

INNOVATIVE TECHNICAL SOLUTIONS, Inc.



*7/4/98 con with Dale
will be installed ~ 6/98 will call
ITSI re: report, determine how to
install etc.*

RO-44

**PORT OF OAKLAND
ENVIRONMENTAL DIVISION**

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May 28, 1998

Project No. 95-113.28

Mr. Dale Klettke
Associate Environmental Scientist
Port of Oakland
530 Water Street
Oakland, California 94607

Groundwater Monitoring and Sampling Report
Tanks MF25 and MF26, United Airlines Hangar - Economy Parking Lot Site
Metropolitan Oakland International Airport (MOIA)
1100 Airport Drive
Oakland, California
(Work Order No. 028691)

Dear Mr. Klettke:

This Groundwater Monitoring and Sampling Report (Report) has been prepared by Innovative Technical Solutions, Inc. (ITSI) on behalf of the Port of Oakland for groundwater monitoring and sampling performed on March 26, 1998 at the United Airlines Hangar-Economy Parking Lot Site, located at 1100 Airport Drive at the Metropolitan Oakland International Airport (MOIA) in Oakland, California. A site location map is shown on Figure 1.

The scope of work included monitoring three groundwater monitoring wells, MW-1, MW-2, and MW-3, and sampling MW-1. The monitoring wells are located in the vicinity of two former underground storage tanks: a 500-gallon oil/solvent tank (MF-25) and a 3,000-gallon oil/solvent tank (MF-26). The USTs were removed in March 1992.

SAMPLING OF MONITORING WELL(S)

Groundwater monitoring and sampling was performed on March 26, 1998. The monitoring wells were initially gauged for depth to water and checked for the presence of separate phase hydrocarbons. Separate phase hydrocarbons were observed in monitoring wells MW-2 and MW-3. Depth to water and product thickness measurements were recorded on Monitoring Well Purge and Sample Forms. Copies of the Monitoring Well Purge and Sample Forms are provided in Attachment A.

After depth to water measurements were recorded, monitoring well MW-1, with no measurable separate phase hydrocarbons, was purged using a disposable bailer. Approximately three casing volumes of water were removed from MW-1. Physical parameters, including pH, conductivity, temperature, and dissolved oxygen were measured following each purge cycle (approximately one casing volume). Field parameters were recorded on Monitoring Well Purge and Sample Forms. Purge water was stored in a properly labeled drum onsite.

A groundwater sample was collected from monitoring well MW-1 using the disposable bailer and placed into laboratory provided containers. The sample containers were properly labeled with the sample number, date and time of collection, and sampler's initials and placed on ice in an insulated cooler.

The above field activities were performed in accordance with the site-specific Health and Safety Plan for groundwater monitoring and sampling activities at the site.

GROUNDWATER LEVELS IN MONITORING WELLS

Depth to water results are summarized in Table 1. Groundwater elevations were calculated using the measured depth to water and survey elevations of top of casing, and are provided in Table 1. This survey used the Port of Oakland datum, which is 3.2 feet below mean sea level. Figure 2 shows the elevation contours and groundwater flow direction for the site. The groundwater flow direction is to the southeast, with a gradient of approximately 0.003 ft/ft.

LABORATORY ANALYSIS OF GROUNDWATER SAMPLE

The sample was sent under chain-of-custody procedures to Curtis and Thompkins, Ltd. in Berkeley, California, the Port of Oakland contract laboratory, and analyzed according to the following schedule:

Monitoring Well ID	Analyses													
	TPHg (1)	BTEX (2)	TPHj (3)	TPHd (4)	TPHmo (5)	VOCs (6)	Fe ²⁺ (7)	Fe ³⁺ (8)	Tot. Fe (9)	Sol. Fe (10)	NO ₃ (11)	SO ₄ (12)	TDS (13)	
MW-1	X	X	X	X	X	X	X	X	X	X	X	X	X	

(1) TPH as gasoline by Modified EPA Method 8015.

(2) Benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA Method 8020A.

(3) TPH as JP-5 by Modified EPA Method 8015 with silica gel cleanup procedure.

- (4) TPH as diesel by Modified EPA Method 8015 with silica gel cleanup procedure.
- (5) TPH as motor oil by Modified EPA Method 8015 with silica gel cleanup procedure.
- (6) VOCs by EPA Method 8010.
- (7) Ferrous iron (Fe^{2+}) by SMWW Method 3500 Fe, D.
- (8) Ferric iron (Fe^{3+}) by SMWW Method 3500 Fe, D.
- (9) Total iron (Tot. Fe) by EPA Method 6010A.
- (10) Soluble iron (Sol. Fe) by EPA Method 6010A.
- (11) Nitrogen, nitrate (NO_3) by EPA Method 353.2.
- (12) Sulfate (SO_4) by EPA Method 300.0.
- (13) Total dissolved solids (TDS) by EPA Method 160.1.

Laboratory results for the groundwater sample are summarized in Tables 2, 3 and 4, and are shown in Figure 3. Copies of the laboratory results, chromatograms and chain-of-custody are provided in Attachment B.

FINDINGS

Results of the March 26, 1998 groundwater monitoring and sampling are summarized below:

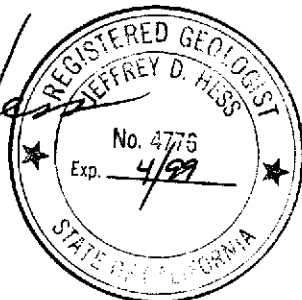
- Separate phase hydrocarbons were observed in monitoring wells MW-2 and MW-3, at a thickness of 0.005 feet.
- TPHg, BTEX, TPHj as JP-5, TPHd and TPHmo were reportedly not detected in MW-1.
- 1,1-Dichloroethane (1,1-DCA) and Cis-1,2-dichloroethene (Cis-1,2-DCE) were reportedly detected in MW-1 at concentrations of 5.3 $\mu\text{g}/\text{l}$ and 8.1 $\mu\text{g}/\text{l}$, respectively.¹
- Ferrous iron (Fe^{2+}) and ferric iron (Fe^{3+}) were reportedly detected in MW-1 at concentrations of 0.41 $\mu\text{g}/\text{l}$ and 2.1 $\mu\text{g}/\text{l}$, respectively.
- Total iron was reportedly detected at a concentration of 2.5 mg/l in MW-1. Soluble iron was reportedly not detected in MW-1.
- Nitrogen/nitrate was reportedly not detected in MW-1.
- Sulfate was reportedly detected in MW-1 at a concentration of 110 mg/l.
- TDS was reported in MW-1 at a concentration of 3,240 mg/l.

Please call us if you have any questions or comments.

Sincerely,


Jim Schollard, R.E.A.
Project Geologist


Jeffrey D. Hess, R.G.
Project Director



Attachments

¹ Laboratory results represent the highest concentrations reported for either the sample or the field duplicate sample.

TABLE 1

**GROUNDWATER ELEVATIONS
TANKS MF25 AND MF26 (UNITED AIRLINES HANGAR - ECONOMY PARKING LOT SITE)
METROPOLITAN OAKLAND INTERNATIONAL AIRPORT (MOIA)
1100 AIRPORT DRIVE
OAKLAND, CALIFORNIA**

Monitoring Well ID	Elevation of Top of Casing (feet)	Date of Monitoring	Measured Depth to Water (feet)	Product Thickness (feet)	Groundwater Elevation (feet)	Note
MW-1	6.91	5/15/92	3.10	-	3.81	1
		8/7/92	3.20	-	3.71	1
		11/24/92	4.04	-	2.87	1
		2/12/93	-	-	-	1
		3/11/93	2.09	-	4.82	1
		5/17/93	3.14	-	3.77	1
		8/3/93	3.15	-	3.76	1
		11/25/93	3.59	-	3.32	1
		3/24/94	3.21	-	3.70	1
		5/9/94	2.99	-	3.92	1
		8/29/94	3.34	-	3.57	1
		9/27/94	3.51	-	3.40	1
		4/25/95	2.38	-	4.53	1
		8/11/95	3.08	-	3.83	1
		11/3/95	3.52	-	3.39	1
		6/19/96	2.93	-	3.98	1
		10/24/96	3.52	-	3.39	1
		1/22/97	2.61	-	4.30	1
		4/25/97	2.77	-	4.14	1
		8/6/97	3.27	-	3.64	1
12/23/97	3.14	-	3.77	1		
3/26/98	2.09	-	4.82	1		
MW-2	6.63	4/25/95	2.20	-	4.43	1
		8/11/95	3.11	-	3.84	1
		11/3/95	3.28	-	3.35	1
		6/19/96	2.53	0.05	4.14	2
		10/24/96	3.44	0.16	3.31	2
		1/22/97	2.45	0.02	4.20	2
		4/25/97	2.60	0.03	4.05	2
		7/30/97	NM	0.14	NM	3
		8/6/97	2.96	-	3.67	2
		12/23/97	2.85	0.25	3.97	2
3/26/98	1.72	0.005	4.92	2		

TABLE 1 (continued)

**GROUNDWATER ELEVATIONS
TANKS MF25 AND MF26 (UNITED AIRLINES HANGAR - ECONOMY PARKING LOT SITE)
METROPOLITAN OAKLAND INTERNATIONAL AIRPORT (MOIA)
1100 AIRPORT DRIVE
OAKLAND, CALIFORNIA**

Monitoring Well ID	Elevation of Top of Casing (feet)	Date of Monitoring	Measured Depth to Water (feet)	Product Thickness (feet)	Groundwater Elevation (feet)	Note
MW-3	7.36	4/25/95	2.78	-	4.58	1
		8/11/95	3.62	-	4.02	1
		11/3/95	4.05	-	3.63	1
		6/19/96	3.17	0.01	4.20	2
		10/24/96	4.02	0.02	3.36	2
		1/22/97	2.86	0.005	4.50	2
		4/25/97	3.13	0.01	4.24	2
		7/30/97	NM	0.03	NM	3
		8/6/97	3.76	-	3.60	
		12/23/97	3.48	-	3.88	
		3/26/98	2.36	0.005	5.00	2

- 1 Data from Table 1, Results of Groundwater Sampling Analysis for Petroleum Hydrocarbons, BTEX, and TDS, Port of Oakland, Oakland International Airport, United Airlines Hangar Area-Economy Parking Lot Site, dated February 21, 1996, by Alisto Engineering Group.
- 2 Groundwater elevation calculated assuming a specific gravity of 0.75 for product.
- 3 Free product removed from well during redevelopment (July 30, 1997).

TABLE 2

SUMMARY OF LABORATORY RESULTS FOR PETROLEUM HYDROCARBONS
TANKS MF25 AND MF26 (UNITED AIRLINES HANGAR AREA - ECONOMY PARKING LOT SITE)
METROPOLITAN OAKLAND INTERNATIONAL AIRPORT (MOIA)
1100 AIRPORT DRIVE
OAKLAND, CALIFORNIA

Monitoring Well ID	Date of Sampling	TPHg (µg/l)	B (µg/l)	T (µg/l)	E (µg/l)	X (µg/l)	TPHj (µg/l)	TPHd (µg/l)	TPHmo (µg/l)	TOG (µg/l)	Note
MW-1	5/15/92	<50	<0.4	<0.3	<0.3	<0.4	-	-	-	<5,000	1
	8/7/92	<50	<0.4	<0.3	<0.3	<0.4	800	-	-	<5,000	1
	11/24/92	<50	<0.4	<0.3	<0.3	<0.4	<50	-	-	<5,000	1
	2/12/93	<50	<0.4	<0.3	<0.3	<0.4	-	-	-	<5,000	1
	5/17/93	<50	<0.4	<0.3	<0.3	<0.4	-	-	-	<5,000	1
	8/3/93	<50	<0.5	<0.5	<0.5	<0.5	-	5,200	-	<5,000	1
	11/25/93	70	<0.5	<0.5	<0.5	0.6	-	-	-	<5,000	1
	5/9/94	<50	<0.5	<0.5	<0.5	<0.5	-	-	-	<930	1
	8/29/94	<50	<0.5	<0.5	2.7	<0.5	-	-	-	<1,000	1
	4/25/95	<50	<5	<5	<5	<5	<50	1,400	610	-	1
	8/11/95	<50	<0.4	<0.3	<0.3	<0.4	<50	1,900	1,200	-	1
	11/3/95	<50	0.4	0.4	<0.3	<0.4	<50	4,200	1,800	-	1
	6/19/96	<50	0.99	<0.5	1.1	<1.0	<500	11,000	820	-	
	10/24/96	57	1.9	<0.5	<0.5	1.3	<500	<250	<250	-	
	1/22/97	<50	<0.5	<0.5	<0.5	<1.0	<500	220 ¹	<250	-	
	4/25/97*	110	1.2	<0.5	1.0	1.2	<500	<50 ¹	<250	-	
	8/6/97	100	2.1	<0.5	<0.5	<1.0	<500	340 ²	<250	-	
	12/23/97	<50	0.7	<0.5	<0.5	<1.0	<50	<50	<300	-	
	3/26/98	<50	<0.5	<0.5	<0.5	<1.0	<48	<48	<290	-	
MW-2	4/25/95	5,200	340	570	110	580	13,000	<10,000	19,000	-	1
	8/11/95	5,500	320	680	110	510	7,900	<8,000	20,000	-	1
	11/3/95	3,800	200	400	27	360	11,000	<11,000	4,200	-	1
	6/19/96	2	2	2	2	2	2	2	2	-	
	10/24/96	2	2	2	2	2	2	2	2	-	
	1/22/97	2	2	2	2	2	2	2	2	-	
	4/25/97	2	2	2	2	2	2	2	2	-	
	8/6/97	9,900	170	270	92	410	<1,000	12,000	2,300 ³	-	
	12/23/97	2	2	2	2	2	2	2	2	-	
	3/26/98	2	2	2	2	2	2	2	2	-	

TABLE 2 (continued)

**SUMMARY OF LABORATORY RESULTS FOR PETROLEUM HYDROCARBONS
TANKS MF25 AND MF26 (UNITED AIRLINES HANGAR AREA - ECONOMY PARKING LOT SITE)
METROPOLITAN OAKLAND INTERNATIONAL AIRPORT (MOIA)
1100 AIRPORT DRIVE
OAKLAND, CALIFORNIA**

Monitoring Well ID	Date of Sampling	TPHg (µg/l)	B (µg/l)	T (µg/l)	E (µg/l)	X (µg/l)	TPHj (µg/l)	TPHd (µg/l)	TPHmo (µg/l)	TOG (µg/l)	Note
MW-3	4/25/95	7,200	150	600	100	580	38,000	<40,000	31,000	-	1
	8/11/95	2	2	2	2	2	2	2	2	-	1
	11/3/95	2	2	2	2	2	2	2	2	-	1
	6/19/96	2	2	2	2	2	2	2	2	-	
	10/24/96	2	2	2	2	2	2	2	2	-	
	1/22/97	2	2	2	2	2	2	2	2	-	
	4/25/97	2	2	2	2	2	2	2	2	-	
	8/6/97	4,200	3.6	16	14	90	<500	1,400	<250	-	
	12/23/97	2,200 ⁸	13	16	8.7	116	110,000	79,000 ^{3,7}	8,200 ^{3,7}	-	
	3/26/98	2	2	2	2	2	2	2	2	-	

* Laboratory results represent the highest concentrations reported for either the sample or field duplicate sample (QC-1).

1 Data from Table 1, Results of Groundwater Sampling Analysis for Petroleum Hydrocarbons, BTEX, and TDS, Port of Oakland, Oakland International Airport, United Airlines Hangar Area-Economy Parking Lot Site, dated February 21, 1996, by Alisto Engineering Group.

2 Not sampled due to presence of free product in monitoring well.

3 Hydrocarbons present do not match profile of laboratory standard.

4 Single analyte peak(s) are present in fuel range. Fuel hydrocarbon pattern is not present.

5 Hydrocarbons are elevated due to the presence of single analyte peak(s) in fuel quantitation range.

6 Hydrocarbons are present in the requested fuel quantitation range but do not resemble pattern of any available fuel standard. Carbon range is C23 - C36.

7 Hydrocarbons are lighter than indicated standard.

8 Hydrocarbons are heavier than indicated standard.

TABLE 3

SUMMARY OF LABORATORY RESULTS FOR VOLATILE ORGANIC COMPOUNDS
TANKS MF25 AND MF26 (UNITED AIRLINES HANGAR AREA - ECONOMY PARKING LOT SITE)
METROPOLITAN OAKLAND INTERNATIONAL AIRPORT (MOIA)
1100 AIRPORT DRIVE
OAKLAND, CALIFORNIA

Monitoring Well ID	Date of Sampling	Acetone (µg/l)	2-Butanone (µg/l)	Chloroform (µg/l)	1,1-DCA (µg/l)	(cis/trans) 1,2-DCE (µg/l)	4-Methyl-2-Pentanone (µg/l)	1,1,1-TCA (µg/l)	TCE (µg/l)	PCE (µg/l)	Note
MW-1	11/24/92	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
	2/12/93	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
	5/17/93	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
	8/3/93	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
	11/25/93	ND	ND	ND	ND	6	ND	ND	ND	ND	1
	5/9/94	ND	ND	ND	ND	ND	ND	ND	ND	5.5	1
	9/27/94	ND	ND	ND	ND	ND	ND	ND	ND	ND	1
	4/25/95	<20	<20	<5	<5	<5	<20	-	-	<5	1
	8/11/95	-	-	<0.5	4.3	13	-	2	1.8	0.6	1
	11/3/95	-	-	<0.5	1.3	3.7/<0.4	-	0.6	0.5	<0.5	1
	6/19/96	-	-	<0.5	5.4	-/<0.5	-	<0.5	1.2	<0.5	
	10/24/96	-	-	<0.5	12	-/<1.0	-	<0.5	1.4	<0.5	
	1/22/97	-	-	<0.5	3.9	8.4/<1.0	-	<0.5	1.7	<0.5	
	4/25/97*	-	-	<0.5	6.2	10/<1.0	-	<0.5	<1.2	0.62	
	8/6/97*	-	-	<0.5	14	19/<1.0	-	<0.5	2.5	0.54	
	12/23/97*	-	-	<1.0	6.6	9.3/<1.0	-	<1.0	<1.0	<1.0	
3/26/98*	-	-	<1.0	5.3	8.1/<1.0	-	<1.0	<1.0	<1.0		
MW-2	4/25/95	<200	200	<50	50	<50	<200	-	-	<50	1
	8/11/95	-	-	5	79	2.6	-	20	4	9	1
	11/3/95	-	-	<0.5	73	24/<0.4	-	4.8	6.7	6.8	1
	6/19/96	-	-	2	2	2	-	2	2	2	
	10/24/96	-	-	2	2	2	-	2	2	2	
	1/22/97	-	-	2	2	2	-	2	2	2	
	4/25/97	-	-	2	2	2	-	2	2	2	
	8/6/97	-	-	<5	69	160/<10	-	<5	<12	<5	
	12/23/97	-	-	2	2	2	-	2	2	2	
	3/26/98	-	-	2	2	2	-	2	2	2	

TABLE 3 (continued)

**SUMMARY OF LABORATORY RESULTS FOR VOLATILE ORGANIC COMPOUNDS
TANKS MF25 AND MF26 (UNITED AIRLINES HANGAR AREA - ECONOMY PARKING LOT SITE)
METROPOLITAN OAKLAND INTERNATIONAL AIRPORT (MOIA)
1100 AIRPORT DRIVE
OAKLAND, CALIFORNIA**

Monitoring Well ID	Date of Sampling	Acetone (µg/l)	2-Butanone (µg/l)	Chloroform (µg/l)	1,1-DCA (µg/l)	(cis/trans) 1,2-DCE (µg/l)	4-Methyl-2-Pentanone (µg/l)	1,1,1-TCA (µg/l)	TCE (µg/l)	PCE (µg/l)	Note
MW-3	4/25/95	300	300	-	30	<30	200	-	-	<30	1
	8/11/95	-	-	2	2	2	-	2	2	2	1
	11/3/95	-	-	2	2	2	-	2	2	2	1
	6/19/96	-	-	2	2	2	-	2	2	2	
	10/24/96	-	-	2	2	2	-	2	2	2	
	1/22/97	-	-	2	2	2	-	2	2	2	
	4/25/97	-	-	2	2	2	-	2	2	2	
	8/6/97	-	-	2.1	3.8	<0.5/<1	-	<0.5	<1.2	0.62	
	12/23/97	-	-	<1.0	4.2	<1.0/<1.0	-	<1.0	<1.0	<1.0	
	3/26/98	-	-	2	2	2	-	2	2	2	

* Laboratory results represent the highest concentrations reported for either the sample or field duplicate sample (QC-1).

- 1 Data from Table 1, Results of Groundwater Sampling Analysis for Petroleum Hydrocarbons, BTEX, and TDS, Port of Oakland, Oakland International Airport, United Airlines Hangar Area Economy Parking Lot Site, dated February 21, 1996, by Alisto Engineering Group.
- 2 Not sampled because free product was present in monitoring well.

TABLE 4

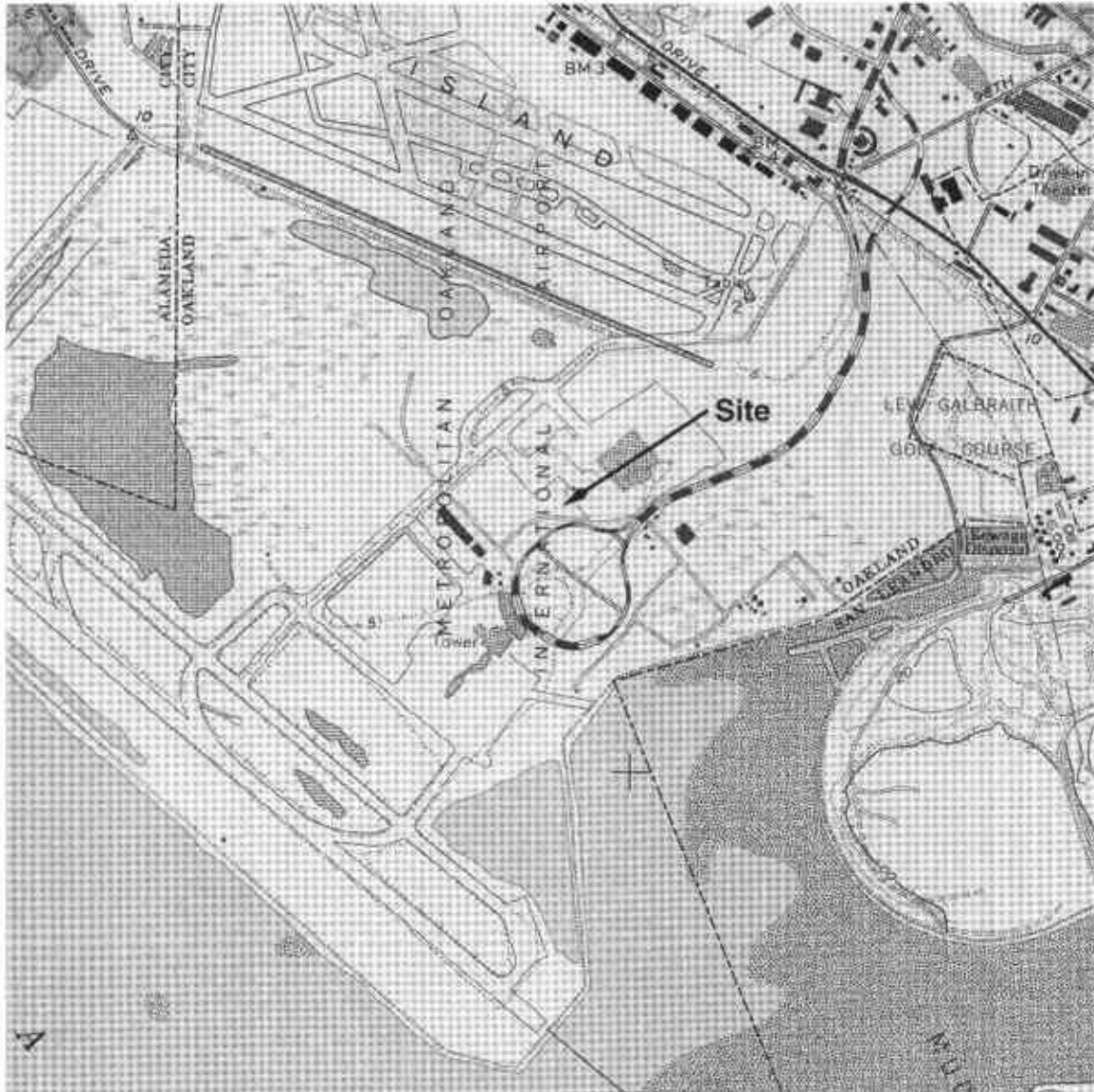
**SUMMARY OF LABORATORY RESULTS FOR INORGANIC ANALYTES
TANKS MF25 AND MF26 (UNITED AIRLINES HANGAR AREA - ECONOMY PARKING LOT SITE)
METROPOLITAN OAKLAND INTERNATIONAL AIRPORT (MOIA)
1100 AIRPORT DRIVE
OAKLAND, CALIFORNIA**

Monitoring Well ID	Date of Sampling	Ferrous Iron (Fe ²⁺) (mg/l)	Ferric Iron (Fe ³⁺) (mg/l)	Total Iron (mg/l)	Soluble Iron (mg/l)	Nitrogen, Nitrate (mg/l)	Sulfate (mg/l)	TDS (mg/l)	Note
MW-1	5/15/92	-	-	-	-	-	-	5,900	1
	8/7/92	-	-	-	-	-	-	-	1
	11/24/92	-	-	-	-	-	-	-	1
	2/12/93	-	-	-	-	-	-	-	1
	5/17/93	-	-	-	-	-	-	4,100	1
	8/3/93	-	-	-	-	-	-	7,700	1
	11/25/93	-	-	-	-	-	-	3,790	1
	5/9/94	-	-	-	-	-	-	9,600	1
	8/29/94	-	-	-	-	-	-	3,900	1
	4/25/95	-	-	-	-	-	-	4,000	1
	8/11/95	-	-	-	-	-	-	8,500	1
	11/3/95	-	-	-	-	-	-	6,600	1
	6/19/96	-	-	-	-	-	-	3,040	
	10/24/96	-	-	-	-	-	-	3,090	
	1/22/97	-	-	-	-	-	-	4,240	
	4/25/97*	-	-	-	-	-	-	2,770	
	8/6/97	-	-	-	-	-	-	2,430	
	12/23/97*	<0.2	3.9	-	-	<0.2	120	3,570	
3/26/98	0.41	2.1	2.5	<0.1	<0.2	110	3,240		
MW-2	4/25/95	-	-	-	-	-	-	1,700	1
	8/11/95	-	-	-	-	-	-	2,500	1
	11/3/95	-	-	-	-	-	-	2,000	1
	6/19/96	-	-	-	-	-	-	-	
	10/24/96	-	-	-	-	-	-	-	
	1/22/97	-	-	-	-	-	-	-	
	4/25/97	-	-	-	-	-	-	-	
	8/6/97	-	-	-	-	-	-	-	
	4/25/97	-	-	-	-	-	-	-	
	12/23/97	²	²	-	-	²	²	²	
3/26/98	²	²	²	²	²	²	²		
MW-3	4/25/95	-	-	-	-	-	-	5,600	1
	8/11/95	-	-	-	-	-	-	-	1
	11/3/95	-	-	-	-	-	-	-	1
	6/19/96	-	-	-	-	-	-	-	
	10/24/96	-	-	-	-	-	-	-	
	1/22/97	-	-	-	-	-	-	-	
	4/25/97	-	-	-	-	-	-	-	
	8/6/97	-	-	-	-	-	-	15,100	
	12/23/97	0.5	1.5	-	-	<0.2	690	13,900	
	3/26/98	²	²	²	²	²	²	²	

* Laboratory results represent the highest concentrations reported for either the sample or field duplicate sample (QC-1).

1 Data from Table 1, Results of Groundwater Sampling Analysis for Petroleum Hydrocarbons, BTEX, and TDS, Port of Oakland, Oakland International Airport, United Airlines Hangar Area-Economy Parking Lot Site, dated February 21, 1996, by Alisto Engineering Group.

2 Not sampled due to presence of free product in monitoring well.



Approximate Scale

FIGURE 1

SITE LOCATION

United Airlines Hangar-Economy Parking Lot Site
 Oakland International Airport
 1100 Airport Drive



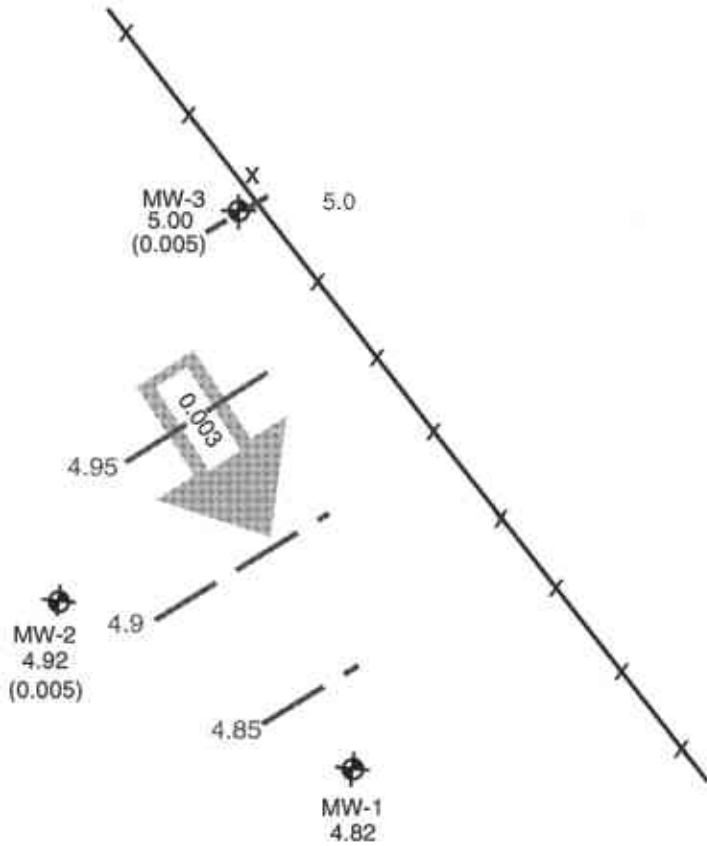
PORT OF OAKLAND




INNOVATIVE TECHNICAL SOLUTIONS, INC.

Source: San Leandro, California 7.5-minute U.S.G.S. Quadrangle, dated 1959, and photorevised 1980.



Economy Parking Lot



- Legend**
-  Monitoring Well
 - 5.00 Groundwater Elevation on 3/26/98
 - (0.005) Product Thickness on 3/26/98
 -  Groundwater Elevation Contour Lines
 -  Groundwater Flow Direction and Gradient

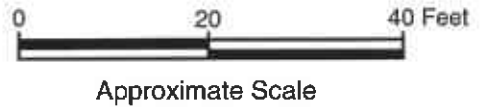


FIGURE 2
GROUNDWATER ELEVATIONS AND FLOW DIRECTION FOR MARCH 26, 1998

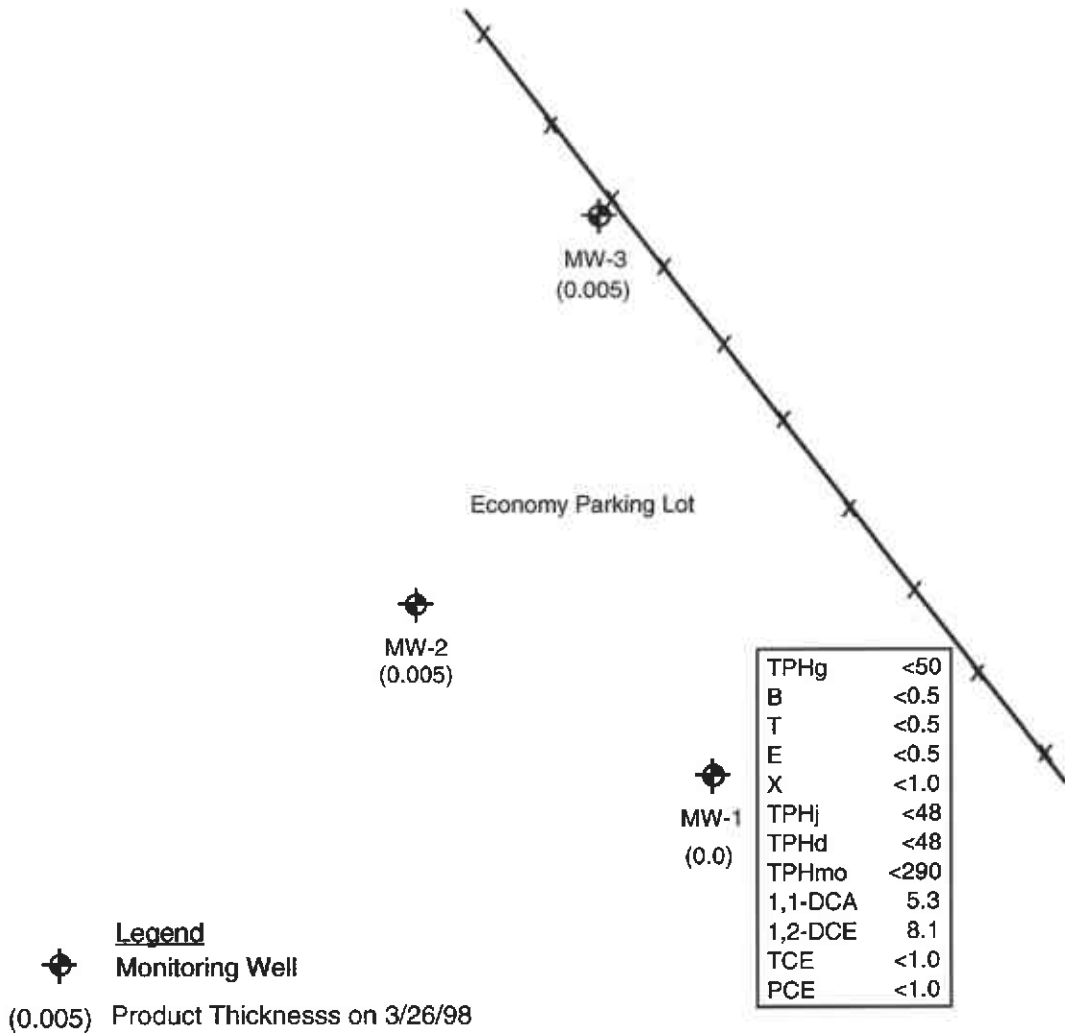
United Airlines Hangar-Economy Parking Lot Site
 Oakland International Airport
 1100 Airport Drive



PORT OF OAKLAND

INNOVATIVE TECHNICAL SOLUTIONS, INC.

Source: Adapted from Figure 2, Potentiometric Groundwater Elevation Contour Map, November 3, 1995, Alisto Engineering Group.



Groundwater Concentrations in $\mu\text{g/l}$ on 3/26/98

TPHg	<50	TPHg - TPH as gasoline
B	<0.5	B - Benzene
T	<0.5	T - Toluene
E	<0.5	E - Ethylbenzene
X	<1.0	X - Total xylenes
TPHj	<48	TPHj - TPH as JP-5 jet fuel
TPHd	<48	TPHd - TPH as diesel
TPHmo	<290	TPHmo - TPH as motor oil
1,1-DCA	5.3	1,1-DCA - 1,1-Dichloroethane
1,2-DCE	8.1	1,2-DCE - cis-1,2-Dichloroethene
TCE	<1.0	TCE - Trichloroethene
PCE	<1.0	PCE - Perchloroethene

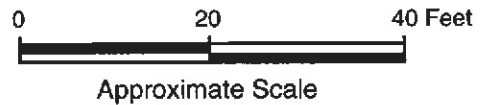


FIGURE 3

CONCENTRATIONS OF PETROLEUM HYDROCARBONS AND VOCs IN GROUNDWATER ON MARCH 26, 1998
 United Airlines Hangar-Economy Parking Lot Site
 Oakland International Airport
 1100 Airport Drive



PORT OF OAKLAND

INNOVATIVE TECHNICAL SOLUTIONS, INC.

Source: Adapted from Figure 2, Potentiometric Groundwater Elevation Contour Map, November 3, 1995, Alisto Engineering Group.

ATTACHMENT A
COPIES OF MONITORING WELL PURGE AND SAMPLE FORMS

MONITORING WELL PURGE AND SAMPLE FORM

PROJECT NAME: P/O - Economy Parking

PROJECT NO.: 95-113.28

WELL NO.: MW-1

TESTED BY: JS and AF

DATE: 3/26/98

Measuring Point Description: Notch on T.O.C.

Static Water Level (ft.): 2.09

Total Well Depth (ft.): 13.21

Sample Method: disposable bailer

Water Level Measurement Method: Solinst Interface Meter

Time Sampled: 1510 / RC-1 / 1515

Purge Method: disposable bailer

Sample Depth (ft.): ~ 2.5'

Time Start Purge: 1348

Field Filtering: N/A

Time End Purge: 1413

Field Preservation: HCl and 40% H₂O ice

Comments: Water over T.O.C., removed water; *conductivity meter readings may be inaccurate due to meter malfunction; collected duplicate sample (RC-1) from MW-1, replaced lock

Well Volume Calculation (fill in before purging)	Total Depth (ft)	Depth to Water (ft)	Water Column (ft)	Multiplier for Casing Diameter (in)			Casing Volume (gal)
				2	4	6	
	13.21	2.09	11.12	0.16	0.64	1.44	1.78 (3 vols = 5.34)
Time	1355	1403	1408	1413			
Volume Purged (gals)	2	4	2	1			
Cumulative Volume Purged (gals)	2	4	6	7			
Cumulative Number of Casing Volumes	1.10	2.25	3.37	3.93			
Purge Rate (gpm)	0.28	0.25	0.40	0.20			
Temperature (F°) or (C°)	17.6	16.7	16.9	16.5			
pH	4.49	4.20	4.16	4.3			
Specific Conductivity (µmhos/cm)	7.58 *	9.17 *	7.51 *	5.52 *			
Dissolved Oxygen (mg/L)	9.35	9.39	9.30	9.28			
Turbidity/Color (NTU)	22	76	109	110			
Odor	None	None	None	None			
Dewatered?	No	No	No	approx. 1/2"			

CHECKED BY: JS Schull

DATE: 3/27/98

MONITORING WELL PURGE AND SAMPLE FORM

PROJECT NAME: 110 - Economy Parking

PROJECT NO.: 95-113.28

WELL NO.: MW-2

TESTED BY: J & AF

DATE: 2/26/98

Measuring Point Description: red rotochan TOC

Static Water Level (ft.): DTP 1.715
DTW 1.715 } 3.005

Total Well Depth (ft.): N.M

Sample Method: Not Sampled *

Water Level Measurement Method: Solinst interface

Time Sampled: _____

Purge Method: NA

Sample Depth (ft.): _____

Time Start Purge: _____

Field Filtering: _____

Time End Purge: _____

Field Preservation: _____

Comments: water and bentonite over TOC, removed water and bentonite, brown oily residue on 410 of probe; lock removed & replaced lock with 95

Well Volume Calculation (fill in before purging)	Total Depth (ft)	-	Depth to Water (ft)	=	Water Column (ft)	x	Multiplier for Casing Diameter (in)			=	Casing Volume (gal)
							2	4	6		
							0.16	0.64	1.44		
Time											
Volume Purged (gals)											
Cumulative Volume Purged (gals)											
Cumulative Number of Casing Volumes											
Purge Rate (gpm)											
Temperature (F°) or (C°)											
pH											
Specific Conductivity (µmhos/cm)											
Dissolved Oxygen (mg/L)											
Turbidity/Color (NTU)											
Odor											
Dewatered?											

** Not Sampled due to presence of free product*

CHECKED BY: [Signature]

DATE: 2/27/98

MONITORING WELL PURGE AND SAMPLE FORM

PROJECT NAME: P/O - Economy Parking

PROJECT NO.: 95-113.28

WELL NO.: MW-3

TESTED BY: JS + AF

DATE: 3/26/98

Measuring Point Description: notch on TOC

Static Water Level (ft.): DTP = 2.35
DTW = 2.355 } 0.005

Total Well Depth (ft.): not measured

Sample Method: not sampled *

Water Level Measurement Method: Sol. inst
Intake Probe

Time Sampled: _____

Purge Method: N/A

Sample Depth (ft.): _____

Time Start Purge: _____

Field Filtering: _____

Time End Purge: _____

Field Preservation: _____

Comments: lock corroded, set lock & replaced with 0895, brown oily residue on probe tip

Well Volume Calculation (fill in before purging)	Total Depth (ft)	-	Depth to Water (ft)	=	Water Column (ft)	x	Multiplier for Casing Diameter (in)			=	Casing Volume (gal)
							2	4	6		
							0.16	0.64	1.44		
Time											
Volume Purged (gals)											
Cumulative Volume Purged (gals)											
Cumulative Number of Casing Volumes											
Purge Rate (gpm)											
Temperature (F°) or (C°)											
pH											
Specific Conductivity (µmhos/cm)											
Dissolved Oxygen (mg/L)											
Turbidity/Color (NTU)											
Odor											
Dewatered?											

* Not sampled because of presence of free product

CHECKED BY: [Signature]

DATE: 3/27/98

ATTACHMENT B
**COPIES OF LABORATORY REPORTS,
CHROMATOGRAMS AND CHAIN-OF-CUSTODY FORM
FOR GROUNDWATER SAMPLES**



Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

A N A L Y T I C A L R E P O R T

Prepared for:

Innovative Technical Solutions, Inc.
2855 Mitchell Dr. Ste. 118
Walnut Creek, CA 94598

Date: 07-APR-98
Lab Job Number: 132892
Project ID: 95-113.28
Location: P/O Economy Parking

Reviewed by:

Damara Moore

Reviewed by:

[Signature]

This package may be reproduced only in its entirety.

Laboratory Number: **132892**
Client: **Innovative Technical Solutions**
Location: **P/O Economy Parking**
Project #: **95-113.28**

Receipt Date: **03/26/98**

Case Narrative

This hardcopy data package contains sample results and batch QC for two samples and one trip blank which were received from the above-referenced project on March 26th, 1998. All samples were received cold and intact. Sulfate analysis was sub-contracted to Clayton Laboratory Services.

TEH as Jet and Diesel by EPA 8015 modified: All sample were treated with silica gel prior to analysis. No problems were encountered.

TEH-Tot Ext Hydrocarbons

Client: Innovative Technical Solutions, Inc.	Analysis Method: EPA 8015M
Project#: 95-113.28	Prep Method: EPA 3520
Location: P/O Economy Parking	Cleanup Method: 3630

Sample #	Client ID	Batch #	Sampled	Extracted	Analyzed	Moisture
132892-002	MW-1	40047	03/26/98	04/03/98	04/07/98	

Matrix: Water

Analyte	Units	132892-002
Diln Fac:		1
JP-5, C10-C16	ug/L	<48
Diesel C12-C22	ug/L	<48
Motor Oil C22-C50	ug/L	<290
Surrogate		
Hexacosane	%REC	115

Lab #: 132892

BATCH QC REPORT



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TEH-Tot Ext Hydrocarbons

Client: Innovative Technical Solutions, Inc. Analysis Method: EPA 8015M
Project#: 95-113.28 Prep Method: EPA 3520
Location: P/O Economy Parking Cleanup Method: EPA 3630

METHOD BLANK

Matrix: Water Prep Date: 04/03/98
Batch#: 40047 Analysis Date: 04/07/98
Units: ug/L
Diln Fac: 1

MB Lab ID: QC67679

Analyte	Result
JP-5, C10-C16	<50
Diesel C12-C22	<50
Motor Oil C22-C50	<300

Surrogate	%Rec	Recovery Limits
Hexacosane	107	53-136



TEH-Tot Ext Hydrocarbons

Client: Innovative Technical Solutions, Inc.	Analysis Method: EPA 8015M
Project#: 95-113.28	Prep Method: EPA 3520
Location: P/O Economy Parking	Cleanup Method: EPA 3630

BLANK SPIKE/BLANK SPIKE DUPLICATE

Matrix: Water	Prep Date: 04/03/98
Batch#: 40047	Analysis Date: 04/07/98
Units: ug/L	
Diln Fac: 1	

BS Lab ID: QC67680

Analyte	Spike Added	BS	%Rec #	Limits
Diesel C12-C22	2475	1997	81	58-110
Surrogate	%Rec	Limits		
Hexacosane	102	53-136		

BSD Lab ID: QC67681

Analyte	Spike Added	BSD	%Rec #	Limits	RPD #	Limit
Diesel C12-C22	2475	2010	81	58-110	1	21
Surrogate	%Rec	Limits				
Hexacosane	104	53-136				

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 1 outside limits

Spike Recovery: 0 out of 2 outside limits

Lab #: 132892

BATCH QC REPORT

TVH-Total Volatile Hydrocarbons

Client: Innovative Technical Solutions, Inc.	Analysis Method: TVH
Project#: 95-113.28	Prep Method: EPA 5030
Location: P/O Economy Parking	

MATRIX SPIKE/MATRIX SPIKE DUPLICATE

Field ID: ZZZZZZ	Sample Date: 03/26/98
Lab ID: 132910-002	Received Date: 03/26/98
Matrix: Water	Prep Date: 03/30/98
Batch#: 39915	Analysis Date: 03/30/98
Units: ug/L	
Diln Fac: 1	

MS Lab ID: QC67202

Analyte	Spike Added	Sample	MS	%Rec #	Limits
Gasoline C7-C12	2000	<50	2193	110	71-131
Surrogate	%Rec	Limits			
Bromofluorobenzene	125	59-162			

MSD Lab ID: QC67203

Analyte	Spike Added	MSD	%Rec #	Limits	RPD #	Limit
Gasoline C7-C12	2000	2115	106	71-131	4	26
Surrogate	%Rec	Limits				
Bromofluorobenzene	125	59-162				

Column to be used to flag recovery and RPD values with an asterisk
 * Values outside of QC limits
 RPD: 0 out of 1 outside limits
 Spike Recovery: 0 out of 2 outside limits



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LABORATORY NUMBER: 132892
CLIENT: INNOVATIVE TECHNICAL SOLUTIONS, INC.
LOCATION: P/O ECONOMY PARKING
PROJECT #: 95-113.28

DATE SAMPLED: 03/26/98
DATE RECEIVED: 03/26/98
DATE ANALYZED: 04/01/98
BATCH#: 39971

=====

ANALYSIS: FERROUS IRON
ANALYSIS METHOD: SMWW 3500 Fe, D

=====

LAB ID	SAMPLE ID	RESULT	UNITS	REPORTING LIMIT
132892-002	MW-1	410	ug/L	200
METHOD BLANK	N/A	ND	ug/L	200

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: LCS, MS/MSD OF 132892-002

=====

RPD, %	0
MS/MSD AVG. RECOVERY, %	68
LCS RECOVERY, %	97

=====



TVH-Total Volatile Hydrocarbons

Client: Innovative Technical Solutions, Inc.
Project#: 95-113.28
Location: P/O Economy Parking

Analysis Method: TVH
Prep Method: EPA 5030

Sample #	Client ID	Batch #	Sampled	Extracted	Analyzed	Moisture
132892-001	TRIP BLANK	39915	03/26/98	03/30/98	03/30/98	
132892-002	MW-1	39915	03/26/98	03/30/98	03/30/98	
132892-003	QC-1	39915	03/26/98	03/31/98	03/31/98	

Matrix: Water

Analyte	Units	132892-001	132892-002	132892-003
Diln Fac:		1	1	1
Gasoline C7-C12	ug/L	<50	<50	<50
Surrogate				
Bromofluorobenzene	%REC	102	108	105



BTXE

Client: Innovative Technical Solutions, Inc.
Project#: 95-113.28
Location: P/O Economy Parking

Analysis Method: EPA 8020A
Prep Method: EPA 5030

Sample #	Client ID	Batch #	Sampled	Extracted	Analyzed	Moisture
132892-001	TRIP BLANK	39915	03/26/98	03/30/98	03/30/98	
132892-002	MW-1	39915	03/26/98	03/30/98	03/30/98	
132892-003	QC-1	39915	03/26/98	03/31/98	03/31/98	

Matrix: Water

Analyte	Units	132892-001	132892-002	132892-003
Diln Fac:		1	1	1
Benzene	ug/L	<0.5	<0.5	<0.5
Toluene	ug/L	<0.5	<0.5	<0.5
Ethylbenzene	ug/L	<0.5	<0.5	<0.5
m,p-Xylenes	ug/L	<0.5	<0.5	<0.5
o-Xylene	ug/L	<0.5	<0.5	<0.5
Surrogate				
Trifluorotoluene	%REC	100	101	99
Bromofluorobenzene	%REC	96	100	97

Lab #: 132892

BATCH QC REPORT



Curtis & Tompkins Ltd.
Page 1 of 1

TVH-Total Volatile Hydrocarbons

Client: Innovative Technical Solutions, Inc. Analysis Method: TVH
Project#: 95-113.28 Prep Method: EPA 5030
Location: P/O Economy Parking

METHOD BLANK

Matrix: Water Prep Date: 03/30/98
Batch#: 39915 Analysis Date: 03/30/98
Units: ug/L
Diln Fac: 1

MB Lab ID: QC67201

Analyte	Result	
Gasoline C7-C12	<50	
Surrogate	%Rec	Recovery Limits
Bromofluorobenzene	88	59-162

Lab #: 132892

BATCH QC REPORT



Curtis & Tompkins Ltd.
Page 1 of 1

BTXE

Client: Innovative Technical Solutions, Inc. Analysis Method: EPA 8020A
Project#: 95-113.28 Prep Method: EPA 5030
Location: P/O Economy Parking

METHOD BLANK

Matrix: Water Prep Date: 03/30/98
Batch#: 39915 Analysis Date: 03/30/98
Units: ug/L
Diln Fac: 1

MB Lab ID: QC67201

Analyte	Result		
Benzene	<0.5		
Toluene	<0.5		
Ethylbenzene	<0.5		
m,p-Xylenes	<0.5		
o-Xylene	<0.5		
Surrogate	%Rec		Recovery Limits
Trifluorotoluene	94		53-124
Bromofluorobenzene	83		41-142

Lab #: 132892

BATCH QC REPORT

TVH-Total Volatile Hydrocarbons

Client: Innovative Technical Solutions, Inc. Analysis Method: TVH
Project#: 95-113.28 Prep Method: EPA 5030
Location: P/O Economy Parking

LABORATORY CONTROL SAMPLE

Matrix: Water Prep Date: 03/30/98
Batch#: 39915 Analysis Date: 03/30/98
Units: ug/L
Diln Fac: 1

LCS Lab ID: QC67199

Analyte	Result	Spike Added	%Rec #	Limits
Gasoline C7-C12	1975	2000	99	80-119
Surrogate	%Rec	Limits		
Bromofluorobenzene	108	59-162		

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits
Spike Recovery: 0 out of 1 outside limits

Lab #: 132892

BATCH QC REPORT



Curtis & Tompkins Ltd.
Page 1 of 1

BTXE

Client: Innovative Technical Solutions, Inc. Analysis Method: EPA 8020A
Project#: 95-113.28 Prep Method: EPA 5030
Location: P/O Economy Parking

LABORATORY CONTROL SAMPLE

Matrix: Water Prep Date: 03/30/98
Batch#: 39915 Analysis Date: 03/30/98
Units: ug/L
Diln Fac: 1

LCS Lab ID: QC67200

Analyte	Result	Spike Added	%Rec #	Limits
Benzene	16.61	20	83	69-109
Toluene	19.67	20	98	72-116
Ethylbenzene	18.85	20	94	67-120
m,p-Xylenes	40.09	40	100	69-117
o-Xylene	19.68	20	98	75-122
Surrogate	%Rec	Limits		
Trifluorotoluene	98	53-124		
Bromofluorobenzene	96	41-142		

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

Spike Recovery: 0 out of 5 outside limits



Curtis & Tompkins, Ltd.

SAMPLE ID: MW-1
LAB ID: 132892-002
CLIENT: Innovative Technical Solutions, Inc.
PROJECT ID: 95-113.28
LOCATION: P/O Economy Parking
MATRIX: Filtrate

DATE SAMPLED: 03/26/98
DATE RECEIVED: 03/26/98
DATE REPORTED: 04/10/98

Metals Analytical Report

Compound	Result (ug/L)	Reporting Limit (ug/L)	IDF	QC Batch	Method	Analysis Date
Iron	ND	100	1	39957	EPA 6010A	04/01/98

ND = Not detected at or above reporting limit



Curtis & Tompkins, Ltd.

SAMPLE ID: MW-1
LAB ID: 132892-002
CLIENT: Innovative Technical Solutions, Inc.
PROJECT ID: 95-113.28
LOCATION: P/O Economy Parking
MATRIX: Water

DATE SAMPLED: 03/26/98
DATE RECEIVED: 03/26/98
DATE REPORTED: 04/10/98

Metals Analytical Report

Compound	Result (ug/L)	Reporting Limit (ug/L)	IDF	QC Batch	Method	Analysis Date
Iron	2500	100	1	39968	EPA 6010A	04/01/98



Curtis & Tompkins, Ltd.

CLIENT: Innovative Technical Solutions, Inc.
JOB NUMBER: 132892

DATE REPORTED: 04/10/98

BATCH QC REPORT
PREP BLANK

Compound	Result	Reporting Limit	Units	IDF	QC Batch	Method	Analysis Date
Iron	ND	100	ug/L	1	39957	EPA 6010A	04/01/98
Iron	ND	100	ug/L	1	39968	EPA 6010A	04/01/98

ND = Not Detected at or above reporting limit



Curtis & Tompkins, Ltd.

CLIENT: Innovative Technical Solutions, Inc.
JOB NUMBER: 132892

DATE REPORTED: 04/10/98

BATCH QC REPORT
BLANK SPIKE / BLANK SPIKE DUPLICATE

Compound	Spike Amount	BS Result	BSD Result	Units	BS% Rec.	BSD% Rec.	Rec. Limits	RPD %	RPD Limit	QC Batch	Method	Analysis Date
Iron	1000	963.3	988.5	ug/L	96	99	80-120	3	35	39957	EPA 6010A	04/01/98
Iron	1000	1081	1088	ug/L	108	109	80-120	1	35	39968	EPA 6010A	04/01/98

Halogenated Volatile Organics
EPA 8010 Analyte List

Client: Innovative Technical Solutions, Inc. Analysis Method: EPA 8260
Project#: 95-113.28 Prep Method: EPA 5030
Location: P/O Economy Parking

Field ID: TRIP BLANK Sampled: 03/26/98
Lab ID: 132892-001 Received: 03/26/98
Matrix: Water Extracted: 03/30/98
Batch#: 39913 Analyzed: 03/30/98
Units: ug/L
Diln Fac: 1

Analyte	Result	Reporting Limit
Chloromethane	ND	2.0
Vinyl Chloride	ND	2.0
Bromomethane	ND	2.0
Chloroethane	ND	2.0
Trichlorofluoromethane	ND	1.0
Freon 113	ND	1.0
1,1-Dichloroethene	ND	1.0
Methylene Chloride	ND	20
trans-1,2-Dichloroethene	ND	1.0
1,1-Dichloroethane	ND	1.0
cis-1,2-Dichloroethene	ND	1.0
Chloroform	ND	1.0
1,1,1-Trichloroethane	ND	1.0
Carbon Tetrachloride	ND	1.0
1,2-Dichloroethane	ND	1.0
Trichloroethene	ND	1.0
1,2-Dichloropropane	ND	1.0
Bromodichloromethane	ND	1.0
cis-1,3-Dichloropropene	ND	1.0
trans-1,3-Dichloropropene	ND	1.0
1,1,2-Trichloroethane	ND	1.0
Tetrachloroethene	ND	1.0
Dibromochloromethane	ND	1.0
Chlorobenzene	ND	1.0
Bromoform	ND	2.0
1,1,2,2-Tetrachloroethane	ND	1.0
1,3-Dichlorobenzene	ND	1.0
1,4-Dichlorobenzene	ND	1.0
1,2-Dichlorobenzene	ND	1.0

Surrogate	%Recovery	Recovery Limits
1,2-Dichloroethane-d4	103	85-121
Toluene-d8	100	92-110
Bromofluorobenzene	102	84-115



Halogenated Volatile Organics
EPA 8010 Analyte List

Client: Innovative Technical Solutions, Inc.	Analysis Method: EPA 8260
Project#: 95-113.28	Prep Method: EPA 5030
Location: P/O Economy Parking	

Field ID: MW-1	Sampled: 03/26/98
Lab ID: 132892-002	Received: 03/26/98
Matrix: Water	Extracted: 03/30/98
Batch#: 39913	Analyzed: 03/30/98
Units: ug/L	
Diln Fac: 1	

Analyte	Result	Reporting Limit
Chloromethane	ND	2.0
Vinyl Chloride	ND	2.0
Bromomethane	ND	2.0
Chloroethane	ND	2.0
Trichlorofluoromethane	ND	1.0
Freon 113	ND	1.0
1,1-Dichloroethene	ND	1.0
Methylene Chloride	ND	20
trans-1,2-Dichloroethene	ND	1.0
1,1-Dichloroethane	4.1	1.0
cis-1,2-Dichloroethene	5.7	1.0
Chloroform	ND	1.0
1,1,1-Trichloroethane	ND	1.0
Carbon Tetrachloride	ND	1.0
1,2-Dichloroethane	ND	1.0
Trichloroethene	ND	1.0
1,2-Dichloropropane	ND	1.0
Bromodichloromethane	ND	1.0
cis-1,3-Dichloropropene	ND	1.0
trans-1,3-Dichloropropene	ND	1.0
1,1,2-Trichloroethane	ND	1.0
Tetrachloroethene	ND	1.0
Dibromochloromethane	ND	1.0
Chlorobenzene	ND	1.0
Bromoform	ND	2.0
1,1,2,2-Tetrachloroethane	ND	1.0
1,3-Dichlorobenzene	ND	1.0
1,4-Dichlorobenzene	ND	1.0
1,2-Dichlorobenzene	ND	1.0

Surrogate	%Recovery	Recovery Limits
1,2-Dichloroethane-d4	107	85-121
Toluene-d8	99	92-110
Bromofluorobenzene	102	84-115

Halogenated Volatile Organics
EPA 8010 Analyte List

Client: Innovative Technical Solutions, Inc. Analysis Method: EPA 8260
Project#: 95-113.28 Prep Method: EPA 5030
Location: P/O Economy Parking

Field ID: QC-1 Sampled: 03/26/98
Lab ID: 132892-003 Received: 03/26/98
Matrix: Water Extracted: 03/30/98
Batch#: 39913 Analyzed: 03/30/98
Units: ug/L
Diln Fac: 1

Analyte	Result	Reporting Limit
Chloromethane	ND	2.0
Vinyl Chloride	ND	2.0
Bromomethane	ND	2.0
Chloroethane	ND	2.0
Trichlorofluoromethane	ND	1.0
Freon 113	ND	1.0
1,1-Dichloroethene	ND	1.0
Methylene Chloride	ND	20
trans-1,2-Dichloroethene	ND	1.0
1,1-Dichloroethane	5.3	1.0
cis-1,2-Dichloroethene	8.1	1.0
Chloroform	ND	1.0
1,1,1-Trichloroethane	ND	1.0
Carbon Tetrachloride	ND	1.0
1,2-Dichloroethane	ND	1.0
Trichloroethene	ND	1.0
1,2-Dichloropropane	ND	1.0
Bromodichloromethane	ND	1.0
cis-1,3-Dichloropropene	ND	1.0
trans-1,3-Dichloropropene	ND	1.0
1,1,2-Trichloroethane	ND	1.0
Tetrachloroethene	ND	1.0
Dibromochloromethane	ND	1.0
Chlorobenzene	ND	1.0
Bromoform	ND	2.0
1,1,2,2-Tetrachloroethane	ND	1.0
1,3-Dichlorobenzene	ND	1.0
1,4-Dichlorobenzene	ND	1.0
1,2-Dichlorobenzene	ND	1.0

Surrogate	%Recovery	Recovery Limits
1,2-Dichloroethane-d4	107	85-121
Toluene-d8	99	92-110
Bromofluorobenzene	102	84-115

Lab #: 132892

BATCH QC REPORT

Curtis & Tompkins Ltd.
Page 1 of 1

Halogenated Volatile Organics
EPA 8010 Analyte List

Client: Innovative Technical Solutions, Inc.
Project#: 95-113.28
Location: P/O Economy Parking

Analysis Method: EPA 8260
Prep Method: EPA 5030

METHOD BLANK

Matrix: Water
Batch#: 39913
Units: ug/L
Diln Fac: 1

Prep Date: 03/30/98
Analysis Date: 03/30/98

MB Lab ID: QC67190

Analyte	Result	Reporting Limit
Chloromethane	ND	2.0
Vinyl Chloride	ND	2.0
Bromomethane	ND	2.0
Chloroethane	ND	2.0
Trichlorofluoromethane	ND	1.0
Freon 113	ND	1.0
1,1-Dichloroethene	ND	1.0
Methylene Chloride	ND	20
trans-1,2-Dichloroethene	ND	1.0
1,1-Dichloroethane	ND	1.0
cis-1,2-Dichloroethene	ND	1.0
Chloroform	ND	1.0
1,1,1-Trichloroethane	ND	1.0
Carbon Tetrachloride	ND	1.0
1,2-Dichloroethane	ND	1.0
Trichloroethene	ND	1.0
1,2-Dichloropropane	ND	1.0
Bromodichloromethane	ND	1.0
cis-1,3-Dichloropropene	ND	1.0
trans-1,3-Dichloropropene	ND	1.0
1,1,2-Trichloroethane	ND	1.0
Tetrachloroethene	ND	1.0
Dibromochloromethane	ND	1.0
Chlorobenzene	ND	1.0
Bromoform	ND	2.0
1,1,2,2-Tetrachloroethane	ND	1.0
1,3-Dichlorobenzene	ND	1.0
1,4-Dichlorobenzene	ND	1.0
1,2-Dichlorobenzene	ND	1.0
Surrogate	%Rec	Recovery Limits
1,2-Dichloroethane-d4	99	85-121
Toluene-d8	99	92-110
Bromofluorobenzene	101	84-115

Lab #: 132892

BATCH QC REPORT



Curtis & Tompkins Ltd.
Page 1 of 1

Halogenated Volatile Organics
EPA 8010 Analyte List

Client: Innovative Technical Solutions, Inc. Analysis Method: EPA 8260
Project#: 95-113.28 Prep Method: EPA 5030
Location: P/O Economy Parking

METHOD BLANK

Matrix: Water Prep Date: 03/30/98
Batch#: 39913 Analysis Date: 03/30/98
Units: ug/L
Diln Fac: 1

MB Lab ID: QC67191

Analyte	Result	Reporting Limit
Chloromethane	ND	2.0
Vinyl Chloride	ND	2.0
Bromomethane	ND	2.0
Chloroethane	ND	2.0
Trichlorofluoromethane	ND	1.0
Freon 113	ND	1.0
1,1-Dichloroethene	ND	1.0
Methylene Chloride	ND	20
trans-1,2-Dichloroethene	ND	1.0
1,1-Dichloroethane	ND	1.0
cis-1,2-Dichloroethene	ND	1.0
Chloroform	ND	1.0
1,1,1-Trichloroethane	ND	1.0
Carbon Tetrachloride	ND	1.0
1,2-Dichloroethane	ND	1.0
Trichloroethene	ND	1.0
1,2-Dichloropropane	ND	1.0
Bromodichloromethane	ND	1.0
cis-1,3-Dichloropropene	ND	1.0
trans-1,3-Dichloropropene	ND	1.0
1,1,2-Trichloroethane	ND	1.0
Tetrachloroethene	ND	1.0
Dibromochloromethane	ND	1.0
Chlorobenzene	ND	1.0
Bromoform	ND	2.0
1,1,2,2-Tetrachloroethane	ND	1.0
1,3-Dichlorobenzene	ND	1.0
1,4-Dichlorobenzene	ND	1.0
1,2-Dichlorobenzene	ND	1.0
Surrogate	%Rec	Recovery Limits
1,2-Dichloroethane-d4	103	85-121
Toluene-d8	100	92-110
Bromofluorobenzene	101	84-115



Halogenated Volatile Organics

Client: Innovative Technical Solutions, Inc. Analysis Method: EPA 8260
 Project#: 95-113.28 Prep Method: EPA 5030
 Location: P/O Economy Parking

BLANK SPIKE/BLANK SPIKE DUPLICATE

Matrix: Water Prep Date: 03/30/98
 Batch#: 39913 Analysis Date: 03/30/98
 Units: ug/L
 Diln Fac: 1

BS Lab ID: QC67188

Analyte	Spike Added	BS	%Rec	#	Limits
1,1-Dichloroethene	50	49.39	99		69-137
Trichloroethene	50	49.37	99		83-116
Chlorobenzene	50	53.04	106		87-117
Surrogate	%Rec	Limits			
1,2-Dichloroethane-d4	97	85-121			
Toluene-d8	99	92-110			
Bromofluorobenzene	95	84-115			

BSD Lab ID: QC67189

Analyte	Spike Added	BSD	%Rec	#	Limits	RPD #	Limit
1,1-Dichloroethene	50	46.09	92		69-137	7	14
Trichloroethene	50	46.29	93		83-116	6	10
Chlorobenzene	50	50.74	101		87-117	4	10
Surrogate	%Rec	Limits					
1,2-Dichloroethane-d4	96	85-121					
Toluene-d8	99	92-110					
Bromofluorobenzene	95	84-115					

Column to be used to flag recovery and RPD values with an asterisk
 * Values outside of QC limits
 RPD: 0 out of 3 outside limits
 Spike Recovery: 0 out of 6 outside limits

Total Dissolved Solids (TDS)

Client: Innovative Technical Solutions, Inc. Analysis Method: EPA 160.1
Project #: 95-113.28 Prep Method: EPA 160.1
Location : P/O Economy Parking

Sample #	Client ID	Batch#	Sampled	Analyzed	Moisture
132892-002	MW-1	39927	26-MAR-98	30-MAR-98	-
QC67243	Method Blank	39927	-	30-MAR-98	-

Analyte: Total Dissolved Solids Matrix: Water Units: mg/L

Sample #	Client ID	Result	Reporting Limit	Dilution Factor
132892-002	MW-1	3240	10	1
QC67243	Method Blank	ND	10	1

ND = None Detected at or above Reporting Limit

Total Dissolved Solids (TDS)

Client: Innovative Technical Solutions, Inc. Analysis Method: EPA 160.1
Project #: 95-113.28 Prep Method: EPA 160.1
Location : P/O Economy Parking

Sample #	Client ID	Batch#	Sampled	Analyzed	Moisture
QC67244	SDUP of 132813-001	39927	23-MAR-98	30-MAR-98	-

Analyte: Total Dissolved Solids Matrix: Water Units: mg/L

Sample #	Sample Type	Result	%RPD	Limit
QC67244	SDUP of 132813-001	12400	1	25
132813-001	ZZZZZZZZ	12300		



Nitrogen, Nitrate

Client: Innovative Technical Solutions, Inc. Analysis Method: EPA 353.2
Project #: 95-113.28 Prep Method: EPA 353.2
Location : P/O Economy Parking

Sample #	Client ID	Batch#	Sampled	Analyzed	Moisture
132892-002	MW-1	39893	26-MAR-98	27-MAR-98	-
QC67111	Method Blank	39893	-	27-MAR-98	-

Analyte: Nitrogen, Nitrate Matrix: Water Units: mg/L

Sample #	Client ID	Result	Reporting Limit	Dilution Factor
132892-002	MW-1	ND	0.2	1
QC67111	Method Blank	ND	0.2	1

ND = None Detected at or above Reporting Limit



Nitrogen, Nitrate

Client: Innovative Technical Solutions, Inc.
Project #: 95-113.28
Location : P/O Economy Parking

Analysis Method: EPA 353.2
Prep Method: EPA 353.2

Sample #	Client ID	Batch#	Sampled	Analyzed	Moisture
QC67112	Lab Control Sample	39893	-	27-MAR-98	-

Analyte: Nitrogen, Nitrate

Matrix: Water

Units: mg/L

Sample #	Sample Type	Spike Amt.	Result	%Recovery	Limits
QC67112	Lab Control Sample	16.00	16.27	102	80-120

Nitrogen, Nitrate

Client: Innovative Technical Solutions, Inc. Analysis Method: EPA 353.2
Project #: 95-113.28 Prep Method: EPA 353.2
Location : P/O Economy Parking

Sample #	Client ID	Batch#	Sampled	Analyzed	Moisture
QC67113	MS of 132892-002	39893	26-MAR-98	27-MAR-98	-
QC67114	MSD of 132892-002	39893	26-MAR-98	27-MAR-98	-

Analyte: Nitrogen, Nitrate Matrix: Water Units: mg/L

Sample #	Client ID	Spikeamt	Result	%Rec	Limits	%RPD	Limit
QC67113	MS of 132892-002	2.000	2.110	106	75-125		
QC67114	MSD of 132892-002	2.000	2.130	107	75-125	1	35
132892-002	MW-1		<0.2000				

San Francisco Regional Office

1252 Quarry Lane
P.O. Box 9019
Pleasanton, CA 94566
(510) 426-2600
Fax (510) 426-0106

Clayton
LABORATORY
SERVICES

April 6, 1998

Ms. Damara Moore
CURTIS & TOMPKINS, LTD.
2323 Fifth Street
Berkeley, CA 94710

Client Ref.: 132892
Clayton Project No.: 98033.92

Dear Ms. Moore:

Attached is our analytical laboratory report for the samples received on March 30, 1998. Following the cover letter is the Quality Control Narrative detailing sample information/problems and a summary of the quality control issues. Also enclosed is a copy of the Chain-of-Custody record acknowledging receipt of these samples.

Please note that any unused portion of the samples will be discarded after May 6, 1998, unless you have requested otherwise.

We appreciate the opportunity to assist you. If you have any questions concerning this report, please contact Client Services at (510) 426-2657.

Sincerely,

Kam DeLla

Andrew C. Bradeen
Director, Laboratory Services
San Francisco Regional Office

ACB/kmd

Attachments

QUALITY CONTROL NARRATIVE
for
Curtis & Tompkins, LTD.
Client Reference: 132892
Clayton Project No. 98033.92

Sample Information/Problems:

There were no problems encountered with sample receipt.

Analytical Information/Problems:

There were no problems encountered with the sample analyses.

Quality Control:

The quality control data is summarized in the Quality Assurance Data Package, which follows the analytical report.

- MS/MSD: A matrix spike and matrix spike duplicate were analyzed where applicable, and all results were acceptable.
- LCS/LCSD: A laboratory control sample and duplicate were analyzed where applicable and all results were acceptable.
- CCV: Response for all analytes met Clayton acceptance criteria.
- Surrogate Recoveries: Not applicable.

Analytical Results
for
Curtis & Tompkins, Ltd.
Client Reference: 132892
Clayton Project No. 98033.92

Sample Identification: See Below
Lab Number: 9803392
Sample Matrix/Media: WATER
Method Reference: EPA 300.0

Date Received: 03/30/98
Date Analyzed: 03/31/98

Lab Number	Sample Identification	Date Sampled	Sulfate (mg/L)	Method Detection Limit (mg/L)
-01	MW-1	03/26/98	110	0.1
-02	METHOD BLANK	--	<0.1	0.1

ND: Not detected at or above limit of detection
--: Information not available or not applicable

Quality Assurance Results Summary
Matrix Spike/Matrix Spike Duplicate Results
for
Clayton Project No. 98033.92

Quality Assurance Results Summary - Matrix Spike/Matrix Spike Duplicate
for
Clayton Project No. 98033.92

Clayton Lab Number: 9803392-1
Ext./Prep. Method: --
Date: 03/31/98
Analyst:
Std. Source: 1C980327A
Sample Matrix/Media: WATER

Analytical Method: EPA 300.0
Instrument ID: 02739
Date: 03/31/98
Time: 12:00
Analyst: DC
Units: MG/L
QC Batch No: 9803317D

Analyte	Sample Result	Spike Level	Matrix Spike Result	MS Recovery (%)	Matrix Spike Duplicate Result	MSD Recovery (%)	Average Recovery (% R)	LCL (% R)	UCL (% R)	RPD (%)	UCL (%RPD)
FLUORIDE	ND	50.0	49.9	100	52.4	105	102	86	106	5.0	20
SULFATE	110	200	303	97	302	96	96	74	109	0.6	20

ND = Not detected at or above limit of detection
SOR = Spike out of range due to high sample concentration.

LCL = Lower Control Limit

UCL = Upper Control Limit

Quality Assurance Results Summary - Matrix Spike/Matrix Spike Duplicate
for
Clayton Project No. 98033.92

Clayton Lab Number: LCS
Ext./Prep. Method: --
Date: 03/31/98
Analyst:
Std. Source: IC980327A
Sample Matrix/Media: WATER_

Analytical Method: EPA 300.0
Instrument ID: 02739
Date: 03/31/98
Time: 12:01
Analyst: DC
Units: MG/L
QC Batch No: 9803317D

Analyte	Sample Result	Spike Level	Matrix Spike Result	MS Recovery (%)	Matrix Spike Duplicate Result	MSD Recovery (%)	Average Recovery (% R)	LCL (% R)	UCL (% R)	RPD (%)	UCL (%RPD)
FLUORIDE	ND	5.00	4.69	94	4.72	94	94	86	106	0.7	20
SULFATE	ND	20.0	18.3	92	18.5	93	92	74	109	1.1	20

ND = Not detected at or above limit of detection
SOR = Spike out of range due to high sample concentration.

LCL = Lower Control Limit

UCL = Upper Control Limit

9803392

Curtis & Tompkins, Ltd.
Analytical Laboratories, Since 1878
2323 Fifth Street
Berkeley, CA 94710
(510)486-0900 ph
(510)486-0532 fx

Project Number: 132892

Subcontract Lab:

Clayton Group Services
1252 Quarry Lane
Pleasanton, CA 94566
(925) 426-2600

Please send report to: Damara Moore

Turnaround Time: _____

Report Level: II

Sample ID	Date Sampled	Matrix	Analysis	C&T Lab #
MW-1	26-MAR-98	Water	SULFATE	132892-002

01A

***Please report using Sample ID instead of C&T Lab #.

Notes:	RELINQUISHED BY:	RECEIVED BY:
	<i>J. Quil</i> Date/Time: <i>3/30/98</i>	<i>[Signature]</i> Date/Time: <i>3/30/98 14:20</i>
	<i>[Signature]</i> Date/Time: _____	<i>Carol Hammerberg</i> Date/Time: <i>3/31/98 16:00</i>

Signature on this form constitutes a firm Purchase Order for the services requested above.

