

ENVIRONMENTAL
PROTECTION

90 JAN 17 PM 3:12

December 20, 1995
93C0276A① add'l mw dg of well w-3
needed (~60' dg) near well w-eMs. Rita Sullins
Don-Sul, Inc.
187 North L Street
Livermore, CA 94550**Subject: Report of Remedial Activities since January 1994, 187 North L Street,
Livermore, California**

Dear Ms. Sullins:

This report is in response to a request by Ms. Eva Chu, of the Alameda County Health Care Services Agency (ACHCSA), in a letter dated June 29, 1995. Ms. Chu requested that the results of a Dual-Phase Pilot Test be presented in a report, along with groundwater monitoring results. The following report presents the results of the work performed by WCC as outlined in our proposal to you dated August 17, 1995.

SCOPE OF WORK

The scope of work included sampling groundwater from existing monitoring wells W-1, W-2, W-3 and W-E, and performing laboratory analyses on groundwater samples for TPH as gasoline and for BTEX. The work scope also included presentation of the results of the Dual Phase Pilot Test performed on March 15-16, 1994. Following the installation of new groundwater monitoring wells and analyses of groundwater samples, the site could be evaluated for closure using the ASTM Risk Based Corrective Action method (RCBA).

GROUNDWATER MONITORING

Groundwater levels were measured and groundwater samples were collected from wells W-1, W-2, W-3 and W-E on September 13, 1995. The results of laboratory analyses were presented in a report to you dated October 6, 1995. Table 1 presents the groundwater depths and the laboratory analysis results. The depth to the top of the screened section in these wells is about 40 feet. The depth to the groundwater level in these wells ranged from about 28.7 feet in well W-1 to 30.7 feet in well W-2. Since the groundwater levels are about 10 feet higher than the screened section these wells have a low potential for sampling floating product.

Ms. Rita Sullins

December 20, 1995

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The highest concentration of benzene (65,000 ug/L) and TPH as gasoline (660,000 ug/L) were detected in groundwater from well W-1. This has been the location historically where the highest concentrations of these compounds were found. BTEX was not detected above the laboratory detection limit in groundwater from well W-2. Only 90 ug/L TPH as gasoline was detected in the groundwater sample from well W-2. The laboratory reported 5,600 ug/L benzene, 290 ug/L toluene, 460 ug/L ethylbenzene, and 280 ug/L total xylenes, and 27,000 ug/L TPH gasoline for groundwater from well W-3. Only 4 ug/L benzene and 95 ug/L TPH gasoline were reported in groundwater from well W-E. MTBE was not detected in groundwater from wells W-1, W-2, and W-3, but was detected at 18 ug/L in groundwater from well W-E. Copies of the laboratory reports are attached for your reference.

Groundwater elevations were calculated using the top of casing elevations shown on Figure 2 of our June 12, 1991 report. The groundwater gradient is towards the west northwest and ranges from an elevation of 70.44 feet in well W-1, to 64.62 feet in well W-E. Calculated elevations of groundwater are 67.45 in well W-2 and 68.31 in well W-3. Figure 2 is attached, and has been modified to show the current groundwater elevations and estimated groundwater elevation contours.

DUAL-PHASE PILOT TEST RESULTS

The Dual-Phase pilot test was conducted on the 14th and 15th of March 1994. A WCC portable trailer unit (see attached description) was used to perform the pilot test. The blower unit was attached to a small pipe that was inserted into well W-1 and about 24 inches of mercury vacuum and about 4 cfm soil gas flow was developed. About 1.7 to 2.0 gpm groundwater extraction rate was developed. Because the groundwater levels were above the top of the well screens in the observation wells, W-A, W-B, W-C, and W-2 no vacuum could be observed in the casing for those wells.

After about 17 hours of extraction a stabilized drawdown of about 1.87 feet was measured in well W-A, and about 0.67 feet was measured in well W-B. Using this information and the approximate extraction rate of 1.7 gpm the estimated conductivity was calculated at about 6×10^{-4} cm/sec, which is consistent with a sand aquifer material. Since well W-B is about 50 feet north of the pumping well (W-1) the radius of groundwater elevation influence, and potential capture zone, appears to be at least 50 feet. The approximate total volume of groundwater removed was 3,600 gallons. This water was temporarily stored in Baker Tanks, and later disposed of properly at Gibson Environmental in Redwood City, California. A copy of the disposal invoice is attached.



Ms. Rita Sullins
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The effectiveness of this method for soil vapor extraction could not be evaluated since the groundwater level in the extraction well, and the observation wells was above the screened section of the well casings.

OPTIONAL CORRECTIVE MEASURES

Construction of New Wells

As shown on Figure 2, we recommend construction of four new groundwater wells with screened sections located above the current groundwater level. One new 6-inch diameter well could be constructed between W-A and W-1. This well should be constructed with sufficient well screen to continue to function with vertical variations of groundwater elevation of at least ten feet. The top of the new well screen should extend at least 10 feet above the current groundwater level. A second 6-inch diameter well should be constructed just south of well W-B.

Because of the rise in groundwater elevations above the screened interval, existing monitoring wells W-2 and W-3 need to be replaced. Adjacent to existing well W-3, a groundwater extraction well with a 6-inch diameter well casing should be constructed. Adjacent to well W-2 a new 4-inch diameter well should be constructed with a screened section set at elevation at least 10 feet above the current groundwater level and extending down below the top of the existing monitoring well screens, at a depth of about 40 feet. The existing 2-inch diameter wells W-2 and W-3 would remain in place to provide for monitoring groundwater levels.

We recommend that each of the four new groundwater wells be properly developed and groundwater samples collected for analysis. Laboratory results of analytes for TPH gasoline and BTEX from these new wells should be compared to previous results of analyses of groundwater from adjacent monitoring wells.

Re-Evaluation of Dual-Phase Extraction

We recommend that a dual-phase extraction pilot test be conducted on the newly constructed 6-inch well between W-1 and W-A. The radius of influence of a vacuum applied to this well could be evaluated by measuring pressure changes in the new well near W-B. If the pilot test shows that the method could be effective, these two new wells, along with the new wells near W-2 and W-3 could be utilized as dual-phase extraction wells.



Ms. Rita Sullins
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RBCA Evaluation

Following the construction of new monitoring wells and evaluation of the results of laboratory analyses of groundwater samples from these new wells, this site can be evaluated for closure using the ASTM Risk Based Corrective Action method. This method is supported by a recent study Rice et al., 1995 (see references).

DISCUSSION

We can provide a schedule and cost for installation of the four new wells, and sampling and analysis of groundwater from the wells. We assume that you will forward a copy of this report to Ms. Eva Chu, at the Alameda County Health Care Services Agency.

Sincerely,



Albert P. Ridley, CEG
Senior Associate

Attachments: Table 1 Laboratory Analysis Results and Groundwater Depths
Table 2 Dual-Phase Extraction Pilot Test Data, MW-1
Table 3 Water Levels in Wells Measured During DPE Pilot Test
Table 4 Summary of Analytical Test Results for Hydrocarbon Vapors
Table 5 DPE Pilot Vacuum Response Data
Figure 1 Groundwater Elevation Contours
Figure 2 Alternate Remediation Plan
Vacuum Extraction Pilot (TEST) Trailer Specifications
H&H Environmental Services Invoice
Analytical Laboratory Reports

References: Rice et al., 1995, Recommendations to Improve the Cleanup Process for California's Leaking Underground Fuel Tanks (LUFTs), Lawrence Livermore National Laboratory, University of California, Livermore, California, October 16, UCRL-AR-121762.



TABLE 1

LABORATORY ANALYSIS RESULTS AND GROUNDWATER DEPTHS

Wells	Date sampled	Groundwater depths (feet)	Compounds (µg/L)					
			MtBE	Benzene	Toluene	Ethylbenzene	Total Xylenes	Gasoline
W-1	9/13/95	28.78	ND	65,000	78,000	6,400	36,000	660,000
W-2	9/13/95	30.76	ND	ND	ND	ND	ND	90
W-3	9/13/95	30.58	ND	5,600	290	460	280	27,000
W-E	9/13/95	29.67	18	4	ND	ND	ND	95

ND Not Detected at or above the reporting limit for the method.

**TABLE 2
DUAL-PHASE EXTRACTION UNIT PILOT TEST DATA
MW-1 EXTRACTION TEST
ARROW RENTALS, LIVERMORE, CALIFORNIA**

Date	Time	Elapsed Time (hrs)	Applied Vacuum (In. Hg)	Inlet Temp. (Deg F)	Out Temp. (Deg F)	Vapor Flow (CFM)	Average Groundwater Extraction Rate (GPM)	Cumulative Volume Extracted Groundwater (gal)	Comments
3/15/94	10:45	0.00	25.50	64	82		0.00	88.8	System Startup
3/15/94	11:00	0.15	25.80	67	84		2.61	128.0	
3/15/94	11:15	0.30	26.00	70	86		NA	NA	Well closed Well open
3/15/94	11:30	0.45	26.20	71	87		NA	NA	
3/15/94	11:43	0.58	26.50	72	88	4	2.65	226.0	
3/15/94	12:00	1.15	26.50	74	88		NA	NA	
3/15/94	12:15	1.30	26.50	73	89		1.84	285.0	
3/15/94	12:45	2.00	26.50	72	90		2.47	359.0	
3/15/94	13:00	2.15	26.50	72	91		2.40	395.0	
3/15/94	13:40	2.55	26.00	70	91		2.38	490.0	
3/15/94	14:09	3.24	26.00	69	90		2.04	549.3	
3/15/94	14:31	3.46	26.00	68	90		2.15	596.5	
3/15/94	15:05	4.20	25.50	65	87		1.93	662.2	Switched to 1/2" straw
3/15/94	16:04	5.19	25.50	64	87		2.04	782.6	
3/15/94	17:02	6.17	24.75	62	85		2.00	898.8	
3/15/94	18:03	7.18	24.60	61	82		1.89	1014.0	
3/15/94	19:03	8.18	24.50	61	80		1.91	1128.5	
3/15/94	20:01	9.16	24.25	60	86		1.97	1242.7	
3/16/94	7:29	11.28	24.00	59	77		1.85	2515.3	
3/16/94	8:30	12.29	24.00	59	78		1.79	2624.4	
3/16/94	9:32	13.31	24.20	60	80		1.77	2733.9	
3/16/94	10:35	14.34	24.30	60	80		1.75	2844.0	
3/16/94	11:32	15.31	24.30	61	80		1.73	2942.4	
3/16/94	12:37	16.36	24.30	60	80		1.67	3050.7	
3/16/94	13:31	17.30	24.30	60	80		1.81	3148.6	
3/16/94	14:46	18.45	24.40	61	81		1.73	3278.4	
3/16/94	15:50	19.49	24.40	61	81		1.69	3386.7	
3/16/94	16:40	20.39	NA	NA	NA		NA	NA	
3/16/94	17:06	21.05	24.70	63	81		1.54	3504.1	
3/16/94	17:50	21.49	24.70	62	79		1.39	3565.3	
3/16/94	18:16	22.15	NA	NA	NA		NA	NA	
3/16/94	18:21	22.20	NA	NA	NA		NA	NA	
3/16/94	18:25	22.24	24.50	60	77		1.46	3616.5	
3/16/94	18:26	22.25	NA	NA	NA		NA	NA	End pilot DPE test

Legend

- NA Not Available
- GPM Gallons per minute
- CFM Cubic feet per minute

TABLE 3
WATER LEVELS IN WELLS MEASURED DURING DPE PILOT TEST
MW-1 EXTRACTION TEST
ARROW RENTALS, LIVERMORE, CALIFORNIA

Date	Time	Elapsed Time (hr)	Extraction Well	Groundwater Elevation (feet from mean sea level)							Comments
				W-A	W-B	W-C	W-D	W-E	W-2	W-3	
3/15/94	9:23	0.00	MW1	67.17	65.91	68.66	64.80	62.62	65.53	64.99	Start
3/15/94	10:45	1.22	MW1	67.03	65.91						
3/15/94	11:00	1.37	MW1	66.84	65.89				65.55	64.99	
3/15/94	11:15	1.52	MW1	66.59	65.88						
3/15/94	11:30	2.07	MW1	66.44	65.86						
3/15/94	11:45	2.22	MW1	66.32	65.84						
3/15/94	12:00	2.37	MW1	66.23	65.83						
3/15/94	12:15	2.52	MW1	66.19	65.82						
3/15/94	12:30	3.07	MW1	66.13	65.81						
3/15/94	12:45	3.22	MW1	NA	65.80						
3/15/94	13:00	3.37	MW1	65.99	65.79						
3/15/94	13:42	4.19	MW1	65.92	65.76						
3/15/94	14:07	4.44	MW1	65.88	65.74						
3/15/94	14:30	5.07	MW1	65.86	65.73						
3/15/94	15:00	5.37	MW1	65.83	65.71	68.81			65.62		
3/15/94	16:00	6.37	MW1	65.80	65.69						
3/15/94	17:00	7.37	MW1	65.76	65.65						
3/15/94	18:00	8.37	MW1	65.69	65.62	68.79			65.61		
3/15/94	19:00	9.37	MW1	65.65	65.58						
3/15/94	20:00	10.37	MW1	65.60	65.56						
3/16/95	7:48	22.25	MW1	65.39	65.39						
3/16/95	8:45	23.22	MW1	65.36	65.36						
3/16/95	9:45	24.22	MW1	65.33	65.33						
3/16/95	10:35	25.12	MW1	65.31	65.32						
3/16/95	11:35	26.12	MW1	65.30	65.31						
3/16/95	12:30	27.07	MW1	65.30	65.30	68.69			65.48		
3/16/95	13:30	28.07	MW1	65.24	65.30						
3/16/95	14:43	29.20	MW1	65.32	65.30						
3/16/95	15:49	30.26	MW1	NA	65.30						
3/16/95	17:09	31.46	MW1	NA	65.28						
3/16/95	18:02	32.39	MW1	NA	65.24	68.69			65.49		

TABLE 4
SUMMARY OF ANALYTICAL TESTING RESULTS FOR HYDROCARBON VAPORS
MW-1 DUAL-PHASE EXTRACTION TEST
ARROW RENTALS, LIVERMORE, CALIFORNIA

Date	Time	Vapor Monitoring with HNU (ppm)			Gastec Colorimetric Tubes (ppm)			
		GAC Inlet	Between GAC	GAC Outlet	Pet Distill.(mg/L)	Gasoline	CO2 (%)	O2(%)
3/15/94	15:00	530	0	0	1	450	0	6.50
3/15/94	16:20	570						
3/15/94	17:12	770						
3/15/94	18:15	770			1.75	400	0	6.25
3/15/94	19:00	720						
3/15/94	20:00	810						

TABLE 5
DPE PILOT TEST VACUUM RESPONSE DATA
MW-1 EXTRACTION TEST
ARROW RENTALS, LIVERMORE, CALIFORNIA

Date	Time	Elapsed Time (hrs)	Extraction Well MW1 (In. Hg)		In Monitoring Wells*			
			In Wellhead	In Straw	WA*	WB*	W-C*	W-2*
3/15/94	10:45	0:00	0	25				
3/15/94	11:00	0:15	0	25				
3/15/94	11:15	0:30	0	25				
3/15/94	11:30	0:45	0	25				
3/15/94	11:43	0:58	0	25				
3/15/94	12:00	1:15	3	25				
3/15/94	12:15	1:30		25				
3/15/94	12:45	2:00		25				
3/15/94	13:00	2:15		25				
3/15/94	13:40	2:55		25				
3/15/94	14:09	3:24		25				
3/15/94	14:30	3:43		25				
3/15/94	15:00	4:13		25				

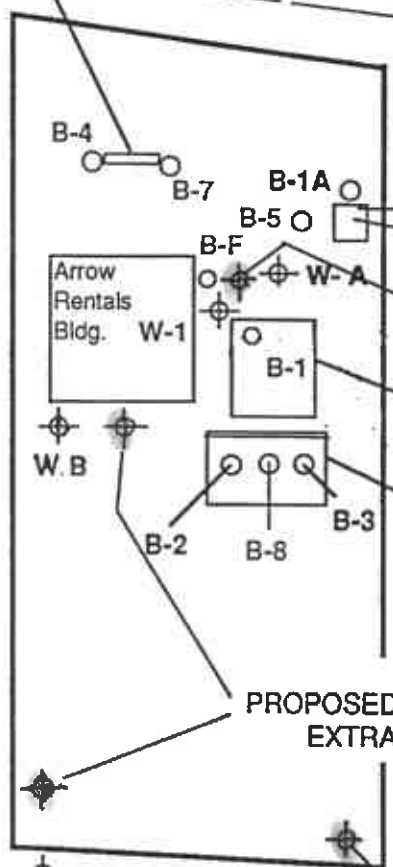
* Water level above well screens, no results measured.

Former Pump island

W-C

North L Street

Railroad Tracks



Vapor well (associated w/Arrow Rentals tank) fuel spill of 1985

Existing 1,000 gallon Chevron regular gasoline underground storage tank (Arrow Rentals)

Former 4,000 gallon and 6,000 gallon Mobil gasoline underground storage tanks

Three former 1,500 gallon Mobil gasoline underground storage tanks

PROPOSED GROUNDWATER EXTRACTION WELL

PROPOSED GROUNDWATER EXTRACTION WELL

PROPOSED 4-INCH MONITORING WELL

LEGEND

Approximate Soil Boring Location ○

Approximate Monitoring Well Location ⊕

PROPOSED GROUNDWATER EXTRACTION WELL ⊕

Project No. 90C0321A	ARROW RENTALS 187 North L Street Livermore, California	ALTERNATE REMEDATION PLAN	OCT. 1995
			FIGURE 2
Woodward-Clyde Consultants			

Vacuum Extraction Pilot (TEST) Trailer

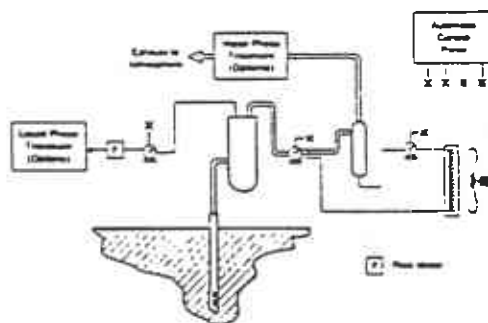
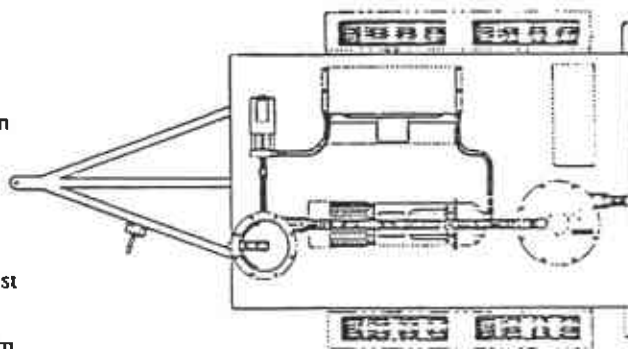
APPLICATIONS:

The WCC Vacuum Extraction Pilot (TEST) Trailer is designed to conduct on-site tests to quantify the effectiveness of vacuum extraction technologies applied to remediate subsurface volatile organics and/or bio-degradable contamination.

The system can be used to demonstrate and test bio-venting, vapor-phase, liquid-phase, and dual-phase extraction (DPE) technologies, from one or multiple wells. This system can generate very high vacuum, enabling it to induce movement of vapors from low-yielding soil such as clays and fine silts.

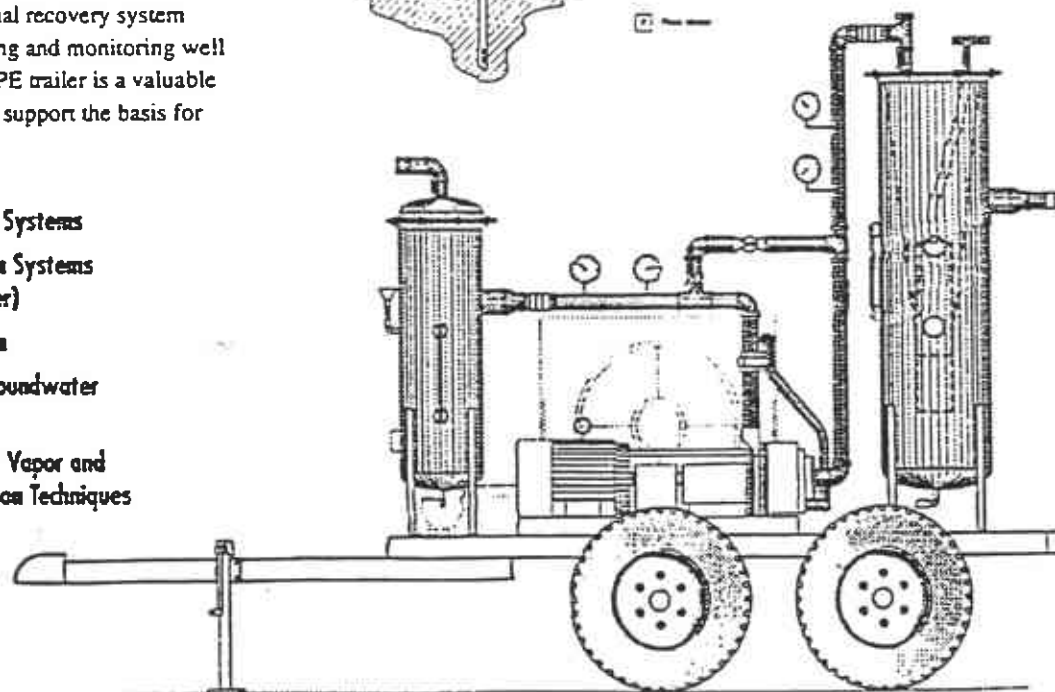
This Mobile DPE trailer can be used to evaluate vacuum-assisted soil vapor and groundwater yield rates, radius of influence, contaminant mass recovery rates, and to gather data necessary to design optimal recovery system configurations well spacing and monitoring well locations. The Mobile DPE trailer is a valuable tool for collecting data to support the basis for remedial design such as:

- Soil Vapor Extraction Systems
- Dual-Phase Extraction Systems (Vapor & Groundwater)
- In Site Bioremediation
- Vacuum-Enhanced Groundwater Pumping Systems
- Other Innovative Soil Vapor and Groundwater Collection Techniques



SYSTEM FEATURES:

- High Vacuum
- 50 Gallon Water Knockout System
- Liquid/Vapor Phase Separator



Woodward-Clyde Consultants 

Engineering & Sciences applied to the earth & its environment

Vacuum Extraction Pilot (TEST) Trailer

SYSTEM SPECIFICATIONS

FULLY AUTOMATIC CONTROLS

- Auto-Off-On control
- Safety/shutdown features
- High water
- Low water
- Component Failure/overload
- Emergency Shutdown Switches
- 460 VAC, 3-phase power requirement

VACUUM PUMP

- Liquid Ring Vacuum Pump
- 10 HP Motor Drive
- 25 in Hg. Vacuum (Max)
- Automatic Cooling system
- Self-contained, automatic
- Closed-loop, Freeze-protected
- Vapor Phase Treatment (Optional)

WATER DISCHARGE PUMP

- Grundfos Submersible, centrifugal
- 30 gpm water flow (Max)

KNOCKOUT TANK

- 50-gallon tank
- Configured for optimal fluid separation
- Automatic level control, high level alarm

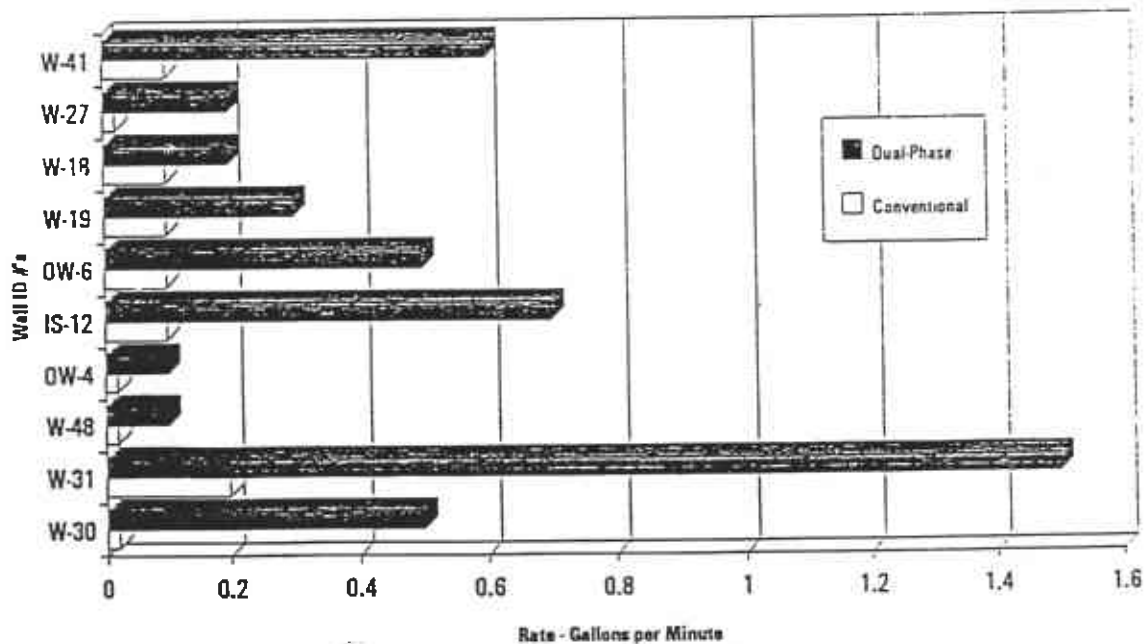
INSTRUMENTATION

- Inlet/Outlet Vacuum and Temperature gauges
- Outlet Vacuum Air Flow Meter
- Discharge Water Flow Totalizer

TRAILER SPECIFICATION

- 8' x 12.6' x 6.6' tandem axle trailer.
- Class III hitch with 2" ball and electric brakes.
- Approximate road weight 1,600 pounds.
- CA registration and inspection.

Typical Extraction Rate Comparison



Woodward-Clyde Consultants

500 Twelfth Street, Suite 100

Oakland, California 94607

TEL: (510) 893-3600 FAX: (510) 874-3268

FOR GENERAL INFORMATION CALL:

STEPHEN ALTON

(510) 874-1777 (Direct Line)



*RUSH
Expedite
Payment*

Approved by *Jobeth Folger*
 Project #: 93C0276A
 Task #: 0003
 Amount: \$2293.90

220 CHINA BASIN, SAN FRANCISCO, CA 94107 • DAY AND NIGHT: (415) 543-4835 FAX (415) 543-8265

DATE: MARCH 22, 1994
 OUR INVOICE NO.: 0394-059
 OUR JOB NO.: 14125
 CUSTOMER'S P.O. NO.:
 CUSTOMER'S JOB NO.:

WOODWARD-CLYDE CONSULTANTS
 500 - 12TH STREET, SUITE 100
 OAKLAND, CALIFORNIA 94607-4014
 ATTENTION: JOBETH FOLGER

FURNISHED VACUUM TRUCK AND OPERATOR TO PUMP OUT OIL AND WATER, AND DISPOSE OF SAME.

WORK STARTED: 03/17/94, ARROW RENTAL
 187 NORTH L STREET
 LIVERMORE, CALIFORNIA

WORK COMPLETED: 03/18/94, GIBSON/PILOT
 REDWOOD CITY, CALIFORNIA

VACUUM TRUCK & OPERATOR (6 ST HOURS @ 65.00)	\$ 390.00
DISPOSAL OF OIL & WATER (3,762 GALS. @ .40)	1,504.80
DISPOSAL OF SOLIDS (38 GALS. @ 6.95)	264.10
LAB ANALYSIS	125.00
BRIDGE TOLL	10.00

TOTAL INVOICE	\$ 2,293.90
	=====

1% PER MONTH CHARGING
 ON UNPAID BALANCE
 30 DAYS
 ADMINISTRATION FEE 18%





Inchcape Testing Services

Anametrix Laboratories

1961 Concourse Drive
Suite E
San Jose, CA 95131
Tel: 408-432-8192
Fax: 408-432-8198

MR. AL RIDLEY
WOODWARD-CLYDE CONSULTANTS
500 12TH STREET, SUITE 100
OAKLAND, CA 94607-4041

Workorder # : 9509137
Date Received : 09/13/95
Project ID : 93C0276A
Purchase Order: N/A

The following samples were received at Anametrix for analysis :

ANAMETRIX ID	CLIENT SAMPLE ID
9509137- 1	TBLANK
9509137- 2	W-E
9509137- 3	W-3
9509137- 4	W-2
9509137- 5	W-5
9509137- 6	W-1

This report is organized in sections according to the specific Anametrix laboratory group which performed the analysis(es) and generated the data.

The results contained within this report relate to only the sample(s) tested. Additionally, these data should be considered in their entirety and Anametrix cannot be responsible for the detachment, separation, or otherwise partial use of this report.

Anametrix is certified by the California Department of Health Services (DHS) to perform environmental testing under Certificate Number 1234.

If you have any further questions or comments on this report, please call your project manager as soon as possible. Thank you for using Inchcape Testing Services.

Nick Heath for
Susan Kraska Yeager
Laboratory Director

Cristina V. Rayburn
Project Manager

9/25/95
Date

This report consists of 16 pages.

REPORT SUMMARY
ANAMETRIX, INC. (408)432-8192

MR. AL RIDLEY
WOODWARD-CLYDE CONSULTANTS
500 12TH STREET, SUITE 100
OAKLAND, CA 94607-4041

Workorder # : 9509137
Date Received : 09/13/95
Project ID : 93C0276A
Purchase Order: N/A
Department : GC
Sub-Department: TPH

SAMPLE INFORMATION:

ANAMETRIX SAMPLE ID	CLIENT SAMPLE ID	MATRIX	DATE SAMPLED	METHOD
9509137- 1	TBLANK	WATER	09/13/95	TPHgBTEX
9509137- 2	W-E	WATER	09/13/95	TPHgBTEX
9509137- 3	W-3	WATER	09/13/95	TPHgBTEX
9509137- 4	W-2	WATER	09/13/95	TPHgBTEX
9509137- 5	W-5	WATER	09/13/95	TPHgBTEX
9509137- 6	W-1	WATER	09/13/95	TPHgBTEX

REPORT SUMMARY
ANAMETRIX, INC. (408)432-8192

MR. AL RIDLEY
WOODWARD-CLYDE CONSULTANTS
500 12TH STREET, SUITE 100
OAKLAND, CA 94607-4041

Workorder # : 9509137
Date Received : 09/13/95
Project ID : 93C0276A
Purchase Order: N/A
Department : GC
Sub-Department: TPH

QA/QC SUMMARY :

- All holding times have been met for the analyses reported in this section.

Cheryl Balman 9/21/95
Department Supervisor Date

Reggie Dawson 9/21/95
Chemist Date

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE WITH BTEX
INCHCAPE TESTING SERVICES - ANAMETRIX
 (408) 432-8192

DATA SUMMARY FORM

Anamatrix ID:	9509137-06	Client Project ID:	93C0276A
Matrix:	WATER	Client Sample ID:	W-1
Date Sampled:	9/13/95	Instrument ID:	HP6
Date Analyzed:	9/16/95	Surrogate Recovery:	127%
Date Released:	9/26/95	Concentration Units:	ug/L

<u>COMPOUND</u>	<u>Dilution</u> <u>Factor</u>	<u>Reporting</u> <u>Limit</u>	<u>Amount</u> <u>Found</u>
MtBE	2500	12500	ND
Benzene	2500	1250	65000
Toluene	2500	1250	78000
Ethylbenzene	2500	1250	6400
Total Xylenes	2500	1250	36000
Gasoline	2500	125000	660000

ND: Not detected at or above the reporting limit for the method.

TPHg: Total Petroleum Hydrocarbons as gasoline is determined by GC/FID (modified EPA Method 8015) following sample purge and trap by EPA Method 5030

BTEX: BTEX as Methyl tert-Butyl Ether, Benzene, Toluene, Ethylbenzene, and Total Xylenes is determined by GC/PID (modified EPA Method 8020) following sample purge and trap by EPA Method 5030.

Surrogate recovery quality control limits for p-Bromofluorobenzene are 61-139%.

All testing procedures follow California Department of Health Services approved methods.

Rayel Syed 9/26/95
 Analyst Date

Cheryl B. Emmer 9/26/95
 Supervisor Date

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE WITH BTEX
INCHCAPE TESTING SERVICES - ANAMETRIX
 (408) 432-8192

DATA SUMMARY FORM

Anametric ID:	9509137-04	Client Project ID:	93C0276A
Matrix:	WATER	Client Sample ID:	W-2
Date Sampled:	9/13/95	Instrument ID:	HP6
Date Analyzed:	9/16/95	Surrogate Recovery:	122%
Date Released:	9/26/95	Concentration Units:	ug/L

<u>COMPOUND</u>	<u>Dilution Factor</u>	<u>Reporting Limit</u>	<u>Amount Found</u>
MtBE	1	5	ND
Benzene	1	0.5	ND
Toluene	1	0.5	ND
Ethylbenzene	1	0.5	ND
Total Xylenes	1	0.5	ND
Gasoline	1	50	90

ND: Not detected at or above the reporting limit for the method.
 TPHg: Total Petroleum Hydrocarbons as gasoline is determined by GC/FID
 (modified EPA Method 8015) following sample purge and trap by EPA Method 5030
 BTEX: BTEX as Methyl tert-Butyl Ether, Benzene, Toluene, Ethylbenzene, and Total
 Xylenes is determined by GC/PID (modified EPA Method 8020) following sample
 purge and trap by EPA Method 5030.
 Surrogate recovery quality control limits for p-Bromofluorobenzene are 61-139%.
 All testing procedures follow California Department of Health Services
 approved methods.

Sayell Sydel 9/26/95
 Analyst Date

Cheryl Balman 9/26/95
 Supervisor Date

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE WITH BTEX
INCHCAPE TESTING SERVICES - ANAMETRIX
(408) 432-8192

DATA SUMMARY FORM

Anametrix ID:	9509137-03	Client Project ID:	93C0276A
Matrix:	WATER	Client Sample ID:	W-3
Date Sampled:	9/13/95	Instrument ID:	HP6
Date Analyzed:	9/19/95	Surrogate Recovery:	110%
Date Released:	9/26/95	Concentration Units:	ug/L

<u>COMPOUND</u>	<u>Dilution</u> <u>Factor</u>	<u>Reporting</u> <u>Limit</u>	<u>Amount</u> <u>Found</u>
MtBE	500	2500	ND
Benzene	500	250	5600
Toluene	500	250	290
Ethylbenzene	500	250	460
Total Xylenes	500	250	280
Gasoline	500	25000	27000

ND: Not detected at or above the reporting limit for the method.

TPHg: Total Petroleum Hydrocarbons as gasoline is determined by GC/FID (modified EPA Method 8015) following sample purge and trap by EPA Method 5030

BTEX: BTEX as Methyl tert-Butyl Ether, Benzene, Toluene, Ethylbenzene, and Total Xylenes is determined by GC/PID (modified EPA Method 8020) following sample purge and trap by EPA Method 5030.

Surrogate recovery quality control limits for p-Bromofluorobenzene are 61-139%.

All testing procedures follow California Department of Health Services approved methods.

Sayed Syed 9/26/95
Analyst Date

Cheryl Beeman 9/26/95
Supervisor Date

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE WITH BTEX
INCHCAPE TESTING SERVICES - ANAMETRIX
(408) 432-8192

DATA SUMMARY FORM

Anametrix ID:	9509137-05	Client Project ID:	93C0276A
Matrix:	WATER	Client Sample ID:	W-5
Date Sampled:	9/13/95	Instrument ID:	HP6
Date Analyzed:	9/16/95	Surrogate Recovery:	113%
Date Released:	9/26/95	Concentration Units:	ug/L

<u>COMPOUND</u>	<u>Dilution Factor</u>	<u>Reporting Limit</u>	<u>Amount Found</u>
MtBE	1	5	ND
Benzene	1	0.5	ND
Toluene	1	0.5	ND
Ethylbenzene	1	0.5	ND
Total Xylenes	1	0.5	ND
Gasoline	1	50	ND

ND: Not detected at or above the reporting limit for the method.

TPHg: Total Petroleum Hydrocarbons as gasoline is determined by GC/FID (modified EPA Method 8015) following sample purge and trap by EPA Method 5030

BTEX: BTEX as Methyl tert-Butyl Ether, Benzene, Toluene, Ethylbenzene, and Total Xylenes is determined by GC/PID (modified EPA Method 8020) following sample purge and trap by EPA Method 5030.

Surrogate recovery quality control limits for p-Bromofluorobenzene are 61-139%.

All testing procedures follow California Department of Health Services approved methods.

Rayell Boyd 9/26/95
Analyst Date

Cheryl Bulman 9/26/95
Supervisor Date

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE WITH BTEX
INCHCAPE TESTING SERVICES - ANAMETRIX
(408) 432-8192

DATA SUMMARY FORM

Anamatrix ID:	9509137-02	Client Project ID:	93C0276A
Matrix:	WATER	Client Sample ID:	W-E
Date Sampled:	9/13/95	Instrument ID:	HP6
Date Analyzed:	9/16/95	Surrogate Recovery:	110%
Date Released:	9/26/95	Concentration Units:	ug/L

<u>COMPOUND</u>	<u>Dilution</u> <u>Factor</u>	<u>Reporting</u> <u>Limit</u>	<u>Amount</u> <u>Found</u>
MtBE	1	5	18
Benzene	1	0.5	4.0
Toluene	1	0.5	ND
Ethylbenzene	1	0.5	ND
Total Xylenes	1	0.5	ND
Gasoline	1	50	95

ND: Not detected at or above the reporting limit for the method.

TPHg: Total Petroleum Hydrocarbons as gasoline is determined by GC/FID (modified EPA Method 8015) following sample purge and trap by EPA Method 5030

BTEX: BTEX as Methyl tert-Butyl Ether, Benzene, Toluene, Ethylbenzene, and Total Xylenes is determined by GC/PID (modified EPA Method 8020) following sample purge and trap by EPA Method 5030.

Surrogate recovery quality control limits for p-Bromofluorobenzene are 61-139%.

All testing procedures follow California Department of Health Services approved methods.

David Syed 9/26/95
Analyst Date

Christ Balmer 9/26/95
Supervisor Date

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE WITH BTEX
INCHCAPE TESTING SERVICES - ANAMETRIX
(408) 432-8192

DATA SUMMARY FORM

Anamatrix ID:	9509137-01	Client Project ID:	93C0276A
Matrix:	WATER	Client Sample ID:	TBLANK
Date Sampled:	9/13/95	Instrument ID:	HP6
Date Analyzed:	9/16/95	Surrogate Recovery:	119%
Date Released:	9/26/95	Concentration Units:	ug/L

<u>COMPOUND</u>	<u>Dilution Factor</u>	<u>Reporting Limit</u>	<u>Amount Found</u>
MtBE	1	5	ND
Benzene	1	0.5	ND
Toluene	1	0.5	ND
Ethylbenzene	1	0.5	ND
Total Xylenes	1	0.5	ND
Gasoline	1	50	ND

ND: Not detected at or above the reporting limit for the method.

TPHg: Total Petroleum Hydrocarbons as gasoline is determined by GC/FID (modified EPA Method 8015) following sample purge and trap by EPA Method 5030

BTEX: BTEX as Methyl tert-Butyl Ether, Benzene, Toluene, Ethylbenzene, and Total Xylenes is determined by GC/PID (modified EPA Method 8020) following sample purge and trap by EPA Method 5030.

Surrogate recovery quality control limits for p-Bromofluorobenzene are 61-139%.

All testing procedures follow California Department of Health Services approved methods.

Sayed Syed 9/26/95
Analyst Date

Cheryl Bucema 9/26/95
Supervisor Date

**TOTAL PETROLEUM HYDROCARBONS AS GASOLINE WITH BTEX
INCHCAPE TESTING SERVICES - ANAMETRIX**
(408) 432-8192

DATA SUMMARY FORM

Anametrix ID:	BS1601E1	Client Project ID:	93C0276A
Matrix:	WATER	Client Sample ID:	Method Blank
Date Sampled:	-----	Instrument ID:	HP6
Date Analyzed:	9/16/95	Surrogate Recovery:	113%
Date Released:	9/26/95	Concentration Units:	ug/L

<u>COMPOUND</u>	<u>Dilution</u> <u>Factor</u>	<u>Reporting</u> <u>Limit</u>	<u>Amount</u> <u>Found</u>
MtBE	1	5	ND
Benzene	1	0.5	ND
Toluene	1	0.5	ND
Ethylbenzene	1	0.5	ND
Total Xylenes	1	0.5	ND
Gasoline	1	50	ND

ND: Not detected at or above the reporting limit for the method.

TPHg: Total Petroleum Hydrocarbons as gasoline is determined by GC/FID (modified EPA Method 8015) following sample purge and trap by EPA Method 5030

BTEX: BTEX as Methyl tert-Butyl Ether, Benzene, Toluene, Ethylbenzene, and Total Xylenes is determined by GC/PID (modified EPA Method 8020) following sample purge and trap by EPA Method 5030.

Surrogate recovery quality control limits for p-Bromofluorobenzene are 61-139%.

All testing procedures follow California Department of Health Services approved methods.

Analyst: David Syed 9/26/95
Date

Supervisor: Cheryl Berman 9/26/95
Date

TOTAL PETROLEUM HYDROCARBONS AS GASOLINE WITH BTEX
INCHCAPE TESTING SERVICES - ANAMETRIX
(408) 432-8192

DATA SUMMARY FORM

Anamatrix ID:	BS1903E1	Client Project ID:	93C0276A
Matrix:	WATER	Client Sample ID:	Method Blank
Date Sampled:	-----	Instrument ID:	HP6
Date Analyzed:	9/19/95	Surrogate Recovery:	103%
Date Released:	9/26/95	Concentration Units:	ug/L

<u>COMPOUND</u>	<u>Dilution Factor</u>	<u>Reporting Limit</u>	<u>Amount Found</u>
MtBE	1	5	ND
Benzene	1	0.5	ND
Toluene	1	0.5	ND
Ethylbenzene	1	0.5	ND
Total Xylenes	1	0.5	ND
Gasoline	1	50	ND

ND: Not detected at or above the reporting limit for the method.

TPHg: Total Petroleum Hydrocarbons as gasoline is determined by GC/FID
(modified EPA Method 8015) following sample purge and trap by EPA Method 5030

BTEX: BTEX as Methyl tert-Butyl Ether, Benzene, Toluene, Ethylbenzene, and Total
Xylenes is determined by GC/PID (modified EPA Method 8020) following sample
purge and trap by EPA Method 5030.

Surrogate recovery quality control limits for p-Bromofluorobenzene are 61-139%.

All testing procedures follow California Department of Health Services
approved methods.

Sayd Syed 9/26/95
Analyst Date

Cheryl Bauman 9/26/95
Supervisor Date

TOTAL PETROLEUM HYDROCARBONS AS BTEX
INCHCAPE TESTING SERVICES - ANAMETRIX
(408) 432-8192

MATRIX SPIKE RECOVERY REPORT

Client Project ID: 93C0276A	Anametrix ID: 9509137-02
Client Sample ID: W-E	Date Released: 9/26/95
Date Sampled: 9/13/95	Instrument ID: HP6
Date Analyzed: 9/16/95	Matrix: WATER
	Concentration Units: ug/L

<u>COMPOUND NAME</u>	<u>SPIKE AMT</u>	<u>SAMPLE CONC</u>	<u>MS CONC</u>	<u>% REC MS</u>	<u>MSD CONC</u>	<u>%REC MSD</u>	<u>RPD</u>
MTBE	10	18	24	60%	24	60%	0%
Benzene	10	4	13	90%	14	100%	7%
Toluene	10	0	12	120%	12	120%	0%
Ethylbenzene	10	0	11	110%	12	120%	9%
Total Xylenes	10	0	11	110%	12	120%	9%
p-Bromofluorobenzene				130%		109%	

Quality control limits for MS/MSD recovery are 50-150% for MTBE, 45-139% for benzen
51-138% for toluene, 48-146% for ethylbenzene, and 50-139% for total xylenes.

Quality control limits for RPD(relative percent difference) are +/- 30%.

Quality control limits for p-Bromofluorobenzene recovery are 61-139%.

TOTAL PETROLEUM HYDROCARBONS AS BTEX
 INCHCAPE TESTING SERVICES - ANAMETRIX
 (408) 432-8192

LABORATORY CONTROL SAMPLE REPORT

Client Project ID:	93C0276A	Anamatrix ID:	MS1601E1
Matrix:	WATER	Date Released:	9/26/95
Date Analyzed:	9/16/95	Instrument ID:	HP6
		Concentration Units:	ug/L

<u>COMPOUND NAME</u>	<u>SPIKE AMT</u>	<u>LCS CONC</u>	<u>%REC LCS</u>
MTBE	10	10.8	108%
Benzene	10	9.8	98%
Toluene	10	11.2	112%
Ethylbenzene	10	10.8	108%
Total Xylenes	10	11.2	112%
 p-Bromofluorobenzene			 131%

Quality control limits for LCS recovery are 50-150% for MTBE, 52-133% for benzene, 57-136% for toluene, 56-139% for ethylbenzene, and 56-141% for total xylenes.

Quality control limits for p-Bromofluorobenzene recovery are 61-139%.

TOTAL PETROLEUM HYDROCARBONS AS BTEX
INCHCAPE TESTING SERVICES - ANAMETRIX
(408) 432-8192

LABORATORY CONTROL SAMPLE REPORT

Client Project ID:	93C0276A	Anametrix ID:	MS1902E1
Matrix:	WATER	Date Released:	9/26/95
Date Analyzed:	9/20/95	Instrument ID:	HP6
		Concentration Units:	ug/L

<u>COMPOUND NAME</u>	<u>SPIKE AMT</u>	<u>LCS CONC</u>	<u>%REC LCS</u>
MTBE	10	9.3	93%
Benzene	10	9.0	90%
Toluene	10	9.0	90%
Ethylbenzene	10	9.3	93%
Total Xylenes	10	9.2	92%
 p-Bromofluorobenzene			 104%

Quality control limits for LCS recovery are 50-150% for MTBE, 52-133% for benzene, 57-136% for toluene, 56-139% for ethylbenzene, and 56-141% for total xylenes.

Quality control limits for p-Bromofluorobenzene recovery are 61-139%.

FD16

7509137 (18)

Woodward-Clyde Consultants

500 12th Street, Suite 100, Oakland, CA 94607-4014
(510) 893-3600

Chain of Custody Record

PROJECT NO. ~~Arrow Rentals~~
93C0276A

SAMPLERS: (Signature)

ANALYSES

TPH GAs/BTEX
Sample Matrix (Soil, Water, Air)

Number of Containers

REMARKS
(Sample preservation, handling procedures, etc.)

DATE	TIME	SAMPLE NUMBER	Sample Matrix (Soil, Water, Air)	EPA Method TPH GAs/BTEX	EPA Method	EPA Method	EPA Method	EPA Method	Number of Containers	REMARKS
9/13/95	0800	TRIP BLANK	W	2					2	Normal TAT
9/13/95	1110	W-E	W	3					3	Results to Al Ridley
9/13/95	1155	W-3	W	3				3		
9/13/95	1240	W-2	W	3					3	Questions, call Al Ridley @ (510) 874-3125
9/13/95	1315	W-5	W	3				3		
9/13/95	1350	W-1	W	3				3		

TOTAL NUMBER OF CONTAINERS

17

Ice Chest

RELINQUISHED BY: (Signature)

DATE/TIME
9/13/95 1430

RECEIVED BY: (Signature)

RELINQUISHED BY: (Signature)

DATE/TIME
9/13/95 1600

RECEIVED BY: (Signature)

METHOD OF SHIPMENT:
Anamatrix Courier

SHIPPED BY: (Signature)

COURIER: (Signature)

RECEIVED FOR LAB BY: (Signature)

DATE/TIME
9/13/95 1600



SAMPLE RECEIVING CHECKLIST

WORKORDER NUMBER: 9509137 CLIENT PROJECT ID: 93C0276A

COOLER

Shipping slip (airbill, etc.) present? If YES, enter carrier name and airbill # : _____	YES	NO	<u>N/A</u>
Custody Seal on the outside of cooler? Condition: INTACT _____ BROKEN _____	YES	NO	<u>N/A</u>
Temperature of sample (s) within range? <u>4°C</u> List temperature of cooler (s): _____	<u>YES</u>	NO	N/A

SAMPLES

Chain of custody seal present for each container? Condition: INTACT _____ BROKEN _____	YES	NO	<u>N/A</u>
Samples arrived within holding time?	<u>YES</u>	NO	N/A
Samples in proper containers for methods requested? Condition of containers: INTACT <u>5</u> BROKEN _____ If NO, were samples transferred to proper container? _____	<u>YES</u>	NO	
Were VOA containers received with zero headspace? If NO, was it noted on the chain of custody? _____	<u>YES</u>	NO	N/A
Were container labels complete? (ID, date, time preservative, etc.)	<u>YES</u>	NO	
Were samples preserved with the proper preservative? If NO, was the proper preservative added at time of receipt? _____	<u>YES</u>	NO	N/A
pH check of samples required at time of receipt? If YES, pH checked and recorded by: _____	YES	<u>NO</u>	
Sufficient amount of sample received for methods requested? If NO, has the client or lab project manager been notified? _____	<u>YES</u>	NO	
Field blanks received with sample batch? # of Sets: _____	YES	NO	<u>N/A</u>
Trip blanks received with sample batch? # of Sets: <u>1</u>	<u>YES</u>	NO	N/A

CHAIN OF CUSTODY

Chain of custody received with samples?	<u>YES</u>	NO
Has it been filled out completely and in ink?	<u>YES</u>	NO
Sample ID's on chain of custody agree with container labels?	<u>YES</u>	NO
Number of containers indicated on chain of custody agree with number received?	<u>YES</u>	NO
Analysis methods clearly specified?	<u>YES</u>	NO
Sampling date and time indicated?	<u>YES</u>	NO
Proper signatures of sampler, courier, sample custodian in appropriate place? with time and date?	<u>YES</u>	NO
Turnaround time? REGULAR <u>5</u> RUSH _____		

Any NO response and/or any "BROKEN" that was checked must be detailed in the Corrective Action Form.

Sample Custodian: [Signature] Date: 07-13-95 Project Manager: [Signature] Date: 07/14/95