhibit background conditions. Nitrate is utilized during intrinsic bioremediation. Therefore, nitrate concentrations should be depressed in areas where intrinsic bioremediation is occurring.

2. Ferrous iron was measured at a concentration of 5.0 mg/L in monitor well MW-10. Ferrous iron was not detected at a concentration in excess of 2 mg/L in any of the other monitor wells at the site. When DO and nitrate are depleted, anaerobic microbes which utilize other electron acceptors become active. Ferrous iron is the reduction product of ferric iron, a common electron acceptor. Therefore, ferrous iron concentrations should increase in areas where intrinsic bioremediation is occurring. The current data suggest that that utilization of ferric iron as an electron acceptor may be occurring in the area of monitor well MW-10.

3. Redox is a measure of chemical energy in groundwater. Redox values in the vicinity of the background monitor wells MW-5, MW-7 and MW-8 were 169.9 millivolts (mV), 82.5 mV and 109.3 mV, respectively. Redox values in the vicinity of monitor wells MW-10, MW-11A and MW-12 were –86.7 mV, -50.4 mV and –75.3 mV, respectively. The negative redox values in monitor wells MW-10, MW-11A and MW-12 indicate that electron acceptors other than dissolved oxygen are being utilized.

4. Methane is a reaction product generated during utilization of carbon dioxide as an electron acceptor, and its concentration should therefore increase in areas where depletion of DO,

nitrate, and ferric iron has occurred. The concentrations of methane are elevated in monitor wells MW-10 and MW-11A relative to the methane concentration in monitor well MW-12, suggesting that utilization of carbon dioxide may be occurring locally in the areas of monitor wells MW-10 and MW-11A.

Dissolved oxygen concentrations measured for monitor wells MW-10, MW-11A, and MW-12 during the December 1998 sampling event are comparable to those measured in the background area monitor wells. The occurrence may be due to the fact that December 1998 DO measurements were made on groundwater samples collected with bailers rather than with a submersible pump and flow-through cell system. Previous sampling at the site (see September 1998 Groundwater Sampling Report for BJ Services Hobbs, New Mexico Facility) using a submersible pump and flow-through cell system has indicated depressed DO content in monitor wells MW-10, MW-11A, and MW-12 relative to background wells, supporting the occurrence of intrinsic bioremediation in the area of the former field waste tank. It is recommended that a submersible pump and flow-through cell system be utilized during future groundwater sampling events at the facility.

Sulfate concentrations in monitor wells MW-10, MW-11A, and MW-12 measured in December 1998 as shown in Table 5 are not substantially lower than those observed in monitor wells MW-5, MW-7, and MW-8 in March 1998 (i.e., 190mg/L, 310 mg/L, and 250 mg/L, respectively). Sulfate utilization during intrinsic bioremediation can therefore not be confirmed on the basis of present data.

The alkalinity data generated during the December 1998 groundwater sampling event is inconclusive with regard to the potential for natural attenuation of hydrocarbons at the facility, because the results from monitor wells MW-10, MW-11A, and MW-12 as well as the background area wells are all greater than 400 mg/L (see field data sheets in Appendix A). Evaluation of laboratory-derived alkalinity data is recommended for the next groundwater sampling event.

Therefore, based on present and past data, it appears that DO and nitrate are supplying electron acceptors to facilitate natural attenuation. In addition, ferric iron and carbon dioxide are apparently

acting as electron acceptors in the vicinity of monitor wells MW-10 and/or MW-11A, as indicated by locally elevated ferrous iron and dissolved methane concentrations.

It is recommended that monitoring for natural attenuation evaluation parameters continue in this area.

3.0 REMEDIATION SYSTEM

Brown and Caldwell submitted a Remedial Action Plan (RAP) to the New Mexico OCD in May 1994. Based on the results of previous investigations conducted by Brown and Caldwell and Roberts/Schornick and Associates, Inc. (RSA), Brown and Caldwell recommended the installation of a biosparging system. The biosparging system simultaneously treats volatile and semivolatile contaminants adsorbed directly to the soil (i.e., residual) as well as contaminants present in soil moisture (i.e., dissolved phase) within the capillary fringe and vadose zone. Additionally, the biosparging system removes volatile and semivolatile contaminants from the saturated zone. The biosparging system operates by injecting air into the saturated zone and extracting air from the vadose zone through a network of wells and piping. The continuous flushing of air through the saturated zone increases the dissolved oxygen concentration in groundwater and in soil moisture present in the capillary fringe and vadose zone. The elevated dissolved oxygen content facilitates the activities of indigenous microorganisms to accelerate biodegradation of contaminants. The flushing of air also strips volatile and semivolatile contaminants.

The New Mexico OCD approved the RAP on August 11, 1994. Installation activities for the biosparging system were conducted August 2 through 24, 1995. Nineteen combined injection and extraction wells, three vacuum extraction wells, associated piping, one extraction blower, and one injection blower were installed. An additional vapor extraction well, VE-4, was installed and connected to the vapor extraction system in April 1997. Five additional injection wells, AI-20 through AI-24, were installed in February 1998. Injection wells AI-20 through AI-24 were installed at locations near the center of the hydrocarbon plume. These injection wells were constructed such that a 10-foot screen submergence was achieved, thereby providing treatment to an expanded vertical interval of the aquifer in the central portion of the plume. Injection wells AI-20 through AI-24 are supplied by a separate blower than the one used to supply injection wells AI-1 through AI-19 in order to avoid short-circuiting to wells with less screen submergence. Three additional vapor extraction wells, VE-5 through VE-7, were also installed in February 1998. The new injection and extraction wells were brought on-line on March 10, 1998, and operation of injection wells AI-1

through AI-19, which had been suspended on February 19, 1998, was resumed on March 24, 1998.

Benzene and total BTEX concentrations in monitor well MW-1 measured during the December 1998 groundwater sampling event continue to display declines relative to concentrations of these parameters prior to installation of injection wells AI-20 through AI-24 in February 1998. Benzene concentrations dropped from 7,600 µg/L in December 1997 to less than 1.0 µg/L in December 1998, and total BTEX concentrations have dropped from 30,600 µg/L to 128.5 µg/L during this time period. Benzene concentrations have decreased from 240 µg/L to 13 µg/L in monitor well MW-3 and from 230 µg/L to 38 µg/L in monitor well MW-4 during this interval of time. Similarly, total BTEX concentrations have decreased from 1,930 µg/L to 683 µg/L in monitor well MW-3 and from 4,250 µg/L to 1,268 µg/L in monitor well MW-4 between December 1997 and December 1998. These decreases are likely attributable to increased air flow being applied to the aquifer through air injection wells AI-20 through AI-24.

A graph showing the calculated dissolved phase benzene mass in the western plume versus time is presented in Figure 5 (the western plume is located in the area of monitor wells MW-1, MW-3, MW-4, and MW-6). This graph shows that the plume mass was increasing up until December 1995, when the biosparging system was installed. This increase was probably due to benzene loading of groundwater from vadose zone soils. The benzene mass then decreased steadily after installation. The rate of plume mass decrease has accelerated since the system modifications were implemented in February 1998. This indicates that the system modifications have been effective in more aggressively removing benzene from groundwater.

The vapors recovered during the extraction process are discharged to the atmosphere in accordance with the State of New Mexico Air Quality Regulations. Following initial system startup operations, effluent air samples were collected on a monthly basis from the recovered vapors to monitor the bioremediation process and emission rate. Upon receiving a determination from the State of New Mexico that an air permit was not required, effluent air samples were collected and analyzed voluntarily on a quarterly basis through July 1997. The air samples were analyzed for TPH using

EPA Method Modified 8015A (Air) and for total volatile aromatic hydrocarbons (BTEX) using EPA Method 5030/8020 (modified).

The analytical results demonstrated a significant reduction in hydrocarbon vapor concentrations and emissions rates between November 1995 and July 1997. Total BTEX concentrations decreased from 391 parts per million by volume (ppmv) in November 1995 to 17.3 ppmv in July 1997. The corresponding BTEX emissions decreased from 0.77 lb/hour to 0.03 lb/hour. TPH concentrations decreased from 1,870 ppmv in November 1995 to 65 ppmv in July 1997. The corresponding TPH - Volatile Organic Compound (VOC) emissions rates decreased from 3.21 lb/hour to 0.08 lb/hour. These emission rates were well below the regulatory limit of 10 lb/hour for VOCs. Therefore, use of a field monitoring instrument utilizing a flame ionization detector (FID) to measure the VOC concentration in the vapors commenced in September 1997. The VOC measurements collected using the FID correspond to TPH concentrations previously determined in the analytical laboratory. The VOC concentration measured using the FID during the December 1998 sampling event was 180 parts per million by volume (ppmv).

The TPH concentration of 180 ppmv measured during the December 1998 sampling event shows a substantial drop from the 1500 ppmv TPH discharge rate observed during the March 24, 1998 groundwater sampling event. The December 1998 TPH discharge rate of 180 ppmv is comparable to TPH concentrations measured during the time period from August 1996 through December 1997, prior to the system modifications performed in February and March 1998. The increased TPH concentration observed in the March 1998 event relative to the time period from August 1997 through December 1997 is believed to be a result of the addition of air injection wells AI-20 through AI-24 to the biosparging system, but discharge rates have returned to more typical levels during the period from June 1998 through December 1998.

The VOC emissions rate calculated for the December 1998 groundwater sampling event was 0.30 pound per hour (lb/hour). This emission rate is below the regulatory limit of 10 lb/hour for VOCs. The December 1998 VOC emissions rate is typical of VOC emissions rates during the time period of August 1996 through December 1997, and represents a substantial drop from the 1.91 lb/hour

VOC emissions rate calculated for the March 1998 sampling event. Discharge rates have varied between 0.24 lb/hour and 0.30 lb/hour during the time period of June 1998 through December 1998.

This initial increase in mass transfer rates after system modification was indicative of increased stripping of hydrocarbons within soil and groundwater from pathways that were not in contact with injected air prior to system modification. The subsequent decrease in mass transfer, in concert with plume mass calculations, as shown in Figure 5, indicates that the overall contaminant mass has been reduced by the biosparging system.

A cumulative summary of analytical results for air emissions monitoring is included in Table 5. These results are based on both laboratory and field analyses.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on information obtained during the December 1998 quarterly groundwater sampling event at the BJ Services Hobbs, New Mexico facility.

4.1 Conclusions

- Groundwater flow was to the east at an average hydraulic gradient of 0.0066 ft/ft.
- No phase-separated hydrocarbons or hydrocarbon sheens were observed in any of the wells.
- Dissolved benzene and total BTEX concentrations in monitor wells MW-1, MW-3 and MW-4, which are located near the central portion of the plume, have decreased during the time period between September 1998 and December 1998. Benzene and total BTEX concentrations in these wells have continued to decline since installation of deep injection wells AI-20 through AI-24 in February 1998.
- Dissolved benzene concentrations have decreased in perimeter monitor wells MW-5, MW-7, MW-8 and MW-9 during operation of the biosparging system.
- Benzene concentrations in monitor wells MW-1, MW-5, MW-6, MW-7, MW-8, MW-9, and MW-11A are below the New Mexico Water Quality Control Commission standard of 0.01 mg/L.
- Hydrocarbon air emissions have decreased substantially since March 1998. The current emissions rate of 0.30 lb/hour TPH is below the regulatory limit of 10 lb/hour for VOCs.

4.2 Recommendations

- Continue the quarterly groundwater sampling program and the operation and maintenance of the biosparging system.
- Continue monitoring hydrocarbon emissions on a quarterly basis using a calibrated field FID.
- Continue monitoring for natural attenuation parameters in monitor wells MW-8, MW-10, MW-11A, and MW-12.

DISTRIBUTION

December 1998 Groundwater Sampling Report
BJ Services Company, U.S.A.
Hobbs, New Mexico

February 9, 1999

1 copy to: State of New Mexico
Energy, Minerals, and Natural Resources Dept.
Oil Conservation Division
2040 South Pacheco Street, State Land Office Building
Santa Fe, New Mexico 87505

Attention: Mr. Wayne Price

1 copy to: State of New Mexico
Oil Conservation Division, Hobbs District Office
Post Office Box 1980
Hobbs, New Mexico 88240

Attention: Mr. Chris Williams

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8701 New Trails Drive
The Woodlands, Texas 77381

Attention: Ms. Jo Ann Cobb

1 copy to: BJ Services Company, U.S.A.
2708 West County Road
Hobbs, New Mexico 88240

Attention: Mr. Roger Sullivan

1 copy to: Brown and Caldwell, Project File

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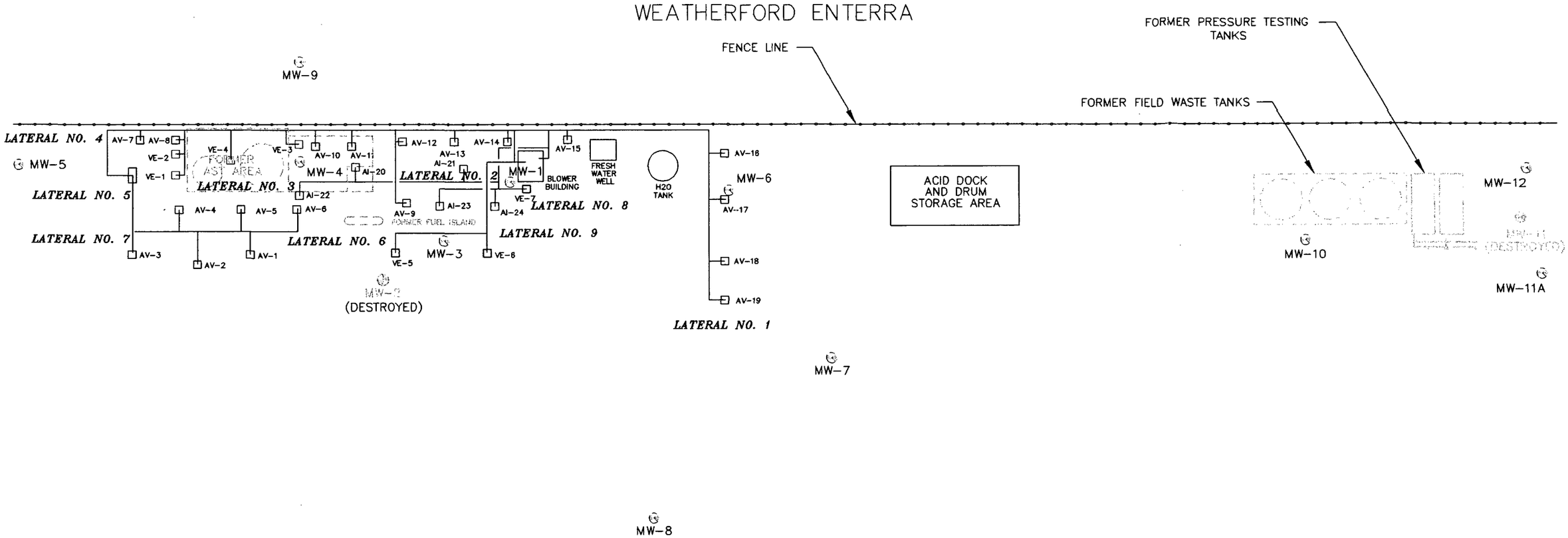
Robert N. Jennings, P.E.
Vice President

RLR/uak/srd

Figures

FIGURES

WEATHERFORD ENTERRA



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HOUSTON, TEXAS

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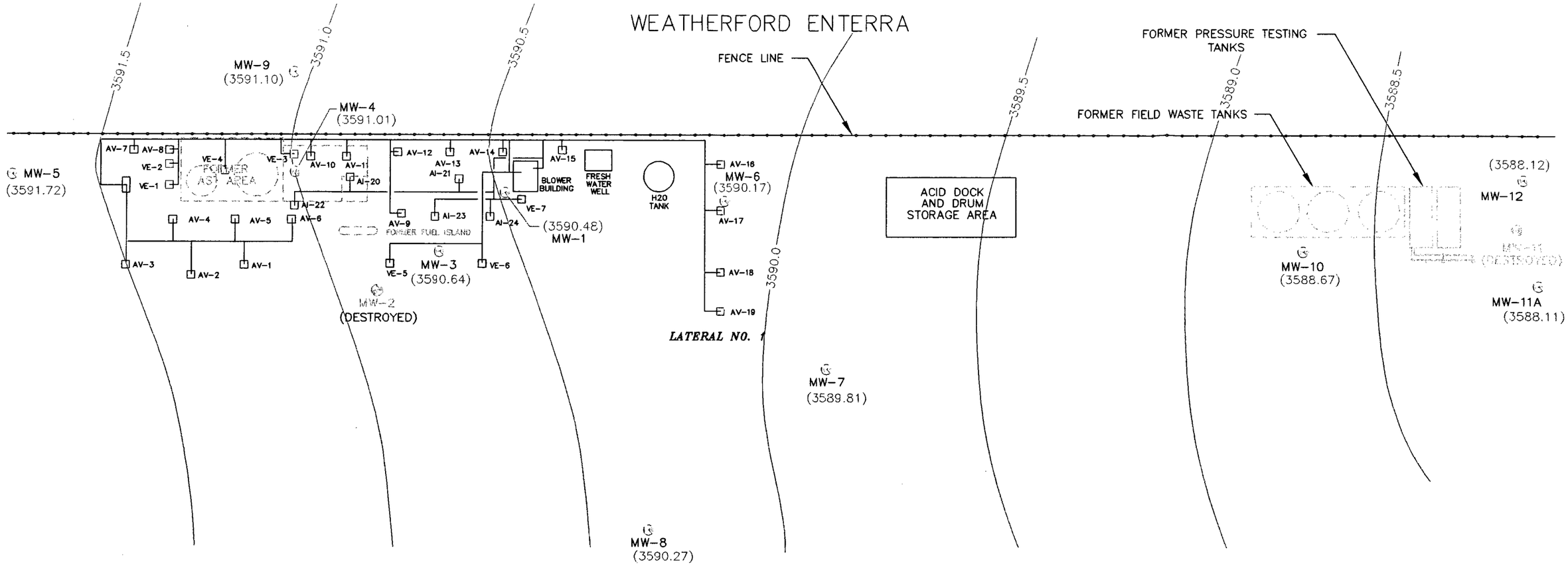
LEGEND

MW-3 MONITOR WELL

VE-4 AV-10 BIOSPARGING SYSTEM

TITLE: SITE MAP	DATE: 10/05/98
CLIENT: BJ SERVICES COMPANY, U.S.A.	PROJECT NUMBER: 12832.012
SITE: HOBBS, NEW MEXICO	FIGURE NUMBER: 1

WEATHERFORD ENTERRA



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BROWN AND CALDWELL

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APPROVED: ____ DATE ____

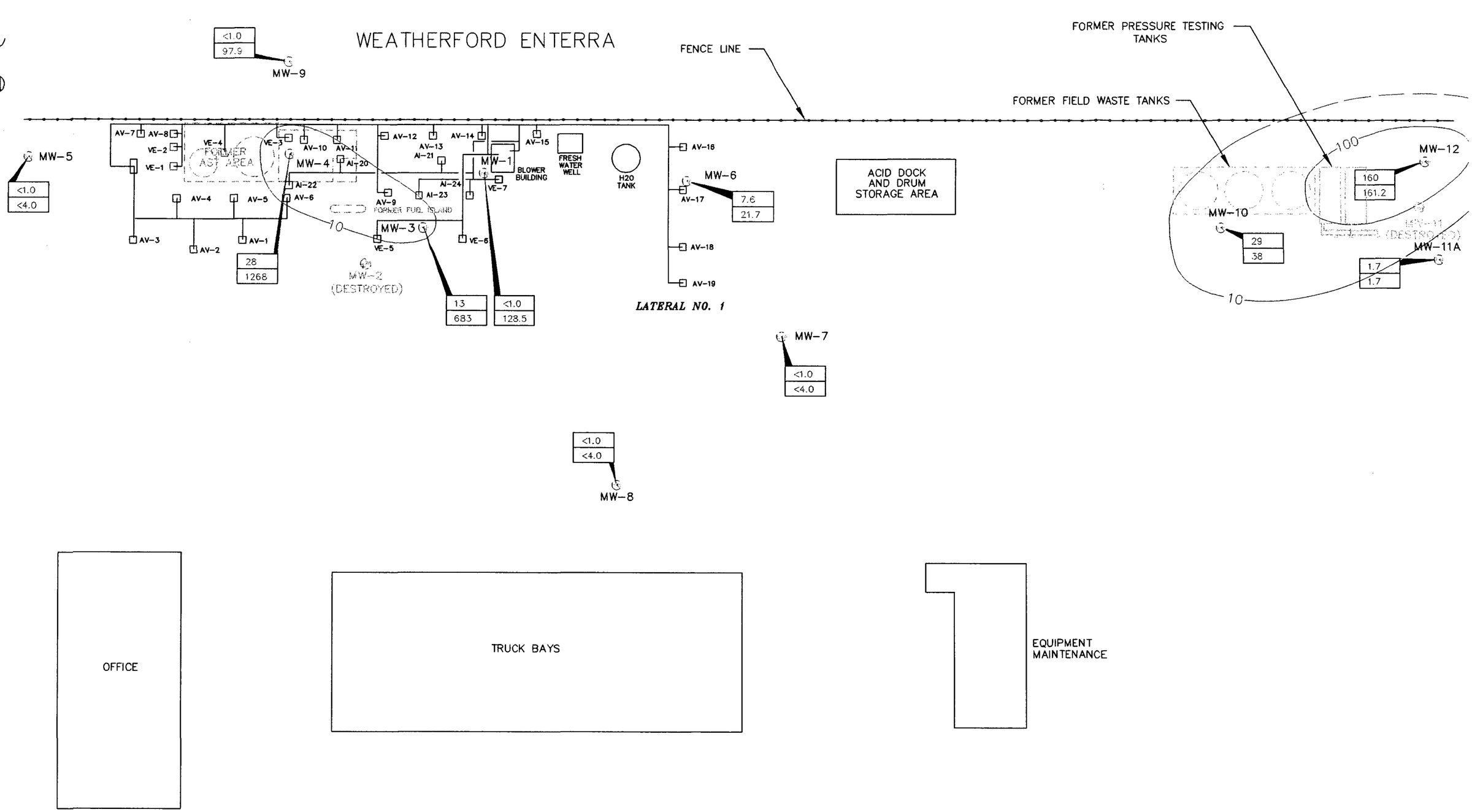
LEGEND

MW-3 MONITOR WELL

VE-4 AV-10 BIOSPARGING SYSTEM

TITLE: POTENTIOMETRIC SURFACE MAP DECEMBER 9, 1998	DATE: 01/06/99
CLIENT: BJ SERVICES COMPANY, U.S.A.	PROJECT NUMBER: 12832.013
SITE: HOBBS, NEW MEXICO	FIGURE NUMBER: 2

WEATHERFORD ENTERRA



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HOUSTON, TEXAS

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PROJECT MANAGER

APPROVED: _____ DATE: _____
BROWN AND CALDWELL

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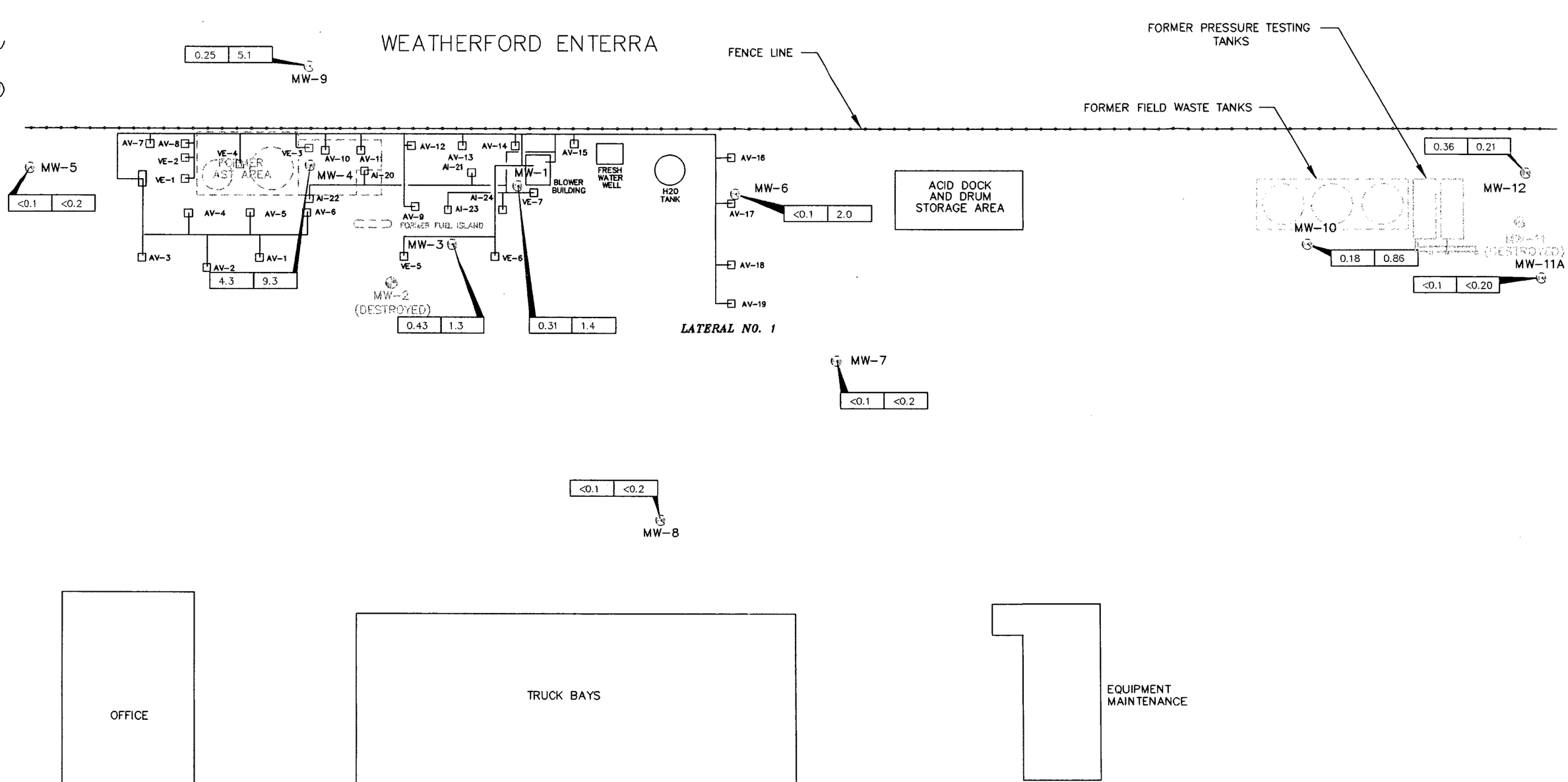
SCALE: 1" = 50'
DRAWN BY: JR DATE 4/98
CHK'D BY: ____ DATE ____
APPROVED: ____ DATE ____

LEGEND

MW-8 — MONITOR WELL
<1.0 — BENZENE CONCENTRATION (ug/L)
<4.0 — TOTAL BTEX CONCENTRATION (ug/L)
10 — BENZENE ISOCONCENTRATION CONTOUR (ug/L)
CONTOUR INTERVAL = LOGARITHMIC

TITLE: BENZENE ISOCONCENTRATION AND TOTAL BTEX DISTRIBUTION MAP FOR DECEMBER 9–10, 1998	DATE: 01/06/99
CLIENT: BJ SERVICES COMPANY, U.S.A.	PROJECT NUMBER: 12832.013
SITE: HOBBS, NEW MEXICO	FIGURE NUMBER: 3

WEATHERFORD ENTERRA



BROWN AND CALDWELL HOUSTON, TEXAS SUBMITTED: _____ DATE: _____ PROJECT MANAGER APPROVED: _____ DATE: _____ BROWN AND CALDWELL	0 20 40 SCALE: 1" = 50' DRAWN BY: JR DATE 4/98 CHK'D BY: ____ DATE ____ APPROVED: ____ DATE ____	LEGEND MW-3 MONITOR WELL 3.8 | 1.0 – TPH-G (mg/L) / TPH-D (mg/L)	TITLE: TOTAL PETROLEUM HYDROCARBONS DISTRIBUTION MAP FOR DECEMBER 9–10, 1998 CLIENT: BJ SERVICES COMPANY, U.S.A. SITE: HOBBS, NEW MEXICO	DATE: 01/06/99 PROJECT NUMBER: 12832.013 FIGURE NUMBER: 4

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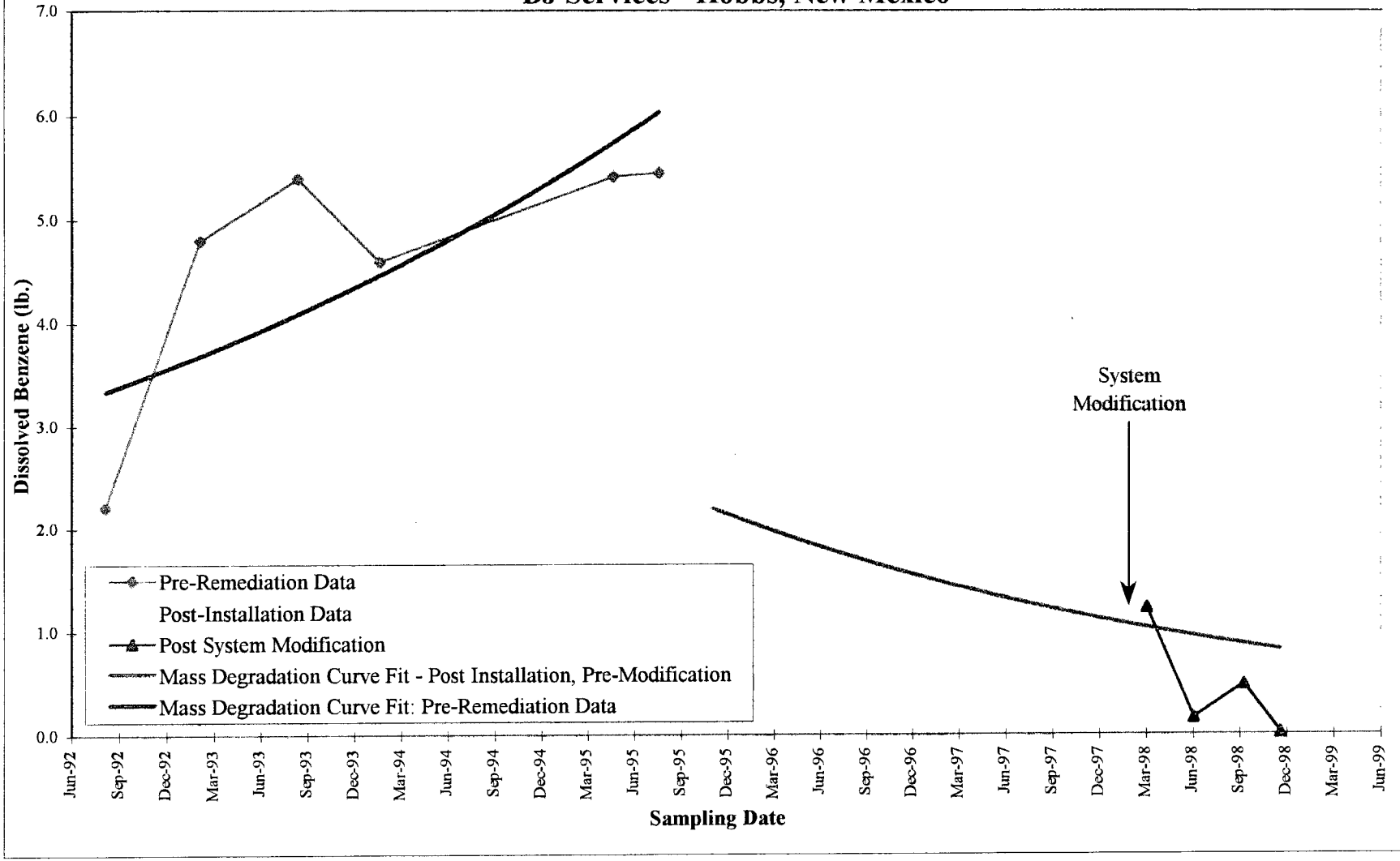
FIGURE 5
Dissolved Benzene Mass vs. Time
West Plume
BJ Services - Hobbs, New Mexico



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Tables

TABLES

Table 1
Site Chronology
BJ Services Company, U.S.A.
Hobbs, New Mexico

Date	Activity
February 7, 1991	The State of New Mexico Oil Conservation Division (OCD) conducted an on-site inspection, including sampling of the on-site fresh water well.
August 6, 1991	OCD requested submittal of an investigation work plan.
September 5, 1991	Roberts/Schornick and Associates, Inc. (RSA) submitted Technical Work Plan for soil and groundwater investigation to the OCD.
November 15, 1991	The OCD approved Technical Work Plan submitted by RSA.
December 16, 1991	RSA sampled the fresh water well. Analytical results were submitted to the OCD.
February 21, 1992	Western sampled the fresh water well. Analytical results were submitted to the OCD.
July 29 - August 10, 1992	Brown and Caldwell conducted a soil and groundwater investigation according to the approved Technical Work Plan. Investigation included drilling and sampling 9 soil borings, sampling 6 hand-augured soil borings, the installation and sampling of 5 monitoring wells and the sampling of the fresh water well.
October 12, 1992	Brown and Caldwell submitted Soil and Groundwater Investigation Report to the OCD.
December 2, 1992	The OCD requested the installation and sampling of 4 additional monitoring wells, including a monitoring well on an adjacent property.
April 13, 1993	Brown and Caldwell conducted a vapor extraction pilot test on existing groundwater monitoring wells.
April 15, 1993	Brown and Caldwell installed off-site monitoring well.
April 22, 1993	Brown and Caldwell sampled off-site monitoring well.
May 27, 1993	Brown and Caldwell submitted a letter report documenting the installation and sampling of the off-site monitoring well to the OCD.
June 2, 1993	Brown and Caldwell conducted a short-term aquifer test using the fresh water well at the facility.
June 8, 1993	USTank Management, Inc. conducted a non-volumetric tank system tightness test on the diesel and unleaded gasoline aboveground storage tanks at the facility.

Table 1 (Continued)
Site Chronology
BJ Services Company, U.S.A.
Hobbs, New Mexico

Date	Activity
June 21, 1993	ENSR Consulting and Engineering (ENSR), the environmental consultant of the adjacent property owner on which the off-site well is located, submitted a request to sample the off-site monitoring well.
July 15, 1993	ENSR split one groundwater sample, collected from the off-site monitoring well, with Brown and Caldwell.
July 30, 1993	USTank Management, Inc. submitted the tank tightness test report to Brown and Caldwell. The report indicated that both tanks and their associated piping passed.
August 16-19, 1993	Brown and Caldwell installed two additional downgradient monitoring wells. Brown and Caldwell sampled each of the existing monitoring and the newly installed monitoring wells.
January 26, 1994	Brown and Caldwell performed groundwater monitoring event; existing monitoring wells and the fresh water well were purged and sampled. Groundwater samples were analyzed for BTEX.
May 6, 1994	Remedial Action Plan (RAP) submitted to the OCD.
August 11, 1994	RAP approved by the OCD.
May 3, 1995	Brown and Caldwell conducted the May 1995 groundwater sampling event.
July 31, 1995	Brown and Caldwell conducted the July 1995 groundwater sampling event.
August 2-9, 1995	Installation of biosparging system was initiated. Nineteen combined injection/extraction wells and three vacuum extraction wells were installed.
August 14-26, 1995	Remedial Construction Services, Inc. (RCS) began construction of the biosparging system.
September 19, 1995	Began operation of the extraction portion of the biosparging system.
November 13, 1995	Began operation of the injection portion of the biosparging system.
November 14, 1995	Brown and Caldwell conducted the November 1995 groundwater sampling event.
February 23, 1996	Brown and Caldwell conducted the February 1996 groundwater sampling event.
May 31, 1996	Brown and Caldwell conducted the May 1996 groundwater sampling event.

Table 1 (Continued)
Site Chronology
BJ Services Company, U.S.A.
Hobbs, New Mexico

Date	Activity
August 23, 1996	Brown and Caldwell conducted the August 1996 groundwater sampling event.
December 2, 1996	Brown and Caldwell conducted the December 1996 groundwater sampling event.
March 6-7, 1997	BJ Services removed the field waste tank and associated hydrocarbon impacted soil.
March 12, 1997	Brown and Caldwell conducted the March 1997 groundwater sampling event.
March 14, 1997	Vapor extraction well VE-4 installed.
April 1997	Vapor extraction well VE-4 connected to the vapor extraction system.
June 12, 1997	Brown and Caldwell conducted the June 1997 groundwater sampling event.
September 11-12, 1997	Brown and Caldwell conducted the September 1997 groundwater sampling event.
December 10, 1997	Brown and Caldwell conducted the December 1997 groundwater sampling event.
February 3-14, 1998	Air injection wells AI-20 through AI-24, vapor extraction wells VE-5 though VE-7 and monitor wells MW-11A and MW-12 were installed.
February 19, 1998	Operation of previously existing injection wells suspended in preparation for start-up of injection wells AI-20 through AI-24.
March 10, 1998	Operation of air injection wells AI-20 through AI-24 commenced.
March 23-24, 1998	Brown and Caldwell conducted the March 1998 groundwater sampling event.
March 24, 1998	Operation of previously existing injection wells resumed.
June 23, 1998	Brown and Caldwell conducted the June 1998 groundwater sampling event.
September 30, 1998	Brown and Caldwell conducted the September 1998 groundwater sampling event.
December 9-10, 1998	Brown and Caldwell conducted the December 1998 groundwater sampling event.

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-1						
	3,647.53	8/10/92	53.22	0.00	3,594.31	(1)
	3,647.53	2/9/93	53.03	0.00	3,594.50	
	3,647.53	8/18/93	53.10	0.00	3,594.43	
	3,647.53	1/26/94	53.31	0.00	3,594.22	
	3,647.53	5/3/95	54.64	0.20	3,593.05	(2)
	3,647.53	7/31/95	54.14	0.00	3,593.39	
	3,647.53	11/14/95	53.69	0.00	3,593.84	
	3,647.53	2/23/96	54.32	0.00	3,593.21	
	3,647.53	5/31/96	54.14	0.00	3,593.39	
	3,647.53	8/23/96	56.17	0.00	3,591.36	
	3,647.53	12/2/96	55.27	0.00	3,592.26	
	3,647.53	3/12/97	55.70	0.27	3,592.05	(3)
	3,647.53	6/12/97	55.08	0.02	3,592.47	
	3,647.53	9/12/97	55.64	0.51	3,592.31	
	3,647.53	12/10/97	55.46	0.00	3,592.07	PSH Sheen
	3,647.53	3/24/98	55.81	0.00	3,591.72	PSH Sheen
	3,647.53	6/23/98	56.38	0.06	3,591.20	
	3,647.53	9/30/98	56.82	0.00	3,590.71	PSH Sheen
	3,647.53	12/9/98	57.05	0.00	3,590.48	
MW-2						
	3,647.59	8/10/92	52.82	0.00	3,594.77	(1)
	3,644.84	2/9/93	49.60	0.00	3,595.24	
	3,644.84	8/18/93	49.71	0.00	3,595.13	
	3,644.84	1/26/94	49.97	0.00	3,594.87	
		5/3/95				(4)

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-3						
	3,647.68	8/10/92	52.99	0.00	3,594.69	(1)
	3,647.68	2/9/93	52.72	0.00	3,594.96	
	3,647.68	8/18/93	52.82	0.00	3,594.86	
	3,647.68	1/26/94	53.05	0.00	3,594.63	
	3,647.68	5/3/95	54.31	0.00	3,593.37	
	3,645.00	7/31/95	51.24	0.00	3,593.76	
	3,645.00	11/14/95	51.10	0.00	3,593.90	
	3,645.00	2/23/96	51.68	0.00	3,593.32	
	3,645.00	5/31/96	51.45	0.00	3,593.55	
	3,645.00	8/23/96	51.55	0.00	3,593.45	
	3,645.00	12/2/96	52.23	0.00	3,592.77	
	3,645.00	3/12/97	52.67	0.00	3,592.33	(3)
	3,645.00	6/12/97	52.68	0.00	3,592.32	
	3,645.00	9/11/97	52.71	0.00	3,592.29	
	3,645.00	12/10/97	52.89	0.00	3,592.11	
	3,645.00	3/23/98	53.22	0.00	3,591.78	
	3,645.00	6/23/98	53.66	0.00	3,591.34	
	3,645.00	9/30/98	54.06	0.00	3,590.94	
	3,645.00	12/9/98	54.36	0.00	3,590.64	

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-4						
	3,645.28	8/10/92	50.55	0.00	3,594.73	(1)
	3,645.28	2/9/93	50.26	0.00	3,595.02	
	3,645.28	8/18/93	50.38	0.00	3,594.90	
	3,645.28	1/26/94	50.90	0.30	3,594.63	
	3,645.28	5/3/95	51.51	0.45	3,594.14	
	3,645.28	7/31/95	51.74	0.26	3,593.75	
	3,645.28	11/14/95	51.03	0.00	3,594.25	
	3,645.28	2/23/96	51.65	0.01	3,593.64	
	3,645.28	5/31/96	51.48	0.00	3,593.80	
	3,645.28	8/23/96	53.49	0.00	3,591.79	
	3,645.28	12/2/96	52.32	0.00	3,592.96	
	3,645.28	3/12/97	52.74	0.05	3,592.58	(3)
	3,645.28	6/12/97	53.08	0.44	3,592.56	
	3,645.28	9/12/97	52.60	0.15	3,592.80	
	3,645.28	12/10/97	52.89	0.00	3,592.39	PSH Sheen
	3,645.28	3/24/98	53.20	0.25	3,592.29	
	3,645.28	6/23/98	53.82	0.22	3,591.64	
	3,645.28	9/30/98	53.96	0.00	3,591.32	200 ml PSH
	3,645.28	12/9/98	54.27	0.00	3,591.01	

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-5						
	3,647.72	8/10/92	52.38	0.00	3,595.34	(1)
	3,647.72	2/9/93	52.06	0.00	3,595.66	
	3,647.72	8/18/93	52.16	0.00	3,595.56	
	3,647.72	1/26/94	52.50	0.00	3,595.22	
	3,647.72	5/3/95	53.57	0.00	3,594.15	
	3,647.72	7/31/95	53.27	0.00	3,594.45	
	3,647.72	11/14/95	52.83	0.00	3,594.89	
	3,647.72	2/23/96	53.57	0.00	3,594.15	
	3,647.72	5/31/96	53.16	0.00	3,594.56	
	3,647.72	8/23/96	53.41	0.00	3,594.31	
	3,647.72	12/2/96	53.98	0.00	3,593.74	
	3,647.72	3/12/97	54.44	0.00	3,593.28	(3)
	3,647.72	6/12/97	54.48	0.00	3,593.24	
	3,647.72	9/12/97	54.29	0.00	3,593.43	
	3,647.72	12/10/97	54.66	0.00	3,593.06	
	3,647.72	3/23/98	55.05	0.00	3,592.67	
	3,647.72	6/23/98	55.44	0.00	3,592.28	
	3,647.72	9/30/98	55.65	0.00	3,592.07	
	3,647.72	12/9/98	56.00	0.00	3,591.72	

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-6						
	3,644.74	2/9/93	50.58	0.00	3,594.16	(1)
	3,644.74	8/18/93	50.78	0.00	3,593.96	
	3,644.74	1/26/94	51.00	0.00	3,593.74	
	3,644.74	5/3/95	52.63	0.00	3,592.11	
	3,644.74	7/31/95	51.90	0.00	3,592.84	
	3,644.74	11/14/95	51.19	0.00	3,593.55	
	3,644.74	2/23/96	52.10	0.00	3,592.64	
	3,644.74	5/31/96	51.76	0.00	3,592.98	
	3,644.74	8/23/96	51.63	0.00	3,593.11	
	3,644.74	12/2/96	52.85	0.00	3,591.89	
	3,644.74	3/12/97	53.55	0.00	3,591.19	(3)
	3,644.74	6/12/97	52.08	0.00	3,592.66	
	3,644.74	9/11/97	53.72	0.00	3,591.02	
	3,644.74	12/10/97	53.27	0.00	3,591.47	
	3,644.74	3/23/98	53.56	0.00	3,591.18	
	3,644.74	6/23/98	52.88	0.00	3,591.86	
	3,644.74	9/30/98	54.89	0.00	3,589.85	
	3,644.74	12/9/98	54.57	0.00	3,590.17	

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-7						
	3,644.55	2/9/93	50.53	0.00	3,594.02	(1)
	3,644.55	8/18/93	50.74	0.00	3,593.81	
	3,644.55	1/26/94	51.01	0.00	3,593.54	
	3,644.55	5/3/95	52.25	0.00	3,592.30	
	3,644.55	7/31/95	51.92	0.00	3,592.63	
	3,644.55	11/14/95	51.48	0.00	3,593.07	
	3,644.55	2/23/96	52.15	0.00	3,592.40	
	3,644.55	5/31/96	51.78	0.00	3,592.77	
	3,644.55	8/23/96	52.02	0.00	3,592.53	
	3,644.55	12/2/96	52.52	0.00	3,592.03	
	3,644.55	3/12/97	52.99	0.00	3,591.56	(3)
	3,644.55	6/12/97	53.08	0.00	3,591.47	
	3,644.55	9/11/97	53.00	0.00	3,591.55	
	3,644.55	12/10/97	53.28	0.00	3,591.27	
	3,644.55	3/23/98	53.59	0.00	3,590.96	
	3,644.55	6/23/98	54.20	0.00	3,590.35	
	3,644.55	9/30/98	54.54	0.00	3,590.01	
	3,644.55	12/9/98	54.74	0.00	3,589.81	

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-8						
	3,644.87	2/9/93	50.48	0.00	3,594.39	(1)
	3,644.87	8/18/93	50.67	0.00	3,594.20	
	3,644.87	1/26/94	50.96	0.00	3,593.91	
	3,644.87	5/3/95	52.15	0.00	3,592.72	
	3,644.87	7/31/95	51.77	0.00	3,593.10	
	3,644.87	11/14/95	51.37	0.00	3,593.50	
	3,644.87	2/23/96	52.17	0.00	3,592.70	
	3,644.87	5/31/96	51.55	0.00	3,593.32	
	3,644.87	8/23/96	51.92	0.00	3,592.95	
	3,644.87	12/2/96	52.43	0.00	3,592.44	
	3,644.87	3/12/97	52.93	0.00	3,591.94	(3)
	3,644.87	6/12/97	53.96	0.00	3,590.91	
	3,644.87	9/11/97	52.73	0.00	3,592.14	
	3,644.87	12/10/97	53.15	0.00	3,591.72	
	3,644.87	3/23/98	53.51	0.00	3,591.36	
	3,644.87	6/23/98	54.01	0.00	3,590.86	
	3,644.87	9/30/98	54.35	0.00	3,590.52	
	3,644.87	12/9/98	54.60	0.00	3,590.27	

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-9						
	3,644.78	4/22/93	49.73	0.00	3,595.05	(1)
	3,644.78	7/15/93	49.65	0.00	3,595.13	
	3,644.78	8/18/93	49.85	0.00	3,594.93	
	3,644.78	1/26/94	50.02	0.00	3,594.76	
	3,644.78	5/3/95	51.35	0.00	3,593.43	
	3,644.78	7/31/95	50.97	0.00	3,593.81	
	3,644.78	11/14/95	50.43	0.00	3,594.35	
	3,644.78	2/23/96	51.12	0.00	3,593.66	
	3,644.78	5/31/96	50.89	0.00	3,593.89	
	3,644.78	8/23/96	50.98	0.00	3,593.80	
	3,644.78	12/2/96	51.58	0.00	3,593.20	
	3,644.78	3/12/97	52.21	0.05	3,592.61	(3)
	3,644.78	6/12/97	52.10	0.00	3,592.68	PSH Sheen
	3,644.78	9/12/97	51.95	0.00	3,592.83	PSH Sheen
	3,644.78	12/10/97	52.37	0.00	3,592.41	Slight Sheen
	3,644.78	3/23/98	52.68	0.00	3,592.10	Slight Sheen
	3,644.78	6/23/98	53.08	0.00	3,591.70	PSH Sheen
	3,644.78	9/30/98	53.39	0.01	3,591.40	PSH Sheen
	3,644.78	12/9/98	53.68	0.00	3,591.10	

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-10						
	3,644.47	8/18/93	51.54	0.00	3,592.93	(1)
	3,644.47	1/26/94	51.90	0.00	3,592.57	
	3,644.47	5/3/95	52.97	0.00	3,591.50	
	3,644.47	7/31/95	52.87	0.00	3,591.60	
	3,644.47	11/14/95	52.51	0.00	3,591.96	
	3,644.47	2/23/96	53.05	0.00	3,591.42	
	3,644.47	5/31/96	52.79	0.00	3,591.68	
	3,644.47	8/23/96	53.03	0.00	3,591.44	
	3,644.47	12/2/96	53.41	0.00	3,591.06	
	3,644.47	3/12/97	54.21	0.00	3,590.26	(3)
	3,644.47	6/12/97	53.99	0.00	3,590.48	
	3,644.47	9/12/97	53.94	0.00	3,590.53	
	3,644.47	12/10/97	54.12	0.00	3,590.35	
	3,644.47	3/23/98	54.51	0.00	3,589.96	
	3,644.47	6/23/98	55.12	0.00	3,589.35	
	3,644.47	9/30/98	55.61	0.00	3,588.86	
	3,644.47	12/9/98	55.80	0.00	3,588.67	
MW-11						
	3,643.78	8/18/93	51.92	0.00	3,591.86	(1)
	3,643.78	1/26/94	52.32	0.00	3,591.46	
	3,643.78	5/3/95	53.38	0.00	3,590.40	
	3,643.78	7/31/95	53.35	0.00	3,590.43	
	3,643.78	11/14/95	52.96	0.00	3,590.82	
	3,643.78	2/23/96	53.50	0.00	3,590.28	
	3,643.78	5/31/96	53.25	0.00	3,590.53	
	3,643.78	8/23/96	53.49	0.00	3,590.29	
	3,643.78	12/2/96	53.79	0.00	3,589.99	
	3,643.78	3/12/97	53.81	0.00	3,589.97	(3)
	3,643.78	6/12/97	53.96	0.00	3,589.82	
	3,643.78	9/12/97	52.93	0.00	3,590.85	
		12/10/97				(5)

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-11A						
	3,644.24	3/23/98	54.79	0.00	3,589.45	(6)
	3,644.24	6/23/98	55.43	0.00	3,588.81	
	3,644.24	9/30/98	55.96	0.00	3,588.28	
	3,644.24	12/9/98	56.13	0.00	3,588.11	
MW-12						
	3,644.29	3/23/98	54.72	0.00	3,589.57	(6)
	3,644.29	6/23/98	55.48	0.00	3,588.81	
	3,644.29	9/30/98	56.02	0.00	3,588.27	
	3,644.29	12/9/98	56.17	0.00	3,588.12	

(1) Top of casing elevations and groundwater elevations of all monitor wells were relative to an arbitary datum of 100.00 feet prior to March 1997 and have been converted to Mean Sea Level (MSL).

(2) Top of casing elevations and groundwater elevations relative to MSL after March 1997.

(3) MW-2 could not be located and is assumed detroyed after January, 1994.

Table 3
Field Screening Results for Groundwater Samples
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitor Well	Date Measured	Well Volume	pH	Temperature oC	Conductivity (umhos)	Redox (mV)	Dissolved Oxygen (mg/L)	Ferrous Iron (mg/L)	Alkalinity (mg/L)
MW-1	12/10/98	0	7.21	18.21	1784.0	-87.1	1.42	NM	NM
		1	7.15	18.90	1760.0	-81.4	1.13	NM	NM
		2	7.11	19.11	1543.0	-75.5	0.87	NM	NM
		3	7.07	20.05	1275.0	-48.3	0.61	1	> 400
MW-3	12/10/98	0	7.51	18.91	1281.0	-112.0	7.11	NM	NM
		1	7.46	19.02	1274.0	-91.7	6.92	NM	NM
		2	7.32	19.91	1211.0	-89.1	6.40	NM	NM
		3	7.30	20.17	1155.0	-87.3	5.75	0	220
MW-4	12/10/98	0	6.88	18.75	1174.0	-71.0	1.14	NM	NM
		1	6.91	19.11	1282.0	-65.5	0.98	NM	NM
		2	6.94	19.69	1311.0	-63.1	0.91	NM	NM
		3	6.91	20.11	1340.0	-61.5	0.85	0	380
MW-5	12/10/98	0	7.78	16.75	1045	194.1	11.89	NM	NM
		1	7.45	17.56	1091	181.8	8.03	NM	NM
		2	7.40	17.84	1099	175.0	7.93	NM	NM
		3	7.36	17.96	1099	169.9	7.84	2	> 400
MW-6	12/10/98	0	7.61	18.22	1783.0	-31.7	MF	NM	NM
		1	7.69	19.97	1693.0	-39.8	MF	NM	NM
		2	7.72	20.04	1611.0	-47.3	MF	NM	NM
		3	7.80	20.11	1557.0	-59.5	1	2	> 400
MW-7	12/10/98	0	7.98	12.59	NM	71.9	9.60	NM	NM
		1	7.58	18.14	1187	79.0	8.87	NM	NM
		2	7.35	17.65	1308	82.0	7.53	NM	NM
		3	7.38	18.61	1271	82.5	7.28	0	> 400
MW-8	12/10/98	0	7.62	17.37	1410	118.5	8.91	NM	NM
		1	7.24	17.87	1456	113.4	5.69	NM	NM
		2	7.19	17.76	1462	110.1	4.68	NM	NM
		3	7.17	17.92	1472	109.3	5.52	0	> 400
MW-9	12/10/98	0	7.51	16.01	1411.0	91.1	7.21	NM	NM
		1	7.40	16.54	1389.1	89.1	6.50	NM	NM
		2	7.32	17.21	1374.0	83.4	6.11	NM	NM
		3	7.27	17.30	1352.0	75.5	5.72	2	> 400
MW-10	12/10/98	0	7.57	15.92	2364	-76.8	7.56	NM	NM
		1	7.32	17.68	2452	-62.2	5.21	NM	NM
		2	7.33	17.70	2499	-74.3	5.61	NM	NM
		3	7.37	17.73	2466	-86.7	5.93	5.0	> 400
MW-11A	12/10/98	0	7.81	14.72	2071.0	47.7	MF	NM	NM
		1	7.52	17.0	2206	-9.7	9.33	NM	NM
		2	7.15	17.6	2308	-39.7	6.79	NM	NM
		3	7.08	17.78	2368	-50.4	4.54	0	> 400
MW-12	12/10/98	0	8.46	15.98	1483	-129.0	12.12	NM	NM
		1	8.21	17.71	1470	-111.0	11.4	NM	NM
		2	7.95	18.40	1443	-98.1	9.1	NM	NM
		3	7.60	19.11	1391	-75.3	8.7	1	> 400

MW-2 could not be located and is assumed destroyed after January, 1994.

MW-11 could not be located and is assumed destroyed after September, 1997.

NM=Not Measured

MF=Invalid Data (Instrument Malfunction)

Table 4

Cummulative Analytical Results for Groundwater Samples

Hobbs, New Mexico Facility

BJ Services Company, U.S.A.

Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
MW-1								
	8/10/92	Regular	5550	12090	2160	7370	NA	NA
	2/9/93	Regular	2100	6500	1300	7400	NA	NA
	8/19/93	Regular	3200	7300	1200	3700	NA	NA
	1/27/94	Regular	1930	4580	672	2390	NA	NA
	5/3/95	Regular	NSP	NSP	NSP	NSP	NA	NSP
	8/1/95	Regular	390	1300	230	800	NA	5.7
	11/15/95	Regular	880	1800	300	970	NA	6.8
	2/23/96	Regular	1500	3700	620	2200	NA	21
	5/31/96	Regular	1100	1700	380	990	NA	7.5
	8/23/96	Regular	1800	3300	570	2100	NA	17
	12/2/96	Regular	5600	9600	2100	9600	100	64
	3/12/97	Regular	5500	9700	2600	8200	22	62
	6/12/97	Regular	5300	34000	7500	27000	180	160
	9/12/97	Regular	1800	4400	1000	3000	23	21
	12/10/97	Regular	7600	12000	2800	8200	11	71
	3/24/98	Regular	4800	7200	1200	2400	4.2	38
	6/23/98	Regular	53	680	580	1400	1.4	9.2
	09/30/98	Regular	3.2	90	280	970	2.5	3.6
	12/10/98	Regular	<1.0	1.5	17	110	1.4	0.31
MW-2								
	8/10/92	Regular	14.9	< 4	< 4	< 4	NA	NA
	2/9/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	8/19/93	Regular	100	12	3	13	NA	NA
	1/27/94	Regular	< 1	1.2	2	2.5	NA	NA
MW-3								
	8/10/92	Regular	304.9	2099	6760	1586	NA	NA
	2/9/93	Regular	130	< 10	< 10	190	NA	NA
	8/19/93	Regular	560	3100	630	1900	NA	NA
	1/27/94	Regular	1070	5380	510	3120	NA	NA
	5/4/95	Regular	770	3300	470	1800	NA	NA
	8/1/95	Regular	490	2900	890	1600	NA	14
	11/15/95	Regular	250	1000	180	440	NA	2.9
	2/23/96	Regular	120	810	170	560	NA	4
	5/31/96	Regular	670	3900	1200	2300	NA	15
	8/23/96	Regular	330	2200	590	1500	NA	12
	12/2/96	Regular	220	1800	670	1000	0.89	7.4
	3/12/97	Regular	370	2000	960	1400	1.8	11
	6/12/97	Regular	860	4800	1700	2600	1.9	20
	9/11/97	Regular	770	3000	1600	1900	1.6	16
	12/10/97	Regular	240	740	500	450	0.59	5.3
	3/24/98	Regular	140	630	360	310	0.56	3.9
	6/23/98	Regular	100	720	350	490	0.40	4.9
	09/30/98	Regular	42	470	450	530	1.0	3.8
	12/10/98	Regular	13	220	160	290	1.3	0.43

Table 4

Cummulative Analytical Results for Groundwater Samples

Hobbs, New Mexico Facility

BJ Services Company, U.S.A.

Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
MW-4								
	8/10/92	Regular	2594	10360	2160	6740	NA	NA
	2/9/93	Regular	5200	15000	2200	10000	NA	NA
	8/19/93	Regular	3000	12000	< 2000	7000	NA	NA
	1/27/94	Regular	NSP	NSP	NSP	NSP	NA	NSP
	5/3/95	Regular	NSP	NSP	NSP	NSP	NA	NSP
	8/1/95	Regular	5700	17000	3500	13000	NA	120
	11/15/95	Regular	490	1600	310	1100	NA	5.2
	2/23/96	Regular	360	2800	560	2500	NA	18
	5/31/96	Regular	84	830	280	1100	NA	6.2
	8/23/96	Regular	110	1400	430	1800	NA	9.8
	12/2/96	Regular	190	2000	1800	7200	56	43
	3/12/97	Regular	220	1500	1500	4400	27	27
	6/12/97	Regular	47	270	360	950	2.5	6.2
	9/12/97	Regular	92	840	670	2100	15	7.6
	12/10/97	Regular	230	750	970	2300	3.7	16
	3/24/98	Regular	150	510	270	620	1.2	5.6
	6/23/98	Regular	160	890	590	1600	0.69	10
	09/30/98	Regular	80	180	370	840	2.0	3.9
	12/10/98	Regular	28	70	210	960	9.3	4.3
	12/10/98	Duplicate	26	62	180	830	3.9	4.3
MW-5								
	8/10/92	Regular	< 4	< 4	< 4	< 4	NA	NA
	2/9/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	8/10/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	1/27/94	Regular	8.7	29.9	4	11.3	NA	NA
	5/3/95	Regular	3.7	5.3	0.92	4.6	NA	NA
	8/1/95	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	NA
	11/15/95	Regular	< 0.3	1.2	< 0.3	1.5	NA	NA
	2/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	NA
	5/31/96	Regular	31	86	10	20	NA	NA
	8/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	12/2/96	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	3/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	6/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	9/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	12/10/97	Regular	< 5	< 5	< 5	< 5	< 0.2	< 0.1
	3/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	6/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	09/30/98	Regular	< 1.0	< 1.0	< 1.0	< 1.0	< 0.20	< 0.1
	12/10/98	Regular	< 1.0	< 1.0	< 1.0	< 1.0	< 0.20	< 0.1
MW-6								
	8/10/92	Regular	NS	NS	NS	NS	NA	NS
	2/9/93	Regular	7000	19000	3100	7200	NA	NA
	8/19/93	Regular	8100	19000	3500	6400	NA	NA
	1/27/94	Regular	7960	20200	3830	6150	NA	NA

Table 4

Cummulative Analytical Results for Groundwater Samples

Hobbs, New Mexico Facility

BJ Services Company, U.S.A.

Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
	5/4/95	Regular	11000	17000	2900	6000	NA	NA
	8/1/95	Regular	8300	12000	2500	5100	NA	60
	11/15/95	Regular	8900	17000	2900	5500	NA	57
	2/23/96	Regular	8100	10000	2300	4000	NA	58
	5/31/96	Regular	83	150	15	51	NA	0.57
	5/31/96	Duplicate	87	160	13	47	NA	0.52
	8/23/96	Regular	31	28	9.4	7.9	NA	0.46
	12/2/96	Regular	< 1	< 1	< 1	1.7	5.6	< 0.1
	3/12/97	Regular	12	< 5	6.8	18	12	< 0.5
	6/12/97	Regular	1900	1400	410	310	7.8	7.4
	9/11/97	Regular	11	1.3	3.4	< 1	1	< 0.1
	12/10/97	Regular	3	4.2	1.2	3.9	1.7	0.14
	3/23/98	Regular	3.6	< 1	4	< 1	< 0.2	< 0.1
	6/23/98	Regular	170	4.1	15	7.2	1.2	0.51
	09/30/98	Regular	1000	420	140	270	4.0	3.3
	12/10/98	Regular	7.6	6.6	1.7	5.8	2.0	< 0.1
MW-7								
	8/10/92	Regular	NS	NS	NS	NS	NA	NS
	2/9/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	8/19/93	Regular	< 2	3	< 2	< 2	NA	NA
	1/27/94	Regular	1.1	< 1	< 1	< 1	NA	NA
	5/3/95	Regular	52	3.4	0.67	2.8	NA	NA
	8/1/95	Regular	22	2.2	0.85	2.8	NA	< 0.1
	11/15/95	Regular	8.4	0.77	< 0.3	0.93	NA	< 0.1
	2/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	2/23/96	Duplicate	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	5/31/96	Regular	29	83	10	21	NA	0.25
	8/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	12/2/96	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	3/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	6/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	9/11/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	12/10/97	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	3/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	6/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	09/30/98	Regular	< 1.0	< 1.0	< 1.0	< 1.0	< 0.20	< 0.1
	12/10/98	Regular	< 1.0	< 1.0	< 1.0	< 1.0	< 0.20	< 0.1
MW-8								
	8/10/92	Regular	NS	NS	NS	NS	NA	NS
	2/9/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	8/19/93	Regular	< 2	< 2	< 2	< 2	NA	NA
	1/27/94	Regular	< 1	< 1	< 1	< 1	NA	NA
	5/3/95	Regular	3	4.9	0.75	3.7	NA	NA
	8/1/95	Regular	3.1	1.2	0.47	1.6	NA	< 0.001
	8/1/95	Duplicate	3.6	1.5	0.51	1.5	NA	< 0.1
	11/15/95	Regular	< 0.3	0.52	< 0.3	< 0.6	NA	< 0.1

Table 4

Cummulative Analytical Results for Groundwater Samples

Hobbs, New Mexico Facility

BJ Services Company, U.S.A.

Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
	2/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	5/31/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	8/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	12/2/96	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	3/12/97	Regular	< 1	< 1	< 1	1.8	< 0.1	< 0.1
	6/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	9/11/97	Regular	< 1	< 1	< 1	< 1	0.1	< 0.1
	12/10/97	Regular	< 1	< 1	< 1	< 1	0.3	< 0.1
	3/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	6/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	09/30/98	Regular	< 1.0	< 1.0	< 1.0	< 1.0	< 0.20	< 0.1
	12/10/98	Regular	< 1.0	< 1.0	< 1.0	< 1.0	< 0.20	< 0.1
MW-9								
	4/22/93	Regular	570	380	< 50	870	NA	NA
	7/15/93	Regular	121	7.3	3	458	NA	NA
	8/19/93	Regular	390	290	40	250	NA	NA
	1/27/94	Regular	327	357	51.1	293	NA	NA
	5/3/95	Regular	380	110	19	120	NA	NA
	8/1/95	Regular	660	410	91	310	NA	6.2
	11/15/95	Regular	240	24	11	140	NA	1.5
	11/15/95	Duplicate	170	18	10	120	NA	1.9
	2/23/96	Regular	170	18	2.3	160	NA	4.3
	5/31/96	Regular	120	16	3	200	NA	NA
	8/23/96	Regular	82	13	6	270	NA	4
	8/23/96	Duplicate	76	14	4.8	250	NA	4.4
	12/2/96	Regular	61	< 25	< 25	210	2.6	2.8
	12/2/96	Duplicate	86	13	2.4	270	3.7	2.9
	3/12/97	Regular	30	48	420	880	8.2	19
	6/12/97	Regular	4.7	2.1	11	97	2.6	2.2
	6/12/97	Duplicate	< 5	< 5	6.6	69	5.2	1.9
	9/12/97	Regular	2.1	2.3	2.1	120	1.2	1.9
	12/10/97	Regular	4.9	9	6.8	62	0.86	0.92
	3/24/98	Regular	< 1	< 1	< 1	26	0.9	1
	6/23/98	Regular	2.4	22	10	36	< 0.2	0.25
	09/30/98	Regular	1.1	5.5	21	59	0.27	0.27
	12/10/98	Regular	< 1.0	1.9	17	79	5.1	0.25
MW-10								
	8/19/93	Regular	190	460	< 200	240	NA	NA
	1/27/94	Regular	13.4	4	5.5	33.6	NA	NA
	5/4/95	Regular	980	15	11	84	NA	NA
	8/1/95	Regular	1300	32	32	100	NA	3.6
	11/15/95	Regular	1000	24	15	36	NA	1.7
	2/23/96	Regular	810	23	27	44	NA	2.4
	5/31/96	Regular	700	24	34	28	NA	2
	8/23/96	Regular	290	3.4	6.4	13	NA	1.4
	12/2/96	Regular	280	1.3	17	8	0.94	0.97

Table 4

Cummulative Analytical Results for Groundwater Samples

Hobbs, New Mexico Facility

BJ Services Company, U.S.A.

Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
	3/12/97	Regular	110	< 5	17	< 5	0.61	0.57
	6/12/97	Regular	150	12	30	< 5	0.68	< 0.5
	9/12/97	Regular	87	2.3	26	2.7	0.76	0.33
	9/12/97	Duplicate	87	2.4	26	2.8	0.79	0.33
	12/10/97	Regular	41	9.8	12	7.7	1.1	0.28
	12/10/97	Duplicate	36	8.5	10	6.7	1.2	0.24
	3/23/98	Regular	36	< 5	5.9	< 5	1.6	< 0.5
	3/23/98	Duplicate	36	< 1	5.3	1.3	1.7	0.18
	6/23/98	Regular	37	< 5	< 5	< 5	2.1	< 0.5
	09/30/98	Regular	84	3.2	30	2.2	1.4	0.36
	12/10/98	Regular	29	1.0	7.0	1.0	0.86	0.18
MW-11								
	8/19/93	Regular	< 2	< 2	< 2	< 2	NA	NA
	1/27/94	Regular	< 1	< 1	< 1	< 1	NA	NA
	5/4/95	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	NA
	8/1/95	Regular	44	29	5.5	13	NA	0.2
	11/15/95	Regular	190	2.8	6.2	11	NA	0.4
	2/23/96	Regular	49	1.2	0.51	4	NA	0.25
	5/31/96	Regular	300	83	12	28	NA	0.8
	8/23/96	Regular	100	1.2	0.3	4.7	NA	0.26
	12/2/96	Regular	970	< 5	6	8.1	2	1.3
	3/12/97	Regular	130	< 5	13	5.8	0.42	< 0.5
	3/12/97	Duplicate	100	< 5	10	5.1	0.43	< 0.5
	6/12/97	Regular	150	23	19	< 5	1.1	0.55
	9/12/97	Regular	220	15	27	13	1	0.46
MW-11A								
	3/24/98	Regular	24	5	< 5	< 5	0.28	0.14
	6/23/98	Regular	9.9	< 5	< 5	< 5	< 0.2	< 0.5
	09/30/98	Regular	9.3	3.7	2.2	7.0	<0.20	0.1
	12/10/98	Regular	1.7	<1.0	<1.0	<1.0	<0.20	<0.1
MW-12								
	3/24/98	Regular	100	11	6	8	0.29	0.41
	6/23/98	Regular	88	< 5	< 5	< 5	< 0.2	< 0.5
	6/23/98	Duplicate	89	< 5	< 5	< 5	0.31	< 0.5
	09/30/98	Regular	260	3.0	1.2	7.9	<0.20	0.62
	12/10/98	Regular	160	<1.0	<1.0	1.2	0.21	0.36

MW-2 destroyed after January, 1994 MW-11 destroyed after September, 1997

NA=Not Analyzed NS=Not Sampled

NSP=Not Sampled due to Phase Separated Hydrocarbons

Table 5
Laboratory Analytical Results for Natural Attenuation Evaluation Parameters
BJ Services Company, U.S.A.
Hobbs, New Mexico

	Date	Nitrate (mg/L)	Sulfate (mg/L)	Dissolved Methane (ppm)
MW-10	6/23/98	<0.1	325	0.55
	9/30/98	<0.1	204	0.81
	12/10/98	<0.1	180	0.091
MW-11A	6/23/98	<0.1	225	0.11
	9/30/98	0.4	196	0.043
	12/10/98	0.7	188	0.033
MW-12	6/23/98	<0.1	240	<0.0012
	9/30/98	<0.1	168	<0.0012
	12/10/98	<0.1	202	<0.0012

Table 6
Summary of Analytical Results for Air Emissions
Hobbs, New Mexico Facilty
BJ Services Company, U.S.A.

Sample Number	Sample Date	Benzene	Toluene	Ethylbenzene	Xylenes	TPH	Discharge Rate, scfm	Benzene Emission Rate, lb/hr	Total BTEX Emission Rate, lb/hr	TPH Emission Rate, lb/hr
		parts per million by volume, ppmv								
Extraction-1	9/19/95	790	1100	340	920	9700	132.47	1.235	5.943	16.31
Effluent-1	9/20/95	990	2500	560	1600	16000	135.76	1.575	10.939	27.37
Effluent-2	9/28/95	13	28	6	18	2533	123.56	0.019	0.112	3.89
Effluent-4	11/7/95	15	58	12	36	1500	131.10	0.024	0.239	2.59
Effluent 111595-01	11/15/95	39	180	42	130	1870	133.33	0.062	0.773	3.21
Effluent 121995-01	12/19/95	10	45	11	33	530	129.64	0.016	0.191	0.89
Effluent 12996-01	1/29/96	12	61	17	53	1200	128.45	0.018	0.271	1.95
Effluent 032296-01	3/22/96	6	44	12	40	990	124.68	0.009	0.189	1.56
Effluent 042496-01	4/25/96	4	37	10	36	900	118.34	0.005	0.147	1.29
Effluent 053196-01	5/31/96	3.7	40	10	33	670	124.11	0.005	0.158	1.04
Effluent 082396-01	8/23/96	<5	12	<5	<5	200	126.18	0.007	0.047	0.31
Effluent 120296-01	12/2/96	<1	<1	<1	<1	<5	129.04	0.002	0.008	0.01
Eff-31297-1	3/12/97	2.1	15	4.6	15	250	110.56	0.003	0.057	0.33
Effluent 070297-01	7/2/97	<1	6.3	2.4	8.6	65	109.90	0.001	0.028	0.08
Monitor 970912 (1)	9/12/97	NA	NA	NA	NA	340	105.40	NA	NA	0.39
Eff-1-2832	12/10/97	<0.001	0.013	0.009	0.031	210	106.27	0.000	0.000	0.28
Monitor 980324 (1)	3/24/98	NA	NA	NA	NA	1500	108.97	NA	NA	1.91
Monitor 980622 (1)	6/22/98	NA	NA	NA	NA	190	108.16	NA	NA	0.24
Monitor 980930 (1)	9/30/98	NA	NA	NA	NA	200	150.00	NA	NA	0.26
Monitor 981210 (1)	12/10/98	NA	NA	NA	NA	180	160	NA	NA	0.30

Emmission rates reported for 12/02/96 sampling event were calculated using the detection limits. The actual emissions were Benzene <0.001 lb/hr, BTEX, <0.01 lb/hr and TPH <0.01 lb/hr.

NA = Not Analyzed

(1) All analysis based on field FID readings

Appendices

APPENDICES

A

APPENDIX A

Groundwater Sampling Forms

BROWN AND CALDWELL

WELL ID: MW-1

Groundwater Sampling Field Data Sheet

Project Number: 12-527- Task Number: 001 Date: 12-10-98

Casing Diameter: 2" inches	Purge Equipment: ~~Submersible pump~~ Disp Bailer	Equipment Calibration - Time
Total Depth of Well from TOC: 64.45 feet		pH = at °C
Static Water from TOC: 57.05 feet	Sample Equipment: Disp. Bailer	pH = at °C
Product Level from TOC: — feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 7.40 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	Measured Value: µmhos/cm at 25° C
Well Volume: 1.2 gal		*Dissolved Oxygen* DO Meter Calibrated to: mg/L
Screened Interval (from GS): 44.75 - 59.75 feet		

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
11:45	0	—	7.21	15.24	1784.0	-87.1	1.42	clear
11:50	1	1.2	7.15	18.60	1760.0	-81.4	1.13	cloudy
11:55	2	2.4	7.11	19.11	1543.0	-75.5	0.87	cloudy
12:00	3	3.5	7.07	20.05	1275.0	-49.5	0.61	cloudy

Geochemical Parameters		*Comments:*
Ferrous Iron:	4 mg/L	Sampled @ 12:00
Dissolved Oxygen:	0 mg/L	
Nitrate:	— mg/L	* See attached calibration sheet
Alkalinity	740 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: drummed on site	

BROWN AND CALDWELL

WELL ID: MW-5

Groundwater Sampling Field Data Sheet

Project Number: 12-592 Task Number: .01 Date: 12-10-15

Casing Diameter: 2" inches	Purge Equipment: ~~Submersible pump~~ Disp. Bailer	Equipment Calibration - Time
Total Depth of Well from TOC: 62.00 feet		pH = at °C
Static Water from TOC: 54.36 feet	Sample Equipment: Disposable Bailer	* pH = at °C
Product Level from TOC: — feet		Conductivity: Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 7.64 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	* Measured Value: µmhos/cm at 25° C
Well Volume: 1.2 gal		Dissolved Oxygen: DO Meter Calibrated to: mg/L
Screened Interval (from GS): 44.75-59.75 feet		*

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
10:15	0	—	7.51	15.91	1285.0	-112.0	7.1	clear
10:20	1	1.2	7.46	15.32	1274.0	-91.7	6.92	cloudy
10:25	2	2.5	7.32	15.91	1211.0	-59.1	6.40	cloudy
10:30	3	4.0	7.30	20.17	1155.0	-57.3	5.75	cloudy

Geochemical Parameters		Comments:
Ferrous Iron:	0 mg/L	Sampled @ 10:30
Dissolved Oxygen:	0 mg/L	
Nitrate:	— mg/L	* see attached calibration sheet
Alkalinity	~220 mg/L	

PPE Worn: Nitrile Gloves	Sampler's Signature:
Disposition of Purge Water: Drummed on SITE	

BROWN AND CALDWELL

WELL ID: MW-4

Groundwater Sampling Field Data Sheet

Project Number: [illegible] Task Number: 001 Date: 12-10-09

Casing Diameter: 2 inches	Purge Equipment: ~~Submersible pump~~ Disp. Bailer	Equipment Calibration - Time
Total Depth of Well from TOC: 61.5 feet		pH = at °C
Static Water from TOC: 54.73 feet	Sample Equipment: Disposable Bailer	* pH = at °C
Product Level from TOC: — feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 7.23 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	* Measured Value: µmhos/cm at 25° C
Well Volume: 1.2 gal		*Dissolved Oxygen*
Screened Interval (from GS): 44.75-59.75 feet		* DO Meter Calibrated to: mg/L

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
10:53	0	—	6.88	18.75	1174.0	-71.0	1.14	clear
10:55	1	1.2	6.91	19.11	1252.0	-65.5	0.98	cloudy
10:57	2	2.4	6.99	19.19	1311.0	-63.1	0.61	cloudy
11:00	3	3.6	6.91	20.11	1340.0	-61.5	0.45	cloudy

Geochemical Parameters		*Comments:*
Ferrous Iron:	0 mg/L	sampled @ 11:00
Dissolved Oxygen:	0 mg/L	Collected duplicate sample for MW-4
Nitrate:	— mg/L	*see attached calibration sheet
Alkalinity	350 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Drummed on site	

BROWN AND CALDWELL

WELL ID: MW-5

Groundwater Sampling Field Data Sheet

Project Number: 12832 Task Number: 001 Date: 12-9-98

Casing Diameter: 2 inches	Purge Equipment: ~~Submersible pump~~ Disp. Bailer	Equipment Calibration - Time
Total Depth of Well from TOC: 64.60 feet		pH = at °C
Static Water from TOC: 56.00 feet	Sample Equipment: Disposable Bailer	* pH = at °C
Product Level from TOC: — feet		Conductivity
Length of Water Column: 8.6 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	Conductance Standard: µmhos/cm at 25° C
Well Volume: 1.4 gal		* Measured Value: µmhos/cm at 25° C
Screened Interval (from GS): 44.75-59.75 feet		Dissolved Oxygen
		* DO Meter Calibrated to: mg/L

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
15:52	0	—	7.78	16.75	1045	194.1	11.89	clear
15:55	1	1.4	7.45	17.56	1091	181.8	8.03	clear
15:57	2	2.8	7.40	17.81	1059	175.0	7.95	clear
16:00	3	4.2	7.36	17.96	1059	169.9	7.84	clear

Geochemical Parameters		Comments:
Ferrous Iron:	2 mg/L	Sampled @ 16:00
Dissolved Oxygen:	0 mg/L	
Nitrate:	— mg/L	* see attached calibration sheet
Alkalinity	>400 mg/L	

PPE Worn: *Nitrile Gloves*	Sampler's Signature:
Disposition of Purge Water: Drummed	

BROWN AND CALDWELL

WELL ID: MW-6

Groundwater Sampling Field Data Sheet

Project Number: 12542 Task Number: 001 Date: 12/10/98

Casing Diameter: 2 inches	Purge Equipment: ~~Submersible pump~~ Disp. Bailer	Equipment Calibration - Time
Total Depth of Well from TOC: 59.70 feet		pH = at °C
Static Water from TOC: 54.57 feet	Sample Equipment: Disposable bailer	* pH = at °C
Product Level from TOC: — feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 5.13 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	* Measured Value: µmhos/cm at 25° C
Well Volume: 1 gal		*Dissolved Oxygen*
Screened Interval (from GS): feet		* DO Meter Calibrated to: mg/L

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
12:45	0	—	7.61	18.22	1783.0	-31.7	27.72	clear
12:50	1	1	7.69	19.57	1675.0	-38.8	26.81	muddy
12:55	2	2	7.72	20.09	1611.0	-47.3	25.35	muddy
13:00	3	3	7.81	20.11	1597.0	-59.5	31.40	muddy

Geochemical Parameters		*Comments:*
Ferrous Iron:	2 mg/L	13:00
Dissolved Oxygen:	1 mg/L	
Nitrate:	— mg/L	* see attached calibration sheet
Alkalinity	>400 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Remained on site	

BROWN AND CALDWELL

WELL ID: MW-7

Groundwater Sampling Field Data Sheet

Project Number: 12-832 Task Number: _____ Date: 12-9-98

Casing Diameter: 2 inches	Purge Equipment: ~~Submersible pump~~ Disp. Bailer	Equipment Calibration - Time
Total Depth of Well from TOC: 61.45 feet		pH = at °C
Static Water from TOC: 54.74 feet	Sample Equipment: Disposable Bailer	* pH = at °C
Product Level from TOC: — feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 6.71 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	* Measured Value: µmhos/cm at 25° C
Well Volume: 1 gal		*Dissolved Oxygen*
Screened Interval (from GS): feet		* DO Meter Calibrated to: mg/L

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
14:52	0	—	7.58	12.59	2.0	71.9	9.60	clear
14:52	1	1	7.58	18.14	1187	79.0	8.87	clear
14:57	2	2	7.35	17.65	1308	82.0	7.53	clear
15:06	3	3	7.38	18.61	1271	82.5	7.28	clear

Geochemical Parameters		*Comments:*
Ferrous Iron:	0 mg/L	Sampled @ 15:30
Dissolved Oxygen:	0 mg/L	
Nitrate:	— mg/L	* see attached calibration sheet
Alkalinity	>400 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Drummed	

BROWN AND CALDWELL

WELL ID: MW-38

Groundwater Sampling Field Data Sheet

Project Number: 12-832 Task Number: 001 Date: 12-9-98

Casing Diameter 2 inches	**Purge Equipment** ~~Submersible pump~~ Disp. Bailer	**Equipment Calibration - Time** pH = at °C * pH = at °C
Total Depth of Well from TOC 62.25 feet		
Static Water from TOC 54.60 feet	**Sample Equipment** Disposable Bailer	*Conductivity* Conductance Standard: µmhos/cm at 25° C
Product Level from TOC — feet		* Measured Value: µmhos/cm at 25° C
Length of Water Column 7.65 feet	**Analytical Equipment (pH, DO, Redox, filtration, etc.)** YSI 600, Hach Kits for DO, Ferrous	*Dissolved Oxygen* DO Meter Calibrated to: mg/L
Well Volume 1.2 gal		* Measured Value: mg/L
Screened Interval (from GS) feet		

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
15:15	0	—	7.62	17.37	1410	118.5	5.51	clear
15:20	1	1.2	7.24	17.87	1456	113.4	5.65	clear
15:25	2	2.5	7.19	17.76	1462	110.1	4.68	clear
15:30	3	4.0	7.17	17.92	1472	109.3	5.52	clear

Geochemical Parameters		*Comments:*
Ferrous Iron:	0 mg/L	Sampled @ 15:30
Dissolved Oxygen:	3 mg/L	
Nitrate:	— mg/L	* See attached calibration sheet
Alkalinity	>400 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Drummed	

BROWN AND CALDWELL

WELL ID: MW-3

Groundwater Sampling Field Data Sheet

Project Number: 12-872 Task Number: 001 Date: 12-9-98

Casing Diameter: 2 inches	Purge Equipment: ~~Submersible pump~~ Disp. Bailer	Equipment Calibration - Time
Total Depth of Well from TOC: 66.5 feet		pH = at °C
Static Water from TOC: 53.68 feet	Sample Equipment:	* pH = at °C
Product Level from TOC: -- feet	Disposable Bailer	*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 12.82 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	* Measured Value: µmhos/cm at 25° C
Well Volume: 2 gal		*Dissolved Oxygen*
Screened Interval (from GS): feet		* DO Meter Calibrated to: mg/L

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
16:15	0	—	7.51	16.1	1411.0	91.1	7.21	clear
16:20	1	2	7.40	16.4	1389.1	93.1	6.50	cloudy
16:25	2	4	7.32	17.2	1374.0	83.4	6.11	cloudy
16:30	3	6	7.27	17.30	1352.0	79.5	5.72	cloudy

Geochemical Parameters		Comments:
Ferrous Iron:	2 mg/L	sample taken @ 16:30
Dissolved Oxygen:	0 mg/L	
Nitrate:	— mg/L	* see attached calibration sheet
Alkalinity	240 mg/L	

PPE Worn: *Nitrile Gloves*	Sampler's Signature:
Disposition of Purge Water: Drummed	

BROWN AND CALDWELL

WELL ID: MW-10

Groundwater Sampling Field Data Sheet

Project Number: 12562 Task Number: 001 Date: 12-10-98

Casing Diameter: 2 inches	Purge Equipment: ~~Submersible pump~~ Disp Bailer	Equipment Calibration - Time
Total Depth of Well from TOC: 62.75 feet		pH = at °C
Static Water from TOC: 55.80 feet	Sample Equipment: Disposable Bailer	* pH = at °C
Product Level from TOC: — feet		Conductivity: Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 6.95 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	* Measured Value: µmhos/cm at 25° C
Well Volume: 1 gal		Dissolved Oxygen: DO Meter Calibrated to: mg/L
Screened Interval (from GS): 46-61.5 feet		*

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
8:25	0	+-	7.57	15.82	2364	-76.8	7.96	cloudy
8:26	1	1	7.32	17.58	2452	-62.2	5.21	cloudy
8:28	2	2	7.33	17.70	2457	-74.3	5.61	cloudy
8:30	3	3	7.37	17.73	2466	-56.7	5.53	cl...

Geochemical Parameters		*Comments:*
Ferrous Iron:	5.0 mg/L	Sampled @ 8:30
Dissolved Oxygen:	1.0 mg/L	
Nitrate:	— mg/L	* see attached calibration sheet
Alkalinity	>400 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: DI Manhole	

BROWN AND CALDWELL

WELL ID: MW-11A

Groundwater Sampling Field Data Sheet

Project Number: 12832 Task Number: 201 Date: 12-10-98

Casing Diameter: 2 inches	Purge Equipment: ~~Submersible pump~~ Disp Bailer	Equipment Calibration - Time
Total Depth of Well from TOC: 63.42 feet		pH = at °C
Static Water from TOC: 56.13 feet	Sample Equipment: Disposable Bailer	* pH = at °C
Product Level from TOC: — feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 7.29 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	* Measured Value: µmhos/cm at 25° C
Well Volume: 1.18 gal		*Dissolved Oxygen*
Screened Interval (from GS): 50-65 feet		* DO Meter Calibrated to: mg/L

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
7:56	0	—	7.51	14.72	2070	427	26.4	clear
7:57	1	1	7.52	17.0	2220	-9.7	9.38	muddy
7:58	2	2	7.15	17.6	2358	-55.7	5.79	muddy
8:00	3	3	7.08	17.78	2368	-50.4	9.51	muddy

Geochemical Parameters		*Comments:*
Ferrous Iron:	0 mg/L	Sampled @ 8:00
Dissolved Oxygen:	0 mg/L	
Nitrate:	— mg/L	* see attached calibration sheet
Alkalinity	340 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Drummed	

BROWN AND CALDWELL

WELL ID: MW-#12

Groundwater Sampling Field Data Sheet

Project Number: 12892 Task Number: 001 Date: 12-10-98

Casing Diameter: 2 inches	Purge Equipment: ~~Submersible pump~~ Disp Bailer	Equipment Calibration - Time
Total Depth of Well from TOC: 67.90 feet		pH = at °C *
Static Water from TOC: 56.17 feet	Sample Equipment: Disposable Bailer	pH = at °C
Product Level from TOC: — feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C *
Length of Water Column: 7.73 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	Measured Value: µmhos/cm at 25° C
Well Volume: 1.2 gal		*Dissolved Oxygen* DO Meter Calibrated to: mg/L *
Screened Interval (from GS): 50-65 feet		

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
9:45	0	—	8.46	15.98	1483	-129.0	12.0	Clear
9:50	1	1.2	8.21	17.71	1470	-111.0	11.4	Cloudy
9:55	2	2.4	7.95	15.40	1443	-98.1	9.1	Cloudy
10:00	3	4.0	7.60	15.11	1391	-75.3	8.7	Cloudy

Geochemical Parameters		*Comments:*
Ferrous Iron:	1 mg/L	Sampled @ 10:00
Dissolved Oxygen:	0 mg/L	
Nitrate:	— mg/L	* see attached calibration sheet
Alkalinity	740 mg/L	

PPE Worn: Nitrile Gloves	Sampler's Signature: [signature]
Disposition of Purge Water: Drummed	

Milco Safety Rental Inc.

Equipment Report Card

for

YSI Model 600XL S/N 632

This equipment has been inspected prior to its shipment and the following items and general, observable condition have been described.

Please review this instrument upon its arrival to confirm the contents of this report. Should you recognize a deviation, please call 800-775-1738 to report your findings.

All items on this report will be reviewd upon the unit's return to MSR, Inc. Any damage, lost items or unreasonable and unusual maintenance required to restore the unit to its reported condition will require additional charges to the customer.

1. 610 D Console	x
2. Sonde	x
3. Sonde Moisture Container	x
4. Charger for 610 D	x
5. Connector cable 10 ft	x
6. Adapter–Console to Sonde Cable	x
7. Adapter–Console to Computer	
8. Computer Interconnect cable	
9. Blank Plug	
10. Zorbell Solution	
11. pH Buffer...4.0pH ...7.0pH ...10.0pH	
12. Conductivity Standards ____ uS/cm	
13. Manual(s)	xx
14. Flow Thru Sampler	x
15. Auto Charger	x
16.	

General Description: Unit Calibrated: 12/3/98

1. pH Buffers: 4.01, 7.01, 10.01
2. Conductivity Standard: 1,413uS
3. ORP: Zorbel Solution: 231 @ 25C
4. DO Calibrated in air @ 760mm Hg

Inspector tb Date 12/3/98

To: Bob Dear

B

APPENDIX B

Laboratory Analytical Report for Groundwater Samples

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

December 29, 1998

Mr. Rick Rexroad
BROWN AND CALDWELL
1415 Louisiana
Houston, TX 77002

The following report contains analytical results for the sample(s) received at Southern Petroleum Laboratories (SPL) on December 11, 1998. The sample(s) was assigned to Certificate of Analysis No.(s) 9812573 and analyzed for all parameters as listed on the chain of custody.

Any data flags or quality control exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s).

If you have any questions or comments pertaining to this data report, please do not hesitate to contact me. Please reference the above Certificate of Analysis No. during any inquiries.

Again, SPL is pleased to be of service to you. We anticipate working with you in fulfilling all your current and future analytical needs.

Southern Petroleum Laboratories

Sonia West

for Bernadette A. Fini
Senior Project Manager

LABORATORIES

Southern Petroleum Laboratories, Inc.

Certificate of Analysis Number: 98-12-573

Approved for Release by:

Dona West
for Bernadette A. Fini, Senior Project Manager

12-30-98
Date

Greg Grandits
Laboratory Director

Cynthia Schreiner
Quality Assurance Officer

The results relate only to the samples tested.
Results reported on a Wet Weight Basis unless otherwise noted.

8880 INTERCHANGE DR.
HOUSTON, TX 77054
(713) 660-0901

500 AMBASSADOR CAFFERY PKWY.
SCOTT, LA 70583-6544
(318) 237-4SPL

459 HUGHES DRIVE
TRAVERSE CITY, MI 49686
(616) 947-5777

1511 E. ORANGETHORPE AVE.
FULLERTON, CA 92631
(714) 447-6868

LABORATORIES

Certificate of Analysis No. H9-9812573-01

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-7

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/09/98 15:00:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	ND	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	87		
1,4-Difluorobenzene	100		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 12/20/98			
BENZENE	ND	1.0 P	ug/L
TOLUENE	ND	1.0 P	ug/L
ETHYLBENZENE	ND	1.0 P	ug/L
TOTAL XYLENE	ND	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	ND		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	103		
4-Bromofluorobenzene	100		
Method 8021B ***			
Analyzed by: CJ			
Date: 12/20/98			
Total Petroleum Hydrocarbons-Diesel	ND	0.20 P	mg/L
Surrogate	**% Recovery**		
n-Pentacosane	154		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 12/22/98 05:55:00			

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

8880 INTERCHANGE DR.
HOUSTON, TX 77054
(713) 660-0901

500 AMBASSADOR CAFFERY PKWY.
SCOTT, LA 70583-8544
(318) 237-4SPL

459 HUGHES DRIVE
TRAVERSE CITY, MI 49686
(616) 947-5777

1511 E. ORANGETHORPE AVE.
FULLERTON, CA 92631
(714) 447-6868

LABORATORIES

Certificate of Analysis No. H9-9812573-02

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-8

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/09/98 15:30:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	ND	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	90		
1,4-Difluorobenzene	93		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 12/20/98			
BENZENE	ND	1.0 P	ug/L
TOLUENE	ND	1.0 P	ug/L
ETHYLBENZENE	ND	1.0 P	ug/L
TOTAL XYLENE	ND	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	ND		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	103		
4-Bromofluorobenzene	100		
Method 8021B ***			
Analyzed by: CJ			
Date: 12/20/98			
Total Petroleum Hydrocarbons-Diesel	ND	0.20 P	mg/L
Surrogate	**% Recovery**		
n-Pentacosane	132		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 12/22/98 06:40:00			

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

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LABORATORIES

Certificate of Analysis No. H9-9812573-03

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-5

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/09/98 16:00:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	ND	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	83		
1,4-Difluorobenzene	97		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 12/21/98			
BENZENE	ND	1.0 P	ug/L
TOLUENE	ND	1.0 P	ug/L
ETHYLBENZENE	ND	1.0 P	ug/L
TOTAL XYLENE	ND	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	ND		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	103		
4-Bromofluorobenzene	100		
Method 8021B ***			
Analyzed by: CJ			
Date: 12/21/98			
Total Petroleum Hydrocarbons-Diesel	ND	0.20 P	mg/L
Surrogate	**% Recovery**		
n-Pentacosane	110		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 12/22/98 08:53:00			

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

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(714) 447-6868

SPL LABORATORIES

Certificate of Analysis No. H9-9812573-04

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-9

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/09/98 16:30:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	0.25	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	93		
1,4-Difluorobenzene	97		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 12/22/98			
BENZENE	ND	1.0 P	ug/L
TOLUENE	1.9	1.0 P	ug/L
ETHYLBENZENE	17	1.0 P	ug/L
TOTAL XYLENE	79	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	97.9		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	103		
4-Bromofluorobenzene	107		
Method 8021B ***			
Analyzed by: CJ			
Date: 12/21/98			
Total Petroleum Hydrocarbons-Diesel	5.1	0.20 P	mg/L
Surrogate	**% Recovery**		
n-Pentacosane	72		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 12/22/98 09:38:00			

(P) - Practical Quantitation Limit ND - Not detected.

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that resemble a diesel pattern.(C10-C24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

LABORATORIES

Certificate of Analysis No. H9-9812573-05

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-11A

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/10/98 08:00:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	ND	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	83		
1,4-Difluorobenzene	93		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 12/22/98			
BENZENE	1.7	1.0 P	ug/L
TOLUENE	ND	1.0 P	ug/L
ETHYLBENZENE	ND	1.0 P	ug/L
TOTAL XYLENE	ND	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	1.7		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	103		
4-Bromofluorobenzene	100		
Method 8021B ***			
Analyzed by: CJ			
Date: 12/21/98			
Total Petroleum Hydrocarbons-Diesel	ND	0.20 P	mg/L
Surrogate	**% Recovery**		
n-Pentacosane	78		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 12/22/98 10:22:00			

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

8880 INTERCHANGE DR.
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TRAVERSE CITY, MI 49686
(616) 947-5777

1511 E. ORANGETHORPE AVE.
FULLERTON, CA 92631
(714) 447-6868

LABORATORIES

Certificate of Analysis No. H9-9812573-05

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-11A

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/10/98 08:00:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Methane	0.033	0.0012 P	mg/L
Ethylene	ND	0.0032 P	mg/L
Ethane	ND	0.0025 P	mg/L
RSKSOP-147			
Analyzed by: JDR			
Date: 12/16/98 04:00:00			
Nitrate (as NO3)	0.7	0.1	mg/L NO3
Method 300.0 *			
Analyzed by: PT			
Date: 12/12/98 09:00:00			
Sulfate	188	2	mg/L
Method 300.0 *			
Analyzed by: PT			
Date: 12/15/98 09:00:00			

(P) - Practical Quantitation Limit ND - Not detected.

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

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LABORATORIES

Certificate of Analysis No. H9-9812573-06

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-10

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/10/98 08:30:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	0.18	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	93		
1,4-Difluorobenzene	113		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 12/22/98			
BENZENE	29	1.0 P	ug/L
TOLUENE	1.0	1.0 P	ug/L
ETHYLBENZENE	7.0	1.0 P	ug/L
TOTAL XYLENE	1.0	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	38		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	113		
4-Bromofluorobenzene	103		
Method 8021B ***			
Analyzed by: CJ			
Date: 12/21/98			
Total Petroleum Hydrocarbons-Diesel	0.86	0.20 P	mg/L
Surrogate	**% Recovery**		
n-Pentacosane	84		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 12/24/98 02:52:00			

(P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that do not resemble a diesel pattern.(C10-C24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

SPL LABORATORIES

Certificate of Analysis No. H9-9812573-06

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-10

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/10/98 08:30:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Methane	0.091	0.0012 P	mg/L
Ethylene	ND	0.0032 P	mg/L
Ethane	ND	0.0025 P	mg/L
RSKSOP-147			
Analyzed by: JDR			
Date: 12/16/98 04:10:00			
Nitrate (as NO3)	ND	0.1	mg/L NO3
Method 300.0 *			
Analyzed by: PT			
Date: 12/12/98 09:00:00			
Sulfate	180	2	mg/L
Method 300.0 *			
Analyzed by: PT			
Date: 12/15/98 09:00:00			

(P) - Practical Quantitation Limit ND - Not detected.

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that do not resemble a diesel pattern.(C10-C24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

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LABORATORIES

Certificate of Analysis No. H9-9812573-07

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-12

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/10/98 10:00:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	0.36	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	103		
1,4-Difluorobenzene	107		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 12/22/98			
BENZENE	160	1.0 P	ug/L
TOLUENE	ND	1.0 P	ug/L
ETHYLBENZENE	ND	1.0 P	ug/L
TOTAL XYLENE	1.2	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	161.2		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	120		
4-Bromofluorobenzene	113		
Method 8021B ***			
Analyzed by: CJ			
Date: 12/21/98			
Total Petroleum Hydrocarbons-Diesel	0.21	0.20 P	mg/L
Surrogate	**% Recovery**		
n-Pentacosane	120		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 12/22/98 11:52:00			

(P) - Practical Quantitation Limit ND - Not detected.

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that do not resemble a diesel pattern.(C10-C24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

LABORATORIES

Certificate of Analysis No. H9-9812573-07

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-12

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/10/98 10:00:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Methane	ND	0.0012 P	mg/L
Ethylene	ND	0.0032 P	mg/L
Ethane	ND	0.0025 P	mg/L
RSKSOP-147			
Analyzed by: JDR			
Date: 12/16/98 04:27:00			
Nitrate (as NO3)	ND	0.1	mg/L NO3
Method 300.0 *			
Analyzed by: PT			
Date: 12/12/98 09:00:00			
Sulfate	202	2	mg/L
Method 300.0 *			
Analyzed by: PT			
Date: 12/15/98 09:00:00			

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that do not resemble a diesel pattern.(C10-C24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

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LABORATORIES

Certificate of Analysis No. H9-9812573-08

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-3

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/10/98 10:30:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	0.43	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	90		
1,4-Difluorobenzene	110		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 12/22/98			
BENZENE	13	1.0 P	ug/L
TOLUENE	220	1.0 P	ug/L
ETHYLBENZENE	160	1.0 P	ug/L
TOTAL XYLENE	290	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	683		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	127		
4-Bromofluorobenzene	113		
Method 8021B ***			
Analyzed by: CJ			
Date: 12/21/98			
Total Petroleum Hydrocarbons-Diesel	1.3	1.00 P	mg/L
Surrogate	**% Recovery**		
n-Pentacosane	138		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 12/23/98 12:37:00			

(P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C18 that do not resemble a diesel pattern.(C10-C24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

LABORATORIES

Certificate of Analysis No. H9-9812573-09

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-4

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/10/98 11:00:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	4.3	1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	100		
1,4-Difluorobenzene	97		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 12/22/98			
BENZENE	28	25 P	ug/L
TOLUENE	70	25 P	ug/L
ETHYLBENZENE	210	25 P	ug/L
TOTAL XYLENE	960	25 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	1268		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	104		
4-Bromofluorobenzene	104		
Method 8021B ***			
Analyzed by: CJ			
Date: 12/21/98			
Total Petroleum Hydrocarbons-Diesel	9.3	1.00 P	mg/L
Surrogate	**% Recovery**		
n-Pentacosane	138		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 12/23/98 01:22:00			

(P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that resemble a diesel pattern.(C10-C24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

LABORATORIES

Certificate of Analysis No. H9-9812573-10

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-1

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/10/98 12:00:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	0.31	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	97		
1,4-Difluorobenzene	90		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 12/22/98			
BENZENE	ND	1.0 P	ug/L
TOLUENE	1.5	1.0 P	ug/L
ETHYLBENZENE	17	1.0 P	ug/L
TOTAL XYLENE	110	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	128.5		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	103		
4-Bromofluorobenzene	113		
Method 8021B ***			
Analyzed by: CJ			
Date: 12/21/98			
Total Petroleum Hydrocarbons-Diesel	1.4	0.20 P	mg/L
Surrogate	**% Recovery**		
n-Pentacosane	52		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 12/23/98 03:37:00			

(P) - Practical Quantitation Limit ND - Not detected.

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that resemble a diesel pattern.(C10-C24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

LABORATORIES

Certificate of Analysis No. H9-9812573-11

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-6

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/10/98 13:00:00
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	ND	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	87		
1,4-Difluorobenzene	93		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 12/22/98			
BENZENE	7.6	1.0 P	ug/L
TOLUENE	6.6	1.0 P	ug/L
ETHYLBENZENE	1.7	1.0 P	ug/L
TOTAL XYLENE	5.8	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	21.7		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	100		
4-Bromofluorobenzene	103		
Method 8021B ***			
Analyzed by: CJ			
Date: 12/21/98			
Total Petroleum Hydrocarbons-Diesel	2.0	0.20 P	mg/L
Surrogate	**% Recovery**		
n-Pentacosane	102		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 12/24/98 03:36:00			

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that resemble a diesel pattern.(C10-C24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

LABORATORIES

Certificate of Analysis No. H9-9812573-12

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Brown & Caldwell
SAMPLE ID: Duplicate

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/10/98
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	4.3	1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	100		
1,4-Difluorobenzene	93		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 12/22/98			
BENZENE	26	25 P	ug/L
TOLUENE	62	25 P	ug/L
ETHYLBENZENE	180	25 P	ug/L
TOTAL XYLENE	830	25 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	1098		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	104		
4-Bromofluorobenzene	105		
Method 8021B ***			
Analyzed by: CJ			
Date: 12/21/98			
Total Petroleum Hydrocarbons-Diesel	3.9	2.0 P	mg/L
Surrogate	**% Recovery**		
n-Pentacosane	128		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 12/23/98 05:07:00			

(P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that do not resemble a diesel pattern.(C10-C24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

LABORATORIES

Certificate of Analysis No. H9-9812573-13

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 12/28/98

PROJECT: BJ Services- Hobbs,TX
SITE: Hobbs,TX
SAMPLED BY: Provided by SPL
SAMPLE ID: Trip Blank

PROJECT NO: 12892
MATRIX: WATER
DATE SAMPLED: 12/10/98
DATE RECEIVED: 12/11/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	ND	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	83		
1,4-Difluorobenzene	97		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 12/20/98			
BENZENE	ND	1.0 P	ug/L
TOLUENE	ND	1.0 P	ug/L
ETHYLBENZENE	ND	1.0 P	ug/L
TOTAL XYLENE	ND	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	ND		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	103		
4-Bromofluorobenzene	100		
Method 8021B ***			
Analyzed by: CJ			
Date: 12/20/98			

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

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QUALITY CONTROL

DOCUMENTATION

SPL LABORATORIES

** SPL BATCH QUALITY CONTROL REPORT **
Method Modified 8015B*** for Gasoline

Matrix: Aqueous
Units: mg/L

Batch Id: HP_U981219224200

LABORATORY CONTROL SAMPLE

SPIKE COMPOUNDS	Method Blank Result <2>	Spike Added <3>	Blank Spike Result <1>	Blank Spike Recovery %	QC Limits(**) (Mandatory) % Recovery Range
Gasoline Range Organics	ND	1.0	0.76	76.0	64 - 131

MATRIX SPIKES

SPIKE COMPOUNDS	Sample Results <2>	Spike Added <3>	Matrix Spike Result <1>	Matrix Spike Recovery <4>	Matrix Spike Duplicate Result <1>	Matrix Spike Duplicate Recovery <5>	MS/MSD Relative % Difference	QC Limits(***) (Advisory) RPD Max.	QC Limits(***) (Advisory) Recovery Range
GASOLINE RANGE ORGANICS	ND	0.9	0.53	58.9	0.54	60.0	1.85	36	36 - 160

Analyst: CJ
Sequence Date: 12/20/98
SPL ID of sample spiked: 9812594-13B
Sample File ID: UUL2217.TX0
Method Blank File ID:
Blank Spike File ID: UUL2197.TX0
Matrix Spike File ID: UUL2201.TX0
Matrix Spike Duplicate File ID: UUL2202.TX0

* = Values outside QC Range due to Matrix Interference (except RPD)
« = Data outside Method Specification limits.
NC = Not Calculated (Sample exceeds spike by factor of 4 or more)
ND = Not Detected/Below Detection Limit
% Recovery = [(<1> - <2>) / <3>] x 100
LCS % Recovery = (<1> / <3>) x 100
Relative Percent Difference = |(<4> - <5> | / [(<4> + <5>) x 0.5] x 100
(**) = Source: SPL-Houston Historical data (1st Q '97)
(***) = Source: SPL-Houston Historical Data (1st Q '97)

SAMPLES IN BATCH(SPL ID): 9812594-13B 9812594-14B 9812938-01A 9812938-02A 9812938-03A 9812573-02A 9812573-03A 9812573-13A 9812573-01A

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LABORATORIES

** SPL BATCH QUALITY CONTROL REPORT **

Method Modified 8015B*** for Gasoline

Matrix: Aqueous

Batch Id: HP_U981222103900

Units: mg/L

L A B O R A T O R Y C O N T R O L S A M P L E

S P I K E C O M P O U N D S	Method Blank Result <2>	Spike Added <3>	Blank Spike Result <1>	Blank Spike Recovery %	QC Limits(**) (Mandatory) % Recovery Range
Gasoline Range Organics	ND	1.0	0.76	76.0	64 - 131

M A T R I X S P I K E S

S P I K E C O M P O U N D S	Sample Results <2>	Spike Added <3>	Matrix Spike Result <1>	Matrix Spike Recovery <4>	Matrix Spike Duplicate Result <1>	Matrix Spike Duplicate Recovery <5>	MS/MSD Relative % Difference	QC Limits(***) (Advisory) RPD Max.	QC Limits(***) (Advisory) Recovery Range
GASOLINE RANGE ORGANICS	ND	0.9	0.59	65.6	0.59	65.6	0	36	36 - 160

Analyst: CJ

Sequence Date: 12/22/98

SPL ID of sample spiked: 9812573-05A

Sample File ID: UUL3051.TX0

Method Blank File ID:

Blank Spike File ID: UUL3040.TX0

Matrix Spike File ID: UUL3045.TX0

Matrix Spike Duplicate File ID: UUL3046.TX0

* = Values outside QC Range due to Matrix Interference (except RPD)

« = Data outside Method Specification limits.

NC = Not Calculated (Sample exceeds spike by factor of 4 or more)

ND = Not Detected/Below Detection Limit

% Recovery = [(<1> - <2>) / <3>] x 100

LCS % Recovery = (<1> / <3>) x 100

Relative Percent Difference = |(<4> - <5> | / [(<4> + <5>) x 0.5] x 100

(**) = Source: SPL-Houston Historical data (1st Q '97)

(***) = Source: SPL-Houston Historical Data (1st Q '97)

SAMPLES IN BATCH(SPL ID): 9812573-08A 9812573-09A 9812573-10A 9812573-11A
9812573-04A 9812573-05A 9812573-06A 9812573-07A

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LABORATORIES

** SPL BATCH QUALITY CONTROL REPORT **

Method Modified 8015B*** for Gasoline

Matrix: Aqueous

Batch Id: HP_U981221100400

Units: mg/L

LABORATORY CONTROL SAMPLE

SPIKE COMPOUNDS	Method Blank Result <2>	Spike Added <3>	Blank Spike Result <1>	Blank Spike Recovery %	QC Limits(**) (Mandatory) % Recovery Range
Gasoline Range Organics	ND	1.0	0.78	78.0	64 - 131

MATRIX SPIKES

SPIKE COMPOUNDS	Sample Results <2>	Spike Added <3>	Matrix Spike Result <1>	Matrix Spike Recovery <4>	Matrix Spike Duplicate Result <1>	Matrix Spike Duplicate Recovery <5>	MS/MSD Relative % Difference	QC Limits(***) (Advisory) RPD Max.	QC Limits(***) (Advisory) Recovery Range
GASOLINE RANGE ORGANICS	0.25	0.9	0.88	70.0	0.86	67.8	3.19	36	36 - 160

Analyst: CJ

Sequence Date: 12/21/98

SPL ID of sample spiked: 9812573-04A

Sample File ID: UUL3050.TX0

Method Blank File ID:

Blank Spike File ID: UUL3018.TX0

Matrix Spike File ID: UUL3022.TX0

Matrix Spike Duplicate File ID: UUL3023.TX0

* = Values outside QC Range due to Matrix Interference (except RPD)

« = Data outside Method Specification limits.

NC = Not Calculated (Sample exceeds spike by factor of 4 or more)

ND = Not Detected/Below Detection Limit

% Recovery = [(<1> - <2>) / <3>] x 100

LCS % Recovery = (<1> / <3>) x 100

Relative Percent Difference = |(<4> - <5> | / [(<4> + <5>) x 0.5] x 100

(**) = Source: SPL-Houston Historical data (1st Q '97)

(***) = Source: SPL-Houston Historical Data (1st Q '97)

SAMPLES IN BATCH(SPL ID): 9812573-12A

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LABORATORIES

** SPL BATCH QUALITY CONTROL REPORT **
Method 8021B ***

Matrix: Aqueous
Units: ug/L

Batch Id: HP_U981220143700

L A B O R A T O R Y C O N T R O L S A M P L E

S P I K E C O M P O U N D S	Method Blank Result <2>	Spike Added <3>	Blank Spike Result <1>	Blank Spike Recovery %	QC Limits(**) (Mandatory) % Recovery Range
Benzene	ND	50	45	90.0	61 - 119
Toluene	ND	50	46	92.0	65 - 125
EthylBenzene	ND	50	46	92.0	70 - 118
O Xylene	ND	50	46	92.0	72 - 117
M & P Xylene	ND	100	88	88.0	72 - 116

M A T R I X S P I K E S

S P I K E C O M P O U N D S	Sample Results <2>	Spike Added <3>	Matrix Spike Result <1>	Matrix Spike Recovery <4>	Matrix Spike Duplicate Result <1>	Matrix Spike Duplicate Recovery <5>	MS/MSD Relative % Difference	QC Limits(***) (Advisory) RPD Max.	QC Limits(***) (Advisory) Recovery Range
BENZENE	ND	20	16	80.0	16	80.0	0	21	32 - 164
TOLUENE	ND	20	16	80.0	16	80.0	0	20	38 - 159
ETHYLBENZENE	ND	20	16	80.0	16	80.0	0	19	52 - 142
O XYLENE	ND	20	16	80.0	16	80.0	0	18	53 - 143
M & P XYLENE	ND	40	31	77.5	31	77.5	0	17	53 - 144

Analyst: CJ
Sequence Date: 12/20/98
SPL ID of sample spiked: 9812573-01A
Sample File ID: U_L2216.TX0
Method Blank File ID:
Blank Spike File ID: U_L2209.TX0
Matrix Spike File ID: U_L2211.TX0
Matrix Spike Duplicate File ID: U_L2212.TX0

* = Values outside QC Range due to Matrix Interference (except RPD)
« = Data outside Method Specification limits.
NC = Not Calculated (Sample exceeds spike by factor of 4 or more)
ND = Not Detected/Below Detection Limit
% Recovery = [(<1> - <2>) / <3>] x 100
LCS % Recovery = (<1> / <3>) x 100
Relative Percent Difference = |(<4> - <5> | / [(<4> + <5>) x 0.5] x 100
(**) = Source: SPL Historical LImits-1st Qtr.'97
(***) = Source: SPL Historical LImits-1st Qtr.'97

SAMPLES IN BATCH(SPL ID):

9812573-05A 9812573-06A 9812573-07A 9812573-08A
9812573-09A 9812573-10A 9812573-11A 9812573-12A
9812573-02A 9812573-03A 9812573-13A 9812573-01A
9812623-01A 9812573-04A

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SPL LABORATORIES

** SPL BATCH QUALITY CONTROL REPORT ** PAGE

Method Modified 8015B*** for Diesel

Matrix: Aqueous Batch Id: HP_V981223012200

Units: mg/L

B L A N K S P I K E S

S P I K E C O M P O U N D S	Sample Results <2>	Spike Added <3>	Matrix Spike Result <1>	Matrix Spike Recovery <4>	Matrix Spike Duplicate Result <1>	Matrix Spike Duplicate Recovery <5>	MS/MSD Relative % Difference	QC Limits(**) (Advisory) RPD Max.	QC Limits(**) (Advisory) Recovery Range
DIESEL	ND	5.0	6.6	132	6.1	122	7.87	39	21 - 175

Analyst: RR

Sequence Date: 12/23/98

Method Blank File ID:

Sample File ID:

Blank Spike File ID: VVL3120.TX0

Matrix Spike File ID:

Matrix Spike Duplicate File ID:

* = Values Outside QC Range. « = Data outside Method Specification limits.

NC = Not Calculated (Sample exceeds spike by factor of 4 or more)

ND = Not Detected/Below Detection Limit

% Recovery = [(<1> - <2>) / <3>] x 100

Relative Percent Difference = |(<4> - <5> | / [(<4> + <5>) x 0.5] x 100

(**) = Source: SPL-Houston Historical Data (4th Q '97)

SAMPLES IN BATCH(SPL ID):

9812573-09B 9812573-10B 9812573-11B 9812573-12B
9812614-19C 9812614-20C 9812614-15C 9812614-16C
9812573-01B 9812614-17C 9812614-21C 9812614-18C
9812573-02B 9812573-03B 9812573-04B 9812573-05B
9812573-06B 9812573-07B 9812573-08B

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** SPL QUALITY CONTROL REPORT **

Matrix: Aqueous

Reported on: 12/29/98
Analyzed on: 12/12/98
Analyst: PT

This sample was randomly selected for use in the SPL quality control program. Samples chosen are fortified with a known concentration in duplicate. The results are as follows:

Nitrate (as NO3)
Method 300.0 *

SPL Sample ID Number	Blank Value mg/L	LCS Concentration mg/L	Measured Concentration mg/L	% Recovery	QC Limits Recovery
LCS	ND	4.3	4.3	100	90 - 110

-9812770

Samples in batch:

9812562-01C 9812562-02C 9812562-03C 9812562-04C
9812562-05C 9812573-05C 9812573-06C 9812573-07C
9812620-01D

COMMENTS:

LCS= SPL ID# 94453171-19

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** SPL QUALITY CONTROL REPORT **

Matrix: Aqueous

Reported on: 12/29/98
Analyzed on: 12/12/98
Analyst: PT

This sample was randomly selected for use in the SPL quality control program. Samples chosen are fortified with a known concentration in duplicate. The results are as follows:

Nitrate (as NO3)
Method 300.0 *

SPL Sample ID Number	Method Blank mg/L	Sample Result mg/L	Spike Added mg/L	Matrix Spike Result mg/L	Matrix Spike Recovery %	Matrix Spike Duplicate Result mg/L	Matrix Spike Duplicate Recovery %	RPD (%)	QC LIMITS (Advisory) RPD Max	QC LIMITS (Advisory) % REC
9812562-01C	ND	5.2	5.0	9.9	94.0	9.9	94.0	0	5	86 -115

-9812771

Samples in batch:

9812562-01C 9812562-02C 9812562-03C 9812562-04C
9812562-05C 9812573-05C 9812573-06C 9812573-07C
9812620-01D

COMMENTS:

LCS= SPL ID# 94453171-19

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** SPL QUALITY CONTROL REPORT **

Matrix: Aqueous

Reported on: 12/29/98
Analyzed on: 12/15/98
Analyst: PT

This sample was randomly selected for use in the SPL quality control program. Samples chosen are fortified with a known concentration in duplicate. The results are as follows:

Sulfate
Method 300.0 *

SPL Sample ID Number	Blank Value mg/L	LCS Concentration mg/L	Measured Concentration mg/L	% Recovery	QC Limits Recovery
LCS	ND	5.0	.5.2	10.4	90 - 110

-9812776

Samples in batch:

9812562-01D 9812562-02D 9812562-03D 9812562-04D
9812562-05D 9812573-05C 9812573-06C 9812573-07C
9812620-01D

COMMENTS:

LCS= SPL ID# 94453171-04

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** SPL QUALITY CONTROL REPORT **

Matrix: Aqueous

Reported on: 12/29/98
Analyzed on: 12/15/98
Analyst: PT

This sample was randomly selected for use in the SPL quality control program. Samples chosen are fortified with a known concentration in duplicate. The results are as follows:

Sulfate
Method 300.0 *

SPL Sample ID Number	Method Blank mg/L	Sample Result mg/L	Spike Added mg/L	Matrix Spike Result mg/L	Matrix Spike Recovery %	Matrix Spike Duplicate Result mg/L	Matrix Spike Duplicate Recovery %	RPD (%)	QC LIMITS (Advisory) RPD Max	QC LIMITS (Advisory) % REC
9812562-02D	ND	20.0	5.0	25.3	106	25.3	106	0	7.0	88 -112

-9812777

Samples in batch:

9812562-01D 9812562-02D 9812562-03D 9812562-04D
9812562-05D 9812573-05C 9812573-06C 9812573-07C
9812620-01D

COMMENTS:

LCS= SPL ID# 94453171-04

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** SPL QUALITY CONTROL REPORT **

Matrix: Aqueous

Reported on: 12/29/98
Analyzed on: 12/15/98
Analyst: PT

This sample was randomly selected for use in the SPL quality control program. Samples chosen are fortified with a known concentration in duplicate. The results are as follows:

Sulfate
Method 300.0 *

SPL Sample ID Number	Method Blank mg/L	Sample Result mg/L	Spike Added mg/L	Matrix Spike Result mg/L	Matrix Spike Recovery %	Matrix Spike Duplicate Result mg/L	Matrix Spike Duplicate Recovery %	RPD (%)	QC LIMITS (Advisory) RPD Max	QC LIMITS (Advisory) % REC
9812562-02D	ND	20.0	5.0	25.3	106	25.3	106	0	7.0	88 -112

-9812777

Samples in batch:

9812562-01D 9812562-02D 9812562-03D 9812562-04D
9812562-05D 9812573-05C 9812573-06C 9812573-07C
9812620-01D

COMMENTS:

LCS= SPL ID# 94453171-04

CHAIN OF CUSTODY

AND

SAMPLE RECEIPT CHECKLIST

SPL Houston Environmental Laboratory

Sample Login Checklist

Date: 12/11/98	Time: 1000

SPL Sample ID: 9812573

			Yes	No
1	Chain-of-Custody (COC) form is present.		✓	
2	COC is properly completed.		✓	
3	If no, Non-Conformance Worksheet has been completed.			
4	Custody seals are present on the shipping container.		✓	
5	If yes, custody seals are intact.		✓	
6	All samples are tagged or labeled.		✓	
7	If no, Non-Conformance Worksheet has been completed.			
8	Sample containers arrived intact		✓	
9	Temperature of samples upon arrival:		4° C	
10	Method of sample delivery to SPL:	SPL Delivery		
		Client Delivery		
		FedEx Delivery (airbill #) 8081	984798 78	
		Other:		
11	Method of sample disposal:	SPL Disposal	✓	
		HOLD		
		Return to Client		

Name: Tina C Cockrum	Date: 12/11/98

SPL, Inc.

Analysis Request & Chain of Custody Record

SPL Workorder No: 101604

page 2 of 2

Client Name: Brown & Caldwell
Address/Phone: 1415 Louisiana #2500
Client Contact: Rick Rexroad
Project Name: BJ-Hobbs
Project Number: 12542
Project Location: Hobbs
Invoice To: Rick Rexroad

SAMPLE ID	DATE	TIME	comp	grab	matrix (W=water S=soil SL=sludge O=other:)	bottle (P=plastic A=amber glass G=glass V=vial)	size (1=1 liter 4=4oz 40=vial 8=8oz 16=16oz)	pres. (1=HCl 2=HNO3 3=H2SO4 O=other:)	Number of Containers	Requested Analysis: BTEX-8021 / TPH-D 8015	Requested Analysis: ORO - 8015
MW-6	12-10-98	13:30			W					3	1
Duplicate	12-10-98				W					3	1

Client/Consultant Remarks:

Laboratory remarks:

Intact? ☐ Y ☐ N

Temp:

Requested TAT

24hr ☐ 72hr ☐

48hr ☐ Standard ☐

Other ☐ _____

Special Reporting Requirements: Fax Results ☐ Raw Data ☐ Standard QC ☐ Level 3 QC ☐ Level 4 QC ☐

Special Detection Limits (specify):

PM review (initial): BAF

	date	time	
1. Relinquished by Sampler: AR	12-10-98	17:30	2. Received by:
3. Relinquished by:	date	time	4. Received by:
5. Relinquished by:	date	time	6. Received by Laboratory: Tina Tockrum 12-11-98 1000

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101605

SPL, Inc.

Analysis Request & Chain of Custody Record

SPL Workorder No: 9812573

page 1 of 2

Client Name: Brown & Caldwell
Address/Phone: 1415 Louisiana #2500
Client Contact: Rick RexRoad
Project Name: BJ-Hobbs
Project Number: 12892
Project Location: Hobbs
Invoice To: Rick RexRoad

SAMPLE ID	DATE	TIME	comp	grab	matrix (W=water S=soil SL=sludge O=other:)	bottle (P=plastic A=amber glass G=glass V=vial)	size (1=1 liter 4=4oz 40=vial 8=8oz 16=16oz)	pres. (1=HCl 2=HNO3 3=H2SO4 O=other:)	Number of Containers	BTEX 8021 / TPH-G 8015	DRO-8015	NO3 / SO4-300.0	HOC-AF-RSK/SOP-147					
MW-7	12-9-98	15:00			W					3	1	[illegible]	[illegible]					
MW-8	12-9-98	15:30			W					3	1	[illegible]	[illegible]					
MW-5	12-9-98	16:00			W					3	1							
MW-9	12-9-98	16:30			W					3	1							
MW-11A	12-10-98	8:00			W					3	1	1	1					
MW-10	12-10-98	8:30			W					3	1	1	1					
MW-12	12-10-98	10:00			W					3	1	1	1					
MW-3	12-10-98	10:30			W					3	1							
MW-4	12-10-98	11:00			W					3	1							
MW-1	12-10-98	12:00			W					3	1							

RUSH

Client/Consultant Remarks:

Laboratory remarks:

Intact? ☐ Y ☐ N
Temp: 4°

Requested TAT
24hr ☐ 72hr ☐
48hr ☐ Standard ☒
Other ☐ ________

Special Reporting Requirements: Fax Results ☒ Raw Data ☐ Standard QC ☒ Level 3 QC ☐ Level 4 QC ☐

Special Detection Limits (specify):

PM review (initial): BHF

1. Relinquished by Sampler: [signature]	date 12-10-98	time 17:00	2. Received by:
3. Relinquished by:	date	time	4. Received by:
5. Relinquished by:	date	time	6. Received by Laboratory: June Cockrum 12-11-98 1000

BROWN AND CALDWELL

Suite 2500, 1415 Louisiana, Houston, TX 77002
(713) 759-0952 • (713) 308-3886

TRANSMITTAL MEMORANDUM

To: Mr. Wayne Price State of New Mexico. Oil Conservation Division 2040 South Pacheco Street, State Land Off. Bldg. Santa Fe, New Mexico 87505	Date: 12/2/98	Job No: 12832.013
	Subject: Hobbs, New Mexico	
	Contract No:	
	Equipment No:	
	Spec. Ref:	
	Submittal No:	

WE ARE SENDING:
☒ Attached ☐ Under separate cover via **1st Class Mail** the following items:
☐ Shop Drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change Order ☒ Other: Final Report

THESE ARE TRANSMITTED AS CHECKED BELOW:
- ☐ For approval
- ☒ For your use
- ☐ As requested
- ☐ For review and comment
- ☐ With submittal review action noted

SUBMITTAL REVIEW ACTIONS:
- ☐ No exceptions taken
- ☐ Make revisions
- ☐ Amend and resubmit
- ☐ Rejected--see Remarks
- ☐ None

Copies	Date	No.	Description
1	11/30/98		Final September 1998 Groundwater Sampling Report, BJ Services Company, U.S.A., Hobbs, New Mexico

REMARKS:

cc: Chris Williams, State of New Mexico
Jo Ann Cobb, BJ Services Company, U.S.A.
Roger Sullivan, BJ Services Company, U.S.A.
Brown and Caldwell File
Transmittal File w/o attachment
Client File w/o attachment

Ursalla Kelly for
Christopher Angel

If enclosures are not as noted, kindly notify us at once

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BROWN AND CALDWELL

SEPTEMBER 1998 GROUNDWATER SAMPLING REPORT HOBBS, NEW MEXICO FACILITY

BJ SERVICES COMPANY, U.S.A.

NOVEMBER 30, 1998

SEPTEMBER 1998 GROUNDWATER SAMPLING REPORT
HOBBS, NEW MEXICO FACILITY
BJ SERVICES COMPANY, U.S.A.

Prepared for

BJ Services Company, U.S.A.
8701 New Trails Drive
The Woodlands, Texas

BC Project Number: 2832.13

Christopher E. Angel, R.G.
Assistant Geologist

November 30, 1998

Brown and Caldwell
1415 Louisiana, Suite 2500
Houston, Texas 77002 - (713) 759-0999

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APPENDICES

1

1.0 INTRODUCTION

Brown and Caldwell conducted field activities associated with the September 1998 quarterly groundwater sampling event at BJ Services Company, U.S.A. (BJ Services) facility located at 2708 West County Road, in Hobbs, New Mexico. The facility layout is shown in Figure 1.

The facility formerly operated an above-grade on-site fueling system. Subsurface impact near a diesel fueling system was first detected by the New Mexico Oil Conservation Division (NMOCD) during an on-site inspection on February 7, 1991. The fueling system was taken out of operation in July 1995. As the result of the diesel fuel release, the NMOCD has required a quarterly groundwater monitoring program to assess the hydrocarbon constituents in the groundwater. A biosparging system was activated in November 1995 to remediate soil and groundwater at the facility. A site chronology detailing the history of the fueling system, the groundwater remediation system, and previous sampling events is presented on Table 1. Expansions of the biosparging system were performed in March/April 1997 and February/March 1998.

During the September 1998 sampling event, groundwater samples collected from all monitor wells were analyzed for gasoline and diesel range total petroleum hydrocarbons (TPH-G and TPH-D) and benzene, toluene, ethylbenzene, and total xylenes (BTEX). Additionally, samples from downgradient wells MW-10, MW-11A, and MW-12 were analyzed for sulfate, nitrate, and dissolved methane. This report presents the results of the groundwater sampling event, a description of the field activities, and a summary of the analytical results. A groundwater potentiometric surface map, a benzene concentration map, and a hydrocarbon distribution map are included.

2.0 GROUNDWATER SAMPLING AND ANALYSES

Brown and Caldwell purged and sampled the groundwater monitoring wells at the facility on September 30, 1998 to determine concentrations of dissolved-phase hydrocarbons in groundwater. The following subsections describe the activities conducted during this sampling event and present the results of the groundwater analyses.

2.1 Groundwater Measurements and Sampling

Eleven monitor wells were sampled during the September 1998 sampling event. A site map depicting the locations of the monitor wells is presented as Figure 1. As noted in previous sampling reports, monitor well MW-2 can not be located and is assumed destroyed by facility activities such as grading.

Groundwater level measurements were obtained from the monitor wells prior to purging and sampling the wells. Groundwater levels were obtained with an oil/water interface probe and recorded to the nearest 0.01 foot. A cumulative table of groundwater elevation data is presented on Table 2. The groundwater elevation data indicates that the general groundwater flow direction is to the east with a hydraulic gradient of approximately 0.005 foot/foot (ft/ft). A potentiometric surface map is presented in Figure 2. A hydrocarbon sheen was observed in monitor wells MW-1, MW-4 and MW-9. The passive skimmer in MW-4 had accumulated approximately 200 milliliters of phase-separated hydrocarbons (PSH) since the last sampling event.

Groundwater samples were collected after purging the wells with a submersible pump to remove at least three well volumes of groundwater. Field parameter measurements for pH, conductivity and temperature were collected after each well volume was purged. Two consecutive readings within five percent were used to indicate that groundwater had stabilized. The parameters in each monitor well typically stabilized after two well volumes had been removed; however, at least three well volumes were removed from each well.

Additional groundwater parameters were measured during the purging and sampling activities to assess the potential for natural attenuation. These parameters were dissolved oxygen (DO), dissolved ferrous iron, alkalinity, and reduction-oxidation potential (redox). The field parameter readings were recorded in the field log book and are listed on the groundwater sampling forms included in Appendix A. The field screening results for groundwater samples are presented on Table 3.

A pump was utilized to perform purging of the wells. Typically, groundwater levels were maintained at approximately 90% or more of the static water level in wells. Groundwater samples were collected directly from the pump discharge after completion of purging operations. Each sample was transferred to laboratory-prepared, clean glass or plastic containers sealed with Teflon®-lined lids, labeled, and placed on ice in an insulated cooler for shipment via overnight courier to the analytical laboratory. Each cooler was accompanied by completed chain-of-custody documentation.

Field measurement equipment was decontaminated prior to and after each use. Decontamination procedures consisted of washing with fresh water and a non-phosphate detergent and rinsing with deionized (DI) water. Purged water and excess water generated by equipment cleaning operations were discharged to the on-site water reclamation system for re-use for other purposes by BJ Services.

2.2 Results of Groundwater Analyses

Groundwater samples collected during this sampling event were analyzed for diesel- and gasoline-range total petroleum hydrocarbons (TPH-D and TPH-G) by EPA Method 8015 Modified and benzene, toluene, ethylbenzene and total xylenes (BTEX) by EPA Method 8020. Additionally, three monitor wells (MW-10, MW-11A and MW-12) were sampled for methane, nitrate, and sulfate.

Current and cumulative analytical results for BTEX, TPH-D, and TPH-G are presented in Table 4. The June 1998 and September 1998 analytical results for nitrate, sulfate, and dissolved methane analyses performed on groundwater samples from monitor wells MW-10, MW-11A, and MW-12 are presented in Table 5.

BTEX constituent concentrations in excess of applicable laboratory detection limits were reported in nine of the 12 groundwater samples collected during this sampling event. Benzene concentrations were below the New Mexico Water Quality Control Commission (WQCC) Standard of 0.01 milligrams per liter (mg/L) in monitor wells MW-1, MW-5, MW-7, MW-8, MW-9, and MW-11A. Figure 3 presents a benzene isoconcentration and total BTEX distribution map for the September 1998 sampling event. A total petroleum hydrocarbon distribution map for the September 1998 sampling event is presented in Figure 4. The laboratory analytical report and chain-of-custody record for the groundwater samples are included in Appendix B.

Benzene concentrations in monitor wells MW-1, MW-3 and MW-4, which are located near the former source area, have continued to decrease since the expansion of the biosparging system in February/March 1998. The benzene concentration in monitor well MW-1 is less than the New Mexico WQCC standard of 0.01 mg/L. Benzene concentrations in the off-site monitor well, MW-9, have generally stabilized at a concentration less than 0.01 mg/L. The benzene concentration increased in monitor well MW-6 during the period from June 1998 to September 1998, however.

Concentrations of dissolved phase BTEX displayed an overall decrease in the area of monitor wells MW-10 and MW-11/11A subsequent to removal of a field waste tank (see Figure 1) in March 1997. Benzene and total BTEX concentrations increased in downgradient wells MW-10 and MW-12 between June 1998 and September 1998, however.

2.3 Natural Attenuation Evaluation

Natural attenuation is planned to be the primary remediation mechanism for the portion of the plume in the area of the former field waste tanks (see Figure 3). The primary evidence of natural

attenuation is plume behavior. Natural attenuation of hydrocarbons is occurring at a rate greater than hydrocarbon loading from the source area when a hydrocarbon plume is decreasing in size or concentration. Conversely, increases in size or hydrocarbon concentrations of a plume indicate that rates of hydrocarbon loading exceed the natural attenuation capacity in the area. The observed decreases in benzene and total BTEX concentrations in monitor wells MW-10 and MW-11 following removal of the of the field waste tank on March 6-7, 1997 reflect a decreased rate of hydrocarbon loading in these areas. The observed increases in benzene and total BTEX concentrations in monitor wells MW-10 and MW-12 during the time period between June 1998 and September 1998 indicate that hydrocarbon loading rates from residual impacted soil periodically exceeds the natural attenuation capacity of certain areas of the site. The following lines of geochemical evidence suggest that intrinsic bioremediation (an important natural attenuation mechanism) is occurring:

1. DO concentrations measured in monitor wells MW-10, MW-11A, and MW-12 are depressed relative to background. DO concentrations of 0.00 mg/L, 0.65 mg/L, and 0.61 mg/L were measured in monitor wells MW-10, MW-11A, and MW-12, respectively. These concentrations are less than the measured DO concentrations of 5.67 mg/L, 4.53 mg/L, and 2.83 mg/L in monitor wells MW-5, MW-7, and MW-8, respectively, which are upgradient or cross-gradient wells believed to exhibit background conditions. DO is utilized during intrinsic bioremediation. Therefore, DO concentrations should be depressed in areas where intrinsic bioremediation is occurring.

2. Nitrate concentrations were measured at less than 0.01 mg/L in monitor wells MW-10 and MW-12 and at a concentration of 0.4 mg/L in MW-11A. These concentrations are less than the nitrate concentrations of 3.87 mg/L, 3.92 mg/L, and 1.84 mg/L measured in March 1998 in monitor wells MW-5, MW-7, and MW-8, respectively, which are believed to exhibit background conditions. Nitrate is utilized during intrinsic bioremediation after DO is depleted. Therefore, nitrate concentrations should be depressed in areas where intrinsic bioremediation is occurring.

3. Ferrous iron was measured at concentrations of 7.0 mg/L and 8.0 mg/L in monitor wells MW-10 and MW-12, respectively. Ferrous iron was not detected in any of the other monitor wells at the site, except MW-8 and MW-9. Ferrous iron concentrations in monitor wells MW-8 and MW-9 were 1.0 mg/L and 0.2 mg/L, respectively. When DO and nitrate are depleted, anaerobic microbes which utilize other electron acceptors become active. Ferrous iron is the reduction product of ferric iron, a common electron acceptor. Therefore, ferrous iron concentrations should increase in areas where intrinsic bioremediation is occurring.

4. Oxidation-Reduction Potential (redox) is the measure of chemical energy in groundwater. Redox values in the vicinity of the background monitor wells MW-5, MW-7 and MW-8 were 182.8 millivolts (mV), 100.9 mV and 27.3 mV, respectively. Redox in the vicinity of monitor wells MW-10, MW-11A and MW-12 were found to be –92.8 mV, -56.6 mV and –106.5 mV, respectively. The negative redox values in monitor wells MW-10, MW-11A and MW-12 indicate that electron acceptors other than dissolved oxygen are being utilized.

Methane is a reaction product generated during utilization of carbon dioxide as an electron acceptor, and its concentration should therefore increase in areas where depletion of DO, nitrate, and ferric iron has occurred. The concentration of methane is elevated in monitor well MW-10 relative to methane concentrations in monitor wells MW-11A and MW-12, suggesting that utilization of carbon dioxide may be occurring locally in that area.

Sulfate concentrations in monitor wells MW-10, MW-11A, and MW-12 measured in September 1998 are comparable to those observed in monitor wells MW-5, MW-7, and MW-8 in March 1998. It therefore appears that sulfate is not being utilized during intrinsic bioremediation, and that DO, nitrate, and ferric iron are supplying electron acceptors to facilitate natural attenuation. In addition, carbon dioxide is apparently acting as an electron acceptor in the vicinity of monitor well MW-10, as indicated by elevated dissolved methane concentrations. Data regarding alkalinity, which is expected to increase during the course of bioremediation processes, is inconclusive.

It is recommended that monitoring for natural attenuation evaluation parameters continue in this area.

3.0 REMEDIATION SYSTEM

Brown and Caldwell submitted a Remedial Action Plan (RAP) to the New Mexico OCD in May 1994. Based on the results of previous investigations conducted by Brown and Caldwell and Roberts/Schornick and Associates, Inc. (RSA), Brown and Caldwell recommended the installation of a biosparging system. The biosparging system simultaneously treats volatile and semivolatile contaminants adsorbed directly to the soil (i.e., residual) as well as contaminants present in soil moisture (i.e., dissolved phase) within the capillary fringe and vadose zone. Additionally, the biosparging system removes volatile and semivolatile contaminants from the saturated zone. The biosparging system operates by injecting air into the saturated zone and extracting air from the vadose zone through a network of wells and piping. The continuous flushing of air through the saturated zone increases the dissolved oxygen concentration in groundwater and in soil moisture present in the capillary fringe and vadose zone. The elevated dissolved oxygen content facilitates the activities of indigenous microorganisms to accelerate biodegradation of contaminants. The flushing of air also strips volatile and semivolatile contaminants.

The New Mexico OCD approved the RAP on August 11, 1994. Installation activities for the biosparging system were conducted between August 2 through 24, 1995. Nineteen combined injection/extraction wells, three vacuum extraction wells, associated piping, and one extraction blower and one injection blower were installed. An additional vapor extraction well, VE-4, was installed and connected to the vapor extraction system in April 1997. Five additional injection wells, AI-20 through AI-24, were installed in February 1998. Injection wells AI-20 through AI-24 were installed at locations near the center of the hydrocarbon plume. These injection wells were constructed such that a 10-foot screen submergence was achieved, thereby providing treatment to an expanded vertical interval of the aquifer in the central portion of the plume. Injection wells AI-20 through AI-24 are supplied by a separate blower than the one used to supply injection wells AI-1 through AI-19 in order to avoid short-circuiting to wells with less screen submergence. Three additional vapor extraction wells, VE-5 through VE-7, were also installed in February 1998. The new injection and extraction wells were brought on-line on March 10, 1998, and operation of

injection wells AI-1 through AI-19, which had been suspended on February 19, 1998, was resumed on March 24, 1998.

Concentrations of benzene and total BTEX in monitor well MW-1 measured during the September 1998 groundwater sampling event have decreased relative to those observed during the March 1998 sampling event. Benzene concentrations dropped from 4,800 µg/L to 3.2 µg/L, and total BTEX concentrations dropped from 15,600 µg/L to 1,343.2 µg/L between March 1998 and September 1998. During this same time period, benzene concentrations decreased from 140 µg/L to 42 µg/L in monitor well MW-3 and from 150 µg/L to 80 µg/L in monitor well MW-4. These decreases are likely attributable to increased air flow being applied to the aquifer through air injection wells AI-20 through AI-24.

The presence of approximately 200 ml of PSH in the hydrophobic filter installed in monitor well MW-4 was noted during the September 1998 groundwater sampling event. Operation of the new sparging and extraction wells in the central portion of the hydrocarbon plume since early March 1998 may have mobilized free product, resulting in its appearance in monitor well MW-4. It is believed that application of additional remediation stress and continued PSH recovery operations from monitor wells near the center of the hydrocarbon plume will ultimately result in removal of PSH from the subsurface.

The vapors recovered during the extraction process are discharged to the atmosphere in accordance with the State of New Mexico Air Quality Regulations. Following initial system startup operations, effluent air samples were collected on a monthly basis from the recovered vapors to monitor the bioremediation process and emission rate. Upon receiving a determination from the State of New Mexico that an air permit was not required, effluent air samples were collected and analyzed voluntarily on a quarterly basis through July 1997. The air samples were analyzed for TPH using EPA Method Modified 8015A (Air) and for total volatile aromatic hydrocarbons (BTEX) using EPA Method 5030/8020 (modified).

The analytical results demonstrated a significant reduction in hydrocarbon vapor concentrations and emissions rates between November 1995 and July 1997. Total BTEX concentrations decreased from 391 parts per million by volume (ppmv) in November 1995 to 17.3 ppmv in July 1997. The corresponding BTEX emissions decreased from 0.77 lb/hour to 0.03 lb/hour. TPH concentrations decreased from 1,870 ppmv in November 1995 to 65 ppmv in July 1997. The corresponding TPH - Volatile Organic Compound (VOC) emissions rates decreased from 3.21 lb/hour to 0.08 lb/hour. These emission rates were well below the regulatory limit of 10 lb/hour for VOCs. Therefore, use of a field monitoring instrument utilizing a flame ionization detector (FID) to measure the VOC concentration in the vapors commenced in September 1997. The VOC measurements collected using the FID correspond to TPH concentrations previously determined in the analytical laboratory. The VOC concentration measured using the FID during the September 1998 sampling event was 200 ppmv.

The TPH concentration of 200 ppmv measured during the September 1998 sampling event shows a substantial drop from the 1500 ppmv TPH discharge rate observed during the March 24, 1998 groundwater sampling event. The September 1998 TPH discharge rate of 200 ppmv is comparable to TPH concentrations measured during the time period from August 1996 through December 1997, prior to the system modifications performed in February and March 1998. The increased TPH concentration observed in the March 1998 event relative to the time period from August 1997 through December 1997 is believed to be a result of the addition of air injection wells AI-20 through AI-24 to the biosparging system, but discharge rates have returned to more typical levels during the June 1998 and September 1998 groundwater sampling events.

The VOC emissions rate calculated for the September 1998 groundwater sampling event was 0.26 lb/hour. This emission rate is below the regulatory limit of 10 lb/hour for VOCs. The September 1998 VOC emissions rate is typical of VOC emissions rates during the time period of August 1996 through December 1997, and represents a substantial drop from the 1.91 lb/hour VOC emissions rate calculated for the March 1998 sampling event.

A cumulative summary of analytical results for air emissions monitoring is included in Table 5. These results are based on both laboratory and field analyses.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on information obtained during the September 1998 quarterly groundwater sampling event at the BJ Services Hobbs, New Mexico facility.

4.1 Conclusions

- Groundwater flow was to the east at an average hydraulic gradient of 0.005 ft/ft.
- Dissolved benzene and total BTEX concentrations have decreased in monitor wells MW-1, MW-3 and MW-4, which are located near the central portion of the plume, during the time period between June 1998 and September 1998.
- Dissolved benzene concentrations have decreased in perimeter monitor wells MW-5, MW-7, MW-8 and MW-9 during operation of the biosparging system.
- Benzene concentrations in monitor wells MW-1, MW-5, MW-7, MW-8, MW-9, and MW-11A are below the New Mexico Water Quality Control Commission standard of 0.01 mg/L.
- Increases in benzene concentrations were observed in monitor wells MW-6, MW-10 and MW-12 during the period from June 1998 to September 1998.
- Hydrocarbon air emissions have decreased substantially since March 1998. The current emissions rate of 0.24 lb/hour TPH is below the regulatory limit of 10 lb/hour for VOCs.

4.2 Recommendations

- Continue the quarterly groundwater sampling program and the operation and maintenance of the biosparging system.
- Evaluate application of increased air flow pressure in the area of monitor well MW-6.
- Continue monitoring hydrocarbon emissions on a quarterly basis using a calibrated field FID.
- Continue monitoring for free product recovery operations in monitor wells MW-1 and MW-4.
- Continue monitoring for natural attenuation parameters in monitor wells MW-10, MW-11A, and MW-12.

DISTRIBUTION

September 1998 Groundwater Sampling Report
BJ Services Company, U.S.A.
Hobbs, New Mexico

November 30, 1998

1 copy to: State of New Mexico
Energy, Minerals, and Natural Resources Dept.
Oil Conservation Division
2040 South Pacheco Street, State Land Office Building
Santa Fe, New Mexico 87505

Attention: Mr. Wayne Price

1 copy to: State of New Mexico
Oil Conservation Division, Hobbs District Office
Post Office Box 1980
Hobbs, New Mexico 88240

Attention: Mr. Chris Williams

1 copy to: BJ Services Company, U.S.A.
8701 New Trails Drive
The Woodlands, Texas 77381

Attention: Ms. Jo Ann Cobb

1 copy to: BJ Services Company, U.S.A.
2708 West County Road
Hobbs, New Mexico 88240

Attention: Mr. Roger Sullivan

1 copy to: Brown and Caldwell, Project File

QUALITY CONTROL REVIEWER

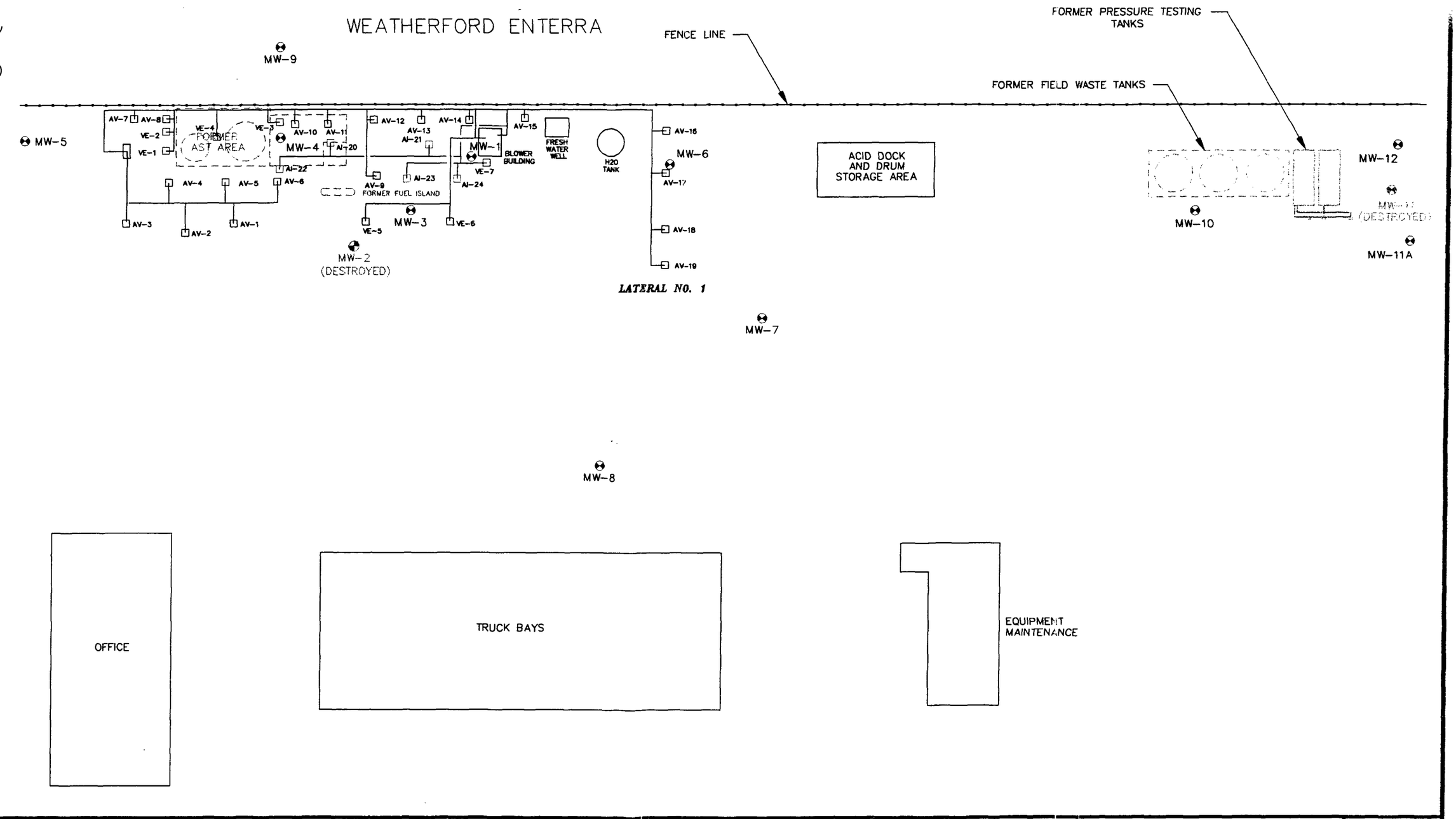
Robert N. Jennings, P.E.
Vice President

RLR/uak

Figures

FIGURES

WEATHERFORD ENTERRA



LATERAL NO. 1

BROWN AND CALDWELL
HOUSTON, TEXAS

SUBMITTED: _____ DATE: _____
PROJECT MANAGER

APPROVED: _____ DATE: _____
BROWN AND CALDWELL

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SCALE: 1" = 50'
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CHK'D BY: ____ DATE ____
APPROVED: ____ DATE ____

LEGEND

MW-3 MONITOR WELL

VE-4 AV-10 BIOSPARGING SYSTEM

TITLE: SITE MAP	DATE: 02/25/98
CLIENT: BJ SERVICES COMPANY, U.S.A.	PROJECT NUMBER: 2832.12
SITE: HOBBS, NEW MEXICO	FIGURE NUMBER: 1

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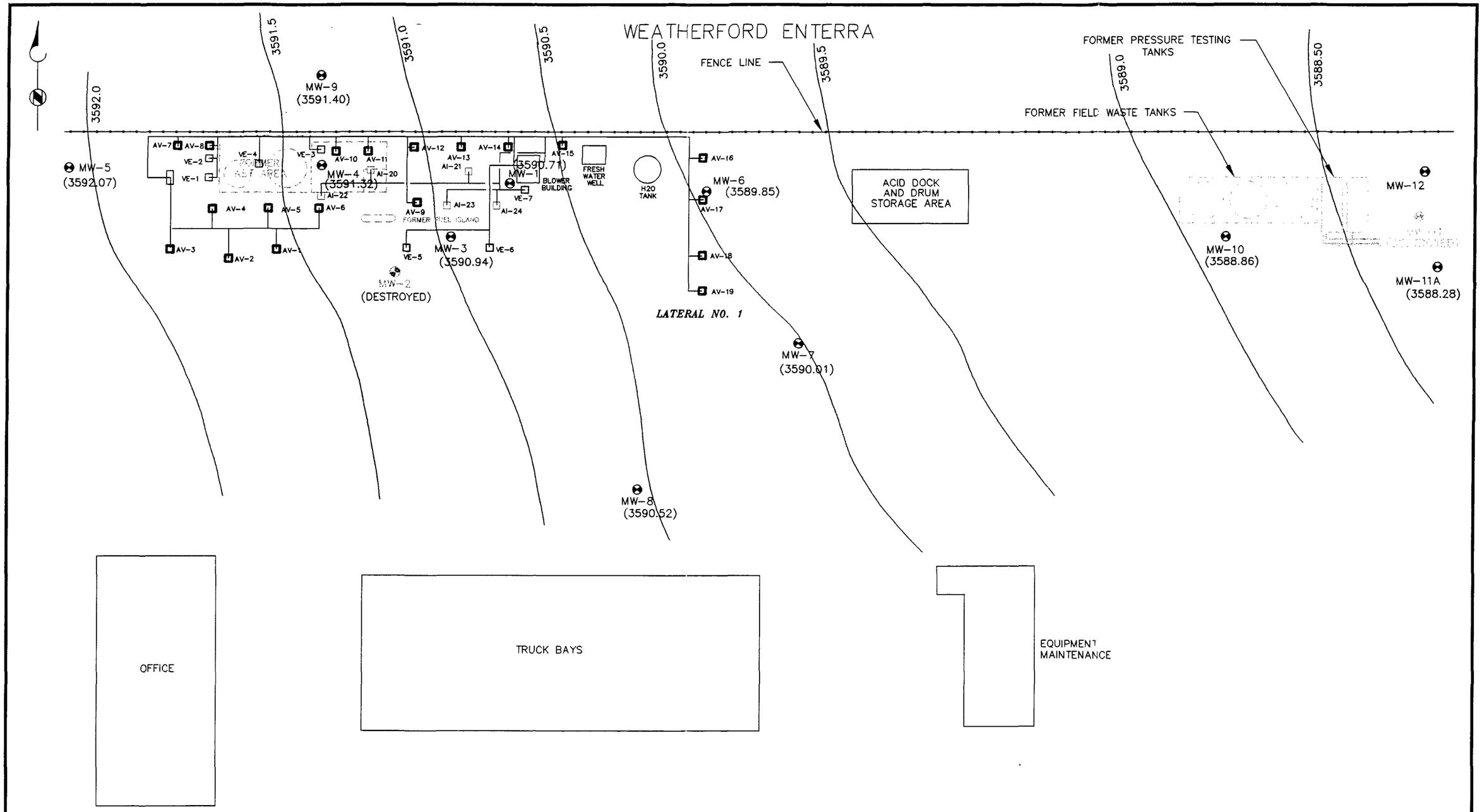

P:\12832\NEWSURVY 10-05-98 JR

BROWN AND CALDWELL
HOUSTON, TEXAS

SUBMITTED: _____ DATE: _____
PROJECT MANAGER

APPROVED: _____ DATE: _____
BROWN AND CALDWELL

0 20 40
SCALE: 1" = 50'
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APPROVED: ____ DATE ____

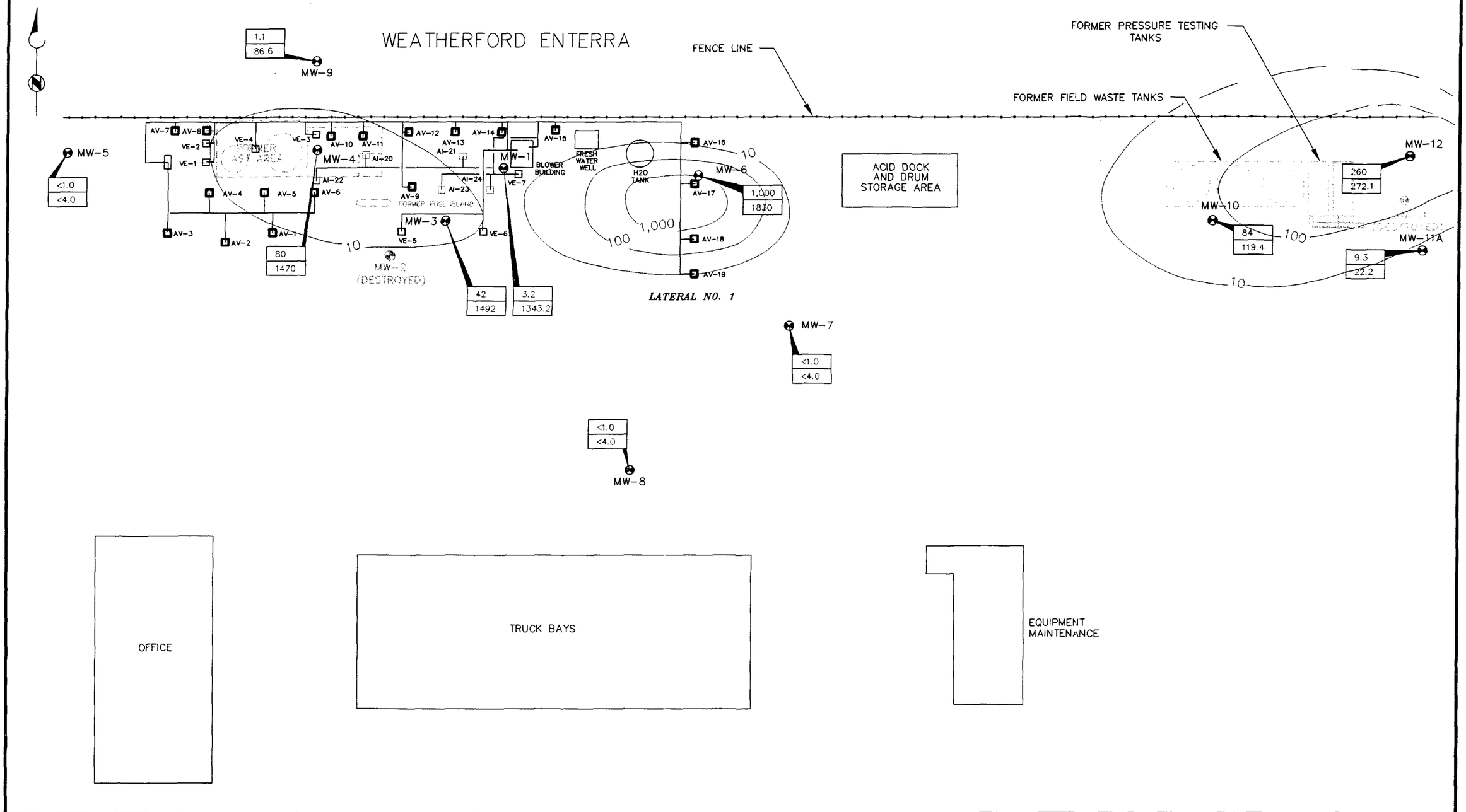
LEGEND

MW-3 MONITOR WELL

VE-4 AV-10 BIOSPARGING SYSTEM

TITLE	POTENTIOMETRIC SURFACE MAP SEPTEMBER 30, 1998	DATE 10/05/98
CLIENT	BJ SERVICES COMPANY, U.S.A.	PROJECT NUMBER 12832.013
SITE	HOBBS, NEW MEXICO	FIGURE NUMBER 2

WEATHERFORD ENTERRA



LATERAL NO. 1

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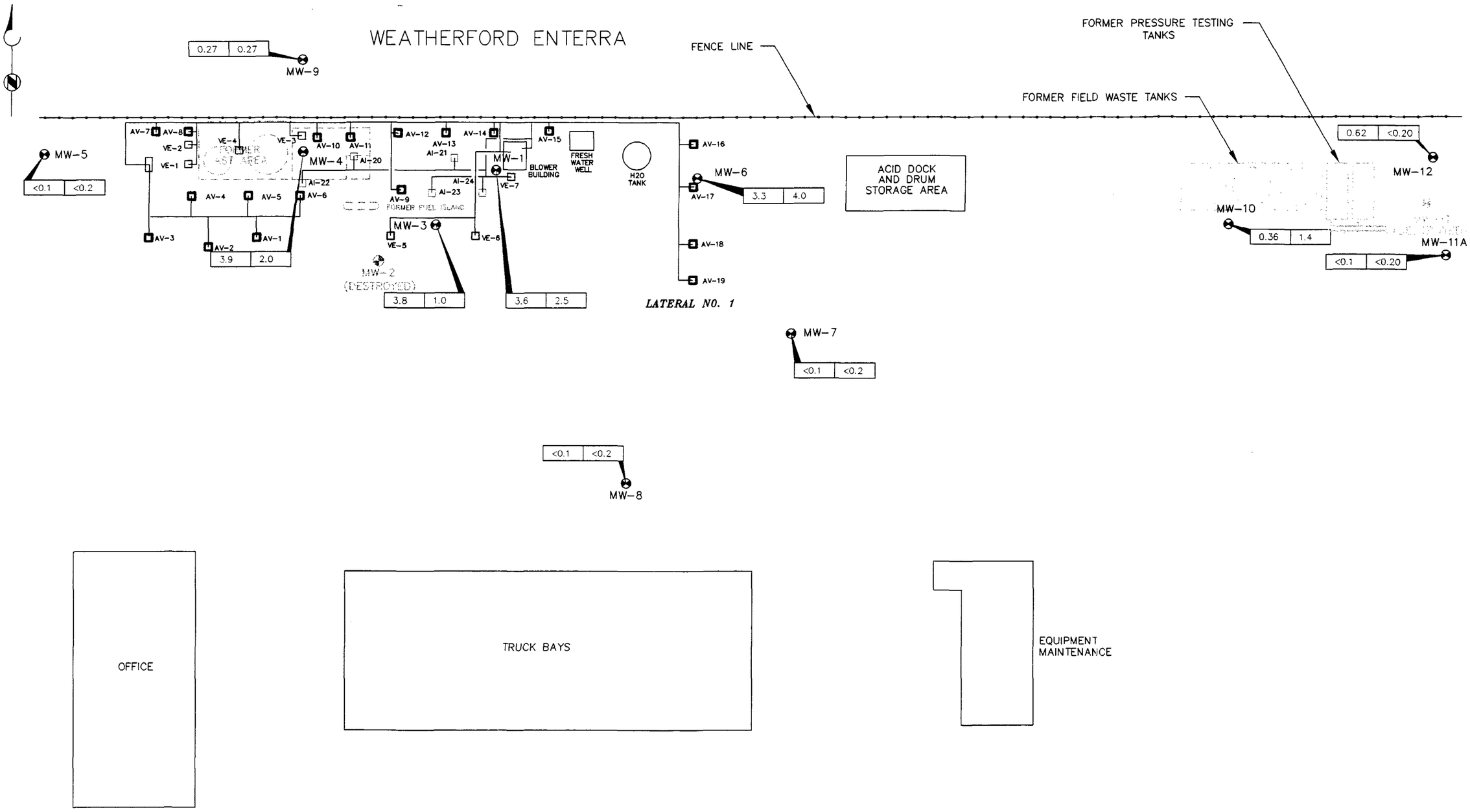
BROWN AND CALDWELL HOUSTON, TEXAS SUBMITTED: _____ DATE: _____ PROJECT MANAGER APPROVED: _____ DATE: _____ BROWN AND CALDWELL	0 20 40 SCALE: 1" = 50' DRAWN BY: JR DATE 4/98 CHK'D BY: ____ DATE ____ APPROVED: ____ DATE ____	LEGEND MW-3 MONITOR WELL <1.0 – BENZENE CONCENTRATION (ug/L) <4.0 – TOTAL BTEX CONCENTRATION (ug/L) 10 BENZENE ISOCONCENTRATION CONTOUR (ug/L) CONTOUR INTERVAL = LOGARITHMIC	TITLE: BENZENE ISOCONCENTRATION AND TOTAL BTEX DISTRIBUTION MAP FOR SEPTEMBER 30, 1998 CLIENT: BJ SERVICES COMPANY, U.S.A. SITE: HOBBS, NEW MEXICO DATE: 10/21/98 PROJECT NUMBER: 12832.013 FIGURE NUMBER: 3

WEATHERFORD ENTERRA



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PROJECT MANAGER

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BROWN AND CALDWELL

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SCALE: 1" = 50'
DRAWN BY: JR DATE 4/98
CHK'D BY: ____ DATE ____
APPROVED: ____ DATE ____

LEGEND

MW-3 MONITOR WELL

3.8 | 1.0 – TPH-G (mg/L) / TPH-D (mg/L)

TITLE: TOTAL PETROLEUM HYDROCARBONS DISTRIBUTION MAP FOR SEPTEMBER 30, 1998	DATE: 10/21/98
CLIENT: BJ SERVICES COMPANY, U.S.A.	PROJECT NUMBER: 12832.013
SITE: HOBBS, NEW MEXICO	FIGURE NUMBER: 4

Tables

TABLES

Table 1
Site Chronology
BJ Services Company, U.S.A.
Hobbs, New Mexico

Date	Activity
February 7, 1991	The State of New Mexico Oil Conservation Division (OCD) conducted an on-site inspection, including sampling of the on-site fresh water well.
August 6, 1991	OCD requested submittal of an investigation work plan.
September 5, 1991	Roberts/Schornick and Associates, Inc. (RSA) submitted Technical Work Plan for soil and groundwater investigation to the OCD.
November 15, 1991	The OCD approved Technical Work Plan submitted by RSA.
December 16, 1991	RSA sampled the fresh water well. Analytical results were submitted to the OCD.
February 21, 1992	Western sampled the fresh water well. Analytical results were submitted to the OCD.
July 29 - August 10, 1992	Brown and Caldwell conducted a soil and groundwater investigation according to the approved Technical Work Plan. Investigation included drilling and sampling 9 soil borings, sampling 6 hand-augured soil borings, the installation and sampling of 5 monitoring wells and the sampling of the fresh water well.
October 12, 1992	Brown and Caldwell submitted Soil and Groundwater Investigation Report to the OCD.
December 2, 1992	The OCD requested the installation and sampling of 4 additional monitoring wells, including a monitoring well on an adjacent property.
April 13, 1993	Brown and Caldwell conducted a vapor extraction pilot test on existing groundwater monitoring wells.
April 15, 1993	Brown and Caldwell installed off-site monitoring well.
April 22, 1993	Brown and Caldwell sampled off-site monitoring well.
May 27, 1993	Brown and Caldwell submitted a letter report documenting the installation and sampling of the off-site monitoring well to the OCD.
June 2, 1993	Brown and Caldwell conducted a short-term aquifer test using the fresh water well at the facility.
June 8, 1993	USTank Management, Inc. conducted a non-volumetric tank system tightness test on the diesel and unleaded gasoline aboveground storage tanks at the facility.

Table 1 (Continued)
Site Chronology
BJ Services Company, U.S.A.
Hobbs, New Mexico

Date	Activity
June 21, 1993	ENSR Consulting and Engineering (ENSR), the environmental consultant of the adjacent property owner on which the off-site well is located, submitted a request to sample the off-site monitoring well.
July 15, 1993	ENSR split one groundwater sample, collected from the off-site monitoring well, with Brown and Caldwell.
July 30, 1993	USTank Management, Inc. submitted the tank tightness test report to Brown and Caldwell. The report indicated that both tanks and their associated piping passed.
August 16-19, 1993	Brown and Caldwell installed two additional downgradient monitoring wells. Brown and Caldwell sampled each of the existing monitoring and the newly installed monitoring wells.
January 26, 1994	Brown and Caldwell performed groundwater monitoring event; existing monitoring wells and the fresh water well were purged and sampled. Groundwater samples were analyzed for BTEX.
May 6, 1994	Remedial Action Plan (RAP) submitted to the OCD.
August 11, 1994	RAP approved by the OCD.
May 3, 1995	Brown and Caldwell conducted the May 1995 groundwater sampling event.
July 31, 1995	Brown and Caldwell conducted the July 1995 groundwater sampling event.
August 2-9, 1995	Installation of biosparging system was initiated. Nineteen combined injection/extraction wells and three vacuum extraction wells were installed.
August 14-26, 1995	Remedial Construction Services, Inc. (RCS) began construction of the biosparging system.
September 19, 1995	Began operation of the extraction portion of the biosparging system.
November 13, 1995	Began operation of the injection portion of the biosparging system.
November 14, 1995	Brown and Caldwell conducted the November 1995 groundwater sampling event.
February 23, 1996	Brown and Caldwell conducted the February 1996 groundwater sampling event.
May 31, 1996	Brown and Caldwell conducted the May 1996 groundwater sampling event.

Table 1 (Continued)
Site Chronology
BJ Services Company, U.S.A.
Hobbs, New Mexico

Date	Activity
August 23, 1996	Brown and Caldwell conducted the August 1996 groundwater sampling event.
December 2, 1996	Brown and Caldwell conducted the December 1996 groundwater sampling event.
March 6-7, 1997	BJ Services removed the field waste tank and associated hydrocarbon impacted soil.
March 12, 1997	Brown and Caldwell conducted the March 1997 groundwater sampling event.
March 14, 1997	Vapor extraction well VE-4 installed.
April 1997	Vapor extraction well VE-4 connected to the vapor extraction system.
June 12, 1997	Brown and Caldwell conducted the June 1997 groundwater sampling event.
September 11-12, 1997	Brown and Caldwell conducted the September 1997 groundwater sampling event.
December 10, 1997	Brown and Caldwell conducted the December 1997 groundwater sampling event.
February 3-14, 1998	Air injection wells AI-20 through AI-24, vapor extraction wells VE-5 though VE-7 and monitor wells MW-11A and MW-12 were installed.
February 19, 1998	Operation of previously existing injection wells suspended in preparation for start-up of injection wells AI-20 through AI-24.
March 10, 1998	Operation of air injection wells AI-20 through AI-24 commenced.
March 23-24, 1998	Brown and Caldwell conducted the March 1998 groundwater sampling event.
March 24, 1998	Operation of previously existing injection wells resumed.
June 23, 1998	Brown and Caldwell conducted the June 1998 groundwater sampling event.
September 30, 1998	Brown and Caldwell conducted the September 1998 groundwater sampling event.

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-1						
	3,647.53	8/10/92	53.22	0.00	3,594.31	(1)
	3,647.53	2/9/93	53.03	0.00	3,594.50	
	3,647.53	8/18/93	53.10	0.00	3,594.43	
	3,647.53	1/26/94	53.31	0.00	3,594.22	
	3,647.53	5/3/95	54.64	0.20	3,593.05	(2)
	3,647.53	7/31/95	54.14	0.00	3,593.39	
	3,647.53	11/14/95	53.69	0.00	3,593.84	
	3,647.53	2/23/96	54.32	0.00	3,593.21	
	3,647.53	5/31/96	54.14	0.00	3,593.39	
	3,647.53	8/23/96	56.17	0.00	3,591.36	
	3,647.53	12/2/96	55.27	0.00	3,592.26	
	3,647.53	3/12/97	55.70	0.27	3,592.05	(3)
	3,647.53	6/12/97	55.08	0.02	3,592.47	
	3,647.53	9/12/97	55.64	0.51	3,592.31	
	3,647.53	12/10/97	55.46	0.00	3,592.07	PSH Sheen
	3,647.53	3/24/98	55.81	0.00	3,591.72	PSH Sheen
	3,647.53	6/23/98	56.38	0.06	3,591.20	
	3,647.53	9/30/98	56.82	0.00	3,590.71	PSH Sheen
MW-2						
	3,647.59	8/10/92	52.82	0.00	3,594.77	(1)
	3,644.84	2/9/93	49.60	0.00	3,595.24	
	3,644.84	8/18/93	49.71	0.00	3,595.13	
	3,644.84	1/26/94	49.97	0.00	3,594.87	
		5/3/95				(4)

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-3						
	3,647.68	8/10/92	52.99	0.00	3,594.69	(1)
	3,647.68	2/9/93	52.72	0.00	3,594.96	
	3,647.68	8/18/93	52.82	0.00	3,594.86	
	3,647.68	1/26/94	53.05	0.00	3,594.63	
	3,647.68	5/3/95	54.31	0.00	3,593.37	
	3,645.00	7/31/95	51.24	0.00	3,593.76	
	3,645.00	11/14/95	51.10	0.00	3,593.90	
	3,645.00	2/23/96	51.68	0.00	3,593.32	
	3,645.00	5/31/96	51.45	0.00	3,593.55	
	3,645.00	8/23/96	51.55	0.00	3,593.45	
	3,645.00	12/2/96	52.23	0.00	3,592.77	
	3,645.00	3/12/97	52.67	0.00	3,592.33	(3)
	3,645.00	6/12/97	52.68	0.00	3,592.32	
	3,645.00	9/11/97	52.71	0.00	3,592.29	
	3,645.00	12/10/97	52.89	0.00	3,592.11	
	3,645.00	3/23/98	53.22	0.00	3,591.78	
	3,645.00	6/23/98	53.66	0.00	3,591.34	
	3,645.00	9/30/98	54.06	0.00	3,590.94	
MW-4						
	3,645.28	8/10/92	50.55	0.00	3,594.73	(1)
	3,645.28	2/9/93	50.26	0.00	3,595.02	
	3,645.28	8/18/93	50.38	0.00	3,594.90	
	3,645.28	1/26/94	50.90	0.30	3,594.63	
	3,645.28	5/3/95	51.51	0.45	3,594.14	
	3,645.28	7/31/95	51.74	0.26	3,593.75	
	3,645.28	11/14/95	51.03	0.00	3,594.25	
	3,645.28	2/23/96	51.65	0.01	3,593.64	
	3,645.28	5/31/96	51.48	0.00	3,593.80	
	3,645.28	8/23/96	53.49	0.00	3,591.79	
	3,645.28	12/2/96	52.32	0.00	3,592.96	
	3,645.28	3/12/97	52.74	0.05	3,592.58	(3)
	3,645.28	6/12/97	53.08	0.44	3,592.56	
	3,645.28	9/12/97	52.60	0.15	3,592.80	
	3,645.28	12/10/97	52.89	0.00	3,592.39	PSH Sheen
	3,645.28	3/24/98	53.20	0.25	3,592.29	
	3,645.28	6/23/98	53.82	0.22	3,591.64	
	3,645.28	9/30/98	53.96	0.00	3,591.32	200 ml PSH

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-5						
	3,647.72	8/10/92	52.38	0.00	3,595.34	(1)
	3,647.72	2/9/93	52.06	0.00	3,595.66	
	3,647.72	8/18/93	52.16	0.00	3,595.56	
	3,647.72	1/26/94	52.50	0.00	3,595.22	
	3,647.72	5/3/95	53.57	0.00	3,594.15	
	3,647.72	7/31/95	53.27	0.00	3,594.45	
	3,647.72	11/14/95	52.83	0.00	3,594.89	
	3,647.72	2/23/96	53.57	0.00	3,594.15	
	3,647.72	5/31/96	53.16	0.00	3,594.56	
	3,647.72	8/23/96	53.41	0.00	3,594.31	
	3,647.72	12/2/96	53.98	0.00	3,593.74	
	3,647.72	3/12/97	54.44	0.00	3,593.28	(3)
	3,647.72	6/12/97	54.48	0.00	3,593.24	
	3,647.72	9/12/97	54.29	0.00	3,593.43	
	3,647.72	12/10/97	54.66	0.00	3,593.06	
	3,647.72	3/23/98	55.05	0.00	3,592.67	
	3,647.72	6/23/98	55.44	0.00	3,592.28	
	3,647.72	9/30/98	55.65	0.00	3,592.07	
MW-6						
	3,644.74	2/9/93	50.58	0.00	3,594.16	(1)
	3,644.74	8/18/93	50.78	0.00	3,593.96	
	3,644.74	1/26/94	51.00	0.00	3,593.74	
	3,644.74	5/3/95	52.63	0.00	3,592.11	
	3,644.74	7/31/95	51.90	0.00	3,592.84	
	3,644.74	11/14/95	51.19	0.00	3,593.55	
	3,644.74	2/23/96	52.10	0.00	3,592.64	
	3,644.74	5/31/96	51.76	0.00	3,592.98	
	3,644.74	8/23/96	51.63	0.00	3,593.11	
	3,644.74	12/2/96	52.85	0.00	3,591.89	
	3,644.74	3/12/97	53.55	0.00	3,591.19	(3)
	3,644.74	6/12/97	52.08	0.00	3,592.66	
	3,644.74	9/11/97	53.72	0.00	3,591.02	
	3,644.74	12/10/97	53.27	0.00	3,591.47	
	3,644.74	3/23/98	53.56	0.00	3,591.18	
	3,644.74	6/23/98	52.88	0.00	3,591.86	
	3,644.74	9/30/98	54.89	0.00	3,589.85	

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-7						
	3,644.55	2/9/93	50.53	0.00	3,594.02	(1)
	3,644.55	8/18/93	50.74	0.00	3,593.81	
	3,644.55	1/26/94	51.01	0.00	3,593.54	
	3,644.55	5/3/95	52.25	0.00	3,592.30	
	3,644.55	7/31/95	51.92	0.00	3,592.63	
	3,644.55	11/14/95	51.48	0.00	3,593.07	
	3,644.55	2/23/96	52.15	0.00	3,592.40	
	3,644.55	5/31/96	51.78	0.00	3,592.77	
	3,644.55	8/23/96	52.02	0.00	3,592.53	
	3,644.55	12/2/96	52.52	0.00	3,592.03	
	3,644.55	3/12/97	52.99	0.00	3,591.56	(3)
	3,644.55	6/12/97	53.08	0.00	3,591.47	
	3,644.55	9/11/97	53.00	0.00	3,591.55	
	3,644.55	12/10/97	53.28	0.00	3,591.27	
	3,644.55	3/23/98	53.59	0.00	3,590.96	
	3,644.55	6/23/98	54.20	0.00	3,590.35	
	3,644.55	9/30/98	54.54	0.00	3,590.01	
MW-8						
	3,644.87	2/9/93	50.48	0.00	3,594.39	(1)
	3,644.87	8/18/93	50.67	0.00	3,594.20	
	3,644.87	1/26/94	50.96	0.00	3,593.91	
	3,644.87	5/3/95	52.15	0.00	3,592.72	
	3,644.87	7/31/95	51.77	0.00	3,593.10	
	3,644.87	11/14/95	51.37	0.00	3,593.50	
	3,644.87	2/23/96	52.17	0.00	3,592.70	
	3,644.87	5/31/96	51.55	0.00	3,593.32	
	3,644.87	8/23/96	51.92	0.00	3,592.95	
	3,644.87	12/2/96	52.43	0.00	3,592.44	
	3,644.87	3/12/97	52.93	0.00	3,591.94	(3)
	3,644.87	6/12/97	53.96	0.00	3,590.91	
	3,644.87	9/11/97	52.73	0.00	3,592.14	
	3,644.87	12/10/97	53.15	0.00	3,591.72	
	3,644.87	3/23/98	53.51	0.00	3,591.36	
	3,644.87	6/23/98	54.01	0.00	3,590.86	
	3,644.87	9/30/98	54.35	0.00	3,590.52	

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-9						
	3,644.78	4/22/93	49.73	0.00	3,595.05	(1)
	3,644.78	7/15/93	49.65	0.00	3,595.13	
	3,644.78	8/18/93	49.85	0.00	3,594.93	
	3,644.78	1/26/94	50.02	0.00	3,594.76	
	3,644.78	5/3/95	51.35	0.00	3,593.43	
	3,644.78	7/31/95	50.97	0.00	3,593.81	
	3,644.78	11/14/95	50.43	0.00	3,594.35	
	3,644.78	2/23/96	51.12	0.00	3,593.66	
	3,644.78	5/31/96	50.89	0.00	3,593.89	
	3,644.78	8/23/96	50.98	0.00	3,593.80	
	3,644.78	12/2/96	51.58	0.00	3,593.20	
	3,644.78	3/12/97	52.21	0.05	3,592.61	(3)
	3,644.78	6/12/97	52.10	0.00	3,592.68	PSH Sheen
	3,644.78	9/12/97	51.95	0.00	3,592.83	PSH Sheen
	3,644.78	12/10/97	52.37	0.00	3,592.41	Slight Sheen
	3,644.78	3/23/98	52.68	0.00	3,592.10	Slight Sheen
	3,644.78	6/23/98	53.08	0.00	3,591.70	PSH Sheen
	3,644.78	9/30/98	53.39	0.01	3,591.40	PSH Sheen
MW-10						
	3,644.47	8/18/93	51.54	0.00	3,592.93	(1)
	3,644.47	1/26/94	51.90	0.00	3,592.57	
	3,644.47	5/3/95	52.97	0.00	3,591.50	
	3,644.47	7/31/95	52.87	0.00	3,591.60	
	3,644.47	11/14/95	52.51	0.00	3,591.96	
	3,644.47	2/23/96	53.05	0.00	3,591.42	
	3,644.47	5/31/96	52.79	0.00	3,591.68	
	3,644.47	8/23/96	53.03	0.00	3,591.44	
	3,644.47	12/2/96	53.41	0.00	3,591.06	
	3,644.47	3/12/97	54.21	0.00	3,590.26	(3)
	3,644.47	6/12/97	53.99	0.00	3,590.48	
	3,644.47	9/12/97	53.94	0.00	3,590.53	
	3,644.47	12/10/97	54.12	0.00	3,590.35	
	3,644.47	3/23/98	54.51	0.00	3,589.96	
	3,644.47	6/23/98	55.12	0.00	3,589.35	
	3,644.47	9/30/98	55.61	0.00	3,588.86	

Table 2
Cumulative Groundwater Elevation Data
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitoring Well	TOC Elevation	Date Measured	Depth to GW (ft)	Free Product Thickness (ft)	GW Elevation (ft MSL)	Comments
MW-11						
	3,643.78	8/18/93	51.92	0.00	3,591.86	(1)
	3,643.78	1/26/94	52.32	0.00	3,591.46	
	3,643.78	5/3/95	53.38	0.00	3,590.40	
	3,643.78	7/31/95	53.35	0.00	3,590.43	
	3,643.78	11/14/95	52.96	0.00	3,590.82	
	3,643.78	2/23/96	53.50	0.00	3,590.28	
	3,643.78	5/31/96	53.25	0.00	3,590.53	
	3,643.78	8/23/96	53.49	0.00	3,590.29	
	3,643.78	12/2/96	53.79	0.00	3,589.99	
	3,643.78	3/12/97	53.81	0.00	3,589.97	(3)
	3,643.78	6/12/97	53.96	0.00	3,589.82	
	3,643.78	9/12/97	52.93	0.00	3,590.85	
		12/10/97				(5)
MW-11A						
	3,644.24	3/23/98	54.79	0.00	3,589.45	(6)
	3,644.24	6/23/98	55.43	0.00	3,588.81	
	3,644.24	9/30/98	55.96	0.00	3,588.28	
MW-12						
	3,644.29	3/23/98	54.72	0.00	3,589.57	(6)
	3,644.29	6/23/98	55.48	0.00	3,588.81	
	3,644.29	9/30/98	56.02	0.00	3,588.27	

(1) Top of casing elevations and groundwater elevations of all monitor wells were relative to an arbitary datum of 100.00 feet prior to March 1997 and have been converted to Mean Sea Level (MSL).

(2) For wells with a hydrocarbon layer the groundwater elevation was calculated as follows:
Groundwater Elevation = (TOC elevation) - (Depth to groundwater) + [(Free product thickness) X (SG of free product)]
Note: The specific gravity (SG) for the free product was 0.82.

(3) Top of casing elevations and groundwater elevations relative to MSL after March 1997.

(4) MW-2 could not be located and is assumed detroyed after January, 1994

(5) MW-11 could not be located and is assumed detroyed after September 12, 1997.

(6) TOC elevations for MW-11A and MW-12 estimated relative to TOC elevation for MW-10.

Table 3
Field Screening Results for Groundwater Samples
Hobbs, New Mexico Facility
BJ Services Company, U.S.A.

Monitor Well	Date Measured	Well Volume	pH	Temperature oC	Conductivity (umhos)	Redox (mV)	Dissolved Oxygen (mg/L)	Ferrous Iron (mg/L)	Alkalinity (mg/L)
MW-1	9/30/98	3	NR	NR	NR	NR	NR	0	NA
MW-3	9/30/98	0	7.42	22.80	1398	106.1	6.66		
		1	7.30	22.40	1360	90.4	5.56		
		2	7.28	22.50	1294	67.6	5.76		
		3	7.24	21.50	1286	32.2	4.84	0	320
MW-4	9/30/98	3	NR	NR	NR	NR	NR	0.1	NA
MW-5	9/30/98	0	7,34	22.28	1156	217.3	6.95		
		1	7.27	20.48	1150	203.2	6.84		
		2	7.25	19.87	1118	193.7	6.00		
		3	7.21	20.12	1103	182.8	5.67	NA	NA
MW-6	9/30/98	0	8.19	25.42	1197	35.2	9.56		
		1	7.90	24.06	1108	234.2	8.42		
		2	7.97	24.36	1152	211.7	7.58		
		3	7.86	25.02	1210	260.7	6.50	0	200
MW-7	9/30/98	0	7.46	21.72	1590	44.1	4.39		
		1	6.98	22.67	1595	53.4	6.10		
		2	6.68	24.78	1650	120.1	4.83		
		3	6.79	23.27	1596	100.9	4.53	0	340
MW-8	9/30/98	0	7.36	24.55	1734	66.7	4.72		
		1	7.06	20.49	1638	54.3	1.92		
		2	7.27	22.83	1726	43.8	4.50		
		3	6.95	23.37	1758	27.3	2.83	1	400
MW-9	9/30/98	3	NR	NR	NR	NR	NR	0.2	380
MW-10	9/30/98	0	7.06	26.09	6800	-106.9	0.90		
		1	7.03	23.67	5370	-115.4	2.06		
		2	7.24	24.59	5314	-92.8	2.27		
		3	ND	ND	ND	ND	ND	7	<400
MW-11A	9/30/98	0	7.19	22.13	3577	-106.6	1.13		
		1	7.03	21.20	2891	-76.3	0.91		
		2	6.91	21.11	2890	-83.4	0.63		
		3	6.66	21.10	2220	-56.6	0.65	0	380
MW-12	9/30/98	0	7.29	22.36	1717	-114.5	2.38		
		1	7.18	20.98	1615	-122.9	1.03		
		2	7.00	20.40	1759	-108.0	0.73		
		3	6.97	20.32	1795	-106.5	0.61	8	380

MW-2 could not be located and is assumed destroyed after January, 1994.

MW-11 could not be located and is assumed destroyed after September, 1997.

NR=No Readings, electronic instrument not used due to presence of PSH which could damage the detector.

NA=Not Analyzed

BROWN AND CALDWELL

Suite 2500, 1415 Louisiana, Houston, TX 77002
(713) 759-0952 • (713) 308-3886

TRANSMITTAL MEMORANDUM

To: Wayne Price State of New Mexico (Oil Conservation Division) Energy, Minerals, and Natural Resources Department 2040 South Pacheco Street, State Land Off. Bldg. Santa Fe, New Mexico 87505	Date: 12/31/98	Job No: 12832-013
	Subject: Hobbs, New Mexico Facility	
	Contract No:	
	Equipment No:	
	Spec. Ref:	
	Submittal No:	

WE ARE SENDING: ☒ Attached ☐ Under separate cover via **1st Class Mail** the following items:
☐ Shop Drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change Order ☒ Other: Replacement Table 4

THESE ARE TRANSMITTED AS CHECKED BELOW:
- ☐ For approval
- ☒ For your use
- ☐ As requested
- ☐ For review and comment
- ☐ With submittal review action noted

SUBMITTAL REVIEW ACTIONS:
- ☐ No exceptions taken
- ☐ Make revisions
- ☐ Amend and resubmit
- ☐ Rejected--see Remarks
- ☐ None

Copies	Date	No.	Description
1	12/31/98		September 1998 Groundwater Sampling Report BJ Services Company, U.S.A., Hobbs, New Mexico Facility Replacement Table 4 Cumulative Analytical Results for Groundwater Samples

REMARKS:

The enclosed are replacement pages for Table 4 of the September 1998 Groundwater Sampling Report, BJ Services Company, U.S.A., Hobbs, New Mexico Facility. Please remove and discard your current version of Table 4 and replace it with the revised Table 4, attached. The previous version of Table 4 did not contain September 1998 analytical data. We apologize for any inconveniences this may have caused.

cc: Chris Williams, State of New Mexico
Jo Ann Cobb, BJ Services Company, U.S.A.
Roger Sullivan, BJ Services Company, U.S.A.
Brown and Caldwell File
Transmittal File w/o attachment
Client File w/o attachment

Richard Rexroad

If enclosures are not as noted, kindly notify us at once

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Table 4

Cummulative Analytical Results for Groundwater Samples

Hobbs, New Mexico Facility

BJ Services Company, U.S.A.

Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
MW-1								
	8/10/92	Regular	5550	12090	2160	7370	NA	NA
	2/9/93	Regular	2100	6500	1300	7400	NA	NA
	8/19/93	Regular	3200	7300	1200	3700	NA	NA
	1/27/94	Regular	1930	4580	672	2390	NA	NA
	5/3/95	Regular	NSP	NSP	NSP	NSP	NA	NSP
	8/1/95	Regular	390	1300	230	800	NA	5.7
	11/15/95	Regular	880	1800	300	970	NA	6.8
	2/23/96	Regular	1500	3700	620	2200	NA	21
	5/31/96	Regular	1100	1700	380	990	NA	7.5
	8/23/96	Regular	1800	3300	570	2100	NA	17
	12/2/96	Regular	5600	9600	2100	9600	100	64
	3/12/97	Regular	5500	9700	2600	8200	22	62
	6/12/97	Regular	5300	34000	7500	27000	180	160
	9/12/97	Regular	1800	4400	1000	3000	23	21
	12/10/97	Regular	7600	12000	2800	8200	11	71
	3/24/98	Regular	4800	7200	1200	2400	4.2	38
	6/23/98	Regular	53	680	580	1400	1.4	9.2
	09/30/98	Regular	3.2	90	280	970	2.5	3.6
MW-2								
	8/10/92	Regular	14.9	< 4	< 4	< 4	NA	NA
	2/9/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	8/19/93	Regular	100	12	3	13	NA	NA
	1/27/94	Regular	< 1	1.2	2	2.5	NA	NA
MW-3								
	8/10/92	Regular	304.9	2099	6760	1586	NA	NA
	2/9/93	Regular	130	< 10	< 10	190	NA	NA
	8/19/93	Regular	560	3100	630	1900	NA	NA
	1/27/94	Regular	1070	5380	510	3120	NA	NA
	5/4/95	Regular	770	3300	470	1800	NA	NA
	8/1/95	Regular	490	2900	890	1600	NA	14
	11/15/95	Regular	250	1000	180	440	NA	2.9
	2/23/96	Regular	120	810	170	560	NA	4
	5/31/96	Regular	670	3900	1200	2300	NA	15
	8/23/96	Regular	330	2200	590	1500	NA	12
	12/2/96	Regular	220	1800	670	1000	0.89	7.4
	3/12/97	Regular	370	2000	960	1400	1.8	11
	6/12/97	Regular	860	4800	1700	2600	1.9	20
	9/11/97	Regular	770	3000	1600	1900	1.6	16
	12/10/97	Regular	240	740	500	450	0.59	5.3
	3/24/98	Regular	140	630	360	310	0.56	3.9
	6/23/98	Regular	100	720	350	490	0.40	4.9
	09/30/98	Regular	42	470	450	530	1.0	3.8

Table 4

Cummulative Analytical Results for Groundwater Samples

Hobbs, New Mexico Facility

BJ Services Company, U.S.A.

Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
MW-4								
	8/10/92	Regular	2594	10360	2160	6740	NA	NA
	2/9/93	Regular	5200	15000	2200	10000	NA	NA
	8/19/93	Regular	3000	12000	< 2000	7000	NA	NA
	1/27/94	Regular	NSP	NSP	NSP	NSP	NA	NSP
	5/3/95	Regular	NSP	NSP	NSP	NSP	NA	NSP
	8/1/95	Regular	5700	17000	3500	13000	NA	120
	11/15/95	Regular	490	1600	310	1100	NA	5.2
	2/23/96	Regular	360	2800	560	2500	NA	18
	5/31/96	Regular	84	830	280	1100	NA	6.2
	8/23/96	Regular	110	1400	430	1800	NA	9.8
	12/2/96	Regular	190	2000	1800	7200	56	43
	3/12/97	Regular	220	1500	1500	4400	27	27
	6/12/97	Regular	47	270	360	950	2.5	6.2
	9/12/97	Regular	92	840	670	2100	15	7.6
	12/10/97	Regular	230	750	970	2300	3.7	16
	3/24/98	Regular	150	510	270	620	1.2	5.6
	6/23/98	Regular	160	890	590	1600	0.69	10
	09/30/98	Regular	80	180	370	840	2.0	3.9
MW-5								
	8/10/92	Regular	< 4	< 4	< 4	< 4	NA	NA
	2/9/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	8/10/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	1/27/94	Regular	8.7	29.9	4	11.3	NA	NA
	5/3/95	Regular	3.7	5.3	0.92	4.6	NA	NA
	8/1/95	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	NA
	11/15/95	Regular	< 0.3	1.2	< 0.3	1.5	NA	NA
	2/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	NA
	5/31/96	Regular	31	86	10	20	NA	NA
	8/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	12/2/96	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	3/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	6/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	9/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	12/10/97	Regular	< 5	< 5	< 5	< 5	< 0.2	< 0.1
	3/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	6/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	09/30/98	Regular	< 1.0	< 1.0	< 1.0	< 1.0	< 0.20	< 0.1
MW-6								
	8/10/92	Regular	NS	NS	NS	NS	NA	NS
	2/9/93	Regular	7000	19000	3100	7200	NA	NA
	8/19/93	Regular	8100	19000	3500	6400	NA	NA
	1/27/94	Regular	7960	20200	3830	6150	NA	NA
	5/4/95	Regular	11000	17000	2900	6000	NA	NA

Table 4

Cummulative Analytical Results for Groundwater Samples

Hobbs, New Mexico Facility

BJ Services Company, U.S.A.

Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
	8/1/95	Regular	8300	12000	2500	5100	NA	60
	11/15/95	Regular	8900	17000	2900	5500	NA	57
	2/23/96	Regular	8100	10000	2300	4000	NA	58
	5/31/96	Regular	83	150	15	51	NA	0.57
	5/31/96	Duplicate	87	160	13	47	NA	0.52
	8/23/96	Regular	31	28	9.4	7.9	NA	0.46
	12/2/96	Regular	< 1	< 1	< 1	1.7	5.6	< 0.1
	3/12/97	Regular	12	< 5	6.8	18	12	< 0.5
	6/12/97	Regular	1900	1400	410	310	7.8	7.4
	9/11/97	Regular	11	1.3	3.4	< 1	1	< 0.1
	12/10/97	Regular	3	4.2	1.2	3.9	1.7	0.14
	3/23/98	Regular	3.6	< 1	4	< 1	< 0.2	< 0.1
	6/23/98	Regular	170	4.1	15	7.2	1.2	0.51
	09/30/98	Regular	1000	420	140	270	4.0	3.3
MW-7								
	8/10/92	Regular	NS	NS	NS	NS	NA	NS
	2/9/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	8/19/93	Regular	< 2	3	< 2	< 2	NA	NA
	1/27/94	Regular	1.1	< 1	< 1	< 1	NA	NA
	5/3/95	Regular	52	3.4	0.67	2.8	NA	NA
	8/1/95	Regular	22	2.2	0.85	2.8	NA	< 0.1
	11/15/95	Regular	8.4	0.77	< 0.3	0.93	NA	< 0.1
	2/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	2/23/96	Duplicate	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	5/31/96	Regular	29	83	10	21	NA	0.25
	8/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	12/2/96	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	3/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	6/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	9/11/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	12/10/97	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	3/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	6/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	09/30/98	Regular	< 1.0	< 1.0	< 1.0	< 1.0	< 0.20	< 0.1
MW-8								
	8/10/92	Regular	NS	NS	NS	NS	NA	NS
	2/9/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	8/19/93	Regular	< 2	< 2	< 2	< 2	NA	NA
	1/27/94	Regular	< 1	< 1	< 1	< 1	NA	NA
	5/3/95	Regular	3	4.9	0.75	3.7	NA	NA
	8/1/95	Regular	3.1	1.2	0.47	1.6	NA	< 0.001
	8/1/95	Duplicate	3.6	1.5	0.51	1.5	NA	< 0.1
	11/15/95	Regular	< 0.3	0.52	< 0.3	< 0.6	NA	< 0.1
	2/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1

Table 4

Cummulative Analytical Results for Groundwater Samples

Hobbs, New Mexico Facility

BJ Services Company, U.S.A.

Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
	5/31/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	8/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	12/2/96	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	3/12/97	Regular	< 1	< 1	< 1	1.8	< 0.1	< 0.1
	6/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	9/11/97	Regular	< 1	< 1	< 1	< 1	0.1	< 0.1
	12/10/97	Regular	< 1	< 1	< 1	< 1	0.3	< 0.1
	3/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	6/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	09/30/98	Regular	< 1.0	< 1.0	< 1.0	< 1.0	< 0.20	< 0.1
MW-9								
	4/22/93	Regular	570	380	< 50	870	NA	NA
	7/15/93	Regular	121	7.3	3	458	NA	NA
	8/19/93	Regular	390	290	40	250	NA	NA
	1/27/94	Regular	327	357	51.1	293	NA	NA
	5/3/95	Regular	380	110	19	120	NA	NA
	8/1/95	Regular	660	410	91	310	NA	6.2
	11/15/95	Regular	240	24	11	140	NA	1.5
	11/15/95	Duplicate	170	18	10	120	NA	1.9
	2/23/96	Regular	170	18	2.3	160	NA	4.3
	5/31/96	Regular	120	16	3	200	NA	NA
	8/23/96	Regular	82	13	6	270	NA	4
	8/23/96	Duplicate	76	14	4.8	250	NA	4.4
	12/2/96	Regular	61	< 25	< 25	210	2.6	2.8
	12/2/96	Duplicate	86	13	2.4	270	3.7	2.9
	3/12/97	Regular	30	48	420	880	8.2	19
	6/12/97	Regular	4.7	2.1	11	97	2.6	2.2
	6/12/97	Duplicate	< 5	< 5	6.6	69	5.2	1.9
	9/12/97	Regular	2.1	2.3	2.1	120	1.2	1.9
	12/10/97	Regular	4.9	9	6.8	62	0.86	0.92
	3/24/98	Regular	< 1	< 1	< 1	26	0.9	1
	6/23/98	Regular	2.4	22	10	36	< 0.2	0.25
	09/30/98	Regular	1.1	5.5	21	59	0.27	0.27
MW-10								
	8/19/93	Regular	190	460	< 200	240	NA	NA
	1/27/94	Regular	13.4	4	5.5	33.6	NA	NA
	5/4/95	Regular	980	15	11	84	NA	NA
	8/1/95	Regular	1300	32	32	100	NA	3.6
	11/15/95	Regular	1000	24	15	36	NA	1.7
	2/23/96	Regular	810	23	27	44	NA	2.4
	5/31/96	Regular	700	24	34	28	NA	2
	8/23/96	Regular	290	3.4	6.4	13	NA	1.4
	12/2/96	Regular	280	1.3	17	8	0.94	0.97
	3/12/97	Regular	110	< 5	17	< 5	0.61	0.57

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Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
	6/12/97	Regular	150	12	30	< 5	0.68	< 0.5
	9/12/97	Regular	87	2.3	26	2.7	0.76	0.33
	9/12/97	Duplicate	87	2.4	26	2.8	0.79	0.33
	12/10/97	Regular	41	9.8	12	7.7	1.1	0.28
	12/10/97	Duplicate	36	8.5	10	6.7	1.2	0.24
	3/23/98	Regular	36	< 5	5.9	< 5	1.6	< 0.5
	3/23/98	Duplicate	36	< 1	5.3	1.3	1.7	0.18
	6/23/98	Regular	37	< 5	< 5	< 5	2.1	< 0.5
	09/30/98	Regular	84	3.2	30	2.2	1.4	0.36
MW-11								
	8/19/93	Regular	< 2	< 2	< 2	< 2	NA	NA
	1/27/94	Regular	< 1	< 1	< 1	< 1	NA	NA
	5/4/95	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	NA
	8/1/95	Regular	44	29	5.5	13	NA	0.2
	11/15/95	Regular	190	2.8	6.2	11	NA	0.4
	2/23/96	Regular	49	1.2	0.51	4	NA	0.25
	5/31/96	Regular	300	83	12	28	NA	0.8
	8/23/96	Regular	100	1.2	0.3	4.7	NA	0.26
	12/2/96	Regular	970	< 5	6	8.1	2	1.3
	3/12/97	Regular	130	< 5	13	5.8	0.42	< 0.5
	3/12/97	Duplicate	100	< 5	10	5.1	0.43	< 0.5
	6/12/97	Regular	150	23	19	< 5	1.1	0.55
	9/12/97	Regular	220	15	27	13	1	0.46
MW-11A								
	3/24/98	Regular	24	5	< 5	< 5	0.28	0.14
	6/23/98	Regular	9.9	< 5	< 5	< 5	< 0.2	< 0.5
	09/30/98	Regular	9.3	3.7	2.2	7.0	<0.20	0.1
MW-12								
	3/24/98	Regular	100	11	6	8	0.29	0.41
	6/23/98	Regular	88	< 5	< 5	< 5	< 0.2	< 0.5
	6/23/98	Duplicate	89	< 5	< 5	< 5	0.31	< 0.5
	09/30/98	Regular	260	3.0	1.2	7.9	<0.20	0.62

MW-2 destroyed after January, 1994 MW-11 destroyed after September, 1997

NA = Not Analyzed NS = Not Sampled

NSP = Not Sampled due to Phase Separated Hydrocarbons

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Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
MW-1								
	8/10/92	Regular	5550	12090	2160	7370	NA	NA
	2/9/93	Regular	2100	6500	1300	7400	NA	NA
	8/19/93	Regular	3200	7300	1200	3700	NA	NA
	1/27/94	Regular	1930	4580	672	2390	NA	NA
	5/3/95	Regular	NSP	NSP	NSP	NSP	NA	NSP
	8/1/95	Regular	390	1300	230	800	NA	5.7
	11/15/95	Regular	880	1800	300	970	NA	6.8
	2/23/96	Regular	1500	3700	620	2200	NA	21
	5/31/96	Regular	1100	1700	380	990	NA	7.5
	8/23/96	Regular	1800	3300	570	2100	NA	17
	12/2/96	Regular	5600	9600	2100	9600	100	64
	3/12/97	Regular	5500	9700	2600	8200	22	62
	6/12/97	Regular	5300	34000	7500	27000	180	160
	9/12/97	Regular	1800	4400	1000	3000	23	21
	12/10/97	Regular	7600	12000	2800	8200	11	71
	3/24/98	Regular	4800	7200	1200	2400	4.2	38
	6/23/98	Regular	53	680	580	1400	1.4	9.2
MW-2								
	8/10/92	Regular	14.9	< 4	< 4	< 4	NA	NA
	2/9/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	8/19/93	Regular	100	12	3	13	NA	NA
	1/27/94	Regular	< 1	1.2	2	2.5	NA	NA
MW-3								
	8/10/92	Regular	304.9	2099	6760	1586	NA	NA
	2/9/93	Regular	130	< 10	< 10	190	NA	NA
	8/19/93	Regular	560	3100	630	1900	NA	NA
	1/27/94	Regular	1070	5380	510	3120	NA	NA
	5/4/95	Regular	770	3300	470	1800	NA	NA
	8/1/95	Regular	490	2900	890	1600	NA	14
	11/15/95	Regular	250	1000	180	440	NA	2.9
	2/23/96	Regular	120	810	170	560	NA	4
	5/31/96	Regular	670	3900	1200	2300	NA	15
	8/23/96	Regular	330	2200	590	1500	NA	12
	12/2/96	Regular	220	1800	670	1000	0.89	7.4
	3/12/97	Regular	370	2000	960	1400	1.8	11
	6/12/97	Regular	860	4800	1700	2600	1.9	20
	9/11/97	Regular	770	3000	1600	1900	1.6	16
	12/10/97	Regular	240	740	500	450	0.59	5.3
	3/24/98	Regular	140	630	360	310	0.56	3.9
	6/23/98	Regular	100	720	350	490	0.40	4.9
MW-4								
	8/10/92	Regular	2594	10360	2160	6740	NA	NA
	2/9/93	Regular	5200	15000	2200	10000	NA	NA

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Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
MW-4	8/19/93	Regular	3000	12000	< 2000	7000	NA	NA
	1/27/94	Regular	NSP	NSP	NSP	NSP	NA	NSP
	5/3/95	Regular	NSP	NSP	NSP	NSP	NA	NSP
	8/1/95	Regular	5700	17000	3500	13000	NA	120
	11/15/95	Regular	490	1600	310	1100	NA	5.2
	2/23/96	Regular	360	2800	560	2500	NA	18
	5/31/96	Regular	84	830	280	1100	NA	6.2
	8/23/96	Regular	110	1400	430	1800	NA	9.8
	12/2/96	Regular	190	2000	1800	7200	56	43
	3/12/97	Regular	220	1500	1500	4400	27	27
	6/12/97	Regular	47	270	360	950	2.5	6.2
	9/12/97	Regular	92	840	670	2100	15	7.6
	12/10/97	Regular	230	750	970	2300	3.7	16
	3/24/98	Regular	150	510	270	620	1.2	5.6
	6/23/98	Regular	160	890	590	1600	0.69	10
MW-5								
	8/10/92	Regular	< 4	< 4	< 4	< 4	NA	NA
	2/9/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	8/10/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	1/27/94	Regular	8.7	29.9	4	11.3	NA	NA
	5/3/95	Regular	3.7	5.3	0.92	4.6	NA	NA
	8/1/95	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	NA
	11/15/95	Regular	< 0.3	1.2	< 0.3	1.5	NA	NA
	2/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	NA
	5/31/96	Regular	31	86	10	20	NA	NA
	8/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	12/2/96	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	3/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	6/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	9/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	12/10/97	Regular	< 5	< 5	< 5	< 5	< 0.2	< 0.1
	3/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	6/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
MW-6								
	8/10/92	Regular	NS	NS	NS	NS	NA	NS
	2/9/93	Regular	7000	19000	3100	7200	NA	NA
	8/19/93	Regular	8100	19000	3500	6400	NA	NA
	1/27/94	Regular	7960	20200	3830	6150	NA	NA
	5/4/95	Regular	11000	17000	2900	6000	NA	NA
	8/1/95	Regular	8300	12000	2500	5100	NA	60
	11/15/95	Regular	8900	17000	2900	5500	NA	57
	2/23/96	Regular	8100	10000	2300	4000	NA	58
	5/31/96	Regular	83	150	15	51	NA	0.57
	5/31/96	Duplicate	87	160	13	47	NA	0.52

Table 4

Cummulative Analytical Results for Groundwater Samples

Hobbs, New Mexico Facility

BJ Services Company, U.S.A.

Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
	8/23/96	Regular	31	28	9.4	7.9	NA	0.46
	12/2/96	Regular	< 1	< 1	< 1	1.7	5.6	< 0.1
	3/12/97	Regular	12	< 5	6.8	18	12	< 0.5
	6/12/97	Regular	1900	1400	410	310	7.8	7.4
	9/11/97	Regular	11	1.3	3.4	< 1	1	< 0.1
	12/10/97	Regular	3	4.2	1.2	3.9	1.7	0.14
	3/23/98	Regular	3.6	< 1	4	< 1	< 0.2	< 0.1
	6/23/98	Regular	170	4.1	15	7.2	1.2	0.51
MW-7								
	8/10/92	Regular	NS	NS	NS	NS	NA	NS
	2/9/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	8/19/93	Regular	< 2	3	< 2	< 2	NA	NA
	1/27/94	Regular	1.1	< 1	< 1	< 1	NA	NA
	5/3/95	Regular	52	3.4	0.67	2.8	NA	NA
	8/1/95	Regular	22	2.2	0.85	2.8	NA	< 0.1
	11/15/95	Regular	8.4	0.77	< 0.3	0.93	NA	< 0.1
	2/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	2/23/96	Duplicate	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	5/31/96	Regular	29	83	10	21	NA	0.25
	8/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	12/2/96	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	3/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	6/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	9/11/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	12/10/97	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	3/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	6/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
MW-8								
	8/10/92	Regular	NS	NS	NS	NS	NA	NS
	2/9/93	Regular	< 2	< 2	< 2	< 6	NA	NA
	8/19/93	Regular	< 2	< 2	< 2	< 2	NA	NA
	1/27/94	Regular	< 1	< 1	< 1	< 1	NA	NA
	5/3/95	Regular	3	4.9	0.75	3.7	NA	NA
	8/1/95	Regular	3.1	1.2	0.47	1.6	NA	< 0.001
	8/1/95	Duplicate	3.6	1.5	0.51	1.5	NA	< 0.1
	11/15/95	Regular	< 0.3	0.52	< 0.3	< 0.6	NA	< 0.1
	2/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	5/31/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	8/23/96	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	< 0.1
	12/2/96	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	3/12/97	Regular	< 1	< 1	< 1	1.8	< 0.1	< 0.1
	6/12/97	Regular	< 1	< 1	< 1	< 1	< 0.1	< 0.1
	9/11/97	Regular	< 1	< 1	< 1	< 1	0.1	< 0.1
	12/10/97	Regular	< 1	< 1	< 1	< 1	0.3	< 0.1

Table 4

Cummulative Analytical Results for Groundwater Samples

Hobbs, New Mexico Facility

BJ Services Company, U.S.A.

Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
	3/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
	6/23/98	Regular	< 1	< 1	< 1	< 1	< 0.2	< 0.1
MW-9								
	4/22/93	Regular	570	380	< 50	870	NA	NA
	7/15/93	Regular	121	7.3	3	458	NA	NA
	8/19/93	Regular	390	290	40	250	NA	NA
	1/27/94	Regular	327	357	51.1	293	NA	NA
	5/3/95	Regular	380	110	19	120	NA	NA
	8/1/95	Regular	660	410	91	310	NA	6.2
	11/15/95	Regular	240	24	11	140	NA	1.5
	11/15/95	Duplicate	170	18	10	120	NA	1.9
	2/23/96	Regular	170	18	2.3	160	NA	4.3
	5/31/96	Regular	120	16	3	200	NA	NA
	8/23/96	Regular	82	13	6	270	NA	4
	8/23/96	Duplicate	76	14	4.8	250	NA	4.4
	12/2/96	Regular	61	< 25	< 25	210	2.6	2.8
MW-9	12/2/96	Duplicate	86	13	2.4	270	3.7	2.9
	3/12/97	Regular	30	48	420	880	8.2	19
	6/12/97	Regular	4.7	2.1	11	97	2.6	2.2
	6/12/97	Duplicate	< 5	< 5	6.6	69	5.2	1.9
	9/12/97	Regular	2.1	2.3	2.1	120	1.2	1.9
	12/10/97	Regular	4.9	9	6.8	62	0.86	0.92
	3/24/98	Regular	< 1	< 1	< 1	26	0.9	1
	6/23/98	Regular	2.4	22	10	36	< 0.2	0.25
MW-10								
	8/19/93	Regular	190	460	< 200	240	NA	NA
	1/27/94	Regular	13.4	4	5.5	33.6	NA	NA
	5/4/95	Regular	980	15	11	84	NA	NA
	8/1/95	Regular	1300	32	32	100	NA	3.6
	11/15/95	Regular	1000	24	15	36	NA	1.7
	2/23/96	Regular	810	23	27	44	NA	2.4
	5/31/96	Regular	700	24	34	28	NA	2
	8/23/96	Regular	290	3.4	6.4	13	NA	1.4
	12/2/96	Regular	280	1.3	17	8	0.94	0.97
	3/12/97	Regular	110	< 5	17	< 5	0.61	0.57
	6/12/97	Regular	150	12	30	< 5	0.68	< 0.5
	9/12/97	Regular	87	2.3	26	2.7	0.76	0.33
	9/12/97	Duplicate	87	2.4	26	2.8	0.79	0.33
	12/10/97	Regular	41	9.8	12	7.7	1.1	0.28
	12/10/97	Duplicate	36	8.5	10	6.7	1.2	0.24
	3/23/98	Regular	36	< 5	5.9	< 5	1.6	< 0.5
	3/23/98	Duplicate	36	< 1	5.3	1.3	1.7	0.18
	6/23/98	Regular	37	< 5	< 5	< 5	2.1	< 0.5
MW-11								

Table 4

Cummulative Analytical Results for Groundwater Samples

Hobbs, New Mexico Facility

BJ Services Company, U.S.A.

Monitor Well	Sample Date	Sample Type	Benzene	Toluene	Ethylbenzene	Xylenes	TPH-D	TPH-G
			micrograms per liter, ug/l				milligrams per liter, mg/L	
	8/19/93	Regular	< 2	< 2	< 2	< 2	NA	NA
	1/27/94	Regular	< 1	< 1	< 1	< 1	NA	NA
	5/4/95	Regular	< 0.3	< 0.3	< 0.3	< 0.6	NA	NA
	8/1/95	Regular	44	29	5.5	13	NA	0.2
	11/15/95	Regular	190	2.8	6.2	11	NA	0.4
	2/23/96	Regular	49	1.2	0.51	4	NA	0.25
	5/31/96	Regular	300	83	12	28	NA	0.8
	8/23/96	Regular	100	1.2	0.3	4.7	NA	0.26
	12/2/96	Regular	970	< 5	6	8.1	2	1.3
	3/12/97	Regular	130	< 5	13	5.8	0.42	< 0.5
	3/12/97	Duplicate	100	< 5	10	5.1	0.43	< 0.5
	6/12/97	Regular	150	23	19	< 5	1.1	0.55
	9/12/97	Regular	220	15	27	13	1	0.46
MW-11A								
	3/24/98	Regular	24	5	< 5	< 5	0.28	0.14
	6/23/98	Regular	9.9	< 5	< 5	< 5	< 0.2	< 0.5
MW-12								
	3/24/98	Regular	100	11	6	8	0.29	0.41
	6/23/98	Regular	88	< 5	< 5	< 5	< 0.2	< 0.5
	6/23/98	Duplicate	89	< 5	< 5	< 5	0.31	< 0.5

MW-2 destroyed after January, 1994 MW-11 destroyed after September, 1997

NA = Not Analyzed NS = Not Sampled

NSP = Not Sampled due to Phase Separated Hydrocarbons

Table 5

Laboratory Analytical Results for Natural Attenuation Evaluation Parameters
BJ Services Company, U.S.A.
Hobbs, New Mexico

	Date	Nitrate (mg/L)	Sulfate (mg/L)	Dissolved Methane (ppm)
MW-10	6/23/98	<0.1	325	0.55
	9/30/98	<0.1	204	0.81
MW-11A	6/23/98	<0.1	225	0.11
	9/30/98	0.4	196	0.043
MW-12	6/23/98	<0.1	240	<0.0012
	9/30/98	<0.1	168	<0.0012

Table 6
Summary of Analytical Results for Air Emissions
Hobbs, New Mexico Facilty
BJ Services Company, U.S.A.

Sample Number	Sample Date	Benzene	Toluene	Ethylbenzene	Xylenes	TPH	Discharge Rate, scfm	Benzene Emission Rate, lb/hr	Total BTEX Emission Rate, lb/hr	TPH Emission Rate, lb/hr
		parts per million by volume, ppmv								
Extraction-1	9/19/95	790	1100	340	920	9700	132.47	1.235	5.943	16.31
Effluent-1	9/20/95	990	2500	560	1600	16000	135.76	1.575	10.939	27.37
Effluent-2	9/28/95	13	28	6	18	2533	123.56	0.019	0.112	3.89
Effluent-4	11/7/95	15	58	12	36	1500	131.10	0.024	0.239	2.59
Effluent 111595-01	11/15/95	39	180	42	130	1870	133.33	0.062	0.773	3.21
Effluent 121995-01	12/19/95	10	45	11	33	530	129.64	0.016	0.191	0.89
Effluent 12996-01	1/29/96	12	61	17	53	1200	128.45	0.018	0.271	1.95
Effluent 032296-01	3/22/96	6	44	12	40	990	124.68	0.009	0.189	1.56
Effluent 042496-01	4/25/96	4	37	10	36	900	118.34	0.005	0.147	1.29
Effluent 053196-01	5/31/96	3.7	40	10	33	670	124.11	0.005	0.158	1.04
Effluent 082396-01	8/23/96	<5	12	<5	<5	200	126.18	0.007	0.047	0.31
Effluent 120296-01	12/2/96	<1	<1	<1	<1	<5	129.04	0.002	0.008	0.01
Eff-31297-1	3/12/97	2.1	15	4.6	15	250	110.56	0.003	0.057	0.33
Effluent 070297-01	7/2/97	<1	6.3	2.4	8.6	65	109.90	0.001	0.028	0.08
Monitor 970912 (1)	9/12/97	NA	NA	NA	NA	340	105.40	NA	NA	0.39
Eff-1-2832	12/10/97	<0.001	0.013	0.009	0.031	210	106.27	0.000	0.000	0.28
Monitor 980324 (1)	3/24/98	NA	NA	NA	NA	1500	108.97	NA	NA	1.91
Monitor 980622 (1)	6/22/98	NA	NA	NA	NA	190	108.16	NA	NA	0.24
Monitor 980930 (1)	9/30/98	NA	NA	NA	NA	200	150.00	NA	NA	0.26

Emmission rates reported for 12/02/96 sampling event were calculated using the detection limits. The actual emissions were Benzene <0.001 lb/hr, BTEX, <0.01 lb/hr and TPH <0.01 lb/hr.

NA = Not Analyzed
(1) All analysis based on field FID readings

Appendices

APPENDICES

A

APPENDIX A

Groundwater Sampling Forms

BROWN AND CALDWELL

WELL ID: |

Groundwater Sampling Field Data Sheet

Project Number: 2832 Task Number: 12 Date: 9/30/94

Casing Diameter: 2 inches	Purge Equipment: Submersible pump	Equipment Calibration - Time
Total Depth of Well from TOC: 64 feet		pH = at °C
Static Water from TOC: 56.82 feet	Sample Equipment	pH = at °C
Product Level from TOC: Sheen feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 7.18 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	Measured Value: µmhos/cm at 25° C
Well Volume: 1.2 gal		*Dissolved Oxygen* DO Meter Calibrated to: mg/L
Screened Interval (from GS): feet		

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
	0	0.25						Sheen
	1	1.2						Sheen
	2	2.4						Sheen
1740	3	3.6						Sheen

Geochemical Parameters		*Comments:*
Ferrous Iron:	Ø mg/L	Sampled @ 1740
Dissolved Oxygen:	Ø mg/L	
Nitrate:	mg/L	
Alkalinity	200 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Drummed	

BROWN AND CALDWELL

WELL ID: 3

Groundwater Sampling Field Data Sheet

Project Number: 2832 Task Number: 12 Date: 5-30-98

Casing Diameter: 2 inches	Purge Equipment: Submersible pump	Equipment Calibration - Time
Total Depth of Well from TOC: ~~62.00~~ feet		pH = at °C
Static Water from TOC: 54.06 feet	Sample Equipment	pH = at °C
Product Level from TOC: 0 feet		Conductivity: Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 7.94 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	Measured Value: µmhos/cm at 25° C
Well Volume: 1.3 gal		Dissolved Oxygen: DO Meter Calibrated to: mg/L
Screened Interval (from GS): feet		

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
1638	0	0.25	7.42	22.8	1398	106.1	6.66 ~~7.76~~	Clear
1440	1	1.3	7.30	22.4	1360	90.4	5.56	clear
1442	2	2.6	7.28	22.50	1294	67.6	5.76	clear
1444	3	3.9	7.24	21.50	1286	32.2	4.84	clear

Geochemical Parameters		*Comments:*
Ferrous Iron:	0 mg/L	Sampled 1444
Dissolved Oxygen:	0.2 mg/L	
Nitrate:	N/A mg/L	
Alkalinity	320 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Drummed	

BROWN AND CALDWELL

WELL ID: MW-4

Groundwater Sampling Field Data Sheet

Project Number: 2532 Task Number: 12 Date: 9.30.08

Casing Diameter: 2 inches	Purge Equipment: Submersible pump	Equipment Calibration - Time
Total Depth of Well from TOC: 61.52 feet		pH = at °C
Static Water from TOC: 53.96 feet	Sample Equipment	pH = at °C
Product Level from TOC: 0 feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 7.56 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	Measured Value: µmhos/cm at 25° C
Well Volume: 1.2 gal		*Dissolved Oxygen* DO Meter Calibrated to: mg/L
Screened Interval (from GS): feet		

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
	0	0.25						Sheen
	1	1.2						Sheen
	2	2.4						Sheen
1830	3	3.6						Sheen

Geochemical Parameters		*Comments:*
Ferrous Iron:	0.1 mg/L	200 mL PS 11
Dissolved Oxygen:	0 mg/L	1830
Nitrate:	mg/L	
Alkalinity	240 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Drummed	

BROWN AND CALDWELL

WELL ID: MW-5

Groundwater Sampling Field Data Sheet

Project Number: 2832 Task Number: 12 Date: 9/30/98

Casing Diameter: 2 inches	Purge Equipment: Submersible pump	Equipment Calibration - Time
Total Depth of Well from TOC: ~~64.45~~ ~~55.65~~ 64.45 feet		pH = at °C
Static Water from TOC: ~~64.45~~ 55.65 feet	Sample Equipment	pH = at °C
Product Level from TOC: 0 feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 8.8 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	Measured Value: µmhos/cm at 25° C
Well Volume: 1.5 gal		*Dissolved Oxygen* DO Meter Calibrated to: mg/L
Screened Interval (from GS) feet		

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
1140	0	0.25	7.34	22.28	1156	217.3	6.95	Slightly Cloudy
1143	1	1.5	7.27	20.48	1150	203.2	6.84	Clear
1146	2	3.0	7.25	19.87	1118	193.7	6.00	Clear
1149	3	4.5	7.21	20.12	1103	182.8	5.67	Clear

Geochemical Parameters		*Comments:*
Ferrous Iron:	mg/L	
Dissolved Oxygen:	mg/L	
Nitrate:	mg/L	
Alkalinity	mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Ground	

BROWN AND CALDWELL

WELL ID: 6

Groundwater Sampling Field Data Sheet

Project Number: 2832 Task Number: 12 Date: 9/30/96

Casing Diameter: 2 inches	Purge Equipment: Submersible pump	Equipment Calibration - Time
Total Depth of Well from TOC: 60' feet		pH = at °C
Static Water from TOC: 54.89 feet	Sample Equipment	pH = at °C
Product Level from TOC: 0 feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 5.11 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	Measured Value: µmhos/cm at 25° C
Well Volume: 0.87 gal		*Dissolved Oxygen* DO Meter Calibrated to: mg/L
Screened Interval (from GS): feet		

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
1231	0	0.0	8.19	25.42	1197	35.2	9.56	Clear
1235	1	0.9	7.90	24.06	1108	234.2	8.42	clear
1235	2	1.8	7.97	24.36	1152	211.7	7.58	clear
1239	3	2.7	7.86	25.02	1210	260.7	6.50	clear

Geochemical Parameters		*Comments:*
Ferrous Iron:	0 mg/L	Sampled @ 1239
Dissolved Oxygen:	1 mg/L	
Nitrate:	N/A mg/L	
Alkalinity	200 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Drained	

BROWN AND CALDWELL

WELL ID: 7

Groundwater Sampling Field Data Sheet

Project Number: 2832 Task Number: 12 Date: 9/30/98

Casing Diameter: 2 inches	Purge Equipment: Submersible pump	Equipment Calibration - Time
Total Depth of Well from TOC: 62.50 feet		pH = at °C
Static Water from TOC: 54.54 feet	Sample Equipment	pH = at °C
Product Level from TOC: 0 feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 6.96 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	Measured Value: µmhos/cm at 25° C
Well Volume: 1.18 gal		*Dissolved Oxygen* DO Meter Calibrated to: mg/L
Screened Interval (from GS): feet		

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
1018	0	0.25	7.46	21.2	1590	44.1	4.39	Clear
1028	1	1.2	6.98	22.67	1595	53.4	6.10	Clear
1035	2	2.4	6.68	24.78	1650	120.1	4.83	Clear
1045	3	3.6	6.79	23.27	1596	100.9	4.53	Clear

Geochemical Parameters		*Comments:*
Ferrous Iron:	0 mg/L	Sample @ 1045
Dissolved Oxygen:	0 mg/L	
Nitrate:	NA mg/L	
Alkalinity	340 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Drummed	

BROWN AND CALDWELL

WELL ID: 8

Groundwater Sampling Field Data Sheet

Project Number: 2832 Task Number: 12 Date: 9/30/97

Casing Diameter: 2 inches	Purge Equipment: Submersible pump	Equipment Calibration - Time
Total Depth of Well from TOC: 62.3 feet		pH = at °C
Static Water from TOC: 54.35 feet	Sample Equipment	pH = at °C
Product Level from TOC: 0 feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 7.95 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	Measured Value: µmhos/cm at 25° C
Well Volume: 1.3 gal		*Dissolved Oxygen* DO Meter Calibrated to: mg/L
Screened Interval (from GS): feet		

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
1110	0	0.25	7.36	24.55	1734	66.7	4.72	Cloudy
1112	1	1.3	7.06	20.49	1638	54.3	1.92	Slightly Cloudy
1114	2	2.6	7.27	22.83	1726	43.8	4.50	Slightly Cloudy
1116	3	3.9	6.95	23.32	1758	27.3	2.83	Slightly Cloudy

Geochemical Parameters		*Comments:*
Ferrous Iron:	1 mg/L	1116 Sampled @
Dissolved Oxygen:	0 mg/L	
Nitrate:	mg/L	
Alkalinity	400 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Drummed	

BROWN AND CALDWELL

WELL ID: 9

Groundwater Sampling Field Data Sheet

Project Number: 2832 Task Number: 12 Date: 4/30/98

Casing Diameter: 2 inches	Purge Equipment: Submersible pump	Equipment Calibration - Time
Total Depth of Well from TOC: 60.60 feet		pH = at °C
Static Water from TOC: 53.39 feet	Sample Equipment	pH = at °C
Product Level from TOC: >53.38 feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 7.21 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	Measured Value: µmhos/cm at 25° C
Well Volume: 1.22 gal		*Dissolved Oxygen* DO Meter Calibrated to: mg/L
Screened Interval (from GS): feet		

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
	0	0.25						Sheen
	1	1.2						Sheen
	2	2.4						Sheen
1900	3	3.6						Sheen

Geochemical Parameters		*Comments:*
Ferrous Iron:	0.2 mg/L	Sample @ 1900
Dissolved Oxygen:	2.2 mg/L	
Nitrate:	— mg/L	
Alkalinity	380 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Drummed	

BROWN AND CALDWELL

WELL ID: 10

Groundwater Sampling Field Data Sheet

Project Number: 2832 Task Number: 12 Date: 9/30/98

Casing Diameter: 2 inches	Purge Equipment: Submersible pump	Equipment Calibration - Time
Total Depth of Well from TOC: ~~65.16~~ 63 feet		pH = at °C
Static Water from TOC: 55.61 feet	Sample Equipment: Submersible Pump	pH = at °C
Product Level from TOC: 0 feet		*Conductivity* Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 7.39 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	Measured Value: µmhos/cm at 25° C
Well Volume: 1.2 gal		*Dissolved Oxygen* DO Meter Calibrated to: mg/L
Screened Interval (from GS): feet		

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
1458	0	0.25	2.06	26.09	6800	-106.9	0.90	Cloudy
1431	1	1.2	2.03	23.62	5320	-115.4	2.06	~~Slightly~~ Cloudy
1434	2	2.4	7.24	24.59	5314	-92.8	2.27	Slightly Cloudy
1436	3	3.6						

Geochemical Parameters		*Comments:*
Ferrous Iron:	7 mg/L	
Dissolved Oxygen:	0 mg/L	Duplicate Sample 2832
Nitrate:	66 mg/L	
Alkalinity	≤ 400 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Ground	

BROWN AND CALDWELL

WELL ID: 117

Groundwater Sampling Field Data Sheet

Project Number: 2832 Task Number: 12 Date: 9/30/98

Casing Diameter	Purge Equipment	Equipment Calibration - Time
2 inches	Submersible pump	pH = at °C
Total Depth of Well from TOC: 63.50 feet		pH = at °C
Static Water from TOC: 55.96 feet	Sample Equipment	*Conductivity*
Product Level from TOC: 0 feet		Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 7.54 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.)	Measured Value: µmhos/cm at 25° C
Well Volume: 1.28 gal	YSI 600, Hach Kits for DO, Ferrous	*Dissolved Oxygen*
Screened Interval (from GS) feet		DO Meter Calibrated to: mg/L

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
1315	0	0.25	7.19	22.13	3577	-106.6	1.13	Cloudy
1318	1	1.3	7.03	21.20	2891	-76.3	0.91	Slight Cloudy
1320	2	2.6	6.91	21.11	2890	-83.4	0.63	Slight Cloudy
1324	3	3.9	6.66	21.10	2220	-56.6	0.65	Clear

Geochemical Parameters		*Comments:*
Ferrous Iron:	0 mg/L	
Dissolved Oxygen:	0 mg/L	
Nitrate:	mg/L	
Alkalinity	380 mg/L	

PPE Worn:	*Sampler's Signature:*
Nitrile Gloves	
Disposition of Purge Water: Drummed	

BROWN AND CALDWELL

WELL ID: 12

Groundwater Sampling Field Data Sheet

Project Number: 2832 Task Number: 12 Date: 9/30/98

Casing Diameter: 2 inches	Purge Equipment: Submersible pump	Equipment Calibration - Time
Total Depth of Well from TOC: 64.00 feet		pH = at °C
Static Water from TOC: 56.02 feet	Sample Equipment	pH = at °C
Product Level from TOC: 0 feet		Conductivity: Conductance Standard: µmhos/cm at 25° C
Length of Water Column: 7.98 feet	Analytical Equipment (pH, DO, Redox, filtration, etc.): YSI 600, Hach Kits for DO, Ferrous	Measured Value: µmhos/cm at 25° C
Well Volume: 1.3 gal		Dissolved Oxygen: DO Meter Calibrated to: mg/L
Screened Interval (from GS): feet		

Time	Well Volume	Gallons Removed	pH	Temp	Conductivity	Redox	Dissolved Oxygen	Visual Description
1344	0	0.25	7.29	22.36	1717	-114.5	2.38	Slightly Cloudy
1346	1	1.3	7.18	20.98	1615	-122.9	1.03	Clear
1349	2	2.6	7.00	20.46	1759	-108.0	0.73	Clear
1357	3	3.9	6.97	20.32	1795	-106.5	0.61	Clear

Geochemical Parameters		*Comments:*
Ferrous Iron:	8 mg/L	
Dissolved Oxygen:	0 mg/L	
Nitrate:	mg/L	
Alkalinity	380 mg/L	

PPE Worn: *Nitrile Gloves*	*Sampler's Signature:*
Disposition of Purge Water: Ground	

B

APPENDIX B

Laboratory Analytical Report for Groundwater Samples

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

October 16, 1998

Mr. Rick Rexroad
BROWN AND CALDWELL
1415 Louisiana
Houston, TX 77002

The following report contains analytical results for the sample(s) received at Southern Petroleum Laboratories (SPL) on October 1, 1998. The sample(s) was assigned to Certificate of Analysis No.(s) 9810018 and analyzed for all parameters as listed on the chain of custody.

Any data flags or quality control exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s).

If you have any questions or comments pertaining to this data report, please do not hesitate to contact me. Please reference the above Certificate of Analysis No. during any inquiries.

Again, SPL is pleased to be of service to you. We anticipate working with you in fulfilling all your current and future analytical needs.

Southern Petroleum Laboratories

Bernadette A. Fini
Senior Project Manager

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Southern Petroleum Laboratories, Inc.

Certificate of Analysis Number: 98-10-018

Approved for Release by:

Bernadette A. Fini, Senior Project Manager — 10-16-98 Date

Greg Grandits
Laboratory Director

Cynthia Schreiner
Quality Assurance Officer

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-01

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-10

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 14:36:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	0.36	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	90		
1,4-Difluorobenzene	73		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 10/08/98			
BENZENE	84	1.0 P	ug/L
TOLUENE	3.2	1.0 P	ug/L
ETHYLBENZENE	30	1.0 P	ug/L
TOTAL XYLENE	2.2	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	119.4		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	110		
4-Bromofluorobenzene	103		
Method 8020A ***			
Analyzed by: CJ			
Date: 10/08/98			
Total Petroleum Hydrocarbons-Diesel	1.4	1.00 P	mg/L

(P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-01

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-10

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 14:36:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Surrogate	**% Recovery**		
n-Pentacosane	80		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 10/14/98 06:37:00			
Methane	0.81	0.060 P	mg/L
Ethylene	ND	0.0032 P	mg/L
Ethane	ND	0.0025 P	mg/L
RSKSOP-147			
Analyzed by: JDR			
Date: 10/07/98 03:33:00			
Nitrate (as NO3)	ND	0.1	mg/L NO3
Method 300.0 *			
Analyzed by: DAM			
Date: 10/01/98 08:30:00			
Sulfate	204	4	mg/L
Method 300.0 *			
Analyzed by: DAM			
Date: 10/01/98 08:30:00			

(P) - Practical Quantitation Limit ND - Not detected.

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-02

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-12

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 13:51:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	0.62	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	90		
1,4-Difluorobenzene	77		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 10/08/98			
BENZENE	260	1.0 P	ug/L
TOLUENE	3.0	1.0 P	ug/L
ETHYLBENZENE	1.2	1.0 P	ug/L
TOTAL XYLENE	7.9	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	272.1		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	130		
4-Bromofluorobenzene	103		
Method 8020A ***			
Analyzed by: CJ			
Date: 10/08/98			
Total Petroleum Hydrocarbons-Diesel	ND	0.20 P	mg/L

(P) - Practical Quantitation Limit ND - Not detected.

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-02

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-12

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 13:51:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Surrogate	**% Recovery**		
n-Pentacosane	100		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 10/14/98 07:16:00			
Methane	ND	0.0012 P	mg/L
Ethylene	ND	0.0032 P	mg/L
Ethane	ND	0.0025 P	mg/L
RSKSOP-147			
Analyzed by: JDR			
Date: 10/08/98 09:45:00			
Nitrate (as NO3)	ND	0.1	mg/L NO3
Method 300.0 *			
Analyzed by: DAM			
Date: 10/01/98 08:30:00			
Sulfate	168	2	mg/L
Method 300.0 *			
Analyzed by: DAM			
Date: 10/01/98 08:30:00			

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-03

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-11A

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 13:21:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	ND	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	93		
1,4-Difluorobenzene	70		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 10/08/98			
BENZENE	9.3	1.0 P	ug/L
TOLUENE	3.7	1.0 P	ug/L
ETHYLBENZENE	2.2	1.0 P	ug/L
TOTAL XYLENE	7.0	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	22.2		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	100		
4-Bromofluorobenzene	107		
Method 8020A ***			
Analyzed by: CJ			
Date: 10/08/98			
Total Petroleum Hydrocarbons-Diesel	ND	0.20 P	mg/L

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-03

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-11A

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 13:21:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT		UNITS
Surrogate	**% Recovery**			
n-Pentacosane	69			
Method 8015B *** for Diesel				
Analyzed by: RR				
Date: 10/14/98 07:55:00				
Methane	0.043	0.0012	P	mg/L
Ethylene	ND	0.0032	P	mg/L
Ethane	ND	0.0025	P	mg/L
RSKSOP-147				
Analyzed by: JDR				
Date: 10/08/98 10:10:00				
Nitrate (as NO3)	0.4	0.1		mg/L NO3
Method 300.0 *				
Analyzed by: DAM				
Date: 10/01/98 08:30:00				
Sulfate	196	4		mg/L
Method 300.0 *				
Analyzed by: DAM				
Date: 10/01/98 08:30:00				

(P) - Practical Quantitation Limit ND - Not detected.

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-04

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-6

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 12:39:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	3.3	0.5 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	93		
1,4-Difluorobenzene	73		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 10/08/98			
BENZENE	1000	5.0 P	ug/L
TOLUENE	420	5.0 P	ug/L
ETHYLBENZENE	140	5.0 P	ug/L
TOTAL XYLENE	270	5.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	1830		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	120		
4-Bromofluorobenzene	107		
Method 8020A ***			
Analyzed by: CJ			
Date: 10/08/98			
Total Petroleum Hydrocarbons-Diesel	4.0	1.00 P	mg/L

(P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-04

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-6

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 12:39:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Surrogate	**% Recovery**		
n-Pentacosane	100		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 10/14/98 08:33:00			

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-05

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-5

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 11:49:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	ND	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	90		
1,4-Difluorobenzene	70		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 10/08/98			
BENZENE	ND	1.0 P	ug/L
TOLUENE	ND	1.0 P	ug/L
ETHYLBENZENE	ND	1.0 P	ug/L
TOTAL XYLENE	ND	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	ND		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	97		
4-Bromofluorobenzene	103		
Method 8020A ***			
Analyzed by: CJ			
Date: 10/08/98			
Total Petroleum Hydrocarbons-Diesel	ND	0.20 P	mg/L

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-05

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-5

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 11:49:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Surrogate	**% Recovery**		
n-Pentacosane	88		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 10/14/98 09:12:00			

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-06

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-8

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 11:16:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	ND	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	93		
1,4-Difluorobenzene	70		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 10/08/98			
BENZENE	ND	1.0 P	ug/L
TOLUENE	ND	1.0 P	ug/L
ETHYLBENZENE	ND	1.0 P	ug/L
TOTAL XYLENE	ND	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	ND		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	97		
4-Bromofluorobenzene	103		
Method 8020A ***			
Analyzed by: CJ			
Date: 10/08/98			
Total Petroleum Hydrocarbons-Diesel	ND	0.20 P	mg/L

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-06

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-8

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 11:16:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Surrogate	**% Recovery**		
n-Pentacosane	37		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 10/14/98 09:51:00			

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-07

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-7

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 10:45:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	ND	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	87		
1,4-Difluorobenzene	70		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 10/08/98			
BENZENE	ND	1.0 P	ug/L
TOLUENE	ND	1.0 P	ug/L
ETHYLBENZENE	ND	1.0 P	ug/L
TOTAL XYLENE	ND	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	ND		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	97		
4-Bromofluorobenzene	103		
Method 8020A ***			
Analyzed by: CJ			
Date: 10/08/98			
Total Petroleum Hydrocarbons-Diesel	ND	0.20 P	mg/L

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-07

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-7

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 10:45:00
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Surrogate	**% Recovery**		
n-Pentacosane	88		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 10/14/98 10:30:00			

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-08

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: 2832

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	ND	0.5 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	90		
1,4-Difluorobenzene	70		
Method 8015B *** for Gasoline			
Analyzed by: CJ			
Date: 10/08/98			
BENZENE	79	5.0 P	ug/L
TOLUENE	ND	5.0 P	ug/L
ETHYLBENZENE	27	5.0 P	ug/L
TOTAL XYLENE	ND	5.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	106		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	100		
4-Bromofluorobenzene	100		
Method 8020A ***			
Analyzed by: CJ			
Date: 10/08/98			
Total Petroleum Hydrocarbons-Diesel	2.0	0.20 P	mg/L

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810018-08

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/16/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: 2832

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98
DATE RECEIVED: 10/01/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Surrogate	**% Recovery**		
n-Pentacosane	75		
Method 8015B *** for Diesel			
Analyzed by: RR			
Date: 10/14/98 11:08:00			

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

QUALITY CONTROL

DOCUMENTATION

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

** SPL BATCH QUALITY CONTROL REPORT **
Method Modified 8015B*** for Gasoline

Matrix: Aqueous
Units: mg/L

Batch Id: HP_S981007163700

LABORATORY CONTROL SAMPLE

SPIKE COMPOUNDS	Method Blank Result <2>	Spike Added <3>	Blank Spike Result <1>	Blank Spike Recovery %	QC Limits(**) (Mandatory) % Recovery Range
Gasoline Range Organics	ND	1.0	0.73	73.0	64 - 131

MATRIX SPIKES

SPIKE COMPOUNDS	Sample Results <2>	Spike Added <3>	Matrix Spike Result <1>	Matrix Spike Recovery <4>	Matrix Spike Duplicate Result <1>	Matrix Spike Duplicate Recovery <5>	MS/MSD Relative % Difference	QC Limits(***) (Advisory) RPD Max.	QC Limits(***) (Advisory) Recovery Range
GASOLINE RANGE ORGANICS	ND	0.9	0.74	82.2	0.75	83.3	1.33	36	36 - 160

Analyst: CJ
Sequence Date: 10/07/98
SPL ID of sample spiked: 9810018-06A
Sample File ID: SSJ1110.TXO
Method Blank File ID:
Blank Spike File ID: SSJ1086.TXO
Matrix Spike File ID: SSJ1089.TXO
Matrix Spike Duplicate File ID: SSJ1090.TXO

* = Values outside QC Range due to Matrix Interference (except RPD)
« = Data outside Method Specification limits.
NC = Not Calculated (Sample exceeds spike by factor of 4 or more)
ND = Not Detected/Below Detection Limit
% Recovery = [(<1> - <2>) / <3>] x 100
LCS % Recovery = (<1> / <3>) x 100
Relative Percent Difference = |(<4> - <5> | / [(<4> + <5>) x 0.5] x 100
(**) = Source: SPL-Houston Historical data (1st Q '97)
(***) = Source: SPL-Houston Historical Data (1st Q '97)

SAMPLES IN BATCH(SPL ID):

9810056-06A	9810056-07A	9810056-08A	9810056-09A
9810056-10A	9810056-01A	9810018-01A	9810018-02A
9810018-03A	9810018-04A	9810018-05A	9810018-06A
9810018-07A	9810018-08A	9810056-11A	9810056-03A
9810056-04A	9810056-05A		

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

** SPL BATCH QUALITY CONTROL REPORT **
METHOD 8020

Matrix: Aqueous **Batch Id:** HP_S981007161000
Units: ug/L

LABORATORY CONTROL SAMPLE

SPIKE COMPOUNDS	Method Blank Result <2>	Spike Added <3>	Blank Spike Result <1>	Blank Spike Recovery %	QC Limits(**) (Mandatory) % Recovery Range
Benzene	ND	50	55	110	61 - 119
Toluene	ND	50	56	112	65 - 125
EthylBenzene	ND	50	55	110	70 - 118
O Xylene	ND	50	54	108	72 - 117
M & P Xylene	ND	100	110	110	72 - 116

MATRIX SPIKES

SPIKE COMPOUNDS	Sample Results <2>	Spike Added <3>	Matrix Spike Result <1>	Matrix Spike Recovery <4>	Matrix Spike Duplicate Result <1>	Matrix Spike Duplicate Recovery <5>	MS/MSD Relative % Difference	QC Limits(***) (Advisory) RPD Max.	QC Limits(***) (Advisory) Recovery Range
BENZENE	ND	20	25	125	23	115	8.33	21	32 - 164
TOLUENE	ND	20	24	120	24	120	0	20	38 - 159
ETHYLBENZENE	ND	20	24	120	23	115	4.26	19	52 - 142
O XYLENE	ND	20	25	125	25	125	0	18	53 - 143
M & P XYLENE	ND	40	48	120	46	115	4.26	17	53 - 144

Analyst: CJ
Sequence Date: 10/07/98
SPL ID of sample spiked: 9810018-05A
Sample File ID: S_J1109.TXO
Method Blank File ID:
Blank Spike File ID: S_J1085.TXO
Matrix Spike File ID: S_J1087.TXO
Matrix Spike Duplicate File ID: S_J1088.TXO

* = Values outside QC Range due to Matrix Interference (except RPD)
« = Data outside Method Specification limits.
NC = Not Calculated (Sample exceeds spike by factor of 4 or more)
ND = Not Detected/Below Detection Limit
% Recovery = [(<1> - <2>) / <3>] x 100
LCS % Recovery = (<1> / <3>) x 100
Relative Percent Difference = |(<4> - <5> | / [(<4> + <5>) x 0.5] x 100
(**) = Source: SPL-Houston Historical Data (1st Q '97)
(***) = Source: SPL-Houston Historical Data (1st Q '97)

SAMPLES IN BATCH(SPL ID): 9810018-04A 9810018-05A 9810018-06A 9810018-07A
9810018-08A 9810018-01A 9810018-02A 9810018-03A

HOUSTON LABORATORY
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HOUSTON, TEXAS 77054
PHONE (713) 660-0901

** SPL BATCH QUALITY CONTROL REPORT ** PAGE
Method Modified 8015B*** for Diesel

Matrix: Aqueous Batch Id: HPVV981009015100
Units: mg/L

BLANK SPIKES

SPIKE COMPOUNDS	Sample Results <2>	Spike Added <3>	Matrix Spike Result <1>	Matrix Spike Recovery <4>	Matrix Spike Duplicate Result <1>	Matrix Spike Duplicate Recovery <5>	MS/MSD Relative % Difference	QC Limits(**) (Advisory) RPD Max.	QC Limits(**) (Advisory) Recovery Range
DIESEL	ND	5.0	5.2	104	5.4	108	3.77	39	21 - 175

Analyst: RR
Sequence Date: 10/09/98
Method Blank File ID:
Sample File ID:
Blank Spike File ID: VVJ2172.TXO
Matrix Spike File ID:
Matrix Spike Duplicate File ID:

* = Values Outside QC Range. « = Data outside Method Specification limits.
NC = Not Calculated (Sample exceeds spike by factor of 4 or more)
ND = Not Detected/Below Detection Limit
% Recovery = [(<1> - <2>) / <3>] x 100
Relative Percent Difference = |(<4> - <5> | / [(<4> + <5>) x 0.5] x 100
(**) = Source: SPL-Houston Historical Data (4th Q '97)

SAMPLES IN BATCH(SPL ID):

9810056-10B	9810056-09B	9810018-01B	9810018-02B
9810018-03B	9810018-04B	9810018-05B	9810018-06B
9810018-07B	9810018-08B	9810056-03B	9810056-02B
9810110-01B	9810056-04B	9810056-05B	9810056-06B
9810056-07B	9810056-08B		

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

** SPL QUALITY CONTROL REPORT **

Matrix: Aqueous

Reported on: 10/08/98
Analyzed on: 10/01/98
Analyst: DAM

This sample was randomly selected for use in the SPL quality control program. Samples chosen are fortified with a known concentration in duplicate. The results are as follows:

Nitrate (as NO3)
Method 300.0 *

SPL Sample ID Number	Blank Value mg/L	LCS Concentration mg/L	Measured Concentration mg/L	% Recovery	QC Limits Recovery
LCS	ND	4.42	4.21	95.2	90 - 110

-9810494

Samples in batch:

9809B56-05C 9809B56-08C 9809B56-13C 9809B56-14C
9810018-01C 9810018-02C 9810018-03C

COMMENTS:

LCS = SPL ID#:94453190-17

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

** SPL QUALITY CONTROL REPORT **

Matrix: Aqueous

Reported on: 10/08/98
Analyzed on: 10/01/98
Analyst: DAM

This sample was randomly selected for use in the SPL quality control program. Samples chosen are fortified with a known concentration in duplicate. The results are as follows:

Nitrate (as NO3)
Method 300.0 *

SPL Sample ID Number	Method Blank mg/L	Sample Result mg/L	Spike Added mg/L	Matrix Spike Result mg/L	Matrix Spike Recovery %	Matrix Spike Duplicate Result mg/L	Matrix Spike Duplicate Recovery %	RPD (%)	QC LIMITS (Advisory) RPD Max	QC LIMITS (Advisory) % REC
9809B56-08C	ND	ND	5.00	5.70	114	5.56	111	2.7	5	86 -115

-9810493

Samples in batch:

9809B56-05C 9809B56-08C 9809B56-13C 9809B56-14C
9810018-01C 9810018-02C 9810018-03C

COMMENTS:

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

** SPL QUALITY CONTROL REPORT **

Matrix: Aqueous

Reported on: 10/08/98
Analyzed on: 10/01/98
Analyst: DAM

This sample was randomly selected for use in the SPL quality control program. Samples chosen are fortified with a known concentration in duplicate. The results are as follows:

Sulfate
Method 300.0 *

SPL Sample ID Number	Blank Value mg/L	LCS Concentration mg/L	Measured Concentration mg/L	% Recovery	QC Limits Recovery
LCS	ND	16.7	15.6	93.4	90 - 110

-9810492

Samples in batch:

9809B56-05C 9809B56-08C 9809B56-13C 9809B56-14C
9810018-01C 9810018-02C 9810018-03C

COMMENTS:

LCS = SPL ID#94453213-21

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

** SPL QUALITY CONTROL REPORT **

Matrix: Aqueous

Reported on: 10/08/98
Analyzed on: 10/01/98
Analyst: DAM

This sample was randomly selected for use in the SPL quality control program. Samples chosen are fortified with a known concentration in duplicate. The results are as follows:

Sulfate
Method 300.0 *

SPL Sample ID Number	Method Blank mg/L	Sample Result mg/L	Spike Added mg/L	Matrix Spike Result mg/L	Matrix Spike Recovery %	Matrix Spike Duplicate Result mg/L	Matrix Spike Duplicate Recovery %	RPD (%)	QC LIMITS (Advisory) RPD Max	QC LIMITS (Advisory) % REC
9809B56-08C	ND	12.06	5.00	17.08	100	17.07	100	0	7.0	88 -112

-9810491

Samples in batch:

9809B56-05C 9809B56-08C 9809B56-13C 9809B56-14C
9810018-01C 9810018-02C 9810018-03C

COMMENTS:

CHAIN OF CUSTODY

AND

SAMPLE RECEIPT CHECKLIST

SPL, Inc.

Analysis Request & Chain of Custody Record

SPL Workorder No: 9810018

096531

page 1 of 1

Client Name: Brown & Caldwell
Address/Phone: 1415 Louisiana #2500 713-759-0999
Client Contact: Rick Rexroad
Project Name: BJ - Hobbs
Project Number: 2832-12
Project Location: Hobbs
Invoice To: Rick Rexroad

SAMPLE ID	DATE	TIME	comp	grab	matrix (W=water S=soil SL=sludge O=other:)	bottle (P=plastic A=amber glass G=glass V=vial)	size (1=1 liter 4=4oz 40=vial 8=8oz 16=16oz)	pres. (1=HCl 2=HNO3 3=H2SO4 O=other:)	Number of Containers	Requested Analysis: BTEX 8020	TPH-D TPH-G 8015	Nitrate 300.0 Sulfate 300.0	Dissolved RSK methane 6AP/175
MW-10	9.30.98	14:36			W				5	X	X	X	X
MW-12	9.30.98	13:51			W				5	X	X	X	X
MW-11A	9.30.98	13:21			W				5	X	X	X	X
MW-6	9.30.98	12:39			W				4	X	X		
MW-5	9.30.98	11:49			W				4	X	X		
MW-8	9.30.98	11:16			W				4	X	X		
MW-7	9.30.98	10:45			W				4	X	X		
2832	9.30.98	—			W				4	X	X		

RUSH

Client/Consultant Remarks:

Laboratory remarks:

Intact? ☐ Y ☐ N

Temp: 3°C

Requested TAT

24hr ☐ 72hr ☐
48hr ☐ Standard ☒
Other ☐ _____

Special Reporting Requirements: Fax Results ☒ Raw Data ☐ Standard QC ☒ Level 3 QC ☐ Level 4 QC ☐

Special Detection Limits (specify):

PM review (initial): BAF

	date	time	
1. Relinquished by Sampler:	9.30.98	15:00	2. Received by:
3. Relinquished by:	date	time	4. Received by:
5. Relinquished by:	10-1-98	1000	6. Received by Laboratory:

☒ 8880 Interchange Drive, Houston, TX 77054 (713) 660-0901
☐ 459-Hughes Drive, Traverse City, MI 49684 (616) 947-5777
☐ 500 Ambassador Caffery Parkway, Scott, LA 70583 (318) 237-4775

SPL Houston Environmental Laboratory

Sample Login Checklist

Date:	Time:
10-1-98	1000

SPL Sample ID:
9810018

			Yes	No
1	Chain-of-Custody (COC) form is present.		—	
2	COC is properly completed.		—	
3	If no, Non-Conformance Worksheet has been completed.			
4	Custody seals are present on the shipping container.		—	
5	If yes, custody seals are intact.		—	
6	All samples are tagged or labeled.		—	
7	If no, Non-Conformance Worksheet has been completed.			
8	Sample containers arrived intact		—	
9	Temperature of samples upon arrival:		3 C	
10	Method of sample delivery to SPL:	SPL Delivery		
		Client Delivery		
		FedEx Delivery (airbill #)	806949040661	
		Other:		
11	Method of sample disposal:	SPL Disposal	—	
		HOLD		
		Return to Client		

Name:	Date:
	10-1-98

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

October 19, 1998

Mr. Rick Rexroad
BROWN AND CALDWELL
1415 Louisiana
Houston, TX 77002

The following report contains analytical results for the sample(s) received at Southern Petroleum Laboratories (SPL) on October 2, 1998. The sample(s) was assigned to Certificate of Analysis No.(s) 9810122 and analyzed for all parameters as listed on the chain of custody.

Any data flags or quality control exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s).

If you have any questions or comments pertaining to this data report, please do not hesitate to contact me. Please reference the above Certificate of Analysis No. during any inquiries.

Again, SPL is pleased to be of service to you. We anticipate working with you in fulfilling all your current and future analytical needs.

Southern Petroleum Laboratories

Bernadette A. Fini
Senior Project Manager

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Southern Petroleum Laboratories, Inc.

Certificate of Analysis Number: 98-10-122

Approved for Release by:

Bernadette A. Fini, Senior Project Manager — Date: 10-19-98

Greg Grandits
Laboratory Director

Cynthia Schreiner
Quality Assurance Officer

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810122-01

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/19/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-9

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 18:00:00
DATE RECEIVED: 10/02/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	0.27	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	107		
1,4-Difluorobenzene	77		
Method 8015B *** for Gasoline			
Analyzed by: LJ			
Date: 10/08/98			
BENZENE	1.1	1.0 P	ug/L
TOLUENE	5.5	1.0 P	ug/L
ETHYLBENZENE	21	1.0 P	ug/L
TOTAL XYLENE	59	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	86.6		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	97		
4-Bromofluorobenzene	100		
Method 8020A ***			
Analyzed by: LJ			
Date: 10/08/98			

(P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that do not resemble a diesel pattern.(c10-c24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810122-01

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/19/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-9

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 18:00:00
DATE RECEIVED: 10/02/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Total Petroleum Hydrocarbons-Diesel	0.27	0.20 P	mg/L

Surrogate	% Recovery
n-Pentacosane	130

Method 8015B *** for Diesel
Analyzed by: RR
Date: 10/13/98 12:34:00

(P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that do not resemble a diesel pattern.(c10-c24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810122-02

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/19/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-4

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 18:30:00
DATE RECEIVED: 10/02/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	3.9	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	187MI		
1,4-Difluorobenzene	107		
Method 8015B *** for Gasoline			
Analyzed by: LJ			
Date: 10/08/98			
BENZENE	80	1.0 P	ug/L
TOLUENE	180	1.0 P	ug/L
ETHYLBENZENE	370	1.0 P	ug/L
TOTAL XYLENE	840	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	1470		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	120		
4-Bromofluorobenzene	97		
Method 8020A ***			
Analyzed by: LJ			
Date: 10/08/98			

(P) - Practical Quantitation Limit MI - Matrix interference.

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that do not resemble a diesel pattern.(c10-c24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810122-02

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/19/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-4

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 18:30:00
DATE RECEIVED: 10/02/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Total Petroleum Hydrocarbons-Diesel	2.0	1.00 P	mg/L
Surrogate	**% Recovery**		
n-Pentacosane	100		

Method 8015B *** for Diesel
Analyzed by: RR
Date: 10/13/98 01:13:00

(P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that do not resemble a diesel pattern.(c10-c24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810122-03

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/19/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-1

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 17:40:00
DATE RECEIVED: 10/02/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	3.6	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	147		
1,4-Difluorobenzene	83		
Method 8015B *** for Gasoline			
Analyzed by: LJ			
Date: 10/08/98			
BENZENE	3.2	1.0 P	ug/L
TOLUENE	90	1.0 P	ug/L
ETHYLBENZENE	280	1.0 P	ug/L
TOTAL XYLENE	970	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	1343.2		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	107		
4-Bromofluorobenzene	97		
Method 8020A ***			
Analyzed by: LJ			
Date: 10/08/98			

(P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that do not resemble a diesel pattern.(c10-c24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810122-03

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/19/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-1

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 17:40:00
DATE RECEIVED: 10/02/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Total Petroleum Hydrocarbons-Diesel	2.5	1.00 P	mg/L

Surrogate	% Recovery
n-Pentacosane	90

Method 8015B *** for Diesel
Analyzed by: RR
Date: 10/13/98 01:52:00

(P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that do not resemble a diesel pattern.(c10-c24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810122-04

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/19/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-3

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 14:44:00
DATE RECEIVED: 10/02/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	3.8	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	163MI		
1,4-Difluorobenzene	97		
Method 8015B *** for Gasoline			
Analyzed by: LJ			
Date: 10/08/98			
BENZENE	42	1.0 P	ug/L
TOLUENE	470	10 P	ug/L
ETHYLBENZENE	450	10 P	ug/L
TOTAL XYLENE	530	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	1492		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	90		
4-Bromofluorobenzene	93		
Method 8020A ***			
Analyzed by: LJ			
Date: 10/12/98			

(P) - Practical Quantitation Limit MI - Matrix interference.

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that do not resemble a diesel pattern.(c10-c24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810122-04

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/19/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Brown & Caldwell
SAMPLE ID: MW-3

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98 14:44:00
DATE RECEIVED: 10/02/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Total Petroleum Hydrocarbons-Diesel	1.0	1.00 P	mg/L

Surrogate	% Recovery
n-Pentacosane	100

Method 8015B *** for Diesel
Analyzed by: RR
Date: 10/13/98 02:31:00

(P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

COMMENTS: Sample contains petroleum hydrocarbons from C10-C24 that do not resemble a diesel pattern.(c10-c24) RR

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis No. H9-9810122-05

Brown and Caldwell
1415 Louisiana
Houston, TX 77002
ATTN: Rick Rexroad

DATE: 10/19/98

PROJECT: BJ-Hobbs
SITE: Hobbs
SAMPLED BY: Provided by SPL
SAMPLE ID: Trip Blank

PROJECT NO: 2832-12
MATRIX: WATER
DATE SAMPLED: 09/30/98
DATE RECEIVED: 10/02/98

ANALYTICAL DATA

PARAMETER	RESULTS	DETECTION LIMIT	UNITS
Gasoline Range Organics	ND	0.1 P	mg/L
Surrogate	**% Recovery**		
4-Bromofluorobenzene	97		
1,4-Difluorobenzene	80		
Method 8015B *** for Gasoline			
Analyzed by: LJ			
Date: 10/08/98			
BENZENE	ND	1.0 P	ug/L
TOLUENE	ND	1.0 P	ug/L
ETHYLBENZENE	ND	1.0 P	ug/L
TOTAL XYLENE	ND	1.0 P	ug/L
TOTAL VOLATILE AROMATIC HYDROCARBONS	ND		ug/L
Surrogate	**% Recovery**		
1,4-Difluorobenzene	97		
4-Bromofluorobenzene	100		
Method 8020A ***			
Analyzed by: LJ			
Date: 10/08/98			

ND - Not detected. (P) - Practical Quantitation Limit

Notes: *Ref: Methods for Chemical Analysis of Water and Wastes, 1983, EPA
**Ref: Standard Methods for Examination of Water & Wastewater, 18th ed.
***Ref: Test Methods for Evaluating Solid Waste, EPA SW846, 3rd Ed.

QUALITY ASSURANCE: These analyses are performed in accordance with EPA guidelines for quality assurance.

QUALITY CONTROL

DOCUMENTATION

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

** SPL BATCH QUALITY CONTROL REPORT **
Method Modified 8015B*** for Gasoline

Matrix: Aqueous
Units: mg/L

Batch Id: VARE981007215700

LABORATORY CONTROL SAMPLE

SPIKE COMPOUNDS	Method Blank Result <2>	Spike Added <3>	Blank Spike Result <1>	Blank Spike Recovery %	QC Limits(**) (Mandatory) % Recovery Range
Gasoline Range Organics	ND	1.0	0.79	79.0	64 - 131

MATRIX SPIKES

SPIKE COMPOUNDS	Sample Results <2>	Spike Added <3>	Matrix Spike Result <1>	Matrix Spike Recovery <4>	Matrix Spike Duplicate Result <1>	Matrix Spike Duplicate Recovery <5>	MS/MSD Relative % Difference	QC Limits(***) (Advisory) RPD Max.	QC Limits(***) (Advisory) Recovery Range
GASOLINE RANGE ORGANICS	0.27	0.9	0.87	66.7	0.97	77.8	15.4	36	36 - 160

Analyst: LJ
Sequence Date: 10/07/98
SPL ID of sample spiked: 9810122-01A
Sample File ID: EEJ1116.TXO
Method Blank File ID:
Blank Spike File ID: EEJ1107.TXO
Matrix Spike File ID: EEJ1110.TXO
Matrix Spike Duplicate File ID: EEJ1111.TXO

* = Values outside QC Range due to Matrix Interference (except RPD)
« = Data outside Method Specification limits.
NC = Not Calculated (Sample exceeds spike by factor of 4 or more)
ND = Not Detected/Below Detection Limit
% Recovery = [(<1> - <2>) / <3>] x 100
LCS % Recovery = (<1> / <3>) x 100
Relative Percent Difference = |(<4> - <5> | / [(<4> + <5>) x 0.5] x 100
(**) = Source: SPL-Houston Historical data (1st Q '97)
(***) = Source: SPL-Houston Historical Data (1st Q '97)

SAMPLES IN BATCH(SPL ID): 9810122-03A 9810122-04A 9810122-01A 9810122-05A 9810122-02A

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

** SPL BATCH QUALITY CONTROL REPORT **
METHOD 8020

Matrix: Aqueous **Batch Id:** VARE981007213100
Units: ug/L

LABORATORY CONTROL SAMPLE

SPIKE COMPOUNDS	Method Blank Result <2>	Spike Added <3>	Blank Spike Result <1>	Blank Spike Recovery %	QC Limits(**) (Mandatory) % Recovery Range
MTBE	ND	100	110	110	72 - 128
Benzene	ND	100	110	110	61 - 119
Toluene	ND	100	110	110	65 - 125
EthylBenzene	ND	100	110	110	70 - 118
O Xylene	ND	100	99	99.0	72 - 117
M & P Xylene	ND	200	210	105	72 - 116

MATRIX SPIKES

SPIKE COMPOUNDS	Sample Results <2>	Spike Added <3>	Matrix Spike Result <1>	Matrix Spike Recovery <4>	Matrix Spike Duplicate Result <1>	Matrix Spike Duplicate Recovery <5>	MS/MSD Relative % Difference	QC Limits(***) (Advisory) RPD Max.	QC Limits(***) (Advisory) Recovery Range
MTBE	ND	100	110	110	120	120	8.70	20	39 - 150
BENZENE	ND	100	100	100	110	110	9.52	21	32 - 164
TOLUENE	ND	100	98	98.0	110	110	11.5	20	38 - 159
ETHYLBENZENE	ND	100	96	96.0	110	110	13.6	19	52 - 142
O XYLENE	ND	100	95	95.0	100	100	5.13	18	53 - 143
M & P XYLENE	ND	200	190	95.0	210	105	10.0	17	53 - 144

Analyst: LJ
Sequence Date: 10/07/98
SPL ID of sample spiked: 9810125-05A
Sample File ID: E_J1115.TXO
Method Blank File ID:
Blank Spike File ID: E_J1106.TXO
Matrix Spike File ID: E_J1108.TXO
Matrix Spike Duplicate File ID: E_J1109.TXO

* = Values outside QC Range due to Matrix Interference (except RPD)
« = Data outside Method Specification limits.
NC = Not Calculated (Sample exceeds spike by factor of 4 or more)
ND = Not Detected/Below Detection Limit
% Recovery = [(<1> - <2>) / <3>] x 100
LCS % Recovery = (<1> / <3>) x 100
Relative Percent Difference = |(<4> - <5> | / [(<4> + <5>) x 0.5] x 100
(**) = Source: SPL-Houston Historical Data (1st Q '97)
(***) = Source: SPL-Houston Historical Data (1st Q '97)

SAMPLES IN BATCH(SPL ID): 9810198-03A 9809B77-01A 9810125-01A 9810125-02A 9810125-03A 9810122-05A 9810125-04A 9810125-06A 9810122-02A 9810122-03A 9810122-04A 9810308-02B 9810308-03B 9810308-02B 9810308-01B 9810198-04A 9810125-07A 9810125-05A 9810122-01A

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

** SPL BATCH QUALITY CONTROL REPORT **
METHOD 8020

Matrix: Aqueous
Units: ug/L

Batch Id: VARE981011102101

LABORATORY CONTROL SAMPLE

SPIKE COMPOUNDS	Method Blank Result <2>	Spike Added <3>	Blank Spike Result <1>	Blank Spike Recovery %	QC Limits(**) (Mandatory) % Recovery Range
Benzene	ND	50.0	50	100	61 - 119
Toluene	ND	50.0	52	104	65 - 125
EthylBenzene	ND	50.0	52	104	70 - 118
O Xylene	ND	50.0	48	96.0	72 - 117
M & P Xylene	ND	100.0	100	100	72 - 116

MATRIX SPIKES

SPIKE COMPOUNDS	Sample Results <2>	Spike Added <3>	Matrix Spike Result <1>	Matrix Spike Recovery <4>	Matrix Spike Duplicate Result <1>	Matrix Spike Duplicate Recovery <5>	MS/MSD Relative % Difference	QC Limits(***) (Advisory) RPD Max.	QC Limits(***) (Advisory) Recovery Range
BENZENE	ND	20.0	19	95.0	19	95.0	0	21	32 - 164
TOLUENE	ND	20.0	19	95.0	20	100	5.13	20	38 - 159
ETHYLBENZENE	ND	20.0	19	95.0	19	95.0	0	19	52 - 142
O XYLENE	ND	20.0	19	95.0	18	90.0	5.41	18	53 - 143
M & P XYLENE	ND	40.0	38	95.0	37	92.5	2.67	17	53 - 144

Analyst: LJ
Sequence Date: 10/11/98
SPL ID of sample spiked: 9810332-01A
Sample File ID: E_J1218.TXO
Method Blank File ID:
Blank Spike File ID: E_J1211.TXO
Matrix Spike File ID: E_J1213.TXO
Matrix Spike Duplicate File ID: E_J1214.TXO

* = Values outside QC Range due to Matrix Interference (except RPD)
« = Data outside Method Specification limits.
NC = Not Calculated (Sample exceeds spike by factor of 4 or more)
ND = Not Detected/Below Detection Limit
% Recovery = [(<1> - <2>) / <3>] x 100
LCS % Recovery = (<1> / <3>) x 100
Relative Percent Difference = |(<4> - <5> | / [(<4> + <5>) x 0.5] x 100
(**) = Source: SPL-Houston Historical Data (1st Q '97)
(***) = Source: SPL-Houston Historical Data (1st Q '97)

SAMPLES IN BATCH(SPL ID): 9810361-01A 9810122-04A 9810359-01A

HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

** SPL BATCH QUALITY CONTROL REPORT ** PAGE
Method Modified 8015B*** for Diesel

Matrix: Aqueous **Batch Id:** HP_V981012074900
Units: mg/L

BLANK SPIKES

SPIKE COMPOUNDS	Sample Results <2>	Spike Added <3>	Matrix Spike Result <1>	Matrix Spike Recovery <4>	Matrix Spike Duplicate Result <1>	Matrix Spike Duplicate Recovery <5>	MS/MSD Relative % Difference	QC Limits(**) (Advisory) RPD Max.	QC Limits(**) (Advisory) Recovery Range
DIESEL	ND	5.0	4.6	92.0	4.7	94.0	2.15	39	21 - 175

Analyst: RR
Sequence Date: 10/12/98
Method Blank File ID:
Sample File ID:
Blank Spike File ID: V_J3036.TXO
Matrix Spike File ID:
Matrix Spike Duplicate File ID:

* = Values Outside QC Range. « = Data outside Method Specification limits.
NC = Not Calculated (Sample exceeds spike by factor of 4 or more)
ND = Not Detected/Below Detection Limit
% Recovery = [(<1> - <2>) / <3>] x 100
Relative Percent Difference = |(<4> - <5> | / [(<4> + <5>) x 0.5] x 100
(**) = Source: SPL-Houston Historical Data (4th Q '97)

SAMPLES IN BATCH(SPL ID): 9810122-01B 9810122-02B 9810122-03B 9810122-04B

CHAIN OF CUSTODY

AND

SAMPLE RECEIPT CHECKLIST

SPL, Inc.

Analysis Request & Chain of Custody Record

SPL Workorder No: 9810122

096529

page 1 of 1

Client Name: Brown & Caldwell

Address/Phone: 1415 Louisiana #2500 713-755-0999

Client Contact: Rick Rexroad

Project Name: BJ Hobbs

Project Number: 2832-12

Project Location: Hobbs

Invoice To: Rick Rexroad

SAMPLE ID	DATE	TIME	comp	grab	matrix (W=water S=soil SL=sludge O=other:)	bottle (P=plastic A=amber glass G=glass V=vial)	size (1=1 liter 4=4oz 40=vial 8=8oz 16=16oz)	pres. (1=HCl 2=HNO3 3=H2SO4 O=other:)	Number of Containers	Requested Analysis: BTEX	Requested Analysis: TPHD TPH-G
MW-9	9.30.98	18:00			W				4	X	X
MW-4	9.30.98	18:30			W				4	X	X
MW-1	9.30.98	17:40			W				4	X	X
MW-3	9.30.98	14:44			W				4	X	X
Trip Blank					W					X	

Client/Consultant Remarks:

Laboratory remarks:

Intact? ☐ Y ☐ N

Temp: 4o

Requested TAT

24hr ☐ 72hr ☐

48hr ☐ Standard ☒

Other ☐ _____

Special Reporting Requirements: Fax Results ☒ Raw Data ☐ Standard QC ☒ Level 3 QC ☐ Level 4 QC ☐

Special Detection Limits (specify):

PM review (initial): BAF

	date	time	
1. Relinquished by Sampler:	10.1.98	8:00	2. Received by:
3. Relinquished by:	date	time	4. Received by:
5. Relinquished by:	date	time	6. Received by Laboratory: 10/2/98 1000

☐ 8880 Interchange Drive, Houston, TX 77054 (713) 660-0901

☐ 500 Ambassador Caffery Parkway, Scott, LA 70583 (318) 237-4775

☐ 459-Hughes Drive, Traverse City, MI 49684 (616) 947-5777

SPL Houston Environmental Laboratory

Sample Login Checklist

Date:	Time:
10/2/98	1000

SPL Sample ID:
9810122

			Yes	No
1	Chain-of-Custody (COC) form is present.		✓	
2	COC is properly completed.		✓	
3	If no, Non-Conformance Worksheet has been completed.			
4	Custody seals are present on the shipping container.		✓	
5	If yes, custody seals are intact.		✓	
6	All samples are tagged or labeled.		✓	
7	If no, Non-Conformance Worksheet has been completed.			
8	Sample containers arrived intact		✓	
9	Temperature of samples upon arrival:		4° C	
10	Method of sample delivery to SPL:	SPL Delivery		
		Client Delivery		
		FedEx Delivery (airbill #)	807876024504	
		Other:		
11	Method of sample disposal:	SPL Disposal	✓	
		HOLD		
		Return to Client		

Name:	Date:
[signature]	10/2/98