aqua science engineers inc.

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SOIL AND GROUNDWATER ASSESSMENT AND CORRECTIVE ACTION PLAN

at

Former Chan's Shell Station
726 Harrison Street
Oakland, California

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1.0 INTRODUCTION

This submittal presents Aqua Science Engineers, Inc. (ASE's) soil and groundwater assessment and corrective action plan (CAP) at the former Chan's Shell Station located at 726 Harrison Street in Oakland, California (Figures 1 and 2). The site assessment activities were initiated by Daisy and Kin Chan, owners of the property, as required by the Alameda County Health Care Services Agency (ACHCSA) in their letters dated December 19, 2000 and May 8, 2001 (Appendix A). The site assessment activities were designed to further define the extent of soil and groundwater contamination at the site, and to conduct remediation feasibility tests at the site to evaluate potential remediation options.

2.0 BRIEF SITE HISTORY AND BACKGROUND INFORMATION

2.1 October 1995 Underground Storage Tank Removal

In October 1995, All Environmental, Inc. removed four gasoline underground storage tanks (USTs) and one waste oil UST from the site. Up to 470 parts per million (ppm) total petroleum hydrocarbons as gasoline (TPH-G) were detected in soil samples collected beneath the former gasoline USTs. Total oil and grease (TOG) was detected in the soil sample collected beneath the waste oil UST at 340 ppm.

2.2 December 1995 Overexcavation and Soil Disposal

In December 1995, approximately 530 tons of contaminated soil were removed from the UST excavation areas to a depth of 20-feet below ground surface (bgs). This soil was subsequently disposed of at the Vasco Road Sanitary Landfill. Seven confirmation soil samples were collected from the bottom and sidewalls of the excavation. One sample collected near the northern portion of the excavation contained 20 ppm TPH-G, 2.9 ppm benzene, 0.33 ppm toluene, 3.7 ppm ethylbenzene, 22 ppm total xylenes and 16 ppm methyl tertiary butyl ether (MTBE). Another sample collected near the southern portion of the excavation contained 5,100 ppm TPH-G, 15 ppm benzene, 110 ppm toluene, 82 ppm ethylbenzene and 510 ppm total xylenes. All of the other samples contained low or non-detectable concentrations of hydrocarbons. Additional overexcavation was not possible due to the location of the building to the southeast and the street to the northwest.

2.3 July 1997 Monitoring Well Installation

In July 1997, Lowney Associates drilled one soil boring at the site and installed groundwater monitoring well MW-1 in the boring (Figure 2). A soil sample collected from the boring at a depth near the capillary zone contained 650 ppm TPH-G, 1.2 ppm benzene, 2.2 ppm ethylbenzene and 2.8 ppm total xylenes. A groundwater sample collected from the well contained 18,000 parts per billion (ppb) TPH-G, 2,700 ppb benzene, 350 ppb toluene, 450 ppb ethylbenzene, 900 ppb total xylenes and 7,400 ppb MTBE.

2.4 December 1998 Monitoring Well Installation

In December 1998, ASE drilled three soil borings at the site and installed monitoring wells MW-2 though MW-4 in the borings (Figure 2). No hydrocarbons were detected in any of the soil samples analyzed. Up to 18,000 ppb TPH-G, 1,500 ppb benzene, 270 ppb toluene, 260 ppb ethylbenzene, 560 ppb total xylenes and 14,000 ppb MTBE were detected in groundwater samples collected from monitoring well MW-1. Much lower hydrocarbon concentrations were detected in groundwater samples collected from monitoring wells MW-3 and MW-4. No hydrocarbons were detected in groundwater samples collected from monitoring well MW-2. The groundwater flow direction was to the southwest with a gradient of 0.01-feet/foot.

2.5 Quarterly Groundwater Monitoring

Since December 1998, ASE has collected and analyzed groundwater samples from all site wells on a quarterly basis. Groundwater elevation data during this period is tabulated in Table One. Hydrocarbon concentrations in groundwater during this period are tabulated in Table Two. The groundwater flow direction at the site has been consistently to the southwest during this period.

3.0 SCOPE OF WORK (SOW)

ASE prepared the following scope of work (SOW) to define the extent of elevated hydrocarbon concentrations on and surrounding the site, and to conduct feasibility tests to evaluate the site for potential soil and groundwater remediation.

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

2) Drill five (5) soil borings to approximately 20-feet bgs and collect soil and groundwater samples from the borings for analysis.

3) Analyze one soil and one groundwater sample from each soil boring at a CAL-EPA certified environmental laboratory for TPH-G, benzene, toluene, ethylbenzene and total xylenes (collectively known as BTEX) and MTBE by EPA Method 8260.

4) Backfill the borings with neat cement.

5) Drill one soil boring to a depth of 30-feet bgs within 10-feet of monitoring well MW-1 and install a groundwater extraction well in the boring.

6) Drill one soil boring to 30-feet bgs and install an air sparging well in the boring.

7) Drill two soil borings at the site to a depth of 15-feet bgs and install vapor extraction wells in the borings.

8) Analyze one soil sample collected from each boring described above at a CAL-EPA certified analytical laboratory for TPH-G, BTEX and MTBE by EPA Method 8260.

9) Develop the new groundwater extraction well using surge block agitation and evacuation with pumps and/or bailers.

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

11) Conduct step drawdown and constant rate pumping tests for the site.

12) Conduct a soil vapor extraction test for the site.

13) Conduct an air sparging test for the site.

14) Prepare a report detailing the methods and findings of the soil and groundwater assessment.

4.0 DRILL SOIL BORINGS FOR THE COLLECTION OF SOIL AND GROUNDWATER SAMPLES

4.1 Drilling Permit

Prior to drilling, ASE obtained an Alameda County Public Works Agency (ACPWA) drilling permit (Appendix B). ASE also notified Underground Service Alert (USA) to have underground public utilities in the vicinity of the site marked prior to drilling.

4.2 Drill Three Soil Borings for the Collection of Soil and Groundwater Samples

On August 17, 2001, Gregg Drilling of Martinez, California drilled soil borings BH-A through BH-C at the site with a Rhino drill rig using direct push and hollow-stem auger drilling techniques. Boring locations are presented in Figure 2. Boring BH-A was located toward the eastern corner of the site building. Borings BH-B was located at the northern corner of the site building, and boring BH-C was located along the northwest property boundary adjacent to Harrison Street.

Originally, a boring was planned for the west side of Harrison Street. However, in a letter from the ACHCSA dated May 8, 2001 (Appendix A), the ACHCSA stated that this boring would not be necessary unless the westernmost on-site boring exhibited contamination in soil and groundwater. Since it was unknown whether significant contamination was present in boring BH-C at the time of the drilling, the boring on the west side of Harrison Street was not drilled. Since elevated hydrocarbon concentrations were identified in groundwater samples collected from boring BH-C, a boring on the west side of Harrison Street should be drilled at a future date to determine the extent of groundwater contamination across Harrison Street. In addition, the southernmost boring planned for the site was converted into a monitoring well as requested by the ACHCSA.

Undisturbed soil samples were collected continuously as drilling progressed for lithologic and hydrogeologic description and for possible chemical analysis. The soil samples from the borings were collected by either driving a sampler lined with acetate tubes using hydraulic direct push methods or by driving a split-barrel sampler lined with 2-inch diameter brass tubes using repeated blows from a 140-pound hammer dropped 30-inches. The hydraulic push drilling method was initially used for boring BH-A; however, due to the silty sand found at the site causing

difficulty in removing the acetate tubes from the sampler, 4-inch hollow-stem augers were used on subsequent borings.

Selected soil samples were sealed with Teflon tape and plastic end caps, labeled, and stored with ice for transport to Kiff Analytical, LLC (Kiff) of Davis, California (ELAP #2236) under appropriate chain of custody documentation. Soil from the remaining tubes was described by the site geologist using the Unified Soil Classification System and was screened for volatile compounds using an organic vapor meter (OVM). The soil was screened by emptying soil from one of the sample tubes into a plastic bag. The bag was then sealed and placed in the sun for approximately 10 minutes. After the volatile compounds were allowed to volatilize, the OVM measured the vapor in the bag through a small hole punched in the bag. OVM readings are used as a screening tool only, since the procedures are not as rigorous as those used in the laboratory. The OVM readings are listed on the boring logs presented in Appendix C.

Groundwater samples were collected from borings BH-A through BH-C with a factory-cleaned, unused polyethylene bailer. The groundwater samples were contained in 40-ml volatile organic analysis (VOA) vials, preserved with hydrochloric acid, and sealed without headspace. The samples were then labeled and stored with ice for transport to Kiff under chain of custody.

Drilling equipment was cleaned with a TSP solution between sampling intervals and between borings to prevent potential cross-contamination. Following collection of the soil and groundwater samples, each boring was backfilled with neat cement to the ground surface.

4.3 Soil Sample Analysis

The soil samples collected from borings BH-A through BH-C were analyzed by Kiff for TPH-G, BTEX, and MTBE by EPA Method 8260. The soil samples with the highest hydrocarbon concentrations based on field indications such as odor, staining, and OVM readings, as well as representation of the capillary zone, were selected for chemical analysis. The analytical results for the selected soil samples are presented in Table Three. The soil sample collected from 15-feet bgs in boring BH-B contained 360 ppm TPH-G, 0.55 ppm benzene, 5.0 ppm toluene, 3.4 ppm ethylbenzene, 23 ppm total xylenes, and 0.064 ppm MTBE. The concentrations of benzene and total xylenes detected in the soil sample collected from BH-B were above Risk-Based Screening Levels (RBSLs), as presented 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 dated August 2000. The two remaining soil samples collected from borings BH-A and BH-C did not contain any compounds above the laboratory detection limits. The certified analytical report and chain of custody are presented in Appendix D.

4.4 Groundwater Sample Analysis

The groundwater samples collected from borings BH-A through BH-C were analyzed by Kiff for TPH-G, BTEX, and MTBE by EPA Method 8260. Analytical Results from these samples are tabulated in Table Four. The laboratory Analytical Report and chain of custody documents are presented in Appendix D.

The groundwater sample collected from BH-B contained 35,000 ppb TPH-G, 4,500 ppb benzene, 4,500 ppb toluene, 770 ppb ethylbenzene, 4,100 ppb total xylenes, and 5,600 ppb MTBE. The groundwater sample collected from BH-C contained 7,100 ppb TPH-G, 280 ppb benzene, 1,600 ppb toluene, 180 ppb ethylbenzene, 1,000 ppb total xylenes, and 2,500 ppb MTBE. Concentrations of several compounds detected in groundwater collected from borings BH-B and BH-C exceeded RBSLs. No compounds were detected above laboratory reporting limits in the groundwater sample collected from boring BH-A.

5.0 INSTALL ONE GROUNDWATER MONITORING WELL

5.1 Drilling Permit

Prior to drilling, ASE obtained an ACPWA drilling permit (Appendix B). ASE also notified USA to have underground public utilities in the vicinity of the site marked prior to drilling.

5.2 Drill One Soil Boring for the Installation of a Groundwater Monitoring Well

On August 16, 2001, Gregg Drilling of Martinez, California drilled soil boring MW-5 at the site with a Mobile B-61 drill rig equipped with hollow-stem augers. The drilling was directed by ASE associate geologist Erik Paddleford. Monitoring well MW-5 was subsequently constructed in this boring. This well is located on the southern end of the property and was originally planned to be a temporary boring (Figure 2). The ACHCSA

requested that this boring be completed as a monitoring well in their letter dated May 8, 2001.

Undisturbed soil samples were collected every 5-feet as drilling progressed for lithologic and hydrogeologic description and for possible chemical analysis. The samples were collected by driving a split-barrel sampler lined with 6-inch diameter brass tubes using repeated blows from a 140-lb hammer dropped 30-inches. Selective soil samples were immediately trimmed, sealed with Teflon tape and plastic end caps, labeled, and stored on ice for transport to Kiff under chain of custody. Soil from the remaining tubes was described by the site geologist using the Unified Soil Classification System and was screened for volatile compounds using an OVM. The soil was screened by emptying soil from one of the sample tubes into a plastic bag. The bag was then sealed and placed in the sun for approximately 10 minutes. After the volatile compounds were allowed to volatilize, the OVM measured the vapor in the bag through a small hole punched in the bag. OVM readings are used as a screening tool only, since the procedures are not as rigorous as those used in the laboratory. The OVM readings are listed on the boring logs presented in Appendix C.

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

5.3 Monitoring Well Construction

Monitoring well MW-5 was constructed in the boring with 2-inch diameter, 0.020-inch slotted, flush-threaded, Schedule 40 PVC well screen and blank casing. The well is screened between 10-feet bgs and 30-feet bgs to monitor the first water bearing zone encountered. #2/12 washed Monterey sand occupies the annular space between the borehole and the casing from the bottom of the boring to approximately 2-feet above the well screen. A 1-foot thick hydrated bentonite layer separates the sand from the overlying cement surface seal. The wellhead is secured with a locking wellplug beneath an at-grade traffic-rated well box. Well construction details are shown on the boring log in Appendix C.

5.4 Monitoring Well Development

On August 25, 2001, ASE associate geologist Erik Paddleford developed monitoring well MW-5 using two episodes of surge-block agitation and submersible pump evacuation. Over ten well casing volumes of water were removed from the well during development, and evacuation

continued until the water was relatively clear. Well development purge water was contained in sealed and labeled 55-gallon steel drums and left on-site for temporary storage until off-site disposal could be arranged. No free-floating hydrocarbons or sheen were present on the surface of groundwater during well development.

5.5 Monitoring Well Sampling

On August 29, 2001, ASE associate geologist Erik Paddleford collected groundwater samples from monitoring well MW-5 for analysis. No free-floating hydrocarbons or sheen were present on the surface of groundwater in the monitoring well. Prior to sampling, the well was purged of four well casing volumes of groundwater. The pH, temperature, and conductivity of the purge water were monitored during evacuation, and samples were not collected until these parameters stabilized. Groundwater samples were removed from the monitoring well with a factory-cleaned, unused polyethylene bailer. The groundwater samples were contained in 40-ml VOA vials, preserved with hydrochloric acid, and sealed without headspace. The samples were then labeled and stored with ice for transport to Kiff under chain of custody. Well sampling purge water was contained in sealed and labeled 55-gallon steel drums and left on-site for temporary storage until off-site disposal could be arranged. The well sampling field log for MW-5 is presented in Appendix E.

5.6 Soil Sample Analysis

The soil sample collected from 14-feet bgs in boring MW-5 was analyzed by Kiff for TPH-G, BTEX, and MTBE by EPA Method 8260. The analytical results are tabulated in Table Three. The certified analytical report and chain of custody are presented in Appendix D. No compounds were detected in the soil sample above laboratory reporting limits.

5.7 Groundwater Sample Analysis

The groundwater sample collected from monitoring well MW-5 was analyzed by Kiff for TPH-G, BTEX, and MTBE by EPA Method 8260. Analytical results are tabulated in Table Two. The laboratory analytical report and chain of custody documents are presented in Appendix D.

The groundwater sample collected from monitoring well MW-5 contained 14,000 ppb TPH-G, 1,300 ppb benzene, 470 ppb toluene, 230 ppb ethylbenzene, 800 ppb total xylenes, and 14,000 ppb MTBE.

6.0 INSTALLATION OF EXTRACTION AND AIR SPARGE WELLS

6.1 Drilling Permits

Prior to drilling, ASE obtained ACPWA drilling permits (Appendix B). ASE also notified USA to have underground public utilities in the vicinity of the site marked prior to drilling.

6.2 Groundwater Extraction Well Installation

ASE installed extraction well EW-1 to provide a large diameter well to conduct a pumping test. Details of the well construction are presented below.

6.2.1 Drill a Boring for the Installation of a Groundwater Extraction Well

On August 17, 2001, Gregg Drilling of Martinez, California drilled boring EW-1 approximately 2-feet northwest of monitoring well MW-1 using a Mobile B-61 drill rig equipped with 14-inch diameter hollow-stem augers (Figure 2). Groundwater extraction well EW-1 was subsequently constructed in this boring. The drilling was directed by ASE associate geologist Erik Paddleford.

Undisturbed soil samples were collected every 5-feet as drilling progressed for lithologic and hydrogeologic description and for possible chemical analysis. The samples were collected by driving a split-barrel sampler lined with 6-inch diameter brass tubes using repeated blows from a 140-lb hammer dropped 30-inches. Selective soil samples were immediately trimmed, sealed with Teflon tape and plastic end caps, labeled, and stored on ice for transport to Kiff under chain of custody. Soil from the remaining tubes was described by the site geologist using the Unified Soil Classification System and was screened for volatile compounds using an OVM. The soil was screened by emptying soil from one of the sample tubes into a plastic bag. The bag was then sealed and placed in the sun for approximately 10 minutes. After the volatile compounds were allowed to volatilize, the OVM measured the vapor in the bag through a small hole punched in the bag. OVM readings are used as a screening tool only, since the procedures are not as rigorous as those used in the laboratory. The OVM readings are listed on the boring logs presented in Appendix C.

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

6.2.2 Groundwater Extraction Well Construction

Groundwater extraction well EW-1 was constructed within the hollow-stem augers using 6-inch diameter flush-threaded, schedule 40, 0.020-inch slotted PVC well screen and blank casing. The well was screened between 9 and 29-feet bgs to allow for pumping the entire unconfined water-bearing zone. The well casing was lowered through the augers and #2/12 filter pack sand was placed in the annular space between the well casing and the borehole from the bottom of the boring to 1-foot above the screened interval. 1-foot of bentonite pellets were placed on top of the sand pack. The bentonite was hydrated with water prior to placing the cement sanitary seal. 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 C.

6.3 Air Sparge Well Installation

ASE installed air sparge well AS-1 to conduct an air sparging test. Details of the well construction are presented below.

6.3.1 Drill a Boring for the Installation of an Air Spaging Well

On August 16, 2001, Gregg Drilling of Martinez, California drilled boring AS-1 at the site using a Mobile B-61 drill rig equipped with 8-inch diameter hollow-stem augers (Figure 2). Air Sparge well AS-1 was subsequently constructed in this boring. The drilling was directed by ASE associate geologist Erik Paddleford.

Undisturbed soil samples were collected every 5-feet as drilling progressed for lithologic and hydrogeologic description and for possible chemical analysis. The samples were collected by driving a split-barrel sampler lined with 6-inch diameter brass tubes using repeated blows from a 140-lb hammer dropped 30-inches. Selective soil samples were immediately trimmed, sealed with Teflon tape and plastic end caps, labeled, and stored on ice for transport to Kiff under chain of custody. Soil from the remaining tubes was described by the site geologist using the Unified Soil Classification System and was screened for volatile compounds using an OVM. The soil was screened by emptying soil from

one of the sample tubes into a plastic bag. The bag was then sealed and placed in the sun for approximately 10 minutes. After the volatile compounds were allowed to volatilize, the OVM measured the vapor in the bag through a small hole punched in the bag. OVM readings are used as a screening tool only, since the procedures are not as rigorous as those used in the laboratory. The OVM readings are listed on the boring logs presented in Appendix C.

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

6.3.2 Air Sparge Well Construction

The well was constructed within the hollow stem augers ~~using~~ 2-inch diameter flush-threaded, schedule 40, 0.020-inch slotted PVC well screen and blank casing. The well was screened between 28 and 30-feet bgs to allow for the injection of air at the very bottom of the water-bearing zone.

The well casing was lowered through the augers and #2/12 filter pack sand was placed in the annular space between the well casing and the borehole from the bottom of the boring to 1.5-foot above the screened interval. 3-feet of bentonite pellets were placed on top of the sand pack. The bentonite was hydrated with water prior to placing the cement sanitary seal. 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 C.

6.4 Vapor Extraction Well Installation

~~ASE installed~~ vapor extraction wells VE-1 and VE-2 to conduct a vapor extraction test. Details of the well construction are presented below.

6.4.1 Drill Borings for the Installation of Vapor Extraction Wells

On August 16, 2001, Gregg Drilling of Martinez, California drilled borings VE-1 and VE-2 at the site using a Mobile B-61 drill rig equipped with 8-inch diameter hollow-stem augers (Figure 2). Vapor extraction wells VE-1 and VE-2 were subsequently constructed in these borings. The drilling was directed by ASE associate geologist Erik Paddleford.

Undisturbed soil samples were collected every 5-feet as drilling progressed for lithologic and hydrogeologic description and for possible chemical analysis. The samples were collected by driving a split-barrel sampler lined with 6-inch diameter brass tubes using repeated blows from a 140-lb hammer dropped 30-inches. Selective soil samples were immediately trimmed, sealed with Teflon tape and plastic end caps, labeled, and stored on ice for transport to Kiff under chain of custody. Soil from the remaining tubes was described by the site geologist using the Unified Soil Classification System and was screened for volatile compounds using an OVM. The soil was screened by emptying soil from one of the sample tubes into a plastic bag. The bag was then sealed and placed in the sun for approximately 10 minutes. After the volatile compounds were allowed to volatilize, the OVM measured the vapor in the bag through a small hole punched in the bag. OVM readings are used as a screening tool only, since the procedures are not as rigorous as those used in the laboratory. The OVM readings are listed on the boring logs presented in Appendix C.

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

6.4.2 Vapor Extraction Well Construction

The vapor extraction wells were constructed within the hollow-stem augers using 2-inch diameter flush-threaded, schedule 40, 0.020-inch slotted PVC well screen and blank casing. The wells were screened between 5 and 15-feet bgs to allow for vapor extraction throughout the entire vadose zone.

In each well, the well casing was lowered through the augers and #2/12 filter pack sand was placed in the annular space between the well casing and the borehole from the bottom of the boring to 1.5-feet above the screened interval. 1-foot of bentonite pellets were placed on top of the sand pack. The bentonite was hydrated with water prior to placing the cement sanitary seal. 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 logs in Appendix C.

6.5 Soil Sample Analysis

The soil samples collected from 10-feet bgs in boring EW-1, 6-feet bgs in boring AS-1, 9-feet bgs in boring VE-1 and 14-feet bgs in boring VE-2 were analyzed by Kiff for TPH-G, BTEX, and MTBE by EPA Method 8260. These samples were selected since they either appeared to represent soil that would have the highest hydrocarbon concentrations based on field indications such as odor, staining and OVM readings or they were collected from the capillary zone (if there was no other indication of contamination). These analyses were performed to provide pre-remediation baselines for these locations. The analytical results are tabulated in Table Three. The certified analytical report and chain of custody are presented in Appendix D.

The soil sample collected from boring EW-1 contained 2,300 ppm TPH-G, 0.33 ppm benzene, 0.27 ppm toluene, 16 ppm ethylbenzene, and 26 ppm total xylenes. The soil sample collected from boring AS-1 contained 740 ppm TPH-G, 3.5 ppm ethylbenzene and 5.1 ppm total xylenes. The only compound detected in the soil sample collected from boring VE-1 was 0.069 ppm MTBE. No hydrocarbons were detected in soil samples collected from boring VE-2.

7.0 GROUNDWATER ELEVATIONS

The top of casing elevation, ground surface elevation and longitude and latitude location of each well was surveyed by Mid Coast Engineers of Watsonville, California on November 29, 2001. A copy of the survey is included as Appendix F. Depth to groundwater measurements are presented in Table One. A groundwater elevation (potentiometric surface) contour map prior to the constant rate pump test on September 15, 2001 is presented as Figure 2 in pump test report in Appendix G. On September 15, 2001, groundwater appeared to flow to the southwest beneath the site at a gradient of 0.00997.

8.0 FEASIBILITY TESTS

Feasibility tests included a step drawdown pumping test, constant rate pumping test, air sparging test and a vapor extraction test.

8.1 Step Drawdown Pumping Test

The step drawdown test was conducted by Gary D. Lowe, R.G., C.E.G., C.HG. of H_2O Geol of Livermore, California on August 23, 2001. A copy of

the report for this test is presented in Appendix G. Pumping rates of 0.5 gallons per minute (gpm), 0.75 gpm and 1.0 gpm were used for the step-drawdown pumping test. Based on the results of the step-drawdown test, a pumping rate of 0.5 gpm was selected for the constant rate pumping test.

8.2 Constant Rate Pumping Test

A 640-minute constant rate pumping test was conducted by Gary D. Lowe, R.G., C.E.G., C.HG. of H_2O Geol of Livermore, California on September 15 and 16, 2001. A copy of the report for this test is presented in Appendix G. Based on the results of the step-drawdown test, a pumping rate of 0.5 gpm was selected for the constant rate pumping test. The actual average pumping rate during the test was 0.65 gpm.

The results of the constant rate pumping test shows the major hydraulic conductivity of 20.2 feet per day oriented approximately S 34 W, and the minor hydraulic conductivity of 5.02 feet per day oriented at a right angle to the major conductivity.

Assuming a maximum pumping rate (Q) of 0.5 gpm (96.25 cubic feet per day), a saturated thickness (B) of 10.75 feet, and a potentiometric surface gradient of 0.00997, the groundwater velocity will range between 1.34 and 6.7 feet per day, depending on the effective porosity used in the calculation. Based on the capture zone analysis, the spacing of wells to ensure capture of all groundwater crossing the downgradient property boundary would range between 0.67 and 3.33-feet, depending on the assumed effective porosity used in the calculation.

8.3 Vapor Extraction Test

On September 25, 2001, ASE senior project manager David Allen, in conjunction with personnel of Environmental Techniques of Huntington Beach, California, conducted a vapor-extraction (VE) test at the site. The test was designed to remove a known rate of soil gas from vapor extraction well VE-1 using a vacuum-blower powered by the power take-off of a 6-cylinder internal combustion engine (ICE), measure vacuum and the amount of air flowing from VE-1, and determine if that vacuum can influence the vadose zone in nearby observation wells. Just prior to the removal of soil gas from well VE-1, observation wells VE-2, MW-1, MW-5, MW-4 and MW-3 were fitted with sealed caps and negative-pressure gauges to record any increase in negative pressure within these wells located at various distances from VE-1. An initial, background, negative-

pressure reading was taken from the five observation wells prior to the beginning of the test.

The test began at 0850 and continued until 1240 when it was obvious that the subsurface soil was not permeable enough to support the use of VE technology.

Test data is included in Appendix H. The following conditions were achieved during the test.

- The vacuum imposed on extraction well VE-1 ranged from 26 inches of water at the beginning of the test to a high of 54 inches of water near the end of the test.

- The airflow coming from VE-1 was immeasurable during the entire length of the test, allowing only approximately 1 to 2 cubic feet per minute (cfm) of air from VE-1. Dilution air was used to support combustion of the ICE. When the dilution air valve was closed, the vacuum on VE-1 increased, but the airflow from VE-1 never increased.

- The ICE's rpm was increased in an attempt to allow airflow to be removed from VE-1; however, the airflow never increased from VE-1. Increasing the vacuum only caused the system's knock-out drum to collapse slightly.

- The influence of the extraction well was measured on the surrounding observation wells during the test. None of the wells showed a significant increase of negative pressure, due to the inability to remove air from the extraction well because of low-permeable soils. Some of the wells actually showed a positive pressure at times during the test. Only observation well VE-2, a vapor-extraction well screened only in the vadose zone, showed a measurable increase in negative pressure.

- Vapor samples were collected from the influent vapor stream in Tedlar bags at 0920 and 1215. These samples were analyzed for TPH-G, BTEX and MTBE by EPA Method 8260 by Chromalab, Inc. of Pleasanton, California (ELAP #1094). Analytical results are tabulated as Table Five, and the certified analytical report is attached in Appendix I.

The ~~data~~ gathered during the vapor-extraction test proved that the technology of vapor extraction would not be a useful tool to capture a sizeable radius of impacted vadose zone hydrocarbons.

8.4 Air Sparging Test

On September 25, 2001, ASE senior project manager David Allen, in conjunction with personnel of Environmental Techniques of Huntington Beach, California, conducted an air sparging test at the site. The test was designed to inject air into air sparging well AS-1 using a blower powered by the power take-off of a 6-cylinder ICE, measure the amount of air flowing into AS-1, and determine if that air would influence the pressure in nearby monitoring wells. Just prior to the injection of air into AS-1, observation wells MW-1, MW-5, MW-4 and MW-3 were fitted with sealed caps and pressure gauges to record any increase in pressure within these wells located at various distances from the injection well. An initial background pressure reading was taken from the four observation wells prior to the beginning of the test.

Beginning at a time of 1335, the blower began delivering air into the air sparging well at a rate of 0 cfm at 5 pounds per square inch (psi). Pressure levels in the four surrounding monitoring wells were measured to determine whether there was any pressure increase in the vadose zone. At the beginning of the test, AS-1 was not allowing any measurable air into the subsurface due to low-permeable geologic conditions. The power of the ICE was increased at various intervals, which increased the psi of the injected air and thus allowed for a measurable amount of air to flow into AS-1. After a short time, all of the observation wells showed a slight increase in pressure.

Because the vapor extraction test proved that this technology was not suited for this site, the air sparging test was conducted for only a short period of time. In that amount of time, however, a slight increase in positive pressure in each of the observation wells was measured. The air sparging test data is included in Appendix H.

9.0 REMEDIAL OPTIONS

The following lists typical remediation options for soil and groundwater contamination from petroleum-hydrocarbons currently in use in northern California.

9.1 Soil Overexcavation

This remedial option involves the excavation of contaminated soil and either treating the soil on-site or transporting the soil to an off-site treatment or disposal facility. On-site soil treatment is usually by aeration

or bioremediation. Advantages of this method is that it is the fastest and most effective method in treating contaminated soil, and removes contaminated soil which could act as a source for groundwater contamination. The disadvantages of this method are that (a) it may cause significant nuisance odors, and (b) it does not directly remediate contaminated groundwater beneath the site.

Limited overexcavation has previously taken place at the site in the northern and eastern portion of the site. Some soil contamination was left in place, however, due to the location of the streets and on-site building. It will not be possible to remove contaminated soil under the city street but further overexcavation is possible on-site, which may be beneficial in removing hydrocarbon mass in soil that is likely acting as a source for groundwater contamination.

For this reason, ASE recommends that future consideration be given to overexcavation as a remediation option for the site.

9.2 Air Sparge and Soil Vapor Extraction

Soil vapor extraction remediation entails the removal of hydrocarbons from the ground in-situ. These vapors are removed through vapor extraction wells placed in contaminated areas. The vapors are removed through wells by a vacuum source and abated by one of several methods such as an internal combustion (IC) engine, a thermal oxidizer or carbon absorption.

Vapor extraction technology is often used in conjunction with air sparging. Air sparging is the injection of air beneath the water table, generally at the bottom of an unconfined aquifer. Air bubbles rise through the saturated zone volatilizing hydrocarbons and forcing the hydrocarbons into the vadose (unsaturated) zone. The hydrocarbons are then subsequently removed from the vadose zone using soil vapor extraction. The addition of air through air sparging may also stimulate bioremediation.

However, both the vapor extraction and air sparging feasibility test at the site showed that it would not be possible to achieve sufficient flow for either air sparging or vapor extraction to be a feasible remediation alternative. The clayey content of the sand beneath the site will not permit effective remediation at the site using these remediation alternatives. In addition, it is ASE's understanding that air sparging/soil

vapor extraction was used on the neighboring property located at 706 Harrison Street with only very limited success.

Based on the feasibility test results, air sparging and soil vapor extraction should be eliminated for consideration as a remediation alternative for the site.

9.3 Groundwater "Pump and Treat"

Groundwater "pump and treat" is a method in which contaminated groundwater is pumped from a pumping well to the surface and then treated in one of several ways such as air stripping, carbon absorption, ultraviolet (UV) peroxidation, etc. prior to disposal. Historically, "pump and treat" has had limited success in groundwater remediation for several reasons, particularly that hydrocarbons have a high affinity to soil, that soil in the capillary zone often goes untreated, and that it takes long periods of time to remove significant volumes of hydrocarbons when the hydrocarbon concentrations in groundwater are in the parts per billion range. "Pump and treat" is, however, considered an effective method of containing a plume and preventing further migration of contamination downgradient. This is because the water table is drawn down and groundwater surrounding the pumping wells flow toward the pumping well.

However, the pumping test at the site showed a capture zone of between only 0.67 and 3.33-feet, depending on the assumed effective porosity used in the calculation. This means that in order to capture all water flowing across the site, wells would have to be spaced less than 3-feet apart, which is unreasonable. Even with this spacing, it would still not effectively remediate the site without source treatment, and would be a very expensive option with very little benefit.

Based on the feasibility test results, "pump and treat" should be eliminated for consideration as a remediation alternative for the site.

9.4 In-Situ Bioremediation

In-situ bioremediation was considered as a remedial option at the site. There are several options to achieve this form of remediation, which involves increasing the amount of dissolved oxygen in the groundwater to enhance naturally occurring aerobic bacterial degradation of petroleum hydrocarbons in-situ. It has been known for some time that naturally occurring bacteria readily degrade (digest) petroleum hydrocarbons into

harmless byproducts. Although anaerobic bacteria will degrade petroleum hydrocarbons, the rate is much slower than with aerobic bacteria. Depleted levels of oxygen appear to be the primary limiting factor for aerobic bacterial activity. Two common methods of increasing dissolved oxygen in groundwater are injection of hydrogen peroxide and one-time application of Oxygen Releasing Compound (ORC). Advantages for this type of remediation include (a) it is very low cost, (b) it is a passive, unintrusive method for groundwater remediation, (c) there is little or no equipment to maintain, and (d) it often works very quickly. Disadvantages include (a) it is not effective at all sites since it is very dependent on groundwater flow rates, (b) soil remediation is also required using these methods, (c) in-situ bioremediation is not typically as effective on MTBE as on other hydrocarbons, and (d) additional applications may be required if using ORC.

Based on pumping test data for this site, soil beneath the site has very low permeability. Unfortunately, for any in-situ bioremediation project to work, dissolved oxygen must be dispersed through the aquifer. The low permeability soils beneath the site will limit the effectiveness of this technology. It should be noted that ASE attempted a hydrogen peroxide injection remediation project at a site approximately 1 block away at 250 8th Street, and the remediation was not successful.

For these reasons, ASE is not considering the use of in-situ bioremediation for remediation of this site at this time.

10.0 SELECTION OF REMEDIATION TECHNOLOGY

(Recommend overex & ORC addtl)

The only remediation alternative that would likely provide a benefit would be overexcavation. Soil should be excavated in the vicinity of BH-B, which would require removal of the building. In addition, the area from the older excavation would need to extend south past MW-1, AS-1 and EW-1, but apparently not as far as MW-5, where no hydrocarbons were detected in the soil sample analyzed. Figure 3 shows the area of the proposed overexcavation. Monitoring wells MW-1, AS-1 and EW-1 would have to be properly destroyed prior to this overexcavation. Due to the limited area of the site, excavated material would have to be disposed of off-site. Water from the excavation could also be pumped out and disposed of off-site. It is ASE's understanding that one of the proposed uses of the site would be a mixed residential/commercial building with underground parking. It would be possible to conduct this remediation project in conjunction with the building of the proposed structure. If the structure extends down into groundwater, a permeable sub-base could be designed

to allow groundwater to be pumped and treated through carbon. Even though pump and treat was not deemed a feasible remediation method based on pump test data, it may be of great use in this configuration. If a proposed structure does not extend deep enough for groundwater to be encountered, a sub-based ventilation design could be engineered to reduce any potential risk to residents from vapors entering the structure from contaminated groundwater.

11.0 REPORT LIMITATIONS

The results of this assessment represent conditions at the time of the soil and groundwater sampling, at the specific locations where the samples were collected, and for the specific parameters analyzed by the laboratory.

It does not fully characterize the site for contamination resulting from unknown sources, or for parameters not analyzed by the laboratory. All of the laboratory work cited in this report was prepared under the direction of an independent CAL-EPA certified laboratory. The independent laboratory is solely responsible for the contents and conclusions of the chemical analysis data.

The pumping test in this report was prepared by H_2O Geol of Livermore, California. H_2O Geol is solely responsible for the contents and conclusions of the pump test report.

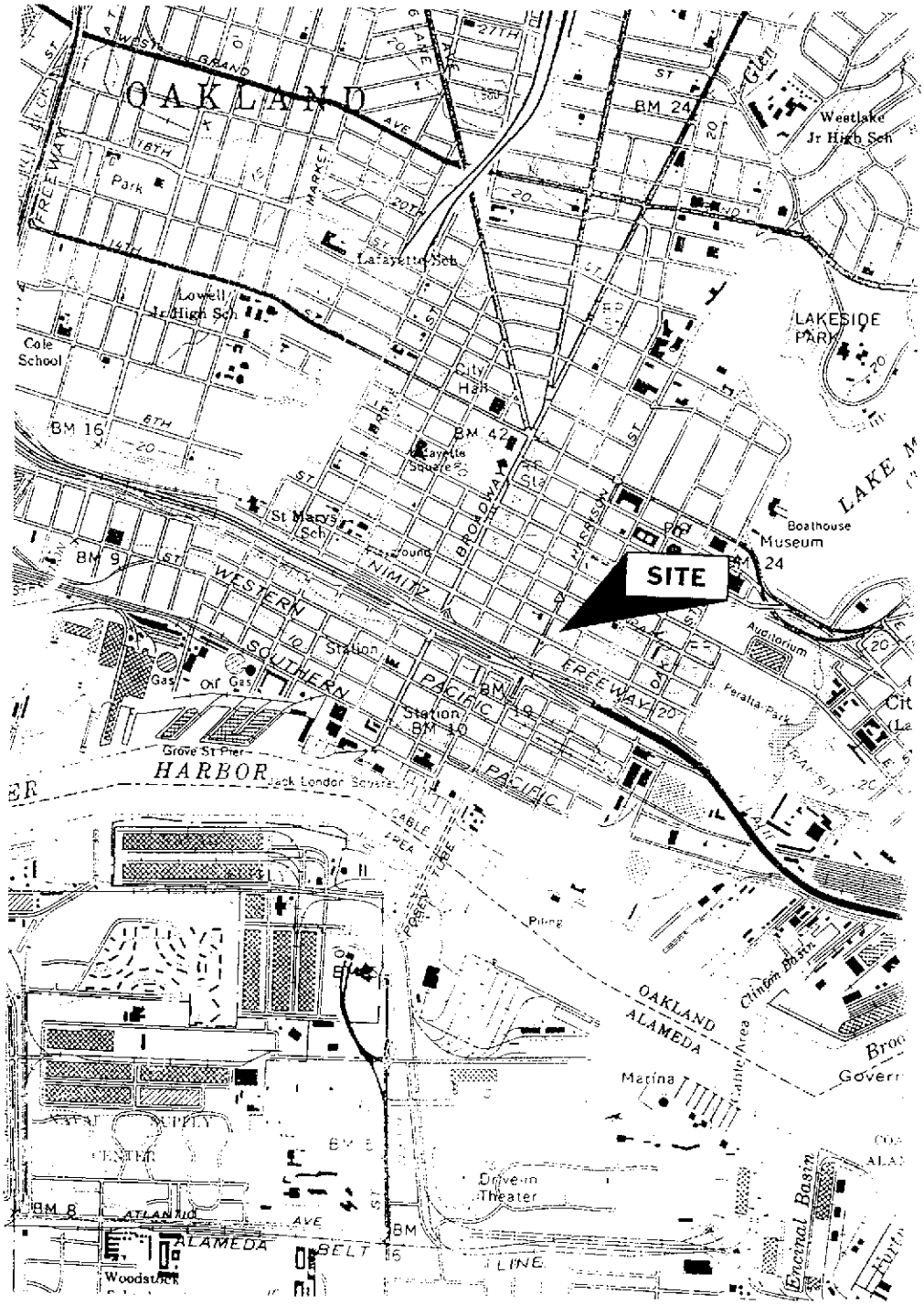
Should you have any questions or comments, please call us at (925) 820-9391.

Respectfully submitted,

AQUA SCIENCE ENGINEERS, INC.

David Allen
Senior Project Manager

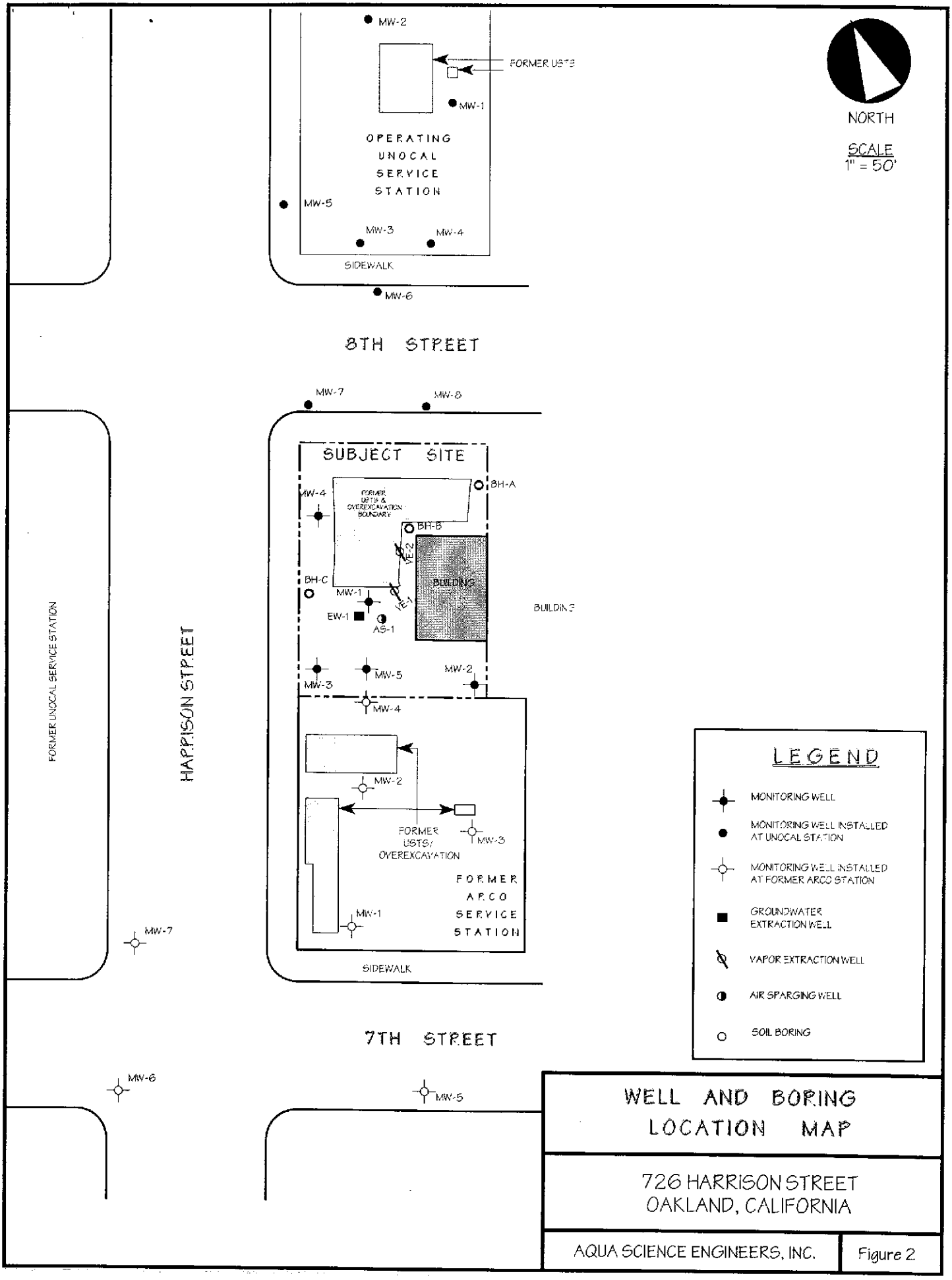
Robert E. Kitay, R.G., R.E.A.
Senior Geologist



SITE LOCATION MAP

FORMER CHAN'S SHELL STATION
726 HARRISION STREET
OAKLAND, CALIFORNIA

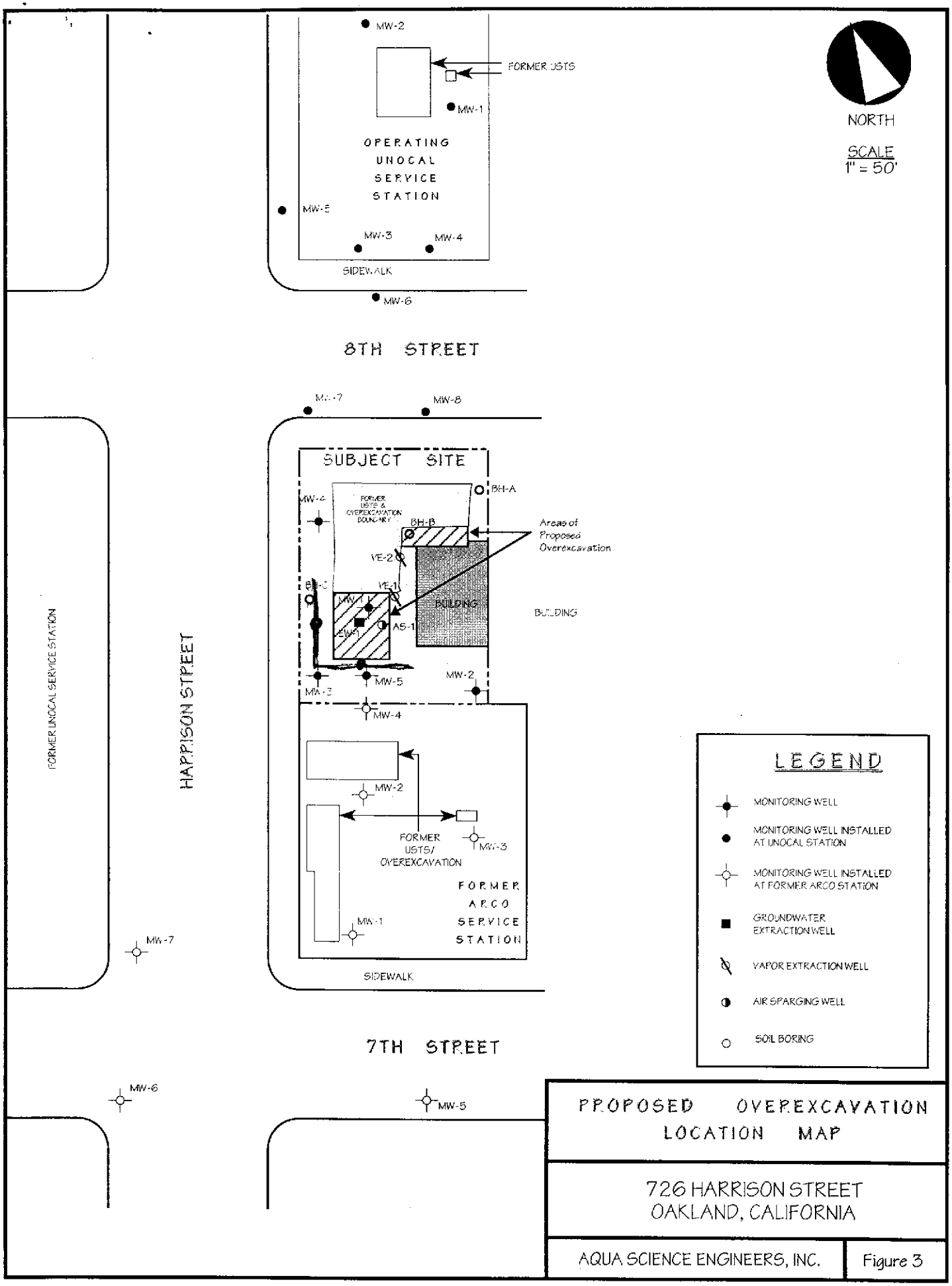
Aqua Science Engineers | Figure 1



WELL AND BORING LOCATION MAP

726 HARRISON STREET
OAKLAND, CALIFORNIA

AQUA SCIENCE ENGINEERS, INC. | Figure 2



PROPOSED OVEREXCAVATION LOCATION MAP

726 HARRISON STREET
OAKLAND, CALIFORNIA

AQUA SCIENCE ENGINEERS, INC. | Figure 3

TABLE ONE
Groundwater Elevation Data
Chan's Former Shell Station

Well ID	Date of Measurement	Top of Casing Elevation (relative to Project Datum)	Depth to Water (feet)	Groundwater Elevation (project data)
MW-1	12/15/1998	31.95	17.32	14.63
	3/4/1999		15.52	16.43
	6/17/1999		16.9	15.05
	8/27/1999		17.39	14.56
	12/9/1999		18.03	13.92
	3/7/2000		15.11	16.84
	6/7/2000		16.66	15.29
	10/11/2000		18.08	13.87
	1/18/2001		17.96	13.99
	4/5/2001		16.35	15.60
	7/17/2001		16.94	15.01
	10/5/2001	**28.98**	**17.35**	**11.63**
MW-2	12/15/1998	32.40	18.03	14.37
	3/4/1999		16.11	16.29
	6/17/1999		17.72	14.68
	8/27/1999	Inaccessible		
	12/9/1999	Inaccessible		
	3/7/2000	Inaccessible		
	6/7/2000		17.67	14.73
	10/11/2000		18.91	13.49
	1/18/2001		18.66	13.74
	4/5/2001		16.97	15.43
	7/17/2001		17.54	14.86
	10/5/2001	**29.44**	**17.98**	**11.46**
MW-3	12/15/1998	31.61	17.26	14.35
	3/4/1999		15.47	16.14
	6/17/1999		16.92	14.69
	8/27/1999		17.40	14.21
	12/9/1999		18.01	13.60
	3/7/2000		16.15	15.46
	6/7/2000		16.85	14.76
	10/11/2000		18.07	13.54
	1/18/2001		17.89	13.72
	4/5/2001		16.21	15.40
	7/17/2001		16.90	14.71
	10/5/2001	**28.64**	**17.32**	**11.32**

TABLE ONE
Groundwater Elevation Data
Chan's Former Shell Station

Well ID	Date of Measurement	Top of Casing Elevation (relative to Project Datum)	Depth to Water (feet)	Groundwater Elevation (project data)
MW-4	12/15/1998	32.53	17.59	14.94
	3/4/1999		15.88	16.65
	6/17/1999		17.14	15.39
	8/27/1999		17.65	14.88
	12/9/1999		18.28	14.25
	3/7/2000		15.41	17.12
	6/7/2000		17.09	15.44
	10/11/2000		18.33	14.20
	1/18/2001		18.23	14.30
	4/5/2001		16.69	15.84
	7/17/2001		17.32	15.21
	10/5/2001	29.58	17.71	11.87
MW-5	8/29/2001	29.06	17.42	11.64

TABLE TWO

Certified Analytical Results for GROUNDWATER Samples
Chan's Former Shell Station
All results are in parts per billion (ppb)

Well ID & Dates Sampled	TPH-G	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE
MW-1						
7/3/1997	18,000	2,700	350	450	900	7,400
12/5/1998	18,000	1,500	270	260	560	14,000
3/4/1999	44,000	2,800	400	440	960	43,000
6/17/1999	33,000	2,200	250	460	660	25,000
8/27/1999	6,000	1,000	97	190	230	14,000/ 16,000*
12/9/1999	15,000	1,500	160	220	420	17,000
3/7/2000	9,300	1,500	210	66	530	12,000
6/7/2000	26,000**	1,700	< 250	360	580	30,000
10/11/2000	13,000**	1,600	< 100	140	160	19,000
1/18/2001	14,000**	450	< 100	110	230	9,600
4/5/2001	38,000	2,200	180	290	590	35,000
7/17/2001	35,000**	1,800	< 100	300	170	35,000
10/5/2001	**17,000**	**1,500**	**210**	**420**	**790**	**27,000**
MW-2						
12/5/1998	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 5
3/4/1999		Inaccessible due to car parked over well				
6/17/1999	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 5
8/27/1999		Inaccessible due to car parked over well				
12/9/1999		Inaccessible due to car parked over well				
3/7/2000		Inaccessible due to car parked over well				
6/7/2000	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 5.0
10/11/2000	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 5.0
1/18/2001	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 5.0
4/5/2001	< 50	< 0.5	< 0.5	< 0.5	< 0.5	< 5.0
7/17/2001			No Longer Sampled			
MW-3						
12/5/1998	6,500	< 50	50	60	50	3,900
3/4/1999	2,800	< 25	< 25	< 25	< 25	1,600
6/17/1999	1,000	< 10	< 10	< 10	< 10	1,400
8/27/1999	230	< 0.5	0.51	0.5	1	1,500/ 1,600*
12/9/1999	870**	< 0.5	< 0.5	< 0.5	< 0.5	2,100
3/7/2000	150**	4	< 0.5	< 0.5	< 0.5	830
6/7/2000	140**	< 0.5	< 0.5	< 0.5	< 0.5	1,100
10/11/2000	620**	< 5.0	< 5.0	< 5.0	< 5.0	1,500
1/18/2001	1,200**	< 5.0	< 5.0	< 5.0	< 5.0	1,000
4/5/2001	1,700**	< 5.0	< 5.0	< 5.0	< 5.0	1,900
7/17/2001	1,400**	< 10	< 10	< 10	< 10	1,700
10/5/2001	**< 1,000**	**< 10**	**< 10**	**< 10**	**< 10**	**1,700**

TABLE TWO

Certified Analytical Results for GROUNDWATER Samples
Chan's Former Shell Station
All results are in parts per billion (ppb)

Well ID & Dates Sampled	TPH-G	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE
MW-4						
12/5/1998	880	3	< 0.5	< 0.5	< 0.5	950
3/4/1999	3,800	< 25	< 25	< 25	< 25	3,700
6/17/1999	2,700	< 25	< 25	< 25	< 25	2,700
8/27/1999	440	4.7	1.1	0.58	1.3	1,600/ 1,700*
12/9/1999	1,100**	< 2.5	< 2.5	< 2.5	< 2.5	1,700
3/7/2000	< 250	< 2.5	< 2.5	< 2.5	< 2.5	1,700
6/7/2000	530**	8.8	< 2.5	< 2.5	< 2.5	440
10/11/2000	700**	3.9	< 2.5	< 2.5	< 2.5	680
1/18/2001	2,000**	< 2.5	< 2.5	< 2.5	< 2.5	780
4/5/2001	810**	< 2.5	< 2.5	< 2.5	< 2.5	620
7/17/2001	880**	< 2.5	< 2.5	< 2.5	< 2.5	570
10/5/2001	**550****	**< 2.5**	**< 2.5**	**< 2.5**	**< 2.5**	**710**
MW-5						
8/29/2001	14,000	1,300	470	230	800	14,000
RBSL	500	46	130	290	1,800	13

Notes:

* EPA Method 8020/EPA Method 8260 (MTBE confirmation)

** Hydrocarbon reported in the gasoline range does not match the laboratory gasoline standard

RBSL = Risk Based Screening Levels presented 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 Regior.

NE = DHS MCL not established

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

MTBE
16

10/24/01

TABLE THREE

Certified Analytical Results for SOIL Samples
Collected from Borings
Chan's Former Shell Station
All results are in parts per million (ppm)

Boring	Sample Depth (ft.)	TPH-G	Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE
BH-A	11.5	< 1.0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
BH-B	15	360	0.55	5.0	3.4	23	0.064
BH-C	10	< 1.0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
AS-1	6	740	< 0.25	< 0.25	3.5	5.1	< 0.25
EW-1	10	2,300	0.33	0.27	16	26	< 0.25
MW-5	14	< 1.0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
VE-1	9	< 1.0	< 0.005	< 0.005	< 0.005	< 0.005	0.069
VE-2	14	< 1.0	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
RBSL-Commercial		400	0.39	8.4	24	1.0	1.0
RBSL-Residential		400	0.18	8.4	24	1.0	1.0

Notes:

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

RBSL = Risk Based Screening Levels presented 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.

TABLE FOUR

Certified Analytical Results for GROUNDWATER Samples
Collected from Borings
Chan's Former Shell Station
All results are in parts per billion (ppb)

Boring ID Date	TPH-G	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE
BH-A 8/17/2001	< 50	< 0.50	< 0.50	< 0.50	< 0.50	< 5.0
BH-B 8/17/2001	35,000	4,500	4,500	770	4,100	5,600
BH-C 8/17/2001	7,100	280	1,600	180	1,000	2,500
RBSL	500	46	130	290	1,800	13

Notes:

RBSL = Risk Based Screening Levels presented 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.

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

TABLE FIVE

Certified Analytical Results for AIR Samples
Chan's Former Shell Station
All Results Are In Micrograms Per Liter (ug/L)

Sample ID	TPH-G	Benzene	Toluene	Ethyl-benzene	Total Xylenes	MTBE
INF-0920-92501	6,300	19	< 5.0	6.7	7.6	< 50
INF-1215-92501	9,100	31	< 5.0	11	11	< 50

Notes:

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

APPENDIX A

Letters from the ACHCSA

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

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6700
FAX (510) 337-9335

December 19, 2000
StID # 39

Mr. Kin and Daisy Chan
4328 Edgewood Ave.
Oakland CA 94602

Re: Former Shell Station, 726 Harrison St., Oakland CA 94612

Dear Mr. and Mrs. Chan:

As you may be aware, I have recently taken over the oversight of the above referenced site from Mr. Larry Seto of this office. I have reviewed the files for the site and it is apparent that a significant gasoline, BTEX (benzene, toluene, ethyl benzene and xylenes), and MTBE release has occurred at the site. Up to now, only groundwater monitoring has been performed at the site. Although there may be a potential of petroleum migration from the neighboring Unocal site onto this site and potential migration of petroleum contamination onto the former ARCO site from this site, the other sites have been doing some type of groundwater remediation. Unocal has installed oxygen releasing compound in their wells, while the ARCO site has been operating a soil vapor/air sparge remediation system for several years. The elevated concentration of contaminants (particularly MTBE) in well MW-1 will require remediation. Since these three sites are involved due to commingling contaminant plumes, a concerted effort is necessary from all parties to remediate their own site according to the severity of their release.

Therefore, please submit a work plan for evaluating and recommending a remediation approach for the elevated groundwater contamination at this site. Minimally, remediation should encompass the area within the former tank pit and around well MW-1 and the effect of the remediation should be evidenced in ARCO's well MW-4. **Please submit your work plan to our office within 45 days or no later than February 6, 2001.**

You may contact me at (510) 567-6765 if you have any questions.

Sincerely,

Barney M. Chan
Hazardous Materials Specialist

C: B. Chan, files
Mr. R. Kitay, ASE, 208 West El Pintado Rd., Danville, CA 94526
Mr. D. DeWitt, Tosco Marketing, 2000 Crow Canyon Place, Suite 400, San Ramon CA 94586
Mr. D. Vossler, Gettler-Ryan Inc., 6747 Sierra Court, Suite J, Dublin, CA 94568
Mr. Bo Gin, 288 11th St., Oakland, CA 94607
Mr. R. Scheele, Cambria Environmental, 1144 65th St., Suite B., Oakland CA 94608

Wprq726Harrison

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

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6700
FAX (510) 337-9335

May 8, 2001
StID # 39

Mr. Kin and Daisy Chan
4328 Edgewood Ave.
Oakland CA 94602

Re: Work Plan for Soil and Groundwater Assessment and Remediation Feasibility Tests at 726 Harrison St., Oakland CA 94607

Dear Mr. and Mrs. Chan:

Our office has received and reviewed the April 30, 2001 report referenced above for your property located at 726 Harrison St., Oakland. As you are aware, Aqua Science Engineers, Inc., (ASE), has submitted a work plan to perform additional site assessment and perform several remediation performance tests. The work plan has the following elements:

- Installing five borings to groundwater. Sample both soil and groundwater.
- Install one groundwater extraction well near MW-1 to be used in a step drawdown and constant rate groundwater extraction test. This well should also be incorporated in the sampling and gradient map on future monitoring events. Sample both soil and groundwater.
- Install one air sparge well in the same general area of MW-1 to perform an air sparge test upon. Sample both soil and groundwater.
- Install two vapor extraction wells, again in the highest impacted area, to perform a vapor extraction test. Sample both soil and groundwater. All samples collected will be analyzed for total petroleum hydrocarbons as gasoline, BTEX and MTBE.

ASE will evaluate the results of the three tests to determine the feasibility of each potential remediation action as well as the analytical data to estimate the extent of contamination.

I have spoke with Mr. Robert Kitay of ASE and the work plan is generally acceptable with the following additions, modifications and recommendations:

- The boring on the west side of Harrison St. may not be necessary to define the limits of the groundwater plume. If the westernmost onsite boring does not exhibit any contamination in soil and groundwater, this boring is not required.
- The southernmost boring should be converted into a monitoring well. This location is suspected to be impacted by MTBE and should be used to confirm or deny the source of elevated MTBE concentrations in MW-4 on 706 Harrison St., Mr. Bo Gin's property.
- Before your consultant makes their recommendations, please have them review the results of the air sparge/vapor extraction system installed and run at 706 Harrison St. I have not received an evaluation of the efficacy of their remediation as of yet. In addition, ASE should also evaluate the possibility of combining the remediation methods to increase hydrocarbon removal.

You may contact me at (510) 567-6765 if you have any questions.

Sincerely,

Barney M Chan

Barney M. Chan
Hazardous Materials Specialist

C: B. Chan, files
Mr. R. Kitay, ASE, 208 West Pintado Rd., Danville, CA 94526
Mr. Bo Gin, 288 11th St., Oakland, CA 94607
Mr. R. Scheele, Cambria Environmental, 1144 65th St., Suite B, Oakland CA 94608
Mr. D. De Witt, Tosco Marketing, 2000 Crow Canyon Place, Suite 400, San Ramon, CA 94586

Wpap726HarrisonSt.

APPENDIX B

Drilling Permits

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-5554
FAX (510)782-1939

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 736 Harrison Street
Oakland, CA

CLIENT
Name Kaiser Dairy Urea
Address 5328 Edgewood Ave. Phone
City Oakland, CA Zip 94602

APPLICANT
Name Argus Science Engineers Fax 925-837-4853
Attn: Robert Kitay Phone 925 825 2371
Address 2081 W. El Pintado
City Danville, CA Zip 94526

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	0	General	0
Water Supply	0	Contamination	X
Monitoring	0	Well Destruction	0

PROPOSED WATER SUPPLY WELL USE

New Domestic	0	Replacement Domestic	0
Municipal	0	Irrigation	0
Industrial	0	Other	0

DRILLING METHOD:

Mud Rotary	0	Air Rotary	0
Cable	0	Other	X Geoprobe

Auger C

DRILLER'S NAME Gregg Drilling
DRILLER'S LICENSE NO. C-57 485165

WELL PROJECTS
Drill Hole Diameter ____ in. Maximum
Casing Diameter ____ in. Depth ____ ft.
Surface Seal Depth ____ ft. Owner's Well Number ____

GEOTECHNICAL PROJECTS
Number of Borings 5 Maximum
Hole Diameter 2 in. Depth 30 ft.

ESTIMATED STARTING DATE 8-16-01
ESTIMATED COMPLETION DATE 8-17-01

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

APPLICANT'S SIGNATURE Robert E. Kitay DATE 8-8-01
PLEASE PRINT NAME Robert E. Kitay

Rev.5-11-00

FOR OFFICE USE
PERMIT NUMBER W01-654
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
Send a map of work site. A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

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 8-8-01

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-5554
FAX (510)782-1939

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 736 Harrison Street
Oakland, CA

CLIENT
Name Kimball Quay Assn
Address 432 W. Eighth Ave Phone
City Oakland, CA Zip 94606

APPLICANT
Name Agua Science Engineers Fax 925-837-4853
Attn: Robert Kitay Phone 925-820-2391
Address 208 W. El Pintado
City Danville, CA Zip 94526

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	0	General	0
Water Supply	0	Contamination	0
Monitoring	X	Well Destruction	0

PROPOSED WATER SUPPLY WELL USE

New Domestic	0	Replacement Domestic	0
Municipal	0	Irrigation	0
Industrial	0	Other	0

DRILLING METHOD:

Mud Rotary	0	Air Rotary	0	Auger	X
Cable	0	Other	0		

DRILLER'S NAME Gregg Drilling
DRILLER'S LICENSE NO. C-57 785165

WELL PROJECTS
Drill Hole Diameter 8 in. Maximum
Casing Diameter 2 in. Depth 30 ft.
Surface Seal Depth 8 ft. Owner's Well Number MW-5

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

ESTIMATED STARTING DATE 5/16/01
ESTIMATED COMPLETION DATE 5/17/01

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

APPLICANT'S SIGNATURE Robert E. Kitay DATE 5-8-01

PLEASE PRINT NAME Robert E. Kitay

Rev 5-13-00

FOR OFFICE USE

PERMIT NUMBER
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
Send a map of work site. A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

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 5-8-01

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-5554
FAX (510)782-1939

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 736 Harrison Street
Oakland, CA

CLIENT
Name Kiesel Dairy Chevron
Address 4325 Edgewood Ave Phone
City Oakland, CA Zip 94602

APPLICANT
Name Aqua Science Engineers Fax 925-837-4853
Attn: Robert Kitay
Address 208 W. El Pintado Phone 925-820-2391
City Danville, CA Zip 94526

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	
Cathodic Protection	0	General	0
Water Supply	0	Contamination	0
Monitoring	0	Well Destruction	0
Vapor Extraction	X		

PROPOSED WATER SUPPLY WELL USE

New Domestic	0	Replacement Domestic	0
Municipal	0	Irrigation	0
Industrial	0	Other	

DRILLING METHOD:

Mud Rotary	0	Air Rotary	0	Auger	X
Cable	0	Other	0		

DRILLER'S NAME Gregg Drilling
DRILLER'S LICENSE NO. C-57 485165

WELL PROJECTS
Drill Hole Diameter 8 in. Maximum
Casing Diameter 4 in. Depth 15 ft
Surface Seal Depth 7 ft. Owner's Well Number VE-1

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

ESTIMATED STARTING DATE 8-16-01
ESTIMATED COMPLETION DATE 8-17-01

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

APPLICANT'S SIGNATURE Robert E. Kitay DATE 8-8-01

PLEASE PRINT NAME Robert E. Kitay

Rev.5-13-00

FOR OFFICE USE

PERMIT NUMBER WO1-654
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 above zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site. A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

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 8-8-01

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-5554
FAX (510) 782-1939

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 736 Harrison Street
Oakland, CA

CLIENT
Name Kaiser Permanente Chevron
Address 4328 Edgewood Ave Phone
City Oakland, CA Zip 94602

APPLICANT
Name Aqua Science Engineers Fax 925-837-4853
Attn: Robert Kitay Phone 925 820-2391
Address 208 W. El Pintado
City Danville, CA Zip 94526

TYPE OF PROJECT

		Geotechnical Investigation	
Well Construction		General	0
Cathodic Protection	0	Contamination	0
Water Supply	0	Well Destruction	0
Monitoring			
Vapor Extraction	X		

PROPOSED WATER SUPPLY WELL USE

New Domestic	0	Replacement Domestic	0
Municipal	0	Irrigation	0
Industrial	0	Other	0

DRILLING METHOD:

Mud Rotary	0	Air Rotary	0	Auger	X
Cable	0	Other	0		

DRILLER'S NAME Gregg Drilling
DRILLER'S LICENSE NO. C-57 485165

WELL PROJECTS
Drill Hole Diameter 8 in. Maximum
Casing Diameter 2 in. Depth 15 ft.
Surface Seal Depth 7 ft. Owner's Well Number VE-K

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

ESTIMATED STARTING DATE 8-16-01
ESTIMATED COMPLETION DATE 8-17-01

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

APPLICANT'S SIGNATURE Robert E. Kitay DATE 8-8-01

PLEASE PRINT NAME Robert E. Kitay

Rev 5-13-00

FOR OFFICE USE

PERMIT NUMBER W01657
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
Send a map of work site. A seperate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

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 8-8-01

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-5554
FAX (510)782-1939

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 736 Harrison Street
Oakland, CA

CLIENT
Name Bin and Daisy Chen
Address 4375 Edgewood Ave. Phone
City Oakland, CA Zip 94602

APPLICANT
Name Aqua Science Engineers Fax 925-837-4853
Attn: Robert Kitay Phone 925 820-2391
Address 208 W. El Pintado
City Danville, CA Zip 94526

TYPE OF PROJECT

Well Construction		Geotechnical Investigation	0
Cathodic Protection	0	General	0
Water Supply	0	Contamination	0
Monitoring	0	Well Destruction	0
Cal Extraction Well	X		

PROPOSED WATER SUPPLY WELL USE

New Domestic	0	Replacement Domestic	0
Municipal	0	Irrigation	0
Industrial	0	Other	

DRILLING METHOD:

Mud Rotary	0	Air Rotary	0	Auger	X
Cable	0	Other	0		

DRILLER'S NAME Gregg Drilling
DRILLER'S LICENSE NO. C-57 485165

WELL PROJECTS
Drill Hole Diameter 12 in. Maximum
Casing Diameter 6 in. Depth 30 ft.
Surface Seal Depth 7 ft. Owner's Well Number EW-1

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

ESTIMATED STARTING DATE 8-16-01
ESTIMATED COMPLETION DATE 8-17-01

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

APPLICANT'S SIGNATURE Robert E. Kitay DATE 8-8-01

PLEASE PRINT NAME Robert E. Kitay

Rev.5-13-00

FOR OFFICE USE
PERMIT NUMBER W01-058
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 above zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site. A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

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 8-8-01

ALAMEDA COUNTY PUBLIC WORKS AGENCY

WATER RESOURCES SECTION
399 ELMHURST ST. HAYWARD CA. 94544-1395
PHONE (510) 670-5554
FAX (510)782-1939

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

LOCATION OF PROJECT 736 Harrison Street
Oakland, CA

CLIENT
Name Kimball Dairy Chevron
Address 4375 Edgewood Ave. Phone
City Oakland, CA Zip 94602

APPLICANT
Name Ayers Associates Engineers Fax 925-837-4853
Attn: Robert Kitay Phone 925 820-2391
Address 208 Utah Court Zip 94526
City Danville, CA

TYPE OF PROJECT
Well Construction
Cathodic Protection
Water Supply
Monitoring
Air Sparge X
Geotechnical Investigation
General
Contamination
Well Destruction

PROPOSED WATER SUPPLY WELL USE
New Domestic 0
Municipal 0
Industrial 0
Replacement Domestic 0
Irrigation 0
Other

DRILLING METHOD:
Mud Rotary 0
Cable 0
Air Rotary 0
Other 0
Auger X

DRILLER'S NAME Gregg Drilling
DRILLER'S LICENSE NO. C-57 485165

WELL PROJECTS
Drill Hole Diameter 6 in. Maximum Depth 30 ft.
Casing Diameter 2 in. Owner's Well Number AS-1
Surface Seal Depth 27 ft.

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

ESTIMATED STARTING DATE 8-16-01
ESTIMATED COMPLETION DATE 8-17-01

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

APPLICANT'S SIGNATURE Robert E. Kitay DATE 8-8-01

PLEASE PRINT NAME Robert E. Kitay

Rev 5-13-00

FOR OFFICE USE

PERMIT NUMBER WO1-659
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 above anode zone with concrete placed by tremie.

F. WELL DESTRUCTION
Send a map of work site. A separate permit is required for wells deeper than 45 feet.

G. SPECIAL CONDITIONS

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 8-8-01

APPENDIX C

Boring Logs
And
Well Construction Details

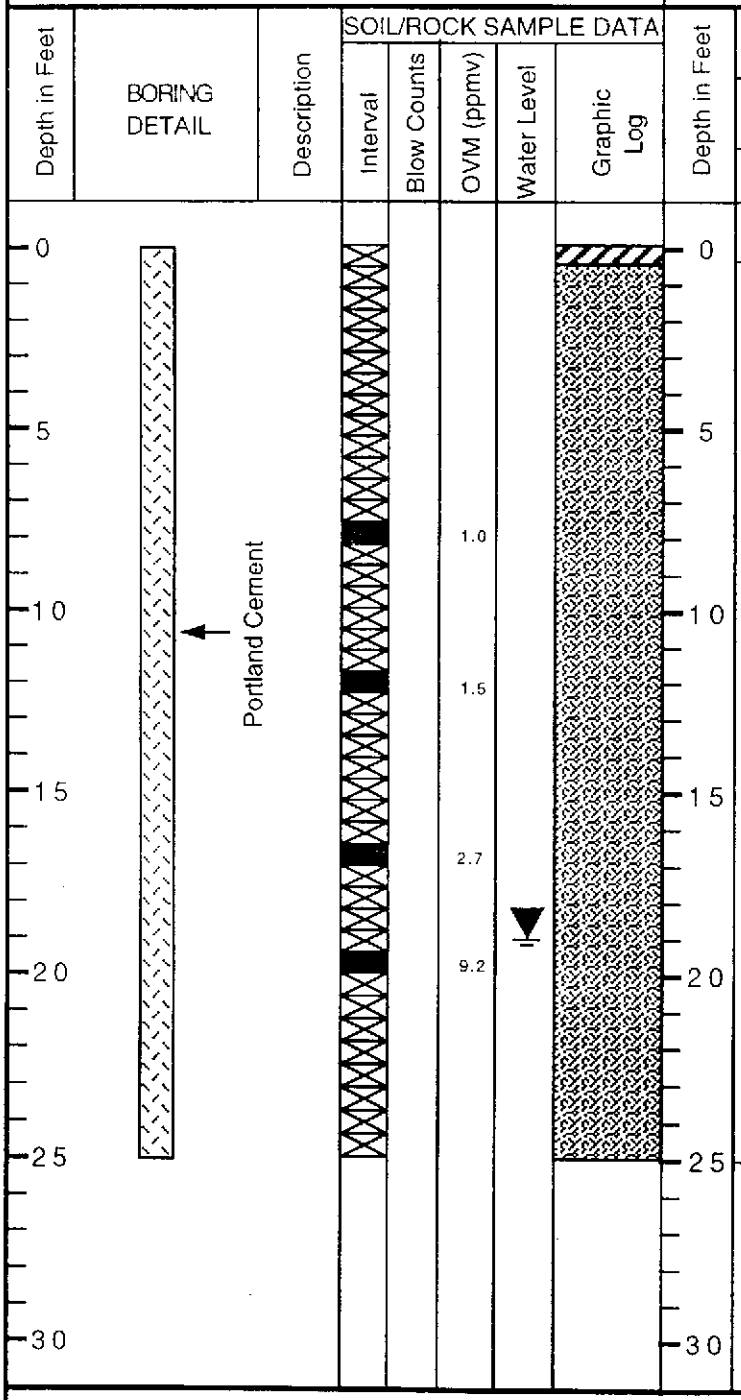
SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

Boring: BH-A

Project Name:Chan Property	Project Location: 726 Harrison Street, Oakland, CA	Page 1 of 1
Driller: Gregg Drilling	Type of Rig: HSA	Size of Drill: 4.0" Diameter
Logged By: Erik H. Paddleford	Date Drilled: August 17, 2001	Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 19'	Total Depth of Well Completed: NA
Static Depth of Water in Well: NA	Well Screen Type and Diameter: NA
Total Depth of Boring: 25'	Well Screen Slot Size: NA
	Type and Size of Soil Sampler: 2.0" I.D. Split-Barrel Sampler



DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

0 — Asphalt

Silty SAND (SM); yellow-brown; medium dense; damp; 90% fine sand; 10% silt; non-plastic; medium estimated K; no odor

5 — 80% fine sand; 15% silt; trace clay

10 — 85% fine sand; 15% silt

15

20 — Wet

25 — End of Boring at 25'

30

AQUA SCIENCE ENGINEERS, INC.

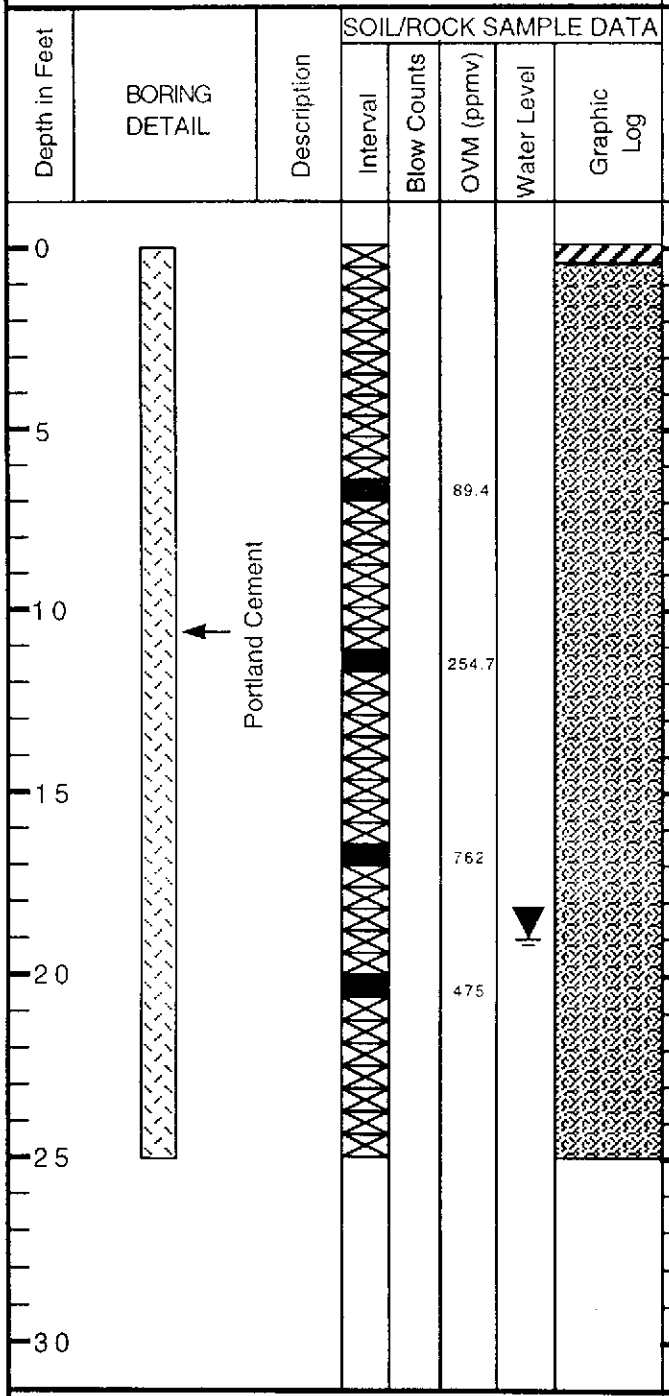
SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS

Boring: BH-B

Project Name: Chan Property	Project Location: 726 Harrison Street, Oakland, CA	Page 1 of 1
Driller: Gregg Drilling	Type of Rig: HSA	Size of Drill: 4.0" Diameter
Logged By: Erik H. Paddleford	Date Drilled: August 17, 2001	Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA

Depth of Water First Encountered: 19'	Total Depth of Well Completed: NA
Static Depth of Water in Well: NA	Well Screen Type and Diameter: NA
Total Depth of Boring: 25'	Well Screen Slot Size: NA
	Type and Size of Soil Sampler: 2.0" I.D. Split-Barrel Sampler

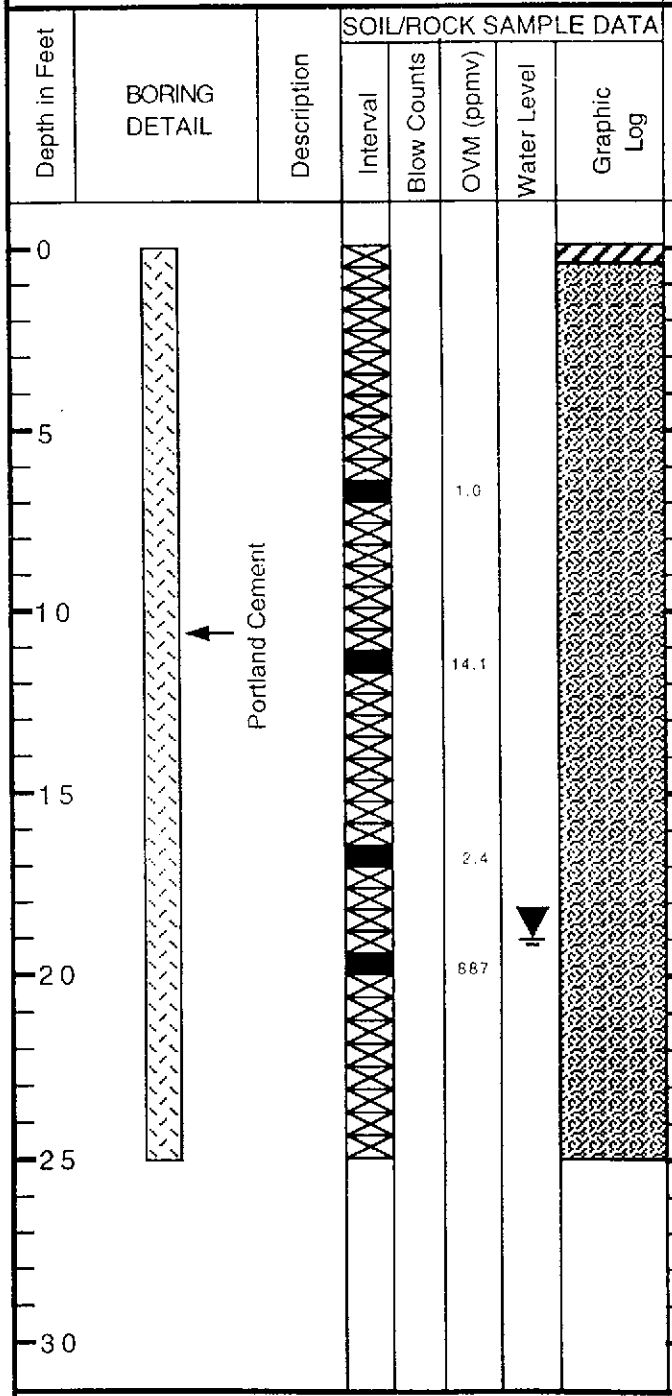


Depth in Feet	DESCRIPTION OF LITHOLOGY standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.
0	Asphalt
	Silty SAND (SM); brown; medium dense; damp; 75% fine sand; 20% silt; 5% clay; low plasticity; medium estimated K; no odor
5	Olive; 80% fine sand; 15% silt; 5% clay; trace clay
15	85% fine sand; 15% silt; trace clay
	Wet
25	End of Boring at 25'

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS		Boring: BH-C
Project Name:Chan Property	Project Location: 726 Harrison Street. Oakland, CA	Page 1 of 1
Driller: Gregg Drilling	Type of Rig: HSA	Size of Drill: 4.0" Diameter
Logged By: Erik H. Paddleford	Date Drilled: August 17, 2001	Checked By: Robert E. Kitay. R.G.

WATER AND WELL DATA	
Depth of Water First Encountered: 19'	Total Depth of Well Completed: NA
Static Depth of Water in Well: NA	Well Screen Type and Diameter: NA
Total Depth of Boring: 25'	Well Screen Slot Size: NA
	Type and Size of Soil Sampler: 2.0" I.D. Split-Barrel Sampler

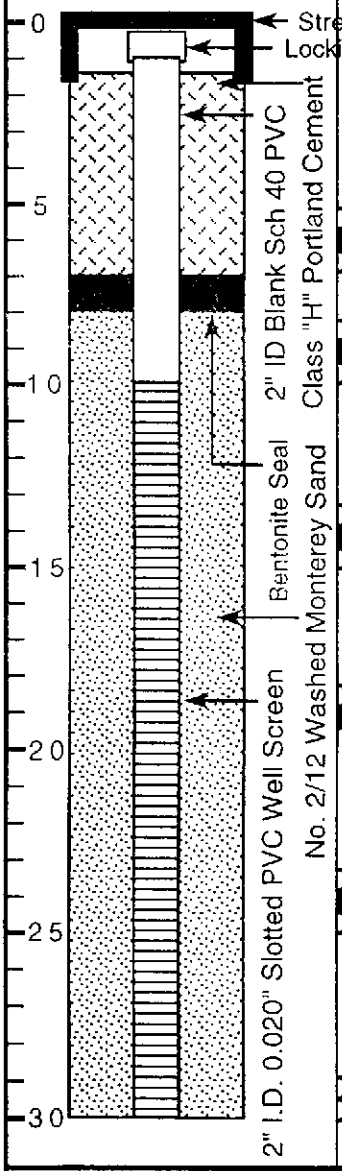


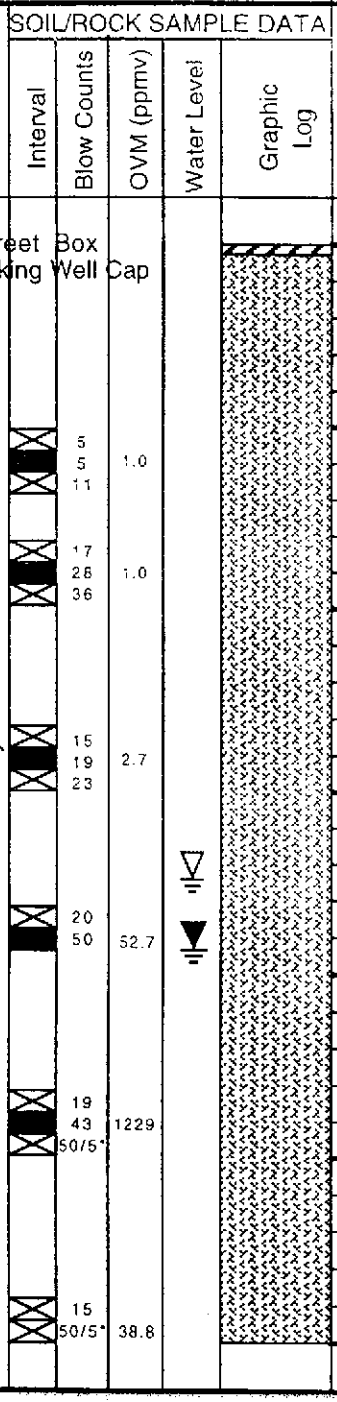
Depth in Feet	DESCRIPTION OF LITHOLOGY standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.
0	Asphalt
	Silty SAND (SM); brown; medium dense; damp; 80% fine sand: 15% silt; 5% clay; very low plasticity; medium estimated K; no odor
15	Olive, slight odor
	Gray-green, wet, moderate odor
25	End of Boring at 25'

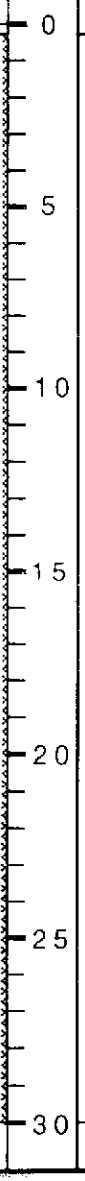
AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS		Well MW-5
Project Name: Chan Property	Project Location: 726 Harrison Street, Oakland, CA	Page 1 of 1
Driller: Gregg Drilling	Type of Rig: Hollow-Stem Auger	Size of Drill: 8" Diameter
Logged By: Erik Paddleford	Date Drilled: August 16, 2001	Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA	
Depth of Water First Encountered: 19.5'	Total Depth of Well Completed: 30.0'
	Well Screen Type and Diameter: 2" Diameter PVC Casing
Static Depth of Water in Well: 17.5'	Well Screen Slot Size: 0.020"
Total Depth of Boring: 30.0'	Type and Size of Soil Sampler: 2.0" I.D. Split-Barrel Sampler







DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

0 Asphalt

Silty SAND (SM); light brown; medium dense; dry; 75% fine sand; 20% silt; 5% clay; low plasticity; medium estimated K; no odor

Olive; very dense; 85% fine sand; 10% silt; 5% fine sand: very low plasticity; slight hydrocarbon odor

Light brown; dense; non-plastic; no odor

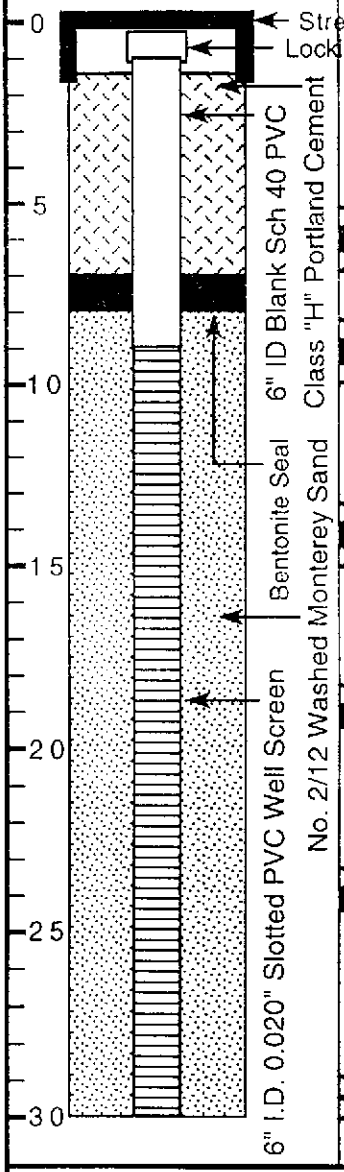
Gray-green; very dense; wet

30 End of boring at 30'

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING·LOG AND MONITORING WELL COMPLETION DETAILS		Well EW-1
Project Name: Chan Property	Project Location: 726 Harrison Street, Oakland, CA	Page 1 of 1
Driller: Gregg Drilling	Type of Rig: Hollow-Stem Auger	Size of Drill: 12" Diameter
Logged By: Erik Paddleford	Date Drilled: August 17, 2001	Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA	
Depth of Water First Encountered: 19.0'	Total Depth of Well Completed: 30.0'
Static Depth of Water in Well: 17'	Well Screen Type and Diameter: 6" Diameter PVC Casing
Total Depth of Boring: 30.0'	Well Screen Slot Size: 0.020"
	Type and Size of Soil Sampler: 2.0" I.D. Split-Barrel Sampler

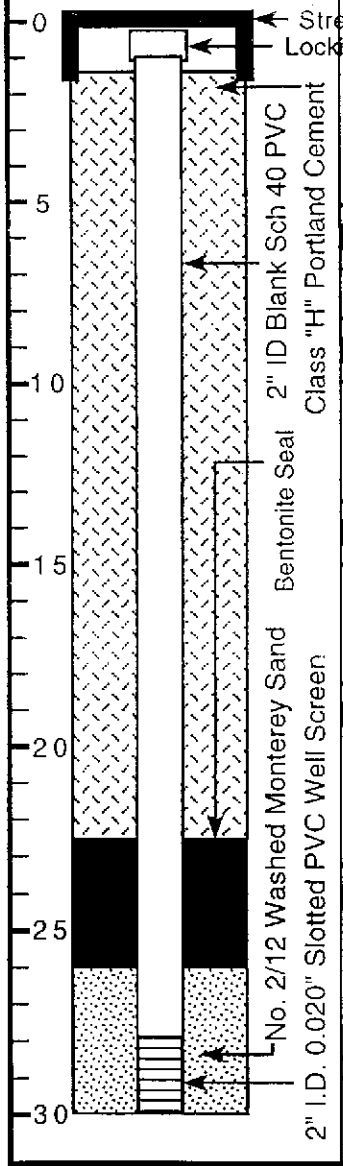


SOIL/ROCK SAMPLE DATA					DESCRIPTION OF LITHOLOGY	
Interval	Blow Counts	OVM (ppmv)	Water Level	Graphic Log	Depth in Feet	standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.
					0	Asphalt
	9					Silty SAND (SM); gray-green; dense; damp; 75% fine sand; 15% silt; 10% clay; trace gravel; low plasticity; medium estimated K; moderate hydrocarbon odor
	13	867			5	Very dense; strong hydrocarbon odor
	31					
	17					
	37	1200				
	35				10	
	16					80% fine sand; 15% silt; 5% clay
	28	956				
	30				15	
	20		▽			Wet
	50	402	▼			
	19				20	
	50	145.5				Brown to gray; moderate odor
	15				25	Slight odor
	50	6.0			30	End of boring at 30'

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS		Well AS-1
Project Name: Chan Property	Project Location: 726 Harrison Street, Oakland, CA	Page 1 of 1
Driller: Gregg Drilling	Type of Rig: Hollow-Stem Auger	Size of Drill: 8" Diameter
Logged By: Erik Paddleford	Date Drilled: August 16, 2001	Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA	
Depth of Water First Encountered: 19.0'	Total Depth of Well Completed: 30.0'
Static Depth of Water in Well: NA	Well Screen Type and Diameter: 2" Diameter PVC Casing
Total Depth of Boring: 30.0'	Well Screen Slot Size: 0.020"
	Type and Size of Soil Sampler: 2.0" I.D. Split-Barrel Sampler

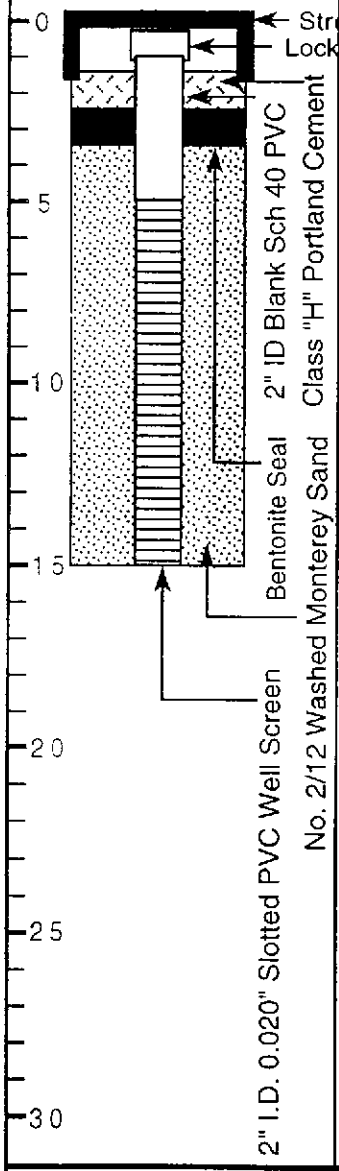


SOIL/ROCK SAMPLE DATA					Depth in Feet	DESCRIPTION OF LITHOLOGY
Interval	Blow Counts	OVM (ppmv)	Water Level	Graphic Log		standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.
					0	Asphalt
	5 7 10	1224			5	Silty SAND (SM); light brown; medium dense; dry; 75% fine sand; 15% silt; 10% clay; trace gravel; low plasticity; medium estimated K; slight odor Gray; 60% fine to medium sand; 20% clay; 20% silt; trace gravel; medium estimated K; non-plastic; strong hydrocarbon odor
	14 40 50/4"	720			10	Brick and rock fragments noted at 7' by driller Olive green to gray; very dense; 80% fine sand; 15% silt; 5% clay
	21 25 26	692			15	90% fine sand; 10% silt; moderate to strong hydrocarbon odor
	27 50/4"	610	▼		20	Wet
	27 50/5"	20.9			25	Slight hydrocarbon odor
	50	11.5			30	Brown

AQUA SCIENCE ENGINEERS, INC.

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS		Well VE-1
Project Name: Chan Property	Project Location: 726 Harrison Street, Oakland, CA	Page 1 of 1
Driller: Gregg Drilling	Type of Rig: Hollow-Stem Auger	Size of Drill: 8" Diameter
Logged By: Erik Paddleford	Date Drilled: August 16, 2001	Checked By: Robert E. Kitay, R.G.

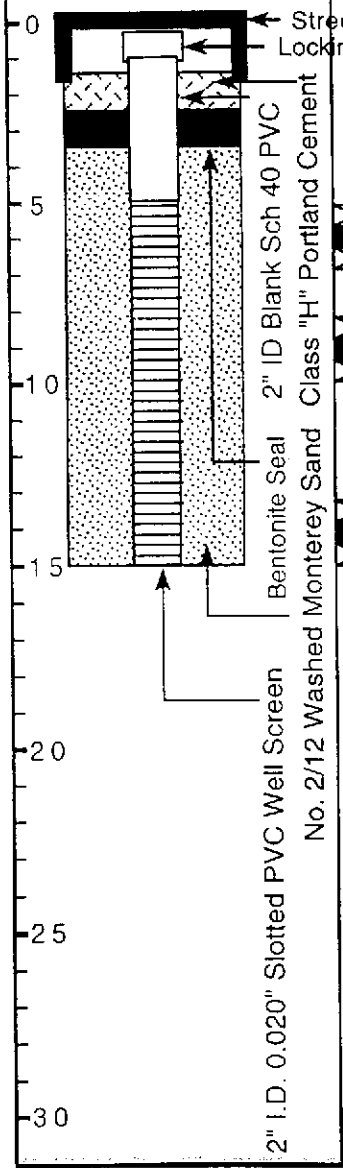
WATER AND WELL DATA	
Depth of Water First Encountered: NA	Total Depth of Well Completed: 15.0'
Static Depth of Water in Well: NA	Well Screen Type and Diameter: 2" Diameter PVC Casing
Total Depth of Boring: 15.0'	Well Screen Slot Size: 0.020"
	Type and Size of Soil Sampler: 2.0" I.D. Split-Barrel Sampler

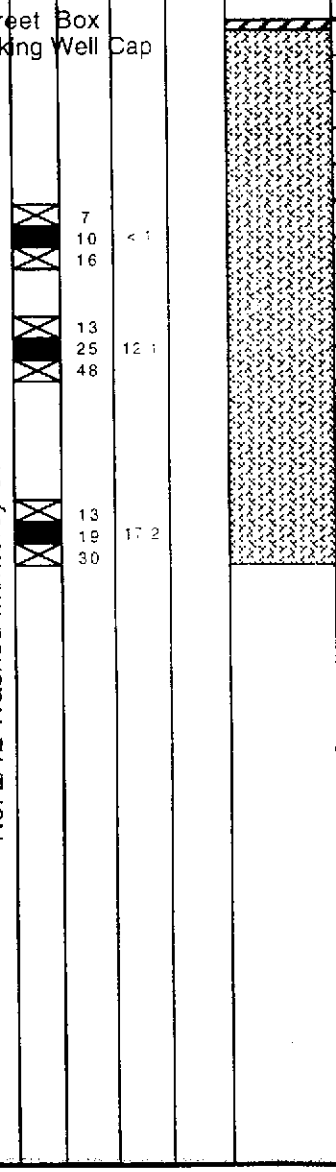


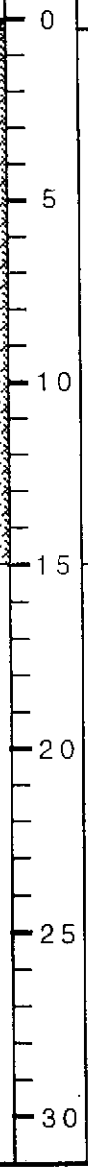
SOIL/ROCK SAMPLE DATA					DESCRIPTION OF LITHOLOGY
Interval	Blow Counts	OVM (ppmv)	Water Level	Graphic Log	standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.
					Asphalt
	5 6 11	1.0			Silty SAND (SM); brown; medium dense; dry; 75% fine sand; 20% silt; 5% clay; very low plasticity; medium estimated K; no odor
	21 35 46	57.9			80% fine sand; 15% silt; 5% clay; non-plastic Very dense
	15 17 43	25.6			Gray-green; 75% fine sand; 15% silt; 10% clay; very low plasticity; low estimated K; slight hydrocarbon odor
					End of boring at 15'

SOIL BORING LOG AND MONITORING WELL COMPLETION DETAILS		Well VE-2
Project Name: Chan Property	Project Location: 726 Harrison Street, Oakland, CA	Page 1 of 1
Driller: Gregg Drilling	Type of Rig: Hollow-Stem Auger	Size of Drill: 8" Diameter
Logged By: Erik Paddleford	Date Drilled: August 16, 2001	Checked By: Robert E. Kitay, R.G.

WATER AND WELL DATA	
Depth of Water First Encountered: NA	Total Depth of Well Completed: 15.0'
Static Depth of Water in Well: NA	Well Screen Type and Diameter: 2" Diameter PVC Casing
Total Depth of Boring: 15.0'	Well Screen Slot Size: 0.020"
	Type and Size of Soil Sampler: 2.0" I.D. Split-Barrel Sampler







DESCRIPTION OF LITHOLOGY

standard classification, texture, relative moisture, density, stiffness, odor-staining, USCS designation.

Asphalt

Silty SAND (SM); brown; medium dense; dry; 80% fine sand; 15% silt; 5% clay; very low plasticity; medium estimated K; no odor

olive-gray

Very dense; slight hydrocarbon odor

End of boring at 15'

AQUA SCIENCE ENGINEERS, INC.

APPENDIX D

Analytical Results
And Chain of Custody
Documentation

KIFF ANALYTICAL LLC

Report Number : 21872
Date : 9/4/2001

Eric Paddleford
Aqua Science Engineers, Inc.
208 West El Pintado Rd.
Danville, CA 94526

Subject : 3 Water Samples and 33 Soil Samples
Project Name : Chan Property
Project Number : 3412

Dear Mr. Paddleford,

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,

Joel Kiff

KIFF ANALYTICAL LLC

Report Number : 21872
Date : 9/4/2001

Project Name : **Chan Property**
Project Number : **3412**

Sample : **AS-1 6'** Matrix : Soil Lab Number : 21872-01
Sample Date :8/16/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.25**	0.25	mg/Kg	EPA 8260B	8/31/2001
Toluene	**< 0.25**	0.25	mg/Kg	EPA 8260B	8/31/2001
Ethylbenzene	**3.5**	0.25	mg/Kg	EPA 8260B	8/31/2001
Total Xylenes	**5.1**	0.25	mg/Kg	EPA 8260B	8/31/2001
Methyl-t-butyl ether (MTBE)	**< 0.25**	0.25	mg/Kg	EPA 8260B	8/31/2001
TPH as Gasoline	**740**	20	mg/Kg	EPA 8260B	8/31/2001
Toluene - d8 (Surr)	104		% Recovery	EPA 8260B	8/31/2001
4-Bromofluorobenzene (Surr)	107		% Recovery	EPA 8260B	8/31/2001

Sample : **MW-5 14'** Matrix : Soil Lab Number : 21872-08
Sample Date :8/16/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
Ethylbenzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
Total Xylenes	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
Methyl-t-butyl ether (MTBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
TPH as Gasoline	**< 1.0**	1.0	mg/Kg	EPA 8260B	8/30/2001
Toluene - d8 (Surr)	99.1		% Recovery	EPA 8260B	8/30/2001
4-Bromofluorobenzene (Surr)	100		% Recovery	EPA 8260B	8/30/2001

Approved By: Joel Kiff

720 Olive Drive, Suite D, Davis, CA 95616, 530.297.4800

KIFF ANALYTICAL LLC

Report Number : 21872
Date : 9/4/2001

Project Name : **Chan Property**
Project Number : **3412**

Sample : **VE-1 9'** Matrix : Soil Lab Number : 21872-12
Sample Date :8/16/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
Ethylbenzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
Total Xylenes	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
Methyl-t-butyl ether (MTBE)	**0.069**	0.0050	mg/Kg	EPA 8260B	8/30/2001
TPH as Gasoline	**< 1.0**	1.0	mg/Kg	EPA 8260B	8/30/2001
Toluene - d8 (Surr)	103		% Recovery	EPA 8260B	8/30/2001
4-Bromofluorobenzene (Surr)	107		% Recovery	EPA 8260B	8/30/2001

Sample : **VE-2 14'** Matrix : Soil Lab Number : 21872-15
Sample Date :8/16/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
Ethylbenzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
Total Xylenes	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
Methyl-t-butyl ether (MTBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/30/2001
TPH as Gasoline	**< 1.0**	1.0	mg/Kg	EPA 8260B	8/30/2001
Toluene - d8 (Surr)	97.6		% Recovery	EPA 8260B	8/30/2001
4-Bromofluorobenzene (Surr)	97.3		% Recovery	EPA 8260B	8/30/2001

Approved By: Joel Kiff

KIFF ANALYTICAL LLC

Report Number : 21872
Date : 9/4/2001

Project Name : **Chan Property**
Project Number : **3412**

Sample : **BH-A 11.5'** Matrix : Soil Lab Number : 21872-18
Sample Date :8/17/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/31/2001
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/31/2001
Ethylbenzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/31/2001
Total Xylenes	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/31/2001
Methyl-t-butyl ether (MTBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/31/2001
TPH as Gasoline	**< 1.0**	1.0	mg/Kg	EPA 8260B	8/31/2001
Toluene - d8 (Surr)	102		% Recovery	EPA 8260B	8/31/2001
4-Bromofluorobenzene (Surr)	108		% Recovery	EPA 8260B	8/31/2001

Sample : **BH-B 15'** Matrix : Soil Lab Number : 21872-22
Sample Date :8/17/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**0.55**	0.050	mg/Kg	EPA 8260B	9/1/2001
Toluene	**5.0**	0.050	mg/Kg	EPA 8260B	9/1/2001
Ethylbenzene	**3.4**	0.050	mg/Kg	EPA 8260B	9/1/2001
Total Xylenes	**23**	0.10	mg/Kg	EPA 8260B	9/1/2001
Methyl-t-butyl ether (MTBE)	**0.064**	0.050	mg/Kg	EPA 8260B	9/1/2001
TPH as Gasoline	**360**	5.0	mg/Kg	EPA 8260B	9/1/2001
Toluene - d8 (Surr)	103		% Recovery	EPA 8260B	9/1/2001
4-Bromofluorobenzene (Surr)	97.3		% Recovery	EPA 8260B	9/1/2001

Approved By: Joel Kiff

KIFF ANALYTICAL LLC

Report Number : 21872
Date : 9/4/2001

Project Name : **Chan Property**
Project Number : **3412**

Sample : **BH-C 10'** Matrix : Soil Lab Number : 21872-25
Sample Date :8/17/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/31/2001
Toluene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/31/2001
Ethylbenzene	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/31/2001
Total Xylenes	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/31/2001
Methyl-t-butyl ether (MTBE)	**< 0.0050**	0.0050	mg/Kg	EPA 8260B	8/31/2001
TPH as Gasoline	**< 1.0**	1.0	mg/Kg	EPA 8260B	8/31/2001
Toluene - d8 (Surr)	102		% Recovery	EPA 8260B	8/31/2001
4-Bromofluorobenzene (Surr)	110		% Recovery	EPA 8260B	8/31/2001

Sample : **BH-A** Matrix : Water Lab Number : 21872-28
Sample Date :8/17/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**< 0.50**	0.50	ug/L	EPA 8260B	8/30/2001
Toluene	**< 0.50**	0.50	ug/L	EPA 8260B	8/30/2001
Ethylbenzene	**< 0.50**	0.50	ug/L	EPA 8260B	8/30/2001
Total Xylenes	**< 0.50**	0.50	ug/L	EPA 8260B	8/30/2001
Methyl-t-butyl ether (MTBE)	**< 5.0**	5.0	ug/L	EPA 8260B	8/30/2001
TPH as Gasoline	**< 50**	50	ug/L	EPA 8260B	8/30/2001
Toluene - d8 (Surr)	100		% Recovery	EPA 8260B	8/30/2001
4-Bromofluorobenzene (Surr)	98.1		% Recovery	EPA 8260B	8/30/2001

Approved By: Joel Kiff

KIFF ANALYTICAL LLC

Report Number : 21872
Date : 9/4/2001

Project Name : **Chan Property**
Project Number : **3412**

Sample : **BH-B** Matrix : Water Lab Number : 21872-29
Sample Date :8/17/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**4500**	20	ug/L	EPA 8260B	8/30/2001
Toluene	**4500**	20	ug/L	EPA 8260B	8/30/2001
Ethylbenzene	**770**	20	ug/L	EPA 8260B	8/30/2001
Total Xylenes	**4100**	20	ug/L	EPA 8260B	8/30/2001
Methyl-t-butyl ether (MTBE)	[redacted]	200	ug/L	EPA 8260B	8/30/2001
TPH as Gasoline	[redacted]	2000	ug/L	EPA 8260B	8/30/2001
Toluene - d8 (Surr)	98.3		% Recovery	EPA 8260B	8/30/2001
4-Bromofluorobenzene (Surr)	100		% Recovery	EPA 8260B	8/30/2001

Sample : **BH-C** Matrix : Water Lab Number : 21872-30
Sample Date :8/17/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**280**	10	ug/L	EPA 8260B	8/30/2001
Toluene	**1600**	10	ug/L	EPA 8260B	8/30/2001
Ethylbenzene	**180**	10	ug/L	EPA 8260B	8/30/2001
Total Xylenes	**1000**	10	ug/L	EPA 8260B	8/30/2001
Methyl-t-butyl ether (MTBE)	**2500**	100	ug/L	EPA 8260B	8/30/2001
TPH as Gasoline	**7100**	1000	ug/L	EPA 8260B	8/30/2001
Toluene - d8 (Surr)	97.9		% Recovery	EPA 8260B	8/30/2001
4-Bromofluorobenzene (Surr)	102		% Recovery	EPA 8260B	8/30/2001

Approved By: Joel Kiff

KIFF ANALYTICAL LLC

Report Number : 21872

Date : 9/4/2001

Project Name : **Chan Property**

Project Number : **3412**

Sample : **EW-1 10'** Matrix : Soil Lab Number : 21872-32

Sample Date :8/17/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**0.33**	0.25	mg/Kg	EPA 8260B	8/31/2001
Toluene	**0.27**	0.25	mg/Kg	EPA 8260B	8/31/2001
Ethylbenzene	**16**	0.25	mg/Kg	EPA 8260B	8/31/2001
Total Xylenes	**26**	0.25	mg/Kg	EPA 8260B	8/31/2001
Methyl-t-butyl ether (MTBE)	**< 0.25**	0.25	mg/Kg	EPA 8260B	8/31/2001
TPH as Gasoline	**2300**	50	mg/Kg	EPA 8260B	8/31/2001
Toluene - d8 (Surr)	95.5		% Recovery	EPA 8260B	8/31/2001
4-Bromofluorobenzene (Surr)	103		% Recovery	EPA 8260B	8/31/2001

Joel Kiff

Approved By: Joel Kiff

Aqua Science Engineers, Inc.
208 W. El Pintado Road
Danville, CA 94526
(925) 820-9391
FAX (925) 837-4853

Chain of Custody

21872

PAGE 1 OF 4

SAMPLER (SIGNATURE) E Goldstein (TELEPHONE NO.)

PROJECT NAME Chan Property JOB NO. 3412

ADDRESS 726 Harrison Street

ANALYSIS REQUEST

SPECIAL INSTRUCTIONS:

SAMPLE ID.	DATE	TIME	MATRIX	NO. OF SAMPLES	TPH-GAS / MTBE & BTEX (EPA 5030/8015-8020)	TPH-DIESEL (EPA 3510/8015)	TPH-DIESEL & MOTOR OIL (EPA 3510/8015)	PURGEABLE HALOCARBONS (EPA 601/8010)	VOLATILE ORGANICS (EPA 624/8240/8260)	SEMI-VOLATILE ORGANICS (EPA 625/8270)	OIL & GREASE (EPA 5520)	LUFT METALS (5) (EPA 6010+7000)	CAM 17 METALS (EPA 6010+7000)	PCBs & PESTICIDES (EPA 608/8080)	ORGANOPHOSPHORUS PESTICIDES (EPA 8141C EPA 608/8080)	FUEL OXYGENATES (EPA 8260)	Pb (TOTAL or DISSOLVED) (EPA 6010)	TPH-G/BTEX/5 OXY'S (EPA 8260)	TPH-G/BTEX/7 OXY'S, HVOCS (EPA 8260)	Pb		COMPOSITE	
AS-1 6'	8/16	827	Soil	1	X																		01
AS-1 9'	8/16	840		1																	X		02
AS-1 14'	8/16	850		1																	X		03
AS-1 19'	8/16	859		1																	X		04
AS-1 24'	8/16	906		1																	X		05
MW-5 5.5'		1038																			X		06
MW-5 9'		1046																			X		07
MW-5 14'		1053			X																		08
MW-5 19'		1104																			X		09
MW-5 24'		1113																			X		10
~~MW-5~~ VE-1 5.5'	↓	1309	↓	↓																	X		11

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY LABORATORY:	COMMENTS:
E Goldstein (signature) (time)	(signature) (time)	(signature) (time)	Harold Bruce 12:10 (signature) (time)	
E Goldstein (printed name) (date)	(printed name) (date)	(printed name) (date)	Harold Bruce 08.20.01 (printed name) (date)	TURN AROUND TIME
Company- ASE	Company-	Company-	Company- Trafton Analytical	STANDARD 24Hr 48Hr 72Hr
				OTHER:

Aqua Science Engineers, Inc.
208 W. El Pintado Road
Danville, CA 94526
(925) 820-9391
FAX (925) 837-4853

Chain of Custody

21872

PAGE 2 OF 4

SAMPLER (SIGNATURE) E. Paddleford (PHONE NO.)

PROJECT NAME Clean Property JOB NO. 3412

ADDRESS 726 Harrison St.

ANALYSIS REQUEST

SPECIAL INSTRUCTIONS:

SAMPLE ID.	DATE	TIME	MATRIX	NO. OF SAMPLES	TPH-GAS / MTBE & BTEX (EPA 5030/8015-8020)	TPH-DIESEL (EPA 3510/8015)	TPH-DIESEL & MOTOR OIL (EPA 3510/8015)	PURGEABLE HALOCARBONS (EPA 601/8010)	VOLATILE ORGANICS (EPA 624/8240/8260)	SEMI-VOLATILE ORGANICS (EPA 625/8270)	OIL & GREASE (EPA 5520)	LUFT METALS (5) (EPA 6010+7000)	CAM 17 METALS (EPA 6010+7000)	PCBs & PESTICIDES (EPA 608/8080)	ORGANOPHOSPHORUS PESTICIDES (EPA 8140 EPA 608/8080)	FUEL OXYGENATES (EPA 8260)	Pb (TOTAL or DISSOLVED) (EPA 6010)	TPH-G/BTEX/5 OXY'S (EPA 8260)	TPH-G/BTEX/7 OXY'S / HVOCS (EPA 8260)	Hold		COMPOSITE	
VE-1 9'	8/16	1318	Soil	1	X																		12
VE-2 5.5'	8/16	1407		1																X			13
VE-2 ~~14'~~ 9'	8/16	1416		1																X			14
VE-2 14'	8/16	1427		1	X																		15
BH-A 7.5'	8/17	825																		X			16
BH-A 15.5'		832																		X			17
BH-A 11.5'		829			X																		18
BH-A 19.5'		905																		X			19
BH-B 5'		938																		X			20
BH-B 10'		941																		X			21
BH-B 15'	↓	943	↓		X																		22

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY LABORATORY:
E. Paddleford (signature) (time)	(signature) (time)	(signature) (time)	Harold Brewer 1210 (signature) (time)
E. Paddleford (printed name) (date)	(printed name) (date)	(printed name) (date)	Harold Brewer 082001 (printed name) (date)
Company- ASE	Company-	Company-	Company- Kemtech Analytical

COMMENTS:

TURN AROUND TIME
STANDARD 24Hr 48Hr 72Hr
OTHER:

Aqua Science Engineers, Inc.
208 W. El Pintado Road
Danville, CA 94526
(925) 820-9391
FAX (925) 837-4853

Chain of Custody

21872

PAGE 3 OF 4

SAMPLER (SIGNATURE) S. Paddleford (PHONE NO.)

PROJECT NAME Chan Property JOB NO. 3412

ADDRESS 2410 Harrison St

ANALYSIS REQUEST

SPECIAL INSTRUCTIONS:

SAMPLE ID.	DATE	TIME	MATRIX	NO. OF SAMPLES	TPH-GAS / MTBE & BTEX (EPA 5030/8015-8020)	TPH-DIESEL (EPA 3510/8015)	TPH-DIESEL & MOTOR OIL (EPA 3510/8015)	PURGEABLE HALOCARBONS (EPA 601/8010)	VOLATILE ORGANICS (EPA 624/8240/8260)	SEMI-VOLATILE ORGANICS (EPA 625/8270)	OIL & GREASE (EPA 5520)	LUFT METALS (5) (EPA 6010+7000)	CAM 17 METALS (EPA 6010+7000)	PCBs & PESTICIDES (EPA 608/8080)	ORGANOPHOSPHORUS PESTICIDES (EPA 8140 EPA 608/8080)	FUEL OXYGENATES (EPA 8260)	Pb (TOTAL or DISSOLVED) (EPA 6010)	TPH-G/BTEX/5 OXY'S (EPA 8260)	TPH-G/BTEX/7 OXY'S / HVOCS (EPA 8260)	Hold		COMPOSITE	
BH-B 20'	8/17	1030	Soil	1																X			23
BH-C 5'		1023		1																X			24
BH-C 10'		1025		1	X																		25
BH-C 15'		1027																		X			26
BH-C 20'		1030	↓	↓																X			27
BH-A		917	Water	5	X																		28
BH-B		954		5	X																		29
BH-C	↓	1045	↓	6	X																		30
EW-1 5'		811	Soil	1																X			31
EW-1 10'		818	Soil	1	X																		32
EW-1 14'	↓	826	Soil	1																X			33

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY LABORATORY:	COMMENTS:
S Paddleford (signature) (time)	(signature) (time)	(signature) (time)	Hank Brown 1210 (signature) (time)	
S Paddleford (printed name) (date)	(printed name) (date)	(printed name) (date)	Hank Brown 082001 (printed name) (date)	TURN AROUND TIME: STANDARD 24Hr 48Hr 72Hr
Company- ASE	Company-	Company-	Company- Kaiser Chevrolet	OTHER:

Aqua Science Engineers, Inc.
208 W. El Pintado Road
Danville, CA 94526
(925) 820-9391
FAX (925) 837-4853

Chain of Custody

2-1872-

PAGE 4 OF 4

SAMPLER (SIGNATURE) S Pudleff (PHONE NO.)

PROJECT NAME Chan Property JOB NO. 3412

ADDRESS 720 Harrison St.

ANALYSIS REQUEST

SPECIAL INSTRUCTIONS:

SAMPLE ID.	DATE	TIME	MATRIX	NO. OF SAMPLES	TPH-GAS / MTBE & BTEX (EPA 5030/8015-8020)	TPH-DIESEL (EPA 3510/8015)	TPH-DIESEL & MOTOR OIL (EPA 3510/8015)	PURGEABLE HALOCARBONS (EPA 601/8010)	VOLATILE ORGANICS (EPA 624/8240/8260)	SEMI-VOLATILE ORGANICS (EPA 625/8270)	OIL & GREASE (EPA 5520) ____	LUFT METALS (5) (EPA 6010+7000)	CAM 17 METALS (EPA 6010+7000)	PCBs & PESTICIDES (EPA 608/8080)	ORGANOPHOSPHORUS PESTICIDES (EPA 8140 EPA 608/8080)	FUEL OXYGENATES (EPA 8260)	Pb (TOTAL or DISSOLVED) (EPA 6010)	TPH-G/BTEX/5 OXYS (EPA 8260)	TPH-G/BTEX/7 OXYS / HVOCS (EPA 8260)	Hold		COMPOSITE	
EW-1 19'	8/17	834	Soil	1																X			34
EW-1 24'	8/17	842	Soil	1																X			35
VE-1 14'	8/16	13:32	Soil	1																X			36

RELINQUISHED BY: S Pudleff (signature) (time)

S Pudleff (printed name) (date)

Company- PSE

RECEIVED BY: (signature) (time)

(printed name) (date)

Company-

RELINQUISHED BY: (signature) (time)

(printed name) (date)

Company-

RECEIVED BY LABORATORY: Harold Brewer 1210 (signature) (time)

HAROLD BREWER 08/20/01 (printed name) (date)

Company- Cal Lab Analytical

COMMENTS:

TURN AROUND TIME

STANDARD 24Hr 48Hr 72Hr

OTHER:

KIFF ANALYTICAL LLC

Report Number : 22062
Date : 9/20/2001

Eric Paddleford
Aqua Science Engineers, Inc.
208 West El Pintaco Rd.
Danville, CA 94526

Subject : 1 Water Sample
Project Name : Chan Property
Project Number : 3412

Dear Mr. Paddleford,

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,

Joel Kiff

Joel Kiff

KIFF ANALYTICAL LLC

Report Number : 22062

Date : 9/20/2001

Project Name : **Chan Property**

Project Number : **3412**

Sample : **MW-5** Matrix : Water Lab Number : 22062-01

Sample Date :8/29/2001

Parameter	Measured Value	Method Reporting Limit	Units	Analysis Method	Date Analyzed
Benzene	**1300**	10	ug/L	EPA 8260B	9/10/2001
Toluene	**470**	10	ug/L	EPA 8260B	9/10/2001
Ethylbenzene	**230**	10	ug/L	EPA 8260B	9/10/2001
Total Xylenes	**800**	10	ug/L	EPA 8260B	9/10/2001
Methyl-t-butyl ether (MTBE)	**14000**	250	ug/L	EPA 8260B	9/11/2001
TPH as Gasoline	**14000**	1000	ug/L	EPA 8260B	9/10/2001
Toluene - d8 (Surr)	102		% Recovery	EPA 8260B	9/10/2001
4-Bromofluorobenzene (Surr)	104		% Recovery	EPA 8260B	9/10/2001

Joel Kiff

Approved By: Joel Kiff

720 Olive Drive, Suite D, Davis, CA 95616, 530-297-4800

Aqua Science Engineers, Inc.
208 W. El Pintado Road
Danville, CA 94526
(925) 820-9391
FAX (925) 837-4853

Chain of Custody

22062

PAGE 1 OF 1

SAMPLER (SIGNATURE) (PHONE NO.)

PROJECT NAME Chan property JOB NO. 3412

ADDRESS 726 Harrison Street Oakland, CA

ANALYSIS REQUEST

SPECIAL INSTRUCTIONS:

Standard TAT

SAMPLE ID.	DATE	TIME	MATRIX	NO. OF SAMPLES	TPH-GAS / MTBE & BTEX (EPA 5030/8015-8020)	TPH-DIESEL (EPA 3510/8015)	TPH-DIESEL & MOTOR OIL (EPA 3510/8015)	PURGEABLE HALOCARBONS (EPA 601/8010)	VOLATILE ORGANICS (EPA 624/8240/8260)	SEMI-VOLATILE ORGANICS (EPA 625/8270)	OIL & GREASE (EPA 5520)	LUFT METALS (5) (EPA 6010+7000)	CAM 17 METALS (EPA 6010+7000)	PCBs & PESTICIDES (EPA 608/8080)	ORGANOPHOSPHORUS PESTICIDES (EPA 8140 EPA 608/8080)	FUEL OXYGENATES (EPA 8260)	Pb (TOTAL or DISSOLVED) (EPA 6010)	TPH-G/BTEX/5 OXY'S (EPA 8260)	TPH-G/BTEX/7 OXY'S/ HVOCS (EPA 8260)			COMPOSITE
MW-5	8/24/01	950	water	5	X																	61

RELINQUISHED BY: (signature) 9:20 (time)

E Padilla (printed name) 8/24/01 (date)

Company- ASE

RECEIVED BY: (signature) (time)

(printed name) (date)

Company-

RELINQUISHED BY: (signature) (time)

(printed name) (date)

Company-

RECEIVED BY LABORATORY: Hank Burns 0910 (signature) (time)

Harold Burns 08/31/01 (printed name) (date)

Company- KAI FF

COMMENTS:

TURN AROUND TIME

STANDARD 24Hr 48Hr 72Hr

OTHER:

APPENDIX E

Well Sampling Field Log

aqua science engineers inc.

WELL SAMPLING FIELD LOG

Project Name and Address: Chan Project
Job #: _____ Date of sampling: 8/29/01
Well Name: MW-5 Sampled by: FP
Total depth of well (feet): 30.1 Well diameter (inches): 2"
Depth to water before sampling (feet): 17.42
Thickness of floating product if any: —
Depth of well casing in water (feet): 11.19
Number of gallons per well casing volume (gallons): 1.79
Number of well casing volumes to be removed: 4
Req'd volume of groundwater to be purged before sampling (gallons): 7.16
Equipment used to purge the well: bailer
Time Evacuation Began: 920 Time Evacuation Finished: 940
Approximate volume of groundwater purged: 8
Did the well go dry?: no After how many gallons: —
Time samples were collected: 950
Depth to water at time of sampling: ~
Percent recovery at time of sampling: ~
Samples collected with: bailer
Sample color: clear/brown Odor: moderate petroleum odor
Description of sediment in sample: silt

CHEMICAL DATA

Volume Purged	Temp	pH	Conductivity
1	67.1	6.38	1110
2	66.8	6.2	1128
3	66.4	6.20	1093
4	66.1	6.11	1011

SAMPLES COLLECTED

Sample	# of containers	Volume & type container	Pres	Iced?	Analysis
MW-5	5	40ml VOA	X	X	

APPENDIX F

Survey Report

Mid Coast Engineers
Civil Engineers and Land Surveyors
70 Penny Lane, Suite A - Watsonville, CA 95076
phone: (831) 724-2580
fax: (831) 724-8025
e-mail: lv@mce1.com

Richard A. Wadsworth
Civil Engineer
Stanley O. Nielsen
Land Surveyor
Lee D. Vaage
Land Surveyor
Jeff S. Nielsen
Land Surveyor

December 3, 2001

Robert Kitay
Aqua Science Engineers, Inc.
208 W. El Pintado Road
Danville, CA 94526

Re: **726 HARRISON STREET, OAKLAND, CALIFORNIA;** MCE Job No. 01238

Dear Mr. Kitay,

As you requested, on November 29, we surveyed nine monitoring wells located at the referenced site. Our findings are as follows:

Designation	Latitude	Longitude	Elevation
MW-1 TOC	37.798450741°N	121.270127029°W	28.98
MW-1TOB	37.798451589°N	121.270127327°W	29.43
MW-2 TOC	37.798326199°N	121.270050020°W	29.44
MW-2 TOB	37.798326806°N	121.270050448°W	29.70
MW-3 TOC	37.798415876°N	121.270229618°W	28.64
MW-3 TOB	37.798416458°N	121.270230559°W	28.85
MW-4 TOC	37.798566168°N	121.270133955°W	29.56
MW-4 TOB	37.798566800°N	121.270134195°W	29.79
MW-5 TOC	37.798384231°N	121.270155967°W	29.06
MW-5 TOB	37.798385097°N	121.270156378°W	29.39
AS-1 TOC	37. 798435449°N	121.270128119°W	29.02
AS-1 TOB	37.798437208°N	121.270129154°W	29.39
EW-1 TOC	37.798452303°N	121.270144416°W	28.89
EW-1 TOB	37.798452787°N	121.270144795°W	29.38
VE-1 TOC	37.798454691°N	121.270089095°W	29.29
VE-1 TOB	37.798455864°N	121.270089518°W	29.64
VE-2 TOC	37.798491023°N	121.270058885°W	29.52
VE-2 TOB	37.798492173°N	121.270059010°W	29.75

A notch was cut in the north rim of the PVC casing (TOC) and a cross chiseled in the north rim of the box (TOB).

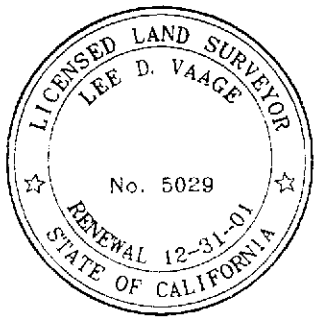
Measurements were obtained from conventional survey techniques in combination with GPS techniques (Code CGPS), using control points H016 and H031 as shown on the map entitled "Record of Survey No. 990, "Monumentation System for the Port of Oakland", filed in Book 18 of Surveys at Pages 50-60, Alameda County Records. Latitude and Longitude as shown were determined from the California Coordinate System, Zone 3, NAD 83 Datum. The accuracy range of the reported information is +/- 5mm. GPS equipment is the Trimble 5700 system (Code T57).

The benchmark is City of Oakland BM 25A, a brass pin in monument box in the sidewalk at the northeast corner of the intersection of 7th Street and Harrison. Elevation =25.812, City of Oakland Datum.

Please let me know if you have questions or need additional information.

Yours truly,

Lee D. Vaage



CC-COGO output, date: 12-03-2001, time: 2:25:27 PM, FILE: 01238.CCC

726 HARRISON ST., OAKLAND - AQUA SCIENCE ENGINEERS

Wells surveyed 11-29-01

7	N2118032.601,	E6050254.046	28.975	MW-1TOC
8	N2118032.911,	E6050253.965	29.432	MW-1TOB
15	N2117986.839,	E6050275.434	29.440	MW-2TOC
16	N2117987.063,	E6050275.315	29.696	MW-2TOB
3	N2118020.469,	E6050224.170	28.636	MW-3TOC
4	N2118020.686,	E6050223.902	28.846	MW-3TOB
20	N2118074.661,	E6050252.840	29.555	MW-4TOC
21	N2118074.892,	E6050252.775	29.792	MW-4TOB
13	N2118008.545,	E6050245.228	29.064	MW-5TOC
14	N2118008.863,	E6050245.115	29.386	MW-5TOB
9	N2118027.040,	E6050253.625	29.024	AS-1TOC
10	N2118027.686,	E6050253.338	29.391	AS-1TOB
11	N2118033.265,	E6050249.034	28.893	EW-1TOC
12	N2118033.443,	E6050248.927	29.381	EW-1TOB
5	N2118033.831,	E6050265.031	29.294	VE-1TOC
6	N2118034.261,	E6050264.917	29.636	VE-1TOB
18	N2118046.893,	E6050274.008	29.522	VE-2TOC
19	N2118047.313,	E6050273.980	29.748	VE-2TOB
2	N2117926.206,	E6050157.375	25.812	BM25A

APPENDIX G

Pump Tests Report
From
H_2OGEOL

H2OGEOL

A GROUND WATER CONSULTANCY

STEP DRAWDOWN TEST AND CONSTANT RATE TEST OF WELL EW-1, SEPTEMBER 15-16, 2001 AND WELL EW-1 CAPTURE ZONE ANALYSIS 726 HARRISON STREET OAKLAND, CALIFORNIA

PREPARED FOR
AQUASCIENCE ENGINEERS, INC.
208 W. EL PINTADO STREET
DANVILLE, CALIFORNIA 94526

DECEMBER 07, 2001

H2OGEOL A GROUND WATER CONSULTANCY

P.O. Box 2165 ■ Livermore, California 94551-2165 ■ (925) 373-9211

H2OGEOL
A GROUND WATER CONSULTANCY

P. O. Box 2165 ■ Livermore, California 94551-2165 ■ (925) 373-9211

STEP DRAWDOWN TEST AND CONSTANT RATE TEST OF WELL EW-1, SEPTEMBER 15-16, 2001 AND WELL EW-1 CAPTURE ZONE ANALYSIS 726 HARRISON STREET OAKLAND, CALIFORNIA

1.0 INTRODUCTION

This report presents flow rate and water level data collected during a step drawdown test and a 640-minute constant rate pump test of extraction well EW-1 associated with the remediation project at 726 Harrison Street in the City of Oakland, California. These tests were authorized by Aquascience Engineers, Inc. on August 20, 2001.

A step drawdown test was conducted in extraction well EW-1 on August 23, 2001. The data from the step drawdown test was analyzed and an optimum nominal long term constant rate test pumping rate of 0.65± gallons per minute (GPM) was selected. During the constant rate pump test water levels were periodically recorded in the pumping well and in five observation wells. The discharge rate from well EW-1 was also periodically recorded from a flow meter.

Water pumped from EW-1 during the step drawdown test was temporarily stored in 55 gallon polydrums. During the constant rate pump test 426 gallons was pumped and also temporarily stored in 55 gallon drums

The following table lists the observation wells, the top of PVC casing elevations, and the distances from the pumping well.

Well	Reference Elevation	Distance to well MW-4
EW-1	28.89	Not Applicable
MW-1	28.98	5.06
MW-5	29.06	25.01
MW-3	28.64	27.46
MW-4	29.56	41.57
MW-2	29.44	53.41

Notes: From survey by Mid Coast Engineers, November 29, 2001.

1.1 Pump Test Equipment

The constant rate pump test was performed using a Grundfos Pumps Corporation 5E3 submersible electric pump. This is a 4-inch, five stage pump capable of up to 7 gallons per minute (GPM), depending on the total dynamic head conditions. This pump was powered by a ½-HP, 115-volt, single phase Franklin submersible electric motor. The pump/motor combination was fitted with a bottom entry cooling shroud. The pumping well was 28.49 feet in depth below the top of the 6-inch PVC casing, being 28.97 feet below the top of the rim of the protective cover. The total available drawdown in the well, the distance from the static water level to the top of the pump, was approximately 9.8 feet.

Pump discharge during the constant rate test was controlled using a nominal 0.75 GPM flexible membrane orifice flow control valve (Dole™ Flow Regulator). Constancy of flow through these devices is within a few percent at specific differential dynamic head configurations. Similar flow control valves were used for the step drawdown test as discussed below in Section 2. The flow rate was measured using an Omega Engineering, Inc. Totalizing flow meter.

Water levels in five observation wells and in the pumping well were measured manually and using submersible pressure transducers. The water level in the pumping well (EW-1) was measured with a 15-PSI transducer and observation wells MW-5 and MW-2 were monitored with 10-PSI transducers connected to the same data logger. Observation wells MW-1 and MW-3 were monitored using 10-PSI transducers and monitoring well MW-4 was monitored with a 15-PSI transducer connected to the same data logger

2.0 STEP DRAWDOWN TEST

A three step, step drawdown test was performed on August 23, 2001. The three steps were conducted at mean flow rates as maintained by DOLE™ Flow Regulators of the indicated nominal flow rates. The following table lists the nominal flow rate, the mean flow rate, the end of step drawdown, and the duration for each step of the step drawdown test. Where the sum of two nominal flow rates are indicated, two DOLE valves were in use.

Step	Nominal Flow Rate (GPM)	Mean Flow Rate (GPM)	Drawdown (Ft.)	Step Duration (minutes)
1	0.5	0.415	3.57	30
2	0.75	0.915	7.80	35
3	1.0	1.202	11.30[A]	20

Note A: Projected to equivalent time from test data.

The interpretation of the step drawdown test is provided in Figure 1. This graph is a double logarithmic plot showing the water level drawdown versus the discharge rate. The step drawdown test data points are represented by the three filled circles.

Drawdown in a pumped well is made of two components: aquifer loss (drawdown caused by resistance to laminar flow in the aquifer) and well loss. Well loss is the drawdown required to overcome the resistance to turbulent flow in the vicinity of the well, through the screen and filterpack, and within the well if the pump is tightly fit. Anisotropic aquifer stratification can also affect this relationship. The total drawdown is represented by the following equation:

$$D = BQ + CQ^P$$

where: D = drawdown in the pumped well in Ft.,

Q = flow or discharge rate in GPM,

BQ = aquifer loss,

CQ^P = well loss,

and B, C, and P are coefficients.

Using the data from the step drawdown test:

$$P = 72.114;$$

$$B = 8.5379;$$

$$\text{and} \quad C = 2.139 \times 10^{-6}$$

The curve defined by this equation for the step drawdown test data is shown on Figure 1 as the line passing through the step drawdown test data (solid circles). Dewatering effects are not considered in this interpretation.

A nominal flow rate of 0.5 GPM was selected for the constant rate test.

3.0 CONSTANT RATE TEST DATA

Antecedent (static) water level data was measured prior to the test on September 15, 2001. The drawdown, or discharge, portion of the constant rate pump test began at 13:45 hours on September 15, 2001. The pump was turned off 10-hours, 57-minutes (657 minutes) later at 00:42 hours on September 16, 2001.

DEPTH TO WATER MEASUREMENTS

Well	Before Test		At End of Test		Casing
Date/Time	Time	Depth to Water	Time	Depth to Water	Elevation
EW-1	13:08	17.28	00:01	22.19	28.89
MW-1	13:07	17.32	00:00	17.84	28.98
MW-5	13:09	17.68	00:07	17.85	29.44
MW-3	13:10	17.27	00:05	17.47	28.64
MW-4	13:06	17.71	00:04	17.85	29.56
MW-2	13:12	17.92	00:07	17.85	29.06

Potentiometric surface maps for these data are presented in Figure 2 (Pre-Test) and in Figure 3 (Near End of Test).

3.1 Flow Rate

During the constant rate test the flow rate was controlled by the methods discussed in Section 1.1. The average flow rate during the 657 minutes of the test was 0.6487 GPM.

3.2 Drawdown Data

Water level monitoring was conducted between about 11:37 on September 15, 2001 and 00:19 on September 16, 2001. The pumping well, EW-1, and five observation wells (MW-1, MW-5, MW-3, MW-4, and MW-2) experienced drawdown in response to the test. All of the listed observation wells experienced an interpretable response.

Semilogarithmic (semi-log) and double logarithmic (log-log) graphs of drawdown versus elapsed time since the pump was started are presented in Figure A1 through A6 in Attachment A for the extraction well (Figure A1) and the observation wells (Figure A2. MW-1; Figure A3, MW-5; Figure A4, MW-3; Figure A5, MW-4, and Figure A6, MW-2). The drawdown data collected during the constant rate pump test and corresponding elapsed time is included as Tables A1 through A3.

4.0 CONSTANT RATE TEST INTERPRETATION

4.1 Saturated Thickness

The first encountered water bearing formation beneath 726 Harrison Street exists in an unconfined condition. The aquifer thickness is assumed to 10.75 feet, the average distance from the static water level to the bottom of each well. This aquifer thickness is assumed to apply at all five observation wells from which interpretable data was obtained. The apparent thickness of the saturated materials varies from day to day, depending on the depth to the top of the saturated materials.

4.2 Water Bearing Formation Characteristics

The log-log drawdown graphs presented in Attachment A in Figure A1 to A6 are presented so that the data can be rapidly compared to available type curves. Pump test analysis theory is not strictly applicable at the pumped well and therefore will not be applied to the pumping well data (Figure A1). The hydrologic characteristics of the responding observation wells (Figure A2, MW-1; Figure A3, MW-5; Figure A4, MW-3; Figure A5, MW-4; and Figure A6, MW-2) are interpreted in this section.

Type curves contained in Kruseman, de Ridder, and Verweij (1990), Lohman (1972) and standard text references were examined to select appropriate type curves for determination of transmissivity and storage coefficient.

The type curves selected for analysis of the early time data available from this constant rate test were those for anisotropic unconfined aquifers experiencing an elastic response. Late time data is not available, as this would have required continuing the constant rate test for an additional four to five days. In addition, the response in the observation wells is obscured by other drainage phenomena, boundary condition effects, or minor variation in discharge rate (power fluctuations and unidentifiable causes). Partial penetration effects were not considered in this analysis. Actual type curve matching was performed using the software Graphical Well Analysis Package (GWAP, version 2.36) developed by Groundwater Graphics, Inc. of Oceanside, California.

The transmissivities calculated using the GWAP type curves matched to the suitable drawdown data are presented in Attachment B. These aquifer hydraulic properties follow:

Well	Attachment B Figure	Analysis Method	Transmissivity (GPD*)/Ft.	Storage Coefficient (dimensionless)	Hydraulic Conductivity Ft/Day
MW-1	B1	Unconf. Elas., β =0.004	449	0.071	5.59
MW-5	B2	Unconf. Elas., β =0.004	855	0.016	9.72
MW-3	B3	Unconf. Elas., β =0.004	780	0.014	10.66
MW-4	B4	Unconf. Elas., β =0.03	780	0.025	9.72
MW-2	B5	Unconf. Elas., β =0.03	449	0.015	5.59

* GPD = gallons per day

The simple average hydraulic conductivity for the five observation wells monitored is 8.26 Ft/Day, and the simple average storage coefficient is 0.028. These values are only applicable for the conditions present during the test.

The hydraulic properties reported above allow an analysis of the apparent aquifer horizontal anisotropy. The anisotropy analysis is presented in Figure 4. The major hydraulic conductivity is about 20.2 Ft/Day oriented approximately S 34°W. The corresponding minor hydraulic conductivity is about 5.06 Ft/Day oriented at a right angle.

5.0 CAPTURE ZONE ANALYSIS OF EXTRACTION WELL EW-1

A capture zone is defined as the area of an aquifer in which all of the groundwater will be removed by a pumping well (or wells) at a specific pumping rate over a certain period of time.

5.1 CAPTURE ZONE METHODOLOGY

The capture zone analyses for extraction well EW-1 was conducted using equations outlined in Javandel and Tsang, 1986 for confined aquifers. Work by Grubb, 1993 lists equations for both confined and unconfined aquifers. However, the method of Grubb, 1993 incorporates data from wells upgradient and downgradient from an extraction well in order to ascertain discharge potentials across the field of the extraction well. Furthermore, Grubb (1993) shows that the confined aquifer analysis method overestimates the capture zone for an unconfined aquifer. Therefore, the capture zones for the wells reported herein are overestimated, relative to the unconfined aquifer method of Grubb (1993). Both of these techniques assume the achievement of steady state conditions (long continuous pumping) and that the aquifer is homogeneous, isotropic, and infinite in horizontal extent, a situation that is never attained.

As indicated above, the equations outlined in Javandel and Tsang (1986) are utilized. These equations are discussed below and are used to determine the distance between dividing stream lines at the extraction wells (i.e., the cross-gradient edge of the capture zone) and far upstream from the extraction wells (the upgradient extension of the capture zone), and the distance from the extraction wells to the stagnation points (downgradient end of the capture zone).

According to Javandel and Tsang (1986), the distance between dividing stream lines at the extraction well is represented by the equation:

$$\frac{Q}{2BU.}$$

Where Q is equal to the pumping rate in cubic feet per day, B is equal to the aquifer thickness in feet, and U is equal to the groundwater flow velocity in feet per day. Groundwater flow velocity is equal to the hydraulic conductivity multiplied by the potentiometric surface gradient and then divided by the porosity.

The distance between dividing stream lines far upstream from the extraction well is represented by the equation:

$$\frac{Q}{BU.}$$

The equation for the distance from the extraction well to the zone of stagnation (downgradient extent of capture) is represented by the equation:

$$\frac{Q}{2\,\pi BU.}$$

Where π is PI which is equal to approximately 3.14159.

Aspects of the development and/or use of the above referenced equations is also presented in Keely (1984), Keely and Tsang (1983), and McElwee (1991), as well as Javandel and Tsang (1986) and Grubb (1993).

5.2 CAPTURE ZONE PARAMETERS FOR WELL EW-1

The sustainable pumping rate from well EW-1 is assumed to be 0.5 gallons per minute, resulting in a Q in the above equations of 96.25 Ft^3/day. Lower pumping rates would result in proportionally narrower capture zones, higher wider.

The aquifer thickness, parameter B, will be assumed to be equivalent to the saturated screened interval in the average well, 10.75 feet. The thickness will vary with the seasonal fluctuations in water level and with dewatering effects.

The groundwater flow velocity, parameter U, is equal to the hydraulic conductivity multiplied by the potentiometric surface gradient and then divided by the porosity.

The hydraulic conductivity is derived from Figure 4 in the direction of the potentiometric surface gradient. The potentiometric surface gradient direction used is that form before the test on September 15, 2001: S 48.8°W. Within the limits of the test methodology this is approximately equivalent to the calculated direction of major hydraulic conductivity (S 34.3°W). The major hydraulic conductivity is 20.2 Ft/Day. The average potentiometric surface gradient for September 15, 2001 was 0.00997. For comparison the capture zone is presented for assumed porosities of 0.03 and 0.15.

5.3 CAPTURE ZONES FOR EXTRACTION WELL EW-1

Calculations made using the above parameters for each of the extraction well EW-1 are presented below for September 15, 2001.

EXTRACTION WELL	Q	B	U	$\frac{Q}{2BU}$	$\frac{Q}{BU}$	$\frac{Q}{2\pi BU}$
	Cu Ft/Day	Ft.	Ft./Day	Ft.	Ft.	Ft.
EW-1 porosity 3%	96.25	10.75	6.71	0.67	0.33	0.21
EW-1 porosity 15%	96.25	10.75	1.34	3.33	1.67	1.06

For the case of porosity of 15 percent the several distances are plotted as the capture zone on Figure 5 for September 15, 2001. For the case of porosity of 3 percent the capture zone would plot as a single line.

6.0 REFERENCES

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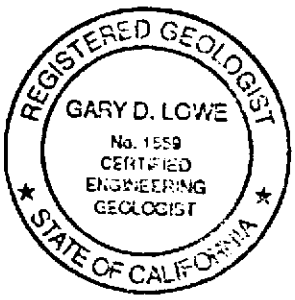
REPORT CERTIFICATION

STEP DRAWDOWN TEST AND CONSTANT RATE TEST OF WELL EW-1, SEPTEMBER 15-16, 2001 AND WELL EW-1 CAPTURE ZONE ANALYSIS 726 HARRISON STREET OAKLAND, CALIFORNIA

This report concerning a three step step drawdown test, a 640-minute 'constant' rate pump test, and a capture zone analysis of extraction well EW-1 associated with the remediation project at 726 Harrison Street in the City of Oakland, California, has been prepared by H_2OGEOL A GroundWater Consultancy, by and under the professional supervision of the sole proprietor. The findings, recommendations, specifications, or professional opinions are presented after being investigated and prepared in accordance with generally accepted professional environmental hydrogeologic practice. There is no other warranty, either expressed or implied. This report incorporates information, assumptions, and interpretations prepared by others.

December 07, 2001



This report was prepared by:

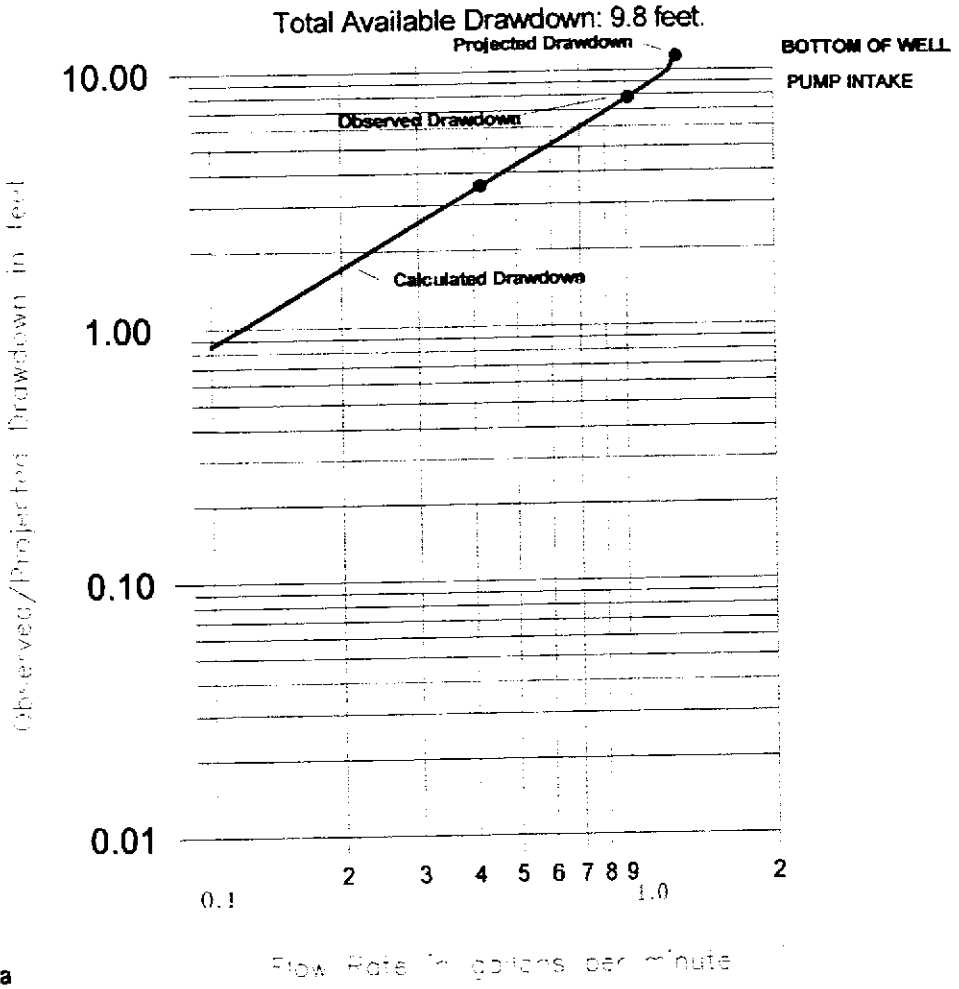
Gary D. Lowe, R.G.,C.E.G., C.HG.
Principal, Hydrogeologist
H_2OGEOL A GroundWater Consultancy

Six-inch Extraction Well EW-1 at 726 Harrison Street, Oakland, Alameda County, California. Variable rate performance test performed August 23, 2001 between 06:00 and 12:00 hours. Depth to static water was 17.19 feet below casing top at 06:15 hours on 08/23/01 (17.66 feet below ground surface).

The graph below shows controlled nominal flow rates and observed drawdowns at transient condition times during the test. Projections based on the polynomial $D = BQ + CQ^P$.

D = Drawdown, feet
Q = Flow Rate, GPM
B,C,P are coefficients

For observed data:
B = 8.5379
C = 2.139E-6
P = 72.114



This test represents aquifer-well system conditions at the time it was conducted and those imposed by the equipment employed. Yield is a function of aquifer characteristics near the well, including storage features, both in the well and in the aquifer (e.g., dewatering), and the well design. Performance over time is a function of pumping-plant operation features and history, screen and filter pack condition, and groundwater/aquifer matrix geochemistry and geochemical (and bioqeochemical) reactions to the change in conditions imposed by the well system. All of these factors change through time, therefore, performance will also vary over time.

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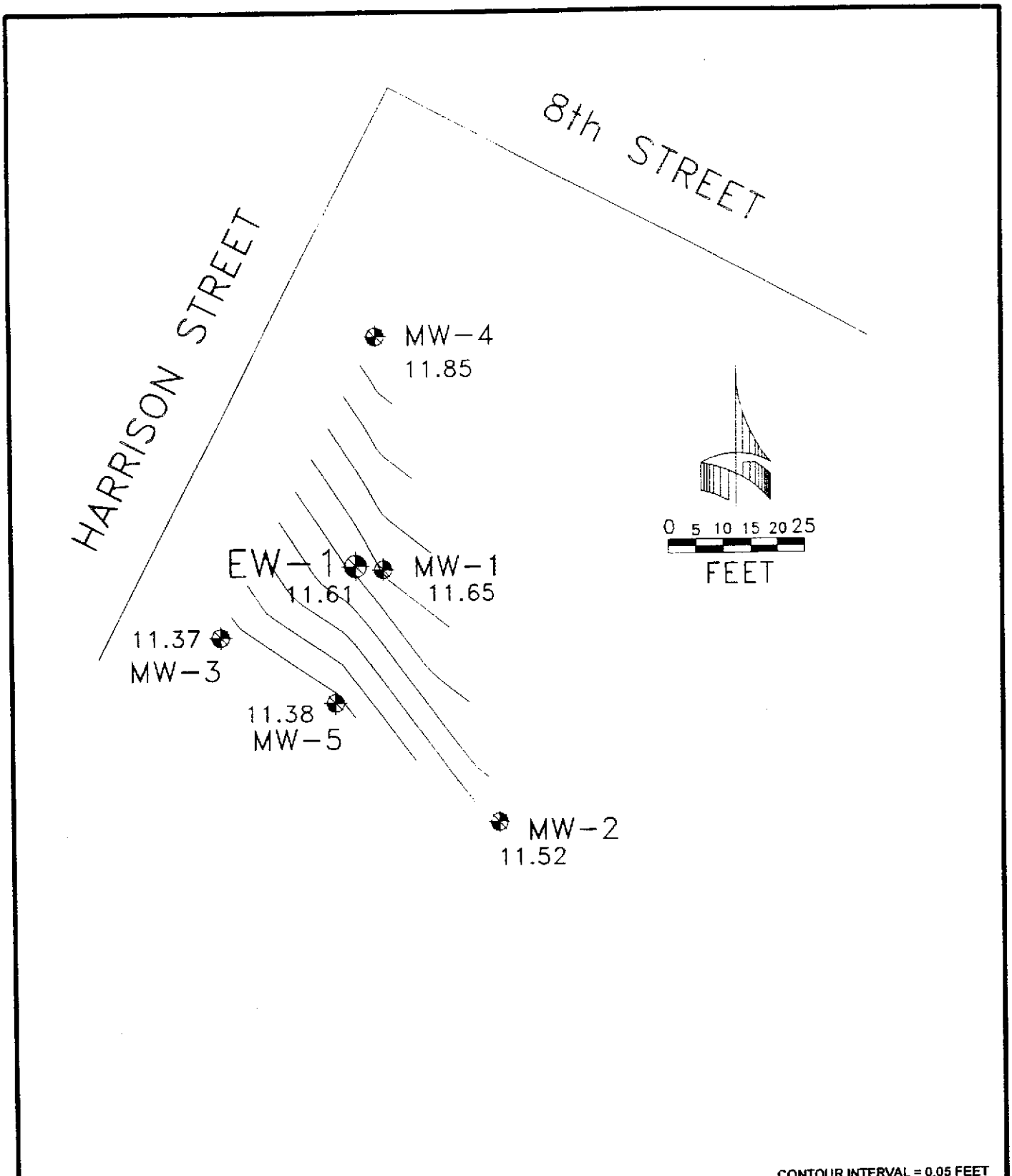
PUMPING WELL (EW-1)
STEP TEST OF AUGUST 23, 2001

726 HARRISON STREET, OAKLAND, CALIFORNIA

FIGURE 1



CONTOUR INTERVAL = 0.05 FEET

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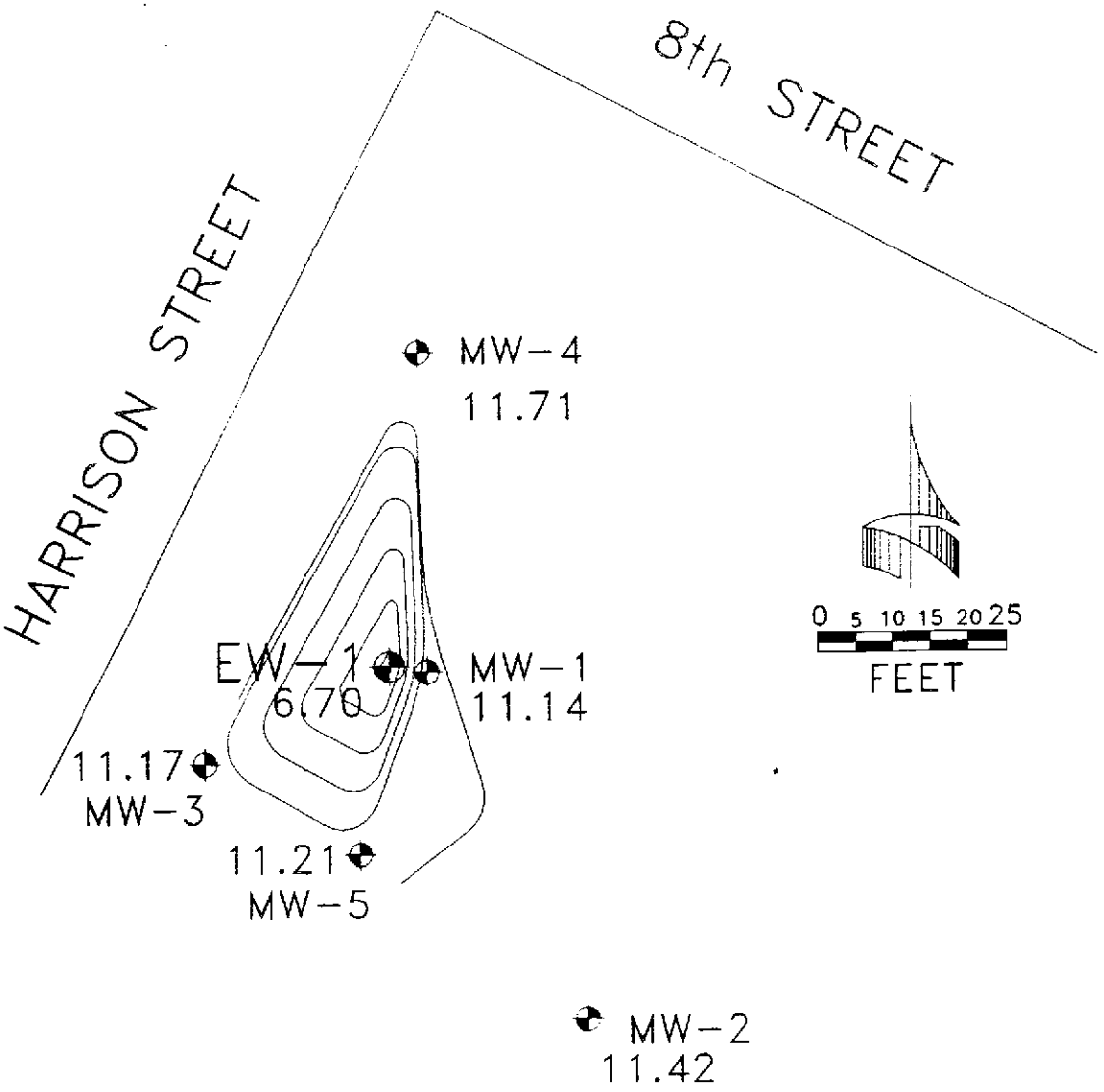
POTENTIOMETRIC SURFACE MAP PRIOR TO 640-MINUTE TEST OF WELL EW-1
SEPTEMBER 15-16, 2001
726 HARRISON STREET
OAKLAND, CALIFORNIA

FIGURE
2



CONTOUR INTERVAL = 0.05 FEET

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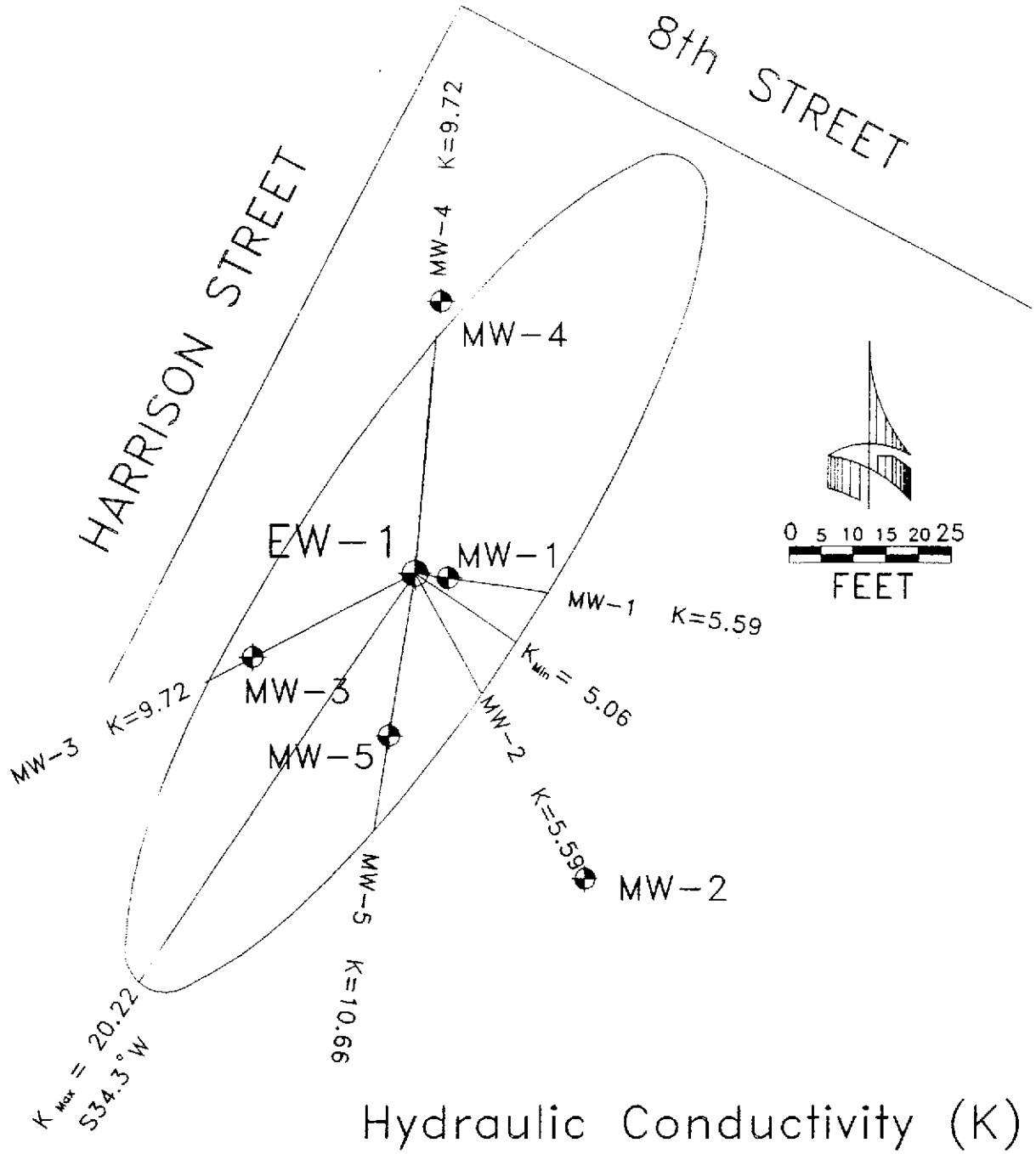
POTENTIOMETRIC SURFACE MAPNEAR END OF 640-MINUTE TEST OF WELL EW-1
SEPTEMBER 15-16, 2001
726 HARRISON STREET
OAKLAND, CALIFORNIA

FIGURE
3



Hydraulic Conductivity (K)
in Feet/Day

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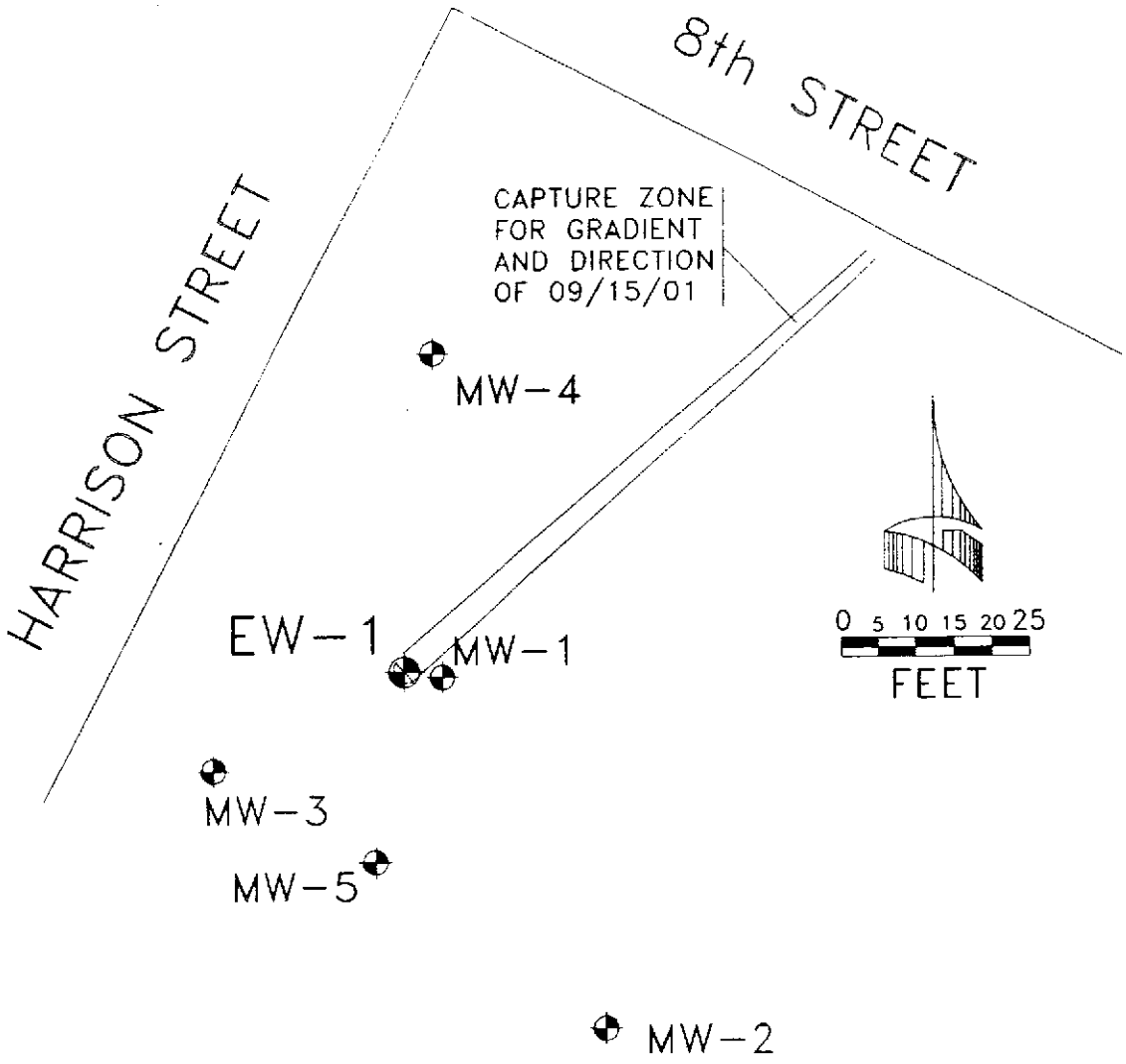
HYDRAULIC CONDUCTIVITY ANISOTROPY ELLIPSE
640-MINUTE TEST OF WELL EW-1
SEPTEMBER 15-16, 2001
726 HARRISON STREET
OAKLAND, CALIFORNIA

FIGURE
4



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EQUILIBRIUM CAPTURE ZONE FOR WELL EW-1
POTENTIOMETRIC SURFACE CONDITIONS OF 09/15/01

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FIGURE
5

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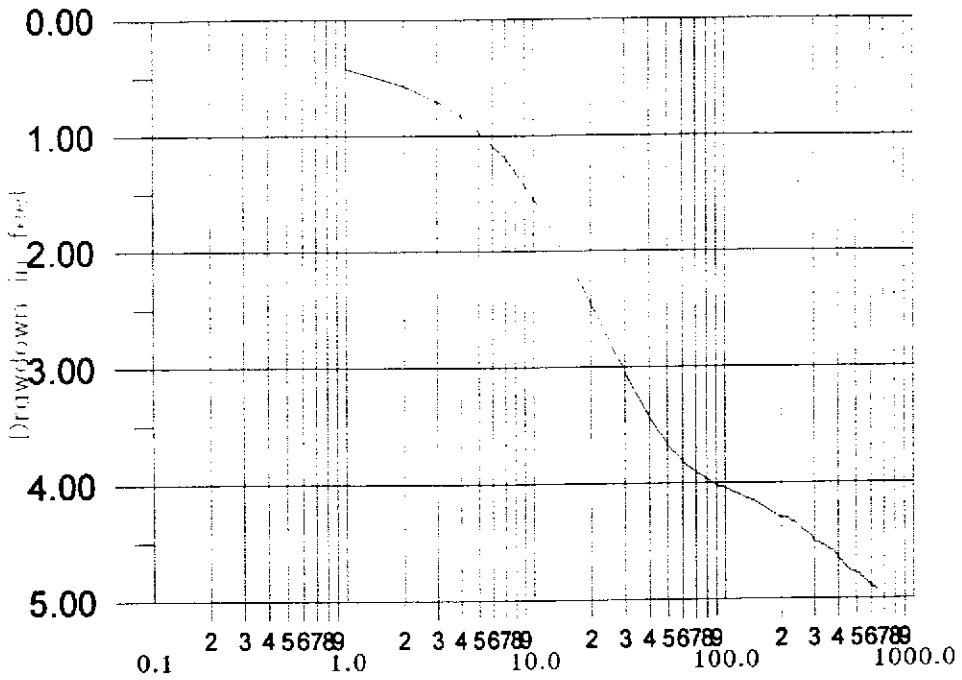
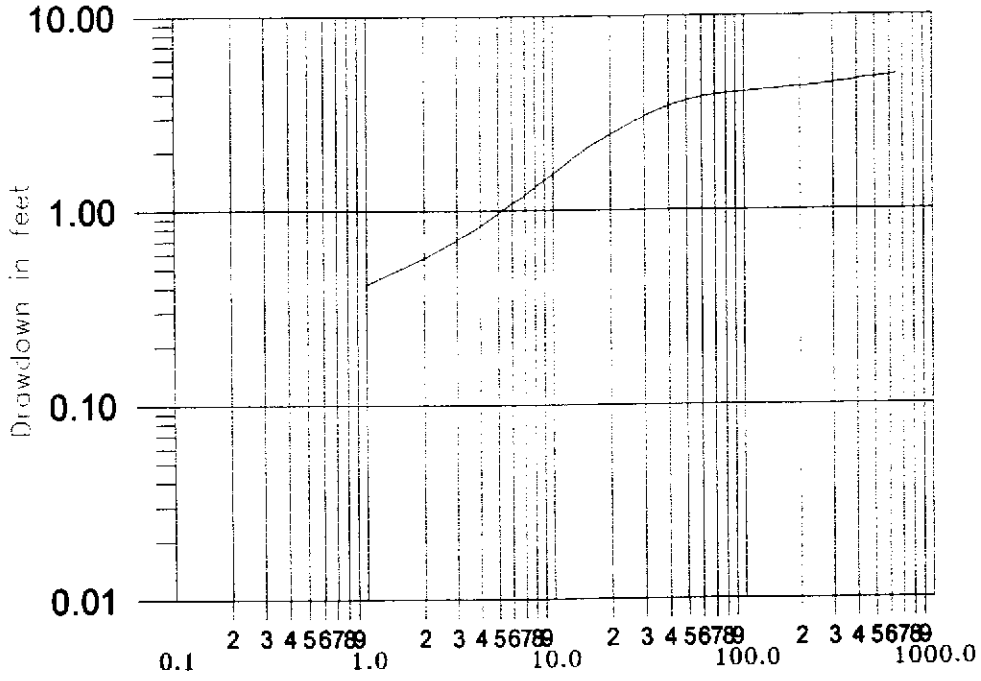
ATTACHMENT A

DRAWDOWN
PUMPING WELL EW-1
AND OBSERVATION WELLS
MW-1, MW-5, MW-3, MW-4, AND MW-2
DURING CONSTANT RATE TEST
SEPTEMBER 15-16, 2001

726 HARRISON STREET
OAKLAND, CALIFORNIA





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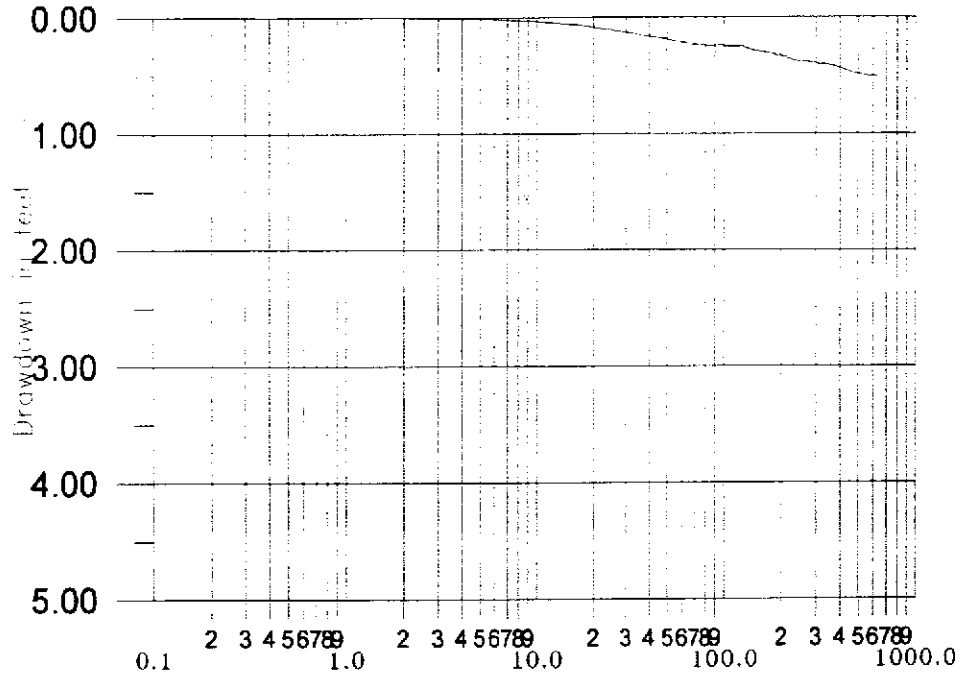
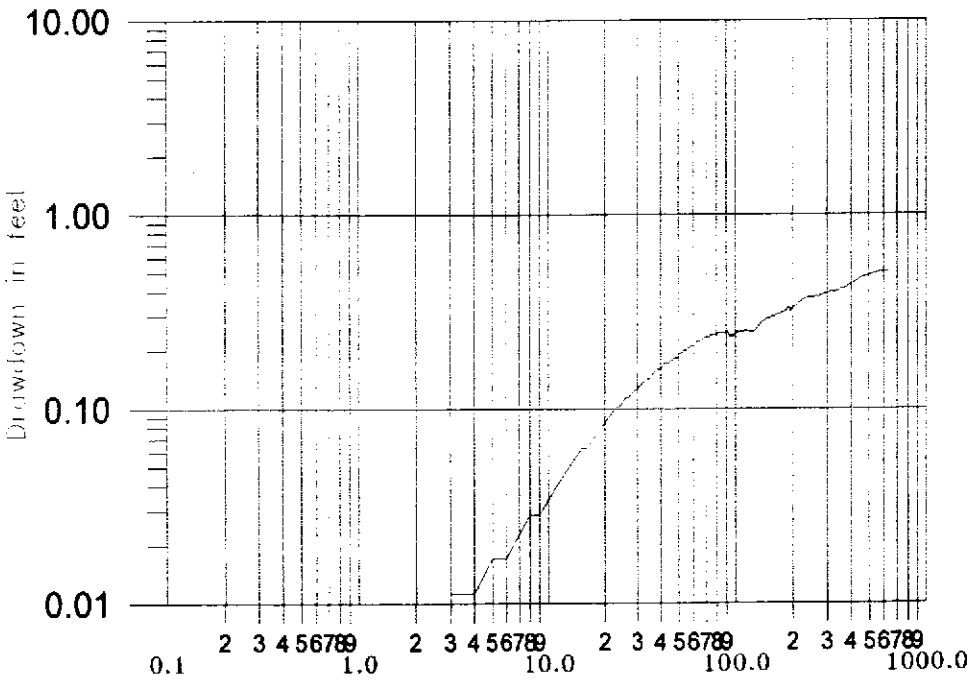
SEMILOGARITHMIC AND DOUBLE LOGARITHMIC GRAPHS OF DRAWDOWN vs. TIME
PUMPING WELL (EW-1), September 15-16. 2001.
726 HARRISON STREET
OAKLAND, CALIFORNIA

FIGURE
A1





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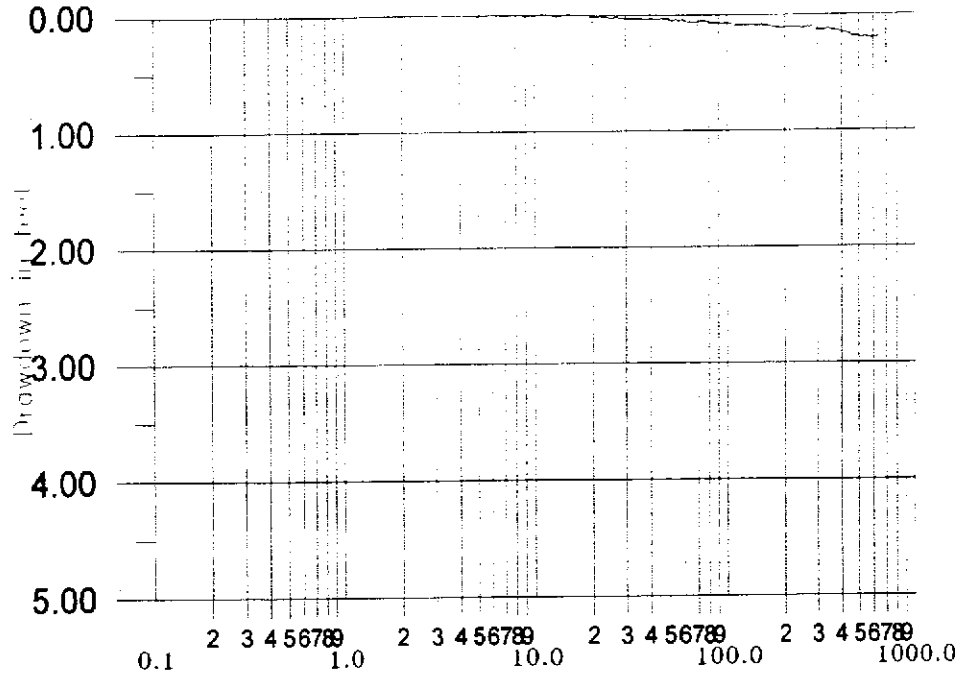
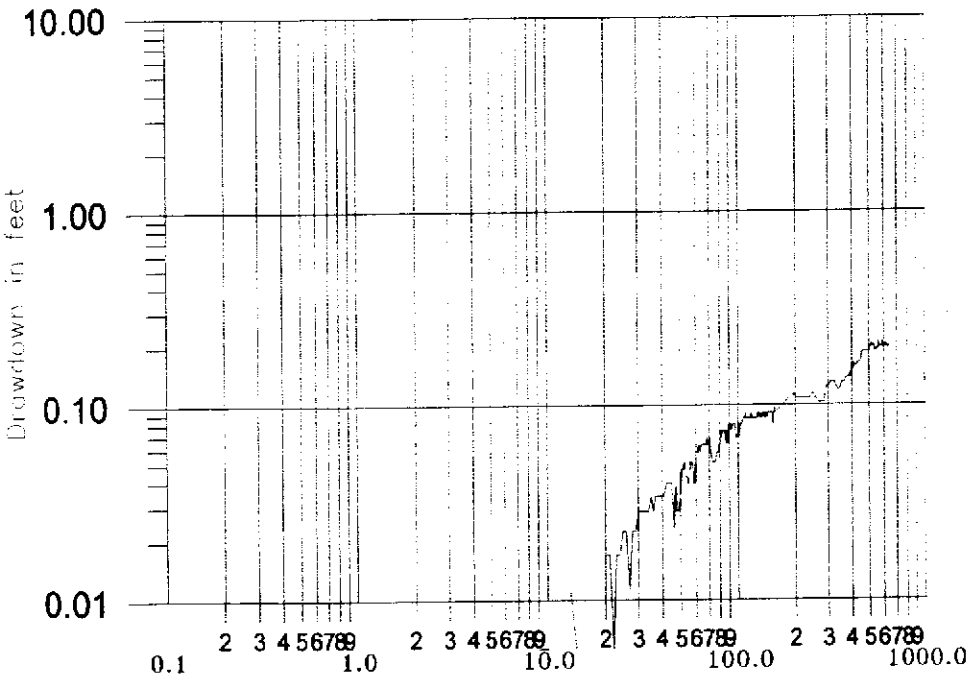
SEMILOGARITHMIC AND DOUBLE LOGARITHMIC GRAPHS OF DRAWDOWN vs. TIME
OBSERVATION WELL (MW-1), September 15-16. 2001.
726 HARRISON STREET
OAKLAND, CALIFORNIA

FIGURE
A2





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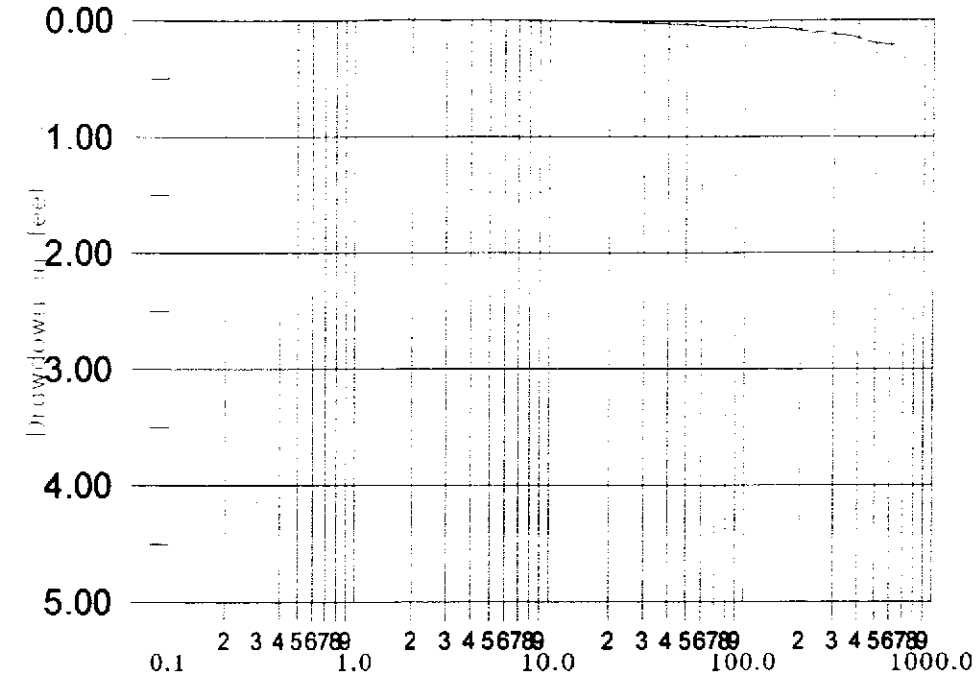
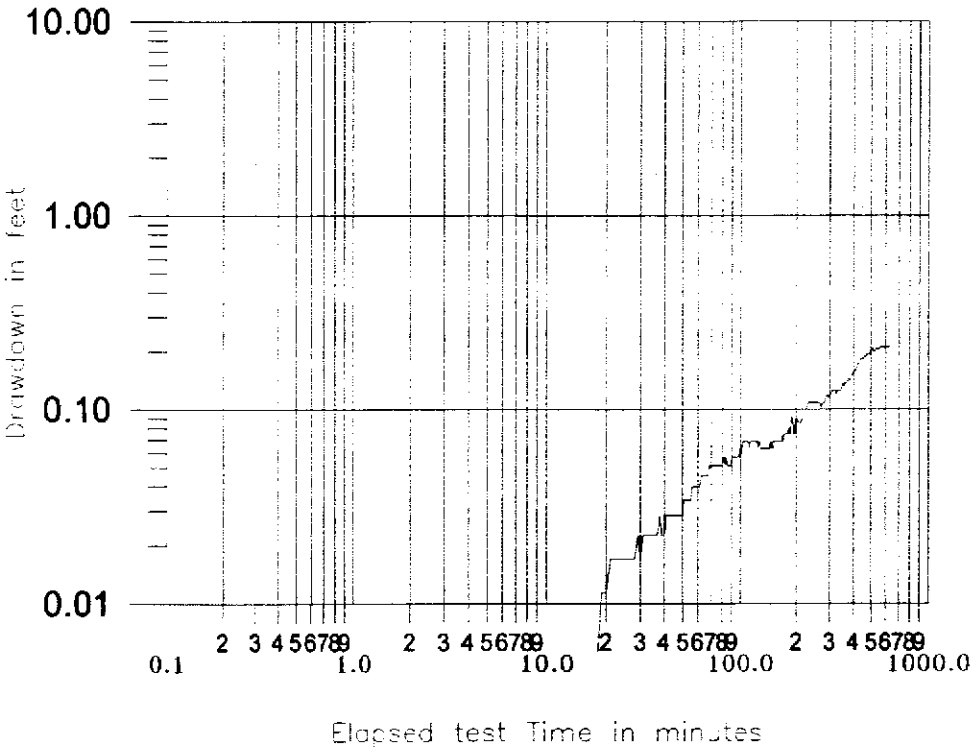
SEMILOGARITHMIC AND DOUBLE LOGARITHMIC GRAPHS OF DRAWDOWN vs. TIME
OBSERVATION WELL (MW-5), September 15-16. 2001.
726 HARRISON STREET
OAKLAND, CALIFORNIA

FIGURE
A3





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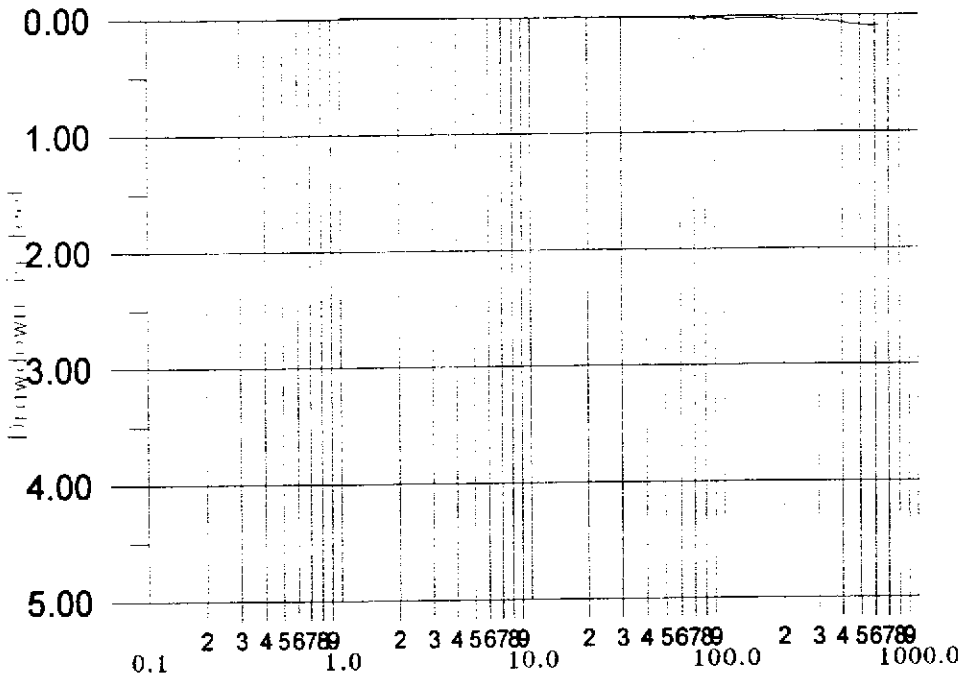
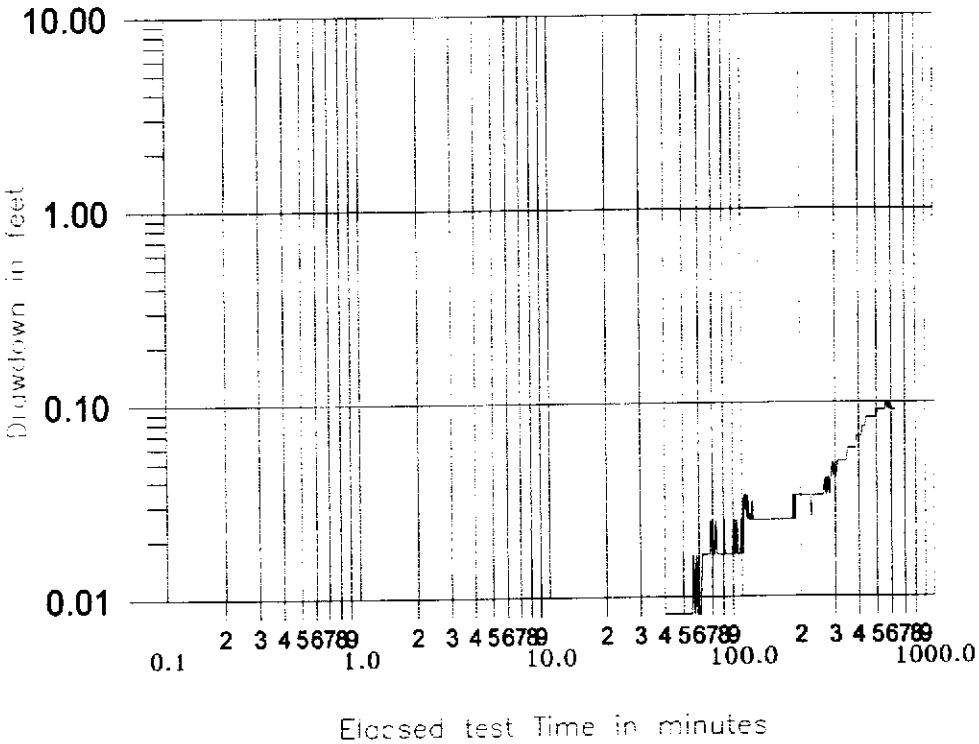
SEMILOGARITHMIC AND DOUBLE LOGARITHMIC GRAPHS OF DRAWDOWN vs. TIME
OBSERVATION WELL (MW-3), September 15-16. 2001.
726 HARRISON STREET
OAKLAND, CALIFORNIA

FIGURE
A4





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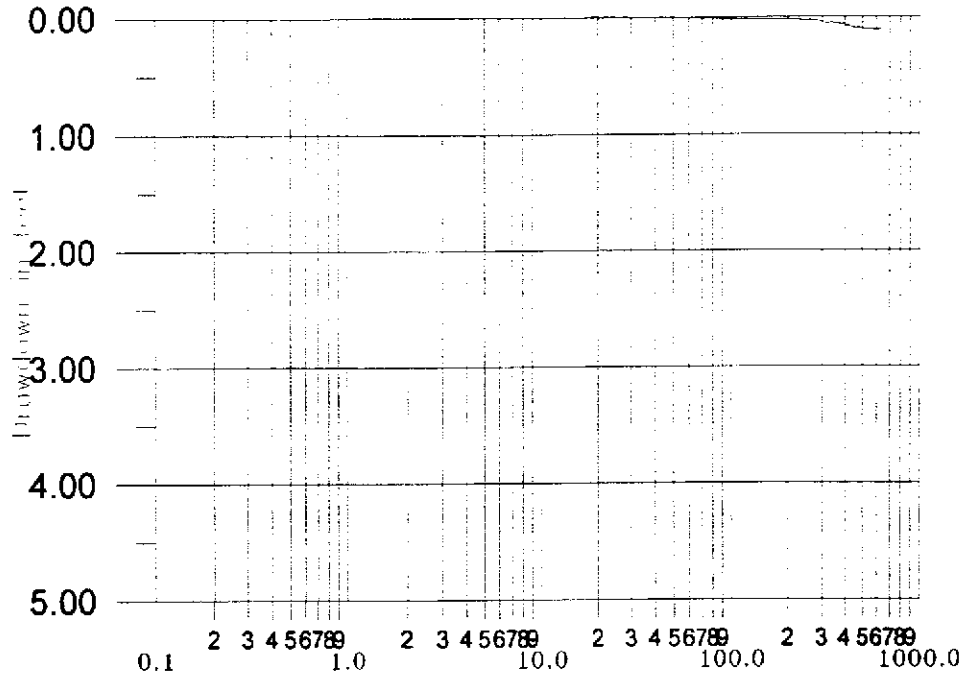
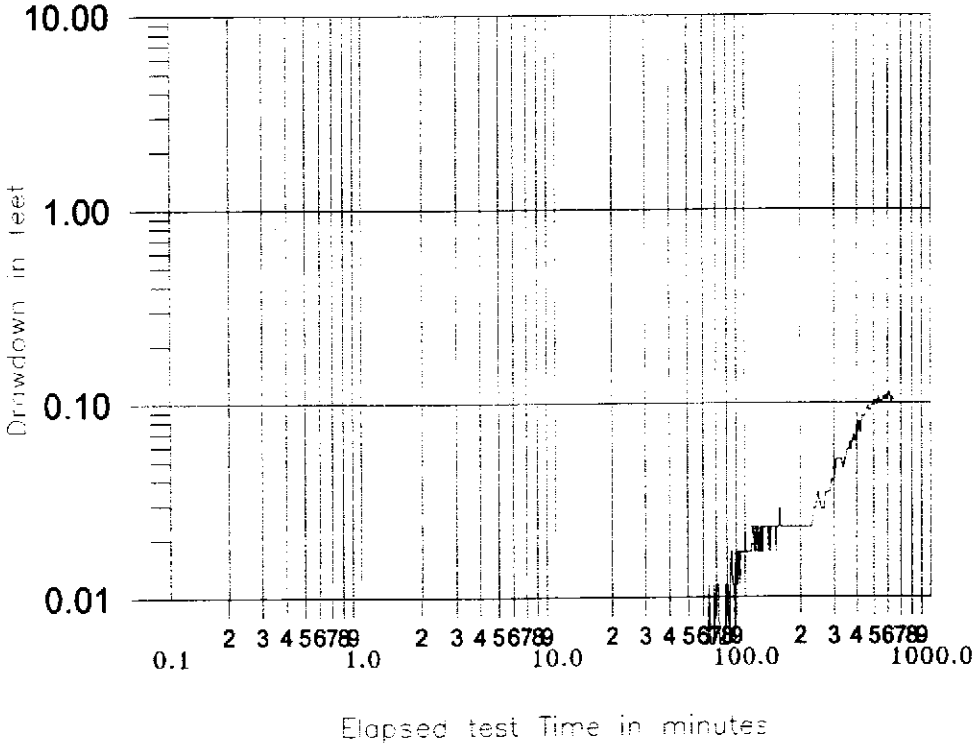
SEMILOGARITHMIC AND DOUBLE LOGARITHMIC GRAPHS OF DRAWDOWN vs. TIME OBSERVATION WELL (MW-4), September 15-16. 2001. 726 HARRISON STREET OAKLAND, CALIFORNIA

FIGURE A5





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SEMILOGARITHMIC AND DOUBLE LOGARITHMIC GRAPHS OF DRAWDOWN vs. TIME
OBSERVATION WELL (MW-2), September 15-16. 2001.
726 HARRISON STREET
OAKLAND, CALIFORNIA

FIGURE
A6

TABLE A1
DRAWDOWN IN
PUMPING WELL EW-1 AND OBSERVATION WELL MW-1
PUMP TEST OF SEPTEMBER 15-16, 2001
726 HARRISON STREET
OAKLAND, CALIFORNIA

EW-1 Elapsed Time (minutes)	EW-1 Drawdown (feet)	EW-1 Elapsed Time (minutes)	EW-1 Drawdown (feet)	MW-1 Elapsed Time (minutes)	MW-1 Drawdown (feet)	MW-1 Elapsed Time (minutes)	MW-1 Drawdown (feet)
1	0.42	280	4.44	1	0.00	280	0.38
2	0.57	300	4.50	2	0.00	300	0.39
3	0.71	340	4.54	3	0.01	340	0.40
4	0.83	360	4.57	4	0.01	360	0.42
5	0.97	400	4.65	5	0.02	400	0.43
6	1.09	440	4.72	6	0.02	440	0.46
7	1.20	480	4.76	7	0.02	480	0.48
8	1.31	500	4.78	8	0.03	500	0.48
9	1.43	540	4.82	9	0.03	540	0.49
10	1.54	600	4.89	10	0.03	600	0.51
12	1.77	620	4.90	12	0.05	620	0.51
15	2.07	625	4.91	15	0.06	625	0.51
20	2.46	630	4.91	20	0.09		
25	2.78	635	4.92	25	0.11		
30	3.03	640	4.92	30	0.13		
35	3.25			35	0.14		
40	3.43			40	0.16		
45	3.56			45	0.18		
50	3.66			50	0.19		
55	3.74			55	0.20		
60	3.82			60	0.21		
65	3.86			65	0.22		
70	3.90			70	0.23		
75	3.93			75	0.24		
80	3.96			80	0.24		
85	4.00			85	0.24		
90	4.01			90	0.25		
95	4.03			95	0.24		
100	4.05			100	0.25		
105	4.06			105	0.24		
110	4.07			110	0.24		
115	4.09			115	0.25		
120	4.10			120	0.25		
130	4.12			130	0.26		
140	4.15			140	0.28		
150	4.17			150	0.30		
200	4.30			200	0.34		
240	4.34			240	0.38		

TABLE A2
DRAWDOWN IN
OBSERVATION WELLS MW-5 and MW-3
PUMP TEST OF SEPTEMBER 15-16, 2001
726 HARRISON STREET
OAKLAND, CALIFORNIA

MW-5 Elapsed Time (minutes)	MW-5 Drawdown (feet)	MW-5 Elapsed Time (minutes)	MW-5 Drawdown (feet)	MW-3 Elapsed Time (minutes)	MW-3 Drawdown (feet)	MW-3 Elapsed Time (minutes)	MW-3 Drawdown (feet)
1	0.00	280	0.10	1	-0.01	280	0.11
2	0.00	300	0.13	2	-0.01	300	0.12
3	0.00	340	0.12	3	0.01	340	0.13
4	0.00	360	0.13	4	0.01	360	0.14
5	0.01	400	0.16	5	0.01	400	0.15
6	0.00	440	0.17	6	0.01	440	0.18
7	0.01	480	0.19	7	0.00	480	0.19
8	0.00	500	0.19	8	0.01	500	0.20
9	0.01	540	0.19	9	0.01	540	0.20
10	0.01	600	0.20	10	0.01	600	0.21
12	0.00	620	0.20	12	0.01	620	0.21
15	-0.01	625	0.19	15	0.01	625	0.21
20	0.02	630	0.20	20	0.01		
25	0.02	635	0.20	25	0.02		
30	0.03	640	0.20	30	0.02		
35	0.03			35	0.02		
40	0.03			40	0.02		
45	0.04			45	0.03		
50	0.03			50	0.03		
55	0.04			55	0.03		
60	0.06			60	0.04		
65	0.06			65	0.05		
70	0.06			70	0.05		
75	0.05			75	0.05		
80	0.06			80	0.05		
85	0.07			85	0.05		
90	0.08			90	0.06		
95	0.08			95	0.06		
100	0.08			100	0.06		
105	0.08			105	0.07		
110	0.09			110	0.07		
115	0.09			115	0.07		
120	0.09			120	0.07		
130	0.09			130	0.06		
140	0.09			140	0.06		
150	0.09			150	0.07		
200	0.11			200	0.09		
240	0.11			240	0.11		

TABLE A3
DRAWDOWN IN
OBSERVATION WELLS MW-4 and MW-2
PUMP TEST OF SEPTEMBER 15-16, 2001
726 HARRISON STREET
OAKLAND, CALIFORNIA

MW-4 Elapsed Time (minutes)	MW-4 Drawdown (feet)	MW-4 Elapsed Time (minutes)	MW-4 Drawdown (feet)	MW-2 Elapsed Time (minutes)	MW-2 Drawdown (feet)	MW-2 Elapsed Time (minutes)	MW-2 Drawdown (feet)
1	-0.01	280	0.03	1	-0.01	280	0.03
2	-0.01	300	0.04	2	0.00	300	0.04
3	0.00	340	0.05	3	-0.01	340	0.05
4	0.00	360	0.06	4	-0.01	360	0.06
5	0.00	400	0.07	5	0.00	400	0.07
6	0.00	440	0.08	6	0.00	440	0.09
7	0.00	480	0.08	7	0.00	480	0.09
8	0.00	500	0.08	8	-0.01	500	0.10
9	0.00	540	0.09	9	-0.01	540	0.10
10	0.00	600	0.09	10	-0.01	600	0.11
12	0.00	620	0.09	12	0.00	620	0.10
15	0.00	625	0.09	15	-0.01	625	0.10
20	0.00			20	-0.01	630	0.11
25	0.00			25	-0.01	635	0.10
30	0.00			30	-0.01	640	0.10
35	0.00			35	-0.01		
40	0.00			40	0.00		
45	0.01			45	-0.01		
50	0.01			50	-0.01		
55	0.01			55	0.00		
60	0.01			60	0.01		
65	0.02			65	0.01		
70	0.02			70	0.01		
75	0.02			75	0.01		
80	0.02			80	0.01		
85	0.02			85	0.02		
90	0.02			90	0.01		
95	0.02			95	0.02		
100	0.02			100	0.02		
105	0.03			105	0.02		
110	0.02			110	0.02		
115	0.02			115	0.02		
120	0.02			120	0.02		
130	0.02			130	0.02		
140	0.02			140	0.02		
150	0.02			150	0.02		
200	0.03			200	0.02		
240	0.03			240	0.03		

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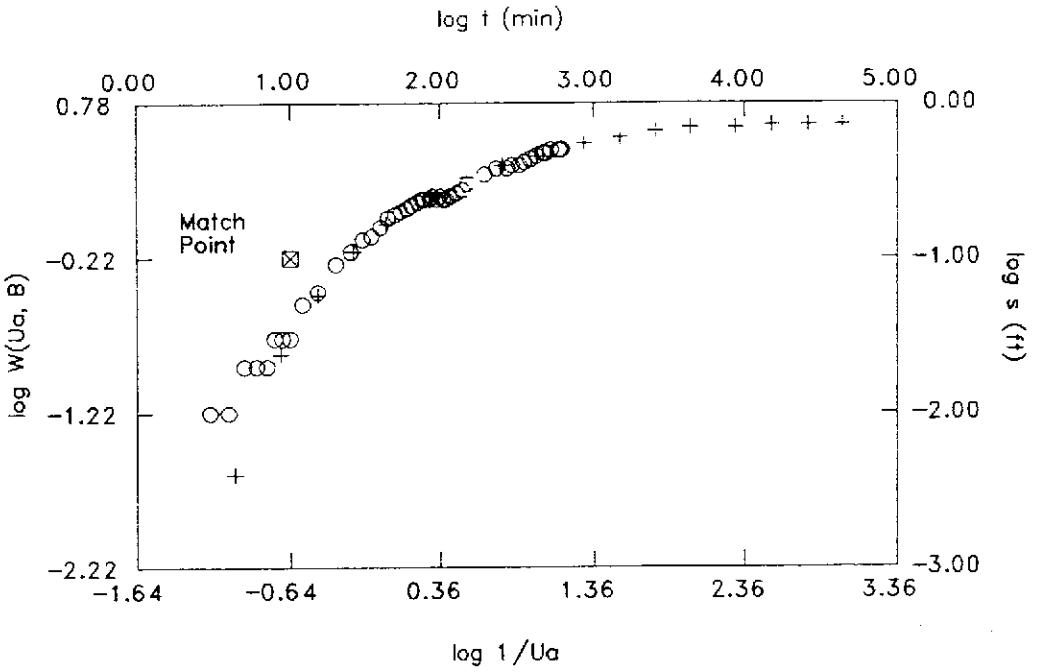
ATTACHMENT B

GRAPHICAL WELL ANALYSIS PACKAGE
TYPE CURVE MATCH TO
DRAWDOWN DATA
FROM OBSERVATION
MW-1, MW-5, MW-3, MW-4, AND MW-2
DURING CONSTANT RATE TEST
OF WELL EW-1
SEPTEMBER 15-16, 2001

726 HARRISON STREET
OAKLAND, CALIFORNIA

OBSERVATION WELL MW-1



○ – Data
\+ – Type Curve
Unconf. Elastic: beta = 0.004

MATCH POINT			SOLUTION		
t	=	1.000E+0001	Transmissivity (T)	=	4.487E+0002 gpd/ft
s	=	1.000E-0001	Hydraulic Conductivity (K)	=	4.174E+0001 gpd/sq ft
1/Ua	=	2.291E-0001	Storativity (S)	=	7.103E-0002
W(Ua, B)	=	6.026E-0001			

WELL INFORMATION	
WELL IDENTIFICATION	: MW-1
DATE OF AQUIFER TEST	: 9/15/01
AQUIFER THICKNESS (b)	: 1.075E+0001 ft
DISCHARGE RATE (Q)	: 6.500E-0001 gpm
PUMPING WELL RADIUS (r)	: 8.330E-0002 ft
DISTANCE OF OBSERVATION WELL FROM PUMPING WELL (d)	: 5.060E+0000 ft

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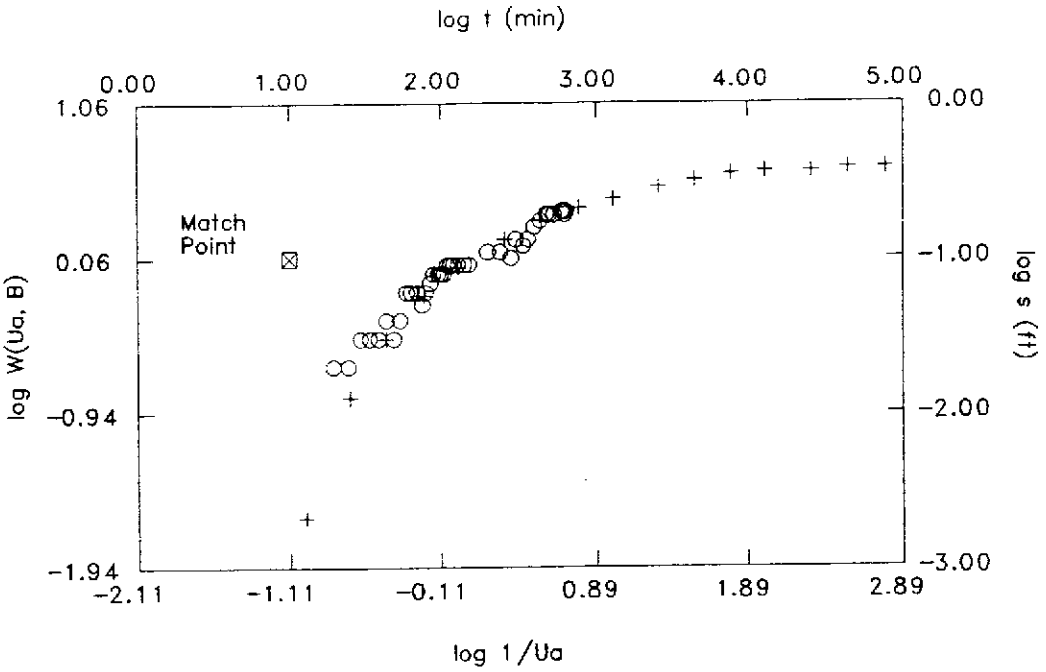
GRAPHICAL WELL ANALYSIS PACKAGE (GWAP)
DRAWDOWN INTERPRETATION
OBSERVATION WELL MW-1
640-MINUTE TEST OF WELL EW-1, SEPTEMBER 15-16, 2001
726 HARRISON STREET, OAKLAND, CALIFORNIA

FIGURE B1

OBSERVATION WELL MW-5



○ – Data
\+ – Type Curve
Unconf. Elastic: beta = 0.004

MATCH POINT			SOLUTION		
t	=	1.000E+0001	Transmissivity (T)	=	8.550E+0002 gpd/ft
s	=	1.000E-0001	Hydraulic Conductivity (K)	=	7.954E+0001 gpd/sq ft
1/Ua	=	7.762E-0002	Storativity (S)	=	1.635E-0002
W(Ua, B)	=	1.148E+0000			

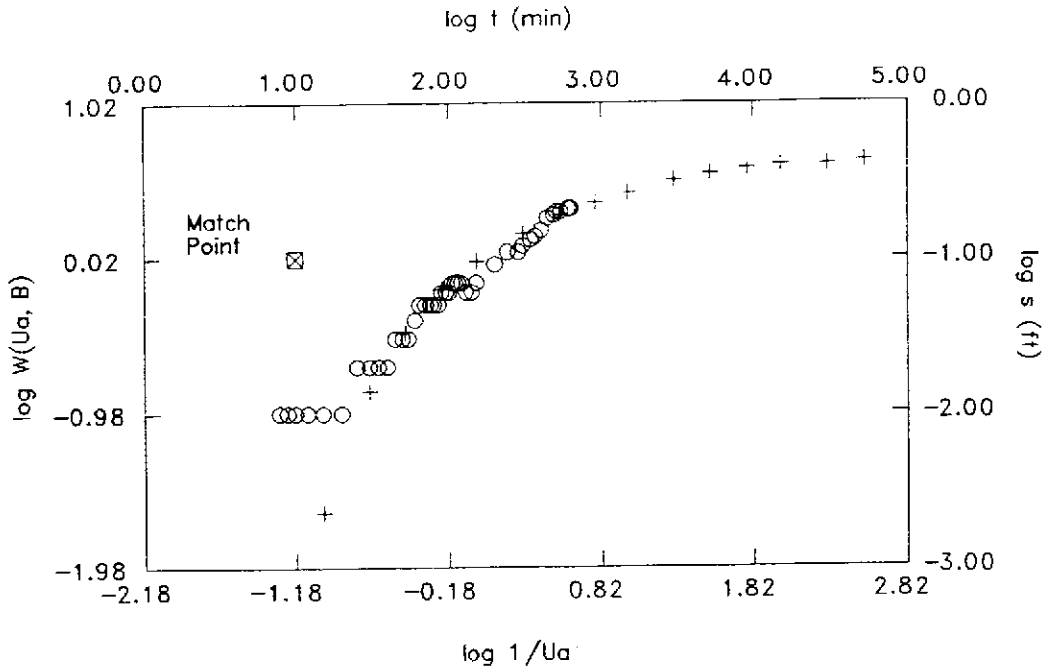
WELL INFORMATION	
WELL IDENTIFICATION	: MW-5
DATE OF AQUIFER TEST	: 9/15/01
AQUIFER THICKNESS (b)	: 1.075E+0001 ft
DISCHARGE RATE (Q)	: 6.500E-0001 gpm
PUMPING WELL RADIUS (r)	: 8.330E-0002 ft
DISTANCE OF OBSERVATION WELL FROM PUMPING WELL (d)	: 2.501E+0001 ft

H$_2$OGEOL
A GROUNDWATER CONSULTANCY

GRAPHICAL WELL ANALYSIS PACKAGE (GWAP)
DRAWDOWN INTERPRETATION
OBSERVATION WELL MW-5
640-MINUTE TEST OF WELL EW-1, SEPTEMBER 15-16, 2001
726 HARRISON STREET, OAKLAND, CALIFORNIA

FIGURE B2

OBSERVATION WELL MW-3



○ – Data
\+ – Type Curve
Unconf. Elastic: beta = 0.004

MATCH POINT		SOLUTION	
t	= 1.000E+0001	Transmissivity (T)	= 7.798E+0002 gpd/ft
s	= 1.000E−0001	Hydraulic Conductivity (K)	= 7.254E+0001 gpd/sq ft
1/Ua	= 6.607E−0002	Storativity (S)	= 1.402E−0002
W(Ua, B)	= 1.047E+0000		

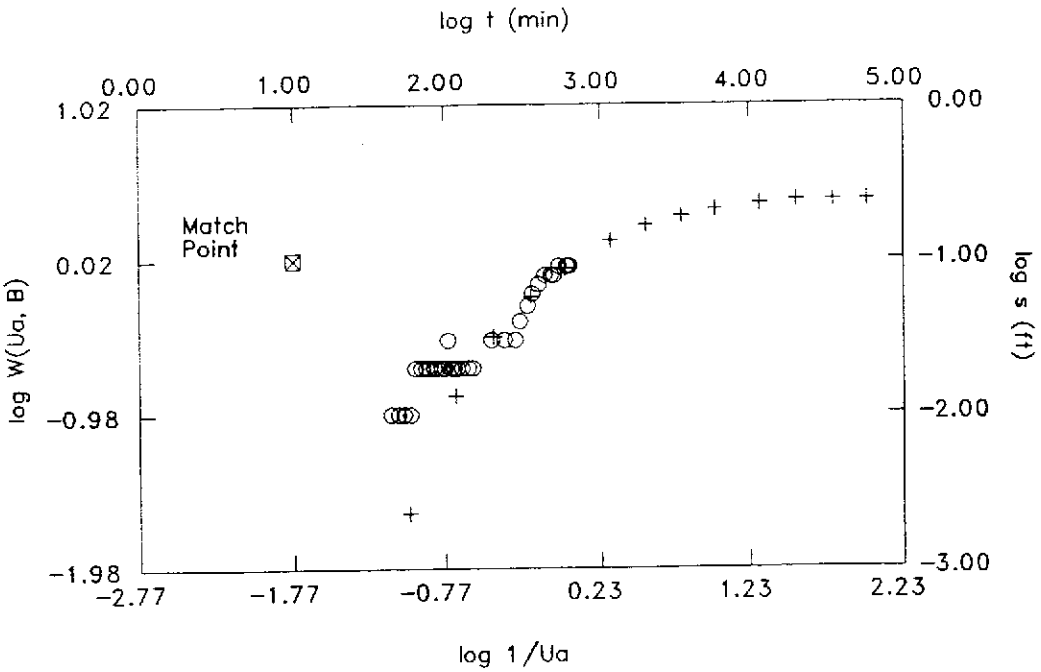
WELL INFORMATION	
WELL IDENTIFICATION	: MW-3
DATE OF AQUIFER TEST	: 9/15/01
AQUIFER THICKNESS (b)	: 1.075E+0001 ft
DISCHARGE RATE (Q)	: 6.500E−0001 gpm
PUMPING WELL RADIUS (r)	: 8.330E−0002 ft
DISTANCE OF OBSERVATION WELL FROM PUMPING WELL (d)	: 2.796E+0001 ft

H2OGEOL
A GROUNDWATER CONSULTANCY

GRAPHICAL WELL ANALYSIS PACKAGE (GWAP)
DRAWDOWN INTERPRETATION
OBSERVATION WELL MW-3
640-MINUTE TEST OF WELL EW-1, SEPTEMBER 15-16, 2001
726 HARRISON STREET, OAKLAND, CALIFORNIA

FIGURE B3

OBSERVATION WELL MW-4



○ – Data
\+ – Type Curve
Unconf. Elastic: beta = 0.03

MATCH POINT			SOLUTION		
t	=	1.000E+0001	Transmissivity (T)	=	7.798E+0002 gpd/ft
s	=	1.000E-0001	Hydraulic Conductivity (K)	=	7.254E+0001 gpd/sq ft
1/Ua	=	1.698E-0002	Storativity (S)	=	2.467E-0002
W(Ua, B)	=	1.047E+0000			

WELL INFORMATION	
WELL IDENTIFICATION	: MW-4
DATE OF AQUIFER TEST	: 9/15/01
AQUIFER THICKNESS (b)	: 1.075E+0001 ft
DISCHARGE RATE (Q)	: 6.500E-0001 gpm
PUMPING WELL RADIUS (r)	: 8.330E-0002 ft
DISTANCE OF OBSERVATION WELL FROM PUMPING WELL (d)	: 4.157E+0001 ft

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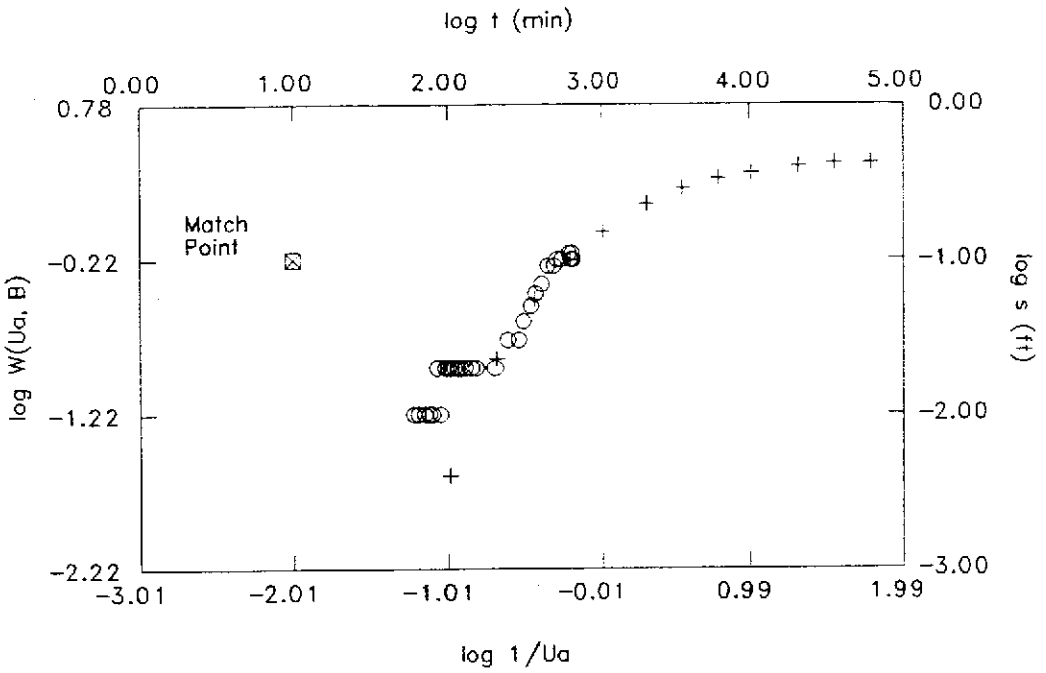
A GROUNDWATER CONSULTANCY

GRAPHICAL WELL ANALYSIS PACKAGE (GWAP)
DRAWDOWN INTERPRETATION
OBSERVATION WELL MW-4
640-MINUTE TEST OF WELL EW-1, SEPTEMBER 15-16, 2001
726 HARRISON STREET, OAKLAND, CALIFORNIA

FIGURE B4

OBSERVATION WELL MW-2



MATCH POINT			SOLUTION		
t	=	1.000E+0001	Transmissivity (T)	=	4.487E+0002 gpd/ft
s	=	1.000E-0001	Hydraulic Conductivity (K)	=	4.174E+0001 gpd/sq ft
1/Ua	=	9.772E-0003	Storativity (S)	=	1.495E-0002
W(Ua, B)	=	6.026E-0001			

WELL INFORMATION	
WELL IDENTIFICATION	: MW-2
DATE OF AQUIFER TEST	: 9/15/01
AQUIFER THICKNESS (b)	: 1.075E+0001 ft
DISCHARGE RATE (Q)	: 6.500E-0001 gpm
PUMPING WELL RADIUS (r)	: 8.330E-0002 ft
DISTANCE OF OBSERVATION WELL FROM PUMPING WELL (d)	: 5.341E+0001 ft

H2OGEOL
A GROUNDWATER CONSULTANCY

GRAPHICAL WELL ANALYSIS PACKAGE (GWAP)
DRAWDOWN INTERPRETATION
OBSERVATION WELL MW-2
640-MINUTE TEST OF WELL EW-1, SEPTEMBER 15-16, 2001
726 HARRISON STREET, OAKLAND, CALIFORNIA

FIGURE B5

APPENDIX H

Air Sparging and Vapor Extraction Test Data

CHAN VAPOR-EXTRACTION TEST DATA PERFORMED ON VE-1
VACUUM INFLUENCE

DATE 9/25/01

TIME TEST BEGAN 840

TIME TEST ENDED 1240

OBSERV. POINT	INITIAL READING	TIME 850	TIME 915	TIME 1000	TIME 1035	TIME 1110	TIME 1200	TIME 1215	TIME 1220	TIME 1240
VE-2	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.4	0.5	0.6
MW-1	0	<0	<0	<0	<0	0.01	0.03	0.02	0.02	0
MW-5	0	<0	0.03	0.03	0.04	0.02	0	0.03	0.02	0.02
MW-4	0.04	<0	<0	<0	<0	0.025	0.02	0.02	0.02	0.025
MW-3	0.03	<0	<0	<0	0.035	0.035	0	<0	<0	<0

TIME	VACUUM ON VE-1 IN INCHES OF WATER	AIRFLOW FROM VE-1 IN CFM	ENGINE RPM
850	26	BETWEEN 1 - 2	1600
915	22.5	BETWEEN 1 - 2	1600
1000	32.5	BETWEEN 1 - 2	1600
1035	34	BETWEEN 1 - 2	1600
1110	34	BETWEEN 1 - 2	1600
1200	36	BETWEEN 1 - 2	1600
1215	49	BETWEEN 1 - 2	2000
1220	54	BETWEEN 1 - 2	2200
1240	54	BETWEEN 1 - 2	2200

CHAN AIR SPARGE TEST DATA PERFORMED ON AS-1
POSITIVE PRESSURE

DATE 9/25/01

TIME TEST BEGAN 1335

TIME TEST ENDED 1500

OBSERV. POINT	BACKGROUND PRESSURE	TIME 1400	TIME 1415	TIME 1435	TIME 1500
MW-1	0	0.03	0.25	1.45	2
MW-5	0.1	0.13	0.5	0.8	1.25
MW-4	0.02	0.02	0.05	0.052	0.02
MW-3	0.03	0.24	0.5	0.9	0.9

TIME	AIRFLOW @ AS-1 IN CFM	AIRFLOW PSI	ENGINE RPM
1335	0	5	1600
1400	1	5.5	1600
1415	3	9	1600
1435	3.5	8	1700
1500	4	7.7	1700

APPENDIX I

Analytical Report From Vapor Extraction Test

Submission #: 2001-09-0583

Date: October 2, 2001

SEVERN TRENT SERVICES

STL Chromalab
1220 Quarry Lane
Pleasanton, CA 94566

Tel 925 484 1919
Fax 925 484 1096
www.stl-inc.com
www.chromalab.com

CA DHS ELAP#1094

Aqua Science Engineers, Inc.

208 West El Pintado Road
Danville, CA 94526

Mr. Dave Allen

Project: 3412
Chan
Oakland

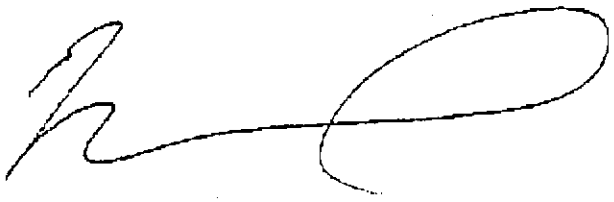
Dear Mr. Allen

Attached is our report for your samples received on Tuesday September 25, 2001
This report has been reviewed and approved for release. Reproduction of this report is permitted only in its entirety.

The report contains a Case Narrative detailing sample receipt and analysis.

Please note that any unused portion of the samples will be discarded after November 9, 2001 unless you have requested otherwise.
We appreciate the opportunity to be of service to you. If you have any questions, please call me at (925) 484-1919.
You can also contact me via email. My email address is: vvancil@chromalab.com

Sincerely,



Vincent Vancil
Project Manager

Submission #: 2001-09-0583

Gas/BTEX Compounds by 8015M/8021

SEVERN TRENT SERVICES

STL Chromalab
1220 Quarry Lane
Pleasanton, CA 94566

Tel 925 484 1919
Fax 925 484 1096
www.stl-inc.com
www.chromalab.com

CA DHS ELAP#1094

Aqua Science Engineers, Inc.	✉ 208 West El Pintado Road Danville, CA 94526
Attn: Dave Allen	Phone: (925) 820-9391 Fax: (925) 837-4853
3412 Site Oakland	Project: Chan

Samples Reported

Sample ID	Matrix	Date Sampled	Lab #
INF-0920-92501	Air	09/25/2001 09:20	1
INF-1215-92501	Air	09/25/2001 12:15	2

Submission #: 2001-09-0583

SEVERN TRENT SERVICES

Gas/BTEX Compounds by 8015M/8021

Aqua Science Engineers, Inc.

Attn: Dave Allen

STL Chromalab
1220 Quarry Lane
Pleasanton, CA 94566

Tel 925 484 1919
Fax 925 484 1096
www.stl-inc.com
www.chromalab.com

CA DHS ELAP#1094

Test Method: 8021B
8015M

Prep Method: 5030

Sample ID:	INF-0920-92501	Lab Sample ID:	2001-09-0583-001
Project:	3412	Received:	09/25/2001 12:00
Site:	Oakland	Extracted:	09/28/2001 11:31
Sampled:	09/25/2001 09:20	QC-Batch:	2001/09/28-01.05
Matrix:	Air		

Compound	Result	Rep Limit	Units	Dilution	Analyzed	Flag
Gasoline	6300	500	ug/L	10.00	09/28/2001 11:31	g
Benzene	19	5.0	ug/L	10.00	09/28/2001 11:31	
Toluene	ND	5.0	ug/L	10.00	09/28/2001 11:31	
Ethyl benzene	6.7	5.0	ug/L	10.00	09/28/2001 11:31	
Xylene(s)	7.6	5.0	ug/L	10.00	09/28/2001 11:31	
MTBE	ND	50	ug/L	10.00	09/28/2001 11:31	
Surrogate(s)						
Trifluorotoluene	91.6	58-124	%	1.00	09/28/2001 11:31	
4-Bromofluorobenzene-FID	101.5	50-150	%	1.00	09/28/2001 11:31	

Submission #: 2001-09-0583

SEVERN TRENT SERVICES

STL Chromalab
1220 Quarry Lane
Pleasanton, CA 94566

Tel 925 484 1919
Fax 925 484 1096
www.stl-inc.com
www.chromalab.com

CA DHS ELAP#1094

Gas/BTEX Compounds by 8015M/8021

Aqua Science Engineers, Inc.

Test Method: 8021B
8015M

Attn: Dave Allen

Prep Method: 5030

Sample ID:	INF-1215-92501	Lab Sample ID:	2001-09-0583-002
Project:	3412	Received:	09/25/2001 12:00
Site:	Oakland	Extracted:	09/28/2001 12:03
Sampled:	09/25 2001 12:15	QC-Batch:	2001/09/28-01.05
Matrix:	Air		

Compound	Result	Rep.Limit	Units	Dilution	Analyzed	Flag
Gasoline	9100	500	ug/L	10.00	09/28/2001 12:03	g
Benzene	31	5.0	ug/L	10.00	09/28/2001 12:03	
Toluene	ND	5.0	ug/L	10.00	09/28/2001 12:03	
Ethyl benzene	11	5.0	ug/L	10.00	09/28/2001 12:03	
Xylene(s)	11	5.0	ug/L	10.00	09/28/2001 12:03	
MTBE	ND	50	ug/L	10.00	09/28/2001 12:03	
Surrogate(s)						
Trifluorotoluene	84.3	58-124	%	1.00	09/28/2001 12:03	
4-Bromofluorobenzene-FID	101.8	50-150	%	1.00	09/28/2001 12:03	

Submission #: 2001-09-0583

SEVERN TRENT SERVICES

STL Chromalab
1220 Quarry Lane
Pleasanton, CA 94566

Tel 925 484 1919
Fax 925 484 1096
www.stl-inc.com
www.chromalab.com

CA DHS ELAP#1094

Gas/BTEX Compounds by 8015M 8021

Batch QC report

Test Method: 8015M
8021B

Prep Method: 5030

Method Blank | **Water** | **QC Batch # 2001/09/28-01.05**

MB: 2001/09/28-01.05-001 | Date Extracted: 09/28/2001 08:18

Compound	Result	Rep.Limit	Unit	Analyzed	Flag
Gasoline	ND	50	ug/L	09/28/2001 08:18	
Benzene	ND	0.5	ug/L	09/28/2001 08:18	
Toluene	ND	0.5	ug/L	09/28/2001 08:18	
Ethyl benzene	ND	0.5	ug/L	09/28/2001 08:18	
Xylene(s)	ND	0.5	ug/L	09/28/2001 08:18	
MTBE	ND	5.0	ug/L	09/28/2001 08:18	
Surrogate(s)					
Trifluorotoluene	115.8	58-124	%	09/28/2001 08:18	
4-Bromofluorobenzene-FID	90.4	50-150	%	09/28/2001 08:18	

Submission #: 2001-09-0583

SEVERN TRENT SERVICES

STL Chromalab
1220 Quarry Lane
Pleasanton, CA 94566

Tel 925 484 1919
Fax 925 484 1096
www.stl-inc.com
www.chromalab.com

CA DHS ELAP#1094

Gas/BTEX Compounds by 8015M/8021

Batch QC report

Test Method: 8021B Prep Method: 5030

Laboratory Control Spike (LCS/LCSD)		Water		QC Batch # 2001/09/28-01.05
LCS:	2001/09/28-01.05-002	Extracted:	09/28/2001 08:50	Analyzed: 09/28/2001 08:50
LCSD:	2001/09/28-01.05-003	Extracted:	09/28/2001 09:22	Analyzed: 09/28/2001 09:22

Compound	Conc. [ug/L]		Exp.Conc. [ug/L]		Recovery [%]		RPD	Ctrl.Limits [%]		Flags	
	LCS	LCSD	LCS	LCSD	LCS	LCSD	[%]	Recovery	RPD	LCS	LCSD
Benzene	108	104	100.0	100.0	108.0	104.0	3.8	77-123	20		
Toluene	114	109	100.0	100.0	114.0	109.0	4.5	78-122	20		
Ethyl benzene	112	107	100.0	100.0	112.0	107.0	4.6	70-130	20		
Xylene(s)	328	315	300	300	109.3	105.0	4.0	75-125	20		
Surrogate(s)											
Trifluorotoluene	565	526	500	500	113.0	105.2		58-124	0		

Submission #: 2001-09-0583

SEVERN TRENT SERVICES

STL Chromalab
1220 Quarry Lane
Pleasanton, CA 94566

Tel 925 484 1919
Fax 925 484 1096
www.stl-inc.com
www.chromalab.com

CA DHS ELAP#1094

Gas/BTEX Compounds by 8015M/8021

Batch QC report

Test Method: 8015M Prep Method: 5030

Laboratory Control Spike (LCS/LCSD)		Water		QC Batch # 2001/09/28-01.05	
LCS:	2001/09/28-01.05-004	Extracted:	09/28/2001 09:54	Analyzed:	09/28/2001 09:54
LCSD:	2001/09/28-01.05-005	Extracted:	09/28/2001 10:26	Analyzed:	09/28/2001 10:26

Compound	Conc. [ug/L]		Exp.Conc. [ug/L]		Recovery [%]		RPD	Ctrl Limits [%]		Flags	
	LCS	LCSD	LCS	LCSD	LCS	LCSD	[%]	Recovery	RPD	LCS	LCSD
Gasoline	503	496	500	500	100.6	99.2	1.4	75-125	20		
Surrogate(s)											
4-Bromofluorobenzene-	542	533	500	500	108.4	106.6		50-150	0		

SEVERN TRENT SERVICES

STL Chromalab
1220 Quarry Lane
Pleasanton, CA 94566

Tel 925 484 1919
Fax 925 484 1096
www.stl-inc.com
www.chromalab.com

CA DHS ELAP#1094

Gas/BTEX Compounds by 8015M/8021

Legend & Notes

Test Method: 8015M
8021B

Prep Method: 5030

Analyte Flags

g

Hydrocarbon reported in the gasoline range does not match our gasoline standard.

2001-09-0583

62000

Aqua Science Engineers, Inc.
208 W. El Pintado Road
Danville, CA 94526
(925) 820-9391
FAX (925) 837-4853

Chain of Custody

PAGE 1 OF 1

SAMPLER (SIGNATURE) (PHONE NO.) 8[illegible]

PROJECT NAME CHAN JOB NO. 3412.

ADDRESS OAKLAND

ANALYSIS REQUEST

SPECIAL INSTRUCTIONS:

SAMPLE ID.	DATE	TIME	MATRIX	NO. OF SAMPLES	TPH-GAS / NTBE & BTEX (EPA 5030/8015-8020)	TPH-DIESEL (EPA 3510/8015)	TPH-DIESEL & MOTOR OIL (EPA 3510/8015)	PURGEABLE HALOCARBONS (EPA 601/8010)	VOLATILE ORGANICS (EPA 624/8240/8260)	SEMI-VOLATILE ORGANICS (EPA 625/8270)	OIL & GREASE (EPA 5520) ____	LUFT METALS (5) (EPA 6010+7000)	CAM 17 METALS (EPA 6010+7000)	PCBs & PESTICIDES (EPA 608/8060)	ORGANOPHOSPHORUS PESTICIDES (EPA 6140 EPA 608/8080)	FUEL OXYGENATES (EPA 8260)	Pb (TOTAL or DISSOLVED) (EPA 6010)	TPH-G/BTEX/5 OXYS (EPA 8260)	TPH-G/BTEX/7 OXYS / HVOCS (EPA 8260)			COMPOSITE
INF-0920-925-01	9/25	0920	AIR	1	X																	
INF-1215-925-01	9/25	1215	AIR	1	X																	

RELINQUISHED BY: (signature) (time)

D. Allen (printed name) (date)

Company- ASE

RECEIVED BY: (signature) (time)

(printed name) (date)

Company-

RELINQUISHED BY: (signature) (time)

[illegible] (printed name) (date) 9/26/01

Company- STL CL

RECEIVED BY LABORATORY: Denise Harrington (signature) (time)

D Harrington (printed name) (date)

Company- STL-CL 9/26/01 1200

COMMENTS: 24.0°C (ice)

TURN AROUND TIME

STANDARD 24Hr 48Hr 72Hr

OTHER: