

**SITE INVESTIGATION
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA**

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EXECUTIVE SUMMARY

GeoSyntec Consultants (GeoSyntec) conducted additional site investigation activities at the Newport Banning Ranch (NBR) primarily in the months of May through August 2001. The objective of the site investigation was to augment existing information developed during previous investigations to provide an up-to-date environmental assessment of the NBR. To accomplish this, data on soil and groundwater quality were collected at 21 areas of potential environmental concern (PECs) both previously identified at the site and as identified during this site investigation. Specific goals of the investigation included the following:

- Characterize the nature and extent of potential impacts to soil and groundwater at each of the PEC areas; and
- Evaluate the volume of impacted material (either soil and/or groundwater) and areas to potentially be remediated.

The primary method of investigation was to identify visual impacts to soils in test pits excavated at the various PECs, and collect and analyze samples of site soil and groundwater. A total of 222 test pits/borings were excavated and 10 shallow, temporary groundwater monitoring wells were installed resulting in over 550 field and laboratory tests being completed.

As anticipated, the site is impacted primarily by petroleum hydrocarbons, both in soil and groundwater, as would be expected of oil fields of this age. Only 7 of the 21 PECs investigated showed significant hydrocarbon impact beyond surficial staining. Generally, the oil impacts observed in the test pits were confined to the upper soil layers (i.e., within approximately 6 ft of the surface). The carbon chain composition of the petroleum impacts was indicative of a weathered crude oil. No hazardous levels of materials tested were found. No groundwater sample contained heavy metals above maximum contaminant levels (MCLs) established by the State. Although low concentrations of VOCs were detected in each groundwater sample, only one well (01-GW-002) demonstrated sample results above MCLs (benzene and vinyl chloride). The groundwater appears to be a low quality, ocean influenced non-drinking water zone.

Two unanticipated conditions were encountered during the site investigation: oil existing as free-product in one groundwater monitoring well, and soil gas appearing in a ponded area. Both conditions were observed in or near the Main Site Tank Farm (PEC #02). The free-product well is bounded by four other wells that do not contain free-product, thus is bounded and contained. Actions to extract the free-product were begun shortly after the finding. Both the free-product and the gas seep conditions are being evaluated further.

It is estimated that approximately 62,000 cubic yards of in-place soil (at the 7 PECs) are impacted to some degree with hydrocarbon-related materials at the site. Approximately 77,000 cubic yards of gross soil volume (includes clean overburdens) may need to be addressed in some manner to reach the impacted soil. The majority of the impacts are located in PEC#02, the Main Site Tank Farm. The site also contains other materials that may have to be addressed during abandonment and development including an estimated 40,000 cubic yards of clean remediated soils, over 4,000 cubic yards of concrete and well abandonment debris, and up to 93,000 cubic yards of asphaltic like materials used as roadway base and paving.

The results of this site investigation will be used to develop a Remedial Action Plan (RAP) that will guide short-term cleanups required and for the longer term abandonment and remediation of the entire site.



1. INTRODUCTION

1.1 Report and Project Objectives

The objective of this report is to summarize the results of recent site investigation activities conducted at the Newport Banning Ranch (NBR). The site investigation was conducted May through August 2001 at the NBR, located in Orange County and the city of Newport Beach, California. This report has been prepared by GeoSyntec Consultants (GeoSyntec) on behalf of the site owners and the site operator, West Newport Oil Company (WNOC).

The objective of the site investigation was to augment the existing information developed during previous investigations to provide an up-to-date environmental assessment of the NBR. To accomplish this objective, data on soil and groundwater quality were collected at areas of potential environmental concern (PECs) both previously identified at the site and as identified during the site investigation. Specific goals of the investigation included the following:

- Characterize the nature and extent of potential impacts to soil and groundwater at each of the PEC areas; and
- Evaluate the volume of impacted material (either soil and/or groundwater) and areas to potentially be remediated.

These data will be combined with data from previous site investigations to develop remedial action alternatives for each specific PEC at the NBR.

1.2 Background and Project Overview

The NBR site covers approximately 400 acres and is located east of the mouth of the Santa Ana River near the Huntington Beach – Newport Beach city boundary in Orange County, California (Figure 1-1). The NBR is currently operated as a crude oil and natural gas production facility by the WNOC. Oil and natural gas production operations are conducted at the NBR as certain areas are being abandoned.

Previous site investigations and remedial actions have been conducted at the NBR. The site assessment history is described in the Summary Report [GeoSyntec, 2001]. A summary timeline in Figure 1-2 provides a history of the investigation activities performed at the site. The results of the previous site investigations indicated that the site was primarily impacted by crude oil, and that these impacts were confined to specific operations (oil well locations, pipelines, associated sumps and roadways). The data



Figure 1-1: Site Map



indicated that specific, focused areas of the site (e.g., the Maintenance Shop – PEC #01) were also impacted by chemicals other than crude oil, such as volatile organic compounds (VOCs) and metals. These results were used to plan the site investigation field and laboratory activities.

An Environmental Restoration Plan (ERP) [GeoSyntec, 1993 and 1998], which has been reviewed and approved by site regulatory agencies, has been and is currently being implemented to guide the oil production abandonment operations. The ERP focuses primarily on oil-impacted soils at well locations and along pipeline routes and roadways. In accordance with the ERP, oil-impacted soils from these areas are identified, excavated, and treated in an on-site lined biotreatment cell.

To identify other areas of the NBR that may require further investigation or remedial action, a Phase I Environmental Site Assessment (ESA) was performed [GeoSyntec, 1999]. The ESA identified 21 areas designated as areas of Potential Environmental Concern (PECs) due to potential soil or groundwater quality impacts at the site. A listing of the features found at each of the 21 PECs and the conditions of potential concern are included in Table 1-1. The location of each of the 21 PECs is shown on Figure 1-3 (GIS Base Map). Additional background information on the identified PECs or the ESA process can be found in the Phase I ESA report [GeoSyntec, 1999]. This site investigation (i.e., a Phase II investigation) work plan was subsequently developed and implemented to investigate the identified PECs. This report documents the activities and results of the Phase II investigation.

1986: Initial Assessment of NBR/SARM [Levine-Fricke]
1987: Additional Assessment of SARM [Mitech]
1989: Additional Assessment of SARM [GeoSyntec]
1990: Study of the Tank Bottom Materials [Earth Technology]
1991: Study of Tank Bottom Materials [GeoSyntec]
1991: Restoration of SARM [USCOE]
1993: Phase I Assessment of NBR [GeoSyntec]
1993: Restoration of NBR [WNOC]
Ongoing
1995: Study of Asphalt-Like Material Soil Gas and Groundwater Assessment [GeoSyntec]
1996: Main Site Tank Farm Assessment [GeoSyntec]
1999: Updated Phase I Assessment of NBR [GeoSyntec]
2001: Additional Site Investigation [GeoSyntec]

Figure 1-2: Timeline of Site Assessment

1.3 Report Organization

The remainder of this report is organized into two volumes having the following sections:

Volume I

- Section 2 – Fieldwork Approach and Activities presents the methods and materials that were used during the field activities to investigate soil and groundwater quality at each of the PEC locations. This Section also includes a summary of the differences between the work plan and actual field work activities performed.
- Section 3 – Findings presents a brief summary of the important results of the investigations, including both visual observations and laboratory chemical data.



- Section 4 – Volume Evaluation describes the method used to estimate the volume of potentially impacted material and presents the PEC-specific volume estimates.
- Section 5 – PEC Summaries presents a summary of the site investigation highlighting key results at each PEC and chemical exceedances of threshold criteria, if any. The data are evaluated on a PEC-specific basis by comparing the data to threshold criteria and site background data.
- Section 6 – Conclusions presents the conclusions reached considering the results of the site investigation.

Volume II

- PEC-Specific Summaries of the assessment activities and findings, including soil boring logs and well installation logs.
- Laboratory Chemical Results for each of the samples collected at the site.

Tables and figures are included in the body of the text and at the end of the report.



2. FIELDWORK APPROACH AND ACTIVITIES

2.1 General

Several tasks were completed to assess the nature and extent of impacted soil and to evaluate groundwater quality at each of the PECs. These tasks included:

- Technical Approach Development;
- Workplan and Fieldwork Preparation;
- Soil Assessment;
- Groundwater Assessment; and
- Data Organization.

2.2 Technical Approach

Several previous site assessments/investigations have been performed at the NBR since 1986. To develop the sampling and analysis program (SAP), GeoSyntec reviewed previous site investigation reports and environmental data, discussed site operations with on-site personnel, and identified the likely areas of potential environmental concern. There are currently 21 areas designated as having Potential Environmental Concern (PECs) at the NBR. The PECs are listed in Table 1-1 and shown on the GIS Base Map (Figure 1-3).

The site-specific SAP was developed and implemented at the NBR using an approach specific to each PEC. The SAP was focused on soil and groundwater media. The program consisted of performing visual observations, collecting samples based on the visual observations, and a chemical evaluation for the presence of various chemical constituents at each PEC. Different methodologies used to collect the samples included digging test pits, hand auguring, and installing shallow temporary groundwater wells. A summary of the SAP, as implemented during this site investigation, is provided in Table 2-1.

The chemical evaluation program was designed to provide information on the nature and extent of the contamination, or absence thereof, at each PEC. Because crude oil is the primary contaminant at the NBR, the majority of analyses were conducted for the presence of total recoverable petroleum hydrocarbons (TRPH). Additional levels of analysis were performed at certain PECs to evaluate if specific chemicals, which may have historically been used or stored in the area, are present. Table 2-2 shows the total number of tests performed to characterize the PECs at the NBR. Table 2-3 presents a breakdown of the analytical suites into each of the analytical components.

This approach was designed to provide the following information:

- Identify visually impacted soils or groundwater (e.g., stained soils or sheen on groundwater);
- Characterize the nature of the primary site containment, crude oil, by selectively testing impacted soil samples for carbon chain components;



- Characterize the nature of additional potential contaminants (e.g., metals, polychlorinated biphenyls [PCBs], and volatile and/or semi-volatile organic compounds [VOC/SVOC]) at selective areas of the site where chemicals may have been used/stored during site operations; and
- Evaluate the extent of impacts by visual means and by sample collection and analysis in areas bounding the visually-impacted materials (e.g., testing in apparent clean boundary areas).

Fieldwork preparation activities and the field procedures and sample analysis are described in the following sections.

2.3 Workplan and Fieldwork Preparation

Prior to commencing fieldwork associated with the NBR site investigation, the following activities were performed:

- development of the SAP;
- site visit to discuss the SAP with site personnel; and
- field biologist site visit to identify biologically sensitive areas.

The SAP was developed to guide the implementation of the Site investigation. The SAP was focused on identifying impacts to soil and groundwater media.

Prior to beginning fieldwork, GeoSyntec personnel visited the site on 1 May and 2 May 2001 to discuss investigation activities with site personnel and to identify specific areas within each PEC that warranted intrusive investigation. Each area identified was marked with flags and assigned a visual observation number. Visual observations were numbered sequentially according to PEC number, for example 01-001 (PEC # – observation #). These observations served to focus initial soil sampling activities.

On 7 May 2001, GeoSyntec personnel and a biologist from Glenn Lukos Associates visited the site to identify biologically sensitive areas in and around each PEC. Care was taken to avoid disturbance in these areas during field assessment activities.

As fieldwork activity implementation was dependent on site conditions, there were modifications made to the SAP. These modifications are identified in Table 2-4.

Item	SAP	As-Implemented
Test Pits/Borings	112	222
Groundwater Wells	6	10

- PEC Naming was Restructured for Clarification
- No Asbestos Sampling was Performed / Will Be Accomplished During Demolition / Remediation

2.4 Soil Assessment

2.4.1 **General**

Soil sampling was initiated on 8 May 2001. Soils at each PEC were evaluated with samples collected from either test pits or hand

Table 2-4: Differences Between SAP and Field Work As-Implemented



auger borings. Test pits were mainly used for the soil investigation at the site because test pits allow a visual observation of the subsurface. Hand auger borings were only used to collect samples in biologically sensitive areas or areas in which a backhoe could not access. It should be noted that visual observations comprised a major component of the soil investigation. Where noted visual observations of oil impacted areas in test pit excavations and in auger cuttings were documented. The boundaries of observed impacted areas were recorded and were considered in conjunction with the laboratory chemical data when volumes of impacted material were evaluated. The following sections present a description of the procedures for each soil sampling method and analysis.

2.4.2 Test Pit Soil Sampling

Soil samples were collected by excavating test pits with a backhoe. Test pit soil sampling was conducted using a hand trowel or the backhoe bucket based on site conditions and test pit depths. The test pits were backfilled with excavated material and marked with flags identifying a specific observation number and sample number, if appropriate.

Approximately 180 test pits were excavated during the site investigation. Test pits were excavated to depths of 2 ft to 18 ft below ground surface (bgs). Test pit depths were determined based on visual and olfactory observations and PID readings of impacted material collected as the test pits were excavated. Typically several test pits were excavated in one area to provide lateral delineation of impacted materials.

For test pits that contained a visually identifiable layer of impacted material within a PEC, one sample of the impacted material was generally collected for an expanded list of laboratory tests to aid in characterization of the material, as needed. Additional samples were generally collected below the impacted layers or from comparable depths in adjacent test pits in an attempt to provide vertical and lateral delineation. Generally the delineation samples were only tested for Total Recoverable Petroleum Hydrocarbon (TRPH) or were screened in the field with an organic vapor analyzer (OVA). Test pit logs are included in Volume II.

2.4.3 Hand Auger Soil Borings

Soil samples were also collected using a hand auger. A hand auger was used to collect soil samples at shallow depths and in areas where test pit excavation was not feasible due to biologically sensitive vegetation or other access limitations. The hand auger borings were backfilled with excavated material and marked with flags identifying visual observation and sample numbers, as needed.

Approximately 40 hand auger borings were excavated during the investigation. For PECs with stockpiled soil and debris piles, several borings were excavated and composite samples were collected. Auger borings from stockpiled soil and debris piles were advanced to approximately the middle of the piles. Depths of hand auger borings in other areas were typically based on visual and olfactory observations and PID readings of soils. As with test pits, visual observations of impacted materials were recorded and samples were collected below zones of visually impacted materials for vertical delineation. Hand Auger boring logs are included in Volume II.



2.4.4 Soil Sample Analysis

Samples were analyzed based on the expected constituents of concern at each PEC. Table 2-1 includes the total number of soil samples collected at each PEC and the associated number of different field or laboratory tests performed. Table 2-2 provides a summary of the total number of soil samples collected during the investigation and the chemical testing performed. Table 2-3 identifies the types of testing performed on soil samples and the rationale for their use. Oil is the main contaminant present at the site; therefore most of the soil samples were analyzed for TRPH. The additional testing performed was largely based on knowledge of historical operations at each PEC.

Background soil concentrations at the NBR were evaluated prior to beginning intrusive investigation of potentially impacted areas. Background soil samples provide an indication of the quality of the soil in a relatively undisturbed area of the site that has not been used in site operations or has been directly affected by urban run-off flow onto the property. Background soil samples were collected from five separate test pits. The logs for the background test pits are included in Volume II. The background sampling locations are shown on Figure 2-1. The number of soil samples and the related laboratory tests performed are summarized on Table 2-2. Laboratory analytical results and chain-of-custody forms are located in Volume II. During the soil evaluation, soil gas was observed (i.e., bubbling) in a pond near PEC #02 – Main Site Tank Farm. Samples were collected using Tedlar bags. These tests are also summarized in Tables 2-3 and 2-4.

2.5 Groundwater Assessment

2.5.1 General

Temporary groundwater monitoring wells were installed at several of the PEC locations for evaluation of groundwater quality in the lowland areas of the NBR. The following sections contain information on the installation, development, sampling, and analysis procedures used for the temporary groundwater monitoring wells.

2.5.2 Groundwater Monitoring Well Installation and Development

Ten temporary groundwater monitoring wells were installed in the lowland areas of the Site on 8 June 2001. The temporary groundwater well locations are shown in Figure 2-1. Prior to performing drilling activities, monitoring well permits were obtained from the County of Orange Department of Public Works. Copies of the well permits are included in Volume II. The groundwater wells were designed in accordance with State of California Monitoring Well Standard Bulletins 74-81 and 74-90. Groundwater monitoring wells were installed using a hollow-stem auger drill rig and a C-57 licensed operator. Soil cuttings were stockpiled next to the temporary wells where the cuttings were generated.

The depth of groundwater in the Lowland area occurs between 4-10 ft bgs depending on ocean tide conditions. The temporary groundwater monitoring wells were each installed to approximately 15 ft bgs. The monitoring wells were constructed of 4-inch diameter schedule 40 PVC, with 10 ft of screen (0.020-inch slot) and approximately 5 ft of blank casing. The annulus of each well was filled with No. 3 sand, which extended from 1



to 2 ft above the top of the screen to the bottom of the borehole. An approximately 1-ft thick hydrated bentonite pellet seal was placed above the sand filter pack. The remaining well annulus was completed with cement grout to provide a surface seal. Only the horizontal locations of the wells were surveyed using a GPS unit, the elevation of the top of casing was not determined.

Following completion, the temporary monitoring wells were developed using a surge block, a bailer, and a submersible pump. Purge water was disposed of in the WNOG water treatment plant. Boring and installation logs for the monitoring wells are included in Volume II.

2.5.3 Groundwater Sampling

Following development, the monitoring wells were allowed to recover for a minimum of 24 hours prior to sampling. The water level in each monitoring well was measured and recorded with an electronic water level meter prior to purging. Each monitoring well was purged using a low flow peristaltic pump prior to collecting samples. A minimum of one well casing volume was purged prior to sample collection. Purge water was disposed of in the WNOG water treatment plant.

Groundwater samples were collected in laboratory-prepared sample containers appropriate for the intended analysis, using a low flow peristaltic pump. The tubing on the pump was changed between each monitoring well to prevent cross contamination. One monitoring well was found to contain free product (02-GW-002). A free product sample was collected from this well using a disposable bailer.

As part of the groundwater QA/QC program a duplicate groundwater sample was collected from a single temporary groundwater monitoring well each sampling event. Additional QA/QC procedures included the resampling of four randomly selected monitoring wells to evaluate data reproducibility. Sample containers were placed in a cooler with ice for transport to a State-certified laboratory under chain-of-custody procedures.

2.5.4 Groundwater Sample Analysis

Table 2-1 includes the total number of groundwater samples collected at each PEC and the associated number of different field or laboratory tests performed. Table 2-2 provides a summary of the total number of groundwater samples collected during the investigation and the chemical testing performed. One well exhibited hydrocarbon free-product and was analyzed for VOCs, PAHs, TPH (C7-C44), and crude oil. Samples collected during the replicate QA/QC sampling event were analyzed for VOCs, TPH-g, TPH-d, and crude oil. Laboratory analytical results and chain-of-custody forms are located in Volume II.

2.6 Data Organization

As previously discussed, visual observations were used as the primary source to evaluate soil quality during this recent site investigation. Visual observations of impacted material largely consisted of oil or TRPH impacts (i.e., stained soil). Boundaries of observation/test pit areas used for visual classification of impacted material were marked in the field with flags. In addition, locations where soil samples were collected for either field or laboratory analyses were marked with flags. The field-marked visual observation boundaries and sampling



locations were recorded with a differential global positioning system (GPS). Each visual boundary or sampling location was stored in the field GPS unit along with the location or sample identifier. These GPS locations of the visual observation boundary and sampling locations were downloaded to a computer database. The location or sample identifiers are a common link throughout the investigation and correlate with those used on field, boring, and test pit logs as well as laboratory chain of custody forms.

Key facts concerning visual observations were added to the project database along with chemical data received electronically from the laboratory. From these data a geographical information system (GIS) was used to spatially analyze and present chemical data and field observations on electronic maps presented in this report. These data are organized as follows:

- Chemical Data
 - Recent Data – was compiled directly into an Access relational database
 - Historical Data – was hand-entered from previous documents into Access
- Test Pit/Boring Logs Visual Observations – electronically stored in data logs (gINT[®])
- Geographic Data
 - Recent Data – was compiled directly through GPS positioning into GIS
 - Historical Data – was hand-entered from maps into GIS

Data tables were generated from these data resources and summarized in this Volume I, along with graphics generated from the GIS tool. Volume II contains the visual observation logs, as well as some graphical summaries of data.



3. FINDINGS

3.1 General

A significant amount of data exists from previous site investigations and environmental restoration activities being conducted at the NBR. The additional site investigation activities conducted in the summer of 2001 were designed to implement a more comprehensive investigation to quantify the nature and extent of soil and groundwater impacts in order to augment the existing data set. The previous data is summarized in the Summary Report [GeoSyntec, 2000], and is referenced in this report as needed, to provide additional detail in specific areas of the site. Specifically, the 1996 study of the Main Site Tank Farm area (PEC #02) provided data that was used to characterize impacts in this PEC. Other historical data (e.g., well sites, pipelines) was generated during the remediation of the soils in these areas, and is not represented in this report, as it no longer represents current conditions at the site.

The additional site investigation focused on areas designated as having a Potential Environmental Concern (PEC), apart from the ERP-focus areas (specifically, oil wells, pipelines, and roadways). The PECs include current and historical tank farm areas, maintenance facilities, stockpile areas, and appurtenant oil production facilities. A PEC-specific approach was used during the site investigation activities that targeted soil and groundwater media. Specific chemicals identified as having been used in each of the PECs were included in the laboratory analytical program, although the primary chemical of concern, common to nearly every PEC, is petroleum hydrocarbons. The primary activity performed during the site investigation was sensory reconnaissance, that is visual and olfactory observations of the excavations made during test pitting and temporary groundwater well installation. The intent was to document the visually impacted soil layers and upload these data to a Geographic Information System (GIS). As a significant data set exists characterizing the oil impacts, the intent was not to collect samples of the impacted layers. Rather, with few exceptions, samples collected within the test pits were sent for analysis primarily to confirm the absence of impacts either at the base of the test pit or boundary of an oil-impacted layer. The exceptions to this approach included sampling in areas (i.e., PECs) that had not previously been evaluated. In these locations, samples were collected and sent for analyses other than petroleum hydrocarbons or to evaluate the chain length of the petroleum hydrocarbon molecule.

The remainder of this section provides a summary of the site investigation findings, including:

- Soils – describing type of impacts, extent, and exceedances of regulatory threshold criteria (where noted); and
- Groundwater – describing type of impacts, extent, and exceedances of regulatory threshold criteria.

Translating the visual observations of impacts and chemical testing into volumes of impacted material is presented in Section 4. Details of the site investigation (e.g., number of borings, dates, detailed breakdown of results) are further described in Section 5, on a PEC-specific basis.



3.2 Soil Evaluation Findings

The focus of the soil evaluation was to identify visual impacts to soils in test pits excavated at the various PECs at the NBR. A total of 222 test pits/borings were excavated at the site. Based on these visual observations, samples were collected to either:

- Evaluate the carbon chain length of the identified petroleum impacts;
- bound the impacted areas (i.e., identify non-impacted soils at the bounds of the test pit excavation); and/or
- investigate the presence/absence of additional chemicals in the soil potentially associated with site operations.

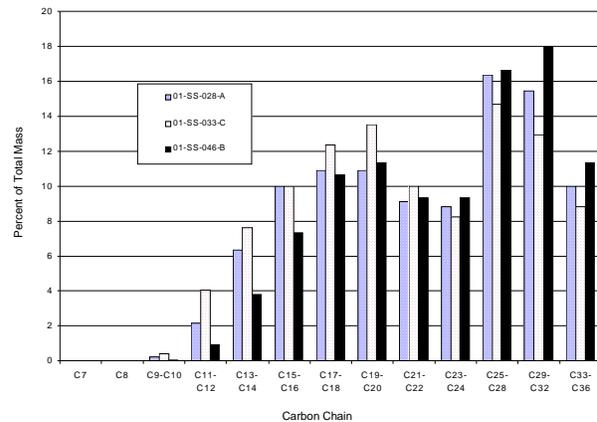


Figure 3-1: PEC #01 Maintenance Shop/Warehouse Hydrocarbon Chain Speciation

The results are presented in detail in Section 5 – PEC Summaries. A summary of the important findings of the soil evaluation follows:

1. As anticipated, oil impacts were noted in many of the 222 test pits/borings. Generally, the oil impacts were confined to the upper soil layers (i.e., within approximately 6 ft of the surface). In certain areas, oil impacts extended deeper than 6 ft. These areas were primarily located within PEC #02 – Main Site Tank Farm.
2. No samples indicated constituents above State Total Threshold Limit Concentrations (TTLC).
3. The carbon chain composition of the petroleum impacts was evaluated in PEC #01, PEC #02, PEC #08, and PEC #20. With the exception of one sample from PEC #02, the carbon chain signatures were similar, indicative of a weathered crude oil. An example of this crude oil signature is presented in Figure 3-1. Each sample is weighted toward the long-chain hydrocarbons (> C12). This signature is also evident in the crude oil free-product sample collected from Groundwater Well 02-GW-002 (Figure 3-2). The one exception was a sample from PEC #02 (02-SS-046B), which indicated

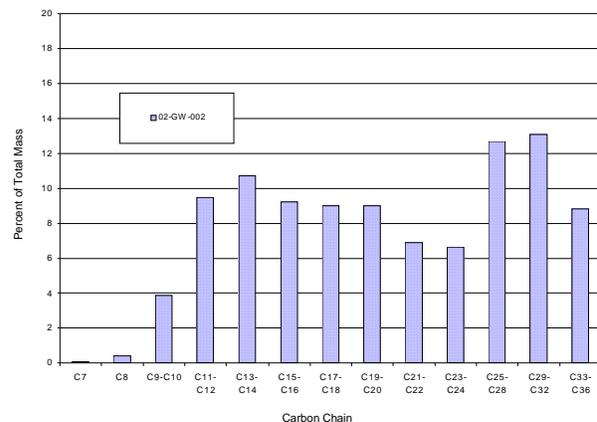


Figure 3-2: PEC #02 Main Site Tank Farm, Free Product Sample Hydrocarbon Chain Speciation



the presence of light chain hydrocarbons in a localized area of the site.

4. Visual observations indicated that petroleum impacts exist in distinct categories based on the mixture of petroleum within the soil matrix. Generally, the soils exhibited brown or black staining, however, in certain areas, soils containing “free” oil within the soil matrix were observed. These free oil-stained areas were only observed in PEC #01 and PEC #02. In each case, they were either coincident with oil sumps or below roadways.

PEC	Sample	Exceeds Regulatory Threshold (PRG-Res)*
01	01-SS-015A 01-SS-016B 01-SS-046B	Benzo(a)Anthracene, Benzo(a)Pyrene, Dibenzo(a,h) anthracene
10	10-SS-001A 10-SS-003A	PCB
20	20-SS-006B	Iron, Benzo(a)Pyrene, Dibenzo(a,h)Anthracene

5. Certain analytes were detected above USEPA Region IX Preliminary Remediation Goals (PRGs) for Residential Areas. There were no exceedances of the USEPA Industrial PRGs. A summary of these exceedances is provided in Table 3-1.

* Note: No Exceedances of TTLTC or Industrial PRG

Table 3-1: Regulatory Exceedances

6. Soil gas was observed in one location near PEC #02 – Main Site Tank Farm. Soil gas was observed to be bubbling through a shallow pond to the west of the Main Site Tank Farm. This area is shown on the PEC #02 – Focus Map (Figure 5-5). Two soil gas samples collected from PEC #02 – Main Site Tank Farm indicated elevated methane concentrations (up to 73.2 percent). No hydrogen sulfide was detected. This region along the coast is prone to natural oil and gas seeps however the origin of this gas has yet to be determined.

The locations of these impacts are shown in the PEC Focus Maps in Section 5.

3.3 Groundwater Evaluation Findings

Based on observations conducted during the soil evaluation, groundwater wells were installed at the NBR. The focus of the groundwater evaluation was to identify potential impacts to shallow groundwater associated with petroleum or chemical usage at selected areas of the site. Similar to the soils evaluation, samples were collected to either:

- evaluate the carbon chain length of petroleum impacts, if any;
- bound the impacted area; and/or
- investigate the presence/absence of chemicals in the groundwater potentially associated with site operations.



The results are presented in detail in Section 5 – PEC Summaries. A summary of the important findings of the groundwater evaluation follows:

1. Ten shallow groundwater wells were installed at the NBR. The well details are shown in Table 3-2.
2. One groundwater well from PEC #02 – Main Site Tank Farm (02-GW-002) contained crude oil as immiscible phase (free product). However, the four wells surrounding 02-GW-002 did not indicate the presence of free product, indicating a limited extent of impact. The carbon chain analysis on the free product sample from this well showed a crude oil signature (Figure 3-2). This well was placed at the location of a former oil sump.

PEC*	Well	TD (ft)	Screen (ft)	Impacts
01	01-GW-001	18	8-18	VOCs
	01-GW-002	17	7-17	VOCs
	01-GW-003	18	8-18	VOCs
02	02-GW-001	18	8-18	VOCs (Lab)
	02-GW-002	18	8-18	Free Product
	02-GW-003	18	8-18	VOCs
	02-GW-004	18	8-18	VOCs
	02-GW-005	18	8-18	VOCs (Lab)
06	06-GW-001	15.5	5.5-15.5	—
08	08-GW-001	19.5	9.5-19.5	VOCs (Lab)

* Note: Lab = Suspected Lab Contaminant (Methylene Chloride)

Table 3-2: Groundwater Well Details and Impacts

3. Groundwater samples collected from each well indicated ocean tidal influence on shallow groundwater quality (i.e., a low quality, non-drinking water zone with elevated ion concentrations compared to non-saline waters).
4. None of the groundwater samples contained heavy metals above maximum contaminant levels (MCLs) established by the State.
5. Groundwater sample impacts are presented in Table 3-2. Although low concentrations of VOCs were detected in each well, only one well (01-GW-002) demonstrated sample results above MCLs. The two VOCs detected above MCLs were benzene (1.1 ug/L) and vinyl chloride (15 ug/L).

The locations of these wells are shown in the PEC Focus Maps in Section 5.



4. VOLUME EVALUATION

Based on the visual observations and chemical analytical findings, the extent of the soil impacts was evaluated. The purpose of this evaluation was to identify the volume of material that may have to be mitigated (either by treatment or relocation). The mitigation alternative will depend, to a large degree, on the type of impact. For purposes of this evaluation, the types of impacts were divided into the following categories:

- Type 1 – Brown Staining which indicates the presence of petroleum, generally above 1,000 mg/Kg, well-mixed within the soil matrix;
- Type 2 – Black Staining which indicates the presence of petroleum, greatly exceeding 1,000 mg/Kg, well-mixed within the soil matrix.
- Type 3 – Oily Staining which indicates the presence of petroleum existing as free liquid within a stained soil matrix.
- Type 4 – Diesel / Gas Staining which indicates the presence of refined petroleum well-mixed within the soil matrix.
- Type 5 – Other Low Level which indicates the presence of contaminants other than petroleum within the soil matrix.

These soil impact types are summarized by PEC on Table 4-1. The total volume of stained soil potentially requiring mitigation is approximately 77,000 cubic yards (yd³). Details regarding these impacts are presented in Section 5. This will be further evaluated during the Remedial Action Plan development phase of the project. The preliminary remediation areas (PRAs), along with the anticipated volume of material that may require remediation, are shown in Figures 4-1 through 4-5.

The gross volumes listed in Table 4-1 are preliminary estimates of the gross volume of soil that may need to be mitigated, considering standard petroleum remediation and soils handling techniques. Following a review of the site investigation boring logs, the actual amount of soil impacted by petroleum may be considerably less, due to the fact that the impacted soils exist in finite layers. However, these layers are often below non-impacted soils, therefore the total gross volume was calculated for initial planning purposes. Depending on the area, the actual percentage of gross volume of soil that is truly impacted is approximately 80 percent or approximately 62,000 yd³.

The site also contains stockpiles of soil that were treated at the on-site bioremediation cell according to the agency-approved ERP, as well as concrete debris stockpiles from on-going abandonment operations (i.e., well cellars), and removed piping that is being recycled. In addition, road base material constructed from oil field related products exists on road surfaces throughout the site. The amount of stockpiled soils varies continuously, as additional materials are treated and stockpiled during the implementation of the ERP. Currently, approximately 40,000 yd³ of treated soil stockpiles exist at the NBR. In addition, approximately 4,000 yd³ of



miscellaneous concrete debris from oil field abandonment exist at the site, as well as approximately 93,000 yd³ of asphaltic like material used as road base.

Groundwater was also observed to be impacted. These impacts were in two distinct areas of the site:

- PEC #01 – Maintenance Shop Area; and
- PEC #02 – Main Site Tank Farm.

The impacts noted in PEC #01 were from VOCs, impacts within PEC #02 were from crude oil, PAH associated with the crude oil, and limited VOC impacts. The extent of the impacts within both areas appears to be limited, with the impacts bounded by “clean” wells (i.e., wells having no documented impacts). Soon after free product was detected within 02-GW-002, an action plan for extracting the free product was developed and implemented. These groundwater impacts are being further evaluated to calculate the volume of groundwater that may require remediation.



5. PEC SUMMARIES

5.1 General

The following sections provide additional details for the results of the soil and groundwater investigations performed at each PEC and background sampling locations. The results are presented on a PEC-specific basis. For ease of reference, the PEC summaries have been organized in this section in chronological order. In addition, Appendix A in this Volume I includes aerial close-up views of each PEC with selected photographs of PEC features, as well as sampling locations. Test Pit and hand auger boring logs are included in Volume II along with groundwater monitoring well boring and installation logs.

Oil-impacted soil was encountered in many of the over 200 test pits/borings excavated at the site. However, significant impacts anticipated to potentially require mitigation are apparent in only 7 of the 21 PECs listed below:

- PEC #01 – Maintenance Shop/Warehouse,
- PEC #02 – Main Site Tank Farm,
- PEC #03 – Air Compression Plant,
- PEC #04 – Steam Generation Plant,
- PEC #06 – Secondary Tank Farm,
- PEC #08 – Former Sumps and Clarifiers, and
- PEC #09 – Electrical Transformer Storage Area.

Impacts were detected at other PECs. For example, two PECs, PEC #07, Biotreatment Cell, and PEC #20, Stockpile, contain crude oil-impacted soil that is awaiting treatment in the biotreatment cell. The data findings in these areas were anticipated and planned for in abandonment operations. Impacted areas less than 2 cubic yards (cy) were not considered to involve significant remedial planning. Also, as listed on Table 2-1, no intrusive sampling was conducted at several PECs. No intrusive sampling was conducted at these locations due to the lack of observed conditions of concern that would be associated with impacts to soil or groundwater. These PECs include:

- PEC #11 – Offices / Personnel Changing Rooms,
- PEC #16 – Coast Watch Station,
- PEC #18 – Concrete Cellar Stockpile and Miscellaneous Debris Stockpiles,
- PEC #21 – Miscellaneous Debris Piles,
- PEC #23 – Equipment Storage, and
- PEC #24 – The Main Site Offices.



5.2 Evaluation Criteria

An objective of the site investigation was to evaluate the nature and extent of potentially impacted materials at the NBR. To satisfy this objective, criteria to define potentially impacted materials were developed. For purposes of this report and used only as a screening tool, potentially impacted material will be defined as soil or groundwater media exceeding one or more of the following:

- Soils characterized by a visual observation as being impacted by petroleum hydrocarbons (e.g., black staining, oily staining),
- Soils with laboratory results for total hydrocarbons greater than 1,000 parts per million (ppm),
- Soils with laboratory results for specific chemicals at concentrations greater than United States Environmental Protection Agency (EPA) Region IX residential preliminary remediation goal (PRGs) concentrations for specific chemicals, where provided,
- Groundwater with laboratory results for specific chemicals at concentrations greater than the State of California maximum contaminant level (MCLs) concentrations for drinking water, or
- Groundwater observed to contain free product or immiscible phase hydrocarbons.

The laboratory chemical or visual observation data from each PEC that meets or exceeds these criteria were identified. The laboratory sampling and analysis plan, as implemented, is presented in Table 2-2. Soil and groundwater investigation results (visual observations and laboratory data) are presented together in the following sections. For each PEC where impacts were identified, the estimated volume of potentially impacted soil was evaluated by considering laboratory sample locations and visual observation boundaries. Table 4-1 presents a summary of estimated impacted soil volumes present at each PEC. The above criteria are listed in Table 4-1, along with the potential origin of the impact.

The following sections present the results and findings for the background soil sampling locations and for the PECs.

5.3 Background Locations

Five soil samples were collected from the background locations for laboratory chemical analysis on 8 May 2001. The five soil samples were collected from five separate test pits. The approximate location of the background test pits and sample points are shown in Figure 2-1. Table 2-1 lists the chemical analyses performed on the background soil samples. Metal concentrations from background soil samples are shown in Table 5-1. The remainder of the chemical tests (i.e., VOC, SVOC, PCB, pesticides) resulted in non-detect concentrations. Laboratory data is provided in Volume II.



5.4 PEC Results

5.4.1 PEC #01 – Maintenance Shop

General

Soil and groundwater quality was evaluated in PEC #01, both by visual observation and chemical laboratory testing. Results indicate that approximately 5,600 cubic yards of soil (estimated gross volume) are impacted. In addition, groundwater was found to be impacted by VOCs, however, no constituents exceeded State MCLs. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #01. The data were divided into 6 separate subareas (denoted potential remediation areas [PRAs] in Table 4-1, 01-PRA-001 through 01-PRA-006). These areas are highlighted on Figure 5-1, along with the anticipated extents of impact in each subarea (both vertically and horizontally), and potential sources.



# Wells	# Pits/Borings	# Samples	# Tests
3	55	31	108
Estimated Volume of Impacted Soil – 5,600 cy			

Soil Evaluation

Soil quality at PEC #01 was evaluated with the excavation of 55 test pits and hand auger borings. Test pits and hand auger borings were installed from 8 May to 4 June 2001. A total of 31 soil samples were collected for laboratory analysis at PEC #01. Appendix A includes selected photographs of PEC #01 site investigation activities and the approximate location where samples were collected. The test pits excavated adjacent to the visually identified materials were primarily used for lateral delineation of the impacted soils. Results of metal analyses from soil samples are included on Table 5-4. Results of organic analyses from soil samples are included on Table 5-5.

Laboratory analysis of soil samples have shown concentrations of four poly-cyclic aromatic hydrocarbons (PAHs) above residential PRGs. The soil samples containing the PAHs were collected from visually hydrocarbon impacted material. PAHs are a common component of crude oil. Results of metals analysis have shown concentrations of several metals above the average concentrations detected in the background samples, however none of the constituent concentrations exceeded its respective EPA Region IX PRG.



Collectively, the results of total hydrocarbon and carbon chain speciation analyses indicate that the hydrocarbon impacts at PEC #01 are due to heavier weight compounds (i.e., greater than C12). Carbon chain analyses indicate that the total mass of detected hydrocarbons is relatively distributed amongst the C13 through C36 carbon chain lengths, similar to the weathered crude oil (see PEC #02). Figure 3-1 presents the normalized hydrocarbon chain speciation results for three soil samples collected at PEC #01.

Groundwater Evaluation

The shallow groundwater at the maintenance shop was investigated through the installation and sampling of three temporary groundwater monitoring wells. Figure 2-1 shows the approximate locations of the temporary monitoring wells. These three groundwater monitoring wells were sampled on 9 June and 26 June 2001. Groundwater samples were tested for the analytes listed on Table 2-1. Table 5-4 includes a summary of inorganic laboratory results. Table 5-5 includes a summary of organic compounds detected in groundwater samples. Metals were not detected at concentrations above MCLs. The samples collected from the wells installed at PEC #01 were found to contain concentrations of benzene (1.1 ug/L) and vinyl chloride (15 ug/L) above MCLs. Other VOCs were detected at each of the PEC locations but at concentrations below MCLs.

5.4.2 PEC #02 – Main Site Tank Farm

General

Soil and groundwater quality was evaluated in PEC #02, both by visual observation and chemical laboratory testing. Results indicate that approximately 44,600 cubic yards of soil (gross) are impacted. In addition, groundwater was found to be impacted by free-product over an area of approximately 0.75 acre. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #02. The data were divided into 15 separate subareas (02-PRA-001 through 02-PRA-015 in Table 4-1). These areas are highlighted on Figure 5-2, along with the anticipated extents of impact in each subarea (both vertically and horizontally), and potential sources. The recent data collection effort was augmented by historical testing in this area that took place in 1996. Both data sets are discussed in the following sections.



# Wells	# Pits/Borings	# Samples	# Tests
5	67	42	133
Estimated Volume of Impacted Soil – 44,600 cy			
Estimated Area of Impacted Groundwater – 0.75 ac			



Soil Evaluation

Soil quality at the Main Site Tank Farm was evaluated during the recent site investigation with the excavation of 67 test pits or borings. Test pits and hand auger borings were excavated from 22 May to 29 August 2001. A total of 42 soil samples were collected for laboratory analysis at PEC #02. Historical investigations in another 16 test pits provided further information. Appendix A includes the area of investigation and selected photographs. Soil samples collected from PEC #02 were analyzed for hydrocarbons during the recent site investigation. Results of hydrocarbon analyses from soil samples are included on Table 5-2. Metals and VOC, SVOC/PAH analyses were conducted on soil samples collected from PEC #02 in 1996. Results of the historical data indicated that petroleum hydrocarbons were prevalent within PEC #02. VOC, SVOC, and pesticides were not detected in the soil samples, however, this may be partially due to the elevated detection limits caused by matrix interferences with the analytical results. The matrix interference was due to the oil/soil mixture.

Hydrocarbon speciation (i.e., carbon chain length analysis) was performed on samples of crude-oil impacted soil (Figure 3-3) from PEC #02. Carbon chain analysis results of one soil sample (02-SS-029-R) indicate hydrocarbons in the range of C11 through C36 similar to the weathered crude oil from 02-GW-002 (see next section), with a range of approximately 5 to 18 percent of the total hydrocarbon mass distributed amongst the various chain lengths. Results from a different sample collected in PEC #02 (02-SS-046-H) have shown a distinct grouping of total hydrocarbon mass that is much different from 02-SS-029R, with approximately 66 percent of the total mass in the C9-C10 range and approximately 33 percent of the total mass in the C11-C12 range. Sample 02-SS-046-H also exhibited a TPH gasoline concentration of 2,700 ppm, a concentration over four times the TRPH or carbon chain total results. This result is likely due to a lighter-end gas liquid or fuel used in the operations. Figure 3-3 presents the normalized hydrocarbon chain speciation results for the two soil samples collected at PEC #02.

Groundwater Evaluation

As indicated previously, temporary Groundwater Well 02-GW-002, installed at PEC #02, was found to be impacted by crude oil as a free product. A sample of the free product was collected for total hydrocarbon and carbon chain analyses. Results of the crude oil sample were used for comparison to hydrocarbon results from soil samples. As discussed in Section 3, the free product sample from Groundwater Well 02-GW-002 provides a signature of the weathered crude oil (Figure 3-2). Hydrocarbon analyses from sample 02-GW-002 indicate an absence of light weight hydrocarbon (less than C9) and a distribution (7 to 13 percent) of the total hydrocarbon mass detected amongst each of the hydrocarbon chains. A comparison of crude oil and total carbon chain results indicates that approximately 50 percent of the hydrocarbon mass is greater than C36, indicative of highly weathered product. As expected, PAH and VOC were detected in the crude oil sample above state MCLs. These impacts were not present in samples collected from other wells within PEC #02, indicating that the impacts are localized around 02-GW-002. However, groundwater samples collected from other wells did detect dissolved phase hydrocarbons at concentrations up to 26 ppm (TPH, crude oil standard) in 02-GW-003.



In addition to the soil and groundwater samples, two soil gas samples were collected from a bubbling gas source identified at an area of ponded water. The location where the two soil gas samples were collected is shown on Figure 5-2. Soil gas samples were analyzed for fixed gas and VOCs. Soil gas results are presented in Table 5-3. Laboratory results of the gas samples indicate methane concentrations ranging from approximately 65 to 75 percent (by volume) and associated VOCs at detectable concentrations. This area is being evaluated further.

5.4.3 PEC #03 – Air Compression Plant

General

Soil quality was evaluated in PEC #03, both by visual observation and chemical laboratory testing. Results indicate that approximately 2,100 cubic yards of soil (estimated gross volume) are impacted. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #03. The data were divided into 4 separate subareas (03-PRA-001 through 03-PRA-004 in Table 4-1). These areas are highlighted on Figure 5-3, along with the anticipated extents of impact in each subarea (both vertically and horizontally), and potential sources.



# Pits/Borings	# Samples	# Tests
21	7	25
Estimated Volume of Impacted Soil – 2,100 cy		

Soil Evaluation

Soil quality at PEC #03 was evaluated with the excavation of 21 test pits and hand auger borings. Test pits and hand auger borings were excavated from 18 May to 6 June 2001. A total of 7 soil samples were collected for laboratory analysis at PEC #03. Appendix A includes the area of investigation and selected photographs. Soil samples collected from PEC #03 were tested for hydrocarbons, VOCs, and PCBs and pesticides as indicated in Table 2-1. Results of hydrocarbon and organic compound analyses are included on Table 5-2.

Results indicated that constituents were not detected above residential PRGs. However, hydrocarbon impacted material was visually identified. Results of laboratory hydrocarbon analyses (generally boundary locations) indicated total hydrocarbon concentrations less than 700 ppm. Although no carbon chain speciation was performed, hydrocarbon impacts were visually similar to those identified in the crude-oil impacted areas of other PECs.



5.4.4 PEC #04 – Steam Generation Plant

General

Soil quality was evaluated in PEC #04, both by visual observation and chemical laboratory testing. Results indicate that approximately 1,000 cubic yards of soil (estimated gross volume) are impacted. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #04. The data were divided into 3 separate subareas (04-PRA-001 through 04-PRA-003 in Table 4-1). These areas are highlighted on Figure 5-4, along with the anticipated extents of impact in each subarea (both vertically and horizontally), and potential sources.



# Pits/Borings	# Samples	# Tests
13	10	27
Estimated Volume of Impacted Soil – 1,000 cy		

Soil Evaluation

Soil quality at PEC #04 was evaluated with the excavation of 13 test pits and hand auger borings. Test pits and hand auger borings were excavated between 15 May and 4 June 2001. A total of 10 soil samples were collected for laboratory analysis at PEC #04. Appendix A includes size feature photographs and the area of investigation and selected photographs. Soil samples from PEC #04 were tested for a combination of hydrocarbons, metals, and general minerals. Results of metal analyses from soil samples are included on Table 5-4. Constituents were not detected at concentrations above residential PRGs.

Results of hydrocarbon analyses are included on Table 5-2. Results of laboratory hydrocarbon analyses (generally boundary locations) indicate total hydrocarbon concentrations in the soil samples of less than 200 ppm. However, hydrocarbon impacted material was visually identified. Although no carbon chain speciation was performed, hydrocarbon impacts were visually similar to those identified in the crude-oil impacted areas of other PECs.

5.4.5 PEC #05 – Water Softening Plant

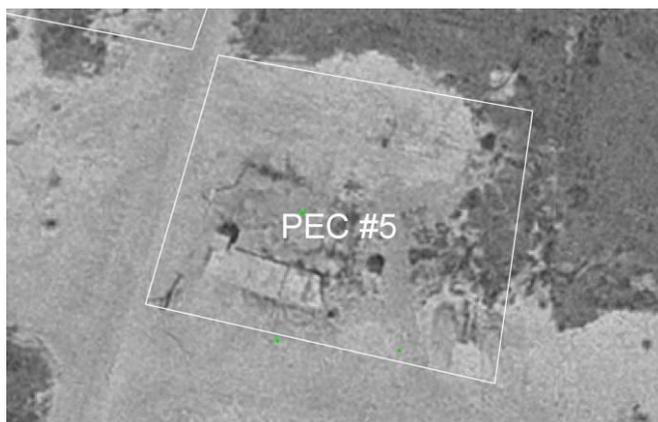
General

Soil quality was evaluated in PEC #05, both by visual observation and chemical laboratory testing. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #05. The data show no significant impacts at this PEC.



Soil Evaluation

Soil quality at PEC #05 was evaluated with the excavation of 3 test pits. Test pits were excavated on 6 June 2001. A total of three soil samples were collected for laboratory analysis at PEC #05. Appendix A includes size feature photographs and the approximate location where samples were collected. Soil samples collected from PEC #05 were tested for a combination of hydrocarbons and VOCs. Results of hydrocarbon and VOC analyses are included on Table 5-2. Based on the results of these tests, constituents were not detected at soil samples at concentrations above residential PRGs.



# Pits/Borings	# Samples	# Tests
3	3	7
Estimated Volume of Impacted Soil – 0 cy		

Results of hydrocarbon analyses (generally boundary locations) have indicated total hydrocarbon concentrations in soil samples of less than 20 ppm. Visually impacted material was not observed. Based on the results of these analyses, potentially impacted material requiring further investigation was not identified at PEC #05.

5.4.6 PEC #06 – Secondary Tank Farm Area

General

Soil and groundwater quality was evaluated in PEC #06, both by visual observation and chemical laboratory testing. Results indicate that approximately 1,500 cubic yards of soil (estimated gross volume) are impacted. No groundwater impacts were observed or indicated by laboratory results. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #06. The data were divided into 4 separate subareas (06-PRA-001 through 06-PRA-004 in Table 4-1). These areas are highlighted on Figure 5-5, along with the anticipated extents of impact in each subarea (both vertically and horizontally), and potential sources.



# Wells	# Pits/Borings	# Samples	# Tests
1	13	10	29
Estimated Volume of Impacted Soil – 1,500 cy			



Soil Evaluation

Soil quality at the secondary tank farm area was evaluated with the excavation of 13 test pits. Test pits were installed from 31 May to 4 June 2001. A total of 10 soil samples were collected for laboratory analysis at PEC #06. Appendix A includes the area of investigation and selected photographs. Soil samples collected from PEC #06 were tested for hydrocarbons only.

Results of hydrocarbon analyses are included on Table 5-2. Results of laboratory hydrocarbon analyses have indicated total hydrocarbon concentrations less than 20 ppm. However, hydrocarbon impacted material was visually identified. Although no carbon chain speciation was performed, hydrocarbon impacts were visually similar to those identified in the crude-oil impacted areas of other PECs.

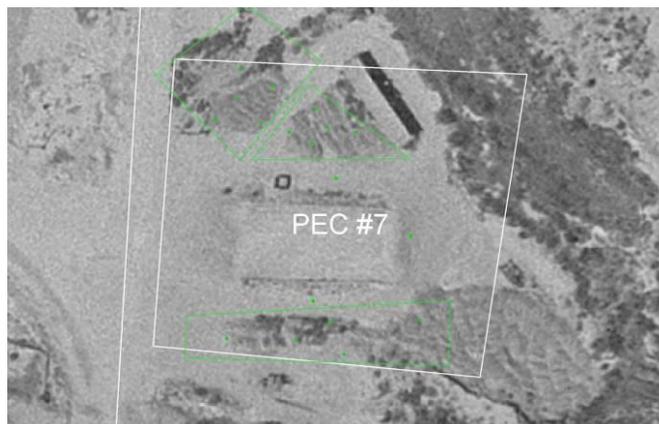
Groundwater Evaluation

The shallow groundwater at the secondary tank farm was investigated through the installation and sampling of one temporary groundwater monitoring well. Figure 3-1 shows the approximate location of the temporary monitoring well. The temporary groundwater monitoring well was installed on 8 June 2001. The groundwater monitoring well was sampled on 9 June 2001. Groundwater samples were tested for the analytes listed on Table 2-1. No constituents in the groundwater sample exceeded regulatory thresholds. Table 5-4 includes a summary of inorganic laboratory results. Table 5-5 includes a summary of organic compounds detected in the groundwater samples.

5.4.7 PEC #07 – Pilot Scale Biotreatment Cell / Stockpiled Soil

General

Soil quality was evaluated in PEC #07, both by visual observation and chemical laboratory testing. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #07. The data show no significant impacts at this PEC.



Soil Evaluation

Soil quality at the biotreatment cell was evaluated with the excavation of 6 test pits and hand auger borings. Test pits and hand auger borings were excavated from 5 June to 6 June 2001. A total of 3 soil samples were collected

# Pits/Borings	# Samples	# Tests
6	3	6
Estimated Volume of Soil ~ 5,000 cy awaiting treatment		

for laboratory analysis at PEC #07. Appendix A includes the area of investigation and selected photographs. Soil samples collected from PEC #07 were only tested for hydrocarbons.



Results of hydrocarbon analyses are included on Table 5-2. Results of laboratory hydrocarbon analyses have indicated total hydrocarbon concentrations less than 40 ppm. However, hydrocarbon impacted material was visually identified in the area where crude oil-impacted soil is awaiting treatment in the biotreatment cell. At the date of the investigation (Summer 2001) approximately 5,000 cy of impacted soil from abandonment operations were stockpiled in PEC #07 awaiting treatment. Although no carbon chain speciation was performed, hydrocarbon impacts were visually similar to those identified in the crude oil-impacted areas of other PECs.

5.4.8 PEC #08 – Former Sumps / Clarifiers

General

Soil and groundwater quality was evaluated in PEC #08, both by visual observation and chemical laboratory testing. Results indicate that approximately 19,800 cubic yards of soil (gross) are impacted. No groundwater impacts were observed or indicated by laboratory results. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #08. The data were divided into 5 separate subareas (08-PRA-001 through 08-PRA-005 in Table 4-1). These areas are highlighted on Figure 5-2, along with the anticipated extents of impact in each subarea (both vertically and horizontally), and potential sources.



# Wells	# Pits/Borings	# Samples	# Tests
1	15	10	38
Estimated Volume of Impacted Soil – 19,800 cy			

Soil Evaluation

Soil quality at PEC #08 was evaluated with the excavation of 15 test pits. Test pits were excavated from 16 May to 22 June 2001. A total of 10 soil samples were collected for laboratory analysis at PEC #08. Appendix A includes the area of investigation and selected photographs. Soil samples collected at PEC #08 were only tested for hydrocarbons. Results of hydrocarbon analyses are included on Table 5-1.

Results of total hydrocarbon and carbon chain speciation analyses indicate that the hydrocarbon impacts at PEC #08 are due to heavier weight compounds, greater than C13. The results of the carbon chain analysis indicates that the total mass of detected hydrocarbons is distributed (between 9 and 19 percent) amongst the C13 through C36 carbon chain lengths, similar to a highly weathered crude oil signature. Figure 3-5 presents the normalized hydrocarbon chain speciation results for the soil sample, 08-SS-006-H.



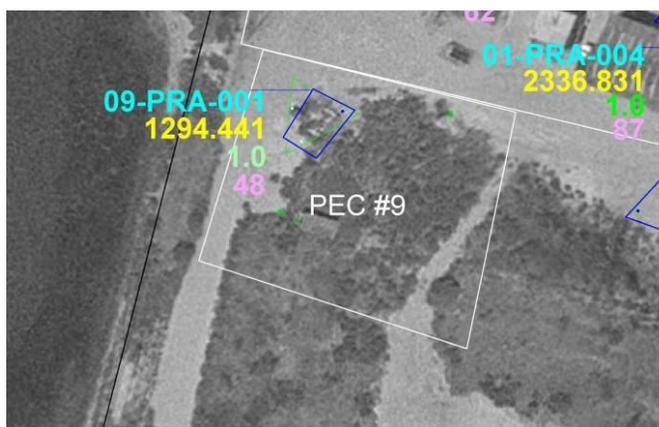
Groundwater Evaluation

The shallow groundwater at PEC #08 was investigated through the installation and sampling of one temporary groundwater monitoring well. Figure 3-1 shows the approximate location of the temporary monitoring well. The temporary groundwater monitoring well was installed on 8 June 2001. The groundwater monitoring well was sampled on 9 June 2001. Groundwater samples were tested for the analytes listed on Table 2-3. No constituents were detected in the groundwater samples above regulatory thresholds. Methylene chloride was detected, however, this is likely a result of laboratory contamination. Table 5-4 includes a summary of inorganic laboratory results. Table 5-5 includes a summary of organic compounds detected in the groundwater samples.

5.4.9 PEC #09 – Electrical Distribution Network and Transformer Storage Area

General

Soil quality was evaluated in PEC #09, both by visual observation and chemical laboratory testing. Results indicate that approximately 50 cubic yards of soil (estimated gross volume) are impacted. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #09. Based on the data, a single subarea was designated as a PRA for this PEC (09-PRA-001 in Table 4-1). This area is highlighted on Figure 5-1, along with the anticipated extents of impact in the subarea (both vertically and horizontally), and the potential source.



# Pits/Borings	# Samples	# Tests
4	2	8
Estimated Volume of Impacted Soil – 50 cy		

Soil Evaluation

Soil quality at PEC #09 was evaluated with the excavation of 4 test pits and hand auger borings. Test pits and hand auger borings were excavated from 11 May to 14 May 2001. A total of 2 soil samples were collected for laboratory analysis at PEC #09. Appendix A includes site feature photographs and the approximate location where samples were collected. Soil samples collected from PEC #09 were tested for hydrocarbons, metals, and PCBs and pesticides. Results of metal analyses from soil samples are included on Table 3-2. Results of hydrocarbon and organic analyses are included on Table 5-2.

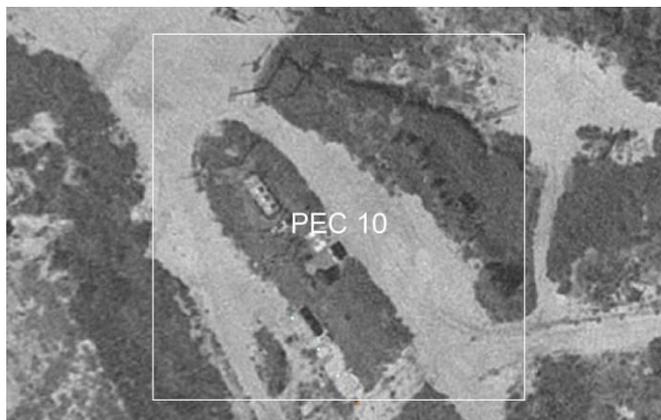
Although the results of metal analyses have shown concentrations of several metals above the average concentrations detected in the background samples, no constituent exceeded the residential PRG. PCBs were not detected in the soil samples collected. Results of hydrocarbon analyses (generally boundary locations) have indicated total hydrocarbon concentrations less than 20 ppm. Visually impacted material was identified in one location (09-PRA-001).



5.4.10 PEC #10 – Transformer Mounts

General

Soil quality was evaluated in PEC #10, both by visual observation and chemical laboratory testing. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #10. Although, PCBs were detected within the PEC, the data show limited impacts at this PEC.



Soil Evaluation

Soil quality at PEC #10 was evaluated with the excavation of 4 hand auger borings. Borings were excavated on 22 May 2001. A total of 2 soil samples were collected for laboratory analysis at PEC #10. Appendix A includes site

# Pits/Borings	# Samples	# Tests
4	2	5
Estimated Volume of Impacted Soil – < 2 cy		

feature photographs and the approximate location where samples were collected. Soil samples collected from PEC #10 were tested for hydrocarbons and PCBs. Results of hydrocarbon and organic analyses are included on Table 5-2.

The PCB Aroclor 1254 was detected in two samples at concentrations exceeding residential PRGs. Results of hydrocarbon analyses have indicated total hydrocarbon concentrations less than 600 ppm. Hydrocarbon impacted material was not visually identified. The estimated volume of soils defined by the detected PCB concentrations above residential PRGs is less than 2 cy.

5.4.11 PEC #11 – Offices/Changing Rooms

Based on visual observation performed at this PEC, no apparent impacts were noted.

5.4.12 PEC #12 – City of Newport Beach Tank Farm

General

Soil quality was evaluated in PEC #12, both by visual observation and chemical laboratory testing. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #12. The data show no significant impacts at this PEC.



Soil Evaluation

Soil quality at the City of Newport Beach tank farm was evaluated with the excavation of 3 test pits. Test pits were excavated on 7 June 2001. A total of 3 soil samples were collected for laboratory analysis at PEC #12. Appendix A includes site feature photographs and the approximate location where samples were collected. Soil samples collected from PEC #12 were only tested for hydrocarbons. Results of hydrocarbon analyses are included on Table 5-2.



Results of laboratory hydrocarbon analyses have indicated total hydrocarbon concentrations less than 20 ppm. However, hydrocarbon impacted material was visually identified in a limited area.

# Pits/Borings	# Samples	# Tests
3	3	6
Estimated Volume of Impacted Soil – < 2 cy		

This area appears to be more consistent with impacts noted in PEC #06, therefore this volume of material will likely be included in the remediation plan for PEC #06. The estimated volume of hydrocarbon impacted soils at PEC #12 is less than 2 cy and therefore was not noted in Table 4-1.

5.4.13 PEC #13 – No Actual PECs

For clarification, PECs were originally assigned to PEC #13, however, based on site operations activities these locations were grouped with other PEC locations.

5.4.14 PEC #14 – No Actual PECs

For clarification, PECs were originally assigned to PEC #14, however, based on site operations activities these locations were grouped with other PEC locations.

5.4.15 PEC #15 – Underground Storage Tank and Fuel Pump

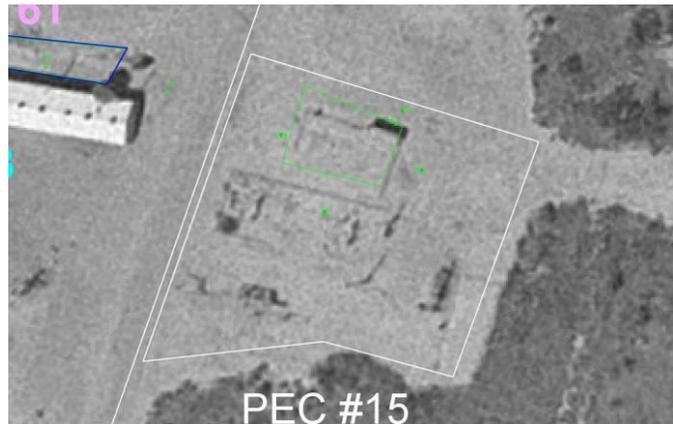
General

Soil quality was evaluated in PEC #15, both by visual observation and chemical laboratory testing. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #15. The data show no significant impacts at this PEC.



Soil Evaluation

Soil quality at PEC #15 was evaluated with the excavation of 4 test pits. Test pits were excavated on 6 June 2001. A total of 4 soil samples were collected for laboratory analysis at PEC #15. Appendix A includes site feature photographs and the approximate location where samples were collected. Soil samples collected from PEC #15 were tested for hydrocarbons only. Results of hydrocarbon analyses are included on Table 5-2. Total hydrocarbon laboratory results were non-detect. However, hydrocarbon impacted material was visually identified in a limited area. The estimated volume of impacted soils at PEC #15 is less than 2 cy and therefore was not noted in Table 4-1.



# Pits/Borings	# Samples	# Tests
4	4	8
Estimated Volume of Impacted Soil – < 2 cy		

5.4.16 PEC #16 – Coast Watch Station

Based on visual observation performed at this PEC, no apparent impacts were noted.

5.4.17 PEC #17 – Oil and Gas Production Equipment Storage

General

Soil quality was evaluated in PEC #17, both by visual observation and chemical laboratory testing. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #17. The data show no significant impacts at this PEC.



Soil Evaluation

Soil quality at PEC #17 was evaluated with the excavation of 1 hand auger boring. The hand auger boring was excavated on 11 May 2001. One soil sample was collected for laboratory analysis at PEC #17. Appendix A includes site feature photographs and the approximate location where the sample was collected. The soil sample was tested for hydrocarbons only. Results of hydrocarbon analyses are included on Table 5-2. Laboratory total

# Pits/Borings	# Samples	# Tests
1	1	2
Estimated Volume of Impacted Soil – 0 cy		



hydrocarbon results were less than 200 ppm and visually impacted material was not observed. Based on the results, potentially impacted material requiring further investigation was not identified at PEC #17.

5.4.18 PEC #18 – Debris Stockpiles

Based on visual observation performed at this PEC, no apparent impacts were noted. Following removal of this debris, sampling of underlying soils may be performed to evaluate soil quality underlying the debris stockpiles.

5.4.19 PEC #19 – Abandoned Shack

General

Soil quality was evaluated in PEC #10, both by visual observation and chemical laboratory testing. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #10. The data show no significant impacts at this PEC.



Soil Evaluation

Soil quality at PEC #19 was evaluated with the excavation of several hand auger borings. The several hand auger borings were excavated on 15 May 2001. One soil sample was composited from the hand auger borings for laboratory analysis at PEC #19. Figure 5-__ shows the approximate location where the grab samples were collected. The soil sample was tested for hydrocarbons only. Visually impacted material was not identified and total hydrocarbon laboratory results were non-detect. Therefore, based on these results potentially impacted material requiring further investigation was not identified at PEC #19.

# Pits/Borings	# Samples	# Tests
4	1	2
Estimated Volume of Impacted Soil – 0 cy		

5.4.20 PEC #20 – Miscellaneous Debris and Soil Stockpiles

General

Soil quality was evaluated in PEC #20, both by visual observation and chemical laboratory testing. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #20. This PEC contains stockpiles of both treated and untreated soil awaiting treatment in the bioremediation cell. Although certain constituents were detected above their respective PRGs; the impacts at this PEC were anticipated in the untreated soil.



Soil Evaluation

Soil quality at PEC #20 was evaluated with the excavation of 10 test pits and hand auger borings. Test pits and hand auger borings were excavated from 14 May to 15 May 2001. A total of 8 soil samples were collected for laboratory analysis at PEC #20. Appendix A includes site feature photographs and the approximate location where samples were collected. Soil samples were tested for a combination of hydrocarbons, metals, SVOCs, VOCs, PCBs and pesticides, and general minerals. Results of metal analyses from soil samples are included on Table 3-2. Results of hydrocarbon and organic analyses are included on Table 3-3. Results of general mineral analyses of soil samples are included on Table 3-4.



# Pits/Borings	# Samples	# Tests
4	1	23
Estimated Volume of Soil – 2,000 cy awaiting treatment		

A carbon chain analysis was performed on one soil sample from PEC #20. The carbon chain analysis results indicate hydrocarbons in the range of C11 through C36, with a range of approximately 7 to 12 percent of the total hydrocarbon mass distributed amongst the various chain lengths similar to the weathered crude oil signature. Figure 3-6 presents the normalized hydrocarbon chain speciation results for the two soil samples collected at PEC #20. Laboratory results have shown concentrations of two PAHs, benzo(a)pyrene and dibenzo(a,h)anthracene above residential PRGs. Iron was also detected at a concentration above the residential PRG. These soils are awaiting treatment in the biotreatment cell. The extent of the impacted soil is approximately 2,000 cubic yards. In accordance with the criteria specified in Section 4, the estimated volume of impacted soils at PEC #20 is less than 2 cubic yards and therefore was not noted in Table 4-1.

5.4.21 PEC #21 – Debris Stockpiles

Based on visual observation performed at this PEC, no apparent impacts were noted. Following removal of the debris, sampling of underlying soils may be performed to evaluate soil quality underlying the debris stockpiles.

5.4.22 PEC #22 – Soil Stockpiles

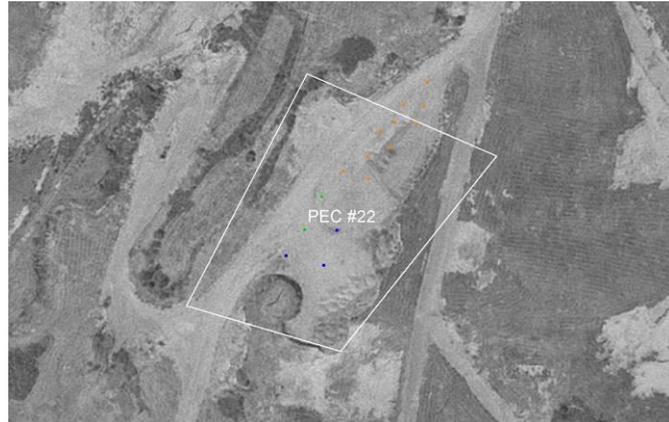
General

Soil quality was evaluated in PEC #22, both by visual observation and chemical laboratory testing. Results from the laboratory and visual observations were combined to evaluate the amount of soil impacted within PEC #22. The data show no significant impacts at this PEC.



Soil Evaluation

Soil quality at PEC #22 was evaluated with the excavation of 1 test pit. The test pit was excavated on 31 May 2001. A total of 3 soil samples were collected for laboratory analysis at PEC #22. Figure 3-17 shows the approximate location where samples were collected. Soil samples collected from PEC #22 were tested for hydrocarbons only. Results of hydrocarbon analyses are included on Table 5-2. Visually impacted material was not identified. Results of hydrocarbon analyses have indicated total hydrocarbon concentrations less than 750 ppm. Based on the results of these analyses, potentially impacted material requiring further investigation was not identified at PEC #22.



# Pits/Borings	# Samples	# Tests
1	3	6
Estimated Volume of Impacted Soil – 0 cy		

5.4.23 PEC #23 – Equipment Storage

Based on visual observation performed at this PEC, no apparent impacts were noted. Following removal of the equipment, sampling of underlying soils may be performed to evaluate soil quality underlying the equipment storage areas.

5.4.24 PEC #24 – Main Office

Based on visual observation performed at this PEC, no apparent impacts were noted.



6. CONCLUSIONS

The original SAP developed for the additional site investigation activities called for a systematic approach involving many test pits, borings, and temporary groundwater wells to be sampled at the NBR. During the course of the work, based on visual observations and the pace of the field activities, the number of test pits and groundwater wells installed was almost double the planned number. Over 200 test pits/borings were excavated and visually observed and 10 groundwater wells were installed and sampled. In addition, two soil gas samples were collected to evaluate soil gas quality in one PEC.

Based on the results, the following conclusions are made:

- The objectives of the investigation were achieved. Sufficient analytical data (both from observations and laboratory testing) were gathered for a Phase II type assessment. The data provide a characterization of the nature and extent of impacts to soil and groundwater, and estimates of the volume of impacted materials.
- No hazardous levels of materials tested were found. As anticipated, the site is impacted primarily by petroleum hydrocarbons, both in soil and groundwater, as expected of oil fields of this age.
- Approximately 62,000 cubic yards of in-place soil are impacted with hydrocarbon related materials. Approximately 77,000 cubic yards of gross soil volume (includes clean overburdens) will need to be addressed in some manner.
- The site also contains stockpiles of soil that were treated at the on-site bioremediation cell according to the agency-approved ERP. The amount of stockpiled soils varies continuously, as additional materials are treated and stockpiled during the implementation of the ERP. Currently, approximately 40,000 cubic yards of treated soil stockpiles exist at the NBR. In addition, approximately 4,000 cubic yards of miscellaneous concrete debris from oil field abandonment exist at the site, as well as approximately 93,000 cubic yards of asphaltic like material used as road base.
- The shallow groundwater, which is a low quality ocean influenced zone that is not used as a drinking water source, is impacted by crude oil free-product in a contained area of approximately 0.75 acre within PEC #02 - Main Site Tank Farm Area. This free-product site is currently being addressed through direct oil/water extraction. Additional investigation as to the extent of the impact and necessary remedial measures may be necessary.
- One area of soil gas emanating from the ground/pond area was detected near PEC #02 – Main Site Tank Farm. The gas was tested and results indicated it was predominantly methane. While the region is prone to natural oil and gas seeps, the source of this gas has yet to be established. Additional investigation as to the nature and extent of this gas may be necessary.



Generally, the results confirm that the primary soil and groundwater impact is from crude oil (i.e., petroleum hydrocarbons). Other chemicals detected during the site investigation are generally co-located with petroleum hydrocarbons. The mitigation approach will likely involve addressing the petroleum hydrocarbons in accordance with the development end-use planned for each area. The results will be used to develop a Remedial Action Plan (RAP) for the site.



TABLE 1-1
AREAS OF POTENTIAL ENVIRONMENTAL CONCERN
NEWPORT BANNING RANCH
(November 2001)

PEC	SITE FEATURE	POTENTIAL ENVIRONMENTAL CONDITIONS
#01	Maintenance shop/warehouse	<ul style="list-style-type: none">• waste oil sump• stockpiled transformers• hazardous substances and petroleum hydrocarbons in use• abandoned vehicles
#02	Main site tank farm	<ul style="list-style-type: none">• above ground storage tanks• oil and gas dewatering operations• natural gas treatment• underground sump
#03	Air compression plant (currently inactive)	<ul style="list-style-type: none">• above ground storage tanks• vehicle fueling area (near)• parts cleaning trough• underground sump
#04	Steam generation plant (currently inactive)	<ul style="list-style-type: none">• possible chemical spills and/or leaks from past operations
#05	Water softening plant (currently inactive)	<ul style="list-style-type: none">• above ground storage tanks• possible chemical spills and/or leaks from past operations
#06	Secondary tank farm (currently out-of-service)	<ul style="list-style-type: none">• above ground storage tanks• oil and gas dewatering operations• natural gas treatment• underground sump
#07	Pilot-scale bioremediation cell	<ul style="list-style-type: none">• biotreatment cell area• stockpiled, unlined, impacted soil• treated soil stockpile canyons (near)
#08	Former sumps and clarifiers	<ul style="list-style-type: none">• possible leaching of crude oil from the sumps/clarifiers to the ground
#09	Electrical and transformer storage	<ul style="list-style-type: none">• possible PCB leaks from electrical transformers
#10	Transformer mounts	<ul style="list-style-type: none">• possible PCB leaks from electrical transformers
#11	Offices/Changing rooms	<ul style="list-style-type: none">• septic wastes• possible solid waste disposal areas (near)



TABLE 1-1 (continued)
AREAS OF POTENTIAL ENVIRONMENTAL CONCERN
NEWPORT BANNING RANCH
(November 2001)

PEC	SITE FEATURE	POTENTIAL ENVIRONMENTAL CONDITIONS
#12	City of Newport Beach tank farm (Boundary Conditions)	<ul style="list-style-type: none">• above ground storage tanks• oil and gas dewatering operations• natural gas treatment• underground sump
#15	Underground storage tank and fuel pump	<ul style="list-style-type: none">• potential gasoline leaks from UST
#16	Coast watch station	<ul style="list-style-type: none">• Miscellaneous debris• Municipal solid waste
#17	Oil and gas production equipment storage	<ul style="list-style-type: none">• possible leaching of materials from the equipment to the ground
#18	Concrete cellar stockpile & miscellaneous debris stockpiles	<ul style="list-style-type: none">• possible leaching of materials from the debris to the ground
#19	Abandoned shack	<ul style="list-style-type: none">• possible chemical spills and/or leaks from past operations
#20	Miscellaneous debris & soil stockpiles	<ul style="list-style-type: none">• possible leaching of materials from the equipment and debris to the ground
#21	Miscellaneous debris stockpiles	<ul style="list-style-type: none">• possible leaching of materials from the equipment and debris to the ground
#22	Soil stockpiles	<ul style="list-style-type: none">• possible leaching of materials from the soil to the ground
#23	Equipment Storage	<ul style="list-style-type: none">• possible leaching of materials from the equipment to the ground• potential oil leaks
#24	Main office	<ul style="list-style-type: none">• septic wastes• possible solid waste disposal areas (near)



**TABLE 2-1
SUMMARY OF SAMPLING AND ANALYSES PLAN – AS IMPLEMENTED
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA
(November 2001)**

Potential Environmental Condition (PEC)	Type of Sample	# of Sampling Points	# of Samples Collected for Analysis Suite	Chemical Analyses Performed													
				Field Screening (OVA)	TRPH (418.1)	TPH/TPH-CC ⁽¹⁾	SVOC/PAHs (8310 or 8270)	Metals (ICP, AA)	Mercury ⁽²⁾	VOCs (8260)	PCB/OC-Pesticides (8081/82)	OP-Pesticides (8140A/41)	Herbicides (8150B)	General Minerals ⁽³⁾	Fixed Gases / VOCs		
#01 - Maintenance Shop/Warehouse	Groundwater	3	3	✓	✓	✓	✓	✓	✓	✓				✓			
	Soil	30	18	✓	✓												
			2	✓	✓	✓											
			6	✓		✓											
			3	✓			✓	✓	✓	✓	✓				✓		
			1	✓	✓	✓	✓	✓	✓	✓	✓			✓			
#02 – Main Site Tank Farm (Active)	Soil Gas	2	2	✓												✓	
	Groundwater	5	4	✓	✓	✓	✓	✓	✓	✓	✓				✓		
			1	✓		✓	✓			✓							
Soil	41	30	✓	✓													
#03 – Air Compression Plant (inactive)	Soil	7	11	✓	✓	✓											
			1	✓	✓												
			1	✓	✓							✓					
#04 – Steam Generation Plant (inactive)	Soil	10	5	✓	✓	✓					✓						
			6	✓	✓												
			1	✓	✓										✓		
#05 – Water Softening Plant (inactive)	Soil	3	3	✓	✓										✓		
			2	✓	✓							✓					
#06 – Secondary Tank Farm (out-of-service)	Groundwater	1	1	✓	✓	✓	✓	✓	✓	✓	✓				✓		
			9	✓	✓												
	Soil	10	1	✓	✓	✓											



TABLE 2-1 (continued)
SUMMARY OF SAMPLING AND ANALYSES PLAN – AS IMPLEMENTED
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA
(November 2001)

Potential Environmental Condition (PEC)	Type of Sample	# of Sampling Points	# of Samples Collected for Analysis Suite	Chemical Analyses Performed												
				Field Screening (OVA)	TRPH (418.1)	TPH/TPH-CC ⁽¹⁾	SVOC/PAHs (8310 or 8270)	Metals (ICP, AA)	Mercury ⁽²⁾	VOCs (8260)	PCB/OC-Pesticides (8081/82)	OP-Pesticides (8140A/41)	Herbicides (8150B)	General Minerals ⁽³⁾	Fixed Gases / VOCs	
#07 - Pilot-Scale Biotreatment Cell/Stockpiled Soil	Soil	3	3	✓	✓											
#08 – Former Sumps / Clarifiers	Groundwater	1	1	✓	✓	✓	✓	✓	✓	✓					✓	
	Soil	13	9	✓	✓											
#09 - Electrical Distribution Network and Transformer Storage Areas	Soil	2	4	✓	✓	✓										
			1	✓	✓		✓	✓								
#10 – Transformer Mounts	Soil	2	1	✓	✓											
			1	✓								✓				
#11 – Offices / Personnel Changing Rooms	NO INTRUSIVE SAMPLING – NO CONDITIONS NOTED															
#12 – City of Newport Beach Tank Farm (active)	Soil	3	3	✓	✓											
#13 & #14 – Combined with other PECs	NA															
#15 – Underground Storage Tank & Fuel Pump	Soil	4	4	✓		✓										
#16 – Coast Watch Station	NO INTRUSIVE SAMPLING – NO CONDITIONS NOTED															
#17 – Oil and Gas Production Equipment Storage	Soil	1	1	✓	✓											
#18 – Concrete Cellar Stockpile & Miscellaneous Debris Stockpiles	NO INTRUSIVE SAMPLING – NO CONDITIONS NOTED															
#19 – Abandoned Shack	Soil	1	1	✓	✓											
#20 - Miscellaneous Debris & Soil Stockpiles	Soil	8	7	✓	✓											
		1	1	✓	✓	✓	✓	✓	✓	✓	✓			✓		



TABLE 2-1 (continued)
SUMMARY OF SAMPLING AND ANALYSES PLAN – AS IMPLEMENTED
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA
(November 2001)

Potential Environmental Condition (PEC)	Type of Sample	# of Sampling Points	# of Samples Collected for Analysis Suite	Chemical Analyses Performed											
				Field Screening (OVA)	TRPH (418.1)	TPH/TPH-CC ⁽¹⁾	SVOC/PAHs (8310 or 8270)	Metals (ICP, AA)	Mercury ⁽²⁾	VOCs (8260)	PCB/OC-Pesticides (8081/82)	OP-Pesticides (8140A/41)	Herbicides (8150B)	General Minerals ⁽³⁾	Fixed Gases / VOCs
#21 - Miscellaneous Debris Stockpiles				NO INTRUSIVE SAMPLING – NO CONDITIONS NOTED											
#22 - Soil Stockpiles	Soil	3	3	✓	✓										
#23 - Equipment Storage				NO INTRUSIVE SAMPLING – NO CONDITIONS NOTED											
Main Site Offices				NO INTRUSIVE SAMPLING – NO CONDITIONS NOTED											
Background Soil Conditions ⁽⁴⁾	Soil	5	5	✓	✓			✓	✓		✓	✓	✓		

- Notes: General: A subset of the total number of samples collected were submitted for chemical analysis. Certain soil samples from borings/pits were archived.
- (1) TPH-CC (8015 M) may have been run for carbon-chain assessment / TPH-g BTEX (8015 M/8010/8020) for benzene, toluene, ethylbenzene, and xylene assessment.
 - (2) Mercury analysis performed as an individual analysis to achieve DQO detection limits.
 - (3) General minerals included pH, anions, cations, nitrates, and E. Coli bacteria, as appropriate.
 - (4) Background Conditions are not enumerated as a PEC, based on the fact that these data are used during comparative evaluations of existing site impacts.



TABLE 2-2
SUMMARY OF TOTAL NUMBER OF CHEMICAL ANALYSES – AS IMPLEMENTED
SITE INVESTIGATION
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA
(November 2001)

TYPE OF SAMPLES	# of Sampling Points ⁽¹⁾	# of Samples Collected	Number of Chemical Analyses Performed											Fixed Gases & VOCs	Subtotal (lab & field tests)
			Field Screening (OVA)	TRPH (418.1)	TPH / TPH-CC	SVOC/PAHs (8310 or 8270)	Metals – Title 22 (ICP, AA)	Mercury ⁽¹⁾	VOCs (8260)	PCB/OC-Pesticides (8081/82)	OP-Pesticides (8140A/41)	Herbicides (8150B/51)	General Minerals ⁽²⁾		
Soil	216	148	216	132	35	5	14	11	11	15	5	5	9	-	458
Groundwater	10	10	10	9	10	10	9	9	10	-	-	-	10	-	77
Soil Gas	2	2	2	-	-	-	-	-	-	-	-	-	-	2	2
Subtotal	228	160	228	141	45	15	23	20	21	15	5	5	19	2	537

Notes: (1) Additional samples were collected and archived. Testing was performed based on earlier results.

(2) General minerals included pH, anions, cations, nitrates, and E. Coli bacteria, as appropriate.



**TABLE 2-3
ANALYTICAL SUITES
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA
(November 2001)**

SUITE	ANALYSIS	METHOD	RATIONALE
Field Screening	Organic Vapor	Flame Ionization Detector (FID) Photoionization Detector (PID)	Used to establish the presence of methane and/or volatile organic compounds in soil or soil gas sample. Used as initial Yes/No impact assessment to select field samples for chemical analysis.
A	TRPH	418.1	Primarily used for Yes/No impact assessment. Also, used for confirmation sampling/boundary delineation of standard oil operations sites or general investigations.
B	TPH-CC / TPH-g BTEX	8015m	Used to identify carbon-chain components (used to identify light end components of impacted areas or for confirmation sampling to show light ends are not present).
C	VOC SVOC/PAH PCB/Pest Metals Mercury Asbestos General Minerals	8260 8310/8270 8081/8082 ICP/AA ICP PLM/ASTM D 5755	Used on a limited basis in new sites to establish contaminant makeup.



**TABLE 4-1
IMPACTED SOIL TYPES AND GROSS VOLUMES
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA
(November 2001)**

PEC	PRA NUMBER	IMPACTED AREA (yd ²)	GROSS THICKNESS (ft)	IMPACTED VOLUME (yd ³)	IMPACT CATEGORY*	DESCRIPTION OF POTENTIAL SOURCE
01	01-PRA-001	6,140	1.5	3,070	Black Staining	Oil Lens - Fluctuating
	01-PRA-002	262	5	436	Black Staining	Oil Lens - Fluctuating
	01-PRA-003	1,910	3	1,910	Oily Staining	Oil Lens - Fluctuating
	01-PRA-004	261	1	87	Oily Staining	Lens - Solvent Storage Area
	01-PRA-005	84	1	28	Diesel/Gas Staining	Truck Leak - Diesel
	01-PRA-006	93	2	62	Brown Staining	Parts Washer
02	02-PRA-001	78	6	156	Oily Staining	Equipment Leak (Pump?)
	02-PRA-002	1,308	5	2,180	Black Staining	Low Lying Area Beside Large Sump
	02-PRA-003	624	5	1,040	Black Staining	Cutting Lab Sump Area
	02-PRA-004	2,297	7	5,360	Black Staining	Cutting Lab Area - Fluctuating
	02-PRA-005	254	13	1,100	Black Staining	Burners / Oil Water Separators
	02-PRA-006	4,714	7	11,000	Black Staining	Large Sump
	02-PRA-007	441	20	2,940	Oily Staining	Corner of Large Sump
	02-PRA-008	120	12	480	Black Staining	Cinder Block Sump - Soil Surrounding Sump
	02-PRA-009	350	12	1,400	Black Staining	Crude Oil Storage Tanks - Fluctuating
	02-PRA-010	375	2	250	Black Staining	Crude Oil Storage Tanks
	02-PRA-011	1,389	10	4,630	Oily Staining	Wide Crude Oil Tank Area - Fluctuating
	02-PRA-012	5,280	8	14,080	Black Staining	Transfer Pump Area - Fluctuating
	02-PRA-013	2,200	3	2,200	Black Staining	Extension of Tank Farm - Fluctuating
	02-PRA-014	62	3	62	Black Staining	Isolated Area with Impacts
	02-PRA-015	1,434	1.5	717	Black Staining	Oil Lens Over Cement Returns - Soil Gas
02-PRA-016	1,980	8-11	784	Black Staining	Cement Returns Area	
03	03-PRA-001	746	8	1,990	Diesel/Gas Staining	Diesel Tank 2° Containment
	03-PRA-002	24	1	8	Diesel/Gas Staining	Diesel Pump & Catch Sump Pipe to Larger Sump
	03-PRA-003	55	4	73	Diesel/Gas Staining	Oily Sump Area
	03-PRA-004	183	1	61	Diesel/Gas Staining	Truck Leak - Spill
04	04-PRA-001	915	2	610	Diesel/Gas Staining	Truck/Equipment Parking & Storage & Diesel Generator
	04-PRA-002	132	1	44	Other (e.g., Iron)	Soda Ash Tanks (Iron)
	04-PRA-003	495	2	330	Other (e.g., Iron)	Low Lying Area (Iron)
06	06-PRA-001	585	4	780	Black Staining	Secondary Tank Farm Area
	06-PRA-002	342	4	456	Black Staining	Secondary Tank Farm Area
	06-PRA-003	195	1	65	Brown Staining	Secondary Tank Farm Area
	06-PRA-004	248	3	248	Brown Staining	Secondary Tank Farm Area
08	08-PRA-001	1,112	2	741	Black Staining	Oil Lens - Fluctuating
	08-PRA-002	68	5	113	Black Staining	Isolated Area with Impacts
	08-PRA-003	816	7.5	2,040	Black Staining	Low Lying Area - Looked like a Former Sump
	08-PRA-004	506	7	1,180	Black Staining	Crude Oil Storage Tanks
	08-PRA-005	7,846	6	15,692	Black Staining	Oil Lens (Sump) - Tidal Area
09	09-PRA-001	144	1	48	Other Low Level (e.g., PCBs)	Surficial PCB Impacts
TOTAL ESTIMATED VOLUME				77,667		

Note: PRA = Preliminary Reduction Area



TABLE 5-1
SUMMARY OF BACKGROUND SOIL SAMPLE RESULTS
NEWPORT BANNING RANCH
(November 2001)

PEC	SAMPLE NUMBER	SAMPLE DATE	EPA 418.1	EPA 6000/7000									EPA 8081A/8141/8151A
			TRPH (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Chromium (Total) (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Nickel (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)	ALL ANALYTES
Background	Background-SS-001-C	05/08/2001	ND	79.4	0.519	17.1	14.4	8.32	7.80	11.8	35.3	39.6	ND
	Background-SS-002-C	05/08/2001	ND	49.0	0.397	11.9	8.26	7.23	5.69	8.54	26.3	25.7	ND
	Background-SS-003-C	05/08/2001	ND	55.7	0.352	14.9	7.42	8.61	6.08	8.94	29.9	30.9	ND
	Background-SS-004-C	05/08/2001	ND	44.8	0.303	11.0	4.78	6.01	4.57	7.13	22.3	19.6	ND
	Background-SS-005-C	05/08/2001	ND	80.1	0.452	17.3	9.36	12.3	5.64	1.20	34.6	42.9	ND
AVERAGE				61.8	0.405	14.4	8.84	8.49	5.96	9.68	29.7	31.7	



TABLE 5-2

SUMMARY OF ANALYTICAL RESULTS - ORGANICS
 SITE INVESTIGATION
 NEWPORT BANNING RANCH
 ORANGE COUNTY, CALIFORNIA
 (November 2001)

PEC	Sample Number	Approx Depth Interval	TRPH (418.1) (ppm)			TPH (8015M) (ppm)			PAH (ppb)			SVOC (ppb)	VOC (ppb)	PCBs/Pesticides (ppb)	Herbicides (ppb)
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg				
1	01-SS-015-A	A	ND	10600	2703	0.52	1800	635	0	1800	218	Bis(2-Ethylhexyl) Phthalate - 2.2	Acetone - 57	Endrin - 11	ND
1	01-SS-024-A											1-Methylnaphthalene - 1.0	1,2-Dichlorobenzene - 50		
1	01-SS-027-A												1,3-Dichlorobenzene - 13		
1	01-SS-028-A												1,4-Dichlorobenzene - 42		
1	01-SS-032-A												c-1,2-Dichloroethene - 12		
1	01-SS-049-A												Tetrachloroethene - 15		
1													Trichloroethene - 28		
1	01-SS-016-B	B	11	7820	1127	1.7	2700	494	0	6600	1584	Phenanthrene - 1.8	sec-Butylbenzene - 150	ND	ND
1	01-SS-023-B											1-Methylnaphthalene - 1.5	Naphthalene - 1700		
1	01-SS-026-B											2-Methylnaphthalene - 3	1,2,4-Trimethylbenzene - 400		
1	01-SS-035-B											Phenanthrene - 1.5			
1	01-SS-037-B											2-Methylnaphthalene - 1.4			
1	01-SS-038-B														
1	01-SS-046-B														
1	01-SS-048-B														
1	01-SS-022-C	C	ND	12	10.6	0.0072	2500	514	Not Collected						
1	01-SS-033-C														
1	01-SS-036-C														
1	01-SS-041-C														
1	01-SS-043-C														
1		D	Not Collected												
1		E	Not Collected												
1	01-SS-051-F	F	11	14	12.5	Not Collected									
1	01-SS-052-F														
1		G	Not Collected												
1		H	Not Collected												



TABLE 5-2 (continued)

SUMMARY OF ANALYTICAL RESULTS - ORGANICS
 SITE INVESTIGATION
 NEWPORT BANNING RANCH
 ORANGE COUNTY, CALIFORNIA
 (November 2001)

PEC	Sample Number	Approx Depth Interval	TRPH (418.1) (ppm)			TPH (8015M) (ppm)			PAH (ppb)			SVOC (ppb)	VOC (ppb)	PCBs/Pesticides (ppb)	Herbicides (ppb)
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg				
1		I	Not Collected												
1		J	Not Collected												
2		A	Not Collected												
2	02-SS-018-B	B	10	11	10.5	ND			Not Collected						
2	02-SS020-B														
2	02-SS-012-C	C	ND			ND			Not Collected						
2	02-SS-027-D	D	14	14	14	Not Collected									
2		E	Not Collected												
2	02-SS-019-F	F	ND												
2	02-SS-009-G	G	10	621	97.7	ND			Not Collected						
2	02-SS-013-G														
2	02-SS-017-G														
2	02-SS-008-G														
2	02-SS-006-G														
2	02-SS-035-G														
2	02-SS-005-G														
2	02-SS-003-G														
2	02-SS-021-G														
2	02-SS-040-G														
2	02-SS-015-H	H	0	277	70	0	2700	118	Not Collected						
2	02-SS-026-H														
2	02-SS-047-H														
2	02-SS-028-H														
2	02-SS-046-H														
2	02-SS-037-H														
2	02-SS-038-H														



TABLE 5-2 (continued)

SUMMARY OF ANALYTICAL RESULTS - ORGANICS
 SITE INVESTIGATION
 NEWPORT BANNING RANCH
 ORANGE COUNTY, CALIFORNIA
 (November 2001)

PEC	Sample Number	Approx Depth Interval	TRPH (418.1) (ppm)			TPH (8015M) (ppm)			PAH (ppb)			SVOC (ppb)	VOC (ppb)	PCBs/Pesticides (ppb)	Herbicides (ppb)
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg				
2	02-SS-002-H														
2	02-SS-024-H														
2	02-SS-014-I	I	10	4070	726	ND			Not Collected						
2	02-SS-045-I														
2	02-SS-004-I														
2	02-SS-011-I														
2	02-SS-043-I														
2	02-SS-001-I														
2	02-SS-041-J	J	0	99	29.6	ND			Not Collected						
2	02-SS-044-J														
2	02-SS-030-J														
2	02-SS-042-J														
2	02-SS-007-L	L	26	112	55				Not Collected						
2	02-SS-010-L														
2	02-SS-023-L														
2	02-SS-022-L														
2	02-SS-025-O	O	2440	2440	2440	Not Collected									
2	02-SS-029-R	R	50000	50000	50000	0	6000	1928	Not Collected						
3	03-SS-010-A	A	0	603	301.5	ND			Not Collected			ND	ND	ND	ND
3	03-SS-003-A														
3		B	Not Collected												
3		C	Not Collected												
3		D	Not Collected												
3		E	Not Collected												
3	03-SS-006-F	F	12	12	12	ND			Not Collected			ND	ND	ND	ND
3	03-SS-007-G	G	ND			ND			Not Collected			ND	ND	ND	ND



TABLE 5-2 (continued)

SUMMARY OF ANALYTICAL RESULTS - ORGANICS
 SITE INVESTIGATION
 NEWPORT BANNING RANCH
 ORANGE COUNTY, CALIFORNIA
 (November 2001)

PEC	Sample Number	Approx Depth Interval	TRPH (418.1) (ppm)			TPH (8015M) (ppm)			PAH (ppb)			SVOC (ppb)	VOC (ppb)	PCBs/Pesticides (ppb)	Herbicides (ppb)
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg				
3	03-SS-009-H	H	0	12	6	ND			Not Collected				ND	ND	ND
3	03-SS-005-H														
3	03-SS-008-I	I	ND			ND			Not Collected				ND	ND	ND
3		J	Not Collected												
4	04-SS-008-A	A	22	180	125	Not Collected									
4	04-SS-007-A														
4	04-SS-005-A														
4	04-SS-004-A														
4	04-SS-002-A														
4	04-SS-001-A														
4	04-SS-011-B	B	0	327	117	Not Collected									
4	04-SS-006-B														
4	04-SS-003-B														
4		C	Not Collected												
4		D	Not Collected												
4		E	Not Collected												
4		F	Not Collected												
4	04-SS-009-G	G	16	16	16	Not Collected									
4		H	Not Collected												
4		I	Not Collected												
4		J	Not Collected												
5		A	Not Collected												
5		B	Not Collected												
5		C	Not Collected												
5		D	Not Collected												
5	05-SS-001-E	E	14	14	14	Not Collected									



TABLE 5-2 (continued)

SUMMARY OF ANALYTICAL RESULTS - ORGANICS
 SITE INVESTIGATION
 NEWPORT BANNING RANCH
 ORANGE COUNTY, CALIFORNIA
 (November 2001)

PEC	Sample Number	Approx Depth Interval	TRPH (418.1) (ppm)			TPH (8015M) (ppm)			PAH (ppb)			SVOC (ppb)	VOC (ppb)	PCBs/Pesticides (ppb)	Herbicides (ppb)
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg				
5	05-SS-002-F	F	ND			Not Collected									
5		G	Not Collected												
5		H	Not Collected												
5		I	Not Collected												
5	05-SS-003-J	J	ND			Not Collected									
6		A	Not Collected												
6		B	Not Collected												
6		C	Not Collected												
6		D	Not Collected												
6	06-SS-010-E	E	0	12	4	Not Collected									
6	06-SS-007-E														
6	06-SS-004-E														
6	06-SS-011-F	F	0	18	11	Not Collected									
6	06-SS-006-F														
6	06-SS-005-F														
6	06-SS-003-F														
6	06-SS-009-G	G	11	12	12	Not Collected									
6	06-SS-001-G														
6		H	Not Collected												
6	06-SS-002-I	I	14	14	14	ND			Not Collected						
6		J	Not Collected												
7		A	Not Collected												
7		B	Not Collected												
7		C	Not Collected												
7		D	Not Collected												
7		E	Not Collected												



TABLE 5-2 (continued)

SUMMARY OF ANALYTICAL RESULTS - ORGANICS
 SITE INVESTIGATION
 NEWPORT BANNING RANCH
 ORANGE COUNTY, CALIFORNIA
 (November 2001)

PEC	Sample Number	Approx Depth Interval	TRPH (418.1) (ppm)			TPH (8015M) (ppm)			PAH (ppb)			SVOC (ppb)	VOC (ppb)	PCBs/Pesticides (ppb)	Herbicides (ppb)
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg				
7		F	Not Collected												
7		G	Not Collected												
7	07-SS-006-H	H	17	36	27	Not Collected									
7	07-SS-004-H														
7	07-SS-005-I	I	14	14	14	Not Collected									
7		J	Not Collected												
8		A	Not Collected												
8	08-SS-002-B	B	0	13	6.5	ND			Not Collected						
8	08-SS-001-B														
8	08-SS-004-C	C	ND			ND			Not Collected						
8	08-SS-015-D	D	0	92	46	ND			Not Collected						
8	08-SS-009-D														
8		E	Not Collected												
8	08-SS-014-F	F	17	17	17	ND			Not Collected						
8	08-SS-016-G	G	0	140	35	ND			Not Collected						
8	08-SS-012-G														
8	08-SS-010-G														
8	08-SS-008-G														
8	08-SS-007-G														
8	08-SS-006-H	H	2490	2490	2490	0	940	277	Not Collected						
8	08-SS-005-I	I	15	15	15	ND			Not Collected						
8		J	Not Collected												
9	09-SS-002-A	A	16	16	16	Not Collected								ND	Not Collected
9	09-SS-004-B	B	ND			Not Collected									
9		C	Not Collected												
9		D	Not Collected												



TABLE 5-2 (continued)

SUMMARY OF ANALYTICAL RESULTS - ORGANICS
 SITE INVESTIGATION
 NEWPORT BANNING RANCH
 ORANGE COUNTY, CALIFORNIA
 (November 2001)

PEC	Sample Number	Approx Depth Interval	TRPH (418.1) (ppm)			TPH (8015M) (ppm)			PAH (ppb)			SVOC (ppb)	VOC (ppb)	PCBs/Pesticides (ppb)	Herbicides (ppb)
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg				
9		E	Not Collected												
9		F	Not Collected												
9		G	Not Collected												
9		H	Not Collected												
9		I	Not Collected												
9		J	Not Collected												
10	10-SS-001-A	A	592	592	592	Not Collected								Aroclor-1254 - 290	Not Collected
10	10-SS-003-A													Aroclor-1254 - 230	
10		B	Not Collected												
10		C	Not Collected												
10		D	Not Collected												
10		E	Not Collected												
10		F	Not Collected												
10		G	Not Collected												
10		H	Not Collected												
10		I	Not Collected												
10		J	Not Collected												
12		A	Not Collected												
12		B	Not Collected												
12		C	Not Collected												
12		D	Not Collected												
12		E	Not Collected												
12	12-SS-003-F	F	12	14	13	Not Collected									
12	12-SS-001-F														
12		F	Not Collected												
12	12-SS-002-G	G	13	13	13	Not Collected									



TABLE 5-2 (continued)

SUMMARY OF ANALYTICAL RESULTS - ORGANICS
 SITE INVESTIGATION
 NEWPORT BANNING RANCH
 ORANGE COUNTY, CALIFORNIA
 (November 2001)

PEC	Sample Number	Approx Depth Interval	TRPH (418.1) (ppm)			TPH (8015M) (ppm)			PAH (ppb)			SVOC (ppb)	VOC (ppb)	PCBs/Pesticides (ppb)	Herbicides (ppb)
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg				
12		H	Not Collected												
12		I	Not Collected												
12		J	Not Collected												
17	17-SS-001-A	A	183	183	183	Not Collected									
17		B	Not Collected												
17		C	Not Collected												
17		D	Not Collected												
17		E	Not Collected												
17		F	Not Collected												
17		G	Not Collected												
17		H	Not Collected												
17		I	Not Collected												
17		J	Not Collected												
20		A	Not Collected												
20	20-SS-001-B	B	41	2080	520	0	260	119	0	1000	228.125	ND	ND	ND	Not Collected
20	20-SS-002-B														
20	20-SS-003-B														
20	20-SS-004-B														
20	20-SS-005-B														
20	20-SS-006-B														
20	20-SS-007-B														
20	20-SS-008-B														
20		C	Not Collected												
20		D	Not Collected												
20		E	Not Collected												
20		F	Not Collected												



TABLE 5-2 (continued)

SUMMARY OF ANALYTICAL RESULTS - ORGANICS
 SITE INVESTIGATION
 NEWPORT BANNING RANCH
 ORANGE COUNTY, CALIFORNIA
 (November 2001)

PEC	Sample Number	Approx Depth Interval	TRPH (418.1) (ppm)			TPH (8015M) (ppm)			PAH (ppb)			SVOC (ppb)	VOC (ppb)	PCBs/Pesticides (ppb)	Herbicides (ppb)
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg				
20		G	Not Collected												
20		H	Not Collected												
20		I	Not Collected												
20		J	Not Collected												
22		A	Not Collected												
22	22-SS-001-B	B	59	745	353										
22	22-SS-002-B					Not Collected									
22	22-SS-003-B														
22		C	Not Collected												
22		D	Not Collected												
22		E	Not Collected												
22		F	Not Collected												
22		G	Not Collected												
22		H	Not Collected												
22		I	Not Collected												
22		J	Not Collected												
BK		A	Not Collected												
BK		B	Not Collected												
BK	Background-SS-001-C	C	ND			Not Collected								ND	ND
BK	Background-SS-002-C														
BK	Background-SS-003-C														
BK	Background-SS-004-C														
BK	Background-SS-005-C														
BK		D	Not Collected												
BK		E	Not Collected												
BK		F	Not Collected												



TABLE 5-2 (continued)

SUMMARY OF ANALYTICAL RESULTS - ORGANICS
SITE INVESTIGATION
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA
(November 2001)

PEC	Sample Number	Approx Depth Interval	TRPH (418.1) (ppm)			TPH (8015M) (ppm)			PAH (ppb)			SVOC (ppb)	VOC (ppb)	PCBs/Pesticides (ppb)	Herbicides (ppb)
			Min	Max	Avg	Min	Max	Avg	Min	Max	Avg				
BK		G	Not Collected												
BK		H	Not Collected												
BK		I	Not Collected												
BK		J	Not Collected												

Notes: BK Background



**TABLE 5-3
SUMMARY OF SOIL GAS SAMPLE RESULTS
NEWPORT BANNING RANCH
(November 2001)**

PEC	SAMPLE NUMBER	SAMPLE DATE	SCAQMD 25.1					TO-14A			GC/FPD
			Carbon Dioxide % (v/v)	Methane % (v/v)	Nitrogen % (v/v)	Oxygen + Argon % (v/v)	TGNMO as Methane ppm (v/v)	Benzene ppb (v/v)	Chloromethane ppb (v/v)	Toluene ppb (v/v)	Hydrogen Sulfide ppm (v/v)
02	02-SG-001	06/07/2001	8.1	73.2	15.5	3.3	13,400	2,000	5,100	500	<1
	02-SG-002	06/07/2001	7.1	64.9	22.6	5.4	11,900	2,400	4,500	460	<1



**TABLE 5-4
SUMMARY OF METAL RESULTS IN SOIL
NEWPORT BANNING RANCH
(November 2001)**

PEC	SAMPLE NUMBER	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper
01	01-SS-015-A	ND	1.86	71.1	ND	2.1	15.3	4.24	34.5
	01-SS-024-A	ND	1.91	28.4	ND	ND	7.85	3.91	5.52
	01-SS-016-B	ND	1.09	75.4	0.304	0.727	14.3	7.86	12.8
	01-SS-046-B	1.07	3.09	87.0	0.423	ND	18.2	9.13	19.4
04	04-SS-004-A	ND	ND	ND	ND	ND	ND	ND	ND
	04-SS-005-A	ND	ND	ND	ND	ND	ND	ND	ND
	04-SS-008-A	ND	ND	ND	ND	ND	ND	ND	ND
09	09-SS-004-B	ND	ND	99.5	0.506	0.851	23.4	12.1	26
20	20-SS-006-B	ND	ND	125.0	0.463	0.81	20	9.4	24.2
Background Avg.		ND	ND	61.8	0.405	ND	14.4	8.84	8.49
PEC	SAMPLE NUMBER	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc
01	01-SS-015-A	113	118	0.244	1.24	10.8	0.938	17.6	96.7
	01-SS-024-A	2.34	113	ND	ND	4.92	ND	18.1	22.8
	01-SS-016-B	15.4	186	ND	ND	22.0	ND	32.4	44.3
	01-SS-046-B	9.83	277	ND	0.326	17.4	4.59	38.7	51.0
04	04-SS-004-A	ND	302	ND	ND	ND	ND	ND	ND
	04-SS-005-A	ND	285	ND	ND	ND	ND	ND	ND
	04-SS-008-A	ND	137	ND	ND	ND	ND	ND	ND
09	09-SS-004-B	11.5	ND	ND	ND	15.9	ND	49.1	73.8
20	20-SS-006-B	12.7	341	0.682	ND	14.1	ND	40.6	62.7
Background Avg.		5.9	—	ND	ND	9.68	ND	29.7	31.7



TABLE 5-4
SUMMARY OF METAL RESULTS IN SOIL
NEWPORT BANNING RANCH
(November 2001)

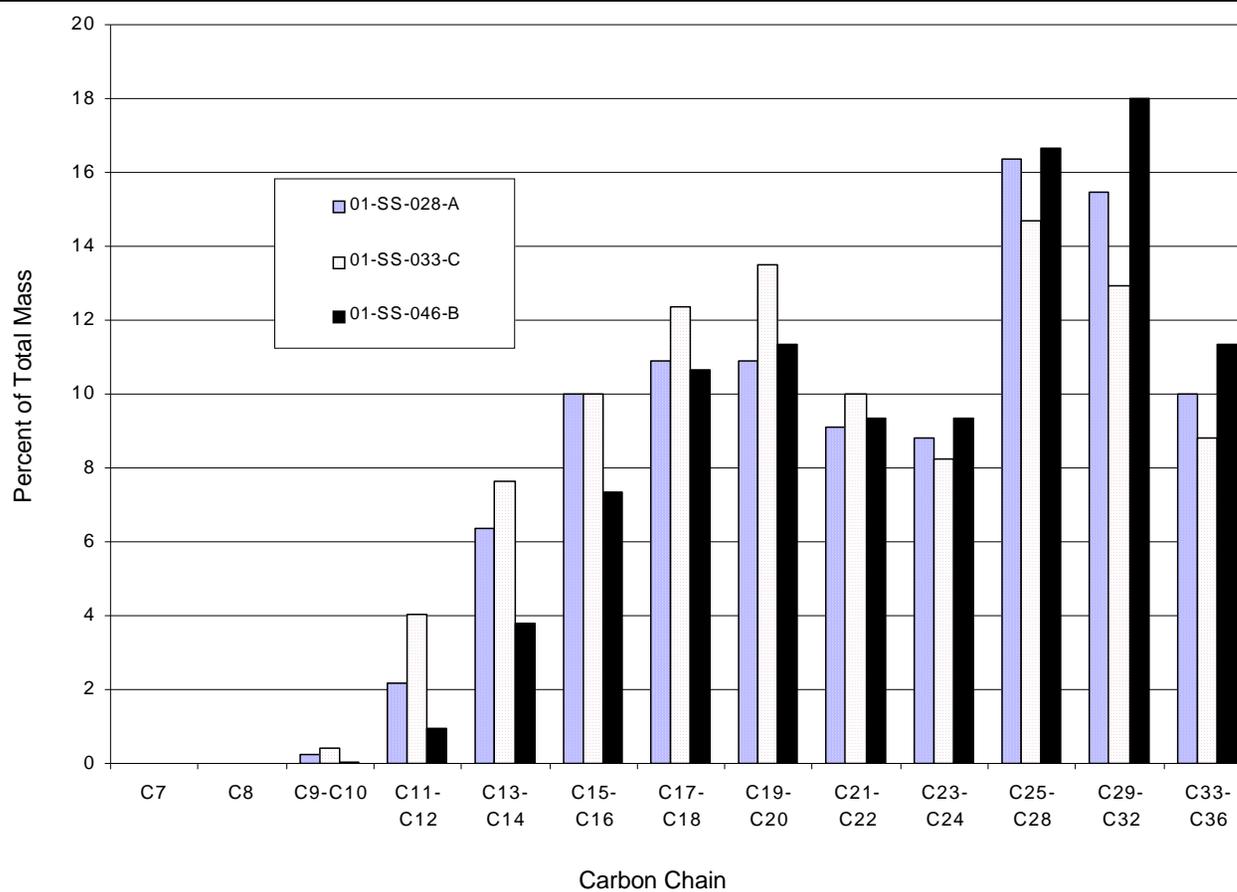
PEC	SAMPLE NUMBER	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper
01	01-SS-015-A	ND	1.86	71.1	ND	2.1	15.3	4.24	34.5
	01-SS-024-A	ND	1.91	28.4	ND	ND	7.85	3.91	5.52
	01-SS-016-B	ND	1.09	75.4	0.304	0.727	14.3	7.86	12.8
	01-SS-046-B	1.07	3.09	87.0	0.423	ND	18.2	9.13	19.4
04	04-SS-004-A	ND	ND	ND	ND	ND	ND	ND	ND
	04-SS-005-A	ND	ND	ND	ND	ND	ND	ND	ND
	04-SS-008-A	ND	ND	ND	ND	ND	ND	ND	ND
09	09-SS-004-B	ND	ND	99.5	0.506	0.851	23.4	12.1	26
20	20-SS-006-B	ND	ND	125.0	0.463	0.81	20	9.4	24.2
Background Avg.		ND	ND	61.8	0.405	ND	14.4	8.84	8.49
PEC	SAMPLE NUMBER	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Vanadium	Zinc
01	01-SS-015-A	113	118	0.244	1.24	10.8	0.938	17.6	96.7
	01-SS-024-A	2.34	113	ND	ND	4.92	ND	18.1	22.8
	01-SS-016-B	15.4	186	ND	ND	22.0	ND	32.4	44.3
	01-SS-046-B	9.83	277	ND	0.326	17.4	4.59	38.7	51.0
04	04-SS-004-A	ND	302	ND	ND	ND	ND	ND	ND
	04-SS-005-A	ND	285	ND	ND	ND	ND	ND	ND
	04-SS-008-A	ND	137	ND	ND	ND	ND	ND	ND
09	09-SS-004-B	11.5	ND	ND	ND	15.9	ND	49.1	73.8
20	20-SS-006-B	12.7	341	0.682	ND	14.1	ND	40.6	62.7
Background Avg.		5.9	—	ND	ND	9.68	ND	29.7	31.7



**TABLE 5-6
SUMMARY OF GROUNDWATER SAMPLE RESULTS - ORGANICS
NEWPORT BANNING RANCH
(November 2001)**

PEC	SAMPLE NUMBER	SAMPLE DATE	EPA 8015M		EPA 8260B							
			TPH as Diesel ug/L	TPH for Crude Oil ug/L	Benzene ug/L	C-1,2-Dichloroethene ug/L	Methylene Chloride ug/L	p/m Xylene ug/L	Styrene ug/L	t-1,2-Dichloroethene ug/L	Toluene ug/L	Vinyl Chloride ug/L
01	01-GW-001	06/09/2001	—	—	ND	1.8	100	ND	3.3	ND	ND	ND
	01-GW-001	06/26/2001	ND	ND	ND	1.2	ND	ND	ND	ND	3.8	0.51 ⁽¹⁾
	01-GW-002	06/09/2001	—	—	ND	1.4	32	ND	ND	ND	ND	4.4 ⁽¹⁾
	01-GW-002	06/26/2001	ND	ND	ND	3.6	ND	ND	ND	ND	3.6	15 ⁽¹⁾
	01-GW-003	06/09/2001	—	—	1.1 ⁽¹⁾	ND	100	ND	2.9	2.5	ND	ND
02	02-GW-001	06/09/2001	—	—	ND	ND	56	ND	ND	ND	ND	ND
	02-GW-001	06/26/2001	ND	ND	ND	ND	ND	ND	ND	ND	4.8	ND
	02-GW-003	06/09/2001	—	—	ND	ND	28	1.3	ND	ND	ND	ND
	02-GW-003	06/27/2001	2200	26000	ND	ND	ND	ND	ND	ND	1.1	ND
	02-GW-004	06/11/2001	—	—	ND	ND	91	ND	2.5	ND	ND	ND
	02-GW-005	06/11/2001	—	—	ND	ND	ND	ND	ND	ND	ND	ND
06	06-GW-001	06/12/2001	—	—	ND	ND	ND	ND	ND	ND	ND	ND
08	08-GW-001	06/11/2001	—	—	ND	ND	25	ND	ND	ND	ND	ND

Note: (1) Above the MCL; benzene 1.0 ug/L, vinyl chloride 0.5 ug/L.



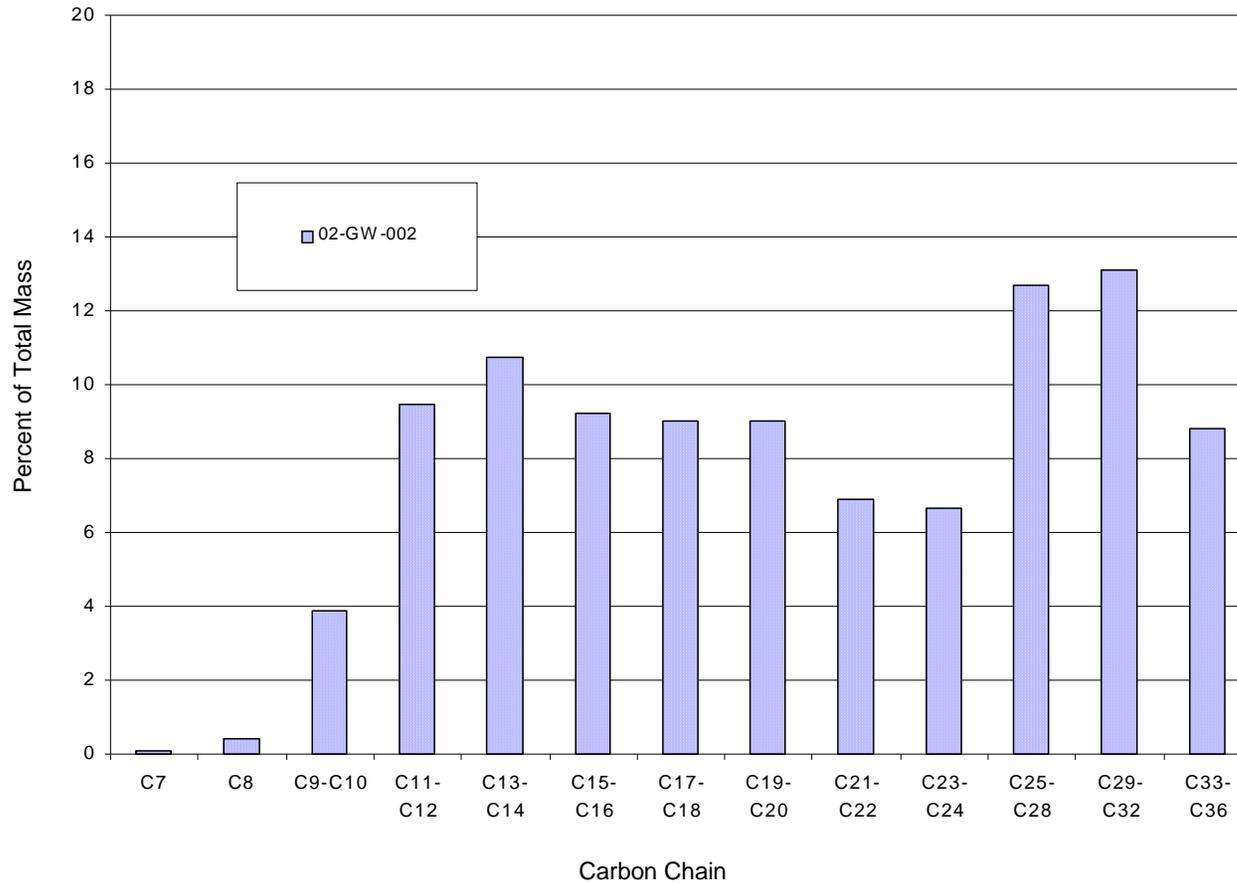
GEO SYNTEC CONSULTANTS

PEC #01 MAINTENANCE SHOP/WAREHOUSE
HYDROCARBON CHAIN SPECIATION
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA

FIGURE NO.: 3-1

PROJECT NO.: HR0575-05

DATE: 26 OCTOBER 2001



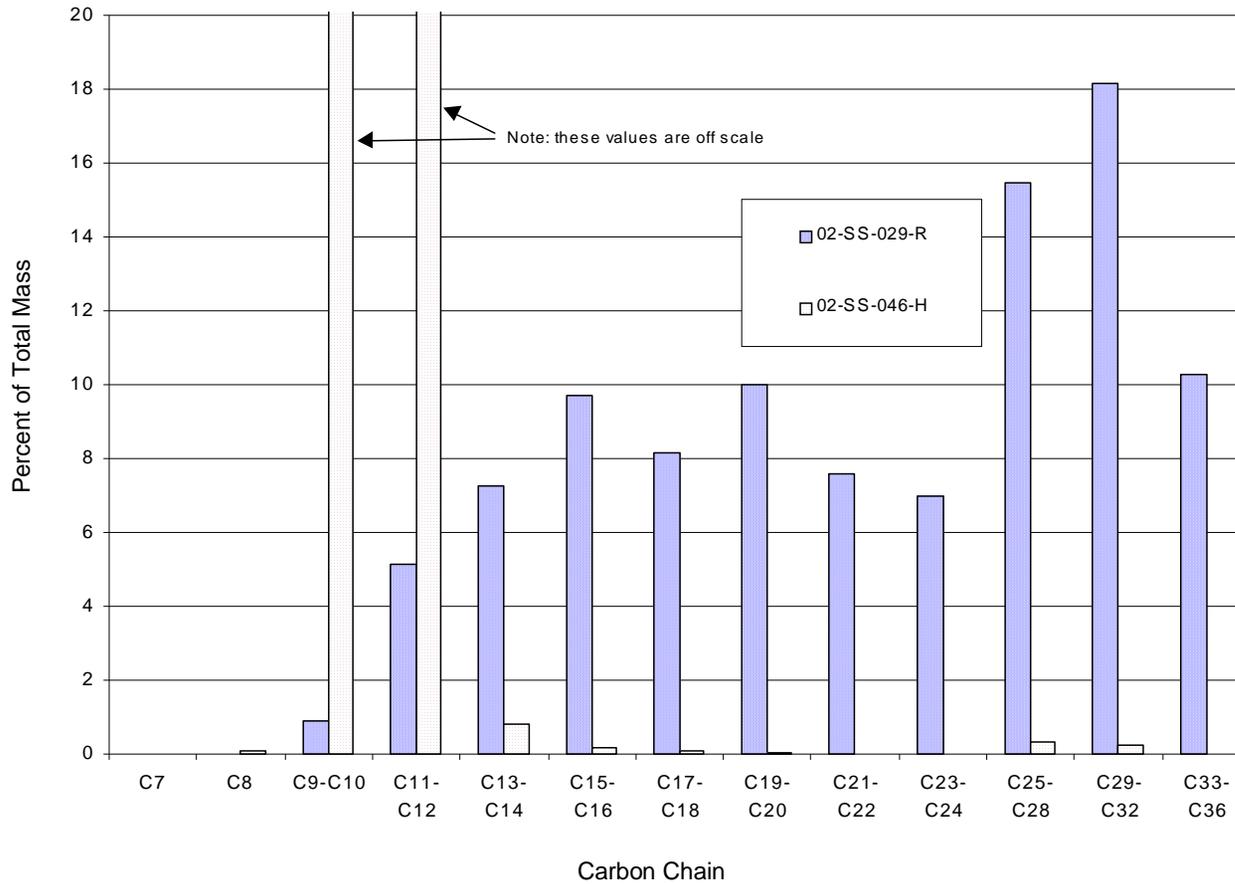
GEOSYNTEC CONSULTANTS

PEC #02 MAIN SITE TANK FARM, FREE PRODUCT
HYDROCARBON CHAIN SPECIATION
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA

FIGURE NO.: 3-2

PROJECT NO.: HR0575-05

DATE: 26 OCTOBER 2001



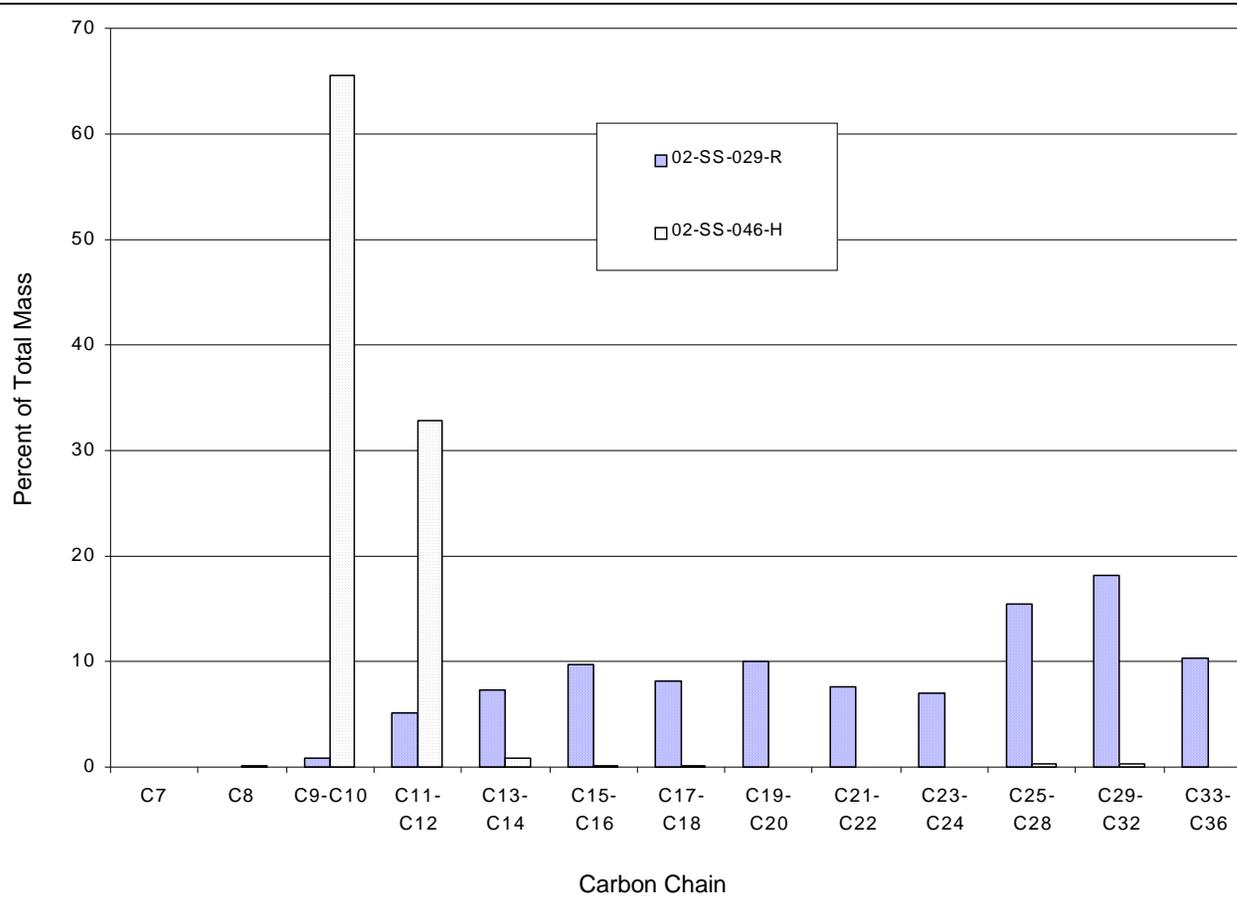
GEO SYNTEC CONSULTANTS

PEC #02 MAIN SITE TANK FARM
HYDROCARBON CHAIN SPECIATION
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA

FIGURE NO.: 3-3

PROJECT NO.: HR0575-05

DATE: 26 OCTOBER 2001



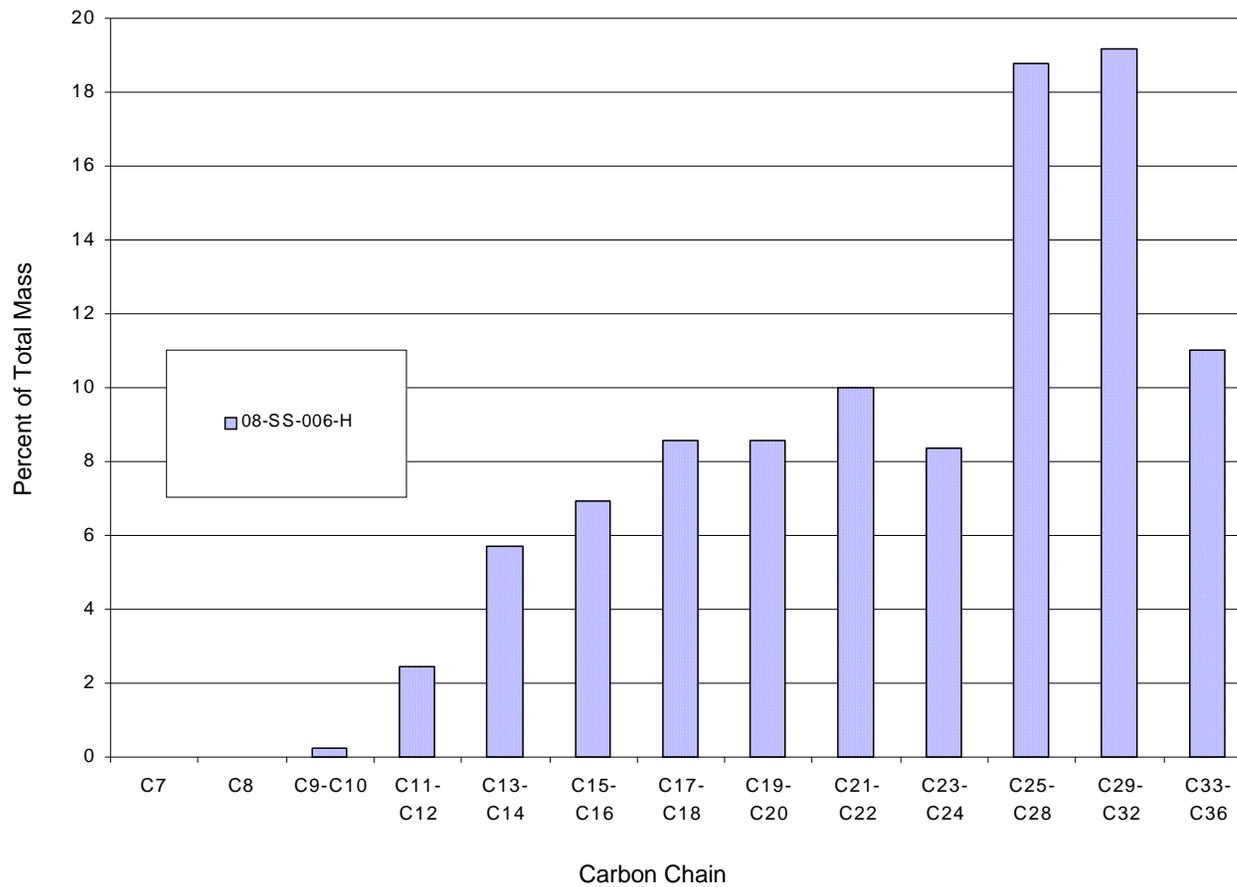
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PEC #02 MAIN SITE TANK FARM
HYDROCARBON CHAIN SPECIATION
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA

FIGURE NO.: 3-4

PROJECT NO.: HR0575-05

DATE: 26 OCTOBER 2001



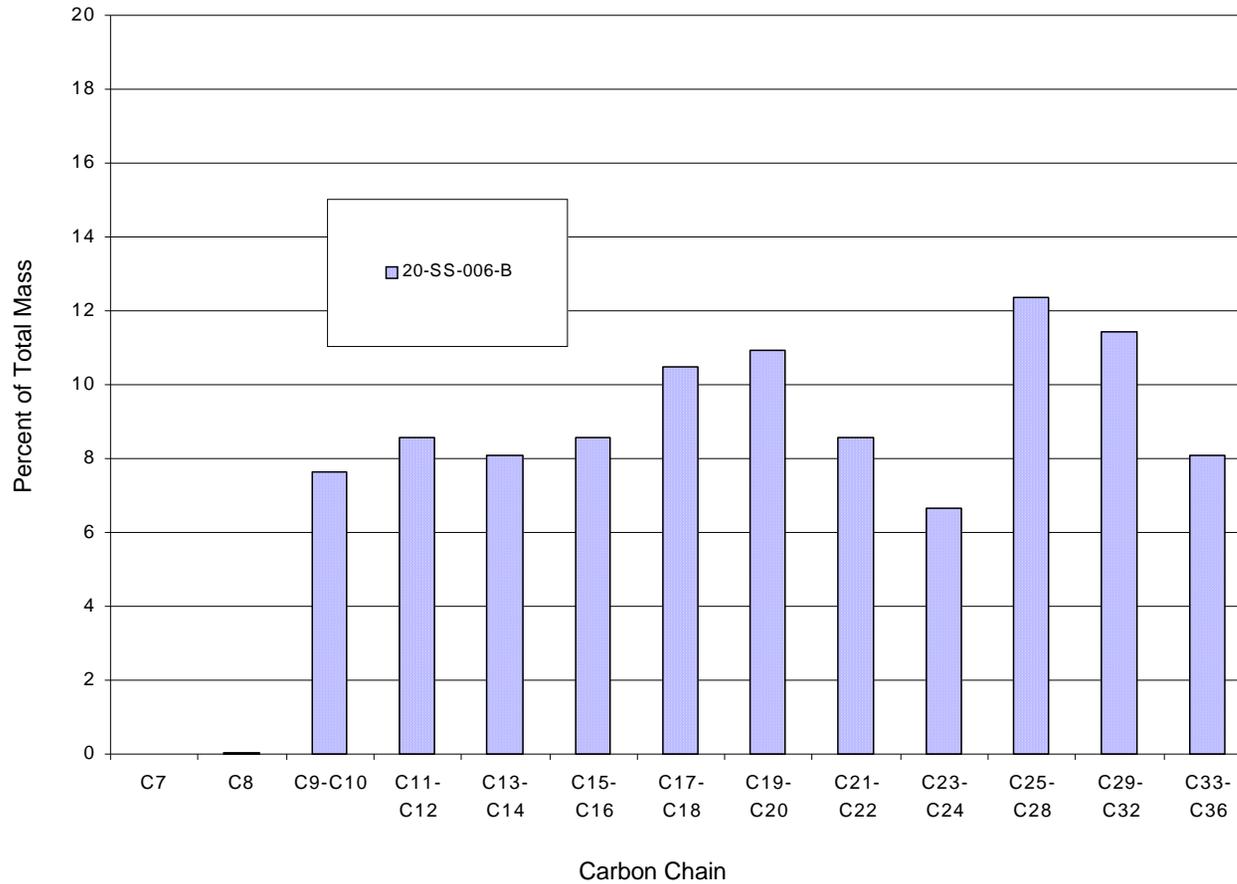
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PEC #08 FORMER SUMPS/CLARIFIERS
HYDROCARBON CHAIN SPECIATION
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA

FIGURE NO.: 3-5

PROJECT NO.: HR0575-05

DATE: 26 OCTOBER 2001



GEO SYNTEC CONSULTANTS

PEC #20 MISCELLANEOUS DEBRIS & SOIL STOCKPILES
HYDROCARBON CHAIN SPECIATION
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA

FIGURE NO.: 3-6

PROJECT NO.: HR0575-05

DATE: 26 OCTOBER 2001