aqua science engineers inc.

#1585

February 8, 2001

WORKPLAN
for a
SOIL AND GROUNDWATER ASSESSMENT
at
Lim Family Property
250 8th Street
Oakland, California

Submitted by:
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1.0 INTRODUCTION

This submittal outlines Aqua Science Engineers, Inc. (ASE's) workplan for a soil and groundwater assessment at 250 8th Street in Oakland, California (Figures 1 and 2). The proposed site assessment activities have been designed to further define the extent of soil and groundwater contamination at and downgradient of the site, and to conduct pumping tests at the site to evaluate the feasibility of "pump and treat" as a remediation option.

2.0 BACKGROUND INFORMATION

A gasoline service station previously occupied the site. In May 1992, ASE removed ten underground fuel storage tanks (USTs) from the site. The USTs consisted of one (1) 10,000-gallon gasoline tank, one (1) 5,000-gallon diesel tank, three (3) 2,000-gallon gasoline tanks, one (1) 2,000-gallon diesel tank, three (3) 500-gallon gasoline tanks and one (1) 250-gallon waste oil tank. Up to 10,000 parts per million (ppm) total petroleum hydrocarbons as gasoline (TPH-G) and 5,900 ppm total petroleum hydrocarbons as diesel (TPH-D) were detected in soil samples collected during the tank removal.

Between December 1992 and March 1993, All Environmental of San Ramon, California overexcavated 1,762 cubic yards of soil from the site and off-hauled the soil to the BFI Landfill in Livermore, California for disposal. Analytical results show that all on-site soil with hydrocarbon concentrations greater than 10 ppm was removed from the site with the exception of soil along the 8th Street shoring. Up to 1,800 ppm TPH-G and 120 ppm TPH-D were detected in soil samples collected along the shoring indicating that contamination likely extends below 8th Street. This contamination left in place may still be a source for groundwater contamination.

In January 1995, ASE installed monitoring wells MW-1 and MW-2 at the site (Figure 2). High hydrocarbon concentrations were detected in monitoring well MW-2, downgradient of the site. Moderate hydrocarbon concentrations were detected in on-site monitoring well MW-1.

In July 1996, ASE collected groundwater samples from each monitoring well and drilled borings BH-C and BH-D to further define the width of the hydrocarbon plume downgradient of the site. Relatively high hydrocarbon concentrations were detected in groundwater samples collected from monitoring well MW-2, downgradient of the site. Slightly

lower but still very high hydrocarbon concentrations were detected in groundwater samples collected from boring BH-D, west of monitoring well MW-2. Very low hydrocarbon concentrations, below California Department of Toxic Substances Control (DTSC) maximum contaminant levels (MCLs) and recommended action levels (RALs) for drinking water, were detected in groundwater samples collected from monitoring well MW-1, located on the site, and boring BH-C, east of monitoring well MW-2. Based on these findings, the plume appears to be moving to the south of Excavation I.

In April 1995, ASE began a quarterly groundwater monitoring program for the site. Since that time, the site has been on either a quarterly or semi-annual sampling schedule. Analytical results of all groundwater sampling periods can be found in the tables section of this workplan.

On June 5, 1997, ASE prepared a remedial action plan (RAP) addressing the need for groundwater remediation at the site, describing the appropriateness of several remedial options and choosing an option. Hydrogen peroxide injection was chosen as the groundwater remediation option of choice for the site.

On February 2 and 3, 1999, five (5) injection wells were installed at the site (Figure 2). On February 18, 1999, the injection system began operation. It delivered a water and hydrogen-peroxide solution to each injection well on a constant basis. Dissolved oxygen (DO) concentrations within the injection wells rose to above 20 ppm. Groundwater in downgradient monitoring well MW-2 never showed a measurable increase in DO.

On June 22, 1999, while measuring the DO content within the injection wells, ASE discovered that the DO probe had a very strong gasoline odor when removed from injection well IW-5. A clear bailer was inserted into IW-5 to check for the presence of floating product. The bailer contained approximately 18-inches of what appeared to be aged gasoline. On June 24, 1999, ASE returned to the site with an interface probe to accurately measure the thickness of the product. On that day, 1.75-feet of product was measured floating on the water surface in IW-5. Injection well IW-4 (15-feet east of IW-5) was measured with the interface probe and did not contain a measurable amount of floating product. On June 24, 1999, ASE bailed the product from IW-5 until only a hydrocarbon sheen was present on the water surface. Approximately 3 gallons of product was removed from IW-5. ASE has continued to measure and bail the floating product within well IW-5 on a bi-weekly basis.

In January 2000, ASE installed groundwater monitoring wells MW-3 and MW-4, ~~east~~ west of injection well IW-5 and monitoring well MW-2. High hydrocarbon concentrations were detected in groundwater samples collected from both of these wells, including up to 140,000 ppb TPH-G, 13,000 ppb TPH-D and 22,000 ppb benzene.

In April 2000, ASE collected groundwater samples from all four monitoring wells. Elevated hydrocarbon concentrations were detected in groundwater samples collected from monitoring wells MW-2, MW-3 and MW-4, including up to 240,000 ppb TPH-G, 700,000 ppb TPH-D and 35,000 ppb benzene. Monitoring well MW-3 contained free-floating hydrocarbons.

On November 27, 2000, with the approval of the Alameda County Health Care Services Agency, ASE turned off the hydrogen peroxide injection system since there was no noticeable DO increase in downgradient monitoring wells MW-2 and MW-4 on the west side of 8th Street.

Probably should continue; may be a "barrier"

The site is currently on a quarterly groundwater monitoring program. Analytical results for all historical groundwater sampling events are tabulated in the tables section of this report.

3.0 PROPOSED SCOPE OF WORK (SOW)

Due to the presence of floating product and elevated hydrocarbon concentrations in groundwater samples collected off-site, ASE has prepared the following scope of work (SOW) to define the extent of elevated hydrocarbon concentrations on and downgradient of the site, and to conduct a pumping test to evaluate the site for the feasibility of "pump and treat" groundwater remediation.

3.1 SECTION I –DOWNGRADIENT MONITORING WELLS

1) Obtain a drilling permit from the Alameda County Public Works Agency (ACPWA). Obtain an excavation and encroachment permit from the City of Oakland.

2) Drill three (3) soil borings to 30-feet below ground surface (bgs) in 8th Street downgradient of the site.

3) Analyze one soil sample collected from each soil boring at a CAL-EPA certified environmental laboratory for total petroleum hydrocarbons

as gasoline (TPH-G) by modified EPA Method 5030/8015M, total petroleum hydrocarbons as diesel and motor-oil (TPH-D/MO) by modified EPA Method 3510/8015M, benzene, toluene, ethyl benzene and total xylenes (collectively known as BTEX) and methyl tertiary butyl ether (MTBE) by EPA Method 8020, and oil and grease (O&G) by Standard Method 5520.

4) Install 2-inch diameter groundwater monitoring wells in each boring described in task 3.

5) Develop the monitoring wells.

6) Collect groundwater samples from all seven monitoring wells for analyses.

7) Analyze the groundwater samples at a CAL-EPA certified analytical laboratory for TPH-G, TPH-D, TPH-MO, BTEX, MTBE, and O&G.

8) Survey the top of casing elevation of each well, and determine the groundwater flow direction and gradient beneath the site.

3.2 SECTION II – ONSITE SOIL BORINGS

1) Drill five (5) soil borings to groundwater within the area of the former excavation to determine whether soil and/or groundwater contamination exists in this area and to determine the lithology of the backfill material.

2) Analyze one soil sample collected from each soil boring at a CAL-EPA certified analytical laboratory for TPH-G, TPH-D, TPH-MO, BTEX, MTBE, and O&G.

3) Collect groundwater samples from each boring for analyses.

4) Analyze the groundwater samples at a CAL-EPA certified analytical laboratory for TPH-G, TPH-D, TPH-MO, BTEX, MTBE, and O&G.

5) Backfill the borings with neat cement.

3.3 SECTION III – REMEDIATION FESABILITY TESTS

1) Conduct a step drawdown pumping test at the site.

2) Conduct a constant rate pumping test.

3) Prepare a comprehensive report presenting the methods and finding of the work performed in all three sections of this workplan.

4.0 DETAILS OF PROPOSED SOW

Details of the assessment are presented below.

4.1 DETAILS OF SECTION I – CONSTRUCT THREE OFF-SITE MONITORING WELLS

TASK 1 - OBTAIN NECESSARY PERMITS

ASE will obtain a drilling permit from the ACPWA, and encroachment and excavation permits from the City of Oakland. ASE will also notify Underground Service Alert (USA) to have underground utility lines marked in the site vicinity.

TASK 2 - DRILL THREE SOIL BORINGS AT THE SITE

ASE will drill three (3) soil borings at the locations shown on Figure 2. The borings will be drilled using a drill rig equipped with 8-inch diameter hollow-stem augers. The drilling will be directed by a qualified ASE geologist. Undisturbed soil samples will be collected at least every 5-feet, at lithographic changes, and from just above the water table for subsurface hydrogeologic description and possible chemical analysis. The ASE geologist will described the samples according to the Unified Soil Classification System. The samples will be collected in brass tubes using a split-barrel drive sampler advanced ahead of the auger tip by successive blows from a 140-lb. hammer dropped 30-inches. Each sample will be immediately removed from the sampler, trimmed, sealed with Teflon tape and plastic caps, secured with duct tape, labeled with the site location, sample designation, date and time the sample was collected, and the initials of the person collecting the sample. The samples will be placed into an ice chest containing wet ice for delivery under chain of custody to a CAL-EPA certified analytical laboratory.

Soil from the remaining tubes not sealed for analysis will be removed for hydrogeologic description and will be screened for volatile compounds with an organic vapor meter (OVM). The soil will be screened by emptying soil from one of the tubes into a plastic bag. The bag will be sealed and placed in the sun for approximately 10 minutes. After the

hydrocarbons have been allowed to volatilize, the OVM will measure the vapor through a small hole punched in the bag. These OVM readings will be used as a screening tool only since these procedures are not as rigorous as those used in an analytical laboratory.

All sampling equipment will be cleaned in buckets with brushes and a trisodium phosphate (TSP) or Alconox solution, then rinsed twice with tap water. Rinsates will be contained on-site in 55-gallon steel drums until off-site disposal can be arranged.

TASK 3 - ANALYZE AT LEAST ONE SOIL SAMPLE FROM EACH BORING

At least one soil sample from each boring will be analyzed at a CAL-EPA certified environmental laboratory for TPH-G by modified EPA Method 5030/8015M, TPH-D and TPH-MO by modified EPA Method 3510/8015M, BTEX and MTBE by EPA Method 8020, and O&G by Standard Method 5520.

TASK 4 - COMPLETE THE BORINGS AS MONITORING WELLS

ASE will complete the borings described in task 2 as 2-inch diameter groundwater monitoring wells. The wells will be constructed with 2-inch diameter, flush-threaded, schedule 40, 0.020-inch factory slotted PVC well screen and blank casing. The well casing will be lowered through the augers and #3 Monterey sand will be placed in the annular space between the well casing and the borehole to approximately 1-foot above the screened interval. Approximately 0.5-feet of bentonite pellets will be placed on top of the sand pack and hydrated with deionized water. This bentonite layer will prevent the cement sanitary seal from infiltrating into the sand pack. Portland cement will be 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 will be protected by a locking well plug and an at-grade, traffic-rated well box (See Figure 3 - Typical Monitoring Well).

The well will be screened to monitor the first water-bearing zone encountered. Wells are typically screened with 5-feet of screen above the water table and 10 to 15-feet of screen below the water table.

TASK 5 - DEVELOP THE MONITORING WELLS

The monitoring wells will be developed after waiting at least 72 hours after well construction. The wells will be developed using at least two episodes of surge block agitation and bailer or pump evacuation. At least

ten well casing volumes of water will be removed during the development, and development will continue until the water appears to be reasonably clear. The well development purge water will be stored temporarily on-site in sealed and labeled 55-gallon steel drums until off-site disposal can be arranged.

TASK 6 - SAMPLE THE MONITORING WELLS

After waiting 72 hours following the well development, ASE will sample all seven monitoring wells. Prior to purging and sampling, the groundwater surface in each well will be checked for sheen or free-floating hydrocarbons. The thickness of any free-floating hydrocarbons will be measured with an interface probe. ASE will also measure the depth to groundwater in all site wells prior to purging water from any well. Prior to sampling, each well will be purged of at least four well casing volumes of groundwater. The temperature, pH and electrical conductivity of evacuated water will be monitored during the well purging, and purging will continue beyond four well casing volumes if these parameters have not stabilized. Groundwater samples will be collected from each well using disposable polyethylene bailers. Groundwater samples to be analyzed for volatile compounds will be decanted from the bailers into 40-ml glass volatile organic analysis (VOA) vials, preserved with hydrochloric acid, and sealed without headspace. Samples to be analyzed for non-volatile compounds will be contained in 1-liter amber glass containers. All samples will be labeled with the site location, sample designation, date and time the samples were collected, and the initials of the person collecting the samples. The samples will then be placed into an ice chest with wet ice for transport to the analytical laboratory under chain of custody. Purged groundwater will be stored temporarily on-site in sealed and labeled 55-gallon steel drums until off-site disposal can be arranged.

TASK 7 - ANALYZE THE GROUNDWATER SAMPLES

The groundwater samples will be analyzed by a CAL-EPA certified analytical laboratory for TPH-G, TPH-D, TPH-MO, BTEX, MTBE, and O&G.

TASK 8 - SURVEY THE TOP OF CASING ELEVATION OF EACH WELL

ASE will survey the top of casing elevation of each well relative to the other wells at the site.

4.2 DETAILS OF SECTION II – DRILL FIVE SOIL BORINGS ON-SITE

Five (5) soil borings will be drilled within the former excavation location (Figure 2). These soil borings will be used to determine whether soil and/or groundwater contamination exists in this area and to determine the lithology of the excavation backfill material. These borings will be drilled using a Geoprobe or similar type drill rig. The drilling will be directed by a qualified geologist.

Undisturbed soil samples will be collected continuously for subsurface hydrogeologic description and possible chemical analysis. The samples will be described by the geologist according to the Unified Soil Classification System. The samples will be collected in acetate tubes using a drive sampler advanced as the boring progresses. Samples to be retained for analysis will be immediately removed from the sampler, trimmed, sealed with Teflon tape and plastic caps, secured with duct tape, labeled with the site location, sample designation, date and time the sample was collected, and the initials of the person collecting the sample. The samples will be placed into an ice chest containing wet ice for delivery under chain of custody to a CAL-EPA certified analytical laboratory.

Soil from the remaining tubes not sealed for analysis will be removed for hydrogeologic description and will be screened for volatile compounds with an organic vapor meter (OVM). The soil will be screened by emptying soil from one of the tubes into a plastic bag. The bag will be sealed and placed in the sun for approximately 10 minutes. After the hydrocarbons have been allowed to volatilize, the OVM will measure the vapor through a small hole, punched in the bag. These OVM readings will be used as a screening tool only since these procedures are not as rigorous as those used in an analytical laboratory.

A groundwater sample will be collected from each boring. Drilling will be halted at the water table and a Hydropunch or similar type device will be utilized to collect groundwater samples from the borings. The groundwater samples will be contained in 40-ml volatile organic analysis (VOA) vials, preserved with hydrochloric acid, sealed without headspace, labeled with the site location, sample designation, date and time the samples were collected, and the initials of the person collecting the samples, sealed in plastic bags, and cooled in an ice chest with wet ice for transport to a state-certified analytical laboratory under chain-of-custody.

All sampling equipment will be cleaned in buckets with brushes and a TSP or Alconox solution, then rinsed twice with tap water. Rinsates will be contained on-site in 55-gallon steel drums and stored on-site until off-site disposal can be arranged.

TASK 6 - ANALYZE THE SOIL AND GROUNDWATER SAMPLES

At least one soil sample from each boring, as well as each groundwater sample, will be analyzed at a CAL-EPA certified analytical laboratory for TPH-G, TPH-D, TPH-MO, BTEX, MTBE, and O&G. The soil samples analyzed will be chosen based on field observations such as odors, staining and OVM readings. If no field indications of contamination are present, the unsaturated sample closest to the water table (capillary zone) will be analyzed.

TASK 7 - BACKFILL THE BORINGS WITH NEAT CEMENT

Following collection of the soil and groundwater samples, the boreholes will be backfilled with neat cement placed by tremie pipe.

4.3 DETAILS OF SECTION III – CONDUCT REMEDIATION FEASABILITY TESTS

TASK 1- CONDUCT A STEP DRAWDOWN TEST

A step drawdown test will be conducted to estimate sustainable pumping rates in the shallow water-bearing zone. Pumping rates for this test will be determined in the field but rates of 0.5, 1, and 2 gallons per minutes are planned. Higher pumping rates will also be used if pumping at higher rates can be sustained. This test will be conducted on well IW-4. Data will be collected manually, and if possible, with a data logger and pressure transducer. Groundwater produced during this test will be stored on-site in sealed and labeled 55-gallon steel drums until off-site disposal can be arranged.

Results of this test, as well as all data collected during this test, will be presented in a report, which will be included as an appendix to the final report.

TASK 2 -CONDUCT A CONSTANT RATE PUMPING TEST

Based on the results of the step drawdown test outlined in Task 1, a 1,000-minute constant rate pumping test will be designed to determine

the hydraulic conductivity and transmissivity in the shallow water-bearing zone, and to calculate the capture zone radius. A large water storage tank will be delivered to the site to contain water produced during this test. The size of this tank will be determined by the results of the step drawdown test. Water levels will be measured in all wells prior to pumping. Pressure transducers will be placed in all of the injection wells and water levels will be recorded with a data logger. Manual water level measurements will also be collected as a backup from these wells. Manual water level measurements will also be collected from all of the remaining wells.

Groundwater samples will be collected during this test at the following times: Immediately upon the start of pumping, after 240-minutes of pumping, after 600-minutes of pumping and at the end of the test. These groundwater samples will be contained in 40-ml glass VOA vials, pre-preserved with hydrochloric acid, and sealed without headspace. The samples will be labeled with the site location, sample designation, date and time the samples were collected, and the initials of the person collecting the samples. The samples will be placed on ice for transport to the analytical laboratory under chain of custody. The groundwater samples will be analyzed by a CAL-EPA certified analytical laboratory for TPH-G, BTEX, and MTBE. TPH d + mo.

Since the existing site wells are 2-inches in diameter, there may be a limitation on the length of the test since pumps may overheat in 2-inch diameter wells with continuous pumping in slow producing aquifers. If the test has to be terminated before the planned 1,000-minute duration, then additional tests may be conducted in the field to gather additional data if deemed practical by the site geologist.

Results of this test, as well as all data collected during this test, will be presented in a report, which will be included as an appendix to the final report.

TASK 3 - PREPARE A SUBSURFACE ASSESSMENT REPORT

ASE will prepare a subsurface assessment report outlining the methods and findings of this assessment. This report will include a summary of the results, the site background and history, description of the well construction, development and sampling, tabulated soil and groundwater analytical results, conclusions and recommendations. Formal boring logs, analytical reports, and chain of custody documents will be included as

appendices. This report will be submitted under the seal of a California registered civil engineer or geologist.

5.0 SCHEDULE

ASE will begin work on this project immediately upon approval of this workplan from the ACHCSA, pre-approval of the costs from the Underground Storage Tank Cleanup Fund (USTCF) and obtaining the required permits.

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

Respectfully submitted,

AQUA SCIENCE ENGINEERS, INC.

Robert E. Kitay

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

SITE LOCATION MAP

Lim Property
250 8th Street
Oakland, California

Aqua Science Engineers | Figure 1

BASE: The Thomas Guide, Alameda and Contra Costa Counties Street Guide & Directory, 1990

RESIDENTIAL

BUILDING

FENCE

LIM
Property

FORMER
EXCAVATION II

EXISTING
UNOCAL
SERVICE STATION

CHURCH

SIDEWALK

FENCE

FORMER
EXCAVATION I

MW-1

SIDEWALK

Alice Street

SIDEWALK

HP SOLUTION TANK

FENCED
COMPOUND

PUMPS

PROPERTY LIMITS

BURIED
TUBING

SIDEWALK

SIDEWALK

IW-5 IW-4 IW-3 IW-2 IW-1

MW-3

FP

just a few ft. shorter than other wells.

Harrison Street

8th Street

BH-C

MW-4

37,000 G/13,000

MW-2

BH-D
ND G/B

SIDEWALK

BUILDINGS 1/02 80,000/4600

4/01 59,000/7100

1/02 76,000/7000

SIDEWALK

SIDEWALK

LIM Property

LIM-1

MW-4

FORMER
SHELL
SERVICE STATION

MW-1

BUILDING

MW-3

MW-2

LEGEND

- Proposed Monitoring Well
- Proposed Boring Location
- ASE Monitoring Well
- AEI Monitoring Well
- HP Injection Well
- Unocal Monitoring Well
- Former Shell Monitoring Well

NORTH

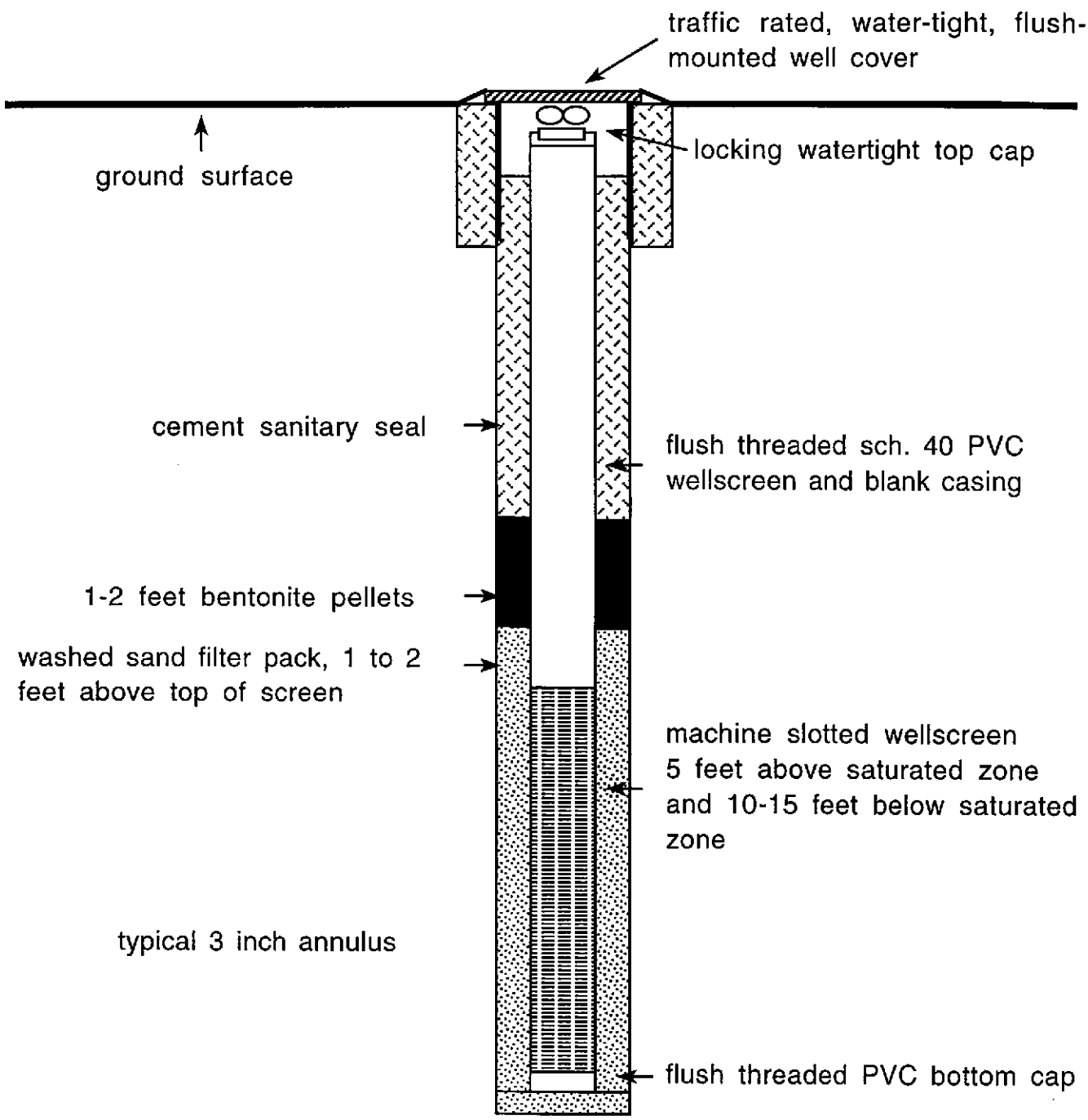
0 30 60 90

SCALE IN FEET

PROPOSED MONITORING WELL AND SOIL BORING LOCATION MAP

LIM PROPERTY
250 8TH STREET
OAKLAND, CALIFORNIA

AQUA SCIENCE ENGINEERS, INC. | Figure 2



TYPICAL
MONITORING WELL CONSTRUCTION
IN CROSS SECTION

Aqua Science Engineers | Figure 3

TABLE ONE

Summary of Chemical Analysis of Groundwater Samples
Petroleum Hydrocarbon Concentrations
All results are in parts per billion

Well/ Date Sampled	TPH Gasoline	TPH Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE
MW-1							
01/30/95	740	200	3	5	1	4	--
04/12/95	400	500	< 0.5	< 0.5	3	< 2	--
07/14/95	520	400	1	< 0.5	2	3	--
10/17/95	400	200	0.5	1	3	< 2	--
01/12/96	120	890	< 0.5	< 0.5	< 0.5	< 1.0	< 2.0
07/08/96	320	300	0.52	2.7	1.2	2.3	< 5.0
01/06/97	110	75	< 0.5	0.68	< 0.5	< 0.5	< 5.0
07/08/97	380	290	< 0.5	1.5	1.4	1.9	< 5.0
01/26/98	< 50	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 5.0
07/23/98	190	< 50	0.54	2.8	2	1.8	< 5.0
01/05/99	200	< 50	1.8	1.6	3.3	< 0.5	< 5.0
07/13/99	340	<50	<0.5	<0.5	2.6	<0.5	< 5.0
01/12/00	300	1,000	22	36	5.5	24	< 5.0
04/24/00	360	280*	< 0.5	< 0.5	< 0.5	2.1	< 5.0
07/20/00	290	150*	1.8	< 0.5	< 0.5	< 0.5	< 5.0
10/24/00	170**	280*	< 0.5	< 0.5	< 0.5	< 0.5	< 5.0
01/18/01	**170****	**150***	**< 0.5**	**<0.5**	**< 0.5**	**2.1**	**< 5.0**

TABLE ONE

Summary of Chemical Analysis of Groundwater Samples
Petroleum Hydrocarbon Concentrations
All results are in parts per billion

Well/ Date Sampled	TPH Gasoline	TPH Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE
MW-2							
01/30/95	88,000	800	19,000	18,000	2,400	10,000	--
04/12/95	110,000	990	21,000	28,000	2,800	14,000	--
07/14/95	120,000	5,000	20,000	25,000	3,200	15,000	--
10/17/95	190,000	4,000	15,000	26,000	4,900	23,000	--
01/12/96	32,000	2,600	10,000	8,000	1,100	4,800	< 2
07/08/96	110,000	2,500	20,000	18,000	2,500	12,000	< 500
01/06/97	230,000	37,000	11,000	19,000	4,300	20,000	< 1,200
07/08/97	91,000	35,000	16,000	20,000	2,700	13,000	< 1,000
01/26/98	50,000	11,000	12,000	12,000	1,600	6,700	< 250
07/23/98	50,000	8,100#	11,000	8,300	1,800	7,000	1,100
01/05/99	50,000	7,600#	12,000	12,000	2,300	9,600	1,300
07/13/99	73,000	8,500	11,000	13,000	2,200	9,800	< 500
01/12/00	63,000	11,000	10,000	12,000	1,800	7,800	< 500
04/24/00	76,000	23,000*	7,100	14,000	2,000	9,400	< 500
07/20/00	68,000	5,300#	11,000	14,000	2,300	11,000	< 1,000
10/24/00	48,000	6,400*	11,000	9,400	1,500	7,300	< 500
01/18/01	**37,000**	**4,600***	**6,900**	**5,600**	**1,200**	**5,300**	**<500**

TABLE ONE

Summary of Chemical Analysis of Groundwater Samples
Petroleum Hydrocarbon Concentrations
All results are in parts per billion

Well/ Date Sampled	TPH Gasoline	TPH Diesel	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE
MW-3							
01/12/00	140,000	13,000*	22,000	19,000	2,400	11,000	< 500
04/24/00	240,000	700,000*	33,000/ 35,000	52,000/ 87,000	5,700/ 18,000	28,000/ 84,000	< 5,000
07/20/00	NOT SAMPLED DUE TO FREE-FLOATING HYDROCARBONS						
10/24/00	NOT SAMPLED DUE TO FREE-FLOATING HYDROCARBONS						
01/18/01	**NOT SAMPLED DUE TO FREE-FLOATING HYDROCARBONS**						
MW-4							
01/12/00	99,000	7,900*	16,000	20,000	2,100	12,000	< 2,500
04/24/00	54,000	44,000*	3,400/ 4,500	13,000/ 20,000	1,800/ 2,800	8,800/ 14,000	< 1,300
07/20/00	8,000	3,500	9,200/ 11,000	20,000 22,000	2,500 3,400	12,000/ 13,000	< 1,000
10/24/00	98,000	8,000*	21,000	29,000	2,700	15,000	< 1,000
01/18/01	**91,000**	**12,000**	**17,000/ 15,000**	**21,000/ 21,000**	**2,500/ 2,800**	**13,000/ 11,000**	**<1,000 <5,000**
DHS MCL	NE	NE	1	150	700	1,750	13
EPA METHOD	5030/ 8015M	3550/ 8015M	8020/ 8260	8020/ 8260	8020/ 8260	8020/ 8260	8020

Notes:

* = Hydrocarbons reported are in the early diesel range, and do not match the laboratory standard.

** = Hydrocarbons reported do not match the laboratory gasoline standard.

= Estimated concentration reported due to overlapping fuel patterns.

/ = Results separated by a slash represent results from two different laboratory methods (8020/8260).

Non-detectable concentrations noted by the less than sign (<) followed by the detection limit. Most recent data in bold.

TABLE TWO

Groundwater Analytical Results
Oil & Grease and Volatile Organic Compounds
All results are in parts per billion

Date Sampled & Compound Analyzed	MW-1	MW-2	MW-3	MW-4
7/8/97				
Hydrocarbon Oil and Grease	---	< 1,000	-	-
Tetrachloroethane (PCE)	0.9	< 0.5	-	-
Other VOCs	< 0.5 - < 3	< 0.5 - < 3	-	-
1/26/98				
Hydrocarbon Oil and Grease	---	< 1,000	-	-
Trichloroethene	0.7	< 5.0	-	-
Tetrachloroethene	10	< 5.0	-	-
1,2-Dichloroethane	< 0.5	11	-	-
Other VOCs	< 0.5 - < 50	< 0.5 - < 50	-	-
7/23/98				
Hydrocarbon Oil and Grease	---	< 1,000	-	-
Tetrachloroethene	4	4.6	-	-
1,2-Dichloroethane	< 2	9.9	-	-
Other VOCs	< 2 - < 10	< 0.5 - < 5.0	-	-
1/5/99				
Hydrocarbon Oil and Grease	---	< 1,000	-	-
Tetrachloroethene	5.1	< 50	-	-
Trichloroethene	0.52	< 50	-	-
1,1,2,2-Tetrachloroethane	0.58	< 50	-	-
Chloroform	8.2	< 50	-	-
Other VOCs	< 0.5 - < 5	< 50 - < 500	-	-

TABLE TWO

Groundwater Analytical Results
Oil & Grease and Volatile Organic Compounds
All results are in parts per billion

Date Sampled & Compound Analyzed	MW-1	MW-2	MW-3	MW-4
7/13/99				
Hydrocarbon Oil and Grease	---	< 1,000	-	-
Tetrachloroethene	1.5	0.68	-	-
Chloroform	4.6	< 50	-	-
1,2-Dichloroethane	<0.50	7.7	-	-
Other VOCs	< 0.5 - < 5	< 0.5 - < 500	-	-
1/12/00				
Hydrocarbon Oil and Grease	---	< 1,000	< 1,000	< 1,000
Tetrachloroethene	0.8	< 1.0	< 100	< 50
Chloroform	3.2	< 1.0	< 100	< 50
1,2-Dichloroethane	<0.50	8.8	120	140
Acetone	---	---	25,000	6,400
Naphthalene	---	---	550	540
Isopropylbenzene	---	---	120	89
Other VOCs	< 0.5 - < 5.0	< 1.0 - < 4.0	< 100 - < 10,000	< 50 - < 5,000
4/24/00				
Hydrocarbon Oil and Grease	---	<1,000	4,100	< 1,000
1,2-Dichloroethane	< 0.5	5.9	< 1,000	< 250
Naphthalene	---	---	3,800	590
Isopropylbenzene	---	---	1,200	< 250
Other VOCs	< 0.5 - < 5.0	< 5.0 - < 20	< 1,000 - < 100,000	< 250 - < 25,000

TABLE TWO

Groundwater Analytical Results
Oil & Grease and Volatile Organic Compounds
All results are in parts per billion

Date Sampled & Compound Analyzed	MW-1	MW-2	MW-3	MW-4
7/20/00				
Hydrocarbon Oil and Grease	---	< 1,000		< 1,000
Tetrachloroethene	0.59	< 5.0	FREE	< 200
Chloroform	2.1	< 5.0	PRODUCT	< 200
1,2-Dichloroethane	< 0.5	6.7	---	< 200
Acetone	---	---	NOT	< 20,000
Naphthalene	---	---	SAMPLED	730
Other VOCs	< 0.5 - < 20	< 5.0 - < 20		< 250 - < 20,000
10/24/00			FREE	
Hydrocarbon Oil and Grease	---	< 1,000	PRODUCT	< 1,000
Tetrachloroethene	< 0.5	< 5.0	---	< 250
Chloroform	1.0	< 5.0	NOT	< 250
Other VOCs	< 0.5 - < 20	< 5.0 - < 20	SAMPLED	< 250 - < 25,000
1/18/01			**FREE**	
Hydrocarbon Oil and Grease	---	**2,100**	**PRODUCT**	**1,300**
Tetrachloroethene	**1.3**	**< 5.0**	**---**	**< 250**
Chloroform	**6.4**	**< 5.0**	**NOT**	**< 250**
Other VOCs	**< 0.5 - < 20**	**< 5.0 - < 20**	**SAMPLED**	**< 250 - < 25,000**