A Report Prepared for

Shell Oil Company
P.O. Box 4023
Concord, California 94524

WORK PLAN FOR A SOIL AND GROUND-WATER INVESTIGATION SHELL SERVICE STATION 6039 COLLEGE AVENUE 618 OAKLAND, CALIFORNIA

1/10/90

HLA Job No. 4022,233.03

by

Dorinda C. Holloway
Hydrogeologist

Randolph Stone
Engineering Geologist

REGISTERED GEOLOGIST
RANDOLPH STONE
NO. 1214
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Harding Lawson Associates
1355 Willow Way, Suite 109
Concord, California 94520
415/687-9660

January 10, 1990

TABLE OF CONTENTS

LIST OF TABLES..... iii

LIST OF ILLUSTRATIONS..... iii

I INTRODUCTION..... 1

A. Purpose of Investigation..... 1
B. Scope of Services..... 1
C. Location..... 2

II SITE DESCRIPTION..... 3

A. Regional Setting and Hydrogeology..... 3
B. Site Inventory..... 3
C. Site History 3
D. Site Visits and Observations..... 5
E. Agency Records..... 5

III PROPOSED SOIL AND GROUND-WATER INVESTIGATION..... 8

A. Soil Borings..... 8
B. Monitoring Wells..... 10
C. Geotechnical Testing..... 12
D. Well Development, Sampling, and Chemical Analyses..... 12
E. Well Surveying and Calculation of Ground-water Gradient..... 13

IV REPORT PREPARATION..... 14

V TABLES..... 15

VI ILLUSTRATIONS

DISTRIBUTION

LIST OF TABLES

Table 1 Site History and Tank Inventory

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

LIST OF ILLUSTRATIONS

Plate 1 Site Location Map

Plate 2 Site Plan

Plate 3 Proposed Boring and Monitoring Well Locations

Plate 4 Soil Classification and Test Data Key

Plate 5 Typical Well Construction

I INTRODUCTION

A. Purpose of Investigation

This work plan outlines actions to be taken in a soil and ground-water investigation for site characterization at the Shell Oil Company (Shell) service station, 6039 College Avenue, in Oakland, California. The work plan addresses the Tri-Regional Water Quality Control Board (RWQCB) Recommendations for Initial Evaluation and Investigation of Underground Tanks (revised May, 1989) and Reporting Requirements (revised April, 1989).

The investigation of this site is prompted by an unauthorized release from an underground storage tank (UST). According to the report filed with Alameda County Department of Environmental Health on September 6, 1989, the source of the release was a slight weep noted at the connection to the submersible pump for the tank holding premium gasoline.

B. Scope of Services

The work plan described herein includes the following scope of services:

- Soil investigation (7 borings)
- Ground-water investigation (4 monitoring wells)
- Preliminary Site Assessment report.

The ground-water portion of the proposed investigation will be pursued only if significant levels of hydrocarbons are present in the soil.

C. Location

The site is on the south corner of College and Claremont Avenues, which bound the property on the east and west (see Plate 1). On the south, the site is bordered by homes and business establishments; the surrounding area has similar types of use.

II SITE DESCRIPTION

A. Regional Setting and Hydrogeology

The Shell station is approximately three miles from the east shore of San Francisco Bay. Regional surface and ground water discharge into the bay. The site lies between elevation 190 and 200 feet mean sea level (MSL), with topography sloping southward from the intersection of College and Claremont Avenues. Approximately one mile to the northeast lie the Berkeley hills.

Although site-specific subsurface information is not yet available, data from an investigation at a nearby Shell station (5755 Broadway) indicate that neighboring areas are underlain to a depth of 10 to 15 feet by unconsolidated silts, clays, and sands. These unconsolidated sediments may lie above shale bedrock. Depth to ground water is estimated to be between 15 and 20 feet. Ground water is inferred to flow southwest toward the bay.

B. Site Inventory

The service station currently has three 10,000-gallon USTs. All are single-walled, fiberglass tanks, approximately 11 years old. There is no waste oil tank on the site at this time. The site plan is shown on Plate 2.

C. Site History

1. Plan Review

Much of the following information was obtained from construction plot plans for 1940, 1957, and 1978, which were provided by Shell. A Shell service station has occupied this

property since 1940. As shown on Plate 2, various sizes of underground fuel tanks have existed at different locations across the site. Table 1 summarizes the dates of construction, tank installation or removal, and current site inventories.

The station had a full-service garage and a waste oil tank 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.

2. Aerial Photograph Review

We examined aerial photographs dated 1947, 1959, 1969, 1979, and 1988 in the offices of Pacific Aerial Surveys. No aerial photographs taken prior to 1947 were available for the site. We observed that since 1947, the majority of the area surrounding the site has been in commercial and residential use.

Information from the photographs regarding previous on-site locations of tanks, buildings, and canopies appears consistent with data from the plot plans. All of the photographs seemed to show the canopy and building at the Union 76 service station directly north, across the intersection from the Shell station.

D. Site Visits and Observations

HLA visited the site on October 25 and November 8, 1989. On October 25, we confirmed the existence and locations of the three USTs and two pump islands. There are three backfill monitoring points at corners of the tank pad. No odors were noticed upon uncapping the monitoring points, which are constructed of 4-inch-diameter, slotted PVC casing. All three points appeared dry.

On November 8, 1989, we checked the monitoring points for the presence of ground water and free product; neither was present. The following total depths were measured:

Monitoring Point	Depth (ft)
OBS-1	8.75
OBS-2	11.44
OBS-3	4.68

We noted possible drilling locations in potential source areas along the southern landscaped area near a redwood fence, and on the east and west sides of the property between the sidewalk and the pump island canopies. Potential source areas include present and past locations of tanks and pump islands observed from review of plot plans and aerial photographs.

E. Agency Records

We reviewed the following 1989 published regulatory agency lists of sites within a 1/4-mile radius of the Shell property that have documented problems with hazardous materials:

- Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) of the U.S. Environmental Protection Agency (USEPA)

- The California Water Resources Control Board's Hazardous Substances Storage Container Information
- Fuel Leaks List and List of North Bay Toxics Cases of the California Regional Water Quality Control Board (CRWQCB)
- Abandoned Sites List and Expenditure Plan for the Hazardous Waste Bond Cleanup Act of 1984, published by the California Department of Health Services (DHS)
- The Cortese List of Hazardous Material Sites in California.

Our review indicates that the nearest property on the CERCLIS and DHS Expenditure Plan is L&M Plating approximately 1-1/4 miles away (920 54th Avenue, Oakland). According to the Expenditure Plan, the DHS is currently drafting a remedial action plan (RAP) for final remediation of soils and ground water at the site.

The Cortese List includes one entry within 1/4 mile of the site: the Jack Ripsteen Project (formerly named the Benz Shop) at 3170 College Avenue in Berkeley. A second list entry lies within 1/3 mile of the site: an ARCO service station at the intersection of Telegraph and Alacatraz Avenues in Oakland.

The closest sites on the CRWQCB's toxic case list for Alameda County are both 1-1/4 miles from the Shell station: L&M Plating (discussed above) and Urban Designs at 1812 Dwight Way in Berkeley.

Three sites on the CRWQCB's Fuel Leaks List are within 1/4 to 1/3 mile of the station. These include the Benz Shop (discussed above); a Chevron service station at 5800 College Avenue, Oakland; and Fire Station #19 at 5776 Miles Avenue, Oakland.

Nine USTs within 1/4 mile of the Shell station are cited in the CRWQCB Hazardous Substances Container Information Program. These include four tanks at the Union 76 station, 6201 Claremont Avenue; four at the Chevron station, 5800 College Avenue; and one at Dreyers Grand Ice Cream, 5929 College Avenue. These tanks and their locations and contents are listed in Table 2.

The County of Alameda Public Works Agency lists numerous registered ground-water wells within a mile of the site. Most of these comprise four shallow ground-water monitoring networks, each with three to four wells. These monitoring wells range from 17 to 36 feet in total depth; depth to ground water ranges from 5 to 17 feet. Many cathodic protection wells (50- to 120-foot depths) are registered. Also, the list includes some abandoned wells, one domestic well, one industrial well, and two irrigation wells. These have total depths ranging from 40 to 200 feet; some of them may be in use.

Potential off-site contaminant sources exist upgradient of the site. Leaks from the Union 76 station USTs could directly affect soil and ground water beneath the site. Although numerous wells exist within 1 mile of the site, none are registered within a 1/4-mile radius.

III PROPOSED SOIL AND GROUND-WATER INVESTIGATION

A. Soil Borings

The objectives of our soil investigation are to evaluate concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX), and total petroleum hydrocarbons (TPH) in the vadose zone; and to evaluate the limits of detectable concentrations of these compounds in vadose zone soils.

We propose to drill seven soil borings to depths of 20 feet, or to the top of the saturated zone, at locations shown on Plate 3. These borings will be located in potential source areas as described below:

Boring	Purpose
B-1	Location of 1940 pump island
B-2	Location of 1940 fuel tanks
B-3	Location of 1957 fuel tank
B-4 and B-5	Location of 1957 pump islands and adjacent to present pump islands
B-6 and B-7	Location of former waste oil tank and present fuel tanks

The borings will be advanced using truck-mounted, 8-inch, hollow-stem augers, and sampled using a 2-1/2-inch inside diameter (I.D.), Sprague and Henwood (S&H), split-barrel sampler lined with 6-inch-long brass tubes. Drilling will be performed under the direction of an HLA field geologist, who will log the borings in accordance with the Unified Soil Classification System presented on Plate 4. Soil samples will be screened in the field

with a photoionization detector (PID), and measurements will be documented on the logs. PID readings indicate relative concentrations of volatile organic compounds in soil.

At least two soil samples with the highest PID readings will be obtained from each boring, sealed with aluminum foil, plastic end caps, and electrical tape. They will be placed in a cooled ice chest and transported under chain-of-custody procedures to a certified chemical testing laboratory for analyses of TPH as gasoline and BTEX, in accordance with EPA Test Methods 8020 and 5030, respectively.

Soil samples from borings near the present tanks and the former waste oil tank location will also be analyzed for TPH as waste oil (EPA Test Method 8015). If results indicate that TPH as waste oil is present, the following additional parameters will be tested: TPH as diesel fuel (EPA Test Method 3550); oil and grease (EPA Test Method 503 D&E); chlorinated hydrocarbons (EPA Test Method 8010); cadmium, chromium, lead, and zinc (by ICP or AA); and polychlorinated biphenyls (PCB), polychlorinated phenols (PCP), polynuclear aromatics (PNA) and creosote (EPA Test Method 8270).

A composite sample of drill cuttings will be analyzed for BTEX and TPH as gasoline. After the cuttings are adequately aerated on site, they will be disposed of at a Class III landfill. A fenced storage area behind the cashier's booth will be used for temporary storage of cuttings during aeration.

Sampling equipment will be washed with a trisodium phosphate (TSP) solution and rinsed with clean water between sampling intervals. All drilling equipment will be steam-cleaned before and after each boring.

The borings will be backfilled to the ground surface with a cement-bentonite grout. Depending on the results of analyses of samples from these seven borings, additional soil investigation may be undertaken and/or the ground-water investigation described below will be implemented.

B. Monitoring Wells

If it is decided to implement the ground-water investigation, four monitoring wells will be installed to a depth of approximately 25 feet at proposed locations shown on Plate 3. We anticipate that all wells will be located on-site during the initial investigation. The proposed monitoring well locations were selected as follows:

Well	Purpose
MW-1	Potential upgradient well to serve as a check for migration of contaminants from off-site sources
MW-2	Directly upgradient from the existing USTs and potentially downgradient of pump islands
MW-3 and MW-4	Downgradient of existing USTs

Additional wells may be installed if warranted by results from the soil investigation.

The purpose of the ground-water monitoring will be to evaluate concentrations of BTEX, TPH, tetraethyllead (TEL) and ethyl dibromide (EDB) in ground water. We will also take water level measurements to characterize ground-water flow direction.

Well borings will be drilled in the manner described for soil borings. At least one of the well borings will be drilled to the top of the first confining layer encountered below saturated sediments. We anticipate the depth of the confining layer to be less than 50 feet. We will use the PID to measure volatile compounds in soil samples from above the water table; those with detectable amounts will be sent to a certified laboratory for analyses, as described above.

Upon completion of each boring, we will install a 4-inch-diameter well constructed of steam-cleaned, Schedule 40 PVC casing (see Typical Well Construction, Plate 5). The annular space between the casing and borehole wall will be filled with No. 3 Monterey sand to approximately one foot above the top of the screened casing. A 2-foot-thick bentonite seal will be placed above the sand pack, and the remainder of the annulus filled with a cement-bentonite grout to just below ground surface. The top of each well will be slightly below the ground surface, and the wells will have locking, water-tight caps to minimize intrusion of surface water. A locking, water-tight traffic box will be installed over each well, set slightly above surrounding grade.

C. Geotechnical Testing

Two samples will be collected from each type of strata encountered beneath the site in soil and/or well borings. Samples will be tested in our laboratory for grain-size distribution and vertical permeability. Results will be used to verify soil logging procedures and to further characterize site hydrogeology.

D. Well Development, Sampling, and Chemical Analyses

The wells will be developed, sampled, and surveyed by an HLA technician. Before development, a clear lucite bailer will be lowered into each well to check for free product. The wells will be developed by bailing with a stainless steel bailer, removing at least six well volumes of water from each well, while monitoring temperature, pH, and conductivity, until these parameters stabilize. After development, three additional volumes will be purged while continuing to monitor the parameters, and then ground water will be sampled. Purged water will be placed in drums approved by the Department of Transportation (DOT) for subsequent disposal at a permitted facility.

If free product is found in the monitoring wells, an oil-water interface probe will be used to measure the thickness of the immiscible layer. Free product will be monitored and removed from the monitoring wells in an appropriate manner.

Ground-water samples will be taken with a clean stainless steel bailer, and decanted into laboratory-prepared, 40-milliliter volatile organic analysis (VOA) vials. The vials

will be immediately sealed, labeled, and placed in a cooler with ice until delivery to a certified laboratory for analysis of TPH and BTEX, in accordance with EPA Test Methods 602 and 5030; and for TEL and EDB, in accordance with DHS test methods. All sampling equipment will be washed with a TSP solution and rinsed in clean water and distilled water between uses.

Appropriate quality assurance and quality control (QA/QC) measures are employed during all field investigations. HLA maintains an internal QA/QC program that includes provisions for avoiding cross-contamination during site investigation and procedures for decontamination, sample handling, preservation, and chain-of-custody.

E. Well Surveying and Calculation of Ground-water Gradient

Tops of well casings and ground surface at well and boring locations will be surveyed (within 0.01 feet) to a common datum with an assumed elevation of 100.0 feet. The direction and magnitude of the ground-water gradient will be calculated from these data.

IV REPORT PREPARATION

HLA will prepare a report documenting the results of the field investigation. The report will include an analysis of data collected and conclusions pertaining to the following items:

- The character of the shallow hydrogeology beneath the site
- The extent of any existing free product
- The lateral extent of petroleum hydrocarbons in soil and ground water
- Recommendations for additional work, if needed
- Conclusions on the need for remediation of soil and/or ground water.

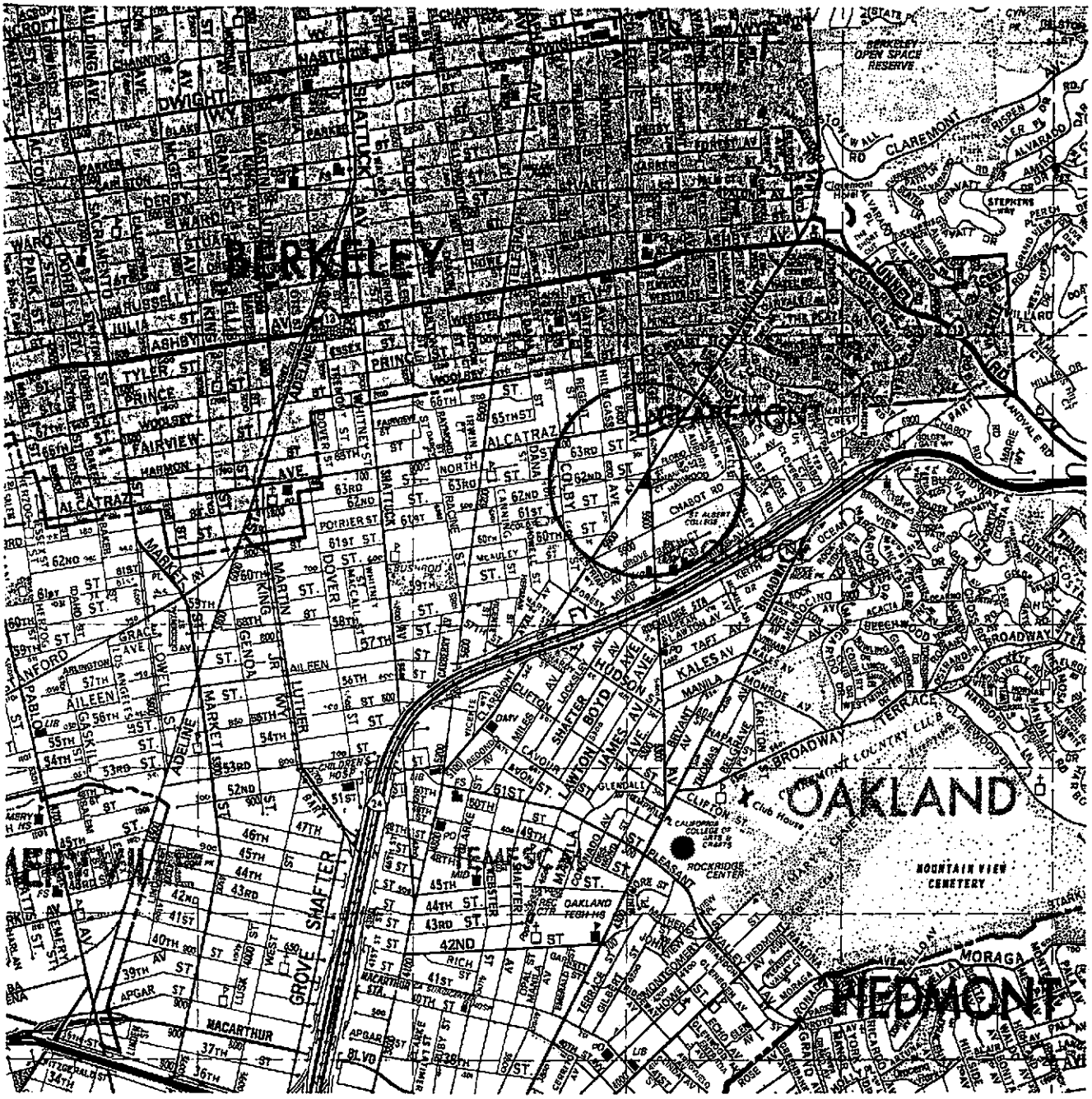
Table 1. Site History and Tank Inventory

Year Constructed	Underground* Tanks	Contents	Structures*
1940	3-1,000-gallon 1- 550-gallon 1- 110-gallon	Leaded gasoline Leaded gasoline Waste Oil	Full service garage and one pump island
1957	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	1-8,000-gallon	Leaded or Unleaded gasoline	
1978	3-10,000-gallon fiberglass	Unleaded gasoline	Cashier counter and Mini-Mart, two pump islands with canopies

* Approximate locations shown on Plate 2

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

Location	Number of Tanks	Material in Tanks
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	1	Diesel Fuel

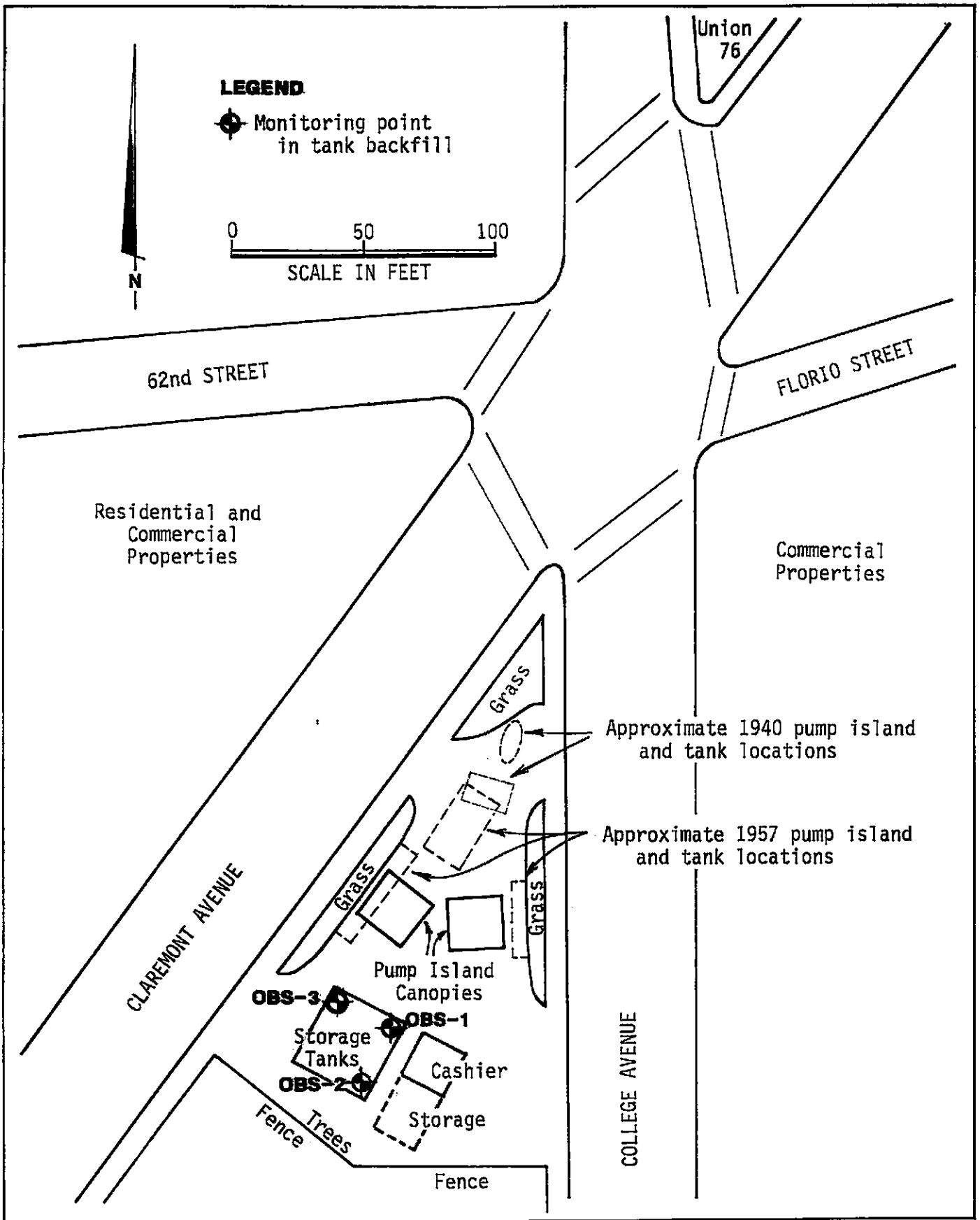


Harding Lawson Associates
Engineering and
Environmental Services

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

PLATE
1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
KH	4022,233.03		11/89	

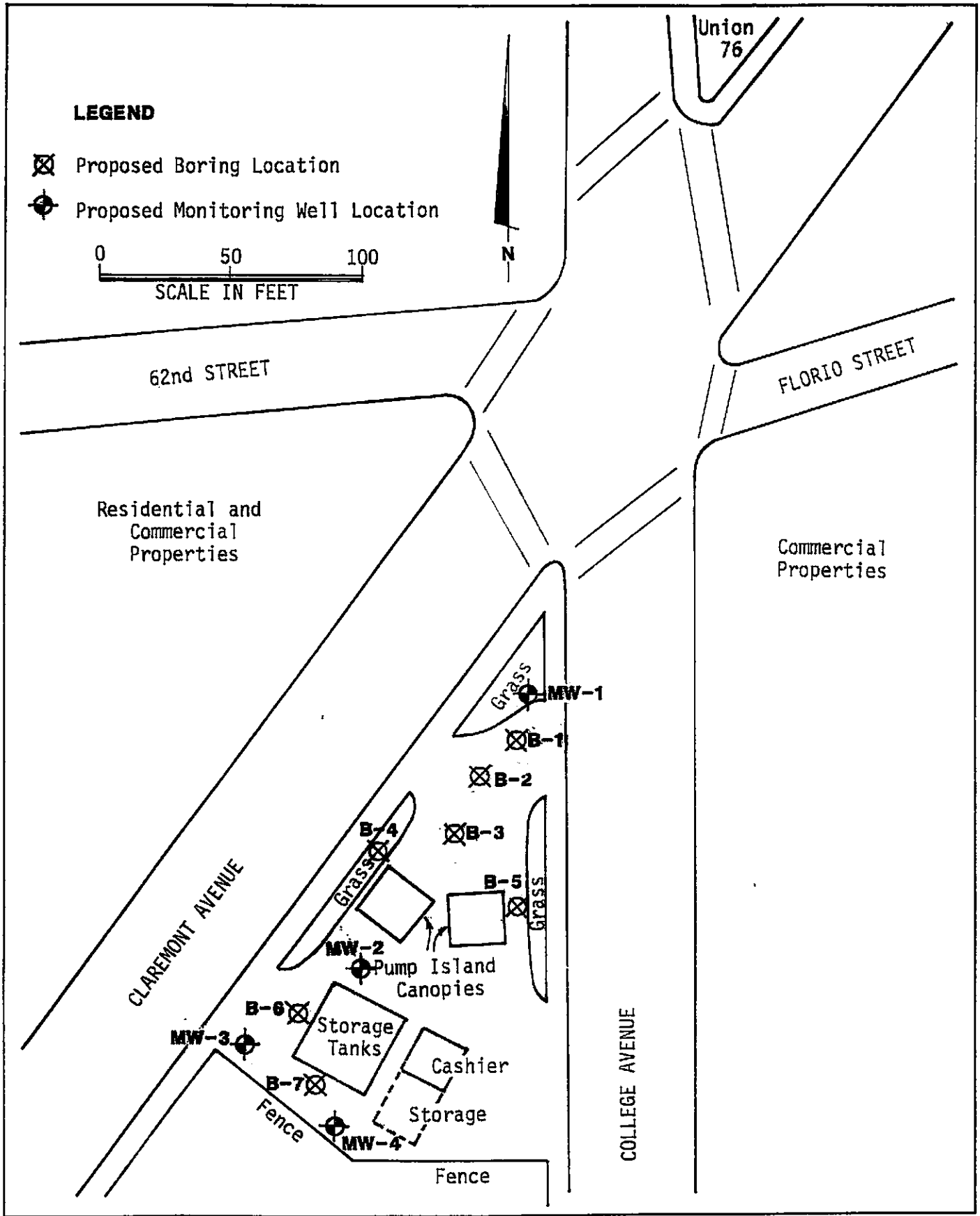


Harding Lawson Associates
Engineering and Environmental Services

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

PLATE **2**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
KH	4022,233.03		11/89	



Harding Lawson Associates
Engineering and Environmental Services

Shell Service Station
6039 College Avenue
Oakland, California

PLATE **3**

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
KH	4022,233.03		11/89	

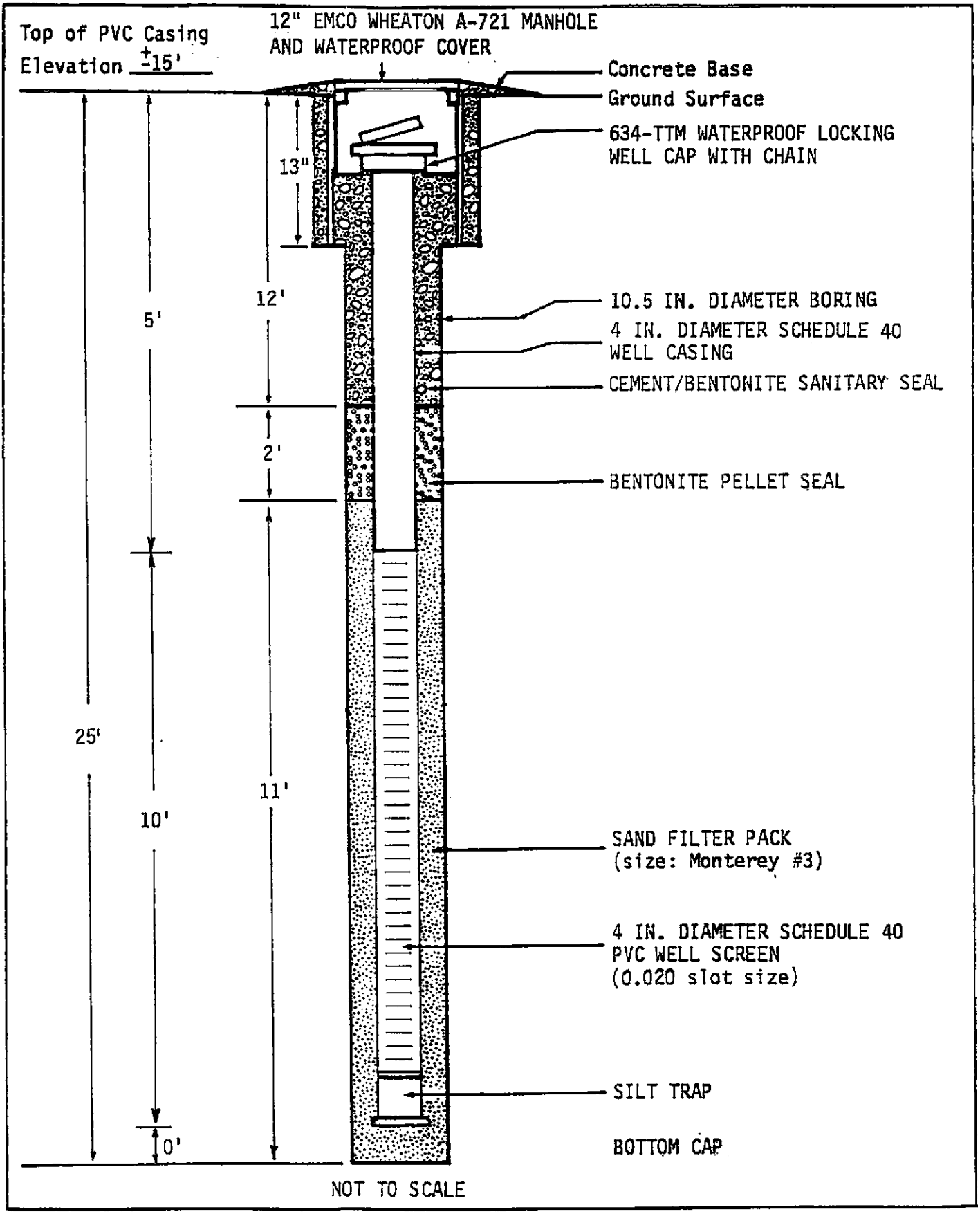
MAJOR DIVISIONS					TYPICAL NAMES
COARSE–GRAINED SOILS MORE THAN HALF IS COARSER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW		WELL GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
			GP		POORLY GRADED GRAVELS WITH OR WITHOUT SAND, LITTLE OR NO FINES
		GRAVELS WITH OVER 12% FINES	GM		SILTY GRAVELS, SILTY GRAVELS WITH SAND
			GC		CLAYEY GRAVELS, CLAYEY GRAVELS WITH SAND
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW		WELL GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
			SP		POORLY GRADED SANDS WITH OR WITHOUT GRAVEL, LITTLE OR NO FINES
		SANDS WITH OVER 12% FINES	SM		SILTY SANDS WITH OR WITHOUT GRAVEL
			SC		CLAYEY SANDS WITH OR WITHOUT GRAVEL
FINE–GRAINED SOILS MORE THAN HALF IS FINER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50% OR LESS		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTS WITH SANDS AND GRAVELS
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, CLAYS WITH SANDS AND GRAVELS, LEAN CLAYS
			OL		ORGANIC SILTS OR CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACIOUS, FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH		ORGANIC SILTS OR CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS

UNIFIED SOIL CLASSIFICATION – ASTM D2487-85

Perm	—	Permeability
Consol	—	Consolidation
LL	—	Liquid Limit (%)
PI	—	Plastic Index (%)
G_s	—	Specific Gravity
MA	—	Particle Size Analysis
■	—	"Undisturbed" Sample
☒	—	Bulk or Classification Sample

Shear Strength (psf) ↓		Confining Pressure ↓		
TxUU (FM) or (S)	3200	(2600)	—	Unconsolidated Undrained Triaxial Shear (field moisture or saturated)
TxCU (P)	3200	(2600)	—	Consolidated Undrained Triaxial Shear (with or without pore pressure measurement)
TxCD	3200	(2600)	—	Consolidated Drained Triaxial Shear
SSCU (P)	3200	(2600)	—	Simple Shear Consolidated Undrained (with or without pore pressure measurement)
SSCD	3200	(2600)	—	Simple Shear Consolidated Drained
DSCD	2700	(2000)	—	Consolidated Drained Direct Shear
UC	470		—	Unconfined Compression
LVS	700		—	Laboratory Vane Shear

KEY TO TEST DATA



Harding Lawson Associates
Engineers and Geoscientists

Typical Well Construction
Shell Service Station
6039 College Avenue
Oakland, California

PLATE
5

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
KH	4022,233.03		11/89		

DISTRIBUTION

3 copies: Shell Oil Company
P.O. Box 4023
Concord, California 94524
Attention: Ms. Diane M. Lundquist

1 copy: Shell Oil Company
P.O. Box 4023
Concord, California 94524
Attention: Ms. Lisa Foster

DCH/RS/ly 031032T/R31

QUALITY CONTROL REVIEWER

Stephen J. Osborne
Principal Engineer