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TO East Bay Regional Parks District
Parklands Design Department
P.O. Box 5381
Oakland, California 94605-0381

DATE	3/2/94	JOB NO.	NC367/723090
ATTENTION	Mr. Warren Gee		
RE:	Redwood Regional Park Service Yard		
	UFST Investigation, Oakland, CA		

GENTLEMEN:

WE ARE SENDING YOU Attached Under separate cover via _____ the following items:

Shop drawings Prints Plans Samples Specifications

Copy of letter Change order _____

Dated _____

COPIES	DATE	NO.	DESCRIPTION
2	3/2/94		Creek and Soil Sampling at Redwood Regional Park, Oakland, California

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REMARKS:

Warren,
we have submitted copies of the report to ACHCSA-DHM and RWDCB. we recommend that you submit a copy to the California Dept of Fish & Game, as well.

COPY TO J. Shin ACHCSA-DHM
L. Feldman RWDCB

SIGNED: B. M. Rucker

PARSONS ENGINEERING SCIENCE, INC.

1301 Marina Village Parkway, Suite 200 • Alameda, California 94501 • (510) 769-0100 • Fax: (510) 769-9244

28 December 1994
Ref: 726104

Alameda County Health Care Services Agency
Department of Environmental Health - Hazardous Materials Division
1131 Harbor Bay Parkway, Suite 250
Alameda CA 94502

Attention: Ms. Juliet Shin

Subject: Quarterly Progress Report 1: Redwood Regional Park Service Yard, Oakland,
California

Dear Ms. Shin:

Attached is Quarterly Progress Report 1 for the site investigation at Redwood Regional Park Service Yard, Oakland, California. This report describes October and November 1994 site characterization and groundwater monitoring activities related to two former leaking underground fuel storage tanks. This report also summarizes previous site characterization and remedial activities associated with the former tanks.

Current quarter activities include installation and development of six groundwater monitoring wells, and hydrologic and hydrochemical monitoring of these wells.

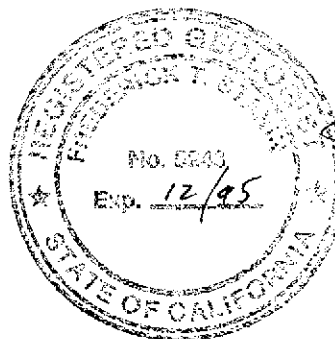
We trust that this submittal meets your needs. Please call if you have questions or require additional information.

Very truly yours,

PARSONS ENGINEERING SCIENCE, INC.

Bruce M. Rucker

Bruce M. Rucker, REA
Project Manager



Frederick T. Stanin
Frederick T. Stanin, R.G.
Principal Geologist

Enclosure

cc: W. Gee, East Bay Regional Parks District

Quarterly Progress Report 1

(October - December 1994)

**REDWOOD REGIONAL PARK SERVICE YARD -
OAKLAND, CALIFORNIA**

Prepared for

**EAST BAY REGIONAL PARKS DISTRICT
Oakland, California**

December 1994

Prepared by

ENGINEERING-SCIENCE, INC.

DESIGN • RESEARCH • PLANNING

1301 MARINA VILLAGE PARKWAY, ALAMEDA, CA 94501 • 510/769-0100

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EXECUTIVE SUMMARY

QUARTERLY PROGRESS REPORT 1

This report describes October and November 1994 site characterization and groundwater monitoring activities at the Redwood Regional Park Service Yard, Oakland, California. Specific activities described in this report include:

- Installation and development of six groundwater monitoring wells to assess contamination from two former underground fuel storage tanks containing gasoline and diesel fuel.
- Collection and laboratory analysis of soil samples during well installations.
- Collection of static water levels to evaluate the local direction of groundwater flow and calculate the hydraulic gradient.
- Laboratory analysis of groundwater samples from all site wells for total petroleum hydrocarbons - gasoline and - diesel ranges (TPH-G,-D) and aromatic hydrocarbons (including benzene, toluene, ethylbenzene and total xylenes [BTEX]).

Static water level elevations measured during the current event confirm the northeast to southwest local groundwater flow direction at the site.

Soil samples collected during the current quarter monitoring well installation program confirm that soil contamination by petroleum and aromatic hydrocarbons is limited to capillary fringe soils downgradient of the former underground fuel storage tank (UFST) excavation. No soil contaminants were detected in excess of published regulatory agency "action levels." Residual soils in the immediate vicinity of the former UFST excavation are contaminated with petroleum hydrocarbons in excess of published regulatory agency "action levels."

TPH-G and TPH-D were detected in site groundwater samples in November 1994 at maximum concentrations of 2,600 and 230 $\mu\text{g/L}$, respectively. Maximum groundwater contamination was detected in well MW-4, located approximately 100 feet downgradient (southwest) of the former UFST source area. Several fuel-related aromatic hydrocarbons (including benzene, ethylbenzene and total xylenes) were detected in groundwater samples at concentrations in excess of regulatory standards for drinking water. The limits of groundwater contamination are defined to the east, west and north of the UFST source area. Gasoline was detected at a concentration equal to the method reporting limit in the background well south of the UFST source area.

Groundwater at the project site is not a current drinking water source, and does not constitute a potential drinking water source based on the inferred low yield. Therefore, groundwater quality data should be considered with respect to numerical water quality objectives for surface water in Redwood Creek which has historically been impacted by groundwater flowing from the project site. Creek surface water samples were not collected during the current quarter due to insufficient streamflow.

Based on the data presented in this and previous reports, Parsons Engineering Science, Inc. (Parsons ES) recommends continuation of the established groundwater monitoring program, with the addition of quarterly sampling and analysis of Redwood Creek surface water. Parsons ES also recommends that an ecological and human health risk assessment be conducted to assess impacts associated with documented surface water contamination.

SECTION 1

INTRODUCTION

This report summarizes October through December 1994 site characterization and monitoring activities at the Redwood Regional Park Service Yard in Oakland, Alameda County, California. The ongoing investigation being conducted by Parsons Engineering Science, Inc. (Parsons ES) (formerly Engineering-Science, Inc. [ES]) is designed to characterize and evaluate the extent and magnitude of soil and groundwater contamination associated with two former underground fuel storage tanks (UFSTs) which contained gasoline and diesel fuel.

This initial quarterly progress report presents a brief summary of historical site investigations, an evaluation of site hydrogeology, current quarter activities, and an assessment of applicable regulatory criteria governing detected contamination. Subsequent quarterly reports will present only the results of current quarter activities. An annual summary assessment report will be presented following the fourth quarterly monitoring event of 1994 (scheduled for August 1995). That summary report will summarize the year of quarterly groundwater monitoring activities, analyze hydrochemical trends, and evaluate regulatory agency criteria governing detected groundwater contaminants.

1.1 SITE DESCRIPTION AND HISTORY

The project site is located at 7867 Redwood Road in Oakland, Alameda County, California. Figure 1.1 shows the location of the project site. The project site is a service yard for Redwood Regional Park, and utilized two UFSTs (one 2,000-gallon diesel fuel and one 5,000-gallon unleaded gasoline) from the mid-1960's to 1993. Figure 1.2 shows the location of the UFSTs. Both UFSTs were reportedly installed between 1965 and 1968 (Parsons ES 1993a). The 5,000-gallon steel UFST contained unleaded gasoline and was reportedly a converted channel buoy purchased from the Navy (Parsons ES 1993a). The tanks and piping underwent integrity testing in 1984, 1986, 1988 and 1989. The unleaded gasoline UFST system failed the 1988 and 1989 tests (Parsons ES 1993a).



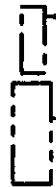
TRAIL

REDWOOD CREEK

PARKING LOT

PARK ENTRANCE ROAD

PARK OFFICE AND SHOP



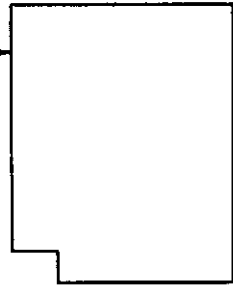
2,000 GALLON DIESEL UFST



5,000 GALLON GASOLINE UFST

SERVICE YARD

EDGE OF PAVEMENT



SCALE IN FEET

NOTES:

UFSTs NOT DRAWN TO SCALE
UFST= FORMER UNDERGROUND FUEL STORAGE TANK
LOCATIONS AND DIMENSIONS OF ROADS, TRAILS AND PARKING LOT ARE APPROXIMATE

SITE PLAN

REDWOOD REGIONAL PARK
SERVICE YARD
OAKLAND, CALIFORNIA

FIGURE 1.2

SECTION 2

PREVIOUS SITE INVESTIGATIONS

This section summarizes previous investigations conducted at the project site. Detailed discussions and evaluations are given in previous reports and workplans (Parsons ES 1993a, 1993b, 1993c, 1994a, 1994b and 1994c).

2.1 UFST CLOSURE AND SOIL REMEDIAL ACTIVITIES

The two project site UFSTs were excavated and transported off-site for disposal in April 1993, at which time discolored soil was observed in the excavation pit below the gasoline UFST location. Initial confirmation soil samples collected from beneath each UFST indicated soil contamination by total petroleum hydrocarbons - gasoline range (TPH-G) and aromatic hydrocarbons (including benzene, toluene, ethylbenzene and total xylenes [BTEX]) (Parsons ES 1993a). No elevated levels of lead were detected in those soil samples.

Approximately 600 cubic yards of contaminated soil in the vicinity of the UFSTs were excavated and stockpiled on site in June 1993 for aeration. The excavation covered a surface area of approximately 2,500 square feet, and had a maximum depth of approximately 25 feet (below grade relative to the eastern edge of the excavation). Soil excavation activities were halted due to the potential for landslides, the presence of significant facility constraints (roads and buildings) and the infiltration of spring water into the excavation.

Five confirmation excavation soil samples were collected by Parsons ES in June 1993. Discolored soil was noted only in the eastern wall of the excavation. However, confirmation soil samples from other areas contained up to 1,700 parts per million by volume (ppmv) total ionizable vapors as measured with a photolization detector (PID) and a total hydrocarbon vapor analyzer (THVA). Maximum concentrations detected in excavation confirmation soil samples include 12,000 mg/Kg TPH-G, 1,300 TPH-D/K, 80 mg/kg benzene, 390 mg/kg toluene, 230 mg/kg ethylbenzene and 1,100 mg/kg total xylenes (Parsons ES 1993c).

The excavation was backfilled between June and August 1993 with previously excavated clean overburden (estimated 270 cubic yards) and imported fill (estimated 330 cubic yards) and the surface was repaved.

The approximately 600 cubic yards of contaminated soil were stockpiled on plastic sheeting at an open area behind the Redwood Park Fire Station #2 located on Redwood

*When
was soil
excavated to*

*Do
no further
excavation
was not to*

Road approximately 500 feet east of the project site. Confirmation soil samples were collected from the stockpiled soil in July 1993, and aeration of the stockpiled, contaminated soil began in August 1993 (Parsons ES 1993a). The East Bay Regional Parks District (EBRPD) has proposed and Alameda County Health Care Services Agency, Environmental Health Department, Hazardous Materials Division (ACHCSA) has approved transporting the soil to Sibley Regional Preserve in Contra Costa County, California for further aeration (ACHCSA 1994b).

*Result
been
done*

2.2 INITIAL SITE CHARACTERIZATION

Following submittal of a technical workplan (Parsons ES 1993b), an initial site characterization was conducted in September and October 1993 in the vicinity of the former UFST excavation. Tasks conducted included: advancing 17 exploratory borings and converting five to temporary well points; collecting for laboratory analysis 27 soil and five "grab" groundwater samples; and, measurement of static water levels (Parsons ES 1993c).

2.3 CREEK SOIL AND SURFACE WATER SAMPLING

Following observation of an area of discolored soil in the bed of Redwood Creek southwest of the former UFSTs, soil and "grab" surface water samples were collected for laboratory analysis in February and March 1994 (Parsons ES 1994a and 1994b). One soil sample was collected in February 1994 for laboratory analysis from the discolored soil. That sample contained 3 mg/kg of TPH-D; neither TPH-G nor BTEX were detected. Two "grab" surface water samples were collected in February and March 1994 immediately downstream of the discolored soil. Those water samples contained up to 130 µg/L TPH-G and selected BTEX constituents; TPH-D/K was not detected. One "grab" surface water sample was also collected in March 1994 approximately 500 feet upstream of the area of discolored soil. That water sample contained 50 µg/L TPH-G; neither TPH-D/K nor BTEX were detected (Parsons ES 1994a and 1994b). It is inferred that this upstream surface water contamination results from runoff of vehicle-sourced fuel compounds from parking areas and/or roadways.

The following conclusions regarding the extent of soil and groundwater contamination are based on the data collected by Parsons ES prior to October 1994:

- Soil excavation activities were effective in reducing the majority of soil contamination in the immediate vicinity of the former UFSTs to concentrations less than regulatory agency action levels.
- Capillary fringe soils and groundwater contaminated with petroleum and aromatic hydrocarbons above regulatory agency action levels were detected up to 130 feet southwest (downgradient) of the UFST source area.
- Surface water in Redwood Creek has been impacted by TPH-G and aromatic hydrocarbons.

*- Act of
Soil Contamination
shows
upto 12/01*

SECTION 3

SITE HYDROGEOLOGY

The following evaluation of the hydrogeologic conditions at the project site is based on geologic logging and water level measurements collected at the site by Parsons ES beginning in September 1993. This section summarizes site geology and groundwater and surface water hydrology.

3.1 GEOLOGY

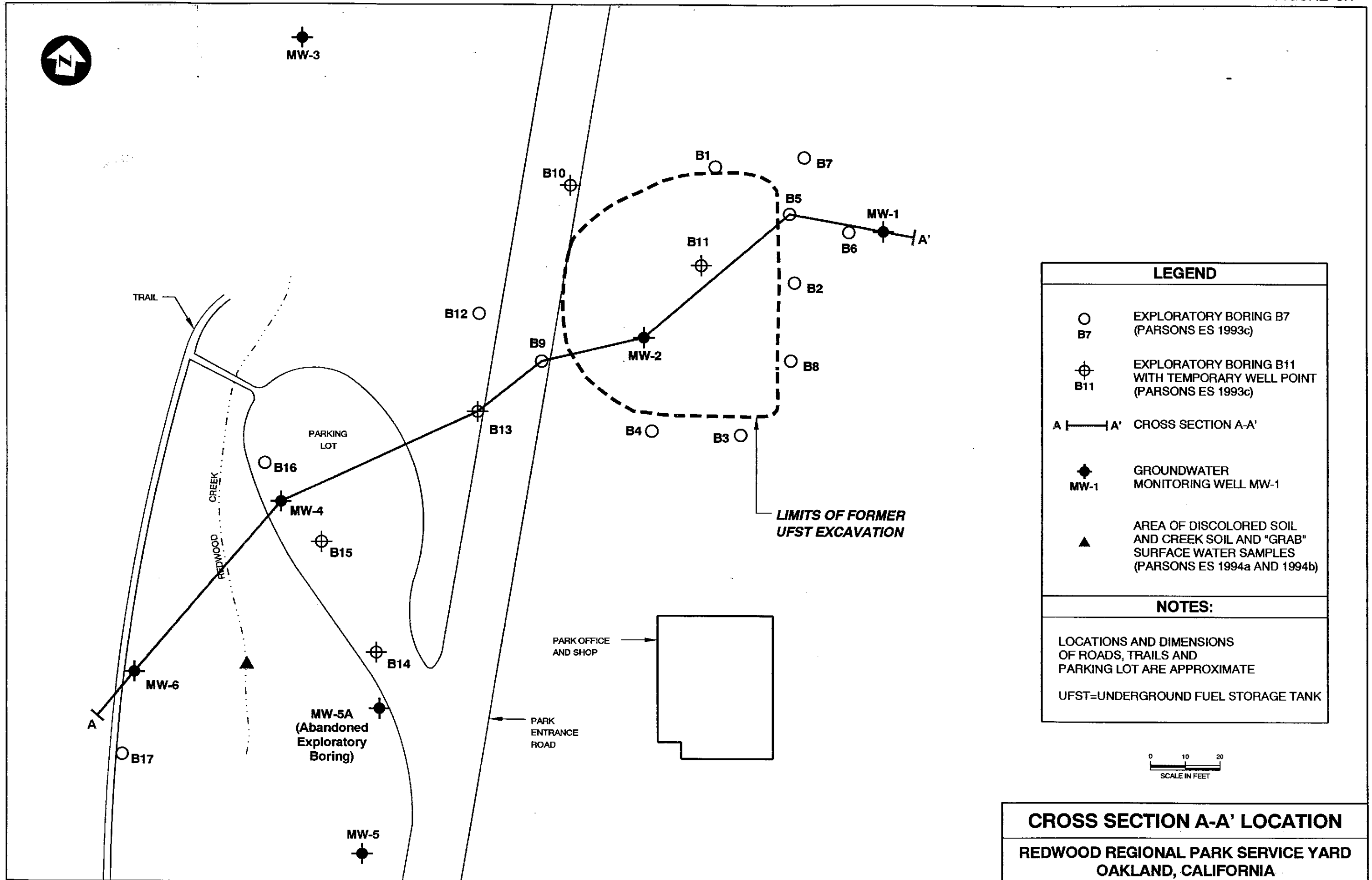
The site is located approximately seven miles east of the southeastern shoreline of San Francisco Bay, within the Coast Ranges physiographic province of California. The San Francisco Bay Area is an elongate structural depression bounded by the Santa Cruz Mountains on the west and the Diablo Range on the east. The Berkeley Hills are encompassed by the Diablo Range.

The San Francisco Bay Area is a seismically active region. The area's main geologic structures are associated with two major faults: the San Andreas Fault in the Santa Cruz Mountains and the Hayward Fault which forms the western boundary of the Diablo Range. The Diablo Range has been uplifted and the bay has gradually subsided over the last three million years. The site is located approximately 2.5 miles east of the Hayward Fault (Norris and Webb 1990) (Nilsen et. al. 1979).

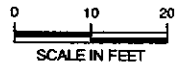
The bedrock in these mountain ranges is composed of sedimentary, metamorphic and volcanic rocks of Jurassic through Tertiary age (Borcherdt et. al. 1975). Overlying the bedrock in Redwood Creek canyon is Quaternary alluvium consisting of silt, sand and gravel. Subsurface stratigraphy at the site is illustrated in cross section A-A' (Figures 3.1 and 3.2) based on soil boring data acquired during the 1993 initial site characterization and the November 1994 well installation program. Shallow soil stratigraphy consists of a surficial three to ten foot-thick clayey silt unit underlain by a five- to fifteen- foot thick silty clay unit. In all monitoring well borings, a five- to ten-foot thick clayey coarse-grained sand and clayey gravel unit was encountered that laterally grades to a clay or silty clay. This unit overlies a weathered siltstone at the base of the observed soil profile. Soils in the vicinity of MW-1 are inferred to be landslide debris.

3.2 HYDROLOGY

Redwood Creek borders the site to the west and is a seasonal creek known for the occurrence of Rainbow Trout. The site lies approximately one mile upstream (northwest) of Upper San Leandro Reservoir (USGS 1959).

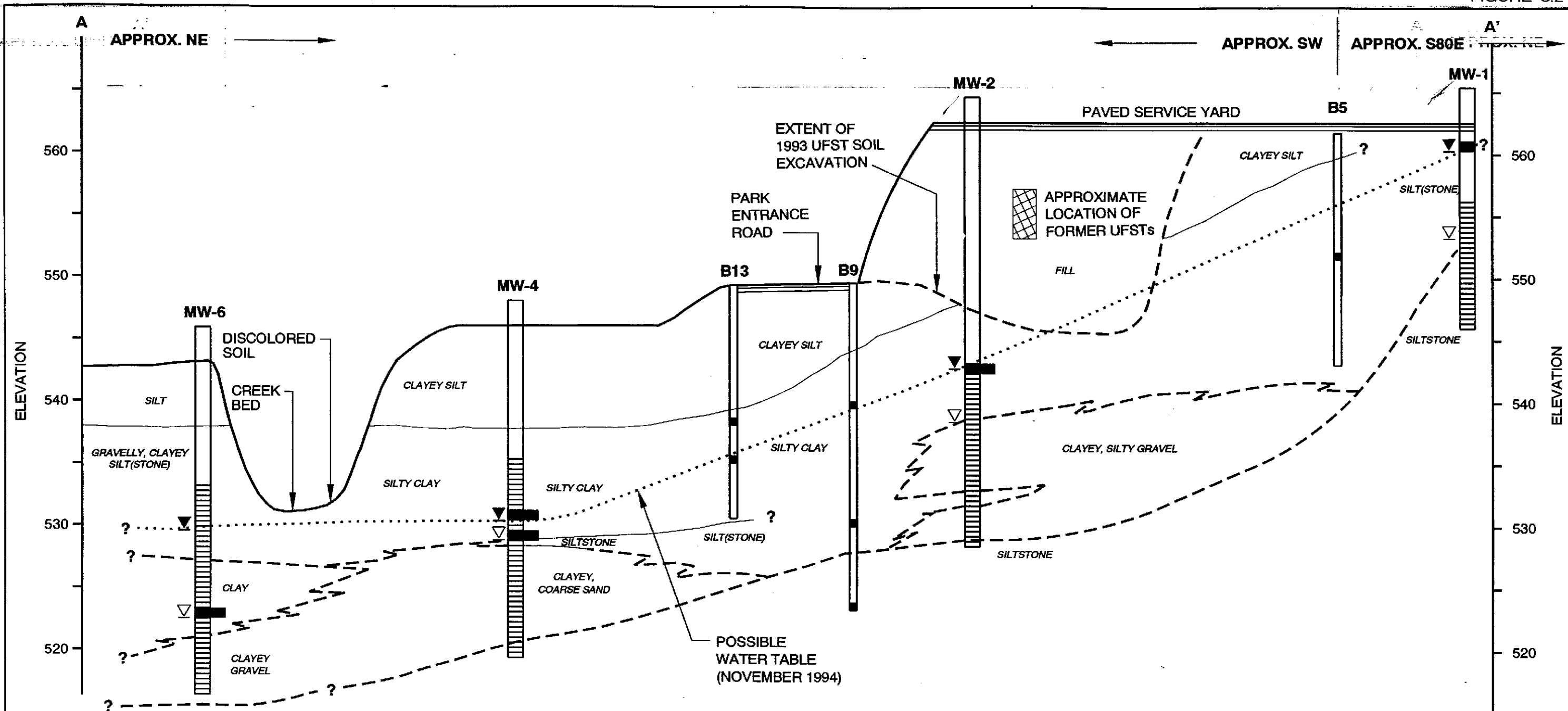


LEGEND	
	EXPLORATORY BORING B7 (PARSONS ES 1993c)
	EXPLORATORY BORING B11 WITH TEMPORARY WELL POINT (PARSONS ES 1993c)
	CROSS SECTION A-A'
	GROUNDWATER MONITORING WELL MW-1
	AREA OF DISCOLORED SOIL AND CREEK SOIL AND "GRAB" SURFACE WATER SAMPLES (PARSONS ES 1994a AND 1994b)
NOTES:	
LOCATIONS AND DIMENSIONS OF ROADS, TRAILS AND PARKING LOT ARE APPROXIMATE	
UFST=UNDERGROUND FUEL STORAGE TANK	

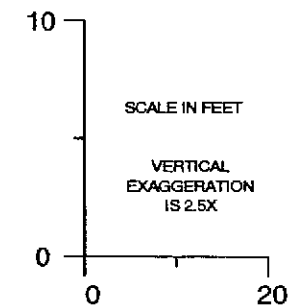


CROSS SECTION A-A' LOCATION
REDWOOD REGIONAL PARK SERVICE YARD
OAKLAND, CALIFORNIA

FIGURE 3.2



LEGEND		NOTES:
	B1 EXPLORATORY BORING B1	LOCATIONS AND DIMENSIONS OF ROADS, TRAILS AND PARKING LOT ARE APPROXIMATE UFST=UNDERGROUND FUEL STORAGE TANK UFSTs NOT DRAWN TO SCALE ALL ELEVATIONS SURVEYED BY EBRPD RELATIVE TO UNITED STATES GEOLOGICAL SURVEY (USGS) SURVEY BENCHMARK NO. JHF-49 AND ARE EXPRESSED AS FEET ABOVE MEAN SEA LEVEL (MSL) WELL CASING AND BORING WIDTHS NOT TO SCALE
	LOCATION OF SOIL SAMPLE COLLECTED FOR LABORATORY ANALYSIS	
	EQUILIBRATED WATER LEVEL (11/94)	
	FIRST ENCOUNTERED GROUNDWATER DURING DRILLING (10/94)	
	MW-1 MONITORING WELL MW-1 SHOWING LOCATION OF SOIL SAMPLE COLLECTED FOR LABORATORY ANALYSIS	

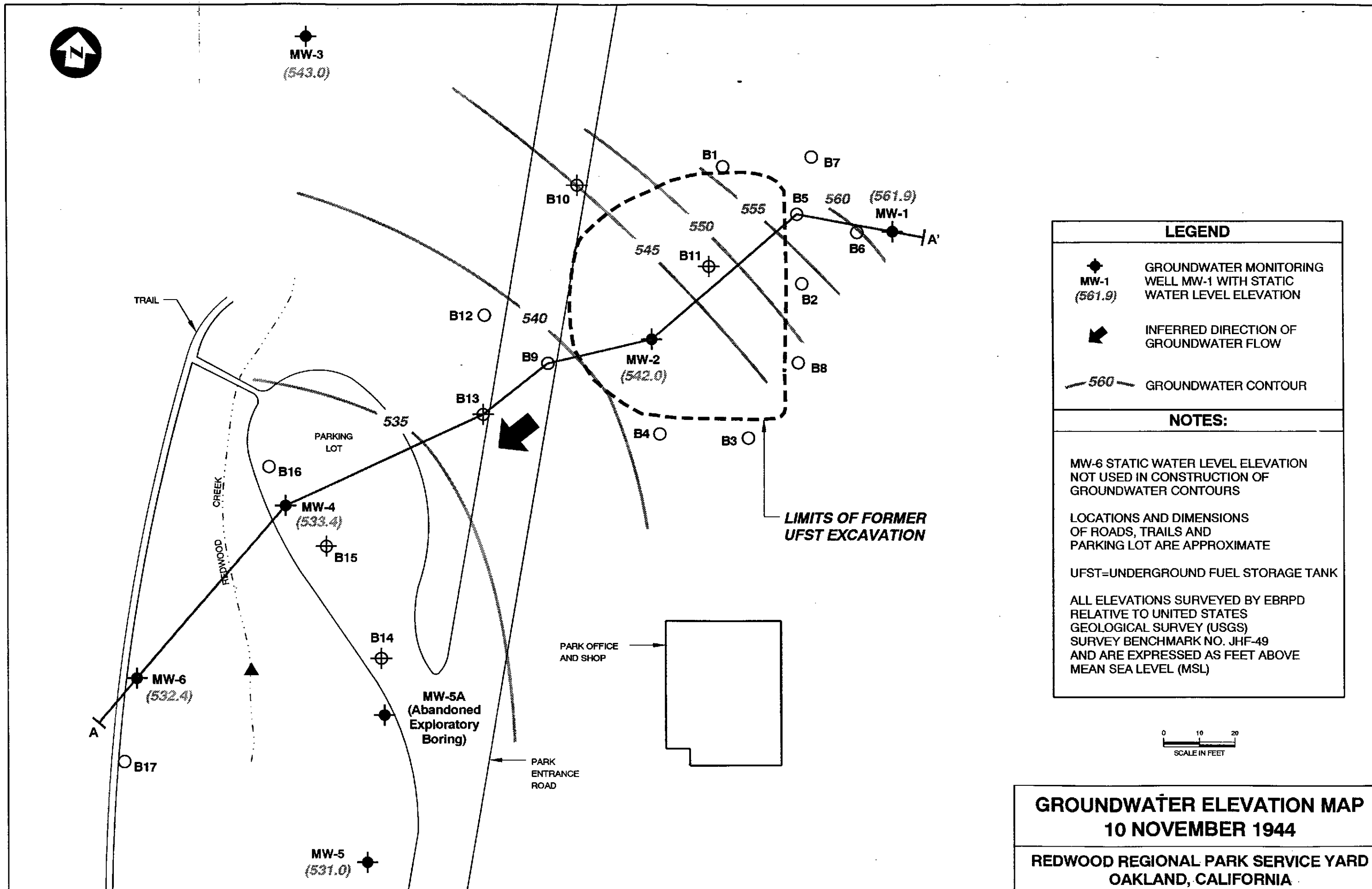


CROSS SECTION A-A'
REDWOOD REGIONAL PARK SERVICE YARD
OAKLAND, CALIFORNIA

Groundwater at the site occurs under unconfined and/or confining conditions, as evidenced by the equilibration of static water levels relative to the first occurrence of groundwater encountered during drilling for the 1993 site characterization and November 1994 well installation program. Groundwater was first observed at the top of the clayey, silty sand-gravel zone in all monitoring well borings except MW-1. First occurrence of groundwater during drilling was encountered from approximately 3 to 25 feet bgs, and equilibrated water levels ranged from 2 to 18 feet bgs (Parsons ES 1993c and Appendices B and C). The difference between first occurrence of groundwater and equilibrated water level ranged from 0 to 13 feet. These differences were the greatest in areas east of the road and were much less west of the road.

Figure 3.2 shows the inferred water table surface, as evidenced by static water level measurements collected 11 November 1994 in the site wells. The inferred water table surface generally follows local topography and generally occurs within the silty clay unit. This water table profile is similar to that observed in 1993 using equilibrated water levels in temporary well points (Parsons ES 1993c). Figure 3.3 is a groundwater elevation map constructed from the November 1994 monitoring well static water levels. The direction of local groundwater flow in the portion of the study area east of Redwood Creek is from northeast to southwest. It is inferred that local groundwater flow direction west of Redwood Creek is toward the east (toward the creek). The groundwater gradient is approximately 0.1 feet per foot between wells MW-2 and Redwood Creek, and is approximately 2 feet per foot between well MW-1 and the former UFST source area. ~~The increased groundwater gradient in that area is inferred to result from the topography and the highly disturbed nature of sediments in the landslide debris.~~

As discussed above, the materials encountered at the water table in borings in the vicinity of the former UFSTs are predominantly clayey silt and silty clay. A hydraulic conductivity value of approximately 0.003 ft/day and an effective porosity value of 30 percent are representative values of these parameters for this soil type (Fetter 1988). Given a groundwater gradient of 0.1 feet per foot as estimated from static water level measurements west of the UFST source area, the average linear groundwater velocity would be approximately 0.4 feet per year. Materials encountered a few feet below the water table in five of the six monitoring wells include a five- to ten-foot thick clayey coarse-grained sand/clayey gravel unit. This is probably the major water-transmitting unit in the observed soil profile. ~~A hydraulic conductivity value of approximately 0.05 ft/day and an effective porosity of 35 percent are representative of these parameters for this soil type (Fetter 1988), yielding an average linear groundwater velocity of approximately five feet per year (approximately ten times the value for the upper silty clay, clayey silt unit).~~ These values are approximations only, and actual groundwater velocities could vary substantially. There is no comprehensive data on groundwater hydrology in the area of the project site (ACFCWCD 1988).



SECTION 4

CURRENT QUARTER ACTIVITIES

This section summarizes recent (October and November 1994) field activities conducted at the project site related to the current soil and groundwater characterization investigation. These activities were conducted in accordance with specifications contained in a technical workplan (Parsons ES 1994c), and included:

- Installation and development of six groundwater monitoring wells
- Collection and laboratory analysis of soil samples during monitoring well installations
- Measurement of static water levels data and collection of groundwater analytical samples from site wells

The locations of all site monitoring wells are shown on Figures 1.2 and 3.1. Well construction information is summarized in Table 4.1. Photodocumentation of well installations is included as Appendix A. Monitoring well installation documentation (including well installation permit, boring logs, well construction diagrams and well completion report) is included as Appendix B.

4.1 MONITORING WELL INSTALLATIONS

4.1.1 Rationale for Monitoring Well Locations

Monitoring well MW-1 was installed adjacent to and upgradient (east) of the former UFST excavation. The objectives of this well are to document that detected groundwater contamination results only from the former UFSTs, and to confirm the northeast to southwest local groundwater flow direction. Monitoring well MW-2 was installed within the footprint of the former UFST excavation. The objective of this well is to document inferred maximum groundwater contaminant levels in the UFST source area.

Monitoring wells MW-3, MW-4 and MW-5 were installed along an approximately north-south line approximately 60 feet downgradient (west) of the former UFST excavation. The objective of well MW-4 is to provide a hydrochemical and static water level monitoring point within the groundwater contaminant plume. Wells MW-3 and MW-5 are located to confirm the northern and southern limits of the groundwater plume at these locations. ~~Note that the initial boring drilled for well MW-5 (MW-5A) was abandoned due to elevated PID/THVA readings during drilling.~~ The final location of well MW-5 was therefore moved approximately 50 feet to the south.

why?

TABLE 4.1

GROUNDWATER MONITORING WELL CONSTRUCTION DATA

Well	Well Depth	Screened Interval	Depth to TOC	Ground Surface Elevation	TOC Elevation
MW-1	18	7-17	-2.3	563.6	565.9
MW-2	36	20-35	-2.4	564.1	566.5
MW-3	42	7-41	-2.8	558.1	560.9
MW-4	26	10-25	-2.1	546.0	548.1
MW-5	26	10-25	-2.3	545.2	547.5
MW-6	26	10-25	-2.3	543.3	545.6

Remarks:

- 1) TOC = Top of Casing
- 2) All depths are feet below ground surface unless otherwise specified. Negative values for "Depth to TOC" indicate that the TOC is above ground surface.
- 3) All elevations are feet above USGS mean sea level (MSL). Elevations were surveyed by EBRPD relative to USGS Benchmark No. JHF-49.

Well MW-6 was installed on the western side of Redwood Creek. The objective of this well is to provide a "point of compliance" to confirm that UFST-sourced groundwater contamination does not extend west of Redwood Creek.

4.1.2 Boring Advancement, Soil Sampling and Well Completions

The borings for the monitoring well installations were advanced between 10 and 14 November 1994 with 10.75-inch outside diameter (OD), truck-mounted, hollow-stem augers. The borings were geologically logged in accordance with the visual method of the Unified Soils Classification System (Appendix B) and drilling spoils were screened for the presence of ionizable organic vapors by analyzing sample headspace using a PID and a THVA. Soil samples were collected in brass sampling sleeves during boring advancement using a modified split-spoon sampler. The sampling sleeves were sealed with Teflon (tradename) tape and non-reactive plastic caps, labeled, refrigerated and transported under chain-of-custody to the analytical laboratory. Drilling equipment was decontaminated by steam cleaning prior to starting each the boring; sampling equipment was decontaminated between sampling depths by washing with Alconox (tradename) solution and rinsing with deionized water. All decontamination rinsate was containerized on site in an 1,100 gallon plastic tank. All drilling spoils (soil) were added to the UFST-sourced soil stockpile.

The monitoring wells were installed between 10 and 16 October 1994. Well completion depths varied from 18 to 37 feet below ground surface (bgs). The monitoring wells were constructed of internally threaded, 4-inch inside diameter (ID), Schedule 40

polyvinyl chloride (PVC) slotted (0.020-inch) casing extending several feet above and below the inferred water table. A threaded PVC bottom plug was placed at the base of the well screen, and blank Schedule 40 PVC casing completed the well to ground surface. Monterey sand (#2/12) was emplaced in the annular space from total depth to two feet above top of well slots. A 3-foot thick bentonite pellet seal was emplaced above the filter pack and hydrated with potable water. The annulus of each well bore was tremie-grouted from the bentonite seal to ground surface with a mixture of 95% neat portland cement to 5% bentonite powder to 9 gallons of potable water, per 94 lb. bag of cement. Surface completions consisted of a locking well cap within an aboveground, iron stovepipe.

4.1.3 Monitoring Well Development

The wells were developed on 18 October 1994 by surging with an approximately 3.75-inch OD pre-cleaned stainless steel bailer, ten times over each foot of screened interval, followed by dewatering of one casing volume. This sequence was completed 10 times for wells MW-1 and MW-3. A minimum of four casing volumes was removed from the remaining wells which were bailed dry. During well development, aquifer stability parameters (including temperature [T], electrical conductivity [EC], and ion index [pH]) were measured and recorded.

A total of 334 gallons was purged from the wells and containerized in the on-site plastic tank. Development water from all wells remained slightly to moderately turbid at the conclusion of each well development.

4.1.4 Monitoring Well Elevation Survey

Following well completions, the elevations at top of casing and adjacent ground surface were surveyed by EBRPD relative to the U.S. Geological Survey (USGS) benchmark number JHF-49 (Table 4.1). Surveying precision was to within 0.1 foot.

4.2 GROUNDWATER MONITORING

Parsons ES personnel measured static water levels (Appendix D) in all six site wells on 10 November 1994. All water level measurements were made using an electric water level indicator.

4.3 GROUNDWATER SAMPLING

Groundwater sampling was conducted in accordance with California Water Resources Control Board (WRCB 1989) guidelines for sampling dissolved product in groundwater associated with leaking UFSTs. Prior to collection of groundwater samples, a pre-cleaned Teflon (tradename) bailer or submersible pump was used to purge a minimum of three casing volumes from each well. EC, pH, and T of purge water were measured during well purging, to document the presence of stabilized formation-water in the wells. Appendix D includes water level data and groundwater monitoring field notes from the groundwater monitoring event.

Glass sample containers were filled with sample water from a pre-cleaned Teflon (tradename) bailer. ~~no samples displayed a petroleum odor~~ in site well MW-4 had a petroleum odor, no samples displayed a petroleum sheen. To prevent cross-contamination, groundwater

date?

sampling equipment was decontaminated prior to use and between each monitoring well with an Alconox (tradename) wash followed by three deionized water rinses. Following sample collection, sample containers were labeled, placed in a cooler packed with "blue ice," and transported under chain-of-custody the same day to a laboratory accredited by the California Environmental Protection Agency (Cal EPA) Department of Toxic Substances Control (DTSC) Environmental Laboratory Accreditation Program (ELAP). A total of 169 gallons of purge water from the current groundwater sampling event was containerized in the on-site plastic tank. Chain-of-custody records for the groundwater samples are included in Appendix D.

SECTION 5

EVALUATION OF RESULTS

This section describes the results of soil and groundwater sampling activities associated with the October 1994 groundwater monitoring well installation program and the first (November 1994) quarterly groundwater sampling event.

5.1 OCTOBER 1994 SOIL ANALYTICAL RESULTS

A total of nine soil samples were collected during installation of the six groundwater monitoring wells in October 1994. Soil samples were collected above first occurrence of groundwater encountered during boring advancement from depths that displayed the highest PID and/or THVA readings. When no PID/THVA readings were detected, the soil sample was collected just above first occurrence of groundwater during boring advancement. All soil samples were analyzed for the following constituents:

- TPH-G, -D and -K by the DTSC Leaking Underground Fuel Tank (LUFT) Manual Method (equivalent to modified EPA Method 8015)
- BTEX by EPA Method 8020

Table 5.1 summarizes soil sample analytical results from the October 1994 monitoring well installation program. ~~Soil contamination by TPH-G, TPH-D/K and BTEX was detected in capillary fringe soils downgradient of the former UFSTs (wells MW-2 and MW-4 and abandoned exploratory boring MW-5A).~~ Minor concentrations (<6 µg/kg) of TPH-D/K contamination were also detected in soil samples from upgradient/transgradient wells MW-1 and MW-3. TPH-D/K was detected in wells MW-6 and MW-5 at a trace concentration (2 µg/kg) just above the method reporting limit.

5.2 NOVEMBER 1994 GROUNDWATER ANALYTICAL RESULTS

The current groundwater monitoring and sampling program is consistent with the Parsons ES workplan for groundwater characterization at the site (Parsons ES 1994c). Groundwater samples collected in November 1994 were analyzed for the following constituents:

- TPH-G,D/K by the DTSC LUFT Manual Method (equivalent to modified EPA Method 8015)
- BTEX by EPA Method 8020

TABLE 5.1
SOIL SAMPLE ANALYTICAL RESULTS
MONITORING WELL INSTALLATION PROGRAM
October 1994

Redwood Regional Park Service Yard, Oakland, California

Compound Sample I.D. Reporting Limit	Concentration (mg/kg)					
	TPH-G	TPH-D/K	Benzene	Toluene	Ethylbenzene	Total Xylenes
	1.0	1.0	0.005	0.005	0.005	0.005
M1-5	ND	3	ND	ND	ND	ND
MW2-21	130	48	0.31	0.18	1.3	4.4
MW3-10	ND	3	ND	ND	ND	ND
MW3-25	ND	5	ND	ND	ND	ND
MW4-15.5	22	4	ND	0.038	ND	0.49
MW4-16.5	10	43	ND	0.009	0.11	0.21
MW5A-15	570	200	ND	1.1	1.9	2.9
MW5-15	ND	2	ND	ND	ND	ND
MW6-19	ND	2	ND	ND	ND	ND

Notes:
 TPH-G = Total petroleum hydrocarbons- gasoline range
 TPH-D/K = Total petroleum hydrocarbons-diesel and kerosene range
 mg/Kg = Milligrams per kilogram, equivalent to parts per million (ppm)
 ND = Not detected above method reporting limit

Figure 5.1 and Table 5.2 summarize groundwater sample analytical results from the November 1994 groundwater sampling event. Maximum groundwater contamination by TPH-G (2,600 µg/L), TPH-D/K (230 µg/L) and total BTEX constituents (363 µg/L) was detected in downgradient well MW-4. TPH-G, benzene and total xylenes were detected at significantly lower concentrations in well MW-2 near the former UFST locations. TPH-G was detected at the method reporting limit (50 µg/L) in well MW-5. TPH-D/K was detected only in the MW-4 groundwater sample. No groundwater contamination was detected in wells MW-1, MW-3 or MW-6.

TABLE 5.2

GROUNDWATER SAMPLE ANALYTICAL RESULTS
10 and 11 November 1994
Redwood Regional Park Service Yard, Oakland, California

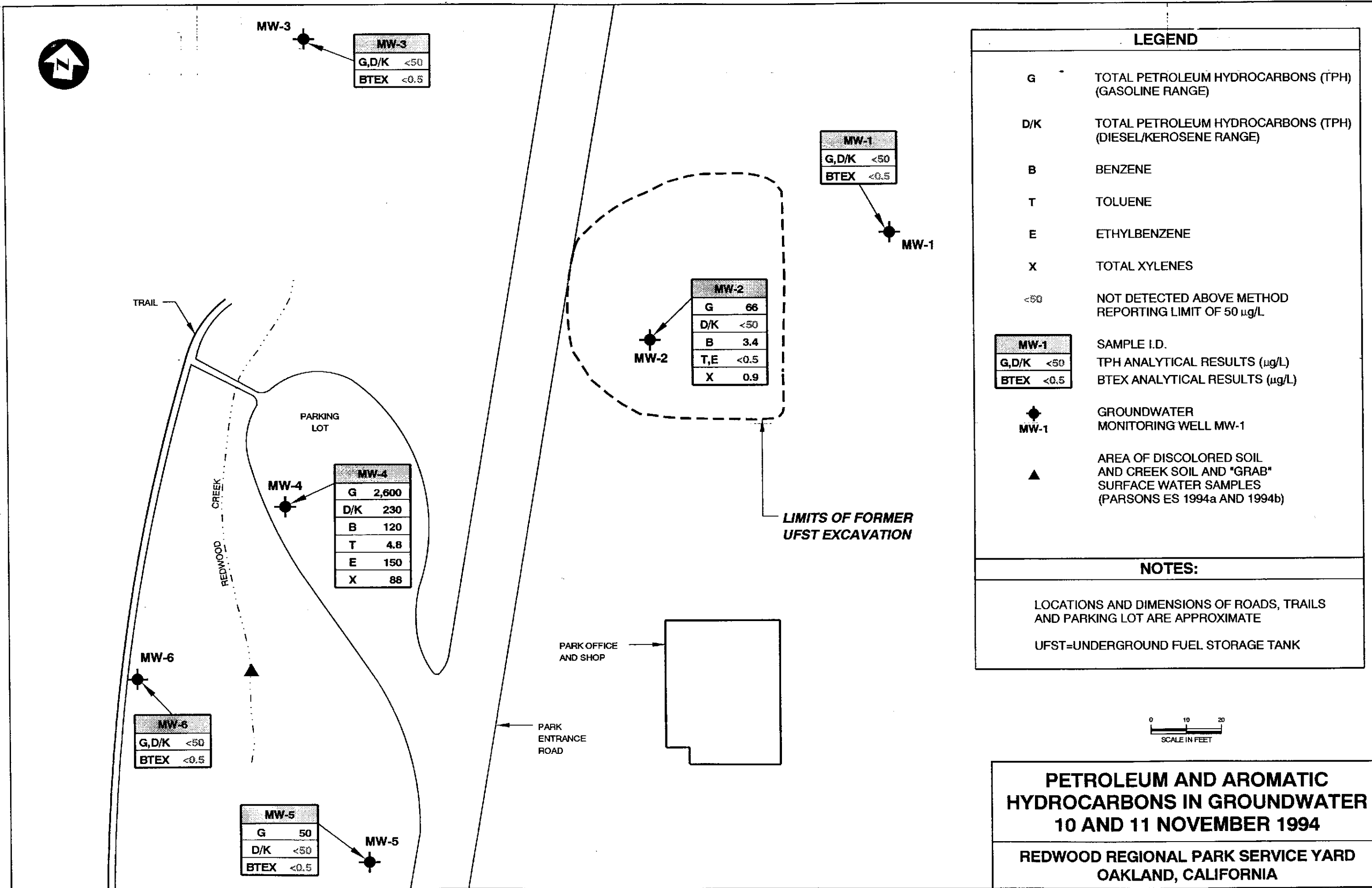
Compound: Reporting Limit:	Concentration (µg/L)					
	TPH-G	TPH-D/K	Benzene	Toluene	Ethylbenzene	Total Xylenes
	50	50	0.5	0.5	0.5	0.5
Sample Location						
MW-1	ND	ND	ND	ND	ND	ND
MW-2	66	ND	3.4	ND	ND	0.9
MW-3	ND	ND	ND	ND	ND	ND
MW-4	2,600	230	1.0	4.8	150	88
MW-4*	2,300	NA	1.0	2.7	120	77
MW-5	50	ND	ND	ND	ND	ND
MW-6	ND	ND	ND	ND	ND	ND

Notes:

- * = Quality control field duplicate sample designated MW-0A on the chain-of-custody and analytical laboratory report
- TPH-G = Total petroleum hydrocarbons - gasoline range
- TPH-D/K = Total petroleum hydrocarbons - diesel/kerosene ranges
- NA = Not Analyzed
- ND = Not Detected
- µg/L = Micrograms per liter, equivalent to parts per billion (ppb)

5.2.1 Quality Control Sample Analytical Results

Three types of field quality control (QC) samples were used to assess whether field or laboratory procedures affected analytical results of the current groundwater sampling event. One equipment rinsate blank (MW-0B) was collected following sampling and decontamination activities at well MW-4 to monitor potential cross-contamination in the field due to inadequate decontamination of sampling equipment and/or sample contamination during transport. That sample was analyzed for TPH-G and BTEX; none of these constituents were detected, verifying the integrity of field decontamination procedures and sample containers.



One field duplicate sample (MW-0A) was collected from well MW-4 and analyzed for TPH-G and BTEX to assess whether field procedures produced reproducible results. The field duplicate sample contained 2,300 $\mu\text{g/L}$ TPH-G (compared to 2,600 $\mu\text{g/L}$ in the field sample), which is a variance of approximately 12 percent from the mean (aka relative percent difference [RPD]). Values of RPD for BTEX constituents were 8.7, 56, 22 and 13 percent, respectively.

One trip blank sample (TB) was prepared by the laboratory and carried into the field during the sampling event to confirm the integrity of sample containers during transport and to assess potential contamination of laboratory source water. That sample was analyzed for TPH-G and BTEX. TPH-G was detected at 67 $\mu\text{g/L}$, however the sample chromatogram did not match those of other samples. No BTEX constituents were detected. It is probable that the trip blank contamination is the result of anomalous laboratory contamination during trip blank sample preparation or analysis. Trip blank QC samples for TPH-G and BTEX will continue to be analyzed and evaluated quarterly to confirm this hypothesis.

Laboratory QC samples (e.g. method blanks, matrix spikes, surrogate spikes, etc.) were analyzed by the laboratory in accordance with requirements of each analytical method. All laboratory QC sample results and sample holding times were within the acceptance limits of the methods (Appendix D).

SECTION 6

REGULATORY CONSIDERATIONS

The ACHCSA is the designated lead agency for oversight of environmental investigations at the project site, and is therefore the principal contact regarding interpretation of applicable regulations. The California Regional Water Quality Control Board - San Francisco Bay Region (RWQCB) provides oversight of ACHCSA decisions.

6.1 RELEVANT CRITERIA FOR SOIL CONTAMINATION

As described in Sections 2 and 5, contaminants detected in site soils include TPH and BTEX. In general, impacts of contamination on the environment by these compounds are evaluated on a case-by-case basis. The following is a discussion of Applicable, Relevant, and Appropriate Requirements (ARARs) for each of these contaminants.

The DTSC uses 1,000 mg/kg TPH in soil (considered hazardous by virtue of its ignitability index) as a minimum criterion for remediation. The RWQCB uses 100 mg/kg TPH in soil as a minimum criterion for assessing impacts to groundwater in investigations related to LUFTs (WRCB 1989). This LUFT guidance also discusses the Designated Level Methodology (DLM) which is used to evaluate the likelihood of impacts to groundwater from contaminated soil. The principal DLM factors considered include: depth to groundwater; subsurface characteristics; and amount of precipitation (water availability). A possible scenario from using the DLM methodology is where the depth to groundwater is shallow, the soil TPH cleanup requirement could therefore be 10 mg/kg or less.

ARARs for residual soil contaminants detected in site soils include: <10 to 1,000 mg/kg TPH; 0.3 to 1.0 mg/kg benzene; 0.3 to 50 mg/kg toluene; and 1 to 50 mg/kg ethylbenzene and total xylenes). All these ARARs are evaluated on a case-by-case risk assessment basis using DTSC/LUFT Manual guidance.

6.2 SOIL CONTAMINATION REGULATORY EVALUATION

Maximum residual soil contaminants at the project site include: 12,000 mg/kg TPH-G; 1,300 mg/kg TPH-K; 80 mg/kg benzene; 390 mg/kg toluene; 230 mg/kg ethylbenzene; and 1,100 mg/kg total xylenes.

6.3 RELEVANT CRITERIA FOR GROUNDWATER AND SURFACE WATER CONTAMINATION

6.3.1 Drinking Water Standards

Measured electrical conductivity values of groundwater at the site range from approximately 200 to 300 $\mu\text{mhos/cm}$ (Appendix D) and therefore do not exceed the maximum value of 5,000 $\mu\text{mhos/cm}$ (equivalent to $\mu\text{S/cm}$) established by WRCB for potential public water supplies. Additionally, sustained yield of site wells is likely to be greater than the 200 gallons per day [gpd] criterion for potentially suitable drinking water (WRCB 1988). Based on these data, groundwater at the site may be considered as a potential drinking water source, and therefore drinking water standards (i.e. Maximum Contaminant Levels [MCLs]) may be applicable to contaminated groundwater at the site.

Numerical drinking water quality standards are published for several contaminants detected in groundwater at the site. Relevant standards include:

Benzene	1 $\mu\text{g/L}$	(California Primary MCL)
Toluene	1,000 $\mu\text{g/L}$	(Proposed Federal Primary MCL)
	40 $\mu\text{g/L}$	(Proposed Federal Secondary MCL)
Xylenes	1,750 $\mu\text{g/L}$	(California Primary MCL)
	20 $\mu\text{g/L}$	(Proposed Federal Secondary MCL)
Ethylbenzene	680 $\mu\text{g/L}$	(California Primary MCL)
	30 $\mu\text{g/L}$	(Proposed Federal Secondary MCL)

However, it should be noted that specific MCLs for drinking water are not published for total petroleum hydrocarbons in groundwater. This contaminant would therefore be regulated under the RWQCB general "nondegradation of beneficial use" policy (RWQCB 1992).

6.3.2 Beneficial Uses and Water Quality Objectives

Beneficial uses of surface water quality in California are used to establish water quality standards and discharge prohibitions (RWQCB 1992). ~~There are no listed beneficial uses for Redwood Creek.~~ However, there are listed beneficial uses for Upper San Leandro Reservoir (located approximately 4,000 feet south [downstream] of the project site), into which Redwood Creek flows. Existing beneficial uses for Upper San Leandro Reservoir include: ~~water contact recreation~~, municipal and domestic supply; warm and cold fresh water habitats; wildlife habitat; and fish spawning. Potential beneficial uses include non-contact water recreation. *NO!*

Groundwater seepage occurs along the eastern boundary of Redwood Creek approximately 130 feet west (downgradient) of the UFST source area. Surface water originating at the seeps flows into Upper San Leandro Reservoir approximately 4,000 feet south (downstream).

The only contaminant detected in surface or groundwater at the site for which there is a published water quality objective (WQO) is benzene (0.34 µg/L in inland surface waters that are existing or potential sources of drinking water) and 21 µg/L for "other waters") (WRCB 1991). These WQOs are based on 30-day average concentrations, however the available site analytical results do not represent an average concentration over a 30-day period.

6.4 GROUNDWATER AND SURFACE WATER CONTAMINATION REGULATORY EVALUATION

Maximum contaminant concentrations detected in site groundwater samples during the current event (all in well MW-4) in excess of published regulatory agency ARARs include:

- Benzene (120 µg/L; exceeds the 1 µg/l California Primary MCL and the 0.34 µg/L and 21 µg/L WQOs for inland surface waters)
- Ethylbenzene (150 µg/L; exceeds the proposed Federal Secondary MCL)
- Total xylenes (88 µg/L; exceeds the proposed Federal Secondary MCL)

The only contaminant historically detected in the "grab" creek water samples in excess of published regulatory agency ARARs is benzene at 1.8 µg/L (exceeds the 0.34 µg/L WQO for inland surface waters that are potential drinking water sources), however, this concentration is not an average concentration over a 30-day period, upon which the WQO is based.

SECTION 7

RECOMMENDATIONS

RECOMMENDATIONS

Parsons Engineering Science recommends a continuation of the current program of groundwater monitoring, with the one revision discussed below. These recommendations are predicated on the assumption that present hydrochemical trends will continue. However, all analytical data collected during ensuing monitoring events will be reviewed to determine whether changes in hydrochemical trends warrant additional characterization and/or remediation measures.

- In accordance with ACHCSA guidance (ACHCSA 1994a), Parsons ES recommends that an ~~ecological and human health risk assessment be conducted to~~ assess potential impacts to wildlife or human health associated with the detected Redwood Creek surface water contamination.
- Collect surface water samples from Redwood Creek on a quarterly basis (contingent upon the presence of surface water) to be analyzed TPH-G, TPH-D/K and BTEX. Those samples should be collected at three locations relative to the area of discolored soil noted during the Initial Site Characterization (Parsons ES 1993a) including: immediately upstream; immediately downstream; and several hundred feet downstream. These analytical results would provide supportive data for the risk assessment.

REFERENCES

- Alameda County Flood Control and Water Conservation District (ACFCWCD) 1988, Geohydrology and Groundwater Quality Overview of the East Bay Plain Area, Report 205 (j).
- Alameda County Health Care Services Agency, Department of Environmental Health, Hazardous Materials Division (ACHCSA) 1994a, Letter to East Bay Regional Parks District regarding Parsons ES Workplan for investigations at Redwood Regional Park Service Yard. 25 August
- Alameda County Health Care Services Agency, Department of Environmental Health, Hazardous Materials Division (ACHCSA) 1994b, Letter to East Bay Regional Parks District regarding transportation of stockpiled soil. 23 November
- Borcherdt, R. D., Gibbs, J.F. and Lajoie, K.R. 1975, Maps Showing Maximum Earthquake Intensity Predicted in the Southern San Francisco Bay Region, California, For Large Earthquakes on the San Andreas and Hayward Faults, Sheet 3: Generalized Geologic Map.
- Fetter 1988, Applied Hydrogeology, MacMillan Publishing Company, New York.
- Nilsen, T.H., Wright, R.H., Vlastic, T.C. and Spangle, W.E. 1979, Relative Slope Stability and Land-Use Planning in the San Francisco Bay Region, California, USGS Professional Paper 944, 96 pp.
- Norris and Webb 1990, Geology of California, 2nd Edition, John Wiley and Sons, Inc., New York, 541 p.
- Parsons ES 1993a, Closure of Underground Fuel Storage Tanks and Initial Site Characterization at Redwood Regional Park Service Yard, Oakland, California. 16 December
- Parsons ES 1993b, Workplan for Site Characterization at East Bay Regional Park District, Redwood Regional Park Corporation Yard, Oakland, Alameda County, California. 3 September
- Parsons ES 1993c, Closure of Underground Fuel Storage Tanks and Initial Site Characterization at Redwood Regional Park Service Yard, Oakland, Alameda County, California. 16 December
- Parsons ES 1994a, Creek and Soil Sampling at Redwood Regional Park, Oakland, California. 2 March
- Parsons ES 1994b, Creek Surface Water at Redwood Regional Park, Oakland, California. 13 May
- Parsons ES 1994c, Workplan for Groundwater Characterization Program at East Bay Regional Park Service Yard, Oakland, California. 17 August

Regional Water Quality Control Board - San Francisco Bay Region (RWQCB) 1992,
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Water Resources Control Board (WRCB) 1988, California Inland Surface Waters Plan,
Water Quality Control Plan for Inland Surface Waters of California, Adoption of
Policy Entitled "Sources of Drinking Water," Resolution No. 88-63. 18 May

WRCB 1989, Leaking Underground Fuel Tank Field Manual: Guidelines for Site
Assessment, Cleanup, and Underground Storage Tank Closure: State of California
Leaking Underground Fuel Tank Task Force, October

WRCB 1991, California Inland Surface Waters Plan, Water Quality Control Plan for
Inland Surface Waters of California, Resolution No. 91-33. April

APPENDIX A
PHOTODOCUMENTATION

PARSONS ENGINEERING SCIENCE PHOTOGRAPHY LOG SHEET

CLIENT: East Bay Regional Parks District

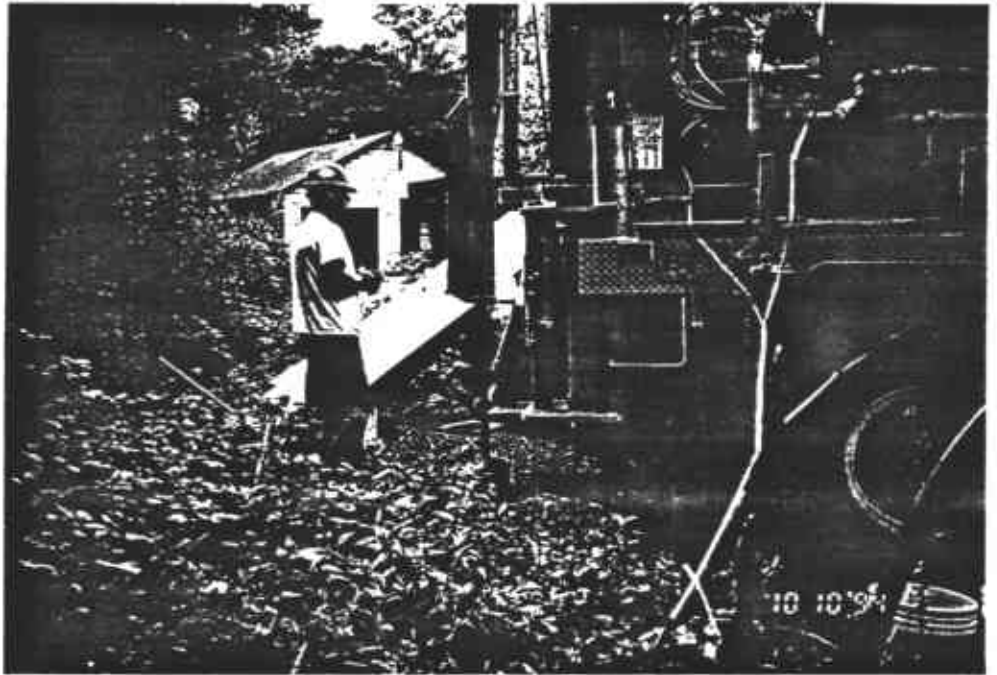
JOB NO. 726104

Sheet 1 of 6

DATE: 10/10/94

DESCRIPTION:

Drilling boring
for MW-1



PHOTOGRAPHED BY: HP

DATE: 10/18/94

DESCRIPTION:

Surface
completion
of MW-1



PHOTOGRAPHED BY: HP

PARSONS ENGINEERING SCIENCE PHOTOGRAPHY LOG SHEET

CLIENT: East Bay Regional Parks District

JOB NO. 726104

Sheet 2 of 6

DATE: 10/13/94

DESCRIPTION:

Advancing
boring for
well MW-2



PHOTOGRAPHED BY: HP

DATE: 10/13/94

DESCRIPTION:

Installing
PVC casing
in well
MW-2



PHOTOGRAPHED BY: HP

PARSONS ENGINEERING SCIENCE PHOTOGRAPHY LOG SHEET

CLIENT: East Bay Regional Parks District

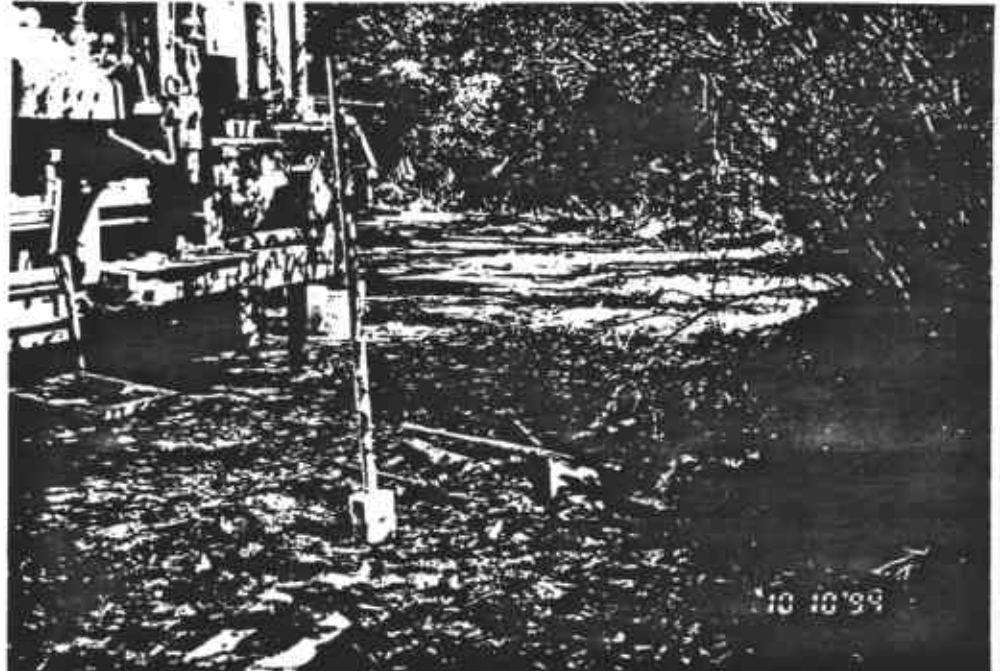
JOB NO. 726104

Sheet 3 of 6

DATE: 10/10/94

DESCRIPTION:

Hollow-stem
auger rig at
location of
MW-3

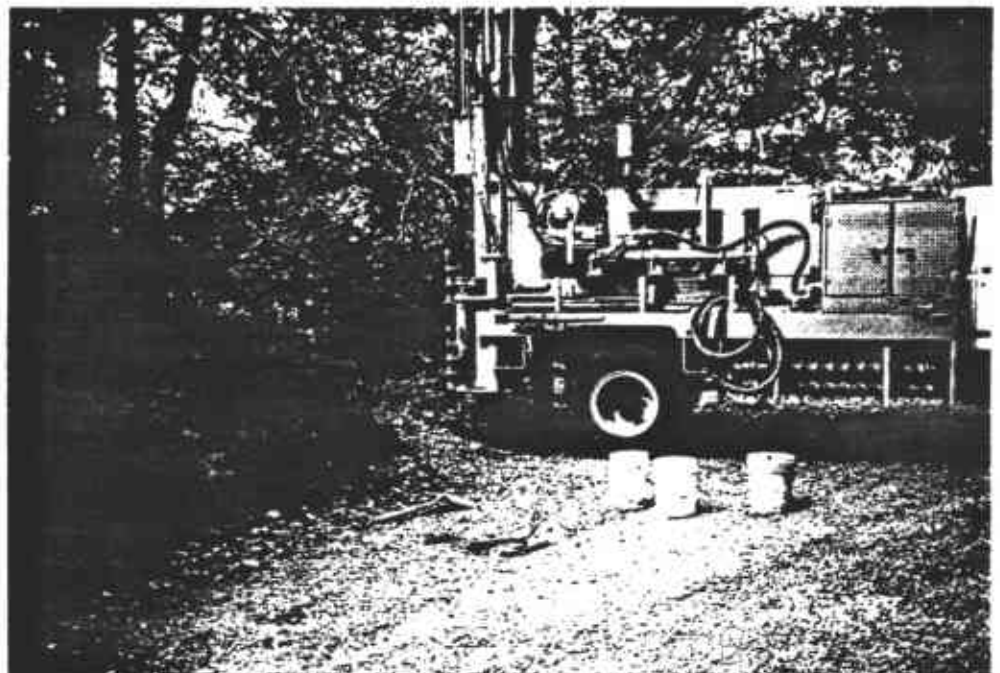


PHOTOGRAPHED BY: HP

DATE: 10/12/94

DESCRIPTION:

Advancing
boring for well
MW-4



PHOTOGRAPHED BY: HP

PARSONS ENGINEERING SCIENCE PHOTOGRAPHY LOG SHEET

CLIENT: East Bay Regional Parks District

JOB NO. 726104

Sheet 4 of 6

DATE: 10/11/94

DESCRIPTION:

Grouting
of
abandoned boring
MW-5A



PHOTOGRAPHED BY: HP

DATE: 10/11/94

DESCRIPTION:

Emplacement of
filter pack sand
in well MW-5



PHOTOGRAPHED BY: HP

PARSONS ENGINEERING SCIENCE PHOTOGRAPHY LOG SHEET

CLIENT: East Bay Regional Parks District

JOB NO. 726104

Sheet 5 of 6

DATE: 10/14/94

DESCRIPTION:

Hollow-stem
auger rig at
location
of well
MW-6



PHOTOGRAPHED BY: HP

DATE: 10/18/94

DESCRIPTION:

Develop-ment of
well MW-1,
showing truck-
mounted bailer



PHOTOGRAPHED BY: HP

PARSONS ENGINEERING SCIENCE PHOTOGRAPHY LOG SHEET

CLIENT: East Bay Regional Parks District

JOB NO. 726104

Sheet 6 of 6

DATE: 10/11/94

DESCRIPTION:

Decontamination of drilling augers by steam cleaning

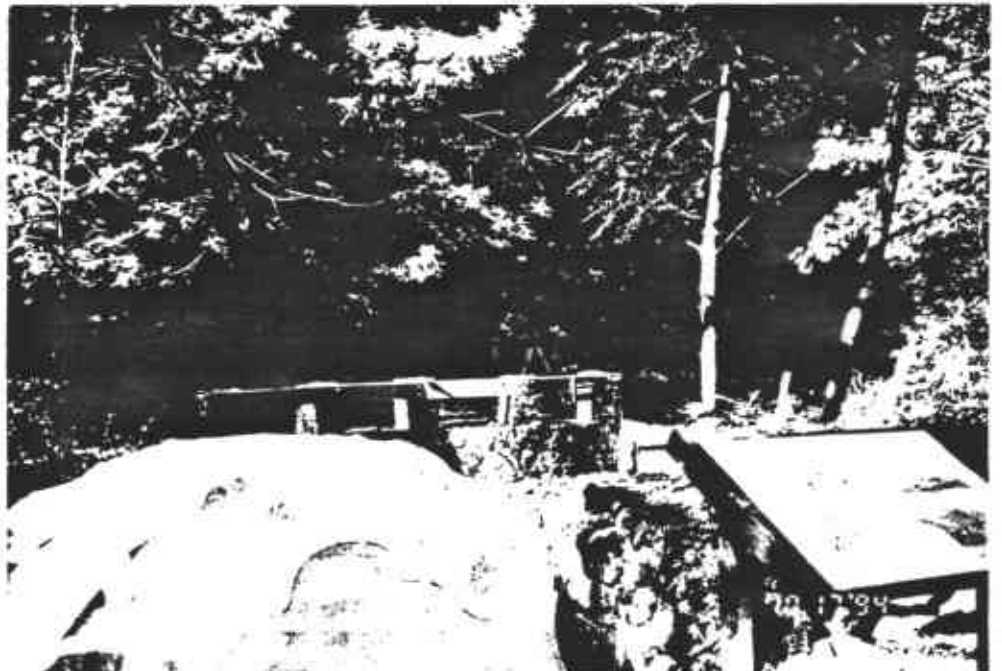


PHOTOGRAPHED BY: HP

DATE: 10/17/94

DESCRIPTION:

EBRPD
surveying of well
MW-6



PHOTOGRAPHED BY: HP

APPENDIX B

MONITORING WELL INSTALLATION DOCUMENTATION

WELL INSTALLATION PERMIT



ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

5997 PARKSIDE DRIVE

PLEASANTON, CALIFORNIA 94588

(510) 484-2600

4 October 1994

Engineering-Science, Inc.
1301 Marina Village Parkway, Suite 200
Alameda, CA 94501

Gentlemen:

Enclosed is drilling permit 94621 for a monitoring well construction project at 7867 Redwood Road near Oakland for East Bay Regional Parks District.

Please note that permit condition A-2 requires that a well construction report be submitted after completion of the work. The report should include drilling and completion logs, location, sketch and permit number.

If you have any questions, please contact Wyman Hong at extension 235 or me at extension 233.

Very truly yours,

Craig A. Mayfield

Craig A. Mayfield
Water Resources Engineer III

WH:mm

Enc.

RECEIVED
OCT 6 1994
ENGINEERING SCIENCE
ALAMEDA



ZONE 7 WATER AGENCY

5997 PARKSIDE DRIVE PLEASANTON, CALIFORNIA 94588

VOICE (510) 484-2600
FAX (510) 462-3914

DRILLING PERMIT APPLICATION

FOR APPLICANT TO COMPLETE

FOR OFFICE USE

LOCATION OF PROJECT Redwood Regional Park,
7867 Redwood Road, Oakland CA

PERMIT NUMBER 94621
LOCATION NUMBER _____

CLIENT
Name East Bay Regional Parks District - Mr. Warren Gee
Address P.O. Box 5381 Voice (510) 635-0135 x 2311
City Oakland CA Zip 94065-0381

PERMIT CONDITIONS

Circled Permit Requirements Apply

APPLICANT
Name Engineering-Science, Inc. - Bruce Rucker
Address 1301 Marina Village Fax (510) 769-9244
City Pkwy, Suite 200 Alameda Voice (510) 769-0100
Zip 94501

A. GENERAL

1. A permit application should be submitted so as to arrive at the Zone 7 office five days prior to proposed starting date.
2. Submit to Zone 7 within 60 days after completion of permitted work the original Department of Water Resources Water Well Drillers Report or equivalent for well Projects, or drilling logs and location sketch for geotechnical projects.
3. Permit is void if project not begun within 90 days of approval date.

B. WATER WELLS, INCLUDING PIEZOMETERS

1. Minimum surface seal thickness is two inches of cement grout placed by tremie.
2. Minimum seal depth is 50 feet for municipal and industrial wells or 20 feet for domestic and irrigation wells unless a lesser depth is specially approved. Minimum seal depth for monitoring wells is the maximum depth practicable or 20 feet.

C. GEOTECHNICAL. Backfill bore hole with compacted cuttings or heavy bentonite and upper two feet with compacted material. In areas of known or suspected contamination, tremied cement grout shall be used in place of compacted cuttings.

D. CATHODIC. Fill hole above anode zone with concrete placed by tremie.

E. WELL DESTRUCTION. See attached.

TYPE OF PROJECT
Well Construction _____ Geotechnical Investigation _____
Cathodic Protection _____ General _____
Water Supply _____ Contamination _____
Monitoring X Well Destruction _____

PROPOSED WATER SUPPLY WELL USE not applicable
Domestic _____ Industrial _____ Other _____
Municipal _____ Irrigation _____

DRILLING METHOD:
Mud Rotary _____ Air Rotary _____ Auger X
Cable _____ Other _____

DRILLER'S LICENSE NO. (C-57) 582696

WELL PROJECTS
Drill Hole Diameter 10 in. Maximum _____
Casing Diameter 4 in. Depth 30 ft.
Surface Seal Depth ~10 ft. Number 6

GEOTECHNICAL PROJECTS not applicable
Number of Borings _____ Maximum _____
Hole Diameter _____ in. Depth _____ ft.

ESTIMATED STARTING DATE 10 October 1994

ESTIMATED COMPLETION DATE 14 October 1994


I hereby agree to comply with all requirements of this permit and Alameda County Ordinance No. 73-68.

Approved

Wyman Hong
Wyman Hong

Date 3 Oct 94

APPLICANT'S SIGNATURE Bruce M. Rucker Date 8/29/94

BORING LOG			BORING NO.: MW-1
PROJECT NO. 726104	PROJECT NAME: Redwood Regional Park Service Yard		PAGE 1 OF 1
CONTRACTOR: Eng. Science	DRILLER: SES	DATE STARTED: 10/10/94	DATE COMPLETED: 10/10/94
METHOD: H-S Auger	AUGER DIA. 10.75 inch	PID: Photoionization Detector	PROTECTION LEVEL: D
GROUND ELEV: 563.6 MSL	THVA: Total Hydrocarbon Vapor Analyzer	TOTAL DEPTH: 18 feet	
LOGGED BY: HP	 FIRST OCCURENCE OF GROUNDWATER (feet below ground surface): 9 feet		

(Elevations are feet above mean seal level [MSL])

HAMMER WEIGHT: 140 lbs

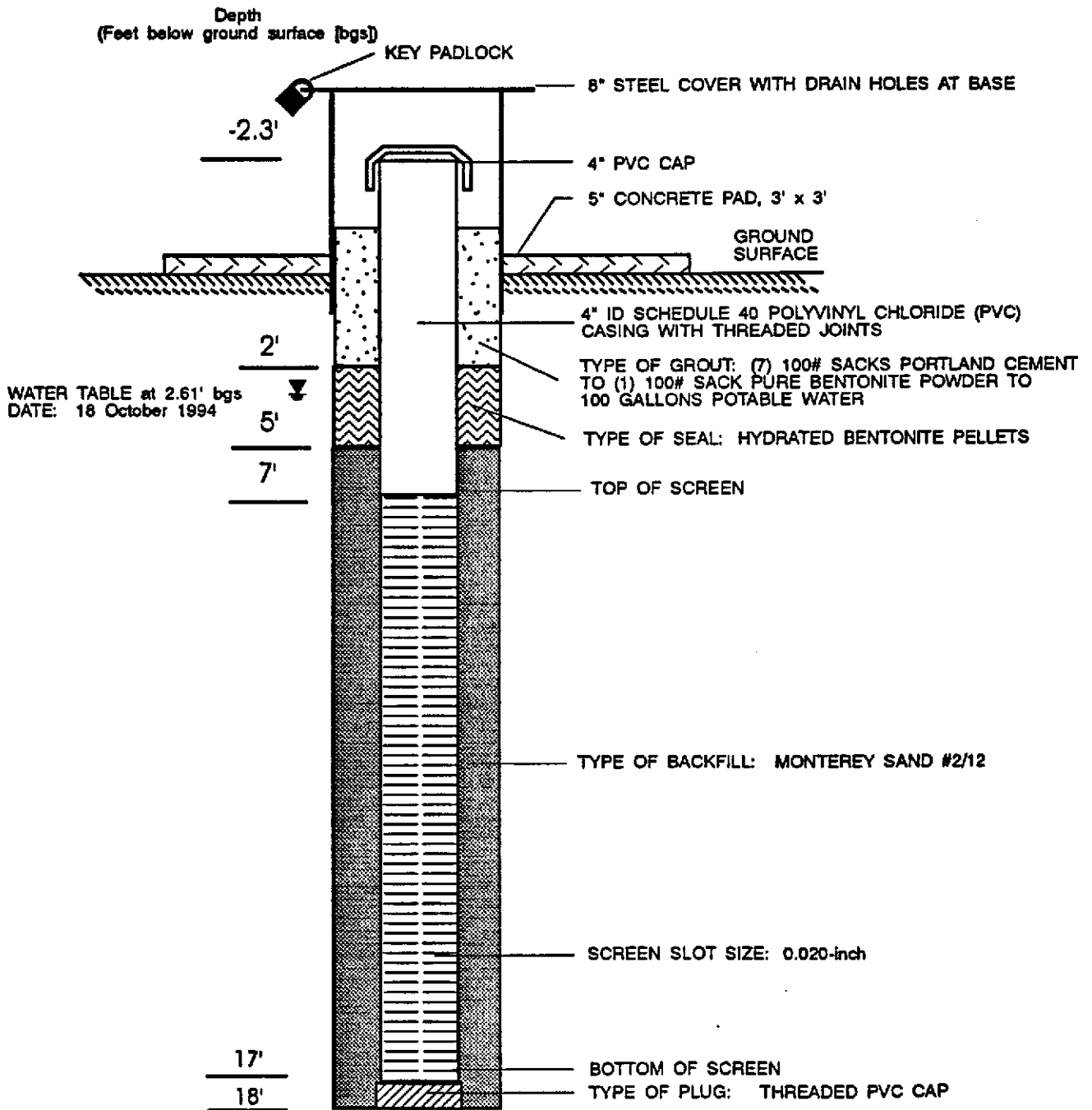
HAMMER DROP: 30 inches

SOIL SAMPLE LOCATION AND NO.	DEPTH IN FEET	BLOWS PER 6 IN.	THVA SPLIT SPOON (ppmv)	PID SPLIT SPOON (ppmv)	SOIL DESCRIPTION AND COMMENTS ON ADVANCE OF BORING
MW1-5	2				Upper 6 inches asphalt Brown top soil and gravel
	4				Dark brown fractured siltstone, weathering to clay, damp, friable
	6	8 16 24	0	0	
	8				
	10	7 10 14	0	0	Light gray-brown siltstone, friable, particles of clay, moist to wet
	12				
	14				
	16	Not Rec.	0	0	
	18				Bottom of boring at 18 feet below ground surface


MONITORING WELL INSTALLATION DATA RECORD

PROJECT NAME: Redwood Regional	BORING DIAMETER: 10.75 inches	WELL NO: MW-1
PROJECT NO: 726104	WELL INSIDE DIAMETER: 4.0 inches	
CONTRACTOR: Engineering-Science	WELL MATERIAL: Polyvinyl chloride	DATE INSTALLED: 10 October 1994
DRILLING CO: Soils Exploration Service	TOP OF CASING ELEVATION: 565.9	DRILLING METHOD: Hollow-stem Auger
FIELD GEOLOGIST: H. Pietropaoli	GROUND SURFACE ELEVATION: 563.6	DEVELOPMENT METHOD: Surge & Bail

(All elevations are feet above mean sea level [MSL])




NOT TO SCALE

BORING LOG			BORING NO.: MW-2	
PROJECT NO. 726104	PROJECT NAME: Redwood Regional Park Service Yard		PAGE 1 OF 2	
CONTRACTOR: Eng. Science	DRILLER: SES	DATE STARTED: 10/12/94	DATE COMPLETED: 10/12/94	
METHOD: H-S Auger	AUGER DIA. 10.75 inch	PID: Photoionization Detector	PROTECTION LEVEL: D	
GROUND ELEV: 564.1 MSL	THVA: Total Hydrocarbon Vapor Analyzer	TOTAL DEPTH: 37 feet		
LOGGED BY: HP	 FIRST OCCURENCE OF GROUNDWATER (feet below ground surface): 25 feet			

(Elevations are feet above mean sea level (MSL)) HAMMER WEIGHT: 140 lbs HAMMER DROP: 30 inches

SOIL SAMPLE LOCATION AND NO.	DEPTH IN FEET	BLOWS PER 6 IN.	THVA SPLIT SPOON (ppmv)	PID SPLIT SPOON (ppmv)	SOIL DESCRIPTION AND COMMENTS ON ADVANCE OF BORING
	2				Red brown gravelly silt (Fill), dry
	4				
	6	4 6 8	0	0.4	Brown gravelly, silty clay (Fill), dry
	8				
	10	7 10 5	0	2.4	Fill as above; becomes damp at 10 feet
	12				Base of fill at 13.5 feet as evidenced by decreased rate of penetration
	14				Dark brown silty clay to clay (CL), damp, plastic, soft fuel odor
	16	2 4 2 4 6 2 6 8	850	2210	
	18				
	20	2 6 10	200	218	Red yellow brown clayey silt (ML), minor gravel, slightly plastic, damp, minor soft clayey zones
MW2-21	22	8 7			
	24	6 5 3			Brown clayey, silty, gravel (GC), (0.5- to 1-inch), slightly plastic, loose, moist
	26	Not Recov.	0	1.7	

(continued)

BORING LOG			BORING NO.: MW-2
PROJECT NO. 726104	PROJECT NAME: Redwood Regional Park Service Yard		PAGE 2 OF 2
CONTRACTOR: Eng. Science	DRILLER: SES	DATE STARTED: 10/12/94	DATE COMPLETED: 10/12/94
METHOD: H-S Auger	AUGER DIA. 10.75 inch	PID: Photoionization Detector	PROTECTION LEVEL: D
GROUND ELEV: 564.1 MSL	THVA: Total Hydrocarbon Vapor Analyzer	TOTAL DEPTH: 37 feet	
LOGGED BY: HP	 FIRST OCCURENCE OF GROUNDWATER (feet below ground surface): 25 feet		

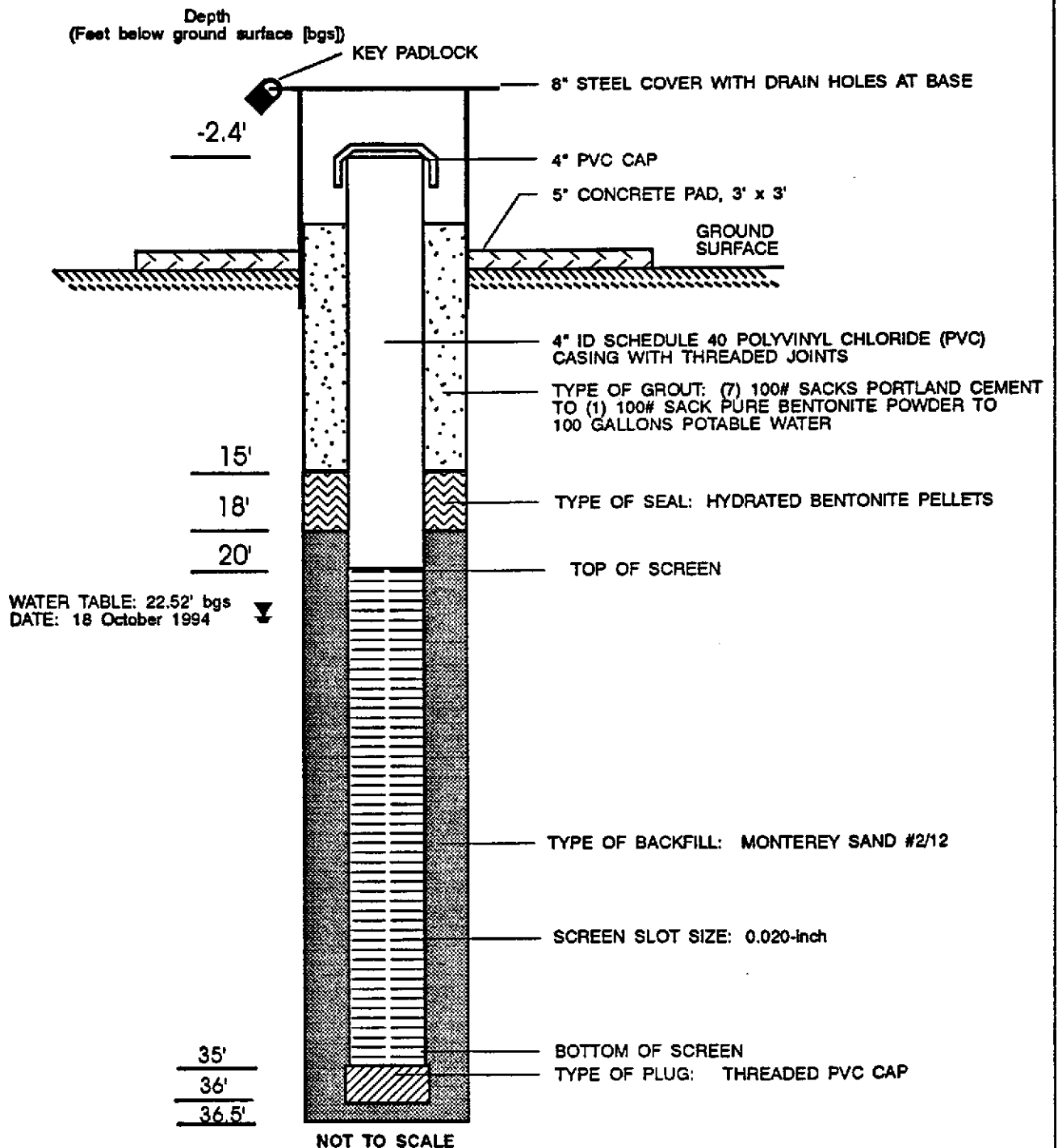
(Elevations are feet above mean sea level [MSL]) HAMMER WEIGHT: 140 lbs HAMMER DROP: 30 inches


SOIL SAMPLE LOCATION AND NO.	DEPTH IN FEET	BLOWS PER 6 IN.	THVA SPLIT SPOON (ppmv)	PID SPLIT SPOON (ppmv)	SOIL DESCRIPTION AND COMMENTS ON ADVANCE OF BORING
		Not Rec			Red brown silty clay (CL), soft, damp to wet, plastic
	28	3			Brown clayey silty gravel (GM), loose, slightly plastic, wet
	30	5	0	1.6	
	32	3			Green brown siltstone, weathering to clay, hard, friable, moist
	34	5			
	36	6			Bottom of drilled boring at 36.5 feet below ground surface
	38	2	0	0	

MONITORING WELL INSTALLATION DATA RECORD

PROJECT NAME: Redwood Regional	BORING DIAMETER: 10.75 inches	WELL NO: MW-2
PROJECT NO: 726104	WELL INSIDE DIAMETER: 4.0 inches	
CONTRACTOR: Engineering-Science	WELL MATERIAL: Polyvinyl chloride	DATE INSTALLED: 13 October 1994
DRILLING CO: Soils Exploration Service	TOP OF CASING ELEVATION: 566.5	DRILLING METHOD: Hollow-stem Auger
FIELD GEOLOGIST: H. Pietropaoli	GROUND SURFACE ELEVATION: 564.1	DEVELOPMENT METHOD: Surge & Bail


(All elevations are feet above mean sea level [MSL])



BORING LOG			BORING NO.: MW-3	
PROJECT NO. 726104	PROJECT NAME: Redwood Regional Park Service Yard		PAGE 1 OF 2	
CONTRACTOR: Eng. Science	DRILLER: SES	DATE STARTED: 10/10/94	DATE COMPLETED: 10/11/94	
METHOD: H-S Auger	AUGER DIA. 10.75 inch	PID: Photoionization Detector	PROTECTION LEVEL: D	
GROUND ELEV: 558.1 MSL	THVA: Total Hydrocarbon Vapor Analyzer	TOTAL DEPTH: 42 feet		
LOGGED BY: HP	 FIRST OCCURENCE OF GROUNDWATER (feet below ground surface): 34.5 feet			

(Elevations are feet above mean sea level (MSL)) HAMMER WEIGHT: 140 lbs HAMMER DROP: 18 inches


SOIL SAMPLE LOCATION AND NO.	DEPTH IN FEET	BLOWS PER 6 IN.	THVA SPLIT SPOON (ppmv)	PID SPLIT SPOON (ppmv)	SOIL DESCRIPTION AND COMMENTS ON ADVANCE OF BORING (INCLUDE WATER LOSS AND MAJOR STRATA CHANGES)	USCS
	2				Light brown silt, loose, dry to damp, fragment of fractured siltstone (2- to 24-inches)	
	4					
	6	3 6 8	0	2.9	Light brown silt, slightly plastic, dry, loose	
	8					
MW3-10	10	9 9 9	0	7.6	Same as above	
	12					
	14				Red brown clayey silt, slightly plastic, soft, damp to moist	
	16	3 3 6	0	1.9		
	18					
	20	3 4 5	0	0.7	Mottled yellow red silty clay, soft,, plastic, damp to wet	
	22					
	24				Blue-grey silty clay, soft,, plastic, damp to wet, wood fragments	
MW3-25	25	1	0	11.1	(Continued)	
	26	2	0			

BORING LOG			BORING NO.: MW-3
PROJECT NO. 726104	PROJECT NAME: Redwood Regional Park Service Yard		PAGE 2 OF 2
CONTRACTOR: Eng. Science	DRILLER: SES	DATE STARTED: 10/10/94	DATE COMPLETED: 10/11/94
METHOD: H-S Auger	AUGER DIA. 10.75 inch	PID: Photoionization Detector	PROTECTION LEVEL: D
GROUND ELEV: 558.1 MSL	THVA: Total Hydrocarbon Vapor Analyzer	TOTAL DEPTH: 42 feet	
LOGGED BY: HP	 FIRST OCCURENCE OF GROUNDWATER (feet below ground surface): 34.5 feet		

(Elevations are feet above mean sea level (MSL))

HAMMER WEIGHT: 140 lbs

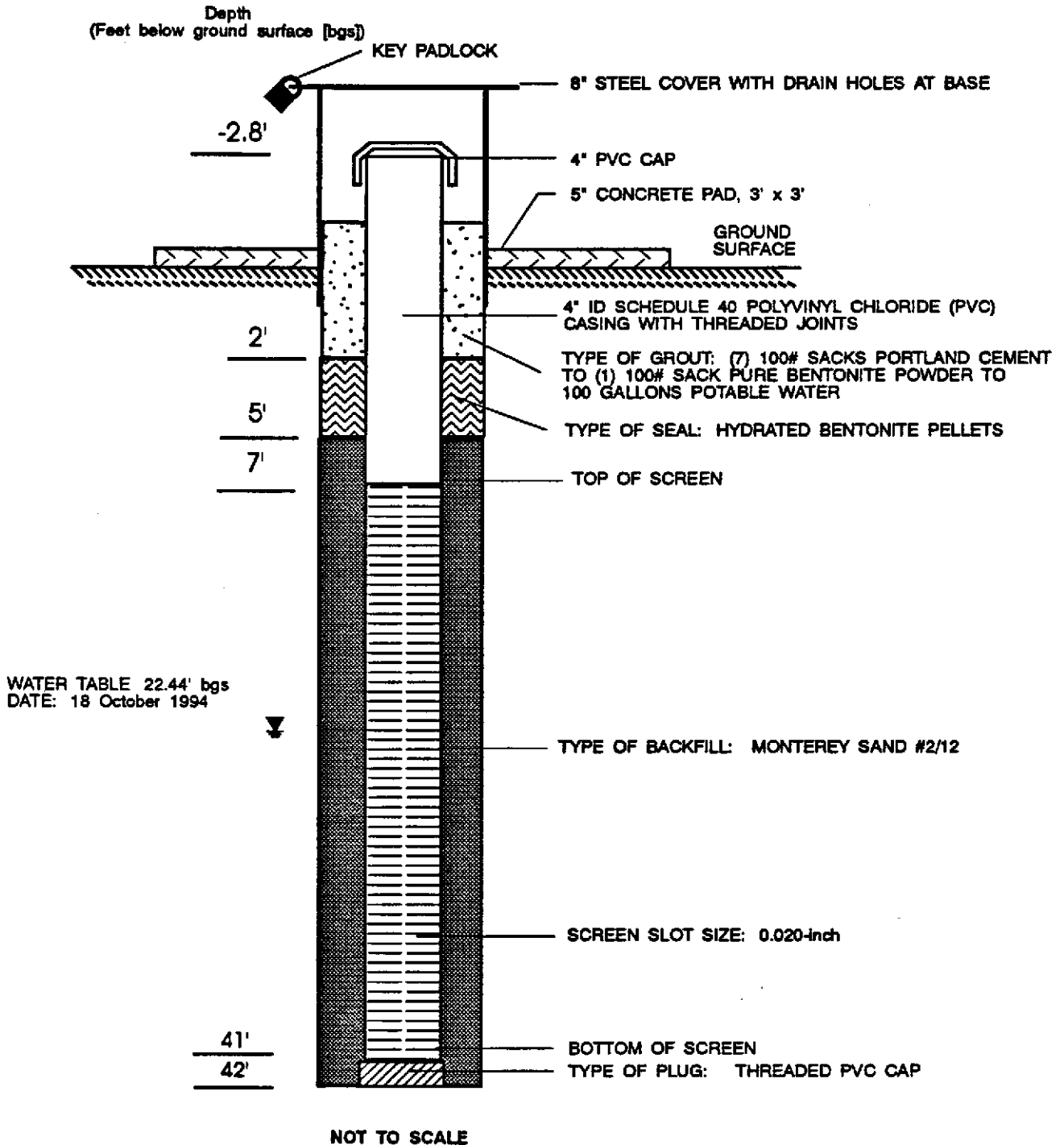
HAMMER DROP: 18 inches


SOILS SAMPLE LOCATION AND NO.	DEPTH IN FEET	BLOWS PER 6 IN.	THVA SPLIT SPOON (ppmv)	PID SPLIT SPOON (ppmv)	SOIL DESCRIPTION AND COMMENTS ON ADVANCE OF BORING (INCLUDE WATER LOSS AND MAJOR STRATA CHANGES)	USCS
	28					
	30	2 2 3	0	0	Same as above, 10-30% organics (wod)	
	32					
	34					
	36					
	38					
	40	3 4			Clayey gravel, angular, 0.25- to 2-inch, med. dense to loose, wet, organics, iron staining	
	42	4	0	1.9	Bottom of boring at 42 feet below ground surface	

MONITORING WELL INSTALLATION DATA RECORD

PROJECT NAME: Redwood Regional	BORING DIAMETER: 10.75 inches	WELL NO: MW-3
PROJECT NO: 726104	WELL INSIDE DIAMETER: 4.0 inches	
CONTRACTOR: Engineering-Science	WELL MATERIAL: Polyvinyl chloride	DATE INSTALLED: 10 October 1994
DRILLING CO: Soils Exploration Service	TOP OF CASING ELEVATION: 560.9	DRILLING METHOD: Hollow-stem Auger
FIELD GEOLOGIST: H. Pietropaoli	GROUND SURFACE ELEVATION: 558.1	DEVELOPMENT METHOD: Surge & Bail

(All elevations are feet above mean sea level [MSL])



BORING LOG			BORING NO.: MW-4	
PROJECT NO. 726104	PROJECT NAME: Redwood Regional Park Service Yard		PAGE 1 OF 1	
CONTRACTOR: Eng. Science	DRILLER: SES	DATE STARTED: 10/12/94	DATE COMPLETED: 10/12/94	
METHOD: H-S Auger	AUGER DIA. 10.75 inch	PID: Photoionization Detector	PROTECTION LEVEL: D	
GROUND ELEV: 546.0 MSL	THVA: Total Hydrocarbon Vapor Analyzer	TOTAL DEPTH: 26 feet		
LOGGED BY: HP	 FIRST OCCURENCE OF GROUNDWATER (feet below ground surface): 17 feet			

(Elevations are feet above mean sea level [MSL])

HAMMER WEIGHT: 140 lbs

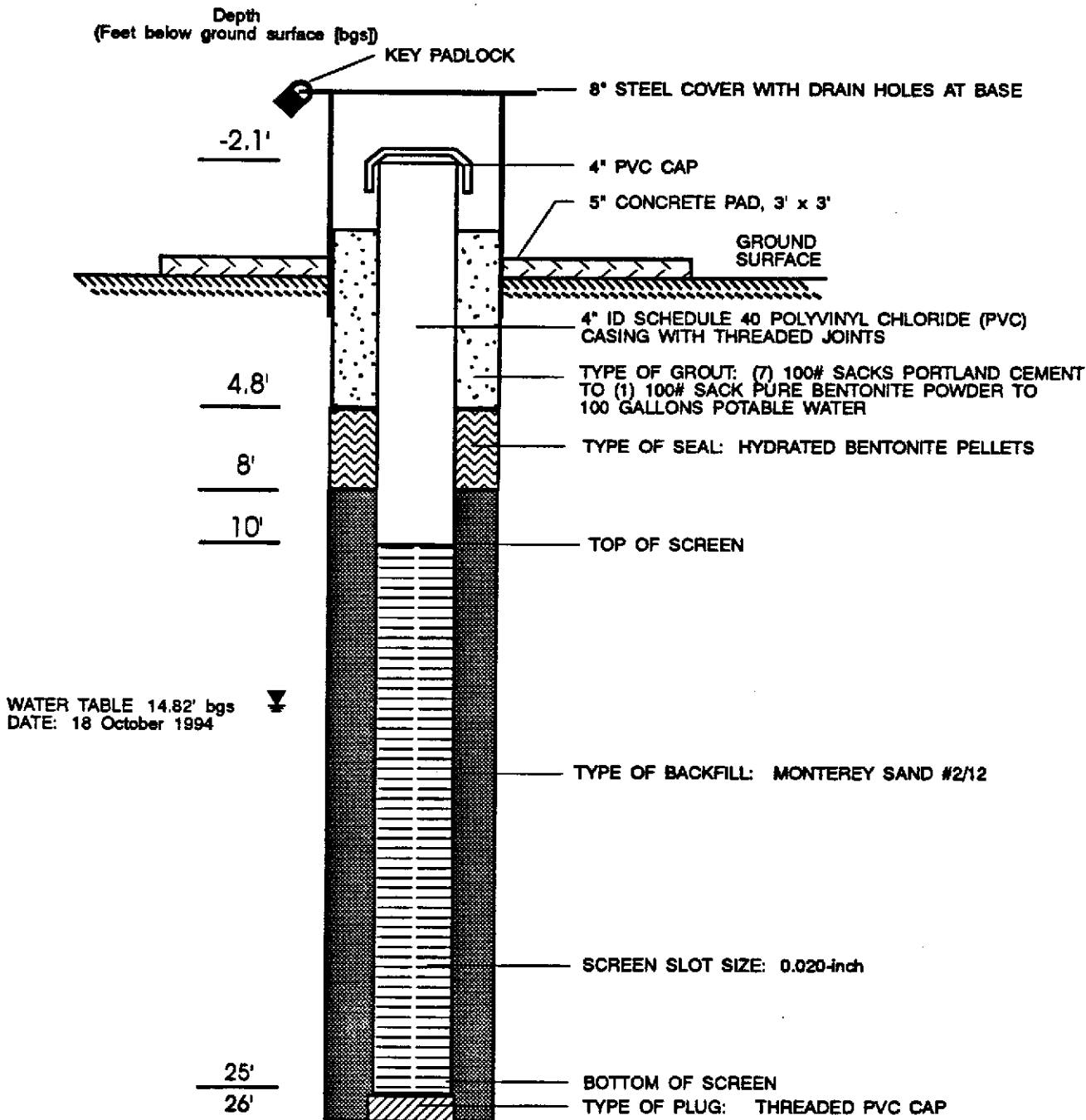
HAMMER DROP: 30 inches

SOIL SAMPLE LOCATION AND NO.	DEPTH IN FEET	BLOWS PER 6 IN.	THVA SPLIT SPOON (ppmv)	PID SPLIT SPOON (ppmv)	SOIL DESCRIPTION AND COMMENTS ON ADVANCE OF BORING
	2	11			Silt with gravel (Fill)
	4	7 5 10	0	45.7	Brown clayey silt to silt (ML), dry, dense, slightly plastic Color change to brown Color change to light brown
	6	9 7 6 6 3 4			
	8	5 12 10 9			
	10	7 7 7	0	28	
	12	5 7 8 8			Mottled orange-brown silty clay to clayey silt (CL/ML), damp, slightly plastic, <2% organics, red silty patches (0.12- to 0.25-inches)
	14	5 7 8 7 5			Blue discolored silty clay (CL), 2% gravel (0.1- to 0.5-inch) damp, slightly plastic, fuel odor
MW4-16.5	16	3 5	680	816	Light brown siltstone, dense, hard, moist
MW4-16.5	17	4			
	18	3 2 2 3			Gray clayey coarse sand (SC), 2% gravel (0.25- to 1-inch) saturated, organics, red and yellow siltstone patches (0.1- to 0.25-inches)
	20	2 2 2 3	0	4.8	
	22	2 2 2 3			
	24	2 3 4 2 2			
	26	5	0	0	Bottom of boring at 26 feet below ground surface


MONITORING WELL INSTALLATION DATA RECORD

PROJECT NAME: Redwood Regional	BORING DIAMETER: 10.75 inches	WELL NO: MW-4
PROJECT NO: 726104	WELL INSIDE DIAMETER: 4.0 inches	
CONTRACTOR: Engineering-Science	WELL MATERIAL: Polyvinyl chloride	DATE INSTALLED: 12 October 1994
DRILLING CO: Soils Exploration Service	TOP OF CASING ELEVATION: 548.1	DRILLING METHOD: Hollow-stem Auger
FIELD GEOLOGIST: H. Pietropaoli	GROUND SURFACE ELEVATION: 546.0	DEVELOPMENT METHOD: Surge & Bail


(All elevations are feet above mean sea level [MSL])



NOT TO SCALE

BORING LOG			BORING NO.: MW-5	
PROJECT NO. 726104	PROJECT NAME: Redwood Regional Park Service Yard		PAGE 1 OF 1	
CONTRACTOR: Eng. Science	DRILLER: SES	DATE STARTED: 10/11/94	DATE COMPLETED: 10/11/94	
METHOD: H-S Auger	AUGER DIA. 10.75 inch	PID: Photoionization Detector	PROTECTION LEVEL: D	
GROUND ELEV: 545.2 MSL	THVA: Total Hydrocarbon Vapor Analyzer		TOTAL DEPTH: 26.5 feet	
LOGGED BY: HP	 FIRST OCCURENCE OF GROUNDWATER (feet below ground surface): 16.5 feet			

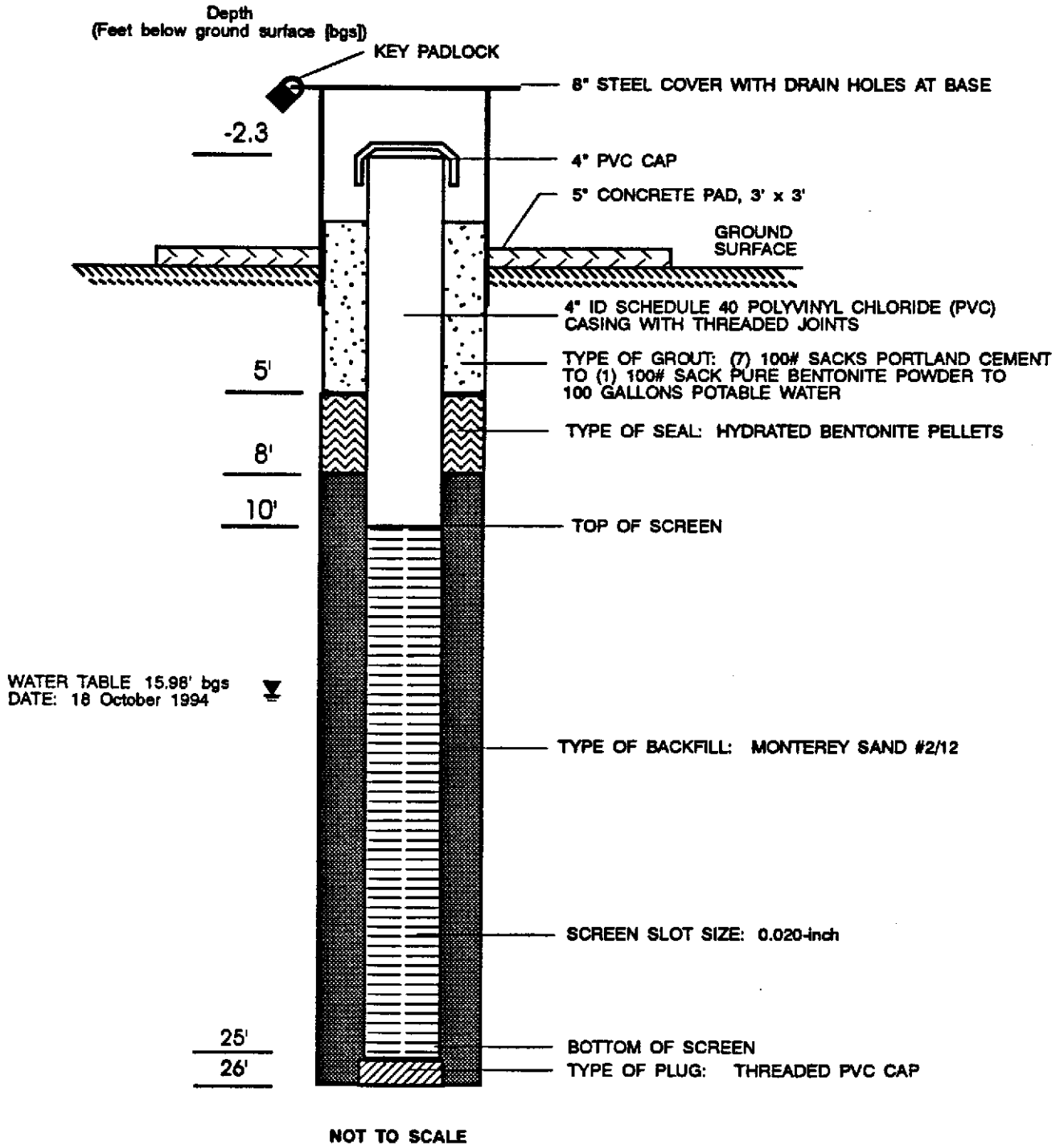
(Elevations are feet above mean sea level (MSL)) HAMMER WEIGHT: 140 lbs HAMMER DROP: 30 inches

SOIL SAMPLE LOCATION AND NO.	DEPTH IN FEET	BLOWS PER 6 IN.	THVA SPLIT SPOON (ppmv)	PID SPLIT SPOON (ppmv)	SOIL DESCRIPTION AND COMMENTS ON ADVANCE OF BORING
	2				
	4				
	6	2 2 2	0	0	Brown clayey silt (ML), damp, medium dense, slightly plastic
	8				
	10	3 4 5	0	1.1	As above
	12				
MW5-15	14	5	0	0	Yellow-brown siltstone, friable, dense, saturated (evidenced by wet sampler tip)
	16	7	0	0	
	16.5	8			
	18				
	20	6	0	0	Brown clayey gravel (GC), wet, poorly sorted, loose
	22	3 5			
	24				As above
	26	10 17 27	0	0	Bottom of drilled boring at 26 feet below ground surface


MONITORING WELL INSTALLATION DATA RECORD

PROJECT NAME: Redwood Regional	BORING DIAMETER: 10.75 inches	WELL NO: MW-5
PROJECT NO: 726104	WELL INSIDE DIAMETER: 4.0 inches	
CONTRACTOR: Engineering Science	WELL MATERIAL: Polyvinyl chloride	DATE INSTALLED: 11 October 1994
DRILLING CO: Soils Exploration Service	TOP OF CASING ELEVATION: 547.5	DRILLING METHOD: Hollow-stem Auger
FIELD GEOLOGIST: H. Pietropaoli	GROUND SURFACE ELEVATION: 545.2	DEVELOPMENT METHOD: Surge & Bail

(All elevations are feet above mean sea level [MSL])



WATER TABLE 15.98' bgs
DATE: 18 October 1994

BORING LOG			BORING NO.: MW-6	
PROJECT NO. 726104	PROJECT NAME: Redwood Regional Park Service Yard		PAGE 1 OF 1	
CONTRACTOR: Eng. Science	DRILLER: SES	DATE STARTED: 10/14/94	DATE COMPLETED: 10/14/94	
METHOD: H-S Auger	AUGER DIA. 10.75 inch	PID: Photoionization Detector	PROTECTION LEVEL: D	
GROUND ELEV: 543.3 MSL	THVA: Total Hydrocarbon Vapor Analyzer	TOTAL DEPTH: 25 feet		
LOGGED BY: HP	 FIRST OCCURENCE OF GROUNDWATER (feet below ground surface): 19.5 feet			

(Elevations are feet above mean sea level [MSL])

HAMMER WEIGHT: 140 lbs

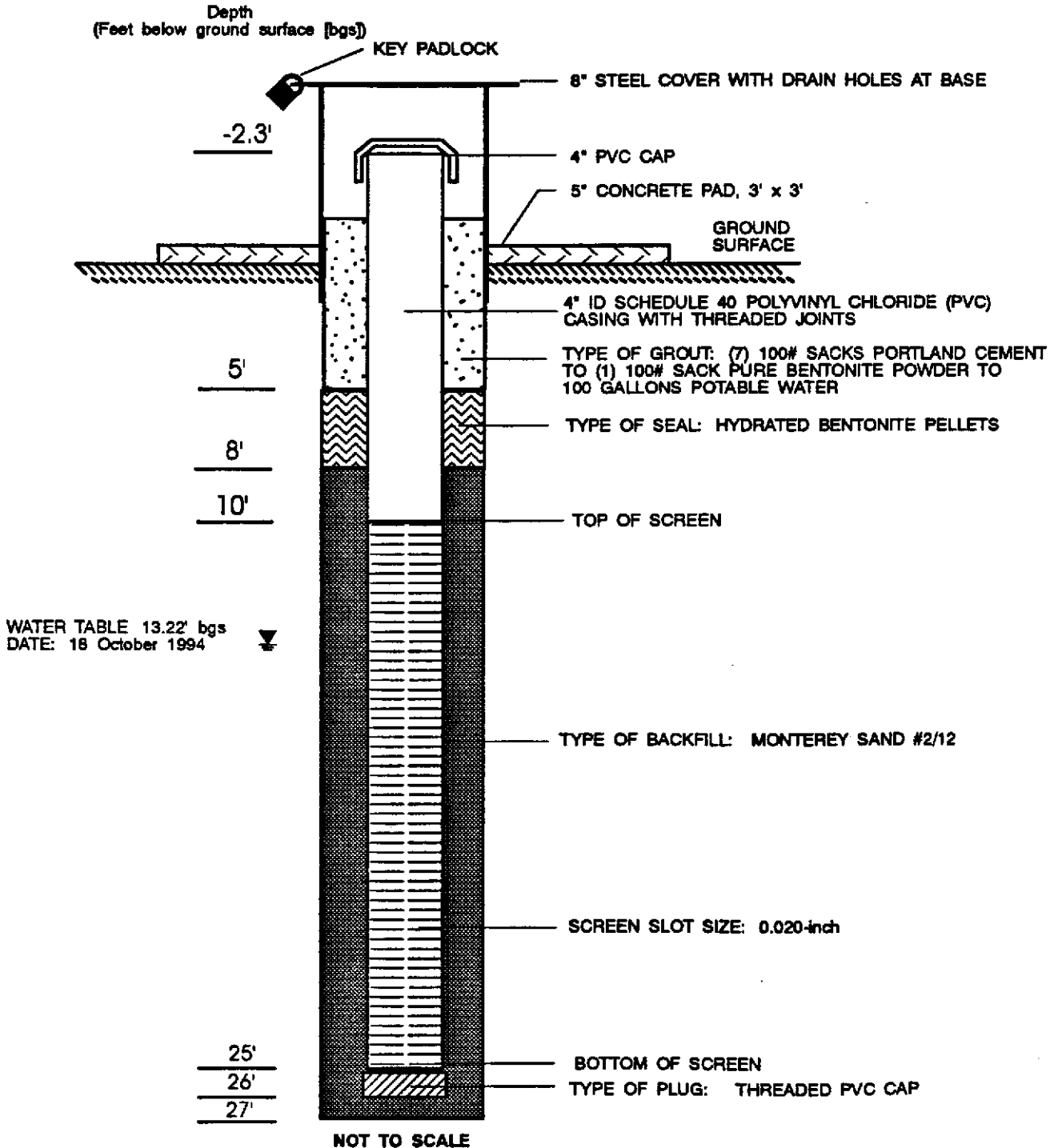
HAMMER DROP: 30 inches

SOIL SAMPLE LOCATION AND NO.	DEPTH IN FEET	BLOWS PER 6 IN.	THVA SPLIT SPOON (ppmv)	PID SPLIT SPOON (ppmv)	SOIL DESCRIPTION AND COMMENTS ON ADVANCE OF BORING
	2				Light brown silt (Fill), dry, loose
	4				
	6	2 2 2	0	0	Gravelly, clayey silt (ML), dry, loose, slightly plastic
	8				
	10	50 38 50+	0	2.8	Yellow siltstone, dense, dry, red siltstone clasts (0.25- to 0.5-inch) abundant gravel and rock fragments in drill cuttings, slow rate of penetration
	12				
	14	6	0	3.5	
	16	6 21 18	0		Mottled yellow-brown-red gravelly, silty clay (CL), moist to wet
	18	12 6 5 4	0	2.0	Blue-grey clay (CH), soft, plastic, 20% organics, moist to wet
MW6-19	19.5	4			As above, with minor gravel, wet
	20	7	0	0	
	22	21 20	0		Green-brown coarse sandy, clayey gravel (GC), loose saturated
	24	No Recov 20 32 50	0	0	
	26				Bottom of drilled boring at 27 feet below ground surface

MONITORING WELL INSTALLATION DATA RECORD

PROJECT NAME: Redwood Regional	BORING DIAMETER: 10.75 inches	WELL NO: MW-6
PROJECT NO: 726104	WELL INSIDE DIAMETER: 4.0 inches	
CONTRACTOR: Engineering Science	WELL MATERIAL: Polyvinyl chloride	DATE INSTALLED: 17 October 1994
DRILLING CO: Soils Exploration Service	TOP OF CASING ELEVATION: 545.6	DRILLING METHOD: Hollow-stem Auger
FIELD GEOLOGIST: H. Pietropaoli	GROUND SURFACE ELEVATION: 543.3	DEVELOPMENT METHOD: Surge & Bail

(All elevations are feet above mean sea level [MSL])



WELL COMPLETION REPORT

CONFIDENTIAL

STATE OF CALIFORNIA DWR
WELL COMPLETION REPORT
(WELL LOGS)

REMOVED

APPENDIX C

**SOIL SAMPLE CHAIN-OF-CUSTODY RECORDS
AND ANALYTICAL LABORATORY REPORTS**



A N A L Y T I C A L R E P O R T

Prepared for:

Engineering Science, Inc.
1301 Marina Village Parkway
Suite 200
Alameda, CA 94501

Date: 25-OCT-94
Lab Job Number: 117997
Project ID: 726104.03000
Location: EBRPD Redwood Yard

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OCT 27 1994
ENGINEERING SCIENCE
ALAMEDA

Reviewed by:

Kathleen B.

Reviewed by:

Anthony E. Schlegel

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LABORATORY NUMBER: 117997
CLIENT: Engineering-Science, Inc.
PROJECT ID: 726104.03000
LOCATION: EBRPD Redwood Yard

DATE SAMPLED: 10/14/94
DATE RECEIVED: 10/14/94
DATE EXTRACTED: 10/17/94
DATE ANALYZED: 10/18/94
DATE REPORTED: 10/25/94

Extractable Petroleum Hydrocarbons in Soils & Wastes
California DOHS Method
LUFT Manual October 1989

LAB ID	SAMPLE ID	KEROSENE RANGE (mg/Kg)	DIESEL RANGE (mg/Kg)	REPORTING LIMIT (mg/Kg)
117997-1	MW6-19	ND	2*	1
117997	Method Blank	ND	ND	1

ND = Not detected at or above reporting limit; reporting limit applies to all analytes.

* Sample chromatogram does not resemble hydrocarbon standard.

QA/QC SUMMARY

RPD, %	<1
RECOVERY, %	97



LABORATORY NUMBER: 117997
CLIENT: Engineering-Science, Inc.
PROJECT ID: 726104.03000
LOCATION: EBRPD Redwood Yard

DATE SAMPLED: 10/14/94
DATE RECEIVED: 10/14/94
DATE ANALYZED: 10/19/94
DATE REPORTED: 10/25/94

Total Volatile Hydrocarbons with BTXE in Soils & Wastes
TVH by California DOHS Method/LUFT Manual October 1989
BTXE by EPA 5030/8020

LAB ID	SAMPLE ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
117997-1	MW6-19	ND(1)	ND(5)	ND(5)	ND(5)	ND(5)
117997	Method Blank	ND(1)	ND(5)	ND(5)	ND(5)	ND(5)

ND = Not detected at or above reporting limit; Reporting limit indicated in parentheses.

QA/QC SUMMARY

RPD, %	4
RECOVERY, %	91



CHAIN OF CUSTODY RECORD

LABORATORY: C+T		PROJECT MANAGER: Rucker		PROJ. #: 126104. 03000		NO. OF CONTAINERS		ANALYSIS REQUIRED				REMARKS		
PROJECT NAME/LOCATION: EBRPD Redwood yard								METHOD PRESERVED BTEx (8020) TPH-g (PHS/LUFT) TPH-D (PHS/LUFT) TPH-K (PHS/LUFT)					TO BE COMPOSITED BY LAB TURN AROUND TIME	
SAMPLER(S): (SIGNATURE) Henry Pietropoli														
SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION										
1 MW6-19	10/14/94	1102	Sol	18-19' bgs								Standard		
RELINQUISHED BY: (SIGNATURE) Henry Pietropoli		DATE 10/14/94	TIME 1755	RECEIVED BY: (SIGNATURE) 		RELINQUISHED BY: (SIGNATURE)		DATE	TIME	RECEIVED BY: (SIGNATURE)				
RELINQUISHED BY: (SIGNATURE)		DATE	TIME	RECEIVED FOR LABORATORY BY: (SIGNATURE) 		DATE 10/14/94	TIME 1755	REMARKS:						



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2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

A N A L Y T I C A L R E P O R T

Prepared for:

Engineering Science, Inc.
1301 Marina Village Parkway
Suite 200
Alameda, CA 94501

Date: 25-OCT-94
Lab Job Number: 117940
Project ID: 726104.03000
Location: EBRPD Redwood Yard

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OCT 28 1994
ENGINEERING SCIENCE
ALAMEDA

Reviewed by:

Kathleen O'Brien

Reviewed by:

Cynthia E. Shelley

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LABORATORY NUMBER: 117940
 CLIENT: ENGINEERING SCIENCE, INC.
 PROJECT ID: 726104.03000
 LOCATION: EBRPD REDWOOD YARD

DATE SAMPLED: 10/10,11/94
 DATE RECEIVED: 10/11/94
 DATE EXTRACTED: 10/13/94
 DATE ANALYZED: 10/15/94
 DATE REPORTED: 10/25/94

Extractable Petroleum Hydrocarbons in Soils & Wastes
 California DOHS Method
 LUFT Manual October 1989

LAB ID	SAMPLE ID	KEROSENE RANGE (mg/Kg)	DIESEL RANGE (mg/Kg)	REPORTING LIMIT (mg/Kg)
117940-1	MW1-5	ND	3*	1
117940-2	MW3-10	ND	3*	1
117940-3	MW3-25	**	5*	1
117940-4	MW5A-15	200*	***	1
117940-5	MW5-15	ND	2*	1
	METHOD BLANK	ND	ND	1

ND = Not detected at or above reporting limit; reporting limit applies to all analytes.

- * Sample chromatogram does not resemble hydrocarbon standard.
- ** Kerosene range not reported due to overlap of hydrocarbon ranges.
- *** Diesel range not reported due to overlap of hydrocarbon ranges.

QA/QC SUMMARY

RECOVERY, %	81
-------------	----

LABORATORY NUMBER: 117940
 CLIENT: ENGINEERING SCIENCE, INC.
 PROJECT ID: 726104.03000
 LOCATION: EBRPD REDWOOD YARD

DATE SAMPLED: 10/11/94
 DATE RECEIVED: 10/11/94
 DATE ANALYZED: 10/22/94
 DATE REPORTED: 10/25/94

Total Volatile Hydrocarbons with BTXE in Soils & Wastes
 TVH by California DOHS Method/LUFT Manual October 1989
 BTXE by EPA 5030/8020

LAB ID	SAMPLE ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
117940-4	MW5A-15	570*	ND(5)	1100	1900	2900
	METHOD BLANK	ND(1)	ND(5)	ND(5)	ND(5)	ND(5)

* = Sample chromatogram does not resemble gasoline standard pattern.

ND = Not detected at or above reporting limit; Reporting limit indicated in parentheses.

QA/QC SUMMARY

RPD, %	6
RECOVERY, %	94



LABORATORY NUMBER: 117940
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: 726104.03000
LOCATION: EBRPD REDWOOD YARD

DATE SAMPLED: 10/10,11/94
DATE RECEIVED: 10/11/94
DATE ANALYZED: 10/17/94
DATE REPORTED: 10/25/94

Total Volatile Hydrocarbons with BTXE in Soils & Wastes
TVH by California DOHS Method/LUFT Manual October 1989
BTXE by EPA 5030/8020

LAB ID	SAMPLE ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
117940-1	MW1-5	ND (1)	ND (5)	ND (5)	ND (5)	ND (5)
117940-2	MW3-10	ND (1)	ND (5)	ND (5)	ND (5)	ND (5)
117940-3	MW3-25	ND (1)	ND (5)	ND (5)	ND (5)	ND (5)
117940-5	MW5-15	ND (1)	ND (5)	ND (5)	ND (5)	ND (5)
	METHOD BLANK	ND (1)	ND (5)	ND (5)	ND (5)	ND (5)

ND = Not detected at or above reporting limit; Reporting limit indicated in parentheses.

QA/QC SUMMARY

LCS RECOVERY, %

101



CHAIN OF CUSTODY RECORD

LABORATORY:		PROJECT MANAGER:		PROJ. #:	NO. OF CONTAINERS	ANALYSIS REQUIRED					REMARKS	
C+T		Rucker		726104,03000		<div style="display: flex; justify-content: space-between;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">METHOD PRESERVED</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg);">TO BE COMPOSTED BY LAB</div> </div>						
PROJECT NAME/LOCATION:												
EBRPD Redwood Yard												
SAMPLER(S): (SIGNATURE)												
Henry Pichon												
SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION		TPH-G; DHS/LUFT	EPA 8080 (BTEX)	TPH-D; DHS/LUFT	TPH-K; DHS/LUFT			
-1 MW1-5	10/10/94	1015	Soil	5.5-6.5' bgs	2	-	-	-	-			Standard four mouset
-2 MW3-10	"	1319	"	10.5-11.5' bgs	2	-	-	-	-			"
-3 MW3-25	"	1348	"	25.5-26.5' bgs	2	-	-	-	-			"
-4 MW5A-15	10/11/94	1400	"	15.0-16.0	2	-	-	-	-			"
-5 MW5-15	10/11/94	1512	"	15.5-16.5	2	-	-	-	-			" (1/2 tubes full)

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
Henry Pichon	10/11/94	1750	Kathleen B.				
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	REMARKS:	



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A N A L Y T I C A L R E P O R T

Prepared for:

Engineering Science, Inc.
1301 Marina Village Parkway
Suite 200
Alameda, CA 94501

Date: 01-NOV-94
Lab Job Number: 117980
Project ID: 726104.03000
Location: EBRPD Redwood Yard

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ALAMEDA, CA

Reviewed by: Teresa K Morrison

Reviewed by: [Signature]

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LABORATORY NUMBER: 117980
 CLIENT: ENGINEERING SCIENCE, INC.
 PROJECT ID: 726104.03000
 LOCATION: EBRPD Redwood Yard

DATE SAMPLED: 10/12/94
 DATE RECEIVED: 10/13/94
 DATE ANALYZED: 10/19/94
 DATE REPORTED: 11/01/94

Total Volatile Hydrocarbons with BTXE in Soils & Wastes
 TVH by California DOHS Method/LUFT Manual October 1989
 BTXE by EPA 5030/8020

LAB ID	SAMPLE ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
117980-001	MW4-15.5	22**	ND(5)	38	ND(5)	490*
117980-002	MW4-16.5	10**	ND(5)	9	110	210*
	METHOD BLANK	ND(1)	ND(5)	ND(5)	ND(5)	ND(5)

* Presence of this compound confirmed by second column; however, the confirmation concentration differed from the reported result by more than a factor of two.

** Sample chromatogram does not match the gasoline standard pattern.

ND = Not detected at or above reporting limit; Reporting limit indicated in parentheses.

QA/QC SUMMARY

RPD, %	4
RECOVERY, %	91



Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 117980
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: 726104.03000
LOCATION: EBRPD Redwood Yard

DATE SAMPLED: 10/12/94
DATE RECEIVED: 10/13/94
DATE ANALYZED: 10/25/94
DATE REPORTED: 11/01/94

Total Volatile Hydrocarbons with BTXE in Soils & Wastes
TVH by California DOHS Method/LUFT Manual October 1989
BTXE by EPA 5030/8020

LAB ID	SAMPLE ID	TVH AS GASOLINE (mg/Kg)	BENZENE (ug/Kg)	TOLUENE (ug/Kg)	ETHYL BENZENE (ug/Kg)	TOTAL XYLENES (ug/Kg)
117980-003	MW2-21	130	310	180	1,300	4,400
	METHOD BLANK	ND(1)	ND(5)	ND(5)	ND(5)	ND(5)

ND = Not detected at or above reporting limit; Reporting limit indicated in parentheses.

QA/QC SUMMARY

RPD, %	<1
RECOVERY, %	102



Curtis & Tompkins, Ltd.

LABORATORY NUMBER: 117980
CLIENT: ENGINEERING SCIENCE, INC.
PROJECT ID: 726104.03000
LOCATION: EBRPD Redwood Yard

DATE SAMPLED: 10/12/94
DATE RECEIVED: 10/13/94
DATE EXTRACTED: 10/17/94
DATE ANALYZED: 10/19/94
DATE REPORTED: 11/01/94

Extractable Petroleum Hydrocarbons in Soils & Wastes
California DOHS Method
LUFT Manual October 1989

LAB ID	SAMPLE ID	KEROSENE RANGE (mg/Kg)	DIESEL RANGE (mg/Kg)	REPORTING LIMIT (mg/Kg)
117980-001	MW4-15.5	4*	***	1
117980-002	MW4-16.5	43*	***	1
117980-003	MW2-21	48*	***	1
	METHOD BLANK	ND	ND	1

ND = Not detected at or above reporting limit; reporting limit applies to all analytes.

* Sample chromatogram does not resemble hydrocarbon standard.

*** Diesel range not reported due to overlap of hydrocarbon ranges.

QA/QC SUMMARY

RPD, %	<1
RECOVERY, %	97



Engineering Science, Inc.
 1301 Marina Village Parkway, Suite 200
 Alameda, California 94501
 Phone: (510) 769-0100 Fax: (510) 769-9244

CHAIN OF CUSTODY RECORD

LABORATORY: <i>CIT</i>		PROJECT MANAGER: <i>Rucker</i>		PROJ. #: <i>726104</i> <i>.03000</i>		NO. OF CONTAINERS		ANALYSIS REQUIRED				REMARKS		
PROJECT NAME/LOCATION: <i>EBRPD Redwood Corp. Yard</i>								METHOD PRESERVED <i>BTEX (8020)</i> <i>TPH-g (DHS/LUFT)</i> <i>TPH-D (DHS/LUFT)</i> <i>TPH-K (DHS/LUFT)</i>					TO BE COMPOSITED BY LAB TURN AROUND TIME	
SAMPLER(S): (SIGNATURE) <i>Henry Pietrogali</i>														
SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION		NO. OF CONTAINERS	METHOD PRESERVED				TO BE COMPOSITED BY LAB TURN AROUND TIME	REMARKS		
<i>1</i> MW4-15.5	<i>10/13/94</i>	<i>1020</i>	<i>Soil</i>	<i>14.5-15.5' bgs</i>			<i>2</i>	<i>/</i>	<i>/</i>	<i>/</i>			<i>/</i>	<i>Standard</i>
<i>2</i> MW4-16.5	<i>10/13/94</i>	<i>1026</i>	<i>"</i>	<i>15.5-16.5' bgs</i>			<i>2</i>	<i>/</i>	<i>/</i>	<i>/</i>			<i>/</i>	<i>"</i>
<i>3</i> MW2-21	<i>10/13/94</i>	<i>1625</i>	<i>"</i>	<i>20.0-21' bgs</i>		<i>2</i>	<i>/</i>	<i>/</i>	<i>/</i>	<i>/</i>	<i>"</i>			

RELINQUISHED BY: (SIGNATURE) <i>Henry Pietrogali</i>	DATE <i>10/13/94</i>	TIME <i>1740</i>	RECEIVED BY: (SIGNATURE)	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)
RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY: (SIGNATURE) <i>[Signature]</i>	DATE <i>10/13/94</i>	TIME <i>1740</i>	REMARKS:	

APPENDIX D
GROUNDWATER MONITORING, SAMPLING AND ANALYSIS
DOCUMENTATION

**WATER LEVEL DATA AND
GROUNDWATER MONITORING NOTES**

WATER LEVEL DATA

PARSONS ENGINEERING SCIENCE

DATE: 10 November 1994

PROJECT/LOCATION: Redwood Regional Park Service Yard,
Oakland, California

PROJECT No.: 726104

PERSONNEL: Alan C. Peel

Well No	Water Level from T.O.C.	Well Depth From T.O.C	Depth to T.O.C	Water Level from G.S.	Well Casing Dia.	Gallons/ Casing Vol.	T.O.C. Elev. USGS	Water Level USGS
MW-1	4.0	18.0	-2.3	1.7	4	9.1	565.9	561.9
MW-2	23.5	36.5	-2.4	21.1	4	8.4	566.5	543.0
MW-3	18.9	42.0	-2.8	16.1	4	15.0	560.9	542.0
MW-4	14.7	26.0	-2.1	12.6	4	7.3	548.1	533.4
MW-5	16.6	26.0	-2.3	14.3	4	6.1	547.5	530.9
MW-6	13.2	27.0	-2.3	10.9	4	8.9	545.6	532.4

NOTES:

T.O.C. = Top of Casing

Gallons/casing volume for 4" inner diameter casing = 0.65 gallons per linear foot

Negative value for "Depth to T.O.C." indicates that T.O.C. is above ground surface

G.S. = Ground Surface

USGS = U.S. Geological Survey mean sea level (MSL)

All elevations surveyed by East Bay Regional Parks District relative to USGS Survey Benchmark No. JHF-49

C:\ebrpd\Nov94\WL.wk1

GROUNDWATER SAMPLING FIELD NOTES

PARSONS ENGINEERING SCIENCE

PROJECT/LOCATION: REDWOOD REGIONAL PARK SERVICE YARD, OAKLAND, CA

PERSONNEL: Alan Peel & Eric Storrs

PROJECT NUMBER: 726104

DATE: 10 & 11 November 1994

Well ID	Sampler Date Time	Water Level Before, Well Diameter and Depth*	Water Level After*	Gallons per Casing Volume	Well Purging Method**	Pump On	Pump Off	Temp. (o C)	Specific Cond (umhos/cm)	pH	Total Water Purged (gals)	Sample Coll. Method	Analysis & Number/type of Containers	Comments
MW-1	ACP	4.0						13.0	372	7.03	0			Turbid
	11/10/94	4"	4.1	9.1	B	NA	NA	13.3	390	7.12	9	B	(a) (b) & (c)	
	1125	18						13.5	365	7.11	18			
								12.5	350	7.21	27			
MW-2	ACP	23.5						12.0	365	7.50	0			Turbid, bailed dry @ 26 gallons
	11/10/94	4"	33.3	9.5	B	NA	NA	11.8	340	7.32	10	B	(a) (b) & (c)	
	1315	36.5						11.3	350	7.57	20			
								11.3	340	7.47	26			
MW-3	ACP	18.9						11.4	230	7.44	0			Turbid
	11/10/94	4"	20.7	15.0	B	NA	NA	11.1	320	7.88	15	B	(a) (b) & (c)	
	1545	42						10.6	280	7.57	30			
								10.4	270	7.45	45			
MW-4	ACP	14.7						11.5	280	7.25	0			Semi-turbid; fuel odor
	11/10/94	4"	18.7	7.3	B	NA	NA	11.7	350	7.20	7	B	(a) (b) & (c)	
	1645	26						11.4	330	7.10	15			
								10.9	310	7.04	22			

NOTES

- * Measured from top of casing in feet
- ** WW -- Well Wizard; G -- Grundfos Pump; B -- Baller
- NA Not Applicable
- NR Not Recorded

- (a) Total Petroleum Hydrocarbons as diesel (TPH-D), unpreserved (1: 1L amber bottles).
- (b) BTEX, EPA Method 8020, HCl preserved (2: 40ml VOAs).
- (c) Total Petroleum Hydrocarbons as gasoline (TPH-G), HCl preserved (2: 40ml VOAs).

GROUNDWATER SAMPLING FIELD NOTES

PARSONS ENGINEERING SCIENCE

PROJECT/LOCATION: REDWOOD REGIONAL PARK SERVICE YARD, OAKLAND, CA

PERSONNEL: Alan Peel & Eric Storrs

PROJECT NUMBER: 726104

DATE: 10 & 11 November 1994

Well ID	Sampler Date Time	Water Level Before, Well Diameter and Depth*	Water Level After *	Gallons per Casing Volume	Well Purging Method **	Pump On	Pump Off	Temp. (o C)	Specific Cond (umhos/cm)	pH	Total Water Purged (gals)	Sample Coll. Method	Analysis & Number/type of Containers	Comments
MW-5	ENS	16.64						11.7	230	8.77	0			Turbid
	11/11/94	4"	17.48	6.1	B	NA	NA	NR	210	8.69	12	B	(a) (b) & (c)	
	1430	26						12.1	260	8.60	18			
MW-6	ENS	13.24						11.5	290	7.48	0			Very turbid
	11/11/94	4"	25.43	8.9	B	NA	NA	10.9	270	7.82	18	B	(a) (b) & (c)	
	1245	27						10.9	260	7.83	27			
MW-0A	ACP													Field duplicate collected at MW-4
	11/10/94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	B	(b) & (c)	
	1655													
MW-0B	ACP													Equipment rinsate blank, collected after decon. at Well MW-4
	11/10/94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	(b) & (c)	
	1715													

NOTES

- * Measured from top of casing in feet
- ** WW -- Well Wizard; G -- Grundfos Pump; B -- Bailor
- NA Not Applicable
- NR Not Recorded

- (a) Total Petroleum Hydrocarbons as diesel (TPH-D), unpreserved (1: 1L amber bottles).
- (b) BTEX, EPA Method 8020, HCl preserved (2: 40ml VOAs).
- (c) Total Petroleum Hydrocarbons as gasoline (TPH-G), HCl preserved (2: 40ml VOAs).

**CHAIN-OF-CUSTODY RECORDS
AND ANALYTICAL LABORATORY REPORTS**



Curtis & Tompkins, Ltd., Analytical Laboratories, Since 1878

2323 Fifth Street, Berkeley, CA 94710, Phone (510) 486-0900

A N A L Y T I C A L R E P O R T

Prepared for:

Engineering Science, Inc.
1301 Marina Village Parkway
Suite 200
Alameda, CA 94501

Date: 17-NOV-94
Lab Job Number: 118442
Project ID: 726104
Location: EBRPD Redwood Regional

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ALAMEDA

Reviewed by: _____

Reviewed by: _____

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LABORATORY NUMBER: 118442
CLIENT: Engineering Science
PROJECT ID: 726104
LOCATION: EBRPD Redwood Regional

DATE SAMPLED: 11/10/94
DATE RECEIVED: 11/10/94
DATE EXTRACTED: 11/11/94
DATE ANALYZED: 11/15/94
DATE REPORTED: 11/18/94

Extractable Petroleum Hydrocarbons in Aqueous Solutions
California DOHS Method
LUFT Manual October 1989

LAB ID	CLIENT ID	KEROSENE RANGE (ug/L)	DIESEL RANGE (ug/L)	REPORTING LIMIT (ug/L)
118442-1	MW-1	ND	ND	50
118442-2	MW-2	ND	ND	50
118442-3	MW-3	ND	ND	50
118442-4	MW-4	230 *	ND	50
	METHOD BLANK	ND	ND	50

ND = Not detected at or above reporting limit. Reporting limit applies to all analytes.

* Sample chromatogram does not resemble kerosene standard.

QA/QC SUMMARY:

RPD, % 2
RECOVERY, % 82



LABORATORY NUMBER: 118442
 CLIENT: Engineering Science
 PROJECT ID: 726104
 LOCATION: EBRPD Redwood Regional

DATE SAMPLED: 11/10/94
 DATE RECEIVED: 11/10/94
 DATE ANALYZED: 11/15,16/94
 DATE REPORTED: 11/18/94

Total Volatile Hydrocarbons with BTXE in Aqueous Solutions
 TVH by California DOHS Method/LUFT Manual October 1989
 BTXE by EPA 5030/8020

LAB ID	SAMPLE ID	TVH AS GASOLINE (ug/L)	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYL BENZENE (ug/L)	TOTAL XYLENES (ug/L)
118442-1	MW-1	ND(50)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
118442-3	MW-3	ND(50)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
	METHOD BLANK	ND(50)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

ND = Not detected at or above reporting limit; Reporting limit indicated in parentheses.

QA/QC SUMMARY

RPD, %	2
RECOVERY, %	90

LABORATORY NUMBER: 118442
 CLIENT: Engineering Science
 PROJECT ID: 726104
 LOCATION: EBRPD Redwood Regional

DATE SAMPLED: 11/10/94
 DATE RECEIVED: 11/10/94
 DATE ANALYZED: 11/16/94
 DATE REPORTED: 11/18/94

Total Volatile Hydrocarbons with BTXE in Aqueous Solutions
 TVH by California DOHS Method/LUFT Manual October 1989
 BTXE by EPA 5030/8020

LAB ID	SAMPLE ID	TVH AS GASOLINE (ug/L)	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYL BENZENE (ug/L)	TOTAL XYLENES (ug/L)
118442-2	MW-2	66	3.4	ND(0.5)	ND(0.5)	0.9
118442-4	MW-4	2600	120	4.8	150	88
118442-5	MW-OA	2300	110	2.7	120	77
118442-6	MW-OB	ND(50)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
118442-7	TB	67*	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)
	METHOD BLANK	ND(50)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)

* Trip Blank was analyzed twice with similar results. Chromatogram for Trip Blank does not resemble that of other samples.

ND = Not detected at or above reporting limit; Reporting limit indicated in parentheses.

QA/QC SUMMARY

RPD, %	13
RECOVERY, %	89



CHAIN OF CUSTODY RECORD

LABORATORY: <i>Curtis & Tompkins</i>		PROJECT MANAGER: <i>Bruce Rucker</i>		PROJ. #: <i>726104</i>		NO. OF CONTAINERS	ANALYSIS REQUIRED										TO BE COMPOSITED BY LAB TURN AROUND TIME	REMARKS				
PROJECT NAME/LOCATION: <i>EBRPD Redwood Regional Park</i>							METHOD PRESERVED	TPH <i>TPH Gasoline</i>	BTXE	HCE <i>HCE</i>	HCE <i>HCE</i>											
SAMPLER(S): (SIGNATURE) <i>[Signature] ACP</i>																						
SAMPLE ID	DATE	TIME	MATRIX	SAMPLE LOCATION																		
<i>MW-1</i>	<i>11/10/94</i>	<i>1125</i>	<i>H₂O</i>	<i>Monitoring Well 1</i>		<i>3</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>											<i>5 days</i>		
<i>MW-2</i>		<i>1315</i>		<i>↓</i>		<i>2</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>													
<i>MW-3</i>		<i>1545</i>				<i>3</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>													
<i>MW-4</i>		<i>1645</i>				<i>4</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>													
<i>MW-0A</i>		<i>1655</i>				<i>0A</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>														
<i>MW-0B</i>		<i>1710</i>				<i>0B</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>														
<i>TB</i>	<i>11/10/94</i>		<i>H₂O</i>	<i>Trip Blank</i>		<i>2</i>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>														

RELINQUISHED BY: (SIGNATURE) <i>[Signature]</i>	DATE <i>11/10/94</i>	TIME <i>1820</i>	RECEIVED BY: (SIGNATURE) _____	RELINQUISHED BY: (SIGNATURE) _____	DATE _____	TIME _____	RECEIVED BY: (SIGNATURE) _____
RELINQUISHED BY: (SIGNATURE) _____	DATE _____	TIME _____	RECEIVED FOR LABORATORY BY: (SIGNATURE) <i>Mary Klossner</i>	DATE <i>11/10/94</i>	TIME <i>1820</i>	REMARKS: _____	



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2323 Fifth Street, Berkeley, CA 94710. Phone (510) 486-0900

A N A L Y T I C A L R E P O R T

Prepared for:

Engineering Science, Inc.
1301 Marina Village Parkway
Suite 200
Alameda, CA 94501

Date: 27-NOV-94
Lab Job Number: 118465
Project ID: 726104.04000
Location: EBRPD Redwood

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ALAMEDA

Reviewed by: Teresa K Morrison

Reviewed by: Kathleen O'Brien

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LABORATORY NUMBER: 118465
 CLIENT: ENGINEERING SCIENCE, INC.
 PROJECT ID: 726104.04000
 LOCATION: EBRPD REDWOOD

DATE SAMPLED: 11/11/94
 DATE RECEIVED: 11/11/94
 DATE ANALYZED: 11/17/94
 DATE REPORTED: 11/27/94

Total Volatile Hydrocarbons as Gasoline in Aqueous Solutions
 California DOHS Method
 LUFT Manual October 1989

LAB ID	CLIENT ID	TVH AS GASOLINE (ug/L)	REPORTING LIMIT (ug/L)
118465-1	MW-6	ND	50
118465-2	MW-5	50	50
	METHOD BLANK	ND	50

ND = Not detected at or above reporting limit.

QA/QC SUMMARY

RPD, %	11
RECOVERY, %	88

LABORATORY NUMBER: 118465
 CLIENT: ENGINEERING SCIENCE, INC.
 PROJECT ID: 726104.04000
 LOCATION: EBRPD REDWOOD

DATE SAMPLED: 11/11/94
 DATE RECEIVED: 11/11/94
 DATE EXTRACTED: 11/14/94
 DATE ANALYZED: 11/15/94
 DATE REPORTED: 11/27/94

Extractable Petroleum Hydrocarbons in Aqueous Solutions
 California DOHS Method
 LUFT Manual October 1989

LAB ID	CLIENT ID	KEROSENE RANGE (ug/L)	DIESEL RANGE (ug/L)	REPORTING LIMIT (ug/L)
118465-1	MW-6	ND	ND	50
118465-2	MW-5	ND	ND	50
	METHOD BLANK	ND	ND	50

ND = Not detected at or above reporting limit. Reporting limit
 applies to all analytes.

QA/QC SUMMARY:

RPD, %	2
RECOVERY, %	106

LABORATORY NUMBER: 118465-1
 CLIENT: ENGINEERING SCIENCE, INC.
 PROJECT ID: 726104.04000
 LOCATION: EBRPD REEDWOOD
 SAMPLE ID: MW-6

DATE SAMPLED: 11/11/94
 DATE RECEIVED: 11/11/94
 DATE ANALYZED: 11/18/94
 DATE REPORTED: 11/27/94

Benzene, Toluene, Ethylbenzene & Xylenes in Water by EPA 8240

COMPOUND	RESULT ug/L	REPORTING LIMIT ug/L
Benzene.....	ND	0.5
Toluene.....	ND	0.5
Ethyl Benzene.....	ND	0.5
Total Xylenes.....	ND	0.5

RECEIVED
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ND = Not detected at or above reporting limit.

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	116%
Toluene-d8	103%
Bromofluorobenzene	93%

ALCO
HAZMAT
MAR -3 PM 3:43

TO East Bay Regional Parks District
Parklands Design Department
P.O. Box 5381
Oakland, California 94605-0381

DATE	3/2/94	JOB NO.	NC367/723090
ATTENTION	Mr. Warren Gee		
RE:	Redwood Regional Park Service Yard		
	UFST Investigation, Oakland, CA		

GENTLEMEN:

WE ARE SENDING YOU Attached Under separate cover via _____ the following items:

Shop drawings Prints Plans Samples Specifications
 Copy of letter Change order _____

Dated _____

COPIES	DATE	NO.	DESCRIPTION
2	3/2/94		Creek and Soil Sampling at Redwood Regional Park, Oakland, California

THESE ARE TRANSMITTED as checked below:

- | | | |
|--|---|---|
| <input type="checkbox"/> For approval | <input type="checkbox"/> For checking | <input type="checkbox"/> Resubmit _____ copies for approval |
| <input checked="" type="checkbox"/> For your use | <input type="checkbox"/> Approved as submitted | <input type="checkbox"/> Design only, not for construction |
| <input type="checkbox"/> As requested | <input type="checkbox"/> Approved as noted | <input type="checkbox"/> Return _____ corrected prints |
| <input type="checkbox"/> For review and comment | <input type="checkbox"/> Returned for corrections | <input type="checkbox"/> _____ |
| <input type="checkbox"/> For Your Action | | |

REMARKS:

Warren,
we have submitted copies of the report to ACHSA-DHM and RWDLB. we recommend that you submit a copy to the California Dept of Fish & Game, as well.

COPY TO J. Shin ACHSA-DHM
L. Feldman RWDLB

SIGNED: B. M. Rucker

LABORATORY NUMBER: 118465-2
 CLIENT: ENGINEERING SCIENCE, INC.
 PROJECT ID: 726104.04000
 LOCATION: EBRPD REEDWOOD
 SAMPLE ID: MW-5

DATE SAMPLED: 11/11/94
 DATE RECEIVED: 11/11/94
 DATE ANALYZED: 11/18/94
 DATE REPORTED: 11/27/94
 DATE REVISED: 11/29/94

Benzene, Toluene, Ethylbenzene & Xylenes in Water by EPA 8240

COMPOUND	RESULT ug/L	REPORTING LIMIT ug/L
Benzene.....	ND	0.5
Toluene.....	ND	0.5
Ethyl Benzene.....	ND	0.5
Total Xylenes.....	ND	0.5

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	118%
Toluene-d8	102%
Bromofluorobenzene	93%

LABORATORY NUMBER: 118465-MB
 CLIENT: ENGINEERING SCIENCE, INC.
 PROJECT ID: 726104.04000
 LOCATION: EBRPD REEDWOOD
 SAMPLE ID: METHOD BLANK

DATE ANALYZED: 11/18/94
 DATE REPORTED: 11/27/94
 DATE REVISED: 11/29/94

Benzene, Toluene, Ethylbenzene & Xylenes in Water by EPA 8240

COMPOUND	RESULT ug/L	REPORTING LIMIT ug/L
Benzene.....	ND	0.5
Toluene.....	ND	0.5
Ethyl Benzene.....	ND	0.5
Total Xylenes.....	ND	0.5

ND = Not detected at or above reporting limit.

QA/QC SUMMARY: SURROGATE RECOVERIES

1,2-Dichloroethane-d4	114%
Toluene-d8	99%
Bromofluorobenzene	93%



8010MS MS/MSD Report

Matrix Sample Number: 118478-002

Date Analyzed: 18-NOV-94

Lab No: QC78502 QC78503

Spike File: DKI13

Matrix: WATER

Spike Dup File: DKI14

Batch No: 17633 304322189013 304322195014 304322183012 Analyst: LL

	Instrdrg	SpikeAmt	% Rec	Limits
<u>MS RESULTS</u>				
1,1-Dichloroethene	47.3149	50	95 %	61-145%
Trichloroethene	78.1275	50	106 %	71-120%
Benzene	52.3271	50	105 %	76-127%
Toluene	51.1094	50	101 %	76-125%
Chlorobenzene	46.367	50	93 %	75-130%
Surrogate Recoveries				
1,2-Dichloroethane-d4	58.1733	50	116 %	75-143%
Toluene-d8	50.7202	50	101 %	77-134%
Bromofluorobenzene	47.0543	50	94 %	65-129%
<u>MSD RESULTS</u>				
1,1-Dichloroethene	48.7257	50	98 %	61-145%
Trichloroethene	78.3867	50	106 %	71-120%
Benzene	52.7673	50	106 %	76-127%
Toluene	51.6941	50	102 %	76-125%
Chlorobenzene	46.9976	50	94 %	75-130%
Surrogate Recoveries				
1,2-Dichloroethane-d4	57.6474	50	115 %	75-143%
Toluene-d8	50.3572	50	101 %	77-134%
Bromofluorobenzene	46.5344	50	93 %	65-129%
<u>MATRIX RESULTS</u>				
1,1-Dichloroethene	0			
Trichloroethene	25.2325			
Benzene	0			
Toluene	.5322			
Chlorobenzene	0			
<u>RPD DATA</u>				
1,1-Dichloroethene	3 %			< 14%
Trichloroethene	0 %			< 14%
Benzene	1 %			< 11%
Toluene	1 %			< 13%
Chlorobenzene	1 %			< 13%

Results within Specifications - PASS

