

WORK PLAN

for

LANDFARM REMEDIATION OF CONTAMINATED SOILS

at

PETERSON MANUFACTURING
1600-63rd Street
Emeryville, California

for

WAREHAM DEVELOPMENT CORPORATION
1120 Nye Street, Suite 400
San Rafael, California 94901

03/31/88

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INTRODUCTION

The Peterson Manufacturing property is located at 1600-63rd Street in western Emeryville, California. The site is bounded on the north by 64th Street, the south by 63rd Street, the east by the Emeryville fire station, and the west by Overland Avenue and the Southern Pacific Railroad right-of-way. A location map of the site is shown in Figure 1.

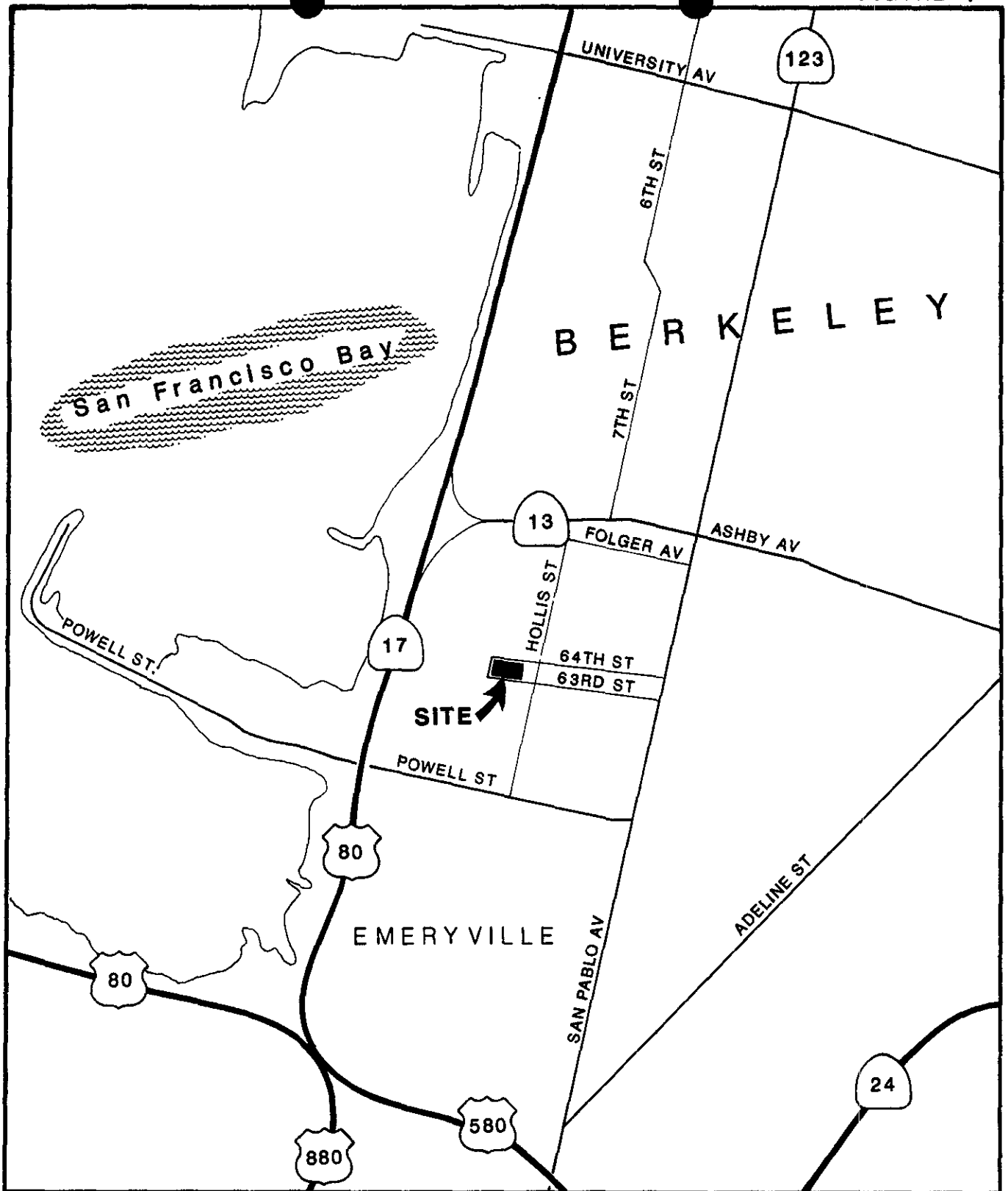
This work plan describes the actions to be taken on behalf of Wareham Development Group to remediate gasoline- and diesel-saturated soil associated with four 10,000 gallon underground storage tanks (USTs) at the subject property. Based on soil borings and an assumed excavation depth of 12 feet, roughly 930 cubic yards of soil will require excavation and treatment. The proposed tank and soil excavation areas are shown in Figure 2.

Engineering-Science (ES) plans to remediate contaminated soil on-site through landfarming and tilling. This process will reduce hydrocarbon levels through the combined effects of aeration, exposure to the ultraviolet component of sunlight, and activity of indigenous microorganisms. This method of remediation has been used successfully on several ES soil contamination and tank removal projects including the Durkee Aquatic Park Center site for Wareham Development in July 1987. Results have shown that this is a highly effective and environmentally sound method of hydrocarbon contaminant removal from soil.

Soil from the area of UST 2 and 3 is contaminated by gasoline and will be landfarmed and tilled according to Regulation 8, Organic Compounds Rule 40, Aeration of Contaminated Soil and Removal of Underground Storage Tanks. Soil from the UST 1 area is contaminated by diesel fuel and is therefore exempt from Regulation 8, Rule 40. This soil will be landfarmed separately and will be tilled to maximize aeration effectiveness and microorganism activity. Soil contaminated with vegetable oil and grease as well as petroleum hydrocarbons from the vicinity of borehole BH-1 will be remediated with the diesel contaminated soil from the UST 1 area. ✓

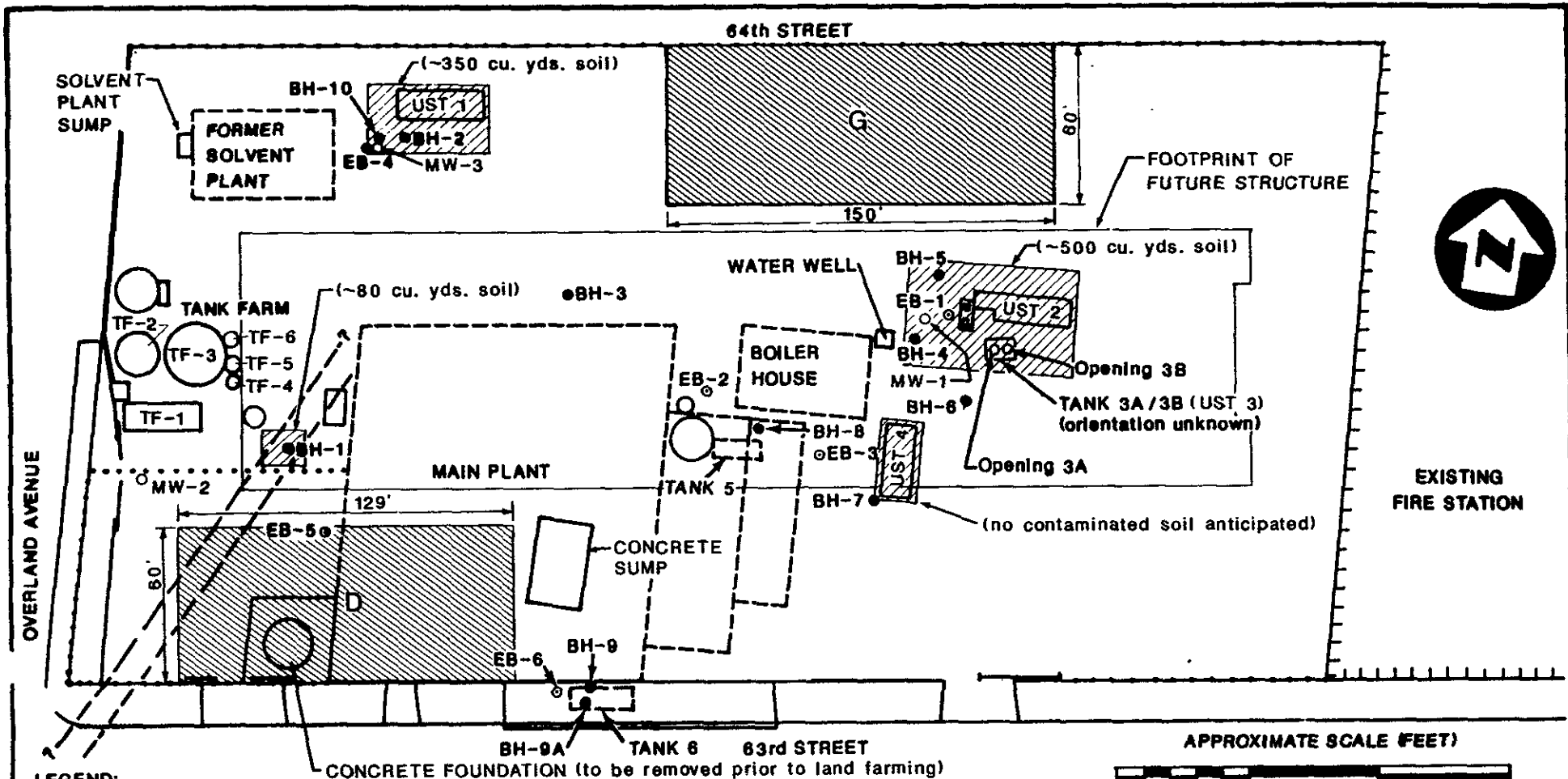
Landfarming and tilling will continue until volatile organic compound concentrations fall to levels at which the Alameda County Department of Environmental Services and the Regional Water Quality Control Board will permit the soil to be used as backfill.

FIGURE 1



LOCATION MAP





- LEGEND:**
- TANK 5 FORMER UNDERGROUND STORAGE TANK, APPROXIMATE LOCATION
 - TANK 1 EXISTING UNDERGROUND STORAGE TANK
 - BH-1 ES BOREHOLE
 - ⊙ EB-1 KALDVEER BORING, APPROXIMATE LOCATION
 - PROPOSED SOIL AND TANK EXCAVATION AREAS
 - LANDFARM REMEDIATION AREAS
G: GASOLINE
D: DIESEL
 - MW-1 MONITORING WELL
 - TF-1 ABOVEGROUND STORAGE TANK



SITE MAP
PETERSON MANUFACTURING CO. PARCEL
EMERYVILLE, CALIFORNIA
 WITH BOREHOLES, MONITORING WELLS, UNDERGROUND TANKS,
 SOIL EXCAVATION LOCATIONS AND LANDFARM
 REMEDIATION AREAS

Base: "Plot Plan", by John F. Tulloch, Engineers, Contractors, dated January 24, 1988.

ENGINEERING-SCIENCE

FIGURE 2

SITE BACKGROUND

The site was purchased in the early 1900s by Mr. Adolph Peterson for the construction of a tallow manufacturing plant, completed in 1914. The plant was operated for over seventy years through numerous modifications of the plant and manufacturing processes. There are areal photographs which indicate that the original manufacturing plant parcel extended 50 to 100 feet further to the east until approximately 1953 when the current site configuration was established. Information on site ownership and useage prior to its purchase by Mr. Peterson are not currently available (Reference 1).

The plant operations were terminated in 1987 and the property sold to Wareham Development Group. At this time, most of the existing plant facilities have been demolished and much of the site cleared. Four 10,000 gallon underground storage tanks still remain buried at the site.

Subsurface Soil Investigations

Six subsurface soil test borings were drilled on the site by Peter Kaldveer and Associates in December 1986. Borehole locations are shown in Figure 3 labeled EB-1 through 6. Surface soils encountered were generally very soft to stiff silty clays to depths of from 5.5 to 16 feet. These were underlain by medium dense to dense gravelly sands. Free groundwater was encountered at depths of 9 to 15.5 feet during drilling, but is thought to have been seepage from the baserock layer and not representative of the general groundwater level across the site. Contamination concentrations of 1600 parts per million (ppm) gasoline and 380 ppm diesel were reported from EB-1 (UST 2), 120 ppm waste oil from EB-3 (UST 4); 1300 ppm oil and grease (animal fat) from EB-5, and 190 ppm waste oil from EB-6 (UST 6) (Reference 2).

Ten exploratory soil borings were drilled by Engineering Science in September 1987 to further investigate soil contamination. Samples from three boreholes contained high levels (>1,000 ppm) of hydrocarbon contamination. The sample from Borehole 1 contained 1,900 ppm total petroleum hydrocarbons and 2,900 ppm vegetable oil and grease, and is not associated with an underground tank. Samples from boreholes 4 and 5 each contained 1,300 ppm gasoline associated with UST 2. In November 1987, two monitoring

wells were installed, and in January 1988, a third monitoring well was installed on the Peterson site. Water samples were analyzed and indicate gasoline contamination in MW-1 (UST 2), and diesel contamination in MW-3 (UST 1). Boreholes, monitoring wells, and UST locations are shown in Figure 2. Analytical results are listed in Table 1.

SOIL SEGREGATION PROGRAM

Three primary soil contaminant types have been identified in areas which require excavation and are suitable candidates for on-site landfarm remediation. These include: Diesel fuel identified west of UST 1 near the former solvent plant; gasoline contamination of soil surrounding UST 2; and petroleum hydrocarbons and vegetable oil and grease identified in soil and water samples from west of the main plant (BH-1). Each of these areas are to be excavated separately. Soil excavated from the area of BH-1 will be remediated with the diesel contaminated soil from the area of UST 1. The gasoline contaminated soil will be remediated separately.

Estimated volumes of soil to be excavated and landfarmed are as follows:

UST 1:	350 cubic yards
UST 2:	500 cubic yards
UST 4:	None anticipated
BH-1:	80 cubic yards

TOTAL ESTIMATED YARDAGE: 930 cubic yards

SOIL TREATMENT PROGRAM

The soil treatment area for gasoline contaminated soil (500 cubic yards) will require 9,000 square feet for remediation. A 60-foot by 150-foot area in the southwestern quadrant of the site is the recommended location for the gasoline contaminated soil remediation. The diesel and otherwise contaminated soil from the UST-1 and BH-1 areas (430 cubic yards) will require 7,740 square feet for remediation. A 60-foot by 129-foot area along the northern site boundary is the recommended location for the diesel

TABLE 1

SUMMARY OF SOIL SAMPLES AND CONTAMINANTS
PETERSON MANUFACTURING COMPANY PROPERTY

Sample Borehole	Sample Depth (in feet)	Sample Lithology	Analyses Performed	Analytical Results
BH ^a -1 (composite)	2.5	Green-black clay	EPA Method 418.1	1,900 mg/kg (TPH)
	6.5	Black and orange gravel; strong hydrocarbon odor	EPA Method 413.2	4,800 mg/kg (THO/G)
BH-2	None	Drilling refusal at 2 feet	None	
BH-3	1.0	Brown sandy silty clay	EPA Method 418.1	<100 mg/kg
			EPA Method 413.2	100 mg/kg
BH-4 (composite)	2.5	Green-black clay; strong hydrocarbon odor	GC/FID, for TPH	1,300 mg/kg (gasoline)
	4.5	Gray silty clay; strong gasoline smell		
BH-5 (composite)	2.5	Black sandy clay; strong hydrocarbon odor	GC/FID for TPH	1,300 mg/kg (gasoline and <5% #2 Diesel)
	6.0	Green clay; strong odor		
BH-6 (composite)	1.0	Black-brown gravelly clay; hydrocarbon smell	GC/FID for TPH	17 mg/kg (gasoline)
	3.5	Black clay; strong hydrocarbon smell		
BH-7 (composite)	3.5	Black organic clayey silt; strong hydrocarbon odor	GC/FID for TPH EPA 8080 (PCBs)	20 mg/kg (#2 Diesel) ND
	9.5	Orange-brown clay		

TABLE 1 (continued)

Sample Borehole	Sample Depth (in feet)	Sample Lithology	Analyses Performed	Analytical Results
BH-8 (composite)	2.5	Dark gray sandy clay; hydrocarbon odor	EPA Method 418.1	<100 mg/kg
	6.0	Orange-light brown sandy clay; hydrocarbon/gasoline odor	EPA Method 413.2	<100 mg/kg
	9.0	Dark brown clayey sandy silt; hydrocarbon odor	EPA Method 8080 (PCBs)	ND
BH-9	None	Drilling refusal at 3 feet	None	
BH-9A (composite)	5.5	Green-gray sandy gravelly clay; faint hydrocarbon/gas and tallow factory odor	GC/FID for TPH	16 mg/kg (#2 Diesel)
	10.0	Orange-brown clay; tallow factory odor	EPA Method 8080 (PCBs)	ND
BH-10	2.5	Black and green clay; tallow factory odor	EPA Method 418.1	<100 mg/kg
			EPA Method 413.2	<100 mg/kg
EB ^b -1	3.0	Dark gray silty clay; fairly strong odor	GC/FID Gasoline Standard	1,600 mg/kg (gasoline)
			GC/FID Diesel Standard	380 mg/kg (diesel fuel)
EB-2	2.5	Gray-green silty clay; slight odor	GD/FID Waste Oil Standard	ND
EB-3	3.0	Gray silty clay	GC/FID Waste Oil Standard	120
EB-4	4.5	Olive-gray silty clay; odor	Mod. EPA 8015 Total Hydro. EPA 8240	ND 6 ppb Benzene 11 ppb Toluene

TABLE 1 (continued)

Sample Borehole	Sample Depth (in feet)	Sample Lithology	Analyses Performed	Analytical Results
EB-5	6.0	Black silty clay; some odor	Mod. EPA 8015 Total Hydro. Standard Method 503D (equivalent to 413.2 if no low boiling point compounds present)	ND 1,300 mg/kg
EB-6	7.5	Light gray silty clay; strong odor	GC/FID Waste Oil Standard GC/FID Gasoline Standard	190 mg/kg ND

^aAll boreholes labeled BH were sampled by Engineering-Science, September 1987.

^bAll Boreholes labeled EB were sampled by other consultants (Reference 2).

TPH = Total Petroleum Hydrocarbons

THO/G = Total Hydrocarbons, Oil and Grease (Includes Animal Fats and Vegetable Oils)

ND = Not Detected

contaminated soil remediation. Each area will be covered with a sheet of 10 mil visquine or plastic sheeting, and surrounded by a berm approximately one foot high, over which the plastic will be draped. Approximately six inches of clean soil will be placed uniformly over the plastic to protect it from damage while tilling.

The contaminated soil will be moved to the treatment area with a front-end loader and placed in a uniform layer, approximately 12 to 18 inches thick, over the plastic sheeting and clean soil cover. During and after the transfer of soil, chunks of concrete, rebar, brick and other debris should be removed and stockpiled.

To promote biodegradation of the contaminated soil, it will be tilled weekly using a small rototiller. The tilling process will increase the contact of contaminated soil and indigenous microorganisms with oxygen, thus speeding up biodegradation of the hydrocarbon fuels. It will also promote aeration of the more volatile fractions. It is estimated that approximately three weeks will be required to reduce total petroleum hydrocarbon levels to less than 1,000 ppm.

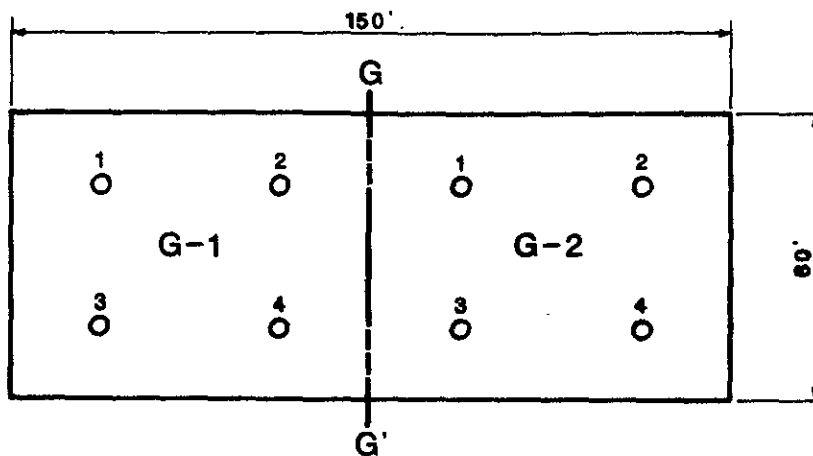
A site plan showing the proposed building footprint and soil remediation areas are shown in Figure 2. Plan and side views of the soil treatment areas are shown in Figure 3.

SOIL SAMPLING AND ANALYTICAL CONFIRMATION PROGRAM

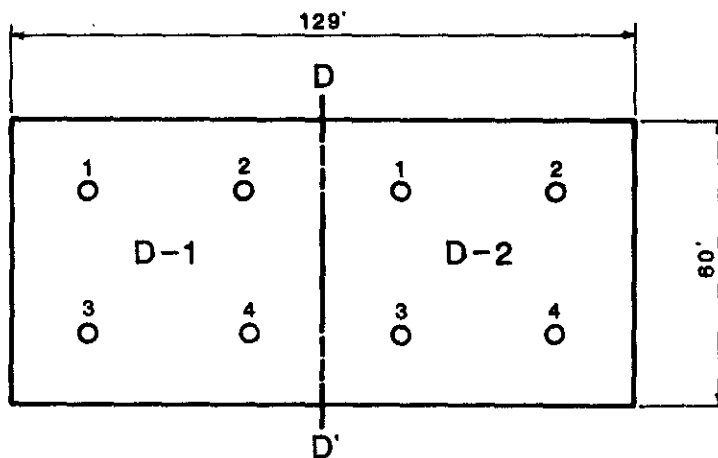
At the end of the third week of treatment, four soil samples will be taken from the each treatment area to verify that the concentration of total petroleum hydrocarbons (TPH) is below 1,000 ppm. The gasoline and diesel treatment areas will each be divided into two halves. Four sampling points will be located in each of the four halves at depths of 8 and 16 inches. The eight samples will then be combined into a single composite sample for each half of the two treatment areas.

If concentrations of TPH are still above 1,000 ppm, the contaminated soil will be tilled and allowed to stand for another week before the sampling is repeated. This will continue weekly until concentrations of TPH can be demonstrated to be below 1,000 ppm.

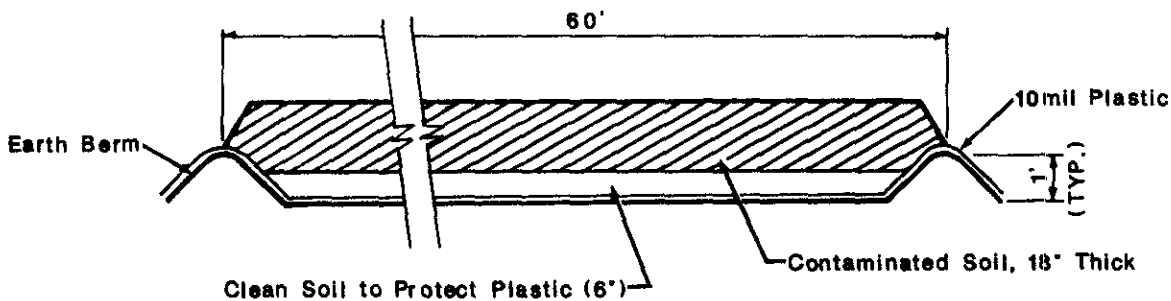
SITE A: GASOLINE REMEDIATION AREA



SITE B: DIESEL REMEDIATION AREA



CROSS SECTION G-G' AND D-D'



KEY

- D-1 SOIL SAMPLING LOCATION
- COMPOSITE SAMPLE DESIGNATION

**PLAN AND SITE VIEWS OF LANDFARM
REMEDATION AREAS**

Soil treatment may be enhanced through the addition of nutrients and/or injection with additional microorganisms at the end of the first three-week period if TPH levels are not being significantly reduced. This will be at the discretion of Wareham Development, and would be conducted by Ecova Corporation under the direction of Engineering-Science.

SUBGRADE PLACEMENT OF TREATED SOIL

Following DOHS review and approval of the test results showing that TPH levels have been reduced below 1,000 ppm, treated soil will be used as fill material under the proposed asphalt-paved parking lot. The soil should be spread out to a maximum thickness of six inches.

CLOSURE REPORT

Upon completion of the subgrade placement of the treated soil, a closure report will be filed with the Alameda County Department of Environmental Health for case closure.

PROJECT SCHEDULE

The time required to implement the soil remediation plan is estimated to be as follows:

Activity	Estimated Time to Complete
Soil excavation	seven days
Transport soil to treatment area	one day
Soil Treatment	twenty-one days

HEALTH AND SAFETY

A health and safety plan (HASP) for protection of personnel involved in operations at the Peterson site has been prepared and submitted under separate cover to the Alameda County Department of Environmental Health.

A copy of the HASP will be kept on site as an available reference for personnel involved with tank closure and soil remediation activities.