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February 3, 2006 Project No. 053-7466

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1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

Ms. Chris Davidson
City of Livermore
1052 S. Livermore Avenue
Livermore, CA 94550-4899

RE: REVISED WORKPLAN FOR CORRECTIVE ACTION, 2008 1ST STREET, LIVERMORE, CA (APN 097-0001-24-01)

To Whom It May Concern::

At the request of our client, Mr. Balaji Angle, we have prepared the following workplan responding to the letter dated August 25, 2005 from the City of Livermore requesting a cleanup plan for 2008 1st Street. The workplan describes our proposed approach for supplemental site characterization and preparation of a remedial action plan for the petroleum release associated with the Valley Gas property. We understand that the Valley Gas property is located in the Downtown Livermore Redevelopment Project Area and we want to confirm that Golder is committed to working with our client, and the City, to get the subject property remediated in a timely and efficient manner to allow for redevelopment as outlined in the Downtown Specific Plan.

This workplan is a revision of our workplan dated October 24, 2005. The October 24, 2005 workplan was a revision of our original workplan dated September 20, 2005 which was submitted to Ms. Donna Drogos of Alameda County Environmental Health Services (ACEH) in response to a letter to our client from ACEH dated July 5, 2005. The prior workplan, and this revision, focuses on additional site characterization activities for the source zone which must be performed before a remedial plan for clean up of the source zone can be prepared. The environmental and human health risks associated with the source zone are now at the forefront due to the proposed redevelopment of the area. This workplan includes additional exploratory locations on the Valley gas property, and several other minor clarifications, to address concerns voiced by the City and their consultant.

It should be noted that this plan does not include a specific remedial action plan since a sound plan cannot be prepared without: (1) additional technical data regarding the nature and extent of the source zone, (2) guidelines from the regulatory agencies regarding appropriate clean up levels (requested from the San Francisco Regional Water Quality Control Board by the City, per your August 25 letter), and (3) a better understanding of the schedule for redevelopment activities and the amount of time available for remedial activities. Based on our recent meeting with the City, and the tentative schedule prepared as Exhibit A to the City's letter dated January 25, 2005, we now understand that remedial activities must be completed by December, 2007.

Prior efforts at this site were focused on definition of the dissolved contaminant plume emanating from the site, and the potential threat the contaminant plume poses to the drinking water aquifer in the region. The primary constituents of concern are total petroleum hydrocarbons as gasoline (TPH-G); the aromatic compounds benzene, toluene, ethylbenzene, and xylenes (collectively referred to as BTEX); and methyl tertiary-butyl ether (MTBE). Work to date indicates that the dissolved plume is separated from the underlying drinking water aquifer by a competent aquiclude and therefore does not appear to be an imminent threat to the drinking water supply. Furthermore, as evidenced by on-going groundwater monitoring data, the plume is shrinking in size and is therefore undergoing natural attenuation associated with naturally occurring biodegradation processes.

SITE BACKGROUND

Site Description

The B&C property is located on the northeast corner of First and South L Streets in Livermore, California, and currently serves as a gasoline station and mini market operating as Valley Gas. From at least 1988 until 1994, Desert Petroleum (DP) owned and operated the site. In January 1994, DP sold the site to the current owner, Mr. Balaji Angle. The following site description has been compiled from reports on file with Alameda County Environmental Health Services (ACEHS) and information provided by the site owner.

The site is located in the Livermore Valley groundwater basin, an area of sedimentary deposition containing braided channel systems with complex interfingering. Subsurface investigations conducted to the west of the B&C site have found an upper unconfined water-bearing zone consisting primarily of gravels with sand and clay. A low-permeability clayey unit is found at depths of approximately 75 to 110 feet below ground surface (bgs). Below the clayey unit, the top of a lower, semi-confined aquifer is found at depths ranging from 110 to 145 feet bgs.1 Over the last 15 years, static water levels have ranged from a low of 69 feet bgs (January 1992) to a high of 17 feet bgs (February 1997). The groundwater flow generally ranges from west of north during the summer and fall months, to north of west during the winter and spring months.

Previous Work Performed at Site

A preliminary site assessment was conducted in September 1988. Three soil borings were completed; one of which was converted to a monitoring well (MW-1). In March 1994, a 280-gallon waste oil underground storage tank (UST) and 25 cubic yards of soil were removed as part of closing the auto repair shop at the station. Three months later in June, wells MW-2, MW-3, and MW-4 were installed (Figure 2).[2]

In August 1994, free product was encountered in well MW-2, and product removal commenced twice a month. By the end of January 1995 no measurable thickness of product remained, only sheen could be detected.[3] In March 1995, a release was reported to have occurred from the union between a tank subpump and product line. The quantity of the release is unknown.

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[1] H^+GCL, Inc. Deep Groundwater Conduit Study, Livermore Arcade Shopping Center, First Street and South P Street, Livermore, California. December 6, 1993.

[2] Remediation Service Int'l. Soil & Groundwater Investigation Report for 2008 First Street, Livermore, California. July 22, 1994.

[3] Product thickness information from Remediation Service, Int'l field records, "Free Product Removal Logs."

One gasoline UST at the B&C site failed an integrity test in September 1995. The tank was immediately taken out of commission and ACEHS was notified. In July 1996, further source removal was conducted. Two more gasoline USTs were removed and new double-walled fiberglass USTs and fiberglass piping with automated leak detection were installed (Figure 2). Other remedial activities included the removal of two hydraulic lifts and approximately 700 cubic yards of impacted soil. Also, one 1,000-gallon UST discovered during excavation activities was closed in place with approval from ACEHS and the Livermore Fire Department by grouting with a cement sand slurry. In October 1995, two additional monitoring wells (off-site well MW-5 and well MW-6) were installed for the B&C site (Figure 2).

Nine downgradient wells (MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, D-1, and D-2) were installed during June and July 1999 to define the downgradient and lateral extent of the plume and provide long-term monitoring locations (Figure 2).[4] Two of the wells, D-1 and D-2, are installed in the semi-confined aquifer below the aquitard. The other wells are installed in the upper water-bearing zone.

A March 2003 workplan proposed additional subsurface investigations to (1) better define the source area, (2) better characterize the geologic and hydrogeologic environment controlling the contaminant fate and transport, (3) improve the delineation of the downgradient, lateral and vertical extent of the plume, (4) estimate the mass flux of MTBE to water supply well CWS#8, and (5) evaluate the potential for vertical migration of the plume to the water supply aquifer.[5] In July and August 2003 the workplan was implemented and four multi-level wells were installed (CMT-1, CMT-2, CMT-3, and CMT-4). Each was constructed using continuous multi-channel tubing (CMT) and completed with seven sampling ports to monitor groundwater both in the upper water-bearing zone and in the semi-confined aquifer below the aquitard. CMT-4 was installed at the B&C site while CMT-1, CMT-2, and CMT-3 were installed downgradient of the site to better define the lateral extent of the plume in the northwest direction.

An electronic report, referred to as the Site Conceptual Model (SCM) was prepared at the request of ACEH, describing the rationale of the new well locations and depths, the methods used to drill and construct the wells, and presenting the analytical results from the first sampling event (August 2003).[6] The report demonstrated several important findings:

- The northwest extent of the dissolved contaminant plume was generally defined and was shown not to have reached municipal water supply wells.
- At approximately 70 feet bgs, a regional-scale aquitard consisting of highly plastic clay was identified. The base of the aquitard varies, however; in general the unit is approximately 8 to 10 feet thick at minimum. This aquitard protects the underlying drinking water aquifer from the release.

[4] Einarson, Fowler & Watson, November 5, 1999, Report of Downgradient Investigation, B&C Gas Mini Mart, 2008 First Street, Livermore, California.

[5] Conor Pacific, Workplan for Additional Site Characterization and Downgradient Investigation, B&C Gas Mini Mart, 2008 First Street, Livermore, California, March 5, 2003

[6] Conor Pacific. Revised Site Conceptual Model (Revision 1.1), B&C Gas Mini Mart/Desert Petroleum Retail Station, Livermore, California. March 24, 2004.

- Investigations to date indicate the source area is concentrated at a depth of 28 to ~40 feet bgs. The entire smear zone extends from approximately 28 to about 48.5 feet bgs. The highest concentration of BTEX and MTBE in soil occurs at about 34 feet (near the water table).
- Concentrations of MTBE and BTEX have been declining throughout the plume since 1995. Declining concentrations appear to be due to natural attenuation based on positive chemical indicators of natural attenuation and the shrinking dimensions of the BTEX plume.

SCOPE OF WORK

The work is divided into four main tasks: (1) data compilation and analyses, (2) supplemental source zone investigation, (3) updating of the SCM, and (4) development of a remedial action plan for the site. The work proposed for each of these tasks is presented in more detail below.

TASK 1 – DATA COMPILATION AND ANALYSES

Task 1 incorporates all tasks that require additional compilation and/or review of data to address questions or data gaps remaining from SCM Revision 1.1.

Subtask 1.1 – Update Regional Groundwater Pumping Data

- Obtain pumping and analytical data since August 2003 for water supply well CWS-8 from Zone 7 Water Agency.
- Compile, analyze and summarize CWS-8 pumping and contaminant data (if applicable). Compare monthly pumping with water level data for the CMT transect.
- Incorporate data into revised SCM Revision 2.0 and quarterly monitoring reports.

Subtask 1.2 – Detailed Well Study

- Obtain updated electronic database well search from EDR for 1 mile radius downgradient from site.
- Meet with Zone 7 Water Agency to review and obtain available well records.
- Compile all data regarding installation date, well construction, decommissioning information, etc. in table format for all water supply wells.
- Incorporate data into revised SCM Revision 2.0.

Subtask 1.3 – Utility Survey

- Update information from City of Livermore re: underground utilities.
- Evaluate Sanborn maps for any utility information.
- Compile all data onto map bases and evaluate potential preferential pathways.
- Incorporate data into revised SCM Revision 2.0.

Subtask 1.4 - Risk Evaluation of Off-site MTBE Plume

- Evaluate data prepared by County re: breakthrough curves and potential for detached plume of MTBE. Evaluate historical chemistry trends to validate the County's detached plume hypothesis.
- Evaluate local and regional scale groundwater flow to analyze rate, trajectory and current position of possible detached plume.
- Meet with Zone 7 to obtain updated information on water supply wells and future plans for water supply and new wells.
- Evaluate possible risk of detached plume being intercepted by downgradient supply wells.
- Incorporate data into revised SCM Revision 2.0.

Subtask 1.5 - Evaluate Natural Attenuation of BTEX

- Evaluate historical chemistry trends in downgradient wells.
- Evaluate natural attenuation parameters and evidence for natural attenuation of BTEX.
- Evaluate and illustrate change in plume over time.
- Incorporate data into revised SCM Revision 2.0.

Subtask 1.6 - Evaluate Need for Additional Downgradient Wells

- Evaluate results of well survey and risk assessment for BTEX.
- Prepare revised recommendations for downgradient wells as needed.
- Incorporate data into revised SCM Revision 2.0.

Subtask 1.7 - Update Groundwater Monitoring Tables/Revise Groundwater Monitoring Plan

- Update proposed groundwater monitoring schedule and plan.
- Update historical groundwater monitoring tables into requested format (Task Completed)
- Perform QA/QC of historical data and address Agency comments (Task Completed).
- Incorporate data into revised SCM Revision 2.0 and include with quarterly reports.

Subtask 1.8 - Evaluate Deep Detections in CMT-4

- Review historical chemistry data for CMT-4.
- Prepare plots of head versus depth over time.
- Develop working hypotheses for low level detections below aquiclude.
- Evaluate risk posed by the detections to downgradient wells.
- Incorporate data into revised SCM Revision 2.0.

TASK 2 – FIELD INVESTIGATION OF SOURCE ZONE

Additional work is required to investigate the extent of the source zone associated with the B&C release. Specifically, additional subsurface investigations are proposed on the Valley gas property, and to the west and northwest of the site (Groth Brothers and Mill Springs Park Apartments), to define the horizontal and vertical limits of petroleum hydrocarbon (NAPL) associated with the release. In addition, a vapor survey is also proposed to better define potential health risks associated with possible vapor in the unsaturated zone associated with the petroleum hydrocarbons. It is our understanding that the City of Livermore intends to redevelop this area with residential housing as part of larger redevelopment plan for the downtown area (Livermore Redevelopment Project Area). Consequently, there is heightened focus on the source area associated with the site and, specifically, moving quickly to a remediation program for the source zone.

Subtask 2.1 – Pre Field Preparation

This task includes all preparations necessary prior to conducting the field investigation. This includes:

- Prepare letters requesting access permission from City of Livermore and Groth Brothers. Follow up with the City and County to expedite the site access.
- Follow up with City regarding traffic control issues and work requirements.
- Coordination and scheduling of drilling subcontractors.
- Identification and field marking of final locations for each proposed boring.
- Preparation of well permits.
- Utility clearance for all subsurface exploratory locations.
- Preparation of a program specific site health and safety plan (HSP).
- Coordination with site owners and personnel regarding schedule, boring locations, and access requirements.

Subtask 2.2 – Field Investigation

Membrane Interface Probe (MIP)

We will perform Membrane Interface Probe (MIP) sampling at approximately 17 locations (Figure 1) to define the horizontal and vertical extent of the petroleum hydrocarbon source area. The MIPs tool will be advanced to a depth of 45 to 50 feet. The MIPs locations, and the approximate order of installation, include:

- Four locations on or adjacent to the Valley Gas Property,
- Five locations in a transect along the eastern margin of the Groth Property,
- Four locations in a transect down the central portion of the Groth Property, and
- Four locations (if required) down the western margin of the Groth Property.

Based on new information provided by G. Young, the City's environmental consultant, there is good evidence that the source zone from the Valley Gas site does not extend a significant distance onto the Groth Property. Therefore, the western transect may not be required if the source zone can be defined by the central transect. These probes may be relocated in the eastern portion of the property on an as-needed basis to fill in potential data gaps. It is our intention to review the findings of the MIP

investigation on a real time basis with the City/County to attempt to complete the three dimensional definition of the source in this mobilization.

The MIP is an advanced site investigation tool developed for the logging of total volatile organic compounds (VOCs) while classifying soil lithology in the subsurface. As the MIP is driven to depth using direct push equipment, a permeable membrane on the side of the probe is heated at desired intervals to volatize organic compounds. The VOCs permeate the membrane and are delivered to the surface using an internal carrier gas. At the surface, total VOC readings are provided by using a single detector or a series of detectors, such as a PID, FID or ECD. The real time log also provides a depth/speed graph, an electrical conductivity log of the formation (lithology), and a temperature log of the heated sensor. The MIP log provides semi quantitative/qualitative information on contaminant levels and allows contaminated zones to be targeted for sampling.

Soil Sampling

To confirm the horizontal and vertical limits of the source zone defined by the MIP tool, and to develop a rough correlation between total VOCs and petroleum hydrocarbon concentrations and species, we will select approximately six locations to obtain confirmatory soil samples. We anticipate selecting two vertical intervals in each boring targeting the highest VOC detections by the MIP. Per the City's request three of the soil borings will be located on or adjacent to the Valley Gas site, with the remaining three borings likely in eastern portion of the Groth Property. Final boring locations will be determined based on the findings of the MIPs work and in consultation with the City and County.

A direct push rig will be used to advance the exploratory borings to evaluate the extent of petroleum hydrocarbons in the selected locations. A piston sampler, or similar, will be used to sample the zones of interest in each boring. The soil core from each boring will be logged by Golder staff according to the Unified Soil Classification System (USCS) under the supervision of a California Professional Geologist. Depending on the depth to groundwater at the time of sampling, and the thickness and elevation of the smear zone, we will attempt to collect one sample to characterize the NAPL remaining in the vadose zone and one sample to characterize the submerged smear zone. Note, however, that based on the findings from CPT-4, the highest concentrations of petroleum hydrocarbon in soil are between 35 and 40 feet bgs (which is likely below the water table based on recent groundwater level measurements).

Bulk samples of soil will also be obtained for bench scale testing of potential in situ oxidation remedial methods.

All soil will be contained for proper disposal. All down-hole equipment will be steam cleaned before use and between borings. Rinsate will be collected in 55-gallon drums for proper disposal. These materials will be properly disposed of consistent with analytical results.

Groundwater Sampling

Grab groundwater samples will be collected from the highest VOC interval in each boring to evaluate concentrations of dissolved-phase hydrocarbons and the potential for free-phase hydrocarbons (if any) in the first encountered water-bearing zone. Samples will be obtained by withdrawing the direct-push drive casing one to two feet to expose the desired sampling interval and obtaining a sample with a bailer. Prior to groundwater grab sample collection; the borings will be gauged with an oil-water interface probe to monitor each boring for the presence of free-phase hydrocarbons. The samples will be collected using new, disposable Teflon® bailers. Following completion of work at each location, each boring will be grouted from the bottom up to the ground surface with bentonite-cement slurry via tremie pipe.

Bulk samples of soil will also be obtained for bench scale testing of potential in situ oxidation remedial methods.

Groundwater and Soil Sample Analysis

All soil and groundwater samples will be properly containerized, labeled, and preserved upon collection. Chain of custody documentation will accompany the samples to the laboratory for analysis. Sequoia Analytical, a state-certified laboratory, will analyze the soil and groundwater samples for TPHg, BTEX, MTBE and fuel oxygenates by US EPA Method 8015M and 8260. In addition, analyses will include the following metals for evaluation of possible in situ chemical oxidation (ISCO) remedial activities: arsenic, barium, cadmium, chromium, copper, iron, lead, and selenium by EPA Method 6010B and hexavalent chromium by EPA Method 7199.

In addition to chemical analyses, a suite of three to five soil samples will also be selected for analysis of physical parameters. The intent of collecting these samples will be to provide physical soil data for input into a vapor migration model, if needed to assess indoor inhalation risk, and for feasibility evaluation of potential remedial methods. The physical soil parameters include:

- Permeability (native and intrinsic) via American Petroleum Institute (API) method RP40 or American Standard Testing Method (ASTM) D425M
- Porosity (total, effective, air-filled, water-filled), grain density, dry bulk density via ASTM 2937 and API RP40
- Volumetric air and water, and moisture content via API RP40
- Soil classification (grain size and Atterberg Limits) via ASTM D2487
- Total organic carbon (f_{oc}) using the Walkley-Black method

Soil Vapor Sampling

To evaluate whether subsurface contamination presents a potential indoor inhalation risk, soil vapor samples will be collected and analyzed for petroleum hydrocarbon constituents from eight locations. We anticipate collecting a minimum of four samples on or immediately adjacent to the Valley Gas Property and a minimum of four samples on the Groth property. Semi-permanent probes will be installed in three of the eight locations (Figure 1). Golder proposes to conduct the soil vapor assessment by using direct-push probes. We will conduct this work in parallel with the soil sampling (i.e., at the same locations as the soil confirmation samples) and will sample locations in the areas of highest known subsurface contamination as documented by the MIP evaluation. The results will be compared to ESLs derived for using soil-vapor concentrations to assess potential indoor inhalation risk.

Soil gas sampling and vapor analysis will be conducted in accordance with Department of Toxics Substance Control guidance[7]. Site soil lithology as determined by the MIP will be used to determine

[7] Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air, Department of Toxic Substances Control, California Environmental Protection Agency, (Interim Final). February 7, 2005.

appropriate locations and depths for soil gas probes. A minimum sampling depth of 5 feet below ground surface will be utilized to minimize potential sample dilution with atmospheric air.

One-Time Direct Push Sampling

Direct push probe rods with a vapor point holder will be advanced to the target sample depth, then the tool string will be pulled back to expose the vapor inlet. A PRT fitting will be attached to ¼" OD Polyethylene Tubing, lowered down the tool string and threaded into the vapor point holder. The PRT fitting is fitted with an o-ring to prevent infiltration of ambient air. At ground surface a hydrated bentonite seal will be placed around the probe rods and the ground surface to prevent ambient air intrusion from occurring. The tubing will be discarded after each sample. Samples will not be collected for 20 minutes to allow subsurface conditions to equilibrate. After each use, reusable components will be properly decontaminated to prevent cross contamination.

Prior to sampling, sampling points will be purged with a vacuum pump. The flow rate is regulated with a flow meter, a maximum flow rate of 200 cc/min. or lower will be used during sample collection whenever possible. Vacuum readings from the line gauge will be recorded on field data sheets. A leak test will be conducted at every Soil Gas Sampling Probe Installation. A leak detection compound as recommended by the air lab will be placed on all sample line fittings, as a means of quality control for leaks in the sample train prior to collecting a sample.

To ensure stagnant or ambient air is removed from the sampling point that samples are representative of subsurface conditions, a purge volume versus contaminant concentration test will be conducted at the first boring of the day. The purge test location will be selected as near as possible to the contamination source. Purge volumes of one (1), three (3), and seven (7) will be conducted. During purging, oxygen and volatile hydrocarbons will be measured in the field using an Innova LS gas meter. The sample yielding the highest concentration for total VOCs will determine the standard purge volume. If VOC's are not detected, a default of three (3) purge volumes will be used.

After the sampling point has been adequately purged, samples will be collected with a Summa canister. The soil vapor sample will be collected at a flow rate of 100 to 200 milliliters/minute to inhibit partitioning or short circuiting. One duplicate sample will be collected. The Summa canister sample will be properly labeled and transported (non-chilled) to a state-certified laboratory with chain-of-custody documentation.

Soil Vapor Well Installation and Sampling Procedures

The borings that will be used for the soil vapor wells will be pushed to a total depth of five feet bgs using a direct push system. Prior to installing the soil vapor well, the bottom one foot of the boring will be brushed using a steel chimney sweep-style brush to "develop" the exposed borehole wall. All down-hole equipment will be steam cleaned before use and between borings.

The proposed soil vapor wells will be constructed using 1/8-inch diameter Teflon™ tubing inserted to a depth of approximately 4.5 feet bgs. The end of the Teflon tube will be covered with a fine mesh stainless steel screen secured with a stainless steel hose clamp to eliminate sand entering and plugging the tubing. A sand pack consisting of Aquarium sand will be placed from the bottom of the boring to a height of 4 feet bgs (one foot filter pack). Six inches of dry granular bentonite will be place above the well screen. The remaining boring will be backfilled with a pre-hydrated bentonite grout to a height of approximately six inches bgs. Since the soil vapor wells are located in high traffic areas, the top of each vapor well will be protected with a traffic rated well vault. Approximately one to two feet of tubing will extend from the top of the boring in order to make a connection with the sample train. This bit of tubing will be sealed with a vapor-tight, stainless steel ball (or plug) valve incorporated into a quick disconnect coupling with compression fittings, and will be coiled in the well vault until sampling.

After competition of the soil vapor wells, they will be purged, sealed, and left to equilibrate for two weeks before soil gas samples are collected for analysis, as recommended by Department of Toxics Substance Control[8]. The well will be purged at a rate of approximately 100 milliliters per minute (ml/min) using a 100-ml syringe. The purge volume will include three tubing volumes and one gravel pack volume. Based on the assumed well installation details, the purge volumes will be approximately 965 milliliters. During purging, oxygen and volatile hydrocarbons will be measured in the field using a field meter.

Soil Vapor Analyses

The soil vapor samples will be analyzed by modified EPA Method TO-3 for TPHg, and modified EPA Method TO-15 for BTEX, MTBE, and the leak detection compound by Air Toxics of Sacramento (at a reporting limit of less than 10 µg/L). Air Toxics will also analyze the samples for oxygen, carbon dioxide, and methane by modified ASTM D-1946 (the laboratory reporting limits shall be below the concentration of these gases in the atmosphere).

Subtask 2.3 - Bench-scale Treatability Testing

Golder proposes to conduct a bench scale test to evaluate the feasibility of implementing an in situ in situ oxidation treatment process for interim and/or final remediation of the source zone. The bench test will assess the process, and various reagents, to determine if petroleum hydrocarbon and MTBE concentrations in soil and groundwater can be treated to site cleanup goals. The treatability test will also be used to establish the design and operating parameters for a pilot-scale injection test and overall strategy for full-scale implementation.

The bench scale test will include analyses to assess the dose requirements (concentration and quantity) of the various potential reagents (e.g., Fenton's Reagent, persulfate, or ozone) and the natural buffering capacity of the soil. The bench-scale treatability test will utilize soil and groundwater samples collected from the site, to simulate site-specific conditions.

TASK 3 – PREPARATION OF UPDATED SCM VERSION 2.0

Following completion of Task 1 and Task 2 the SCM will be updated. This will include the findings of the specific data gap work performed in Task 1 and the findings of the source zone characterization effort. The goal of the SCM will be to (1) address remaining questions regarding risk to groundwater resources associated with the dissolved phase plume, and (2) provide sufficient characterization and data to design a source zone remediation plan.

[8] *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air, Department of Toxic Substances Control, California Environmental Protection Agency*, (Interim Final). February 7, 2005.

TASK 4 - CORRECTIVE ACTION PLAN

Remediation Objective and Clean-Up Goals

It is our understanding that the City is invoking the Polanco Redevelopment Act to facilitate clean up of the subject property such that the proposed redevelopment can occur in a timely fashion. As part of this process, it is the lead agency's responsibility (ACEH as authorized by RWCQB) to specify clean up goals consistent with the proposed uses of the property and California Health and Safety Code Section 33459.1. The City has requested that clean up goals be provided for this project such that the proposed redevelopment uses identified in the Downtown Specific Plan can be implemented without adverse impact.

MTBE and benzene are considered the primary constituents of concern at this site; TPH-g is also present. Based on investigations to date and monitoring results, achieving acceptable levels of MTBE and benzene in soil and groundwater to protect beneficial uses of groundwater and human health are considered the likely primary objectives of corrective action for the site. It is anticipated that potential health risks associated with vapor from the remaining NAPL in the source zone may drive the remedial activities for this site. Existing data indicate that the dissolved phase plume is shrinking and therefore undergoing natural attenuation. Source zone remediation, if necessary, will enhance and accelerate the natural attenuation process.

Remedial Alternatives Evaluation and Comparison

Remedial action alternatives will be formulated considering (1) the findings of the proposed source zone investigation, (2) the clean-up goals provided by the lead agency, (3) the logistics associated with the site (e.g., traffic, utilities, etc.) and (4) the amount of time available to implement the corrective action.

Based on existing information, and our experience with similar remedial projects, several remedial technologies have been tentatively identified for potential use as corrective action alternatives. Technologies were qualitatively screened, and applicable technologies were used to develop appropriate remedial alternatives. During the screening process, technologies were eliminated from further consideration on the basis of technical implementability. Both in situ and ex situ technologies have been considered.

The following remedial technologies are being considered for further evaluation, however, additional alternatives may also be considered based on the findings of the source zone investigation:

- Monitored natural attenuation (dissolved phase plume)
- Enhanced aerobic bioremediation
- Bioventing
- Dual-phase extraction
- In Situ Chemical Oxidation (ISCO)

The selection of an appropriate corrective action for mitigating MTBE and petroleum hydrocarbons at the site will be based on evaluation of the following criteria: (1) regulatory agency acceptance; (2) reduction of toxicity, mobility, or volume; (3) technical feasibility, (4) schedule and (5) cost.

- **Regulatory Agency Acceptance.** This criterion is used to assess the likelihood of acceptance of the various alternatives by regulatory agencies having jurisdiction over corrective action.

- **Reduction of Toxicity, Mobility, or Volume.** This criterion establishes preference for alternatives that will produce permanent and significant reductions. The evaluation focuses on the amount of chemicals to be destroyed or treated, the irreversibility of the treatment, and the type and quantity of residual petroleum hydrocarbons and MTBE that will remain after treatment.
- **Technical Feasibility.** Technical feasibility refers to the ease of construction given the site constraints, the reliability of the technology, and the ability to monitor the effectiveness of an alternative.
- **Schedule.** The time available for implementation of the remedial alternative is a necessary criterion due to the City schedule for redevelopment.
- **Cost.** This criterion is used to assess capital, and operation and maintenance (O&M) costs on a conceptual level only. Capital costs include direct costs, such as equipment, site development, and relocation expenses. Indirect costs include engineering, permits, and start-up costs. O&M costs include labor, materials, repairs, disposal, administrative fees, and reporting costs.

Based on the evaluation of the corrective action alternatives above, and the requirements of the lead agency, Golder will select a remedial alternative, or combination of alternatives. Depending on the alternative(s) selected, bench-scale and/or pilot-scale testing may be required.

Prior to commencing with site remediation activities, Golder will prepare a work plan for agency and stakeholder review detailing the procedures that will be used to conduct the bench-scale and pilot-scale test programs (if required), and the implementation of the remedial alternative.

PROPOSED SCHEDULE

We intend to complete this phase of work in accordance with the Schedule recently provided by the City. The schedule calls for issuance of a report describing the cleanup investigation by April 25, 2006. This will require obtaining access agreements to work on the Groth Brothers in addition to City approvals for work along South L and South M Street. We are prepared to begin on work on this project immediately upon receiving approval of this workplan by the City and ACEH.

CLOSURE

We look forward to working closely with you to expeditiously move this site into remediation and to facilitate the activities of the Livermore Redevelopment Agency. Please call Kris Johnson or Bill Fowler at (650) 386-3828 if you would like to discuss any aspect of our workplan.

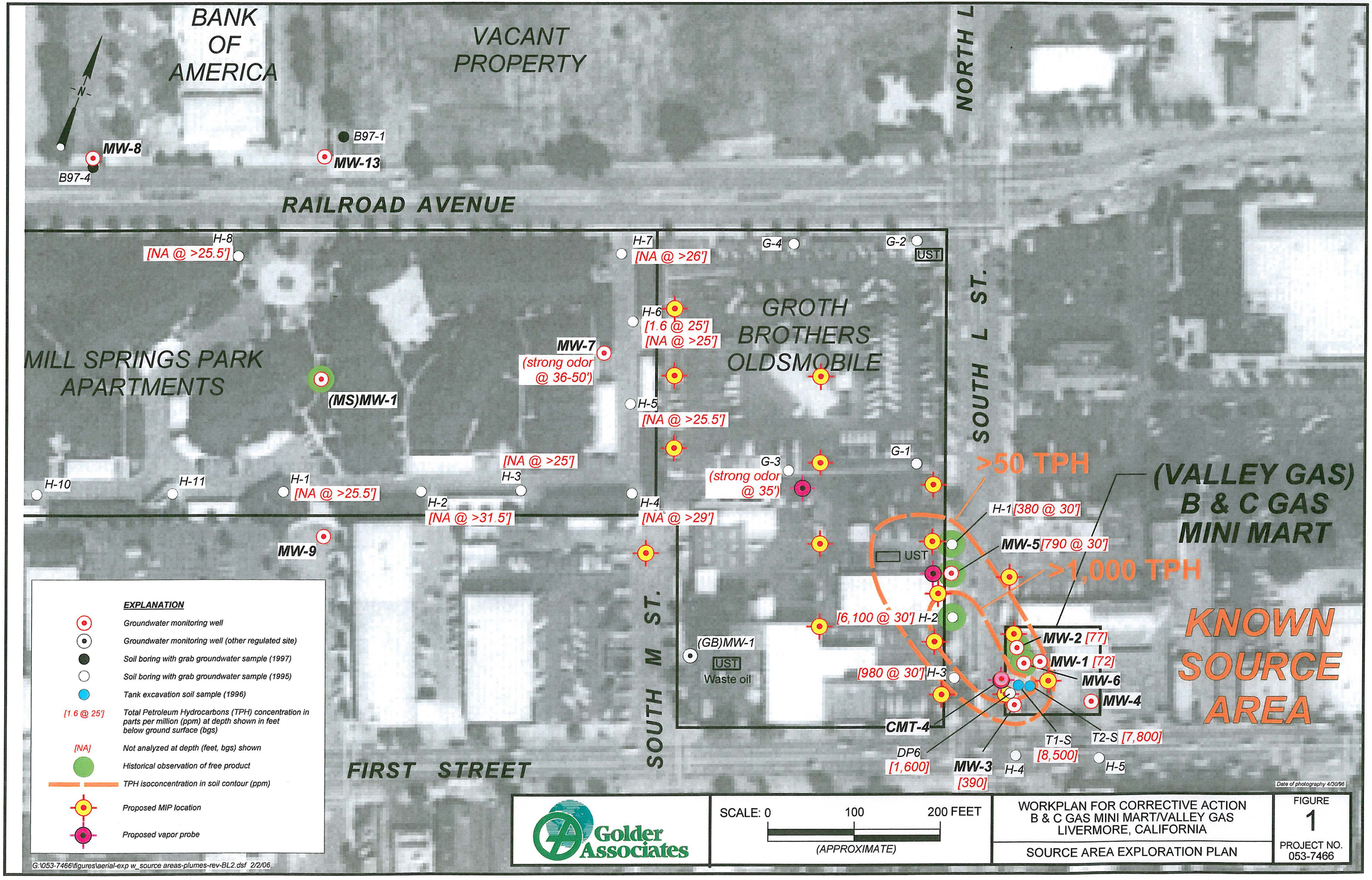
Sincerely,

GOLDER ASSOCIATES INC.

William L. Fowler, C.E.G. 1401
Senior Consultant

Attachments: Figure 1 – Source Area Exploration Plan

Cc: Mr. Balaji Angle (hardcopy)
Mr. Michael Veiluva (PDF)
Mr. Glenn Young (PDF)
Ms. Leah Goldberg (PDF)


BANK OF AMERICA
VACANT PROPERTY
NORTH L
N
MW-8
B97-4
B97-1
MW-13
RAILROAD AVENUE
H-8
[NA @ >25.5']
H-7
[NA @ >26']
G-4
G-2
UST
H-6
[1.6 @ 25']
[NA @ >25']
GROTH BROTHERS OLDSMOBILE
MW-7
(strong odor @ 36-50')
MILL SPRINGS PARK APARTMENTS
(MS)MW-1
H-5
[NA @ >25.5']
SOUTH L ST.
[NA @ >25']
H-3
G-3
(strong odor @ 35')
G-1
>50 TPH
(VALLEY GAS) B & C GAS MINI MART
H-10
H-11
H-1
[NA @ >25.5']
H-2
[NA @ >31.5']
H-4
[NA @ >29']
H-1 [380 @ 30']
MW-5 [790 @ 30']
UST
>1,000 TPH
MW-9
[6,100 @ 30']
H-2
KNOWN SOURCE AREA
MW-2 [77]
MW-1 [72]
MW-6
MW-4
(GB)MW-1
UST
Waste oil
[980 @ 30']
H-3
SOUTH M ST.
CMT-4
T1-S
[8,500]
T2-S [7,800]
DP6
[1,600]
MW-3
[390]
H-4
H-5
FIRST STREET
Date of photography 4/30/96
EXPLANATION
Groundwater monitoring well
Groundwater monitoring well (other regulated site)
Soil boring with grab groundwater sample (1997)
Soil boring with grab groundwater sample (1995)
Tank excavation soil sample (1996)
[1.6 @ 25'] Total Petroleum Hydrocarbons (TPH) concentration in parts per million (ppm) at depth shown in feet below ground surface (bgs)
[NA] Not analyzed at depth (feet, bgs) shown
Historical observation of free product
TPH isoconcentration in soil contour (ppm)
Proposed MIP location
Proposed vapor probe
G:\053-7466\figures\aerial-exp w_source areas-plumes-rev-BL2.dsf 2/2/06
Golder Associates
SCALE: 0 100 200 FEET
(APPROXIMATE)
WORKPLAN FOR CORRECTIVE ACTION
B & C GAS MINI MART/VALLEY GAS
LIVERMORE, CALIFORNIA
SOURCE AREA EXPLORATION PLAN
FIGURE
1
PROJECT NO.
053-7466