CONESTOGA-ROVERS & ASSOCIATES

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# TRANSMITTAL

**DATE:** January 29, 2009

**REFERENCE NO.:** 240781

**PROJECT NAME:** 2703 Martin Luther King Jr. Way, Oakland

**TO:** Jerry Wickham
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

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11:40 am, Feb 04, 2009
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Environmental Health

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| 1 | Subsurface Investigation Work Plan |
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**COMMENTS:**
If you have any questions regarding the contents of this document, please contact Tom Sparrowe at (510) 420-3316

Copy to: Denis Brown
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Completed by: Tom Sparrowe [Please Print]

Signed: Tom Sparrowe

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# SUBSURFACE INVESTIGATION WORK PLAN

## FORMER SHELL SERVICE STATION
## 2703 MARTIN LUTHER KING JR. WAY
## OAKLAND, CALIFORNIA

| | |
|---|---|
| SAP CODE | 129449 |
| INCIDENT NO. | 97093397 |
| AGENCY NO. | RO0000145 |

**Prepared by:**
**Conestoga-Rovers & Associates**

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JANUARY 29, 2009
REF. NO. 240781 (3)
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(Following Text)



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## 1.0 INTRODUCTION

Conestoga-Rovers & Associates, Inc. (CRA) prepared this work plan on behalf of Equilon Enterprises LLC dba Shell Oil Products US (Shell) to delineate the extent of elevated lead concentrations in soil prior to completing the proposed excavation activities. This work plan was requested in Alameda County Health Care Services Agency's (ACHCSA's) November 6, 2008 letter. ACHCSA's January 8, 2009 electronic correspondence granted an extension of the original due date to February 9, 2009.

The subject site is a former service station located on the northwest corner of Martin Luther King Jr. Way and 27th Street in a mixed commercial and residential area of Oakland, California (Figure 1). Currently, the site is occupied by Auto-Tech West and is used as an automotive repair shop (Figure 2).

A summary of previous work performed at the site and additional background information is contained in Appendix A.

## 2.0 WORK TASKS

### 2.1 PERMITS

CRA will obtain the required permit from Alameda County Public Works Agency for the boring locations.

### 2.2 HEALTH AND SAFETY PLAN (HASP)

CRA will prepare a HASP to protect site workers. The plan will be reviewed and signed by each site worker and kept on the site during field activities.

### 2.3 UTILITY CLEARANCE

CRA will mark the proposed boring locations and will clear the locations through Underground Service Alert (USA) and a private utility locating service prior to completing the borings.

### 2.4 SOIL BORINGS

Soil generated during the installation of vapor probe VP-1 was sampled and profiled for disposal. The soil sample contained 2,630 milligrams per kilogram (mg/kg) total lead. To investigate the extent of lead in soil, eight borings will be advanced using hand augers behind the station building, near vapor probe VP-9 (Figure 2). The borings will be advanced to approximately 5 feet below grade (fbg). Soil samples will be collected from the borings using a hand auger at approximately 0 to 0.5 fbg, 1 to 1.5 fbg, and 4.5 to 5 fbg for chemical analysis.

Soil samples will be collected in 6-inch steel sleeves, sealed with Teflon tape and tight fitting plastic end caps, labeled, logged onto a chain-of-custody record, and placed into a cooler with ice for transport to a State of California certified laboratory for analysis. No boring logs will be prepared.

Following sampling each boring will be backfilled with top soil or concrete to match the surrounding ground surface.

CRA will perform this work under the supervision of a professional geologist or engineer.

## 2.5 CHEMICAL ANALYSIS

Soil samples will be analyzed for analysis for total lead by EPA Method 6010B.

## 2.6 REPORT PREPARATION

Following the receipt of analytical results from the laboratory, CRA will prepare a written report which will include field procedures, laboratory results, and conclusions.

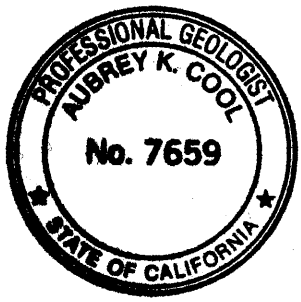
## 3.0 SCHEDULE

CRA will begin work upon receiving ACHCSA's written approval of this work plan and the appropriate permits.

All of Which is Respectfully Submitted,
CONESTOGA-ROVERS & ASSOCIATES

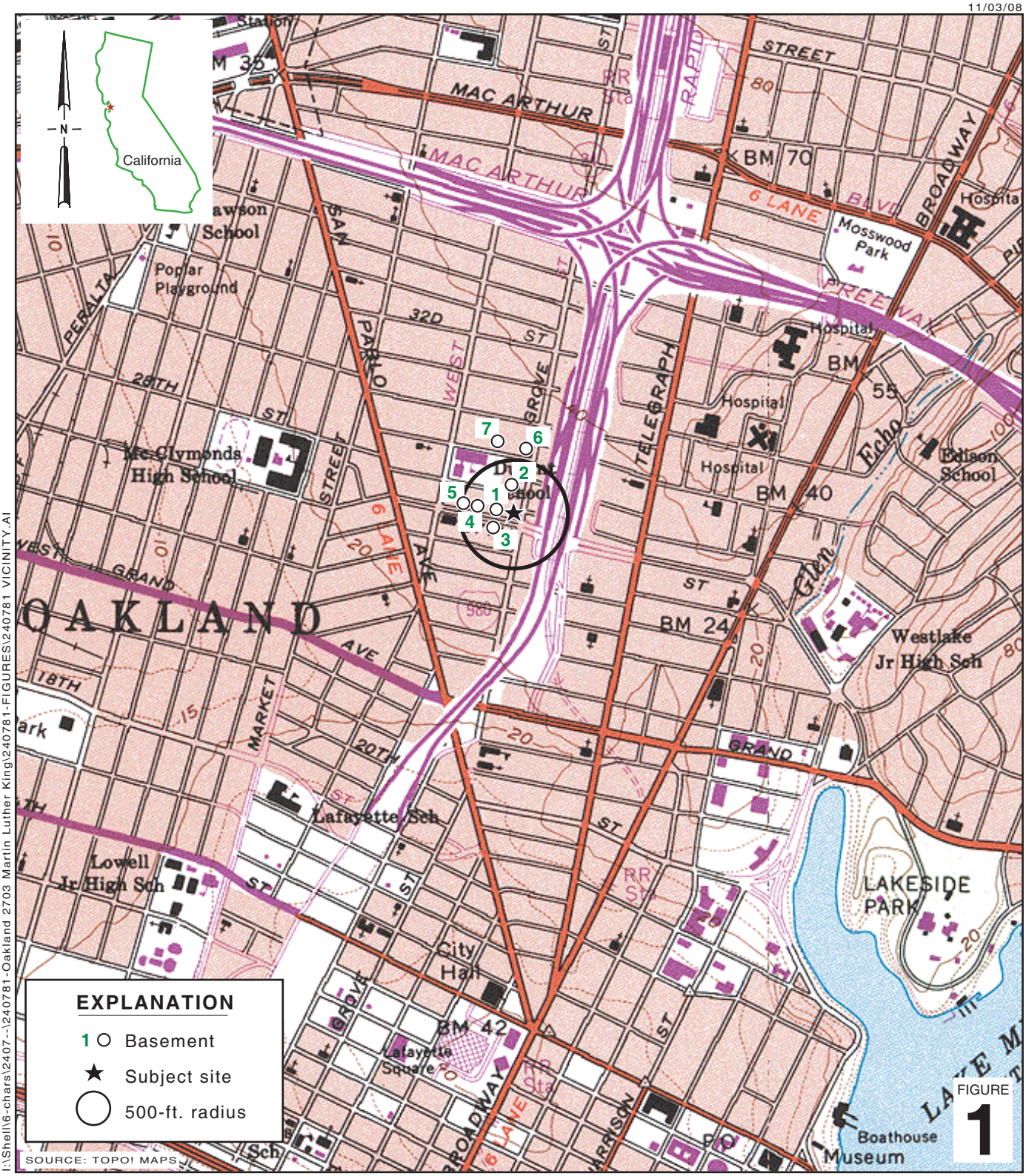
Thomas A. Sparrowe, PG

Aubrey K. Cool, PG



# FIGURES

11/03/08

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0 1/8 1/4 1/2 1

SCALE (MILES)

**Former Shell Service Station**
2703 Martin Luther King Jr. Way
Oakland, California

CONESTOGA-ROVERS & ASSOCIATES

**Vicinity Map**

01/28/09

# Site Plan

## EXPLANATION

- HA-1 — Proposed hand auger boring location
- VP-1 — Vapor probe location (1/06, 5-6/07,7/08)
- V-1 — Soil vapor well location (7/96)
- MW-1 — Monitoring well location (7/96-2/06)
- SAN — Sanitary sewer line (SAN)
- W — Water line (W)

carport

Residential
2719-23 Martin Luther King

VP-9

W/O AST

HA-3

HA-2

HA-1

HA-4

HA-7

HA-8

HA-5

HA-6

VP-6

MW-7

MW-8

Anode

Former Vent Lines

BUILDING

VP-8

VP-1

TRENCH

MW-5

VP-5

Wooden Carport

MW-1

GATE

DRIVEWAY

VP-4

Former USTs

VP-2

V-1

MW-6

Former Dispensers

Residential
670 27th St.

Residential
688 27th St.

Residential
664 27th St.

MW-4

VP-3

V-2

Former Dispensers

Former Shell Station
2703 Martin Luther King

Proposed excavation limits
(Depth = 20 fbg)

GATE

DRIVEWAY

MW-3

MW-2

DRIVEWAY

DRIVEWAY

MARTIN LUTHER KING JR. WAY

27TH STREET

N
W E
S

Groundwater Flow Direction
(2Q00 through 1Q07)

N

0 7.5 15 30

Scale (ft)

Basemap from Virgil Chavez Land Surveying and Alameda County Assessors Parcel Map

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**Former Shell Service Station**

2703 Martin Luther King Jr Way
Oakland, California

FIGURE

**2**

# APPENDIX A

# SITE HISTORY

## SITE HISTORY

***1994 Underground Storage Tank (UST) Removal:*** The 2,000-gallon UST was removed on October 11, 1994 by KTW & Associates on behalf of ATW. Two soil samples (TP-1-N and TP-2-S) were collected from beneath the tank. Total petroleum hydrocarbons as gasoline (TPHg) was detected at concentrations ranging from 870 milligrams per kilogram (mg/kg) to 18,000 mg/kg in the samples. Benzene concentrations in these samples ranged from 2.9 to 100 mg/kg.

***1995 Phase I Environmental Site Assessment (ESA):*** In August and September 1995, Enviros Inc. (Enviros) performed a Phase I ESA for this site. Available information collected during this ESA indicates that the subject property was occupied by residential housing prior to approximately 1959. A building permit to erect a building was obtained for Shell Oil Company in February 1959. A building permit to "close lube bays with sheet metal panels" was secured for Shell Oil Company in July 1976.

In 1979, several building permits were secured for Acme to modify existing site structures. Two building permits were secured in 1979 related to the installation of a fuel pump at the site.

During a site survey in conjunction with the Phase I ESA, an excavation was observed near the southwest corner of the service building. The excavation was covered by a blue tarp. This excavation's location is consistent with that of the 2,000-gallon UST removed in 1994 by ATW, and with a large concrete slab observed in aerial photographs taken in 1971 and 1973, and a smaller concrete slab observed in aerial photographs taken in 1981 and 1985. The larger concrete slab observed in the aerial photographs was likely covering the USTs operated by Shell, and the smaller slab was likely covering the UST operated by Acme, confirming that the same location was used for both UST complexes.

***1995 Subsurface Investigation:*** A site assessment was performed by ACC Environmental Consultants on May 23, 1995. This included drilling nine soil borings (B-1 through B-9) using a pneumatic sampling tool in the vicinity of the excavation (which formerly housed both Shell's and Acme's USTs) and the product dispenser islands, and collecting soil and groundwater samples for chemical analysis. TPHg concentrations in soil samples ranged from <20.0 to 830 mg/kg. Benzene concentrations ranged from <1.0 to 1.8 mg/kg. Separate phase hydrocarbons (SPH) were identified in water samples collected from four of the soil borings (B-1, B-5, B-6, and B-9). TPHg concentrations in the non-SPH grab groundwater samples submitted for chemical

analysis ranged from <50 to 89,000 micrograms per liter (µg/l). Benzene concentrations in the grab groundwater samples ranged from <0.5 to 21,000 µg/l.

***1996 Over-Excavation:*** Over-excavation and back-filling of Acme's former UST excavation were performed on March 19, 1996. The excavation, originally left open to 9 feet below grade (fbg), was over-excavated to approximately 11 fbg. Two soil samples (TP-3-W and TP-4-E) were collected from the bottom of the over-excavated former UST area. Soil sample TP-3-W, collected from the western end of the excavation, contained 560 mg/kg TPHg, and 3.1 mg/kg benzene. Soil sample TP-4-E, collected from the eastern end of the excavation, contained 2,700 mg/kg TPHg and <3.0 mg/kg benzene. The excavation was back-filled with clean imported fill material. Soil sampling and back-filling activities are documented in Enviros' May 10, 1996 correspondence.

***1996 Subsurface Investigation:*** In July 1996, Enviros performed additional site assessment activities. Six exploratory borings (B-10, B-11, B-12, B-13, V-1, and V-2) were drilled and sampled on July 17 and 19, 1996 using a hollow-stem auger drill rig. Borings B-11 and B-12 were completed as groundwater monitoring wells MW-1 and MW-2, and borings V-1 and V-2 were completed as soil vapor extraction wells V-1 and V-2, respectively. Soil sampling was not performed in boring V-1 due to the fact that it was installed into the back-fill material within the former UST excavation. A soil sample from below the saturated zone in boring V-2 was submitted for physical parameter analyses (porosity, permeability, fractional organic carbon content, and dry bulk density).

TPHg and benzene were not detected in soil samples collected from MW-1 (B-11), MW-2 (B-12), and B-13. TPHg was detected in soil samples collected from B-10 and V-2 at concentrations of 1.7 and 110 mg/kg, respectively. Benzene concentrations in soil samples from B-10 and V-2 were <0.0050 and 0.29 mg/kg, respectively.

Grab groundwater samples were collected from borings B-10, B-12 (MW-2), and B-13 at the depth of first encountered groundwater (approximately 8 to 11 fbg) for chemical analysis. Boring B-11 (MW-1) did not yield sufficient groundwater for grab groundwater sample collection. Monitoring wells MW-1 and MW-2 were developed and sampled on August 2, 1999 by Blaine Tech Services, Inc. (Blaine) of San Jose, CA. TPHg concentrations in the groundwater samples ranged from <50 to 290,000 µg/l. Benzene concentrations ranged from <0.50 to 34,000 µg/l.

***1997 Modified Phase I ESA:*** In February 1997, Enviros performed a modified Phase I ESA for the subject facility. A review of aerial photographs (1952 to 1994), city directories (1967 to 1993) and Sanborn maps (1912 to 1970) did not reveal evidence of an off-site source of petroleum hydrocarbons which would have impacted groundwater onsite. The properties located north and west of the subject facility appear to have been

occupied by residential houses from at least 1912 to the present. The nearest gasoline stations identified in the vicinity of the subject facility were a former Chevron station (740 27th Street at West) approximately 450 feet to the west, a former station (26th Street and Martin Luther King, Jr. Way) approximately 300 feet to the south, and a former Mobil station (554 27th Street) approximately 950 feet to the east.

***2000 Sensitive Receptor Survey (SRS):*** In late 2000, Cambria performed a SRS to identify wells and underground utility conduits. Cambria identified the local sanitary and storm sewer systems as the only utility conduits which may act as preferential pathways for groundwater and soil vapor migration. Conduits identified in the area are located at depths of approximately 3.5 to 9 fbg. Therefore, the potential does exist for groundwater to flow within these conduit trenches. Groundwater depth onsite historically ranges from approximately 4.5 to 10 fbg. However, since the typical groundwater flow direction onsite has generally been to the south, it is likely that any contaminant migration within the utility conduits would be limited, since the utility conduits located to the south of the site are the shallowest of all the conduits identified adjacent to the site at depths of 3.5 to 5.5 fbg.

Cambria also obtained well installation and destruction records from the California Department of Water Resources (DWR) in order to identify any active water producing wells in the vicinity of the site which may be at risk to petroleum hydrocarbon impact due to contaminant migration from the subsurface of the site. DWR records did not identify any existing wells within a ½-mile radius of the site. The SRS results are presented in Cambria's May 16, 2001 *Subsurface Investigation Report.*

***2000 Subsurface Investigation:*** In November 2000, Cambria installed three soil borings (B-17, B-18 and B-19) and three groundwater monitoring wells (MW-3, MW-4 and MW-5). Concentrations up to 2,100 mg/kg TPHg and 3.3 mg/kg benzene were reported in soil samples. Methyl tertiary-butyl ether (MTBE) was detected in one soil sample at a concentration of 0.0070 mg/kg. Tertiary-butyl alcohol (TBA) was detected in two soil samples at concentrations of 0.0079 and 0.0059 mg/kg, respectively.

Grab groundwater samples were collected from borings B-17 through B-19 at first encountered groundwater for analyses during the investigation. TPHg concentrations in grab water samples were up to 190,000 µg/l and benzene concentrations were up to 13,000 µg/l. MTBE was detected at concentrations up to 300 µg/l, and TBA was detected at a concentration of 240 µg/l in one sample. No SPH was observed during the investigation. Results from this investigation are presented in Cambria's May 16, 2001 *Subsurface Investigation Report.*

***2001 Oxygen Releasing Compound (ORC) Installation:*** As approved by the Alameda County Health Care Services Agency (ACHCSA), Blaine installed ORCs in wells V-1 and

V-2 during the second quarter monitoring event on May 2, 2001. ORCs were removed during the fourth quarter 2001 monitoring event. MTBE has not been detected in these two wells since the ORCs were installed. Details of the ORC installation activities are presented in Cambria's quarterly groundwater monitoring reports for the second through the fourth quarter of 2001.

***2002 Subsurface Investigation:*** In April 2002, Cambria installed borings B-20 through B-22. Groundwater was first encountered in the borings between 8.0 fbg (B-20) and 8.8 fbg (B-21 and B-22). The maximum TPHg and benzene concentrations detected in soil were 380 and 0.17 mg/kg, respectively, in the soil sample collected from 8.0 fbg in boring B-22, located behind the station building. No TPHg was detected in soil samples collected from boring B-21. No MTBE was detected in any of the analyzed soil samples collected from borings B-20, B-21, or B-22. Up to 160,000 µg/l TPHg and 18,000 µg/l benzene were reported in grab groundwater samples collected from borings B-20, B-21, and B-22. No MTBE was detected in grab groundwater samples collected from the borings. The complete report of findings was included in Cambria's June 21, 2002 *Site Investigation Report*. This document included recommendations for additional activities; however, a response from ACHCSA was never received. Results from this investigation are presented in Cambria's June 21, 2002 *Subsurface Investigation Report.*

***2003 - 2005 Oxygen Releasing Compound (ORC) Installation:*** Although agency approval was not received, Shell proactively installed ORC in wells MW-5 and V-2 during first quarter of 2003. The ORCs were replaced on a semi-annual basis. The use of ORC was discontinued during the first quarter 2005, at Shell's request. Details of the ORC installation activities are presented in Cambria's quarterly groundwater monitoring reports for the first quarter 2003 through the first quarter of 2005.

***2005 Agency Meeting:*** Since no agency response was received to the June 2002 *Site Investigation Report* that contained recommendations for additional investigation, and since monitoring continued to indicate elevated concentrations of volatile constituents in groundwater, Shell authorized Cambria to prepare a work plan to investigate subsurface soil, groundwater, and soil vapor conditions along the property boundaries and at select locations on site. A new case worker was assigned to this project in early 2005, and following a meeting with the new case worker, technical comments and work plan approval were received in ACHCSA correspondence dated June 6, 2005. On August 15, 2005, Cambria submitted correspondence providing responses to the technical comments, notification of field work, and a request for extension for the report of findings. In correspondence dated August 19, 2005, ACHCSA granted the extension.

***2005 Soil Vapor Investigation:*** From August 28 through 31, 2005, Cambria installed ten soil borings (GP-1 through GP-10). TPHg was detected in soil samples from the borings

at concentrations up to 3,300 mg/kg and benzene was detected at concentrations up to 15 mg/kg. TPHg was detected in all groundwater samples at concentrations up to 140,000 µg/l and benzene was also detected in all four groundwater samples at concentrations up to 17,000 µg/l. TPHg was detected in soil vapor samples at concentrations ranging up to 71,000,000 micrograms per cubic meter (□g/m$^3$) and benzene was detected at concentrations up to 170,000 □g/m$^3$. Details of these activities are included in Cambria's November 15, 2005 *Site Investigation Report.*

***2005 Door-to-Door Survey:*** Cambria conducted a door-to-door survey within 300-feet of the subject site for wells, basements, and foundation type to identify building construction and potential vapor receptors. Questionnaires were sent to 110 properties and responses for 25 properties were received as of January 13, 2006. Of the 25 responses received, none of the properties had basements. Three properties were denoted as vacant; nine properties contained buildings constructed with slab-on-grade foundations; three contained buildings constructed with perimeter foundations. Tabulated data and a list of properties included in the survey, and which completed surveys were received was included in Cambria's January 15, 2006 *Door to Door Survey Report, Access Agreement Update, and Status/Schedule Update.*

***2006 Subsurface Investigation:*** Cambria advanced three monitoring wells (MW-6 through MW-8), one soil boring (B-23), and six soil vapor probes (VP-1 through VP-6). TPHg was detected in soil samples at concentrations up to 3,800 mg/kg and benzene was detected at concentrations up to 33 mg/kg. A complete discussion and presentation of these activities and findings is included in Cambria's April 14, 2006 *Site Investigation Report, and First Quarter 2006 – Groundwater Monitoring Report.*

***2006 Dual-Phase Extraction (DPE) Pilot Test:*** Cambria conducted a five-day DPE pilot test on wells V-1, V-2, MW-6, MW-7, MW-4, MW-5, and MW-8 and a constant vacuum DPE test was conducted on well MW-6. The report concluded **1)** the absence of vapor phase concentrations (and groundwater concentrations) from well V-1 indicates that the former UST excavation does not contain residual source material; **2)** high sustained and increasing vapor concentrations suggest source material is present in the vicinity of wells V-2, MW-5, and MW-8; **3)** variability in extraction flow rates across the site may reflect heterogeneities in subsurface soils or may suggest preferential pathways; and **4)** the extremely high effective radius of influence calculated for wells MW-5 and MW-8 during DPE testing on well MW-7 supports the presence of a preferential pathway in the vicinity of these wells. The data from the DPE pilot test suggests that DPE is feasible at this site. The groundwater table was effectively drawn down by DPE and moderate vapor extraction flow rates were yielded from some of the extraction points. Although DPE is deemed feasible, Cambria did not recommend implementing DPE at this site. The extraction points that yielded the highest vapor concentrations did not yield an effective

vapor extraction flow rate. Conversely, low vapor concentrations were yielded from the extraction point that did yield an effective vapor extraction flow rate. Therefore, DPE is not considered feasible in the target areas at this site. The pilot test details and results are presented in Cambria's March 14, 2006 *Pilot Test Report.*

***2006 Subsurface Investigation:*** Monitoring wells MW-12 and MW-14 were installed at two offsite properties. None of the soil samples from well MW-12 indicated the presence of any TPHg, benzene, toluene, ethylbenzene, or xylenes (BTEX). The 5-fbg sample from MW-14 also did not contain any reportable concentrations. TPHg was reported in the 10- and 14-fbg samples from MW-14 at concentrations of 32 and 970 mg/kg, respectively. Benzene was reported in the same two samples at concentrations of 0.0083 and 2.3 mg/kg, respectively. These activities are documented in Cambria's May 25, 2006 *Subsurface Investigation Report.*

***2006 Survey and Site Visit:*** In addition to surveying the new wells, Cambria identified historical boring locations from patches on the ground surface, historical excavation edges, trenches, and other site features, and requested that they be included in the survey. Report figures since May 2006 have included the new survey data. Also, during the site visit, an inspection inside the building identified two bathrooms. A floor drain was observed in the northern-most bathroom. Standing liquid was present in the floor drain and automotive parts and cleaners were stored in this area. Thus, a sample from the floor drain was collected and submitted for analyses of volatile organic compounds (VOCs) by EPA Method 8260 and semi-volatile organic compounds (SVOCs) by EPA Method 8270. The floor drain sample was analyzed for VOCs and SVOCs. The results indicated the presence of carbon disulfide (3.69 µg/l), ethylbenzene (0.610 µg/l), and toluene (0.770 µg/l). This information was reported in Cambria's May 25, 2006 *Subsurface Investigation Report.*

***2006 Geophysical Survey:*** As recommended in Cambria's May 25, 2006 *Subsurface Investigation Report*, a geophysical study was performed on May 22, 2006. The objectives of this effort were to determine whether or not a waste oil UST was in the ground in the northwest portion of the property, and to evaluate the presence of subsurface utilities in this area that may act as preferential pathways, including the mapping of the sewer line from the floor drain found inside the northwest corner of the building during the April 19, 2006 site inspection. The results did not identify the presence of a UST on the northwest corner of the site, but did find another vent line located behind the northeast corner of the station building. A subsurface electric line was traced from the station building to the western property boundary, and an unidentified subsurface utility was traced from the northwest corner of the station building to the southwest, near MW-5 and toward MW-6. The presence of the unknown utility line in the northwest corner confirms the observations of a possible preferential pathway in this area based on the

dual-phase extraction pilot test performed in January 2006. NORCAL was unable to run a line down the floor drain inside of the building due to the trap in the line, so the sewer cleanout was found on the exterior of the building. Accessing the cleanout would have resulted in damage to the cap, and the property owner would not grant permission for Cambria to open the cleanout and repair any damage. Thus, the location, direction, and depth of the sewer line in this area are still unknown. However, based on the GPR survey that was performed to try to locate a non-metallic sewer line, NORCAL concludes that the sewer line may be more than 4 feet below grade, since the GPR was unable to identify the line. This information was presented in Cambria's July 25, 2006 *Status Update, Report of Geophysical Survey, and Request for Agency Meeting.*

***2006 Subsurface Investigation and Vapor Probe Installation:*** Cambria installed cone-penetrometer test borings CPT-1 through CPT-5 and soil vapor probes VP-1 through VP-6. There was a lack of adequate groundwater recharge for many of the groundwater samples attempted between 15 and 29 fbg. Groundwater sample results from between 31-37 fbg confirm significant attenuation of contaminants of at least one order of magnitude from the interval monitored by the site wells (5-20 fbg), thus nor further vertical delineation is warranted. Comparison of data from 1995, 2000, and 2006 in similar location (B-6 & B-9, B-19, and CPT-5, respectively) demonstrates attenuation of contaminant concentrations over time is occurring. A site inspection at the neighboring property was performed and revealed that due to significant ventilation and air exchange with outdoor ambient air, vapor sampling within the above-ground basement was no longer warranted. These activities are documented in Cambria's January 31, 2007 *CPT Investigation and Vapor Probe Installation Report.*

***2007 Subsurface Investigation and Vapor Probe Installation:*** Conestoga-Rovers & Associates (CRA) installed CPT-6 and CPT-7 within 27th Street southwest of the site, CPT-10 on the Marcus-Foster school property northwest of the site, and VP-7 and VP-8 on private properties west-northwest of the site. The CPT logs identified thin lithologic units of higher permeability that appear to be allowing preferential migration of contaminants in groundwater toward MW-14 and CPT-10. Further delineation and monitoring of the first encountered water zone to the northwest and west of the site was recommended. Soil vapor samples collected from onsite probes indicated petroleum hydrocarbon concentrations exceeding screening levels for protection of onsite commercial workers. Soil vapor samples collected from offsite vapor probe pairs VP-7 and VP-8, located on residential property, indicated that the soil gas concentrations immediately adjacent to the subject site and three parcels down gradient do no exceed the residential ESLs. Results of the investigation are documented in CRA's August 27, 2007 *Plume Delineation and Soil Vapor Sampling Report.*

***2008 Site Conceptual Model (SCM) and Feasibility Study/Corrective Action Plan (FS/CAP):*** CRA submitted a February 2, 2008 SCM and FS/CAP for the site. Excavation followed by a bio-sparge curtain to assist biodegradation was recommended as remedial action for the site. A *Remedial Action Plan* was submitted by CRA on May 28, 2008 detailing the excavation and bio-sparging.

***Groundwater Monitoring:*** Quarterly groundwater monitoring has been ongoing at the site since August 1996 and currently includes on-site monitoring wells MW-1 through MW-8, VP-1, and VP-2, and off-site monitoring wells MW-12 and MW-14. Fuel oxygenates are not a significant component of the groundwater plumes, although some detections of di-isopropyl ether and TBA have been observed. Overall, the groundwater flow direction is primarily to the west, with some radial components on site to the northwest and southwest. Historically, monitoring wells MW-1, MW-2, MW-3, and MW-12 have shown little or no impact from petroleum hydrocarbons. Maximum historical concentrations of TPHg and benzene have been observed in onsite monitoring well MW-5. The fourth quarter 2008 sample event reported maximum concentrations of TPHg and benzene at 110,000 and 7,900 µg/l, respectively in well MW-5. Historical groundwater monitoring results and current conditions are detailed in CRA's December 30, 2008 *Groundwater Monitoring Report – Fourth Quarter 2008*

***Vapor Monitoring:*** Vapor monitoring of off-site soil vapor probes VP-7 and VP-8 has been ongoing at the site since October 2007 and is currently conducted semiannually. Vapor probe VP-9 was added to the monitoring program in the fourth quarter of 2008. BTEX concentrations in soil vapor samples have consistently been below applicable screening levels in off-site vapor probes.