TES

Work Plan for Additional Groundwater Assessment Surrounding the Diesel Dump Tanks at PG&E's Oakland Power Plant Alameda County, California

4/93

Prepared by

Land and Water Quality

Prepared for

Steam Generation

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INTRODUCTION

This work plan describes additional site investigation activities proposed for the shallow water bearing zone near two diesel tanks at Pacific Gas and Electric Company's (PG&E) Oakland Power Plant. This investigation is needed to further define the horizontal extent of diesel in the shallow groundwater at the site prior to remediation. This work is being performed as required by the Alameda County Department of Environmental Health in accordance with the Leaking Underground Fuel Tank Manual (LUFT) revised October 1989, the Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Storage Tank Sites, revised August 10, 1990, and Article 11 of Title 23, California Code of Regulations. This work plan describes the general approach, methods, and schedule for performing these tasks.

SCOPE OF WORK

The objectives of the proposed investigation are:

1. To install at least three monitoring wells.
2. To properly abandon all temporary monitoring points at the site.
3. Determine the groundwater flow direction and hydraulic gradient of the shallow groundwater zone surrounding the former underground tanks.
4. Collect additional shallow groundwater samples to delineate the horizontal extent of diesel in groundwater.

Following collection and analyses of groundwater samples and determination of groundwater flow direction and hydraulic gradient, an evaluation will be made to determine the need for further site assessment and/or remediation at the site.

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BACKGROUND

SITE DESCRIPTION

PG&E's Oakland Power Plant is located at 50 Martin Luther King Jr. Way in Oakland, and lies at an elevation of less than 10 feet above mean sea level (Figure 1). The site is located in an industrial area adjacent to San Francisco Bay.

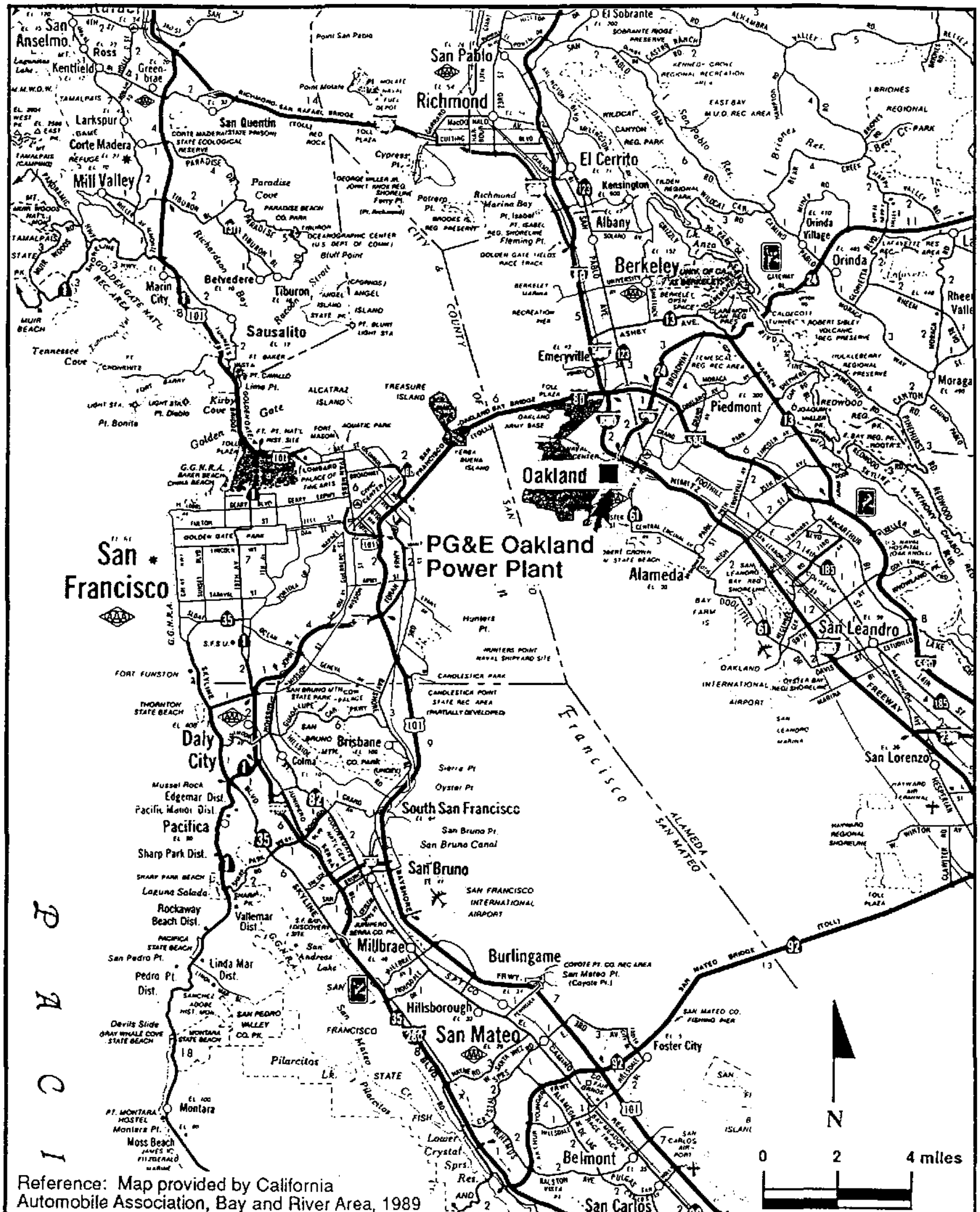
The facility is used to generate electricity during peak loads by burning diesel oil through three jet turbine generators located at the site (turbines #1, #2, and #3) (Figure 2). Each turbine had a 75-gallon underground diesel dump tank for temporary storage of diesel fuel associated with its operation. These former tanks were cylindrical in shape and were located approximately 1 to 4.5 feet below the ground surface. The diesel fuel was intermittently drained into the tank from each turbine when the fuel lines are purged of unused diesel fuel. The 75-gallon diesel dump tanks were removed and replaced with double-walled tanks contained in sealed concrete vaults in November 1991.

SITE HISTORY

A preliminary soil investigation was conducted near the three diesel dump tanks during September 1990 prior to removal and replacement of the tanks to determine if the soils near the tanks were affected by diesel fuel. The investigation consisted of drilling and sampling several soil borings in the immediate vicinity of each tank. Results of the preliminary soil investigation indicated that total petroleum hydrocarbons as diesel (TPH-D) were detected in the soils near all three diesel dump tanks, but the concentrations of TPH-D were highly variable from tank to tank. These results were presented in PG&E Report No. 402.331-90.55, issued December 1990.

In November 1991, the three 75-gallon diesel dump tanks were excavated and replaced. Soil samples were collected from each excavation and each soil pile and analyzed for TPH-D and BTEX. The analytical results for these samples indicated TPH-D and BTEX were generally absent in samples obtained from the excavation associated with Tank #1, while elevated concentrations of TPH-D were reported in samples collected from the bottom of the excavations for Tank #2 and #3. These results were presented in PG&E's Work Plan for the Soil and Shallow Groundwater Investigation, dated August, 1992.

Following removal of the tanks, new tanks were installed and excavations backfilled with clean fill. With the concurrence of the Alameda County Department of Environmental Health, PG&E conducted confirmation soil sampling immediately adjacent to diesel tanks #2 and #3. On June 3, 1992, nine soil samples were collected from four borings and the samples were analyzed for TPH-D and BTEX. Analytical results for these soil samples showed elevated concentrations of TPH-D remained near the



Reference: Map provided by California Automobile Association, Bay and River Area, 1989

Figure 1. Site location map.

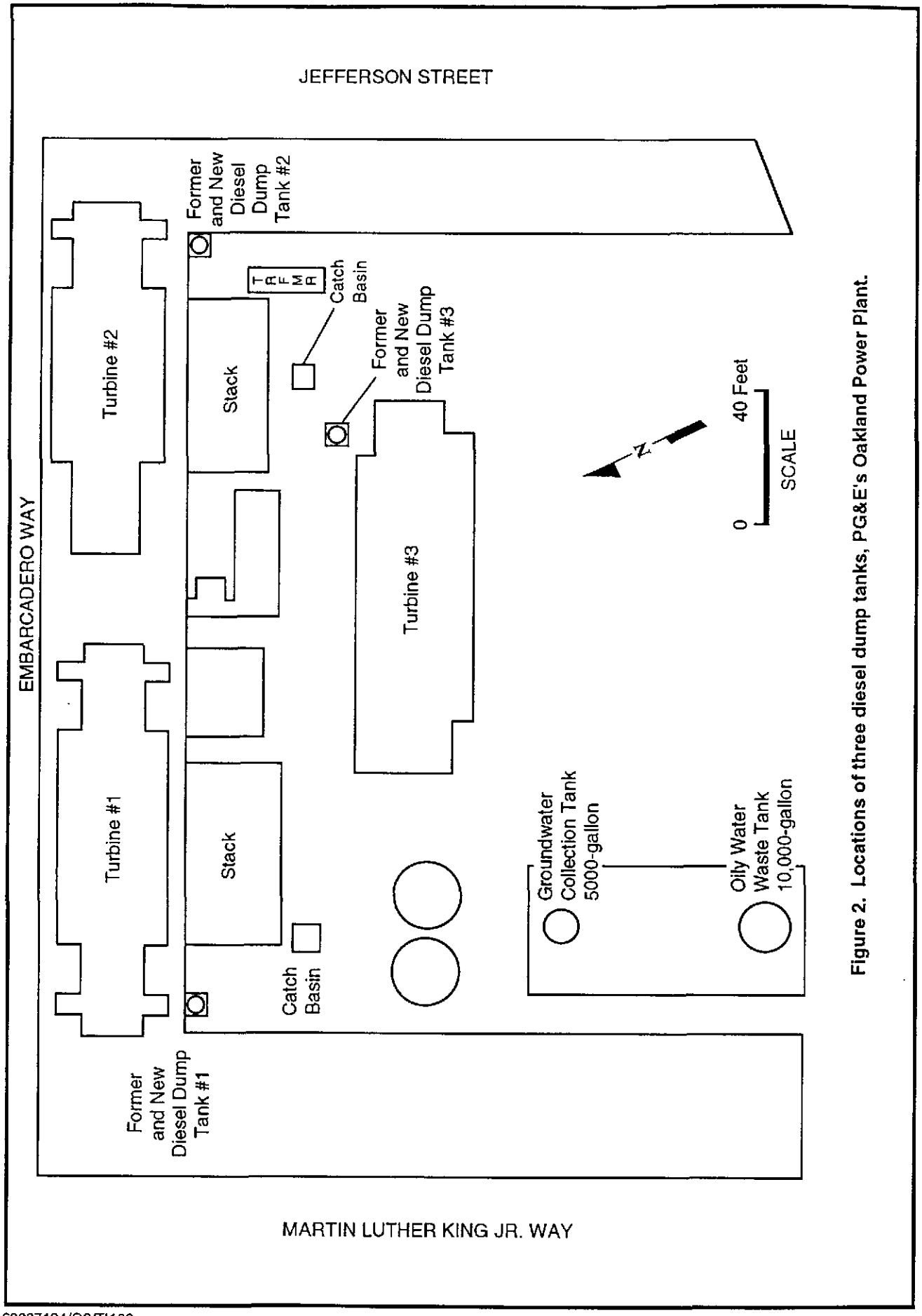


Figure 2. Locations of three diesel dump tanks, PG&E's Oakland Power Plant.

bottom of the former tank excavations. These results were presented in PG&E Report No. 402.331-92.35 dated June 1992.

To further delineate the extent of diesel fuel present in the soils and groundwater near diesel dump tanks #2 and #3, a shallow soil and groundwater survey was performed in October 1992. Site activities included installing and sampling four temporary monitoring well points, consisting of 1-inch PVC casing (except GWS-3E was constructed with 2-inch casing). Soil and groundwater sampling locations are shown on Figure 3; the results of laboratory analysis are presented in Tables 1 and 2. Results of this investigation were presented in TES Report No. 402.331-92.58. As discussed in that report, TPH-D concentrations in shallow soils adjacent to the former tanks ranged from nondetectable to 4100 mg/kg. TPH-D concentrations in the shallow groundwater ranged from nondetectable to 160 mg/l. Floating product was not present in any of the shallow groundwater sampling locations. In general, the survey defined the extent of TPH-D contamination in soil and groundwater near the tanks. The highest concentration of TPH-D appeared to be restricted to within 30 feet of the tanks.

Table 1

Summary of Soil Analytical Results
Collected During the Shallow Groundwater Investigation
PG&E's Oakland Power Plant

Sample Name	Sample Date	TPH as Diesel mg/Kg	Benzene µg/Kg	Toluene µg/Kg	Ethylbenzene µg/Kg	Xylenes µg/Kg
GWS-2BS (5.5-6')	10/07/92	310	<5.0	<5.0	<5.0	<10.0
GWS-2CS (5.5-6')	10/07/92	<5.0	<5.0	<5.0	<5.0	<10.0
GWS-2DS (3.5-4')	10/07/92	<5.0	<5.0	<5.0	<5.0	<10.0
GWS-2ES (5.5-6')	10/07/92	<5.0	<5.0	<5.0	<5.0	<10.0
GWS-2FS (5.5-6')	10/07/92	<5.0	<5.0	<5.0	<5.0	<10.0
GWS-3AS (6-6.5')	10/07/92	4100	<5.0	<5.0	<5.0	<10.0
GWS-3BS (7-7.5')	10/14/92	130*	<5.0	<5.0	<5.0	<5.0
GWS-3CS (5.5-6')	10/07/92	<5.0	<5.0	<5.0	<5.0	<10.0
GWS-3DS (5.5-6.0')	10/14/92	320	<5.0	<5.0	<5.0	<5.0
GWS-3ES (6-6.5')	10/14/92	<1.0	<5.0	<5.0	<5.0	<5.0
GWS-3FS (5.5-6')	10/08/92	33	<5.0	<5.0	<5.0	<10.0
GWS-3GS (5.5-6.0')	10/14/92	<1.0	<5.0	<5.0	<5.0	<5.0
GWS-3HS (5.5-6')	10/07/92	<5.0	<5.0	<5.0	<5.0	<10.0
GWS-3IS (5.5-6')	10/07/92	<5.0	<5.0	<5.0	<5.0	<10.0
GWS-3JS (5.5-6')	10/08/92	<5.0	<5.0	<5.0	<5.0	<10.0

mw 2"

<1.0 = Not detected at or above stated detection limit.
* = 140 mg/Kg of motor oil was found in this sample.
TPH-D = Total petroleum hydrocarbons as diesel.
mg/Kg = Milligrams per Kilograms.
µg/Kg = Micrograms per Kilogram.

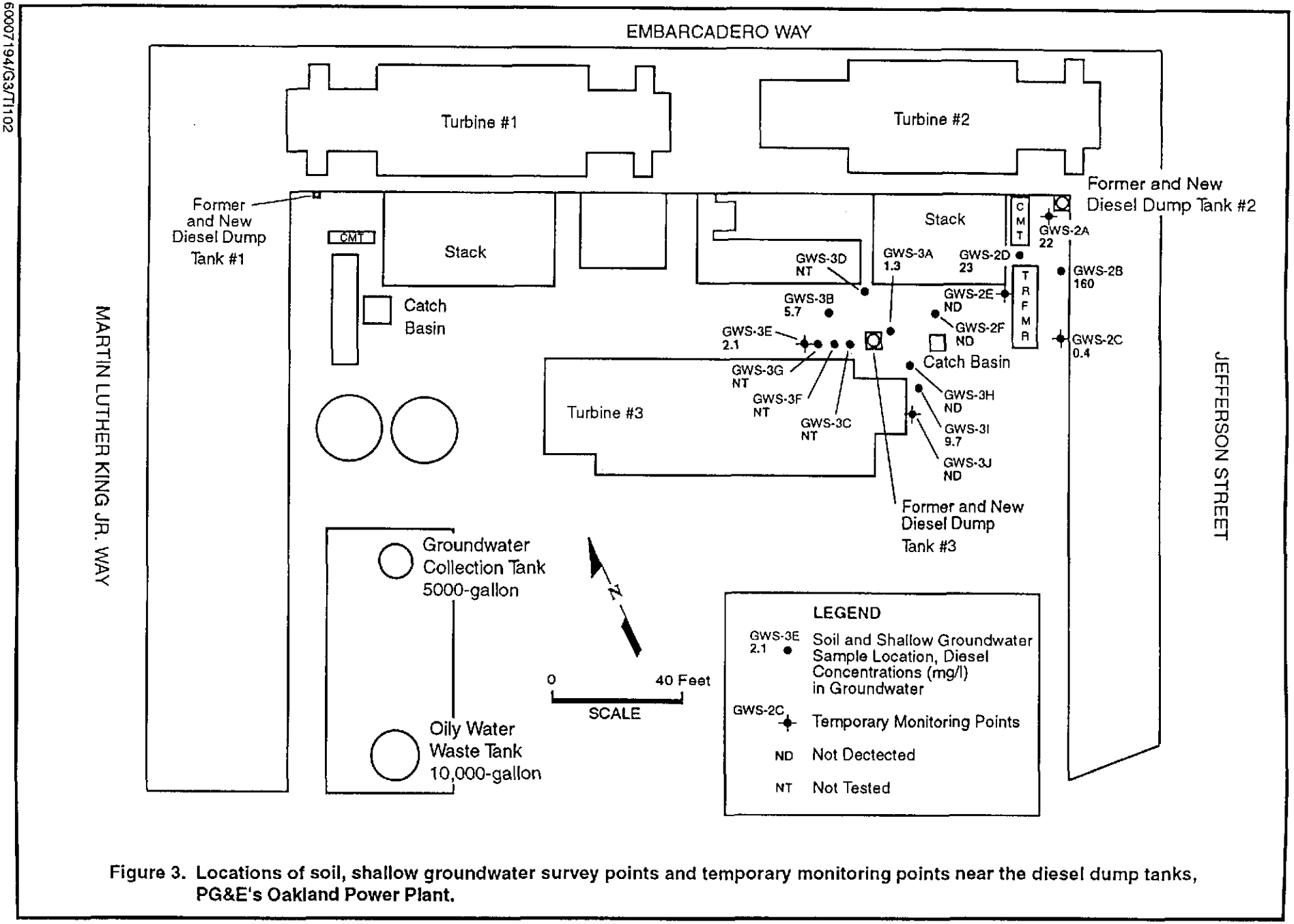


Figure 3. Locations of soil, shallow groundwater survey points and temporary monitoring points near the diesel dump tanks, PG&E's Oakland Power Plant.

Table 2

Shallow Groundwater Survey Analytical Results
PG&E Oakland Power Plant

Sample Name	Sample Date	TPH as Diesel mg/l	Benzene µg/l	Toluene µg/l	Ethylbenzene µg/l	Xylenes µg/l
GWS-2A	10/7/92	22	<0.5	<0.5	<0.5	<1.0
GWS-2B	10/7/92	160	<0.5	<0.5	9.0	100
GWS-2C	10/7/92	0.4	<0.5	<0.5	<0.5	<1.0
GWS-2D	10/7/92	23	<0.5	<0.5	<0.5	130
GWS-2E	10/7/92	<0.1	<0.5	<0.5	<0.5	<1.0
GSW-2F	10/7/92	<0.1	<0.5	<0.5	<0.5	<1.0
GWS-3A	10/14/92	1.3	<0.5	<0.5	<0.5	<1.5
GWS-3B	10/14/92	5.7	<0.5	<0.5	<0.5	<1.5
GWS-3E	10/14/92	2.1	<0.5	<0.5	<0.5	<1.5
GWS-3H	10/7/92	<0.1	<0.5	<0.5	<0.5	<1.0
GWS-3I	10/7/92	9.7	<0.5	<0.5	<0.5	<1.0
GWS-3J	10/7/92	<0.1	<0.5	<0.5	<0.5	<1.0

SITE GEOLOGY

SUBSURFACE CONDITIONS

The site is covered by two to six-inches of asphalt. Based on examination of soil samples obtained during the previous investigations, shallow soils generally consist of artificial fill that contains varying amounts of clay, silt, gravelly sand and red brick. Near Tank #2, subsurface materials consist of silty sand interbedded with gray clays, red brick, and black glassy shards. Some of the samples contained fibrous organic material, and oyster shells with a strong organic odor. Saturated soils were encountered approximately 6 feet below the surface. Near locations GWS-2B and GWS-2C (Figure 3), old foundation (concrete), red brick, and yellow, hard weathered rock were encountered which prevented probe or drill auger advancement beyond 2 to 3 feet below the ground surface at these locations. Groundwater recharge near tank #2 was generally very slow and some of the borings were deepened to enhance recharge.

Subsurface conditions near Tank #3 generally consisted of silts, clays, silty sands, fine grained sands, red brick, and concrete. Saturated soils were encountered approximately 6 to 7 feet below the surface. Groundwater recharge was generally very good at locations GWS-3A, GWS-3B, GWS-3E, GWS-3H, and GWS-3J. A subsurface vault is present below Tank #3. The nature and size of this vault is not well defined but it was encountered in borings GWS-3A and GWS-3B.

will the existing 1" mws be destroyed 1st? Or retrofitted?

PROPOSED METHODOLOGY

INSTALLATION OF MONITORING WELLS AND COLLECTION OF ADDITIONAL GROUNDWATER SAMPLES

At least three monitoring wells will be installed at the site. The locations of the proposed wells will coincide with the existing temporary monitoring wells (designated GWS-2A, 3E, and 3J) installed in conjunction with the shallow soil and groundwater survey (Figure 4). The monitoring wells will be installed in the downgradient direction from each tank, to determine the groundwater flow direction, hydraulic gradient, and monitor groundwater quality. All site work will be performed under the direct supervision of a California registered geologist.

do we know this? I don't think so.

The drilling will be conducted by a State of California licensed C57 drilling company using a continuous flight hollow stem auger. The wells will be drilled with an 8-inch outside diameter, hollow-stem auger to approximately 8 feet below the encountered water table (approximately 14 feet below the ground surface). Descriptions of soil types encountered, sample collection intervals, and well construction details will be recorded on well/boring logs and included within the field test report. Cored soil samples will be collected in accordance with the enclosed Site Soil Sampling Protocol (Appendix A). Selected soil samples will be submitted for laboratory analysis based upon Photoionization Detector (PID) readings, discoloration, odors and site stratigraphic changes. Analysis will be conducted for total petroleum hydrocarbons as diesel (TPH-D), benzene, toluene, ethylbenzene, and xylenes (BTEX) by EPA methods 3550/8015/8020 at a State of California certified laboratory. Analytical methods, sample containers, holding times, and means of preservation are provided in the Quality Assurance and Control Plan (Appendix B).

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All drill cuttings will be collected and stored on-site in 55-gallon steel drums (DOT 17c) with a removable head painted solid yellow pending laboratory results. Appropriate disposal methods for the cuttings will be determined based on the analyses. To avoid cross-contamination, drilling augers will be steam-cleaned before drilling each borehole. Soil sampling equipment will be cleaned with potable water and trisodium phosphate prior to collection of each sample. All water used to clean sampling and drilling equipment will be collected and stored on-site in 55 gallon steel drums (DOT 17c) with 2-inch bungs in a nonremovable head painted solid yellow.

Monitoring wells will be constructed of 4-inch diameter schedule 40 PVC well screen/casing and completed as shown on (Figure 5). Well screen slot size and filter pack will be determined based on the encountered aquifer characteristics. A neat cement mixture will be used to seal the wells in accordance with State of California Water Well Standards (December 1981 p.34, Section 9, Part D).

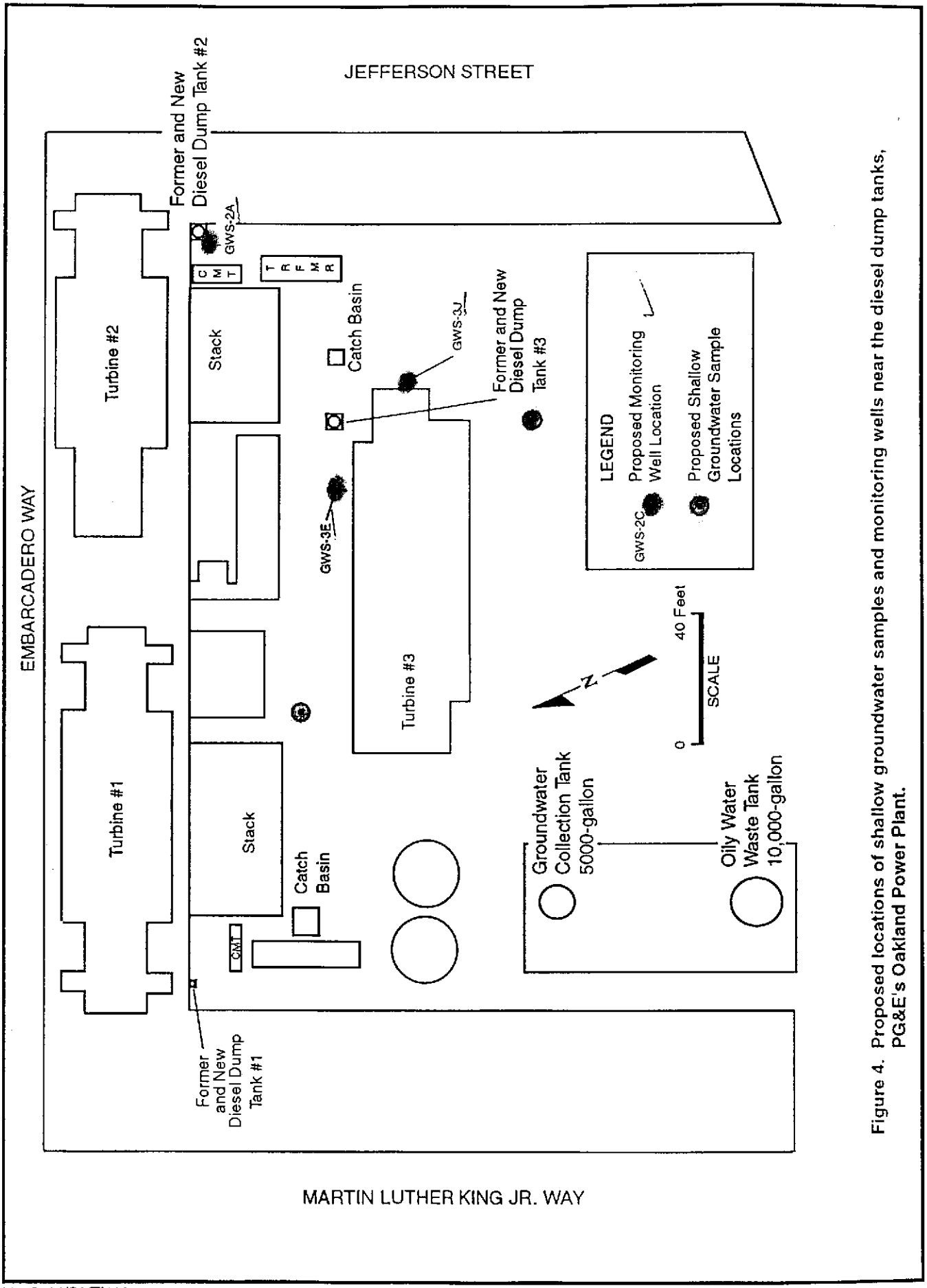

Figure 4. Proposed locations of shallow groundwater samples and monitoring wells near the diesel dump tanks, PG&E's Oakland Power Plant.

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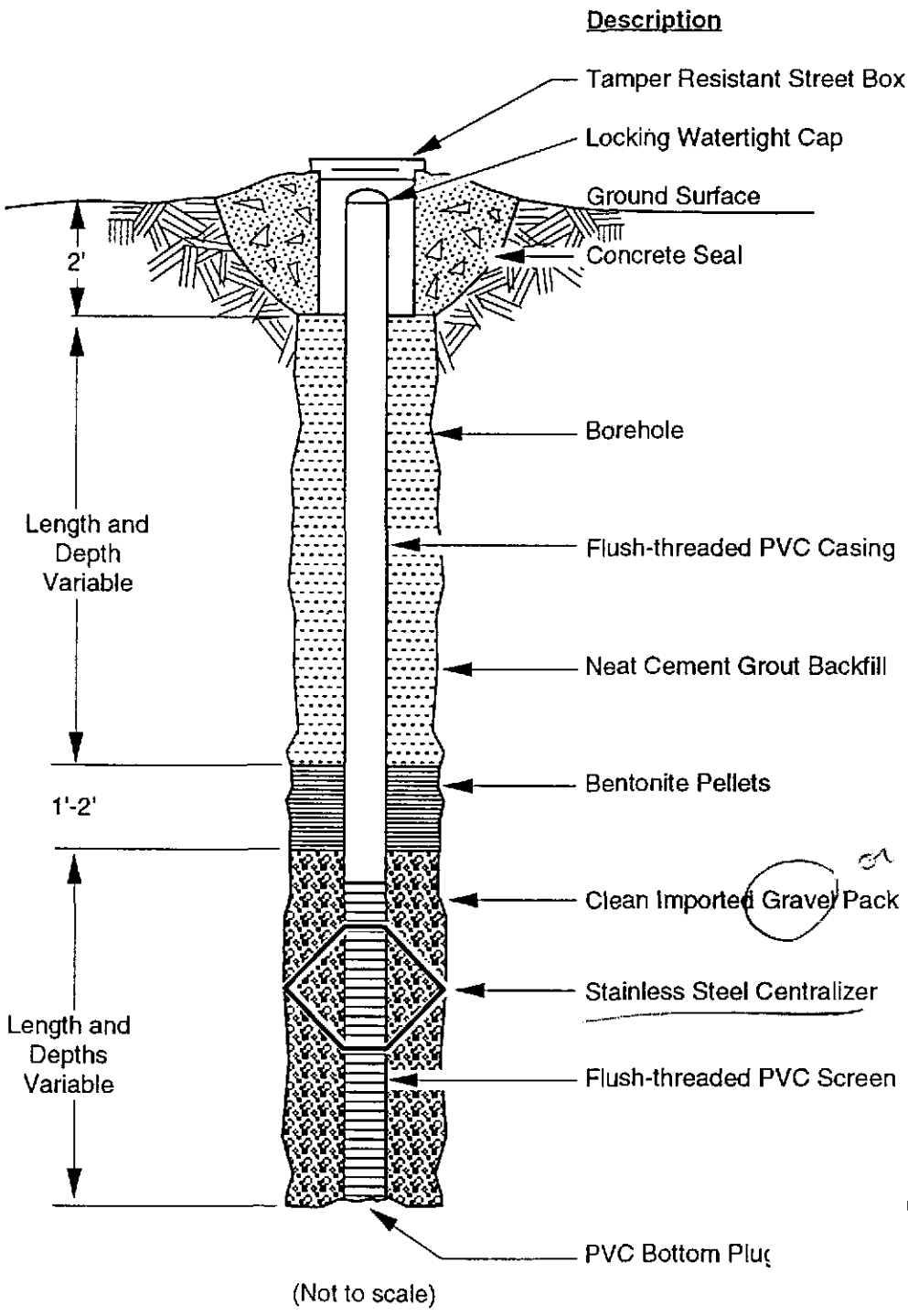


Figure 5. Typical monitoring well installation

After installation, the wellheads will be surveyed to a common datum (Mean Sea Level). Depth-to-water readings will be used to determine flow direction and hydraulic gradient beneath the study area. Each well will be developed in accordance with the Site Well Development Protocol (Appendix C).

Following completion of these wells, several additional borings will be installed for the purpose of further delineating the lateral extent of TPH-D and BTEX in shallow groundwater at the site. Proposed additional boring and groundwater sampling locations are shown on Figure 4. Samples will be collected by advancing the eight-inch auger into the water table. Once the augers penetrate a sufficient depth to collect a groundwater sample, a clean bailer will be used to collect a groundwater sample. Additional samples may be collected based on the field geologist observations. After the groundwater samples have been collected, the retrieved fluid will be carefully transferred to 40-ml VOA and 1-liter amber glass bottles. Samples containers will be appropriately labeled and chain-of-custody documentation initiated for each sample. The samples will be analyzed by a California state-certified laboratory for TPH-D (EPA method 3510/8015 modified)and BTEX (EPA method 8020).

DESTRUCTION OF MONITORING POINTS what about the other 1" mws? they were 12 in total. grouted already

Monitoring points GWS-2A, GWS-2C, GWS-2E, and GWS-3J were completed with 1-inch diameter PVC casing in a 2-inch OD hole. These temporary monitoring points will be properly abandoned or recompleted as permanent 4-inch monitoring wells. Destruction of the temporary monitoring points will be in accordance with State of California Water Well Standards (Monitoring Well Standards, Part I, Section 19, and Part III Section 23). The temporary monitoring points shall be destroyed by removing all material within the original borehole and the created hole filled completely with the appropriate sealing material.

GROUNDWATER SAMPLING AND ANALYSIS

Groundwater monitoring will be conducted in accordance with the Site Groundwater Monitoring Protocol (Appendix D). After the monitoring wells have been allowed to stabilize for at least 48 hours, they will be sampled for free product in accordance with the Site Groundwater Monitoring Protocol. Water samples will then be collected for these wells after purging a minimum of four well volumes. Sample collection will be performed in accordance with the Site Groundwater Sampling Protocol. The water samples will be analyzed by a State of California certified laboratory for TPH-D and BTEX by EPA methods 3510/8015/8020. Laboratory methods, sample containers, holding times and preservation are summarized in (Appendix B). All site activities involving potential contact with hazardous materials associated with this investigation will be conducted in accordance with the Site Health and Safety Plan (Appendix E).

FLOW DIRECTION AND HYDRAULIC GRADIENT DETERMINATION

Water level data collected from the wells will be used to develop a groundwater equipotential contour map for the project site. Groundwater flow will be estimated to be perpendicular to equipotential lines drawn on the map.

REPORTING

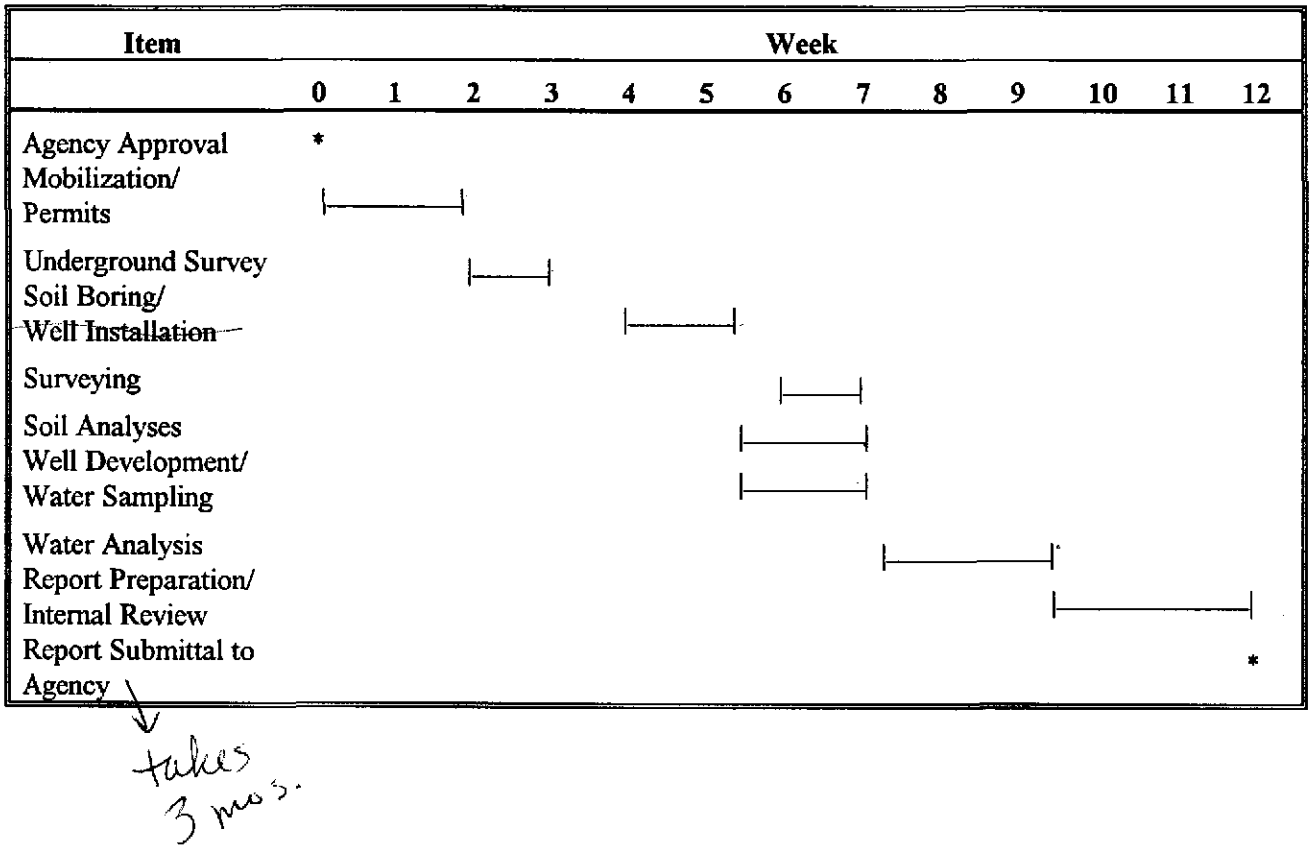
A report that documents the activities described in this work plan will be prepared under the direction of a California-Registered Geologist. This report will summarize the findings of the investigation.

ADDITIONAL WORK

The new monitoring wells will be sampled quarterly for a one year period to determine if seasonal variation affects groundwater flow direction at the site. At the end of this period, sample locations and frequency will be re-evaluated by PG&E and Alameda County Environmental Health Department.

PROPOSED SCHEDULE

The estimated time necessary to complete the tasks proposed in this work plan is 12 weeks from receipt of written approval to proceed. The proposed schedule is shown below. The actual completion time may vary depending on drill rig availability, laboratory turn-around-time, and other unforeseen circumstances.



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Appendix A

Site Soil Sampling Protocol

SITE SOIL SAMPLING PROTOCOL

SAMPLE COLLECTION DURING DRILLING ACTIVITIES

The exact location and number of borings at each site will be determined in the field by the Project Geologist/Engineer.

Prior to arriving at the sample site, the drill rig/augers and all sample equipment will be steam cleaned. Cleaning will be conducted on-site on all sampling equipment between each sample interval.

Soil samples will be obtained using a California modified split-spoon samplers containing three, six inch long, two inch diameter brass tubes. The sampler will be driven 18 inches ahead of the hollow stem auger by a 140 pound hammer with a 30 inch drop in accordance with American Society for Testing and Materials (ASTM) Methods D1586-84 for split barrel sampling of soil and D1587-83 for thin-walled tube sampling of soils. The blows required to drive the sampler each six inch interval will be recorded on the boring log. The sampler will be removed from the boring and opened to reveal the brass tubes. The bottom tube will be capped with aluminum foil and plastic end caps, taped and labeled with the following information: date, time, project ID, sample ID, name of sampler and type of analysis. This sample will be immediately placed into a cooler containing dry ice or frozen "blue ice" sealed in plastic bags. The samples will be delivered to a state certified laboratory under chain-of-custody protocol within 48 hours of sampling, or whenever possible.

Soil in the uppermost brass tube will be described according to ASTM standard practice for description and identification of soils (ASTM D-2488-84). Stratigraphic and other data/interpretations will also be recorded. Soil properties will also be noted for the sample collected from the middle brass tube and from the sampler shoe. Alternatively, the second sample tube may be used with the uppermost tube for preparation of duplicates. Sample selection will be noted on a log prepared for each boring/well.

Soil samples will be continuously collected from the surface to the bottom of the boring. Soil borings will extend through the entire interval of contaminated soil and will terminate if the water table is encountered.

Appendix B

Quality Assurance and Quality Control Plan

QUALITY ASSURANCE AND QUALITY CONTROL PLAN

1.0 FIELD QA/QC PLAN

The Field QA/QC Plan includes protocols for:

- Data Collection
- Equipment Decontamination
- Soil Sampling
- Groundwater sampling

The following descriptions are general summaries of the QA/QC procedures for field activities. Detailed sampling procedures are described in the attached protocols. This section presents sampling procedures relating to QA objectives.

All information pertinent to the field investigation will be kept in a field log book. Information to be documented includes at least the following:

- Sample numbers
- Locations of sample collection
- Soil boring numbers
- Depths at which samples were obtained
- Names of collectors
- Dates and times of collection
- Purpose of sample
- Sample distribution (e.g., laboratory, archive, etc.)
- Field observations
- Field measurements (e.g., PID readings, pH, conductivity, water levels).
- Other data records (e.g., development log, soil sampling report, well log, etc.)

All drilling equipment, pipe, and materials coming in contact with the borehole material will be decontaminated before use according to the procedures described in Section 4.0 of this plan. All sampling equipment will be decontaminated prior to sampling following these same procedures.

Soil samples will be collected as drilling progresses. All downhole drilling equipment will be decontaminated prior to use and between use for each well according to the procedures described in Section 4.0.

All well construction material, including well casing, screen, and well caps, will be decontaminated prior to installation by steam cleaning according to the procedures described in Section 4.0.

Samples will be placed in laboratory prepared containers, appropriate for the analyses specified as indicated on Table B-1.

Amber glass and polyethylene bottles will be filled to the bottle neck. Samples collected in 40-ml VOA vials will be filled to overflowing with a positive meniscus. The vials will be sealed with a teflon-lined screw cap such that no head space exists within the vial.

2.0 SAMPLE PRESERVATION

Sample containers will be pre-cooled and transported to the site in the cooler. All samples will be preserved as indicated on Table B-1 and placed in a cooler immediately after collection. Chemical ice sealed in plastic bags will be used in the cooler to cool and maintain samples at a temperature of 4°C.

3.0 CHAIN-OF-CUSTODY PROCEDURES

3.1 Sample Labels

Each sample container will be labeled prior to filling to prevent misidentification. The label will contain at least the following information:

- Sample number which uniquely identifies the sample
- Project title or number
- Location of sample collection
- Soil boring or well number, as applicable
- Sample depth
- Name of collector
- Date and time of collection
- Type of analysis requested.

3.2 Chain-of-custody Record and Sample Analysis Request Form

A chain-of-custody record for each container or sample will be used to track possession of the samples from the time they were collected in the field until the time they are analyzed in the laboratory.

Table B-1

Sample Containers, Holding Times, and Preservation

Parameter	Matrix	Container	Holding	Preservation
Total Petroleum Hydrocarbons (Heavy Fractions)	Soil	3" stainless steel or brass cylinder.	14 days[1] 40 days[2]	4°C
	Water	1-liter amber bottle, teflon seal/silicon.	14 days[1] 40 days[2]	4°C
Benzene Toluene Xylenes Ethylbenzene	Soil	3" stainless steel or brass cylinder.	14 days[1]	4°C
	Water	40 ml glass vial. teflon seal/silicon section	7 days[1] 14 days[3]	4°C

Note:
1 = Maximum holding time for sample (extract within this time or analyze if extraction is not required).
2 = Maximum holding time for extract (analyze within this time).
3 = Maximum holding time for sample when pH adjusted with HCl

The chain-of-custody record will contain the following information:

1. Site Name
2. Signature of collector
3. Date and time of collection
4. Sample identification number(s)
5. Number of containers in sample set
6. Description of sample and container(s)
7. Name and signature of persons, and the companies or agencies they represent, who are involved in the chain of possession
8. Inclusive dates and times of possession
9. Requested analysis for each sample

3.3 Delivery of Samples to Laboratory

Samples will be delivered to the laboratory on a daily basis. Samples will be refrigerated to approximately 4°C for shipping. Shipping containers will be sealed with security tape to assure sample integrity during shipping. Delivered samples will be accompanied by a chain-of-custody record. The laboratory shall note on the chain-of-custody that samples were cold properly preserved and security tape was intact upon arrival.

4.0 Sampling and Drilling Equipment Decontamination

All equipment used for drilling and sampling soil and groundwater will be decontaminated prior to use. Well construction materials will be decontaminated before installation. All equipment used for collection of more than one sample, such as bailers and spoons, will be decontaminated between each use to prevent cross contamination between samples. Drilling equipment will be decontaminated prior to commencing drilling at each hole.

Equipment and well material decontamination will be conducted on an impermeable surface and all decontamination effluent will be contained. All surfaces of the equipment will be thoroughly cleaned with a steam cleaner. The equipment will be placed on a drying rack for air drying. The decontamination water will be stored in containers certified for hazardous materials storage and disposed of in an approved manner.

Sample equipment to be used for organic analysis will be washed in a nonphosphate detergent (Alconox or equivalent) and rinsed with tap water, followed by deionized water.

5.0 FIELD EQUIPMENT CALIBRATION AND MAINTENANCE

The following measuring equipment may be used during the Remedial Investigation. Equipment is grouped by field activity. Calibration procedures and frequency are listed for each piece.

Soil Borings and Temporary Well Installation - Steel and coated cloth tape. Calibration: none.

Water Level Measurements in Wells - Steel surveyors tape. Calibration: manufacturer supplied temperature correction will be applied as applicable for field conditions. Electrical well sounders. Calibration: check against steel surveyor's tape.

Organic Vapors - Photoionization detector. Calibration: Daily field Calibration using isobutylene standard.

Groundwater pH Measurement - Digital pH meter. Calibration: standard pH solutions of 4, 7, and 10 will be utilized for daily field calibration.

Electrical Conductivity - Electrical conductivity meter. Calibration: factory-calibrated annually and periodically calibrated against laboratory prepared standard calibration solution.

Water Temperature - Digital thermometers. Calibration: factory-calibrated once.

Combustible Gas/Oxygen - Combustible gas/oxygen meter calibration: Factory calibrated, field calibrated monthly, zeroed daily.

Miscellaneous Measuring Devices - Calibration procedures for any other measuring device used will be documented at the request of the regulatory authority.

All equipment will be checked daily and replaced as necessary. Instrument manuals and an instrument log book will accompany equipment into the field. Any calibration, repairs or related information will be recorded in the log book.

6.0 LABORATORY QA/QC PLAN

Soil and groundwater samples will be submitted to a State Certified Hazardous Waste Laboratory for chemical analysis of hazardous constituents. Established QA/QC procedures for analytical operations will include sample custody procedures, standards of analytical accuracy, analysis of

matrix spikes and method blanks, data reduction, verification of raw analytical data, and maintenance of control charts to monitor analytical performance. These QA/QC procedures are outlined in the laboratory QA/QC Plan which is available upon request. Organic chemical analyses will be performed in conformance with standard procedures established by the United States Environmental Protection Agency (EPA) in "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act" (40 CFR part 136, October 1984). The laboratory is periodically evaluated through external performance audits conducted by EPA and DTSC using QC labs. The specific analytical methods to be utilized for purgeable and semivolatile hydrocarbons analyses are shown on Table B-2. Provided the data base is of sufficient size, statistical techniques may be employed for data validation.

Table B-2
Revised 10 August 1990

RECOMMENDED MINIMUM VERIFICATION ANALYSES FOR UNDERGROUND TANK LEAKS

HYDROCARBON LEAK	SOIL ANALYSIS		WATER ANALYSIS	
Unknown Fuel	TPH G	GCFID (5030)	TPH G	GCFID (5030)
	TPH D	GCFID (3550)	TPH D	GCFID (3510)
	BTX&E	8020 or 8240	BTX&E	602, 624 or 8260
	TPH AND BTX&E	8260		
Leaded Gas	TPH G	GCFID (5030)	TPH G	GCFID (5030)
	TPH D	8020 or 8240	BTX&E	602, 624 or 8260
	TPH AND BTX&E	8260	TOTAL LEAD	AA
	TOTAL LEAD	AA		
		--Optional--		
	TEL	DES-LUFT	TEL	DES-LUFT
	EDB	DHS-AB1803	EDB	DHS-AB1803
Unleaded Gas	TPH G	GCFID (5030)	TPH G	GCFID (3510)
	BTX&E	8020 or 8240	BTX&E	602, 624 or 8260
	TPH AND BTX&E	8260		
Diesel	TPH D	GCFID (3550)	TPH D	GCFID (3510)
	BTX&E	8020 or 8240	BTX&E	602, 624 or 8260
	TPH AND BTX&E	8260		
Jet Fuel	TPH D	GCFID (3550)	TPH D	GCFID (3510)
	BTX&E	8020 or 8240	BTX&E	602, 624 or 8260
	TPE AND BTX&E	8260		
Kerosene	TPH D	GCFID (3550)	TPH D	GCFID (3510)
	BTX&E	8020 or 8240	BTX&E	602, 624 or 8260
	TPH AND BTX&E	8260		
Fuel/Heating Oil	TPH D	GCFID (3550)	TPH D	GCFID (3510)
	BTX&E	8020 or 8240	BTX&E	602, 624 or 8260
	TPH AND BTX&E	8260		
Chlorinated Solvents	CL HC	8010 or 8240	CL HC	601 or 624
	BTX&E	8020 or 8240	BTX&E	602 or 624
	CL HC AND BTX&E	8260	CL HC AND BTX&E	8260
Non Chlorinated Solvents	TPH D	GCFID (3550)	TPH D	GCFID (3510)
	BTX&E	8020 or 8240	BTX&E	602 or 624
	TPH AND BTX&E	8260	TPH AND BTX&E	8260
Waste and Used Oil or Unknown	TPH G	GCFID (5030)	TPH G	GCFID (5030)
	TPH D	GCFID (3550)	TPH D	GCFID (3510)
	TPH AND BTX&E	8260		
	O & G	5520 D&F	O & G	5520 C&F
	BTX&E	8020 or 8240	BTX&E	602, 624 or 8260
	CL HC	8010 or 8240	CL HC	601 or 624
	ICAP or AA TO DETECT METALS: Cd, Cr, Pb, Zn, Ni			
	METHOD 8270 FOR SOIL OR WATER TO DETECT:			
	PCB*		PCB*	
	PCP*		PCP*	
	PNA		PNA	
	CREOSOTE		CREOSOTE	

*If found, analyze for dibenzofurans (PCBs) or dioxins (PCP)

Appendix C

Site Well Development Protocol

SITE WELL DEVELOPMENT PROTOCOL

Groundwater monitoring wells will be developed by removing approximately 10 times the volume of water in the casing or until relatively free of sand and silt, if possible. Casing volumes will be calculated in the following manner:

Volume of Schedule 40 PVC Pipe		
Diameter (inches)	**I.D. (inches)**	**Volume Gal/linear ft.**
2	2.067	0.17
4	4.026	0.66

If the aquifer if slow to recharge, development will continue until recharge is too slow to practically continue. The volume of water produced versus time will be recorded.

All withdrawn groundwater will be stored in approved 55-gallon hazardous waste drums on-site pending analytical results for proper disposal within the 90-day period.

Appendix D

Site Groundwater Monitoring and Sampling Protocol Including PG&E Purging and Sampling Log

SITE GROUNDWATER MONITORING PROTOCOL

Monitoring depth-to-water and apparent product thickness within wells at the site will be conducted using an Interface Probe/electric water probe and clear acrylic bailer. The Interface Probe is a hand held, battery operated device for measuring depth to petroleum product and depth-to-water as measured from an established datum (i.e., top of the well casing which has been surveyed). For consistency, all measurements will be taken from the north side of the wellhead at the survey mark. To assess potential infiltration of fine grained sediments, total well depth will also be sounded.

Apparent product thickness is calculated by subtracting the depth-to-product from the depth-to-water. In addition, water elevations are adjusted for the presence of fuel with the following calculation:

(Apparent Product Thickness) (.8) + (Water Elevation) = Corrected Water Elevation

Note: The factor of 0.8 accounts for the density difference between water and petroleum hydrocarbons.

Newly installed wells will be allowed to stabilize for 48 hours after development prior to free product inspection.

An acrylic Surface Sampler will be used for visual inspection of the grundwater in order to note sheens (difficult to detect with the Interface Probe), odors, microbial action and sediments. The sampler is calibrated in inches and centimeters for visual inspection of any recovered product.

To reduce the potential for cross contamination between wells, the monitorings will take place in order from the least to most contaminated. Wells containing free product will be monitored last. Between each well, the equipment will be decontaminated.

SITE GROUNDWATER SAMPLING PROTOCOL

Prior to arriving at the sampling site, all sampling equipment will be washed with laboratory grade detergent, and rinsed twice with tap water, once with acetone, and once with deionized water. The sample washing procedure will be carried out on-site before sampling of other monitoring wells, in such cases where more than one monitoring well is to be sampled, with the sampling device.

Immediately prior to sampling, the depth to water (DTW) level in the well will be recorded. The apparent thickness of product on top of the groundwater, if present, will be measured using an interface probe or clear graduated acrylic bailer. The procedure for conducting these monitorings are presented in the Groundwater Monitoring Protocol.

If free product is detected, analysis of groundwater for dissolved product will not be conducted. The product will be sampled for content, if collection of a sample is possible. Before collecting at least two groundwater samples from each well, the well will be purged until indicator parameters entail the removal of at least four or more well casing volumes by bailing or pumping. The criteria for determining well casing volumes and storage of purged waste is shown on the enclosed purging and sampling log. Parameter measurements will be taken both before and after purging of each well casing volume. Once the well is purged and well water chemistry has stabilized, a sample will be collected after the water level approaches 80 percent of its initial elevation. Where water level recovery is slow, the sample will be collected after stabilization is achieved and enough water is present to fill sample containers.

Cross contamination from transferring pumps from well to well will be avoided by utilizing dedicated equipment. Where this is not feasible, thorough cleaning of equipment will be performed between sampling rounds. Sampling will proceed from the least contaminated to the most contaminated well, if information is available before sample collection, or if it is indicated by field evidence. Where several types of analysis will be performed for a given well individual samples will be collected in the following order:

1. Volatile organics
2. Purgeable organic carbon
3. Purgeable organic halogens
4. Total organic carbon
5. Total organic halogens

6. Extractable organics
7. Total metals
8. Dissolved metals
9. Phenols
10 Cyanide

The specific analytical methods to be utilized for the common volatile/semivolatile to analyses are shown in Appendix B, Table B-2.

Groundwater samples will be collected with a Teflon bailer equipped with a bottom emptying device. Duplicate samples will be transferred to vials or containers that meet Regional Board specifications, Appendix B (Table B-1). Groundwater from the bailer will be transferred to the sample container by allowing the fluid to flow slowly along the sides of the vessel. All containers will be filled above the top of the opening to form a positive meniscus. No head space should be present in the sample container once it is sealed. If it is not possible to collect a sample without head space, the problem will be noted on the field technician's sampling log.

Immediately following sample collection, samples will be labeled and stored in an ice chest containing crushed ice sealed in plastic bags. Sample labels will contain the following information: date, time, project ID, sample ID, name of sampler and type of analysis. All samples will be transported under chain-of-custody protocol to a state certified laboratory within 48 hours, or whenever possible.

Samples will be transported either by site personnel or by provide carrier. analytical holding times will be considered in determining sampling and shipping schedules. Friday shipment/Saturday laboratory receipt of samples will be coordinated in advance with the laboratory.

PG & E PURGING AND SAMPLING LOG

SITE _____ JOB ID _____ WELL # _____

PURGE DATE _____, BY _____ WEATHER _____

SAMPLE DATE _____, BY _____

WATER ELEVATION / VOLUME CALCULATIONS

MEASURING POINT (MP) TOC @ _____ HYDROCARBON ODOR YES NO

DEPTH OF WELL (DTB) _____ FT THICKNESS _____

DEPTH TO WATER (DTW) _____ FT

TOTAL WATER DEPTH _____ FT

MEASUREMENT METHOD SOLINST SLOPE INDICATOR

TOC ELEV = _____ FT - DTW _____ FT = GW ELEV. _____ FT

PURGE VOLUME CALCULATIONS

_____ FT WATER * CASING FACTOR = _____ GAL/CASING VOL. * _____ VOLUMES = _____ TOTAL PURGED

CASING FACTOR *FOR 2" DIA = 0.17 GAL / FT* (GALS)

(CIRCLE ONE) *FOR 3" DIA = 0.38 GAL / FT*

FOR 4" DIA = 0.66 GAL / FT

PURGING

TIME		CUMULATIVE DISCHARGE		CONDUCTIVITY		°C	
START	END	(GAL)	pH	umho/cm	TURBIDITY	TEMP	COMMENTS

METHOD OF DISCHARGE DISPOSAL GROUND BARREL POND *(CIRCLE ONE)*

METHOD OF PURGING HOMELITE BAILER HAND PUMP SUBMERSIBLE WATERRA *(CIRCLE ONE)*

METHOD OF SAMPLING WELL WIZARD TEFLON BAILER HAND PUMP DISPOSABLE BAILER *(CIRCLE ONE)*

METHOD OF CLEANING ALCONOX / DI WATER STEAM CLEANER / DI WATER *(CIRCLE ONE)*

PUMP LINES / BAILER ROPES NEW, CLEANED, OR DEDICATED *(CIRCLE ONE)*

pH METER _____ CALIBRATED YES NO COND. METER _____ CALIBRATED YES NO

TEMP. CORRECTED YES NO CALIBRATION DATA pH 4 = _____ COND. 1,000= _____

pH 7 = _____ COND. 10,000= _____

SAMPLES pH 10 = _____

LAB ANALYSIS _____

LABORATORY _____

SAMPLE TIME _____

REMARKS _____

Appendix E

Site Health and Safety Plan

Current enforceable and recommended exposure limitations for potential site contaminants are presented in Table E-1.

Table E-1

Hazard Exposure Guidelines

Substances	Cal-OSHA PEL	1992 to 1993 ACGIH TLV
Benzene	1 ppm (TWA)	10 ppm (TWA)
	5 ppm (STEL)	
Toluene	100 ppm (twa)	100 ppm (TWA)
	150 ppm (STEL)	150 ppm (STEL)
Ethylbenzene	100 ppm (TWA)	100 ppm (TWA)
	125 ppm (STEL)	125 ppm (STEL)
Xylene	100 ppm (TWA)	100 ppm (TWA)
	150 ppm (STEL)	150 ppm (STEL)

PERSONAL PROTECTIVE EQUIPMENT

A minimum of US EPA level D protection will be required within the exclusion zone for any workers engaged in sample collection or other activities on this site. Level D protection will include:

- Disposal Tyvek coverall (When in contact with contaminated material)
- Boots with steel toe
- Splash goggles or safety glasses with side shields
- Chemical resistant disposable gloves (When in contact with contaminated material)

Level C protection will be required if PID readings exceeding 300 ppm total volatile organics over background concentrations are recorded in the workers breathing zone. Level C protection will consist of:

- Disposable Tyvek coverall
- Boots with steel toe
- Chemical resistant boot covers
- Splash goggles
- Chemical resistant disposable gloves (inner)
- Chemical resistant outer gloves
- MSHA/NIOSH approved half-face or full-face air-purifying respirator with dual organic vapor cartridges

PID readings exceeding 500 ppm in the workers breathing zone will require work stoppage and site evacuation. An explosion-proof fan may be used, if necessary, to vent the work area.

DECONTAMINATION

During all field operations, care will be taken to minimize contact with soils and groundwater. Drilling spoils and developmental water will be stored on-site for proper treatment or disposal. This will minimize contact and dispersion of potentially contaminated materials.

If necessary, upon exit from the work site, loose debris will be removed from protective clothing by brushing or rinsing. Gloves and boots will be decontaminated in a 5% solution of trisodium phosphate and rinsed with water that will be disposed of on-site.

EMERGENCY RESPONSE

The potential exists for fire, explosion or toxic material release during on-site activities. Prior to commencement of any activities, personnel will have available telephone numbers and contacts for emergency response assistance including:

- Ambulance - 911 and ACME Ambulance (510) 653-6622
- Fire Department - 911
- Hospital: Merritt Hospital
  Hawthorne and Webster
  Oakland, CA 94609
  (510) 655-4000
- Poison Control Center - (510) 476-6600
- Community Evacuation Contact - 911

Emergency equipment on-site will include:

- Portable eyewash bottles
- A dry chemical fire extinguisher
- Industrial first aid kit

SITE SECURITY

Access during all on-site activities will be restricted to authorized personnel. All personnel and authorized visitors must contact the Safety Coordinator/Project Manager prior to entering and exiting site.

RECORD KEEPING

All site safety records pertaining to the site characterization study will be maintained by the Safety Coordinator/Project Manager throughout the project.

AIR MONITORING

The Safety Coordinator/Project Manager will conduct periodic air monitoring using direct reading sampling equipment as required. At a minimum the following monitoring will be performed:

A direct reading photoionization detector (PID) (HNU I 101 or equivalent) will be used to monitor the concentrations of organic vapors in the work area. Measurements will be taken at intervals determined by the site safety officer during drilling activities. The meter will be calibrated with isobutylene. Total organic vapor measurements will be used to determine the appropriate levels of respiratory protection and identify conditions requiring site evacuation. Total organic vapor concentrations in the workers breathing zone in excess of 300 ppm above background concentrations will require the use of personal protective equipment. Breathing zone concentrations in excess of 500 ppm will stop the work on-site until the work zone concentrations are reduced to below 500 ppm.

EMPLOYEE TRAINING AND INFORMATION

Prior to site activity site personnel without a previous documented hazardous waste training course will be trained. The training will have the following objectives:

- Ensure that workers are aware of potential hazards they may encounter.
- Provide the knowledge and skills necessary to perform the work with minimal risk to workers health and safety.
- Provide familiarization with the Site Safety plan and site-specific requirements.

The training plan for this site will encompass:

- Potential physical and chemical health hazards.
- Respiratory protection, rationale, use, maintenance and fit testing.
- Protective clothing use and maintenance.
- Entry, exit and decontamination procedures.
- Documentation and record keeping procedures.
- Emergency response.