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A Report Prepared for

Shell Oil Company
Environmental Engineering
P. O. Box 5278
Concord, California 94520

QUARTERLY TECHNICAL REPORT
FOURTH QUARTER 1991
SHELL SERVICE STATION
6039 COLLEGE AVENUE 24618
OAKLAND, CALIFORNIA
SHELL WIC NO. 204-5508-330

1/2/92

HLA Job No. 4022,233.03

by


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January 2, 1992

INTRODUCTION

This Quarterly Technical Report by Harding Lawson Associates (HLA) presents results of our continuing environmental investigation at and near the Shell Oil Company (Shell) service station at 6039 College Avenue in Oakland, California. The site location is shown on Plate 1. This report discusses the site history and investigation progress through the fourth quarter of 1991, along with anticipated activities for the first quarter of 1992.

HLA submitted to the appropriate agencies a work plan (dated January 10, 1990) for a soil and groundwater investigation. In addition, quarterly technical reports have been issued since April, 1990.

SUMMARY OF PREVIOUS WORK

Preliminary Site Assessment

A Shell service station has occupied this property since 1940. As shown on Plate 2, underground fuel tanks have existed at different locations across the site. Table 1 summarizes the dates of tank installation and removal, and the types of fuel products held in the tanks.

Shell retained HLA to perform a site assessment after an unauthorized release from an underground storage tank (UST). According to the report filed with the Alameda County Department of Environmental Health on September 6, 1989, the source of the

release was a slight weep noted at the piping connection to the submersible pump for the tank holding premium gasoline.

We gathered information on site history from construction plot plans dated 1940, 1957, and 1978 provided by Shell. The station had a full service garage from 1940 to 1978. Plot plans indicate that until 1957, a waste oil tank was located adjacent to the old building, in the present location of the fuel tanks. The 1957 construction plot plan indicates an intent to replace the old waste oil tank with a larger tank, previously used to store fuel; however, no new location is indicated on the plan. The tank was most likely placed in the old excavation near the building, and removed when the present tanks were installed.

Three UST sites within 1/4 mile of the Shell station are listed in the San Francisco Regional Water Quality Control Board (SFRWQCB) Hazardous Substances Container Information Program. The tank locations and contents are listed in Table 2. Results of our previous soil and groundwater investigation activities are summarized below.

Soil Investigation

In January 1990, six soil borings (B-1 through B-6) were drilled and sampled to depths of 25 feet, or the top of the saturated zone, at locations shown in Plate 3. The purpose of these borings was to evaluate lithologies in the vadose zone and near the groundwater surface, and to evaluate the presence and limits of detectable concentrations of benzene, toluene,

ethylbenzene, and xylenes (BTEX) and total petroleum hydrocarbons (TPH) in the soil. The borings were located in areas that were potential sources of hydrocarbons identified during our preliminary site assessment.

Soil samples exhibiting the highest organic vapor readings were sealed and transported to an analytical laboratory, under chain-of-custody documentation, for chemical analysis. Results of analyses are presented in Table 3.

Groundwater Investigation

Because the results of soil analyses indicated detectable concentrations of petroleum hydrocarbons in soils near the groundwater surface, a groundwater investigation was implemented in early February 1990. Four monitoring wells (MW-1 through MW-4) were installed at that time (Plate 4). Free-phase hydrocarbons were observed on the soil sampler at a depth of 20 feet during drilling of MW-4. A fifth well (MW-5) was installed in August of 1991.

Selected soil samples from each well boring were delivered to a state-certified laboratory and chemically analyzed to further delineate the lateral and vertical extent of petroleum hydrocarbons in soil. Results are summarized in Table 4.

HLA has measured water levels in wells to the nearest 0.01 foot on a quarterly basis. Casing elevations were surveyed by HLA, using a temporary benchmark of 195.00 feet, established at

the northwest corner of the cashier's booth on site. Quarterly water level data are summarized in Table 5.

HLA has sampled water from the wells on a quarterly basis. Results of chemical analyses are presented in Table 6. Data have indicated low to non-detectable concentrations of petroleum hydrocarbons in water samples from MW-1, MW-2, and MW-5; results for MW-3 and MW-4 have indicated higher concentrations of hydrocarbons.

Approximately one-half inch of separate-phase floating hydrocarbon product was found in MW-4 in November 1990. Product was removed biweekly from MW-4 by bailing until March 1991. Since that time, only a product sheen has been observed.

Hydrogeology

The shallow lithology at the site is summarized below:

<u>Soil</u>	<u>Approximate Depth (ft)</u>
Sandy silt	0 to 10
Sandy clay	10 to 15
Sandy silt	15 to 25
Interbedded clays, silts, and sand	25 to 50

Depth to groundwater at the site ranges from 16 to 21 feet (Table 5). Groundwater elevation data for the site indicate that the general groundwater flow direction is to the south-southwest.

ACCOMPLISHMENTS DURING THE FOURTH QUARTER 1991

HLA performed the following tasks during the fourth quarter of 1991:

1. Purged and sampled groundwater from MW-1 through MW-3 and MW-5;
2. Measured depth to groundwater and checked for the presence of separate-phase product in MW-1 through MW-5;
3. Submitted groundwater samples for chemical analysis; and
4. Installed a PetroTrapTM, passive, separate-phase product skimmer in MW-4.

Groundwater Sampling

Groundwater from MW-1, MW-2, MW-3, and MW-5 was purged and sampled on November 22, 1991. Groundwater from MW-4 was not sampled because of the presence of separate-phase product. Wells were purged at least three well volumes while monitoring turbidity, temperature, pH, and conductivity. Groundwater removed from the wells was stored on site in 55-gallon drums pending analytical results. The groundwater was then hauled to Shell's refinery in Martinez, California.

After purging, groundwater from the wells was sampled with a clean stainless steel bailer, and samples were decanted into laboratory prepared containers. Sampling and purging equipment was decontaminated between wells in an Alconox solution and rinsed with deionized water. Groundwater samples were placed in cooled ice chests and delivered under chain-of-custody to IT Analytical Services in San Jose, California, a state-certified

chemical testing laboratory. Water samples were analyzed for TPH as gasoline, diesel fuel, and motor oil, as well as for BTEX content.

Water Level and Free-product Measurements

On November 22, 1991, prior to purging and sampling, groundwater levels were measured in all wells to the nearest 0.01 foot. Groundwater was approximately 17 to 21 feet below ground surface (Table 5). Groundwater elevations have dropped by approximately 1/2 foot in the last quarter. A potentiometric surface map constructed using current data is shown in Plate 5. This map shows contours of equal groundwater elevation and the general groundwater flow direction. The predominant groundwater flow direction appears to be southwest and is consistent with previous flow directions estimated since February, 1990.

Using an oil/water interface probe, 0.64 feet of separate-phase product was measured in MW-4. No product was found in the other four wells.

Installation of PetroTrap™ Passive Skimmer

On December 5, 1991, a PetroTrap™ passive product skimmer was installed in MW-4. HLA has checked the skimmer twice since its installation and the hydrocarbon chamber was filled to capacity (approximately two liters) each time. The product was black and had an oil-like consistency. Product removed from the skimmer is presently stored on site in a labelled 55-gallon drum pending disposal.

Results of Groundwater Analyses

Results of groundwater analyses are summarized in Table 6. The laboratory report and chain-of-custody are in the Appendix. The distribution of benzene and TPH as gasoline in groundwater are shown on Plates 6 and 7, respectively. The groundwater samples from MW-1 and MW-2 continued to show no detectable concentrations of BTEX or TPH. The sample from MW-3 contained 18 parts per billion (ppb) benzene and cumulative concentrations of TPH totaling 950 ppb. The water sample from MW-5 contained 50 ppb of TPH as diesel fuel; all other compounds tested for were below the analytical detection limits.

ANTICIPATED ACTIVITIES FOR THE FIRST QUARTER, 1992

During the first quarter of 1992, the following activities are planned for the subject Shell service station:

1. Measure water levels in MW-1 through MW-5;
2. Check the skimmer in MW-4 on a weekly basis for accumulated product, and if present, remove and dispose of the product;
3. Sample groundwater from MW-1, MW-2, MW-3, and MW-5 and submit the samples for analysis of BTEX, TPH as gasoline, diesel fuel, and motor oil.

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APPENDIX

Laboratory Report - Groundwater Analysis

Table 1. Site History and Tank Inventory

<u>Year Constructed/ Removed</u>	<u>Underground* Tanks</u>	<u>Contents</u>	<u>Structures</u>
1940/1957	3 1,000-gallon 1 550-gallon 1 110-gallon	Leaded gasoline Leaded gasoline Waste oil	Full service garage and one pump island
1957/1978	3 5,000-gallon 1 1,000-gallon	Leaded gasoline Waste oil	Full service garage and two pump islands with canopies
Unknown, but between 1957 and 1978/1978	1 8,000-gallon	Leaded or Unleaded gasoline	Same as above
1978/NR	3 10,000-gallon fiberglass	Unleaded gasoline	Cashier counter and Mini-* Mart, two pump islands with canopies

* Approximate locations shown on Plate 2
NR Not removed, currently in operation

Table 2. Underground Storage Tanks within
1/4 Mile of
6039 College Avenue Shell

<u>Location</u>	<u>Number of Tanks</u>	<u>Material in Tanks</u>
1. Union 76 6201 Claremont Avenue	4	Unleaded and Premium unleaded Gasoline Waste oil Oil/water Mix
2. Chevron 5800 College Avenue	4	Unknown
3. Dreyers Grand Ice Cream 5929 College Avenue	1	Diesel fuel

Table 3. Soil Analytical Results - Borings
Concentrations in parts per million (ppm)

Sample Depth	B-1-22.5'	B-2-18'	B-2-24'	B-3-19'	B-3-21'	B-4-18.5'	B-4-25'	B-5-22'	B-5-23'	B-6-19.5'	B-6-22.5'
Approx. GW Depth	21'	22'	22'	18'	18'	20'	20'	19'	19'	18'	18'
Sample Date	01/04/90	01/05/90	01/05/90	01/05/90	01/05/90	01/04/90	01/04/90	01/04/90	01/04/90	01/05/90	01/05/90
Parameter /Method											
Benzene	ND @ 0.05	0.62	ND @ 0.05	0.24	0.19	0.57	ND @ 0.05	ND @ 0.05	ND @ 0.05	0.28	ND @ 0.05
Toluene	ND @ 0.1	ND @ 0.1	ND @ 0.1	0.18	ND @ 0.1	0.11	ND @ 0.1	ND @ 0.1	ND @ 0.1	ND @ 0.1	ND @ 0.1
Ethylbenzene	ND @ 0.1	0.48	ND @ 0.1	4.1	0.53	0.65	ND @ 0.1	ND @ 0.1	ND @ 0.1	1.3	ND @ 0.1
Xylenes	ND @ 0.1	1.2	ND @ 0.1	9.8	0.68	1.3	ND @ 0.1	ND @ 0.1	ND @ 0.1	2.1	ND @ 0.1
/EPA 8020											
TPH as Gasoline	8.1	130	1.8	610	71	170	ND @ 1	ND @ 1	4.4	260	ND @ 1
TPH as Motor Oil	---	---	---	110000	14000	---	---	---	---	12000	320
TPH as Diesel	---	---	---	5900	750	---	---	---	---	600	16
/EPA 8015											
Oil and Grease	---	---	---	810	380	---	---	---	---	1100	91
/SM 503 D&E											
Halogenated VOCs	---	---	---	ND @ 0.5	ND @ 0.5	---	---	---	---	ND @ 0.05	ND @ 0.005
/EPA 8010				to 2.5	to 0.25					to 0.25	to 0.025
Cadmium	---	---	---	ND @ 0.5	ND @ 0.5	---	---	---	---	ND @ 0.5	ND @ 0.5
Chromium	---	---	---	48	61	---	---	---	---	86	73
Zinc	---	---	---	51	54	---	---	---	---	52	60
/EPA 6010											
Lead/EPA 7241	---	---	---	13	7.6	---	---	---	---	8.1	9.2

--- = Analysis not performed on sample

ND = Not present above the stated detection limit

Table 4. Soil Analytical Results - Well Borings
 Shell 6039 College Avenue, Oakland
 Concentrations in parts per million (ppm)

Sample/Depth	MW-2-11'	MW-2-15.5'	MW-2-20.5'	MW-3-10'	MW-3-15.5'	MW-3-20.5'	MW-4-10.5'	MW-4-15.5'	MW-4-20.5'	MW-5-6'	MW-5-16'	MW-5-21'
Approx. GW Depth	17'	17'	17'	16'	16'	16'	17'	17'	17'	17"	17'	17'
Sample Date	2/08/90	2/08/90	2/08/90	2/07/90	2/07/90	2/07/90	2/07/90	2/07/90	2/07/90	8/24/91	8/24/91	08/24/91
Parameter /Method												
Benzene	ND @ 0.05	ND @ 0.05	ND @ 0.05	ND @ 0.05	1.1	ND @ 0.05	ND @ 0.05	0.31	0.06	ND @ 0.005	ND @ 0.005	ND @ 0.005
Toluene	ND @ 0.1	ND @ 0.1	ND @ 0.1	ND @ 0.1	0.7	ND @ 0.1	ND @ 0.11	0.34	ND @ 0.1	ND @ 0.005	ND @ 0.005	ND @ 0.005
Ethylbenzene	ND @ 0.1	ND @ 0.1	ND @ 0.1	ND @ 0.1	3.1	ND @ 0.1	ND @ 0.1	0.92	0.46	ND @ 0.005	0.028	ND @ 0.005
Xylenes	ND @ 0.1	ND @ 0.1	ND @ 0.1	0.11	1.9	ND @ 0.1	ND @ 0.1	2.6	0.57	ND @ 0.005	0.10	ND @ 0.005
/EPA 8020												
TPH as Gasoline	ND @ 1	ND @ 1	ND @ 1	12	230	28	ND @ 1	140	72	ND @ 1	23*	ND @ 1
TPH as Motor Oil	ND @ 10	ND @ 1	ND @ 10	ND @ 10	1,800	ND @ 10	ND @ 1	6,400	46,000	ND @ 12	13	ND @ 12
TPH as Diesel	ND @ 1	ND @ 1	1.1	4.4	200	9.9	1.2	61	2200	ND @ 1.2	7**	ND @ 1.2
/EPA 8015												
PCBs/EPA 8080	---	---	---	ND @ 0.05	ND @ 0.05	ND @ 0.05	ND @ 0.05	ND @ 0.05	ND @ 0.05	---	---	---
TOG /503E	---	---	---	---	---	---	---	---	---	ND @ 50	ND @ 50	ND @ 50

- = Analysis not performed on sample
 ND = Not present above the stated detection limit
 TPH = Total petroleum hydrocarbons
 PCBs = Polychlorinated biphenyls
 TOG = Total oil and grease
 * = Compounds detected are due to petroleum mixture other than gasoline
 ** = Not characteristic of standard diesel pattern
 *** = Results include compounds apparently due to gasoline as well as those due to diesel.

Table 5. Groundwater Elevations

Well	Top of Casing Elevations ¹	Depth to Groundwater (feet)									
		2/15/90	4/19/90	5/14/90	6/21/90	9/12/90	11/27/90	03/08/91	06/03/91	08/30/91	11/22/91
MW-1	195.89	17.73	18.51	18.92	18.21	19.81	20.39	16.85	17.82	19.87	20.58
MW-2	194.27	16.90	17.69	18.01	17.39	19.00	19.44	15.96	17.00	18.95	19.55
MW-3	192.52	15.81	16.57	16.97	16.27	18.78	18.27	14.86	15.84	17.79	18.40
MW-4	193.37	16.73	17.48	17.88	17.18	17.85	19.16	15.77	16.77	18.71	NM
MW-5	190.35	--	--	--	--	--	--	--	--	16.74	17.27

Well	Casing Elevations ¹	Groundwater Elevations									
		2/15/90	4/19/90	5/14/90	6/21/90	9/12/90	11/27/90	03/08/91	06/03/91	08/30/91	11/22/91
MW-1	195.89	178.16	177.38	176.97	177.68	176.08	175.50	179.04	178.07	176.02	175.31
MW-2	194.27	177.37	176.58	176.26	176.88	175.27	174.83	178.31	177.27	175.32	174.72
MW-3	192.52	176.71	175.95	175.55	176.25	173.74	174.25	177.66	176.68	174.73	174.12
MW-4	193.37	176.65	175.89	175.49	176.19	175.52	174.21	177.60	176.60	174.66	NM
MW-5	190.35	--	--	--	--	--	--	--	--	173.61	173.08

¹ Based on a temporary benchmark of 195.00 feet established at the northwest corner of the cashier's booth

-- No measurements; well constructed on 08/24/91

NM Not measured; free product was present

Table 6. Groundwater Analytical Results
Concentrations in Parts Per Billion (ppb)

Sample No.	Sample Date	EPA 8020				EPA 8015 - Modified		
		Benzene	Toluene	Ethyl-Benzene	Xylenes	Total Petroleum Hydrocarbons		
						Gasoline	Diesel	Motor Oil
MW-1	02/13/90	ND @ 0.3	0.67	0.37	3.2	95	650	770
	05/14/90	0.70	0.57	0.71	3.5	95	ND @ 50	770
	09/12/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	84	ND @ 50
	11/27/90	NS	NS	NS	NS	NS	NS	NS
	03/08/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	50	ND @ 50
	06/03/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	ND @ 50	ND @ 500
	08/30/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ .05	520	ND @ 500
	11/22/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	ND @ 500
MW-2	02/13/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	560	ND @ 50
	05/14/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	ND @ 50	ND @ 50
	09/12/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	ND @ 50	ND @ 50
	11/27/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	ND @ 50	ND @ 50
	03/08/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	ND @ 50	ND @ 500
	06/03/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	ND @ 50	ND @ 500
	08/30/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	ND @ 500
	11/22/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	ND @ 500
MW-3	02/13/90	320	29	110	33	4,700	3,100	3,000
	05/14/90	130	8.6	40	17	1,400	620	40,000
	09/12/90	58	5.8	16	15	2,000	1,500	19,000
	11/27/90	18	1.5	8.7	2.5	540	240	460
	03/08/91	630	33	270	18	3,400	2,100	ND @ 500
	06/03/91	260	13	98	24	1,700	690*	ND @ 500
	08/30/91	44	6.1	10	2.9	870	370**	500
	11/22/91	18	1.2	3.3	2.9	310	140	500

--- = Analysis not performed on sample

ND = Not present above the stated detection limit

-D = Duplicate sample

NS = Not sampled

* = Laboratory reported that these compounds appear to be the less volatile constituents of gasoline.

** = Compounds are within the chromatographic range for gasoline but are not characteristic of the standard gasoline pattern.

Table 6. (Continued)

Sample No.	Sample Date	EPA 8020				EPA 8015 - Modified		
		Benzene	Toluene	Ethyl-Benzene	Xylenes	Total Petroleum Hydrocarbons		
						Gasoline	Diesel	Motor Oil
MW-3-D	02/13/90	380	8.6	160	57	4,600	4,500	8,300
	05/14/90	120	31	38	13	820	660	10,000
MW-4	02/13/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	1,200	3,000
	05/14/90	160	7	1.9	3.1	650	350	12,000
	09/12/90	91	1.1	0.75	0.79	440	260	2,600
	11/27/90	64	1.2	0.80	2.7	470	2,400	1,000
	03/08/91	330	3.5	88	5.8	1,100	2,600	15,000
	06/03/91	240	2.3	1.6	2.3	670*	1,100**	ND @ 500
	08/30/91	64	1.8	0.9	0.9	570	280**	2,000
11/22/91	NS	NS	NS	NS	NS	NS	NS	
MW-4-D	09/12/90	85	1.0	0.71	0.81	520	1,100	16,000
MW-5	08/30/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	80**	ND @ 500
	11/22/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	50	ND @ 500
Trip Blank	02/13/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	--	--
	05/14/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	--	--
	09/12/90	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 0.3	ND @ 30	--	--
	03/08/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	--	--
	08/30/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 50	--	--
	11/22/91	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND @ 0.5	ND 2 50	--	--

--- = Analysis not performed on sample

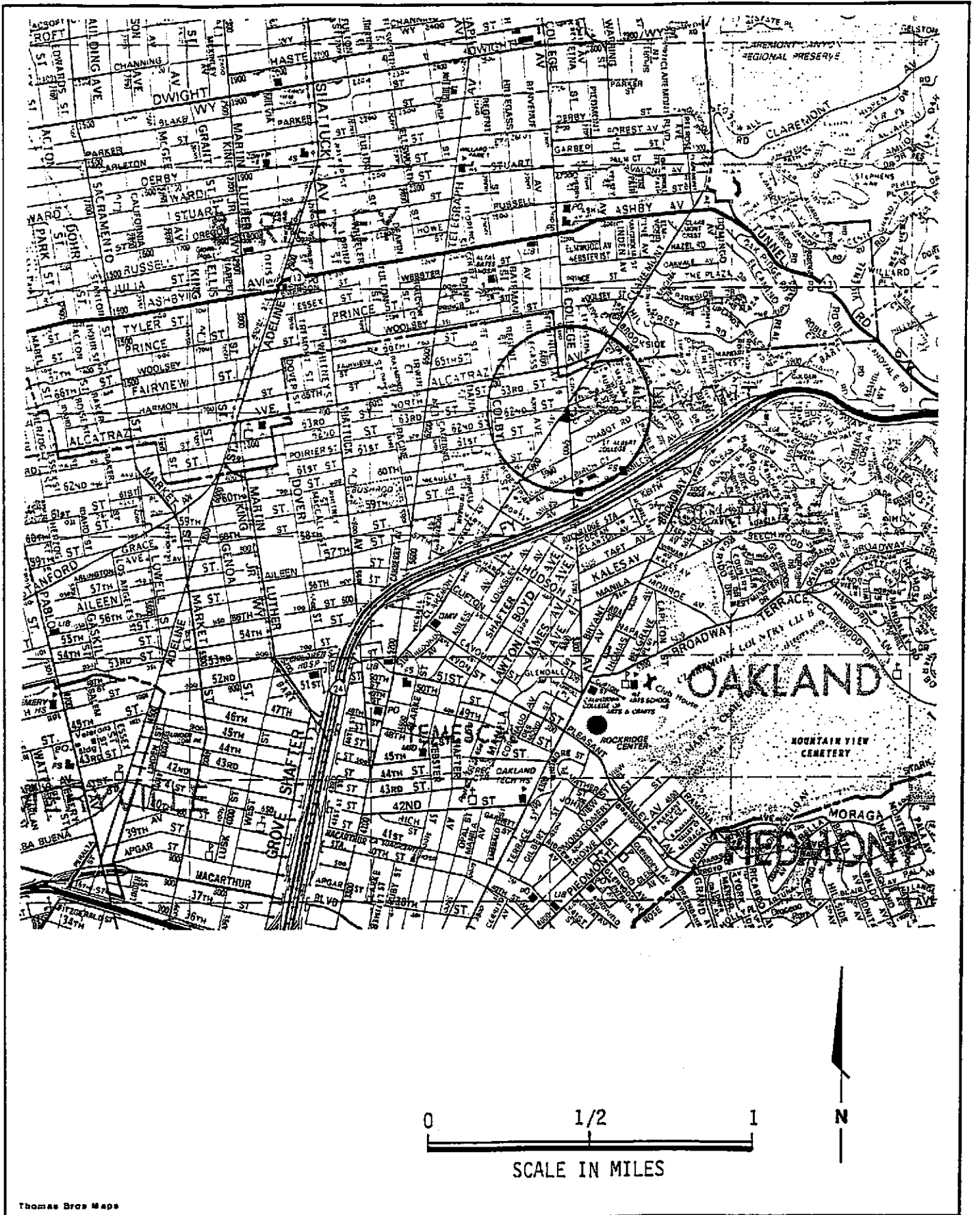
ND = Not present above the stated detection limit

-D = Duplicate sample

NS = Not sampled

* = Compounds are within the chromatographic range for gasoline but are not characteristic of the standard gasoline pattern.

** = Results include compounds apparently due to gasoline as well as those due to diesel.



Thomas Bros Maps



Harding Lawson Associates
 Engineering and
 Environmental Services

Site Location Map
 Shell Service Station
 6039 College Avenue
 Oakland, California

PLATE

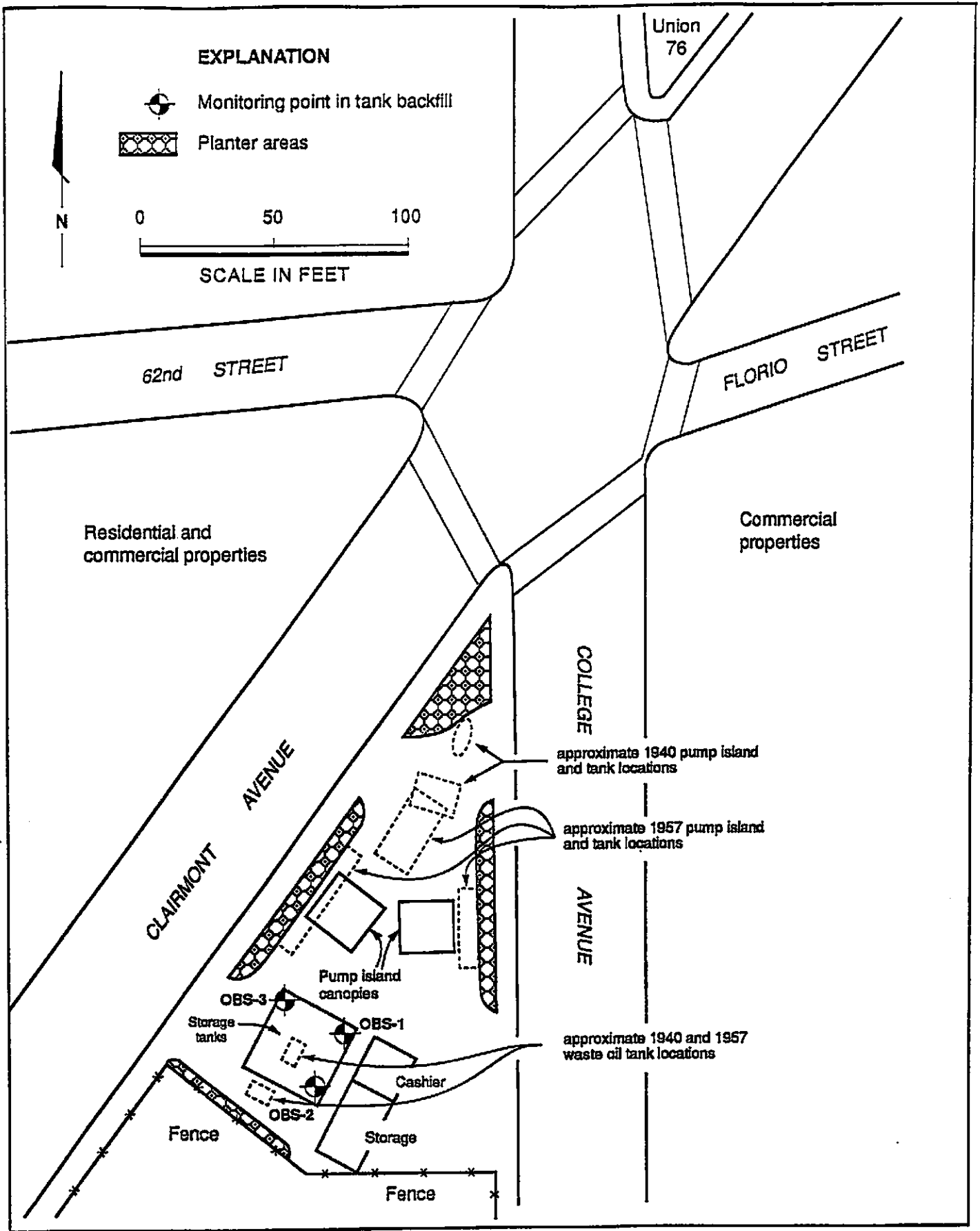
1

DRAWN S. Patel
 JOB NUMBER 4022,233.03

APPROVED
[Signature]

DATE 11/89

REVISED DATE 01/04/91



EXPLANATION

 Monitoring point in tank backfill

 Planter areas

N

0 50 100

SCALE IN FEET

Union
76

62nd STREET

FLORIO STREET

Residential and
commercial properties

Commercial
properties

CLAIRMONT
AVENUE

COLLEGE

approximate 1940 pump island
and tank locations

approximate 1957 pump island
and tank locations

AVENUE

Pump island
canopies

approximate 1940 and 1957
waste oil tank locations

OBS-3

Storage
tanks

OBS-1

Cashier

Fence

Storage

Fence



Harding Lawson Associates
Engineering and
Environmental Services

Site Plan
Shell Service Station
6039 College Avenue
Oakland, California

PLATE

2

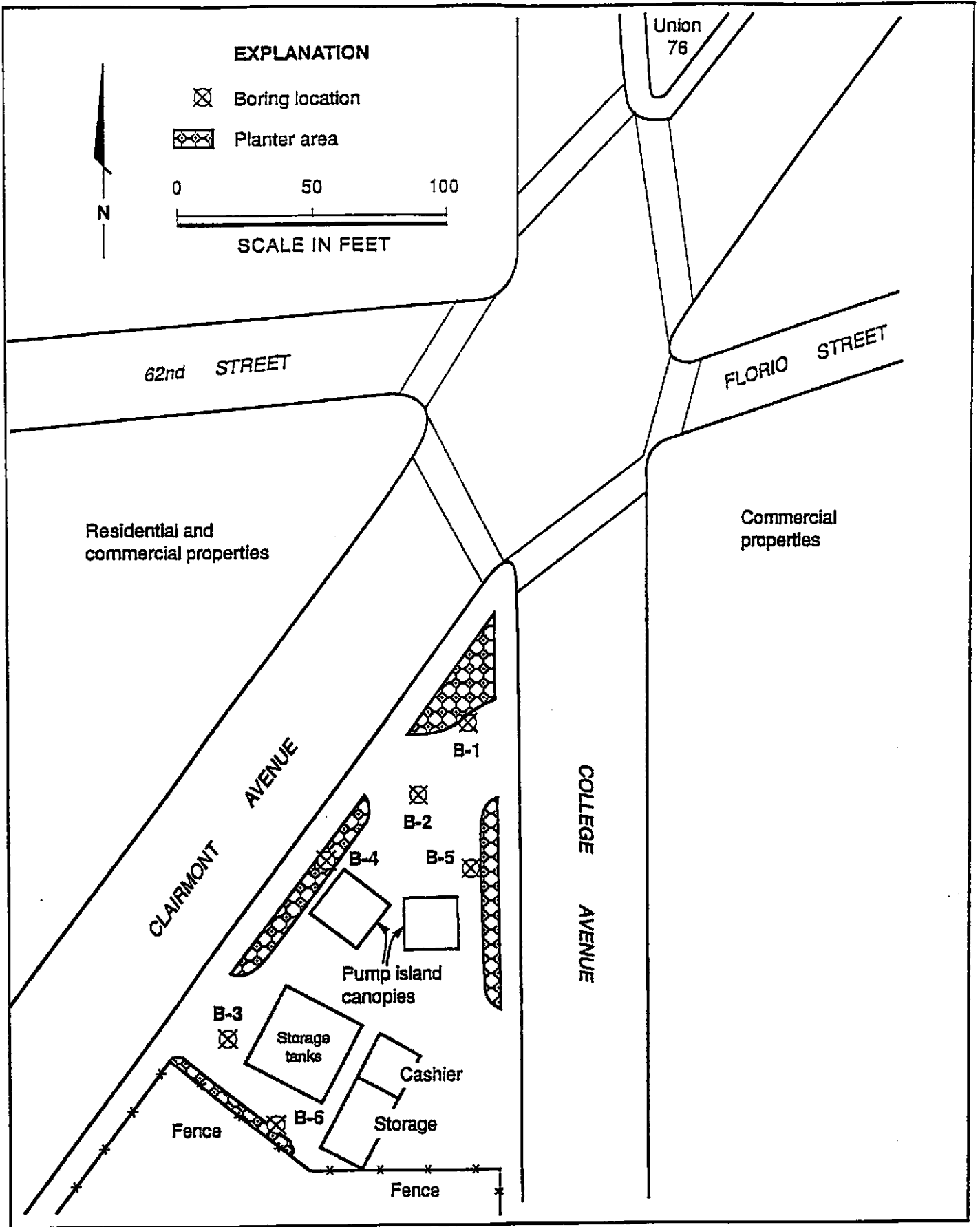
DRAWN
S. Patel

JOB NUMBER
4022,233.03

APPROVED
MJB

DATE
10/03/91

REVISED DATE



Harding Lawson Associates
Engineering and Environmental Services

DRAWN
S. Patel

JOB NUMBER
4022,233.03

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MJB

DATE
10/03/91



REVISED DATE

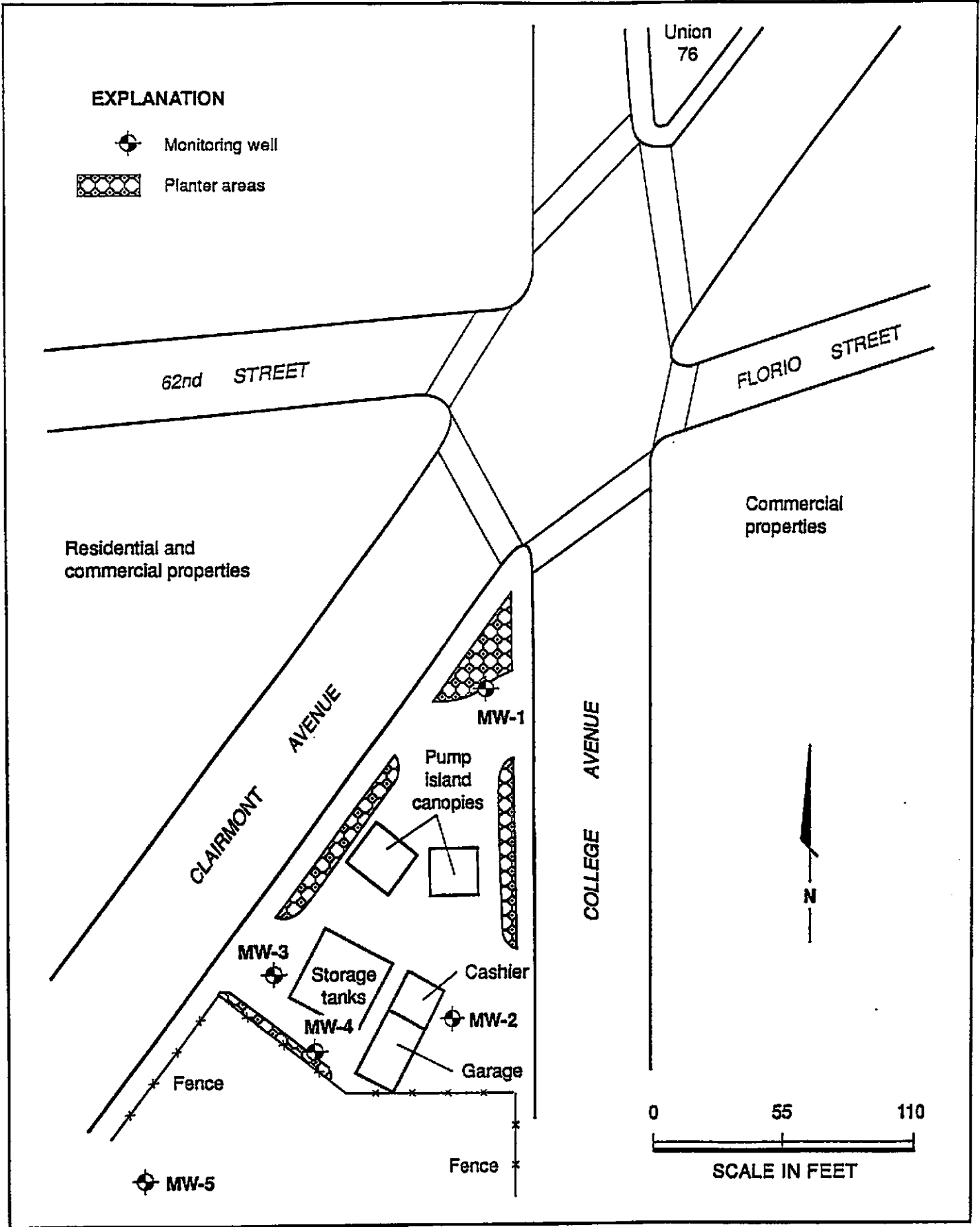
Soil Boring Locations
Shell Service Station
6039 College Avenue
Oakland, California

PLATE

3

EXPLANATION

-  Monitoring well
-  Planter areas



Harding Lawson Associates
 Engineering and
 Environmental Services

Monitoring Well Locations
 Shell Service Station
 6039 College Avenue
 Oakland, California

PLATE

4




DRAWN S. Patel
 JOB NUMBER 4022,233.03

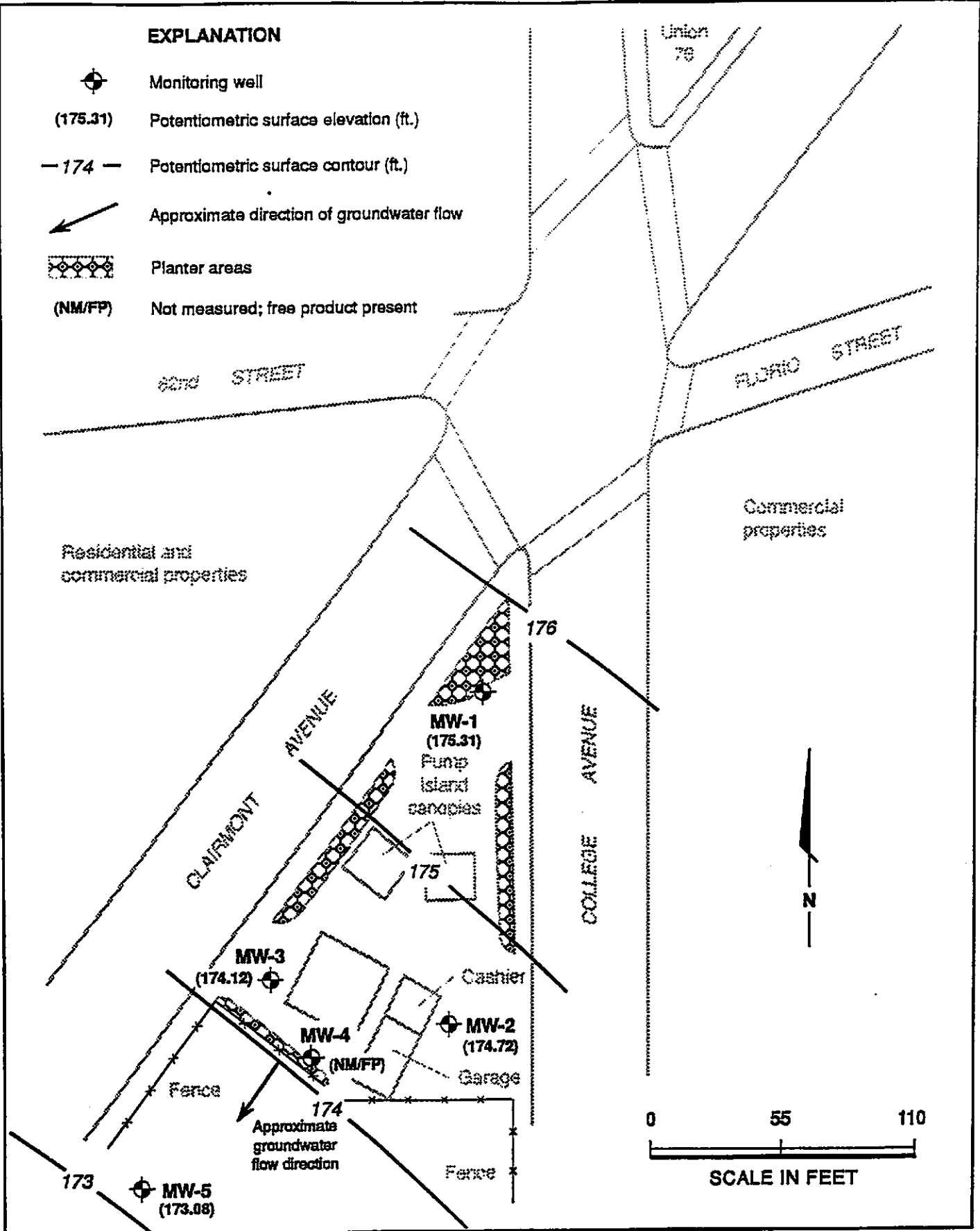
APPROVED
MJB

DATE 10/03/91

REVISED DATE

EXPLANATION

-  Monitoring well
- (175.31) Potentiometric surface elevation (ft.)
- 174 — Potentiometric surface contour (ft.)
-  Approximate direction of groundwater flow
-  Plantar areas
- (NM/FP) Not measured; free product present



Harding Lawson Associates
 Engineering and
 Environmental Services

Potentiometric Surface – November 1991
 Shell Service Station
 6039 College Avenue
 Oakland, California

PLATE

5



DRAWN S. Patel
 JOB NUMBER 4022,233.03

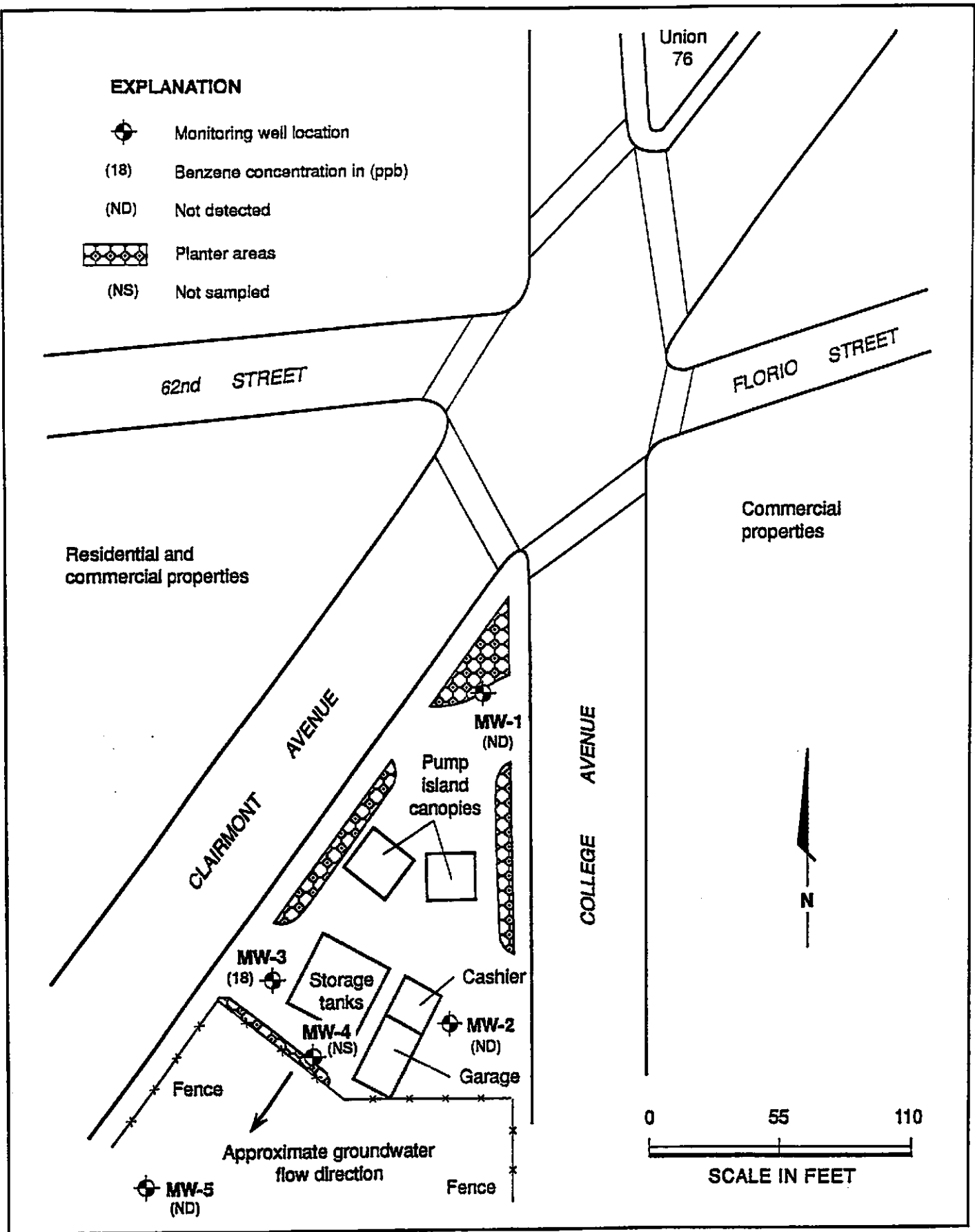
APPROVED
 TJM

DATE 12/30/91

REVISED DATE

EXPLANATION

-  Monitoring well location
- (18) Benzene concentration in (ppb)
- (ND) Not detected
-  Planter areas
- (NS) Not sampled



Harding Lawson Associates
 Engineering and
 Environmental Services

Distribution of Benzene in Groundwater November, 1991 PLATE
 Shell Service Station
 6039 College Avenue
 Oakland, California

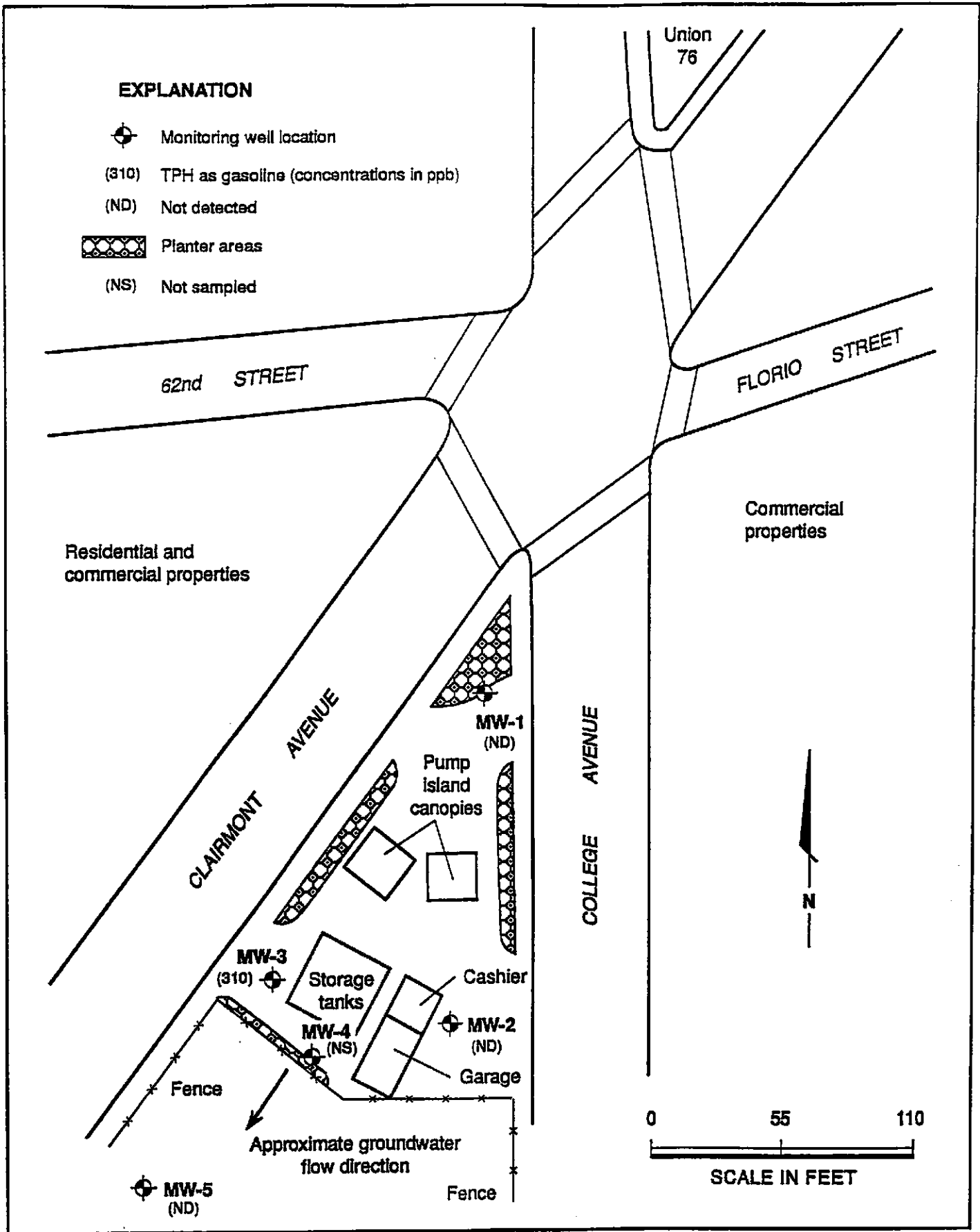
6

DRAWN S. Patel
 JOB NUMBER 4022,233.03

APPROVED
TJM

DATE 12/26/91

REVISED DATE



Harding Lawson Associates
 Engineering and
 Environmental Services

Distribution of TPH as Gasoline in Groundwater November, 1991
 Shell Service Station
 6039 College Avenue
 Oakland, California

PLATE

7

DRAWN
 S. Patel

JOB NUMBER
 4022,233.03

APPROVED
 TJA

DATE
 12/26/91

REVISED DATE

APPENDIX
LABORATORY REPORT - GROUNDWATER ANALYSIS



INTERNATIONAL
TECHNOLOGY
CORPORATION

ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

Shell Oil Company
Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, CA 94520
Mike Brink

Date: 12/13/91

Work Order: T1-11-234

P.O. Number: MOH 880-021 Vendor #I0002402

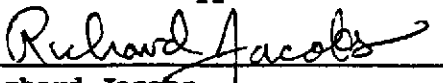
This is the Certificate of Analysis for the following samples:

Client Work ID: 6039 College Ave, Oakland
Date Received: 11/25/91
Number of Samples: 5
Sample Type: aqueous

TABLE OF CONTENTS FOR ANALYTICAL RESULTS

<u>PAGES</u>	<u>LABORATORY #</u>	<u>SAMPLE IDENTIFICATION</u>
2	T1-11-234-01	101 MW-1
3	T1-11-234-02	102 MW-2
4	T1-11-234-03	103 MW-3
5	T1-11-234-03	103 MS/MSD
6	T1-11-234-04	105 MW-5
7	T1-11-234-05	106 TRIP
10	T1-11-234-06	Quality Control

Reviewed and Approved:


Richard Jacobs
Project Manager

American Council of Independent Laboratories
International Association of Environmental Testing Laboratories
American Association for Laboratory Accreditation

Company: Shell Oil Company

Date: 12/13/91

Client Work ID: 6039 College Ave, Oakland

Work Order: T1-11-234

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: 101

SAMPLE DATE: 11/22/91

LAB SAMPLE ID: T111234-01

SAMPLE MATRIX: aqueous

RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		12/03/91
Low Boiling Hydrocarbons	Mod.8015		12/03/91
High Boiling Hydrocarbons	Mod.8015	11/27/91	12/03/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None
High Boiling Hydrocarbons calculated as Diesel	0.05	None
calculated as Oil	0.5	None

SURROGATES	% REC
1,3-Dichlorobenzene (Gasoline)	94.
1,3-Dichlorobenzene (BTEX)	97.
nC32 (Diesel)	89.

Company: Shell Oil Company
 Date: 12/13/91
 Client Work ID: 6039 College Ave, Oakland

IT ANALYTICAL SERVICES
 SAN JOSE, CA

Work Order: T1-11-234

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: 102
 SAMPLE DATE: 11/22/91
 LAB SAMPLE ID: T111234-02
 SAMPLE MATRIX: aqueous
 RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		12/03/91
Low Boiling Hydrocarbons	Mod.8015		12/03/91
High Boiling Hydrocarbons	Mod.8015	11/27/91	12/03/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None
High Boiling Hydrocarbons calculated as Diesel	0.05	None
calculated as Oil	0.5	None

SURROGATES	% REC
1,3-Dichlorobenzene (Gasoline)	93.
1,3-Dichlorobenzene (BTEX)	98.
nC32 (Diesel)	96.

Company: Shell Oil Company
 Date: 12/13/91
 Client Work ID: 6039 College Ave, Oakland

IT ANALYTICAL SERVICES
 SAN JOSE, CA

Work Order: T1-11-234

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: 103
 SAMPLE DATE: 11/22/91
 LAB SAMPLE ID: T111234-03
 SAMPLE MATRIX: aqueous
 RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		12/06/91
Low Boiling Hydrocarbons	Mod.8015		12/06/91
High Boiling Hydrocarbons	Mod.8015	11/27/91	12/03/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	0.31
BTEX		
Benzene	0.0005	0.018
Toluene	0.0005	0.0012
Ethylbenzene	0.0005	0.0033
Xylenes (total)	0.0005	0.0029
High Boiling Hydrocarbons		
calculated as Diesel	0.05	0.14
calculated as Oil	0.5	0.5

SURROGATES	% REC
1,3-Dichlorobenzene (Gasoline)	99.
1,3-Dichlorobenzene (BTEX)	102.
nC32 (Diesel)	97.

Company: Shell Oil Company
Date: 12/13/91
Client Work ID: 6039 College Ave, Oakland

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-11-234

TEST NAME: Spike and Spike Duplicates

SAMPLE ID: 103 MS/MSD
SAMPLE DATE: 11/22/91
LAB SAMPLE ID: T111234-03M
EXTRACTION DATE: 11/27/91
ANALYSIS DATE: 12/03/91
ANALYSIS METHOD: Mod.8015

QUALITY CONTROL REPORT

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Analyses

RESULTS in Micrograms per Liter

PARAMETER	Sample Amt	Spike Amt	MS Result	MSD Result	MS %Rec	MSD %Rec	RPD
Diesel	137.	1000.	1013.	1066.	88.	93.	6.
SURROGATES					MS %Rec	MSD %Rec	
nC32					102.	103.	

Company: Shell Oil Company

Date: 12/13/91

Client Work ID: 6039 College Ave, Oakland

Work Order: T1-11-234

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: 105

SAMPLE DATE: 11/22/91

LAB SAMPLE ID: T111234-04

SAMPLE MATRIX: aqueous

RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		12/03/91
Low Boiling Hydrocarbons	Mod.8015		12/03/91
High Boiling Hydrocarbons	Mod.8015	11/27/91	12/04/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None
High Boiling Hydrocarbons		
calculated as Diesel	0.05	0.05
calculated as Oil	0.5	None

SURROGATES	% REC
1,3-Dichlorobenzene (Gasoline)	96.
1,3-Dichlorobenzene (BTEX)	99.
nC32 (Diesel)	63.

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company

Date: 12/13/91

Client Work ID: 6039 College Ave, Oakland

Work Order: T1-11-234

TEST NAME: Petroleum Hydrocarbons

SAMPLE ID: 106

SAMPLE DATE: 11/22/91

LAB SAMPLE ID: T111234-05

SAMPLE MATRIX: aqueous

RECEIPT CONDITION: Cool pH < 2

RESULTS in Milligrams per Liter:

	METHOD	EXTRACTION DATE	ANALYSIS DATE
BTEX	8020		12/03/91
Low Boiling Hydrocarbons	Mod.8015		12/03/91

PARAMETER	DETECTION LIMIT	DETECTED
Low Boiling Hydrocarbons calculated as Gasoline	0.05	None
BTEX		
Benzene	0.0005	None
Toluene	0.0005	None
Ethylbenzene	0.0005	None
Xylenes (total)	0.0005	None

SURROGATES	% REC
1,3-Dichlorobenzene (Gasoline)	91.
1,3-Dichlorobenzene (BTEX)	95.

IT ANALYTICAL SERVICES
SAN JOSE, CA

Company: Shell Oil Company

Date: 12/13/91

Client Work ID: 6039 College Ave, Oakland

Work Order: T1-11-234

TEST NAME: Spike and Spike Duplicates

SAMPLE ID: Quality Control

SAMPLE DATE: not spec

LAB SAMPLE ID: T111234-06B

EXTRACTION DATE:

ANALYSIS DATE: 12/04/91

ANALYSIS METHOD: 8020

QUALITY CONTROL REPORT

Laboratory Spike(LS) and Laboratory Spike Duplicate(LSD) Analyses

RESULTS in Micrograms per Liter

PARAMETER	Sample Amt	Spike Amt	LS Result	LSD Result	LS %Rec	LSD %Rec	RPD
Benzene	None	50.0	37.4	N/A	75.	N/A	N/A
Toluene	None	50.0	37.8	N/A	76.	N/A	N/A
Ethyl benzene	None	50.0	37.8	N/A	76.	N/A	N/A
Xylenes	None	150.	121.	N/A	81.	N/A	N/A

SURROGATES	LS %Rec	LSD %Rec
1,3-Dichlorobenzene	100.	N/A

Company: Shell Oil Company
 Date: 12/13/91
 Client Work ID: 6039 College Ave, Oakland

IT ANALYTICAL SERVICES
 SAN JOSE, CA

Work Order: T1-11-234

TEST NAME: Spike and Spike Duplicates

SAMPLE ID: Quality Control
 SAMPLE DATE: not spec
 LAB SAMPLE ID: T111234-06C
 EXTRACTION DATE:
 ANALYSIS DATE: 12/03/91
 ANALYSIS METHOD: Mod. 8015

QUALITY CONTROL REPORT

Laboratory Spike(LS) and Laboratory Spike Duplicate(LSD) Analyses

RESULTS in Micrograms per Liter

PARAMETER	Sample Amt	Spike Amt	LS Result	LSD Result	LS %Rec	LSD %Rec	RPD
Gasoline	None	500.	545.	N/A	109.	N/A	N/A
SURROGATES					LS %Rec	LSD %Rec	
1-3-Dichlorobenzene					105.	N/A	

Company: Shell Oil Company
 Date: 12/13/91
 Client Work ID: 6039 College Ave, Oakland

IT ANALYTICAL SERVICES
 SAN JOSE, CA

Work Order: T1-11-234

TEST NAME: Spike and Spike Duplicates

SAMPLE ID: Quality Control
 SAMPLE DATE: not spec
 LAB SAMPLE ID: T111234-06A
 EXTRACTION DATE:
 ANALYSIS DATE: 12/06/91
 ANALYSIS METHOD: Mod. 8015

QUALITY CONTROL REPORT

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Analyses

RESULTS in Micrograms per Liter

PARAMETER	Sample Amt	Spike Amt	MS Result	MSD Result	MS %Rec	MSD %Rec	RPD
Gasoline	None	500.	499.	472.	100.	94.	6.

SURROGATES	MS %Rec	MSD %Rec
1,3-Dichlorobenzene	106.	101.

Company: Shell Oil Company
Date: 12/13/91
Client Work ID: 6039 College Ave, Oakland

HARDING ASSOC.
MJB
DEC 18 1991

IT ANALYTICAL SERVICES
SAN JOSE, CA

Work Order: T1-11-234

TEST CODE QC TEST NAME Quality Control

Quality control (QC) samples are analyzed and used to assess the laboratory control measures. Routine QC samples include method blanks, spikes and duplicates. The purpose of the method blank (MB) analysis is to demonstrate that artifacts of the test do not yield false positives. The laboratory control spike (LS) and /or matrix spike (MS) analysis is used to evaluate the ability of the test to recover analytes of interest, i.e. accuracy. Accuracy is expressed as percent (%) recovery. The laboratory spike duplicate (LSD), matrix spike duplicate (MSD), or duplicate sample (DUP) is used to determine the precision of the test, by comparing the result from the original spike (or sample) to the duplicate spike (or sample). Precision is expressed as relative percent difference (RPD).

The results of appropriate QC samples from QC batches associated with the listed samples are included in this report.

TEST CODE TPHN TEST NAME TPH High Boiling by 8015

The method of analysis for high boiling hydrocarbons is taken from the LUFT field manual. Samples are extracted with solvent and examined by gas chromatography using a flame ionization detector. Results in soils are corrected for moisture content and are reported on a dry soil basis unless otherwise noted.

TEST CODE TPHVB TEST NAME TPH Gas, BTEX by 8015/8020

The method of analysis for low boiling hydrocarbons is taken from EPA Methods modified 8015, 8020 and 5030. The sample is examined using the purge and trap technique. Final detection is by gas chromatography using a flame ionization detector in series with a photoionization detector. The result for total low boiling hydrocarbons is calculated as gasoline. Results in soils are corrected for moisture content and are reported on a dry soil basis unless otherwise noted.

The MS/MSD recoveries for gasoline were outside acceptance limits; however the RPD was within acceptance limits. The LS recovery was acceptable and is reported.



SHELL OIL COMPANY
RETAIL ENVIRONMENTAL ENGINEERING - WEST

CHAIN OF CUSTODY RECORD

Serial No.:

Date: 11/22/91

Page 1 of 1

Site Address:

6039 COLLEGE AVE, OAKLAND

WIC#:

204-5508-330

Shell Engineer:

PAUL HAYES

Phone No. 510

605-3052

Fax #: 605-3943

Consultant Name & Address:

HARDING LAWSON ASSOCIATES.
1355 WILLOW WAY, STE 109 CONCORD CA 94520

Consultant Contact:

MIKE BRINK

Phone No. 510 607-9660

Fax #: 510 607-9673

Comments: SAMPLE 106 ONLY ANALYZED FOR
BTEX + TPH + GAS

NORMAL TURNAROUND

Sampled By: Doreen Meyer

4022 23303

Printed Name:

Analysis Required

LAB: I.T.

CHECK ONE (1) BOX ONLY CT/DT TURN AROUND TIME

Quarterly Monitoring	<input checked="" type="checkbox"/>	5461	24 hours	<input type="checkbox"/>
Site Investigation	<input type="checkbox"/>	5441	48 hours	<input type="checkbox"/>
Soil for disposal	<input type="checkbox"/>	5442	15 days	<input checked="" type="checkbox"/> (Normal)
Water for disposal	<input type="checkbox"/>	5443	Other	<input type="checkbox"/>
Air Sample - Sys O&M	<input type="checkbox"/>	5452	NOTE: Notify Lab as soon as possible of 24/48 hrs. TAT.	
Water Sample - Sys O&M	<input type="checkbox"/>	5453		
Other	<input type="checkbox"/>			

Sample ID	Date	Soil	Water	Air	No. of conds.	TPH (EPA 8015 Mod. Gas) ^{ABC} _{03 A-I}	TPH (EPA 8015 Mod. Diesel) ^D _{05 JKL}	BTEX (EPA 8020/602) ^{ABC} _{03 A-E}	Volatile Organics (EPA 8240)	Test for Disposal	TPH (EPA 8015, METAB OIL) ^D _{05 JKL}	Container Size	Preparation Used	Composite Y/N	MATERIAL DESCRIPTION	SAMPLE CONDITION/ COMMENTS
101	11/22/91		X		4	X	X	X			X	VOA	HCL	N	GROUNDWATER	
102	↓		X		4	X	X	X			X	"	HCL	N	"	
103	↓		X		12	X	X	X			X	"	HCL	N	"	
104			X		4	X	X	X			X	"	HCL	N	"	DM
105	↓		X		4	X	X	X			X	"	HCL	N	"	
106	↓		X		3	X	X	X			X	"	HCL	N	"	LAB PREPARED - HAVE BUBBLES IN VOA'S

Relinquished By (signature):

Relinquished By (signature):

Relinquished By (signature):

Printed name: Doreen Meyer

Printed name: James Martinez

Printed name: James Martinez

Date: 11/22/91

Time: 5:15p

Date: 11/25/91

Time: 1850

Date:

Time:

Received (signature):

Received (signature):

Received (signature):

Received (signature):

Received (signature):

Received (signature):

Printed name:

Printed name: James Martinez

Printed name: M. LeGRANDE

Printed name:

Printed name:

Printed name:

Date: 11-25-91

Time: 65:34

Date: 11-25-91

Time: 1850

Date:

Time:

THE LABORATORY MUST PROVIDE A COPY OF THIS CHAIN OF CUSTODY WITH INVOICE AND RESULTS

Last Revision Date: 10/15/91

QC on sample 103 by 11-27
100 ms/ms on sample or rec'd

DISTRIBUTION

- 1 copy: Shell Oil Company
Environmental Engineering
P. O. Box 5278
Concord, California 94520
Attention: Mr. E. Paul Hayes
- 1 copy: Shell Oil Company
Environmental Engineering
P.O. Box 5278
Concord, California 94520
Attention: Ms. Lisa Foster
- 1 copy: San Francisco Bay
Regional Water Quality Control Board
2101 Webster Street, Suite 500
Oakland, California 94612
Attention: Mr. Tom Callaghan
- 1 copy: Alameda County Environmental
Health Department
80 Swan Way, Room 200
Oakland, California 94621
Attention: Mr. Ed Howell

MJB/DGG/mlw 031798T/R52

QUALITY CONTROL REVIEWER



Terence J. McManus
Associate Environmental Scientist