Ultramar

Ultramar Inc.
P.O. Box 466
525 W. Third Street
Hanford, CA 93232-0466
(209) 582-0241

Telecopy: 209-584-6113 Credit & Wholesale
209-583-3330 Administrative
209-583-3302 Information Services
209-583-3358 Accounting

January 6, 1995

Ms. Eva Chu
Department of Environmental Health
Alameda County Health Care Services
1131 Harbor Bay Parkway, Room 250
Alameda, CA 94502-6577

SUBJECT: BEACON STATION NO. 604, 1619 FIRST STREET, LIVERMORE, CALIFORNIA

Dear Ms. Chu:

Enclosed is a copy of the Remedial Action Plan for the above-referenced Ultramar facility.

Please call if you have any questions regarding this site.

Sincerely,

ULTRAMAR INC.

Terrence A. Fox
Senior Project Manager
Marketing Environmental Department

cc: Mr. Cecil Fox, San Francisco Bay Region, RWQCB
Mr. Jim Ellis, Ellis Partners Inc., 351 California Street, Suite 1120, San Francisco, CA 94104

REMEDIAL ACTION PLAN
FORMER BEACON STATION NO. 604

1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA
AMV PROJECT NO. 19024.07

December 14, 1994

Prepared By

ACTON • MICKELSON • van DAM, INC.
4511 Golden Foothill Parkway, Suite 1
El Dorado Hills, California 95762
(916) 939-7550

PREPARED BY:

Dale A. van Dam

Dale A. van Dam, R.G.
California Registered Geologist #4632

Date 12/14/94

REVIEWED BY:

James C. Twiford
Project Engineer

Date 12/14/94

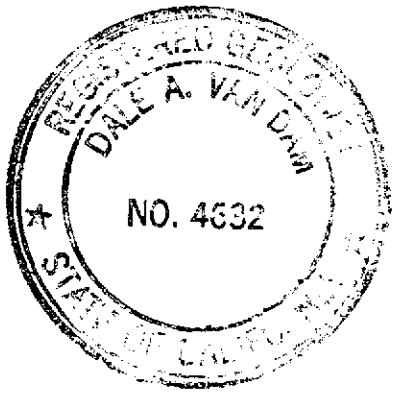


TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

LIST OF TABLES

LIST OF FIGURES

REMEDIAL ACTION PLAN
FORMER BEACON STATION NO. 604

1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA
AMV PROJECT NO. 19024.07

1.0 INTRODUCTION

Acton • Mickelson • van Dam, Inc. (AMV) has been authorized by Ultramar Inc. (Ultramar) to continue an ongoing hydrogeologic investigation at and prepare this Remedial Action Plan for Beacon Station No. 604 located at 1619 West First Street, Livermore, Alameda County, California (Figures 1 and 2). This report summarizes the results of previous hydrogeologic investigations conducted by other consultants as well as work recently completed by AMV. AMV's recommendations for future work are included in this report.

1.1 SITE BACKGROUND

The site is located at the intersection of First and South P Streets in Livermore. The site is bordered on the north by First Street and on the west by South P Street. The surrounding area consists predominantly of commercial and residential properties.

The site lies approximately 2,400 feet northeast of Arroyo Mocho, which contains an ephemeral, northwestward-flowing creek. The elevation of the site is approximately 475 feet above mean sea level. Livermore is situated at the eastern end of the Livermore Valley, bounded on the north by the Black and Sherburne Hills, and on the west, south, and east by outliers of the Diablo Range. Ground surface in the area of the site generally slopes toward the west. The Greenville fault forms the eastern boundary of the Livermore Valley, and the Calaveras fault forms the western boundary (State of California, Department of Water Resources (DWR), Bulletin No. 118-2, "Evaluation of Ground Water Resources: Livermore and Sunol Valleys," June 1974). Other minor faults are inferred to bisect the Livermore Valley.

Delta Environmental Consultants, Inc. (Delta), observed and reported on tank replacement activities conducted at the site in November 1992. A total of seven monitoring wells have been installed on or near the site by AMV since 1993. The site is currently in operation as a retail gasoline service station.

1.2 REGIONAL GEOLOGIC AND HYDROGEOLOGIC SETTING

The site is located in the Livermore Valley of California, east of the San Francisco Bay Area. Ground water has been reported at 32 to 45 feet below ground surface at the site. The surface of Livermore Valley is covered with Quaternary nonmarine alluvium, consisting of unconsolidated deposits of clay, silt, sand, and gravel (DWR Bulletin 118-2, 1974). In some

areas of the Livermore Valley near the city of Livermore, alluvial fan deposits, consisting of semi-consolidated sand and gravel in a clayey sand matrix, are present. These fans are a result of erosion of the adjacent Livermore Upland on the south. The Tertiary Livermore Formation is also present at the surface in some areas. The Livermore Formation consists of massive beds of rounded gravel cemented by an iron-rich sandy clay matrix. Bedrock in the Livermore Valley (at depths exceeding 400 feet) consists of marine shale, sandstone, conglomerate, and chert.

2.0 RESULTS OF PREVIOUS PHASES OF HYDROGEOLOGIC INVESTIGATION

2.1 UNDERGROUND STORAGE TANK REMOVAL

During the week of November 9, 1992, three underground storage tanks and the product distribution piping system were excavated and removed from the site. Underground storage tanks removed included a 10,000-gallon-capacity tank and two 8,000-gallon-capacity tanks. The tanks contained regular unleaded gasoline, unleaded plus gasoline, and unleaded premium gasoline, respectively. A 550-gallon-capacity waste oil tank had previously been removed from the site. Removal of the waste oil tank was documented in the Delta report "Removal of Waste Oil Tank and Adjacent Soils," dated July 2, 1990. Delta reported that the three underground storage tanks removed in November 1992 were "intact with no visible holes." After removal, soil samples were collected from the former locations of the east and west ends of each tank. After sampling, the entire tank basin was deepened to 19 feet to accommodate the replacement tanks. Additional soil samples were collected at this depth. Based on field observations and laboratory analytical results, the southwest corner of the tank excavation was overexcavated to a depth of 27 feet, the practical limit of excavation. Approximately 1,200 cubic yards of soil was excavated and stockpiled on site during the tank replacement activities.

During tank removal, soil samples were collected at locations indicated on Figure 3. Nine soil samples were collected from the tank basin area at depths ranging from 14 to 27 feet below grade, and five samples were collected from below the excavated product distribution piping at depths of approximately 2.5 feet below grade. Each soil sample collected was analyzed for benzene, toluene, ethylbenzene, xylenes (BTEX), and total petroleum hydrocarbons as gasoline (TPHg). Two soil samples collected from the tank basin were also analyzed for the presence of total lead, and one sample, collected from 27 feet below grade at the southwest corner of the tank basin excavation, was also analyzed for semivolatile organic priority pollutants (U.S. Environmental Protection Agency (EPA) Method 8270) and halogenated volatile organic compounds (EPA Method 8010). Analytical results are contained in Table 1.

The analytical results indicate that BTEX and TPHg concentrations were less than detectable at depths ranging from 14 to 16 feet below ground surface in all areas of the tank basin except the southwest corner, beneath the former 10,000-gallon-capacity unleaded regular tank (Figure 3). The sample collected at 27 feet below grade from this location contained benzene at a concentration of 1.4 parts per million (ppm) and TPHg at a concentration of 490 ppm. This sample was also analyzed using EPA Methods 8270 and 8010; the only additional compound detected using these methods was naphthalene (a gasoline component) at a concentration of 13 ppm. The two soil samples collected from the tank basin and analyzed for total lead contained 6.5 and 5.6 ppm, well within background levels of lead. Soil samples collected from below the product distribution piping did not contain detectable concentrations of benzene. Soil samples collected from beneath the eastern pump island (labeled "product line #4" and "product line #5" on Figure 3), contained TPHg at concentrations of 4.4 and 2.7 ppm, respectively.

Approximately 1,000 cubic yards of the stockpiled soil were transported to Ultramar's Hanford facility for aeration; approximately 90 yards went to a Class III landfill in Sacramento County; and approximately 110 cubic yards were transported to Redwood Landfill in Novato, California, for disposal.

Ultramar installed replacement underground storage tanks, consisting of one 20,000-gallon capacity tank and one 12,000-gallon-capacity tank (Figure 4).

2.2 Soil Borings and Monitoring Well Installation

On May 27 and 28 and June 1, 1993, a total of seven soil borings were advanced at the site. Three of the soil borings were completed as ground water monitoring wells MW-1, MW-2, and MW-3; three of the borings were completed as vapor extraction wells VW-1, VW-2, and VW-3. One of the borings, labeled B-4 on Figure 4, was drilled to a depth of 35 feet and then abandoned by completely filling with cement grout. The ground water monitoring wells were completed to a depth of 54 feet below grade. Vapor extraction wells VW-1, VW-2, and VW-3 were completed at depths of 36, 37, and 36 feet below grade, respectively.

Observations made as the borings were advanced indicate that the site is underlain by silty clay and clayey gravel. For example, samples collected from the boring of monitoring well MW-3 indicated the following vertical soil sequence: from below the surface concrete to 18.5 feet below grade, the soil encountered consisted of clayey gravel; from 18.5 to 35 feet, a silty clay unit was encountered; from 35 feet to a total depth of 53 feet below grade, a clayey gravel unit was present. Soil boring logs containing descriptions of soil conditions encountered in each soil boring are included in Appendix A. Ground water was encountered at depths ranging from 36 to 39 feet below grade. Monitoring and vapor extraction well construction specifications are contained in Appendix B.

Selected soil samples collected as the seven soil borings were advanced were submitted for analysis of BTEX and TPHg. The results indicate the presence of TPHg at detectable concentrations in soil above the water table in samples collected from VW-1, VW-2, MW-2, and B-4. TPHg concentrations ranged from 1.5 ppm in the sample collected from 25 feet below grade in the boring for monitoring well MW-2 to 280 ppm in the sample collected from the boring for monitoring well VW-1 at 30 feet below grade. Soil sample analytical results associated with drilling activities in May and June 1993 are compiled in Table 2.

Water levels measured in monitoring wells on June 1 and 22, 1993, indicated ground water was present at depths ranging from 36 to 39 feet below grade. The depth to ground water measurements indicated a direction of ground water flow toward the northwest. On June 22, 1993, the ground water gradient was approximately 0.03 foot per foot. Historical ground water level measurements are compiled in Table 3.

Ground water samples collected from monitoring wells MW-1, MW-2, and MW-3 on June 1 and 22, 1993, indicated the presence of benzene at concentrations up to 20,000 micrograms per liter (μg/l). TPHg concentrations ranged from 160 to 170,000 μg/l. The highest concentration of petroleum constituents was reported in the sample collected from monitoring well MW-2. Historical ground water sample analytical results are compiled in Table 4.

The results of the first phase of hydrogeologic investigation indicated additional work was appropriate. In March 1994, four additional soil borings were drilled and completed as ground water monitoring wells MW-4, MW-5, MW-6, and MW-7 (Figure 4). Observations made as the boring for monitoring well MW-6 was advanced indicated the following vertical soil sequence: from the ground surface to 4.5 feet below grade, the soil encountered consisted of silty gravel; from 4.5 to 18 feet below grade, sandy gravel was encountered; silty clay is present from 18 to 24 feet below grade; from 24 to 31 feet below grade, sandy gravel is present; under the sandy gravel, clayey sand was encountered from 31 to 35 feet below grade; and from 35 to 48 feet below grade, sandy gravel was encountered. Ground water was encountered in the borings for monitoring well MW-6 at approximately 33 feet below grade. The boring for monitoring well MW-6 was terminated at 48 feet below grade. Soil borings for monitoring wells MW-4, MW-5, and MW-7, each terminated at 47 feet below grade, generally encountered approximately the same sequence of sedimentary materials. Soil boring logs containing descriptions of soil conditions encountered in borings MW-4 through MW-7 are included in Appendix A. Construction specifications for these monitoring wells are contained in Appendix B.

Selected soil samples collected from borings for monitoring wells MW-4 through MW-7 were submitted for laboratory analysis. Analytical results of these samples are compiled in Table 5. Petroleum constituents were detected in soil samples collected above the present water table only in the boring for monitoring well MW-6. A sample collected from this boring at a depth of 30

feet below grade contained 42 milligrams per kilogram (mg/kg) TPHg and 0.65 mg/kg benzene. Soil samples collected from the boring for monitoring well MW-7 at depths of 35 and 40 feet below grade also contained detectable concentrations of BTEX and TPHg (Table 5).

Depth to water measurements made in all seven monitoring wells on March 30, 1994, indicate ground water was present at a depth of 31 to 33.5 feet below grade. The inferred direction of ground water flow was generally toward the northwest. The ground water gradient on March 30, 1994, was 0.02 foot per foot. Analysis of ground water samples collected from each of the four newly installed monitoring wells in March 1994 indicated the presence of petroleum hydrocarbon constituents. Benzene concentrations ranged from 4.2 (MW-4) to 21,000 μg/l (MW-6). Analytical results are compiled in Table 4.

3.0 ADDITIONAL HYDROGEOLOGIC INVESTIGATION

3.1 HYDROGEOLOGIC TESTING RESULTS

3.1.1 Aquifer Pumping Test

AMV conducted a continuous ground water pumping test on June 23 and 24, 1994, to evaluate aquifer characteristics of the shallow water-bearing strata beneath the site. The test was performed using monitoring well MW-2 as the pumping well for approximately 24 hours. Water levels have historically indicated an inferred ambient ground water gradient of 0.02 to 0.03 foot per foot toward the northwest. Ground water measurements made by AMV on June 23, 1994, before pumping began, confirmed this gradient and direction.

The initial pumping rate from monitoring well MW-2 was approximately 1.8 gallons per minute (gpm). This rate was adjusted downward to 1.5 gpm after 2 hours and 45 minutes of pumping, because the water level in the pumping well was approaching the pump inlet. The average pumping rate over the duration of the test was assumed to be 1.6 gpm for purposes of analysis. Water levels were recorded with pressure transducers and an automated data logger in the pumping well and in monitoring well MW-1 (located 93 feet from the pumping well) throughout the test. Water levels were measured manually from other monitoring wells on and adjacent to the site at intervals during the aquifer pumping test.

After 1,390 minutes (23 hours and 10 minutes) of pumping, drawdown in the pumping well was 9.32 feet; drawdown in observation well MW-1 was 0.45 foot. Manual water level measurements made in monitoring wells MW-3 and MW-7 (located approximately 90 and 95 feet from the pumping well, respectively) indicate drawdown of 0.11 and 0.35 foot, respectively. These measurements serve to confirm the measurements made with the transducer in monitoring

well MW-1. Raw data collected during the pumping test and analytical calculations are contained in Appendix C. A water sample collected at the beginning of the aquifer pumping test was submitted for analysis of BTEX and TPHg. This sample contained benzene at a concentration of 12,000 μg/l and TPHg at a concentration of 57,000 μg/l. A sample collected near the end of the aquifer pumping test contained 7,200 μg/l benzene and 36,000 μg/l TPHg. The second sample was also analyzed for volatile organic priority pollutants (EPA Method 624), semivolatile organic priority pollutants (EPA Method 625), priority pollutant metals, and pH, conductivity, hardness, total dissolved solids, and other general mineral parameters. Copies of certified analytical reports of ground water samples collected during the pumping test are contained in Appendix D.

Approximately 2,400 gallons of water were produced during the pumping test. The ground water was routed from the pumping well through a flowmeter and a granulated charcoal filter into the local sanitary sewer under permit from the City of Livermore. Analysis of one water sample collected downstream of the carbon filter indicated the presence of 65 μg/l TPHg (Appendix D), within the permit requirements of the City of Livermore.

3.1.2 Aquifer Test Analysis

Analysis of aquifer characteristics was facilitated by use of the computer program AQTESOLV. A casing storage effect calculation indicated that only that portion of the drawdown curve after 12 minutes of pumping should be used for analysis (Appendix C). The estimated average value of hydraulic conductivity (K) calculated from the test was 0.003 foot/minute (ft/min). This value is at the low end of the range expected for sediments encountered in soil borings in the shallow subsurface beneath this site, but is consistent with the relatively low pumping rate attainable from monitoring well MW-2.

The capture zones associated with pumping of monitoring well MW-2 at rates of 1.0 and 1.6 gpm were simulated using the value for K of 0.003 ft/min, a gradient of 0.02 foot per foot, an assumed aquifer porosity of 25 percent, and an assumed aquifer thickness of 20 feet. At a pumping rate of 1.0 gpm, the simulated capture zone extended approximately 20 feet downgradient (northwest) of the pumping well and reached a maximum upgradient width of approximately 115 feet. Water level measurements made in monitoring wells MW-3 and MW-7 during the pumping test indicated drawdown was detected in both of these wells. These measurements indicate a slightly more extensive capture zone than is indicated by the calculations. At a pumping rate of 1.6 gpm, the simulated capture zone extended approximately 25 feet downgradient of the pumping well and reached a maximum upgradient width of approximately 170 feet. The extent of the capture zone could be expected to increase with time under continuous pumping conditions.

3.1.3 Soil Vapor Extraction Tests

On June 24, 1994, a 4-hour vapor extraction test was performed by AMV using vapor well VW-1 as the test well. A 1.5-horsepower vacuum blower (EG&G Rotron Model DR454W58), powered by a portable 6.5-kilowatt generator applied a continuous vacuum of about 53 inches of water column at the well head. The water level in vapor well VW-1 prior to the start of the test was about 36.44 feet below the casing riser. Comparison with the well completion diagram for this well (Appendix B), indicates the top of the screen in this well is located at 27 feet below grade, resulting in an open screen area of 9.44 feet prior to the start of the test. Applying 53 inches of vacuum would result in a maximum theoretical water table rise of approximately 4.42 feet. Therefore, during the vapor test, a minimum of 5 feet of screen was open to the surrounding soil.

A rotameter in the exhaust line of the blower indicated a flow rate of approximately 20 standard cubic feet of air per minute (scfm), after correcting for temperature. Soil vapor extraction test field observations and calculations are contained in Appendix E. In accordance with the requirements of the Bay Area Air Quality Management District, vapor emissions from the vapor extraction test were routed through vapor-phase activated carbon prior to discharge to the atmosphere.

Throughout the vapor extraction test, AMV monitored vacuum influence at vapor wells VW-2 and VW-3 and monitoring wells MW-3 and MW-7. Vacuum influence was not detected at any other wells at the site throughout the duration of the test, indicating a zone of vacuum influence of less than 30 feet from the extraction well.

To monitor concentrations of total volatile hydrocarbons (TVH) in the extracted vapors during the extraction test, AMV used a lower-explosive-limit (LEL) detector and Draeger tubes. The LEL readings (Appendix E) indicated TVH readings between 80 and 200 ppm. Draeger tube analysis indicated concentrations between 90 and 160 ppm as octane. A table of field readings recorded during the test is contained in Appendix E.

To confirm field readings and to help estimate mass extraction rates of TPHg, three bag samples were collected of the blower effluent; one at the beginning, middle, and end of the vapor extraction test. These samples contained 72, 13, and 56 ppm (molar) TPHg, respectively. Copies of certified analytical reports for air samples collected during the vapor extraction test on June 24, 1994, are contained in Appendix F. From the analytical results, the estimated extraction rate for TPHg during the 4-hour test ranged from 0.09 to 0.43 pound per day (Appendix E). The calculated zone of vacuum influence (using recorded airflow data) ranged from 32 to 35 feet from the test extraction rate. Field readings indicated that the zone of vacuum influence was slightly less than this value.

Because both the flow rate and TPHg concentration were lower than expected during the vapor extraction test conducted on June 24, 1994, and because it was thought that the presence of ground water in the bottom of the screened interval of VW-1 may have limited the amount of screened interval open to surrounding soil, the test was repeated on August 12, 1994.

On August 12, 1994, the depth to water in vapor well VW-1 was again measured at 36.44 feet below the casing riser, indicating that what is being measured is water or moisture collected in the end cap of the vapor well (records indicate the well is 37 feet deep). Depth to water in vapor wells VW-2 and VW-3 on August 12, 1994, was reported to be 35.95 and 35.73 feet, respectively. These wells were reportedly completed at depths of 37 and 36 feet below grade, respectively. Water detected in these vapor wells may also represent moisture gathered in the end caps of the wells.

A vapor test was conducted on August 12, 1994, using vapor well VW-1 for just under 1 hour. On this date, corrected airflow was approximately 9.6 scfm at between 55 and 66 inches of water. Vacuum influence was not detected in vapor well VW-3 or monitoring well MW-1 during the test. Soil vapor extraction test field observations and calculations are contained in Appendix G. A flame ionization detector (FID) was used to monitor TVH concentrations in the field. FID readings ranged from 5,000 (start of test) to 2,500 (end of test) ppm TVH as methane. A bag air sample collected after 50 minutes of testing contained 520 ppm (molar) TPHg. This result corresponds to a TPHg recovery rate of 1.7 pounds per day. The theoretical zone of vacuum influence around VW-1 was calculated to be 16 feet. Analytical results of air samples collected on August 12, 1994, are contained in Appendix H. Calculation sheets are contained in Appendix G.

A vapor extraction test was then run on vapor well VW-2 for 40 minutes, using vapor well VW-1 and monitoring well MW-2 as observation wells. Vacuum influence was not detected in either VW-1 or MW-2 during the vapor test on VW-2. Corrected airflow from VW-2 was 9.6 scfm at a vacuum ranging from 56 to 67 inches of water. FID readings ranged from 1,200 ppm TVH as methane (start of test) to 5,000 ppm (after 25 minutes of testing) to 2,700 ppm (end of test). An air sample collected in a bag after 40 minutes of testing contained 7,500 ppm (molar) TPHg (Appendix H). This result corresponds to an initial TPHg recovery rate of 23.2 pounds per day (Appendix G). The theoretical zone of vacuum influence around VW-2 was calculated to be 10.8 feet (Appendix G).

A vapor extraction test was then run on vapor well VW-3 for 90 minutes, using vapor well VW-1 and monitoring well MW-1 as observation wells. Vacuum influence was not detected in either VW-1 or MW-1 during the vapor test on VW-2. Corrected airflow from VW-3 was 9.7 scfm at a vacuum ranging from 58 to 65 inches of water. FID readings ranged from 150 ppm TVH as methane (start of test) to 250 ppm (after 30 minutes of testing) to 1,200 ppm (after 70 minutes of testing) to 1,700 ppm (end of test). An air sample collected in a bag after

90 minutes of testing contained 1,600 ppm (molar) TPHg (Appendix H). This result corresponds to an initial TPHg recovery rate of 5.2 pounds per day (Appendix G). The theoretical zone of vacuum influence around VW-3 was calculated to be 10.3 feet (Appendix G).

3.2 Results of Hydropunch® Borings on Adjacent Property

To assess the downgradient extent of dissolved petroleum hydrocarbons in ground water, AMV advanced soil borings at locations on property located northwest of the subject site and collected Hydropunch® water samples without installation of permanent monitoring wells. This work was approved by Alameda County prior to commencing. Soil borings to collect Hydropunch® samples were advanced at three locations (identified as HP-1, HP-2, and HP-3 on Figure 5). Soil borings to collect Hydropunch® samples were advanced using a drill rig equipped with hollow-stem augers.

Soil samples collected as the Hydropunch® borings were advanced indicate that silty gravel, silt, sandy gravel, and silty sand were encountered beneath the property lying northwest of the site. For example, in the boring for HP-3, the following vertical sequence of soil types was encountered: from immediately below the surface asphalt to a depth of 20 feet below grade, silty gravel is present; from 20 to 25 feet below grade, yellowish-brown silt was encountered; between 25 and 30 feet below grade, silty sand was encountered; from 35 to 42.5 feet below grade (the depth at which the boring was terminated) silty gravel is present. Ground water was encountered at a depth of 42.5 feet below grade in boring HP-3. Field notes and soil boring logs describing the soil encountered in the Hydropunch® borings are contained in Appendix I.

The soil sample collected from 40 feet below grade in each boring (HP-1, HP-2, and HP-3) was selected for laboratory analysis of BTEX and TPHg. Soil sample analytical results from the Hydropunch® borings are compiled in Table 6. Only the sample collected from soil boring HP-1 contained detectable concentrations of petroleum constituents (0.012 mg/kg benzene and 5.2 mg/kg TPHg). The laboratory reported that the soil sample collected at 40 feet below grade from HP-3 contained 1.9 mg/kg of a compound other than gasoline. Copies of certified laboratory reports are contained in Appendix J. Soil cuttings from the three borings were stockpiled on the Beacon service station site, sampled, and transported off the site for disposal.

Ground water samples were collected using Hydropunch® methodology from the borings for HP-2 and HP-3. A temporary well casing was utilized to collect the ground water sample from boring HP-1. Each collected ground water sample was submitted for laboratory analysis of BTEX and TPHg. Ground water sample analytical results are compiled in Table 7, and copies of certified analytical reports are contained in Appendix K. Dissolved benzene was detected in ground water samples collected from HP-1 (7,600 µg/l) and HP-2 (250 µg/l). TPHg was detected in ground water samples collected from all three borings; sample HP-1 contained

49,000 µg/l, sample HP-2 contained 1,800 µg/l, and sample HP-3 contained 370 µg/l. Each Hydropunch® boring was abandoned by filling completely with cement grout containing 5 percent bentonite.

4.0 SUMMARY OF HYDROGEOLOGIC ASSESSMENT

4.1 DISTRIBUTION OF PETROLEUM CONSTITUENTS IN SOIL

AMV has constructed two interpretive cross sections to illustrate the inferred distribution of petroleum constituents in soil underlying the site. The cross section locations are illustrated on Figure 6, and the cross sections are designated A-A' (Figure 7) and B-B' (Figure 8). Both cross sections indicate the area of soil containing TPHg at concentrations exceeding 10 mg/kg is limited to the area beneath and adjacent to the underground storage tank basin. The area of soil containing more than 10 mg/kg TPHg is apparently elongated in the north-south direction (Figure 8) and lies along the western edge of the underground storage tank basin. The maximum concentration of TPHg in soil samples was detected in samples collected from the boring for vapor well VW-1, located at the southwest corner of the former underground storage tank basin. At the time of tank replacement in November 1992, this area of the tank basin contained the highest concentrations of petroleum constituents as documented by soil samples collected during the tank replacement activities. This portion of the tank basin was overexcavated to a depth of 27 feet below grade. The distribution of petroleum constituents in soil above the zone of water table fluctuation west of the underground storage tank basin is defined by soil samples collected from boring B-4 and monitoring well MW-7; to the north, soil samples collected from the boring for monitoring well MW-2 define the extent of petroleum constituents in soil; on the east, soil samples collected from the boring for vapor well VW-3 define the extent of petroleum constituents in soil; and on the south, the distribution of petroleum constituents in soil is defined by soil samples collected from the boring for monitoring well MW-1.

The depth to ground water beneath the site has varied more than 10 feet within the last year. Over a longer period than the historical ground water monitoring record, the variations may have been greater. This relatively wide zone of water table fluctuation has complicated the apparent distribution of petroleum constituents in soil by "smearing" these constituents over a portion of this 10-foot-thick zone of fluctuation. Transport along the water table is probably also responsible for the detection of benzene and TPHg in soil samples collected at 35 and 40 feet below grade in the boring for monitoring well MW-7, located west (down- or crossgradient) of the site.

4.2 DISTRIBUTION OF PETROLEUM CONSTITUENTS IN GROUND WATER

The most recent quarterly monitoring event was conducted by AMV on August 12, 1994. On that date, depth to ground water ranged from 41.03 feet (MW-1) to 45.14 feet (MW-6) below the top of respective well casings. Ground water level measurements are compiled in Table 3. Ground water elevations decreased an average of 9.11 feet between April 25 and August 12, 1994. The inferred direction of ground water flow in August 1994 was generally toward the northwest (Figure 9) which is consistent with previous monitoring results. Gradient in August 1994 was calculated to be approximately 0.03 foot per foot.

Ground water samples collected from each monitoring well (MW-1 through MW-7) except MW-4 in August 1994, contained dissolved benzene. Reported detectable concentrations ranged from 7.3 μg/l in the sample collected from monitoring well MW-3 to 12,000 μg/l in the sample collected from monitoring well MW-6. Ground water sample analytical results from August 1994 are compiled with previous results in Table 4. The inferred distribution of dissolved benzene in monitoring wells on August 12, 1994 is illustrated in Figure 10. Figure 11, which illustrates the inferred distribution of benzene in ground water in the area of the site (including the property lying northwest of the site), was constructed using the monitoring well data from August 1994 and the Hydropunch® water sample data from July 1994. The addition of the Hydropunch® data indicates that the downgradient extent of dissolved petroleum constituents in ground water is defined with the analytical results of the ground water sample collected from HP-3 (which contained less than detectable benzene concentrations).

5.0 DISCUSSION OF REMEDIATION ALTERNATIVES

As discussed in Section 4.0, the delineation of petroleum constituents in soil and ground water beneath the site appears to be complete. The extent of migration of ground water containing these constituents is defined. This section outlines an interim course of action for the remediation of soil and ground water underlying the site which contain petroleum constituents. The remediation activities discussed in this section have three goals:

1. Gradient control and prevention of further off-site migration of ground water containing dissolved petroleum constituents.

2. Removal of petroleum constituents from ground water underlying the site.

3. Removal of petroleum constituents from soil underlying the site.

5.1 REMOVAL OF PETROLEUM CONSTITUENTS FROM GROUND WATER

Strategies considered for interim remediation of ground water containing dissolved petroleum constituents include:

- Passive Remediation
- Ground Water Pumping and Aboveground Treatment
- Vapor Extraction
- Vapor Extraction With Air Sparging

5.1.1 Passive Remediation

Passive remediation relies on existing natural processes to restrict migration of dissolved petroleum constituents in ground water and remove these constituents from ground water. Continued volatilization and biodegradation of petroleum constituents in ground water and soil within the zone of water table fluctuation would be expected to reduce concentrations of these constituents with time. The available data indicate that while these natural mechanisms may be operating to restrict movement of the petroleum constituents in ground water, considerable off-site migration has already occurred. Passive remediation at this site is apparently not sufficient to prevent migration of petroleum constituents beyond acceptable limits.

5.1.2 Ground Water Pumping and Aboveground Treatment

This remediation alternative involves recovery of ground water by pumping from one or more extraction wells. After aboveground treatment, possibilities for disposal of the ground water include discharge to the sanitary or storm sewer.

Implementation of ground water pumping constitutes a method for both controlling the migration of and removing petroleum constituents from ground water beneath the site. The pumping test on monitoring well MW-2 described in Section 3.1.1 indicates that this well will yield approximately 1.5 gpm (or less) on a long-term, continuous basis. The calculated extent of the capture zone resulting from this short-term pumping test was about 170 feet crossgradient and 25 feet downgradient of the pumping well. Sustained, continuous pumping may be expected to result in a larger capture zone.

In general, implementation of ground water pumping by itself is not a time-effective remedial technique. At many sites, multi-year operation of ground water pumping alone has not resulted in satisfactory remediation of ground water containing petroleum constituents. At sites where ground water flow velocities are high and off-site migration of ground water containing petroleum constituents represents a risk to potential receptors, ground water pumping can

provide a positive means of controlling migration. The downgradient extent of the dissolved petroleum constituent plume at this site indicates that intervention to control incremental off-site migration of petroleum constituents in ground water is appropriate.

Drawbacks to implementing ground water pumping at this site include the cost to design, permit, construct, operate, monitor, and maintain a system. The treatment of the ground water results in removal of petroleum constituents either by adsorption onto carbon or air stripping and discharge to the atmosphere. In either case, the constituents removed from ground water must be disposed of in some manner, creating another potential source of contamination. The treated ground water must then be discharged to the sanitary sewer (if allowed) or to the storm sewer (surface waters); either situation creates the possibility of accidental discharge of ground water containing residual petroleum constituents. Ground water pumping (even at low rates) disrupts the ambient flow conditions, and can potentially result in migration of ground water impacted by off-site sources onto the former Beacon site.

are there any off site sources?

5.1.3 Vapor Extraction

Though typically considered a soil remediation technology, utilization of vapor extraction for removing dissolved hydrocarbons from ground water can be viable under certain conditions. A vapor extraction system operates on the concepts of vapor-liquid equilibrium and vapor flow through soil. Upon applying vacuum to the soil overlying the water table, the reduced pressure in the overlying soil vapor causes the volatile hydrocarbons dissolved in ground water to move from the liquid to the vapor phase. The induced vacuum extraction airflow above the water table surface removes the hydrocarbon-enriched vapors. Because the vapor extraction flow continually removes the hydrocarbons that migrate from the ground water into the soil vapor, a state of disequilibrium exists. The volatilization of dissolved hydrocarbons from the ground water into the overlying soil vapor will continue as the system moves toward equilibrium.

In addition, vapor extraction can promote natural biodegradation of dissolved hydrocarbons by providing a continual source of fresh oxygen to stimulate indigenous microorganisms, which convert the hydrocarbons to carbon dioxide and water. At the same time, vapor extraction would be removing the hydrocarbons in the soil above the water table that presumably impacted ground water in the past, and could potentially impact ground water again. A possible limitation of vapor extraction, and one that may render this method inappropriate for ground water remediation at this site, is inability to control migration of dissolved hydrocarbons in ground water.

Disadvantages of this method are the costs associated with design, permitting, installation, maintenance, monitoring, and operation of the vapor extraction system. In addition, as with ground water extraction, petroleum constituents extracted with soil vapors would be discharged to the atmosphere or collected in carbon canisters through adsorption, with the attendant disposal difficulties.

5.1.4 Vapor Extraction With Air Sparging

The use of air sparging can enhance the effectiveness of vapor extraction for removing dissolved hydrocarbons from ground water. Sparging air into the water table within the zone of influence of vapor extraction wells can speed remediation by means of air stripping dissolved hydrocarbons from the ground water as the air passes through the ground water enroute to the vapor extraction wells. Furthermore, introduction of air via sparging would provide additional oxygen for enhancing the biologic breakdown of hydrocarbon compounds in the subsurface. With strategically located sparge points, air sparging has the additional possible benefit of controlling the migration of ground water containing dissolved hydrocarbons.

The disadvantages of this method are the costs associated with design, permitting, installation, maintenance, monitoring, and operation of the vapor extraction system. In addition, petroleum constituents extracted with soil vapors would need to be discharged to the atmosphere or collected in carbon canisters through adsorption, with the attendant disposal difficulties and the potential for contact during waste handling and transport.

5.2 Removal of Petroleum Constituents from Soil

Strategies considered for removing petroleum hydrocarbons from soil underlying the site include:

- Passive Remediation
- Soil Vapor Extraction

5.2.1 Passive Remediation

This alternative involves leaving the petroleum constituents in the soil and leaving the soil unaltered. Continuing natural volatilization and biodegradation of petroleum constituents in soil would be expected to reduce concentrations of petroleum constituents with time. These natural agents may have already attenuated the hydrocarbon impact to a certain degree.

While this method will take substantially longer than more active remedial strategies, low cost and low impacts to property use make it attractive at sites where monitoring indicates that the potential for receptor contact with impacted soil and ground water is low. Because off-site

migration of dissolved petroleum constituents in ground water has been documented at this site, this option may not be appropriate. If this option were to be selected, it would be necessary to continue (and probably augment) the existing ground water monitoring program to verify that the movement of petroleum constituents from soil to ground water does not result in incremental migration of dissolved petroleum constituents in ground water and movement to points of potential or existing use.

5.2.2 Soil Vapor Extraction

Soil vapor extraction utilizes a vapor extraction well (or wells) to remove volatile hydrocarbons from the soil matrix. A vacuum applied to the extraction well results in the removal of soil vapors from the subsurface, accompanied by volatilization of petroleum constituents out of the soil matrix. Depending on the concentration levels of hydrocarbons entrained in the extracted vapor, the extracted soil vapors are either discharged directly to the atmosphere or treated before discharge to the atmosphere. The treatment would destroy or remove hydrocarbons from the discharged air in accordance with the local regulatory agency air discharge requirements. Extraction rates vary with the consistency, moisture content, and grain size of the soil horizon. In addition to the extraction benefit, soil venting can also be effective at promoting biologic breakdown of petroleum hydrocarbon compounds contained in soil and ground water by the introduction of additional oxygen into the subsurface.

The vacuum radius of influence and initial recovered petroleum constituent concentrations noted during the soil vapor extraction test (Section 3.1.2) indicated that application of this technology would remove petroleum constituents from soil at this site. However, the zone of vacuum influence during the short-term testing was determined to be only 10 or 15 feet from each test extraction point, lower than anticipated given the gravel content of some soil units underlying the site. The concentrations of petroleum constituents in extracted vapors was also somewhat lower than anticipated, given the apparent extent of the dissolved petroleum constituent plume in ground water. However, test results did indicate that use of soil vapor extraction at this site would result in removal of petroleum constituents from soil underlying the site.

Disadvantages of this method include the costs associated with design, permitting, installation, maintenance, monitoring, and operation of the vapor extraction system. In addition, as with ground water extraction, petroleum constituents extracted with soil vapors would need to be discharged to the atmosphere or collected in carbon canisters through adsorption, with the attendant disposal difficulties.

6.0 RECOMMENDATIONS FOR INTERIM REMEDIATION

Based on data discussed in this report regarding the downgradient extent of petroleum constituents in ground water, it appears that intervention is warranted to reduce the likelihood that incremental off-site migration of ground water containing dissolved petroleum constituents will occur and to intercept ground water containing petroleum constituents that have previously migrated beyond site boundaries. At this time, the most effective way to accomplish this is implementation of ground water pumping and aboveground treatment using monitoring well MW-2 and additional extraction wells to be installed on downgradient property. The exact location of the proposed additional monitoring wells cannot be specified prior to discussions with the owners/managers of the Arcade Shopping Center, located northwest of the site. It is also possible that Ultramar could utilize an existing ground water pumping system, located on the Arcade Shopping Center property, to extract ground water at a downgradient location. Implementation of ground water pumping from these wells is intended to intercept ground water that would otherwise move downgradient from the site, and to recover ground water currently located northwest of the site containing dissolved petroleum constituents. Besides migration control, this method has the added benefit of recovering and treating ground water containing petroleum constituents. Implementation of this plan would necessitate alteration of monitoring well MW-2 to allow use as a ground water extraction well. This would involve changes to the casing riser to accept pump installation and a water discharge line. Underground piping will be used to convey the recovered ground water from the well to the aboveground treatment system, to be located as indicated on Figure 12. After treatment with carbon or air stripping, water will be discharged to the sanitary or storm sewer system, under appropriate permit.

To address petroleum constituents remaining in soil above the water table, the use of soil vapor extraction is recommended. Although performance of a short-term test indicated a relatively limited zone of vacuum influence associated with vapor extraction, implementation of this alternative will have the added benefit of increased oxygen circulation in the subsurface, which will enhance bacteriological breakdown of petroleum hydrocarbons in soil. Soil vapor extraction will also aid in the removal of petroleum constituents from ground water by reducing the concentration of these constituents in soil above the water table. It is recommended that vapor extraction wells VW-1 and VW-2 and proposed vapor extraction wells VW-4, VW-5, VW-6, and VW-7 (Figure 12) be used as vapor extraction points. These extraction points will be valved to allow any combination of vapor extraction points to operate simultaneously. Vapors will be extracted by means of a blower installed within the treatment system area designated on Figure 12. Extracted vapors will be conveyed to the treatment system via underground piping. After treatment with vapor-phase carbon, the vapors will be discharged to the atmosphere under appropriate permit.

7.0 REMARKS

It is recommended that a copy of this report be submitted to:

Ms. Eva Chu
Department of Environmental Health
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, 2nd Floor
Alameda, California 94502

Mr. Cecil Fox
California Regional Water Quality Control Board,
San Francisco Bay Region
2101 Webster Street, Suite 500
Oakland, California 94612

The opinions and conclusions contained in this report represent our professional opinions. These opinions are based in part, on information provided by the client and were developed in accordance with currently accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied nor intended.

TABLE 1

TANK EXCAVATION
[redacted] SAMPLE ANALYTICAL RESULTS
Beacon Service Station No. 604
1619 West First Street, Livermore, CA
Concentrations in parts per million ([redacted])

Sample	Date of Collection	Depth of Sample (feet)	Benzene	Toluene	Ethylbenzene	Xylenes	TPHg[a]	Total Lead
Unleaded plus-East	11-10-92	14	<0.005	<0.005	<0.005	<0.005	<0.050	NA[b]
Unleaded plus-West	11-10-92	14	<0.50	<0.50	0.58	[redacted]	600	6.5
	11-10-92	16	<0.005	<0.005	<0.005	0.0066	<0.50	NA
Unleaded-East	11-10-92	14	<0.005	<0.005	<0.005	<0.005	<0.50	NA
Unleaded-West	11-10-92	14	<0.50	0.91	18	170	1,800	5.6
	11-10-92	19	<5.0	160	110	700	4,700	NA
Unleaded-SW	11-12-92	27	1.4	22	9.3	70	490	NA
Premium Unleaded-East	11-10-92	14	<0.005	<0.005	<0.005	<0.005	<0.50	NA
Premium Unleaded-West	11-10-92	14	<0.005	<0.005	<0.005	<0.005	<0.50	NA
Product Line #1	11-10-92	2.5	<0.005	<0.005	<0.005	<0.005	<0.50	NA
Product Line #2	11-10-92	2.5	<0.005	<0.005	<0.005	<0.005	<0.50	NA
Product Line #3	11-10-92	2.5	<0.005	<0.005	<0.005	0.008	<0.50	NA
Product Line #4	11-10-92	2.5	<0.005	0.029	0.041	1.2	4.4	NA
Product Line #5	11-10-92	2.5	<0.005	<0.005	<0.005	0.10	2.7	NA

[a]TPHg = Total petroleum hydrocarbons as gasoline.
[b]NA = Not analyzed.

TABLE 2

SOIL SAMPLE ANALYTICAL RESULTS - May and June, 1993
Beacon Service Station No. 604
1619 West First Street, Livermore, CA
Concentrations in milligrams per kilogram (mg/kg)

Boring No.	Sample No.	Depth (feet below grade)	Date Sampled	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPHg*
VW-1	6	30	05-27-93	<0.50	4.3	2.6	17	280
	7	35	05-27-93	0.20	0.45	0.11	0.56	11
	8	40	05-27-93	1.8	16	5.3	32	340
VW-2	4	20	05-28-93	<0.50	4.0	4.0	25	200
	6	30	05-28-93	0.018	0.15	0.044	0.23	3.5
	7	35	05-28-93	0.021	0.024	0.0086	0.056	<1.0
VW-3	4	20	06-01-93	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
	5	25	06-01-93	0.017	<0.0050	<0.0050	<0.0050	<1.0
	6	30	06-01-93	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
	7	35	06-01-93	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
MW-1	5	25	05-27-93	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
	6	30	05-27-93	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
	7	35	05-27-93	0.029	0.015	0.0051	0.031	<1.0
MW-2	4	20	05-27-93	<0.0050	<0.0050	<0.0050	0.037	6.4
	5	25	05-27-93	0.057	0.099	0.026	0.22	1.5
	6	30	05-27-93	0.040	0.065	0.0070	0.051	<1.0
	7	35	05-27-93	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
MW-3	5	25	05-28-93	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
	6	30	05-28-93	<0.0050	<0.0050	<0.005	<0.0050	<1.0
	7	35	05-28-93	<0.0050	<0.0050	<0.005	<0.0050	<1.0
B-4	4	20	06-01-93	<0.0050	<0.0050	<0.0050	0.020	<1.0
	5	25	06-01-93	<0.050	0.27	0.18	1.7	16
	6	30	06-01-93	0.17	0.044	0.013	0.057	<1.0
	7	35	06-01-93	0.073	0.11	0.30	0.65	55

TABLE 4

GROUND WATER SAMPLE ANALYTICAL RESULTS
Beacon Service Station #604
1619 West First Street, Livermore, CA
Concentrations in micrograms per liter

Monitoring Well	Date Sampled	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPHg[a]
MW-1	06-01-93	2,200	400	<50	4,900	27,000
	06-22-93	8,000	10,000	260	10,000	87,000
	10-06-93	4,700	6,500	740	5,300	40,000
	01-13-94	1,300	950	110	850	9,400
	04-25-94	1,500	1,800	290	1,700	11,000
	08-12-94	550	330	260	1,400	11,000
MW-2	06-01-93	20,000	21,000	3,300	18,000	170,000
	06-22-93	19,000	22,000	3,500	18,000	160,000
	10-06-93	17,000	17,000	3,000	15,000	110,000
	01-13-94	20,000	19,000	2,300	14,000	93,000
	04-25-94	9,600	7,300	840	7,800	41,000
	08-12-94	11,000	11,000	2,300	11,000	59,000
MW-3	06-01-93	4.6	<0.50	<0.50	1.9	270
	06-22-93	8.2	<0.50	<0.50	0.72	160
	10-06-93	57	110	24	120	740
	01-13-94	2.6	0.67	0.78	4.2	83
	04-25-94	0.75	3.2	0.50	3.6	60
	08-12-94	7.3	14	2.6	13	310
MW-4	03-30-94	4.2	15	2.5	26	120
	04-25-94	<0.50	1.8	<0.50	2.1	65
	08-12-94	<0.50	<0.50	<0.50	<0.50	<50
MW-5	03-30-94	1,300	20	<13	160	7,500
	04-25-94	1,100	41	130	740	6,500
	08-12-94	420	2.9	41	98	4,000
MW-6	03-30-94	21,000	8,600	1,700	12,000	63,000
	04-25-94	22,000	12,000	2,300	16,000	77,000
	08-12-94	12,000	8,100	2,200	16,000	65,000
MW-7	03-30-94	7,200	2,400	1,600	11,000	43,000
	04-25-94	3,900	1,000	940	6,900	30,000
	08-12-94	3,800	1,400	1,300	7,500	30,000

TABLE 3

HISTORIAL GROUND WATER ELEVATION DATA
Beacon Service Station #604
1619 West First Street, Livermore, California

Monitoring Well	Date	Top of Riser (feet)	Depth of Water (feet)	Ground Water Elevation (feet)	Physical Observation
MW-1	06-01-93	100.00	37.50	62.50	No Product
	06-22-93		38.46	61.54	No Product
	10-06-93		42.22	57.78	No Product
	01-13-94		34.52	65.48	No Product
	03-30-94		31.93	68.07	No Product
	04-25-94		33.49	66.51	No Product
	08-12-94		41.03	58.97	No Product
MW-2	06-01-93	98.68	38.02	60.66	No Product
	06-22-93		39.07	59.61	No Product
	10-06-93		43.72	54.96	No Product
	01-13-94		35.85	62.83	No Product
	03-30-94		32.82	65.86	No Product
	04-25-94		34.76	63.92	No Product
	08-12-94		44.33	54.35	No Product
MW-3	06-01-93	97.08	36.18	61.90	No Product
	06-22-93		37.11	61.97	No Product
	10-06-93		41.15	55.93	No Product
	01-13-94		33.95	63.13	No Product
	03-30-94		30.97	66.11	No Product
	04-25-94		32.46	64.62	No Product
	08-12-94		41.72	55.36	No Product
MW-4	03-30-94	99.35	31.56	67.79	No Product
	04-25-94		32.73	66.62	No Product
	08-12-94		41.61	57.74	No Product
MW-5	03-30-94	98.37	32.07	66.30	No Product
	04-25-94		33.65	64.72	No Product
	08-12-94		42.73	55.64	No Product
MW-6	03-30-94	97.62	33.38	64.24	No Product
	04-25-94		35.49	62.13	No Product
	08-12-94		45.14	52.48	No Product
MW-7	03-30-94	98.03	31.98	66.05	No Product
	04-25-94		33.56	64.47	No Product
	08-12-94		43.35	54.68	No Product

Note: Monitoring well casing elevations were surveyed relative to an arbitrary bench mark at the top of the casing of monitoring well MW-1 with an assumed elevation of 100.00 feet.

TABLE 5

SOIL SAMPLE ANALYTICAL RESULTS
Beacon Service Station #604 - March 1994
(concentrations in milligrams per kilogram)

Boring No.	Sample No.	Date Sampled	Depth (feet below grade)	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPHg[a]
MW-4	MW4-6	03-30-94	30	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
	MW4-7		35	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
MW-5	MW5-6	03-29-94	30	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
	MW5-7		35	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
MW-6	MW6-6	03-29-94	30	0.65	1.7	0.72	4.6	42
	MW6-7		35	0.061	0.16	0.094	0.55	3.7
MW-7	MW7-4	03-30-94	20	<0.0050	<0.0050	<0.0050	<0.0050	<1.0
	MW7-7		35	0.016	0.013	0.025	0.048	4.9
	MW7-8		40	0.064	0.029	0.065	0.39	8.8

[a]TPHg = total petroleum hydrocarbons as gasoline.

TABLE 6

HYDROPUNCH® BORINGS, JULY 1994
SOIL SAMPLE ANALYTICAL RESULTS
Beacon Service Station #604
1619 West First Street, Livermore, CA
(concentrations in milligrams per kilogram)

Boring No.	Sample No.	Date Sampled	Depth (feet below grade)	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPHg[a]
HP-1	HP1-4 (40')	07-07-94	40	0.012	0.0072	0.011	0.12	5.2
HP-2	HP2-4	07-08-94	40	<0.0050	<0.0050	<0.0050	0.040	<1.0
HP-3	HP3-4	07-08-94	40	<0.0050	<0.0050	<0.0050	<0.0050	1.9[b]

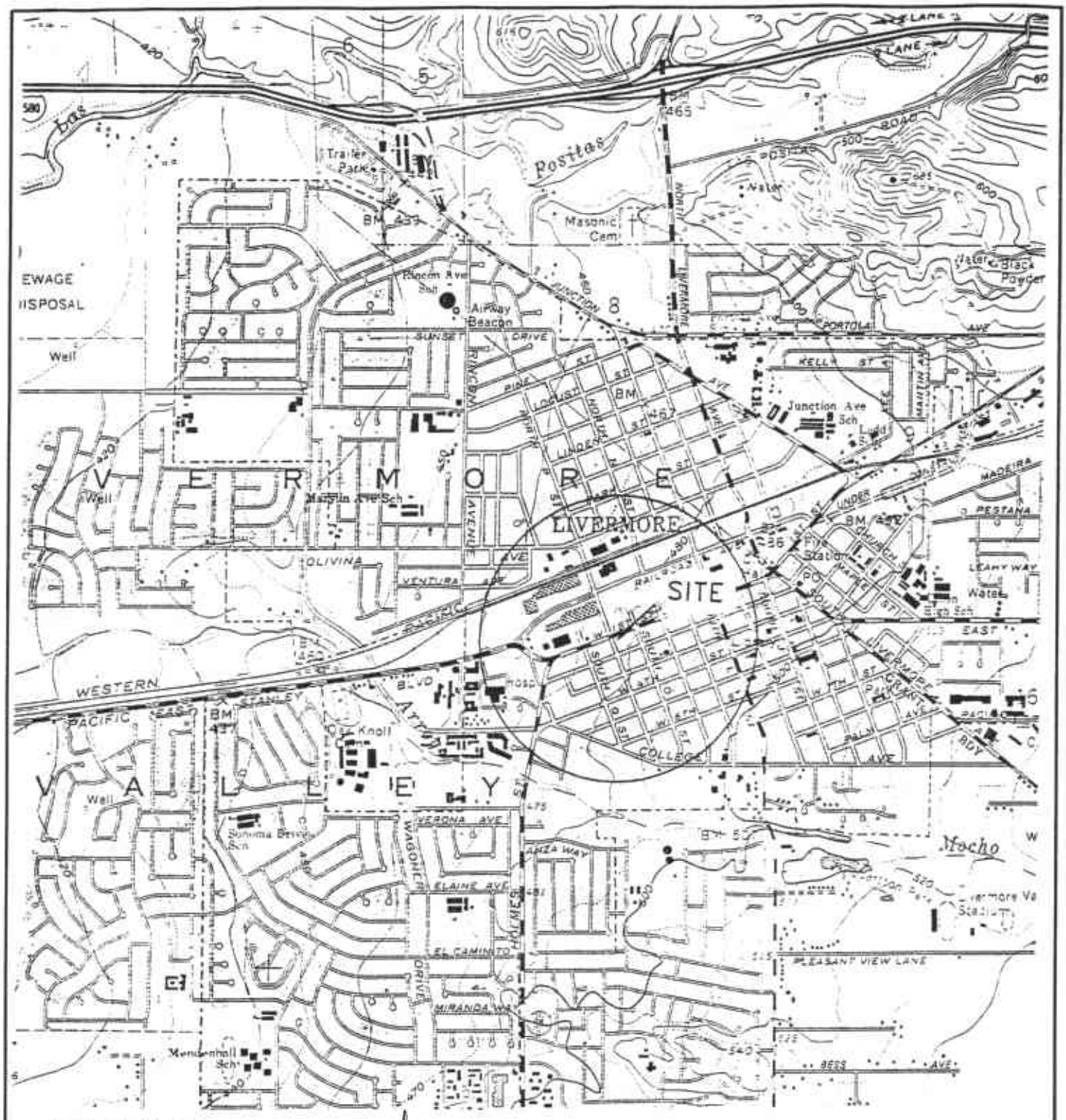
[a]TPHg = total petroleum hydrocarbons as gasoline.
[b]Laboratory report states "Product is not typical gasoline."

TABLE 7

HYDROPUNCH® GROUND WATER SAMPLE
ANALYTICAL RESULTS - July 1994
Beacon Service Station #604
1619 West First Street, Livermore, CA
concentrations in micrograms per liter (μg/l)

Boring/Sample Identification	Date Collected	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPHg[a]
HP-1	07-07-94	7,600	560	2,800	19,000	49,000
HP-2	07-08-94	250	3.2	20	200	1,800
HP-3	07-08-94	<0.50	0.50	0.64	4.0	370

[a]TPHg = total petroleum hydrocarbons as gasoline.



General Notes

Base Map from U.S.G.S.
Livermore, California
7.5 Minute Topographic
Photorevised 1980

QUADRANGLE LOCATION

CALIF

Approximate Scale
(in feet)

FIGURE 1

SITE LOCATION MAP
BEACON STATION #604
1610 NEST FIRST STREET
LIVERMORE, CALIFORNIA

Project No.	Drawn
19024	LMC
File No.	Prepared
FIG1	SAL
Revision	Reviewed

Acton • Mickelson • Van Dam, Inc.
Consulting Scientists, Engineers, and Geologists
4511 Golden Foothill Parkway, Suite 1
El Dorado Hills, California 95762
(916) 939-7550

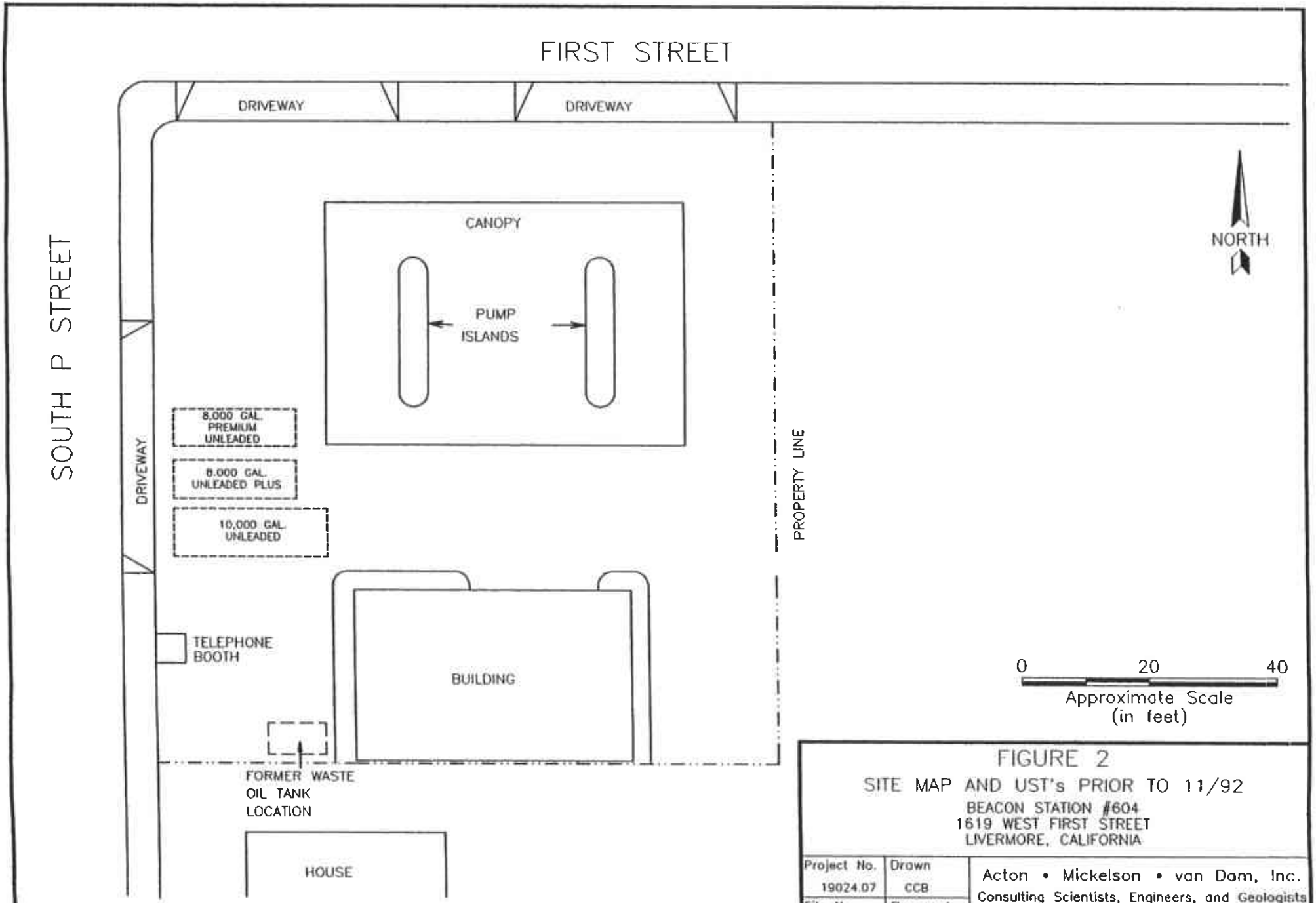


FIGURE 2

SITE MAP AND UST's PRIOR TO 11/92

BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Project No. 19024.07	Drawn CCB
File No. IR02SM	Prepared DvD
Revision 0	Reviewed

Acton • Mickelson • van Dam, Inc.
Consulting Scientists, Engineers, and Geologists
4511 Golden Foothill Parkway, #1
El Dorado Hills, California 95762
(916) 939-7550

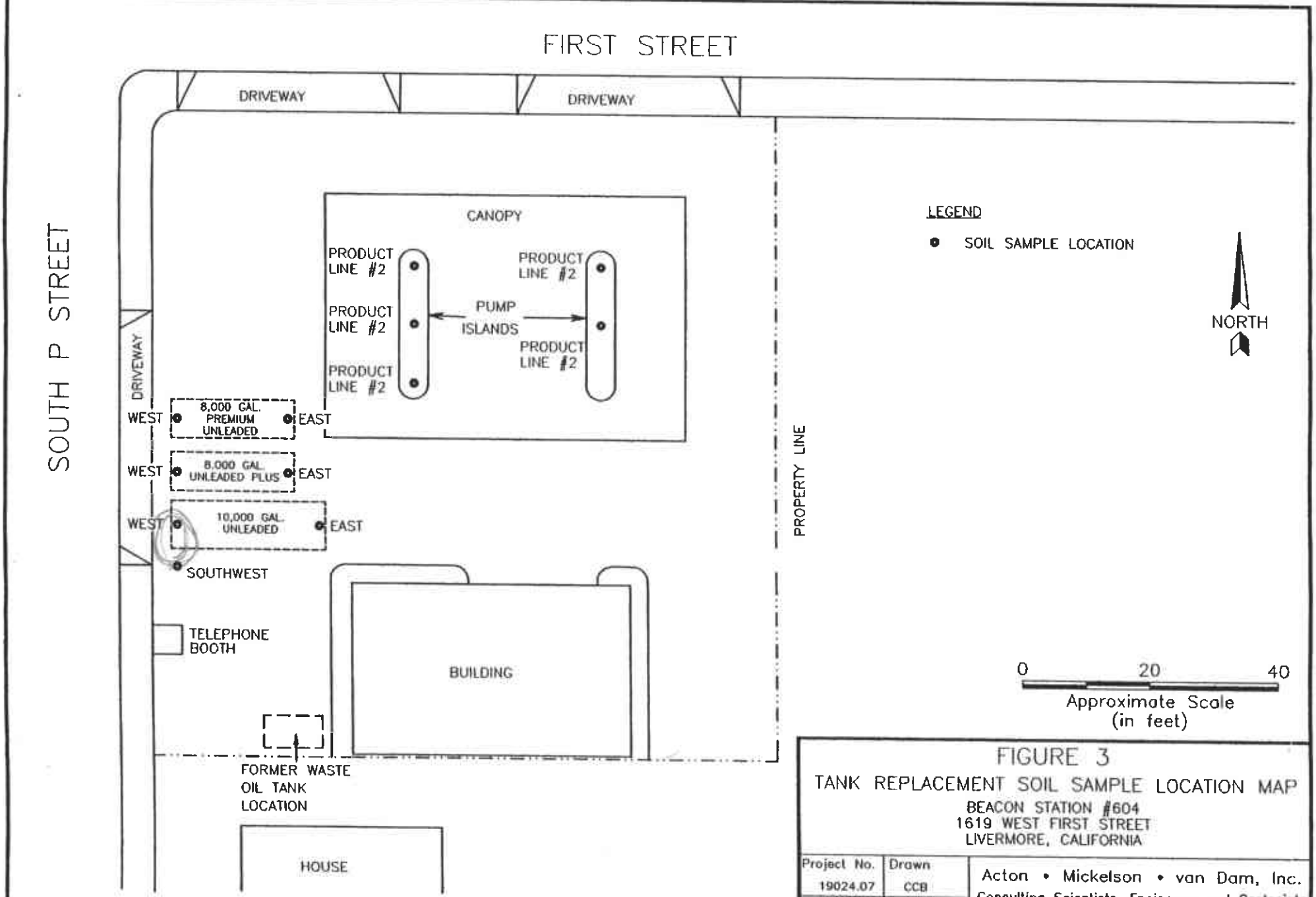


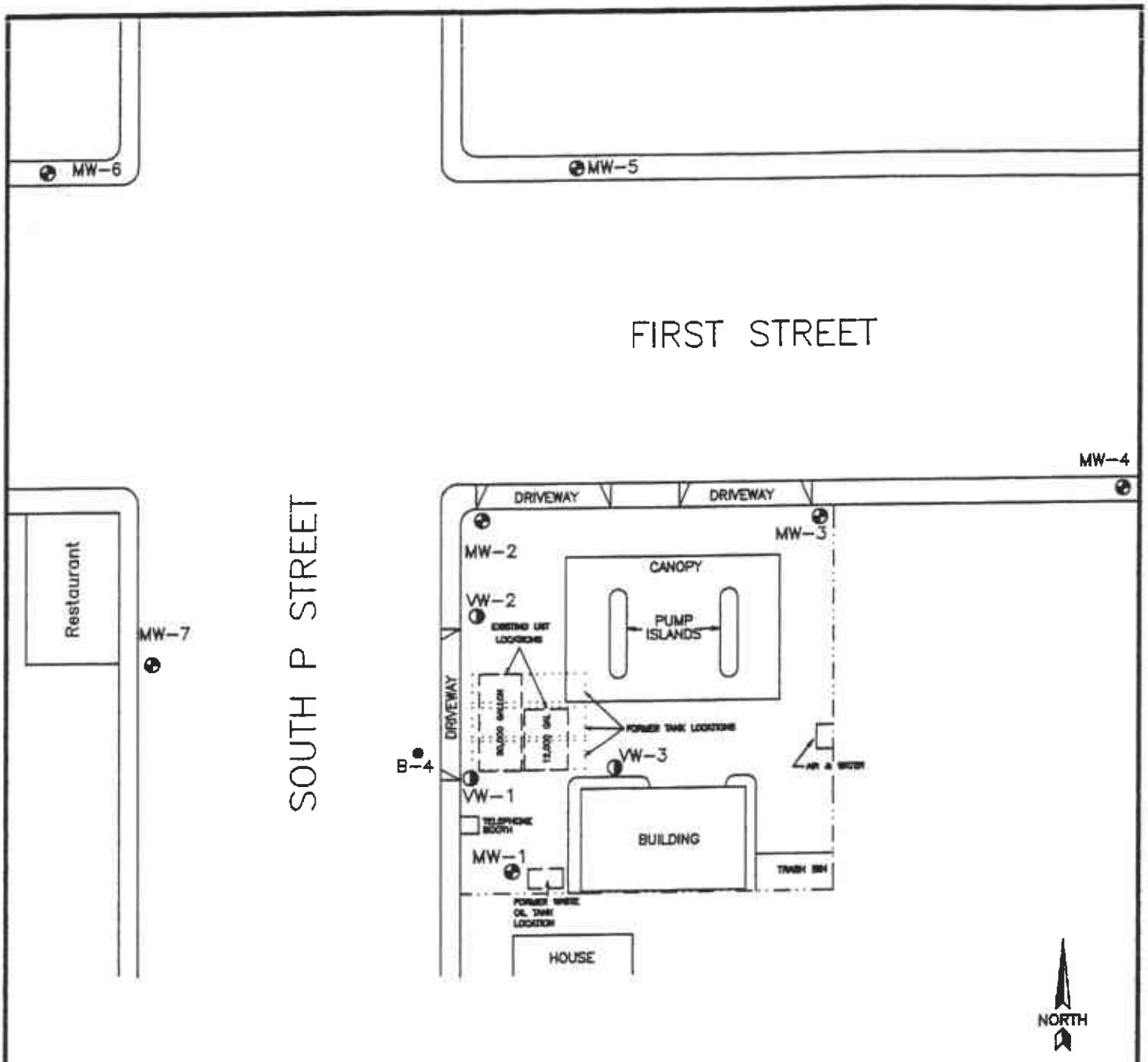
FIGURE 3

TANK REPLACEMENT SOIL SAMPLE LOCATION MAP

BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Project No. 19024.07	Drawn CCB
File No. IR03SSLM	Prepared DvD
Revision 0	Reviewed

Acton • Mickelson • van Dam, Inc.
Consulting Scientists, Engineers, and Geologists
4511 Golden Foothill Parkway, #1
El Dorado Hills, California 95762
(916) 939-7550



LEGEND

VW-3 VADOSE WELL LOCATION AND NUMBER

MW-3 MONITORING WELL LOCATION AND NUMBER

B-4 SOIL BORING LOCATION AND NUMBER

PROPERTY BOUNDARY

FIGURE 4

SITE MAP

BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Project No.	Drawn
19024.04	CCB
File No.	Prepared
IR04SM	TAD
Revision	Reviewed

Acton • Mickelson • van Dam, Inc.
Consulting Scientists, Engineers, and Geologists
4511 Golden Foothill Parkway, Suite 1
El Dorado Hills, California 95762
(916) 939-7550

BUILDING

BUILDING

HP-2

HP-3

ARCADE SHOPPING CENTER

HP-1

BUILDING

PARKING

MW-1

PARKING

BUILDING

MW-6

SOUTH P STREET

MW-5

FIRST STREET

SOUTH Q STREET

RESTAURANT

MW-7

MW-2

MW-3

MW-4

MW-1

NORTH

LEGEND

- VW-3 — VADOSE WELL LOCATION AND NUMBER
- MW-3 — MONITORING WELL LOCATION AND NUMBER
- MW-1 — MONITORING WELL LOCATION AND NUMBER (INSTALLED BY OTHERS)
- B-4 — SOIL BORING LOCATION AND NUMBER
- HP-1 — HYDROPUNCH LOCATION AND NUMBER
- PROPERTY BOUNDARY
- AREA OF INVESTIGATION

0 75 150

Approximate Scale (in feet)

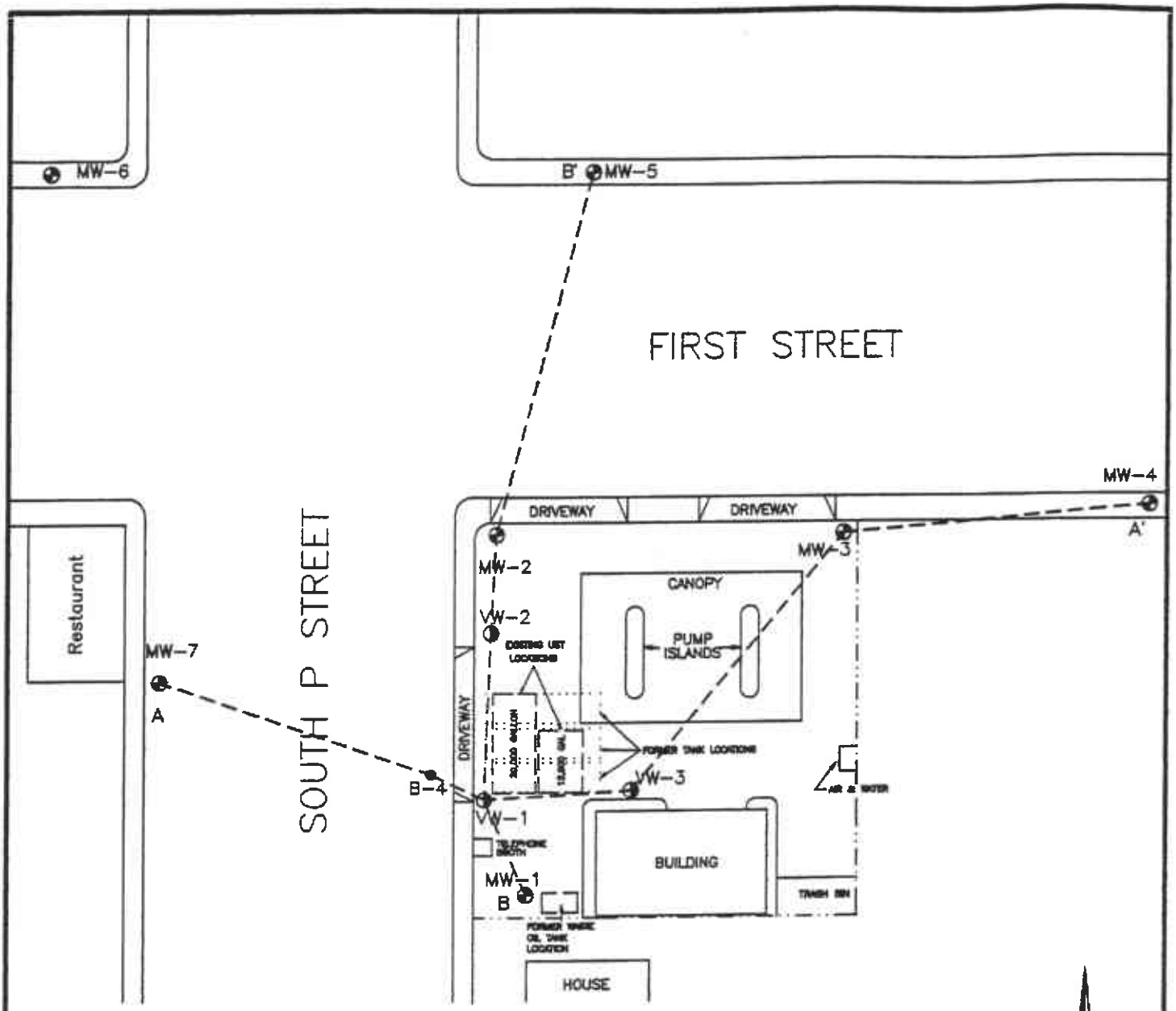
FIGURE 5

HYDROPUNCH SAMPLING LOCATIONS

BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Project No.	Drawn
19024.07	CCB
File No.	Prepared
IR05SSLM	DvD
Revision	Reviewed
0	

Acton • Mickelson • van Dam, Inc.
Consulting Scientists, Engineers, and Geologists
4511 Golden Foothill Parkway, #1
El Dorado Hills, California 95762
(916) 939-7550



LEGEND

- VW-3 — VADOSE WELL LOCATION AND NUMBER
- MW-3 — MONITORING WELL LOCATION AND NUMBER
- B-4 — SOIL BORING LOCATION AND NUMBER
- PROPERTY BOUNDARY

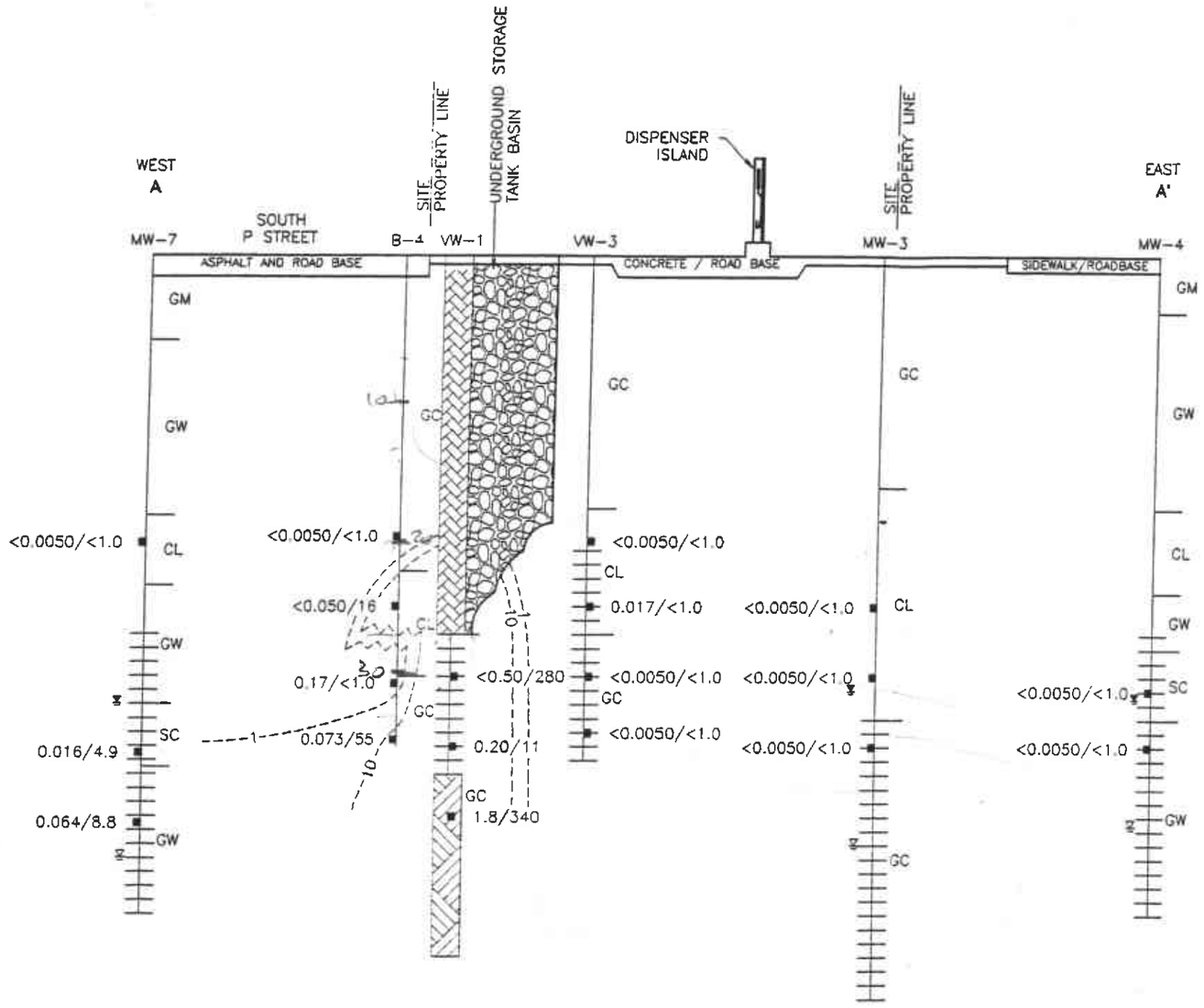
FIGURE 6

CROSS SECTION LOCATION MAP

BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

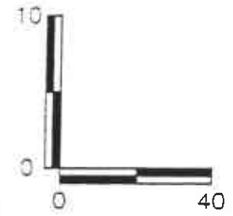
Project No.	Drawn
19024.04	CCB
File No.	Prepared
IR06FD	TAD
Revision	Reviewed

Acton • Mickelson • van Dam, Inc.
Consulting Scientists, Engineers, and Geologists
4511 Golden Foothill Parkway, Suite 1
El Dorado Hills, California 95762
(916) 939-7550



LEGEND

- WATER LEVEL ON 8/12/94
- WATER LEVEL ON 3/30/94
- <0.0050/<1.0 BENZENE/TPHg CONCENTRATION IN MILLIGRAMS PER KILOGRAM
- SAMPLED INTERVAL
- SCREENED INTERVAL
- CONDUCTOR CASING
- BENTONITE BACKFILL



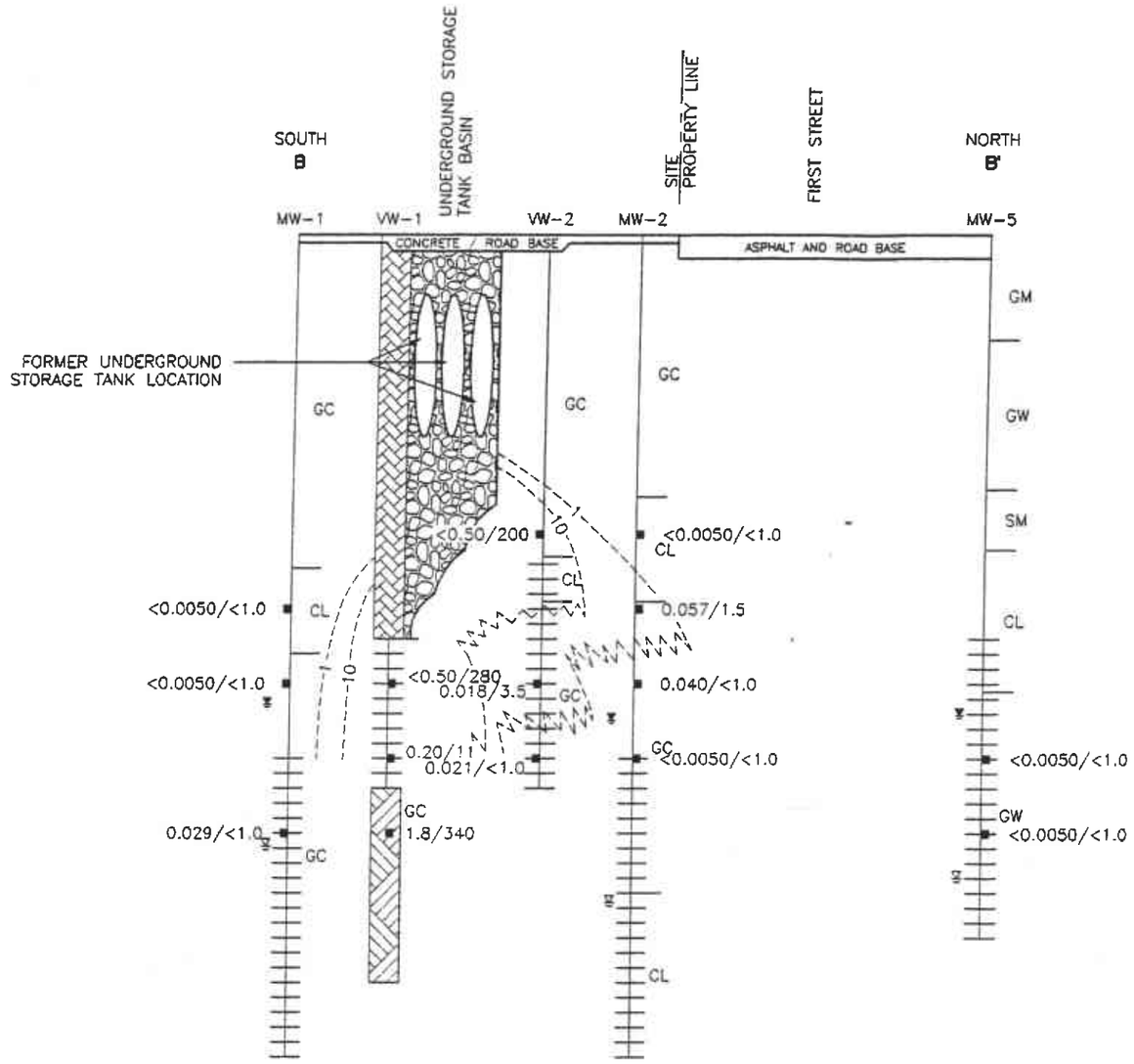
Approximate Scale
Measured In Feet
(Vertical Exaggeration: 4X)

FIGURE 7
GEOLOGIC CROSS SECTION A–A'

BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Project No.	Drawn
19024.07	CCB
File No.	Prepared
IR07XSEC	DvD
Revision	Reviewed
0	

Acton • Mickelson • van Dam, Inc.
Consulting Scientists, Engineers, and Geologists
4511 Golden Foothill Parkway, #1
El Dorado Hills, California 95762
(916) 939-7550



LEGEND

- WATER LEVEL ON 8/12/94
- WATER LEVEL ON 3/30/94
- <0.0050/<1.0 BENZENE/TPHg CONCENTRATION IN MILLIGRAMS PER KILOGRAM
- SAMPLED INTERVAL
- SCREENED INTERVAL
- CONDUCTOR CASING
- BENTONITE BACKFILL

10
0
0
40

Approximate Scale
Measured In Feet
(Vertical Exaggeration: 4x)

FIGURE 8

GEOLOGIC CROSS SECTION B-B'

BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Project No. 19024.07	Drawn CCB
File No. IR08XSEC	Prepared DVO
Revision 0	Reviewed

Acton • Mickelson • van Dam, Inc.
Consulting Scientists, Engineers, and Geologists
4511 Golden Foothill Parkway, #1
El Dorado Hills, California 95762
(916) 939-7550

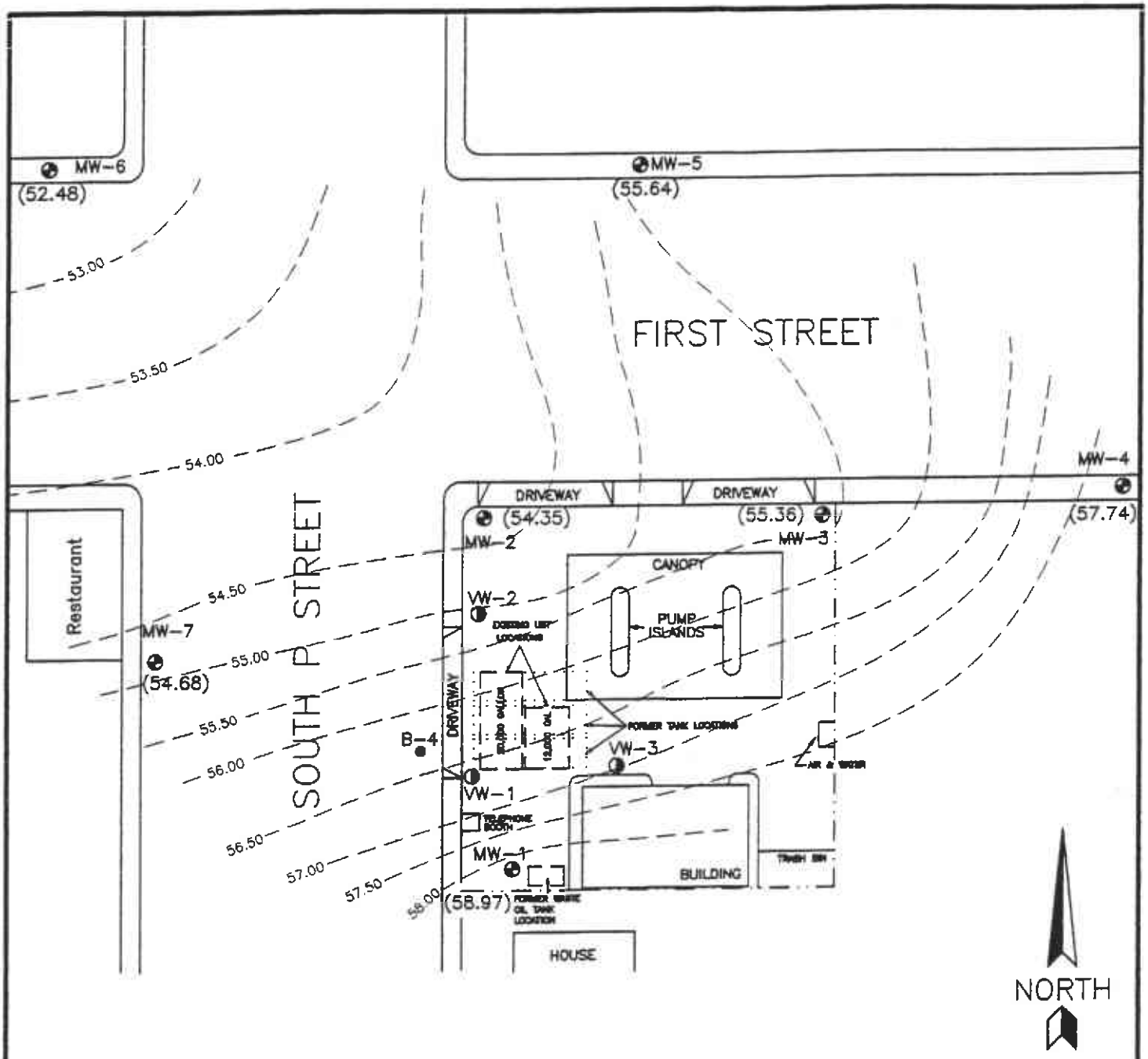


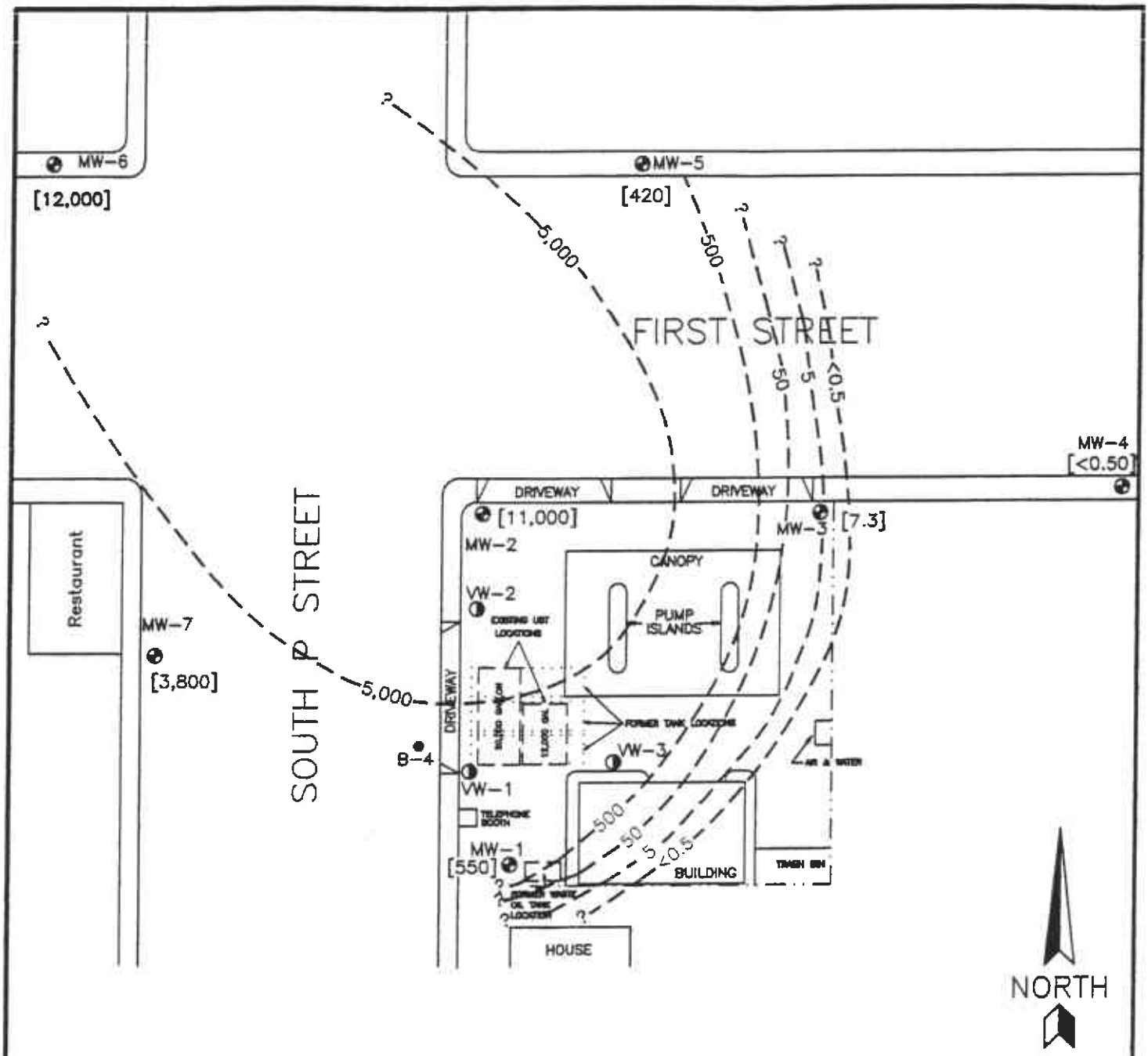
FIGURE 9

GROUND WATER TABLE CONTOUR MAP (08/12/94)

BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Project No. 19024.04	Drawn LMC
File No. QM84WTC9	Prepared RCG
Revision	Reviewed

Acton • Mickelson • van Dam, Inc.
Consulting Scientists, Engineers, and Geologists
4511 Golden Foothill Parkway, Suite 1
El Dorado Hills, California 95762
(916) 939-7550



LEGEND

- VW-3 — VADOSE WELL LOCATION AND NUMBER
- MW-3 — MONITORING WELL LOCATION AND NUMBER
- B-4 — SOIL BORING LOCATION AND NUMBER
- PROPERTY BOUNDARY
- [4.2] — BENZENE CONCENTRATION IN MICROGRAMS PER/LITER
- 5 — BENZENE ISOCONCENTRATION CONTOUR IN MICROGRAMS PER/LITER

FIGURE 10
INFERRED DISTRIBUTION OF BENZENE IN GROUND WATER (08/12/94)

BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Project No.	Drawn
19024.04	CCB
File No.	Prepared
QM84ICDA	RCG
Revision	Reviewed

Acton • Mickelson • van Dam, Inc.
Consulting Scientists, Engineers, and Geologists
4511 Golden Foothill Parkway, Suite 1
El Dorado Hills, California 95762
(916) 939-7550

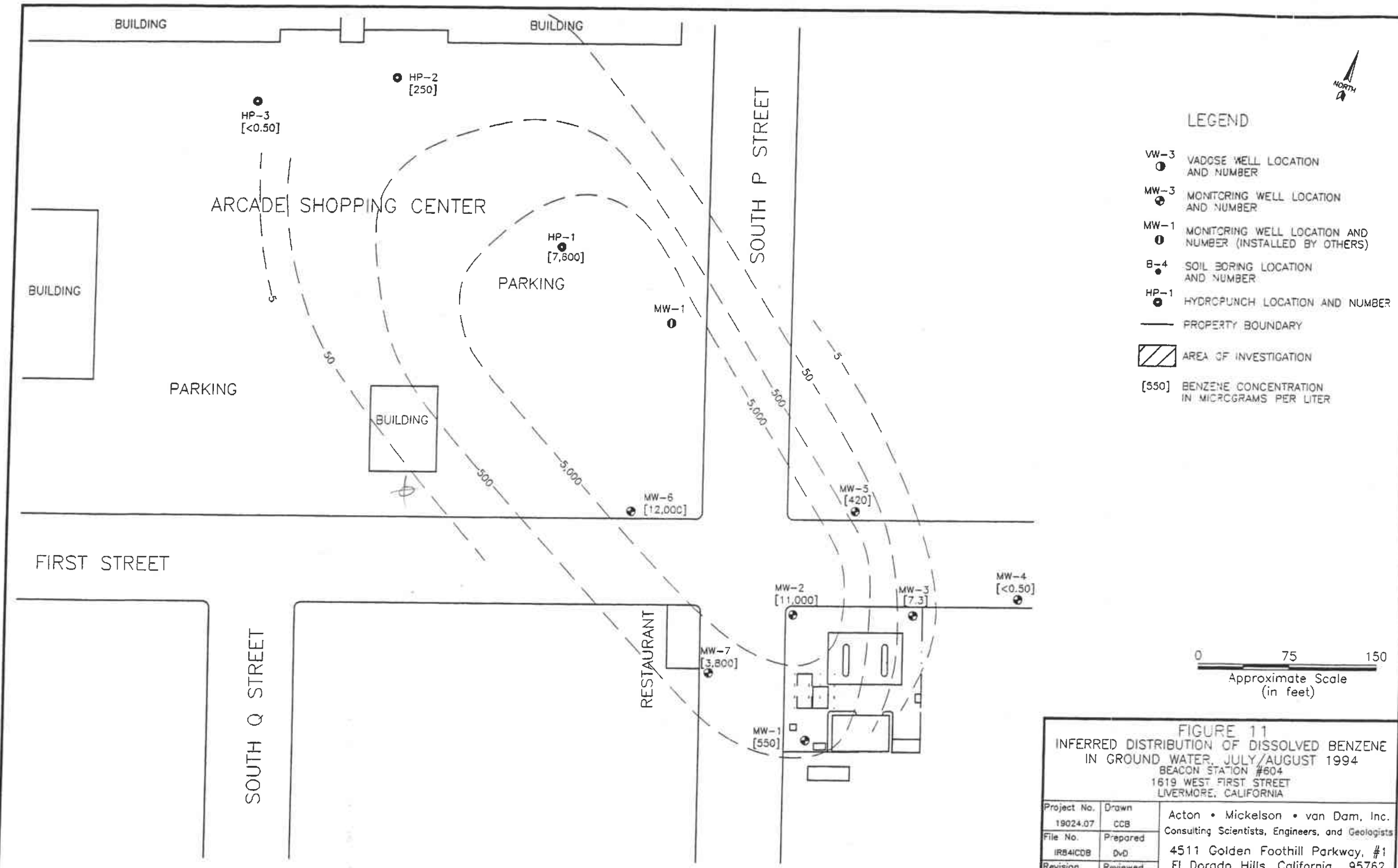
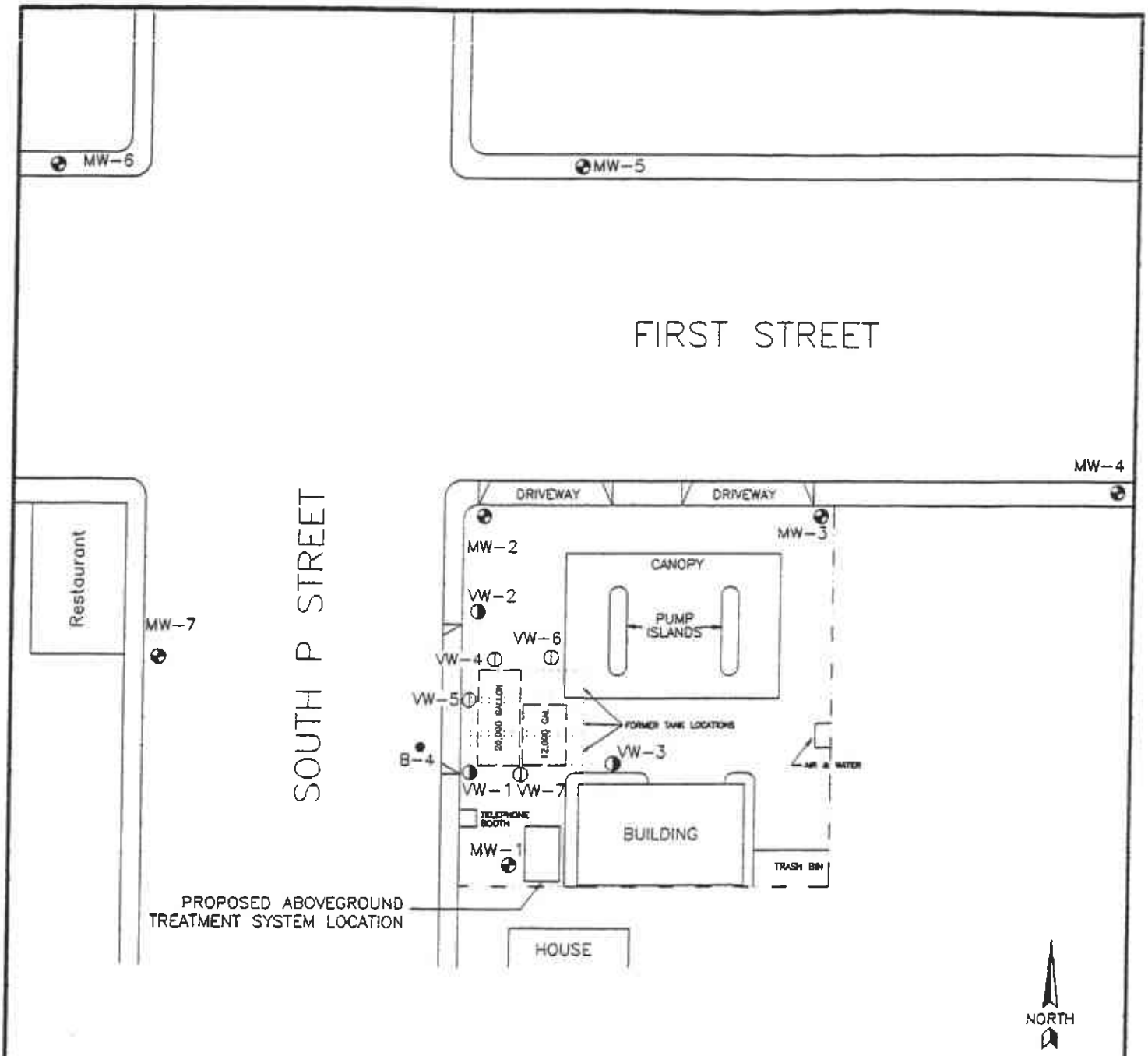


FIGURE 11
INFERRED DISTRIBUTION OF DISSOLVED BENZENE IN GROUND WATER, JULY/AUGUST 1994
BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Project No.	Drawn
19024.07	CCB
File No.	Prepared
IR84ICDB	DvD
Revision	Reviewed
0	

Acton • Mickelson • van Dam, Inc.
Consulting Scientists, Engineers, and Geologists
4511 Golden Foothill Parkway, #1
El Dorado Hills, California 95762
(916) 939-7550



LEGEND

- VW-4 ⊕ PROPOSED VAPOR EXTRACTION WELL
- VW-3 ◑ VADOSE WELL LOCATION AND NUMBER
- MW-3 ◕ MONITORING WELL LOCATION AND NUMBER
- B-4 ● SOIL BORING LOCATION AND NUMBER
- — — PROPERTY BOUNDARY

FIGURE 12
PROPOSED TREATMENT SYSTEM AND VAPOR EXTRACTION WELL LOCATION MAP

BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Project No. 19024.07	Drawn CCB
File No. IR12WLM	Prepared DvD
Revision	Reviewed

Acton • Mickelson • van Dam, Inc.
Consulting Scientists, Engineers, and Geologists
4511 Golden Foothill Parkway, Suite 1
El Dorado Hills, California 95762
(916) 939-7550

APPENDIX A

SOIL BORING LOGS

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring MW-1

Casing Elevation: 100.00 feet

Completion Depth: 54 feet

Project No.	Location:
19024.01	Beacon 604 1619 W. First Street Livermore, CA.

Drilling Company: Turner Exploration

Driller: Mike Barr

Drilling and Sampling Methods:

BK-81 HSA California Modified split-spoon sampler

OVM/OVA: HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	05-27-93	13:10
Finish	05-27-93	15:15
Water Depth	Initial	Completion 38.46 feet

Logged by: H. Hansen

Checked by: DvD

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 In	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
0		12 inch bore concrete								
1		CLAYEY GRAVEL Olive brown, 1/2 to 2 inch gravel, fine to coarse-grained sand, common plastic fines, dry (GC)								
2										
3										
4										
5					17 12 35	18	14		MW1-1	0
6										
7										
8										
9										
10			GC		40 45 50/4	18	12		MW1-2	0
11										
12										
13										
14										
15										
16					35 50/3	9	9		MW1-3	0
17										
18										
19										
20		moist at 20.5 feet			18 27 28	18	18		MW1-4	0

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring MW-1 (cont)

Casing Elevation: 100.00 feet

Completion Depth: 54 feet

Project No.	Location: Beacon 604, 1619 W. First Street, Livermore, CA.
19024.01	

Drilling Company: Turner Exploration
Driller: Mike Barr
Drilling and Sampling Methods:
BK-81 HSA California Modified split-spoon sampler

OVM/OVA: HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	05-27-93	
Finish	05-27-93	15:15
Water Depth	Initial	Completion 38.46 feet

Logged by: H. Hansen
Checked by: D.D

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 In	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
20		(continued from above) CLAYEY GRAVEL, olive brown, 1/2 to 3 inch gravel, fine- to coarse-grained sand, common plastic fines, moist (GC)	GC							
21										
22										
23		SILTY CLAY brown, slighty plastic, moist, (CL)								
24										
25			CL		6 27 28	18	18		MW1-5	0
26										
27										
28		CLAYEY GRAVEL Olive brown, 1/2 to 2 inch gravel fine to coarse-grained sand common plastic fines, moist (GC)								
29										
30					14 17 33	18	18		MW1-6	4
31										
32										
33										
34			GC							
35					18 27 33	18	18		MW1-7	110
36										
37										
38										
39										
40		saturated at 40 feet			19 27 37	18	16		MW1-8	40
41										

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring MW-1 (cont)

Casing Elevation: 100.00 feet

Completion Depth: 54 feet

Project No.	Location:
19024.01	Beacon 604, 1619 W. First Street, Livermore, CA.

Drilling Company: Turner Exploration

Driller: Mike Barr

Drilling and Sampling Methods:

BK-81 HSA California Modified split-spoon sampler

OVM/OVA Hnu PID with 10.2 eV Probe

Drilling	Time	Date
Start	05-27-93	13:10
Finish	05-27-93	15:15
Water Depth	Initial	Completion 38.46 feet

Logged by: H. Hansen

Checked by: DvD

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
40		(continued from above) CLAYEY GRAVEL, olive brown, 1/2 to 2 inch gravel, fine- to coarse-grained sand, common plastic fines, saturated (GC)								
41										
42										
43										
44										
45					28 29 42	18	18		MW1-9	15
46										
47			GC							
48										
49										
50					16 14 33	18"	15		MW1-10	150
51										
52										
53										
54					16 17 24	18	9		MW1-11	60
55		Boring terminated at 55 feet								
56										
57										
58										
59										
60										
61										

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring MW-2

Casing Elevation: 98.68 feet

Completion Depth: 54 feet

Project No.	Location:
19024.01	Beacon 604 1619 W. First Street Livermore, CA.

Drilling Company: Turner Exploration

Driller: Mike Barr

Drilling and Sampling Methods:

BK-81 HSA California Modified split-spoon sampler

OVM/OVA HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	05-27-93	07:00
Finish	05-27-93	09:00
Water Depth	Initial	Completion 39.07 feet

Logged by: H. Hansen

Checked by: DR

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
0		Concrete								
1		CLAYEY GRAVEL Olive brown, 1/2 to 2 Inch gravel, fine to coarse-grained sand, common plastic fines, slighty moist, (GC)								
2										
3										
4										
5					2 3 -	12	12		MW2-1	0
6										
7				GC						
8										
9										
10					9 7 10	18	14		MW2-2	0
11										
12										
13										
14										
15					11 17 37	18	12		MW2-3	0
16										
17										
18		SILTY CLAY brown, moderately plastic, moist, (CL)								
19										
20				CL	14 22 24	18	16		MW2-4	12

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring MW-2 (cont)

Casing Elevation: 98.68 feet

Completion Depth: 54 feet

Project No.	Location:
19024.01	Beacon 604 1619 W. First Street Livermore, CA.

Drilling Company: Turner Exploration

Driller: Mike Barr

Drilling and Sampling Methods:

BK-81 HSA California Modified split-spoon sampler

OVM/OVA HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	05-27-93	07:00
Finish	05-27-93	09:00
Water Depth	Initial	Completion 39.07 feet

Logged by: H. Hansen

Checked by: DD

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
20		(continued from above) SILTY CLAY, brown, moderately plastic, moist (CL)	CL							
21										
22										
23										
24										
25		CLAYEY GRAVEL olive brown, 1/2 to 1 inch gravel fine to coarse-grained sand common plastic fines, very moist, (GC)			7 19 24	18	15		MW2-5	30
26										
27										
28										
29										
30					28 32 41	18	18		MW2-6	150
31										
32										
33										
34			GC							
35					26 78	12	12		MW2-7	4
36										
37										
38										
39		saturated at 39.5 feet			24 38 32	18	14		MW2-8	400
40										
41										

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring MW-2 (cont)

Casing Elevation: 98.68 feet

Completion Depth: 54 feet

Project No.	Location:
19024.01	Beacon 604 1619 W. First Street Livermore, CA.

Drilling Company: Turner Exploration

Driller: Mike Barr

Drilling and Sampling Methods:

BK-81 HSA California Modified split-spoon sampler

OVM/OVA HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	05-27-93	07:00
Finish	05-27-93	09:00
Water Depth	Initial	Completion 39.07 feet

Logged by: H. Hansen

Checked by: DVR

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
40		(continued from above) CLAYEY GRAVEL, olive brown, 1/2 to 1 inch gravel, fine- to coarse-grained sand, common plastic fines, saturated (GC)	GC							
41										
42										
43										
44										
45		- SILTY CLAY brown, moderately plastic saturated, (CL)	CL		16 17 22	18	18		MW2-9	300
46										
47										
48										
49										
50					19 24 22	18	17		MW2-10	250
51										
52										
53										
54					8 9 12	18	12		MW2-11	15
55		Total depth 55 feet.								
56										
57										
58										
59										
60										
61										

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring MW-3

Casing Elevation: 99.08 feet

Completion Depth: 54 feet

Project No.	Location:
19024.01	Beacon 604 1619 W. First Street Livermore, CA.

Drilling Company: Turner Exploration

Driller: Mike Barr

Drilling and Sampling Methods:

BK-81 HSA California Modified split-spoon sampler

OVM/OVA HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	05-28-93	12:30
Finish	05-28-93	15:30
Water Depth	Initial	Completion 37.11 feet

Logged by: H. Hansen

Checked by: DvP

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
0		Concrete/roadbase								
1		CLAYEY GRAVEL Olive brown, 1/2 to 2 inch gravel, fine to coarse-grained sand, common plastic fines, moist, (GC)								
2										
3										
4										
5					6 17 42	18	17		MW3-1	0
6										
7										
8			GC							
9										
10					9 24 32	18	18		MW3-2	0
11										
12										
13										
14										
15					10 5 12	18	0		MW3-3	NO RECOVERY
16										
17										
18										
19		SILTY CLAY brown, moderately plastic, moist, (CL)								
20			CL		18 24 22	18	9		MW3-4	0

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring MW-3 (cont)

Casing Elevation: 99.08 feet

Completion Depth: 54 feet

Project No.	Location: Beacon 604, 1619 W. First Street, Livermore, CA.
19024.01	

Drilling Company: Turner Exploration
Driller: Mike Barr
Drilling and Sampling Methods:
BK-81 HSA California Modified split-spoon sampler

OVM/OVA HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	05-28-93	12:30
Finish	05-28-93	15:30
Water Depth	Initial	Completion 37.11 feet

Logged by: H. Hansen
Checked by: D-D

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
20		(continued from above) SILTY CLAY, brown, moderately plastic, moist (CL)	CL		22 28 29	18	11		MW3-5	0
21										
22										
23										
24										
25										
26										
27										
28										
29										
30					17 19 21	18	16		MW3-6	0
31										
32										
33										
34										
35					9 37 42	18	11		MW3-7	0
36		CLAYEY GRAVEL 1/2 to 2 inch gravel, fine to coarse-grained sand, common plastic fines, saturated (GC)	GC							
37										
38										
39										
40					14 22 25	18	18		MW3-8	0
41										

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring MW-3 (cont)

Casing Elevation: 99.08 feet

Completion Depth: 54 feet

Project No.	Location:
19024.01	Beacon 604, 1619 W. First Street, Livermore, CA.

Drilling Company: Turner Exploration

Driller: Mike Barr

Drilling and Sampling Methods:

BK-81 HSA California Modified split-spoon sampler

OVM/OVA: HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	05-28-93	12:30
Finish	05-28-93	15:30
Water Depth	Initial	Completion 37.11 feet

Logged by: H. Hansen

Checked by: DvD

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
40		(continued from above) CLAYEY GRAVEL, 1/2 to 2 inch gravel, fine- to coarse-grained sand, common plastic fines, saturated (GC)	GC							
41										
42										
43										
44										
45					9 37 42	18	18		MW3-9	0
46										
47										
48										
49					7 9 24	18	12		MW3-10	0
50										
51										
52										
53		Boring terminated at 53 feet								
54										
55										
56										
57										
58										
59										
60										
61										

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring VW-1

Casing Elevation:

Completion Depth: 37 feet

Project No.	Location:
19024.01	Beacon 604 1619 W. First Street Livermore, CA.

Drilling Company: Turner Exploration

Driller: Mike Barr

Drilling and Sampling Methods:

BK-81 HSA California Modified split-spoon sampler

OVM/OVA HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	05-27-93	08:30
Finish	05-27-93	10:30
Water Depth	Initial	Completion N/A

Logged by: H. Hansen

Checked by: DvD

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
0		Concrete								
1		0 to 27 feet; conductor casing, no samples collected								
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring VW-1 (cont)

Casing Elevation:

Completion Depth: 37 feet

Project No.	Location:
19024.01	Beacon 604, 1619 W. First Street, Livermore, CA.

Drilling Company: Turner Exploration

Driller: Mike Barr

Drilling and Sampling Methods:

BK-81 HSA California Modified split-spoon sampler

OVM/OVA HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	05-27-93	08:30
Finish	05-27-93	10:30
Water Depth	Initial	Completion N/A

Logged by: H. Hansen

Checked by: DP

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
20		(continued from above) 0 to 27 feet; conductor casing, no samples collected								
21										
22										
23										
24										
25										
26										
27		CLAYEY GRAVEL olive brown, 1/2 to 1 inch gravel, fine to coarse-grained sand, common plastic fines, very moist, (GC)	GC		23 13 11	18	9		VW1-6	225
28										
29										
30										
31										
32										
33										
34										
35					21 31 33	18	16		VW1-7	325
36										
37										
38										
39		Saturated at 39.5 feet			37 14 13	18	18		VW1-8	500
40										
41										

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring VW-1 (cont)

Project No. 19024.01	Location: Beacon 604, 1619 W. First Street, Livermore, CA.
Drilling Company: Turner Exploration	
Driller: Mike Barr	
Drilling and Sampling Methods: BK-81 HSA California Modified split-spoon sampler	
Casing Elevation:	OVM/OVA: HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	05-27-93	08:30
Finish	05-27-93	10:30
Water Depth	Initial	Completion N/A

Completion Depth: 37 feet

Logged by: H. Hansen

Checked by: DJD

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
40		(continued from above) CLAYEY GRAVEL, olive brown, 1/2 to 1 inch gravel, fine- to coarse-grained sand, common plastic fines, saturated (GC)	GC		19 22 18	18	18		VW1-9	300
41										
42										
43										
44										
45										
46										
47										
48										
49										
50		Boring terminated at 50 feet			26 36 24	18	18		VW1-10	450
51										
52										
53										
54										
55										
56										
57										
58										
59										
60										
61										

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring VW-2

Casing Elevation:

Completion Depth: 37 feet

Project No.	Location:
19024.01	Beacon 604 1619 W. First Street Livermore, CA.

Drilling Company: Turner Exploration
Driller: Mike Barr
Drilling and Sampling Methods:
BK-81 HSA California Modified split-spoon sampler

OVM/OVA HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	05-28-93	08:45
Finish	05-27-93	09:45
Water Depth	Initial	Completion N/A

Logged by: H. Hansen
Checked by: DvD

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
0		Concrete								
1		CLAYEY GRAVEL olive brown, 1/2 to 2 inch gravel, fine to coarse-grained sand common plastic fines, slightyly moist, (GC)								
2										
3										
4					17					
5					19	18	17		VW2-1	0
6					24					
7										
8										
9										
10					25	12	9		VW2-2	0
11					35					
12										
13										
14										
15					49	12	8		VW2-3	0
16					38					
17										
18										
19										
20					11					
					9	18	10		VW2-4	0
					22					

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring VW-2 (cont)

Project No. 19024.01

Location: Beacon 604, 1619 W. First Street, Livermore, CA.

Drilling Company: Turner Exploration

Driller: Mike Barr

Drilling and Sampling Methods: BK-81 HSA California Modified split-spoon sampler

Casing Elevation:

OVM/OVA: HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	05-28-93	08:45
Finish	05-27-93	09:45
Water Depth	Initial	Completion N/A

Completion Depth: 37 feet

Logged by: H. Hansen

Checked by: DvD

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
20		(continued from above) CLAYEY GRAVEL, olive brown, 1/2 to 2 inch gravel, fine- to coarse-grained sand, common plastic fines, slightly moist (GC)	GC							
21										
22		SILTY CLAY brown, moderately plastic moist, (CL)	CL							
23										
24										
25		CLAYEY GRAVEL 1/2 to 2 inch gravel, fine to coarse-grained sand, common plastic fines, (GC)	GC		15 17 19	18	2		VW2-5	225
26										
27										
28										
29										
30					12 19 27	18	6	Retained for chemical analysis.	VW2-6	—
31										
32										
33										
34										
35					42 50/0				VW2-7	475
36										
37		boring terminated at 37 feet								
38										
39										
40										
41										

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring VW-3

Project No. 19024.01

Location: Beacon 604, 1619 W. First Stree, Livermore, CA.

Drilling Company: Turner Exploration

Driller: Mike Barr

Drilling and Sampling Methods:

BK-81 HSA California Modified split-spoon sampler

Casing Elevation:

OVM/OVA: HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	06-01-93	08:40
Finish	06-01-93	09:30
Water Depth	Initial	Completion N/A

Completion Depth: 36 feet

Logged by: H. Hansen

Checked by: DvP

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
0		Concrete								
1		CLAYEY GRAVEL olive brown, 1/2 to 2 inch gravel, fine to coarse-grained sand, common plastic fines, moist, (GC)								
2										
3										
4					12					
5					12	18	18		VW3-1	2
6					14					
7										
8			GC							
9										
10					15					
11					17	16	16		VW3-2	0
12					22					
13										
14										
15					26					
16					50/5	12	12		VW3-3	0
17										
18		SILTY CLAY olive brown, moderately plastic, (CL)								
19										
20			CL		15					
					19	18	18		VW3-4	0
					25					

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring VW-3 (cont)

Casing Elevation:

Completion Depth: 36 feet

Project No.	Location:
19024.01	Beacon 504, 1619 W. First Street, Livermore, CA.

Drilling Company: Turner Exploration

Driller: Mike Barr

Drilling and Sampling Methods:

BK-81 HSA California Modified split-spoon sampler

OVM/OVA HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	06-01-93	08:40
Finish	06-01-93	09:30
Water Depth	Initial	Completion N/A

Logged by: H. Hansen

Checked by: DP

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
20		(continued from above)	CL							
21										
22										
23										
24										
25					19, 24, 32	18	17		VW3-5	2
26										
27		CLAYEY GRAVEL brown, fine to coarse-grained, common plastic fines, very moist, (GC)	GC							
28										
29										
30					27, 25, 42	18	18		VW3-6	1
31										
32										
33										
34					20, 25, 31	18	18		VW3-7	1
35										
36		boring terminated at 36.0 feet								
37										
38										
39										
40										
41										

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring B-4

Project No. 19024.01

Location: Beacon 604, 1619 W. First Street, Livermore, CA.

Drilling Company: Turner Exploration

Driller: Mike Barr

Drilling and Sampling Methods:

BK-81 HSA California Modified split-spoon sampler

Casing Elevation:

OVM/OVA: HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	06-01-93	11:20
Finish	06-01-93	12:20
Water Depth	Initial	Completion N/A

Completion Depth: 35.0 feet

Logged by: H. Hansen

Checked by: DP

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
0		Asphalt								
1		CLAYEY GRAVEL olive brown, 1/2 to 2 inch gravel, fine to coarse-grained sand, common plastic fines, (GC)								
2										
3										
4										
5					16 18 22	18	12		B4-1	0
6										
7										
8										
9										
10				GC	10 28 23	18	17		B4-2	0
11										
12										
13										
14										
15					12 14 42	18	12		B4-3	0
16										
17										
18										
19										
20					15 43 50/6	18	16		B4-4	25

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring B-4 (cont)

Casing Elevation:

Completion Depth: 35.0 feet

Project No.	Location:
19024.01	Beacon 604, 1619 W. First Street, Livermore, CA.

Drilling Company: Turner Exploration
Driller: Mike Barr
Drilling and Sampling Methods:
BK-81 HSA California Modified split-spoon sampler

OVM/OVA HNu PID with 10.2 eV probe

Drilling	Time	Date
Start	06-01-93	11:20
Finish	06-01-93	12:20
Water Depth	Initial	Completion N/A

Logged by: H. Hansen
Checked by: DP

Depth (feet)	Sample Int.	Description	Graphic Log	BORING/WELL DETAIL	Blows/6 in	Inches Driven	Inches Recov'd	Comments	Sample #	Field OVM/OVA Reading (ppm)
20		(continued from above) CLAYEY GRAVEL, 1/2 to 2 inch gravel, fine- to coarse-grained sand, common plastic fines (GC)	GC							
21										
22										
23		SILTY CLAY brown, moderately plastic, very moist, some gravel, (CL)								
24										
25			CL		15 43 50/6	18	16		B4-5	100
26										
27										
28										
29										
30		CLAYEY GRAVEL olive brown, 1/2 to 3 inch gravel, fine to coarse-grained sand, common plastic fines, (GC)			23 28 41	18	18		B4-6	40
31			GC							
32										
33										
34		saturated at 35.0 feet			19 27 42	18	18		B4-7	65
35		boring terminated at 35.0 feet								
36										
37										
38										
39										
40										
41										

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: MW-4

Project Number: 19024.03

Location: Beacon #604
1619 West First Street
Livermore, Califorina

Drilling Company: V & W Drilling
Drilled By: Robert Vickery
Drilling Method: 8" O.D. HSA, B-61 HDX Mobile Drill Rig
Sampling Method: Califorina Modified Split Spoon Sampler
Fitted With 2"x6" Brass Sample Sleeves

OVM/OVA: hNu PID with 10.2 eV probe

Drilling	Time	Date
Start	1115	3/30/94
Finish	1300	3/30/94

Water Depth (Date): 31.56 Feet (3/30/94)
Casing Elevation: 99.35 Feet
Completion Depth: 47 Feet
Logged By: S. Liaty
Checked By:

DEPTH (feet)	SAMPLE INTERVAL	DESCRIPTION	GRAPHIC LOG	USCS CLASS	WELL CONSTRUCTION	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.	FIELD OVM/OVA READING (ppm)
		CONCRETE AND ROAD BASE							Gravel up to 1.75 inches in diameter.		
		SILTY GRAVEL, moderately dark yellowish brown, damp, dense,		GM							
5		SANDY GRAVEL, yellowish brown, damp, very dense, fine- to medium-grained sand		GW		13 15 15	18	18	Gravel up to 1.5 inches in diameter.	MW4-1	<1
10						26 50/ 6"	12	12		MW4-2	<1
15		Mottled reddish brown, partially cemented at 15 feet				22 50/ 6"	12	12		MW4-3	<1
		SILTY CLAY with trace sand, dark yellowish brown, moist, dense, fine- to medium-grained sand		CL							
20						12 13 16	18	18	Gravel up to 1.5 inches in diameter.	MW4-4	<1
25		SANDY GRAVEL, yellowish brown, moist, dense, fine- to medium-grained sand		GW		11 17 26	18	18		MW4-5	<1
		CLAYEY SAND with minor gravel, dark yellowish brown, very dense, coarse-grained		SC							
30											

(Boring continued on next page)

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: MW-4

Project Number: 19024.03

Location: Beacon #604
1619 West First Street
Livermore, Califorina

Drilling Company: V & W Drilling
Drilled By: Robert Vickery
Drilling Method: 8" O.D. HSA, B-61 HDX Mobile Drill Rig
Sampling Method: Califorina Modified Split Spoon Sampler
Fitted With 2"x6" Brass Sample Sleeves

OVM/OVA: hNu PID with 10.2 eV probe

Drilling	Time	Date
Start	1115	3/30/94
Finish	1300	3/30/94

Water Depth (Date): 31.56 Feet (3/30/94)
Casing Elevation: 99.35 Feet
Completion Depth: 47 Feet
Logged By: S. Liaty
Checked By:

DEPTH (feet)	SAMPLE INTERVAL	DESCRIPTION	GRAPHIC LOG	USCS CLASS	WELL CONSTRUCTION	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.	FIELD OVM/OVA READING (ppm)
		CLAYEY SAND with minor gravel, dark yellowish brown, very dense, coarse-grained		SC		29 32 34	18	18		MW4-6	<1
35		SANDY GRAVEL, dark yellowish brown, saturated, very dense, fine- to medium-grained sand		GW		29 50/ 6"	12	12	Gravel up to 1.5 inches in diameter.	MW4-7	<1
40						17 23 36	18	14		MW4-8	<1
45						16 22 35	18	10	Boring terminated approximately 15 feet below the water table.	MW4-9	<1
		Boring terminated. Total depth = 47 feet									
50											
55											
60											

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: MW-5

Project Number: 19024.03

Location: Beacon #604
1619 West First Street
Livermore, Califorina

Drilling Company: V & W Drilling
Drilled By: Robert Vickery
Drilling Method: 8" O.D. HSA, B-61 HDX Mobile Drill Rig
Sampling Method: Califorina Modified Split Spoon Sampler
Fitted With 2"x6" Brass Sample Sleeves

OVM/OVA: hNu PID with 10.2 eV probe

Drilling	Time	Date
Start	1000	3/29/94
Finish	1130	3/29/94

Water Depth (Date): 32.07 Feet (3/30/94)
Casing Elevation: 98.37 Feet
Completion Depth: 47 Feet
Logged By: S. Liaty
Checked By:

DEPTH (feet)	DESCRIPTION	USCS CLASS	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.	FIELD OVM/OVA READING (ppm)
	CONCRETE AND ROAD BASE							
5	SILTY GRAVEL, moderate yellowish brown, damp, very dense	GM	50/6"	8	8	Gravel up to 1.5 inches in diameter.	MW5-1	<1
10	SANDY GRAVEL, dark yellowish brown, damp, very dense, fine- to medium-grained sand	GW	50 50/3"	9	9	Gravel up to 1.5 inches in diameter.	MW5-2	<1
15			38 50/6"	12	12		MW5-3	<1
20	SILTY SAND, yellowish brown, moist, medium dense, slightly stiff, fine-grained	SM	7 11 14	18	18		MW5-4	<1
25	CLAY, dark yellowish brown, moist, hard Minor gravel at 25 feet	CL	15 21 19	18	18		MW5-5	<1
30	SANDY GRAVEL, gray, moist, dense, saturated, fine- to medium-grained sand							

(Boring continued on next page)

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: MW-5

Project Number: 19024.03

Location: Beacon #604
1619 West First Street
Livermore, Califorina

Drilling Company: V & W Drilling
Drilled By: Robert Vickery
Drilling Method: 8" O.D. HSA, B-61 HDX Mobile Drill Rig
Sampling Method: Califorina Modified Split Spoon Sampler
Fitted With 2"x6" Brass Sample Sleeves

OVM/OVA: hNu PID with 10.2 eV probe

Drilling	Time	Date
Start	1000	3/29/94
Finish	1130	3/29/94

Water Depth (Date): 32.07 Feet (3/30/94)
Casing Elevation: 98.37 Feet
Completion Depth: 47 Feet
Logged By: S. Liaty
Checked By:

DEPTH (feet)	SAMPLE INTERVAL	DESCRIPTION	GRAPHIC LOG	USCS CLASS	WELL CONSTRUCTION	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.	FIELD OVM/OVA READING (ppm)
35		SANDY GRAVEL, gray, dense, saturated, fine- to medium-grained sand		CL GW		10 21 28	18	18	Gravel up to 1 inch in diameter.	MW5-6	<1
						26 50/5"	11	10		MW5-7	<1
40						25 30 50/6"	18	18		MW5-8	<1
45									No sample collected at 45 feet.		
		Boring terminated. Total depth = 47 feet							Boring terminated approximately 15 feet below the water table.		
50											
55											
60											

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: MW-6

Project Number: 19024.03

Location: Beacon #604
1619 West First Street
Livermore, Califorina

Drilling Company: V & W Drilling
Drilled By: Robert Vickery
Drilling Method: 8" O.D. HSA, B-61 HDX Mobile Drill Rig
Sampling Method: Califorina Modified Split Spoon Sampler
Fitted With 2"x6" Brass Sample Sleeves

OVM/OVA: hNu PID with 10.2 eV probe

Drilling	Time	Date
Start	1310	3/29/94
Finish	1445	3/29/94

Water Depth (Date) : 33.38 Feet (3/30/94)
Casing Elevation: 97.62 Feet
Completion Depth: 48 Feet
Logged By: S. Liaty
Checked By:

DEPTH (feet)	SAMPLE INTERVAL	DESCRIPTION	GRAPHIC LOG	USCS CLASS	WELL CONSTRUCTION	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.	FIELD OVM/OVA READING (ppm)
		CONCRETE AND ROAD BASE							Gravel up to 1 inch in diameter.		
		SILTY GRAVEL, dark yellowish brown, damp, very dense		GM							
5		SANDY GRAVEL, dark yellowish brown, moist, very dense, fine- to medium-grained sand		GW		11 21 34	18	14	Gravel up to 1.5 inches in diameter.	MW6-1	<1
10						12 50/ 5"	11	11		MW6-2	<1
15						10 28 36	18	16		MW6-3	<1
20		SILTY CLAY, dark yellowish brown, moist, very stiff		CL		6 8 10	18	18		MW6-4	<1
25		SANDY GRAVEL, yellowish brown, moist, moderately dense, fine- to medium-grained sand		GW		7 17 25	18	18	Gravel up to 1.5 inches in diameter.	MW6-5	<1
30											

(Boring continued on next page)

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: MW-6

Project Number: 19024.03

Location: Beacon #604
1619 West First Street
Livermore, Califorina

Drilling Company: V & W Drilling
Drilled By: Robert Vickery
Drilling Method: 8" O.D. HSA, B-61 HDX Mobile Drill Rig
Sampling Method: Califorina Modified Split Spoon Sampler
Fitted With 2"x6" Brass Sample Sleeves

OVM/OVA: hNu PID with 10.2 eV probe

Drilling	Time	Date
Start	1310	3/29/94
Finish	1445	3/29/94

Water Depth (Date): 33.38 Feet (3/30/94)
Casing Elevation: 97.62 Feet
Completion Depth: 48 Feet
Logged By: S. Liaty
Checked By:

DEPTH (feet)	SAMPLE INTERVAL	DESCRIPTION	USCS CLASS	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.	FIELD OVM/OVA READING (ppm)
		SANDY GRAVEL, yellowish brown, moist, moderately dense, fine- to medium-grained sand	GW	6 9 12	18	18	Gravel up to .5 inches in diameter.	MW6-6	<1
		CLAYEY SAND with minor gravel, dark yellowish brown, moist, fine- to medium-grained sand	SC	10 28 40	18	18		MW6-7	<1
35		SANDY GRAVEL, gray, saturated, very dense, medium- to coarse-grained sand	GW	29 50/ 5"	11	11	Soil appears to be stained. Gravel up to 1 inch in diameter.	MW6-8	<1
40									
45									
		Boring terminated. Total depth = 48 feet					Boring terminated approximately 15 feet below the water table.		
50									
55									
60									

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: MW-7

Project Number: 19024.03

Location: Beacon #604
1619 West First Street
Livermore, Califorina

Drilling Company: V & W Drilling
Drilled By: Robert Vickery
Drilling Method: 8" O.D. HSA, B-61 HDX Mobile Drill Rig
Sampling Method: Califorina Modified Split Spoon Sampler
Fitted With 2"x6" Brass Sample Sleeves

OVM/OVA: hNu PID with 10.2 eV probe

Drilling	Time	Date
Start	0815	3/30/94
Finish	0935	3/30/94

Water Depth (Date): 31.98 Feet (3/30/94)
Casing Elevation: 98.03 Feet
Completion Depth: 47 Feet
Logged By: S. Liaty
Checked By:

DEPTH (feet)	SAMPLE INTERVAL	DESCRIPTION	GRAPHIC LOG	USCS CLASS	WELL CONSTRUCTION	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.	FIELD OVM/OVA READING (ppm)
		ASPHALT AND ROAD BASE							Gravel up to 1.5 inches in diameter.		
		SILTY GRAVEL, yellowish brown, damp, dense to very dense		GM		11 24 28	18	18		MW7-1	<1
5									Gravel up to 1.5 inches in diameter.		
		SANDY GRAVEL, dark yellowish brown with gray mottling, moist, very dense, fine- to medium-grained sand		GW		50 50/ 6"	12	12		MW7-2	<1
10											
						37 50/ 6"	12	12		MW7-3	<1
15											
		SILTY CLAY, dark yellowish brown, moist, hard		CL		10 17 17	18	18		MW7-4	<1
20											
		SANDY GRAVEL, yellowish brown, moist, very dense, fine- to medium-grained sand		GW		21 50/ 6"	12	12	Gravel up to 1.5 inches in diameter.	MW7-5	<1
25											
						23					
30											

(Boring continued on next page)

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: MW-7

Project Number: 19024.03

Location: Beacon #604
1619 West First Street
Livermore, Califorina

Drilling Company: V & W Drilling
Drilled By: Robert Vickery
Drilling Method: 8" O.D. HSA, B-61 HDX Mobile Drill Rig
Sampling Method: Califorina Modified Split Spoon Sampler
Fitted With 2"x6" Brass Sample Sleeves

OVM/OVA: hNu PID with 10.2 eV probe

Drilling	Time	Date
Start	0815	3/30/94
Finish	0935	3/30/94

Water Depth (Date): 31.98 Feet (3/30/94)
Casing Elevation: 98.03 Feet
Completion Depth: 47 Feet
Logged By: S. Liaty
Checked By:

DEPTH (feet)	DESCRIPTION	USCS CLASS	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.	FIELD OVM/OVA READING (ppm)
	SANDY GRAVEL, yellowish brown, moist, very dense, fine- to medium-grained sand	GW	50/5"	11	11	Gravel up to .5 inches in diameter.	MW7-6	<1
35	CLAYEY SAND with minor gravel, dark yellowish brown, saturated, very dense, medium- to coarse-grained sand	SC	28 31 50/5"	17	17	Soil appears to be stained. Gravel up to 1.5 inches in diameter.	MW7-7	19
	SANDY GRAVEL, light gray, saturated, very dense, fine- to coarse- grained sand	GW	9 17 36	18	15		MW7-8	21
40								
45						No sample collected at 45 feet.		
	Boring terminated. Total depth = 47 feet					Boring terminated approximately 15 feet below the water table.		
50								
55								
60								

APPENDIX B

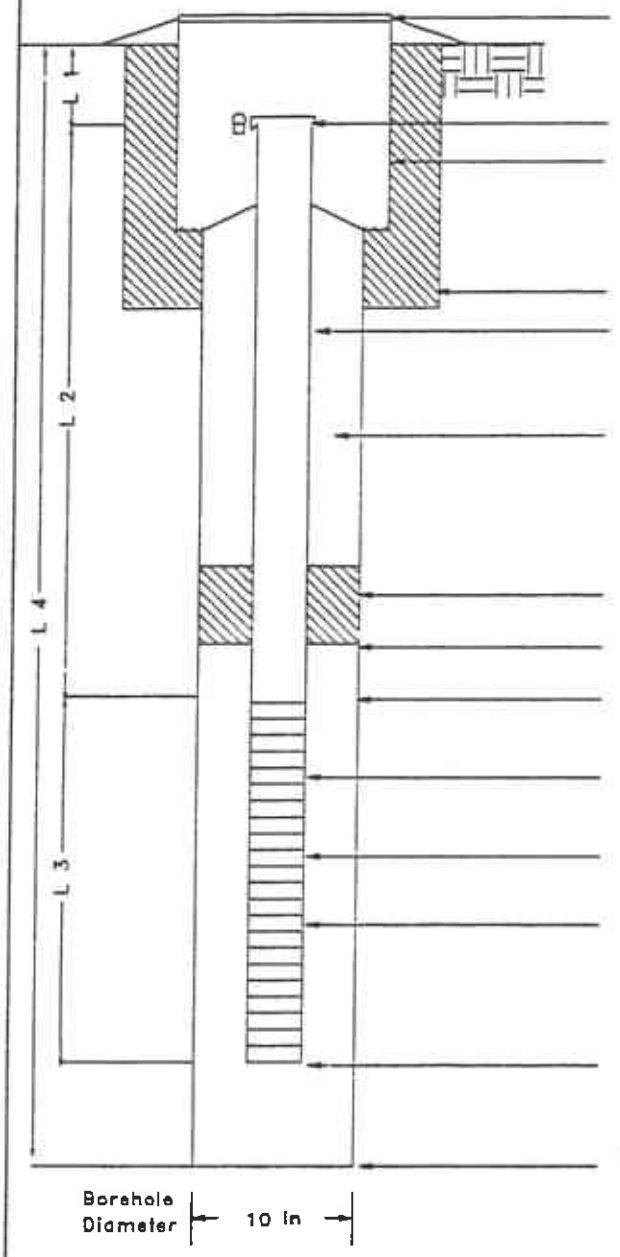
WELL CONSTRUCTION SPECIFICATIONS

MONITORING WELL CONSTRUCTION DETAILS

MONITORING WELL NO. MW-1

PROJECT: Beacon #604
1619 W. First Street
Livermore, CA

ELEVATION: 100.00



Protective Casing	
Locking Water Tight Cap	
Flush Grade Well Construction	
Diameter and Mat'l	12-inch steel
Total length	12 inches
Length Above Ground	1/4 inch
Thickness and Type of Seal	2 feet, concrete
Diameter, Mat'l and Joint Type of Riser Pipe	4 inch, SCH 40 PVC, flush thread
Type of Backfill Around Riser	cement/ 5% bentonite grout
Thickness and Type of Seal	2 feet bentonite chips
Distance of Filter Sand Above Top of Screen	2 feet
Type of Filter Around Screen	#3 Lonestar
Monitoring Well Mat'l	SCH 40 PVC
Screen Gauge/Slot Size	0.020 inch
Diameter and Length of Screen	4 inch, 20 feet
Depth to Bottom of Monitoring Well	54 feet
Depth to the Bottom of Filter Sand	55 feet

L1 = 0.25

L2 = 33.75

L3 = 20

L4 = 54

COMPLETION DATE AND TIME 15:30 05-27-93

MONITORING WELL WATER LEVEL MEASUREMENTS

DATE	TIME	WATER LEVEL*
06-22-93	13:26	38.46 ft

* MEASURING POINT TOP OF CASING

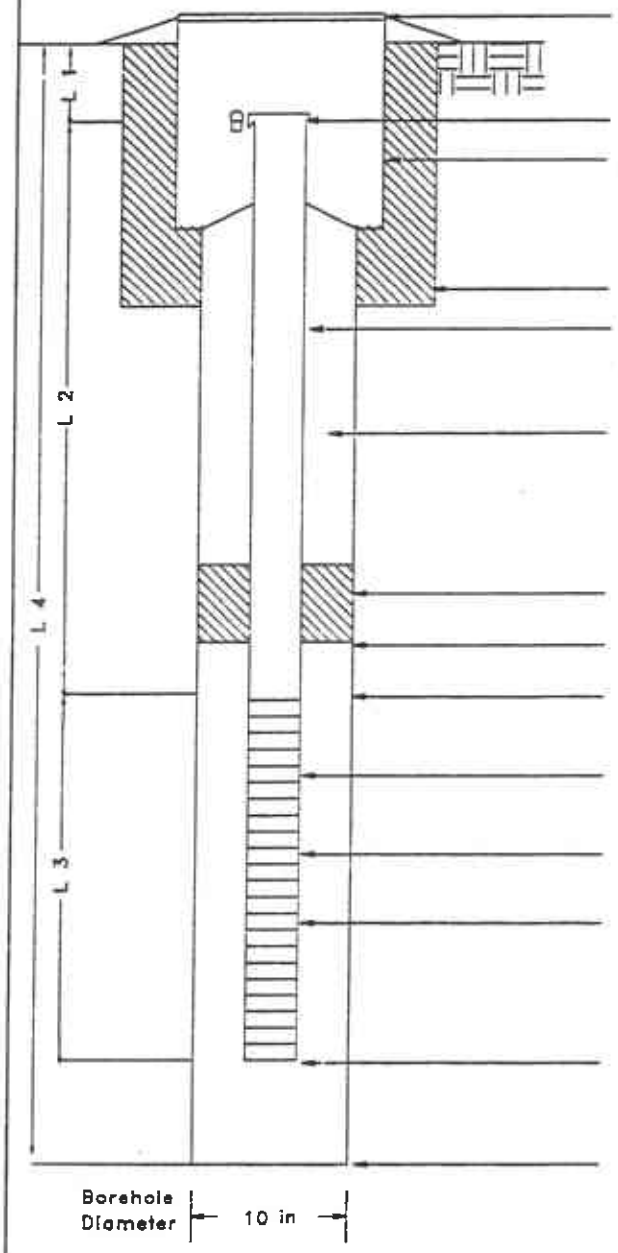
ACTON • MICKELSON • VAN DAM, INC.

MONITORING WELL CONSTRUCTION DETAILS

MONITORING WELL NO. MW-2

PROJECT: Beacon #604
1619 W. First Street
Livermore, CA

ELEVATION: 98.68



Protective Casing	
Locking Water Tight Cap	
Flush Grade Well Construction	
Diameter and Mat'l	12-inch steel
Total length	12 inches
Length Above Ground	1/4 inch
Thickness and Type of Seal	2 feet, concrete
Diameter, Mat'l and Joint Type of Riser Pipe	4 inch, SCH 40 PVC, flush thread
Type of Backfill Around Riser	cement/ 5% bentonite grout
Thickness and Type of Seal	2 feet bentonite chips
Distance of Filter Sand Above Top of Screen	2 feet
Type of Filter Around Screen	#3 Lonestar
Monitoring Well Mat'l	SCH 40 PVC
Screen Gauge/Slot Size	0.020 inch
Diameter and Length of Screen	4 inch, 20 feet
Depth to Bottom of Monitoring Well	54 feet
Depth to the Bottom of Filter Sand	54 feet

L1 = 0.25

L2 = 33.75

L3 = 20

L4 = 54

MONITORING WELL WATER LEVEL MEASUREMENTS

DATE	TIME	WATER LEVEL*
06-22-93	13:30	39.07 ft

* MEASURING POINT TOP OF CASING

COMPLETION DATE AND TIME 10:00 05-27-93

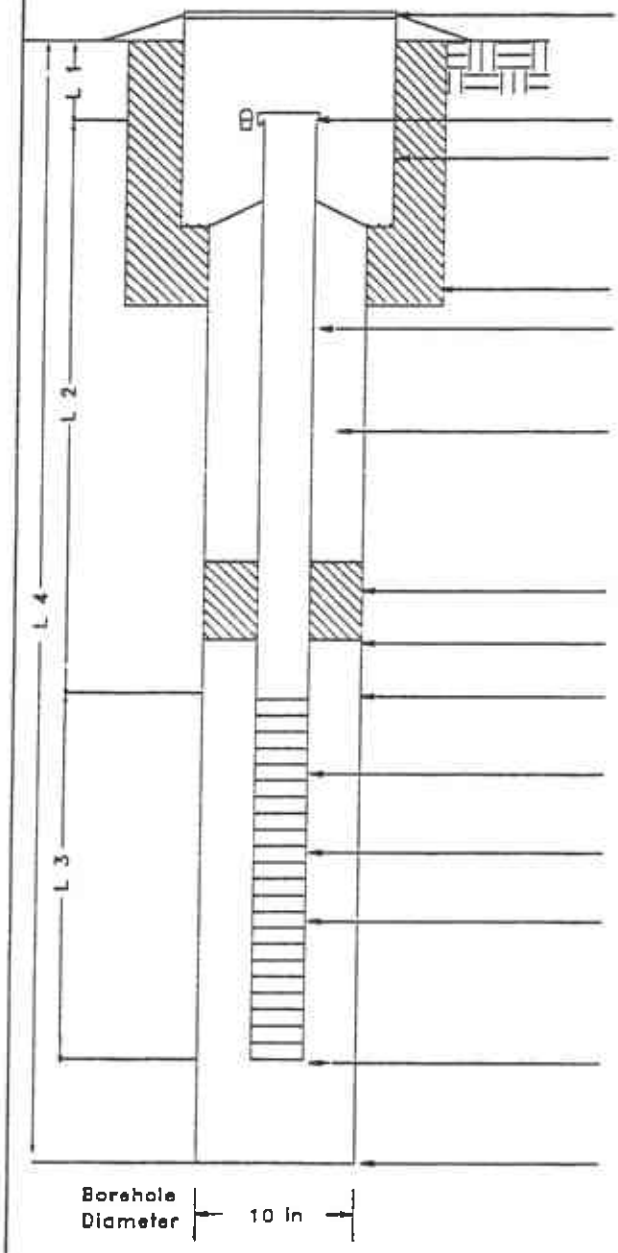
ACTON • MICKELSON • VAN DAM, INC.

MONITORING WELL CONSTRUCTION DETAILS

MONITORING WELL NO. MW-3

PROJECT: Beacon #604
1619 W. First Street
Livermore, CA

ELEVATION: 99.08



Protective Casing	
Locking Water Tight Cap	
Flush Grade Well Construction	
Diameter and Mat'l	12-inch steel
Total length	12 inches
Length Above Ground	1/4 inch
Thickness and Type of Seal	2 feet, concrete
Diameter, Mat'l and Joint Type of Riser Pipe	4 inch, SCH 40 PVC, flush thread
Type of Backfill Around Riser	cement/ 5% bentonite grout
Thickness and Type of Seal	2 feet bentonite chips
Distance of Filter Sand Above Top of Screen	2 feet
Type of Filter Around Screen	#3 Lonestar
Monitoring Well Mat'l	SCH 40 PVC
Screen Gauge/Slot Size	0.020 inch
Diameter and Length of Screen	4 inch, 20 feet
Depth to Bottom of Monitoring Well	53 feet
Depth to the Bottom of Filter Sand	53 feet

L1 = 0.25

L2 = 32.75

L3 = 20

L4 = 53

MONITORING WELL WATER LEVEL MEASUREMENTS

DATE	TIME	WATER LEVEL*
06-22-93	13:22	37.11 ft

* MEASURING POINT TOP OF CASING

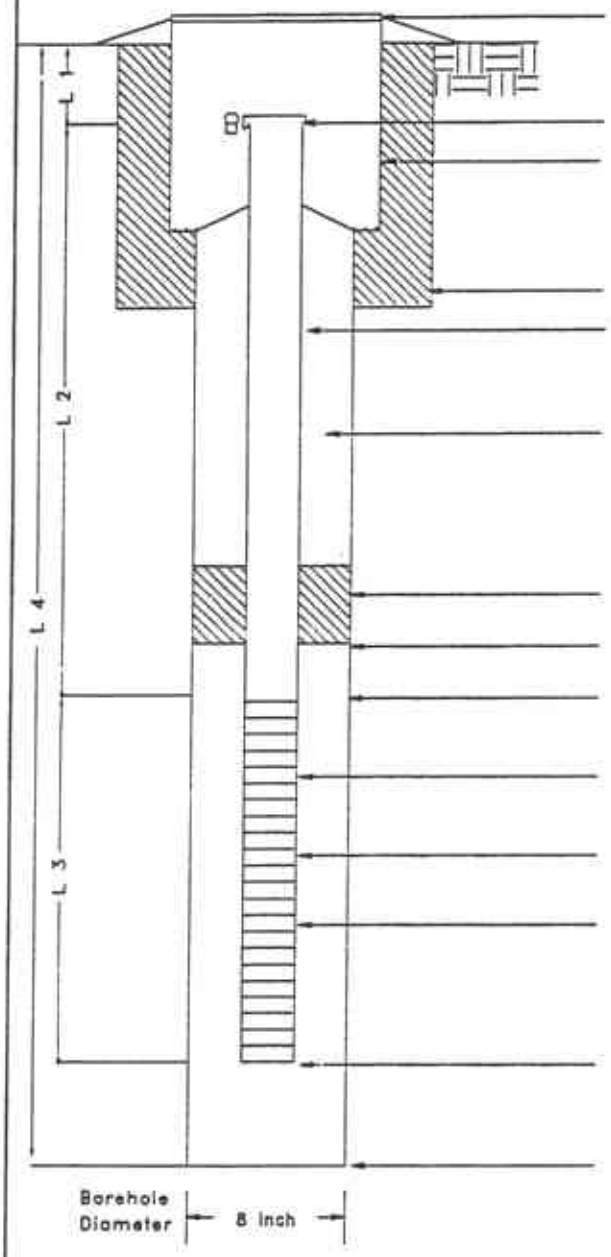
COMPLETION DATE AND TIME 15:45 05-28-93

ACTON • MICKELSON • VAN DAM, INC.

VADOSE WELL CONSTRUCTION DETAILS

VADOSE WELL NO. VW-1

PROJECT: Beacon #604
1619 W. First Street
Livermore, CA



Protective Casing	
Locking Water Tight Cap	
Flush Grade Well Construction	
Diameter and Mat'l	12-inch steel
Total length	12 inches
Length Above Ground	1/4 inch
Thickness and Type of Seal	2 feet, concrete
Diameter, Mat'l and Joint Type of Riser Pipe	2 inch, SCH 40 PVC, flush thread
Type of Backfill Around Riser	cement/ 5% bentonite grout
Thickness and Type of Seal	2 feet bentonite chips
Distance of Filter Sand Above Top of Screen	2 feet
Type of Filter Around Screen	#3 Lonestar
Monitoring Well Mat'l	SCH 40 PVC
Screen Gauge/Slot Size	0.020 inch
Diameter and Length of Screen	2 inch, 10 feet
Depth to Bottom of Monitoring Well	37 feet
Depth to the Bottom of Filter Sand	37 feet

L1 = 0.25

L2 = 26.75

L3 = 10

L4 = 37

COMPLETION DATE AND TIME 18:45 05-28-93

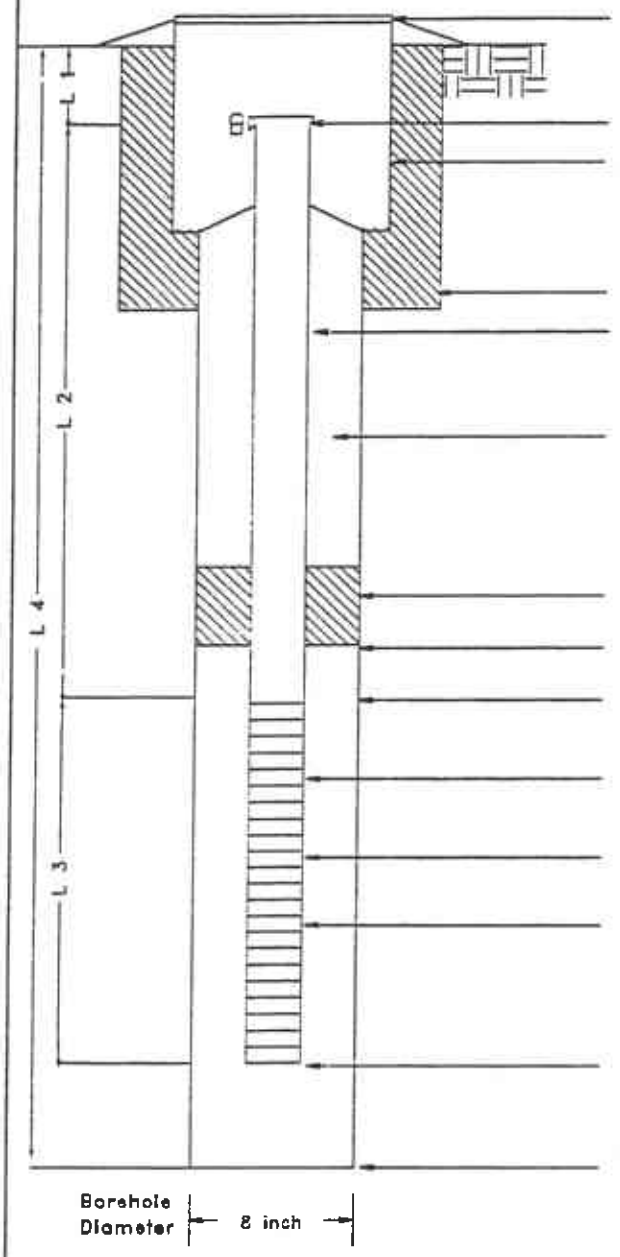
Note: hole backfilled with bentonite chips 37 to 50 feet

ACTON • MICKELSON • VAN DAM, INC.

VADOSE WELL CONSTRUCTION DETAILS

VADOSE WELL NO. VW-2

PROJECT: Beacon #604
1619 W. First Street
Livermore, CA



Protective Casing	
Locking Water Tight Cap	
Flush Grade Well Construction	
Diameter and Mat'l	12-inch steel
Total length	12 inches
Length Above Ground	1/4 inch
Thickness and Type of Seal	2 feet, concrete
Diameter, Mat'l and Joint Type of Riser Pipe	2 inch, SCH 40 PVC, flush thread
Type of Backfill Around Riser	cement/ 5% bentonite grout
Thickness and Type of Seal	2 feet bentonite chips
Distance of Filter Sand Above Top of Screen	2 feet
Type of Filter Around Screen	#3 Lonestar
Monitoring Well Mat'l	SCH 40 PVC
Screen Gauge/Slot Size	0.020 inch
Diameter and Length of Screen	2 inch, 15 feet
Depth to Bottom of Monitoring Well	37 feet
Depth to the Bottom of Filter Sand	37 feet

L1 = 0.25

L2 = 21.75

L3 = 15

L4 = 37

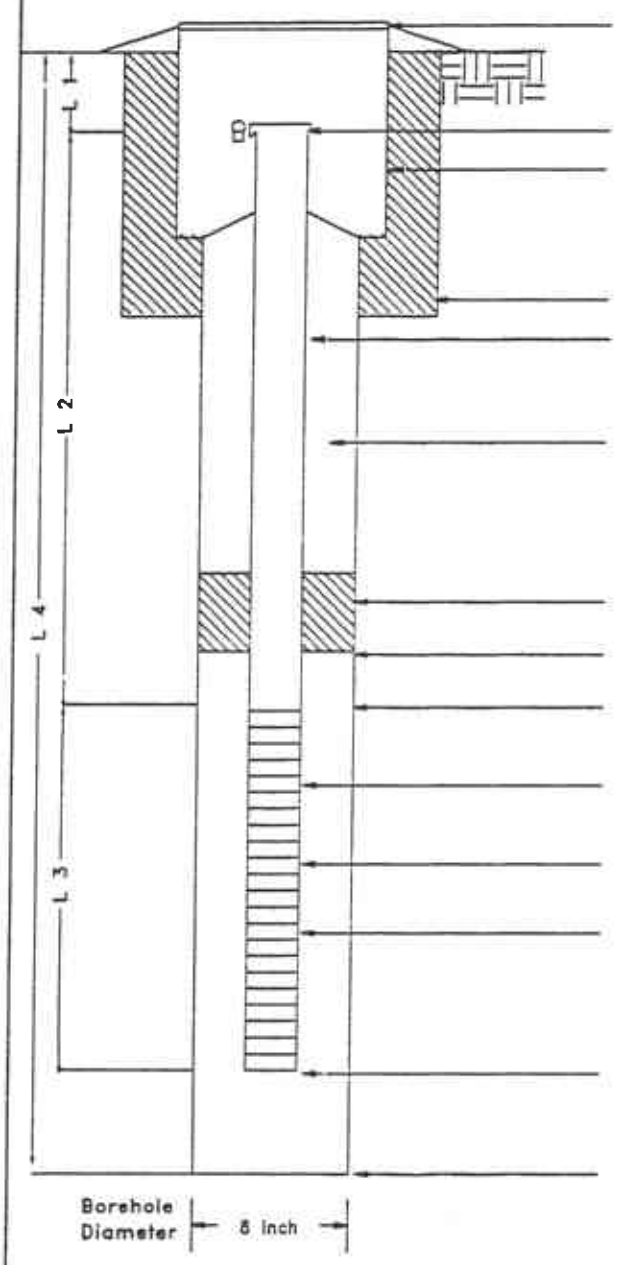
COMPLETION DATE AND TIME 10:45 05-28-93

ACTON • MICKELSON • VAN DAM, INC.

VADOSE WELL CONSTRUCTION DETAILS

VADOSE WELL NO. VW-3

PROJECT: Beacon #604
1619 W. First Street
Livermore, CA



Protective Casing	
Locking Water Tight Cap	
Flush Grade Well Construction	
Diameter and Mat'l	8-inch steel
Total length	12 inches
Length Above Ground	1/4 inch
Thickness and Type of Seal	2 feet, concrete
Diameter, Mat'l and Joint Type of Riser Pipe	2 inch, SCH 40 PVC, flush thread
Type of Backfill Around Riser	cement/ 5% bentonite grout
Thickness and Type of Seal	2 feet bentonite chips
Distance of Filter Sand Above Top of Screen	2 feet
Type of Filter Around Screen	#3 Lonestar
Monitoring Well Mat'l	SCH 40 PVC
Screen Gauge/Slot Size	0.020 inch
Diameter and Length of Screen	2 inch, 10 feet
Depth to Bottom of Monitoring Well	36 feet
Depth to the Bottom of Filter Sand	36 feet

L1 = 0.25

L2 = 20.75

L3 = 15

L4 = 36

COMPLETION DATE AND TIME 10:40 06-01-93

ACTON • MICKELSON • VAN DAM, INC.

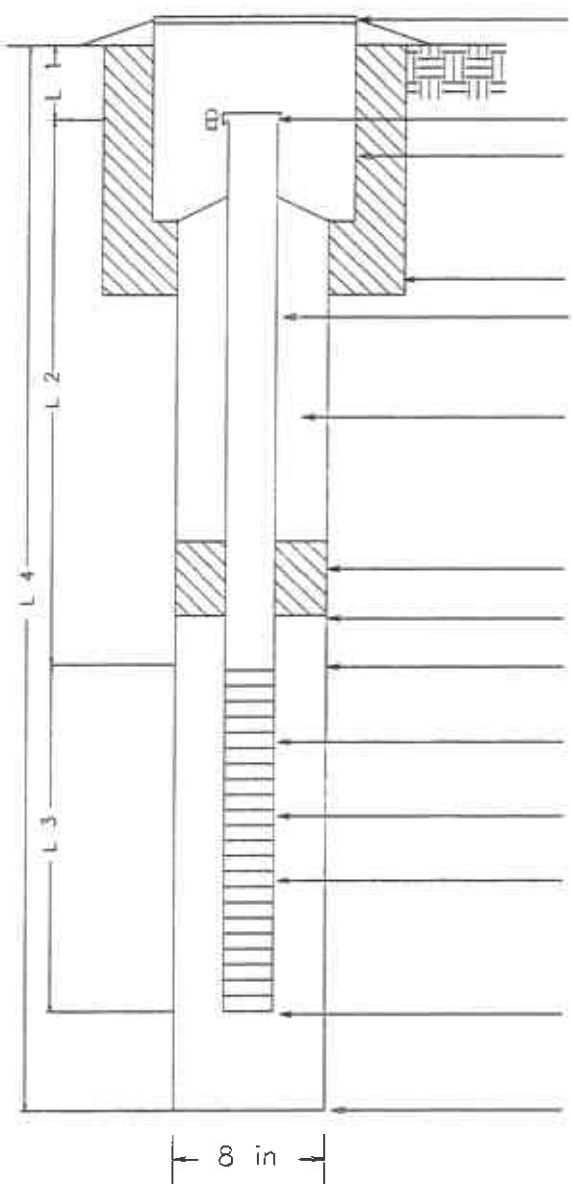
MONITORING WELL CONSTRUCTION DETAILS

PROJECT NO: 19024.03

LOCATION: Beacon #604
1619 West First Street
Livermore, California

MONITORING WELL NO.: MW-4

ELEVATION: 99.35 feet



Protective Casing	
Locking Water Tight Cap	
Flush Grade Well Construction	
Diameter and Mat'l	8-inch steel
Total length	12 inches
Length Above Ground	1/4 inch
Thickness and Type of Seal	2 feet, concrete
Diameter, Mat'l and Joint Type of Riser Pipe	2 inch, SCH 40 PVC flush thread
Type of Backfill Around Riser	cement/ 5% bentonite grout
Thickness and Type of Seal	2 feet bentonite chips
Distance of Filter Sand Above Top of Screen	2 feet
Type of Filter Around Screen	#3 lonestar
Monitoring Well Mat'l	SCH 40 PVC
Screen Gauge/Slot Size	0.020 inch
Diameter and Length of Screen	2 inch, 20 feet
Depth to Bottom of Monitoring Well	47 feet
Depth to the Bottom of Filter Sand	47 feet

L1 = 0.25 feet
L2 = 26.75 feet
L3 = 20.00 feet
L4 = 47.00 feet

MONITORING WELL WATER LEVEL MEASUREMENTS

Date:	Time:	Water Level*
03/30/94	1545	31.56

Completion Date and Time: 03/30/94 1500

* Measuring Point: Top Of Casing

ACTON • MICKELSON • VAN DAM, INC.
4511 Golden Foothill Parkway, Suite 1
El Dorado Hills, CA 95762

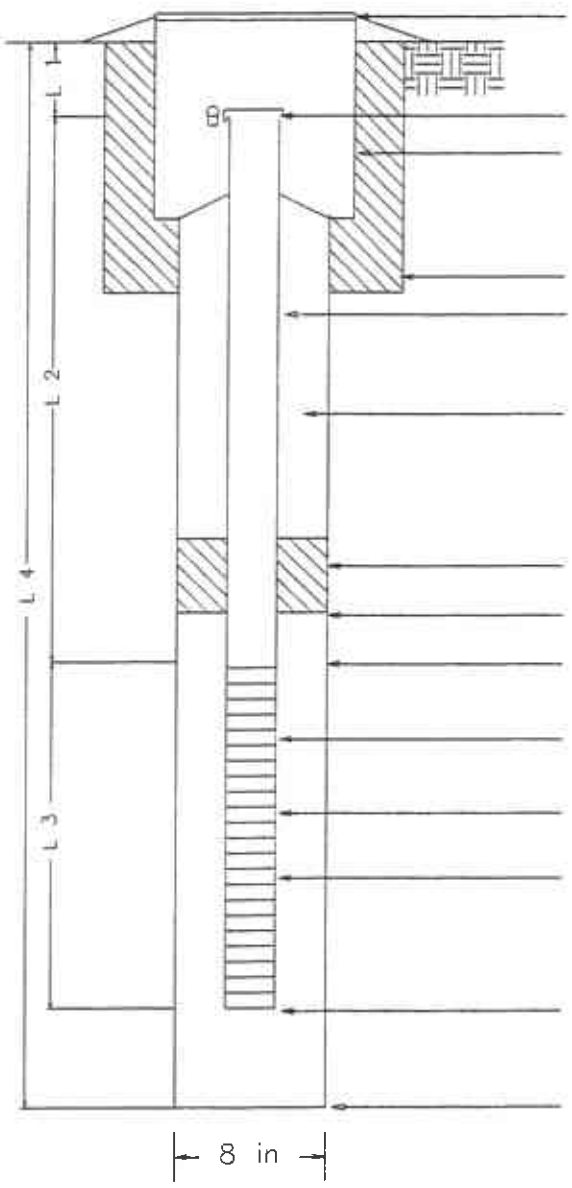
MONITORING WELL CONSTRUCTION DETAILS

PROJECT NO: 19024.03

LOCATION: Beacon #604
1619 West First Street
Livermore, California

MONITORING WELL NO.: MW-5

ELEVATION: 98.37 feet



Protective Casing	
Locking Water Tight Cap	
Flush Grade Well Construction	
Diameter and Mat'l	8-inch steel
Total length	12 inches
Length Above Ground	1/4 inch
Thickness and Type of Seal	2 feet, concrete
Diameter, Mat'l and Joint Type of Riser Pipe	2 inch, SCH 40 PVC flush thread
Type of Backfill Around Riser	cement/ 5% bentonite grout
Thickness and Type of Seal	2 feet bentonite chips
Distance of Filter Sand Above Top of Screen	2 feet
Type of Filter Around Screen	#3 lonestar
Monitoring Well Mat'l	SCH 40 PVC
Screen Gauge/Slot Size	0.020 inch
Diameter and Length of Screen	2 inch, 20 feet
Depth to Bottom of Monitoring Well	47 feet
Depth to the Bottom of Filter Sand	47 feet

L1 = 0.25 feet
L2 = 26.75 feet
L3 = 20.00 feet
L4 = 47.00 feet

MONITORING WELL WATER LEVEL MEASUREMENTS

Date:	Time:	Water Level*
03/30/94	1525	32.07

Completion Date and Time: 03/29/94 1300

* Measuring Point: Top Of Casing

ACTON • MICKELSON • VAN DAM, INC.
4511 Golden Foothill Parkway, Suite 1
El Dorado Hills, CA 95762

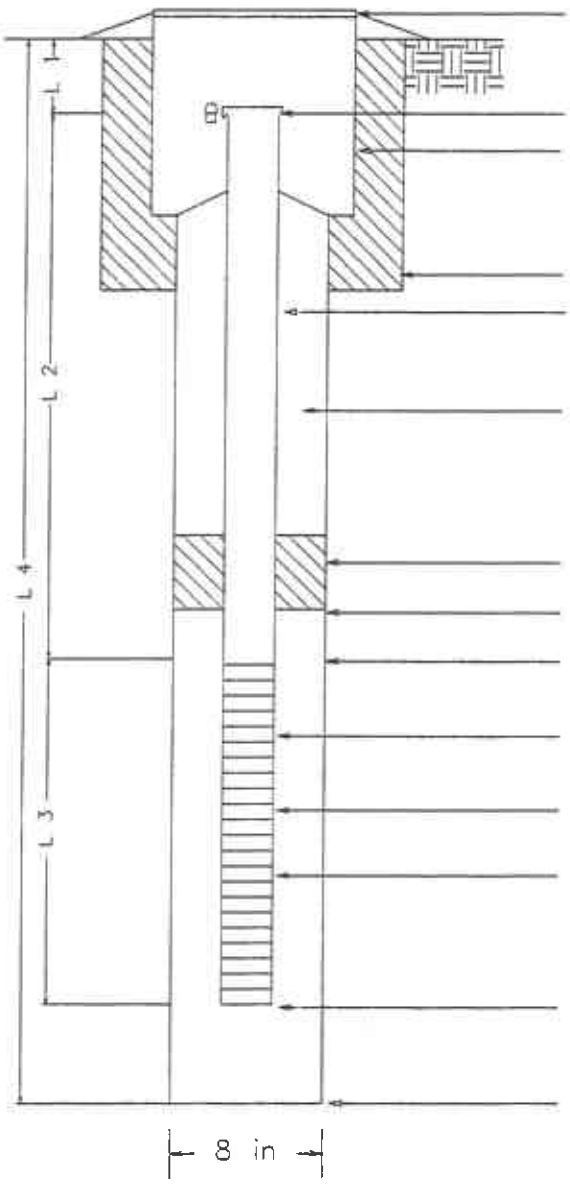
MONITORING WELL CONSTRUCTION DETAILS

PROJECT NO: 19024.03

LOCATION: Beacon #604
1619 West First Street
Livermore, California

MONITORING WELL NO.: MW-6

ELEVATION: 97.62 feet



Protective Casing	
Locking Water Tight Cap	
Flush Grade Well Construction	
Diameter and Mat'l	8-inch steel
Total length	12 inches
Length Above Ground	1/4 inch
Thickness and Type of Seal	2 feet, concrete
Diameter, Mat'l and Joint Type of Riser Pipe	2 inch, SCH 40 PVC flush thread
Type of Backfill Around Riser	cement/ 5% bentonite grout
Thickness and Type of Seal	2 feet bentonite chips
Distance of Filter Sand Above Top of Screen	2 feet
Type of Filter Around Screen	#3 lonestar
Monitoring Well Mat'l	SCH 40 PVC
Screen Gauge/Slot Size	0.020 inch
Diameter and Length of Screen	2 inch, 20 feet
Depth to Bottom of Monitoring Well	48 feet
Depth to the Bottom of Filter Sand	48 feet

L1 = 0.25 feet
L2 = 27.75 feet
L3 = 20.00 feet
L4 = 48.00 feet

MONITORING WELL WATER LEVEL MEASUREMENTS

Date:	Time:	Water Level*
03/30/94	1521	33.38

Completion Date and Time: 03/29/94 1600

* Measuring Point: Top Of Casing

ACTON • MICKELSON • VAN DAM, INC.
4511 Golden Foothill Parkway, Suite 1
El Dorado Hills, CA 95762

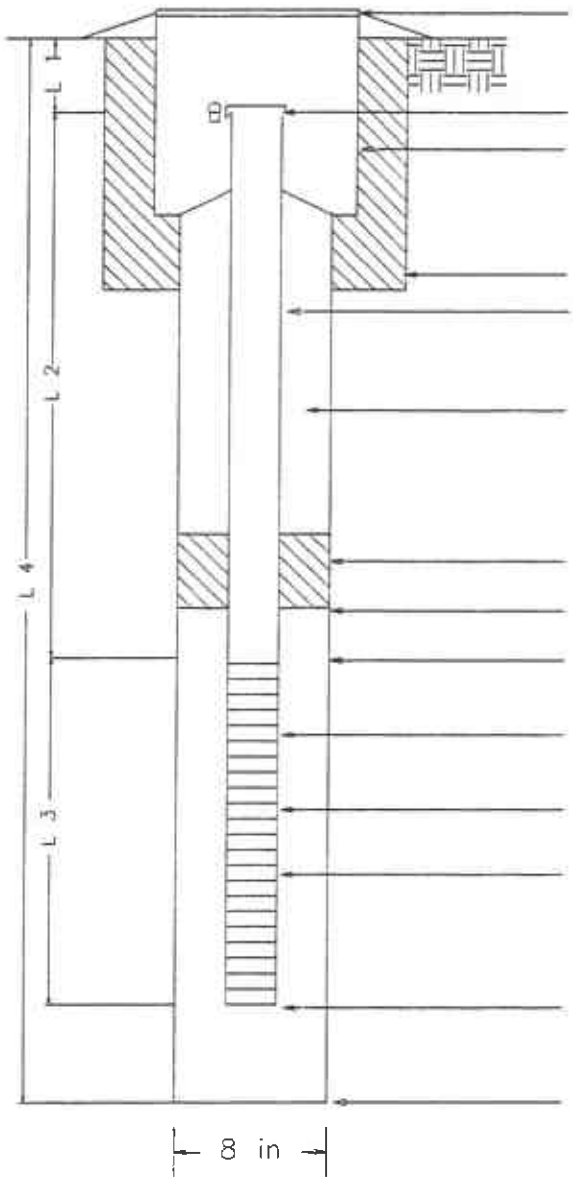
MONITORING WELL CONSTRUCTION DETAILS

PROJECT NO: 19024.03

LOCATION: Beacon #604
1619 West First Street
Livermore, California

MONITORING WELL NO.: MW-7

ELEVATION: 98.03 feet



Protective Casing	
Locking Water Tight Cap	
Flush Grade Well Construction	
Diameter and Mat'l	8-inch steel
Total length	12 inches
Length Above Ground	1/4 inch
Thickness and Type of Seal	2 feet, concrete
Diameter, Mat'l and Joint Type of Riser Pipe	2 inch, SCH 40 PVC flush thread
Type of Backfill Around Riser	cement/ 5% bentonite grout
Thickness and Type of Seal	2 feet bentonite chips
Distance of Filter Sand Above Top of Screen	2 feet
Type of Filter Around Screen	#3 lonestar
Monitoring Well Mat'l	SCH 40 PVC
Screen Gauge/Slot Size	0.020 inch
Diameter and Length of Screen	2 inch, 20 feet
Depth to Bottom of Monitoring Well	47 feet
Depth to the Bottom of Filter Sand	47 feet

L1 = 0.25 feet
L2 = 26.75 feet
L3 = 20.00 feet
L4 = 47.00 feet

MONITORING WELL WATER LEVEL MEASUREMENTS

Date:	Time:	Water Level*
03/30/94	1519	31.98

Completion Date and Time: 03/30/94 1100

* Measuring Point: Top Of Casing

ACTON • MICKELSON • VAN DAM, INC.
4511 Golden Foothill Parkway, Suite 1
El Dorado Hills, CA 95762

APPENDIX C

AQUIFER PUMPING TEST FIELD DATA AND ANALYSIS

DAILY FIELD REPORT

ACTON • MICKELSON • van DAM, INC.

Project No. 1902 4.05	**Date:** 6-23-94
Project Name: Beacon 604	**Project Location:** Livermore
Weather: Warm, Clear	**Field Crew:** SAC

Today's Work Activities:

0700-0830 Drive from office to Livermore

0830-0930 Pick up supplies at orchard Supply

0930-1200 Set up pump test using 4" Grundfos and 1" discharge hose.

1230 Begin first pump test. Water level in MW-2 @ 4.41.15 feet below grade. Pumping at 1.8 gpm.

1330 Blew out discharge hose because of high backpressure Todd Brown of AMU @ site. Sent him to get 175' of garden hose

1330-1430 Break down and re-setup pump test.

1430 Begin second pump test. Pump rate at 1.8 gpm again

1700 Drawdown of 9.48 feet in MW-2

1715 Dropped rate down to 1.0 ~~feet~~ gpm, Drawdown back at 7.31 feet

1735 Increase rate to 1.5 gpm, Drawdown @ 4.36 feet

1930 Leave site for meal

2030 Return to site and monitor test

2055 Leave site

2200 Return to site and monitor test

2235 Leave site

Signature Steve Troy Date 6-23-94

ACTON • MICKELSON • van DAM, INC.

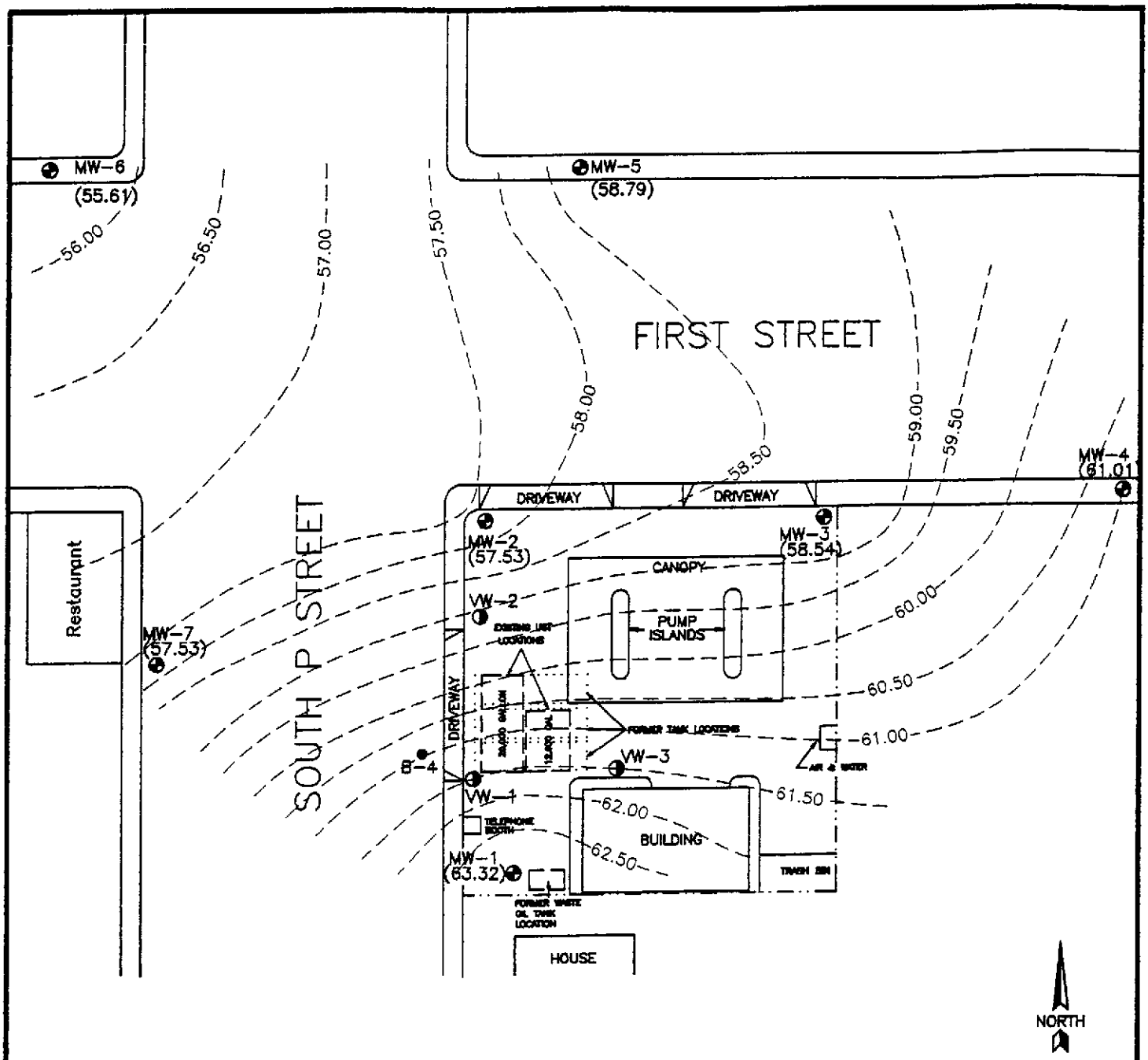
GROUND WATER LEVEL DATA

Project Name Beacon 604 Project Number 19024.05

Date 6-23-94 Field Crew SM Measuring Device and Number Interface Probe

Well No.	Time	Depth to Product (feet)	Depth to Ground Water (feet)	Product Thickness (feet)	Reference Elevation (feet)	Ground Water Elevation (feet)	Physical Observations/Comments
MW-1	1020		36.68		100.00	63.32	
MW-2	0915		41.15		98.68	57.53	
MW-3	1530		38.54		97.08	58.54	
MW-4	1417		38.34		99.35	61.01	
MW-5	1413		39.58		98.37	58.79	
MW-6	1420		42.01		97.62	55.61	
MW-7	1425		40.50		98.03	57.53	

Signature Steve Sm



LEGEND

- VW-3 — VADOSE WELL LOCATION AND NUMBER
- MW-3 — MONITORING WELL LOCATION AND NUMBER
- B-4 — SOIL BORING LOCATION AND NUMBER
- PROPERTY BOUNDARY

FIGURE C-1
WATER TABLE MAP
B604, 6/23/94
BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Project No. 19024.04	Drawn CCB
File No. IR64WTCC	Prepared TAD
Revision	Reviewed

Acton • Mickelson • van Dam, Inc.
Consulting Scientists, Engineers, and Geologists
4511 Golden Foothill Parkway, Suite 1
El Dorado Hills, California 95762
(916) 939-7550

ACTON • MICKELSON • van DAM, INC.

GROUND WATER LEVEL DATA

Project Name Beacon 604 Project Number 19024.05

Date 6-23-94 Field Crew SAL/TSB Measuring Device and Number Interface Probe

Well No.	Time	Depth to Product (feet)	Depth to Ground Water (feet)	Product Thickness (feet)	Reference Elevation (feet)	Ground Water Elevation (feet)	Physical Observations/Comments
MW-3	1815		38.55		97.08	58.53	
MW-4	1817		38.58		99.35	60.77	
MW-5	1820		39.60		98.37	58.77	
MW-6	1825		42.34		97.62	55.28	
MW-7	1827		40.55		98.03	57.48	

Signature Todd J. Brown

ACTON • MICKELSON • van DAM, INC.

GROUND WATER LEVEL DATA

Project Name Beacon 604 Project Number 19024.05

Date 6-24-94 Field Crew SAL/TJB Measuring Device and Number Interface Probe

Well No.	Time	Depth to Product (feet)	Depth to Ground Water (feet)	Product Thickness (feet)	Reference Elevation (feet)	Ground Water Elevation (feet)	Physical Observations/Comments
MW-3	0830		38.63		97.08	58.45	
MW-4	0833		38.39		99.35	60.96	
MW-5	0836		39.37		98.37	59.00	
MW-6	0840		42.21		97.62	55.41	
MW-7	0843		40.66		98.03	57.37	

Signature Todd J. Brown

ACTON • MICKELSON • van DAM, INC.

GROUND WATER LEVEL DATA

Project Name Beacon 604 Project Number 19024.05

Date 6-24-94 Field Crew SAL / TJB Measuring Device and Number Interface Probe

Well No.	Time	Depth to Product (feet)	Depth to Ground Water (feet)	Product Thickness (feet)	Reference Elevation (feet)	Ground Water Elevation (feet)	Physical Observations/Comments
MW-3	1323		38.65		97.08	58.43	
MW-4	1305		38.38		99.35	60.97	
MW-5	1309		39.69		98.37	58.68	
MW-6	1315		42.21		97.62	55.41	
MW-7	1320		40.85		98.03	57.18	

Signature Todd J. Brown

ACTON • MICKELSON • van DAM, INC.

GROUND WATER LEVEL DATA

Project Name Beacon 604 Project Number 19024.05

Date 6-24-94 Field Crew SAL/JJB Measuring Device and Number Interface Probe

Well No.	Time	Depth to Product (feet)	Depth to Ground Water (feet)	Product Thickness (feet)	Reference Elevation (feet)	Ground Water Elevation (feet)	Physical Observations/Comments
MW-1	1496		39.76		100.00	60.24	
MW-2	1453		42.96		98.68	55.72	
MW-3	1430		38.65		97.08	58.43	
MW-4	1432		38.39		99.35	60.96	
MW-5	1435		39.69		98.37	58.68	
MW-6	1440		42.21		97.62	55.41	
MW-7	1443		40.85		98.03	57.18	

Signature Todd J. Brown

Title: Aquifer Pumping Test
Job No: 19024.05
Station: Beacon #604
Aquifer Test Performed: June 23&24, 1994
Analysis By: Steve Lighty

AQUIFER TEST PARAMETERS: MW-2 (Pumping Well)

-Pumping Rate = 1.6 gpm or 0.21 ft^3/min
Duration = 24 hours
-Distance to Observation Well (ft) = 0.5 feet
-Saturated Thickness = 54.00 - 41.15 = 12.85 (1.5) = 19.28 feet (used 20 feet)
*water level on 6/23 = 41.15 (feet below top of casing)
*depth to bottom of screen = 54.00 (feet below top of casing)
-Depth to top of pumping well screen = ∅
-Depth to bottom of pumping well screen = 12.85
-Hydraulic Conductivity Ratio = 0.1 (K_z/K_r)

AQUIFER TEST PARAMETERS: MW-1 (Observation Well)

-Distance from Pumping Well (ft) = 93.0
-Pumping Rate (from above) = 0.21 ft^3/min
-Saturated Thickness = 54 - 39.86 = 14.14 (1.5) = 21.21 feet
*water level on 6/23 = 39.86 (feet below top of casing)
*depth to bottom of screen = 54.0 (feet below top of casing)
-Depth to top of pumping well screen = ∅
-Depth to bottom of pumping well screen = 12.85
-Depth to top of observation well screen = ∅
-Depth to bottom of pumping well screen = 14.14

Ground water gradient on 6/24/94 was caluculated to be 0.02 ft/ft toward the northwest.

CASING STORAGE EFFECT CALCULATION

$$t_c = \frac{0.6\,(d_c^2 - d_p^2)}{Q/s}$$

t_c = time of test affected by casing storage (minutes)

d_c = inside diameter of casing (inches)

d_p = outside diameter of column (discharge) pipe (inches)

Q/s = specific capacity of flow rate divided by drawdown

for MW-2

d_c = 4.0

d_p = 1.0

Q = 1.6 gpm

s = drawdown at t_c (guessed and iterated)

1.) $t_c = \frac{0.6[(4.0)^2 - (1.0)^2]}{1.6/1} = 5.6$ minutes

@ 5.6 minutes, $s \cong 3.4$ feet

2.) $t_c = \frac{5.6}{1.6/3.4} = 11.9$ minutes

* Results indicate that only that portion of the curve after an elapsed time of 12 minutes into the test will be used for analysis.

ESTIMATED TRANSMISSIVITY VALUES

Theis:

for MW-2:

$T = 0.03517\ ft^2/min$

$S = 0.001049$

for MW-1:

$T = 0.08996\ ft^2/min$

$S = 0.003423$

Cooper Jacob:

for MW-2:

$T = 0.02635\ ft^2/min$

$S = 0.003629$

for MW-1:

$T = 0.09108\ ft^2/min$

$S = 0.002897$

1.) TRANSMISSIVITY:

	MW-2 (pumping)	MW-1 (observation)
Theis:	$T = 0.035$ ft²/min	$T = 0.090$ ft²/min
Cooper Jacob:	$T = 0.026$ ft²/min	$T = 0.091$ ft²/min

$$T_{ave} = 0.060 \text{ ft}^2/\text{min}$$

2.) CALCULATION OF HYDRAULIC CONDUCTIVITY:

$T = Kb$ or $K = T/b$ where b = aquifer thickness in feet = -Saturated thickness

for MW-2 :

$T = 0.060$
$b = 19.29$

$K = 0.060/19.29 = 0.0031$ ft/min

for MW-1 :

$T = 0.060$
$b = 21.21$

$K = 0.060/21.21 = 0.0028$ ft/min

$$K_{ave} = \frac{0.0031 + 0.0028}{2} = 0.0030 \text{ ft/min}$$

SE1000C
Environmental Logger
06/27 10:24

Unit# 01919 Test 0

Setups:	INPUT 1	INPUT 2
Type	Level (F)	Level (F)
Mode	TOC	TOC
I.D.	00000	00000
Reference	0.000	0.000
Linearity	0.120	0.040
Scale factor	19.950	10.040
Offset	0.030	0.050
Delay mSEC	50.000	50.000

Step 0 06/23 14:33:47

Elapsed Time	INPUT 1	INPUT 2	Time	Drawdown	Drawdown
0.0000	-0.006	0.000	0	-0.006	0
0.0033	-0.012	0.000	0.0033	-0.012	0
0.0066	-0.012	0.000	0.0066	-0.012	0
0.0100	-0.012	0.000	0.01	-0.012	0
0.0133	-0.012	0.000	0.0133	-0.012	0
0.0166	-0.012	0.000	0.0166	-0.012	0
0.0200	-0.012	0.000	0.02	-0.012	0
0.0233	-0.012	0.000	0.0233	-0.012	0
0.0266	-0.012	0.000	0.0266	-0.012	0
0.0300	-0.012	0.000	0.03	-0.012	0
0.0333	-0.012	0.000	0.0333	-0.012	0
0.0366	-0.012	0.000	0.0366	-0.012	0
0.0400	-0.012	0.000	0.04	-0.012	0
0.0433	-0.012	0.000	0.0433	-0.012	0
0.0466	-0.012	0.000	0.0466	-0.012	0
0.0500	-0.012	0.000	0.05	-0.012	0
0.0533	-0.012	0.000	0.0533	-0.012	0
0.0566	-0.012	0.000	0.0566	-0.012	0
0.0600	-0.012	0.000	0.06	-0.012	0
0.0633	-0.012	0.000	0.0633	-0.012	0
0.0666	-0.012	0.000	0.0666	-0.012	0
0.0700	-0.012	0.000	0.07	-0.012	0
0.0733	-0.012	0.000	0.0733	-0.012	0
0.0766	-0.012	0.000	0.0766	-0.012	0
0.0800	-0.012	0.000	0.08	-0.012	0
0.0833	-0.012	0.000	0.0833	-0.012	0
0.0866	-0.012	0.000	0.0866	-0.012	0
0.0900	-0.012	0.000	0.09	-0.012	0
0.0933	0.044	0.000	0.0933	0.044	0
0.0966	0.201	0.000	0.0966	0.201	0
0.1000	0.271	0.000	0.1	0.271	0
0.1033	0.182	0.000	0.1033	0.182	0
0.1066	0.075	0.000	0.1066	0.075	0
0.1100	0.132	0.000	0.11	0.132	0
0.1133	0.233	0.000	0.1133	0.233	0
0.1166	0.309	0.000	0.1166	0.309	0
0.1200	0.334	0.000	0.12	0.334	0

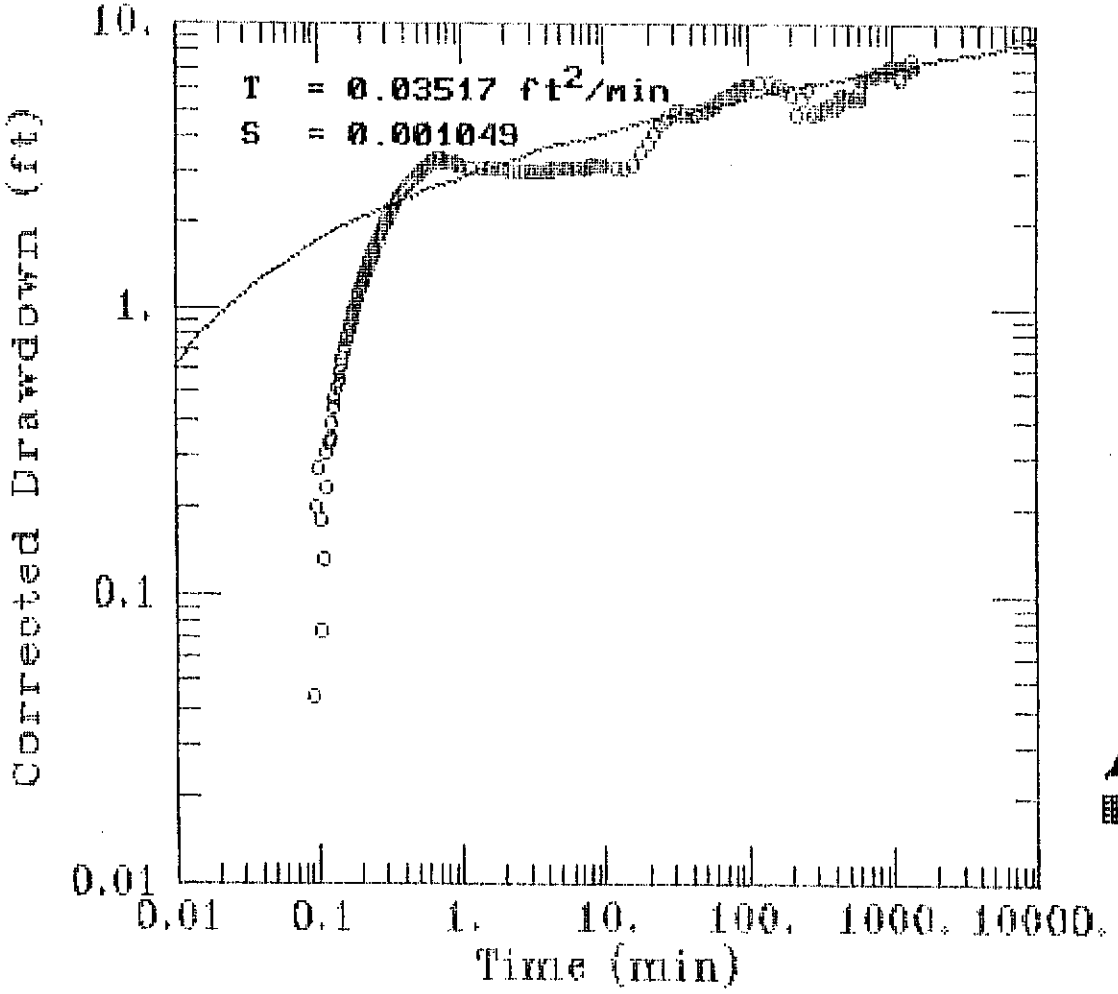
0.1300	0.454	0.000	0.13	0.454	0
0.1333	0.491	0.000	0.1333	0.491	0
0.1366	0.523	0.000	0.1366	0.523	0
0.1400	0.561	0.000	0.14	0.561	0
0.1433	0.599	0.000	0.1433	0.599	0
0.1466	0.636	0.000	0.1466	0.636	0
0.1500	0.674	0.000	0.15	0.674	0
0.1533	0.712	0.000	0.1533	0.712	0
0.1566	0.750	0.000	0.1566	0.75	0
0.1600	0.782	0.000	0.16	0.782	0
0.1633	0.813	0.000	0.1633	0.813	0
0.1666	0.851	0.000	0.1666	0.851	0
0.1700	0.889	0.003	0.17	0.889	0.003
0.1733	0.920	0.000	0.1733	0.92	0
0.1766	0.958	0.000	0.1766	0.958	0
0.1800	0.990	0.000	0.18	0.99	0
0.1833	1.021	0.000	0.1833	1.021	0
0.1866	1.053	0.003	0.1866	1.053	0.003
0.1900	1.090	0.003	0.19	1.09	0.003
0.1933	1.122	0.003	0.1933	1.122	0.003
0.1966	1.153	0.003	0.1966	1.153	0.003
0.2000	1.191	0.003	0.2	1.191	0.003
0.2033	1.223	0.003	0.2033	1.223	0.003
0.2066	1.254	0.003	0.2066	1.254	0.003
0.2100	1.286	0.003	0.21	1.286	0.003
0.2133	1.317	0.003	0.2133	1.317	0.003
0.2166	1.349	0.003	0.2166	1.349	0.003
0.2200	1.381	0.003	0.22	1.381	0.003
0.2233	1.412	0.003	0.2233	1.412	0.003
0.2266	1.444	0.003	0.2266	1.444	0.003
0.2300	1.475	0.003	0.23	1.475	0.003
0.2333	1.507	0.003	0.2333	1.507	0.003
0.2366	1.538	0.003	0.2366	1.538	0.003
0.2400	1.570	0.003	0.24	1.57	0.003
0.2433	1.601	0.003	0.2433	1.601	0.003
0.2466	1.626	0.003	0.2466	1.626	0.003
0.2500	1.658	0.003	0.25	1.658	0.003
0.2533	1.689	0.003	0.2533	1.689	0.003
0.2566	1.721	0.000	0.2566	1.721	0
0.2600	1.752	0.003	0.26	1.752	0.003
0.2633	1.784	0.003	0.2633	1.784	0.003
0.2666	1.809	0.000	0.2666	1.809	0
0.2700	1.841	0.003	0.27	1.841	0.003
0.2733	1.872	0.003	0.2733	1.872	0.003
0.2766	1.904	0.000	0.2766	1.904	0
0.2800	1.929	0.000	0.28	1.929	0
0.2833	1.960	0.003	0.2833	1.96	0.003
0.2866	1.992	0.000	0.2866	1.992	0
0.2900	2.017	0.000	0.29	2.017	0
0.2933	2.049	0.000	0.2933	2.049	0
0.2966	2.074	0.000	0.2966	2.074	0
0.3000	2.105	0.000	0.3	2.105	0
0.3033	2.137	0.000	0.3033	2.137	0
0.3066	2.162	0.000	0.3066	2.162	0
0.3100	2.194	0.000	0.31	2.194	0
0.3133	2.219	0.000	0.3133	2.219	0
0.3166	2.244	0.000	0.3166	2.244	0
0.3200	2.269	0.000	0.32	2.269	0
0.3233	2.301	0.000	0.3233	2.301	0
0.3266	2.326	0.000	0.3266	2.326	0
0.3300	2.351	0.000	0.33	2.351	0
0.3333	2.376	0.000	0.3333	2.376	0
0.3500	2.515	0.003	0.35	2.515	0.003
0.3666	2.635	0.003	0.3666	2.635	0.003

0.4166	2.893	0.003	0.4166	2.893	0.003
0.4333	2.956	0.003	0.4333	2.956	0.003
0.4500	3.019	0.003	0.45	3.019	0.003
0.4666	3.082	0.000	0.4666	3.082	0
0.4833	3.139	0.003	0.4833	3.139	0.003
0.5000	3.189	0.003	0.5	3.189	0.003
0.5166	3.246	0.000	0.5166	3.246	0
0.5333	3.303	0.000	0.5333	3.303	0
0.5500	3.353	0.000	0.55	3.353	0
0.5666	3.410	0.000	0.5666	3.41	0
0.5833	3.460	0.000	0.5833	3.46	0
0.6000	3.517	0.000	0.6	3.517	0
0.6166	3.568	0.000	0.6166	3.568	0
0.6333	3.612	0.000	0.6333	3.612	0
0.6500	3.643	0.000	0.65	3.643	0
0.6666	3.656	0.000	0.6666	3.656	0
0.6833	3.662	0.000	0.6833	3.662	0
0.7000	3.662	0.000	0.7	3.662	0
0.7166	3.656	0.000	0.7166	3.656	0
0.7333	3.649	0.000	0.7333	3.649	0
0.7500	3.637	0.000	0.75	3.637	0
0.7666	3.631	0.000	0.7666	3.631	0
0.7833	3.618	0.000	0.7833	3.618	0
0.8000	3.612	0.000	0.8	3.612	0
0.8166	3.599	0.000	0.8166	3.599	0
0.8333	3.586	0.000	0.8333	3.586	0
0.8500	3.580	0.003	0.85	3.58	0.003
0.8666	3.574	0.000	0.8666	3.574	0
0.8833	3.568	0.000	0.8833	3.568	0
0.9000	3.561	0.000	0.9	3.561	0
0.9166	3.549	0.000	0.9166	3.549	0
0.9333	3.536	0.000	0.9333	3.536	0
0.9500	3.517	0.000	0.95	3.517	0
0.9666	3.504	0.000	0.9666	3.504	0
0.9833	3.492	0.000	0.9833	3.492	0
1.0000	3.479	0.000	1	3.479	0
1.2000	3.416	0.000	1.2	3.416	0
1.4000	3.385	0.000	1.4	3.385	0
1.6000	3.366	0.000	1.6	3.366	0
1.8000	3.360	0.000	1.8	3.36	0
2.0000	3.347	0.000	2	3.347	0
2.2000	3.322	0.000	2.2	3.322	0
2.4000	3.303	0.000	2.4	3.303	0
2.6000	3.297	0.000	2.6	3.297	0
2.8000	3.290	0.000	2.8	3.29	0
3.0000	3.297	0.003	3	3.297	0.003
3.2000	3.309	0.000	3.2	3.309	0
3.4000	3.315	0.000	3.4	3.315	0
3.6000	3.322	0.003	3.6	3.322	0.003
3.8000	3.334	0.003	3.8	3.334	0.003
4.0000	3.341	0.000	4	3.341	0
4.2000	3.347	0.000	4.2	3.347	0
4.4000	3.341	0.003	4.4	3.341	0.003
4.6000	3.347	0.000	4.6	3.347	0
4.8000	3.347	0.000	4.8	3.347	0
5.0000	3.353	0.003	5	3.353	0.003
5.2000	3.353	0.003	5.2	3.353	0.003
5.4000	3.353	0.003	5.4	3.353	0.003
5.6000	3.360	0.000	5.6	3.36	0
5.8000	3.360	0.000	5.8	3.36	0
6.0000	3.366	0.000	6	3.366	0
6.2000	3.372	0.000	6.2	3.372	0
6.4000	3.378	0.000	6.4	3.378	0
6.6000	3.385	0.003	6.6	3.385	0.003

7.2000	3.416	0.003	7.2	3.416	0.003
7.4000	3.423	0.006	7.4	3.423	0.006
7.6000	3.429	0.003	7.6	3.429	0.003
7.8000	3.441	0.003	7.8	3.441	0.003
8.0000	3.454	0.003	8	3.454	0.003
8.2000	3.460	0.003	8.2	3.46	0.003
8.4000	3.467	0.003	8.4	3.467	0.003
8.6000	3.473	0.003	8.6	3.473	0.003
8.8000	3.479	0.003	8.8	3.479	0.003
9.0000	3.486	0.003	9	3.486	0.003
9.2000	3.498	0.003	9.2	3.498	0.003
9.4000	3.511	0.003	9.4	3.511	0.003
9.6000	3.511	0.003	9.6	3.511	0.003
9.8000	3.511	0.003	9.8	3.511	0.003
10.0000	3.504	0.000	10	3.504	0
12.0000	3.435	0.009	12	3.435	0.009
14.0000	3.416	0.009	14	3.416	0.009
16.0000	3.530	0.009	16	3.53	0.009
18.0000	3.939	0.009	18	3.939	0.009
20.0000	4.298	0.015	20	4.298	0.015
22.0000	4.739	0.015	22	4.739	0.015
24.0000	5.168	0.015	24	5.168	0.015
26.0000	5.287	0.015	26	5.287	0.015
28.0000	5.464	0.012	28	5.464	0.012
30.0000	5.653	0.019	30	5.653	0.019
32.0000	5.703	0.019	32	5.703	0.019
34.0000	5.709	0.022	34	5.709	0.022
36.0000	5.646	0.022	36	5.646	0.022
38.0000	5.627	0.025	38	5.627	0.025
40.0000	5.621	0.025	40	5.621	0.025
42.0000	5.634	0.022	42	5.634	0.022
44.0000	5.671	0.028	44	5.671	0.028
46.0000	5.716	0.028	46	5.716	0.028
48.0000	5.760	0.031	48	5.76	0.031
50.0000	5.810	0.028	50	5.81	0.028
52.0000	5.936	0.031	52	5.936	0.031
54.0000	5.986	0.034	54	5.986	0.034
56.0000	6.056	0.031	56	6.056	0.031
58.0000	6.144	0.031	58	6.144	0.031
60.0000	6.251	0.038	60	6.251	0.038
62.0000	6.339	0.034	62	6.339	0.034
64.0000	6.433	0.041	64	6.433	0.041
66.0000	6.477	0.041	66	6.477	0.041
68.0000	6.503	0.041	68	6.503	0.041
70.0000	6.559	0.044	70	6.559	0.044
72.0000	6.591	0.041	72	6.591	0.041
74.0000	6.641	0.041	74	6.641	0.041
76.0000	6.679	0.044	76	6.679	0.044
78.0000	6.723	0.047	78	6.723	0.047
80.0000	6.773	0.050	80	6.773	0.05
82.0000	7.069	0.050	82	7.069	0.05
84.0000	7.113	0.050	84	7.113	0.05
86.0000	7.164	0.053	86	7.164	0.053
88.0000	7.227	0.057	88	7.227	0.057
90.0000	7.271	0.053	90	7.271	0.053
92.0000	7.302	0.057	92	7.302	0.057
94.0000	7.353	0.060	94	7.353	0.06
96.0000	7.397	0.060	96	7.397	0.06
98.0000	7.441	0.060	98	7.441	0.06
100.000	7.478	0.066	100	7.478	0.066
120.000	7.812	0.076	120	7.812	0.076
140.000	7.745	0.085	140	7.745	0.085
160.000	7.371	0.082	160	7.371	0.082
180.000	7.296	0.095	180	7.296	0.095

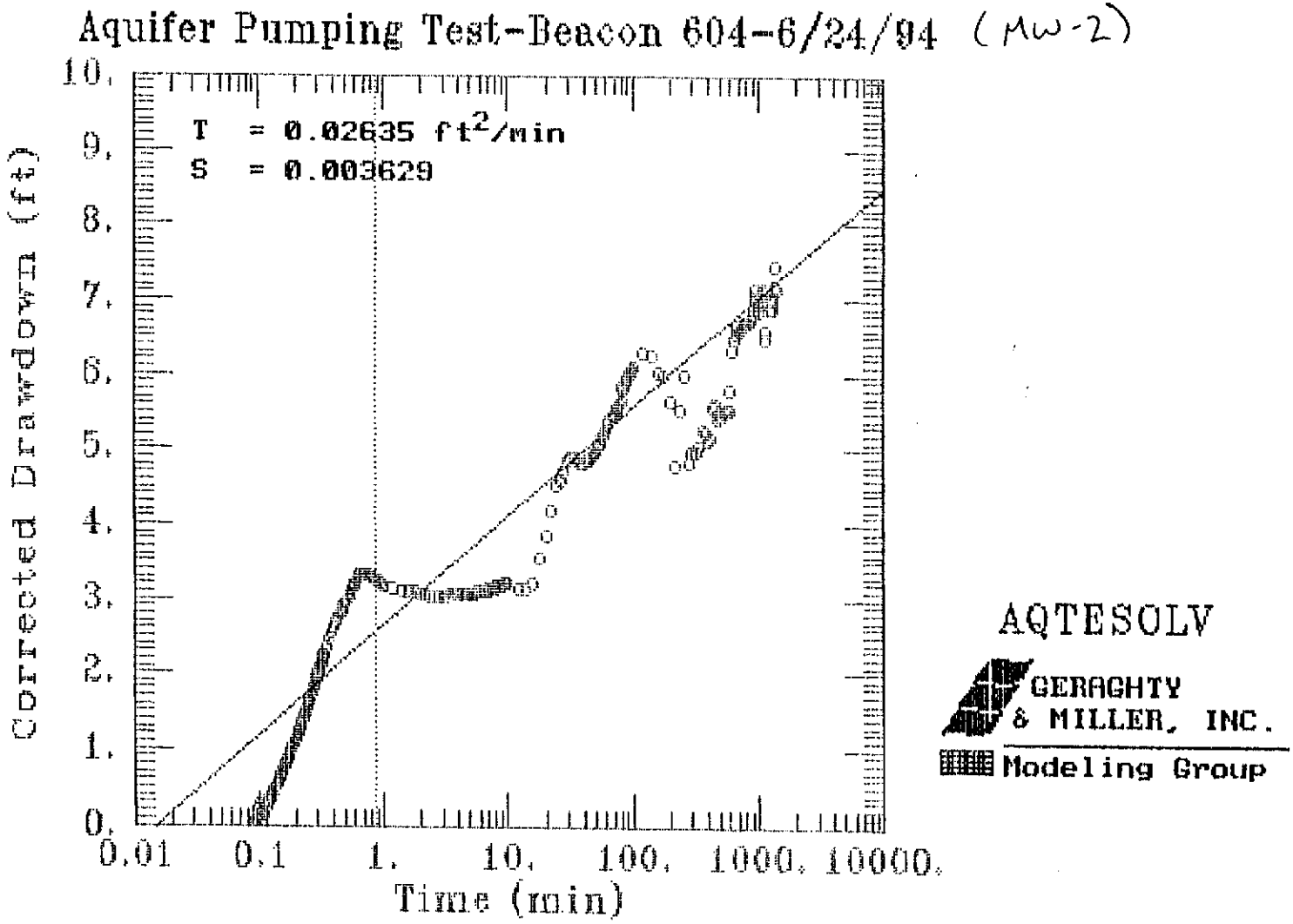
240.000	6.610	0.117	240	6.61	0.117
260.000	7.327	0.130	260	7.327	0.13
280.000	5.615	0.146	280	5.615	0.146
300.000	5.810	0.152	300	5.81	0.152
320.000	5.823	0.161	320	5.823	0.161
340.000	5.904	0.165	340	5.904	0.165
360.000	6.219	0.177	360	6.219	0.177
380.000	6.207	0.187	380	6.207	0.187
400.000	6.011	0.196	400	6.011	0.196
420.000	6.068	0.209	420	6.068	0.209
440.000	6.685	0.222	440	6.685	0.222
460.000	6.754	0.228	460	6.754	0.228
480.000	6.477	0.235	480	6.477	0.235
500.000	6.503	0.244	500	6.503	0.244
520.000	6.540	0.250	520	6.54	0.25
540.000	6.591	0.260	540	6.591	0.26
560.000	6.622	0.266	560	6.622	0.266
580.000	6.641	0.269	580	6.641	0.269
600.000	7.006	0.269	600	7.006	0.269
620.000	7.888	0.276	620	7.888	0.276
640.000	8.127	0.285	640	8.127	0.285
660.000	8.441	0.292	660	8.441	0.292
680.000	8.246	0.295	680	8.246	0.295
700.000	8.290	0.298	700	8.29	0.298
720.000	8.341	0.301	720	8.341	0.301
740.000	8.397	0.308	740	8.397	0.308
760.000	8.448	0.311	760	8.448	0.311
780.000	8.504	0.314	780	8.504	0.314
800.000	8.485	0.317	800	8.485	0.317
820.000	8.485	0.317	820	8.485	0.317
840.000	8.523	0.323	840	8.523	0.323
860.000	8.567	0.330	860	8.567	0.33
880.000	8.536	0.336	880	8.536	0.336
900.000	8.687	0.342	900	8.687	0.342
920.000	8.831	0.352	920	8.831	0.352
940.000	9.341	0.358	940	9.341	0.358
960.000	9.109	0.362	960	9.109	0.362
980.000	8.775	0.371	980	8.775	0.371
1000.00	8.938	0.381	1000	8.938	0.381
1030.00	9.146	0.393	1030	9.146	0.393
1060.00	9.291	0.403	1060	9.291	0.403
1090.00	9.272	0.409	1090	9.272	0.409
1120.00	8.089	0.412	1120	8.089	0.412
1150.00	8.309	0.416	1150	8.309	0.416
1180.00	9.266	0.419	1180	9.266	0.419
1210.00	9.127	0.425	1210	9.127	0.425
1240.00	8.813	0.428	1240	8.813	0.428
1270.00	8.806	0.431	1270	8.806	0.431
1300.00	9.008	0.444	1300	9.008	0.444
1330.00	9.379	0.450	1330	9.379	0.45
1360.00	9.870	0.454	1360	9.87	0.454
1390.00	9.322	0.454	1390	9.322	0.454

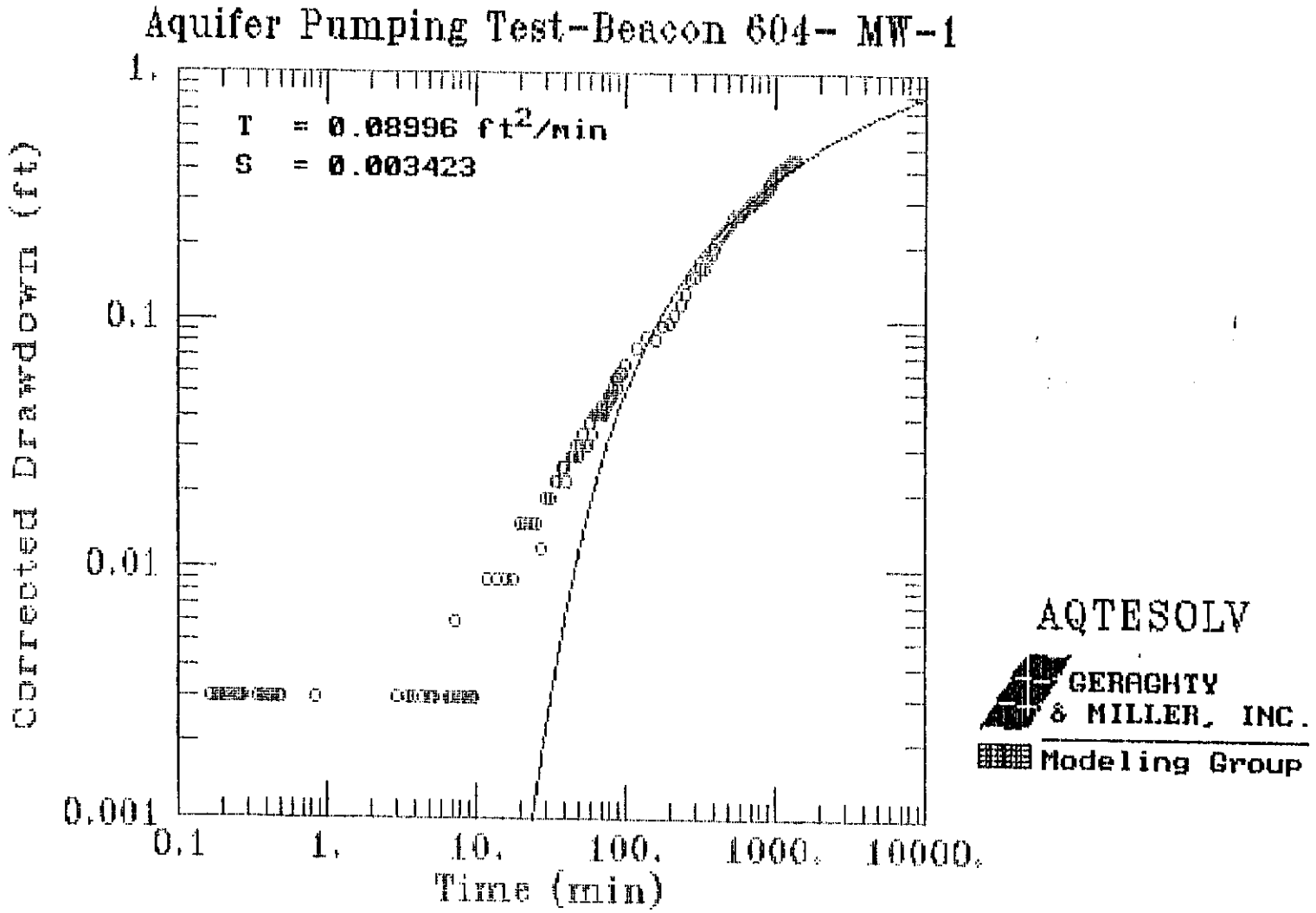
Aquifer Pumping Test-Beacon 604-6/24/94 (MW-2)

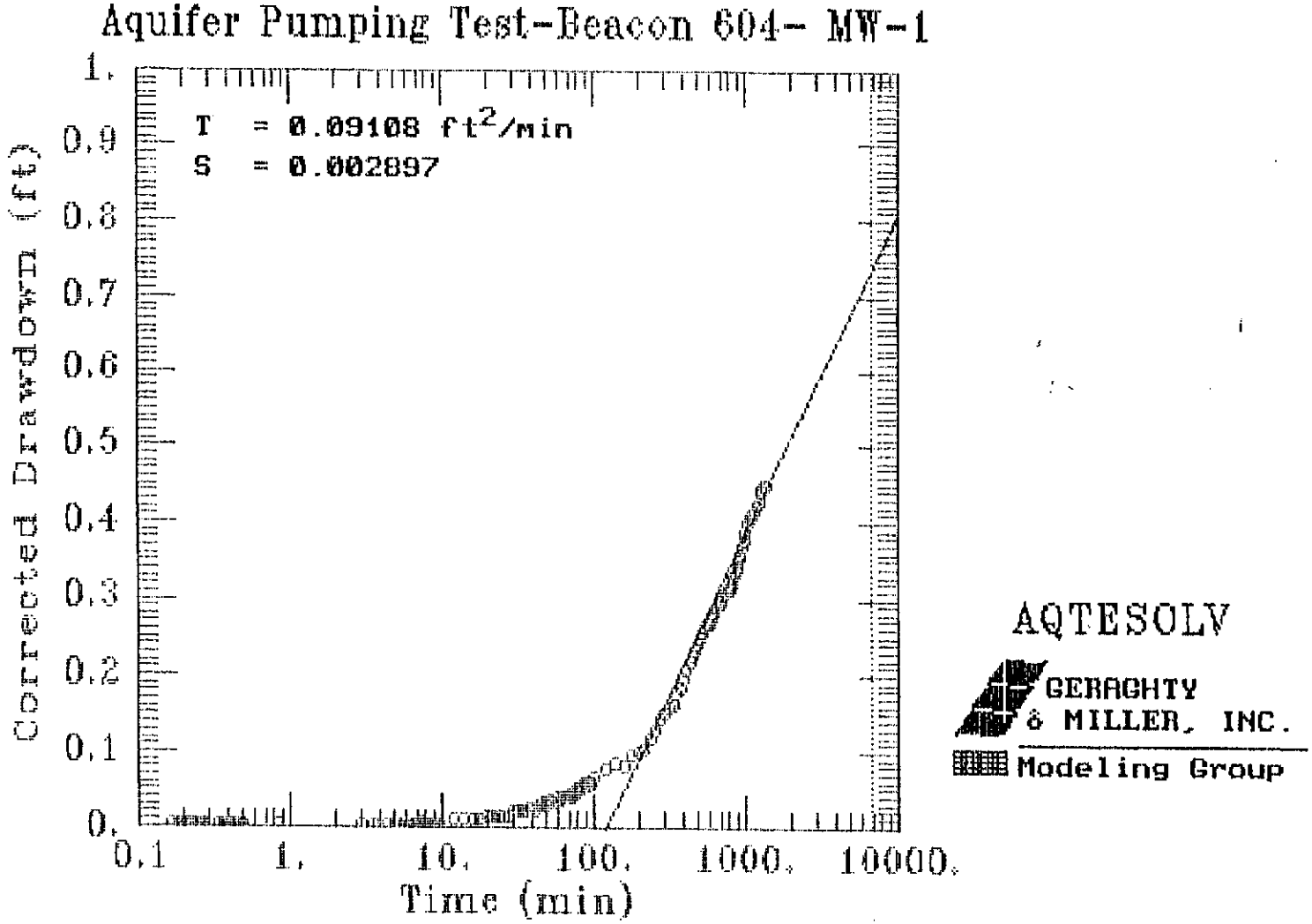


AQTESOLV

GERAGHTY & MILLER, INC.
Modeling Group

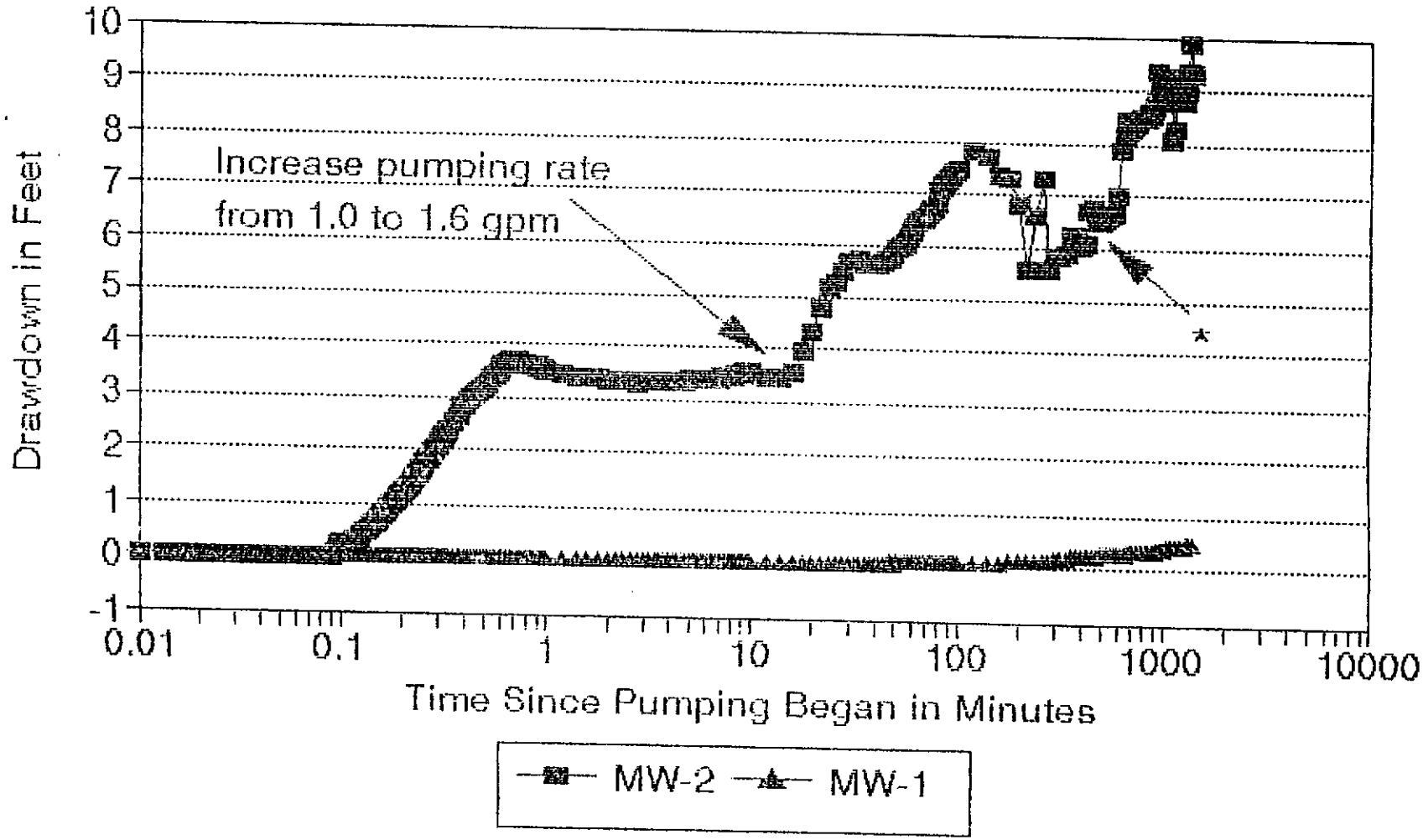

Aquifer Pumping Test-Beacon 604-6/24/94 (MW-2)
T = 0.02635 ft²/min
S = 0.003629
Corrected Drawdown (ft)
10.
9.
8.
7.
6.
5.
4.
3.
2.
1.
0.
0.01
0.1
1.
10.
100.
1000.
10000.
Time (min)
AQTESOLV
GERAGHTY & MILLER, INC.
Modeling Group


Aquifer Pumping Test-Beacon 604- MW-1
T = 0.08996 ft²/min
S = 0.003423
Corrected Drawdown (ft)
1.
0.1
0.01
0.001
0.1
1.
10.
100.
1000.
10000.
Time (min)
AQTESOLV
GERAGHTY & MILLER, INC.
Modeling Group


Aquifer Pumping Test-Beacon 604- MW-1
T = 0.09108 ft²/min
S = 0.002897
Corrected Drawdown (ft)
1.
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.
0.1
1.
10.
100.
1000.
10000.
Time (min)
AQTESOLV
GERAGHTY & MILLER, INC.
Modeling Group

HYDROGRAPHS FROM PUMPING TEST

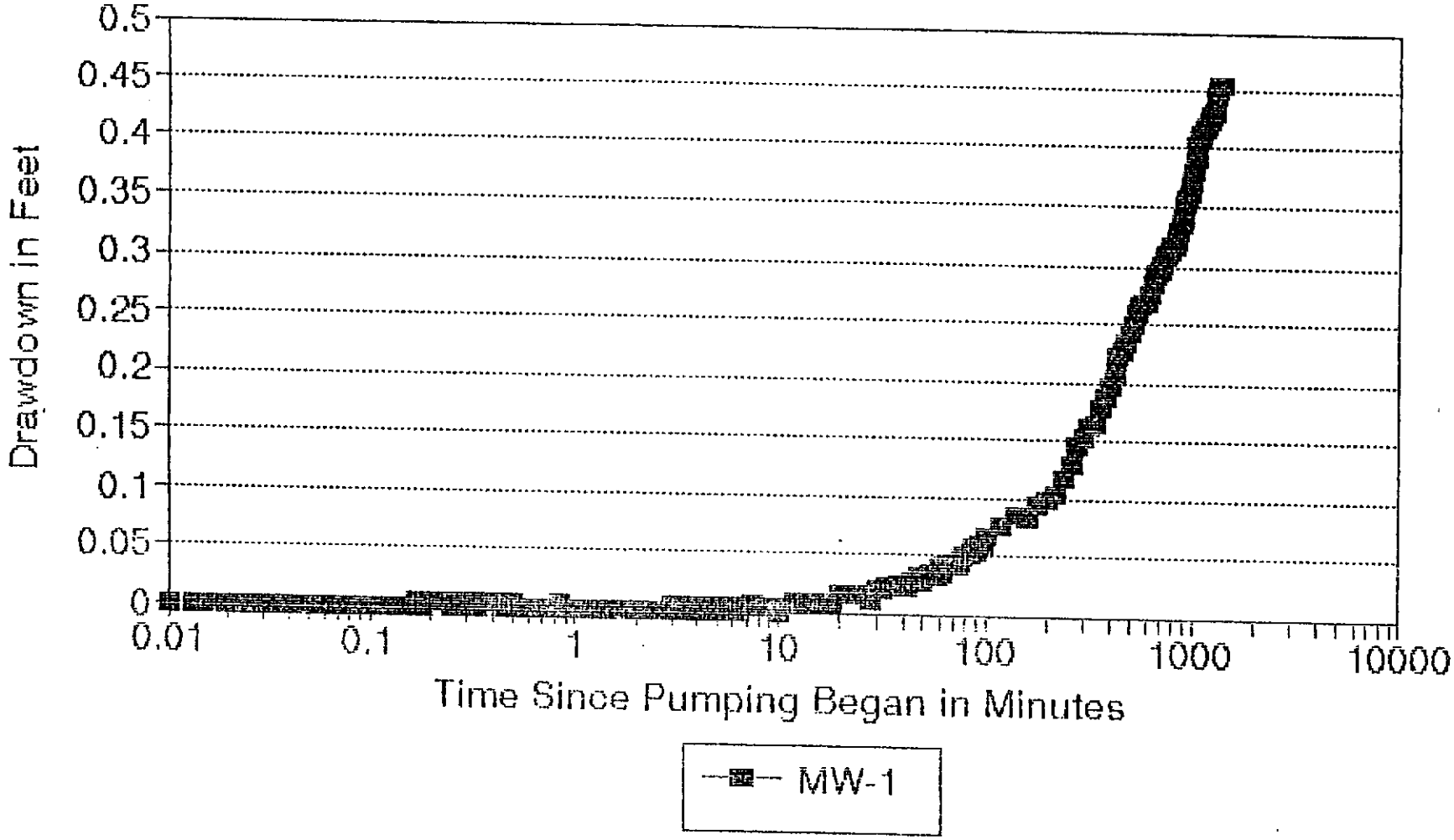
Beacon Station #604, June 23 & 24, 1994



* = Disengaged pump temporarily to repair break in hose

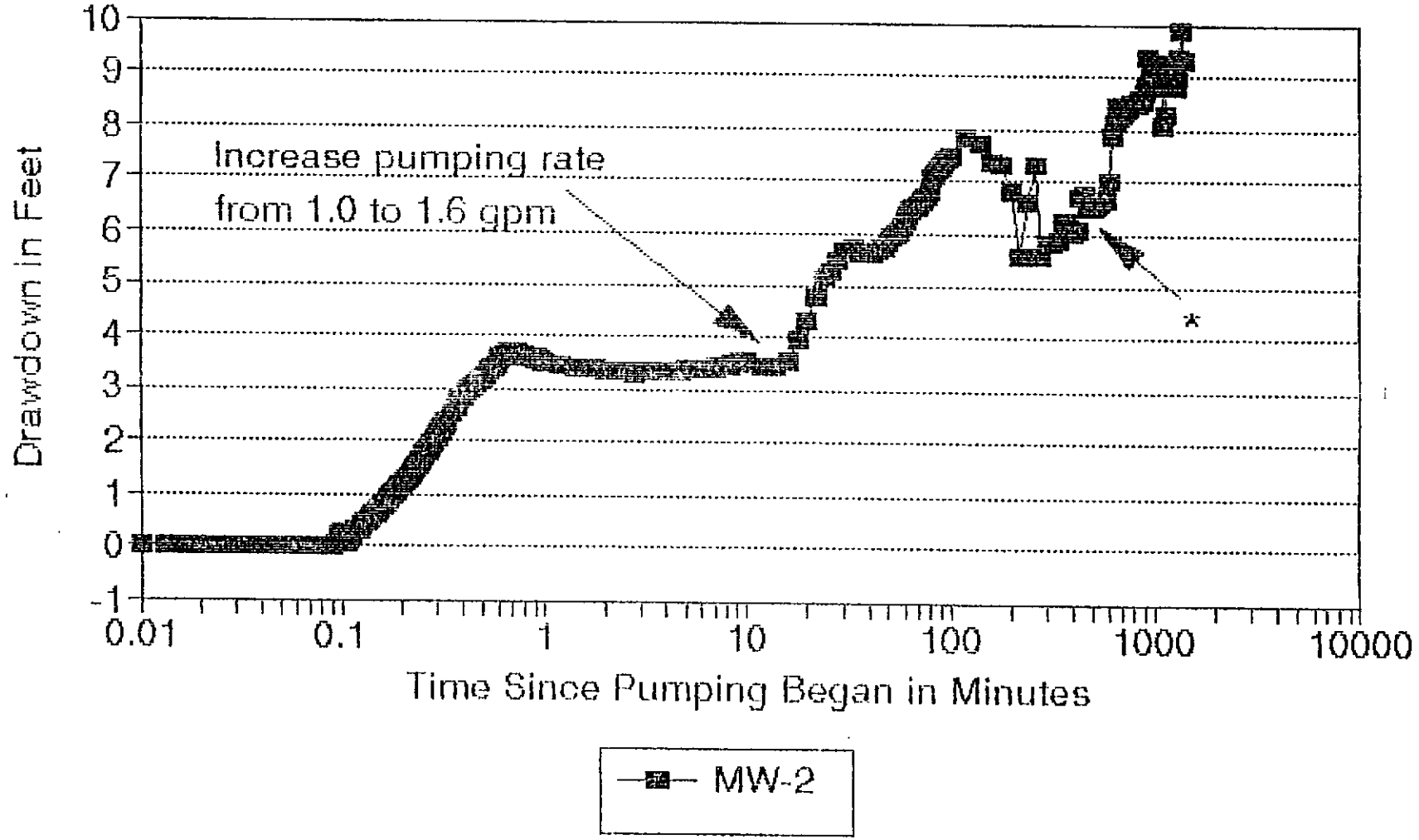
HYDROGRAPHS FROM PUMPING TEST

Beacon Station #604, June 23 & 24, 1994



HYDROGRAPHS FROM PUMPING TEST

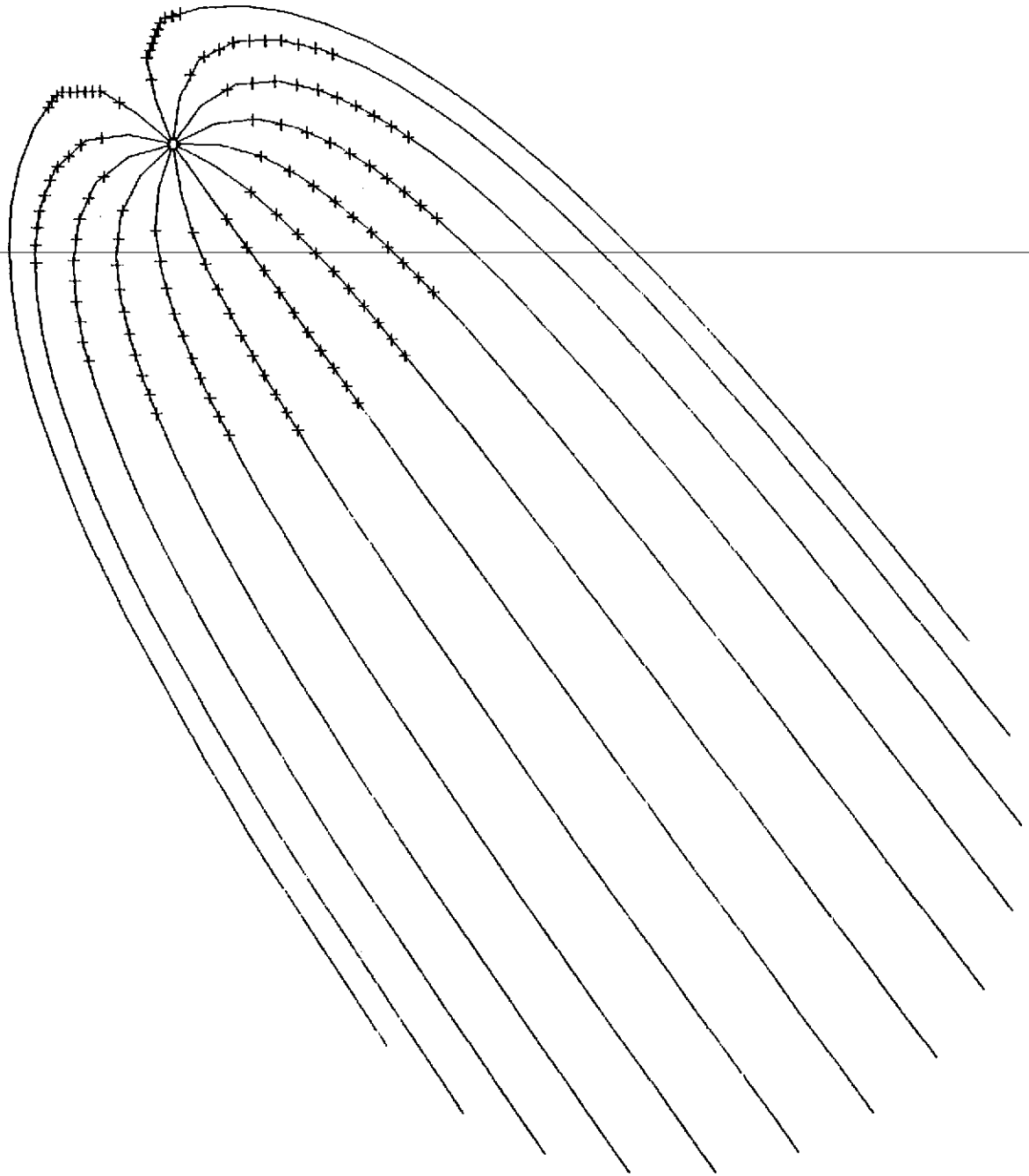
Beacon Station #604, June 23 & 24, 1994



* = Disengaged pump temporarily to repair break in hose

```
CAPTURE 2.20                by Data Services - 707/792-0528
(C)Copyright 1985-88 Don McEdwards -- All Rights Reserved

Enter the input file name   19024a.dat
Create *.PLT file (Y OR N)  y
Enter the *.PLT file name 19024a.plt
MW-2 Pumping at 1.6 gpm K is 0.003 ft/min

     SCALE      XORG      YORG      GRAD     THETA
  40.0000    0.0000    0.0000    0.0200 125.0000

      PERM    HEIGHT POROSITY
     0.003    20.000     0.250

      STEP     LPATH
     10.00    280.00

 NWSTREAM NLSPAIRS     PLTM1     PLTM2     PLTDT
     13.0       0.0      10.0     100.0      10.0



ENTER Q TO STOP, HIT <RETURN> TO PROCEED


MW-2 Pumping at 1.6 gpm K is 0.003 ft/min
     WELL       GPM     XCORD     YCORD     PLOT?

        1      1.60     40.00    250.00         y









ENTER Q TO STOP, HIT <RETURN> TO PROCEED
```

MW-2 Pumping at 1.6 gpm K is 0.003 ft/min



CAPTURE 2.20 by Data Services - 707/792-0528

Enter the input file name 19024a.dat
Create *.PLT file (Y OR N) y
Enter the *.PLT file name 19024a.plt
MW-2 Pumping at 1.0 gpm K is 0.003 ft/min

SCALE	XORG	YORG	GRAD	THETA
40.0000	0.0000	0.0000	0.0200	125.0000

PERM	HEIGHT	POROSITY
0.003	20.000	0.250

STEP	LPATH
10.00	280.00

NWSTREAM	NLSPAIRS	PLTM1	PLTM2	PLTDT
13.0	0.0	10.0	100.0	10.0

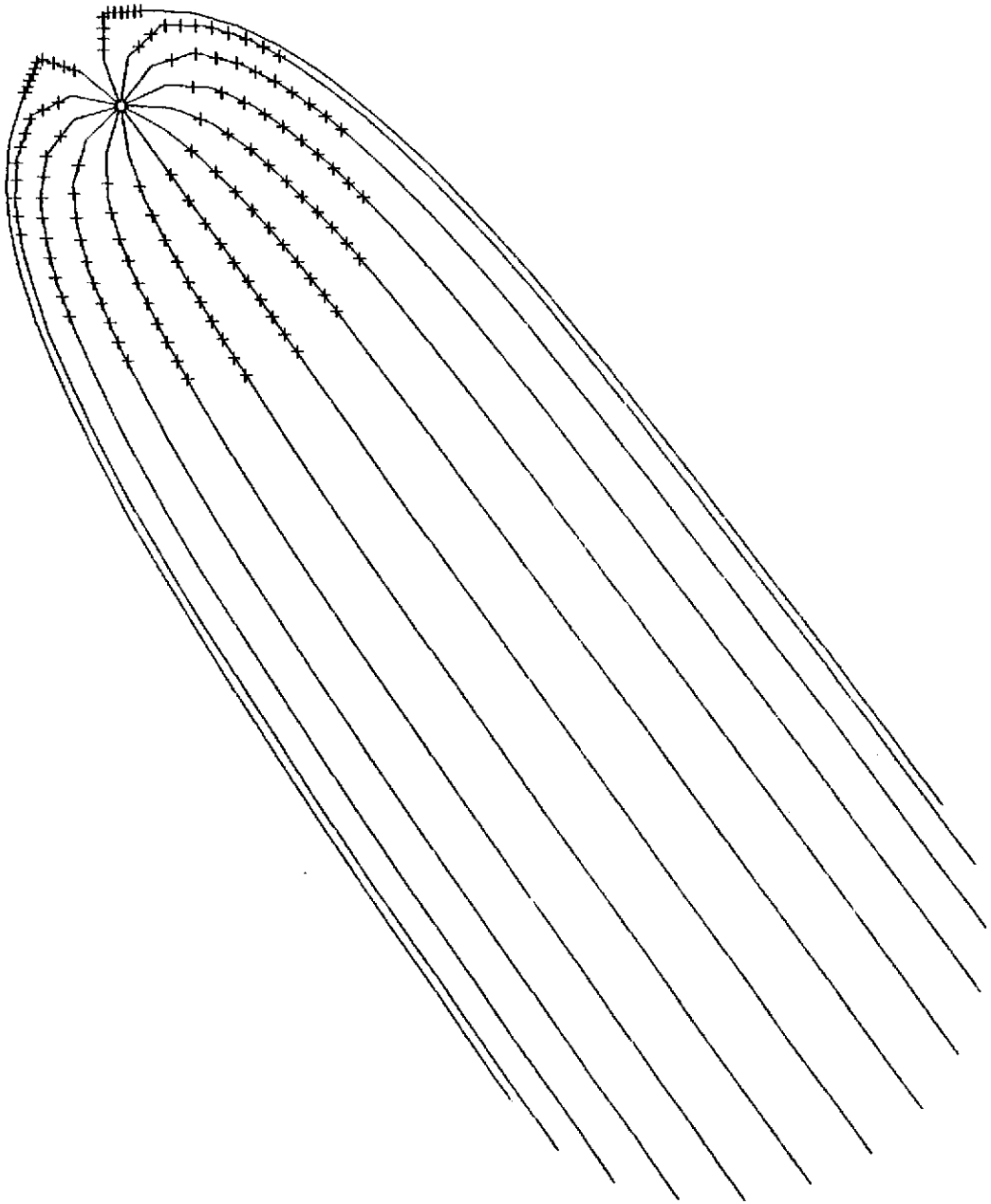
ENTER Q TO STOP, HIT <RETURN> TO PROCEED

MW-2 Pumping at 1.0 gpm K is 0.003 ft/min

WELL	GPM	XCORD	YCORD	PLOT?
1	1.00	40.00	250.00	Y

ENTER Q TO STOP, HIT <RETURN> TO PROCEED

MW-2 Pumping at 1.0 gpm K is 0.003 ft/min



APPENDIX D

GROUND WATER SAMPLE ANALYTICAL RESULTS

June 29, 1994
Sample Log 9724

Steve Liaty
Acton, Mickelson & van Dam
5090 Robert J. Matthews Pkwy
El Dorado Hills, CA 95762

Subject: Analytical Results for 1 Water Sample
Identified as: Project # 19024.05 (Beacon 604)
Received: 06/24/94

Dear Mr. Liaty:

Analysis of the sample(s) referenced above has been completed. This report is written to confirm results communicated on June 29, 1994 and describes procedures used to analyze the samples.

Sample(s) were received in 40-milliliter glass vials sealed with TFE lined septae and plastic screw-caps. Each sample was transported and received under documented chain of custody and stored at 4 degrees C until analysis was performed.

Sample(s) were analyzed using the following method(s):

"BTEX" (EPA Method 602/Purge-and-Trap)
"TPH as Gasoline" (Modified EPA Method 8015/Purge-and-Trap)

Please refer to the following table(s) for summarized analytical results and contact us at 916-753-9500 if you have questions regarding procedures or results. The chain-of-custody document is enclosed.

Approved by:

Joel Kiff
Senior Chemist

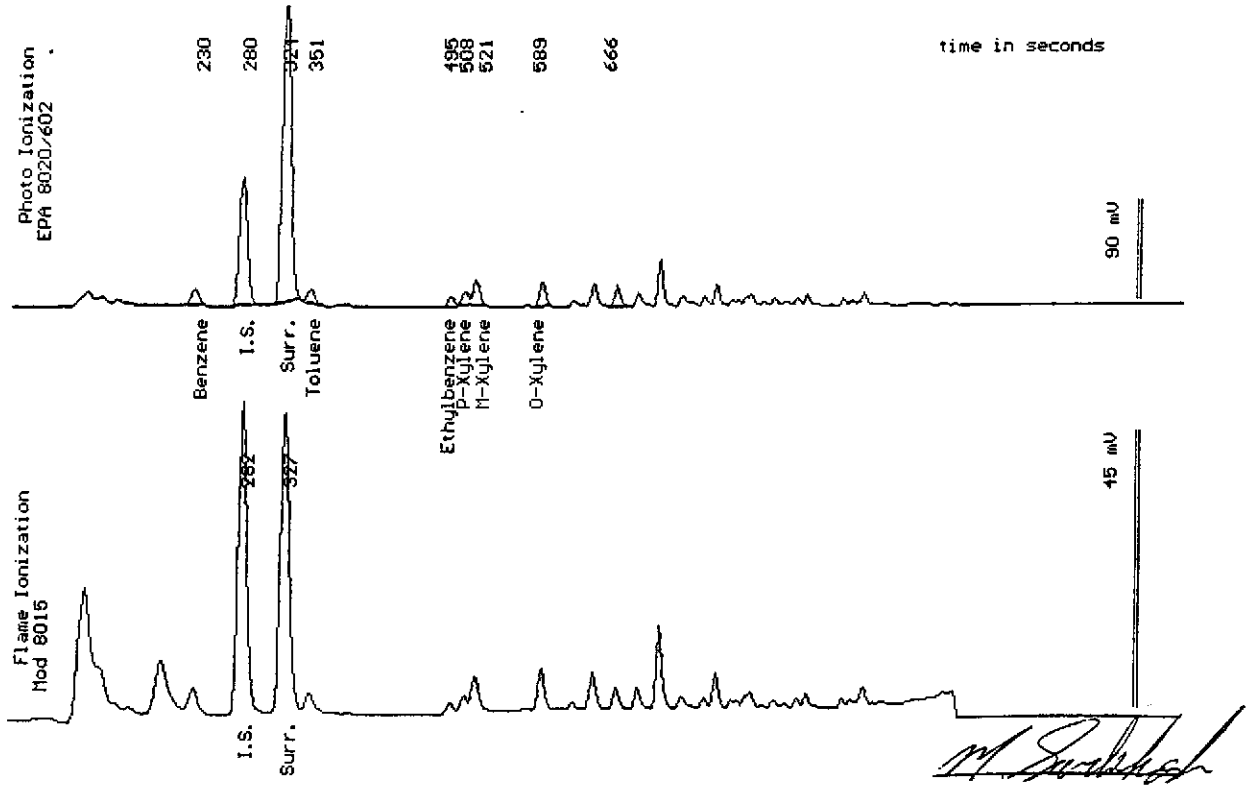
Sample Log 9724

9724-1

Sample: **MW-2 (effluent)**

From : Project # 19024.05 (Beacon 604)
Sampled : 06/24/94
Dilution : 1:1 QC Batch : 2089B
Matrix : Water

Parameter	(MRL) ug/L	Measured Value ug/L
Benzene	(.50)	2.3
Toluene	(.50)	1.9
Ethylbenzene	(.50)	1.2
Total Xylenes	(.50)	8.5
TPH as Gasoline	(50)	65
Surrogate Recovery		96 %



Date Analyzed: 06-28-94
Column : 0.53mm ID X 30m DBWAX (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

Ultramar Inc.

CHAIN OF CUSTODY REPORT

BEACON

Beacon Station No.	Sampler (Print Name)	Date	Form No.
604	Steve Liaty	6-24-94	1 of 1

Project No.	Sampler (Signature)
19024.05	Steve Liaty

Project Location	Affiliation
Livermore	AMJ Geo

ANALYSES

Sample No./Identification	Date	Time	Lab No.	BTEX	TPH (gasoline)	TPH (diesel)						No. of Containers	REMARKS
MW-2 (effluent)	6-24-94	13:00		X	X							3	(3) VOA's
0°C date 06/24/94													

Relinquished by: (Signature/Affiliation)	Date	Time	Received by: (Signature/Affiliation)	Date	Time
Steve Liaty	6-24-94	13:40	[illegible] /WEST	6-24-94	13:40
[illegible] /WEST	6-24-94	16:25			
			John Kelse	06/24/94	16:25

Report To:

Steve Liaty

AMJ

Bill to: ULTRAMAR INC.
525 West Third Street
Hanford, CA 93230
Attention: Terry Fox

WHITE: Return to Client with Report YELLOW: Laboratory Copy PINK: Originator Copy

July 1, 1994
Sample Log 9716

Steve Liaty
Acton, Mickelson & van Dam
5090 Robert J. Matthews Pkwy
El Dorado Hills, CA 95762

Subject: Analytical Results for 2 Water Samples
Identified as: Project # 19024.05 (Beacon 604)
Received: 06/24/94

Dear Mr. Liaty:

Analysis of the sample(s) referenced above has been completed. This report is written to confirm results communicated on July 1, 1994 and describes procedures used to analyze the samples.

The sample(s) were received in:

40ml voa vials sealed with TFE-lined septae
1-L glass bottle sealed with TFE-lined cap
1-L polyethylene bottle sealed with polyethylene cap

Each sample was transported and received under documented chain of custody, assigned a consecutive log number and stored at 4 degrees Celsius until analysis commenced.

Sample(s) were analyzed using the following method(s):

"BTEX" (EPA Method 602/Purge-and-Trap)
"TPH as Gasoline" (Modified EPA Method 8015/Purge-and-Trap)
"Volatile Organic Priority Pollutants" (EPA Method 624)
"Semi-Volatile Priority Pollutants" (EPA Method 625)
"Metals" (EPA 6010,7000)

Please refer to the following table(s) for summarized analytical results and contact us at 916-753-9500 if you have questions regarding procedures or results. The chain-of-custody document is enclosed.

Approved by:

Joel Kiff
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

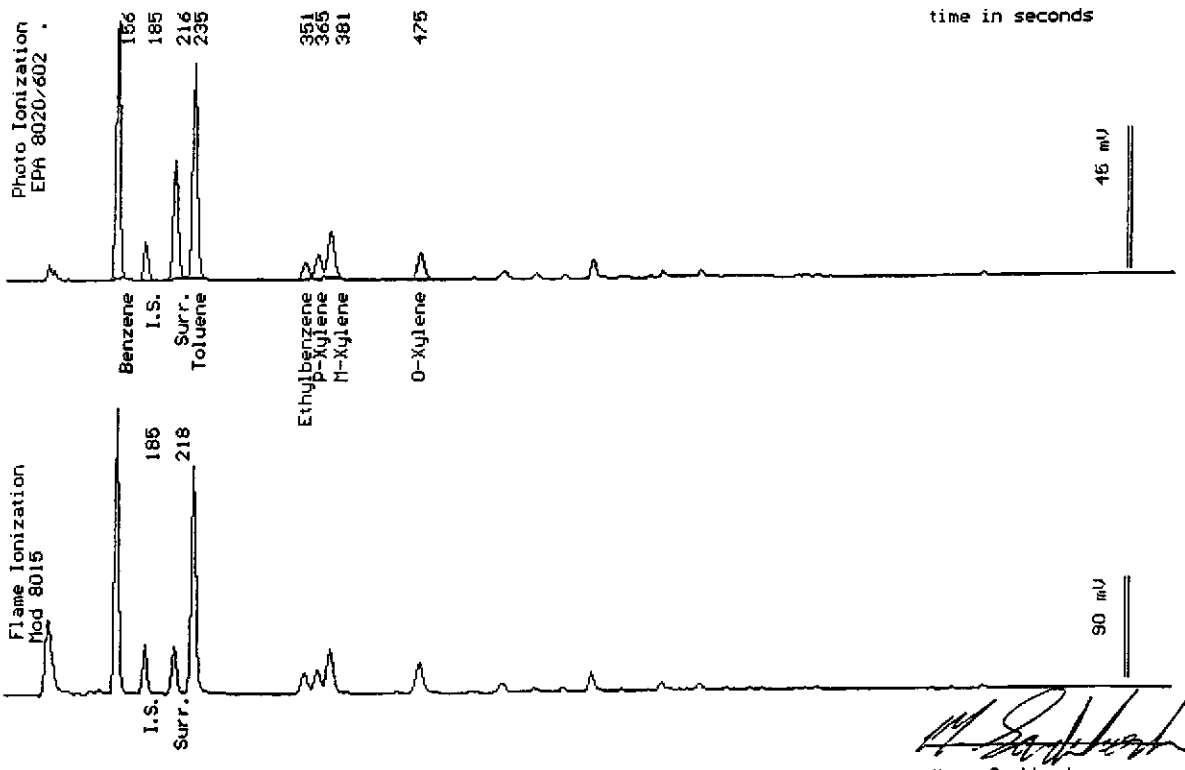
Sample Log 9716

9716-1

Sample: **MW-2 6/23/94**

From : Project # 19024.05 (Beacon 604)
Sampled : 06/23/94
Dilution : 1:100 QC Batch : 4093d
Matrix : Water

Parameter	(MRL) ug/L	Measured Value ug/L
Benzene	(50)	12000
Toluene	(50)	12000
Ethylbenzene	(50)	1400
Total Xylenes	(50)	7800
TPH as Gasoline	(5000)	57000
Surrogate Recovery		102 %



Date Analyzed: 06-30-94
Column : 0.53mm ID X 30m DBWAX (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

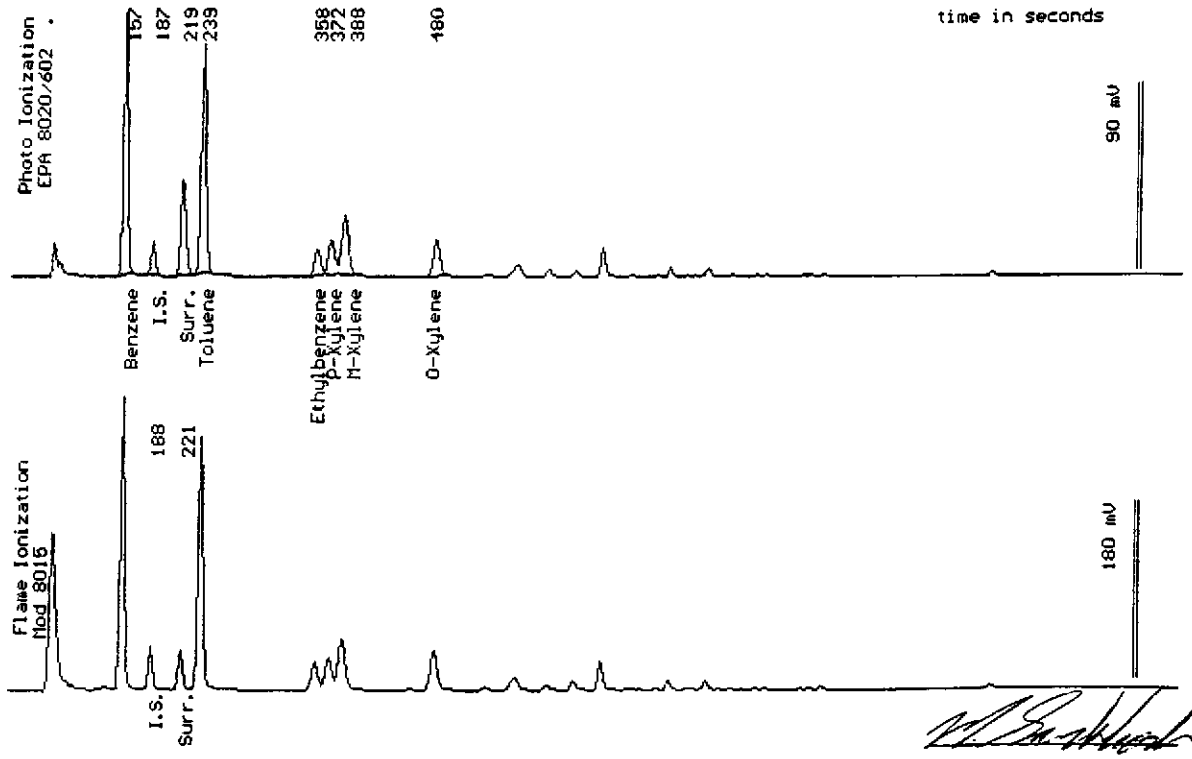
Sample Log 9716

9716-2

Sample: **MW-2 6/24/94**

From : Project # 19024.05 (Beacon 604)
Sampled : 06/24/94
Dilution : 1:50 QC Batch : 4093b
Matrix : Water

Parameter	(MRL) ug/L	Measured Value ug/L
Benzene	(25)	7200
Toluene	(25)	7500
Ethylbenzene	(25)	1200
Total Xylenes	(25)	6000
TPH as Gasoline	(2500)	36000
Surrogate Recovery		100 %



Date Analyzed: 06-29-94
Column : 0.53mm ID X 30m DBWAX (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

Western Environmental Science & Technology • 45133 County Road 32B • Davis, CA 95616 • 916 753-9500 • FAX: 916 757-4652

July 1, 1994
Sample Log 9716

Sample: **MW-2 6/24/94**

From : Project # 19024.05 (Beacon 604)
Sampled : 06/24/94 Received : 06/24/94
Matrix : Water Analyzed : 06/30/94

624 - Volatile Organic Priority Pollutants

Parameter	(MRL) ug/L	Measured Value ug/L	Flag
Chloromethane	(500)	< 500	
Bromomethane	(500)	< 500	
cis-1,2-Dichloroethene	(250)	< 250	
trans-1,2-Dichloroethene	(250)	< 250	
Vinyl Chloride	(500)	< 500	
Chloroethane	(500)	< 500	
Methylene Chloride	(250)	< 250	
Acetone	(5000)	<5000	
Carbon Disulfide	(250)	< 250	
1,1-Dichloroethene	(250)	< 250	
1,1-Dichloroethane	(250)	< 250	
Chloroform	(250)	< 250	
1,2-Dichloroethane	(250)	< 250	
2-Butanone	(5000)	<5000	
1,1,1-Trichloroethane	(250)	< 250	
Carbon Tetrachloride	(250)	< 250	
Bromodichloromethane	(250)	< 250	
1,2-Dichloropropane	(250)	< 250	
cis-1,3-Dichloropropene	(250)	< 250	
Trichloroethene	(250)	< 250	
Dibromochloromethane	(250)	< 250	
1,1,2-Trichloroethane	(250)	< 250	
Benzene	**(250)**	**6400**	
trans-1,3-Dichloropropene	(250)	< 250	
Bromoform	(250)	< 250	
4-Methyl-2-Pentanone	(2500)	<2500	
1,3-Dichlorobenzene	(250)	< 250	
1,2-Dichlorobenzene	(250)	< 250	
1,4-Dichlorobenzene	(250)	< 250	
2-Hexanone	(2500)	<2500	
Tetrachloroethene	(250)	< 250	
1,1,2,2-Tetrachloroethane	(250)	< 250	
Toluene	**(250)**	**6200**	
Chlorobenzene	(250)	< 250	
Ethylbenzene	**(250)**	**1900**	
Styrene	(250)	< 250	
P,M-Xylene	**(250)**	**5500**	
O-Xylene	**(250)**	**2800**	

Joel Kiff
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

July 1, 1994
Sample Log 9716

EPA 624 System Monitoring Compound Recovery

Sample	SMC1 (TOL)#	SMC2 (BFB)#	SMC3 (DCE)#	OTHER	TOT OUT
MW-2 6/24/94	99	97	100		0

	QC Limits
SMC1 (TOL) = Toluene-d8	(88-120)
SMC2 (BFB) = Bromofluorobenzene	(86-120)
SMC3 (DCE) = 1,2-Dichloroethane-d4	(76-114)

Column to be used to flag recovery values

* Values outside of QC limits

D System Monitoring Compound diluted out

Joel Kiff
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

July 1, 1994
Sample Log 9716

Sample: **MW-2 6/24/94**

From : Project # 19024.05 (Beacon 604)
Sampled : 06/24/94 Received : 06/24/94
Matrix : Water Analyzed : 06/29/94
Extracted : 06/29/94

625 - Semi Volatile Organic Priority Pollutants

Parameter	(MRL) ug/L	Measured Value ug/L	Flag
Acenaphthene	(10)	< 10	
Acenaphthylene	(10)	< 10	
Anthracene	(10)	< 10	
Benzo (a) anthracene	(10)	< 10	
Benzo (b) fluoranthene	(10)	< 10	
Benzo (k) fluoranthene	(10)	< 10	
Benzo (a) pyrene	(10)	< 10	
Benzo (ghi) perylene	(10)	< 10	
Butyl benzyl phthalate	(10)	< 10	
bis (2-chloroethyl) ether	(10)	< 10	
bis (2-chloroethoxy) methane	(10)	< 10	
bis (2-ethylhexyl) phthalate	(10)	< 10	
bis (2-chloroisopropyl) ether	(10)	< 10	
4-Bromophenyl phenyl ether	(10)	< 10	
2-Chloronaphthalene	(10)	< 10	
4-Chlorophenyl phenyl ether	(10)	< 10	
Chrysene	(10)	< 10	
Dibenzo (ah) anthracene	(10)	< 10	
Di-n-butyl phthalate	(10)	< 10	
Di-n-octyl phthalate	(10)	< 10	
1,3-Dichlorobenzene	(10)	< 10	
1,2-Dichlorobenzene	(10)	< 10	
1,4-Dichlorobenzene	(10)	< 10	
3,3'-Dichlorobenzidine	(20)	< 20	
Diethyl phthalate	(10)	< 10	
Dimethyl phthalate	(10)	< 10	
2,4-Dinitrotoluene	(10)	< 10	

Joel Kiff
Senior Chemist

Western Environmental Science & Technology • 45133 County Road 32B • Davis, CA 95616 • 916 753-9500 • FAX: 916 757-4652

July 1, 1994
Sample Log 9716

Sample: **MW-2 6/24/94**

From : Project # 19024.05 (Beacon 604)
Sampled : 06/24/94 Received : 06/24/94
Matrix : Water Analyzed : 06/29/94
Extracted : 06/29/94

625 - Semi Volatile Organic Priority Pollutants

Parameter	(MRL) ug/L	Measured Value ug/L	Flag
2,6-Dinitrotoluene	(10)	< 10	
Fluoranthene	(10)	< 10	
Fluorene	(10)	< 10	
Hexachlorobenzene	(10)	< 10	
Hexachlorobutadiene	(10)	< 10	
Hexachloroethane	(10)	< 10	
Indeno (1,2,3-cd) pyrene	(10)	< 10	
Isophorone	(10)	< 10	
Naphthalene	**(10)**	**300**	
Nitrobenzene	(10)	< 10	
n-Nitrosodi-n-propylamine	(10)	< 10	
Phenanthrene	(10)	< 10	
Pyrene	(10)	< 10	
1,2,4-Trichlorobenzene	(10)	< 10	
Hexachlorocyclopentadiene	(10)	< 10	
n-Nitrosodimethylamine	(10)	< 10	
n-Nitrosodiphenylamine	(10)	< 10	
4-Chloro-3-methylphenol	(20)	< 20	
2-Chlorophenol	(10)	< 10	
2,4-Dichlorophenol	(10)	< 10	
2,4-Dimethylphenol	(10)	< 10	
2,4-Dinitrophenol	(50)	< 50	
2-Methyl-4,6-dinitrophenol	(50)	< 50	
2-Nitrophenol	(10)	< 10	
4-Nitrophenol	(50)	< 50	
Pentachlorophenol	(50)	< 50	
Phenol	(10)	< 10	
2,4,6-Trichlorophenol	(10)	< 10	

Joel Kiff
Senior Chemist

Western Environmental Science & Technology • 45133 County Road 32B • Davis, CA 95616 • 916 753-9500 • FAX: 916 757-4652

July 1, 1994
Sample Log 9716

EPA 625 System Monitoring Compound Recovery

Sample	SMC1 (NBZ)#	SMC2 (FBP)#	SMC3 (TPH)#	SMC4 (PHL)#	SMC5 (2FP)#	SMC6 (TBF)#	OTHER	TOT OUT
MW-2 6/24/94	80	85	112	79	44	98		0

	QC Limits
SMC1 (NBZ) = Nitrobenzene-d5	(35-114)
SMC2 (FBP) = 2-Fluorobiphenyl	(43-116)
SMC3 (TPH) = Terphenyl-d14	(33-141)
SMC4 (PHL) = Phenol-d6	(10-110)
SMC5 (2FP) = 2-Fluorophenol	(21-110)
SMC6 (TBF) = 2,4,6-Tribromophenol	(10-123)

Column to be used to flag recovery values

* Values outside of QC limits

D System Monitoring Compound diluted out

Joel Kiff
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

July 1, 1994
Sample Log 9716-2

Sample : **MW-2**
From : Project # 19024.05 (Beacon 604)
Sampled : 06/24/94 Received : 06/24/94
Matrix : Water Units : mg/L

Priority Pollutant Metals

Parameter	EPA Method	Date Digested	Date Analyzed	MRL*	Conc.
Antimony	6010	06/29/94	06/30/94	(0.032)	<0.032
Arsenic	7060	06/29/94	06/30/94	(0.005)	<0.005
Beryllium	6010	06/29/94	06/30/94	(0.001)	0.0010
Cadmium	6010	06/29/94	06/30/94	(0.004)	0.0089
Chromium	6010	06/29/94	06/30/94	(0.007)	0.035
Copper	6010	06/29/94	06/30/94	(0.006)	0.0091
Lead	7421	06/29/94	07/01/94	(0.003)	<0.003
Mercury	7470	06/28/94	06/28/94	(0.005)	<0.005
Nickel	6010	06/29/94	06/30/94	(0.015)	0.036
Selenium	7740	06/29/94	06/30/94	(0.005)	<0.005
Silver	6010	06/29/94	06/30/94	(0.007)	0.0097
Thallium	7841	06/29/94	07/01/94	(0.005)	<0.005
Zinc	6010	06/29/94	06/30/94	(0.010)	0.012

* MRL = Method Reporting Limit

Michelle L. Anderson
Metals Supervisor

Western Environmental Science & Technology • 45133 County Road 32B • Davis, CA 95616 • 916 753-9500 • FAX: 916 757-4652

Anlab
ANALYTICAL LABORATORY
1910 S STREET SACRAMENTO, CALIFORNIA 95814 • 916-447-2946 • FAX 916-447-8321

July 27, 1994

Western Environmental Science
& Technology
1046 Olive Drive, Suite 3
Davis, CA 95616
Attn: Les Biddle

Project Name: Beacon 604
Project Location: Livermore
Project #: 19024.05
P.O. #: 9716

Anlab I.D. AD15833
SAMPLE DESCRIPTION: MW-2
Sample collection date: 06/24/94
Lab submittal date: 06/24/94
Turn-Around-Time: TYPE 10

Client Code: 315
Matrix: W
Time: 13:15
Time: 16:54
Sample Disposal: LAB

TEST PARAMETER		UNITS	TEST RESULT	DETECTION LIMIT
pH by EPA 150.1 (Electrometric)		Std. units	6.8	--
EC by EPA 120.1		umhos/cm	1200	1
Hardness as CaCO3 by SM 2340 B		mg/l	640	5.0
Tot. Dissolved Solids, EPA 160.1		mg/l	620	15
Chloride by EPA 300.0		mg/l	65	1.0
Alkalinity, Tot(CaCO3) EPA 310.1		mg/l	510	2.0
Hydroxide Alkalinity (OH)		mg/l	ND	0.20
Sulfate by EPA 300.0		mg/l	10	0.5
Carbonate Alkalinity (CO3)		mg/l	ND	1.2
Bicarbonate Alkalinity (HCO3)		mg/l	620	2.4
Multicomponent analysis: METALS BY ICAP				
Calcium	EPA 200.7	mg/l	72	0.10
Copper	EPA 200.7	mg/l	ND	0.020
Iron	EPA 200.7	mg/l	18	0.030
Magnesium	EPA 200.7	mg/l	110	0.10
Manganese	EPA 200.7	mg/l	3.5	0.0050
Potassium	EPA 200.7	mg/l	1.6	0.50
Sodium	EPA 200.7	mg/l	42	0.50
Zinc	EPA 200.7	mg/l	0.038	0.0050
Total Anions		meq/l	12	
Total Cations		meq/l	14	

ND = Not Detected

Note: Sample was not analyzed for MBAS due to laboratory error.

Report Approved By: Jennilyn Fuss
ELAP ID #: 1468

:jbc

9716

Ultramar Inc.
CHAIN OF CUSTODY REPORT

BEACON

Beacon Station No.	Sampler (Print Name)	Date	Form No.
604	Steve Lum	6-24-94	1 of 1
Project No.	**Sampler (Signature)**		
19024.05	Steve Lum		
Project Location	**Affiliation**		
Livermore	AMJ Geo		

Sample No./Identification	Date	Time	Lab No.	BTEX	TPH (gasoline)	TPH (diesel)	624	625	Priority Poll. Metals	General Minerals	PH	No. of Containers	REMARKS
MW-2	6-23-94	15:56		X	X							3	(3) VOA's
MW-2	6-24-94	12:50		X	X							3	(3) VOA's
~~MW-2 (effluent)~~	~~6-24-94~~			~~X~~	~~X~~							~~3~~	~~(3) VOA's~~
MW-2	6-24-94	12:55					X					3	(3) VOA's)
MW-2	6-24-94	13:20						X				1	(1) Liter Amber
MW-2	6-24-94	13:05							X			1	(1) 500 ml Poly
MW-2	6-24-94	13:20								X		5	(1) 500 ml Poly (2) 250 ml Poly (1) Plastic (1) Amber
MW-2	6-24-94	13:15									X	1	(1) 250 ml Poly

Relinquished by: (Signature/Affiliation)	Date	Time	Received by: (Signature/Affiliation)	Date	Time
Steve Lum	6-24-94	13:40	Troy G. Luyan / WEST	6-24-94	13:40
Troy G. Luyan / WEST	6-24-94	16:25			
			John Reese	6/24/94	16:25

Report To: Steve Lum, AMJ

Bill to: ULTRAMAR INC.
525 West Third Street
Hanford, CA 93230
Attention: Terry Fox

06/24/94

WHITE: Return to Client with Report   YELLOW: Laboratory Copy   PINK: Originator Copy

32 0003 1/90

APPENDIX E

SOIL VAPOR EXTRACTION TEST - JUNE 24, 1994

FIELD OBSERVATIONS AND CALCULATIONS

VAPOR EXTRACTION TEST DATA

Site: # 604
Date: 6-24-94
Test wells: UW-1
Observation well(s): UW-2 UW-3, MW-1, MW-3
Field conditions: Clear, warm
Note: Field readings using FID, O2/LEL meter, and Drager tubes.

Notes: water level in UW-1 @ 36.44 feet
≈ 9 feet of exposed screen

Time	Test Well	Vacuum in Extraction Well (inches H2O)	Air Flow Meter (cfm)	Air Temperature at Meter (degrees F)	Air Pressure at Meter (inches H2O)	Vacuum Influence Measurements: Well ID UW-2	Well ID UW-3	Well ID MW-1	Well ID MW-3	Effluent Carbon Dioxide Concentration (percent) (Drager)	Effluent Oxygen Concentration (percent)	Effluent Vapor TPHg Concentration (ppm) (Drager)	Effluent Vapor Sample TPHg Concentration (ppm) (Lab)
0930*	VW-1	54	19	119	0.75	0.00	0.00	0.00	0.00	0	20.8	100	140
1030		52	22	150	0.72	0.00	0.00	NM	NM	--	20.5	160	200
1130*		52	22	153	0.73	0.00	0.00	NM	NM	--	22.5	90	130
1230		52	22	155	0.70	0.00	0.00	NM	NM	--	--	85 100	95
1330		54	20	154	0.70	0.00	0.00	NM	NM	--	--	110	90

* Air bag sample collected

UW-2 = 40 feet
UW-3 = 30 feet

Site: Beacon 604
Date: 6-24-94
Test Well: ~~MW~~-1
Observation Well: VW-2, VW-3
Field Conditions: Warm, Clear 80 °F.

VAPOR EXTRACTION PILOT TEST DATA

Hour	Flow (cfm)	Vacuum (inches of H_2O)	Temperature at Flowmeter (degrees F.)	Airflow Corrected for Temperature (scfm)	Vacuum at Observation Point VW-2 (inches of H_2O)	Vacuum at Observation Point VW-3 (inches of H_2O)	TPHG Test Well Effluent Concentrations (ppm)			Extraction Rates (lbs/day)	
							~~PID~~ LEL	Draeger	Analytical	TPH	Benzene
0930*	19	54	119	18	0.00	0.00	140	100	72	0.43	0.01 ~~9.0E-2~~
1030	22	52	150	21	0.00	0.00	200	160			
1130*	22	52	153	20	0.00	0.00	80	90	13	0.09	0.002 ~~1.6E-3~~
1230	21	52	155	19	0.00	0.00	95	100			
1330*	20	54	154	19	0.00	0.00	90	110	56	0.34	0.008 ~~9.4E-4~~

* Vapor effluent sample collected

General Notes: ① Water level in VW-1 ≈ 36.44 feet below grade. Approximately 9 feet of exposed screen at beginning of test

② VW-2 : 40 feet from VW-1
VW-3 : 30 feet from VW-1

VAPOR EXTRACTION PILOT TEST CALCULATIONS
AMV PROJECT NO. 19024.05

Extraction Rate

The pilot test flow rate from vapor well VW-1 at 0930 hours was determined to be approximately 18 standard cubic feet per minute (scfm) or 25,920 standard cubic feet per day (scfd). Laboratory analysis of an air sample collected at this time during the pilot test (laboratory report(s) enclosed) indicates the concentration of total petroleum hydrocarbons as gasoline (TPHg) in the vapor stream to be 72 parts per million by volume (ppmv), with a benzene fraction of ~~0.3~~ 2.6 percent. These values represent the maximum expected concentration at start-up. Continued system operation should result in decreased concentration.

The maximum volumetric rate of TPHg extraction is calculated as follows:

$$19\,cfm\sqrt{\frac{530\,R}{1.0\,bar}\cdot\frac{1.0\,bar}{579\,R}} = 18\,scfm; \quad 18\,scfm \times 1440\,\frac{min}{day} \times \frac{72\,FT^3}{1E6\,FT^3} = 1.9\,scfd\ TPHg$$

Using the ideal gas law to determine the equivalent pound-moles (lb-moles) for 25,920 scfd gives:

$$1.9\,scfd \times \frac{lb\cdot mol}{387\,FT^3} = 0.005\,\frac{lb\cdot mol}{day}\ TPHg$$

Using the molecular weight of hexane, the rate of TPHg extracted on a pounds basis is calculated as:

$$0.005\,\frac{lb\cdot mol}{day} \times \frac{86\,lb}{lb\cdot mol} = 0.43\,lb/day\ TPHg$$

With a benzene fraction of 0.3 percent, the lb-moles rate of benzene extraction is calculated as:

$$0.005\,\frac{lb\cdot mol}{day} \times \frac{0.026}{(0.003)} = \frac{1.3\,(10^{-4})}{1.5\times10^{-5}}\,\frac{lb\cdot mol}{day}\ Benzene$$

On a pounds basis, the extraction rate for benzene is calculated as:

$$\frac{1.3\,(10^{-4})}{1.30\times10^{-3}}\,\frac{lb\cdot mol}{day} \times \frac{78\,lb}{lb\cdot mol} = \frac{1.2\times10^{-3}}{0.01}\,lb/day\ Benzene$$

Vapor Extraction Zone of Influence

Approximation of the vapor extraction zone of influence is calculated using the empirical equation:

$$r = Q/2\pi hv$$

where r = distance from extraction of minimum effective air velocity, ft
Q = extracted air flow rate, scfm
h = thickness of the unsaturated zone of the screened interval
v = assumed minimum effective air velocity, 0.01 feet/minute

The calculated zone of influence is:

$$r = \frac{18\ scfm}{2\pi\,(9\,FT)\,(0.01\,\frac{FT}{min})} = 32\,FT.$$

VAPOR EXTRACTION PILOT TEST CALCULATIONS
AMV PROJECT NO. 19024.05

Extraction Rate

The pilot test flow rate from vapor well VW-1 at 1130 hours was determined to be approximately 20 standard cubic feet per minute (scfm) or 28,800 standard cubic feet per day (scfd). Laboratory analysis of an air sample collected at this time during the pilot test (laboratory report(s) enclosed) indicates the concentration of total petroleum hydrocarbons as gasoline (TPHg) in the vapor stream to be 13 parts per million by volume (ppmv), with a benzene fraction of ~~0.2~~ 7.5 percent. These values represent the maximum expected concentration at start-up. Continued system operation should result in decreased concentration.

The maximum volumetric rate of TPHg extraction is calculated as follows:

$$22\,cfm\sqrt{\frac{530\,R}{1.0\,bar}\times\frac{1.0\,bar}{613\,R}} = 20\,scfm\;;\quad 20\,\frac{FT^3}{min}\times 1440\,\frac{min}{day}\times\frac{13\,FT^3}{1E6\,FT^3} = 0.4\,scfd\ TPHg$$

Using the ideal gas law to determine the equivalent pound-moles (lb-moles) for 28,800 scfd gives:

$$0.4\ scfd\times\frac{lb\cdot mol}{587\,FT^3} = 0.001\,\frac{lb\cdot mol}{day}\ TPHg$$

Using the molecular weight of hexane, the rate of TPHg extracted on a pounds basis is calculated as:

$$0.001\,\frac{lb\cdot mol}{day}\times\frac{86\,lb}{lb\cdot mol} = 0.09\ lb/day\ TPHg$$

With a benzene fraction of 0.2 percent, the lb-moles rate of benzene extraction is calculated as:

$$0.001\,\frac{lb\cdot mol}{day}\times\frac{(0.002)}{0.025} = \frac{2.0\times10^{-7}}{2.5\,(10^{-5})}\ Benzene$$

On a pounds basis, the extraction rate for benzene is calculated as:

$$\frac{2.0\times10^{-7}}{2.5\,(10^{-5})}\times\frac{78\,lb}{lb\cdot mol} = \frac{1.6\times10^{-5}}{0.002}\ Benzene$$

Vapor Extraction Zone of Influence

Approximation of the vapor extraction zone of influence is calculated using the empirical equation:

$$r = Q/2\pi hv$$

where r = distance from extraction of minimum effective air velocity, ft
Q = extracted air flow rate, scfm
h = thickness of the unsaturated zone of the screened interval
v = assumed minimum effective air velocity, 0.01 feet/minute

The calculated zone of influence is:

$$r = \frac{20\ scfm}{2\pi\,(9\,FT)\,(0.01\,\frac{FT}{MIN})} = 35\ FT$$

VAPOR EXTRACTION PILOT TEST CALCULATIONS
AMV PROJECT NO. 19024.05

Extraction Rate

The pilot test flow rate from vapor well VW-1 at 1330 hours was determined to be approximately 19 standard cubic feet per minute (scfm) or 27,360 standard cubic feet per day (scfd). Laboratory analysis of an air sample collected at this time during the pilot test (laboratory report(s) enclosed) indicates the concentration of total petroleum hydrocarbons as gasoline (TPHg) in the vapor stream to be 56 parts per million by volume (ppmv), with a benzene fraction of ~~0.3~~ 0.27 percent. These values represent the maximum expected concentration at start-up. Continued system operation should result in decreased concentration.

The maximum volumetric rate of TPHg extraction is calculated as follows:

$$20\,cfm\sqrt{\frac{530R}{1.0bar}\cdot\frac{1.0bar}{614R}} = 19scfm; \quad 19scfm \times 1440\frac{min}{day} \times \frac{56\,FT^3}{1E6\,FT^3} = 1.5\,scfd\ TPHg$$

Using the ideal gas law to determine the equivalent pound-moles (lb-moles) for 27,360 scfd gives:

$$1.5\,scfd \times \frac{lb\cdot mol}{387\,FT^3} = 0.004\,\frac{lb\cdot mol}{day}\ TPHg$$

Using the molecular weight of hexane, the rate of TPHg extracted on a pounds basis is calculated as:

$$0.004\,\frac{lb\cdot mol}{day} \times \frac{86\,lb}{lb\cdot mol} = 0.34\,lb/day\ TPHg$$

With a benzene fraction of 0.3 percent, the lb-moles rate of benzene extraction is calculated as:

$$0.004\,\frac{lb\cdot mol}{day} \times \left(\frac{0.027}{0.003}\right) = \frac{1.2\times10^{-3}}{(1.1\times10^{-4})}\,\frac{lb\cdot mol}{day}\ Benzene$$

On a pounds basis, the extraction rate for benzene is calculated as:

$$\frac{1.2\times10^{-3}}{(1.1\times10^{-4})}\,\frac{lb\cdot mol}{day} \times \frac{78\,lb}{lb\cdot mol} = \frac{9.4\times10^{-4}}{0.003}\,lb/day\ Benzene$$

Vapor Extraction Zone of Influence

Approximation of the vapor extraction zone of influence is calculated using the empirical equation:

$$r = Q/2\pi hv$$

where r = distance from extraction of minimum effective air velocity, ft
Q = extracted air flow rate, scfm
h = thickness of the unsaturated zone of the screened interval
v = assumed minimum effective air velocity, 0.01 feet/minute

The calculated zone of influence is:

$$r = \frac{19\,scfm}{2\pi\,(9FT)\left(0.01\frac{FT}{min}\right)} = 34FT$$

APPENDIX F

AIR SAMPLE ANALYTICAL RESULTS - JUNE 24, 1994

June 27, 1994
Sample Log 9715

Steve Liaty
Acton, Mickelson & van Dam
5090 Robert J. Matthews Pkwy
El Dorado Hills, CA 95762

Subject: Analytical Results for 3 Air Samples
Identified as: Project # 19024.05 (Beacon 604)
Received: 06/24/94

Dear Mr. Liaty:

Analysis of the sample(s) referenced above has been completed. This report is written to confirm results communicated on June 27, 1994 and describes procedures used to analyze the samples.

The sample(s) were received in:

Tedlar air sampling bag

Each sample was transported and received under documented chain of custody, assigned a consecutive log number and stored at 4 degrees Celsius until analysis commenced.

Sample(s) were analyzed using the following method(s):

"BTEX" (EPA Method 8020/Purge-and-Trap)
"TPH as Gasoline" (Modified EPA Method 8015/Purge-and-Trap)

Please refer to the following table(s) for summarized analytical results and contact us at 916-753-9500 if you have questions regarding procedures or results. The chain-of-custody document is enclosed.

Approved by:

Joel Kiff
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

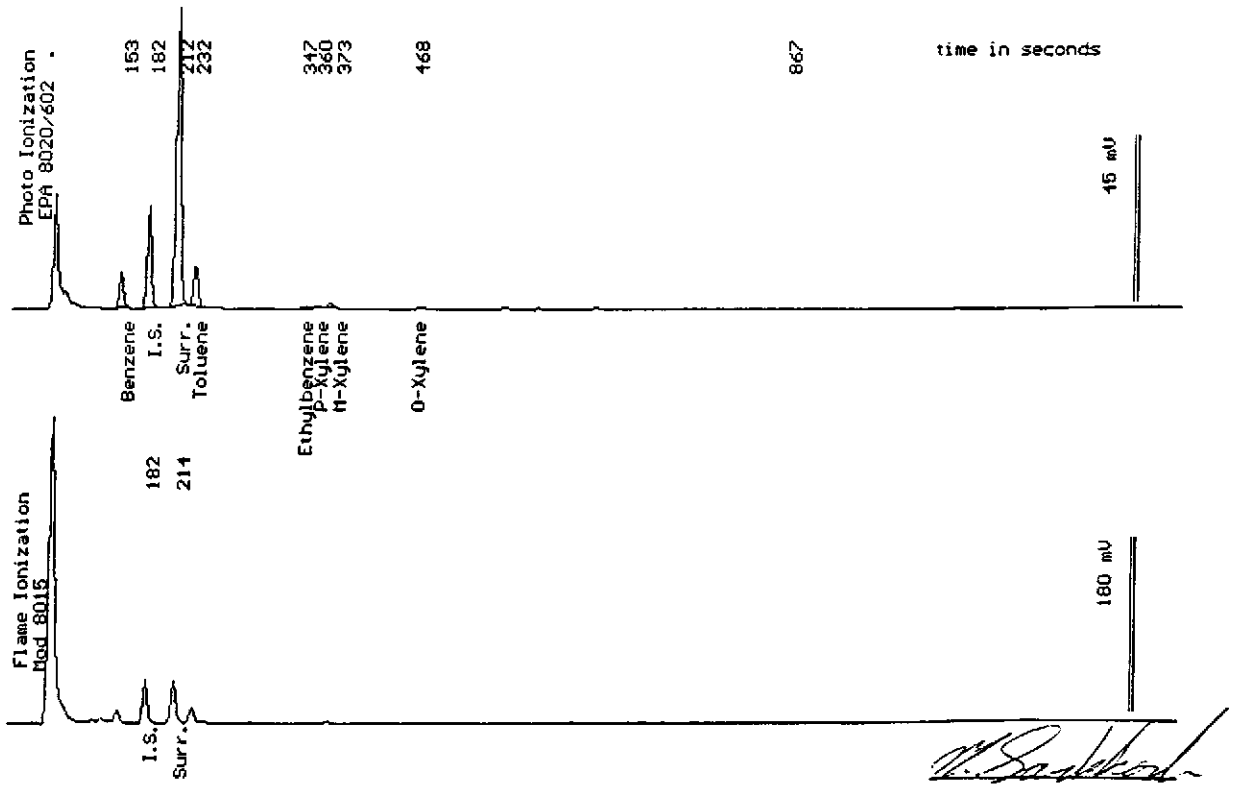
Sample Log 9715

9715-1

Sample: **VW-1 (0930)**

From : Project # 19024.05 (Beacon 604)
Sampled : 06/24/94
Dilution : 1:5 QC Batch : 4092CC
Matrix : Air

Parameter	(MRL) Molar ppm	Measured Value Molar ppm
Benzene	(.25)	1.9
Toluene	(.25)	2.4
Ethylbenzene	(.25)	<.25
Total Xylenes	(.25)	.50
TPH as Gasoline	(25)	72
Surrogate Recovery		104 %



Date Analyzed: 06-24-94
Column : 0.53mm ID X 30m DBWAX (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

Western Environmental Science & Technology • 45133 County Road 32B • Davis, CA 95616 • 916 753-9500 • FAX: 916 757-4652

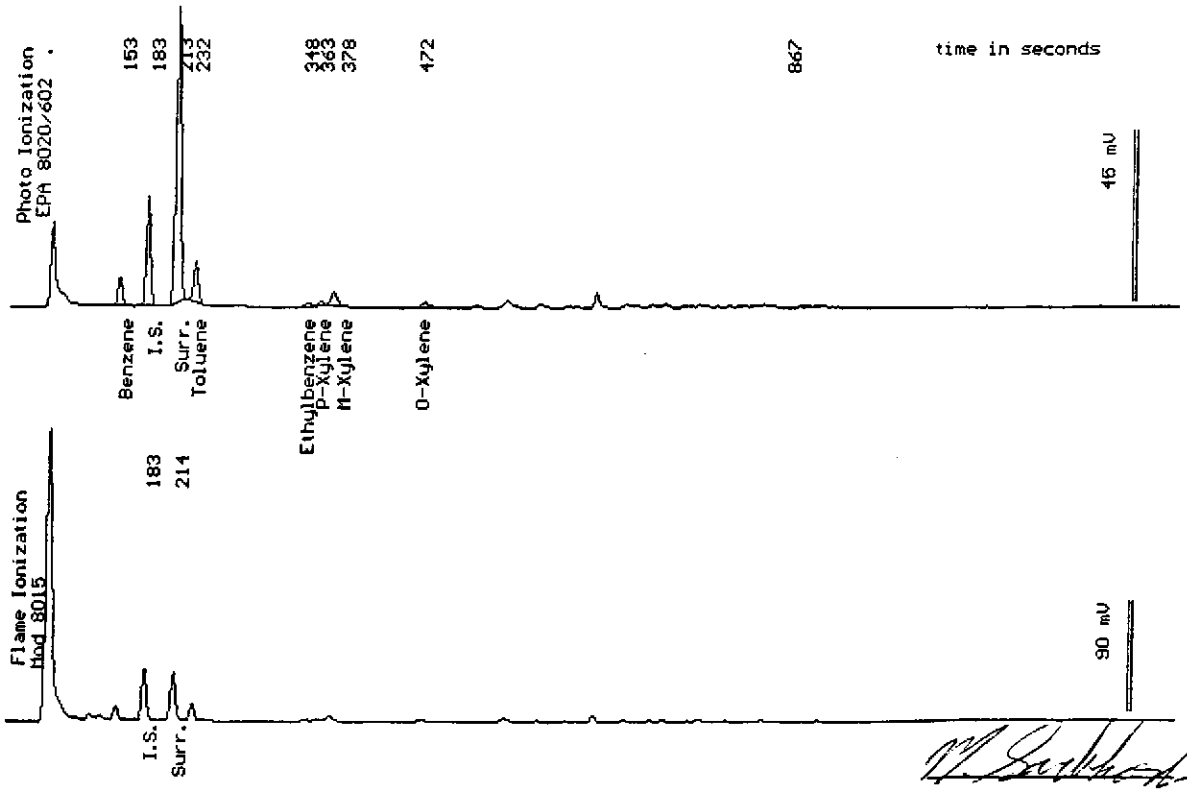
Sample Log 9715

9715-2

Sample: **VW-1 (1130)**

From : Project # 19024.05 (Beacon 604)
Sampled : 06/24/94
Dilution : 1:1 QC Batch : 4092CC
Matrix : Air

Parameter	(MRL) Molar ppm	Measured Value Molar ppm
Benzene	(.050)	.32
Toluene	(.050)	.43
Ethylbenzene	(.050)	.054
Total Xylenes	(.050)	.35
TPH as Gasoline	(5.0)	13
Surrogate Recovery		98 %



Date Analyzed: 06-24-94
Column : 0.53mm ID X 30m DBWAX (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

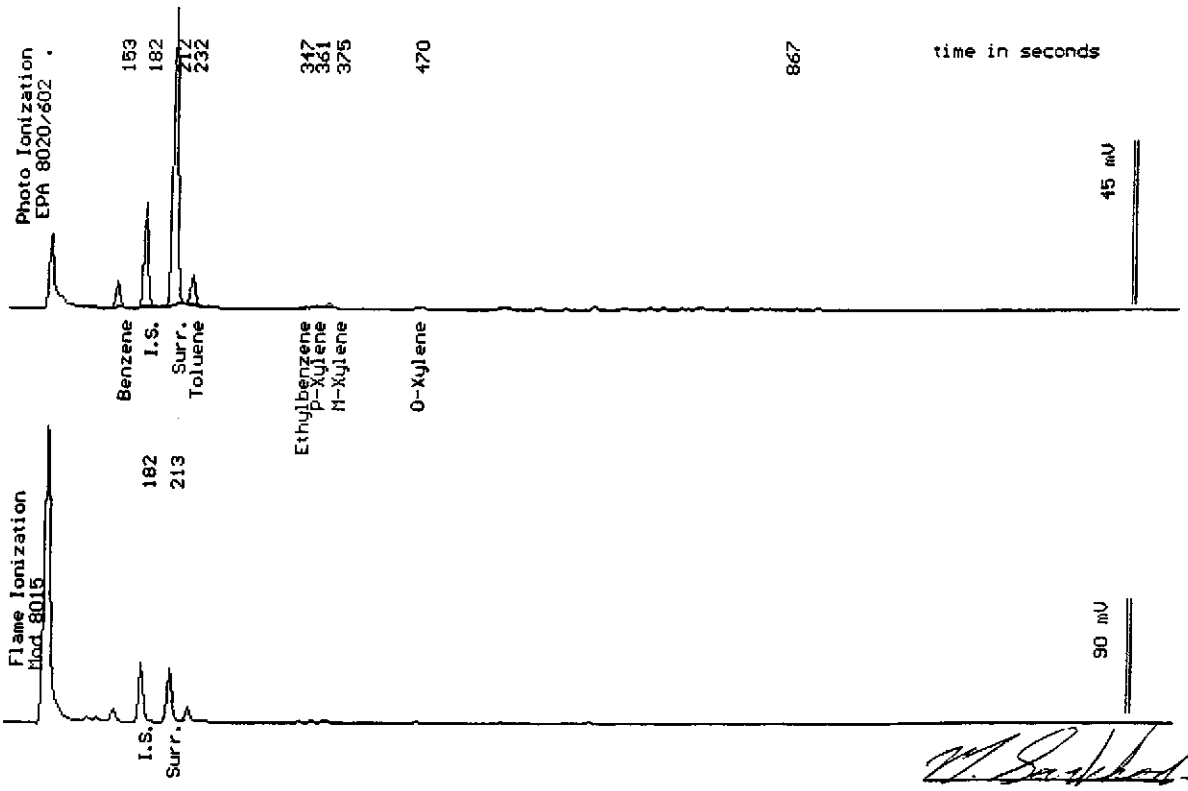
Sample Log 9715

9715-3

Sample: VW-1 (1330)

From : Project # 19024.05 (Beacon 604)
Sampled : 06/24/94
Dilution : 1:5 QC Batch : 4092CC
Matrix : Air

Parameter	(MRL) Molar ppm	Measured Value Molar ppm
Benzene	(.25)	1.5
Toluene	(.25)	1.7
Ethylbenzene	(.25)	<.25
Total Xylenes	(.25)	.47
TPH as Gasoline	(25)	56
Surrogate Recovery		104 %



Date Analyzed: 06-25-94
Column : 0.53mm ID X 30m DBWAX (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

Ultramar Inc.

CHAIN OF CUSTODY REPORT

BEACON

Beacon Station No.	Sampler (Print Name)	Date	Form No.
604	Steve [illegible]	6-24-94	1 of 1

Project No. 19024.05	Sampler (Signature) Steve [illegible]
Project Location Livermore	Affiliation AMW Geo

9415

	Sample No./Identification	Date	Time	Lab No.	BTEX	TPH (gasoline)	TPH (diesel)						No. of Containers	REMARKS
-1	VW-1 (0930)	6-24-94	930		X	X							1	Tedlar air bag
-2	VW-1 (1130)	↓	1130		X	X							1	↓
-3	VW-1 (1330)	↓	130		X	X							1	↓

Relinquished by: (Signature/Affiliation)	Date	Time	Received by: (Signature/Affiliation)	Date	Time
Steve [illegible]	6-24-94	13:40	Troy D. [illegible] / WEST	6-24-94	13:40
Troy D. [illegible] / WEST	6-24-94	16:25			
			John Reese	6/24-94	16:25

Report To: Steve Leaty

Bill to: ULTRAMAR INC.
525 West Third Street
Hanford, CA 93230
Attention: Terry Fox

WHITE: Return to Client with Report YELLOW: Laboratory Copy PINK: Originator Copy

32 8003 1/90

APPENDIX G

SOIL VAPOR EXTRACTION TEST - AUGUST 12, 1994

FIELD OBSERVATIONS AND CALCULATIONS

DAILY FIELD REPORT

ACTON • MICKELSON • van DAM, INC.

Project No. 19005.10 19024.05 19024.04	Date: 8-12-94
Project Name: 494, 604	Project Location: 494, 604
Weather: Sunny Warm 90°F	Field Crew: WGR, RG

Today's Work Activities: M, 355

0600 - 0715 TO 494

0715 - 0930 Restart Thermtech (catox)
Take FID Readings from each well. observed that HC concentration with valves in final setting much higher than any one well.

0930 - 1030 TO GAS
setup VES test equipment w/ RG

1030 - 1630 Conduct VES pilot test on wells (vadose)
VW-1, VW-2 and VW-3 (in that order).
Called JCT near end of each test. Informed him that the was a very low flow coming from each well. Took bag sample for t/BTEX @ end of each test.
½ hr lunch
No influence was recorded in any of the observation wells. After setting up @ VW-1 show RG QM procedures @ well MW-5 (@ 1320). Disassemble VES test equipment and load truck. Also take 55 gal Ventsorb.

1630 - 1915 Assist RG w/ QM. Take water levels @ MW-1, MW-2, MW-3 and MW-7. Begin and complete QM @ MW-1, MW-2, and MW-3. Return to MW-4, 5 and 6 to sample All three did not recharge to 80% therefore sample was taken.

1915 - 2015 TO 494

2015 - 2030 @ 494 Take MW-3 sample and I-1 bag sample

2130 - 2125 TO West

2125 - 2135 @ West

2135 - 2300 TO SAC (½ hr dinner)

Signature WGR Date 8-12-94

Site: 604
Date: 8-12-94
Test Well: VW-1, VW-2, VW-3
Observation Well:
Field Conditions: Sunny Warm 90 °F.

VAPOR EXTRACTION PILOT TEST DATA

	Hour	Flow (cfm)	P=Pressure in "H_2O Vacuum (inches of H_2O)	Temperature at Flowmeter (degrees F.)	Airflow Corrected for Temperature (scfm)	Vacuum at Observation Point ___ (inches of H_2O)	Vacuum at Observation Point ___ (inches of H_2O)	Test Well Effluent Concentrations (ppm)			Extraction Rates (lbs/day)		
								FID	Draeger	Analytical	TPH	Benzene	
VW-1 start 1105	11 15	10 9.7	press. 0.2" 66	105	9.7	VW-3	MW-1	5000					DTW, 36.
VW-1	1200	10 9.6	Press. 0.1" 55	110	9.6	0	0	2500		X 1155, 570	1.7	0.055	
VW-2 start 1305	13 10	10 9.6	P=0.3 67	112	9.6	VW-1	MW-2	1200					
	1335	10 9.6	P=0.2 57	120	9.6	0	0	5000					DTW, 35.
	1350	10 9.5	P=0.2 56	124	9.5	0	0	2700		X 1350 7500	23	0.84	
VW-3 start 1425	1425	10	P=0.1 65	108	9.7	VW-1	MW-1	150					DTW, 35.
	1455	10	P=0.55 58	106	9.7	0	0	250					
	1535	10	P=0.15 58	98	9.7	0	0	1200					
	1555	10	P=0.15 58	98	9.7	0	0	1700	CO_2 0.5%	X 1605 1600	5.2	0.014	

VAPOR EXTRACTION PILOT TEST CALCULATIONS
AMV PROJECT NO. 19024.05

Extraction Rate

The pilot test flow rate from vapor well VW-1 at 1155 hours on August 12, 1994 was determined to be approximately 9.6 standard cubic feet per minute (scfm) or 13,824 standard cubic feet per day (scfd). Laboratory analysis of an air sample collected at this time during the pilot test (laboratory report(s) enclosed) indicates the concentration of total petroleum hydrocarbons as gasoline (TPHg) in the vapor stream to be 520 parts per million by volume (ppmv), with a benzene fraction of 3.5 percent. These values represent the maximum expected concentration at start-up. Continued system operation should result in decreased concentration.

The maximum volumetric rate of TPHg extraction is calculated as follows:

$$10 cfm \sqrt{\frac{530R}{1.0 bar} \times \frac{1.0 bar}{570R}} = 9.6 scfm \; ; \; 9.6 \frac{FT^3}{min} \times 1440 \frac{min}{day} \times \frac{520 FT^3}{1E6 FT^3} = 7.2 \; scfd \; TPHg$$

Using the ideal gas law to determine the equivalent pound-moles (lb-moles) for 13,824 scfd gives:

$$\frac{7.2 scfd \cdot 1 atm}{0.73 \frac{atm \, scf}{lb{\cdot}mol \, ^\circ R} (530 R)} = \frac{7.2 lb{\cdot}mol}{387 day} = 0.02 \frac{lb{\cdot}mol}{day} \; TPHg$$

Using the molecular weight of hexane, the rate of TPHg extracted on a pounds basis is calculated as:

$$0.02 \frac{lb{\cdot}mol}{day} \times \frac{86 lb}{lb{\cdot}mol} = 1.7 lb/day \; TPHg$$

With a benzene fraction of 3.5 percent, the lb-moles rate of benzene extraction is calculated as:

$$0.02 \frac{lb{\cdot}mol}{day} \times (0.035) = 7.0 \times 10^{-4} \frac{lb{\cdot}mol}{day} \; benzene$$

On a pounds basis, the extraction rate for benzene is calculated as:

$$7.0 \times 10^{-4} \frac{lb{\cdot}mol}{day} \times \frac{78 lb}{lb{\cdot}mol} = 5.5 \times 10^{-2} lb/day \; benzene$$

Vapor Extraction Zone of Influence

Approximation of the vapor extraction zone of influence is calculated using the empirical equation:

$$r = Q/2\pi hv$$

where:
- r = distance from extraction of minimum effective air velocity, ft
- Q = extracted air flow rate, scfm
- h = thickness of the unsaturated zone of the screened interval
- v = assumed minimum effective air velocity, 0.01 feet/minute

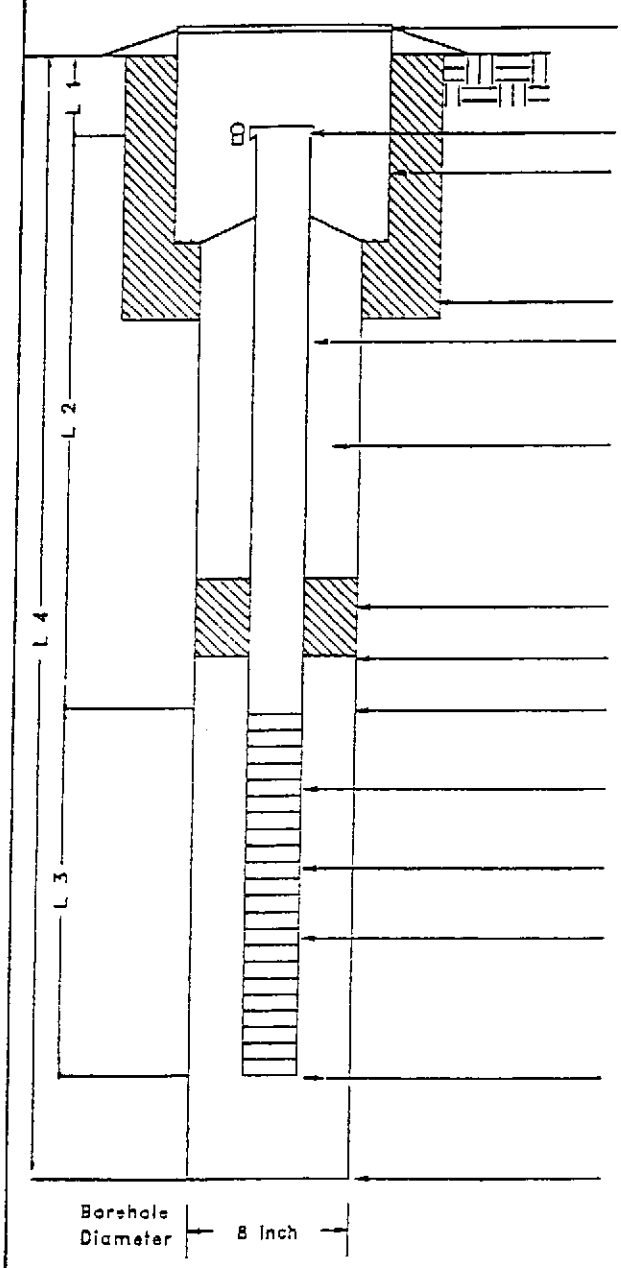
The calculated zone of influence is:

$$r = \frac{9.6 scfm}{2\pi (9.5 FT)(0.01 \frac{FT}{MIN})} = 16.1 FT$$

VADOSE WELL CONSTRUCTION DETAILS

VADOSE WELL NO. VW-1

PROJECT: Beacon #604
1619 W. First Street
Livermore, CA



L1 = 0.25

L2 = 26.75

L3 = 10

L4 = 37

COMPLETION DATE AND TIME 18:45 05-28-93

Note: hole backfilled with bentonite chips 37 to 50 feet

ACTON • MICKELSON • VAN DAM, INC.

VAPOR EXTRACTION PILOT TEST CALCULATIONS
AMV PROJECT NO. 19024.05

Extraction Rate

The pilot test flow rate from vapor well VW-2 at 1350 hours on August 12, 1994 was determined to be approximately 9.5 standard cubic feet per minute (scfm) or 13,680 standard cubic feet per day (scfd). Laboratory analysis of an air sample collected at this time during the pilot test (laboratory report(s) enclosed) indicates the concentration of total petroleum hydrocarbons as gasoline (TPHg) in the vapor stream to be 7500 parts per million by volume (ppmv), with a benzene fraction of 4.1 percent. These values represent the maximum expected concentration at start-up. Continued system operation should result in decreased concentration.

The maximum volumetric rate of TPHg extraction is calculated as follows:

$$10\ cfm\sqrt{\frac{530°R}{1.0bar}\times\frac{1.0bar}{584°R}} = 9.5\ scfm;\quad 9.5\frac{FT^3}{min}\times 1440\frac{min}{day}\times\frac{7500\ FT^3}{1E6\ FT^3} = 102.6\ scfd\ TPHg$$

Using the ideal gas law to determine the equivalent pound-moles (lb-moles) for 13,680 scfd gives:

$$\frac{102.6\ scfd\cdot 1\ atm}{0.73\frac{atm\ scf}{lb\cdot mol\ °R}\ (530°R)} = \frac{102.6\ lb\cdot mol}{387\ day} = 0.27\frac{lb\cdot mol}{day}\ TPHg$$

Using the molecular weight of hexane, the rate of TPHg extracted on a pounds basis is calculated as:

$$0.27\frac{lb\cdot mol}{day}\times\frac{86\ lb}{lb\cdot mol} = 23.2\ lb/day\ TPHg$$

With a benzene fraction of 4.1 percent, the lb-moles rate of benzene extraction is calculated as:

$$0.27\frac{lb\cdot mol}{day}\times(0.041) = 1.1\times10^{-2}\frac{lb\cdot mol}{day}\ benzene$$

On a pounds basis, the extraction rate for benzene is calculated as:

$$1.1\times10^{-2}\frac{lb\cdot mol}{day}\times\frac{78\ lb}{lb\cdot mol} = 0.86\ lb/day\ benzene$$

Vapor Extraction Zone of Influence

Approximation of the vapor extraction zone of influence is calculated using the empirical equation:

$$r = Q/2\pi hv$$

where:
- r = distance from extraction of minimum effective air velocity, ft
- Q = extracted air flow rate, scfm
- h = thickness of the unsaturated zone of the screened interval
- v = assumed minimum effective air velocity, 0.01 feet/minute

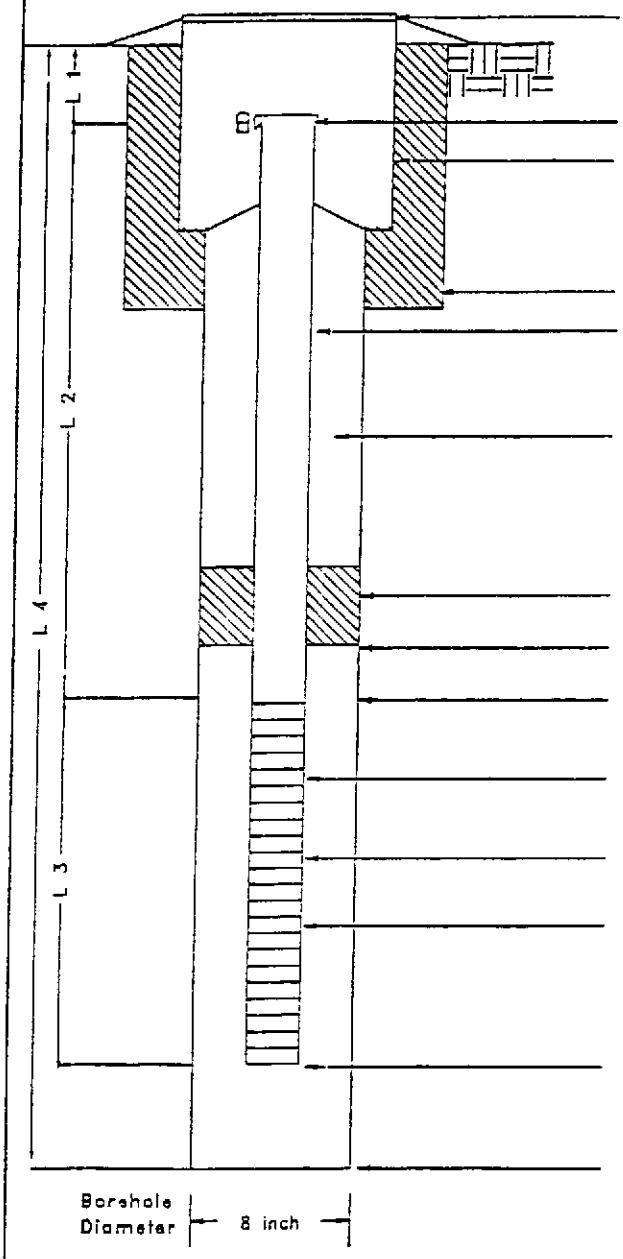
The calculated zone of influence is:

$$r = \frac{9.5\ scfm}{2\pi(14\ Ft)(0.01\frac{FT}{MIN})} = 10.8\ FT$$

VADOSE WELL CONSTRUCTION DETAILS

VADOSE WELL NO. VW-2

PROJECT: Beacon #604
1619 W. First Street
Livermore, CA



Protective Casing	
Locking Water Tight Cap	
Flush Grade Well Construction	
Diameter and Mat'l	12-inch steel
Total length	12 inches
Length Above Ground	1/4 inch
Thickness and Type of Seal	2 feet, concrete
Diameter, Mat'l and Joint Type of Riser Pipe	2 inch, SCH 40 PVC, flush thread
Type of Backfill Around Riser	cement/ 5% bentonite grout
Thickness and Type of Seal	2 feet bentonite chips
Distance of Filter Sand Above Top of Screen	2 feet
Type of Filter Around Screen	#3 Lonestar
Monitoring Well Mat'l	SCH 40 PVC
Screen Gauge/Slot Size	0.020 inch
Diameter and Length of Screen	2 inch, 15 feet
Depth to Bottom of Monitoring Well	37 feet
Depth to the Bottom of Filter Sand	37 feet

L1 = 0.25

L2 = 21.75

L3 = 15

L4 = 37

COMPLETION DATE AND TIME 10:45 05-28-93

ACTON • MICKELSON • VAN DAM, INC.

VAPOR EXTRACTION PILOT TEST CALCULATIONS
AMV PROJECT NO. 19024.05

Extraction Rate

The pilot test flow rate from vapor well VW-3 at 1605 hours on August 12, 1994 was determined to be approximately 9.7 standard cubic feet per minute (scfm) or 13,968 standard cubic feet per day (scfd). Laboratory analysis of an air sample collected at this time during the pilot test (laboratory report(s) enclosed) indicates the concentration of total petroleum hydrocarbons as gasoline (TPHg) in the vapor stream to be 1600 parts per million by volume (ppmv), with a benzene fraction of 0.3 percent. These values represent the maximum expected concentration at start-up. Continued system operation should result in decreased concentration.

The maximum volumetric rate of TPHg extraction is calculated as follows:

$$10\,cfm\sqrt{\frac{530°R}{1.0\,bar}\times\frac{1.0\,bar}{558°R}} = 9.7\,scfm;\quad 9.7\,scfm\times\frac{1440\,min}{day}\times\frac{1600\,FT^3}{1E6\,FT^3} = 22.3\,scfd\ TPHg$$

Using the ideal gas law to determine the equivalent pound-moles (lb-moles) for 13,968 scfd gives:

$$\frac{22.3\,scfd\cdot 1\,atm}{0.73\,\frac{atm\cdot scf}{lb\cdot mol\cdot °R}\,(530°R)} = \frac{22.3\,lb\cdot mol}{387\,day} = 0.06\,\frac{lb\cdot mol}{day}\ TPHg$$

Using the molecular weight of hexane, the rate of TPHg extracted on a pounds basis is calculated as:

$$0.06\,\frac{lb\cdot mol}{day}\times\frac{86\,lb}{lb\cdot mol} = 5.2\,\frac{lb}{day}\ TPHg$$

With a benzene fraction of 0.3 percent, the lb-moles rate of benzene extraction is calculated as:

$$0.06\,\frac{lb\cdot mol}{day}\times(0.003) = 1.8\times10^{-4}\,\frac{lb\cdot mol}{day}\ benzene$$

On a pounds basis, the extraction rate for benzene is calculated as:

$$1.8\times10^{-4}\,\frac{lb\cdot mol}{day}\times\frac{78\,lb}{lb\cdot mol} = 1.4\times10^{-2}\,lb/day\ benzene$$

Vapor Extraction Zone of Influence

Approximation of the vapor extraction zone of influence is calculated using the empirical equation:

$$r = Q/2\pi hv$$

where:
- r = distance from extraction of minimum effective air velocity, ft
- Q = extracted air flow rate, scfm
- h = thickness of the unsaturated zone of the screened interval
- v = assumed minimum effective air velocity, 0.01 feet/minute

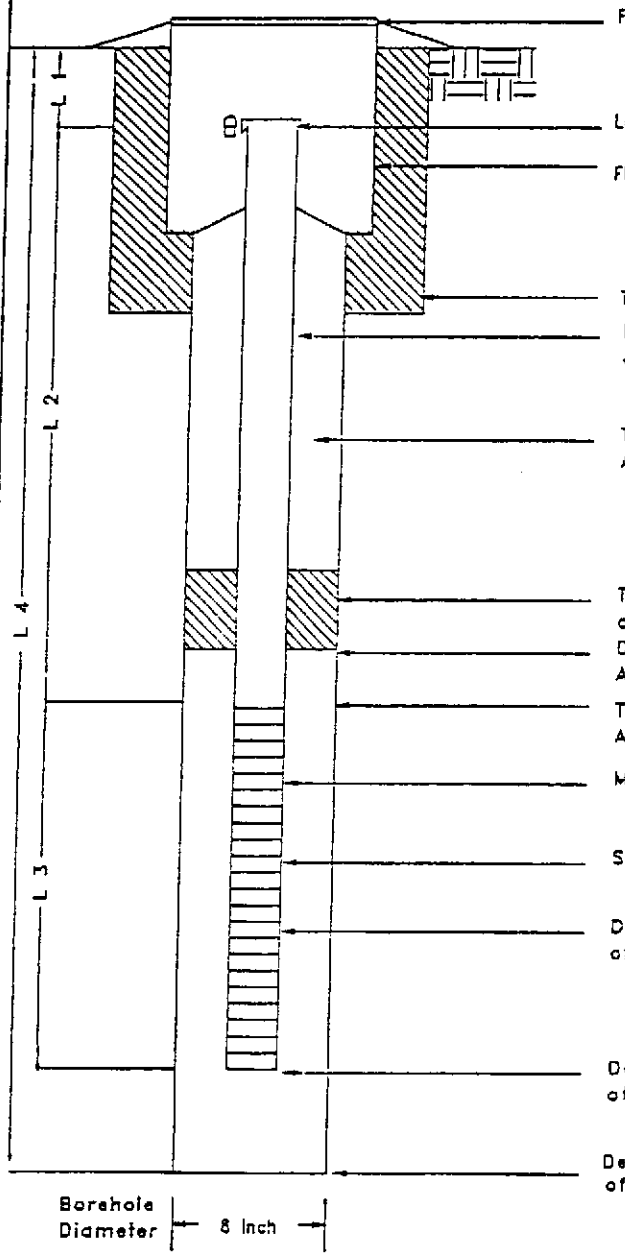
The calculated zone of influence is:

$$r = \frac{9.7\,scfm}{2\pi(15\,FT)\left(0.01\,\frac{FT}{MIN}\right)} = 10.3\,FT$$

VADOSE WELL CONSTRUCTION DETAILS

VADOSE WELL NO. VW-3

PROJECT: Beacon #604
1619 W. First Street
Livermore, CA



Protective Casing	
Locking Water Tight Cap	
Flush Grade Well Construction	
Diameter and Mat'l	8-inch steel
Total length	12 inches
Length Above Ground	1/4 inch
Thickness and Type of Seal	2 feet, concrete
Diameter, Mat'l and Joint Type of Riser Pipe	2 inch, SCH 40 PVC, flush thread
Type of Backfill Around Riser	cement/ 5% bentonite grout
Thickness and Type of Seal	2 feet bentonite chips
Distance of Filter Sand Above Top of Screen	2 feet
Type of Filter Around Screen	#3 Lonestar
Monitoring Well Mat'l	SCH 40 PVC
Screen Gauge/Slot Size	0.020 inch
Diameter and Length of Screen	2 inch, 10 feet
Depth to Bottom of Monitoring Well	36 feet
Depth to the Bottom of Filter Sand	36 feet

L1 = 0.25

L2 = 20.75

L3 = 15

L4 = 36

COMPLETION DATE AND TIME 10:40 06-01-93

ACTON • MICKELSON • VAN DAM, INC.

APPENDIX H

AIR SAMPLE ANALYTICAL RESULTS - AUGUST 12, 1994

August 15, 1994
Sample Log 10057

Jim Twiford
Acton, Mickelson & van Dam
5090 Robert J. Matthews Pkwy
El Dorado Hills, CA 95762

Subject: Analytical Results for 3 Air Samples
Identified as: Project # 19024.05 (Beacon 604)
Received: 08/12/94

Dear Mr. Twiford:

Analysis of the sample(s) referenced above has been completed. This report is written to confirm results communicated on August 15, 1994 and describes procedures used to analyze the samples.

The sample(s) were received in:

Tedlar air sampling bags

Each sample was transported and received under documented chain of custody, assigned a consecutive log number and stored at 4 degrees Celsius until analysis commenced.

Sample(s) were analyzed using the following method(s):

"BTEX" (EPA Method 8020/Purge-and-Trap)
"TPH as Gasoline" (Modified EPA Method 8015/Purge-and-Trap)

Please refer to the following table(s) for summarized analytical results and contact us at 916-753-9500 if you have questions regarding procedures or results. The chain-of-custody document is enclosed.

Approved by:

Joel Kiff
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

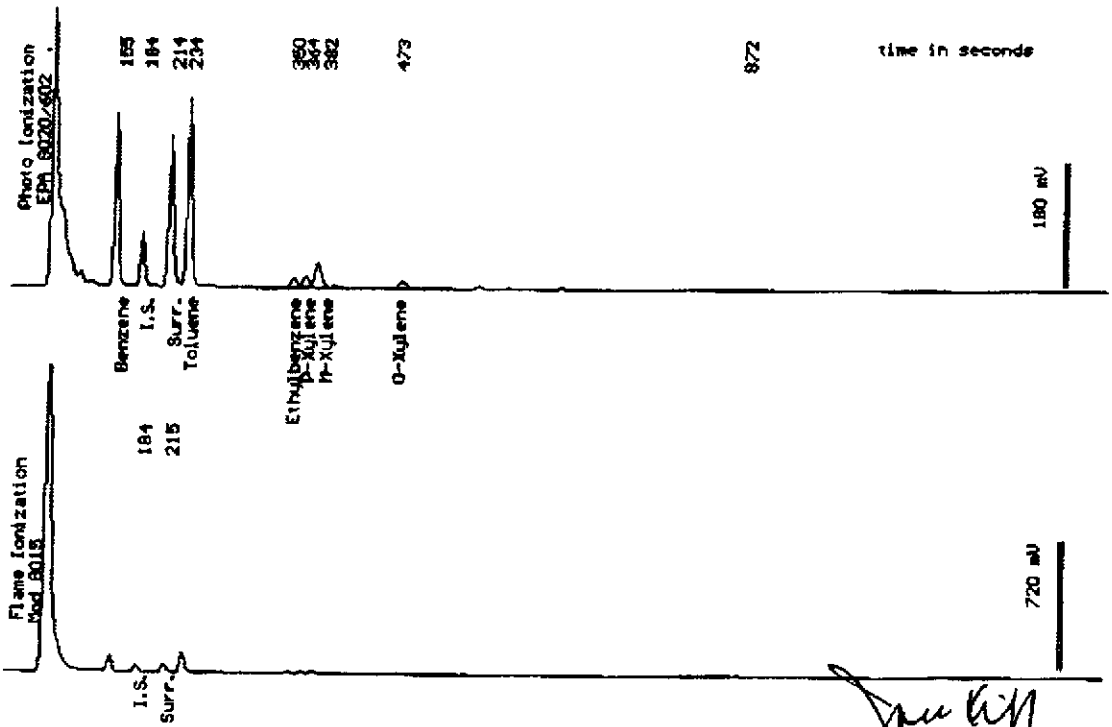
Sample Log 10057

10057-1

Sample: VW 1

From : Project # 19024.05 (Beacon 604)
Sampled : 08/12/94
Dilution : 1:5 QC Batch : 4100E
Matrix : Air

Parameter	(MRL) Molar ppm	Measured Value Molar ppm
Benzene	(.25)	18
Toluene	(.25)	19
Ethylbenzene	(.25)	1.3
Total Xylenes	(.25)	5.5
TPH as Gasoline	(25)	520
Surrogate Recovery		101 %



Date Analyzed: 08-13-94
Column : 0.53mm ID X 30m DBWAX (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

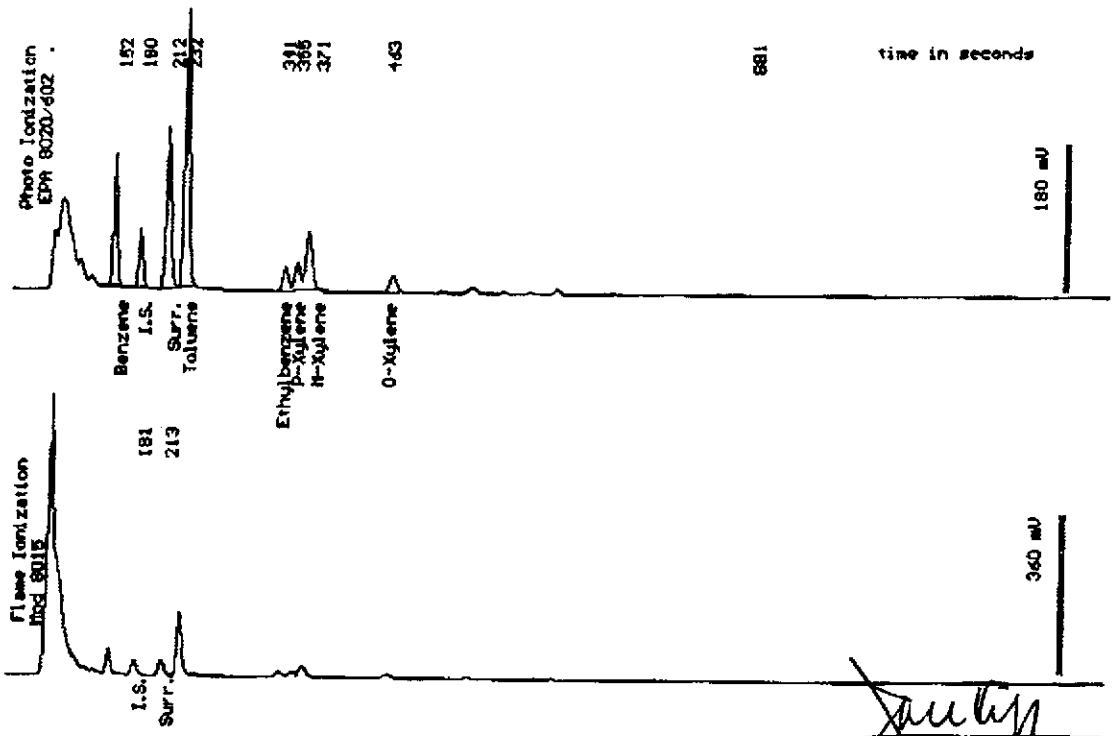
Western Environmental Science & Technology • 45133 County Road 32B • Davis, CA 95616 • 916 753-9500 • FAX: 916 757-4652

Sample Log 10057
10057-2

Sample: VW 2

From : Project # 19024.05 (Beacon 604)
Sampled : 08/12/94
Dilution : 1:125 QC Batch : 4100F
Matrix : Air

Parameter	(MRL) Molar ppm	Measured Value Molar ppm
Benzene	(6.3)	310
Toluene	(6.3)	740
Ethylbenzene	(6.3)	69
Total Xylenes	(6.3)	310
TPH as Gasoline	(630)	7500
Surrogate Recovery		106 %



Date Analyzed: 08-13-94
Column : 0.53mm ID X 30m DBWAX (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

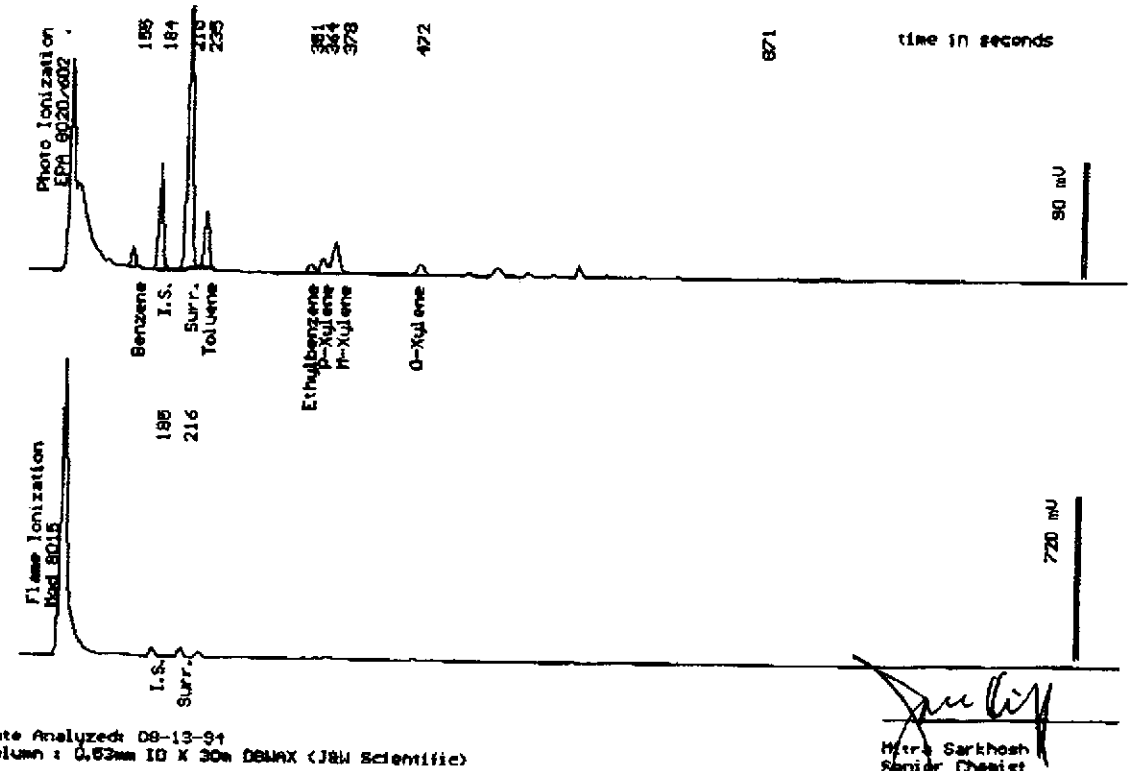
Sample Log 10057

10057-3

Sample: VW 3

From : Project # 19024.05 (Beacon 604)
Sampled : 08/12/94
Dilution : 1:25 QC Batch : 4100E
Matrix : Air

Parameter	(MRL) Molar ppm	Measured Value Molar ppm
Benzene	(1.3)	5.3
Toluene	(1.3)	17
Ethylbenzene	(1.3)	3.2
Total Xylenes	(1.3)	20
TPH as Gasoline	(130)	1600
Surrogate Recovery		100 %



Date Analyzed: 08-13-94
Column : 0.53mm ID X 30m DBWAX (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

Western Environmental Science & Technology • 45133 County Road 32B • Davis, CA 95616 • 916 753-9500 • FAX: 916 757-4652

#10057

Ultramar Inc.

CHAIN OF CUSTODY REPORT

BEACON

Beacon Station No. #604	Sampler (Print Name) ROD GOSS			ANALYSES								Date 8/12/94	Form No. 2 of 2
Project No. 19024.05	Sampler (Signature)												
Project Location 1619 W. FIRST ST LIVERMORE, CA.	Affiliation AMV, INC.											STANDARD TAT	
Sample No./Identification	Date	Time	Lab No.	BTEX	TPH (gasoline)	TPH (diesel)					No. of Containers	REMARKS	
0057-1 VW 1	8/12/94	11:55		X	X							1@ TEDLAR BAG	
-2 VW 2	8/12/94	13:50		X	X							"	
-3 VW 3	8/12/94	16:05		X	X							"	

Relinquished by: (Signature/Affiliation)	Date	Time	Received by: (Signature/Affiliation)	Date	Time
AMV	8/12/94	21:31			
Relinquished by: (Signature/Affiliation)	Date	Time	Received by: (Signature/Affiliation)	Date	Time
Relinquished by: (Signature/Affiliation)	Date	Time	Received by: (Signature/Affiliation)	Date	Time
	8/12/94	21:31			

Report To: JIM TWIFORD
AMV, INC.

Bill to: ULTRAMAR INC.
525 West Third Street
Hanford, CA 93230
Attention: T. FOX

WHITE: Return to Client with Report YELLOW: Laboratory Copy PINK: Originator Copy

32-0003 1/90

APPENDIX I

FIELD NOTES AND SOIL BORING LOGS

HYDROPUNCH® BORINGS - JULY 1994

DAILY FIELD REPORT

ACTON • MICKELSON • van DAM, INC.

Project No.: 19024.06	Date: 7-7-94
Project Name: Beacon #604	Project Location: Livermore
Weather: Clear, Hot	Field Crew: SM

Today's Work Activities:

0915 Arrive @ site and meet with Pat Motaro of GCL and West Hazmat Crew. Pat had a depth to water map prepared for the area of investigation.

0945 Terry Fox of Ultramar on site to observe drilling

1030 Begin drilling HP-1

1106 Collect 5.5 HP1-1 1-Sample not retained By GCL

1200 GCL has elected to use their own VOA's for G.W. Samples (Possible variable in analytical

1200-1400 Attempt at retrieve g.w. sample using hydropunch Rods are bent harder will not go T.D. 7 Fox to decide option

1415 Decide to drill out to 48 feet and re-hydropunch

1530 Drill to 48 feet, set temporary casing and collect ground water sample @ 1610

1630-1900 Pull Augers, decon, clean work area, stockpile soil

1520 Discuss with W. Hazmat materials and start time for 7-8

1930 Leave site

Signature Steve Ly

Date 7-7-94

DAILY FIELD REPORT

ACTON • MICKELSON • van DAM, INC.

Project No. 19024.06	Date: 7-8-94
Project Name: Beacon 604	Project Location: Livermore, CA
Weather: Clear, Hot	Field Crew: SAL

Today's Work Activities:

0630 Arrive at site and secure HP-2 location.
0650 West Hazmat arrives at site
0700-0720 Set up on HP-2
0720 Begin drilling HP-2, Pat Montano of GCL suggested moving location to west (in line w/ treatment system
0905 West Hazmat having trouble with wireline to collect soil sample at 25' ; on this to 0825
0915 T.D. HP-2 @ 42.5 feet. Slight H.C. odor in soil at 40 feet.
0915-0925 Setting up Hydropunch assembly.
1200 Start drilling HP-3
1210-1235 W.H. having trouble with wireline again.
1235 Resume drilling HP-3
1315 Drill Rig is overheating, Antifreeze / coolant discharged below rig. Down time to 1350
1535 Collect G.W. Sample from HP-3

Signature _____ Date _____

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: HP-1

Project Number: 19024.06

Location: BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Drilling	Time	Date
Start	10:30	07/07/94
Finish	11:40	07/07/94

Drilling Company: WEST HAZMAT
Drilled By: GENE NUNES
Drilling Method: 8" O.D. HSA; MOBILE B-52 DRILL RIG
Sampling Method: CALIFORNIA MODIFIED SPLIT-SPOON FITTED WITH 2" x 6" BRASS SAMPLE SLEEVES

Completion Depth: 47.0 Feet
Logged By: S. LIATY
Checked By:

DEPTH (feet)	SAMPLE INTERVAL	DESCRIPTION	GRAPHIC LOG	USCS CLASS	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.
0		ASPHALT		GM				Gravel from 1/2 to 4 cm in diameter	
		SILTY GRAVEL, dark yellowish brown (10 YR 3/4), damp, minor sand							
5									
		Some sand at 8 feet							
10									
15					45 60/ 6"	12	12		HP1-1
20									
		SILT, yellowish brown (10 YR 5/4), damp, trace fine-grained sand		ML					
25					15 40 40	18	18		HP1-2
30									

(Boring continued on next page)

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: HP-1

Project Number: 19024.06

Location: BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Drilling	Time	Date
Start	10:30	07/07/94
Finish	11:40	07/07/94

Drilling Company: WEST HAZMAT
Drilled By: GENE NUNES
Drilling Method: 8" O.D. HSA; MOBILE B-52 DRILL RIG
Sampling Method: CALIFORNIA MODIFIED SPLIT-SPOON FITTED WITH 2" x 6" BRASS SAMPLE SLEEVES

Completion Depth: 47.0 Feet
Logged By: S. LIATY
Checked By:

DEPTH (feet)	SAMPLE INTERVAL	DESCRIPTION	GRAPHIC LOG	USCS CLASS	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.
		SILT, yellowish brown (10 YR 5/4), damp, trace fine-grained sand		ML					
		SANDY GRAVEL, yellowish brown (10 YR 5/8), wet, trace silt		GW				Gravel from 1/4 to 1 cm in diameter	
35					42 60/ 6"	12	12		HP1-3
40					35 70/ 6"	12	12		HP1-4
		Saturated at 42 feet.							
45									
		Boring terminated. Total depth = 47.0 feet						Boring terminated to advance Hydrocounch	
50									
55									
60									

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: HP-2

Project Number: 19024.06

Location: BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Drilling	Time	Date
Start	07:20	07/08/94
Finish	09:15	07/08/94

Drilling Company: WEST HAZMAT
Drilled By: GENE NUNES
Drilling Method: 8" O.D. HSA; MOBILE B-52 DRILL RIG
Sampling Method: CALIFORNIA MODIFIED SPLIT-SPOON FITTED WITH 2" x 6" BRASS SAMPLE SLEEVES

Completion Depth: 42.5 Feet
Logged By: S. LIATY
Checked By:

DEPTH (feet)	SAMPLE INTERVAL	DESCRIPTION	GRAPHIC LOG	USCS CLASS	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.
0		ASPHALT		GM					
		SILTY GRAVEL, dark yellowish brown (10 YR 3/4), damp, minor sand							
5									
10		Increase in sand content at 10 feet							
15		Becomes moderate yellowish brown (10 YR 5/8), at 15 feet			24 50 50	18	18		HP2-1
20		SILT, yellowish brown (10 YR 5/4), damp, trace fine-grained sand		ML					
25					18 18 30	18	18		HP2-2
30									

(Boring continued on next page)

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: HP-2

Project Number: 19024.06

Location: BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Drilling	Time	Date
Start	07:20	07/08/94
Finish	09:15	07/08/94

Drilling Company: WEST HAZMAT
Drilled By: GENE NUNES
Drilling Method: 8" O.D. HSA; MOBILE B-52 DRILL RIG
Sampling Method: CALIFORNIA MODIFIED SPLIT-SPOON FITTED WITH 2" x 6" BRASS SAMPLE SLEEVES

Completion Depth: 42.5 Feet
Logged By: S. LIATY
Checked By:

DEPTH (feet)	SAMPLE INTERVAL	DESCRIPTION	GRAPHIC LOG	USCS CLASS	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.
35		SILT, yellowish brown (10 YR 5/4), damp		ML	35 90/ 6"	12	12		HP2-3
40		SILTY GRAVEL, dark yellowish brown (10 YR 3/4), damp, minor sand Saturated at 41.5 feet		GM	35 30 30	18	18		HP2-4
45		Boring terminated. Total depth = 42.5 feet						Boring terminated to advance Hydropunch	
50									
55									
60									

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: HP-3

Project Number: 19024.06

Location: BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Drilling	Time	Date
Start	12:00	07/08/94
Finish	15:00	07/08/94

Drilling Company: WEST HAZMAT
Drilled By: GENE NUNES
Drilling Method: 8" O.D. HSA; MOBILE B-52 DRILL RIG
Sampling Method: CALIFORNIA MODIFIED SPLIT-SPOON FITTED WITH 2" x 6" BRASS SAMPLE SLEEVES

Completion Depth: 42.5 Feet
Logged By: S. LIATY
Checked By:

DEPTH (feet)	SAMPLE INTERVAL	DESCRIPTION	GRAPHIC LOG	USCS CLASS	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.
0		ASPHALT		GM				Gravel up to 6 cm in diameter	
		SILTY GRAVEL, dark yellowish brown (10 YR 3/4), damp, minor fine-grained sand							
5									
10									
15		Becomes moist at 15 feet			40 50/ 6"	12	12		HP3-1
20		SILT, yellowish brown (10 YR 5/4), damp, trace fine-grained sand		ML					
25		SILTY SAND, yellowish brown (10 YR 5/4), moist, fine to medium grained		SM	15 20 30	18	18		HP3-2
30				ML					

(Boring continued on next page)

Acton • Mickelson • van Dam, Inc.

Consulting Scientists, Engineers, and Geologists

Log of Soil Boring: HP-3

Project Number: 19024.06

Location: BEACON STATION #604
1619 WEST FIRST STREET
LIVERMORE, CALIFORNIA

Drilling	Time	Date
Start	12:00	07/08/94
Finish	15:00	07/08/94

Drilling Company: WEST HAZMAT
Drilled By: GENE NUNES
Drilling Method: 8" O.D. HSA; MOBILE B-52 DRILL RIG
Sampling Method: CALIFORNIA MODIFIED SPLIT-SPOON FITTED WITH 2" x 6" BRASS SAMPLE SLEEVES

Completion Depth: 42.5 Feet
Logged By: S. LIATY
Checked By:

DEPTH (feet)	SAMPLE INTERVAL	DESCRIPTION	GRAPHIC LOG	USCS CLASS	BLOWS/6 IN.	INCHES DRIVEN	INCHES RECOV'D	COMMENTS	SAMPLE NO.
		SILT, yellowish brown (10 YR 5/4), damp		ML					
35		SILTY GRAVEL, dark yellowish brown (10 YR 5/4), moist, trace fine-grained sand		GM	60/6"	6	6		HP3-3
40					40 60/6"	12	12		HP3-4
		Saturated at 42 feet						Borings terminated to advance Hydropunch	
		Boring terminated. Total depth = 42.5 feet							
45									
50									
55									
60									

APPENDIX J

SOIL SAMPLE ANALYTICAL RESULTS

HYDROPUNCH® BORINGS - JULY 1994

July 19, 1994
Sample Log 9806

Joseph Mello
Acton, Mickelson & van Dam
5090 Robert J. Matthews Pkwy
El Dorado Hills, CA 95762

Subject: Analytical Results for 2 Water Samples and 3 Soil Samples
Identified as: Project # 19024.06 (Beacon 604)
Received: 07/09/94

Dear Mr. Mello:

Analysis of the sample(s) referenced above has been completed. This report is written to confirm results communicated on July 19, 1994 and describes procedures used to analyze the samples.

Sample(s) were received in 40-mL glass vials sealed with TFE lined septae, and in brass sleeves sealed with TFE sheets and endcaps. Each sample was transported and received under documented chain of custody and stored at 4 degrees C until analysis was performed.

Sample(s) were analyzed using the following method(s):

"BTEX" (EPA Method 8020/Purge-and-Trap)
"BTEX" (EPA Method 602/Purge-and-Trap)
"TPH as Gasoline" (Modified EPA Method 8015/Purge-and-Trap)

Please refer to the following table(s) for summarized analytical results and contact us at 916-753-9500 if you have questions regarding procedures or results. The chain-of-custody document is enclosed.

Approved by:

Joel Kiff
Senior Chemist

Western Environmental Science & Technology • 45133 County Road 32B • Davis, CA 95616 • 916 753-9500 • FAX: 916 757-4652

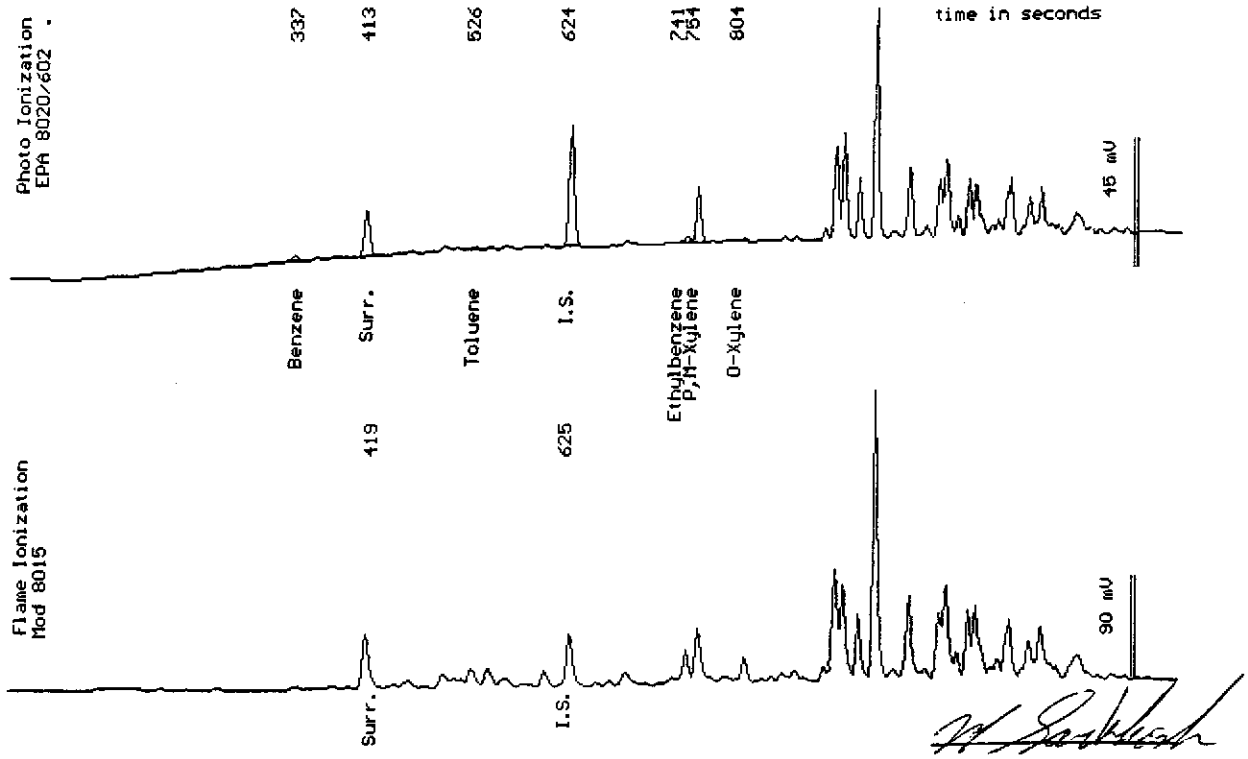
Sample Log 9798

9798-5

Sample: HP1-4(40')

From : Project # 19024.06 (Beacon 604)
Sampled : 07/07/94
Dilution : 1:1 QC Batch : 6118B
Matrix : Soil

Parameter	(MRL) mg/kg	Measured Value mg/kg
Benzene	(.0050)	.012
Toluene	(.0050)	.0072
Ethylbenzene	(.0050)	.011
Total Xylenes	(.0050)	.12
TPH as Gasoline	(1.0)	5.2
Surrogate Recovery		103 %



Date Analyzed: 07-12-94
Column : 0.53mm ID X 30m DB5 (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

Ultramar Inc

Excelchem
Environmental Labs

~~8112 Patton Avenue~~
~~Citrus Heights, CA 95610~~ ~~(916) 729-5313~~

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager:	Phone #:
Joe Mello	(916) 939-7550
Company/Address:	**FAX #:**
AMV, Inc	(916) 939-7570
Project Number: / **P.O.#:**	**Project Name:**
19024.06	Beacon 604
Project Location:	**Sampler Signature:**
Livermore	Steve Ly

ANALYSIS REQUEST — **TAT**

Sample ID	Sampling DATE	Sampling TIME	Container VOA	Container SLEEVE	Container 1L GLASS	Container 1L PLASTIC	Method Preserved HCl	Method Preserved HNO_3	Method Preserved ICE	Method Preserved NONE	Matrix WATER	Matrix SOIL
HP2-1	7-8-94			X					X			X
HP2-2				X								
HP2-3				X								
HP2-4				X								
HP3-1				X								
HP3-2				X								
HP3-3				X								
HP3-4				X								X
1— HP-2				3				X			X	X
2— HP-3		1555		3				X			X	
HP(A,B,C,D)		1615		4								X

BTEX (602/8020)	BTEX/TPH as Gasoline (602/8020/8015)	TPH as Diesel/Oil (8015)	Total Oil & Grease (5520 B/E,F)	Total Oil & Grease IR (5520 B/E,F,C)	96 - Hour Fish Bioassay	EPA 601/8010	EPA 602/8020	EPA 615/8150	EPA 608/8080 - Pesticides	EPA 608/8080-PCBs	EPA 624/8240	EPA 625/8270	ORGANIC LEAD	Reactivity, Corrosivity, Ignitibility	W.E.T.(✓) / TOTAL(✓) CAM - 17 Metals	EPA - Priority Pollutant Metals	LEAD(7420/7421/239.2)	Cd, Cr, Pb, Zn, Ni	RUSH SERVICE (12 hour or (24 hr)	EXPEDITED SERVICE (48 hr)	STANDARD SERVICE
	X																				✓
	↓																				✓
																					✓
																					✓
																					✓
																					✓
																					✓
																					✓
																					✓
																			✓		
																			✓		
	↓																				✓

Relinquished by:	Date	Time	Received by:
Steve Ly	7-9-94	8:40	
Relinquished by: Mary McBride	7/9/94	11:05	Received by:
Relinquished by	Date	Time	Received by Laboratory:

Remarks:
Hold All soil Samples until further notice

G.W. Results by 8:00 am Monday

Bill To:
Ultramar Attn: Terry Fox

WEST

July 18, 1994
Sample Log 9798

Joseph Mello
Acton, Mickelson & van Dam
5090 Robert J. Matthews Pkwy
El Dorado Hills, CA 95762

Subject: Analytical Results for 1 Water Sample and 1 Soil Sample
Identified as: Project # 19024.06 (Beacon 604)
Received: 07/07/94

/3

Dear Mr. Mello:

Analysis of the sample(s) referenced above has been completed. This report is written to confirm results communicated on July 18, 1994 and describes procedures used to analyze the samples.

Sample(s) were received in 40-mL glass vials sealed with TFE lined septae, and in brass sleeves sealed with Al foil and endcaps. Each sample was transported and received under documented chain of custody and stored at 4 degrees C until analysis was performed.

Sample(s) were analyzed using the following method(s):

"BTEX" (EPA Method 8020/Purge-and-Trap)
"BTEX" (EPA Method 602/Purge-and-Trap)
"TPH as Gasoline" (Modified EPA Method 8015/Purge-and-Trap)

Please refer to the following table(s) for summarized analytical results and contact us at 916-753-9500 if you have questions regarding procedures or results. The chain-of-custody document is enclosed.

Approved by:

Joel Kiff
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

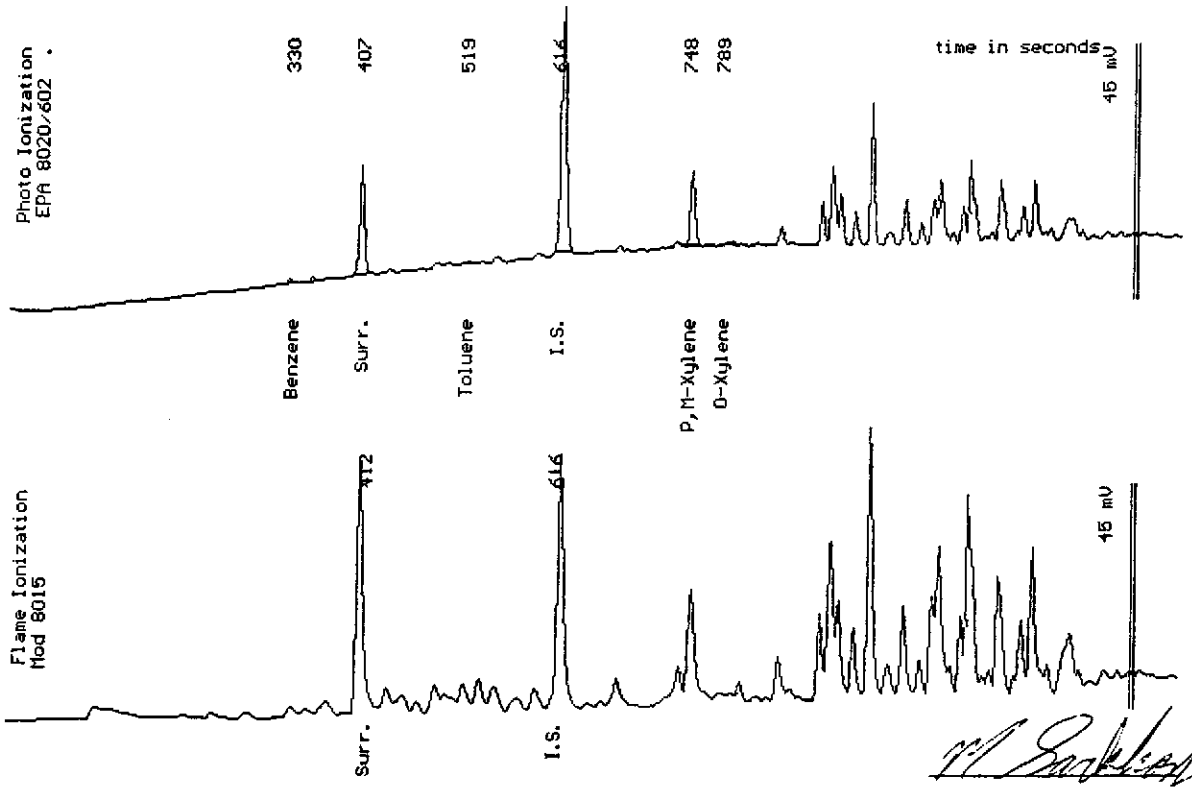
Sample Log 9806

9806-6

Sample: HP2-4

From : Project # 19024.06 (Beacon 604)
Sampled : 07/08/94
Dilution : 1:1 QC Batch : 6119g
Matrix : Soil

Parameter	(MRL) mg/kg	Measured Value mg/kg
Benzene	(.0050)	<.0050
Toluene	(.0050)	<.0050
Ethylbenzene	(.0050)	<.0050
Total Xylenes	(.0050)	.040
TPH as Gasoline	(1.0)	<1.0
Surrogate Recovery		101 %



Date Analyzed: 07-18-94
Column : 0.53mm ID X 30m DB5 (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

Sample Log 9806

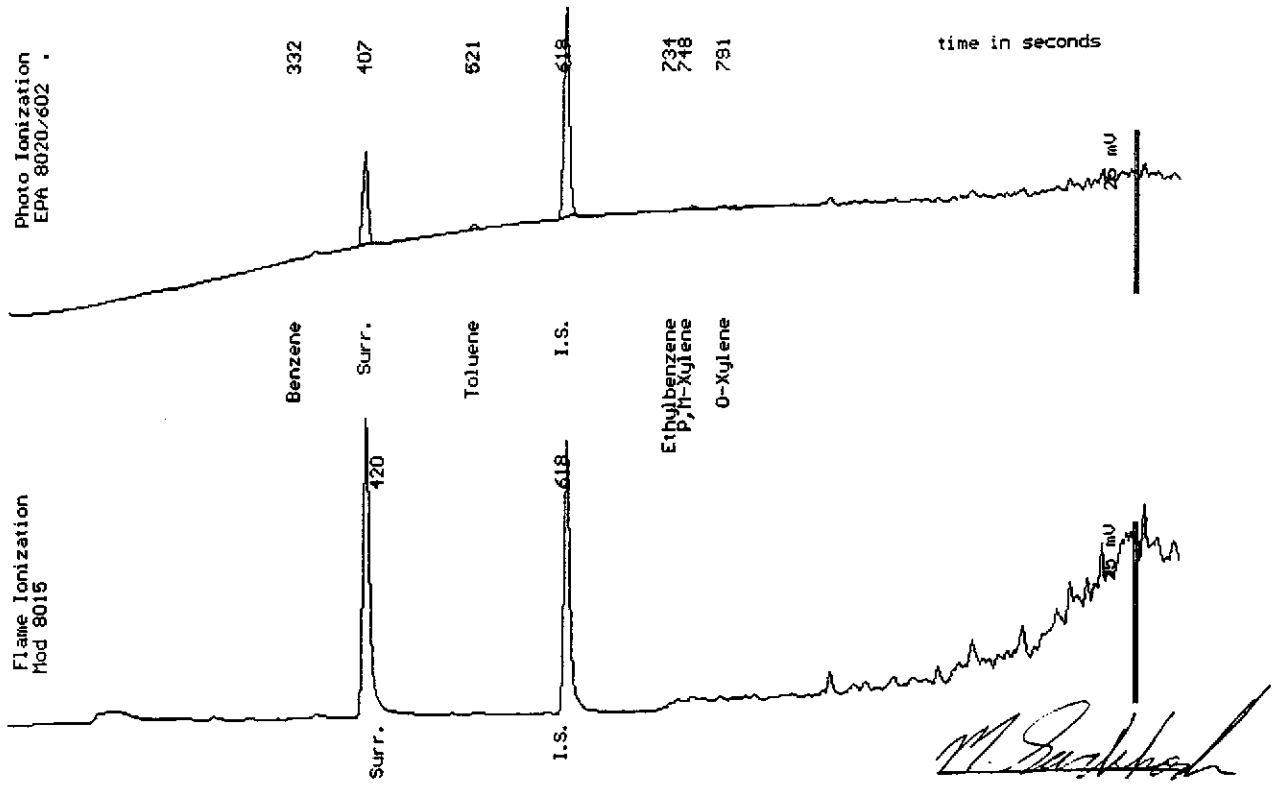
9806-10

Sample: **HP3-4**

From : Project # 19024.06 (Beacon 604)
Sampled : 07/08/94
Dilution : 1:1 QC Batch : 6120f
Matrix : Soil

Parameter	(MRL) mg/kg	Measured Value mg/kg
Benzene	(.0050)	<.0050
Toluene	(.0050)	<.0050
Ethylbenzene	(.0050)	<.0050
Total Xylenes	(.0050)	<.0050
TPH as Gasoline	(1.0)	1.9 *
Surrogate Recovery		99 %

* Product is not typical gasoline.



Date Analyzed: 07-19-94
Column : 0.53mm ID X 30m DB5 (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

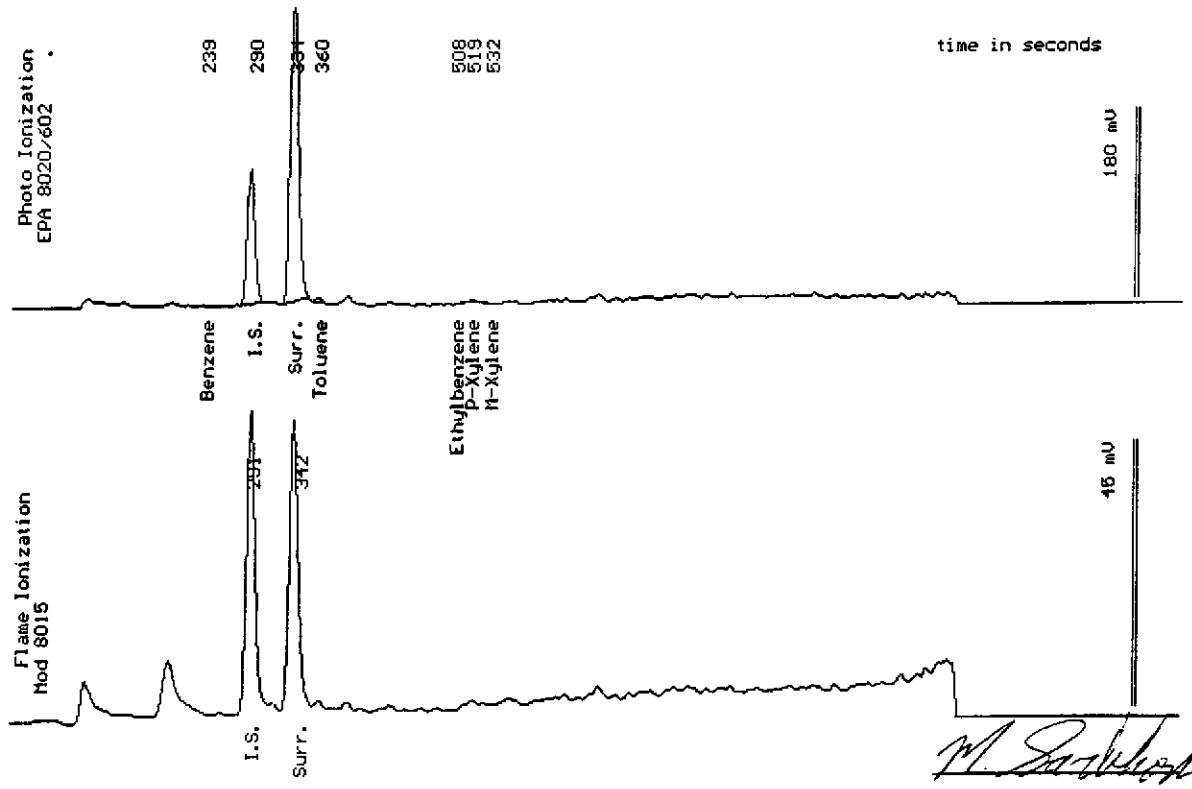
Sample Log 9806

9806-11

Sample: **HP(ABCD)**

From : Project # 19024.06 (Beacon 604)
Sampled : 07/08/94
Dilution : 1:1 QC Batch : 2095b
Matrix : Soil

Parameter	(MRL) mg/kg	Measured Value mg/kg
Benzene	(.0050)	<.0050
Toluene	(.0050)	<.0050
Ethylbenzene	(.0050)	<.0050
Total Xylenes	(.0050)	<.0050
TPH as Gasoline	(1.0)	<1.0
Surrogate Recovery		93 %



Date Analyzed: 07-18-94
Column : 0.53mm ID X 30m DBWAX (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

Western Environmental Science & Technology • 45133 County Road 32B • Davis, CA 95616 • 916 753-9500 • FAX: 916 757-4652

Ultramar Inc 22

Excelchem
Environmental Labs

8112 Patton Avenue
Citrus Heights, CA 95610 (916) 729-5313

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager:	Phone #:
Joe Mello	916 939-7550
Company/Address:	**FAX #:**
AMV, Inc	916 939-7570
Project Number: / **P.O.#:**	**Project Name:**
19024.06	Beacon 604
Project Location:	**Sampler Signature:**
Livermore	Steve Luz

9798

Sample ID	Sampling DATE	Sampling TIME	Container VOA	Container SLEEVE	Container 1L GLASS	Container 1L PLASTIC	Method Preserved HCl	Method Preserved HNO_3	Method Preserved ICE	Method Preserved NONE	Matrix WATER	Matrix SOIL
1 HP-1	7-7-94	1610	3				X		X		X	
2 HP1-1(15')				1								X
3 HP1-2(25')				1								X
4 HP1-3(35')				1								X
5 HP1-4(40')				1								X

ANALYSIS REQUEST

BTEX (602/8020)	BTEX/TPH as Gasoline (602/8020/8015)	TPH as Diesel/Oil (8015)	Total Oil & Grease (5520 B/E,F)	Total Oil & Grease IR (5520 B/E,F,C)	96 - Hour Fish Bioassay	EPA 601/8010	EPA 602/8020	EPA 615/8150	EPA 608/8080 - Pesticides	EPA 608/8080-PCBs	EPA 624/8240	EPA 625/8270	ORGANIC LEAD	Reactivity, Corrosivity, Ignitibility	W.E.T.(Y) / TOTAL(Y) CAM - 17 Metals	EPA - Priority Pollutant Metals	LEAD(7420/7421/239.2)	Cd, Cr, Pb, Zn, Ni	
	X																		

TAT

RUSH SERVICE (12 hr or (24 hr)	EXPEDITED SERVICE (48 hr)	STANDARD SERVICE
X		
		X
		X
		X
		X

Relinquished by:	Date	Time	Received by:
Steve Luz	7-7-94	1622	Mary McBride 7/7/94 6:10pm
Relinquished by: Mary McBride	7/7/94	6:10 pm	Received by:
Relinquished by:	Date 07/07/94	Time 1810	Received by Laboratory: John Kelso

Remarks:
Hold all soil S further notice

RECEIVED
DATE 6/5 TIME 1610
TEMP 0°C
INITIAL MC
~~WEST LAB~~

Bill To:
~~AP~~ Ultramar Inc Attn: T. Fox

APPENDIX K

GROUND WATER SAMPLE ANALYTICAL RESULTS

HYDROPUNCH® SAMPLES - JULY 1994

WESTERN ENVIRONMENTAL SCIENCE & TECHNOLOGY

July 18, 1994
Sample Log 9798

Joseph Mello
Acton, Mickelson & van Dam
5090 Robert J. Matthews Pkwy
El Dorado Hills, CA 95762

Subject: Analytical Results for 1 Water Sample and 1 Soil Sample
Identified as: Project # 19024.06 (Beacon 604)
Received: 07/07/94 /8

Dear Mr. Mello:

Analysis of the sample(s) referenced above has been completed. This report is written to confirm results communicated on July 18, 1994 and describes procedures used to analyze the samples.

Sample(s) were received in 40-mL glass vials sealed with TFE lined septae, and in brass sleeves sealed with Al foil and endcaps. Each sample was transported and received under documented chain of custody and stored at 4 degrees C until analysis was performed.

Sample(s) were analyzed using the following method(s):

"BTEX" (EPA Method 8020/Purge-and-Trap)
"BTEX" (EPA Method 602/Purge-and-Trap)
"TPH as Gasoline" (Modified EPA Method 8015/Purge-and-Trap)

Please refer to the following table(s) for summarized analytical results and contact us at 916-753-9500 if you have questions regarding procedures or results. The chain-of-custody document is enclosed.

Approved by:

Joel Kiff
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

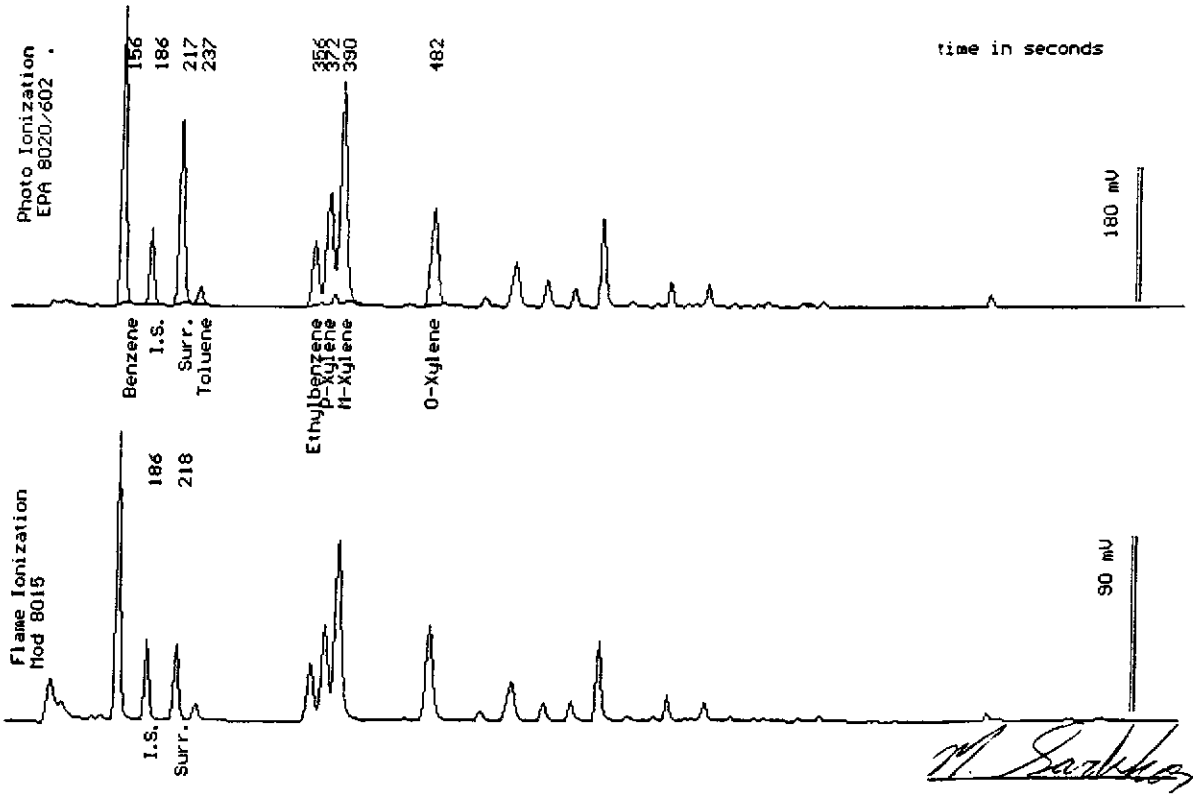
Sample Log 9798

9798-1

Sample: HP-1

From : Project # 19024.06 (Beacon 604)
Sampled : 07/07/94
Dilution : 1:100 QC Batch : 4094d
Matrix : Water

Parameter	(MRL) ug/L	Measured Value ug/L
Benzene	(50)	7600
Toluene	(50)	560
Ethylbenzene	(50)	2800
Total Xylenes	(50)	19000
TPH as Gasoline	(5000)	49000
Surrogate Recovery		98 %



Date Analyzed: 07-07-94
Column : 0.53mm ID X 30m DB5 (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

Western Environmental Science & Technology • 45133 County Road 32B • Davis, CA 95616 • 916 753-9500 • FAX: 916 757-4652

Illframan Inc 2k

Excelchem
Environmental Labs

8112 Patton Avenue
Citrus Heights, CA 95610 (916) 729-5313

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager:	Phone #:
Joe Mello	916 939-7550
Company/Address:	**FAX #:**
AMV, Inc	916 939-7570
Project Number: / **P.O.#:**	**Project Name:**
19024.06	Beacon 604
Project Location:	**Sampler Signature:**
Livermore	Steve Luz

Sample ID	Sampling DATE	Sampling TIME	Container VOA	Container SLEEVE	Container 1L GLASS	Container 1L PLASTIC	Method Preserved HCl	Method Preserved HNO_3	Method Preserved ICE	Method Preserved NONE	Matrix WATER	Matrix SOIL
7798												
1 HP-1	7-7-94	1610	3				X		X		X	
2 HP1-1(15')				1								X
3 HP1-2(25')				1								X
4 HP1-3(35')				1								X
5 HP1-4(40')				1								X

ANALYSIS REQUEST

BTEX (602/8020)	BTEX/TPH as Gasoline (602/8020/8015)	TPH as Diesel/Oil (8015)	Total Oil & Grease (5520 B/E,F)	Total Oil & Grease IR (5520 B/E,F,C)	96 - Hour Fish Bioassay	EPA 601/8010	EPA 602/8020	EPA 615/8150	EPA 608/8080 - Pesticides	EPA 608/8080-PCBs	EPA 624/8240	EPA 625/8270	ORGANIC LEAD	Reactivity, Corrosivity, Ignitibility	W.E.T.(✓) / TOTAL(✓) CAM - 17 Metals	EPA - Priority Pollutant Metals	LEAD(7420/7421/239.2)	Cd, Cr, Pb, Zn, Ni
	X																	

TAT

RUSH SERVICE (12 hr / 24 hr)	EXPEDITED SERVICE (48 hr)	STANDARD SERVICE
X		
		X
		X
		X
		X

Relinquished by:	Date	Time	Received by:	Date	Time
Steve Luz	7-7-94	1622	Mary McBride	7/7/94	4:26pm
Relinquished by: Mary McBride	7/7/94	6:10 pm	Received by:		
Relinquished by:	07/07/94	1810	Received by Laboratory: John Reese		

Remarks:
Hold all soil S for further notice

RECEIVED
DATE 6/5 TIME 1810
TEMP 0°C
INITIAL MC
~~WEST LAB~~

Bill To:
AP Illframan Inc Attn: T. Fox

July 19, 1994
Sample Log 9806

Joseph Mello
Acton, Mickelson & van Dam
5090 Robert J. Matthews Pkwy
El Dorado Hills, CA 95762

Subject: Analytical Results for 2 Water Samples and 3 Soil Samples
Identified as: Project # 19024.06 (Beacon 604)
Received: 07/09/94 8

Dear Mr. Mello:

Analysis of the sample(s) referenced above has been completed. This report is written to confirm results communicated on July 19, 1994 and describes procedures used to analyze the samples.

Sample(s) were received in 40-mL glass vials sealed with TFE lined septae, and in brass sleeves sealed with TFE sheets and endcaps. Each sample was transported and received under documented chain of custody and stored at 4 degrees C until analysis was performed.

Sample(s) were analyzed using the following method(s):

"BTEX" (EPA Method 8020/Purge-and-Trap)
"BTEX" (EPA Method 602/Purge-and-Trap)
"TPH as Gasoline" (Modified EPA Method 8015/Purge-and-Trap)

Please refer to the following table(s) for summarized analytical results and contact us at 916-753-9500 if you have questions regarding procedures or results. The chain-of-custody document is enclosed.

Approved by:

Joel Kiff
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

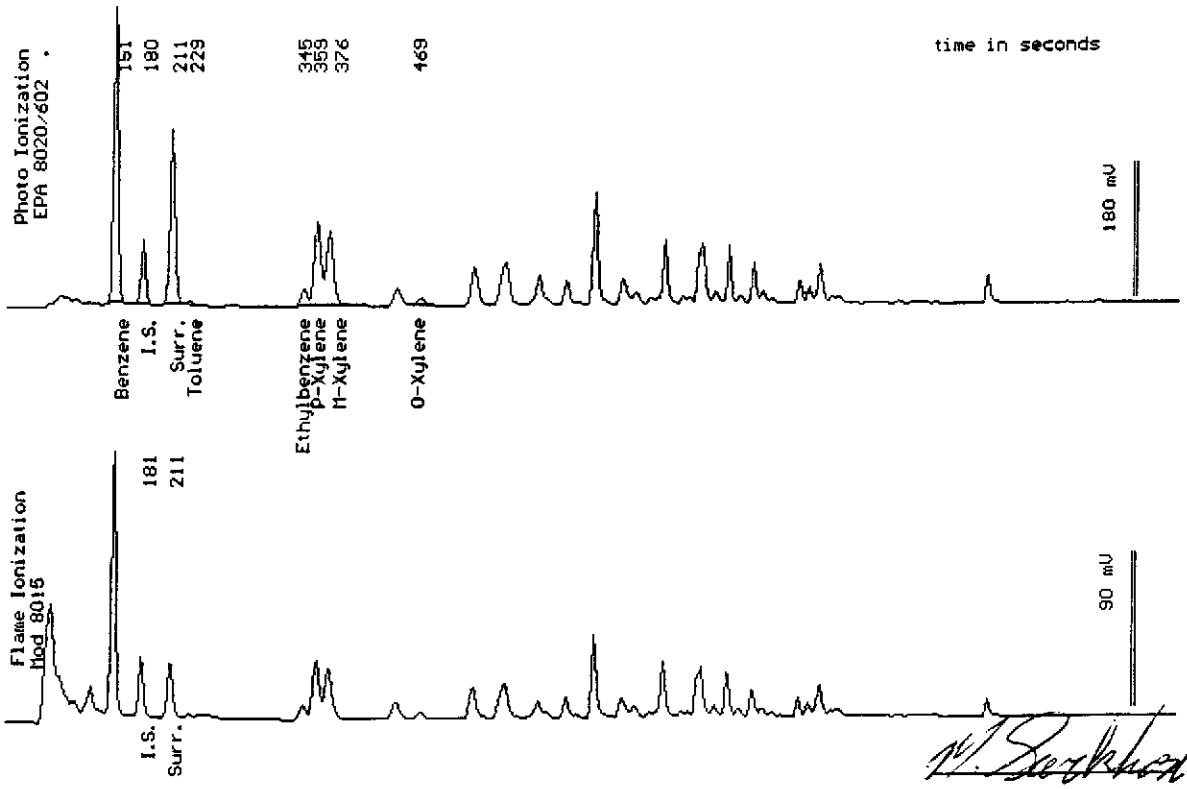
Sample Log 9806

9806-1

Sample: HP-2

From : Beacon 604 (Project # 19024.06)
Sampled : 07/08/94
Dilution : 1:3 QC Batch : 4095C
Matrix : Water

Parameter	(MRL) ug/L	Measured Value ug/L
Benzene	(1.3)	250
Toluene	(1.3)	3.2
Ethylbenzene	(1.3)	20
Total Xylenes	(1.3)	200
TPH as Gasoline	(130)	1800
Surrogate Recovery		98 %



Date Analyzed: 07-10-94
Column : 0.53mm ID X 30m DBWAX (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

Western Environmental Science & Technology • 45133 County Road 32B • Davis, CA 95616 • 916 753-9500 • FAX: 916 757-4652

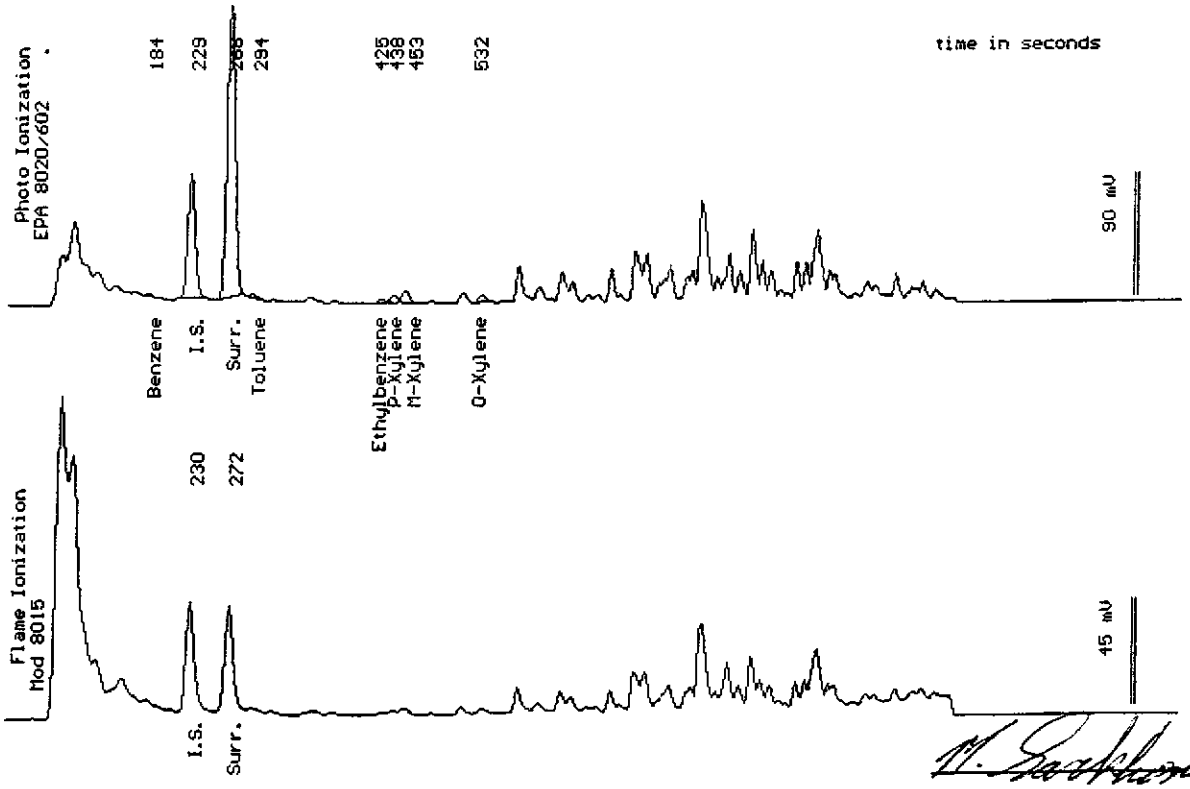
Sample Log 9806

9806-2

Sample: **HP-3**

From : Beacon 604 (Project # 19024.06)
Sampled : 07/08/94
Dilution : 1:1 QC Batch : 2093A
Matrix : Water

Parameter	(MRL) ug/L	Measured Value ug/L
Benzene	(.50)	<.50
Toluene	(.50)	.50
Ethylbenzene	(.50)	.64
Total Xylenes	(.50)	4.0
TPH as Gasoline	(50)	370
Surrogate Recovery		95 %



Date Analyzed: 07-10-94
Column : 0.53mm ID X 30m DBWAX (J&W Scientific)

Mitra Sarkhosh
Senior Chemist

Western Environmental Science & Technology · 45133 County Road 32B · Davis, CA 95616 · 916 753-9500 · FAX: 916 757-4652

Ultramar Inc

Excelchem
Environmental Labs

~~8112 Patton Avenue~~
~~Citrus Heights, CA 95610~~ (916) 729-5343

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Joe Mella	Phone #: (916) 939-7550
Company/Address: AMW, Inc	FAX #: (916) 939-7570
Project Number: 19024.06	P.O.#:
Project Name: Beacon 604	
Project Location: Livermore	Sampler Signature: Steve Ly

ANALYSIS REQUEST — **TAT**

Sample ID	Sampling: DATE	Sampling: TIME	Container: VOA	Container: SLEEVE	Container: 1L GLASS	Container: 1L PLASTIC	Method Preserved: HCl	Method Preserved: HNO_3	Method Preserved: ICE	Method Preserved: NONE	Matrix: WATER	Matrix: SOIL
HP2-1	7-8-94			X					X			X
HP2-2				X								
HP2-3				X								
HP2-4				X								
HP3-1				X								
HP3-2				X								
HP3-3				X								
HP3-4				X								X
HP-2				3				X			X	X
HP-3		1555		3				X			X	
HP(A1B3C)		1615		4								X

Analysis	
BTEX (602/8020)	
BTEX/TPH as Gasoline (602/8020/8015)	X
TPH as Diesel/Oil (8015)	
Total Oil & Grease (5520 B/E,F)	
Total Oil & Grease IR (5520 B/E,F,C)	
96 - Hour Fish Bioassay	
EPA 601/8010	
EPA 602/8020	
EPA 615/8150	
EPA 608/8080 - Pesticides	
EPA 608/8080-PCBs	
EPA 624/8240	
EPA 625/8270	
ORGANIC LEAD	
Reactivity, Corrosivity, Ignitibility	
W.E.T. (✓)	
TOTAL (✓)	
CAM - 17 Metals	
EPA - Priority Pollutant Metals	
LEAD(7420/7421/239.2)	
Cd, Cr, Pb, Zn, Ni	

TAT	
RUSH SERVICE (72 hour (24 hr)	✓
EXPEDITED SERVICE (48 hr)	
STANDARD SERVICE	✓

	Date	Time	
Relinquished by: Steve Ly	7-9-94	8:40	Received by:
Relinquished by: Mary McBride	7/9/94	14:05	Received by:
Relinquished by			Received by Laboratory:

Remarks:
Hold All soil Samples until further notice

G.W. Results by 8:00 am Monday

Bill To:
Ultramar Attn. Terry Fox