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WORK PLAN
SUPPLEMENTAL SUBSURFACE ENVIRONMENTAL INVESTIGATION
at
ARCO Station No. 0374
Telegraph and Alcatraz Avenues
Oakland, California

AGS Job No. 018039-3W

Report prepared for

ARCO Products Company
P.O. Box 5811
2000 Alameda de las Pulgas
San Mateo, California 94403

by
Applied GeoSystems

John T. Lambert
Project Geologist

Gillian Holmes
G.E. 2023

September 11, 1988

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AGS 18039-3W
September 11, 1988

Mr. Kyle Christie
ARCO Products Company
2000 Alameda de las Pulgas
P.O. Box 5811
San Mateo, California 90071

Subject: Transmittal of Work Plan No. 018039-3W, Subsurface Environmental Investigation at ARCO Station No. 0374, Telegraph Avenue and Alcatraz Avenue, Oakland, California.

Mr. Christie:

This Work Plan summarizes the results of previous environmental investigations performed at the above-referenced site and proposes additional work necessary to evaluate hydrocarbon contamination of soil and ground water.

The proposed work includes drilling three soil borings, constructing a 4-inch-diameter ground-water monitoring well in each boring, developing each well and one of the existing tank pit wells, and sampling water from each of these wells for laboratory analysis. The elevation of each of the wells will be surveyed, and the ground-water gradient will be evaluated. On completion of the work, we will prepare a report that documents field methodology and presents our findings, conclusions, and recommendations. This work was requested by ARCO personnel to evaluate the lateral and vertical extent of dissolved hydrocarbon contamination in ground water at the site.

We recommend that ARCO Products Company submit a copy of this Work Plan to Mr. T. M. Gerow of the Alameda County Environmental Health Department, 80 Swan Way, No. 200, Oakland, California 94621 and Mr. Greg Zentner of the California Regional Water Quality Control Board, 1111 Jackson Street, Room 6040, Oakland, California 94621.

Sincerely,
Applied GeoSystems

John T. Lambert
Project Geologist

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WORK PLAN
SUPPLEMENTAL SUBSURFACE ENVIRONMENTAL INVESTIGATION
at
ARCO Station No. 0374
Telegraph Avenue and Alcatraz Avenue
Oakland, California

For ARCO Products Company

INTRODUCTION

This Work Plan outlines a supplemental subsurface environmental investigation at ARCO Service Station No. 0374 in Oakland, California. The purpose of this investigation is to evaluate the extent of hydrocarbon contamination in the soil and ground water at the site. The Work Plan was requested by Arco Products Company because contamination was found in soil and water samples collected during a previous environmental investigation related to the removal of four underground gasoline storage tanks at the site between June 7 and 10, 1988.

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LETTER TRANSMITTAL

JOB NUMBER: 018039-3

SEND TO: Mr. T. M. Gerow

DATE: 13th September 1988

OF: Alameda County Dept. Health

ENCLOSURES	NO. OF COPIES
Work Plan, Supplemental Subsurface Environmental Investigation at ARCO Station No 0376, Telegraph and Alcatraz Avenues, Oakland, CA.	1

COMMENTS:

BACKGROUND

ARCO Station No. 0374 is an operating service station located on the northwest corner of the intersection of Telegraph Avenue and Alcatraz Avenue in Oakland, California. The location of the site is shown on the Site Vicinity Map, Plate P-1. The property and approximate locations of selected features at the site are shown on the Generalized Site Plan, Plate P-2.

The site is situated on a relatively flat, asphalt- and concrete-covered lot. Apartments are located adjacent to the west and north sides of the service station. Small shops and apartments are located across Telegraph and Alcatraz Avenues to the east and south of the site, and an abandoned service station is located on the southeast corner of the intersection of Telegraph and Alcatraz Avenues.

Four underground petroleum-product storage tanks were located along the west side of the site, as shown on Plate P-2. We understand that the tanks were used to store regular, unleaded, and supreme-unleaded gasoline for retail sale. These tanks were excavated and removed from the site in June 1988 (Applied GeoSystems Report No. 018039-2, dated August 1, 1988). Three new

12,000-gallon-capacity fiberglass tanks were installed in a new tank pit excavated at the northeast corner of the property.

PREVIOUS WORK

Applied GeoSystems performed a limited site assessment in April 1988 to evaluate the extent of soil contamination in the vicinity of the underground storage tanks (Applied GeoSystems Report No. 018039-1, dated May 1, 1988). This work involved drilling four soil borings near the underground storage tanks. The locations of the borings are shown in Plate P-2. The results of the laboratory analyses of soil samples collected are summarized in Table 1 and they show generally elevated levels of total petroleum hydrocarbons.

Applied GeoSystems performed an environmental investigation related to the underground tank removal (Applied GeoSystems Report No. 018039-2, dated August 1, 1988). Soil samples were collected from beneath the ends of each tank, and a water sample was collected from ground water encountered in the excavation. The results of laboratory analyses of these samples are summarized in Table 2. Two wells were installed in the vicinity of the cluster of old tank pits and two wells were installed in the new tank pit when these pits were backfilled. The locations of

the wells are shown on Plate P-2.

TABLE 1
RESULTS OF LIMITED SITE ASSESSMENT
ARCO Service Station No. 0374
Telegraph Avenue and Alcatraz Avenue
Oakland, California
(April 8, 1988)

Sample Number	Total Petroleum Hydrocarbons	Detection Limits
S-05-B1	165	2
S-10-B1	48	2
S-05-B2	260	2
S-8.5-B2	60	2
S-05-B3	64	2
S-09-B3	62	2
S-05-B4	389	5
S-8.5-B4	930	10

Results in milligrams per kilogram (mg/kg), or parts per million (ppm)
Total petroleum hydrocarbons analyzed by modified Environmental Protection Agency (EPA) Method 8015
Sample identification:

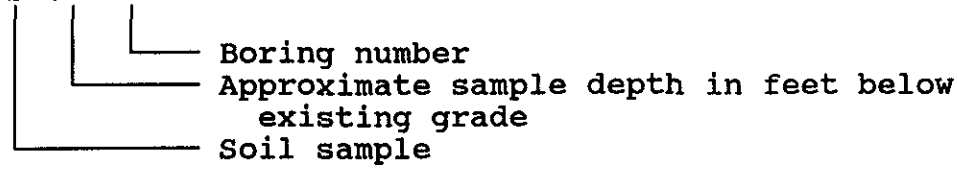
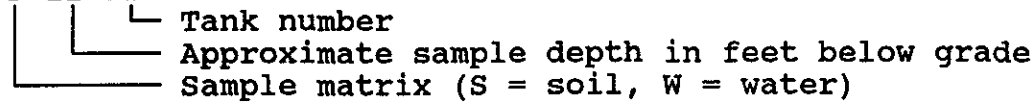


TABLE 2
RESULTS OF SOIL AND WATER SAMPLES
FROM TANK-PIT EXCAVATIONS
ARCO Service Station No. 0374
Telegraph Avenue and Alcatraz Avenue
Oakland, California
(7 June, 1988)

Sample Number	TPH	Benzene	Ethyl-benzene	Toluene	Total Xylenes
S-11-T1A	399	14.7	20.0	20.5	91.9
S-11-T1B	8	2.57	0.74	0.39	2.75
S-12-T2A	4	0.35	0.10	0.38	0.70
S-12-T2B	75	0.91	1.77	3.61	11.92
S-12-T3A	4	2.54	0.13	<0.05	0.13
S-12-T3B	<2	<0.05	<0.05	<0.05	<0.05
S-12-T4A	1,097	16.3	34.5	81.6	188.2
S-12-T4A2*	795	23.1	24.9	67.1	130.9
S-12-T4B	3	0.76	<0.05	<0.05	<0.05
W-13-PIT	3.6	0.738	0.038	0.154	0.566

Soil results in milligrams per kilogram (mg/kg), or parts per million (ppm)
TPH = Total petroleum hydrocarbons
< = Less than the detection limit for the method of analysis
* = Resample of area near sample T4A following additional excavation
Sample identification:



REGIONAL AND LOCAL HYDROGEOLOGY

The site is located on the East Bay Alluvial Plain, near the base of the East Bay Hills, at an elevation of approximately 160 feet above mean sea level. The site is underlain by late Pleistocene alluvial deposits that consist of poorly sorted silt, sand, and gravel deposits (Helley et al., 1979). The site area is underlain by a complex distribution of continuous and discontinuous perched layers and aquifers which vary from a few to tens of feet in thickness. The shallow soils at the site consist of silty and sandy clay. The local ground-water table was encountered at a depth of approximately 11 and 14 feet below the ground surface at the time of the underground tank excavation. Based on local topography ground water is inferred to flow in a west-southwest direction.

SAFETY PLAN

The following safety procedures will be followed during the recommended drilling at ARCO Station No. 0374. Underground Service Alert will be notified of our intent to drill, and underground utility lines and structures will be appropriately marked prior to beginning drilling.

A organic vapor meter (OVM) will be onsite to evaluate organic vapor emitted from soil and water during drilling. The OVM is capable of detecting organic vapor in concentrations less than 1 part per million (ppm) to concentrations that are indicative of explosive environments.

Appropriate protective clothing will be worn by field personnel. Clothing will include (but will not be limited to) hard hats, safety glasses, Tyvek coveralls, and steel-toed rubber boots. Neoprene gloves will be worn by field personnel who will be in contact with soil and water samples. Respirators will be available at the site if strong hydrocarbon vapor is encountered during drilling.

A first-aid kit will be available at the site. If emergency care is needed, the nearest medical facility is Alta Bates Hospital located at 3001 Colby Road, Berkeley, California. This facility is approximately 0.5-mile from the site.

Prior to initiation of the field program, a Health and Safety Officer will be assigned to the site. The officer will barricade the site during the field work and will arrange a safety meeting with field personnel to advise personnel on safety procedures.

DELINEATION OF HYDROCARBON CONTAMINATION

We propose to drill three soil borings and construct a 4-inch-diameter ground-water monitoring well in each boring. One boring will be located at the southeast corner of the site, one boring will be located north of the station building in the inferred downgradient direction of the new tank pit, and one boring will be located offsite on Alcatraz Avenue to the west of the property boundary. These borings will be used to gather data on the type and distribution of the underlying soil and to evaluate the extent of hydrocarbon contamination in the soil. The ground-water monitoring wells will be used to evaluate the origin and level of hydrocarbon contamination in the ground water. Well W-1 will be used as a monitoring well to sample the ground water near the area where the highest levels of soil contamination were detected during the tank removal. The locations of the proposed ground-water monitoring wells and well W-1 are shown on the Plate P-3.

The proposed work will include the following activities:

1. Observe drilling of three borings, each to a depth of approximately 26 feet.

2. Collect and classify relatively undisturbed soil samples taken at 5-foot intervals from the ground surface to total depth of each the boring.

3. Submit the soil sample with the highest OVM reading and the deepest unsaturated soil sample collected from each boring to a State-certified laboratory to be analyzed for hydrocarbon constituents.

4. Construct and develop a 4-inch-diameter ground-water monitoring well in each borehole.

5. Purge the newly constructed wells and one of the tank-pit wells and collecting water samples.

6. Submit one water sample from each newly constructed well and the purged tank-pit well to a State-certified laboratory to be analyzed for total petroleum hydrocarbons (TPH) and the hydrocarbon constituents benzene, ethylbenzene, toluene, and total xylene isomers (BETX).

7. Evaluate the elevation of each well and calculate the local ground-water gradient using relative ground-water elevations.

8. Interpret field and laboratory data and preparing a report summarizing our findings, conclusions, and recommendations.

Soil Boring

Each boring will be drilled with a 10-inch-diameter, hollow-stem auger using a Mobile B-57 (or equivalent) truck-mounted drill rig. The augers will be steam-cleaned prior to drilling each boring to minimize the possibility of cross-contamination.

The boring will be drilled until first ground water is encountered. Each boring will extend into the aquifer either 15 feet or to a competent clay layer or aquitard. To test the competence of the aquitard or clay layer, the borehole will be drilled up to 5 feet into the clay. The excess hole will be backfilled with either bentonite or neat cement placed using a tremie method, and the monitoring well will be completed in the aquifer above this backfill. If the first saturated material is greater than 15 feet thick, the boring (and ground-water monitoring well) will be completed at a depth of 15 feet below the top of the saturated material.

A geologist will log the materials encountered in the boring during drilling on a field borehole log; examples of the field borehole log and the Log of Boring plate used in our report are attached to this Work Plan.

Drill cuttings subjectively evaluated as having hydrocarbon contamination levels greater than 100 ppm will be separated from those subjectively evaluated as having hydrocarbon contamination levels less than 100 ppm. Subjective evaluation will be based on the presence of soil discoloration and on measurements from the OVM. Field instruments such as the OVM are capable of evaluating relative concentrations of vapor content but cannot be used to

measure levels of contamination. Drill cuttings will be aerated onsite and disposed of at an appropriate landfill.

Soil Sampling

Soil samples will be collected at 5-foot intervals in the borings. The relative vapor content of the soil samples will be measured using an OVM and recorded on the boring logs. 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 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.

The soil samples will be removed from the sampler and immediately sealed in their brass sleeves with aluminum foil, plastic caps, and airtight tape. The samples will then be labeled, placed in iced storage, and delivered to a laboratory that is certified by the State of California to perform the types of analyses requested. Chain of Custody Records for the samples tested will be included with the final report; an example of a Chain of

Custody Record is attached to this Work Plan.

Monitoring Well Construction and Development

A 4-inch-diameter well will be constructed in each soil boring to evaluate and monitor ground-water conditions at the site. The well will be completed to a depth of approximately 15 feet below the first occurrence of ground water.

The well will be constructed of thread-jointed, polyvinyl chloride (PVC) casing. No chemical cements, glues, or solvents will be used in well construction. The bottom of the casing will have a threaded end plug, and the top will have a slip cap. The screened portion of the well will consist of factory-perforated casing with 0.020-inch-wide slots. The well screen will extend from the total depth of the well to approximately 5 feet above the upper zone of saturation to allow monitoring during seasonal fluctuations of ground-water levels.

The annular space of the well will be packed with sorted and washed sand to approximately 2 feet above the perforated interval. A 1-foot-thick bentonite plug will be placed above the sand as a seal against cement entering the sand pack. The remaining annulus will be backfilled with a slurry of water, neat

cement, and bentonite to approximately 1 foot below grade. A graphical log of the well construction will be provided on the boring logs in the final report.

An aluminum utility box with a PVC apron will be placed over each well head and secured in place with concrete set 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.

Ground-Water Sampling

The well will be developed by air-jetting or surge pumping. The wells will be allowed to equilibrate after developing. A bailer will then be used to obtain a sample from the surface of the water in each of the newly constructed wells and tank-pit well W-1 for subjective evaluation prior to purging. If floating hydrocarbon product is detected, the thickness of the product will be measured and the well will not be purged. If floating product is not observed, the well will then be purged of approximately four well volumes of water before collecting a

water sample for laboratory analysis.

Following ground-water recovery to static conditions, a water sample will be retrieved from each well that does not contain floating product by using a Teflon bailer. The bailer will be cleaned with distilled water and Alconox between each sampling to prevent cross-contamination. The water samples will be sealed in laboratory-cleaned glass containers with Teflon-lined lids, labeled and immediately placed in iced storage. Chain of Custody Records will be initiated by the geologist and will accompany the samples to a State-certified analytical laboratory. Copies of the Chain of Custody Records will be included in our final report; an example of a Chain of Custody Record is attached to this Work Plan.

The purged water will be pumped into 55-gallon holding drums and temporarily stored onsite. Based on the results of the laboratory analyses, the water will be disposed of in a manner acceptable to the Alameda County Department of Environmental Health.

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 certified surveyor. The static-water levels will be measured with the water-level indicator to the nearest 0.01-foot, to calculate the differences in water-level elevations between the wells. The elevation differences will be used to construct a ground-water potentiometric surface map of the site. The ground-water gradient will be measured and direction of ground-water flow will be evaluated from this map.

Analytical Methods

Soil samples selected for testing will be analyzed for TPH in accordance with Environmental Protection Agency (EPA) Method 8015 modified for gasoline. Water samples will be analyzed for TPH and BTEX using EPA Methods 8015 and 602, respectively. Detection limits suitable for the tests requested will be stated on the laboratory analytical reports. Analyses will be facilitated through solvent extraction, gas chromatography separation, and photoionization and flame-ionization detection.

Report Preparation

A report will be provided to ARCO Products Company summarizing soil stratigraphy, field and laboratory procedures, well construction details, laboratory results, our interpretations regarding the source and extent of contamination, and recommendations for further work. Information gathered during the work will be considered confidential and released only with the authorization of ARCO Products Company.

PROJECT STAFF

Ms. Gillian S. Holmes, a Registered Geotechnical Engineer (G.E. 2023) in the State of California, will be in overall charge of this project. Mr. John Lambert, Project Geologist, will manage field and office operations for the work. Applied GeoSystems employs a staff of geologists and technicians who will be used as needed to see the project to completion.

REFERENCE CITED

Helley, E.S., Lajoie, K.R., Spangle, W.E., and Blair, M.L., 1979, Flatland deposits of the San Francisco Bay region, California, U.S. Geological Survey Professional Paper 943, 87p.

Source: U.S. Geological Survey
7.5-Minute Quadrangle
Oakland West/Oakland East
California
Photorevised 1980

N

Approximate Scale

2000 1000 0 2000 4000

feet

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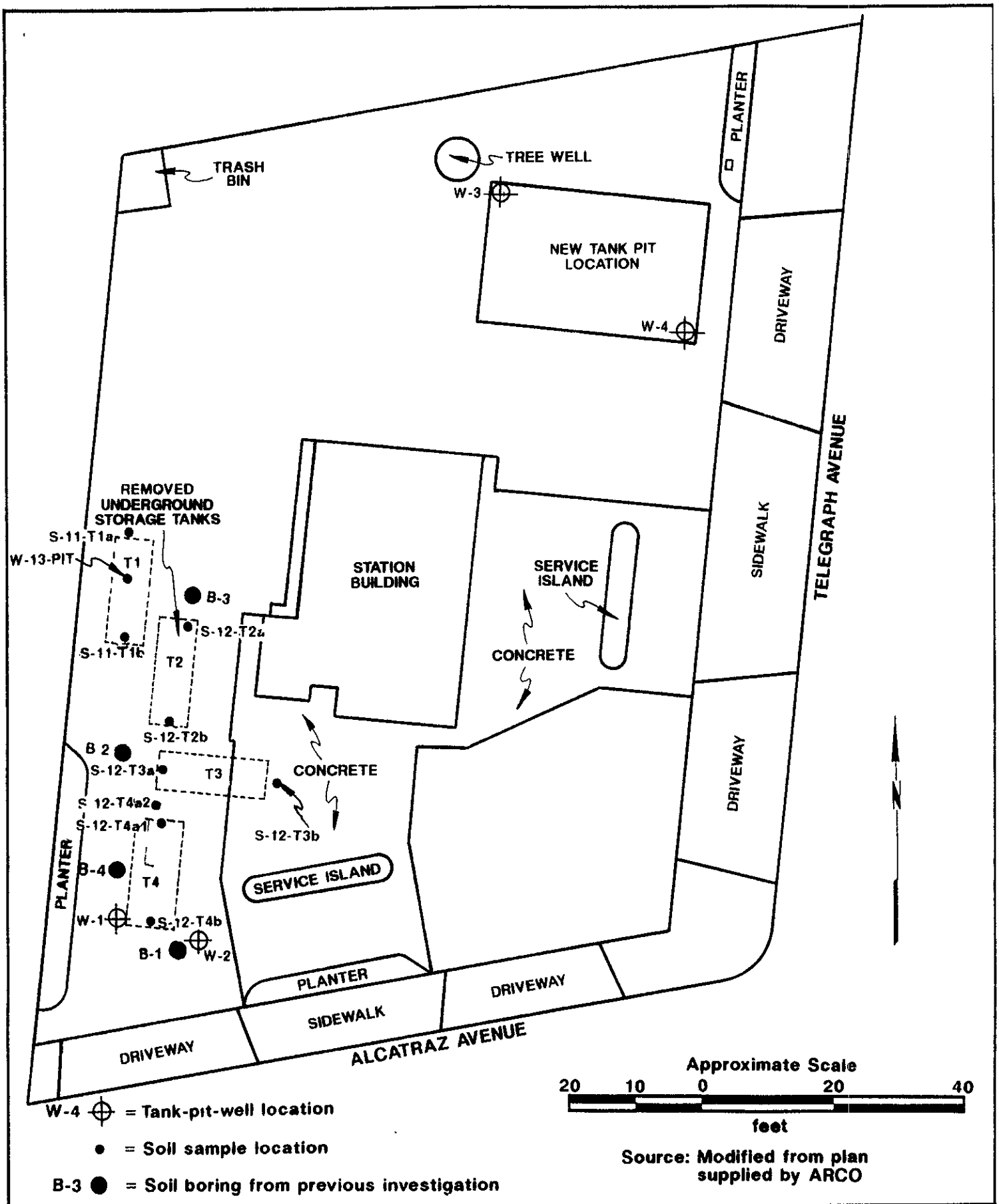
PROJECT NO. 18039-3

SITE VICINITY MAP
ARCO Station No. 0374
Telegraph and Alcatraz Avenues
Oakland, California

PLATE

P - 1



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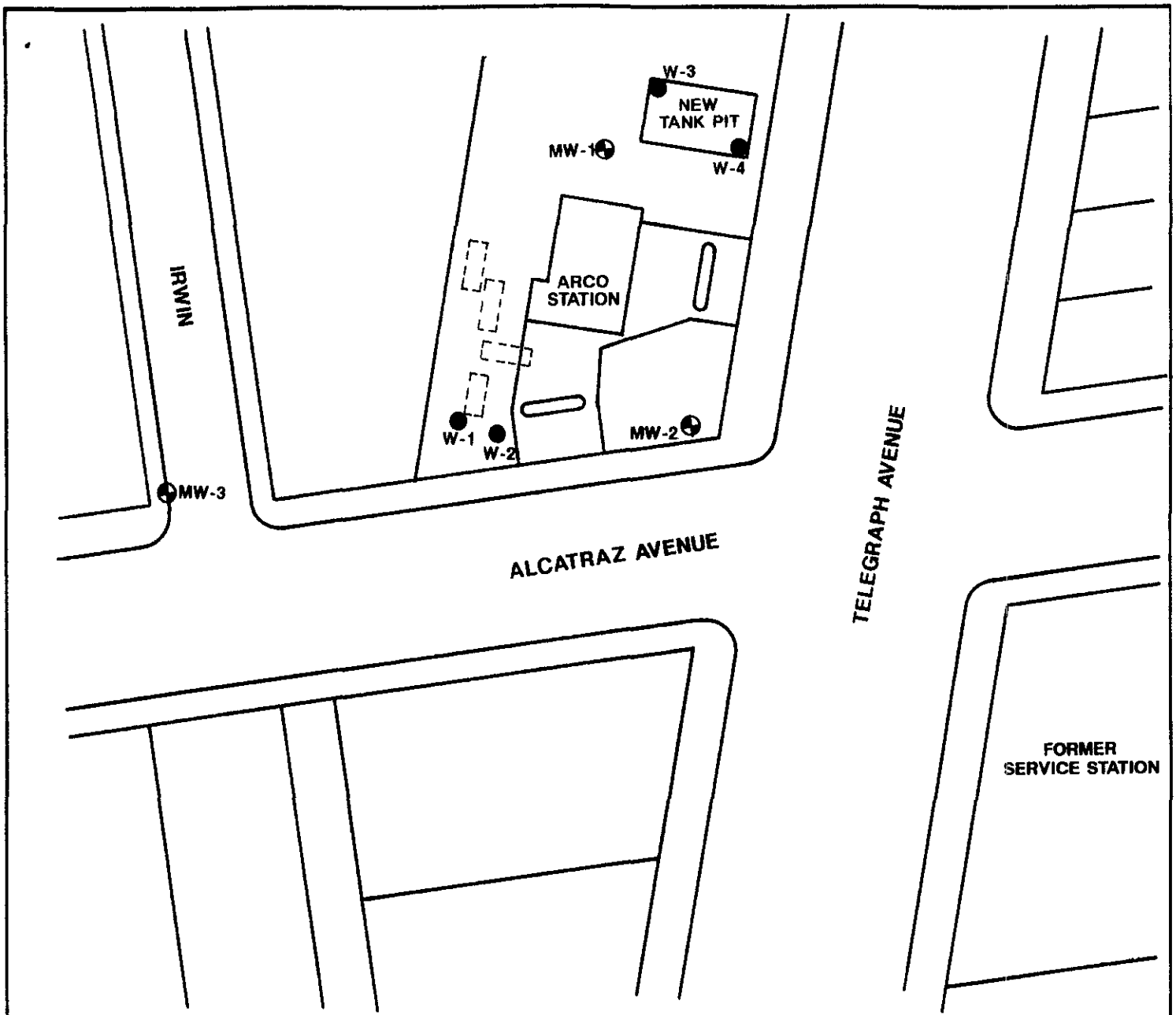
PROJECT NO. 18039-3

GENERALIZED SITE PLAN
ARCO Station No. 0374
Telegraph and Alcatraz Avenues
Oakland, California

PLATE
P - 2



[ ] = Former underground tank

◐ = Proposed monitoring well location

● = Well location

Source: Modified from Assessor's maps and ARCO site plan

N

Approximate Scale

50 25 0 50 100

feet

Applied GeoSystems

PROJECT NO. 18039-3

PROPOSED MONITORING WELL LOCATIONS
ARCO Station No. 0374
Telegraph and Alcatraz Avenues
Oakland, California

PLATE
P - 3