RESNA
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1/6/93

REPORT
SUBSURFACE ENVIRONMENTAL INVESTIGATION

Former Chevron Service Station No. 9-3575
5775 Broadway
Oakland, California

for

Chevron U.S.A. Products Company

1.0 INTRODUCTION

At the request of Chevron U.S.A. Products Company (Chevron), RESNA Industries Inc. (RESNA) performed a subsurface environmental investigation at Former Chevron Service Station No. 9-3575 located at 5775 Broadway, Oakland, California (Plate 1). Work RESNA performed during this investigation included drilling three soil borings, constructing groundwater monitoring wells in the borings, sampling soil and groundwater, chemically analyzing selected soil and groundwater samples, and preparing this report. The purpose of this investigation was to evaluate whether petroleum hydrocarbons are present in soil and ground water below the site at the locations of the borings.

2.0 BACKGROUND

The site located at 5775 Broadway in Oakland was formerly a Standard Oil service station. Information in Chevron's files indicates that four 1,000-gallon, one 7,500-gallon, and one 6,000-gallon underground gasoline storage tanks were removed from the site in April 1973. The site was later demolished, and is now an undeveloped lot.

2.1 Previous Work

Other consultants previously performed subsurface investigations at the site in January, March, November, and December, 1991, and June 1992. Work performed during these previous investigations included (1) excavating approximately 114 tons of soil containing oil and grease near the west corner of the site; (2) drilling six soil borings to bedrock (depths varied between six and17.5 feet below ground surface); (3) excavating additional soil at four areas to remove oil-and-grease-bearing soil detected during drilling; and (4) characterizing and disposing excavated soil at the Browning-Ferris Industries (BFI) landfill in Livermore, California. A total of 406 cubic yards of oil--and-grease-bearing soil was excavated from the site during previous investigations.

Following excavation, loose debris was cleaned from pit sidewalls and bottoms. This material was also disposed at the BFI landfill. We understand that total petroleum hydrocarbons as gasoline (TPHg), and benzene, toluene, ethylbenzene, and total xylene isomers (BTEX) were not detected in any of the samples collected from the six soil borings during drilling. We understand that total oil and grease (TOG) was not detected in each soil sample collected following the completion of soil excavation. Consultant reports presenting the results of previous investigations were submitted to Chevron.

3.0 FIELD INVESTIGATION

3.1 Site-Specific Health and Safety Plan/ Background Review/ Permitting

RESNA prepared a Site-Specific Health and Safety Plan required by the Occupational Health and Safety Administration (OSHA) Standard "Hazardous Waste Operations and Emergency Response" guidelines (29 CFR 1910.120). The Site-Specific Health and Safety Plan (HSP) was prepared by RESNA personnel, following a review of site conditions. The HSP was reviewed by the project manager, RESNA field personnel, and subcontractor personnel before beginning field operations at the site.

3.2 Soil Borings and Sampling

All applicable permits pertaining to drilling soil borings and installing groundwater monitoring wells were obtained prior to drilling from the Alameda County Flood Control & Water Conservation District, Zone 7. Copies of permits obtained by RESNA are in Appendix A.

During field operations, RESNA personnel followed standard operating procedures for drilling soil borings and installing groundwater monitoring wells. Standard operating procedures are presented in Appendix B. At Chevron's request, a geologist from RESNA was at the site on August 20 and 21, 1992, to observe Westex Drilling of West Sacramento, California, drill three soil/rock borings (B-1 through B-3) using a truck-mounted air-rotary drill rig. An air-rotary drill rig was used because indurated bedrock was known to occur at the site. Boring locations are shown on the Site Plan (Plate 2). Borings B-1 and B-3 were drilled to an approximate depth of 43 feet below ground surface; boring B-2 was drilled to an approximate depth of 38 feet below ground surface. Soil sampling equipment was washed in a solution of Alconox between samples to reduce the possibility of cross-contamination. Where appropriate, the field geologist logged the earth materials encountered during drilling using the Unified Soil Classification System. Materials encountered are presented on the boring logs (Appendix C). Drill cuttings were placed on plastic sheeting pending characterization and disposal.

During drilling, soil samples were collected at five-foot intervals and at noticeable stratigraphic changes using a 2- inch inside diameter, California-modified sampler lined with cleaned brass sleeves. The sampler was driven 18 inches ahead of the drill bit at each sample point. Soil samples were screened in the field using a photoionization detector (PID). Hydrocarbons were not detected by the PID in any of the soil samples collected during this investigation. Results of the PID screening are on the boring logs. At each sampling point, one sample was sealed with

aluminum foil, capped, taped with Teflon tape, and labeled. Samples were placed on ice in an insulated container for delivery under chain-of-custody protocol to a California-certified laboratory.

3.3 Monitoring Well Construction

Monitoring wells MW-1 through MW-3 were installed in borings B-1 through B-3, respectively. Monitoring wells were constructed of flush -threaded, 2-inch diameter, schedule 40 PVC casing and 0.020-inch-slot well screen. The well screen of monitoring wells MW-1 through MW-3 was installed between depths of 27-43 feet, 18-38 feet, and 23-43 feet, respectively. Well construction details are on the boring logs in Appendix D. A sand filter was placed around each well screen to a height of approximately 2 feet above the top of the screen. The wells were sealed with a two-feet-thick bentonite plug to prevent cement from entering the sand pack; the remaining annular space was filled to grade with a cement/bentonite slurry. At the request of Chevron, wellheads were completed inside a steel cylinder "stovepipe" extending about three feet above grade.

3.4 Monitoring Well Development and Sampling

Monitoring wells MW-1, MW-2, and MW-3 were developed by surging and pumping on August 26, 1992. The purpose of well development is to remove fine-grained sediments from the well and sand pack, produce an evenly distributed sand filter pack, and improve ground-water flow to the well. Fine-grained sediments were removed from each well by pumping. Development water was retained on site in a DOT-approved 55-gallon drum pending disposal.

On November 10, 1992, RESNA personnel measured the depth-to-water in each well using an interface probe. The interface probe consists of an optical sensor and electrical conductivity probe which distinguishes between water and petroleum products. Free phase petroleum hydrocarbons were not detected in any of the wells. Before collecting ground-water samples, RESNA personnel purged approximately three well casing volumes of water from the wells using a bailer. Ground water samples were collected following groundwater recovery for a time sufficient to allow collection of representative samples. Ground-water samples were collected using a Teflon bailer cleaned with a solution of Alconox and rinsed with tap water and distilled water. Immediately before collection of water samples, a distilled water rinsate blank was collected from the Teflon bailer. A trip blank was also prepared and accompanied the ground-water samples to the analytical laboratory. Each sample was preserved with hydrochloric acid, labeled, and placed on ice in an insulated container for delivery under chain-of-custody protocol to a California-certified laboratory. Purge water generated during ground-water sampling was stored in a DOT-approved purge water trailer and transported to Chevron's Refinery in Richmond, California for recycling.

At Chevron's request, a technician from RESNA returned to the site on November 25, 1992, to resample groundwater from monitoring well MW-3. On that date our technician collected a groundwater sample from well MW-3 using the methods described above.

4.0 LABORATORY ANALYSES

A limited number of soil/rock samples were analyzed because (1) drilling and sampling occurred primarily in a bedrock environment; (2) no hydrocarbons were detected by the PID during drilling; and (3) imported fill was present over much of the site. Soil samples selected for laboratory analysis included samples collected from a depth of 20.9 feet in boring B-1, 22.8 feet in boring B-2, and 30.5 feet in boring B-3. Each selected sample was analyzed for total petroleum hydrocarbons as gasoline (TPHg) and diesel (TPHd) using modified Environmental Protection Agency (EPA) Method 8015, benzene, toluene, ethylbenzene and xylenes (BTEX) using EPA Method 8020, halogenated volatile organics (HVO's) using EPA Method 8010, total oil and grease using Standard Method 5520F, and the metals cadmium, chromium, lead, nickel, and zinc using EPA Method 6010. One soil sample was also analyzed for organic lead using the California Department of Health Services (DHS) method described in the LUFT manual. Ground-water samples were analyzed for TPHg and TPHd, BTEX, and TOG using EPA Methods 8015 (modified) and 602, and Standard method 5520F, respectively.

5.0 SITE CONDITIONS

5.1 Geology and Hydrogeology

Sandy gravel fill was encountered at the locations of borings B-1 and B-2; fill thickness ranged from 2 to 5-1/2 feet. A green-to-brown, very dense, indurated mudstone was encountered underlying the fill at the location of borings B-1, and at the surface at the location of boring B-3. At the location of boring B-1, a green, fractured metamorphic rock (possibly serpentinite) was encountered underlying the mudstone at a depth of about 25 feet and was present to the total depth of the boring. At the location of boring B-2 a dark brown gravelly sand was present below surface fill from depths between 5-1/2 to 10-1/2 feet. Weathered, green very dense bedrock was encountered below the sandy gravel and extended to the total depth of the boring. Weathering of bedrock had produced varying amounts of clay, sand and gravel. At the location of boring B-3 mudstone extended from the surface to the total depth of the boring with local lenses of sandy clay to clayey gravel. Descriptions of the materials encountered are on the boring logs in Appendix D. During drilling, ground water was first encountered in boring B-1 at a depth of about 41 feet and in boring B-2 at a depth of about 27 feet. Groundwater was not encountered during drilling of boring B-3. However, following well installation, on November 10, 1992, groundwater was present in monitoring well MW-3 at an approximate depth of 33 feet. The presence of groundwater in monitoring well MW-3 is probably due to groundwater seepage through bedrock fractures. On November 10, 1992, depth to groundwater in monitoring wells MW-1 and MW-2 was approximately 15 and 16 feet, respectively.

5.2 Groundwater Gradient

The elevation of each wellhead with respect to mean sea level was surveyed by Moldenhauer Engineering Company (Moldenhauer) of Davis, California (licensed land surveyor). Because groundwater was not encountered during drilling of boring B-3, at Chevron's request, Moldenhauer also surveyed the location and elevation of one groundwater monitoring well (SHELL-3) at a Shell service station adjacent to the site. Well survey data are in Appendix C.

These data were combined with the depths to groundwater measured on November 10, 1992, to evaluate the elevation of the ground-water surface in each well and the ground-water gradient across the site. A map of the potentiometric surface at the site is presented in Figure 3. Because the groundwater elevation in monitoring well MW-3 was anomalous (approximately 17 feet lower than other wells), it was not used to compile Plate 3. Data used to compile the Potentiometric Map is presented in Table 1. Based on these data, the interpreted groundwater flow direction at the site is to the southeast with an evaluated gradient of approximately 0.013 feet per foot.

6.0 ANALYTICAL RESULTS

6.1 Soil

Results of all soil samples analyses are summarized in Table 2. Laboratory analytical results are included in Appendix E. TPHg, TPHd, BTEX, and TOG were not detected in any of the chemically analyzed soil samples. Six parts per billion chloroform was detected in one soil sample. Metals were detected at the concentrations indicated in Table 1.

6.2 Groundwater

TPHg and BTEX were not detected in ground-water samples collected from monitoring wells MW-1 and MW-2. On November 10, 1992, a TPHg concentration of 53 parts per billion (ppb) and a benzene concentration of 1.7 ppb was detected in the ground-water sample collected from monitoring well MW-3. On November 25, 1992, TPHg and BTEX were not detected in the groundwater sample collected from monitoring well MW-3. Results of all ground-water sample analyses are summarized in Table 3; laboratory analytical reports are included in Appendix D.

7.0 LIMITATIONS

This report was prepared in accordance with generally accepted standards of environmental geological practice in California at the time this investigation was performed. This investigation was conducted solely for the purpose of evaluating environmental conditions of soil and ground water beneath the site. No soil engineering or geotechnical recommendations are implied or should be inferred. Evaluation of the geologic conditions at the site for the purpose of this investigation is made from a limited number of observation points. Subsurface conditions may vary away from the data points available. Additional work, including further subsurface investigation, can reduce the inherent uncertainties associated with this type of investigation.

8.0 REFERENCES

RESNA Industries Inc., July 27, 1992, *Work Plan for Evaluation of Soil and Groundwater at Chevron Service Station No. 9--3575, 5775 Broadway, Oakland, California*. RESNA 17046-1W

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Table 1

SOIL ANALYTICAL RESULTS
Chevron Service Station No. 9-3575
5775 Broadway
Oakland, California

Analyte	B-1 20.9	B-2 22.8	B-3 30.5	A,B,C,D
TPHg	<1	<1	<1	<1
TPHd	<1	<1	[illegible]	9
Benzene	<0.005	<0.005	<0.005	<0.005
Toluene	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.005	<0.005	<0.005	<0.005
Xylenes	<0.005	<0.005	<0.005	<0.005
TOG	<50	<50	<50	<50
HVO	ND	ND	[illegible]	NA
Cadmium	<1	<1	<1	NA
Chromium	130	160	620	NA
Zinc	<20	<20	70	NA
Lead	<5	<5	<5	NA
Nickel	60	190	730	NA

Notes:

All results in parts per million (ppm)

TPHg = Total Petroleum Hydrocarbons as Gasoline.
TPHd = Total Petroleum Hydrocarbons as Diesel.
TOG = Total Oil and Grease
HVO = Halogenated Volatile Organics.
* = Chloroform
ND = Not detected; see laboratory analytical reports for detection limits of individual compounds
NA = Not analyzed
< = Less than indicated detection limit established by the laboratory

Table 2

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GROUNDWATER ELEVATION DATA
Chevron Service Station No. 9-3575
5775 Broadway
Oakland, California

WELL NUMBER	DATE	TOC	DTW	ELEV./P.S.
MW-1	11-10-92	189.13	15.53	173.60
MW-2	11-10-92	189.82	16.86	172.96
MW-3	11-10-92	189.05	33.37	155.68
SHELL 3	11-10-92	177.51	4.42	173.09

Notes:

Elevations in feet
TOC = Top-of-Casing elevation feet above sea level
DTW = Depth to Water
ELEV./P.S. = Groundwater/Potentiometric Surface elevation above mean sea level.

Table 3

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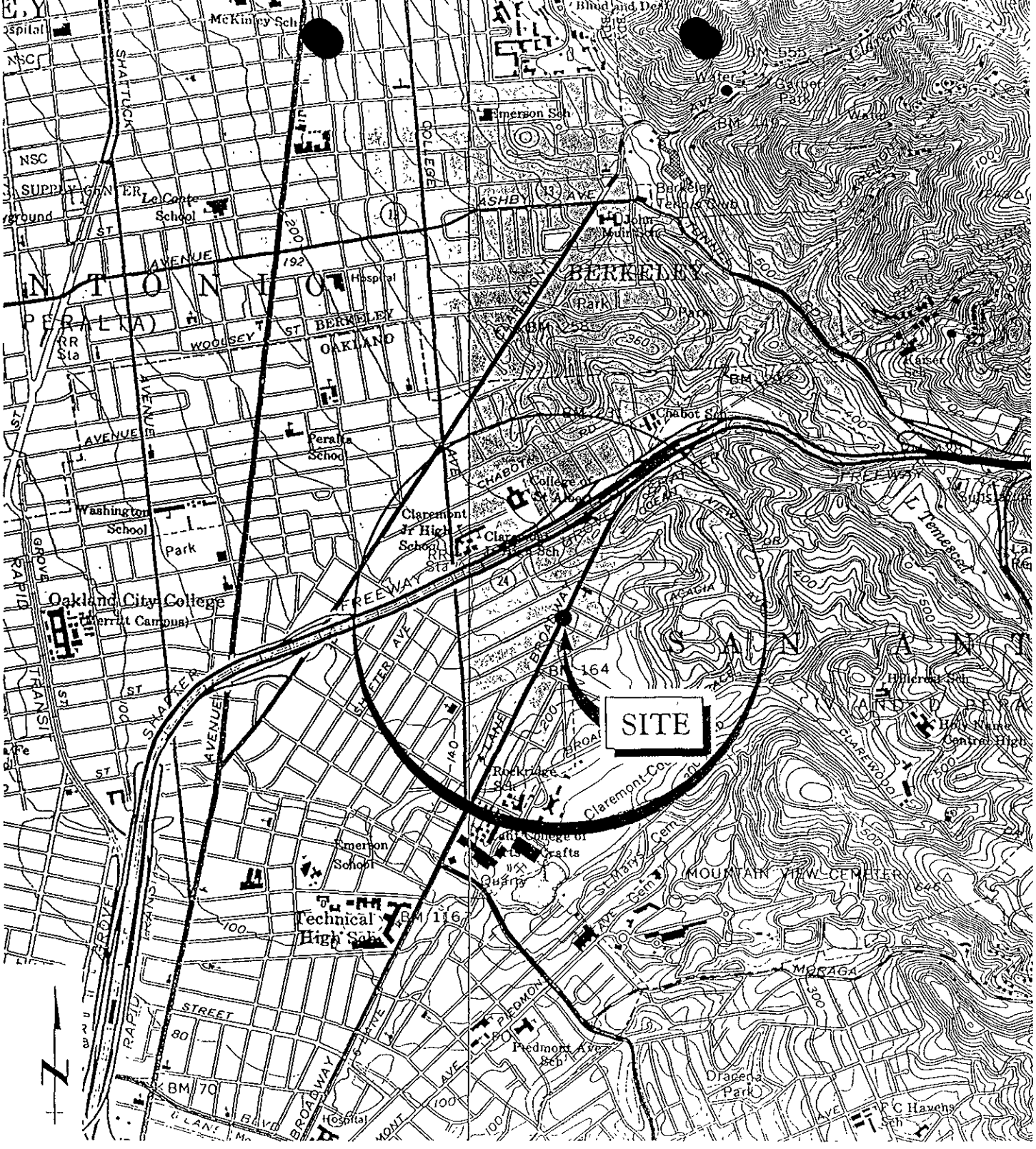
GROUNDWATER ANALYTICAL RESULTS
Chevron Service Station No. 9-3575
5775 Broadway
Oakland, California

Sample Number	Sample Date	TPHg	B	T	E	X	TOG	HVO
MW-1	11/10/91	<50	<0.5	<0.5	<0.5	<0.5	<5000	ND
MW-2	11/10/91	<50	<0.5	<0.5	<0.5	<0.5	<5000	ND
MW-3	11/10/91	53	1.7	0.6	<0.5	0.8	<5000	ND
MW-3	11/25/91	<50	<0.5	<0.5	<0.5	<0.5	<5000	NA

Notes:

All results in parts per billion (ppb)

TPHg	=	Total Petroleum Hydrocarbons as Gasoline.
B	=	Benzene
E	=	Ethylbenzene
T	=	Toluene
X	=	Total Xylenes
TOG	=	Total Oil and Grease
HVO	=	Halogenated Volatile Organics
ND	=	Not detected; see laboratory analytical reports for detection limits of individual compounds
<	=	Less than indicated detection limit established by the laboratory



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EXPLANATION

Site Location Map

Former Chevron Service Station #9-3575
5775 Broadway
Oakland, California

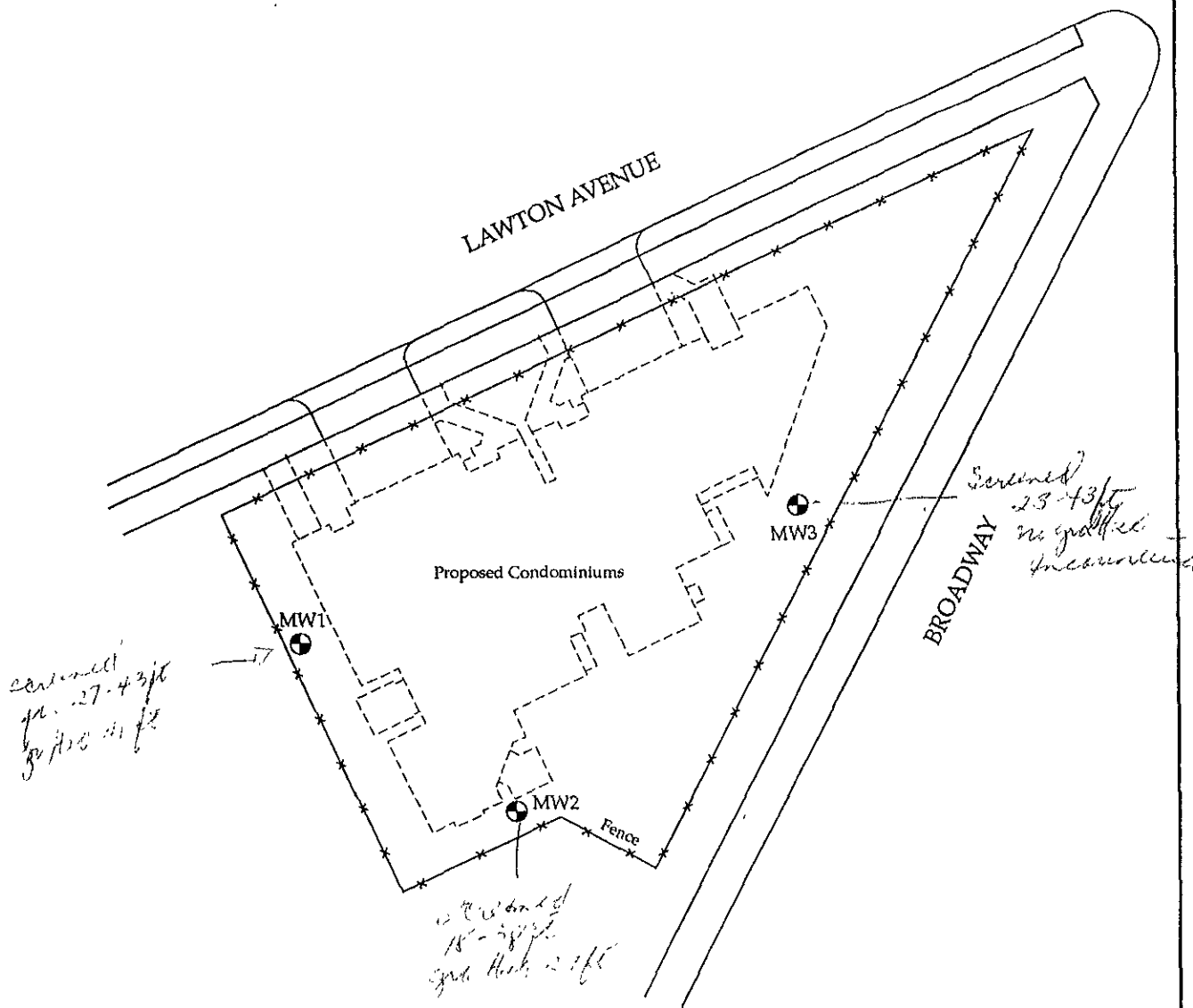
PLATE

1

Map reference: USGS Topographic Map, 7.5 minute series, Oakland East, Calif. and Oakland West, Calif. quadrangles, 1980

RESNA

17046.01



SHELL 3

0 30' 60' 90'

N

Map Source: site map by Riedel Environmental Services, Inc. and well locations survey by Moldenhauer Engineering Company

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EXPLANATION

MW-3 Monitor Well location (RESNA, November 1992)

SHELL 3 Off-site monitoring well (Weiss Associates)

Site Map

Former Chevron Service Station #9-3575
5775 Broadway
Oakland, California

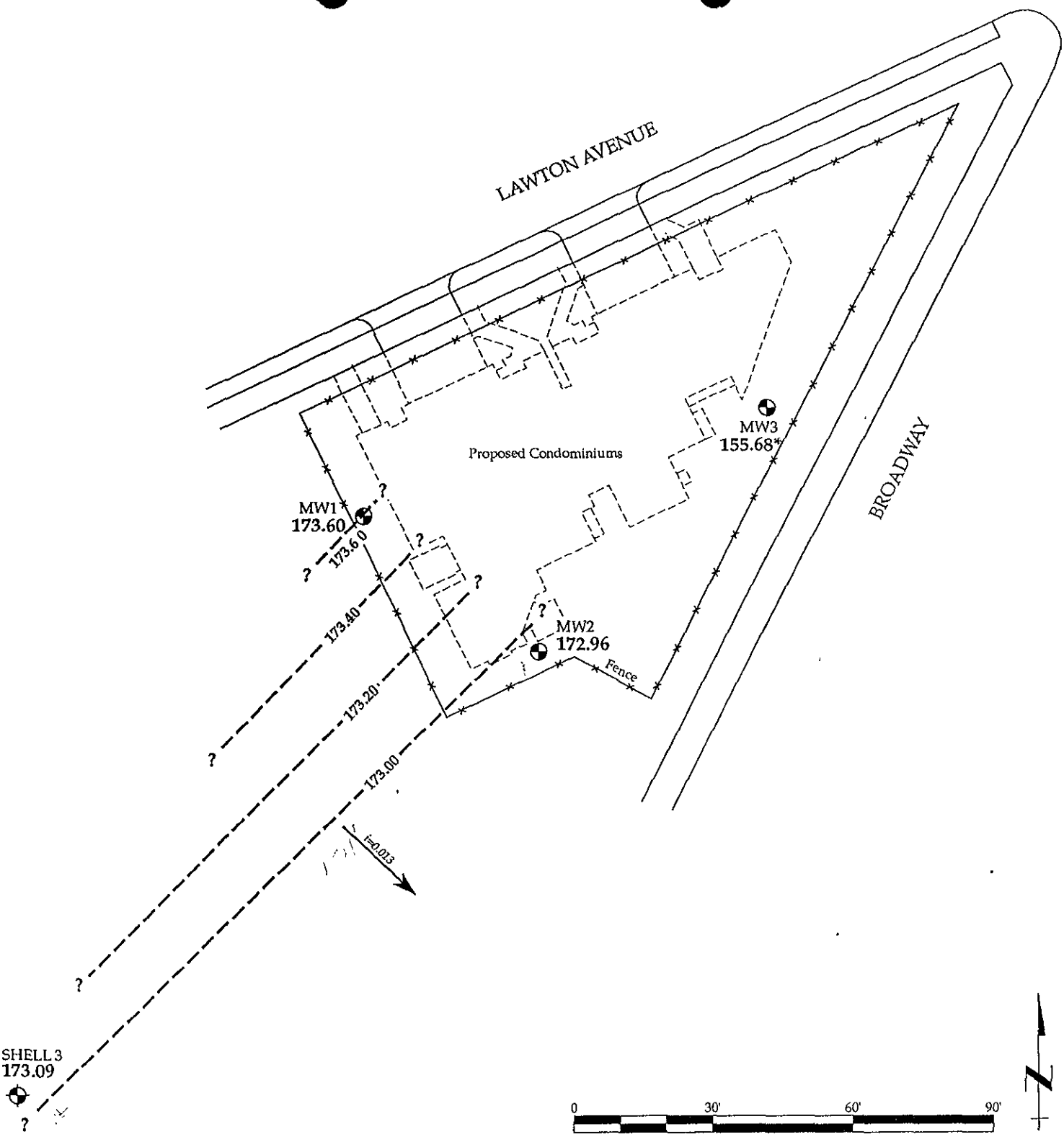
PLATE

2

Map Source: site map by Riedel Environmental Services, Inc. and well locations survey by Moldenhauer Engineering Company

RESNA

17046.01



Map Source: site map by Riedel Environmental Services, Inc. and well locations survey by Moldenhauer Engineering Company

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EXPLANATION

MW-1	Monitor Well location (RESNA, November 1992)
SHELL 3	Off-site monitoring well (Weiss Associates)
173.09	Groundwater elevation, feet above mean sea level
*	Anomalous groundwater surface elevation
173.00 — — · ?	Groundwater elevation contour, feet above mean sea level, dashed where inferred, queried where uncertain
i=0.013	Estimated direction of groundwater flow with evaluated gradient

Potentiometric Surface of Shallow Groundwater
November 10, 1992

Former Chevron Service Station #9-3575
5775 Broadway
Oakland, California

PLATE

3

RESNA

17046.01