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POINT MOLATE NAVAL FUEL DEPOT

SITE INSPECTION

FINAL SUMMARY REPORT

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COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY
CLEAN
Western Division

Contract Number N62474-88-D-5086

Contract Task Order 0010

NAVY ENGINEER-IN-CHARGE: MR. ALLAN FUNG

PRC PROJECT MANAGER: MR. DAVID L. WEST

POINT MOLATE NAVAL FUEL DEPOT
SITE INSPECTION
DRAFT SUMMARY REPORT

Prepared By

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August 26, 1992

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1.0 INTRODUCTION

PRC Environmental Management, Inc. (PRC) received contract task order (CTO) 0010 from the Naval Facilities Engineering Command, Western Division (WESTDIV) under the Comprehensive Long-term Environmental Action Navy (CLEAN) contract number N62474-88-D-5086. Under this CTO, PRC performed a site inspection (SI) at Naval Supply Center Oakland, Point Molate site, near Richmond, California. Point Molate site is an active naval fuel depot. From September 14 to October 6, 1990, PRC investigated three areas within the fuel depot. The areas included a waste disposal area (landfill), sandblast grit disposal areas, and the treatment ponds area (wastewater treatment plant). The waste disposal area is hereafter referred to as the landfill.

On April 5, 1991, PRC submitted a draft SI summary report, discussing the results of the investigation of the landfill, the sandblast grit disposal areas, and the treatment ponds area. The following report is the final submittal summarizing the SI (PRC, 1991a).

CTO 0010 also required the development of a site-wide ground-water monitoring plan for Point Molate Fuel Depot (PMFD). The ground-water monitoring plan and a related site characterization study were submitted to WESTDIV on July 10, 1991 (PRC, 1991b). The ground-water monitoring plan and characterization study was designed to incorporate and follow up with the results of a site-wide shallow soil investigation conducted by Environmental Resources Management-West, Inc. (ERM-West) during April 1989 through September 1990 (ERM-West, 1990). The ERM-West shallow soil investigation may be considered a site-wide SI within the hillside and shoreline areas with exception to those areas investigated under CTO 0010.

The treatment ponds area, previously investigated by PRC in 1990 and Harding Lawson Associates (HLA) in 1973, 1981, and 1984, is a known source of hydrocarbon contamination in subsurface soils and fill material and within the shallow ground-water table. A prioritized investigation and evaluation of corrective action(s) within the treatment ponds area was issued under a new CTO in July 1991 as a result of SI recommendations (PRC, 1991a). The investigation is referred to as the Treatment Ponds Area Characterization Study and Interim Corrective Action Evaluation, and is numbered CTO 0143. The prioritized investigation of the treatment ponds area

was initiated in August 1991. The results of this comprehensive and focused characterization within the treatment ponds area will be submitted in the fall of 1992.

1.1 SITE HISTORY

PMFD covers more than 300 acres in the Potrero Hills near Richmond, California along the eastern shore of San Francisco Bay. PMFD is located approximately 1.5 miles north of the Richmond-San Raphael Bridge and approximately 2 miles northwest of the city of Richmond. PMFD is bordered to the north by Point San Pablo, south and east by Chevron Oil Corporation of California and to the west by San Francisco Bay. The majority of land around PMFD is used for oil refining and storage. Topography at PMFD ranges from flat, reclaimed tidal marsh at sea level to steep, dissected slopes almost 500 feet above mean sea level.

PMFD began operations in the early 1940s. It currently stores over 40 million gallons of fuel and oil in 29 underground and aboveground bulk storage tanks. PMFD also has three smaller capacity secondary storage tanks (one of which is abandoned), one inactive waste disposal site, an oil reclamation and storage facility, an operating oily wastewater treatment plant, and a sewage treatment plant.

In 1981, a large diesel fuel leak was discovered at PMFD. In response to this and previous uncontrolled releases, WESTDIV initiated a series of characterization and prevention activities. The Naval Energy and Environmental Support Activity (NEESA) performed a preliminary assessment (PA) at PMFD on September 22, 1987. The PA report (NEESA, 1988) recommended an SI under the Department of the Navy's Installation Restoration Program (IRP) for Sites 1 and 2 described below. Site 3 was identified and recommended for inclusion in the SI after the PA was completed. More extensive characterization of Site 3, treatment ponds area, was initiated under a prioritized CTO (CTO 143) as discussed in the introduction. Sites 1, 2, 3, and storage tank locations are shown on Figure 1. The following sections describe the three SI sites.

1.1.1 SITE 1 - WASTE DISPOSAL AREA

The waste disposal area near Tank 20 is a landfill located in a ravine near the center of PMFD, south of Tank 7. The waste disposal area is here after referred to as the landfill. It was used for the disposal of fuel depot waste materials generated by PMFD activities. Use of the site began in the 1940s and continued for at least 20 years. The types of waste included construction debris (rebar and wood scraps), cans and drums, and possibly other materials. The amount of waste disposed at the site is unknown. The waste was covered with soil and may extend as much as 50 feet below the present ground surface. Oil seepage was discovered at the base of the ravine below the disposal site in 1978. The suspected source was pipes or vent lines near Tank 14 upgradient from the disposal site. After the discovery of this seep, marine diesel fuel (F-76) from the Tank 14 leak was captured in a ditch at the base of the ravine. Additionally, a jet fuel (JP-5) spill from Valve Box 9 (near Tank 14) occurred in 1979 or 1980, and flowed through the landfill. Contaminated surface soils were also reportedly removed. A more recent leak was discovered in March 1990. This leak was associated with the pipeline near Valve Box 7 and resulted in a loss of approximately 5,000 gallons of JP-5. Two monitoring/extraction wells were installed by ERM-West in response to this leak, and a french drain recovery system was installed by the Navy further downgradient within the ravine. Approximately 4,200 gallons of JP-5 reportedly were recovered.

1.1.2 SITE 2 - SANDBLAST GRIT DISPOSAL AREAS

Sandblast grit from past metal cleaning operations was disposed at several locations, including near the Building 85 paint shop and behind the Building 123 maintenance shop. This area has been designated as Site 2A as shown on Figure 1. Turpentine and paint thinner reportedly were dumped on at least one occasion (not a regular practice) at a clay drain pipe near Building 85. These buildings are located approximately 600 feet east of the PMFD administrative building. Portions of the drum storage area number 2 (south drum lot) were used for metal cleaning by a subcontractor (PRC, 1990a). This area has been designated as Site 2B as shown in Figure 1. Sandblast grit from metal cleaning operations at Building 85 and Building 123 was disposed by PMFD personnel on the eastern edge of the south drum lot; however, this material was subsequently covered by excavation of fill material in the adjacent hillside. The quantities of grit disposed at the south drum lot included

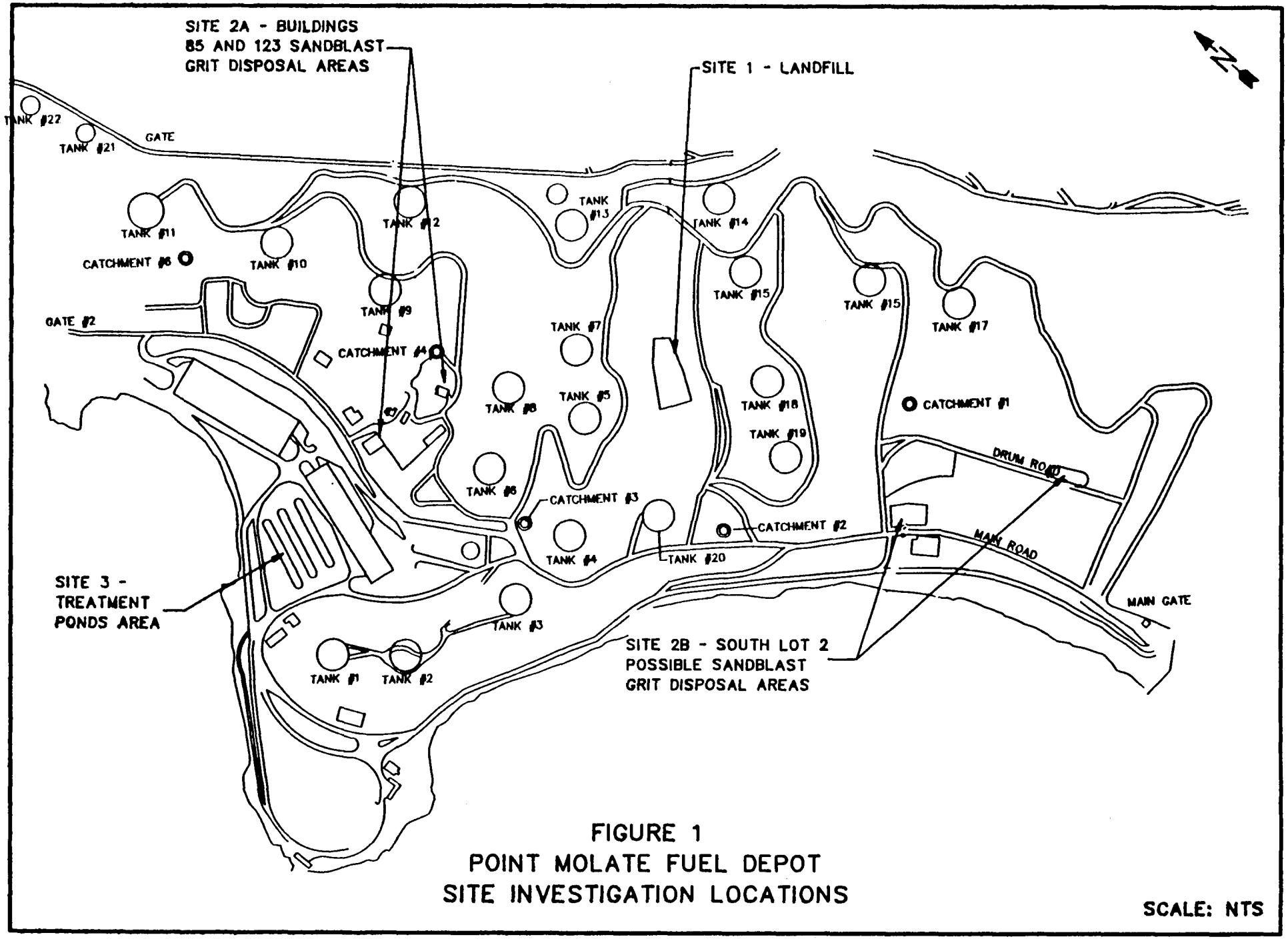

FIGURE 1
POINT MOLATE FUEL DEPOT
SITE INVESTIGATION LOCATIONS

SCALE: NTS

several front end loader buckets (PRC, 1990a). Although sandblast grit was observed on the ground in small quantities (less than 1 cubic yard) at various locations, the most significant accumulation of grit was behind the Building 123 maintenance shop.

1.1.3 SITE 3 - TREATMENT PONDS AREA

The treatment ponds area includes three aeration basins (ponds) located over a former sump pond. The site also includes a wastewater treatment plant, fuel reclamation facility, and a sewage treatment plant. The entire treatment ponds area is constructed above what used to be tidal flats. The shoreline extended nearly to the edge of the PMFD administration building. Only a strip of land, constructed above the tidal flats to support a railroad, separated the bay from the former sump pond. The sump pond, installed in the early 1940s, apparently contained bunker fuel, tank sludges, contaminated fuels, leaking drums, and other liquid wastes. Other materials, including up to six railroad cars of used batteries, were disposed in the sump pond (PRC, 1990a). A sheet piling cutoff wall associated with the sump pond was installed in the early 1940s. The cutoff wall extends to depths of 4.5 to 24 feet below the ground surface. It provided a partial barrier to subsurface flow toward the bay. The integrity of this cutoff wall is not known. In 1974, the sump pond was closed. Liquids in the sump pond were pumped out and sent to neighboring refineries for reprocessing. Some sludge and waste, including the batteries, were removed before backfilling the pond with material excavated from the south drum lot (PRC, 1990a) and possibly other areas. The remaining sludge was tilled with the clean fill material; however, an undetermined quantity of sludge remained in the former sump pond area. The present wastewater treatment facility and aeration ponds were constructed over the fill. The treatment ponds are unlined and are approximately 6 feet deep. The treatment ponds are about 140 feet from the shoreline.

1.2 HISTORY OF LEAKS, SPILLS AND TANK USAGE

The history of known leaks and spills has been well documented by ERM-West in its report for the shallow soil investigation for PMFD (ERM-West, 1990). According to this report, Point Molate personnel provided the most helpful information when compiling data from known leaks or spills. Some information also was available from tank history cards. A fire at PMFD in 1977

destroyed many of the previously existing records. Point Molate personnel were also very helpful as a source of information for the current report. Table 1 is an updated version of the table included in the ERM-West report, and provides information on the history of known leaks at PMFD, as well as information on more recent leaks or spills. This table is included as a historical summary and will also be helpful in referencing site-specific locations discussed in this summary report. Tank and valve box locations, catchments, and the approximate extent of known or historical spills or leaks or petroleum contaminated areas are shown on Plate 1.

The following information for tank usage and construction is also summarized from ERM-West (1990). Other than general information from the tank history cards, records of tank construction were not located. On-site personnel, however, have indicated that Tanks 1 through 20 were constructed directly in the bedrock hillsides. Bedrock was blasted in the slope of the hillside to create space for the tanks, then concrete walls were poured in wooden forms in direct contact with bedrock.

French drains, of unknown composition, were constructed around the tanks and drain into a steel-grated valve box adjacent to each tank. There have been no recorded tank leaks, but in the event of a leak, the french drains would funnel fuel into the valve box for collection and transport to the wastewater treatment plant. The tanks were covered with the blasted rock gravel and fill material. Tanks 21 through 24, located on Chevron property, were built by and are leased from Chevron.

Several different fuels have been stored in Tanks 1 through 24. Navy special fuel oil (NSFO), a black, viscous bunker fuel, was stored first in Tanks 1 through 20. Tanks 1 through 9 have contained diesel fuel and jet turbine fuel subsequent to containing NSFO. Aviation gasoline has been stored in five tanks (Tanks 11, 21, 22, 23, and 24), motor gasoline in four (Tanks 21, 22, 23, and 24), and ballast in one (Tank 20).

Current tank usage is limited to F-76 (diesel fuel marine); JP-5 (jet turbine fuel); reclaimed fuels (fuel oil recovery); defuel mixtures (fuel, fresh water, and sediment mixtures) from off-loading of Naval vessels; and off load fuel (fuel from Naval vessels). Tank usage is summarized as follows:

TABLE 1

POINT MOLATE FUEL DEPOT
HISTORY OF KNOWN LEAKS

Source: ERM-West, 1990

Structure	Location	Product	Source of Information	Notes
Pipeline	Between Tank 7 and Valve Box 16	F-76	Personnel	1981, contractor damaged pipeline with a backhoe, leak remained undetected for 18 months before product seeps were discovered
Sump Pond	Beneath present-day wastewater treatment ponds	liquid fuels/NSFO/ wastes/batteries	Personnel	Sediment from tank cleaning was dumped here
Pipeline	Unclear - Between Tanks 4 and 5	F-76	Personnel	1980
Pipeline	Near Tank 4	JP-5	Personnel	1988 - 10-inch pipeline leak associated with Tank 4
Valve Box 19	Near Administration Building	NSFO	Personnel	Patched three times, 1970 - 1975
Tank 17	Downhill from Tank 17	NSFO	Personnel	20+ years ago - overfill extended to Bay
Tank 10	Downhill from Tank 10	F-76	Personnel	20+ years ago - overfill
Valve Box 3	Near Main Road, south of Catchment #2	SFO	Personnel	Leak about 15 years ago
Pipeline	Between Tank 6 and Valve Box 14	F-76	Personnel	Recent (within last 2 years)
Pipeline	Near Tank 13	F-76	Personnel	1978
Pipeline	Below Tank 11	JP-5	Tank history cards	Seepage discovered 1979 - lost fuel for 6 - 12 months

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TABLE 1
(Continued)

POINT MOLATE FUEL DEPOT
HISTORY OF KNOWN LEAKS

Source: ERM-West, 1990

Structure	Location	Product	Source of Information	Notes
Pipeline or Valve Box	Between Valve Box 7 and Valve Box 8	JP-5	ERM-West Point Molate	March, 1990 - Approximately 5,000 gallons, 4,200 gallons recovered. Flowed into ravine below landfill. ERM-WEST installed 2 extraction wells; Navy installed 2 french drain extraction systems
Valve Box 9	Downgradient of valve box towards landfill	JP-5	Personnel communication	1979 - 1980
Vent Lines of Tank 14	Near Tank 14	F-76	Tank history cards, personnel	Seepage discovered 1978 at base of hill; product flowed through landfill to near Tank 20
Vent Lines of Tank 19	Near Tank 19	F-76	Tank history cards	Seepage discovered 1978
Pipeline	Near Valve Box 2	BS&W	Tank history cards	Three leaks discovered 1975 - 1976
Waste Disposal Site (Landfill)	Along D Road, above Tank 20	Unknown - possibly paint and oil, tank bottoms, and sludge from former sump pond	Point Molate records, personnel	Quantity estimated at less than 5,000 gallons

NOTE:

F-76 = Diesel Fuel Marine JP-5 = Jet Turbine Fuel NSFO = Navy Special Fuel Oil (Bunker Fuel) BS&W = Ballast, Salt, and Water

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F-76:	Tanks 1, 2, 5 through 13, and 21 through 24
JP-5:	Tanks 3, 4, 14 through 19
Defuel tanks:	Tanks 20, B, C
Off load tanks:	Tanks F and G
Fuel oil recovery:	Tank E

The tanks are cleaned periodically, a record of which is maintained on the tank history cards. The tanks are currently being poly-coated as they are cleaned to strengthen them, lengthen tank life, and prevent leakage. In addition, the tank contents are inventoried quarterly to check for possible leaks. Tank integrity testing has been conducted in another study. Volumetric tank inventory testing is performed annually. New methods of tank inventory testing are currently being investigated.

Two of the more extensive fuel spills, discussed in Table 1, flowed toward or within two of the SI sites: the landfill and the south drum lot. An F-76 leak from vent lines associated with Tank 14 flowed into the steep ravine directly below Tank 14 and through or below the landfill toward Catchment #2. Seepage was discovered in 1978 at the base of the hill near Catchment #2. An NSFO spill occurred over 20 years ago from an overfill at Tank 17. This spill, extending into San Francisco Bay, flowed near the south drum lot. However, it did not impact potential sandblast grit disposal areas within the south drum lot.

The treatment ponds area may have been impacted from nearby (upgradient) fuel system leaks or spills; however, the former sump pond was apparently the major source of product found in nearby (downgradient) monitoring wells.

1.3 SUMMARY OF PREVIOUS INVESTIGATIONS

Several earlier studies, from 1973 to 1982, have been completed at PMFD, primarily targeted at both spill prevention control (engineering measures) and assessment of site conditions (site characterization). These early studies were not reviewed because they were not available at the time of SI activities, site conditions have changed since these earlier studies, and they were not directly or

only partially applicable to the SI sites. These studies are listed below, however, to provide a historical summary of earlier investigations.

- Harding Lawson Associates, 1973, Engineering Services to Determine Extent of and Correction Measures for Possible Subsurface Intrusion of Oil at the Naval Fuel Department, Point Molate, California
- Bissell & Karn, Inc., 1979, Spill Prevention Control and Counter Measures Plan
- Navy Public Works Center, 1979, Environmental Impact Assessment for the Oil Spill Prevention Facility
- Harding Lawson Associates, 1981, Soil Investigation, Sewer Outfall, Point Molate, Richmond, California
- Associated Geotechnical Engineering, 1981, Leakage from Underground Fuel Tanks, Point Molate, U.S. Naval Fuel Depot, Richmond, California
- Bissell & Karn, Inc., 1982, Engineering Study for the Fuel Oil Valve Box Drainage Problem

Studies completed at PMFD from 1982 to 1990 have included the following:

- Graham and Kellam, 1984, Harding Lawson Associates, and Buonaccorsi and Associates, Concept Study, Oil Spill Prevention at Point Molate Fuel Depot (P-075)
- Harding Lawson Associates, 1985, Additional soil borings along Burma Road (No Report); Tracer soil gas survey along Burma Road (No Report)
- EnviroServ, Inc., 1987, Preliminary Investigation of Pressure Measurements to Monitor Inventory for Large Underground Storage Tanks
- NEESA, 1988, Preliminary Assessment Report, Point Molate Fuel Depot
- ERM-West, 1990, Shallow Soil Investigation for Point Molate Naval Fuel Depot

The above studies are discussed in more detail as follows.

In May 1984, Graham & Kellam, in conjunction with HLA and Buonaccorsi & Associates, prepared a concept study for oil spill prevention (P-075). The report summarizes a subsurface investigation by HLA as well as an engineering concept study by Buonaccorsi and Associates. HLA's investigation included geophysical refraction profiling, soil borings, monitoring well installation, ground-water sampling, and recommendations for further work. Buonaccorsi and Associates' study addressed oil/water separation at the valve boxes and catch basins and proposed construction of systems to implement the process.

A set of detailed construction plans, dated 1986, supplement the concept study (P-075). Also included in these plans are locations of 24 borings installed by HLA in 1985 and a set of drawings summarizing the associated soil gas survey performed by Tracer Research along Burma Road in December 1985.

These 24 borings installed by HLA were limited to a 200-foot long area along Burma Road, and were used to define the extent of hydrocarbons in the subsurface for this particular area. Three cross-sections were included, showing generalized lithologies encountered in each boring. Boring data were also included indicating the depth, thickness, and type (based on visual identification) of hydrocarbons encountered.

Construction details for the pre-existing wells mentioned in the P-075 report, water level measurements, records of oil recovery from extraction wells, and a report of the soil gas survey, documented in the construction plans (P-075), were not located.

In September 1987, EnviroServ, Inc. submitted a study entitled Preliminary Investigation of Pressure Measurements to Monitor Inventory for Large Underground Fuel Storage Tanks. The study proposed a method for monitoring large underground storage tank inventories and recommended a more broad-based project for further study.

In April 1988, the Naval Energy and Environmental Support Activity, Port Hueneme prepared a preliminary assessment report that assigned a medium inspection priority to three potential hazardous waste disposal sites. These sites are the subject of this SI report.

During April 1989 through September 1990, ERM-West conducted a shallow soil investigation at PMFD to determine if petroleum hydrocarbons were present near valve box locations and within areas of historic leaks and spills. The scope of work for this investigation included:

- Review of available records of pipeline and tank leaks and spills
- Review of previous geotechnical and geological studies and utilities maps
- A soil gas survey to aid in determination of boring and monitoring well locations
- A geophysical survey to delineate drilling locations
- Installation of 85 continuously logged soil borings, 43 associated with valve boxes, 23 associated with areas of historic known leaks and spills, and 19 associated with the March 1990 pipeline leak
- Total extractable hydrocarbon (TEH) or benzene, toluene, ethylbenzene, and xylene (BTEX) analyses of soils from these borings
- Installation of three monitoring wells
- TEH and BTEX analyses of ground-water samples from these wells
- Installation of two extraction wells in response to a jet fuel leak found during the course of the investigation.

As the HLA 1984 study and ERM-West 1990 investigations are applicable or partially applicable to SI areas of investigation, they are discussed in more detail in the following sections.

1.3.1 HLA 1984 Subsurface Contamination Concept Study

Field activities during the 1984 HLA study consisted of geophysical surveys, soil boring, soil sampling for physical parameters, monitoring well installation, ground-water sampling, and sampling of a product seep adjacent to San Francisco Bay. Included in the report of this study were recommendations on mitigation of petroleum contamination at PMFD, most of which have since been implemented.

Geophysical surveys included ground penetrating radar (GPR) and seismic refraction profiling. GPR surveys were used to clear proposed borehole locations, and prevent damage to underground utilities, pipelines, or conduits. Seismic refraction surveys were performed to determine the depth to bedrock and to evaluate lithologic variability. Seven surveys were conducted, primarily across various ravines within the hillside areas. Three monitoring wells, installed in the vicinity of two of these seismic profiles, encountered bedrock at depths comparable to those in the refraction data.

Sixteen soil borings were installed during this study, 11 of which were converted to 2-inch monitoring wells. Areas investigated are broadly outlined as (1) an active product seep within the ravine along F Road near Tank 6; (2) the continuation of this seep toward the southeast corner of the Administration Building, and including the north end of the Administration Building; and (3) the wastewater treatment ponds area, including the possible continuation of hydrocarbon contamination from the south end of the Administration Building toward the treatment ponds area. At the time of this study, three Navy extraction wells had been installed within these areas, and a fourth was under construction. Four Navy monitoring wells, apparently installed in 1983, were also incorporated in this study. The areas investigated and associated HLA borings or monitoring wells, and Navy extraction or monitoring wells are outlined as follows:

Area	1984 HLA Borings/Wells	1983 Navy Monitoring Wells	Navy Extraction Well Number
Tank 6/F Road	Wells 2, 3	------	1
Administration Building	Borings 8, 12, 13, and 14/Wells 4, 9, 10, and 11	------	2
Treatment Ponds	Boring 16/Wells 5, 6, 7, and 15	USN 2, 5, 6, and 8	3, 4 (under construction)

One of the 16 HLA borings/wells installed during 1984, well number 1, not listed above, was installed between C Road and B Road, near Tank 18, presumably to confirm depth to bedrock in a nearby seismic refraction profile.

Ground-water samples were obtained from all monitoring wells listed above, including HLA well number 1, as well as from Navy extraction wells 1 and 2, and from two Navy monitoring wells apparently installed in 1983. These 1983 Navy wells were located in the treatment ponds area; however, no information was available on well construction details. Some of these 1983 wells were located during SI field activities. Those wells were constructed as flush mount installations without protective vaults and had been partially destroyed or impacted by local traffic. None of the 1983 wells had surface seals. In addition, some HLA monitoring wells were not located during the 1990 SI investigation, presumably due to destruction from vehicular traffic or damage to the above-ground 2-inch PVC risers.

These 1984 HLA borings or monitoring wells are shown on Plate 1, and are designated with "HLA (84)" prior to the boring or well number. Plate 1 also depicts earlier soil borings installed by HLA in 1973 and 1981 studies. These borings are designated with "HLA (73)" or "HLA (81)" prior to the boring number. Subsequent borings installed by HLA in 1985, in conjunction with the tracer soil gas survey along Burma Road, are not individually shown on Plate 1. However, the general location of these 24 soil borings is outlined on Plate 1. Navy extraction wells are designated with "EW" prior to the well number on Plate 1. Four Navy monitoring wells installed in 1983 are designated with "USN (83)" prior to the well number as shown on Plate 1.

Ground-water sampling results were presented in Graham and Kellam (1984) only for those analyses available at the time of their report. F-76, JP-5, toluene, and xylene was detected in samples from all HLA wells, USN wells 6 and 8, and Navy extraction wells 1 and 2. Volatile organic compounds (VOCs) were also detected in samples from HLA well 10, and USN wells 6 and 8.

F-76 was detected in samples from HLA (1984) wells 1, 3, 5, 6, 7, 10, 11, and 15; Navy (1983) wells 2 and 6; and Navy extraction wells 1 and 2 (Plate 1). JP-5 was detected in samples from Navy (1983) wells 2 and 6, and in samples from Navy extraction wells 1 and 2. Several VOCs, primarily solvents, were detected in HLA (1984) well 10. These solvents include Freon 113, 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethane (1,1-DCA), perchloroethylene (PCE), and methylene chloride. Toluene and xylene were detected in HLA (1984) well 11 and in Navy (1983) wells 2, 6, and 8. HLA observed floating product in several wells, with the maximum thickness (not

documented) in Navy extraction well 2 and Navy (1983) well 6. Generally, HLA reported the presence of more viscous product (NSFO) along shoreline locations; however, the specific locations (wells or seeps) were not reported.

HLA's 1984 study reported general ground-water flow directions from hillside canyons toward areas of flat-lying fill near the shore. With the exception of preferential flow paths along buried conduit or pipelines, HLA suggested that there are no preferred flow paths within heterogeneous fill material. HLA reported that structures such as building foundations and the treatment ponds cutoff wall which extend below the water table may also divert ground-water flow directions. For example, the HLA report suggested that product may be pooling on the upgradient side of the Administration Building. Discharge from the treatment ponds was also reported as impacting local flow directions.

In general, HLA referred to both bedrock and bay muds as low permeability materials and considered the bay mud to restrict or preclude downward ground-water flow. HLA suggested the presence of perched water within specific localities based on the existence of low permeability clayey silt. A horizontal ground-water flow rate was estimated by HLA for the Administration Building area as 1 to 1.5 gallons per minute (gpm). This calculation assumed steady state ground-water flow patterns and a representative conductivity value for alluvium was chosen. No in-situ or laboratory characterization of conductivity values were employed in the HLA study. HLA also suggested that leakage from the treatment ponds contributes to ground-water flow toward the bay. This potentially induced gradient from the treatment ponds area may be associated with the movement of petroleum from the ponds toward the bay.

Two cross sections within the treatment ponds area were provided in the HLA report. These sections, one transverse to the ponds and one parallel to the ponds, were compiled from 1973, 1981, and 1984 HLA soil boring data. Tidal variations in the water table were also projected on these sections. The cross sections broadly defined lithologies as fill material, bay mud, or bedrock.

The extent of petroleum product contamination was roughly outlined in the HLA report. Product seepage in the Tank 6/F Road area was shown to extend to the south end of the

Administration Building. The entire treatment ponds area, including the near shore area between 1983 Navy well 2 and 1984 HLA boring 16 (see Plate 1), was shown as an area of petroleum contamination.

Petroleum seepage was also observed along the shoreline near Burma Road between Tanks 2 and 3. HLA analyzed a sample from this seep for oil and grease; however, results of this analysis were not available at the time of its report. A subsequent soil gas study was completed along Burma Road in 1985 extending from just south of the North Drum Lot to Valve Box 1; however, results of this study were not available. Associated with the soil gas study was the installation of 24 soil borings by HLA in 1985; these borings were concentrated near the area of the seepage observed along the shoreline. Results of these borings are provided in the P-075 construction plans (1986) as discussed earlier. These boreholes were placed apparently to assess the presence of petroleum contamination and provide general lithologic descriptions.

HLA provided several options for mitigation of petroleum contamination at the site, as well as recommendations for operation of Navy extraction wells, and installation of additional extraction wells. Four additional extraction wells were subsequently installed by the Navy; however, the effectiveness, performance, and routine operation or maintenance of these wells has not been documented or established.

1.3.2 ERM-West 1990 Shallow Soil Investigation

As discussed earlier, the ERM-West investigation focused on shallow soils in the vicinity of valve boxes, known pipeline leaks, or within known spill areas. With the exception of the borings or extraction wells installed in response to the March 1990 JP-5 spill downgradient of the landfill, including borings 17 to 20, 34, and 37 to 47 (see Plate 1), few additional ERM-West borings were directly applicable to SI sites. No ERM-West borings were installed in the treatment ponds area or the Building 123 or Building 85 sandblast grit disposal areas. Although some ERM-West borings were coincidentally placed within areas subsequently investigated during the SI investigation, targeted analytes for ERM-West borings were limited to TEH, or in some cases BTEX.

The resulting information provided by ERM-West was partially applicable to the data requirement at specific SI sites. ERM-West requested analyses for TEH using EPA Method 8015 (Modified) as extractable only and reported in jet fuel (JP-5), diesel (F-76), or kerosene ranges. However, PRC requested both purgeable and extractable total petroleum hydrocarbons (TPH) analyses in soil and ground-water samples. TPH ranges as reported by PRC included jet fuel (JP-5), gasoline, diesel (F-76), and motor oil ranges. PRC also required the analysis of other compounds at specific SI locations. These included volatile organic compounds, semivolatile organic compounds, metals, or pesticides and polychlorinated biphenyls (PCBs).

The site-specific stratigraphy and structure were described within the ERM-West (1990) reports with the use of several cross sections. Generally, the stratigraphic profile above bedrock consists of clays, sands, and gravels, with occasional peaty lenses. These sediments, interpreted to be alluvial/colluvial in nature, thicken downslope. Included in the report is a cross section drawn parallel to the ravine in which the landfill is located. This cross section extends from ERM-West boring 22, adjacent to the landfill, to ERM-West boring 38, located near the shoreline. This cross section depicts colluvial materials encountered in borings and lying above inferred or actual bedrock contacts. Also included in this cross section is ERM-West extraction well EW-2. Although no ground-water samples were obtained from this well during the course of the ERM-West investigation, this well was developed and sampled during SI field activities (see Section 2.1).

Ground-water sampling conducted by ERM-West was limited to the three monitoring wells installed during its investigation. Only JP-5, F-76, and volatile aromatic hydrocarbons were targeted analytes in ground-water samples collected from these wells. Samples from ERM-West well MW-1, located along Garden Road near the shoreline (see Plate 1), contained JP-5 at a concentration of 0.23 milligrams per liter (mg/L), but no BTEX was detected. Samples from ERM-West well MW-3, located north of the treatment ponds area along the shoreline, contained BTEX; only the concentration of benzene, 0.62 micrograms per liter (μg/L), exceeded the California Department of Health Services (DOHS) action level of 1 μg/L for this compound.

Soil sampling results at several locations investigated by ERM-West indicated TEH contamination, the extent of which was not defined laterally or vertically in some cases. Vertical

characterization of petroleum contamination was limited to colluvial or alluvial materials existing above bedrock; however, further characterization within bedrock was not possible due to drilling techniques, nor was it within the scope of the ERM-West investigation. TEH was present in concentrations above reporting limits in soil samples from 37 borings, and was detected in concentrations greater than 1,000 mg/kg in soil samples from 25 of these borings. According to ERM-West (1990), further investigation of 19 of these boring locations was not warranted because TEH concentrations were found to decrease with depth to below 1,000 mg/kg. Of these, TEH concentrations decreased to below laboratory detection limits in samples from nine borings. BTEX concentrations were detected in samples from five borings. According to ERM-West (1990), a determination of exact fuel type(s) contained in soil samples was unsuccessful due to the diversity of fuel types historically stored at the site, as well as degradation of these fuels with time. Additionally, laboratory analyses were conducted for volatile aromatic hydrocarbons (EPA Method 8020) in JP-5 and F-76 fuel samples. According to ERM-West, the analyses indicated that the volatile aromatic hydrocarbon concentrations were low enough that they should not pose a risk to field personnel nor be a significant problem in soils on site. Analytical results from soil and ground-water analyses completed for the ERM-West investigation are included for reference in Appendix A. These summary tables are reproductions of those included in the ERM-West (1990) report.

Further definition of the extent of petroleum contamination and characterization of ground-water movement within bedrock or at the colluvial/bedrock contact are currently proposed by PRC for a subsequent investigation (PRC, 1991b).

2.0 SCOPE OF SITE INVESTIGATION

This section describes the rationale for characterization efforts at each of the SI sites; investigative methods employed including the types and numbers of samples collected within each of the sites; and a description of the types of waste or contamination encountered. The results of chemical analyses from samples collected within each site are discussed in Section 3.0 and tabulated in Appendix B.

2.1 SITE 1 - WASTE DISPOSAL AREA

The purpose of characterization efforts within the landfill was to determine if potential sources of contaminants existed within the landfill, and if so, whether these sources were contributing to soil or ground-water contamination below or downgradient of the landfill.

Analytes targeted for samples collected at the landfill included VOCs; semivolatile organic compounds (SVOCs); pesticides/PCBs; total and dissolved metals for ground-water samples and total metals for soil samples; BTEX; and extractable and nonextractable TPH. A full suite of analyses consisted of all the analytes just described, however was not justified at all sampling locations or depths. Table 2 summarizes SI sample analyses and sample matrices. Since limited information regarding the contents and disposal practices within the landfill were available, soil, ground-water, and liquid waste samples were generally analyzed for the full suite of analytes listed above. The sample collected within the pathway of the March 1990 JP-5 spill below the landfill (DA-3) was targeted specifically at JP-5 and was analyzed for BTEX and TPH only.

Five boreholes were drilled within the landfill as shown in Figure 2. Appendix B contains field borelogs for all borings completed during the SI. Much of the information provided in the following section is based on these logs. Boreholes and sampling locations within the landfill were prefixed with "DA" as the site designator. DA refers to disposal area, the name of this site as previously referenced. The boring number follows the DA prefix, which is followed by the sample depth interval in parentheses. The same format is used to designate soil and ground-water samples, although ground-water samples are designated with GW following the boring number. This designation format is used at the other SI sites as well.

The landfill was primarily used for disposal of construction debris and possibly empty cans or drums; however, PRC observed several 5-gallon containers and some 55-gallon drums containing black, viscous liquids during the SI investigation. Many of the containers were deteriorated due to rust, and were labeled as "liquid foaming agent." The liquid waste in these containers was sampled for chemical analyses and was designated as sample DA-6. During the SI field activities, Point Molate personnel also suggested sludges removed from the former sump pond (at the present

TABLE 2

POINT MOLATE FUEL DEPOT
SITE INSPECTION
SEPTEMBER - OCTOBER 1990
SUMMARY OF ANALYSES PERFORMED

Site and Sample Designations	Matrix	Analyses Performed						
Site 1 - Disposal Area								
DA-4B (18 - 19.5)	Soil	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	----
DA-4B GW (39)	Ground water	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	F
DA-1 (5 - 6.5)	Soil	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	----
DA-5 (5 - 6.5)	Soil	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	----
DA-5 (10 - 11.5)	Soil	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	----
DA-5 (15 - 16.5)	Soil	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	----
DA-5 (30 - 31.5)	Soil	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	----
DA-5 GW (21)	Ground water	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	----
DA-6	Liquid waste	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	----
DA-2	Soil	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	----
DA-3	Soil	----	----	----	----	BTEX	TPH	----
EW-2	Ground water	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	F
DA-100-2	Rinsate water	VOA	SVOA	----	----	----	----	----
DA-200-1	DIUF water	VOA	----	----	----	----	----	----
DA-200-2	DIUF water	VOA	----	----	----	----	----	----
Site 2 - Sandblast Grit Disposal Areas								
B123-1 (0 - 1.5)	Soil	----	----	----	Metals	----	----	----
B123-1 (1.5 - 3)	Soil	----	----	----	Metals	----	----	----
B123-1 GW (36)	Ground water	VOA	----	----	Metals	----	TPH	F
B123-2 (4 - 5.5)	Soil	----	----	----	Metals	----	TPH	----
B123-2 (8 - 9.5)	Soil	----	----	----	Metals	----	TPH	----
B123-2 (12.5 - 14)	Soil	----	----	----	Metals	----	TPH	----
B123-2 (28)	Soil	----	----	----	Metals	----	TPH	----
B123-2 GW (30) (PRC #1)	Ground water	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	F
B123-3	Sandblast grit	----	----	----	Metals	----	----	----
B123-100-2	Rinsate water	VOA	----	----	Metals	BTEX	TPH	----
B123-200-1	DIUF water	VOA	----	----	----	----	----	----
B85-1	Soil	----	----	----	Metals	----	----	----
B85-2	Soil	----	----	----	Metals	----	----	----
SL-1	Soil	----	----	----	Metals	----	----	----
SL-2	Soil	----	----	----	Metals	----	----	----
Site 3 - Treatment Ponds Area								
TP-1 (5.5 - 7)	Soil	----	----	----	----	BTEX	TPH	----
TP-1 (8.5 - 10)	Soil	----	----	----	----	BTEX	TPH	----
TP-1 (11.5 - 13)	Soil	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	----
TP-1 (16 - 17.5)	Soil	----	----	----	----	BTEX	TPH	----
TP-1 (19 - 20.5)	Soil	----	----	----	----	BTEX	TPH	----
TP-1 (20.5 - 22.5)	Soil	----	----	----	----	BTEX	TPH	----
TP-10 (0 - 2)	Soil	----	----	----	----	BTEX	TPH	----
TP-1 GW (8)	Ground water	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	F
TP-2 (4.5 - 6)	Soil	----	----	----	----	BTEX	TPH	----
TP-2 (8 - 9.5)	Soil	----	----	----	----	BTEX	TPH	----
TP-2 (13 - 14.5)	Soil	----	----	----	----	BTEX	TPH	----
TP-2 (16 - 18)	Soil	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	----
TP-2 (18 - 19.5)	Soil	----	----	----	----	BTEX	TPH	----
TP-2 (24.5 - 28)	Soil	----	----	----	----	BTEX	TPH	----
TP-2 GW (6)	Ground water	VOA	SVOA	----	Metals	BTEX	TPH	----
TP-100-1	Rinsate water	VOA	SVOA	Pest/PCBs	----	BTEX	TPH	----
TP-100-2	Rinsate water	VOA	----	----	----	BTEX	TPH	----
TP-3 (5 - 6.5)	Soil	----	----	----	----	BTEX	TPH	----
TP-3 (9.5 - 13)	Soil	----	----	----	----	BTEX	TPH	----
TP-3 (13 - 14.5)	Soil	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	----
TP-3 (19.5 - 21)	Soil	----	----	----	----	BTEX	TPH	----
TP-3 (22.5 - 24)	Soil	----	----	----	----	BTEX	TPH	----

TABLE 2 - Continued

POINT MOLATE FUEL DEPOT
SITE INSPECTION
SEPTEMBER - OCTOBER 1990
SUMMARY OF ANALYSES PERFORMED

Site and Sample Designations	Matrix	Analyses Performed						
Site 3 - Treatment Ponds Area - Continued								
TP-3 (35 - 37)	Soil	----	----	----	----	BTEX	TPH	----
TP-4 (14 - 15.5)	Soil	----	----	----	----	BTEX	TPH	----
TP-4 (17.5 - 19)	Soil	----	----	----	----	BTEX	TPH	----
TP-4 (22.5 - 24)	Soil	----	----	----	----	BTEX	TPH	----
TP-4 (41 - 42.5)	Soil	----	----	----	----	BTEX	TPH	----
TP-4 GW (13)	Ground water	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	F
PRC #2	Ground water	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	F
TP-5 (13 - 14.5)	Soil	----	----	----	----	BTEX	TPH	----
TP-5 (18 - 21.5)	Soil	----	----	----	----	BTEX	TPH	----
TP-5 GW (14)	Ground water	VOA	SVOA	Pest/PCBs	Metals	BTEX	TPH	F
PRC #3	Ground water	VOA	----	----	Metals	BTEX	TPH	----
SDS #1	Wastewater	----	----	----	----	BTEX	TPH	----
TP-6 (2)	Sediment	----	----	----	----	BTEX	TPH	----
TP-7 (1)	Sediment	----	----	----	----	BTEX	TPH	----
TP-100-3	Rinsate water	VOA	----	----	----	BTEX	TPH	----
TP-200-1	DIUF water	VOA	----	----	----	----	----	----
TP-200-2	DIUF water	VOA	----	----	----	----	----	----
TP-200-3	DIUF water	VOA	----	----	----	----	----	----
TP-200-4	DIUF water	VOA	----	----	----	----	----	----
TP-200-5	DIUF water	VOA	----	----	----	----	----	----

(73 samples total)

NOTES:

VOA:	Volatile Organic Analyses (Methods 624/8240)
SVOA:	Semivolatile Organic Analyses (Methods 625/8270)
Pest/PCBs:	Pesticides/Polychlorinated Biphenyls (Methods 608/8080)
Metals:	Metals Analyses - Total and Dissolved (Methods 6010/7470/7060/7740)
BTEX:	Aromatic Volatile Organics (Methods 602/8020)
TPH:	Total Petroleum Hydrocarbons (Method 8015 mod)
F:	Flouride (Method 340.2)
DIUF:	Deionized Ultra-Filtered Water

QA/QC Samples: Site Disignator
followed by:
100 - X = Equipment Rinsate Blanks
200 - X = Trip Blanks

Example:
TP-100-3 = Third equipment blank in the Treatment Ponds Area

Duplicate Samples: Soil

TP-1 (20.5 - 22.5) = TP-10 (0 - 2)

Groundwater

TP-4 GW (13) = PRC #2
TP-5 GW (14) = PRC #3

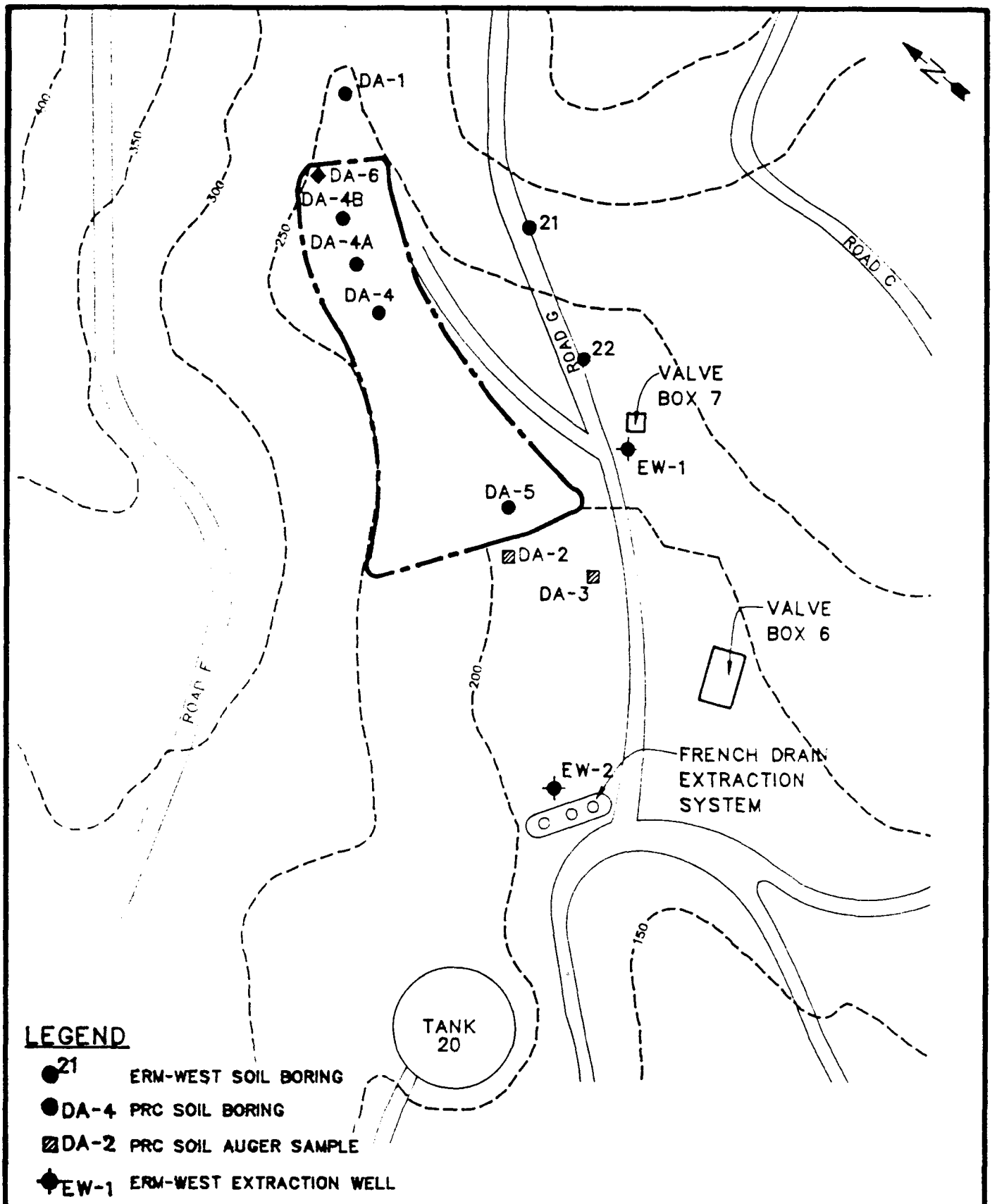

FIGURE 2
POINT MOLATE FUEL DEPOT
SITE INSPECTION
SITE 1 LANDFILL - BOREHOLE AND SAMPLING LOCATIONS

SCALE: NTS

treatment ponds area) may have also been disposed in the landfill. However, this procedure was not documented. Other materials observed in the landfill were a telephone pole, large blocks of concrete rubble or foundation materials, shrubbery and vegetation debris, and some refuse. The majority of the landfill was overgrown in shrubbery or grass and no evidence of recent disposal was observed.

All borings were drilled using either 3.25-inch inside diameter (ID) or 4.25-inch ID hollow stem auger (HSA). The first series of borings, DA-4, DA-4A, and DA-4B, were considered exploratory and were located toward the central and upper (northeastern) portions of the landfill. They were drilled to determine if: downhole sampling was possible, if materials encountered within the landfill were penetrable, and what safety considerations should be considered.

Soils from borings DA-4 and DA-4A were described based on soil cuttings from the auger flights only. Clay stained with hydrocarbons was encountered in Boring DA-4 at 19 feet. Visibly stained sandy silt was encountered at 7 feet in Boring DA-4A. Although the stained material did not have hydrocarbon odors, it did have photoionization readings of 15 to 20 parts per million (ppm). Borings DA-4 and DA-4A encountered auger refusal at 29 and 37 feet below land surface (BLS), respectively, in either impenetrable landfill materials or bedrock. This caused the clutch to slip and burn on the Mobil B-57 drill rig. A CME-75 drill rig was mobilized to the site the following day. A third attempt was made to penetrate the landfill materials, and to collect a soil or ground-water sample below the landfill. This boring, DA-4B, was located about 15 feet upgradient of DA-4A.

A soil sample was collected in borehole DA-4B at a depth of 18 to 19.5 feet, using a split spoon sampler. This sample contained gray mottled silt with photoionization headspace readings of 10 to 15 ppm, similar to the stained clay at 19 feet in boring DA-4. Also similar to cuttings from boring DA-4 was gravelly silt, stained very dark brown to black at a depth of 6 feet. Ground water was encountered at 38 feet in borehole DA-4B, and was also sampled. The ground water was not purged prior to sampling because of a limited quantity available for sampling. This sample was designated as DA-4B GW(38).

Boring DA-1 was drilled at the uppermost (northeastern) location of the landfill where access was possible for the CME-75 rig. This borehole was drilled to determine upgradient soil or ground-

water quality. This location was originally proposed as a surface sample location; however, due to the compaction of surficial materials, a soil boring was more appropriate to assess subsurface conditions. One soil sample was collected from this boring at 5 feet using a split spoon sampler before encountering auger refusal below 7 feet. This sample and gravelly silt cuttings directly above this sample interval were stained very dark brown with an apparent odor of jet fuel. Soils at 2 feet were also oil stained black. The boring was completed to 15 feet with HSA into apparent bedrock material, but no ground water was encountered.

The fifth soil boring, DA-5, was drilled at the lowermost (southern) end of the landfill through a thicker accumulation of fill materials. Four split spoon soil samples were collected within the borehole and ground water was encountered at 21 feet and subsequently sampled. Soils at 5, 10, and 15 feet contained hydrocarbon stained silty and gravelly clay with headspace readings of 5 to 15 ppm. The interval at 10 to 11.5 feet contained oil saturated silt. The ground-water sample from 21 feet was designated DA-5 GW(21). Ground water was sampled from standing water within the auger flights, however 30 gallons of this water were purged, and ground-water quality parameters collected prior to sampling. Appendix E contains the ground-water sampling sheet on which this information was documented.

Two shallow soil samples, DA-2 and DA-3, were collected directly below the landfill using a hand-driven soil auger. Figure 2 depicts these sample locations. Sample DA-2 was collected directly below the landfill in the center of the ravine. Water was encountered at about a 1-foot depth, as was hydrocarbon saturated silty clay. Several other locations were also probed with the soil auger where hydrocarbon saturated soils were encountered. Sample DA-3 was collected at the side of the ravine about 25 feet downgradient of DA-2, where seepage of hydrocarbons was or had occurred. This seepage was related to the March 1990 JP-5 spill. This JP-5 spill apparently flowed into this narrow ravine, and contaminated the soil and the shallow ground water in the center of the ravine.

To assess ground-water quality further downgradient of the landfill, a previously existing extraction well (EW-2), installed by ERM-West in response to the JP-5 spill, was redeveloped and sampled. Figure 3 depicts this well location and associated extraction well systems. Fifty-five gallons of ground water were bailed and containerized during development. An additional 50 gallons were purged prior to sampling. Ground-water quality parameters were measured during the purging as shown in the ground-water sampling data sheets included in Appendix F.

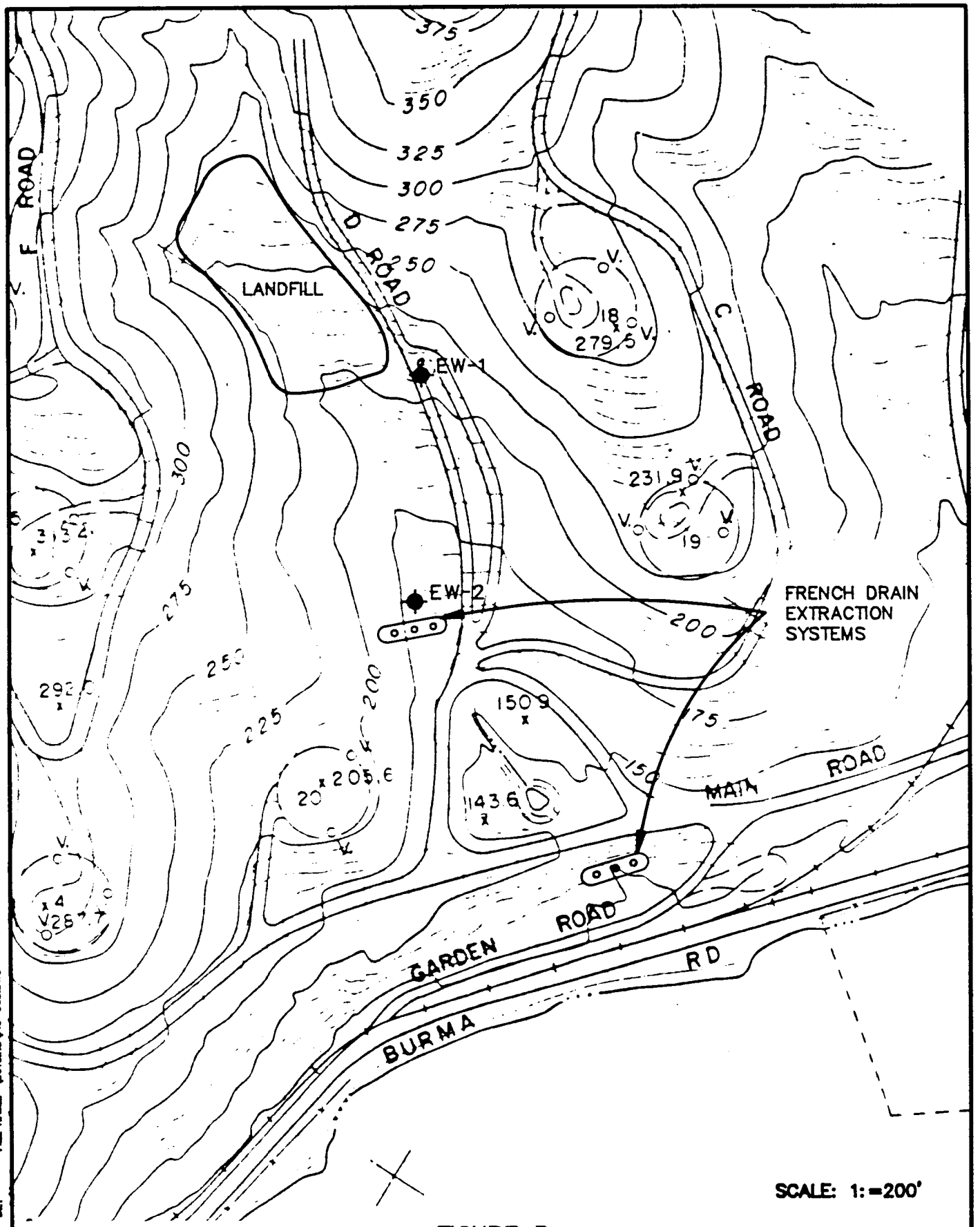

FIGURE 3
POINT MOLATE FUEL DEPOT
ERM–WEST EXTRACTION WELL SYSTEMS FOR MARCH 1990 JP–5 SPILL

In addition, a second extraction well, EW-1, installed by ERM-West near Valve Box 7 was monitored for floating hydrocarbons. Approximately 4 feet of product was initially measured in EW-1. The product was removed with a bailer, and the well subsequently monitored for product recharge.

2.2 SANDBLAST GRIT DISPOSAL AREAS

Sandblast grit from metal cleaning operations was performed by PMFD personnel or their subcontractors. The grit was disposed at several locations across the installation. Three specific areas were targeted to determine if the sandblast grit was a potential source of contamination. Shallow soils were generally targeted for analyses; however, at one location (Building 123), ground-water was encountered and was also analyzed.

The area used most extensively for sandblast operations and grit disposal is the Building 123 maintenance shop, shown in Figure 4. Boreholes and sampling locations in the vicinity of Building 123 were prefixed with B-123 as the site designator. Sandblasting is conducted directly south of the maintenance shop on top of a concrete slab which extends nearly to the steep hillside further to the south. Sandblast grit was present as a thin veneer across most of this slab, and several piles of grit were also present. Grit was also present on the unprotected grass surface adjacent to the steep hillside. Soil boring B123-1 was completed in this grass surface and samples were collected in two intervals: 0 to 1.5 feet and 1.5 to 3 feet BLS. These samples were analyzed for metals only. No soil was present in the borehole, as weathered sandstone bedrock was immediately encountered. The sandstone was, however, penetrable with split spoon samplers to a depth of 5 feet. Continued drilling was performed below 5 feet with HSA, and split spoon samplers were driven to various depths to characterize the lithology. Initial logging was terminated at 20 feet. The boring was completed to 42 feet at auger refusal, and ground water was encountered at 36 feet on the following day. Although no obvious contamination was noted from samples in this borehole, a ground-water sample was collected to determine water quality within the saturated bedrock encountered. The ground-water sample designated B123-1 GW(36) was analyzed for VOCs, total and dissolved metals, TPH, and fluoride as shown in Table 2. Fluoride was analyzed to assess the association of fluoride added to the City of Richmond water supply (0.83 mg/L) and fluoride levels observed in ground water at PMFD. From

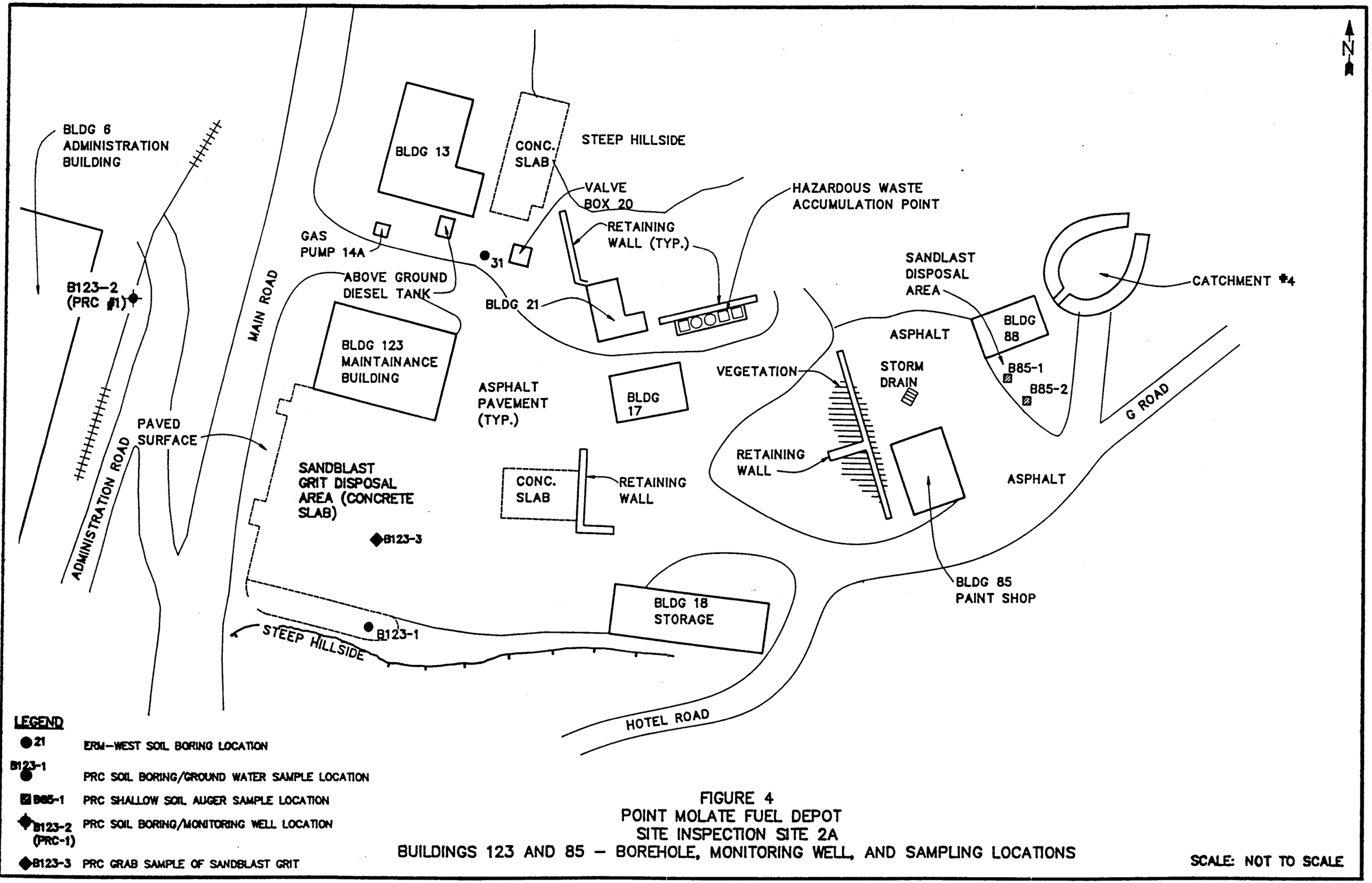

FIGURE 4
POINT MOLATE FUEL DEPOT
SITE INSPECTION SITE 2A
BUILDINGS 123 AND 85 – BOREHOLE, MONITORING WELL, AND SAMPLING LOCATIONS

SCALE: NOT TO SCALE

this association, recharge of ground water within the ravines from the potentially leaking City of Richmond fire main atop PMFD was assessed. The ground water was collected from the open borehole and was not purged prior to sampling because of insufficient recharge.

A second boring was originally proposed within the area covered by the concrete slab. However, it was determined that the slab was of sufficient thickness and integrity to prevent soil contamination from sandblast grit. Additionally, two surface sampling locations originally proposed adjacent to the steep hillside were not sampled because boring B123-1 was deemed more representative of areas where actual disposal had occurred. As an alternative, a sample of sandblast grit was collected from a disposal pile on the concrete slab. It was analyzed for metals, was designated as B123-3, and is shown in Table 2.

To assess soil and ground-water quality downgradient of the sandblast grit disposal and maintenance area, a soil boring (B123-2) was chosen west northwest of Building 123, across Main Road near the northern end of the Administration Building (Figure 4). This location intercepts likely ground-water flow paths from the maintenance area, as well as from other structures near Building 123 where potential sources of contamination may exist. For these reasons, boring B123-2 was converted to a monitoring well, designated as PRC #1, and subsequently sampled for ground-water quality. Appendix D contains the well construction details for PRC #1 in the monitoring well installation records.

Four soil samples were collected at boring B123-2. The first was collected in the uppermost competent material below surficial gravels; the second was collected in unsaturated vadose soils; the third was collected in the first saturated material which is indicative of the capillary fringe; and the fourth was collected in stained material below the water table. The collection of soil samples in these horizons was outlined in the field sampling plan and where appropriate, was implemented during the SI.

Minor lenses of clay stained with hydrocarbons were encountered in boring B123-2. Otherwise, clay and silty clay soils encountered were generally not stained and some were weathered and contained oxidized clasts or pebbles. Soil samples were analyzed for metals and TPH, and

ground water collected from monitoring well PRC #1 was analyzed for the full suite of analytes as shown in Table 2. Although ground-water recharge was very slow into this well, 75 gallons were purged and ground-water quality parameters were measured during the development process. Eighteen gallons of ground water were also purged prior to sampling. Development and sampling parameters are documented in the well development and ground-water sampling data sheets, which are included in Appendices E and F, respectively.

The second sandblast grit landfill investigated was the Building 85 paint shop. Sampling locations near Building 85 were prefixed with B85 as the site designator. At these locations, sandblast grit was previously disposed on several occasions, and PRC observed small piles of sandblast grit dispersed within the vegetated cover. Figure 4 depicts the locations of B85-1 and B85-2. Shallow soil samples were collected at each location with a hand-driven auger at depths of about 8 to 12 inches BLS. These samples were analyzed for metals only (Table 2).

The third sandblast grit landfill was located in and near the south drum lot at the southern end of PMFD. Sampling locations near the south lot were prefixed with SL as the site designator. This area consists of two locations where potential sandblast grit was disposed (Figure 5). The first area, at the northeast side of Drum Road adjacent to the hillside, was completely reworked to obtain clean fill material for other areas within the fuel depot. Any evidence of disposed sandblast grit was completely covered and inaccessible under the excavated material. Furthermore, during interviews with Point Molate personnel, PRC was informed that the quantity of sandblast grit disposed was relatively minor (several front end loader buckets) and that this was not a routine practice.

The other location of potential sandblast grit was at the northwestern corner of the drum lot. No evidence of sandblast grit was observed here during the SI. The drum lot was mostly surfaced by concrete slabs in the area of concern and was bounded on the southwestern perimeter by an asphalt berm. Furthermore, PMFD personnel stated sandblast grit was never disposed of in this area, and that the only related activity was sandblasting by a NAVY subcontractor. The duration of this activity and quantities and location of potential grit is not known.

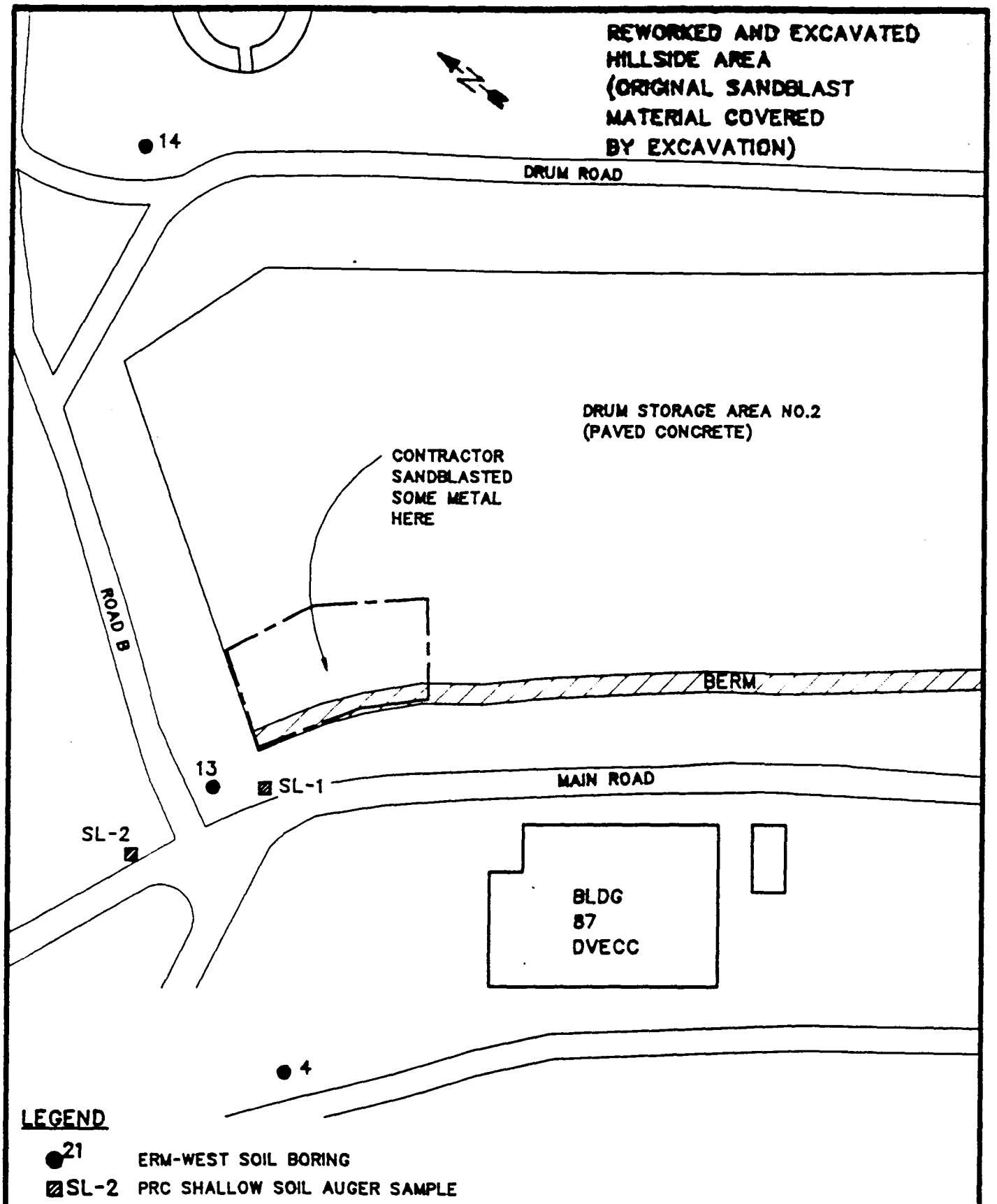

FIGURE 5
POINT MOLATE FUEL DEPOT
SITE INSPECTION
SITE 2B SOUTH LOT - SAMPLING LOCATIONS

SCALE: NTS

To confirm shallow soil quality in this area, two hand-driven soil samples were collected as shown in Figure 5. These samples were designated SL-1 and SL-2. SL-1 was collected directly adjacent to the asphalt berm at a depth of about 1 foot. SL-2 was collected near the entrance gate to the south lot in a shallow roadside ditch. SL-2 was composited from the soil auger at depths of about 0.5 to 2.0 feet. Samples SL-1 and SL-2 were analyzed for metals only (Table 2).

2.3 TREATMENT PONDS AREA

The treatment ponds area was the focus of a more extensive investigation due to known hydrocarbons in soil and ground water and the history of disposal practices at the former sump pond, which was located beneath the treatment ponds.

Boreholes and sampling locations within the treatment ponds area were prefixed with TP as the site designator. Characterization activities included the installation of five soil borings (TP-1 through TP-5), conversion of two of these borings (TP-4 and TP-5) into monitoring wells (PRC #2 and PRC #3), collection of ground-water samples from these wells, collection of two near-shore shallow sediment samples (TP-6 and TP-7), monitoring of various existing extraction or monitoring wells, and collection of one wastewater sample at the storm drain separator Unit #1. Figure 6 depicts the locations of borings, monitoring wells, near-shore sediment samples, and the storm drain separator. The treatment ponds (and the western boundary of the former sump pond) are approximately 140 feet from the existing shoreline.

Boring TP-1 was drilled on the west northwestern edge of Pond #1 within the approximate boundary of the former sump pond. Seven soil samples were collected within the boring, all of which were near the capillary fringe or below the water table, which was encountered at 8 feet BLS. Hydrocarbon staining, free oil, and some sludge were noted in many of the samples collected. Soil types within the borehole varied from gravelly clay, indicative of artificial fill material, to silty clay and clayey very fine sands representative of the local bay muds. All soil samples were analyzed for BTEX and TPH and one sample, representative for the most visibly contaminated soil, was analyzed for VOCs, semivolatiles, pesticides/PCBs, metals, BTEX and TPH (Table 2). Portions of this full suite of analytes was selectively chosen in subsequent samples in an effort to minimize analytical costs. Additionally, a ground-water sample was collected within the open borehole following drilling

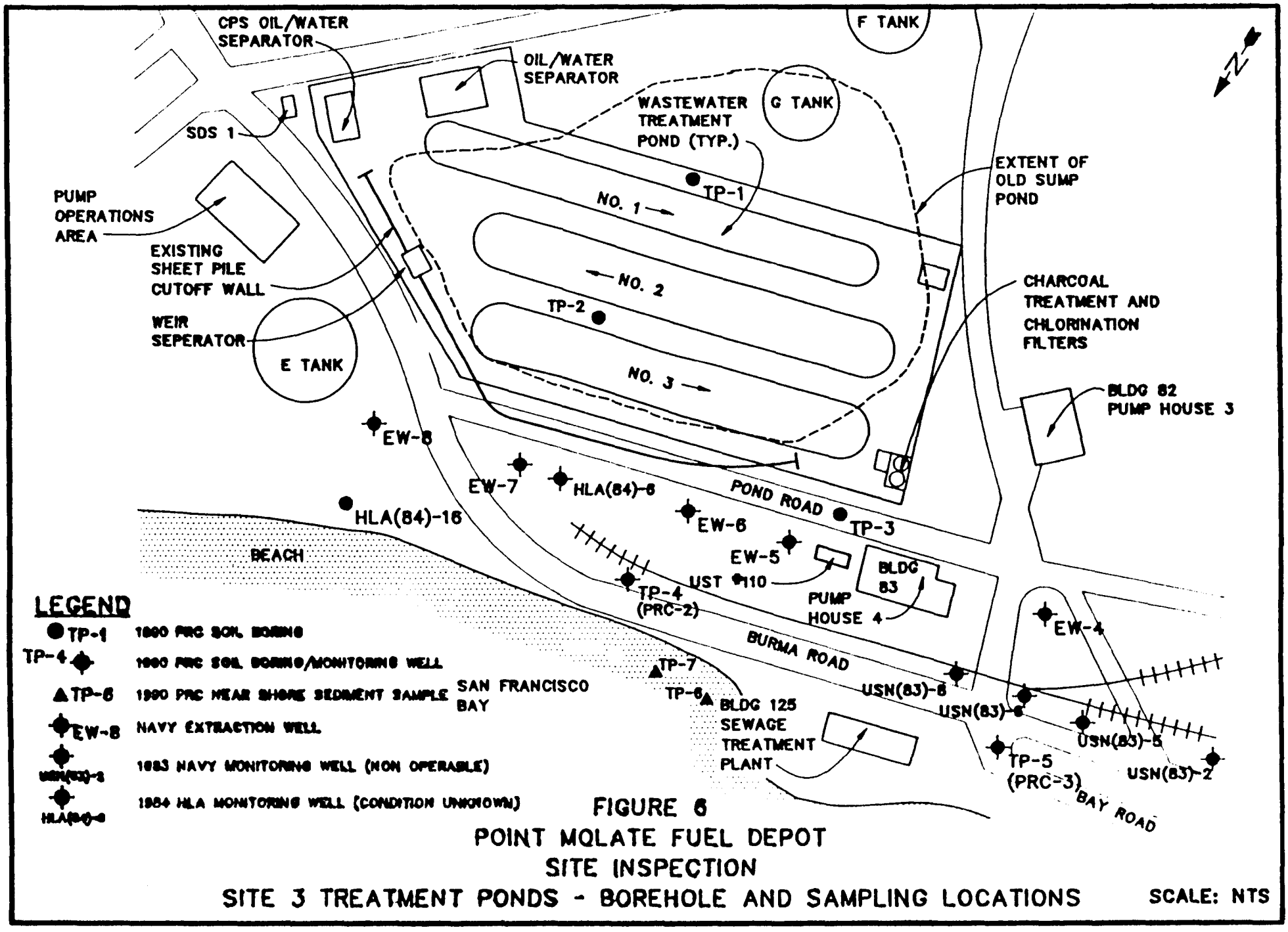

FIGURE 6
POINT MOLATE FUEL DEPOT
SITE INSPECTION
SITE 3 TREATMENT PONDS - BOREHOLE AND SAMPLING LOCATIONS

SCALE: NTS

activities. Forty gallons of water and some oil were purged from this borehole prior to collection of this ground-water sample. Ground-water quality parameters were not collected during this purging process. Ground water from borehole TP-1 was sampled for the full suite of analytes shown in Table 2.

Boring TP-2 was drilled in the berm between Pond #s 2 and 3, also within the boundary of the former sump pond. Gravelly clay and silty clay, indicative of fill material, was encountered to a depth of 18 feet. Intervals of stained material and free oil were encountered from 5 to 20 feet BLS, but not to the extent in boring TP-1, and no sludge was encountered. Silty clay and clayey very fine sands indicative of bay muds were encountered below 20 feet. Six soil samples were collected from boring TP-2 to characterize and assess the vertical extent of potential contamination. All samples were analyzed for BTEX and TPH, and one sample from the 16 to 18 feet depth was analyzed for the full suite of analytes. This sample interval (16 to 18 feet) contained free oil in a dark gray stained sand matrix. A ground-water sample was also collected from the open borehole at a depth of 6 feet and analyzed for the full suite of analytes (Table 2). Fifty-five gallons were bailed from the borehole prior to collection of the ground-water sample. Ground-water quality parameters were not collected during this purging process.

Boring TP-3 was drilled directly west of the treatment ponds, just outside the boundary of the former sump pond as shown in Figure 6. Fill materials consisting of clay or silt, gravel, and clayey gravel were encountered to a depth of approximately 22 feet. Ground water was encountered at 5.5 feet, below which several zones of oil saturated material including black sludge were present. The gravel, silt, and clay fill material was the most highly contaminated (oil and sludge saturated) material encountered thus far and was very difficult to remove from the split spoon and other sampling devices, even with the use of a high pressure steam cleaner. Silty and sandy clay and clayey very fine sands encountered between 22 and 24 feet were also stained very dark gray with hydrocarbons. The hydrocarbon staining was not evident below 24 feet. This material was indicative of the bay muds encountered in the previous boreholes and extended to a depth of 43 feet. Weathered, yellowish brown, and dense clay was encountered at 43 to 44.5 feet where the borehole was terminated. Six soil samples were collected from this borehole between the capillary fringe and 37 feet BLS. All samples were analyzed for BTEX and TPH. The sample from 13 to 14.5 feet, which

contained abundant oil saturated material, was analyzed for the full suite of analytes (Table 2). A ground-water sample was not obtained from this borehole because a measurable thickness of floating oil prevented collection of representative ground-water samples.

Boring TP-4 was drilled west of Navy extraction wells EW-6 and EW-7 as shown in Figure 6. These extraction wells contained measurable thicknesses of viscous black oil similar to bunker fuel or NSFO. A nearby 2-inch polyvinyl chloride (PVC) monitoring well, previously installed by HLA in 1984 and designated as HLA(84)-6 (see Figure 6), also contained an accumulation of this viscous oil. Accurate determination of the thickness of this floating product was not possible because of its viscosity; it coated the electrodes on the interface probe which passed through the product and into the water. Boring TP-4 was placed to assess the movement of these viscous hydrocarbons toward the shoreline. For this reason, boring TP-4 was converted to a monitoring well and designated as PRC #2.

Fill material was encountered in boring TP-4 to a depth of about 23 feet and consisted of sand, gravelly sand, and clayey gravels. Sample recovery using continuously driven split spoons was generally poor; however, some hydrocarbon staining was evident as the water table was encountered. Floating hydrocarbons were encountered at the water table, and were measured at 0.09 feet with an interface probe. Oil-saturated or oil-stained fill materials were encountered below the water table until native material was reached at approximately 23 feet. Soft bay muds consisting of silty clay and clayey very fine sand were encountered from approximately 23 feet to 42.5 feet BLS. Soil samples were collected at four intervals, beginning at the capillary fringe and extending to the total depth of the borehole. The sample collected at total depth, TP-4 (41 to 42.5 feet), also consisted of very dark gray clayey very fine sand and had no apparent hydrocarbon odors. This sample was collected to assess whether the dark gray color characteristic of these bay muds was the result of hydrocarbon staining or indicative of the organic content of the bay muds. Each of these samples was analyzed for BTEX and TPH (Table 2); however, a ground-water sample was collected from the subsequently installed monitoring well (PRC #2) and was analyzed for the full suite of analytes (Table 2). A duplicate ground-water sample was also collected at PRC #2, designated as TP-4 GW (13). Appendix D contains the monitoring well installation records and well construction details for PRC #2. Monitoring well PRC #2 was extensively developed (including swabbing and bailing) prior to

collection of ground-water samples. Appendix E contains development data for this well, including ground-water quality parameters. Ground water was again purged from PRC #2 and ground-water quality parameters were obtained prior to sample collection. Appendix F contains this information in ground-water sampling data sheets.

Following development procedures at well PRC #2, some immiscible hydrocarbons were present in the ground water. They consisted of ganglia or globules; but a measurable thickness of floating hydrocarbons had not accumulated. Approximately 3 weeks following completion of field activities, PRC personnel again monitored hydrocarbon thickness in PRC #2 with an interface probe, and measured about 0.4 feet of floating product. Well PRC #2 is located approximately 40 feet from the shoreline.

In an effort to determine the existence of hydrocarbons in near shoreline sediments in close proximity to well PRC #2, two shallow sediment samples were collected during low tide using a hand-driven soil auger. Figure 6 shows the location of these samples, designated as TP-6 and TP-7. Obvious hydrocarbons were observed in these samples, collected at 1 to 2 feet BLS, as well as in many other near shore locations probed with the soil auger. Isolated hydrocarbon sheens were observed on the surface of the tidal flat sediments during low tide, and the sheen was more evident after walking across specific areas. However, no oily sheens were observed on the bay water during high tide. Samples TP-6 and TP-7 were collected in beach sediments near the edge of the tidal flats. They were analyzed for BTEX and TPH only (Table 2).

Boring TP-5 was located to assess soil and ground-water quality in the area west southwest of the treatment ponds. Prior to the placement of this boring, previously existing Navy monitoring wells and nearby Navy extraction wells were monitored for product occurrence. The Navy extraction well, EW-4, contained about 0.2 feet of floating hydrocarbons of much lighter viscosity than that found in Navy extraction well EW-7 to the northeast. Similar floating hydrocarbons were present in the nearby Navy monitoring well designated as USN(83)-6 (see Figure 6 and Plate 1). These hydrocarbons had characteristics similar to JP-5 or diesel (F-76). Several potential JP-5 and other product sources exist in this area, including several underground pipelines. Soil and ground-water

quality at boring TP-5 therefore may not be indicative of potential contamination from the treatment ponds, but other sources.

Boring TP-5 was also converted to a monitoring well. It was the third and final monitoring well installed during the SI investigation activities and designated as PRC #3. Appendix D contains well construction details for PRC #3 in monitoring well installation records. This monitoring well is located about 60 feet from the shoreline.

Materials encountered in boring TP-5 were indicative of both fill material, native colluvium or bedrock, and possibly some bay mud. A bedrock outcropping near the borehole apparently extended in the subsurface toward the shoreline. Sample recovery was generally poor, especially below 21 feet in this borehole, largely due to the coarse, fractured bedrock fragments encountered. Materials encountered in the borehole included sand, sandy clay, clayey sand, gravel, and weathered bedrock. Oil-stained and oil-saturated materials were associated with and below the capillary fringe, from approximately 13 to 21 feet BLS. The water table stabilized at 14 feet BLS. Two soil samples were collected, one at the capillary fringe/water table and another in oil-stained, well-sorted sands below the water table. Each sample was analyzed for BTEX and TPH only. However, a ground-water sample was collected from PRC #3 and targeted for the full suite of analytes (Table 2). A duplicate ground-water sample was also collected and designated as TP-5 GW(14).

Well PRC #3 was fully developed, including swabbing and bailing. Appendix E contains the well development data sheets and ground-water quality parameters. Ground-water was again purged and ground-water quality parameters obtained prior to sample collection. Appendix F contains this information documented in the ground-water sampling data sheets.

Although floating hydrocarbons were observed (measured) in nearby monitoring or extraction wells, well PRC #3 did not contain measurable thicknesses of hydrocarbons. However, ground-water obtained from the well did contain a hydrocarbon sheen. Approximately 3 weeks following field activities, PRC personnel again monitored this well for product occurrence and none was found, although an oil sheen was present.

Finally, a water sample was collected at the storm drain separator (SDS) #1, located near the corrugated plate steel (CPS) oil-water separator at the northeastern corner of the treatment ponds area. This sample was designated as SDS #1. It was analyzed for BTEX and TPH. This sample was collected to assess potential hydrocarbons or related compounds entering the storm drain system. The water collected was characterized by a very faint hydrocarbon sheen.

3.0 SITE EVALUATION

The following sections evaluate the results of characterization efforts at each of the SI sites. Field samples are described and evaluation of their results is included. Appendix B provides a tabulated analytical results summary for all samples collected, including field QC samples.

3.1 SITE 1 - WASTE DISPOSAL AREA

The nature of materials placed in the landfill was not documented in Point Molate records. However, personnel familiar with the site suggested that a variety of materials, including potentially hazardous wastes, may have been disposed within the landfill. Included in these potentially hazardous materials are spent solvents or fuels, tank bottoms, spent tank cleaning solutions, oil-water separator sludges, or sludges associated with the former sump pond.

Borings completed in the landfill generally indicated a shallow zone of hydrocarbon-stained soils, followed at increasing depth by intermittent or isolated occurrences of oil-saturated or sludge-like materials. The shallower hydrocarbon-stained materials are likely the result of a subsequent fuel leak or spill upgradient of the landfill which flowed into the natural ravine occupied by the landfill. The source of the hydrocarbons may be related to the valve box leak (or spill) which reportedly occurred during 1979 or 1980 (Table 1). Oil-saturated or sludge-like materials encountered at isolated intervals within borehole TP-5 may likely be related to former sump pond sludge or tank bottom sludge which may have been disposed of in the landfill and subsequently covered with additional fill material.

Given the unknown nature of potential contaminants, most samples collected within the landfill area were targeted at a full suite of analytes including VOCs, SVOCs, pesticides/PCBs, metals, BTEX, and TPH as described in Section 2.1 and Table 2. Following is a summary of analytical results:

- VOCs were detected only in liquid waste sample DA-6
- SVOCs were detected in soil and ground-water samples collected from borehole DA-5, in the soil samples collected in boreholes DA-4B and DA-1, in the stream sediment sample collected at DA-2, and in the liquid waste sample DA-6
- Pesticides were detected in samples DA-6 and DA-2
- PCBs were not detected in any samples
- No elevated concentrations of metals were detected
- BTEX was detected in soil or ground-water samples collected from boreholes DA-4B, DA-1, and DA-5
- TPH in the jet fuel (JP-5) range was detected in soil and ground-water samples from boreholes DA-4B and DA-5, from soil collected at borehole DA-1, from soil or sediment collected at DA-2 and DA-3, and from ground water collected at well EW-2
- TPH in the diesel range (F-76) was detected in soil samples from borehole DA-5 and DA-1
- TPH in the motor oil range was detected in soil samples from borings DA-1 and DA-5

These analytical results, which are tabulated in Appendix B, are discussed in more detail below for each sampling location. The discussion follows the order in which the samples were collected.

Boreholes DA-4 and DA-4A were drilled within the middle and upper (northeastern) portion of the landfill; however, no soil samples were collected from either borehole. These boreholes were considered exploratory and assessed drilling and sampling methodology. Borehole DA-4B was drilled

further toward the uppermost (northeastern) portion of the landfill. One soil and one ground-water sample were collected at boring DA-4B.

Three SVOCs were detected in sample DA-4B (18-19.5) as was TPH in the jet fuel range. Two of these SVOCs, 2-methylnaphthalene and acenapthene, are polycyclic aromatic hydrocarbons (PAHs) and may be attributed to components of heavier, unrefined hydrocarbons, such as crude oil or bunker fuel, including NSFO. An additional source of 2-methylnapthalene is JP-5. The other SVOC detected, bis (2 ethylhexyl) phthalate, is a potential breakdown product from the oxidation of xylenes, but most likely is attributable to laboratory contaminants such as the compounds found in rubber gloves. The gray and brown mottled silt in this sample was likely stained from JP-5, possibly from an older spill.

The depth at which this sample was collected (18 to 19.5 feet) suggests several possibilities. JP-5 may have migrated vertically through approximately 18 feet of fill material. It may have migrated from a shallower depth further upgradient. Or it may have been present in soils or fill material prior to the placement of overburden (fill).

Benzene, toluene, and xylene (BTX) were detected in the ground-water sample at boring DA-4B designated as DA-4B GW(39). However, only benzene detected at 1.8 μg/L was above the California and federal maximum contaminant level (MCL) of 1 μg/L for this compound. It should be noted that MCLs are applicable to drinking water standards, and that ground water downgradient of the landfill is not used for drinking water. The primary concern for contaminants migrating from the landfill would be impact to water quality in San Francisco Bay, the only potential receptor. No VOCs, SVOCs, or pesticides/PCBs were detected in this ground-water sample.

Many metals were detected in nonfiltered ground-water samples collected from borehole DA-4B. These concentrations exceeded MCLs, secondary MCLs (SMCLs), or levels recommended by the Regional Water Quality Control Board (RWQCB). However, all concentrations in filtered samples for these same compounds were less than MCL, SMCL, or RWQCB levels with the exception of manganese. This comparison in nonfiltered to filtered concentrations may be attributable to the large amount of suspended sediments encountered since the sample was collected from an open borehole containing a limited column of water.

Borehole DA-5 was drilled as far toward the lower (southern) end of the landfill as possible. Numerous SVOCs, predominantly PAHs, were detected from two of the four soil samples collected at borehole DA-5. These samples contained oil-coated fill material (10 to 11.5 feet) or oil-stained and mottled clay (15 to 16.5 feet). The sample collected at 10 to 11.5 feet contained phenanthrene, fluoranthene, and pyrene at concentrations over 0.2 percent, or 2,350 to 2,810 mg/L. Appendix B provides a summary of analytical results. No VOCs or pesticides/ PCBs were detected in this soil sample; however, ethylbenzene and xylene were detected at 3.2 and 30.2 milligrams per kilogram (mg/kg), respectively. A TPH concentration of 101,800 mg/kg, or approximately 10 percent, consisting of jet fuel (JP-5), diesel (F-76), and motor oil was detected in soil sample DA-5 (10-11.5). Sample DA-5 (5-6.5) contained the highest concentration of lead (178 mg/kg) from all samples collected during the SI sampling activities. This concentration is considered elevated in comparison to the concentrations in other soil samples. Table 3, discussed further in Section 3.2, shows the concentration range of metals from two soil samples collected in bay mud deposits at the adjacent Chevron refinery and at the southern San Francisco Bay area near Naval Air Station (NAS) Moffett Field, as well as ranges for metals compiled by the United States Geological Survey (USGS). Table 4, also discussed in Section 3.2, provides comparative values for metal concentrations in ground water from various sources.

Several of the more water soluble PAHs (naphthalene to pyrene); ethylbenzene and xylene; and TPH in the jet fuel (JP-5) range were detected in the ground-water sample from boring DA-5. This sample was also collected in an open borehole. No VOCs or pesticides/PCBs were detected in this sample. Manganese as a dissolved fraction was the only metal detected at elevated levels, above the SMCL for this compound.

The range of PAHs and TPH detected in soil samples DA-5 (10-11.5) and DA-5 (15-16.5) may be attributable to potential sludge and other oil waste products disposed within the landfill, possibly concentrated at the lower end (downgradient portion) of the landfill. The presence of lighter PAHs in ground water at the lower end of the landfill (sample DA-5 GW(21)) suggests that components of the waste oil or sludge may have migrated through landfill materials into saturated material below. The presence of only TPH as jet fuel in the ground-water sample from DA-5 also suggests that only the lighter hydrocarbons are migrating downward through landfill material. In fact,

TABLE 3

POINT MOLATE FUEL DEPOT
SITE INSPECTION
RANGES AND MAXIMUM CONCENTRATIONS
AND TTLC VALUES FOR METALS IN SOIL
UNITS: mg/kg

COMPOUND (UNITS) METALS (mg/kg)	POINT MOLATE MAXIMUM VALUES	CHEVRON VALUES[a*]	NAS MOFFETT FIELD VALUES[b]	WESTERN U.S.[a]	USGS RANGE[b]	TTLC**
Aluminum	NA	NA	14,065 - 24,287	--	70,000	DNA
Antimony	153	ND	5 - 54	--	<1 - 10	500
Arsenic	15.3	5 - 14	1 - 9	6.1	6.5 - 10	500
Barium	233	17 - 36	78 - 220	560	700 - 5,000	10,000
Beryllium	1.0	0.24 - 0.37	1.3 - 3.7	0.6	<1	75
Cadmium	14.9	0.7 - 1.3	0.5 - 3.5	1	1 - 10	100
Chromium	167	22 - 36	48 - 77	38	100 - 2,000	2,500
Chromium, Hexavalent	NA	ND	NA	--	--	500
Cobalt	11.2	6.8 - 10	12 - 19	8	15 - 70	8,000
Copper	79.9	10 - 23	24 - 57	21	30 - 700	2,500
Lead	178	5.0 - 8.8	4 - 28	15	30 - 700	1,000
Manganese	481	NA	343 - 721	--	500 - 7,000	DNA
Mercury	1.0	0.12	0.1 - 0.5	0.55	0.2 - 5.1	20
Molybdenum	5.3	1.4 - 2.5	NA	3	--	3,500
Nickel	105	26 - 45	46 - 89	16	30 - 700	2,000
Selenium	<0.3	ND	NA	0.25	<0.1 - 0.5	100
Silver	1.7	ND	1.8 - 5	<0.5	0.7 - 5	500
Thallium	150	NA	0.2 - 0.6	--	--	700
Vanadium	41.3	20 - 32	46 - 78	66	150 - 500	2,400
Zinc	1,760	25 - 44	54 - 104	51	120 - 3,500	5,000

* Not to be considered background values.
[a] Values reported in Dames & Moore, 1985
[b] Value reported in IT Corp., 1990
** Total Threshold Limit Concentration
ND: Not detected
NA: Not analyzed
DNA: Does not apply; no TTLC established

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POINT MOLATE FUEL DEPOT
SITE INSPECTION
RANGES AND MAXIMUM CONCENTRATIONS OF METALS AND INORGANICS IN GROUND WATER

COMPOUND	CHEVRON REFINERY AREA[a] (mg/l)	CALIFORNIA DWR RANGE[b] (mg/l)	POINT MOLATE MAXIMUM VALUES (mg/l)	GROUND WATER STANDARDS[c] (mg/l)
Antimony	NR	<0.01 - 0.01	0.32 T / <0.05 D	0.005 (RWQCB)
Arsenic	<0.001 - 0.52	<0.01	0.248 T / 0.016 D	0.05 (MCL)
Barium	<0.1 - 0.8	0.08 - 0.710	3.31 T / 0.23 D	1.0 (MCL)
Beryllium	NR	<0.001	0.59 T / <0.01 D	0.001 (RWQCB)
Cadmium	0.0002 - 0.05	0.001 - 0.005	<0.02 T & D	0.01 (MCL)
Chromium	<0.001 - 0.6	0.001 - 0.004	1.27 T / <0.02 D	0.05 (MCL)
Cobalt	NR	NR	0.32 T / <0.02 D	0.3 (SMCL)
Copper	0.01 - 0.38	0.01 - 0.05	1.22 T / 0.02 D	1.3 (MCL)
Lead	<0.004 - 1.4	0.01 - 0.03	1.24 T / <0.05 D	0.05 (MCL)
Manganese	NR	0.01 - 0.410	9.18 T / 4.59 D	0.05 (SMCL)
Mercury	<0.0001 - 0.0016	NR	0.0024 T / 0.15 D	0.002 (MCL)
Molybdenum	NR	NR	0.11 T / <0.02 D	--
Nickel	NR	<0.01 0.01	0.9 T / <0.1 D	0.4 (RWQCB)
Selenium	<0.001 - 0.012	0.01 - 0.140	<0.03 T / <0.003 D	0.01 (MCL)
Silver	<0.001 - 0.028	<0.001	0.02 T / <0.01 D	0.05 (MCL)
Thallium	NR	NR	2.3 T / <0.1 D	0.002 (MCL)
Vanadium	NR	<0.100	0.61 T / <0.01 D	--
Zinc	0.01 - 0.26	0.01 - 0.100	2.0 T / 0.2 D	5.0 (SMCL)
Chloride	8 - 16,000	0.14 - 120	NA	250 (SMCL)
Fluoride	0.1 - 1.1	NR	1.7	4.0 (MCL)
TDS	300 - 29,000	40 - 751	NA	500 (SMCL)

NA: Not Analyzed NR: Not Reported T: Total Fraction (non-filtered) D: Dissolved Fraction following 0.45μm filtration

[a] Values reported by Dames & Moore, 1985 from Caltrans Report 04-CC-17, 1979

[b] Values reported by IT Corp., 1990, Data for the Coyote Creek, Hydrologic Area in the Santa Clara Hydrologic Unit, State of California, Dept. of Water Resources Hydrologic Data, 1985.

[c] Ground Water Standards Based on the following: Federal maximum contaminant level (MCL) (EPA, 1990); Federal secondary MCL (SMCL) (EPA, 1990); RWQCB (Marshack, 1989)

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jet fuel may not be related to sludge or oily waste potentially disposed within the landfill, but to the migration of JP-5 beneath or through the landfill from subsequent or prior spills or leaks.

An equipment rinsate sample (DA-100-2) was collected from the Teflon bailer used to collect ground-water samples at borehole DA-5. The rinsate water was analyzed for VOCs and SVOCs only and none were detected.

Sample DA-6, a viscous black liquid, was collected from deteriorating drums located at the uppermost (northeastern) portion of the landfill. These drums, both 55-gallon barrels and 5-gallon cans, were labeled as liquid foaming agent on the original, exterior painted label. These cans originally may have contained an oil surfactant used in the tank cleaning and apparently now contain a waste oil. The following compounds were detected from chemical analyses of sample DA-6:

- VOCs detected were xylene (an aromatic hydrocarbon), methylene chloride, 1,1,1-trichloroethane (1,1,1-TCA), and acetone.
- Methylene chloride: this compound is a potential breakdown or daughter product of 1,1,1-TCA; 1,1,1-TCA is a solvent commonly used in degreasing operations.
- Acetone: this compound is a common laboratory contaminant, however, it may be a solvent contained in the liquid waste.
- SVOCs detected were pentachlorophenol (PCP) and di-n-butyl phthalate. The oxidation of xylene may be the source of di-n-butyl phthalate, however, phthalates are also common laboratory contaminants.
- Two chlorinated hydrocarbon compounds were detected, d-benzene hexachloride (d-BHC) which is a pesticide, and PCP, as mentioned above. These compounds may be related to on-site or off-site contamination of the liquid waste.
- There was no TPH signature.
- Two metals, zinc and cadmium, were detected at elevated levels in sample DA-6.

Generally, the source of the waste oil cannot be determined specifically from these results, and the liquid which was sampled, may in fact be liquid foaming agent or a surfactant which has subsequently been contaminated by these additional compounds.

To determine if this liquid is indeed a surfactant, another sample collected from these drums should be submitted for surfactant analysis by a laboratory.

Shallow soil sample DA-3, collected in an obvious oil seep in the side of the ravine and downgradient of the landfill, was targeted specifically for JP-5 analysis. The TPH analysis of sample DA-3 confirmed the presence of jet fuel (JP-5) at 5,570 mg/kg and no other TPH ranges. Xylene was also detected at 0.32 mg/kg under the volatile aromatic organics analysis (EPA Method 8020). This JP-5 oil seep is attributable to the March 1990 pipeline leak near or between Valve Box 7 and Valve Box 8.

Sample DA-2 was a shallow sediment sample collected directly downgradient of the landfill in the center of the ravine. Concentrations of TPH as jet fuel (JP-5) and xylene, 3,610 mg/kg and 0.15 mg/kg, respectively, were similar to sample DA-3 as expected due to the proximity of these sample locations and the extent of the JP-5 spill. No VOCs were detected using EPA Method 8240; however, several SVOCs consisting of lighter PAHs (naphthalene to pyrene), PCP, one pesticide (dieldrin), and one phthalate were detected in sample DA-2. The PAHs are generally attributable to heavier hydrocarbons, diesel (F-76) or bunker (NSFO), with the exception to napthalene and 2-methylnapthalene which may be attributed to JP-5. PCP may be attributable to the mixture of compounds associated with sludges reportedly disposed in the landfill, or from the drums or barrels at the opposite end of the landfill in which PCP was also detected (sample DA-6). The phthalate may be an oxidation product of xylene, or may be attributable to laboratory contamination. No inorganic metals were detected at elevated levels in sample DA-2.

Because of the strategic location downgradient of the landfill, the ground-water sample collected from extraction well EW-2 was targeted with the full suite of analytes described in Table 2. As stated earlier, the well was redeveloped and then purged prior to sample collection. As a result, the ground water obtained was considered representative of surface water or ground water flowing from the landfill or impacted by the landfill. Surprisingly, very few compounds were detected. One metal, manganese, was detected at an elevated concentration of 4.59 mg/L from the dissolved fraction. Recommended drinking water standards or SMCLs for manganese are 0.05 mg/L, although ground-water drinking standards are not applicable but in terms of applicable or relevant and

appropriate requirements (ARARs), are relevant and appropriate to PMFD. Higher levels of manganese may be related to streambed materials, including sand grains and pebbles having manganese oxide coatings. The coatings may be reduced and dissolved by water of different composition; for example, dissolved organic solutes may reduce the oxide and liberate Mn^{+2} (Hem, 1989). Jet fuel (JP-5) was detected from sample EW-2 under the TPH analysis, at a concentration of 0.3 mg/L, which suggests that the levels of JP-5 contamination in ground water decrease significantly with distance from the landfill. In comparison, sample DA-5 GW(21), collected at the lower end of the landfill, contained TPH in the jet fuel range at a concentration of 2.1 mg/L.

The analytical results described above indicate that either fuel spills or leaks from other areas or materials disposed within the landfill have followed the ravine in which the landfill is located and impacted surface water and shallow sediments downgradient and within the landfill. However, the potential impact downgradient from the landfill (toward San Francisco Bay) has not been completely determined. In order to assess the presence of JP-5 or other fuel products closer to San Francisco Bay, the water within the second extraction well system was monitored with an interface probe. This system is located below Catchment #2 and downgradient of the EW-2 extraction well system. This extraction well system, also installed by ERM-West in response to the March 1990 JP-5 leak, is shown in Figure 3. No immiscible phases were detected in this series of three extraction wells; however, no ground-water samples were collected from these wells.

3.2 SITE 2 - SANDBLAST GRIT DISPOSAL AREAS

In an effort to assess values of inorganic metals detected in soil samples at the sandblast grit disposal areas, comparative or background values for inorganic soils data were reviewed from several sources. These sources include baseline element concentrations of soils in the NAS Moffett Field area, prepared by IT Corporation (1990); chemical analyses on background soil for the Chevron, Richmond refinery, prepared by Dames & Moore (1985); and total threshold limit concentration (TTLC) values for inorganic compounds as reported in the California Code of Regulations, Title 22. Substances (soil or ground water) which contain compounds listed in these Title 22 regulations above the TTLC values are considered hazardous waste. The range of metals concentrations, TTLC values, and maximum values detected in soil samples collected during SI field activities are compiled on

Table 3. Although site specific background soil samples were not collected during the SI field activities, an assessment of elevated or anomalous inorganic metals values was based on the values presented in Table 3 as well as the range of values observed in the SI soil samples. Metals concentrations reported for the adjacent Chevron refinery are the closest source of comparative data. It should be noted, however, that only two samples, including one duplicate sample, were collected in the Dames & Moore background study, and these sample consisted of bay mud deposits underlying marsh land (1985). Therefore, comparison to samples collected in colluvium or heterogeneous fill at PMFD may not be applicable.

Although site-specific background ground-water information was not obtained in conjunction with SI field activities, background concentrations of inorganic constituents and metals in ground water were reviewed from both Dames & Moore (1985) for the Chevron refinery area and IT Corporation (1990), which reported ranges of metals and inorganic constituents in the Coyote Creek hydrologic area of the Santa Clara hydrologic unit collected by the California Department of Water Resources (DWR). The Chevron data were collected by the California Department of Transportation (Caltrans) in 1979, from 17 monitoring wells over an 8-year period. These wells are located southeast of Chevron refinery in an area geologically similar to the effluent treatment pond system at Chevron. Table 4 presents the Chevron (Dames & Moore) data, IT Corporation (DWR) data, maximum values of metals and inorganic components detected in ground-water samples during the SI field activities, and ground-water protection standards for these compounds.

Samples within or near potential sandblast grit disposal areas were collected at Building 123, Building 85, and at the south lot. The following paragraphs describe their evaluation in the order in which they were collected.

The area near Building 123 was investigated the most thoroughly, as it was the primary sandblasting location and primary area of sandblast grit disposal. Shallow samples of weathered bedrock collected at boring B123-1 were analyzed for metals only, as discussed in Section 2.2. With the exception of barium in sample B123-1 (0-1.5), no elevated metals concentrations were detected (see Appendix B and Table 3). Although barium was detected at 233 mg/kg, higher than in all samples collected, it is within the range of background concentrations listed in Table 3. A ground-

water sample was also collected from this boring, which is designated as B123-1 GW(36). This sample was analyzed for VOCs, metals, TPH, and fluoride as summarized on Table 2. No VOCs were detected. Nonfiltered mercury, chromium, and lead were detected above MCLs, and nonfiltered manganese was detected above the SMCL. However, filtered concentrations of these metals were below MCL or SMCL levels. No TPH was detected and fluoride was detected at 1.7 mg/L, which was the maximum concentration from all fluoride samples collected (see Table 4).

Four soil samples were collected from boring B123-2, and analyzed for metals and TPH as discussed in Section 2.2. No elevated values of metals were detected in these four samples; however, the maximum value of manganese (481 mg/kg) detected from all soil samples was encountered in sample B123-2 (4-5.5). This concentration of manganese is within the range of background concentrations shown in Table 3. All TPH values were below detection limits for these four samples.

Ground-water sample B123-2 GW(30) was collected from monitoring well PRC #1. No VOCs, SVOCs, pesticides/PCBs, BTEX, or TPH were detected in this sample. Only one metal (lead) was detected slightly above the MCL as a total (nonfiltered) fraction (0.07 mg/L), but was less than the MCL (0.05 mg/L) in the dissolved (filtered) fraction. Fluoride was detected at 0.4 mg/L in this ground-water sample, which is within the range of background concentrations shown in Table 4.

Sample B123-3 was collected from the actual sandblast grit disposed behind Building 123. This sample, analyzed for metals only, contained elevated levels of cadmium (12.9 mg/kg), chromium (167 mg/kg), copper (79.9 mg/kg), molybdenum (5.3 mg/kg), nickel (105 mg/kg), lead (173 mg/kg), and zinc (423 mg/kg). The concentrations of chromium, copper, molybdenum, and nickel were the maximum concentrations for these compounds from all SI samples collected (see Table 3). The concentrations of these four compounds is higher than the range of background concentrations reported for the Chevron refinery area and NAS Moffett Field, but within the range of values reported by the USGS in Table 3. It is apparent that the metals detected at elevated, but not necessarily anomalous, values are related to the sandblasted materials.

Sample B123-100-2 is an equipment blank collected from the Teflon bailer used to collect ground-water samples at boring B123-1 and monitoring well PRC #1. This sample was analyzed for

VOCs, metals, BTEX, and TPH. The only compound detected above detection limits was zinc in both total and dissolved fractions. These concentrations of 0.09 and 0.07 mg/L, respectively, are possibly related to residual zinc contained in tap water used during the rinsing procedure.

Building 85 is a paint shop. Small piles of sandblast grit were observed in the brush near Building 85. Samples B85-1 and B85-2 were collected from shallow soil where sandblast grit had been disposed. These samples were analyzed for metals only. Sample B85-1 contained an elevated concentration of lead (156 mg/kg) and slightly elevated concentration of mercury (1.0 mg/kg) when comparing these values to background concentrations shown in Table 3. Both sets of values are, however, within the USGS range of values shown on Table 3.

Sample B85-2 contained slightly elevated values of cobalt (11.2 mg/kg) and arsenic (15.3 mg/kg). While these values were the maximum concentrations detected for these compounds from all samples, they were within the ranges of background concentrations shown in Table 3.

Two samples were collected near an area of reported sandblasting operations at the south lot (as discussed in Section 2.2). Samples SL-1 and SL-2, also collected in shallow soil, were analyzed for metals only. No elevated values of metals were detected in either sample. In fact, these metals concentrations (see Appendix B) may be comparable to background concentrations due to the lack of evidence of any sandblasting within or near the location of these samples and their similarity to ranges of metals concentrations detected in other PMFD and off-site studies.

Chemical analysis of sandblast grit, soil potentially contaminated with sandblast grit, and ground water within the primary area of sandblast grit disposal (Building 123) indicated that the sandblast grit is not a major source of elevated metals concentrations within ground water. It also indicates that the sandblast grit is only a minor source for elevated concentrations of chromium, copper, lead, molybdenum, nickel, and zinc within surficial soils in direct contact or proximity to sandblast grit. Elevated concentrations of specific metals in ground-water samples collected at boring B123-1 and monitoring well PRC #1 are likely related to scavenging of metallic ions on colloidal particles or within turbid nonfiltered samples. With the exception of manganese, no concentrations of filtered (dissolved) metals in ground water exceeded MCLs, SMCLs, or RWQCB recommended levels within the sandblast grit disposal areas.

3.3 TREATMENT PONDS AREA

Five soil borings were completed in the treatment ponds area (TP-1 through TP-5), two of which were completed as monitoring wells (TP-4 and TP-5). Borings TP-1 and TP-2 were located within the approximate boundary of the former sump pond. Ground-water samples were collected from each of these wells, PRC #2 and PRC #3, as well as from boreholes TP-1 and TP-2. In addition, two near-shore shallow sediment samples (TP-6 and TP-7) were collected, and water in a storm drain separator unit (SDS #1) was sampled. Results of analyses of these samples are described in the order in which the samples were collected.

Seven soil samples were collected in borehole TP-1, including one duplicate, all of which were analyzed for BTEX and TPH. One sample collected from 11.5 to 13 feet was targeted for the full suite of analytes shown on Table 2. No benzene was detected in any of these soils samples; however, ethylbenzene, toluene, and xylene were detected in the following ranges:

Ethylbenzene:	<0.001 to 0.711 mg/kg
Toluene:	<0.001 to 0.147 mg/kg
Benzene:	<0.001 to 0.974 mg/kg

The sample collected at 11.5 to 13 feet contained free oil seeping from sludge-like material and resulted in the highest concentration of xylene (0.974 mg/kg); however, the sample collected at 20.5 to 22.5 feet, which was predominantly organic clay with no visible oil, contained the highest concentrations of ethylbenzene and toluene (0.771 and 0.147 mg/kg, respectively). In contrast, the duplicate of the sample collected at 20.5 to 22.5 feet, designated artificially as TP-10 (0-2), resulted in significantly lower or nondetectable values of ethylbenzene and toluene (0.02 and <0.001 mg/kg, respectively). This discrepancy is likely attributable to the volatile nature of these compounds and laboratory procedures used to prepare these samples prior to analysis.

TPH analysis of this duplicate pair resulted in confirmed values in both the diesel (F-76) and motor oil ranges. The TPH values for samples TP-1 (20.5-22.5) and TP-10 (0-2) were 255 mg/kg and 827 mg/kg, respectively. With the exception of the deepest sample in boring TP-1 (22.5 to 27.5

feet), most samples contained TPH in the diesel and motor oil ranges, with higher concentrations in the diesel (F-76) ranges (see Appendix B). The highest TPH value (4,553 mg/kg) was associated with the sludge-like material encountered at 11.5 to 13 feet.

No VOCs were detected in the sample from boring TP-1 at 11.5 to 13 feet. Five SVOCs, indicative of the lighter PAHs, were detected. These include 2-methylnapthalene, fluorene, phenanthrene, pyrene, and chrysene. No pesticides/PCBs were detected and one metal, antimony, was detected at an elevated value (153 mg/kg). This concentration of antimony was above background values and the USGS range of values as reported in Table 3.

The ground-water sample collected from the open borehole at boring TP-1 was analyzed for VOCs, SVOCs, pesticides/PCBs, metals, BTEX, TPH, and fluoride. No VOCs, pesticides/PCBs, or anomalous or elevated metals was detected. One SVOC, 2 methylnapthalene, was detected in this sample. All BTEX compounds were detected in the ground-water sample; however, only benzene (2.9 μg/L) exceeded the MCL for this compound (1.0 μg/L). TPH was detected in the diesel (F-76) and motor oil ranges at 2.4 and 0.6 mg/L, respectively. Fluoride was detected at 0.7 mg/L.

Six soil samples were collected at boring TP-2 and analyzed for BTEX and TPH. The sample at 16 to 18 feet, which contained wet sand stained with hydrocarbons as well as free oil, was also analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. No benzene was detected in any of these soil samples. However, ethylbenzene, toluene, or xylene were detected in the first five samples, but not in the sixth sample at 24.5 to 28 feet. Similarly, TPH in the diesel (F-76) and motor oil ranges was detected in all samples above 24.5 to 28 feet. The highest concentration of TPH (1,194 mg/kg) was associated with the sample collected at 16 to 18 feet, which contained free oil. Approximately equal concentrations of TPH in the diesel (F-76) and motor oil ranges were detected. This sample (16 to 18 feet) also contained several SVOCs consisting of lighter (more water soluble) PAHs ranging from 2-methylnapthalene to benzo(a)anthracene. No pesticides/PCBs or anomalous concentrations of metals were detected in this soil sample.

One interesting discrepancy was noted for soil sample TP-2 (16-18). Toluene was detected under the volatile organic analysis (EPA Method 8240) at a concentration of 0.216 mg/kg with a

detection limit of 100 μg/kg; toluene was not detected in the same sample under the aromatic volatile organic analysis (EPA Method 8020) with a much lower detection limit (1 μg/kg). This discrepancy is likely attributable to the volatile nature of this compound and laboratory procedures used in sample preparation prior to analysis.

The ground-water sample collected from the open borehole at boring TP-2 contained no detectable concentrations of VOCs or SVOCs, but did contain elevated metals concentrations for manganese (2.4 mg/L) and mercury (0.15 mg/L) from dissolved (filtered) fractions. Elevated levels of manganese, as discussed earlier, may be the result of manganese oxide coatings on streambed material; however, in the vicinity of the treatment ponds area, which is largely fill material, this elevated concentration may be the result of weathering. The chemistry of manganese is somewhat like that of iron in that both metals participate in oxidation and reduction processes in weathering environments (Hem, 1989). Much of the fill material, noted in boring logs from the treatment ponds area, contained weathered sandstones and siltstones with iron-oxide coatings. The concentration of mercury reported for the dissolved fraction (0.15 mg/L) is suspect in that the maximum total (nonfiltered) concentration reported for all ground-water samples is 0.0024 mg/L (see Table 4). Although an oily sheen was noted in the ground water purged from borehole TP-2 prior to sampling, no BTEX or TPH were detected from the ground-water sample.

Boring TP-3 was located just outside the former sump pond, toward the southwestern corner of the existing treatment ponds. Six soil samples were collected from boring TP-3, all of which were analyzed for BTEX and TPH. The sample from 13 to 14.5 feet containing oil saturated clayey gravel was also analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. No benzene was detected in any of these soil samples; however, toluene, ethylbenzene, and xylene were detected in samples collected at 9.5 to 13 feet, 13 to 14.5 feet, and 19.5 to 21 feet. These samples contained hydrocarbon sheens, oil saturated material, and oil saturated material with black sludges, respectively. Toluene was detected in the remaining samples, including the deepest sample (35 to 37 feet) which consisted of bay mud (sandy organic clay) without any obvious indications of hydrocarbons. TPH, predominantly in the diesel and motor oil ranges, was detected in all samples above 35 to 37 feet. The maximum values were associated with samples 9.5 to 13 feet (1,830 mg/kg), 13 to 14.5 feet (1,592 mg/kg), and 19.5 to 21 feet (585 mg/kg) which contained oil or sludge as discussed above. The sludges

encountered in this borehole are likely attributable to waste oil products that may have been contained in the former sump pond. Several PAHs, 2-methylnapthalene to benzo(a)anthracene were detected in the soil sample from 13 to 14.5 feet. These compounds are generally attributable to crude oil similar in nature to NSFO. One PAH, 2-methylnapthalene, may also be associated with JP-5. No VOCs, pesticides/PCBs, or elevated metals were detected in this sample.

Boring TP-4 was located west-northwest of the treatment ponds near the shoreline. Four soils samples were collected at boring TP-4, all of which were analyzed for BTEX and TPH. No benzene was detected in any of these samples; however, toluene, ethylbenzene, and xylene were detected in samples at 14 to 15.5 feet and 17.5 to 19 feet. Oil-saturated or oil-stained clayey or sandy gravels were encountered in these intervals. However, no visibly obvious hydrocarbons were encountered in the silty clay/sandy clay (bay mud) at 22.5 to 24 feet, which contained detectable toluene (0.007 mg/kg) only. No BTEX was detected the deepest sample from this borehole (41 to 42.5 feet), consisting of clayey very fine sand indicative of bay mud. TPH in the diesel and motor oil ranges was detected at sample depths 14 to 15.5 feet and 17.5 to 19 feet at concentrations of 2,299 mg/kg and 2,459 mg/kg, respectively. The majority of the TPH was in the diesel (F-76) range. A hydrocarbon thickness of 0.13 foot was measured with an interface probe upon encountering the water table during the drilling of borehole TP-4.

Due to its proximity to San Francisco Bay and the occurrence of measurable product on the water table, a monitoring well (PRC #2) was installed in boring TP-4. Ground-water sample TP-4 GW(13) and duplicate ground-water sample PRC #2 were collected from this monitoring well. No VOCs, SVOCs, pesticides/PCBs, or BTEX were detected in these ground-water samples, and with the exception of manganese (see discussion for ground-water sample TP-2), no elevated metals were detected. Small concentrations of TPH in the diesel and motor oil ranges were detected in samples TP-4 GW(13) and PRC #2, at 6.5 mg/L and 6.2 mg/L, respectively. TPH in these ranges is attributable to the oil (bunker fuel) encountered when drilling this borehole. This product was also encountered during subsequent purging of ground water during the development of monitoring well PRC #2. Fluoride was detected at concentrations of 0.76 mg/L and 0.59 mg/L from the duplicate ground-water samples. The values from PRC #2 and TP-2 GW(13) were very comparable, as seen in Appendix B.

Boring TP-5 was located about 300 feet southwest of the treatment ponds and former sump pond area, also near the shoreline. Two soil samples were collected at boring TP-5, each of which was analyzed for BTEX and TPH only. No benzene was detected in either sample; however, ethylbenzene, toluene, and xylene were detected in the 13 to 14.5 foot sample, and ethylbenzene and xylene in the 18 to 21.5-foot sample. Both samples contained sand stained very dark gray with hydrocarbons. TPH detections varied in each of these samples. The shallower sample (13 to 14.5 feet) contained TPH in the jet fuel (JP-5) range only, at a total concentration of 221 mg/kg. The deeper sample (18 to 21.5 feet) contained TPH in the diesel (F-76) and motor oil ranges at values, of 71 mg/kg and 51 mg/kg, respectively.

Due to its proximity to San Francisco Bay, and the detection of hydrocarbons during drilling, boring TP-5 was converted to a monitoring well, designated as PRC #3. Duplicate ground-water samples, PRC #3 and TP-5 GW(14), were collected from this monitoring well. Only VOCs, metals, BTEX, and TPH were duplicated for analysis. One VOC, xylene, was detected under the volatile organic analysis (EPA Method 8240) in sample TP-5 GW(14) only, whereas all BTEX compounds were detected in both duplicate samples under the aromatic organic analysis (EPA Method 8020). Benzene was detected in each duplicate sample (0.0051 and 0.0123 mg/L) above the MCL for this compound (0.001 mg/L). Ethylbenzene, toluene, and xylene were detected within MCLs. TPH was detected in these duplicate samples in the jet fuel (JP-5) range only at similar and relatively low concentrations (0.6 and 1.3 mg/L). The detection of TPH in the jet fuel range was expected because nearby monitoring wells contained measurable thickness of product similar to JP-5 or possibly diesel (see Section 2.3). There are also numerous underground fuel lines in the vicinity of well PRC #3. Hydrocarbon contamination, if present, will likely follow the pipeline base fill as conduits beneath or to the sides of the pipelines. Two SVOCs were detected in sample TP-5 GW(14): 2-methylnapthalene and bis(2 ethylhexyl) phthalate. As discussed earlier, 2-methylnapthalene is a PAH not attributable to jet fuel, gasoline, or motor oils, but indicative of heavier oil. The phthalate is a potential laboratory contaminant but may be related to plasticizers used in the manufacture of PVC, and is also an oxidation product from xylenes.

With the exception of manganese (see earlier discussions), no elevated metals concentrations were detected in the duplicate ground-water samples from monitoring well PRC #3, nor were any pesticides/PCBs detected. The values in these duplicate ground-water samples were very comparable.

Samples TP-6 and TP-7 were collected in near-shore tidal flat sediments in the vicinity of the treatment ponds. These samples were analyzed for BTEX and TPH. No benzene was detected in either sample; however, ethylbenzene, toluene, and xylene were detected in each sample at concentrations ranging from 0.013 to 0.073 mg/kg, 0.008 to 0.184 mg/kg, and 0.024 to 0.046 mg/kg, respectively. TPH was detected only in the diesel (F-76) and motor oil ranges for both samples, with the highest values associated with the motor oil range. A significant TPH concentration (4,710 mg/kg) was detected in sample TP-7. These TPH ranges are as expected, given the proximity of these sample locations to the potential NSFO or heavy oil plume that has developed in the vicinity of monitoring well PRC #2, and the hydrocarbon thickness (~ 0.4 feet) subsequently measured in this well (see discussion in Section 2.3).

Finally, sample SDS #1, collected from standing water in this storm drain separator unit, was analyzed for BTEX and TPH. No BTEX was detected while TPH in the diesel range only (13.3 mg/L) was detected. This indicates the possible presence of F-76 either within the storm drain collection system or carried with storm water.

Three equipment (rinsate) blanks were collected from equipment used to collect soil and ground-water samples in the treatment ponds area. These include a rinsate blank collected from a split spoon following sampling of soils contaminated with hydrocarbons and sludge at boring TP-3. This sample, designated TP-100-1, was analyzed for VOCs, SVOCs, pesticides/PCBs, BTEX, and TPH, none of which were detected. Sample TP-100-2 is an equipment blank collected from a stainless steel bailer used to purge oily ground water at boring TP-1. This sample was analyzed for VOCs, BTEX, and TPH, none of which were detected. Sample TP-100-3 is an equipment blank collected from a Teflon bailer used to collect ground-water samples at monitoring well PRC #2. This sample was analyzed for VOCs, BTEX, and TPH, none of which were detected.

Several trip blanks were also prepared to accompany shipment of soil and ground-water samples collected in the treatment ponds area. These samples, designated TP-200-1 through TP-200-5, were prepared off-site with deionized ultra-filtered (DIUF) water and analyzed for VOCs only. No VOCs were detected in these samples.

4.0 QUALITY ASSURANCE/QUALITY CONTROL RESULTS

The Point Molate SI was conducted in accordance with the QA requirements presented in the quality assurance project plan (QAPjP) (PRC, 1990a). The QAPjP includes QA objectives for measurement systems associated with field and laboratory analysis, and presents the procedures to be followed to achieve those objectives. This section reviews results from laboratory QA/QC samples and field QC samples.

4.1 LABORATORY ANALYTICAL (QA/QC) RESULTS

With a few exceptions, all metals, SVOCs, and pesticide/PCB data are valid and meet QA/QC criteria. There were no holding time, instrument tuning, or calibration problems, and blanks were not contaminated. There were minor problems with matrix spike analyses for metals, and with the surrogate recovery of SVOCs, as well as replication of duplicate samples in soil matrices.

The recovery of silver from inorganic matrix spike analyses for four sets of data are slightly below the contract laboratory program (CLP) control limits of 75 to 125 percent. Most values were below detection limits, but the results of the silver analyses should be considered estimates. According to Eureka Laboratories, Inc., this deviation can be accounted for by matrix interferences. Appendix G includes monthly reports from Eureka Laboratories documenting any internal QA/QC problems.

SVOC analyses for three samples should be considered unusable. CLP control limits were exceeded in TP-1 (11.5-13) and B123-2 GW(30) for more than one analyte in surrogate recovery. Sample TP-5 GW(14) had a surrogate recovery of less than 10 percent for 2-fluoroephenol.

4.1.1 Assessment of TPH Data

The samples were analyzed for total petroleum hydrocarbons by EPA Method 8015 (modified). Specifically, jet fuel, gasoline, diesel, and motor oil ranges were reported. There were no problems with holding times, laboratory and field blanks, or calibration data. Reagent spikes and reagent spike duplicates, and matrix spikes and matrix spike duplicates were within acceptable limits and detection limits were reasonable.

4.1.2 Assessment of BTEX Data

The SI samples were also analyzed for BTEX, using EPA Methods 602, 624, 8020, and 8240. No problems were encountered in holding times, blanks, or calibration data. Surrogate recoveries and matrix spike/matric spike duplicate (MS/MSD) recoveries were within CLP limits. Problems were encountered with detection limits for EPA Methods 624 and 8240. For EPA Method 624, they ranged from 5 to 10 μg/L, and from 100 to 5,000 μg/kg for EPA Method 8240. Table 5 summarizes method detection limits for all laboratory analyses. Equipment blank contamination may not have been realized within these detection limits. For example, sample TP-100-1, an equipment blank, was collected from a split spoon which had just previously been exposed to heavy hydrocarbons and sludge. Analysis of this sample detected none of the BTEX analytes, so the laboratory techniques may be in question, and samples analyzed by EPA Methods 624 or 8240 should have been reanalyzed.

In addition, two fuel samples, collected from fuel tankers at the site were also analyzed for BTEX. The concentrations of BTEX found in the samples of JP-5 and F-76 could attribute to the presence of xylene and ethylbenzene in soil or ground water samples from historical leaks or spills, from leaks associated with subsurface pipelines containing either of these fuels, or from product moving along conduits associated with the pipeines.

TA 5

POINT MOLATE FUEL DEPOT
SITE INSPECTION
METHOD DETECTION LIMITS FOR LABORATORY ANALYSES

TARGET COMPOUND	LABORATORY METHOD	DETECTION LIMIT RANGE WATER	SOIL
VOLATILE ORGANICS*		(µg/L)	(µg/kg)
Methylene Chloride	EPA 8240	10	500
1,1,1-Trichloroethane	EPA 8240	5	100
Toluene	EPA 8240	5	100
Ethylbenzene	EPA 8240	5	100
Total Xylenes	EPA 8240	5	100
Acetone	EPA 8240	5	500
SEMI-VOLATILE ORGANICS*		(µg/L)	(µg/kg)
Pentachlorophenol	EPA 8270	10 - 20	150 - 3,000
Naphthalene	EPA 8270	10 - 20	150 - 3,000
2-methylnapthalene	EPA 8270	10 - 20	150 - 3,000
Acenaphthaylene	EPA 8270	10 - 20	150 - 3,000
Fluorene	EPA 8270	10 - 20	150 - 3,000
Diethyl phthalate	EPA 8270	10 - 20	150 - 3,000
Phenanthrene	EPA 8270	10 - 20	150 - 3,000
Di-n-butyl phthalate	EPA 8270	10 - 20	150 - 3,000
Anthracene	EPA 8270	10 - 20	150 - 3,000
Fluoranthene	EPA 8270	10 - 20	150 - 3,000
Pyrene	EPA 8270	10 - 20	150 - 3,000
Chrysene	EPA 8270	10 - 20	150 - 3,000
Benzo(a)anthracene	EPA 8270	10 - 20	150 - 3,000
Bis(2 ethylhexyl) phthalate	EPA 8270	40 - 80	1,000 - 20,000
Benzo(k)flouranthene	EPA 8270	10 - 20	150 - 3,000
Benzo(b)fluoranthene	EPA 8720	10 - 20	150 - 3,000
Benzo(a) pyrene	EPA 8720	10 - 20	150 - 3,000
Indeno(1,2,3-cd) pyrene	EPA 8720	10 - 20	150 - 3,000
Dibenzo(a,h) anthracene	EPA 8720	10 - 20	150 - 3,000
Benzo(g,h,i) perylene	EPA 8720	10 - 20	150 - 3,000
Dibenzofuran	EPA 8720	10 - 20	150 - 3,000
PESTICIDES*		µg/L	(µg/kg)
D-BHC	EPA 608	0.015 - 0.030	0.5 - 50
Dieldrin	EPA 608	0.045 - 0.090	1.5 - 150

TABLE 5 (continued)

POINT MOLATE FUEL DEPOT
SITE INSPECTION
METHOD DETECTION LIMITS FOR LABORATORY ANALYSES

TARGET COMPOUND	LABORATORY METHOD	DETECTION LIMIT RANGE WATER	SOIL
VOLATILE AROMATIC ORGANICS*		(µg/L)	(µg/kg)
Benzene	EPA 602	0.5	1 - 500
Ethylbenzene	EPA 602	0.5	1 - 500
Toluene	EPA 602	0.5	1 - 500
Xylene	EPA 602	0.5	1 - 500
TPH		(mg/L)	(mg/kg)
Jet Fuel (JP-5)	EPA 8015 (Modified)	0.1	5 - 50
Gasoline	EPA 8015 (Modified)	0.1 - 0.2	5 - 50
Diesel (F-76)	EPA 8015 (Modified)	0.2 - 0.4	10 - 100
Motor Oil	EPA 8015 (Modified)	0.5 - 1.0	25 - 250
METALS/INORGANICS		(mg/L)	(mg/kg)
Mercury	EPA 7470 & 7471	0.001 - 0.1	0.050 - 1.00
Arsenic	EPA 7060 & 6010	0.004	0.200 - 2.00
Selenium	EPA 6010 & 7740	0.003	0.3
Fluoride	EPA 340.2	0.1 - 0.5	--
Silver	EPA 6010	0.01	0.5
Arsenic	EPA 6010	0.1	--
Barium	EPA 6010	0.02	0.1
Berylium	EPA 6010	0.01	0.5
Cadmium	EPA 6010	0.02	1.0
Cobalt	EPA 6010	0.02	1.0
Chromium	EPA 6010	0.02	0.5
Copper	EPA 6010	0.01	0.5
Mercury	EPA 6010	0.05	--
Molybdenum	EPA 6010	0.02	1.0
Nickel	EPA 6010	0.1	1.0
Lead	EPA 6010	0.05	3.0
Antionony	EPA 6010	0.05	3.0
Selenium	EPA 6010	0.1	--
Thallium	EPA 6010	0.1	1.0
Vanadium	EPA 6010	0.01	0.5
Zinc	EPA 6010	0.01	0.5
Manganese	EPA 6010	0.01	--

* Detection limits provided only for those compounds detected

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4.2 FIELD QA/QC SAMPLES

Field QA/QC samples were collected at all sites. Field QC samples included equipment rinsate blanks, trip blanks, and duplicate soil or ground-water samples. These samples are identified in Table 6, and analytical results from these samples are discussed in Section 3.1 to 3.3

Samples of soil and ground-water matrices were also submitted for internal laboratory QA/QC. These samples consisted of predesignated MS and MSDs, and included additional volumes of each matrix type as required by the laboratory. Section 4.1 discusses laboratory methods and QA/QC results.

5.0 SUMMARY AND RECOMMENDATIONS

The following section provides a summary of the SI findings and characterization efforts at the SI sites, and provides PRC's recommendations for additional investigation or site characterization at PMFD.

The SI during September and October 1990 was tailored specifically to areas of concern identified in the preliminary assessment. The areas investigated included a waste disposal site (landfill), three sandblast grit disposal areas, and the treatment ponds area. The following paragraphs summarize the findings of the SI.

The landfill was used for the disposal of a variety of potentially hazardous materials. Although not documented, these materials may have included spent or contaminated solvents or fuels, tank bottoms, spent tank cleaning solutions, oil-water separator sludges, or sludges associated with the former sump pond. Quantities of these potential materials are also not documented; however, the landfill was first used in the 1940s and its use continued for at least 20 years thereafter.

Only three VOCs were detected in what appeared to be liquid waste, possibly liquid foaming agent, disposed of in the upper end of the landfill. PCP and one pesticide were also detected in this liquid waste sample. Several SVOCs, predominantly PAHs, were detected in soil, sediment, and

POINT MOLATE FUEL DEPOT
SITE INSPECTION
FIELD QC SAMPLES

SITE/LOCATION	QC SAMPLE DESIGNATION	MATRIX	QC SAMPLE TYPE	ANALYSES PERFORMED
SITE 1 - DISPOSAL AREA				
	DA-100-2	Rinsate Water	Equipment Blank-Teflon Bailer	VOA, SVOA
	DA-200-1	DIUF Water	Trip Blank	VOA
	DA-200-2	DIUF Water	Trip Blank	VOA
SITE 2 - SANDBLAST GRIT DISPOSAL AREAS				
Building 123	B123-100-2	Rinsate Water	Equipment Blank-Teflon Bailer	VOA, Metals, BTEX, TPH
	B123-200-1	DIUF Water	Trip Blank	VOA
SITE 3 - TREATMENT PONDS AREA				
	TP-100-1	Rinsate Water	Equipment Blank-Split Spoon	VOA, SVOA, Metals, BTEX, TPH
	TP-100-2	Rinsate Water	Equipment Blank-Stainless Steel Bailer	VOA, BTEX, TPH
	TP-100-3	Rinsate Water	Equipment Blank-Teflon Bailer	VOA, BTEX, TPH
	TP-200-1	DIUF Water	Trip Blank	VOA
	TP-200-2	DIUF Water	Trip Blank	VOA
	TP-200-3	DIUF Water	Trip Blank	VOA
	TP-200-4	DIUF Water	Trip Blank	VOA
	TP-200-5	DIUF Water	Trip Blank	VOA
	TP-1(20.5-22.5)/TP-10(0-2)	Soil	Duplicates	BTEX, TPH
	TP-4 GW (13)/PRC # 2	Ground Water	Duplicates	VOA, SVOA, Pest/PCBs, Metals, BTEX, TPH, F
	TP-4 GW (13)	Ground Water	MS/MSD (triplicate volume)	VOA, SVOA, Pest/PCBs, Metals, BTEX, TPH
	TP-4 (22.5 - 24)	Soil	MS/MSD (triplicate volume)	BTEX, TPH
	TP-5 GW (14)/PRC # 3	Ground Water	Duplicates	VOA, Metals, BTEX, TPH

VOA: Volatile Organic Analyses (Methods 624/8240)
Pest/PCBs: Pesticides/polychlorinated biphenyls (Methods 608/8080)
MS/MSD: Matrix Spike/Matrix Spike Duplicate
TPH: Total Petroleum Hydrocarbons (Method 8015 mod)
DIUF: Deionized Ultra-Filtered Water
SVOA: Semivolatile Organic Analyses (Methods 625/8270)
Metals: Metals Analyses - total and dissolved (Methods 6010/7470/7060/7740)
BTEX: Aromatic Volatile Organics (Methods 602/8020)
F: Fluoride (Method 340.2)

RE:PtMolate\tables.3-6/08/21/92\alc

ground-water samples collected within or directly downgradient of the landfill. One pesticide (dieldrin) was also detected in sediment directly downgradient of the landfill. Some elevated metals were detected in soil and ground-water samples within the landfill. Of the BTEX analytes targeted, benzene was detected in only one soil sample; ethylbenzene in one soil sample and two ground-water samples; toluene in one ground-water sample; and xylene in five soil samples, the liquid waste sample, and two ground-water samples. TPH was detected in the jet fuel (JP-5), diesel (F-76), and motor oil ranges from several soil, sediment, or ground-water samples. Previous JP-5 spills resulted in the contamination of materials both within, and possibly beneath the landfill, as well as directly downgradient of the landfill. Ground water directly beneath the landfill is apparently contaminated with lighter PAHs, some BTEX compounds, and JP-5 jet fuel.

It is apparent from these results that the landfill currently contains materials potentially providing the source of numerous SVOCs (PAHs), some BTEX compounds, TPH in the jet fuel to motor oil ranges, some pesticides, and PCP. Most importantly, however, was the detection of only JP-5 in the ground-water sample collected from well EW-2, located further downgradient of the landfill. This suggests that the above compounds are either not mobile, their concentrations are reduced prior to reaching well EW-2, or there may be other pathways of migration.

The landfill, therefore, does not present an immediate threat to the environment or, specifically, San Francisco Bay. This does not preclude the possibility of vertical migration of these constituents within colluvium, alluvium, or bedrock directly beneath the landfill, and further characterization within these media may be justified.

Sandblast grit disposal areas investigated were Building 123, Building 85, and the entrance to the south lot. Currently, the only active area of sandblasting or disposal of grit occurs at Building 123. Soil, bedrock, sandblast grit, and ground-water samples were collected within the Building 123 area. Elevated concentrations of specific metals were detected in the sandblast grit sample, however, elevated concentrations of metals in the ground-water samples collected from boring B123-1 and monitoring well PRC #1 are likely attributable to the sorption of metals to colloidal particles within turbid nonfiltered samples. With the exception of manganese, no concentrations of filtered (dissolved) metals in ground water exceeded MCLs, SMCLs, or levels recommended by RWQCB. Shallow soil

samples were collected at Building 85 and at the south lot entrance. Concentrations of metals detected in these samples were within the range of background concentrations developed for nearby and regional areas. The sandblast grit disposal areas are, therefore, not considered to be contributing to elevated concentrations of metals in either soil or ground water.

Soil and ground-water samples collected in the treatment ponds area were analyzed for VOCs and SVOCs, inorganic compounds, pesticides/PCBs, BTEX, and TPH. TPH concentrations in soil in the diesel range (F-76) were reported as high as 3,630 mg/kg with associated values in ground water of 2.4 mg/L. Numerous SVOCs, indicative of heavier oils, were detected in some treatment ponds soil samples; however, these compounds were not detected in associated ground-water samples. The concentrations of benzene detected in the ground-water sample from monitoring well PRC #3 was above the MCL for this compound and above the California Department of Health Services (DHS) action levels. Also apparent, following the installation and subsequent monitoring of monitoring well PRC #2, was the presence of immiscible hydrocarbons consisting of heavy oil similar to NSFO on the water table within the area and directly downgradient of existing Navy extraction wells.

As a result of the SI investigation, only the treatment ponds area was recognized as having an impact on ground water and possibly San Francisco Bay. Two sediment samples obtained in beach sediments near the treatment ponds area resulted in the detection of TPH in the diesel (F-76) and motor oil range at concentrations from 129 mg/kg to 4,710 mg/kg. Toluene, ethylbenzene, and xylene were detected in these sediment samples at concentrations well below water quality criteria for the protection of saltwater aquatic life or California applied action levels (AALs) in water for saltwater species, with the exception of toluene in one sample. These samples indicate that the movement of contaminants from the treatment ponds area toward San Francisco Bay has occurred or may be occurring, but the extent and concentration of hydrocarbon constituents within the tidal flats area is not known and warrants further investigation.

The following are recommendations based on the information obtained during the SI:

- Determination of the extent of hydrocarbon contamination in the near shore tidal flats area of the treatment ponds

- Determination of metals concentrations in the near shore tidal flats area that may pose a threat to aquatic life
- Determination of the extent and further characterization of hydrocarbon contamination within the treatment ponds area
- Installation of additional monitoring wells along the treatment ponds shoreline area targeted at intercepting potential hydrocarbon plumes from sources within or near the treatment ponds area
- Determination of sources of hydrocarbon contamination (including heavy bunker fuel and lighter JP-5 or F-76 sources) within the treatment ponds area
- Estimation of hydrocarbon migration rates within the treatment ponds and associated areas through determination of ranges of hydraulic conductivities in the highly heterogeneous materials within these areas
- Installation of monitoring wells in the vicinity of existing Navy extraction wells to monitor the efficiency of any operating extraction well
- Installation of additional monitoring wells along the southern Point Molate shoreline to assess contaminant movement from previous or potential hydrocarbon spills or leaks from within hillside locations
- Completion of additional soil borings in hillside areas where the extent of hydrocarbon contamination has not been adequately defined
- Installation of monitoring wells strategically placed at the bottom of ravines or valleys within the hillside areas to intersect and assess previous or potential hydrocarbon spills or leaks from within hillside locations
- Collection of colluvial soil and bedrock samples for determination of laboratory porosity in each medium

6.0 REFERENCES

Title 22, 1986, California Code of Regulations, Section 66699

Code of Federal Regulations, Title 40 (40 CFR), Parts 300. July, 1990. Office of the Federal Register, Washington, D.C.

Dames & Moore, 1985. Final Report, Hydrogeologic Assessment, Effluent Treatment Pond System, Richmond, California Refinery for Chevron, U.S.A., Inc. December 31, 1985, Job No. 113-877-03.

ERM-West, 1990. Shallow Soil Investigation for Point Molate Naval Fuel Depot, Navy Delivery Order N62474-85-D-5627-0069, ERM-West, Inc., September 24, 1990.

Graham and Kellam, 1984, Harding Lawson Associates, and Buonaccorsi and Associates, May 1984, Concept Study, Oil Spill Prevention at Point Molate Fuel Depot (P-075).

Hem, John D., 1989. Study and Interpretation of the Chemical Characteristics of Natural Water, U.S. Department of the Interior, 3rd Edition, USGS Water Supply Paper 2254, 263 pp.

IT Corporation, 1990. Phase I Characterization Report, NAS Moffett Field, California, Volume 1, August 1, 1990.

Marchack, J.B., 1989. A Compilation of Water Quality Goals, Staff Report of the California Regional Water Quality Control Board, Central Valley Region, November 1989, RWQCB, Central Valley Region, Fresno, California.

Naval Energy and Environmental Support Activity (NEESA), 1988. Preliminary Assessment Report, Point Molate Fuel Depot, Western Drive, Richmond, California. U.S. Environmental Protection Agency, April 1988, NEESA 13-159PA.

PRC Environmental Management, Inc., 1990a. Personal communication with Point Molate personnel, September through October 1990.

PRC Environmental Management, Inc., 1990b. Revised Site Inspection Field Work Plan, Point Molate Naval Supply Center Fuel Depot, Richmond, California, July 18, 1990. Prepared for Naval Facilities Engineering Command, Western Division, San Bruno, California.

PRC Environmental Management, Inc., 1991a. Point Molate Naval Fuel Depot, Site Inspection, Draft Summary Report, April 5, 1991. Prepared for Naval Facilities Engineering Command, Western Division, San Bruno, California.

PRC Environmental Management, Inc., 1991b. Point Molate Naval Fuel Depot, Final Ground-water Monitoring Plan/Site Characterization Study, July 10, 1991. Prepared for Naval Facilities Engineering Command, Western Division, San Bruno, California.

U.S. Environmental Protection Agency, Hazardous Site Evaluation Division, 1988a. Laboratory Data Validation Guidelines for Evaluating Organic Analyses, prepared by Data Review Work Group, February 1988, U.S. Government Printing Office, Washington, D.C.

U.S. Environmental Protection Agency, Hazardous Site Evaluation Division, 1988b. Laboratory Data Validation Guidelines for Evaluating Inorganic Analyses, prepared by Data Review Work Group, February 1988, U.S. Government Printing Office, Washington, D.C.

U.S. Environmental Protection Agency, 1990. Update for Table of Drinking Water Standards and Health Advisories, memo from Daniel A. Wilson, Chief, Drinking Water Section, May 7, 1990.

APPENDIX A

ERM-WEST 1990 SHALLOW SOIL INVESTIGATION
SOIL BORING AND MONITORING WELL INFORMATION
ANALYTICAL RESULTS SUMMARY

TABLE 3-3

BORING LOCATIONS
POINT MOLATE NAVAL FUEL DEPOT

Boring	Location	Boring	Location
B-1	VB1	B-40	Recent fuel leak
B-2	VB2	B-41	Recent fuel leak
B-3	VB3 leak area	B-42	Recent fuel leak
B-4	Tank 17 overfill area	B-43	Recent fuel leak
B-5	VB19	B-44	Recent fuel leak
B-6	VB19 leak area	B-45	Recent fuel leak
B-7	VB19 leak area	B-46	Recent fuel leak
B-8	VB11	B-47	Recent fuel leak
B-9	VB13	B-48	VB26
B-10	VB10	B-49	VB29
B-11	VB14	B-50	VB37
B-12	VB15	B-51	VB27
B-13	Tank 17 overfill area	B-52	VB28
B-14	Tank 17 overfill area	B-53	VB32
B-15	Tank 17 overfill area	B-54	VB38
B-16	VB4	B-55	Upgradient VB1
B-17	VB6/Recent fuel leak	B-56	Upgradient VB2
B-18	VB7/Recent fuel leak	B-57	Upgradient VB3
B-19	Recent fuel leak	B-58	Downgradient VB4
B-20	Recent fuel leak	B-59	VB9
B-21	Recent fuel leak	B-60	Upgradient VB16
B-22	Recent fuel leak	B-61	VB22
B-23	VB8/Recent fuel leak	B-62	Upgradient VB26
B-24	Tank 19 pipeline leak	B-63	VB19 leak area
B-25	Tank 19 pipeline leak	B-64	VB19 leak area
B-26	Tank 13 pipeline leak	B-65	VB30
B-27	Tank 6 pipeline leak	B-66	Tank 3-4 pipeline leak
B-28	VB16	B-67	Tank 3-4 pipeline leak
B-29	Tank 5 pipeline leak	B-68	Tank 3-4 pipeline leak
B-30	Tank 7 pipeline leak	B-69	Upgradient VB4
B-31	VB20	B-70	Tank 17 overfill area
B-32	VB21	B-71	Tank 5 pipeline leak
B-33	VB22	B-72	Upgradient VB16
B-34	Recent fuel leak	B-73	VB17
B-35	VB18	B-74	Tank 10 overfill area
B-36	VB24	B-75	VB23
B-37	Recent fuel leak	B-76	Upgradient VB24/Tank 11 pipeline leak
B-38	Recent fuel leak	B-77	VB33
B-39	Recent fuel leak	B-78	VB34
		B-79	VB35
		B-80	VB31
		B-81	VB19 leak area

VB - valve box

TABLE 3-4

Borings Associated with Areas of Historic Known Leaks and Spills
Point Molate Naval Fuel Depot

Area	Associated Boring(s)
Tank 3-4 pipeline	B-66, B-67, B-68
Tank 5 pipeline	B-29, B-71
Tank 6 pipeline	B-27
Tank 7 pipeline	B-30
Tank 10 overfill	B-74
Tank 11 pipeline	B-76
Tank 13 pipeline	B-26
Tank 14 pipeline	None - No Access
Tank 17 overfill	B-4, B-13, B-14, B-15, B-70
Tank 19 pipeline (2 areas)	B-24, B-25
Valve Box 3 (leak)	B-3
Valve Box 19 (leak)	B-6, B-7, B-63, B-64, B-81
Wastewater Treatment Ponds	None - To be investigated in a separate study
Tank 20 disposal area	None - To be investigated in a separate study

TABLE 3-5

*Borings and Monitoring/Extraction Wells Associated with Valve Boxes**
Point Molate Naval Fuel Depot

Valve Box	Associated Boring(s)	Borings Converted to Wells
1	B-1, B-55	MW-1
2	B-2, B-56	MW-2
3	B-57	
4	B-16, B-58, B-69	
6	B-17	
7	B-18	EW-1
8	B-23	
9	B-59	
10	B-10	
11	B-8	
13	B-9	
14	B-11	
15	B-12	
16	B-28, B-60, B-72	
17	B-73	
18	B-35	
19	B-5	
20	B-31	
21	B-32	
22	B-33, B-61	
23	B-75	
24	B-36, B-76	
26	B-48, B-62	MW-3
27	B-54	
28	B-52	
29	B-49	
30	B-65	
31	B-80	
32	B-53	
33	B-77	
34	B-78	
35	B-79	
36	No Access	
37	B-50	
38	B-51	

* No valve boxes are numbered 5, 12, or 25

TABLE 3-6

Borings and Extraction Wells Associated with the March 1990 Fuel Leak Point Molate Naval Fuel Depot

Associated Borings	Borings Converted to Extraction Wells (Boring; Extraction Well)
B-17, B-18, B-19, B-20, B-21, B-22, B-23, B-34, B-37, B-38, B-39, B-40, B-41, B-42, B-43, B-44, B-45, B-46, B-47	B-18; EW-1 B-20; EW-2

TABLE 3-7

Analyses of Soil Samples
Point Molate Naval Fuel Depot

Borings	Analysis	Comments
B-1 through B-36, B-48 through B-81	TEH	All borings except 11 associated with March 1990 fuel leak
B-48 through B-54, B-62, B-65, B-77 through B-80	BTXE	Borings near Tanks 21-24 where gasoline was historically stored and borings near associated valve boxes

TABLE 3-8

Monitoring Well Construction Details
Point Molate Naval Fuel Depot

	MW-1	MW-2	MW-3
Drilling technique	HSA	HSA	HSA
Rig type and model	CME 55	CME 55	Acker AD2*
Borehole diameter	10"	10"	10"
Casing diameter	4"	4"	4"
Filter pack thickness	6"	6"	6"
Filter pack length	12.5'	7'	7.5'
Screen slot size	.01"	.01"	.01"
Screen length	10'	5'	5'
Screened interval	14' - 24'	14' - 19'	14' - 19'
Bottom of borehole	24.5'	19.5'	19.6'

Note:

HSA - Hollow Stem Auger
* - Equivalent to CME 55

TABLE 4-1

Concentrations of Volatile Aromatic Hydrocarbons in JP-5 and F-76 Fuel Samples* Point Molate Naval Fuel Depot

Compound	Concentration in JP-5 (mg/L)	Concentration in F-76 (mg/L)	LOD (mg/L)
Benzene	ND	ND	50
Toluene	**160**	**610**	50
Ethyl Benzene	**400**	**1,600**	50
Total Xylenes	**2,000**	**1,500**	50
Chlorobenzene	ND	ND	50
1,4-Dichlorobenzene	ND	ND	50
1,3-Dichlorobenzene	ND	ND	50
1,2-Dichlorobenzene	ND	ND	50

NOTE:

* - EPA 8020; Extraction by EPA 5030
LOD - Limit of Detection
mg/L - milligrams per liter

TABLE 4-2

Concentrations of
*Extractable Petroleum Hydrocarbons in Soil**
Point Molate Naval Fuel Depot

Boring	Depth(Feet)/Lithology	JP-5 Jet Fuel (mg/kg)	F-76 Diesel Fuel (mg/kg)	Kerosene Range (mg/kg)	Diesel Range (mg/kg)	Reporting Limit (mg/kg)
B-1	17.5-18/ bedrock gravel	1,900	ND			100
B-1	20-20.5/bedrock gravel	ND	ND			10
B-1	25-25.5/bedrock gravel	ND	ND			10
B-2	14-14.5/clay	ND	ND			10
B-2	16.5-17/clay	ND	750			10
B-2	18-18.5/bedrock	ND	ND			10
B-3	8-8.5/clay	ND	1,100			10
B-3	13.5-14/clay	ND	290			10
B-3	16.5-17/bedrock	ND	ND			10
B-4	4-4.5/clay	ND	ND			10
B-4	9-9.5/gravelly clay	ND	ND			10
B-4	22-22.5/clay	ND	ND			10
B-5	6-6.5/silty clay	ND	4,200			10
B-5	7.5-8/silty clay	ND	11,000			10
B-5	28.5-29/clay	ND	ND			10
B-6	8.5-9/clay	ND	ND			10
B-6	21.5-22/clay	ND	ND			10
B-6	28.5-29/clay	ND	ND			10
B-7	5.5-6.0/clay	ND	ND			10
B-7	22-22.5/clay	ND	ND			10
B-7	26.5-27/gravelly clay	ND	ND			10
B-8	8-8.5/gravel	ND	ND			10
B-8	18-18.5/clay	ND	ND			10
B-8	21-21.5/bedrock	ND	ND			10
B-9	7-7.5/gravel	ND	ND			10
B-9	9.5-10/clay	ND	990			10
B-9	16.5-17/bedrock (dry)	ND	ND			10
B-10	3-3.5/gravelly clay	ND	ND			10
B-10	6-6.5/bedrock	ND	ND			10
B-11	7.5-8/sandy gravel	ND	ND			10
B-11	15.5-16/silt	ND	ND			10

TABLE 4-2 (CONTINUED)

Concentrations of
*Extractable Petroleum Hydrocarbons in Soil**
Point Molate Naval Fuel Depot

Boring	Depth(Feet)/Lithology	JP-5 Jet Fuel (mg/kg)	F-76 Diesel Fuel (mg/kg)	Kerosene Range (mg/kg)	Diesel Range (mg/kg)	Reporting Limit (mg/kg)
B-12	11.5-12/sandstone	ND	ND			10
B-12	13-13.5/sandstone	ND	ND			10
B-12	15.5-16/sandstone	ND	ND			10
B-13	8-8.5/clay	ND	ND			10
B-13	16.5-17/gravel	ND	ND			10
B-13	26-26.5/wet gravel	ND	ND			10
B-14	8-8.5/gravel	ND	ND			10
B-14	16-16.5/gravel	ND	ND			10
B-14	25.5-26/gravel	ND	ND			10
B-15	6-6.5/clay	ND	ND			10
B-15	11.5-12/clay	ND	ND			10
B-16	7-7.5/clay	ND	**9,900**			100
B-16	12.5-13/bedrock	ND	ND			10
B-17	10.5-11/clay	ND	ND			10
B-17	13-13.5/clay	ND	ND			10
B-17	29-29.5/clay	ND	ND			10
B-18	11.5-12/sandy gravel	**1,700**	ND			100
B-18	23-23.5/clay	ND	**1,100**			10
B-18	29-29.5/gravelly clay	**210**	ND			10
B-19	4-4.5/gravel	**470**	ND			100
B-19	9-9.5/gravel	ND	ND			10
B-19	29-29.5/clay	ND	ND			10
B-20	3-3.5/gravel/clay	**3,900**	ND			100
B-20	9-9.5/silt/clay	ND	ND			10
B-21	3-3.5/gravel	ND	ND			10
B-22	2-2.5/clay	ND	ND			10
B-22	5.5-6/clay/bedrock	ND	ND			10
B-23	10.5-11/clay	ND	ND			10
B-23	20.5-21/gravelly silt	ND	ND			10
B-23	23.5-24/bedrock gravel	ND	ND			10
B-24	1.5-2/clay	ND	ND			10

TABLE 4-2 (CONTINUED)

Concentrations of
*Extractable Petroleum Hydrocarbons in Soil**
Point Molate Naval Fuel Depot

Boring	Depth(Feet)/Lithology	JP-5 Jet Fuel (mg/kg)	F-76 Diesel Fuel (mg/kg)	Kerosene Range (mg/kg)	Diesel Range (mg/kg)	Reporting Limit (mg/kg)
B-25	1.5-2/gravel	ND	ND			10
B-26	1.5-2/sandy gravel	ND	ND			10
B-27	6-6.5 weathered sandstone	ND	ND			10
B-27	9-9.5 weathered sandstone	ND	1,100			10
B-28	5-5.5/sand	ND	1,300			100
B-28	10-10.5/weathered bedrock	ND	160			10
B-29	4-4.5/bedrock	ND	ND			10
B-30	8.5-9/gravelly clay	ND	340			10
B-30	22.5-23/weathered bedrock	ND	1,700			100
B-30	26-26.5/highly fractured bedrock	ND	1,100			100
B-31	7-7.5/clay	ND	ND			10
B-31	11.5-12/bedrock	ND	ND			10
B-32	8-8.5/clay	ND	ND			10
B-32	17-17.5/bedrock	ND	ND			10
B-33	0.5-1/gravel	ND	14,000			100
B-34	10-10.5 gravelly clay	ND	55			10
B-34	18.5-19/siltstone (bedrock)	ND	ND			10
B-35	4-4.5/gravel	ND	ND			10
B-35	13-13.5/siltstone	ND	ND			10
B-36	7.5-8/gravel	ND	11,000			1,000
B-36	13-13.5/bedrock	ND	ND			10
B-48	9-9.5/clay	ND	ND			10
B-48	16.5-17/sand(1' stringer)	ND	1,300			100
B-48	28.5-29/clayey sand	ND	ND			10
B-49	6.5-7/clay/sand	ND	13,000			100
B-50	6.5-7/clay/sand	ND	ND			10
B-51	1.5-2/weathered bedrock	ND	10			10

TABLE 4-2 (CONTINUED)

Concentrations of
*Extractable Petroleum Hydrocarbons in Soil**
Point Molate Naval Fuel Depot

Boring	Depth(Feet)/Lithology	JP-5 Jet Fuel (mg/kg)	F-76 Diesel Fuel (mg/kg)	Kerosene Range (mg/kg)	Diesel Range (mg/kg)	Reporting Limit (mg/kg)
B-52	5-5.5/clay(stringer)	ND	14			10
B-53	6.5-7/weathered bedrock	ND	ND			10
B-53	15.5-16/weathered bedrock	ND	ND			10
B-54	9-9.5/bedrock	ND	580			10
B-55	13-13.5/weathered bedrock			ND	4,100	100
B-55	14-14.5/weathered bedrock			ND	30	10
B-55	15.5-16/fractured siltstone			ND	2,200	100
B-56	9-9.5/sand			ND	ND	10
B-56	19-19.5/silt			ND	ND	10
B-56	23.5-24/weathered siltstone			ND	ND	10
B-57	8.5-9/fractured siltstone			ND	520	10
B-57	14-14.5/crumbled siltstone			ND	850	10
B-57	18-18.5/siltstone			ND	ND	10
B-58	10.5-11/silty clay			ND	5,800	100
B-58	13.5-14/weathered bedrock			ND	120	10
B-59	24-24.5/fractured siltstone			ND	3,500	100
B-59	27.5-28/fractured siltstone			ND	5,700	100
B-59	29.5-30/siltstone			ND	570	10
B-60	13.5-14/sandstone			ND	ND	10
B-60	20.5-21/fractured siltstone			ND	ND	10
B-61	4-4.5/gravel			ND	300	10
B-61	9.5-10/siltstone			ND	40	10
B-62	4-4.5/silty clay			ND	ND	10
B-62	12.5-13/silty clay			ND	ND	10
B-62	25.5-26/gravel			ND	ND	10
B-63	9.5-10/sandy clay			ND	1,500	10
B-63	13.5-14/silty clay			ND	1,100	10
B-63	22-22.5/gravel		1,000	ND		100
B-63	29.5-30/silty clay		50	ND		10
B-64	10-10.5/silty clay			ND	270	10
B-64	13-13.5/silt			ND	2,300	100

TABLE 4-2 (CONTINUED)

Concentrations of Extractable Petroleum Hydrocarbons in Soil* Point Molate Naval Fuel Depot

Boring	Depth(Feet)/Lithology	JP-5 Jet Fuel (mg/kg)	F-76 Diesel Fuel (mg/kg)	Kerosene Range (mg/kg)	Diesel Range (mg/kg)	Reporting Limit (mg/kg)
B-65	8.5-9/siltstone			ND	ND	10
B-65	18-18.5/siltstone			ND	ND	10
B-65	23.5-24/siltstone			ND	ND	10
B-66	7-7.5/gravelly silt	21			ND	10
B-66	13.5-14/gravelly silt	2,000			ND	100
B-66	29.5-30/gravelly silt			ND	610	10
B-67	9.5-10/silty gravel - silt			22,000	ND	1000
B-67	13-13.5/gravel			3,200	ND	100
B-67	29-29.5/siltstone			430	ND	10
B-68	9-9.5/clayey silt			ND	ND	10
B-68	14-14.5/silt	950			ND	100
B-68	24.5-25/siltstone	16			ND	10
B-69	7.5-8/silt			ND	ND	10
B-69	24-24.5/silt			ND	5,800	100
B-69	28-28.5/siltstone			ND	120	10
B-70	7.5-8/bedrock gravel			ND	ND	10
B-70	17-17.5/bedrock gravel		4,400	ND		100
B-70	27-27.5/bedrock gravel		860	ND		10
B-71	7.5-8/silty clay			1,500	ND	1000
B-71	17.5-18/silt			13,000	ND	100
B-71	20.5-21/silt			ND	ND	10
B-72	6-6.5/silt			ND	ND	10
B-72	14.5-15/clayey silt			ND	150	10
B-72	24.5-25/siltstone			ND	ND	10
B-73	8-8.5/silt			ND	ND	10
B-73	13-13.5/gravelly silt			ND	ND	10
B-74	8.5-9/gravelly silt			ND	ND	10
B-74	18.5-19/gravelly silt			ND	ND	10
B-74	26.5-27/gravelly silt			ND	ND	10
B-75	7-7.5/siltstone			ND	41	10
B-75	17-17.5/sandstone			ND	ND	10
B-75	27-27.5/shaly siltstone			ND	ND	10

TABLE 4-2 (CONTINUED)

Concentrations of
*Extractable Petroleum Hydrocarbons in Soil**
Point Molate Naval Fuel Depot

Boring	Depth(Feet)/Lithology	JP-5 Jet Fuel (mg/kg)	F-76 Diesel Fuel (mg/kg)	Kerosene Range (mg/kg)	Diesel Range (mg/kg)	Reporting Limit (mg/kg)
B-76	7.5-8/silt			ND	ND	10
B-76	17.5-18/clayey silt			ND	ND	10
B-76	27.5-28/siltstone			ND	ND	10
B-77	2.5-3/silt			ND	ND	10
B-77	17-17.5/gravel			ND	ND	10
B-77	24.5-25/gravel			ND	ND	10
B-78	4.5-5/silt			ND	ND	10
B-78	19.5-20/silt			ND	ND	10
B-78	29.5-30/siltstone			ND	ND	10
B-79	8-8.5/sandstone			ND	ND	10
B-79	17-17.5/siltstone			ND	ND	10
B-79	27-27.5/siltstone			ND	ND	10
B-80	6.5-7/silt			ND	1,200	10
B-80	11.5-12/gravel			ND	66	10
B-80	19-19.5/gravel			ND	50	10
B-81	7-7.5/clay			ND	1,000	10
B-81	18-18.5/silty clay			ND	1,800	100
B-81	29.5-30/sand			ND	ND	10

Note:

* - California DOHS Method, EPA 8015 (Modified), LUFT Manual, October 1989
mg/kg - milligrams per kilogram
ND - Not Detected at or above reporting limit

TABLE 4-3

Borings with Concentrations of Extractable Petroleum Hydrocarbons Greater than 1000 Milligrams per Kilogram Point Molate Naval Fuel Depot

Boring	Depth (feet)	Concentration (mg/kg)
B-1	17.5-18	**1900**
B-1	20-20.5	ND
B-1	25-25.5	ND
B-3	8-8.5	**1,100**
B-3	13.5-14	290
B-3	16.5-17	ND
B-5	6-6.5	**4,200**
B-5	7.5-8	**11,000**
B-5	28.5-29	ND
B-16	7-7.5	**9,900**
B-16	12.5-13	ND
B-18	11.5-12	**1,700**
B-18	23-23.5	**1,100**
B-18	29-29.5	210
B-20	3-3.5	**3,900**
B-20	9-9.5	ND
B-27	6-6.5	ND
B-27	9-9.5	**1,100**
B-28	5-5.5	**1,300**
B-28	10-10.5	160
B-30	8.5-9	340
B-30	22.5-23	**1,700**
B-30	26-26.5	**1,100**

TABLE 4-3 (CONTINUED)

Borings with Concentrations of Extractable Petroleum Hydrocarbons Greater than 1000 Milligrams per Kilogram Point Molate Naval Fuel Depot

Boring	Depth (feet)	Concentration (mg/kg)
B-33	0.5-1	**14,000**
B-36	7.5-8	**11,000**
B-36	13-13.5	ND
B-48	9-9.5	ND
B-48	16.5-17	**1,300**
B-48	28.5-29	ND
B-49	6.5-7	**13,000**
B-55	13-13.5	**4,100**
B-55	14-14.5	30
B-55	15.5-16	**2,200**
B-58	10.5-11	**5,800**
B-58	13.5-14	120
B-59	24-24.5	**3,500**
B-59	27.5-28	**5,700**
B-59	29.5-30	570
B-63	9.5-10	**1,500**
B-63	13.5-14	**1,100**
B-63	22-22.5	**1,000**
B-63	29.5-30	50
B-64	10-10.5	270
B-64	13-13.5	**2,300**

TABLE 4-3 (CONTINUED)

Borings with Concentrations of Extractable Petroleum Hydrocarbons Greater than 1000 Milligrams per Kilogram Point Molate Naval Fuel Depot

Boring	Depth (feet)	Concentration (mg/kg)
B-66	7-7.5	21
B-66	13.5-14	**2,000**
B-66	29.5-30	610
B-67	9.5-10	**22,000**
B-67	13-13.5	**3,200**
B-67	29-29.5	430
B-69	7.5-8	ND
B-69	24-24.5	**5,800**
B-69	28-28.5	120
B-70	7.5-8	ND
B-70	17-17.5	**4,400**
B-70	27-27.5	860
B-71	7.5-8	**1,500**
B-71	17.5-18	**13,000**
B-71	20.5-21	ND
B-80	6.5-7	**1,200**
B-80	11.5-12	66
B-80	19-19.5	50
B-81	7-7.5	**1,000**
B-81	18-18.5	**1,800**
B-81	29.5-30	ND

Note:

mg/kg - milligrams per kilogram
ND - Not Detected
1,000 - Concentrations ≥ 1,000 milligrams per kilogram

TABLE 4-4

Borings with Extractable Petroleum Hydrocarbon Concentrations Not Defined with Depth to less than 1,000 Milligrams per Kilogram Point Molate Naval Fuel Depot

Area	Boring	Depth (feet)	Concentration*	Total Depth (feet)	Comments
Tank 6 pipeline leak area	B-27	6-6.5 9-9.5	ND 1,100	12	refusal in bedrock at 12'
Tank 7 pipeline leak area	B-30	8.5-9 22.5-23 26-26.5	340 1,700 1,100	28	refusal in bedrock at 28'
VB-22	B-33	0.5-1	14,000	8	depth of TEH defined in adjacent boring B-61
VB-28	B-49	6.5-7	13,000	7.5	refusal in bedrock at 7.5'
VB-1	B-55	13-13.5 14-14.5 15.5-16	4,100 30 2200	16	refusal in bedrock at 16'
VB-19	B-64	10-10.5 13-13.5	270 2,300	13.5	stopped drilling when pipe wrapping surfaced

Note:

* - milligrams per kilogram
VB - Valve Box

TABLE 4-5

Concentrations of
*Benzene, Toluene, Xylenes, Ethyl Benzene in Soil**
Point Molate Naval Fuel Depot

Boring	Depth(feet)	Benzene (µg/kg)	Toluene (µg/kg)	Total Xylenes (µg/kg)	Ethyl Benzene (µg/kg)	Reporting Limit* (µg/kg)
B-48A	9-9.5	ND	ND	ND	ND	5.0
B-48A	16.5-17	**1,100**	**1,900**	**160,000**	**19,000**	1000
B-48A	17-17.5	ND	ND	**320,000**	**100,000**	10,000
B-48A	28.5-29	ND	ND	ND	ND	5.0
B-49A	6.5-7	ND	ND	**3,800**	ND	1,000
B-50A	6.5-7	ND	ND	ND	ND	5.0
B-51A	1.5-2	ND	ND	ND	ND	5.0
B-52A	5-5.5	ND	ND	ND	ND	5.0
B-53A	6.5-7	ND	ND	ND	ND	5.0
B-53A	15.5-16	ND	ND	ND	ND	5.0
B-54A	9-9.5	ND	ND	**490**	ND	100
B-62	4-4.5	ND	ND	ND	ND	5.0
B-62	12.5-13	ND	ND	ND	ND	5.0
B-62	25.5-26	ND	ND	ND	ND	5.0
B-65	8.5-9	ND	ND	**6.4**	ND	5.0
B-65	18-18.5	ND	**15**	ND	**5.2**	5.0
B-65	23.5-24	ND	ND	ND	ND	5.0
B-77	2.5-3	ND	ND	ND	ND	5.0
B-77	17-17.5	ND	ND	ND	ND	100
B-77	24.5-25	ND	ND	ND	ND	5.0
B-78	4.5-5	ND	ND	ND	ND	5.0
B-78	19.5-20	ND	ND	ND	ND	5.0
B-78	25.5-30	ND	ND	ND	ND	5.0
B-79	8-8.5	ND	ND	ND	ND	5.0
B-79	17-17.5	ND	ND	ND	ND	5.0
B-79	27-27.5	ND	ND	ND	ND	5.0
B-80	6.5-7	ND	ND	ND	ND	5.0
B-80	11.5-12	ND	ND	ND	ND	5.0
B-80	19-19.5	ND	ND	ND	ND	5.0

Note:

* - EPA 8020; Extraction by EPA 5030
µg/kg - micrograms per kilogram
ND - Not detected at or above reporting limit

TABLE 4-6

*Concentrations of Benzene, Toluene, Xylene, and/or Ethyl Benzene**
Greater than the Reporting Limit in Soil
Point Molate Naval Fuel Depot

Boring	Depth (feet)	Concentration (µg/kg)				
		B	T	X	E	Reporting Limit (µg/kg)
B-48A	16.5-17	1,100	1,900	160,000	19,000	1000
B-48A	17-17.5			320,000	100,000	10000
B-49A	6.5-7			3,800		1000
B-54A	9-9.5			490		100
B-65	8.5-9			6.4		5
B-65	18-18.5		15		5.2	5

Note:

* - BTXE
µg/kg - micrograms per kilogram

TABLE 4-7

Concentrations of
*Extractable Petroleum Hydrocarbons in Groundwater**
Point Molate Naval Fuel Depot

Well	JP-5 Jet Fuel (mg/L)	F-76 Diesel Fuel (mg/L)	Quantitation Limit (mg/L)
MW-1	0.33	ND	0.50
MW-1	0.23	ND	0.50
MW-2	ND	ND	0.50
MW-2	ND	ND	0.50
MW-3	ND	ND	0.50

Note:

* - California DOHS Method, EPA 8015 (Modified), LUFT Manual, October 1989
mg/L - milligrams per liter
MW-1 - Monitoring Well 1
MW-2 - Monitoring Well 2
MW-3 - Monitoring Well 3
ND - Not detected at or above quantitation limit

TABLE 4-8

Concentrations of Volatile Aromatic Hydrocarbons in Groundwater*
Point Molate Naval Fuel Depot

Compound	Concentration (µg/L) MW-1	Concentration (µg/L) MW-2	Concentration (µg/L) MW-3	Detection Limit (µg/L)
Benzene	ND	ND	62	1.0
Toluene	ND	ND	14	1.0
Ethyl Benzene	ND	ND	9.4	1.0
Total Xylenes	ND	ND	97	1.0
Chlorobenzene	ND	ND	NA	1.0
1,4-Dichlorobenzene	ND	ND	NA	1.0
1,3-Dichlorobenzene	ND	ND	NA	1.0
1,2-Dichlorobenzene	ND	ND	NA	1.0

Note:

* - EPA 8020
µg/L - micrograms per liter
MW-1 - Monitoring Well 1
MW-2 - Monitoring Well 2
MW-3 - Monitoring Well 3
ND - None Detected
NA - Not Analyzed

TABLE 4-9

Concentration of Fluoride in Water from Boring B-63*
Point Molate Naval Fuel Depot

Boring	Concentration (mg/L)	Reporting Limit (mg/L)
B-63	1.0	0.30

Note:

* - SMWW 17:4110B
mg/L - milligrams per liter

TABLE 5-1

Concentrations of Extractable Petroleum Hydrocarbons in Bedrock Samples
Point Molate Naval Fuel Depot

Boring	Depth/Concentration (mg/kg)	Depth to Refusal**	Notes on Bedrock
*B-1	17.5' - 1900 20' - ND 25' - ND	26'	Wet bedrock, above dry, coherent-bedrock
*B-2	14' - ND 16.5' - 750 18' - ND	18.5'	Highly fractured
*B-3	8' -1100 13.5' - 290 16.5' - ND	18'	Coherent
B-7	5.5' - ND 22' - ND 26.5' - ND	28.5'	Easily broken
B-8	8' - ND 18' - ND 21' - ND	23'	Highly fractured
*B-9	7' - ND 9.5' - 990 16-.5' - ND	18'	Weathered
B-10	3' - ND 6' - ND	7'	None
B-12	11.5' - ND 13' - ND 15.5' - ND	16'	Highly fractured
*B-16	7- 9900 12.5' - ND	13'	Highly fractured
B-23	10.5' - ND 20.5' - ND 23.5' - ND	24.5'	None

TABLE 5-1 (CONTINUED)

Concentrations of Extractable Petroleum Hydrocarbons in Bedrock Samples
Point Molate Naval Fuel Depot

Boring	Depth/Concentration (mg/kg)	Depth to Refusal**	Notes on Bedrock
B-28	5' - 1300 10' - 160	13.5'	Highly fractured
B-29	4' - ND	4.5'	Interbedded siltstone and sandstone/highly fractured
B-30	8.5' - 340 22.5' - 1700 26' - 1100	28'	Fractured
B-31	7' - ND 11.5' - ND	13.5'	Highly fractured
B-32	8' - ND 17' - ND	18'	None
*B-34	10' - 55 18.5' - ND	19.5'	Highly fractured
B-35	4' - ND 13' - ND	17.5'	Easily crumbled
*B-36	7.5' - 11000 13' - ND	16'	Highly fractured
B-50	6.5' - ND	7'	Occasional fractures
B-53	6.5' - ND 15.5' - ND	16'	Highly weathered
B-54	9' - 580	9.5'	coherent
B-55	13' - 4100 14' - 30 15.5' - 2200	16'	Weathered, fractured

TABLE 5-1 (CONTINUED)

Concentrations of Extractable Petroleum Hydrocarbons in Bedrock Samples
Point Molate Naval Fuel Depot

Boring	Depth/Concentration (mg/kg)	Depth to Refusal**	Notes on Bedrock
B-56	9' - ND 19' - ND 23.5' - ND	24'	weathered
*B-57	8.5' - 520 14' - 850 18' - ND	18.5'	None
B-58	10.5' - 5800 13.5' - 120	14.5'	Highly fractured
B-59	24' - 3500 27.5' - 5700 29.5' - 570	30' (no refusal)	Highly fractured, easily crumbled
B-60	13.5' - ND 20.5' - ND	22'	Highly fractured
B-61	4.5' - 300 9.5' - 40	10'	None
B-65	8.5' - ND 18' - ND 23.5' - ND	24'	Coherent
B-67	9.5' - 22000 13' - 3200 29' - 430	30' (no refusal)	Competent
B-68	9' - ND 14' - 950 24.5' - 16	25'	Hard, dry
B-69	7.5' - ND 24' - 5800 28' - 120	28.5'	Competent
B-70	7.5' - ND 17' - 4400 27' - 860	30' (no refusal)	Gravelly

TABLE 5-1 (CONTINUED)

Concentrations of Extractable Petroleum Hydrocarbons in Bedrock Samples
Point Molate Naval Fuel Depot

Boring	Depth/Concentration (mg/kg)	Depth to Refusal**	Notes on Bedrock
*B-72	6' - ND 14.5' - 150 24.5' - ND	26'	Hard, competent
*B-75	7' - 41 17' - ND 27' - ND	27.5'	Clay lining fracture surfaces
B-76	7.5' - ND 17.5' - ND 27.5' - ND	28'	Gravelly
B-78	19.5' - ND 29.5' - ND	30' (no refusal)	Very weathered
B-79	8' - ND 17' - ND 27' - ND	27.5'	Very weathered
B-80	6.5' - 1200 11.5' - 66 19' - 50	20'	Gravelly

Note:

mg/kg - milligrams per kilogram
ND - Not Detected
* - Hydrocarbon concentrations decrease to ND in bedrock
** - Rounded to nearest 0.5'

TABLE 5-2

Concentrations of Extractable Petroleum Hydrocarbons in Soil Borings Near Valve Box 19 Point Molate Naval Fuel Depot

Boring	Depth (feet)	JP-5 Jet Fuel (mg/kg)	F-76 Diesel Fuel (mg/kg)	Kerosene Range (mg/kg)	Diesel Range (mg/kg)
B-5	6-6.5	ND	4,200		
B-5	7.5-8	ND	11,000		
B-5	28.5-29	ND	ND		
B-6	8.5-9	ND	ND		
B-6	21.5-22	ND	ND		
B-6	28.5-29	ND	ND		
B-63	9.5-10			ND	1,500
B-63	13.5-14			ND	1,100
B-63	22-22.5		1,000	ND	
B-63	29.5-30		50	ND	
B-64	10-10.5			ND	270
B-64	13-13.5			ND	2,300
B-81	7-7.5			ND	1000
B-81	18-18.5			ND	1800
B-81	29.5-30			ND	ND

Note:

mg/kg - milligrams per kilogram
ND - Not detected at or above reporting limit

APPENDIX B

PRC SITE INSPECTION
ANALYTICAL RESULTS SUMMARY

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT
SITE INSPECTION
SPETEMBER - OCTOBER, 1990

SITE 1 DISPOSAL AREA (LANDFILL)

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	DA-4B(18-19.5)	DA-4B GW(39)	DA-1(5-6.5)	DA-5(5-6.5)	DA-5(10-11.5)	DA-5(15-16.5)	DA-5(30-31.5)	DA-5 GW(21)	DA-100-2
SAMPLE MATRIX	Soil	Ground Water	Soil	Soil	Soil	Soil	Soil	Ground Water	Rinsate Water
SAMPLE METHOD	Split Spoon	Bailer	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Bailer	Equipment Blank
VOA (624/8240)									
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylene	ND	ND	ND	ND	ND	ND	ND	ND	ND
Semi-Volatiles (625/8270)									
Naphthalene	ND	ND	ND	ND	446	16.1	ND	0.398	ND
2-methylnapthalene	0.454	ND	0.594	ND	140	4.71	ND	0.1	ND
Acenaphthaylene	ND	ND	ND	ND	29.9	ND	ND	ND	ND
Acenaphthene	0.174	ND	ND	ND	579	8.64	ND	0.113	ND
Fluorene	ND	ND	ND	ND	692	8.86	ND	0.083	ND
Phenanthrene	ND	ND	ND	ND	2350	23.3	ND	0.13	ND
Anthracene	ND	ND	ND	ND	419	5.1	ND	0.017	ND
Fluoranthene	ND	ND	ND	ND	2810	18.2	ND	0.036	ND
Pyrene	ND	ND	ND	ND	2580	13.2	ND	0.019	ND
Chrysene	ND	ND	ND	ND	496	5.01	ND	ND	ND
Benzo(a)anthracene	ND	ND	ND	ND	1600	5.74	ND	ND	ND
Bis(2 ethylhexyl)phthalate	3.7	ND	ND	2.32	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND	ND	395	3.39	ND	ND	ND
Benzo(b)fluoranthene	ND	ND	ND	ND	893	4.69	ND	ND	ND
Benzo(a)pyrene	ND	ND	ND	ND	394	3.83	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	130	1.84	ND	ND	ND
Dibenzo(a,h)anthracene	ND	ND	ND	ND	130	0.874	ND	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND	ND	231	1.9	ND	ND	ND
Dibenzofuran	ND	ND	ND	ND	329	6.1	ND	0.07	ND
Pesticides/PCB (608/8080)	ND	ND	ND	ND	ND	ND	ND	ND	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 1 DISPOSAL AREA (LANDFILL)

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	DA-4B(18-19.5)	DA-4B GW(39)	DA-1(5-6.5)	DA-5(5-6.5)	DA-5(10-11.5)	DA-5(15-16.5)	DA-5(30-31.5)	DA-5 GW(21)	DA-100-2
SAMPLE MATRIX	Soil	Ground Water	Soil	Soil	Soil	Soil	Soil	Ground Water	Rinsate Water
SAMPLE METHOD	Split Spoon	Bailer	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Bailer	Equipment Blank
Metals (6010)									
Silver	0.9	0.02T <0.01D	0.6	<0.5	<0.5	<0.5	0.6	<0.01T&D	NA
Barium	125	3.31T 0.11D	139	161	29.6	158	85.7	0.12T 0.11D	NA
Beryllium	1	0.02T <0.01D	0.7	0.6	<0.5	0.7	0.6	<0.01T&D	NA
Cadmium	<1.0	<0.02T&D	<1.0	<1	<1	<1	<1	<0.02T&D	NA
Cobalt	10.7	0.32T <0.02D	10	7.1	3.5	7.7	9.5	<0.02T&D	NA
Chromium	29.9	1.27T <0.02D	16.8	34.5	9.4	16.7	18.5	<0.02T&D	NA
Copper	45.9	1.22T <0.01D	28.3	23.6	6	21.5	18.9	0.01T <0.01D	NA
Manganese	278	9.18T 0.43D	327	215	121	243	155	0.65T 0.58D	NA
Molybdenum	4.6	0.11T <0.02D	2.7	2.1	<1	2.3	2.3	<0.02T&D	NA
Nickel	43.7	0.9T <0.1D	27.1	24.6	12.3	22.2	29.8	<0.1T&D	NA
Lead	54.3	1.24T <0.05D	32.8	178	22.1	29.3	29.6	<0.05T&D	NA
Antimony	16.5	0.32T <0.05D	10	7.1	<3	8.2	9.1	<0.05T&D	NA
Thallium	150	2.3T <0.1D	85.6	60.2	17.3	77.7	77.4	<0.1T&D	NA
Vanadium	41.3	0.61T <0.01D	25.4	25.5	9.3	31	24.6	<0.01T&D	NA
Zinc	109	2.0T 0.2D	78.7	115	104	53	60.9	0.24T 0.19D	NA
Metals (7000)									
Mercury (7471)	0.095	0.0024T <0.001D	<0.050	0.075	<0.050	<0.050	0.060	<0.001T&D	NA
Arsenic (7060)	10.2	0.248T <0.004D	6.35	8.05	3.45	6.55	5.53	<0.004T&D	NA
Selenium (7746)	<0.3	<0.03T <0.003D	<0.3	<0.3	<0.3	<0.3	<0.3	<0.003T&D	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 1 DISPOSAL AREA (LANDFILL)

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	DA-4B(18-19.5)	DA-4B GW(39)	DA-1(5-6.5)	DA-5(5-6.5)	DA-5(10-11.5)	DA-5(15-16.5)	DA-5(30-31.5)	DA-5 GW(21)	DA-100-2
SAMPLE MATRIX	Soil	Ground Water	Soil	Soil	Soil	Soil	Soil	Ground Water	Rinsate Water
SAMPLE METHOD	Split Spoon	Bailer	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Bailer	Equipment Blank
BTEX (602/8020)									
Benzene	<0.025	0.0018	<0.025	<0.010	<0.5	<0.010	<0.001	<0.0005	NA
Ethylbenzene	<0.025	<0.0005	<0.025	<0.010	3.2	<0.010	<0.001	0.0007	NA
Toluene	<0.025	0.0011	<0.025	<0.010	<0.5	<0.010	<0.001	<0.0005	NA
Xylene	<0.025	0.0015	0.088	0.046	30.2	<0.010	<0.001	0.0054	NA
TPH (8015mod)									
Jet Fuel(JP5)	541	0.3	598	635	15100	307	<5	2.1	NA
Gasoline range	<5	<0.1	<5	<5	<5	<5	<5	<0.1	NA
Diesel range(F76)	<10	<0.2	<10	<10	64800	513	<10	<0.2	NA
Motor Oil range	<25	<0.5	122	242	21900	162	<25	<0.5	NA
TPH	541	0.3	720	877	101800	982	--	2.1	NA
Fluoride (340.2)	NA	1.00	NA	NA	NA	NA	NA	1.09	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 1 DISPOSAL AREA (LANDFILL)

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	DA-200-1	DA-200-2	DA-6	DA-3	DA-2	EW-2
SAMPLE MATRIX	Deionized Water	Deionized Water	Liquid Waste	Soil	Soil	Ground Water
SAMPLE METHOD	Trip Blank	Trip Blank	Grab Sample	Hand Auger	Hand Auger	Bailer
VOA (624/8240)						
Methylene chloride	ND	ND	1.68	NA	ND	ND
1,1,1-Trichloroethane	ND	ND	1.88	NA	ND	ND
Toluene	ND	ND	ND	NA	ND	ND
Ethylbenzene	ND	ND	ND	NA	ND	ND
Total Xylene	ND	ND	ND	NA	ND	ND
Acetone	ND	ND	6.51	NA	ND	ND
Semi-Volatiles (625/8270)						
Pentachlorophenol	NA	NA	0.94	NA	0.514	ND
Naphthalene	NA	NA	ND	NA	ND	ND
2-methylnapthalene	NA	NA	ND	NA	1.79	ND
Acenaphthaylene	NA	NA	ND	NA	ND	ND
Acenaphthene	NA	NA	ND	NA	ND	ND
Fluorene	NA	NA	ND	NA	0.371	ND
Diethyl phthalate			ND	NA	ND	ND
Phenanthrene			ND	NA	0.402	ND
Di-n-butyl phthalate	NA	NA	0.248	NA	0.215	ND
Fluoranthene			ND	NA	0.203	ND
Pyrene	NA	NA	ND	NA	0.154	ND
Chrysene	NA	NA	ND	NA	ND	ND
Benzo(a)anathracene	NA	NA	ND	NA	ND	ND
Bis(2 ethylhexyl)phthalate	NA	NA	ND	NA	ND	ND
Benzo(a)pyrene	NA	NA	ND	NA	ND	ND
Indeno(1,2,3-cd)anthracene	NA	NA	ND	NA	ND	ND
Benzo(g,h,i)perylene	NA	NA	ND	NA	ND	ND
Dibenzofuran	NA	NA	ND	NA	0.604	ND
Pesticides/PCB (608/8080)						

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 1 DISPOSAL AREA (LANDFILL)

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	DA-200-1	DA-200-2	DA-6	DA-3	DA-2	EW-2
SAMPLE MATRIX	Deionized Water	Deionized Water	Liquid Waste	Soil	Soil	Ground Water
SAMPLE METHOD	Trip Blank	Trip Blank	Grab Sample	Hand Auger	Hand Auger	Bailer
d-BHC	NA	NA	0.397	NA	ND	ND
Dieldrin	NA	NA	ND	NA	0.0048	ND
Metals (6010)						
Silver	NA	NA	<0.5	NA	0.7	<0.01T&D
Barium	NA	NA	3.3	NA	118	0.15T 0.19D
Beryllium	NA	NA	<0.5	NA	0.7	<0.01T&D
Cadmium	NA	NA	14.9	NA	<1.0	<0.02T&D
Cobalt	NA	NA	<1.0	NA	14.5	<0.02T&D
Chromium	NA	NA	2.6	NA	18.9	<0.02T&D
Copper	NA	NA	19.4	NA	32.2	<0.01T&D
Manganese	NA	NA	21	NA	237	4.63T 4.59D
Molybdenum	NA	NA	1.5	NA	3.3	<0.02T&D
Nickel	NA	NA	5.9	NA	34.5	<0.1T&D
Lead	NA	NA	46.6	NA	20.6	0.06T <0.01D
Antimony	NA	NA	<3.0	NA	14.1	<0.05T&D
Thallium	NA	NA	36.1	NA	68.8	0.1T&D
Vanadium	NA	NA	<0.5	NA	23.3	0.01T&D
Zinc	NA	NA	1760	NA	77.5	<0.01T&D
Metals (7000)						
Mercury (7471)	NA	NA	<1.00	NA	<1.00	0.001T 0.001D
Arsenic (7060)	NA	NA	<0.400	NA	10.5	0.021T 0.016D
Selenium (7746)	NA	NA	<0.300	NA	<0.300	<0.003T <0.003D

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 1 DISPOSAL AREA (LANDFILL)

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	DA-200-1	DA-200-2	DA-6	DA-3	DA-2	EW-2
SAMPLE MATRIX	Deionized Water	Deionized Water	Liquid Waste	Soil	Soil	Ground Water
SAMPLE METHOD	Trip Blank	Trip Blank	Grab Sample	Hand Auger	Hand Auger	Bailer
BTEX (602/8020)						
Benzene	NA	NA	<0.010	<0.050	<0.025	<0.0005
Ethylbenzene	NA	NA	<0.010	<0.050	<0.025	<0.0005
Toluene	NA	NA	<0.010	<0.050	<0.025	<0.0005
Xylene	NA	NA	0.064	0.32	0.15	<0.0005
TPH (8015mod)						
Jet Fuel(JP5)	NA	NA	<5	5570	3610	0.3
Gasoline range	NA	NA	<5	<5	<5	<0.1
Diesel range(F76)	NA	NA	<10	<10	<10	<0.2
Motor Oil range	NA	NA	<25	<25	<25	<0.5
TPH	NA	NA	--	5570	3610	0.3
Flouride (340.2)	NA	NA	NA	NA	NA	0.65

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 2 SANDBLAST GRIT DISPOSAL AREAS

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	B123-1(0-1.5)	B123-1(1.5-3)	B123-2(4-5.5)	B123-2(8-9.5)	B123-2(12.5-14)	B123-2(28)	B123-1 GW(36)	B123-2 GW(30)	B123-3
SAMPLE MATRIX	Soil	Soil	Soil	Soil	Soil	Soil	Ground Water	Ground Water	Sandblast Grit
SAMPLE METHOD	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Bailer	Bailer	Grab Sample
VOA (624/8240)									
Toluene	NA	NA	NA	NA	NA	NA	ND	ND	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	ND	ND	NA
Total Xylene	NA	NA	NA	NA	NA	NA	ND	ND	NA
Semi-Volatiles (625/8270)									
Naphthalene	NA	NA	NA	NA	NA	NA	NA	ND	NA
2-methylnapthalene	NA	NA	NA	NA	NA	NA	NA	ND	NA
Acenaphthaylene	NA	NA	NA	NA	NA	NA	NA	ND	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	ND	NA
Flourene	NA	NA	NA	NA	NA	NA	NA	ND	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	ND	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	ND	NA
Benzo(a)anathracene	NA	NA	NA	NA	NA	NA	NA	ND	NA
Bis(2 ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	ND	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	ND	NA
Indeno(1,2,3-cd)anthracene	NA	NA	NA	NA	NA	NA	NA	ND	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	ND	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	ND	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 2 SANDBLAST GRIT DISPOSAL AREAS

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	B123-1(0-1.5)	B123-1(1.5-3)	B123-2(4-5.5)	B123-2(8-9.5)	B123-2(12.5-14)	B123-2(28)	B123-1 GW(36)	B123-2 GW(30)	B123-3
SAMPLE MATRIX	Soil	Soil	Soil	Soil	Soil	Soil	Ground Water	Ground Water	Sandblast Grit
SAMPLE METHOD	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Bailer	Bailer	Grab Sample
Pesticides/PCB (608/8080)	NA	NA	NA	NA	NA	NA	NA	ND	NA
Metals (6010)									
Silver	0.5	0.7	0.7	0.7	0.8	0.9	<0.01T&D	<0.01T&D	1.7
Barium	233	155	184	164	163	105	0.59T 0.07D	0.19T 0.03D	26.8
Beryllium	0.6	0.8	0.8	0.7	0.8	0.7	<0.01T&D	<0.01T&D	<0.5
Cadmium	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.02T&D	<0.02T&D	12.9
Cobalt	4.7	4.9	9.4	8	10.8	8.8	<0.02T&D	<0.02T&D	5.9
Chromium	12	38.3	20.3	19.1	21.9	27.6	0.12T <0.02D	0.03T <0.02D	167
Copper	12.9	11.8	27	20.6	22.7	24	0.02T <0.01D	0.04T 0.01D	79.9
Manganese	111	89.8	481	328	259	246	0.6T 0.09D	0.43T 0.07D	135
Molybdenum	2.7	3	2.6	2.6	3	3.6	0.02T&D	<0.02T&D	5.3
Nickel	15.2	26.1	28.4	24.6	27.5	29.6	<0.1T&D	<0.1T&D	105
Lead	16.6	18.7	17.1	14.6	16.8	14.8	0.06T < 0.1D	0.07T <0.05D	173
Antimony	13.6	14.7	12.4	11.9	14.3	14.5	<0.05T&D	<0.05T&D	18
Thallium	28.4	35.4	40.3	36	41.6	44.1	<0.1T&D	<0.1T&D	35.9
Vanadium	24.8	33.4	29.3	27.4	32.2	30.4	0.03T <0.01D	0.03T <0.01D	4.8
Zinc	44.5	55.7	51.1	43.3	45.8	56.2	0.15T 0.14D	0.14T 0.11D	423
Metals (7000)									
Mercury (7471)	0.18	0.45	<0.25	<0.1	0.1	0.15	0.12 <0.01D	0.002T <0.001D	<1.0
Arsenic (7060)	10.8	12.2	10.3	10.3	11.4	13.7	<0.1T <0.004D	<0.004T&D	0.78
Selenium (7746)	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.1T <0.003D	<0.003T&D	<0.3

Note

ND: Not Detected
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ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 2 SANDBLAST GRIT DISPOSAL AREAS

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	B123-1(0-1.5)	B123-1(1.5-3)	B123-2(4-5.5)	B123-2(8-9.5)	B123-2(12.5-14)	B123-2(28)	B123-1 GW(36)	B123-2 GW(30)	B123-3
SAMPLE MATRIX	Soil	Soil	Soil	Soil	Soil	Soil	Ground Water	Ground Water	Sandblast Grit
SAMPLE METHOD	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Bailer	Bailer	Grab Sample
BTEX (602/8020)									
Benzene	NA	NA	NA	NA	NA	NA	NA	<0.0005	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	<0.0005	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	<0.0005	NA
Xylene	NA	NA	NA	NA	NA	NA	NA	<0.0005	NA
TPH (8015mod)									
Jet Fuel(JP5)	NA	NA	<5	<5	<5	<5	<0.1	<0.1	NA
Gasoline range	NA	NA	<5	<5	<5	<5	<0.1	<0.1	NA
Diesel range(F76)	NA	NA	<10	<10	<10	<10	<0.2	<0.2	NA
Motor Oil range	NA	NA	<25	<25	<25	<25	<0.5	<0.5	NA
TPH	NA	NA	--	--	--	--	--	--	NA
Fluoride (340.2)	NA	NA	NA	NA	NA	NA	1.7	0.4	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 2 SANDBLAST GRIT DISPOSAL AREAS

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	B123-100-2	B123-200-1	B85-1	B85-2	SL-1	SL-2
SAMPLE MATRIX	Rinsate Water	Deionized Water	Soil	Soil	Soil	Soil
SAMPLE METHOD	Equipment Blank	Trip Blank	Hand Auger	Hand Auger	Hand Auger	Hand Auger
VOA (624/8240)						
Toluene	ND	ND	NA	NA	NA	NA
Ethylbenzene	ND	ND	NA	NA	NA	NA
Total Xylene	ND	ND	NA	NA	NA	NA
Metals (6010)						
Silver	<0.01T&D	NA	0.6	1.1	0.6	0.6
Barium	<0.02T&D	NA	37.5	145	143	194
Beryllium	<0.01T&D	NA	<0.5	<0.5	0.6	0.9
Cadmium	<0.02T&D	NA	<1.0	<1.0	<1.0	<1.0
Cobalt	<0.02T&D	NA	6.1	11.2	9.5	10.3
Chromium	<0.02T&D	NA	41.8	76.3	18.7	22.1
Copper	0.01T&D	NA	10.8	29.8	30.6	22
Manganese	<0.01T&D	NA	159	357	259	269
Molybdenum	<0.02T&D	NA	1.7	3.8	3	3.5
Nickel	<0.17T&D	NA	41.2	42.8	24.7	25.4
Lead	<0.05T&D	NA	156	55.6	34.3	21.7
Antimony	<0.05T&D	NA	7.1	17.7	13.3	14.8
Thallium	<0.1T&D	NA	28.7	63.1	67.8	82
Vanadium	<0.01T&D	NA	15.8	33.9	24.7	30.8
Zinc	0.09T 0.07D	NA	92.7	98.6	124	45.6
Metals (7000)						
Mercury (7471)	0.002T <0.001D	NA	1	<1.00	<1.00	<1.00
Arsenic (7060)	<0.004T&D	NA	6.39	15.3	14.7	12.7
Selenium (7746)	<0.003T&D	NA	<3.00	<3.00	<3.00	<3.00

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 2 SANDBLAST GRIT DISPOSAL AREAS

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	B123-100-2	B123-200-1	B85-1	B85-2	SL-1	SL-2
SAMPLE MATRIX	Rinsate Water	Deionized Water	Soil	Soil	Soil	Soil
SAMPLE METHOD	Equipment Blank	Trip Blank	Hand Auger	Hand Auger	Hand Auger	Hand Auger
BTEX (602/8020)						
Benzene	<0.0005	NA	NA	NA	NA	NA
Ethylbenzene	<0.0005	NA	NA	NA	NA	NA
Toluene	<0.0005	NA	NA	NA	NA	NA
Xylene	<0.0005	NA	NA	NA	NA	NA
TPH (8015mod)						
Jet Fuel(JP5)	NA	NA	NA	NA	NA	NA
Gasoline range	<0.2	NA	NA	NA	NA	NA
Diesel range(F76)	<0.4	NA	NA	NA	NA	NA
Motor Oil range	<1.0	NA	NA	NA	NA	NA
TPH	--	NA	NA	NA	NA	NA
Fluoride (340.2)	NA	NA	NA	NA	NA	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT PONDS AREA

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-1(5.5-7)	TP-1(8.5-10)	TP-1(11.5-13)	TP-1(16-17.5)	TP-1(19-20.5)	TP-1(20.5-22.5)	TP-10(0-2)	TP-1(25.5-27.5)	TP-2(4.5-6)
SAMPLE MATRIX	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
SAMPLE METHOD	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon
VOA (624/8240)									
Toluene	NA	NA	ND	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	ND	NA	NA	NA	NA	NA	NA
Total Xylene	NA	NA	ND	NA	NA	NA	NA	NA	NA
Semi-Volatiles (625/8270)									
Naphthalene	NA	NA	ND	NA	NA	NA	NA	NA	NA
2-methylnapthalene	NA	NA	16	NA	NA	NA	NA	NA	NA
Acenaphthaylene	NA	NA	ND	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	ND	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	3.92	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	11.4	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	ND	NA	NA	NA	NA	NA	NA
Fluorathene	NA	NA	ND	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	0.384	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	1.35	NA	NA	NA	NA	NA	NA
Benzo(a)anathracene	NA	NA	ND	NA	NA	NA	NA	NA	NA
Bis(2 ethylhexyl)phthalate	NA	NA	ND	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	ND	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)anthracene	NA	NA	ND	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	ND	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	ND	NA	NA	NA	NA	NA	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT PONDS AREA

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-1(5.5-7)	TP-1(8.5-10)	TP-1(11.5-13)	TP-1(16-17.5)	TP-1(19-20.5)	TP-1(20.5-22.5)	TP-10(0-2)	TP-1(25.5-27.5)	TP-2(4.5-6)
SAMPLE MATRIX	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
SAMPLE METHOD	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon
Pesticides/PCB (608/8080)	NA	NA	ND	NA	NA	NA	NA	NA	NA
Metals (6010)									
Silver	NA	NA	0.9	NA	NA	NA	NA	NA	NA
Barium	NA	NA	40.5	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	<0.5	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	<1.0	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	11.1	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	41.1	NA	NA	NA	NA	NA	NA
Copper	NA	NA	29.8	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	377	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	3.2	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	49.6	NA	NA	NA	NA	NA	NA
Lead	NA	NA	20.1	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	153	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	45.3	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	42	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	67.4	NA	NA	NA	NA	NA	NA
Metals (7000)									
Mercury (7471)	NA	NA	0.35	NA	NA	NA	NA	NA	NA
Arsenic (7060)	NA	NA	11.2	NA	NA	NA	NA	NA	NA
Selenium (7746)	NA	NA	<0.3	NA	NA	NA	NA	NA	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT PONDS AREA

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-1(5.5-7)	TP-1(8.5-10)	TP-1(11.5-13)	TP-1(16-17.5)	TP-1(19-20.5)	TP-1(20.5-22.5)	TP-10(0-2)	TP-1(25.5-27.5)	TP-2(4.5-6)
SAMPLE MATRIX	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
SAMPLE METHOD	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon
BTEX (602/8020)									
Benzene	<0.001	<0.0025	<0.020	<0.001	<0.0025	<0.020	<0.001	<0.001	<0.001
Ethylbenzene	0.016	0.034	0.339	<0.001	0.024	0.711	0.02	<0.001	0.014
Toluene	0.026	0.018	0.099	0.013	0.015	0.147	<0.001	0.018	0.068
Xylene	0.029	0.122	0.974	<0.001	0.057	0.197	0.05	<0.001	0.036
TPH (8015mod)									
Jet Fuel(JP5)	<5	<5	<5	<5	<5	<5	<5	<5	<5
Gasoline range	<5	<5	<5	<5	<5	<5	<5	<5	<5
Diesel range(F76)	46	403	3630	50	2650	174	654	<10	121
Motor Oil range	<25	<25	923	150	323	81	173	<25	117
TPH	46	403	4553	200	2973	255	827	--	238

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT POND AREAS

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-2(8-9.5)	TP-2(13-14.5)	TP-2(16-18)	TP-2(18-19.5)	TP-2(24.5-28)	TP-1 GW(8)	TP-2 GW(6)	TP-100-1	TP-100-2
SAMPLE MATRIX	Soil	Soil	Soil	Soil	Soil	Ground Water	Ground Water	Rinsate Water	Rinsate Water
SAMPLE METHOD	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Bailer	Bailer	Equipment Blank	Equipment Blank
VOA (624/8240)									
Toluene	NA	NA	0.216	NA	NA	ND	ND	ND	ND
Ethylbenzene	NA	NA	ND	NA	NA	ND	ND	ND	ND
Total Xylene	NA	NA	ND	NA	NA	ND	ND	ND	ND
Semi-Volatiles (625/8270)									
Naphthalene	NA	NA	ND	NA	NA	ND	ND	ND	NA
2-methylnapthalene	NA	NA	2.34	NA	NA	0.018	ND	ND	NA
Acenaphthaylene	NA	NA	ND	NA	NA	ND	ND	ND	NA
Acenaphthene	NA	NA	ND	NA	NA	ND	ND	ND	NA
Fluorene	NA	NA	0.716	NA	NA	ND	ND	ND	NA
Pyrene	NA	NA	0.784	NA	NA	ND	ND	ND	NA
Chrysene	NA	NA	0.562	NA	NA	ND	ND	ND	NA
Benzo(a)anathracene	NA	NA	0.358	NA	NA	ND	ND	ND	NA
Bis(2 ethylhexyl)phthalate	NA	NA	ND	NA	NA	ND	ND	ND	NA
Benzo(a)pyrene	NA	NA	ND	NA	NA	ND	ND	ND	NA
Indeno(1,2,3-cd)anthracene	NA	NA	ND	NA	NA	ND	ND	ND	NA
Benzo(g,h,i)perylene	NA	NA	ND	NA	NA	ND	ND	ND	NA
Dibenzofuran	NA	NA	ND	NA	NA	ND	ND	ND	NA
Phenanthrene	NA	NA	0.87	NA	NA	ND	ND	ND	NA
Anthracene	NA	NA	0.43	NA	NA	ND	ND	ND	NA
Fluoranthene	NA	NA	0.388	NA	NA	ND	ND	ND	NA

Note

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ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT POND AREAS

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-2(8-9.5)	TP-2(13-14.5)	TP-2(16-18)	TP-2(18-19.5)	TP-2(24.5-28)	TP-1 GW(8)	TP-2 GW(6)	TP-100-1	TP-100-2
SAMPLE MATRIX	Soil	Soil	Soil	Soil	Soil	Ground Water	Ground Water	Rinsate Water	Rinsate Water
SAMPLE METHOD	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Bailer	Bailer	Equipment Blank	Equipment Blank
Pesticides/PCB (608/8080)	NA	NA	ND	NA	NA	ND	NA	ND	NA
Metals (6010)									
Silver	NA	NA	0.5	NA	NA	<0.01T <0.01D	<0.01T&D	NA	NA
Barium	NA	NA	43.8	NA	NA	0.6T 0.16D	0.26T 0.14D	NA	NA
Beryllium	NA	NA	0.5	NA	NA	<0.01T <0.01D	<0.01T&D	NA	NA
Cadmium	NA	NA	<1.0	NA	NA	<0.02T <0.02D	<0.02T&D	NA	NA
Cobalt	NA	NA	4.6	NA	NA	0.05T <0.02D	<0.02T&D	NA	NA
Chromium	NA	NA	11.3	NA	NA	0.12T <0.02D	<0.02T&D	NA	NA
Copper	NA	NA	12.6	NA	NA	0.13T <0.01D	0.01T 0.01D	NA	NA
Manganese	NA	NA	156	NA	NA	0.09T 0.03D	2.62T 2.4D	NA	NA
Molybdenum	NA	NA	1.6	NA	NA	<0.02T <0.02D	<0.02T&D	NA	NA
Nickel	NA	NA	18.2	NA	NA	0.2T <0.1D	<0.1T&D	NA	NA
Lead	NA	NA	8.8	NA	NA	0.22T <0.05D	<0.1T <0.05D	NA	NA
Antimony	NA	NA	8.5	NA	NA	<0.05T <0.05D	<0.05T&D	NA	NA
Thallium	NA	NA	23.3	NA	NA	0.3T <0.01D	<0.1T&D	NA	NA
Vanadium	NA	NA	17.2	NA	NA	0.13T <0.01D	0.02T <0.01D	NA	NA
Zinc	NA	NA	34.6	NA	NA	0.45T 0.14D	0.20T <0.1D	NA	NA
Metals (7000)									
Mercury (7471)	NA	NA	0.2	NA	NA	0.006T <0.001D	<0.01T 0.15D	NA	NA
Arsenic (7060)	NA	NA	6.6	NA	NA	0.008T 0.003D	<0.004T <0.1D	NA	NA
Selenium (7746)	NA	NA	<0.3	NA	NA	<0.003T <0.003D	<0.003T <0.1D	NA	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT POND AREAS

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-2(8-9.5)	TP-2(13-14.5)	TP-2(16-18)	TP-2(18-19.5)	TP-2(24.5-28)	TP-1 GW(8)	TP-2 GW(6)	TP-100-1	TP-100-2
SAMPLE MATRIX	Soil	Soil	Soil	Soil	Soil	Ground Water	Ground Water	Rinsate Water	Rinsate Water
SAMPLE METHOD	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Bailer	Bailer	Equipment Blank	Equipment Blank
BTEX (602/8020)									
Benzene	<0.001	<0.001	<0.001	<0.001	<0.001	0.0029	<0.0005	<0.0005	<0.0005
Ethylbenzene	0.024	<0.001	0.006	<0.001	<0.001	0.0005	<0.0005	<0.0005	<0.0005
Toluene	0.076	0.015	<0.001	0.024	<0.001	0.0005	<0.0005	<0.0005	<0.0005
Xylene	0.058	<0.001	0.013	<0.001	<0.001	0.0012	<0.0005	<0.0005	<0.0005
TPH (8015mod)									
Jet Fuel(JP5)	<5	<5	<5	<5	<5	<0.1	<0.1	<0.1	<0.1
Gasoline range	<5	<5	<5	<5	<5	<0.1	<0.1	<0.1	<0.1
Diesel range(F76)	258	217	585	<10	<10	2.4	<0.2	<0.2	<0.2
Motor Oil range	109	128	609	26	<25	0.6	<0.5	<0.5	<0.5
TPH	367	345	1194	26	--	3	--	--	--
Fluoride (340.2)	NA	NA	NA	NA	NA	0.7	NA	NA	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT POND AREA

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-100-3	TP-200-1	TP-200-2	TP-200-3	TP-200-4	TP-200-5
SAMPLE MATRIX	Rinsate Water	Deionized Water	Deionized Water	Deionized Water	Deionized Water	Deionized Water
SAMPLE METHOD	Equipment Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
VOA (624/8240)						
Toluene	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND
Total Xylene	ND	ND	ND	ND	ND	ND
Semi-Volatiles (625/8270)						
Naphthalene	NA	NA	NA	NA	NA	NA
2-methylnapthalene	NA	NA	NA	NA	NA	NA
Acenaphthaylene	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA
Benzo(a)anathracene	NA	NA	NA	NA	NA	NA
Bis(2 ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)anthracene	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA

Note

ND: Not Detected
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ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT POND AREA

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-100-3	TP-200-1	TP-200-2	TP-200-3	TP-200-4	TP-200-5
SAMPLE MATRIX	Rinsate Water	Deionized Water	Deionized Water	Deionized Water	Deionized Water	Deionized Water
SAMPLE METHOD	Equipment Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
Pesticides/PCB (608/8080)	NA	NA	NA	NA	NA	NA
Metals (6010)						
Silver	NA	NA	NA	NA	NA	NA
Barium	NA	NA	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA	NA	NA
Nickel	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA
Thallium	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA
Metals (7000)						
Mercury (7471)	NA	NA	NA	NA	NA	NA
Arsenic (7060)	NA	NA	NA	NA	NA	NA
Selenium (7746)	NA	NA	NA	NA	NA	NA

Note

ND: Not Detected
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ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT POND AREA

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-100-3	TP-200-1	TP-200-2	TP-200-3	TP-200-4	TP-200-5
SAMPLE MATRIX	Rinsate Water	Deionized Water	Deionized Water	Deionized Water	Deionized Water	Deionized Water
SAMPLE METHOD	Equipment Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
BTEX (602/8020)						
Benzene	<0.0005	NA	NA	NA	NA	NA
Ethylbenzene	<0.0005	NA	NA	NA	NA	NA
Toluene	<0.0005	NA	NA	NA	NA	NA
Xylene	<0.0005	NA	NA	NA	NA	NA
TPH (8015mod)						
Jet Fuel (JP5)	<0.1	NA	NA	NA	NA	NA
Gasoline range	<0.1	NA	NA	NA	NA	NA
Diesel range(F76)	<0.2	NA	NA	NA	NA	NA
Motor Oil range	<0.5	NA	NA	NA	NA	NA
TPH	--	NA	NA	NA	NA	NA
Fluoride (340.2)	NA	NA	NA	NA	NA	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT POND AREA

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-100-3	TP-200-1	TP-200-2	TP-200-3	TP-200-4	TP-200-5
SAMPLE MATRIX	Rinsate Water	Deionized Water	Deionized Water	Deionized Water	Deionized Water	Deionized Water
SAMPLE METHOD	Equipment Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank	Trip Blank
VOA (624/8240)	ND	ND	ND	ND	ND	ND
Semi-Volatiles (625/8270)	NA	NA	NA	NA	NA	NA
Pesticides/PCB (608/8080)	NA	NA	NA	NA	NA	NA
Metals (6010)	NA	NA	NA	NA	NA	NA
Metals (7000)	NA	NA	NA	NA	NA	NA
BTEX (602/8020)						
Benzene	<0.0005	NA	NA	NA	NA	NA
Ethylbenzene	<0.0005	NA	NA	NA	NA	NA
Toluene	<0.0005	NA	NA	NA	NA	NA
Xylene	<0.0005	NA	NA	NA	NA	NA
TPH (8015mod)						
Jet Fuel (JP5)	<0.1	NA	NA	NA	NA	NA
Gasoline range	<0.1	NA	NA	NA	NA	NA
Diesel range(F76)	<0.2	NA	NA	NA	NA	NA
Motor Oil range	<0.5	NA	NA	NA	NA	NA
TPH	--	NA	NA	NA	NA	NA
Fluoride (340.2)	NA	NA	NA	NA	NA	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT POND AREAS

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-3(5-6.5)	TP-3(9.5-13)	TP-3(13-14.5)	TP-3(19.5-21)	TP-3(22.5-24)	TP-3(35-37)	TP-4(14-15.5)
SAMPLE MATRIX	Soil	Soil	Soil	Soil	Soil	Soil	Soil
SAMPLE METHOD	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon
VOA (624/8240)							
Toluene	NA	NA	ND	NA	NA	NA	NA
Ethylbenzene	NA	NA	ND	NA	NA	NA	NA
Total Xylene	NA	NA	ND	NA	NA	NA	NA
Semi-Volatiles (625/8270)							
Naphthalene	NA	NA	ND	NA	NA	NA	NA
2-methylnapthalene	NA	NA	3.24	NA	NA	NA	NA
Acenaphthaylene	NA	NA	ND	NA	NA	NA	NA
Acenaphthene	NA	NA	0.72	NA	NA	NA	NA
Fluorene	NA	NA	1.75	NA	NA	NA	NA
Phenanthrene	NA	NA	3.51	NA	NA	NA	NA
Anthracene	NA	NA	0.76	NA	NA	NA	NA
Pyrene	NA	NA	0.692	NA	NA	NA	NA
Chrysene	NA	NA	0.486	NA	NA	NA	NA
Benzo(a)anathracene	NA	NA	0.33	NA	NA	NA	NA
Bis(2 ethylhexyl)phthalate	NA	NA	ND	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	ND	NA	NA	NA	NA
Indeno(1,2,3-cd)anthracene	NA	NA	ND	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	ND	NA	NA	NA	NA
Dibenzofuran	NA	NA	ND	NA	NA	NA	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT POND AREAS

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-3(5-6.5)	TP-3(9.5-13)	TP-3(13-14.5)	TP-3(19.5-21)	TP-3(22.5-24)	TP-3(35-37)	TP-4(14-15.5)
SAMPLE MATRIX	Soil	Soil	Soil	Soil	Soil	Soil	Soil
SAMPLE METHOD	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon
Pesticides/PCB (608/8080)	NA	NA	ND	NA	NA	NA	NA
Metals (6010)							
Silver	NA	NA	1.0	NA	NA	NA	NA
Barium	NA	NA	161	NA	NA	NA	NA
Beryllium	NA	NA	0.7	NA	NA	NA	NA
Cadmium	NA	NA	<1.0	NA	NA	NA	NA
Cobalt	NA	NA	9.2	NA	NA	NA	NA
Chromium	NA	NA	18.6	NA	NA	NA	NA
Copper	NA	NA	16.9	NA	NA	NA	NA
Manganese	NA	NA	219	NA	NA	NA	NA
Molybdenum	NA	NA	2.2	NA	NA	NA	NA
Nickel	NA	NA	24.4	NA	NA	NA	NA
Lead	NA	NA	24.8	NA	NA	NA	NA
Antimony	NA	NA	13.7	NA	NA	NA	NA
Thallium	NA	NA	26.2	NA	NA	NA	NA
Vanadium	NA	NA	28.3	NA	NA	NA	NA
Zinc	NA	NA	48.4	NA	NA	NA	NA
Metals (7000)							
Mercury (7471)	NA	NA	0.09	NA	NA	NA	NA
Arsenic (7060)	NA	NA	2.45	NA	NA	NA	NA
Selenium (7746)	NA	NA	<0.30	NA	NA	NA	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT POND AREAS

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-3(5-6.5)	TP-3(9.5-13)	TP-3(13-14.5)	TP-3(19.5-21)	TP-3(22.5-24)	TP-3(35-37)	TP-4(14-15.5)
SAMPLE MATRIX	Soil	Soil	Soil	Soil	Soil	Soil	Soil
SAMPLE METHOD	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon
BTEX (602/8020)							
Benzene	<0.001	<0.025	<500	<0.001	<0.001	<0.001	<0.010
Ethylbenzene	<0.001	1.01	0.397	0.044	<0.001	<0.001	0.200
Toluene	0.034	1.83	0.942	0.075	0.019	0.011	0.408
Xylene	<0.001	1.10	0.349	0.039	<0.001	<0.001	0.253
TPH (8015mod)							
Jet Fuel(JP5)	<5	<5	<5	<5	<5	<5	<5
Gasoline range	<5	<5	<5	<5	<5	<5	<5
Diesel range(F76)	<10	1220	966	225	89	<10	1890
Motor Oil range	50	610	626	360	78	<25	409
TPH	50	1830	1592	585	167	--	2299
Fluoride (340.2)	NA	NA	NA	NA	NA	NA	NA

Note

ND: Not Detected
NA: Not Analyzed

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ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT POND AREAS

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-4(17.5-19)	TP-4(22.5-24)	TP-4(41-42.5)	TP-5(13-14.5)	TP-5(18-21.5)
SAMPLE MATRIX	Soil	Soil	Soil	Soil	Soil
SAMPLE METHOD	Split Spoon	Split Spoon	Split Spoon	Split Spoon	Split Spoon
BTEX (602/8020)					
Benzene	<0.010	<0.001	<0.001	<0..25	<0.010
Ethylbenzene	0.288	<0.001	<0.001	1.050	0.136
Toluene	0.566	0.007	<0.001	2.060	<0.010
Xylene	0.512	<0.001	<0.001	1.850	0.474
TPH (8015mod)					
Jet Fuel(JP5)	<5	<5	<5	221	<5
Gasoline range	<5	<5	<5	<5	<5
Diesel range(F76)	2030	<10	<10	<10	71
Motor Oil range	429	<25	<25	<25	51
TPH	2459	--	--	221	122

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT POND AREA

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-4 GW(13)	PRC #2	TP-5 GW(14)	PRC #3	SDS #1	TP-6(2)	TP-7(1)
SAMPLE MATRIX	Ground Water	Ground Water	Ground Water	Ground Water	Waste Water	Soil	Soil
SAMPLE METHOD	Bailer	Bailer	Bailer	Bailer	Bailer	Split spoon	Split spoon
VOA (624/8240)							
Toluene	ND	ND	ND	ND	NA	NA	NA
Ethylbenzene	ND	ND	ND	ND	NA	NA	NA
Total Xylene	ND	ND	0.008	ND	NA	NA	NA
Semi-Volatiles (625/8270)							
Naphthalene	ND	ND	ND	NA	NA	NA	NA
2-methylnapthalene	ND	ND	0.031	NA	NA	NA	NA
Acenaphthaylene	ND	ND	ND	NA	NA	NA	NA
Acenaphthene	ND	ND	ND	NA	NA	NA	NA
Fluorene	ND	ND	ND	NA	NA	NA	NA
Pyrene	ND	ND	ND	NA	NA	NA	NA
Chrysene	ND	ND	ND	NA	NA	NA	NA
Benzo(a)anathracene	ND	ND	ND	NA	NA	NA	NA
Bis(2 ethylhexyl)phthalate	ND	ND	0.073	NA	NA	NA	NA
Benzo(a)pyrene	ND	ND	ND	NA	NA	NA	NA
Indeno(1,2,3-cd)anthracene	ND	ND	ND	NA	NA	NA	NA
Benzo(g,h,i)perylene	ND	ND	ND	NA	NA	NA	NA
Dibenzofuran	ND	ND	ND	NA	NA	NA	NA
Pesticides/PCB (608/8080)	ND	ND	ND	NA	NA	NA	NA

Note

ND: Not Detected
NA: Not Analyzed

SITE 3 TREATMENT POND AREA

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-4 GW(13)	PRC #2	TP-5 GW(14)	PRC #3	SDS #1	TP-6(2)	TP-7(1)
SAMPLE MATRIX	Ground Water	Ground Water	Ground Water	Ground Water	Waste Water	Soil	Soil
SAMPLE METHOD	Bailer	Bailer	Bailer	Bailer	Bailer	Split spoon	Split spoon
Metals (6010)							
Silver	<0.01T&D	<0.01T&D	<0.01T&D	<0.01T&D	NA	NA	NA
Barium	0.32T 0.21D	0.32T 0.23D	0.13T 0.09D	0.11T 0.10D	NA	NA	NA
Beryllium	<0.01T&D	<0.01T&D	<0.01T&D	<0.01T&D	NA	NA	NA
Cadmium	<0.02T&D	<0.02T&D	<0.02T&D	<0.02T&D	NA	NA	NA
Cobalt	<0.02T&D	<0.02T&D	<0.02T&D	<0.02T&D	NA	NA	NA
Chromium	<0.02T&D	<0.02T&D	<0.02T&D	<0.02T&D	NA	NA	NA
Copper	0.02T <0.01D	0.02T <0.01D	<0.01T&D	<0.01T 0.02D	NA	NA	NA
Manganese	2.33T 2.11D	2.31T 2.13D	2.98T 2.40D	2.87T 2.65D	NA	NA	NA
Molybdenum	<0.02T&D	<0.02T&D	<0.02T&D	<0.02T&D	NA	NA	NA
Nickel	<0.1T&D	<0.1T&D	<0.1T&D	<0.1T&D	NA	NA	NA
Lead	0.05T <0.05D	<0.05T&D	<0.05T&D	<0.05T&D	NA	NA	NA
Antimony	<0.05T&D	<0.05T&D	<0.05T&D	<0.05T&D	NA	NA	NA
Thallium	<0.1T&D	<0.1T&D	<0.1T&D	<0.1T&D	NA	NA	NA
Vanadium	0.02T <0.01D	0.02T <0.01D	<0.01T&D	<0.01T&D	NA	NA	NA
Zinc	0.16T 0.05D	0.07T 0.11D	0.07T 0.03D	0.08T 0.07D	NA	NA	NA
Metals (7000)							
Mercury (7471)	0.002T&D	0.002T&D	0.001T&D	0.002T&D	NA	NA	NA
Arsenic (7060)	0.007T <0.004D	0.005T <0.004D	<0.004T&D	<0.004T&D	NA	NA	NA
Selenium (7746)	<0.003T&D	<0.003T&D	<0.003T&D	<0.003T&D	NA	NA	NA

Note

ND: Not Detected
NA: Not Analyzed

ANALYTICAL RESULTS SUMMARY
POINT MOLATE NAVAL FUEL DEPOT

SITE 3 TREATMENT POND AREA

All values reported in mg/l(water) or mg/kg(solids)

Compounds Detected (Method)	TP-4 GW(13)	PRC #2	TP-5 GW(14)	PRC #3	SDS #1	TP-6(2)	TP-7(1)
SAMPLE MATRIX	Ground Water	Ground Water	Ground Water	Ground Water	Waste Water	Soil	Soil
SAMPLE METHOD	Bailer	Bailer	Bailer	Bailer	Bailer	Split spoon	Split spoon
BTEX (602/8020)							
Benzene	<0.0005	<0.0005	0.0051	0.0123	<0.0005	<0.001	<0.001
Ethylbenzene	<0.0005	<0.0005	0.0014	0.0014	<0.0005	0.073	0.013
Toluene	<0.0005	<0.0005	0.0129	0.0096	<0.0005	0.008	0.184
Xylene	<0.0005	<0.0005	0.0123	0.0117	<0.0005	0.046	0.024
TPH (8015mod)							
Jet Fuel (JP5)	<0.1	<0.1	0.6	1.3	<0.1	<5	<5
Gasoline range	<0.1	<0.1	<0.1	<0.1	<0.1	<5	<5
Diesel range(F76)	5.2	4.8	<0.2	<0.2	13.3	38	1960
Motor Oil range	1.3	1.4	<0.5	<0.5	<0.5	91	2750
TPH	6.5	6.2	0.6	1.3	13.3	129	4710
Fluoride (340.2)	0.76	0.59	0.66	NA	NA	NA	NA

Note

ND: Not Detected
NA: Not Analyzed

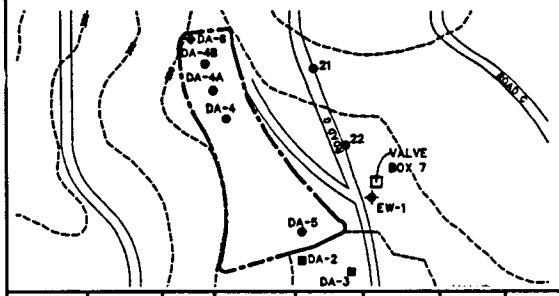
APPENDIX C

PRC SITE INSPECTION
FIELD BORELOGS

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOCATION OF BOREHOLE



JOB NO: 044-0010 IRSIFW	BOREHOLE DESIGNATION: DA-4
CLIENT: U.S. Navy	SURFACE ELEVATION:
SITE: Point Molate Naval Fuel Depot	DEPTH TO WATER:
SUBSITE: Disposal Area (Landfill)	LOGGED BY: David West
DRILLING CO: Layne Environmental	DRILLING DATE(S): 9/17/90
DRILLING PERSONNEL/METHOD: Jim McDonald, Brian Patkowski/Mobil B-57, 4 1/4" ID	
HSA, exploratory auger drilling only; no split spoon samples driven	

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
										NOTE: Exploratory auger drilling through landfill, descriptions based on drill cuttings only.
				1212	0			1		0.0 to 2.0 ft: Silt, gravelly silt, gravels approximately 1/2 to 2 inches, subrounded to subangular quartz/feldspar; brown silt (10YR5/3), hard to slightly hard, dry, structureless, likely heterogeneous fill material over landfill.
								2		
								3		
								4		
				1216				5		5.0 ft: As above.
								6		
								7		
								8		8.0 ft: As above.
				1222	0			9		
								10		10.0 ft: As above but looser.
								11		
								12		
								13		
								14		
					0			15		15.0 ft: As above.
								16		
								17		
								18		
				1232	10-15 (BH)			19		19.0 ft: Clay and gravel, clay is nonplastic to slightly plastic, dark grayish brown (10YR4/2), moist, slightly hard to firm, structureless, some hydrocarbon odors (HNu = 10-15 at borehole); stiff at 20 ft.
								20		

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

JOB NO: 044-0010 IRSIFW

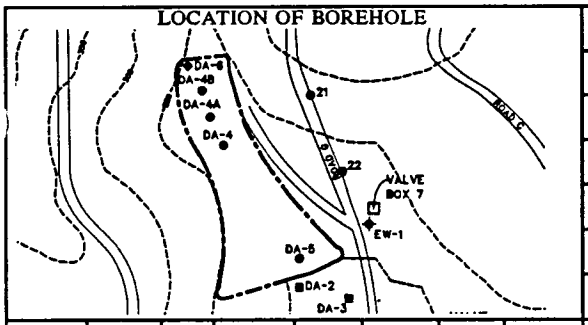
BOREHOLE DESIGNATION: DA-4 continued

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
								21	CL/ML	21 ft: Clay/clay with silt and gravel, similar to above, gravels are rounded, 1/2 to 1 1/2 inches, quartz or feldspar, <5%; clay with silt is dark grayish brown to grayish brown (10YR5/2), slightly moist, stiff, continued hard drilling.
					5-10 (BH)					
				1241				22		
								23		
								24		24.0 to 25.0 ft: Silt content increases (silty clay), pebble content increases to ~10%; occasional HNu spikes up to 15-20 ppm.
					15-20 (BH)			25		
								26	GW	26.0 ft: Very gravelly (silty gravels), gravels subrounded to subangular, 1/2 to 2 inches, occasional HNu spikes as before; very tight drilling.
					15-20 (BH)			27		
								28		28.0 ft: Continued very tight drilling but still penetrating; 1310-shut down drilling to allow clutch to cool on rig. Resumed at 1320; auger refusal at 29.0 ft on sandstone (boulder or bedrock).
				1254				29		TOTAL DEPTH = 29 FT.

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOCATION OF BOREHOLE



JOB NO: 044-0010 IRSIFW	BOREHOLE DESIGNATION: DA-4A
CLIENT: U.S. Navy	SURFACE ELEVATION:
SITE: Point Molate Naval Fuel Depot	DEPTH TO WATER:
SUBSITE: Disposal Area (Landfill)	LOGGED BY: David West
DRILLING CO: Layne Environmental	DRILLING DATE(S): 9/17/90
DRILLING PERSONNEL/METHOD: Jim McDonald, Brian Patkowski/Mobil B-57, 4 1/4" ID	
HSA/CME-75, 3 1/4" ID HSA, exploratory auger boring; no drive samples	

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
				1335						NOTE: Descriptions based on cuttings only.
								1	ML	0.0 to 2.0 ft: Surficial gravels and silt followed by gravelly silt, gravels are 1/2 to 2 inches, quartzite or feldspar, subrounded to subangular; silt is brown to yellowish brown (10YR5/4), hard to very hard, dry; fill material overlying landfill.
								2		
								3		
				1339				4		4.0 ft: As above.
								5		
								6		6.0 to 7.0 ft: Grades to sandy silt, sand is fine-grained to coarse; dark brown (10YR3/3) to black, moist, slightly firm, visibly stained but no apparent odor (at 7.0 ft); likely contaminated fill material; HNu readings 15-20 on stained material only; odors in breathing zone require APRs, but not hydrocarbon odors; maintain respirators to 20 ft.
				1341	15-20			7	ML/SM	
								8		
								9		
								10		
								11	ML/SM	11.0 ft: Sandy silt as above; grading to silt and clay. Silt and clay is nonplastic, brown (10YR5/3) to dark brown (10YR3/3), slightly moist, firm, structureless (fill material).
					10-15			12		
								13		
				1350				14		14.0 to 15.0 ft: As above.
								15		
								16		
								17		17.0 ft: As above. Easy drilling 17.0 to 20.0 feet.
								18		
								19		
				1359	0-1			20	ML/CL	20.0 ft: Silt/clayey silt, clay ≈ 25 to 50%, nonplastic, brown, slightly moist, firm, no staining.

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

JOB NO: 044-0010 IRSIFW

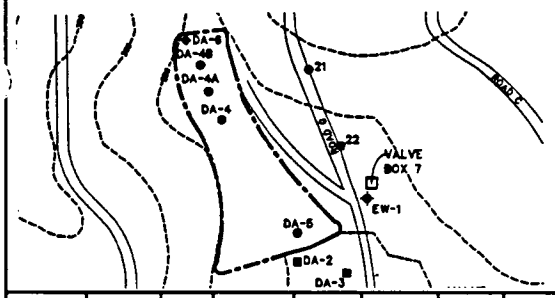
BOREHOLE DESIGNATION: DA-4A continued

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
										NOTE: Descriptions based on cuttings only
								21	ML/CL	21.0 ft: Silt/clayey silt as above.
								22		
								23		
				1406				24		24.0 ft: Complete to 24.0 ft. Tight drilling thereafter, trip out hole, steel wire and wood cuttings in lead auger. Clutch slipping, shut down and allow to cool; set up CME-75 on 9/18/90, trip back into hole with 3 1/4" HSA to 25 feet.
				1410				25		
				0945				26		
								27		27.0 ft: Poor cuttings.
								28		
								29		
				1005				30		30.0 ft: Poor cuttings, tight drilling.
								31		
								32		
								33		33.0 ft: Poor cuttings, some gravels, fractured, 1-2 inches.
								34		
								35		
				1023				36		36.0 ft: Very hard drilling 36 to 37 ft; poor cuttings, auger refused below 37 ft; move off hole.
								37		TOTAL DEPTH = 37 FT.

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOCATION OF BOREHOLE



JOB NO: 044-0010 IRSIFW	BOREHOLE DESIGNATION: DA-4B
CLIENT: U.S. Navy	SURFACE ELEVATION:
SITE: Point Molate Naval Fuel Depot	DEPTH TO WATER: 38 ft
SUBSITE: Disposal Area (Landfill)	LOGGED BY: David West
DRILLING CO: Layne Environmental	DRILLING DATE(S): 9/18/90
DRILLING PERSONNEL/METHOD: Jim McDonald, Brian Patkowski/CME-75, 3 1/4" ID	
HSA, auger with selective split spoon drives	

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
				1050	0					NOTE: Descriptions based mostly on drill cuttings.
								1	ML	0.0 to 5.0 ft: Surficial gravels and silt followed by: gravelly silt to 5 ft; gravels are 1/2 to 2 inches, subrounded to subangular quartzite with feldspar; silt is brown (10YR5/3), dry, slightly hard, structureless, fill material.
								2		
								3		
								4		
				1054				5		5.0 ft: As above.
								6		6.0 ft: Gravelly silt similar to above but very dark brown (10YR2/2) to black (10YR2/1), dry, hard, some odors but no significant HNu readings (possibly stained fill material).
					0-2			7	ML	
								8		8.0 to 9.0 ft: As above, but silts are becoming grayish brown (10YR5/2), dry.
								9		
								10		10.0 to 11.5 ft: Sample driven, only slough recovered.
Std.	10.0 - 11.5	4/3/2	0.1/1.5	1103	0			11		
								12		
								13		
								14		
					0-2			15		15.0 ft: As above, poor cuttings.
								16		
								17		
								18		18.0 to 19.4 ft: Silt and organic silt, silt is mottled gray (10YR5/1) and brown (10YR5/3), dry, hard to very hard; about 1/3 organic silt, dark brown (10YR3/3) with wood fragments, dry, slightly hard, gray mottles yield HNu reading to 10 ppm, HNu headspace reading to 15 ppm. Sample DA-4B (18.0-19.5) collected.
Std.	18.0 - 19.5	8/7/8	1.1/1.5	1115	10; 15 (HS)			19	ML	
								20		20.0 to 21.0 ft: Silt, gravelly silt (20 to 30 ft); gravels are subrounded to subangular, 1/2 to 2 inches, about 10-25% of sample, silt matrix is brown (10YR5/3), dry, slightly hard to hard, structureless, continued fill material.

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

JOB NO: 044-0010 IRSIFW

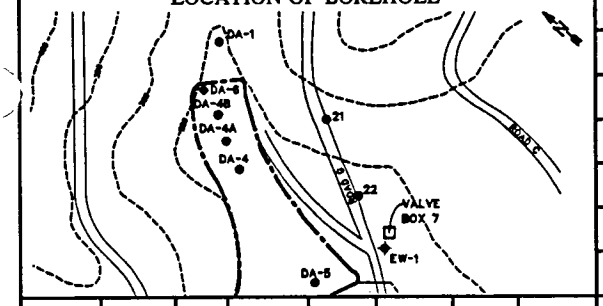
BOREHOLE DESIGNATION: DA-4B continued

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
					0-1			21	ML	NOTE: Descriptions below 20 ft based on cuttings only.
								22		
								23		
								24		
				1122	0-2			25		25.0 ft: As above.
								26		
								27		
								28	ML	
								29		
					0-2			30		30.0 ft: Silt, gravelly silt, similar to above but grayish brown (10YR5/2), dry, gravels increasing to over 50%, HNu readings up to 5 ppm at 30 to 35 ft.
					3-5			31	GM	
								32		
								33		
								34		
				1130	3-5			35		35.0 ft: Gravels are rounded, 1/2 to 1 1/2 inches.
								36		
								37		
								38		38.0 ft: As above, harder drilling; water encountered after completion of borehole; depth to water measured at 38.3 ft below ground, ground water sample DA-4BGW(39) collected.
						■	▼	39		
								40		40.0 ft: Becoming very gravelly.
				1145				41		41.0 to 42.5 ft: Gravels only, mostly rounded 1/2 to 1 1/2 inches, very hard drilling. Complete to 42.5 ft, auger refusal in bedrock or impenetrable obstruction.
				1156				42		TOTAL DEPTH = 42.5 FT.
								43		

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOCATION OF BOREHOLE



JOB NO: 044-0010 IRSIFW

BOREHOLE DESIGNATION: DA-1

CLIENT: U.S. Navy

SURFACE ELEVATION:

SITE: Point Molate Naval Fuel Depot

DEPTH TO WATER:

SUBSITE: Disposal Area (Landfill)

LOGGED BY: David West

DRILLING CO: Layne Environmental

DRILLING DATE(S): 9-18-90

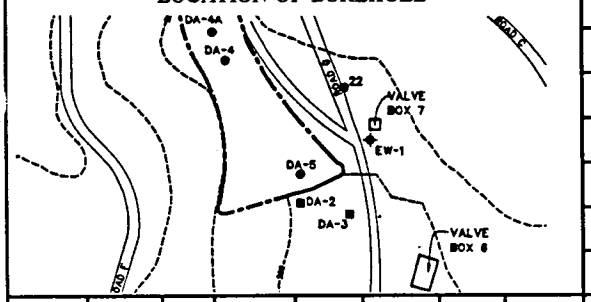
DRILLING PERSONNEL/METHOD: Jim McDonald, Brian Patkowski, CME-75, 3 1/4" ID HSA, Auger with selective split spoon drives

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD / DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
				1330						Surficial gravels 0.0 to 1.0 ft.
								1	GM/ML	1.0 to 2.0 ft: Silt, gravelly silt, gravels approximately 1-2 inches, subrounded to subangular quartz/feldspar; brown silt (10YR5/3), dry, hard to very hard (dense), structureless, oil staining encountered at 2 ft.
								2		
								3	ML	3.0 to 4.0 ft: Silt, gravelly silt, similar to above, dark brown (10YR3/3), dry, hard, smell of old JP-5.
					15-20 (HS)			4		4.0 to 5.0 ft: As above, except darker brown.
Std.	5.0 - 6.5	4 / 3 / 2	1.0 / 1.5	1350	0-5			5	ML/CL	5.0 to 6.5 ft: Silt, gravelly silt, similar to above, dark brown to very dark brown (10YR2/2); denser with depth. Sample DA-1 (5.0-6.5) collected.
								6		6.5 to 8.0 ft: Drive 1 1/2 inch sampler with only 0.3 ft penetration, very hard gravelly silt/bedrock?
Std.	6.5 - 6.8	50	0.3 / 0.3	1358	0-1			7		
								8		Auger to 15 ft, cuttings indicate similar silty gravels/gravelly bedrock? No moisture encountered; dense, slow auger penetration.
								9		
								10		
								11		
								12		
								13		
								14		
								15		
Std.	15.0 - 15.2	60	0.1 / 0.2	1420	0-1			16		15.0 ft: 60 blow counts for 0.2 ft, only 0.1 ft recovered; mostly slough but includes slightly moist grayish brown (10YR5/2) clay with oil staining; probably from above. TOTAL DEPTH = 15.2 FT

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOCATION OF BOREHOLE



JOB NO: 044-0010 IRSIFW	BOREHOLE DESIGNATION: DA-5
CLIENT: U.S. Navy	SURFACE ELEVATION:
SITE: Point Molate Naval Fuel Depot	DEPTH TO WATER: 32 ft (Initial)
SUBSITE: Disposal Area (Landfill)	LOGGED BY: David West
DRILLING CO: Layne Environmental	DRILLING DATE(S): 9/18/90 to 9/19/90
DRILLING PERSONNEL/METHOD: Jim McDonald, Brian Patkowski, CME-75, 3 1/4" ID HSA, auger with selective split spoon drives	

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD / DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
								1	ML	0.0 to 0.5 ft: Surficial gravels followed by: silt, gravelly silt; gravels are 1/2 to 1 inch, subrounded to subangular ~ 25%; silt is brown (10YR5/3), dry, slightly hard.
								2		
								3		
								4		4.0 ft: As above, becoming finer grained with abundant gravels.
								5	ML/CL	5.0 to 6.5 ft: Clay, silty clay with abundant gravel; gravel content up to 50%, 1/2 to 1 inch subrounded; clay-silty clay is slightly plastic, stained dark gray (10YR4/1) to gray (10YR5/1) with hydrocarbons, hydrocarbon odor evident with headspace readings 10-15 ppm, no apparent soil structure. Sample DA-5 (5.0-6.5) collected.
Std.	5.0 - 6.5	7/8/6	0.7/1.5	1535	10-15 (HS)			6		
								7		
								8		
								9		9.0 ft: As above, gravel content increasing.
								10	GC/ML	10.0 to 11.5 ft: Clayey gravels, gravels mostly well sorted 1/2 to 1 inch, subrounded, occasional angular rock fragments; clays are slightly plastic, light brownish gray (10YR6/2) and mottled brown and gray, slightly moist, some hydrocarbon odors, interval also includes dry gravelly silt (possible slough), followed by silt and wood fragments, silt is oil coated and wet, dark gray (10YR4/1) to black; headspace reading 10-15 ppm. Sample DA-5 (10.0-11.5) collected.
Std.	10.0 - 11.5	4/8/11	1.3/1.5	1545	10-15 (HS)			11		
								12		
								13		
							▼	14		14.0 ft: Depth to water on 9/19/90 (0904) is 14.05 ft below ground (measured inside augers).
								15		15.0 to 16.5 ft: Clay with minor gravel, nonplastic, gray stained with gray and brown mottling, oxidized with reddish brown (2.5YR4/4) patches, slightly moist, tight/firm, no apparent soil structure. Sample DA-5 (15.0-16.5) collected.
Std.	15.0 - 16.5	6/8/9		1552	0-5 (HS)			16		
								17		
								18		18.0 to 20 ft: Clay, silty clay similar to above; depth to water ~ 20.0 to 21.0 ft below ground on 9/18/90.
								19		
								20		20.0 to 21.5 ft: Clay, silty clay with minor gravel, nonplastic, mottled reddish brown (2.5YR4/4) to red (2.5YR5/8) with gray (10YR6/1) and light gray (10YR7/1) pods or streaks, oxidized reddish brown pods as well, slightly moist, tight/firm, structure not apparent; gravels are subrounded to subangular siltstone or very fine-grained sandstone.
Std.	20.0 - 21.5	13/18/22	1.5/1.5	1602	0-5 (HS)					

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

JOB NO: 044-0010 IRSIFW

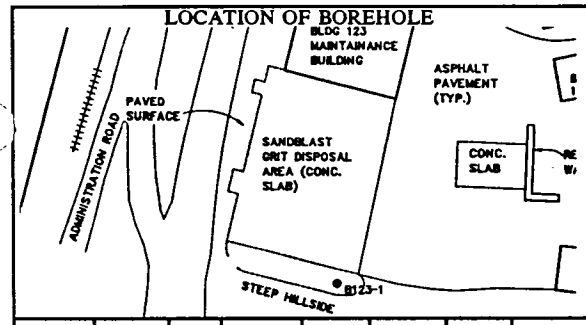
BOREHOLE DESIGNATION: DA-5 Continued

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD / DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
								21	CL	
								22		
								23		
								24		
								25		25.0 to 26.5 ft: Silty clay similar to above; light gray (10YR7/1) partings and red (10R4/8 to 2.5YR5/8) oxidized pods, mottled gray (10YR6/1) and red (2.5YR5/8); partings are more prominent.
Std.	25.0 - 26.5	13 / 16 / 8	1.5 / 1.5	1615	0-5 (HS)			26	CL	
								27		
								28		
								29		
								30		30.0 to 31.5 ft: Clay or silt with minor gravel, nonplastic to slightly plastic, mottled brown (7.5YR5/4) and yellowish red (5YR5/8) to light gray (10YR7/1), slightly moist to wet within partings, firm/tight, structure not apparent; gravel is subangular siltstone or very fine sandstone. Sample DA-5 (30.0-31.5) collected.
Std.	30.0 - 31.5	8 / 8 / 10	1.1 / 1.5	1626	0-5 (HS)			31	CL/ML	
								32		
								33		33.0 ft: Clay/silt similar to above but more gray clay encountered than yellowish brown. Water table initially encountered at 32 ft, but stabilized at ~ 20.0 to 21.0 ft, on 9/18/90, then 14.05 ft below ground on 9/19/90. Rise in water probably due to steep gradient within landfill and head change in open borehole.
								34		
								35		35.0 to 35.5 ft: Fractured siltstone (bedrock) encountered, wet; augers complete to 35 ft on 9/18/90. Auger 35.0 to 42.0 feet on 9/19/90.
Std.	35.0 - 35.5	50	0.4 / 0.5	1645				36		
								37		
								38		
								39		
								40		40.0 to 42.0 ft: Complete augers to 42.0 ft total depth. Auger refusal at 42 ft (bedrock).
								41		
								42		TOTAL DEPTH = 42 FT

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOCATION OF BOREHOLE



JOB NO: 044-0010 IRSIFW	BOREHOLE DESIGNATION: B123-1
CLIENT: U.S. Navy	SURFACE ELEVATION:
SITE: Point Molate Naval Fuel Depot	DEPTH TO WATER: 36 ft
SUBSITE: Building 123	LOGGED BY: David West
DRILLING CO: Layne Environmental	DRILLING DATE(S): 9/19/90 to 9/21/90
DRILLING PERSONNEL/METHOD: Jim McDonald, Brian Patkowski/Mobil B-57, 4 1/4" ID/ HSA, Auger with selected split spoon drives	

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD / DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
Mod. (2.5")	0.0 - 1.5	26 / 32 / 40	0.9 / 1.5	1530	0			1	NA	0.0 to 1.5 ft: Fine sandstone (sand) with silty (siltstone) liminations, mottled dark gray (2.5YN/4) and light reddish brown (5YR7/4), dry, dense, crumbly, grades into uniform light reddish brown (5YR7/4) very fine sandstone, also dry and crumbly, trace quartz or feldspar grains, 2-3mm and rounded. Sample B123-1 (0.0-1.5) collected.
								2		1.5 to 3.0 ft: Very fine to fine sandstone bedrock like above but less dense, dry, very crumbly, weathered and oxidized along partings or fractures, quartz arenite sand grains. Sample B123-1 (1.5-3.0) collected.
Calif. (2")	1.5 - 3.0	33 / 50 / 42	1.5 / 1.5	1535	1-2			3		3.0 to 3.3 ft: Slough with 0.1 ft very fine sandstone, yellow (10YR7/8), dry.
Std. (1.5")	3.0 - 3.3	50	0.2 / 0.3	1540				4	NA	4.0 to 5.0 ft: Weathered siltstone/sandstone bedrock, finely laminated and cross laminated siltstone, weathered reddish brown (2.5YR4/4) to black along fractures or partings, dry.
Std.	4.0 - 5.0	86 / 100	0.8 / 1.0	1545	0			5		
								6	NA	6.5 to 7.0 ft: Mostly slough from plug, fractured shale and sandstone imbedded in slough matrix, sandstone is yellow (10YR7/8) to grayish brown (10YR5/2). End 9/19/90.
								7		
Calif.	6.5 - 7.0	100	1.5 / 0.5	1550				8		
								9	NA	Begin 9/20/90 9.0 to 10.0 ft: Sandstone bedrock, finely laminated, clean but weathered brownish yellow (10YR6/8) with strong brown (7.5YR5/8) partings, also contains laminations, partings, and clasts of pale brown (10YR6/3) clay.
Std.	9.0 - 10.0	46 / 90	1.0 / 1.0	0830	0			10		10.0 to 13.0 ft: Logged from cuttings: sand, well sorted, brownish yellow (10YR6/8), dry, medium dense, some clods of silt, occasional siltstone and clay cuttings.
								11	NA	
								12		
								13		13.0 to 14.5 ft: Sandstone bedrock, weathered and finely laminated as above, brownish yellow (10YR6/8), oxidized dark reddish brown (2.5YR3/4) partings, dry. Bedrock Upper 1.0 ft contains slough of light gray (10YR7/2) clay and brownish yellow (10YR6/6) silt.
Calif.	13.0 - 14.5	43 / 60 / 53	1.5 / 1.5	0845	0			14		
								15		
								16		
								17		
								18	NA	18.0 to 18.5 ft: Upper 0.5 ft is slough followed by 0.4 ft fractured sandstone bedrock, oxidized along fractures, black to dark reddish brown (5YR3/3) oxidized faces along fractures, dry, very dense. Sample obtained is angular and fractured from drilling/hammering. End 9/20/90.
Std.	18.0 - 18.5	90	0.9 / 0.5	0920	0			19		
								20		

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

JOB NO: 044-0010IRSIFW

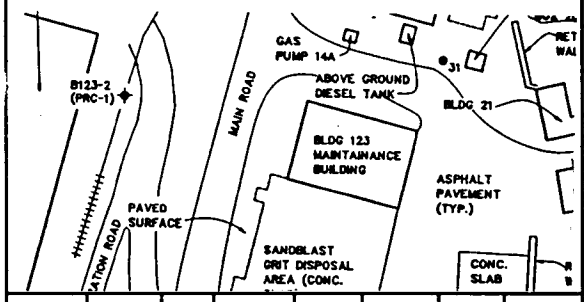
BOREHOLE DESIGNATION: B123-1

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
				1112				21	NA	NOTE: Rig moved off borehole 9/20/90. Moved back onto borehole on 9/21/90. Drill deeper to auger refusal and/or water. Start 9/21/90. Following descriptions based on cuttings only. 21.0 ft: Fractured sandstone bedrock, brownish yellow (10YR6/6), dry, pulverized.
								22		22.0 ft: Sandstone bedrock, brownish yellow (10YR6/6), dry, occasional small (4-6mm) fractured chips of siltstone/quartzite.
								23		
								24		
								25		
								26		26.0 ft: As above.
								27		
				1130				28		28.0 to 30.0 ft: Very tight drilling. Rounded pebbles of weathered quartzite; gravel consisting of quartz arenite sandstone, quartz and feldspar grains predominant, also dark gray microcrystalline quartz.
								29	NA	
								30		30.0 to 33.0 ft: Gravel cuttings only to 33 ft, similar to above.
								31		
								32		
								33		33.0 ft: Softer material; mostly siltstone/sandstone cuttings, mostly pulverized; trip out to check teeth on bit. Changed 3 of 4 teeth on lead auger bit; 2-inch quartzite pebble obtained from auger bit. Continued very hard drilling in bedrock.
				1144				34	NA	
								35		
						■	▼	36		36.0 ft: Ground water encountered on 9/22/90, sample obtained as B123-1 GW(36).
								37		
								38		
								39		
				1258				40		40.0 ft: Very hard drilling.
								41		41.0 ft Continued drilling in bedrock.
				1306				42		42.0 ft: Auger refusal in sandstone/siltstone bedrock.

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOCATION OF BOREHOLE



JOB NO: 044-0010 IRSIFW | BOREHOLE DESIGNATION: B123-2

CLIENT: U.S. Navy | SURFACE ELEVATION:

SITE: Point Molate Naval Fuel Depot | DEPTH TO WATER: 30 ft

SUBSITE: Building 123 | LOGGED BY: David West

DRILLING CO: Layne Environmental | DRILLING DATE(S): 9/20/90

DRILLING PERSONNEL/METHOD: Jim McDonald, Brian Patkowski/Mobil B-57, 4 1/4" ID/7 7/8" OD HSA, continuous split spoon drives

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
								1	GM	Surficial gravels-railroad base material to about 2 ft, followed by silt, yellowish brown (10YR5/6), some root material.
								2		
								3	CL	2.5 to 4.0 ft: Sharp contact with the following at 2.5 ft: clay, slightly plastic, very dark gray (10YR3/1), slightly moist, moderately stiff; minor gravel, 5-10mm, abundant 1-2mm rounded clasts of siltstone, oxidized orange to brown.
Mod. (2.5")	2.5 - 4.0	4/6/6	1.5/1.5	1125	0-1			4		
Calif. (2")	4.0 5.5	5/7/4	0.7/1.5	1200	0.5			5		4.0 to 5.5 ft: Clay, similar to above, dry, crumbly. Sample B123-2 (4.0-5.5) collected.
								6	CL	5.5 to 7.5 ft: Clay, similar to above, slightly plastic, slightly moist, with olive green/gray silt clasts to 10mm, also contains greenish-gray siltstone clasts and oxidized reddish brown pebbles.
Std. (1.5")	5.5 - 7.5	4/2/4/3	1.0/2.0	1205	0-1			7		
								8	CL	8.0 to 9.5 ft: Clay, similar to above, very dark gray (10YR3/1) to black with olive green silty clasts and thin lenses (1-2mm). Sample B123-2 (8.0-9.5) collected.
Mod.	8.0 - 9.5	15/18/4	1.1/1.5	1210	0-1			9		9.5 to 11.0 Clay, similar to above, olive gray (5YR5/2), slightly plastic, slightly moist, moderately stiff, increasing light olive brown (7.5Y5/6) oxidation in discrete pods and siltstone clasts.
Calif.	9.5 - 11.0	4/8/14	1.5/1.5	1215	0-1			10		
Std.	11.0 - 12.5	11/14/18	0.6/1.5	1219				11		11.0 to 12.5 ft: Clay, slightly plastic, yellowish brown (10YR5/4) with yellowish brown (10YR6/8) oxidized silt (siltstone) clasts, slightly moist.
								12		
Mod.	12.5 - 14.0	11/11/14	1.5/1.5	1231	4.5			13	CL	12.5 to 14.0 ft: Clay (upper 0.7 ft), slightly plastic, stained very dark gray (10YR3/1) grading into brownish yellow (10YR6/6) clay with brownish yellow (10YR6/8) oxidized clasts; becoming saturated (wet) within clay partings, some gravel, rounded to subangular siltstone; water table encountered with stained/non-stained clay indicative of capillary fringe. Sample B123-2 (12.5-14.0) collected.
Calif.	14.0 - 15.5	11/11/13	1.4/2.5	1236	1-2			14		14.0 to 15.5 ft: Clay, slightly plastic to plastic, yellowish brown (10YR5/4), wet, grades into (0.4 ft) gravelly clay with siltstone clasts (2-4mm), oxidized and mottled grayish brown to yellowish brown.
								15		
Std.	15.5 - 17.0	11/14/18	1.2/1.5	1245				16	CL/ML	15.5 to 17.0 ft: Weathered clay/silty clay, slightly plastic, mottled pale brown (10YR6/3) to brownish yellow (10YR6/6 to 6/8), dry, stiff, 1-2mm siltstone fragments.
Mod.	17.0 - 18.5	14/16/19	1.4/1.5	1250	4			17		17.0 to 18.5 ft: Clay, as above (0.3 ft) followed by: clay more plastic, dark brown (10YR4/3 to 3/3) with dark grayish brown (10YR4/2) streaks (stained with hydrocarbons), slightly moist, medium stiff.
								18		
Calif.	18.5 - 20.0	11/17/28	0.9/1.5	1315	1-2			19	CL/ML	18.5 to 20.0 ft: Silty clay, nonplastic, mottled brownish yellow (10YR6/8) to dark brown (10YR4/3), oxidized with reddish brown (2.5YR4/4) fracture surfaces and weathered siltstone fragments to 20mm, dry, crumbly.
Std.	20.0- 21.5	17/21/33	1.0/1.5	1318				20		20.0 to 21.5 ft: Gravelly silt with siltstone fragments, brownish yellow (10YR6/6), contains weathered red (10R4/8) to brownish yellow (10YR6/8) siltstone clasts, dry, crumbly, limonitic streaks along fracture surfaces; depth to water following well installation = 20.4 ft.

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

JOB NO: 044-0010IRSIFW

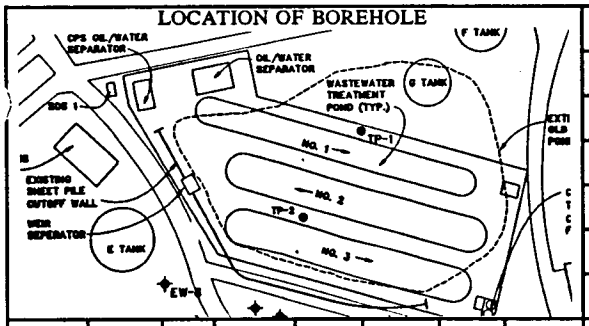
BOREHOLE DESIGNATION: B123-2 Continued

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
								21	ML	
								22		21.5 to 23.0 ft: Clay with minor gravel (upper 0.2 ft), very dark gray (10YR3/1) oily streaks or clasts, slightly moist, occasional rounded siltstone pebbles to 25mm and siltstone fragments (1-2mm); wet at 21.7 to 22.5 ft, then very gravelly with fractured, angular siltstone up to 30mm.
Mod.	21.5 - 23.0	17/27/31	1.5/1.5	1322				23		23.0 to 24.5 ft: Overdrilled to retrieve California (2 inch) split spoon lost off drill rod, not logged.
								24		
								25		24.5 to 26.0 ft: Gravelly silt/clay, siltier at top of interval, slightly plastic, weathered and mottled brownish yellow (10YR6/6) and dark grayish brown (10YR4/2), wet between fractures, but overall sample not saturated, stiff, some angular fragments of siltstone (1-5mm).
Std.	24.5 - 26.0	18/21/31		1425				26	ML/CL	
								27		
								28		27.5 to 29.0 ft: Clay, plastic, yellow brown (10YR5/4), wet from 27.5 to 27.9 ft, loose; followed by clay with very dark grayish brown (10YR3/2) streaks (stained); lower 0.7 ft is weathered clay/siltstone, yellowish brown (10YR5/4), slightly moist, many siltstone/shale fragments (1-3mm). Sample B123-2 (28.0) collected.
Mod.	27.5 - 29.0	31/31/35	1.5/1.5	1440		■ ■		29	CL	29.0 to 30.5 ft: Clay, similar to above, plastic, wet from 29.0 to 29.6 ft, followed by weathered clay/siltstone and gravelly clay with reddish brown (oxidized) subrounded pebbles up to 15mm, ground water sample B123-2 GW(30) collected.
Calif.	29.0 - 30.5	11/16/18	1.5/1.5	1442				30	CL/GC	30.5 to 32.0 ft: Wet slough in upper 0.5 ft, followed by gravelly weathered clay/silt as above, subrounded siltstone pebbles up to 40mm.
								31		
Std.	30.5 - 32.0	9/11/17	1.0/1.5	1452				32		32.0 to 33.5 ft: Clay with some gravel, plastic, brownish yellow (10YR6/6) to grayish brown (10YR5/2), weathered dark reddish brown (2.5YR2.5/4) to black (limonitic or iron oxide) on fracture surfaces or in pebble clasts, moist, cohesive.
Mod.	32.0 - 33.5	21/22/27	1.5/1.5	1506				33	CL	33.5 to 35 ft: Clay as above.
								34		
Std.	33.5 - 35.0	19/21/24	0.3/1.5	1510				35		
								36		Auger to 36 FT TOTAL DEPTH.

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOCATION OF BOREHOLE



JOB NO: 044-0010 IRSIFW	BOREHOLE DESIGNATION: TP-1
CLIENT: U.S. Navy	SURFACE ELEVATION:
SITE: Point Molate Naval Fuel Depot	DEPTH TO WATER: 8 ft
SUBSITE: Treatment Ponds	LOGGED BY: David West
DRILLING CO: Layne Environmental	DRILLING DATE(S): 9/21/90
DRILLING PERSONNEL/METHOD: Jim McDonald, Brian Patkowski/Mobil B-57, 4 1/4"	
ID/7 7/8" OD HSA, continuous split spoon drives	

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
								1		Auger 0 to 2.5 ft; surface fill consisting of coarse, angular, subrounded gravels and yellowish brown silt.
								2		
								3	GC	2.5 to 4 ft: Upper 0.8 ft is slough: gravelly silt/clay, brownish yellow, followed by: silty clay or silt/clay, dark yellowish brown (10YR4/4), weathered brownish yellow (10YR6/6), nonplastic, dry, crumbly; grades immediately into stained gravelly clay with hydrocarbon odors, fractured siltstone gravel up to 10mm, plastic, gray (10YR5/1), moist, medium stiff.
Mod. (2.5")	2.5 - 4.0	8/6/6	1.5/1.5	1455	0-2			4		4.0 to 7 ft: Slough, surficial gravels and silt. Slough in upper 0.3 ft followed by: gravelly silty clay (silt/clay), dark brownish yellow (10YR3/3) with dark gray (10YR4/1) hydrocarbon staining increasing towards 7 ft, plastic, very moist to wet, loose, gravels are weathered and fractured siltstone; water initially encountered at 6.9 ft. Sample TP-1 (5.5-7.0) collected. HNu headspace (HS) readings to 5 ppm at 6.0 ft.
Calif. (2")	4.0 - 5.5	3/4/6	0.6/1.5	1500	2-4			5	CL/ML	
								6	CL/ML	
Std. (1.5")	5.5 - 7.0	5/6/6	1.0/1.5	1505	5 (HS)			7		7.0 to 8.5 ft: Gravelly clay, dark grayish brown (10YR4/2) to very dark gray (10YR3/1), plastic, wet, moderately stiff to loose, stained throughout, some free oil noted in pockets; gravel is angular to subangular siltstone up to 40mm. **Sample TP-1GW(8) collected.**
Mod.	7.0 - 8.5	6/6/7	1.1/1.5	1510	4 (HS)		▼	8	GC	8.5 to 10 ft: Upper 1 ft is wet slough, followed by gravelly clay as above, dark gray, wet, spots of free oil noted. Sample TP-1 (8.5-10.0) collected.
								9	GC	
Calif.	8.5 - 10.0	3/5/10	0.5/1.5	1515	5 (HS)			10		10.0 to 11.5 ft: Gravelly silty clay (silt/clay), dark gray (10YR4/1), to black (10YR2/1), plastic, soft to moderately stiff, gravel is subangular, microcrystalline (dense) siltstone 10 to 15mm, numerous shell fragments, some whole.
Std.	10.0 - 11.5	6/6/7	0.8/1.5	1522	6 (HS)			11	CL	11.5 to 13 ft: Silty clay, uniform, very dark grayish brown (10YR3/2) to black (10YR3/1), plastic, shell fragments as above, free oil seeping form sludge-like material. Sample TP-1 (11.5-13.0) collected.
								12	CL	
Mod.	11.5 - 13.0	4/4/4	1.5/1.5	1530	7 (HS)			13		13.0 to 14.5 ft: Silty clay, as above, fewer shell fragments, some smaller siltstone pebbles, free oil noted in partings, small piece of tin foil also noted.
Calif.	13.0 - 14.5	4/5/5	1.5/1.5	1542	6 (HS)			14	CL	14.5 to 16.0 ft: Overdrilled, not logged.
								15		
								16		16.0 to 17.5 ft: Silty clay, as above, less free oil noted but color remains very dark gray to black, some dark brown (10YR3/3) organic peat noted, very few shell fragments. Sample TP-1 (16.0-17.5) collected.
Std.	16.0 - 17.5	4/5/6	1.3/1.5	1552	4 (HS)			17	CL	17.5 to 19.0 ft: As above.
								18		
Mod.	17.5 - 19.0	3/3/4	1.5/1.5	1600	2 (HS)			19		19.0 to 20.5 ft: As above, uniform very dark brown to black silty clay, shell fragments noted, free oil noted in pockets (photo #29). Sample TP-1 (19.0-20.5) collected.
	19.0 - 20.5	3/4/4	1.5/1.5	1606	2 (HS)			20		

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

JOB NO: 044-0010 IRSIFW

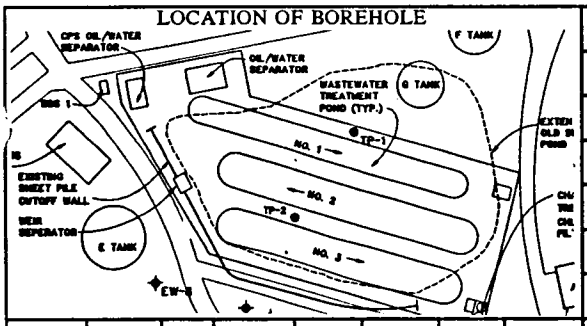
BOREHOLE DESIGNATION: TP-1 Continued

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD / DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
								21	CL	20.5 to 22.5 ft: Clayey silt as above, black to very dark brown, plastic, moist, soft, contains abundant mica flakes, shell fragments absent, sample TP-1 (20.5-22.5), duplicate soil sample collected and labeled as TP-10 (0-2) with artificial sample time as 1730.
Std.	20.5 - 22.5	2 / 3 / 4	2.0 / 2.0	1612	2 (HS)			22		
		1 / 4						23	CL/ML	22.5 to 24.0 ft: Upper 0.3 ft clayey silt as above, black to very dark brown, plastic, very moist, soft, mica; followed by 0.2 ft organic peat, dark yellowish brown (10YR3/4); followed by 0.5 ft silty clay, mottled olive (5YR5/3) to yellowish brown (10YR5/6), dry, dense, crumbly with 1-2mm granules and a 1 to 2 inch lense of coarse quartz sand and gravel, gravels are 3-4mm, rounded, crystalline hard siltstone.
Mod.	22.5 - 24.0	5 / 10 / 14	1.5 / 1.5					24		24.0 to 25.5 ft: Silty clay, mottled light brownish gray (2.5Y6/2) and yellowish brown (10YR5/6), slightly plastic, moist, with occasional large subangular pebbles of crystalline siltstone, weathered reddish brown (2.5YR4/1), also reddish brown weathered granules.
Calif.	24.0 - 25.5	11 / 18 / 19	1.3 / 1.5	1626	0 (HS)			25		25.5 to 27.5 ft: Silty clay, mottled, as above. Sample TP-1 (25.5-27.5) collected.
								26		
Std.	25.5 - 27.5	11 / 14 / 19	0.7 / 2.0		0 (HS)			27	CL/ML	
		26						28		TOTAL DEPTH = 27.5 FT

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOCATION OF BOREHOLE



JOB NO: 044-0010 IRSIFW	BOREHOLE DESIGNATION: TP-2
CLIENT: U.S. Navy	SURFACE ELEVATION:
SITE: Point Molate Naval Fuel Depot	DEPTH TO WATER: 9.75 ft
SUBSITE: Treatment Ponds	LOGGED BY: David West
DRILLING CO: Layne Environmental	DRILLING DATE(S): 9/24/90

DRILLING PERSONNEL/METHOD: Jim McDonald, Brian Patkowski/CME - 75; 3 1/4" ID/7 7/8" OD HSA, continuous split spoon drives.

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD / DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
Mod.	0.0 - 1.5	9/16/10	1.5/1.5	1026				1	GM	0.0 to 1.3 ft: Surficial gravel and silt - road bed 1.3 to 1.5 feet: gravelly silt, yellowish brown (10YR5/8)
Calif.	1.5 - 3.0	4/3/4	1.1/1.5	1028				2	GM	1.5 to 2.2 ft: Slough-gravelly silt, followed by: clay with some silt and poorly sorted gravel (~ 15% gravel) dark brown (10YR3/3), some dark gray (10YR4/1) pods of stained clay; gravels are granule sized to 20 mm, subrounded, rock fragments (siltstone).
								3		3.0 to 4.5 ft: 0.7 feet of slough
Std.	3.0 - 4.5	4/5/3	0.7/1.5	1031				4		
								5	GC	4.5 to 6.0 ft: Wet gravelly slough, grayish brown (10YR5/2) followed by gravelly silty clay (60-70% gravel); very dark gray (10YR3/1) pockets of hydrocarbons in stained dark grayish brown matrix of silty clay, slightly plastic, moist, moderately stiff, gravels are angular and subangular siltstone up to 50 mm. Sample TP-2 (4.5-6.0) collected. **Sample TP-2 GW(6) collected.**
Calif.	4.5 - 6.0	3/8/6	1.3/1.5	1042	3-4 (HS)		▼	6		6.0 to 8.0 ft: Wet gravelly and sandy slough followed by 0.2 ft of gravel (as above) with some silty clay, grayish brown (10YR5/2), moist; gravels are angular siltstone (bedrock)
Std.	6.0 - 8.0	4/5/6/6	1.2/2.0	1045				7		
								8	GC	8.0 to 9.5 ft: Gravelly clay (over 60 % gravel), yellowish brown (10YR5/4), plastic, moist to wet, soft, angular dark gray siltstone rock fragments up to 40mm; moderately sharp contact with: stained gravelly clay, olive gray (5YR5/2) with mottled (weathered) silty clasts, olive yellow (2.5YR6/6); water at 9.75 ft. Sample TP-2 (8.0-9.5) collected.
Mod.	8.0 - 9.5	7/23/12	1.5/1.5	1055	3-5 (HS)			9		9.5 to 11 ft: Gravelly clay as above with 0.4 ft slough, followed by: clay, yellowish brown (10YR5/4) or dark gray (10YR4/1), not mottled; pebbles of gray, angular, siltstone up to 30-40mm and yellowish brown, subrounded crystalline quartzite.
								10		
Calif.	9.5 - 11.0	1/5/5	0.9/1.5	1057				11	GC	11.0 to 13 ft: 0.9 ft wet gravelly slough followed by: gravelly clay mottled gray (10YR5/1) and yellowish brown (10YR5/6), contains yellowish brown silty clasts; lower 0.1 ft is gravelly clay and some silt, greenish gray.
Std.	11.0 - 13.0	4/5/4/3	1.2/2.0	1059				12	GC/GM	
								13		13.0 to 14.5 ft: Gravelly/silty clay, like above, grayish brown (2.5Y5/2), plastic in upper 0.7 ft, wet; sharp contact with: silt/silty clay, some gravel, dark gray (2.5YRN/5 to 5YR4/1) with greenish gray (weathered) clasts, non plastic, moist, crumbly. Sample TP-2 (13.0-14.5) collected.
Mod.	13.0 - 14.5	2/2/3	1.4/1.5	1108	0-1 (HS)			14	GM/ML	14.5 to 16.0 ft: Silty clay as above with increasing hydrocarbons at 16 ft., less gravel but free oil noted along fractured siltstone surfaces.
								15	ML	
Calif.	14.5 - 16.0	1/1/3	1.4/1.5	1117				16		16.0 to 18.0 ft: 0.8 ft wet slough with free oil, followed by sand, medium to coarse, stained very dark greenish gray (10YR3/1) well sorted, wet, free oil. Sample TP-2 (16.0-18.0) collected.
Std.	16.0 - 18.0	1/1/1/1		1123				17	SP	
								18		18.0 to 19.5 ft: Gravelly silty clay, dark gray (5YR4/1) with greenish gray (weathered) silty clasts, grades into: silty clay, very dark gray to black (2.5N/3-N/2), 0.2 ft sand lense, abundant mica (as in TP-1 silty clays), shell fragments, hydrocarbon odors, photo #33. Sample TP-2 (18.0-19.5) collected.
Mod.	18.0 - 19.5	1/1/1/1		1133				19	CL	19.5 to 21.0 ft: Silty clay, very dark gray (2.5YN/3 to N/2), slightly plastic, moist, soft, uniform, few shell fragments but one whole mussel shell, no gravel.
								20		
Calif.	19.5 - 21.0	0/0/0/0		1140						

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

JOB NO: 044-0010 IRSIFW

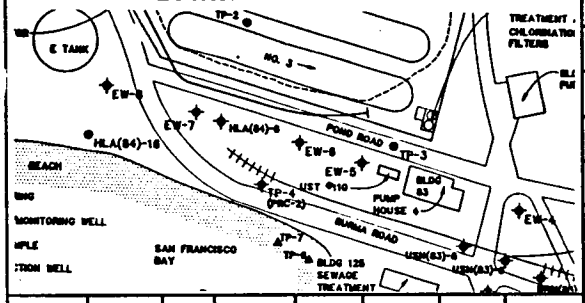
BOREHOLE DESIGNATION: TP-2 Continued

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD / DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
								21	CL	21.0 to 23 ft: Split spoon dropped to 23 ft, weight of rods only.
		0 0 0						22		
								23		23.0 to 24.5 ft: Silty clay as above, uniform dark gray silt/silty clay, occasional white shell fragments.
Mod.	23.0 - 24.5	2 2 2	1.5 / 1.5	1210				24	ML/CL	
								25		24.5 to 28 ft: Split spoon advanced to 28 ft. weight of rods only; silty clay as above, dark gray 10YR4/1. Sample TP-2(24.5-28.0) collected.
	24.5 - 28.0	0 0 0	1.5 / 3.5	1215				26		
		0 0 0						27		
		0						28		TOTAL DEPTH = 28 FT

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOCATION OF BOREHOLE



JOB NO: 044-0010 IRSIFW	BOREHOLE DESIGNATION: TP-3
CLIENT: U.S. Navy	SURFACE ELEVATION:
SITE: Point Molate Naval Fuel Depot	DEPTH TO WATER: 6 ft
SUBSITE: Treatment Ponds	LOGGED BY: David West
DRILLING CO: Layne Environmental	DRILLING DATE(S): 9/24/90 - 9/25/90
DRILLING PERSONNEL/METHOD: Jim McDonald, Brian Patkowski/CME - 75; 3 1/4" ID/7 7/8" OD HSA, 1.5-foot split spoon, continuous sampling	

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
										Auger through road asphalt to 0.5 ft.
								1		0.5 to 2.0 ft: Slough followed by: silty clay with moderately sorted gravel (about 25-30%), silty clay is mottled yellowish brown (10YR5/4) and very dark gray (10YR3/1) with yellowish brown streaks, low plasticity, slightly moist, olive green weathered clasts and pebbles of tight siltstone and quartz.
Mod. (2.5")	0.5 - 2.0	4/6/8	0.9/1.5	1609				2	CL	2.0 to 3.5 ft: Similar to above, silty clay mottled yellowish brown (10YR5/8); reddish brown (5YR5/3) and light olive brown (2.5Y5/4) gravels are subrounded tight (crystalline) siltstone.
Calif. (2")	2.0 - 3.5	3/4/3	1.1/1.5	1611				3		3.5 to 5.0 ft: Gravels and some clay, gravels are fractured siltstone pebbles; clays are silty, olive (5YR5/4), slightly plastic, slightly moist, one wet zone (0.1 ft thick).
								4		
Std. (1.5")	3.5 - 5.0	1/3/5	0.7/1.5	1615				5	GC	5.0 to 6.5 ft: Gravel and silty clay similar to above, abundant gravel is angular to subrounded siltstone or quartzite up to 40mm. Silty clay is mottled olive (5YR5/3) and light olive brown (25Y5/4), wet, cohesive; water encountered. Sample TP-3 (5.0-6.5) collected.
Mod.	5.0 - 6.5	9/5/4	0.7/1.5	1621	2-3 (HS)		▼	6	GC	6.5 to 8 ft: Clay and less gravel, mottled dark gray (5YR4/1) and olive gray (5YR4/2), low plasticity, moist, crumbly, slight hydrocarbon odors, siltstone pebbles are subangular to 10mm, oily sheen in water.
								7		
Calif.	6.5 - 8.0	1/4/11	1.3/1.5	1640				8		8.0 to 9.5 ft: Silty clay, some gravel, light olive brown (2.5Y5/4), nonplastic, very slightly moist, crumbly, tight subrounded siltstone pebbles to 35mm.; followed by silty clay with minor pebbles, mottled very dark gray (2.5YN/3) and olive (5Y4/3), slightly moist, crumbly, strong hydrocarbon odors.
Mod.	8.0 - 9.5	2/5/3	1.3/1.5	1642				9	CL	9.5 to 13 ft: Silty clay, dark gray (5Y4/1), plastic, slightly moist, soft, uniform, some emerald green mottling, slight hydrocarbon sheen and hydrocarbon odors, no gravel, split spoon to 13 ft under weight of rods. Sample TP-3 (9.5-13.0) collected.
								10		
Calif.	9.5 - 13.0	0/0/0	1.3/3.5	1646	> 20 (HS)			11		
		0/0/0/0						12	CL	
								13		13.0 to 14.5 ft: Clayey gravel, dark gray (5Y4/1), wet, oil saturated, gravel is fractured angular siltstone and quartzite up to 50mm, oil saturated between fractures, fractures from drilling. Sample TP-3 (13.0-14.5) collected.
Mod.	13.0 - 14.5	8/6/8	0.9/1.5	1650	20 (HS)			14	GC	14.5 to 16.0 ft: Slough, gravels similar to above.
								15		
Calif.	14.5 16.0	3/3/3	0.7/1.5	1653				16		16.0 to 18.0 ft: Slough, contains oily water.
Std.	16.0 - 18.0	0/1/3	0.3/2.0	1656				17		
		3								End 9/24/90 - Start 9/25/90.
								18		18.0 to 19.5 ft: Gravel and some clay, gravels are fractured tight siltstone including large angular rock fragments, oil stained and saturated, clays are dark gray (10YR4/1), low plasticity, slightly moist, about 10-20%.
Mod.	18.0 - 19.5	12/14/9	0.8/1.5	1010				19	GC	19.5 to 21 ft: Gravelly clay, similar to above, siltstone gravel is very dark gray on fresh fracture surfaces, oil saturated with black sludge, clay is greenish gray to very dark gray (2.5YN/4), slightly plastic, slightly moist. Sample TP-3 (19.5-21.0) collected.
								20		
Calif.	19.5 - 21.0	5/4/2	1.4/1.5	1017	7 (HS)					

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

JOB NO: 044-0010 IRSIFW

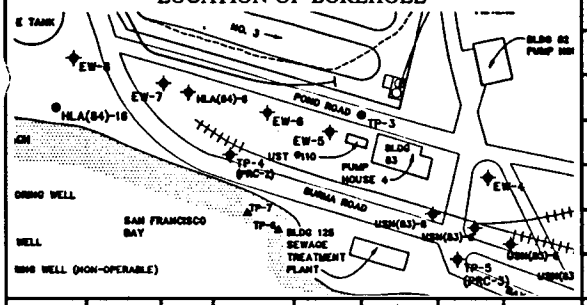
BOREHOLE DESIGNATION: TP-3 continued

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD / DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
								21	SC/CL	21.0 to 24.0 ft: Sandy clay, also very dark gray (2.5YN/3), moderately sorted, medium to coarse-grained sand to well sorted, fine to medium sand grains, also oil saturated and occurring in 0.1 to 0.5 ft. lenses; less gravel at 22 ft., followed by silty or sandy clay and very fine sand, very dark gray (2.5YN/3) plastic, moist, soft, abundant mica (possible bay mud); silty clay with sandy lenses and abundant gravel at 23.0 to 24.0 ft, gravels are fractured siltstones in blocky fragments; followed by uniform silty (sandy) clay as above, dark gray (2.5YN/3), less oil saturated, stained?. Sample TP-3 (22.5-24.0) collected.
Std.	21.0 - 22.5	1/1/1	1.5/1.5	1020				22		
								23	CL	
Mod.	22.5 - 24.0	3/3/4	1.5/1.5	1032	10 (HS)			24		24.0 to 25.5 ft: Weight of rods 24.0 to 25.5 ft. Silty (very fine sand) clay as above, very dark gray (2.5YN/3), plastic, wet, soft, micaceous, occasional angular quartzite rock fragments 15 to 20mm.
Calif.	24.0 - 25.5	0/0/0	1.2/1.5					25		25.5 to 27.0 ft: No recovery.
								26		
Calif.	25.5 - 27.0	3/2/1	0/1.5	1036				27	CL	27.0 to 30.5 ft: Weight of rods only, mostly slough (0.8 ft) but contains very fine sandy clay as above.
Mod.	27.0 - 30.5	0/0/0	0.8/3.5	1118				28		
		0/0/0						29	CL	
								30		30.5 to 35.0 ft: Sampler from 30.5 to 35.0 ft under weight of rods only, no sample obtained.
								31		
Mod.	30.5 - 35.0	0/0/0	0/4.5	1129				32		
		0/0/0						33		
		0/0/0						34		
								35	CL	35.0 to 37.0 ft: Sandy clay, as above, sand is very fine grained (nearly silt), very dark gray (2.5YN/3), plastic, moist to wet, micaceous, occasional subangular quartzite rock fragments up to 40mm, no significant hydrocarbon odors, HNu (headspace) only 0-1 ppm, sample overdriven 0.5 ft. Sample TP-3 (35.0-37.0) collected.
Mod.	35.0 - 37.0	1/1/1	1.5/2.0	1140	0-1 (HS)			36		
		1						37		37.0 to 40.5 ft: Sampler from 37.0 to 40.5 ft under weight of rods only, no samples obtained.
Calif.	37.0 - 40.5	0/0/0	0/3.5					38		
		0/0/0						39		
		0						40		
								41	CL	40.5 to 42.5 ft: Sandy clay, as above, micaceous, no visible hydrocarbons or odors, numerous 1 to 2mm brownish white shell fragments.
Mod.	40.5 - 42.5	4/4/4	1.5/2.0	1158				42		
		0						43		42.5 to 44.5 ft: Some sandy clay as above, followed by clay (silty), weathered (mottled) yellowish brown (10YR5/4 - 5/8) or grayish brown (2.5Y5/2) with yellowish red (5YR5/4) and dark reddish brown (5YR3/2) weathered clasts or pebbles, very slightly plastic, slightly moist, dense, occasional 3-5mm pebbles of siltstone, oxidized red, photo #5 (fugichrome), sample overdriven 0.5 ft.
Calif.	42.5 - 44.5	5/16/20	1.5/2.0	1208				44	CL	
		32						45		TOTAL DEPTH = 44.5 FT

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOCATION OF BOREHOLE



JOB NO: 044-0010 IRSIFW	BOREHOLE DESIGNATION: TP-4
CLIENT: U.S. Navy	SURFACE ELEVATION:
SITE: Point Molate Naval Fuel Depot	DEPTH TO WATER: 13 ft
SUBSITE: Treatment Ponds	LOGGED BY: David West
DRILLING CO: Layne Environmental	DRILLING DATE(S): 9/26/90
DRILLING PERSONNEL/METHOD: Jim McDonald, Brian Patkowski/CME-75; 4 1/4" ID/7 7/8" OD HSA, 1 1/2 ft. split spoon continuous sampling.	

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD / DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
										Auger to 3 ft.; begin sampling at 3 ft.; surficial gravels and sand (railroad base material)
								1		
								2		
								3		
Mod. (2.5")	3.0 - 4.5	4/11/9	1.5/1.5	1030					GP/SP	3.0 to 4.5 ft: 0.2 ft. slough, followed by sand, clean, well sorted medium to coarse, light olive brown (2.5Y5/6), slightly moist, moderately dense, minor gravel but abundant chips of dark gray shale.
								4		4.5 to 6 ft: Sand as above, occasional large rock fragments of tight crystalline quartzite (bedrock fragment), fill material.
								5		
Calif. (2")	4.5 - 6.0	4/6/5	0.9/1.5	1032					SP	
Std. (1.5")	6.0 - 7.5	4/5/6	0.7/1.5	1036				6		6.0 to 7.5 ft: Mostly gravelly slough; 0.2 ft. coarse sand and shale/siltstone chips and fractured rock fragments, similar to above.
								7		
								8	GP/SP	7.5 to 9 ft: Gravelly sand (similar to above), light olive brown (2.5Y5/6), well sorted medium to coarse sand, slightly moist, gravels contain abundant 2 to 10mm fractured siltstone chips and some larger (>40mm) subangular crystalline quartzite rock fragments with white quarts veins.
Mod.	7.5 - 9.0	10/13/11	0.6/1.5	1042						
Calif.	9.0 - 10.5	12/10/8	0.2/1.5	1046				9		9.0 to 10.5 ft: Mostly slough, some cohesive clayey sand, slightly moist to wet, also light olive brown, water table encountered?
								10		10.5 to 12.5 ft: No recovery.
								11		
	10.5 - 12.5	5/6/3/4	0.0/2.0	1050				12		
								13		12.5 to 14.0 ft: Gravel sand slough with some dark gray clay, similar to above but slight hydrocarbon odor. Sample TP-4 GW(13) collected.
Mod.	12.5 - 14.0	8/6/4	0.2/1.5	1055						
Calif.	14.0 - 15.5	3/3/4	0.9/1.5	1102	15-20			14		14.0 to 15.5 ft: Clayey and sandy gravel (mostly slough), dark gray (2.5YN/4) oil stained; Depth to product = 12.96 (below ground); Depth to water = 12.83 (below ground) measured with interface probe. Sample TP-4 (14.0-15.5) collected.
								15	GC	15.5 to 17.5 ft: Clayey gravels, oil saturated, fractured siltstone and shale rock fragments, saturated between some fractures, dark grayish brown (2.5Y4/2) to very dark gray (2.5YN/4) where stained with oil, unstained rock fragments are dark grayish brown and weathered light olive brown (2.5Y5/6).
								16		
Std.	15.5 - 17.5	1/3/4	1.3/2.0	1107				17		
		3						18	GC	17.5 to 19 ft: Clayey gravel as above, wet and oil saturated, rock fragments are fractured siltstone/quartzite, subrounded to subangular; clays are gray (10YR5/1), plastic, wet, soft; photo #6. Sample TP-4 (17.5-19.0) collected.
Mod.	17.5 - 19.0	3/7/9	0.9/1.5	1126	14-15					
Calif.	19.0 - 20.5	3/3/3	0.8/1.5	1130				19		19.0 to 20.5 ft: As above with some sand, poorly sorted subangular fractured quartzite, ranging from rock fragments to 2 to 3mm chips; sand and clay stained olive gray (5Y4/2) to gray (5Y5/1)
								20		

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

JOB NO: 044-0010 IRSIFW

BOREHOLE DESIGNATION: TP-4 continued

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD / DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
								21		20.5 to 22.5 ft: Gravel (>50%), sand (~30%), and clay (~10-20%), graded, dark gray (10YR4/1), wet, no visible oil but sand contains oily sheen, fractured siltstone is yellowish brown (10YR5/4) on clean surfaces.
Std.	20.5 - 22.5	2 3 3 4	1.1 / 2.0	1137					GC	
								22		
								23		22.5 to 24.0 ft: Silty clay/sandy clay, very dark gray (2.5YN/3), slightly plastic, slightly moist, soft, uniform, micaceous, small white shell fragments, sand is rounded very fine quartz; hydrocarbon odors not evident; bay mud?, followed by sandy clay/clayey sand as above, uniform, moist, bay mud? Sample TP-4 (22.5-24.0) collected.
Mod.	22.5 - 24.0	7 3 0	1.5 / 1.5	1212					SC/CL	
								24		24.0 to 27.5 ft: Sampler to 26.5 ft under weight of rods, clayey very fine sands as above, very dark gray (2.5YN/3), slightly plastic, moist, soft, uniform, micaceous, white shell fragments, bay mud?
Calif.	24.0 - 27.5	0 0 0	1.5 / 1.5	1220						
								25		
		0 0 3 2						26		
									SC/CL	
								27		
								28		27.5 to 29.0 ft: Clayey very fine sand as above; shell fragments more abundant and larger (up to 25mm).
Mod.	27.5 - 29.0	2 1 3	1.5 / 1.5	1228						
								29		29.0 to 32.5 ft: Clayey very fine sand as above, fewer shell fragments, micaceous; split spoon to 31 ft. under weight of rods, soft bay muds?
Calif.	29.0 - 32.5	0 0 0	1.3 / 1.5	1232						
								30		
		0 1 1 1						31		
								32		
								33		32.5 to 41 ft: Clayey very fine sand as above; split spoon to 39 ft under weight of rods, soft bay muds?
Mod.	32.5 - 41.0	0 0 0	1.1 / 1.5	1310						
								34		
		0 0 0						35		
									SC/CL	
		0 0 0						36		
		0 0 0						37		
		0 1 1						38		
		0 0						39		
								40		
								41		41.0 to 42.5 ft: Clayey very fine sand as above, very dark gray (2.5YN/3), some white shell fragments (3-5mm) and whole shells, bay mud? Sample TP-4 (41.0-42.5) collected.
Calif.	41.0 - 42.5	3 3 2	1.5 / 1.5	1317					SC/CL	
								42		
								43		TOTAL DEPTH = 42.5 FT

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

LOCATION OF BOREHOLE

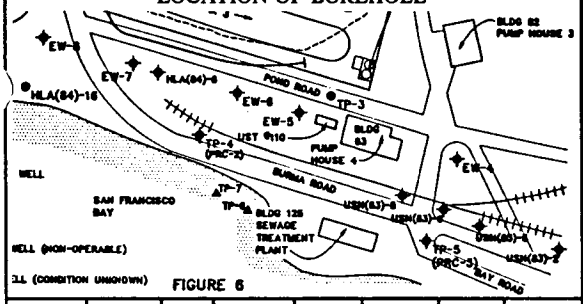


FIGURE 6

JOB NO: 044-0010 IRSIFW	BOREHOLE DESIGNATION: TP-5
CLIENT: U.S. Navy	SURFACE ELEVATION:
SITE: Point Molate Naval Fuel Depot	DEPTH TO WATER: 14 ft
SUBSITE: Treatment Ponds	LOGGED BY: David West
DRILLING CO: Layne Environmental	DRILLING DATE(S): 9/26/90 - 9/27/90
DRILLING PERSONNEL/METHOD: Jim McDonald, Brian Patkowski/ CME-75 and Mobil	
B-61, 4 1/4" ID/7 7/8" OD HSA, 1 1/2 ft continuous split spoon drives	

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD / DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
										Auger through asphalt surface to 2 feet.
								1		
								2		2.0 to 3.5 ft: Clayey sand with some gravel, grayish brown (2.5Y5/2), well sorted medium to coarse quartz sand, very slightly moist, occasional subrounded quartzite pebbles up to 25mm.
Mod. (2.5")	2.0 - 3.5	8/8/5	1.4/1.5	1538					SC	
								3		3.5 to 5.0 ft: Clay and gravels, yellowish brown (10YR5/6), slightly moist, subangular siltstone and quartzite gravel up to 35mm with brownish yellow (10YR6/8) weathered siltstone fragments, no apparent hydrocarbons, clean fill material.
								4		
Calif. (2")	3.5 - 5.0	4/6/10	0.9/1.5	1541					SC/GC	
Std. (1.5")	5.0 - 6.5	2/4/4	0.2/1.5	1544				5		5.0 to 6.5 ft: Slough only, light gray (10YR6/1), quartzite pebble >4cm lodged in split spoon, yellowish brown (10YR5/8) speckles and weathered faces.
								6		6.5 to 8.0 ft: Clayey sand, grayish brown (2.5Y5/2), well sorted, medium to coarse quartz sand (over 85%), uniform, small 1-2mm chips of siltstone.
								7		
Mod.	6.5 - 8.0	5/6/8	1.5/1.5	1554					SC	
Calif.	8.0 - 9.5	3/3/5	0.6/1.5	1556				8		8.0 to 9.5 ft: Gravelly clayey sand, similar to above, light olive brown (2.5Y5/4), tight siltstone and quartzite is very dark grayish brown (10YR3/2) to very dark gray (10YR3/1) on fresh fractures, conchoidal fractures.
									SC/GC	
								9		9.5 to 11.5 ft: Clean sandy gravel fill as above.
								10		
Std.	9.5 - 11.5	2/2/3/4	0.8/2.0	1558					GC/GP	
								11		
								12		11.5 to 13 feet: Sandy gravel fill as above, light olive brown (2.5Y5/4), 0.8 ft followed by sand, well sorted, medium to coarse grained, stained very dark grayish brown (10YR3/2) to very dark gray (10YR3/1) with hydrocarbons, moist, strong hydrocarbon odors at 13 ft.
Mod.	11.5 - 13.0	10/7/7	1.3/1.5	1606	10-15				SP	
Calif.	13.0 - 14.5	4/4/4	1.3/1.5	1608	15-20			13		13.0 to 14.5 ft: Sand and rock fragments, sand like above stained uniformly very dark gray (10YR3/1), moist becoming wet, saturated with hydrocarbons but no free oil, occasional subrounded siltstone or quartzite up to 25 mm. Sample TP-5 (13.0-14.5) collected. Sample TP-5GW(14) collected.
								14		14.5 to 16.5 ft: Sand and clayey sand, stained very dark gray as above, clay <10%, wet and oil saturated with free oil noted.
								15		
Std.	14.5 - 16.5	3/3/3/4	2.0/2.0	1610					SP	
								16		16.5 to 18.0 ft: Clayey gravel slough and well sorted sand/clayey sand as above, <5% clay, moist and oil stained with hydrocarbons.
								17		
Mod.	16.5 - 18.0	7/9/8	1.5/1.5	1613				18		18.0 to 21.5 ft: Sand (1.3 ft) stained, very dark gray (2.5YN/3) with hydrocarbons, well sorted medium to coarse quartz grains, moist, uniform; followed by 0.2 ft very fine clayey sand, very dark gray (2.5YN/3), moderately plastic, moist, soft, (bay mud?). Sample TP-5 (18.0-21.5) collected.
Calif.	18.0 - 21.5	1/1/1/0	1.5/1.5	1619					SP	
								19		
								20		

FIELD BORELOG

PRC ENVIRONMENTAL MANAGEMENT, INC.

JOB NO: 044-0010 IRSIFW

BOREHOLE DESIGNATION: TP-5 Continued

SAMPLER TYPE	SAMPLE DEPTH	BLOW CTS	RECVD / DRIVEN	TIME	PID READING	ANLYS Phy Ch	WELL INFO	DEPTH IN FT	USCS GRAPHICS	SOIL DESCRIPTION
								21		
Mod.	21.5 - 23.0	2/3/5	0/1.5	1630				22		21.5 to 23.0 ft: No recovery.
								23		
Calif.	23.0 - 24.5	7/7/5	0.4/1.5	1644				24		23.0 to 24.5 ft: Slough, wet, subangular quartzite to 4cm and sandy clay, dark gray (5Y4/1).
								25		24.5 to 26.5 ft: Slough, wet clayey and sandy gravel with fractured sandstone; sandstone is weathered light yellowish brown (10YR6/4); subangular quartzite up to 4cm; clay and sand is dark gray (10YR4/1). End 9/26/90 - Driller had to demob CME rig.
Std.	24.5 - 26.5	3/4/4/6	0.3/2.0	1647				26		
								27		Start 9/27/90 - Overdrill 0.5 ft to 27 ft.
Mod.	26.5 - 28.5	27/50	0/1.5	0940				28		27.0 to 28.5 ft: Refusal after 27/6 and 50/6 blow counts, 6cm quartzite rock prevents collection in spoon, some olive yellow (2.5Y6/6) weathered quartz sandstone, soft and crumbly.
		—						29		28.5 to 30.0 ft: No recovery, 100/2 (bedrock?) redriven 27/32/50, 1.3 ft wet gravelly slough, 0.2 ft light olive brown (2.5Y5/6) weathered quartz sandstone (bedrock?).
Calif.	28.5 - 30.0	100/—	0.2/1.5	0945				30		30.0 to 31.5 ft: 100 blow counts for 0.1 ft, 1.4 ft wet gravelly slough, gray; 0.1 ft sandstone, olive yellow (2.5Y6/6), as above, weathered, soft, crumbly, oxidized with brownish yellow (10YR6/8) specs throughout, medium to coarse grained subrounded to subangular quartz, bedrock.
Std.	30.0 - 31.5	100	0.1/0.1	1006				31		
								32		TOTAL DEPTH = 31.5 FT

APPENDIX D

PRC SITE INSPECTION
MONITORING WELL INSTALLATION RECORDS

PRC
ENVIRONMENTAL MANAGEMENT, INC.

MONITORING WELL INSTALLATION RECORD
NONTELESCOPING WELL

WELL LOCATION INFORMATION

WELL NO. PRC #1
BOREHOLE NO. B123-2
SITE Point Mugu Naval Fuel Depot
SUBSITE Building 123
DATE 9/21/90
RECORDED BY David West
WELL PERMIT NO. N/A

SURFACE COMPLETION INFORMATION

TYPE OF INSTALLATION
- ■ ABOVE GROUND INSTALLATION
  - ☐ PROTECTIVE POSTS INSTALLED
- ☐ FLUSH MOUNT INSTALLATION
  - TYPE ____
  - ☐ TRAFFIC RATED
  - ☐ WATERTIGHT SEAL
  - ☐ WATERTIGHT WELL CAP

TYPE OF PROTECTIVE CASING
- ■ STEEL SIZE 8"
- ☐ ____

SURFACE SEAL
- ☐ NONSHRINKING CEMENT
- ■ CONCRETE
- ☐ ____
- ■ CHECKED FOR SETTLEMENT
- ■ INTERNAL MORTAR ADDED

GROUND SURFACE ELEVATION
- ☐ SURVEYED
  - DATE ____

MEASURING POINT
- ■ TOP OF WELL CASING
- ☐ TOP OF PROTECTIVE CASING
- ☐ GROUND SURFACE
- ☐ ____

DRILLING INFORMATION

DRILLING COMPANY/PERSONNEL
Layne Environmental
Jim McDonald
Brian Pattkowski

DRILL RIG Mobil B-57

DRILLING METHOD
- ■ HOLLOWSTEM AUGER
- ☐ AIR ROTARY
- ☐ MUD/WATER ROTARY
- ☐ ____

DRILLING BEGAN
DATE 9/20/90 TIME 1040

WELL COMPLETION BEGAN
DATE 9/21/90 TIME 0805

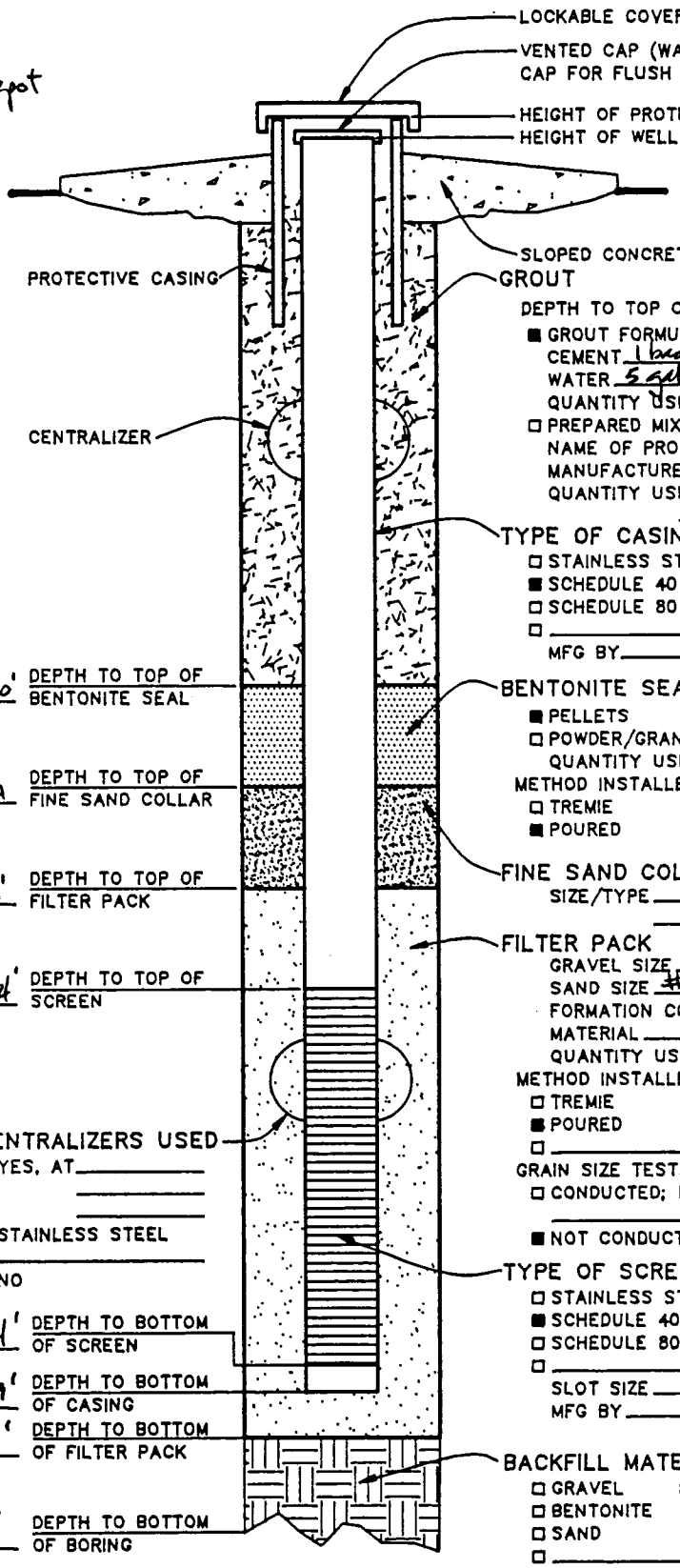
WELL COMPLETION FINISHED
DATE 9/21/90 TIME 1045

DRILLING FLUID TYPE
- ☐ BENTONITE ☐ WATER
- ☐ POLYMER ☐ ____

DRILLING FLUID LOSS
- ☐ YES ____ GALLONS
- ☐ NO

WATER ADDED DURING COMPLETION
- ☐ YES ____ GALLONS
- ■ NO

TOTAL FLUID LOSS TO FORMATION
0 GALLONS



DEPTH TO TOP OF GROUT
- ■ GROUT FORMULA (PROPORTION OF EACH)
  - CEMENT 1 bag BENTONITE ____
  - WATER 5 gal. OTHER ____
  - QUANTITY USED 3½-94 lb. bags
- ☐ PREPARED MIX
  - NAME OF PRODUCT ____
  - MANUFACTURED BY ____
  - QUANTITY USED ____

TYPE OF CASING
- ☐ STAINLESS STEEL
- ■ SCHEDULE 40 PVC
- ☐ SCHEDULE 80 PVC
- ☐ ____
- MFG BY ____

CASING DIAMETER
INSIDE 4.0"
OUTSIDE 4.5"

BENTONITE SEAL
- ■ PELLETS ☐ SLURRY
- ☐ POWDER/GRANULAR ☐ ____
- QUANTITY USED 1½-50 lb. buckets

METHOD INSTALLED
- ☐ TREMIE ☐ ____
- ■ POURED ☐ NOT USED

FINE SAND COLLAR (OPTIONAL)
SIZE/TYPE N/A

FILTER PACK
- GRAVEL SIZE ____ ; ____ TO ____ FT
- SAND SIZE #2/12 ; 15.3 TO 29.3 FT
- FORMATION COLLAPSE; ____ TO ____ FT
- MATERIAL ____
- QUANTITY USED 6-100 lb. bags

METHOD INSTALLED
- ☐ TREMIE
- ■ POURED
- ☐ ____

GRAIN SIZE TESTS FOR FILTER PACK
- ☐ CONDUCTED; FOR REPORT, REFER TO ____
- ■ NOT CONDUCTED

TYPE OF SCREEN
- ☐ STAINLESS STEEL
- ■ SCHEDULE 40 PVC
- ☐ SCHEDULE 80 PVC
- ☐ ____
- SLOT SIZE 0.020"
- MFG BY ____

SCREEN DIAMETER
INSIDE 4.0"
OUTSIDE 4.5"

BACKFILL MATERIAL
- ☐ GRAVEL
- ☐ BENTONITE
- ☐ SAND
- ☐ ____
- ■ FORMATION COLLAPSE; MATERIAL Clay, gravelly clay

TOTAL LENGTH OF CASING AND SCREEN 30.25'

DEPTH TO WATER FOLLOWING INSTALLATION (TOC) 20.54'

DIAMETER OF BOREHOLE ~8"

NOTES:
1. SCALE: NONE
2. RECORD FRACTIONAL FEET IN DECIMAL, NOT IN INCHES
3. RECORD CONSTRUCTION DEPTHS BELOW GROUND LEVEL

PRC
ENVIRONMENTAL MANAGEMENT, INC.

MONITORING WELL INSTALLATION RECORD
NONTELESCOPING WELL

WELL LOCATION INFORMATION

WELL NO. PRC #2
BOREHOLE NO. TP-4
SITE Point Molate Naval Fuel Depot
SUBSITE Treatment Ponds
DATE 9/27/90
RECORDED BY David West
WELL PERMIT NO. N/A

SURFACE COMPLETION INFORMATION

TYPE OF INSTALLATION
- ☐ ABOVE GROUND INSTALLATION
  - ☐ PROTECTIVE POSTS INSTALLED
- ■ FLUSH MOUNT INSTALLATION
  - TYPE Christy Box
  - ■ TRAFFIC RATED
  - ☐ WATERTIGHT SEAL
  - ■ WATERTIGHT WELL CAP

TYPE OF PROTECTIVE CASING
- ☐ STEEL SIZE
- ☐

SURFACE SEAL
- ☐ NONSHRINKING CEMENT
- ■ CONCRETE
- ☐
- ■ CHECKED FOR SETTLEMENT
- ■ INTERNAL MORTAR ADDED

GROUND SURFACE ELEVATION
- ☐ SURVEYED
  - DATE
- MEASURING POINT
  - ■ TOP OF WELL CASING
  - ☐ TOP OF PROTECTIVE CASING
  - ☐ GROUND SURFACE
  - ☐

DRILLING INFORMATION

DRILLING COMPANY/PERSONNEL
Layne Environmental
Mike Sloan
Brian Patkowski

DRILL RIG Mobil B-57

DRILLING METHOD
- ■ HOLLOWSTEM AUGER
- ☐ AIR ROTARY
- ☐ MUD/WATER ROTARY
- ☐

DRILLING BEGAN
DATE 9/26/90 TIME 1005

WELL COMPLETION BEGAN
DATE 9/27/90 TIME 1445

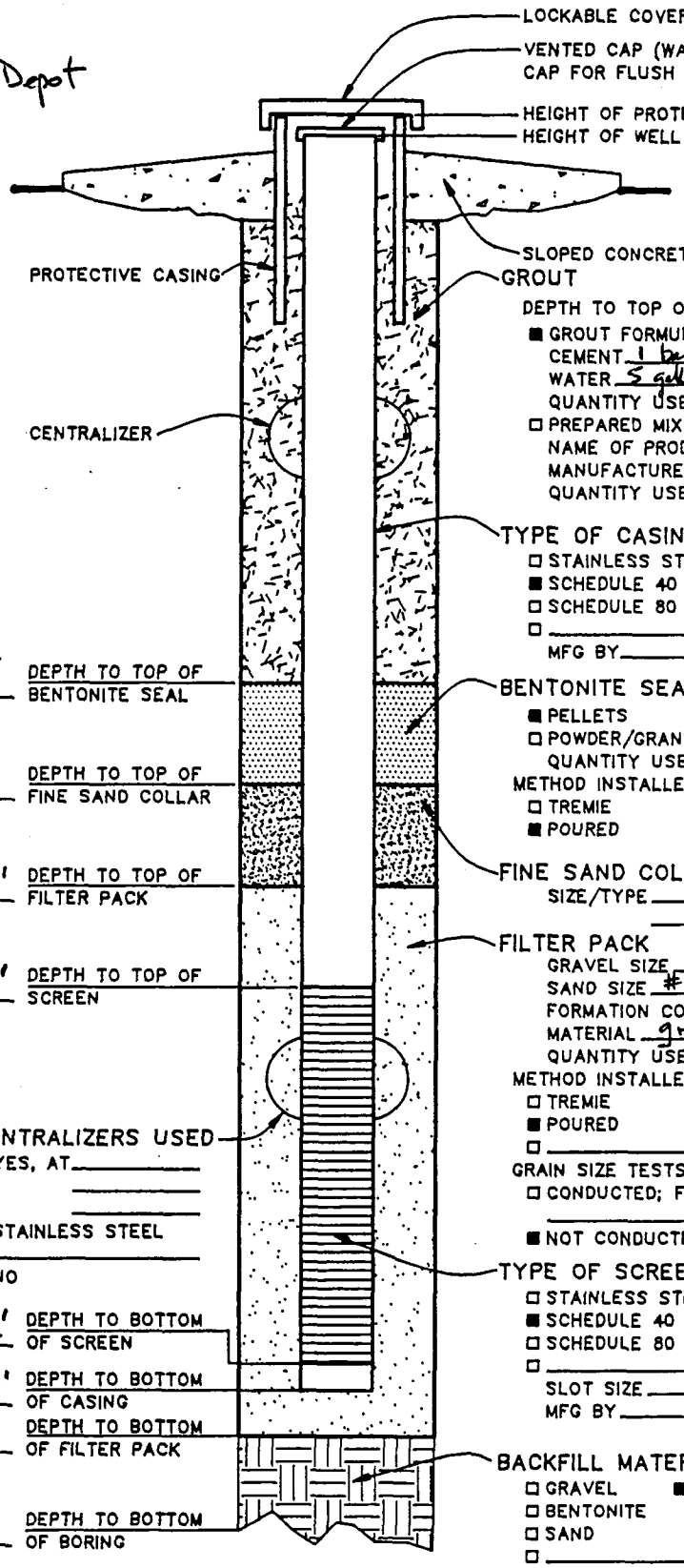
WELL COMPLETION FINISHED
DATE 9/28/90 TIME 1556

DRILLING FLUID TYPE
- ☐ BENTONITE ☐ WATER
- ☐ POLYMER ☐

DRILLING FLUID LOSS
- ☐ YES GALLONS
- ☐ NO

WATER ADDED DURING COMPLETION
- ■ YES ~200 GALLONS
- ☐ NO

TOTAL FLUID LOSS TO FORMATION
~200 GALLONS



TOTAL LENGTH OF CASING AND SCREEN 18.87'

DEPTH TO WATER FOLLOWING INSTALLATION (TOC) 12.83'

GROUT
DEPTH TO TOP OF GROUT
- ■ GROUT FORMULA (PROPORTION OF EACH)
  - CEMENT 1 bag BENTONITE
  - WATER 5 gallons OTHER
  - QUANTITY USED 4 bags (94 lb.)
- ☐ PREPARED MIX
  - NAME OF PRODUCT
  - MANUFACTURED BY
  - QUANTITY USED

TYPE OF CASING
- ☐ STAINLESS STEEL
- ■ SCHEDULE 40 PVC
- ☐ SCHEDULE 80 PVC
- ☐
- MFG BY

CASING DIAMETER
INSIDE 4.0"
OUTSIDE 4.5"

BENTONITE SEAL
- ■ PELLETS ☐ SLURRY
- ☐ POWDER/GRANULAR ☐
- QUANTITY USED 1 50 lb. bucket

METHOD INSTALLED
- ☐ TREMIE ☐
- ■ POURED ☐ NOT USED

FINE SAND COLLAR (OPTIONAL)
SIZE/TYPE N/A

FILTER PACK
GRAVEL SIZE ; TO FT
SAND SIZE #2/12 ; 7.2 TO 19 FT
FORMATION COLLAPSE; 15 TO 19 FT
MATERIAL gravel/sand mixture
QUANTITY USED 3 ± 100 lb. bags

METHOD INSTALLED
- ☐ TREMIE
- ■ POURED
- ☐

GRAIN SIZE TESTS FOR FILTER PACK
- ☐ CONDUCTED; FOR REPORT, REFER TO
- ■ NOT CONDUCTED

TYPE OF SCREEN
- ☐ STAINLESS STEEL
- ■ SCHEDULE 40 PVC
- ☐ SCHEDULE 80 PVC
- ☐

SCREEN DIAMETER
INSIDE 4.0"
OUTSIDE 4.5"

SLOT SIZE 0.010"
MFG BY

BACKFILL MATERIAL
- ☐ GRAVEL
- ☐ BENTONITE
- ☐ SAND
- ☐
- ■ FORMATION COLLAPSE; MATERIAL gravel/sand mixture

DIAMETER OF BOREHOLE 9.8"

NOTES:
1. SCALE: NONE
2. RECORD FRACTIONAL FEET IN DECIMAL, NOT IN INCHES
3. RECORD CONSTRUCTION DEPTHS BELOW GROUND LEVEL

PRC
ENVIRONMENTAL MANAGEMENT, INC.

MONITORING WELL INSTALLATION RECORD
NONTELESCOPING WELL

WELL LOCATION INFORMATION

WELL NO. PRC #3
BOREHOLE NO. TP-5
SITE Point Molate Naval Fuel Depot
SUBSITE Treatment Ponds
DATE 9/27/90
RECORDED BY David West
WELL PERMIT NO. N/A

SURFACE COMPLETION INFORMATION

TYPE OF INSTALLATION
- ☐ ABOVE GROUND INSTALLATION
  - ☐ PROTECTIVE POSTS INSTALLED
- ■ FLUSH MOUNT INSTALLATION
  - TYPE Christy Box
  - ■ TRAFFIC RATED
  - ☐ WATERTIGHT SEAL
  - ■ WATERTIGHT WELL CAP

TYPE OF PROTECTIVE CASING
- ☐ STEEL SIZE
- ☐

SURFACE SEAL
- ☐ NONSHRINKING CEMENT
- ■ CONCRETE
- ☐
- ■ CHECKED FOR SETTLEMENT
- ■ INTERNAL MORTAR ADDED

GROUND SURFACE ELEVATION
- ☐ SURVEYED
  - DATE

MEASURING POINT
- ■ TOP OF WELL CASING
- ☐ TOP OF PROTECTIVE CASING
- ☐ GROUND SURFACE
- ☐

DRILLING INFORMATION

DRILLING COMPANY/PERSONNEL
Layne Environmental
Jim McDonald
Brian Patkowski

DRILL RIG Mobil B-61

DRILLING METHOD
- ■ HOLLOWSTEM AUGER
- ☐ AIR ROTARY
- ☐ MUD/WATER ROTARY
- ☐

DRILLING BEGAN
DATE 9/26/90 TIME 1535

WELL COMPLETION BEGAN
DATE 9/27/90 TIME 1120

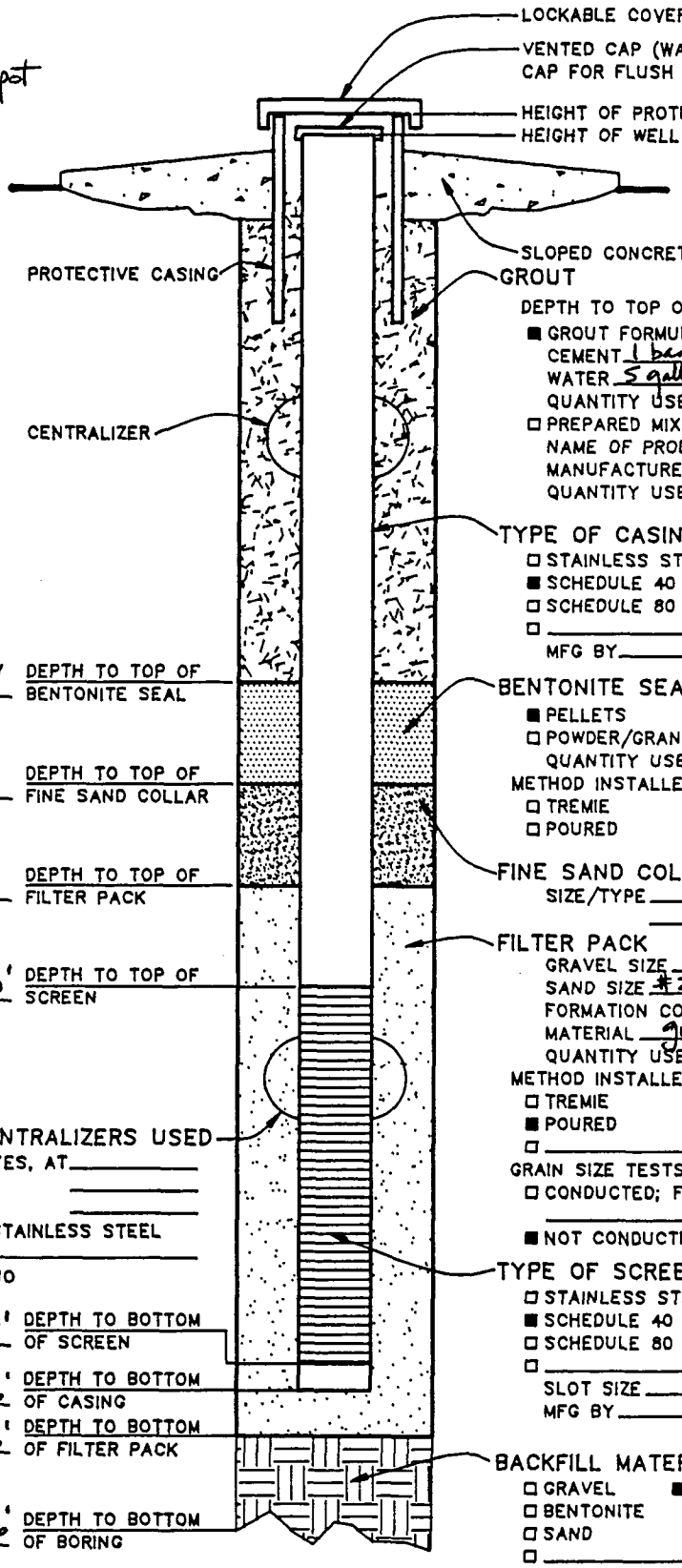
WELL COMPLETION FINISHED
DATE 9/27/90 TIME 1305

DRILLING FLUID TYPE
- ☐ BENTONITE ☐ WATER
- ☐ POLYMER ☐

DRILLING FLUID LOSS
- ☐ YES GALLONS
- ☐ NO

WATER ADDED DURING COMPLETION
- ■ YES ~60 GALLONS
- ☐ NO

TOTAL FLUID LOSS TO FORMATION ~60 GALLONS



DEPTH TO TOP OF GROUT
- ■ GROUT FORMULA (PROPORTION OF EACH)
  - CEMENT 1 bag BENTONITE
  - WATER 5 gallons OTHER
  - QUANTITY USED 5-94 lb. bags
- ☐ PREPARED MIX
  - NAME OF PRODUCT
  - MANUFACTURED BY
  - QUANTITY USED

TYPE OF CASING
- ☐ STAINLESS STEEL
- ■ SCHEDULE 40 PVC
- ☐ SCHEDULE 80 PVC
- ☐

CASING DIAMETER
INSIDE 4.0"
OUTSIDE 4.5"

MFG BY

BENTONITE SEAL
- ■ PELLETS ☐ SLURRY
- ☐ POWDER/GRANULAR ☐
- QUANTITY USED 1½-50 lb. buckets

METHOD INSTALLED
- ☐ TREMIE ☐
- ☐ POURED ☐ NOT USED

FINE SAND COLLAR (OPTIONAL)
SIZE/TYPE N/A

FILTER PACK
- GRAVEL SIZE ; TO FT
- SAND SIZE #2/12 ; 9.7 TO 23.06 FT
- FORMATION COLLAPSE: ~17 TO 23 FT
- MATERIAL gravel/sand mixture
- QUANTITY USED 4-100 lb. bags

METHOD INSTALLED
- ☐ TREMIE
- ■ POURED
- ☐

GRAIN SIZE TESTS FOR FILTER PACK
- ☐ CONDUCTED; FOR REPORT, REFER TO
- ■ NOT CONDUCTED

TYPE OF SCREEN
- ☐ STAINLESS STEEL
- ■ SCHEDULE 40 PVC
- ☐ SCHEDULE 80 PVC
- ☐

SCREEN DIAMETER
INSIDE 4.0"
OUTSIDE 4.5"

SLOT SIZE 0.010"
MFG BY

BACKFILL MATERIAL
- ☐ GRAVEL
- ☐ BENTONITE
- ☐ SAND
- ☐
- ■ FORMATION COLLAPSE; MATERIAL gravel/sand mixture

CENTRALIZERS USED
- ☐ YES, AT
- ☐ STAINLESS STEEL
- ☐
- ■ NO

TOTAL LENGTH OF CASING AND SCREEN 22.58'

DEPTH TO WATER FOLLOWING INSTALLATION (TOC) 14.78'

DIAMETER OF BOREHOLE 9.25"

NOTES:
1. SCALE: NONE
2. RECORD FRACTIONAL FEET IN DECIMAL, NOT IN INCHES
3. RECORD CONSTRUCTION DEPTHS BELOW GROUND LEVEL

APPENDIX E

PRC SITE INSPECTION
WELL DEVELOPMENT DATA SHEETS

PRC Environmental Management Inc.

WELL DEVELOPMENT DATA SHEET

Boring No. B123-2 Well No. PRC #1

Project: Point Molate ST
Project No.: 044-0010, 1RS1 FW
Date(s) of Installation: 9/21/90
Date(s) of Development: 9/21/90 - 9/25/90
Personnel/Company: David West, Don Kearns / PRC
Type of Rig Used: —

Casing Diameter/Type: 4" PVC
Borehole Diameter: 8 inchs
Screened Interval(s): 19.04 - 29.29
Total Length of Well Casing: 30.25'
Measured Total Depth (TOC) Initial: 30.5'
Final: 30.52

Initial Depth to Water (TOC): 21.5 Date: 9/21/90 Time: 1830
Stabilized Depth to Water (TOC): 21.34 Date: 10/3/90 Time: 1600

DEVELOPMENT

TECHNIQUE(S)	EQUIPMENT TYPE/CAPACITY
___ Jetting (Airlift)	
___ Surge Block	
✓ Bailing	3.5" x 2.0' Stainless bailer
___ Pumping	
___ Other	

FLUIDS ADDED

Lost Drilling Fluid: — Gallons

Lost Purge Water: — Gallons

Water During Installation: — Gallons

Total Fluids Added: 0 Gallons

Source of Added Water: —

PURGE VOLUME CALCULATION

Casing Volume: 9.0 Feet of Water
X 0.653 Gallons/Foot
= 6 Gallons per Single Casing Volume
Sandpack Volume: 14 Ft. of ~~Saturated~~ Sandpack
X 2.5 Gallons/Ft. (Borehole Dia.)
X 0.3 (Assuming porosity = 30%)
- 6 Gallons of Casing Volume
= 4.5 Gallons within Sandpack
Single Purge Volume: 10.5 Gallons (Casing Vol. + Sandpack Vol. + Fluids Added)
Minimum Purge Volume: 52.5 Gallons
Actual Purge Volume: 75 Gallons
Volume Measured by: 5 gallon bucket
Rate of Development: 12 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: N/A @ ___ Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

INSTRUMENT CALIBRATION

pH Meter: Orion SA 250 SN: 3155
pH 4.0 = ___ @ ___ °C
pH 7.0 = 6.82 @ 18.8 °C
pH 10.0 = 9.86 @ 18.8 °C
Dissolved Oxygen Meter: N/A

Conductivity Meter: YSI Model 33
Standard: 9985 µmhos/cm@ 25°C
Reading: 8600 µmhos/cm @ 18.8 °C
Turbidity Meter: N/A
Other: ___

	Volume Discharged	Rate of Discharge	Time	Temp	pH	Conductivity*	Turbidity or D.O.	Clarity, Odor PID Readings, Other:
9/21/90	12½ gal.	—	1845	20.5	6.65	680 @ 20.5°C	—	very silty, brown
9/22/90	12¾	—	1115	20.2	6.42	500 @ 20.2	—	slightly cloudy
	18	—	1121	20.3	6.60	550 @ 20.3	—	very silty, brown
	24	—	1128	20.3	6.48	550 @ 20.3	—	very silty, brown
	35	—	1625	19.4	6.58	420 @ 20.5	—	cloudy w/ brown silt, Dewatered in 11 gallons
9/24/90	50	—	0900	21.2	6.47	362 @ 21.2	—	cloudy w/ yellow brown silt.
	61	—	1916	21.2	6.20	349 @ 21.2	—	cloudy w/ yellow brown silt
9/25/90	75	—	1751	20.2	6.79	360 @ 20.0	—	cloudy w/ yellow brown silt

* Conductivity readings temperature compensated to 25°C, if not, report temperatures at which reading obtained.

WELL DEVELOPMENT DATA SHEET

Boring No. TP-4 Well No. PRC #2

Project: Point Molate SI
Project No.: 044-0010, RSI FW
Date(s) of Installation: 9/27/90 - 9/28/90
Date(s) of Development: 9/28/90 - 9/29/90
Personnel/Company: David West, Don Kerns/ PRC
Type of Rig Used: Mobil B-57/Smeal/

Casing Diameter/Type: 4" PVC
Borehole Diameter: 9 7/8"
Screened Interval(s): 8.62 - 18.87
Total Length of Well Casing: 18.87
Measured Total Depth (TOC) Initial: 19.10
Final: 19.08
Initial Depth to Water (TOC): 12.72 Date: 9/28/90 Time: 1815
Stabilized Depth to Water (TOC): 12.66 Date: 10/3/90 Time: 1316 (high tide)
12.82 10/2/90 1822 (low tide)

DEVELOPMENT TECHNIQUE(S) / EQUIPMENT TYPE/CAPACITY

- ___ Jetting (Airlift)
- ✓ Surge Block — Used with both Mobil B-57 & Smeal
- ✓ Bailing — 3½" x 8 ft / 3½" x 2 ft
- ___ Pumping
- ___ Other

FLUIDS ADDED

Lost Drilling Fluid: — Gallons
Lost Purge Water: — Gallons
Water During Installation: ~200 Gallons
Total Fluids Added: ~200 Gallons
Source of Added Water: Point Molate

PURGE VOLUME CALCULATION

Casing Volume: 6.09 Feet of Water
X 0.653 Gallons/Foot
= 4 Gallons per Single Casing Volume
Sandpack Volume: 6 Ft. of Saturated Sandpack
X 4.1 Gallons/Ft. (Borehole Dia.)
X 0.3 (Assuming porosity = 30%)
- 4 Gallons of Casing Volume
= 3.4 Gallons within Sandpack
Single Purge Volume: 7.4 + 200 Gallons (Casing Vol. + Sandpack Vol. + Fluids Added)
Minimum Purge Volume: 207.4 Gallons
Actual Purge Volume: 275 Gallons
Volume Measured by: 55 gallon drum
Rate of Development: N/A Gallons/Minute (Hour,Day)
Pumping Rate/Depth: N/A @ ___ Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

INSTRUMENT CALIBRATION

pH Meter: ORION SA 250
pH 4.0 = ___ @ ___ °C
pH 7.0 = 6.95 @ 23.5 °C
pH 10.0 = 10.02 @ 23.4 °C
Dissolved Oxygen Meter: N/A

Conductivity Meter: YSI Model 33
Standard: 9985 µmhos/cm @ 25°C
Reading: 9940 µmhos/cm @ 24.5 °C
Turbidity Meter: N/A
Other: ___

	Volume Discharged	Rate of Discharge	Time	Temp	pH	Conductivity*	Turbidity or D.O.	Clarity, Odor PID Readings, Other:
9/28/90	40 gal.	—	1110	23.5	7.06	1300 @23.5	—	cloudy w/ oil sheen
9/29/90	110	—	1130	23.5	6.94	1,050 @ 23.5	—	cloudy w/ oil sheen
	165	—	1150	24.0	7.04	1,050 @ 24.0	—	cloudy w/ oil sheen
	220	—	1215	25.0	6.88	1,100 @ 24.5	—	cloudy w/ oil sheen
	275	—	1225	25.0	7.00	1,100 @ 25.0	—	cloudy w/ oil sheen.

Note: Initial 40 gallons developed with 8 ft bailer and Mobil B-57 rig on 9/28/90, 4 hours following well installation. Subsequent 235 gallons bailed on 9/29/90 using Smeal Rig with 3½" x 6 foot bailer.

* Conductivity readings temperature compensated to 25°C, if not, report temperatures at which reading obtained.

WELL DEVELOPMENT DATA SHEET

Boring No. TP-5 Well No. PRC #3

Project: Point Molate SI
Project No.: 044-0010 IRSIFW
Date(s) of Installation: 9/27/90
Date(s) of Development: 9/27/90 –
Personnel/Company: David West / PRC

Type of Rig Used: Mobil B-61 / Sneal / Mobil B-57

Casing Diameter/Type: 4" PVC
Borehole Diameter: 9 1/4"
Screened Interval(s): 12.50 – 23.06
Total Length of Well Casing: 22.58
Measured Total Depth (TOC) Initial: 22.29
Final:

Initial Depth to Water (TOC): 14.0 Date: 9/27/90 Time: 1428
Stabilized Depth to Water (TOC): 13.03 Date: 10/2/90 Time: 1220 (high tide)
13.78 10/4/90 1920 (low tide)

DEVELOPMENT

TECHNIQUE(S)	EQUIPMENT TYPE/CAPACITY
___ Jetting (Airlift)	
✓ Surge Block	Used with both B-61 & Sneal
✓ Bailing	8 ft. & 6 ft. bailers / 3½"x2' bailer.
___ Pumping	
___ Other	

FLUIDS ADDED

Lost Drilling Fluid: — Gallons

Lost Purge Water: — Gallons

Water During Installation: ~60 Gallons

Total Fluids Added: ~60 Gallons

Source of Added Water: Point Molate

PURGE VOLUME CALCULATION

Casing Volume: 9.25 Feet of Water
X 0.653 Gallons/Foot
= 6 Gallons per Single Casing Volume
Sandpack Volume: 8.5 Ft. of Saturated Sandpack
X 3.5 Gallons/Ft. (Borehole Dia.)
X 0.3 (Assuming porosity = 30%)
- 6 Gallons of Casing Volume
= ~3 Gallons within Sandpack
Single Purge Volume: 9 + 60 Gallons (Casing Vol. + Sandpack Vol. + Fluids Added)
Minimum Purge Volume: 69 Gallons
Actual Purge Volume: 166 Gallons
Volume Measured by: 55 gallon drum
Rate of Development: N/A Gallons/Minute (Hour,Day)
Pumping Rate/Depth: N/A @ ___ Ft. (Below Grd.)
Immiscible Phases Present: (Y) N Thickness: 0.005 ft.

INSTRUMENT CALIBRATION

pH Meter: Orion SA 250
pH 4.0 = ___ @ ___ °C
pH 7.0 = 7.03 @ 24.0 °C
pH 10.0 = 9.99 @ 24.0 °C
Dissolved Oxygen Meter: N/A

Conductivity Meter: YSI Model 33
Standard 9985 µmhos/cm @ 25°C
Reading 8,600 µmhos/cm @ 23.3 °C
Turbidity Meter: N/A
Other: Salinity w/ YSI Model 33

	Volume Discharged	Rate of Discharge	Time	Temp °C	pH	Conductivity*	Turbidity or D.O.	Clarity, Odor PID Readings, Other:
9/27/90	15 gal	– Bailed following installation w/ Mobil B-61 and 8-foot bailer						
	30 gal.	–	1600	Bailed and swabbed with surge block				
9/28/90	70		1650	Bailed another 40 gallons with Mobil B-57; no parameters.				
	78		1830	Bailed another 8 gallons - well dewatered				
9/29/90	86		1049	8 gallons bailed w/ Sneal using 4" x 8 foot bailer.				
10/1/90	101	—	1918	22.0	6.92	1,300 @ 20.5	—	better recharge after swabbing.
10/2/90	121	—	1228	22.0	6.95	1,280 @ 22.0	—	Salinity = 0.5 to 1%
	146	—	1850	20.9	6.76	1280 @ 22.1	—	slightly cloudy w/ oily sheen
10/3/90	166	—	1405	21.4	6.79	1,400 @ 22.0	—	slightly cloudy w/ oily sheen
	Note: Well sampled on 10/4/90 @ 1930							

* Conductivity readings temperature compensated to 25°C, if not, report temperatures at which reading obtained.

APPENDIX F

PRC SITE INSPECTION
GROUND-WATER SAMPLING DATA SHEETS

prc GROUND WATER SAMPLING DATA SHEET

Page 1 of

Borehole ~~Well Number~~ DA-5 | Location W. end of Disposal Area (Landfill) | Date 9/18/90

Project PT. UOLATE SI | Project No. 044-0010 | Samplers D. WEST

Station Elevation | Well Stick Up N/A | Supervisor J. WEST

Borehole ~~Casing Diameter~~ 6.5 inches | Well Depth: 34.7 Measured ✓ Reported | Water Level (From TOC) 19.6 (below grd)

Gallons Water/Ft. 0.43 | Casing Volume N/A | Screened Interval N/A

Immiscible Phases Present No | Type | Thickness | Measured with

PID Readings (Background) — | TOC —

FIELD CHEMISTRY CALIBRATION

Date/Time: 9/18/90/1912 | Conductivity: Standard 9985 umhos/cm at 25°C | Reading 9200 umhos/cm at 19 °C

pH: pH 4.00 = ____ at ____ °C | pH 7.00 = 7.07 at 21.5 °C | pH 10.00 = 10.18 at 21.5 °C | Slope 99.5

DO: D.O. Meter: ____ mg/l at ____ °C | PID: Calibration Gas ____ ppm ____ Span ____ Reading ____

Time	Pumping Rate gpm	D.O. mg/l	pH	Temp. °C	E.C. umhos/cm at °C	Cum. Vol. of H_2O Removed gallons	Casing Vols.	PID Reading Loc.	Value	Comments
1927	—	—	7.21	21.5	520 @ 18.5	0	0	—	—	cloudy w/ silt
1946	—	—	7.26	21.0	520 @ 18.9	10	1.5	TOA	3 ppm	cloudy w/ silt
DTW measured again @ 1957 = 23.0 ft below ground										
(Sample from DA-4B								Sample designated as:		
1959	—	—	7.15	22.5	690 @ 18.2°C)				DA-5 GW (21)	
2049	—	—	~~6.95~~ 7.37	20.2	510 @ 19.0	20	3.0	TOC	1-2 ppm	cloudy w/ silt
2118	Measure DTW again @ 28.05 below ground									
2119	—	—	7.07	19.5	510 @ 20.5	30	5.0	TOA	1-2 ppm	V. cloudy w/ silt
2232	Measure DTW = 20.6 below ground									

Condition of Well Note: Ground Water sampled from inside auger flights, 30 gallons purged.

Remarks 3½" ID augers = 0.43 gal/ft × 15.1 ft = 6.5 gal = 1 ~~casing~~ auger volume.
TOA = Top of augers

FIELD EQUIPMENT

pH meter ORION SA 250 | Serial No. 3155

E.C. meter YSI Model 33 | Serial No. 90A01922

Pump N/A | Serial No.

Bailer 2" NORTON TEFLON | Size 2" x 3'

Water Level Meter Solinst | ~~Serial No.~~ PRC 00223

D.O. Meter N/A | Serial No.

Filter Apparatus Geotech In Line | Filters 0.45μ disposable

Temperature Measure ORION pH

Interface Probe Oil Recovery Systems | Serial No. 1068013

PID HNu Model HW-101 | Serial No. A70169

SAMPLING DESCRIPTION:

Fractions VOA 2x40 ml Fluoride
BTEX 2x40 ml Metals - Total 1x250
TPH 1x1 L Metals - Diss 1x250
BNA 1x1 L ~~PEST~~ Pest 1x1 L

No. of Bottles 9 (Fluoride collected from ~~to title~~ Pest.)

Sample Depth 20-21 ft.

Field Notebook No.

Sample Method Bail from inside auger flights

Discharge H_2O Containerized ____ Yes ✓ No

prc GROUND WATER SAMPLING DATA SHEET

Page 1 of 1

Borehole Well Number: TP-1 | Location: Treatment Ponds - Borehole #1 | Date: 9/22/90

Project: Point Molate SI | Project No.: 044-0010 | Samplers: D.WEST / D.KERNS

Station Elevation: | Well Stick Up: N/A | Supervisor: D.WEST

Borehole ~~Casing~~ Diameter: 7 7/8" | Borehole Well Depth: 20' (Measured) 28' Drilled (~~Reported~~) | Water Level (From ~~TOC~~ Grd.): 5.9

Gallons Water/Ft.: | Casing Volume: | Screened Interval:

Immiscible Phases Present: Oily Sheen | Type: | Thickness: | Measured with: Interface Probe

PID Readings (Background): | TOC:

FIELD CHEMISTRY CALIBRATION

Date/Time: 9/22/90 1230 | Conductivity: Standard 10,000 umhos/cm at 25°C | Reading 9,100 umhos/cm at ~~24.8~~ 25.6°C DW

pH: pH 4.00 = 4.02 at 25 °C | pH 7.00 = 6.93 at 25 °C | pH 10.00 = at °C | Slope 97.2

DO: D.O. Meter: mg/l at °C | PID: Calibration Gas ppm | Span | Reading

Time	Pumping Rate gpm	D.O. mg/l	pH	Temp. °C	E.C. umhos/cm at °C	Cum. Vol. of H_2O Removed gallons	Casing Vols.	PID Reading Loc.	Value	Comments
1240	N/A	N/A	6.61	25C	4800 @25	1/2				dk. gray - silty, oily sheen
1248	N/A	N/A	6.57	23.2	3550 @23.2	20				as above
1258	N/A	N/A	6.79	20.7	4380 @22.8	40				dk. gray, silty w/oily sheen
1300	Begin Sampling.									

Condition of ~~Well~~ Borehole - open and non caving; sloughed in ~8 ft. since drilling on 9/21/90

Remarks: Bailed water had oily immiscible clods floating on surface.

FIELD EQUIPMENT

pH meter: ORION SA 250 | Serial No.: 3155

E.C. meter: YSI Model 33 | Serial No.: 90A011922

Pump: N/A | Serial No.:

Bailer: Timpco Stainless Steel | Size: 3 1/2" x 2' Stainless

Water Level Meter: N/A | Serial No.:

D.O. Meter: N/A | Serial No.:

Filter Apparatus: Geotech Peristaltic Pump | Filters: 0.45μ disposable

Temperature Measure: pH & conductivity meters

Interface Probe: Oil Recovery Systems | Serial No.: 06240

PID: N/A | Serial No.:

SAMPLING DESCRIPTION:

Fractions: 2x40 ml VOAs | 1x1L PEST/PCB
2x40 ml BTEX | 1x500ml Flouride
1x1L TPH | 1x250 ml T. Metals
2x1L BNA | 1x250 ml Diss. Metals

No. of Bottles: 10

Sample Depth: ~8 ft. below grd.

Field Notebook No.:

Sample Method: Bailer

Discharge H_2O Containerized: ___ Yes ☒ No

prc GROUND WATER SAMPLING DATA SHEET

Page 1 of 1

Well Number: PRC #1 (B123-2) Location: Due West of Building 123 by Admin. Bldg. Date: 10/3/90

Project: Point Molate SI Project No.: 044-0010 IRS1FW Samplers: D. West

Station Elevation: Well Stick Up: 0.96 ft. Supervisor: D. West

Casing Diameter: 4" PVC (20 slot) Well Depth: 30.52 Measured ✓ Reported ___ Water Level (From TOC): 21.36 (ORS), 21.34 (Solinst)

Gallons Water/Ft.: 0.653 Casing Volume: 6 gallons x 3 = 18 gal. Screened Interval:

Immiscible Phases Present: No Type: — Thickness: — Measured with: ORS Interface Probe

PID Readings (Background): 0.5 ppm TOC: 5 ppm upon opening cap / then background

FIELD CHEMISTRY CALIBRATION

Date/Time: 10/3/90 1515 Conductivity: Standard 9985 umhos/cm at 25°C Reading 10,000 umhos/cm at 27.2°C

pH: pH 4.00 = ___ at ___ °C pH 7.00 = 6.98 at 26.6 °C pH 10.00 = 10.0 at 26.4 °C Slope 98.9

DO: D.O. Meter: ___ mg/l at ___ °C PID: Calibration Gas Isobutylene ppm 100 Span 5.0 Reading 38 ppm

Time	Pumping Rate gpm	D.O. mg/l	pH	Temp. °C	E.C. umhos/cm at °C	Cum. Vol. of H_2O Removed gallons	Casing Vols.	PID Reading Loc.	Value	Comments
1650	—	—	5.95	23.5	386 @ 23.5	1	—	TOC	Bckgd	Sl. cloudy w/ yellow brown silt.
1700	—	—	6.16	20.7	375 @ 20.7	6	1	TOC	Bckgd	as above
1708	—	—	6.23	20.9	350 @ 20.9	12	2	TOC	Bckgd	as above - more silt.
1758	—	—	6.42	20.3	345 @ 20.3	18	3	TOC	Bckgd	very silty
50	Minutes to	allow	recharge - dewatered			again	at	18 gallons.		
1720	Sampling	time	- all fractions collected							
				BTEX & VOA collected		from	1st	bailer using		
				controlled		flow	bottom	discharge.		

Condition of Well: Intact, newly installed

Remarks: 75 gallons bailed during development (9/25/90) pH = 6.79 cond = 360 @ 20.0°C
Well dewatered after ~10 gallons, very slow recharge; 1714 - allow recharge to obtain 18 gallons.

FIELD EQUIPMENT

pH meter: ORION SA 250 Serial No.: 3155

E.C. meter: YSI Model 32 Serial No.: 90A011922

Pump: N/A Serial No.:

Bailer: Timco Stainless/Norton Teflon Size: 3½" x 2' / 1¾" x 3'

Water Level Meter: Solinst Serial No.:

D.O. Meter: N/A Serial No.:

Filter Apparatus: Peristaltic Pump Filters: 0.45μ disposable

Temperature Measure: ORION/YSI

Interface Probe: ORS Serial No.:

PID: HNu Model HN101 11.7 eV Serial No.: A70169

SAMPLING DESCRIPTION:

Fractions: VOA 2x40 ml BNA 1x1L
BTEX 2x40 ml PESTICIDES 1x1L
TPH 1x1L Flouride 1x500 ml
Dissolved + Total Metals 1x250 ml each

No. of Bottles: 10

Sample Depth: 30 ft.

Field Notebook No.:

Sample Method: Purge well w/ stainless bailer 3½" x 2'
Sample well w/ 2" x 3' teflon bailer

Discharge H_2O Containerized: ✓ Yes ___ No

prc GROUND WATER SAMPLING DATA SHEET

Page 1 of 1

Well Number: PRC #2 TP-4 GW
Location: W. of treatment ponds along RR tracks
Date: 10/4/90
Project: Point Mokule SI
Project No.: 044-0010 IRS1 FW
Samplers: D. WEST
Station Elevation: ~15 ft
Well Stick Up: 0.0 at ground level
Supervisor: D. WEST
Casing Diameter: 4"
Well Depth: 19.08 Measured ✓ Reported ___
Water Level (From TOC): 12.82 (ORS) 12.81 (Solinst)
Gallons Water/Ft.: 0.653
Casing Volume: 4 gallons
Screened Interval: 8.62 – 18.87 ft (B.G.)
Immiscible Phases Present: Yes
Type: Oil
Thickness: 0.005
Measured with: ORS Interface Probe
PID Readings (Background): 0.4 ppm
TOC: 2.0 ppm

FIELD CHEMISTRY CALIBRATION

Date/Time: 10/4/90 0950
Conductivity: Standard 9985 umhos/cm at 25°C Reading 9850 umhos/cm at 24.8 °C
pH: pH 4.00 = ___ at ___ °C
pH 7.00 = ~~7.00~~ 6.97 at ~~25~~ 24.7 °C
pH 10.00 = ~~10.15~~ 10.10 at 24.5 °C
Slope 103.7
DO: D.O. Meter: ___ mg/l at ___ °C
PID: Calibration Gas Isobutylene ppm 100 Span 5.0 Reading 50 ppm

Time	Pumping Rate gpm	D.O. mg/l	pH	Temp. °C	E.C. umhos/cm at °C	Cum. Vol. of H_2O Removed gallons	Casing Vols.	PID Reading Loc.	Value	Comments
1037	—	—	6.68	22.6	1210 @ 21.9°C	1	—	TOC	2-3	blobs of brown oil
1044	—	—	6.69	22.4	1140 @ 22.2	5	1+	TOC	4-5	blobs of brown oil & gray brown silty water
1049	—	—	6.63	22.1	1080 @ 22.0	10	2+	TOC	2-3	as above
1059	—	—	6.58	22.3	1070 @ 22.0	20	5	TOC	2-3	as above
1149	—	—	6.56	21.7	1030 @ 21.9	30	7.5	TOC	1-2	as above
1215	—	—	6.60	21.5	1030 @ 21.8	40	10	TOC	1-2	as above
1244	—	—	6.66	21.5	1030 @ 21.9	50	12.5	TOC	1-2	blobs of brown oil, fewer than initially; water is gray w/ gray & black silt/
1330	Sampling time on labels,									very very fine sand (formati
designated as TP-4 GW(1B), triplicate volumes collected										
for MS/MSD analysis on each fraction; also collect										
another complete duplicate set designated as PRC #2 10/4/90 1415.										

Condition of Well: Intact flush mount, recently installed w/ concrete christy box.

Remarks: DTP = 12.815 DTW = 12.82 (about high tide); well recharges w/o dewatering. Salinity = 0.5%, Salinity of bay water = 28.5%; cond. of bay water = 4000 µmho/cm. DTW measured at 12.63 following sampling 1600

FIELD EQUIPMENT

pH meter: Orion SA 250 Serial No. 3155
E.C. meter: YSI Model 33 Serial No. 90A011922
Pump: N/A Serial No. ___
Bailer: 3½" x 2' Stainless/1¾" x 3' Teflon Size ___
Water Level Meter: Solinst Serial No. ___
D.O. Meter: N/A Serial No. ___
Filter Apparatus: Geotech Filters: 0.45 µ disposable.
Temperature Measure: Orions / YSI
Interface Probe: Oil Recovery Systems Serial No. 1068013
PID: HNu Model HNU-101 Serial No. A70169

SAMPLING DESCRIPTION:

Fractions	No. of Bottles	Bottles
BTEX 2x40 ml + MS/MSD	→	6
VOA 2x40 ml + MS/MSD	→	6
TPH 1x1L + MS/MSD	→	3
BNA 1x1L + MS/MSD	→	3
PEST/PCBs 1x1L + MS/MSD	→	3
Diss. Metals 1x250 ml + MS/MSD	→	3
Total Metals 1x250 ml + MS/MSD	→	3
Flouride 1x500 ml + MS/MSD	→	3
		30

Sample Depth: 13 feet
Field Notebook No. ___
Sample Method: Discharge from bailer – controlled flow bottom discharge for VOAs, BTEX
Discharge H_2O Containerized ✓ Yes ___ No

prc GROUND WATER SAMPLING DATA SHEET

Page 1 of 1

Well Number: PRC#3 (TP-5) Location: Treatment Ponds Area - near Bldg. 125 Date: 10/4/90

Project: Point Mohate SI Project No.: 044-0010 IRS1 RP Samplers: D. WEST

Station Elevation: — Well Stick Up: -0.78' Supervisor: D. WEST

Casing Diameter: 4" PVC (10 slot) Well Depth: 22.29 Measured ✓ Reported ___ Water Level (From TOC): 13.70 (ORS) 13.65 (Solinst)

Gallons Water/Ft.: 0.653 Casing Volume: 5.6 x 3 = 16.8 Screened Interval: 12.5 - 23.06

Immiscible Phases Present: No Type: — Thickness: — Measured with: ORS Interface probe.

PID Readings (Background): 0.6 ppm TOC: 4-5 ppm

FIELD CHEMISTRY CALIBRATION

Date/Time: 10/4/90 Conductivity: Standard 9,985 umhos/cm at 25°C Reading ___ umhos/cm at ___ °C

pH: pH 4.00 = ___ at ___ °C pH 7.00 = 7.00 at 24.9 °C pH 10.00 = 9.97 at 24.7 °C Slope 105.2

DO: D.O. Meter: ___ mg/l at ___ °C PID: Calibration Gas Isobutylene ppm 100 Span 5.0 Reading 50

	Time	Pumping Rate gpm	D.O. mg/l	pH	Temp. °C	E.C. umhos/cm at °C	Cum. Vol. of H_2O Removed gallons	Casing Vols.	PID Reading Loc.	Value	Comments
Sal = 0.75%	1832	—	—	6.35	21.0	1600 @ 20.9	2	—	TOC	1-2	Slightly cloudy - oily sheen but
Sal = 1%	1840	—	—	6.46	20.4	1750 @ 20.8	6	1	TOC	4-5	cloudy, gray brown silt, blobs of oil.
Sal = 0.8%	1848	—	—	6.47	20.6	1480 @ 20.7	12	2	TOC	3-4	cloudy, gray brown silt, oilsheen
Sal = 0.6%	1855	—	—	6.47	20.6	1380 @ 20.7	18	3	TOC	3-4	as above
Sal = 0.6%	1903	—	—	6.45	20.4	1320 @ 20.7	24	4	TOC	3-4	as above
0.7%	1908	—	—	6.51	20.4	1440 @ 20.7	30	5	TOC	2-3	as above
	1930	Sampled and designated as TP-5 GW (14) 1930									
		Duplicate of VOA & BTEX & TPH (non-acidified) designated as									
		PRC#3 (~~2000~~ 1945); duplicate metals also collected.									

Condition of Well: Intact, newly installed flush mount; TOC is 0.75 ft below ground surface (asphalt)

Remarks: Sampled during low tide - very low.
DTW = 13.78 just prior to sampling. Bottle lot # on VOA/BTEX = 1117101A (E55)

FIELD EQUIPMENT

pH meter: Orion SA 250 Serial No.: 3155

E.C. meter: YSI Model 33 Serial No.: 90A011922

Pump: N/A Serial No.: ___

Bailer: 3½" x 2' Stainless / 1¾" x 3' Teflon Size: ___

Water Level Meter: Solinst Serial No.: ___

D.O. Meter: N/A Serial No.: ___

Filter Apparatus: Geotech Filters: 0.45 µm disposable

Temperature Measure: Orion SA 250

Interface Probe: ORS Serial No.: 1068013

PID: HNu Model HW-101 Serial No.: A70169

SAMPLING DESCRIPTION:

Fractions: VOA 2x40 ml — 2
BNA 1x1L — 1
PEST/PCBs 1x1L — 1
~~Diss. Metals 1x250 ml~~ — 1
~~Total Metals 1x250 ml~~ — 1
BTEX 2x40 ml — 2
No. of Bottles: ~~TPH 1x1L~~ — 1
9 x 2 = 18 (Duplicate)

Sample Depth: 14 ft.

Field Notebook No.: ___

Sample Method: Discharge from bailer - controlled flow bottom discharge for VOA, BTEX.

Discharge H_2O Containerized: ✓ Yes ___ No

prc GROUND WATER SAMPLING DATA SHEET

Page 1 of 1

Well Number: ERM-West EW-2 | Location: Downgradient from disposal area - in ravine | Date: 10/5/90

Project: Point Molate SI | Project No.: 044-0010 IRS1 FW | Samplers: D. WEST

Station Elevation: | Well Stick Up: 2.38 ft. | Supervisor: D. WEST

Casing Diameter: 4" PVC | Well Depth: 14.5 Measured ✓ Reported | Water Level (From TOC): 9.09 (ORS) 9.08 (Solinst)

Gallons Water/Ft.: 0.653 | Casing Volume: 3.5 gallons | Screened Interval: ?

Immiscible Phases Present: No | Type: Oily sheen | Thickness: — | Measured with: ORS Interface Probe

PID Readings (Background): 1.0 | TOC: 5.0 ppm

FIELD CHEMISTRY CALIBRATION

Date/Time: 10/5/90 1745 | Conductivity: Standard 9,985 umhos/cm at 25°C | Reading 8,900 umhos/cm at 21.2 °C

pH: pH 4.00 = ____ at ____ °C | pH 7.00 = 7.03 at 24.7 °C | pH 10.00 = 10.00 at 23.8 °C | Slope 104.3

DO: D.O. Meter: ____ mg/l at ____ °C | PID: Calibration Gas Isobutylene ppm 100 | Span 5.0 | Reading 25 ppm

Time	Pumping Rate gpm	D.O. mg/l	pH	Temp. °C	E.C. umhos/cm at °C	Cum. Vol. of H_2O Removed gallons	Casing Vols.	PID Reading Loc.	PID Reading Value	Comments
1829	—	—	6.14	21.0	1000 @ 19.5	1	—	TOC	15	sl. cloudy, gray-brown silt.
1836	—	—	6.21	21.2	990 @ 19.8	10	~3	TOC	10	cloudy w/ gray-yellow brown silt oily sheen
1842	—	—	6.26	21.6	986 @ 19.8	20	~6	TOC	4	as above
1849	—	—	6.23	21.5	990 @ 20.0	30	~8.6	TOC	3-4	as above
1857	—	—	6.23	21.3	980 @ 20.0	40	~11.5	TOC	2-3	as above
1905	—	—	6.21	21.0	980 @ 19.4	50	~14.3	TOC	2-3	as above - hydrocarbon odors, slight sheen
1916	Sampling time			Samples designated as EW-2						
	Lot nos. for VOA's & BTEX : Eagle Picher B9104229 & B9109054									
		80 gallons previously developed from well - see below, however no ground water quality parameters were collected.								

TOS to ground = 2.8 ft. TOS to TOC$_{PVC}$ = 0.42

2.80 - .42 = 2.38

Condition of Well: Intact, 8" steel surface casing, partially degraded concrete seal

Remarks: Solid bottom on total depth measurement; well was redeveloped on Sat. 9/29/90, both swabbed & bailed; 55 gallon bailed.; well recharges very fast - could not dewater w/ 1-gallon bailer.

25 gallons also bailed on 9/27/90 - no readings taken

FIELD EQUIPMENT

pH meter: ORION SA 250 | Serial No. 3155

E.C. meter: YSI Model 33 | Serial No. 90A011922

Pump: N/A | Serial No.

Bailer: TIMCO Stainless steel, NORTON Teflon | Size 3½" x 2', 1 3/4" x 3' | Serial No. 00223

Water Level Meter: Solinst

D.O. Meter: N/A | Serial No. N/A

Filter Apparatus: Geotech | Filters 0.45 µm disposable

Temperature Measure: Orion pH meter

Interface Probe: ORS | Serial No. 10608073

PID: HNu Model HW-101 | Serial No. A70169

SAMPLING DESCRIPTION:

Fractions: VOA, BTEX, BNA, PEST/PCBs, TPH, Fluoride, Dissolved Metals, Total Metals

No. of Bottles: 10

Sample Depth: ~6 ft below ground

Field Notebook No.

Sample Method: discharge from bailer, controlled flow bottom discharge.

Discharge H_2O Containerized: ✓ Yes ___ No

APPENDIX G

EUREKA LABORATORIES MONTHLY REPORTS

EUREKA LABORATORIES, INC.

Corporate Office:
6790 FLORIN PERKINS ROAD
SACRAMENTO, CA 95828
TEL: (916) 381-7953
FAX: (916) 381-4013

Branch Office:
12121 NORTHUP WAY, SUITE 212
BELLEVUE, WA 98005
TEL: (206) 885-0284
FAX: (206) 885-6162

Air Pollution
Chemical Analysis,
Research & Testing
Environmental Studies
Robotics
Toxicology

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JAN 30 1991

PRC ENVIRONMENTAL
MANAGEMENT, INC.

January 29, 1991

Mr. Nile A. Luedtke:
MARTIN MARIETTA ENERGY SYSTEM, INC.
Post Office Box 2003
Oak Ridge, TN 37831-7440

RE: CLEAN Project No.: N62474-88-D-5086

Dear Mr. Luedtke:

Enclosed is the monthly progress report (MPR) for October. This MPR consists of a two page MPR summary and analytical reports completed in October. The analytical reports present sample and QA/QC data which include % spike recovery, % RPD, % surrogate recovery method, blanks, detection limits as well as the chain of custody information.

We regret that this MPR is late because of a misunderstanding of whom should write this report. The November and December MPRs will be completed in about one week. Future MPRs will be submitted on or before the 15th of each month starting February 1991.

Sincerely,
EUREKA LABORATORIES, INC.

By:_____
Felix Yeung
QA/QC Program Director

FY/jn
Attachments:

Appendix A and Analytical Reports

CC: Santiago Lee, PRC
(Cover letter and MPR summary)

C:MMES.6

MONTHLY PROGRESS REPORT FOR OCTOBER

1. Site Name: Point Molate SI
   Contract Number: DE-AC05-840R21400
   Project Number: 044-0010

2. Numbers, types of samples: The number of samples, their types and locations are identified in the individual analytical reports. Below is a summary:

	Date of Report	ELI Number	# of Soil Samples	# of Water Samples
1.	10/15/90	90-09-221	20	1
2.	10/17/90	90-10-013	13	3
3.	10/24/90	90-10-099	0	5
4.	10/24/90	90-10-100	0	2
5.	10/25/90	90-10-098	0	4
6.	10/29/90	90-10-138	8	3

3. The data for blanks, spikes, duplicates or spiked duplicates, surrogates recovery percentage and other QA/QC data are presented in the individual reports. Control charts of the percentage spike recovery are presented in Appendix A.

4. Methods used: All the methods used are listed in each analytical report. There is no unusual problems encountered in any of the analyses.

5. Control Charts: Copies of spiked recovery control charts are presented in Appendix A.

6. Summary of out-of-control incidents and corrective actions.

The % spike recovery of silver using EPA Method 6010 is slightly outside the CLP control limits criteria. For EPA methods 624, 625, 8240, 8270, and metals, the EPA CLP control limits for percent spiked recovery are used as guidelines are shown in each chart. For EPA Methods 602, 8020 and total petroleum hydrocarbons analysis (Modified Method 8015), the control limits are based on limits achievable in our laboratory. These limits are frequently updated. The control limits of fluoride are set at 75 and 125 and will be updated when more data is available.

There is no special trends indicating the reasons for the data to be out of control. For some analytes, such as silver and arsenic, matrix interferences may be the cause for out-of-control. For these samples with matrix interferences, either post digestion spike with or without dilution, or using alternative methods (GFAA for silver or hydride for arsenic) may be necessary.

7. Significant changes in the QA: None

8. Changes in personnel: The Manager of the Sample/Data Management Branch group, Thelma Wu has resigned. Ms. Sandia Kao is currently acting Manager for this group. Ms. Kao's resume has been submitted before.

9. Completed sample data: All the data completed and reported in October is enclosed.

C:October.rpt

EUREKA LABORATORIES, INC.

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6790 FLORIN PERKINS ROAD
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Air Pollution
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PRC ENVIRONMENTAL
MANAGEMENT, INC.

February 1, 1991

Mr. Nile A. Luedtke:
MARTIN MARIETTA ENERGY SYSTEM, INC.
Post Office Box 2003
Oak Ridge, TN 37831-7440

RE: November Monthly Progress Reports (MPR),
CLEAN Project No.: N62474-88-D-5086

Dear Mr. Luedtke:

Enclosed is the monthly progress report (MPR) for November. This MPR consists of a one page MPR summary, control charts (Appendix A) and analytical reports completed in November. The analytical reports present sample and QA/QC data which include % spike recovery, % RPD, % surrogate recovery method, blanks, detection limits as well as the chain of custody information.

Sincerely,
EUREKA LABORATORIES, INC.

By: Felix Yeung
Felix Yeung
QA/QC Program Director

FY/jn
Attachments:

Appendix A and Analytical Reports

CC: Santiago Lee, PRC
(Cover letter and MPR summary)

C:MMES.7

MONTHLY PROGRESS REPORT FOR NOVEMBER, 1990

1. Site Name: Point Molate SI
   Contract Number: DE-AC05-84OR21400
   Project Number: 044-0010

   Site Name: Aiea Laundry
   Project Number: 044-0035

2. Numbers, types of samples: The number of samples, their types and locations are identified in the individual analytical reports. Below is a summary:

	Date of Report	ELI Number	# of Soil Samples	# of Water Samples
1.	11/13/90	90-10-210	7	6
2.	11/13/90	90-10-232	21	3
3.	11/13/90	90-10-258	12	4
4.	11/13/90	90-10-308	7	3
5.	11/13/90	90-10-243	9	3
6.	11/13/90	90-10-279	9	3
7.	11/13/90	90-10-298	7	3
8.	11/13/90	90-10-326	12	3
9.	11/13/90	90-10-335	11	3
10.	11/13/90	90-11-065	0	2

3. The data for blanks, spikes, duplicates or spiked duplicates, surrogates recovery percentage and other QA/QC data are presented in the individual reports. Control charts of the percentage spike recovery are presented in Appendix A.

4. Methods used: All the methods used are listed in each analytical report. There is no unusual problems encountered in any of the analyses.

5. Control Charts: Copies of the spiked recovery control charts are presented in Appendix A. Please note that the spiked compound 1.1-Dichloroethene in EPA Method 624/8240 was erroneously listed as 1.1-Dichloroethane in some of the control charts and reports in the October MPR. The error was in the listing of the compound name and not in the analytical results.

6. All data is within the control limits. The percent spiked recovery of some analytes is better than the CLP control limits.

7. Significant changes in the QA: None

8. Changes in personnel: None

9. Completed Sample Data: All Data completed.

C:November.rpt

EUREKA LABORATORIES, INC.

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Air Pollution
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Environmental Studies
Robotics
Toxicology

February 8, 1991

Mr. Nile A. Luedtke:
MARTIN MARIETTA ENERGY SYSTEM, INC.
Post Office Box 2003
Oak Ridge, TN 37831-7440

RE: December Monthly Progress Reports (MPR),
CLEAN Project No.: N62474-88-D-5086

Dear Mr. Luedtke:

Enclosed is the monthly progress report (MPR) for December. This MPR consists of a one page MPR summary, control charts (Appendix A) and analytical reports completed in December. The analytical reports present sample and QA/QC data which include % spike recovery, % RPD, % surrogate recovery method, blanks, detection limits as well as the chain of custody information.

Sincerely,
EUREKA LABORATORIES, INC.

By: Felix Yeung
Felix Yeung
QA/QC Program Director

FY/jn
Attachments:

Appendix A and Analytical Reports

CC: Santiago Lee, PRC
(Cover letter and MPR summary)

C:MMES.8

MONTHLY PROGRESS REPORT FOR DECEMBER, 1990

1. Site Name: Point Molate SI
   Contract Number: N62474-88-D-5086
   Project Number: 044-0010

   Site Name: Navcams East Pac Wahiawa Hawaii
   Project Number: 044-0035
   Contact Number: N62474-88-D-5086

   Site Name: Mare Island NST Digested Tanks
   Project Name: 044-099-IRRATC
   Contract Number: N62474-88-D-5086

2. Numbers, types of samples: The number of samples, their types and locations are identified in the individual analytical reports. Below is a summary:

	Date of Report	ELI Number	# of Soil Samples	# of Water Samples
1.	12/06/90	90-11-065	0	2
2.	12/11/90	90-12-026	11	1
3.	12/11/90	90-12-057	8	0
4.	12/13/90	90-12-072	20	1
5.	12/18/90	90-12-106	27	0
6.	12/19/90	90-12-134	27	0
7.	12/19/90	90-12-195	41	0
8.	12/20/90	90-12-152	11	0
9.	12/27/90	90-12-209	35	0
10.	12/28/90	90-12-070	18	0
11.	12/28/90	90-12-058	36	1
12.	12/28/90	90-12-194	0	16
13.	12/31/90	90-12-228	0	16

3. The data for blanks, spikes, duplicates or spiked duplicates, surrogates recovery percentage and other QA/QC data are presented in the individual reports. Control charts of the percentage spike recovery are presented in Appendix A.

4. Methods used: All the methods used are listed in each analytical report. There is no unusual problems encountered in any of the analyses.

5. Control Charts: Copies of the spiked recovery control charts are presented in Appendix A.

6. All data is within the control limits. The percent spiked recovery of some analytes is better than the CLP control limits.

7. Significant changes in the QA: None

8. Changes in personnel: Jim Mentessi has joined Eureka Laboratories, Inc. as the Manager of the Inorganic Branch. (His resume is attached)

9. Completed Sample Data: All Data completed.

C:December.Rpt

PLATES

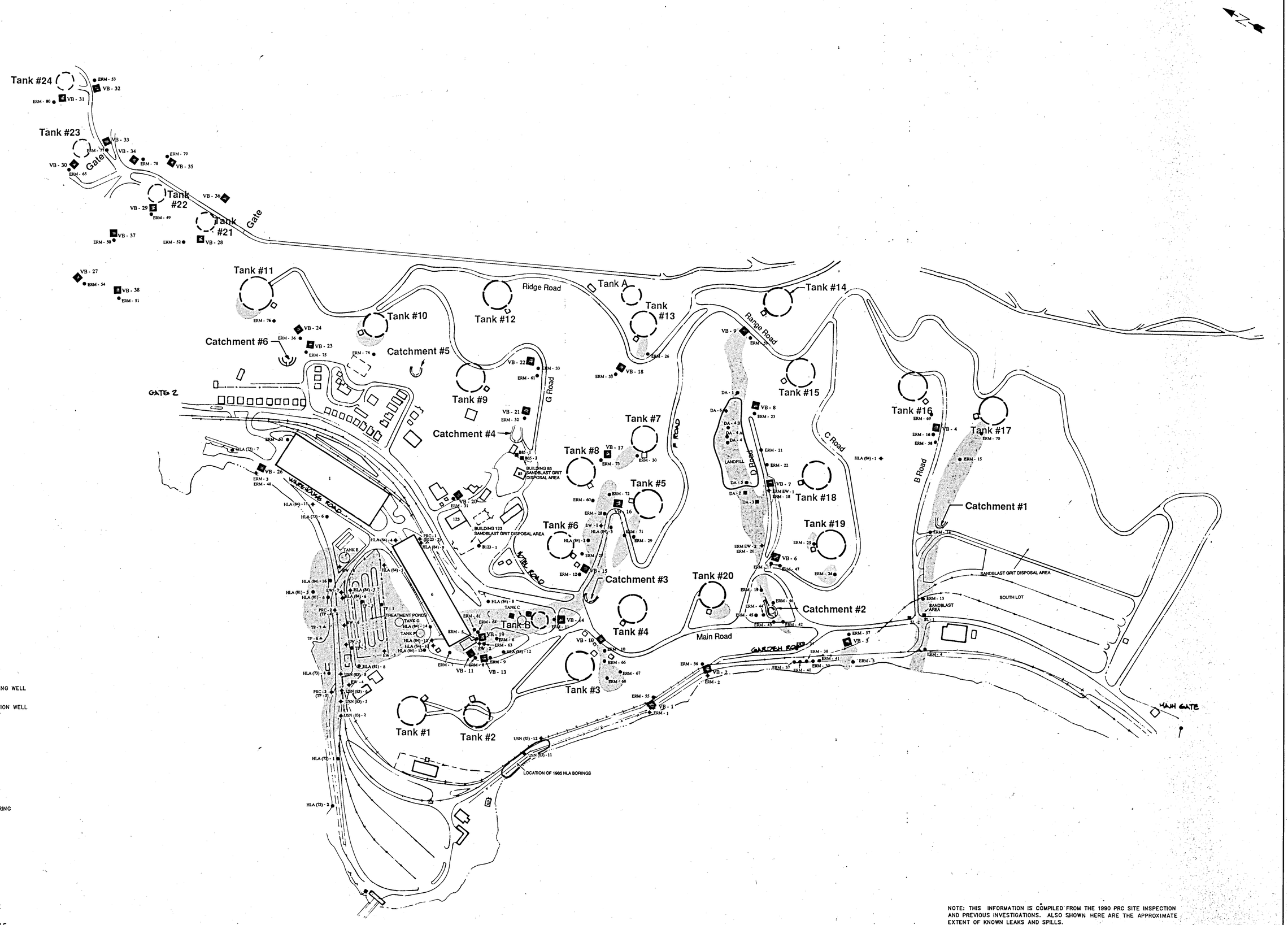

PLATE 1
POINT MOLATE FUEL DEPOT SITE INSPECTION
SOIL BORING, MONITORING WELL, AND SAMPLE LOCATIONS