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May 23, 2006

Mr. Jerry Wickham
Alameda County Environmental Health Services
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502

**Subject: Dual-Phase Extraction Pilot Test Report for Fuel Leak Case No. RO0000324,
Livermore Gas and Mini-Mart, 160 Holmes Street, Livermore, California**

Dear Mr. Wickham:

On behalf of Mr. Manwel Shuwayhat, Allterra Environmental, Inc. (Allterra) has prepared the enclosed Dual-Phase Extraction Pilot Test Report. Should you have any questions or comments please contact Allterra at (831) 425-2608.

Sincerely,

Allterra Environmental, Inc.



James Allen
Project Manager

enclosures: Dual-Phase Extraction Pilot Test Report



**Dual-Phase Extraction Pilot Test Report for Fuel Leak Case No. RO000324
Livermore Gas and Mini-Mart, 160 Holmes Street, Livermore, California**

Date:
May 24, 2006

Project No.:
015-01-009

Prepared For:
Livermore Gas and Mini mart
Attention: Manwel and Samira Shuwayhat
54 Wolfe Canyon Road
Kentfield, California 94904

Allterra Environmental, Inc.
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May 24, 2006

Project No.: 015-01-009

Manwel and Samira Shuwayhat
Livermore Gas and Mini Mart
54 Wolfe Canyon Road
Kentfield, California 94904

**Subject: Dual-Phase Extraction Pilot Test Report for Fuel Leak Case No. RO0000324,
Livermore Gas and Mini-Mart, 160 Holmes Street, Livermore, California**

Dear Mr. And Mrs. Shuwayhat:

On your behalf, Allterra Environmental, Inc. (Allterra) has prepared this remedial pilot test report for the property located at 160 Holmes Street in Livermore, California (Site). The purpose of this remedial pilot test was to assess subsurface conditions beneath the Site and evaluate dual-phase extraction (DPE) equipment for potential use for remediation. Site work was conducted in accordance with Allterra's March 31, 2006 *Addendum to the Interim Remediation Action Plan*, Regional Water Quality Control Board (RWQCB) and Alameda County Department of Environmental Health (ACEH) regulations, and Allterra's Site Investigation Field Protocol presented in Appendix A.

Site Location and Description

The Site is located on the southwest corner of Holmes Street and Second Street at 160 Holmes Street in Livermore, California (Figure 1). The Site currently operates as a service station and convenience store. Pertinent site features, such as monitoring well locations, are presented in Figure 2.

DPE Remedial Pilot Testing Activities

The following is a discussion of remedial pilot testing activities conducted at the Site. Remedial pilot testing work was conducted to determine radius-of-influence, soil vapor and water production rates, and hydrocarbon removal rates for possible DPE at the Site.

Bay Area Air Quality Management District (BAAQMD) Notification

On April 5, 2006, Allterra notified BAAQMD regarding remedial DPE pilot testing activities. No permit is required for short-term pilot tests where extracted soil vapors are abated prior to discharge.

DPE Test Wells and Observation Wells

Extraction wells EW-1 and EW-2 will be used in the future as remediation wells and, therefore, were selected as pilot test wells. Due to their proximity to EW-1 and EW-2, monitoring wells MW-1A, MW-1B, MW-2A, and MW-3A were selected as observation wells. Well MW-1B was

not an ideal observation well because it has a screen interval from 50 to 55 feet below groundwater surface (bgs), which is approximately 10 to 15 feet below the bottom of wells EW-1 and EW-2. Nevertheless, MW-1B was designated an observation well due to its close proximity (2 feet) to EW-1. The following table lists the approximate distances between test wells and observation wells.

Distance Between Test Wells and Observation Wells

Test Wells	Observation Wells			
	MW-1A	MW-1B	MW-2A	MW-3A
EW-1	4 feet	2 feet	56 feet	90 feet
EW-2	60 feet	62 feet	86 feet	51 feet

DPE Test Equipment

Mobile DPE equipment consists of a vacuum blower, submersible pump with a mechanical liquid level control and associated conveyance piping, wellhead adaptors to connect the vacuum blower to the pilot test well, and instantaneous and totalizing groundwater flow meters. Exhausted vapors were processed through two (2), 200-pound vapor phase carbon filters prior to discharge and extracted groundwater was transferred to a tank pending permitted discharge.

DPE Pilot Testing Activities

On April 11 and 12, 2006, DPE remedial pilot testing was conducted at wells EW-1 and EW-2. Testing was conducted using mobile DPE equipment to apply vacuums ranging from 0- to 84-inches of H₂O on wells EW-1 and EW-2 while a submersible pump extracted groundwater. The DPE pilot test was designed to determine the soil vapor flow rate, sustainable groundwater production rate, DPE radius of influences for vapor and groundwater, and petroleum hydrocarbon production rates for vapor and dissolved phases. Extracted vapors were directed through two (2), 200-pound vapor phase granular activated carbon (GAC) vessels for treatment, and then discharged to the atmosphere, while extracted groundwater was directed to an on-site holding tank pending permitted discharge to the sanitary sewer.

Data Collection

While conducting the DPE pilot test, Allterra personnel collected and recorded routine measurements from EW-1 and EW-2. Measurements included observed vacuums, soil vapor flow rates, groundwater flow rates, and influent groundwater qualitative observations. Additionally, measurements from observation wells (MW-1A, MW-1B, MW-2A, and MW-3A), including induced vacuum and depth to groundwater, were recorded.

Vapor and Groundwater Sampling

Soil vapor and groundwater samples were collected from influent vapor and groundwater streams at various times throughout pilot testing activities. Influent vapor samples were collected from EW-1 at the beginning (EW-1-0) and end (EW-1-6) of the test and vapor samples were collected from EW-2 at the beginning (EW-2-0), mid-point (EW-2-3), and end (EW-2-6) of the test. Vapor samples were collected in tedlar bags from an influent vapor stream sample port. Influent groundwater samples were collected from wells EW-1 and EW-2 at the beginning (EW-

1-0 and EW-2-0), mid-point (EW-1-3 and EW-2-3), and end (EW-1-6 and EW-2-6) of each pilot test. Influent groundwater samples were collected in appropriate glass sample containers and stored on ice. Field logs from pilot testing activities are included as Appendix B.

Laboratory Analyses

Vapor and groundwater samples collected during pilot testing activities were submitted under chain-of-custody protocol to McCampbell Analytical, Inc. (DHS Certification #1644) of Pacheco, California. Vapor samples were analyzed for total petroleum hydrocarbons as gasoline (TPHg) by EPA Method 8015Cm and benzene, toluene, ethylbenzene, xylenes (BTEX) and methyl tertiary butyl ether (MTBE) by EPA Method 8021B. Groundwater samples were analyzed for TPHg and TPH as diesel (TPHd) by EPA Method 8015Cm and BTEX/MTBE by EPA Method 8021B and MTBE, tert-amyl methyl ether (TAME), tert-butyl alcohol (TBA), diisopropyl ether (DIPE), ethyl tert-butyl ether (ETBE), ethanol, methanol, 1,2-Dichloroethane (1,2-DCA), and 1,2-Dibromoethane (EDB) by EPA Method 8260B. Certified laboratory reports with chain of custody documentation for the vapor and groundwater samples are included in Appendix C (vapor) and D (groundwater).

DPE Pilot Testing Results

DPE Pilot Testing

Soil Vapor Extraction

Generally, rates of vapor extraction from EW-1 ranged from approximately 35 to 55 cubic feet per minute (cfm) with an average of 47 cfm over the duration of the pilot test. Rates of vapor extraction from EW-2 ranged from 20 to 26 cfm with an average of 22 cfm over the duration of the pilot test. Soil vapor flow rates and data are presented in Table 1.

Groundwater Extraction

Generally, extraction wells EW-1 and EW-2 produced groundwater at rates ranging from 5 to 10 gallons per minute (gpm). After approximately 4.5 hours of DPE, the groundwater production rate stabilized at approximately 5 gpm from each well. Groundwater flow rates and data are presented in Table 1.

DPE Radius of Influence (ROI)

The following section presents DPE test observations and estimates for ROI for vapor and groundwater extraction for wells EW-1 and EW-2:

- EW-1 – Vapor Extraction ROI: During DPE testing, no measurable applied vacuum levels were observed at wells MW-1A, MW-1B, MW-2A, and MW-3A. Field observations from well MW-1A were used for ROI estimates because its screen interval is within the area targeted for vapor extraction (approximately 15 to 30 feet bgs) and it is located approximately 4 feet from EW-1. Therefore, EW-1's vapor extraction ROI, or the distance at which the subsurface vacuum is approximately 0.1 inch of H₂O or 1 to 10% of the applied vacuum at the test well, is estimated to be less than 4 feet (the horizontal distance between wells EW-1 and MW-1A). Additionally, while applied vacuum was not observed at well MW-1B, located only 2 feet from EW-1, field

observations from MW-1B were not used in ROI estimates because its screen interval is 50 to 55 feet bgs, which is roughly 20 feet below the area targeted for vapor extraction.

- EW-1 – Groundwater Extraction ROI: While conducting DPE from extraction well EW-1, measurable drawdown of static groundwater levels were observed in wells MW-1A (1.38 feet) and MW-1B (0.13 feet). Static groundwater levels in observation wells MW-2A and MW-3A lowered approximately 0.01 feet during the DPE test; however, the groundwater elevation change was not attributed to influence due to its negligible value. Based on the recorded data, EW-1's groundwater extraction ROI was measured to be between 4 and 56 feet and has an estimated value of 20 feet.
- EW-2 – Vapor Extraction ROI: During DPE testing, no measurable applied vacuum levels were observed at wells MW-1A, MW-1B, MW-2A, and MW-3A. Therefore, the EW-2's vapor extraction ROI, or the distance at which the subsurface vacuum is approximately 0.1 inch of H₂O or 1 to 10 % of the applied vacuum at the test well, was measured to be less than 51 feet and is estimated to be 5 to 10 feet.
- EW-2 – Groundwater Extraction ROI: During DPE from extraction well EW-2, a measurable drawdown of the static groundwater level was observed in one well, MW-1A, at 0.11 feet. Static groundwater levels in observation wells MW-1B, MW-2A, and MW-3A lowered between approximately 0.01 and 0.04 feet during the DPE test; however, the groundwater elevation change was not attributed to influence due to its low to negligible values. EW-2's groundwater extraction ROI was measured to be up to approximately 60 feet.

Vapor Analytical Data

Influent vapor sample analytical results from EW-1 and EW-2 indicated relatively low to non-detect levels for petroleum hydrocarbons. TPHg and benzene were detected in one sample, EW-2-0, at 41 milligrams per cubic meter (mg/m³) and 0.97 mg/m³, respectively. MTBE was detected in three samples, EW-1-0, EW-1-6, and EW-2-0, at concentrations of 7.0 mg/m³, 4.9 mg/m³, and 96 mg/m³, respectively. Soil vapor analytical results are presented in Table 2 and the certified analytical results and chain of custody documentation are included as Appendix C.

Groundwater Analytical Data

Analytical results from influent groundwater samples indicated elevated levels of fuel-related compounds in each of the six samples. Dissolved TPHg was detected in all samples and levels ranged from 200 micrograms per liter (µg/L) in sample EW-1-0 to 13,000 µg/L in samples EW-1-3 and EW-1-6. Concentrations of TPHd were found in all six samples at levels between 100 µg/L (EW-1-0) and 720 µg/L (EW-1-6). Benzene concentrations were detected in all six samples at levels ranging from 1.5 µg/L in EW-1-0 to 520 µg/L in EW-1-3. Dissolved MTBE was detected in each sample at concentrations between 1,400 µg/L (EW-2-0) and 44,000 µg/L (EW-1-3) (Note: MTBE was detected using both the 8021B and 8260B Analytical Methods and the higher concentration of the two was reported). Groundwater analytical results are presented

in Table 3 and certified analytical reports with chain of custody documentation is included in Appendix D.

Contaminant Mass Removal Estimates

Hydrocarbon Production - Vapor

Based on the average vapor extraction rate from EW-1 of 47 cfm and the average influent vapor concentrations of TPHg from the 0- and 6-hour samples ($<25 \text{ mg/m}^3$), no vapor phase TPHg was removed from EW-1 during the pilot test.

Based on the average vapor extraction rate from EW-2 of 22 cfm and the average influent vapor concentrations of TPHg from the 0-, 3-, and 6-hour samples (14 mg/m^3), vapor phase TPHg was removed from EW-1 at a rate of approximately 0.028 pounds per day (ppd) over the duration of the pilot test. Therefore, during the 6-hour pilot test approximately 0.007 pounds of TPHg was removed.

Hydrocarbon Production - Groundwater

Based on the average groundwater extraction rate of 7 gpm from EW-1 and the average influent concentrations from the 3- and 6-hour samples for TPHg ($13,000 \text{ } \mu\text{g/L}$) and MTBE ($42,000 \text{ } \mu\text{g/L}$), dissolved phase TPHg and MTBE were removed at rates of approximately 1.1 pounds per day (ppd) and 3.5 ppd, respectively. Over the duration of the pilot test, approximately 0.27 pounds of TPHg and 0.88 pounds of MTBE were removed from EW-1. Analytical results for the initial sample (EW-1-0) were not used in this calculation because they were less representative of in-situ concentrations and not indicative of the groundwater produced for the duration of the pilot test.

TPHg and MTBE removal rates from EW-2 were calculated using the average groundwater extraction rate of 7 gpm and the average influent concentrations from the 3- and 6-hour samples for TPHg ($950 \text{ } \mu\text{g/L}$) and MTBE ($3,000 \text{ } \mu\text{g/L}$). Based on test data, dissolved phase TPHg and MTBE were removed at rates of approximately 0.080 ppd and 0.25 ppd, respectively, and approximately 0.020 pounds of TPHg and 0.063 pounds of MTBE were removed from EW-2 over the duration of the pilot test. The initial sample collected from EW-2 (EW-2-0) was not used in this calculation because the data was less representative of in-situ concentrations and not indicative of the groundwater produced for the duration of the pilot test.

Waste Disposal

Soil vapor extracted during DPE pilot testing was treated with GAC prior to discharge to the atmosphere. Groundwater generated during DPE pilot testing was stored on-site in a 6,500-gallon polyethylene tank. Groundwater generated will be discharged to the sanitary sewer under a short-term wastewater discharge permit.

Conclusions

Based on previous and current site data, Allterra concludes the following:

- DPE testing at EW-1 resulted in a soil vapor extraction flow rate of 47 cfm (average) with an influent vapor stream concentration for TPHg of $<25 \text{ mg/m}^3$; the stabilized groundwater production rate from EW-1 was 5 gpm and the average influent stream concentrations for dissolved TPHg and MTBE were 13,000 $\mu\text{g/L}$ and 42,000 $\mu\text{g/L}$, respectively.
- EW-2 DPE test results indicate an average soil vapor extraction flow rate of 22 cfm with an average influent TPHg vapor stream level of 14 mg/m^3 ; the groundwater production rate from EW-1 stabilized at 5 gpm and the average influent stream concentrations for dissolved TPHg and MTBE were 950 $\mu\text{g/L}$ and 3,000 $\mu\text{g/L}$, respectively.
- Based on data collected from observation wells, EW-1's vapor extraction ROI was less than 4 feet and the groundwater extraction ROI was measured to be between 4 and 56 feet and is estimated to be approximately 20 feet.
- Based on data collected from observation wells, EW-2's vapor extraction ROI was less than 51 feet and was estimated to be between 5 and 10 feet. EW-2's groundwater extraction ROI was measured to up to 60 feet.
- Hydrocarbon levels in the influent vapor stream for EW-1 were lower than anticipated, with "non-detect" levels for TPHg, benzene, toluene, and ethylbenzene. Vapor samples from EW-1 indicated trace levels (0.51 mg/m^3) of xylenes in one sample and low levels of MTBE (7.0 mg/m^3 and 4.9 mg/m^3).
- Vapor samples collected from EW-2 at the beginning of the DPE test indicated detectable levels of TPHg, BTEX, and MTBE; however, analysis of vapor samples collected after 3 and 6 hours of testing indicated vapor concentrations at or below detection limits for all constituents.
- Influent groundwater data from EW-1 indicated elevated levels of fuel-related compounds, with TPHg levels up to 13,000 $\mu\text{g/L}$ and MTBE levels up to 44,000 $\mu\text{g/L}$.
- Influent groundwater concentrations from EW-2 indicated TPHg levels up to 1,000 $\mu\text{g/L}$ and MTBE levels up to 3,100 $\mu\text{g/L}$.
- DPE pilot testing at EW-1 resulted in estimated contaminant mass removal rates for vapor phase and dissolved TPHg of 0 ppd (pounds per day) and 1.1 ppd, respectively. During the pilot test at EW-1, approximately 0.27 pounds of TPHg was removed (0 pounds in vapor phase and 0.27 pounds in dissolved phase).

- For EW-2, the estimated removal rate for vapor phase TPHg was 0.028 ppd and for dissolved TPHg was 0.080 ppd. During the pilot test at EW-2, approximately 0.027 pounds of TPHg was removed (0.007 pounds in vapor phase and 0.020 pounds in dissolved phase).
- The soil vapor extraction (SVE) aspect of the DPE pilot test indicated low levels of vapor phase hydrocarbons from extraction wells EW-1 and EW-2. This data suggests that vapor phase carbon would be an adequate abatement device for treating extracted soil vapors.
- Groundwater extraction (GWE) data collected during DPE pilot testing indicated that relatively high levels of dissolved fuel-related compounds were produced from wells EW-1 and EW-2. The data suggests that liquid phase carbon will be adequate for abating dissolved contaminants generated from wells EW-1 and EW-2. Additionally, GWE from wells EW-1 and EW-2 should reduce contaminant levels in the suspected source area (former UST pit and dispenser area) and limit further off-site migration of the dissolved hydrocarbon plume.

Hypothesis and Recommended Actions Regarding Interim Remediation Activities

Data collected during DPE pilot testing was evaluated for the purpose of determining an appropriate strategy for installing and operating an interim DPE and treatment system at the Site. The following discussion presents Allterra’s hypotheses and recommended actions for future interim remediation work.

Hypothesis 1	
<i>Hypothesis</i>	Installing and operating an interim DPE and treatment system will remove contaminant mass from beneath the Site and limit (and potentially eliminate) further off-site migration of dissolved contaminants.
<i>Rationale</i>	Wells EW-1 and EW-2 appear to be in appropriate locations for extracting soil vapor and groundwater from the suspected contaminant source area (the former UST pit and dispenser area). Additionally, well EW-1 is located in the area of the Site with the highest levels of dissolved TPHg and MTBE and is adjacent to the down-gradient (northwestern) edge of the property; therefore, DPE from EW-1 should provide the dual-function of removing contaminant source and providing a migration control point that limits hydrocarbons from leaving the Site.
<i>Recommended Action</i>	Proceed with plans to permit, install, and operate an interim DPE and treatment system. The DPE and treatment system will include SVE and GWE equipment and GAC abatement devices for vapor and dissolved phases.

Hypothesis 2	
<i>Hypothesis</i>	While DPE pilot test data indicated low hydrocarbon removal rates from wells EW-1 and EW-2, long-term SVE may result in an increase in influent vapor concentrations.
<i>Rationale</i>	Vapor sample data from EW-1 and EW-2 indicated low to non-detect hydrocarbon levels; however, the wells appear to be in locations appropriate for extracting hydrocarbon contaminated soil vapors that are suspected to exist near the former UST pit. A possible explanation for the lack of hydrocarbon vapors during pilot testing is that the test was not run for a sufficient duration to capture soil vapors that may remain in the subsurface.
<i>Recommended Action</i>	Install and operate DPE equipment at the Site and monitor hydrocarbon levels in the vapor influent over several quarters to evaluate the effectiveness of SVE for removing contaminated soil vapors.

Report Distribution

To comply with state and local environmental laws, Allterra recommends that a copy of this report be forwarded to the following agencies:

- Mr. Jerry Wickham, ACEH
- State of California GeoTracker Database

References

Allterra Environmental, Inc., May 2, 2006, "Soil and Groundwater Investigation Report," 160 Holmes Street, Livermore, California

Allterra Environmental, Inc., March 31, 2006, "Addendum to the Interim Remediation Action Plan," 160 Holmes Street, Livermore, California

Allterra Environmental, Inc., August 10, 2005, "Interim Remediation Action Plan," 160 Holmes Street, Livermore, California

Jimmy H.C. Wong, Chin Hong Lim, and Gregory L. Nolen, 1997, *Design of Remediation Systems*, Lewis Publishers, Boca Raton, Florida

Maidment, David, R., 1993, *Handbook of Hydrology*, McGraw-Hill, Inc., New York, New York

Limitations

Allterra prepared this report for the use of Livermore Gas and Mini Mart and ACEHS in evaluating site conditions at selected on-site locations at the time of this study. Statements, conclusions, and recommendations in this report are based solely on the field observations and analytical results related to work performed by Allterra and there is no warranty, expressed or implied. Site conditions and data can change over time; therefore, data presented in this report is only applicable to the timeframe of this study. Allterra's services have been performed in accordance with environmental principles generally accepted at this time and location.

Should you have any questions, please contact Allterra at (831) 425-2608.

Sincerely,
Allterra Environmental, Inc.



James Allen
Project Manager



Michael Killoran, P.G. 6670
Senior Geologist

Attachments:

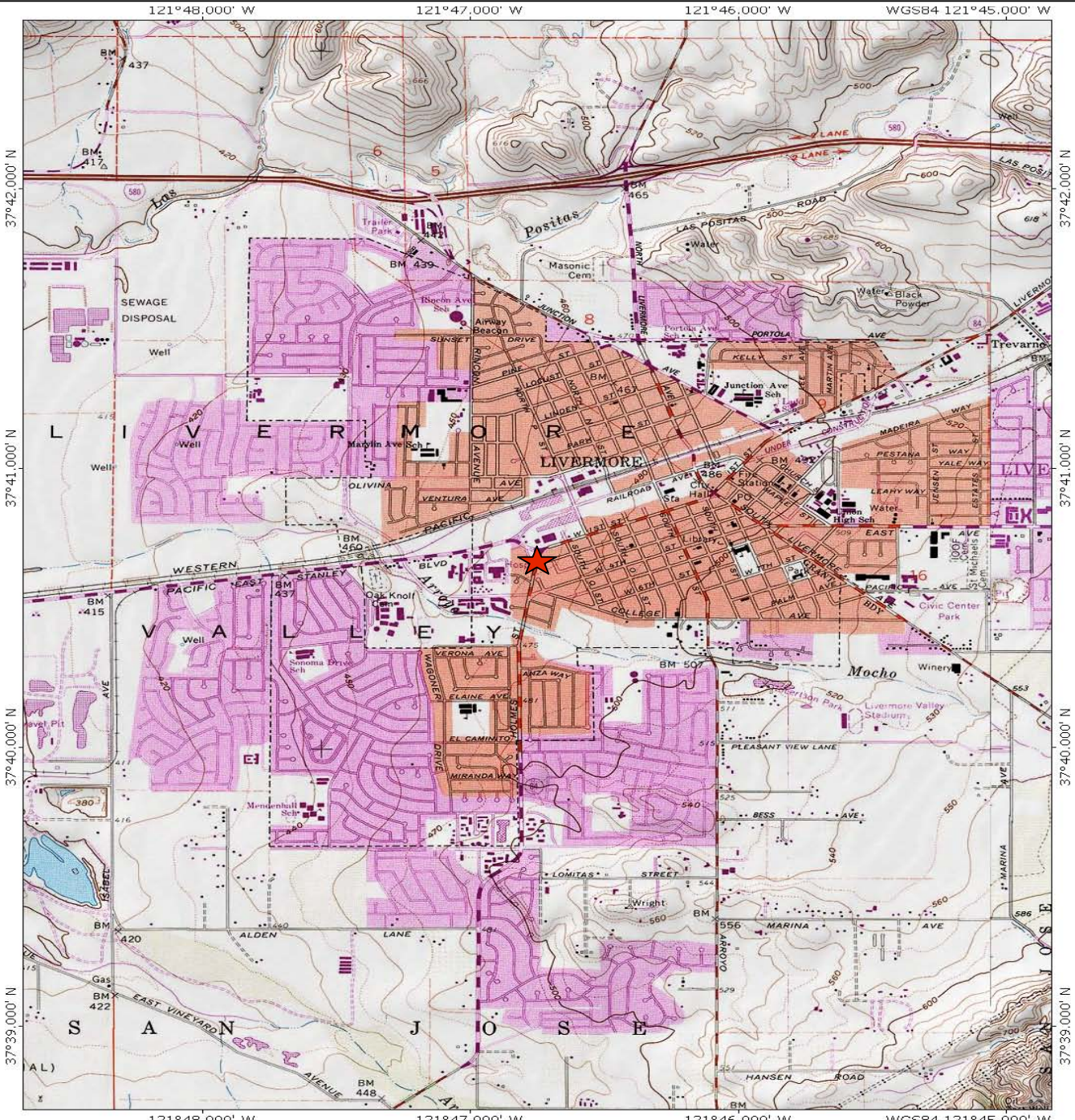
Figure 1, Site Vicinity Map
Figure 2, Site Plan

Table 1, Dual-Phase Extraction Pilot Test Data
Table 2, Soil Vapor Analytical Results for DPE Pilot Test
Table 3, Groundwater Analytical Results for DPE Pilot Test

Appendix A, Site Investigation Field Protocol
Appendix B, Field Data Sheets
Appendix C, Vapor Analytical Reports and Chain of Custody Documentation
Appendix D, Groundwater Analytical Reports and Chain of Custody Documentation



FIGURES 1-2



TN $\frac{1}{15^\circ}$ MN
 0 1000 FEET 0 500 1000 METERS
 121°48.000' W 121°47.000' W 121°46.000' W WGS84 121°45.000' W
 37°39.000' N 37°40.000' N 37°41.000' N 37°42.000' N

Vicinity Map

Livermore Gas and Mini-mart
 160 Holmes Street
 Livermore, California

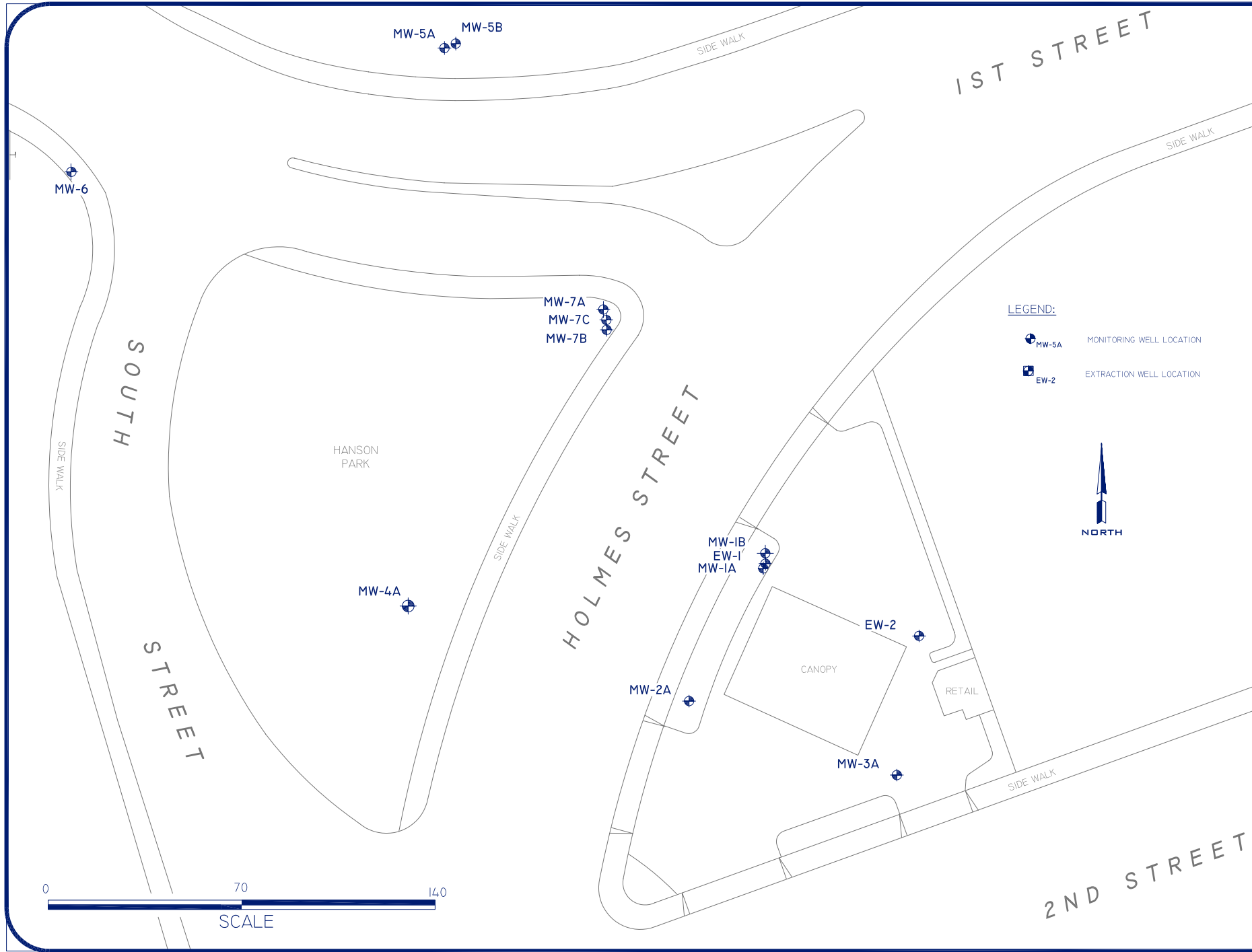
Figure 1

3/31/06



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General Notes

STAMP

**160 HOLMES STREET
SOIL AND GROUNDWATER INVESTIGATION
AND REMEDIATION PROJECT**



No.	Revision/Issue	Date
0	DRAFT/REVIEW	5/3

Firm Name and Address
ALLTERRA ENVIRONMENTAL, INC.
 849 ALMAR AVE., SUITE C, No. 281
 SANTA CRUZ, CALIFORNIA
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 WWW.ALLTERRAENV.COM

Sheet Name and Address
SITE PLAN
 160 HOLMES STREET
 LIVERMORE, CALIFORNIA

<small>Project</small> 015-01-002	<small>Sheet</small>
<small>Date</small> 5-3-06	FIGURE 2
<small>Scale</small> SEE DRAWING	

TABLES 1-3

Table 1
Dual-Phase Extraction Pilot Test Data
160 Holmes Street, Livermore, California

Well ID	Well Casing Diameter (inches)	Time (hours)	Soil Vapor Flow Rate (ft/min)	Soil Vapor Flow Rate (cfm)	Average Vacuum (Inches Water)	Average GW Flow Rate (gpm)	Observation Wells											
							MW-1A			MW-1B			MW-2A			MW-3A		
							Vacuum (Inches Water)	Depth to Water (feet)	Estimated Drawdown (feet)	Vacuum (Inches Water)	Depth to Water (feet)	Estimated Drawdown (feet)	Vacuum (Inches Water)	Depth to Water (feet)	Estimated Drawdown (feet)	Vacuum (Inches Water)	Depth to Water (feet)	Estimated Drawdown (feet)
EW-1	4.0	0.00	2,200	48	-70.0	10*	0.00	15.02	0.00	0.00	15.07	0.00	0.00	14.90	0.00	0.00	15.45	0.00
EW-1	4.0	0.25	2,200	48	-71.0	10*	0.00	15.90	-0.88	0.00	15.09	-0.02	0.00	14.90	0.00	0.00	15.45	0.00
EW-1	4.0	0.50	2,000	44	-70.0	10*	0.00	15.98	-0.96	0.00	15.11	-0.04	0.00	14.90	0.00	0.00	15.45	0.00
EW-1	4.0	0.75	1,900	41	-68.0	10*	0.00	16.22	-1.20	0.00	15.12	-0.05	0.00	14.90	0.00	0.00	15.46	-0.01
EW-1	4.0	1.00	1,800	39	-69.0	7*	0.00	16.28	-1.26	0.00	15.13	-0.06	0.00	14.90	0.00	0.00	15.46	-0.01
EW-1	4.0	1.50	1,700	37	-60.0	7*	0.00	16.30	-1.28	0.00	15.14	-0.07	0.00	14.90	0.00	0.00	15.46	-0.01
EW-1	4.0	2.00	1,600	35	-62.0	7*	0.00	16.31	-1.29	0.00	15.14	-0.07	0.00	14.90	0.00	0.00	15.46	-0.01
EW-1	4.0	2.50	2,400	52	-62.0	7*	0.00	16.33	-1.31	0.00	15.15	-0.08	0.00	14.90	0.00	0.00	15.46	-0.01
EW-1	4.0	3.00	2,400	52	-62.0	7*	0.00	16.34	-1.32	0.00	15.17	-0.10	0.00	14.90	0.00	0.00	15.46	-0.01
EW-1	4.0	3.50	2,400	52	-61.0	7*	0.00	16.27	-1.25	0.00	15.17	-0.10	0.00	14.90	0.00	0.00	15.46	-0.01
EW-1	4.0	4.00	2,500	55	-60.0	7*	0.00	16.28	-1.26	0.00	15.17	-0.10	0.00	14.90	0.00	0.00	15.46	-0.01
EW-1	4.0	4.50	2,400	52	-62.0	5*	0.00	16.25	-1.23	0.00	15.20	-0.13	0.00	14.91	-0.01	0.00	15.46	-0.01
EW-1	4.0	5.00	2,300	50	-61.0	5*	0.00	16.35	-1.33	0.00	15.20	-0.13	0.00	14.91	-0.01	0.00	15.46	-0.01
EW-1	4.0	5.50	2,250	49	-60.0	5*	0.00	16.38	-1.36	0.00	15.20	-0.13	0.00	14.91	-0.01	0.00	15.46	-0.01
EW-1	4.0	6.00	2,500	55	-60.0	5*	0.00	16.40	-1.38	0.00	15.20	-0.13	0.00	14.91	-0.01	0.00	15.46	-0.01
EW-2	4.0	0.00	1,000	22	-70.0	10*	0.00	14.90	0.00	0.00	15.02	0.00	0.00	14.90	0.00	0.00	15.45	0.00
EW-2	4.0	0.25	950	21	-70.4	10*	0.00	15.00	-0.10	0.00	15.03	-0.01	0.00	14.90	0.00	0.00	15.45	0.00
EW-2	4.0	0.50	900	20	-70.2	10*	0.00	15.00	-0.10	0.00	15.04	-0.02	0.00	14.90	0.00	0.00	15.45	0.00
EW-2	4.0	0.75	950	21	-70.8	10*	0.00	15.00	-0.10	0.00	15.05	-0.03	0.00	14.90	0.00	0.00	15.46	-0.01
EW-2	4.0	1.00	1,000	22	-71.3	10*	0.00	15.00	-0.10	0.00	15.05	-0.03	0.00	14.90	0.00	0.00	15.46	-0.01
EW-2	4.0	1.25	1,200	26	-71.0	7*	0.00	15.00	-0.10	0.00	15.05	-0.03	0.00	14.90	0.00	0.00	15.46	-0.01
EW-2	4.0	1.50	900	20	-68.2	7*	0.00	15.00	-0.10	0.00	15.05	-0.03	0.00	14.90	0.00	0.00	15.46	-0.01
EW-2	4.0	1.75	1,000	22	-67.1	7*	0.00	15.00	-0.10	0.00	15.05	-0.03	0.00	14.90	0.00	0.00	15.46	-0.01
EW-2	4.0	2.00	950	21	-74.2	7*	0.00	15.00	-0.10	0.00	15.05	-0.03	0.00	14.90	0.00	0.00	15.46	-0.01
EW-2	4.0	2.50	1,100	24	-76.1	7*	0.00	15.00	-0.10	0.00	15.05	-0.03	0.00	14.90	0.00	0.00	15.46	-0.01
EW-2	4.0	3.00	1,000	22	-74.3	7*	0.00	15.00	-0.10	0.00	15.05	-0.03	0.00	14.91	-0.01	0.00	15.46	-0.01

Table 1
Dual-Phase Extraction Pilot Test Data
 160 Holmes Street, Livermore, California

Well ID	Well Casing Diameter (inches)	Time (hours)	Soil Vapor Flow Rate (ft/min)	Soil Vapor Flow Rate (cfm)	Average Vacuum (Inches Water)	Average GW Flow Rate (gpm)	Observation Wells											
							MW-1A			MW-1B			MW-2A			MW-3A		
							Vacuum (Inches Water)	Depth to Water (feet)	Estimated Drawdown (feet)	Vacuum (Inches Water)	Depth to Water (feet)	Estimated Drawdown (feet)	Vacuum (Inches Water)	Depth to Water (feet)	Estimated Drawdown (feet)	Vacuum (Inches Water)	Depth to Water (feet)	Estimated Drawdown (feet)
EW-2	4.0	3.50	900	20	-72.1	7*	0.00	15.00	-0.10	0.00	15.05	-0.03	0.00	14.91	-0.01	0.00	15.46	-0.01
EW-2	4.0	4.00	1,000	22	-72.1	7*	0.00	15.00	-0.10	0.00	15.05	-0.03	0.00	14.91	-0.01	0.00	15.46	-0.01
EW-2	4.0	4.50	1,100	24	-73.2	5*	0.00	15.00	-0.10	0.00	15.05	-0.03	0.00	14.91	-0.01	0.00	15.46	-0.01
EW-2	4.0	5.00	1,200	26	-74.8	5*	0.00	15.01	-0.11	0.00	15.06	-0.04	0.00	14.91	-0.01	0.00	15.47	-0.02
EW-2	4.0	5.50	900	20	-72.6	5*	0.00	15.01	-0.11	0.00	15.06	-0.04	0.00	14.91	-0.01	0.00	15.47	-0.02
EW-2	4.0	6.00	1,000	22	-84.3	5*	0.00	15.01	-0.11	0.00	15.06	-0.04	0.00	14.91	-0.01	0.00	15.47	-0.02

Notes:

ft/min: feet per minute

* : gallons per minute calculated

gpm: gallons per minute

cfm = cubic feet per minute

GW = groundwater

Average vapor flow rate EW-1 = 47 cfm

Average vapor flow rate EW-2 = 22 cfm

Table 2
Soil Vapor Analytical Results for DPE Pilot Test
 160 Holmes Street, Livermore, California

Sample ID	Test Hour	Date	Total Petroleum Hydrocarbons as (mg/m3)	Aromatic Volatile Organic Compounds (mg/m3)				Oxygenated Volatile Organic Compounds (mg/m3)
			Gasoline	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE
EW-1	0	4/12/06	<25	<0.25	<0.25	<0.25	<0.25	7.0
EW-1	6	4/12/06	<25	<0.25	<0.25	<0.25	0.51	4.9
EW-2	0	4/11/06	41	0.97	0.39	0.6	2.4	96
EW-2	3	4/11/06	<25	<0.25	<0.25	<0.25	<0.25	<2.5
EW-2	6	4/11/06	<25	<0.25	<0.25	<0.25	<0.25	<2.5

Notes:

Samples analyzed for TPHg by EPA Method 8015CM and BTEX and MTBE (unless otherwise noted) by EPA Method 8021B

mg/m3 = milligrams per cubic meter

MTBE = methyl tertiary butyl ether

Table 3
Groundwater Analytical Results for DPE Pilot Test
 160 Holmes Street, Livermore, California

Sample ID	Test Hour	Date	Total Petroleum Hydrocarbons as (µg/L)		Aromatic Volatile Organic Compounds (µg/L)					Oxygenated Volatile Organics (µg/L)						Lead Scavengers (µg/L)		
			Gasoline	Diesel	Benzene	Toluene	Ethyl-benzene	Xylenes	MTBE	TAME	TBA	DIPE	ETBE	MTBE	ethanol	methanol	EDB	1,2-DCA
EW-1	0	4/12/06	200	100	1.5	15	8.5	29	2,200	<50	<500	<50	<50	2,300	<5,000	<50,000	<50	<50
EW-1	3	4/12/06	13,000	690	520	1,500	880	2,900	44,000	<500	<5,000	<500	<500	35,000	<50,000	<500,000	<500	<500
EW-1	6	4/12/06	13,000	720	500	1,500	890	3,000	40,000	<500	<5,000	<500	<500	32,000	<50,000	<500,000	<500	<500
EW-2	0	4/11/06	380	140	9.4	34	16	56	1,400	<50	<500	<50	<50	1,200	<5,000	<50,000	<50	<50
EW-2	3	4/11/06	1,000	220	39	34	81	180	3,100	<50	<500	<50	<50	2,700	<5,000	<50,000	<50	<50
EW-2	6	4/11/06	900	200	40	33	81	180	2,900	<50	<500	<50	<50	2,400	<5,000	<50,000	<50	<50

Notes:

Samples analyzed for TPHg by EPA Method 8015CM and BTEX and MTBE (unless otherwise noted) by EPA Method 8021B

µg/L = micrograms per liter

ETBE = Ethyl tert-Butyl Ether

MTBE = methyl tertiary butyl ether

TAME - tert-Amyl Methyl Ether

DIPE =Di-isoprpopyl Ether

TBA = tert-Butanol

EDB = 1,2-Dibromoether

1,2-DCA = 1,2-Dichloroethane

APPENDIX A
Site Investigation Field Protocol

Appendix A

Site Investigation Field Protocol

Geoprobe® Drilling

Soil Boring Installations and Sampling

Geoprobe® soil borings are installed by pushing a clean, 2.5-inch diameter, 4-foot long, steel core barrel into undisturbed soil. The core barrel, equipped with a new, clean acetate liner, is pushed with the aid of a hydraulic hammer. The soil sample is collected in the acetate liner. The core barrel is removed from the borehole and the acetate liner is removed from the core barrel. The desired interval is immediately cut from the acetate liner, capped with Teflon® sheets and plastic caps. The sample is then labeled and placed on ice in a cooler.

A portion of each sample is retained for field screening purposes. A small amount of soil (approximately 1 ounce) is placed in a plastic bag and placed in the sun for approximately 15 minutes. The bag is then pierced by the tip of a portable photo-ionization detector (PID) and the air in the bag is analyzed for total volatile hydrocarbons. The purpose of the field screening is to qualitatively determine the presence or absence of chemical organic compounds in order to aid in the selection of samples to be analyzed at the laboratory. The data is then recorded on the boring logs at the depth corresponding to the sampling point.

Upon completion of each soil boring, the hole is filled with a cement grout and bentonite mixture from the bottom of the boring to surface grade. The purpose of grouting the hole is to prevent future surface contamination from having a conduit to the groundwater table.

Water Sampling

Once the borings are advanced to the desired depth, water samples are collected. If the boring stays open, a clean stainless steel bailer is lowered into the boring to retrieve water samples. If the boring does not stay open, a new, clean, temporary, well casing and screen will be lowered into the boring to aid in water sample collection. The water is then carefully transferred from the bailer into the sample containers. The containers are then capped, labeled and placed on ice. After the water samples are collected, the temporary well casing and screen are removed from the boring and properly disposed of.

Hydropunch Water Sampling

The hydropunch groundwater sampler is assembled with the expendable drive point, the drive head, the protective sheath, the inner stainless steel screen (or PVC) and the O-ring seal. A drive rod is added to the top of the sampler and the entire assembly is driven into the subsurface using the percussion of the direct push rig. By adding a series of hardened steel, hollow drive rods, the sampler is advanced to the desired depth. Once the desired depth is achieved, extension rods are placed down the center of the drive rods to knock the expendable point loose and to hold the screen in position as the rods are retracted approximately 4 feet. The stainless steel screen is exposed to the aquifer and fills with groundwater. The groundwater is extracted using tubing which is inserted down the center of the rods into the stainless screen sampler. The most common methods of extracting the groundwater are a bailer, a check valve, or a peristaltic pump, depending upon the contaminant, the volume desired, and the local protocols.

Monitoring Well Installation

Hollow Stem Auger Technique

Boreholes for monitoring wells are drilled using a truck-mounted, hollow-stem auger drill rig. The borehole diameter will be a minimum of 4-inches larger than the outside diameter of the casing when installing well screen. The hollow-stem auger provides minimal interruption of drilling while permitting soil sampling at desired intervals. An Allterra geologist or engineer will continuously log each borehole during drilling and will constantly check drill cuttings for indications of both the first recognizable occurrence of groundwater and volatile organic compounds using either a portable photoionization detector (PID), flame ionization detector (FID), or an explosimeter.

Soil Boring Sampling

During drilling, soil samples are collected in 2-inch by 6-inch long brass tubes. Three brass tubes are placed in an 18-inch long split-barrel (spoon) sampler of the appropriate inside-diameter. The split-barrel sampler is driven its entire length, either hydraulically or using a 140-pound hammer, or until refusal is encountered. The sampler is

extracted from the borehole and the brass tubes are immediately trimmed and capped with Teflon® sheets and plastic caps. The samples are then sealed, labeled, and placed in chilled storage (refrigerated) for delivery, under chain of custody to the state-certified analytical laboratory. These procedures minimize the potential for cross contamination and volatilization of volatile organic compounds (VOCs) prior to chemical analysis.

A portion of each sample is retained for field screening purposes. A small amount of soil (approximately 1 ounce) is placed in a plastic bag and placed in the sun for approximately 15 minutes. The bag is then pierced by the tip of a portable photo-ionization detector (PID) and the air in the bag is analyzed for total volatile hydrocarbons. The purpose of the field screening is to qualitatively determine the presence or absence of chemical organic compounds in order to aid in the selection of samples to be analyzed at the laboratory. The data is then recorded on the boring logs at the depth corresponding to the sampling point.

All soil borings not converted into monitoring wells are backfilled with a mixture of neat cement with 5% bentonite powder to surface grade.

Soil Classification

Soil from borings is examined for lithology according to the Unified Soil Classification System under the supervision of a California Registered Geologist. Job location, boring location, boring name, date, soil types, observations and activities are recorded on the boring logs.

Monitoring Well Construction

Monitoring wells are cased with threaded, factory-perforated and blank Schedule 40 polyvinyl chloride (PVC). The perforated interval consists of slotted casing, generally with either 0.01- or 0.02-inch wide by 1.5-inch long slots, with 42 slots per foot. A PVC cap is secured to the bottom of the casing with stainless steel screws; no solvents or cements are used. Centering devices may be fastened to the casing to ensure even distribution of filter material and grout within the borehole annulus.

After setting the casing inside the hollow-stem auger, sand or gravel filter material is poured into the annular space to fill from boring bottom to generally 2 feet above the perforated interval. A 1 - to 2-foot thick bentonite plug is set above this filter material to prevent grout from infiltrating the filter pack. Neat cement containing about 5 percent bentonite is then tremmied into the annular space from the top of the bentonite plug to near surface. A traffic-rated vault is installed around each wellhead for wells located in parking lots or driveways, while steel "stovepipes" are usually set over wellheads in landscaped areas.

Well Development

After installation, the wells are thoroughly developed to remove residual drilling materials from the wellbore, and to improve well performance by removing fine material from the filter pack that may pass into the well. Well development techniques used may include pumping, surging, bailing, swabbing, jetting, flushing, and airlifting. All development water is collected either in drums or tanks for temporary storage, and properly disposed of pending laboratory analytical results. Following development, the well is allowed to stand undisturbed for a minimum of 48 hours before its first sampling.

Well Monitoring and Sample Collection

A Teflon bailer or submersible pump was used to purge a minimum of three well volumes of groundwater from each well. After each well volume is purged, field parameters such as pH, temperature, and conductivity are recorded. Wells are purged until field parameters have stabilized or a maximum of ten (10) well volumes of groundwater have been removed. When possible, purge rates will not exceed the recharge rate for the well. However, if the well yield is low and the well was dewatered, the well is allowed to recharge to 80% of its original volume prior to sample collection. Field parameter measurements and pertinent qualitative observations, such as groundwater color and odor, are recorded in Groundwater Sampling Field Logs. Groundwater samples are collected in appropriate bottles and stored on ice for delivery, under chain-of-custody documentation, to a state-certified laboratory for analysis.

Sample Identification and Chain-Of-Custody Procedures

Each sample container submitted for analysis is labeled to identify the job number, date, time of sample collection, a sample number unique to the sample, any in-field measurements made, sampling methodology, name(s) of on-site personnel, and any other pertinent field observations also recorded on the field excavation or boring log. During shipment, the person with custody of the samples will relinquish them to the next person by signing the chain-of-custody form(s) and noting the date and time.

Equipment Decontamination

All drilling, sampling, well construction, and well development equipment is cleaned in a solution of laboratory grade detergent and distilled water or steam cleaned before use at each sampling point.

Field Personnel

During groundwater sampling activities, sampling personnel will wear pertinent attire to minimize risks to health and safety. Field personnel will also use a pair of clean, powderless, surgical gloves for each successive sampling point. Used surgical gloves will be placed into waste drums for future disposal.

Waste Disposal

Soil Disposal: Soil generated during drilling will be stored in DOT-approved 55-gallon waste drums pending proper disposal.

Water Disposal: Water generated during well development, purging, and sampling activities will be placed into DOT-approved 55-gallon waste drums pending proper disposal and/or permitted discharge to the sanitary sewer.

APPENDIX B
Field Data Sheets

APPENDIX C
Vapor Certified Analytical Reports and Chain of Custody

0604235

ALLTERRA
 849 Almar Avenue, Suite C, #281
 Santa Cruz, California 95060
 Website: www.allterraenv.com
 Phone: (831) 425-2608 Facsimile: (831) 425-2609

Chain of Custody Record

Turn Around Time (circle one) RUSH 24HR 48HR 72HR 5 Day

Report and Bill to: Allterra Environmental, Inc.

Project Number:

Project Location:

Project Name: 160 HOLMES DPE PILOT TEST

Sampler Signature:

Sample ID	Sample Collection		Sample Containers		Matrix					Preservation				TPH _g , BTEX&MTBE (EPA 8015/8021)	TPH _g , BTEX (EPA 8021B)	TPH _d (EPA 8015)	5-fuel oxy's (EPA 8260)	Ethanol and Methanol (EPA 8260)	Lead Scavengers (8260)	Total HVOCs (EPA 8260)	Hardness/Total dissolved solids	CAM-17 Metals (EPA 6010/6020)	LUFT 5 Metals (EPA 6010/6020)	PAHs/PNA's (EPA 8270.625/8310)	Fish Toxicity/Bioassay	Lead (EPA 6010/200.9/200.8)	Turbidity	EDF required		
	Date	Time	Number of Containers	Container Type	Air	Water	Soil	Sludge	Other	Ice	HCl	HNO ₃	Other																	
EW-2-6	4/11/06		1	BAG	X									X															X	
EW-1-0	4/12/06		1	BAG	X									X															X	
EW-2-0	4/11/06		1	BAG	X									X															X	
EW-1-6	4/12/06		1	BAG	X									X															X	
EW-2-3	4/11/06		1	BAG	X									X															X	

Sampled By: JR	Date: 4/14/05	Time:	Received By:
Received By:	Date: 4/14/06	Time: 1120	Received By: <i>Maria U</i>
Received By:	Date:	Time:	Received By:

Comments: ICE/° *NO*
 GOOD CONDITION APPROPRIATE CONTAINERS
 HEAD SPACE ABSENT _____ PRESERVED IN LAB _____
 DECHLORINATED IN LAB _____
 PRESERVATION VOAS O&G METALS OTHER

REC'D SEALED & INTACT VIA *allterra Courier*

McC Campbell Analytical, Inc.



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

CHAIN-OF-CUSTODY RECORD

WorkOrder: 0604235

ClientID: ATRS

EDF: YES

Report to:

James Allen
 Allterra Environmental, Inc
 849 Almar Ave, Ste. C #281
 Santa Cruz, CA 95060

TEL: 831-425-2608
 FAX: 831-425-2609
 ProjectNo: 160 Holmes DPE Pilot Test
 PO:

Bill to:

Accounts Payable
 Allterra Environmental
 849 Almar Ave, Ste. C #281
 Santa Cruz, CA 95060

Requested TAT:

5 days

Date Received: 04/14/2006

Date Printed: 04/14/2006

Sample ID	ClientSampID	Matrix	Collection Date	Hold	Requested Tests (See legend below)												
					1	2	3	4	5	6	7	8	9	10	11	12	
0604235-001	EW-2-6	Air	4/11/06	<input type="checkbox"/>	A	A											
0604235-002	EW-1-0	Air	4/12/06	<input type="checkbox"/>	A												
0604235-003	EW-2-0	Air	4/11/06	<input type="checkbox"/>	A												
0604235-004	EW-1-6	Air	4/12/06	<input type="checkbox"/>	A												
0604235-005	EW-2-3	Air	4/11/06	<input type="checkbox"/>	A												

Test Legend:

1	G-MBTEX_AIR	2	PREF REPORT	3		4		5	
6		7		8		9		10	
11		12							

Prepared by: Maria Venegas

Comments:

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.



McC Campbell Analytical, Inc.

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

Allterra Environmental, Inc 849 Almar Ave, Ste. C #281 Santa Cruz, CA 95060	Client Project ID: 160 Holmes DPE Pilot Test	Date Sampled: 04/11/06-04/12/06
		Date Received: 04/14/06
	Client Contact: James Allen	Date Extracted: 04/14/06-04/15/06
	Client P.O.:	Date Analyzed: 04/14/06-04/15/06

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

Extraction method: SW5030B

Analytical methods: SW8021B/8015Cm

Work Order: 0604235

Lab ID	Client ID	Matrix	TPH(g)	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS
001A	EW-2-6	A	ND	ND	ND	ND	ND	ND	1	111
002A	EW-1-0	A	ND	7.0	ND	ND	ND	ND	1	102
003A	EW-2-0	A	41,a	96	0.97	0.39	0.60	2.4	1	110
004A	EW-1-6	A	ND	4.9	ND	ND	ND	0.51	1	113
005A	EW-2-3	A	ND	ND	ND	ND	ND	ND	1	112

Reporting Limit for DF =1; ND means not detected at or above the reporting limit	A	25	2.5	0.25	0.25	0.25	0.25	0.25	1	µg/L
	S	NA	NA	NA	NA	NA	NA	NA	1	mg/Kg

* water and vapor samples are reported in µg/L, soil/sludge/solid samples in mg/kg, wipe samples in µg/wipe, product/oil/non-aqueous liquid samples in mg/L.

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McC Campbell 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 / mineral spirit?); 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 ~1 vol. % sediment; j) reporting limit raised due to high MTBE content; k) TPH pattern that does not appear to be derived from gasoline (aviation gas). m) no recognizable pattern.



QC SUMMARY REPORT FOR SW8021B/8015Cm

W.O. Sample Matrix: Air

QC Matrix: Water

WorkOrder: 0604235

EPA Method: SW8021B/8015Cm		Extraction: SW5030B			BatchID: 21269			Spiked Sample ID: 0604237-007A		
Analyte	Sample	Spiked	MS	MSD	MS-MSD	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)	
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	MS / MSD	LCS / LCSD
TPH(btex) £	ND	60	99.9	106	6.32	98.7	98.2	0.485	70 - 130	70 - 130
MTBE	ND	10	114	112	1.44	104	102	2.07	70 - 130	70 - 130
Benzene	ND	10	103	99.2	3.33	95.4	97.1	1.70	70 - 130	70 - 130
Toluene	ND	10	96.8	94	2.96	97.5	99.4	1.93	70 - 130	70 - 130
Ethylbenzene	ND	10	105	101	3.69	95.9	97.6	1.76	70 - 130	70 - 130
Xylenes	ND	30	96	91.3	4.98	89.3	89.7	0.372	70 - 130	70 - 130
%SS:	105	10	103	102	0.958	106	107	0.821	70 - 130	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

BATCH 21269 SUMMARY

Sample ID	Date Sampled	Date Extracted	Date Analyzed	Sample ID	Date Sampled	Date Extracted	Date Analyzed
0604235-001A	4/11/06	4/14/06	4/14/06 12:47 PM	0604235-002A	4/12/06	4/14/06	4/14/06 9:15 PM
0604235-003A	4/11/06	4/14/06	4/14/06 11:28 PM	0604235-004A	4/12/06	4/15/06	4/15/06 12:33 AM
0604235-005A	4/11/06	4/15/06	4/15/06 1:06 AM				

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.
 % Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / ((MS + MSD) / 2).
 MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.
 £ TPH(btex) = sum of BTEX areas from the FID.
 # cluttered chromatogram; sample peak coelutes with surrogate peak.
 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.

APPENDIX D
Groundwater Certified Analytical Reports and Chain of Custody

0604238



849 Almar Avenue, Suite C, #281

Santa Cruz, California 95060

Website: www.allterraenv.com

Phone: (831) 425-2608 Facsimile: (831) 425-2609

Report and Bill to: Allterra Environmental, Inc.

Project Number:

Project Location:

Project Name: 160 HOLMES DPE PILOT TEST

Sampler Signature:

Chain of Custody Record

Turn Around Time (circle one) RUSH 24HR 48HR 72HR 5 Day

Sample ID	Sample Collection		Sample Containers		Matrix					Preservation				TPHg, BTEX&MTBE (EPA 8015/8021)	TPHg, (EPA 8021B)	TPHd (EPA 8015)	5-fuel oxy (EPA 8260)	Ethanol and Methanol (EPA 8260)	Lead Scavengers (8260)	Total HVOCs (EPA 8260)	Hardness/Total dissolved solids	CAM-17 Metals (EPA 6010/6020)	LUFT 5 Metals (EPA 6010/6020)	PAHs/PNA's (EPA 8270.625/8310)	Fish Toxicity/Bioassay	Lead (EPA 6010/200.9/200.8)	Turbidity	EDF required	
	Date	Time	Number of Containers	Container Type	Air	Water	Soil	Sludge	Other	Ice	HCl	HNO ₃	Other																
EW-2-6	4/11/06		5	voa/amber		X				X	X			X		X	X	X											X
EW-1-0	4/12/06		5	voa/amber		X				X	X			X		X	X	X											X
EW-2-0	4/11/06		5	voa/amber		X				X	X			X		X	X	X											X
EW-1-6	4/12/06		5	voa/amber		X				X	X			X		X	X	X											X
EW-2-3	4/11/06		5	voa/amber		X				X	X			X		X	X	X											X
EW-1-3	4/12/06		5	voa/amber		X				X	X			X		X	X	X											X

Sampled By: JR	4/14/05	Time:	Received By:
Received By:	Date: 4/14/06	Time: 1120	Received By: <i>[Signature]</i>
Received By:	Date:	Time:	Received By:

Comments:

ICE/1°

GOOD CONDITION

HEAD SPACE ABSENT

DECHLORINATED IN LAB

PRESERVATION VOAS O&G METALS OTHER

APPROPRIATE CONTAINERS

PRESERVED IN LAB

REC'D SEALED & INTACT VIA allterra Courier

McC Campbell Analytical, Inc.



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

CHAIN-OF-CUSTODY RECORD

WorkOrder: 0604238

ClientID: ATRS

EDF: YES

Report to:
 James Allen
 Allterra Environmental, Inc
 849 Almar Ave, Ste. C #281
 Santa Cruz, CA 95060

TEL: 831-425-2608
 FAX: 831-425-2609
 ProjectNo: 160 Holmes DPE Pilot Test
 PO:

Bill to:
 Accounts Payable
 Allterra Environmental
 849 Almar Ave, Ste. C #281
 Santa Cruz, CA 95060

Requested TAT: 5 days

Date Received: 04/14/2006
Date Printed: 04/14/2006

Sample ID	ClientSampID	Matrix	Collection Date	Hold	Requested Tests (See legend below)												
					1	2	3	4	5	6	7	8	9	10	11	12	
0604238-001	EW-2-6	Water	4/11/06	<input type="checkbox"/>	C	A	A	B									
0604238-002	EW-1-0	Water	4/12/06	<input type="checkbox"/>	C	A		B									
0604238-003	EW-2-0	Water	4/11/06	<input type="checkbox"/>	C	A		B									
0604238-004	EW-1-6	Water	4/12/06	<input type="checkbox"/>	C	A		B									
0604238-005	EW-2-3	Water	4/11/06	<input type="checkbox"/>	C	A		B									
0604238-006	EW-1-3	Water	4/12/06	<input type="checkbox"/>	C	A		B									

Test Legend:

1	9-OXYS_W	2	G-MBTEX_W	3	PREF REPORT	4	TPH(D)_W	5	
6		7		8		9		10	
11		12							

Prepared by: Maria Venegas

Comments:

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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 Telephone : 925-798-1620 Fax : 925-798-1622
 Website: www.mcccampbell.com E-mail: main@mcccampbell.com

Allterra Environmental, Inc 849 Almar Ave, Ste. C #281 Santa Cruz, CA 95060	Client Project ID: 160 Holmes DPE Pilot Test	Date Sampled: 04/11/06-04/12/06
	Client Contact: James Allen	Date Received: 04/14/06
	Client P.O.:	Date Extracted: 04/14/06-04/15/06
		Date Analyzed: 04/14/06-04/15/06

Oxygenated Volatile Organics + EDB and 1,2-DCA by P&T and GC/MS*

Extraction Method: SW5030B

Analytical Method: SW8260B

Work Order: 0604238

Lab ID	0604238-001C	0604238-002C	0604238-003C	0604238-004C	Reporting Limit for DF =1	
Client ID	EW-2-6	EW-1-0	EW-2-0	EW-1-6		
Matrix	W	W	W	W		
DF	100	100	100	1000		

Compound	Concentration				ug/kg	µg/L
tert-Amyl methyl ether (TAME)	ND<50	ND<50	ND<50	ND<500	NA	0.5
t-Butyl alcohol (TBA)	ND<500	ND<500	ND<500	ND<5000	NA	5.0
1,2-Dibromoethane (EDB)	ND<50	ND<50	ND<50	ND<500	NA	0.5
1,2-Dichloroethane (1,2-DCA)	ND<50	ND<50	ND<50	ND<500	NA	0.5
Diisopropyl ether (DIPE)	ND<50	ND<50	ND<50	ND<500	NA	0.5
Ethanol	ND<5000	ND<5000	ND<5000	ND<50,000	NA	50
Ethyl tert-butyl ether (ETBE)	ND<50	ND<50	ND<50	ND<500	NA	0.5
Methanol	ND<50,000	ND<50,000	ND<50,000	ND<500,000	NA	500
Methyl-t-butyl ether (MTBE)	2400	2300	1200	32,000	NA	0.5

Surrogate Recoveries (%)

%SS1:	104	104	104	107	
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Comments			i		
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* water and vapor samples are reported in µg/L, soil/sludge/solid samples in mg/kg, product/oil/non-aqueous liquid samples and all TCLP & SPLP extracts are reported in mg/L, wipe samples in µg/wipe.

ND means not detected above the reporting limit; N/A means analyte not applicable to this analysis.

surrogate diluted out of range or coelutes with another peak; &) low surrogate due to matrix interference.

h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~1 vol. % sediment; j) sample diluted due to high organic content/matrix interference; k) reporting limit near, but not identical to our standard reporting limit due to variable Encore sample weight; m) reporting limit raised due to insufficient sample amount; n) results are reported on a dry weight basis; p) see attached narrative.



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Allterra Environmental, Inc 849 Almar Ave, Ste. C #281 Santa Cruz, CA 95060	Client Project ID: 160 Holmes DPE Pilot Test	Date Sampled: 04/11/06-04/12/06
	Client Contact: James Allen	Date Received: 04/14/06
	Client P.O.:	Date Extracted: 04/14/06-04/15/06
		Date Analyzed: 04/14/06-04/15/06

Oxygenated Volatile Organics + EDB and 1,2-DCA by P&T and GC/MS*

Extraction Method: SW5030B

Analytical Method: SW8260B

Work Order: 0604238

Lab ID	0604238-005C	0604238-006C			Reporting Limit for DF =1
Client ID	EW-2-3	EW-1-3			
Matrix	W	W			
DF	100	1000			

Compound	Concentration				ug/kg	µg/L
	tert-Amyl methyl ether (TAME)	ND<50	ND<500			NA
t-Butyl alcohol (TBA)	ND<500	ND<5000			NA	5.0
1,2-Dibromoethane (EDB)	ND<50	ND<500			NA	0.5
1,2-Dichloroethane (1,2-DCA)	ND<50	ND<500			NA	0.5
Diisopropyl ether (DIPE)	ND<50	ND<500			NA	0.5
Ethanol	ND<5000	ND<50,000			NA	50
Ethyl tert-butyl ether (ETBE)	ND<50	ND<500			NA	0.5
Methanol	ND<50,000	ND<500,000			NA	500
Methyl-t-butyl ether (MTBE)	2700	35,000			NA	0.5

Surrogate Recoveries (%)

%SS1:	104	106		
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Comments

* water and vapor samples are reported in µg/L, soil/sludge/solid samples in mg/kg, product/oil/non-aqueous liquid samples and all TCLP & SPLP extracts are reported in mg/L, wipe samples in µg/wipe.

ND means not detected above the reporting limit; N/A means analyte not applicable to this analysis.

surrogate diluted out of range or coelutes with another peak; &) low surrogate due to matrix interference.

h) lighter than water immiscible sheen/product is present; i) liquid sample that contains greater than ~1 vol. % sediment; j) sample diluted due to high organic content/matrix interference; k) reporting limit near, but not identical to our standard reporting limit due to variable Encore sample weight; m) reporting limit raised due to insufficient sample amount; n) results are reported on a dry weight basis; p) see attached narrative.



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Allterra Environmental, Inc 849 Almar Ave, Ste. C #281 Santa Cruz, CA 95060	Client Project ID: 160 Holmes DPE Pilot Test	Date Sampled: 04/11/06-04/12/06
		Date Received: 04/14/06
	Client Contact: James Allen	Date Extracted: 04/15/06-04/18/06
	Client P.O.:	Date Analyzed: 04/15/06-04/18/06

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

Extraction method: SW5030B

Analytical methods: SW8021B/8015Cm

Work Order: 0604238

Lab ID	Client ID	Matrix	TPH(g)	MTBE	Benzene	Toluene	Ethylbenzene	Xylenes	DF	% SS
001A	EW-2-6	W	900,a	2900	40	33	81	180	3.3	118
002A	EW-1-0	W	200,a,i	2200	1.5	15	8.5	29	2	112
003A	EW-2-0	W	380,a,i	1400	9.4	34	16	56	1	120
004A	EW-1-6	W	13,000,a	40,000	500	1500	890	3000	50	109
005A	EW-2-3	W	1000,a	3100	39	34	81	180	2	111
006A	EW-1-3	W	13,000,a	44,000	520	1500	880	2900	33	110

Reporting Limit for DF =1; ND means not detected at or above the reporting limit	W	50	5.0	0.5	0.5	0.5	0.5	0.5	1	µg/L
	S	NA	NA	NA	NA	NA	NA	NA	1	mg/Kg

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

cluttered chromatogram; sample peak coelutes with surrogate peak.

+The following descriptions of the TPH chromatogram are cursory in nature and McC Campbell 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 / mineral spirit?); 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 ~1 vol. % sediment; j) reporting limit raised due to high MTBE content; k) TPH pattern that does not appear to be derived from gasoline (aviation gas). m) no recognizable pattern; n) TPH(g) range non-target isolated peaks subtracted out of the TPH(g) concentration at the client's request.



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Allterra Environmental, Inc 849 Almar Ave, Ste. C #281 Santa Cruz, CA 95060	Client Project ID: 160 Holmes DPE Pilot Test	Date Sampled: 04/11/06-04/12/06
	Client Contact: James Allen	Date Received: 04/14/06
	Client P.O.:	Date Analyzed: 04/14/06
		Date Extracted: 04/14/06

Diesel Range (C10-C23) Extractable Hydrocarbons as Diesel*

Extraction method: SW3510C

Analytical methods: SW8015C

Work Order: 0604238

Lab ID	Client ID	Matrix	TPH(d)	DF	% SS
0604238-001B	EW-2-6	W	200,d	1	101
0604238-002B	EW-1-0	W	100,d,i	1	102
0604238-003B	EW-2-0	W	140,d,i	1	103
0604238-004B	EW-1-6	W	720,d	1	101
0604238-005B	EW-2-3	W	220,d	1	104
0604238-006B	EW-1-3	W	690,d	1	103

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

* water samples are reported in µg/L, wipe samples in µg/wipe, soil/solid/sludge samples in mg/kg, product/oil/non-aqueous liquid samples in mg/L, and all DISTLC / STLC / SPLP / TCLP extracts are reported in µg/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.

+The following descriptions of the TPH chromatogram are cursory in nature and McC Campbell 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 ~1 vol. % sediment; k) kerosene/kerosene range/jet fuel range; l) bunker oil; m) fuel oil; n) stoddard solvent/mineral spirit.



QC SUMMARY REPORT FOR SW8260B

W.O. Sample Matrix: Water

QC Matrix: Water

WorkOrder: 0604238

EPA Method: SW8260B		Extraction: SW5030B			BatchID: 21260			Spiked Sample ID 0604237-005B		
Analyte	Sample	Spiked	MS	MSD	MS-MSD	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)	
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	MS / MSD	LCS / LCSD
tert-Amyl methyl ether (TAME)	ND	10	89.2	87.5	1.97	80.5	88.1	9.04	70 - 130	70 - 130
t-Butyl alcohol (TBA)	ND	50	112	111	1.36	86.2	110	23.9	70 - 130	70 - 130
1,2-Dibromoethane (EDB)	ND	10	119	119	0	104	117	12.0	70 - 130	70 - 130
1,2-Dichloroethane (1,2-DCA)	ND	10	102	102	0	93.2	98.7	5.74	70 - 130	70 - 130
Diisopropyl ether (DIPE)	ND	10	118	118	0	83.6	86.8	3.76	70 - 130	70 - 130
Ethanol	ND	500	103	113	9.15	85.5	106	21.0	70 - 130	70 - 130
Ethyl tert-butyl ether (ETBE)	ND	10	93.3	92.6	0.809	84.1	90.2	7.01	70 - 130	70 - 130
Methanol	ND	2500	114	115	1.05	99.7	100	0.715	70 - 130	70 - 130
Methyl-t-butyl ether (MTBE)	ND	10	95.9	97.6	1.84	96.5	100	3.78	70 - 130	70 - 130
%SS1:	106	10	104	103	0.742	99	100	1.50	70 - 130	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

BATCH 21260 SUMMARY

Sample ID	Date Sampled	Date Extracted	Date Analyzed	Sample ID	Date Sampled	Date Extracted	Date Analyzed
0604238-001C	4/11/06	4/14/06	4/14/06 7:24 PM	0604238-002C	4/12/06	4/14/06	4/14/06 8:07 PM
0604238-003C	4/11/06	4/14/06	4/14/06 10:15 PM	0604238-004C	4/12/06	4/14/06	4/14/06 10:57 PM
0604238-005C	4/11/06	4/14/06	4/14/06 11:40 PM	0604238-006C	4/12/06	4/15/06	4/15/06 12:22 AM

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

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

MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.

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.

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



QC SUMMARY REPORT FOR SW8015C

W.O. Sample Matrix: Water

QC Matrix: Water

WorkOrder: 0604238

EPA Method: SW8015C		Extraction: SW3510C			BatchID: 21236			Spiked Sample ID: N/A		
Analyte	Sample	Spiked	MS	MSD	MS-MSD	LCS	LCSD	LCS-LCSD	Acceptance Criteria (%)	
	µg/L	µg/L	% Rec.	% Rec.	% RPD	% Rec.	% Rec.	% RPD	MS / MSD	LCS / LCSD
TPH(d)	N/A	1000	N/A	N/A	N/A	99.1	98.7	0.425	N/A	70 - 130
%SS:	N/A	2500	N/A	N/A	N/A	90	89	1.95	N/A	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										

BATCH 21236 SUMMARY

Sample ID	Date Sampled	Date Extracted	Date Analyzed	Sample ID	Date Sampled	Date Extracted	Date Analyzed
0604238-001B	4/11/06	4/14/06	4/14/06 3:20 PM	0604238-002B	4/12/06	4/14/06	4/14/06 4:32 PM
0604238-003B	4/11/06	4/14/06	4/14/06 5:43 PM	0604238-004B	4/12/06	4/14/06	4/14/06 6:54 PM
0604238-005B	4/11/06	4/14/06	4/14/06 10:25 PM	0604238-006B	4/12/06	4/14/06	4/14/06 11:34 PM

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.
 % Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / ((MS + MSD) / 2).
 MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.
 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.



QC SUMMARY REPORT FOR SW8021B/8015Cm

W.O. Sample Matrix: Water

QC Matrix: Water

WorkOrder: 0604238

Table with columns: EPA Method: SW8021B/8015Cm, Extraction: SW5030B, BatchID: 21269, Spiked Sample ID: 0604237-007A. Rows include analytes like TPH(btex), MTBE, Benzene, Toluene, Ethylbenzene, Xylenes, and %SS with various metrics like MS, MSD, MS-MSD, LCS, LCSD, LCS-LCSD, and Acceptance Criteria.

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

BATCH 21269 SUMMARY

Summary table with columns: Sample ID, Date Sampled, Date Extracted, Date Analyzed. It lists sample IDs from 0604238-001A to 0604238-006A and their corresponding dates and analysis times.

MS = Matrix Spike; MSD = Matrix Spike Duplicate; LCS = Laboratory Control Sample; LCSD = Laboratory Control Sample Duplicate; RPD = Relative Percent Deviation.
% Recovery = 100 * (MS-Sample) / (Amount Spiked); RPD = 100 * (MS - MSD) / ((MS + MSD) / 2).
MS / MSD spike recoveries and / or %RPD may fall outside of laboratory acceptance criteria due to one or more of the following reasons: a) the sample is inhomogenous AND contains significant concentrations of analyte relative to the amount spiked, or b) the spiked sample's matrix interferes with the spike recovery.
£ TPH(btex) = sum of BTEX areas from the FID.
cluttered chromatogram; sample peak coelutes with surrogate peak.
N/A = not applicable or 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.