USPCI
A Subsidiary of
Union Pacific Corporation

2044

SECOND QUARTER 1993 MONITORING REPORT
UNION PACIFIC RAILROAD
UPRR TOFC YARD, UPMF FACILITY
OAKLAND, CALIFORNIA
USPCI Project No. 96120-844

Prepared for:

Union Pacific Railroad
Environmental Management - Room 930
1416 Dodge Street
Omaha, Nebraska 68179

for submittal to:

Ms. Jennifer Eberle
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, California 94621

Prepared by:

USPCI Remedial Services
24125 Aldine Westfield Road
Spring, Texas 77373

July 1993

printed on recycled paper

USPCI
A Subsidiary of
Union Pacific Corporation

On the behalf of UPRR, USPCI has forwared copies of this report to Ms. Jennifer Eberle (ACDEH), Mr. Rich Hiett (CRWQCB), and Mr. Jon Amduer with the Port Of Oakland. If you have any questions regarding the attached report or our proposed recommendations, please call either Cris Byerman at UPNet 350-7265 or Rick Pollard at UPNet 350-7243. We appreciate the opportunity to provide services for Union Pacific Railroad.

Sincerely,

Christopher S. Byerman
Christopher S. Byerman
Geologist

Richard Pollard by
Richard Pollard
Project Geologist

cc: John Yellich - Boulder
Curt Hull - USPCI, Boulder
Jennifer Eberle - ACDEH, Oakland
Rich Hiett - SFB/RWQCB, Oakland
John Amduer - Port of Oakland, Oakland
File 96281.26-1

SECOND QUARTER 1993 MONITORING REPORT
UNION PACIFIC RAILROAD
UPRR TOFC YARD, UPMF FACILITY
OAKLAND, CALIFORNIA
USPCI Project No. 96120-844

Prepared for:

Union Pacific Railroad
Environmental Management - Room 930
1416 Dodge Street
Omaha, Nebraska 68179

for submittal to

Ms. Jennifer Eberle
Department of Environmental Health
Hazardous Materials Division
80 Swan Way, Room 200
Oakland, California 94621

Prepared by:

USPCI Remedial Services
24125 Aldine Westfield Road
Spring, Texas 77373

93 AUG -3 AM 11:09

Christopher S. Byerman
Geologist

Richard M . Pollard
Geologist
R.G. No. 4659

July 1993

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

USPCI
A Subsidiary of
Union Pacific Corporation

Remedial Services

July 30, 1993

Mr. Harry Patterson
Union Pacific Railroad
Environmental Management - Room 930
1416 Dodge Street
Omaha, Nebraska 68179

RE: Final Report: Second Quarter 1993 Monitoring Report
UPMF 1750 Ferro Street Facility, Oakland, California
USPCI Project No. 96120-844

Mr. Patterson:

At the request of Union Pacific Railroad (UPRR), USPCI conducted a Quarterly Monitoring Event on UPRR property at 1750 Ferro Street, Oakland, California. The work was performed in response to the Alameda County Department of Environmental Health (ACDEH) letter to UPRR dated April 29, 1993. The five existing monitoring wells were analyzed for benzene, toluene, ethylbenzene, and total xylenes, total petroleum hydrocarbons (purgeable, extractable and recoverable), arsenic by flame/furnace, and total lead. Selected groundwater samples were analyzed for purgeable halocarbons. Based on our field work and analysis of soil and groundwater samples, USPCI has reached the following conclusions:

- Groundwater flows to the east-southeast beneath the site at a gradient of approximately 0.006 foot per foot.
- Groundwater samples collected from the four of the five monitoring wells in May 1993 contained TPH identified as gasoline (TPH/G) and BTEX. TPH/G concentrations in groundwater samples ranged from non-detect in monitoring well OKUS-W1 (200 feet south-southwest of the known sources) 8.8 mg/L in monitoring well OKUS-W2 (15 feet south of the former fuel island). BTEX concentrations in groundwater samples ranged from non-detect in monitoring well OKUS-W1 to 4.97 mg/L in monitoring well OKUS-W4 which is 150 feet to the west (upgradient) to the former tankhold. Benzene concentrations exceeded the California Maximum Contaminant Level (MCL) in groundwater samples from four of the five monitoring wells. Ethylbenzene exceeded the MCL in samples from three of the five monitoring wells. Groundwater samples from four out of five monitoring wells contained detectable concentrations TPH diesel (TPH/D) or TPH as oil (TPH-IR) or both.

1.0 INTRODUCTION

This Quarterly Monitoring Report has been prepared for Union Pacific Railroad (UPRR) by USPCI in response to a April 29, 1993, Alameda County Department of Environmental Health, Hazardous Materials Division (ACDEH) request for UPRR to begin a quarterly monitoring program at the Union Pacific Motor Freight (UPMF) Ferro Street facility in Oakland, California (See Figure 1). The facility was the site of an unauthorized release of petroleum hydrocarbons from underground storage tanks (USTs).

The quarterly monitoring event involved:

- Measuring the static water levels, purging, and sampling the five existing monitoring wells and determining the local groundwater gradient;
- Analyzing groundwater samples from the monitoring wells for total petroleum hydrocarbons (TPH, EPA Method 418.1); TPH diesel (TPH/D, EPA Method 8015 Modified, TPH gasoline (TPH/G, EPA Method 8015 Modified); benzene, toluene, ethylbenzene and xylenes (BTEX, EPA Method 8020); dissolved arsenic (As) and lead (Pb) by EPA Method 6000/7000; and for purgeable halocarbons (EPA Method 8010) in selected well samples; and
- Preparing a Quarterly Monitoring Report.

Free product (oil) was observed in two of the existing monitoring wells. There was approximately 0.2 inch of free product (oil) noted in the first bailer volume purged from well OKUS-W5. Monitoring well OKUS-W4 contained 0.1 inch of free product (oil) in the first bailer volume. Free product was not noted in any of the remaining monitoring wells and the free product did not recover after the first bailer volume was removed. Groundwater samples collected from the four of the five monitoring wells in May 1993 contained TPH identified as gasoline (TPH/G) and BTEX. TPH/G concentrations in groundwater samples ranged from non-detect in monitoring well OKUS-W1 (200 feet south-southwest of the known sources) to 8.8 mg/L in monitoring well OKUS-W2 (15 feet south of the former fuel island). BTEX concentrations in groundwater samples ranged from non-detect in monitoring well OKUS-W1 to 4.97 mg/L in monitoring well OKUS-W4 which is 150 to 200 feet to the west (upgradient) of the known sources. Benzene concentrations exceeded the California Maximum Contaminant Level (MCL) in groundwater samples from four of the five monitoring wells. Ethylbenzene exceeded the MCL in samples from three of the five monitoring wells. Groundwater samples from the five monitoring wells contained minor concentrations (< 5.0 mg/L) of TPH diesel (TPH/D). A groundwater sample from OKUS-W5 contained 130 mg/L of petroleum oil (TPH 418.1).

- Analytical results from groundwater samples indicated detectable concentrations of arsenic (As) in three of the five monitoring wells and detectable concentration of chlorobenzene in two of the five monitoring wells. There was no analytical evidence of chloroform which was present during the PSA. Concentrations of As in groundwater samples ranged from a low of 0.093 mg/L in OKUS-W2 to a high of 0.560 mg/L in OKUS-W5. Two groundwater samples contained chlorobenzene concentrations above the Method Detection Limit (MDL) and ranged from 0.016 mg/L in OKUS-W3 to 0.026 mg/L in OKUS-W2. The MCL for As is 0.050 mg/L, and the MCL for chlorobenzene is 0.100 mg/L (Marshack, 1989).

- Detectable concentrations of TPH/G, BTEX and dissolved As were recorded in the groundwater samples from wells located in the vicinity of the former fuel island and gasoline UST. There was also detectable TPH/G and BTEX in the sample from monitoring well OKUS-W4 which is up-gradient from the former fuel island and UST locations.

- Arsenic and chlorobenzene are not believed to be related to the contents of the former USTs. The former USTs contained engine oil, waste oil, diesel fuel and gasoline.

- Free phase petroleum product was noted in monitoring wells OKUS-W4 (0.1 inch) and OKUS-W5 (0.2 inch). The product did not recover in either well after the first bailer volume was removed. There was no free phase hydrocarbons noted in the remaining wells.

Based on these conclusions, USPCI recommends the following actions:

- Continue the quarterly monitoring program throughout 1993. The data gathered during the quarterly monitoring program will be utilized for development of a remediation plan for hydrocarbon-impacted groundwater in the vicinity of the truck repair shop.

- Complete the report of the Phase II assessment in July 1993 which was designed to define the lateral extent of hydrocarbon impacted soil and groundwater.

Analytical results indicated elevated concentrations of arsenic (As) in groundwater samples from three of the five monitoring wells and minor concentrations of chlorobenzene in samples from two of the five monitoring wells. There was no analytical evidence of chloroform which was present during the Preliminary Site Assessment (PSA). Concentrations of As in groundwater samples ranged from 0.093 mg/L in OKUS-W2 to 0.560 mg/L in OKUS-W5. Chlorobenzene concentrations in groundwater samples ranged from 0.016 mg/L in OKUS-W3 to 0.026 mg/L in OKUS-W2. The MCL for As is 0.050 mg/L, and the MCL for chlorobenzene is 0.100 mg/L (Marshack, 1989). There was no analytical evidence of dissolved lead in any of the groundwater samples collected from the five monitoring wells which is consistent with previous sampling results.

The arsenic and chlorobenzene detected in groundwater samples are not believed to be related to the contents of the former USTs. The former USTs contained engine oil, waste oil, diesel fuel and gasoline.

Phase-separated hydrocarbons (PSH) were observed in two of the five of the monitoring wells.

Groundwater beneath the site flowed to the east-southeast at a gentle gradient (0.006 ft/ft) on the date measured.

1.1 Site Background

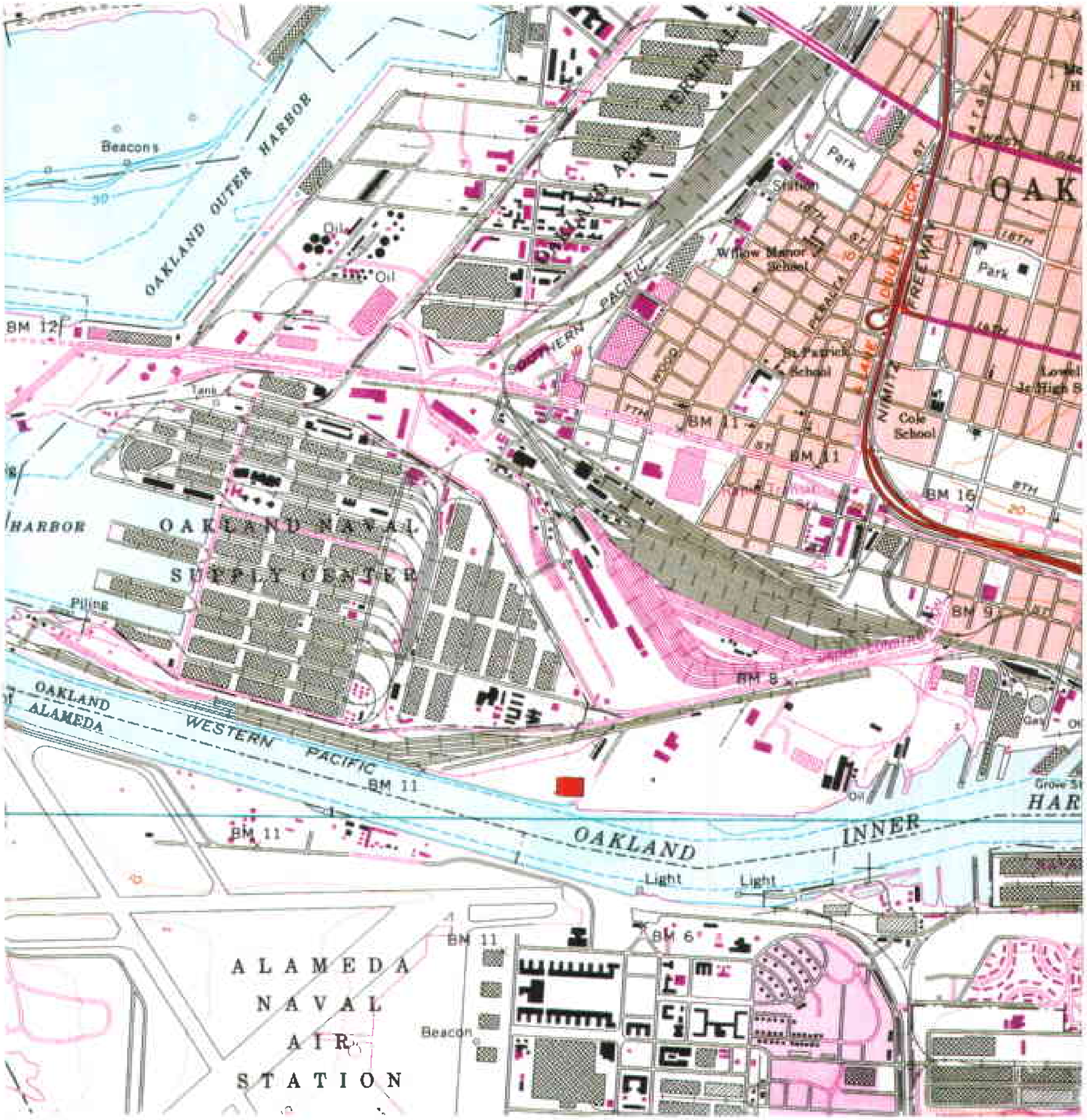
1.1.1 General Description and Previous Activities

The site is located on the southeastern end of the UPRR TOFC Yard (Figure 2) located in the Port of Oakland. The area surrounding the site is used for heavy to light commerce, with residential areas being located inland to the east and west across the Oakland Estuary. Five USTs were removed from the UPMF site from 1987 to 1990 (Figure 3). The refueling portion of the TOFC yard, approximately 700 feet northwest of the truck repair shop, is currently undergoing groundwater remediation by recovery of diesel product. The limits of the diesel plume in that portion of the site have been adequately defined (USPCI, 1991), and impacted groundwater at the truck repair facility does not appear to be related to groundwater being treated in the TOFC Yard refueling area.

1.1.2 Location and Access

The site is located in the UPRR TOFC Yard at 1750 Ferro Street in the Port of Oakland on east side of the Inner Harbor, Oakland, California. Access to the site at the intersection of Middle Harbor Road and Ferro Street.

Underground sewer lines and fiber optics lines were located and marked



🟥 - SITE

N

USPCI
A Subsidiary of Union Pacific Corporation

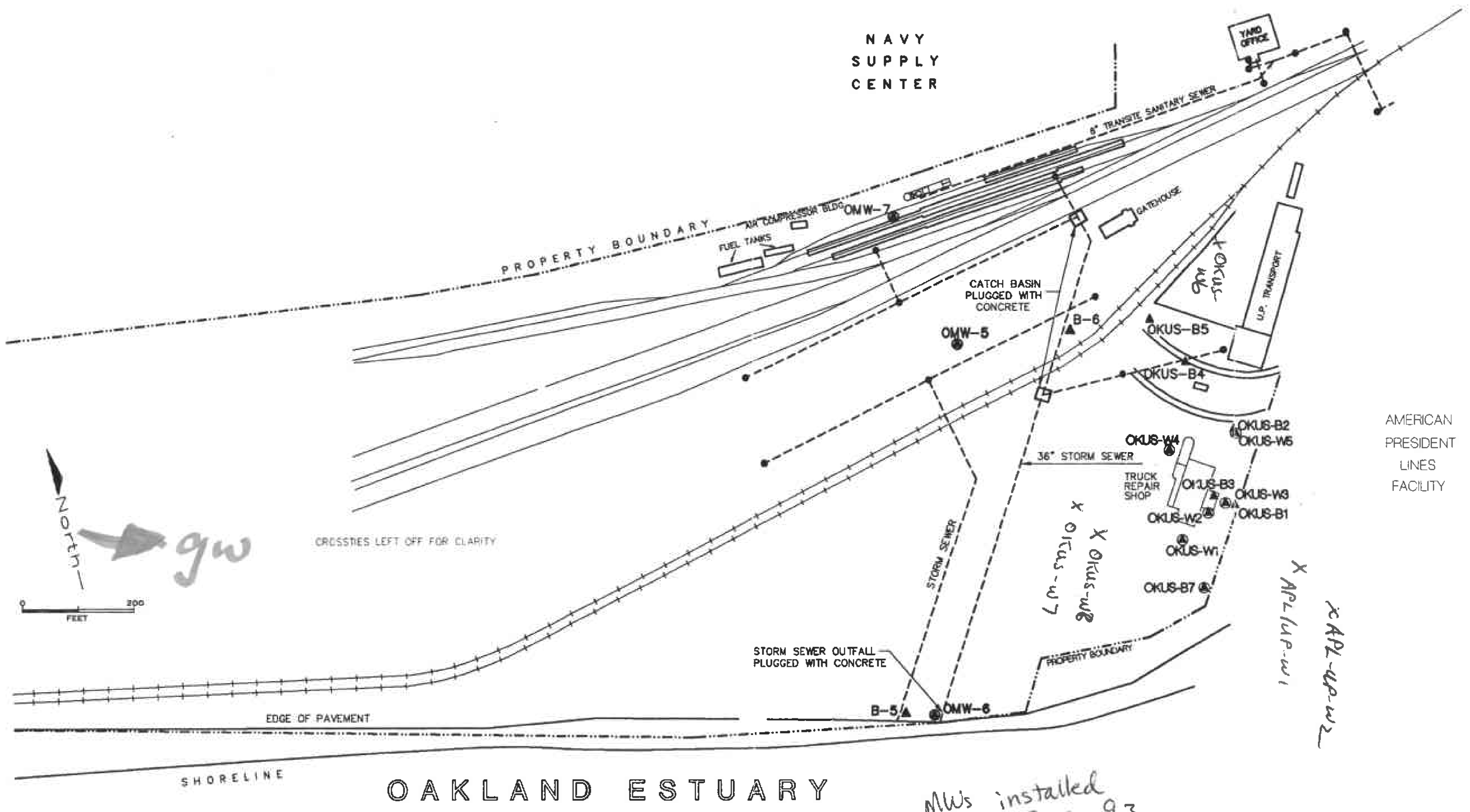
Remedial Services

UPRR TOFC YARD, OAKLAND, CA

FIGURE 1

SITE LOCATION MAP

SCALE: 1" = 2000'	USGS 7.5 TOPO: OAKLAND WEST



MWs installed in June 93
(6, 7, 8,
W1, W2)

LEGEND

- ● OMW-1 MONITORING WELL LOCATION AND NUMBER
- ▲ B-1 BORING LOCATION AND NUMBER
- • CATCH BASIN FOR STORM SEWER

	BY	DATE
DRAWN		3/93
CHECKED		
APPROVED		
APPROVED		
APPROVED		

USPCI
A Subsidiary of
Union Pacific Corporation

UPRR TOFC RAILYARD
UPMF REPAIR SHOP, OAKLAND, CALIFORNIA

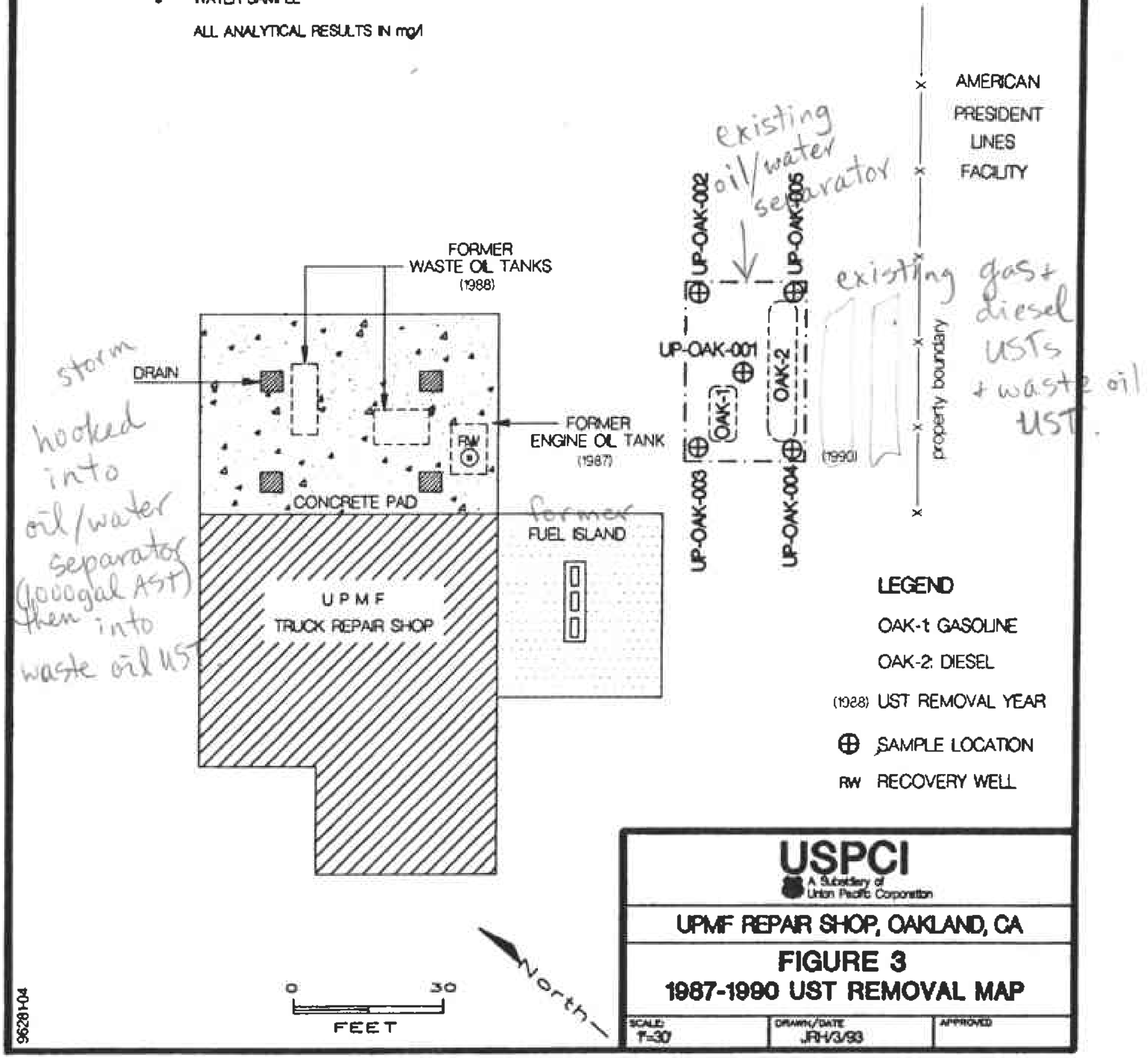
FIGURE 2
SITE VICINITY MAP

SCALE 1"=200'
DATE 1/15/93
DWG. NO. 96199-24

ANALYTICAL RESULTS FOR OAK-1 & OAK-2 REMOVAL IN 1990

SAMPLE LOCATION	SAMPLE ID	DATE SAMPLED	TPH C5-C20 mg/kg	TPH/D mg/kg	TPH/G mg/kg	BENZENE mg/kg	TOLUENE mg/kg	ETHYL-BENZENE mg/kg	XYLENE mg/kg	TOTAL BTEX mg/kg
CENTRAL *	UP-OAK-001	2/22/90	ND	ND	ND	0.053	0.023	ND	0.026	0.102
NW WALL	UP-OAK-002	2/22/90	ND	ND	ND	ND	ND	ND	ND	ND
SW WALL	UP-OAK-003	2/22/90	ND	ND	ND	ND	ND	ND	ND	ND
SE WALL	UP-OAK-004	2/22/90	ND	ND	0.032	ND	0.005	ND	0.025	0.025
NE WALL	UP-OAK-005	2/22/90	2.13	ND	ND	0.004	0.003	0.007	0.012	0.026

ND	NOT DETECTED
TPH	TOTAL PETROLEUM HYDROCARBONS
*	WATER SAMPLE
	ALL ANALYTICAL RESULTS IN mg/l



USPCI
A Subsidiary of Union Pacific Corporation

UPMF REPAIR SHOP, OAKLAND, CA

FIGURE 3
1987-1990 UST REMOVAL MAP

SCALE:	DRAWN/DATE	APPROVED
1"=30'	JRH/3/93	

96281-04

1.2. Investigative Procedures

All USPCI field activities, including data recording procedures, decontamination methods, groundwater sample collection, and purge water disposal, were conducted in accordance with USPCI's Quality Assurance/Quality Control (QA/QC) Plan located in Appendix A.

The quarterly monitoring event was conducted by Mr. Christopher Byerman under the direct supervision of F. Erickson Taylor, California Registered Geologist #4710.

2.0 CHRONOLOGY OF EVENTS

The following section presents a detailed chronology of 1992 and 1993 activities related to the site assessment, along with dates of relevant correspondence between the parties involved.

April 29, 1992	The Alameda County Department of Environmental Health (ACDEH) issued a letter to Mr. Andrew Clark-Clough of the Port of Oakland and Mr. John Seagle of UPRR requesting that a Preliminary Site Assessment (PSA) be performed at the UPRR facility at 1750 Ferro Street, Oakland, California.
June 10, 1992	UPRR contacted Mr. Paul Smith of the ACDEH regarding the ACDEH letter dated April 29, 1992 concerning UPRR's UST removals at 1750 Ferro Street, Oakland, California.
June 18, 1992	USPCI submitted a PSA workplan to the UPRR for review and submittal to the ACDEH and the Port of Oakland presenting the proposed workscope, technical information, and methods used to conduct the assessment.
July 10, 1992	UPRR submitted the PSA workplan, along with analytical data from the December 1987 excavation and the 1990 UST removals, to Ms. Susan Hugo of the ACDEH and Ms. Michele Heffes of the Port of Oakland.
July 28, 1992	USPCI responded to a request from Ms. Jennifer Eberle of the ACDEH for supplemental information for the PSA workplan.
August 6, 1992	The Port of Oakland responded to UPRR on USPCI's proposed PSA. Ms. Michele Heffes of the Port of Oakland informed UPRR that permits would be required from the Port of Oakland, Bay Conservation and Development Commission (BCDC) and the Alameda County Flood

	Control District (ACFCD) before proceeding with the PSA. A permit to install groundwater monitoring wells on Port property was also required.
August 10, 1992	USPCI responded to a second request from Ms. Jennifer Eberle of the ACDEH for supplemental information for the PSA workplan.
August 25, 1992	ACDEH approved USPCI's PSA workplan with comments. ACDEH also informed USPCI that Ms. Jennifer Eberle will be overseeing this case.
November 10, 1992	USPCI requested a permit from the ACFCD and the Port of Oakland to install monitoring wells at the UPMF facility at 1750 Ferro Street, Oakland, California.
November 16, 1992	USPCI received a permit application number (92580) from the ACFCD for the construction of the monitoring wells.
December 6, 1992	USPCI received a permit application approval from the ACFCD for the construction of the monitoring wells.
January 7, 1993	USPCI requested and received ticket numbers from UPRR Fiber Optics (# 672732) and Underground Service Alert (# 4997). Underground Service Alert notified all utilities that had underground lines in the area to mark lines by 8:00 AM, January 12, 1993. USPCI also informed Ms. Jennifer Eberle of the ACDEH that the PSA would begin on January 12, 1993.
January 11, 1993	USPCI personnel arrived at the UPMF facility to collect site information and plan drilling activities.
January 12-15, 1993	USPCI conducted a PSA on the UPMF facility at 1750 Ferro Street. Five monitoring wells and seven soil borings were installed. Soil and groundwater samples were collected and analyzed as part of the assessment.
February 2, 1993	USPCI contacted Ms. Jennifer Eberle of the ACDEH to discuss report format and relay analytical information collected in the PSA.
February 18, 1993	USPCI personnel collected additional groundwater samples due to elevated concentrations of metals and minor concentrations of semivolatiles and purgeable halocarbons that were found in several soil samples. Composite samples of drummed soil cuttings and purge/decon water were also collected for final treatment and/or disposal.

February 25, 1993	Mr. Craig Mayfield from the ACFCD contacted USPCI by letter and requested copies of the well construction diagram, boring logs and a site map showing the locations of the borings/monitoring wells. USPCI forwarded this information to Mr. Mayfield on February 26, 1993.
April 21, 1993	USPCI forwarded the completed Preliminary Site Assessment Report to UPRR, ACDEH, CRWQCB (San Francisco Bay) and the Port of Oakland.
April 29, 1993	Ms. Jennifer Eberle of the ACDEH informed UPRR that the county agrees with USPCI recommendations to begin a quarterly monitoring program and complete a Phase II Site Assessment.

3.0 FIELD INVESTIGATION RESULTS

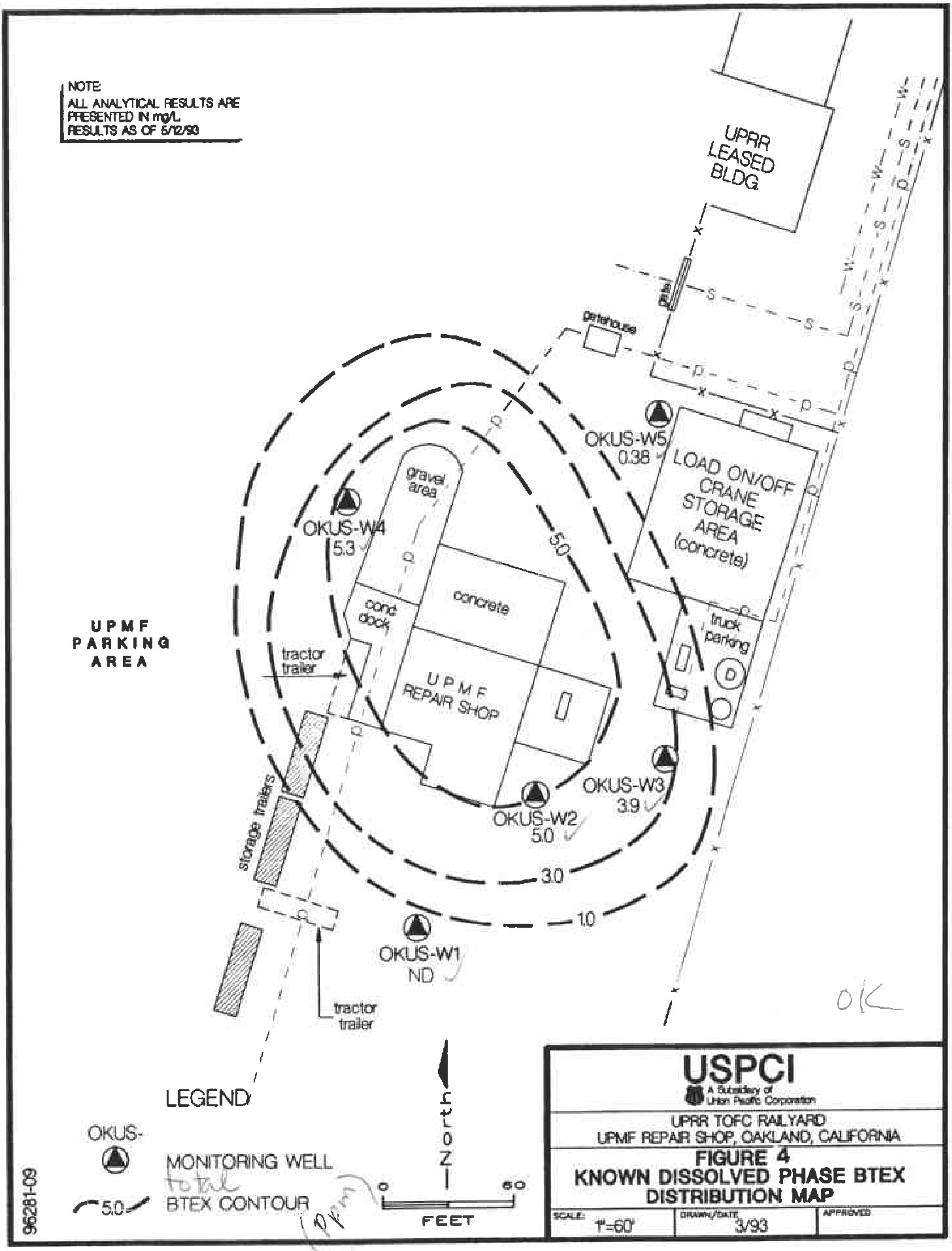
3.1 Groundwater Assessment Determinations

3.1.1 Groundwater Characteristics

The UPRR Oakland TOFC Railyard and UPMF Facility (Figure 2) are immediately adjacent to the Oakland Estuary, which is located in the eastern portion of the San Francisco Bay. The close proximity of the Estuary to the site suggests that a direct hydrologic connection may exist between the Estuary and the groundwater beneath the site. Tidal influences from the Estuary may influence water levels in the monitoring wells at the site; however, previous studies in the San Francisco Bay Area suggests that tidal influences are generally minimal and are only detectable in monitoring wells in very close proximity to the Bay (usually within 200 feet; USPCI, 1991). The actual degree of influence is dependent on individual site characteristics.

3.1.2 Results of Laboratory Analysis of Groundwater Samples

Analytical results indicate elevated TPH/G and BTEX concentrations in groundwater at the site (Figure 4 and Table 1). Total BTEX concentrations ranged from non-detect in the sample from monitoring well OKUS-W1 to 4.97 mg/L in sample OKUS-W2. Benzene concentrations were above the MCL (0.001 mg/L) in samples from four of the five monitoring wells. Ethylbenzene concentrations were above the MCL (680 mg/L) in samples from three of the five monitoring wells. TPH/G concentrations ranged from below analytical detection limits in OKUS-W1 to 8.8 mg/L in sample OKUS-W2. TPH/D concentrations ranged from 0.12 mg/L in sample OKUS-W1 to 4.20 mg/L in samples OKUS-W3. TPH 418.1 concentrations ranged from below the Method Detection Limit



USPCI
A Subsidiary of Union Pacific Corporation

UPRR TOFC RAILYARD
UPMF REPAIR SHOP, OAKLAND, CALIFORNIA

FIGURE 4
KNOWN DISSOLVED PHASE BTEX DISTRIBUTION MAP

SCALE:	DRAWN/DATE	APPROVED
1"=60'	3/93	

96281-09

TABLE 1
CUMULATIVE ANALYTICAL RESULTS OF GROUNDWATER SAMPLES
UNION PACIFIC RAILROAD MOTOR FREIGHT FACILITY
OAKLAND, CALIFORNIA
USPCI PROJECT NO. 96120-844

SAMPLE LOCATION	SAMPLE ID	DATE SAMPLED	[redacted] [redacted]	TPH/D [redacted]	TPH/G [redacted]	BENZENE [redacted]	TOLUENE ug/L	ETHYL-BENZENE ug/L	TOTAL XYLENES ug/L	TOTAL BTEX ug/L	[redacted] mg/L	[redacted] mg/L	CHLORO-BENZENE ug/L	CHLORO-FORM ug/L	8010
OKUS-W1 "	OKUS-W1 "	1/14/93 [redacted]	ND [redacted] ND	ND 120	410 ND	20 ND	4 ND	220 ND	ND ND	244 ND	ND ND	ND ND	ND ND	ND ND	ND
OKUS-W2 "	OKUS-W2 "	1/14/93 5/12/93	2.5 ND	5400 2800	14000 8800	480 [redacted]	92 47	8500 4600	ND 100	9072 4967	0.036 [redacted]	ND ND	14 [redacted]	290 ND	ND
OKUS-W3 "	OKUS-W3 "	1/14/93 5/12/93	4.5 [redacted]	4200 [redacted] 4200	4900 [redacted]	230 280	42 60	2600 3500	44 72	2916 3922	NA [redacted]	ND ND	15 [redacted]	140 ND	ND
OKUS-W4 "	OKUS-W4 "	1/15/93 [redacted]	2.5 [redacted]	5400 2900	8900 6000	300 [redacted]	ND 110	4500 4600	ND 230	4800 5260	NA [redacted]	ND ND	ND NA	75 NA	
OKUS-W5 "	OKUS-W5 "	1/15/93 [redacted]	ND [redacted]	2900 2100 ST 2900	550 550	53 [redacted]	11 14	180 250	20 37	264 382	NA [redacted]	ND ND	ND NA	5.9 NA	
QA/QC															
OKUS-W5 OKUS-W1	OKUS-W6 OKUS-W6	1/15/93 5/12/93	ND ND	2800 140	510 ND	50 ND	10 ND	170 ND	19 ND	249 ND	NA ND	NA ND	NA ND	NA ND	

ND - Not Detected
NA - Not Analyzed
TPH - Total Petroleum Hydrocarbons
mg/L - milligram per liter
ug/L - microgram per liter

Water samples were collected by USPCI Remedial Services, Ontario, CA.
Water samples were analyzed by Sequoia Analytical, Concord, CA.

TPH/IR - analyzed using Method 418.1
TPH/D - anaylzed using Method 8015 Mod.
TPH/G - anaylzed using Method 8015 Mod.
BTEX - analyzed using Method 8020
CHLOROBENZENE - analyzed using Method 8010
CHLOROFORM - analyzed using Method 8010

As - analyzed using Method 7060
Pb - analyzed using Method 7421

(MDL) in groundwater samples from wells OKUS-W1 and OKUS-W2 to 130.0 mg/L in a groundwater sample from well OKUS-W5.

Groundwater samples were also analyzed for dissolved arsenic, lead, and purgeable halocarbons. The analytical results indicated dissolved arsenic in samples from four of the five monitoring wells. The detected concentrations of dissolved arsenic in groundwater samples ranged from 0.093 mg/L in OKUS-W2 to 0.560 mg/L in OKUS-W5. Three groundwater samples contained concentrations of dissolved arsenic exceeding the MCL of 0.050 mg/L (Table 1). Dissolved lead was not detected above the MDL in any of the existing wells. Chlorobenzene was detected in groundwater water samples from two of the five monitoring wells. Detected chlorobenzene concentrations in groundwater samples ranged from 0.016 mg/L in OKUS-W2 to 0.026 mg/L in OKUS-W3. Two groundwater samples contained chlorobenzene above the MCL of 0.100 mg/L. A complete listing of these analytical results are in Table 1.

3.1.3 Groundwater Gradient

The static water levels measured in May 1993 in wells completed within the borings ranged from 6.40 to 9.23 feet below ground surface (BGS). The data from the water level measurements and mouth-of-casing elevations was used to calculate a local groundwater gradient of approximately 0.006 foot per foot to the east-southeast, toward the Oakland Estuary. [redacted] The data from the measurements and measuring point elevations (Table 2) were used to prepare the potentiometric surface map (Figure 5). Well stabilization and sampling reports are located in Appendix B.

4.0 SUMMARY AND CONCLUSIONS

4.1 Nature and Extent of Contamination

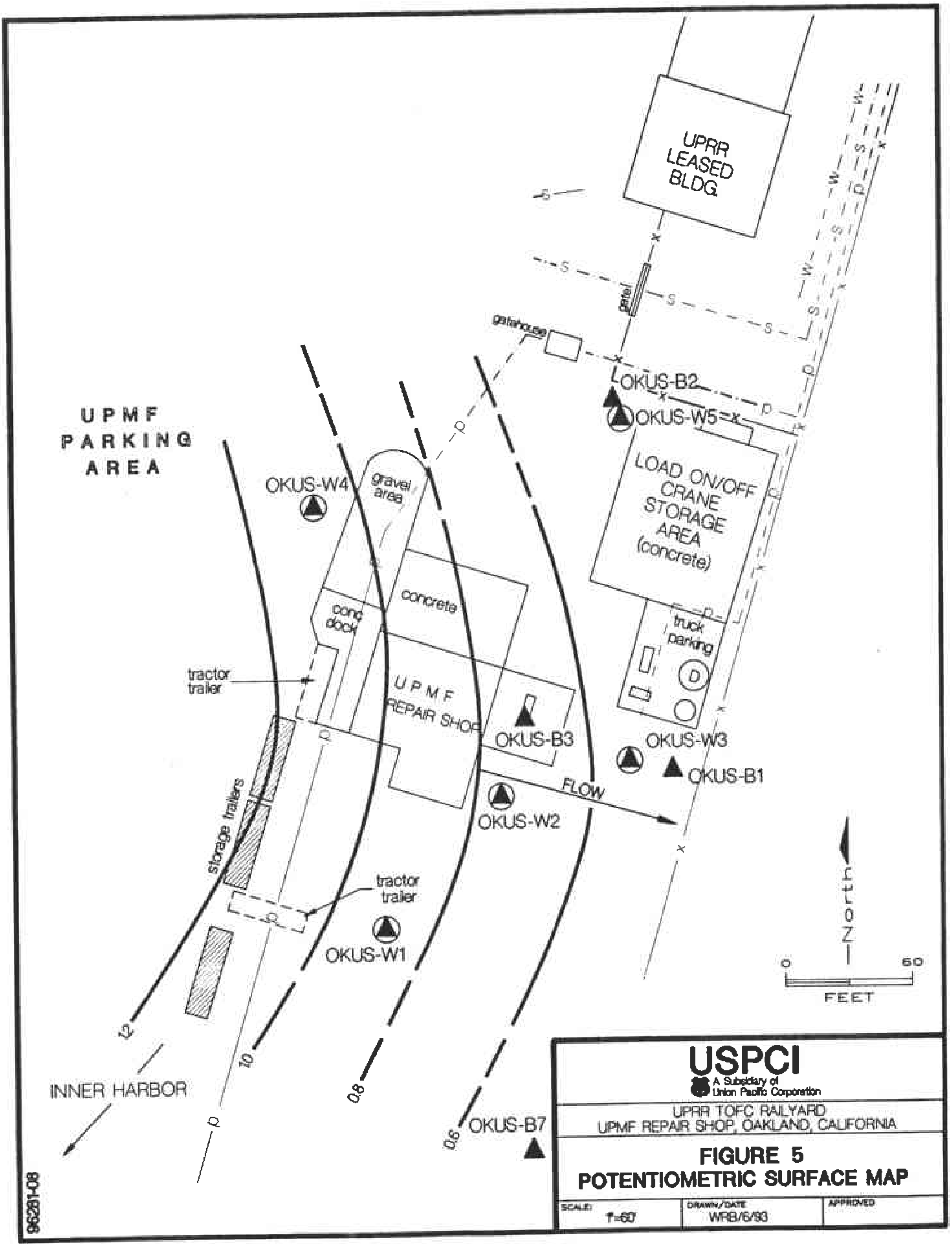
The analytical results from the January 1993 PSA, the February 1993 groundwater sampling event, and the May 1993 quarterly monitoring event indicate a dissolved plume of BTEX and TPH/G that appears to be localized in the immediate area surrounding the UPMF facility (Figure 4 and Table 1). Other contaminants not clearly associated with the UST system were also detected in groundwater beneath the site. The lateral extent of groundwater impacted either by hydrocarbons or other contaminants has not yet been defined.

TABLE 2
CUMULATIVE FLUID LEVEL MEASUREMENT DATA
UNION PACIFIC RAILROAD MOTOR FREIGHT FACILITY
OAKLAND, CALIFORNIA
USPCI PROJECT NO. 96120-844

WELL NO.	ELEV.* TOC	DATE	DEPTH TO PRODUCT	PRODUCT ELEVATION	inch PRODUCT THICKNESS (ft)	DEPTH TO WATER	WATER ELEV. (UNCORRECTED)	WATER ELEV. (CORRECTED)
OKUS-W1	9.17	1/14/93	N/A	N/A	NP	8.42	0.75	0.75
	9.17	1/15/93	N/A	N/A	NP	8.45	0.72	0.72
	9.17	2/18/93	N/A	N/A	NP	7.79	1.38	1.38
	9.17	5/12/93	N/A	N/A	NP	8.04	1.13	1.13
OKUS-W2	9.71	1/14/93	N/A	N/A	NP	9.08	0.63	0.63
	9.71	1/15/93	N/A	N/A	NP	9.12	0.59	0.59
	9.71	2/18/93	N/A	N/A	NP	8.70	1.01	1.01
	9.71	5/12/93	N/A	N/A	NP	9.04	0.67	0.67
OKUS-W3	9.8	1/14/93	N/A	N/A	NP	9.39	0.41	0.41
	9.8	1/15/93	N/A	N/A	NP	9.33	0.47	0.47
	9.8	2/18/93	N/A	N/A	NP	8.85	0.95	0.95
	9.8	5/12/93	N/A	N/A	NP	9.23	0.57	0.54
OKUS-W4	7.35	1/14/93	N/A	N/A	NP	6.43	0.92	0.92
	7.35	1/15/93	N/A	N/A	NP	6.44	0.91	0.91
	7.35	2/18/93	N/A	N/A	NP	5.77	1.58	1.58
	7.35	[redacted]	6.39	0.96	~~0.01~~ .1	6.40	0.95	0.96
OKUS-W5	9.25	1/14/93	N/A	N/A	NP	9.13	0.12	0.12
	9.25	1/15/93	N/A	N/A	NP	9.15	0.10	0.10
	9.25	2/18/93	N/A	N/A	NP	8.85	0.40	0.40
	9.25	[redacted]	9.18	0.07	~~0.02~~ .2	9.20	0.05	0.07

* All well casings measured to mean sea level (MSL).

N/A - Not Applicable
NP - No Product



USPCI
A Subsidiary of Union Pacific Corporation

UPRR TOFC RAILYARD
UPMF REPAIR SHOP, OAKLAND, CALIFORNIA

FIGURE 5
POTENTIOMETRIC SURFACE MAP

SCALE:	DRAWN/DATE	APPROVED
1"=60'	WRB/6/93	

4.2 Conclusions

TPH/G and BTEX were detected in groundwater samples from wells in the vicinity of the truck repair shop/UST system. Benzene concentrations were above the MCL (0.001 mg/L) in samples from four of the five existing monitoring wells. Ethylbenzene concentrations were above the MCL (680 mg/L) in samples from three of the five monitoring wells. TPH/G concentrations in groundwater samples were as high as 8.8 mg/L. The UST system appears to have been the source for petroleum hydrocarbons detected in groundwater samples.

The concentrations of dissolved arsenic exceeded the MCL of 0.050 mg/L in groundwater samples from four of five wells. Chlorobenzene was detected in groundwater water samples in two of the five monitoring wells. The chlorobenzene concentrations did not exceed the MCL of 0.100 mg/L. Due to the fact that the lateral extent of these non-hydrocarbon contaminants has not been delineated, the source of arsenic and chlorobenzene cannot yet be reliably defined. However, the UST system is not believed to have been the source of these contaminants, based on historical use of the tanks and on interpretation of the incompletely-defined distribution of these compounds in groundwater. The was no analytical evidence of chloroform which was present in the February 1993 sampling event.

5.0 RECOMMENDATIONS

Analytical results from the May 1993 quarterly monitoring event at the 1750 Ferro Street, UPMF site by USPCI indicated the presence of elevated TPH, BTEX and arsenic in groundwater samples collected from the four of the five existing monitoring wells.

Based on these conclusions, USPCI recommends the following steps.

- Continue the quarterly monitoring program throughout 1993. The data gathered during the quarterly monitoring program will be utilized for development of a remediation plan for hydrocarbon-impacted groundwater in the vicinity of the truck repair shop.
- Complete the report of the Phase II assessment in July 1993 which was designed to define the lateral extent of hydrocarbon impacted soil and groundwater.

6.0 REFERENCES CITED

Helley, Lajoie , Spangle, and Blair. 1979. Flatland Deposits of the San Francisco Bay Region, California. U.S. Geological Survey Professional Paper No. 943.

Hickenbottom, Kelvin, and Muir. June 1988. Geohydrology and Groundwater-Quality Overview of the East Plain Area, Alameda County, California. Alameda County Flood Control and Water Conservation District Report No. 205(J).

USPCI, 1991, Hydrocarbon Investigation and Remedial Design at Union Pacific Railroad's Oakland, California TOFC Yard.

USPCI, 1992, Site Investigation Workplan at the Union Pacific Motor Freight Facility at 1750 Ferro Street, Oakland, California.

USPCI, 1993, Preliminary Site Assessment at the Union Pacific Motor Freight Facility at 1750 Ferro Street, Oakland, California.

Marshack, 1989, The Designated Level Methodology for Waste Classification and Cleanup Level Determination. California Regional Water Quality Control Board-Central Valley Region, Sacramento, California.

USPCI

QUALITY ASSURANCE / QUALITY CONTROL PLAN

TABLE OF CONTENTS

USPCI
Quality Assurance /Quality Control Plan

INTRODUCTION

The USPCI quality assurance/quality control program (QA/QC) is intended to facilitate the acquisition of accurate and reliable data for environmental assessments.

The Quality Assurance Program is a totally integrated program for assuring the reliability of laboratory data, including quality planning, quality assessment and quality improvement efforts to meet project requirements at an economical level. Quality Assurance incorporates procedures for field sampling, sample handling and storage, analytical quality control and document preparation and review.

The Quality Control Program is a routine application of procedures such as blanks, spikes and spike duplicates for obtaining prescribed standards of performance in the measuring process. Quality Control is an audit of the overall Quality Assurance Program. Both programs are necessary to provide accurate data and documentation for investigations and laboratory analyses. The following personnel requirements and field and laboratory procedures will be implemented to ensure that QA/QC objectives are met on all USPCI projects.

1.0 FIELD PERSONNEL

All USPCI Project management personnel are formally educated and, at minimum, hold bachelor's degrees in their fields of technical expertise. In addition, many have advanced degrees in their technical disciplines. Where applicable, USPCI professionals are State Registered or Certified in their fields of expertise. Experience levels will vary depending on job responsibilities. Project Managers have at least five years experience in conducting and managing environmental drilling and sampling programs. Field personnel are experienced in conducting field activities involving monitoring well installation, water sampling, aquifer testing, core description, field program management, and data analysis.

Due to the importance of protecting the health of USPCI employees, subcontractor personnel and others, all on-site workers involved in USPCI projects must have Occupational Safety and Health Administration (OSHA) 40-hour Health and Safety Training Certification. Additionally, USPCI personnel receive periodic training in the use of special equipment for air monitoring and contaminant detection, excavation and shoring, and computerized project management systems.

2.0 FIELD TECHNIQUES

2.1 Recording of Field Data

All information pertinent to the field investigation will be documented on field forms. Information to be documented includes at least the following:

- Sample numbers
- Locations of sample collection
- Soil boring or well numbers, as applicable
- Depths at which samples were obtained
- Names of sample collectors
- Dates and times of collection
- Purpose of sample
- Sample distribution (e.g., laboratory, archive, etc.)
- Field observations
- Field measurements (e.g., PID readings, Ph, conductivity, water levels).
- Other data records (e.g., development log, soil sampling report, well log, etc.)

2.2 Field Equipment Calibration and Maintenance

The following measurement or monitoring equipment may be used during environmental assessments. Equipment is grouped by field activity. Calibration procedures and frequency are listed for each piece.

<u>Soil Borings and Well dimensions</u>- Steel and coated cloth tape. Calibration: none.

Water Level Measurements in Wells- Steel surveyors tape. Calibration: manufacturer supplied temperature correction will be applied as applicable for field conditions. Electrical well sounders. Calibration: check against steel surveyor's tape.

Organic Vapors- Photoionization detector. Calibration: daily field calibration using an isobutylene standard as per manufacturers instructions.

Groundwater pH Measurement- Digital pH meter. Calibration: standard pH solutions of 4, 7, and 10 will be utilized for daily field calibration according to manufacturers instructions.

Electrical Conductivity- Electrical conductivity meter. Calibration: factory-calibrated annually and periodically calibrated against laboratory prepared standard calibration solution.

Water Temperature- Mercury or digital thermometers. Calibration: factory-calibrated once.

Combustible Gas/Oxygen- Combustible gas/oxygen meter calibration: Factory calibrated, field calibrated monthly, zeroed daily according to manufacturers instructions.

Miscellaneous Measuring Devices- Calibration procedures for any other measuring device used will be documented at the request of the regulatory authority.

All equipment will be checked daily and replaced as necessary. Instrument manuals and an instrument log book will accompany all equipment into the field. Any calibration, repairs or related information will be recorded in the log book.

3.0 SOIL SAMPLING METHODOLOGY

3.1 Soil Sampling and Drilling Equipment Decontamination

All equipment used for drilling and sampling during USPCI environmental assessments will be decontaminated using a steam cleaner or high pressure washer prior to use. In addition, the equipment will be decontaminated subsequent to completion of each boring/monitoring well. All equipment used for collection of more than one sample, such as split-spoon soil samplers, will be decontaminated between each use to prevent cross contamination between samples. The sampling equipment decontamination procedure for pesticides and organic analysis will consist of a low phosphate detergent (Alconox or equivalent) bath followed by tap water, and deionized water rinses. Nylon brushes will be used to scrub sediment from the equipment. If the equipment is used to sample for metals, the initial rinse will be conducted with 0.1 N nitric acid followed by tap water and deionized water. Clean equipment will be placed on a rack and allowed to air dry. Bath and rinse water will be replaced as necessary to ensure adequate cleaning. The water used in the decontamination procedure will be stored in containers certified for hazardous materials storage by U.S. Department of Transportation (DOT). The drums will be secured on-site.

3.2 Soil Sample Collection During Drilling Activities

A proposal will be submitted to the lead Regulatory Authority with proposed boring/sampling locations. The exact location and number of borings at each site will be determined in the field by the Project Geologist/Engineer.

Drilling will be conducted by a State Certified Well Driller under the supervision of the USPCI field representative. Soil borings will be advanced with a continuous flight, hollow stem auger drill rig. No petroleum hydrocarbon based lubricants will be allowed on the drill string and associated connections. Soil cores will be collected with either a split-spoon sampler or a continuous coring device.

3.2.1 Split-Spoon Sampler

A California modified split-spoon sampler consists of a thin-walled steel cylinder, held together on each end by threaded steel end pieces, which separates longitudinally into two halves allowing the removal of brass or stainless steel liners which are used to contain the sampled soil interval. The sampler is 18 to 24 inches long and typically contains 3 to 4, six inch long, 2 to 2.5 inch diameter liners. The sampler will be driven ahead of the hollow stem auger by a 140 pound hammer with a 30 inch drop in accordance with the American Society for Testing and Materials (ASTM) Methods D 1586-84 for split barrel sampling of soil and D 1587-83 for thin-walled tube sampling of soils. The blows required to drive the sampler each six inch interval will be recorded on the boring log. The sampler will be removed from the boring and opened to reveal the liners. Latex gloves will be worn to prevent cross-contamination with other samples. The disposable gloves will be discarded after collection of samples from each sample drive.

Whenever possible, the bottom liner will be selected for laboratory analysis.

The liner will be sealed on each end with aluminum foil, plastic end caps and duct tape. Samples selected for laboratory analysis will be preserved, stored and transported in accordance with USPCI sample processing protocol (see Section 6).

Soil in the other liners and sampler shoe will be described by the USPCI field representative according to ASTM Standard Practice for Description and Identification of Soils, Visual-Manual Procedure (ASTM D-2488-90). Stratigraphic, genetic and other data/interpretations will also be recorded. Alternatively, one of the other sample liners may be used for the preparation of a duplicate sample. Field observations and selected sample intervals for laboratory analysis will be noted on the log prepared for each soil boring/ monitoring well. An explanation of the ASTM soil classification system will be included with the soil boring/well logs in an appendix of the assessment report.

3.2.2 Continuous Coring Devices

A variety of continuous coring devices may be employed for core collection. During coring operations, samples selected for laboratory analysis will be contained in glass jars and processed in accordance with the above mentioned USPCI sample processing protocol.

At a minimum, soil samples will be collected at five foot intervals, at significant changes in lithology and at intervals of obvious contamination in order to develop a complete profile of soil contamination.

3.3 Soil Sampling by Hand Auger and Coring Hammer

Hand tools will be utilized to collect soil samples from areas which are inaccessible to drilling rigs or do not require one. A hand auger will be used to advance the soil boring to the interval of interest. A hand held sliding hammer soil coring device will be utilized to drive a steel liner to obtain a undisturbed sample. Latex gloves will be worn to prevent cross-contamination with other samples. The disposable gloves will be discarded after sample collection from each interval. The steel liner containing the collected sample will be sealed on each end with aluminum foil, plastic end caps and duct tape. Samples selected for laboratory analysis will be preserved, stored and transported in accordance with USPCI sample processing protocol (See Section 6).

Soil description and sample collection intervals will follow methods discussed in Section 3.2.

3.4 Sampling from Soil Piles or Shallow Soil Pits

Soil samples will be collected and transported from excavated material or shallow pits in the manner described in the previous section except that a backhoe will not be utilized. If composite samples are collected, four metal liners (brass or stainless steel) will be filled for every 50 cubic yards of material to be sampled unless otherwise specified by the regulatory agency. The samples will be composited in a State Certified laboratory prior to analysis.

3.5 Sample Collection During Underground Tank Removal

Soil samples will be collected as soon as possible after removal of the tank. Where feasible, all preparations for soil sampling will be made prior to tank removal. Soil samples collected from a backhoe bucket or directly from the excavation floor will be collected in thin-walled stainless steel or brass liners at least three inches long by one inch in diameter. From 3 to 24 inches of soil will be removed from the immediate surface area where the sample is to be taken and the cylinder then pounded into the soil with a wooden mallet, bulk density driver, or other decontaminated driving device. No head space will be present in the cylinder once the sample is collected. Care will be taken to avoid contamination of both the inside and outside of the cylinder as well as its contents. During sampling, latex gloves will be worn to prevent cross contamination with other samples. The disposable gloves will be discarded after collection of each sample.

Once the sample is collected, the liner will be sealed on each end with aluminum foil or teflon tape, polyethylene lids, and duct tape. The sample will be stored and transported to the laboratory in accordance with USPCI Sample Processing Protocol (Section 6).

4.0 SOIL BORING ABANDONMENT AND DRILL CUTTINGS DISPOSAL

4.1 Soil Boring Abandonment

Upon completion of sampling activities, all USPCI soil borings will be abandoned with neat cement in order to prevent development of any preferential pathways from the surface to subsurface. The neat cement shall be composed of one sack of Portland cement (94 pounds or 43 kilograms) to 4.5 to 6.5 (depending on cement type and additives used) gallons (17 to 25 liters) of clean water. The borings will be backfilled in one continuous operation from the bottom up either through the drilling augers or via tremie pipe.

4.2 Disposal of Drill Cuttings

All soil cuttings generated during drilling activities will be contained in DOT approved, labeled steel drums certified for the storage of hazardous materials. The drums will be secured on-site.

5.0 GROUNDWATER MONITORING WELLS/ INSTALLATION, DEVELOPMENT, SURVEY, MONITORING, AND SAMPLING

5.1 Monitoring Well Installation

If a soil boring is converted to a groundwater monitoring well, all well screen and casing, centralizers and casing handling equipment will be decontaminated with a steam cleaner or high pressure, hot water washer utilizing potable water immediately prior to installation. Well construction material decontamination will be conducted on impermeable surfaces and all decontamination effluent will be contained and transferred to DOT approved plastic or steel drums. The drums will be secured on-site.

Well casing will be selected based on the chemical compounds targeted for laboratory analysis, anticipated lifetime of the monitoring program, well depth and geochemistry. In most cases, polyvinyl chloride (PVC) well casing and screen will be utilized. Site specific conditions may, in some cases, require the use of other well construction materials. The casing/screen will be flush threaded. Unless site-specific conditions warrant otherwise, 0.020 inch slotted screen will be installed. All appropriate measures will be taken to ensure that the well casing is centrally located in the boring. The screened interval will extend up to 15 feet below the water table. Five feet of screen will extend above the saturated zone in unconfined conditions in order to allow for monitoring of free product under conditions of a rising water table. Screened intervals completed in confined aquifers will not extend above the saturated zone. In order to prevent potential dilution of target chemical compounds in water samples, no more than 20 feet of screen will be installed in any monitoring well.

A coarse-grained sand filter pack (e.g. #2/12 Lonestar, #3 Monterey) will usually be utilized to mitigate siltation of the well by fine-grained sediments in the surrounding aquifer (grain size of the filter pack will be of appropriate size to ensure hydraulic connection between the well bore and the adjacent water-bearing formation). The sand will be introduced through the drilling augers in order to ensure the integrity of the filter pack. A minimum 3 inch differential between the outer diameter of the well screen and the inner diameter of the augers will be maintained in order to ensure effective placement of filter pack. In some instances, saturated fine-grained sand (flowing sand) may enter the drill string during well completion. Although every effort will be made to prevent entry of native materials into the drill string during well completion (e.g. loading the augers with water), it may sometimes be necessary to utilize native material for filter pack. Information regarding filter pack condition will be included on the well log. The filter pack will extend to at least one foot but no more than two feet above the top of the screened interval to allow for filter pack settling during well development.

Subsequent to introduction of the filter pack, the surface sanitary seal will be completed. At least a two foot thick interval of sodium bentonite pellets will be deposited directly above the filter pack. The pellets will then be hydrated with potable water. A neat cement grout seal will be placed via tremie pipe from the bentonite pellet seal to just below the frost line. The neat cement grout seal will be composed of one sack of Portland cement (94 pounds or 43 kilograms) to 4.5 to 6.5 (depending on cement type and additives used) gallons (17 to 25 liters) of clean water.

Soundings will be made by the USPCI field representative during all stages of well construction to ensure proper placement of filter pack and sealant materials. Moreover, the volume of filter pack and sealant required will be calculated to establish the correct subsurface distribution of the materials. The actual volume of materials used will be recorded during well construction. Discrepancies between calculated volumes and actual volumes will be noted and explained on the monitoring well construction log.

A subgrade traffic-rated well box, or aboveground steel casing imbedded in concrete will be installed to protect the wellhead. The concrete cap will extend from below the frost line to the surface and blend into a four-inch thick apron at least two feet in diameter. The annulus between the well casing and the steel casing will be filled with bentonite pellets or chips from below the frost line to the surface. The bentonite sealant material will then be hydrated with potable water. This non-bonding surface seal will serve to protect the well casing from damage during periods of frost heaving. The wellhead will be locked to provide monitoring well security.

A typical monitoring well completion is diagramed in Figure A. All well completion information will be included in the well log.

5.2 Well Development Protocol

Groundwater monitoring wells will be surged and developed subsequent to well completion. Flow reversals or surges will be created by using surge blocks, bailers or pumps. Formation water will be used to surge the well. In low yielding water bearing formations, an outside source of water may be introduced into the well to facilitate development. In such cases this water will be chemically analyzed beforehand to evaluate its potential impact on in-situ water quality. At no time will air be used to develop a well. Approximately 4 to 10 times the volume of water in the casing and pores of the filter pack will be withdrawn, if possible. Development volumes will be calculated in the following manner:

Volume of Schedule 40 PVC Pipe

Diameter (inches)	I.D. (inches)	Volume Gal/linear ft.
2	2.067	0.17
4	4.026	0.66

Volume of Open Borehole and Annular Space
Between Casing and Hole

Hole Diameter (inches)	Volume/linear ft. of hole		Normal Casing Diameter	Volume/ linear ft. of* Annular Space	
	Gal.	Cu. Ft.	(inches)	Gal.	Cu. ft.
7.25	2.14	0.29	2	1.91	0.26
8.25	2.78	0.37	2	2.55	0.34
10.25	4.29	0.57	2	4.06	0.54
10.25	4.29	0.57	4	3.46	0.46
12.25	6.13	0.82	4	5.30	0.71

*Note: Annular volumes will be multiplied by 30% to account for porosity of filter pack.

If the aquifer is slow to recharge, development will continue until recharge is too slow to practically continue. The volume of water produced versus time will be recorded on the well log.

All withdrawn groundwater will be stored on-site in DOT approved containers for hazardous material storage unless prior permission is granted by the appropriate regulatory agency to discharge the water to the ground surface or sanitary sewer. Contained water will be labeled with the source of the water to help ensure appropriate disposal based on contamination levels.

5.3 Elevation Survey of Monitoring Wells

All monitoring wells at USPCI project sites will be surveyed to a common datum by a qualified surveyor. Where required by regulatory agencies, the wells will be surveyed to mean sea level datum (MSLD) by a Registered land surveyor to an accuracy of 0.01 foot. The surveyor's report will be included as an appendix to the report. For consistency, the wells will be surveyed from the north side of the top of the monitoring well casing.

5.4 Documentation of Well Design, Construction and Development

The following well design and construction details for each monitoring well will be included on the boring log, well construction log, purge log, or surveyor' report:

1) Date/time of construction
2) Drilling method and drilling fluid used
3) Well location (within 0.5 ft.)
4) Bore hole diameter and well casing diameter
5) Well depth (within 0.1 ft.)
6) Drilling and lithologic logs
7) Casing materials
8) Screen materials and design
9) Casing and screen joint type
10) Screen slot size /length
11) Filter pack material/size
12) Filter pack volume calculations
13) Filter pack placement method
14) Sealant materials (percent bentonite)
15) Sealant volume (lbs/gallon of cement)
16) Sealant placement method
17) Surface seal design/construction
18) Well development procedure
19) Type of protective well cap
20) Ground surface elevation (within 0.01 ft.)
21) Top of monitoring well casing elevation (within 0.01 ft.)
22) Detailed drawing of well (including dimensions)

5.5 Groundwater Monitoring Protocol

During a sampling event the depth to standing water and total depth of the well (bottom of screened interval) well be measured to an accuracy of 0.01 foot. For consistency, all measurements will be taken from the north side of the wellhead at the survey mark. These measurements are required to calculate the volume of stagnant water in the well and provide a check of the integrity of the well (e.g., identify siltation problems). The devices used to detect the water level surface and calibration methods have been discussed previously (Section 2.2).

To reduce the potential for cross contamination between wells, well monitorings will proceed in order from the least to most contaminated wells, if known. Wells containing free product will be monitored last.

Between each well monitoring the equipment will be decontaminated following the procedure detailed in Section 3.1.

Water elevations will be collected during each subsequent sampling event in order to determine if horizontal and vertical flow gradients have changed since initial site characterization. A change in hydrologic conditions may necessitate modification to the design of the site groundwater monitoring system.

5.5.1 Detection of Immiscible Layers

The thickness of immiscible layers (i.e., "floaters" and/or "sinkers") within a monitoring well, if present, will be determined during each sampling event. "Floaters" are those relatively insoluble organic liquids that are less dense than water and which spread across the potentiometric surface. "Sinkers" are those relatively insoluble organic liquids that are more dense than water and tend to migrate vertically through sand and gravel aquifers to the underlying confining layer.

The following procedures will be utilized for detecting the presence of light and/or dense phase immiscible organic layers. These procedures will be conducted prior to well evacuation for conventional sampling:

1) Remove the locking and protective well caps.

2) Sample the air in the wellhead for organic vapors using either a photoionization analyzer or an organic vapor analyzer, and record measurements. The air above the wellhead will be monitored in order to determine the potential for fire, explosion, and/or toxic effects on workers.

3) Determine, using an interface probe, the static liquid level and thickness, if present, of any floating immiscible organic layers.

4) Determine the presence of dense phase immiscible layers by lowering an interface probe to the bottom of the well.

5.5.2 Collection of immiscible solutions

The approach to collecting light phase immiscibles is dependent upon the depth to the surface of the floating layer and the thickness of that layer. If the thickness of the phase is 2 feet or greater, a bottom valve bailer will be used. The bailer will be lowered slowly until contact is made with the surface of the immiscible phase, then lowered to a depth less than that of the immiscible/water interface depth as determined by preliminary measure with the interface probe.

A double check valve bailer will be used to collect dense phase immiscibles. The bailer will be slowly lowered and raised for sample collection.

Floating product thickness is calculated by subtracting the depth to product from the depth to water. In addition, water elevations are adjusted for the presence of fuel with the following calculation:

$$(\text{Product Thickness})\ (.8) + (\text{Water Elevation}) = \text{Corrected Water Elevation}$$

Note: The factor of 0.8 accounts for the density difference between water and petroleum hydrocarbons.

Newly installed wells will be allowed to stabilize for 24 hours after development prior to free product inspection.

A transparent surface sampler will be used for visual inspection of the groundwater in order to note sheens (difficult to detect with an Interface Probe), odors, microbial action and sediments.

If free product is detected, laboratory analysis of groundwater at the interface for dissolved product will not be conducted. A product sample will be collected for source identification.

5.6 Groundwater Sampling Protocol

5.6.1 Sampling Equipment Decontamination

Prior to arriving at the sampling site, all groundwater sampling equipment except pre-cleaned disposable materials, and laboratory prepared sampling containers will be washed with a low phosphate detergent (Alconox or equivalent), rinsed twice with tap water, and once with deionized water. If more than one monitoring well is on-site, this procedure will be carried out prior to sampling of each of the other monitoring wells.

Latex gloves will be worn at each sampling location to prevent cross-contamination with other samples. The disposable gloves will be discarded after collection of samples from each well.

5.6.2 Well Purging

The water standing in a well prior to sample collection may not be representative of in-situ ground-water quality. Prior to sample collection, the well will be purged with a bailer, WaTerra pump, or positive-gas-displacement pump until indicator parameters (temperature, conductivity and pH) stabilize. This generally requires the removal of at least three well casing volumes by bailing or pumping. The water will be drawn from the uppermost part of the water column in high-yield formations to ensure that fresh water from the formation will move upward in the screen. In low-yield formations, water will be purged so that it is removed from the bottom of the screened interval.

The criteria for determining well casing volumes and disposition of purged water is outlined in Section 5.3 (Well Development Protocol). The indicator parameter measurements will be taken both before and after purging of each well casing volume. Once indicator parameters have stabilized, a sample will be collected after the water level approaches 80 percent of its initial elevation. Where water level recovery is slow (exceeding 2 hours), the sample will be collected after stabilization is achieved and enough water is present to collect an adequate amount of sample for analysis. At no time will a well be pumped dry if the recharge rate causes the formation water to vigorously cascade down the sides of the screen and cause an accelerated loss of volatiles. All well development and purging information will be noted on purge logs and included as an appendix of the report.

5.6.4 Sample Collection

Observations made during to groundwater sample collection will include a description of the area surrounding the well, possible impacts by surface-water runoff, ambient weather conditions and other factors which could affect the final data analysis. This documentation will be recorded on the well purge log.

Sampling will proceed from the least contaminated to the most contaminated well, if that information is available before sample collection, or if such information can be determined by field evidence. Where several types of analysis will be performed for a given well, individual samples will be collected in order of decreasing volatility as follows:

1. Volatile organics
2. Purgeable organic carbon
3. Purgeable organic halogens
4. Total organic carbon
5. Total organic halogens
6. Extractable organics
7. Total metals
8. Dissolved metals
9. Phenols
10. Cyanide
11. Sulfate and chloride
12. Turbidity
13. Nitrate and ammonia

The specific analytical methods to be utilized for the various analyses are shown on Table 2.

All sampling procedures will conform with the following:

1) Water samples will be collected with a teflon bailer equipped with a bottom emptying device, a WaTerra pump, or a positive gas displacement bladder pump.

2) All sampling equipment introduced to the well will be constructed of inert materials (i.e. teflon or stainless steel).

3) Positive gas displacement bladder pumps will be operated in a continuous manner so that they do not produce pulsating samples that are aerated in the return tube or upon discharge.

4) Check valves will be designed and inspected to assure that fouling problems do not reduce delivery capabilities or result in aeration of the sample.

5) Sampling equipment (e.g., especially bailers) will never be dropped into the well, which causes degassing of the water upon impact. When using a bailer, the device will be lowered slowly into

the well to mitigate agitation (causing turbidity) of the water. The bailer will be retrieved gently but quickly and the sample then poured slowly into the sample container in order to minimize agitation, turbulence and exposure to air.

6) Clean sampling equipment will not be placed directly on the ground or other contaminated surfaces prior to insertion into the well.

7) Duplicate samples will be transferred to vials or containers that meet Regulatory specifications (Table 1). When filling 40 ml vials, groundwater will be transferred from the sampling device to the sample container by allowing the fluid to flow slowly along the sides of the vessel. All containers will be filled above the top of the opening to form a positive meniscus. No head space should be present in the sample container once it is sealed. After the vial is capped, it will be inverted to check for air bubbles. If bubbles are present, the sample will be discarded and replaced. If it is not possible to collect a sample without head space, the problem will be noted on the field technician's sampling log.

8) Immediately following sample collection, sample containers will be stored and transferred to the laboratory in accordance with USPCI sample processing protocol (Section 6).

9) If a positive gas displacement bladder pump is used for sample collection, pumping rates will not exceed 100 milliliters/minute. Higher rates can increase the loss of volatile constituents and can cause fluctuation in pH and pH-sensitive analytes. Once the portions of the sample reserved for the analysis of volatile components have been collected, higher pumping rates may be utilized for sample collection for other analyses. However, the sampling flow rate will not exceed the flow rate used while purging.

6.0 SAMPLE PROCESSING

6.1 Sample Containers

Soil and Groundwater samples will be placed in the proper containers for the desired analysis. Table 1 summarizes the required sample containers. All sample containers will be verified clean in the laboratory prior to shipment to a sampling site.

6.2 Sample Preservation

Samples will be preserved in order to : 1) retard biological activity, 2) retard hydrolysis, and 3) reduce sorption effects. Soil and groundwater samples will be preserved as indicated on Table 1 and placed in an ice chest immediately after collection. Chemical ice (blue ice), dry ice, or, where allowed, regular ice, sealed in plastic bags will be used to cool and maintain samples at a temperature of 4°C.

Samples requiring analysis for organics will not be filtered. Samples will not be transferred from one container to another which could result in loss of organic material onto the walls of the container or through aeration.

Metallic ions that migrate through the unsaturated (vadose) and saturated zones and arrive at a ground-water monitoring well may be present in the well. Particles (e.g., silt, clay), which may be present in the well even after well evacuation procedures, may absorb or adsorb various ionic species to effectively lower the dissolved metal content in the well water. Ground-water samples on which metals analysis will be conducted will be split into two portions. One portion will be filtered through a 0.45 micron membrane filter, transferred to a bottle, preserved with nitric acid to a pH less than 2 (Table 1), and analyzed for dissolved metals. Dissolved metals content is utilized to determine hydrochemical conditions. The remaining portion will be transferred to a bottle, preserved with nitric acid, and analyzed for total metals. Total metals content is used to determine worst case contaminant concentrations. Any difference in concentration between the total and dissolved fractions may be attributed to the original metallic ion content of the particles and any sorption of ions to the particles. Disposable filters will be dedicated to individual wells to prevent cross-contamination of other samples.

6.3 Sample Labeling

Each sample container will be labeled to prevent misidentification. The label will contain at least the following information:

- Sample number which uniquely identifies the sample
- Project title or number

- Location of sample collection
- Soil boring or well number, as applicable
- Name of collector
- Date and time of collection
- Type of analysis requested.

Table 1
Sample Containers, Holding Times and Preservation

Parameter	Matrix	Container	Holding Time	Preservation
Total Petrol. Hydrocarbons	Soil	3" stainless steel or brass cylinder	14 days[1]/ 40 days[2]/	4°C
(Light Fractions)	Water	40 ml glass vial, teflon-faced silicon septum	14 days[1]/ 20 days[2]/	4°C HCl to pH * 2 (except CaCO$_3$ water)
(Heavy fractions)	Water	1 amber bottles, teflon seal/silicon septum	14 days[1]/ 40 days[2]/	4°C
Benzene Toluene Xylene Ethylbenzene	Soil	3" stainless steel or brass cylinder	14 days[1]/	4°C
	Water	40 ml glass vial, teflon seal/silicon septum	7 days[1]/ 14 days[3]/	4°C HCl to pH * 2 (except CaCO$_3$ water)
Purgeable Halocarbons	Soil	3" stainless steel or brass cylinder	14 days[1]/	4°C
	Water	500 ml glass vial, teflon seal/silicon septum	14 days[1]/	
Organic lead	Soil	3" stainless steel or brass cylinder	14 days[1]/	4°C
	Water	40 ml glass vial, teflon seal/silicon septum	14 days[1]/	4°C
Ethylene Dibromide	Soil	3" stainless steel or brass cylinder	14 days[2]/	4°C
	Water	40 ml glass vial, teflon faced silicon septum	14 days[1]/	4°C
Polynuclear Aromatic Hydrocarbons	Soil	8 oz. wide mouth glass with teflon seal	14 days[1]/ 40 days[2]/	4°C
	Water	1000 m. amber glass with teflon seal	7 days[1]/ 40 days[2]/	4°C

Table 1
Sample Containers, Holding Times and Preservation

Parameter	Matrix	Container	Holding Time	Preservation
Poly-Chlorinated Biphenyls	Soil	8 oz. wide mouth glass with teflon seal	7 days[1]/ 40 days[2]/	4°C
	Water	1000 ml amber glass with teflon seal	7 days[1]/ 40 days[2]/	4°C
Total Metals	Soil	3" stainless steel or brass cylinder	6 months	
	Water	1000 ml plastic	6 months	pH<2
Dissolved Metals	Water	1000 ml plastic	6 months	pH<2 0.45 micron filtration
Pesticides	Soil	3" stainless steel or brass cylinder	14 days[2]/	4°C
	Water	1000 ml glass	7 days[2]/	4°C

Note: [1]/ - Maximum holding time for sample (extract within this time or analyze if extraction is not required).

[2]/ - Maximum holding time for extract (analyze within this time).

[3]/ - Maximum holding time for sample when pH adjusted with HCl.

6.4 Chain-of-Custody Record and Sample Analysis Request Form

A chain-of-custody record for each container or sample will be used to track possession of the samples from collection in the field until arrival at the laboratory.

The chain-of-custody record will contain the following information:

1. Site name
2. Signature of collector
3. Date and time of collection
4. Sample identification number(s)
5. Number of containers in sample set
6. Description of sample and container(s)
7. Name and signature of persons, and the companies or agencies they represent, who are involved in the chain of possession
8. Inclusive dates and times of possession
9. Requested analysis for each sample

6.5 Delivery of Samples to Laboratory

Samples will be delivered to the laboratory within 48 hours when possible. Delivered samples will be accompanied by a chain-of-custody record. The laboratory shall note sample condition on the chain-of-custody (e.g. chilled, presence or absence of head space) upon arrival. Samples will be transported either by USPCI personnel or by private carrier. Analytical holding times will be considered in determining sampling and shipping schedules. Friday shipment/ Saturday laboratory receipt of samples will be coordinated in advance with the laboratory.

6.6 Quality Control Field Samples

A QC program independent from the laboratory's program will be instituted. The program entails "blind" submittals to the laboratory of blank and duplicate samples. No spiked samples will be supplied from the field for these investigations. All QC samples will be assigned independent sample numbers and made indistinguishable from non QC samples.

When submitting groundwater samples, travel blanks will be used to detect the introduction of contaminants during sample handling or transportation from the field to the laboratory. The travel blanks, provided by the analytical laboratory, will remain sealed in the field and accompany the collected groundwater samples to the laboratory for analysis. The blanks will consist of deionized, analytically confirmed organic-free water. The blanks will be numbered, packaged, and sealed in the same manner as the other samples. Each blank will carry the appropriate preservative for the analytes of concern. A minimum of one trip blank per sampling event will be collected.

Field or Equipment blanks will be collected in order to detect introduction (if any) of cross-contamination into environmental matrices from nondedicated sampling devices that have been cleaned in the laboratory or field. Laboratory prepared analyte-free water, brought to the field in sealed containers, will be poured over decontaminated sampling equipment, collected in basins and transferred to appropriate sample jars for shipment to the laboratory. Each Equipment blank will carry the appropriate preservative for the analyte of concern. These blanks will be numbered, packaged, and sealed in the same manner as the groundwater samples. A minimum of one equipment blank will be processed during each day of well sampling activity.

Analytical results for travel and equipment blanks will not be used to correct groundwater data. If contaminants are found in the blanks, the source of the contamination will be identified and corrective action, including resampling, will be initiated.

Ten percent of groundwater samples submitted to the laboratory for analysis will be duplicates. Water sample duplicates will be collected by filling two sample bottles from the one bailer volume. If more than one bailer volume is required, each bailer volume will be split between containers.

6.7 Laboratory QA/QC Plan

Soil and groundwater samples will be submitted to a State Certified Hazardous Waste Laboratory for chemical analysis of hazardous constituents. Established QA/QC procedures for analytical laboratory operations will include sample custody procedures, standards of analytical accuracy, analysis of matrix spikes and method blanks, data reduction, verification of raw analytical data, and maintenance of control charts to monitor analytical performance. These QA/QC procedures are outlined in the laboratory QA/QC Plan which is available upon request. Chemical analyses will be performed in accordance with standard procedures established by the United States Environmental Protection Agency (EPA) in "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act" (40 CFR Part 136, October 1984). Analytical laboratories are periodically evaluated through external performance audits conducted by EPA and State agencies through government QC labs. The specific analytical methods to be utilized for purgeable and semivolatile hydrocarbons analyses are shown on Table 2.

Provided the data base is of sufficient size, statistical techniques may be employed for data validation.

Table 2
Laboratory Test Methodology
Underground Tank Sites

Hydrocarbon Leak	Soil Analysis		Water Analysis	
Unknown Fuel	TPH G	GCFID(5030)	TPH G	GCFID(5030)
	TPH D	GCFID(3550)	TPH D	GCFID(3510)
	BTX&E	8020 or 8240	BTX&E	602 or 624
Leaded Gas	TPH G	GCFID(5030)	TPH G	GCFID(5030)
	BTX&E	8020 or 8240	BTX&E	602 or 624
	---Optional---		TEL	DHS-LUFT
	TEL	DHS-LUFT	EDB	DHS-AB1803
	EDB	DHS-AB1803		
Unleaded Gas	TPH G	GCFID(5030)	TPH G	GCFID(5030)
	BTX&E	8020 or 8240	BTX&E	602 or 624
Diesel TPH D	GCFID(3550)		TPH D	GCFID(3510)
	BTX&E	8020 or 8240	BTX&E	602 or 624
Jet Fuel	TPH D	GCFID(3550)	TPH D	GCFID(3510)
	BTX&E	8020 or 8240	BTX&E	602 OR 624
Kerosene	TPH D	GCFID(3550)	TPH D	GCFID(3510)
	BTX&E	8020 or 8240	BTX&E	602 or 624
Fuel Oil	TPH D	GCFID(3550)	TPH D	GCFID(3510)
	BTX&E	8020 or 8240	BTX&E	602 or 624
Chlorinated Solvents	CL HC	8010 or 8240	CL HC	601 or 624
	BTX&E	8020 or 8240	BTX&E	602 or 624
Non Chlorinated Solvents	TPH D	GCFID(3550)	TPH D	GCFID(3510)
	BTX&E	8020 or 8240	BTX&E	602 or 624
Waste Oil or Unknown	TPH G	GCFID(5030)	TPH G	GCFID(5030)
	TPH D	GCFID(3550)	TPH D	GCFID(3510)
	O & G	503D&E	O & G	503A&E
	BTX&E	8020 or 8240	BTX&E	602 or 624
	CL HC	8010 or 8240	CL HC	601 or 624

ICAP or AA to Detect Metals: Cd, Cr, Pb, Zn

Method 8270 for Soil or Water to Detect:

PCB*	PCB*
PCP*	PCP*
PNA	PNA
Creosote	Creosote

* If found, analyze for dibenzofurans (PCBs) or dioxins (PCP)

USPCI Project Name: UPMF Oakland Facility Quarterly Monitoring
USPCI Project Number: 96120-844

Well No. OKUS-W1

Measuring Point (MP) Top of casing
Well Depth: (Below MP): 22.00 Feet
Casing diameter: 2 Inches
Sampling Date: 5/12/93
Depth To Ground Water (Below MP): 8.04 Feet
Sample ID No. OKUS-W1
OKUS-W6(QA/QC)
Depth To Product (Below MP): N/A
Method Of Well Development
Time: 11:20
[ ] Tap [ ] Submersible Pump [ ] Inertia Pump
Riser Elevation (MP): 9.17
[X] Bailer [ ] Centrifugal Pump [ ] Other
Top of Screen Elevation: 6.85 Feet
Sampling Collection Method:
Sample Appearance: Turbid
[ ] Tap [ ] Submersible Pump [ ] Inertia Pump:
Odor: none
[X] Bailer Type: [ ] Teflon [ ] Stainless Steel
Sampling Problems (if any):
[X] HDPE Plastic [ ] PVC [X] Disposable
Pump Intake Or Bailer Set At: Feet Below MP
Decontamination Performed:
Tubing Type (if Used):
Tubing Used for: [ ]SampleCollection [ ] Well Development/Field Tests
Samples Collected: BTEX,TPH/G/D/418.1, As, Pb, 8010

Time	pH (Units)	Temperature Corrected Conductance (umho/cm)	Temperature (Centigrade)	Water Level (Nearest 0.01 Ft.)	Cumulative Volume of Water Removed From Well (Gallons)	Pumping Rate in Gallons/Minute (GPM)
11:27	7.4	1400	20.0		5.0	
11:35	7.5	1400	20.0		10.0	
11:50	7.6	1400	20.0		15.0	
samples taken at 12:20						

At Least 3 Well Bore Volumes Were Purged Before Sampl Discharge Rate = GPM x 0.00223 = cfs

Comments: 15 gallons of water removed during purging. A QC/QC sample was collected at this well labeled OKUS-W6. The bailer had a black stain covering.

Form Completed By: C. S. Byerman
Witnessed By: Ara Mardirosain

USPCI Project Name: UPMF Oakland Facility Quarterly Monitoring

USPCI Project Number: 96120-844

Well No. OKUS-W2

Measuring Point (MP) Top of casing

Well Depth: (Below MP): 22.00 Feet

Casing diameter: 2 Inches

Sampling Date: 5/12/93

Depth To Ground Water (Below MP): 9.04 Feet

Sample ID No. OKUS-W2

Depth To Product (Below MP): N/A

Time: 11:55

Method Of Well Development

Riser Elevation (MP): 9.71

☐ Tap ☐ Submersible Pump ☐ Inertia Pump

☒ Bailer ☐ Centrifugal Pump ☐ Other

Top of Screen Elevation: 7.05 Feet

Sampling Collection Method:

Sample Appearance: Turbid

☐ Tap ☐ Submersible Pump ☐ Inertia Pump:

Odor: Strong Petroleum

☒ Bailer Type: ☐ Teflon ☐ Stainless Steel

Sampling Problems (if any):

☒ HDPE Plastic ☐ PVC ☒ Disposable

Pump Intake Or Bailer Set At: Feet Below MP

Decontamination Performed:

Tubing Type (if Used):

Tubing Used for: ☐ SampleCollection ☐ Well Development/Field Tests

Samples Collected: BTEX,TPH/G/D/418.1, As, Pb, 8010

Time	pH (Units)	Temperature Corrected Conductance (umho/cm)	Temperature (Centigrade)	Water Level (Nearest 0.01 Ft.)	Cumulative Volume of Water Removed From Well (Gallons)	Pumping Rate in Gallons/Minute (GPM)
12:02	7.2	3800	20.0		5.0	
12:12	7.3	3700	20.0		10.0	
12:20	7.3	3900	20.0		15.0	
samples taken at 12:40						

At Least 3 Well Bore Volumes Were Purged Before Sampl Discharge Rate = GPM x 0.00223 = cfs

Comments: 15 gallons of water removed during purging.

(Comments may continue on back)

Form Completed By: C. S. Byerman

Witnessed By: Ara Mardirosain

USPCI Project Name: **UPMF Oakland Facility Quarterly Monitoring**

USPCI Project Number: **96120-844**

Well No. OKUS-W3

Measuring Point (MP) Top of casing

Well Depth: (Below MP): 21.50 Feet

Casing diameter: 2 Inches

Depth To Ground Water (Below MP): 9.23 Feet

Depth To Product (Below MP): N/A

Sampling Date: 5/12/93

Sample ID No. OKUS-W3

Time: 12:08

Riser Elevation (MP): 9.80

Top of Screen Elevation: 6.55 Feet

Method Of Well Development

[ ] Tap [ ] Submersible Pump [ ] Inertia Pump

[X] Bailer [ ] Centrifugal Pump [ ] Other

Sample Appearance: Turbid

Odor: Moderate Petroleum

Sampling Collection Method:

[ ] Tap [ ] Submersible Pump [ ] Inertia Pump:

[X] Bailer Type: [ ] Teflon [ ] Stainless Steel

[X] HDPE Plastic [ ] PVC [X] Disposable

Sampling Problems (if any):

Pump Intake Or Bailer Set At: Feet Below MP

Decontamination Performed:

Tubing Type (if Used):

Tubing Used for: [ ]SampleCollection [ ] Well Development/Field Tests

Samples Collected: BTEX,TPH/G/D/418.1, As, Pb, 8010

Time	pH (Units)	Temperature Corrected Conductance (umho/cm)	Temperature (Centigrade)	Water Level (Nearest 0.01 Ft.)	Cumulative Volume of Water Removed From Well (Gallons)	Pumping Rate in Gallons/Minute (GPM)
12:19	7.3	3100	20.0		5.0	
13:04	7.5	3200	20.0		10.0	
13:10	7.4	3100	20.0		15.0	
samples taken at 13:10						

At Least 3 Well Bore Volumes Were Purged Before Sampl Discharge Rate = GPM x 0.00223 = cfs

Comments: 15 gallons of water removed during purging.

(Comments may continue on back)

Form Completed By: C. S. Byerman

Witnessed By: Ara Mardirosain

USPCI Project Name: **UPMF Oakland Facility Quarterly Monitoring**

USPCI Project Number: **96120-844**

Measuring Point (MP) **Top of casing**

Well No. OKUS-W4

Well Depth: (Below MP): 21.50 Feet

Casing diameter: 2 Inches

Sampling Date: 5/12/93

Depth To Ground Water (Below MP): 6.40 Feet

Sample ID No. **OKUS-W4**

Depth To Product (Below MP): N/A

Method Of Well Development

Time: 15:48

[ ] Tap [ ] Submersible Pump [ ] Inertia Pump

Riser Elevation (MP): 7.35

[X] Bailer [ ] Centrifugal Pump [ ] Other

Top of Screen Elevation: 6.08 Feet

Sampling Collection Method:

Sample Appearance: Turbid

[ ] Tap [ ] Submersible Pump [ ] Inertia Pump:

Odor: Moderate Petroleum

[X] Bailer Type: [ ] Teflon [ ] Stainless Steel

Sampling Problems (if any):

[X] HDPE Plastic [ ] PVC [X] Disposable

Pump Intake Or Bailer Set At: Feet Below MP

Decontamination Performed:

Tubing Type (if Used):

Tubing Used for: [ ]SampleCollection [ ] Well Development/Field Tests

Samples Collected: BTEX,TPH/G/D/418.1, As, Pb, 8010

Time	pH (Units)	Temperature Corrected Conductance (umho/cm)	Temperature (Centigrade)	Water Level (Nearest 0.01 Ft.)	Cumulative Volume of Water Removed From Well (Gallons)	Pumping Rate in Gallons/Minute (GPM)
15:56	8.1	3000	19.0		5.0	
16:04	7.9	3300	19.0		10.0	
16:12	7.9	3200	19.0		15.0	
samples taken at 16:13						

ft . .1 inch

At Least 3 Well Bore Volumes Were Purged Before Sampl Discharge Rate = GPM x 0.00223 = cfs

Comments: 15 gallons of water removed during purging. [redacted] noted on the first bailer volume removed. The oil did not recover after the fisrt bailer volume so the well was sampled.

Form Completed By: C. S. Byerman

Witnessed By: Ara Mardirosain

USPCI Project Name: **UPMF Oakland Facility Quarterly Monitoring**
USPCI Project Number: **96120-844**

Measuring Point (MP) **Top of casing**
Well No. **OKUS-W5**

Well Depth: (Below MP): 21.00 Feet

Casing diameter: 2 Inches
Sampling Date: 5/12/93

Depth To Ground Water (Below MP): 9.20 Feet
Sample ID No. **OKUS-W5**

Depth To Product (Below MP): 9.18

Method Of Well Development
Time: 14:15

[ ] Tap [ ] Submersible Pump [ ] Inertia Pump
Riser Elevation (MP): 9.25

[X] Bailer [ ] Centrifugal Pump [ ] Other
Top of Screen Elevation: 5.95 Feet

Sampling Collection Method:
Sample Appearance: Turbid

[ ] Tap [ ] Submersible Pump [ ] Inertia Pump:
Odor: Moderate Petroleum

[X] Bailer Type: [ ] Teflon [ ] Stainless Steel
Sampling Problems (if any):

[X] HDPE Plastic [ ] PVC [X] Disposable

Pump Intake Or Bailer Set At: Feet Below MP
Decontamination Performed:

Tubing Type (if Used):

Tubing Used for: [ ]SampleCollection [ ] Well Development/Field Tests
Samples Collected: BTEX,TPH/G/D/418.1, As, Pb, 8010

Time	pH (Units)	Temperature Corrected Conductance (umho/cm)	Temperature (Centigrade)	Water Level (Nearest 0.01 Ft.)	Cumulative Volume of Water Removed From Well (Gallons)	Pumping Rate in Gallons/Minute (GPM)
14:30	7.9	3400	20.0		5.0	
14:40	7.8	3500	20.0		10.0	
14:50	7.8	3500	20.0		15.0	
samples taken at 15:00						

Ex. •2inch

At Least 3 Well Bore Volumes Were Purged Before Sampl Discharge Rate = GPM x 0.00223 = cfs

Comments: 15 gallons of water removed during purging. [redacted] was noted on the first bailer volume removed. The oil did not recover after the fisrt bailer volume so the well was sampled.

(Comments may continue on back)

Form Completed By: C. S. Byerman
Witnessed By: Ara Mardirosain

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

U.S.P.C.I.
24125 Aldine Westfield Rd.
Spring, Texas 77373
Attnetion: Christopher Byerman

Client Project ID: #96281/UPMF, Oakland
Sample Matrix: Water
Analysis Method: EPA 5030/8015/8020
First Sample #: 305-0659

Sampled: Ma
Received: Ma
Reported: May 27, 1993

TOTAL PURGEABLE PETROLEUM HYDROCARBONS with BTEX DISTINCTION

Analyte	Reporting Limit µg/L	Sample I.D. 305-0659 OKU5-W1	Sample I.D. 305-0660 OKU5-W2	Sample I.D. 305-0661 OKU5-W3	Sample I.D. 305-0662 OKU5-W4	Sample I.D. 305-0664 OKU5-W5	Sample I.D. 305-0665 OKU5-W6
Purgeable Hydrocarbons	50	N.D.	8,800	4,600	6,000	550	N.D.
Benzene	0.5	N.D.	220	290	320	81	N.D.
Toluene	0.5	N.D.	47	60	110	14	N.D.
Ethyl Benzene	0.5	N.D.	4,600	3,500	4,600	250	N.D.
Total Xylenes	0.5	N.D.	100	72	230	37	N.D.
Chromatogram Pattern:		--	Gasoline	Gasoline	Gasoline	Gasoline	--

Quality Control Data

Report Limit Multiplication Factor:	1.0	40	20	40	5.0	1.0
Date Analyzed:	5/14/93	5/14/93	5/14/93	5/14/93	5/14/93	5/14/93
Instrument Identification:	HP-2	HP-2	HP-5	HP-5	HP-5	HP-2
Surrogate Recovery, %: (QC Limits = 70-130%)	106	104	128	118	129	104

Purgeable Hydrocarbons are quantitated against a fresh gasoline standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Karen Enstrom

Karen L. Enstrom
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

U.S.P.C.I.
24125 Aldine Westfield Rd.
Spring, Texas 77373
Attnetion: Christopher Byerman

Client Project ID: #96281/UPMF, Oakland
Sample Matrix: Water
Analysis Method: EPA 5030/8020
First Sample #: 305-0663

Sampled: May 12, 1993
Received: May 12, 1993
Reported: May 27, 1993

BTEX DISTINCTION

Analyte	Reporting Limit μg/L	Sample I.D. 305-0663 TB-1
Benzene	0.5	N.D.
Toluene	0.5	N.D.
Ethyl Benzene	0.5	N.D.
Total Xylenes	0.5	N.D.

Quality Control Data

Report Limit Multiplication Factor:	1.0
Date Analyzed:	5/14/93
Instrument Identification:	HP-2
Surrogate Recovery, %: (QC Limits = 70-130%)	104

Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Karen L. Enstrom
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

U.S.P.C.I.
24125 Aldine Westfield Rd.
Spring, Texas 77373
Attnetion: Christopher Byerman

Client Project ID: #96281/UPMF, Oakland
Sample Matrix: Water
Analysis Method: EPA 3510/3520/8015
First Sample #: 305-0659

Sampled: May 12, 1993
Received: May 12, 1993
Reported: May 27, 1993

TOTAL EXTRACTABLE PETROLEUM HYDROCARBONS

Analyte	Reporting Limit µg/L	Sample I.D. 305-0659 OKU5-W1	Sample I.D. 305-0660 OKU5-W2	Sample I.D. 305-0661 OKU5-W3	Sample I.D. 305-0662 OKU5-W4	Sample I.D. 305-0664 OKU5-W5	Sample I.D. 305-0665 OKU5-W6
Extractable Hydrocarbons	50	120 ✓	2,800 ✓	4,200 ✓	2,900 ✓	2,100 ✓	140 ✓
Chromatogram Pattern:		Diesel & Non Diesel Mixture (>C20)	Diesel & Non Diesel Mixture (<C14)	Diesel & Non Diesel Mixture (<C14)	Diesel & Non Diesel Mixture (<C14)	Diesel & Non Diesel Mixture (<C14; >C20)	Diesel & Non Diesel Mixture (>C20)

Quality Control Data

Report Limit Multiplication Factor:	1.0	10	10	10	10	1.0
Date Extracted:	5/18/93	5/18/93	5/18/93	5/18/93	5/18/93	5/18/93
Date Analyzed:	5/25/93	5/27/93	5/27/93	5/27/93	5/25/93	5/25/93
Instrument Identification:	HP-3A	HP-3A	HP-3A	HP-3A	HP-3A	HP-3A

Extractable Hydrocarbons are quantitated against a fresh diesel standard.
Analytes reported as N.D. were not detected above the stated reporting limit.

SEQUOIA ANALYTICAL

Karen L. Enstrom
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

U.S.P.C.I.
24125 Aldine Westfield Rd.
Spring, Texas 77373
Attnetion: Christopher Byerman

Client Project ID: #96281/UPMF, Oakland
Matrix Descript: Water
Analysis Method: EPA 418.1 (I.R. with clean-up)
First Sample #: 305-0659

Sampled: May 12, 1993
Received: May 12, 1993
Extracted: May 20, 1993
Analyzed: May 21, 1993

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

Sample Number	Sample Description	Petroleum Oil mg/L (ppm)
305-0659	OKU5-W1	N.D. /
305-0660	OKU5-W2	N.D. /
305-0661	OKU5-W3	1.7 /
305-0662	OKU5-W4	1.3 /
305-0665	OKU5-W6	N.D. /

W5 ?

Detection Limits: 1.0

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Karen L. Enstrom
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

U.S.P.C.I.
24125 Aldine Westfield Rd.
Spring, Texas 77373
Attnetion: Christopher Byerman

Client Project ID: #96281/UPMF, Oakland
Matrix Descript: Water
Analysis Method: EPA 418.1 (I.R. with clean-up)
First Sample #: 305-0664

Sampled: May 12, 1993
Received: May 12, 1993
Extracted: May 20, 1993
Analyzed: May 21, 1993
Reported: May 27, 1993

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

Sample Number	Sample Description	Petroleum Oil mg/L (ppm)
305-0664	OKU5-W5	130

Detection Limits:	10

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

Karen Enstrom

Karen L. Enstrom
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

U.S.P.C.I.
24125 Aldine Westfield Rd.
Spring, Texas 77373
Attnetion: Christopher Byerman

Client Project ID: #96281/UPMF, Oakland
Sample Descript: Water, OKU5-W1
Analysis Method: EPA 5030/8010
Lab Number: 305-0659

Sampled: May 12, 1993
Received: May 12, 1993
Analyzed: May 21, 1993
Reported: May 27, 1993

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	0.50	N.D.
Bromoform	0.50	N.D.
Bromomethane	1.0	N.D.
Carbon tetrachloride	0.50	N.D.
Chlorobenzene	0.50	N.D.
Chloroethane	1.0	N.D.
2-Chloroethylvinyl ether	1.0	N.D.
Chloroform	0.50	N.D.
Chloromethane	1.0	N.D.
Dibromochloromethane	0.50	N.D.
1,3-Dichlorobenzene	0.50	N.D.
1,4-Dichlorobenzene	0.50	N.D.
1,2-Dichlorobenzene	0.50	N.D.
1,1-Dichloroethane	0.50	N.D.
1,2-Dichloroethane	0.50	N.D.
1,1-Dichloroethene	0.50	N.D.
cis-1,2-Dichloroethene	0.50	N.D.
trans-1,2-Dichloroethene	0.50	N.D.
1,2-Dichloropropane	0.50	N.D.
cis-1,3-Dichloropropene	0.50	N.D.
trans-1,3-Dichloropropene	0.50	N.D.
Methylene chloride	5.0	N.D.
1,1,2,2-Tetrachloroethane	0.50	N.D.
Tetrachloroethene	0.50	N.D.
1,1,1-Trichloroethane	0.50	N.D.
1,1,2-Trichloroethane	0.50	N.D.
Trichloroethene	0.50	N.D.
Trichlorofluoromethane	0.50	N.D.
Vinyl chloride	1.0	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Karen L. Enstrom
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

U.S.P.C.I.
24125 Aldine Westfield Rd.
Spring, Texas 77373
Attnetion: Christopher Byerman

Client Project ID: #96281/UPMF, Oakland
Sample Descript: Water, OKU5-W2
Analysis Method: EPA 5030/8010
Lab Number: 305-0660

Sampled: May 12, 1993
Received: May 12, 1993
Analyzed: May 24, 1993
Reported: May 27, 1993

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	5.0	N.D.
Bromoform	5.0	N.D.
Bromomethane	10	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	26
Chloroethane	10	N.D.
2-Chloroethylvinyl ether	10	N.D.
Chloroform	5.0	N.D.
Chloromethane	10	N.D.
Dibromochloromethane	5.0	N.D.
1,3-Dichlorobenzene	5.0	N.D.
1,4-Dichlorobenzene	5.0	N.D.
1,2-Dichlorobenzene	5.0	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
cis-1,2-Dichloroethene	5.0	N.D.
trans-1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	50	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	5.0	N.D.
Vinyl chloride	10	N.D.

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

Karen L. Enstrom
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

U.S.P.C.I.
24125 Aldine Westfield Rd.
Spring, Texas 77373
Attnetion: Christopher Byerman

Client Project ID: #96281/UPMF, Oakland
Sample Descript: Water, OKU5-W3
Analysis Method: EPA 5030/8010
Lab Number: 305-0661

Sampled: May 12, 1993
Received: May 12, 1993
Analyzed: May 24, 1993
Reported: May 27, 1993

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	5.0	N.D.
Bromoform	5.0	N.D.
Bromomethane	10	N.D.
Carbon tetrachloride	5.0	N.D.
Chlorobenzene	5.0	16
Chloroethane	10	N.D.
2-Chloroethylvinyl ether	10	N.D.
Chloroform	5.0	N.D.
Chloromethane	10	N.D.
Dibromochloromethane	5.0	N.D.
1,3-Dichlorobenzene	5.0	N.D.
1,4-Dichlorobenzene	5.0	N.D.
1,2-Dichlorobenzene	5.0	N.D.
1,1-Dichloroethane	5.0	N.D.
1,2-Dichloroethane	5.0	N.D.
1,1-Dichloroethene	5.0	N.D.
cis-1,2-Dichloroethene	5.0	N.D.
trans-1,2-Dichloroethene	5.0	N.D.
1,2-Dichloropropane	5.0	N.D.
cis-1,3-Dichloropropene	5.0	N.D.
trans-1,3-Dichloropropene	5.0	N.D.
Methylene chloride	50	N.D.
1,1,2,2-Tetrachloroethane	5.0	N.D.
Tetrachloroethene	5.0	N.D.
1,1,1-Trichloroethane	5.0	N.D.
1,1,2-Trichloroethane	5.0	N.D.
Trichloroethene	5.0	N.D.
Trichlorofluoromethane	5.0	N.D.
Vinyl chloride	10	N.D.

Analytes reported as N.D. were not present above the stated limit of detection. Because matrix effects and/or other factors required additional sample dilution, detection limits for this sample have been raised.

SEQUOIA ANALYTICAL

Karen L. Enstrom
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

U.S.P.C.I.	Client Project ID:	#96281/UPMF, Oakland	Sampled:	May 12, 1993
24125 Aldine Westfield Rd.	Sample Descript:	Water, OKU5-W6	Received:	May 12, 1993
Spring, Texas 77373	Analysis Method:	EPA 5030/8010	Analyzed:	May 21, 1993
Attnetion: Christopher Byerman	Lab Number:	305-0665	Reported:	May 27, 1993

HALOGENATED VOLATILE ORGANICS (EPA 8010)

Analyte	Detection Limit µg/L	Sample Results µg/L
Bromodichloromethane	0.50	N.D.
Bromoform	0.50	N.D.
Bromomethane	1.0	N.D.
Carbon tetrachloride	0.50	N.D.
Chlorobenzene	0.50	N.D.
Chloroethane	1.0	N.D.
2-Chloroethylvinyl ether	1.0	N.D.
Chloroform	0.50	N.D.
Chloromethane	1.0	N.D.
Dibromochloromethane	0.50	N.D.
1,3-Dichlorobenzene	0.50	N.D.
1,4-Dichlorobenzene	0.50	N.D.
1,2-Dichlorobenzene	0.50	N.D.
1,1-Dichloroethane	0.50	N.D.
1,2-Dichloroethane	0.50	N.D.
1,1-Dichloroethene	0.50	N.D.
cis-1,2-Dichloroethene	0.50	N.D.
trans-1,2-Dichloroethene	0.50	N.D.
1,2-Dichloropropane	0.50	N.D.
cis-1,3-Dichloropropene	0.50	N.D.
trans-1,3-Dichloropropene	0.50	N.D.
Methylene chloride	5.0	N.D.
1,1,2,2-Tetrachloroethane	0.50	N.D.
Tetrachloroethene	0.50	N.D.
1,1,1-Trichloroethane	0.50	N.D.
1,1,2-Trichloroethane	0.50	N.D.
Trichloroethene	0.50	N.D.
Trichlorofluoromethane	0.50	N.D.
Vinyl chloride	1.0	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Karen L. Enstrom
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

U.S.P.C.I.
24125 Aldine Westfield Rd.
Spring, Texas 77373
Attnetion: Christopher Byerman

Client Project ID: #96281/UPMF, Oakland
Sample Descript: Water
Analysis for: Dissolved Arsenic
First Sample #: 305-0659

Sampled: May 12, 1993
Received: May 12, 1993
Extracted: May 17, 1993
Analyzed: May 26, 1993

LABORATORY ANALYSIS FOR: Dissolved Arsenic

Sample Number	Sample Description	Detection Limit mg/L	Sample Result mg/L
305-0659	OKU5-W1	0.0050	N.D.
305-0660	OKU5-W2	0.0050	0.093
305-0661	OKU5-W3	0.0050	0.14
305-0662	OKU5-W4	0.0050	0.16
305-0664	OKU5-W5	0.0050	0.56
305-0665	OKU5-W6	0.0050	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Karen Enstrom

Karen L. Enstrom
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

U.S.P.C.I.
24125 Aldine Westfield Rd.
Spring, Texas 77373
Attnetion: Christopher Byerman

Client Project ID:	#96281/UPMF, Oakland	Sampled:	May 12, 1993
Sample Descript:	Water	Received:	May 12, 1993
Analysis for:	Dissolved Lead	Extracted:	May 17, 1993
First Sample #:	305-0659	Analyzed:	May 17, 1993
		Reported:	May 27, 1993

LABORATORY ANALYSIS FOR: Dissolved Lead

Sample Number	Sample Description	Detection Limit mg/L	Sample Result mg/L
305-0659	OKU5-W1	0.0050	N.D.
305-0660	OKU5-W2	0.0050	N.D.
305-0661	OKU5-W3	0.0050	N.D.
305-0662	OKU5-W4	0.0050	N.D.
305-0664	OKU5-W5	0.0050	N.D.
305-0665	OKU5-W6	0.0050	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Karen Enstrom

Karen L. Enstrom
Project Manager

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

U.S.P.C.I.
24125 Aldine Westfield Rd.
Spring, Texas 77373
Attnetion: Christopher Byerman

Client Project ID: #96281/UPMF, Oakland
Matrix: Water
QC Sample Group 3050659-665

Reported: May 27, 1993

QUALITY CONTROL DATA REPORT

ANALYTE	Benzene	Toluene	Ethyl-Benzene	Xylenes	Diesel	Oil & Grease
Method:	EPA 8020	EPA 8020	EPA 8020	EPA 8020	EPA 8015	EPA 418.1
Analyst:	J.F.	J.F.	J.F.	J.F.	K.Wimer	Son Le
Conc. Spiked:	20	20	20	60	300	5.0
Units:	μg/L	μg/L	μg/L	μg/L	μg/L	mg/L
LCS Batch#:	1LCS051493	1LCS051493	1LCS051493	1LCS051493	BLK051893	418.1SLO3H
Date Prepared:	5/14/93	5/14/93	5/14/93	5/14/93	5/18/93	5/20/93
Date Analyzed:	5/14/93	5/14/93	5/14/93	5/14/93	5/21/93	5/21/93
Instrument I.D.#:	HP-2	HP-2	HP-2	HP-2	HP-3A	MIRAN 1FF
LCS % Recovery:	104	102	105	114	101	110
Control Limits:	70-130	70-130	70-130	70-130	80-120	80-120
MS/MSD Batch #:	3050666	3050666	3050666	3050666	BLK051893	BLK052093
Date Prepared:	5/14/93	5/14/93	5/14/93	5/14/93	5/18/93	5/20/93
Date Analyzed:	5/14/93	5/14/93	5/14/93	5/14/93	5/21/93	5/21/93
Instrument I.D.#:	HP-2	HP-2	HP-2	HP-2	HP-3A	MIRAN 1FF
Matrix Spike % Recovery:	105	105	105	116	101	90
Matrix Spike Duplicate % Recovery:	105	100	105	113	99	86
Relative % Difference:	0.0	4.4	0.0	2.6	2.0	4.5

SEQUOIA ANALYTICAL

Karen L. Enstrom
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation and analytical methods employed for the samples. The LCS % recovery data is used for validation of sample batch results. Due to matrix effects, the QC limits for MS/MSD's are advisory only and are not used to accept or reject batch results.

SEQUOIA ANALYTICAL
1900 Bates Avenue • Suite LM • Concord, California 94520
(510) 686-9600 • FAX (510) 686-9689

U.S.P.C.I.
24125 Aldine Westfield Rd.
Spring, Texas 77373
Attnetion: Christopher Byerman

Client Project ID: #96281/UPMF, Oakland
Matrix: Water
QC Sample Goup: 3050659-665
Reported: May 27, 1993

QUALITY CONTROL DATA REPORT

ANALYTE:	1,1-Dichloro-ethene	Trichloroethene	Chloro-benzene	Arsenic	Lead
Method:	EPA 8010	EPA 8010	EPA 8010	EPA 7060	EPA 7421
Analyst:	K.Nill	K.Nill	K.Nill	K.V.S.	K.M.A.
Conc. Spiked:	10	10	10	0.10	0.10
Units:	μg/L	μg/L	μg/L	mg/L	mg/L
LCS Batch#:	LCS052193	LCS052193	LCS052193	BLK051793	BLK051793
Date Prepared:	5/21/93	5/21/93	5/21/93	5/17/93	5/17/93
Date Analyzed:	5/21/93	5/21/93	5/21/93	5/26/93	5/17/93
Instrument I.D.#:	HP5890/1	HP5890/1	HP5890/1	SpectrAA-400	SpectrAA-400
LCS % Recovery:	98	95	93	99	96
Control Limits:	70-130	70-130	70-130	75-125	75-125
MS/MSD Batch #:	3050548	3050548	3050548	3050491	3050491
Date Prepared:	5/21/93	5/21/93	5/21/93	5/17/93	5/17/93
Date Analyzed:	5/21/93	5/21/93	5/21/93	5/17/93	5/17/93
Instrument I.D.#:	HP5890/1	HP5890/1	HP5890/1	SpectrAA-400	SpectrAA-400
Matrix Spike % Recovery:	92	92	87	83	97
Matrix Spike Duplicate % Recovery:	97	94	87	82	98
Relative % Difference:	5.3	2.2	0.0	1.2	1.0

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation and analytical methods employed for the samples. The LCS % recovery data is used for validation of sample batch results. Due to matrix effects, the QC limits for MS/MSD's are advisory only and are not used to accept or reject batch results.

SEQUOIA ANALYTICAL

Karen L. Enstrom
Project Manager

USPCI
A Subsidiary of Union Pacific Corporation

Ship To: USPCI Remedial Services
24125 Aldine Westfield
Spring, TX 77373
(713) 350-7240

No 000650

REPORT TO
CONTACT CHRISTOPHER BYERMAN
COMPANY USPCI R/S
ADDRESS 24125 ALDINE WESTFIELD
CITY SPRING ST. TX ZIP 77373
PHONE (713) 350-7265 FAX (713) 350-7296

BILL TO
CONTACT SAME
COMPANY
ADDRESS
CITY ST. ZIP
PHONE PO #

CHAIN OF CUSTODY RECORD

PROJ. NO. 96281
PROJECT NAME UPMF OAKLAND
SAMPLERS (SIGNATURE) Christopher Byerman

STANDARD TURNAROUND YES
RUSH TURNAROUND (specify required date)
1 of

CUSTOMER SAMPLE I.D.	DATE	TIME	MATRIX	# CONTAINERS	BTEX 8020	TPH/G 8015	8010	TPH/D 8015	TPH 418.1	DISSOLVED METALS AS+PB 6010							LABORATORY SAMPLE I.D.	REMARKS
OKUS-W1	5-12-93	12:20	H_2O	1	X												3050659AG	SOME VOAS
OKUS-W1		12:20		1		X												WERE NOT
OKUS-W1		12:22		2			X											PRESERVED
OKUS-W1		12:24		1				X										AS CHECK
OKUS-W1		12:25		1					X									
OKUS-W1		12:30		1						X								METALS WERE
OKUS-W2		12:40		1	X												660AG	FILTERED IN
OKUS-W2		12:40		1		X												THE FIELD
OKUS-W2		12:43		2			X											
OKUS-W2		12:45		1				X										
OKUS-W2		12:46		1					X									
OKUS-W2		12:50		1						X								

RELINQUISHED BY Christopher Byerman	DATE / TIME 5-12-93 16:30	RECEIVED BY	DATE / TIME 5-12-93 16:30	COURIER
RELINQUISHED BY	DATE / TIME	RECEIVED BY	DATE / TIME	AIRBILL NO

USPCI

A Subsidiary of
Union Pacific Corporation

Ship To: USPCI Remedial Services
24125 Aldine Westfield
Spring, TX 77373
(713) 350-7240

N° [redacted]00[redacted]

REPORT TO

CONTACT Christopher Byerman
COMPANY USPCI R/S
ADDRESS ~~ ~~ 24125 Aldine Westfield
CITY Spring ST. Tx ZIP 77373
PHONE 713 350 7265 FAX 713-350-7246

BILL TO

CONTACT Same
COMPANY
ADDRESS
CITY ST. ZIP
PHONE PO #

CHAIN OF CUSTODY RECORD

PROJ. NO. 96281
PROJECT NAME UPMF OAKLAND
SAMPLERS (SIGNATURE) Chris L. B

STANDARD TURNAROUND yes
RUSH TURNAROUND (specify required date)

CUSTOMER SAMPLE I.D.	DATE	TIME	MATRIX	# CONTAINERS	BTEX 8020	TPH/G 8015	8010	TPH/D 8015	TPH 418.1	Dissolved Metals As+Pb	LABORATORY SAMPLE I.D.	REMARKS
OKUS-W3	5-12-93	13:13	H_2O	2	X	X					3050661AE	NOTE SOME
OKUS-W3		13:10		1			X					VOA s ARE
OKUS-W3		13:15		1				X				NOT PRESERVED
"		13:16		1					X			PLS CHILL
" "		13:20		1						X		
OKUS-W4		16:13		1	X	X					662AD	
OKUS-W4		16:15		1				X				
OKUS-W4		16:16		1					X			
OKUS-W4		16:18		1						X		
TB-1		—		1	X						663	

RELINQUISHED BY	DATE / TIME	RECEIVED BY	DATE / TIME	COURIER
Christoph- B	5-12-93 16:30		5-12-93	

RELINQUISHED BY
DATE / TIME
RECEIVED BY
DATE / TIME
AIRBILL NO.

USPCI
A Subsidiary of Union Pacific Corporation

Ship To: USPCI Remedial Services
24125 Aldine Westfield
Spring, TX 77373
(713) 350-7240

N [illegible] 0 0 [illegible] 8

REPORT TO
CONTACT Same
COMPANY Christopher Bryan
ADDRESS
CITY ST. ZIP
PHONE FAX

BILL TO
CONTACT Same
COMPANY
ADDRESS
CITY ST. ZIP
PHONE PO #

CHAIN OF CUSTODY RECORD

PROJ. NO. 96281
PROJECT NAME UPMF OAKLAND
SAMPLERS (SIGNATURE) Christopher Bryan

STANDARD TURNAROUND Yes
RUSH TURNAROUND (specify required date)

CUSTOMER SAMPLE I.D.	DATE	TIME	MATRIX	# CONTAINERS	BTEX 8020	TPH G 8015	8010	TPH/D 8015	TPH 418.1	Dissolved Metals As/Pb 6010/[illegible]							LABORATORY SAMPLE I.D.	REMARKS
OKUS-W5	5-12-95	15:00	H2O	1	x	x											3050664AD	
OKW-W5		15:05		1			~~x~~	x										
OKUS-W5		15:07		1				~~x~~	x									
OKUS-W5		15:10		1						x								
OKUS-W6				2	x	x											665AG	
OKUS-W6				2			x											
OKUS-W6				1				x										
OKUS-W6				1					x									
OKUS-W6				1						x								

RELINQUISHED BY	DATE / TIME	RECEIVED BY	DATE / TIME	COURIER
Christopher Bryan	5-12-95 16:3[illegible]	V[illegible]	5-12-95 16:30	
RELINQUISHED BY	DATE / TIME	RECEIVED BY	DATE / TIME	AIRBILL NO