Applied GeoSystems, Inc.
A RESNA Company

RESNA
Working To Restore Nature

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# ADDENDUM TO WORK PLAN
at
ARCO Station 6148
5131 Shattuck Avenue
Oakland, California

61035.02

Prepared for
ARCO Products Company
P.O. Box 6411
San Mateo, California 94402

by
RESNA

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November 7, 1991

REGISTERED GEOLOGIST
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Exp. 6-30-92
STATE OF CALIFORNIA

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## INTRODUCTION

RESNA has prepared this letter to serve as an addendum to the Work Plan for Initial Subsurface Investigation Related to Former Waste-Oil Tank (RESNA 61035.01, August 30, 1991) for the subject site. This addendum has been prepared in response to the letter from Ms. Susan Hugo of the Alameda County Health Care Services Agency (ACHCSA) dated September 30, 1991 requesting additional laboratory analyses of soil samples for the metal nickel, and recommending investigation of potential groundwater contamination related to the former waste-oil tank. This addendum is also in response to the recommendation of Ms. Susan Hugo of the ACHCSA (in telephone conversations on October 9 and 10, 1991 with Mr. Joel Coffman, RESNA Project Geologist) for installation of three groundwater monitoring wells to be added to the original proposed work at the site to investigate possible impact to groundwater from previously reported waste oil in the soil beneath the former waste-oil tank. The location of the subject site is shown on the Site Vicinity Map, Plate 1.

RESNA's recommended approach and project tasks to evaluate the presence and extent of hydrocarbons in the soil and groundwater in the area of the former waste oil tank include following: drilling and sampling four onsite soil borings (B-1 through B-4) in the immediate vicinity of the former waste-oil tank; installing three 4-inch diameter groundwater monitoring wells (MW-1 through MW-3) in borings B-1 through B-3, respectively; developing, measuring water levels, and sampling the monitoring wells; surveying the monitoring wells for top-of-casing elevations relative to mean sea level datum by a licensed surveyor; performing laboratory analyses of soil and groundwater samples; and preparing a report of the findings, interpretations, and conclusions.

The purpose of this work is to evaluate the presence and extent of waste-oil related hydrocarbons in the soil and groundwater, and to provide information necessary for calculation of the gradient of first-encountered groundwater beneath the site.

**PROPOSED WORK**

RESNA recommends the following work at the site based on the previous investigation and requests from Ms. Susan Hugo of the ACHCSA:

Step 1: Prepare a Site Safety Plan.

Step 2: Obtain permits for borings and monitoring wells at the site.

Step 3: Drill and obtain soil samples for soil classification and laboratory analyses from four onsite soil borings (B-1 through B-4) as shown on Plate 2, Proposed Boring/Monitoring Well Locations. Drill borings B-1, B-2, and B-3 no more than 5 feet into a possible perching or confining layer beneath the first-encountered groundwater in the first-water bearing zone or no more than 20 feet into a water bearing zone (total depths of approximately 35 to 45 feet below the ground surface) and install three 4-inch diameter groundwater monitoring wells (MW-1 through MW-3) in borings B-1 through B-3. Drill boring B-4 until groundwater is encountered (total depth of approximately 20 to 30 feet below ground surface). The purpose of the borings/monitoring wells is to evaluate the presence of waste-oil hydrocarbons in soil and groundwater in the area of the former waste oil tank and to evaluate the gradient of the first groundwater-bearing zone beneath the site.

Step 4: Submit selected soil samples from borings B-1 through B-4 to a State-certified laboratory for analyses for total oil and grease (TOG) using standard method 5520 E&F; total petroleum hydrocarbons as gasoline (TPHg), and benzene, toluene, ethylbenzene, and total xylenes (BTEX) using Environmental Protection Agency (EPA) Methods 5030/8015/8020; total petroleum hydrocarbons as diesel (TPHd) using EPA Method 3550/8015; and for the metals cadmium (Cd), chromium (Cr), nickel (Ni), and zinc (Zn) by EPA Method 6010, and for lead (Pb) by EPA Method 7421. Up to two soil samples from each boring, B-1 through B-4, will be analyzed for volatile organic compounds (VOCs) by EPA method 8240.

Step 5: Survey monitoring wells MW-1 through MW-3 to a National Geodetic Vertical Datum for top of casing elevations relative to mean sea level (msl).

Step 6: Develop monitoring wells MW-1 through MW-3.

Step 7: Measure depths-to-water in, record visual evidence of floating product in initial groundwater samples from, and purge and collect groundwater samples for laboratory analyses from wells MW-1 through MW-3. Submit groundwater samples to a State-certified laboratory for analyses for TOG using standard method 5520 C&F; TPHg and BTEX using EPA Methods 5030/602; TPHd using modified EPA Method 3510/602; VOCs by EPA method 601; and for the metals Cd, Cr, Ni, and Zn using EPA Method 200.7, and Pb using EPA Method 7421. Chain of Custody Records will be maintained for all samples.

Step 8: Prepare a report to include results of the investigation and our interpretations and conclusions.

Field work proposed in this Addendum to Work Plan will be performed according to the Field Methods included in Appendix A (Field Protocol) of this Addendum to Work Plan for Initial Subsurface Investigations Related to Former Waste-Oil Tank at the subject site. A preliminary time schedule to perform Steps 1 through 8 is shown on Plate 3. Subsequent work plans will be prepared and submitted to ARCO and proper regulatory agencies as necessary to describe future work proposed at the site.


Base: U.S. Geological Survey
7.5-Minute Quadrangles
Oakland East/West,
California
Photorevised 1980

N

LEGEND

(•) = Site Location

Approximate Scale

2000 1000 0 2000 4000

feet

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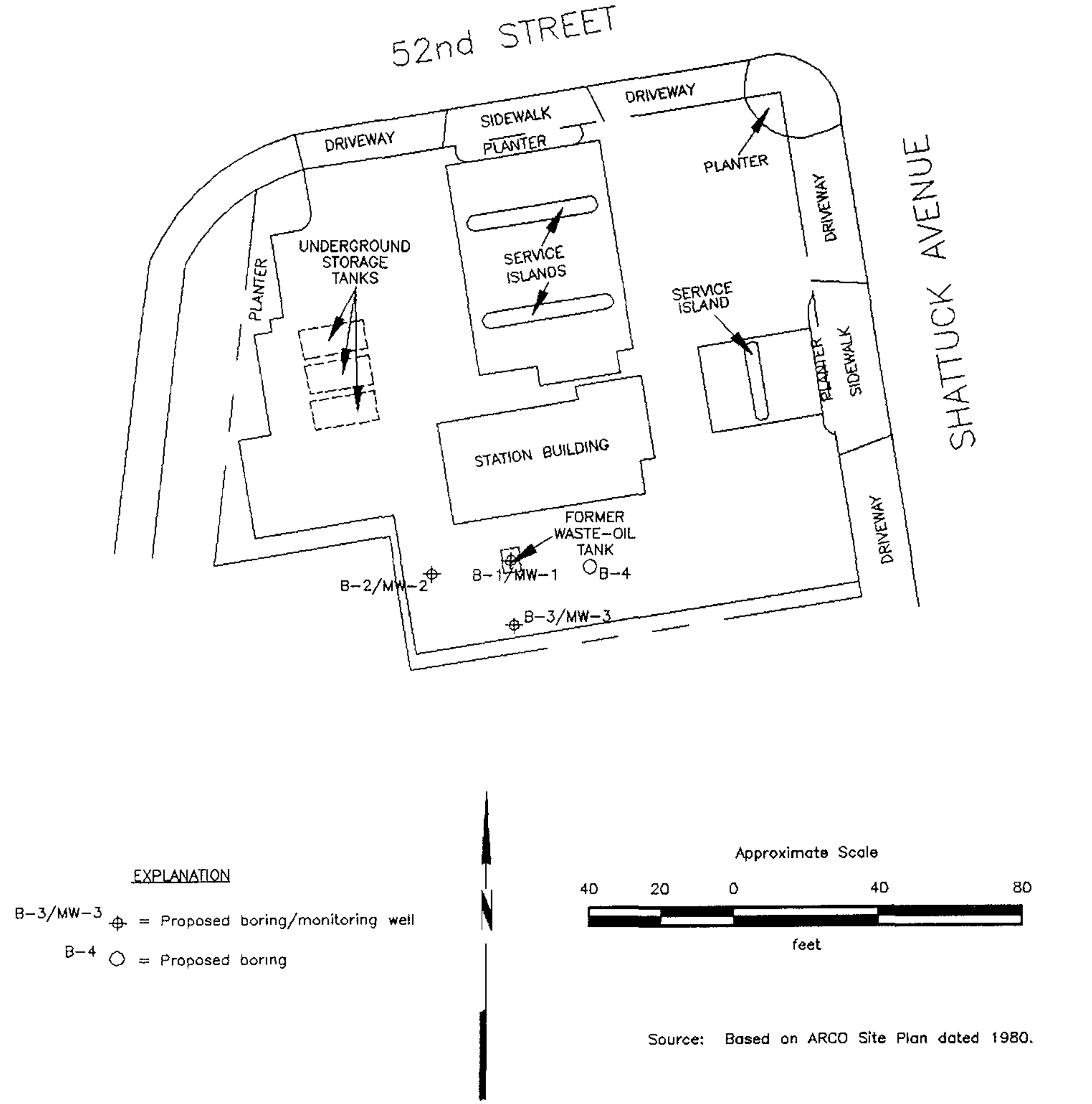
**SITE VICINITY MAP**

**ARCO Station 6148**
**5131 Shattuck Avenue**
**Oakland, California**

**PLATE**

**1**




Source: Based on ARCO Site Plan dated 1980.

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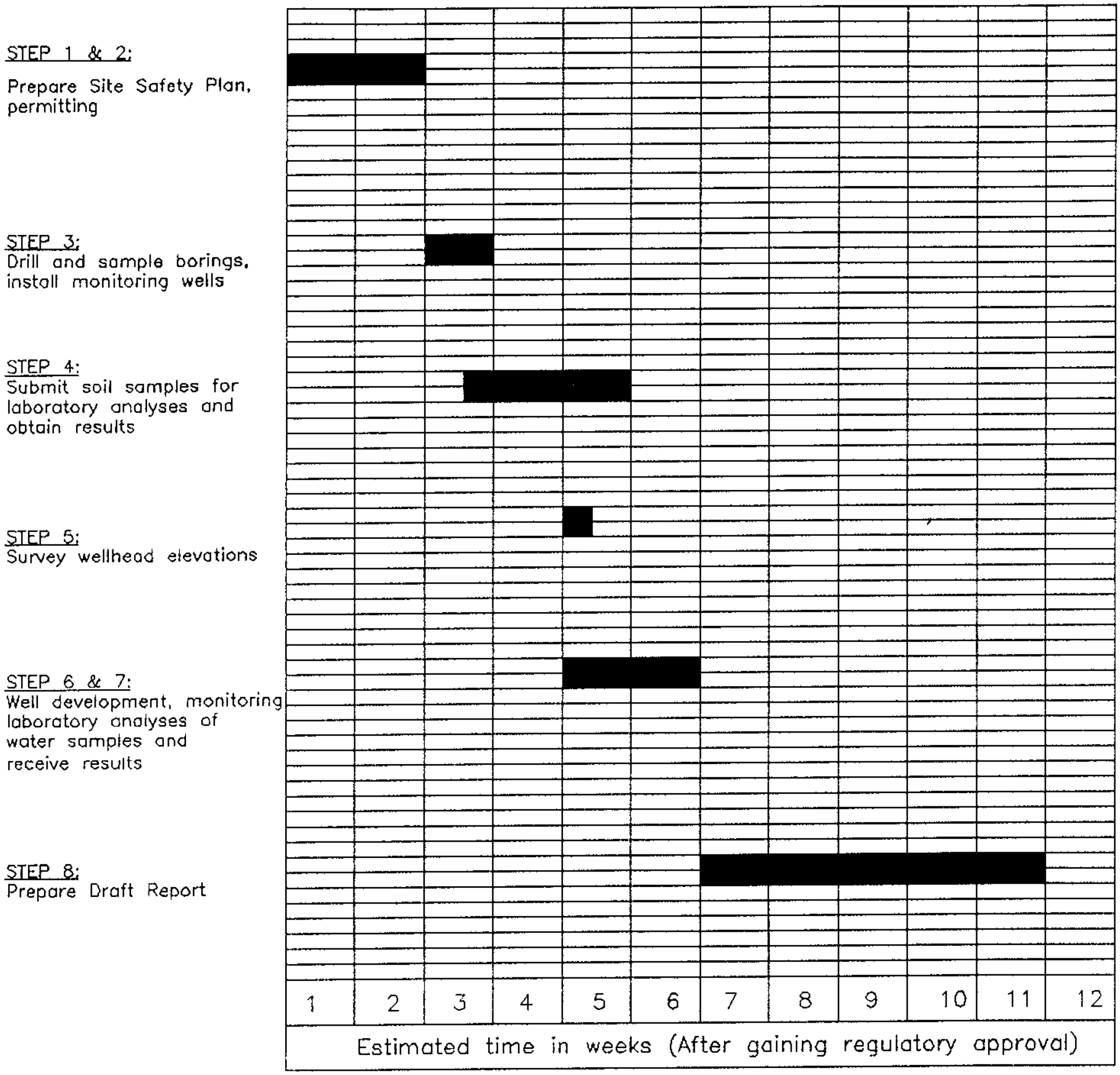
**PROPOSED BORING/ MONITORING WELL LOCATIONS**
**ARCO Station 6148**
**5131 Shattuck Avenue**
**Oakland, California**

**PLATE 2**

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**PRELIMINARY TIME SCHEDULE**
**ARCO Station 6148**
**5131 Shattuck Avenue**
**Oakland, California**

**PLATE**

**3**

# APPENDIX A

# FIELD PROTOCOL

# FIELD PROTOCOL

The following presents RESNA's protocol for a typical site investigation involving gasoline hydrocarbon-impacted soil and/or groundwater.

## Site Safety Plan

The Site Safety Plan describes the safety requirements for the evaluation of gasoline hydrocarbons in soil, groundwater, and the vadose-zone at the site. The site Safety Plan is applicable to personnel of RESNA and its subcontractors. RESNA personnel and subcontractors of RESNA scheduled to perform the work at the site are be briefed on the contents of the Site Safety Plan before work begins. A copy of the Site Safety Plan is available for reference by appropriate parties during the work. A site Safety Officer is assigned to the project.

## Soil Excavation

Permits are acquired prior to the commencement of work at the site. Excavated soil is evaluated using a field calibrated (using isobutylene) Thermo-Environmental Instruments Model 580 Organic Vapor Meter (OVM). This evaluation is done upon arrival of the soil at the ground surface in the excavator bucket by removing the top portion of soil from the bucket, and then placing the intake probe of the OVM against the surface of the soil in the bucket. Field instruments such as the OVM are useful for measuring relative concentrations of vapor content, but cannot be used to measure levels of hydrocarbons with the accuracy of laboratory analysis. Samples are taken from the soil in the bucket by driving laboratory-cleaned brass sleeves into the soil. The samples are sealed in the sleeves using aluminum foil, plastic caps, and aluminized duct tape; labeled; and promptly placed in iced storage. If field subjective analyses suggest the presence of hydrocarbons in the soil, additional excavation and soil sampling is performed, using similar methods. If groundwater is encountered in the excavation, groundwater samples are collected from the excavation using a clean Teflon® bailer. The groundwater samples are collected as described below under "Groundwater Sampling". Stockpiled soil is placed on plastic and covered with plastic, and remains the responsibility of the client. The excavation is backfilled or fenced prior to departure from the site.

## Sampling of Stockpiled Soil

One composite soil sample is collected for each 50 cubic yards of stockpiled soil, and for each individual stockpile composed of less than 50 cubic yards. Composite soil samples are obtained by first evaluating relatively high, average, and low areas of hydrocarbon concentration by digging approximately one to two feet into the stockpile and placing the intake probe of a field calibrated OVM against the surface of the soil; and then collecting one sample from the "high" reading area, and three samples from the "average" areas. Samples are collected by removing the top one to two feet of soil, then driving laboratory-cleaned brass sleeves into the soil. The samples are sealed in the sleeves using aluminum foil, plastic caps, and aluminized duct tape; labeled; and promptly placed in iced storage for transport to the laboratory, where compositing will be performed.

Soil Borings

Prior to the drilling of borings and construction of monitoring wells, permits are acquired from the appropriate regulatory agency. In addition to the above-mentioned permits, encroachment permits from the City or State are acquired if drilling of borings offsite in the City or State streets is necessary. Copies of the permits are included in the appendix of the project report. Prior to drilling, Underground Services Alert is notified of our intent to drill, and known underground utility lines and structures are approximately marked.

The borings are drilled by a truck-mounted drill rig equipped with 8- or 10-inch-diameter, hollow-stem augers. The augers are steam-cleaned prior to drilling each boring to minimize the possibility of cross-contamination. After drilling the borings, monitoring wells are constructed in the borings, or neat-cement grout with bentonite is used to backfill the borings to the ground surface.

Borings for groundwater monitoring wells are drilled to a depth of no more than 20 feet below the depth at which a saturated zone is first encountered, or a short distance into a stratum beneath the saturated zone which is of sufficient moisture and consistency to be judged as a perching layer by the field geologist, whichever is shallower. Drilling into a deeper aquifer below the shallowest aquifer can begin only after a conductor casing is properly installed and allowed to set, to seal the shallow aquifer.

Drill Cuttings

Drill cuttings subjectively evaluated as having hydrocarbon contamination at levels greater than 100 parts per million (ppm) are separated from those subjectively evaluated as having hydrocarbon contamination levels less than 100 ppm. Evaluation is based either on subjective evidence of soil discoloration, or on measurements made using a field calibrated OVM. Readings are taken by placing a soil sample into a ziplock type plastic bag and allowing volatilization to occur. The intake probe of the OVM is then inserted into the headspace created in the plastic bag immediately after opening it. The drill cuttings from the borings are placed in labeled 55-gallon drums approved by the Department of Transportation; or on plastic at the site, and covered with plastic. The cuttings remain the responsibility of the client.

Soil Sampling in Borings

Soil samples are collected at no greater than 5-foot intervals from the ground surface to the total depth of the borings. The soil samples are collected by advancing the boring to a point immediately above the sampling depth, and then driving a California-modified, split-spoon sampler containing brass sleeves through the hollow center of the auger into the soil. The sampler and brass sleeves are laboratory-cleaned, steam-cleaned, or washed thoroughly with Alconox® and water, prior to each use. The sampler is driven with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows to drive the sampler each successive six inches are counted and recorded to evaluate the relative consistency of the soil.

The samples selected for laboratory analysis are removed from the sampler and quickly sealed in their brass sleeves with aluminum soil, plastic caps, and aluminized duct tape. The samples are then be labeled, promptly placed in iced storage, and delivered to a laboratory certified by the State of California to perform the analyses requested.

One of the samples in brass sleeves not selected for laboratory analysis at each sampling interval is tested in the field using an OVM that is field calibrated at the beginning of each day it is used. This testing is performed by inserting the intake probe of the OVM into the headspace created in the plastic bag containing the soil sample as described in the Drill Cuttings section above. The OVM readings are presented in Logs of Borings included in the project report.

Logging of Borings

A geologist is present to log the soil cuttings and samples using the Unified Soil Classification System. Samples not selected for chemical analysis, and the soil in the sampler shoe, are extruded in the field for inspection. Logs include texture, color, moisture, plasticity, consistency, blow counts, and any other characteristics noted. Logs also include subjective evidence for the presence of hydrocarbons, such as soil staining, noticeable or obvious product odor, and OVM readings.

Monitoring Well Construction

Monitoring wells are constructed in selected borings using clean 2- or 4-inch-diameter, thread-jointed, Schedule 40 polyvinyl chloride (PVC) casing. No chemical cements, glues, or solvents are used in well construction. Each casing bottom is sealed with a threaded end-plug, and each casing top with a locking plug. The screened portions of the wells are constructed of machine-slotted PVC casing with 0.020-inch-wide (typical) slots for initial site wells. Slot size for subsequent wells may be based on sieve analysis and/or well development data. The screened sections in groundwater monitoring wells are placed to allow monitoring during seasonal fluctuations of groundwater levels.

The annular space of each well is backfilled with No. 2 by 12 sand, or similar sorted sand, to approximately two feet above the top of the screened casing for initial site wells. The sand pack grain size for subsequent wells may be based on sieve analysis and/or well development data. A 1- to 2-foot-thick bentonite plug is placed above the sand as a seal against cement entering the filter pack. The remaining annulus is then backfilled with a slurry of water, neat cement, and bentonite to approximately one foot below the ground surface.

An aluminum utility box with a PVC apron is placed over each wellhead and set in concrete placed flush with the surrounding ground surface. Each wellhead cover has a seal to protect the monitoring well against surface-water infiltration and requires a special wrench to open. The design discourages vandalism and reduces the possibility of accidental disturbance of the well.

Groundwater Monitoring Well Development

The monitoring wells are developed by bailing or over-pumping and surge-block techniques. The wells are either bailed or pumped, allowed to recharge, and bailed or pumped again until the water removed from the wells is determined to be clear. Turbidity measurements (in NTUs) are recorded during well development and are used in evaluating well development. The development method used, initial turbidity measurement, volume of water removed, final turbidity measurement, and other pertinent field data and observations are included in reports. The wells are allowed to equilibrate for at least 48 hours after development prior to sampling. Water generated by well development will be stored in 17E Department of Transportation (DOT) 55-gallon drums on site and will remain the responsibility of the client.

Groundwater Sampling

The static water level in each well is measured to the nearest 0.01-foot using a Solinst® electric water-level sounder or oil/water interface probe (if the wells contain floating product) cleaned with Alconox® and water before use in each well. The liquid in the onsite wells is examined for visual evidence of hydrocarbons by gently lowering approximately half the length of a Teflon® bailer (cleaned with Alconox® and water) past the air/water interface. The sample is then retrieved and inspected for floating product, sheen, emulsion, color, and clarity. The thickness of floating product detected is recorded to the nearest 1/8-inch.

Wells which do not contain floating product are purged using a submersible pump. The pump, cables, and hoses are cleaned with Alconox® and water prior to use in each well. The wells are purged until withdrawal is of sufficient duration to result in stabilized pH, temperature, and electrical conductivity of the water, as measured using portable meters calibrated to a standard buffer and conductivity standard. If the well becomes dewatered, the water level is allowed to recover to at least 80 percent of the initial water level. Prior to the collection of each groundwater sample, the Teflon® bailer is cleaned with Alconox® and rinsed with tap water and deionized water, and the latex gloves worn by the sampler changed. Hydrochloric acid is added to the sample vials as a preservative (when applicable). A sample method blank is collected by pouring distilled water into the bailer and then into sample vials. A sample of the formation water is then collected from the surface of the water in each of the wells using the Teflon® bailer. The water samples are then gently poured into laboratory-cleaned, 40-milliliter (ml) glass vials, 500 ml plastic bottles or 1-liter glass bottles (as required for specific laboratory analysis) and sealed with Teflon®-lined caps, and inspected for air bubbles to check for headspace, which would allow volatilization to occur. The samples are then labeled and promptly placed in iced storage. A field log of well evacuation procedures and parameter monitoring is maintained. Water generated by the purging of wells is stored in 17E DOT 55-gallon drums onsite and remains the responsibility of the client.

Vadose-Zone Sampling

Vapor readings are made with a field calibrated OVM, which has a lower detection limit of 0.1 ppm. Prior to purging each vadose-zone monitoring well, an initial reading is taken inside the well by connecting the tubing of the OVM to a tight fitting at the top of the well. Each vadose-zone monitoring well is then purged for approximately 60 seconds using an electric vacuum pump connected to the tight fitting. Ambient readings of the air at the site are taken with the OVM after each well is purged. The OVM is then connected to the well fitting, and the reading recorded. The well is then again purged for approximately 30 seconds, and again measured using the OVM. These purging and measuring procedures are repeated until two consecutive OVM readings are within ten percent of each other.

Sample Labeling and Handling

Sample containers are labeled in the field with the job number, sample location and depth, and date, and promptly placed in iced storage for transport to the laboratory. A Chain of Custody Record is initiated by the field geologist and updated throughout handling of the samples, and accompanies the samples to a laboratory certified by the State of California for the analyses requested. Samples are transported to the laboratory promptly to help ensure that recommended sample holding times are not exceeded. Samples are properly disposed of after their useful life has expired.

Aquifer Testing

Bailer Test

The initial water level is measured in the test well, and water bailed from the test well using a Teflon® bailer and cable cleaned with Alconox® and water. Pressure transducers are used to measure water levels in the test well during drawdown and partial recovery phases, over a minimum period of approximately one to two hours. The bailing rate for the designated test well is recorded.

Pumping Test

The initial water levels in wells to be used during the test are measured prior to commencement of pumping. The flow rate of the pump is adjusted to the desired pumping rate, and water levels allowed to recover to initial levels. Pumping then begins, and the starting time of pumping is recorded. Drawdowns in observation wells are recorded at intervals throughout pumping using pressure transducers. Evacuated water is stored in a storage tank at the site and remains the responsibility of the client. After the pump is shut off, recovery measurements are taken in the wells until recovery is at least 80 percent of the initial water level. Barometric pressure and tidal information are collected for the time interval of the pumping test to allow screening of possible effects of atmospheric pressure and tidal fluctuations on the groundwater levels.

FEDERAL EXPRESS

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91 NOV -8 AM 9:16

# TRANSMITTAL

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TO: MS. SUSAN HUGO
ALAMEDA COUNTY HEALTH CARE SERVICES
AGENCY, DEPT OF ENVIRON. HEALTH
80 SWAN WAY, ROOM 200
OAKLAND, CALIFORNIA 94621

DATE: 11/7/91
PROJECT NUMBER: 61035.02
SUBJECT: ARCO STATION 6148 AT
5131 SHATTUCK AVENUE, OAKLAND, CA

FROM: JOEL COFFMAN
TITLE: PROJECT GEOLOGIST

WE ARE SENDING YOU [XX] Attached [ ] Under separate cover via ________ the following items:

[ ] Shop drawings [ ] Prints [XX] Reports [ ] Specifications

[ ] Letters [ ] Change Orders [ ] ________

| COPIES | DATED | NO. | DESCRIPTION |
|---|---|---|---|
| 1 | 11/7/91 | | ADDENDUM TO WORK PLAN FOR INITIAL SUBSURFACE INVESTIGATION RELATED TO FORMER WASTE-OIL TANK AT THE ABOVE SUBJECT SITE. |

THESE ARE TRANSMITTED as checked below:

[ ] For review and comment [ ] Approved as submitted [ ] Resubmit ___ copies for approval

[ ] As requested [ ] Approved as noted [ ] Submit ___ copies for distribution

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[ ] For your files [ ] ________

REMARKS: THIS REPORT HAS BEEN FORWARDED TO YOU AT THE REQUEST OF MR. CHUCK CARMEL OF ARCO PRODUCTS COMPANY.

Copies: 1 to AGS project file no. 61035.02

SAN JOSE READER'S FILE

*Revision Date: 10/15/90
*File Name: TRANSMT.PRJ