

CITY OF OAKLAND



DALZIEL BUILDING • 250 FRANK H. OGAWA PLAZA, SUITE 5301 • OAKLAND, CALIFORNIA 94612-2034

Public Works Agency Environmental Services, FAX (510) 238-7286 TDD (510) 238-7644

Alameda County SEP 1 v 2002 invironmento:

September 4, 2002

Mr. Barney Chan Alameda County Environmental Health Services 1131 Harbor Bay Parkway Alameda, California 94502-6577

Subject:

Dual Phase Extraction Pilot Test and Feasibility Study -

City of Oakland Municipal Service Center 7101 Edgewater Drive Oakland, California

Dear Mr. Chan:

Enclosed is a copy of the above referenced report prepared by our consultants, Cambria Environmental Consultants for the City of Oakland Municipal Service Center at 7101 Edgewater Drive.

Please call me at 238-6259, if you have any questions or require additional information.

Sincerely,

cc:

Joseph Al Cotton, R.G.

Environmental Program Specialist

Diane Heinz, Port of Oakland, 530 Water St., Oakland, CA 94604

TPE PILOT TEST AND FEASIBILITY REPORT

City of Oakland, Municipal Services Center
7101 Edgewater Drive
Oakland, California
Cambria Project No. 153-1653

August 28, 2002

Environmental Health

Prepared for:

Mr. Joseph Cotton
City Of Oakland, Public Works Agency
Environmental Services Division
250 Frank H. Ogawa Plaza Suite 5301
Oakland, California 94612-2034

Prepared by:

Cambria Environmental Technology, Inc. 1144 65th Street, Suite B Oakland, California 94608

No. 6842

Oakiand, CA San Ramon, CA Sonoma, CA

Cambria Environmental Technology, Inc.

1144 65th Street Suite B Oakland, CA 94608 Tel (510) 420-0700 Fax (510) 420-9170 La Schul

Ron Scheele, R.G. Senior Geologist

Boblieddell

Bob Clark-Riddell, P.E Principal Engineer

TPE PILOT TEST AND FEASIBILITY REPORT

City of Oakland, Municipal Services Center
7101 Edgewater Drive
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Cambria Project No. 153-1653

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INTRODUCTION

Cambria Environmental Technology, Inc. (Cambria) has prepared this *Two Phase Extraction* (TPE) Pilot Test and Feasibility Report for the above-referenced site. The site background, TPE pilot test activities and results, and a feasibility study are presented below.

SITE BACKGROUND

Site Description

The 17-acre site is located in Oakland, California (Figure 1). It consists of a corporation yard of offices, shops, warehouse structures, and a vehicle maintenance and repair facility (Figure 2). Bordering the site to the west and to the north is the Martin Luther King Regional Shoreline Park. Beyond the narrow strip of parkland lies San Leandro Bay to the west and Damon Slough to the north. Area use to the east and south is primarily light industrial and commercial business.

Previous Work

In 1989, an environmental site assessment was performed, and monitoring wells MW-1 through MW-4 were installed. In 1992, an additional investigation was performed and monitoring wells MW-5 through MW-7 were installed. In 1993, thirty-four soil borings were advanced across the site, and groundwater samples were collected. In 1995, three shallow borings were advanced as part of a geotechnical investigation and soil samples were analyzed for petroleum hydrocarbons. In 1996, ten soil borings were advanced and temporary wells were installed outside the western and northern perimeters of the site along San Leandro Bay and Damon Slough. Three of the temporary well locations were converted to monitoring wells: MW-8 through MW-10. From

Oakland, CA San Ramon, CA Sonoma, CA

Cambria Environmental Technology, Inc.

1144 65th Street Suite B Oakland, CA 94608 Tel (510) 420-0700 Fax (510) 420-9170

September through December 1999, an approximately 2,650 lineal foot fuel transport and dispensing system was removed from the site. In addition, eight underground storage tanks (USTs) and associated piping were removed. In November 1999, MW-3 and MW-4 were destroyed and monitoring wells MW-11 through MW-17 were subsequently installed. In July 2000, 42 direct push soil borings were advanced to assess the extent of contamination. Since installation, monitoring wells have been regularly gauged and sampled. See Baseline's *Site History and Characterization Report* dated January 2001 for further details regarding past site assessment activities.



Site Hydrogeology

The site is underlain by artificial fill that was emplaced during several construction phases since 1945. The fill material varies significantly in character across the site. The fill is underlain by clayey silt deposits, known as Bay Mud and coarse-grained sediments. Based on measured groundwater elevations, groundwater generally appears to flow towards Damon Slough in the northern part of the site, and toward San Leandro Bay in the southern part of the site. The heterogeneity of the artificial fill material and the low permeability of the Bay Mud used as fill at various site locations appear to influence local groundwater flow. In general, the site monitoring wells are screened from 5-13 feet below grade surface (bgs). A groundwater monitoring program has been in place since 1989. Water levels have historically ranged from 5 to 11 feet bgs in the vicinity of the Plumes C and D (Figure 2). Based on past tidal studies, groundwater appears to be tidally influenced in select wells (see Baseline's *Site History and Characterization Report* dated January 2001 for further details).

Contaminant Distribution

Petroleum hydrocarbons have been detected in soil and groundwater at multiple locations across the site. Separate phase hydrocarbons (SPH) have been observed in four areas designated as Plumes A through D. The distribution of a majority of the contamination appears to be related to the former USTs and fuel dispensing systems. The contamination also may have been entrained in the fill material used to reclaim the wetland. The former USTs near TBW-1 and TBW-2, the former USTs east of MW-6, and the recently upgraded active USTs near MW-5 are likely to have been sources of contamination, in addition to the recently removed extensive fuel dispensing system. Low concentrations of petroleum hydrocarbons have been detected in off-site wells MW-8, MW-9, and MW-10 in the past. No petroleum hydrocarbons have ever been detected in off-site wells MW-3 and MW-4, which were recently destroyed.

TPE PILOT TEST ACTIVITIES

Field activities were performed over a four-week period with TPE pilot testing performed individually on Plumes C and Plume D (Figure 3). The objective of the pilot testing was to maximize SPH removal and determine the feasibility of using TPE to remediate the test areas. The TPE testing activities are described below.

Field Activities

3

Personnel Present: Rowan Fennell and Sanjiv Gill, Cambria technicians, and Matt

Meyers, Cambria environmental scientist, working under the

supervision of Ron Scheele, California Registered Geologist.

TPE Contractor: Jeff Sproul of EnviroSupply & Service (EnviroSupply) of Irvine,

California.

Notifications: Cambria notified the Bay Area Air Quality Management District of

pilot testing activities on Plume C and D test areas in letters dated May

24, and June 5, 2002.

Field Activity Dates: Plume C Petroleum Oil Release-VRA Injection - Fri. May 31, 2002

Groundwater and Pre-test Parameter Monitoring - Mon. June 3, 2002 Plume C TPE Testing - Mon. June 10 through Fri. June 14, 2002

Groundwater and Pre-test Parameter Monitoring - Mon. June, 17, 2002

Plume D TPE Testing - Tues. June 18 through Sat. June 24, 2002

Post-test Groundwater Monitoring - Mon. June 24, 2002

Field Procedures: TPE is the process of applying high vacuum (up to 29 inches of

mercury) to a well using a one-inch "stinger" pipe installed through an airtight wellhead seal to simultaneously extract both soil vapors and groundwater. The TPE pilot test was conducted using a liquid-ring pump, moisture knock-out tank, and thermal oxidizer. Extracted vapors were treated using a propane-powered thermal oxidizer. A diesel generator was used to provide electricity and a 499-gallon portable propane tank was used to provide supplemental fuel for the thermal oxidizer. Extracted SPH and groundwater from each plume

was temporarily stored in a temporary 21,000-gallon baker tank.

TPE Pilot Test and Feasibility Report City of Oakland, Municipal Services Center Oakland, California August 28, 2002

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Groundwater Monitoring: Prior to, during, and after testing, groundwater and SPH levels were measured in all extraction and observation wells (see Table 3). Groundwater levels were also measured twice on June 17, 2002, at low and high tide.

VRA Injection: Prior to testing, a proprietary compound called Petroleum Oil Release-VRA (VRA) was injected into a select well of Plume C. VRA is manufactured by Polychem Corporation of Chestnut Ridge, New York. It is a biodegradable compound with a low viscosity and specific gravity (0.87) which mobilizes trapped SPH by dissolving into the hydrocarbons and shortening their chain lengths, thereby increasing the mobility, volatility, and biodegradability of the parent compounds. VRA was designed specifically to loosen, dilute, and release heavy oils from solid surfaces and is commonly used in the cleanup of oil spills. Alameda County Environmental Health Agency approved VRA injection into site wells.

On May 31, 2002, approximately 50 gallons of VRA was injected in RW-C5 followed by the injection of 30 gallons of tap water. The water slug was used to help force the VRA away from the well and further into the saturated zone. Groundwater and SPH levels were measured prior to and after injection of VRA to determine its impact on the SPH thickness.

Chemical Analysis: To assess hydrocarbon vapor concentration trends and confirm Horiba gas analyzer readings, grab vapor samples were collected from the vaporstream prior to dilution. The samples were collected in Tedlar bags using a vacuum pump and analyzed for TPHg, BTEX and MTBE using EPA Method TO-3 (Table 2 and Appendix A).

Prior to and following completion of the TPE pilot test, well vapor samples were also analyzed for oxygen, and carbon dioxide using a Horiba gas analyzer to determine concentration trends and confirm radius of influence observations from vacuum data.

In addition, a grab water sample from the water storage tank was analyzed to profile the extracted water for future disposal/recycling (Appendix B).

Step Vacuum Tests: Step vacuum tests were conducted on the test wells followed by constant vacuum during the remainder of the pilot test. TPE extraction was performed on each test area (Plume C and Plume D, respectively) for a duration one week with the system operating 24 hours per day. During the day, measurements of vacuum, flow, water level, hydrocarbon concentration, oxygen and carbon dioxide were recorded in the extraction wells and selected observation wells (see Table 1).



During the beginning of TPE testing, step vacuum tests were conducted on wells RW-C5, RW-C6, RW-D2, RW-D3, and RW-D4 to determine the well response with various TPE stinger depths and applied vacuum levels. The TPE stinger was typically placed near the static water level at approximately 6-8 feet bgs and dropped several feet below the static water level depending upon the sediments and contamination in the area of test well. As the stinger depth was kept constant, the applied vacuum was typically increased in steps of 5 inches of mercury to the maximum achievable by the system (see Table 1).

TPE Pilot Test Results



Petroleum Oil Release-VRA: Following VRA injection into well RW-C5 but prior to TPE testing, the SPH thickness in RW-C5 increased from 0.02 ft to 0.68 ft on June 3 and to 1.64 ft on June 7, 2002 (See Table 3). An increase in the SPH thickness was also observed in nearby well RW-C6, increasing from 0.19 to 0.74 on June 7 and to 1.04 ft on June 10, 2002 (Table 3). A noticeable difference in the appearance of a SPH sample collected from RW-C5 was observed. The SPH showed to have a significantly lower surface tension and a slightly reduced viscosity although the amount of VRA in the SPH sample was not quantified. The increased SPH thickness in the wells along with the reduced surface tension of the SPH suggests that the VRA may enhance SPH mobilization and biodegradation. It is unknown if the fluctuating (tidally influenced) groundwater table affected SPH accumulations in the wells.

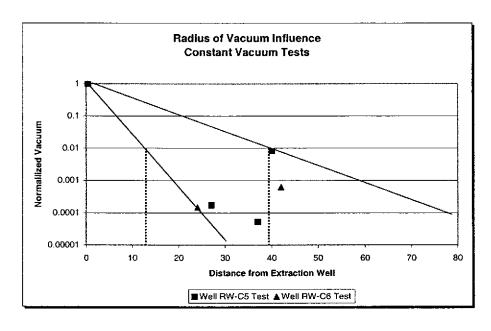
Plume C Test Area: During TPE testing, the following observations were noted:

- Well vapor flow rates ranged from 7 to 36 cfm. Well vapor and system flowrates usually decreased as the applied vacuum and stinger depth increased.
- Lower well vapor extraction flowrates corresponded with the higher groundwater extraction rates. Groundwater extraction rates ranged from 2.3 to 8.0 gallons per minute (gpm). These variable rates are likely related to heterogeneous soil conditions.
- The highest hydrocarbon vapor concentration was measured in OB-C1 at 41,000 parts per million by volume (ppmv). Hydrocarbon vapor concentrations were highest at the beginning of the test and decreased significantly during the test.
- Drawdown in water levels was observed up to 0.5 ft in RW-C6 and 0.9 ft in OB-C1 while extracting from RW-C5 was observed. The amount of drawdown related to the TPE activities was difficult to determine due to varying SPH levels, remnant conditions between test wells, and possible tidal affects. Post-test monitoring performed at low and high tides on June 17, 2002, indicated an average change in

water levels of 0.06 ft within a 12-hour period (Table 3).

- Vacuum influence in observation wells ranged from 0 to 2.85 inches of H₂O. Vacuum levels did not always increase with proximity from the extraction well. For example, wells RW-C3, located 40 feet away from extraction well RW-C5, had 2.35 inches of H₂O of vacuum while RW-C6 located 15 feet exhibited an anomalous positive pressure. These variable and anomalous readings are likely related to the heterogeneities of the underlying soils and tidal influences. These conditions require significant consideration prior to implementation of a remediation system.
- After TPE testing, the SPH thickness had decreased in wells RW-C6, OB-C1, increased in wells RW-C5, and appeared in RW-C2, RW-C3, RW-C7, and TBW-1 (see Table 3).

Radius of Vacuum Influence: The effective radius of vacuum influence was estimated according to A Summary of Nationwide Vapor Extraction System Performance Study (T.E. Buscheck, T. R. Peargin, November 1991). This approach involves normalizing the vacuum data by dividing the vacuum observed in monitoring points by the vacuum applied to the extraction wellhead. The log of the normalized vacuum data is then plotted against the distance to the observation wells. The effective radius of influence is frequently considered to be the distance corresponding to 1% (0.01) of the normalized vacuum. As shown on the graph below, the estimated effective radius of vacuum influence ranged from 13 to 39 feet at the completion of the constant vacuum tests on wells RW-C5 and RW-C6.





Vapor Analytical Data: Vapor samples were collected from wells RW-C1, OB-C1, and RW-C3 near the end of the constant vacuum tests. Analytical results exhibit a decreasing concentration trend during each test similar to the readings collected using the Horiba gas analyzer (see Table 1).

Vapor measurements collected from the test wells had pre-test levels of oxygen ranging from 5.5 to 20.6%, (atmospheric level is ~20.9%), and levels of carbon dioxide ranging from 0 to 17%, (atmospheric level is ~0.03%) (see Table 1). Wells RW-C3 and OB-C1 had depleted levels of oxygen, and wells RW-C6 and OB-C1 had enriched levels of carbon dioxide, which is often indicative of the presence of aerobic, hydrocarbon-degrading microbes within the soil. At the end of each test, significant increases in oxygen were measured in wells OB-C1 and RW-C3, which is indicative of subsurface air movement and introduction of air at atmospheric levels.

Estimated Hydrocarbon Removal Rates: During the TPE testing of Plume C, vapor-phase mass removal rates from the test wells ranged from low (2.2 lbs/day) to moderate levels (22 lbs/day). Approximately 297 gallons or 45 pounds of vapor-phase hydrocarbons were removed from test wells in Plume C (see equations below)

HC vapor removal rate (lbs/day) = flowrate (sfcm) x well conc. (ppmv) x conv. factor (3.2E-4) HC volume in vapor (gal) = HC vapor removal rate (lbs/day) x # of days / 6.6 lbs of HC/gal

A water sample collected from the Plume C storage tank had TPHg and TPHd concentrations of 7,700 and 3,300 parts per billion (ppb), respectively (Table 2 and Appendix B). Approximately 16,000 gallons of hydrocarbon-impacted groundwater was extracted during the five days of testing. Approximately 0.23 gallons of dissolved-phase hydrocarbons and 200 gallons of separate-phase hydrocarbons were removed from the subsurface (see equations below).

HC volume in gw (gal) = TPHg+TPHd conc. (ug/L) x gw volume (gal) x conv. factor (8.346E-9) / 6.6 lbs of HC/gal

SPH volume (gal) = SPH volume (cubic ft) x 7.48 gal/cubic ft

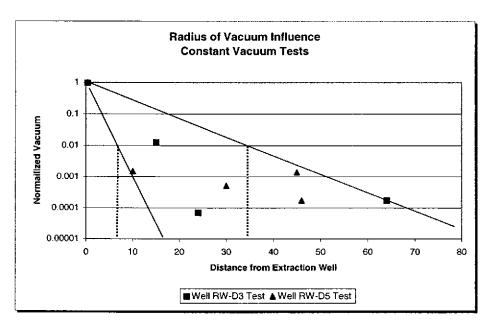
<u>PLUME D Test Area:</u> During TPE testing, the following observations and findings were noted from wells related to Plume D:

• Well vapor flow rates ranged from 5 to 32 cfm. Well vapor and system flowrates usually decreased as the applied vacuum and stinger depth increased.



- Lower well vapor extraction flowrates corresponded with the higher groundwater extraction rates. Groundwater extraction rates ranged from 0.7 to 4.1 gpm.
- The highest hydrocarbon vapor concentration was measured in RW-D4 at 46,280 ppmv. Hydrocarbon vapor concentrations were highest at the beginning of the test and decreased significantly by the end of the test.
- Significant drawdown in water levels was observed up to 2.6 ft in RW-D1, 2.7 ft in RW-D3, and 0.8 ft in RW-D4 while extracting from RW-D2. The amount of drawdown related to the TPE activities was difficult to determine due to varying SPH levels, remnant conditions between test wells, and tidal influences.
- Vacuum influence in observation wells ranged from 0 to 3.6 inches of H₂O. Vacuum levels did not always respond as expected, with positive pressure often being observed in observations near to the extraction well. The relatively close proximity of the wells to the San Leandro Bay and changing tides may be a possible cause for the anomalous positive pressure readings.
- After TPE testing, SPH thickness had decreased in all test wells: RW-D2, RW-D3, RW-D4, and TBW-5 (see Table 3).

Radius of Vacuum Influence: The effective radius of vacuum influence was estimated as previously described for Plume C. As shown on the graph below, the estimated effective radius of vacuum influence ranged from 7 to 34 feet at the end of the constant vacuum tests on wells RW-D3 and RW-D5.





Vapor Analytical Data: Vapor samples were collected from wells RW-D2, RW-D3, RW-D4, RW-D5 near the end of the constant vacuum tests. Sample analytical results exhibit a decreasing concentration trend during each test similar to the readings collected using the Horiba gas analyzer (see Table 1).

Vapor measurements collected from the test wells had pre-test levels of oxygen ranging from 0.82 to 18.94%, (atmospheric level is ~20.9%), and levels of carbon dioxide ranging from 0 to 15.16%, (atmospheric level is ~0.03%) (see Table 1). Wells RW-D2, RW-D3, RW-D4, and TBW-5 had depleted levels of oxygen, and wells RW-D3, RW-D4, and TBW-5 had enriched levels of carbon dioxide, which is often indicative of the presence of aerobic, hydrocarbon-degrading, microbes within the soil. Significant increases in oxygen were measured in wells RW-D2, RW-D3, and RW-D5 at the end of each test, which is indicative of subsurface air movement and introduction of air at atmospheric levels.

Estimated Hydrocarbon Removal Rates: During the TPE testing of Plume D, vapor-phase mass removal rates from the test wells ranged from low (1.2 lbs/day) to high levels (135 lbs/day). Approximately 245 pounds or 1,617 gallons of vapor-phase hydrocarbons were removed from test wells in Plume D (see equations below).

HC vapor removal rate (lbs/day) = flowrate (sfcm) x well conc. (ppmv) x conv. factor (3.2E-4) HC volume in vapor (gal) = HC vapor removal rate (lbs/day) x # of days / 6.6 lbs of HC/gal

A water sample collected from the Plume C storage tank had TPHg and TPHd concentrations of 48,000 and 10,000 parts per billion (ppb), respectively (Table 2 and Appendix B). Approximately 17,000 gallons of hydrocarbon-impacted groundwater was extracted during the five days of testing. Approximately 1.2 gallons of dissolved-phase hydrocarbons and 143 gallons of separate-phase hydrocarbons were removed from the subsurface (Table 4).

HC volume in gw (gal) = TPHg+TPHd conc. (ug/L) x gw volume (gal) x conv. factor (8.346E-9) / 6.6 lbs of HC/gal

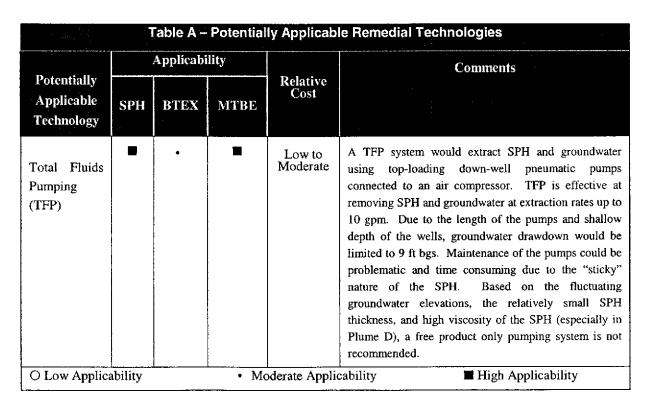
SPH volume (gal) = SPH volume (cubic ft) x 7.48 gal/cubic ft



FEASIBILITY STUDY

Remedial Objective: The remedial objective was to evaluate and determine the most cost effective technology for SPH removal which would subsequently allow a long term groundwater monitoring and natural attenuation remedial approach to be implemented for the site.

Remedial Technologies Considered: Four potentially applicable technologies were considered: 1) total fluids pumping ([TFP] – top loading, down-well pumps extract both SPH and groundwater), 2) dual phase extraction ([DPE] – a blower extracts soil vapors while pumps extract groundwater), 3) two phase extraction ([TPE] – a liquid ring pump extracts soil vapor and groundwater simultaneously through a stinger pipe), and 4) vacuum truck operations ([Vac-Ops] – a vacuum truck extracts SPH and groundwater using a high vacuum pump. All options assume that overhead electricity is not available onsite, and that power for the remediation system would need to be provided by other means (i.e. diesel generator). All options also assume the same type of SPH/groundwater treatment system would be installed for each plume, consisting of a free product separator, surge tank, transfer pump, and polymer (PetrolokTM) and/or aqueous-phase carbon for treatment prior to discharge to the storm drain. Our evaluation includes a comparative analysis of each technology's relative cost effectiveness, applicability to contaminants, and anticipated effectiveness at the site.





				ly Applicab	le Remedial Technologies
	.	Applicabi	lity		Comments
Potentially Applicable Technology	SPH	BTEX	МТВЕ	Relative Cost	
Dual-phase extraction (DPE)				High to Very High	A DPE system typically uses a blower for soil vapor extraction (SVE) and removal of SPH, and down-well pumps to lower the water table and extract groundwater. Soil vapors are typically abated using a catalytic/thermal oxidizer. The applied vacuum enhances groundwater extraction rates. DPE is typically applied to sites where well dewatering is needed to maintain lower water levels or expose previously saturated soil to airflow. Sites usually have moderate groundwater extraction rates (5-10 gpm), submerged smear zones, and/or varying soil vapor concentrations due to seasonal groundwater levels. The SVE portion of the TPE system could be seasonally shut off allowing groundwater extraction only. While groundwater extraction rates during the pilot testing ranged from 0.7 to 8.0 gpm, decreasing vapor concentrations indicate that this method may use excessive amounts of supplemental fuel over the long term. DPE systems require a large amount of power (200-amp service), and are typically noisy and require frequent (weekly) operation and maintenance visits. Maintenance of the pumps could be problematic and time consuming due to the "sticky" nature of the SPH. The high boiling point nature of the SPH may not be amenable to complete removal by SVE only (especially plume D).
O Low Applic	ability	<u> </u>	• Mo	oderate Appli	cability ■ High Applicability



		Γable A –	Potential	lly Applicab	le Remedial Technologies
		Applicabi	ility	-	Comments
Potentially Applicable Technology	SPH	втех	MTBE	Relative Cost	
Two Phase extraction (TPE)				High to Very High	TPE typically uses an aboveground liquid ring pump to extract both soil vapor and SPH/groundwater through a down hole stinger pipe. Soil vapors are usually abated using a catalytic/thermal oxidizer. The applied vacuum enhances SPH/water extraction rates and SVE performance by drawing down the water level and exposing previously saturated soil. Using a stinger pipe, the depth at which SPH/groundwater is extracted is easily adjusted, enabling preferred SPH extraction from the top of the water table downward. TPE is typically most effective in lower permeability soils where relatively low groundwater extraction rates (<5 gpm) result in significant drawdown enhancing SVE. During the pilot testing, groundwater extraction rates ranged as high as 8.0 gpm, making it difficult to achieve sufficient groundwater drawdown. Decreasing vapor concentrations during testing indicate that excessive amounts of supplemental fuel may be required to operate the system over the long term. TPE systems require a large amount of power (200 amp service), and costs to provide this power are very expensive. TPE systems require frequent (weekly) operation and maintenance visits.
O Low Applica	ability		• Mo	oderate Applie	cability H igh Applicability



		Applicabi	lity		Comments
Potentially Applicable Technology	SPH	BTEX	MTBE	Relative Cost	
Vacuum Truck Operations (Vac-Ops)				low	Vac-Ops typically involves a vacuum truck equippe with a 4,800-gallon tank and a high vacuum pump to extract both soil vapor and SPH/groundwater. Vac-Opt typically uses similar equipment as a TPE system but the truck's diesel engine provides the power to operate the equipment. A stinger pipe is used to extract SPH/groundwater from a series of wells. Soil vapor are abated using vapor-phase carbon, if needed. The applied vacuum can enhance SPH/groundwate extraction rates and SVE performance by drawing dow the water level and exposing previously saturated soil Using a stinger pipe, the depth at whice SPH/groundwater is extracted is easily adjusted enabling controlled SPH extraction from the top of the water table downward. Groundwater extraction volume and subsequent disposal costs are comparatively much less. Vac-Ops is typically performed when installation and/or operation of a permanent TPE or DPE system is cost prohibitive, or when hydrocarbon removal rates an anticipated to drop quickly. Decreasing vapor concentrations and removal rates were noticed on more wells after only one day of testing. The frequency and duration of Vac-Ops events can be scheduled according to site conditions allowing better control of remediation costs. Vac-Ops could be performed on both or either Plume C or Plume D areas, thereby eliminating the installation and maintenance costs for two separatemediation systems.

Estimated Costs of Applicable Technologies: Based on the above analysis, TPE and Vac-Ops approaches are the most technically applicable potential technologies for the site. Depending on project time frames, the flexibility and lower capital and maintenance costs of implementing Vac-Ops makes it the most cost-effective approach to address both plumes. A more detailed estimate of anticipated costs for all options is summarized below. We assumed that each plume would require its own remediation system, and the costs are applicable to cleanup of only one plume area. Costs



could be reduced by sharing remedial systems between plumes. If the cleanup of both plumes were to be combined, cost savings from operation and maintenance would be realized though system installation and construction costs would also be substantially higher. The estimated costs shown below are based, in part, on our past experience working with all four technologies.

	,	Table B -	- Duration ar	nd Cost Est	imates		
Potentially Applicable Technology	Permits and Approvals	Installation/ Construction	Operations And Maintenance (Annual)	Quarterly Monitoring (Annual)	Estimated Duration (Years)	Estimated First Year Cost	Estimated Life Cycle Cost
TFP	\$5,000 (water discharge fees)	\$45,000 (trenching/ install piping, and purchase and install 4 pumps and equipment/ gw treatment system)	\$90,000 (three site visits/mo, rental diesel generator usage costs \$38k/yr, consumables)	NA	2 total (SPH removal only)	\$137,000	\$227,000
DPE	\$10,000 (air, water discharge permitting and fees, and building permit)	\$120,000 (convert groundwater wells for DPE, trenching/ install piping, purchase 4 pumps, and install DPE equipment/ gw treatment system)	\$155,000 (three site visits/mo, rental cat-ox, rental diesel generator usage costs \$44k/yr, consumables)	NA	1.5 total (SPH removal only)	\$285,000	\$440,000
TPE	\$10,000 (air, water discharge permitting and fees, and building permit)	\$110,000 (convert groundwater wells for TPE, trenching/ install piping, and TPE equipment/ gw treatment system)	\$160,000 (three site visits/mo, rental liquid ring/cat-ox, rental diesel generator usage costs \$44k/yr, consumables)	NA	1.5 total (SPH removal only)	\$280,000	\$440,000
Vac-Ops	\$2,000 (water discharge permit and fees)	\$20,000 (build stingers and install gw treatment system)	\$35,000 (weekly 8 hr events, subcontract vacuum truck)	NA	3 total (SPH removal only)	\$57,000	\$127,000



RECOMMENDATIONS

Based on our detailed evaluation presented above, vacuum truck operations is the most costeffective approach to address removal of SPH at the site. To summarize, we recommend this approach for the following reasons:

- Vac-Ops utilizes downwell stingers, the same favorable extraction process as TPE,
- No system operation and maintenance is needed,
- No on site power is required,
- No capital costs for equipment and minimal equipment installation costs are required,
- Vac-Ops is timely and can be implemented as needed depending upon seasonal variations in SPH levels,
- Vac-Ops has the flexibility to extract from various wells from different plumes based on varying extraction schedules,
- The use of downhole pumps is avoided thereby eliminating costly pump maintenance related to the "sticky" nature of the SPH,
- Vac-Ops requires minimal space allowing more space for truck parking and related City of Oakland activities,
- Remediation costs are substantially less than other alternatives through reduced disposal costs, elimination of a diesel generator and supplemental fuel, and reduced O&M efforts.

In the short term, we recommend that a Vac-Ops approach be implemented immediately to maximize SPH removal during the fall months. Extracted SPH and groundwater can either be immediately hauled away for disposal or temporarily stored in the 21,000-gallon storage tanks, and subsequently treated and batch discharged into a sanitary sewer or storm drain depending upon treatment facilities and discharge permit conditions. After evaluating the outcome of these short-term activities, further consideration can be given to installation of a permanent TPE next year, if needed. In an effort to decrease the duration of Vac-Ops activities and in turn reduce lifecycle costs, we recommend that additional VRA injections be considered with the SPH cleanup efforts, when SPH levels and removal rates have stabilized, so that VRA's affect on SPH mobilization can be quantified.



ATTACHMENTS

Figure 1 – Vicinity Map

Figure 2 – Site Map

Figure 3 – Plume C and Plume D Test Areas

Table 1 – Two Phase Extraction Test Summary

Table 2 – Laboratory Analytical Results

Table 3 - Groundwater Monitoring Data

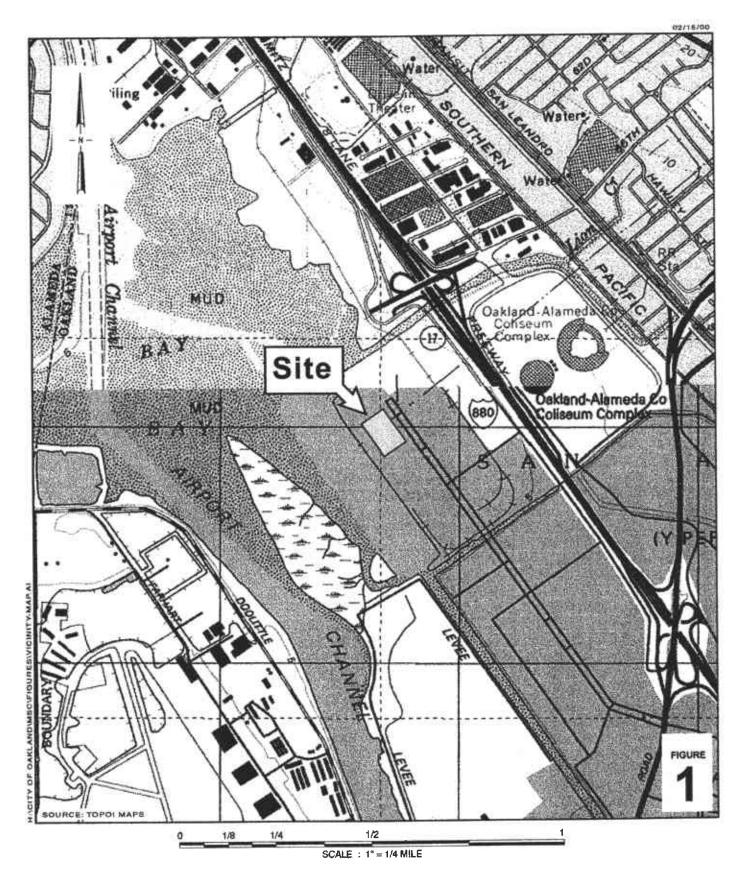
Table 4 - Hydrocarbon Removal Data

Appendix A – TPE Pilot Test Vapor Analytical Data Appendix B – Baker Tank Water Analytical Data

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Municipal Service Center

7101 Edgewater Drive Oakland, California



Vicinity Map

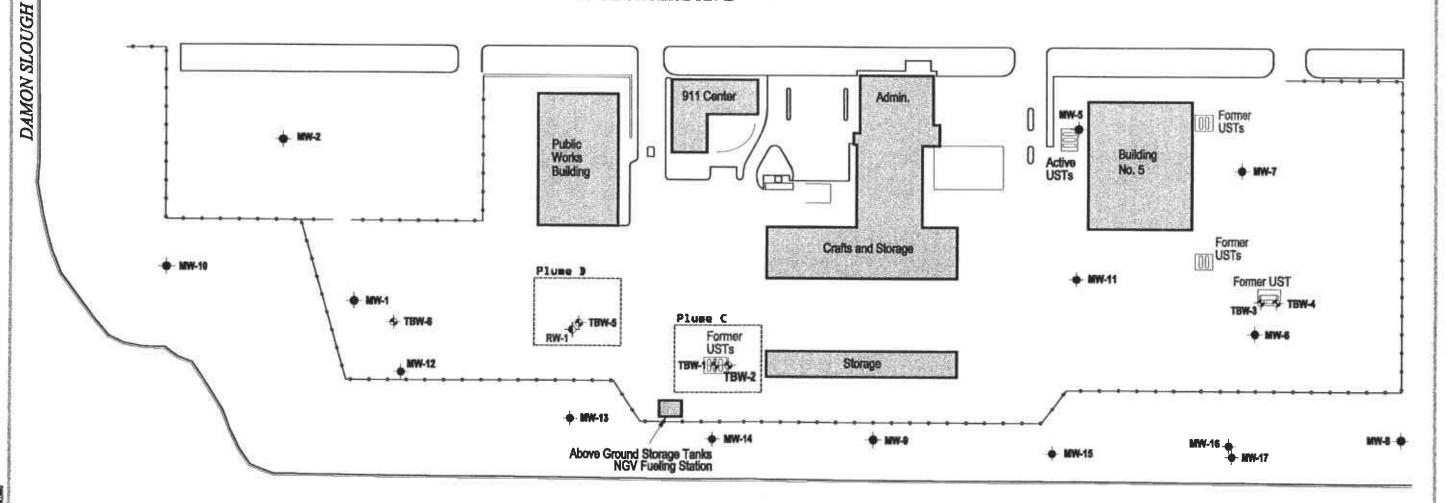
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X MW4

EXPLANATION

X MW-3

EDGEWATER DRIVE

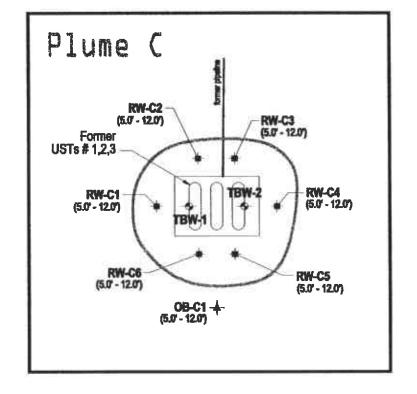


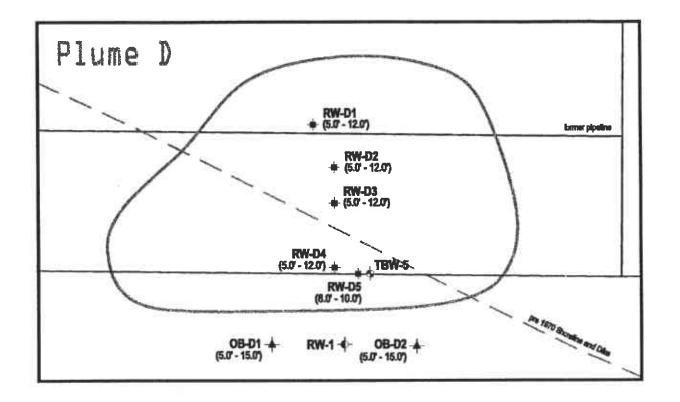
Scale (ft)

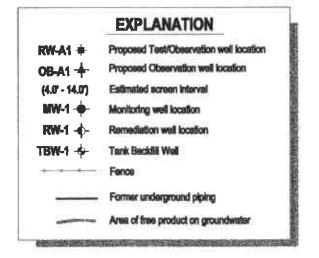
SAN LEANDRO BAY

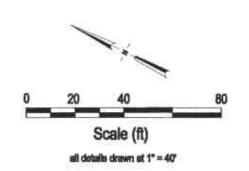
FIGURE

Municipal Service Center 7101 Edgewater Drive Oakland, California









FIGURE

Table 1. Two Phase Extraction Test Summary

City Of Oakland, Municipal Services Center 7101 Edgewater Drive, Oakland, California

																	vac	uum Read	រោជ្ជន			
	Well	System	Stinger	Applied	Well HC	Well HC	Well CO,	Well O,	Depth	Depth to	SPH	Vapor Removal	GW Extraction									
Date and Time	Flowrate	Flowrate	Depth	Vacuum	Conc.	Conc.	Conc.	Conc.	to SPH	Water	Thickness	Rate	Rate	RW-C1	RW-C2	RW-C3	RW-C4	RW-C5	RW-C6	RW-C7	OB-C1	TBW-
	(cfm)	(cfm)	(feet bgs)	(in.of Hg)	Lab (ppmv)	(ppmv)	Horiba (%)	Horiba (%)	(feet bgs)	(feet bgs)	(feet)	(lbs/day)	(gpm)	(in. of water)	(in. of water)	(in, of water)	water)	(in. of water)	water)	water)	water)	water
PLUME C T	EST A	REA																				
Well RW-C5 Test						4700°	0.84*	19.36*	6.96*	6.28	0.68*											
						4,00	0.04	13.00	6.16	7.80	1.64		_									
6/7/02 7:45 6/10/02 8:30	-	-	-	-	-	•	•	•	6.20	7.76	1.56											
	20	20	7.5	12			-		0.20	1.70	1.30			0.01	-	0.41	0	-	0	0	0	0.02
6/10/02 12:00	-26	80 95			•	•	•	-	_	_	-		-	0.01	•	>1.0	Ö	-	٥	Ŏ	Ŏ	0.02
6/10/02 13:10	~31		0.8	12.0	•	•	-	*	•	•	•		2.1	1		2.35	+				,	0.05
6/10/02 15:10	-33	102	0.8	18	-	-	-	•	•	•	•		3.1	0.015	•	2.33	+	•	+	+	+	0.05
system off overnight-r	repairs needs	a							6.00	6.54	0.00			١ ,					^	^		^
6/11/02 13:20	· -		•	-	•				6.82	6.84	0.02		-	0	-	0	0	•	0	0	0	0
6/11/02 13:50	32	97	8.0	18		1,140	1.32	20.60	•	•	•		•	0.01	-	0.40	+	-	+	+	+	0
6/11/02 15:10	-18	54	9.0	21	1,300	3,550	1.60	19.71	•	•	•	2.2	-	0.01	•	1,75	+	-	+	+	+	0.10
Well RW-C6 Test						33,000°	17.22	18.00	5.83ª	6.02*	0.19°											
6/7/02 7:45	-						•	-	5.75	6.49	0.74											
6/10/02 8:30		_	_	-	-		-		5.71	6.75	1.04											
6/11/02 15:35	~23	71	8.5	18	-	7,500	0.62	20.28	6.53	7.05	0.52	22.0	-	0.005		2.80	+	0.08		+	0	0
6/11/02 16:20	~26	80	12.0	21	_	-								0		2,85	0.01	0.11		+	ō	ō
6/12/02 8:50	-16	49	12.0	21			-	_	_	_	_		8.0	1 -	_		-	•			·	
6/12/02 10:00	-16	48	11.0	21	_		_	_	_	_	_		-	0.01	-	0.23	D	0.90	_	n	0.05	0
		47		21	•	•							-	0.0	-	0.24	0.01	0.90	_	ŏ	0.05	ő
6/12/02 11:00	~15		11.0		-	•	•	•	•	•	•		•	0		0.18	0.01	0.50	-	Õ	0.03	ă
6/12/02 12:35	~7	20	11.0	25	-		-	45.55	7.00	-			•		•		-	-	-	0	-	0
6/12/02 13:00	-7	20	11.0	25	•	21,000	3.60	15.55	7.90	8.05	0.15	7.7	-	0	-	0.21	0.01	0.01	•	U	0.05	v
Well OB-C1 Test						41,000°	8.66*	5.54°	6.43*	6.714	0.29"											
6/12/02 14:30	_	•	•				-	-	7.22	7.75	0.53		-									
6/12/02 18:30	-22	68	9	20			-							a	-	0	٥	0	o o	0	-	0
6/12/02 20:30	~19	58	7.75	21	-				-	-				O.		0	0	0	0	o	-	0
6/13/02 6:30	~18	55	7.75	21	_	-	_	_	-	9.86			2.3	a		Ó	٥	Ó	o	0.05		0
6/13/02 8:49	-	•	-		11,000	-950	6.01	10.51	•	-	-	18.9	-	ŏ	-	ō	ō	ŏ	ō	0.05		Ō
						pros	?*	20.44°		6.13°												
Well RW-C2 Test						2760°	f	20.44						_		•	•	•	•	•	0.05	•
6/13/02 7:45	19	58	8.5	21	•	•	•	-	8.09	8.14	0.05		-	0	•	0	0	0	0	0	0.05	0
6/13/02 8:10	-19	59	8.5	21	•	•	•	•	•	•	•		-	0	-	0.09	0	0	0	0	0.05	0
6/13/02 10:00	~19	57	9.0	21	•	•	•	-	•	-	•		•	0	•	0.09	0	•	0.04	0	•	0
6/13/02 14:10	~14	44	11.0	22	-	-	-	-	•	•	-		•	0	•	0.1	0.04	•	0.02	0	•	0.02
6/13/02 15:05	-14	44	11.0	22	•	•	•	-	•	•	-		-	0	-	0.07	0.04	-	0.02	0.02	-	0.02
6/13/02 19:30	-	-	•	٠	-	•	•	-	8.31	8.32	0,01		2.4									
Well RW-C3 Test						35,000	?*	9.26*		6.25°				<u> </u>								
6/13/02 15:20	-14	44	11.0	22				•		•				0	0.04	-	0.04		0.02	0.02		0
6/13/02 15:40	~14	44	11.0	22										ő	0.04		0.04		0.02	0.02		ŏ
6/13/02 19:30	~20	61	11.0	21	12,000	10,000	0.10	14.6	-		-	22.9	2.3	ő	0.04		0.04	0	0.02	0.02		ő
	~20	O1	-	21	12,000	10,000	0.10	14.0	-	-	-	22.5	2.0	Ö	0.04	-	0.04	-	0.06	0.01	•	0.02
6/13/02 20:45			9.0	∠ 1	•	•	•	-	•	•	•		-	, ,	Ų	-	0.03	-	0.00	0.02	-	0.02
system left running over	rright on RW-C	5	0.0	24										a	0.01		0.055		0.06	0.05		0.04
	-	110	9.0 9.0	21 21	-	7.780	0.80	20.08	-	-	•		-	٥	0.01	•	0.055	•	0.06	0.05		0.04
6/14/02 9:45 6/14/02 10:15	36																					

Page 1 of 2

Table 1. Two Phase Extraction Test Summary

City Of Oakland, Municipal Services Center 7101 Edgewater Drive, Oakland, California

Date and Time	Well Flowrate	System Flowrate	Stinger Depth	Applied			Well CO ₂	_	Depth	Depth to	SPH	HC Removal		5111 54	DIII DO	DIA D0	DW D4	DW DE	00.04	TD141.5	mu. 4	
Date and Time				Vacuum	Conc.	Conc. Horiba	Horiba	Conc. Horiba	to SPH	Water	Thickness	Rate	Rate	RW-D1 (in. of	RW-D2 (in. of	RW-D3	RW-D4	RW-D5 (in. of	OB-D1 (In. of	TBW-5 (in. of	RW-1 (in. of	
DI UNE D. 7	(clm)	(cfm)	(feet bgs)	(In.of Hg)	(ppmv)	(ppmv)	(%)	(%)	(feet bgs)	(feet bgs)	(feet)	(lbs/day)	(gpm)	water)	water)	water)	water)	water)	water)	water)	water)	
PLUME D T	EST A	KEA																				
Well RW-D2 Test						55,000°	?*	6.00°	6.06ª	7.76°	1.70ª											
6/18/02 12:00	-	>300	6.0	7.5	-	-	•	•	•	•				+	-	+	0.91	+	0.41	0	0.95	
6/18/02 12:15	5	205	6.0	15	•	•	•	•		-	-		-] -	-	-		-	•	-	•	
6/18/02 12:30	26	126	6,0	20		•	-	•	•	•	-		1.0	+	•	+	+	+	+	0	0.36	
6/18/02 13:10	32	124	9.0	20	40,000	32,500	?	16.54	-	-		135.6	3.3	0,52	•	+	+	+	+	0	0.30	
6/19/02 9:00	22	125	9.0	20	13,000	34,000	?	16.34	-	•	•	30.3	4.1	0.20	-	+	+	+	0.05	0	0.06	
6/20/02 10:50	•	•	-	•	•	•	•	•	8.60	8.90	0.30		-	ļ								
Well RW-D3 Test						41,020"	15.16°	4.55°	5.88ª	7.51°	1.63ª											
6/19/02 9:50	-	>300	6.0	10	-	-	_				-		•		•	-	-	-	-	-		
6/19/02 10:20	-	>300	6.0	10		-							0.7	0.36	+		+	+	0.03	0	0.04	
6/19/02 10:27	~ 5	190	6.0	15	36,000	37,000	?	11.74			•	28.7	- :	-					•.••		•	
6/19/02 10:57		196	6.0	15	•		÷	-					1.0	0.36	+		4	_	0	n	0.03	
6/19/02 11:43	19	108	9,0	20				_	_	. <u>-</u>	-		-	+	1.75			÷	ő	ő	0.02	
6/19/02 12:15	23	108	9.0	20			_		_	_	_		3.2	+	2.45	_	i	·	0.05	ŏ	0.02	
6/20/02 9:30	23	108	9.0	21			_	_					2.6		3.60	_	÷	+	0.02	ŏ	0.02	
6/20/02 11:15	23	108	9.0	21	1,700	2,140	0.26	20.72	_			3.7	-	,	0.00		•		U.UE		0.02	
8/20/02 14:30	-	-		-		-,	•	•	8.00	8.25	0.25		•									
Well RW-D4 Test						46,280°	12.14	6.72ª	6.78	6.91°	0.13ª											
6/20/02 12:05	-	_	7.0	10	_				0.,0	5.51	•		1.0	Ð	0				0.02	0	o.	
6/20/02 12:55	_	_	7.0	15	_	_	_	_	_				2.0	Ŏ	0	0.3 0.3	-	+	0.02	0	Ō	
6/20/02 13:35	~20	~100	7.0	20	570	-				-		1.2	2.0	n	n	0.3	-	0	0.02	0	0	
6/20/02 14:30	-	* 100		-	3/0			-	6.90	7.25	0.35	1.2			U	v	•	U	0.02	U	U	
Well RW-D5 Test						5.950ª	3.84°	18.94°		6.56												
6/20/02 14:30						41900	0.04	10.94	6.70	6. 7 7	0.07											
6/20/02 14:30 6/20/02 15:20	20	-95	11.0	23	•	•	•		0.70	0.77	0.07		•	_	•		_		0.00	0.00		
6/21/02 9:00	17.5	92	11.0	21	-	•	•	•	•	•			2.4	0	0	0	+	0	0.02	0.02	0	
6/21/02 9:50 6/21/02 9:50	17.5	72	11.0	۷۱	2 102	5,780	4.40	19.94	-	-		5.2	2.4	+	0.40	+	- 0.43	•	0.05	0.01	0.15	
6/21/02 12:45	:	:	:	-	3,100	5,760	1.40	19.94	7.63	7.65	0.02	5.2	3.4	•	-	•	•	-	•	-	-	-
Well TRW E To						40.000	45.04	0.004	e Tel	c not	o ant											
Well TBW-5 Test 5/21/02 10:00	_	_	9.0	21	_	40,000	15.04	0.82	6.70°	6.93"	0.23ª			_	_	_	_	_		_		
3/21/02 12:45	-15	~81	9.0	21	-	_	-	-	7.83	7.B5	0.02	57.2	3.4	_	-	•	•	•	•	•	•	
system left running o					22/02 at 3:	15PM	=	-	7.00	1.00	0.02	J1.2	J. 4	Ţ	-	•	•	•	-	-	-	-
a = background parar	ntar massure	d oriente TDI	E testina an	luna 3 /Pku	ma C) and	June 17 1	2002 (E)	o D)														
a = background parar - = estmated value	indi ilibasuid	a prior to TPI	= resuring our	101 C 6110	ine ∪/ a⊓o	JUNE 17, 2	cook (Fluit	1 0 D)														
 = positive pressure 	megzarerden	ı																				

Table 2. Laboratory Analytical Results
City of Oakland, Municipal Service Center
7101 Edgewater Drive, Oakland, California

Test Area	Extraction Well	Date	Time	Media	TPHd (ppmv)	TPHg (ppmv)	Benzene (ppmv)	Toluene (ppmv)	Ethylbenzene (ppmv)	Xylenes (ppmv)	MTBE (ppmv)	
				Analyti	cal Method:	8020	8020	8020	8020	8020	8015C	
Plume C												
	MW-C5	06/11/02	15:00	air		1,300	49	8.4	2.5	5.2	<14	
	OB-C1	06/13/02	9:00	air		11,000	170	35	12	15	<50	
	RW-C3	06/13/02	20:15	air		12,000	120	120	20	120	<50	
Plume D			•									<i>(</i>
	RW-D2	06/18/02	12:55	air		40,000	1,000	800	49	180	430	not confirmed
	RW-D2	06/19/02	9:25	air		13,000	340	216	9.6	40	<70	(C)
	RW-D3	06/19/02	10:40	air	_	36,000	870	610	32	120	350	
	RW-D3	06/20/02	11:15	аіг	**	1,700	33	30	4.8	21	na	
	RW-D4	06/20/02	13:30	air		570	9.8	5.5	3.2	13	na	
	RW-D5	06/21/02	9:50	аіт	-	3,100	200	31	10	39	<60	
				L	TPHd	TPHg	Benzene	Toluene	Ethylbenzene	Xylenes	MTBE	
	Sample ID	Date	Time		(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	(ppb)	
		Analytic	al Method:		8015	8020	8020	8020	8020	8020	8015	
	TANK (Plume C)	06/17/02	15:00	water	3,300	7,700	390	520	38	1,200	<50	
	TANK (Plume D)	07/11/02	7:00	water	10,000	48,000	1,000	3,700	930	7,000	<250	

TPHd = Total Petroleum Hydrocarbons as diesel

TPHg = Total Petroleum Hydrocarbons as gasoline

MTBE = Methyl tertiary butyl ether

ppmv = parts per million by volume

ppb = parts per billion

<n = less than method reporting limit

na = not analyzed

Table 3. Groundwater Monitoring Well Data
City of Oakland, Municipal Service Center
7101 Edgewater Drive, Oakland, California

			land, California				
Test	Extraction			Groundwater	SPH	SPH	
Агеа	Well	Date	Time	Depth	Depth	Thickness	Comments
				feet	feet	feet	
lume C							
	RW-C1	06/03/02	9:25	6.31	na	0.00	prior to testing
	RW-C1	06/17/02	6:00	8.05	па	0.00	3 days after testing at high tide
	RW-C1	06/17/02	13:10	8.09	па	0.00	3 days after testing at low tide
	RW-C2	06/03/02	8:20	6.13	na	0.00	prior to testing
	RW-C2	06/17/02	6:05	8.20	8.13	0.07	3 days after testing at high tide
	RW-C2	06/17/02	13:15	8.25	8.19	0.06	3 days after testing at low tide
	RW-C3	06/03/02	8:25	6.25	na	0.00	prior to testing
	RW-C3	06/17/02	6:10	8.22	8.20	0.02	3 days after testing at high tide
	RW-C3	06/17/02	13:20	8.21	8.15	0.06	3 days after testing at low tide
							•
	RW-C4	06/03/02	8:30	6.90	na	0.00	prior to testing
	RW-C4	06/17/02	6:15	8.64	na	0.00	3 days after testing at high tide
	RW-C4	06/17/02	13:25	8.67	па	0.00	3 days after testing at low tide
	RW-C5	05/31/02	10:00	6.34	6.32	0.02	prior to VRA injection
	RW-C5	06/03/02	8:48	6.96	6.28	0.68	after VRA injection and prior to testing
	RW-C5	06/07/02	8:04	7.80	6.16	1.64	after VRA injection and prior to testing
	RW-C5	06/10/02	8:30	7.76	6.20	1.56	after VRA injection and prior to testing
	RW-C5	06/17/02	6:20	8.51	8.47	0.04	3 days after testing at high tide
	RW-C5	06/17/02	13:30	8.59	8.43	0.16	3 days after testing at low tide
	RW-C6	06/03/02	8:50	6.02	5.83	0.19	prior to testing
	RW-C6	06/07/02	8:08	6,49	5.75	0.74	prior to testing (affected by VRA?)
	RW-C6	06/10/02	8:50	6.75	5.71	1.04	prior to testing (affected by VRA?)
	RW-C6	06/17/02	6:25	7.90	7.83	0.07	3 days after testing at high tide
	RW-C6	06/17/02		-	_	_	,, ,
	RW-C7	06/03/02	0.70			0.00	muion to tostima
	RW-C7	06/17/02	8:38 6:30	6.41 8.58	. па 8.55	0.00 0.03	prior to testing
	RW-C7	06/17/02	13:35	8.84			3 days after testing at high tide
	RW-C/	00/1//02	15:55	0.04	8.75	0.09	3 days after testing at low tide
	OB-C1	05/31/02	10:00	6.56	6.34	0.22	prior to testing
	OB-C1	06/03/02	8:53	6.71	6.43	0.28	prior to testing (affected by VRA/other wells?)
	OB-C1	06/07/02	8:12	6.60	6.43	0.17	prior to testing (affected by VRA/other wells?)
	OB-C1	06/12/02	14:30	7.75	7.22	0.53	prior to testing (affected by VRA/other wells?)
	OB-C1	06/17/02	-			••	3 days after testing at high tide
	OB-C1	06/17/02	13:50	8.13	8.02	0.11	3 days after testing at low tide
	TBW-1	06/03/02	8:40	6.33	na	0.00	prior to testing
	TBW-i	06/17/02	6:35	8.60	8.49	0.11	3 days after testing at high tide
	TBW-1	06/17/02	13:40	8.62	8.42	0.20	3 days after testing at low tide
	TBW-2	06/03/02	8:32	6.61		0.00	prior to testing
	TBW-2	06/17/02	6:40	6.61 8.60	па	0.00	3 days after testing at high tide
	TBW-2	06/17/02	13:45	8.64	na aa	0.00	3 days after testing at fight fide
	15W-2		15:45 hange in DTW:	8.04 0.06	Ωa	0.00	2 days after resume at row time

Table 3. Groundwater Monitoring Well Data
City of Oakland, Municipal Service Center
7101 Edgewater Drive, Oakland, California

Test	Extraction			Groundwater	SPH	SPH	
Area	Well	Date	Time	Depth	Depth	Thickness	Comments
				feet	feet	feet	
Plume D							
	RW-1	06/18/02	8:15	6.31	na	0.00	prior to testing
	RW-1	06/24/02	-14:15	6.92	na	0.00	2 days after testing
	RW-DI	06/18/02	10:15	6.26	na	0.00	prior to testing
	RW-D1	06/24/02	~14:15	7.63	па	0.00	2 days after testing
	RW-D2	06/18/02	10:00	7.76	6.06	1.70	prior to testing
	RW-D2	06/24/02	~14:15	8.15	7.67	0.48	2 days after testing
	RW-D3	06/18/02	9:45	7.51	5.88	L.63	prior to testing
	RW-D3	06/24/02	-14:15	7.54	7.49	0.05	2 days after testing
	RW-D4	06/18/02	9:30	6.91	6.78	0.13	prior to testing
	RW-D4	06/24/02	~14:15	7,57	7.47	0.10	2 days after testing
	RW-D5	06/18/02	9:00	6.56	na	0.00	prior to testing
	RW-D5	06/24/02	-14:15	7.42	па	0.00	2 days after testing
	OB-D1	06/18/02	8:45	6.06	na	0.00	prior to testing
	OB-D1	06/24/02	~14:15	6.60	ла	0.00	2 days after testing
	OB-D2	06/18/02	8:15	5.04	na	0.00	prior to testing
	OB-D2	06/24/02	-14:15	6.93	na	0.00	2 days after testing
	TBW-5		9:15	6.93	6.70		
	TBW-5	06/18/02 06/24/02	9:13 ~14:15	6.93 7.62	7.55	0.23 0.07	prior to testing 2 days after testing

SPH = separate phase hydrocarbons na = data not applicable

Analytical.xls 2 of 2

^{- =} data not collected

Table 4. Hydrocarbons Removal Data
City of Oakland, Municipal Service Center
7101 Edgewater Drive, Oakland, California

Test Area	Vapor-Phase HC (gallons)	Dissolved-Phase HC (gallons)	Separate-Phase HC (gallons)	Total Volume (gallons)
Plume C	297	0.23	200	497
Plume D	1,617	1.2	143	1,761
Total	1,914	1.4	343	2,258

HC = total petroleum hydrocarbons as gasoline and diesel



APPENDIX A

TPE Pilot Test Vapor Analytical Data

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560
Telephone: 925-798-1620 Fax: 925-798-1622
http://www.mccampbell.com E-mail: main@mccampbell.com

Cambria Env. Technology	Client Project ID: 153-1653; OAK-MSC	Date Sampled: 06/11/02
6262 Hollis St.		Date Received: 06/12/02
Emeryville, CA 94608	Client Contact: Ron Scheele	Date Reported: 06/18/02
	Client P.O.:	Date Completed: 06/18/02

June 18, 2002

Dear Ron:

Enclosed are:

- 1). the results of 1 samples from your 153-1653; OAK-MSC project,
- 2). a QC report for the above samples
- 3). a copy of the chain of custody, and
- 4). a bill for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits. If you have any questions please contact me. McCampbell Analytical Laboratories strives for excellence in quality, service and cost. Thank you for your business and I look forward to working with you again.

Angela Rydelius, Lab Manager

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560 Telephone: 925-798-1620 Fax: 925-798-1622 http://www.mccampbell.com E-mail: main@mccampbell.com

Cambria I	Environmental	Technolo	ogy	Client	Project ID	: 153-1653	; OAK-	Date Sampled: 06/11/02					
6262 Hol			~	MSC	.			Date Recei	ved: 06/12	/02			
Emeryvill	le, CA 94608			Client	Contact: R	Ron Scheele		Date Extrac	eted: 06/13	3/02			
			,	Client	P.O:			Date Analyzed: 06/13/02					
	e Range (C6-0 ds 5030, modified									& BTEX*			
Lab ID	Client ID	Matrix		H(g) [†]	мтве	Benzene	Toluene	Ethylben- zene	Xylenes	% Recovery Surrogate			
0206197 -001A	MW-C5	Air	130	00,c,a	ND<14	49	8.4	2.5	5.2	#			
* pp	om (mg/L) to ppm	v (uL/L) co	nversio	on for TPI	H(g) assumes	the molecular	r weight of g	asoline to be eq	ual to that of	hexane.			
								-100. 1100-11-12-12-12-12-12-12-12-12-12-12-12-12-					
otherwis	g Limit unless se stated; ND	Air	10	uL/L	1.5	0.15	0.15	0.15	0.25				
	detected above orting limit	s	1.0	mg/kg	0.05	0.005	0.005	0.005	0.005				

The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified gasoline is significant; b) heavier gasoline range compounds are significant(aged gasoline?); c) lighter gasoline range compounds (the most mobile fraction) are significant; d) gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline?; e) TPH pattern that does not appear to be derived from gasoline (?); f) one to a few isolated peaks present; g) strongly aged gasoline or diesel range compounds are significant; h) lighter than water immiscible sheen is present; i) liquid sample that contains greater than ~5 vol. % sediment; j) no recognizable pattern.



^{*} water and air samples are reported in uL/L(ppmv), wipe samples in ug/wipe, soil and sludge samples in mg/kg, and all TCLP and SPLP extracts in ug/L

^{*} cluttered chromatogram; sample peak coelutes with surrogate peak

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560
Telephone: 925-798-1620 Fax: 925-798-1622
http://www.mccampbell.com E-mail: main@mccampbell.com

QC SUMMARY REPORT FOR SW8021B/8015Cm

BatchID: 2416

Matrix: A

WorkOrder: 0206197

EPA Method: SW8021B/8	015Cm E	Extraction: SW5030B			Ext. Date: 6/12/02			Spiked Sample ID: N/A				
Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD	Acceptance Criteria			
	μg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High		
TPH(gas)	N/A	60	N/A	N/A	N/A	112	105	6.0	80	120		
МТВЕ	N/A	10	N/A	N/A	N/A	84.6	86.8	2.7	80	120		
Benzene	N/A	10	N/A	N/A	N/A	95.2	88.5	7.3	80	120		
Toluene	N/A	10	N/A	N/A	N/A	98.5	92.3	6.6	80	120		
Ethylbenzene	N/A	01	N/A	N/A	N/A	97.9	93.1	5.0	80	120		
Xylenes	N/A	30	N/A	N/A	N/A	99	94	5.2	80	120		
%SS	N/A	10	N/A	N/A	N/A	102	101	0.93	80	120		

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions: NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike, or analyte concentration in sample exceeds spike amount.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / (MS + MSD) * 2.

* MS and / or MSD spike recoveries may not be near 100% or their RPDs near 0% if: a) the sample is inhomogeneous AND contains significant concentrations of analyze relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

McCampbell Analytical Inc.

110 Second Avenue South, #D7 Pacheco, CA 94553-5560 (925) 798-1620

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

WorkOrder: 0206197

Cambria Env. Technology

6262 Hollis St.

Emeryville, CA 94608

TEL:

(510) 450-1983

FAX:

(510) 450-8295

ProjectNo: 153-1653; OAK-

PO:

12-Jun-02

				.,,		the second makes the second of	Requested T	ests			*** *** **		
Sample ID	ClientSampID	Matrix	Collection Date	Bottle	8021B/8015	COLUMN COMPANION	A Section 1.	gan rama, a demonstrativos antidos contrativos de la contrativo de la cont	gr sagen glavery etchios	e manage and		41	-
			. 100 Mars	-, -,							-		
0206197-001	MW-C5	Air	6/11/02 3:00:00 PM	1	<u> </u>	a to the town year year	con to the contract of		:		- •		

Date/Time	Date/Time
Relinquished by:	Received by:
Relinquished by:	Received by:
Relinquished by:	Received by:

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

McCampbell Analytical, Inc.; 1 925 798 4612;

Sep - 5-:01_

Page 2/

3.5.00 1.15.4 1.7 1.7	110 2nd Avenue South, #D7, Pacheco, CA 94553-5560
McCampbell Analytical Inc.	Telephone: 925-798-1620 Fax: 925-798-1622
<u> </u>	http://www.mccampbell.com E-mail: main@mccampbell.com

Cambria Env. Technology	Client Project ID: #153-1653-031; MSC-	Date Sampled: 06/13/02
6262 Hollis St.	Oakland	Date Received: 06/14/02
Emeryville, CA 94608	Client Contact: Ron Scheele	Date Reported: 06/20/02
	Client P.O.:	Date Completed: 06/20/02

June 20, 2002

Dear Ron:

Enclosed are:

- 1). the results of 2 samples from your #153-1653-031; MSC-Oakland project,
- 2). a QC report for the above samples
- 3). a copy of the chain of custody, and
- 4). a bill for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits. If you have any questions please contact me. McCampbell Analytical Laboratories strives for excellence in quality, service and cost. Thank you for your business and I look forward to working with you again.

Angela Rydelius, Lab Manager

McCampbell Analytical Inc. Telephone: 925-798-1620 Fax: 925-798-1622 http://www.mccampbell.com E-mail: main@mccampbell.com Cambria Env. Technology Client Project ID: #153-1653-031; MSC-Date Sampled: 06/13/02 Oakland Date Received: 06/14/02 6262 Hollis St. Date Extracted: 06/14/02 Client Contact: Ron Scheele Emeryville, CA 94608

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560

Date Analyzed: 06/14/02

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE*

Client P.O.:

extraction method: SW5030B Analytical methods: SW8021B/8015Cm Work Order: 0206244 Client ID Matrix Lab ID TPH(g) MTBE Benzene Toluene Ethylbenzene Xylenes % SS 001A OB-C1 A 38,000,c,a ND<170 560 140 52 65 33 --# 002A RW-C3 Α 41,000,c,a ND<170 380 450 89 530 ---# Reporting Limit for DF =1; A 50 5.0 0.5 0.5 0.5 0.5 ug/L ND means not detected at or 1.0 0.05 0.005 0.005 0.005 0.005 mg/Kg above the reporting limit

DF = dilution factor.

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified gasoline is significant; b) heavier gasoline range compounds are significant(aged gasoline?); c) lighter gasoline range compounds (the most mobile fraction) are significant; d) gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline?; e) TPH pattern that does not appear to be derived from gasoline (stoddard solvent); f) one to a few isolated non-target peaks present; g) strongly aged gasoline or diesel range compounds are significant; h) lighter than water immiscible sheen/product is present, i) liquid sample that contains greater than ~2 vol. % sediment; j) no recognizable pattern; k) TPH pattern that does not appear to be derived from gasoline (aviation gas).

^{*}water and vapor samples are reported in ug/L, soil and sludge samples in mg/kg, wipe samples in ug/wipe, and TCLP extracts in ug/L.

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560 McCampbell Analytical Inc. Telephone: 925-798-1620 Fax: 925-798-1622 http://www.mccampbell.com E-mail: main@mccampbell.com Cambria Env. Technology Client Project ID: #153-1653-031; MSC-Date Sampled: 06/13/02 Oakland Date Received: 06/14/02 6262 Hollis St. Client Contact: Ron Scheele Date Extracted: 06/17/02 Emeryville, CA 94608 Client P.O.: Date Analyzed: 06/17/02 Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with MTBE and BTEX* Extraction method: SW5030B Analytical methods: SW8021B/8015Cm Work Order: 0206244 Lab ID Client ID Matrix MTBE TPH(g) Benzene Toluene Ethylbenzene Xylenes DF % SS 001B OB-C1 A 11,000,c,a ND<50 170 35 12 15 33 002B RW-C3 A 12,000,c,a ND<50 120 120 20 120 33 --#

% ppm (mg/L) to ppmv (ul/L) conversion for TPH(g) assumes the molecular weight of gasoline to be equal to that of hexane.									
Reporting Limit for DF =1; ND means not detected at or	A	15	1.5	0.15	0.15	0.15	0.25	1	uL/L
above the reporting limit	S	NA	NA	NA	NA	NA	NA	1	mg/Kg

*water and vapor samples are reported in ug/L, soil and sludge samples in mg/kg, wipe samples in ug/wipe, and TCLP extracts in ug/L.

DF = dilution factor.

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified gasoline is significant; b) heavier gasoline range compounds are significant(aged gasoline?); c) lighter gasoline range compounds (the most mobile fraction) are significant; d) gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline?; e) TPH pattern that does not appear to be derived from gasoline (stoddard solvent); f) one to a few isolated non-target peaks present; g) strongly aged gasoline or diesel range compounds are significant; h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; j) no recognizable pattern; k) TPH pattern that does not appear to be derived from gasoline (aviation gas).



QC SUMMARY REPORT FOR SW8021B/8015Cm

BatchID: 2461

Matrix: A

WorkOrder: 0206244

EPA Method: SW802	21B/8015Cm E	xtraction:	SW5030E	3	Ext. Date:	6/14/02	s	piked Sampl	e ID: 02062	40-020A
Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD	Acceptance	Criteria (%)
Compound	uL/L	uL/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High
TPH(gas)	ND	60	107	99.5	7.06	94.5	89.8	5.0	80	120
мтве	ND	10	113	105	7.43	94	103	8.8	80	120
Benzene	ND	10	116	112	3.63	115	116	0.90	80	120
Toluene	ND	10	118	113	4.71	117	118	1.2	80	120
Ethylbenzene	ND	10	117	114	2.78	118	118	0.070	80	120
Xylenes	ND	30	117	113	2.90	120	120	0	80	120
%SS:	105	10	105	101	3.85	108	106	2.1	80	120

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions: NONE

ih ...

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike, or analyte concentration in sample exceeds spike amount.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS -- MSD) / (MS + MSD) * 2.

* MS and / or MSD splke recoveries may not be near 100% or their RPDs near 0% if: a) the sample is inhomogeneous AND contains significant concentrations of analyze relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

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McCampbell Analytical Inc.

CHAIN-OF-CUSTODY RECORD

Page 1 of I

110 Second Avenue South, #D7 Pacheco, CA 94553-5560 (925) 798-1620

WorkOrder: 0206244

Client:

Cambria Env. Technology

TEL:

(510) 450-1983

6262 Hollis St.

FAX:

(510) 450-8295

Emeryville, CA 94608

ProjectNo: #153-1653-031;

PO:

14-Jun-02

	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1				[Requested Te		
Sample ID	ClientSamplD	Matrix	Collection Date	Bottle	8021B/8015			
0206244-001	OB-C1	Air	6/13/02 9:00:00 AM	<u> </u>	A	 		
0206244-002	RW-C3	Air	6/13/02 8:15:00 AM	1	Α	 		

Comments:

Date/Time	Date/Time
Relinquished by:	Received by:
Relinquished by:	Received by:
Relinquished by:	Received by:

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

Bottle Type: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

McComent -11 Augustust - 1 T	110 2nd Avenue South, #D7, Pacheco, CA 94553-5560
McCampbell Analytical Inc.	Telephone: 925-798-1620 Fax: 925-798-1622
	http://www.mccampbell.com E-mail: main@mccampbell.com

Cambria Env. Technology	Client Project ID: 153-1653-031; MSC-	Date Sampled: 06/18/02
6262 Hollis St.	Oakland	Date Received: 06/19/02
Emeryville, CA 94608	Client Contact: Ron Scheele	Date Reported: 06/25/02
Zinory vine, Ork 94000	Client P.O.:	Date Completed: 06/25/02

June 25, 2002

Dear Ron:

Enclosed are:

- 1). the results of 1 samples from your 153-1653-031; MSC-Oakland project,
- 2). a QC report for the above samples
- 3). a copy of the chain of custody, and
- 4). a bill for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits. If you have any questions please contact me. McCampbell Analytical Laboratories strives for excellence in quality, service and cost. Thank you for your business and I look forward to working with you again.

Angela Rydelius, Lab Manager

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560 McCampbell Analytical Inc. Telephone: 925-798-1620 Fax: 925-798-1622 http://www.mccampbell.com E-mail: main@mccampbell.com Cambria Env. Technology Client Project ID: 153-1653-031; MSC-Date Sampled: 06/18/02 Oakland Date Received: 06/19/02 6262 Hollis St. Client Contact: Ron Scheele Date Extracted: 06/19/02 Emeryville, CA 94608 Client P.O.: Date Analyzed: 06/19/02 Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with MTBE and BTEX* Extraction method: SW5030B Analytical methods: SW8021B/8015Cm Work Order: 0206309 Lab ID Client ID Matrix TPH(g) MTBE Benzene Toluene Ethylbenzene Xylenes DF % SS 001A RW-D2 A 40000,c,j 430 1000 800 49 180 33 --# % ppm (mg/L) to ppmv (ul/L) conversion for TPH(g) assumes the molecular weight of gasoline to be equal to that of hexane.

										1
Reporting Limit for DF =1; ND means not detected at or	A	15	1.5	0.15	0.15	0.15	0.25	1	uL/L	
above the reporting limit	S	NA	NA	NA	NA	NA	NA	1	mg/Kg	

water and vapor samples are reported in ug/L, soil and sludge samples in mg/kg, wipe samples in ug/wipe, and TCLP extracts in ug/L.

DF = dilution factor.

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified gasoline is significant; b) heavier gasoline range compounds are significant(aged gasoline?); c) lighter gasoline range compounds (the most mobile fraction) are significant; d) gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline?; e) TPH pattern that does not appear to be derived from gasoline (stoddard solvent); f) one to a few isolated non-target peaks present; g) strongly aged gasoline or diesel range compounds are significant; h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; j) no recognizable pattern; k) TPH pattern that does not appear to be derived from gasoline (aviation gas).



110 2nd Avenue South, #D7, Pacheco, CA 94553-5560 Telephone: 925-798-1620 Fax: 925-798-1622

http://www.mccampbell.com E-mail: main@mccampbell.com

QC SUMMARY REPORT FOR SW8021B/8015Cm

BatchID: 2522

Matrix: A

WorkOrder: 0206309

EPA Method: SW802	21B/8015Cm E	xtraction:	SW5030B		Ext. Date:	6/19/02	S	piked Sampi	e ID: N/A	
Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD	Acceptance	Criteria (%)
	uL/L	uL/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High
TPH(gas)	N/A	60	N/A	N/A	N/A	106	119	11	80	120
МТВЕ	N/A	10	N/A	N/A	N/A	82.5	81.5	1.2	80	120
Benzene	N/A	10	N/A	N/A	N/A	91.4	89.4	2.2	80	120
Toluene	N/A	10	N/A	N/A	N/A	94.8	93.4	1.5	80	120
Ethylbenzene	N/A	10	N/A	N/A	N/A	96.1	95.3	0.86	80	120
Xylenes	N/A	30	N/A	N/A	N/A	98.7	95	3.8	80	120
%\$S:	N/A	10	N/A	N/A	N/A	103	102	1.2	80	120

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions: NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike, or analyte concentration in sample exceeds spike amount.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / (MS + MSD) * 2.

* MS and / or MSD spike recoveries may not be near 100% or their RPDs near 0% if: a) the sample is inhomogeneous AND contains significant concentrations of analyze relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

McCampbell Analytical Inc.

110 Second Avenue South, #D7 Pacheco, CA 94553-5560 (925) 798-1620

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

WorkOrder: 0206309

Client:

Cambria Env. Technology 6262 Hollis St. Emeryville, CA 94608

TEL:

(510) 450-1983

FAX:

(510) 450-8295

ProjectNo:

153-1653-031; M

PO:

19-Jun-02

Sample ID	ClientSamplD	Matrix	Collection Date	Bottle	8021B/8015	28.1		Requested Tests	And the second s	Promote of the state of the sta	en e
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Date/Time —	Date/Time
Relinquished by:	Received by:
Relinquished by:	Received by:
Relinquished by:	Received by:

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

Bottle Type: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

Relinquished By: Date: Time: Received By: Residualished By: Residua	KIE.												(() (10	آم.	\mathcal{Z}	\mathcal{O}^{\prime}	1		7 (°	١.	نا لم	ر ـــ	0	1.							,	
Telephone: (923) 794-120 IEDO CANON TIME OF ACTION TO THE COMPANY AND		: McCAN	MPBEL	L ANA	LYI	ICA	LID	VC.						Ť		Ψ	<u></u>		$\frac{1}{2}$		- <u>_</u>	$\frac{4}{1}$	<u> </u>	7		$\stackrel{\sim}{\approx}$								
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Report To: Earn Schlesche Bill To: Same Company Cambria Environmental Technology G262 Hollis Street Fineryulis, CA 94608 Tele: (\$10) 497 - (93) Fax: (\$10) 450-8295 Project Incallon: Expressionation Active Ordinary CA Sampler Signature: SAMPLING SAMPLING Date Time Do as & Bill To: Sample Cambridge CA Sampler Signature: RU - D2 Oalcland (1860) 2.55 1 Rec. SAMPLING Date Time Do as & Bill To: Sampler Signature RU - D2 Oalcland (1860) 2.55 1 Rec. SAMPLING Recreased CA R	Teleph	one: (925) 798	3-1620	ILCO, CA	. 9933.1		Fax:	(92°	51 798	-161))					10	(IXC	ΥД	KU	/UN	U	1 11	VIE				-						3	
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37.00 1 11 4 1 2 17	110 2nd Avenue South, #D7, Pacheco, CA 94553-5560
McCampbell Analytical Inc.	Telephone: 925-798-1620 Fax: 925-798-1622
	http://www.mccampbell.com E-mail: main@mccampbell.com

Cambria Env. Technology	Client Project ID: 153-1653-31; Oak-MSC	Date Sampled: 06/19/02
6262 Hollis St.		Date Received: 06/19/02
Emeryville, CA 94608	Client Contact: Ron Scheele	Date Reported: 06/25/02
Emeryvine, CA 94000	Client P.O.:	Date Completed: 06/25/02

June 25, 2002

Dear Ron:

Enclosed are:

- 1). the results of 2 samples from your 153-1653-31; Oak-MSC project,
- 2). a QC report for the above samples
- 3). a copy of the chain of custody, and
- 4): a bill for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits. If you have any questions please contact me. McCampbell Analytical Laboratories strives for excellence in quality, service and cost. Thank you for your business and I look forward to working with you again.

Angela Rydelius, Lab Manager

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560 McCampbell Analytical Inc. Telephone: 925-798-1620 Fax: 925-798-1622 http://www.mccampbell.com E-mail: main@mccampbell.com Cambria Env. Technology Client Project ID: 153-1653-31; Oak-MSC Date Sampled: 06/19/02 6262 Hollis St. Date Received: 06/19/02 Client Contact: Ron Scheele Date Extracted: 06/19/02 Emeryville, CA 94608 Client P.O.: Date Analyzed: 06/19/02 Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with MTBE and BTEX* Extraction method: SW5030B Analytical methods: SW8021B/8015Cm

	method: SW50301	В		Work Order: 0206310						
Lab ID	Client ID	Matrix	TPH(g)	МТВЕ	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS
001A	RW-D2	A	13000,с	ND<70	340	216	9.6	40	50	#
002A	RW-D3	A	36000,c.j	350	870	610	32	120	50	#
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% ppm (mg/L) to ppmv (ul/L) conversion for TPH(g) assumes the molecular weight of gasoline to be equal to that of hexane. Reporting Limit for DF =1; 15 1.5 0.15 0.15 0.15 0.25 uL/L ND means not detected at or S NA NA NA above the reporting limit NA NA NA mg/Kg

*water and vapor samples are reported in ug/L, soil and sludge samples in mg/kg, wipe samples in ug/wipe, and TCLP extracts in ug/L.

DF = dilution factor.

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified gasoline is significant; b) heavier gasoline range compounds are significant(aged gasoline?); c) lighter gasoline range compounds (the most mobile fraction) are significant; d) gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline?; e) TPH pattern that does not appear to be derived from gasoline (stoddard solvent); f) one to a few isolated non-target peaks present; g) strongly aged gasoline or diesel range compounds are significant; h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; j) no recognizable pattern; k) TPH pattern that does not appear to be derived from gasoline (aviation gas).



QC SUMMARY REPORT FOR SW8021B/8015Cm

BatchID: 2522

Matrix: A

WorkOrder: 0206310

EPA Method: S	SW8021B/8	3015Cm E	xtraction:	SW5030E	3	Ext. Date:	6/19/02	Spiked Sample ID: N/A									
Compound		Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD	Acceptance	Criteria (%)						
oumpound		uL/L	uL/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High						
TPH(gas)		N/A	60	N/A	N/A	N/A	106	119	11	80	120						
MTBE		N/A	10	N/A	N/A	N/A	82.5	81.5	1.2	80	120						
Benzene		N/A	10	N/A	N/A	N/A	91.4	89.4	2.2	80	120						
Toluene		N/A	10	N/A	N/A	N/A	94.8	93.4	1.5	80	120						
Ethylbenzene		N/A	10	N/A	N/A	N/A	96.1	95.3	0.86	80	120						
Xylenes		N/A	30	N/A	N/A	N/A	98.7	95	3.8	80	120						
%SS:		N/A	10	N/A	N/A	N/A	103	102	1.2	80	120						

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions: NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike, or analyte concentration in sample exceeds spike amount.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS – MSD) / (MS + MSD) * 2.

* MS and / or MSD spike recoveries may not be near 100% or their RPDs near 0% if: a) the sample is inhomogeneous AND contains significant concentrations of analyze relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

Malytical Inc.

110 Second Avenue South, #D7 Pacheco, CA 94553-5560 (925) 798-1620

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

WorkOrder: 0206310

Client:

Cambria Env. Technology 6262 Hollis St.

Emeryville, CA 94608

TEL:

(510) 450-1983

FAX:

(510) 450-8295

ProjectNo:

153-1653-31; Oa

PO:

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Sample ID	ClientSampID	Matrix	Collection Date	Bottle	8021B/8015	Requested Tests	the same of the sa
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0206310-002	RW-D3		6/19/02 9:25:00 AM 6/19/02 10:40:00 AM		A	and the second of the second o	
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NOTE: Samples are discarded 60 days after coults and	Treceived by:

carded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

Bottle Type: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

MaCamentall Ameladia 1 Your	110 2nd Avenue South, #D7, Pacheco, CA 94553-5560
McCampbell Analytical Inc.	Telephone: 925-798-1620 Fax: 925-798-1622
	http://www.mccampbell.com E-mail: main@mccampbell.com

Cambria Env. Technology	Client Project ID: #153-1653-031; MSC	Date Sampled: 06/20/02
6262 Hollis St.	Oakland	Date Received: 06/21/02
Emeryville, CA 94608	Client Contact: Ron Scheele	Date Reported: 06/27/02
	Client P.O.:	Date Completed: 06/27/02

June 27, 2002

Dear Ron:

Enclosed are:

- 1). the results of 2 samples from your #153-1653-031; MSC Oakland project,
- 2). a QC report for the above samples
- 3), a copy of the chain of custody, and
- 4). a bill for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits. If you have any questions please contact me. McCampbell Analytical Laboratories strives for excellence in quality, service and cost. Thank you for your business and I look forward to working with you again.

Angela Rydelius, Lab Manager

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560 McCampbell Analytical Inc. Telephone: 925-798-1620 Fax: 925-798-1622 http://www.mccampbell.com E-mail: main@mccampbell.com Cambria Env. Technology Client Project ID: #153-1653-031; MSC Date Sampled: 06/20/02 Oakland Date Received: 06/21/02 6262 Hollis St. Client Contact: Ron Scheele Date Extracted: 06/21/02 Emeryville, CA 94608 Client P.O.: Date Analyzed: 06/21/02 Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with MTBE and BTEX* Extraction method: SW5030B Analytical methods: SW8021B/8015Cm Work Order: 0206360 Lab ID Client ID Matrix TPH(g) MTBE Toluene Benzene Ethylbenzene Xylenes DF % SS 001A RW-D3 A 1700,c,a N/A 33 30 4.8 21 10 ---# 002A RW-D4 Α 570,c,a N/A 9.8 5.5 3.2 13 10 116

% ppm (mg/L)	to ppmv	(ul/L) conversion	n for TPH(g) assu	imes the molecul	ar weight of gasc	line to be equal	to that of hexane		
Reporting Limit for DF =1; ND means not detected at or	A	15	1.5	0.15	0.15	0.15	0.25	1	uL/L
above the reporting limit	S	NA	NA	NA	NA	NA	NA	1	mg/Kg

*water and vapor samples are reported in ug/L, soil and sludge samples in mg/kg, wipe samples in ug/wipe, and TCLP extracts in ug/L.

DF = dilution factor.

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified gasoline is significant; b) heavier gasoline range compounds are significant(aged gasoline?); c) lighter gasoline range compounds (the most mobile fraction) are significant; d) gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline?; e) TPH pattern that does not appear to be derived from gasoline (stoddard solvent); f) one to a few isolated non-target peaks present; g) strongly aged gasoline or diesel range compounds are significant; h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; j) no recognizable pattern; k) TPH pattern that does not appear to be derived from gasoline (aviation gas).



110 2nd Avendessum out 1708 Parkers. EA 3443-15560
Telephone 745-748-1620. Fax 375-736-737-7560
Telephone 745-748-1620. Fax 375-736-737-7560
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QC SUMMARY REPORT FOR BATCH 2571

BatchID: 2571

Matrix: A

WorkOrder: 0206360

EPA Method: SW802	21B/8015Cm E	xtraction:	SW50308	3	Ext. Date:	6/21/02	Spiked Sample ID: 0206355-006A									
Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD	Acceptance	Criteria (%)						
	uL/L	uL/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High						
TPH(gas)	ND	60	111	110	0.982	117	115	2.3	80	120						
МТВЕ	ND	10	99.6	96.8	2.88	100	94.8	5.7	80	120						
Benzene	ND	10	95.1	93.9	1.30	108	103	4.7	80	120						
Toluene	ND	10	99.5	98.9	0.643	110	106	3,6	80	120						
Ethylbenzene	ND	10	99.7	98.6	1.19	111	108	2.8	80	120						
Xylenes	ND	30	99.7	99.3	0.335	107	110	3.1	80	120						
%SS:	101	10	101	101	0.0203	107	102	4.0	80	120						

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:

NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike, or analyte concentration in sample exceeds spike amount.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / (MS + MSD) * 2.

* MS and / or MSD spike recoveries may not be near 100% or their RPDs near 0% if: a) the sample is inhomogeneous AND contains significant concentrations of analyze relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

Inc.; 1 925 798 4612;

Sep-5-01 8:42AM:

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Tele: (510) 450	-1983			Fax: (510)	450-	8295	;					1		83.0	15						625 / 8270 / 8310	}		į			i				
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McCampbell Analytical Inc.

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

110 Second Avenue South, #D7 Pacheco, CA 94553-5560 (925) 798-1620

WorkOrder: 0206360

Client:

Cambria Env. Technology

TEL:

(510) 450-1983

6262 Hollis St.

FAX:

(510) 450-8295

Emeryville, CA 94608

ProjectNo: #153-1653-031;

PO:

21-Jun-02

					Requested Tests							
Sample ID	ClientSampID	Matrix	Collection Date Bot	ttle [8021B/8015							
0206360-001	RW-D3	Air	6/20/02 11:15:00 AM		Α							
0206360-002	RW-D4	Alr	6/20/02 1:30:00 AM		Α							

Comments:

Report Data in PPMV

Date/Time	Date/Time
Relinquished by:	Received by:
Relinquished by:	Received by:
Relinquished by:	Received by:

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

McCampbell Analytical Inc.	110 2nd Avenue South, #D7, Pacheco, CA 94553-5560 Telephone: 925-798-1620 Fax: 925-798-1622
	http://www.mccampbell.com E-mail: main@mccampbell.com

Cambria Env. Technology	Client Project ID: #153-1653-31; OAK-	Date Sampled: 06/21/02
6262 Hollis St.	MSC	Date Received: 06/21/02
Emeryville, CA 94608	Client Contact: Ron Scheele	Date Reported: 06/27/02
	Client P.O.:	Date Completed: 06/27/02

June 27, 2002

Dear Ron:

Enclosed are:

- 1). the results of 1 samples from your #153-1653-31; OAK-MSC project,
- 2). a QC report for the above samples
- 3). a copy of the chain of custody, and
- 4). a bill for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits. If you have any questions please contact me. McCampbell Analytical Laboratories strives for excellence in quality, service and cost. Thank you for your business and I look forward to working with you again.

Angela Rydelius, Lab Manager

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560 McCampbell Analytical Inc. Telephone: 925-798-1620 Fax: 925-798-1622 http://www.mccampbell.com E-mail: main@mccampbell.com Cambria Env. Technology Client Project ID: #153-1653-31; OAK-Date Sampled: 06/21/02 MSC Date Received: 06/21/02 6262 Hollis St. Date Extracted: 06/21/02 Client Contact: Ron Scheele Emeryville, CA 94608 Client P.O.: Date Analyzed: 06/21/02 Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with MTBE and BTEX* Extraction method: SW5030B Analytical methods: SW8021B/8015Cm Work Order: 0206361 Lab ID Client ID Matrix TPH(g) MTBE Ethylbenzene Benzene Toluene Xylenes DF % SS 001A RW-D5 A 3100,c,a ND<60 200 31 10 39 10 --# % ppm (mg/L) to ppmv (ul/L) conversion for TPH(g) assumes the molecular weight of gasoline to be equal to that of hexane. Reporting Limit for DF =1; A 15 1.5 0.15 0.15 0.15 0.25 uL/L ND means not detected at or

*water and vapor samples are reported in ug/L, soil and sludge samples in mg/kg, wipe samples in ug/wipe, and TCLP extracts in ug/L.

NA

DF = dilution factor.

above the reporting limit

cluttered chromatogram; sample peak coelutes with surrogate peak.

S

NA

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified gasoline is significant; b) heavier gasoline range compounds are significant(aged gasoline?); c) lighter gasoline range compounds (the most mobile fraction) are significant; d) gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline?; e) TPH pattern that does not appear to be derived from gasoline (stoddard solvent); f) one to a few isolated non-target peaks present; g) strongly aged gasoline or diesel range compounds are significant; h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; j) no recognizable pattern; k) TPH pattern that does not appear to be derived from gasoline (aviation gas).

NA

NA

ΝA



NA

mg/Kg

QC SUMMARY REPORT FOR BATCH 2571

BatchID: 2571

Matrix: A

WorkOrder: 0206361

EPA Method: SW802	21B/8015Cm E	xtraction:	SW5030E	}	Ext. Date:	6/21/02	S	piked Sampl	le ID: 02063	55-006A
Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD	Acceptance	Criteria (%)
·	oL/L	ul/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High
TPH(gas)	ND	60	111	110	0.982	117	115	2.3	80	120
МТВЕ	ND	10	99.6	96.8	2.88	100	94.8	5.7	80	120
Benzene	ND	10	95.1	93.9	1.30	108	103	4.7	80	120
Toluene	ND	10	99.5	98.9	0.643	110	106	3.6	80	120
Ethylbenzene	ND	10	99.7	98.6	1.19	111	108	2.8	80	120
Xylenes	ND	30	99.7	99.3	0.335	107	110	3.1	80	120
%SS:	101	10	101	101	0.0203	107	102	4.0	80	120

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions: NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike, or analyte concentration in sample exceeds spike amount.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / (MS + MSD) * 2.

* MS and / or MSD spike recoveries may not be near 100% or their RPDs near 0% if: a) the sample is inhomogeneous AND contains significant concentrations of analyze relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

McCampbell Analytical Inc.

CHAIN-OF-CUSTODY RECORD

110 Second Avenue South, #D7 Pacheco, CA 94553-5560 (925) 798-1620 Page 1 of 1

WorkOrder: 0206361

Client:

Cambria Env. Technology

6262 Hollis St.

Emeryville, CA 94608

TEL:

(510) 450-1983

FAX:

(510) 450-8295

ProjectNo:

#153-1653-31; O

PO:

21-Jun-02

						Reques	ted Tests	
Sample ID	ClientSampID	Matrix	Collection Date	Bottle	8021B/8015			
0206361-001	RW-D5	Air	6/21/02 9:50:00 AM		A	<u> </u>		

Comments:

Report Data in PPMV

	Date/Time		Date/Time
Relinquished by:		Received by:	
Relinquished by:		Received by:	
Relinquished by:		Received by:	

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

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APPENDIX B

Baker Tank Water Analytical Data

M.C. 1 11 4 1 C 17	110 2nd Avenue South, #D7, Pacheco, CA 94553-5560
McCampbell Analytical Inc.	Telephone: 925-798-1620 Fax: 925-798-1622
	http://www.mccampbell.com E-mail: main@mccampbell.com

Cambria Env. Technology	Client Project ID: #153-1653-031; City of	Date Sampled: 06/17/02	
6262 Hollis St.	Oakland	Date Received: 06/18/02	
Emeryville, CA 94608	Client Contact: Ron Scheele	Date Reported: 06/24/02	
Zmery vine, err 54000	Client P.O.:	Date Completed: 06/24/02	

June 24, 2002

Dear Ron:

Enclosed are:

- 1). the results of 1 samples from your #153-1653-031; City of Oakland project,
- 2). a QC report for the above samples
- 3). a copy of the chain of custody, and
- 4). a bill for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits. If you have any questions please contact me. McCampbell Analytical Laboratories strives for excellence in quality, service and cost. Thank you for your business and I look forward to working with you again.

Angela Rydelius, Lab Manager

http://www.mccampbell.com B-mail: main@mccampbell.com Cambria Env. Technology Client Project ID: #153-1653-031; City of Date Sampled: 06/17/02 Oakland Date Received: 06/18/02 6262 Hollis St. Date Extracted: 06/22/02 Client Contact: Ron Scheele Emeryville, CA 94608 Client P.O.: Date Analyzed: 06/22/02

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560

Telephone: 925-798-1620 Fax: 925-798-1622

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE*

xtraction m	ethod: SW5030B			Analytical 1	nethods: SW802	1B/8015Cm		V	Vork Orde	r: 0206290		
Lab ID	Client ID	Matrix	TPH(g)	МТВЕ	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS		
001A	TANK	w	7700,a	ND<50	390	520	38	1200	10	106		
								· ·				
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	Limit for DF =1; not detected at or	w	50	5.0	0.5	0.5	0.5	0.5	ug/L			
	reporting limit	S	1.0	0.05	0.005	0.005	0.005	0.005	mg	g/Kg		

^{*}water and vapor samples are reported in ug/L, soil and sludge samples in mg/kg, wipe samples in ug/wipe, and TCLP extracts in ug/L.

DF = dilution factor.

cluttered chromatogram; sample peak coelutes with surrogate peak.

McCampbell Analytical Inc.

+The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified gasoline is significant; b) heavier gasoline range compounds are significant(aged gasoline?); c) lighter gasoline range compounds (the most mobile fraction) are significant; d) gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline?; e) TPH pattern that does not appear to be derived from gasoline (stoddard solvent); f) one to a few isolated non-target peaks present; g) strongly aged gasoline or diesel range compounds are significant; h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; j) no recognizable pattern; k) TPH pattern that does not appear to be derived from gasoline (aviation gas).

				,	· · · · · · · · · · · · · · · · · · ·		
МсС	Campbell Analytic	al Inc.		Teleph	venue South, #D7, Pacheco, CA one: 925-798-1620 Fax: 925 ccampbell.com E-mail: main@	5-798-1622	
Cambria Env.	Technology	Client Pro	ject ID: #153-1 Oaklan	653-031; City of	Date Sampled: 06/	/17/02	
6262 Hollis S	t.		Vakia n		Date Received: 06/	/18/02	
Emeryville, C	CA 94608		ntact: Ron Sche	ele	/18/02		
, , , , , , , , , , , , , , , , , , , ,		Client P.C).:		Date Analyzed: 06/	/19/02	
	=	(C10-C23)		•	Silica Gel Clean-Up		
Extraction method:	SW3510C		Analytical m	ethods: SW8015C		Work Order:	0206290
Lab ID	Client ID	Matrix		TPH(d)		DF	% SS
0206290-001B	TANK	w		3300,d		1	103
			:				
	-						
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				· · -			

 \mathbf{W}

S

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NA

⁺The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified diesel is significant; b) diesel range compounds are significant; no recognizable pattern; c) aged diesel? is significant); d) gasoline range compounds are significant; e) unknown medium boiling point pattern that does not appear to be derived from diesel; f) one to a few isolated peaks present; g) oil range compounds are significant; h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; k) kerosene/kerosene range; l) bunker oil; m) fuel oil; n) stoddard solvent.



 $\mu g/L$

NA

Reporting Limit for DF =1;

ND means not detected at or

above the reporting limit

^{*} water and vapor samples are reported in ug/L, wipe samples in ug/wipe, soil and sludge samples in mg/kg, and all TCLP / STLC / SPLP extracts in ug/L

[#] cluttered chromatogram resulting in coeluted surrogate and sample peaks, or; surrogate peak is on elevated baseline, or; surrogate has been diminished by dilution of original extract.

110 2nd Avenue South, #D7, Pacheco, CA 94553-5560 Telephone: 925-798-1620 Fax: 925-798-1622

http://www.mccampbell.com E-mail: main@mccampbell.com

QC SUMMARY REPORT FOR SW8021B/8015Cm

BatchID: 2506

Matrix: W

WorkOrder: 0206290

EPA Method: SW802	21B/8015Cm E	xtraction:	SW5030B		Ext. Date:	6/18/02	Spiked Sample ID: N/A						
Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD	Acceptance	Criteria (%)			
Оотроина	μg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High			
TPH(gas)	N/A	60	N/A	N/A	N/A	105	119	12	80	120			
МТВЕ	N/A	10	N/A	N/A	N/A	87	90.6	4.0	80	120			
Benzene	N/A	10	N/A	N/A	N/A	106	110	3.5	80	120			
Toluene	N/A	10	N/A	N/A	N/A	104	108	3.3	80	120			
Ethylbenzene	N/A	10	N/A	N/A	N/A	109	111	1.6	80	120			
Xylenes	N/A	30	N/A	N/A	N/A	110	107	3.1	80	120			
%SS	N/A	10	N/A	N/A	N/A	104	107	2.9	80	120			

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions: NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike, or analyte concentration in sample exceeds spike amount.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / (MS + MSD) * 2.

MS and / or MSD spike recoveries may not be near 100% or their RPDs near 0% if: a) the sample is inhomogeneous AND contains significant concentrations of analyze relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

QC SUMMARY REPORT FOR SW8015C

BatchID: 2521

Matrix: W

WorkOrder: 0206290

EPA Method: SW8015C	E	Extraction: SW3510C				6/19/02	Spiked Sample ID: N/A						
Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD	Acceptance	e Criteria (%)			
Сотронна	μg/L	μg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High			
TPH(d)	N/A	7500	N/A	N/A	N/A	101	104	2.7	70	130			
%SS:	N/A	2500	N/A	N/A	N/A	103	106	2.2	70	130			

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions: NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike, or analyte concentration in sample exceeds spike amount.

% Recovery = 100 * (MS-Sample)/(Amount Spiked); RPD = 100 * (MS - MSD)/(MS + MSD) * 2.

* MS and / or MSD spike recoveries may not be near 100% or the RPDs near 0% if: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

Laboratory extraction solvents such as methylene chloride and acetone may occasionally appear in the method blank at low levels.

McCampbell Analytical Inc.

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

110 Second Avenue South, #D7 Pacheco, CA 94553-5560 (925) 798-1620

WorkOrder: 0206290

Cambria Env. Technology

TEL:

(510) 450-1983

6262 Hollis St.

FAX:

(510) 450-8295

Emeryville, CA 94608

ProjectNo:

#153-1653-031;

PO:

18-Jun-02

						Requested Tests										
Sample ID	ClientSampID	Matrix	Collection Date	Bottle	SW8015C	8021B/8015										
					,	···			1	1						
0206290-001	TANK	Water	6/17/02 3:00:00 PM		В	Α										

Comments:

Date/Time	Date/Time
Relinquished by:	Received by:
Relinquished by:	Received by:
Relinquished by:	Received by:

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

Bottle Type: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other



	McCAMPBELL ANALYTICAL INC.								T					CI	Υ.Α.	TX		<u> </u>	\T Y														
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ncCampbell Analytical Inc.	Telephone: 925-798-1620 Fax: 925-798-1622
	http://www.mecampbell.com E-mail: main@mecampbell.com

Cambria Env. Technology	Client Project ID: #153-1653-001; MSC-	Date Sampled: 07/11/02
6262 Hollis St.	Oakland	Date Received: 07/12/02
Emeryville, CA 94608	Client Contact: Ron Scheele	Date Reported: 07/18/02
Linery vine, On 94000	Client P.O.:	Date Completed: 07/18/02

July 18, 2002

Dear Ron:

Enclosed are:

- 1). the results of 1 samples from your #153-1653-001; MSC-Oakland project,
- 2). a QC report for the above samples
- 3). a copy of the chain of custody, and
- 4). a bill for analytical services.

All analyses were completed satisfactorily and all QC samples were found to be within our control limits.

If you have any questions please contact me. McCampbell Analytical Laboratories strives for excellence in quality, service and cost. Thank you for your business and I look forward to working with you again.

Angela Rydelius, Lab Manager

A	McCampbell	Analytical	Inc.

Cambria Env. Technology	Client Project ID: #153-1653-001; MSC-	Date Sampled: 07/11/02
6262 Hollis St.	Oakland	Date Received: 07/12/02
Emeryville, CA 94608	Client Contact: Ron Scheele	Date Extracted: 07/17/02
Elliot yvino, CA 74000	Client P.O.:	Date Analyzed: 07/17/02

Gasoline Range (C6-C12) Volatile Hydrocarbons as Gasoline with BTEX and MTBE*

Lab ID			PROPERTY 5 / 1						7	
DQU 12	Client ID	Matrix	TPH(g)	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS
001A	Tank Plume D	w	48,000,a	ND<250	1000	3700	930	7000	50	#
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	g Limit for DF =1;	w	50	5.0	0.5	0.5	0.5	0.5	ug	z/L

^{*}water and vapor samples are reported in ug/L, soil and sludge samples in mg/kg, wipe samples in ug/wipe, and TCLP extracts in ug/L.

⁺The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified gasoline is significant; b) heavier gasoline range compounds are significant(aged gasoline?); c) lighter gasoline range compounds (the most mobile fraction) are significant; d) gasoline range compounds having broad chromatographic peaks are significant; biologically altered gasoline?; e) TPH pattern that does not appear to be derived from gasoline (stoddard solvent); f) one to a few isolated non-target peaks present; g) strongly aged gasoline or diesel range compounds are significant; h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; j) sample diluted due to high MTBE content; k) TPH pattern that does not appear to be derived from gasoline (aviation gas). m) no recognizable pattern.



[#] cluttered chromatogram; sample peak coelutes with surrogate peak.

McCampbell Analytic	al Inc.
Cambria Env. Technology	Client Oaklar

Cambria Env. Technology 6262 Hollis St. Emeryville, CA 94608		Client Projec	Date Sampled: 07/11/	02				
		Oakland		Date Received: 07/12/	02			
		Client Conta	ct: Ron Scheele	Date Extracted: 07/12/02				
		Client P.O.:		Date Analyzed: 07/13/	02			
Extraction method: SV	Diesel Range	e (C10-C23) Ex	tractable Hydrocarbons with Analytical methods: SW8015C	Silica Gel Clean-Up*				
Lab ID	Client ID	Matrix	The state of the s		Work Order:			
Luo ID	CHERTE	Madix	TPH(d)		DF	% SS		
0207170-001B	Tank Plume D	w	10,000,d,b	g	1	111		
	<u></u>							

Reporting Limit for DF =1; ND means not detected at or	W	50	μg/L
above the reporting limit	S	NA.	NA

^{*} water and vapor samples are reported in ug/L, wipe samples in ug/wipe, soil/solid/sludge samples in mg/kg, product/oil/non-aqueous liquid samples in mg/L, and all TCLP / STLC / SPLP extracts in ug/L

⁺The following descriptions of the TPH chromatogram are cursory in nature and McCampbell Analytical is not responsible for their interpretation: a) unmodified or weakly modified diesel is significant; b) diesel range compounds are significant; no recognizable pattern; c) aged diesel? is significant); d) gasoline range compounds are significant; e) unknown medium boiling point pattern that does not appear to be derived from diesel; f) one to a few isolated peaks present; g) oil range compounds are significant; h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~2 vol. % sediment; k) kerosene/kerosene range; i) bunker oil; m) fuel oil; n) stoddard solvent.



[#] cluttered chromatogram resulting in coeluted surrogate and sample peaks, or, surrogate peak is on elevated baseline, or, surrogate has been diminished by dilution of original extract.

QC SUMMARY REPORT FOR SW8021B/8015Cm

Matrix: W

WorkOrder: 0207170

EPA Method: SW802	21B/8015Cm E	xtraction:	SW5030E	3	BatchID:	2917	s	piked Sampl	e ID: N/A	
Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD	Acceptance	Criteria (%)
	μg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	Low	High
TPH(gas)	N/A	60	N/A	N/A	N/A	105	105	0.412	80	120
МТВЕ	N/A	10	N/A	N/A	N/A	99.8	97.1	2.73	80	120
Benzene	N/A	10	N/A	N/A	N/A	109	109	0.509	80	120
Toluene	N/A	10	N/A	N/A	N/A	111	111	0.639	80	120
Ethylbenzene	N/A	10	N/A	N/A	N/A	112	111	0.662	80	120
Xylenes	N/A	30	N/A	N/A	N/A	113	113	0	80	120
%SS:	N/A	100	N/A	N/A	N/A	102	102	0.197	80	120

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions:

NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

[%] Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS – MSD) / (MS + MSD) * 2.

^{*} MS and / or MSD spike recoveries may not be near 100% or the RPDs near 0% if: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

QC SUMMARY REPORT FOR SW8015C

Matrix: W

WorkOrder: 0207170-

EPA Method: SW8015C	E	xtraction:	SW35100	;	BatchID: 2915		S	¥.,		
Compound	Sample	Spiked	MS*	MSD*	MS-MSD*	LCS	LCSD	LCS-LCSD	Acceptance	Criteria (%)
Compound	μg/L	μg/L	% Rec. % Rec.		% RPD	% Rec.	% Rec.	% RPD	Low	High
TPH(d)	N/A	7500	N/A	N/A	N/A	93.6	94.2	0.664	70	130
%SS:	N/A	100	N/A	N/A	N/A	97.7	97.6	0.0662	70	130

All target compounds in the Method Blank of this extraction batch were ND less than the method RL with the following exceptions: NONE

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.

N/A = not enough sample to perform matrix spike and matrix spike duplicate.

NR = analyte concentration in sample exceeds spike amount for soil matrix or exceeds 2x spike amount for water matrix or sample diluted due to high matrix or analyte content.

% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / (MS + MSD) * 2.

* MS and / or MSD spike recoveries may not be near 100% or the RPDs near 0% if: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) if that specific sample matrix interferes with spike recovery.

McCampbell Analytical Inc.

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

110 Second Avenue South, #D7 Pacheco, CA 94553-5560 (925) 798-1620

WorkOrder: 0207170

Client:

Cambria Env. Technology

TEL:

(510) 450-1983

6262 Hollis St.

FAX:

(510) 450-8295

Emeryville, CA 94608

ProjectNo:

#153-1653-001:

PO:

18-Jul-02

					Requested Tests					
Sample ID	ClientSamplD	Matrix	Collection Date	Bottle	SW8015C N8021B/8015C					
0207170-001	Tank Plume D	Water	07/11/02 7:00:00 AM	<u> </u>	В	Α				

Comments:

Date/Time	Date/Time
Relinquished by:	Received by:
Relinquished by:	Received by:
Relinquished by:	Received by:

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

Bottle Type: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

Thec

ву:

McCampbell Analytical,

·Inc.;

925

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8:42AM

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