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September 28, 1990

Avis Rent A Car System, Inc. -
Oakland Airport Remediation

Ms. Cynthia Chapman
Department of Environmental Health
Hazardous Materials Program
80 Swan Way, Room 200
Oakland, California 94621

Dear Ms. Chapman:

Enclosed please find a copy of the Soil and Ground-Water Investigation Report prepared for Avis Rent A Car System, Inc. (Avis) by its consultant, McCulley, Frick & Gilman (MF&G). Please note particularly section 8, "Proposed Remedial and Ground-Water Monitoring Program. If there are no objections to this remedial proposal, we would like to implement it in the near future.

If you have any questions, or would like to discuss our proposal, please call me at the above number or Ed Conti of MF&G at (415) 495-7110.

Very truly yours,

Beth Hamilton

Beth L. Hamilton

Enc.

cc: Karl Westermann, Avis w/enc.
✓Lester Feldman, RWQCB w/enc.
Michele Heffes, Port of Oakland, w/enc.

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SOIL AND GROUND-WATER INVESTIGATION REPORT

Avis Rent A Car System, Inc.
Oakland International Airport Facility
Oakland, California

Prepared for

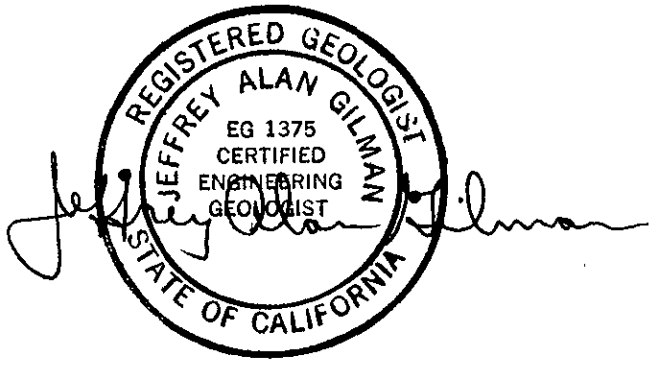
Avis Rent A Car System, Inc.
900 Old Country Road
Garden City, New York

September 19, 1990

McCULLEY, FRICK & GILMAN, INC.
Consulting Hydrologists and Geologists

PROFESSIONAL CERTIFICATION

This report has been prepared by McCulley, Frick & Gilman, Inc. under the professional supervision of Jeffrey A Gilman. The findings, recommendations, specifications and/or professional opinions presented in this report have been prepared in accordance with generally accepted professional hydrogeologic practice, and within the scope of the project. There is no other warranty, either express or implied.



Jeffrey A. Gilman
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Vice President and Principal Hydrogeologist
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SOIL AND GROUND-WATER INVESTIGATION REPORT

AVIS RENT A CAR SYSTEM, INC.
OAKLAND INTERNATIONAL AIRPORT FACILITY
OAKLAND, CALIFORNIA

1.0 INTRODUCTION

This report presents the methods and results of a soil and ground-water investigation at the Avis Rent A Car System, Inc. Oakland International Airport Facility, Neil Armstrong Way, Oakland, California (the "site"). The site location is illustrated in Figure 1.

The objectives of this investigation were to: (1) install monitoring wells that could serve as a ground-water monitoring system for the site; and (2) evaluate the extent of soil in the vicinity of the former underground gasoline tanks which might require remediation. This investigation was conducted in accordance with the following technical proposals prepared by McCulley, Frick & Gilman, Inc. (MFG): "Ground-Water Monitoring Program, Avis Rent A Car System, Inc., Oakland International Airport Facility, Oakland, California," dated April 20, 1990; and "Addendum, West Coast Zone, Environmental Monitoring Program, Oakland International Airport, Oakland, California," dated July 30, 1990.

The tasks described in this report include: soil sampling and analysis (Section 3.0); monitoring well installation and development (Section 4.0); ground-water sampling and analysis (Section 5.0); evaluation of the lateral hydraulic gradient (Section 6.0); and shallow soil gas sampling and analysis (Section 7.0). This report also proposes a remedial and ground-water monitoring program for the site (Section 8.0).

2.0 BACKGROUND

Total petroleum hydrocarbons (TPH) as gasoline and benzene, toluene, ethylbenzene and xylenes (BTEX) were detected in soil and ground-water samples collected on May 4, 1989 from two borings at the site: one located adjacent to a former pump island and underground gasoline storage tanks; and one approximately 25 feet south of the former pump island. The two underground storage tanks were removed from the site on August 25, 1989. Following tank removal, six soil samples were collected from the perimeter of each tank excavation and were analyzed for TPH as gasoline and BTEX. An elevated concentration of TPH as gasoline (290 mg/Kg) was identified in only one of these soil samples. Three composite soil samples were also collected from the soil removed from the excavations. TPH as gasoline (up to 1,100 mg/Kg) and BTEX were detected in these samples. TPH and BTEX were also identified in ground-water samples collected from the base of the tank excavations.

An additional soil sample was collected on September 7, 1989 from the base of each excavation following (1) removal of hydrocarbon liquids floating on the surface of the ground water within the excavations and (2) pumping the excavations dry. The analytical results indicated no detectable levels of TPH as gasoline in either sample and only low concentrations of toluene and xylenes in one of the samples.

The excavations were again pumped dry on September 22, 1989. Following pumping the ground water was allowed to recharge, and a ground-water sample was collected from each excavation. Polynuclear aromatic compounds (PNA's) were detected in low concentrations in the ground water from both excavations. TPH as gasoline was detected in concentrations of 9.2 milligrams per liter (mg/L) and 59 mg/L. BTEX were detected in the samples in concentrations ranging from 0.06 to 6.7 mg/L. Total recoverable petroleum hydrocarbons (EPA Method 418.1) were detected in the sample from one of the excavations at a concentration of 2.0 mg/L.

One of the ground-water samples was analyzed for specific conductance, total dissolved solids and chlorides. The analytical results indicated that the ground water at the site is brackish.

Two water-saturated soil samples were collected on October 4, 1989 in the area of one of the excavations where a sidewall sample had indicated the presence of TPH. The sample was analyzed for volatile organic compounds (EPA Method 8240) and TPH as gasoline. None of the constituents analyzed by these methods was detected.

The soils removed from the locations of the former underground tanks are currently undergoing bioremediation at the site.

3.0 SOIL SAMPLING AND ANALYSIS

3.1 FIELD METHODS

Prior to drilling at the site, a permit for monitoring well construction was obtained from the Zone 7 Alameda County Flood Control and Water Conservation District. A copy of the permit is included in Appendix A.

Three soil borings, MW-1, MW-2 and MW-3, were drilled at the site on May 17, 1990 under the supervision of MFG, at the approximate locations shown in Figure 2. The borings were drilled with a CME-75 drilling rig using the hollow-stem auger method. Drilling services were provided by HEW Drilling Company, Inc. of East Palo Alto, California. The borings were completed as monitoring wells following drilling and soil sampling. The monitoring well installation is discussed in Section 4.0. The logs of the soil borings are included in Appendix B.

Drilling and sampling equipment were steam cleaned on-site prior to use. Soil cuttings generated during drilling were stockpiled adjacent to an existing, on-site stockpile of excavated soil and were covered with plastic sheets.

The borings were drilled using a eight inches outside diameter (o.d.) by 3.75 inches inside diameter (i.d.) hollow-stem auger. A split-spoon sampler (two inches i.d. and 1.5 feet long) was used to collect soil samples for visual description and for chemical analysis. The soil samples were collected within brass liners inserted into the split-spoon sampler. The sampler was driven approximately 18 inches into the soil using a 140-pound, free-falling drive hammer with a 30-inch drop. Blow counts were recorded for every six-inch interval sampled and are noted on the boring logs in Appendix B. Soil samples were collected at least every five feet.

Boring MW-1 was advanced to a depth of approximately 17.5 feet below ground level (BGL). Soil samples from 2 to 2.5 feet BGL (sample MW-1-1-2) and from 6 to 6.5 feet BGL (sample MW-1-2-2) were collected, preserved and submitted to a State-certified laboratory for analysis.

Boring MW-2 was advanced to a depth of approximately 17 feet BGL. Soil samples from 2 to 2.5 feet BGL (sample MW-2-1-2) and from 6 to 6.5 feet BGL (sample MW-2-2-2) were collected, preserved and submitted to a State-certified laboratory for analysis.

Boring MW-3 was advanced to a depth of approximately 19 feet BGL. Soil samples from 2 to 2.5 feet BGL (sample MW-3-1-2), from 6.5 to 7 feet BGL (sample MW-3-2-1), and from 10.5 to 11 feet BGL (sample MW-3-3-3) were collected, preserved and submitted to a State-certified laboratory for analysis.

The lithology of soils encountered during drilling was described in the field. Detailed soil descriptions are included on the boring logs in Appendix B. In general, predominantly clayey soils were encountered in the borings drilled on site. Fine sand and/or clayey sand layers were present below the sandy clay or silty clay in borings MW-1, MW-2 and MW-3. The top of the sandy layer ranged from depths of approximately 8 to 11.5 feet. The thicknesses of the sandy layer in each boring was approximately 0.5, 2.5 and 4 feet, respectively. Predominantly sandy clay or silty clay underlay the sandy layer to the bottom of the borings.

Following sample collection, the ends of each brass liner to be submitted to the laboratory for chemical analysis were covered with aluminum foil, capped with a polyethylene lid, and then taped. The samples were labeled and immediately placed in an insulated chest cooled with dry ice. A chain-of-custody record was completed for the samples and accompanied the samples until receipt by the laboratory.

3.2 ANALYTICAL METHODS AND RESULTS

Soil samples were analyzed by Anametrix Inc. (Anametrix) laboratory of San Jose, California. The following analyses were performed by Anametrix:

A. Total Volatile Petroleum Hydrocarbons (TPH) as Gasoline [EPA Method 5030/modified EPA method 8015]

B. Benzene, Toluene, Ethylbenzene and Total Xylenes (BTEX) [EPA method 8020]

The laboratory results are summarized in Table 1. The laboratory report and chain-of-custody record are included in Appendix C.

TPH as gasoline and BTEX were not detected in the soil samples from borings MW-2 and MW-3. TPH as gasoline, ethylbenzene and total xylenes were detected in one soil sample from boring MW-1, collected from the interval of 6 to 6.5 feet BGL (sample MW-1-2-2). The concentrations of these compounds detected in sample MW-1-2-2 were: 620 milligrams per kilogram (mg/Kg) of TPH as gasoline, 24 mg/Kg of ethylbenzene and 97 mg/Kg of total xylenes (Table 1). TPH as gasoline or BTEX were not detected in the other soil sample from MW-1 (sample MW-1-1-2), collected from a depth interval of 2 to 2.5 feet BGL.

4.0 MONITORING WELL INSTALLATION AND DEVELOPMENT

4.1 MONITORING WELL INSTALLATION

Borings MW-1, MW-2 and MW-3 were completed as monitoring wells on May 17, 1990 under the supervision of MFG. The well locations are shown in Figure 2. The monitoring well construction details are included on the boring logs in Appendix B.

The bottoms of the soil borings were backfilled with bentonite pellets to the total depth of the monitoring wells. The monitoring wells were constructed inside of the augers as the auger flights were removed from the boreholes in small increments. The wells were constructed using steam cleaned, two-inch diameter, flush threaded PVC unperforated and slotted casing (0.010-inch slots). A PVC threaded plug was placed on the bottom of the casing prior to lowering it through the center of the hollow-stem augers. The slotted casing intervals extend from approximately 5 feet BGL to 14.5 feet BGL in monitoring wells MW-1 and MW-3, and from approximately 5.5 feet BGL to 15 feet BGL in monitoring well MW-2. The unperforated casing intervals extend from the top of the slotted section to near the ground surface in all three wells.

A filter pack consisting of Lonestar Lapis Lustre #2/16 Monterey sand was installed from the bottom of the casing to approximately 2 feet above the slotted interval in each well. Approximately one foot of bentonite pellets was then placed on top of the filter pack and hydrated with water. The remaining annular space, from the top of the bentonite pellets to approximately one foot BGL, was then sealed using neat cement grout. Watertight plugs were placed in the tops of the PVC well casings, and a locking steel casing was cemented in place around each well for security. A concrete well box was then set in concrete around each well; the tops of the well boxes were finished slightly above the surrounding grade.

4.2 MONITORING WELL DEVELOPMENT

The wells were developed on May 21, 1990 by bailing. Prior to beginning development in each well, the presence of a light immiscible layer or sheen was checked using a clear, acrylic bailer. No immiscible layer or sheen was observed in the three wells. Each well was then developed until the ground water removed from it was relatively clear and relatively free of sediment. Approximately 7, 13 and 10 casing volumes were removed from wells MW-1, MW-2 and MW-3, respectively, during the development process.

The temperature, pH and specific conductance of the ground water removed from the wells were monitored during development. These parameters stabilized as development proceeded. The water generated during development of each well was placed in separate 55-gallon drums, which were labeled and stored on site.

Well development equipment was washed in an Alconox detergent-water solution and rinsed with tap water prior to use in each well.

5.0 GROUND-WATER SAMPLING AND ANALYSIS

5.1 FIELD METHODS

MFG collected ground-water samples from the monitoring wells on May 23, 1990. Prior to sampling, the depth to water in each well was measured from the measuring point of the well (north side top of casing) using a steel tape. The presence of a light immiscible layer or sheen was then checked using a clear, acrylic bailer. No free product or sheen was observed in any of the wells.

Approximately 5, 5 and 4 casing volumes were removed from monitoring wells MW-1, MW-2 and MW-3, respectively, prior to collection of the ground-water samples for chemical analysis. Monitoring wells MW-2 and MW-3 were purged using a PVC bailer. Monitoring well MW-1, which had a petroleum odor, was purged using a Teflon bailer to facilitate equipment decontamination. The temperature, pH and specific conductance of the water were monitored during the purging of each well and were stable prior to sampling.

After purging, ground-water samples were collected using a Teflon bailer. One bailer volume collected from the well was used to measure the temperature, pH and specific conductance of the sample. The values of these parameters were as follows:

Sample	Temperature (°C)	pH	Specific Conductance (micromhos/cm at 25 °C)
MW-1	19.5	7.0	6,300
MW-2	18.0	7.3	3,200
MW-3	18.0	7.3	14,000

The following samples were collected in containers supplied by the laboratory:

A. TPH as Gasoline and Benzene, Toluene, Ethylbenzene and Total Xylenes (BTEX): two, 40-milliliter (ml) glass vials closed with a screw cap with a Teflon-lined septum; hydrochloric acid had been placed in the vials by the laboratory for sample preservation

B. Ethylene Dibromide (EDB): two, 40-ml glass vials closed with a screw cap with a Teflon-lined septum

C. Organic Lead: one-liter amber glass bottle with Teflon-lined lid

D. Polynuclear Aromatic Hydrocarbons (PNA's): two, one-liter amber glass bottles with Teflon-lined lid

After filling, the ground-water sample containers were placed on ice in an insulated chest. A chain-of-custody record was completed for the samples and accompanied the samples until receipt by the laboratory. All equipment used in purging and sampling the wells was washed in an Alconox detergent-water solution, rinsed with tap water, and then rinsed with deionized water both before and after use in each well.

5.2 ANALYTICAL METHODS AND RESULTS

The ground-water samples were analyzed by Anametrix Inc. (Anametrix) laboratory of San Jose, California. The following analyses were performed by Anametrix:

A. TPH as gasoline (EPA method 5030/modified EPA method 8015)

B. Benzene, Toluene, Ethylbenzene and Total Xylenes (BTEX) (EPA method 8020)

C. Ethylene Dibromide (EDB) (EPA method 8011)

D. Organic Lead (LUFT method)

E. Polynuclear Aromatic Hydrocarbons (PNA's) (EPA method 8270)

The laboratory results are summarized in Table 2. The laboratory report and chain-of-custody record are included in Appendix D.

None of the compounds analyzed for were detected in the ground-water samples from wells MW-2 and MW-3. The ground-water sample from well MW-1 contained TPH as gasoline at a concentration of 12 milligrams per liter (mg/L), benzene at a concentration of 0.65 mg/L, toluene at a concentration of 0.050 mg/L, total xylenes at a concentration of 2.2 mg/L, and the PNA compounds napthalene and 2-methylnapthalene at concentrations of 0.25 mg/L and 0.033 mg/L, respectively.

6.0 EVALUATION OF LATERAL HYDRAULIC GRADIENT

Following completion of monitoring wells MW-1, MW-2 and MW-3, the elevations of the measuring points (MP) of wells were surveyed by Moran Engineering of Berkeley, California, a licensed land surveyor. The MP's are the north side of the top of the PVC well casing, and the elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). The elevation survey report is included in Appendix E.

MFG measured the depth to ground water in the wells on May 23, 1990 (Table 3). The depth to water in the wells ranged from approximately 6 to 7 feet below the ground surface. Water-level elevations were calculated using the depth-to-water measurements and the MP elevations of the wells.

A potentiometric surface map of the shallow ground water on May 23, 1990 is shown in Figures 3. The potentiometric surface contours illustrate that the lateral hydraulic gradient on May 23 was to the south-southeast, with an approximate magnitude of 0.004, or about 22 feet per mile.

7.0 SHALLOW SOIL GAS INVESTIGATION

7.1 INTRODUCTION

The analytical results for a soil sample collected from boring MW-1 from the depth interval of 6-6.5 feet BGL indicated the presence of elevated levels of TPH as gasoline, ethylbenzene and total xylenes (Table 1).

MFG conducted a soil gas investigation at the site on August 3, 1990. The objective of this investigation was to evaluate the extent of soil in the unsaturated (vadose) zone in the vicinity of the former underground gasoline tanks and monitoring well MW-1 which might require remediation.

Collection and analysis of soil gas samples were performed by Tracer Research Corporation of Tucson, Arizona, a firm with extensive experience performing similar investigations. MFG personnel directed the investigation and were present at the site during the investigation.

7.2 SAMPLE COLLECTION METHODS

Soil gas samples were collected at 12 locations on the site. The locations of the soil gas samples are illustrated in Figure 4. Soil gas samples were collected by pushing or driving a hollow steel probe into the ground. Probes consisted of 7- to 10-foot lengths of 3/4-inch diameter steel pipe which were fitted with detachable drive points. A hydraulic pusher/puller mechanism was used to drive and withdraw the sampling probes. A hydraulic hammer was used to assist in driving probes past hard soils. The above-ground end of the sampling probe was fitted with a steel reducer and a length of polyethylene tubing leading to a vacuum pump.

At each sample location, the probes were pushed or driven to a depth of four or five feet below the ground surface. If soil gas could not be drawn from the probe by the vacuum pump, the probe was raised slowly until soil gas could be withdrawn. Soil gas samples were collected from depths of approximately 1 to 5 feet below the ground surface. The depth at which each sample was collected is included in Table 4.

The vadose zone soils in the vicinity of the former underground tanks were generally found to have low permeability to soil gas. Soil gas could be drawn from four feet bgl or deeper at only four sample locations (SG1, SG2, SG6 and SG9). The remaining eight samples were drawn from depths of one to two feet bgl. These low permeability conditions may have impeded the movement of gasoline within the vadose zone

During withdrawal of the soil gas by the vacuum pump, soil gas samples were collected by inserting a syringe needle through a silicone rubber segment in the polyethylene evacuation tubing and down into the steel probe. The soil gas sample was drawn into a glass syringe and subsequently injected into a gas chromatograph in an on-site mobile laboratory.

After the sample collection was completed at each location, the steel probe was withdrawn. The open probe holes were sealed by filling them to capacity with cement grout.

The sample collection methods are discussed further in Tracer Research Corporation's report in Appendix F.

7.3 ANALYTICAL METHODS AND RESULTS

Analyses of soil gas samples were performed in an on-site mobile laboratory containing a gas chromatograph equipped with a flame ionization detector (FID). Soil gas samples were injected directly into the gas chromatograph. The samples were analyzed for TPH as gasoline, benzene, toluene, ethylbenzene and total xylenes. Compounds detected in the soil gas were identified by chromatographic retention time. A computing integrator was used to plot the chromatogram of each

sample and to compute the size and area of each chromatographic peak. Compound concentrations were quantified by comparison of the detector response of a sample to the response measured for calibration standards. The analytical procedures are discussed further in Tracer Research Corporation's report in Appendix F.

TPH as gasoline, benzene, toluene, ethylbenzene and total xylenes were generally not detected in the soil gas samples collected at the site. Elevated levels of TPH as gasoline, benzene, toluene and total xylenes were detected in only one (sample SG1) of the 12 soil gas samples collected. The concentrations of these compounds in sample SG1 were: 230,000 micrograms per liter (ug/L) of TPH as gasoline; 26,000 ug/L of benzene; 23,000 ug/L of toluene; and 1,300 ug/L of total xylenes. Sample SG1 was collected from approximately five feet BGL from a probe driven approximately two feet northeast of monitoring well MW-1 (Figure 4). Upon removal of the steel pipe used to collect sample SG1, a black, tar-like substance was noted on the bottom of the pipe.

The analytical results for all sample locations are summarized in Table 4 and are included in the condensed data table in Tracer Research Corporation's report (Appendix F).

8.0 PROPOSED REMEDIAL AND GROUND-WATER MONITORING PROGRAM

8.1 REMEDIAL PROGRAM

The remedial program proposed for the site will consist of excavation of soils in the vicinity of monitoring well MW-1, removal and disposal of ground water entering the excavation, and treatment of the excavated soils using the bioremediation system currently operating at the site.

To minimize the potential for the soil containing gasoline components to act as a source of ground-water contamination at the site, MFG proposes to excavate soil in the vicinity of monitoring well MW-1. The presence of soil containing gasoline components in the vicinity of well MW-1, southeast of the former underground tanks, is indicated by the results of both the soil chemical analyses (Section 3.2) and the soil gas survey (Section 7.0) conducted by MFG.

The extent of soil requiring excavation is expected to be limited to within several feet of well MW-1. This expectation is based on the following evidence:

1. Six soil samples were collected from the perimeter of each tank excavation following removal of the tanks in August 1989 (Section 2.0). Samples were collected from all four sidewalls of each tank excavation. These samples were analyzed for TPH as gasoline and BTEX. The analytical results indicated an elevated concentration of TPH as gasoline (290 mg/Kg) in only one sample, located on the southeast side of the tanks (same side as well MW-1).

2. Chemical analysis of the soil samples collected by MFG during installation of monitoring wells MW-1, MW-2 and MW-3 indicated the presence of gasoline components in only one sample (sample MW-1-2-2) collected from well MW-1 (Table 1). Gasoline components were not detected in any of the soil samples collected from wells MW-2 and MW-3.

3. Only the soil gas sample collected adjacent to well MW-1 (sample SG1) indicated the presence of gasoline components in the soil gas (Section 7.2). All other soil gas samples collected at the site did not indicate the presence of gasoline components.

4. Soils at the site have relatively low permeability (Section 7.2). The low permeability of the soils are likely to have impeded the migration of gasoline in the vadose zone.

Following excavation of soil containing gasoline components in the vicinity of well MW-1, ground water entering the excavation will be removed using a vacuum truck operated by a registered hazardous waste transporter.

Excavated soil will be incorporated into the soil bioremediation program currently underway at the site.

8.2 GROUND-WATER MONITORING PROGRAM

The following ground-water monitoring program is proposed, based on the results of the soil and ground-water investigation discussed in this report. Ground-water monitoring at the site will consist of the collection and analysis of ground-water samples from monitoring wells MW-1, MW-2 and MW-3 on a quarterly basis for one year.

During the present investigation, petroleum constituents were found in ground-water samples only from well MW-1, which is located within approximately 10 feet of the former underground gasoline tanks. Based on the potentiometric surface shown in Figure 3, the location of well MW-3 would enable it to function as a representative downgradient monitoring point in the proposed program. Well MW-3 is located approximately 120 feet downgradient of both the tanks and well MW-1. Well MW-2 is located upgradient of the former underground tanks.

The proposed soil excavation and ground-water removal (Section 8.1) will require the destruction of well MW-1. . Following excavation, ground-water removal and backfilling, well MW-1 will be replaced within approximately 10 feet of the former tanks and will be sampled in accordance with the ground-water monitoring program discussed in this section.

The water level in each well will be measured prior to sampling during each calendar quarter. A potentiometric surface map of the shallow ground water will be prepared and included in a quarterly monitoring report.

Ground-water samples will be collected from the three monitoring wells. The samples will be analyzed for TPH as gasoline, BTEX and PNA's using the methods discussed in Section 5.0. These chemical constituents have been selected because they are the only groups of compounds that were detected in the present study.

Counting the May 23, 1990 samples as the first quarter of the proposed monitoring program, subsequent quarterly sampling would be scheduled for September and December 1990, and March 1991. Quarterly monitoring reports will be prepared and submitted within 30 days after receipt of the confirmed analytical results for each monitoring period. The anticipated submittal dates for these reports would be November 1990, and February and May 1991. In addition to the second quarter ground-water monitoring results, the monitoring report submitted in November 1990 would document the abandonment of well MW-1, the results of the proposed soil excavation and ground-water removal (Section 8.1), and the re-installation of well MW-1. The monitoring report submitted in April 1991 would evaluate the four quarters of monitoring data and propose continuing or modifying the ground-water monitoring program, if necessary.

TABLE 1

SUMMARY OF CHEMICAL ANALYSES OF SOIL SAMPLES

Avis Rent A Car System, Inc.
Oakland International Airport Facility
Oakland, California

SAMPLE NO.	WELL/BORING NO.	SAMPLE DEPTH (feet BGL[1])	ANALYTICAL RESULTS IN mg/Kg				
			TPH as GASOLINE[2]	BENZENE	TOLUENE	ETHYL-BENZENE	TOTAL XYLENES
MW-1-1-2	MW-1	2 - 2.5	ND[3]	ND	ND	ND	ND
MW-1-2-2	MW-1	6 - 6.5	620	ND	ND	24	97
MW-2-1-2	MW-2	2 - 2.5	ND	ND	ND	ND	ND
MW-2-2-2	MW-2	6 - 6.5	ND	ND	ND	ND	ND
MW-3-1-2	MW-3	2 - 2.5	ND	ND	ND	ND	ND
MW-3-2-1	MW-3	6.5 - 7	ND	ND	ND	ND	ND
MW-3-3-3	MW-3	10.5 - 11	ND	ND	ND	ND	ND

1 BGL = Below Ground Level

2 TPH = Total Petroleum Hydrocarbons

3 ND = Not Detected. Laboratory reporting limits are contained in the laboratory report in Appendix C.

avisoak.tb1

TABLE 2

SUMMARY OF CHEMICAL ANALYSES OF GROUND-WATER SAMPLES[1]

Avis Rent A Car System, Inc.
Oakland International Airport Facility
Oakland, California

SAMPLE NO.	WELL NO.	ANALYTICAL RESULTS IN mg/L						
		TPH as GASOLINE[2]	BENZENE	TOLUENE	ETHYL-BENZENE	TOTAL XYLENES	NAPHTHALENE	2-METHYL-NAPHTHALENE
MW-1	MW-1	12	0.65	0.050	ND[3]	2.2	0.25	0.033
MW-2	MW-2	ND	ND	ND	ND	ND	ND	ND
MW-3	MW-3	ND	ND	ND	ND	ND	ND	ND

1 Constituents in the EPA Method 8270 analysis which are not listed were not detected in ground-water samples.

2 TPH = Total Petroleum Hydrocarbons

3 ND = Not Detected. Laboratory reporting limits are contained in the laboratory report in Appendix D.

avisoak.tb2

TABLE 3

SUMMARY OF WATER LEVEL DATA FOR GROUND-WATER MONITORING WELLS

Avis Rent A Car System, Inc.
Oakland International Airport Facility
Oakland, California

WELL	DATE	DEPTH TO WATER (ft BMP[1])	MEASURING POINT ELEVATION[2] (ft NGVD[3])	WATER LEVEL ELEVATION (ft NGVD)
MW-1	05-23-90	5.62	3.34	-2.28
MW-2	05-23-90	6.13	4.25	-1.88
MW-3	05-23-90	6.77	3.98	-2.79

1 BMP = Below Measuring Point

2 Measuring Point is north side of top of PVC well casing

3 National Geodetic Vertical Datum of 1929

avisoak.tb3

TABLE 4

SUMMARY OF CHEMICAL ANALYSES OF SOIL GAS SAMPLES

Avis Rent A Car System, Inc.
Oakland International Airport Facility
Oakland, California

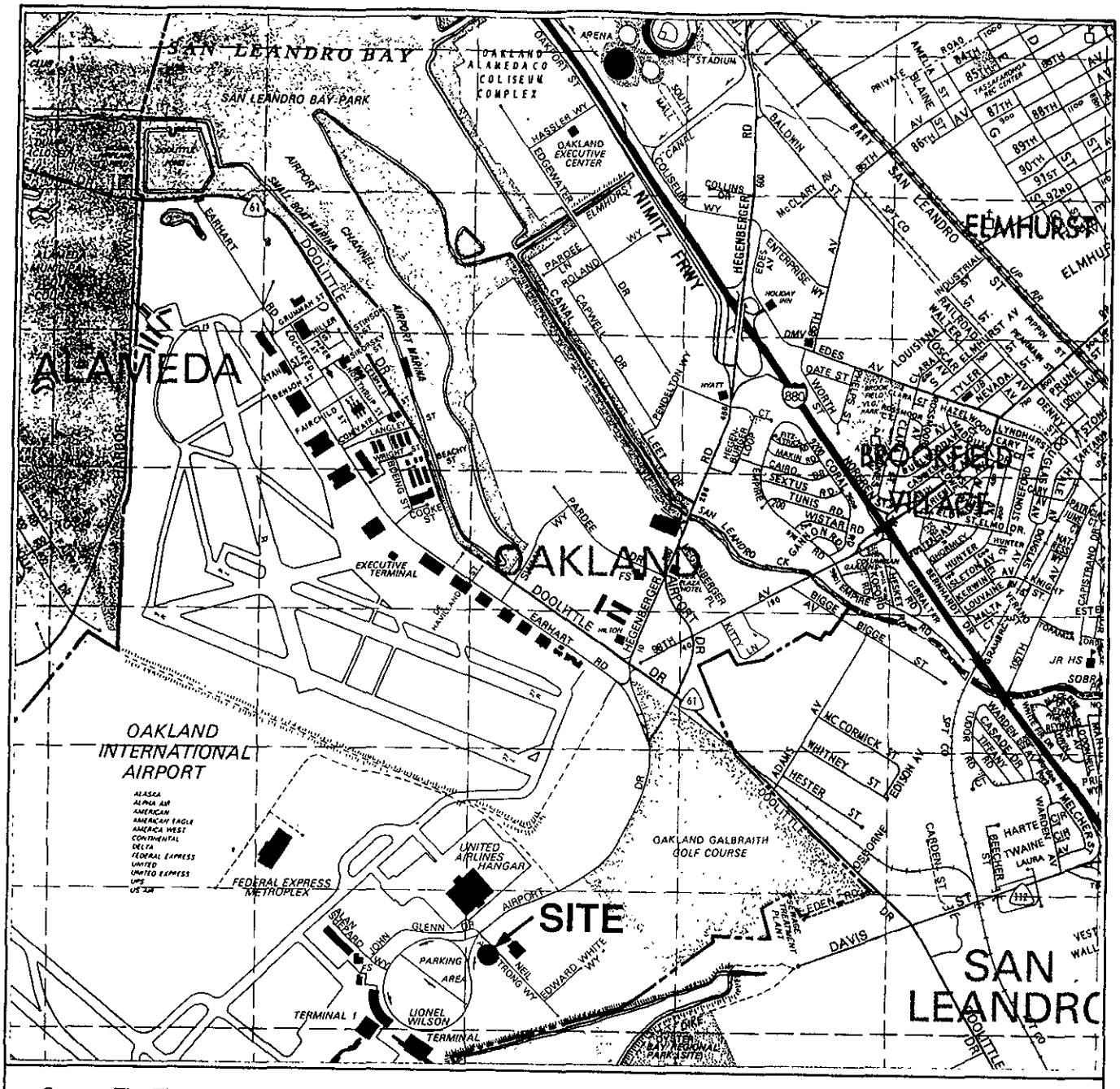
SAMPLE NO.	SAMPLE DEPTH (ft. BGL[1])	ANALYTICAL RESULTS IN ug/L				
		TPH as GASOLINE[2]	BENZENE	TOLUENE	ETYHL-BENZENE	TOTAL XYLENES
SG1	5	230,000	26,000	23,000	ND[3]	1,300
SG2	4	13	2	3	ND	1
SG3	2	0.8	0.1	0.2	ND	ND
SG4	2	0.1	0.1	ND	ND	ND
SG5	2	0.4	ND	ND	ND	ND
SG6	5	0.4	ND	ND	ND	ND
SG7	1	0.9	ND	ND	ND	ND
SG8	1.5	0.6	ND	0.2	ND	ND
SG9	4.5	0.2	0.2	ND	ND	ND
SG10	1	ND	ND	ND	ND	ND
SG11	1	1	ND	ND	ND	ND
SG12	2	ND	ND	ND	ND	ND

1 BGL = Below Ground Level

2 TPH = Total Petroleum Hydrocarbons

3 ND = Not Detected. Laboratory reporting limits are contained in the Tracer Research Corporation report in Appendix F.

avisoak.tb4



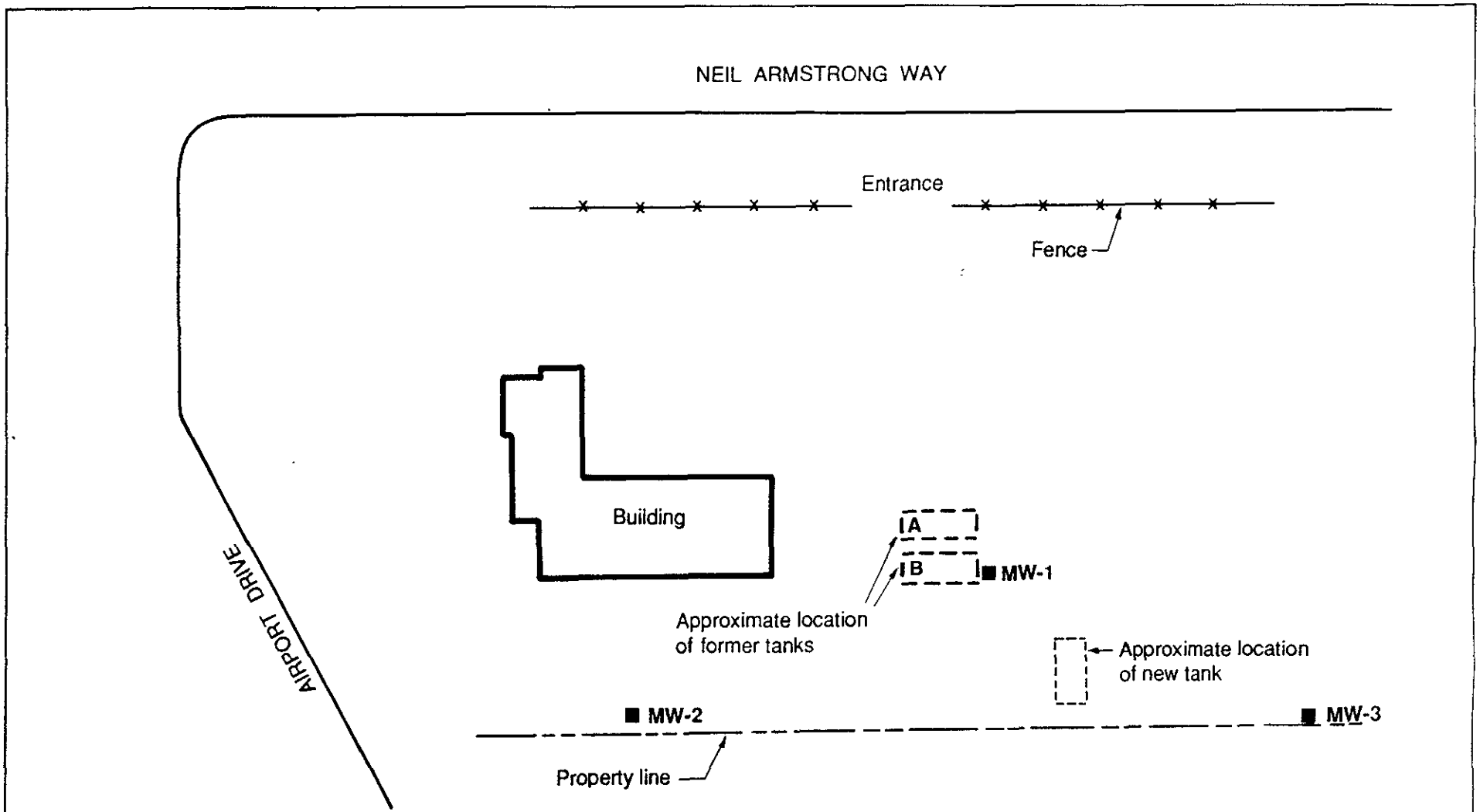
Source: The Thomas Guide,
Alameda and Santa Clara Counties Street Guide and Directory,
1989 Edition

N

0 1/2 Mile

LOCATION MAP
Avis Rent A Car System, Inc. Facility
Oakland International Airport
Oakland, California

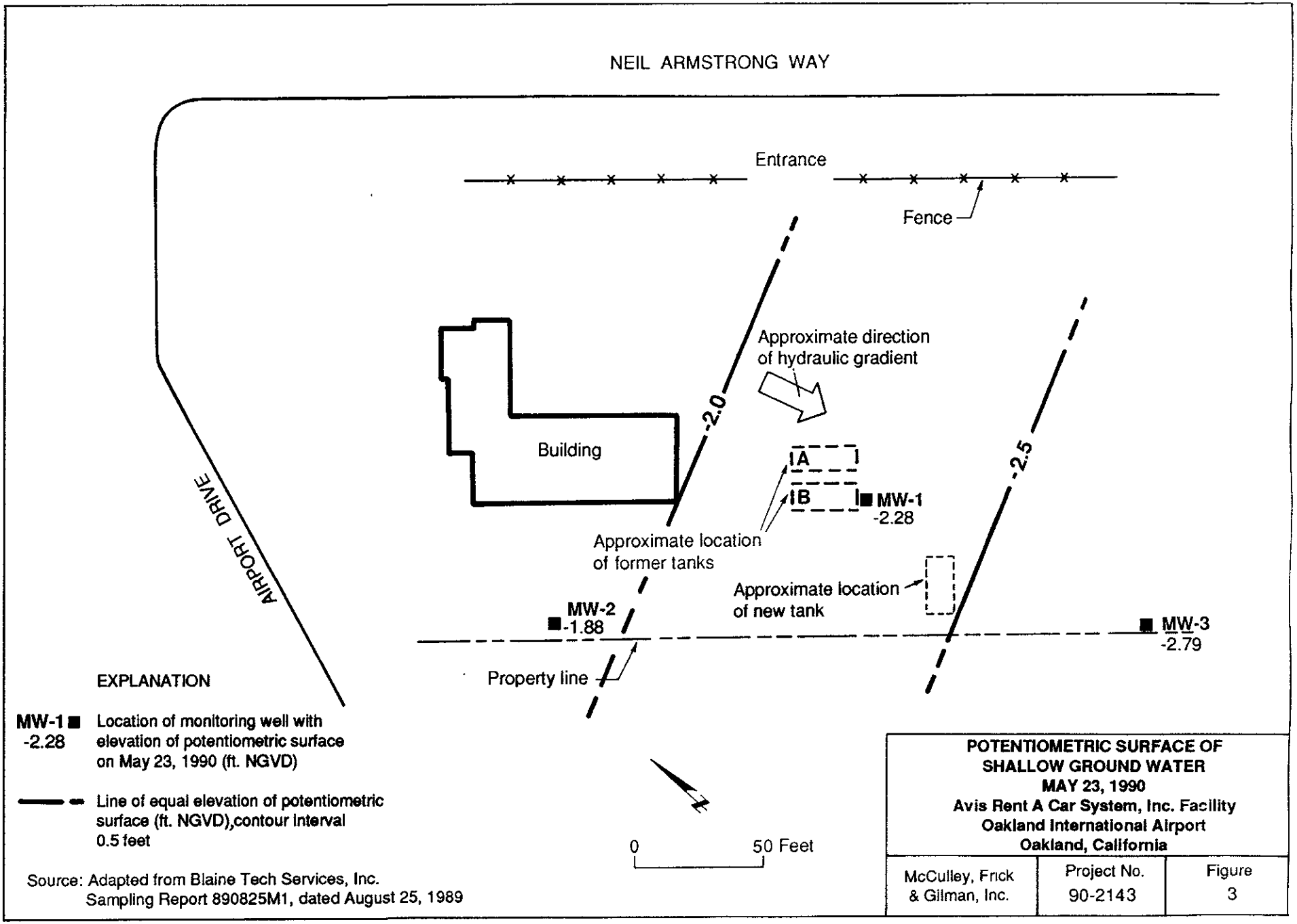
McCulley, Frick & Gilman, Inc.	Project No. 90-2143	Figure 1

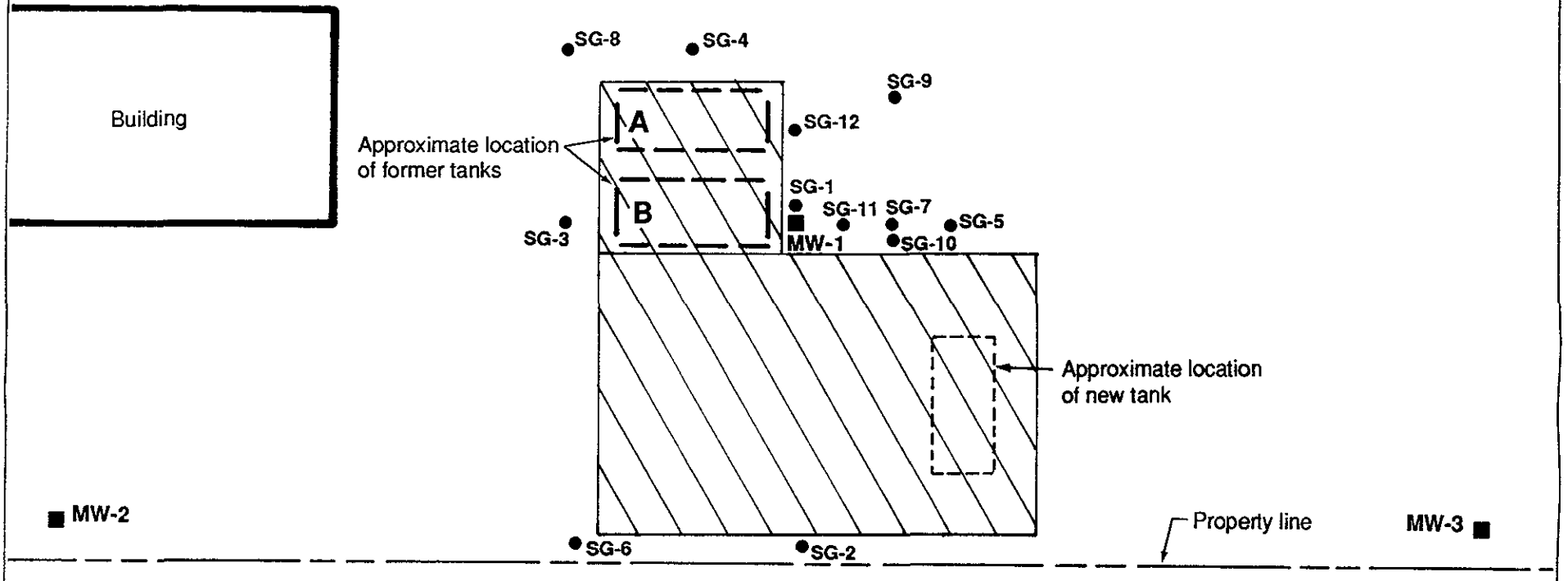


Source: Adapted from Blaine Tech Services, Inc.
Sampling Report 890825M1, dated August 25, 1989

SITE PLAN
Avis Rent A Car System, Inc. Facility
Oakland International Airport
Oakland, California

McCulley, Frick & Gilman, Inc.	Project No. 90-2143	Figure 2


NEIL ARMSTRONG WAY
Entrance
Fence
AIRPORT DRIVE
Building
-2.0
-2.5
Approximate direction of hydraulic gradient
A
B
MW-1
-2.28
Approximate location of former tanks
Approximate location of new tank
MW-2
-1.88
MW-3
-2.79
Property line
0
50 Feet
EXPLANATION
MW-1 -2.28
Location of monitoring well with elevation of potentiometric surface on May 23, 1990 (ft. NGVD)
Line of equal elevation of potentiometric surface (ft. NGVD),contour interval 0.5 feet
Source: Adapted from Blaine Tech Services, Inc. Sampling Report 890825M1, dated August 25, 1989
POTENTIOMETRIC SURFACE OF SHALLOW GROUND WATER
MAY 23, 1990
Avis Rent A Car System, Inc. Facility
Oakland International Airport
Oakland, California
McCulley, Frick & Gilman, Inc.
Project No. 90-2143
Figure 3



EXPLANATION

Reinforced concrete pad

MW-2 Location of monitoring well

SG-1 Location of soil gas probe

0 25 50 Feet

Source: Adapted from Blaine Tech Services, Inc. Sampling Report 890825M1, dated August 25, 1989

SOIL GAS SAMPLE LOCATIONS
Avis Rent A Car System, Inc. Facility
Oakland International Airport
Oakland, California

McCulley, Frick & Gilman, Inc.	Project No. 90-2143	Figure 4

APPENDIX A

Alameda County Flood Control and Water Conservation District
Groundwater Protection Ordinance Permit
for Construction of Monitoring Well

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
5997 PARKSIDE DRIVE • PLEASANTON, CALIFORNIA 94566 • (415) 484-2600

10 May 1990

McCulley, Frick and Gilman, Inc.
5 Third Street, Suite 916
San Francisco, Ca 94103

Gentlemen:

Enclosed is Groundwater Protection Ordinance permit 90287 for a monitoring well construction project at the intersection of Airport Drive and Neil Armstrong Way in Oakland for Avis Rent-A-Car.

Please note that permit condition A-2 requires that a well construction report be submitted after completion of the work. The report should include drilling and completion logs, location sketch, and permit number.

If you have any questions, please contact Wyman Hong or Craig Mayfield at 484-2600.

Very truly yours,

Mun J. Mar
General Manager

By J. Killingstad, Chief
Water Resources Engineering

WH:mm
Enc.

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

5997 PARKSIDE DRIVE • PLEASANTON, CALIFORNIA 94566 • (415) 484-2600

GROUNDWATER PROTECTION ORDINANCE PERMIT APPLICATION

RECEIVED
MAY 11 1990
M, F & G, INC.

FOR APPLICANT TO COMPLETE

FOR OFFICE USE

PERMIT NUMBER 90287
LOCATION NUMBER

(1) LOCATION OF PROJECT Oakland International Airport
Avis Rent A Car System, Inc. Facility
Corner of Airport Dr. & Neil Armstrong Way

(2) CLIENT
Name Avis Rent A Car System, Inc.
Address 900 Old Country Rd. Phone 516-222-4735
City Garden City, NY Zip 11530

(3) APPLICANT
Name McCulley, Frick & Gilman, Inc.
5 Third Street, Suite 916
Address Phone 415-495-7110
City San Francisco, CA Zip 11530

(4) DESCRIPTION OF PROJECT
Water Well Construction X Geotechnical Investigation
Cathodic Protection ___ General ___
Well Destruction ___ Contamination ___

(5) PROPOSED WATER WELL USE
Domestic ___ Industrial ___ Irrigation ___
Municipal ___ Monitoring X Other ___

(6) PROPOSED CONSTRUCTION
Drilling Method:
Mud Rotary ___ Air Rotary ___ Auger X
Cable ___ Other ___

DRILLER'S LICENSE NO. 384167

WELL PROJECTS
Drill Hole Diameter ~~10~~ 8 in. Maximum
Casing Diameter ~~4~~ 2 in. Depth 20 ft.
Surface Seal Depth 5 ft. Number 3

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

(7) ESTIMATED STARTING DATE 5/17/90
ESTIMATED COMPLETION DATE 5/18/90

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

APPLICANT'S SIGNATURE Edward P. Conti Date 5/7/90

PERMIT CONDITIONS

Circled Permit Requirements Apply

(A.) GENERAL
1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well projects, or drilling logs and location sketch for geotechnical projects.
3. Permit is void if project not begun within 90 days of approval date.

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

C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

E. WELL DESTRUCTION. See attached.

Approved Wyman Hong Date 8 May 90
Wyman Hong

APPENDIX B

Soil Boring Logs and Monitoring Well Construction Data

ABBREVIATIONS/SYMBOLS USED IN BORING LOGS

GENERAL

PID - Photoionization Detector
OVM - Organic Vapor Meter
ppm - Parts Per Million in Air
sfc csg - Surface Casing
USCS - Unified Soil Classification System
NGVD - National Geodetic Vertical Datum of 1929
NA - Not Analyzed
BGL - Below Ground Level

COLORS

v - very
lt - light
dk - dark
yel - yellow/yellowish
brn - brown/brownish
red-brn - reddish brown
a.a. - as above
(10 YR 4/6) - Munsell notation (hue value/chroma)

SAND GRAIN SIZE

VF - Very Fine
F - Fine
Med - Medium
Crs - Coarse

DENSITY/STIFFNESS

Med - Medium
V - Very

GEOLOGICAL CONTACTS

———— Sharp Contact
— — — Gradational Contact

GEOTECHNICAL

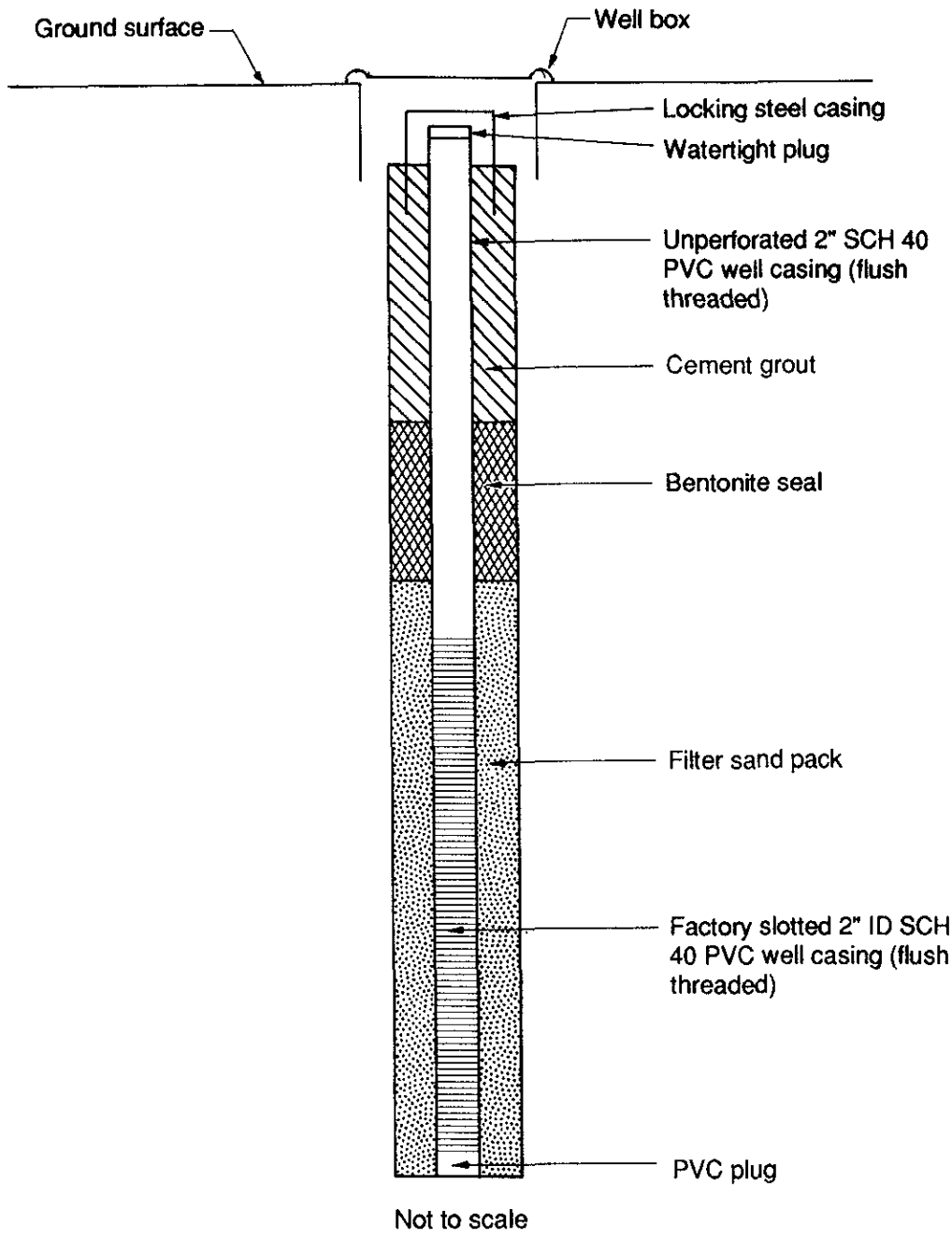
L.L. - Liquid Limit in percent
P.I. - Plasticity Index in percent
K - Vertical Hydraulic Conductivity (permeability) in cm/sec

MOISTURE CONTENT

▽ Observed top of saturated soil interval

EXPLANATION FOR BORING LOGS

McCULLEY, FRICK & GILMAN, INC.



MONITORING WELL CONSTRUCTION DETAILS

McCULLEY, FRICK & GILMAN, INC.

Avis Rent A Car System, Inc.

LOG OF MONITORING WELL MW-1

BORING LOCATION Oakland International Airport, Oakland, California		ELEVATION AND DATUM Top of PVC casing 3.34 ft. NGVD	
DRILLING AGENCY HEW Drilling Company, Inc.	DRILLER Casto Pineda	DATE STARTED 5/17/90	DATE FINISHED 5/17/90
DRILLING METHOD Hollow-stem auger		DRILL BIT 8" O.D. auger	COMPLETION DEPTH 17.5' BGL
SIZE AND TYPE OF CASING 2" I.D. flush-threaded SCH 40 PVC		LOGGED BY Y. Ono	CHECKED BY E.P. Conti R.G. #4721
SAMPLING METHOD Drive sample, 140 lb hammer			
SAMPLER TYPE 2" I.D. split-spoon	LENGTH 1.5'	DROP 30"	

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG: Lithology (USCS Class)	GRAPHIC LOG: Well Construction	Water Content	DEPTH (FEET)	SAMPLING: Run No. (Recov.)	SAMPLING: Blows per 6"	REMARKS (Drill Rate, Fluid loss, Odor, etc.)
0	ASPHALT							
	GRAVEL FILL	GW						
1	CLAYEY SAND, olive gray (5Y 4/2), F sand to gravel to 1/2", moist	SC			1			
2	SANDY CLAY,olive brn (2.5Y 4/4), F sand, little Med sand to gravel to 1 1/2", some yel, brn, black, red-brn and green mottling, moist	CL			2	1 (1.5')	4 6 9	Sample MW-1-1-2 (2 to 2.5' BGL)
3					3			
4					4			
5					5			
6	olive gray (no Munsell notation)				6	2 (1.5')	2 3 3	Sample MW-1-2-2 (6 to 6.5' BGL) petroleum odor below 5.5' BGL Strong petroleum odor below 5.9' BGL no odor below ~6.3' BGL
7	SANDY CLAY, yel brn (10YR 5/4) F sand, little Med to Crs sand, little silt, moist	CL			7			
8				▽	8			Driller call: sand or bay mud below 8' BGL (basis for top of saturated soil interval)
9					9			
10					10			
11	SAND, v dk gray (2.5 YN 3/), F sand, little silt, wet	SP			11	3 (1.1')	push	Decayed vegetation odor below 10.5' BGL
	SILTY CLAY, a.a., little F sand	CL						
	CLAYEY SILT, a.a., some F sand	ML						
12	CLAYEY SAND, a.a., F sand, some silt	SC			12			
	SANDY CLAY, a.a., F sand, some silt	CL						
13					13			
14					14			

Project No. 90-2143

McCulley, Frick & Gilman, Inc.

Figure Sheet 1 of 2

Avis Rent A Car System, Inc.

LOG OF MONITORING WELL MW-1

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG: Lithology (USCS Class)	GRAPHIC LOG: Well Construction	Water Content	DEPTH (FEET)	SAMPLING: Run No. (Recov.)	SAMPLING: Blows per 6"	REMARKS (Drill Rate, Fluid loss, Odor, Etc.)
15					15			No odor below 15.5' BGL Run No. 5 cored 15.5' BGL to 17.5' BGL over lost core from Run No. 4
16	SANDY CLAY, dk gray (5Y 4/1), F sand, little Med sand, some silt	CL			16	4 (0')	3 4 6	
	grading to lighter gray, increasing sand content					5 (1.5')		
17	lt gray/gray (5Y 6/1)				17			
18	Bottom of boring at 17.5' BGL				18			
19					19			
20					20			
21					21			
22					22			
23					23			
24					24			
25					25			
26					26			
27					27			
28					28			
29					29			
30					30			
31					31			
32					32			
33					33			

Project No. 90-2143 | McCulley, Frick & Gilman, Inc. | Figure Sheet 2 of 2

Avis Rent A Car System, Inc.

LOG OF MONITORING WELL MW-2

BORING LOCATION Oakland International Airport, Oakland, California		ELEVATION AND DATUM Top of PVC casing 4.25 ft. NGVD	
DRILLING AGENCY HEW Drilling Company, Inc.	DRILLER Casto Pineda	DATE STARTED 5/17/90	DATE FINISHED 5/17/90
DRILLING METHOD Hollow-stem auger		DRILL BIT 8" O.D. auger	COMPLETION DEPTH 17' BGL
SIZE AND TYPE OF CASING 2" I.D. flush-threaded SCH 40 PVC		LOGGED BY Y. Ono	CHECKED BY E.P. Conti R.G. #4721
SAMPLING METHOD Drive sample, 140 lb hammer			
SAMPLER TYPE 2" I.D. split-spoon	LENGTH 1.5' DROP 30"		

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG: Lithology (USCS Class)	GRAPHIC LOG: Well Construction	Water Content	DEPTH (FEET)	SAMPLING: Run No. (Recov.)	SAMPLING: Blows per 6"	REMARKS (Drill Rate, Fluid loss, Odor, etc.)
0	ASPHALT							
1	CLAYEY SAND, olive (5 Y 3/3), F to Crs sand, little gravel to 2", moist	SC			1			
2	SANDY CLAY, yel brn (10YR 5/6), F sand, little Med to Crs sand, trace gravel to 1 1/2", little red-brn mottling, moist	CL			2	1 (1.5')	6 7 10	Sample MW-2-1-2 (2 to 2.5' BGL)
3					3			
4	dk brn (10YR 3/3)				4			
5					5			
6	yel brn (10 YR 5/6), some Med sand to gravel to 1 1/2", mottled with grayish, less sandy clay, little red-brn mottling, moist				6	2 (1.5')	1 2 2	Sample MW-2-2-2 (6 to 6.5' BGL)
7					7			
8	SAND, olive gray (5Y 5/2), F sand, wet	SP		▽	8			Sand in cuttings; driller call - sand at ~8' BGL, ~1' thick underlain by soft material (basis for top of saturated soil interval)
9					9			
10					10			
11	SILTY CLAY, v dk gray (2.5 Y N3/), trace decayed vegetation	CL			11	3 (1.5')	push	Decayed vegetation odor below 10.5' BGL
12	SANDY CLAY, a.a., F. sand, some silt, trace shells	CL			12			
13					13			
14					14			Driller call: stiffer clay below 14' BGL

Avis Rent A Car System, Inc.

LOG OF MONITORING WELL MW-2

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG: Lithology (USCS Class)	GRAPHIC LOG: Well Construction	Water Content	DEPTH (FEET)	SAMPLING: Run No. (Recov.)	SAMPLING: Blows per 6"	REMARKS (Drill Rate, Fluid loss, Odor, Etc.)
15					15			
16	SILTY CLAY, v dk gray (5Y 3/1), little F sand some F sand	CL			16	4 (1.5')	2 3 6	Slight decayed vegetation odor
17	SANDY CLAY, a.a., F. sand, some silt	CL			17			
	Bottom of boring at 17' BGL							
18					18			
19					19			
20					20			
21					21			
22					22			
23					23			
24					24			
25					25			
26					26			
27					27			
28					28			
29					29			
30					30			
31					31			
32					32			
33					33			

Project No. 90-2143 | McCulley, Frick & Gilman, Inc. | Figure Sheet 2of 2

Avis Rent A Car System, Inc.

LOG OF MONITORING WELL MW-3

BORING LOCATION Oakland International Airport, Oakland, California		ELEVATION AND DATUM Top of PVC casing 3.98 ft. NGVD	
DRILLING AGENCY HEW Drilling Company, Inc.	DRILLER Casto Pineda	DATE STARTED 5/17/90	DATE FINISHED 5/17/90
DRILLING METHOD Hollow-stem auger		DRILL BIT 8" O.D. auger	COMPLETION DEPTH 19' BGL
SIZE AND TYPE OF CASING 2" I.D. flush-threaded SCH 40 PVC		LOGGED BY Y. Ono	CHECKED BY E.P. Conti R.G. #4721
SAMPLING METHOD Drive sample, 140 lb hammer			
SAMPLER TYPE 2" I.D. split-spoon	LENGTH 1.5' DROP 30"		

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG: Lithology (USCS Class)	GRAPHIC LOG: Well Construction	Water Content	DEPTH (FEET)	SAMPLING: Run No. (Recov.)	SAMPLING: Blows per 6"	REMARKS (Drill Rate, Fluid loss, Odor, etc.)
0	ASPHALT							
1	SANDY CLAY, lt olive brn (2.5Y 5/4), F sand to gravel to 2", dry	CL			1			
2	some red-brn and brn mottling, little calcareous nodules, dry to damp				2	1 (1.5')	12 17 23	Sample MW-3-1-2 (2 to 2.5' BGL)
3					3			
4					4			
5	moist				5			
6					6	2 (1.0')	4 5 5	Sample MW-3-2-1 (6.5 to 7' BGL)
7					7			
8					8			
9					9			
10				▽	10			
11	SILTY CLAY, v dk gray (2.5Y N3/), moist to wet	CL			11	3 (1.5')	push	Driller call: soft below 10.5' BGL Sample MW-3-3-3 (10.5 to 11' BGL) Decayed vegetation odor below 10.5' BGL
12	CLAYEY SAND, a.a., F to Med sand, some silt	SC			12			
13					13			
14					14			

Avis Rent A Car System, Inc.

LOG OF MONITORING WELL MW-3

DEPTH (FEET)	DESCRIPTION	GRAPHIC LOG: Lithology (USCS Class)	GRAPHIC LOG: Well Construction	Water Content	DEPTH (FEET)	SAMPLING: Run No. (Recov.)	SAMPLING: Blows per 6"	REMARKS (Drill Rate, Fluid loss, Odor, Etc.)
15					15			
16	SILTY CLAY, a.a., little F sand	CL			16	4 (0') 5 (1')	push 3 3	Run No. 5 cored 15.5' BGL to 17.5' BGL over Run No. 4 lost core
17	SANDY CLAY, a.a., F sand, little Med sand, some silt lt green gray (no Munsell notation), increasing sand content, F to Med sand	CL			17			
18	CLAYEY SAND, a.a., F to Med sand, little silt	SC			18	6 (1.5')	push	
19	Bottom of boring at 19' BGL				19			
20					20			
21					21			
22					22			
23					23			
24					24			
25					25			
26					26			
27					27			
28					28			
29					29			
30					30			
31					31			
32					32			
33					33			

Project No. 90-2143 | McCulley, Frick & Gilman, Inc. | Figure Sheet 2 of 2

APPENDIX C

Laboratory Report for Soil Samples
and
Chain-of-Custody Record

ANAMETRIX INC
Environmental & Analytical Chemistry
1961 Concourse Drive, Suite E, San Jose, CA 95131
(408) 432-8192 • Fax (408) 432-8198

REPORT

Ed Conti
McCulley, Frick & Gilman, Inc.
5 Third Street
Suite 916
San Francisco, CA 94103

May 31, 1990
Anametrix W.O.#: 9005245
Date Received : 05/18/90
Project Number : 90-2143

Dear Mr. Conti:

Your samples have been received for analysis. The REPORT SUMMARY lists your sample identifications and the analytical methods you requested. The following sections are included in this report: RESULTS.

NOTE: Amounts reported are net values, i.e. corrected for method blank contamination.

If there is any more that we can do, please give us a call. Thank you for using ANAMETRIX, INC.

Sincerely,

ANAMETRIX, INC.

Sarah Schoen, Ph.D.
Laboratory Manager

SRS/dag

REPORT SUMMARY
ANAMETRIX, INC. (408) 432-8192

Client : McCulley, Frick & Gilman, Inc.
Address : 5 Third Street
Suite 916
City : San Francisco, CA 94103
Attn. : Ed Conti

Anametrix W.O.#: 9005245
Date Received : 05/18/90
Purchase Order#: N/A
Project No. : 90-2143
Date Released : 05/31/90

Anametrix I.D.	Sample I.D.	Matrix	Date Sampled	Method	Date Extract	Date Analyzed	Inst I.D.
RESULTS							
9005245-01	MW-2-1-2	SOIL	05/17/90	TPHg		05/30/90	N/A
9005245-02	MW-2-2-2	SOIL	05/17/90	TPHg		05/29/90	N/A
9005245-03	MW-3-1-2	SOIL	05/17/90	TPHg		05/29/90	N/A
9005245-04	MW-3-2-1	SOIL	05/17/90	TPHg		05/29/90	N/A
9005245-05	MW-3-3-3	SOIL	05/17/90	TPHg		05/29/90	N/A
9005245-06	MW-1-1-2	SOIL	05/17/90	TPHg		05/29/90	N/A
9005245-07	MW-1-2-2	SOIL	05/17/90	TPHg		05/26/90	N/A

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 90-2143 MW-2-1-2	Anametrix I.D.	: 9005245-01
Matrix	: SOIL	Analyst	: CB
Date sampled	: 05/17/90	Supervisor	: DDG
Date anl.TPHg	: 05/30/90	Date released	: 05/31/90
Date ext.TPHd	: N/A	Date ext. TOG	: N/A
Date anl.TPHd	: N/A	Date anl. TOG	: N/A

CAS #	Compound Name	Reporting Limit (mg/Kg)	Amount Found (mg/Kg)
71-43-2	Benzene	0.005	ND
108-88-3	Toluene	0.005	ND
100-41-4	Ethylbenzene	0.005	ND
1330-20-7	Total Xylenes	0.005	ND
	TPH as Gasoline	1	ND

ND - Not detected at or above the practical quantitation limit for the method.

TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.

BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 90-2143 MW-2-2-2	Anametrix I.D.	: 9005245-02
Matrix	: SOIL	Analyst	: [illegible]
Date sampled	: 05/17/90	Supervisor	: [illegible]
Date anl.TPHg	: 05/29/90	Date released	: 05/31/90
Date ext.TPHd	: N/A	Date ext. TOG	: N/A
Date anl.TPHd	: N/A	Date anl. TOG	: N/A

CAS #	Compound Name	Reporting Limit (mg/Kg)	Amount Found (mg/Kg)
71-43-2	Benzene	0.005	ND
108-88-3	Toluene	0.005	ND
100-41-4	Ethylbenzene	0.005	ND
1330-20-7	Total Xylenes	0.005	ND
	TPH as Gasoline	1	ND

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 90-2143 MW-3-1-2	Anametrix I.D.	: 9005245-03
Matrix	: SOIL	Analyst	:
Date sampled	: 05/17/90	Supervisor	:
Date anl.TPHg	: 05/29/90	Date released	: 05/31/90
Date ext.TPHd	: N/A	Date ext. TOG	: N/A
Date anl.TPHd	: N/A	Date anl. TOG	: N/A

CAS #	Compound Name	Reporting Limit (mg/Kg)	Amount Found (mg/Kg)
71-43-2	Benzene	0.005	ND
108-88-3	Toluene	0.005	ND
100-41-4	Ethylbenzene	0.005	ND
1330-20-7	Total Xylenes	0.005	ND
	TPH as Gasoline	1	ND

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 90-2143 MW-3-2-1	Anametrix I.D.	: 9005245-04
Matrix	: SOIL	Analyst	: CB
Date sampled	: 05/17/90	Supervisor	: DDG
Date anl.TPHg	: 05/29/90	Date released	: 05/31/90
Date ext.TPHd	: N/A	Date ext. TOG	: N/A
Date anl.TPHd	: N/A	Date anl. TOG	: N/A

CAS #	Compound Name	Reporting Limit (mg/Kg)	Amount Found (mg/Kg)
71-43-2	Benzene	0.005	ND
108-88-3	Toluene	0.005	ND
100-41-4	Ethylbenzene	0.005	ND
1330-20-7	Total Xylenes	0.005	ND
	TPH as Gasoline	1	ND

ND - Not detected at or above the practical quantitation limit for the method.

TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.

BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 90-2143 MW-3-3-3
Matrix : SOIL
Date sampled : 05/17/90
Date anl.TPHg: 05/29/90
Date ext.TPHd: N/A
Date anl.TPHd: N/A

Anametrix I.D. : 9005245-05
Analyst : [illegible]
Supervisor : [illegible]
Date released : 05/31/90
Date ext. TOG : N/A
Date anl. TOG : N/A

CAS #	Compound Name	Reporting Limit (mg/Kg)	Amount Found (mg/Kg)
71-43-2	Benzene	0.005	ND
108-88-3	Toluene	0.005	ND
100-41-4	Ethylbenzene	0.005	ND
1330-20-7	Total Xylenes	0.005	ND
	TPH as Gasoline	1	ND

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 90-2143 MW-1-1-2
Matrix : SOIL
Date sampled : 05/17/90
Date anl.TPHg: 05/29/90
Date ext.TPHd: N/A
Date anl.TPHd: N/A

Anametrix I.D. : 9005245-06
Analyst : CY
Supervisor : DDG
Date released : 05/31/90
Date ext. TOG : N/A
Date anl. TOG : N/A

CAS #	Compound Name	Reporting Limit (mg/Kg)	Amount Found (mg/Kg)
71-43-2	Benzene	0.005	ND
108-88-3	Toluene	0.005	ND
100-41-4	Ethylbenzene	0.005	ND
1330-20-7	Total Xylenes	0.005	ND
	TPH as Gasoline	1	ND

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 90-2143 MW-1-2-2
Matrix : SOIL
Date sampled : 05/17/90
Date anl.TPHg: 05/26/90
Date ext.TPHd: N/A
Date anl.TPHd: N/A

Anametrix I.D. : 9005245-07
Analyst : CB
Supervisor : DDG
Date released : 05/31/90
Date ext. TOG : N/A
Date anl. TOG : N/A

CAS #	Compound Name	Reporting Limit (mg/Kg)	Amount Found (mg/Kg)
71-43-2	Benzene	5	ND
108-88-3	Toluene	5	ND
100-41-4	Ethylbenzene	5	24
1330-20-7	Total Xylenes	5	97
	TPH as Gasoline	100	620

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

(W) 10:30 9005245 (2)

CHAIN-OF-CUSTODY RECORD AND REQUEST FOR ANALYSIS

NO.

McCULLEY, FRICK & GILMAN, INC.

RECEIVED
JUN 0 4 1990
M, F & G, INC.

☐ 3300 Arapahoe Ave., Suite 218
Boulder, CO 80303
TEL: (303) 447-1823
FAX: (303) 447-1836

☐ 5818 Balcones Dr., Suite 202
Austin, TX 78731
TEL: (512) 371-1667
FAX (512) 454-4126

☒ 5 Third St., Suite 916
San Francisco, CA 94103
TEL: (415) 495-7110
FAX: (415) 495-7107

PROJECT No.: 90-2143 PROJECT NAME: AMES-OAKLAND PAGE: 1 OF: 1
SAMPLER (Signature): Yuji Ono DATE: 5-18-90
METHOD OF SHIPMENT: L&B COURIER CARRIER/ WAYBILL NO. DESTINATION: ANAMETRIX
SPECIAL INSTRUCTIONS/HAZARDS: DRY ICE TPHG = EPA mod 5030/mod EPA 8015; BTEX = EPA 8020.

SAMPLES

	Lab No.	Sample Identification	Sample Collection DATE	Sample Collection TIME	Matrix*	Preservation HCl	Preservation HNO_3	Preservation H_2SO_4	Preservation COLD DRY ICE	Preservation NONE	Preservation OTHER	Containers* VOL. (ml)	Containers* TYPE*	Containers* No.
(1)		MW-2-1-2	5/17	906	SO				X			2"x6"	B	1
(2)		MW-2-2-2		910	SO				X			2"x6"	B	1
(3)		~~MW-2-3-2~~		~~930~~	~~SO~~									
(3)		MW-3-1-2		1145	SO				X			2"x6"	B	1
(4)		MW-3-2-1		1157	SO				X				B	1
(5)		MW-3-3-3		1210	SO				X				B	1
(6)		MW-1-1-2		1525	SO				X				B	1
(7)		MW-1-2-2		1530	SO				X				B	1
				1545										

TOTAL NUMBER OF CONTAINERS 7

ANALYSIS REQUEST

Methods EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	TPH as Gasoline	TPH as Diesel	BTEX	Handling HOLD	RUSH	STANDARD	REMARKS (Special handling procedures, specific analytical methods, observations, etc.)
				X		X				
				X		X				
				X		X				
				X		X				
				X		X				
				X		X				
				X		X				Analyze and marked
				X		X				

LABORATORY COMMENTS/ CONDITION OF SAMPLES

RELINQUISHED BY: SIGNATURE	PRINTED NAME	COMPANY	DATE	TIME	RECEIVED BY: SIGNATURE	PRINTED NAME	COMPANY
Yuji Ono	Yuji Ono	MFG	5/18/90	1350	Yoshi Nemoto	YOSHI	Anametrix
							LABORATORY

*KEY: Matrix AQ-aqueous NA-nonaqueous SO-soil SL-sludge P-petroleum A-air OT-other Containers P-plastic G-glass T-teflon B-brass OT-other

DISTRIBUTION PINK Field Copy YELLOW Laboratory Copy WHITE Return to Originator

APPENDIX D

Laboratory Report for Ground-Water Samples
and
Chain-of-Custody Record

ANAMETRIX INC
Environmental & Analytical Chemistry
1961 Concourse Drive, Suite E, San Jose, CA 95131
(408) 432-8192 • Fax (408) 432-8198

REPORT

MR. ED CONTI
McCULLEY, FRICK & GILMAN, INC.
5 THIRD STREET SUITE 916
SAN FRANCISCO, CA 94103

Workorder # : 9005300
Date Received : 05/24/90
Project ID : 90-2143
Purchase Order: N/A

The following samples were received at Anametrix, Inc. for analysis :

ANAMETRIX ID	CLIENT SAMPLE ID
9005300- 1	MW-2
9005300- 2	MW-3
9005300- 3	MW-1
9005300- 4	TRIP BLANK

This report is paginated for your convenience and ease of review. It contains 24 pages excluding the cover letter. The report is organized into sections. Each section contains all analytical results and quality assurance data related to a specific group or section within Anametrix. The Report Summary that precedes each section will help you determine which group at Anametrix generated the data. The Report Summary will contain the signatures of the department supervisor and a chemist, both of whom reviewed the analytical data. Please refer all questions to the department supervisor that signed the form.

If you have any further questions or comments on this report, please give us a call as soon as possible. Thank you for using Anametrix.

Burt Sutherland
Laboratory Director

06-11-90
Date

ANAMETRIX REPORT ORGANIZATION & FORM DESCRIPTION

Organics

Organic Analysis Data Sheets (OADS)

OADS forms contain tabulated results for target compounds. The OADS are grouped by method and, within each method, organized sequentially in order of increasing Anametrix ID number.

Tentatively Identified Compounds (TIC)

TIC forms contain tabulated results for non-target compounds detected in GC/MSanalyses. TICs must be requested at the time samples are submitted at Anametrix. TIC forms immediately follow the OADS form for each sample. If TICs are requested but not found, then TIC forms will not be included with the report.

Surrogate Recovery Summary (SRS)

SRS forms contain quality assurance data. An SRS form will be printed for each method, if the method requires surrogate compounds. They will list surrogate percent recoveries for all samples and any method blanks. Any surrogate recovery outside the established limits will be flagged with an "*", and the total number of surrogates outside the limits will be listed in the column labelled "Total Out".

Matrix Spike Recovery Form (MSR)

MSR forms contain quality assurance data. They summarize percent recovery and relative percent difference information for matrix spikes and matrix spike duplicates. This information is a statement of both accuracy and precision. Any percent recovery or relative percent difference outside established limits will be flagged with an "*", and the total number outside the limits will be listed at the bottom of the page. Not all reports will contain an MSR form.

NOTES:

1) Due to a size limitation in our data processing step, only the first eight (8) characters of your project ID and sample ID will be printed on the report forms. However, the report cover letter and report summary pages display up to twenty (20) characters of your project and sample IDs.

2) Amounts reported are gross values, i.e., not corrected for method blank contamination.

PG/dm/3274

ANAMETRIX REPORTING CONVENTIONS

Organics

Qualifiers

Anametrix uses several data qualifiers (Q) in it's report forms. These qualifiers give additional information on the compounds reported. They should help a data reviewer to verify the integrity of the analytical results. The following is a list of qualifiers and their meanings:

U - Indicates that the compound was analyzed for, but was not detected at or above the specified reporting limit.

B - Indicates that the compound was detected in the associated method blank.

J - Indicates that the compound was detected at an amount below the specified reporting limit. Consequently, the amount should be considered an approximate value. Tentatively identified compounds will always have a "J" qualifier because they are not included in the instrument calibration.

E - Indicates that the amount reported exceeded the linear range of the instrument calibration.

D - Indicates that the compound was detected in an analysis performed at a secondary dilution.

A - Indicates that the tentatively identified compound is a suspected aldol condensation product. This is common in EPA Method 8270 soil analyses.

NOTE: Absence of a qualifier indicates that the compound was detected at a concentration at or above the specified reporting limit.

PG/dm/3274

REPORT SUMMARY
ANAMETRIX, INC. (408)432-8192

MR. ED CONTI
McCULLEY, FRICK & GILMAN, INC.
5 THIRD STREET SUITE 916
SAN FRANCISCO, CA 94103

Workorder # : 9005300
Date Received : 05/24/90
Project ID : 90-2143
Purchase Order: N/A
Department : GCMS
Sub-Department: GCMS

SAMPLE INFORMATION:

ANAMETRIX SAMPLE ID	CLIENT SAMPLE ID	MATRIX	DATE SAMPLED	METHOD
9005300- 1	MW-2	H2O	05/23/90	8270
9005300- 2	MW-3	H2O	05/23/90	8270
9005300- 3	MW-1	H2O	05/23/90	8270

REPORT SUMMARY
ANAMETRIX, INC. (408)432-8192

MR. ED CONTI
McCULLEY, FRICK & GILMAN, INC.
5 THIRD STREET SUITE 916
SAN FRANCISCO, CA 94103

Workorder # : 9005300
Date Received : 05/24/90
Project ID : 90-2143
Purchase Order: N/A
Department : GCMS
Sub-Department: GCMS

QA/QC SUMMARY :

-Internal standard area was outdside established limits in the EPA Method 8270 analysis of sample MW-1.
-Naphthalene was outside the calibration range in the EPA Method 8270 analysis of sample MW-1.

Paul Gowan 6-11-90
Department Supervisor Date

Chemist 06.11.90
Date

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 625/8270
ANAMETRIX, INC. (408)432-8192

Project ID	: 90-2143	Anametrix ID	: 9005300-01
Sample ID	: MW-2	Analyst	:
Matrix	: WATER	Supervisor	:
Date Sampled	: 5/23/90		
Date Extracted	: 5/25/90		
Amount Extracted	: 1000.0 ML		
Date Analyzed	: 6/ 5/90	Dilution Factor	: 1.00
Instrument ID	: F2	Conc. Units	: ug/L

CAS NO.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
91-20-3	NAPHTHALENE	10.	ND	U
91-57-6	2-METHYLNAPHTHALENE	10.	ND	U
91-58-7	2-CHLORONAPHTHALENE	10.	ND	U
208-96-8	ACENAPHTHYLENE	10.	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 625/8270
ANAMETRIX, INC. (408)432-8192

Project ID	: 90-2143	Anametrix ID	: 9005300-01
Sample ID	: MW-2	Analyst	: M
Matrix	: WATER	Supervisor	: PG
Date Sampled	: 5/23/90		
Date Extracted	: 5/25/90		
Amount Extracted	: 1000.0 ML		
Date Analyzed	: 6/ 5/90	Dilution Factor	: 1.00
Instrument ID	: F2	Conc. Units	: ug/L

CAS NO.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
83-32-9	ACENAPHTHENE	10.	ND	U
86-73-7	FLUORENE	10.	ND	U
85-01-8	PHENANTHRENE	10.	ND	U
120-12-7	ANTHRACENE	10.	ND	U
206-44-0	FLUORANTHENE	10.	ND	U
129-00-0	PYRENE	10.	ND	U
56-55-3	BENZO(A)ANTHRACENE	10.	ND	U
218-01-9	CHRYSENE	10.	ND	U
205-99-2	BENZO(B)FLUOROANTHENE	10.	ND	U
207-08-9	BENZO(K)FLUOROANTHENE	10.	ND	U
50-32-8	BENZO(A)PYRENE	10.	ND	U
193-39-5	INDENO(1,2,3-CD)PYRENE	10.	ND	U
53-70-3	DIBENZ[A,H]ANTHRACENE	10.	ND	U
191-24-2	BENZO(G,H,I)PERYLENE	10.	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 625/8270
ANAMETRIX, INC. (408)432-8192

Project ID : 90-2143
Sample ID : MW-3
Matrix : WATER
Date Sampled : 5/23/90
Date Extracted : 5/25/90
Amount Extracted : 1000.0 ML
Date Analyzed : 6/ 5/90
Instrument ID : F2

Anametrix ID : 9005300-02
Analyst : UM
Supervisor : PG

Dilution Factor : 1.00
Conc. Units : ug/L

CAS NO.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
91-20-3	NAPHTHALENE	10.	ND	U
91-57-6	2-METHYLNAPHTHALENE	10.	ND	U
91-58-7	2-CHLORONAPHTHALENE	10.	ND	U
208-96-8	ACENAPHTHYLENE	10.	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 625/8270
ANAMETRIX, INC. (408)432-8192

Project ID	: 90-2143	Anametrix ID	: 9005300-02
Sample ID	: MW-3	Analyst	: VJ
Matrix	: WATER	Supervisor	: PC
Date Sampled	: 5/23/90		
Date Extracted	: 5/25/90		
Amount Extracted	: 1000.0 ML		
Date Analyzed	: 6/ 5/90	Dilution Factor	: 1.00
Instrument ID	: F2	Conc. Units	: ug/L

CAS NO.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
83-32-9	ACENAPHTHENE	10.	ND	U
86-73-7	FLUORENE	10.	ND	U
85-01-8	PHENANTHRENE	10.	ND	U
120-12-7	ANTHRACENE	10.	ND	U
206-44-0	FLUORANTHENE	10.	ND	U
129-00-0	PYRENE	10.	ND	U
56-55-3	BENZO(A)ANTHRACENE	10.	ND	U
218-01-9	CHRYSENE	10.	ND	U
205-99-2	BENZO(B)FLUOROANTHENE	10.	ND	U
207-08-9	BENZO(K)FLUOROANTHENE	10.	ND	U
50-32-8	BENZO(A)PYRENE	10.	ND	U
193-39-5	INDENO(1,2,3-CD)PYRENE	10.	ND	U
53-70-3	DIBENZ[A,H]ANTHRACENE	10.	ND	U
191-24-2	BENZO(G,H,I)PERYLENE	10.	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 625/8270
ANAMETRIX, INC. (408)432-8192

Project ID : 90-2143
Sample ID : MW-1
Matrix : WATER
Date Sampled : 5/23/90
Date Extracted : 5/25/90
Amount Extracted : 1000.0 ML
Date Analyzed : 6/ 5/90
Instrument ID : F2

Anametrix ID : 9005300-03
Analyst : UH
Supervisor : PG

Dilution Factor : 1.00
Conc. Units : ug/L

CAS NO.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
91-20-3	NAPHTHALENE	10.	250.	E
91-57-6	2-METHYLNAPHTHALENE	10.	33.	
91-58-7	2-CHLORONAPHTHALENE	10.	ND	U
208-96-8	ACENAPHTHYLENE	10.	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 625/8270
ANAMETRIX, INC. (408)432-8192

Project ID	: 90-2143	Anametrix ID	: 9005300-03
Sample ID	: MW-1	Analyst	: UJ
Matrix	: WATER	Supervisor	: PG
Date Sampled	: 5/23/90		
Date Extracted	: 5/25/90		
Amount Extracted	: 1000.0 ML		
Date Analyzed	: 6/ 5/90	Dilution Factor	: 1.00
Instrument ID	: F2	Conc. Units	: ug/L

CAS NO.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
83-32-9	ACENAPHTHENE	10.	ND	U
86-73-7	FLUORENE	10.	ND	U
85-01-8	PHENANTHRENE	10.	ND	U
120-12-7	ANTHRACENE	10.	ND	U
206-44-0	FLUORANTHENE	10.	ND	U
129-00-0	PYRENE	10.	ND	U
56-55-3	BENZO(A)ANTHRACENE	10.	ND	U
218-01-9	CHRYSENE	10.	ND	U
205-99-2	BENZO(B)FLUOROANTHENE	10.	ND	U
207-08-9	BENZO(K)FLUOROANTHENE	10.	ND	U
50-32-8	BENZO(A)PYRENE	10.	ND	U
193-39-5	INDENO(1,2,3-CD)PYRENE	10.	ND	U
53-70-3	DIBENZ[A,H]ANTHRACENE	10.	ND	U
191-24-2	BENZO(G,H,I)PERYLENE	10.	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 625/8270
ANAMETRIX, INC. (408)432-8192

Project ID	:	Anametrix ID	: 2CB0525C01
Sample ID	: BLANK	Analyst	: UH
Matrix	: WATER	Supervisor	: PG
Date Sampled	: 0/ 0/ 0		
Date Extracted	: 5/25/90		
Amount Extracted	: 1000.0 ML		
Date Analyzed	: 6/ 4/90	Dilution Factor	: 1.00
Instrument ID	: F2	Conc. Units	: ug/L

CAS NO.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
91-20-3	NAPHTHALENE	10.	ND	U
91-57-6	2-METHYLNAPHTHALENE	10.	ND	U
91-58-7	2-CHLORONAPHTHALENE	10.	ND	U
208-96-8	ACENAPHTHYLENE	10.	ND	U

ORGANIC ANALYSIS DATA SHEET -- EPA METHOD 625/8270
ANAMETRIX, INC. (408)432-8192

Project ID :
Sample ID : BLANK
Matrix : WATER
Date Sampled : 0/ 0/ 0
Date Extracted : 5/25/90
Amount Extracted : 1000.0 ML
Date Analyzed : 6/ 4/90
Instrument ID : F2

Anametrix ID : 2CB0525C01
Analyst : UH
Supervisor : PG

Dilution Factor : 1.00
Conc. Units : ug/L

CAS NO.	COMPOUND NAME	REPORTING LIMIT	AMOUNT DETECTED	Q
83-32-9	ACENAPHTHENE	10.	ND	U
86-73-7	FLUORENE	10.	ND	U
85-01-8	PHENANTHRENE	10.	ND	U
120-12-7	ANTHRACENE	10.	ND	U
206-44-0	FLUORANTHENE	10.	ND	U
129-00-0	PYRENE	10.	ND	U
56-55-3	BENZO(A)ANTHRACENE	10.	ND	U
218-01-9	CHRYSENE	10.	ND	U
205-99-2	BENZO(B)FLUOROANTHENE	10.	ND	U
207-08-9	BENZO(K)FLUOROANTHENE	10.	ND	U
50-32-8	BENZO(A)PYRENE	10.	ND	U
193-39-5	INDENO(1,2,3-CD)PYRENE	10.	ND	U
53-70-3	DIBENZ[A,H]ANTHRACENE	10.	ND	U
191-24-2	BENZO(G,H,I)PERYLENE	10.	ND	U

SURROGATE RECOVERY SUMMARY -- EPA METHOD 625/8270
ANAMETRIX, INC. (408)432-8192

Project ID : 90-2143
Matrix : WATER

Anametrix ID : 9005300
Analyst : UM
Supervisor : PG

	SAMPLE ID	SU1	SU2	SU3	SU4	SU5	SU6	TOTAL OUT
1	BLANK	48	34	74	69	62	84	0
2	MW-2	54	37	80	72	83	103	0
3	MW-3	50	40	76	72	86	94	0
4	MW-1	47	37	75	68	77	78	0
5								
6								
7								
8								
9								
10								
11								
12								
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21								
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REPORT SUMMARY
ANAMETRIX, INC. (408) 432-8192

Client : McCulley, Frick & Gilman, Inc.
Address : 5 Third Street Suite 916
City : San Francisco, CA 94103
Attn. : Ed Conti

Anametrix W.O.#: 9005300
Date Received : 05/24/90
Purchase Order#: N/A
Project No. : 90-2143
Date Released : 06/08/90

Anametrix I.D.	Sample I.D.	Matrix	Date Sampled	Method	Date Extract	Date Analyzed	Inst I.D.
RESULTS							
9005300-01	MW-2	WATER	05/23/90	8011		06/06/90	HP5
9005300-02	MW-3	WATER	05/23/90	8011		06/06/90	HP5
9005300-03	MW-1	WATER	05/23/90	8011		06/06/90	HP5
9005300-01	MW-2	WATER	05/23/90	TPHg		05/30/90	N/A
9005300-02	MW-3	WATER	05/23/90	TPHg		05/30/90	N/A
9005300-03	MW-1	WATER	05/23/90	TPHg		05/30/90	N/A
9005300-04	TRIP BLANK	WATER	05/23/90	TPHg		05/30/90	N/A
9005300-01	MW-2	WATER	05/23/90	ORGPb		06/01/90	AA1
9005300-02	MW-3	WATER	05/23/90	ORGPb		06/01/90	AA1
9005300-03	MW-1	WATER	05/23/90	ORGPb		06/01/90	AA1
QUALITY ASSURANCE (QA)							
PWBL060190	METHOD BLANK	WATER	N/A	8011		06/06/90	HP5
OMB060190W	METHOD BLANK	WATER	N/A	ORGPb		06/01/90	AA1
9005300-01	MW-2	WATER	05/23/90	SPIKE		06/01/90	AA1

ANALYSIS DATA SHEET - EDB AND DBCP EPA METHOD 8011
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 90-2143 MW-2	Anametrix I.D.	: 9005300-01
Matrix	: WATER	Analyst	: ST
Date sampled	: 05/23/90	Supervisor	: JT
Date ext.	: 06/01/90	Volume ext.	: 35 ml
Date analyzed	: 06/06/90	Date released	: 06/08/90
Dilution	: NONE	Instrument I.D.	: HP5

CAS #	Compound Name	Detection Limit (ug/l)	Amount Found (ug/l)
106-93-4	Ethylene dibromide	0.02	ND

ND : Not detected at or above the practical quantitation limit for the method.

ANALYSIS DATA SHEET - EDB AND DBCP EPA METHOD 8011
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 90-2143 MW-3	Anametrix I.D.	: 9005300-02
Matrix	: WATER	Analyst	: ST
Date sampled	: 05/23/90	Supervisor	: [illegible]
Date ext.	: 06/01/90	Volume ext.	: 35 ml
Date analyzed	: 06/06/90	Date released	: 06/08/90
Dilution	: NONE	Instrument I.D.	: HP5

CAS #	Compound Name	Detection Limit (ug/l)	Amount Found (ug/l)
106-93-4	Ethylene dibromide	0.02	ND

ND : Not detected at or above the practical quantitation limit for the method.

ANALYSIS DATA SHEET - EDB AND DBCP EPA METHOD 8011
ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: 90-2143 MW-1	Anametrix I.D.	: 9005300-03
Matrix	: WATER	Analyst	: ST
Date sampled	: 05/23/90	Supervisor	: BR
Date ext.	: 06/01/90	Volume ext.	: 35 ml
Date analyzed	: 06/06/90	Date released	: 06/08/90
Dilution	: NONE	Instrument I.D.	: HP5

CAS #	Compound Name	Detection Limit (ug/l)	Amount Found (ug/l)
106-93-4	Ethylene dibromide	0.02	ND

ND : Not detected at or above the practical quantitation limit for the method.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 90-2143 MW-2
Matrix : WATER
Date sampled : 05/23/90
Date anl.TPHg: 05/30/90

Anametrix I.D. : 9005300-01
Analyst : CB
Supervisor : CCG
Date released : 06/08/90

CAS #	Compound Name	Detection Limit (ug/l)	Amount Found (ug/l)
71-43-2	Benzene	0.5	ND
108-88-3	Toluene	0.5	ND
100-41-4	Ethylbenzene	0.5	ND
1330-20-7	Total Xylenes	0.5	ND
	TPH as Gasoline	50	ND

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 90-2143 MW-3
Matrix : WATER
Date sampled : 05/23/90
Date anl.TPHg: 05/30/90

Anametrix I.D. : 9005300-02
Analyst : CB
Supervisor : DDG
Date released : 06/08/90

CAS #	Compound Name	Detection Limit (ug/l)	Amount Found (ug/l)
71-43-2	Benzene	0.5	ND
108-88-3	Toluene	0.5	ND
100-41-4	Ethylbenzene	0.5	ND
1330-20-7	Total Xylenes	0.5	ND
	TPH as Gasoline	50	ND

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 90-2143 MW-1
Matrix : WATER
Date sampled : 05/23/90
Date anl.TPHg: 05/30/90

Anametrix I.D. : 9005300-03
Analyst : CS
Supervisor : DOG
Date released : 06/08/90

CAS #	Compound Name	Detection Limit (ug/l)	Amount Found (ug/l)
71-43-2	Benzene	50	650
108-88-3	Toluene	50	50
100-41-4	Ethylbenzene	50	ND
1330-20-7	Total Xylenes	50	2200
	TPH as Gasoline	5000	12000

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - PETROLEUM HYDROCARBON COMPOUNDS
ANAMETRIX, INC. (408) 432-8192

Sample I.D. : 90-2143 TRIP BLANK
Matrix : WATER
Date sampled : 05/23/90
Date anl.TPHg: 05/30/90

Anametrix I.D. : 9005300-04
Analyst : CB
Supervisor : PDG
Date released : 06/08/90

CAS #	Compound Name	Detection Limit (ug/l)	Amount Found (ug/l)
71-43-2	Benzene	0.5	ND
108-88-3	Toluene	0.5	ND
100-41-4	Ethylbenzene	0.5	ND
1330-20-7	Total Xylenes	0.5	ND
	TPH as Gasoline	50	ND

ND - Not detected at or above the practical quantitation limit for the method.
TPHg - Total Petroleum Hydrocarbons as gasoline is determined by GCFID using EPA Method 5030.
BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes are determined by modified EPA 8020.

All testing procedures follow California Department of Health Services (Cal-DHS) approved methods.

ANALYSIS DATA SHEET - ORGANIC LEAD
ANAMETRIX, INC. - (408) 432-8192

Anametrix I.D.: 9005300
Matrix : WATER
Date Sampled : 05/23/90
Project Number: 90-2143

Date Prepared : 06/01/90
Date Analyzed : 06/01/90
Instrument I.D.: AA1
Date Released : 06/08/90

	EPA Method#	Reporting Limit	Sample I.D.# MW-2	Sample I.D.# MW-2	Sample I.D.# MW-3	Sample I.D.# MW-1	Sample I.D.# BLANK
ELEMENTS		(mg/L)	-01	-01D	-02	-03	OMB0601
Organic Lead	LUFT	0.04	ND	ND	ND	ND	ND

ND : Not detected at or above the practical quantitation limit for the method.

D : Duplicated sample.

Organic Lead by Leaking Underground Fuel Tank (LUFT) Manual, 1987 California State Water Resources Control Board.

mona Kamel 6/8/90
Analyst Date

Manny Nguyen 6/08/90
Supervisor Date

ANALYSIS DATA SHEET - EDB AND DBCP EPA METHOD 8011

ANAMETRIX, INC. (408) 432-8192

Sample I.D.	: METHOD BLANK	Anametrix I.D.	: PWBL060190
Matrix	: WATER	Analyst	: [illegible]
Date sampled	: N/A	Supervisor	: SD
Date ext.	: 06/01/90	Volume ext.	: 35 ml
Date analyzed	: 06/06/90	Date released	: 06/08/90
Dilution	: NONE	Instrument I.D.	: HP5

CAS #	Compound Name	Detection Limit (ug/l)	Amount Found (ug/l)
106-93-4	Ethylene dibromide	0.02	ND
96-12-8	Dibromochloropropane	0.2	ND

ND : Not detected at or above the practical quantitation limit for the method.

ANAMETRIX, INC.
1961 CONCOURSE DRIVE, SUITE E
SAN JOSE, CA 95131, (408) 432-8192

ORGANIC LEAD MATRIX SPIKE REPORT

Spike I.D. : 9005300-01S
Assoc. WO # : 9005300
Date Analyzed: 06/01/90
Conc. Units : mg/L

Inst. ID: AA1
Date : 06/08/90
Matrix : WATER

ELEMENTS	METHOD	SPIKE AMOUNT	SAMPLE CONC.	M S CONC.	% REC
Pb	LUFT	0.51	0.00	0.43	85.5

COMMENT: Spiked with sample ID# 9005300-01.

mona Kamel 6/8/90
Analyst Date

Thanny Nguyen 6/08/90
Supervisor Date

CHAIN-OF-CUSTODY RECORD AND REQUEST FOR ANALYSIS

NO.

McCULLEY, FRICK & GILMAN, INC.

☐ 3300 Arapahoe Ave., Suite 218
Boulder, CO 80303
TEL: (303) 447-1823
FAX: (303) 447-1836

☐ 5818 Balcones Dr., Suite 202
Austin, TX 78731
TEL: (512) 371-1667
FAX: (512) 454-4126

☒ 5 Third St., Suite 916
San Francisco, CA 94103
TEL: (415) 495-7110
FAX: (415) 495-7107

PROJECT No.: 90-2143 PROJECT NAME: AVC-Oakland PAGE: 1 OF: 2

SAMPLER (Signature): T. Ono Fuji Elec DATE: 5-24-90

METHOD OF SHIPMENT: Lil Connie CARRIER/ WAYBILL NO. DESTINATION: Anametrix

SPECIAL INSTRUCTIONS/HAZARDS:

SAMPLES

Lab No.	Sample Identification	Sample Collection DATE	Sample Collection TIME	Matrix*	Preservation HCL	HNO3	H2SO4	COLD	NONE	OTHER	Containers* VOL. (ml)	TYPE*	No.
	MW-2	5-23	1055	AQ	X			X			40	G	2
	MW-2							X			40	G	2
	MW-2							X			40	G	2
	MW-2		↓					X			1000	G	2
	MW-3		800		X			X			40	G	2
	MW-3							X			40	G	2
	MW-3							X			40	G	2
	MW-3		↓					X			1000	G	2
	MW-1		1495		X			X			40	G	2
	MW-1	↓	↓	↓							40	G	2

TOTAL NUMBER OF CONTAINERS see p. 2

ANALYSIS REQUEST

Methods EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	TPH as Gasoline	TPH as Diesel	BTEX	Oxygen. Pb	EDB	PNA (ENCB)	Handling HOLD	RUSH	STANDARD	REMARKS (Special handling procedures, specific analytical methods, observations, etc.)
				X		X						X	
							X					X	
								X				X	
									X			X	
				X		X						X	
							X					X	
								X				X	
									X			X	
				X		X						X	
							X					X	

LABORATORY COMMENTS/ CONDITION OF SAMPLES

RELINQUISHED BY:

SIGNATURE	PRINTED NAME	COMPANY	DATE	TIME
T. Ono	T. Ono	FFG	5-24	1140

RECEIVED BY:

SIGNATURE	PRINTED NAME	COMPANY
Taghi Hemmati	TAGHI	Anametrix
		LABORATORY

*KEY: Matrix AQ-aqueous NA-nonaqueous SO-soil SL-sludge P-petroleum A-air OT-other Containers P-plastic G-glass T-teflon B-brass OT-other

DISTRIBUTION PINK Field Copy YELLOW Laboratory Copy WHITE: Return to Originator

CHAIN-OF-CUSTODY RECORD AND REQUEST FOR ANALYSIS

McCULLEY, FRICK & GILMAN, INC.

NO.

☐ 3300 Arapahoe Ave., Suite 218
Boulder, CO 80303
TEL: (303) 447-1823
FAX: (303) 447-1836

☐ 5818 Balcones Dr., Suite 202
Austin, TX 78731
TEL: (512) 371-1667
FAX. (512) 454-4126

☒ 5 Third St., Suite 916
San Francisco, CA 94103
TEL: (415) 495-7110
FAX: (415) 495-7107

PROJECT No.: 90-2143 PROJECT NAME: AVIS - Oakland PAGE 2 OF 2
SAMPLER (Signature): [signature] DATE: 5-24-90
METHOD OF SHIPMENT: Lab Carrier CARRIER/ WAYBILL NO. DESTINATION: Anametrix
SPECIAL INSTRUCTIONS/HAZARDS:

Lab No.	Sample Identification	Sample Collection DATE	Sample Collection TIME	Matrix*	Preservation HCL	HNO₃	H₂SO₄	COLD	NONE	OTHER	Containers* VOL. (ml)	TYPE*	No.	Methods EPA 601/8010	EPA 602/8020	EPA 624/8240	EPA 625/8270	TPH as Gasoline	TPH as Diesel	BTEX	EDB	TVA (TPH?)		Handling HOLD	RUSH	STANDARD	REMARKS (Special handling procedures, specific analytical methods, observations, etc.)
	MW-1	5-23	1445	AQ				X			40	G	2								X					X	
	MW-1	5-23	1445	AQ				X			1000	G	2									X				X	
	Trip Blank	5-23	—	AQ	X			X			40	G	2					X		X						X	

TOTAL NUMBER OF CONTAINERS 26

LABORATORY COMMENTS/ CONDITION OF SAMPLES

RELINQUISHED BY: SIGNATURE	PRINTED NAME	COMPANY	DATE	TIME	RECEIVED BY: SIGNATURE	PRINTED NAME	COMPANY
[signature]	Yely Cruz	MFG	5-24	1140	[signature]	TAGHI	Anametrix

LABORATORY

*KEY: Matrix AQ-aqueous NA-nonaqueous SO-soil SL sludge P-petroleum A-air OT other Containers P-plastic G-glass T-teflon B-brass OT-other

DISTRIBUTION PINK Field Copy YELLOW Laboratory Copy WHITE: Return to Originator

APPENDIX E

Monitoring Well Elevation Survey Report

MORAN Engineering
CIVIL ENGINEERS LAND SURVEYORS
463 KENTUCKY AVE • BERKELEY CA 94707 • (415) 527-7744

RECEIVED
JUN 0 6 1990
M, F & G, INC.

June 4, 1990
90-2465

Ed Conti
McCulley, Frick & Gilman
5 Third Street
San Francisco, Calif. 94103

Re: Avis Car Sales Lot, Oakland, Calif.

STATEMENT

Provide elevations based on National Geodetic Vertical Datum on three well casings for monitoring wells. Project completed on May 25. Elevations below.

Thank you

Well No.	Casing Rim	Cover - Rim
MW-1	3.34	3.77
MW-2	4.25	4.61
MW-3	3.98	4.31

APPENDIX F

Tracer Research Corporation Report On Shallow Soil Gas Investigation

Tracer Research Corporation

PREPARED FOR:

McCulley, Frick & Gilman, Inc.
5 Third Street
Suite 916
San Francisco, California 94103
TEL: (415) 495-7110
FAX: (415) 495-7107

SHALLOW SOIL GAS INVESTIGATION

OAKLAND AIRPORT AVIS RENTAL
OAKLAND, CALIFORNIA

AUGUST 1990

SUBMITTED BY:

Tracer Research Corporation

190682S.MSG
1-90-682-S

TABLE OF CONTENTS

INTRODUCTION

A shallow soil gas investigation was performed by Tracer Research Corporation (TRC) at the Avis Rental at the Oakland Airport located in Oakland, California. The investigation was conducted August 3, 1990 under contract to McCulley, Frick & Gilman, Inc. The purpose of the investigation was to delineate the extent of potential contamination in the soil and groundwater caused by underground storage tanks.

During this survey, a total of twelve soil gas samples were collected and analyzed. Samples were analyzed for volatile organic compounds from the following suite:

benzene
toluene
ethylbenzene
xylenes
total hydrocarbons (THC)

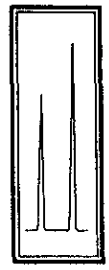
Xylenes are reported as the total of the three xylene isomers. Total hydrocarbons are reported as gasoline range compounds consisting of approximately C_4-C_9 aliphatic, alicyclic and aromatic compounds.

The compounds in this suite were chosen as target compounds because of their suspected presence in the subsurface and amenability to soil gas technology. Soil gas samples were screened on a gas chromatograph equipped with a flame ionization detector (FID).

SHALLOW SOIL GAS INVESTIGATION - METHODOLOGY

Shallow soil gas investigation refers to a method developed by TRC for investigating underground contamination from volatile organic chemicals (VOCs) such as industrial solvents, cleaning fluids and petroleum products by looking for their vapors in the shallow soil gas. The method involves pumping a small amount of soil gas out of the ground through a hollow probe driven into the ground and analyzing the gas for the presence of volatile contaminants. The presence of VOCs in shallow soil gas indicates the observed compounds may either be in the vadose zone near the probe or in groundwater below the probe. The soil gas technology is most effective in mapping low molecular weight halogenated solvent chemicals and petroleum hydrocarbons possessing high vapor pressures and low aqueous solubilities. These compounds readily partition out of the groundwater and into the soil gas as a result of their high gas/liquid partitioning coefficients. Once in the soil gas, VOCs diffuse vertically and horizontally through the soil to the ground surface where they dissipate into the atmosphere. The contamination acts as a source and the above ground atmosphere acts as a sink, and typically a concentration gradient develops between the two. The concentration gradient in soil gas between the source and ground surface may be locally distorted by hydrologic and geologic anomalies (e.g. clays, perched water); however, soil gas mapping generally remains effective because distribution of the contamination is usually broader in areal extent than the local geologic barriers and is defined using a large data base. The presence of geologic obstructions on a small scale tends to create anomalies in the soil gas-groundwater correlation, but generally does not obscure the broader areal picture of the contaminant distribution.

Soil gas contaminant mapping helps to reduce the time and cost required to delineate underground contamination by volatile contaminants. The soil gas investigation does this by outlining the general areal extent of contamination. Conventional bore holes or observation wells are used to verify both the presence and extent of the subsurface contamination as indicated in the soil gas survey. In this manner, soil gas contaminant mapping can assist in determining the placement of monitoring wells. Thus, the likelihood



of drilling unnecessary monitoring wells is reduced. The soil gas survey is not intended to be a substitute for conventional methodology, but rather to enable conventional methods to be used efficiently.

EQUIPMENT

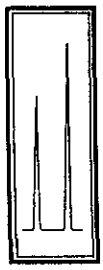
Tracer Research Corporation utilized a one ton Ford analytical field van that was equipped with one gas chromatograph and two Spectra Physics computing integrators. In addition, the van has two built-in gasoline powered generators that provide the electrical power (110 volts AC) to operate all of the gas chromatographic instruments and field equipment. A specialized hydraulic mechanism consisting of two cylinders and a set of jaws was used to drive and withdraw the sampling probes. A hydraulic hammer was used to assist in driving probes past cobbles and through unusually hard soil.

SAMPLING PROCEDURES

Sampling probes consist of 7 foot lengths of 3/4 inch diameter hollow steel pipe that are fitted with detachable drive tips. Soil gas probes were advanced 1-6 feet below grade. Once inserted into the ground, the above-ground end of the sampling probes were fitted with a steel reducer and a length of polyethylene tubing leading to a vacuum pump. Gas flow is monitored by a vacuum gauge to insure that an adequate flow is obtained.

To adequately purge the volume of air within the probe, 2 to 5 liters of gas is evacuated with a vacuum pump. During the soil gas evacuation, samples are collected in a glass syringe by inserting a syringe needle through a silicone rubber segment in the evacuation line and down into the steel probe. Ten milliliters of gas are collected for immediate analysis in the TRC analytical field van. Soil gas is subsampled (duplicate injections) in volumes ranging from 1 uL to 2 mL, depending on the VOC concentration at any particular location.

Sample probe vacuum, measured with a vacuum gauge, ranged from five to twenty inches Hg. Maximum pump vacuum was measured at twenty-six inches Hg.



ANALYTICAL PROCEDURES

A Varian 3300 gas chromatograph, equipped with a flame ionization detector (FID) was used for the soil gas analyses. Compounds were separated on a 6' by 1/8" OD packed column with OV-101 as the stationary phase at 80°C in a temperature controlled oven.

Hydrocarbon compounds detected in soil gas were identified by chromatographic retention time. Quantification of compounds was achieved by comparison of the detector response of the sample with the response measured for calibration standards (external standardization). Instrument calibration checks were run periodically throughout the day and system blanks were run at the beginning of the day to check for contamination in the soil gas sampling equipment. Air samples were also routinely analyzed to check for background levels in the atmosphere.

Detection limits for the compounds of interest are a function of the injection volume as well as the detector sensitivity for individual compounds. Thus, the detection limit varies with the sample size. Generally, the larger the injection size the greater the sensitivity. However, peaks for compounds of interest must be kept within the linear range of the analytical equipment. If any compound has a high concentration, it is necessary to use small injections, and in some cases to dilute the sample to keep it within linear range. This may cause decreased detection limits for other compounds in the analyses.

The detection limits for the selected compounds were approximately 0.04 ug/L for hydrocarbons, depending on the conditions of the measurement, in particular, the sample size. If any component being analyzed is not detected, the detection limit for that compound in that analysis is given as a "less than" value (e.g. <0.04 ug/L). Detection limits obtained from GC analyses are calculated from the current response factor, the sample size, and the estimated minimum peak size (area) that would have been visible under the conditions of the measurement.

QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Tracer Research Corporation's normal quality assurance procedures were followed in order to prevent any cross-contamination of soil gas samples.

- Steel probes are used only once during the day and then washed with high pressure soap and hot water spray or steam-cleaned to eliminate the possibility of cross-contamination. Enough probes are carried on each van to avoid the need to reuse any during the day.
- Probe adaptors (TRC's patented design) are used to connect the sample probe to the vacuum pump. The adaptor is designed to eliminate the possibility of exposing the sample stream to any part of the adaptor. Associated tubing connecting the adaptor to the vacuum pump is replaced periodically as needed during the job to insure cleanliness and good fit. At the end of each day the adaptor is cleaned with soap and water and baked in the GC oven.
- Silicone tubing (which acts as a septum for the syringe needle) is replaced as needed to insure proper sealing around the syringe needle. This tubing does not directly contact soil gas samples.
- Glass syringes are usually used for only one sample per day and are washed and baked out at night. If they must be used twice, they are purged with carrier gas (nitrogen) and baked out between probe samplings.
- Injector port septa through which soil gas samples are injected into the chromatograph are replaced on a daily basis to prevent possible gas leaks from the chromatographic column.
- Analytical instruments are calibrated each day by analytical standards from Chem Service, Inc. Calibration checks are also run after approximately every five soil gas sampling locations.
- Subsampling syringes are checked for contamination prior to sampling each day by injecting nitrogen carrier gas into the gas chromatograph.

. Prior to sampling each day, system blanks are run to check the sampling apparatus (probe, adaptor, 10 cc syringe) for contamination by drawing ambient air from above ground through the system and comparing the analysis to a concurrently sampled ambient air analysis.

. All sampling and subsampling syringes are decontaminated each day and no such equipment is reused before being decontaminated. Microliter size subsampling syringes are reused only after a nitrogen carrier gas blank is run to insure it is not contaminated by the previous sample.

. Soil gas pumping is monitored by a vacuum gauge to insure that an adequate gas flow from the vadose zone is maintained. A reliable gas sample can be obtained if the negative pressure reading on the vacuum gauge is at least 2 inches Hg less than the maximum pump vacuum.

APPENDIX A: ANALYTICAL DATA

MCCULLEY, FRICK & GILMAN/AVIS/OAKLAND, CALIFORNIA JOB#1-90-682-S
08/03/90
CONDENSED DATA

SAMPLE	BENZENE ug/l	TOLUENE ug/l	ETHYL BENZENE ug/l	XYLENES ug/l	THC ug/l
AIR	<0.05	<0.05	<0.05	<0.06	<0.05
SG1-5'	26000	23000	<26	1300	230000
SG2-4'	2	3	<0.05	1	13
SG3-2'	0.1	0.2	<0.02	<0.03	0.8
SG4-2'	0.1	<0.01	<0.01	<0.01	0.1
AIR	<0.05	<0.05	<0.05	<0.06	<0.05
SG5-2'	<0.02	<0.02	<0.02	<0.03	0.4
SG6-5'	<0.01	<0.01	<0.01	<0.01	0.4
SG7-1'	<0.02	<0.02	<0.02	<0.03	0.9
SG8-1.5'	<0.01	0.2	<0.01	<0.01	0.6
SG9-4.5'	0.2	<0.02	<0.02	<0.03	0.2
SG10-1'	<0.01	<0.01	<0.01	<0.01	<0.01
SG11-1'	<0.01	<0.01	<0.01	<0.01	1
AIR	0.4	<0.05	<0.05	<0.06	0.4
SG12-2'	<0.01	<0.01	<0.01	<0.01	<0.01
AIR	<0.02	<0.02	<0.02	<0.03	<0.02

Analyzed by: M. Flack
Checked by: B. Pfeil
Proofed by: _____