Chevron

Satya P. Sinha
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Retail and Terminal
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Alameda County Health Care Services
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

RE: Chevron Service Station # 30-7233

Address 2259 First St., Livermore, CA

I have reviewed the attached report dated 10/29/07.

I agree with the conclusions and recommendations presented in the referenced report. The information in this report is accurate to the best of my knowledge and all local Agency/Regional Board guidelines have been followed. This report was prepared by Cambria Environmental Technology, Inc., upon whose assistance and advice I have relied.

This letter is submitted pursuant to the requirements of California Water Code Section 13267(b) (1) and the regulating implementation entitled Appendix A pertaining thereto.

I declare under penalty of perjury that the foregoing is true and correct.

Sincerely,

Satya P. Sinha

Satya P. Sinha

Attachment: Report

CONESTOGA-ROVERS
& ASSOCIATES

5900 Hollis Street, Suite A, Emeryville, California 94608
Telephone: 510·420·0700 Facsimile: 510·420·9170
www.CRAworld.com

October 29, 2007

Mr. Jerry Wickham
Alameda County Environmental Health Services (ACEHS)
1131 Harbor Bay Parkway
Alameda, CA 94502

Re: **Revised Site Investigation Workplan**
Former Texaco Service Station (Chevron Site # 307233)
2259 First Street
Livermore, CA
RO #2908

Dear Mr. Wickham:

On behalf of Chevron Environmental Management Company (Chevron), Conestoga-Rovers & Associates (CRA), is submitting this *Revised Site Investigation Workplan,* in response to an ACEHS letter, dated August 22, 2007 (Attachment A). ACEHS has requested that Chevron conduct an additional site investigation, following the removal of two orphan tanks from beneath Mills Square Park in the City of Livermore. The objective of this investigation is to further define and evaluate hydrocarbon impacts from the previous service station activities. The site background and CRA's revised scope of work are presented below.

SITE BACKGROUND

The site is the location of Mills Square Park, owned by the City of Livermore and located on the east corner of First Street and North Livermore Avenue in Livermore, California. Topography around the site slopes gently to the north at an elevation of approximately 485 feet above mean sea level (Figure 1). The park consists of grass and trees with a concrete walkway.

Aerial photos indicate that the site was a retail service station prior to 1973. The earliest available aerial photograph was from 1959. This photo shows a station building located on the southern edge of the property and two dispenser islands located on the western portion of the property (Figure 2). The 1973 aerial photograph indicates that the station building and dispenser island had been removed and only a paved lot remained. By 1978, the property had been redeveloped as a park. The park remains in the same configuration as indicated on the 1978 aerial photo.

PREVIOUS ENVIRONMENTAL WORK

September 2003 Investigation: The City of Livermore Engineering Division, as part of a redevelopment plan, requested Fugro West, Inc. (Fugro) to investigate soil and groundwater conditions in Mills Square Park for the purpose of evaluating the potential presence of petroleum hydrocarbons resulting from the historical use of the site as a service station. Total petroleum hydrocarbons as gasoline (TPHg) and total petroleum hydrocarbons as diesel (TPHd) were detected in only one soil sample at concentrations of 3.5 milligrams per kilogram (mg/kg) and 9.6 mg/kg, respectively. TPHg and TPHd were detected in groundwater at maximum concentrations of 18,000 and 42,000 micrograms per liter (µg/l), respectively. Benzene was not detected in soil, but was detected in groundwater at a maximum concentration of 140 µg/l. Total lead was detected in all soil samples at 3 feet below grade (fbg), at a maximum concentration of 3,700 mg/kg.

September 2005 UST Removal: In September 2005, an orphan underground storage tank (UST) was encountered beneath the sidewalk on the southwest corner of the site. Under the direction of the Livermore-Pleasanton Fire Department, the UST was removed, soil samples were collected, and the excavated soil was backfilled into the tankpit. According to Consolidated Engineering Laboratories' *Environmental Sampling, Testing and Evaluation of Soil* report, dated October 4, 2005, soil beneath the UST contained maximum concentrations of 1,200 mg/kg TPHg, 4,100 mg/kg TPHd, and 54 mg/kg total petroleum hydrocarbons as motor oil (TPHmo). Chevron was not involved with the tank removal and was contacted later by ACEHS to investigate whether any other USTs remained in Mills Square Park.

August 2006 Geophysical Investigation: Cambria Environmental Technology, Inc. (Cambria), now CRA, contracted with NORCAL Geophysical Consultants, Inc. to determine if any USTs still remained in place. Two suspected tanks were identified in the southwest corner of the park, measuring approximately 5 by 7 feet and located approximately 3 fbg.

September and October 2006 Site Investigation: Woodward Drilling Company, Inc. (Woodward) advanced five borings in the vicinity of the former dispenser islands and suspected USTs. The highest hydrocarbon concentrations detected were 8,700 mg/kg TPHg, 3,000 mg/kg TPHd, 1,400 mg/kg TPHmo and 14 mg/kg benzene. The maximum lead concentration was 65.4 mg/kg at 5 fbg. No groundwater was encountered to the total explored depth of 40 fbg.

June 2007 Tank Removal: On June 20, 2007, CRA observed Gettler-Ryan Inc. (Gettler-Ryan) remove two 750-gallon single-wall steel gasoline USTs (Tank 1 and Tank 2) and approximately 27 feet of associated product piping. CRA collected seven compliance soil samples from beneath the ends and middle of both Tank 1 and Tank 2 and from below the opening of a group of pipes protruding into the northwestern wall of the tank pit. No TPHg was detected in any sample. TPHd and TPHmo were detected at maximum concentrations of 2,800 mg/kg and 11,000 mg/kg, respectively. Lead was detected at a maximum concentration of 1170 mg/kg at 8 fbg.

PROPOSED SCOPE OF WORK

To investigate potential preferential migration pathways and to define the extent of residual hydrocarbons, CRA proposes to advance two cone penetration testing (CPT) borings on North Livermore Avenue, four GeoProbe® borings within the park, and install three nested vapor probe adjacent to the building on the southeastern property line. Locations of these proposed borings are illustrated on Figure 2. CPT borings will be advanced to approximately 80 fbg. GeoProbe® borings will be advanced to approximately 10 feet below the first occurrence of groundwater or deeper if contamination is observed and continues vertically. The vapor probe boring depth will not exceed 11 fbg. To meet the objective of this investigation, CRA proposes the following tasks:

Site Health and Safety Plan: CRA will prepare a site health and safety plan to protect site workers. The plan will be reviewed and signed by all site workers/visitors and kept onsite at all times.

Permits: CRA will obtain boring permits from the Zone 7 Water District, and any other required permits from the City of Livermore prior to field activities.

Underground Utility Location: CRA will contact Underground Service Alert to identify potential utilities in the vicinity of all proposed boring locations. A subsurface utility locating contractor will also be retained to clear each individual boring location. Per Chevron safety standards, each boring will be cleared to eight fbg using an air-knife assisted vacuum rig or hand auger.

CPT Borings: CRA proposes to advance two CPT borings (CPT-1 and CPT-2) to approximately 80 fbg (Figure 2). CRA will attempt to collect grab groundwater samples from zones identified by lithology as being potentially water bearing. Soil samples will be collected at the capillary fringe zone, if encountered, and at intervals of distinct lithologic change where potential hydrocarbons could become perched. Upon completion, the borings will be filled with Portland type I/II grout using a tremie pipe and patched to match the existing surface. CRA's *Standard Field Procedures for Cone Penetrometer Testing and Sampling* is presented as Attachment B.

GeoProbe® Borings: CRA will advance four GeoProbe® borings within Mills Square Park to approximately 10 feet below the first occurrence of groundwater (Figure 2). Boring depth will be extended if contamination is observed at the total proposed depth of the boring. Grab groundwater samples will be collected from each boring, The soil borings will be logged continuously in the field using the Universal Soil Classification System (USCS) ASTM D-2487 guidelines and will be screened with a photo-ionization detector (PID). Soil samples will be collected for laboratory analysis at depths where visible staining, odor or elevated PID readings are observed. If visible staining, odor, or elevated PID readings are observed, a sufficient number of soil samples will be collected to characterize the vertical interval over which contamination occurs. If no visible staining, odor or elevated PID readings are observed, soil samples will be collected for laboratory analysis at 10 foot intervals starting from 5 fbg to the total depth of the boring. Samples will be labeled, placed on ice and transported to a Chevron-approved laboratory under proper chain of custody. Upon completion, the borings will be filled with Portland type I/II grout using a tremie pipe and patched to match the existing surface. CRA's *Standard Field Procedures for GeoProbe® Soil and Groundwater Sampling* is presented as Attachment C.

Using a limited access rig with direct push capabilities, borings can be advanced approximately 40 fbg. If water is not encountered above 40fbg using direct push methods, a small diameter hollow stem auger will be used to drill down until water is encountered. Samples will still be collected as stated above. CRA's *Standard Field Procedures for Soil Borings* is presented as Attachment D.

Shallow Soil Borings (Investigation of Metals in Shallow Soil): CRA proposes to advance 11 hand-auger borings to a total depth of 10 fbg or until refusal, to investigate the occurrence of elevated lead concentrations in shallow soil (Figure 2). The borings are proposed to be hand-augered in order to comply with Chevron's safety protocol of 8 fbg utility clearance. Hand-auger cuttings will be logged continuously in the field using USCS ASTM D-2487 guidelines and will be screened with a PID. Soil samples will be collected from each boring at depths of 1.5, 3, 5 and 10 fbg, and will be analyzed for total lead by EPA Method 6010B. If staining, odor or elevated PID readings are observed in any of the soil samples, the soil samples will also be analyzed for hydrocarbon constituents as outlined below in "*Chemical Analysis*".

Vapor Probes: CRA will install nested vapor probes at 5 fbg and 10 fbg in 3 borings within Mills Square Park. One boring will be adjacent to the building, near the previously removed USTs, along the southeastern property line. The other two borings will be placed over the locations of the former dispenser islands within the park. It is estimated that the total depth of the boring will not exceed 11 fbg. Soil samples will be collected using a hand-auger above 8 fbg and using a split-spoon sampler at depths greater than 8 fbg.

Vapor Probes Construction and Sampling: Vapor probes will be constructed of a 6-inch screen attached to ¼-inch Teflon tubing. Each probe will be placed at the desired depth, surrounded by a sand pack and isolated from the other by a bentonite grout mixture. Collection of soil vapor samples will be conducted at least 48 hours after completion of the probe installation. Samples from soil vapor points will be collected using flow meters and 1-liter Summa™ canisters connected to the sampling tube for each vapor point. A battery powered air pump with attached vacuum-chamber and Tedlar™ bag will be used to purge an appropriate volume of air from the vapor point prior to collecting the sample. After purging, the valve between the purge pump and Summa™ canister will be closed and the Summa™ canister valve will be opened. The vacuum of the Summa™ canister will be used to draw the soil vapor through the flow controller until a negative pressure of approximately 5-inches of Hg is observed on the vacuum gauge. In accordance with the Department of Toxic Substances Control (DTSC) *Advisory-Active Soil Gas Investigations* guidance document, dated January 28, 2003, leak testing will be performed during sampling. After sampling, the Summa™ canisters will be packaged and sent to the Air Toxics laboratory under chain-of-custody for analysis. CRA's *Standard Field Procedures for Soil Vapor Probe Installation and Sampling* is presented as Attachment E.

Chemical Analysis: Select soil and grab groundwater samples will be analyzed for the following:

- TPHd with silica gel cleanup and TPHmo by modified EPA Method 8015M;
- TPHg, Benzene, toluene, ethylbenzene, and xylene (BTEX), fuel oxygenates and lead scavengers 1,2-dichloroethane (1,2-DCA) and 1,2-dibromoethane (EDB) by EPA Method 8260B;
- Lead by EPA Method 6010B and
- Physical parameters including moisture content, bulk density, total porosity, air- and water-filled porosity, organic carbon and effective permeability in undisturbed soil samples.

Vapor Chemical Analysis: Vapor samples will be analyzed for the following:

- TPHg by EPA Method TO-3;
- BTEX, fuel oxygenates, and lead scavengers 1,2-DCA and EDB, naphthalene and helium (for leak check) by EPA Method TO-15; and
- O_2 and CO_2 by ASTM 1946 (GC/TCD).

Soil and Water Disposal: Soil and water produced during field activities will be temporarily stored on site in 55-gallon drums. Following review of analytic results, the soil and water will be transported to an appropriate Chevron-approved facility for disposal.

Reporting

Upon completion of field activities and review of the analytic results, CRA will prepare an investigation report that, at a minimum, will contain:

- Descriptions of the drilling and sampling methods;
- Boring logs;

- Tabulated analytic results for soil, groundwater, and soil vapor samples;
- A discussion of hydrocarbon distribution;
- Analytic reports and chain-of-custody forms;
- Conclusions and recommendations.

Schedule

The above scope of work will be implemented after receipt of written concurrence from ACEHS and with the approval of the City of Livermore so that this work does not impact any city activities already scheduled in the downtown area. An investigation report will be submitted approximately six weeks after receiving the analytic data.

CONESTOGA-ROVERS
& ASSOCIATES

CLOSING

We appreciate the opportunity to work with you on this project. Please contact Charlotte Evans at (510) 420-3351 or Satya Sinha at (925) 842-9876 if you have any questions or comments regarding this work.

Sincerely,
Conestoga-Rovers & Associates

Charlotte Evans

Robert Foss, P.G. #7445

PROFESSIONAL GEOLOGIST ROBERT C. FOSS No. 7445 Exp 08/08 STATE OF CALIFORNIA

Figures: 1 – Vicinity Map
2 – Site Plan with Proposed Boring Locations

Attachments: A – Regulatory Correspondence
B – Standard Field Procedures for CPT Sampling
C – Standard Field Procedures for Geoprobe Borings
D – Standard Field Procedures for Soil Borings
E – Standard Field Procedures for Soil Vapor Probe Installation and Sampling

cc: Mr. Satya Sinha, Chevron Environmental Management Company, 6001 Bollinger Canyon Road, San Ramon, CA 94583
Chris Davidson, City of Livermore Economic and Redevelopment, 1052 South Livermore Avenue, Livermore, CA 94550

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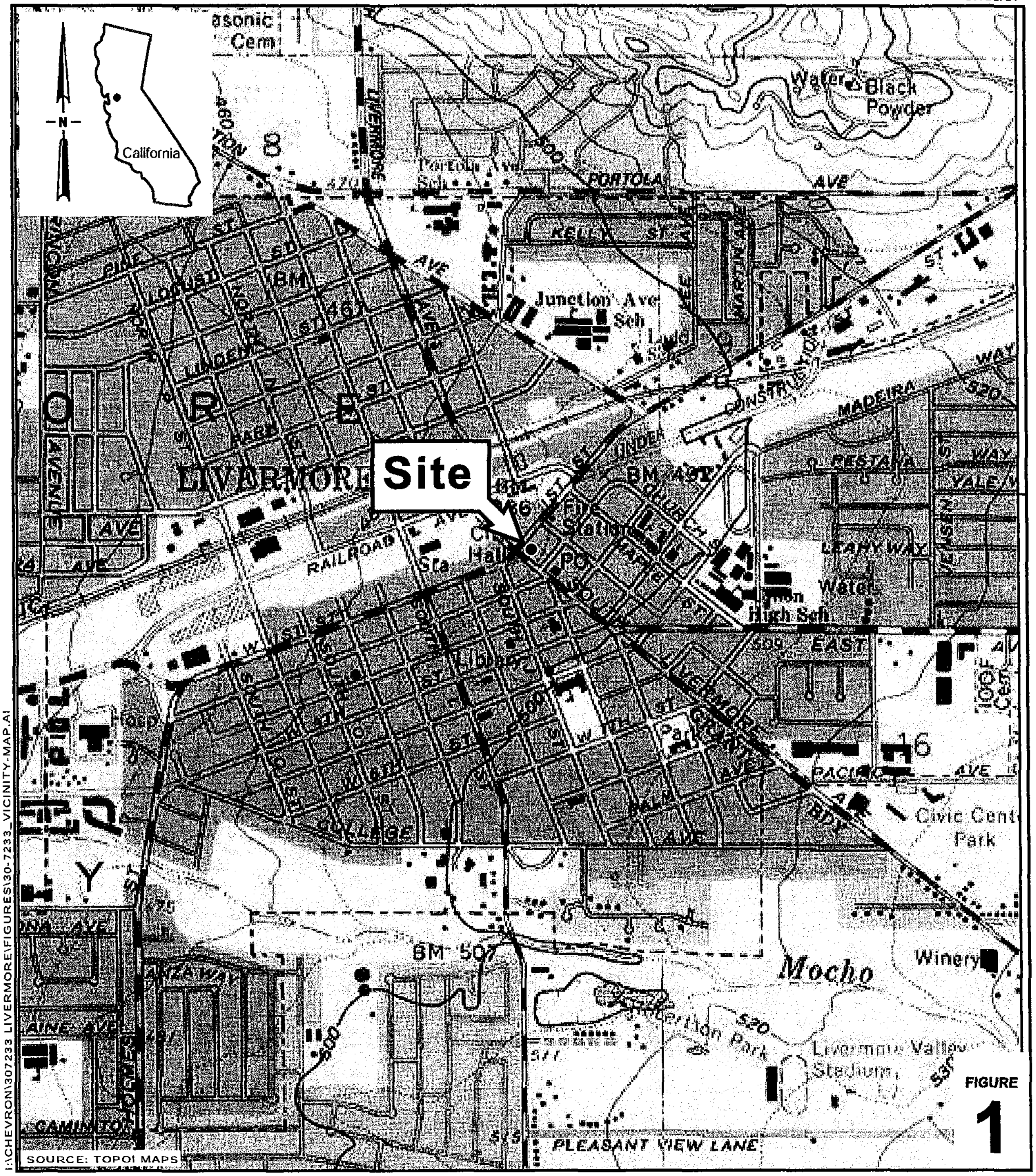
07/20/07



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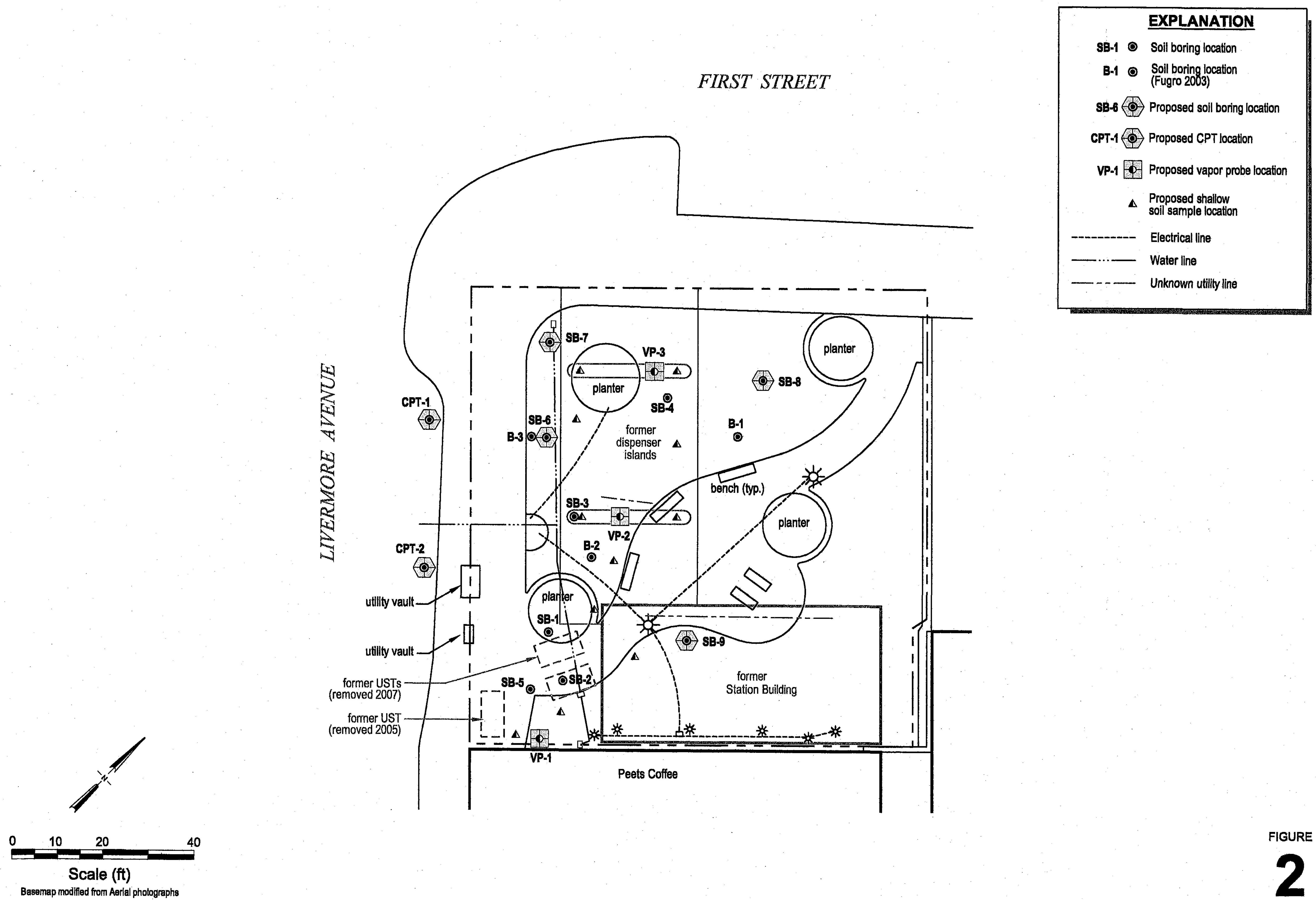
SCALE : 1" = 1/4 MILE

Chevron Service Station 30-7233
2259 First Street
Livermore, California

CRA
CONESTOGA-ROVERS & ASSOCIATES

Vicinity Map

10/26/07



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Site Plan with Proposed Boring Locations

CONESTOGA-ROVERS & ASSOCIATES

Former Chevron Station 30-7233
2259 First Street
Livermore, California

FIGURE
2

CONESTOGA-ROVERS
& ASSOCIATES

ATTACHMENT A

Regulatory Correspondence

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
DAVID J. KEARS, Agency Director

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6700
FAX (510) 337-9335

October 11, 2007

Mr. Satya Sinha
Chevron Environmental Management Company
6001 Bollinger Canyon Rd., K2256
San Ramon, CA 94583-2324

Ms. Chris Davidson
City of Livermore Economic Development
1052 S. Livermore Ave.
Livermore, CA 94550

RECEIVED
OCT 16 2007
Evans, Charlotte

Subject: Fuel Leak Case No. RO0002908 and Geotracker Global ID T0600196622, Miller Square Park, 2259 First Street, Livermore, CA 94550

Dear Mr. Sinha and Ms. Davidson:

Alameda County Environmental Health (ACEH) staff has reviewed the fuel leak case file for the above referenced site including the recently submitted document entitled, "Revised Site Investigation Workplan," dated October 2, 2007, which was prepared on behalf of Chevron by Conestoga-Rovers & Associates. The Revised Site Investigation Work Plan was modified in response to technical comments in ACEH correspondence dated August 22, 2007. With one exception, the work plan revisions adequately address our August 22, 2007 technical comments. However, the work plan only includes one soil vapor sampling location adjacent to an existing building and proposes delaying an evaluation of potential future indoor vapor intrusion until the site is redeveloped. This proposal is unacceptable since an evaluation of potential future human health risks is necessary to make decisions with regard to site investigation and cleanup. Therefore, we request that you propose additional soil vapor sampling throughout the site that will provide a complete evaluation of potential future indoor vapor intrusion. We request that you expand the Revised Site Investigation Work Plan in accordance with the technical comments below and **submit a revised Work Plan by October 31, 2007.**

TECHNICAL COMMENTS

1. **Direct Push Borings.** The Revised Work Plan indicates that grab groundwater samples will be collected *from each boring, "if groundwater is encountered." Please note that the* collection of groundwater samples from these borings is the primary purpose for the borings. If groundwater samples are not collected from the proposed direct push borings, please include plans to use a different drilling technique that is capable of advancing the borings to sufficient depths to collect grab groundwater samples. Please include a description of this supplemental drilling method in the Revised Work Plan requested below.

2. **Soil Vapor Sampling.** As previously discussed, the proposal to delay an evaluation of potential future indoor vapor intrusion until the site is redeveloped is unacceptable since an evaluation of potential future human health risks is necessary to make decisions with regard to site investigation and cleanup. Therefore, we request that you propose additional soil vapor sampling throughout the site in the Revised Site Investigation Work Plan that will provide a complete evaluation of potential future indoor vapor intrusion. Previous site data along with the known locations of former USTs and suspected locations of former dispensers and product piping are to be reviewed in proposing the additional soil vapor sampling locations. Please include the additional soil vapor sampling in the Revised Work Plan requested below.

TECHNICAL REPORT REQUEST

Please submit technical reports to Alameda County Environmental Health (Attention: Jerry Wickham), according to the following schedule:

- **October 31, 2007** – Revised Work Plan

These reports are being requested pursuant to California Health and Safety Code Section 25296.10. 23 CCR Sections 2652 through 2654, and 2721 through 2728 outline the responsibilities of a responsible party in response to an unauthorized release from a petroleum UST system, and require your compliance with this request.

ELECTRONIC SUBMITTAL OF REPORTS

The Alameda County Environmental Cleanup Oversight Programs (LOP and SLIC) require submission of all reports in electronic form to the county's ftp site. Paper copies of reports will no longer be accepted. The electronic copy replaces the paper copy and will be used for all public information requests, regulatory review, and compliance/enforcement activities. Instructions for submission of electronic documents to the Alameda County Environmental Cleanup Oversight Program ftp site are provided on the attached "Electronic Report Upload (ftp) Instructions." Please do not submit reports as attachments to electronic mail.

Submission of reports to the Alameda County ftp site is an addition to existing requirements for electronic submittal of information to the State Water Resources Control Board (SWRCB) Geotracker website. Submission of reports to the Geotracker website does not fulfill the requirement to submit documents to the Alameda County ftp site. In September 2004, the SWRCB adopted regulations that require electronic submittal of information for groundwater cleanup programs. For several years, responsible parties for cleanup of leaks from underground storage tanks (USTs) have been required to submit groundwater analytical data, surveyed locations of monitor wells, and other data to the Geotracker database over the Internet. Beginning July 1, 2005, electronic submittal of a complete copy of all necessary reports was required in Geotracker (in PDF format). Please visit the SWRCB website for more information on these requirements (http://www.swrcb.ca.gov/ust/cleanup/electronic_reporting).

PERJURY STATEMENT

All work plans, technical reports, or technical documents submitted to ACEH must be accompanied by a cover letter from the responsible party that states, at a minimum, the following: "I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document or report is true and correct to the best of my knowledge." This letter must be signed by an officer or legally authorized representative of your company. Please include a cover letter satisfying these requirements with all future reports and technical documents submitted for this fuel leak case.

PROFESSIONAL CERTIFICATION & CONCLUSIONS/RECOMMENDATIONS

The California Business and Professions Code (Sections 6735, 6835, and 7835.1) requires that work plans and technical or implementation reports containing geologic or engineering evaluations and/or judgments be performed under the direction of an appropriately registered or certified professional. For your submittal to be considered a valid technical report, you are to present site specific data, data interpretations, and recommendations prepared by an appropriately licensed professional and include the professional registration stamp, signature, and statement of professional certification. Please ensure all that all technical reports submitted for this fuel leak case meet this requirement.

UNDERGROUND STORAGE TANK CLEANUP FUND

Please note that delays in investigation, later reports, or enforcement actions may result in your becoming ineligible to receive grant money from the state's Underground Storage Tank Cleanup Fund (Senate Bill 2004) to reimburse you for the cost of cleanup.

AGENCY OVERSIGHT

If it appears as though significant delays are occurring or reports are not submitted as requested, we will consider referring your case to the Regional Board or other appropriate agency, including the County District Attorney, for possible enforcement actions. California Health and Safety Code, Section 25299.76 authorizes enforcement including administrative action or monetary penalties of up to $10,000 per day for each day of violation.

If you have any questions, please call me at (510) 567-6791 or contact me my electronic mail at jerry.wickham@acgov.org.

Sincerely,

Jerry Wickham

Jerry Wickham, P.G.
Hazardous Materials Specialist

Enclosure: ACEH Electronic Report Upload (ftp) Instructions

cc: Cheryl Dizon, QIC 80201
Zone 7 Water Agency
100 North Canyons Parkway
Livermore, CA 94551

Danielle Stefani
Livermore-Pleasanton Fire Department
3560 Nevada Street
Pleasanton, CA 94566

John Rigter
Livermore-Pleasanton Fire Department
3560 Nevada Street
Pleasanton, CA 94566

Charlotte Evans
Conestoga-Rovers & Associates
5900 Hollis Street, Suite A
Emeryville, CA 94608

Donna Drogos, ACEH
Jerry Wickham, ACEH
File

CONESTOGA-ROVERS
& ASSOCIATES

ATTACHMENT B

Standard Field Procedures for Cone Penetrometer Testing and Sampling

STANDARD FIELD PROCEDURES FOR CONE PENETROMETER TESTING AND SAMPLING

This document describes Conestoga-Rovers & Associates (CRA's) standard field methods for Cone Penetrometer Testing (CPT) and direct-push soil and groundwater sampling. These procedures are designed to comply with Federal, State and local regulatory guidelines.

Use of CPT for logging and soil and groundwater sampling requires separate borings. Typically an initial boring is advanced to estimate soil and groundwater characteristics as described below. To collect soil samples a separate boring must be advanced using a soil sampling device. If groundwater samples are collected, another separate boring must be advanced using a groundwater sampling device. Specific field procedures are summarized below.

Cone Penetrometer Testing (CPT)

Cone Penetrometer Testing is performed by a trained geologist or engineer working under the supervision of a California Professional Geologist (PG) or a Certified Engineering Geologist (CEG). Cone Penetrometer Tests (CPT) are carried out by pushing an integrated electronic piezocone into the subsurface. The piezocone is pushed using a specially designed CPT rig with a force capacity of 20 to 25 tons. The piezocones are capable of recording the following parameters:

Tip Resistance (Qc)
Sleeve Friction (Fs)
Pore Water Pressure (U)
Bulk Soil Resistivity (rho)- with an added module

A compression cone is used for each CPT sounding. Piezocones with rated load capacities of 5, 10 or 20 tons are used depending on soil conditions. The 5 and 10 ton cones have a tip area of 10 sq. cm. and a friction sleeve area of 150 sq. cm. The 20 ton cones have a tip area of 15 sq. cm. and a friction sleeve area of 250 sq. cm. A pore water pressure filter is located directly behind the cone tip. Each of the filters is saturated in glycerin under vacuum pressure prior to penetration. Pore Pressure Dissipation Tests (PPDT) are recorded at 5 second intervals during pauses in penetration. The equilibrium pore water pressure from the dissipation test can be used to identify the depth to groundwater.

The measured parameters are printed simultaneously on a printer and stored on a computer disk for future analysis. All CPTs are carried out in accordance with ASTM D-3441. A complete set of baseline readings is taken prior to each sounding to determine any zero load offsets.

The inferred stratigraphic profile at each CPT location is included on the plotted CPT logs. The stratigraphic interpretations are based on relationships between cone bearing (Qc) and friction ratio (Rf). The friction ratio is a calculated parameter (Fs/Qc) used in conjunction with the cone bearing to identify the soil type. Generally, soft cohesive soils have low cone bearing pressures and high friction ratios. Cohesionless soils (sands) have high cone bearing pressures and low friction ratios. The classification of soils is based on correlations developed by Robertson et al (1986). It is not always possible to clearly identify a soil type based on Qc and Rf alone. Correlation with existing soils information and analysis of pore water pressure measurements should also be used in determining soil type.

CPT and sampling equipment are steam-cleaned or washed prior to work and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent. Groundwater samples are decanted into appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4° C, and transported under chain-of-custody to the laboratory.

After the CPT probes are removed, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor odor or staining, estimate groundwater depth and quality and to submit samples for chemical analysis.

Soil Classification/Logging

All soil samples are classified according to the Unified Soil Classification System by a trained geologist or engineer working under the supervision of a California Professional Geologist (PG) or a Certified Engineering Geologist (CEG). The following soil properties are noted for each soil sample:

- Principal and secondary grain size category (i.e., sand, silt, clay or gravel)
- Approximate percentage of each grain size category,
- Color,
- Approximate water or separate-phase hydrocarbon saturation percentage,
- Observed odor and/or discoloration,
- Other significant observations (i.e., cementation, presence of marker horizons, mineralogy), and
- Estimated permeability.

Soil Sampling

Soil samples are collected from borings driven using hydraulic push technologies. A minimum of one and one half ft of the soil column is collected for every five ft of drilled depth. Additional soil samples can be collected near the water table and at lithologic changes. Samples are collected using samplers lined with polyethylene or brass tubes driven into undisturbed sediments at the bottom of the borehole. The ground surface immediately adjacent to the boring is used as a datum to measure sample depth. The horizontal location of each boring is measured in the field relative to a permanent onsite reference using a measuring wheel or tape measure.

Drilling and sampling equipment is steam-cleaned or washed prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

Sample Storage, Handling and Transport

Sampling tubes chosen for analysisare trimmed of excess soil and capped with Teflon[7] tape and plastic end caps. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Samples are transported under chainof-custody to a State-certified analytic laboratory.

CRA

Field Screening

After a soil sample has been collected, soil from the remaining tubing is placed inside a sealed plastic bag and set aside to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable photoionization detector measures volatile hydrocarbon vapor concentrations in the bag=s headspace, extracting the vapor through a slit in the plastic bag. The measurements are used along with the field observations, odors, stratigraphy, and groundwater depth to select soil samples for analysis.

Grab Groundwater Sampling

Groundwater samples are collected from the open borehole using bailers, advancing disposable Tygon[7] tubing into the borehole and extracting groundwater using a diaphragm pump, or using a hydro-punch style sampler with a bailer or tubing. The groundwater samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4° C, and transported under chain-of-custody to the laboratory.

Duplicates and Blanks

Blind duplicate water samples are usually collected only for monitoring well sampling programs, at a rate of one blind sample for every 10 wells sampled. Laboratory-supplied trip blanks accompany samples collected for all sampling programs to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory quality assurance/quality control (QA/QC) blanks contain the suspected field contaminants. An equipment blank may also be analyzed if non-dedicated sampling equipment is used.

Grouting

If the borings are not completed as wells, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

CONESTOGA-ROVERS
& ASSOCIATES

ATTACHMENT C

Standard Field Procedures for GeoProbe®
Borings

STANDARD FIELD PROCEDURES FOR GEOPROBE® SAMPLING

This document describes Conestoga-Rovers & Associates' standard field methods for GeoProbe® soil and ground water sampling. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor odor or staining, estimate ground water depth and quality and to submit samples for chemical analysis.

Soil Classification/Logging

All soil samples are classified according to the Unified Soil Classification System by a trained geologist or engineer working under the supervision of a California Professional Geologist (PG) or a Certified Engineering Geologist (CEG). The following soil properties are noted for each soil sample:

- Principal and secondary grain size category (i.e., sand, silt, clay or gravel)
- Approximate percentage of each grain size category,
- Color,
- Approximate water or separate-phase hydrocarbon saturation percentage,
- Observed odor and/or discoloration,
- Other significant observations (i.e., cementation, presence of marker horizons, mineralogy), and
- Estimated permeability.

Soil Sampling

GeoProbe® soil samples are collected from borings driven using hydraulic push technologies. Prior to drilling, the first 8 ft of the boring are cleared using an air or water knife and vacuum extraction. This minimizes the potential for impacting utilties.

A minimum of one and one half ft of the soil column is collected for every five ft of drilled depth. Additional soil samples can be collected near the water table and at lithologic changes. Samples are collected using samplers lined with polyethylene or brass tubes driven into undisturbed sediments at the bottom of the borehole. The ground surface immediately adjacent to the boring is used as a datum to measure sample depth. The horizontal location of each boring is measured in the field relative to a permanent on-site reference using a measuring wheel or tape measure.

Drilling and sampling equipment is steam-cleaned or washed prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

Sample Storage, Handling, and Transport

Sampling tubes chosen for analysis are trimmed of excess soil and capped with Teflon® tape and plastic end caps. Soil samples are labeled and stored at or below 4°C on either crushed or dry ice, depending upon local regulations. Samples are transported under chain-of-custody to a State-certified analytic laboratory.

Field Screening

After a soil sample has been collected, soil from the remaining tubing is placed inside a sealed plastic bag and set aside to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable GasTech® or photo ionization detector measures volatile hydrocarbon vapor concentrations in the bag's headspace, extracting the vapor through a slit in the plastic bag. The measurements are used along with the field observations, odors, stratigraphy and ground water depth to select soil samples for analysis.

Grab Ground Water Sampling

Ground water samples are collected from the open borehole using bailers, advancing disposable Tygon® tubing into the borehole and extracting ground water using a diaphragm pump, or using a hydro-punch style sampler with a bailer or tubing. The ground water samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4° C, and transported under chain-of-custody to the laboratory.

Duplicates and Blanks

Blind duplicate water samples are usually collected only for monitoring well sampling programs, at a rate of one blind sample for every 10 wells sampled. Laboratory-supplied trip blanks accompany samples collected for all sampling programs to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory quality assurance/quality control (QA/QC) blanks contain the suspected field contaminants. An equipment blank may also be analyzed if non-dedicated sampling equipment is used.

Grouting

If the borings are not completed as wells, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

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CONESTOGA-ROVERS
& ASSOCIATES

ATTACHMENT D

Standard Field Procedures for Soil Borings

CONESTOGA-ROVERS & ASSOCIATES

STANDARD FIELD PROCEDURES FOR SOIL BORINGS

This document describes Conestoga-Rovers & Associates, Inc. (CRA) standard field methods for drilling and sampling soil borings. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor odor or staining, estimate ground water depth and quality and to submit samples for chemical analysis.

Soil Classification/Logging

All soil samples are classified according to the Unified Soil Classification System by a trained geologist or engineer working under the supervision of a California Professional Geologist (PG) or a Certified Engineering Geologist (CEG). The following soil properties are noted for each soil sample:

- Principal and secondary grain size category (i.e. sand, silt, clay or gravel)
- Approximate percentage of each grain size category,
- Color,
- Approximate water or product saturation percentage,
- Observed odor and/or discoloration,
- Other significant observations (i.e. cementation, presence of marker horizons, mineralogy), and
- Estimated permeability.

Soil Boring and Sampling

Soil borings are typically drilled using hollow-stem augers or hydraulic push technologies. Prior to drilling, the first 8 ft of the boring are cleared using an air or water knife and vacuum extraction. This minimizes the potential for impacting utilities.

At least one and one half ft of the soil column is collected for every five ft of drilled depth. Additional soil samples are collected near the water table and at lithologic changes. Samples are collected using lined split-barrel or equivalent samplers driven into undisturbed sediments beyond the bottom of the borehole. The vertical location of each soil sample is determined by measuring the distance from the middle of the soil sample tube to the end of the drive rod used to advance the split barrel sampler. All sample depths use the ground surface immediately adjacent to the boring as a datum. The horizontal location of each boring is measured in the field from an onsite permanent reference using a measuring wheel or tape measure.

Drilling and sampling equipment is steam-cleaned prior to drilling and between borings to prevent cross-contamination. Sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent.

Sample Storage, Handling and Transport

Sampling tubes chosen for analysis are trimmed of excess soil and capped with Teflon tape and plastic end caps. Soil samples are labeled and stored at or below 4oC on either crushed or dry ice, depending upon local regulations. Samples are transported under chain-of-custody to a State-certified analytic laboratory.

Field Screening

One of the remaining tubes is partially emptied leaving about one-third of the soil in the tube. The tube is capped with plastic end caps and set aside to allow hydrocarbons to volatilize from the soil. After ten to fifteen minutes, a portable photoionization detector (PID) measures volatile hydrocarbon vapor concentrations in the tube headspace, extracting the vapor through a slit in the cap. PID measurements are used along with the field observations, odors, stratigraphy and ground water depth to select soil samples for analysis.

Water Sampling

Water samples, if they are collected from the boring, are either collected using a driven Hydropunch type sampler or are collected from the open borehole using bailers. The ground water samples are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labeled, placed in protective foam sleeves, stored on crushed ice at or below 4oC, and transported under chain-of-custody to the laboratory.

Duplicates and Blanks

Blind duplicate water samples are collected usually collected only for monitoring well sampling programs, at a rate of one blind sample for every 10 wells sampled. Laboratory-supplied trip blanks accompany samples collected for all sampling programs to check for cross-contamination caused by sample handling and transport. These trip blanks are analyzed if the internal laboratory QA/QC blanks contain the suspected field contaminants. An equipment blank may also be analyzed if non-dedicated sampling equipment is used.

Grouting

If the borings are not completed as wells, the borings are filled to the ground surface with cement grout poured or pumped through a tremie pipe.

Waste Handling and Disposal

Soil cuttings from drilling activities are usually stockpiled onsite on top of and covered by plastic sheeting. At least four individual soil samples are collected from the stockpiles for later compositing at the analytic laboratory. The composite sample is analyzed for the same constituents analyzed in the borehole samples. Soil cuttings are transported by licensed waste haulers and disposed in secure, licensed facilities based on the composite analytic results.

Ground water removed during sampling and/or rinsate generated during decontamination procedures are stored onsite in sealed 55 gallon drums. Each drum is labeled with the drum number, date of generation, suspected contents, generator identification and consultant contact. Disposal of the water is based on the analytic results for the well samples. The water is either pumped out using a vacuum truck for transport to a licensed waste treatment/disposal facility or the individual drums are picked up and transported to the waste facility where the drum contents are removed and appropriately disposed.

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ATTACHMENT E

Standard Field Procedures for Soil Vapor Probe Installation and Sampling

CRA

STANDARD FIELD PROCEDURES FOR SOIL VAPOR PROBE INSTALLATION AND SAMPLING

DIRECT PUSH AND VAPOR POINT METHODS

This document describes Conestoga-Rovers & Associates' standard field methods for soil vapor sampling. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

Objectives

Soil vapor samples are collected and analyzed to assess whether vapor-phase subsurface contaminants pose a threat to human health or the environment.

Direct Push Method for Soil Vapor Sampling

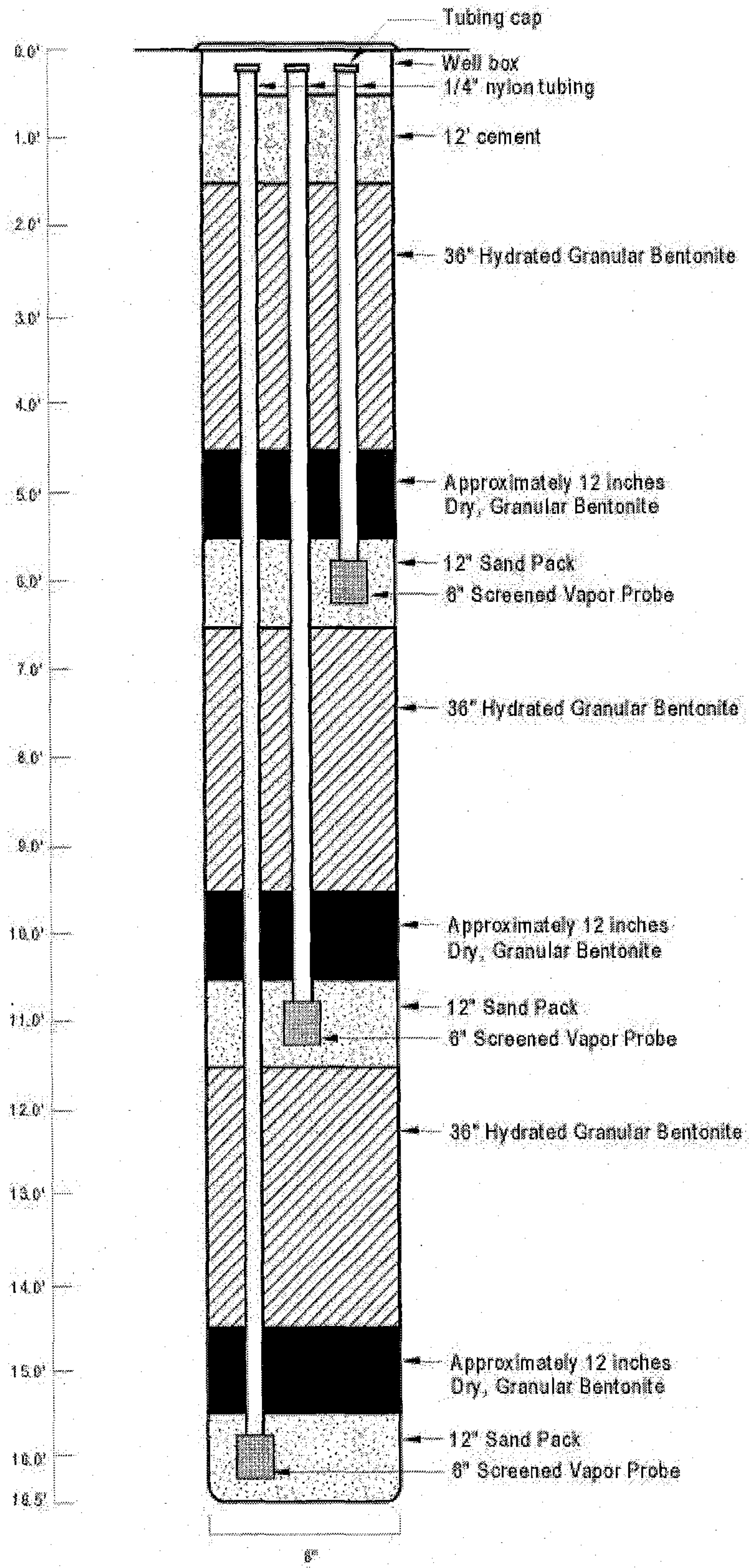
The direct push method for soil vapor sampling uses a hollow vapor probe, which is pushed into the ground, rather than augured, and the stratigraphy forms a vapor seal between the surface and subsurface environments ensuring that the surface and subsurface gases do not mix. Once the desired soil vapor sampling depth has been reached, the field technician installs disposable polyethylene tubing with a threaded adapter that screw into the bottom of the rods. The screw adapter ensures that the vapor sample comes directly from the bottom of the drill rods and does not mix with other vapor from inside the rod or from the ground surface. In addition, hydrated bentonite is placed around the sampling rod and the annulus of the boring to prevent ambient air from entering the boring. The operator then pulls up on the rods and exposes the desired stratigraphy by leaving an expendable drive point at the maximum depth. The required volume of soil vapor is then purged through the polyethylene tubing using a standard vacuum pump. The soil vapor can be sampled for direct injection into a field gas chromatograph, pumped into inert tedlar bags using a "bell jar" sampling device, or allowed to enter a Summa vacuum canister. Once collected, the vapor sample is transported under chain-of-custody to a state-certified laboratory. The ground surface immediately adjacent to the boring is used as a datum to measure sample depth. The horizontal location of each boring is measured in the field relative to a permanent on-site reference using a measuring wheel or tape measure. Drilling and sampling equipment is washed between samples with trisodium phosphate or an equivalent EPA-approved detergent. Once the sampling is completed, the borings are filled to the ground surface with neat cement.

Shallow Soil Vapor Point Method for Soil Vapor Sampling

The shallow soil vapor point method for soil vapor sampling utilizes a hand auger or drill rig to advance a boring for the installation of a soil vapor sampling point. Once the boring is hand augered to the final depth, a 6-inch slotted probe, capped on either end with brass or Swagelok fittings, is placed within 12-inches of number 2/16 filter sand (Figure A). Nylon tubing of ¼-inch outer-diameter of known length is attached to the probe. A 2-inch to 12-inch layer of unhydrated bentonite chips is placed on top of the filter pack. Next pre-hydrated granular bentonite is then poured into the hole to approximately and topped with another 2-inch layer of unhydrated bentonite chips or concrete, depending if the boring will hold one probe or multiple probes. The tube is coiled and placed within a wellbox finished flush to the surface. Soil vapor samples will be collected no sooner than one week after installation of the soil-vapor points to allow adequate time for representative soil vapors to accumulate. Soil vapor sample collection will not be scheduled until after a minimum of three consecutive precipitation-free days and irrigation onsite has ceased. Figure B shows the soil vapor sampling apparatus. A measured volume of air will be purged from the tubing using a vacuum pump and a tedlar bag. Immediately after purging, soil-vapor samples will be collected using the appropriate size Summa canister with attached flow regulator and sediment filter. The soil-vapor points will be preserved until they are nolonger needed for risk evaluation purposes. At that time, they will be destroyed by extracting the tubing, hand augering to remove the sand and bentonite, and backfilling the boring with neat cement. The boring will be patched with asphalt or concrete, as appropriate.

Vapor Sample Storage, Handling, and Transport

Samples are stored and transported under chain-of-custody to a state-certified analytic laboratory. Samples should never be cooled due to the possibility of condensation within the canister.



FIGURE

A

Nested Soil Vapor Probe Construction

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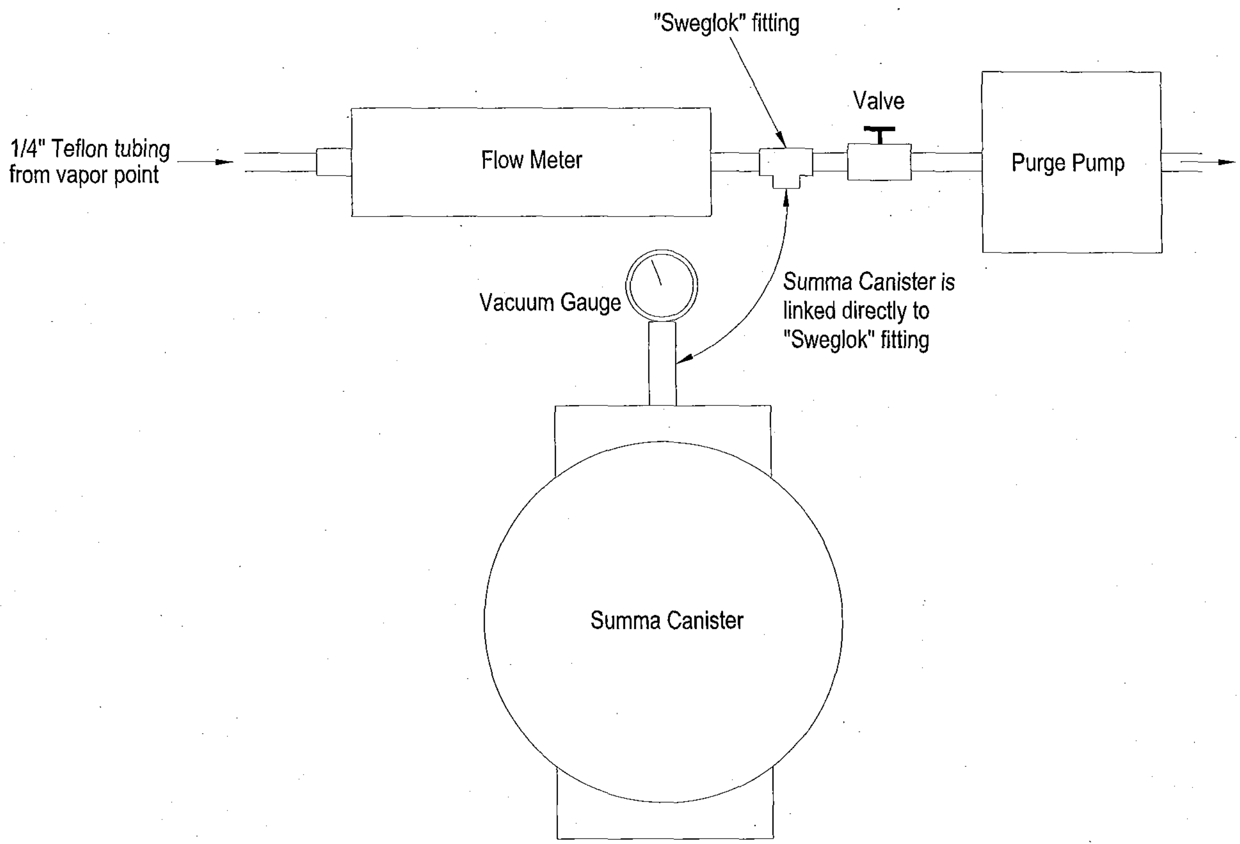

S:\0-TEXACO\TEX-SITES\211273\FIGURES\VAPOR-DIAG.DWG

Schematic Not to Scale

FIGURE

B

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Soil Vapor Sampling Apparatus Diagram