CAMBRIA
Environmental Technology, Inc.

August 15, 1994

Jennifer Eberle
Alameda County Department of
Environmental Health
UST Local Oversight Program
1131 Harbor Bay Parkway, 2nd Floor
Alameda, CA 94502

Re: Investigation Work Plan
Former Arco Station
706 Harrison Street
Oakland, California
Cambria Proj. # 23-116

Dear Ms. Eberle:

As we discussed on August 10, 1994, we are submitting this work plan for a subsurface investigation at the site referenced above. Our investigation objectives are to further define the extent of hydrocarbons in soil beneath the site, define the leading edge of hydrocarbons in ground water downgradient of the site, and install wells for site remediation. Our scope of work for this investigation is presented below.

PROPOSED SCOPE OF WORK

Our primary objective in this investigation is to determine the extent of hydrocarbons in soil beneath the site and determine the extent of hydrocarbons in ground water downgradient of the site. To meet these objectives, we will:

1. Prepare a site safety plan and coordinate field activities.
2. Drill and sample five soil borings on site to about 30 ft depth and analyze selected soil samples for total petroleum hydrocarbons as gasoline (TPHg) and benzene, ethylbenzene, toluene and xylenes (BETX).
3. Convert three of the soil borings to combination soil vapor extraction (SVE) and air sparging wells.
4. Install an additional ground water monitoring well at the upgradient property boundary and analyze soil samples from the well boring for TPHg and BETX.

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5. Install three ground water monitoring wells across 7th and Harrison Streets to define the downgradient extent of hydrocarbons in ground water as we discussed in our August 8, 1994 telephone conversation.[1]

6. Develop the monitoring wells using surge block agitation and ground water evacuation and sample them for TPHg and BETX at least 48 hours after development. ok

7. Survey the new wells for location and elevation. ok

8. Gauge the site wells and determine the ground water gradient and flow direction. ok

9. Prepare a subsurface investigation report. ok

The specific tasks to be performed are presented below.

Site Safety Plan: We will prepare a comprehensive site safety plan to protect site workers. The plan will be kept on site at all times and signed by all site workers.

Permits: We will obtain well permits from Alameda County Zone 7 for the three ground water monitoring wells. We will also obtain excavation permits from the City of Oakland to install wells in the streets downgradient and crossgradient of the site.

Underground Utility Location: We will notify Underground Service Alert of our drilling activities so they can clear the offsite well locations prior to drilling.

Soil Borings: We will drill five soil borings in the former tank excavations (Figure 1). We will collect soil samples from the borings at five ft intervals, at lithologic changes and at the water table. After sampling, the borings not completed as wells will be backfilled with Portland Type I, II cement through a tremie pipe to grade. Our standard field procedures are presented in Attachment A.

don't need to collect backfill samples.

Install Three SVE/Air Sparging Wells: We will install three 2-inch diameter combination SVE/Sparging wells in the locations shown on Figure 1. Based on conditions described during previous investigations, we will construct the wells using #1/20 sand and 0.010-inch slotted PVC well screen. We will screen the wells from about ten ft below and five ft above the static ground water elevation.

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[1] Telephone conversation between Alameda County Department of Environmental Health Hazardous Materials Specialist Jennifer Eberle and Cambria Principal Geologist N. Scott MacLeod regarding the need for wells downgradient of the site.

Install Ground Water Monitoring Wells: We will install one ground water monitoring well at the upgradient property line to assess whether the upgradient Shell station is contributing hydrocarbons to the former Arco site. We will also install three wells crossgradient and downgradient of the site to determine the extent of hydrocarbons in ground water. The wells will be two inches in diameter and screened similarly to the other site ground water monitoring wells.

Well Elevation Survey: We will survey the ground water monitoring wells horizontally with respect to site boundaries and vertically with respect to mean sea level.

Soil Analyses: We will analyze selected soil samples from each boring for TPH-G and BETX. One of the soil samples analyzed will be from immediately above the water table, the others will be from the portion of the boring containing the highest field indications of hydrocarbons.

Ground Water Analyses: Since the previous consultant did not collect Third Quarter 1994 ground water samples from the site, we will collect water samples following our standard field procedures (Attachment A) and analyze the ground water samples from the wells for TPH-G and BETX.

Reporting: After the analytic results are received, we will prepare a subsurface investigation report that, at a minimum, will contain:

- A summary of the site background and history,
- Rationale for the boring and well placements and design,
- Descriptions of the drilling, soil sampling, and well installation, development and sampling methods,
- Boring logs for all soil borings and construction diagrams for the three wells,
- Tabulated soil and ground water analytic results,
- Analytic reports and chain-of-custody forms,
- Well elevation survey and ground water elevation data,
- Soil and water disposal methods, and
- Hydrogeologic interpretation.

Ground Water Monitoring: After installing the wells we will begin quarterly ground water sampling and reporting. The quarterly reports will discuss activities performed during the current quarter, activities anticipated in the upcoming quarter and summarize the current sampling results.

SCHEDULE

We will begin drilling as soon as this work plan is approved in writing and as soon as the well and excavation permits are received from Zone 7. We will submit our investigation report about six weeks after finishing the field work.

Please call if you have any questions or comments.

Sincerely,
Cambria Environmental Technology, Inc.

N. Scott MacLeod, R.G.
Principal Geologist

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Attachments: A - Standard Field Procedures

cc: Bo Gin, Oakland Auto Parts, 288 11th Street, Oakland, CA 94607
Gil Jensen, Alameda County District Attorney, 7677 Oak Port Street, Suite 400, Oakland, CA 94621
Ed Howell, RWQCB 2101 Webster Street, Suite 500, Oakland, CA, 94612

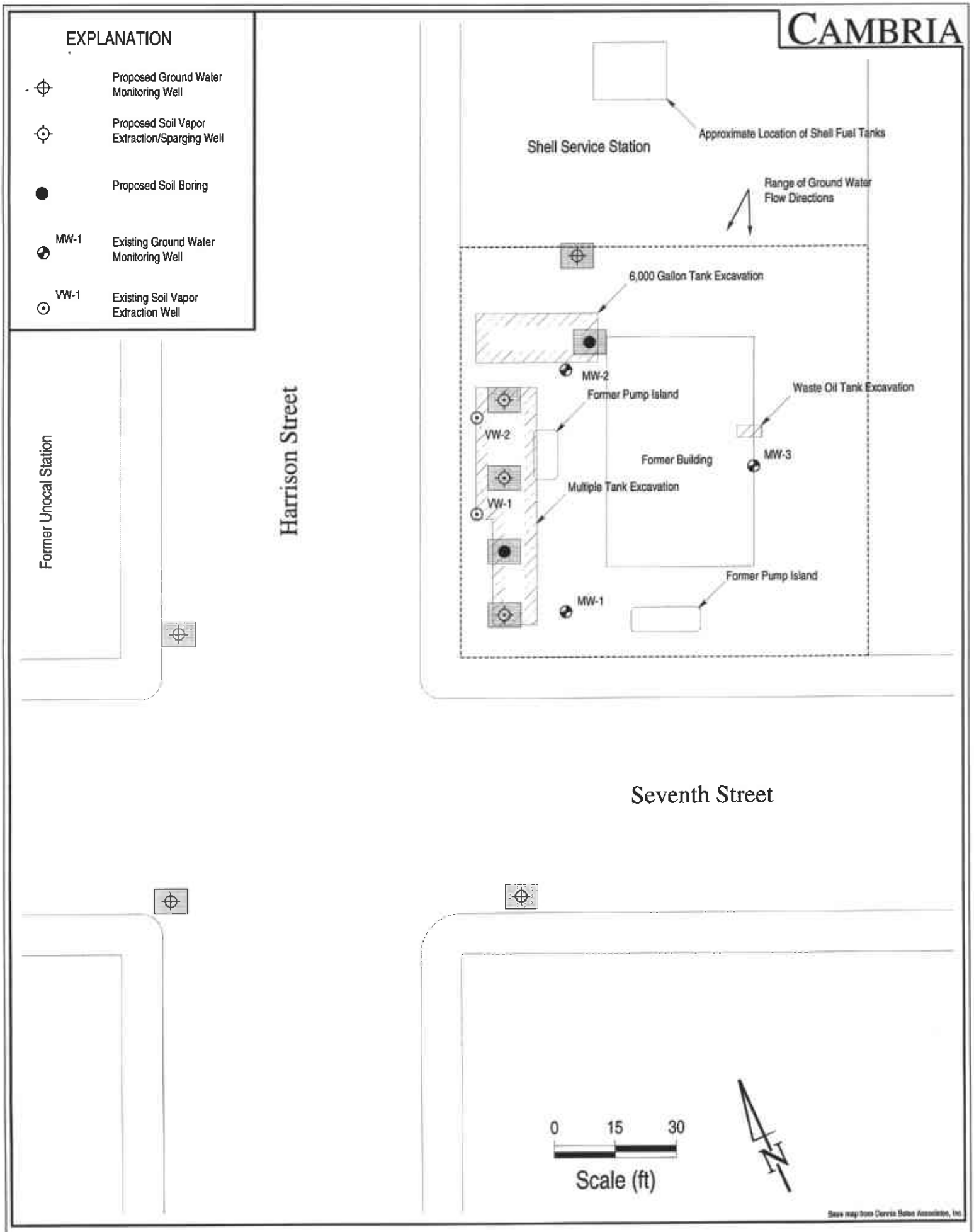

Figure 1. Proposed Well and Boring Locations - Former Arco Station - 706 Harrison Street, Oakland, California

ATTACHMENT A

STANDARD FIELD PROCEDURES

This document describes standard field methods for drilling and sampling soil borings and installing, developing and sampling ground water monitoring wells. These procedures are designed to comply with Federal, State and local regulatory guidelines. Specific field procedures are summarized below.

SOIL BORING AND SAMPLING

Objectives

Soil samples are collected to characterize subsurface lithology, assess whether the soils exhibit obvious hydrocarbon or other compound vapor or staining, and to collect samples for analysis at a State-certified laboratory. All borings are logged using the Unified Soil Classification System by a trained geologist working under the supervision of a California Registered Geologist (RG) or a Certified Engineering Geologist (CEG).

Soil Boring and Sampling

Soil borings are typically drilled using solid flight or hollow-stem augers. Soil samples are collected at least every five ft to characterize the subsurface sediments and for possible chemical analysis. Additional soil samples are collected near the water table and at lithologic changes. Samples are collected using split-barrel samplers lined with steam-cleaned brass or stainless steel tubes that are driven through the hollow auger stem into undisturbed sediments at the bottom of the borehole. Samples are driven using a 140 pound hammer dropped 30 inches.

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 Analysis

Sampling tubes chosen for analysis are trimmed of excess soil and capped with Teflon tape and plastic end caps. Soil samples are labelled 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

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 stratigraphy and ground water depth to select soil samples for analysis.

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. If wells are completed in the borings, the well installation, development and sampling procedures summarized below are followed.

MONITORING WELL INSTALLATION, DEVELOPMENT AND SAMPLING

Well Construction and Surveying

Wells are installed to monitor ground water quality and determine the ground water elevation, flow direction and gradient. Well depths and screen lengths are based on ground water depth, occurrence of hydrocarbons or other compounds in the borehole, stratigraphy and State and local regulatory guidelines. Well screens typically extend 10 to 15 ft below and 5 ft above the static water level at the time of drilling. However, the well screen will generally not extend into or through a clay layer that is at least three ft thick.

Well casing and screen are flush-threaded, Schedule 40 PVC. Screen slot size varies according to the sediments screened, but slots are generally 0.010 or 0.020 inches wide. A rinsed and graded sand occupies the annular space between the boring and the well screen to about one to two ft above the well screen. A two ft thick hydrated bentonite seal separates the sand from the overlying sanitary surface seal composed of Portland type I,II cement.

Well-heads are secured by locking well-caps inside traffic-rated vaults finished flush with the ground surface. A stovepipe may be installed between the well-head and the vault cap for additional security.

The well top-of-casing elevation is surveyed with respect to mean sea level and the well is surveyed for horizontal location with respect to an onsite or nearby offsite landmark.

Well Development

Wells are generally developed using a combination of ground water surging and extraction. Surging agitates the ground water and dislodges fine sediments from the sand pack. After about ten minutes of surging, ground water is extracted from the well using bailing, pumping and/or reverse air-lifting through an eductor pipe to remove the sediments from the well. Surging and extraction continue until at least ten well-casing volumes of ground water are extracted and the sediment volume in the ground water is negligible. This process usually occurs prior to installing the sanitary surface seal to ensure sand pack stabilization. If development occurs after surface seal installation, then development occurs 24 to 72 hours after seal installation to ensure that the Portland cement has set up correctly.

All equipment is steam-cleaned prior to use and air used for air-lifting is filtered to prevent oil entrained in the compressed air from entering the well. Wells that are developed using air-lift evacuation are not sampled until at least 24 hours after they are developed.

Ground Water Sampling

Depending on local regulatory guidelines, three to four well-casing volumes of ground water are purged prior to sampling. Purging continues until ground water pH, conductivity, and temperature have stabilized. Ground water samples are collected using bailers or pumps and are decanted into the appropriate containers supplied by the analytic laboratory. Samples are labelled, placed in protective foam sleeves, stored on crushed ice at or below 4°C, and transported under chain-of-custody to the laboratory. Laboratory-supplied trip blanks accompany the samples and are analyzed to check for cross-contamination. An equipment blank may be analyzed if non-dedicated sampling equipment is used.