Workplan
Soil Vapor Survey and
Tier 3 Risk Assessment
Former Clarifier Sump
106-110 Hegenberger Road
Oakland, California

BSK & ASSOCIATES
Geotechnical Consultants, Inc.

BSK JOB NO. 04-40-0184
October 1, 1998

BSK

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October 1, 1998

BSK JOB NO. 04-40-0184

Mr. Barney M. Chan
Hazardous Materials Specialist
Alameda County Health Care Services
Environmental Protection
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

Subject: Workplan
Soil Vapor Survey and
Tier 3 Risk Assessment
Former Clarifier Sump
106-110 Hegenberger Road
Oakland, California
STID No. 4240

Dear Mr. Chan:

BSK & Associates, Inc. (BSK) is pleased to present this Workplan for a Soil Vapor Survey and Tier 3 Risk Assessment for the Former Clarifier Sump located at 106-110 Hegenberger Road in Oakland, California. This Workplan is presented in response to a request in a letter submitted by you to Deborah David (property owner), dated September 2, 1998.

The purpose of the proposed work is to collect and analyze soil petroleum hydrocarbon vapor samples at three locations in the vicinity of the former clarifier sump. The concentrations of soil vapors in the subsurface will be utilized to determine the potential risks resulting from the inhalation of vapors via the indoor air and outdoor air exposure routes. The risk assessment will be based on a comparison to Risk Based Screening Levels (RBSLs) which have recently been developed by the Regional Water Quality Control Board (RWQCB).

If you have questions concerning the contents of the Workplan, please do not hesitate to contact us.

Respectfully submitted,
BSK & Associates

Martin B. Cline, C.E.G.
Project Geologist
C.E.G. No. 2084

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Distribution: Barney Chan, (2 copies)
Deborah David, (2 copies)

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1.0 PURPOSE AND SCOPE

The purpose of the soil vapor survey is to provide an estimation of soil vapor concentrations of chemicals of concern resulting from on-site residual petroleum hydrocarbon contamination which will be utilized to determine the potential risks resulting from the inhalation of vapors via the indoor air and outdoor air exposure routes. The risk assessment will be based on an excess cancer risk target level of 1×10^{-5} and a hazard quotient of 1.

2.0 INTRODUCTION

BSK & Associates has prepared this Work Plan for a soil vapor survey. During site activities, BSK & Associates would be the prime drilling contractor (C-57 #490942).

2.1 Permits - Prior to commencement of exploration and sampling activities, a drilling permit will be submitted to the County of Alameda Public Works Agency.

2.2 Underground Utilities - Underground Service Alert (USA) will be notified 48 hours before any subsurface work will begin. If available, as-built underground utility plans will be reviewed for the location of underground utilities.

Site Safety Plan - All work for the supplemental subsurface characterization will be performed under the guidelines presented in the Health and Safety Plan attached to this Work Plan.

3.0 BACKGROUND

The site is located on Hegenberger Road near the intersection with Pardee Drive, in a commercial/industrial area between Oakland International Airport and Interstate 880 (see Figure 1). The site was previously occupied by a gasoline service station and carwash facility. In 1990, three 10,000-gallon gasoline underground storage tanks and one 2-stage clarifier sump were removed, and soil samples were collected from the excavation sidewalls and associated piping trenches. Groundwater was not encountered to depths of 10 feet below ground surface (BGS) (West Coast Environmental, 1991), and the soils encountered consisted of silts and clays with minor sands (Harding Lawson Associates, 1990). Based on the petroleum hydrocarbon and soluble lead concentrations detected, ACEHS requested additional investigation of the site.

In April 1991, additional soil samples were collected near the former clarifier sump (see Figure 2). West Coast Environmental (WCE) indicated that the clarifier sump excavation remained open during the rainy season, which caused local water mounding. The depth to groundwater was approximately 0.5 feet BGS near the clarifier sump excavation, and 5 feet BGS at distances of 15 feet from the clarifier sump excavation. Soil analytical results for samples collected southeast (HA-4 and HA-7) of the clarifier sump contained relatively high total petroleum hydrocarbons as gasoline (TPHg) and benzene, toluene, ethylbenzene, and total xylenes (BTEX) concentrations, and low metals concentrations. Soil sample HA-6-5, collected between the former clarifier sump and the offsite building did not contain detectable concentrations of TPHg or BTEX constituents, and contained background concentrations of total lead.

In 1994, four groundwater monitoring wells (MW-1 to MW-4) were installed and five soil borings (B-3, 4, 5, 8, and MW-4A) were sampled. Soils typically consisted of up to 3 feet of fill material underlain by 13 to 15 feet of silts and clays, which were in turn underlain by silty sands and sands. A one foot thick silty or clayey sand was locally encountered at approximately 10 feet BGS within the silt/clay interval. Groundwater was typically encountered at depths of over 17 feet BGS. Perched groundwater was locally encountered at approximately 5 feet BGS within backfill material at borings MW-4A and MW-4B. Except for the trace BTEX and/or TPHg concentrations detected in one shallow soil sample (S-6-B3), and one sample of perched groundwater (W-MW-4), soil and groundwater samples did not contain detectable concentrations of petroleum hydrocarbons or soluble lead, and contained background concentrations of selected metals (Dugan & Associates, 1994). Based on these results, ACEHS, in a January 19, 1996 correspondence, indicated that the site qualified as a "low risk groundwater case", except for the former clarifier sump area.

In the *Former Clarifier Sump Health Risk Assessment Report* (Risk Assessment) dated November 21, 1996, BSK presented the findings of a Tier 2 risk assessment for the former clarifier sump area based on exposure to petroleum hydrocarbon vapors from soil via outdoor air inhalation under two scenarios for impacted soil thickness. The results indicated that under the more conservative scenario, which assumed 14 feet of impacted soil (4.5 to 18.5 feet BGS), adult commercial/industrial exposure via volatilization of the maximum concentrations of benzene, ethylbenzene, naphthalene, toluene, and xylenes detected at the site to outdoor air did not represent a human health risk above 1×10^{-5} excess cancer risk or 1.0 chronic hazard quotient. The Risk Assessment also indicated that the maximum concentration of total lead detected at the site did not exceed Region 9 Preliminary Remediation Goals or result in blood lead levels above 10 micrograms per deciliter, the concentration of concern, based on the California Environmental Protection Agency - Department of Toxic Substances Control Lead Risk Assessment Spreadsheet. In correspondence dated February 10, 1997, ACEHS requested (1) evaluation of the indoor air exposure pathway to address potential future development at the site, (2) clarification of the depth to water at the site, and (3) modification of the porosity value used in the risk calculations.

On October 30, 1997, BSK & Associates submitted a Preliminary Tier 2 Indoor Air Evaluation Supplemental Investigation and Risk Assessment Report. Based on the concentrations of benzene in the soil samples collected from two additional borings at depths of 5 feet below the ground surface, the risk from volatilization to indoor air pathway exceeded a health risk of 1.0×10^{-5} excess cancer

risk.

The report presented the following recommendations as potential options:

Option 1 — Conduct soil vapor flux measurements at the site which would provide an estimation of the actual rate of benzene migration through the subsurface soils to air within the atmosphere mixing zone. Revaluate the potential risk using a Tier 3 assessment.

Option 2 — Remediate the subsurface soils such that the benzene levels are below the 0.28 mg/kg SSTL.

Option 3 — Establish a deed restriction such that buildings would be excluded from the area of the former clarifier sump or require special construction techniques which would prevent vapor intrusion into the buildings.

4.0 SOIL VAPOR SAMPLING METHODOLOGY

A BSK & Associates engineer or geologist under the direct supervision of a Registered Civil Engineer or Geologist will be present during soil vapor sampling. Refer to Figure 2, Site Map for the location of the proposed soil vapor sampling points. Two of the sampling points will be located within three feet of the adjacent building located at 100 Hegenberger. The third sampling point will be located within three feet of the location of the soil boring B-102. Soil vapor samples will be collected at two sampling depths, 3 feet and 6 feet below the ground surface, from each sampling point.

The soil vapor samples will be collected at depths of 3 feet and 6 feet below the ground surface using the following method:

- The soil vapor sampling probe will be driven using a rotary hammer drill to the desired sampling depths.

- The sampling probe will be driven to a depth of 39 inches and then retracted to a depth of 36 inches. This will expose the sampling port of the probe at an approximate depth of 3 feet below the ground surface.

- The sampling probe will then be purged of three probe volumes by pumping with a vacuum pump. Soil vapors will be collected in laboratory supplied Summa Canisters. The flow of vapors into the canisters will be controlled by a flow controller at a rate of six liters per hour (100 milliliters per minute).

- Subsequent to the collection of the sample at a depth of 3 feet, the probe will be driven to a depth of 75 inches and then retracted to a depth of 72 inches. This will expose the sampling port of the probe at an approximate depth of 6 feet below the ground surface. Soil vapor samples will be collected using the above mentioned method.

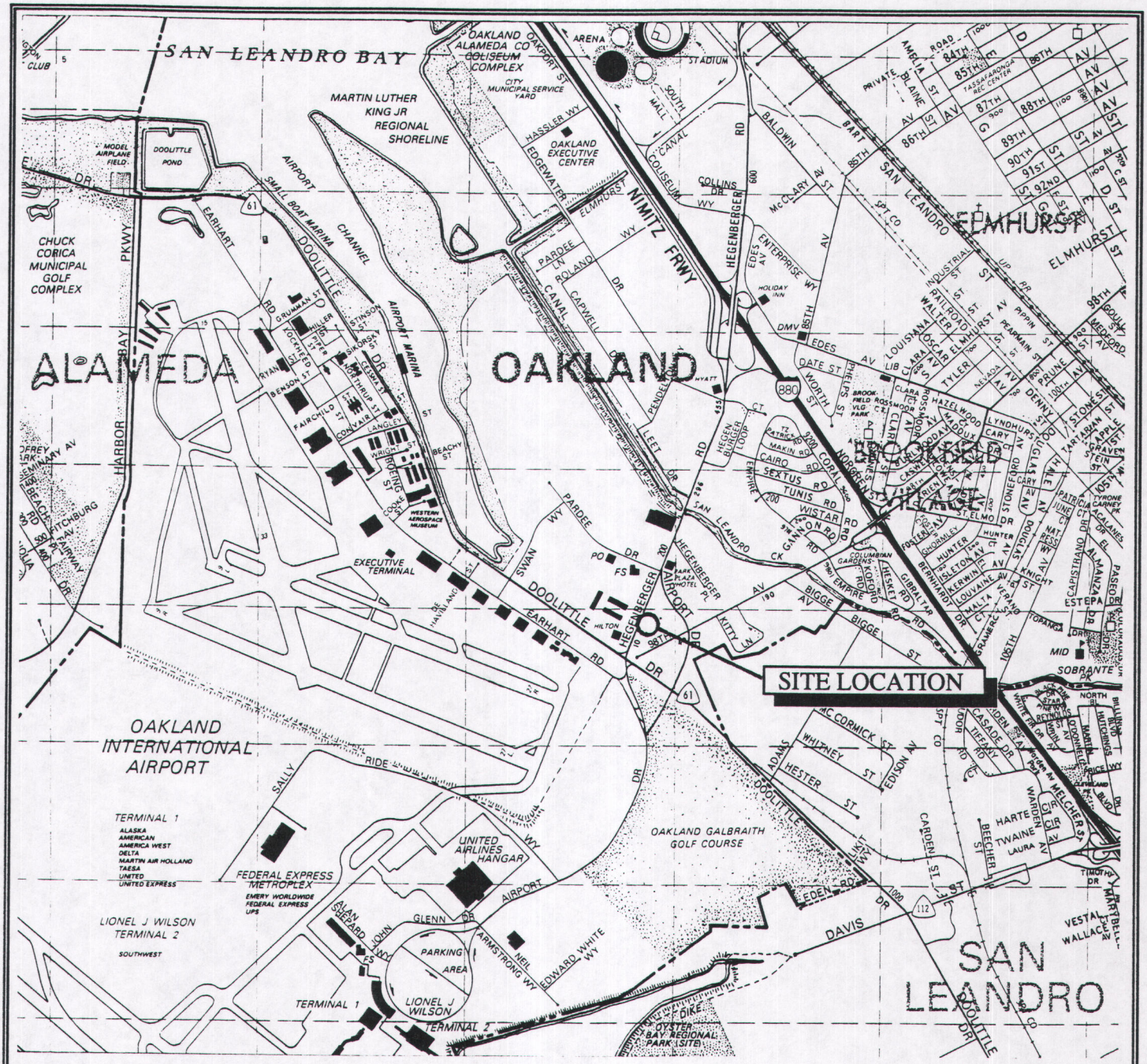
- A total of 6 soil vapor samples will be submitted to the analytical laboratory using chain-of-custody documentation. The soil vapor samples will be analyzed for benzene, toluene, ethyl-benzene and xylenes using method TO14.

- Subsequent to sampling the probe holes will be backfilled with neat cement.

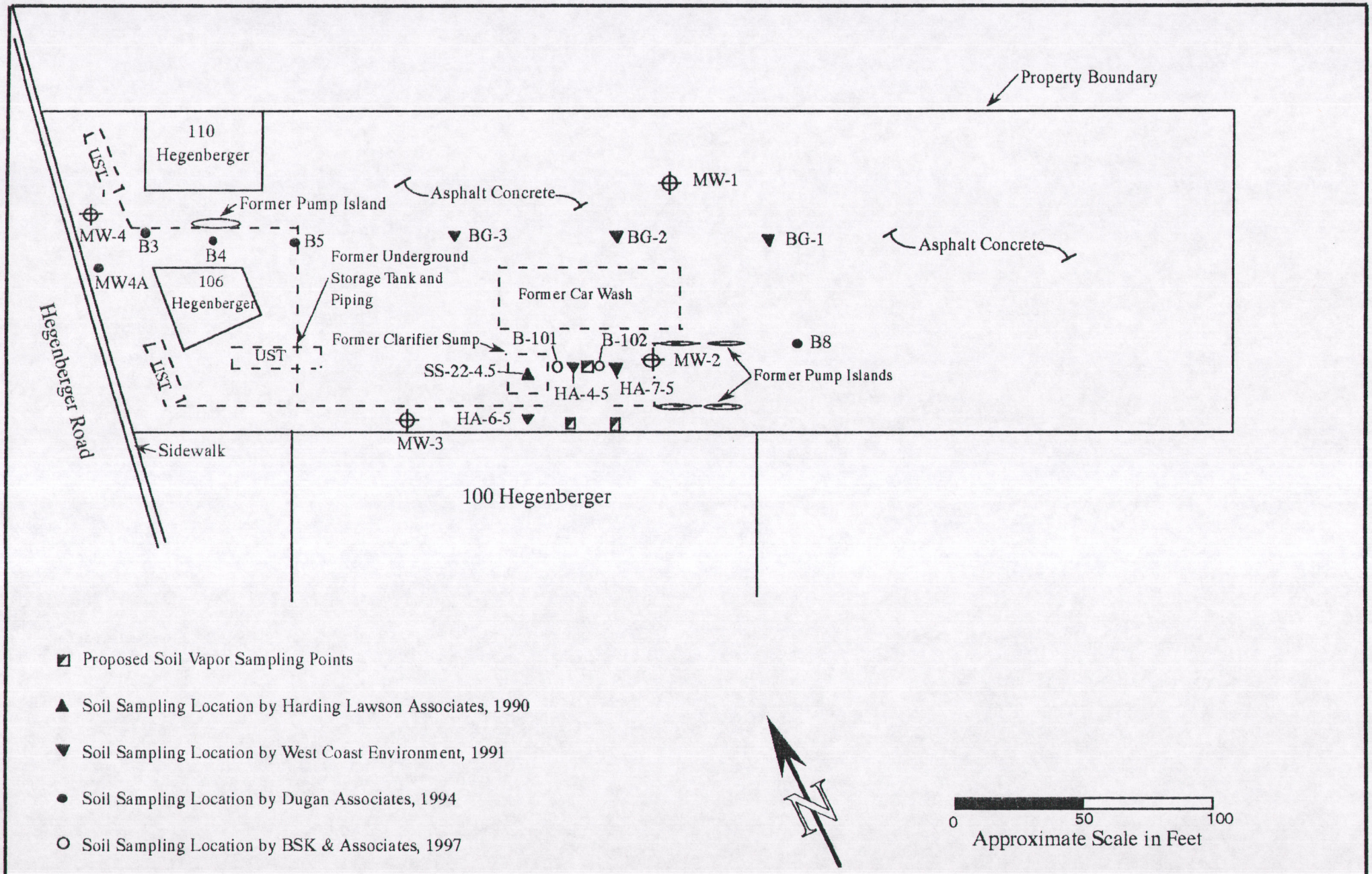
5.0 TIER 3 RISK ASSESSMENT

The soil vapor concentrations for chemicals of concern will be utilized in the preparation of a Tier 3 health risk assessment. The Tier 3 health risk assessment will be based on commercial/industrial inhalation exposures with target levels of less than 1×10^{-5} for carcinogens and chronic hazard quotient of less than 1.0 for noncarcinogens. In order to reflect State of California cancer slope criteria for benzene, a cancer slope factor (SFo) of 0.10 /mg/kg-d will be utilized in the model. Cumulative risks for the COCs will be determined for the exposure pathways of vapor intrusion into commercial buildings and vapor exposure to outdoor air.

Following completion of the Tier 3 health risk assessment a report will be submitted. The report will contain, at a minimum, a description of field procedures, soil vapor collection logs, site plan, tables summarizing the soil vapor sample analytical results, copies of the laboratory analytical reports and chain-of-custody documentation, and the methods and results of the health risk assessment.



David Property 106/110 Hegenberger Road Oakland, California	Job No. 04-40-0184 VICINITY MAP FIGURE 1	BSK & ASSOCIATES



After Dugan Associates 1994

David Property 106/110 Hegenberger Road Oakland, California	Job No. 04-20-0184 SITE PLAN FIGURE: 2	BSK & ASSOCIATES

APPENDIX A
HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

1.0 ORGANIZATIONAL STRUCTURE

1.1 Client Supervisor - Deborah David

1.2 Project Manager -Alex Y. Eskandari

The Project Manager (PM) has overall responsibility for safe conduct of field work, including full implementation of this operating procedure by project staff assisting with field work. The Contractor will comply with regulations, including OSHA 29 CFR 1910.134 (Respiratory Protection) and 29 CFR 1910.120 (Hazardous Waste Operations).

The PM shall assign a Site Safety Officer (SSO), who may be the Site Supervisor, to attend to day-to-day health and safety matters in the field. The SSO/Site Supervisor must be on-site whenever work by employees of the Contractor (BSK) is being performed at the site. The PM, SSO or the Contractor's employees are authorized to suspend work when, in their judgement, working conditions become too hazardous. The PM or SSO may remove from the site any employee whose conduct endangers the health and safety of the employee or of others.

In addition, the PM, SSO, or Site Supervisor has primary responsibility for:

- Assuring that personnel are aware of known site conditions, components of this plan, and are familiar with planned procedures for dealing with emergencies.
- Monitoring the safety performance of site personnel to ensure that required work practices are employed, and correcting work practices that may result in injury or potential exposure to hazardous substances.
- Preparing accident/incident reports.

The Contractor's Project Manager, Site Safety Officer and/or Site Supervisor shall have successfully completed the OSHA 40-hour safety training, plus requisite annual 8-hour recertification training.

2.0 SAFETY MEETINGS

Daily Tailgate Meetings - "Tailgate" safety meetings shall be held daily prior to work start-up to present and review health and safety concerns associated with the project.

3.0 EMERGENCY RESPONSE

Initial Response - All emergencies shall be reported by dialing 911 on a mobile phone to be maintained on site at all times. The nearest Hospital is the San Leandro Hospital located at 13855 East 14th Street, San Leandro.

4.0 POTENTIAL CHEMICAL HAZARDS

Chemicals which have been detected at the site from previous investigations and present a potential hazard to personnel are listed in Table 1. The primary route of entry for the chemicals which have high vapor pressures would be inhalation.

TABLE 1

Compound Name	Vapor Pressure (mm Hg)	Threshold Limiting Value (ppm)	Time Weighted Average (ppm)	Short-Term Exposure Limits (ppm)	IDLH (ppm)	Other Hazards
Benzene	75	Ca	0.1	1.0	Ca	
Toluene	20	100	100	200	2000	
Ethylbenzene	10	100	100	125	2000	
Xylene	9	100	100	200	1000	
Gasoline	--	300	300	500	--	LEL=14,000
Portland Cement	NA	10*	10*	NA	NA	Caustic When Wet

LEL - Lower Explosion Limit
Ca - Carcinogen
NA - Not Available
* - mg/M^3

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5.0 MONITORING

5.1 Photo Ionization Detector (PID) - A PID utilizing a 10.0 ev lamp can detect the following compounds of concern:

Benzene
Xylene
Toluene
Ehtylbenzene

The PID shall be calibrated daily to a 100 ppm iso-butylene standard, and zeroed in the field to ambient working conditions.

5.2 Combustible Gas and Oxygen Indicator (LEL-O_2) - A detector capable of detecting lower explosion limits from 0 to 100% and oxygen levels 0 to 25%. The LEL-O_2 meter shall be calibrated according to the manufacturers specifications prior to use.

5.3 Odors - Unusual odor or other chemical warning encountered during work activities would result in cessation of work.

The worker breathing zone shall be monitored during field activities which would cause a potential exposure to hazardous chemicals. Trenches and excavations shall be monitored for inhalation and explosion hazards.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

If the compounds described in Section 5.0 are encountered during the site activities, the most likely entry route for contaminants to workers is inhalation and skin contact.

6.1 Perceived Hazards

6.1.a. Inhalation - Dust, fumes, mist and vapors may be inhaled during remedial activities. Volatilized organic compounds may be expected at the site, and can be monitored by a PID or LEL-O_2 meter.

6.1.b. Skin Contact - Contact with the skin by splashing or sloshing of excavated effluent, possibly containing hazardous compounds, is a perceived hazard. Eye contact with fluids may also be anticipated.

6.2 Personal Protective Equipment

6.2.a. Protective Materials - The following protective materials are

recommended for gloves and boots at the site: Nitrile, Vinyl or PVC.

6.2.b. Uncoated Tyveks are recommended.

6.2.c. Eye Protection - To prevent contact with the eyes, encapsulating goggles shall be worn around fluids. Workers not handling fluids shall wear protective eyewear to guard against flying debris. Eyewear must conform to ANSI Standard Z87.1.

6.2.d. Respirator Selection - If required, respirators shall be full or ½-face, and shown to have been fit-tested to the user. Respirator cartridges available for use at the site shall be suitable for organic vapors, dust, mist and fumes.

6.3 Working PPE Levels - Workers within the work area control zones should be dressed in Level D Protective apparel, which includes, but is not limited to:

Boots
Safety Glasses/Goggles
Hard Hat
Gloves
Hearing Protection

For emergency measures, respirators with the appropriate cartridge and Tyveks shall also be available.

6.4 PPE Revision - Encounter with and identification of a hazardous compound or compounds would necessitate re-evaluation of PPE and safety procedures at the work site.

7.0 PHYSICAL HAZARDS

Physical hazards which can be expected at the project site include equipment failure, slip, trip and fall, flammable vapors and weather. Equipment used at the site shall be regularly and properly maintained, kept clean and stored in its proper location or position when not in immediate use. Equipment utilized in areas where flammable vapors may be present shall be properly bonded and/or grounded.

7.1 Weather - Inclement weather such as heat or rain can result in accident or injury.

7.1.a. Heat: - Appropriate measures shall be taken to monitor personnel for signs of heat stress.

7.1.b. Rain - During rain, extra caution shall be maintained for slip and overhead hazards, as well as containment of runoff from waste. If a thunderstorm occurs, work shall cease, any equipment with a mast shall be lowered, if safe to do so, and cover taken away from the work vehicle.

8.0 SITE CONTROL

Access to hazardous and potentially hazardous areas of spill sites must be controlled to reduce the probability of occurrence of physical injury and chemical exposure of field personnel, visitors and the public. A hazardous or potentially hazardous area includes areas where (1) field personnel are required to wear respirators, (2) borings are being drilled with powered augers, or (3) excavating operations with heavy equipment are being performed.

Entry to hazardous areas would be limited to individuals who must work in those areas, and those qualified to do so. Unofficial visitors must not be permitted to enter hazardous areas while work is in progress in those areas. Official visitors should be discouraged from entering hazardous areas, but may be allowed to enter only if they agree to abide by the provisions of this document, have the requisite OSHA certifications, follow orders issued by the Site Safety Officer, and are informed of the potential dangers that could be encountered in the areas.

8.1 Hot Zone - Drill or Excavation Operation Zone

8.1.a. Authorized Personnel - Authorized personnel shall be those persons directly involved in drilling, equipment operating, logging, monitoring and primary support activities.

8.1.b. Personal Protection - A minimum of Level D personnel protective equipment will be maintained, which includes a minimum of a hard-hat, work shoes, ear protection, and gloves.

8.1.c. Zone Limits - Hot zone limits extend to 15 feet from the excavation equipment or drill rig.

8.2 Warm Zone - Transitional area, decontamination area. Fully encircles Hot Zone.

8.2.a. Authorized Personnel - Persons authorized to enter this zone include secondary drilling/work support, decontamination personnel and supervisory personnel with requisite health and safety-training.

8.2.b. Personal Protection - Persons entering the Warm Zone shall

wear at a minimum a hard-hat. Persons working within the warm zone shall dress in Personal Protective Equipment (PPE) similar to that used in the Hot Zone at that time.

8.2.c. Zone Limits - Warm Zone limits extend 10 feet from vehicles and equipment in use at the site, other than the drill rig. The zone would extend to 25 feet from the drill rig.

8.3 Control Zone Delineation - Control zones shall be clearly delineated by barricades, traffic cones, barricade tape or other demarcation or as required.

9.0 DECONTAMINATION

Decontamination of employees and equipment shall occur before exit from site control zones. PPE and equipment that may be reused will be washed with detergent and water, and thoroughly rinsed with potable water. Articles to be changed daily, such as tyvek coveralls, inner gloves, foam ear inserts and respirator cartridges will be discarded to a plastic bag, tied, and placed in a DOT drum reserved for such purpose. Removal of PPE will be performed in a manner such that inner protective gloves will be the last item removed, and skin and clothing will not contact soiled gear. Wash and rinse bins and brushes will be supplied for decontamination. Decontamination will be performed in the Warm Control Zone. Rinsate and wash water will be contained, and stored in DOT-approved drums reserved for that use.

If used, respirators will be washed separately, stored and sealed for next use.

10.0 SPILL CONTAINMENT

Containment of leakage or spill from a storage container at the site will be exercised promptly, with materials designed for that purpose, such as dikes, booms, pads and plug material. If a container has leaked, it will be properly disposed, and the contents transferred to another suitable container.

11.0 ILLUMINATION

No drilling activities are anticipated ½-hour after sunset and ½-hour before sunrise.

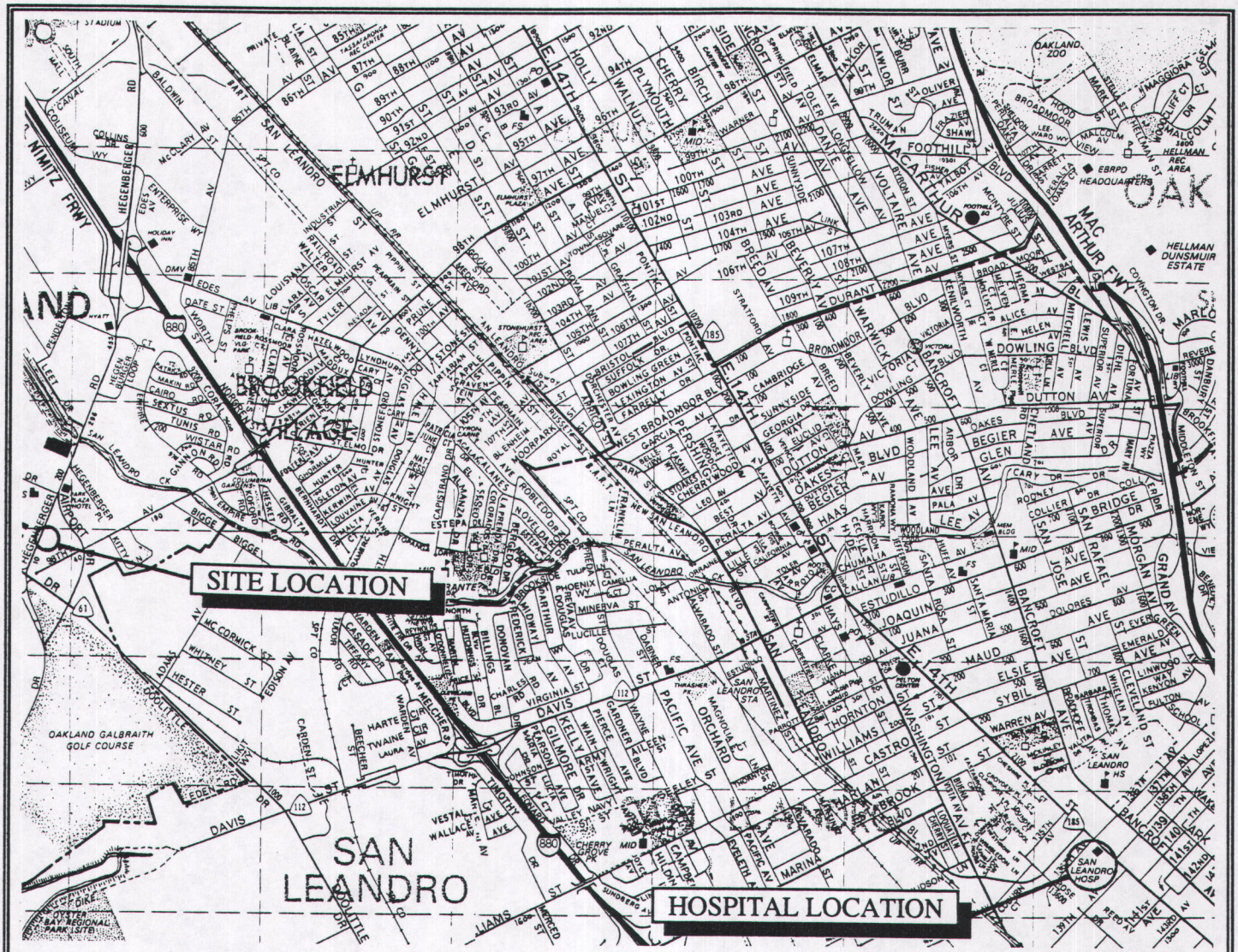
12.0 CONFINED SPACE ENTRY

Confined space entry is not anticipated.

13.0 SITE EXCAVATION

Excavations and sampling holes shall be securely covered to prevent accidental entry, or

deliberate entry without tools. Prior to conducting any digging or boring operations, Underground Service Alert (USA) shall be notified at least 48 hours before subsurface activities begin.



David Property 106/110 Hegenberger Road Oakland, California	Job No. 04-40-0184 HOSPITAL ROUTE MAP FIGURE A-1	BSK & ASSOCIATES