RZA AGRA, Inc.
(formerly Rittenhouse Zeman & Associates, Inc.)
Engineering & Environmental Services

11335 NE 122nd Way
Suite 100
Kirkland, WA 98034-6918
(206) 820-4669
FAX (206) 821-3914

23 June 1992

W-6997-11

Unocal Refining and Marketing Division
P.O. Box 76
Seattle, Washington 98111

Attention: Mr. Howard Brinkerhoff

Subject: Quarterly Groundwater Monitoring
Unocal Service Station No. 7283
Intersection of 100th Avenue S.W. and Bridgeport Way S.W.
Tacoma, Washington

Gentlemen:

This letter presents the analytical test results of groundwater samples collected for this quarterly monitoring interval accomplished at the above referenced site on 1 May 1992. Groundwater samples were collected from four on-site monitoring wells installed during our initial petroleum hydrocarbon evaluation in January 1991. A quarterly groundwater monitoring program was recommended by RZA AGRA, Inc. following a review of analytical results indicating elevated TPH concentrations within a groundwater sample collected from monitoring well MW-2 during our assessment in January 1991. This program was initiated following the removal of three underground gasoline storage tanks accomplished on 31 July 1990.

A gasoline odor and an oily sheen were observed in water purged from monitoring well MW-2 during our initial groundwater assessment. A groundwater sample collected from this well exhibited concentrations of ethylbenzene, xylenes, and total petroleum hydrocarbons (by EPA Method 418.1) of 2 ppb, 10 ppb and 4,500 ppb, respectively (see Table 1). The TPH concentration of 4,500 ppb was above the Washington State Model Toxics Control Act (MTCA) cleanup level of 1,000 ppb for TPH in water. However, the concentrations of ethylbenzene and xylenes were below MTCA cleanup criteria. Water samples collected from the remaining three monitoring wells on-site did not exhibit detectable concentrations of TPH or BTEX.

Analytical test results of groundwater samples collected during our June 1991 sampling interval indicated detectable total petroleum hydrocarbons (TPH) by EPA Methods 418.1 and/or 8015-modified in monitoring wells MW-2, MW-3 and MW-4 (see Table 1). Monitoring wells MW-3 and MW-4 also exhibited detectable concentrations of benzene, toluene, ethylbenzene and xylenes (BTEX). Total lead concentrations in water samples from all four monitoring wells were above the MTCA cleanup guidelines. Dissolved lead concentrations in water from these wells were at or below the method detection limit for this analysis.

The four monitoring wells were aggressively developed prior to our third sampling interval in October 1991. Analytical laboratory results of groundwater samples collected following the additional well development indicated the samples did not contain detectable BTEX, total lead, or dissolved lead concentrations. These results also indicated purgeable hydrocarbon concentrations ranged from non-detectable to very low levels. Monitoring wells MW-2 and MW-3 exhibited purgeable hydrocarbon concentrations of 100 ppb and 200 ppb, respectively. These concentrations were below the MTCA cleanup level of 1000 ppb in water.

Analytical laboratory results of water samples collected during our 16 January 1992 groundwater sampling event indicated the samples contained total lead concentrations ranging from 6 ppb to 16 ppb, which are above the MTCA Method A cleanup level of 5 ppb for total lead in water. These samples did not contain detectable concentrations of purgeable hydrocarbons, BTEX or dissolved lead, except the groundwater sample collected from monitoring well MW-3, which contained a dissolved lead concentration of 6 ppb. A second or field duplicate sample (MW5-4) was collected during the sampling of monitoring well MW-3. This sample contained a purgeable hydrocarbon and a dissolved lead concentration of 170 ppb and 6 ppb, respectively. The purgeable hydrocarbon concentration is below the MTCA Method A cleanup level of 1000 ppb for these compounds in groundwater.

Prior to our groundwater sampling on 1 May 1992, the monitoring wells were purged by pumping approximately 55 gallons of water from each well to ensure that less turbid groundwater samples were collected from the wells. The purged water did not exhibit any evidence of petroleum hydrocarbon impact during the pumping procedures. Depth to groundwater within the four monitoring wells during this monitoring interval ranged between 15 and 16 feet below top of well casing. Based on the water levels of the four monitoring wells measured over the duration of this monitoring program, the groundwater gradient across the site has been generally toward the north-northeast direction (Figure 1). Table 2 is a summary of the groundwater measurements and relative groundwater elevations for this groundwater monitoring program.

Analytical test results of groundwater samples collected from the four monitoring wells during this monitoring interval indicated these samples did not contain detectable concentrations of purgeable hydrocarbons, BTEX, total lead or dissolved lead. Turbidity values for these samples ranged from 5.4 to 49 NTU.

DISCUSSION

During our first two sampling intervals, the concentrations of TPH, BTEX and lead were slightly above MTCA cleanup levels. During those intervals, the water was noted as being slightly turbid. After additional well development, the water samples collected during our three latest sampling intervals appeared to be clearer and contain fewer particulates. The low or nondetectable concentrations of purgeable hydrocarbons, BTEX and dissolved lead in groundwater samples collected during our three latest sampling intervals indicates that there may have been possible interference due to the turbidity in samples collected during the first two sampling intervals. The total lead concentrations (unfiltered) in all wells may be due to suspended particulates within the samples and not representative of organic lead associated with leaded gasoline.

Attached is a groundwater elevation contour map, a table of historical groundwater levels and a table of analytical test results for this sampling program. We will be forwarding this information to Mr. Gary Porter of the Tacoma-Pierce County Health Department for review and determination of closure for the above referenced site.

We are pleased to be of continued service to you on this project, and if you have any questions, please feel free to call us at your earliest convenience.

Respectfully submitted,

RZA-AGRA

Andrew J. Smith
Environmental Geologist

Stanley S. Thompson
Senior Environmental Geologist

David G. Cooper, P.G.
Associate Environmental Geologist

Attachments: Table 1 - Analytical Test Results for Water
Table 2 - Depth to Water Measurements and Groundwater Elevations
Groundwater Elevation Contour Map for 1 May 1992
Analytical Laboratory Certificates/Chain-of-Custody Document

cc: Mr. Gary Porter, Tacoma-Pierce County Health Department

AJS/SST/CLT

Table 1 - Analytical Test Results of Groundwater Samples

Unocal Service Station No. 7283
Tacoma, Washington
RZA-AGRA Job# W-6997-11

Well No./ Dates	TPH by 418.1 (ppb)	TPH by 8015 (ppb)	TPH WTPH-G (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl Benzene (ppb)	Xylenes (ppb)	Total Lead (ppb)	Dissolved Lead (ppb)	Turbidity (NTU)
MW-1										
14 Jan 91	<1000	<1000	---	<1	<1	<1	<1	---	---	---
25 Jun 91	<1000	<100	---	<1	<1	<1	<1	8	<5	---
8 Oct 91	---	---	<100	<1	<1	<1	<1	<5	<5	---
16 Jan 92	---	---	<100	<1	<1	<1	<1	11	<5	290
1 May 92	---	---	<100	<2	<2	<2	<2	<5	<5	19
MW-2										
14 Jan 91	4,500	<1000	---	<1	<1	2	10	---	---	---
25 Jun 91	2,000	<100	---	<1	<1	<1	<1	10	<5	---
8 Oct 91	---	---	100	<1	<1	<1	<1	<5	<5	---
16 Jan 92	---	---	<100	<1	<1	<1	<1	10	<5	480
1 May 92	---	---	<100	<2	<2	<2	<2	<5	<5	6.2
MW-3										
14 Jan 91	<1000	<1000	---	<1	<1	<1	<1	---	---	---
25 Jun 91	1,500	*1,200	---	30	130	14	83	11	5	---
8 Oct 91	---	---	200	<1	<1	<1	<1	<5	<5	---
16 Jan 92	---	---	<100	<1	<1	<1	<1	6	6	120
1 May 92	---	---	<100	<2	<2	<2	<2	<5	<5	5.4
MW-4										
14 Jan 91	<1000	<1000	---	<1	<1	<1	<1	---	---	---
25 Jun 91	<1000	*1,800	---	1	8	3	120	6	<5	---
8 Oct 91	---	---	<100	<1	<1	<1	<1	<5	<5	---
16 Jan 92	---	---	<100	<1	<1	<1	<1	16	<5	140
1 May 92	---	---	<100	<2	<2	<2	<2	<5	<5	49
MTCA Lvls:	1,000	1,000	1,000	5	40	30	20	5	5	N/A

Notes:
Values are expressed in parts per billion (ppb) concentrations.
TPH - Total petroleum hydrocarbons.
MTCA - Model Toxics Control Act Method A cleanup levels.
--- - indicates samples were not analyzed for this element or by this method.
* - TPH was typed as gasoline by this analytical method.
A duplicate sample was collected from monitoring well MW-3 and labelled MW5-4.
MW5-4 contained 170 ppb purgeable hydrocarbons, 8 ppb total lead and 6 ppb dissolved lead.
NTU - Nephelometer Turbidity Units

Table 2 Depth to Water Mearurements and Groundwater Elevations

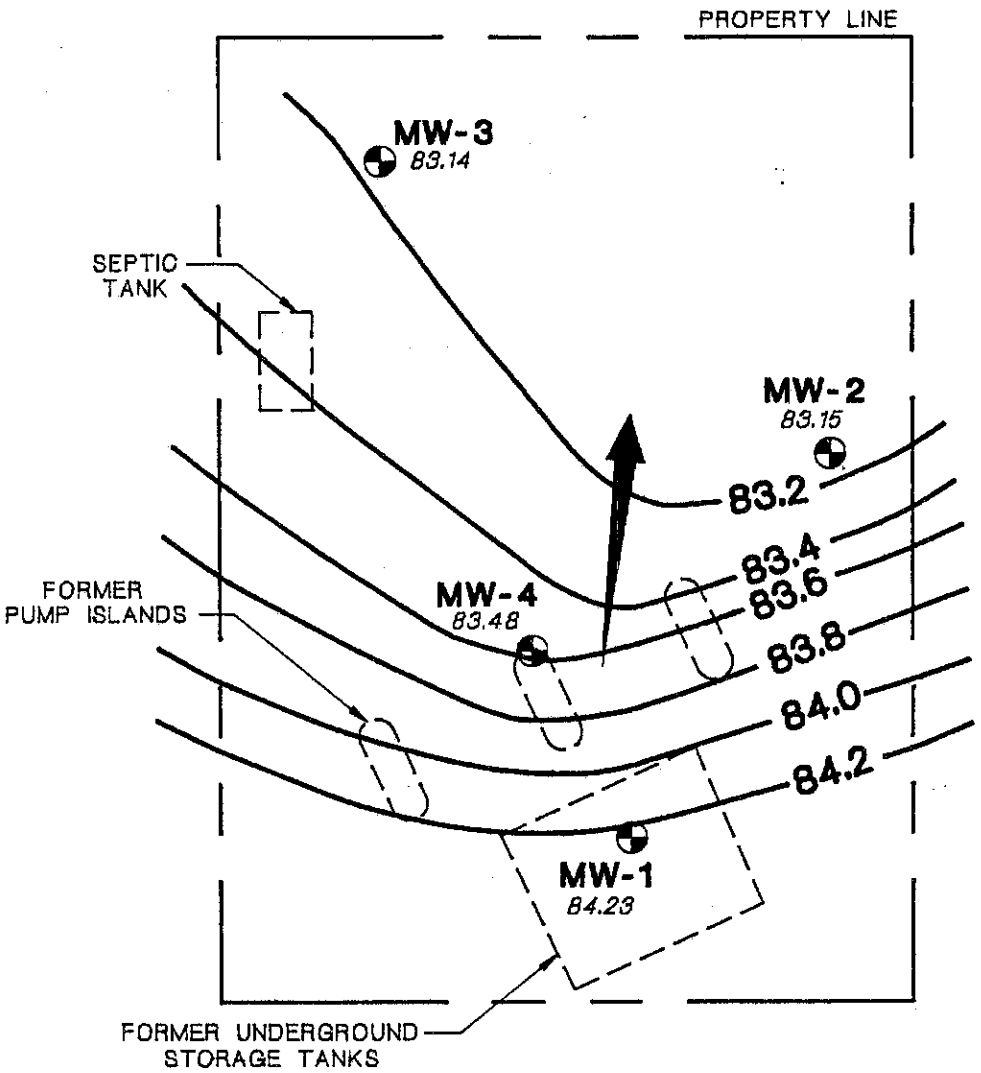
Unocal Service Station No. 7283
Tacoma, Washington
RZA-AGRA Job# W-6997-11

Well No.	Depth To Groundwater (feet)				
	14 Jan 91	25 Jun 91	8 Oct 91	16 Jan 92	1 May 92
MW-1	13.70	15.67	18.16	16.08	15.24
MW-2	14.09	16.11	18.60	16.48	15.67
MW-3	14.56	16.52	18.94	16.87	16.07
MW-4	14.10	16.07	18.54	16.45	15.36

Well No.	Top of Casing Elevation	Groundwater Elevation (feet)				
		14 Jan 91	25 Jun 91	8 Oct 91	16 Jan 92	1 May 92
MW-1	99.47	84.77	83.80	80.31	83.39	84.23
MW-2	98.82	84.73	82.71	80.22	82.34	83.15
MW-3	99.21	84.65	82.69	80.27	82.34	83.14
MW-4	98.84	84.74	82.77	80.30	82.39	83.48

Notes:

Top of casing elevation and groundwater elevation surveyed relative to an assigned datum of 100 feet



LEGEND

MW-4 — NUMBER AND APPROXIMATE LOCATION OF MONITORING WELLS

—84.2— INFERRED GROUNDWATER SURFACE ELEVATION CONTOUR IN FEET

INFERRED DIRECTION OF GROUNDWATER MIGRATION

84.23 SPOT GROUNDWATER SURFACE ELEVATION IN FEET

N

0 30 60

SCALE IN FEET

RZA AGRA, INC.
Engineering & Environmental Services

11335 N.E. 122nd Way
Suite 100
Kirkland, Washington 98034-6918

W.O.	W-6997-11
DESIGN	AJS
DRAWN	MJF
DATE	MAY 1992
SCALE	1"=30'

UNOCAL SERVICE STATION No. 7283
TACOMA, WASHINGTON

GROUNDWATER SURFACE ELEVATION CONTOUR MAP FOR 1 MAY 1992

FIGURE 1

DRAWING NO. \68\W6997-11\GW-5-92.DWG

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

ANALYTICAL NARRATIVE

Client: RZA - AGRA

Date: May 20, 1992

Project: W-6997-11 Unocal #7283

Lab No.: 24130

Delivered by: RZA - AGRA

Date Sampled: 5-1-92

Condition of Samples upon Receipt:

Samples were received cold and in good condition. Chain-of-custody was in order.

SAMPLE EXTRACTION AND ANALYSIS

Samples 24130-1 through 24130-4 were analyzed for BTEX in accordance with EPA SW-846 Method 8020 and gasoline range hydrocarbons per WA State DOE method WTPH-G on 5-6-92 and 5-7-92. Insufficient sample volume was submitted to perform matrix spike and matrix spike duplicate analysis for this sample batch. Blank spike analysis was performed as required.

The surrogate recovery for the blank spike associated with this sample set was above the acceptable limit in the initial analysis. The extract was reanalyzed on 5-9-92, with an acceptable surrogate recovery. The results from the reanalysis are included in the quality control report, and raw data from both analyses are included in the deliverables package.

Sample 24130-4 and 24130-4 duplicate were reanalyzed due to low level toluene contamination which was suspected to be a laboratory contaminant. Toluene was not present in the reanalysis of the sample or duplicate.

All other quality control parameters were within acceptable limits.

Samples 24130-1 through 24130-4 were analyzed on 4-30-92 for total and dissolved lead per EPA SW-846 Method 7421. All quality control parameters were within acceptable limits.

Samples 24130-1 through 24130-4 were analyzed for turbidity per EPA Method 180.1 All quality control parameters were within acceptable limits.

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: RZA - AGRA

Date: May 8, 1992

Report On: Analysis of Water

Lab No: 24130

IDENTIFICATION:
Samples received on 05-04-92
Project: W-6997-11 Unocal #7283

ANALYSIS:

Lab No. 24130-1 Client ID: MW-1

WTPH-G with BTEX by Method 8020
Date Analyzed: 5-6-92

Gasoline, mg/l (C7 - C12)	< 0.1
Benzene, mg/l	< 0.002
Toluene, mg/l	< 0.002
Ethyl Benzene, mg/l	< 0.002
Xylenes, mg/l	< 0.002
SURROGATE RECOVERY, %	
Trifluorotoluene	91

Lead by GFAA Method 7421
Date Digested: 5-4-92
Date Analyzed: 5-5-92

Total Lead, ug/l	< 5
Dissolved Lead, ug/l	< 5
Turbidity, NTU	19

Continued . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-6997-11

Lab No. 24130
May 8, 1992

Lab No. 24130-2 Client ID: MW-2

WTPH-G with BTEX by Method 8020
Date Analyzed: 5-6-92

Gasoline, mg/l (C7 - C12)	< 0.1
Benzene, mg/l	< 0.002
Toluene, mg/l	< 0.002
Ethyl Benzene, mg/l	< 0.002
Xylenes, mg/l	< 0.002
SURROGATE RECOVERY, %	
Trifluorotoluene	80

Lead by GFAA Method 7421
Date Digested: 5-4-92
Date Analyzed: 5-5-92

Total Lead, ug/l	< 5
Dissolved Lead, ug/l	< 5
Turbidity, NTU	6.2

Continued . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-6997-11

Lab No. 24130
May 8, 1992

Lab No. 24130-3 Client ID: MW-3

WTPH-G with BTEX by Method 8020
Date Analyzed: 5-6-92

Gasoline, mg/l (C7 - C12)	< 0.1
Benzene, mg/l	< 0.002
Toluene, mg/l	< 0.002
Ethyl Benzene, mg/l	< 0.002
Xylenes, mg/l	< 0.002
SURROGATE RECOVERY, %	
Trifluorotoluene	91

Lead by GFAA Method 7421
Date Digested: 5-4-92
Date Analyzed: 5-5-92

Total Lead, ug/l	< 5
Dissolved Lead, ug/l	< 5
Turbidity, NTU	5.4

Continued . . .

SOUND ANALYTICAL SERVICES, INC.

RZA - AGRA
Project: W-6997-11

Lab No. 24130
May 8, 1992

Lab No. 24130-4 Client ID: MW-4

WTPH-G with BTEX by Method 8020
Date Analyzed: 5-6-92

Gasoline, mg/l (C7 - C12)	< 0.1
Benzene, mg/l	< 0.002
Toluene, mg/l	< 0.002
Ethyl Benzene, mg/l	< 0.002
Xylenes, mg/l	< 0.002
SURROGATE RECOVERY, %	
Trifluorotoluene	112

Lead by GFAA Method 7421
Date Digested: 5-4-92
Date Analyzed: 5-5-92

Total Lead, ug/l	< 5
Dissolved Lead, ug/l	< 5
Turbidity, NTU	49

SOUND ANALYTICAL SERVICES

MARTY FRENCH

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

Total and Dissolved Lead

Client: RZA - AGRA
Lab No: 24130qc1
Matrix: Water
Units: ug/l
Date: May 8, 1992

INSTRUMENT BLANK

Parameter	Blank Value
Dissolved Lead	< 5

DUPLICATE

Dup No. 24130-4

Parameter	Sample (S)	Duplicate (D)	RPD
Dissolved Lead	< 5	< 5	0.0

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2)] x 100

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MS/MSD No. 24130-4

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Dissolved Lead	< 5	32	40	80.0	32	0.0

SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

Total and Dissolved Lead

Client: RZA - AGRA
Lab No: 24130qc1
Matrix: Water
Units: ug/l
Date: May 8, 1992

CHECK STANDARDS

Continuing Calibration Check Standard

Parameter	Result (R)	True Value (TV)	% D
Lead	46	50	8.0

% D = % Difference
= TV - R / TV x 100

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

WTPH-G with BTEX by EPA SW-846 Method 8020

Client: RZA - AGRA
Lab No: 24130qc2
Matrix: Water
Units: mg/l
Date: May 8, 1992

DUPLICATES

Dup. No. 24130-4

Parameter	Sample (S)	Duplicate (D)	RPD
Gasoline (C_7-C_{12})	< 0.1	< 0.1	0.0
Benzene	< 0.002	< 0.002	0.0
Toluene	< 0.002	< 0.002	0.0
Ethyl Benzene	< 0.002	< 0.002	0.0
Xylenes	< 0.002	< 0.002	0.0
SURROGATE RECOVERY,% Trifluorotoluene	112	134	

RPD = Relative Percent Difference
= [(S - D) / ((S + D) / 2)] x 100

BLANK SPIKE RECOVERY

BS No.		BS9205051		BS9205071	
Parameter	Spike Added	Spike Recovered	%R	Spike Recov.	%R
Gasoline					
Benzene	0.023	0.028	123	0.021	91
Toluene	0.023	0.027	119	0.025	109
Ethyl Benzene	0.023	0.028	122	0.025	109
Total Xylenes	0.068	0.083	121	0.083	122

%R = Percent Recovery
= [(MS - SR) / SA] x 100
RPD = Relative Percent Difference
= [(MS - MSD) / ((MS + MSD) / 2)] x 100

SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

WTPH-G with BTEX by EPA SW-846 Method 8020

Client: RZA - AGRA
Lab No: 24130qc2
Matrix: Water
Units: mg/l
Date: May 8, 1992

METHOD BLANK

Blank No.	9205052	9205073	9205082
Parameter	Blank Value	Blank Value	Blank Value
Gasoline (C_7-C_{12})	< 0.1	< 0.1	< 0.1
Benzene	< 0.002	< 0.002	< 0.002
Toluene	< 0.002	< 0.002	< 0.002
Ethyl Benzene	< 0.002	< 0.002	< 0.002
Xylenes	< 0.002	< 0.002	< 0.002
SURROGATE RECOVERY, % Trifluorotoluene	86	89	110

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

QUALITY CONTROL REPORT

Turbidity

Client: RZA - AGRA
Lab No. 24130qc3
Matrix: Water
Units: NTU
Date: May 8, 1992

DUPLICATE

Parameter	Sample(S)	Duplicate(D)	RPD
Turbidity	6.2	6.5	4.7

RPD = relative percent difference
= [(S - D) / ((S + D) / 2)] x 100

RZA-AGRA
Environmental & Engineering Services
11335 Northeast 122nd Way
Kirkland, Washington 98034-6918
(206) 820-4669/FAX (206) 821-3914

Chain of Custody Record / Analysis Request

Nº 00261

Project Name: UNOCAL No. 7283 Job No.: W-6997-11
Project Manager: ANDY SMITH Phone #: 820-4669
Sampler: MARK R. UNDERHILL

RZA-AGRA Sample ID	Lab Samp ID	Date Collected	Time Collected	Matrix (S=soil, W=water, A=air)	# Containers/Preservation: 40 ml VOA /	1 L Glass /	8 oz Glass /	500 ML	1/ALGENE		CHILL
MW-1		1 MAY	1637	W	2			2	1		X
MW-2		↓	1715	↓	↓			↓	↓		X
MW-3			1745								X
MW-4		↓	1645	↓	↓			↓	↓		X

Analysis Requested: (write preferred method in box)

WTPH-G / BTEX	TOTAL LEAD	DISSOLVED LEAD	TURBIDITY	Hold for Further Analysis	RUSH (see below)
X	X	X	X		
X	X	X	X		
X	X	X	X		
X	X	X	X		

RELINQUISHED BY SAMPLER:	RELINQUISHED BY:	RELINQUISHED BY:
Signature: Mark R Underhill	Signature:	Signature:
Printed Name: MARK R. UNDERHILL	Printed Name: KELLY DAVID	Printed Name: PALMQUIST
Firm: RZA AGRA, INC.	Firm: RZA-AGRA	Firm: SAS
Date/Time: 1 MAY 92 0900	Date/Time:	Date/Time: 5-4 11:30 A
RECEIVED BY:	RECEIVED BY:	RECEIVED BY:
Signature:	Signature:	Signature: Mary Curtiss
Printed Name: KELLY DAVID	Printed Name: PALMQUIST	Printed Name: Mary Curtiss
Firm: RZA-AGRA	Firm: SAS	Firm:
Date/Time: 4 MAY 92 0900	Date/Time: 5-4 10:40 A	Date/Time: 5/4/92 11:30

LABORATORY:

Total # Containers:

Condition of Containers?

Condition of Seals?

Special Handling
Turnaround.
- ☐ 8 hour
- ☐ 24 hour
- ☐ 5 business day
- ☐ 10 business day
- ☐ other _____ (#)business day

PURPOSE OF SAMPLING / COMMENTS:

Form 100B

DISTRIBUTION: WHITE - return to originator; YELLOW - lab; PINK - retained by originator; GOLDENROD - to lab in advance