Rcvd.
7/25/89

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • IRVINE • HOUSTON • BOSTON • SACRAMENTO • CULVER CITY • SAN JOSE

WORK PLAN
LIMITED SUBSURFACE ENVIRONMENTAL INVESTIGATION
at
ARCO Service Station No. 6113
785 East Stanley Boulevard
Livermore, California

AGS Job No. 69028-1W

Work Plan prepared for

ARCO Products Company
P.O. Box 5811
San Mateo, California 94403

by
Applied GeoSystems

George L. Williams by GLW

George L. Williams
Assistant Project Geologist

Gillian S. Holmes By GSH

Gillian S. Holmes
G.E. 2023

July 18, 1989

Applied GeoSystems
43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906
• FREMONT • IRVINE • HOUSTON • BOSTON • SACRAMENTO • CULVER CITY • SAN JOSE

July 18, 1989
AGS 69028-1W

Mr. Kyle Christie
ARCO Products Company
P.O. Box 5811
San Mateo, California 94403

Subject: Executive Summary of Work Plan No. 69028-1W, Limited Subsurface Environmental Investigation at ARCO Products Service Station No. 6113, 785 East Stanley Boulevard, Livermore, California.

Mr. Christie:

As requested, this Work Plan summarizes the results of previous environmental investigations performed by Pacific Environmental Group, Inc., and discusses the additional work required by the Alameda County Environmental Health Department in their May 4, 1989 letter to ARCO Products Company (ARCO). The proposed work is limited to investigation of hydrocarbons related to the underground waste oil tank formerly located at the site. Our proposed work includes drilling three soil borings, constructing three 2-inch-diameter monitoring wells in the borings, developing the wells, collecting water samples for laboratory analysis, evaluating the ground-water gradient, and preparing a report documenting our findings, conclusions, and recommendations.

This work is necessary to evaluate the lateral and vertical extent of hydrocarbons in the soil and ground water related to the former underground waste oil tank at the site. The work is described in detail in the attached Work Plan, which includes a preliminary estimated time schedule for the work.

Copies of this Work Plan should be sent to the following regulators:

(1) Mr. Scott Hugenberger
Regional Water Quality Control Board
San Francisco Bay Region
1111 Jackson Street
Oakland, California 94607

(2) Mr. Gil Wistar
Hazardous Materials Specialist
Department of Environmental Health
80 Swan Way, Room 200
Oakland, California 94621

Please call if you have any questions regarding the contents of this Work Plan.

Sincerely,
Applied GeoSystems

George L. Williams
Assistant Project
Geologist

TABLE OF CONTENTS

TABLES

PLATES

Applied GeoSystems 43255 Mission Boulevard, Fremont, CA 94539 (415) 651-1906

• FREMONT • IRVINE • HOUSTON • BOSTON • SACRAMENTO • CULVER CITY • SAN JOSE

WORK PLAN
LIMITED SUBSURFACE ENVIRONMENTAL INVESTIGATION
at
ARCO Station No. 6113
785 East Stanley Boulevard
Livermore, California

For ARCO Products Company

INTRODUCTION

This Work Plan summarizes previous work conducted by Pacific Environmental Group (PACIFIC), and describes the work proposed to perform a subsurface investigation limited to evaluation of the lateral and vertical extent of hydrocarbon contamination in the soil and ground water related to the former underground waste-oil tank at the subject site. A preliminary time schedule for performing the proposed work at the site is also included. ARCO Products Company (ARCO) requested that Applied GeoSystems prepare this Work Plan for submittal to the Regional Water Quality Control Board (RWQCB), and the Alameda County Department of Environmental Health (ACDEH). This work plan has been prepared in response to a letter from the ACDEH to ARCO, dated May 4, 1989.

The proposed work includes the following: (1) preparing a Site Safety Plan which discusses the precautions and protective equipment necessary for work at the site; (2) drilling three soil borings to a depth approximately 10 to 15 feet below first-encountered ground water (or to the first-encountered aquitard below first-encountered ground water); (3) collecting soil samples at intervals no greater than five feet in the borings, and logging the soil types encountered during drilling; (4) installing three 2-inch-diameter ground-water monitoring wells in the borings; (5) surveying the well locations; (6) collecting and subjectively analyzing water samples from the wells at the site; (7) analyzing soil samples from each boring for high boiling range total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene, and xylene (BTEX), and total petroleum oil and grease (TOG); (8) analyzing water samples from each well for high and low boiling range total petroleum hydrocarbons, lead, chromium, zinc, semi-volatile organic compounds, and total petroleum oil and grease; and (9) preparing a report summarizing our field procedures, laboratory methods, findings, conclusions, and recommendations.

SITE DESCRIPTION AND BACKGROUND

The site is an operating gasoline station and mini market in a commercial and residential area. It is located at 785 East Stanley Boulevard, on the southwestern corner of the intersection of East Stanley Boulevard and Murrieta Boulevard in Livermore, California. The site location is shown on the Site Vicinity Map (Plate P-1). The elevation of the site is approximately 460 feet above mean sea level.

It is our understanding, from information supplied by PACIFIC, that one 280-gallon waste-oil storage tank and four underground gasoline storage tanks were present at the site. On January 26, 1989, the 280-gallon waste-oil storage tank was excavated and removed from the site. We understand that the underground gasoline storage tanks are presently in service at the site. The locations of the former underground waste oil tank, underground gasoline storage tanks, and selected site features are shown on the Generalized Site Plan (Plate P-2).

PREVIOUS WORK

Previous work performed at the site in January and February 1989 by PACIFIC and Crosby & Overton, Inc. (C&O) included soil excavation, removal of the 280-gallon waste-oil tank, and collection of soil samples for laboratory analysis. The waste-oil tank pit was excavated and the tank removed from the pit by C&O on January 26, 1989. During the removal of the waste-oil tank, PACIFIC noted that the tank displayed no sign of leakage from either the fill pipe or the tank, and reported no detectable product odor in the soil beneath the tank. PACIFIC reported that soil removed from the northern wall of the tank excavation was slightly darker than soil from other areas of the excavation.

The tank pit was excavated to a depth of 7-1/2 feet below grade. PACIFIC collected a soil sample (WO-1) at this depth (two feet below the bottom of the former waste-oil tank) in the central portion of the excavation. PACIFIC also collected a soil sample (WOSW-N) from the discolored area at a depth of 5 feet in the northern wall of the tank excavation, as requested by Mr. Gil Wistar of ACDEH (PACIFIC, 1989).

The soil samples were analyzed for (1) total oil and grease (TOG), high boiling hydrocarbons (HBHC, calculated as oil and diesel), (3) semi-volatile organic compounds, (4) volatile organic compounds (VOC's), and (5) cadmium, chromium, lead, and zinc at International Technology Corporation (I.T. Corp., certification number 137) in San Jose, California. The results of these analyses are shown in Table 1 and Table 2.

TABLE 1
RESULTS OF LABORATORY ANALYSIS OF SOIL SAMPLES
FOR PETROLEUM HYDROCARBONS AND METALS
ARCO Service Station No. 6113
785 East Stanley Boulevard
Livermore, California

Sample Identifier	TOG	HBHC DIESEL	HBHC OIL	ZN	PB	CD	CR
01/26/89							
WO-1	660	160	60	36	18	ND	35
WOSW-N	1700	490	790	43	16	ND	61
02/03/89							
WO-2	ND	ND	ND	NM	NM	NM	NM
WOSW-N2	1100	30	800	NM	NM	NM	NM

Results in parts per million (ppm).

TOG: Total oil and grease
HBHC: High boiling hydrocarbons
ZN: zinc PB: lead CD: Cadmium CR: chromium

ND: Not detected NM: Not measured

TABLE 2
RESULTS OF LABORATORY ANALYSIS OF SOIL SAMPLES
FOR SEMIVOLATILE ORGANIC COMPOUNDS
ARCO Service Station No. 6113
785 East Stanley Boulevard
Livermore, California

Sample Identifier	PYRENE	PHENAN-THRANE	ANTHRA-CENE	FLOURAN-THENE	BENZO(a)-ANTHRACENE
01/26/89					
WO-1	19	14	3.9	21	7.3
WOSW-N	13	15	3.5	15	5

Sample Identifier	CHRYSENE	BENZO(b)-FLOURAN-THENE	BENZO(k)-FLOURAN-THENE	BENZO(a)-PYRENE	OTHER
01/26/89					
WO-1	7.2	4.4	4.4		ND
WOSW-N	5	ND	ND		3.4

Results in parts per million (ppm).
ND: Not detected

PACIFIC reported that concentrations reported for chromium, lead, zinc, and the nine semi-volatile organic compounds listed in Table 2 were below the levels set by the RWQCB (for these compounds in soil) to protect ground water. Because of the concentrations of TOG (660 to 1700 ppm) and HBHC (60 to 790 ppm) detected in both samples, the pit was further excavated 2 feet laterally and 1 foot vertically on February 3, 1989. Soil sample WO-2 was collected at a depth of 8-1/2 feet from the center of the excavation, and soil sample WOSW-N2 was collected at a depth

of 7 feet from the northern end of the excavation. These samples were analyzed at I.T. Corp. for total oil and grease (EPA method 3550 and Standard Methods Section 503E), and high boiling hydrocarbons (calculated as oil and diesel by EPA method 8015). The results of laboratory analysis of these samples are shown in Table 1.

As indicated in PACIFIC's report, the excavation was backfilled with clean fill material to the original grade. PACIFIC concluded that due to the proximity of the excavation to the station building, further excavation would have threatened the stability of the station building. The tank and stockpiled soil were disposed of as hazardous wastes by C&O and ARCO at Chemical Waste Management, Inc.'s Kettleman Hills facility.

REGIONAL AND LOCAL HYDROGEOLOGY

The City of Livermore is located in the Livermore Valley, which is an intermontane valley in the Coast Ranges Geomorphic Province. The valley is approximately 13 miles long in an east-west direction, and is 4 miles wide. The valley is surrounded by hills of the Diablo Range (California Department of Water Resources [DWR], 1974). The valley floor slopes gently toward

the west. The principal streams in the area are the Arroyo Valle and Arroyo Mocho, which flow toward the western end of the valley. Arroyo Mocho is approximately 1/10-mile west of the site.

Livermore Valley is underlain by nonwater-bearing rocks and water-bearing rocks and sediments. The water-bearing rocks and sediments, underlain by nonwater-bearing rocks, comprise the Livermore Valley ground-water basin. Water-bearing rock units include the Tassajara Formation, the Livermore Formation, and valley-fill materials (DWR, 1966, 1974).

The Livermore Valley ground-water basin is divided into subbasins based on fault traces or other hydrologic discontinuities. The ground-water system in Livermore Valley is a multilayered system with an unconfined aquifer overlying a sequence of leaky or semiconfined aquifers. Ground water in the basin moves downslope toward the east-west-trending axis of the valley, and then generally to the west. Ground water in the vicinity of the site flows generally west-northwest. The depth to first-encountered ground water at the site is estimated to be between 50 to 60 feet below the ground surface (Zone 7, Alameda County Flood Control).

PROPOSED WORK

The following tasks are proposed for the limited subsurface environmental work at the former ARCO Service Station located at 785 Stanley Boulevard in Livermore, California. Applied GeoSystems' work at the site will include: (1) preparing a Site Safety Plan which discusses the precautions and protective equipment necessary for work at the site; (2) drilling three soil borings to a depth approximately 10 to 15 feet below first-encountered ground water (or to the first-encountered aquitard below first-encountered ground water); (3) collecting soil samples at lithologic boundaries, intervals no greater than five feet, and just above first-encountered ground water in the borings, and logging the soil types encountered during drilling; (4) installing three 2-inch-diameter ground-water monitoring wells in the borings; (5) surveying the well locations; (6) collecting and subjectively analyzing water samples from the wells at the site; (7) analyzing soil samples from each boring for high boiling range TPH, BTEX, and TOG (in a State certified laboratory); (8) analyzing water samples from each well for high and low boiling range TPH, TOG, lead, chromium, zinc, and semi-volatile organic compounds;

and (9) preparing a report summarizing our field procedures, laboratory methods, findings, conclusions, and recommendations.

Site Safety Plan

Field work performed by Applied GeoSystems on behalf of ARCO at the work site will be governed by an Applied GeoSystems' Site Safety Plan. This Plan delineates the basic safety requirements for the Limited Subsurface Environmental Investigation which includes drilling of soil borings and installation of monitoring wells at the site. The Site Safety Plan is applicable to personnel of Applied GeoSystems and to any subcontractors of Applied GeoSystems. Applied GeoSystems personnel (and any subcontractors of Applied GeoSystems) scheduled to perform the work at the site are briefed on the contents of the Site Safety Plan prior to commencing that work. A copy of the Site Safety Plan is maintained at the work site and is available for reference by appropriate parties at all times. The Staff Geologist of Applied GeoSystems is the Site Safety Officer onsite and may stop work if he/she decides an unsafe situation exists. The work will resume as soon as the situation is resolved. Underground Service Alert (USA) will be notified of our intent to drill, and underground utility lines and structures known to USA

or made known to us by the client will be approximately marked prior to drilling or excavation.

Soil Borings

Three borings, in which monitoring wells will be constructed, will be located west of the ARCO station building. One boring (monitoring well) will be located within 10 feet of the former waste oil tank, as requested by ACDEH in their May 4, 1989 letter. The other two soil borings (monitoring wells) will be located approximately forty to fifty feet west and northwest (the assumed downgradient direction is based on information provided by Zone 7 Alameda County Flood Control and Water Conservation District) of the former waste oil tank, as shown on Plate P-2. These locations will enable us to evaluate the site ground-water gradient, and investigate the lateral extent of soil and ground-water contamination.

The borings will be drilled with a CME-55 (or equivalent) truck-mounted drill rig using 10-inch-diameter, hollow-stem augers. The augers will be steam-cleaned prior to drilling each boring to minimize the possibility of cross-contamination. A geologist will log materials (using the Unified Soil Classication System)

encountered in the borings during drilling.

Earth materials encountered in the borings will be logged by a geologist as drilling progresses, and described on boring logs for inclusion in the report.

Disposal of Soil Cuttings

Soil cuttings generated during drilling will be placed in 55-gallon 17H drums approved for this use by the Department of Transportation. Each drum will be individually labeled with a "pending" label. The pending label will indicate the drum identification number, type of material present (soil or water), type of suspected contaminant, approximate field-detected contaminant level (not detected, less than 100 ppm, 100 to 1,000 ppm, or greater than 1,000 ppm), depth of origin, and accumulation date. Upon receipt of the laboratory soil analyses, the drums will then be individually labeled either nondetectable, non-hazardous, or hazardous. The soil cuttings will remain the responsibility of ARCO and will be disposed of in an appropriate manner after verbal contact with ARCO's Project Environmental Engineer or Hazardous Waste Coordinator.

Soil Sampling

Soil samples for possible laboratory analysis will be collected from each boring at intervals no greater than 5 feet. These soil samples will be 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 into the soil through the hollow center of the auger. The sampler will be driven 18 inches with a standard 140-pound hammer repeatedly dropped 30 inches. The number of blows to drive the sampler each successive 6 inches will be counted and recorded to evaluate the relative consistency of the soil.

During drilling, soil samples collected from the borehole will be subjectively evaluated before laboratory analysis. Subjective evaluation will be based on the presence of soil discoloration and on measurements made using an OVM. The samples selected for laboratory analysis will be removed from the sampler and promptly sealed in their brass sleeves with aluminum foil, plastic caps, and aluminized duct or teflon tape. The samples will then be labeled, placed in iced storage, and delivered to a laboratory certified by the state to perform the types of analyses requested.

Chain of Custody Records for the samples tested will be initiated in the field, and maintained throughout handling of the samples.

Well Construction and Development

Ground-water monitoring wells will be constructed in the soil borings to enable evaluation of the presence of hydrocarbons and metals in the first-encountered water-bearing zone at the site. The wells will be constructed of 2-inch-diameter, thread-jointed, polyvinyl chloride (PVC) casing. No chemical cements, glues, or solvents will be used in well construction. The bottom of each casing will have a threaded end plug, and the top will have a locking plug.

The screened portion of the well will consist of factory-perforated casing. Selection of well screen will be based on observation of the stratigraphic units encountered. The screened section will extend from approximately the total depth of each boring to approximately 5 feet above the upper zone of saturation (as necessary, based on the hydrostratigraphic units encountered) to allow monitoring during seasonal fluctuations of ground-water levels.

The annular space of each well will be backfilled with a filter pack to approximately 2 feet above the perforations. The filter pack will also be selected based on particle-size analysis of the soil stratigraphic units encountered. A 1-foot-thick bentonite plug will be placed above the sand as a seal against cement entering the filter pack. The remaining annulus will be backfilled with a slurry of water, neat cement and bentonite to approximately 1 foot below the ground surface. Graphic logs of the well constructions will be noted on the boring logs for inclusion in the final report.

An aluminum utility box with a PVC apron will be placed over each well head and set in concrete placed flush with the surrounding ground surface. The well-head cover will have a watertight seal to protect the ground-water monitoring well against surface-water infiltration, and will require a specially designed spanner wrench to open. This design discourages vandalism and reduces the possibility of accidental disturbance of the well.
The wells will be developed by air-jetting or surge-pumping.

Ground-Water Sampling

The wells will be allowed to equilibrate for at least 48 hours after development. The liquid in the wells will then be checked for visual evidence of hydrocarbon contamination. Any subjective evidence of product detected in the well will be recorded. If floating product is encountered in a well, the well will not be purged or sampled. If no floating product is observed in a well, a sample of the formation water will be collected after the well is purged. The well will be purged of at least three well volumes of water or until consistent pH, conductivity, and T measurements observed. Wells that are dewatered will be allowed to recover to 80 per cent of the static water level prior to sampling. The wells will then be sampled using a stainless steel bailer cleaned with Alconox and rinsed with tap water and deionized water.

The water samples will be sealed in laboratory-cleaned, 1-liter and 40-milliliter glass vials with Teflon-lined lids. The samples will then be labeled and promptly placed in iced storage. A Chain of Custody Record will be initiated by the geologist, maintained throughout sample handling, and will

accompany the samples to a laboratory certified by the State of California for the types of analyses requested.

Laboratory Analyses

Selected soil and ground-water samples will be analyzed in a State certified laboratory according to the following guidelines:

(a) Soil samples with vapor readings which register on the OVM will be analyzed for total petroleum hydrocarbons (TPH - high boiling range) by modified EPA Method 8015, benzene, toluene, ethylbenzene, and xylene (BTEX) by EPA Method 8020, and total petroleum oil and grease (TOG) by Standard Method 503E.

(b) Ground water samples will be analyzed for TPH (high and low boiling), TOG, lead, chromium, zinc, and semi-volatile organic compounds.

Lead, chromium, zinc, semi-volatile organic compounds, VOCs, and low boiling range hydrocarbons (LBHC) will not be analyzed in soil samples due to their low or non-detected concentrations in the tank pit (LBHC's will be analyzed for only if field OVM readings suggest their presence). VOC's were not detected in the tank pit by PACIFIC, therefore, ground water analytical work will not include testing for these substances. Detection limits suitable for the test methods requested and concentrations detected will be stated on the laboratory reports.

Evaluation of Ground-Water Gradient

Ground-water elevations will be measured to evaluate the ground-water gradient. The elevation of the top of each well casing will be referenced to National Geodetic Vertical Datum by a licensed land surveyor. The static water levels will be measured with a water-level indicator to the nearest 0.01-foot to allow calculation of the differences in water-level elevations between the wells. The water-level elevation differences will be interpreted to construct a ground-water gradient map. The ground-water gradient and direction of ground-water flow will be evaluated from this map.

Report Preparation

A report will be provided summarizing the analytical results, interpretations, and our recommendations for further delineation work (if necessary). Our report will include boring and well location logs, cross sections, chain of custody records, and site plans. Information gathered during all phases of work will be considered confidential and released only upon the authorization of ARCO.

SCHEDULE OF OPERATIONS

Prior to drilling the borings and constructing monitoring wells at the site, permits will be acquired from the Zone 7 Alameda County Flood Control and Water Conservation District. We anticipate soil boring and monitoring well construction will be scheduled for mid-to-late August 1989 (depending upon timely response to our application for drilling permits and the availability of a licensed drilling contractor). Drilling will be performed as approved by the Zone 7 Alameda County Flood Control District, the ACDEH, and the Regional Water Quality Control Board. Well development and sampling will take place shortly after well installation. All laboratory analytical will be completed on a two week turnaround time. We expect to have a report completed for this phase of work by mid-to-late October.

PROJECT STAFF

Ms. Gillian S. Holmes, a Registered Geotechnical Engineer (G.E. 2023) in the State of California, and Mr. Greg Barclay, Project Branch Manager, will be in overall charge of this project. Mr. George Williams, Assistant Project Geologist, will manage field and office operations of the project.

Applied GeoSystems employs a staff of geologists and technicians who will assist as needed to see the project to completion.

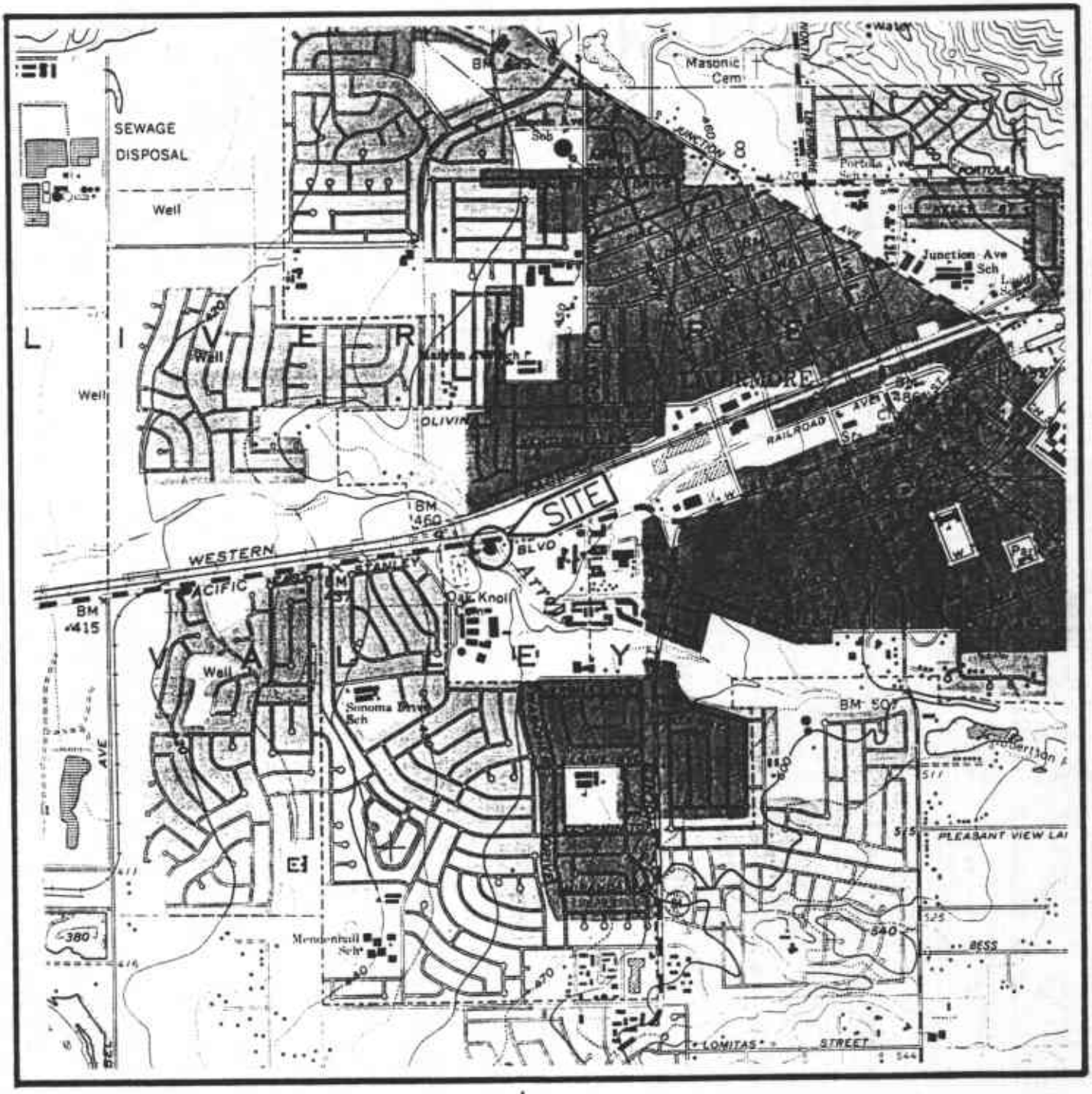
REFERENCES

California Department of Water Resources, 1966, "Evaluation of ground water resources, Livermore and Sunol Valleys"; Appendix A: Geology: California Department of Water Resources Bulletin No. 118-2.

California Department of Water Resources, 1974, "Evaluation of ground water resources, Livermore and Sunol Valleys"; Appendix A: Geology: California Department of Water Resources Bulletin No. 118-2.

Pacific Environmental Group, April 25, 1989. ARCO Station No. 6113, 785 East Stanley Boulevard, Livermore, California. Project 330-53.01.

Zone 7, Alameda County Flood Control and Water Conservation District, Water Resources Engineering. Fall 1986. Water Level Contours; 1 inch = 3000 feet scale map.



Source: U.S. Geological Survey 7.5-Minute Quadrangle

N

Approximate Scale

2000 1000 0 2000 4000

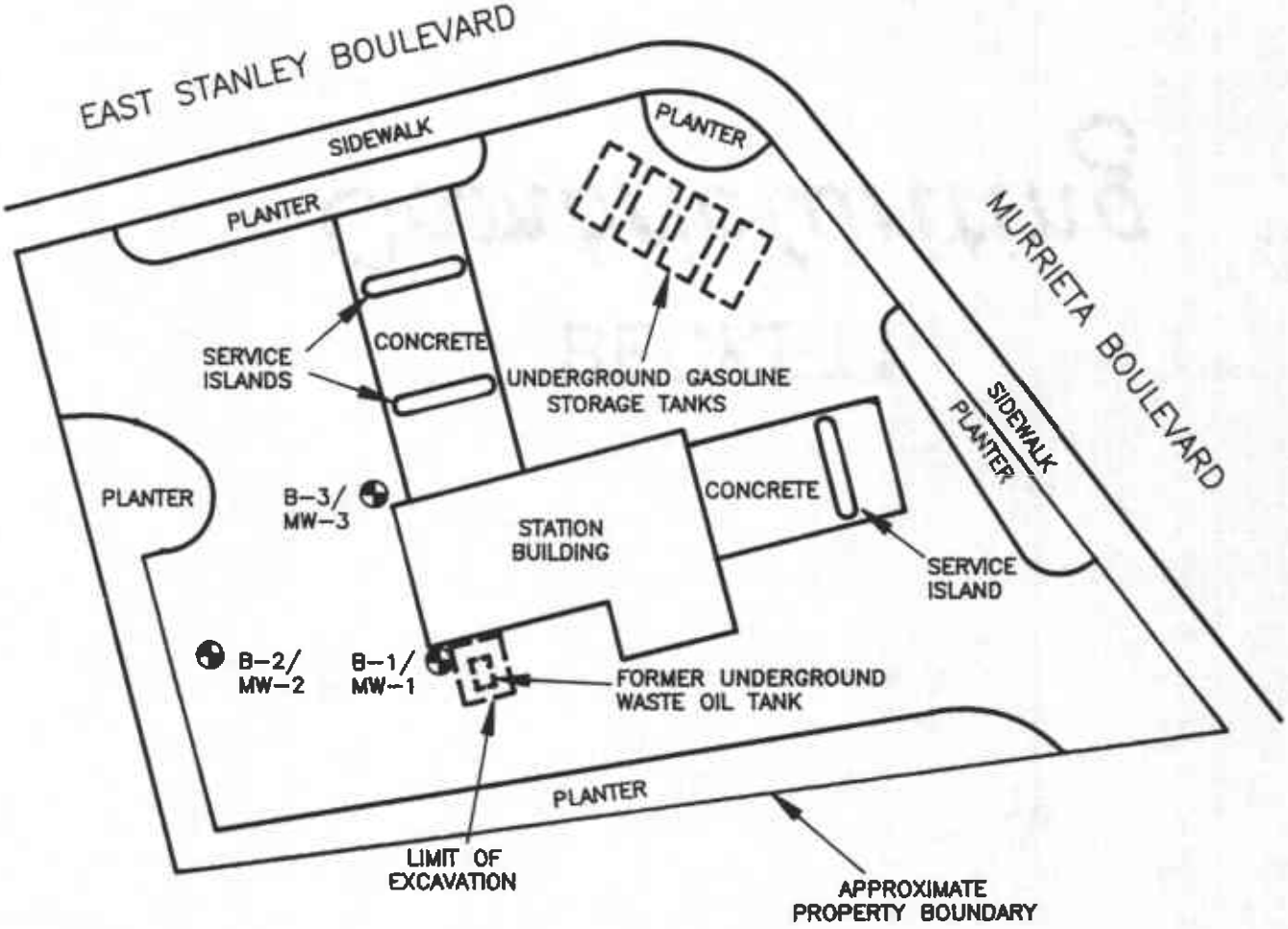
feet

Applied GeoSystems

PROJECT NO. 69028-1

SITE VICINITY MAP
ARCO Service Station No. 6113
785 East Stanley Boulevard
Livermore, California

PLATE
P - 1



B-3/ MW-3 = Approximate location of proposed boring/monitoring well

Approximate Scale

40 20 0 40 80

feet

Source: Modified from plan supplied by Arco

Applied GeoSystems

PROJECT NO. 69028-1

GENERALIZED SITE PLAN
ARCO Service Station No. 6113
785 East Stanley Boulevard
Livermore, California

PLATE

P - 2