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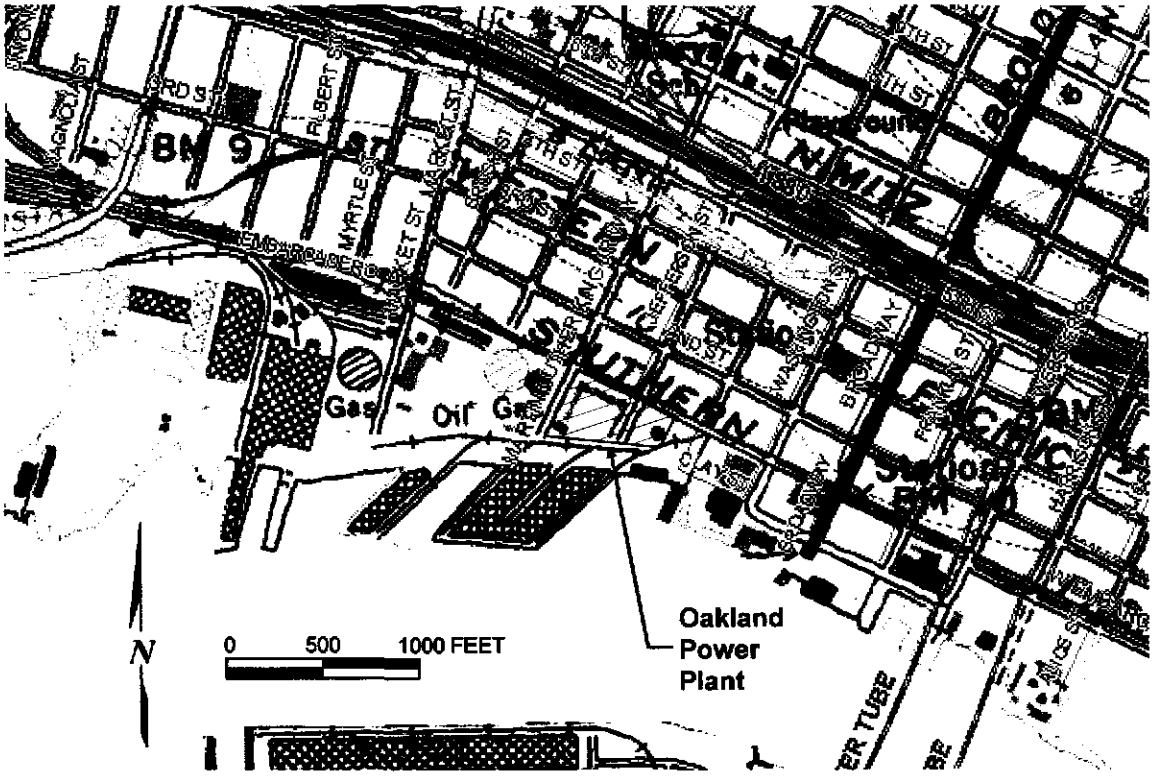
Investigation Summary and 2004 Annual Groundwater Monitoring Report Diesel Dump Tanks, Oakland Power Plant 50 Martin Luther King Jr. Way, Oakland, California 94607



September 10, 2004

Prepared by
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Prepared for
Alameda County Environmental Health

TES Report Number 402.331.04.35

PG&E

TES

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September 10, 2004

Ms. Eva Chu
Hazardous Materials Specialist
Alameda County Environmental Health Department
Environmental Cleanup Oversight
1131 Harbor Way Parkway
Alameda, CA 94502-6577

Subject: *Investigation Summary and 2004 Annual Groundwater Monitoring Report, Diesel Dump Tanks Oakland Power Plant, 50 Martin Luther King Jr. Way, Oakland, California, TES Report No.402.331.04.35*

Dear Ms. Chu:

On behalf of PG&E Environmental Affairs, enclosed is a copy of the Investigation Summary and 2004 Annual Groundwater Monitoring Report for the Diesel Dump Tanks at Oakland Power Plant at 50 Martin Luther King Jr. Way, Oakland, California. This report presents a summary of results of past activities and investigations related to three diesel dump tanks at the site, a risk assessment, and a management strategy for addressing the residual hydrocarbons in the soil and groundwater at the site. This report also presents the results of the 2004 annual groundwater monitoring of three monitoring wells at the plant.

The wells monitor groundwater near Tanks 2 and 3. The area near the third tank, Tank 1, is not monitored because past results showed that the soil and groundwater near Tank 1 had not been significantly impacted by hydrocarbons. The 2004 monitoring was performed on April 13 2004, and consisted of collecting groundwater level measurements, collecting groundwater samples, and analyzing the samples for diesel.

Groundwater elevations ranged from 5.65 to 5.78 feet above mean sea level in the three wells. The groundwater gradient was calculated to be about 0.002 foot per foot toward the south. As with all past samples collected since monitoring began in June 1993, floating product was not observed on any of the groundwater samples from the three wells.

The analytical results show that diesel was detected in the MW-1-3 groundwater sample at 872 micrograms per liter (µg/L), but was not detected in the MW-1-2 or MW-2-3 samples. Following is a list of the 2004 analytical results, as well as average concentrations of the 20 samples from each well since monitoring began.

Monitoring well	April 13, 2004 diesel concentration (µg/L)	Average diesel concentration of 20 samples since 1993 (µg/L)
MW-1-2	<100	533
MW-1-3	872	424
MW-2-3	<100	242

An evaluation of field observations and soil and groundwater analytical results since 1990 indicates that significant product releases from the diesel dump tanks have not occurred. This conclusion is based primarily on the absence of measurable floating product on the groundwater and the lack of widespread hydrocarbon contamination. The source of the residual petroleum hydrocarbons is considered to be from minor overfilling of the original diesel dump tanks, which were replaced in 1991 with larger double-walled tanks sealed in concrete vaults. During the replacement of the three tanks, a total of 77 cubic yards plus 430 pounds of excavated soil, some of which was impacted by diesel fuel, was removed.

The site is considered to be a Low Risk Groundwater Case for the following reasons:

1) The source of the diesel, presumed to be the impacted soils near the original diesel dump tanks, has been mostly removed.

2) The hydrocarbons in groundwater are present as dissolved residual hydrocarbons, and not as measurable free-phase floating product.

3) Benzene is not considered a chemical of potential concern. Benzene has not been detected in groundwater samples from wells MW-1-2 and MW-1-3, and has only been detected in low concentrations in two of the ten groundwater samples from MW-2-3.

4) The site has been adequately characterized geologically and geochemically.

5) The site does not present a significant risk to human health because the impacted area is covered with asphalt or concrete.

6) Groundwater in the uppermost water-bearing zone near the site is neither currently used as a source of drinking water, nor projected to be used as a source of drinking water within the expected life of the dissolved hydrocarbons.

7) The site does not present a significant risk to the environment because the dissolved residual hydrocarbons should not reach ecological receptors within the expected life of the contaminants.

PG&E proposes passive bioremediation. TES scientists and hydrogeologists believe that the overall favorable results do not warrant any further investigative work or groundwater monitoring, and respectfully request that your department consider issuing a No Further Action letter.

Feel free to contact me at 925.866.5883 (jxwf@pge.com) or Betsy Brunswick at 415.973.1642 (bmb7@pge.com) of Environmental Affairs if you have any questions or concerns.

Sincerely,

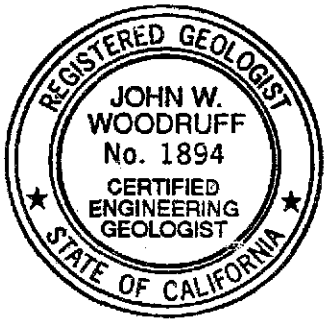
JOHN W. WOODRUFF
Registered Geologist

JWW:ngc
402.331.04.35

cc: Mr. Homayune Atiqee, Department of Toxic Substances Control
Luis Medina, Duke Energy North America

Enclosure

Prepared by:



John Woodruff
Registered Geologist

Approved by:

Fred Flint
Certified Hydrogeologist
Environmental Engineering
and Chemical Analysis Unit

402.331.04.35

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Letter of transmittal

1 INTRODUCTION

This report presents a summary of results of past activities and investigations related to three diesel dump tanks at the site, a risk assessment, and a management strategy for addressing the residual hydrocarbons in the soil and groundwater at the Oakland Power Plant (OPP) at 50 Martin Luther King Jr. Way in Oakland, Alameda County, California (Figure 1). This report also presents the results of the 2004 annual groundwater monitoring of three monitoring wells at the site. The plant is owned and operated by Duke Energy. Duke Energy purchased OPP from Pacific Gas and Electric Company (PG&E) in 1998; however, PG&E is responsible for environmental conditions at OPP that existed prior to the sale, including the groundwater monitoring. PG&E Technical and Ecological Services (TES) performs the groundwater monitoring under the oversight of Alameda County Environmental Health (ACEH). The monitoring wells, designated MW-1-2, MW-1-3, and MW-2-3, are located near two diesel dump tanks (tanks). The 2004 annual monitoring was performed on April 13, and consisted of measuring groundwater levels, collecting groundwater samples, and analyzing the samples for diesel.

2 SITE DESCRIPTION

OPP is located in an industrial area about 150 feet north of the Oakland Inner Harbor. The Port of Oakland Howard Terminal is immediately south of the OPP property. OPP occupies approximately 2.6 acres, and is divided into two parcels by Jefferson Street: the power generating parcel to the west and a fuel storage parcel to the east (Figure 2). The plant generates electricity by burning No. 2 diesel fuel through three turbine generators during peak load periods only. Each of the three turbine units has an associated diesel dump tank for temporary storage of diesel fuel. The diesel fuel is drained into the tanks from each turbine when the fuel lines are purged of unused diesel fuel. The three, original, underground 75-gallon diesel dump tanks, which were installed in 1978, were removed in 1991 and were replaced at the same locations with larger (250-gallon) underground double-walled tanks within sealed concrete vaults in 1992. The three monitoring wells that are discussed in this report are located in the power-generating parcel near Tanks 2 and 3.

3 TOPOGRAPHIC AND GEOLOGIC SETTING

OPP is located on the East Bay Plain at an elevation of about 10 to 11 feet above mean sea level (MSL). The site soils consist of fill materials to depths of up to 10 feet at some locations . This fill consists predominantly of clayey sand and clayey gravel that contains organic matter, fragments of concrete, brick, and glass. The fill materials appear to have been placed prior to 1889. Bay mud consisting of mixtures of clay, silt, and subordinate sand underlies the fill (Fluor Daniel GTI 1997; PG&E, 1990, 1992a, 1993b, 2002b).

4 BACKGROUND

4.1 1990 Preliminary Soil Investigation

In September 1990, prior to the removal of the original tanks, PG&E performed a preliminary soil investigation that included the drilling of seven exploratory borings adjacent to the tanks: two borings near Tank 1 (B1-1, B1-2), two borings near Tank 2 (B2-1, B2-2), and three borings near Tank 3 (B3-1, B3-2, B3-3) (Figures 3 and 4) (PG&E, 1990). The purpose of the investigation was to determine if tank overflow or leakage had occurred and whether the soil near the tanks was impacted. Twelve soil samples collected from these borings, ranging from 2.5 to 6.0 feet deep, were analyzed for diesel, and benzene, toluene, ethylbenzene, and xylenes (BTEX). The results were reported in milligrams per kilogram (mg/Kg) and in micrograms per kilogram (ug/Kg), as summarized below. Table 1 presents all analytical results.

- Tank 1—Diesel was detected in all 4 soil samples at 12 to 70 mg/Kg (averaging 42 mg/Kg). BTEX was not detected. Hydrocarbon odor was not observed.
- Tank 2—Diesel was detected in all 4 soil samples at 60 to 10,000 mg/Kg diesel (averaging 2,803 mg/Kg). BTEX was not detected. Hydrocarbon odor was noted as strong.
- Tank 3—Diesel was detected in all 4 soil samples at 210 to 12,000 mg/Kg, averaging 4,403 mg/Kg. BTEX was not detected in 3 of the samples, but was detected in one of the samples at the following concentrations: benzene: 1,700 mg/Kg, toluene: 200 mg/kg, ethylbenzene: 400 mg/Kg, and xylenes: 1,500 mg/Kg (the unusually high BTEX concentrations reported in this sample are suspect; the benzene result is especially suspect because of the absence of benzene detections in any of the soil samples analyzed from this investigation and all subsequent investigations). Hydrocarbon odor was noted as weak.

Groundwater was encountered at about 5 feet. Floating product was not observed in any of the seven borings. Organic matter in the fill soils was noted in some of the boring logs. The reported diesel concentrations may be greater than actual petroleum hydrocarbon diesel concentrations because the analyses did not include Silica Gel Cleanup, which removes false positive interferences from the organic matter within the fill soils.

4.2 1991 Groundwater Investigation

In May 1991, PG&E coordinated a groundwater investigation by advancing and collecting grab groundwater samples from 14 sample points: three near Tank 1 (O1A, O1B, and O1C), six near Tank 2 (O2A-O2F), and five near Tank 3 (O3A-O3E) (Figures 3 and 5) (PG&E, 1991b). The purpose of the investigation was to assess if the diesel tanks had impacted groundwater. One grab groundwater sample from each of the 14 sample points was analyzed for diesel and BTEX, and the results were reported in milligrams per liter (mg/L) and micrograms per liter (ug/L), as summarized below. Table 2 presents all analytical results.

- Tank 1—Diesel was not detected in two of the three groundwater samples, but was detected in one sample at 1.9 mg/L.

- Tank 2—Diesel was not detected in three of the six groundwater samples, but was detected at 12 to 204mg/L (averaging 95 mg/L) in the three other samples.

- Tank 3—Diesel was not detected in two of the five groundwater samples, but was detected at 1.0 to 19 mg/L (averaging 9.5 mg/L) in the three other samples.

- BTEX was detected at variable, but low concentrations in 7 of the 14 groundwater samples, and ranged from 1.0 to 73 ug/L.

The reported diesel concentrations may be greater than actual petroleum hydrocarbon diesel concentrations because the analyses did not include Silica Gel Cleanup, which removes false positive interferences from the organic matter within the fill soils.

4.3 1991 Tank Removal and Confirmation Soil Sampling

In September 1991, PG&E submitted to Alameda County an application for Underground Tank closure. Tom Daniels Excavating, contractor to PG&E, submitted to the City of Oakland Fire Marshall's Office an Application for Permit to Remove Tanks. The applications were approved in October 1991. On November 6, 1991, the three original tanks and much of the surrounding soils (including those soils at the locations of the September 1990 exploratory borings) were removed (PG&E, 1992a). In December 1991, Robert Gils Associates submitted a tank removal report to the County, which noted that an Oakland Fire Inspector and an Alameda County Environmental Health Hazardous Waste Specialist were on site during the tank removal. Holes were not observed in the tanks, but signs of surface pitting and rust were noted.

Results of diesel and BTEX analyses of confirmation soil samples (T1A, T2A, and T3A) collected beneath the tanks (Figures 3 and 4) at a depth of 5-7 feet are summarized below (see Table 1).

- Tank 1—Diesel was not detected. BTEX was not detected.

- Tank 2—Diesel was detected at 4,901 mg/Kg. BTX was not detected, but ethylbenzene was detected at 200 ug/Kg.

- Tank 3—Diesel was detected at 7,999 mg/Kg. BTEX was not detected.

The reported diesel concentrations may be greater than actual petroleum hydrocarbon diesel concentrations because the analyses did not include Silica Gel Cleanup, which removes false positive interferences from the organic matter within the fill soils.

Soil hazardous waste manifests prepared in November and January 1992 document that a total of 77 cubic yards plus 430 pounds of excavated soil impacted by diesel fuel was removed to Kettleman Hills Facility.

4.4 1992 Additional Soil Investigation Near Tanks 2 and 3

In June 1992, following the installation of the 3 new tanks, PG&E drilled and sampled four additional borings (UT1 through UT4) adjacent to Tanks 2 and 3 to quantify the levels of residual diesel remaining in the soils (Figure 4) (PG&E, 1992a). Nine soil samples from these borings, collected from depths of 4.5 to 7.0 feet were analyzed for diesel and BTEX, and the results are summarized below: (see Table 1).

- Tank 2—Diesel in the four soil samples ranged from 72 to 3,800 mg/Kg, averaging 2,268 mg/Kg. Benzene was not detected, but variable concentrations of TEX, ranging from 8.7 to 1,300 ug/Kg, were detected.

- Tank 3—Diesel in the five soil samples ranged from 20 to 2,900 mg/Kg, averaging 752 mg/Kg. Benzene was not detected, but variable concentrations of TEX, ranging from 5.7 to 140 ug/Kg, were detected.

The reported diesel concentrations may be greater than actual petroleum hydrocarbon diesel concentrations because the analyses did not include Silica Gel Cleanup, which removes false positive interferences from the organic matter within the fill soils.

The July 1, 1992 report cover letter to Ms. Jennifer Eberle of ACEH states that, "further soil removal from the vicinity of the two tank locations would be very difficult due to the close proximity of in-service electrical equipment and related structures. Additionally, soil removal equipment would have limited access to the area due to space constraints."

The Tank 1 area was not explored for this investigation, or subsequent investigations, because of the favorable past analytical results and lack of evidence of significant diesel contamination near Tank 1.

4.5 1992 Soil and Groundwater Investigation Near Tanks 2 and 3

In October 1992, PG&E performed a soil and groundwater investigation near Tanks 2 and 3 by advancing 16 soil probes: 6 probes near Tank 2 (G2A through G2F) and 10 probes (G3A through G3J) near Tank 3 (Figures 4 and 5) (PG&E, 1993b). A single soil sample was collected from 15 of the 16 probes, from depths of 3.5 to 7.5 feet. A sample was not collected from G2A, and the location of G2A is therefore not shown on Figure 4. Grab groundwater samples were collected from 12 of the probes (G2A-G2F, G3A, G3B, G3E, G3H, G3I, and G3J). The soil and grab groundwater samples were analyzed for diesel and BTEX, and the results are summarized below (see Tables 1 and 2).

- Tank 2 Soil—Diesel was not detected in four of the five soil samples, but was detected at 310 mg/Kg in one sample located 20 feet south of the tank. BTEX was not detected in any of the five samples.

- Tank 2 Groundwater—Diesel was not detected in two of the six grab groundwater samples, but was detected in the other four samples at 0.4 to 160 mg/L (averaging 51 mg/L). Benzene and toluene were not detected. Ethylbenzene (9.0 ug/L) and xylenes (100 ug/L) were detected in a

sample 20 feet south of the tank. Xylenes (130 ug/L) were detected in a sample 15 feet south of the tank.

- Tank 3 Soil—Diesel was not detected in six of the ten soil samples, but was detected in the other four samples at 33 to 4,100 mg/Kg (averaging 1,146 mg/Kg). BTEX was not detected.
- Tank 3 Groundwater—Diesel was not detected in two of the six grab groundwater samples, but was detected in the other four samples at 1.3 to 9.7 mg/L (averaging 4.7 mg/L). BTEX was not detected.

The reported diesel concentrations may be greater than actual petroleum hydrocarbon diesel concentrations because the analyses did not include Silica Gel Cleanup, which removes false positive interferences from the organic matter within the fill soils.

Free product was not observed at any of the sample locations.

4.6 1993 Installation and Initial Sampling of Three Groundwater Monitoring Wells

In June 1993, Weiss Associates installed three monitoring wells (MW-1-2, MW-1-3, and MW-2-3) in the vicinity of Tanks 2 and 3 (Weiss, 1993). The wells are located in a triangular configuration in the vicinity of these tanks to monitor water quality and to gather groundwater gradient information. MW-1-2 is located adjacent to Tank 2, MW1-3 is 25 feet northwest of Tank 3, and MW-2-3 is 20 feet southeast of Tank 3 (Figures 2, 4, and 5). The wells are constructed of 4-inch PVC with a screened interval of 4-14 feet for MW-1-2 and MW-2-3, and 4-7 feet for MW-2-3. Floating product at the three well locations was not noted in the report (Weiss, 1993).

Initial (June 23, 1993) groundwater samples collected from the wells indicated diesel in the three wells at the following concentrations (Table 3).

- MW-1-2. Diesel in groundwater was detected at 1,500 ug/L.
- MW-1-3. Diesel in groundwater was detected at 160 ug/L.
- MW-2-3. Diesel in groundwater was detected at 560 ug/L.

The reported diesel concentrations may be greater than actual petroleum hydrocarbon diesel concentrations because the analyses did not include Silica Gel Cleanup, which removes false positive interferences from the organic matter within the fill soils.

4.7 2002 Confirmation Soil and Grab Groundwater Sampling Near Tank 2

On October 31, 2002, at the request of ACEH, PG&E (2002b) collected three confirmation soil samples and one confirmation grab groundwater sample from a single soil probe (CS1), which was located approximately one foot north of 1992 soil probe G2B. These probes are located about 20 feet south of

Tank 2 (Figures 4 and 5). The purpose of the 2002 probe was to confirm the unusually high 1992 grab groundwater sample diesel result (160 mg/L) from G2B and to further delineate diesel concentrations in the soil and groundwater at that location. The reported groundwater diesel concentrations of 160 mg/L may be greater than actual petroleum hydrocarbon diesel concentrations because the analysis did not include Silica Gel Cleanup, which removes false positive interferences from the organic matter within the fill soils.

The October 31 2002 confirmation sample soil probe CS1 was advanced to a total depth of 12 feet. Groundwater was measured at 5.5 feet. Floating product was not observed in the groundwater sample, however, a diesel odor and a sheen was observed. Three soil samples from 4.5, 6.0, and 11.5 feet, one grab groundwater sample, and a duplicate sample were analyzed for diesel using Silica Gel Cleanup to reduce biogenic interferences. The groundwater sample was filtered through a 0.7-micron glass filtration to remove particulate matter. Results of the analyses indicated diesel at the following concentrations (see Tables 1 and 2).

- Diesel in soil at 4.5 feet was detected at 5.0 mg/Kg.
- Diesel in soil at 6.0 feet was detected at 7,600 mg/Kg.
- Diesel in soil at 11.5 feet was detected at 1.8 mg/Kg.
- Diesel in groundwater (primary and duplicate samples) at 5.5 feet was detected at 880 and 900 ug/L.

These concentrations are considered to be representative of actual diesel concentrations because the diesel analyses included Silica Gel Cleanup, which removes false positive interferences from the organic matter within the fill soils. The 2002 groundwater diesel result is three orders of magnitude less than the unusually high 1992 result, which is considered suspect.

4.8 Historic Groundwater Monitoring

The three monitoring wells have been sampled 20 times since their installation in June 1993. From 1993 to 1995, the wells were sampled quarterly. In 1996, the wells were sampled twice. Since 1997, the wells have been sampled annually. Some of the early groundwater samples were tested for benzene, toluene, ethylbenzene, and xylenes (BTEX). The analysis for BTEX was eliminated in April 1994 for wells MW-1-2 and MW-1-3, and in January 1996 for MW-2-3 because of the absence or very low detections of BTEX. Numerous groundwater monitoring reports were submitted to ACEH and are listed in the References section of this report.

Table 3 summarizes the results of all groundwater monitoring, and shows high, low, and average diesel concentrations in the three wells. Figure 6 is a graph showing historic diesel concentrations and groundwater levels in the three wells.

5 2004 ANNUAL GROUNDWATER MONITORING

5.1 Field Methods

The 2004 annual groundwater monitoring was performed on April 13, 2004. Groundwater levels were measured in the three monitoring wells using an electronic water level meter. The wells were then purged according to the monitoring well purging protocol presented in Appendix A. The purged water volume, pH, conductivity, turbidity, and temperature were measured. Once purged, groundwater samples were collected from each well in one-liter glass amber bottles using disposable bailers. A duplicate sample from MW-1-2 and an equipment blank consisting of distilled water poured through a new disposable bailer were also collected. Appendix B contains the water level form and the purging and sampling logs.

5.2 Field Observations

As with all past samples collected since monitoring began in June 1993, measurable free-phase floating product was not observed on any of the groundwater samples from the three wells. A sheen was observed in MW-1-3, but not in MW-1-2 or MW-2-3.

5.3 Groundwater Elevations and Gradient

Groundwater elevations ranged from 5.65 to 5.78 feet above MSL in the three wells. The calculated groundwater gradient was determined to be approximately 0.002 foot per foot toward the northwest (Figure 7). Table 4 summarizes the groundwater elevations and hydraulic gradient information from the 2004 monitoring, as well as past monitoring events.

5.4 Analytical Results of Groundwater Samples

The groundwater and equipment blank samples were analyzed for diesel using silica gel cleanup. Table 3 and Figure 6 summarize the April 2004 analytical results and historical analytical results. Appendix C contains the chemical laboratory report and the chain of custody. The analytical results show that diesel was detected in the MW-1-3 groundwater sample, but was not detected in the MW-1-2 or MW-2-3 samples. Following is a summary of the 2004 analytical results and the average concentrations of the 20 samples from each well since monitoring began in 1993.

Monitoring well	April 13, 2004 diesel concentration (µ/L)	Average diesel concentration of 20 samples since 1993 (µg/L)
MW-1-2	<100	533
MW-1-3	872	424
MW-2-3	<100	242

5.5 Quality Control Results

The Quality Control (QC) program included the collection of a duplicate sample from well MW-1-2 (designated QCAB) and an equipment blank (designated QCEB) consisting of distilled water poured through a new disposable bailer. The QCAB and QCEB samples were analyzed for diesel using silica gel cleanup. The QCAB sample was analyzed for laboratory consistency and accuracy. The QCEB sample was analyzed to identify possible false positives. Diesel was not detected in the QCEB equipment blank. The QCAB duplicate sample contained 120 µg/L diesel compared with the primary sample (MW-1-2), which did not contain detectable diesel (<100 µg/L). This range is within acceptance limits.

The laboratory QC consisted of adherence to holding times and evaluating method blanks and matrix spike (MS) results. The U.S. Environmental Protection Agency (USEPA) establishes the holding times, which refer to the maximum time between sample collection and laboratory analysis. The method blank results help assess the effect of the laboratory environment on the analytical results. The MS recoveries help assess accuracy of the analytical results. All analyses were performed within the holding times specified by the USEPA. Recoveries of MS were within the laboratory acceptance limits.

6 SUMMARY

- During the 1991 removal of the three diesel dump tanks, excavation of surrounding soils that were impacted by diesel fuel was performed as much as possible. Further excavation to remove additional potentially impacted soil was not feasible because of the constraints of in-service electrical equipment and related structures. Mitigation consisted of the excavation and removal of 77 cubic yards plus 430 pounds of soil, some of which was impacted by diesel fuel.

- Significant releases of diesel from the tanks have not likely occurred based upon the absence of holes in the tanks during their removal and absence of observations of measurable free-phase floating product in any of the investigative or groundwater monitoring reports.

- Releases in the vicinity of Tank 1 appear to have been negligible based upon the absence of hydrocarbon odor and favorably low to nondetectable diesel and BTEX concentrations in soil and grab groundwater samples. Therefore, the Tank 1 area is not considered to have been significantly impacted by hydrocarbons, and, following an evaluation of early investigation results, was not included in the groundwater monitoring program.

- Results of diesel and BTEX analyses of numerous soil and grab groundwater samples collected during several investigations indicate that residual hydrocarbons are relatively confined to within 20 feet of Tanks 2 and 3, and is generally either not present or present in low concentrations beyond 20 feet.

- Most of the soil samples and groundwater samples were analyzed for diesel without Silica Gel Cleanup. Many of the past boring logs and groundwater sampling and purging logs have noted fine organic particulates in the fill soils and groundwater. The reported diesel concentrations that did not include Silica Gel Cleanup may be greater than actual petroleum hydrocarbon diesel concentrations because Silica Gel Cleanup removes false positive interferences from the organic matter within the fill soils.

- The minor diesel releases from the original Tanks 2 and 3 may have occurred from periodic overfilling. The potential for further releases from any of the tanks has been mitigated by the 1991 removal and replacement of the original 75-gallon tanks with 250-gallon double-walled tanks within sealed concrete vaults.

- Groundwater monitoring of three wells in the vicinity of Tanks 2 and 3 since 1993 indicate that residual diesel is present in the groundwater as a dissolved hydrocarbon or sometimes a sheen, but not as measurable free-phase floating product. Average diesel concentrations of the 20 samples analyzed from each of the three wells are 533 ug/L for MW-1-2, 424 ug/L for MW-1-3, and 242 ug/L for MW-2-3.

- BTEX in soil and groundwater was reported as nondetect or in low concentrations overall. Elevated concentrations (exceeding 100 ug/Kg) were reported in 5 of the 39 soil samples analyzed for BTEX. Elevated concentrations (exceeding 10 ug/L) were reported in 6 of the 26 grab groundwater samples analyzed for BTEX. An elevated concentration (exceeding 10 ug/L) was reported in one of the 18 monitoring well groundwater samples analyzed for BTEX.

7 RISK EVALUATION OF HUMAN HEALTH AND ENVIRONMENT

The site is assessed as a Low Risk Groundwater Case for the following reasons:

- The source of the diesel, presumed to be the impacted soils near the original diesel dump tanks, has been mostly removed. This source removal occurred in 1991 in conjunction with the replacement of the original tanks with 250-gallon double-walled tanks within sealed concrete vaults.

- The hydrocarbons in groundwater are present as dissolved residual hydrocarbons, and not as measurable free-phase floating product.

- Benzene is not considered a chemical of potential concern. Benzene has not been detected in groundwater samples from wells MW-1-2 and MW-1-3, and has only been detected in low concentrations in two of the ten groundwater samples from MW-2-3.

- The site has been adequately characterized geologically and geochemically. The low-permeability Bay mud underlying the fill soils and the high groundwater restrict vertical migration of dissolved diesel. Horizontal migration through the more permeable fill is more likely. However, analytical results of numerous soil and grab groundwater samples indicate that the residual hydrocarbons have not migrated significantly. It is highly unlikely that water wells, aquifers, or other sensitive receptors could be impacted by the hydrocarbon-affected groundwater at the site.

- The site does not present a significant risk to human health because the impacted area is covered with asphalt or concrete.

- Groundwater in the uppermost water-bearing zone near the site is neither currently used as a source of drinking water, nor projected to be used as a source of drinking water within the expected life of the dissolved hydrocarbons.

- The site does not present a significant risk to the environment because the dissolved residual hydrocarbons should not reach ecological receptors within the expected life of the contaminants.

8 MANAGEMENT STRATEGY

PG&E proposes passive bioremediation at the site with no further action. PG&E scientists estimate that the mass of residual diesel at the site is naturally reducing over time, primarily through intrinsic biodegradation by indigenous microorganisms. This natural attenuation includes the physical, chemical, and/or biological processes that reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater.

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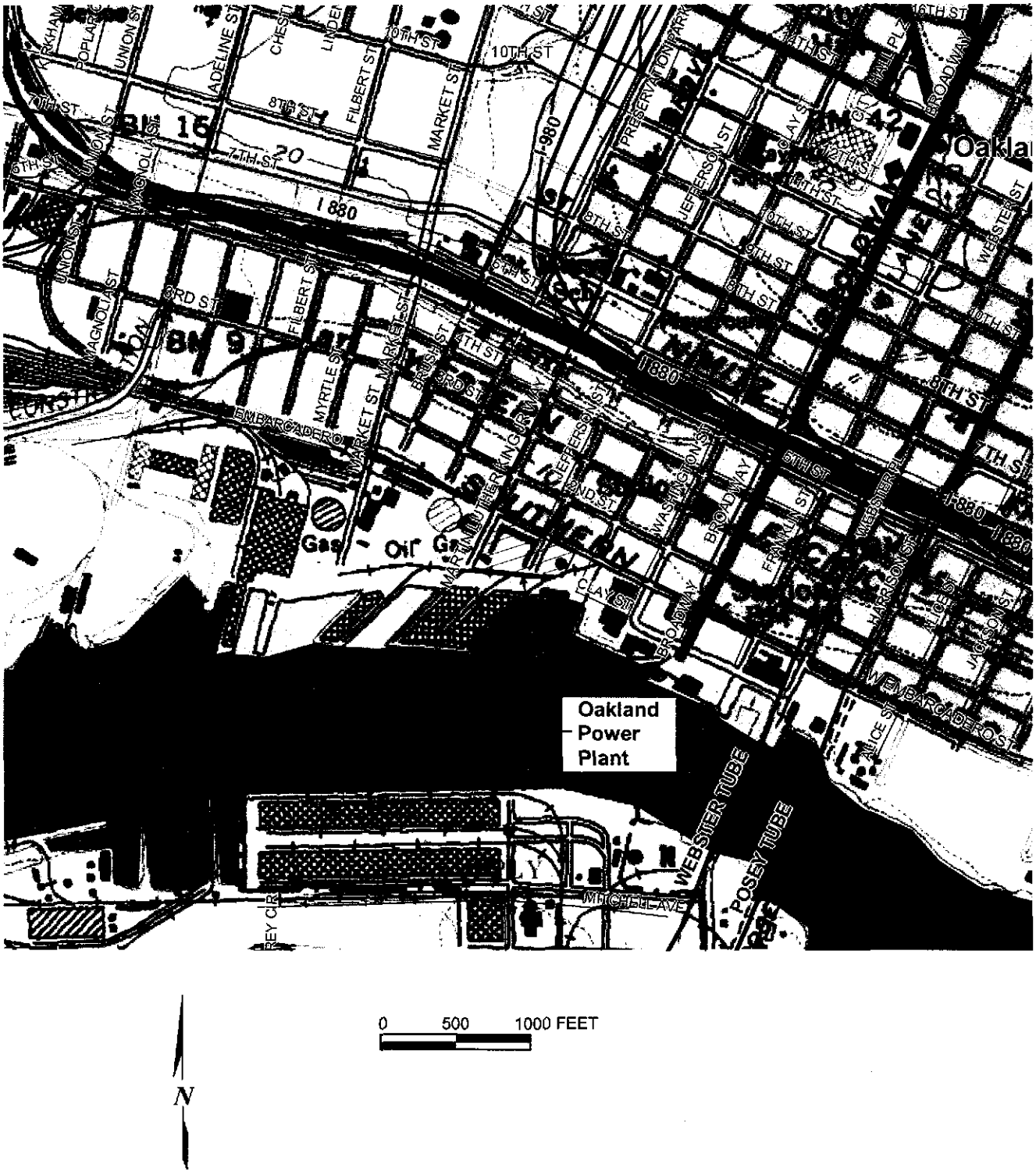


Figure 1. Location map of Oakland Power Plant, 50 Martin Luther King Jr. Way, Oakland, California 94607

Table 1
Analytical Results of Soil Samples
Diesel Dump Tanks, Oakland Power Plant, 55 Martin Luther King Jr. Way, Oakland, California

	Sample Location ID	Sample ID	Sample Depth (feet)	Sample Date	Location	Diesel (mg/Kg)	Silica Gel Cleanup	Benzene (ug/Kg)	Toluene (ug/Kg)	Ethyl-benzene (ug/Kg)	Total Xylenes (ug/Kg)	Notes	Ref.
1	B1-1	OPB 1-1A	2.5-3.0	26-Sep-90	4' east of Tank 1	**25**		<5	<5	<5	<5		A
2		OPB 1-1B	5.5-6.0			**12**		<5	<5	<5	<5		
3	B1-2	OPB 1-2A	4.0-4.5	26-Sep-90	4' south ofTank 1	**60**		<5	<5	<5	<5		
4		OPB 1-2B	5.5-6.0			**70**		<5	<5	<5	<5		
5	B2-1	OPB 2-1B	2.5-3.0	25-Sep-90	4' west of Tank 2	**150**		<5	<5	<5	<5		
6		OPB 2-1B	4.0-4.5			**1,800**		<25	<25	<25	<25		
7	B2-2	OPB 2-2A	2.5-3.0	25-Sep-90	4' south of Tank 2	**60**		<5	<5	<5	<5		
8		OPB 2-2B	5.0-5.5			**10,000**		<1	<1	<1	<1		
9	B3-1	OPB 3-1A	3.0-3.5	24-Sep-90	4' west of Tank 3	**1,300**		<25	<25	<25	<25		
10	B3-2	OPB 3-2A	3.0-3.5	24-Sep-90	4' north of Tank 3	**4,100**		<400	<400	<400	<400		
11		OPB 3-2B	4.5-5.0			**12,000**		**1,700**	**280**	**400**	**1,500**	1	
12	B3-3	OPB 3-3A	3.5-4.0	24-Sep-90	5' NW of Tank 3	**210**		<5	<5	<5	<5		
1	T1A	T1-A	6	06-Nov-91	Tank 1 excavation	<1.0		<5	<5	<5	<5		
2	T2A	T2-A	6	06-Nov-91	Tank 2 excavation	**4,901**		<5	<5	**200**	<5	2	B
3	T3A	T3-A	6	06-Nov-91	Tank 3 excavation	**7,999**		<5	<5	<5	<5		
1	UT1	UT1	5.5-6.0	03-Jun-92	3' south of Tank 2	**2,700**		<5.0	<5.0	<5.0	**5.3**		B
2		UT1	6.5-7.0			**72**		<5.0	**130**	**148**	**1,300**		
3	UT2	UT2	4.5-5.0		2' west of Tank 2	**2,500**		<5.0	**18**	<5.0	**10**		
4		UT2	6.5-7.0			**3,800**		<5.0	**8.7**	**28**	**220**		
5	UT3	UT3	4.5-5.0		2' east of Tank 3	**850**		<5.0	<5.0	<5.0	**10**		
6		UT3	5.5-6.0			**2,900**		<5.0	**6.7**	**17**	**140**		
7		UT3	6.5-7.0			**170**		<5.0	**10**	**22**	**97**		
8	UT4	UT4	4.5-5.0		3' west of Tank 3	**20**		<5.0	<5.0	<5.0	<5.0		
9		UT4	5.5-6.0			**140**		<5.0	<5.0	**5.7**	**29**		
	G2A	None collected		07-Oct-92	5' south of Tank 2								B
1	G2B	GWS-2BS	5.5-6.0		20' south of Tank 2	**318**		<5.0	<5.0	<5.0	<10.0		
2	G2C	GWS-2CS	5.5-6.0		35' south of Tank 2	<5.0		<5.0	<5.0	<5.0	<10.0		
3	G2D	GWS-2DS	3.5-4.0		15' south of Tank 2	<5.0		<5.0	<5.0	<5.0	<10.0		
4	G2E	GWS-2ES	5.5-6.0		18' south of Tank 2	<5.0		<5.0	<5.0	<5.0	<10.0		
5	G2F	GWS-2FS	5.5-6.0		35' SW of Tank 2	<5.0		<5.0	<5.0	<5.0	<10.0		
6	G3A	GWS-3AS	6.0-6.5	07-Oct-92	6' east of Tank 3	**4,100**		<5.0	<5.0	<5.0	<10.0		
7	G3B	GWS-3BS	7.0-7.5	14-Oct-92	12' NW of Tank 3	**130**		<5.0	<5.0	<5.0	<5.0		
8	G3C	GWS-3CS	5.5-6.0	07-Oct-92	6' west of Tank 3	<5.0		<5.0	<5.0	<5.0	<10.0		
9	G3D	GWS-3DS	5.5-6.0	14-Oct-92	20' north of Tank 3	**320**		<5.0	<5.0	<5.0	<5.0		
10	G3E	GWS-3ES	6.0-6.5	14-Oct-92	20' west of Tank 3	<5.0		<5.0	<5.0	<5.0	<5.0		
11	G3F	GWS-3FS	5.5-6.0	08-Oct-92	10' west of Tank 3	**33**		<5.0	<5.0	<5.0	<10.0		
12	G3G	GWS-3GS	5.5-6.0	14-Oct-92	12' west of Tank 3	<5.0		<5.0	<5.0	<5.0	<5.0		
13	G3H	GWS-3HS	5.5-6.0	07-Oct-92	10' east of Tank 3	<5.0		<5.0	<5.0	<5.0	<10.0		
14	G3I	GWS-3IS	5.5-6.0	07-Oct-92	10' SE of Tank 3	<5.0		<5.0	<5.0	<5.0	<10.0		
15	G3J	GWS-3JS	5.5-6.0	08-Oct-92	17' south of Tank 3	<5.0		<5.0	<5.0	<5.0	<10.0		
1	CS1	CS-1	4.5	31-Oct-02	19' south of Tank 2, one foot north of G2B	**5.0**	√						C
2			6			**7,600**	√						
3			11.5			**1.8**	√						

ABBREVIATIONS

mg/Kg = milligrams per kilogram
ug/Kg = micrograms per kilogram
< = below the indicated detection limit
not analyzed

NOTES

1 See Figures 3 and 4 for sample locations.
2 **Detections are in bold**
3 Location distances are approximate
4 The reported diesel concentrations that did not include Silica Gel Cleanup may be greater than actual petroleum hydrocarbon diesel concentrations because Silica Gel Cleanup removes false positive interferences from the organic matter within the fill soils.

TABLE NOTES

1 The unusually high BTEX concentrations reported in sample OPB 3-2B are suspect. The benzene result is especially suspect because of the absence of other benzene detections in any other of the soil samples.
2 The depth of confirmation samples T1A, T2A, and T3A, collected in the tank excavations, is estimated at 6 feet.

REFERENCES

A PG&E, 1990, Preliminary Soil Investigation Report.
B PG&E, 1993, Shallow Soil and Groundwater Investigation Report.
C PG&E, 2002, Confirmation Soil and Groundwater Sampling Report.

[redacted]

	Sample Location ID	Sample ID	Sample Date	Location	Diesel (mg/L)	Silica Gel Cleanup	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	Total Xylenes (ug/L)	Reference
1	O1A	OWS-1A	14-May-91	2' SE of Tank 1	**1.9**		<0.04	<0.04	**8.7**	**16**	
2	O1B	OWS-1B	14-May-91	17' east of Tank 1	<0.05		<0.04	<0.04	<0.05	<0.05	
3	O1C	OWS-1C	14-May-91	17' SE of Tank 1	<0.05		<0.04	<0.04	<0.05	<0.05	
4	O2A	OWS-2A	13-May-91	5' south of Tank 2	**65**		<0.5	<0.5	<0.5	**51**	
5	O2B	OWS-2B	13-May-91	15' south of Tank 2	**12**		<0.5	<0.5	<0.5	<0.5	
6	O2C	OWS-2C	13-May-91	35' south of Tank 2	<0.05		<0.04	<0.04	<0.05	<0.05	
7	O2D	OWS-2D	13-May-91	13' SW of Tank 2	**204**		<0.04	<0.04	<0.05	**73**	A
8	O2E	OWS-2E	14-May-91	40' SW of Tank 2	<0.2		<0.5	<0.5	<0.5	<0.5	
9	O2F	OWS-2F	14-May-91	45' SW of Tank 3	<0.05		<0.04	<0.04	<0.05	<0.05	
10	O3A	OWS-3A	13-May-91	5' east of Tank 3	<0.05		**1.5**	<0.04	**1.6**	**2.4**	
11	O3B	OWS-3B	13-May-91	6' north of Tank 3	**19**		<0.04	<0.04	**20**	<0.05	
12	O3C	OWS-3C	14-May-91	6' west of Tank 3	**8.5**		**3.4**	**1.4**	**4.4**	**5.7**	
13	O3D	OWS-3D	14-May-91	17' NW of Tank 3	**1.0**		**1.1**	<0.04	**1.3**	**1.0**	
14	O3E	OWS-3E	14-May-91	11' west of Tank 3	<0.2		<0.5	<0.5	<0.5	<0.5	
	[redacted]										
1	G2A	GWS-2A	07-Oct-92	5' south of Tank 2	**22**		<0.5	<0.5	<0.5	<1.0	B
2	G2B	GWS-2B		20' south of Tank 2	**160**		<0.5	<0.5	**9.0**	**188**	
3	G2C	GWS-2C		35' south of Tank 2	**0.4**		<0.5	<0.5	<5	<1.0	
4	G2D	GWS-2D		15' south of Tank 2	**23**		<0.5	<0.5	<5	**139**	
5	G2E	GWS-2E		18' south of Tank 2	<0.1		<0.5	<0.5	<5	<1.0	
6	G2F	GWS-2F		35' SW of Tank 2	<0.1		<0.5	<0.5	<5	<1.0	
7	G3A	GWS-3A	14-Oct-92	6' east of Tank 3	**1.3**		<0.5	<0.5	<5	<1.5	
8	G3B	GWS-3B		12' NW of Tank 3	**5.7**		<0.5	<0.5	<5	<1.5	
9	G3E	GWS-3E		20' west of Tank 3	**2.1**		<0.5	<0.5	<5	<1.5	
10	G3H	GWS-3H		10' east of Tank 3	<0.1		<0.5	<0.5	<5	<1.0	
11	G3I	GWS-3I		10' SE of Tank 3	**9.7**		<0.5	<0.5	<5	<1.0	
12	G3J	GWS-3J		17' south of Tank 3	<0.1		<0.5	<0.5	<5	<1.0	
	[redacted]										
1	CS1	CS-1-A	31-Oct-02	19' south of Tank 2	**900**	√	[redacted]				C
2		CS-1-B			**88**	√					

ABBREVIATIONS

ug/L = micrograms per liter

< = below the indicated detection limit

[redacted] not analyzed

NOTES

1 See Figure 5 for sample locations.

2 **Detections are in bold**

3 Location distances are approximate

4 The reported diesel concentrations that did not include Silica Gel Cleanup may be greater than actual petroleum hydrocarbon diesel concentrations because Silica Gel Cleanup removes false positive interferences from the organic matter within the fill soils.

REFERENCES

A PG&E, 1991, Shallow Groundwater Investigation report.

B PG&E, 1993, Shallow Soil and Groundwater Investigation Report.

C PG&E, 2002, Confirmation Soil and Groundwater Sampling Report.

Monitoring Well	Top of Casing Elevation (feet AMSL)	Sample Event No.	Sample Date	Depth to Groundwater (feet)	Groundwater Elevation (feet AMSL)	Diesel (ug/L)	Silica Gel Cleanup	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	Total Xylenes (ug/L)	Notes
MW-1-2	10.43	1	22-Jun-93	5.05	5.38	1,500		<0.5	<0.5	<0.5	<0.5	
		2	22-Sep-93			240		<0.5	<0.5	<0.5	<0.5	
		3	28-Dec-93	4.77	5.66	200		<0.5	<0.5	<0.5	<0.5	
		4	11-Apr-94	4.66	5.77			<0.5	<0.5	<0.5	<0.5	
			20-Apr-94	4.86	5.57	600						
		5	29-Jun-94	5.18	5.25	520						
		6	07-Oct-94	4.55	5.88	590						
		7	03-Jan-95	4.11	6.32	650						
		8	24-Mar-95	3.57	6.86	740						
		9	30-Jun-95	4.69	5.74	540						
		10	12-Oct-95	5.35	5.08	230						
		11	18-Jan-96	4.19	6.24	600						
		12	19-Feb-96	4.03	6.40	670						
		13	28-Feb-97	4.73	5.70	1,800						
		14	24-Feb-98	3.50	6.93	430						
		15	17-Feb-99			130	√					
		16	16-Feb-00	3.42	7.01	710						
		17	01-Mar-01	4.00	6.43	140						
		18	20-Feb-02	4.13	6.30	130	√					
		19	25-Feb-03	4.42	6.01	140	√					
		20	13-Apr-04	4.65	5.78	<100	√					
MW-1-3	10.49	1	22-Jun-93	5.15	5.34	160		<0.5	<0.5	<0.5	<0.5	
		2	22-Sep-93	5.57	4.92	430		<0.5	<0.5	<0.5	<0.5	
		3	28-Dec-93	5.13	5.36	<50		<0.5	<0.5	<0.5	<0.5	
		4	11-Apr-94	5.01	5.48			<0.5	<0.5	<0.5	<0.5	
			20-Apr-94	5.09	5.40	<50						
		5	29-Jun-94	5.30	5.19	280						
		6	07-Oct-94			150						
		7	03-Jan-95	4.62	5.87	210						
		8	24-Mar-95	3.92	6.57	<50						
		9	30-Jun-95	4.89	5.60	231						
		10	12-Oct-95	5.43	5.06	190						
		11	18-Jan-96	4.72	5.77	240						
		12	19-Feb-96	4.41	6.08	290						
		13	28-Feb-97	4.90	5.59	1,500						
		14	24-Feb-98	3.82	6.67	160						
		15	17-Feb-99	4.10	6.39		√					
		16	16-Feb-00			150						
		17	01-Mar-01	4.28	6.21							
		18	20-Feb-02	4.68	5.81	260	√					
		19	25-Feb-03	4.72	5.77	3,100	√					1
		20	13-Apr-04	4.84	5.65	872	√					

[redacted]

Monitoring Well	Top of Casing Elevation (feet AMSL)	Sample Event No.	Sample Date	Depth to Groundwater (feet)	Groundwater Elevation (feet AMSL)	Diesel (ug/L)	Silica Gel Cleanup	Benzene (ug/L)	Toluene (ug/L)	Ethyl-benzene (ug/L)	Total Xylenes (ug/L)	Notes
MW-2-3	10.38	1	22-Jun-93	5.00	5.38	**560**		**3**	<0.5	<0.5	<0.5	
		2	22-Sep-93	5.50	4.88	**460**		<0.5	<0.5	<0.5	<0.5	
		3	28-Dec-93	4.74	5.64	<50		<0.5	<0.5	<0.5	<0.5	
		4	11-Apr-94	5.62	4.76	[redacted]		<0.5	<0.5	<0.5	<0.5	
			20-Apr-94	[redacted]		<50		[redacted]				
		5	29-Jun-94	5.14	5.24	**920**		<0.5	<0.5	<0.5	<0.5	
		6	07-Oct-94	5.50	4.88	<50		**16**	**13**	**6**	**24**	
		7	03-Jan-95	4.11	6.27	**190**		<0.5	<0.5	<0.5	<0.5	
		8	24-Mar-95	3.47	6.91	**110**		<0.5	<0.5	<0.5	<0.5	
		9	30-Jun-95	4.66	5.72	**187**		<0.5	<0.5	<0.5	<0.5	
		10	12-Oct-95	5.30	5.08	**290**		<0.5	<0.5	<0.5	<0.5	
		11	18-Jan-96	4.15	6.23	**370**		[redacted]				
		12	19-Feb-96	3.97	6.41	**320**		[redacted]				
		13	28-Feb-97	4.70	5.68	**810**		[redacted]				
		14	24-Feb-98	3.40	6.98	**140**		[redacted]				
		15	17-Feb-99	3.31	7.07	<50	√	[redacted]				
		16	16-Feb-00	[redacted]	[redacted]	**190**		[redacted]				
		17	01-Mar-01	3.93	6.45	<50		[redacted]				
		18	20-Feb-02	4.13	6.25	<50	√	[redacted]				
		19	25-Feb-03	4.38	6.00	**99**	√	[redacted]				
		20	13-Apr-04	4.61	5.77	[redacted]	√	[redacted]				
		[redacted]										
		[redacted]										
Dup (MW-1-2)		2	22-Sep-93			[redacted]		<0.5	<0.5	<0.5	<0.5	
		3	28-Dec-93			[redacted]		<0.5	<0.5	<0.5	<0.5	
		4	11-Apr-94			[redacted]		<0.5	<0.5	<0.5	<0.5	
		5	30-Jun-95			[redacted]		<0.5	<0.5	<0.5	<0.5	
		20	13-Apr-04			**120**		[redacted]				
Travel Blank		2	22-Sep-93			[redacted]		<0.5	<0.5	<0.5	<0.5	
		3	28-Dec-93			[redacted]		<0.5	<0.5	<0.5	<0.5	
		4	11-Apr-94			[redacted]		<0.5	<0.5	<0.5	<0.5	
		7	03-Jan-95			[redacted]		<0.5	<0.5	<0.5	<0.5	
		8	24-Mar-95			[redacted]		<0.5	0.5	<0.5	<0.5	
		9	30-Jun-95			[redacted]		<0.5	<0.5	<0.5	<0.5	
		10	12-Oct-95			[redacted]		<0.5	<0.5	<0.5	<0.5	
		11	18-Jan-96			<50		[redacted]				
Equipment Blank		12	19-Feb-96			<50		[redacted]				
		13	28-Feb-97			<50		[redacted]				
		14	24-Feb-98			<50		[redacted]				
		15	17-Feb-99			<50		[redacted]				
		16	16-Feb-00			<50		[redacted]				
		17	01-Mar-01			<50		[redacted]				
		18	20-Feb-02			<50		[redacted]				
		19	25-Feb-03			<50		[redacted]				
		20	13-Apr-04			<100		[redacted]				

ABBREVIATIONS

AMSL = Above Mean Sea Level
ug/L = micrograms per liter
< = below the indicated detection limit
[redacted] not analyzed

NOTES

1 See Figures 2, 4, and 5 for monitoring well locations.
2 **Detections are in bold**
3 The top of casing elevations were surveyed by PG&E Corporate Real Estate on 12/12/2001 to NGVD29 (National Geodetic Vertical Datum of 1929).
4 Oakland Power Plant groundwater monitoring reports issued prior to the 2004 report used top of casing elevations that were surveyed to a Port of Oakland datum that is 3.2 feet lower than Mean Sea Level (Weiss, 1993).
5 Low and average diesel concentrations were calculated by assuming that concentrations below the detection limit equaled the detection limit.
6 The two sample dates, 4/11/1994 and 4/20/1994, are considered to comprise the same sample event.
7 The reported diesel concentrations that did not include Silica Gel Cleanup may be greater than actual petroleum hydrocarbon diesel concentrations because Silica Gel Cleanup removes false positive interferences from the organic matter within the fill soils.

TABLE NOTES

1 The unusually high concentration of 3,100 mg/L diesel in the 2/25/2003 MW-1-3 sample may in part be due to interference from abundant fine organic particulates observed in the sample.

	Sample Date	Monitoring Well	Total Depth of Well (feet)	Top of Casing Elevation (feet AMSL)	Depth to Groundwater (feet)	Groundwater Elevation (feet AMSL)	Groundwater Gradient		
							Compass Direction	Bearing (degrees)	Magnitude (foot/foot)
1	06/22/93	MW-1-2	13.6	10.43	5.05	5.38	WNW	290	0.003
		MW-1-3	7.3	10.49	5.15	5.34			
		MW-2-3	13.4	10.38	5.00	5.38			
2	09/22/93	MW-1-2			5.91	4.52	E	80	0.005
		MW-1-3			5.57	4.92			
		MW-2-3			5.50	4.88			
3	12/28/93	MW-1-2			4.77	5.66	NNW	330	0.005
		MW-1-3			5.13	5.36			
		MW-2-3			4.74	5.64			
4	04/11/94	MW-1-2			4.66	5.77	W	260	0.004
		MW-1-3			5.01	5.48			
		MW-2-3			5.62	4.76			
5	04/20/94	MW-1-2			4.86	5.57	NW	320	0.003
		MW-1-3			5.09	5.40			
		MW-2-3			5.83	4.55			
6	06/29/94	MW-1-2			5.18	5.25	NW	325	0.001
		MW-1-3			5.30	5.19			
		MW-2-3			5.14	5.24			
7	10/07/94	MW-1-2			4.55	5.88	WSW	250	0.01
		MW-1-3			5.69	4.80			
		MW-2-3			5.50	4.88			
8	01/03/95	MW-1-2			4.11	6.32	NW	320	0.007
		MW-1-3			4.62	5.87			
		MW-2-3			4.11	6.27			
9	03/24/95	MW-1-2			3.57	6.86	NNW	335	0.006
		MW-1-3			3.91	6.58			
		MW-2-3			3.47	6.91			
10	06/30/95	MW-1-2			4.69	5.74	NW	325	0.002
		MW-1-3			4.89	5.60			
		MW-2-3			4.66	5.72			
11	10/12/95	MW-1-2			5.35	5.08	N	350	0.0005
		MW-1-3			5.43	5.06			
		MW-2-3			5.30	5.08			
12	01/18/96	MW-1-2			4.19	6.24	NNW	330	0.007
		MW-1-3			4.72	5.77			
		MW-2-3			4.15	6.23			
13	02/19/96	MW-1-2			4.03	6.40	NW	315	0.007
		MW-1-3			4.41	6.08			
		MW-2-3			3.97	6.41			
14	02/28/97	MW-1-2			4.73	5.70	SSE	165	0.009
		MW-1-3			4.90	5.59			
		MW-2-3			4.70	5.68			
15	02/24/98	MW-1-2			3.50	6.93	NNW	330	0.007
		MW-1-3			3.82	6.67			
		MW-2-3			3.40	6.98			
16	02/17/99	MW-1-2			3.33	7.10	NW	320	0.009
		MW-1-3			4.10	6.39			
		MW-2-3			3.31	7.07			
17	02/16/00	MW-1-2			3.42	7.01	NNW	335	0.007
		MW-1-3			3.80	6.69			
		MW-2-3			3.27	7.11			
18	03/01/01	MW-1-2			4.00	6.43	NW	320	0.004
		MW-1-3			4.28	6.21			
		MW-2-3			3.93	6.45			
19	02/20/02	MW-1-2			4.13	6.30	NW	325	0.006
		MW-1-3			4.68	5.81			
		MW-2-3			4.13	6.25			
20	02/25/03	MW-1-2			4.42	6.01	NNW	335	0.004
		MW-1-3			4.72	5.77			
		MW-2-3			4.38	6.00			
21	04/13/04	MW-1-2			4.65	5.78	NNW	340	0.002
		MW-1-3			4.84	5.65			
		MW-2-3			4.61	5.77			

ABBREVIATIONS

AMSL = Above Mean Sea Level

NOTES

1 Top of casing elevations were surveyed by PG&E Corporate Real Estate on 12/12/2001 to NGVD29 (National Geodetic Vertical Datum of 1929).

2 Oakland Power Plant groundwater monitoring reports issued prior to the 2004 report used top of casing elevations that were surveyed to a Port of Oakland datum that is 3.2 feet lower than Mean Sea Level (Weiss, 1993).

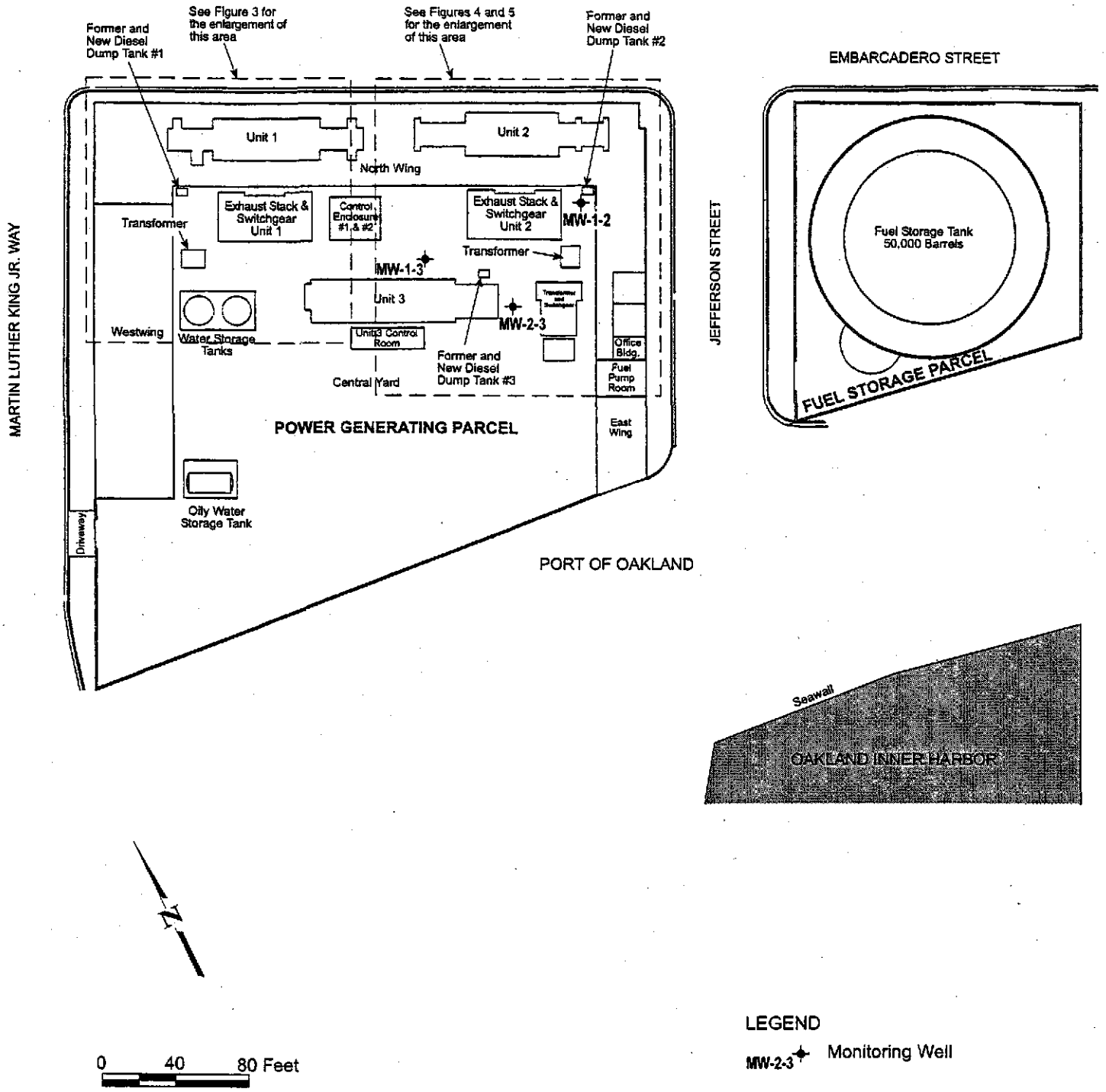


Figure 2. Facility layout of Oakland Power Plant
50 Martin Luther King Jr. Way, Oakland, California

020826/Oakland PP layout

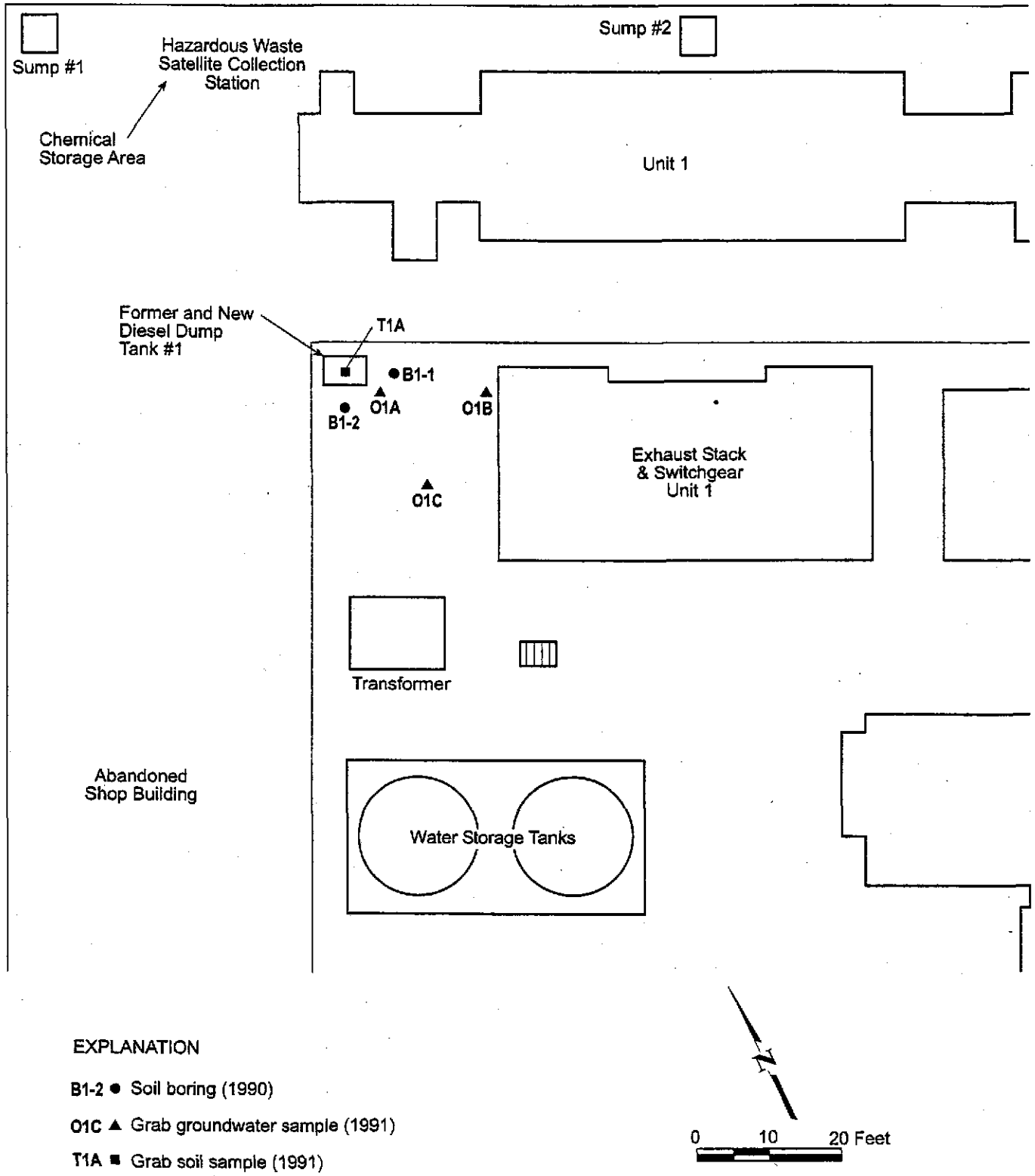


Figure 3. Locations of soil and grabwater samples near Diesel Dump Tank No. 1, Oakland Power Plant, 50 Martin Luther King Jr. Way, Oakland, California

020826/Tank 1 sample locs

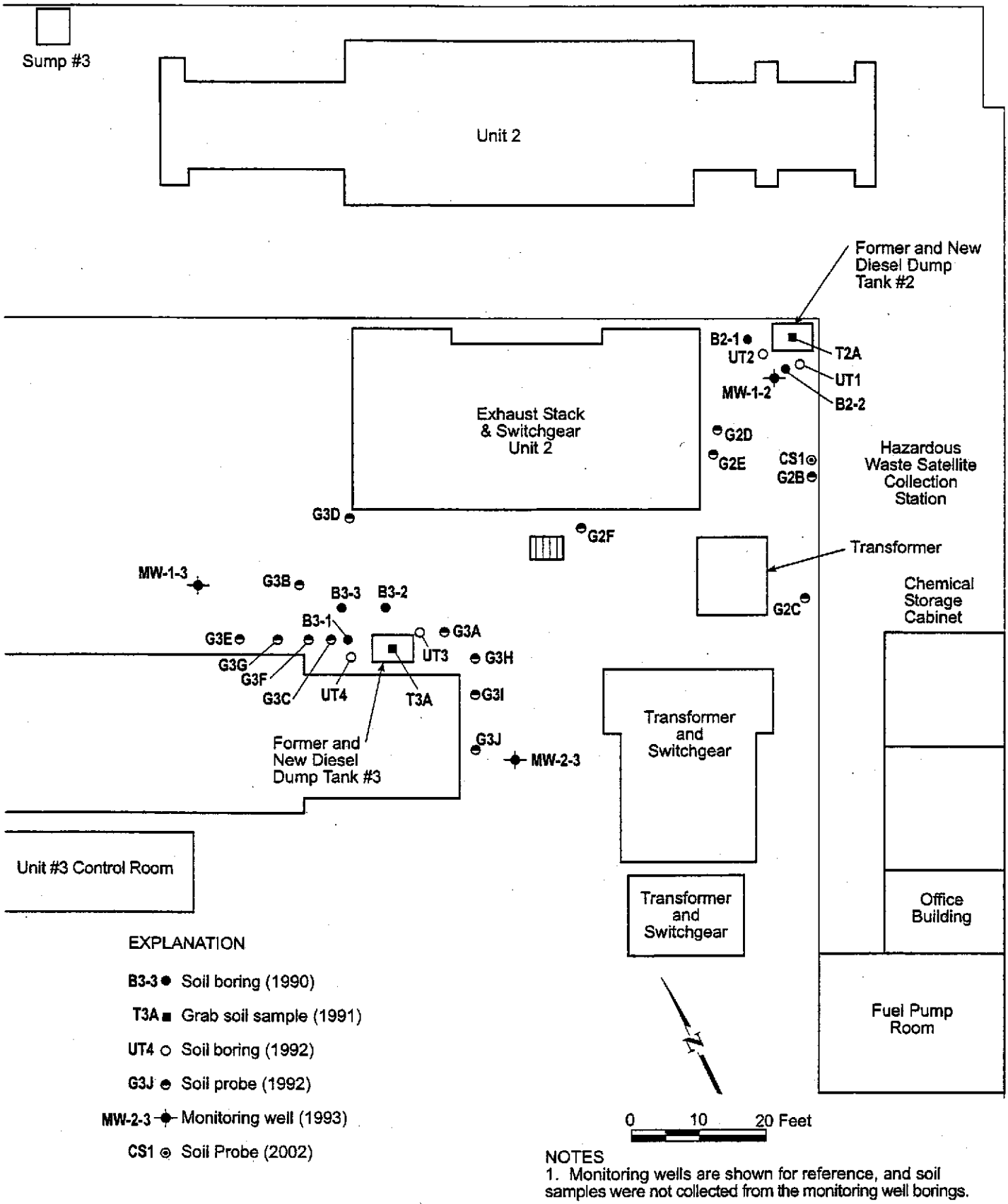


Figure 4. Locations of soil samples near Diesel Dump Tanks 2 and 3, Oakland Power Plant, 50 Martin Luther King Jr. Way, Oakland, California

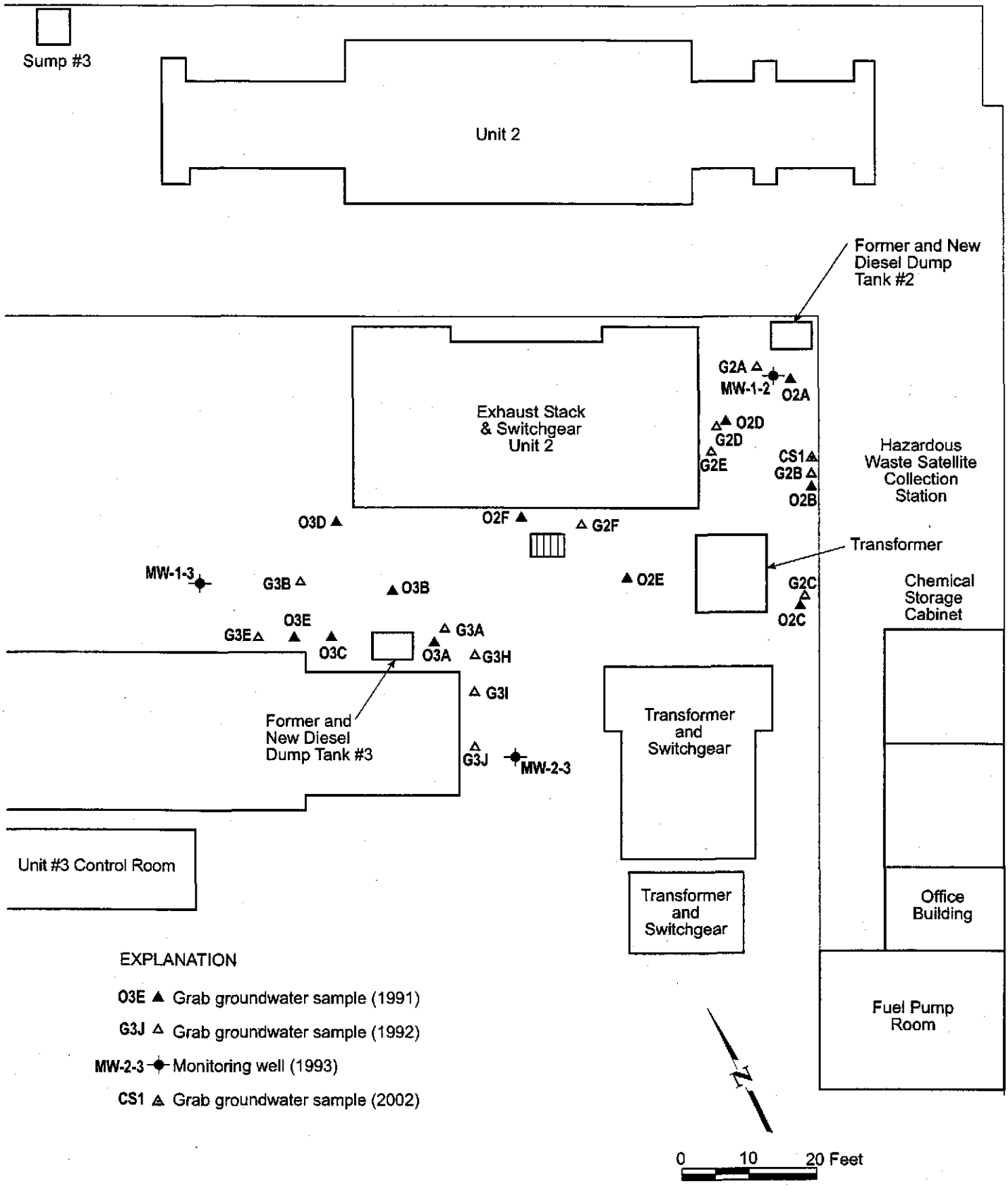


Figure 5. Locations of grab groundwater samples and monitoring wells near Diesel Dump Tanks 2 and 3, Oakland Power Plant, 50 Martin Luther King Jr. Way, Oakland, California

020826/Tank 2 and 3 grab groundwater

Figure 6. Residual diesel concentrations and groundwater levels versus time in three monitoring wells, Diesel Dump Tanks, Oakland Power Plant, 50 Martin Luther King Jr. Way, Oakland, CA

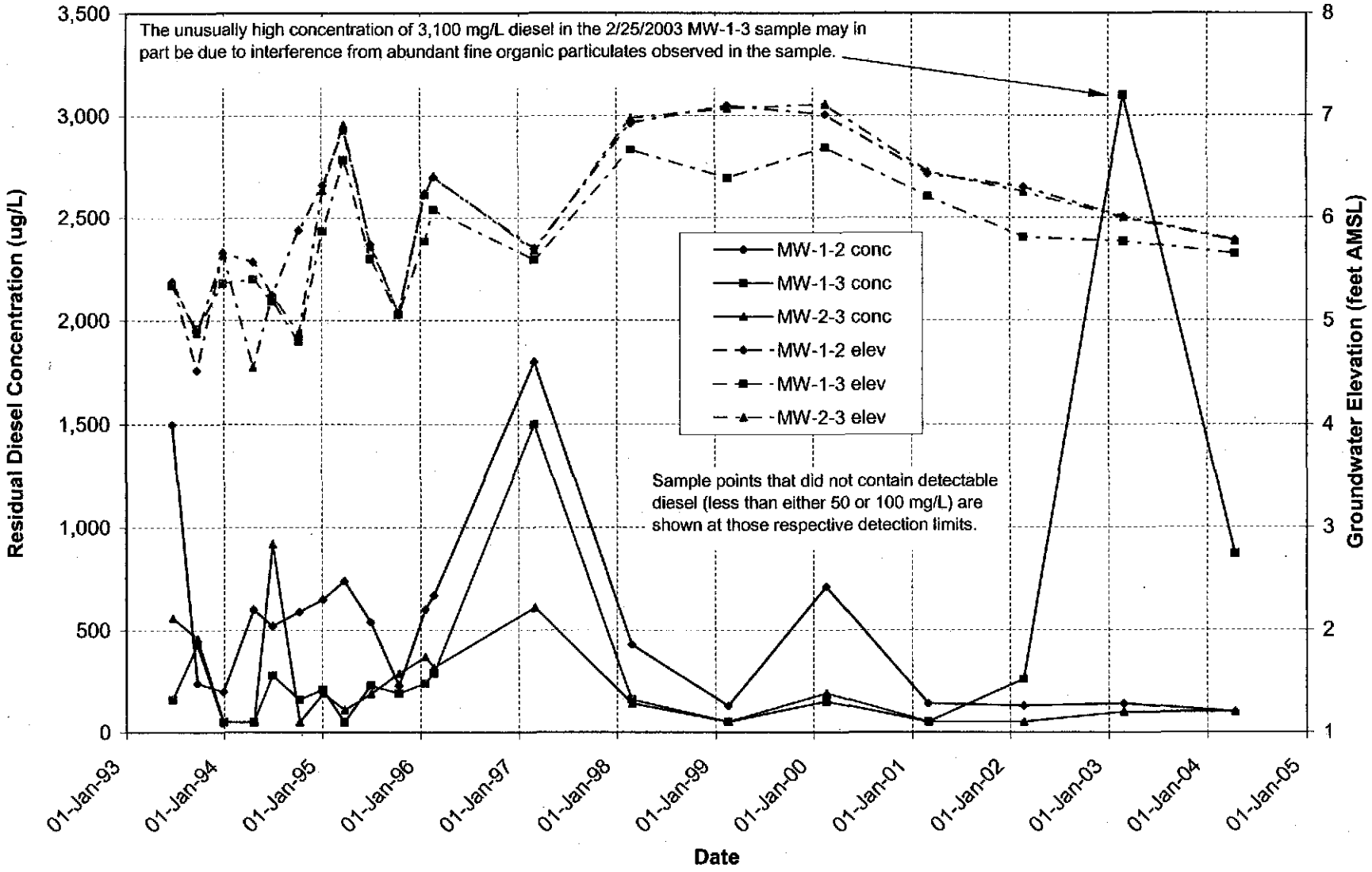
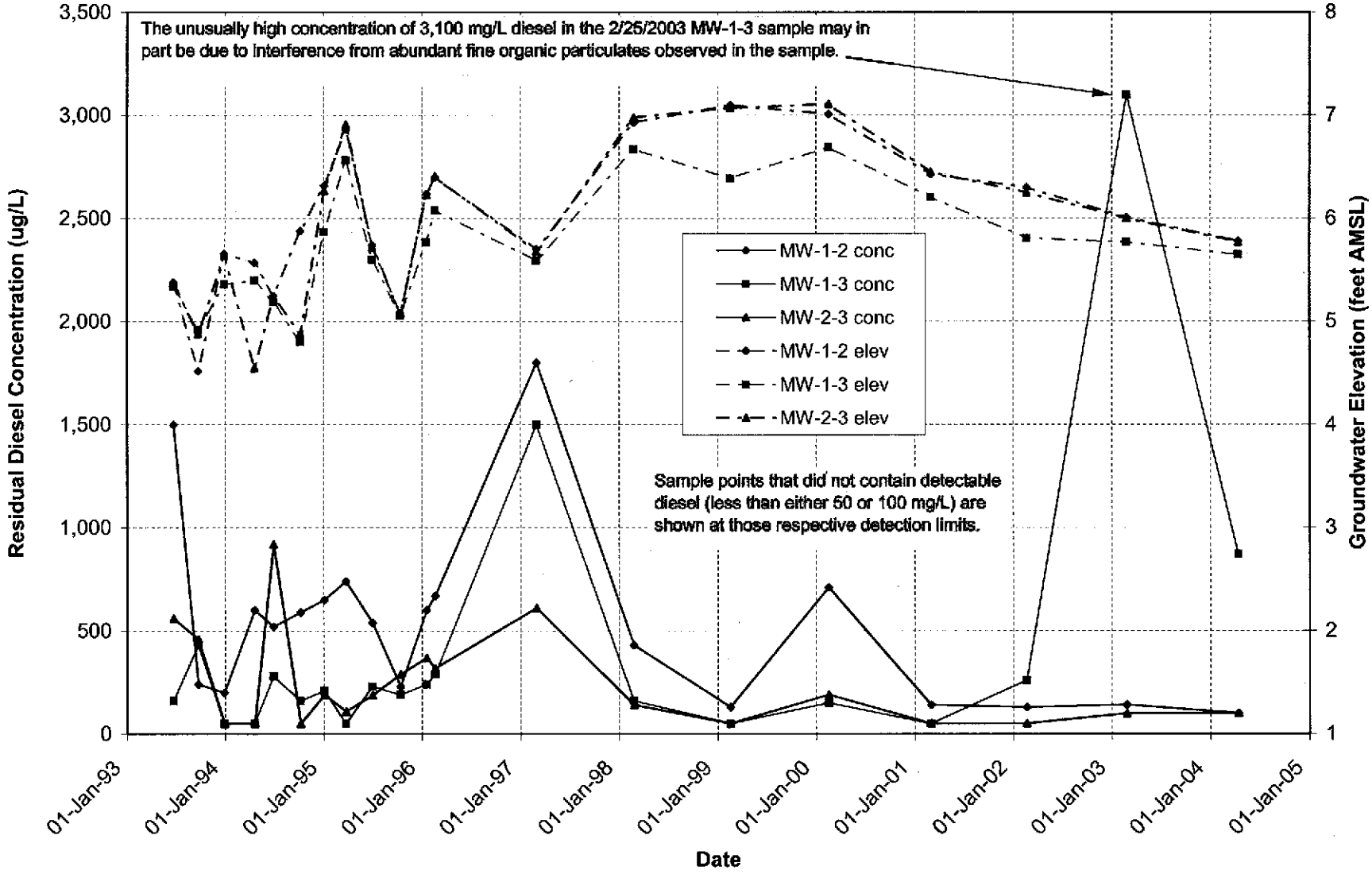
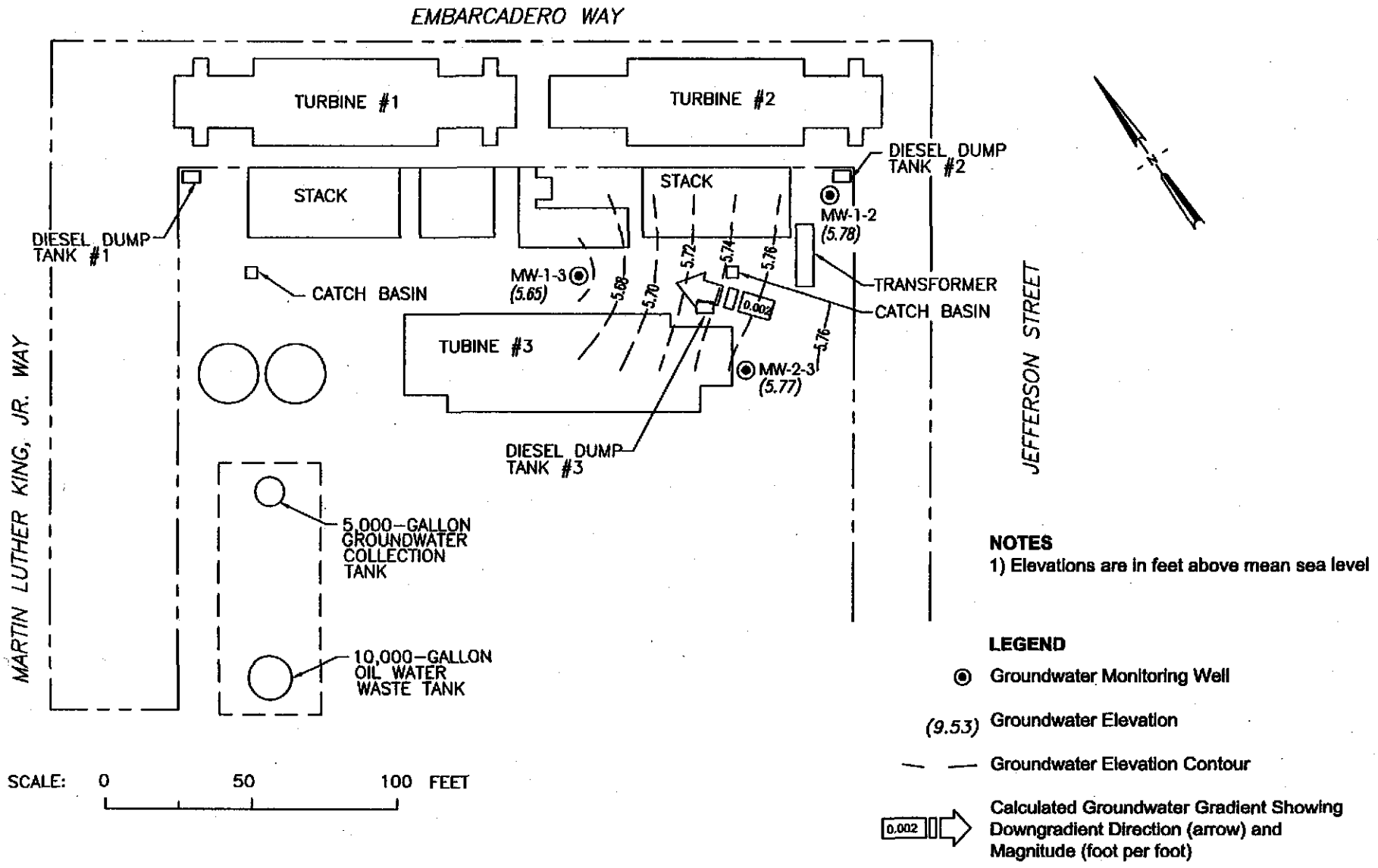


Figure 6. Residual diesel concentrations and groundwater levels versus time in three monitoring wells, Diesel Dump Tanks, Oakland Power Plant, 50 Martin Luther King Jr. Way, Oakland, CA





April 13, 2004 groundwater contour map, Diesel Dump Tanks, Oakland Power Plant, 50 Martin Luther King Jr. Way, Oakland, California.

TECHNICAL AND ECOLOGICAL SERVICES

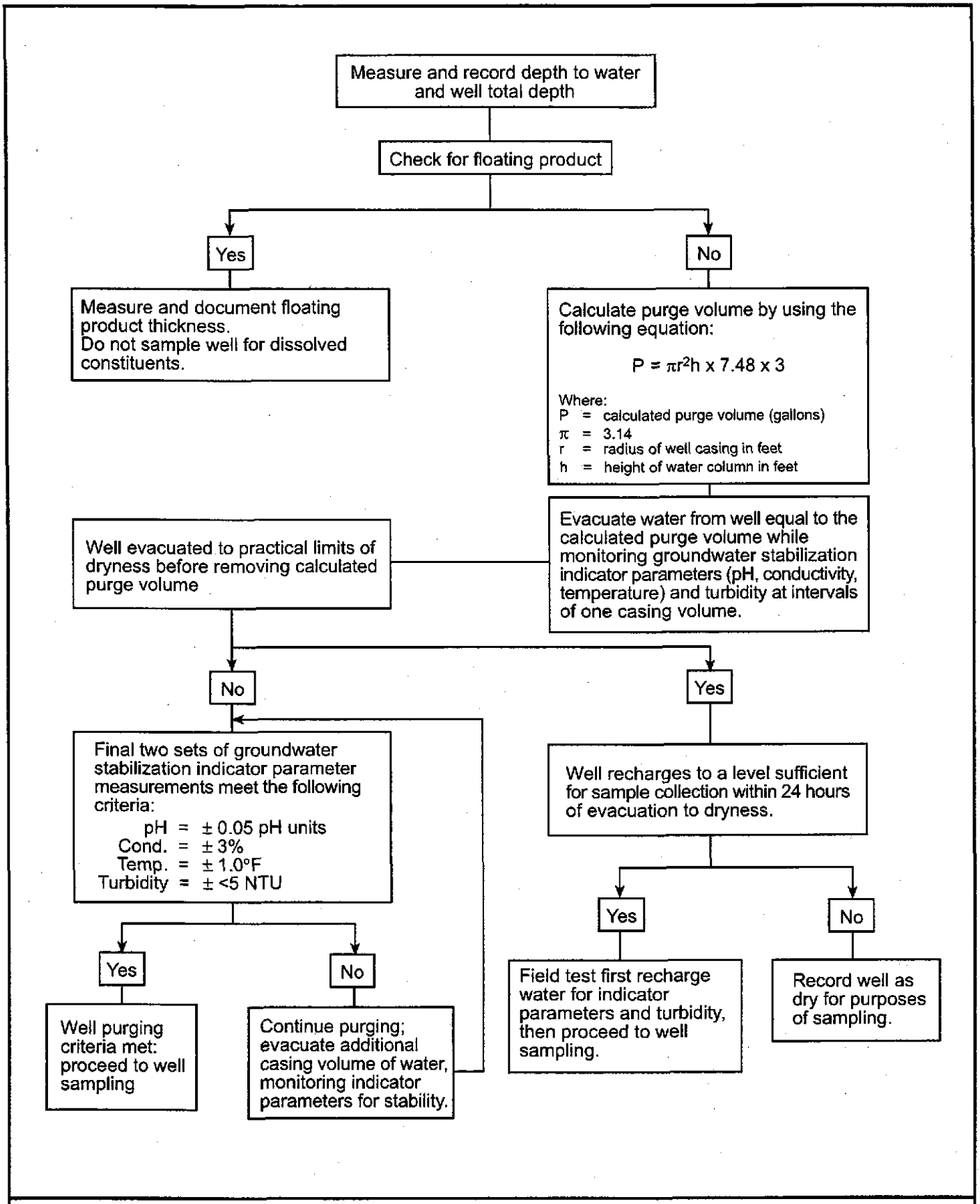
DRN:LKE	DATE : 6-4-04
CHK:JWW	SCALE: AS_SHOWN
APR:JWW	SHEET OAKLAND_PP

Figure 7

REV. 0

Appendix A

Monitoring Well Purging Protocol



PG&E

Monitoring Well Purging Protocol

grndwtr/protocol

Appendix B

Field Forms: Water Level Form and Purging and Sampling Logs

FIELD REPORT
WATER LEVEL / FLOATING PRODUCT SURVEY
PACIFIC GAS & ELECTRIC COMPANY - TES

Site location: OAKLAND PP

Survey date: 4/13/04

Sampler: D.J. WRIGHT

Well ID	Casing elevation (ft, MSL)	Time of level	Total depth (ft)	Depth to water (ft)	Depth to floating product (ft)	Floating product thickness (ft)	Dissolved oxygen (mg/L	Temp. (°C)	Comments
MW1-2	[redacted]	1015		4.65					
MW1-3	[redacted]	1025		4.84					OILY SHEEN.
MW1-3	[redacted]	1020		4.61					

Comments:

Signature

Pacific Gas & Electric Co. - TES

Groundwater Purging and Sampling Log

Site: Oakland PP | Job ID: | Well ID: MW 1-3

Purge date: 4/13/04 | Sampler | Weather: Cloudy

Sample date: 4/13/04 | Sampler

Depth measurements and purge volume calculation

Measuring point: TOC @ | Hydrocarbon odor (yes) no surfaces

Depth of well (DTB): 7.1 ft | Thickness

Depth to water (DTW): 4.84 ft

Total water depth (TD): 2.26 ft

Measurement method: solinst slope indicator

TD		casing factor		gal. per vol.		volumes		total purge volume (gal)
2.26	x	.66	=	1.5	x	3	=	4.5

Casing factor: for 2" dia. = 0.17 gallons per ft.
for 3" dia. = 0.38 gallons per ft.
~~for 4" dia. = 0.66~~ gallons per ft.
for 6" dia. = 1.47 gallons per ft.

Purge water data

Time Start	Time End	Cumulative volume (gal.)	pH	Conductivity (umho/cm)	Turbidity	Temp. (deg. C)	Comments
1402	1403	1.5	7.08	2450	13	19.9	WELL PURGED TO DRYNESS
1412	1413	3.0	7.18	2400	8	20.0	" "
1421	1422	4.5	7.16	2050	1	19.6	" "

Methods

(circle methods used)

Discharge disposal:	~~ground~~ ~~barrel~~	pond	treatment system	
Purging:	~~surface pump~~	bailer	submersible	
Sampling:	~~disp. bailer~~	bailer	dedicated pump	
Decontamination:	soap/DI	pressure wash	dedicated equip.	

Calibration

calibrated (yes) no

temp. corrected (yes) no

pH meter Corning 313

pH 4 = 4.00

pH 7 = 7.04

pH 10 = 10.12

Cond. meter Myron L

std. ~~1,000~~ 700 = 700

std. ~~10,000~~ 7,000 = 7,000

TURBIDITY 0.0 = -0.2

Samples

Sample time: 1500

Lab analyses: TPH-D

Remarks

Pacific Gas & Electric Co. - TES
Groundwater Purging and Sampling Log

Site: OAKLAND A P Job ID: Well ID: MW 1-2
Purge date: 4/13/04 Sampler DURGIN Weather: Sunny, Cool
Sample date: 4/13/04 Sampler DLW

Depth measurements and purge volume calculation

Measuring point: TOC @
Depth of well (DTB): 13.5 ft.
Depth to water (DTW): 4.65 ft.
Total water depth (TD): 8.85 ft.
Measurement method: solinst slope indicator

Hydrocarbon odor (yes) no Sulfurous
Thickness N/A

TD		casing factor		gal. per vol.		volumes		total purge volume (gal)
8.85	x	.66	=	5.8	x	3	=	17.5

Casing factor: for 2" dia. = 0.17 gallons per ft.
for 3" dia. = 0.38 gallons per ft.
for 4" dia. = 0.66 gallons per ft.
for 6" dia. = 1.47 gallons per ft.

Purge water data

Time Start	Time End	Cumulative volume (gal.)	pH	Conductivity (umho/cm)	Turbidity	Temp. (deg. C)	Comments
1125	1129	6.0	6.98	1375	5	17.5	odor
1136	1140	12.0	7.07	1350	0	18.1	Sulfur odor
1146	1500	18.0	7.13	1400	0	18.0	

Methods

(circle methods used)

Discharge disposal:	ground	(barrel)	pond	treatment system
Purging:	(surface pump)	bailer	submersible	
Sampling:	(disp bailer)	bailer	dedicated pump	
Decontamination:	(soap/DI)	pressure wash	dedicated equip.	

Calibration
calibrated (yes) no
temp. corrected (yes) no

pH meter Corning 313
15.8°C
pH 4 = 4.00
pH 7 = 7.04
pH 10 = 10.12

Cond. meter mMHOS/CM
std. ~~1,000~~ = 700 = 700
std. ~~10,000~~ = 7,000 = 7,000

Turbidity 0 NTU = 0.2 NTU

Samples
Sample time: 1445
Lab analyses: TPH-D

Remarks
Also QC AB - 4 of

Pacific Gas & Electric Co. - TES
Groundwater Purging and Sampling Log

Site: BAKLAND PL Job ID: Well ID: MW2-3
Purge date: 4/12/04 Sampler DL Wright Weather: Sunny, Cool
Sample date: 4/13/04 Sampler DLW

Depth measurements and purge volume calculation

Measuring point: TOC @
Depth of well (DTB): 13.3 ft.
Depth to water (DTW): 4.61 ft.
Total water depth (TD): 8.69 ft.
Measurement method: solinst slope indicator
Hydrocarbon odor yes (no)
Thickness

TD		casing factor		gal. per vol.		volumes		total purge volume (gal)
8.69	x	.66	=	5.7	x	3	=	17

Casing factor for 2" dia. = 0.17 gallons per ft.
for 3" dia. = 0.38 gallons per ft.
for 4" dia. = 0.66 gallons per ft.
for 6" dia. = 1.47 gallons per ft.

Purge water data

Time Start	Time End	Cumulative volume (gal.)	pH	Conductivity (umho/cm)	Turbidity	Temp. (deg. C)	Comments
1205	1209	5.5	7.39	2,000	5	19.7	Slow Recharge
1346	1350	10.5	7.20	1650	1	19.9	well purged to Dry (YES)

Methods

(circle methods used)

Discharge disposal: ground barrel pond treatment system
Purging: surface pump bailer submersible
Sampling: disp. bailer bailer dedicated pump
Decontamination: soap/DI pressure wash dedicated equip.

Calibration
calibrated (yes) no
temp. corrected (yes) no

pH meter Oakton 313 @ 15.8°C
pH 4 = 4.00
pH 7 = 7.04
pH 10 = 10.12

Cond. meter myron L
std. ~~1,000~~ 700 = 700
std. ~~10,000~~ 7000 = 7,000

Turbidity 0 = 0.2

Samples
Sample time: 1515
Lab analyses: TPH-D

Remarks

Appendix C

Analytical Laboratory Report
and
Chain of Custody for April 13, 2004 Groundwater Samples

TORRENT LABORATORY, INC.

483 Sinclair Frontage Rd. • Milpitas, CA 95035 • Ph: (408) 263-5258 • Fax: (408) 263-8293

www.torrentlab.com

April 22, 2004

John Woodruff
PG&E Technical and Ecological Services(TES)
3400 Crow Canyon Road
San Ramon, CA 94583

TEL: 925-866-5883
FAX 925-866-5681

RE:

Order No.: 0404042

Dear John Woodruff:

Torrent Laboratory, Inc. received 5 samples on 4/14/2004 for the analyses presented in the following report.

All data for associated QC met EPA or Laboratory specification except where noted in the case narative.

Torrent laboratory Inc. is certified by the State of California, ELAP #1991. If you have any question regarding these tests results, please feel free to contact Environmental Coordinator, Ms. Anu Patel at (408)263-5258;ext: 204.

Sincerely,

Laboratory Director

04/22/04
Date

TORRENT LABORATORY, INC.

483 Sinclair Frontage Rd. • Milpitas, CA 95035 • Ph: (408) 263-5258 • Fax: (408) 263-8293

www.torrentlab.com

Certified Analytical Report of Petroleum Hydrocarbons

Report prepared for: John Woodruff
PG&E Technical and Ecological Services(TE

Date Received: 4/14/2004
Date Reported: 4/22/2004

Client Sample ID: MW1-2-U
Sample Location: Oakland power Plant
Sample Matrix: WATER
Date/Time Sampled 4/13/2004 2:45:00 PM

Lab Sample ID: 0404042-001A
Date Prepared: 4/16/2004

Parameters	Analysis Method	Date Analyzed	RL	Dilution Factor	MRL	Result	Units
TPH (Diesel)	SW8015B	4/16/2004	0.1	1	0.100	ND	mg/L
Surr: Pentacosane	SW8015B	4/16/2004	0	1	50-150	83.0	%REC

Note: Silica gel cleanup employed.

These analyses were performed according to State of California Environmental Laboratory Accreditation program, Certificate # 1991

TORRENT LABORATORY, INC.

483 Sinclair Frontage Rd. • Milpitas, CA 95035 • Ph: (408) 263-5258 • Fax: (408) 263-8293

www.torrentlab.com

Certified Analytical Report of
Petroleum Hydrocarbons

Report prepared for: John Woodruff
PG&E Technical and Ecological Services(TE

Date Received: 4/14/2004
Date Reported: 4/22/2004

Client Sample ID: MW1-3-U
Sample Location: Oakland Power Plant
Sample Matrix: WATER
Date/Time Sampled 4/13/2004 3:00:00 PM

Lab Sample ID: 0404042-002A
Date Prepared: 4/16/2004

Parameters	Analysis Method	Date Analyzed	RL	Dilution Factor	MRL	Result	Units
TPH (Diesel)	SW8015B	4/16/2004	0.1	1	0 100	0.872	mg/L
Surr: Pentacosane	SW8015B	4/16/2004	0	1	50-150	65.0	%REC

Note: Silica gel cleanup employed.

These analyses were performed according to State of California Environmental Laboratory Accreditation program, Certificate # 1991

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483 Sinclair Frontage Rd. • Milpitas, CA 95035 • Ph: (408) 263-5258 • Fax: (408) 263-8293

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Certified Analytical Report of Petroleum Hydrocarbons

Report prepared for: John Woodruff
PG&E Technical and Ecological Services(TE

Date Received: 4/14/2004
Date Reported: 4/22/2004

Client Sample ID: MW2-3-U
Sample Location: Oakland Power Plant
Sample Matrix: WATER
Date/Time Sampled 4/13/2004 3:15:00 PM

Lab Sample ID: 0404042-003A
Date Prepared: 4/16/2004

Parameters	Analysis Method	Date Analyzed	RL	Dilution Factor	MRL	Result	Units
TPH (Diesel)	SW8015B	4/16/2004	0.1	1	0.100	ND	mg/L
Surr: Pentacosane	SW8015B	4/16/2004	0	1	50-150	91.0	%REC

Note: Silica gel cleanup employed.

These analyses were performed according to State of California Environmental Laboratory Accreditation program, Certificate # 1991

TORRENT LABORATORY, INC.

483 Sinclair Frontage Rd. • Milpitas, CA 95035 • Ph: (408) 263-5258 • Fax: (408) 263-8293

www.torrentlab.com

Certified Analytical Report of Petroleum Hydrocarbons

Report prepared for: John Woodruff
PG&E Technical and Ecological Services(TE

Date Received: 4/14/2004
Date Reported: 4/22/2004

Client Sample ID: QCEB-U
Sample Location: Oakland Power Plant
Sample Matrix: WATER
Date/Time Sampled 4/13/2004 10:45:00 AM

Lab Sample ID: 0404042-004A
Date Prepared: 4/16/2004

Parameters	Analysis Method	Date Analyzed	RL	Dilution Factor	MRL	Result	Units
TPH (Diesel)	SW8015B	4/16/2004	0.1	1	0.100	ND	mg/L
Surr: Pentacosane	SW8015B	4/16/2004	0	1	50-150	61.0	%REC

Note: Silica gel cleanup employed.

These analyses were performed according to State of California Environmental Laboratory Accreditation program, Certificate # 1991

TORRENT LABORATORY, INC.

483 Sinclair Frontage Rd. • Milpitas, CA 95035 • Ph: (408) 263-5258 • Fax: (408) 263-8293

www.torrentlab.com

Certified Analytical Report of Petroleum Hydrocarbons

Report prepared for: John Woodruff
PG&E Technical and Ecological Services(TE

Date Received: 4/14/2004
Date Reported: 4/22/2004

Client Sample ID: QCAB-U
Sample Location: Oakland Power Plant
Sample Matrix: WATER
Date/Time Sampled 4/13/2004

Lab Sample ID: 0404042-005A
Date Prepared: 4/16/2004

Parameters	Analysis Method	Date Analyzed	RL	Dilution Factor	MRL	Result	Units
TPH (Diesel)	SW8015B	4/16/2004	0.1	1	0.100	0.120	mg/L
Surr: Pentacosane	SW8015B	4/16/2004	0	1	50-150	69.0	%REC

Note: Silica gel cleanup employed.

These analyses were performed according to State of California Environmental Laboratory Accreditation program, Certificate # 1991

TORRENT LABORATORY, INC.

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www.torrentlab.com

Definitions, legends and Notes

Note	Description
ug/kg	Microgram per kilogram (ppb, part per billion).
ug/L	Microgram per liter (ppb, part per billion).
mg/kg	Milligram per kilogram (ppm, part per million).
mg/L	Milligram per liter (ppm, part per million).
LCS/LCSD	Laboratory control sample/laboratory control sample duplicate.
MDL	Method detection limit.
MRL	Modified reporting limit. When sample is subject to dilution, reporting limit times dilution factor yields MRL.
MS/MSD	Matrix spike/matrix spike duplicate.
N/A	Not applicable.
ND	Not detected at or above detection limit.
NR	Not reported.
QC	Quality Control.
RL	Reporting limit.
% RPD	Percent relative difference.
a	pH was measured immediately upon the receipt of the sample, but it was still done outside the holding time.
sub	Analyzed by subcontracting laboratory, Lab Certificate #

These analyses were performed according to State of California Environmental Laboratory Accreditation program, Certificate # 1991

Torrent Laboratory, Inc.

Date: *22-Apr-04*

CLIENT: PG&E Technical and Ecological Services(T
Work Order: 0404042
Project:

ANALYTICAL QC SUMMARY REPORT

TestCode: TPH_DSL_W_8015B

Sample ID WD040416A-MB	SampType: MBLK	TestCode: TPH_DSL_W	Units: mg/L	Prep Date: 4/16/2004	Run ID: SVOCGC1_040416A
Client ID: ZZZZZ	Batch ID: R3290	TestNo: SW8015B		Analysis Date: 4/16/2004	SeqNo: 47500

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPH (Diesel)	0.039	0.100									J
Surr: Pentacosane	0.068	0	0.1	0	68	50	150	0	0		

Sample ID WD040416A-LCS	SampType: LCS	TestCode: TPH_DSL_W	Units: mg/L	Prep Date: 4/16/2004	Run ID: SVOCGC1_040416A
Client ID: ZZZZZ	Batch ID: R3290	TestNo: SW8015B		Analysis Date: 4/16/2004	SeqNo: 47501

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPH (Diesel)	0.767	0.100	1	0.039	72.8	50	150	0	0		
Surr: Pentacosane	0.073	0	0.1	0	73	50	150	0	0		

Sample ID WD040416A-LCSD	SampType: LCSD	TestCode: TPH_DSL_W	Units: mg/L	Prep Date: 4/16/2004	Run ID: SVOCGC1_040416A
Client ID: ZZZZZ	Batch ID: R3290	TestNo: SW8015B		Analysis Date: 4/16/2004	SeqNo: 47502

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPH (Diesel)	0.758	0.100	1	0.039	71.9	50	150	0.767	1.18	30	
Surr: Pentacosane	0.09	0	0.1	0	90	50	150	0	0	0	

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

Chain of Custody Record | **Pacific Gas and Electric Company** | **Lab's W.O. # 0404042**

Client: PG&E Technical and Ecological Services (TES)	Project Manager: John Woodruff - PG&E (jxwf@pge.com)		Date: April 13, 2004
Address: 3400 Crow Canyon Road	Telephone Number: 925.866.5883	Fax Number: 925.866.5681	Laboratory: Torrent Laboratory, Inc.
City: San Ramon; State: CA; Zip Code: 94583	Site Contact: None		Laboratory Phone: 408.263.5258
Project Number/Name: Oakland Power Plant	Sampler: Dawson Wright		Laboratory Fax: 408.263.8293
Contract/Purchase Order/Quote Number: 4600013885	Laboratory Contact: Mukesh Jani, Anu Patel (anupatel@torrentlab.com, analysis@torrentlab.com). www.torrentlab.com		

Sample I.D. Number and Description	Date	Time	Sample Type	Containers Volume	Containers Type	Containers No.	Preservative	Condition on Receipt/Comments (0404042 Torrent's Id.)	Ice	Diesel with Silica Gel Cleanup	Hold
MW1-2-U	13-Apr-2004	1445	Water	1000ml	Amber	1.		0404042-001A	X	X	
MW1-3-U	↓	1500	↓	↓	↓	↓		0404042-002A	↓	↓	
MW2-3-U	↓	1515	↓	↓	↓	↓		0404042-003A	↓	↓	
QCEB-U	↓	1045	↓	↓	↓	↓		0404042-004A	↓	↓	
QCAB-U	↓		↓	↓	↓	↓		0404042-005A	↓	↓	

Special Instructions: Email and send Lab Report to John Woodruff. Produce EDD files and email to Eric Kenzler at EMK1@pge.com, 925.866.5806 (State Tank Fund Site, Global ID No. T0600100992).

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☑ Archive for 1 Months

Turn Around Time Required: ☑ 10 Working Days ☐ Rush ☐ Other

QC Level: ☐ I. ☐ II. ☐ III.

Project Specific Requirements (Specify)

1. Relinquished By: Dawson Wright	Date: 4/13/04	Time: 17:00	1. Received By: SAS Mike - World Courier	Date: 041404	Time: 0800
2. Relinquished By: SAS Mike	Date: 041404	Time: 10:30	2. Received By: Apatel	Date: 4/14/04	Time: 10:30

Were samples received in good condition? ☐ Yes ☐ No

Samples on Ice? ☐ Yes ☐ No

Method of shipment

Sample seals intact? ☐ Yes ☐ No

Comments: Sample containers: One one-liter amber botle for each sample.

PG&E

COC Oakland_PP_GW_Torrent.xls