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Work Plan for the

Soil and Shallow

Groundwater Investigation

Surrounding the Diesel Dump Tanks

at PG&E's Oakland Power Plant

Alameda County, California

8/92

Prepared by

Land and Water Quality Unit

Prepared for

Steam Generation

August 1992

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INTRODUCTION

The purpose of the following work plan is to describe additional site investigation activities proposed for the soils and shallow water bearing zone near two diesel dump tanks at Pacific Gas and Electric Company's (PG&E) Oakland Power Plant. This investigation is designed to further define the horizontal and vertical extent of diesel possibly present in the soils and shallow groundwater near the diesel tanks. This work is being performed as required by Alameda County Department of Environmental Health in accordance with the Leaking Underground Fuel Tank Manual (LUFT), revised October 1989, and the Tri-Regional Board Staff Recommendations for Preliminary Evaluation and Investigation of Underground Storage Tank Sites, revised August 10, 1990.

SCOPE OF WORK

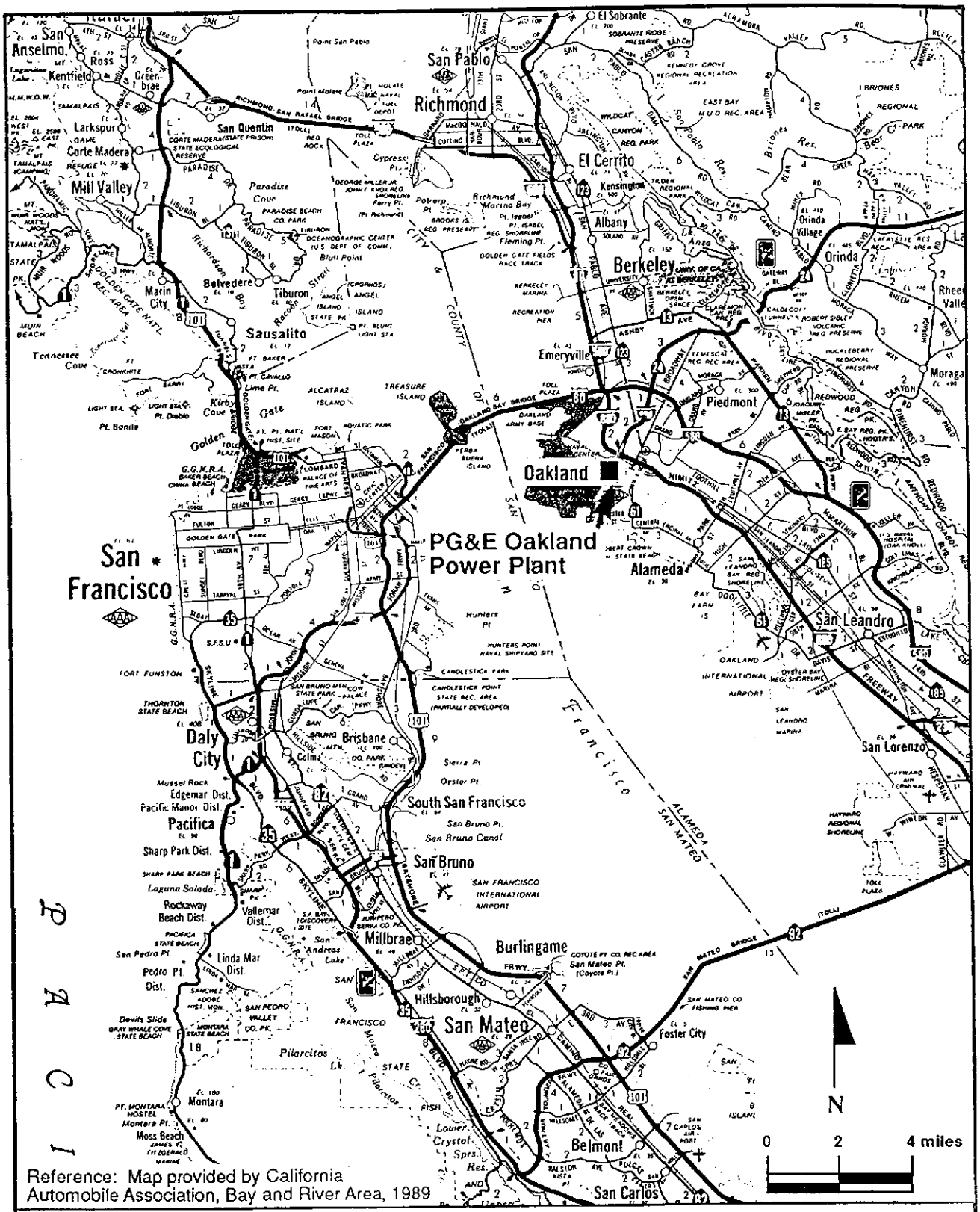
The scope of this investigation is to collect and analyze soil and groundwater samples for total petroleum hydrocarbons as diesel (TPH-D), and benzene, ethylbenzene, toluene, and xylenes (BTEX) for the purpose of further defining the horizontal and vertical extent of petroleum hydrocarbons in the soils and groundwater near the diesel tanks.

This work plan describes the general approach, methods, and schedule for performing these tasks.

SITE DESCRIPTION

PG&E's Oakland Power Plant is located at 50 Martin Luther King Jr. Blvd. 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 by burning diesel oil through jet turbine generators during peak loads only. Three turbines are located at the site, turbines #1, #2, and #3 (Figure 2). Each turbine had an underground 75-gallon 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 ground surface. The diesel fuel is 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 placed in sealed concrete vaults in November 1991.



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

Figure 1. Site location map.

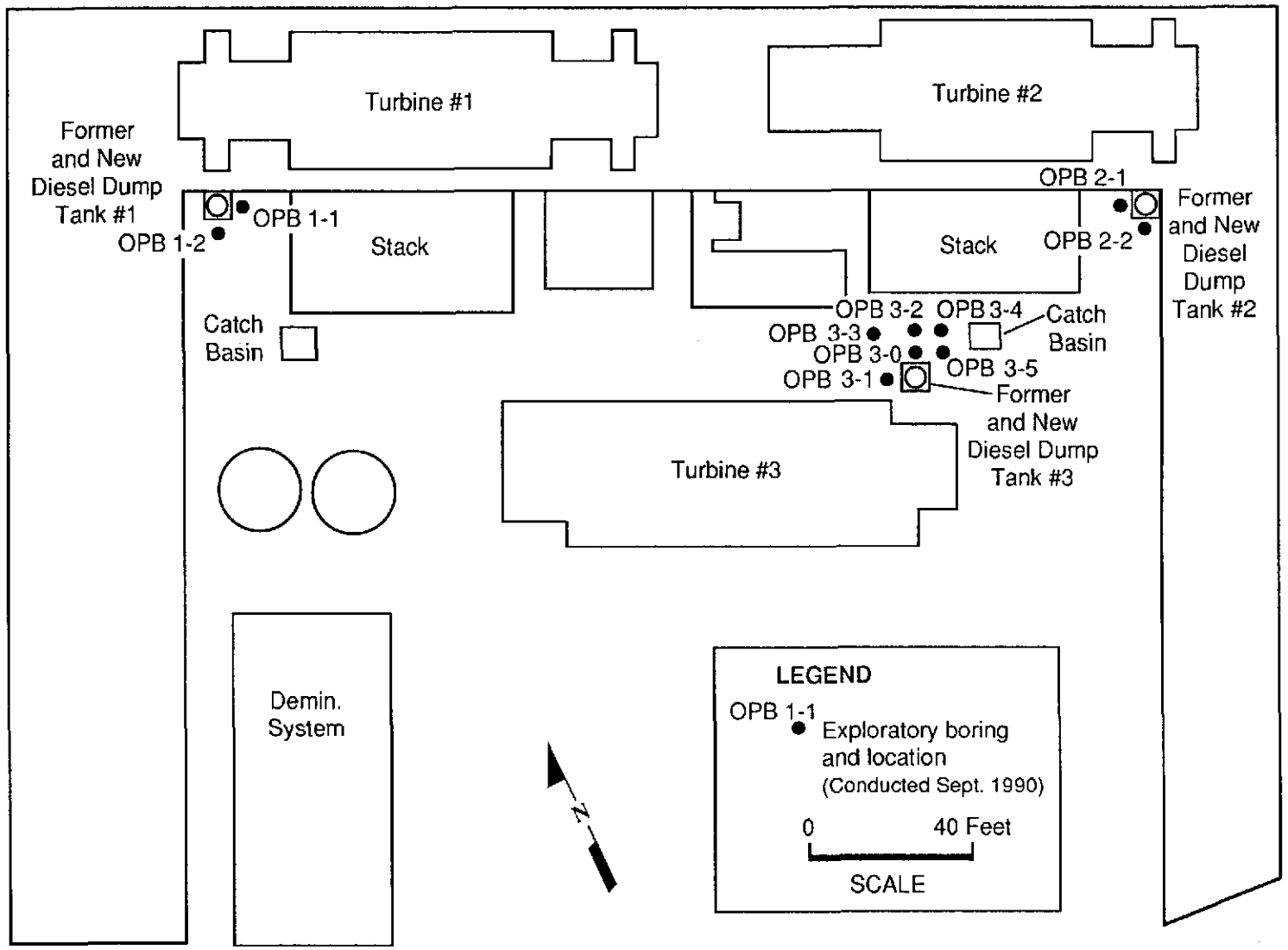


FIGURE 2. Locations of exploratory soil borings, conducted in September 1990, near the diesel dump tanks, PG&E's Oakland Power Plant.

BACKGROUND

PRELIMINARY SOIL INVESTIGATION

A preliminary soil investigation study was conducted during September 1990 near the three diesel dump tanks to determine if tank overflow or leakage had occurred and whether the soil near the tanks was affected by diesel fuel. The investigation consisted of drilling and sampling several soil borings in the immediate vicinity of each tank (Figure 2). Results of the preliminary soil investigation are presented in Table 1. As shown, 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. The highest concentration of TPH-D near tank #1 was 70 mg/kg from soil sample OPB 1-2B at a depth of 5.5 to 6.0 feet. The highest concentration of TPH-D near tank #2 was 10,000 mg/kg from soil sample OPB 2-2B at a depth of 5.0 to 5.5 feet. The highest concentration of TPH-D near tank #3 was 12,000 mg/kg from soil sample OPB 3-2B at 4.5 to 5.0 feet.

Aromatic hydrocarbons, including benzene, toluene, ethylbenzene, and xylenes (BTEX) were nondetectable in all soil samples except one near tank #3 (OPB 3-2B). Sample results for OPB 3-2B (at a depth of 4.5 to 5.0 feet) indicated concentrations of benzene at 1.7 mg/kg, toluene at 0.2 mg/kg, ethylbenzene at 0.4 mg/kg, and xylenes at 1.5 mg/kg. These results were presented in PG&E Report No. 402.331-90.55, issued December 1990.

EXCAVATION SOIL SAMPLES

The three 75-gallon diesel dump tanks were excavated and replaced in November 1991. Six soil grab samples were collected (one sample from each excavation and one sample from each soil pile) and analyzed for TPH-D and BTEX (Figure 3) during excavation. The analytical results for these samples are presented in Table 2.

No TPH-D or BTX was measured in samples obtained from the excavation or soil pile associated with Tank #1. Only ethylbenzene was detected in the soil pile at 0.3 mg/kg.

Tank #2 soil samples reported elevated concentrations of TPH-D from the samples collected from the bottom of the excavation (4901 mg/kg) and soil pile (2770 mg/kg). Non-detectable concentrations of aromatic hydrocarbons (detection limit 0.005 mg/kg) were reported in all the samples collected from the Tank #2 location except for low levels of ethylbenzene (0.2 and 0.4 mg/kg).

Tank #3 soil samples reported nondetectable concentrations of TPH-D (detection limit 1.0 mg/kg) and BTEX (detection limit 0.005 mg/kg) from the soil pile sample. Elevated concentrations of TPH-D were measured in the soil sample collected from the bottom of the excavation (7999 mg/kg).

Table 1

Summary of Preliminary Soil Sample Analytical Results Collected Near the Diesel Dump Tanks

(all concentrations in mg/kg)

Sample ID	Depth (feet)	Date Sampled	TPH-D	Aromatic Hydrocarbons B	T	E	X
Tank #1							
OPB 1-1A	2.5-3.0	9/26/90	26	<0.005	<0.005	<0.005	<0.005
OPB 1-1B	5.5-6.0	9/26/90	12	<0.005	<0.005	<0.005	<0.005
OPB 1-2A	4.0-4.5	9/26/90	60	<0.005	<0.005	<0.005	<0.005
OPB 1-2B	5.5-6.0	9/26/90	70	<0.005	<0.005	<0.005	<0.005
Tank #2							
OPB 2-1A	2.5-3.0	9/25/90	150	<0.005	<0.005	<0.005	<0.005
OPB 2-1B	4.0-4.5	9/25/90	1,000	<0.025	<0.025	<0.025	<0.025
OPB 2-2A	2.5-3.0	9/25/90	60	<0.005	<0.005	<0.005	<0.005
OPB 2-2B	5.0-5.5	9/25/90	10,000	<1	<1	<1	<1
Tank #3							
OPB 3-1A	3.0-3.5	9/24/90	1,300	<0.025	<0.025	<0.025	<0.025
OPB 3-2A	3.0-3.5	9/24/90	4,100	<0.4	<0.4	<0.4	<0.4
OPB 3-2B	4.5-5.0	9/24/90	12,000	1.7	0.2	0.4	1.5
OPB 3-3A	3.5-4.0	9/24/90	210	<0.005	<0.005	<0.005	<0.005

TPH-D = Total petroleum hydrocarbons as diesel
B = Benzene
T = Toluene
E = Ethylbenzene
X = Xylene
< = Concentrations of analyte were nondetectable at or above stated detection limit.

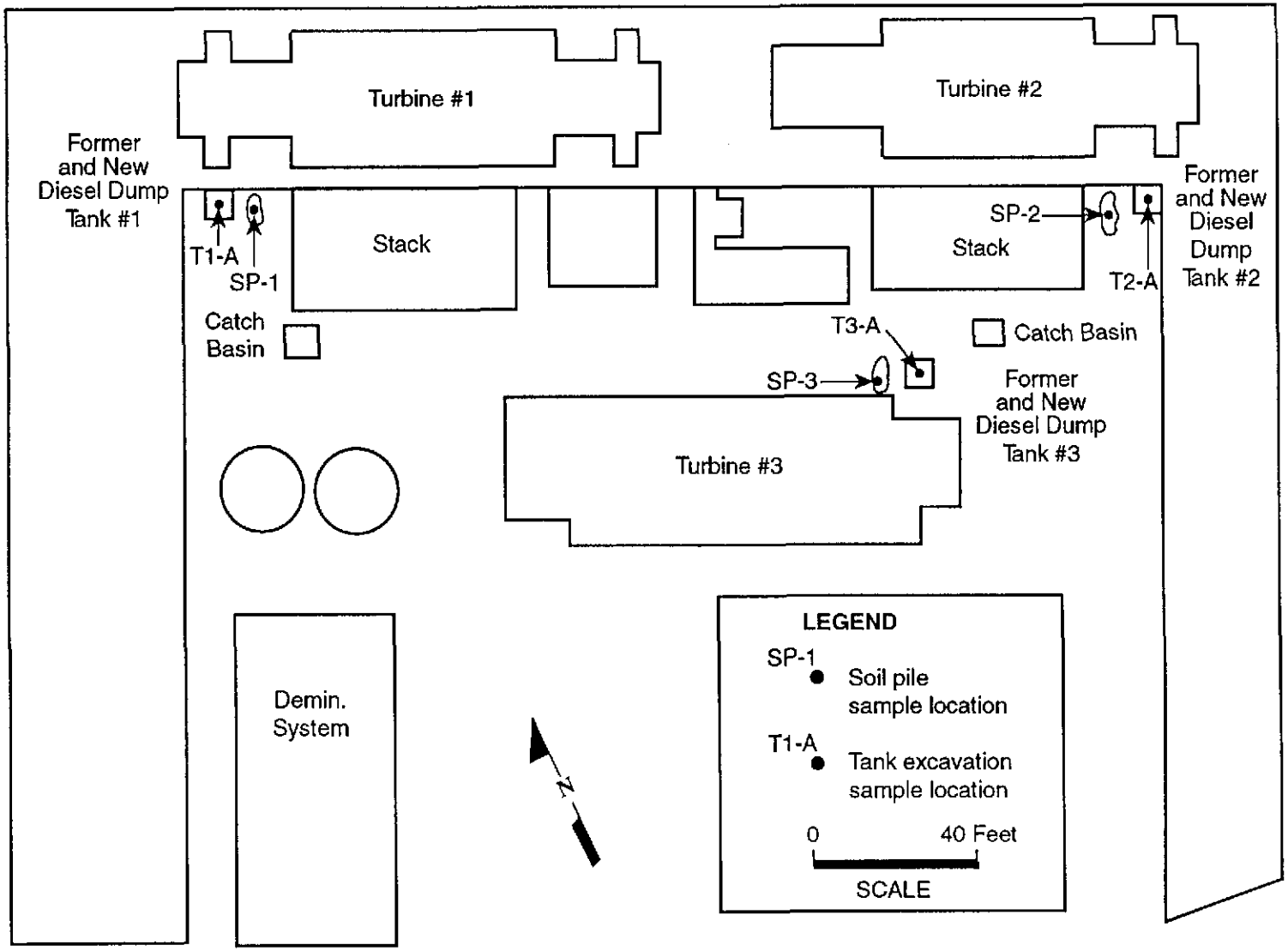


Figure 3. Locations of soil pile and excavation soil samples near the diesel dump tanks, PG&E's Oakland Power Plant.

Table 2

Summary of Soil Sample Analytical Results Collected from Soil Piles and Excavations (mg/kg)

Location	Sample ID	TPH-D	Benzene	Toluene	Ethyl Benzene	Xylenes
Tank #1	T1-A	<1.0	<0.005	<0.005	<0.005	<0.005
Tank #2	T2-A	4901	<0.005	<0.005	0.2	<0.005
Tank #3	T3-A	7999	<0.005	<0.005	<0.005	<0.005
Tank #1	SP-1	<1.0	<0.005	<0.005	0.3	<0.005
Tank #2	SP-2	2770	<0.005	<0.005	0.4	<0.005
Tank #3	SP-3	<1.0	<0.005	<0.005	<0.005	<0.005
Detection Limit		1.0	0.005	0.005	0.005	0.005

<1.0 = Detection limit, analytes not detected at or above stated detection limit
T1-A = Sample collected from excavation
SP-1 = Sample collected from soil pile removed from excavation

CONFIRMATION SOIL SAMPLING SURROUNDING DIESEL TANKS #2 AND #3

After the new tanks were installed and the excavations backfilled with clean fill, Alameda County Department of Environmental Health approved PG&E's proposal to conduct confirmation soil sampling immediately adjacent to diesel tanks #2 and #3. On June 3, 1992, nine soil samples were collected from four borings UT 1 and UT 2 (Tank #2), and UT 3 and UT 4 (Tank #3) (Figure 4). The samples were analyzed for TPH-D and BTEX. The analytical results for these soil samples are presented in Table 3.

Results of the confirmation soil sampling near Tank #2 showed elevated concentrations of TPH-D, non-detectable concentrations of benzene, and detectable concentrations of toluene, ethylbenzene, and xylenes. TPH-D concentrations ranged from 72 mg/kg to 3800 mg/kg, toluene concentrations from non-detect (detection limit <5.0 μg/kg) to 130 μg/kg, ethylbenzene concentrations from non-detect (detection limit <5.0 μg/kg) to 140 μg/kg, and xylenes from 6.3 μg/kg to 1300 μg/kg.

Results of the confirmation soil sampling near Tank #3 showed elevated concentrations of TPH-D, non-detectable concentrations for benzene, and detectable concentrations of toluene, ethylbenzene, and xylenes. TPH-D concentrations ranged from 20 mg/kg to 2900 mg/kg, toluene concentrations from non-detect (detection limit <5.0 μg/kg) to 10 μg/kg, ethylbenzene from non-detect (detection limit <5.0 μg/kg) to 22 μg/kg, and xylenes from non-detect (detection limit <5.0 μg/kg) to 140 μg/kg (Reference PG&E Report No. 402.331-92.35, June 1992).

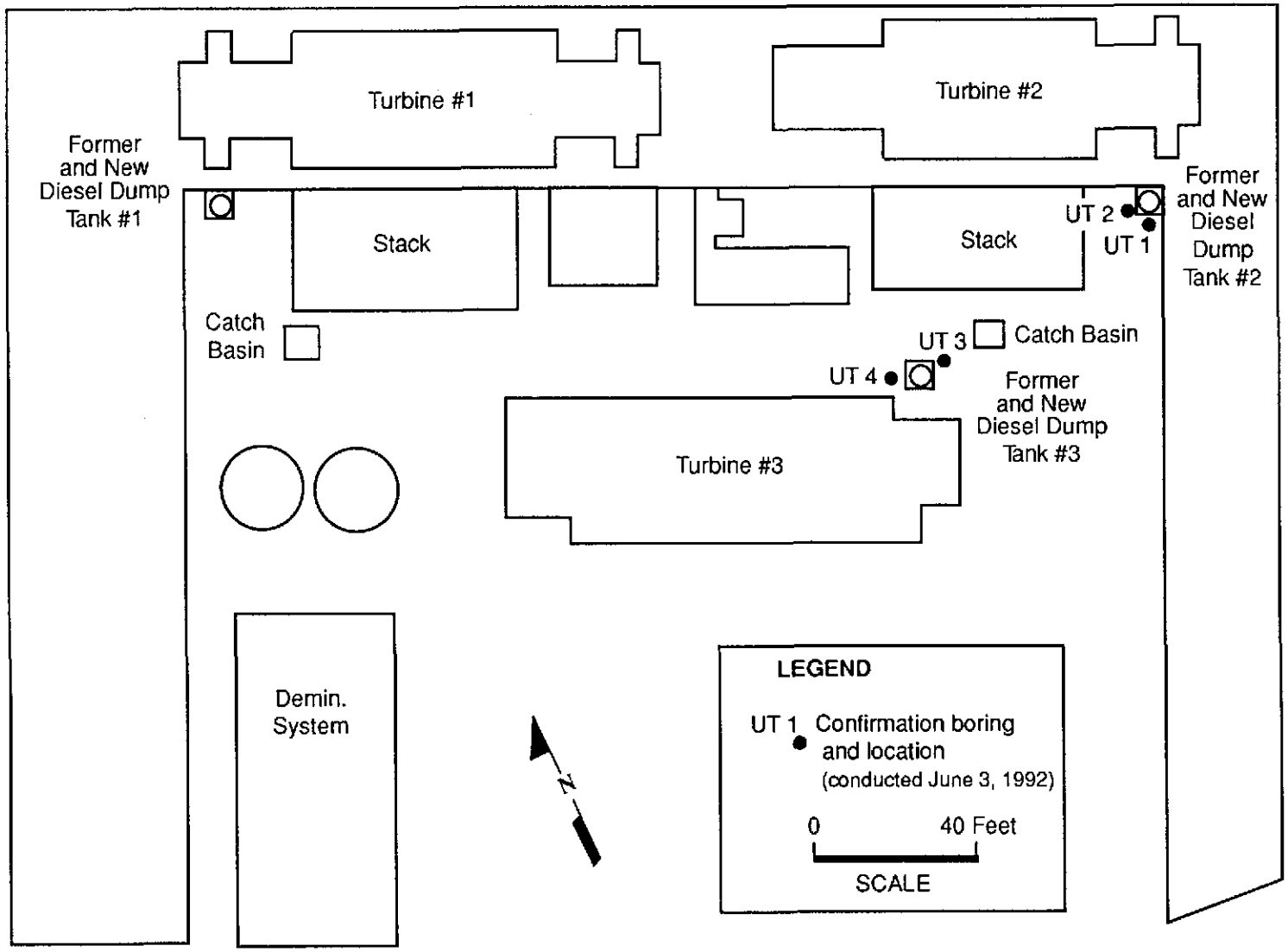


Figure 4. Locations of confirmation soil borings collected on 6/3/92 near the diesel dump tanks, PG&E's Oakland Power Plant.

Table 3

Summary of Confirmation Soil Samples Analytical Results
Oakland Power Plant
Diesel Dump Tanks #2 and #3

Location	Boring	Date Sampled	B µg/kg	T µg/kg	E µg/kg	X µg/kg	TPH-D mg/kg
Tank #2	UT1 5.5-6.0	6/3/92	<5.0	<5.0	<5.0	6.3	2,700
Tank #2	UT1 6.5-7.0	6/3/92	<5.0	130	140	1,300	72
Tank #2	UT2 4.5-5.0	6/3/92	<5.0	10	<5.0	10	2,500
Tank #2	UT2 6.5-7.0	6/3/92	<5.0	8.7	28	220	3,800
Tank #3	UT3 4.5-5.0	6/3/92	<5.0	<5.0	<5.0	10	530
Tank #3	UT3 5.5-6.0	6/3/92	<5.0	6.7	17	140	2,900
Tank #3	UT3 6.5-7.0	6/3/92	<5.0	10	22	57	170
Tank #3	UT4 4.5-5.0	6/3/92	<5.0	<5.0	<5.0	<5.0	20
Tank #3	UT4 5.5-6.0	6/3/92	<5.0	<5.0	5.7	29	140

TPH-D = Total Petroleum Hydrocarbons as Diesel
B = Benzene
T = Toluene
E = Ethylbenzene
X = Xylenes

< = Concentrations of analyte were non-detectable at or above stated detection limit.

SITE GEOLOGY

The site is covered by a two inch asphalt base. Based on an examination of soils samples obtained during previous investigations at the site, the shallow soils consist of a silty, gravelly sand from the surface to 5 feet below the surface. Near Tank #2, a silt-sand, gravel sequence was reported from 5 to 6.5 feet below the surface. Groundwater levels near Tank #2 were found at 5 feet below the surface.

The soil borings surrounding tank #3 encountered a clayey-gravel sequence to a depth of approximately 3.5-4.0 feet below the surface. A sand with gravel sequence was encountered from approximately 3 to 5 feet in soil borings OPB3-1 and OPB 3-2. Three soil borings (OPB 3-0, OPB 3-4, and OPB 3-5) were terminated at a shallow depth (2 feet) because of impenetrable material in the subsurface. This material appeared to be old concrete and fire brick that may have been left from an old foundation. Groundwater near Tank #3 was encountered at a depth of 5 feet below the surface.

PROPOSED SOIL SAMPLING AND SHALLOW GROUNDWATER SURVEY

The site investigation will consist of shallow soil sampling and a groundwater survey designed to determine the extent of petroleum hydrocarbons (diesel and BTEX) in the area immediately surrounding Tank #2 and #3. All site work will be performed under the direct supervision of a California registered geologist.

SHALLOW SOIL SAMPLING

Soil samples will be collected using portable hydraulically-operated equipment in conjunction with a 2-inch O.D split spoon sampler. Samples will be collected at the locations shown on Figure 5. The final number and location of each sampling point will depend on the results obtained from the prior sampling point and logistical factors (location of utilities). Sampling will continue in a lateral direction until the petroleum hydrocarbon concentration is non-detectable or approaches the method detection limit. Samples will be continuously collected from approximately 1 foot below the surface to the saturated zone (approximately 5 to 7 feet below the surface). The soil sample will be examined by the field geologist and logged according to the Unified Soil Classification System. Upon retrieval of the soil samples for analysis, the brass tube will be capped with aluminum foil and a plastic cap, sealed with tape, labeled, and placed in a cooler containing frozen blue ice and maintained at 4°C until analyzed. Soil samples will be screened for hydrocarbon content using a portable organic vapor analyzer (photoionization detecter-PID). The sample(s) with the highest PID reading will be analyzed by a state-certified laboratory for total petroleum hydrocarbons as diesel (EPA method 3550/8015 modified) and aromatic hydrocarbons (BTEX) (EPA method 8020). Protocol for soil coring procedures are presented in Appendix A.

SHALLOW GROUNDWATER SURVEY

To determine the presence (or absence) and lateral extent of TPH-D and BTEX in the shallow groundwater, a shallow groundwater survey will be conducted at each soil sampling location (Figure 5). Protocol for groundwater sampling is presented in Appendix B.

Groundwater will be sampled by advancing a 2-inch hydraulic-punch into the water table. Once the probes penetrate a sufficient depth to collect a groundwater sample, a decontaminated 1-inch schedule 80 PVC, 0.02-inch slotted well screen will be placed in the hole. Before a groundwater sample is collected, the depth to groundwater will be measured with an electronic probe, and the holes will be purged of sufficient volume of water to provide water free of suspended solids. Groundwater samples will be collected using a clean bailer.

After the groundwater samples have been collected according to the sampling protocol, the retrieved fluid will be carefully transferred to 40-ml VOA and 1-liter amber glass bottles. Sample containers will be

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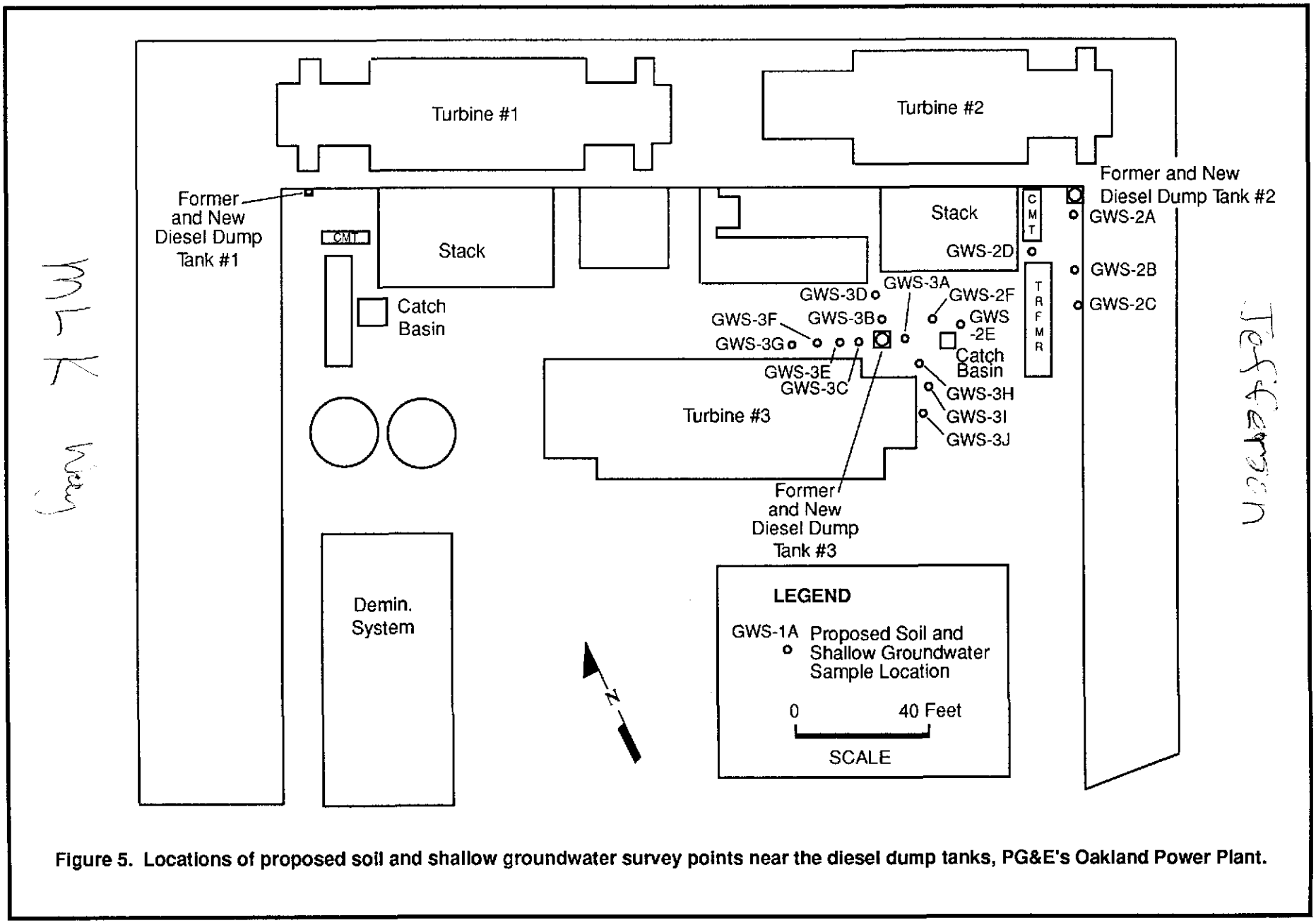

Figure 5. Locations of proposed soil and shallow groundwater survey points near the diesel dump tanks, PG&E's Oakland Power Plant.

appropriately labeled and chain-of-custody documentation initiated for each sample. The samples will be analyzed by a California state-certified laboratory for total petroleum hydrocarbons as diesel (EPA method 3510/8015 modified) and aromatic hydrocarbons (BTEX) (EPA method 8020). Both soil and shallow groundwater sampling activities will follow the Quality Assurance and Control Plan presented in Appendix C and the Health and Safety Plan presented in Appendix D.

REPORTING

A report that documents the activities described in this work plan will be prepared under the direction of a Registered Geologist. This report will summarize the findings of the investigation. Boring logs, laboratory reports, and chain-of-custody records will also be included.

PROPOSED SCHEDULE

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

ITEM	WEEK												
	0	1	2	3	4	5	6	7	8	9	10	11	12
Agency Approval		*											
Mobilization/Permits/Underground Survey			|----	----	---|								
Soil, Shallow Groundwater Survey and Laboratory Analysis					|----	----	----	---|				
Report Preparation and Internal Review									|----	----	----	---|	
Report Submittal to Agency													*

REFERENCES

Pacific Gas & Electric Company. December 1990. Preliminary Soil Investigation Report for the PG&E Oakland Power Plant Diesel Oil Tanks. Technical and Ecological Services - Water Resources Unit, Report No. 402.331-90.55.

_____. June 1992. Oakland Power Plant Confirmation Soil Sampling Surrounding Diesel Tank #2 and #3. Technical and Ecological Services - Land and Water Quality, Report No. 402.331-92.35.

Appendix A

SOIL CORING PROCEDURES

POWERCORE
SOIL SAMPLING INC.
PORTABLE SOIL CORING OPERATIONS
P.O. BOX 2664 • ANTIOCH, CA 94531
510-778-6879 FAX 510-778-0733

Protocol for Soil Coring Procedure:

Powercore Soil Sampling, Inc. makes use of hydraulically operated machinery to provide the force necessary to first drive in the samplers, and second to be able to extract the drill string to retreive the samplers. The remotely operated portable rig may be operated by one person while samplers are being opened by helper or engineer on site.

The samples are taken by using a hydraulically actuated hammer/driver which is hoisted into place over the drill string/sampler where the boring is to be located. The hammer is rated at 70lb. and will deliver this force at approx. 1000-1200 per min. depending on remote engine speed (r.p.m. vs g.p.m.) to maintain maximum p.s.i. The drill string consists of various lengths of 1-3/4" steel AWML drill rod attached to split spoon samplers 2"O.D. x 1½"I.D. x 24" long. By using the hammer to drive in sampler the soil core enters up into the S.P.T. (standard penetration test) split spoon sampler. After driving 2' the hammer is hoisted off of drill string and placed to the side. A hoisting plug is attached to end of drill string to allow a hook/cable to be also attached. A hydraulically operated ram is actuated to pull the cable, therefore extracting drill string/sampler out of the hole. To continuously core, this procedure will be repeated down to the desired depth pulling out of the hole every 2' of driving, therefore creating no cuttings.

Interval sampling is also possible by first driving a 2-1/8" busting point down to sample depth. After pulling out driving point the drill string/sampler is placed down hole and driven down to desired depth. By using this method continuous coring would not be necessary unless conditions present in soil warrants it.

For enviromental investigations decontamination procedures are easier due to smaller sized sampling tools, waste is minimal. The coring leaves only a 2" hole in the ground that is easily grout sealed.

Most important this method creates virtually no cuttings to barrel and dispose of, saving time, material and above all cost. Our method is also time efficent making our drilling time very competitive and cost effective, therefore cutting bottom line project expenses by a significant percentage.

POWERCORE
SOIL SAMPLING INC.
PORTABLE SOIL CORING OPERATIONS
P.O. BOX 2664 • ANTIOCH, CA 94531
510-778-6879 FAX 510-778-0733

Protocol For Soil Coring Using EW Casing:

First by using the hydraulically operated machinery described on the first page the methodology is essentially the same. The difference being that instead of using a 2" split spoon sampler we drive in a $1^{13}/16$" casing with a 1" split spoon inside the casing. These are driven simultaneously into the ground, when the sampler is pulled out the casing is left in the ground to eliminate fall back or caving and to minimize cross contamination. This method is similar in principle to a hollow stem auger. To advance deeper another sampler is placed downhole and more casing is attached then driven in again. Each sampler is driven two feet at a time before it has to be pulled out.

This procedure is effective in loose material such as sand or soft dirt. Our maximum depth with this method is 30' providing the soil conditions allow it.

As with the first procedure this method creates virtually no cuttings.

Appendix B

PROTOCOL FOR GROUNDWATER SAMPLING

POWERCORE
SOIL SAMPLING INC.
PORTABLE SOIL CORING OPERATIONS
P.O. BOX 2664 • ANTIOCH, CA 94531
510-778-6879 FAX 510-778-0733

PROTOCOL FOR GROUNDWATER SAMPLING:

By first advancing our hydraulic punch, using a 2" split spoon sampler, to the desired depth we're able to make our bore hole leaving a 2" opening.

After removing the entire drill string a schedule 80 1" PVC slotted well screen is placed downhole, using .020 screen, the annulus around the screen casing is then backfilled using a #3 sand. Usually the well screen is placed approximately 5' below the groundwater interface to insure a fast recharge time.

Once the well screen is in place a 3/4" disposable bailer or perastaltic pump can be used to collect water samples for analysis.

Although this method is usually a temporary installation, it could be developed into a small monitoring piezometer. Once the sampling is finished the casing can be either removed or possibly grouted in place.

Appendix C

QUALITY ASSURANCE/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 C-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 C-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 C-1

Sample Containers, Holding Times and Preservation

Parameter	Matrix	Container	Holding Time	Preservation
Total Petroleum Hydrocarbons	Soil	3" stainless steel or brass cylinder	14 days[1] 40 days[2]	4°C
(Heavy Fractions)	Water	1-liter amber bottle, teflon seal/silicon septum	14 days[1] 40 days[2]	4°C
Benzene Toluene Xylene Ethylbenzene	Soil	3" stainless steel or brass cylinder	14 days[1]	4°C
	Water	40 ml glass vial. teflon seal/silicon	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 C-2. Provided the data base is of sufficient size, statistical techniques may be employed for data validation.

Table C-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 D

HEALTH AND SAFETY PLAN

Health and Safety Plan
PG&E - Oakland Power Plant
50 Martin Luther King Way
Oakland, CA 95609

INTRODUCTION

PURPOSE AND SCOPE

This Health and Safety Plan for soil and groundwater investigations, provides for the protection of on-site personnel and the surrounding community during site characterization activities. The requirements, specifications and procedures presented in this plan will apply to all on-site personnel, including employees, sub-contractors, site visitors and regulatory agency personnel.

KEY PERSONNEL

The Safety Coordinator/Project Manager will provide training to site personnel in the use of safety and personal protection equipment and will manage the on-site monitoring program. The Safety Coordinator/Project Manager will have the authority to deny access to any individual without the proper training or protective equipment required for the site conditions or those individuals disregarding site safety procedures. All site personnel will be working under the direction of the Safety Coordinator/Project Manager.

HAZARD ANALYSIS

The property previously operated three underground diesel dump tanks. Historic data and evaluation of subsurface data indicate the presence of the elevated levels of diesel in the soils surrounding tanks 2 and 3.

The activities addressed by this safety plan include subsurface soil and groundwater sample collection. Although exposure to fuel hydrocarbons at hazardous levels is unlikely, work activities present the potential for exposure to toxic materials through both skin contact and inhalation. The subsurface sampling may also pose a fire and explosion hazard from gases and vapors trapped beneath the ground surface.

The most significant risk associated with petroleum fuels is exposure to aromatic compounds. Skin contact will be eliminated by use of protective clothing, eye wear, and gloves. Inhalation hazards will be minimized using appropriate respiratory protective devices as determined by on-site air monitoring. Air monitoring will be performed using a photoionization detector (PID) calibrated with isobutylene gas (100 ppm). The Safety Coordinator/Project Manager will establish an exclusion zone encompassing a conservative 50 foot radius from the work area. Limits of the exclusion zones may be modified based on field measurements taken during the course of investigative activities. Access within this zone will be limited to required personnel.

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

Table D-1

Hazard Exposure Guidelines

Substances	Cal OSHA PEL	1990-91 ACGIH TLV
Benzene	1 ppm (TWA) 25 ppm (Ceiling)	1 ppm (TWA)
Toluene	100 ppm (TWA) 150 ppm (STEL)	100 ppm (TWA) 150 ppm (STEL)
Ethylbenzene	100 ppm (TWA) 125 ppm (STEL)	100 ppm (TWA) 125 ppm (STEL)
Xylene	100 ppm (TWA) 150 ppm (STEL)	100 ppm (TWA) 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.