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**SELF-MONITORING REPORT –
FOURTH QUARTER & YEAR 2006
NPDES PERMIT NO. CAG912002**

**GROUNDWATER REMEDIATION AT
CITY OF OAKLAND
MUNICIPAL SERVICES CENTER
7101 EDGEWATER DRIVE
OAKLAND, CALIFORNIA**

Prepared for

**City of Oakland
Public Works Agency
Environmental Services Division
250 Frank H. Ogawa Plaza, Suite 5301
Oakland, CA94612**

January 2007

Prepared by

OTG
**Enviroengineering
Solutions, Inc.**

464 19th Street, Suite 206
Oakland, CA 94612

January 15, 2007

Mr. Farhad Azimzadeh
Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Reference: RWQCB Order No. 01-100, NPDES Permit #CAG912002

Subject: Self-Monitoring Report – Fourth Quarter and Year 2006
Groundwater Remediation at 7101 Edgewater Drive, Oakland, CA

Dear Mr. Azimzadeh:

On behalf of the City of Oakland, OTG Enviroengineering Solutions, Inc. is pleased to submit this Self-Monitoring Report for a groundwater extraction, treatment and discharge system at the City of Oakland Municipal Services Center (MSC) located at 7101 Edgewater Drive, Oakland, California. No violations of RWQCB Order No. 01-100 and NPDES Permit #CAG912002 were identified during this reporting period of time.

Certification

I certify under penalty of law that this document and all attachments are prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who managed the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Please contact the undersigned at (510) 465-8982 if you have questions or comments.

Sincerely,
OTG EnviroEngineering Solutions, Inc.



Xinggang Tong, PhD, PE
Project Manager



cc: Mr. Gopal Nair, City of Oakland
Mr. Barney Chan, Alameda County Department of Environmental Health

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1 INTRODUCTION

The City of Oakland Municipal Services Center (MSC) is located at 7101 Edgewater Drive, Oakland, CA (Figure 1). The site was originally part of a waterfront tidal marsh complex, which was filled between 1950 and 1971. The MSC occupies an area of approximately 17 acres. The City leased the land from the Port of Oakland for use as a corporation yard. Bordering the MSC site to the west and the north is the Martin Luther King Regional Shoreline Park. This park land is also owned by the Port of Oakland. Damon Slough is located to the north, and commercial developments are located to the east and south.

The MSC site has been the subject of numerous environmental investigations starting in about 1989. The suspected sources of on-site contamination include releases from underground storage tanks (USTs), gasoline and diesel fuel hydrant system, and the floor drain waste collection pits formerly located adjacent to Building No. 5. In addition, some or all of the material used to fill the site may have been waste or contaminated prior to placement at the site. A comprehensive investigation conducted by Baseline in 2000 identified the existence of free-phase petroleum hydrocarbon product at four separate areas within the MSC. They are labeled as Plumes A through D on Figure 2. Baseline's investigation is documented in the report of *Site History and Characterization* (January 2001).

Groundwater monitoring has been conducted quarterly from the fourth Quarter of 1989 through the third quarter of 2002 and then semi-annually to current. Shallow groundwater elevation varies from 2 to 10 feet below ground surface and is partially subject to tidal influence. Shallow groundwater flow is toward the southwest to the nearest shoreline along San Leandro Bay across much of the site. In the northern portion of the MSC, groundwater flows in a more northerly direction toward the curving shoreline and Damon Slough (Baseline, January 2001)

Pilot-scale Dual-Phase Extraction (DPE) tests were conducted in 2002 to enhance the removal of free-phase petroleum product from the four identified areas (Cambria, August 13, 2002 and URS, August 29, 2002). Extracted groundwater was treated on-site through two 2,000-lb granular activated carbon units connected in series and discharged to on-site storm drain via a NPDES permit granted by the San Francisco Bay Regional Water Quality Control Board (NPDES Permit No. CAG912002). Based on the pilot test result, the City retained Cambria in May 2003 to design a full-scale application of product recovery and groundwater/soil vapor extraction at Plumes C and D. Cambria's design was revised in October 2005 by Groundwater and Environmental Services (GES) to focus the first phase of product removal in Plume D. The final design drawings were included in Appendix A of the Startup Report (OTG, June 2006). Chemical oxidation and enhanced bioremediation through periodic injections of hydrogen peroxide have been implemented in Plumes A, B and C since July 2004.

In March 2006, the City retained URS Corporation and its subcontractor ERRG to construct the GES' revised remediation system of product recovery and groundwater/soil vapor extraction. The construction was completed in early May 2006. On May 22, 2006, the product recovery and groundwater extraction portion of the remediation system was turned on.

2. DESCRIPTION OF REMEDIATION SYSTEM

The remediation system consists of extraction of liquid (petroleum product and groundwater) and soil vapor from seven (7) wells located in Plume D area (Figure 3), separation of petroleum product from groundwater, treatment of groundwater by activated carbon, discharge of treated water to local storm drain via a NPDES permit, treatment of soil vapor, and discharge of treated vapor to the atmosphere via an air discharge permit. A process and instrumentation diagram of the remediation system is illustrated on Figure 4. Design details were included in Appendix A of the Startup Report (OTG, June 2006).

The seven wells are: RW-D1, RW-D2, RW-D3, RW-D4, RW-D5, TBW-5 and RW-1. Their locations are shown on Figure 3. RW-D1 through RW-D5 were constructed in December 2001 specifically for remediation purposes, and RW-1 and TBW-5 were placed during backfilling of the excavation of former fuel hydrant lines in the early 1990s. Each well is equipped with a total fluid recovery pneumatic pump specifically designed for viscous petroleum product recovery. The pump is manufactured by Clean Environment Equipment in Oakland and has the Model # AP-Custom. An Ingersoll-Rand air compressor (model # SSR UP6-10) provides compressed air to the pneumatic pumps. Each well is also piped into a high vacuum extraction unit that can produce up to 28 inches of mercury vacuum. This vacuum unit can be operated at either mode of soil vapor extraction only or soil vapor and liquid simultaneous extraction. The pneumatic pumps and the vacuum extraction unit can be operated independently.

The liquid extracted by the pneumatic pumps and the vacuum unit is pumped into an oil/water separator (Model # AGM-3SS-90V, Hydro Quip, Inc.). Recovered oil is contained in 55-gallon drums, which are sent to an off-site oil recycling facility. Groundwater is treated through three (3) granular activated carbon (GAC) units connected in series (Model #ASC-2000, U.S.Filter/Westates Carbons) before being discharged into local storm drain. Each GAC unit contains 2,000 lbs of GAC. Figure 5 illustrates the groundwater treatment portion of the remediation system and identifies sampling ports.

A 40 hp liquid-ring vacuum pump capable of 500 ACFM and up to 28" Hg extracts soil vapor and liquid from the seven wells. The vapor is abated by a combination of thermal and catalytic oxidizer. At low vapor organic concentrations, activated carbon can also be used for vapor abatement.

3 OPERATIONS AND MAINTENANCE

On May 22, 2006, the pneumatic pumps were turned on to start the remediation process. The vacuum extraction portion remained off line. Because the free-phase product appears to be a mixture of gasoline, diesel, and some other highly viscous organics (petroleum tank bottom or coal tar like material), the vacuum extraction, if turned on, will vaporize gasoline and a portion of the diesel and will make the removal of the viscous product even more difficult. The plan is to first use the pneumatic pumps to remove the free-phase product as much as practically achievable and then to use the vacuum extraction system to enhance the removal of the remaining petroleum hydrocarbons.

The groundwater extraction, treatment, and discharge system was operated continuously during the Fourth Quarter 2006. Operations and maintenance (O&M) of the system were performed following the instruction of *Operation & Maintenance Manual for Groundwater Remediation System at City of Oakland Municipal Services Center, Draft* (OTG, July 2006), which included daily check of air compressor's oil & pressure levels, functions of liquid level sensors and pumps, draining condensate from air tank, removing oil from the oil/water separator, and other tasks necessary for maintaining proper functions of the remediation system. No carbon changes were performed this quarter since no chemical breakthrough was detected in any of the three carbon vessels.

On-site measurement included temperature, pH, and electric conductivity using an Oakton pH/Con 10 meter (Serial #311648) and turbidity using an Oakton T-100 meter (Serial #316738). Before measurement, the pH probe was calibrated with standard solutions of pH 4.00, 7.00, and 10.00; the electric conductivity probe calibrated with 1413 ug/cm standard solution; and the turbidity meter calibrated with standards of 0.02, 20.0, 100, and 800 NTUs.

Chemical analyses were performed by Curtis & Tompkins, Ltd of Berkeley. Fish toxicity bioassay was conducted by Block Environmental Services of Pleasant Hill. The data received from laboratories was found to be of acceptable quality with qualifications as noted in the laboratory reports.

4 DISCHARGE MONITORING – FOURTH QUARTER AND YEAR 2006

Field measured data and laboratory analysis results are summarized in the following tables:

- Table 1 – Summary of Laboratory Analytical Procedures
- Table 2 – Summary of Operational Data and Field Measured Parameters
- Table 3 – Summary of Petroleum Hydrocarbon Analytical Data
- Table 4 – Summary of Analytical Data for Inorganic Constituents & Fish Bioassay
- Table 5 – Summary of Analytical Data for Organic Constituents
- Table 6 – TPH removed through Dissolved in Groundwater and Floating Product

Major highlights for the Fourth Quarter 2006 are:

- Liquid extraction by the seven pneumatic pumps ran continuously for this reporting period (October 1 through December 31, 2006). A total of 168,460 gallons of groundwater was extracted within the plume D area, treated, and discharged into the local storm drain, resulting in an average monthly flow rate of 1.69 gallons per minute (gpm) in October, 1.07 gpm in November, and 1.07 gpm in December.
- 70 gallons of separate-phase floating product was recovered. Counting the TPH removed with the groundwater (dissolved phase), approximately 80 gallons, or 568 lbs, of TPH was removed.

- Monthly monitoring was conducted on October 4, November 8, and December 6. Monthly monitoring results are summarized in Tables 2 and 3. Quarterly monitoring was conducted on November 8 and results are presented in Tables 4 and 5.
- Effluent (treated groundwater) had pHs between 7.1 and 7.35, temperatures between 12.3 and 19.4 °C, conductivities between 10.03 and 15.4 ms/cm, and turbidities between 0.04 and 0.1.
- TPH gas, diesel, benzene, toluene, ethylbenzene, and xylenes (BTEX), and MTBE in the monthly effluent samples were all below their respective reporting limits.
- Daily mass discharges calculated based on the average daily flow rate and the quarterly monitoring data (November 8) for all inorganic constituents were significantly below their respective daily mass limits imposed by the discharge permit for the category of less than 10 gpm discharge rate (Table 4).
- The rainbow trout survival rate was 100% in the 96-hour static renewal bioassay conducted for the effluent sample collected on November 8 (Table 4).
- The average concentration for the influent (after the oil/water separator, but before the carbon treatment) for the Fourth Quarter 2006 was 43 mg/L TPH gas, 8.2 mg/L TPH diesel, and 4.67 mg/L benzene.

Major highlights for Year 2006 are:

- A total of 547,431 gallons of groundwater was extracted from May 22, when the groundwater extraction and treatment system was turned on, through December 31, 2006, resulting in an average flow rate of 1.70 gpm.
- 315 gallons of separate-phase floating product was recovered. Counting the TPH removed with the groundwater (dissolved phase), approximately 352 gallons, or 2,490 lbs of TPH was removed.
- Effluent (treated groundwater) had pHs between 6.95 and 8.3, temperatures between 12.3 and 23.6 °C, conductivities between 8.81 and 15.4 ms/cm, and turbidities between 0.04 and 0.2.
- TPH gas, diesel, benzene, toluene, ethylbenzene, and xylenes (BTEX), and MTBE in the monthly effluent samples were all below their respective discharge limits at all times.
- Daily mass discharges calculated based on the average daily flow rate and the quarterly monitoring data for all inorganic constituents were significantly below their respective daily mass limits imposed by the discharge permit for the category of less than 10 gpm discharge rate.
- The rainbow trout survival rate was 100% in the 96-hour static renewal bioassay conducted quarterly for the effluent.
- Effluent concentrations of volatile organic compounds (VOCs) and fuel oxygenates analyzed by EPA8260 and semi-VOCs analyzed by EPA8270 and EPA8310 were all below their respective reporting limits.
- Influent groundwater (after the oil/water separator, but before carbon treatment) had TPH gas concentrations of between 32 and 60 mg/L, TPH diesel between 4.0 and 25 mg/L, and benzene between 3.1 and 6.1 mg/L.

5 REFERENCES

Baseline Environmental Consulting, *Site History and Characterization*, January 2001

Cambria Environmental Technology, Inc. *TPE Pilot Test and Feasibility Report*, August 13, 2002.

California Regional Water Quality Control Board – San Francisco Bay Region, *Authorization to Discharge Treated Groundwater Under the Requirements of Order No. 01-100, NPDES Permit No. CAG 912002*, April 23, 2002.

OTG Enviroengineering Solutions, Inc. *Self-Monitoring Report – Third Quarter 2006, Groundwater Remediation at City of Oakland Municipal Services Center*, October 2006

OTG Enviroengineering Solutions, Inc. *Self-Monitoring Report – Second Quarter 2006, Groundwater Remediation at City of Oakland Municipal Services Center*, July 2006

OTG Enviroengineering Solutions, Inc. *Operation & Maintenance Manual for Groundwater Remediation System at City of Oakland Municipal Services Center, Draft*, July 2006

OTG Enviroengineering Solutions, Inc. *Startup Report, Groundwater Remediation at City of Oakland Municipal Services Center*, June 2006

URS Corporation, *Results of Dual-Phase Extraction Pilot Test for Plumes A & B, City of Oakland Municipal Services Center*, August 29, 2002.

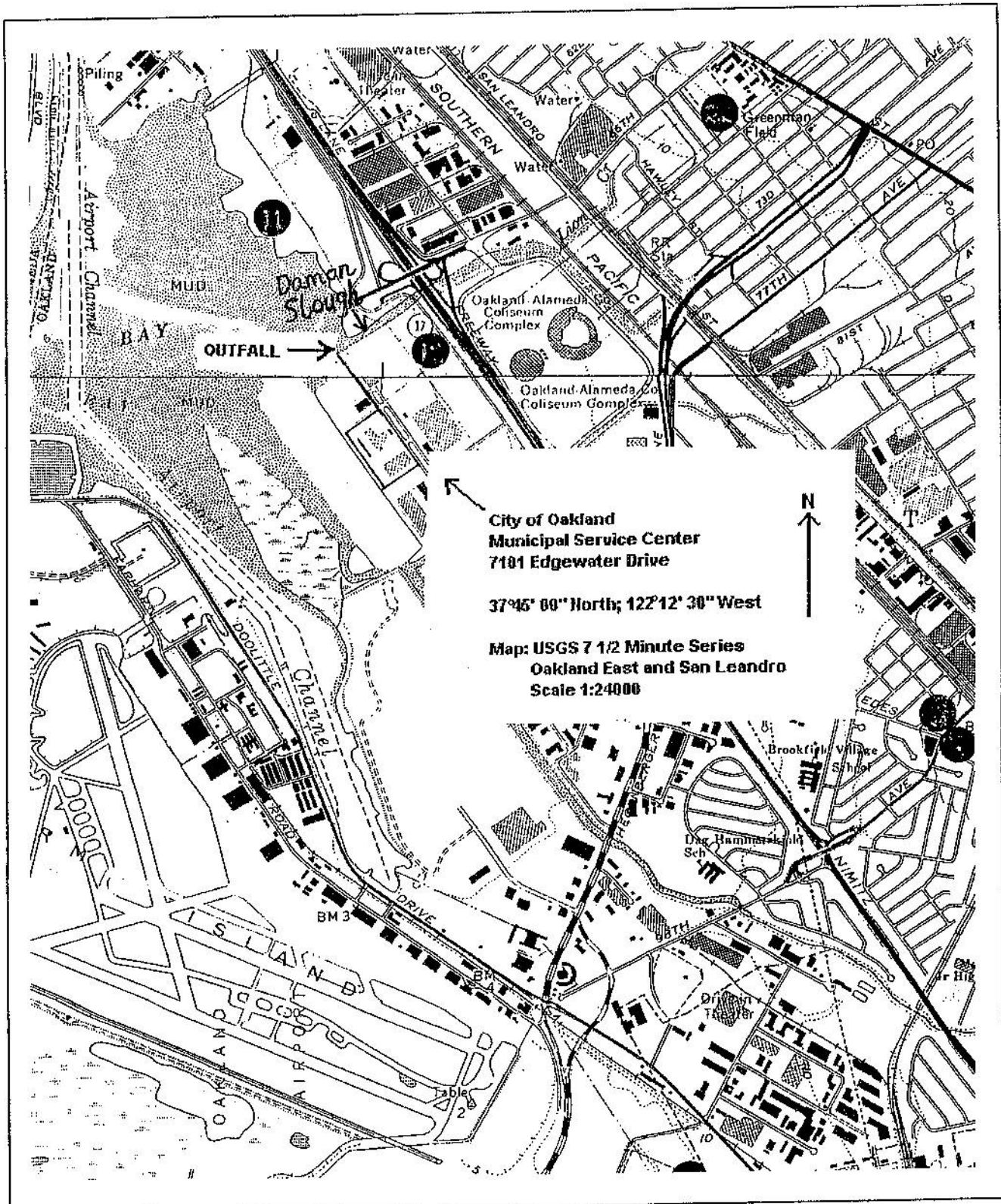


FIGURE 1 SITE LOCATION AND DISCHARGE LOCATION

OTG **EnviroEngineering**
Solutions, Inc.

City of Oakland Municipal Service Center
7101 EdgeWater Drive, Oakland, CA

EXPLANATION

- MW-1 ● Monitoring well location
- RW-1 ⚡ Remediation well location
- TBW-1 ⚡ Tank Backfill Well
- MW-3 ⊗ Abandoned Well
- Fence
- Former underground piping
- Area of free product on groundwater

DAMON SLOUGH

EDGEWATER DRIVE

SAN LEANDRO BAY

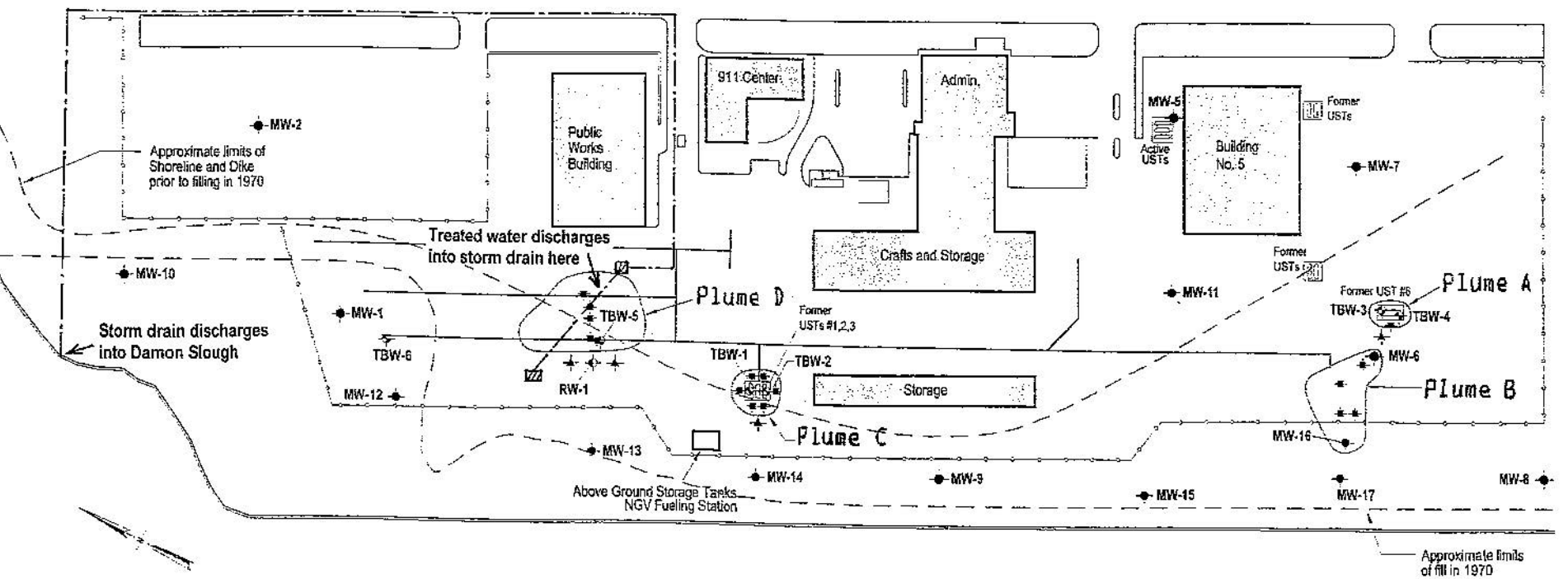


FIGURE 2 Identification of Free-Phase Petroleum Product Locations

OTG EnviroEngineering Solutions, Inc.

City of Oakland Municipal Services Center
7101 Edgewater Drive, Oakland, CA

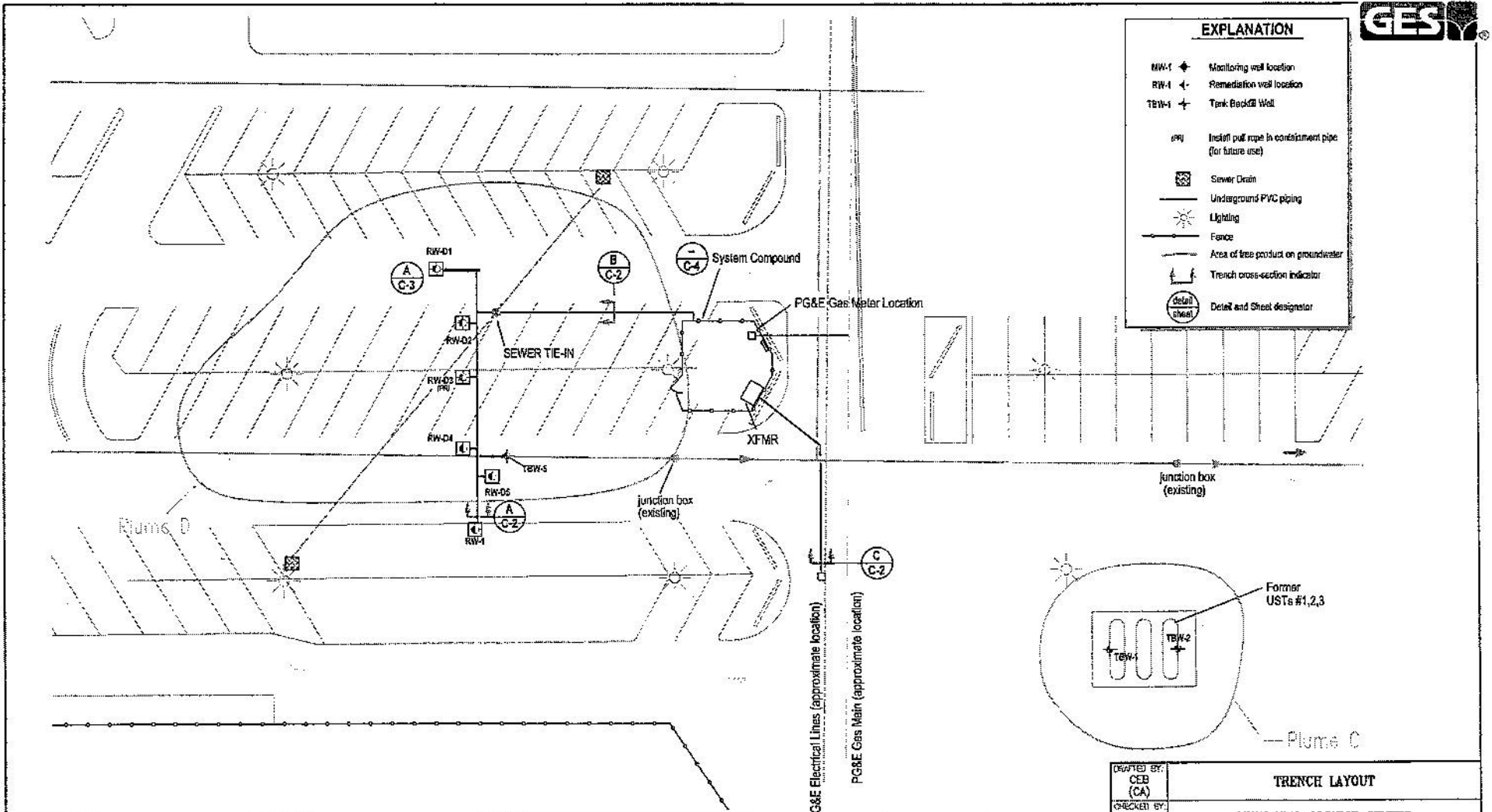


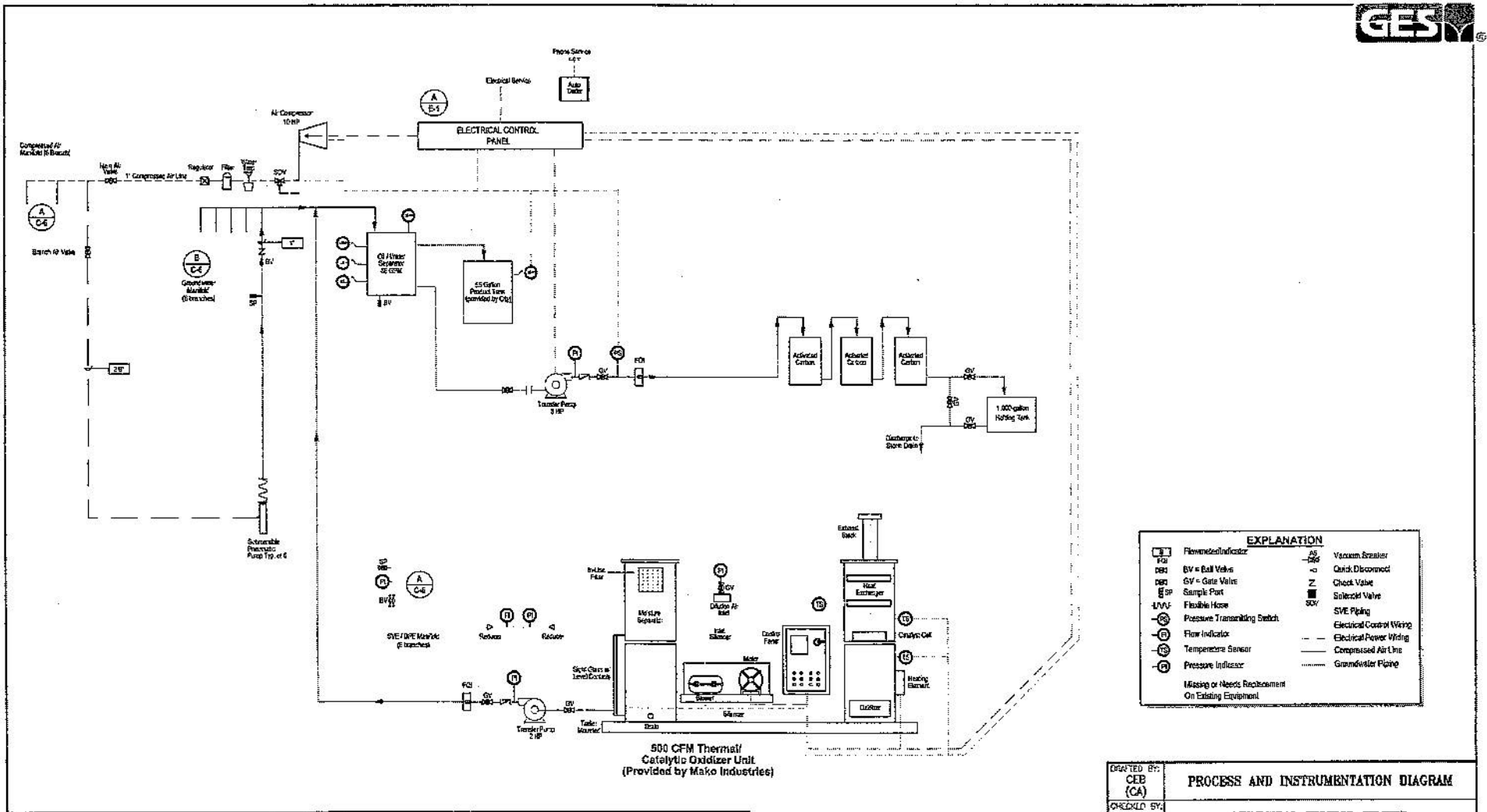
FIGURE 3 Identification of Extraction Wells & Trench Layout

OTG EnviroEngineering Solutions, Inc.

City of Oakland Municipal Services Center
7101 Edgewater Drive, Oakland, CA

Above Ground Storage Tanks
NGV Fueling Station

DRAFTED BY: CEB (CA) CHECKED BY: GWH REVIEWED BY:	TRENCH LAYOUT	
	MUNICIPAL SERVICE CENTER 7101 EDGEWATER DRIVE OAKLAND, CALIFORNIA	
NORTH 	Groundwater & Environmental Services, Inc. 333 VINCENT ROAD, SUITE 222, PLEASANT HILL, CA 94523	
APPROX. SCALE 	DATE 11-02-05	FIGURE C-1



EXPLANATION	
	Flowmeter/Indicator
	BV = Ball Valve
	GV = Gate Valve
	Sample Post
	Flexible Hose
	Pressure Transducing Switch
	Flow Indicator
	Temperature Sensor
	Pressure Indicator
	Vacuum Breaker
	Quick Disconnect
	Check Valve
	Sink/Drain Valve
	SVE Piping
	Electrical Control Wiring
	Electrical Power Wiring
	Compressed Air Line
	Groundwater Piping
Missing or Needs Replacement On Existing Equipment	

DRAFTED BY: CEB (CA)	PROCESS AND INSTRUMENTATION DIAGRAM	
CHECKED BY: GMH	MUNICIPAL SERVICE CENTER 7101 EDGEWATER DRIVE OAKLAND, CALIFORNIA	
REVIEWED BY: NORTH	Groundwater & Environmental Services, Inc. 333 VINCENT ROAD, SUITE 222, PLEASANT HILL, CA 94523	
	NOT TO SCALE	DATE 11-02-05
		FIGURE M-1

FIGURE 4 Remediation System Process & Instrumentation Diagram

OTG **EnviroEngineering**
Solutions, Inc.

City of Oakland Municipal Services Center
7101 Edgewater Drive, Oakland, CA

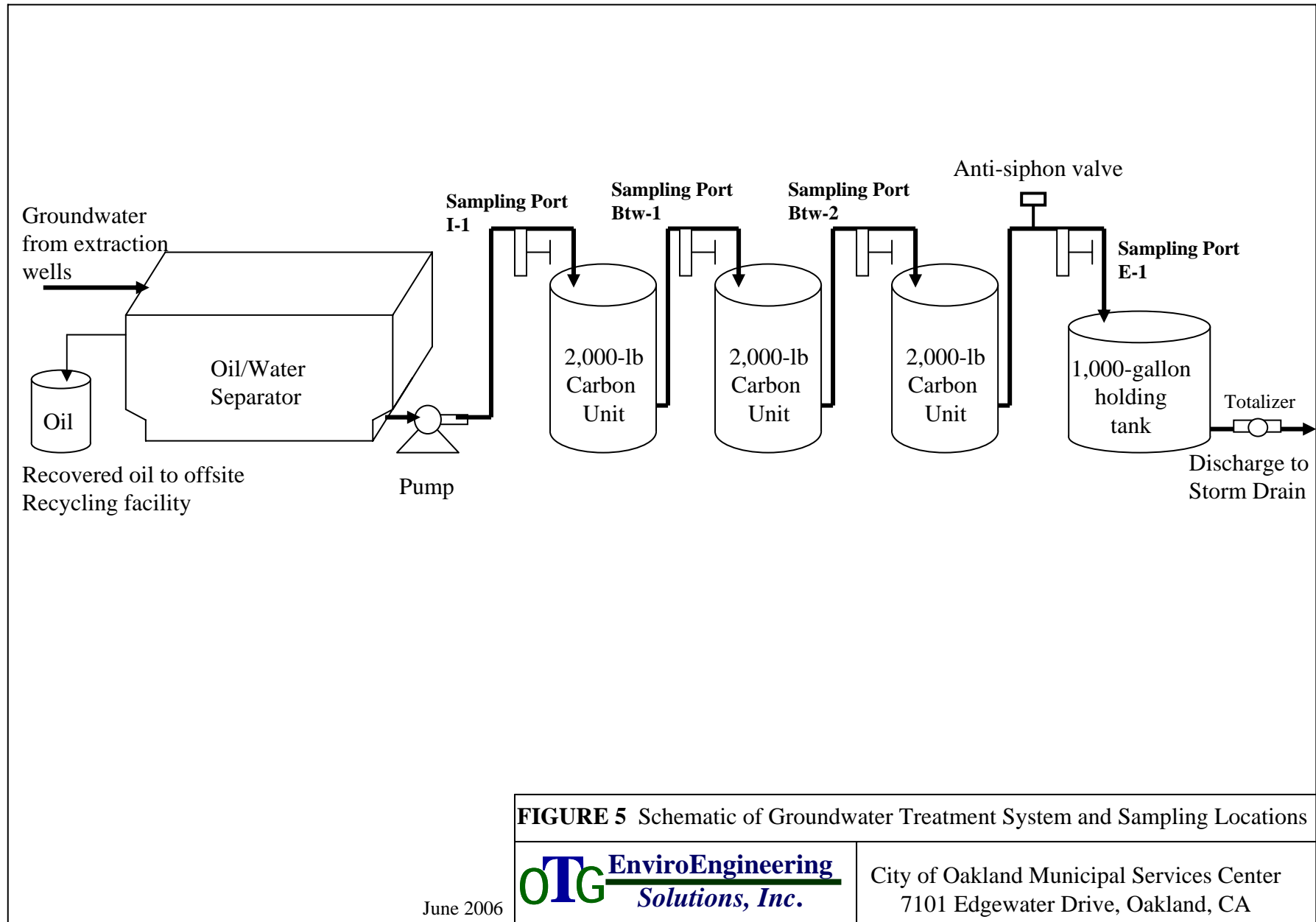


FIGURE 5 Schematic of Groundwater Treatment System and Sampling Locations

June 2006

OTG **EnviroEngineering**
Solutions, Inc.

City of Oakland Municipal Services Center
7101 Edgewater Drive, Oakland, CA

Table 1 - Summary of Laboratory Analytical Procedures
City of Oakland Municipal Services Center Groundwater Remediation Project

	5/22/06	5/30/06	6/26/06	7/25/06	9/5/06	10/4/06	11/8/06
Flow rate	onsite totalizer	onsite totalizer	onsite totalizer	& 8/11/06	onsite totalizer	onsite totalizer	onsite totalizer
Turbidity	on-site	on-site	on-site	on-site	on-site	on-site	on-site
Fish bioassay			EPA/821/R-02/012		EPA/821/R-02/012		EPA/821/R-02/012
pH	on-site	on-site	on-site	on-site	on-site	on-site	on-site
DO							
Temperature	on-site	on-site	on-site	on-site	on-site	on-site	on-site
E. conductivity	on-site	on-site	on-site	on-site	on-site	on-site	on-site
Benzene	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8260B	EPA 8021B	EPA 8021B
Toluene	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8260B	EPA 8021B	EPA 8021B
Ethylbenzene	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8260B	EPA 8021B	EPA 8021B
Total xylenes	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8260B	EPA 8021B	EPA 8021B
MTBE	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8021B	EPA 8260B	EPA 8021B	EPA 8021B
TPH g&d	EPA 8015B	EPA 8015B	EPA 8015B	EPA 8015B	EPA 8015B	EPA 8015B	EPA 8015B
EDB		EPA 8260B			EPA 8260B		
VOCs		EPA 8260B			EPA 8260B		
TAME		EPA 8260B			EPA 8260B		
DIPE		EPA 8260B			EPA 8260B		
ETBE		EPA 8260B			EPA 8260B		
TBA		EPA 8260B			EPA 8260B		
Ethanol		EPA 8015B			EPA 8260B		
Methanol		EPA 8015B			EPA 8015B		
SVOCs		EPA 625			EPA 8270C		
PAHs		EPA 610			EPA 8310		
Hardness	SM 2340B	SM 2340B	SM 2340B		SM 2340B		SM 2340B
Antimony	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Arsenic	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Beryllium	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Cadmium	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Chromium	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Cr +6	EPA 7196	EPA 7196	EPA 7199		EPA 7199		EPA 7199
Copper	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Cyanide	EPA 335.2	EPA 335.2	EPA 335.2		EPA 335.2		EPA 335.2
Lead	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Mercury	EPA 245.1	EPA 245.1	EPA 7470A		EPA 7470A		EPA 7470A
Nickel	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Selenium	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Silver	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Thallium	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
Zinc	EPA 200.8	EPA 200.8	EPA 6020		EPA 6020		EPA 6020
pH/Conductivity/Tempt were measured on-site using a Oakton pH/Con 10 meter, Serial #311648, calibrated daily before use.							
Turbidity was measured on-site using a Oakton T-100 meter, Serial #316738, calibrated daily before use.							

Table 2 - Summary of Operational Data and Field Measured Parameters
City of Oakland Municipal Services Center Groundwater Remediation Project

Date	Time	Effluent (E-1)				Influent (I-1)			Btw-1	Btw-2	Totalizer Reading (gallons)	Monthly Treated (gallons)	Monthly ave. rate (gal/min)	Product recovered (gallons)	Notes
		pH	Temp (°C)	E. conduc (ms/cm)	Turbidity (NTU)	pH	Temp (°C)	E. cond. (ms/cm)							
5/22/2006	7:00									1,389					Before turn on system
5/22/2006	11:25	8.3	20.4	8.81	0.2	7.12	21.4	10.2	sampled	2,050					treated water held in tank
5/22/2006	14:15									2,414					stopped, waiting for analy data
5/24/2006	13:00									2,414					system on, start discharge
5/30/2006	12:30	7.48	19.4	8.25	0.04	6.98	23.1	8.32	sampled	14,230			20		
5/31/2006	10:00									18,980	17,591	1.705			
6/2/2006	16:30								sampled	31,080					
6/9/2006	8:30									48,610					
6/16/2006	10:20									67,755					
6/19/2006	9:40									74,670					
6/22/2006	11:00									90,480					
6/26/2006	9:00	7.32	22.3	13	0.1	7.37	23.3	13.4	sampled	106,950					Monthly monitoring
6/30/2006	9:00									122,860	103,880	2.405	100		
7/5/2006	10:00									140,500					two full drums of product
7/12/2006	9:30								sampled	163,230					
7/19/2006	9:30									182,740					
7/25/2006	9:30	7.35	23.6	12.5	0.04	7.4	24.2	13.1	sampled	197,030					Monthly monitoring
7/31/2006	19:30									212,010	89,150	1.997	155		
8/2/2006	19:30									216,790				165	three full drums of product
8/9/2006	9:00									233,260					Morgan removed 3 drums prodt
8/11/2006	9:30	6.95	21.5	12.8	0.1	7.25	22.3	12.6	sampled	238,380					Monthly monitoring
8/14/2006	8:00									246,180					lowered pumps in wells
8/17/2006	11:30									255,030					
8/28/2006	11:30									283,080					
9/1/2006	18:30									294,910	82,900	1.801	220		one full drum of product
9/5/2006	11:00	7	19.7	12.3	0.1	7.1	22.8	11.5	sampled	301,450					Monthly & Qtrly monitoring
9/9/2006	18:00									310,750					
9/17/2006	13:00									333,310					
9/22/2006	13:30									349,210					
9/27/2006	10:00									364,350					
9/29/2006	15:00									371,290					
10/2/2006	14:30									380,360	85,450	1.925	245		
10/4/2006	11:00	7.1	19.4	12.67	0.04	7.3	21.5	12.22	sampled	386,160					monthly monitoring
10/9/2006	13:00									402,090					
10/16/2006	11:00									417,310					
10/23/2006	17:00									436,170					
10/27/2006	18:30									443,640					
10/30/2006	11:00									448,220				275	two full drums of product

Table 2 - Summary of Operational Data and Field Measured Parameters
 City of Oakland Municipal Services Center Groundwater Remediation Project

Date	Time	Effluent (E-1)				Influent (I-1)			Btw-1	Btw-2	Totalizer Reading (gallons)	Monthly Treated (gallons)	Monthly ave. rate (gal/min)	Product recovered (gallons)	Notes
		pH	Temp (°C)	E. conduc (ms/cm)	Turbidity (NTU)	pH	Temp (°C)	E. cond. (ms/cm)							
11/1/2006	10:30										453,340	72,980	1.689		
11/8/2006	11:00	7.35	18.6	10.03	0.1	7.03	21.7	10.79	sampled	sampled	461,210				monthly & quarterly monitoring
11/14/2006	12:30										483,660				
11/20/2006	10:30										487,970				
12/1/2006	11:30										499,540	46,200	1.069	295	
12/6/2006	11:00	7.1	12.3	15.4	0.08	8.45	14.8	17.7	sampled	sampled	504,500				monthly monitoring
12/15/2006	10:00										513,050				
12/22/2006	14:30										533,130				
12/27/2006	10:00										540,340			315	2 full drums plus 40 gal product
1/2/2007	9:00										548,820	49,280	1.073		

Table 4 - Summary of Analytical Data for Inorganic Constituents and Fish Bioassay
City of Oakland Municipal Services Center Groundwater Remediation Project

Constituent	Unit	Eff Limit (<10 gpm)	Effluent (E-1)										
			5/22/06	5/30/06	6/26/06	9/5/06	11/8/06						
Antimony	ug/L		2.3	1.8	0.12	0.13	0.35						
	g/day	3	0.02137	0.01672	0.001572	0.00138	0.00243						
Arsenic	ug/L		36	24	7	3	4.3						
	g/day	1	0.33444	0.22296	0.0917	0.03177	0.0298						
Beryllium	ug/L		ND (0.35)	ND (0.5)	ND (0.055)	ND (0.12)	ND (0.12)						
	g/day	3											
Cadmium	ug/L		1	0.5	ND (0.14)	ND (0.17)	ND (0.17)						
	g/day	1	0.00929	0.00465									
Total Cr	ug/L		3.1	ND (0.5)	0.62	0.86	0.78						
	g/day	2	0.0288		0.008122	0.00911	0.00541						
Cr +6	ug/L		ND (1.0)	ND (10)	ND (0.5)	ND (0.5)	ND (0.5)						
	g/day	2											
Copper	ug/L		1.3	0.9	1.3	1.5	1.2						
	g/day	3	0.01208	0.00836	0.01703	0.01589	0.00832						
Lead	ug/L		ND (0.1)	ND (0.25)	0.26	0.3	0.3						
	g/day	5			0.003406	0.00318	0.00208						
Mercury	ug/L		ND(0.008)	ND(0.2)	ND (0.2)	ND (0.06)	ND (0.02)						
	g/day	0.01											
Nickel	ug/L		11	67	15	9.6	2.9						
	g/day	5	0.10219	0.62243	0.1965	0.10166	0.0201						
Selenium	ug/L		3	3	1.2	ND (0.35)	1.2						
	g/day	2	0.02787	0.02787	0.01572		0.00832						
Silver	ug/L		ND (0.02)	ND (0.1)	ND (0.041)	ND (0.07)	ND (0.07)						
	g/day	1											
Thallium	ug/L		0.06	ND (0.1)	0.21	ND (0.03)	ND (0.03)						
	g/day	3	0.00056		0.002751								
Zinc	ug/L		2	ND (10)	44	11	1.9						
	g/day	10	0.01858		0.5764	0.11649	0.01317						
Cyanide	ug/L		ND (0.8)	ND (3)	ND (10)	ND (10)	ND (10)						
	g/day												
Hardness	mg/LCaCO3		560	960	1100	1100	1,500						
Fish Bioassay -													
% survival of Rainbow Trout					100%	100%	100%						

Table 4 - Summary of Analytical Data for Inorganic Constituents and Fish Bioassay
City of Oakland Municipal Services Center Groundwater Remediation Project

Inorganic	Unit	Eff Limit (<10 gpm)	Influent (I-1)		11/8/06
			5/22/06	5/30/06	
Antimony	ug/L		ND (60)	ND (1)	
	g/day	3			
Arsenic	ug/L		7.2	8.5	
	g/day	1	0.06689	0.07897	
Beryllium	ug/L		ND (2)	ND (1)	
	g/day	3			
Cadmium	ug/L		34	10	
	g/day	1	0.31586	0.0929	
Total Cr	ug/L		ND (10)	ND (1)	
	g/day	2			
Cr +6	ug/L		ND (0.5)	ND (0.5)	
	g/day	2			
Copper	ug/L		250	25	
	g/day	3	2.3225	0.23225	
Lead	ug/L		28	21	
	g/day	5	0.26012	0.19509	
Mercury	ug/L		ND (0.2)	ND (0.2)	
	g/day	0.01			
Nickel	ug/L		68	19	
	g/day	5	0.63172	0.17651	
Selenium	ug/L		9.4	ND (1)	
	g/day	2	0.08733		
Silver	ug/L		ND (5)	ND (1)	
	g/day	1			
Thallium	ug/L		25	ND (1)	
	g/day	3	0.23225		
Zinc	ug/L		31	57	
	g/day	10	0.28799	0.52953	
Cyanide	ug/L		10	10	20
	g/day		0.0929	0.0929	

Table 5 - Summary of Analytical Data for Organic Constituents
 City of Oakland Municipal Services Center Groundwater Remediation Project

	Influent (I-1)						
	5/30/06						
	(ug/L)						
Benzene	4900						
Carbon tetrachloride	ND (36)						
Chloroform	ND (36)						
1,1-Dichloroethane	ND (36)						
1,2-Dichloroethane	ND (36)						
1,1-dichloroethylene	ND (36)						
Ethylbenzene	1100						
Methylene chloride	ND (36)						
Tetrachloroethylene	ND (36)						
Toluene	5300						
c-1,2-Dichloroethylene	ND (36)						
t-1,2-Dichloroethylene	ND (36)						
1,1,1-Trichloroethane	ND (36)						
1,1,2-Trichloroethane	ND (36)						
Trichloroethylene	ND (36)						
vinyl chloride	ND (36)						
total xylenes	7100						
MTBE	ND (36)						
Ethylene dibromide	ND (36)						
Trichlorotrifluoroethane	ND (360)						
TPH gas	57000						
TPH diesel	9200						
TAME	ND (36)						
DIPE	ND (36)						
ETBE	ND (36)						
TBA	ND (710)						
Ethanol	ND(1000)						
Methanol	ND(1000)						
Other VOCs (EPA 8260)							
Isopropylbenzene	40						
Propylbenzene	120						
1,3,5-Trimethylbenzene	410						
1,2,4-Trimethylbenzene	1500						
Naphthalene	370						
PAHs (EPA 8310 or 610)							
Benzo(a)anthracene	1.7						
Benzo(a)pyrene	1.6						
Chrysene	2.6						
Fluoranthene	3.8						
Naphthalene	130						
Pyrene	3.3						
SVOCs(EPA8270 or625)							
Dimethylphthalate	28						
bis(2-Ethylhexyl)phthalate	12						
Naphthalene	290						
Phenol	13						

Table 5 - Summary of Analytical Data for Organic Constituents
 City of Oakland Municipal Services Center Groundwater Remediation Project

	After First Carbon Unit (Btw-1)							
	Max Daily	5/30/06	9/5/06					
	Eff. Limit (ug/L)	(ug/L)						
Benzene	5	ND (0.5)	ND (0.5)					
Carbon tetrachloride	5	ND (0.5)	NA					
Chloroform	5	ND (0.5)	NA					
1,1-Dichloroethane	5	ND (0.5)	NA					
1,2-Dichloroethane	5	ND (0.5)	NA					
1,1-dichloroethylene	5	ND (0.5)	NA					
Ethylbenzene	5	ND (0.5)	ND (0.5)					
Methylene chloride	5	ND (0.5)	NA					
Tetrachloroethylene	5	ND (0.5)	NA					
Toluene	5	ND (0.5)	ND (0.5)					
c-1,2-Dichloroethylene	5	ND (0.5)	NA					
t-1,2-Dichloroethylene	5	ND (0.5)	NA					
1,1,1-Trichloroethane	5	ND (0.5)	NA					
1,1,2-Trichloroethane	5	ND (0.5)	NA					
Trichloroethylene	5	ND (0.5)	NA					
vinyl chloride	5	ND (0.5)	NA					
total xylenes	5	ND (0.5)	ND (0.5)					
MTBE	13	ND (0.5)	ND (2)					
Ethylene dibromide	5	ND (0.5)	NA					
Trichlorotrifluoroethane	5	ND (5)	NA					
TPH gas	50	ND (50)	ND (50)					
TPH diesel	50	ND (50)	ND (50)					
TAME		ND (0.5)	NA					
DIPE		ND (0.5)	NA					
ETBE		ND (0.5)	NA					
TBA		ND (10)	NA					
Ethanol		NA	NA					
Methanol		NA	NA					
Other VOCs (EPA 8260)		ND	NA					
PAHs (EPA 8310 or 610)		NA						
SVOCs(EPA8270 or625)		NA						

Table 5 - Summary of Analytical Data for Organic Constituents
 City of Oakland Municipal Services Center Groundwater Remediation Project

	After Second Carbon Unit (Btw-2)						
	Max Daily		9/5/06				
	Eff. Limit						
	(ug/L)		(ug/L)				
Benzene	5		ND (0.5)				
Carbon tetrachloride	5		ND (0.5)				
Chloroform	5		ND (0.5)				
1,1-Dichloroethane	5		ND (0.5)				
1,2-Dichloroethane	5		ND (0.5)				
1,1-dichloroethylene	5		ND (0.5)				
Ethylbenzene	5		ND (0.5)				
Methylene chloride	5		ND (0.5)				
Tetrachloroethylene	5		ND (0.5)				
Toluene	5		ND (0.5)				
c-1,2-Dichloroethylene	5		ND (0.5)				
t-1,2-Dichloroethylene	5		ND (0.5)				
1,1,1-Trichloroethane	5		ND (0.5)				
1,1,2-Trichloroethane	5		ND (0.5)				
Trichloroethylene	5		ND (0.5)				
vinyl chloride	5		ND (0.5)				
total xylenes	5		ND (0.5)				
MTBE	13		ND (0.5)				
Ethylene dibromide	5		ND (0.5)				
Trichlorotrifluoroethane	5		ND (5)				
TPH gas	50		NA				
TPH diesel	50		NA				
TAME			ND (0.5)				
DIPE			ND (0.5)				
ETBE			ND (0.5)				
TBA			ND (10)				
Ethanol			ND (1000)				
Methanol			NA				
Other VOCs (EPA 8260)			ND				
PAHs (EPA 8310 or 610)			NA				
SVOCs(EPA8270 or625)			NA				

Table 6 - TPH Removed Through Dissolved in Groundwater and Floating Product
City of Oakland Municipal Services Center Groundwater Remediation Project

Month	groundwater	TPH gas	TPH diesel	Mass removed through groundwater			Floating produ	total monthly	% removed	Cumulative product removed		
	removed	Influent	Influent	as TPH gas	as TPH diesel	combined	recovered	removal	by floating	(Floating + Dissolved)		
	(gallons)	(mg/L)	(mg/L)	(lbs)	(lbs)	(lbs)	(gallons)	(gallons)	product	(gallons)	(lbs)	
May-06	17,591	54.5	17.1	7.98	2.50	10.49	20	21.48	0.93	21.48	152	
Jun-06	103,880	50	10	43.25	8.65	51.90	80	87.33	0.92	108.81	770	
Jul-06	89,150	60	4	44.54	2.97	47.51	65	71.71	0.91	180.53	1278	
Aug-06	82,900	59	4.1	40.73	2.83	43.56	55	61.15	0.90	241.68	1711	
Sep-06	85,450	44	4.8	31.31	3.42	34.72	25	29.91	0.84	271.59	1922	
Oct-06	72,980	42	9.1	25.52	5.53	31.05	30	34.39	0.87	305.97	2166	
Nov-06	46,200	32	7.8	12.31	3.00	15.31	20	22.16	0.90	328.14	2323	
Dec-06	49,280	55	7.6	22.57	3.12	25.69	20	23.63	0.85	351.77	2490	
Jan-07												
Note:	Morgan disposed of 3 55-gallon drums full of recovered product on 8/9/06											

APPENDIX A

Laboratory Analytical Reports for Fourth Quarter 2006 Samples