aqua science engineers inc.

April 7, 2004

RESULTS OF PILOT STUDY AND REMEDIAL ACTION WORKPLAN (RAP) FOR THE INSTALLATION OF AN OZONE SPARGING SYSTEM

at
The Oakland Truck Stop
8255 San Leandro Street
Oakland, California

Submitted by:
AQUA SCIENCE ENGINEERS, INC.
208 West El Pintado
Danville, CA 94526
(925) 820-9391

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

APPENDICES

1.0 INTRODUCTION

This submittal presents Aqua Science Engineers, Inc. (ASE)'s report of the ozone-sparging pilot test and remedial action plan (RAP) to install a permanent ozone-sparging remediation system at the Oakland Truck Stop site located at 8255 San Leandro Street in Oakland, California (Figures 1 and 2). This report was prepared on behalf of Mr. Nissan Saidian, owner of the property, as required by the Alameda County Health Care Services Agency (ACHCSA) in their directive letter dated January 23, 2004 (Appendix A).

2.0 BRIEF SITE HISTORY AND BACKGROUND INFORMATION

The subject site is currently a truck stop that has been in operation since the early 1960s.

2.1 March 1998 Underground Storage Tank (UST) Removal

In March 1998, W.A. Craig, Inc. removed one 500-gallon waste oil underground storage tank (UST) and two 4,000-gallon gasoline USTs from the site. Up to 460 parts per million (ppm) total petroleum hydrocarbons as gasoline (TPH-G), 930 ppm total petroleum hydrocarbons as diesel (TPH-D), 5.8 ppm benzene, 1.7 ppm toluene, 8.2 ppm ethyl benzene, 3.3 ppm total xylenes and 0.64 ppm methyl tertiary butyl ether (MTBE) were detected in soil samples collected from the gasoline UST excavations at the time of the removal. Up to 3,600 ppm TPH-G, 21,000 ppm TPH-D, 2.1 ppm benzene, 8 ppm toluene, 18 ppm ethyl benzene, 15 ppm total xylenes and 8.1 ppm MTBE were detected in soil samples collected from the waste oil UST excavation. Water samples collected from the UST excavations contained up to 5,500 parts per billion (ppb) TPH-G, 880,000 ppb TPH-D, 580 ppb benzene, 12 ppb toluene, 180 ppb ethyl benzene, 39 ppb total xylenes and 1,900 ppb MTBE. W.A. Craig reported that all contaminated soil from both the gasoline and waste oil UST excavations were removed based on visual, olfactory and photoionization detector readings. This contaminated soil was transported from the site for disposal in a Class II landfill. The excavations were backfilled with clean imported material.

2.2 February 1999 Soil and Groundwater Assessment

In February 1999, Penn Environmental drilled 13 soil borings at the site and constructed monitoring wells in four of the borings (Figure 2 from Penn Environmental - See Appendix B). Relatively low hydrocarbon concentrations were detected in soil samples collected near the former waste oil USTs, and relatively low to moderate hydrocarbon concentrations were detected in groundwater samples collected from these borings. Soil samples collected from borings B-4, B-6, B-8 and MW-3 contained TPH-G concentrations over 100 ppm and benzene concentrations over 1 ppm. All of these borings are in the vicinity of the existing gasoline USTs. Soil samples collected from the remaining borings contained much lower TPH-G and benzene, toluene, ethyl benzene, and total xylenes (collectively known as BTEX) concentrations in soil. Soil samples collected from all of the borings contained TPH-D concentrations over 100 ppm except for samples collected from borings B-7 and B-9, at the southern and western corners of the site. Up to 68,000 ppb TPH-G, 62,000 ppb TPH-D, 24,000 ppb benzene, 390 ppb toluene, 2,000 ppb ethyl benzene, 2,300 ppb total xylenes and 28,000 ppb MTBE were detected in groundwater samples collected from these monitoring wells/borings. Once again, the highest TPH-G and BTEX concentrations were in the wells/borings drilled near the existing USTs, although the highest TPH-D concentrations (between 25,000 ppb and 62,000 ppb) were detected in groundwater samples collected from monitoring well MW-1 and borings B-1 and B-2, all in the vicinity of the dispensers. Elevated MTBE concentrations (up to 7,800 ppb) were also detected in groundwater samples collected from borings in the dispenser area.

2.3 August 1999 Quarterly Groundwater Monitoring

In August 1999, ASE performed quarterly groundwater monitoring for the site. Monitoring well MW-1 contained free-floating diesel. Groundwater samples collected from monitoring well MW-3 contained 56,000 ppb TPH-G, 10,000 ppb TPH-D, 17,000 ppb benzene, 2,600 ppb toluene, 2,600 ppb ethyl benzene, 1,200 ppb total xylenes and 6,100 ppb MTBE. Much lower hydrocarbon concentrations were detected in groundwater samples collected from monitoring wells MW-2 and MW-4, located near the former waste oil USTs. In addition, the groundwater samples collected from monitoring wells MW-2 and MW-4, near the former waste oil USTs, were also analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated bi-phenols (PCBs), cadmium, chromium, lead, nickel and zinc. No SVOCs, PCBs or VOCs were detected in these samples other than 11 ppb isopropyl benzene. The only metal concentration that exceeded California Department of Health Services (DHS) maximum contaminant levels (MCLs) for drinking water was lead in the groundwater sample collected from monitoring well MW-4 at 260 ppb. The groundwater flow direction was to the west. See Tables One and Two for tabulated results from this and subsequent groundwater samplings.

2.4 December 1999 Monitoring Well Installation

In December 1999, ASE constructed monitoring wells MW-5 and MW-6 at the site (Figure 2). Free-floating hydrocarbons were still present on the groundwater surface of monitoring well MW-1. High hydrocarbon concentrations, including benzene, ethyl benzene and MTBE concentrations exceeding DHS MCLs for drinking water, were detected in groundwater samples collected from monitoring well MW-2. Benzene concentrations in groundwater samples collected from monitoring wells MW-2 and MW-6 exceeded DHS MCLs for drinking water. The MTBE concentration in groundwater samples collected from monitoring wells MW-3, MW-4 and MW-5 also exceeded DHS MCLs for drinking water. MTBE was confirmed in monitoring well MW-3 by EPA Method 8260. Most of these concentrations were similar to previous results. No dissolved lead was detected in groundwater samples collected from monitoring well MW-4 this quarter. The groundwater flow direction was to the southwest.

2.5 March 2000 Quarterly Groundwater Monitoring

In March 2000, ASE conducted a groundwater monitoring event at the site. The analytical results from this sampling showed very similar hydrocarbon concentrations to the previous sampling results except that high MTBE concentrations (12,000 ppb) were detected in the groundwater sample collected from monitoring well MW-6. Free-floating hydrocarbons were still present in monitoring well MW-1.

2.6 May and June 2000 Soil and Groundwater Assessment

In May and June 2000, ASE drilled eight soil borings at the site (Figure 2). Soil samples collected from borings BH-A and BH-B contained TPH-G and TPH-D concentrations over 100 ppm. Boring BH-B also contained BTEX concentrations over 1 ppm, including 2.3 ppm benzene. Soil samples collected from borings BH-G and BH-H contained TPH-G over 100 ppm and over 1,000 ppm TPH-D; however, all of the BTEX concentrations were below 1 ppm. Soil samples collected from borings BH-C, BH-D, BH-E, and BH-F did not contain any significant concentrations of TPH-G, TPH-D or

BTEX. MTBE concentrations detected in soil samples collected from borings BH-C and BH-D exceeded 1 ppm. Lower concentrations of MTBE were detected in soil samples collected from borings BH-B, BH-G and BH-H. The analytical results are tabulated in Tables Three and Four.

Relatively high TPH-G, TPH-D and BTEX concentrations were detected in groundwater samples collected from borings BH-A and BH-B, west and southwest of the former USTs. Groundwater samples collected from these borings contained TPH-G as high as 51,000 ppb, TPH-D as high as 120,000 ppb and benzene as high as 4,000 ppb. The MTBE concentration in boring BH-A, which contained the highest BTEX concentrations, was only 46 ppb. Groundwater samples collected from borings BH-C, BH-D and BH-E, along the southern property line and south of the existing USTs, contained total petroleum hydrocarbons as motor oil (TPH-MO) as high as 11,000 ppb, MTBE as high as 42,000 ppb and tert-butyl alcohol (TBA) as high as 6,800 ppb. No TPH-G or BTEX was detected in the groundwater samples collected from these borings. A very high TPH-D concentration of 2,200,000 ppb was detected in groundwater samples collected from boring BH-G, near the pump island. TPH-G and MTBE were also detected in groundwater samples collected from boring BH-G at 120,000 ppb and 170 ppb, respectively. This boring is east of monitoring well MW-1, which contains free-floating hydrocarbons. The remaining two borings, BH-F and BH-H, both drilled in the eastern portion of the property, contained TPH-D and/or TPH-MO at concentrations as high as 1,400 ppb, but did not contain detectable concentrations of BTEX or oxygenates. These analytical results are tabulated in Tables Five and Six.

2.7 July 2002 Soil and Groundwater Assessment

In July 2002, ASE installed wells MW-7, MW-8 and MW-9 at the site (Figure 2). ASE also attempted to drill a soil boring on the eastern parking lane of San Leandro Street to define the extent of soil and groundwater contamination to the east. Several attempts were made but drilling was met with refusal at relatively shallow depths in each instance.

No compounds were detected in the soil sample collected from 10.5-feet below ground surface (bgs) in MW-7. The only hydrocarbon concentration detected in the soil sample collected from 11.0-feet bgs in MW-8 was 3.9 ppm TPH-D. The soil sample collected from 13.0-feet bgs in MW-9 contained 15 ppm TPH-MO, 0.0058 ppm MTBE and 0.0051 ppm TBA. No other hydrocarbons were detected in the soil samples analyzed. See Tables One and Two for tabulated results from this and subsequent groundwater samplings.

2.8 August 2002 Step Drawdown and Constant Rate Pumping Tests

In August 2002, step drawdown and 605-minute constant rate pumping tests were conducted by H_2O Geol of Livermore, California. Based on the results of the step-drawdown test, a pumping rate of 1 gallon per minute (gpm) was selected for the constant rate pumping test. Water was pumped from extraction well MW-9 and water levels were monitored in the remaining site wells during the duration of the test. The actual average pumping rate during the test was 1.08 gpm.

The pumping well (MW-9), as well as monitoring wells MW-3, MW-6 and MW-8 experienced drawdown in response to the test. The distance drawdown relationship among the monitoring wells in response to the pumping was inconsistent with a drawdown of 0.15-feet in monitoring well MW-3 located 49.14-feet from the pumping well and a drawdown of 0.59-feet in monitoring well MW-8 located 65.8-feet from the pumping well. This apparent anisotropy is attributed to the presence of the tank excavation and a pipeline trench along the southeast property boundary. The hydraulic conductivity of the wells that experienced drawdown ranged from 2.45 feet/day to 7.6 feet/day. These hydraulic conductivity calculations, however, represent a combination of the hydraulics of the tank excavation and pipeline trench as well as the semi-confined silt sand aquifer.

Because of the influence from the tank backfill and pipeline trench, actual sustainable hydraulic properties for the site can not be calculated without conducting a very long pump test (over 12,000 minutes) and completely dewatering the excavation and pipeline trench, which may not be possible at all.

2.9 October 2002 Sensitive Receptor Survey, Tier I Risk-Assessment, and Corrective Action Plan

In October 2002, ASE conducted a sensitive receptor survey, a Tier I Risk-Assessment, and prepared a corrective action plan. ASE also presented the results of the July 2002 soil and groundwater assessment and August 2002 pump tests in this same report.

For the sensitive receptor survey, ASE researched whether any surface water bodies or water supply wells are located within 2,000-feet of the site. Directly behind the site lies a small, unnamed creek. This creek appears to provide drainage and is very heavily vegetated. Given the flat topography in the area and location of the San Francisco Bay, it is likely that this creek is tidally influenced. This is the likely explanation as to why the groundwater gradient beneath the site is highly variable. Three wells were identified within 2,000-feet of the site. One of the wells is used for industrial purposes and two are used for irrigation. No domestic or municipal water supply wells were located within 2,000-feet of the site.

The Tier I risk-assessment was conducted by comparing the concentrations detected in soil and groundwater at the site with Risk-Based Screening Levels (RBSLs) published in the "Application of Risk-Based Screening Levels and Decision Making to Sites With Impacted Soil and Groundwater" document prepared by the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB) dated December 2001. Since there are no domestic or municipal water supply wells in the site vicinity, and since it is unlikely that groundwater in the site vicinity will ever be used for drinking water, ASE compared the hydrocarbon concentrations detected at the site to RBSLs for sites where groundwater is not a current or potential source of drinking water.

Benzene, MTBE, TPH-G and TPH-D concentrations detected in groundwater samples collected from the site wells exceeded RBSLs for sites where groundwater is not a current or potential source of drinking water. ASE then compared the concentrations for these four compounds to the "indoor air impacts" concentrations in Table F-2 in Volume 2 of the RBSL document to determine whether the hydrocarbon concentrations detected at the site may be a threat to human health based on volatilization of hydrocarbons into indoor air. The benzene concentration detected in groundwater from monitoring well MW-3 exceeded the RBSL regardless of soil type. Based on the Tier I risk-assessment, the benzene concentration detected in groundwater samples collected from monitoring well MW-3 presents a threat to human health if a building were built on this location. TPH-G, TPH-D, benzene and MTBE concentrations detected in several wells at the site exceeded RBSLs for other non-human health criteria including ceiling values and aquatic life protection.

The corrective action plan (CAP) discussed potential remediation strategies for the site. Soil overexcavation, air sparging and soil vapor extraction, groundwater "pump and treat," in-situ bioremediation, and in-situ chemical oxidation were discussed as possible remediation alternatives. Of these alternatives, chemical oxidation, and specifically ozone sparging, was selected as the preferred remediation alternative.

2.10 March 2003 Workplan for an Ozone Sparging Test

In March 2003, ASE prepared a workplan to conduct an ozone sparging test. This RAP explains the results of the ozone sparging test and presents the details of the ozone sparging system to be installed at the site.

3.0 PURPOSE OF PILOT STUDY

The purpose of this pilot study was to determine the effectiveness of ozone sparging as a remediation alternative at the site. The most significant groundwater contamination at the site is in the southern portion of the site in the vicinity of the former underground storage tanks (USTs).

4.0 INSTALLATION OF THREE OZONE-SPARGING WELLS

ASE installed three ozone-sparging wells to be used during the ozone sparging test. These wells were spaced to allow for the injection of air at different distances from observation wells.

4.1 Drilling Permits

Prior to drilling, ASE obtained drilling permits from the Alameda County Public Works Agency (Appendix C). ASE also notified USA to have underground public utilities in the vicinity of the site marked prior to drilling.

4.2 Drill Soil Borings for the Installation of Ozone-Sparging Wells

On February 2, 2004, Gregg Drilling of Martinez, California drilled borings OS-1, OS-2 and OS-3 at the site using a Rhino drill rig equipped with 8-inch diameter hollow-stem augers (Figure 3). Ozone sparging wells OS-1, OS-2 and OS-3 were subsequently constructed in these borings. The drilling was directed by ASE associate geologist Damian Hriciga.

Soil samples were collected by driving a sampler lined with acetate tubes using hydraulic direct push methods. Selective soil samples were immediately cut, trimmed, sealed with Teflon tape, plastic end caps and duct tape, labeled, sealed in plastic bags and stored on ice for transport to Kiff Analytical of Davis, California (ELAP #2236) under chain of custody. Soil from the remaining tubes was described by the site geologist using the Unified Soil Classification System. Boring logs are presented in

Appendix D. Analytical results for the analyzed soil samples are presented in Appendix E.

Drilling equipment was cleaned with a TSP solution between sampling intervals to prevent potential cross-contamination.

4.3 Construction of Ozone-Sparge Wells

Ozone sparging wells OS-1, OS-2 and OS-3 were constructed within the hollow stem augers using 3/4-inch diameter, flush-threaded, schedule 40 PVC well casing with a 2-inch diameter sparge point with 10-50 micron perforations. The wells were screened between 19.5 and 22-feet bgs to allow for the injection of air in the water-bearing zone.

The well casing was lowered through the augers and #2/16 filter pack sand was placed in the annular space between the sparge point and the borehole from the bottom of the boring to 0.5-foot above the sparge point. A 0.5-foot thick layer of bentonite pellets were placed on top of the sand pack. Cement was used to fill the annular space between the bentonite layer and the surface to prevent surface water from infiltrating into the well. The well head is protected with a locking well plug beneath an at-grade, traffic-rated well box. Well construction details are shown on the boring log in Appendix D.

5.0 PERFORMANCE OF THE PILOT STUDY

5.1 Scope of Work

An air sparging test was conducted to determine whether ozone-sparging may be an effective method of remediation for the site. The ozone-sparging test was conducted by injecting compressed air into one of the new ozone-sparging wells at a rate of approximately 2-5 cubic feet per minute (cfm) and 25-50 pounds per square inch (PSI). This flow and pressure are typical operating parameters of current ozone-sparging generation systems on the market today. Pressure and water levels in the other ozone sparge wells and surrounding monitoring wells were monitored to determine whether there is any pressure increase in the vadose zone or mounding of the water table. The test continued until pressures and water table elevations remained stable. Injected air pressure and flow was adjusted to determine future design criteria of the ozone generating system.

An alternate test technique used was injecting a tracer gas, helium, into the air stream at a rate of approximately 35 cubic feet per hour (cfh). A helium detector was then used to measure the concentration of helium, if any, in the surrounding observation wells. The presence of helium in the surrounding wells would be an indication of the area of influence.

On February 24, 2004, ASE senior engineer David Allen and staff geologist Damian Hriciga, conducted the air sparging test at the site. Air-sparging well OS-2 was chosen as the injection well due to its proximity in relation to air-sparging wells OS-1 and OS-3 and three monitoring wells used for observation, MW-3, MW-6 and MW-8 (Figure 3).

5.2 System Test Components

The equipment used during this test included:

- a 5.75-Hp, 13-gallon, oil-free electric air compressor,
- a 300 cubic foot compressed helium tank and regulator,
- various valves, pressure gauges and flow gauges,
- a water level meter,
- a helium detector

5.3 Operating Parameters

- The electric air-compressor was fitted with a regulator and flowmeter that allowed for an initial discharge pressure of approximately 50 psi, and a flow of approximately 3-4 cfm.
- The compressed helium tank was outfitted with a regulator that could meter the volume of helium released into the injection well. Initially, the test was designed for approximately 30-40 cfh of helium. The regulator had a fixed-point pressure of 25 psi.
- The top of the injection well was outfitted with a pressure gauge, which measured the total pressure of the air/helium mixture. ASE initially projected an operating pressure of approximately 60-75 psi.
- The observation wells were outfitted with a cap that housed a sample port for helium readings, and a pressure gauge.

5.4 Performance of the Test

Prior to injection of air/helium into ozone-sparge well OS-1, the water level was to be measured in all of the observation wells, as well as the collection of a water sample from wells OS-1, OS-2 and OS-3. Unfortunately, the sampling device and water level sensor were too large to fit down the small casing of the newly installed ozone-sparging wells. Therefore, only water levels were obtained from the three monitoring wells used as observation wells during the test. Please see Appendix F for a copy of the test field data sheet.

After the water levels were measured and the fittings were in place on the injection well and observation wells, the test was started. The test began at 0935. The injected air was regulated to 50 psi, the injected air flow was 3.5 cfm. The helium flow was regulated to 35 cfh. The pressure at the injection well, OS-1, was measured at 15 psi.

The first readings were taken at 1005. There was no indication of increased pressure in either of the two ozone-sparging wells. However, a rise in positive pressure was noted in observation wells MW-3 and MW-6. Helium was also detected in observation well MW-6.

The next readings were taken at 1100. There was no indication of increased pressure or helium in either of the two ozone-sparging wells. However, a rise in positive pressure was noted in observation wells MW-3, MW-6 and MW-8. Helium was also detected in observation wells MW-3 and MW-6. After these readings were logged, the injected air was increased to 64 psi and 3.8 cfm. The pressure at the injection well had dropped to 12 psi. The helium flow was increased to 42 cfh.

The next readings were taken at 1200. There was still no indication of increased pressure in either of the two ozone-sparging wells. However, a positive pressure was still noted in observation wells MW-3, MW-6 and MW-8. Helium was not measured at this time. After these readings were logged, the injected air was measured at 64 psi and 4 cfm. The pressure at the injection well had dropped to 10 psi. The helium flow was measured at 38 cfh.

The next readings were taken at 1300. There was still no indication of increased pressure or helium in either of the two ozone-sparging wells. However, a positive pressure was still noted in observation wells MW-3, MW-6 and MW-8. The helium concentration had risen in both observation wells MW-3 and MW-6; there was still no indication of helium in observation well MW-8. After these readings were logged, the injected air was measured at 64 psi and 4 cfm. The pressure at the injection well had dropped to 10 psi. The helium flow was measured at 38 cfh.

The next readings were taken at 1400. There was still no indication of increased pressure in either of the two ozone-sparging wells. However, a positive pressure was still noted in observation well MW-6; there was no indication any longer of positive pressure in observation wells MW-3 and MW-8. Helium was not measured at this time. After these readings were logged, the injected air was adjusted to 75 psi and 3.5 cfm. The pressure at the injection well remained 10 psi. The helium flow was increased to 150 cfh.

The final readings were taken at 1500. There was still no indication of increased pressure or helium in either of the two ozone-sparging wells. A positive pressure was still noted in observation well MW-6; however, it had dropped in half. There was no indication of positive pressure in observation wells MW-3 and MW-8. The helium concentration had increased again in observation well MW-3, but dropped slightly in MW-6. MW-8 still did not detect helium.

5.5 Water Level Measurements

After the air-injection activities were completed, the water levels were again measured in monitoring wells MW-3, MW-6 and MW-8. The water leve rose from 1.14-feet in MW-3, rose 0.89-feet in MW-6, and rose 0.34-feet in MW-8.

5.6 Test Findings

As for positive pressure and water-level rise, the test indicates a radius of influence over 50-feet. As for helium measurements, the test indicates a radius of influence of approximately 35-feet. ASE cannot explain the lack of pressure increase or helium detection in the two ozone-sparging observation wells. We can only speculate that the sparge-point medium allows only for exit, not entry, as some form of a check-valve.

6.0 REMEDIATION SYSTEM DESIGN

Based on the pilot study test detailed in the section above, it appears that the site will accept pressurized air, with a conservative area of influence of approximately 30-feet. Ozone sparging is the process of adding an ozone/air mixture into a water-bearing zone contaminated with organic compounds. The ozone acts as an oxidant, which will destroy organic hydrocarbons. Ozone can oxidize contaminants either directly or through the formation of hydroxyl radicals. In situ decomposition of ozone can also lead to beneficial oxygenation and biostimulation. In addition, since a gas is injected, it may be possible for some remediation to also take place in the vadose zone as well.

6.1 Ozone-Sparging Wells

The proposed remediation system will incorporate the use of ten (10) ozone-sparge wells. The locations of these wells are shown on Figure 4. A cross-sectional view of a typical ozone sparging well is shown on Figure 5. ASE is assuming a conservative radius of influence of 30-feet based on data from the air-sparging test at the site. The wells will be located to destroy hydrocarbons within and downgradient of the former USTs. All ten ports on the ozone generation unit will be utilized.

The wells will be drilled with a drill rig equipped with 5-inch diameter hollow-stem augers. The wells will be constructed with 3/4-inch diameter PVC well casing. Ozone will be sparged from the casing through a 2-inch diameter by 30-inch long sparge point with 10-50 micron perforations. These sparge points will be placed in the location of the permeable water-bearing zone approximately 20-feet bgs. Lonestar #2/16 or finer sand will be placed between the sparge point and the boring from the bottom of the boring to 1-foot above the top of the sparge point. A 0.5-foot thick bentonite layer will be placed between the sandpack and the overlying cement sanitary seal. A Portland cement sanitary seal will be placed above the bentonite layer to prevent surface water from infiltrating into the well. The wellheads will be piped directly into an ozone-sparging manifold, which will then be piped directly to the ozone generator.

6.2 Ozone Generator

The system will utilize a C-Sparger System manufactured by Kerfoot Technologies. The C-Sparger System is a compact unit that generates an air/ozone mixture on-site. The unit will then pump the air/ozone mixture through ten ports one port at a time on a cycle set by a timer. The air/ozone flow is approximately 3 to 5 cubic feet per minute (cfm) at a pressure of up to 65 pounds per square inch (psi), although 20-24 psi is more typical. Each sparge point will receive air for 7 to 8 minutes approximately 18 times per day. The cycle timing will be programmed and cycle duration adjusted as needed. The entire unit operates on 110-volt power. A diagram of the C-Sparger unit is shown on Figure 6.

6.3 Manifold System

The air/ozone mixture will be pumped through double contained ozone-resistant poly tubing from the C-Sparing System to the sparging wells. This tubing consists of a 1/4-inch diameter inner transport tubing with a

7/8-inch outside diameter secondary containment tube. This tubing is flexible and will be buried through narrow trenches cut through the asphalt/concrete surface. The tubing will be placed into the trenches, buried with sand and covered with a surface patch. Due to the layout of the site in relation to the proposed well locations, and the heavy traffic volume at the site, trenching will be completed in two phases, see Figures 7 and 8. A detailed drawing of the manifold to sparge well connection is shown on Figure 9.

7.0 OPERATION, MONITORING AND REPORTING

The system will operate continuously 24-hours a day, 7 days a week. The system will be checked daily for the first week of operation and weekly thereafter. During the first week of operation, dissolved oxygen will be measured in all site groundwater monitoring wells to verify that ozone is being distributed as designed. In addition to the scheduled quarterly groundwater monitoring at the site, ASE will also conduct interim groundwater sampling one month after system startup, 2 months after system startup and one sampling in the period between regularly scheduled quarterly monitoring periods approximately 4 months after system startup. Results of the interim sampling will be reported in the normal quarterly report and will be addressed in detail in a report to be completed after 6-months of operation.

8.0 SCHEDULE

ASE will begin construction and installation of the remediation system immediately upon approval of this RAP by the ACHCSA.

Should you have any questions or comments, please call us at (925) 820-9391.

Respectfully submitted,

AQUA SCIENCE ENGINEERS, INC.

David Allen
Senior Project Manager

REGISTERED ENVIRONMENTAL ASSESSOR
DAVID ALLEN
No. REA-06211
Expires: 06 04
STATE OF CALIFORNIA

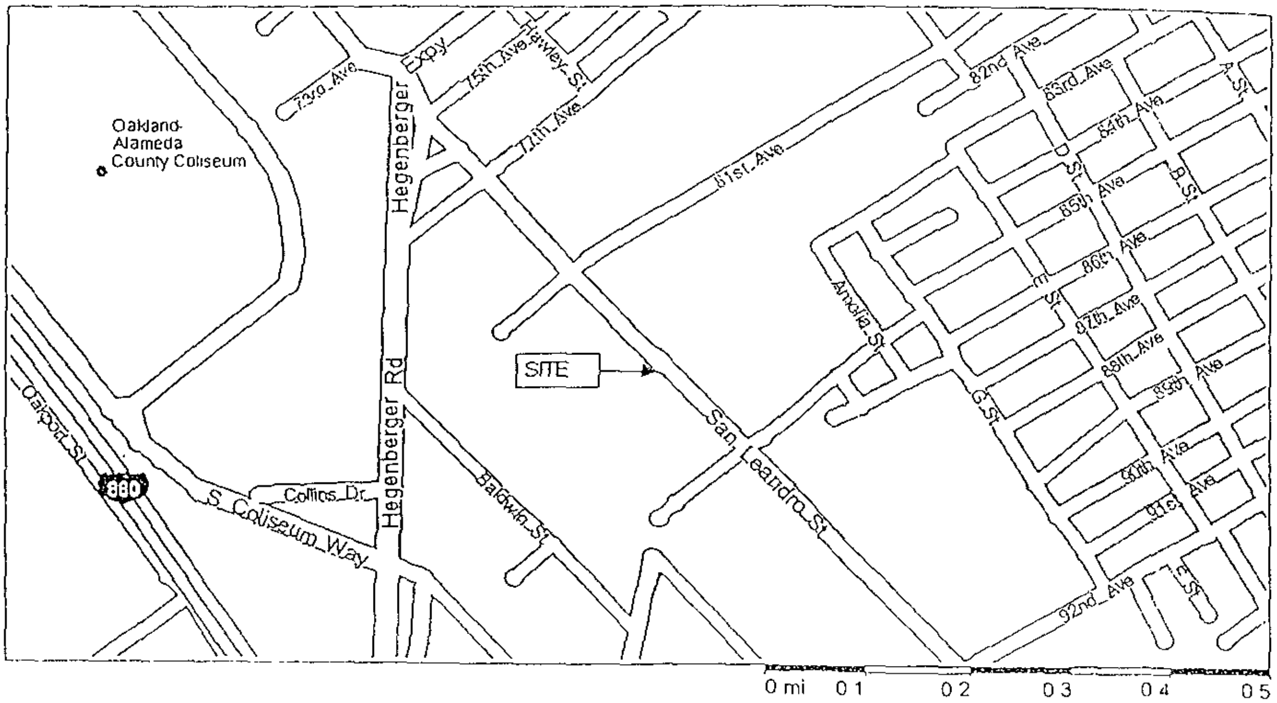
REGISTERED GEOLOGIST
ROBERT E. KITAY
No. 6586
STATE OF CALIFORNIA

Robert E. Kitay, ~~R.G.~~, R.E.A.
Senior Geologist

cc: Mr. Nissan Saidian, responsible party and client
Mr. Amir Gholami, ACHCSA

FIGURES

NORTH

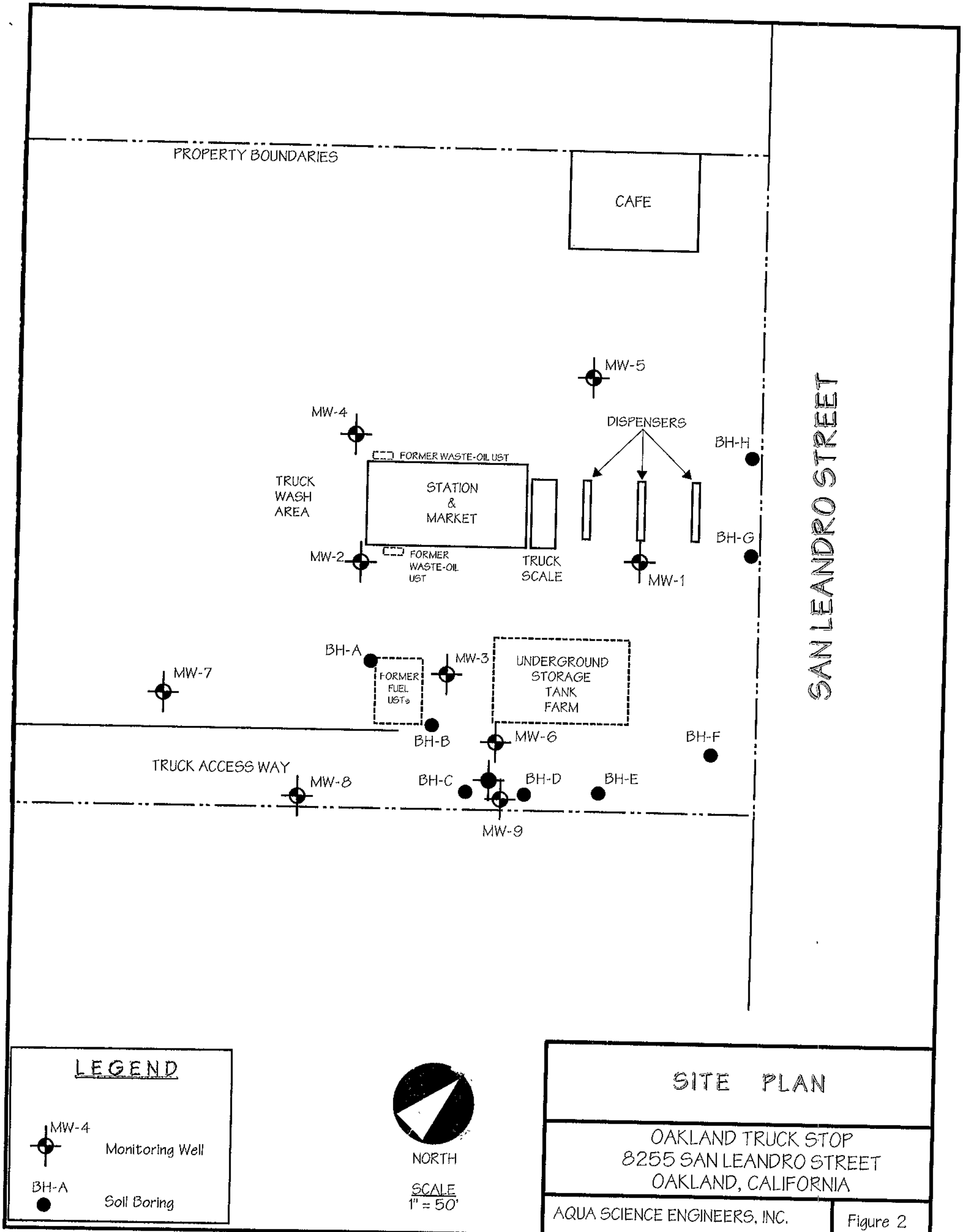


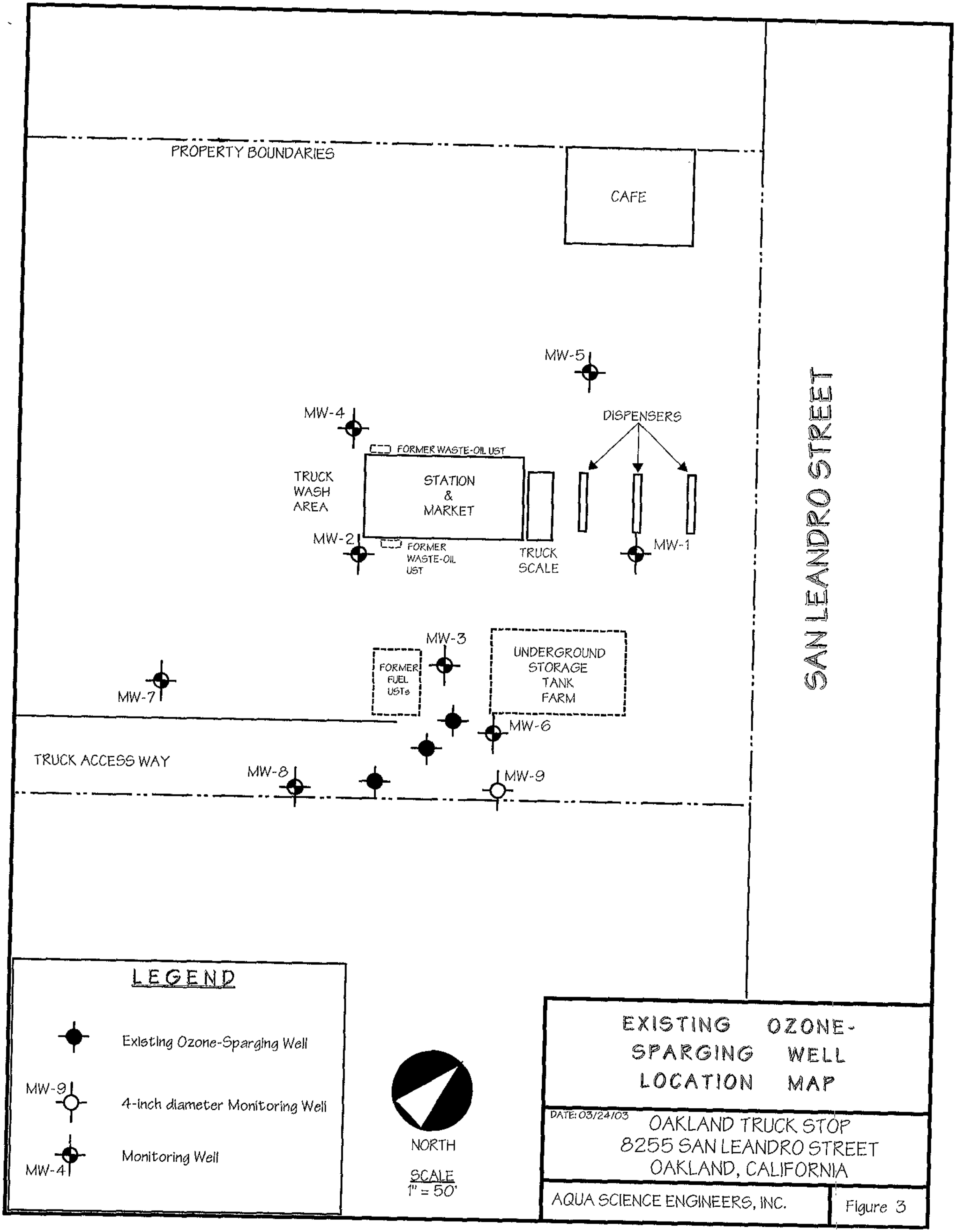
LOCATION MAP

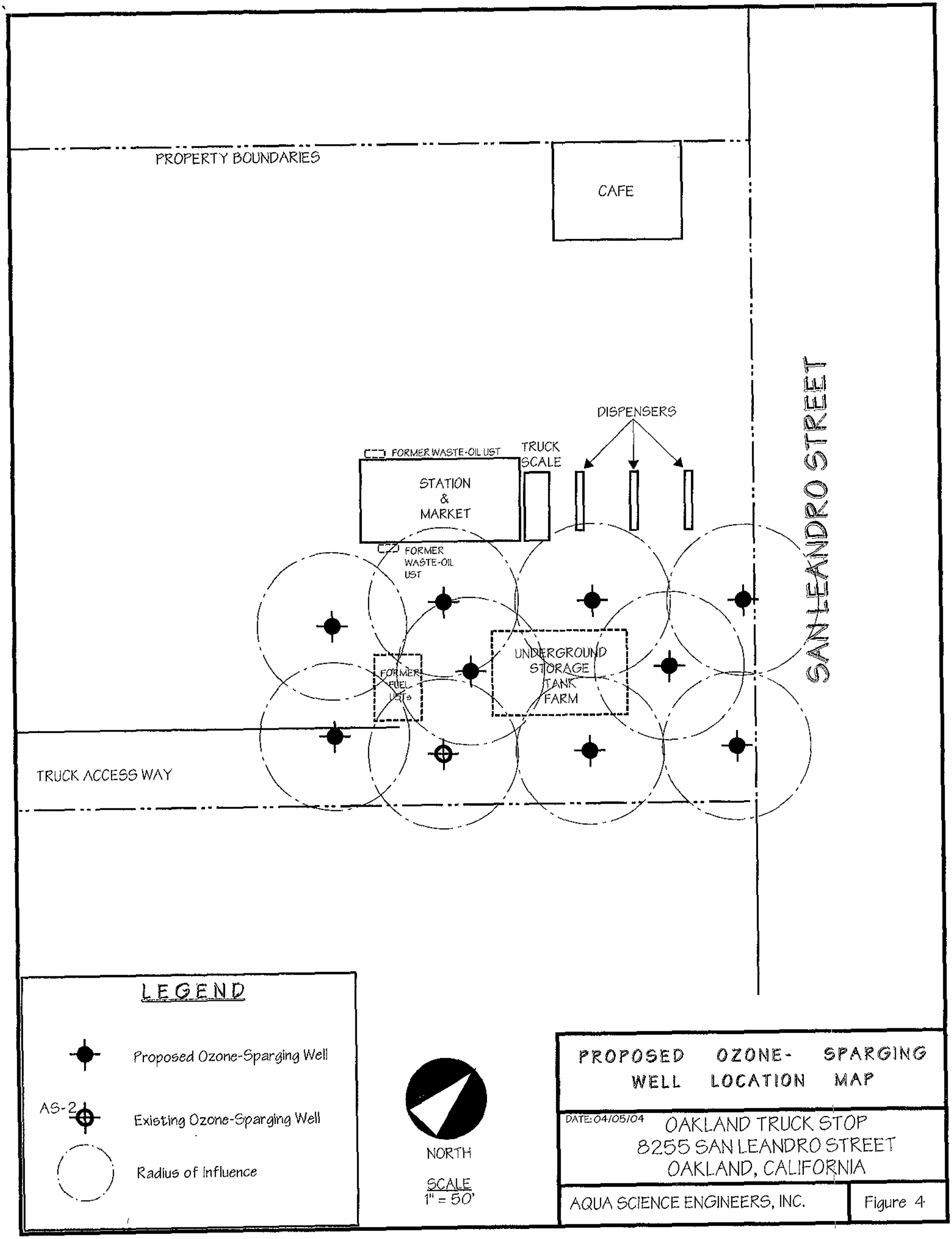
OAKLAND TRUCK STOP
8255 SAN LEANDRO STREET
OAKLAND, CALIFORNIA

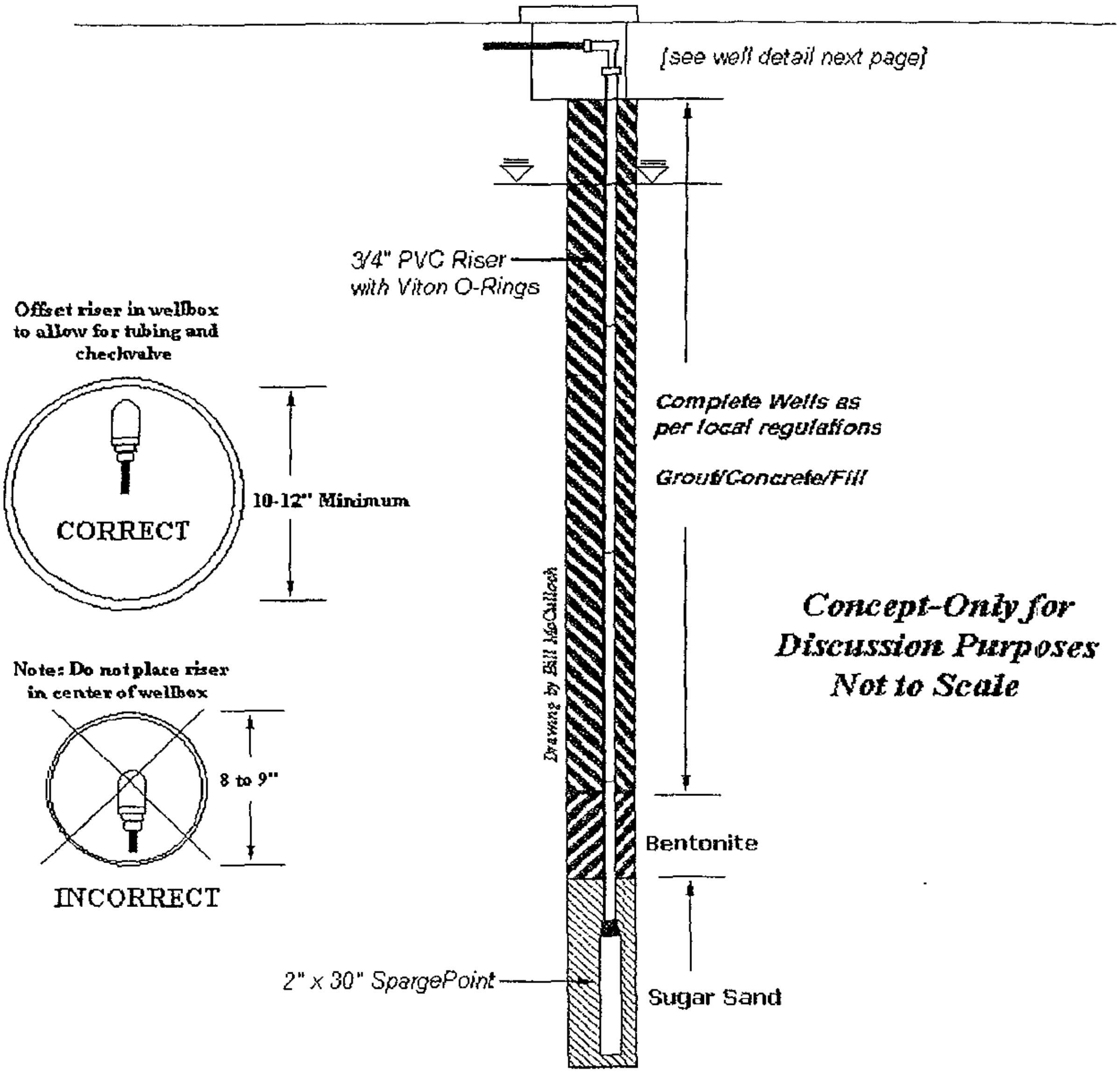
AQUA SCIENCE ENGINEERS, INC

Figure 1


PROPERTY BOUNDARIES
CAFE
MW-5
MW-4
DISPENSERS
BH-H
FORMER WASTE-OIL UST
TRUCK WASH AREA
STATION & MARKET
SAN LEANDRO STREET
BH-G
MW-2
FORMER WASTE-OIL UST
TRUCK SCALE
MW-1
BH-A
MW-3
UNDERGROUND STORAGE TANK FARM
MW-7
FORMER FUEL USTs
BH-B
MW-6
BH-F
TRUCK ACCESS WAY
MW-8
BH-C
BH-D
BH-E
MW-9
LEGEND
MW-4
Monitoring Well
BH-A
Soil Boring
NORTH
SCALE
1" = 50'
SITE PLAN
OAKLAND TRUCK STOP
8255 SAN LEANDRO STREET
OAKLAND, CALIFORNIA
AQUA SCIENCE ENGINEERS, INC.
Figure 2


PROPERTY BOUNDARIES
CAFE
MW-5
DISPENSERS
MW-4
FORMER WASTE-OIL UST
TRUCK WASH AREA
STATION & MARKET
MW-2
FORMER WASTE-OIL UST
TRUCK SCALE
MW-1
SAN LEANDRO STREET
MW-3
FORMER FUEL USTs
UNDERGROUND STORAGE TANK FARM
MW-7
MW-6
TRUCK ACCESS WAY
MW-8
MW-9
LEGEND
Existing Ozone-Sparging Well
MW-9
4-inch diameter Monitoring Well
MW-4
Monitoring Well
NORTH
SCALE
1" = 50'
EXISTING OZONE-SPARGING WELL LOCATION MAP
DATE: 03/24/03
OAKLAND TRUCK STOP
8255 SAN LEANDRO STREET
OAKLAND, CALIFORNIA
AQUA SCIENCE ENGINEERS, INC.
Figure 3

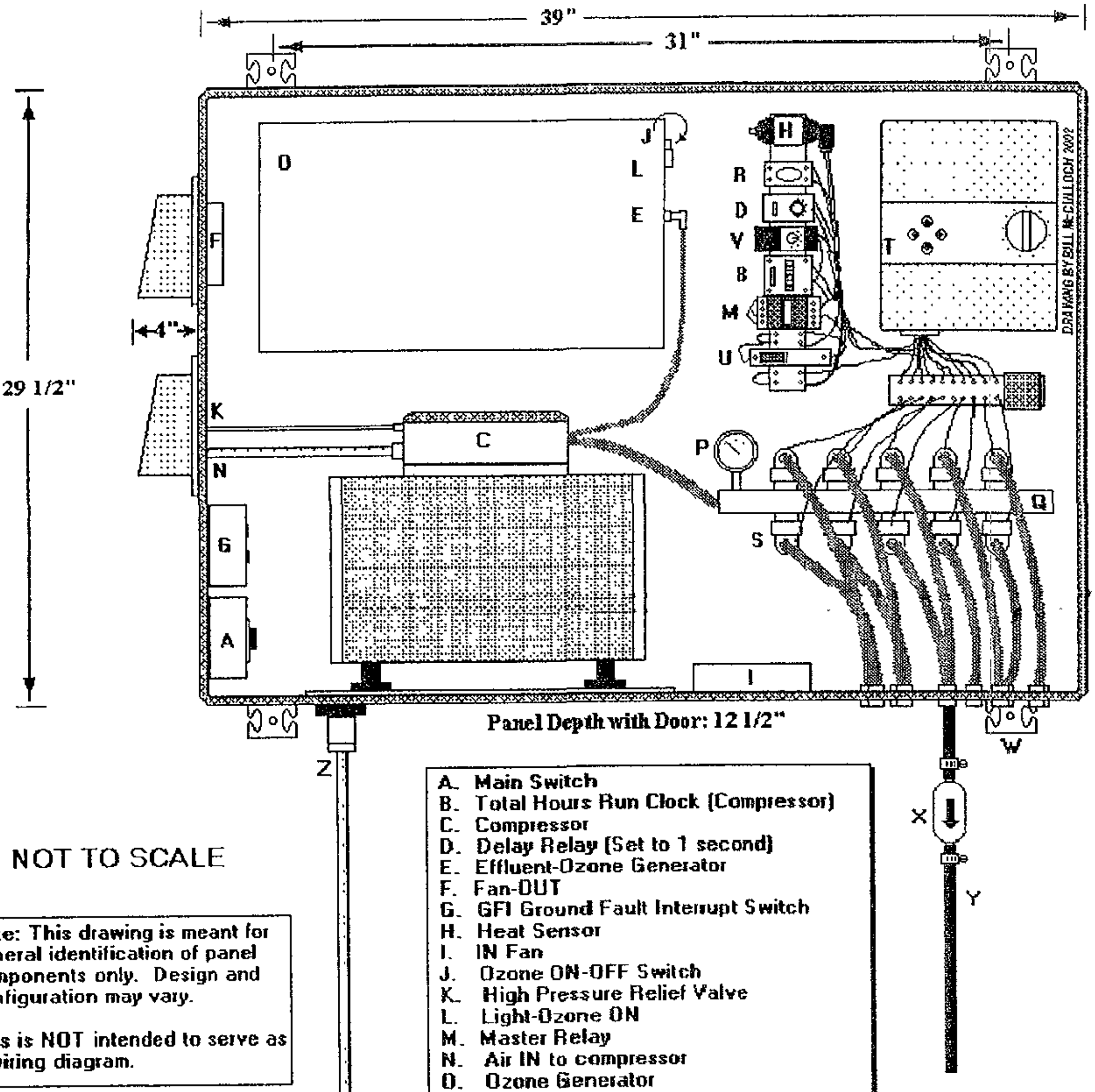

PROPERTY BOUNDARIES
CAFE
SAN LEANDRO STREET
DISPENSERS
FORMER WASTE-OIL UST
TRUCK SCALE
STATION & MARKET
FORMER WASTE-OIL UST
FORMER FUEL USTs
UNDERGROUND STORAGE TANK FARM
TRUCK ACCESS WAY
LEGEND
Proposed Ozone-Sparging Well
AS-2
Existing Ozone-Sparging Well
Radius of Influence
NORTH
SCALE
1" = 50'
PROPOSED OZONE-SPARGING WELL LOCATION MAP
DATE: 04/05/04
OAKLAND TRUCK STOP
8255 SAN LEANDRO STREET
OAKLAND, CALIFORNIA
AQUA SCIENCE ENGINEERS, INC.
Figure 4



OZONE SPARGING WELL
CROSS SECTION

OAKLAND TRUCK STOP
8255 SAN LEANDRO STREET
OAKLAND, CALIFORNIA

AQUA SCIENCE ENGINEERS, INC. | Figure 5



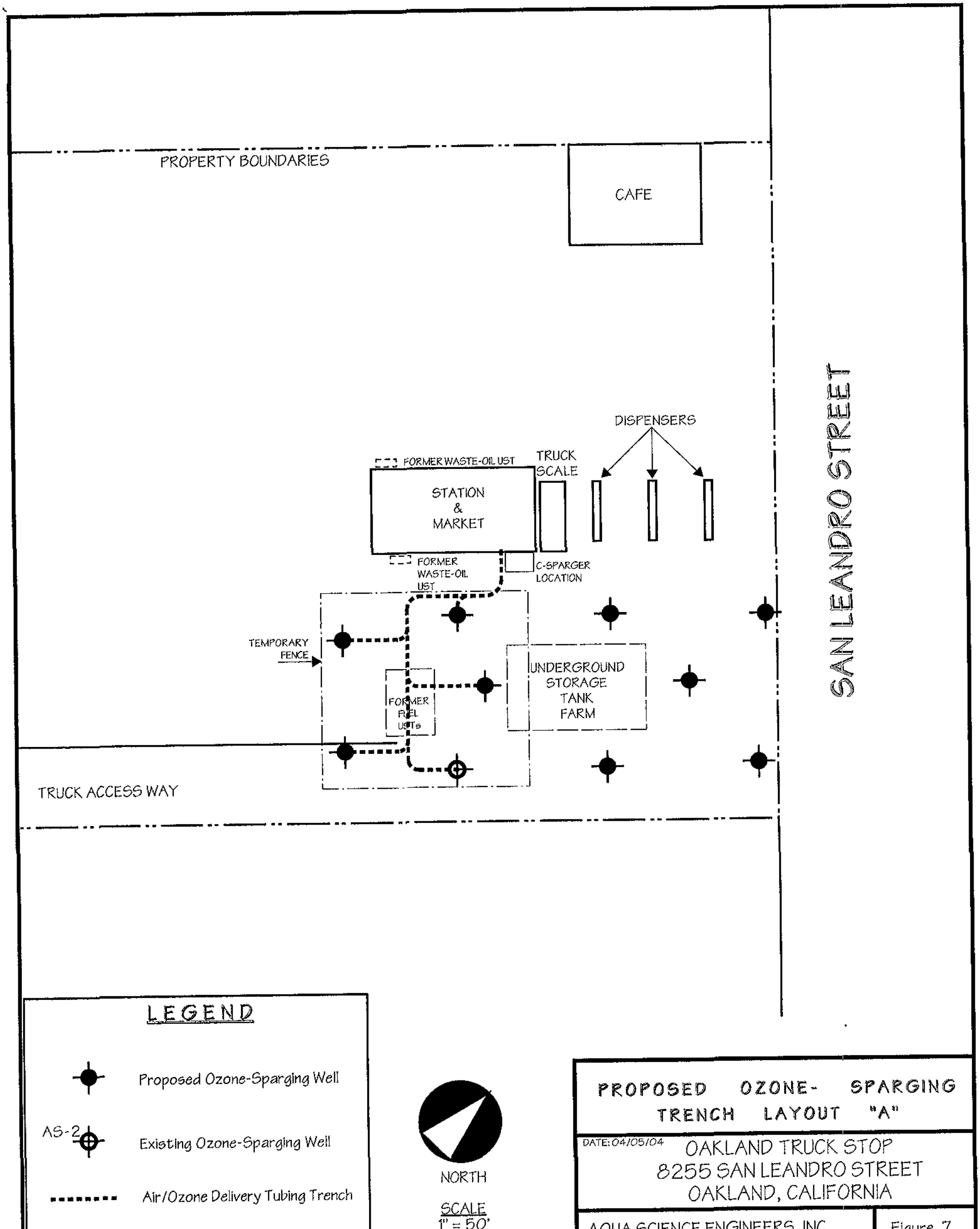
NOT TO SCALE

Note: This drawing is meant for general identification of panel components only. Design and configuration may vary.

This is NOT intended to serve as a wiring diagram.

A. Main Switch
B. Total Hours Run Clock (Compressor)
C. Compressor
D. Delay Relay (Set to 1 second)
E. Effluent-Ozone Generator
F. Fan-OUT
G. GFI Ground Fault Interrupt Switch
H. Heat Sensor
I. IN Fan
J. Ozone ON-OFF Switch
K. High Pressure Relief Valve
L. Light-Ozone ON
M. Master Relay
N. Air IN to compressor
O. Ozone Generator
P. Pressure Gage
Q. Manifold
R. Relay
S. Solenoid
T. Timer-Controller
U. 16 Amp Breaker
V. Current Sensing Relay
W. Mounting Bracket
X. One-Way Checkvalve (Arrow Down)
Y. Air-Ozone Tubing to Well
Z. Power Cord Plug

C-SPARGER DIAGRAM	
OAKLAND TRUCK STOP 8255 SAN LEANDRO STREET OAKLAND, CALIFORNIA	
AQUA SCIENCE ENGINEERS, INC.	Figure 6



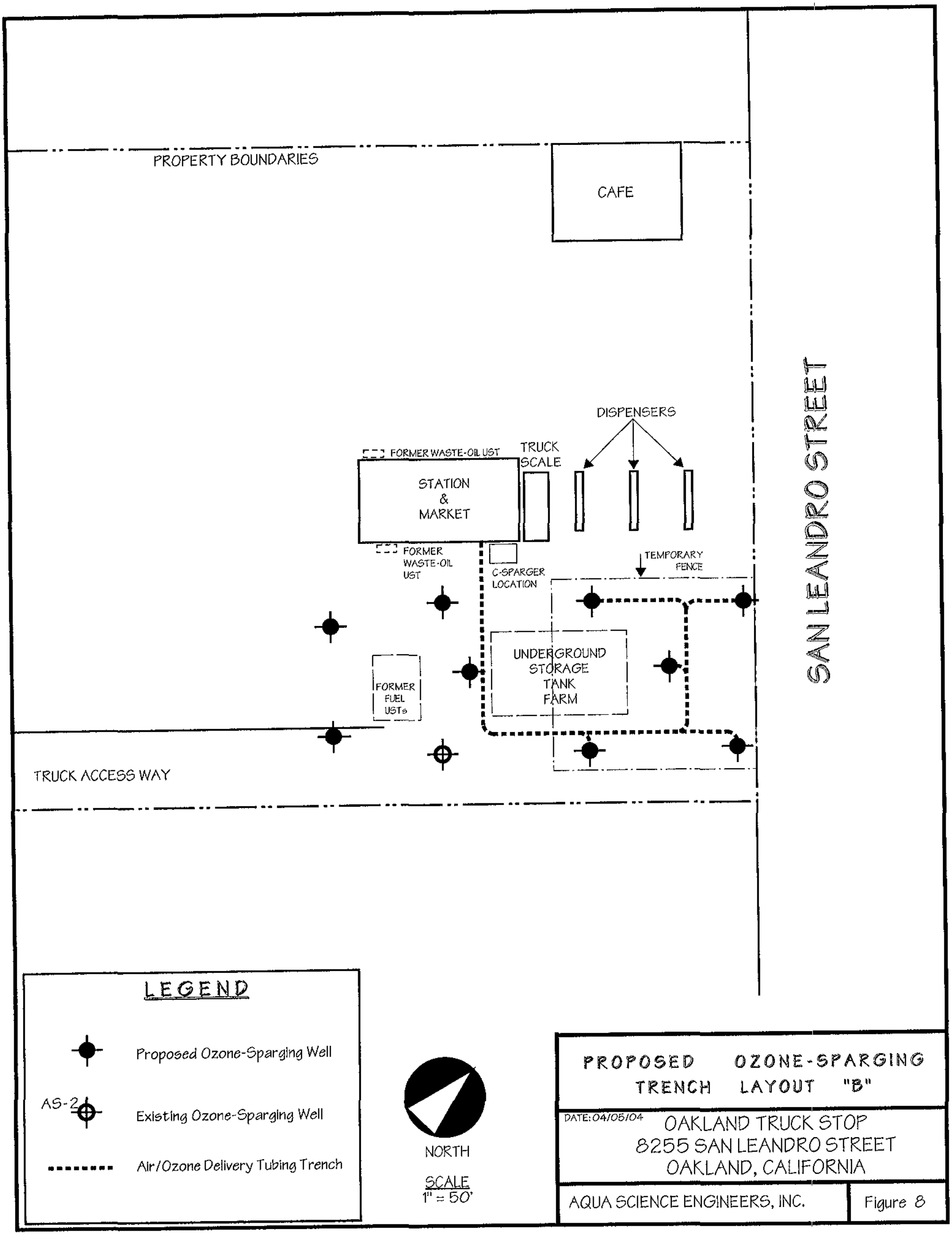
PROPOSED OZONE- SPARGING TRENCH LAYOUT "A"

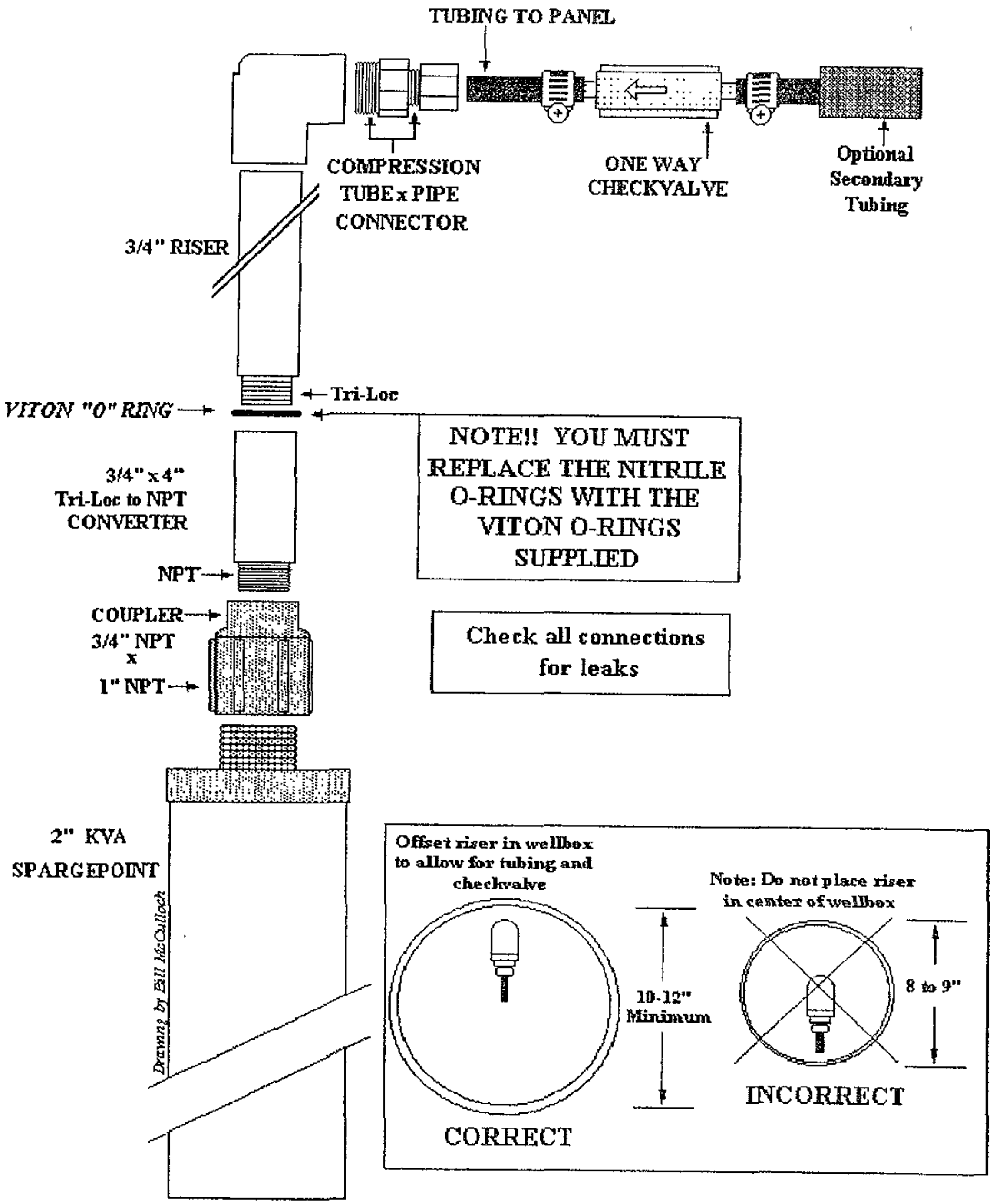
DATE: 04/05/04

OAKLAND TRUCK STOP
8255 SAN LEANDRO STREET
OAKLAND, CALIFORNIA

AQUA SCIENCE ENGINEERS, INC.

Figure 7


PROPERTY BOUNDARIES
CAFE
SAN LEANDRO STREET
DISPENSERS
FORMER WASTE-OIL UST
TRUCK SCALE
STATION & MARKET
FORMER WASTE-OIL UST
C-SPARGER LOCATION
TEMPORARY FENCE
UNDERGROUND STORAGE TANK FARM
FORMER FUEL USTs
TRUCK ACCESS WAY
LEGEND
Proposed Ozone-Sparging Well
AS-2
Existing Ozone-Sparging Well
Air/Ozone Delivery Tubing Trench
NORTH
SCALE
1" = 50'
PROPOSED OZONE-SPARGING TRENCH LAYOUT "B"
DATE: 04/05/04
OAKLAND TRUCK STOP
8255 SAN LEANDRO STREET
OAKLAND, CALIFORNIA
AQUA SCIENCE ENGINEERS, INC.
Figure 8



MANIFOLD TO WELL PLUMBING CONNECTION

OAKLAND TRUCK STOP
8255 SAN LEANDRO STREET
OAKLAND, CALIFORNIA

AQUA SCIENCE ENGINEERS, INC. | Figure 9

TABLES

TABLE ONE
Groundwater Elevation Data
Oakland Truck Stop
8255 San Leandro Street, Oakland, CA

Well I.D & Date Sampled	Top of Casing Elevation (msl)	Depth to Water (feet)	Free-Floating Hydrocarbon Thickness (feet)	Groundwater Elevation (msl)
MW-1				
8/16/99	97.12	Unknown	> 1.0	Unknown
8/27/99		6.90	0.36	90.51*
9/10/99		6.85	0.18	90.41*
9/24/99		6.65	0.08	90.53*
10/8/99		6.87	0.28	90.47*
10/22/99		6.81	0.23	90.49*
11/2/99		6.94	0.31	90.43*
11/19/99		6.91	0.12	90.31*
12/6/99		6.93	0.12	90.29*
3/8/00		5.93	0.21	91.36*
6/14/00		6.57	0.72	90.41*
12/11/00		6.70	0.60	90.90*
3/6/01		5.75	0.40	91.69*
6/6/01		7.60	1.48	90.70*
9/4/01		6.80	0.20	90.48*
3/11/02		approx. 7.47	approx. 3	approx. 92.05*
6/6/02		6.49	0.67	91.17*
9/4/02	11.02	6.89	0.54	4.56*
12/17/02		4.65		6.47*
3/7/03		6.55	1.19	3.52*
6/5/03		9.77	4.63	4.95*
9/19/03		6.56	0.32	4.72*
12/12/03		**5.63**	**0.41**	**5.72***
MW-2				
8/16/99	96.82	6.30	--	90.52
12/6/99		8.46	--	88.36
3/8/00		9.12	--	87.70
6/14/00		8.34	--	88.48
12/11/00		5.94	--	90.88
3/6/01		4.70	--	92.12
6/6/01		6.03	--	90.79
9/4/01		6.34	--	90.48
3/11/02		4.89	--	91.93
6/6/02		5.69	--	91.13
9/4/02	10.70	6.17	--	4.53
12/17/02		4.39	--	6.31
3/7/03		5.44	--	5.26
6/5/03		5.59	--	5.11
9/19/03		6.09	--	4.61
12/12/03		**5.13**	**--**	**5.57**

TABLE ONE
Groundwater Elevation Data
Oakland Truck Stop
8255 San Leandro Street, Oakland, CA

Well I.D & Date Sampled	Top of Casing Elevation (msl)	Depth to Water (feet)	Free-Floating Hydrocarbon Thickness (feet)	Groundwater Elevation (msl)
MW-3				
8/16/99	96.43	5.85	--	90.58
12/6/99		5.70	--	90.73
3/8/00		5.32	--	91.11
6/14/00		6.95	--	89.48
12/11/00		6.22	--	90.21
3/6/01		4.83	--	91.60
6/6/01		5.62	--	90.81
9/4/01		5.91	--	90.52
3/11/02		4.42	--	92.01
6/6/02		5.19	--	91.24
9/4/02	10.32	5.72	--	4.60
12/17/02		3.96	--	6.36
3/7/03		4.88	--	5.44
6/5/03		5.05	--	5.27
9/19/03		5.62	--	4.70
12/12/03		4.68	--	5.64
MW-4				
8/16/99	96.60	6.12	--	90.48
12/6/99		5.98	--	90.62
3/8/00		4.32	--	92.28
6/14/00		5.58	--	91.02
12/11/00		5.70	--	90.90
3/6/01		4.46	--	92.14
6/6/01		5.89	--	90.71
9/4/01		6.16	--	90.44
3/11/02		4.67	--	91.93
6/6/02		5.50	--	91.10
9/4/02	10.50	5.97	--	4.53
12/17/02		4.22	--	6.28
3/7/03		5.23	--	5.27
6/5/03		5.38	--	5.12
9/19/03		5.91	--	4.59
12/12/03		4.91	--	5.59
MW-5				
12/6/99	96.30	5.94	--	90.36
3/8/00		4.06	--	92.24
6/14/00		5.25	--	91.05
12/11/00		5.45	--	90.85
3/6/01		4.12	--	92.18
6/6/01		5.56	--	90.74
9/4/01		5.84	--	90.46
3/11/02		4.38	--	91.92
6/6/02		5.16	--	91.14
9/4/02	10.20	5.62	--	4.58
12/17/02		4.12	--	6.08
3/7/03		4.89	--	5.31
6/5/03		5.04	--	5.16
9/19/03		5.56	--	4.64
12/12/03		4.72	--	5.48

TABLE ONE
Groundwater Elevation Data
Oakland Truck Stop
8255 San Leandro Street, Oakland, CA

Well I.D & Date Sampled	Top of Casing Elevation (msl)	Depth to Water (feet)	Free-Floating Hydrocarbon Thickness (feet)	Groundwater Elevation (msl)
MW-6				
12/6/99	96.79	5.80	--	90.99
3/8/00		4.10	--	92.69
6/14/00		5.64	--	91.15
12/11/00		5.72	--	91.07
3/6/01		4.32	--	92.47
6/6/01		5.81	--	90.98
9/4/01		6.12	--	90.67
3/11/02		4.49	--	92.30
6/6/02		5.33	--	91.46
9/4/02	10.71	5.92	--	4.79
12/17/02		3.85	--	6.86
3/7/03		4.96	--	5.75
6/5/03		5.18	--	5.53
9/19/03		5.81	--	4.90
12/12/03		**4.73**	**--**	**5.98**
MW-7				
9/4/02	9.17	4.67	--	4.50
12/17/02		3.11	--	6.06
3/7/03		3.89	--	5.28
6/5/03		3.57	--	5.60
9/19/03		4.57	--	4.60
12/12/03		**3.48**	**--**	**5.69**
MW-8				
9/4/02	9.68	4.94	--	4.74
12/17/02		3.26	--	6.42
3/7/03		4.01	--	5.67
6/5/03		4.28	--	5.40
9/19/03		4.87	--	4.81
12/12/03		**3.77**	**--**	**5.91**
MW-9				
9/4/02	11.07	6.26	--	4.81
12/17/02		4.23	--	6.84
3/7/03		5.26	--	5.81
6/5/03		5.56	--	5.51
9/19/03		6.25	--	4.82
12/12/03			**Truck Parked Over Well**	

Notes:
* = Groundwater elevation adjusted for the presence of free-floating hydrocarbons by the equation: Adjusted groundwater elevation = Top of of casing elevation - depth to groundwater + (0.8 x free-floating hydrocarbon thickness)

Mid Coast Engineers (MCE) surveyed all site monitoring wells on July 11, 2002 to mean sea level (MSL). The updated elevation data is reflected in the table above.

TABLE TWO

Summary of Chemical Analysis of GROUNDWATER Samples

Petroleum Hydrocarbons

All results are in parts per billion

Well ID DATE	TPH Gasoline	TPH Diesel	TPH Motor Oil	Benzene	Toluene	Ethyl Benzene	Total Xylenes	MTBE	DIPE	ETBE	TAME	TBA
MW-1												
8/16/99					Not Sampled Due to Free-Floating Hydrocarbons							
12/6/99					Not Sampled Due to Free-Floating Hydrocarbons							
3/8/00					Not Sampled Due to Free-Floating Hydrocarbons							
6/14/00					Not Sampled Due to Free-Floating Hydrocarbons							
12/11/00					Not Sampled Due to Free-Floating Hydrocarbons							
3/6/01					Not Sampled Due to Free-Floating Hydrocarbons							
6/6/01					Not Sampled Due to Free-Floating Hydrocarbons							
9/4/01					Not Sampled Due to Free-Floating Hydrocarbons							
3/11/02					Not Sampled Due to Free-Floating Hydrocarbons							
6/6/02					Not Sampled Due to Free-Floating Hydrocarbons							
9/4/02					Not Sampled Due to Free-Floating Hydrocarbons							
12/17/02					Not Sampled Due to Free-Floating Hydrocarbons							
3/7/03					Not Sampled Due to Free-Floating Hydrocarbons							
6/5/03					Not Sampled Due to Free-Floating Hydrocarbons							
9/19/03					Not Sampled Due to Free-Floating Hydrocarbons							
12/12/03					**Not Sampled Due to Free-Floating Hydrocarbons**							
MW-2												
8/16/99	2,200	970*	<500	3.8	<2.0	3	<4.0	<20	NA	NA	NA	NA
12/6/99	1,900	400*	<500	16	<0.5	1.5	<0.5	5.2	NA	NA	NA	NA
3/8/00	1,600*	530*	<500	9.7	<0.5	2.7	<0.5	27	NA	NA	NA	NA
6/14/00	2,000	75	<100	2.8	<0.5	3.4	<0.5	16	3.4	<0.5	<0.5	64
12/11/00	1,000	120	<100	2.6	<0.5	<0.5	<0.5	15	2.9	<0.5	<0.5	62
3/6/01	1,500	1,400	NA	2.2	<0.5	1.7	<0.5	22	3.4	<0.5	<0.5	83
6/6/01	1,700	190	NA	2.6	<0.5	2.3	<0.5	26	3.2	<0.5	<0.5	83
9/4/01	2,000	450	NA	2.7	<0.5	2.1	<0.5	33	3.4	<0.5	<0.5	93
3/11/02	1,100	410	NA	1.0	<0.5	0.5	<0.5	26	2.5	<0.5	<0.5	69
6/6/02	900	430	NA	1.2	<0.5	<0.5	<0.5	23	2.8	<0.5	<0.5	73
9/4/02	910	510	NA	1.6	<0.5	<0.5	<0.5	45	2.5	<0.5	<0.5	67
12/17/02	190	220	NA	0.65	<0.5	<0.5	<0.5	34	1.5	<0.5	<0.5	46
3/7/03	380	300	NA	0.81	<0.5	<0.5	<0.5	50	1.9	<0.5	<0.5	73
6/5//2003	2,200	2,200	NA	1.7	<0.5	1.5	<0.5	180	4.9	<0.5	1.3	110
9/19/03	2,300	520	NA	2.0	<0.5	2.1	<0.5	180	3.7	<0.5	1.1	120
12/12/03	**3,000**	**2,200**	**NA**	**2.1**	**<0.5**	**1.7**	**<0.5**	**250**	**4.5**	**<0.5**	**1.6**	**130**
MW-3												
~~8/16/99~~	56,000	10,000**	<500	17,000	2,600	2,600	1,200	6,100	NA	NA	NA	NA
12/6/99	40,000	9,100*	<500	16,000	140	1,800	100	2,200/4,000#	NA	NA	NA	NA
3/8/00	22,000	4,500*	<500	11,000	72	1,100	130	3,400	NA	NA	NA	NA
6/14/00	34,000	16,000	<100	13,000	94	1,300	160	4,800	31	<10	21	2,700
12/11/00	24,000	14,000	<100	13,000	88	780	120	4,300	<50	<50	<50	2,300
3/6/01	34,000	12,000	NA	15,000	100	1,100	130	4,000	<50	<50	<50	2,100
6/6/01	34,000	20,000	NA	14,000	94	550	110	4,400	<50	<50	<50	2,300
9/4/01	29,000	19,000	NA	13,000	83	480	83	4,100	<50	<50	<50	3,400
3/11/02	12,000	14,000	NA	2,900	<20	110	<20	530	<20	<20	<20	330
6/6/02	20,000	14,000	NA	10,000	<50	200	51	2,400	<50	<50	<50	1,200
9/4/02	24,000	17,000	NA	11,000	<50	140	<50	3,200	<50	<50	<50	1,400
12/17/02	4,900	17,000	NA	2,000	<10	52	12	360	<10	<10	<10	220
3/7/03	8,700	16,000	NA	2,300	<10	43	11	770	<10	<10	<10	360
6/5/03	27,000	14 000	NA	10,000	53	220	53	5,000	<50	<50	<50	1,600
9/19/03	120,000	13,000	NA	20,000	170	710	250	6,100	<25	<25	<25	2,600
12/12/03	**29,000**	**27,000**	**NA**	**12,000**	**74**	**240**	**79**	**5,600**	**17**	**<10**	**30**	**2,100**

TABLE TWO

Summary of Chemical Analysis of GROUNDWATER Samples

Petroleum Hydrocarbons

All results are in parts per billion

Well ID DATE	TPH Gasoline	TPH Diesel	TPH Motor Oil	Benzene	Toluene	Ethyl Benzene	Total Xylenes	MTBE	DIPE	ETBE	TAME	TBA
MW-4												
8/16/99	61***	1,100*	<500	<0.5	<0.5	<0.5	<1.0	86	NA	NA	NA	NA
12/6/99	130***	220*	<500	<1.0	<1.0	<1.0	<1.0	130	NA	NA	NA	NA
3/8/00	<50	220*	<500	<0.5	<0.5	<0.5	<0.5	130	NA	NA	NA	NA
6/14/00	<50	<50	<100	<0.5	<0.5	<0.5	<0.5	100	<0.5	<0.5	<0.5	20
12/11/00	<50	<50	<100	<0.5	<0.5	<0.5	<0.5	110	<0.5	<0.5	<0.5	16
3/6/01	<50	670	NA	<0.5	<0.5	<0.5	<0.5	110	<0.5	<0.5	<0.5	9.9
6/6/01	<50	790	NA	<0.5	<0.5	<0.5	<0.5	110	<0.5	<0.5	<0.5	20
9/4/01	<50	950	NA	<0.5	<0.5	<0.5	<0.5	110	<0.5	<0.5	<0.5	26
3/11/02	<50	250	NA	<0.5	<0.5	<0.5	<0.5	84	<0.5	<0.5	<0.5	21
6/6/02	<50	710	NA	<0.5	<0.5	<0.5	<0.5	92	<0.5	<0.5	<0.5	21
9/4/02	<50	1,100	NA	<0.5	<0.5	<0.5	<0.5	150	<0.5	<0.5	<0.5	18
12/17/02	<50	470	NA	<0.5	<0.5	<0.5	<0.5	120	<0.5	<0.5	<0.5	<5.0
3/7/03	<50	470	NA	<0.5	<0.5	<0.5	<0.5	120	<0.5	<0.5	0.52	18
6/5/03	<50	2,000	NA	<0.5	<0.5	<0.5	<0.5	110	<0.5	<0.5	0.50	23
9/19/03	<50	830	NA	<0.5	<0.5	<0.5	<0.5	110	<0.5	<0.5	<0.80	23
12/12/03	**<50**	**1,700**	**NA**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**120**	**<0.5**	**<0.5**	**<0.50**	**16**
MW-5												
12/6/99	450***	2,000*	<500	<1.0	<1.0	<1.0	<1.0	21	NA	NA	NA	NA
3/8/00	51***	530*	<500	<0.5	<0.5	<0.5	<0.5	84	NA	NA	NA	NA
6/14/00	380	1,400	<100	<0.5	<0.5	<0.5	<0.5	160	12	<0.5	<0.5	22
12/11/00	540	590	<100	<0.5	<0.5	<0.5	<0.5	240	9.5	<0.5	<0.5	32
3/6/01	510	2,900	NA	<0.5	<0.5	<0.5	<0.5	140	13	<0.5	<0.5	19
6/6/01	280	2,700	NA	<0.5	<0.5	<0.5	<0.5	180	13	<0.5	<0.5	26
9/4/01	630	2,600	NA	<0.5	<0.5	<0.5	<0.5	180	9.4	<0.5	<0.5	29
3/11/02	97	3,500	NA	<0.5	<0.5	<0.5	<0.5	29	0.79	<0.5	<0.5	7.4
6/6/02	61	3,500	NA	<0.5	<0.5	<0.5	<0.5	150	2.9	<0.5	<0.5	34
9/4/02	92	6,100	NA	<0.5	<0.5	<0.5	<0.5	370	3.6	<0.5	<0.5	72
12/17/02	110	2,100	NA	<0.5	<0.5	<0.5	<0.5	110	4.2	<0.5	<0.5	14
3/7/03	71	1,600	NA	<0.5	<0.5	<0.5	<0.5	150	2.2	<0.5	<0.5	35
6/5/03	95	3,300	NA	<0.5	<0.5	<0.5	<0.5	170	4.6	<0.5	<0.5	43
9/19/03	100	1,400	NA	<0.5	<0.5	<0.5	<0.5	310	5.2	<0.50	0.68	86
12/12/03	**<50**	**7,600**	**NA**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**270**	**5.9**	**<0.50**	**0.70**	**91**
MW-6												
~~12/6/99~~	13,000	<50	<500	180	21	11	24	<100	NA	NA	NA	NA
3/8/00	<10,000	4,600*	<500	230	26	18	39	12,000	NA	NA	NA	NA
6/14/00	8,400	12,000	<100	190	12	9.5	22	15,000	<5.0	<5.0	70	3,300
12/11/00	<5,000	10,000	<100	190	<50	<50	<50	14,000	<50	<50	74	2,900
3/6/01	5,300	6,700	NA	220	<50	<50	<50	13,000	<50	<50	84	2,100
6/6/01	5,000	23,000	NA	210	<25	<25	<25	12,000	<25	<25	84	4,200
9/4/01	5,400	22,000	NA	190	12	<10	23	15,000	<10	<10	79	4,000
3/11/02	4,600	11,000	NA	160	<25	<25	<25	15,000	<25	<25	39	5,100
6/6/02	<5,000	14,000	NA	200	<50	<50	<50	17,000	<50	<50	77	8,700
9/4/02	<5,000	50,000	NA	140	<50	<50	<50	21,000	<50	<50	52	7,500
12/17/02	<5,000	9,100	NA	130	<50	<50	<50	16,000	<50	<50	64	6,300
3/7/03	<5,000	12,000	NA	160	<50	<50	<50	20,000	<50	<50	53	7,500
6/5//2003	<5,000	23,000	NA	230	<50	<50	<50	19,000	<50	<50	86	7,100
9/19/03	8,900	24,000	NA	220	<25	<25	<25	15,000	<25	<25	74	8,100
12/12/03	**8,000**	**24,000**	**NA**	**190**	**<25**	**<25**	**32**	**14,000**	**<25**	**<25**	**65**	**7,400**

TABLE TWO

Summary of Chemical Analysis of GROUNDWATER Samples
Petroleum Hydrocarbons
All results are in parts per billion

Well ID DATE	TPH Gasoline	TPH Diesel	TPH Motor Oil	Benzene	Toluene	Ethyl Benzene	Total Xylenes	MTBE	DIPE	ETBE	TAME	TBA
MW-7												
9/4/02	<50	130****	NA	<0.5	<0.5	<0.5	<0.5	3.4	<0.5	<0.5	<0.5	<5.0
12/17/02	<50	220	NA	<0.5	<0.5	<0.5	<0.5	2.8	<0.5	<0.5	<0.5	<5.0
3/7/03	<50	140	NA	<0.5	<0.5	<0.5	<0.5	1.8	<0.5	<0.5	<0.5	<5.0
6/5/03	<50	200	NA	<0.5	<0.5	<0.5	<0.5	2.5	<0.5	<0.5	<0.5	<5.0
9/19/03	<50	320	NA	<0.5	<0.5	<0.5	<0.5	5.0	<0.5	<0.5	<0.5	<5.0
12/12/03	**<50**	**380**	**NA**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**2.3**	**<0.5**	**<0.5**	**<0.5**	**<5.0**
MW-8												
9/4/02	<50	170	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5.0
12/17/02	<50	100	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5.0
3/7/03	<50	62	NA	<0.5	<0.5	<0.5	<0.5	33	<0.5	<0.5	<0.5	<5.0
6/5/03	<50	270	NA	<0.5	<0.5	<0.5	<0.5	13	<0.5	<0.5	<0.5	<5.0
9/19/03	<50	250	NA	<0.5	<0.5	<0.5	<0.5	11	<0.5	<0.5	<0.5	<5.0
12/12/03	**<50**	**420**	**NA**	**<0.5**	**<0.5**	**<0.5**	**<0.5**	**11**	**<0.5**	**<0.5**	**<0.5**	**<5.0**
MW-9												
9/4/02	<2,500	1,000	NA	<25	<25	<25	<25	12,000	<25	<25	70	1,700
12/17/02	<2,000	880	NA	<20	<20	<20	<20	4,500	<20	<20	23	2,300
3/7/03	<500	450	NA	<5.0	<5.0	<5.0	<5.0	1,700	<5.0	<5.0	8.4	6,600
6/5/03	<500	4,500	NA	<5.0	<5.0	<5.0	<5.0	120	<5.0	<5.0	<5.0	17,000
9/19/03	<1000	4,500	NA	<10	<10	<10	<10	38	<10	<10	<10	15,000
12/12/03						**Not Sampled - Truck Parked Over Well**						
DHS MCL	NE	NE	NE	1	150	700	1,750	13	NE	NE	NE	NE
ESL	400	500	500	46	130	290	1	1,800	NE	NE	NE	NE

Notes:

Non-detectable concentrations are noted by the less than symbol (<) followed by the detection limit.

Most recent concentrations are in bold.

DHS MCL is the California Department of Health Services maximum contaminant level for drinking water.

ESL = Environmental screening levels presented in the "Screening For Environmental Concerns at Sites With Contaminated Soil and Groundwater (July 2003)" document prepared by the California Regional Water Quality Control Board, San Francisco Bay Region.

NE = MCL/ESL not established.

NA = Sample not analyzed for this compound

* = Non-typical diesel pattern, hydrocarbons in early diesel range

** = Estimated concentration due to overlapping fuel patterns in the sample.

*** = Non-typical gasoline pattern.

**** = Non-typical diesel pattern.

= MTBE concentration by EPA Method 8260

TABLE THREE
Summary of Analysis of **SOIL** Samples
TPH-G, TPH-D, BTEX
All results are in **parts per million**

Boring	Depth (Feet)	TPH Gasoline	TPH Diesel	TPH Motor Oil	Benzene	Toluene	Ethyl Benzene	Total Xylenes
BH-A	7.5'	**370**	**670**	< 200	**2.3**	**0.16**	**4.7**	**1.1**
	11.5'	**210**	**130**	< 10	**1.3**	**0.52**	**3.7**	**15**
BH-B	7.5'	**4.4**	**2.5**	**24**	**0.040**	< 0.0050	< 0.0050	< 0.0050
	11.5'	**190**	**120**	< 10	**0.048**	**0.030**	**0.37**	**0.020**
BH-C	11.5'	< 1.0	< 1.0	< 10	< 0.0050	< 0.0050	< 0.0050	< 0.0050
BH-D	11.5'	< 1.0	< 1.0	< 10	< 0.0050	< 0.0050	< 0.0050	< 0.0050
BH-E	11.5'	< 1.0	< 1.0	**14**	< 0.0050	< 0.0050	< 0.0050	< 0.0050
BH-F	11.5'	< 1.0	< 1.0	< 10	< 0.0050	< 0.0050	< 0.0050	< 0.0050
BH-G	12'	**270**	**1,500**	< 10	< 0.020	**0.028**	< 0.020	< 0.020
BH-H	8'	**150**	**1,100**	< 10	**0.029**	**0.024**	< 0.020	< 0.020
	12'	**3.0**	**320**	< 10	< 0.0050	< 0.0050	< 0.0050	< 0.0050
MW-7	10.5'	< 1.0	< 1.0	< 10	< 0.0050	< 0.0050	< 0.0050	< 0.0050
MW-8	11.0'	< 1.0	**3.9**	< 10	< 0.0050	< 0.0050	< 0.0050	< 0.0050
MW-9	13.0'	< 10	< 1.0	**15**	< 0.0050	< 0.0050	< 0.0050	< 0.0050
RBSL		400	500	500	0.39	8.4	24	1.0

Notes:
Non-detectable concentrations are noted by the less than symbol (<) followed by the detection limit.

Detectable concentrations are in **bold**.

RBSL is the California Regional Water Quality Control Board, San Francisco Bay Region Risk-Based Screening Level for subsurface soil at commercial/industrial property where groundwater is not a current or potential source of drinking water.

TABLE FOUR
Summary of Analysis of **SOIL** Samples
Oxygenates
All results are in **parts per million**

Boring	Depth (Feet)	MTBE	DIPE	ETBE	TAME	TBA
BH-A	7.5'	< 0.050	< 0.050	< 0.050	< 0.050	< 0.50
	11.5'	< 0.020	< 0.020	< 0.020	< 0.020	< 0.20
BH-B	7.5'	< 0.0050	< 0.0050	< 0.0050	< 0.0050	**0.012**
	11.5'	**0.41**	< 0.020	< 0.020	< 0.020	< 0.20
BH-C	11.5'	**1.0**	< 0.0050	< 0.0050	**0.025**	**0.49**
BH-D	11.5'	**1.7**	< 0.0050	< 0.0050	**0.024**	**0.57**
BH-E	11.5	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
BH-F	11.5'	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
BH-G	12'	**0.050**	< 0.020	< 0.020	< 0.020	< 0.20
BH-H	8'	**0.060**	< 0.020	< 0.020	< 0.020	< 0.20
	12'	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.020
MW-7	10.5'	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
MW-8	11.0'	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
MW-9	13.0'	**0.0058**	< 0.0050	< 0.0050	< 0.0050	**0.0051**
RBSL		1.0	NE	NE	NE	NE

Notes:
Non-detectable concentrations are noted by the less than symbol (<) followed by the detection limit.

Detectable concentrations are in **bold**.

RBSL is the California Regional Water Quality Control Board, San Francisco Bay Region Risk-Based Screening Level for subsurface soil at commercial/industrial property where groundwater is not a current or potential source of drinking water.

NE = RBSL is not established.

TABLE FIVE
Summary of Analysis of **WATER** Samples
TPH-G, TPH-D, BTEX
All results are in **parts per billion**

Boring	TPH Gasoline	TPH Diesel	TPH Motor Oil	Benzene	Toluene	Ethyl Benzene	Total Xylenes
BH-A	**43,000**	**8,700**	< 100	**4,000**	**400**	**2,200**	**3,100**
BH-B	**51,000**	**120,000**	< 2,000	**430**	< 10	**700**	**19**
BH-C	< 200	**200**	**890**	< 2.0	< 2.0	< 2.0	< 2.0
BH-D	< 500	< 50	**2,400**	< 5.0	< 5.0	< 5.0	< 5.0
BH-E	< 50	< 50	**11,000**	< 0.50	< 0.50	< 0.50	< 0.50
BH-F	< 50	< 50	**780**	< 0.50	< 0.50	< 0.50	< 0.50
BH-G	**120,000**	**2,200,000**	< 1,000	< 50	< 50	< 50	< 50
BH-H	< 50	**1,400**	**1,400**	< 0.50	< 0.50	< 0.50	< 0.50
MCL		NE	NE	1.0	150	700	1,750

Notes:

Non-detectable concentrations are noted by the less than symbol (<) followed by the detection limit.

Detectable concentrations are in **bold**.

MCL is the California Department of Health Services maximum contaminant level for drinking water.

NE = No MCL is established.

TABLE SIX

Summary of Analysis of WATER Samples
Oxygenates
All results are in **parts per billion**

Boring	MTBE	DIPE	ETBE	TAME	TBA
BH-A	**46**	< 20	< 20	< 20	< 200
BH-B	**6,200**	< 10	< 10	**37**	**1,000**
BH-C	**13,000**	< 2.0	< 2.0	**100**	**2,600**
BH-D	**42,000**	< 5.0	< 5.0	**250**	**6,800**
BH-E	**6.0**	< 0.50	< 0.50	< 0.50	< 5.0
BH-F	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
BH-G	**170**	< 50	< 50	< 50	< 500
BH-H	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
PRG	13	NE	NE	NE	NE

Notes:

Non-detectable concentrations are noted by the less than symbol (<) followed by the detection limit.

Detectable concentrations are in **bold**.

MCL is the California Department of Health Services maximum contaminant level for drinking water.

NE = No MCL is established.

APPENDIX A

Letter from the ACHCSA

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

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

RO0000085

January 23, 2004

Mr. Nissan Saidian
5733 Medallion Ct.
Castro Valley, CA 94552

Dear Mr. Saidian:

Subject: Fuel Leak Case #RO0000085, Oakland Truck Stop, 8255 San Leandro St., Oakland, CA 94621

Alameda County Environmental Health, Local Oversight Program (LOP), has received and reviewed the December 4, 2002 document regarding the above referenced site as prepared by Mr. Robert Kitay of Aqua Science Engineers, (ASE). I have also called and discussed with Mr. Kitay of Aqua Science Engineers.

This office requests that you address the following technical comments, perform the proposed work, and send us the technical reports requested below:

TECHNICAL COMMENTS

This work plan addresses all the required investigations in my correspondence dated December 31, 2003 including:

Ozone sparging test, further definition of both the horizontal and vertical extent of groundwater contamination, verification that no unknown USTs exist at the site, continued quarterly groundwater monitoring, continued weekly bailing of free-floating product, repair of the cracked concrete in the vicinity of the diesel dispensers, conduit and preferential pathway studies, and drawing of geological cross sections.

This office concurs with the submitted workplan as specified above.

TECHNICAL REPORT REQUEST

Please submit the following technical reports to Alameda County Department of Environmental Health (Attention: Amir K. Gholami):

February 23, 2004 Result of the Work Plan

Should you have any questions, please do not hesitate to call me at (510) 567-6876.

Sincerely,

Amir K. Gholami

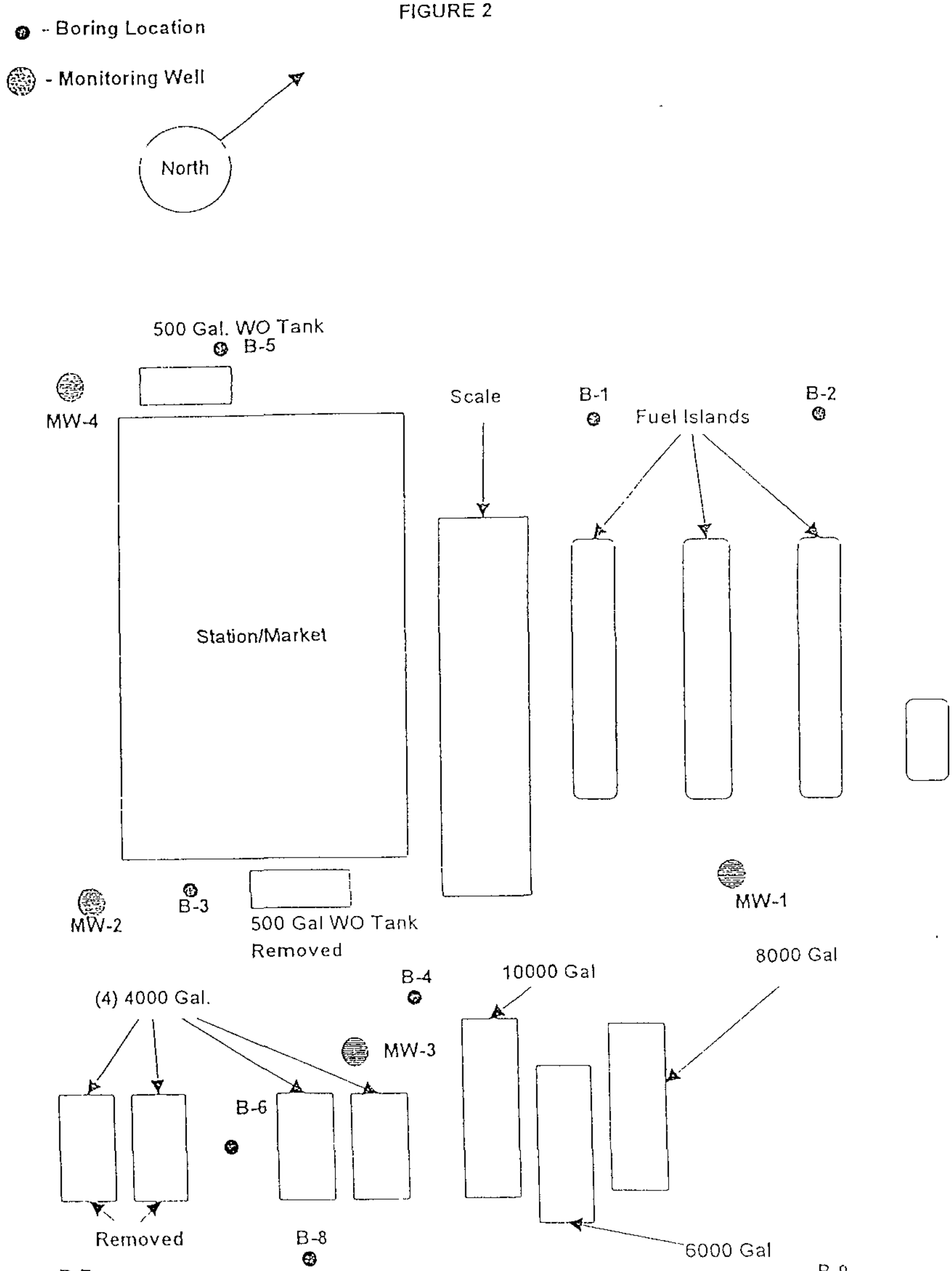
Amir K. Gholami
Hazardous Materials Specialist

C: A.gholami, D.Drogos
Mr. R. Kitay, ASE, 208 West El Pintado Road, Danville, CA 94526

APPENDIX B

Map from Penn Environmental

FIGURE 2



Site Plan

8255 San Leandro St., Oakland CA

APPENDIX C

Drilling Permits

PUBLIC WORKS

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) ~~670-5575 MARLON MAGALLANES/FRANK CODD (510) 670-5786~~ James Yoo 510-670-6633
FAX (510)782-1939

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 8255 San Leandro St Oakland, CA 94621

CLIENT
Name Oakland Truck Stop
Address 8255 San Leandro St Phone
City Oakland, CA Zip 94621

APPLICANT
Name Aqua Science Engineers
Fax 925-837-4853
Address 208 W. El Pintado Phone 925-820-9391
City Danville, CA Zip 94526

TYPE OF PROJECT
Well Construction
Cathodic Protection ☐ / Water Supply ☐ / Monitoring ☐ / Ozone Sparging ☒
Geotechnical Investigation: General ☐ / Contamination ☐ / Well Destruction ☐

PROPOSED WATER SUPPLY WELL USE
New Domestic ☐ / Municipal ☐ / Industrial ☐ / Replacement Domestic ☐ / Irrigation ☐ / Other ____ ☐

DRILLING METHOD:
Mud Rotary ☐ / Cable ☐ / Air Rotary ☐ / Other ☐ / Auger ☒

DRILLER'S NAME Gregg Drilling

DRILLER'S LICENSE NO C-57 485165

WELL PROJECTS
Drill Hole Diameter 6 in.
Casing Diameter 3/4 in.
Surface Seal Depth 6 ft.
Maximum Depth 20 ft.
Owner's Well Number 05-1

GEOTECHNICAL PROJECTS
Number of Borings ____
Hole Diameter ____ in.
Maximum Depth ____ ft

ESTIMATED STARTING DATE 2-2-04
ESTIMATED COMPLETION DATE 2-3-04

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE [signature] DATE 1-27-04

PLEASE PRINT NAME Robert E. Kitay

Rev.6-5-00

FOR OFFICE USE

PERMIT NUMBER W04-0098
WELL NUMBER
APN

PERMIT CONDITIONS
Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date.

B. WATER SUPPLY WELLS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.

C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

D. GEOTECHNICAL
Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings.

E. CATHODIC
Fill hole anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
See attached requirements for destruction of shallow wells. Send a map of work site. A different permit application is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS — MWH I

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED [signature] DATE 1-29-04

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-5554 ~~MARLON MAGALLANES/FRANK CODD (510) 670-5463~~ James Yoo (510) 670-6633
FAX (510) 782-1939

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 8255 San Leandro St
Oakland, CA 94621

CLIENT
Name Oakland Truck Stop
Address 8255 San Leandro St Phone
City Oakland, CA Zip 94621

APPLICANT
Name Aqua Science Engineers
Fax 925-837-4853
Address 208 W. El Pintado Phone 925-820-9391
City Danville, CA Zip 94526

TYPE OF PROJECT
Well Construction
Cathodic Protection ☐
Water Supply ☐
Monitoring ☐
Ozone sparging ☒
Geotechnical Investigation
General ☐
Contamination ☐
Well Destruction ☐

PROPOSED WATER SUPPLY WELL USE
New Domestic ☐ Replacement Domestic ☐
Municipal ☐ Irrigation ☐
Industrial ☐ Other ______ ☐

DRILLING METHOD:
Mud Rotary ☐ Air Rotary ☐ Auger ☒
Cable ☐ Other ☐

DRILLER'S NAME Gregg Drilling

DRILLER'S LICENSE NO. C-57 485165

WELL PROJECTS
Drill Hole Diameter 6 in.
Casing Diameter 3/4 in.
Surface Seal Depth 6 ft.
Maximum Depth 20 ft.
Owner's Well Number OS-2

GEOTECHNICAL PROJECTS
Number of Borings ______
Hole Diameter ______ in.
Maximum Depth ______ ft.

ESTIMATED STARTING DATE 2-2-04
ESTIMATED COMPLETION DATE 2-7-04

FOR OFFICE USE

PERMIT NUMBER W04-0099
WELL NUMBER
APN

PERMIT CONDITIONS
Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources-Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date.

B. WATER SUPPLY WELLS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.

C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

D. GEOTECHNICAL
Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings.

E. CATHODIC
Fill hole anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
See attached requirements for destruction of shallow wells. Send a map of work site. A different permit application is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS MW#1

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED [signature] DATE 1-28-04

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE [signature] DATE 1-27-04

PLEASE PRINT NAME Robert E. Kitay

Rev.6-5-00

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) ~~670-5564 MARLON MAGALLANES~~ ~~FRANK CODD (510) 670-5783~~ James Yoo 510-670-6633
FAX (510) 782-1939

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 8255 San Leandro St
Oakland, CA 94621

CLIENT
Name Oakland Truck Stop
Address 8255 San Leandro St Phone
City Oakland, CA Zip 94621

APPLICANT
Name Aqua Science Engineers
Fax 925-837-4853
Address 208 W El Pintado Phone 925-820-9391
City Danville, CA Zip 94526

TYPE OF PROJECT
Well Construction
Cathodic Protection ☐
Water Supply ☐
Monitoring ☐
Ozone sparging ☒
Geotechnical Investigation
General ☐
Contamination ☐
Well Destruction ☐

PROPOSED WATER SUPPLY WELL USE
New Domestic ☐ Replacement Domestic ☐
Municipal ☐ Irrigation ☐
Industrial ☐ Other ______ ☐

DRILLING METHOD:
Mud Rotary ☐ Air Rotary ☐ Auger ☒
Cable ☐ Other ☐

DRILLER'S NAME Gregg Drilling

DRILLER'S LICENSE NO C-57 485165

WELL PROJECTS
Drill Hole Diameter 6 in. Maximum
Casing Diameter 3/4 in. Depth 20 ft.
Surface Seal Depth 6 ft. Owner's Well Number OS-7

GEOTECHNICAL PROJECTS
Number of Borings ____ Maximum
Hole Diameter ____ in. Depth ____ ft.

ESTIMATED STARTING DATE 2-2-04
ESTIMATED COMPLETION DATE 2-3-04

I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

APPLICANT'S SIGNATURE [signature] DATE 1-27-04

PLEASE PRINT NAME Robert E. Kitay

Rev 6-5-00

FOR OFFICE USE

PERMIT NUMBER W04-0100
WELL NUMBER
APN

PERMIT CONDITIONS
Circled Permit Requirements Apply

A. GENERAL
1. A permit application should be submitted so as to arrive at the ACPWA office five days prior to proposed starting date.
2. Submit to ACPWA within 60 days after completion of permitted original Department of Water Resources-Well Completion Report.
3. Permit is void if project not begun within 90 days of approval date

B. WATER SUPPLY WELLS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved.

C. GROUNDWATER MONITORING WELLS INCLUDING PIEZOMETERS
1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

D. GEOTECHNICAL
Backfill bore hole by tremie with cement grout or cement grout/sand mixture. Upper two-three feet replaced in kind or with compacted cuttings.

E. CATHODIC
Fill hole anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
See attached requirements for destruction of shallow wells. Send a map of work site. A different permit application is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS MW#1

NOTE: One application must be submitted for each well or well destruction. Multiple borings on one application are acceptable for geotechnical and contamination investigations.

APPROVED [signature] DATE 1-29-04

APPENDIX D

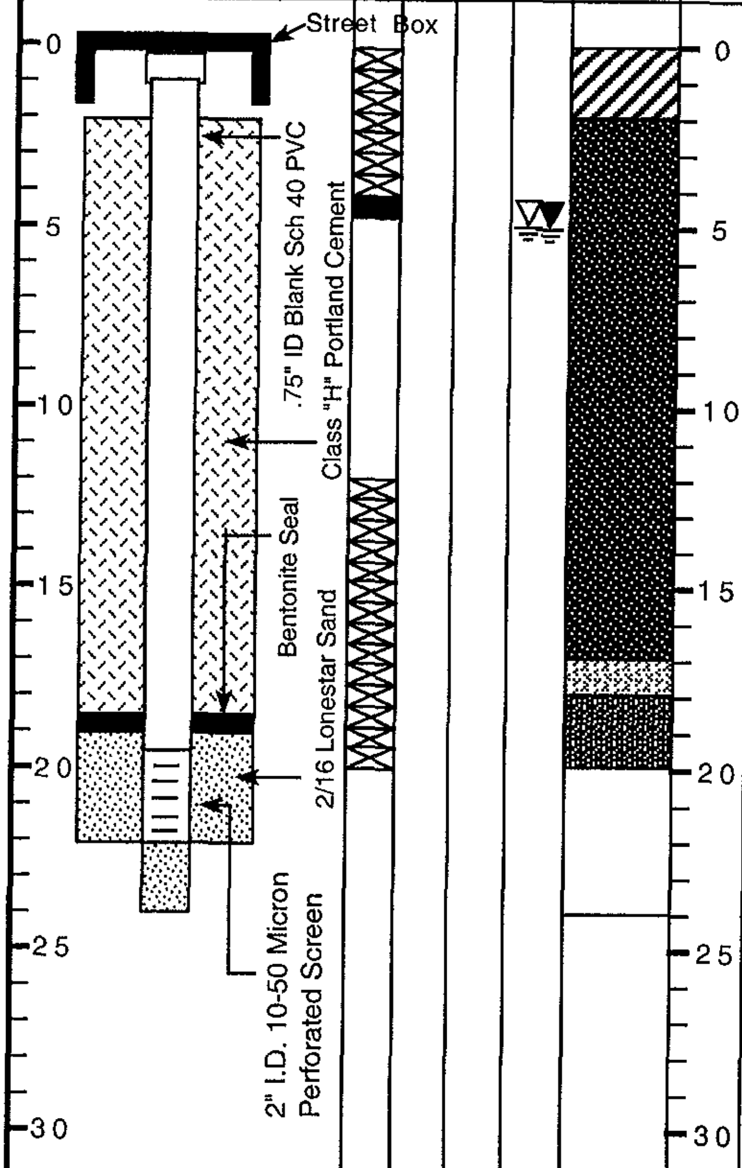
Boring Logs

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

Well OS-1		
Project Name: Oakland Truck Stop	Project Location: 8225 San Leandro Street, Oakland, CA	Page 1 of 1
Driller: Gregg Drilling	Type of Rig: Hollow-Stem Auger	Size of Drill: 8.0" Diameter
Logged By: Damian Hriciga	Date Drilled: February 2, 2004	Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA	
Depth of Water First Encountered: 5'	Total Depth of Well Completed: 22'
Static Depth of Water in Boring: 5	Well Screen Type and Diameter: 2" Ozone Sparge Point
	Well Screen Perforation Size: 10-50 microns
Total Depth of Boring: 24'	Type and Size of Soil Sampler: 2.0" I.D. Macro Core

Depth in Feet	BORING DETAIL	Description	SOIL/ROCK SAMPLE DATA: Interval	Blow Counts	OVM (ppmv)	Water Level	Graphic Log	Depth in Feet	DESCRIPTION OF LITHOLOGY (standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.)

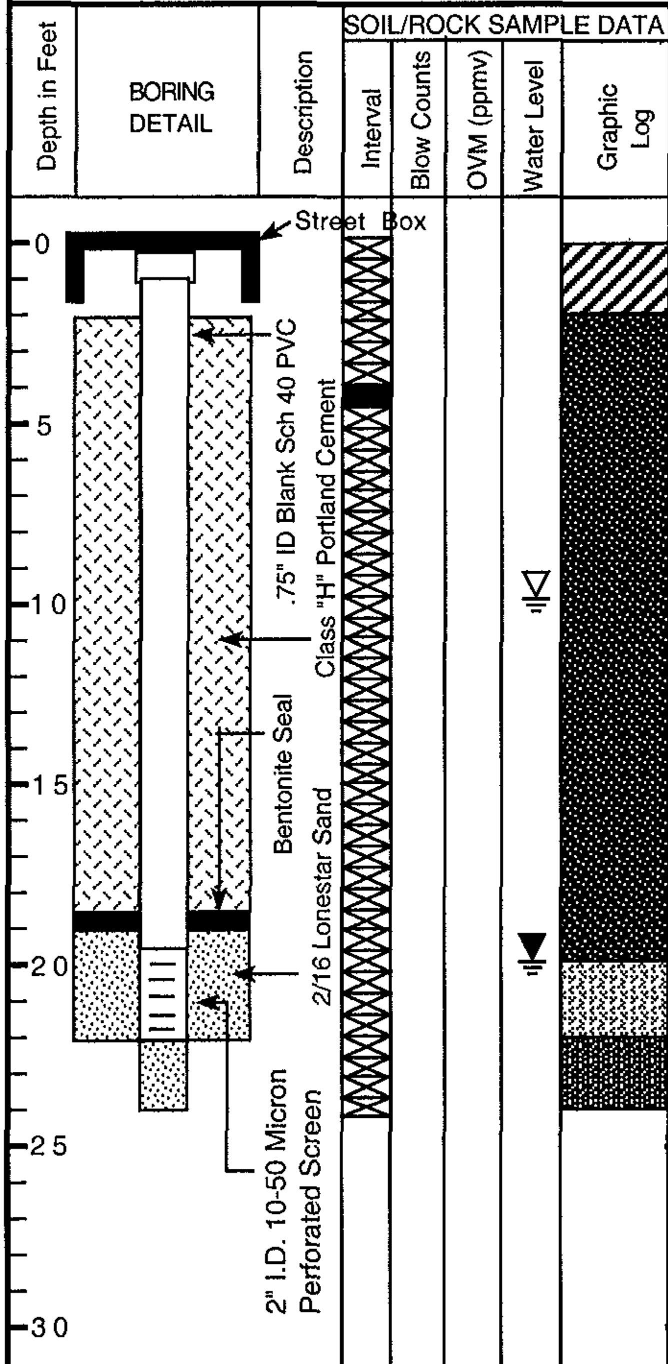


Depth in Feet	DESCRIPTION OF LITHOLOGY
0	*Asphalt and Road-Base*
	Silty CLAY (CH); black; medium stiff; damp; 80% clay; 20% silt; high plasticity; very low estimated K; slight odor
5	olive; 90% silt; 10% clay; no odor
	Silty SAND (SM); grey; loose; wet; 80% fine to medium sand; 20% silt; non-plastic; high estimated K; slight odor
20	Sandy Silt (ML); olive; medium stiff; wet; 70% silt; 30% fine to medium sand; non-plastic; low estimated K; slight odor No recovery below 20'
25	End of boring at 24'

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS		Well OS-2
Project Name: Oakland Truck Stop	Project Location: 8225 San Leandro Street, Oakland, CA	Page 1 of 1
Driller: Gregg Drilling	Type of Rig: Hollow-Stem Auger	Size of Drill: 8.0" Diameter
Logged By: Damian Hriciga	Date Drilled: February 2, 2004	Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA	Total Depth of Well Completed: 22'
Depth of Water First Encountered: 20'	Well Screen Type and Diameter: 2" Ozone Sparge Point
Static Depth of Water in Boring: 10'	Well Screen Perforation Size: 10-50 microns
Total Depth of Boring: 24'	Type and Size of Soil Sampler: 2.0" I.D. Macro Core



Depth in Feet	DESCRIPTION OF LITHOLOGY standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.
0	Asphalt and Road-Base
	Silty CLAY (CH); black; medium stiff; damp; 80% clay; 20% silt; high plasticity; very low estimated K; *slight odor*
5	olive; 90% silt; 10% clay; no odor
10	
15	
20	Silty SAND (SM); grey; loose; wet; 80% fine to medium sand; 20% silt; non-plastic; high estimated K; slight odor
	Sandy SILT (ML); olive; medium stiff; wet; 70% silt; 30% fine to medium sand; non-plastic; low estimated K; slight odor
25	End of boring at 24'
30	

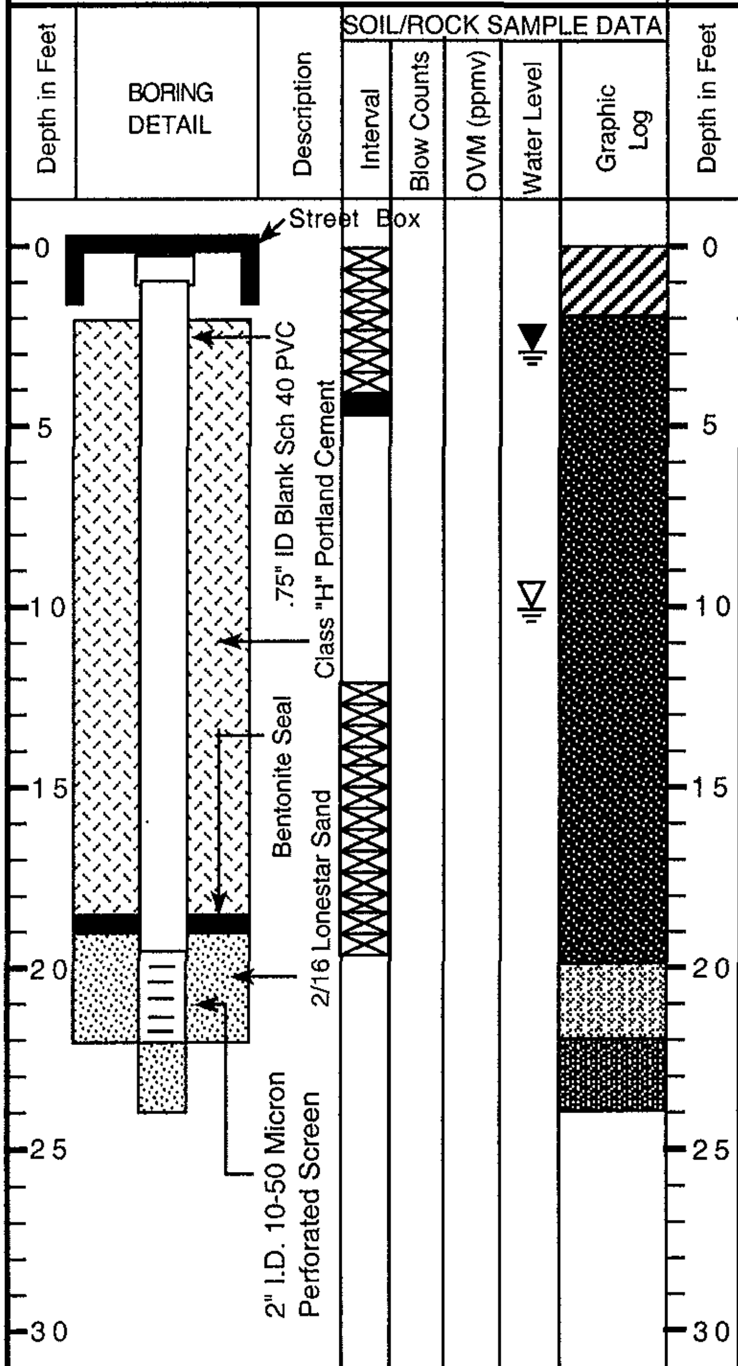
SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

Well OS-3

Project Name: Oakland Truck Stop	Project Location: 8225 San Leandro Street, Oakland, CA	Page 1 of 1
Driller: Gregg Drilling	Type of Rig: Hollow-Stem Auger	Size of Drill: 8.0" Diameter
Logged By: Damian Hriciga	Date Drilled: February 2, 2004	Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 1.5'	Total Depth of Well Completed: 22'
	Well Screen Type and Diameter: 2" Ozone Sparge Point
Static Depth of Water in Boring: 10'	Well Screen Perforation Size: 10-50 microns
Total Depth of Boring: 24'	Type and Size of Soil Sampler: 2.0" I.D. Macro Core



Depth in Feet	DESCRIPTION OF LITHOLOGY — standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.
0	Asphalt and Road-Base
	Silty CLAY (CH); black; medium stiff; damp; 80% clay; 20% silt; high plasticity; very low estimated K; slight odor
5	olive; 90% silt; 10% clay; no odor
20	Silty SAND (SM); grey; loose; wet; 80% fine to medium sand; 20% silt; non-plastic; high estimated K; slight odor
	Sandy SILT (ML); olive; medium stiff; wet; 70% silt; 30% fine to medium sand; non-plastic; low estimated K; slight odor
25	End of boring at 24'

APPENDIX E

Analytical Report
And
Chain of Custody for Soil Samples

KIFF ANALYTICAL LLC

Report Number : 36915

Date : 2/12/2004

Damian Hriciga
Aqua Science Engineers, Inc.
208 W. El Pintado Road
Danville, CA 94526

Subject : 3 Soil Samples
Project Name : OTS
Project Number : 3540

Dear Mr. Hriciga,

Chemical analysis of the samples referenced above has been completed. Summaries of the data are contained on the following pages. Sample(s) were received under documented chain-of-custody. US EPA protocols for sample storage and preservation were followed.

Kiff Analytical is certified by the State of California (# 2236). If you have any questions regarding procedures or results, please call me at 530-297-4800.

Sincerely,

Jeff Dahl

KIFF ANALYTICAL LLC

Report Number : 36915
Date : 2/12/2004

Subject : 3 Soil Samples
Project Name : OTS
Project Number : 3540

Case Narrative

Hydrocarbons reported as TPH as Diesel do not exhibit a typical Diesel chromatographic pattern for samples OS-1 4' and OS-2 4'. These hydrocarbons are higher boiling than typical diesel fuel.

Approved By: Jeff Dahl

2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

KIFF ANALYTICAL LLC

Report Number : 36915

Date : 2/12/2004

Project Name : **OTS**

Project Number : **3540**

Sample : **OS-1 4'**   Matrix : Soil   Lab Number : 36915-01

Sample Date :2/2/2004

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/5/2004
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/5/2004
Ethylbenzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/5/2004
Total Xylenes	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/5/2004
Methyl-t-butyl ether (MTBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/5/2004
Diisopropyl ether (DIPE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/5/2004
Ethyl-t-butyl ether (ETBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/5/2004
Tert-amyl methyl ether (TAME)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/5/2004
Tert-Butanol	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/5/2004
Methanol	**< 0.20**	0.20	mg/Kg	EPA 8260B	2/5/2004
Ethanol	**< 0.010**	0.010	mg/Kg	EPA 8260B	2/5/2004
TPH as Gasoline	**< 1.0**	1.0	mg/Kg	EPA 8260B	2/5/2004
Toluene - d8 (Surr)	101		% Recovery	EPA 8260B	2/5/2004
4-Bromofluorobenzene (Surr)	99.6		% Recovery	EPA 8260B	2/5/2004
TPH as Diesel	**41**	10	mg/Kg	M EPA 8015	2/7/2004
1-Chlorooctadecane (Diesel Surrogate)	Diluted Out		% Recovery	M EPA 8015	2/7/2004

Approved By: Jeff Dahl

2795 2nd St., Suite 300 Davis, CA 95616 530-297-4800

KIFF ANALYTICAL LLC

Report Number : 36915
Date : 2/12/2004

Project Name : **OTS**
Project Number : **3540**

Sample : **OS-2 4'** Matrix : Soil Lab Number : 36915-02
Sample Date :2/2/2004

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/7/2004
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/7/2004
Ethylbenzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/7/2004
Total Xylenes	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/7/2004
Methyl-t-butyl ether (MTBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/7/2004
Diisopropyl ether (DIPE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/7/2004
Ethyl-t-butyl ether (ETBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/7/2004
Tert-amyl methyl ether (TAME)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/7/2004
Tert-Butanol	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	2/7/2004
Methanol	**0.37**	0.20	mg/Kg	EPA 8260B	2/7/2004
Ethanol	**0.016**	0.010	mg/Kg	EPA 8260B	2/7/2004
TPH as Gasoline	**< 1.0**	1.0	mg/Kg	EPA 8260B	2/7/2004
Toluene - d8 (Surr)	103		% Recovery	EPA 8260B	2/7/2004
4-Bromofluorobenzene (Surr)	98.7		% Recovery	EPA 8260B	2/7/2004
TPH as Diesel	**8.9**	1.0	mg/Kg	M EPA 8015	2/6/2004
1-Chlorooctadecane (Diesel Surrogate)	87.4		% Recovery	M EPA 8015	2/6/2004

Approved By: Jeff Dahl

2795 2nd St., Suite 300 Davis, CA 95616 530-297-4800

KIFF ANALYTICAL LLC

Report Number : 36915
Date : 2/12/2004

Project Name : OTS
Project Number : 3540

Sample : OS-3 4'
Matrix : Soil
Lab Number : 36915-03
Sample Date :2/2/2004

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**0.053**	0.050	mg/Kg	EPA 8260B	2/6/2004
Toluene	**< 0.050**	0.050	mg/Kg	EPA 8260B	2/6/2004
Ethylbenzene	**0.065**	0.050	mg/Kg	EPA 8260B	2/6/2004
Total Xylenes	**< 0.10**	0.10	mg/Kg	EPA 8260B	2/6/2004
Methyl-t-butyl ether (MTBE)	**0.45**	0.050	mg/Kg	EPA 8260B	2/6/2004
Diisopropyl ether (DIPE)	**< 0.050**	0.050	mg/Kg	EPA 8260B	2/6/2004
Ethyl-t-butyl ether (ETBE)	**< 0.050**	0.050	mg/Kg	EPA 8260B	2/6/2004
Tert-amyl methyl ether (TAME)	**< 0.050**	0.050	mg/Kg	EPA 8260B	2/6/2004
Tert-Butanol	**0.29**	0.25	mg/Kg	EPA 8260B	2/6/2004
Methanol	**< 10**	10	mg/Kg	EPA 8260B	2/6/2004
Ethanol	**< 0.50**	0.50	mg/Kg	EPA 8260B	2/6/2004
TPH as Gasoline	**380**	5.0	mg/Kg	EPA 8260B	2/6/2004
Toluene - d8 (Surr)	99.4		% Recovery	EPA 8260B	2/6/2004
4-Bromofluorobenzene (Surr)	99.6		% Recovery	EPA 8260B	2/6/2004
TPH as Diesel	**1800**	1.0	mg/Kg	M EPA 8015	2/7/2004
1-Chlorooctadecane (Diesel Surrogate)	93.9		% Recovery	M EPA 8015	2/7/2004

Approved By: Jeff Dahl

2795 2nd St., Suite 300 Davis, CA 95616 530-297-4800

Report Number : 36915

Date : 2/12/2004

QC Report : Method Blank Data

Project Name : **OTS**

Project Number : **3540**

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
TPH as Diesel	< 1.0	1.0	mg/Kg	M EPA 8015	2/6/2004
1-Chlorooctadecane (Diesel Surrogate)	82 1		%	M EPA 8015	2/6/2004
Benzene	< 0.0050	0.0050	mg/Kg	EPA 8260B	2/5/2004
Toluene	< 0.0050	0 0050	mg/Kg	EPA 8260B	2/5/2004
Ethylbenzene	< 0.0050	0 0050	mg/Kg	EPA 8260B	2/5/2004
Total Xylenes	< 0 0050	0.0050	mg/Kg	EPA 8260B	2/5/2004
Methyl-t-butyl ether (MTBE)	< 0.0050	0 0050	mg/Kg	EPA 8260B	2/5/2004
Diisopropyl ether (DIPE)	< 0.0050	0.0050	mg/Kg	EPA 8260B	2/5/2004
Ethyl-t-butyl ether (ETBE)	< 0 0050	0 0050	mg/Kg	EPA 8260B	2/5/2004
Tert-amyl methyl ether (TAME)	< 0.0050	0 0050	mg/Kg	EPA 8260B	2/5/2004
Tert-Butanol	< 0 0050	0 0050	mg/Kg	EPA 8260B	2/5/2004
Methanol	< 0 20	0 20	mg/Kg	EPA 8260B	2/5/2004
Ethanol	< 0 010	0.010	mg/Kg	EPA 8260B	2/5/2004
TPH as Gasoline	< 1 0	1.0	mg/Kg	EPA 8260B	2/5/2004
Toluene - d8 (Surr)	101		%	EPA 8260B	2/5/2004
4-Bromofluorobenzene (Surr)	99.8		%	EPA 8260B	2/5/2004

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed

Approved By: Jeff Dahl

KIFF ANALYTICAL, LLC

2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

QC Report : Matrix Spike/ Matrix Spike Duplicate

Report Number : 36915

Date : 2/12/2004

Project Name : **OTS**

Project Number : **3540**

Parameter	Spiked Sample	Sample Value	Spike Level	Spike Dup. Level	Spiked Sample Value	Duplicate Spiked Sample Value	Units	Analysis Method	Date Analyzed	Spiked Sample Percent Recov.	Duplicate Spiked Sample Percent Recov.	Relative Percent Diff.	Spiked Sample Percent Recov. Limit	Relative Percent Diff. Limit
Benzene	36892-02	<0.0050	0.0380	0.0383	0.0336	0.0346	mg/Kg	EPA 8260B	2/5/04	88.6	90.2	1.73	70-130	25
Toluene	36892-02	<0.0050	0.0380	0.0383	0.0334	0.0343	mg/Kg	EPA 8260B	2/5/04	87.9	89.6	1.83	70-130	25
Tert-Butanol	36892-02	<0.0050	0.190	0.192	0.157	0.167	mg/Kg	EPA 8260B	2/5/04	82.8	87.1	5.06	70-130	25
Methyl-t-Butyl Ether	36892-02	<0.0050	0.0380	0.0383	0.0359	0.0362	mg/Kg	EPA 8260B	2/5/04	94.7	94.5	0.185	70-130	25
TPH as Diesel	36915-02	8.9	20.0	20.0	30.9	29.9	mg/Kg	M EPA 8015	2/7/04	107	103	3.32	60-140	25

Approved By: Jeff Dahl

KIFF ANALYTICAL, LLC

2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

QC Report : Laboratory Control Sample (LCS)

Report Number : 36915
Date : 2/12/2004

Project Name : **OTS**
Project Number : **3540**

Parameter	Spike Level	Units	Analysis Method	Date Analyzed	LCS Percent Recov.	LCS Percent Recov. Limit
Benzene	0.0382	mg/Kg	EPA 8260B	2/5/04	94.3	70-130
Toluene	0.0382	mg/Kg	EPA 8260B	2/5/04	93.2	70-130
Tert-Butanol	0.191	mg/Kg	EPA 8260B	2/5/04	92.2	70-130
Methyl-t-Butyl Ether	0.0382	mg/Kg	EPA 8260B	2/5/04	98.2	70-130
TPH as Diesel	20.0	mg/Kg	M EPA 8015	2/6/04	105	70-130

Approved By: Jeff Dahl

KIFF ANALYTICAL, LLC
2795 2nd St, Suite 300 Davis, CA 95616 530-297-4800

KIFF ANALYTICAL LLC

2795 2nd Street, Suite 300
Davis, CA 95616
Lab: 530.297.4800
Fax: 530.297.4808

Lab No. 36915 Page 1 of 1

Chain-of-Custody Record and Analysis Request

Project Contact (Hardcopy or PDF To): DAMIAN HRICKO dhricko@aquascience env.com

California EDF Report? ☑ Yes ☐ No

Company/Address: ASE / DANVILLE

Recommended but not mandatory to complete this section:
Sampling Company Log Code:

Phone No.: FAX No.:

Global ID: T0600101487

Project Number: 3340 P.O. No:

EDF Deliverable To (Email Address): DALLEN@AQUASCIENCE ENGINEERS.COM

Project Name: OTS

Sampler Signature:

Project Address: SAN LEANDRO, OAKLAND

Sample Designation	Sampling Date	Sampling Time	Container: 40 ml VOA	SLEEVE	JAR			Preservative: HCl	HNO_3	ICE	NONE	Matrix: WATER	SOIL		BTEX (8021B)	BTEX/TPH Gas/MTBE (8021B/M8015)	TPH as Diesel (M8015)	TPH as Motor Oil (M8015)	TPH Gas/BTEX/MTBE (8260B)	5 Oxygenates/TPH Gas/BTEX (8260B)	7 Oxygenates/TPH Gas/BTEX (8260B)	5 Oxygenates (8260B)	7 Oxygenates (8260B)	Lead Scav. (1,2 DCA & 1,2 EDB - 8260B)	EPA 8260B (Full List)	Volatile Halocarbons (EPA 8260B)	Lead (7421/239.2) TOTAL (X) W.E.T. (X)				TAT: 12 hr/24 hr/48 hr/72 hr/1 wk	For Lab Use Only
OS-1 4'	2/2/04	1130			X								X				X				X											01
OS-2 4'	2/2/04	1030			X								X				X				X											02
OS-3 4'	2/2/04	0930			X								X				X				X											03

TAT: 1 wk

Relinquished by:	Date	Time	Received by:
[signature]	2/5/04	0830	
Relinquished by:	Date	Time	Received by:
Relinquished by:	Date	Time	Received by Laboratory: Natalie Woodruff / Kiff Analytical
	020504	1000	

Remarks:

Bill to:

Distribution: White - Lab, Yellow - File, Pink - Originator

Forms/coc 121001.fh9

APPENDIX F

Pilot Study Test Field Data

OTS AIR SPARGE TEST DATA PERFORMED ON OS-2
POSITIVE PRESSURE (PSI)

DATE 2/24/04 TIME TEST BEGIN 0935

OBSERV. POINT	INITIAL	TIME 1005	TIME 1100	TIME 1200	TIME 1300	TIME 1400	TIME 1500
OS-1	0	0	0	0	0	0	0
OS-3	0	0	0	0	0	0	0
MW-3	0	1.0	1.25	1.5	1.5	0	0
MW-6	0	2.0	2.5	2.5	2.5	1.0	0.5
MW-8	0	0	1.25	1.0	1.1	0	0

OTS AIR SPARGE TEST DATA PERFORMED ON OS-2
HELIUM (%)

OBSERV. POINT	INITIAL	TIME 1005	TIME 1100	TIME 1200	TIME 1300	TIME 1400	TIME 1500
OS-1	0	0	0	NM	0	NM	0
OS-3	0	0	0	NM	0	NM	0
MW-3	0	0	1.3	NM	2.7	NM	2.9
MW-6	0	2.0	2.1	NM	2.2	NM	1.9
MW-8	0	0	0	NM	0	NM	0

OPERATING PARAMETERS

ITEM	START	TIME 1005	TIME 1100	TIME 1200	TIME 1300	TIME 1400	TIME 1500
AIR COMPRESSOR PRESSURE (PSI)	50	50	64	64	64	75	76
AIR COMPRESSOR FLOW (CFM)	3.5	3.5	3.8	4.0	4.0	3.5	3.4
PRESSRE AT INJECTION WELL (PSI)	15	15	12	10	10	10	10
HELIUM FLOW (CFH)	35	35	42	38	38	150	150

DEPTH TO WATER (IN FEET)

WELL NAME	START	TIME 1005	TIME 1100	TIME 1200	TIME 1300	TIME 1400	TIME 1510
MW-3	4.67	NM	NM	NM	NM	NM	3.53
MW-6	4.59	NM	NM	NM	NM	NM	3.70
MW-8	3.47	NM	NM	NM	NM	NM	3.03

NM means not measured