RECEIVED

4:19 pm, Apr 15, 2010

Alameda County
Environmental Health

Atlantic Richfield Company

Chuck Carmel
Environmental Business Manager

PO Box 1257
San Ramon, CA 94583
Phone: (925) 275-3803
Fax: (925) 275-3815
E-Mail: charles.carmel@bp.com

15 April 2010

Re: Revised Vapor Intrusion Assessment Work Plan
Atlantic Richfield Company Station #2112
1260 Park Street, Alameda, California
ACEH Case #RO0000044

"I declare, that to the best of my knowledge at the present time, that the information and/or recommendations contained in the attached document are true and correct.

Submitted by,

Chuck Carmel
Environmental Business Manager

Attachment

REVISED
VAPOR INTRUSION ASSESSMENT WORK PLAN
Atlantic Richfield Company Station #2112
1260 Park Street, Alameda, California
ACEH Case No. RO0000044

Prepared for

Mr. Chuck Carmel
Environmental Business Manager
Atlantic Richfield Company
P.O. Box 1257
San Ramon, California 94583

Prepared by

BROADBENT & ASSOCIATES, INC.
ENGINEERING, WATER RESOURCES & ENVIRONMENTAL

1324 Mangrove Avenue, Suite 212
Chico, California 95926
(530) 566-1400
www.broadbentinc.com

15 April 2010

Project No. 06-88-616

Broadbent & Associates, Inc.
1324 Mangrove Ave., Suite 212
Chico, CA 95926
Voice (530) 566-1400
Fax (530) 566-1401

BROADBENT & ASSOCIATES, INC
ENVIRONMENTAL, WATER RESOURCES & ENGINEERING

15 April 2010

Project No. 06-88-616

Atlantic Richfield Company
P.O. Box 1257
San Ramon, CA 94583
Submitted via ENFOS

Attn.: Mr. Chuck Carmel

Re: Revised Vapor Intrusion Assessment Work Plan, Atlantic Richfield Company
Station #2112 1260 Park Street, Alameda, California; ACEH Case #RO0000044

Dear Mr. Carmel:

Broadbent & Associates, Inc. (BAI) is pleased to present this *Revised Vapor Intrusion Assessment Work Plan* for Atlantic Richfield Company (a BP affiliated company) Station #2112 (herein referred to as Station #2112) located at 1260 Park Street, Alameda, California (Site). BAI prepared this revised work plan in response to the 10 February 2010 letter request from Mr. Paresh Khatri of Alameda County Environmental Health Services (ACEH). This work plan includes the proposed scope of work for vapor intrusion assessment with a proposed completion schedule.

Should you have questions or require additional information, please do not hesitate to contact me at (530) 566-1400.

Sincerely,

BROADBENT & ASSOCIATES, INC.

Thomas A. Venus, P.E.
Senior Engineer

Enclosures

cc: Paresh Khatri, Alameda County Environmental Health (Submitted via ACEH ftp site)
Electronic copy uploaded to GeoTracker

REVISED VAPOR INTRUSION ASSESSMENT WORK PLAN
Atlantic Richfield Company Station #2112
1260 Park Street, Alameda, California
ACEH Fuel Leak Case #RO0000044

TABLE OF CONTENTS

DRAWINGS

APPENDICES

REVISED VAPOR INTRUSION ASSESSMENT WORK PLAN
Atlantic Richfield Company Station #2112
1260 Park Street, Alameda, California
ACEH Fuel Leak Case #RO0000044

1.0 INTRODUCTION

Broadbent & Associates, Inc. (BAI) has prepared this *Revised Vapor Intrusion Assessment Work Plan* for the Atlantic Richfield Company Station #2112, located at 1260 Park Street, Alameda, California (Site). The work plan dated 26 October 2009 was prepared in response to the 3 September 2009 letter request from Mr. Paresh Khatri of Alameda County Environmental Health Services (ACEH). In his letter dated 10 February 2010, a copy of which is provided within Appendix A, Mr. Khatri expressed concerns regarding the proposed depths of the soil vapor samples are requested a work plan addendum. In response, BAI has prepared this *Revised Vapor Intrusion Assessment Work Plan.* This work plan includes a revised scope of work for vapor intrusion assessment and a completion schedule.

2.0 SITE BACKGROUND

The Site is an active ARCO-branded gasoline retail outlet located on the southern corner of Park Street and Encinal Avenue in Alameda, California (Drawing 1 and Drawing 2). The land use in the immediate vicinity of the Site is mixed commercial and residential. The Site consists of a service station building and four gasoline underground storage tanks (USTs) with associated piping and dispensers. The Site is covered with asphalt or concrete surfacing except for planters along the northwest, northeast, and southeast property boundaries containing mature trees.

On 15 May 1987, a waste oil tank was removed from the Site by Crosby & Overton Environmental. Laboratory analytical tests performed on soil samples (9310-1, 9310-2, and 9347-1) collected beneath the waste oil tank indicated the presence of diesel and motor oil contamination. Contaminated soil from the tank excavation was removed and transported offsite for disposal. The tank pit was reportedly backfilled with clean sand. A summary of the analytical results and site map depicting the previous location of the waste oil tank is provided in Appendix B.

On 22 and 29 January 1990, a soil investigation was conducted by Applied GeoSystems Inc. to assess soil conditions prior to the removal and replacement of the existing gasoline USTs. The investigation included the advancement of five soil borings (B1-B5) in the vicinity of the then-existing gasoline USTs, and one boring (B6) in the location of the new UST complex. Total boring depths ranged from 11.5 to 13 feet below ground surface (ft bgs) with the exception of boring B1, which was advanced to a total depth of 25 ft bgs. Ground water was encountered at approximately 12 ft bgs. Petroleum hydrocarbon contaminants were detected above laboratory reporting limits in samples collected from borings B1 through B5. Hydrocarbon constituents were not detected above laboratory reporting limits in the samples collected from boring B6. A summary of analytical results and a map depicting boring locations are provided in Appendix B.

The removal and replacement of the gasoline USTs and product piping took place at the Site between 27 July and 30 September 1990. During excavation activities, soil samples were collected by GeoStrategies, Inc. from the sidewalls and bottom of each tank complex excavation, the new UST complex location, and within the product line trenches. The existing UST complex

was excavated to approximately 13 ft bgs and soil samples (AX1-1 through AX1-11) were collected between six and 12 ft bgs. Product line trenches were excavated to a depth of three ft bgs except in locations of observed contamination in which the trenches were extended to a depth of 9.5 ft bgs. Soil samples AT-1 through AT-33 were collected at an approximate ratio of one sample per 20 lineal feet of trench during excavation of the product lines. Approximately 1,950 cubic yards of soil was removed from the Site and transported to a licensed offsite facility for disposal. Historic soil sampling locations and a summary of laboratory analytical results are presented in Appendix B.

Between September 1991 and June 1992, four on-site (A-1 through A-4) and one off-site (A-5) ground-water monitoring wells, two ground-water recovery wells (AR-1 and AR-2), and seven vapor extraction wells (AV-1 through AV-7) were installed at the Site by GeoStrategies, Inc. These wells were installed to further evaluate the vertical and horizontal extent of petroleum hydrocarbon contamination associated with the Site and provide extraction wells for use with interim soil vapor and ground-water remediation systems. Well locations are presented in Drawing 2.

A vapor extraction pilot test was conducted in October 1991. Step-drawdown and constant rate aquifer pumping tests were performed in December 1991.

During the Fourth Quarter of 1992, soil vapor and ground-water extraction systems were installed at the Site. The ground-water remedial system consisted of the two existing recovery wells (AR-1 and AR-2) and an on-site treatment facility. Each well contained a pneumatic total fluids pump, which transferred extracted ground water to the on-site treatment facility consisting of a surge tank, particulate filter, and two 180-pound activated carbon vessels connected in series. The ground-water extraction system reportedly became operational on 5 January 1993. The soil vapor extraction system consisted of eight vapor extraction wells (AV-1 through AV-7 and A-1). Extracted vapors were routed through a particulate filter and three 2,000-pound carbon vessels connected in series. The vapor extraction system reportedly began operation on 7 January 1993.

In August 1995, both the ground-water and soil vapor extraction systems were shutdown due to low influent concentrations of Total Purgeable Petroleum Hydrocarbons as gasoline (TPPHg). The systems were decommissioned and removed from the Site in 1997. Ground-water and soil vapor extraction system performance data are included in Appendix C.

A Case Closure Summary was prepared and submitted by Pacific Environmental Group, Inc. on 20 November 1996. This report stated that “remediation and site assessment are complete.” The case was not closed by ACEH.

On 31 July 2001, Delta Environmental Consultants, Inc. conducted soil sampling during product line and dispenser removal and upgrade activities. Soil samples were collected beneath the dispensers following their removal (PL-1 through PL-4) and along the product line trenches at depths ranging from 3.6 to 4.8 ft bgs (DP-1 through DP-4). At the request of ACEH, UST soil samples were collected on the east side of the current UST pit at approximately three ft bgs (UST-1 and UST-2). Petroleum hydrocarbon concentrations were detected above laboratory reporting limits in samples PL-3, DP-3, UST-1, and UST-2. Following receipt of the analytical

results, approximately seven cubic yards of soil was over-excavated in the area of sample PL-3. A confirmation soil sample was collected from the base of the over-excavation at approximately nine ft bgs. No soil was excavated immediately adjacent to the locations of the UST samples due to the proximity of the USTs. Approximately 9.8 cubic yards of soil was removed from the Site during product line and dispenser upgrades and transported to an appropriate facility for disposal. Soil sampling locations and a summary of analytical results are provided in Appendix B.

Periodic ground-water monitoring and sampling of Site wells began in October 1991. Currently, ground-water monitoring and sampling is not conducted on-site. As requested by ACEH in their letter dated 20 June 2006, wells associated with the Site were redeveloped and sampled during the Third Quarter 2006. Detected concentrations during this sampling event were consistent with results previously reported prior to and following the case closure request. Historic ground-water elevation and analytical data through Third Quarter 2006 are provided in Appendix D.

On 10 June 2009, Stratus field personnel observed RSI Drilling advance three soil borings (B-7, B-8, and B-9) on the eastern side of the Station Building around the former UST pits. A total of twelve soil samples were collected from the three borings at depths of 5, 8, 11 and 14 ft bgs. Gasoline Range Organics (GRO, hydrocarbon chain lengths between C6-C-12) were detected in five of the samples at concentrations up to 2,000 mg/kg in sample B-8 11'. Benzene was detected in sample B-8 11' at 0.23 mg/kg. Toluene was detected in three of the samples at concentrations up to 14 mg/kg in sample B-8 11'. Ethylbenzene was detected in five of the samples at concentrations up to 18 mg/kg in sample B-8 11'. Total Xylenes were detected in eight of the samples at concentrations up to 210 mg/kg in sample B-8 11'. Methyl Tert-Butyl Ether (MTBE), Ethyl Tert-Butyl Ether (ETBE), Tert-Amyl Methyl Ether (TAME), Di-Isopropyl Ether (DIPE), 1,2-Dichloroethane (1,2-DCA), 1,2-Dibromoethane (EDB), Tert-Butyl Alcohol (TBA), nor Ethanol were detected above the laboratory reporting limits. GRO and BTEX concentrations exceeded the Environmental Screening Levels (ESLs) established by the San Francisco Regional Water Quality Control Board in sample B-8 11'. Concentrations of GRO and BTEX in the remaining 11 samples were below the established ESLs. A summary of the soil analytical data is provided in Appendix B. Copies of the soil boring logs are provided in Appendix E.

3.0 VAPOR INTRUSION ASSESSMENT

In his letter dated 3 September 2009, Mr. Paresh Khatri thought it conceivable that Benzene concentrations reported in BAI's *Soil & Ground-Water Investigation Report,* dated 20 May 2009, were indicative of vadose zone soil conditions that might potentially pose a vapor inhalation risk at the Site. In the original *Vapor Intrusion Assessment Work Plan* (BAI, 10/26/2009) written in response, BAI proposed to perform a vapor intrusion assessment using active subsurface soil gas sampling in the vicinity of the Station Building from two soil gas boring locations on the southeast side of the Station Building. The first soil gas boring location (SG-1) was proposed to be located between recent soil boring SB-8 and the Station Building, but at least five feet from the Station Building. The second soil gas boring location (SG-2) was proposed to be located five feet from the Station Building approximately midway between SG-1 and the east corner of the Station Building. The proposed soil gas locations were thus located

above an area of suspected contamination to the ground water by petroleum hydrocarbons, an appreciable distance from the existing vapor well AV-4 which might have allowed short-circuiting of soil gas, and close to the base slab of the station building to closely represent sub-slab conditions. The proposed soil gas boring/temporary vapor well sampling locations are presented in Drawing 2.

The proposed soil gas investigation methodology will be consistent with the guidelines published by the California Regional Water Quality Control Board – Los Angeles Region (LARWQCB) in the 25 February 1997 *Interim Guidance for Active Soil Gas Investigation*, the Department of Toxic Substances Control (DTSC) and LARWQCB 28 January 2003 *Advisory – Active Soil Gas Investigations*, and the American Petroleum Institute's (API) November 2005 Publication No. 4741 – *Collecting and Interpreting Soil Gas Samples from the Vadose Zone*. In accordance with this guidance, soil gas sampling should not be performed during or immediately after a rainfall event of 0.5 inches or more. If a rainfall event of this magnitude occurs within 24 hours of the scheduled soil gas sampling activities, the field work shall be rescheduled.

In the original 26 October 2009 work plan, soil vapor monitoring points were proposed to be installed at depths of 3.5 feet. In his letter dated 10 February 2010, a copy of which is provided within Appendix A, Mr. Khatri expressed concerns regarding the proposed depths of the soil vapor samples and requested a work plan addendum. Specifically, Mr. Khatri stipulated that "soil gas samples should not be collected at depths shallower than five feet in order to minimize barometric pumping effects, and that deeper samples should be collected as needed to define vertical trends in vapor concentrations." To this end, BAI proposes the creation of nested/three-level soil-vapor sampling wells with midpoint depths of 3.5 feet, 5.5 feet, and 7.5 feet.

The two soil vapor borings will be advanced using an air knife/vacuum extraction rig or hand auger for the installation of the shallow soil vapor sampling wells/implants at the locations depicted in Drawing 2. To the extent possible, soil will be classified in accordance with the USCS, and will be examined using visual and manual methods for parameters including staining, color, grain size, moisture content, and screened for volatile organic compounds using a Photo-Ionization Detector (PID). The borings will be converted into two nested/multi-level soil vapor wells following advancement of each boring to 8.0 ft bgs.

Each sampling string in the nested/three-level soil vapor sampling well will be constructed by attaching a 6-inch long soil vapor probe to a 0.25-inch diameter nylon tubing (e.g., NylaFlow or Teflon, not Polyethylene, Vinyl or Tygon) extending to the surface. The soil vapor probes will be constructed of double-woven stainless steel wire screen with a pore diameter of 0.057-inch, equipped with stainless steel end fittings. Each soil vapor probe will be embedded within the middle of a one foot thick sand filter pack (#2/12 sorted sand), separated from each other by one-half foot of dry granular bentonite below one-half foot of hydrated granular bentonite. Each nested/three-level soil vapor sampling well is proposed to have the following profile:

- Flush, traffic-rated well vault at the surface set within concrete surface seal to match the existing grade;
- Neat cement grout from within the well box (approximately 0.75 ft bgs) to 2.0 ft bgs;
- Hydrated granular bentonite from 2.0 to 2.5 ft bgs;

- Dry granular bentonite from 2.5 to 3.0 ft bgs;
- Upper sand filter pack from 3.0 to 4.0 ft bgs (probe embedded between 3.25-3.75 ft bgs);
- Hydrated granular bentonite from 4.0 to 4.5 ft bgs;
- Dry granular bentonite from 4.5 to 5.0 ft bgs;
- Middle sand filter pack from 5.0 to 6.0 ft bgs (probe embedded between 5.25-5.75 ft bgs);
- Hydrated granular bentonite from 6.0 to 6.5 ft bgs;
- Dry granular bentonite from 6.5 to 7.0 ft bgs;
- Bottom sand filter pack from 7.0 to 8.0 ft bgs (probe embedded between 7.25-7.75ft bgs).

The sample tubing lines to the surface will extend two feet above grade, be permanently labeled with the probe location and depth, and then sealed with the gas-tight valves/sampling fittings. Care will be taken to prevent the tubing from being damaged or kinked when coiled back into the well vault. The cement grout seal will be allowed to cure a minimum of two weeks prior to sampling.

The air knife/vacuum extraction rig or hand auger and other reusable components will be properly decontaminated to minimize the potential for cross-contamination between soil gas sampling points. As outlined in the DTSC/LARWQCB and API guidance documents, these methods will include three-stage wash and rinse (i.e., wash equipment with a non-phosphate detergent, rinse with potable water, and a final rinse with distilled water) and/or steam cleaning.

One-liter Summa® canisters will be used to collect samples for analysis by an offsite laboratory. The Summa® canisters will be shipped by the laboratory under high vacuum, leak checked, and batch certified to be free of contaminants. The initial canister vacuum will be measured before use and should be approximately 30 inches of Mercury (in.Hg). If the initial vacuum is less than 28 in.Hg, the affected canister(s) will not be used. A purge canister will be used to purge the sampling train (sampling point and tubing) a minimum of three volumes prior to sample collection with the purge effluent being screened for volatile organic compounds using a PID. Swagelok fittings will be used to connect the canisters to the tubing. Once the purge canister is connected to the tubing, the sampling train will be checked for leaks by applying a vacuum for a minimum of 10 minutes. If the vacuum in the canister does not drop, this will indicate the sample train is not leaking.

In addition, a chemical leak check will be performed identify whether ambient air is leaking into the sample train. Prior to and during sample collection, a tracer/leak test compound (e.g., Butane, Isopropanol, Difluoroethane) will be applied around the probe at the ground surface and at connections in the sampling system. The tracer/leak test compound can easily be emplaced by spreading shaving cream, wetting paper towels and wrapping them, or spraying the pressurized canister around the leak-check locations. The leak test compound will be included in the laboratory analysis. A single duplicate sample will be collected per field day of work from a sample point likely to have been impacted by petroleum hydrocarbons. The duplicate sample will serve as a means to validate the sample collection methods and laboratory analytical data. Soil gas samples will not be chilled.

Once the leak test is complete, the in-line valve will be closed and the sample canister connected to the tubing. The in-line valve will then be opened and the sample collected. The sampling flow rate will not exceed 200 milliliters per minute (mL/min) as measured by a flow regulator. Samples will be collected until the pressure in the canister(s) reaches approximately five in.Hg or 30 minutes has elapsed. A measurement with a PID will also be collected from each sampling point following sample collection. In addition, one ambient air sample will be collected outside the station building entrance door using a Summa® canister. This sample will also be submitted to the off-site laboratory to compare soil gas analytical results with ambient air results.

Collected samples will be submitted promptly under chain-of-custody protocol to Calscience Environmental Laboratories, Inc. in Garden Grove, California (CA-ELAP #1230, NELAP #03220CA). Soil gas samples will be analyzed for Gasoline Range Organics (GRO, hydrocarbon chain lengths C6-C12), Benzene, Toluene, Ethylbenzene, and Total Xylenes (BTEX), Methyl Tertiary Butyl Ether (MTBE), Ethanol, Tertiary Butyl Alcohol (TBA), Di-Isopropyl Ether (DIPE), Ethyl Tertiary Butyl Ether (ETBE), Tertiary Amyl Methyl Ether (TAME), and the leak-check compound (e.g., Butane, Isopropanol, or Difluoroethane) by EPA Method TO-15. Soil gas samples will also be analyzed for Oxygen (O_2), Carbon Dioxide (CO_2), and Methane (CH_4). Laboratory analyses for soil gas samples will be performed in accordance with the EPA standard holding times for Summa® canisters.

In the ACEH letter dated 10 February 2010, Mr. Khatri also requested that sub-slab samples be collected. At this time, BAI does not recommend perforating the foundation slab of the station building to collect sub-slab samples. BAI recommends reviewing the results of the proposed scope of work first to see if subsurface soil vapor contaminants are present at concentrations deemed significant.

4.0 PRE-MOBILIZATION ACTIVITIES

Prior to initiating field activities, BAI will obtain the necessary permits from Alameda County; prepare a site health and safety plan (HASP) for the proposed work; clear the Site for subsurface utilities; and provide 72-hour advance written notification(s) to ACEH (email preferred to paresh.khatri@acgov.org) prior to the start of field activities. The utility clearance will include notifying Underground Service Alert (USA) of the pending work a minimum of 48 hours prior to initiating the subsurface field investigation. In addition, the services of a private underground utility locator will be utilized.

The Site-specific HASP will be prepared for use by personnel implementing the work plan. The HASP will address the proposed soil-gas boring/sampling scope of work. A copy of the HASP will be available on-site during work. If used, subcontractor(s) performing field activities will be provided with a copy of the HASP prior to initiating work. A safety tailgate meeting will also be conducted daily to review the Site hazards and work scope.

5.0 DOCUMENTATION AND REPORTING

Upon completion of the work activities described above and after receipt of laboratory analytical data, BAI will prepare a Vapor Intrusion Assessment Report containing the following information at a minimum:

- Descriptions of the work performed;
- Copies of the required permits;
- Copies of the field notes;
- Tabulated results and measurements; and
- Laboratory analytical reports with copies of chain-of-custody records.

6.0 PROPOSED SCHEDULE

The schedule for the above-noted work is proposed to proceed as follows:

- Implement Soil Gas Investigation – Within 60 days of this work plan approval.
- Submittal of Soil Gas Investigation Report – Within 120 days of this work plan approval.

7.0 CLOSURE

Discovery of hazardous or regulated materials constitutes a changed condition mandating a renegotiation of the scope of work described herein or termination of services. BAI will endeavor to alert the client of matters which, in the opinion of BAI, require immediate attention to protect the public health, safety, and environment. BAI will endeavor to advise the client of matters which should be reported to proper governmental entities. However, the client is solely responsible for reporting such matters and BAI shall not be held liable in the event the proper agency is not notified. Our services will be performed in accordance with the generally accepted practice at the time work commences. Results and recommendations will be based on laboratory results, observations of field personnel, and the points investigated. No other warranty, expressed on implied was made. This document has been prepared for the exclusive use of Atlantic Richfield Company.

8.0 REFERENCES

Alameda County Environmental Health, 3 September 2009. *Fuel Leak Case No. RO0000044 and GeoTracker Global ID T0600100083, ARCO #2112, 1260 Park Street, Alameda, CA 94501*. Submitted to Mr. Paul Supple for Atlantic Richfield Company by Mr. Paresh Khatri for ACEH.

Alameda County Environmental Health, 10 February 2010. *Soil Vapor Sampling at Fuel Leak Case No. RO0000044 and GeoTracker Global ID T0600100083, ARCO #2112, 1260 Park Street, Alameda, CA 94501*. Submitted to Mr. Chuck Carmel for Atlantic Richfield Company by Mr. Paresh Khatri for ACEH.

American Petroleum Institute, November 2005. *Collecting and Interpreting Soil Gas Samples from the Vadose Zone*. Publication Number 4741.

Applied GeoSystems, Inc., 20 February 1990. *Limited Environmental Site Assessment, ARCO Service Station No. 2112, 1260 Park Street, Alameda, California.*

Broadbent & Associates, Inc., 13 October 2006. *Third Quarter 2006 Ground-Water Monitoring Report, Atlantic Richfield Company Station No. 2112, 1260 Park Street, Alameda, California.*

Broadbent & Associates, Inc., 12 December 2008. *Work Plan for Soil & Ground-Water Investigation, Atlantic Richfield Company Station No. 2112, 1260 Park Street, Alameda, California, ACEHS Case No. RO0000044.* Submitted to Messrs. Paul Supple for Atlantic Richfield Company and Mr. Paresh Khatri for ACEH.

Broadbent & Associates, Inc., 10 August 2009. *On-Site Soil Investigation Report, Atlantic Richfield Company Station No. 2112, 1260 Park Street, Alameda, California, ACEHS Case No. RO0000044.* Submitted to Messrs. Paul Supple for Atlantic Richfield Company and Mr. Paresh Khatri for ACEH.

Broadbent & Associates, Inc., 26 October 2009. *Vapor Intrusion Assessment Work Plan, Atlantic Richfield Company Station #2112, 1260 Park Street, Alameda, California, ACEHS Case #RO0000044.* Submitted to Mr. Chuck Carmel for Atlantic Richfield Company and Mr. Paresh Khatri for ACEH.

California Regional Water Quality Control Board – San Francisco Region, June 1999. *East Bay Plain Groundwater Basin Beneficial Use Evaluation Report, Alameda and Contra Costa Counties, CA.*

Calscience Environmental Laboratories, Inc. *Calscience Air Sampling Guide – A Guide to Whole Air Sampling and Analysis.*

Davis, Robin, May 2006. Vapor Attenuation in the Subsurface from Petroleum Hydrocarbon Sources: An Update and Discussion on the Ramifications of the Vapor-Intrusion Risk Pathway. *LUSTLine,* New England Interstate Water Pollution Control Commission, Bulletin 52: 22-25.

Davis, Robin, March 2005. Making Sense of Subsurface Vapor Attenuation in Petroleum Hydrocarbon Sources. *LUSTLine,* New England Interstate Water Pollution Control Commission, Bulletin 49: 10-14.

Delta Environmental Consultants, Inc., 20 November 2001. *Product Line and Dispenser Island Sampling Results, ARCO Station No. 2112, 1260 Park Street, Alameda, California.*

DTSC, 15 December 2004 (Revised 7 February 2005). *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*. Interim Final.

DTSC and LARWQCB, 28 January 2003. *Advisory – Active Soil Gas Investigations*.

DTSC and LARWQCB, 3 March 2010. *Advisory – Active Soil Gas Investigations* (Draft for Review).

GeoStrategies, Inc., 7 November 1990. *Tank Replacement Observation Report, ARCO Service Station No. 2112, 1260 Park Street, Alameda, California.*

GeoStrategies, Inc., 5 November 1993. *Quarterly Monitoring/Recovery System Evaluation Report – Third Quarter 1993, ARCO Service Station No. 2112, 1260 Park Street, Alameda, California.*

Johnson, P.C. and Ettinger, R.A., 1991. Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors into Buildings. *Environmental Science Technology*, No.25: 1445-1452.

Pacific Environmental Group, Inc., 20 November 1996. *Case Closure Summary, ARCO Service Station No. 2112, 1260 Park Street at Encinal Avenue, Alameda, California.*

Pacific Environmental Group, Inc., 14 July 1997. *Quarterly Ground-Water Monitoring Report and Remedial System Performance Evaluation – First Quarter 1997, ARCO Service Station No. 2112, 1260 Park Street at Encinal Avenue, Alameda, California.*

Ririe, G.T., R.E. Sweeney, and S.J. Daugherty, 2002. A Comparison of Hydrocarbon Vapor Attenuation in the Field with Predictions from Vapor Diffusion Models. *Soil & Sediment Contamination,* AEHS Publishers, No.11(4):529-554.

Roggemans, Sophie, Cristin L. Bruce, Paul C. Johnson, and Richard L. Johnson, December 2001. *Vadose Zone Natural Attenuation of Hydrocarbon Vapors: An Empirical Assessment of Soil Gas Vertical Profile Data.* API Bulletin No.15.

US EPA, 4 March 2008. US EPA's Vapor Intrusion Database: Preliminary Evaluation of Attenuation Factors. Office of Solid Waste and Emergency Response, Draft.

US EPA, November 2002. *OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance).* EPA530-D-02-004.

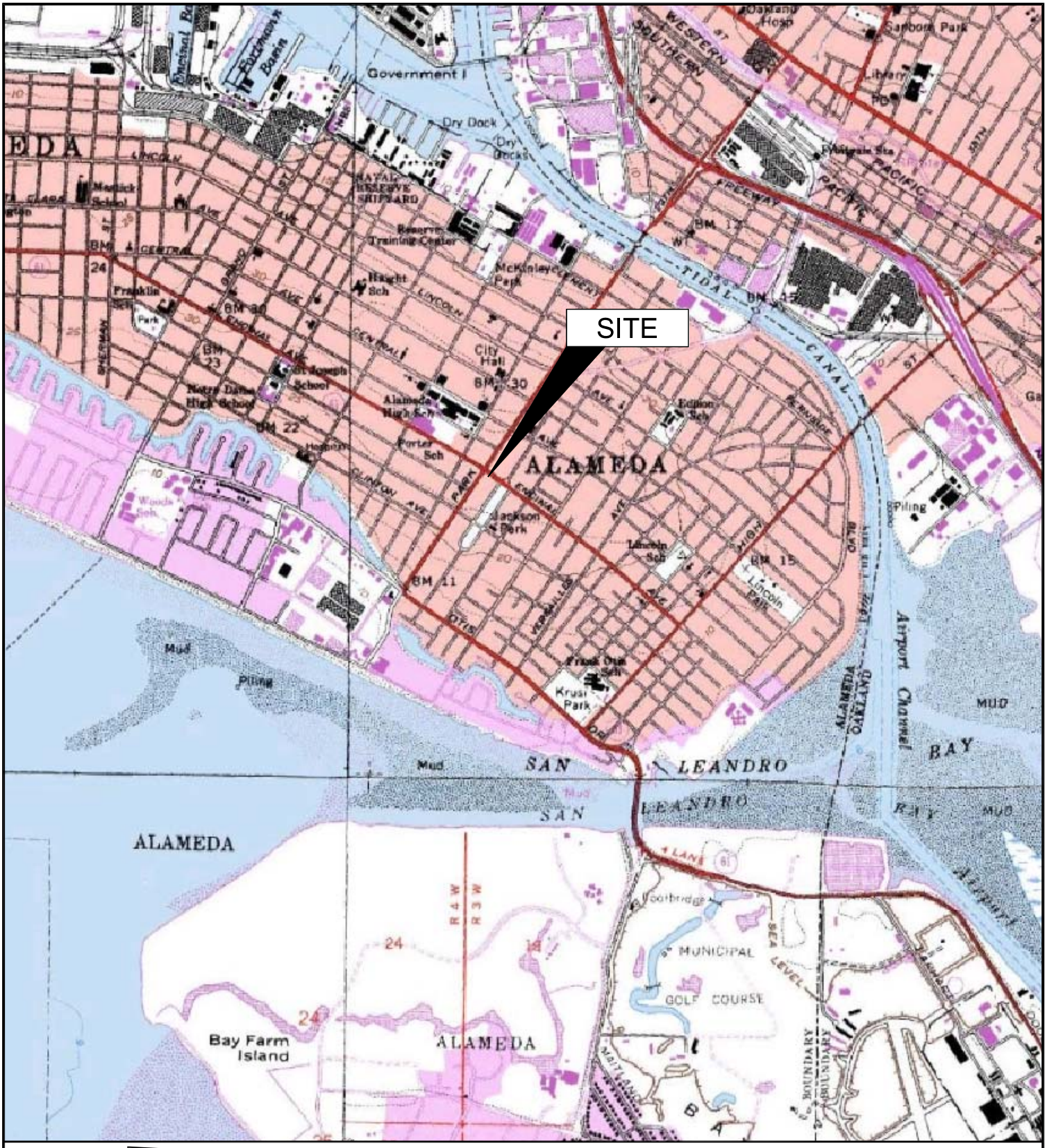


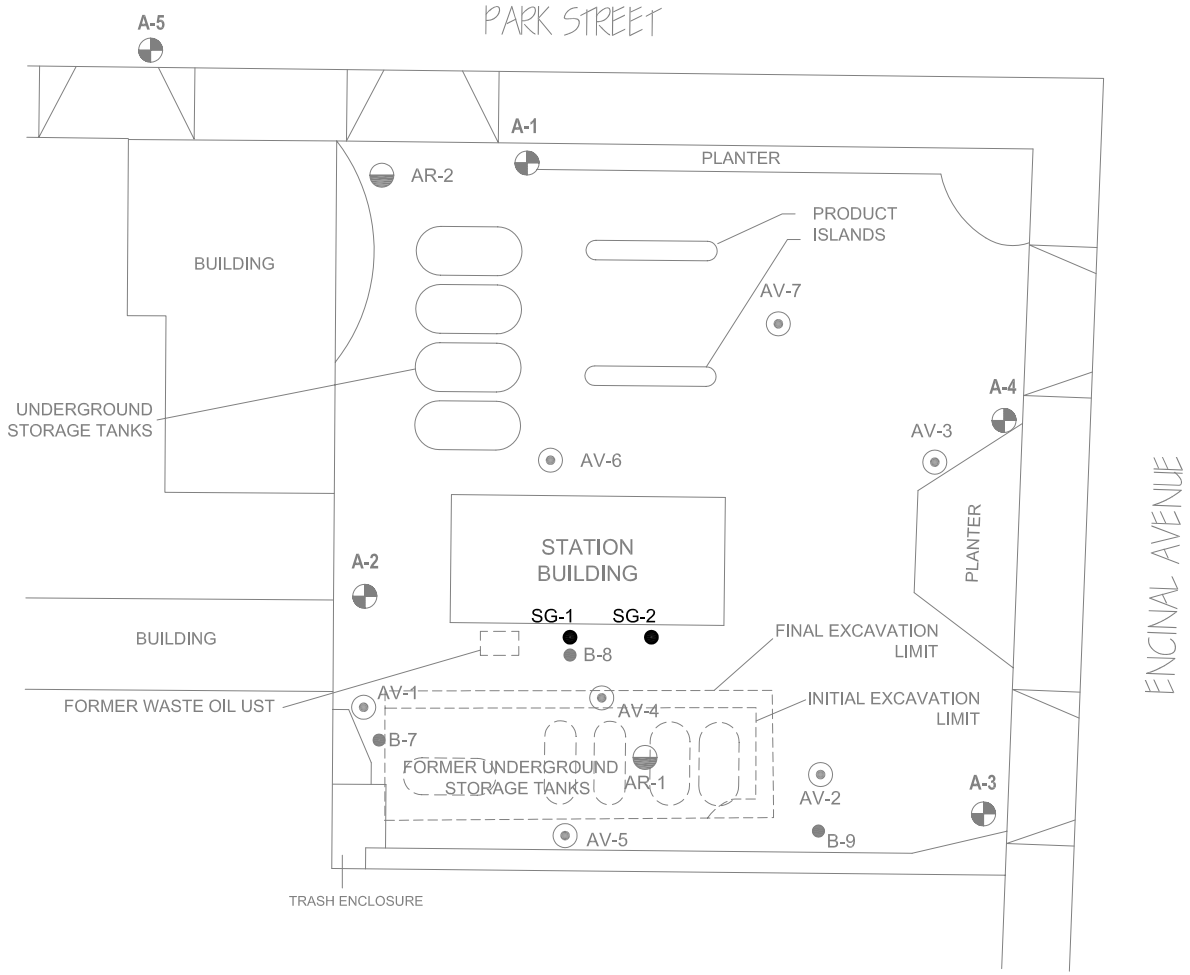
IMAGE SOURCE: USGS

BROADBENT & ASSOCIATES, INC.
ENGINEERING, WATER RESOURCES & ENVIRONMENTAL
1324 Mangrove Ave. Suite 212, Chico, CA 95926
Project No.: 06-88-616 Date: 07/27/09

Station #2112
1260 Park Street
Alameda, California

Site Location Map

Drawing
1



LEGEND:

SG-2	PROPOSED SOIL GAS BORING
A-1	MONITORING WELL LOCATION
AR-1	GROUND-WATER EXTRACTION WELL LOCATION
AV-1	VAPOR EXTRACTION WELL LOCATION
B-9	RECENT BORING LOCATION
- - - - - -	EXCAVATED AREA

0 40 80

SCALE (ft)

BROADBENT & ASSOCIATES, INC.
ENGINEERING, WATER RESOURCES & ENVIRONMENTAL
1324 Mangrove Ave. Suite 212, Chico, California 95926

Project No.: 06-88-616 Date: 10/14/09

Station #2112
1260 Park Street
Alameda, California

Site Map with Proposed
Soil Gas Boring Locations

Drawing
2

APPENDIX A

RECENT 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

February 10, 2010

Chuck Carmel (*Sent via e-mail to: charles.carmel@bp.com*)
Atlantic Richfield Company
(A BP Affiliated Company)
P.O. Box 1257
San Ramon, CA 94583

Subject: Soil Vapor Sampling at Fuel Leak Case No. RO0000044 and GeoTracker Global ID T0600100083, ARCO #2112, 1260 Park Street, Alameda, CA 94501

Dear Mr. Carmel:

Alameda County Environmental Health (ACEH) staff has reviewed the case file for the above-referenced site including the recently submitted document entitled, "Vapor Assessment Work Plan," dated October 26, 2009, which was prepared by Broadbent and Associated, Inc. (BAI) for the subject site. To assess potential vapor intrusion to indoor air, BAI has proposed to install two soil vapor points, each to a depth of 3.5 feet bgs in the vicinity of previously installed boring B-8, where elevated concentrations of TPH-g and benzene were detected. ACEH has concerns regarding the proposed depths of the soil vapor samples and is requesting that you address the following technical comments described below, and send us a work plan addendum.

TECHNICAL COMMENTS

1. **Soil Vapor Sampling Depth & Sub-slab Sampling**– As mentioned above, BAI proposes to install two soil vapor wells to a depth of 3.5 feet bgs. According to the Department of Toxic Substances Control's December 15, 2004 (Revised February 7, 2005) *Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air*, "[s]oil gas samples should not be collected depths shallower than 5 feet in order to minimize barometric pumping effects. Deeper samples should be collected as needed to define vertical trends in vapor concentrations." Depth to groundwater at the site is approximately 10 feet bgs. At this time, please justify that the proposed sampling depths are sufficient to demonstrate actual soil gas conditions in the subsurface at the site. Please note that ACEH believes that modifications to the proposed scope of work will be necessary to satisfy criteria outlined in the guidance document. To that end, ACEH recommends that soil vapor sampling depths should be at 5 feet bgs consistent with the DTSC's guidance. Additionally, it is recommended that sub-slab samples are also collected so that vertical concentrations trends can be evaluated. Please provide justification that the current scope of work sufficiently satisfies the above-mentioned concerns or submit a scope of work that addresses the above-mentioned concerns and submit a work plan addendum due by the date specified below.

TECHNICAL REPORT REQUEST

Please submit technical reports to ACEH (Attention: Paresh Khatri), according to the following schedule:

- **April 12, 2010** – Revised Soil and Water Investigation 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

ACEH's Environmental Cleanup Oversight Programs (LOP and SLIC) require submission of reports in electronic form. The electronic copy replaces paper copies and is expected to 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 Instructions." 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. In September 2004, the SWRCB adopted regulations that require electronic submittal of information for all 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 monitoring wells, and other data to the GeoTracker database over the Internet. Beginning July 1, 2005, these same reporting requirements were added to Spills, Leaks, Investigations, and Cleanup (SLIC) sites. Beginning July 1, 2005, electronic submittal of a complete copy of all reports for all sites is required in GeoTracker (in PDF format). Please visit the SWRCB website for more information on these requirements (http://www.swrcb.ca.gov/ust/electronic_submittal/report_rqmts.shtml.

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) 777-2478 or send me an electronic mail message at paresh.khatri@acgov.org.

Sincerely,

Paresh C. Khatri
Hazardous Materials Specialist

Enclosure: ACEH Electronic Report Upload (ftp) Instructions

cc: Tom Venus, Broadbent & Associates, Inc., 1324 Mangrove Avenue, Suite 212, Chico, CA 95926 (*Sent via E-mail to: tvenus@broadbentinc.com*)
Donna Drogos, ACEH (*Sent via E-mail to: donna.drogos@acgov.org*)
Paresh Khatri, ACEH (*Sent via E-mail to: paresh.khatri@acgov.org*)
GeoTracker
File

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

September 3, 2009

Paul Supple (*Sent via E-mail to: paul.supple@bp.com*)
Atlantic Richfield Company
(A BP Affiliated Company)
P.O. Box 1257
San Ramon, CA 94583

Subject: Fuel Leak Case No. RO0000044 and GeoTracker Global ID T0600100083, ARCO #2112, 1260 Park Street, Alameda, CA 94501

Dear Mr. Supple:

Alameda County Environmental Health (ACEH) staff has reviewed the case file for the above-referenced site including the recently submitted document entitled, "On-Site Soil Investigation Report," dated August 10, 2009, which was prepared by Broadbent & Associates, Inc. for the subject site. The intent of the subsurface investigation was to obtain data to characterize the source area and remediation system effectiveness. Soil sample analytical results from a majority of the samples did not detect or detected low concentrations of hydrocarbons with the exception of soil sample B-8 11'. Total petroleum hydrocarbons (TPH) as gasoline (g) and benzene were detected at concentrations of 2,000 mg/kg and 0.23 mg/kg, respectively in a soil sample collected from B-8 at a depth of 11 feet bgs, located just southeast of the station building. BAI states "[b]ased on the analytical results obtained during the soil investigation, progress toward case closure is recommended." However, the soil sample analytical results indicate that the site may pose a risk to human health or the environment, specifically potential contaminant volatilization to indoor air. Therefore, prior to evaluating the case for closure, this data gap must be addressed and it must be demonstrated that the site does not present a risk to human health and/or the environment.

ACEH requests that you address the following technical comments and send us the technical reports requested below.

TECHNICAL COMMENTS

1. **Soil and Groundwater Characterization** – As mentioned above, TPH-g and benzene were detected at concentrations of 2,000 mg/kg and 0.23 mg/kg, respectively, in a soil sample collected from B-8 at a depth of 11 feet bgs, located near the station building. These concentrations are above the Regional Water Quality Control Board's (RWQCB) Environmental Screening Levels (ESLs) of 83 mg/kg for TPH-g and 0.044 mg/kg for benzene indicating that the site may pose a risk to human health and the environment. At this time, please propose a scope of work to address the above-mentioned concerns and submit a work plan due by the date specified below.

TECHNICAL REPORT REQUEST

Please submit technical reports to ACEH (Attention: Paresh Khatri), according to the following schedule:

- **October 26, 2009** – Soil and Water Investigation 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

ACEH's Environmental Cleanup Oversight Programs (LOP and SLIC) require submission of reports in electronic form. The electronic copy replaces paper copies and is expected to 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 Instructions." 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. In September 2004, the SWRCB adopted regulations that require electronic submittal of information for all 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 monitoring wells, and other data to the GeoTracker database over the Internet. Beginning July 1, 2005, these same reporting requirements were added to Spills, Leaks, Investigations, and Cleanup (SLIC) sites. Beginning July 1, 2005, electronic submittal of a complete copy of all reports for all sites is required in GeoTracker (in PDF format). Please visit the SWRCB website for more information on these requirements (http://www.swrcb.ca.gov/ust/electronic_submittal/report_rqmts.shtml.

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) 777-2478 or send me an electronic mail message at paresh.khatri@acgov.org.

Sincerely,

Paresh C. Khatri
Hazardous Materials Specialist

Enclosure: ACEH Electronic Report Upload (ftp) Instructions

cc: Tom Venus, Broadbent & Associates, Inc., 1324 Mangrove Ave., Ste 212, Chico, CA 95926 (*Sent via E-mail to: tvenus@broadbentinc.com*)
Donna Drogos, ACEH (*Sent via E-mail to: donna.drogos@acgov.org*)
Paresh Khatri, ACEH (*Sent via E-mail to: paresh.khatri@acgov.org*)
GeoTracker
File

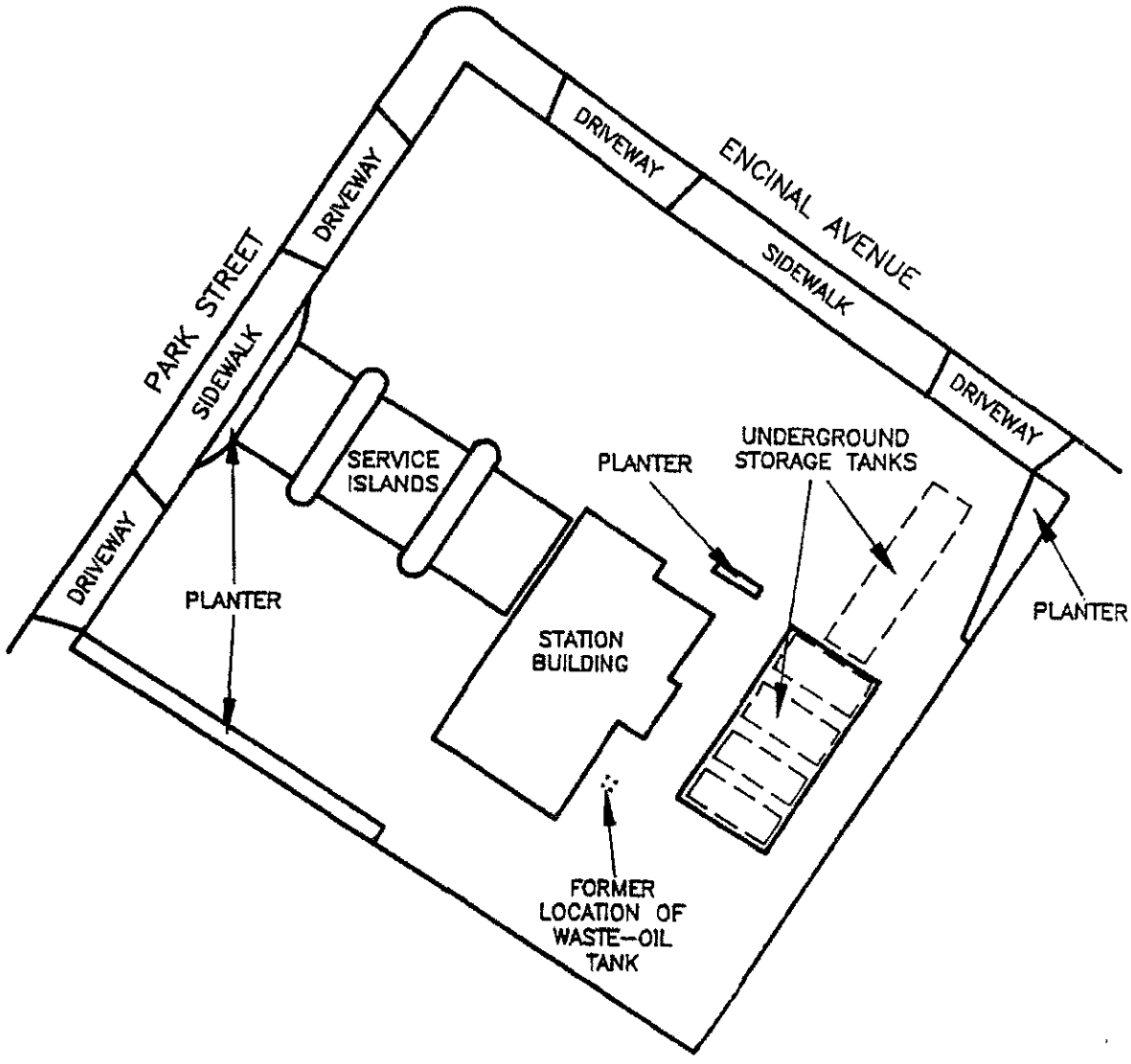
APPENDIX B.

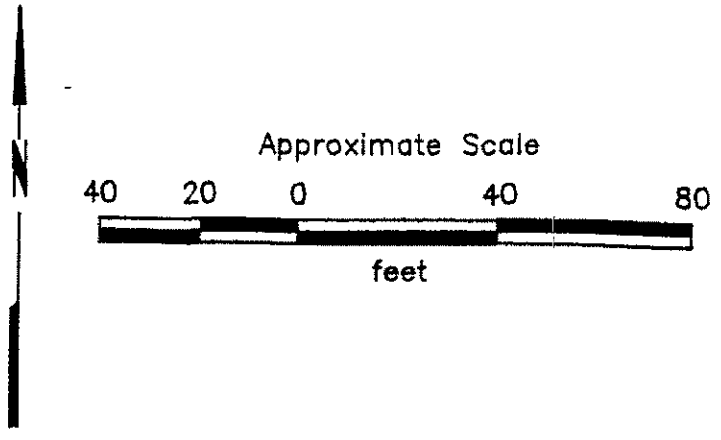
HISTORIC SOIL ANALYTICAL DATA

TABLE 1
RESULTS OF CHEMICAL ANALYSES
ON SOIL SAMPLES
Arco Service Station No. 2112
1260 Park Street/Encinal Avenue
Alameda, California

Sample Number	Date Sampled	TEH (as diesel fuel)	TEH (as motor oil)
9310-1 (bottom of tank)	5/14/87	430	2,400
9310-2 (west side of tank)	5/15/87	<10	<10
9347-1 (6-foot depth)	5/21/87	NA	<10

Results in milligrams/kilogram (mg/kg) = parts per million (ppm)
TEH: Total extractable hydrocarbons
NA: Not analyzed
Sampled by Crosby and Overton.





Source: Based on ARCO site plan dated 1983

Applied GeoSystems

PROJECT NO. 19011-1

GENERALIZED SITE PLAN
ARCO Station No. 2112
1260 Park Street
Alameda, California

PLATE
P - 1

TABLE 1
RESULTS OF LABORATORY ANALYSIS OF SOIL SAMPLES
ARCO Station 2112
1260 Park Street
Alameda, California

Sample Number	TPHg	B	T	E	X
S-6-B1	12	0.16	0.34	0.14	1.3
S-10-B1	1,700	15	72	22	180
S-6-B2	<2.0	<0.050	<0.050	<0.050	<0.050
S-11-B2	570	3.9	13	11	82
S-6-B3	<2.0	0.097	<0.050	<0.050	0.20
S-11-B3	10,000	47	350	120	940
S-6-B4	<2.0	0.063	0.096	<0.050	0.20
S-11-B4	21,000	210	1,100	320	2,600
S-6-B5	3.7	<0.050	0.081	<0.050	0.18
S-11-B5	5,400	8.8	27	66	160
S-5.5-B6	<2.0	<0.050	<0.050	<0.050	<0.050
S-10-B6	<2.0	<0.050	<0.050	<0.050	<0.050

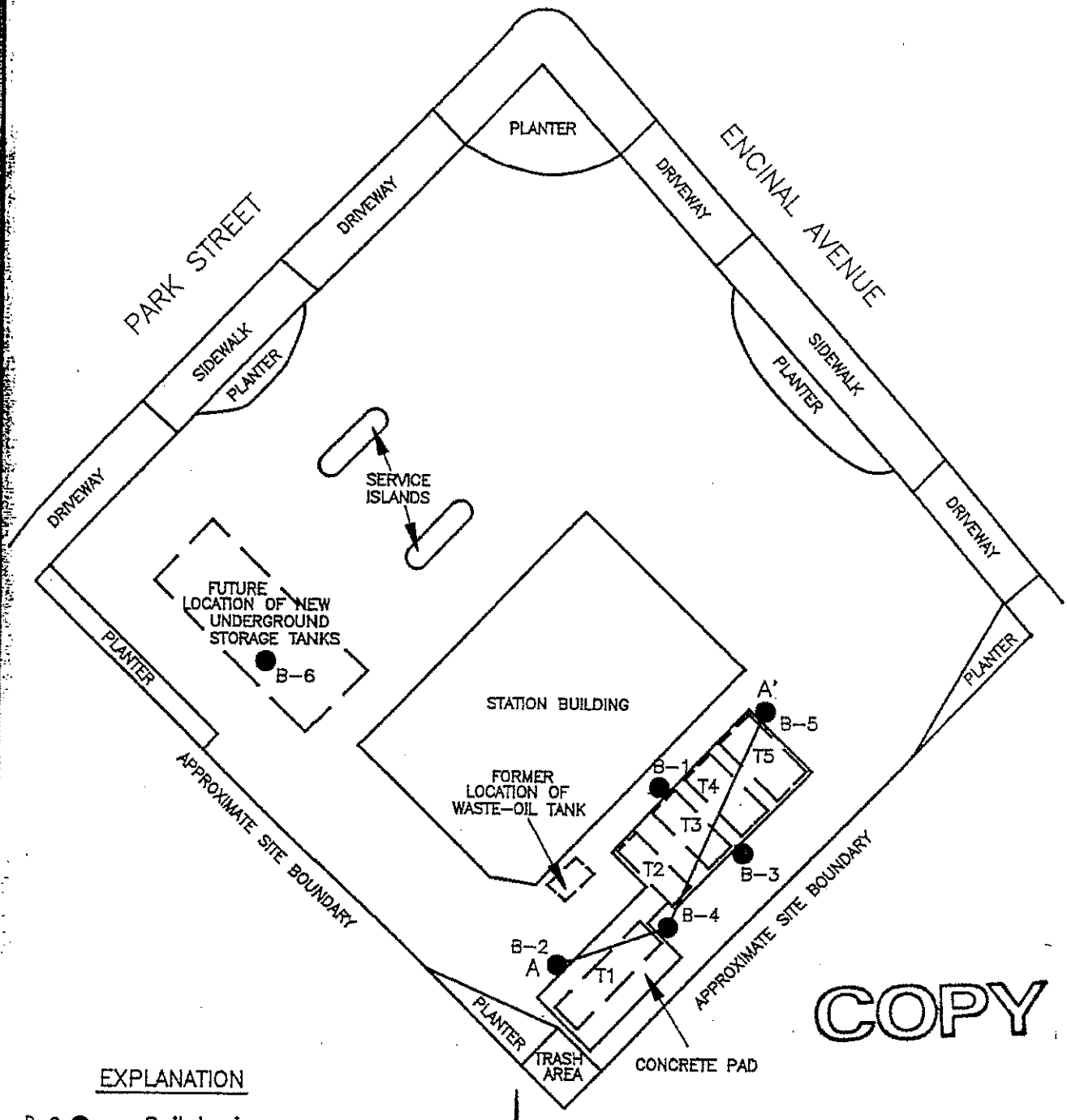
Results in milligrams per kilogram or parts per million

TPHg = Total petroleum hydrocarbons as gasoline
B = benzene E = ethylbenzene T = toluene X = total xylene isomers
< = indicates less than the reported limit

Sample identification:

S-10-B6
- Boring number
- Approximate sample depth in feet
- Soil sample

COPY



COPY

EXPLANATION

B-6 ● = Soil boring (Applied GeoSystems, January 23, 1990)

T5 = Existing underground storage tanks

A' = Cross Section

A

N

Approximate Scale

30 15 0 30 60

feet

Source: Modified from plan supplied by ARCO.

Applied GeoSystems

PROJECT 69048-1

GENERALIZED SITE PLAN
ARCO Station 2112
1260 Park Street
Alameda, California

PLATE
2

TABLE 1

SOIL ANALYTICAL DATA
(EXCAVATIONS)

SAMPLE I.D.	SAMPLE DATE	ANALYZED DATE	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
AX1-1-6	26-Jul-90	26-Jul-90	14	<0.005	<0.005	<0.005	1
AX1-1-10	10-Aug-90	21-Aug-90	27.	0.12	1.1	0.7	4.4
AX1-2-6	26-Jul-90	26-Jul-90	1700	<0.005	16	4.8	76
AX1-2*-10	10-Aug-90	19-Aug-90	7700.	60.	360.	150.	930.
AX1-3-6	26-Jul-90	26-Jul-90	<1	<0.005	<0.005	<0.005	<0.005
AX1-3-10	09-Aug-90	21-Aug-90	15000.	130.	850.	330.	1900.
AX1-3-12	26-Jul-90	26-Jul-90	23000	150	490	940	2700
AX1-4-6	26-Jul-90	31-Jul-90	<1	<0.005	<0.005	<0.005	<0.005
AX1-4-12	26-Jul-90	26-Jul-90	1.2	<0.005	0.011	0.018	0.062
AX1-5-6	26-Jul-90	26-Jul-90	<1	0.019	<0.005	<0.005	0.032
AX1-6-6	26-Jul-90	26-Jul-90	<1	0.067	0.011	0.042	0.055
AX1-6-10	10-Aug-90	18-Aug-90	1000.	2.0	24.	18.	110.
AX1-7-6	26-Jul-90	27-Jul-90	50	<0.005	<0.005	<0.005	<0.005
AX1-7*-10	10-Aug-90	21-Aug-90	9400.	96.	570.	200.	1200.

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline
PPM = Parts Per Million

Notes: 1. All data shown as <x are reported as ND (NONE DETECTED).
2. BTEX data analyzed on July 26, 27 and 31, 1990 by NET are reported in micrograms per kilogram.
3. The last number of the Sample I.D. corresponds to the approximate depth below existing grade that the sample was collected.
4. For sample locations, see Plate 3.
5. TPH-G concentration for AX1-8-10' appear to be the more volatile constituents of diesel.

COPY

TABLE 1

SOIL ANALYTICAL DATA
(EXCAVATIONS)

SAMPLE I.D.	SAMPLE DATE	ANALYZED DATE	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
AX1-8-10	27-Jul-90	27-Jul-90	7,300	20	130	98	650
AX1-8*-10	10-Aug-90	18-Aug-90	320.	<0.4	<0.4	3.8	12.
AX1-9-10	27-Jul-90	27-Jul-90	<1	0.014	<0.005	0.020	0.017
AX1-9*-10	10-Aug-90	18-Aug-90	1.6	0.037	0.057	0.01	0.051
AX1-10-10	27-Jul-90	27-Jul-90	2,700	36	51	180	320
AX1-10*-10	10-Aug-90	18-Aug-90	120.	0.56	4.3	2.5	15.
AX1-11-10	27-Jul-90	27-Jul-90	<1	12	6	14	35
AX2-1-6	31-Jul-90	31-Jul-90	<1	<0.005	<0.005	0.007	0.007
AX2-1-12	31-Jul-90	31-Jul-90	2.0	0.024	0.073	0.048	0.110
AX2-2-11	31-Jul-90	31-Jul-90	2.0	0.470	0.180	0.005	0.013
AX2-3-6	31-Jul-90	31-Jul-90	<1	<0.005	<0.005	<0.005	<0.005
AX2-3-11.5	31-Jul-90	31-Jul-90	<1	<0.005	<0.005	<0.005	<0.005
AX2-4-6	31-Jul-90	31-Jul-90	<1	<0.005	<0.005	<0.005	<0.005
AX2-4-11	31-Jul-90	31-Jul-90	<1	<0.005	<0.005	<0.005	<0.005
AX2-5-6	31-Jul-90	31-Jul-90	<1	<0.005	<0.005	<0.005	<0.005
AX2-5-11	31-Jul-90	31-Jul-90	<1	<0.005	<0.005	<0.005	<0.005
AX2-6-11	31-Jul-90	31-Jul-90	<1	0.013	0.011	<0.005	<0.005
AX2-7-11	31-Jul-90	31-Jul-90	<1	<0.005	<0.005	<0.005	<0.005

COPY

TABLE 2

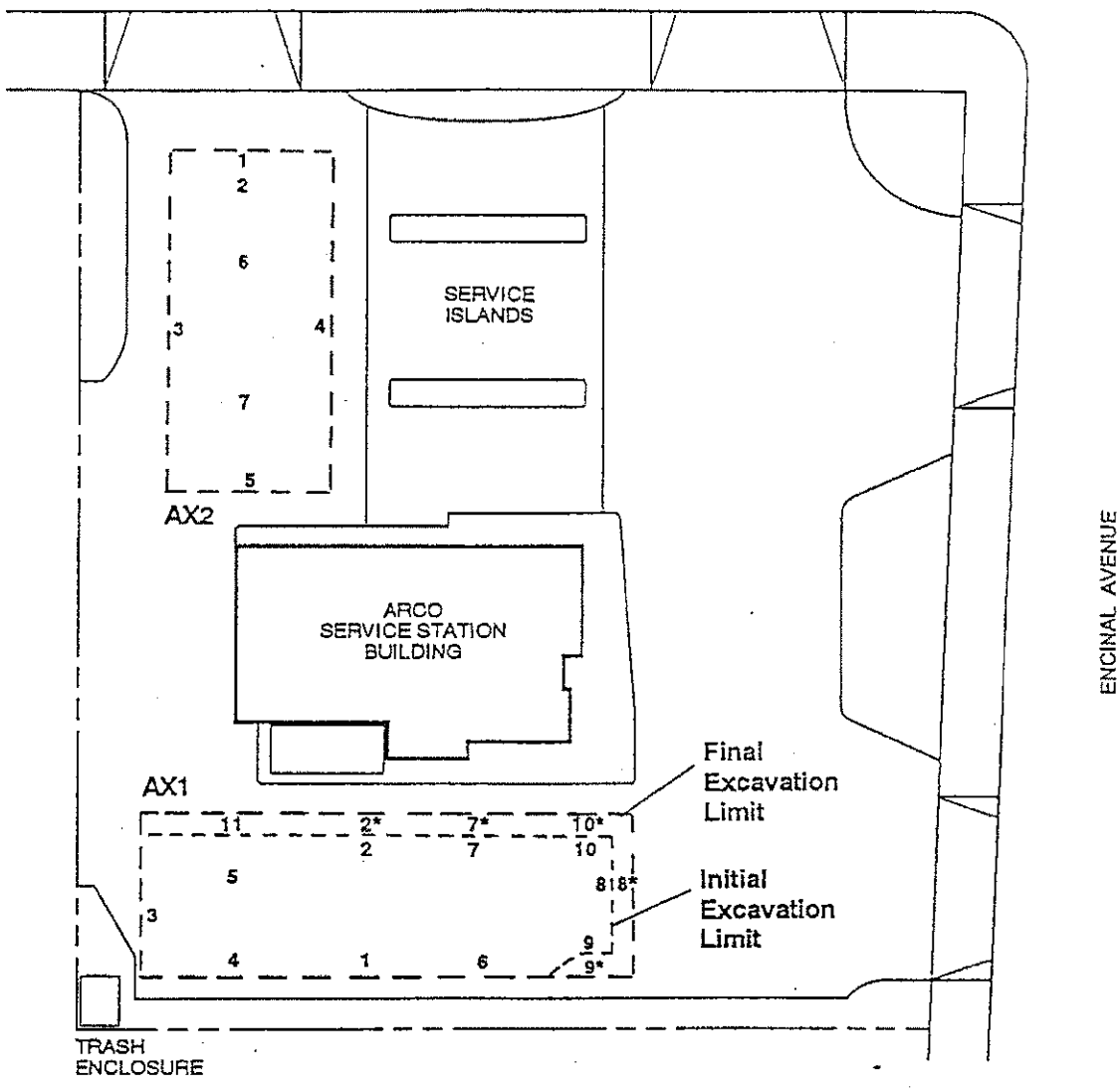
SOIL ANALYTICAL DATA
(TRENCHING)

SAMPLE I.D.	SAMPLE DATE	ANALYZED DATE	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
AT-1	17-Aug-90	20-Aug-90	2000.	<0.8	23.	28.	210.
AT-2	17-Aug-90	20-Aug-90	6.7	0.023	0.088	0.11	0.84
AT-3	17-Aug-90	20-Aug-90	<1.	<0.005	<0.005	<0.005	<0.005
AT-4	17-Aug-90	20-Aug-90	5.8	0.034	0.12	0.057	0.52
AT-7-2	08-Aug-90	16-Aug-90	2.0	0.008	0.017	0.008	0.061
AT-8-2.5	08-Aug-90	16-Aug-90	14.	0.11	0.15	0.28	1.6
AT-9-9.5	20-Aug-90	29-Aug-90	<1.	<0.01	<0.01	<0.01	<0.01
AT-10-2.5	15-Aug-90	17-Aug-90	<1	<0.003	<0.003	<0.003	<0.003
AT-10-9.5	20-Aug-90	28-Aug-90	<1.	<0.005	<0.005	0.008	0.014
AT-11-2.5	15-Aug-90	17-Aug-90	<1	<0.003	<0.003	<0.003	<0.003
AT-12-2.5	15-Aug-90	17-Aug-90	<1	<0.003	<0.003	<0.003	<0.003

COPY

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline
PPM = Parts Per Million

Notes: 1. All data shown as <x are reported as ND (none detected).
2. BTEX data analyzed on August 17, 1990 by Superior are reported in micrograms per kilograms.
3. The last number of the Sample I.D. corresponds to the approximate depth below existing grade that the sample was collected. AT-1 and AT-3 were collected at 3.5 feet below existing grade. AT-2 and AT-4 were collected at 2.5 feet below existing grade.
4. For sample locations, see Plate 4.

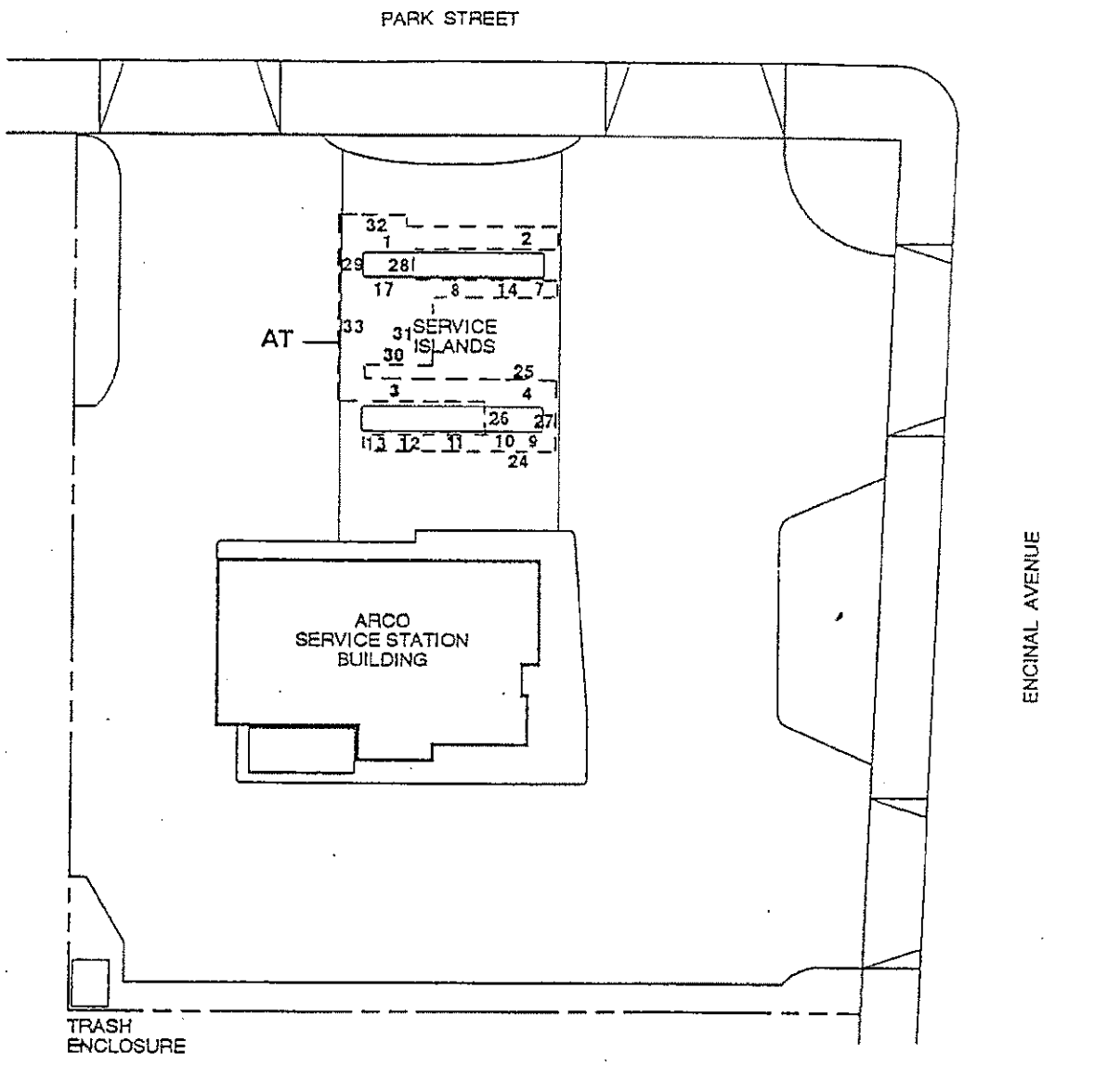


GeoStrategies Inc.

Excavation Soil Sample Map
ARCO Service Station #2112
1260 Park Street
Alameda, California

PLATE **3**

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7920	RG CEG 12/92	10/90		



EXPLANATION

AT — Trench excavation and designation

1 — Sample location and designation

N

COPY

0 30 60

Scale in Feet

GeoStrategies Inc.

Trench Soil Sample Map
ARCO Service Station #2112
1260 Park Street
Alameda, California

PLATE 4

JOB NUMBER	REVIEWED BY RG/CEG	DATE	REVISED DATE	REVISED DATE
7920	CWP CEG 1262	10/90		

TABLE 1

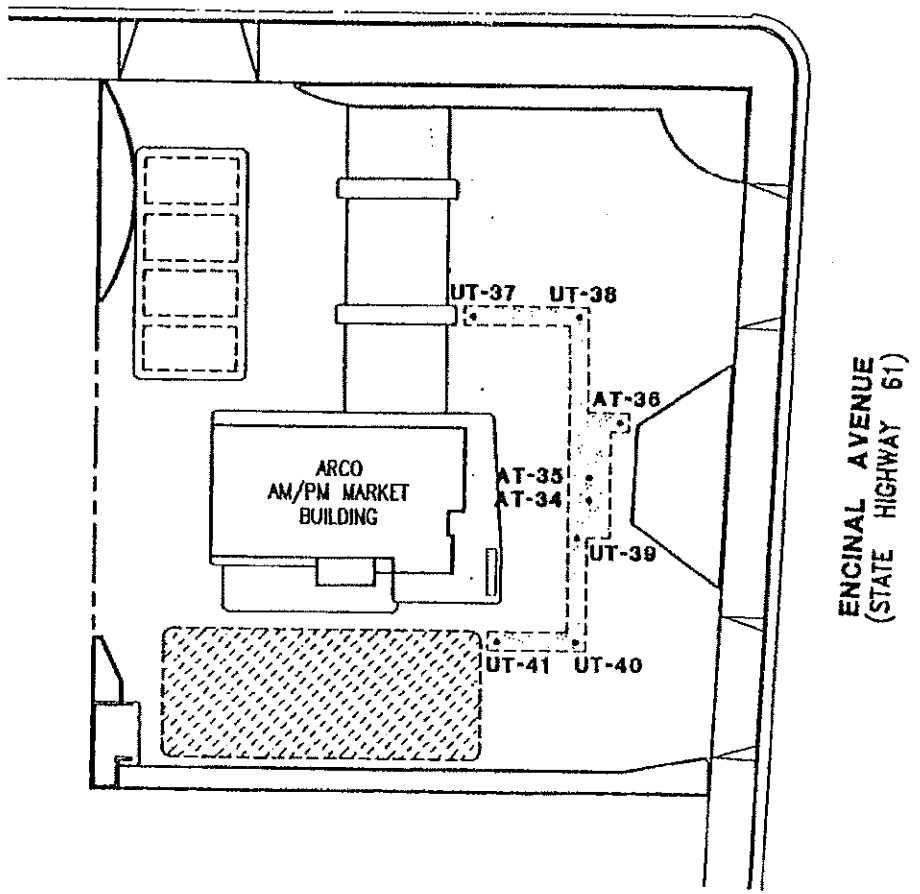
SOIL ANALYTICAL DATA
(Trench Samples)

SAMPLE NO	DEPTH (FT)	SAMPLE DATE	ANALYSIS DATE	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
AT-34	3.0	25-Oct-90	25-Oct-90	<1.0	<0.003	<0.003	<0.003	<0.003
AT-35	3.0	25-Oct-90	25-Oct-90	<1.0	<0.003	<0.003	<0.003	<0.003
AT-36	3.0	25-Oct-90	25-Oct-90	15000	71	710	200	1300
UT-37	4.0	05-Mar-91	08-Mar-91	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
UT-38	4.0	05-Mar-91	08-Mar-91	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
UT-39	4.0	05-Mar-91	08-Mar-91	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
UT-40	3.5	05-Mar-91	08-Mar-91	<1.0	<0.0050	<0.0050	<0.0050	<0.0050
UT-41	3.5	05-Mar-91	08-Mar-91	<1.0	<0.0050	<0.0050	<0.0050	<0.0050

COPY

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline
PPM = Parts Per Million

Notes: 1. BTEX for samples AT-34 through AT-36 were reported in parts per billion (ppb).
2. All data shown as <x are reported as ND (none detected).



EXPLANATION

- Trench Samples
- Approximate location of trench
- Soil Stockpile

COPY

Base Map: ARCO Site Plans dated 3-19-86 and 2-21-90

0 40

Scale in Feet

GeoStrategies Inc.

SOIL SAMPLING MAP
ARCO Service Station #2112
1260 Park Street
Alameda, California

PLATE 3

JOB NUMBER 792001-3

REVIEWED BY DHP

DATE 3/91

REVISED DATE

TABLE 1

SOIL ANALYSES DATA

SAMPLE NO	SAMPLE DATE	ANALYZED DATE	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
AV-1-5.5	23-Sep-91	04-Oct-91	<1.0	<0.005	<0.005	<0.005	<0.005
AV-1-11	23-Sep-91	05-Oct-91	2,900	<5.0	12	6.0	34
AV-2-6	24-Sep-91	04-Oct-91	<1.0	<0.005	<0.005	<0.005	<0.005
AV-2-11	24-Sep-91	04-Oct-91	<1.0	<0.005	<0.005	<0.005	<0.005
AV-3-6.5	25-Sep-91	05-Oct-91	<1.0	<0.005	<0.005	<0.005	<0.005
AV-3-11.5	25-Sep-91	05-Oct-91	540	5.3	12	7.6	35
A-1-5	25-Sep-91	04-Oct-91	<1.0	<0.005	<0.005	<0.005	<0.005
A-1-11	25-Sep-91	05-Oct-91	730	6.4	24	11	56
A-2-12	24-Sep-91	04-Oct-91	<1.0	0.038	0.038	0.038	0.038
A-3-11.5	24-Sep-91	04-Oct-91	<1.0	<0.005	<0.005	<0.005	<0.005
A-4-11	25-Sep-91	04-Oct-91	<1.0	<0.005	<0.005	<0.005	<0.005

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline
PPM = Parts Per Million

Note: 1. All data shown as <x are reported as ND (none detected).

COPY

TABLE 2

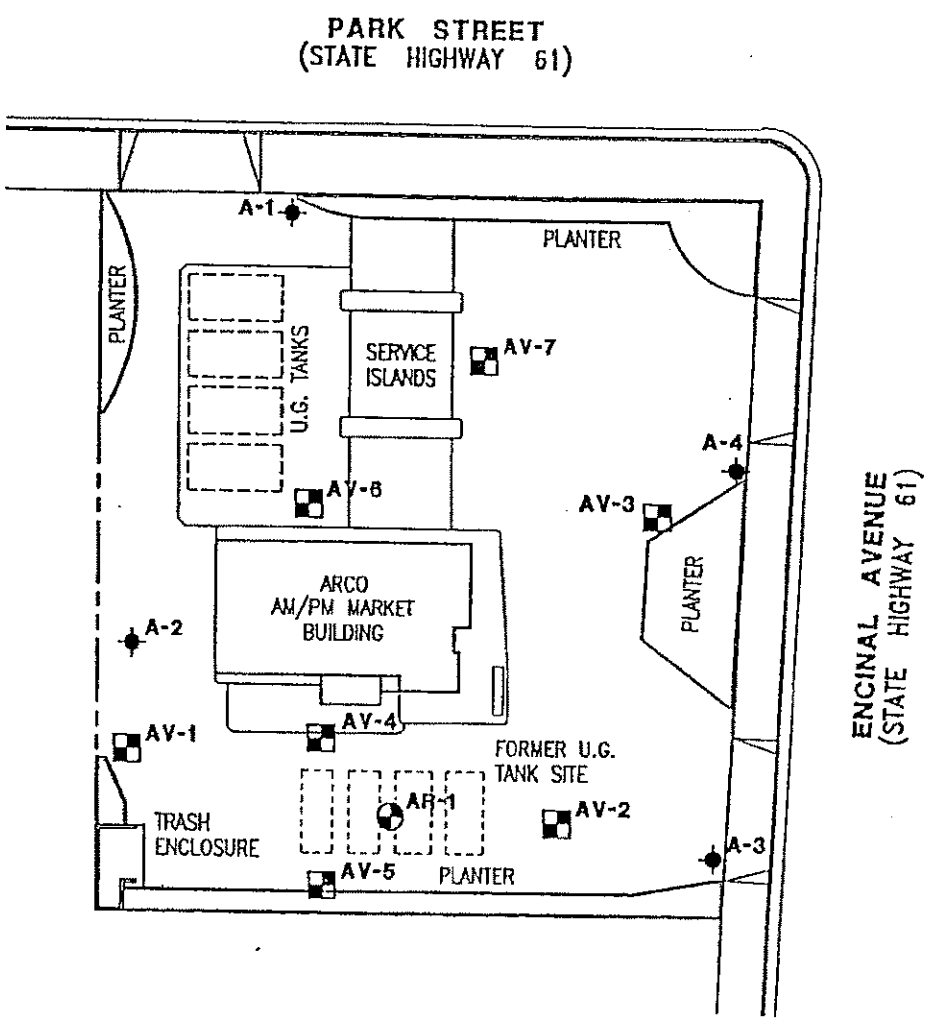
SOIL ANALYSES DATA

SAMPLE NO	SAMPLE DATE	ANALYZED DATE	TPH-G (PPM)	BENZENE (PPM)	TOLUENE (PPM)	ETHYLBENZENE (PPM)	XYLENES (PPM)
AV-4-10.5	02-Jan-92	06-Jan-92	21,000	190	860	290	1,700
AV-5-10.5	02-Jan-92	06-Jan-92	<1	0.0070	0.018	0.0060	0.031
AV-6-10.5	02-Jan-92	06-Jan-92	<1	<0.0050	<0.0050	<0.0050	<0.0050
AV-7-10.5	02-Jan-92	06-Jan-92	<1	<0.0050	<0.0050	<0.0050	<0.0050

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline
PPM = Parts Per Million

Note: 1. All data shown as <x are reported as ND (not detected).

COPY



EXPLANATION

- Ground-water monitoring well
- Ground-water recovery well
- Vapor extraction well

COPY

Base Map: ARCO Site Plans dated 3-19-86 and 2-21-90

0 40

Scale in Feet

GeoStrategies Inc.

SITE PLAN
ARCO Service Station #2112
1260 Park Street
Alameda, California

PLATE 2

JOB NUMBER 792005-5

REVIEWED BY

DATE 2/92

REVISED DATE

TABLE 1

SOIL SAMPLE ANALYTICAL RESULTS

ARCO Service Station No. 2112
1260 Park Street
Alameda, California

Sample ID	Date Sampled	Depth (ft)	Benzene (mg/kg)	Toluene (mg/kg)	Ethyl-benzene (mg/kg)	Total Xylenes (mg/kg)	TPHg (mg/kg)	MTBE (mg/kg)	Lead (mg/kg)
Product Line Samples									
PL-1	07/31/01	3.7	<0.025	<0.025	<0.025	<0.025	<5.0	<0.25	<10
PL-2	07/31/01	4.6	<0.025	<0.025	<0.025	<0.025	<5.0	<0.25	<10
PL-3	07/31/01	4.8	0.32	15	15	94.0	1400	2.6	<10
PL-4	07/31/01	3.6	<0.025	<0.025	<0.025	<0.025	<5.0	<0.25	<10
									<10
Dispenser Samples									
DP-1	07/31/01	3.3	<0.025	<0.025	<0.025	<0.025	<5.0	<0.25	<10
DP-2	07/31/01	4.3	<0.025	<0.025	<0.025	<0.025	<5.0	<0.25	<10
DP-3	07/31/01	4.6	<0.025	<0.025	<0.025	0.120	<5.0	0.58	<10
DP-4	07/31/01	3.5	<0.025	<0.025	<0.025	<0.025	<5.0	<0.25	<10
UST Samples									
UST-1	07/31/01	3	2.4	31	17	110	1400	11	<10
UST-2	07/31/01	3	<0.025	0.060	0.036	0.32	6.3	<0.25	<10
Over-excavation									
PL-3	08/07/01	9	<0.050	0.075	0.072	0.45	<10	11	<10
Soil Stockpile Results									
SP-1,2,3,4	07/31/01		<0.025	0.050	0.05	0.47	11	NA	11
SP-5,6,7,8	08/07/01		0.070	0.16	0.14	5.2	35	NA	<10

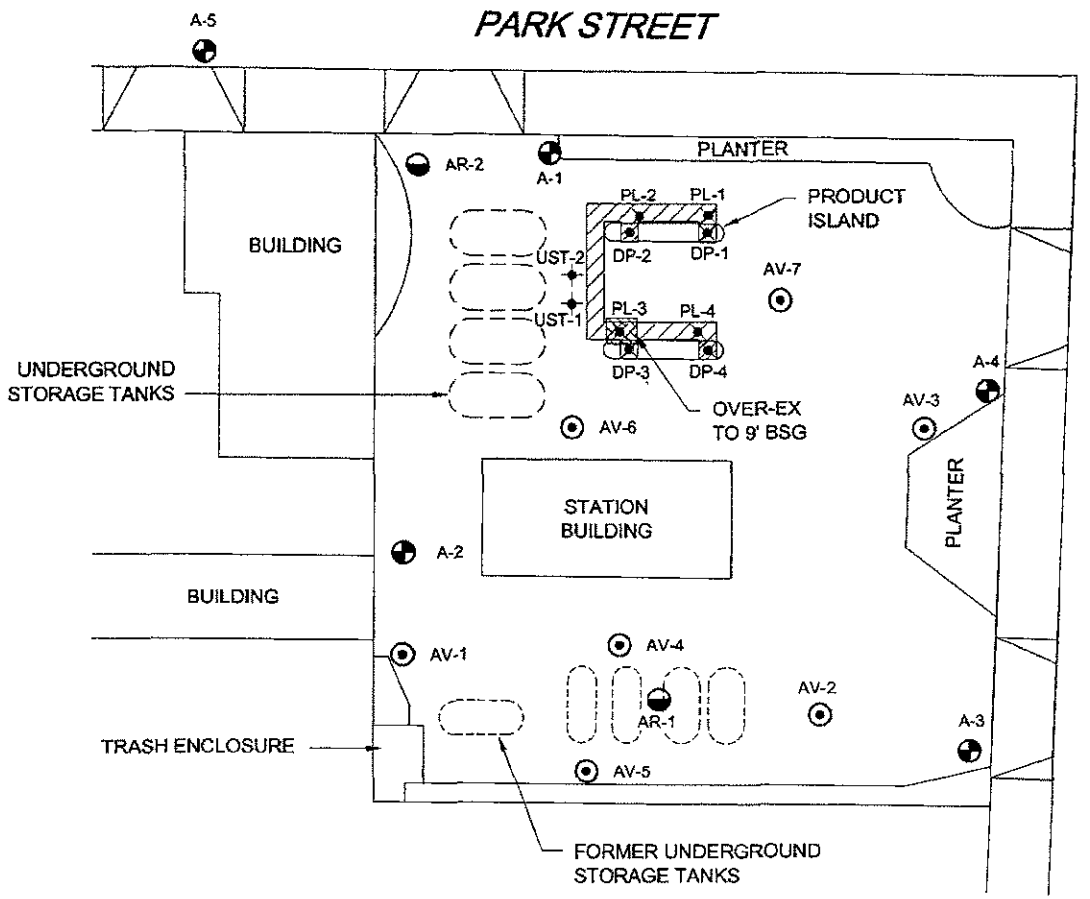
TPHg = Total Petroleum Hydrocarbons as gasoline (C6-C12)

MTBE = Methyl tertiary butyl ether analyzed by EPA Method 8021B unless otherwise noted

µg/L = Micrograms per liter

NA = Not Analyzed

N/A = Not Applicable



DISPENSER PUMP & PRODUCT LINES

SAMPLE I.D.	SAMPLE DEPTH
DP-1	3.3 FEET
DP-2	4.3 FEET
DP-3	4.6 FEET
DP-4	3.5 FEET
PL-1	3.7 FEET
PL-2	4.6 FEET
PL-3	4.8 FEET
PL-4	3.6 FEET
UST-1	3 0 FEET
UST-2	3 0 FEET

LEGEND:

- A-1 — MONITORING WELL LOCATION
- AR-1 — GROUND WATER EXTRACTION WELL LOCATION
- AV-1 — VAPOR EXTRACTION WELL LOCATION
- UST-1 — TANK BASIN SOIL SAMPLE LOCATIONS
- PL-1 — FORMER PRODUCT LINE/ DISPENSER PUMP SOIL SAMPLE LOCATIONS
- PRODUCT LINE EXCAVATION TRENCH

FIGURE 2
SOIL SAMPLE LOCATION MAP

ARCO SERVICE STATION NO. 2112
1260 PARK STREET
ALAMEDA, CALIFORNIA

PROJECT NO 0000-307	DRAWN BY TLA 9/24/01
FILE NO. 2112-1	PREPARED BY TLA
REVISION NO 2	REVIEWED BY

Delta Environmental Consultants, Inc.

\\Sacramento\CAD Files\Sacramento\ARCO\2112\2112-1.dwg

analytical results (EDF) were uploaded to the GeoTracker AB2886 database. Upload confirmation pages are provided in Appendix C.

Soil Samples - Laboratory Analytical Results (mg/kg)

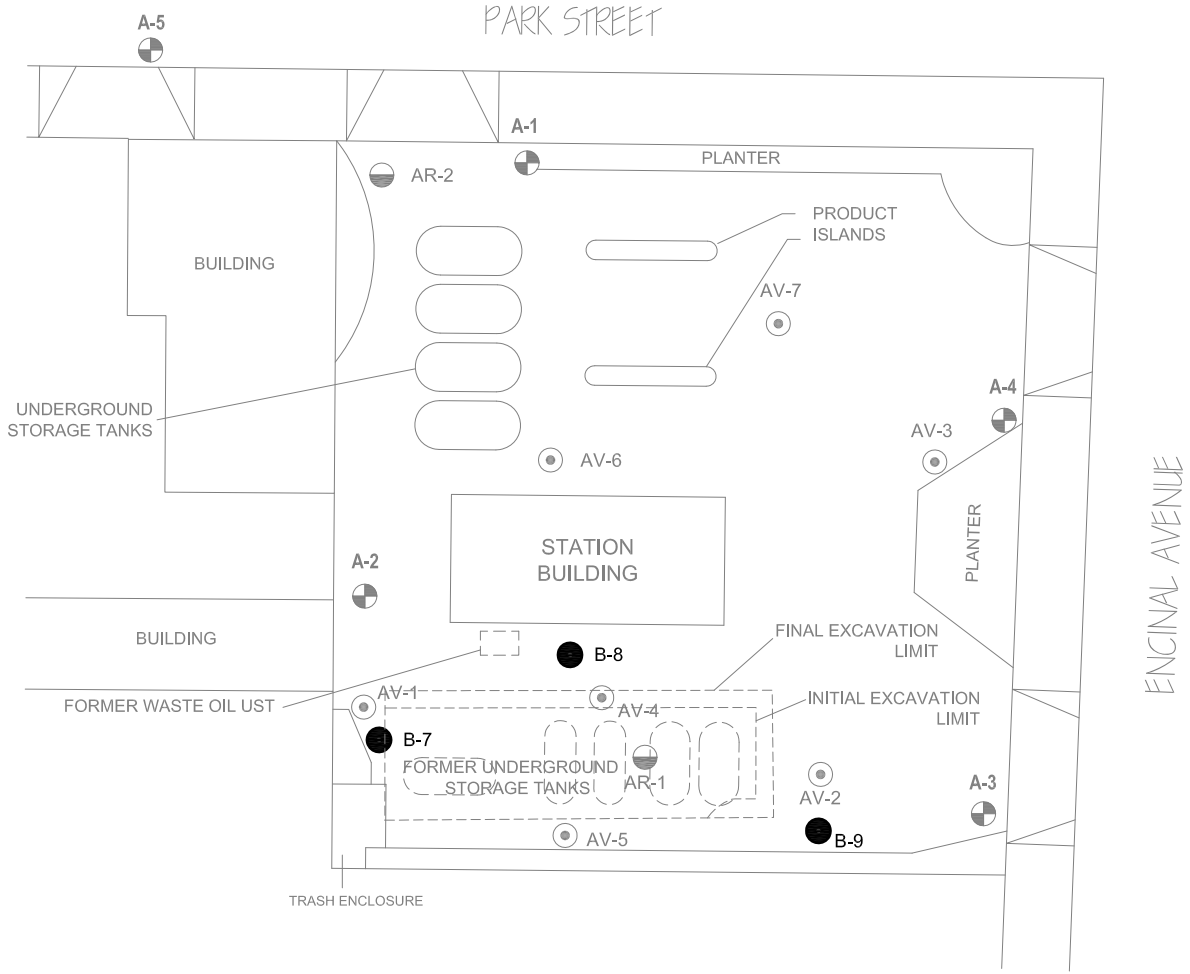
Sample ID	GRO	Benzene	Toluene	Ethylbenzene	Xylenes
B-7 5'	<0.50	<0.001	<0.001	<0.001	<0.001
B-7 8'	<0.50	<0.001	<0.001	<0.001	<0.001
B-7 11'	**2.8**	<0.10	<0.10	**0.14**	<0.10
B-7 14'	**8.6**	<0.001	**0.0016**	**0.0063**	**0.04**
B-8 5'	<0.50	<0.001	<0.001	<0.001	<0.001
B-8 8'	<0.50	<0.001	<0.001	<0.001	**0.0015**
B-8 11'	**2,000**	**0.23**	**14**	**18**	**210**
B-8 14'	**3.2**	<0.001	**0.005**	**0.0044**	**0.031**
B-9 5'	**26**	<0.10	<0.10	**0.31**	**2.8**
B-9 8'	<0.50	<0.001	<0.001	<0.001	**0.0015**
B-9 11'	<0.50	<0.001	<0.001	<0.001	**0.0022**
B-9 14'	<0.50	<0.001	<0.001	<0.001	**0.0023**
ESLs	**100**	**0.12**	**9.3**	**2.3**	**11**

mg/kg – milligrams per kilogram
ESLs – Environmental Screening Levels for Residential Shallow Soil (less than 3 meters)

6.0 DISCUSSION OF FINDINGS

Observed results are summarized in the following bullet points:

- GRO was detected above the laboratory reporting limit in five of the 12 soil samples collected at concentrations up to 2,000 milligrams per kilogram (mg/kg) in sample B-8 11'.
- Benzene was detected above the laboratory reporting limit in one of the 12 samples at a concentration of 0.23 mg/kg in sample B-8 11'.
- Toluene was detected above the laboratory reporting limit in three of the 12 soil samples collected at concentrations up to 14 mg/kg in sample B-8 11'.
- Ethylbenzene was detected above the laboratory reporting limit in five of the 12 soil samples collected at concentrations up to 18 mg/kg in sample B-8 11'.
- Total xylenes were detected above the laboratory reporting limit in eight of the 12 soil samples collected at concentrations up to 210 mg/kg in sample B-8 11'.
- The remaining constituents analyzed for were not detected above their respective laboratory reporting limits in the 12 soil samples collected.
- GRO and BTEX concentrations exceeded the ESLs in sample B-8 11'. GRO and BTEX concentrations detected above laboratory reporting limits in the remaining 11 soil samples collected were below the established ESLs.



LEGEND:

A-1	MONITORING WELL LOCATION
AR-1	GROUND-WATER EXTRACTION WELL LOCATION
AV-1	VAPOR EXTRACTION WELL LOCATION
B-9	BORING LOCATION
- - - - - -	EXCAVATED AREA

0 40 80

SCALE (ft)

BROADBENT & ASSOCIATES, INC.
ENGINEERING, WATER RESOURCES & ENVIRONMENTAL
1324 Mangrove Ave. Suite 212, Chico, California 95926
Project No.: 06-88-616 Date: 4/30/09

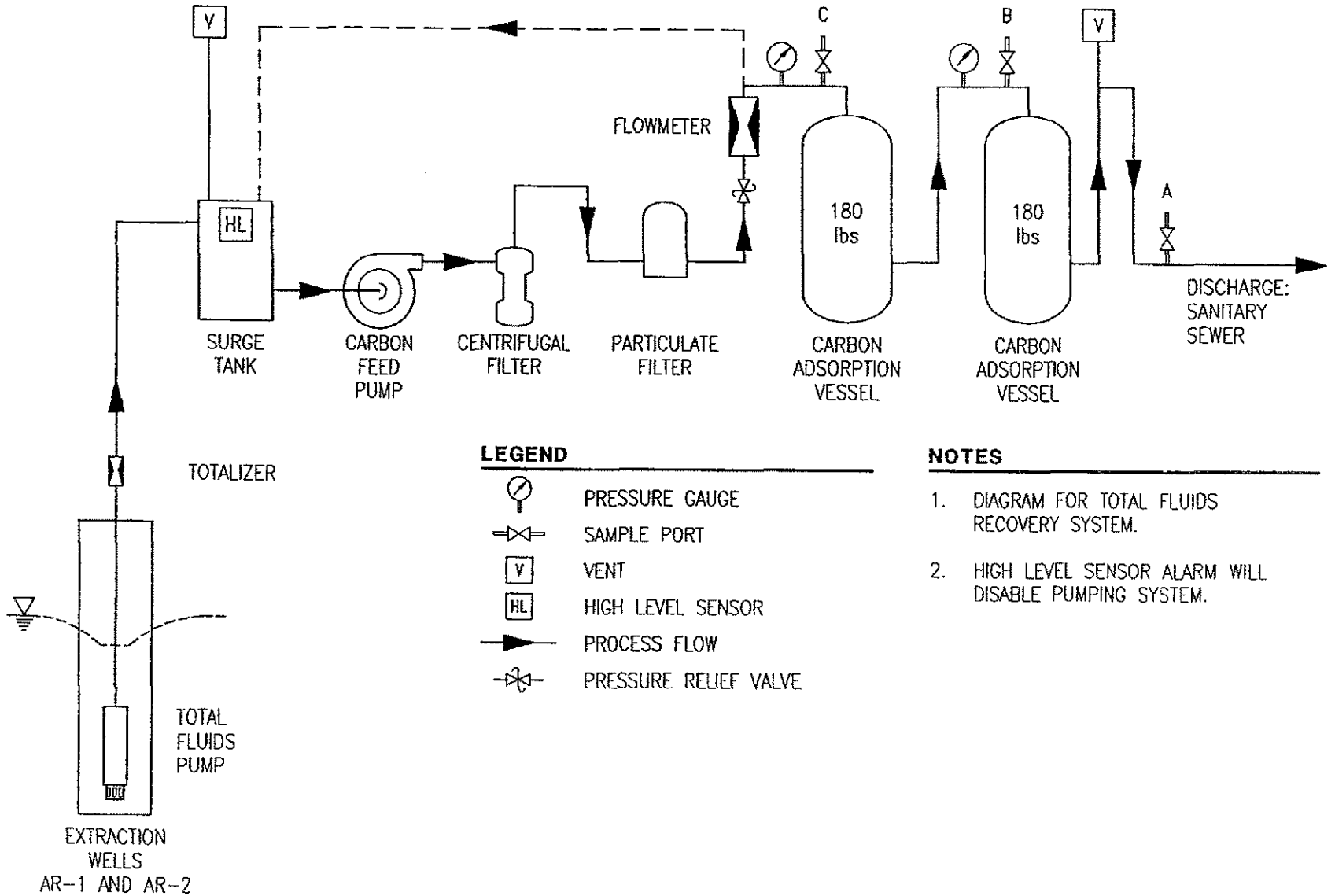
Station #2112
1260 Park Street
Alameda, California

Site Map with Soil Boring Locations and Excavation Limits

Drawing
2

APPENDIX C.

GROUND WATER AND SOIL VAPOR EXTRACTION PERFORMANCE DATA



LEGEND

- PRESSURE GAUGE
- SAMPLE PORT
- V — VENT
- HL — HIGH LEVEL SENSOR
- PROCESS FLOW
- PRESSURE RELIEF VALVE

NOTES

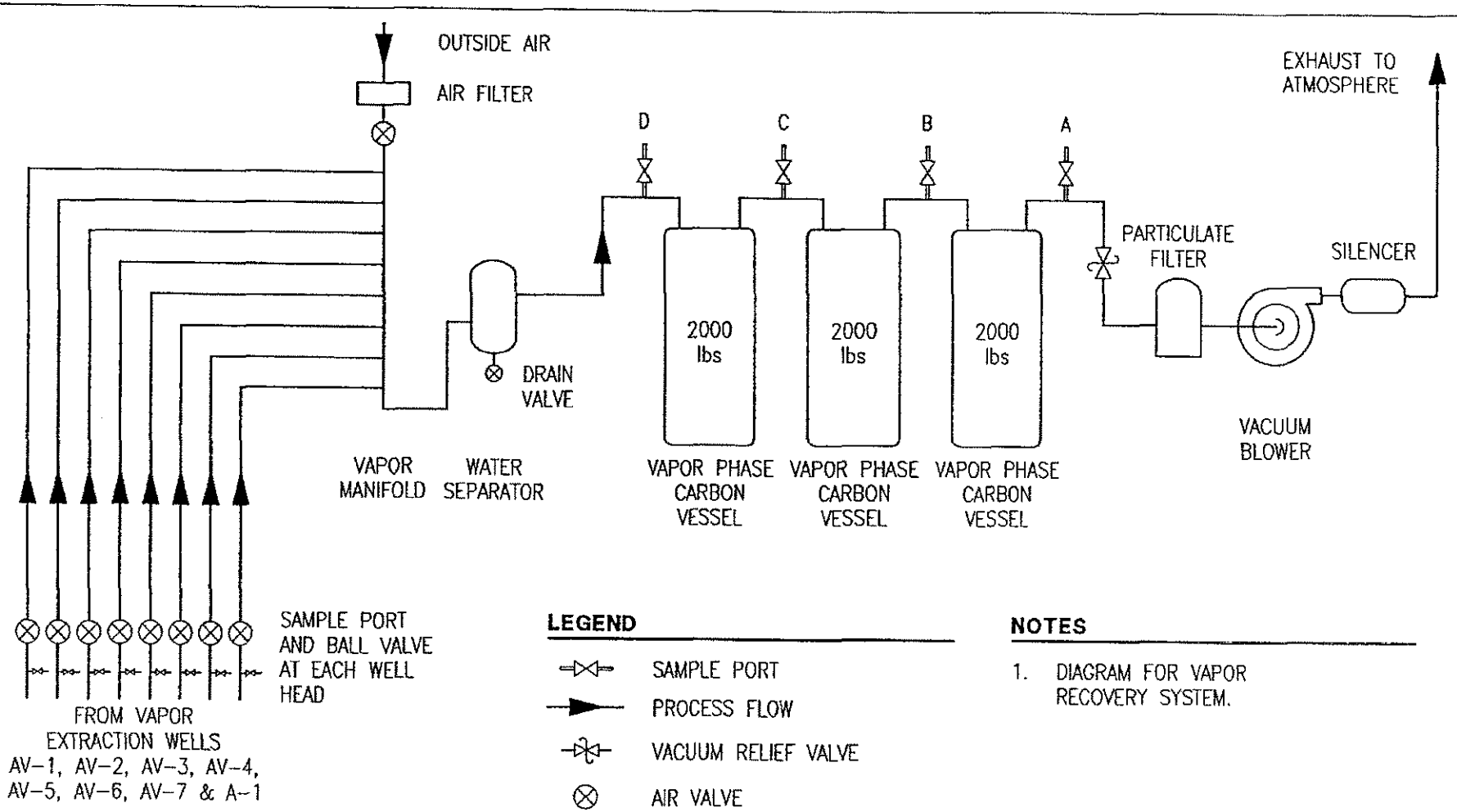
1. DIAGRAM FOR TOTAL FLUIDS RECOVERY SYSTEM.
2. HIGH LEVEL SENSOR ALARM WILL DISABLE PUMPING SYSTEM.

GeoStrategies Inc.

GROUNDWATER SYSTEM PROCESS FLOW DIAGRAM
ARCO Service Station #2112
1260 Park Street
Alameda, California

PLATE **3**

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
7920	BS	6/93	



GeoStrategies Inc.

VAPOR SYSTEM PROCESS FLOW DIAGRAM
ARCO Service Station #2112
1260 Park Street
Alameda, California

PLATE **4**

JOB NUMBER	REVIEWED BY	DATE	REVISED DATE
7920	BS	6/93	

TABLE 4
GROUNDWATER TREATMENT SYSTEM SAMPLING DATA
ARCO Station 2112
Alameda, California

SAMPLE POINT	SAMPLE DATE	SAMPLE TIME	TPH-G (PPB)	BENZENE (PPB)	TOLUENE (PPB)	ETHYLBENZENE (PPB)	XYLENES (PPB)	pH	CONDUCTIVITY (umhos)	TEMP. (C)
A	15-Jul-93	14:02	<50	<0.50	<0.50	<0.50	<0.50	---	---	---
A	23-Aug-93	12:15	<50	<0.50	<0.50	<0.50	<0.50	6.80	832	28.6
A	15-Sep-93	14:20	<50	<0.50	<0.50	<0.50	<0.50	7.20	1000	22.6
B	15-Jul-93	14:05	<50	<0.50	<0.50	<0.50	<0.50	---	---	---
B	23-Aug-93	12:20	<50	<0.50	<0.50	<0.50	<0.50	6.69	835	31.8
B	15-Sep-93	14:25	<50	<0.50	<0.50	<0.50	<0.50	7.25	1070	23.5
C	15-Jul-93	14:08	58	7.5	0.57	3.0	5.1	---	---	---
C	23-Aug-93	12:25	<50	<0.50	<0.50	<0.50	<0.50	6.98	840	26.0
C	15-Sep-93	14:30	<50	3.5	<0.50	1.7	2.3	7.28	1060	23.0
TB	15-Jul-93	---	<50	<0.50	<0.50	<0.50	<0.50	---	---	---
TB	23-Aug-93	---	<50	<0.50	<0.50	<0.50	<0.50	---	---	---
TB	15-Sep093	---	<50	<0.50	<0.50	<050	<0.50	---	---	---

TPH-G = Total Petroleum Hydrocarbons Calculated as Gasoline
PPB = Parts Per Billion.
A = Effluent sample
B = Sample collected between carbon vessels
C = Influent sample
TB = Trip Blank

TABLE 5
GROUNDWATER TREATMENT SYSTEM FLOW/RECOVERY DATA
ARCO Station 2112
Alameda California

Reading Date	Flow Meter Reading (gallons)	Average Flowrates		Laboratory Results			Periodic Dissolved Hydrocarbon Recovery (lb)
		(gal/day)	(gal/min)	Port A TPH-G (ug/l)	Port B TPH-G (ug/l)	Port C TPH-G (ug/l)	
13-Jun-93	412,174	1204	0.84				
15-Jul-93	482,409	2195	1.52	<50	<50	58	0 03
23-Aug-93	525,121	1095	0.76	<50	<50	<50	0 01
15-Sep-93	551,379	1142	0.79	<50	<50	<50	0 00
Averages		1409	0.98				
Totals	139,205						0.04

Notes:
1. Flowrates based on flow meter readings and the number of days between readings.
2 TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline.
3. ug/l = micrograms per liter per billion (ppb).

TABLE 6
VAPOR TREATMENT SYSTEM SAMPLING DATA
ARCO Station 2112
Alameda, California

SAMPLE POINT	SAMPLE DATE	TPH-G (PPMV)	BENZENE (PPMV)	TOLUENE (PPMV)	ETHYLBENZENE (PPMV)	XYLENES (PPMV)
S-1 (Influent, Port D)	07-Sep-93	110	1.7	2.7	0.37	3.0
A1/A2 (Port C)	07-Sep-93	<2.3	<0.019	<0.016	<0.014	<0.014
A2/A3 (Port B)	07-Sep-93	<2.3	<0.019	<0.016	<0.014	<0.014
A-3 (Effluent, Port A)	07-Sep-93	<2.3	<0.019	<0.016	<0.014	<0.014

TPH-G = Total Petroleum Hydrocarbons calculated as Gasoline.
PPMV = Parts Per Million by Volume.

Carbon Adsorption
ARCO Station 2112
1260 Park St./Encinal
Alameda, CA

Table 7
Vapor Extraction System Performance

Date	Cumulative hours	Vapor Flow			Hydrocarbon Concentrations				Periodic Hydrocarbon Recovery			Total Periodic Flow
		Temp (F)	Delta P (in H2O)	Flow (SCFM)	Port A3 (PPMV)	Port A2/A3 (PPMV)	Port A1/A2 (PPMV)	Port S-1 (PPMV)	Vessels A1 (pounds)	Vessels A2 (pounds)	Vessels A3 (pounds)	(SCF)
7-Jan-93	0	50	0.9	199	0	0	0	150	0.00	0.00	0.00	0
8-Jan-93	5	50	1.0	210	0	0	0	180	1.91	0.00	0.00	62,957
11-Jan-93	77	50	1.2	230	0	0	0	120	20.07	0.00	0.00	993,107
12-Jan-93	101	50	1.0	210	0	0	0	130	6.62	0.00	0.00	302,193
13-Jan-93	125	53	1.0	209	0	0	0	120	6.09	0.00	0.00	301,308
14-Jan-93	149	54	1.1	219	0	0	0	100	5.32	0.00	0.00	315,707
15-Jan-93	173	54	1.1	219	0	0	0	120	6.38	0.00	0.00	315,707
18-Jan-93	245	50	1.0	210	0	0	0	70	10.69	0.00	0.00	906,579
19-Jan-93	269	52	1.0	209	0	0	0	50	2.54	0.00	0.00	301,602
20-Jan-93	293	54	1.0	209	0	0	0	50	2.53	0.00	0.00	301,015
21-Jan-93	317	55	1.1	219	0	0	0	85	4.51	0.00	0.00	315,400
22-Jan-93	341	55	1.0	209	0	0	0	40	2.03	0.00	0.00	300,722
5-Feb-93	605	58	0.95	203	0	0	0	55	29.77	0.00	0.00	3,214,837
18-Feb-93	917	58	1.0	208	0	0	0	37	24.29	0.00	0.00	3,898,054
12-Mar-93	1445	62	1.1	218	0	14	30	50	23.21	18.57	16.25	6,892,124
25-Mar-93	1446	63	1.05	212	0	0	0	79	0.17	0.00	0.00	12,741
20-May-93	1998	64	0.85	179	0	0	0	26	25.99	0.00	0.00	5,937,228
3-Sep-93	1998	70	0.82	174	0	0	0	300	0.00	0.00	0.00	0
7-Sep-93	2094	72	0.82	177	0	0	0	110	18.84	0.00	0.00	1,017,296
3rd Quarter 1993	96								18.84	0.00	0.00	1,017,296
Total	2094								190.96	18.57	16.25	25,388,576
Averages				206				99				

PPMV = parts per million by volume.
SCFM = standard cubic feet per minute.

Notes:
1) Cumulative hours calculated from dates given on field logs.
2) Total hydrocarbons captured by all three carbon vessels = 225.8 pounds
3) A molecular weight of 65 was used to calculate hydrocarbon recovery.

Table D-1
Groundwater Extraction System Performance Data

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

Sample I.D.	Date Sampled	Totalizer Reading (gallons)	Net Volume (gallons)	Average Flow Rate (gpm)	TPPH as Gasoline: Influent Concentration (µg/L)	TPPH as Gasoline: Net Removed (lbs)	TPPH as Gasoline: Removed to Date (lbs)	Benzene: Influent Concentration (µg/L)	Benzene: Net Remove (lbs)	Benzene: Removed to Date (lbs)	Primary Carbon Loading (percent)
INFL	06/28/94	741,520	N/A	1.3	ND	0.00	0.80	ND	0.000	0.133	1.0
INFL	11/04/94 a	782,881	41,361	N/A	ND	0.00	0.80	ND	0.000	0.133	1.0
INFL	03/07/95 b	804,954	22,073	N/A	NS	0.00	0.80	NS	0.000	0.133	1.0
INFL	04/20/95	826,131	21,177	0.3	ND	0.00	0.80	ND	0.000	0.133	1.0
INFL	05/03/95	836,000	9,869	0.5	NS	0.00	0.80	NS	0.000	0.133	1.0
INFL	06/06/95	898,000	62,000	1.3	NS	0.00	0.80	NS	0.000	0.133	1.0
INFL	07/06/95 c	945,200	47,200	1.1	74	0.01	0.81	13	0.003	0.135	1.0
INFL	08/03/95 d	945,200	0	0.0	ND	0.00	0.81	3.5	0.000	0.135	1.0
REPORTING PERIOD: 01/01/96 - 03/31/96											
TOTAL POUNDS REMOVED:							**0.81**			**0.135**	
TOTAL GALLONS REMOVED:							**0.13**			**0.018**	
PERIOD POUNDS REMOVED:						**0.00**			**0.000**		
PERIOD GALLONS REMOVED:						**0.00**			**0.000**		
TOTAL GALLONS EXTRACTED:					**945,200**						
PERIOD GALLONS EXTRACTED:					**0**						
PERIOD AVERAGE FLOW RATE (gpm):					**N/A**						

TPPH = Total purgeable petroleum hydrocarbons
gpm = Gallons per minute
µg/L = Micrograms per liter
lbs = Pounds
N/A = Not available or not applicable
ND = Not detected above the detection limit
NS = Not sampled (system influent sampled quarterly in January, April, July, and August)
a. System shut down for repair by Pacific Environmental Group, Inc. on November 4, 1994.
b. System restarted March 7, 1995; continuous operation began on this date.
c. GWE system shut down for pulsing.
d. GWE system re-started for sampling, then temporarily shut down August 3, 1995.
Mass removed is an approximation calculated using averaged concentrations.
Pounds of hydrocarbons removed to date provided by prior consultant, GeoStrategies Incorporated.
Prior to June 1995, TPPH as gasoline was reported as TPH as gasoline.
See certified analytical reports for detection limits.

Table D-2
Soil Vapor Extraction System Performance Data

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

Sample I.D.	Date Sampled	Hourmeter Reading (hours)	Hours of Operation (hours)	Vacuum (" H20)	Flow Rate (scfm)	TPPH as Gasoline: Influent Concentration (ppmv)	TPPH as Gasoline: Removal Rate (lbs/day)	TPPH as Gasoline: Removed to Date (lbs)	Benzene: Influent Concentration (ppmv)	Benzene: Removal Rate (lbs/day)	Benzene: Removed to Date (lbs)
INFL	11/04/94 a	N/A	N/A	N/A	210	N/A	N/A	276.7	N/A	N/A	0.18
INFL	11/14/94 a	N/A	15	66	210	36	3.0	278.6	0.72	0.05	0.22
INFL	11/16/94	N/A	38	42	210	54	4.3	284.4	0.89	0.06	0.30
INFL	11/17/94	N/A	12	42	290	43	4.7	286.7	0.46	0.04	0.32
INFL	11/30/94	N/A	39	40	240	28	2.6	292.6	0.37	0.03	0.38
INFL	12/02/94 b	N/A	36	50	240	28	2.6	295.4	ND	0.00	0.40
INFL	01/11/95 c	N/A	0	27	100	11	0.4	296.4	ND	0.00	0.40
INFL	02/02/95 d	N/A	528	36.5	170	20	0.3	304.2	ND	0.00	0.40
INFL	04/12/95 e	N/A	0	3.5 f	190	26	1.9	304.2	0.22	0.01	0.40
INFL	04/20/95	N/A	192	3.0 f	200	3.3	0.3	312.7	ND	0.00	0.45
INFL	05/03/95	0.0 g	312	4.0 f	200	ND	0.0	314.3	ND	0.00	0.45
INFL	06/06/95	764.0	764	44	210	5.9	0.5	321.6	0.092	0.01	0.55
INFL	07/06/95 h	1,201.7	438	45	210	12	0.9	334.6	0.092	0.01	0.66
INFL	08/03/95 i	1,203.3	2	43	215	11	0.9	334.6	0.18	0.01	0.66
REPORTING PERIOD: 01/01/66 - 03/31/96											
TOTAL POUNDS REMOVED:								**334.6**			**0.66**
TOTAL GALLONS REMOVED:								**54.9**			**0.09**
PERIOD POUNDS REMOVED:							**0.0**			**0.00**	
PERIOD GALLONS REMOVED:							**0.0**			**0.00**	
PERIOD AVERAGE FLOW RATE:					**N/A**						
TOTAL HOURS OF OPERATION:			**2,375**								

TPPH = Total purgeable petroleum hydrocarbons
" H20 = Inches of water
scfm = Standard cubic feet per minute
ppmv = Parts per million by volume
lbs = Pounds
N/A = Not available or not applicable
ND = Not detected

a. System started, run approx. 7 hours 11/4/94 by PACIFIC; restarted on 11/14/94.
b. System shut down pending the BAAQMDs approval of a monthly monitoring schedule.
c. System restarted with BAAQMD's approval to monitor the system on a monthly basis.
d. System down; performance values estimated by averaging two previous values.
e. System restarted on 4/12/95.
f. Vacuum measured in inches of mercury rather than inches of water.
g. Hourmeter installed 5/3/95 (initial reading = 0.0 hours).
h. SVE system shut down for pulsing.
i. SVE system restarted for sampling, then temporarily shut down 8/3/95.

Mass removed is an approximation calculated using averaged instantaneous mass removal rates.
Pounds of hydrocarbons removed to date provided by prior consultant, GeoStrategies Incorporated.
Timer disconnected on November 15, 1994; continuous operation during week initiated, shutdown weekends.
Prior to June 1995, TPPH as gasoline was reported as TPH calculated as gasoline.
See certified analytical reports for detection limits.

Table D-3
Soil Vapor Extraction Well Data

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

Date System Monitored	Well Number																			
	A-1					AV-1					AV-2					AV-3				
	Status (O/C)	Vacuum (" H20) M	Vacuum (" H20) W	TPPH as Gasoline (ppmv)	Benzene (ppmv)	Status (O/C)	Vacuum (" H20) M	Vacuum (" H20) W	TPPH as Gasoline (ppmv)	Benzene (ppmv)	Status (O/C)	Vacuum (" H20) M	Vacuum (" H20) W	TPPH as Gasoline (ppmv)	Benzene (ppmv)	Status (O/C)	Vacuum (" H20) M	Vacuum (" H20) W	TPPH as Gasoline (ppmv)	Benzene (ppmv)
11/15/94	O	68	68	180 *	N/A *	O	68	68	20 *	N/A *	O	68	66	ND *	N/A *	O	64	60	4.0 *	N/A *
11/16/94	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A
11/17/94	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A
12/01/95	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A
12/02/95	O	40	N/A	200 *	N/A *	O	40	N/A	70 *	N/A *	O	40	N/A	15 *	N/A *	O	40	N/A	10 *	N/A *
01/11/95	O	37	N/A	6.1 +	0.06 +	O	37	N/A	ND +	ND +	O	36	N/A	ND +	ND +	O	36	N/A	ND +	ND +
04/20/95	O	48	48	14 +	0.15 +	O	48	48	ND +	ND +	O	48	48	ND +	ND +	O	48	48	ND +	ND +
05/03/95	O	55	48	35 *	N/A *	O	55	50	ND *	N/A *	O	55	50	ND *	N/A *	O	55	50	ND *	N/A *
06/06/95	O	43	40	55 *	N/A *	O	43	42	65 *	N/A *	O	43	42	6 *	N/A *	O	43	42	5.5 *	N/A *
07/06/95	O	45	41	50 +	ND +	O	45	43	6 +	0.03 +	O	45	43	ND +	ND +	O	45	43	18 +	0.2 +
08/03/95 a	O	43	39	11 *	N/A *	O	43	42	12 *	N/A *	O	43	42	10 *	N/A *	O	43	41	6 *	N/A *

Date System Monitored	Well Number																			
	AV-4					AV-5					AV-6					AV-7				
	Status (O/C)	Vacuum (" H20) M	Vacuum (" H20) W	TPPH as Gasoline (ppmv)	Benzene (ppmv)	Status (O/C)	Vacuum (" H20) M	Vacuum (" H20) W	TPPH as Gasoline (ppmv)	Benzene (ppmv)	Status (O/C)	Vacuum (" H20) M	Vacuum (" H20) W	TPPH as Gasoline (ppmv)	Benzene (ppmv)	Status (O/C)	Vacuum (" H20) M	Vacuum (" H20) W	TPPH as Gasoline (ppmv)	Benzene (ppmv)
11/15/94	O	64	62	300 *	N/A *	O	68	68	150 *	N/A *	O	64	64	60 *	N/A *	O	64	60	50 *	N/A *
11/16/94	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A
11/17/94	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A
12/01/95	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A	O	40	N/A	N/A	N/A
12/02/95	O	40	N/A	175 *	N/A *	O	40	N/A	10 *	N/A *	O	40	N/A	15 *	N/A *	O	40	N/A	30 *	N/A *
01/11/95	O	33	N/A	3.7 +	0.22 +	O	36	N/A	0.03 +	ND +	O	35	N/A	3.0 +	0.31 +	O	35	N/A	165.5 +	ND +
04/20/95	O	48	N/A	26 +	0.04 +	O	48	48	ND +	ND +	O	48	46	ND +	ND +	O	48	46	5.9 +	ND +
05/03/95	O	55	N/A	N/A *	N/A *	O	55	47	ND *	N/A *	O	55	46	ND *	N/A *	O	55	48	10 *	N/A *
06/06/95	O	43	N/A	150 *	N/A *	O	43	40	20 *	N/A *	O	43	39	8 *	N/A *	O	43	40	8 *	N/A *
07/06/95	O	45	N/A	95 +	0.43 +	O	45	41	284 +	2 +	O	45	41	ND +	0.07 +	O	45	41	4 +	0.03 +
08/03/95 a	O	43	N/A	192 *	N/A *	O	43	40	21 *	N/A *	O	43	38	2 *	N/A *	O	43	39	3 *	N/A *

TPPH = Total purgeable petroleum hydrocarbons
O = Valve open
C = Valve closed
" H20 = Inches of water
ppmv = Parts per million by volume; converted from micrograms per liter.
Pacific Environmental Group, Inc. startup 11/4/94; prior consultant was GeoStrategies Inc.
Prior to June 1995, TPPH as gasoline was reported as TPH as gasoline.

M = Vacuum measured at manifold
W = Vacuum measured at well head
* = Concentration readings obtained by flame-ionization detector (FID).
+ = Air bag sampled analyzed by EPA Method 8015/8020.
N/A = Not available or not applicable
ND = Not detected above the detection limit
a. Remediation systems temporarily shut down 8/3/95.

Figure D-1
Groundwater Extraction System Mass Removal Trend

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

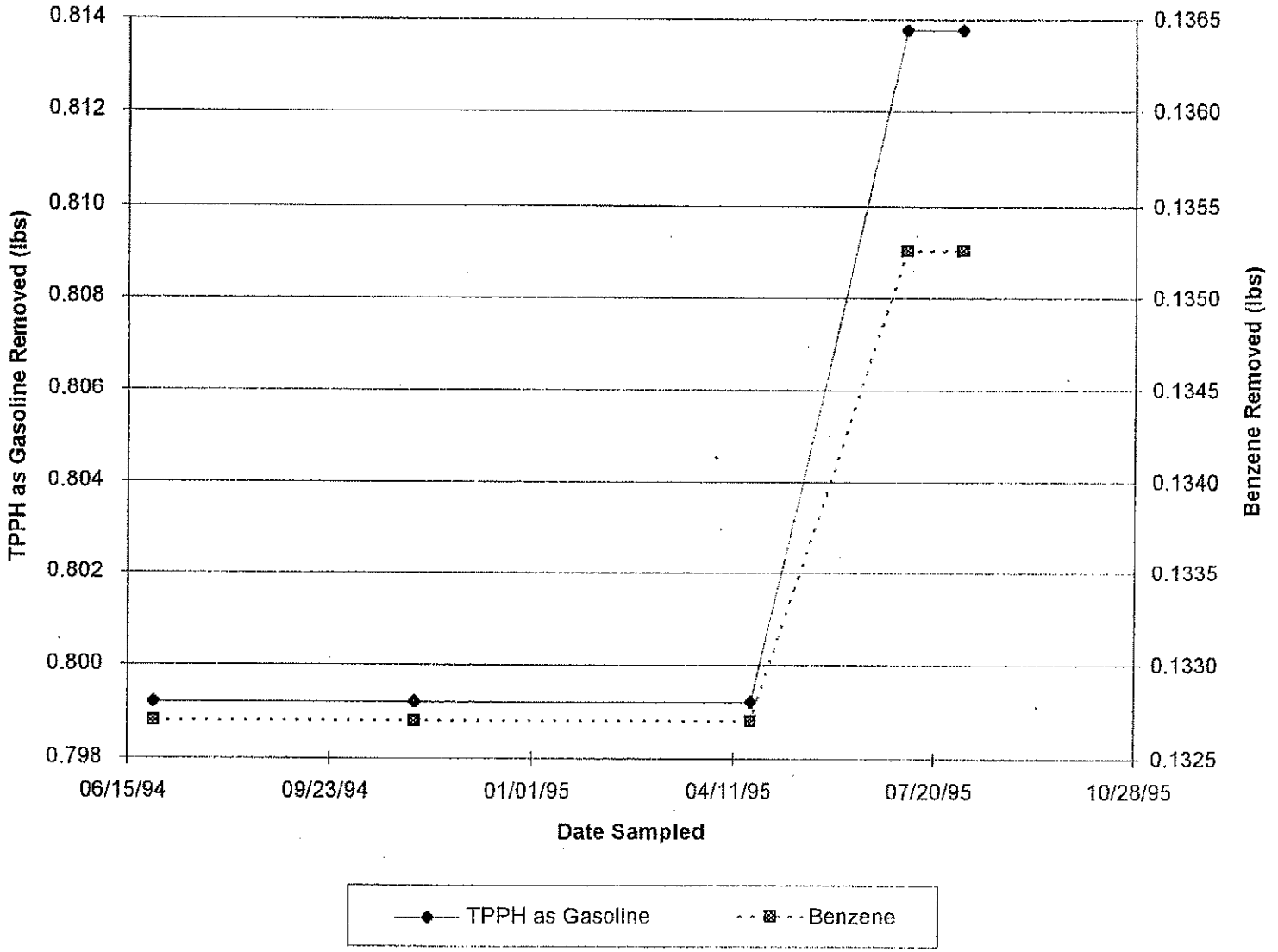


Figure D-2
Groundwater Extraction System Hydrocarbon Concentrations

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

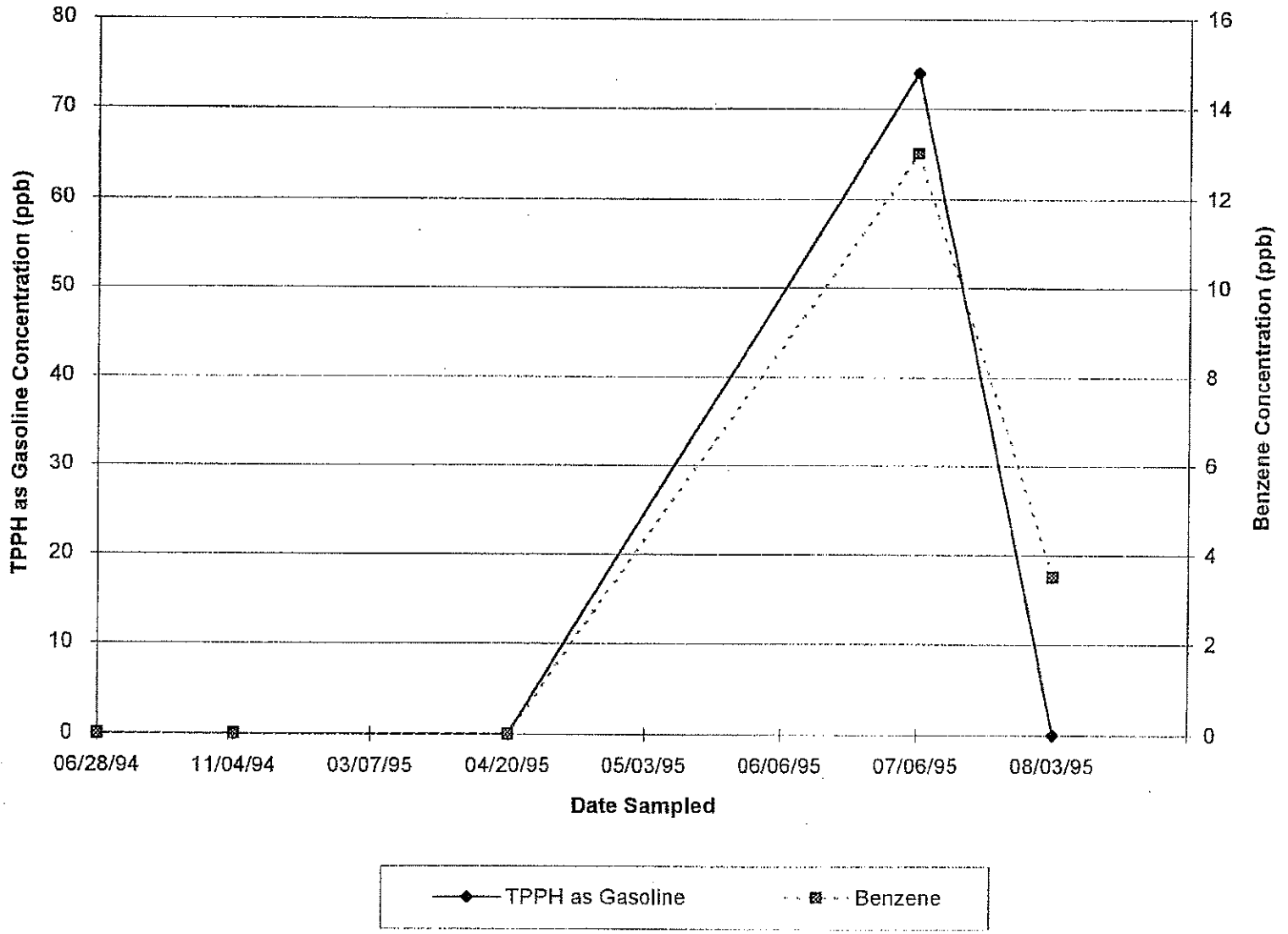


Figure D-3
Soil Vapor Extraction System Mass Removal Trend

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

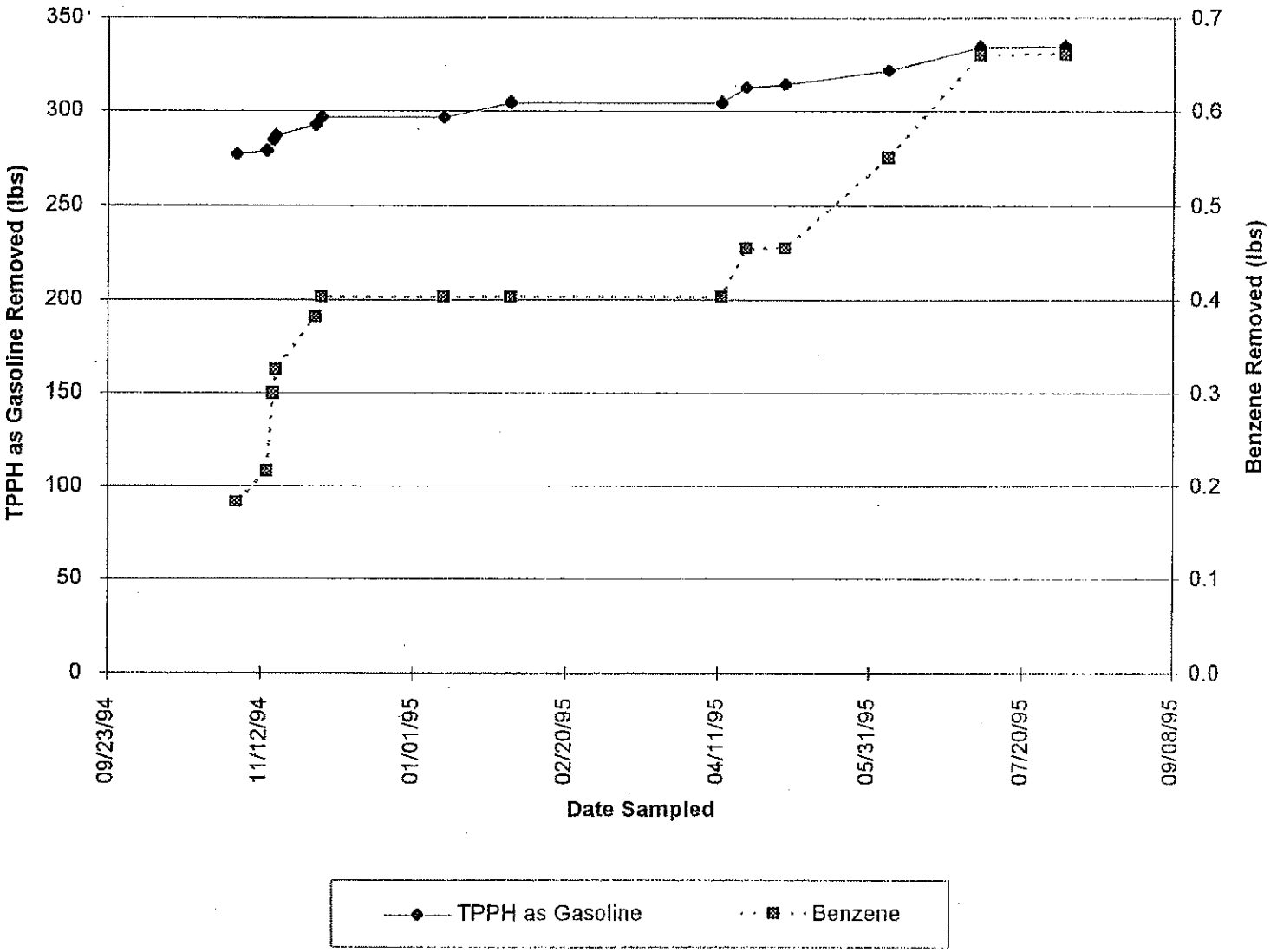
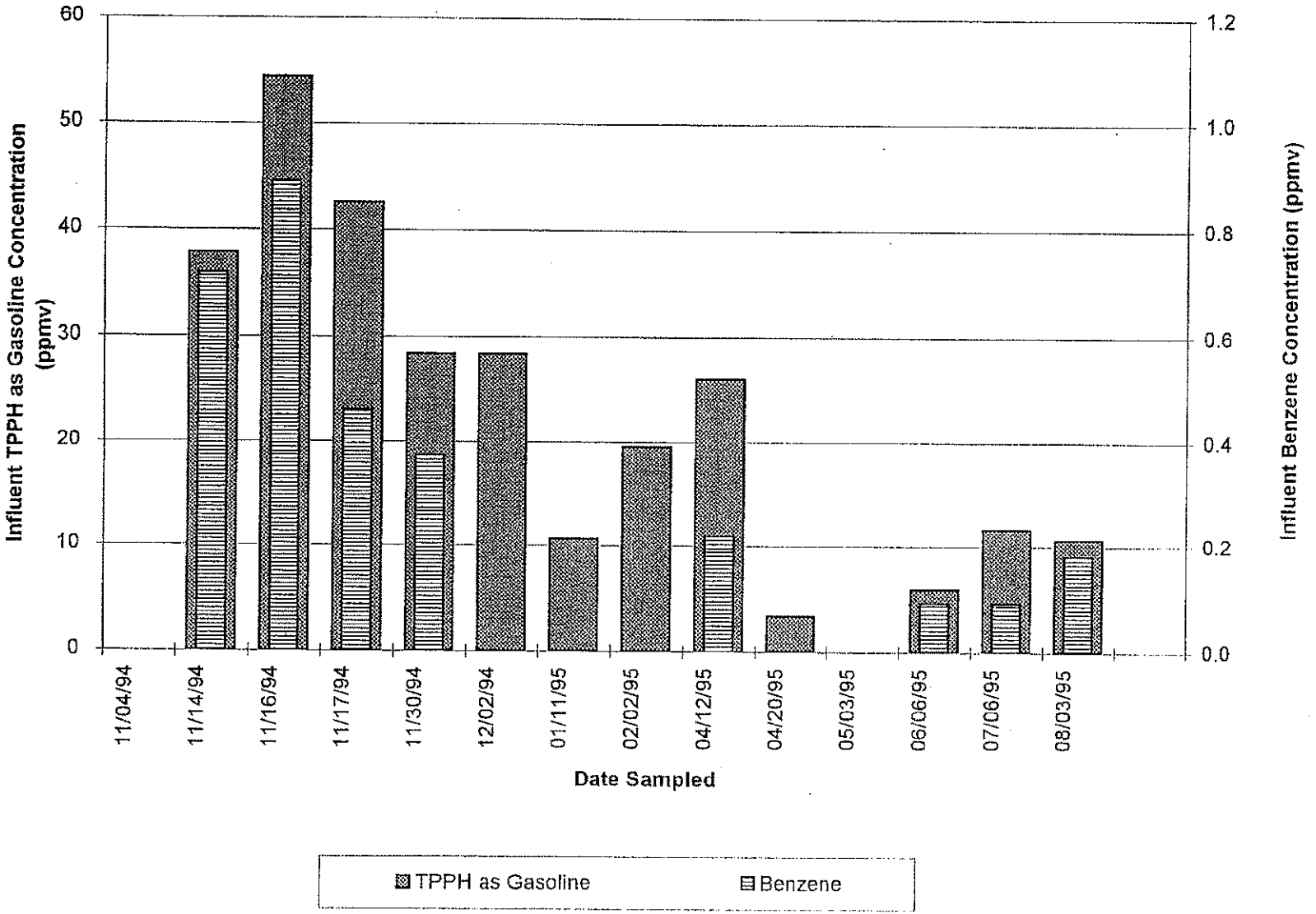


Figure D-4
Soil Vapor Extraction System Hydrocarbon Concentrations

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California



APPENDIX D.

HISTORIC GROUND-WATER ELEVATION AND ANALYTICAL DATA

Table A-1
Historical Groundwater Elevation Data

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

Well Number	Date Gauged	Well Elevation (feet, MSL)	Depth to Water (feet, TOB)	Groundwater Elevation (feet, MSL)
A-1	10/07/91	28.39	16.47	11.92
	02/18/92		17.16	11.23
	05/22/92		17.14	11.25
	08/14/92		16.63	11.76
	10/23/92		16.28	12.11
	01/28/93		17.34	11.05
	02/24/93		18.43	9.96
	04/28/93		17.71	10.68
	05/28/93		17.18	11.21
	06/16/93		16.63	11.76
	07/27/93		16.60	11.79
	08/24/93		16.44	11.95
	09/28/93		16.66	11.73
	10/22/93		16.67	11.72
	11/16/93		16.56	11.83
	12/16/93		16.96	11.43
	02/07/94		17.62	10.77
	05/02/94		17.17	11.22
	08/05/94		11.40	16.99
	11/30/94		9.43	18.96
	02/22/95		10.76	17.63
	05/23/95		9.25	19.14
	08/09/95		11.33	17.06
	11/16/95		12.11	16.28
A-2	10/07/91	29.28	12.74	16.54
	02/18/92		11.55	17.73
	05/22/92		11.71	17.57
	08/14/92		12.54	16.74
	10/23/92		12.64	16.64
	01/28/93		10.29	18.99
	02/24/93		11.05	18.23
	04/28/93		10.91	18.37
	05/28/93		11.27	18.01
	06/16/93		12.20	17.08
	07/27/93		11.27	18.01
	08/24/93		12.25	17.03
	09/28/93		12.36	16.92
	10/22/93		12.18	17.10
	11/16/93		12.34	16.94
	12/16/93		11.74	17.54
	02/07/94		10.56	18.72
	05/02/94		11.48	17.80
	08/05/94		12.26	17.02
	11/30/94		10.93	18.35
	02/22/95		10.55	18.73
	05/23/95		11.05	18.23
	08/09/95		11.70	17.58
	11/16/95		12.64	16.64
A-3	10/07/91	27.87	10.55	17.32
	02/18/92		9.12	18.75
	05/22/92		9.41	18.46
	08/14/92		10.31	17.56
	10/23/92		10.57	17.30
	01/28/93		7.66	20.21
	02/24/93		8.28	19.59
	04/28/93		6.76	21.11

Table A-1 (continued)
Historical Groundwater Elevation Data

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

Well Number	Date Gauged	Well Elevation (feet, MSL)	Depth to Water (feet, TOB)	Groundwater Elevation (feet, MSL)
A-3	05/28/93		8.98	18.89
(cont.)	06/16/93		9.69	18.18
	07/27/93		9.66	18.21
	08/24/93		9.85	18.02
	09/28/93		10.21	17.66
	10/22/93		10.05	17.82
	11/16/93		11.20	16.67
	11/16/93		9.42	18.45
	02/07/94		8.29	19.58
	05/02/94		9.08	18.79
	08/05/94		10.02	17.85
	11/30/94		8.53	19.34
	02/22/95		7.90	19.97
	05/23/95		8.60	19.27
	08/09/95		9.30	18.57
	11/16/95		NM	--
A-4	10/07/91	28.54	11.40	17.14
	02/18/92		10.52	18.02
	05/22/92		10.45	18.09
	08/14/92		11.22	17.32
	10/23/92		11.44	17.10
	01/28/93		9.12	19.42
	02/24/93		9.91	18.63
	04/28/93		8.29	20.25
	05/28/93		9.92	18.62
	06/16/93		10.64	17.90
	07/27/93		10.81	17.73
	08/24/93		10.98	17.56
	09/28/93		11.08	17.46
	10/22/93		11.06	17.48
	11/16/93		10.27	18.27
	12/16/93		10.64	17.90
	02/07/94		9.42	19.12
	05/02/94		10.33	18.21
	08/05/94		10.94	17.60
	11/30/94		9.89	18.65
	02/22/95		9.44	19.10
	05/23/95		9.80	18.74
	08/09/95		10.39	18.15
	11/16/95		NM	--
A-5	06/26/92	27.29	10.77	16.52
	08/14/92		11.04	16.25
	10/23/92		11.12	16.17
	01/28/93		9.94	17.35
	02/24/93		10.63	16.66
	04/28/93		10.70	16.59
	05/28/93		10.35	16.94
	06/16/93		10.76	16.53
	07/27/93		10.78	16.51
	08/24/93		10.97	16.32
	09/28/93		10.90	16.39
	10/22/93		10.82	16.47
	11/16/93		10.98	16.31
	12/16/93		10.70	16.59
	02/07/94		9.96	17.33
	05/02/94		10.59	16.70

Table A-1 (continued)
Historical Groundwater Elevation Data

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

Well Number	Date Gauged	Well Elevation (feet, MSL)	Depth to Water (feet, TOB)	Groundwater Elevation (feet, MSL)
A-5	08/05/94		10.91	16.38
(cont.)	11/30/94		10.69	16.60
	02/22/95		10.71	16.58
	05/23/95		10.75	16.33
	08/09/95		10.78	16.30
	11/16/95		11.33	15.96
AR-1	10/07/91	29.08	12.09	16.99
	02/18/92		11.11	17.97
	05/22/92		10.10	18.98
	08/14/92		11.86	17.22
	10/23/92		12.12	16.96
	01/28/93		9.85	19.23
	02/24/93		14.80	14.28
	04/28/93		9.74	19.34
	05/28/93		13.52	15.56
	06/16/93		15.12	13.96
	06/27/93		13.48	15.60
	08/24/93		13.52	15.56
	09/28/93		13.90	15.18
	10/22/93		13.19	15.89
	11/16/93		12.72	16.36
	12/16/93		12.13	16.95
	02/07/94		10.03	19.05
	05/02/94		10.82	18.26
	08/05/94		12.63	16.45
	11/30/94		10.23	18.85
	02/22/95		9.90	19.18
	05/23/95		10.40	18.68
	08/09/95		11.00	18.08
	11/16/95		11.94	17.14
AR-2	06/26/92	28.20	11.54	16.66
	08/14/92		11.76	16.44
	10/23/92		11.85	16.35
	01/28/93		19.70	8.50
	02/24/93		19.58	8.62
	04/28/93		12.27	15.93
	05/28/93		14.93	13.27
	06/16/93		16.45	11.75
	07/27/93		11.65	16.55
	08/24/93		17.02	11.18
	09/28/93		11.65	16.55
	10/22/93		10.61	17.59
	11/16/93		11.63	16.57
	12/16/93		14.33	13.87
	02/07/94		10.51	17.69
	05/02/94		11.16	17.04
	05/03/94		12.03	16.17
	08/05/94		11.59	16.61
	11/30/94		9.56	18.64
	02/22/95		10.60	17.60
	05/23/95		10.95	17.25
	08/09/95		11.84	16.36
	11/16/95		11.30	16.90

MSL = Mean sea level
TOB = Top of box
NM = Not measured

Table A-2
Historical Groundwater Analytical Data
Total Purgeable Petroleum Hydrocarbons
(TPPH as Gasoline and BTEX Compounds)

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

Well Number	Date Sampled	TPPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Xylenes (ppb)
A-1	10/07/91	470	48	34	7.5	82
	02/18/92	<30	5.4	0.82	<0.3	<0.3
	05/22/92	38	15	0.92	1.3	0.51
	08/14/92	<50	14	<0.5	1.5	<0.5
	10/23/92	66	22	4.6	2	4.3
	01/28/93	750	120	120	16	96
	04/28/93	6,700	1,900	1,700	240	1,300
	08/24/93	1,800	230	88	34	160
	10/22/93	2,500	79	<10	<10	160
	02/07/94	61	24	<0.5	2.1	0.8
	05/02/94	58	17	0.7	2.2	4.2
	08/05/94	<50	5.1	1.4	0.6	2.5
	11/30/94	130	16	8.4	0.6	27
	02/22/95	<50	1.2	<0.50	<0.50	<0.50
	05/23/95	<50	4.9	0.95	0.61	3.9
	08/09/95	<50	2.3	<0.50	<0.50	0.53
	11/16/95	<50	3.3	1.5	<0.50	1.9
A-2	10/07/91	31	7.4	0.39	<0.3	0.93
	02/18/92	490	120	< 1.5	< 1.5	17
	05/22/92	100	2.4	<0.3	<0.3	0.89
	08/14/92	110	5	<0.5	<0.5	<0.5
	10/23/92	<50	<0.5	<0.5	<0.5	<0.5
	01/28/93	280	130	<2.5	<2.5	<2.5
	04/28/93	210	32	0.89	5.2	2.3
	08/24/93	<50	<0.5	<0.5	<0.5	<0.5
	10/22/93	<50	<0.5	<0.5	<0.5	<0.5
	02/07/94	<50	<0.5	<0.5	<0.5	<0.5
	05/02/94	<50	<0.5	<0.5	<0.5	<0.5
	08/05/94	<50	<0.5	<0.5	<0.5	<0.5
	11/30/94	<50	<0.5	<0.5	<0.5	<0.5
	02/22/95	<50	0.68	1.3	<0.50	0.52
	05/23/95	<50	<0.50	<0.50	<0.50	<0.50
	08/09/95	<50	<0.50	<0.50	<0.50	<0.50
	11/16/95	<50	<0.50	<0.50	<0.50	<0.50
A-3	10/07/91	<30	<0.3	<0.3	<0.3	<0.3
	02/18/92	<30	<0.3	<0.3	<0.3	<0.3
	05/22/92	<30	<0.3	<0.3	<0.3	<0.3
	08/14/92	<50	<0.5	<0.5	<0.5	<0.5
	10/23/92	<50	<0.5	<0.5	<0.5	<0.5
	01/28/93	<50	<0.5	<0.5	<0.5	<0.5
	04/28/93	<50	<0.5	<0.5	<0.5	<0.5
	08/24/93	<50	<0.5	<0.5	<0.5	<0.5
	10/22/93	<50	<0.5	<0.5	<0.5	<0.5
	02/07/94	<50	<0.5	<0.5	<0.5	<0.5
	05/02/94	<50	<0.5	<0.5	<0.5	<0.5
	08/05/94	<50	<0.5	<0.5	<0.5	<0.5
	11/30/94	<50	<0.5	<0.5	<0.5	<0.5
	02/22/95	<50	<0.50	<0.50	<0.50	<0.50
	05/23/95	<50	<0.50	<0.50	<0.50	<0.50
	08/09/95	<50	<0.50	<0.50	<0.50	<0.50
	11/16/95	----------	----------	Well Sampled Annually	----------	----------

Table A-2 (continued)
Historical Groundwater Analytical Data
Total Purgeable Petroleum Hydrocarbons
(TPPH as Gasoline and BTEX Compounds)

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

Well Number	Date Sampled	TPPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Xylenes (ppb)
A-4	10/07/91	<30	0.32	0.69	<0.3	1.1
	02/18/92	<30	<0.3	<0.3	<0.3	<0.3
	05/22/92	<30	<0.3	<0.3	<0.3	<0.3
	08/14/92	<50	<0.5	<0.5	<0.5	<0.5
	10/23/92	<50	<0.5	<0.5	<0.5	<0.5
	01/28/93	<50	<0.5	<0.5	<0.5	<0.5
	04/28/93	<50	<0.5	<0.5	<0.5	<0.5
	08/24/93	<50	<0.5	<0.5	<0.5	<0.5
	10/22/93	<50	<0.5	<0.5	<0.5	<0.5
	02/07/94	<50	<0.5	<0.5	<0.5	<0.5
	05/02/94	<50	<0.5	<0.5	<0.5	<0.5
	08/05/94	<50	<0.5	<0.5	<0.5	<0.5
	11/30/94	<50	<0.5	<0.5	<0.5	<0.5
	02/22/95	<50	<0.50	<0.50	<0.50	<0.50
	05/23/95	<50	<0.50	0.59	<0.50	<0.50
	08/09/95	<50	<0.50	<0.50	<0.50	<0.50
	11/16/95		----------Well Sampled Annually----------			
A-5	06/26/92	<50	<0.5	<0.5	<0.5	<0.5
	08/14/92	<50	<0.5	<0.5	<0.5	<0.5
	10/23/92	<50	<0.5	<0.5	<0.5	<0.5
	01/28/93	<50	<0.5	<0.5	<0.5	<0.5
	04/28/93	<50	<0.5	<0.5	<0.5	<0.5
	08/24/93	<50	<0.5	<0.5	<0.5	<0.5
	10/22/93	<50	<0.5	<0.5	<0.5	<0.5
	02/07/94	<50	<0.5	0.9	<0.5	0.7
	05/02/94	<50	<0.5	<0.5	<0.5	<0.5
	08/05/94	<50	<0.5	<0.5	<0.5	<0.5
	11/30/94	<50	<0.5	<0.5	<0.5	<0.5
	02/22/95	<50	<0.50	<0.50	<0.50	<0.50
	05/23/95	<50	<0.50	<0.50	<0.50	<0.50
	08/09/95	<50	<0.50	<0.50	<0.50	<0.50
	11/16/95	<50	<0.50	<0.50	<0.50	<0.50
AR-1	10/07/91	<30	<0.3	<0.3	<0.3	<0.3
	02/18/92	<30	<0.3	<0.3	<0.3	<0.3
	05/22/92	<30	<0.3	<0.3	<0.3	<0.3
	08/14/92	<50	<0.5	<0.5	<0.5	<0.5
	10/23/92	<50	<0.5	<0.5	<0.5	<0.5
	10/22/93	150	29	2.3	7.9	7.4
	02/07/94	<50	1.3	<0.5	1	<0.5
	05/02/94	120	24	<0.5	1.9	2.7
	08/05/94	980	200	<2.5 a	55	21
	11/30/94	60	7.7	<0.5	1.2	<0.5
	02/22/95	<50	<0.50	<0.50	<0.50	<0.50
	05/23/95	310	47	1.3	11	4.4
	08/09/95	<50	8.3	<0.50	0.97	<0.50
	11/16/95	<50	<0.50	<0.50	<0.50	<0.50
AR-2	06/26/92	<50	<0.5	<0.5	<0.5	<0.5
	08/14/92	<50	<0.5	<0.5	<0.5	<0.5
	10/23/92	110	0.15	0.27	<0.5	0.56
	02/07/94	<50	<0.5	<0.5	<0.5	<0.5
	05/02/94	<50	<0.5	<0.5	<0.5	<0.5
	08/05/94	<50	<0.5	<0.5	<0.5	<0.5
	11/30/94	<50	<0.5	<0.5	<0.5	<0.5

Table A-2 (continued)
Historical Groundwater Analytical Data
Total Purgeable Petroleum Hydrocarbons
(TPPH as Gasoline and BTEX Compounds)

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

Well Number	Date Sampled	TPPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Xylenes (ppb)
AR-2	02/22/95	<50	<0.50	<0.50	<0.50	<0.50
(cont.)	05/23/95	<50	4.2	<0.50	<0.50	<0.50
	08/09/95	<50	<0.50	<0.50	<0.50	<0.50
	11/16/95	<50	<0.50	<0.50	<0.50	<0.50

ppb = Parts per billion
a. Laboratory raised MRL due to high analyte concentration requiring sample dilution.
Prior to June 1995, TPPH as gasoline was reported as TPH as gasoline.

Table A-3
Historical Groundwater Analytical Data
Total Methyl t-Butyl Ether

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

Well Number	Date Sampled	Methyl t-Butyl Ether (ppb)
A-1	08/09/95	<2.5
A-2	08/09/95	<2.5
A-3	08/09/95	<2.5
A-4	08/09/95	<2.5
A-5	08/09/95	<2.5
A-6	08/09/95	<2.5
AR-1	08/09/95	<2.5
AR-2	08/09/95	<2.5

ppb = Parts per billion

Table 2
Groundwater Elevation and Analytical Data
Total Purgeable Petroleum Hydrocarbons
(TPPH as Gasoline, BTEX Compounds, and MtBE)

ARCO Service Station 2112
1260 Park Street at Encinal Avenue
Alameda, California

Well Number	Date Gauged/ Sampled	Well Elevation (feet, MSL)	Depth to Water (feet, TOB)	Groundwater Elevation (feet, MSL)	TPPH as Gasoline (ppb)	Benzene (ppb)	Toluene (ppb)	Ethyl-benzene (ppb)	Xylenes (ppb)	MtBE (ppb)
A-1	01/15/96	28.39	11.18	17.21	<50	<0.50	<0.50	<0.50	<0.50	NA
	04/08/96		10.61	17.78	<50	<0.50	<0.50	<0.50	<0.50	NA
	07/02/96		11.28	17.11	<50	<0.50	<0.50	<0.50	<0.50	<2.5
A-2	01/15/96	29.28	11.17	18.11	<50	<0.50	<0.50	<0.50	<0.50	NA
	04/08/96		10.45	18.83	<50	<0.50	<0.50	<0.50	<0.50	NA
	07/02/96		11.40	17.88	<50	<0.50	<0.50	<0.50	<0.50	<2.5
A-3	01/15/96	27.87	8.66	19.21	---------- Well Sampled Annually ----------					
	04/08/96		7.86	20.01	---------- Well Sampled Annually ----------					
	07/02/96		9.03	18.84	<50	<0.50	<0.50	<0.50	<0.50	<2.5
A-4	01/15/96	28.54	10.00	18.54	---------- Well Sampled Annually ----------					
	04/08/96		9.34	19.20	---------- Well Sampled Annually ----------					
	07/02/96		10.22	18.32	<50	<0.50	<0.50	<0.50	<0.50	<2.5
A-5	01/15/96	27.29	10.61	16.68	<50	<0.50	<0.50	<0.50	<0.50	NA
	04/08/96		10.59	16.70	<50	<0.50	<0.50	<0.50	<0.50	NA
	07/02/96		10.73	16.56	<50	<0.50	<0.50	<0.50	<0.50	<2.5
AR-1	01/15/96	29.08	10.44	18.64	<50	<0.50	<0.50	<0.50	<0.50	NA
	04/08/96		9.56	19.52	<50	<0.50	<0.50	<0.50	<0.50	NA
	07/02/96		10.67	18.41	<50	<0.50	<0.50	<0.50	<0.50	<2.5
AR-2	01/15/96	28.20	11.00	17.20	<50	<0.50	<0.50	<0.50	<0.50	NA
	04/08/96		9.71	18.49	<50	<0.50	<0.50	<0.50	<0.50	NA
	07/02/96		11.15	17.05	<50	<0.50	<0.50	<0.50	<0.50	<2.5

MtBE = Methyl tert-butyl ether
MSL = Mean sea level
TOB = Top of box
ppb = Parts per billion
NA = Not analyzed

Table 1. Summary of Ground-Water Monitoring Data: Relative Water Elevations and Laboratory Analyses

Station #2112, 1260 Park Street, Alameda, CA

Well and Sample Date	P/NP	Comments	TOC (feet msl)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	DTW (feet bgs)	Water Level Elevation (feet msl)	Concentrations in (µg/L)							DO (mg/L)	pH
								DRO/ TPHd	GRO/ TPHg	Benzene	Toluene	Ethyl-Benzene	Total Xylenes	MtBE		
A-1																
7/17/2006	--	a	30.81	--	--	10.92	19.89	52	<50	<0.50	<0.50	<0.50	<0.50	22	--	6.4
A-2																
7/17/2006	--		31.26	--	--	11.00	20.26	120	<50	<0.50	<0.50	<0.50	<0.50	<0.50	--	7.1
A-3																
7/17/2006	--	c	30.20	--	--	--	--	--	--	--	--	--	--	--	--	--
A-4																
7/17/2006	--	a,b	30.73	--	--	9.02	21.71	<47	<50	<0.50	<0.50	<0.50	<0.50	<0.50	--	7.1
A-5																
7/17/2006	--	a	29.53	--	--	10.67	18.86	120	<50	<0.50	<0.50	<0.50	<0.50	<0.50	--	6.9

ABBREVIATIONS & SYMBOLS:
-- = Not analyzed/applicable/measured/available
< = Not detected at or above laboratory reporting limit
ft bgs = Feet below ground surface
ft MSL = Feet above mean sea level
BTEX = Benzene, toluene, ethylbenzene and xylenes
DO = Dissolved oxygen
DTW = Depth to water in ft bgs
GRO = Gasoline range organics, range C4-C12
GWE = Groundwater elevation measured in ft MSL
mg/L = Milligrams per liter
MTBE = Methyl tert butyl ether
NP = Not purged before sampling
P = Purged before sampling
TOC = Top of casing measured in ft MSL
TPH-g = Total petroleum hydrocarbons as gasoline, analyzed using EPA Method 8015, Modified
µg/L = Micrograms per liter
SEQ/SEQM = Sequoia Analytical/Sequoia Morgan Hill Laboratories

FOOTNOTES:
a = Hydrocarb. in req. fuel range, but doesn't resemble req. fuel
b = Surrogate recovery above the acceptance limits. Matrix interference suspected
c = Well obstructed

Note: The data within this table collected prior to April 2006 was provided to Broadbent & Associates, Inc. by Atlantic Richfield Company and their previous consultants. Broadbent & Associates, Inc. has not verified the accuracy of this information.

Table 2. Summary of Fuel Additives Analytical Data

Station #2112, 1260 Park Street, Alameda, CA

Well and Sample Date	Concentrations in (µg/L)								Comments
	Ethanol	TBA	MTBE	DIPE	ETBE	TAME	1,2-DCA	EDB	
A-1									
7/17/2006	<300	<20	22	<0.50	<0.50	3.3	0.76	<0.50	
A-2									
7/17/2006	<300	<20	<0.50	<0.50	<0.50	<0.50	1.2	<0.50	
A-3									
7/17/2006	--	--	--	--	--	--	--	--	
A-4									
7/17/2006	<300	<20	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	
A-5									
7/17/2006	<300	<20	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	

ABBREVIATIONS & SYMBOLS:
< = Not detected at or above specified laboratory reporting limit
1,2-DCA = 1,2-Dichloroethane
DIPE = Di-isopropyl ether
EDB = 1,2-Dibromoethane
ETBE = Ethyl tert-butyl ether
MTBE = Methyl tert-butyl ether
TAME = tert-Amyl methyl ether
TBA = tert-Butyl alcohol
µg/L = micrograms per liter

Note: The data within this table collected prior to April 2006 was provided to Broadbent & Associates, Inc. by Atlantic Richfield Company and their previous consultants. Broadbent & Associates, Inc. has not verified the accuracy of this information.

APPENDIX E.

SOIL BORING LOGS AND GEOLOGIC CROSS-SECTION

Total depth of boring: 25-1/2 feet **Diameter of boring:** 6 inches **Date drilled:** 1-22-90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: H.E.W. Drilling Inc. **Driller:** Tomas & Defecto

Method Used: Continuos-Flight Auger **Field Geologist:** Steve Bittman

Signature of Registered Professional:

Registration No.: CEG 1264 **State:** CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Asphalt (6 inches) over baserock (6 inches).	
2	S-1.5	8		SP	Sand with some clay, fine-grained, gray-green, damp to moist, medium dense, noticeable odor.	
	S-2	6 10	80			
4	S-3.5	5				
	S-4	8 9	425			
6	S-5.5	8			Gray-brown.	
	S-6	10 17	450			
8	S-7.5	21		SC	Clayey sand, fine-grained, brown-gray, moist, very dense, obvious odor.	
	S-8	39 52	660			
10	S-9.5	10				
	S-10	35 50	600			
12	S-12.5	15		▽	Wet, noticeable odor.	
	S-13	35 57	50			
14	S-15.5	14				
16	S-16	32 59	35		Brown.	
18						
20	S-20	35				
	S-20.5	60	2		(Section continues downward)	

Applied GeoSystems

PROJECT 69048-1

LOG OF BORING B - 1

ARCO Station 2112
1260 Park Street
Alameda, California

PLATE 4

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
22				SC	Clayey sand, fine-grained, brown, moist, very dense.	
24	S-25	0				
26					Total Depth = 25-1/2 feet.	
28						
30						
32						
34						
36						
38						
40						
42						
44						
46						
48						
50						

Applied GeoSystems

PROJECT 69048-1

LOG OF BORING B - 1

ARCO Station 2112
1260 Park Street
Alameda, California

PLATE 5

Total depth of boring: 11-1/2 feet **Diameter of boring:** 6 inches **Date drilled:** 1-22-90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: H.E.W. Drilling Inc. **Driller:** Tomas & Pefecto

Method Used: Continuos-Flight Auger **Field Geologist:** Steve Bittman

Signature of Registered Professional:

Registration No.: CEG 1264 **State:** CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Asphalt (6 inches) over baserock (6 inches).	
2	S-3	11 12 13	110	SP	Sand with some clay, fine-grained, dark brown, damp, medium dense, noticeable odor.	
4						
6	S-6	10 15 26	115	SC	Clayey sand, fine-grained, dark brown, damp to moist, dense, noticeable odor.	
8						
10	S-11	15 26 39	650			
12					Total Depth = 11-1/2 feet.	
14						
16						
18						
20						

Applied GeoSystems

PROJECT 69048-1

LOG OF BORING B - 2

ARCO Station 2112
1260 Park Street
Alameda, California

PLATE 6

Total depth of boring: 11-1/2 feet **Diameter of boring:** 6 inches **Date drilled:** 1-22-90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: H.E.W. Drilling Inc. **Driller:** Tomas & Pefecto

Method Used: Continuos-Flight Auger **Field Geologist:** Steve Bittman

Signature of Registered Professional:

Registration No.: CEG1264 **State:** CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0						
					Asphalt (6 inches) over baserock (6 inches).	
2		11		SP	Sand with some clay, fine-grained, brown, moist, dense.	
		12				
	S-3	13	110			
4						
		10				
		15		SC	Clayey sand, fine-grained, gray, moist, noticeable odor.	
6	S-6	26	115			
8						
10		15				
		26				
	S-11	39	650			
12					Total Depth = 11-1/2 feet.	
14						
16						
18						
20						

Applied GeoSystems

PROJECT 69048-1

LOG OF BORING B - 3

ARCO Station 2112
1260 Park Street
Alameda, California

PLATE 7

Total depth of boring: 11-1/2 feet **Diameter of boring:** 6 inches **Date drilled:** 1-22-90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: H.E.W. Drilling Inc. **Driller:** Tomas & Pefecto

Method Used: Continuos-Flight Auger **Field Geologist:** Steve Bittman

Signature of Registered Professional:

Registration No.: CEG 1264 **State:** CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Asphalt (6 inches) over baserock (6 inches).	
2	S-3	20 22 35	60	SP	Sand with some clay, fine-grained, dark brown, damp, very dense, noticeable odor.	
4						
6	S-6	3 6 10	25	SC	Clayey sand, fine-grained, blue-gray, medium dense, noticeable odor.	
8						
10	S-11	16 21 32	800			
12					Total Depth = 11-1/2 feet.	
14						
16						
18						
20						

Applied GeoSystems

PROJECT 69048-1

LOG OF BORING B - 4

ARCO Station 2112
1260 Park Street
Alameda, California

PLATE 8

Total depth of boring: 11-1/2 feet **Diameter of boring:** 6 inches **Date drilled:** 1-22-90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: H.E.W. Drilling Inc. **Driller:** Tomas & Pefecto

Method Used: Continuos-Flight Auger **Field Geologist:** Steve Bittman

Signature of Registered Professional:

Registration No.: CEG 1264 **State:** CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0					Asphalt (6 inches) over baserock (6 inches).	
2	S-3	5, 8, 9	0	SP	Sand with some clay, fine-grained, brown, damp, medium dense.	
4						
6	S-6	7, 7, 7	2	SC	Clayey sand, fine-grained, brown, mottled gray, medium dense, noticeable odor.	
8						
10	S-11	12, 22, 35	800			
12					Total Depth = 11-1/2 feet.	
14						
16						
18						
20						

Applied GeoSystems

PROJECT 69048-1

LOG OF BORING B - 5

ARCO Station 2112
1260 Park Street
Alameda, California

PLATE 9

Total depth of boring: 13 feet **Diameter of boring:** 6 inches **Date drilled:** 1-29-90

Casing diameter: N/A **Length:** N/A **Slot size:** N/A

Screen diameter: N/A **Length:** N/A **Material type:** N/A

Drilling Company: Garret Enterprises **Driller:** Red & Dave

Method Used: Continuos-Flight Auger **Field Geologist:** Steve Strausz

Signature of Registered Professional:

Registration No.: CEG 1264 **State:** CA

Depth	Sample No.	Blows	P.I.D.	USCS Code	Description	Well Const.
0						
					Asphalt (6 inches) over baserock (6 inches).	
2						
4				SM	Silty sand, fine-to medium-grained, gray to light brown, damp, medium dense.	
6	S-5.5	5 6				
	S-6	8	1.7			
8						
				SC	Clayey sand, gray-brown, moist, dense.	
10		12				
		18				
	S-10	18				
12		14		▽		
		21				
	S-12	30	3.1			
14					Total Depth = 13 feet.	
16						
18						
20						

Applied GeoSystems

PROJECT 69048-1

LOG OF BORING B - 6

ARCO Station 2112
1260 Park Street
Alameda, California

PLATE 10

SOIL BORING LOG **Boring No. B-7** **Sheet: 1 of 1**

Client	ARCO 2112	Date	June 10, 2009
Address	1260 Park Street	Drilling Co.	RSI Drilling rig type: Powerprobe 9630 Pro-D
	Alameda, CA	Driller	Norman
Project No.	E2112	Method	Direct Push Hole Diameter: 2"
Logged By:	Collin Fischer	Sampler:	Continuous core

Sample Type	Sample No.	Date	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
						1		Cleared to 6.5' bgs with air knife.	
						2			
						3			
						4	SM	Silty sand, SM, (0'-7.5'), dark yellowish brown, dry 85% fine to medium grained sand, 15% silt	
S	B-7 5'	6/10/09	1050	100		5			0
						6			
						7			
S	B-7 8'	6/10/09	1053	100		8			0
						9	SC	Clayey sand, SC, (7.5'-10.5'), dark yellowish brown, moist 70% medium grained sand, 30% clay	
						10			
S	B-7 11'	6/10/09	1055	100		11			0
						12	SM	Silty sand, SM, (10.5'-14'), dark grayish brown, wet 85% medium grained sand, 15% silt	
						13			
S	B-7 14'	6/10/09	1058	100		14			0
						15			
						16			
						17			
						18			
						19			
						20			

Recovery

Sample

Comments:

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG **Boring No. B-8** **Sheet: 1 of 1**

Client	ARCO 2112	Date	June 10, 2009
Address	1260 Park Street	Drilling Co.	RSI Drilling rig type: Powerprobe 9630 Pro-D
	Alameda, CA	Driller	Norman
Project No.	E2112	Method	Direct Push Hole Diameter: 2"
Logged By:	Collin Fischer	Sampler:	Continuous core

Sample Type	Sample No.	Date	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
						1		Cleared to 6.5' bgs with air knife.	
						2			
						3			
						4	SM	Silty sand with gravel, SM, (0'-7'), dark yellowish brown, dry 70% fine to medium grained sand, 20% silt, 10 % medium gravel	
S	B-8 5'	6/10/09	1103	100		5			0
						6			
						7			
S	B-8 8'	6/10/09	1105	100		8	SC		0
						9		Clayey sand, SC, (7'-9.5'), dark yellowish brown, moist 70% medium grained sand, 30% clay	
						10			
S	B-8 11'	6/10/09	1108	100		11			5000+
						12	SM	Silty sand, SM, (9.5'-14'), dark grayish brown, wet 85% medium grained sand, 15% silt	
						13			
S	B-8 14'	6/10/09	1110	100		14			0
						15			
						16			
						17			
						18			
						19			
						20			

Recovery

Sample

Comments:

STRATUS ENVIRONMENTAL, INC.

SOIL BORING LOG Boring No. B-9 Sheet: 1 of 1

Client	ARCO 2112	Date	June 10, 2009
Address	1260 Park Street	Drilling Co.	RSI Drilling rig type: 6620 DT
	Alameda, CA	Driller	Norman
Project No.	E2112	Method	Direct Push Hole Diameter: 2"
Logged By:	Collin Fischer	Sampler:	Continuous core

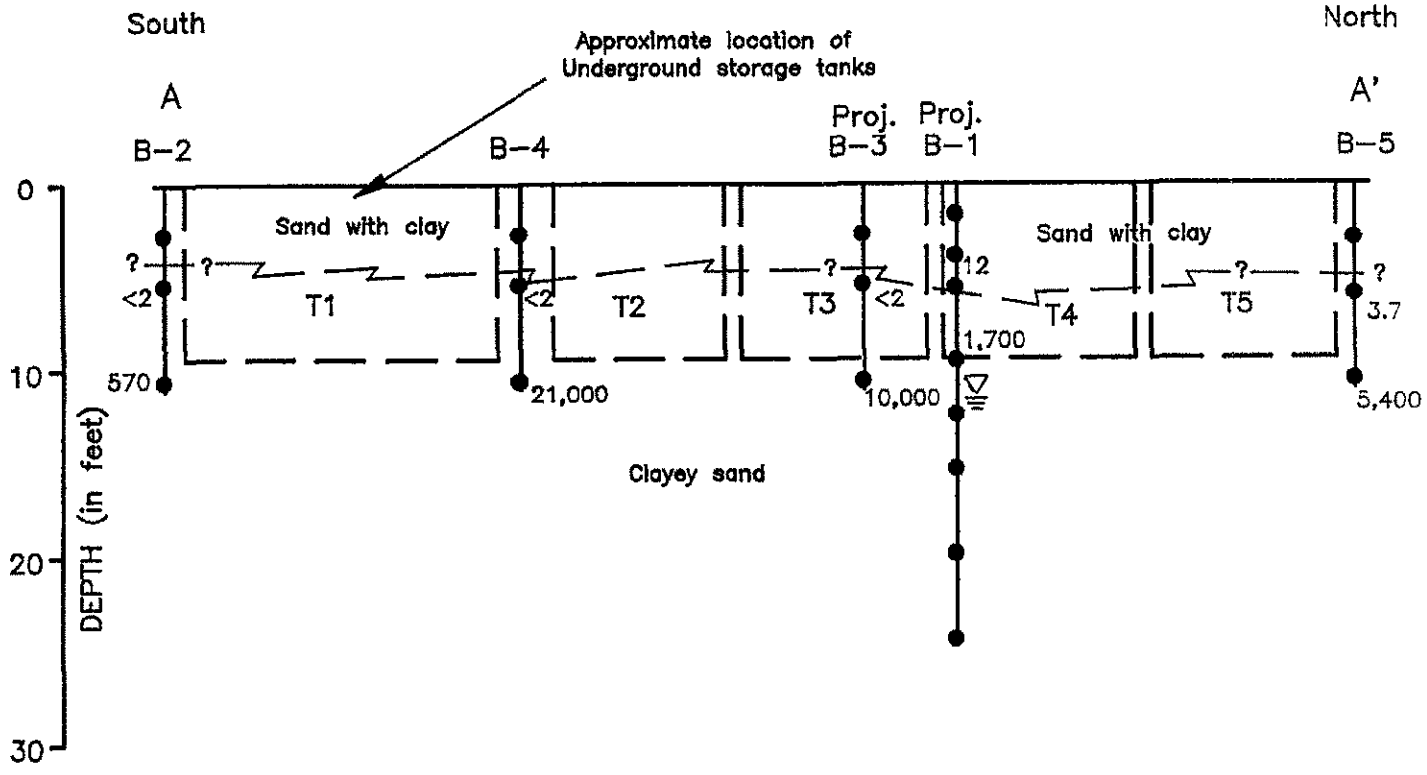
Sample Type	Sample No.	Date	Sample Time	Sample Recov.	Well Details	Depth Scale	Lithologic Column	Descriptions of Materials and Conditions	PID (PPM)
						1		Cleared to 6.5' bgs with air knife.	
						2			
						3			
						4			
S	B-9 5'	6/10/09	1135	100		5			0
						6			
						7		Silty sand, SM, (0'-12'), dark yellowish brown, dry 85% fine to medium grained sand, 15% silt	
S	B-9 8'	6/10/09	1138	100		8	SM		0
						9			
						10			
S	B-9 11'	6/10/09	1140	100		11			0
						12			
						13		Silty sand, SM, (12'-14'), dark yellowish brown, wet 80% fine to medium grained sand, 20% silt	
S	B-9 14'	6/10/09	1143	100		14			0
						15			
						16			
						17			
						18			
						19			
						20			

Recovery

Sample

Comments:

STRATUS ENVIRONMENTAL, INC.



EXPLANATION

= Laboratory analyzed soil sample showing concentration of TPH in part per million

= Boring

= Initial water level in boring

Approximate Horizontal and Vertical Scale

10 5 0 10 20

feet

Applied GeoSystems

PROJECT 69048-1

GEOLOGIC CROSS SECTION A - A'
ARCO Station 2112
1260 Park Street
Alameda, California

PLATE 11