Ro 2606

Rolls-Royce

Rolls-Royce Engine Services-Oakland Inc.
7200 Earhart Road
Oakland, California 94621-4504

Tel: (510) 613-1000

SL

NOVEMBER 20, 2006

ALAMEDA COUNTY HEALTH AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH
ATTN: BARNEY CHAN
1131 HARBOR BAY PARKWAY, 2ND FLOOR
ALAMEDA, CALIFORNIA 94502

REF: ROLLS-ROYCE ENGINE SERVICES-OAKLAND INC., TEST CELL FACILITY, 6701 OLD EARHART ROAD, OAKLAND, CALIFORNIA, 94621.

SUBJECT: WORK PLAN FOR SOIL REMEDIATION AND INSTALLATION OF ADDITIONAL GROUNDWATER MONITORING WELLS.

Dear Mr. Chan,

Enclosed is a copy of a Work Plan for Soil Remediation and Installation of Additional Groundwater Monitoring Wells, that describes all the activities that will be performed by our contractor on our behalf at the above referenced site.

This Work Plan also describes all the tasks that when completed, will help us be in control of the environmental concerns at the referenced site.

If you have any questions or comments regarding the contents of this Work Plan, please don't hesitate to give me a call at (510)-615-5095.

Sincerely,
Rolls-Royce Engine Services-Oakland, Inc.

Dave Goldberg
Environmental Manager

Rolls-Royce

Dave Golberg
Environmental Manager

Rolls-Royce Engine Services-Oakland Inc.
7200 Earhart Road
Oakland, CA 94621-4504
Tel: (510) 615-5095 Fax: (510) 635-2209
E-mail: dgoldberg@rolls-royceeso.com

Cc: Mr. David Elias, CEG
California Regional Water Quality Control Board

R02606

Applied Remediation Company, Inc.

Environmental Services and Engineering
CA Lic. #695939

Telephone: (408) 453-0188
Fax: (408) 453-0757
E-mail: appliedrco@aol.com

WORK PLAN

FOR

SOIL REMEDIATION AND INSTALLATION OF ADDITIONAL GROUNDWATER MONITORING WELLS

AT

ROLLS-ROYCE ENGINE SERVICES TEST FACILITY
6701 OLD EARHART ROAD
OAKLAND, CALIFORNIA, 94621

OCTOBER 17, 2006

PREPARED FOR:

ALAMEDA COUNTY HEALTH AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH
ATTN: BARNEY CHAN, HAZARDOUS MATERIALS SPECIALIST
1131 HARBOR BAY PARKWAY, 2ND FLOOR
ALAMEDA, CALIFORNIA 94502

BY

APPLIED REMEDIATION COMPANY, INC.
1376 NORTH FOURTH STREET, SUITE 203
P.O. BOX 612421
SAN JOSE, CA 95161-2421

Applied Remediation Company, Inc.

Environmental Services and Engineering
CA Lic. #695939

Telephone: (408) 453-0188
Fax: (408) 453-0757
E-mail: appliedrco@aol.com

WORK PLAN

FOR

SOIL REMEDIATION AND INSTALLATION OF ADDITIONAL GROUNDWATER MONITORING WELLS

OCTOBER 17, 2006

Alameda County
NOV 2 1 2006
Environmental Health

PREPARED FOR:
MR. BARNEY CHAN
ALAMEDA COUNTY HEALTH AGENCY
DEPARTMENT OF ENVIRONMENTAL HEALTH
1131 HARBOR BAY PARKWAY, 2ND FLOOR
ALAMEDA, CALIFORNIA 94502

PREPARED BY:
APPLIED REMEDIATION COMPANY
1376 NORTH FOURTH STREET, STE. 203
P.O. BOX 612421
SAN JOSE, CALIFORNIA, 95161-24214

REGISTERED PROFESSIONAL ENGINEER
BRIGGS O. OGAMBA
4114
EXP. 12/31/07
CHEMICAL
STATE OF CALIFORNIA

Mark A. Mestressat
Staff Geologist

Briggs O. Ogamba, P.E.
License No. CH 4114

George B. Matanga, Ph.D., P.E.
License No. C.48432

REGISTERED PROFESSIONAL ENGINEER
George Bwalya Matanga
No. C 48432
Exp. 6/30/2008
CIVIL
STATE OF CALIFORNIA

TABLE OF CONTENTS

TABLE OF CONTENTS (cont')

TABLE OF CONTENTS (cont')

TABLE OF CONTENTS (cont')

1.0 INTRODUCTION

This Work Plan prepared by Applied Remediation Company, Inc. (ARCI) describes all the major activities of soil remediation by excavation, installation of additional groundwater monitoring wells and design and installation of a drainage system activities that will be performed at Rolls-Royce Engine Services-Oakland, Inc. (RRESO) Test Cell Facility located at 6701 Old Earhart Road, Metropolitan Oakland International Airport (MOIA)-North Field, Oakland, California. Rolls-Royce leases the premises from the Port of Oakland pursuant to a Lease dated January 23, 1991 ("Lease"), and amended by First Supplemental Agreement dated June 19, 2001 ("First Supplemental Agreement").

The surface soil and groundwater within the vicinity of Test Cell # 2 and the unlined drainage ditch southwest of Test Cell # 2 will be remediated by excavation and limited dewatering respectively. A drainage system will be designed and installed southwest of Test Cell # 2 within the boundaries of the facility in order to prevent or minimize future runoff of petroleum hydrocarbons used with operation of Test Cell #s 1, 2, 3 and 4. Additional groundwater monitoring wells will be installed within the vicinity of the two underground storage tanks (USTs) within the boundaries of the facility in the northwest corner of the facility to monitor hydrocarbon stability due to the September 1992 accidental release of jet fuel.

Some of the groundwater monitoring wells will also be installed southwest of the facility and within the vicinities of Trenches 1 and 2 near the 10,000 gallon UST as well as within the vicinity of Trenches 3 and 4 to monitor petroleum hydrocarbons stability due to the 1994 discharge of gray water (water containing oil from Test Cell wash down operations) and the October 1998 petroleum hydrocarbons discovered during trenching operations for the 10,000-gallon UST jet fuel pipe upgrades respectively. The three existing on-site groundwater monitoring wells will be reactivated and all on-site monitoring wells monitored on quarterly basis or any monitoring frequency that will be acceptable to the Local Enforcement Agency (LEA), Alameda County Department of Environmental Health (ACDEH), until the site is appropriate for recommendation for site closure.

1.1 LOCATION OF SITE

The project site is the RRESO Test Cell Facility located at 6701 Old Earhart Road, Metropolitan Oakland International Airport (MOIA)-North Field, Oakland, California. In the past, a portion of the site and north end of the airport were used as a U.S. Naval Base for aircraft engine tests. The site had also been part of the former North Port of Oakland Refuse Disposal (NPORD) property and adjacent to City of Alameda Landfill. The tidal marsh east of the site is considered a protected wetland.

1.2 BACKGROUND INFORMATION

According to the August 23, 2002, Kleinfelder "Report of Supplemental Site Investigation", Rolls-Royce Engine Services Test Cell Facility, 6701 Old Earhart Road, Oakland, California, the Test Cell Facility is built on artificial fill material adjacent to tidal wetlands at the north end of Old Earhart Road on the MOIA property. It is surrounded by fencing and comprises an area of approximately 2.3 acres. The Test Cell Facility consists of six engine Test Cells with auxiliary structures (sheds, pump house, waste water sumps, oil/water separator, control buildings, gas conditioning facility, air receivers, cooling towers, and flare stack), one 30,000 gallons aboveground fuel tank for liquefied petroleum (LP) gas and three underground storage tanks (USTs) for jet-A-fuel (one 10,000 gallon and two paired 8,000 gallon tanks).

The groundwater level beneath the site is typically shallow and is encountered between approximately 3 to 5 feet below ground surface (bgs). According to ETIC Engineering "Third Quarter 2005 Monitoring Report", North Port of Oakland Refuse Disposal Site, December 30, 2005, page 5, previous site investigations and data collected adjacent to the site indicate that groundwater flows toward the east. The depth to water table at the nearby site varies seasonally and may be tidally influenced to a limited extent by the wetland east of the site. There are three existing shallow groundwater monitoring wells (MW-1, MW-2 and MW-3) at the site. Groundwater level is also influenced by irrigation to a soccer field operated by the City of Oakland located to the west of the Test Cell Facility.

An unlined ditch that borders the southwestern side of the site currently receives stormwater and runoff of products used in connection with the operation of Test Cell #s 1, 2, 3 and 4. The unlined ditch drains southward through an underground pipe to a channel on the Airport. Pumphouse # 2 lifts water from the channel across the Old Earhart Road levee to the tidal wetland east of the site where it flows to San Leandro Bay.

1.2.1 SITE HISTORY

The following site historical summary is taken from the reviewed site investigation reports on the Test Cell Facility obtained from Roll-Royce by ARCI. The Test Cell Facility is thought to have been built circa World War II by the U.S Navy to test repaired aircraft engines. A portion of the Test Cell Facility may have been built over the northeastern side of the former North Port of Oakland Refuse Disposal (NPORD) Site to the west. According to the cross-sections prepared by Golder Associates (1989), a portion of the site does not appear to be underlain by the building demolition debris (wood, concrete, brick, and steel) reportedly disposed of in the landfill until about 1960. However, Rolls-Royce has indicated that construction debris and other refuse were uncovered during the construction of test cells 5, 6 and 7 as well as replacement of an underground storage tank south of test cells 5, 6 and 7.

National Airmotive Corporation (NAC), under a lease from the Port, took over the Test Cell Facility as part of their aircraft engine maintenance operations at MOIA in the late 1960s and subsequently enlarged it. NAC's operations in Oakland including the Test Cell and the Maintenance Facility at 7200 Earhart Road (formerly Lockheed Street) were purchased by Rolls-Royce in 1999. According to the terms of the Lease, Rolls-Royce assumed the environmental responsibilities involving the former NAC operations and its facilities. Rolls-Royce continues to operate the Test Cell Facility under a lease from Port of Oakland.

1.2.2 DOCUMENTED RELEASES

According to Kleinfelder (Kleinfelder, August 23, 2002), General Counsel Associates, lawyers for NAC, (GCA, 1999b), there were three documented instances of chemical releases at the Test Cell Facility in the 1990s.

In September 1992, a release of 1,143 gallons of jet-A-fuel apparently occurred adjacent to the two USTs in the northwest corner of the facility. The released product was mostly contained but some were speculated to have entered the uncapped backfill near the two USTs (ACDEH, 1996 a).

In April or May of 1994, a discharge of "gray water", or water containing oil from Test Cell Engine wash down operations, occurred near the southwest corner of the facility. Prior to the 1960s and until 1978, gray water reportedly was discharged to an unlined ditch west of the facility. In 1978 as reported, NAC began treating the gray water using an oil/water separator prior to discharge. In 1992, NAC stopped discharging treated gray water from the site and had it transported off-site for disposal (EMCON, 1996). After the 1994 release, ACDEH conducted surface soil sampling west of the Test Cell Facility in and around the drainage channel in May 1994. In the ACDEH soil samples, elevated concentrations of lead and oil and grease were detected in the nine samples that were collected and analyzed.

Finally in October 1998, petroleum hydrocarbons identified as a mixture of "old motor oil, diesel, and/or kerosene" was discovered during trenching operations for upgrades to the 10,000-gallon jet-A-fuel underground storage tank and associated product lines. The source of the hydrocarbons was suspected to be from "unidentified leak (s) in the 10,000-gallon jet-A-fuel UST and its associated product pipes, or from one or more historical surface spills in and around the storage tank (GCA, 1998). Since 1998, no further release incidents have been reported, although incidents of stormwater and runoffs from the site to the west apparently continue.

1.2.3 CONSENT JUDGMENT

As a result of the first two above incidents, a Complaint of Civil Penalties and Injunctive Relief was filed against NAC on October 17, 1994, accompanied by a concurrent stipulation for consent judgment reflecting settlement terms between Alameda County and NAC. It was stipulated that NAC pay costs and penalties of $200,000 for a period of one year to "investigate, monitor, and/or remediate the effects of the discharges of jet-A-fuel and the "gray water" oil-containing water at or near the Test Cell Facility". However, NAC could receive credit for the latter amount against costs incurred with complying with the terms of the Consent Judgment.

1.2.4 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Approximately six major known investigations have been conducted at the site. The "initial investigation (Jet-A-Fuel Release Investigation)" was conducted to assess environmental impact of the 1992 jet-A-fuel release. EMCON conducted the subsurface investigation within the vicinity of the two USTs in the northwest corner of the Test Cell Facility for NAC in April and November of 1995. Petroleum hydrocarbons in excess of 1,000 mg/Kg were detected in the soil samples collected and analyzed from the immediate vicinity of the two USTs. Groundwater next to the two USTs and to the west was locally impacted by petroleum hydrocarbons and aromatic hydrocarbon compounds (except benzene). Soil and groundwater in other directions away from the two USTs did not appear to be impacted by the release of the jet-A-fuel. No soil or groundwater remediation was undertaken by NAC in the vicinity of the two 8,000 gallon USTs as a result of that subsurface investigation.

In the second investigation pertaining to the 1994 gray water release, (Gray Water Release Investigation), EMCON was retained by NAC to perform a subsurface investigation by advancing five soil borings in the unlined drainage ditch area immediately west of the Test Cell Facility boundary in November 1995. The results of two soil samples collected in two of the boreholes indicated elevated levels of petroleum hydrocarbons greater than 1,000 mg/Kg. Cadmium, chromium, copper, lead, and mercury were detected in the surface soil samples at concentrations exceeding hazardous waste disposal limits. However, the investigated area was adjacent to NPORD, and EMCON in its report suggested that the metals detected could have been associated with disposal activities at the adjacent landfill (EMCON, 1996). A November 3, 1995 ACDEH memorandum on file, noted that there are two monitoring wells (MW-3 and MW-4) associated with the NPORD, and in a meeting held that day, ACDEH recommended that NAC gain access to these two monitoring wells for sampling on the western side of the Test Cell. No further investigation or remediation of elevated petroleum hydrocarbons and metals concentrations west of the Test Cell Facility was performed by NAC.

On February 20, 1996, ACDEH notified the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB), that results of sampling groundwater monitoring wells at NPORD site indicated that "the presence of organic compounds (jet fuel constituents) in sampled groundwater monitoring wells from the southeast portion of the (landfill) site (that portion adjoining the NAC Test Site) is from a source not associated with the landfill". In ACDEH's opinion, metals identified in the soil samples collected in the drainage ditch area "appear (s) to be from soil materials incorporated into the fill overlying the landfill site and not from the known releases occurring at the NAC Facility". Further, ACDEH noted that "surface water collects at a Pumphouse # 2 located a short distance southeast of both the subject landfill and the NAC Test Site. Collected water is subsequently pumped into a tidal marsh located immediately east of Old Earhart Road". Water from the unlined surface ditch west of the Test Site flows to the pond via a pipe through a levee. ACDEH suggested that "discharges to the tidal marsh would be subject to a National Pollutant Discharge Elimination System (NPDES) permit evaluation and subsequent testing prior to discharge".

On February 21, 1996, ACDEH requested that NAC install three groundwater monitoring wells along the eastern side of the Test Cell Facility to "ensure that the jet fuel plume is stable and not migrating towards the tidal marsh" to the east. NAC retained EMC to install the three monitoring wells (two along Old Earhart Road and one in the southwest corner of the facility) in March 1996 (EMC, 1996a and b). The wells were sampled annually in 1996 through 1998. Initial concentrations of jet-A- fuel and/or diesel fuel detected in 1996 diminished and were not detected by 1998. No aromatic or semi-volatile organic compounds were detected in the groundwater samples. EMC indicated that the groundwater flow direction over the three monitored years was consistently westward away from the tidal marsh. The final groundwater monitoring report provided by NAC in mid 1998 indicated no detectable spread of jet-A-fuel from the 1992 release and a case closure was requested (EMC, 1998).

After the 1998 petroleum product release in a pipeline trench, Foss Environmental Services, Inc (FES) in the Pipeline Release Response, contained the product, disposed of excavated impacted soil, and installed a passive product recovery device in a sump constructed in the trench backfill (FES, 1998). The amount of free product recovered diminished rapidly from the initial amounts, and according to NAC records, a total of approximately 3.6 gallons of products were recovered between October 1998 and May 2000 (NAC, 2000 a). Soil samples obtained from stained areas remaining in the trenches after excavation was completed contained between 230 and 18,000 mg/Kg levels of jet-A-fuel (FES, 1998). The single-wall fuel lines were reportedly removed from the trenches prior to backfilling; Trenches 1 and 3 now contain double-wall fuel lines. Trench 2 no longer contains a fuel line.

In July 2002, Kleinfelder conducted a Supplemental Site Investigation at the Test Cell Facility. This Baseline Study involved the advancing of 26 supplemental soil borings to further evaluate the on-site areas of environmental concerns (the three jet-A- fuel USTs, the vicinity of the 1998 fuel release into pipeline trenches, the off-site storm water drainage ditch system, the oily discharge from the gas compressors and the existing groundwater monitoring wells). As a result of this Baseline Study, Kleinfelder recommended that the subsurface soil and groundwater in the vicinity of the former fuel pipeline trenches and the unlined drainage ditch be remediated to remove the continuing source of hydrocarbons and prevent future impacts to soil, groundwater, and potentially surface water. Kleinfelder further recommended that the soil within the unlined ditch west of the facility be excavated to remove impacted soil and groundwater, and that the stormwater runoff system at the Test Cell Facility be reviewed and upgraded to improve its function and prevent off-site discharge during storm events.

1.2.5 CURRENT OWNER/TYPE OF BUSINESS

Rolls-Royce Engine Service-Oakland Inc. is leasing the property (Test Cell Facility) at 6701 Old Earhart Road from Port of Oakland for aircraft engine testing. The Rolls-

Royce Oakland facility provides overhaul and maintenance services for several variants of the T56 engine for military transport and reconnaissance aircraft. It also reworks Model 250 turboshaft engines for a broad range of helicopters and its turboprop variant for a variety of small fixed-wing aircraft. The main contact person for the Test Cell Facility environmental issues is Mr. David Goldberg. Mr. Goldberg can be reached at (510) 615-5095.

1.3 PROJECT OBJECTIVES

The overall project objective is to remediate the contaminated surface soil and groundwater in the vicinity of the former fuel pipeline trenches located adjacent to Test Cell # 2 and the unlined drainage ditch in order to remove the continuing source of hydrocarbons and prevent future impacts to the soil and groundwater. The major objectives of this project are to:

- Prevent or minimize the future runoff of products used in connection with the operations of Test Cell #s 1, 2, 3 and 4.

- Perform quarterly (or on any frequency acceptable to Alameda County Department of Health (ACDEH)) groundwater monitoring on all newly installed and existing on-site monitoring wells including off-site surface water sampling location SW-3 and NPORD monitoring well MW-4 on the southwestern border of Test Cell Facility for a period of five years or until the site is appropriate for site closure.

1.4 SCOPE OF WORK TO BE PERFORMED/APPROACH

The specific scope of work to be performed in order to achieve the objectives of this current project is to:

- Prepare and submit this Work Plan, Health and Safety Plan as well as a Project Schedule and Scaled Site Map to Alameda County Department of Environmental Health (ACDEH) and the Port of Oakland.

- Acquire all the necessary permits and licenses (soil excavation, groundwater treatment/ drainage system installation and groundwater construction permits).

- Obtain Utility Clearance in order to identify all the underground utilities in the proposed excavation and monitoring well drilling locations in the Test Cell Facility prior to any excavation or drilling activity.

- Saw cut concrete area that is covering the contaminated soil measuring approximately 75' x 75' x 0.5'. Remove approximately 104 cubic yards (125 tons) of the concrete, transport and recycle at a nearby concrete recycling center.

- Excavate contaminated soil within the vicinities of Trenches 1 and 2 as well as the unlined ditch southwest of Test Cell # 2 down to the soil/water interface and dispose off-site approximately 1,041 cubic yards of the excavated contaminated soil at a permitted Class III, II, or I landfill facility. Collect confirmatory sidewall soil samples from the excavated pit. Normally, a minimum of four (4) sidewall samples will be collected from each sidewall, however, since each side of the proposed excavation pit measures 75 linear feet, a minimum of four sidewall samples will be collected from each side of the excavation pit. Also, confirmatory soil samples will be collected in areas of elevated PID readings or in areas showing obvious signs of contamination. Each soil sample collected for chemical analysis will be analyzed for TPH-d w/si-gel standard cleanup/TPH-jet-A-fuel/TPH-motor oil/TPH-g/BTE&X/MTBE using EPA Methods 8015B/8260BB respectively.

- Extract approximately 126,000 gallons of contaminated groundwater from the excavation pit. The extracted contaminated groundwater will either be disposed off-site or treated on-site. If on-site treatment is the preferred disposal option, an NPDES permit will be obtained from the RWQCB to discharge the treated groundwater to the nearby surface water.

- Design and install a drainage system southwest of Test Cell # 2 that will consist of a catch basin, an oil/water separator and an oilsorb/carbon system that will control, convey, collect and cleanup the stormwater/runoffs associated with the operations of Test Cell numbers 1, 2, 3, and 4.

- Install thirteen (13) 2-inch and one 4-inch diameter groundwater monitoring wells (MW-4[1], MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16 and MW-17) in the selected and agreed locations as shown in Figure 3-3. Each groundwater monitoring well will be drilled down to 15.25 feet (15.00 feet for MW-13) bgs. All the new groundwater monitoring wells Geo-Z, Geo-Well, and EDF data will be submitted to the State GeoTracker database.

- Collect and analyze soil and groundwater samples from each monitoring well and analyze each sample for TPH-d w/si-gel standard cleanup/TPH-jet-A-fuel/TPH-motor oil/TPH-g/BTE&X/MTBE using EPA-Method 8015B/8260B respectively.

- Reactivate all the three (3) existing on-site groundwater monitoring wells by taking water level measurements, purging and collecting groundwater samples for analysis from each well.

- Perform quarterly groundwater monitoring and reporting on all the newly installed and existing on-site groundwater monitoring wells including off-site surface location (SW-3) and monitoring well NPORD MW-4 on the southwestern border of the Test Cell Facility for a period of least five years.

- At the end of the project, submit a final project report describing all the activities completed and submit copies of the final report to Rolls-Royce Engine Services-Oakland Inc., Port of Oakland and ACDEH.

2.0 SITE DESCRIPTION

The Test Cell Facility as shown in Figure 2-2 is built on artificial material adjacent to tidal wetlands at north of Old Earhart Road on MOIA property. It is surrounded by fencing and comprises an area of approximately 2.3 acres. The Test Cell Facility consists of six Engine Test Cells with auxiliary structures (sheds, pumphouse, waste water sumps, aboveground oil/water separator, control buildings, gas conditioning facility, air receivers, cooling towers, flare stack, and etc), one aboveground fuel tank for liquefied petroleum (LP) gas (30,000-gallons), and three underground storage tanks (USTs) for jet-A-fuel (one 10, 000-gallon) and two paired 8,000-gallon tanks.

An unlined ditch currently borders the southwestern side of the Test Cell Facility and receives stormwater and wastewater runoffs from Test Cell numbers 1, 2, 3 and 4. Currently the wastewater runoffs are contained and treated. The unlined ditch drains southward through an underground pipe to a channel in the Airport. Pumphouse # 2 lifts water from the channel across Old Earhart Road Levee to the tidal wetland east of the site where it flows to San Leadro Bay. A general description of the site detailing the vicinity and site maps, topography, geology and hydrology is presented below.

2.1 VICINITY MAP

A vicinity map showing the general area of the site and the surroundings is presented in Figure 2-1.

2.2 SITE MAP

A site map illustrating the on-site infrastructures, locations of the existing underground and aboveground storage tanks (USTs) existing monitoring wells, and previous soil borings is shown in Figure 2-2.

2.3 SITE GEOLOGY AND HYDROLOGY

According to EMC's report, the site is flat with elevation of approximately one to two feet above Mean Sea Level (MSL) (USGS, 1980). The site is located on an artificial rise separating the north end of Oakland Airport from tidal marsh

2.3.1 GEOLOGY

The site lies in the Eastern Franciscan Block of the Coast Range geomorphic province. The province is characterized by many elongate ranges and narrow valleys that trend generally northwest (Norris & Webb, 1990). The basement rock in the area is Franciscan subduction complex (Franciscan). The Franciscan is dominated by greenish-gray greywacke interbedded with dark shale and occasional limestone (Norris & Webb, 1990).

The surface rocks are Cenozoic shelf, slope and land deposits. These deposits consist mostly of sandstone and shale or mudstone of restricted aerial extent (Bailey, 1996).

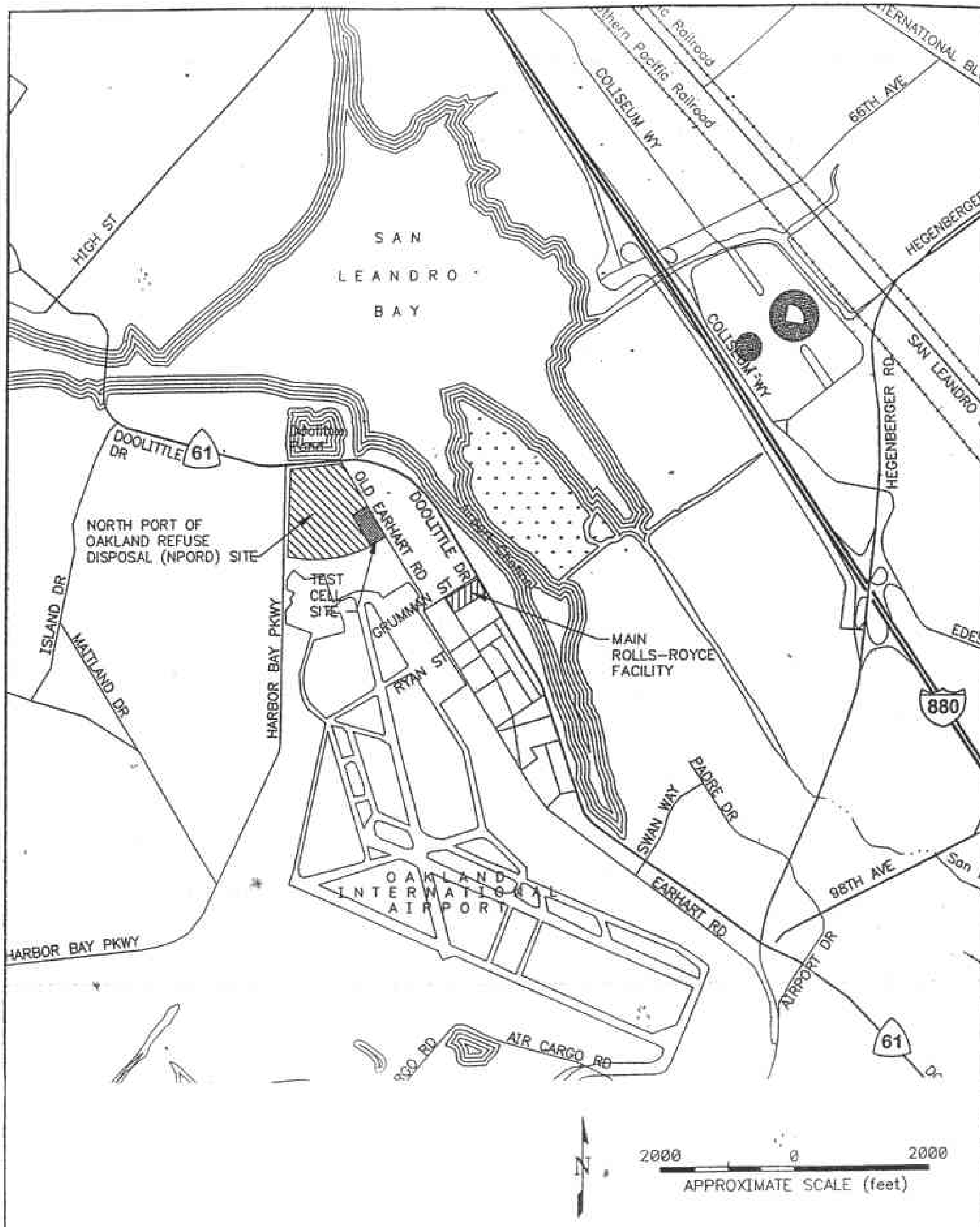


Figure 2-1: Vicinity Map
Rolls-Royce Test Cell Facility
6701 Old Earhart Road
Oakland, CA 94621

BASE MAP BY KLEINFELDER, INC.

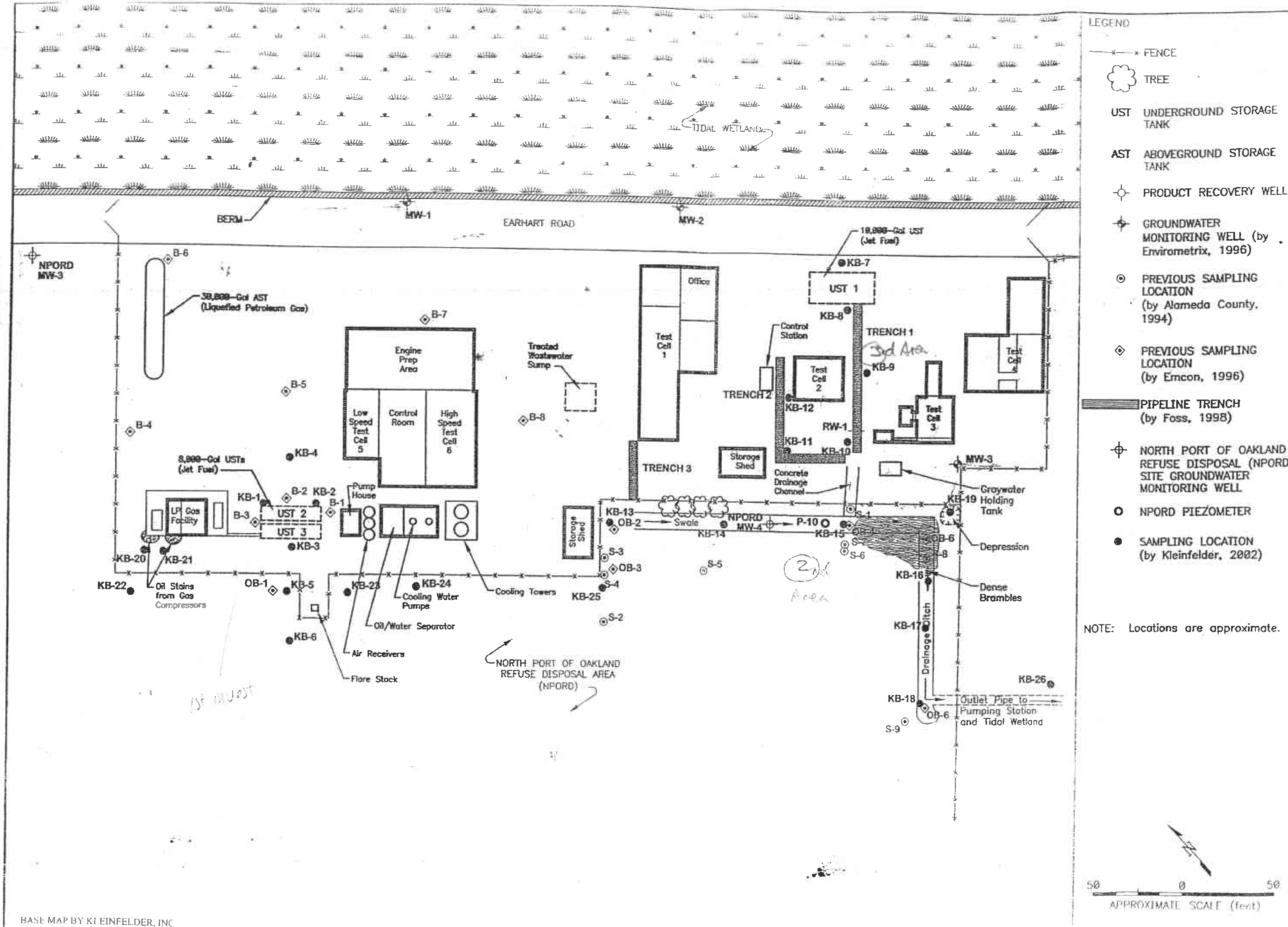


Figure 2-2: Site Map
Rolls-Royce Test Cell Facility
6701 Old Earhart Road
Oakland, CA 94621

Locally, the site sits on a loose fill mixture of Pleistocene silts and clays. The clays, known as Bay Mud, are generally bluish gray. The site is approximately 5 miles west of the Hayward Fault and approximately 17 miles east of the San Andreas Fault. Both the Hayward and San Andreas are considered active faults.

2.3.2 HYDROLOGY

The site is approximately 1,000 feet from San Leandro Bay. Depth to water table is approximately between 3 feet to 5 feet below ground surface (bgs); however, tidal influences and irrigation may influence the depth and gradient locally.

3.0 TASKS

This section describes in detail all the major tasks that ARCI will accomplish during this project. These tasks are presented in sections 3.1 through 4.0 and include the submission of this Work Plan to ACDEH and Port of Oakland, acquisition of permits and licenses, notification of Underground Service Alert, acquisition of access agreement from Port of Oakland (by David D. Cooke with Allen Matkins), contaminated soil and groundwater remediation, drainage system design and installation, groundwater monitoring well installation, and collection and analyses of sidewall soil and groundwater samples. The three existing on-site groundwater monitoring wells will be reactivated and monitored on quarterly basis including the newly installed wells. At the end of all the field activities, ARCI will submit a copy of the final technical report each to RRESO, ACDEH and Port of Oakland.

3.1 PERMITS AND LICENSES

ARCI will procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of this work. All permits required for the performance of the work will be obtained by ARCI prior to performing any work governed by the permits. The permits that are anticipated include but are not limited to:

- Current and Active State of California, Class A or C-61/D-6 Contractor's License with a State Hazardous Substance Removal Certification
- Current and Active State of California C-57 License
- Air Permit from Bay Area Air Quality Management District (BAAQMD).
- California EPA, DTSC License for Hazardous waste haulers
- California Department of Transportation, Highway Patrol permits for hazardous materials transportation

- Monitoring Well Construction/Installation Permit from Alameda County Public Works

- Excavation, drainage system installation and water discharge permits from Port of Oakland/City of Oakland Unified Public Authority (CUPA).

Sampling of NORPD's monitoring well MW-4 and surface water sampling location SW-3 quarterly will require obtaining an Access Agreement from Port of Oakland.

All field activities will be tentatively scheduled with Port of Oakland/CUPA, at least 3 days prior to the over-excavation and drainage system installation. ACDEH/Alameda County Department of Public Works will also be notified at least five (5) working days prior to monitoring well installation.

3.2 UTILITY CLEARNACE

Prior to any excavation or drilling, ARCI will notify Underground Service Alert (USA North) not less than two (2) working days prior to any planned excavation or digging. Prior to the call, excavation or digging locations will be outlined with white chalk paint or another manner sufficient to enable USA North underground facility members to determine the area of excavation or digging to be field marked. USA North will notify its members of the excavation or digging. The USA members will provide information about, mark or stake the horizontal path of their facilities or will advise of clearance. At the end of the call, USA North referencing the excavation or digging information will give a ticket number. The ticket number will be held in case there is a need to call USA North back. The USA North ticket will be active for only 28 days (CA)/14 days (NV).

3.3 CONTAMINATED SOIL AND GROUNDWATER (IN EXCAVATION PIT) REMEDIATION

The soil and groundwater within the vicinities of Test Cell # 2 and the unlined ditch are contaminated with TPH as diesel, gasoline, jet fuel, and motor oil levels that exceed their respective ESLs as shown in boldfaced type levels in Tables 3-1 and 3-2. Remediation of the contaminated soil approximately 1,041 cubic yards (1,667 tons) will be accomplished by excavation and off-site disposal. Once the contaminated soil has been over-excavated, approximately 126,000-gallons of contaminated groundwater will accumulate in the excavation pit. The groundwater will be extracted and either is disposed off-site or treated on-site. If treated on-site, the treated groundwater will be discharged to the nearby surface water after obtaining an NPDES permit from RWQCB to discharge to surface water.

3.3.1 SOURCE, NATURE AND EXTENT OF CONTAMINATION

Petroleum hydrocarbon releases, leaking product pipes and historical land use at the site caused the petroleum hydrocarbon contamination. The nature and types of contaminants as well as extent of contamination are presented in section 3.3.2.

3.3.2 CONTAMINANTS

The contaminants of concern at the site include TPH as gasoline, diesel, jet A-fuel, motor oil, MTBE and benzene. The maximum contaminant levels and sample depths in previous subsurface investigations in the soil and groundwater are summarized in Tables 3-1 through 3-2.

TABLE 3-1: HISTORICAL GASOLINE, DIESEL, JET-A-FUEL, MOTOR OIL AND THEIR CONSTITUENTS SOIL SAMPLE ANALYTICAL RESULTS.

Boring Location Number	Depth (feet)	Sample Date (2002)	TPH as diesel (mg/Kg)	TPH as gasoline (mg/Kg)	TPH as jet-A-fuel (mg/Kg)	TPH as motor oil (mg/Kg)
KB-01	1.0	15-Jul	3.1 [c]	<1.0	1.2	31
KB-01	3.0	15-Jul	4.9 [c]	<1.0	1.2	26
KB-02	1.0	15-Jul	58 [c]	11 [j]	51	56
KB-02	4.0	15-Jul	78 [f]	34 [j]	82	7
KB-03	0.0	15-Jul	3.1 [c]	<1.0	<1.0	47
KB-03	1.0	15-Jul	2.5 [c]	<1.0	<1.0	47
KB-04	1.0	15-Jul	44 [b,c,d]	<1.0	34	160
KB-04	4.0	15-Jul	<1.0	<1.0	<1.0	<5.0
KB-05	0.0	16-Jul	4.4 [b,c,d]	<1.0	<1.0	46
KB-05	2.0	16-Jul	1.1 [c]	<1.0	<1.0	11
KB-06	0.0	16-Jul	1.6 [c]	<1.0	<1.0	18
KB-06	2.0	16-Jul	380 [c]	<1.0	120	**1,700**
KB-07	1.0	15-Jul	1.4 [c]	<1.0	<1.0	13
KB-07	4.0	15-Jul	<1.0	<1.0	<1.0	<5.0
KB-08	1.0	16-Jul	1.5 [c]	6.2 [n]	<1.0	13
KB-08	4.0	16-Jul	<1.0 [c]	1.7 [n]	<1.0	6.5
KB-09	1.0	16-Jul	<1.0	3.8 [j]	<1.0	<5.0
KB-09	4.0	16-Jul	14 [b,c]	<1.0	4.1	50
KB-10	2.0	16-Jul	**29,000** [m]	**13,000** [j]	**42,000**	**2,500**
KB-11	1.0	16-Jul	**2,600** [m]	**3,000** [j]	**3,500**	530
KB-11	3.0	16-Jul	**1,600** [c,g]	**1,300** [j]	**1,800**	**1,900**
KB-12	1.0	16-Jul	470 [c,g]	**480** [j]	**630**	33
KB-12	3.0	16-Jul	**21,000** [m]	**6,400** [j]	**25,000**	<5,000
KB-13	0.0	17-Jul	72 [b,c]	5.7	14	300
KB-13	2.0	17-Jul	140 [f,p]	92	170	66
KB-14	0.0	17-Jul	7.9 [b,c]	<1.0	2.2	89
Soil ESLs (mg/Kg)			500	400	500	1,000

TABLE 3-1: HISTORICAL GASOLINE, DIESEL, JET-A-FUEL, MOTOR OIL AND THEIR CONSTITUENTS SOIL SAMPLE ANALYTICAL RESULTS (cont').

Boring Location Number	Depth (feet)	Sample Date (2002)	TPH as diesel (mg/Kg)	TPH as gasoline (mg/Kg)	TPH as jet-A-fuel (mg/Kg)	TPH as motor oil (mg/Kg)
KB-15	0.0	17-Jul	60 [b,c]	<1.0	13	180
KB-16	0.0	17-Jul	63 [b,c]	<1.0	12	180
KB-17	0.0	12-Jul	92 [b,c]	3.7 [j]	49	110
KB-18	0.0	17-Jul	77 [e,p]	<1.0	17	190
KB-19	0.0	12-Jul	24 [b,c]	<1.0	17	24
KB-20	1.0	15-Jul	3.2 [c]	<1.0	<1.0	93
KB-20	3.0	15-Jul	1.1 [c]	<1.0	<1.0	8.7
KB-21	1.0	15-Jul	3.9 [c]	<1.0	<1.0	45
KB-21	3.0	15-Jul	1.8 [c]	<1.0	<1.0	9.7
KB-22	1.0	16-Jul	16 [c]	<1.0	16	130
KB-22	3.0	16-Jul	1.3 [c]	<1.0	<1.0	9.6
KB-23	0.0	17-Jul	23 [c]	<1.0	<1.0	190
KB-24	0.0	17-Jul	2.9 [c]	<1.0	<1.0	25
KB-24	2.0	17-Jul	13 [c]	<1.0	<1.0	120
KB-25	0.0	17-Jul	6.9 [c]	<1.0	<1.0	88
KB-25	2.0	17-Jul	<200 [c]	<1.0	<,200	**3,100**
KB-26	0.0	12-Jul	20 [b,a,c,k]	<1.0	8.2	43
KB-26	3.0	12-Jul	4.4 [b,a,c,k]	<1.0	2.4	15
Soil ESLs (mg/Kg)			500	400	500	1,000

Notes:

TPH	Total Petroleum Hydrocarbons by modified EPA Method 8015B, silica gel cleanup used for TPH as diesel, jet fuel, and motor oil
mg/Kg	Milligram per kilogram
ESLs	Environmental Screening Levels (ESLs), industrial/commercial land use surface soil (<3 m) and groundwater not a current or potential source of drinking water (RWQCB, February 18, 2005)
Bold	Values in **boldface type** exceed their respective ESLs.

<u>Lab Qualifiers</u>

a	Heavier gasoline range compounds are significant (aged gasoline)
c	Oil range compounds are significant
d	Liquid sample contains greater than 2 % by volume of sediment
e	Aged diesel (?) is significant
f	Unmodified or weakly modified diesel is significant
g	Kerosene/Kerosene range
j	Strongly aged gasoline or diesel range compounds are significant
m	Stoddard solvent

TABLE 3-2: HISTORICAL GASOLINE, DIESEL, MOTOR OIL, JET-A-FUEL AND THEIR CONSTITUENTS IN THE GROUND/GRAB WATER SAMPLE ANALYTICAL RESULTS.

Well Number	Sample Date (2002)	TPH (filtered**) as diesel (µg/L)	TPH (unfiltered) as gasoline (µg/L)	TPH (filtered**) as jet-A-fuel (µg/L)	TPH (filtered) as motor oil (µg/L)
KB-01-GW	15-Jul	280 [b, c, d]	100 [d, j]	170	520
KB-02-GW	15-Jul	110 [b, d]	68 [d, j]	98	<250
KB-03-GW	15-Jul	240 [b, d]	<50 [d]	13	<250
KB-04-GW	15-Jul	360 [d, f]	<50 [d]	37	<250
KB-05-GW	16-Jul	100 [b/k, d, h]	120 [a, d, h]	86	<250
KB-06-GW	16-Jul	<50	<50	<50	<250
KB-07-GW	15-Jul	260	<50 [d, h]	240	<50
KB-08-GW	16-Jul	70 [k]	310 [n]	<50	<250
KB-09-GW	16-Jul	54 [b, d]	100 [d, n]	<50	<250
KB-10-GW	16-Jul	110 [d, h, k]	**27,000** [d, h, j]	98	<250
KB-11-GW	16-Jul	**3,000** [c, h]	**7,900** [h, j]	**3,300**	570
KB-12-GW	16-Jul	460 [h, k]	**1,300** [h, j]	500	<250
KB-13-GW	17-Jul	**9,900** [d, f, h]	**590** [d, h, j]	**11,000**	**1,100**
KB-13-GW (Dup)	17-Jul	**1,900** [c, d, f]	**500**	**1,900**	**880**
KB-14-GW	17-Jul	**3,200** [b, c, d]	150	**750**	**4,500**
KB-15-GW	17-Jul	**5,300** [b, c, d, k]	**1,200**	**4,800**	**2,200**
KB-16-GW	12-Jul	**5,900** [b, c]	**2,600**	**6,500**	**690**
KB-17-GW	12-Jul	460 [b]	220	500	<250
KB-18-GW	12-Jul	**4,700** [b, c, b]	**1,600**	**4,500**	**2,600**
KB-19-GW	12-Jul	<50	<1.0	<50	<250
KB-21-GW	15-Jul	57 [b, d]	<50	<50	<250
KB-22-GW	16-Jul	<50	<50	<50	<250
KB-24-GW	17-Jul	160 [b, c]	<50	<50	450
KB-25-GW	17-Jul	130 [b, c, d]	<50 [d]	<50	320
KB-26-GW	18-Jul	NA	<50	NA	NA
MW-4*	2-Jul	85	110	<50	<250
MW-4*	02/18/2005	330	66	NA	<500
MW-4*	07/07/2005	1,200	71	NA	740
MW-4*	09/30/2005	850	94	NA	<500
MW-4*	12/12/2005	990	100	NA	510
MW-4*	03/28/2006	0.28 (mg/L)	ND (mg/L)	ND (mg/L)	0.81 (mg/L)
ESLs (µg/L)		640	500	640	640

Notes:

TPH Total Petroleum Hydrocarbons by Modified EPA Method 8015; with silica gel cleanup used for TPH as gasoline, diesel, jet fuel, and motor oil

* NPORD groundwater monitoring well.

** Samples were filtered to remove entrained sediment with adsorbed hydrocarbons to provide better representation of dissolved fractions of groundwater.

µg/L	Micrograms per liter
ESLs	Environmental Screening Levels (ESLs), industrial/commercial land use surface soil (<3m) and groundwater not a current or potential source of drinking water (RWQCB, February 18, 2005)
Bold	Values in **boldfaced** type exceed their respective ESLs; only filtered sample results for TPH-d, TPH-g, TPH-jf, and TPH-mo compared to ESLs.
NA	Not analyzed

Lab Qualifiers:

a Heavier gasoline range compounds are significant (aged gasoline)
b Diesel range compounds are significant, no recognizable pattern
c Oil range compounds are significant
d Liquid sample contains greater than 2 volume % sediment
f Unmodified or weakly modified diesel is significant
g Kerosene/Kerosene range
h Lighter than water immiscible sheen/product is present
j Strongly aged gasoline or diesel range compounds are significant
k Gasoline range compounds are significant
n No recognizable pattern

3.3.3 CONTAMINATION ABOVE REMEDIAL ACTION LEVELS

Based on the review of previous results of soil and groundwater investigations at the site, contaminants are distributed throughout most of the entire site. The levels of soil and groundwater especially around KB-10, KB-11, and KB-12 are above their respective Environmental Screening Levels (ESLs). This means that a potential for adverse risk may exist and additional evaluation is warranted.

3.3.4 TIERED APPROACH TO ENVIRONMENTAL RISK EVALUATION

Under "Tier 1", of RWQCBSF three-tiered approach to environmental risk assessment, the site's chemicals of concern analytical data such as TPH-as diesel, gasoline, motor oil and jet fuel that are distributed in the above locations are directly compared to the respective ESLs. The selected ESLs of the chemical parameters of concern and their cleanup level goals for this project are presented in Tables 3-3 and 3-4 respectively.

TABLE 3-3: ENVIRONMENTAL SCREENING LEVELS (ESLs)
Shallow Soils (< 10 feet bgs)
Groundwater IS NOT a Current or Potential Source of Drinking Water

CHEMICAL PARAMETERS (CONTAMINANTS)	Shallow Soil		
	Residential Land Use (mg/Kg)	**Commercial Land Use (mg/Kg)**	**Groundwater (µg/L)**
TPH-g	100	400	500
TPH-d	100	500	640
TPH-jet-A-fuel	100	500	640
TPH-motor oil	500	1,000	640
MTBE	2	5.6	1,800
Benzene	0.18	0.38	46
Toluene	9.3	9.3	130
Ethyl benzene	32	32	290
Total Xylenes	11	11	100

Based on the comparisons, RRESO made a decision regarding the need for remedial action for the site, mostly in the areas covering former soil boring locations (KB-10, KB-11 and KB-12) for soil excavation and KB-10-GW, KB-11-GW, KB-12-GW, KB-13-GW, KB-14-GW, KB-15-GW, KB-16-GW and KB-18-GW for groundwater, because the levels of the contaminants of concern in the soil and garb water samples collected are above their respective ESLs and MCLs. ESLs were developed to address environmental protection concerns in the Water Quality Control Plan For San Francisco Bay Basin ("Basin Plan, RWQCBSF 1995) of the San Francisco Bay Area Regional Water Quality Control Board (RWQQCB). These concerns include:

GROUNDWATER QUALITY

- **PROTECTION OF HUMAN HEALTH**
- Current or potential drinking water resource
- Protection of aquatic habitats
- Emission of subsurface vapors to building interior
- Protection of aquatic habitats (discharges to surface water)
- Protection against nuisance concerns (odors, etc) and general resource degradation

SOIL QUALITY

- Protection of human health
- Direct/indirect exposure to impacted soil (ingestion, dermal absorption, inhalation of vapors and dust in outdoor air)
- Emission of subsurface vapors to building interiors
- Protection of groundwater quality (leaching of petroleum hydrocarbons from soil)
- Protection of terrestrial (nonhuman) habitats
- Protection against nuisance concerns (odors, etc) and general resource degradation

SHALLOW SOIL GAS

- Protection of human health
- Emission of subsurface vapors to building interiors

The presence of a chemical at concentrations in excess of the respective ESLs does not necessarily indicate that significant risk exists at the site. It does, however, generally indicate that additional investigation; evaluation of potential environmental concerns or remedial action for the site is warranted. Current potential receptors include on-site workers, surface water and San Leandro fauna and flora. RRESO remedial action will remove subsurface soil vapors and groundwater containing elevated concentrations of petroleum hydrocarbons to risk-based residual soil vapors and groundwater concentrations that can result in reducing cancer risk for continued use of the site.

No previous risk assessment has been conducted for the site. Conditions at the site meet the following NCP requirements for a remedial action (40 CFR 300.415 (b) (2). The criteria that are applicable include:

- Actual or potential exposure to human population, aquatic habitats, and surface water.
- High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface that may migrate.
- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

3.3.5 SCOPE OF REMEDIAL ACTION

The physical removal and treatment of petroleum hydrocarbon contaminated soil vapors and groundwater (in the excavation pit) are not anticipated to exceed 45 days. The media that will be subject to a removal action include petroleum hydrocarbons in the soil vapors and groundwater (in the excavation pit) containing diesel, gasoline, MTBE, jet-A-fuel and motor oil with concentrations above the San Francisco Bay Regional Water Quality Control Board (RWQCB) Environmental Screening Levels (ESLs) and MCLs. The removal action may minimize the need for other subsequent remedial actions to protect health, surface water aquatic habitats and the environment.

3.3.5.1 SELECTED ACTION LEVELS

Two types of "Action Levels" were selected for this Work Plan, namely Removal Action Level; and Treatment Goals.

3.3.5.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The NCP states, "Remedial Actions, shall to the extent practical considering the exigencies of the situation, attain applicable or relevant and appropriate requirements under federal environmental or state environmental or local (ACDEH) laws". [40 CFR 300.415 (i)]. Applicable ESLs for water and State Maximum Concentrations Levels (MCLs) for soil were considered. ACDEH has no published Cleanup Levels but relies on published RWQCB ESLs, and State MCLs for soil and groundwater in residential and commercial/industrial land use.

The primary Cleanup Levels (acceptable to ACDEH) that RRESO will use to assess removal, remediation and treatment goals of this project are summarized on Table 3-4.

TABLE 3-4: CLEANUP ACTION LEVELS SUMMARY

CONTAMINANTS	**PURPOSE**	**PROPOSED REMOVAL/ TREATMENT ACTION LEVEL**	**CLEANUP LEVELS**	
		SOIL	SOIL (mg/Kg)	GROUNDWATER (µg/L)
TPH-g	CLEANUP	NA	<400	<500
TPH-d	CLEANUP	NA	<500	<640

TABLE 3-4: CLEANUP ACTION LEVELS SUMMARY (cont')

CONTAMINANTS	PURPOSE	PROPOSED REMOVAL/ TREATMENT ACTION LEVEL	CLEANUP LEVELS	CONTAMINANTS
		SOIL	SOIL (mg/Kg)	GROUNDWATER (μg/L)
TPH-jet-A-fuel	CLEANUP	NA	<500	<640
TPH-motor oil	CLEANUP	NA	<1,000	<640
MTBE	CLEANUP	NA	<5.6	<1,800
Benzene	CLEANUP	NA	<0.38	<46
Toluene	CLEANUP	NA	<9.3	<130
Ethyl benzene	CLEANUP	NA	<32	<290
Total Xylenes	CLEANUP	NA	<11	<100

NA = Not Available

ARCI's personnel and subcontractor will excavate approximately a total of 1,041 cubic yards (1,667 tons) of contaminated soil measuring 75' x 75' x 5.0' (see Figure 3-1) within the vicinities of Trench numbers 1 and 2 as well as the unlined ditch southwest of Test Cell Facility. The above area is within the vicinities of former soil boring locations (as illustrated in Table 3-1) KB-10, KB-11 and KB-12 with highest diesel levels of 29,000 mg/Kg, 2,600 mg/Kg and 21,000 mg/Kg respectively. The highest gasoline levels at KB-10, KB-11 and KB-12 were 13,000 mg/Kg, 3,000 mg/Kg and 6,400 mg/Kg respectively. The highest TPH level as jet-A-fuel in KB-10, KB-11 and KB-12 were 42,000 mg/Kg, 3,500 mg/Kg and 25,000 mg/Kg respectively. Also the highest TPH level as motor oil in KB-10, KB-11 and KB-12 were 2,500 mg/Kg, 1,900 mg/Kg and <5,000 mg/Kg respectively. The concentrations of total petroleum hydrocarbons in these former soil borings far exceed their respective ESLs of diesel (**500 mg/Kg**), gasoline (**400 mg/Kg**), jet-A-fuel (**500 mg/Kg**) and motor oil (**1,000 mg/Kg**) as illustrated in Table 3-1.

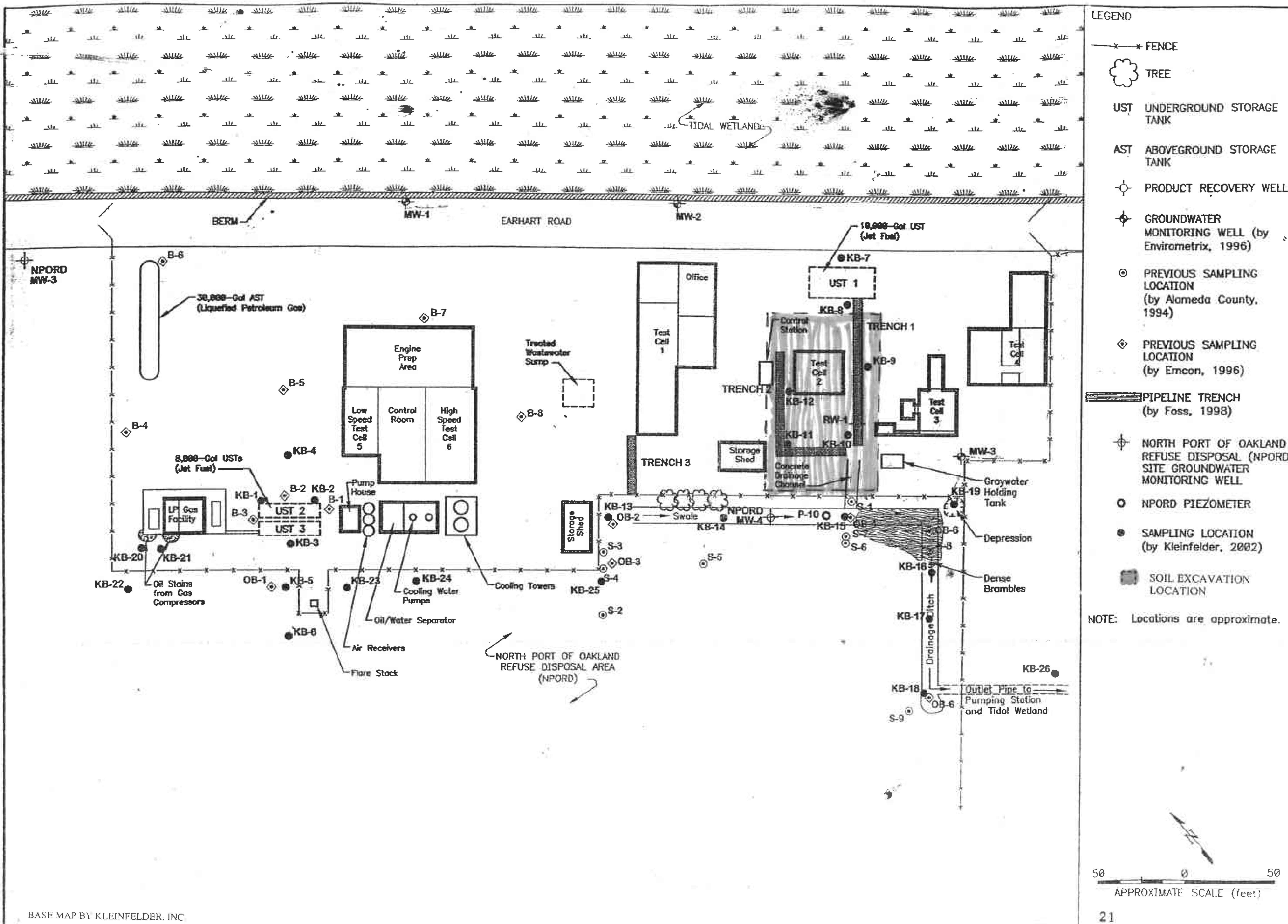


Figure 3-1: Contaminated Soil Over Excavation Area
Rolls-Royce Test Cell Facility
6701 Old Earhart Road
Oakland, CA 94621

The soil remediation in this project, will involve excavation and off-site disposal of the contaminated soil in the affected areas.

3.3.6 CONCRETE REMOVAL

The contaminated soil in the Test Cell Facility to be remediated is covered with concrete slab measuring 75' x 75' x 0.5' and will be removed to allow for the excavation of the petroleum hydrocarbons contaminated soil. The limits of excavation will be marked, USA North called and the whole marked areas saw cut as necessary. After saw cutting, the approximately 104 cubic yards (125 tons) of concrete and Test Cell # 2 iron slabs will be removed using an excavator or backhoe. The concrete will be loaded into a dump truck and transported to a nearby concrete recycling facility for recycling.

3.3.7 SOIL EXCAVATION

Approximately 1,041 cubic yards (75' x 75' x 5.0') of the petroleum contaminated soil will be remediated by over-excavation using a conventional soil excavation equipment such as an excavator because of the nature of the likely landfill materials (gravel, concrete, wood, glass, mixture of leather pieces and glass) to be encountered during the over-excavation.

The soil cleanup objectives are to remove the contaminated soil within the vicinities of Trenches 1 and 2 as well as the unlined ditch southwest of Test Cell # 2 by over-excavation with the maximum level of contamination that will be allowed to remain on-site after remediation activities being less or equal to the ESLs of diesel, gasoline, jet-A-fuel and motor oil. ACDEH has no published Cleanup Levels but relies on published RWQCBSF Bay Region ESLs for soil and groundwater for residential or commercial/industrial land use. The excavated soil from the excavation pit will be temporarily stockpiled on-site on visqueen, barricaded, and covered with visqueen, before being characterized, profiled, loaded into transfer trucks and transported to a permitted landfill facility for off-site disposal.

After reaching the over-excavation limits, a Photo-Ionization-Detector (PID) will be used to provide an estimate of the level of contamination for the residual volatile organic compounds (VOCs) of concern, however, the specified excavation limits may not be exceeded. In order to document satisfactory remediation of the contaminated soil by over-excavation, confirmatory sidewall samples will be collected and analyzed by a State of California Certified Environmental Laboratory. Temporary barricades, caution tapes, lights and other means will be provided to prevent accidents to persons and damage to property. This safety measure will adequately safeguard the open excavation pit.

It may be necessary to perform soil characterization and subsequent profiling during concrete removal so that the contaminated soil may be loaded into transfer trucks immediately it is removed from the excavation pit and be transported to a permitted landfill facility for disposal.

3.3.7.1 CONFIRMATORY SOIL SAMPLING AND ANALYSIS

To document satisfactory remediation of the contaminated soil by over-excavation, one confirmatory composite sidewall soil sample will be collected every 20 linear feet of each sidewall of the excavation pit. A total of 16 confirmatory sidewall soil samples will be collected. Confirmatory soil samples will be collected in areas with elevated PID readings or areas showing signs of obvious contaminations. A the soil samples for chemical analysis will be submitted to a State Certified Laboratory for analysis. Each confirmatory soil sample will be collected in a brass tube. The ends of each brass tube will be wrapped with aluminum foil, then capped, taped with a Teflon tape and labeled. Each brass tube will be labeled with the soil sample location number, site identification, date and time of sample collection and type of analysis, then recorded in a chain-of-custody (COC) record and wrapped in a Ziploc bag. All the wrapped confirmatory sidewall soil sample brass tubes will be kept in an ice chest at 4 ^{0}C and transported to a State of California Certified Laboratory.

All the soil samples will be analyzed for TPH as diesel w/s-gel standard cleanup, gasoline, jet fuel and motor oil using EPA Method 8015B. The soil samples will also be analyzed for BTE&X/MTBE using EPA Method 8260B.

3.3.7.2 CONTAMINATED SOIL PROFILING

Five composite soil samples (based on estimated 1,041 cubic yards of contaminated soil) will be collected from the stockpiled soil and analyzed for TPH-d/TPH-g/TPH-jet –A-fuel/TPH-motor oil using EPA Method 8015B. These samples will also be analyzed for BTE&X/MTBE using EPA Method 8260B. After the receipt of laboratory results, ARCI will obtain and complete a Waste Profile Sheet from the selected permitted landfill facility for the disposal of the contaminated soil. After submitting and obtaining approval of the soil profile from the permitted landfill facility, the excavated contaminated soil will be ready for acceptance for off-site disposal at a permitted Landfill facility.

3.3.7.3 CONTAMINATED SOIL MANIFESTING

Several truckloads of the profiled contaminated soil will be hauled to the selected permitted Landfill facility. The responsible RRESO representative will sign the manifest/bill of lading accompanying each load being transported to the permitted Landfill facility.

3.3.7.4 CONTAMINATED SOIL TRANSPORTATION

A State of California Licensed Hazardous Waste Haulers will be used to transport all the excavated contaminated soils to the selected permitted Landfill facility. Soil in each transfer truck will be loaded with a loader into the transfer truck for transportation and disposal at the permitted landfill facility. All the trucks that will be used to haul away the contaminated soil prior to leaving the Test Cell Facility will be affixed with the appropriate placards to ensure that all the EPA, DOT and State transporter requirements are met.

3.3.7.5 CONTAMINATED SOIL OFF-SITE DISPOSAL

After the contaminated soil has been deemed acceptable for disposal at the permitted landfill facility, it will be loaded, manifested, and transported to the landfill facility. Each truck driver leaving the Test Cell Facility for the soil disposal will leave with copies of the Waste Acceptance Form and signed manifest/bill of lading. Each truckload reaching the permitted landfill facility, will either be disposed of at a Class II Daily Cover Soil- (Gas/VOCs<50 mg/Kg, minimal debris) or Class II Soil Disposal- (soil>50 mg/Kg Gas/VOCs) section of the facility. For the soil to be disposed of as Class II Daily Cover soil, it must be dry, stackable, and useable for alternative daily cover. At the end of all the off-site disposal activities, RRESO will receive copies of all the approved waste profile sheets, soil sample laboratory results and signed manifests/bill of ladings.

3.3.8 EXTRACTION AND HANDLING OF CONTAMINATED GROUNDWATER (IN THE EXCAVATION PIT)

An estimated 126,000 gallons of contaminated groundwater that will accumulate in the excavation pit will be extracted (pumped out) from the excavation pit using two submersible pumps. Each pump will be installed down to 3 feet below the excavation depth. Each of the pumps is expected to have dewatering discharges ranging from 10-20 gallons per minute (gpm). All the dewatering discharges will be pumped into a Baker Tank for temporary storage before possible off-site disposal or on-site treatment. Groundwater extraction from the excavation pit will continue until approximately 126,000 gallons (or as needed) of contaminated groundwater have been pumped out from the excavation pit and its surroundings.

3.3.8.1 HANDLING OF CONTAMINATED WATER FROM THE EXCAVATION PIT

The extracted groundwater will either be disposed off-site at a permitted recycling facility or treated on-site using US Filter PV1000-3-ACNS Granular Activated Carbon Vessel. If on-site treatment is the preferred disposal option, the treated groundwater will be discharged into the nearby surface water after obtaining an NPDES permit from the RWQCB to discharge the treated groundwater to the nearby surface water.

3.3.9 BACKFILLING, COMPACTION AND CONCRETE RESURFACING

After completion of dewatering, the excavation pit will be backfilled with gravel and graded to elevations shown on the construction drawings, and as needed to meet the requirements of the construction as specified by RRESO. The gravel materials provided for backfilling will be free from organic and deleterious substances, and containing no rocks or lumps over 3 inches in greatest dimension. Such gravel materials shall comply with Alameda County Public Works excavation backfilling. Backfilling will be accomplished using a backhoe/excavator or loader, to required elevations and backfill material depth of approximately 4.5 feet. No compaction will be required since the backfill material is gravel.

3.3.9.1 CONCRETE REINFORCEMENT

Concrete reinforcement will be provided through out all the excavated pit areas and as shown in the construction drawings for complete installation. Concrete work will be performed in accordance with ACI 301, using # 5 rebar. Reinforcing bars will be fabricated to conform to the required shapes and dimensions. All reinforcements, will be placed, supported and secured against displacements.

3.3.9.2 CONCRETE MIXES

Portland cement will be used to achieve a weight of not less than 110 per cubic foot (pcf) and an ultimate compressive strength of 3500 psi at 28 days.

In placing conduits in slabs in the excavation pit, ARCI will place below the reinforcement and encase in concrete by increasing the thickness of the slab locally to at least 3 inches of concrete around the conduit on all sides. Concrete will not be placed until reinforcement, conduits, outlet boxes, anchors, sleeves, hangers, bolts and other embedded materials are securely and properly fastened in their correct positions.

ARCI will place concrete continuously between predetermined expansion, control and construction joints. We will thoroughly work concrete around reinforcement and embedded fixtures and into corners of forms during placing operations. ARCI will completely compact with tamping poles and tapping forms until the concrete is thoroughly compact and without voids. Immediately after concrete placement, protect concrete with wet fabric material from premature drying. Concrete will be maintained with minimal moisture loss at relatively constant temperature for a period necessary for hydration of cement and hardening of concrete.

3.4 CONSTRUCTION OF DRAINAGE SYSTEM

A drainage system (see Figure 3-2) will be designed and installed southwest of Test Cell # 2 and will consist of a catch basin and an oil/water separator that will control, convey, collect and cleanup stormwater/runoff of petroleum hydrocarbons used with operation of Test Cell # 2 before discharge into Port of Oakland drainage ditch. This drainage system will prevent or minimize and handle future wastewater flows from operation of Test Cell numbers 1, 2, 3 and 4.

3.4.1 DRAINAGE SYSTEM DESCRIPTION

The drainage system will consist of a 4' x 4' x 4' catch basin that will contain and collect petroleum hydrocarbons contaminated runoffs from Test Cell # 2 operations. The driveway surrounding this first catch basin will be sloped so that all potential wastewater

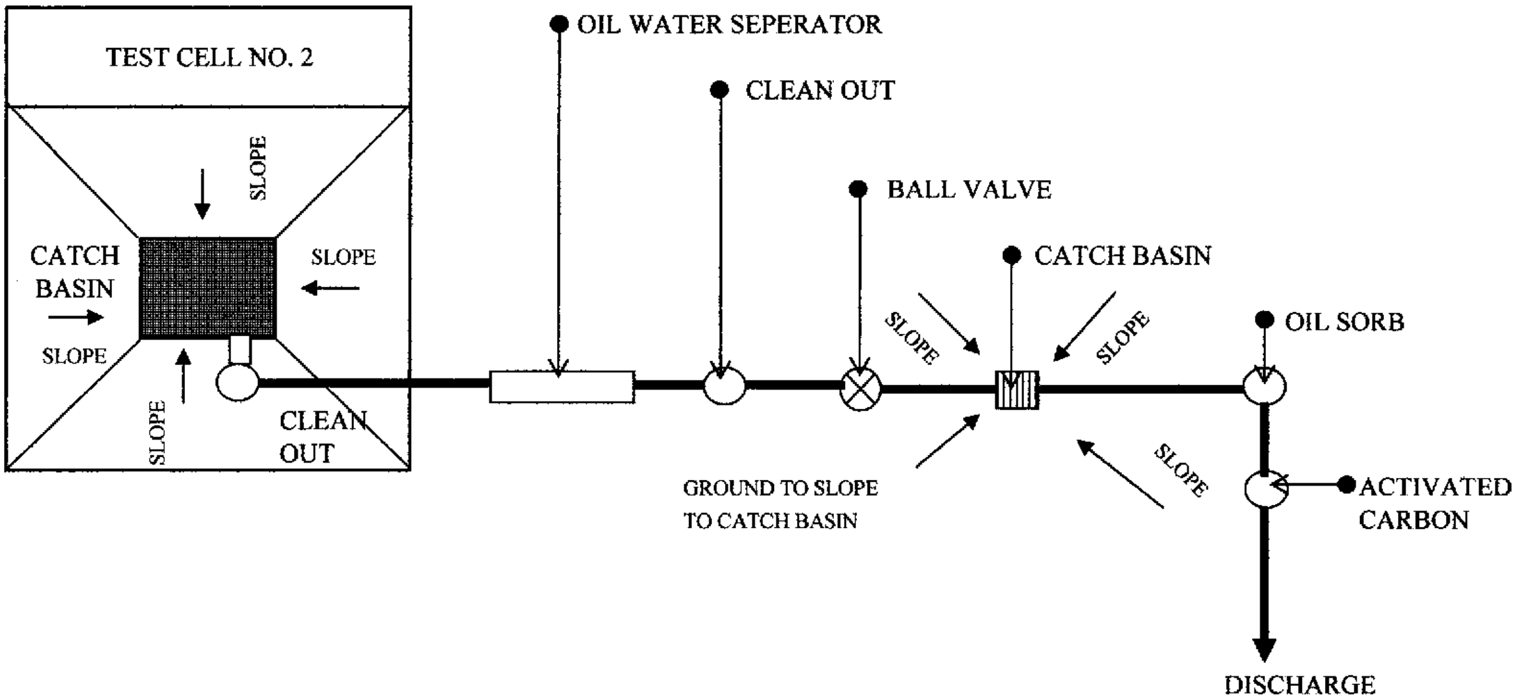


FIGURE 3-2
SCHEMATIC DIAGRAM:
STORMWATER/RUNOFF-DRAINAGE SYSTEM

flows from Test Cell numbers 1, 2, 3 and 4 drain into the catch basin and sending the drained runoff via underground pipe existing the catch basin to a 320-gallon oil/water separator. The oil/water separator separates oil from water and the water drains into another 4' x 4' x 4' catch basin via a 4-inch Schedule 40 PVC pipe existing the oil/water separator. The slab surrounding the second catch basin is sloped so that stormwater from surrounding areas drains into this catch basin as well as the effluent from the oil/water separator. The liquid in the second catch basin will be treated before discharge.

3.4.2 STORMWATER/RUNOFF TREATMENT

The liquid that has accumulated in the second catch basin will be pumped through an underground piping to an on-site stormwater/runoff treatment system. The pumped out liquid will be processed through an oilsorb/filter system to remove any suspended solids carried over from the preceding processes to protect the down stream carbon adsorption system. This filtration is followed by activated carbon adsorption system (US Filter PV1000-3-ACNS Vessel), a final polishing step primarily for the removal of any remaining petroleum hydrocarbons. This activated carbon system will consist of one (1) 1,000 pound Granular Activated Carbon (US Filter PV1000-A-ACNS) Adsorption Vessel. Following the activated carbon adsorption system, the treated effluent will be discharged to the nearby surface water after acquiring an NPDES permit from the RWQCB to discharge to the nearby surface water (San Leandro Bay).

3.4.2.1 EFFLUENT MONITORING

In making sure that the water discharged meets the RWQCB NPDES Discharge permit requirements, the treatment system effluent will be sampled and analyzed to verify the quality of the treated effluent. During the startup phase, the effluent will be sampled and analyzed on regular basis to make sure that the contaminants of concern meet the permit limits. The influent and mid line will also be sampled and analyzed to check against possible breakthrough. After the startup phase, the effluent sampling port will be sampled and analyzed on quarterly basis. All the samples collected from the treatment system sampling ports will be analyzed for TPH-d/TPH-g/TPH-jf/TPH-mo and BTE&X/MTBE using EPA Methods 8015B and 8260B respectively. Laboratory results of the effluent sample and the total volume of liquid discharged will be reported to the RWQCB on quarterly basis.

3.5 INSTALLATION OF GROUNDWATER MONITORING WELLS AND GROUNDWATER MONITORING

The contaminated soil removal as well as the excavation pit accumulated groundwater extraction and disposal are expected to reduce the groundwater pollution to asymptotic levels and it is hoped that natural attenuation will further reduce petroleum hydrocarbons contaminant levels at the Test Cell Facility. In other to demonstrate that natural attenuation is taking place, fourteen (14) additional groundwater monitoring wells will be installed throughout the site as shown in Figure 3-3 and monitored on regular basis.

3.5.1 RATIONALE FOR GROUNDWATER MONITORING WELL LOCATIONS

A total of fourteen (14) additional groundwater monitoring wells (MW-4[1], MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16 and MW-17) (see Figure 3-3) will be installed to monitor petroleum hydrocarbons stability within the vicinities of the two 8,000-gallon USTs where the 1992 jet-A-fuel release (MW-4[1], MW-5 MW-6 and MW-7) occurred, where the 1994 "gray water" release (MW-13, MW-14 and MW-16) occurred and where the 1998 product release (MW-12, MW-11, MW-13 and MW-14) occurred in pipeline Trenches 1 and 2. Monitoring well MW-8 (off-site RRESO and east of former soil boring S-4) will be used to monitor TPH motor oil and diesel levels in KB-25 (soil) and S-4 (grab water) respectively. Monitoring wells (MW-9 and MW-10) will also be used to monitor hydrocarbons stability within the vicinities of Test Cell # 6, storage shed, and wastewater sump areas. In addition, monitoring wells MW-5, MW-15 and MW-16 will be used to determine limits of contamination. Monitoring well MW-17 will be installed near the outlet pipe to Pumphouse # 2 (in the vicinity of former soil boring KB-26) to monitor petroleum hydrocarbon stability because of the high concentrations of petroleum hydrocarbons detected along the drainage ditch (as identified in groundwater samples collected from KB-14 through KB-18). This monitoring well (MW-17) will in addition, help to define groundwater concentrations migrating off-site and which could impact surface water at Pumphouse # 2. The selection of each monitoring well location was based primarily on previous soil and grab water samples' analytical results and to accurately determine hydraulic gradient at the site.

3.5.2 MONITORING WELL CONSTRUCTION REQUIREMENTS

Fourteen (14) groundwater monitoring wells (MW-4[1], MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16 and MW-17) will be installed in the locations indicated in Figure 3-3. Our subcontractor, Gregg Drilling Inc, a C-57 Licensed drilling company (or any other licensed driller), will drill each of the groundwater monitoring wells using a hollow stem auger to depths of approximately 15.25 feet (except MW-13 a 4-inch diameter well which will be drilled down to 15.0 feet because the end cap is flat). Each of the fourteen groundwater monitoring wells will be screened from 4.75 feet to 14.75 feet below ground surface (bgs).

3.5.3 MONITORING WELL CONSTRUCTION

The first 4 feet of each borehole will be hand augered (there may be several refusals because of the nature of the landfill materials that may be encountered) by drilling contractor's personnel for safe digging prior to using the 8-inch diameter hollow stem auger and for collecting unsaturated soil samples for chemical analyses. This auger will be large enough to provide for at least a two inch annular space between the outside of each well casing and the borehole. Appropriate safety measures will be applied for possible presence of hazardous materials. Prior to the commencement of each well drilling and installation operation, the auger will be cleaned to avoid the introduction of

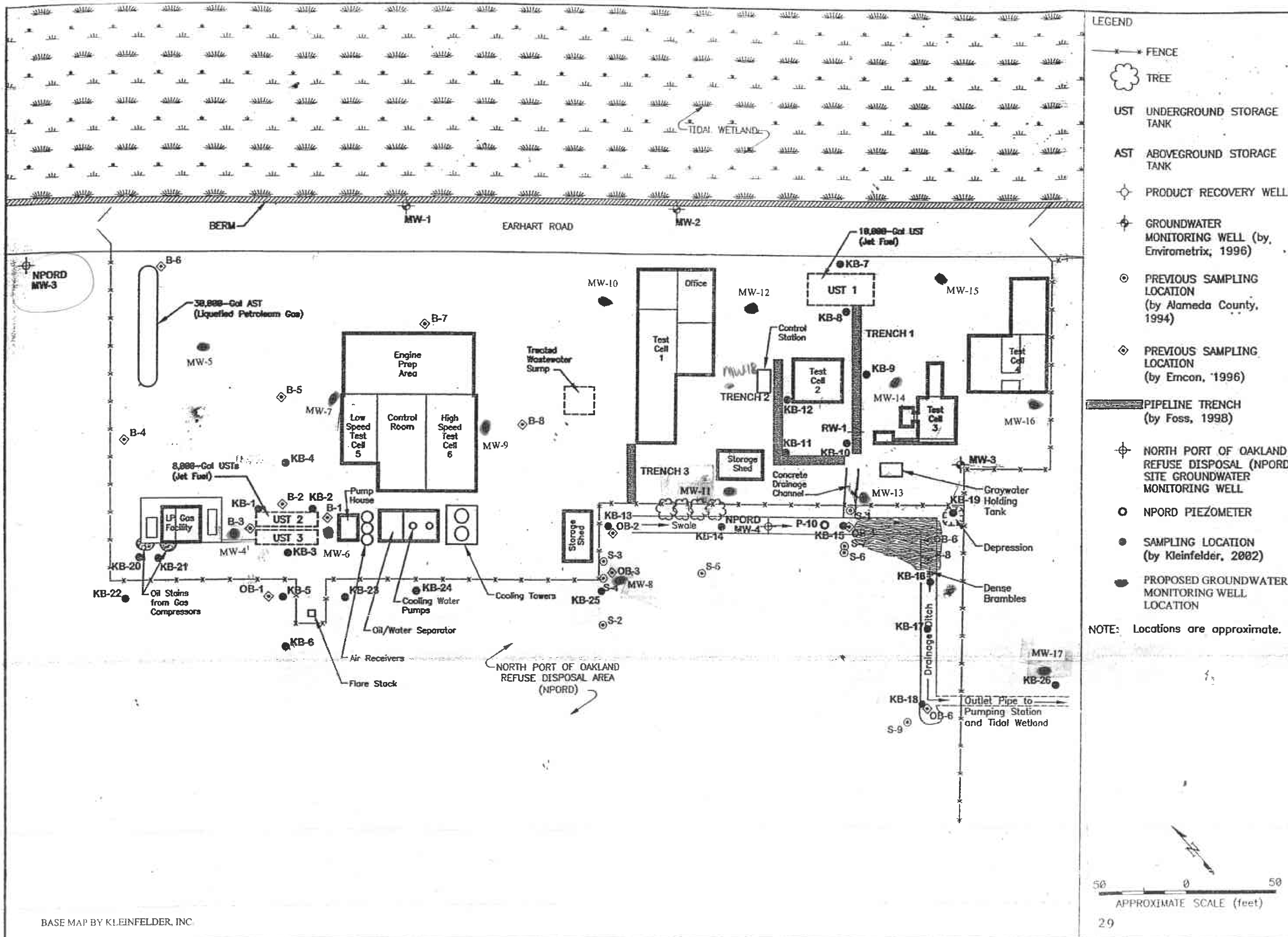


Figure 3-3: Proposed Groundwater Monitoring Well Locations
Rolls-Royce Test Cell Facility
6701 Old Earhart Road
Oakland, CA 94621

cross contamination. Unsaturated soil samples for chemical analyses will be collected from each monitoring well borehole at a depth of between 1.0-5.0 feet (if there is sign of obvious contamination) by a split spoon sampler by grabbing and the soil samples collected in brass tubes.

As drilling continues from each sampling depth to 15.25 (15.00 for MW-13) feet bgs for all the monitoring wells, every 18 inches of soil drilled out will be observed or screened properly by a staff geologist for lithologic correlation and field screening for apparent contamination using a Photo Ionization Detector (PID).

After advancing the rig to a depth of 15.25 (15.00 for MW-13) feet, each monitoring well will be completed such that the top of the screen will be positioned above anticipated seasonal high level of groundwater. MW-4[1], MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16 and MW-17 schematic drawings are illustrated in Figures 3-4, 3-5, 3-6, 3-7, 3-8, 3-9, 3-10, 3-11, 3-12, 3-13, 3-14, 3-15, 3-16 and 3-17 respectively.

Each of the fourteen (14) groundwater monitoring wells will be constructed with 4.50 feet of Schedule 40 PVC blank casing and 10 feet of Schedule 40 PVC 0.02 inch slotted screen. Each casing will be of clean, inert materials and had a diameter of 2 inches each for monitoring wells MW-4[1], MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-14, MW-15, MW-16 and MW-17. Monitoring well MW-13 will have a 4-inch diameter casing and may be converted to an extraction well if required. Flush threaded joints will join all the Schedule 40 PVC casings. Each monitoring well casing will be held in tension during construction and this will be accomplished by suspending the casing above the bottom of the hole during the gravel pack and seal installations.

Each slotted interval will be sand packed up to 0.5 feet above the uppermost slot. The sand pack will not extend into the less permeable zone that would overlie or underlie the water bearing zone monitored. Gregg Drilling & Testing, Inc. or any other C-57 licensed driller selected will add a 0.5 feet section of bentonite pellets above the sand pack and 3.50 feet of cement grout to the surface. The neat seal material will be composed of one sack of Portland Type I-II cement (94 pounds) to six gallons of clean water. The seal material will be placed in a continuous operation until the specific interval of each borehole will be filled. Each of the new groundwater monitoring wells will be surged by the driller before it is developed. The surface of each of the fourteen monitoring wells will be protected from liquid (fluid) entry, accidental damage, unauthorized access and vandalism. Each of the new groundwater monitoring wellheads will be secured below the ground surface in a Christy-type box. A watertight locking cap will be installed in each monitoring well and kept locked.

All the soil cuttings and debris generated during the well drilling and installations will be stored on a visqueen and covered properly. The contaminated soil debris will be profiled to a permitted landfill facility and will be loaded, transported and disposed of at the selected landfill. Copies of the waste profile sheet, bill of lading and signed waste acceptance forms will be submitted to RRESO.

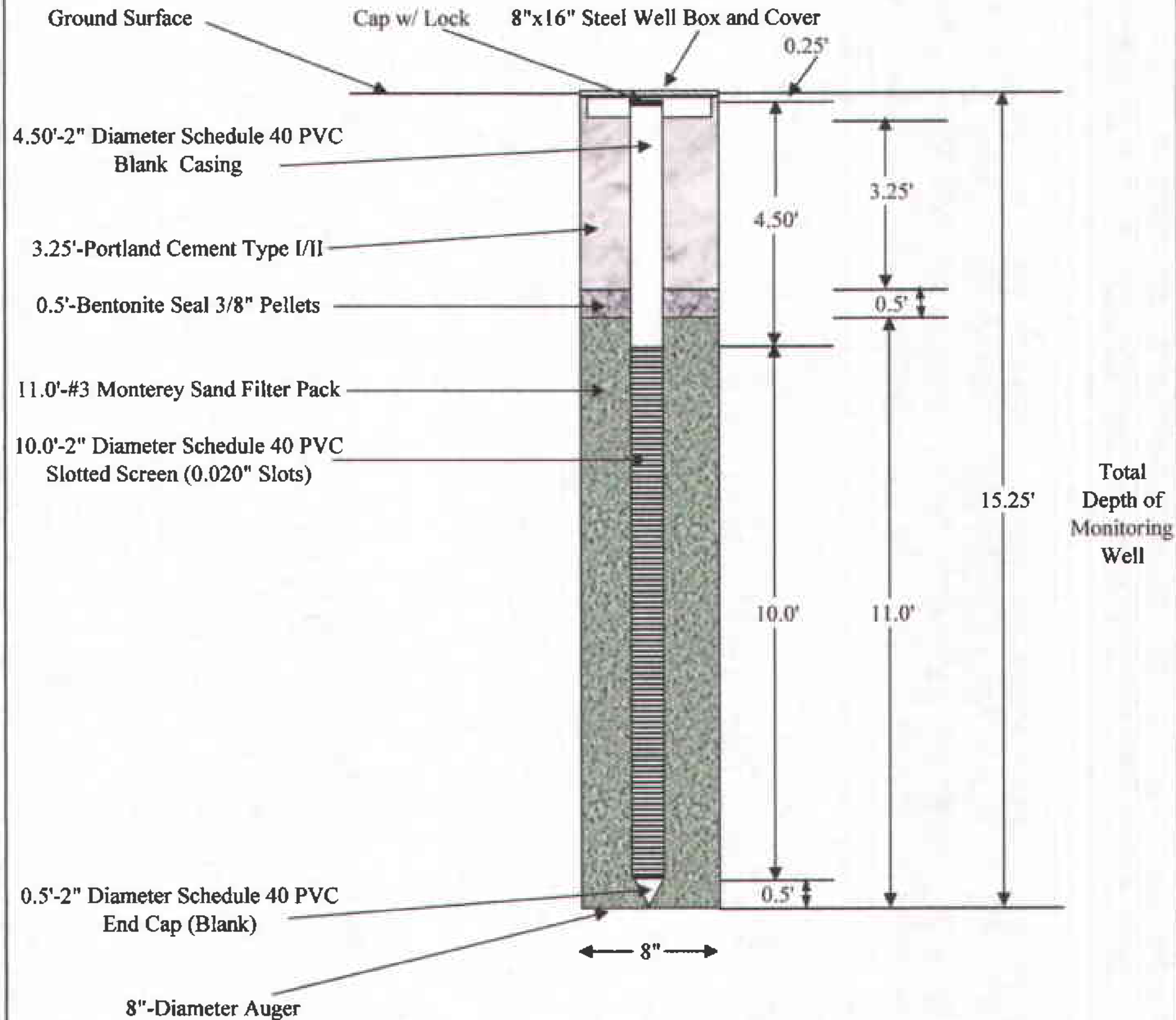


Figure 3-4
Schematic Diagram Monitoring Well
MW-4[1]
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

APPLIED REMEDIATION COMPANY, INC.

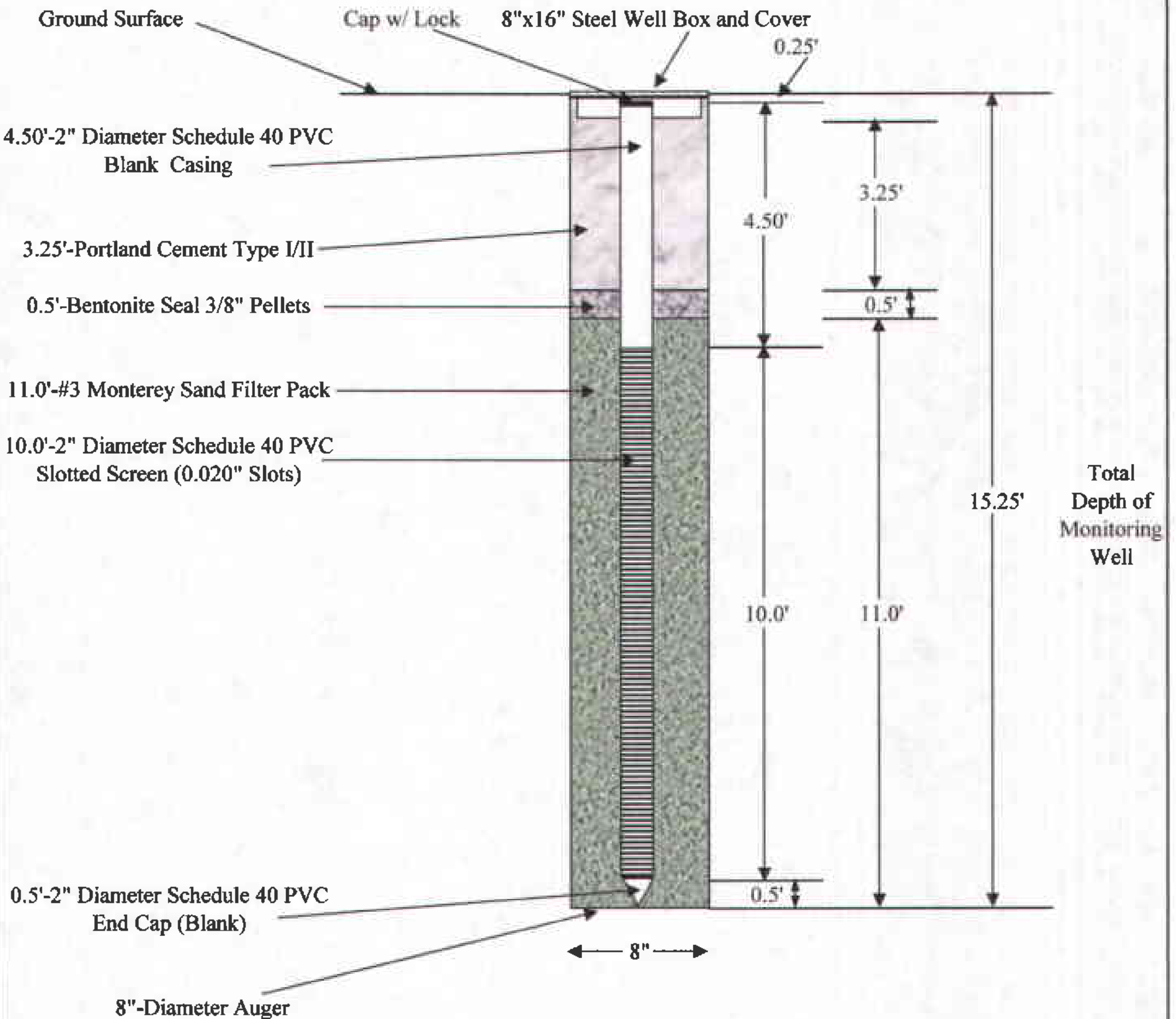


Figure 3-5
Schematic Diagram Monitoring Well
MW-5
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

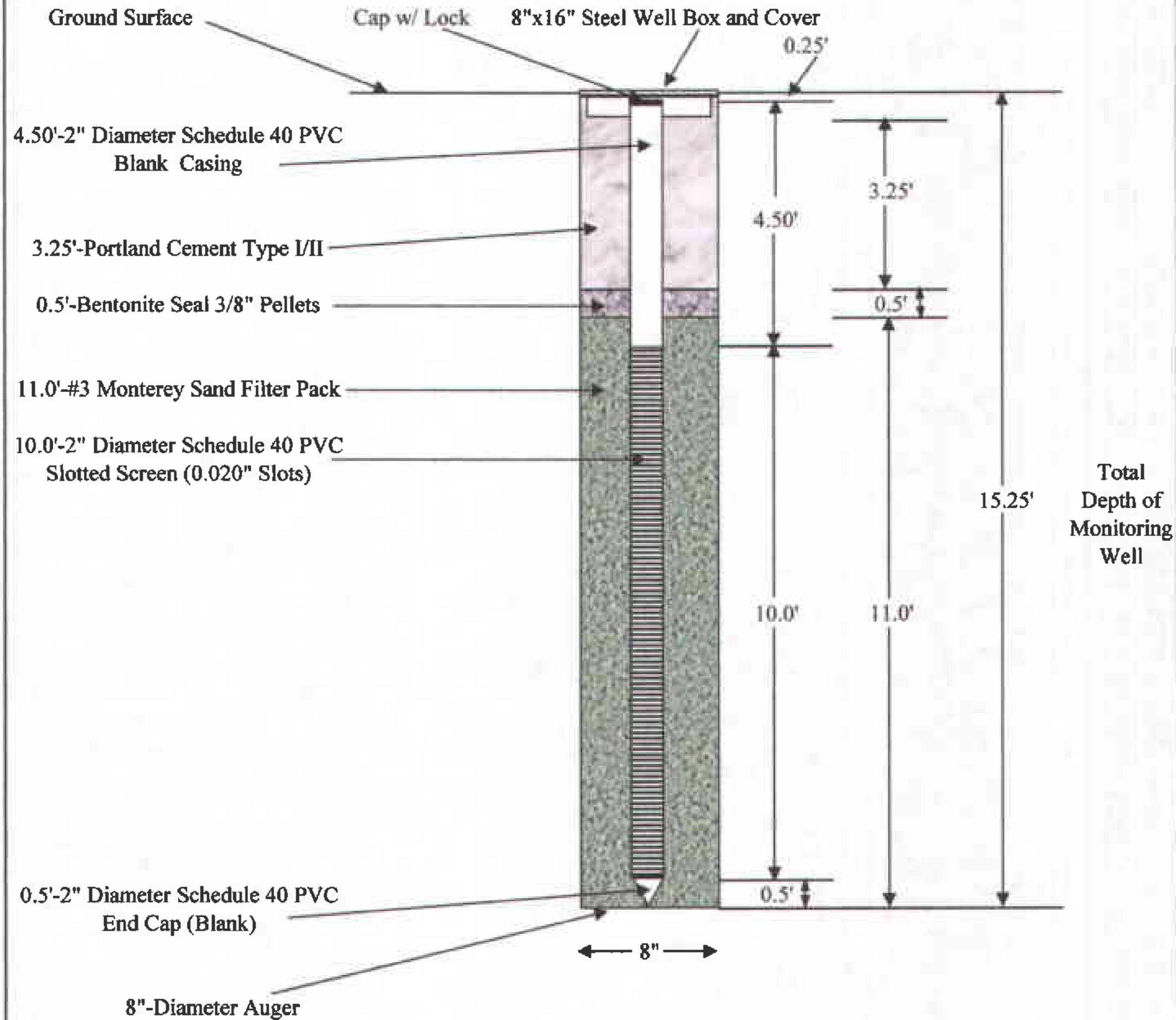


Figure 3-6
Schematic Diagram Monitoring Well
MW-6
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

APPLIED REMEDIATION COMPANY, INC.

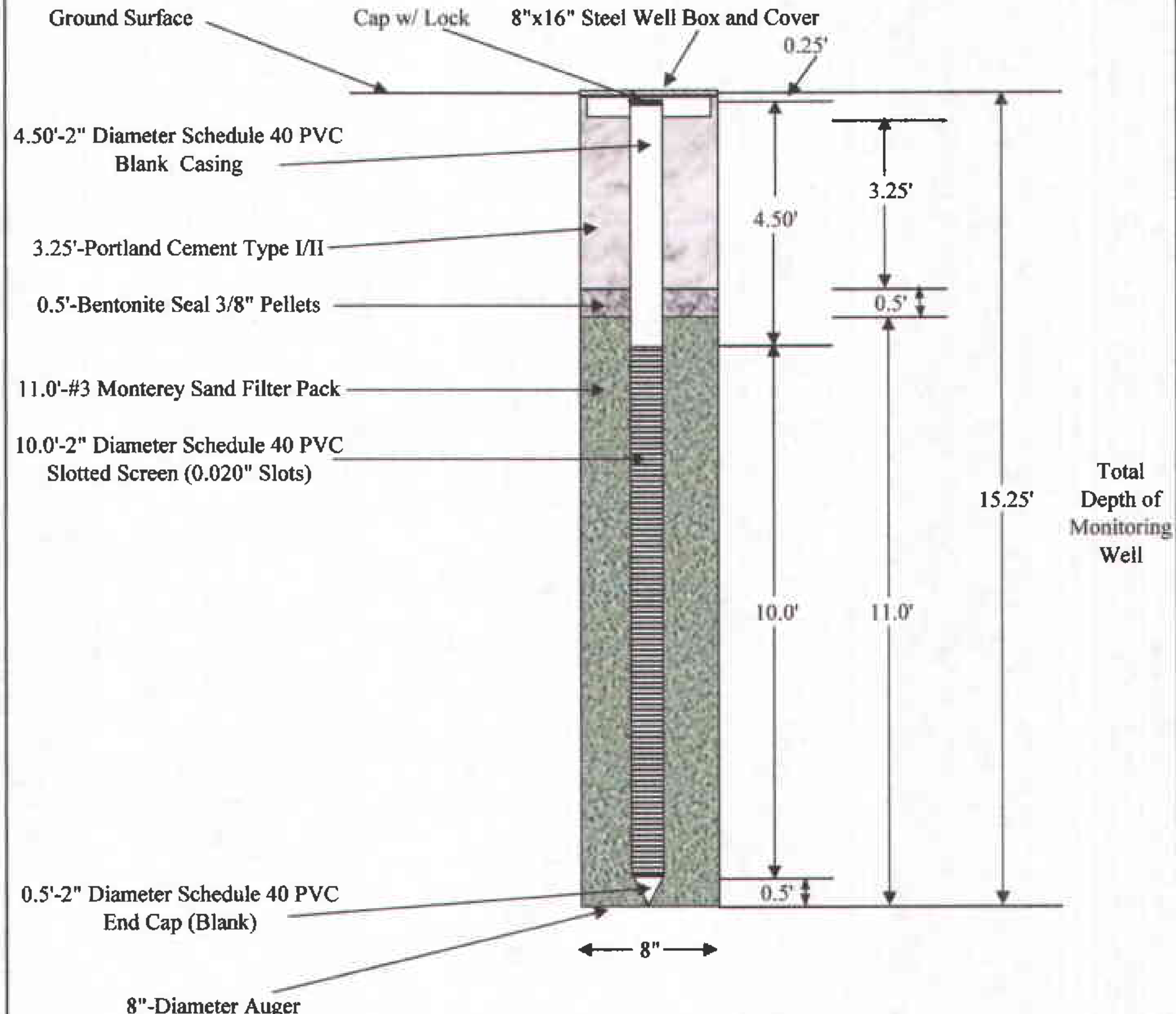


Figure 3-7
Schematic Diagram Monitoring Well
MW-7
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

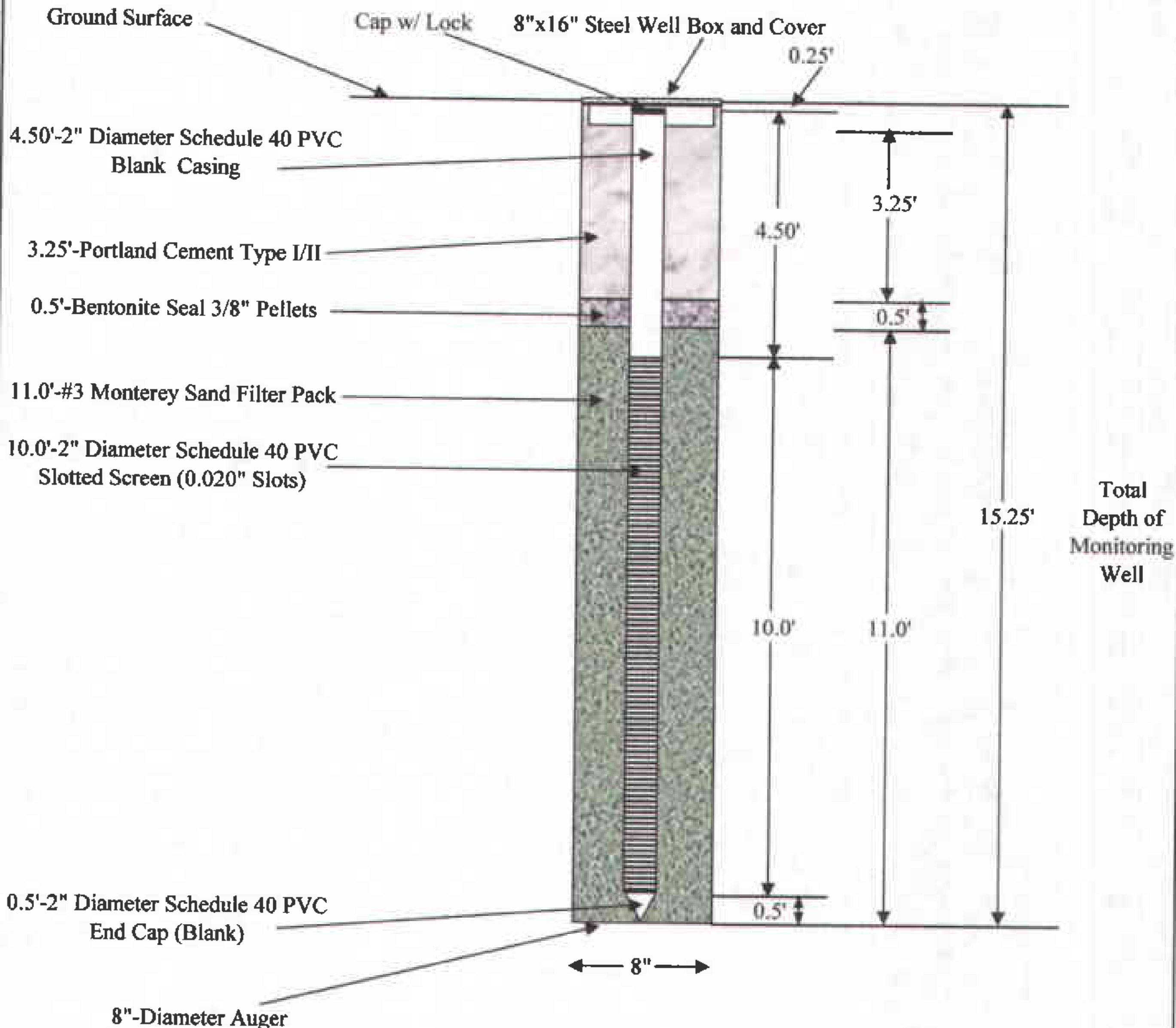


Figure 3-8
Schematic Diagram Monitoring Well
MW-8
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

APPLIED REMEDIATION COMPANY, INC.

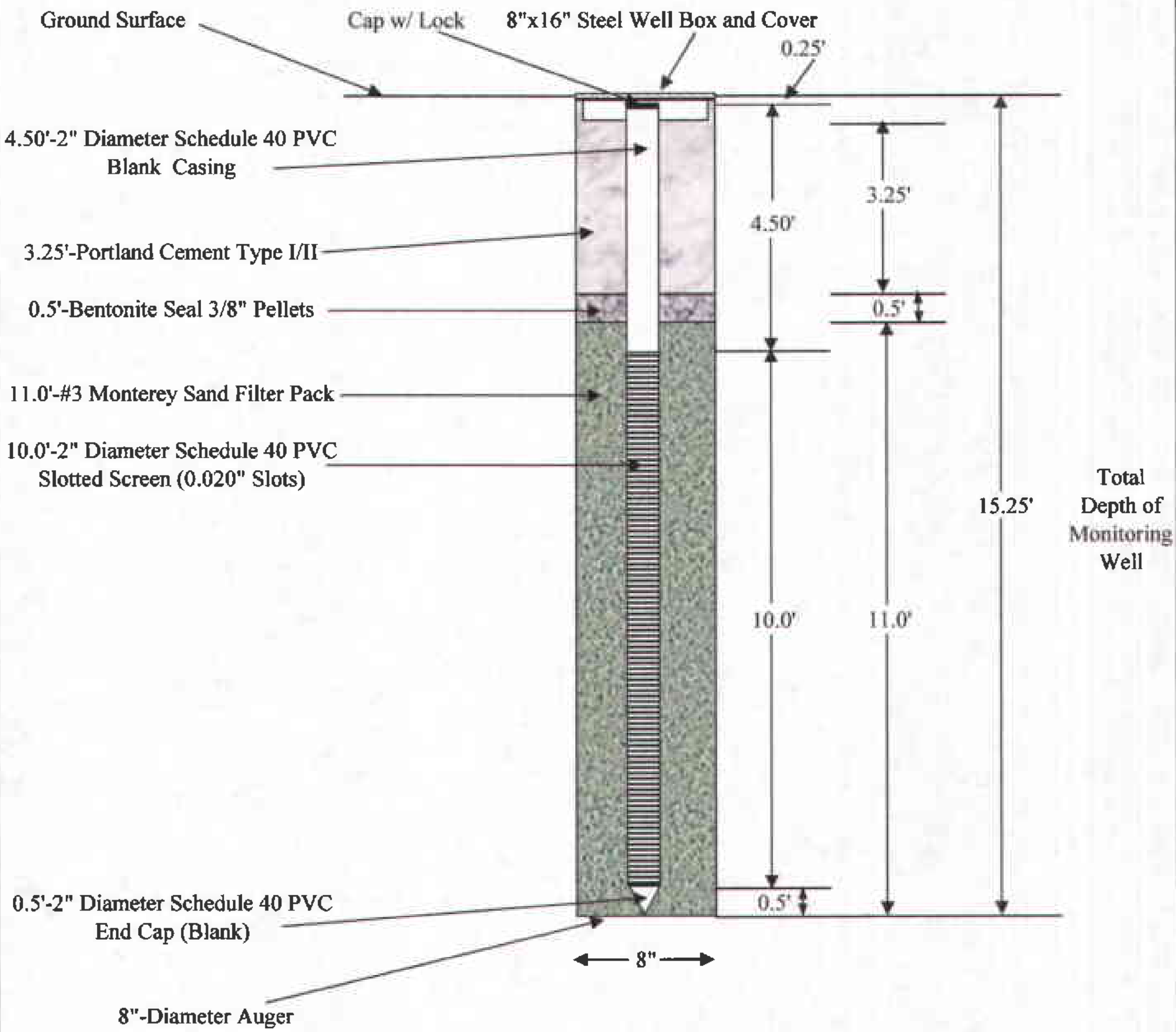


Figure 3-9
Schematic Diagram Monitoring Well
MW-9
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

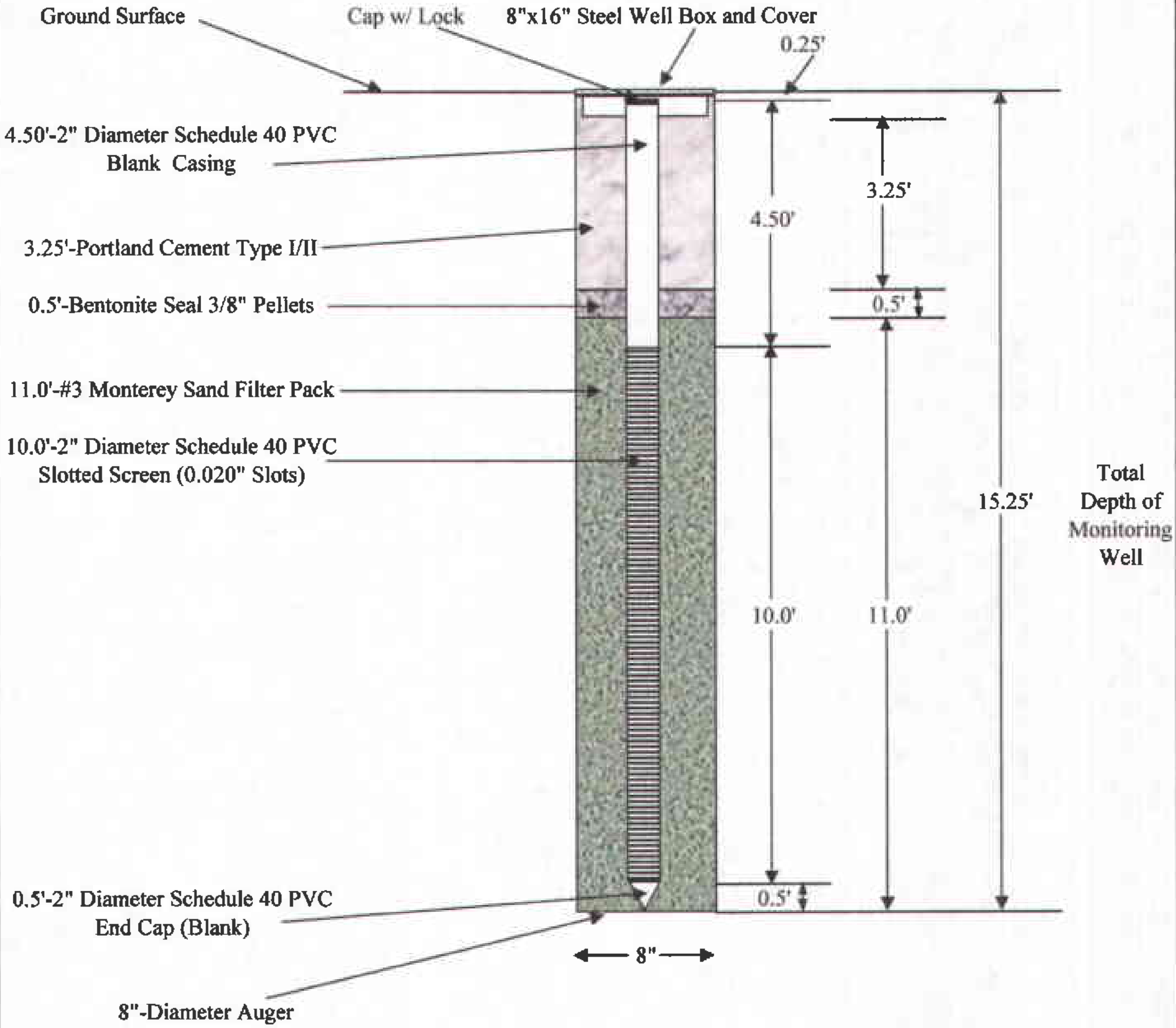


Figure 3-10
Schematic Diagram Monitoring Well
MW-10
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

APPLIED REMEDIATION COMPANY, INC.

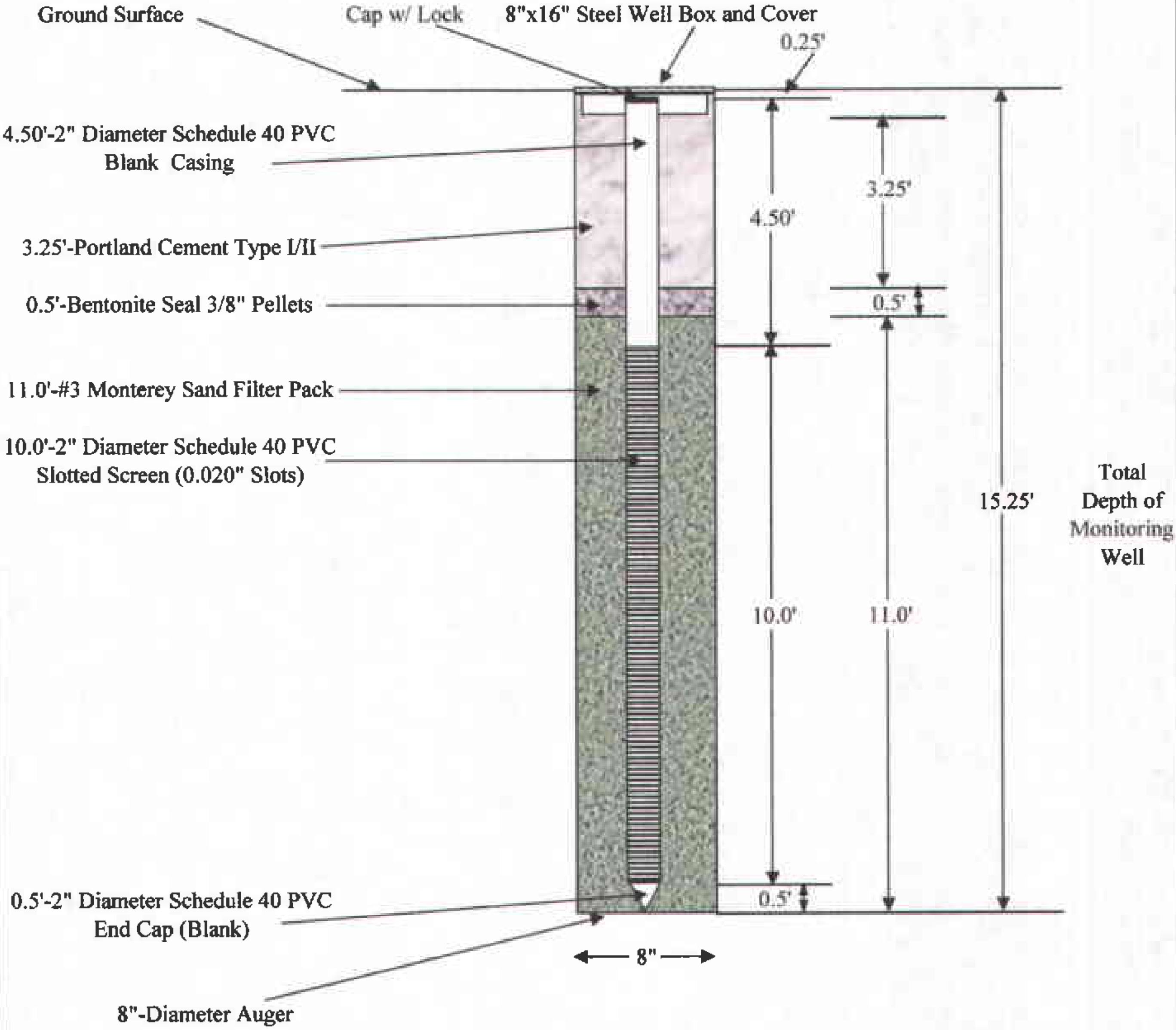


Figure 3-11
Schematic Diagram Monitoring Well
MW-11
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

APPLIED REMEDIATION COMPANY, INC.

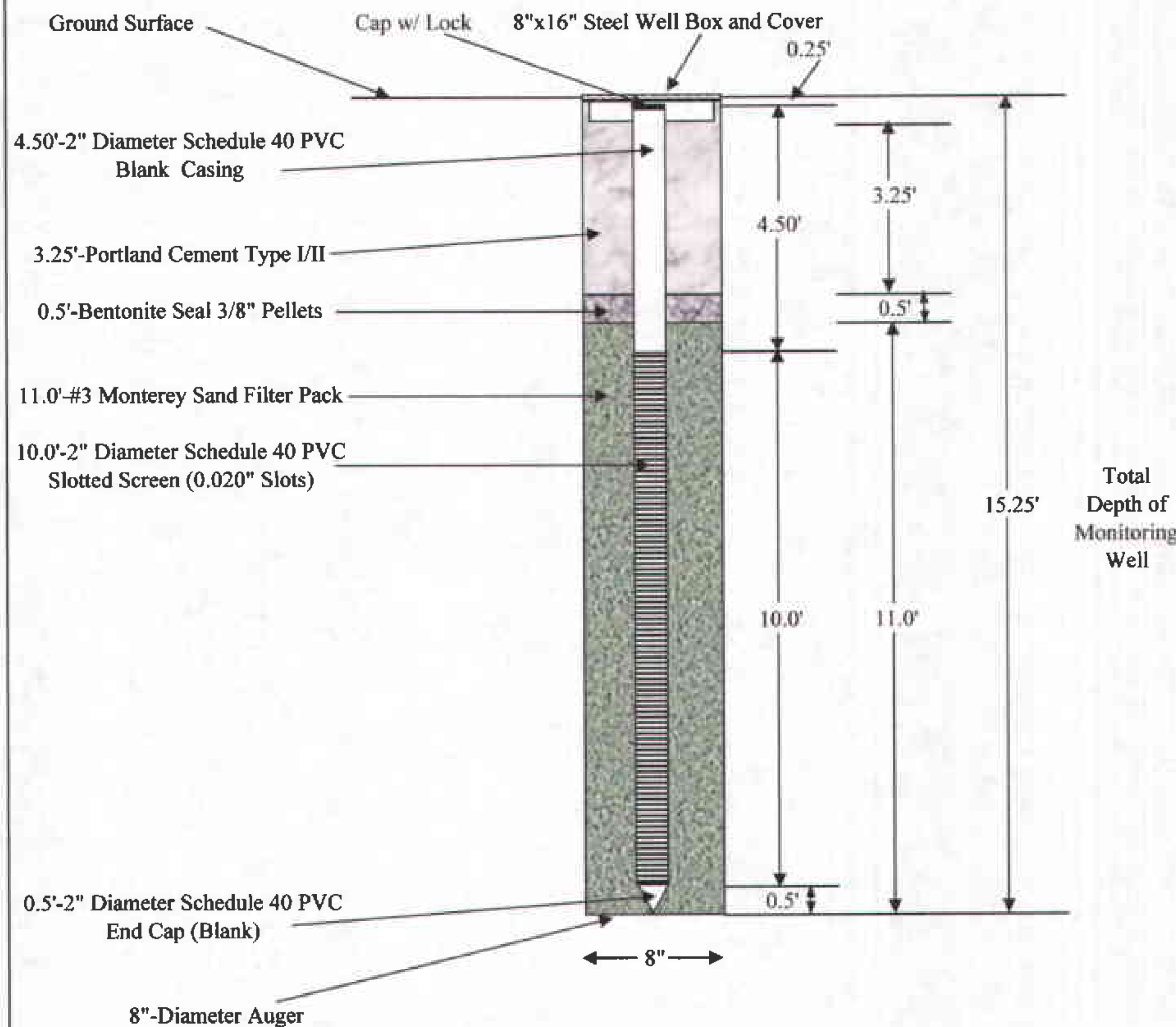


Figure 3-12
Schematic Diagram Monitoring Well
MW-12
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

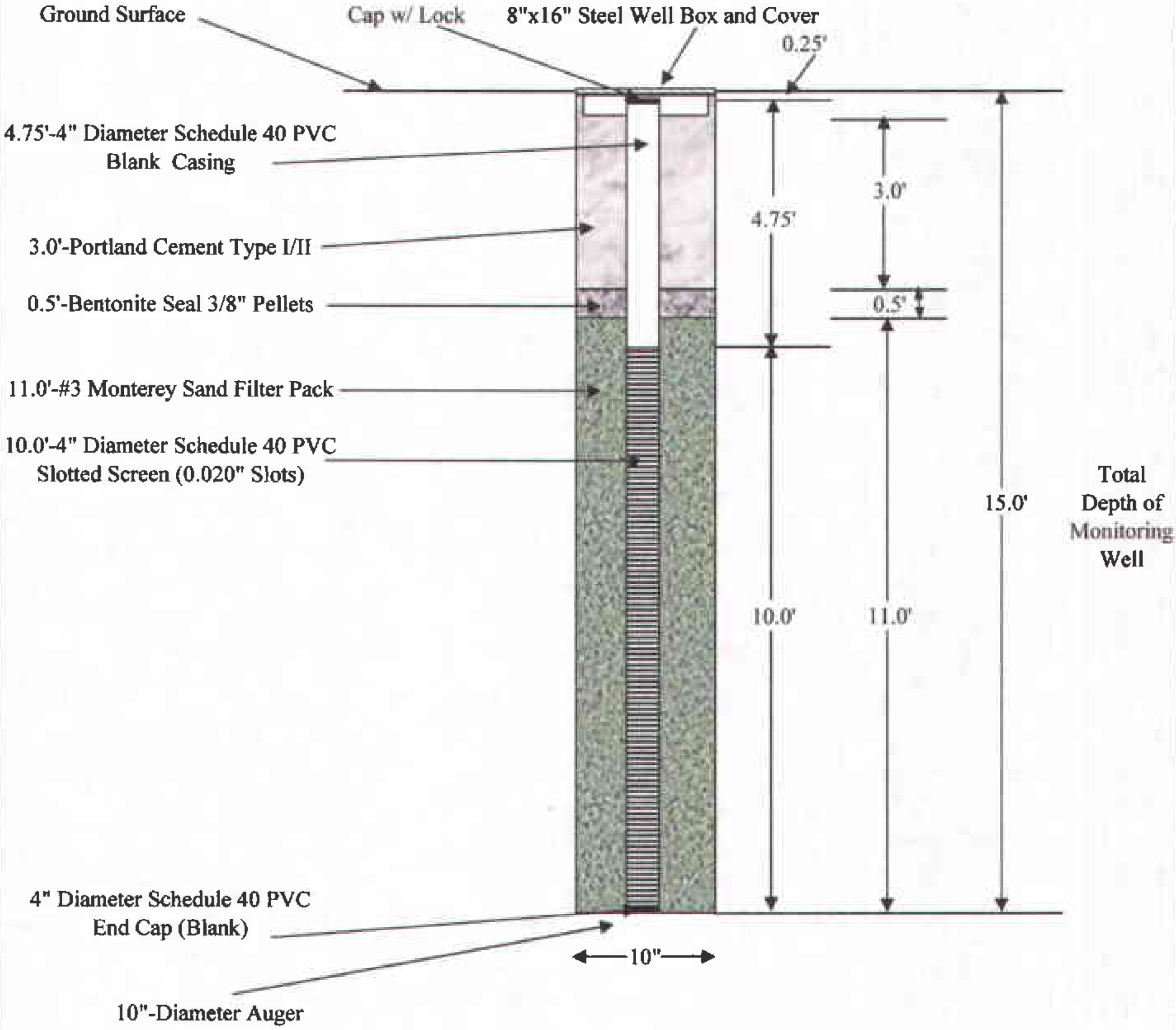


Figure 3-13
Schematic Diagram Monitoring Well
MW-13
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

APPLIED REMEDIATION COMPANY, INC.

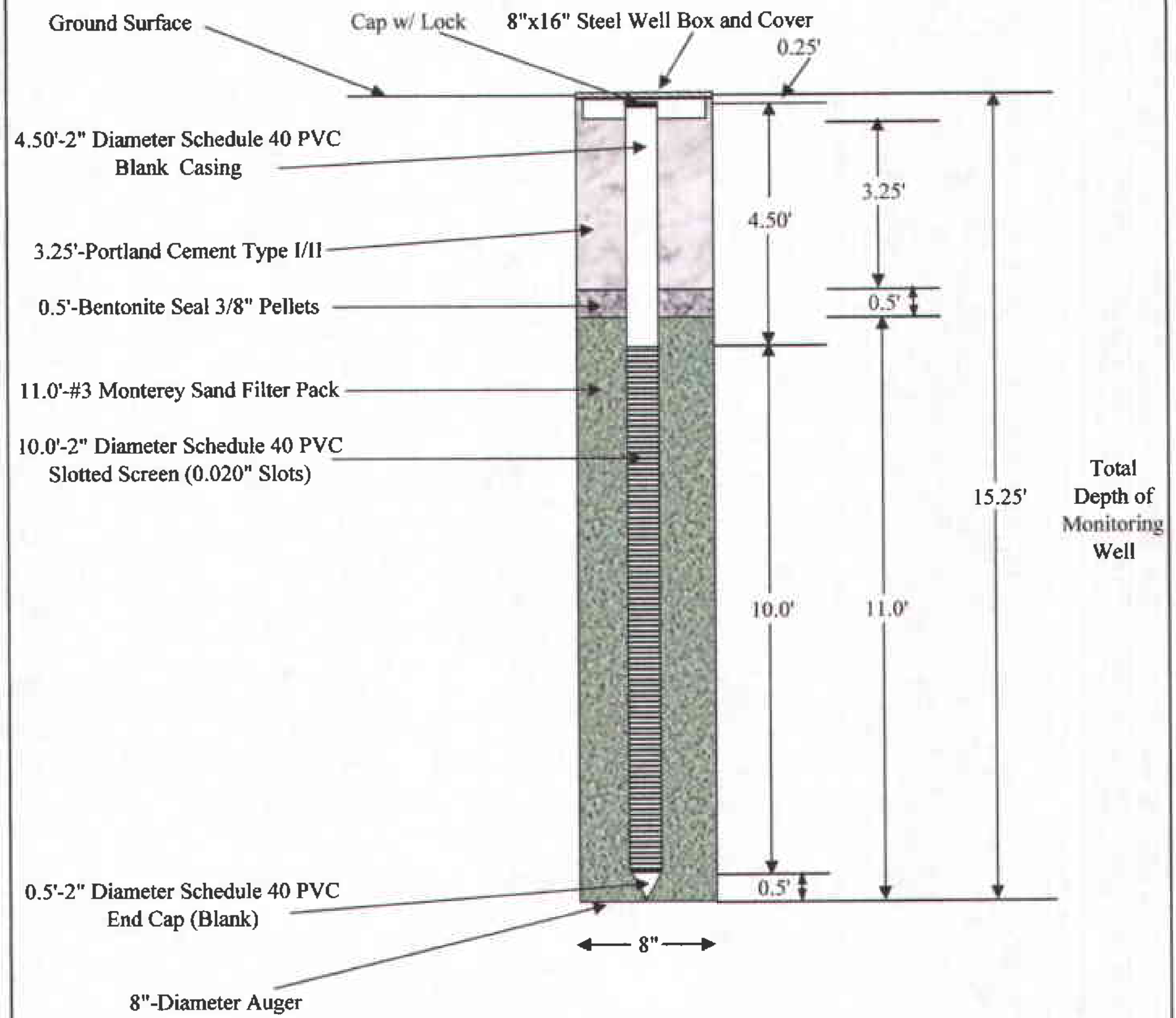


Figure 3-14
Schematic Diagram Monitoring Well
MW-14
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

APPLIED REMEDIATION COMPANY, INC.

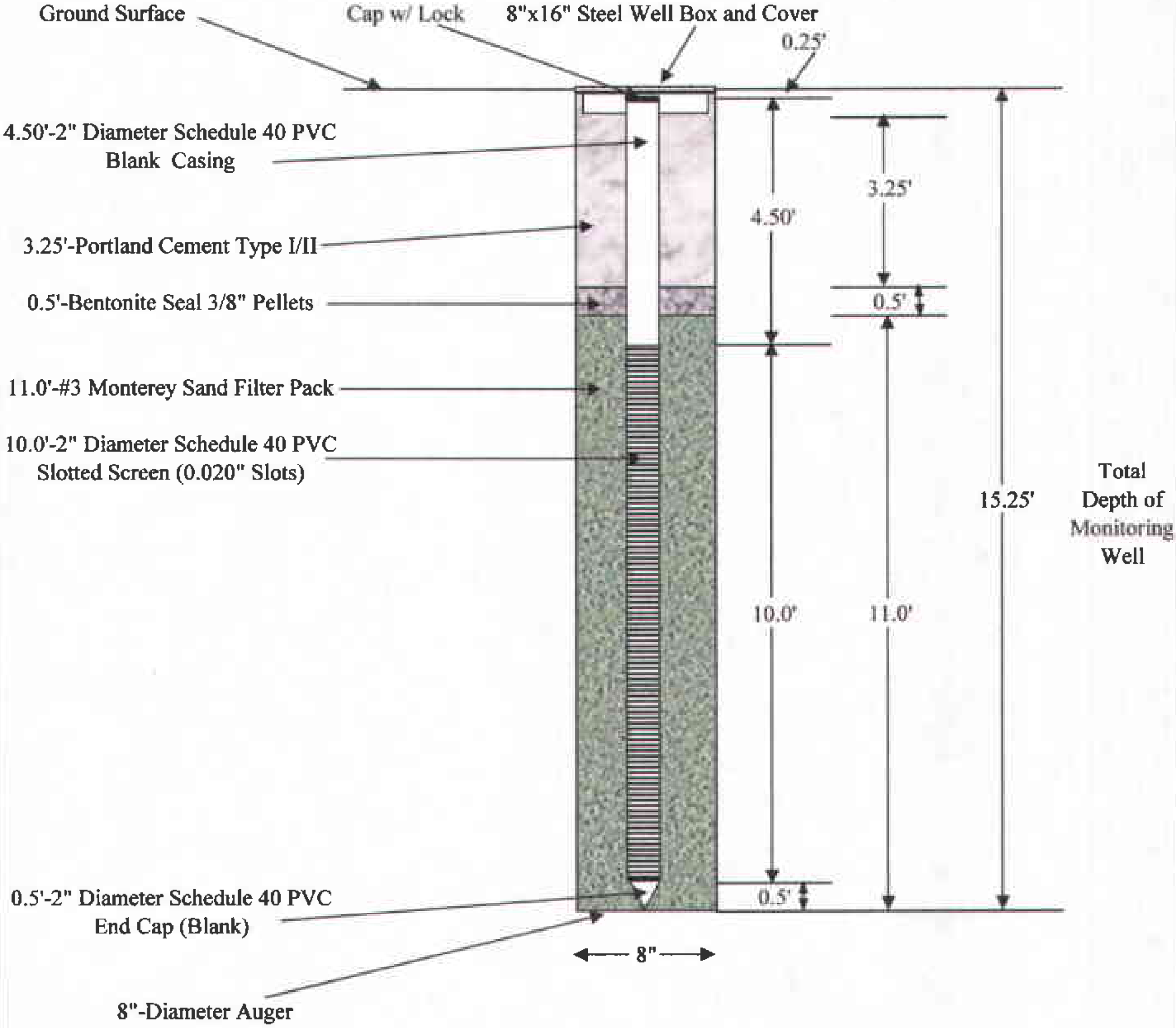


Figure 3-15
Schematic Diagram Monitoring Well
MW-15
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

APPLIED REMEDIATION COMPANY, INC.

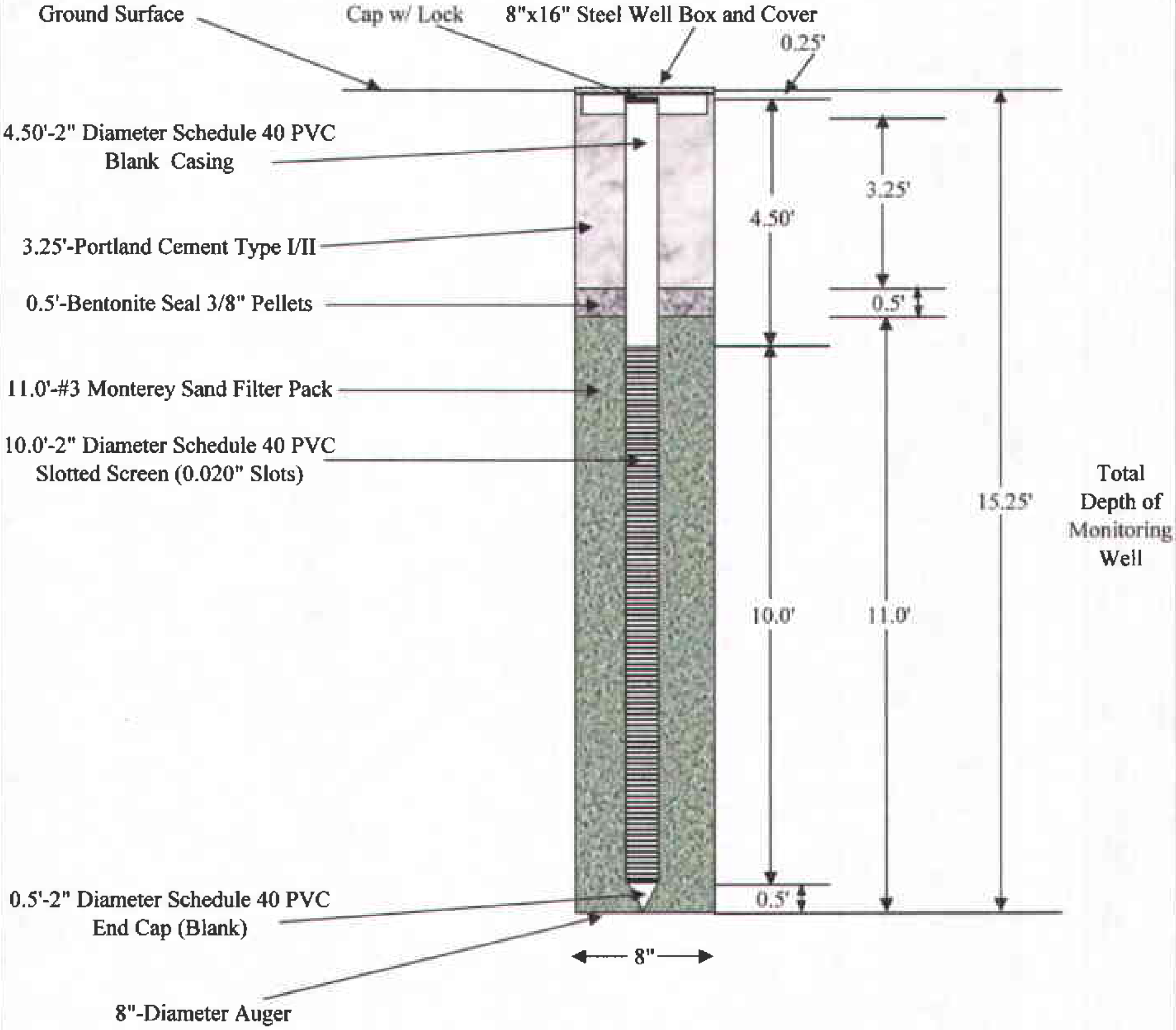


Figure 3-16
Schematic Diagram Monitoring Well
MW-16
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

APPLIED REMEDIATION COMPANY, INC.

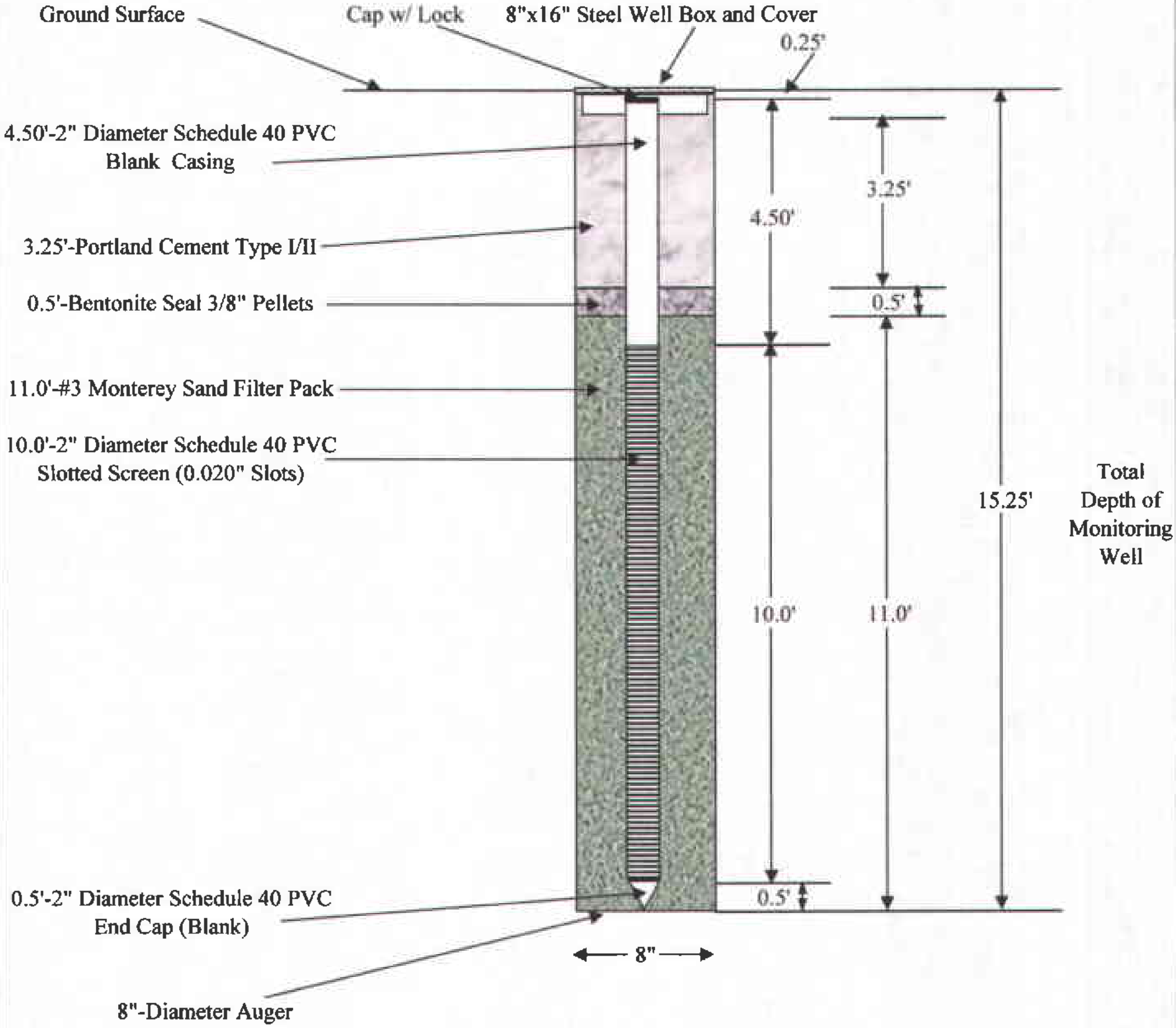


Figure 3-17
Schematic Diagram Monitoring Well
MW-17
Rolls-Royce Engine Services Test Cell Facility
6701 Earhart Road
Oakland, CA 94621
Drawn by: BOO

3.5.4 SOIL SAMPLING, HANDLING AND PRESERVATION

An unsaturated soil sample will be collected from each groundwater monitoring well borehole with a split spoon sampler at a depth of between 1 to 5 feet bgs or any depth within the limit with obvious signs of contamination or with elevated PID readings. Each soil sample may have to be hand packed in a brass tube.

Other soil samples will be collected at different intervals for geologic loggings. Continuous core logging of the fourteen monitoring well boreholes will be conducted to identify the site stratigraphy and assess potential pathways. A potable Photo Ionization Detector (PID) to quantitatively determine the presence of volatile organic compounds (VOCs) and to accurately confirm where to sample will be used during the soil sample collections. PID readings at each sampling depth will be recorded for each monitoring well borehole. All the soil samples in brass tubes will be labeled and recorded in chain-of-custody (COC) records and each brass tube wrapped in a Ziploc bag. All the soil samples will be maintained in an ice chest at 4 ^{0}C pending the chemical analyses that will performed within 14 days of each soil sample collection.

3.5.5 MONITORING WELL DEVELOPMENT

Each grout of the fourteen newly installed groundwater monitoring wells will be allowed to settle properly for at least 72 hours before the monitoring well's development and after recording the water levels. Approximately 10 casing volumes of groundwater will be removed from each monitoring well and stored in 55-gallon open top DOT-17H approved drums. Each monitoring well will be purged using a pre-cleaned bailer until temperature, pH and conductivity reading stabilize and the amount of turbidity of the monitoring well has decreased (most of the sediments have been removed) and also after removing at least 10 casing volumes of water.

Several gallons of groundwater will be bailed out from the fourteen groundwater monitoring wells. The developed groundwaterwater will be stored on-site in 55-gallon open top DOT-17H approved drums and disposed of by RRESO.

3.5.6 MONITORING WELL SAMPLING

Approximately 72 hours will be allowed to elapse after each of the fourteen groundwater monitoring wells has been developed before it will be monitored, purged and sampled. All the fourteen new groundwater monitoring wells will be monitored, purged and sampled. The water level measurements of each of the fourteen new monitoring wells will be taken for use in determining the hydraulic gradient of the site. Before taking the water level measurements from each monitoring well, the well's end cap with lock will be removed and the groundwater in the monitoring well allowed to stabilize for at least thirty minutes.

First, the depth to water level of each monitoring will be determined using a Solinst model number 121 interface meter. Then, a dedicated clear plastic bailer will be lowered into each of the monitoring wells and a water sample obtained to see if there is any floating product in the water.

The first water sample from each monitoring well will be field-inspected for the presence of odor and sheen. Any obvious findings will be documented in a sampling log data sheet and be included in the final report.

Each monitoring well will be purged of 10 casing volumes of water. After removing each casing volume of water from each monitoring well, temperature, electrical conductivity and pH of the water will be measured to check for the stabilization of the flowing water. After the removal of the tenth casing volume of water from each of the new monitoring wells, each well will be sampled and groundwater samples for chemical analysis collected using a clean clear plastic bailer and placed in either 40 mL clear glass vials (TPH-g/BTE&X/MTBE) and 8 oz amber bottles (diesel, jet-A-fuel and motor oil) respectively. A duplicate water sample may be collected for each type of analysis.

All the water sample containers will be labeled with site name, project number, sample identification number, time and date sample is collected and type of analysis, recorded in a chain of custody (COC) record and wrapped in Ziploc bags. All the wrapped water sample containers will be kept in an ice chest at 4 ^{0}C and later transported to a California State Certified Environmental Laboratory. Several gallons of groundwater will be purged from the thirteen-groundwater monitoring wells and will be stored in several 55-gallon open top DOT-17H approved drums and the volume of water purged noted in a sampling log data sheet.

3.5.7 GROUNDWATER SAMPLES LABORATORY ANALYSES

The groundwater samples that are collected for chemical analysis will be analyzed for TPH-d w/si-gel standard cleanup/TPH-jet-A-fuel/TPH-motor oil/TPH-g using EPA Methods 8015B. Each of the groundwater samples will also be analyzed for BTE&X/MTBE using EPA Method 8260B.

Hard copies of the analytical results as received from the laboratory will be included in the final report. The laboratory results will provide brief sample descriptions, date samples were collected, received, analyzed and reported, and the minimum detection limits. The EDF data produced by the State Certified Laboratory will be uploaded to the State Geotracker Database. A copy of AB2886 Electronic Delivery Submittal Report will also be included in the final report.

3.6 REACTIVATION OF EXISTING GROUNDWATER MONITORING WELLS

The three existing on-site groundwater monitoring wells (two along Earhart Road (MW-1 and MW-2) and one in the southwest corner of the Test Cell facility (MW-3)) were installed on March 29, 1996 by EMC to ensure that the jet-A-fuel plume due to the 1992 jet fuel release was stable and not migrating towards the tidal marsh to the east. The monitoring wells were sampled annually in 1996 through 1998. Initial concentrations of jet-A-fuel and diesel detected in 1996 diminished and were not detected by 1998.

The last groundwater monitoring report was provided in mid-1998. The groundwater sample analytical results in the report indicated no detectable levels of jet-A-fuel from the 1992 release and a case closure was requested then. Since mid-1998, the three monitoring wells had not been monitored and need to be included in the new groundwater monitoring program.

In order to reactivate the monitoring wells, each well condition will be checked (check well box and cover and surroundings). Each of the three groundwater monitoring water level measurements will be taken and recorded. ARCI will purge at least twenty casing volumes of groundwater from each well. This volume will be enough to remove all the sediments that have accumulated in each monitoring well since 1998. The several gallons of groundwater that will be removed will be stored in 55-gallon open top DOT approved drums. Each well will be purged using a pre-cleaned bailer until temperature, pH, and conductivity readings stabilize and the amount of turbidity of the well has decreased.

3.6.1 SAMPLE COLLECTIONS

Groundwater samples for TPH-g/BTE&X/MTBE (VOCs) and diesel, jet-A-fuel and motor oil from each monitoring well will be collected immediately after purging the last casing volume of water in 40 mL Amber glass vials and 8 oz Amber bottles using a dedicated bailer. All the groundwater sample containers will be labeled and recorded in a chain-of-custody (COC) record and the containers wrapped in Ziploc bags. All the wrapped water sample containers will be kept in an ice chest at 4 ^{0}C and will be transported to a State of California Certified Laboratory under those conditions with the COC record.

The groundwater samples will be analyzed for TPH-d/TPH-g/TPH-jet-A-fuel/TPH-motor oil using EPA Method 8015B. The same groundwater samples will also be analyzed for benzene, toluene, ethyl benzene and total xylenes (BTE&X) and methyl tertiary butyl ether (MTBE) using EPA Method 8260B.

3.6.2 WASTE DRUM DISPOSAL

All the purged water and rinsate generated during the well reactivation purging and sampling activities will be collected and stored in 55-gallon open top DOT-17H waste drums for off-site disposal. The waste drums will be handed over to RRESO Environmental for proper disposal.

3.6.3 PREPARATION OF BRIEF REPORT

At the end of the three on-site monitoring well reactivation activities, a brief report will be submitted to RRESO. This report will be part of the final technical report, which will be submitted at the end of the project. This report will be based on and will contain the appropriate technical information required by ACDEH. It will also describe all the monitoring well reactivation related activities, present the chain of custody record, the type of analytical procedures and methods used, laboratory results and disposal manifests.

3.7 SURVEY OF GROUNDWATER MONITORING WELLS

ARCI will subcontract the surveying of all the seventeen groundwater wells (MW-1, MW-2, MW-3, MW-4[1], MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16 and MW-17) including the existing three on-site monitoring wells to establish the latitude, longitude and top of casing elevations for all the wells. ARCI's technical personnel will visit the site to identify to the surveying crew the locations of all the seventeen groundwater monitoring wells, the necessary infrastructures and streets to be included in the study map as required by ACDEH.

The top of casing elevations of all the monitoring wells will be measured by a licensed land surveyor to the nearest 0.01-foot relative to Mean Sea Level (MSL) at a known City of Oakland Bench mark. The groundwater monitoring elevations will also be used for the site groundwater gradient determination. The groundwater monitoring well Geo-Well and Geo-Z data will be submitted via the internet to the GeoTracker data warehouse in the appropriate deliverable format after the licensed surveyor has prepared the survey report including the GeoTracker compliant data in accordance with SWRCB reporting.

3.8 QUARTERLY GROUNDWATER MONITORING AND REPORTING

The fourteen new and three reactivated on-site groundwater monitoring wells are necessary to monitor the extent of groundwater contamination and evaluate the effectiveness of the contaminated soil remediation and excavation pit groundwater extraction and the drainage system installation. All the on-site and off-site (MW-8 and MW-17) groundwater monitoring wells and NPORD groundwater monitoring well MW-4 will be monitored quarterly starting the first quarter after the completion of all the monitoring well installations (RRESO is currently performing semi-annual groundwater monitoring of MW-4 and surface sampling location SW-3). Groundwater elevations will be measured in all the wells during each quarterly sampling event. Groundwater samples will be collected from each well and analyzed quarterly for TPH-d/TPH-g/TPH-jet-A-fuel/TPH-motor oil using EPA Method 8015B. The groundwater samples will also be analyzed for benzene, toluene, ethyl benzene and total xylenes (BTE&X) as well as methyl tertiary butyl ether (MTBE) using EPA Method 8260B.

3.8.1 WATER LEVEL MEASUREMENT

Groundwater elevations of all the on-site groundwater monitoring wells (MW-1, MW-2, MW-3, MW-4[1], MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-16 and MW-17) and NPORD monitoring well MW-4 will be measured during each quarterly sampling event by first removing all the groundwater monitoring wells' end caps with locks and taking groundwater elevations with depth probe on the same day. Any free-floating product thickness prior to purging each well, will be measured and confirmed by observing a clear plastic bailer sample of the groundwater in the upper 1-foot of groundwater in the bailer from each of the groundwater monitoring wells.

3.8.2 WELL PURGING

Each groundwater monitoring well will be purged using a dedicated clear plastic bailer. Each well will be checked for the presence of free-floating product. The equivalent of at least four casing volumes of groundwater will be pumped or bailed out from each of the wells. Should any of the monitoring wells run dry during purging; a weighted bailer will be used to remove the high sediments. After the removal of the estimated amount of groundwater (four casing volumes), the amount of groundwater removed will be noted in a well purging/sampling log data sheet and included in the quarterly monitoring report. Each casing volume of groundwater purged will be collected in 5 gallon buckets and finally stored in 55-gallon open top DOT-17H waste drums for proper disposal by RRESO.

3.8.3 WELL RECOVERY RATE

After purging the last casing volume of water from each of the groundwater monitoring wells, the groundwater level in each well will be measured with a depth probe. The water level in each of the wells will again be measured at a predetermined time after termination of each purging. The water level measurements will be used to determine the recovery rates by dividing change in water level by change in time. The well recovery rate of each monitoring well will be recorded in the sampling log data sheet and included in the quarterly monitoring report.

3.8.4 SAMPLE COLLECTIONS

The groundwater samples for TPH-g/BTE&X/MTBE (VOCs) from each monitoring well will be collected immediately after purging the last casing volume of water in 40 mL Amber glass vials using a dedicated clear plastic bailer. Also the groundwater samples for TPH-d w/si-gel standard cleanup/TPH-jet-A-fuel/TPH-motor oil will be collected immediately after purging the last casing volume of water in 8 oz Amber bottles. All the groundwater sample containers with labeled with site name, project number, sample identification number, time and date sample is collected and type of analysis, recorded in chain-of-custody (COC) record and wrapped in Ziploc bag. All the wrapped water sample containers will be kept in an ice chest at 4 ^{0}C and transported to a State of California Certified Laboratory for chemical analysis under those conditions with COC records. All the VOC samples will be preserved in HCl. The 8 oz Amber bottles for diesel, jet-A-fuel and motor oil samples will not be preserved.

3.8.5 EQUIPMENT DECONTAMINATION

After purging and sampling each well, the depth probe, bailer and rope, pH, conductivity, turbidity and temperature meters that will come into contact with the contaminated groundwater will be decontaminated on-site using non-phosphate detergent and purified water. All the rinsate generated during the equipment decontamination will also be stored in the same 55-gallon open top DOT-17H waste drums.

3.8.6 WASTE DRUM DISPOSAL

All the purged groundwater and rinsate generated during each quarterly purging and sampling activities will be collected and stored in several 55-gallon open top DOT-17H waste drums for proper off-site disposal by RRESO at the end of each quarter.

3.8.7 LABORATORY ANALYSIS

A California State Certified Laboratory will analyze the groundwater samples from MW-1, MW-2 and MW-3, MW-4[1], MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-13, MW-14, MW-15, MW-16, MW-17, NPORD monitoring well MW-4 and surface water sampling location SW-3 for TPH-g/TPH-d w/si-gel standard cleanup/TPH-jet-A-fuel/TPH-motor oil and BTE&X/MTBE using EPA Methods 8015B/8260B respectively.

3.8.8 PREPARATION AND SUBMISSION OF QUARTERLY MONITORING REPORTS

Each groundwater monitoring event report will be submitted to ACDEH and Port of Oakland no later than 30 days following end of the sampling event. The first required groundwater monitoring event report for this site will be due at the end of the first quarter following the installation of the fourteen groundwater monitoring wells. Additional sampling event reports will comply with the schedule in Table 3-5.

The sampling event monitoring report will provide technical interpretation of the groundwater data, describe relevant work (site investigation, interim remedial measures) completed during the reporting period, any significant increases in contaminant concentrations since the last report, conclusions and recommendations for future action.

TABLE 3-5: QUARTERLY MONITORING REPORT SCHEDULE

Quarter	Months Covered	Report Due Date
First Quarter	January, February, March	April 30th
Second Quarter	April, May, June	July 31st
Third Quarter	July, August, September	October 30th

TABLE 3-5: QUARTERLY MONITORING REPORT SCHEDULE (cont')

Quarter	Months Covered	Report Due Date
Fourth Quarter	October, November, December	January 31st

The quarterly report will include:

- **Transmittal Letter:** This transmittal letter will discuss any violations during the reporting period and actions taken or planned to correct the problem. RRESO duly authorized representative will sign this letter.
- **Groundwater Elevations:** Water table elevation data will be presented in tabular form, with depth to water level, top of casing elevations, depths to top of well screens, length of well screens and total depth for each well included in the monitoring program. For all the groundwater monitoring wells containing free-floating petroleum product (light non-aqueous phase liquids or LNAPL), the measured thickness of LNAPL will also be presented in a tabular form. A groundwater elevation map should be prepared for each monitored water-bearing zone with the groundwater flow direction and calculated gradient (s) clearly indicated in the figure (s). The historical groundwater elevations will be included in the fourth quarterly report each year. Sampling data and groundwater elevation data will be submitted via the internet to the GeoTracker data warehouse in the appropriate electronic deliverable format according to the quarterly monitoring report schedule.
- **Reporting Groundwater Results**: Groundwater sampling data will be presented in tabular form and a site map which clearly illustrates the locations of monitoring wells, former/current underground storage tank systems (and product piping) and buildings located on-site and immediately adjacent to the property lines of the site will also be included.

4.0 PREPARATION AND SUBMISSION OF PROJECT FINAL TECHNICAL REPORT

After the end of the current project, ARCI will submit a draft technical report for RRESO's review and will submit the final copies of the report to RRESO, Port of Oakland and ACDEH. The draft technical report will be based on and will contain the appropriate technical information required by ACDEH. The final technical report will also describe all the project related activities, present the chain-of-custody (COC) records, the type of analytical procedures and methods used, laboratory results and bill of lading/manifests.

5.0 PROJECT ORGANIZATION

Mr. Dave Goldberg will be the main client contact. He will be constantly kept informed on the status of the project.

Mr. Briggs O. Ogamba, P.E. will be the project manager for ARCI with an overall technical and financial control of the project. He will be the key contact with RRESO. Mr. Briggs O. Ogamba, P.E. and Dr. George B. Matanga, Ph.D., P.E., the responsible engineer will direct all the construction, soil and groundwater remediation and drilling operations and will be supported by Mr. Mark A. Mestressat, a staff geologist. Dr. George B. Matanga, Ph.D., P.E. the Peer Reviewer will review all the reports.

Dr. George B. Matanga, Ph.D., P.E. will be responsible for all QC/QA functions and will act as Peer Reviewer throughout this project. Mr. Mark A. Mestressat the Staff Geologist will be responsible for all the on-site Health and Safety activities. Mr. Cesar Olmos with Olmos Excavating will be the excavation subcontractor.

Mr. Mark A. Mestressat will also be responsible for all the soil and groundwater collection activities and will also be supported by Mr. Miguel Plata. Gregg Drilling & Testing, Inc will be the licensed C-57 subcontractor on-site. Our staff geologist, Mr. Mark A. Mestressat and the project manager Mr. Briggs O. Ogamba, P.E as well as George B. Matanga, Ph.D, P.E will also be responsible for other project related activities. Briggs O. Ogamba, P.E., George B. Matanga, Ph.D., and Mark A. Mestressat will perform all the data reduction and evaluation. Some of the key personnel that will be involved in this project are presented in Figure 5-1. The resumes of some of the key personnel are presented in Appendix A.

5.1 MANAGEMENT APPROACH

ARCI selected team members will bring the following strengths to the project:

- Outstanding experience in soil and groundwater remediation and remedial investigations including contaminated soil over-excavation, groundwater remediation, soil and groundwater sampling and handling activities.

- Excellent experience in monitoring well installation, soil boring drilling, quarterly groundwater and reporting, contaminated soil and groundwater remediation and other soil and groundwater treatment measures.

- Experience in handling leaking underground fuel tank related projects.

- Substantial experience directly related to all areas of soil and groundwater investigation and remediation projects.

- Excellent experience in construction stormwater drainage systems.

APPLIED REMEDIATION COMPANY, INC.

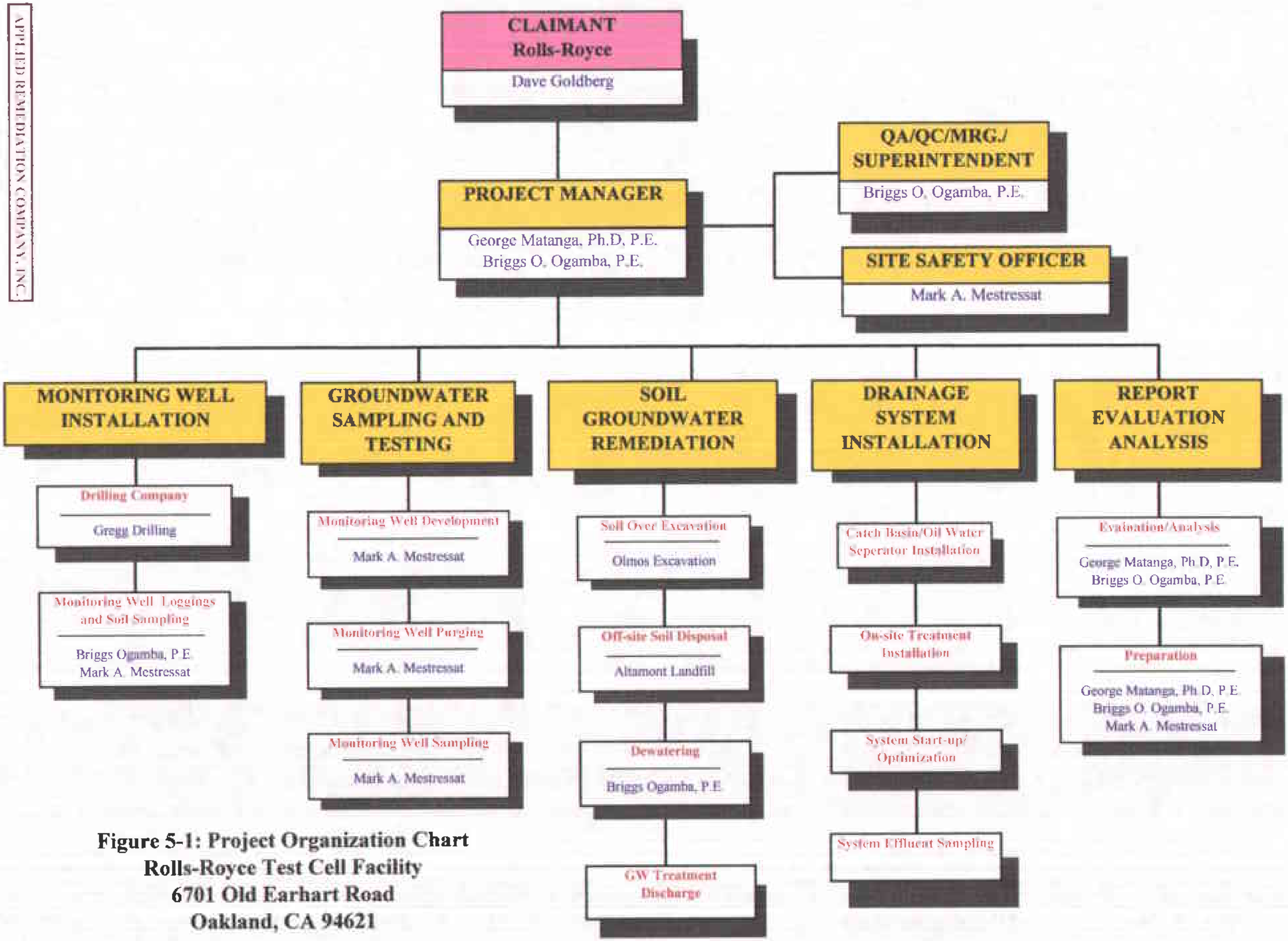


Figure 5-1: Project Organization Chart
Rolls-Royce Test Cell Facility
6701 Old Earhart Road
Oakland, CA 94621

- Special experience and expertise in managing projects involving similar environmental issues.

- Excellent knowledge of the local geology.

ARCI employs many professionals experienced in Underground Storage Tank (UST) Support Services, design and construction, and management of site investigation and remediation projects. ARCI can use its experience to maintain the smooth operation of this project and keep unforeseen problems to a minimum.

5.2 TENTATIVE PROJECT SCHEDULE

A copy of this Work Plan will be submitted to Port of Oakland on October 20, 2006. Date for subsequent submittal of the Work Plan to ACDEH will be determined. We expect the acquisitions of all permits and licenses including Access Agreement to be completed after getting approval from ACDEH. Procurement of all equipment lead items will start after the approval of the Work Plan by ACDEH and award of the contract by RRESO. Start of all the phases of construct activities will be determined by RRESO. Preparation of Draft Technical report for the entire project will start after the installation of all the fourteen monitoring wells and all the construction activities. All the milestones and the tentative schedule are illustrated in Figure 5-2.

6.0 SITE SAFETY PLAN

ARCI, in performing projects involving hazardous waste materials, and related construction activities as a policy, develops Site-Specific Health and Safety Protocols. Such protocols are normally approved by a Site Safety Manager and made available to all the personnel and subcontractors who are actively involved in the performance of the contract. The typical project protocols normally include the following:

- Site-specific control measures to assure protection of personnel and the general public.

- Training requirements (the project protocol is always a requirement).

- Engineering controls and procedures to assure personnel safety during project operation.

- Monitoring schedules.

- Listing hazardous materials including quantities to be used or stored in the facility.

- Procedures for handling, transporting, labeling and disposing all hazardous substances as well as use of construction equipment.

- Listing of personnel involved in the project and their responsibilities.
- Project checklists.
- Decontamination procedures.
- Emergency response-Safety, Health and Emergency Response Plan (SHERP).

A review of all applicable regulations will be performed to ensure that the SHERP is in compliance with federal, state, and local codes. All the personnel that will be involved in the on-site activities are certified under OSHA regulations 29 CFR1910.120 (e) Hazardous Waste Operations and Emergency Response. Prior to commencing work on-site, a training program will be developed for attendance by all on-site personnel. The training program will be tailored to the site while following OSHA standard 29 CFR 1910.120 (e). Safety meetings will be held at the site before any field daily activities, however at the moment, some of the employees at present are participating in a medical surveillance program. All subcontractors will be required to participate in the program in such a manner as to be in compliance with any contract specifications. The Title Page as well as the Signature/Approval Page is presented in section 6.1.

6.1 TITLES AND SIGNATURE/APPROVAL

This section presents the Site Safety Plan that will be adopted and followed by all the ARCI's employees working in this project. By the signatures below, ARCI assumes the overall responsibility for the plan.

PROJECT SITE SAFETY PLAN (SSP)

Briggs O. Ogamba, P.E., Project Manager — Date: 10/20/06

George B. Matanga, Ph.D., P.E., Reviewer — Date

Mark A. Mestressat, Staff Geologist and HSO — Date: 10/20/06

6.2 RESPONSIBILITIES AND ORGANIZATION

The project manager for this project is Mr. Briggs O. Ogamba, P.E. The designated Peer Reviewer is Dr. George B. Matanga, Ph.D., P.E. The designated Site Safety Officer is Mr. Mark A. Mestressat. In the event that Mr. Mark A. Mestrssat is not available on site, the Alternate Site Safety Officer is Mr. Miguel A. Plata. Mr. Plata will support all the related construction and borehole grouting activities. Mr. Mark A. Mestressat is the designated soil and groundwater sampler. The above personnel are assigned the above responsibilities in addition to those in section 6.0.

It is the responsibility of the Site Safety Officer to review the Site Safety Plan with ARCI's personnel or any sub-contractor before any work can begin on any scheduled day of work at a job site. The Site Safety Officer will inform the on-site construction crew and associated personnel the locations of fire extinguishers.

The Site Safety Officer must also be notified before placement of warning signs. The Site Safety Officer must be in compliance with certain contractual requirements before these activities can take place. The Site Safety officer will be responsible for assuring the safety and timely packaging, handling, profiling, storage and disposal for any hazardous waste generated by this project.

The Site Safety Officer will also communicate with the property owner on concerns of safety regarding the protection of personnel, property and the environment.

6.3 MEDICAL AND TRAINING STATUS

ARCI's personnel have all been trained in compliance with the requirement of OSHA regulation 29 CFR 1910.120 (e). Some of ARCI's employees or sub-contractors must obtain the OSHA training and meet the requirements specified in the regulation in order to be allowed to work on any of our field projects.

6.4 GENERAL SAFETY, CONTINGENCY PLANS: FIRE CONTROL, SPILL CONTROL, ACCIDENTS AND ACCIDENT REPORTING

In order to protect the personnel, property and the environment, certain precautions must be taken before any work can begin at any job site.

When working with heavy pieces of machinery or heavy parts in excess of 80 pounds, a mechanical lifting device such as forklift, hoist or something other than one person can lift, must be used.

When working with electrical components, for anything except normal operation or inspection, the proper lock-out and tag-out procedures must be utilized.

When working around moving mechanical parts, for anything other than normal inspection or operation, the proper lockout and tag-out procedures must be utilized.

There will be no eating, drinking or smoking allowed in the work areas, pump locations or other areas that are not designated specifically for this purpose.

Site Safety and control is not only the responsibility of the Site Safety Officer, however, any one who has knowledge of any specific hazard in any work area should immediately report such a hazard to the Site Safety Officer. When any employee on the job site determines that a hazard may exist, it is the employee's responsibility to report such a hazard to the Site Safety Officer as well as all the employees working at the site. Personnel Protection Equipment will be used as specified by the Site Safety Officer, or whenever a person working in the field determines the use of such equipment is necessary in performing specific tasks.

The equipment that will be made available for use on this project is not limited. If it becomes obvious that a specific piece of equipment is needed and is not readily available, work will proceed only if it is determined to be safe and that the correct equipment to be used on-site has been obtained.

The following is a list of the Safety Equipment that will be available on the job site while all the field activities are taking place:

- Hard Hat
- Safety Glasses or Face Shield
- Gloves, suited to task being performed, leather work gloves for cut and abrasion resistance
- PVC, neoprene or nitrite gloves for handling solids and liquids
- Steel toe, Steel shank work boots, which offer ankle support
- Fire Extinguisher (ABC Type)
- Emergency Eye Wash Station will be available for use at all times during project
- First Aid Kit

7.0 REFERENCES

Kleinfelder, Inc., August 23, 2002, "Report of Supplemental Site Investigation", Rolls-Royce Engine Services-Oakland Inc., Test Cell Facility, 6701 Old Earhart Road, Oakland, California 94621.

David D. Cooke, January 13, 2006, Allen Matkins Leck Gamble & Mallory LLP, Attorney at Law, "Letter to Christine K. Noma, Esq., follow up letter on meeting on December 9, 2005 at Port of Oakland ("Port") Offices".

EMC, April 19, 1996, "Groundwater Investigation ", Test Cell Facility, 6701 Earhart Road, Oakland, California 94621.

Golder Associates Inc., June 27, 1990, "Final Report, Solid Waste Assessment" Test For Port of Oakland, Refuse Disposal Site.

ETIC Engineering, October 21, 2005, "Second Quarter 2005, Monitoring Report", North Port of Oakland Refuse Disposal Site, Port of Oakland, 530 Water Street, Oakland, California 94607.

ETIC Engineering, December 30, 2005, "Third Quarter 2005, Monitoring Report", North Port of Oakland Refuse Disposal Site, Port of Oakland, 530 Water Street, Oakland, California 94607.

ETIC Engineering, December 30, 2005, "Fourth Quarter 2005, Monitoring Report", North Port of Oakland Refuse Disposal Site, Port of Oakland, 530 Water Street, Oakland, California 94607.

RWQCB, February 18, 2005, "Screening For Environmental Concerns At Sites With Contaminated Soil and Groundwater, Volume 1: Summary Tier 1 Lookup Tables", Interim Final.

8.0 LIMITATIONS

ARCI warrants that its services are performed within the limits prescribed by its **CLIENTS**, with the usual thoroughness and competence of the engineering profession. No other warranty or representation, wither expressed or implied, is included in any of its work plans, reports, proposals or contracts.

ARCI will not be liable for damages or injury arising from damage to subterranean structures (pipes, tanks, telephones, cables and etc), which are not called to its attention and currently shown on the plans furnished to the company, in connection with the work that it performs.

ARCI is being engaged to render professional environmental consulting and construction related services involving hazardous materials. It will be compensated largely on the basis of time required in rendering these services not on the basis of potential legal liabilities created by risks associated with hazardous materials.

Several thousand chemicals, wastes and other materials have been designated as hazardous or toxic materials by several laws and regulations. If retained as in this case to remediate contaminated soil and groundwater and install groundwater monitoring wells or cleanup with respect to such materials, ARCI will direct its efforts at locating the most significant sources, or potential sources, of such materials with potential from the most significant impact. For remediation, ARCI will continue a cleanup until the concentrations of contaminants of concern have reached levels that are acceptable to the local enforcement agency (LEA) in this case, ACDEH.

ARCI's liability to **CLIENT** for injury or damage to persons or property arising out of work performed for **CLIENT** and for which legal liability may be found to rest upon ARCI, other than for professional errors and omissions, will be limited to its general liability insurance coverage maximum limit.

For any damage on account of any error, omissions, or other professional and construction related negligence, ARCI's liability will be limited to a sum not to exceed its fees. **CLIENTS** shall indemnify ARCI against any claims or costs, which exceed the limit on ARCI's liability provided in its insurance coverage, or results from acts of omissions of **CLIENTS**. This Work Plan for soil remediation and installation of additional groundwater monitoring wells was prepared in accordance with accepted professional standards and technical procedures as certified above.

APPENDIX A-RESUMES OF KEY PERSONNEL

BRIGGS O. OGAMBA, P.E.

- Remediation
- Chemical Engineering
- Hazardous Waste Management

Education

- B.S. Chemical Engineering, San Jose State University, San Jose, California, 1978.
- M.A. Management with Emphasis in Business Administration, University of Redlands, California, 1982.

Professional Registration/Certification

- Registered Professional Engineer (Chemical Engineering), State of California, 1983.

Professional History

Applied Remediation Company, President and Principal Engineer, 1989-Present.

Accurex Corporation, Project Manager, 1988-1989.

Groundwater Technology, Inc., District Engineering Manager, 1987-1988.

MATSCO/General Electric Company, Project Engineer, 1979-1987.

Professional Experience

Mr. Ogamba has a great experience in all phases of groundwater, soil, and air remediations including remedial action systems alternative evaluations, design, installation, start-up and optimization, and supervision of operation and maintenance of the treatment systems. He has extensive experience in the design of industrial waste minimization and air pollution control systems. Mr. Ogamba has designed and managed several on-site contaminated soil clean-ups using feasible Bioremediation methods. Most of the soils were contaminated with diesel and gasoline. He is also excellent in the design and project management of remedial action systems for removal of volatile organic compounds(VOCs), semi-volatile organics and heavy metals. He has extensive knowledge in permit acquisitions and negotiations with different regulatory agencies on permitting of new treatment systems.

Mr. Ogamba has extensive experience in management of leaking underground fuel tank(LUFT) projects involving underground storage tank surveys, corrective action assessments, excavations, removals and disposal. In several LUFT projects where contaminations occurred, he was responsible for the remedial investigations for the complete soil and groundwater remediations. Mr. Ogamba has several years of experience in management of hazardous waste sites and is familiar with RCRA and CERCLA requirements.

As a District Engineering Manager, Mr. Ogamba was responsible for the technical quality, schedule and cost performance of all groundwater remediation, industrial waste minimization and other engineering related projects. He also supervised the operations and maintenance phases of many of the projects in conjunction with direct project management in GTI's Concord, California District Office. The responsibilities included placing and training engineers in the Concord office. He was also responsible for designing groundwater and industrial wastewater treatment systems for treating VOCs and inorganic contaminants. These equipment included air stripping towers, carbon absorption systems, oil-water separators, catalytic incinerators, subsurface vapor extraction systems and biofouling and scaling treatment systems.

Some of Mr. Ogamba's recent projects are summarized below:

- Started and developed remediation business for Acurex Corporation. Wrote and prepared cost estimates for all soil, groundwater, and air remediation projects. His excellent technical and costing skills assured all his proposals more than 70 percent winning probability. Working for owners of soil and groundwater contaminated site in San Jose, under the requirements of clean-up and Abatement order (CAO), issued by the Regional Water Quality Control Board(RWQCB), Mr. Ogamba conducted extensive characterization of soil and groundwater contamination and installed the interim soil and groundwater remedial measures for the site that met the RWQCB's requirements including suspension of all enforcement actions.

- Working with a major solid fuel propellant manufacturer with site contaminated with TCE, TCA, DCA, and Freon-11, Mr. Ogamba reviewed all the investigative work performed by previous consultants and recommended potential remedial alternatives to clean-up site. Currently, clean-up efforts are continuing at the site based on the phase I site assessment report.

- He investigated three leaking 25,000 underground fuel tanks. He supervised the excavation and disposal of the tanks, sampled the soils and prepared the closure plans. In one of the sites, the laboratory results prompted the removal and treatment of 3,000 cubic yards on-site. In the same project, monitoring activities were instituted for the client to assess aquifer characteristics.

- As a project manager for an EPA-Air Force sponsored project, Mr. Ogamba evaluated several innovative volatile organic compounds control technologies that would reduce or eliminate emissions from a typical U.S. Air Force paint spray booth. He selected and supervised the pilot test conducted on the control units at McClellan Air Force Base.

- For a paper mill company, Mr. Ogamba supervised the preliminary investigation to determine the extent of contamination. The tasks continued with on-site and off-site groundwater assessment including the preparation of the detailed Work Plan for SCVWD and RWQCB-SFBR.

- Working with the city of Gilroy, Mr. Ogamba designed and installed a catalytic incineration system for treating air stripper and soil vapor extraction system emissions from the facility contaminated with gasoline. The 300 CFM incinerator operated successfully for more than two years.

Affiliations

- Member American Institute of Chemical Engineers(AICHE)

Publications

Ogamba, B.O., Wolbach, C.D., and Darvin, C.H. Evaluation of Innovative Volatile Organic Compounds and Hazardous Air Pollutants Emissions Control Concepts and Systems For U.S. Air Force Paint Spray Booths. Volume 1. Report For EPA Air and Engineering Research Laboratory, Research Triangle Park, North Carolina 27711.

GEORGE B. MATANGA

Education:

Ph.D., Civil Engineering, University of California, Davis, 1978.
M.S., Civil Engineering, University of California, Berkeley, 1973
B.S., Civil Engineering, CAL. State University, Sacramento, 1971

Professional Registration/Certifications

Professional Civil Engineer, State of California
Professional Hydrologist (GW), American Institute of Hydrology

Experience:

- Senior Engineer, Radian Corporation, Sacramento, Ca.,1991 to Present

- Supervising Engineer, McLaren/Hart Environmental Engineer, Rancho Cordova, Ca., 1986-1991

- Visiting Assistant Professor, Department of Agriculture Engineering, Oregon State University, Corvallis, Oregon, 1984-1986

- Visiting Research Scientist, Department of Land, Water and Air Resources, University of Ca., Davis, 1983-1984

- Senior Research Fellow, Department of Civil Engineering, University of Zimbabwe, Harare, Zimbabwe, 1982-1983

- Post Doctoral Fellow, Department of Earth Sciences, University of Waterloo, Waterloo, Canada, 1980-1082

- Civil Engineer, Ingenieuburo Dr.-Ing. Gerhard Bjornsen, Koblenz, West Germany, January 1979-December 1979

- Post Graduate Research Assistant, Department of Land, Air and Water Resources, University of Ca., Davis, Ca., 1976-1978

- Teaching Assistant, School of Engineering, University of Zambia Lusaka, Zambia, 1971-1972

- Junior Civil Engineer, Department of Highways, Bridge Section, City of New York, New York, June 1971-August 1971.

Fields of Experience

As Senior Engineer:

Projects:

- Applying analytical and numerical models in design of remediation systems at Lockheed site in Southern California and McClellan Air Force Base in Sacramento.

- Applying analytical and numerical models to evaluate contaminant transport at Chevron site in Southern California and Reynolds Metals in Sacramento.

Research:

- Continuing with development of three-dimensional stream function models.

As Supervising Engineer:

Projects:

- Evaluated ground water flow and chemical migration in an aquifer under tidal influence for an Aerospace Company in Seattle, Washington.

- Applied air models for AB 2588 compliance services to a number of companies in southern California.

- Applied numerical models in the design of well remediation system for groundwater contamination at Lockheed and Ford sites in the San Francisco Bay area.

- Developed for the U.S. Bureau of Reclamation a finite element model for evaluation of temporal variation of chemical concentration in a well discharge. The model is being used to develop plans for use of saline water in San Joaquin Valley of California. Training Bureau of Reclamation technical staff in application of the model to field problems Modifying the model to account for more realistic flow conditions encountered in the San Joaquin Valley.

- Provided Proposition 65 compliance services to a confidential southern California aerospace manufacturer. The compliance assessment involved investigating over 85 processes, involving 29 listed chemicals at 17 facilities.

- Applied a semi-analytical model to define of capture of chemicals well remediation systems on sites of a number of aerospace manufacturing and electronics companies.

- Applied the Dual Theory of Potential Head and Stream Function to determine possible chemical sources in the San Gabriel Basin of southern California.

- Evaluated hydrogeologic parameters for groundwater flow systems for two large confidential aerospace clients.

- Reviewed reports concerning groundwater pollution at a major aerospace manufacturer's facilities in Florida and Oregon.

- Designed a well remediation system at Sacramento Metropolitan Airport.

- Applied a numerical model in the design of a well remediation system for groundwater contamination at McClellan Air Force Base, and a major aerospace manufacturing facility in Sacramento, California.

- Evaluated hydrogeology at sites of a weapon-testing company and a waste management company.

Research:

- Developed a new theory of pseudopotential functions in anisotropic porous media. Pseudopotential functions are valuable in construction of solution grids for contaminant transport modeling.

- Developed a new theory of stream functions in three dimensional groundwater flow systems.

- Developed a program for construction of flow nets in three-dimensional groundwater flow systems.

- Developed a finite-element program for system functions, hydraulic head andpseudopptential functions in two-dimensional and three-dimensional groundwater flow systems.

- Developed a program based on perspective projection for plotting of contours in three-dimensional groundwater flow systems.

As Assistant Professor:

- Taught undergraduate courses in Computer Application and Computer Modeling of Agricultural Systems, and a graduate course on Groundwater Modeling.

- Continued with research of pseudopotential functions in anisotropic porous media. The pseudopotential functions have specific application in ground water contamination and clean-up of toxic wastes in the environment caused by chemical disposal.

- Engaged in a project with McLaren Environmental Engineering concerning the clean-up of toxic wastes at McClellan Air Force Base and Aerojet in Sacramento, and Hughes Properties in southern California.

As Research Scientist:

- Undertook research projects in numerical modeling of groundwater flow and chemical migration through porous media.

- Tested the new theory of pseudopotential functions in anisotropic porous media.

As Senior Research Scientist:

- Undertook research projects and taught undergraduate courses.

- Developed a new theory of pseudopotential functions in anisotropic porous media.

As Post-Doctoral Fellow:

- Participated in development of the theory of dual application of stream functions and hydraulic head.

- Applied numerical models based on stream functions and hydraulic head in analysis of chemical migration in an aquifer underlying an irrigated land in southern Alberta.

- Interfaced with Atomic Energy of Canada in evaluation of contaminant migration models that could be used in studies of nuclear waste contaminants.

As Civil Engineer:

- Primarily responsible for introduction of groundwater numerical models into the company.

- Analyzed interrelationship between surface water and groundwater in southern West Germany.

As Post-Graduate Research Assistant:

- Developed a saturated-unsaturated finite element model for groundwater flow and chemical migration.

As Teaching Assistant:

- Assist in teaching courses in structural engineering, hydraulic engineering, fluid mechanics and applied mechanics.

As Junior Civil Engineer:

- Participated in the development of a computer program for analysis of stress factors of beams under different loading.

Professional Societies

American Society of Civil Engineers
American Geophysical Union
American Institute of Hydrology
Association of Ground Water Scientists and Engineers

Publications

Matanga, G.B. and E.O. Frind, 1991, Stream Functions in Three Dimensional Groundwater Flow Systems, Water Resources Research (submitted).

Matanga, G.B., 1991. Solution Grid for Contaminant Transport Modeling, Groundwater (submitted).

Matanga, G.B., 1991, Flow Nets in Three-dimensional Ground water Flow Systems, Groundwater (submitted).

Matanga, G.B., 1988. Pseudopotential Functions in Construction of Flow Nets for Contaminant Transport, Water Resource. Res., Vol. 24, No. 4, pp. 553-560, April.

Matanga, G.B., 1988. A Finite Element Model for Capture Zones of Chemicals in Anisotropic-Heterogeneous Aquifers, Proc. HAZMACON Conf., April 507, Anaheim, California.

Frind, E.O. and G.B. Matanga, 1985. The Dual Formulation of Flow for Contaminant Transport Modeling: 1. Review of Theory and Accuracy Aspects, Water Resources Research, Vol. 21, No. 2, pp. 159-169, Feb.

Frind, E.O. G.B., Matanga, and J.A. Cherry, 1985. The Dual Formulation of Flow for Contaminant Transport Modeling: 2.

The Borden Aquifer, Water Resources Research, Vol. 21, No. 2, pp. 170-182, Feb.

Matanga, G.B. and E.O. Frind, 1981. An Evaluation of Mathematical Models for Mass Transport in Saturated-Unsaturated Porous Media, prepared for Atomic Energy of Canada, May.
Frind, E.O. and G.B. Matanga, 1981. Ground water Flow and Salt Transport in Irrigated Land in the Bow River Irrigation District, Alberta, prepared for Agriculture Alberta, Canada, July.

Matanga, G.B. and M.A. Marino, 1979. Irrigation Planning: 1. Cropping Pattern, Water Resources Research, Vol. 15, No. 3, pp. 672-678, June.

Matanga, G.B. and M.A. Marino, 1979. Irrigation Planning: 2. Water Allocation for Leaching and Irrigation Purposes, Water Resources Research, Vol. 15. No. 3, pp. 679-673, June.

Marino, M.A. and G.B. Matanga, 1978. A Galerkin-Finite Element Simulation of Solute Transport in Subsurface Drainage Systems, Proc. Second Inter Conf. on Finite Elements in Water Resources, Imperial College, London.

Matanga, G.B. and M.A. Marino, 1977. Application of Optimization and Simulation Techniques to Irrigation Management, Rep. 5003, Department of Land, Air and Water Resources, University of California, Davis.

MARK A. MESTRESSAT

- Geology/Hydrogeology
- Waste Sampling and Testing
- Site Assessment/Remedial Investigation

EDUCATION

B.S. Geology, San Jose State University, 1986.

Professional Certifications

Hazardous Waste Operations and Emergency Response-40 hr.,
Geo Line Safety Service, San Jose, CA 1990
Compliance Solution Inc., Certification of Completion-8 hr. Waste Operations and Emergency Response Refresher 29CFR 1910.120(e) 5/1/98

PROFESSIONAL HISTORY

Applied Remediation Company, Geologist, 1990-Present.
San Jose State University, San Jose, Student Assistant, 1985-1986.

REPRESENTATIVE EXPERIENCE

Mr. Mestressat has experience in groundwater remedial investigation and site assessment. He has excellent knowledge and experience in groundwater and wastewater sampling and analysis. He has experience in using ground penetrating radar, construction and maintaining various geological testing instruments.

Mr. Mestressat's recent project work includes:

- Managed installation of monitoring wells, groundwater samplings.
- Managed tank excavation project, including soil sampling, tank transportation and disposal.
- Hazardous waste collection, packaging, manifesting and labeling and review waste profile sheet regarding acceptability.
- Logged boreholes and soil samplings, sample preparation, labeling, chain of custody and shipped samples in accordance with IATA and DOT specifications, as well as performing test pits and percolation tests.
- Review and preparation of reports and of test results for submittal to appropriate agencies and clients.
- Provide technical back-up for manager on analysis and interpretation of data.

- Perform preventative maintenance and trouble shooting of analytical instruments.

- Serve as an environmental coordinator for Laboratory's hazardous waste disposal program including emergency response duties.

- Performed analysis for TPH-g and d using DHS 8015 MOD, BTE&X using EPA 602/EPA 8020, pH using 150.1 and Oil and Grease using EPA 413.1/SM5520 C.

- Developed and implemented and independent research project using x-ray and computer equipment to analyze effects of dredging on growth rates of surrounding coral species.

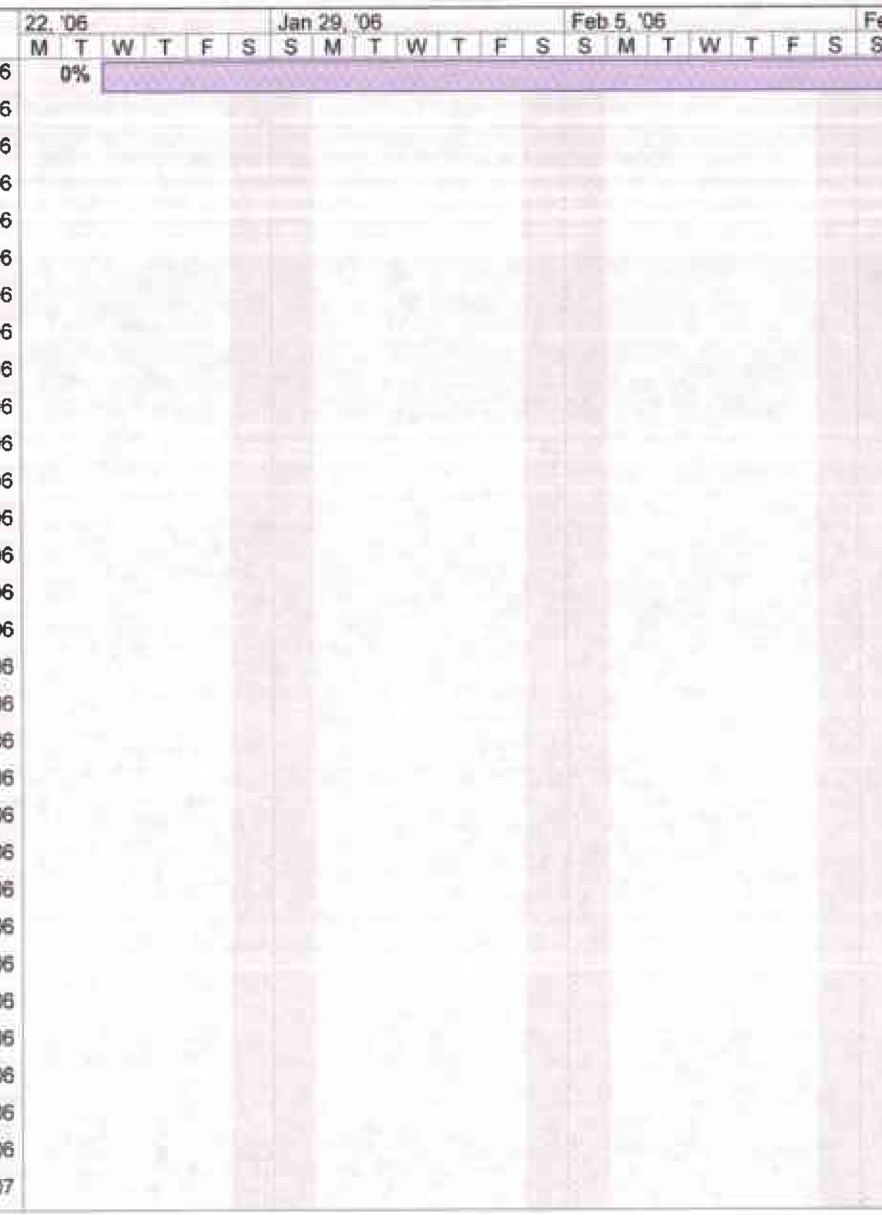
- GORE-SORBER Screening Survey Modules Installation and retrieval for detection of TPH (Total Petroleum Hydrocarbons) BTEX and MtBE underground contaminants and interpretation of analytical results.

- Performed Operation & Maintenance of Groundwater Air Injection Treatment System at DDRW-WB (Sharpe Army Base, Lathrop, CA), Nutrient and Oxygen Injection System at U-Haul Site 707-61 (San Jose, CA) and GAC System at MCLB-Barstow, CA.

- Bioremediation of soil contaminated with TPH (Total Petroleum Hydrocarbons as Gasoline and Diesel), MtBE (Methyl-t-Butyl Ether), BTE&X (Benzene, Toluene, Ethyl Benzene and Total Xylenes) and Oil and Grease.

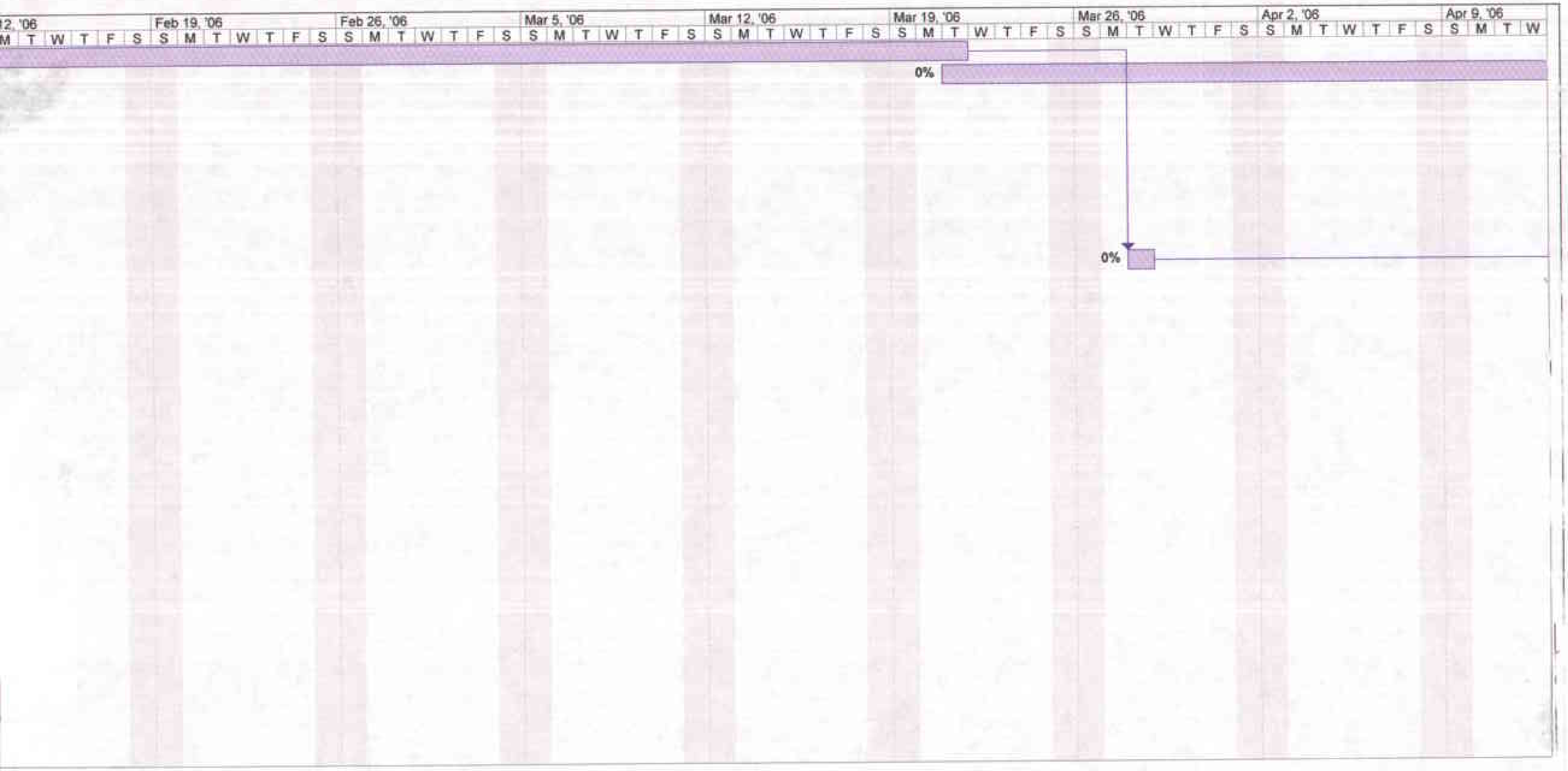
- Managed Phase I Phase II and Phase III Site Assessments (Phase I – USGS GEO Kids - Menlo Park, CA, European Auto Wrecking, Newark, CA and Coast Counties Trucks and Equipment Company in Richmond, CA, Phase II - Coast Counties Trucks and Equipment Company in Richmond, CA and Phase III – Mt. Pise, FAA, Crystal Springs Res., CA and San Jose State University, San Jose, CA).

ID	Task Name	Duration	Start	Finish
1	Preparation of Initial Draft Work Plan	40 days	Wed 1/25/06	Tue 3/21/06
2	Initial Draft Work Plan Review, Preaparation and Submission of Revised Work Plan to RRESO	49 days	Tue 3/21/06	Fri 5/26/06
3	RRESO Internal Final Work Plan Review	11 days	Mon 5/29/06	Mon 6/12/06
4	Submission of Work Plan to Port of Oakland and Port's Work Plan Approval	21 days	Mon 6/12/06	Mon 7/10/06
5	Submission of Work Plan to ACDEH and ACEDH's Work Plan Approval	21 days	Mon 7/10/06	Mon 8/7/06
6	Preparation of Construction Drawings (Soil excavation and Drainage System)	10 days	Mon 7/10/06	Fri 7/21/06
7	Acquisition of Excavation Permit From CUPA	10 days	Fri 7/21/06	Mon 8/7/06
8	Acquisition of Groundwater Treatment System Permit from CUPA	10 days	Tue 7/25/06	Mon 8/7/06
9	Approval of Excavation, backfilling, treatment system installation Drawings and issuance of permit	11 days	Fri 7/21/06	Fri 8/4/06
10	Quarterly Groundwater Monitoring and Reporting (NPORD MW-4 and SW-3)	1 day	Tue 3/28/06	Tue 3/28/06
11	Quarterly Groundwater Monitoring and Reporting (NPORD MW-4 and SW-3)	1 day	Wed 6/28/06	Wed 6/28/06
12	Utility Clearance (USA North)	1 day	Mon 8/7/06	Mon 8/7/06
13	Concrete sawcutting and concrete Disposal/Recycling	2 days	Tue 8/8/06	Wed 8/9/06
14	Soil excavation, Stockpiling/Soil Characterization and Soil Off-Site Disposal	11 days	Wed 8/9/06	Wed 8/23/06
15	Acqquisition of Groundwater Monitoring Well Construction Permits (13 Permits)	9 days	Wed 8/9/06	Mon 8/21/06
16	Excavated soil profiling, loading, transportation, disposal/Recyling at Altamont Landfill, Livermore	14 days	Wed 8/9/06	Mon 8/28/06
17	Construction of temporary Groundwater Treatment System	4 days	Fri 8/4/06	Wed 8/9/06
18	Extracted Groundwater Disposal/On-Site Treatment	14 days	Wed 8/9/06	Mon 8/28/06
19	Backfilling with Gravel Materials	2 days	Mon 8/28/06	Tue 8/29/06
20	Construction of Wood Forms and Rebar	2 days	Tue 8/29/06	Wed 8/30/06
21	Concrete Pour and Broom Finishing	1 day	Wed 8/30/06	Wed 8/30/06
22	Installation of Groundwater Monitoring Wells	3 days	Wed 8/30/06	Fri 9/1/06
23	Groundwater Monitoring Well Development	3 days	Tue 9/5/06	Thu 9/7/06
24	Groundwater Monitoring Well Sampling	3 days	Tue 8/8/06	Thu 8/10/06
25	Soil and Groundwater Samples Analyses	14 days	Mon 9/4/06	Thu 9/21/06
26	Design and Installation of Drainage System	21 days	Wed 8/9/06	Wed 9/6/06
27	Installation of Permananent On-Site Groundwater Treatment System	21 days	Wed 8/9/06	Wed 9/6/06
28	Start-up Sampling and Analyses	10 days	Wed 9/6/06	Tue 9/19/06
29	Report Preparation, Draft Report Review, Final Report and Submission	15 days	Mon 9/18/06	Fri 10/6/06
30	Groundwater Monitoring, 1st Quarterly Monitoring	3 days	Mon 12/11/06	Wed 12/13/06
31	Fourth Quarter 2006 Groundwater Monitoring and Reporting Due	1 day?	Wed 1/31/07	Wed 1/31/07



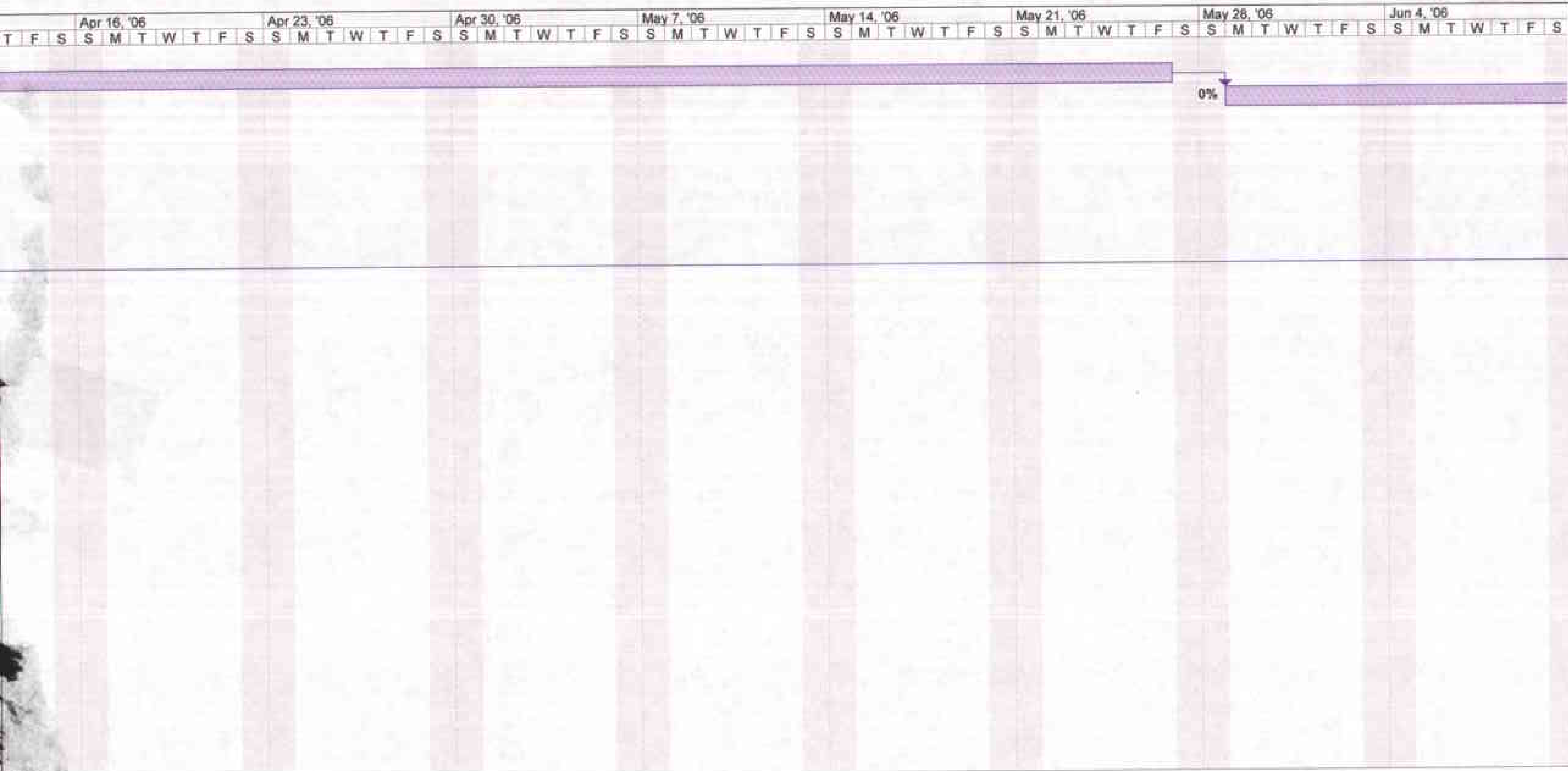
Project: Figure 5-2 Project Schedule
Date: Thu 10/19/06

Task		Progress		Summary		External Tasks	
Split		Milestone	◆	Project Summary		External Milestone	◆
Deadline							



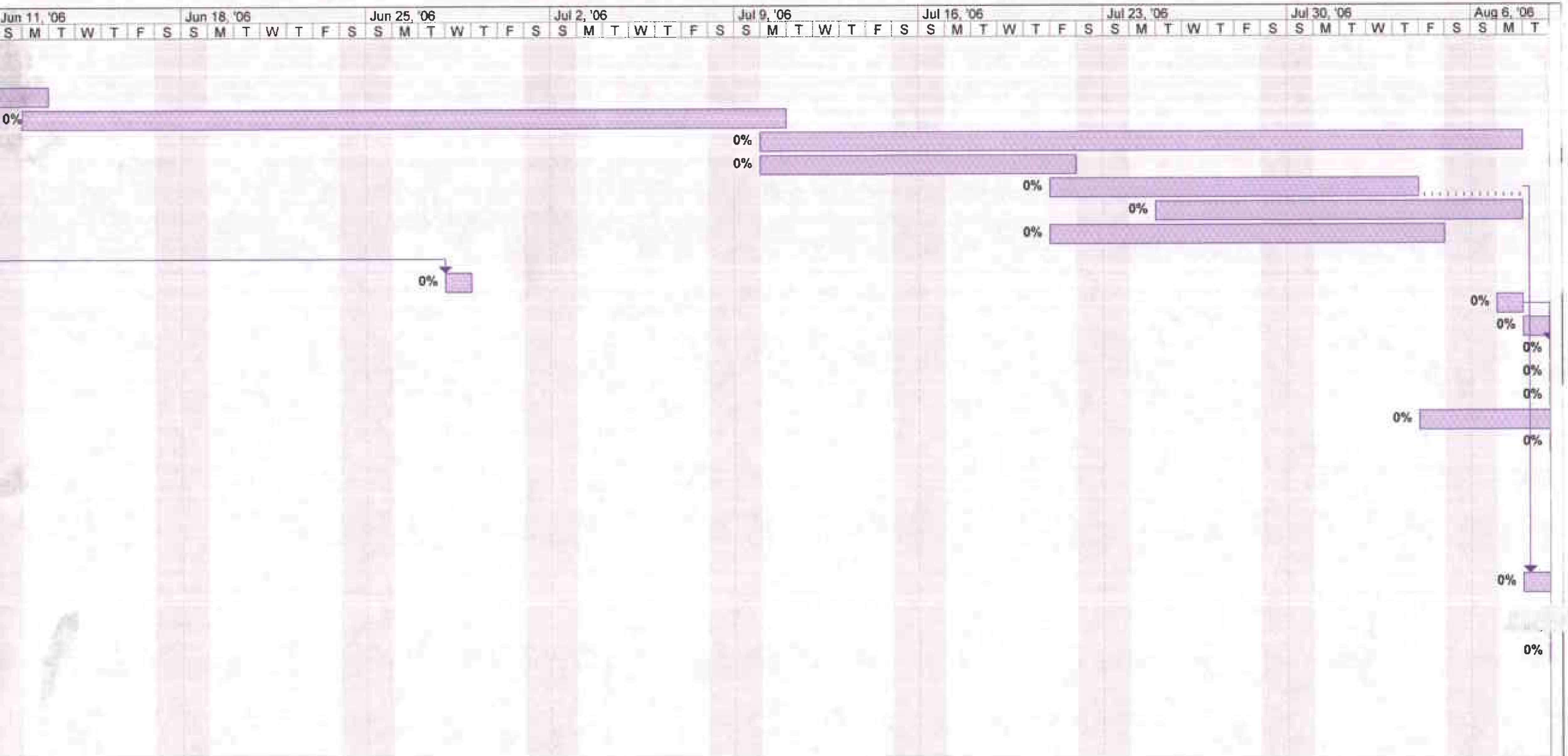
Project: Figure 5-2 Project Schedule
Date: Thu 10/19/06

Task		Progress		Summary		External Tasks		Deadline
Split		Milestone		Project Summary		External Milestone		



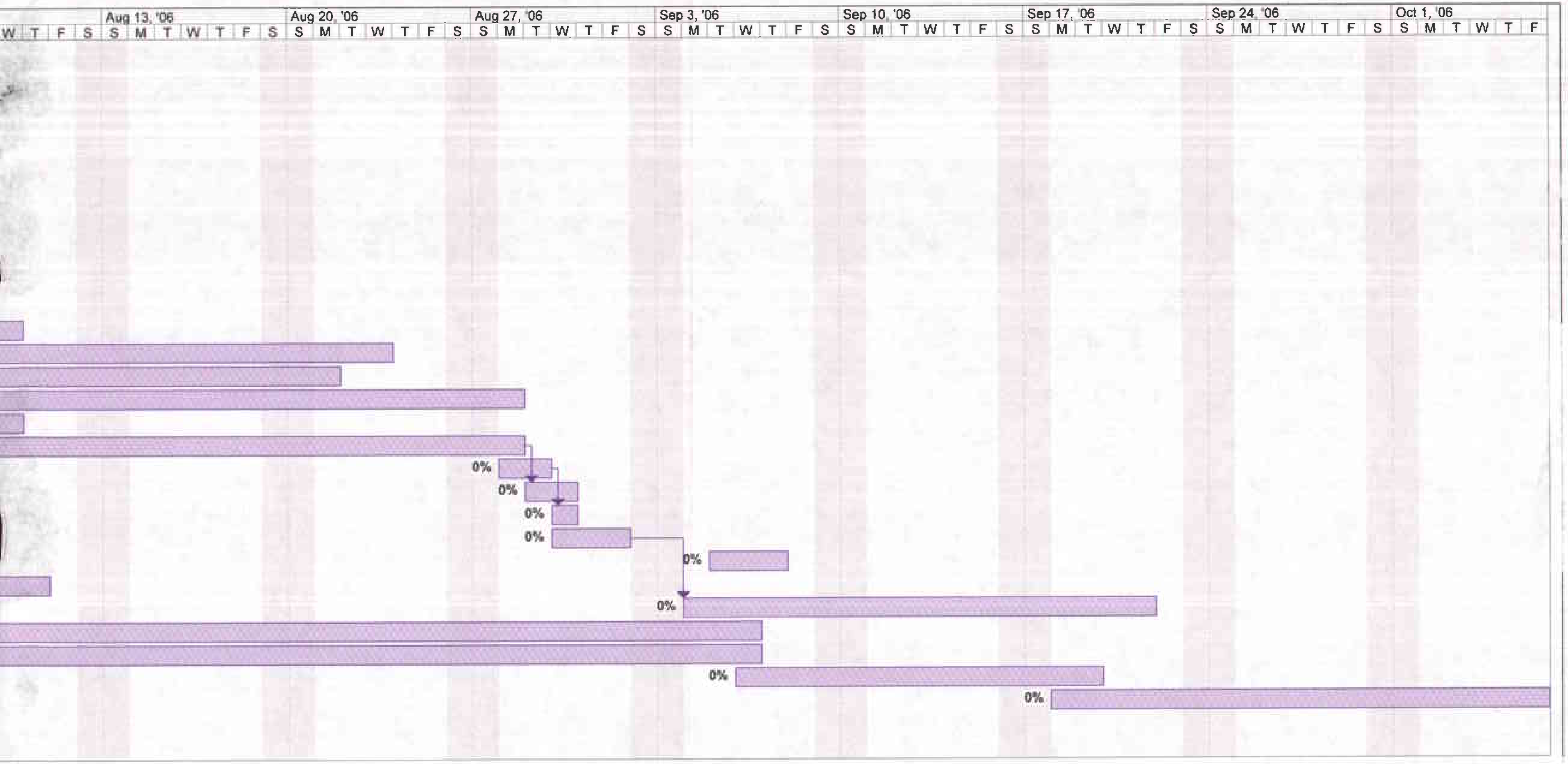
Project: Figure 5-2 Project Schedule
Date: Thu 10/19/06

Task	Progress	Summary	External Tasks	Deadline
Split	Milestone	Project Summary	External Milestone	



Project: Figure 5-2 Project Schedule
Date: Thu 10/19/06

Task		Progress		Summary		External Tasks		Deadline
Split		Milestone		Project Summary		External Milestone		

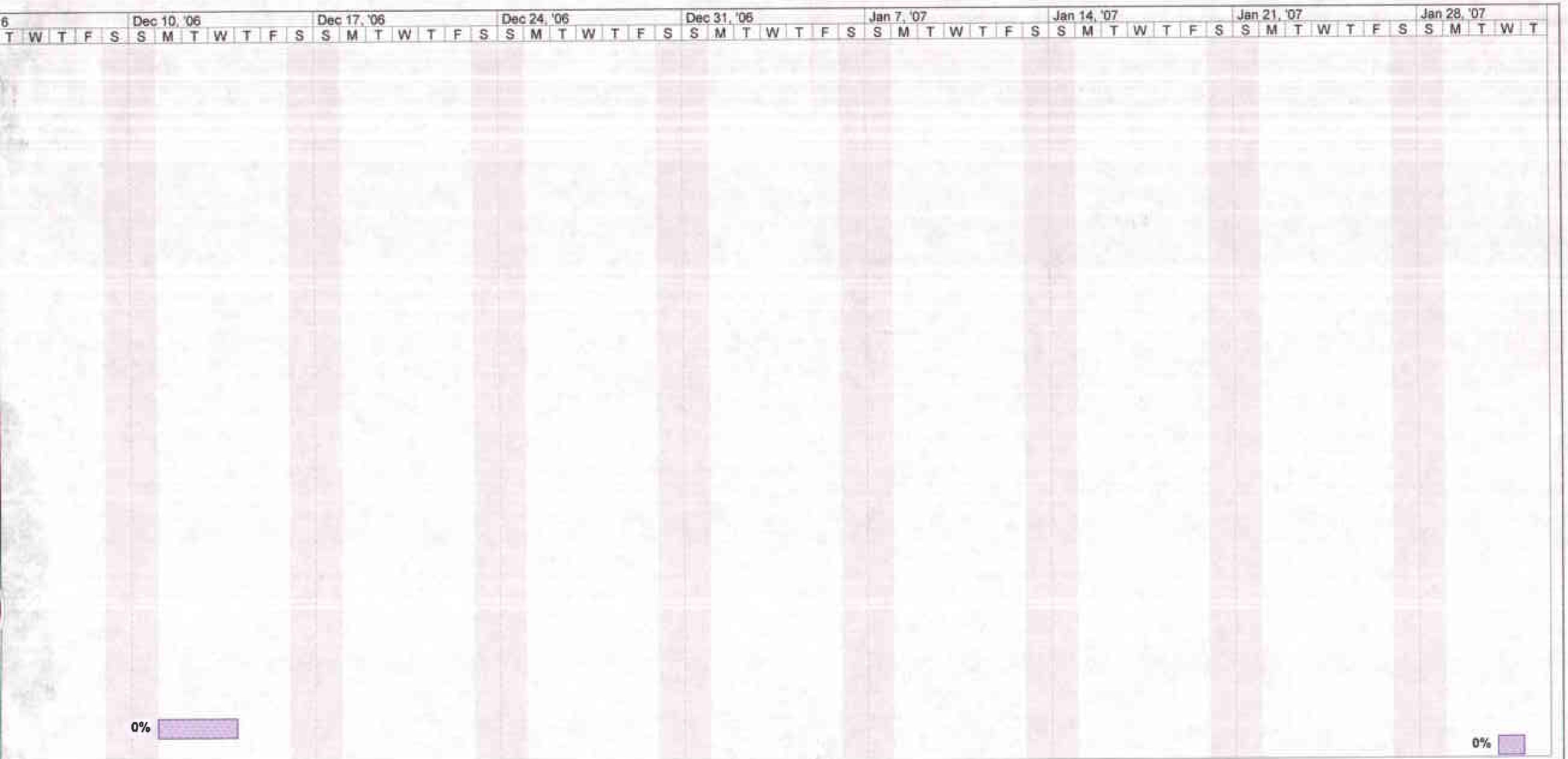


Project: Figure 5-2 Project Schedule
Date: Thu 10/19/06

Task		Progress		Summary		External Tasks		Deadline
Split		Milestone		Project Summary		External Milestone		

	Oct 8, '06							Oct 15, '06							Oct 22, '06							Oct 29, '06							Nov 5, '06							Nov 12, '06							Nov 19, '06							Nov 26, '06							Dec 3, '	
S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M

Project: Figure 5-2 Project Schedule Date: Thu 10/19/06	Task		Progress		Summary		External Tasks		Deadline
	Split		Milestone		Project Summary		External Milestone		



Project: Figure 5-2 Project Schedule
Date: Thu 10/19/06

Task		Progress		Summary		External Tasks		Deadline
Split		Milestone	◆	Project Summary		External Milestone ◆		