REGIONAL PARKS

EAST BAY REGIONAL PARK DISTRICT

LETTER OF TRANSMITTAL

To: Department of Fish and Game **Date:** January 4, 1994

Attn: Mr. Mike Rugg

P.O. Box 47

Yountville, CA 94599

Subject: Contaminated Ground Water and Soil at Redwood Regional Park Service Yard Area

We are sending you herewith:

____Prints, ____Tracings, ____Working drawings,

____Specifications, ____Correspondence, ____Photographs,

XX Documents from our consultant, Engineering Science, dated December, 1993

For the following action:

__X__For your information, __X__For your records, ____For your review,

____For your action, ____Please return, ____Please retain one copy and return the others with corrections and comments,

Comments: If you have any questions, please call me at (510) 635-0135, Ext. 2311. Thank you.

Drawing Number	Date of original or revision	Copies	Description

Parkland Design Department

BY: Warren Gee
Warren Gee

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Closure of Underground Fuel Storage Tanks and Initial Site Characterization at REDWOOD REGIONAL PARK SERVICE YARD Oakland, California

Prepared for:

EAST BAY REGIONAL PARKS DISTRICT
Parklands Design Department

December 1993

Prepared by:

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OFFICES IN PRINCIPAL CITIES
NC367.05.05/49-04

EXECUTIVE SUMMARY

Engineering-Science, Inc. (ES) provided technical oversight and documentation associated with the removal of two underground fuel storage tanks (UFSTs) and subsequent remediation and characterization activities at the Redwood Regional Park Service Yard (RRPSY) in Oakland, California. The characterization and remediation activities conducted by ES, Petroleum Engineering, Inc. (PEI) and Powercore Soil Sampling, Inc. (PSSI) from June through October 1993 included: removal of the UFSTs and associated clean overburden and contaminated soil, excavation confirmation soil sampling and analysis; stockpiling and profile sampling of contaminated soil; partial backfilling of the excavation; and, conduct of an exploratory subsurface soil/groundwater "grab" sampling and analysis program.

Background and Previous Findings

The site is the service yard for Redwood Regional Park, which utilized one 2,000-gallon diesel UFST and one 5,000-gallon gasoline UFST from the mid-1960's to 1993. The tanks and piping underwent integrity testing in 1984, 1986, 1988 and 1989. The unleaded gasoline UFST failed the 1988 and 1989 tests.

Remedial Activities

The UFSTs were removed and transported off-site for disposal in April 1993. Initial soil samples collected beneath the UFSTs contained up to 2,200 mg/kg total petroleum hydrocarbons as gasoline (TPH-G) and elevated levels of aromatic hydrocarbons benzene, toluene, ethylbenzene and total xylenes (BTEX). Maximum concentrations of total lead and total petroleum hydrocarbons as diesel (TPH-D) were 10 and 4 mg/kg, respectively.

Approximately 600 cubic yards of contaminated soil associated with the former UFSTs were removed in June 1993. Five excavation confirmation soil samples were collected for laboratory analysis; TPH-G was detected up to 12,000 mg/kg and total BTEX was detected up to 1,800 mg/kg. Total lead was detected at a maximum concentration of 8 mg/kg. Excavated, contaminated soil was stockpiled at an adjacent location on site, and baseline soil sampling and analysis was conducted prior to aeration of the soil. The excavation was partially backfilled in June 1993 using excavated, clean overburden soil.

Characterization Activities

Following submittal and regulatory agency approval of a workplan for site characterization activities, an exploratory subsurface soil/groundwater "grab" sampling and analysis program was conducted in the vicinity of the excavation during September and October 1993. A total of 17 boreholes were advanced, geologically logged, sampled, backfilled and surveyed. Temporary well points were constructed in five of the boreholes, from which "grab" water samples were collected and static water levels were

measured. Twenty-seven soil samples and five "grab" water samples were submitted for laboratory analysis.

Geology and Hydrogeology

The shallow soil profile at the site consists of a surficial 3 to 10 foot clayey silt unit underlain by a 5 to 15 foot thick silty clay unit. All boreholes were terminated in a locally occurring siltstone or a clay with variable amounts of silt and gravel. Groundwater at the site occurs under unconfined to semi-confined or confined conditions. First occurrence of groundwater during drilling was encountered from 3 to 25 feet below ground surface. Equilibrated water levels ranged from 3 to 18 feet. The difference between first occurrence of groundwater and equilibrated water level ranged from 0 to 13 feet. The surface of the water table generally follows topography. The direction of groundwater flow in the vicinity of the excavation is northeast to southwest.

Magnitude and Extent of Soil and Groundwater Contamination

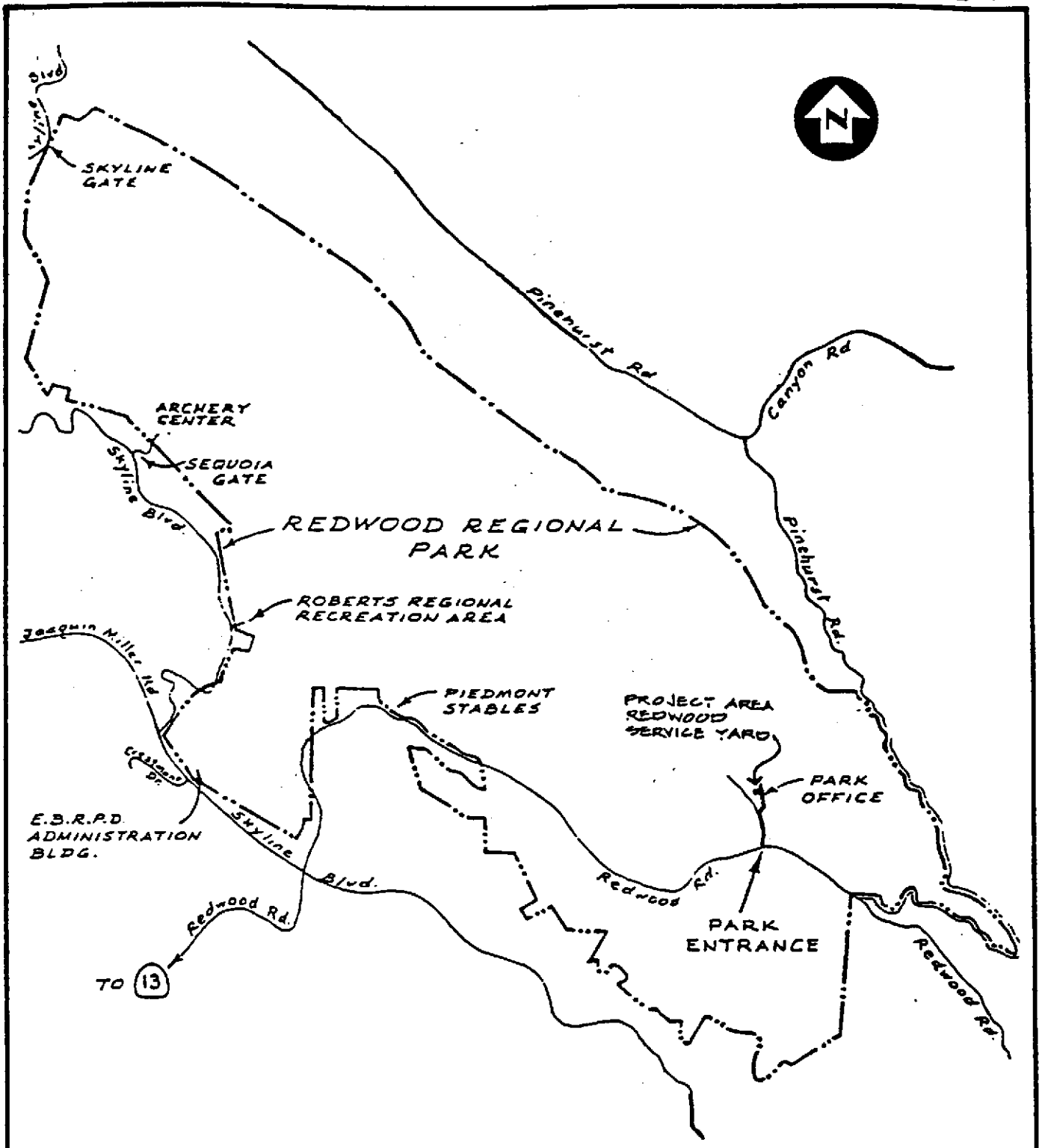
No soil contamination was detected above regulatory agency action cleanup levels in boreholes immediately north, east or south of the excavation. Significant soil contamination (up to 1,900 mg/kg TPH-G; 1,300 mg/kg total petroleum hydrocarbons as kerosene [TPH-K] and 198 mg/kg total BTEX) was detected in boreholes southwest of the excavation. Soil contamination was detected up to 90 feet southwest of the excavation and an area of discolored soil with noticeable fuel odor was observed in the east wall of Redwood Creek (130 feet southwest of the excavation) approximately one foot above the creekbed. This suggests that UFST-sourced soil and/or water contamination may extend at least to the creek, and that this contamination may have been discharging and may continue to discharge into that surface body. Soil contamination is inferred to result from lateral transport with groundwater and vertical desorption in the capillary fringe during periods of groundwater fluctuation.

Groundwater contamination by TPH and BTEX was detected in all of the five temporary well points at the site. Several BTEX compounds were detected above regulatory agency action levels. Groundwater contamination extends at least 100 feet southwest of the excavation.

The lateral and vertical extent of soil and groundwater contamination have not been fully defined.

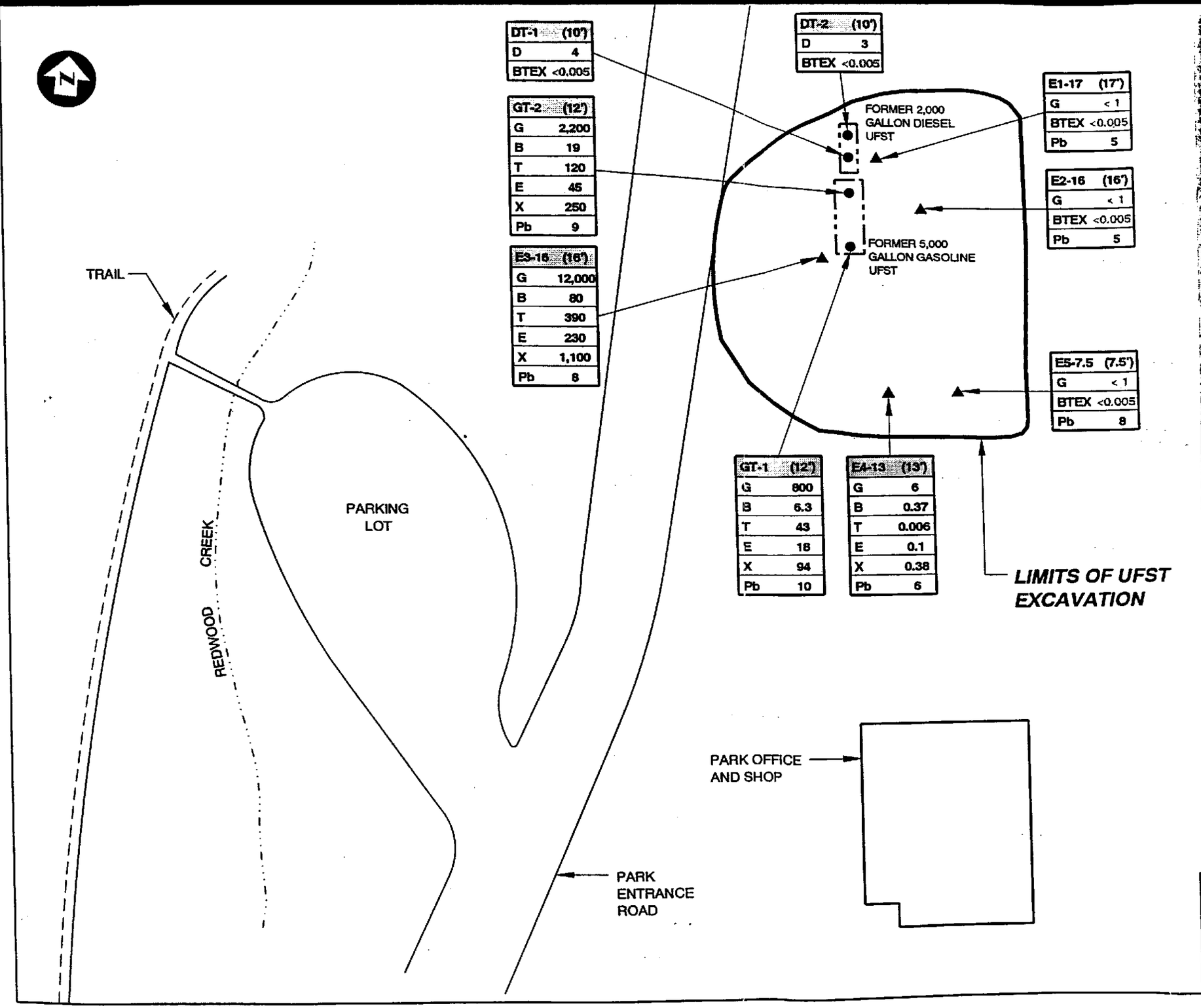
Recommendations

Three to five groundwater monitoring wells should be installed and monitored on a quarterly basis to evaluate impacts to groundwater associated with the former UFSTs and to verify the direction of groundwater flow. Soil sampling should also be conducted during well installations to evaluate the vertical extent of contamination.



LOCATION MAP

REDWOOD REGIONAL PARK
CORPORATION YARD SITE



LEGEND

- ● INITIAL SOIL SAMPLE COLLECTED 3 MAY 1993 FROM BENEATH UFST
- ▲ E4-13 EXCAVATION CONFIRMATION SOIL SAMPLE COLLECTED AT DEPTH OF 13 FEET BELOW GRADE OF SERVICE YARD

E1-17 (17')	
G,K	4
BTEX	0.2
Pb	8

SOIL SAMPLE I.D AND DEPTH BELOW GROUND SURFACE
TPH ANALYTICAL RESULTS (mg/kg)
BTEX ANALYTICAL RESULTS (mg/kg)
TOTAL LEAD ANALYTICAL RESULTS (mg/Kg)

<0.005 NOT DETECTED ABOVE METHOD REPORTING LIMIT (MRL) OF 0.005 mg/kg

- G TOTAL PETROLEUM HYDROCARBONS (TPH) AS GASOLINE
- K TPH AS KEROSENE
- D TPH AS DIESEL
- B BENZENE
- T TOLUENE
- E ETHYLBENZENE
- X TOTAL XYLENES

NOTES:

UFSTs NOT DRAWN TO SCALE

UFST=UNDERGROUND FUEL STORAGE TANK

LOCATIONS AND DIMENSIONS OF ROADS, TRAILS AND PARKING LOT ARE APPROXIMATE

UFST EXCAVATION MAP
SOIL SAMPLE LOCATIONS
REDWOOD RECREATION AREA
OAKLAND

REV. 2 C266-08.DWG 11/10/93

SECTION 5

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the data collected by ES during the recent UFST remedial program and subsequent site characterization activities.

CONCLUSIONS

- The excavation of approximately 600 cubic yards of contaminated soil was effective in reducing 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 have been detected up to 100 feet southwest (downgradient) of the former UFSTs.
- Field observations suggest that UFST-sourced soil and/or water contamination may extend at least to Redwood Creek approximately 130 feet to the southwest, and that this contamination may have been and may continue to discharge into that surface water body.
- The lateral and vertical extent of soil and groundwater contamination have not been fully defined.

RECOMMENDATIONS

- In accordance with regulatory agency requirements and guidelines, ES recommends three to five permanent groundwater monitoring wells be installed and hydrochemically monitored on a quarterly basis to evaluate the impacts to groundwater associated with the former UFSTs.
- Soil sampling should also be conducted during installation of these wells to evaluate the vertical extent of contamination.
- Quarterly measurement of static water levels should be conducted to determine the direction of local groundwater flow.
- Evaluate options for remediation of contaminated soil and groundwater.
- All findings of this report should be reported to all concerned regulatory agencies for their assessment.