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REMEDIAL ACTION PLAN
NEWPORT BANNING RANCH OIL FIELD ABANDONMENT

ORANGE COUNTY, CALIFORNIA

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LIST OF ACRONYMS AND ABBREVIATIONS

A&R – Abandonment and Remediation

ACOE – Army Corps of Engineers

ALM – Asphalt-Like Materials

BACM – Best Available Control Measures

BMP – Best Management Practice

BTEX – Benzene, Toluene, Ethylbenzene, and Xylenes

CAO – Cleanup and Abatement Order

CCA – California Coast Act

CCC – California Coastal Commission

CDFW – California Department of Fish and Wildlife

CEQA – California Environmental Quality Act

DOGGR – Division of Gas and Geothermal Resources

dRAP – Draft Remedial Action Plan

EA – Environmental Assessment

ELAP – Environmental Laboratory Accreditation Program

EPA – Environmental Protection Agency

ERP – Environmental Restoration Plan

ESA – Environmental Site Assessment

FWS – US Fish and Wildlife Service

GPS – Global Positioning Satellite

HASP – Health and Safety Plan

HDLLC – Horizontal Drilling, LLC

JSA – Job Safety Analysis

MCL – Maximum Contaminant Level

mg/kg – Milligrams Per Kilogram

mg/L – Milligrams per Liter

NBR – Newport Banning Ranch

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

NBRLLC – Newport Banning Ranch, LLC

NELAP – National Environmental Laboratory Accreditation Program

NOI – Notice of Intent

OCHCA – Orange County Health Care Agency

OSHA – State of California Division of Occupational Safety and Health

PA – Planning Area

PCBs – Polychlorinated Biphenyls

PEC – Potential Environmental Condition

PID – Photoionization Detector

RAP – Remedial Action Plan

REC – Recognized Environmental Condition

RSL – Regional Screening Level

RWQCB – Regional Water Quality Control Board, Santa Ana Region

SCAQMD – South Coast Air Quality Management District

SCP – Site Cleanup Program - RWQCB

SLIC – Spills Leaks Investigation and Cleanup

SVOC – Semi-Volatile Organic Compound

SWPPP – Storm Water Pollution Prevention Plan

SWRCB – State Water Resources Control Board

TDS – Total Dissolved Solids

TFDS – Tank Farm Drill Site

TPH – Total Petroleum Hydrocarbons

TRPH – Total Recoverable Petroleum Hydrocarbons

TTLC – Total Threshold Limit Concentration

USA – Underground Service Alert

USACE – US Army Corps of Engineers

USFWS – United States Fish and Wildlife Service

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

UST – Underground Storage Tank

VOC – Volatile Organic Compound

WNOC – West Newport Oil Company

1. INTRODUCTION

1.1 Terms of Reference

This document presents the Remedial Action Plan (hereafter referred to as the RAP) for the decommissioning and abandonment of oil field operations on the Newport Banning Ranch (NBR) property (the Site), located in Orange County, California. This RAP documents the procedures to be used when implementing the remediation of historic oil field impacts at the Site that are located outside of the two future oil consolidation areas, also referred to as the oil remainder areas, and in continuing the remediation of one site within one of the future consolidation sites. This RAP was prepared by Geosyntec Consultants, Inc. (Geosyntec) for the sole use of its client, Newport Banning Ranch LLC (NBRLLC), for the purposes of managing the environmental conditions encountered at the Site.

The activities presented in this RAP are components of the overall Oil Field Abandonment by NBRLLC and combined with those activities constitute the Abandonment and Remediation (A&R) work to be performed at the Site. This work is intended to prepare the Site for alternate public and natural uses, including development and restoration activities.

NBRLLC is seeking a California Coastal Commission (CCC) Coastal Development Permit (CDP) (Application 5-13-032) for an Open Space and Development Plan on 384 acres of the 401-acre Site (Figure 3). NBRLLC is a separate entity from the oil field operator, West Newport Oil Company (WNOC), who is not a participant in the CDP Application/Project. In the project development plan (the Project), WNOC would continue oil operations confined to two consolidation areas totaling approximately 17 acres. Approval of the CDP would be required before commencement of the A&R work.

1.2 Purpose of the RAP

The purpose of this RAP is to present the oil field remediation process, describe the steps involved in remediating the impacts of the crude oil production and related activities at the Site, and to seek concurrence with the methods and clean-up criteria presented. To this end, the objectives of this RAP are:

- To outline the scope of the oil field remediation project based on past investigations and assessments;
- To describe the type of impacts that will be remediated;

- To describe the remediation processes and methods that will be used at the Site outside of the future oil consolidation areas;
- To update the existing site clean-up criteria that will be used for the remediation of each of the potential land use areas;
- To outline the next steps in the ongoing remediation project located within one of the oil consolidation areas;
- To describe the potential future land uses on the Site and what features exist in each of those areas; and
- To describe the regulatory framework to conduct Site remediation activities.

The current oil field operator, WNOC, will continue to produce oil and gas from the two oil consolidation areas, one of which contains the existing field tank facility. There is an active remediation project already being conducted within that consolidation area footprint (Tank Farm Drill Site [TFDS]) and this RAP will outline the next steps in that project that will coincide with activities outside of the consolidation areas. The oversight for that project, the TFDS Sump, which involves the shallow lowland groundwater, is currently being provided by the Regional Water Quality Control Board, Santa Ana Region (RWQCB).

1.3 Site Overview

The Site is currently a 401-acre oil and natural gas production facility located east of the mouth of the Santa Ana River near the Huntington Beach – Newport Beach city boundary in Orange County, California (see Figures 1 and 2). The Site is topographically diverse with the eastern portion of the Site transitioning from coastal bluff "Upland Area" to the "Lowland Area" along the western portion of the Site, with a few erosional arroyos carrying surface water from the developed urban areas of Costa Mesa to the Lowland Area adjacent to the Santa Ana River channel.

Over the 70+ years of oil production at the Site, over 475 locations were used at some time as oil well drilling and production pads as wells were drilled and abandoned, or replaced to produce the oil as efficiently as possible. The oil operations currently produce over 180 barrels of oil per day from approximately 85 wells located in both the Lowland and Upland Areas of the property. Various features, structures and equipment which are or were used for the production of oil and natural gas are present across the Site. These include:

- Pumping units;
- Pipelines;
- Power poles and utility infrastructure;
- Facility tanks, vessels, pumps, and other equipment;
- Production offices, buildings, garages, sheds and covers;
- Facility foundations, drains, and pipes;
- Sumps and fluid containment areas; and
- Asphaltic and crude oil roads, road base materials, gravels and other base materials.

The overall NBR Project includes an open space conservation area, parks and trails, mixed use development, and two consolidated oil areas (see Figure 3). The abandonment of the oil operations and the remediation work outlined in this RAP will only be commenced after the CCC CDP application is approved and all other necessary permits have been obtained.

As shown on Figure 4, historical oil field operation areas extend throughout the Site. As part of on-going oil field operations, environmental assessments and previous A&R work have been performed at the Site for over 25 years under regulatory oversight agencies which include the California Division of Oil, Gas, and Geothermal Resources (DOGGR), the California EPA Regional Water Quality Control Board – Santa Ana Region (RWQCB), and the Orange County Health Care Agency (OCHCA).

1.4 Organization of the RAP

The remainder of this RAP is organized into the following sections:

- Section 2, *Site Background and Historical Uses*, provides additional details of the Site location, characteristics, and background information on the regional geology and hydrogeology and surrounding land use;
- Section 3, *Regulatory Oversight Framework*, presents the regulatory oversight history and involved agencies;
- Section 4, *Site Assessment and Investigations*, presents a summary of environmental conditions documented at the Site;

- Section 5, *Remediation Approach and Scope*, presents the details associated with the Site remediation components including clean-up levels, remediation scope, remediation process, and remediation project controls;
- Section 6, *Closure Documentation*, describes the remedial action completion reporting process;
- Section 7, *Limitations*, provides context for the information provided in this RAP; and
- Section 8, *References*, provides a list of documents used and referred to in this RAP.

Tables, figures, and appendices are included at the end of the RAP.

2. SITE BACKGROUND AND HISTORICAL USES

2.1 Introduction

This section provides Site background information based on: (i) work conducted by consultants at the Site since 1986, (ii) conversations with long-time oil field operators (WNOC/HDLLC employees), (iii) reports of work conducted by the United States Army Corps of Engineers (ACOE) [1988] at nearby locations, and (iv) data collected from agencies pertaining to this area of Orange County. A list of documents used by Geosyntec to prepare the information presented in this section is included in Section 8 of this RAP.

2.2 Site Setting and Topography

The Site encompasses 401 acres along the eastern side of the mouth of the Santa Ana River near the Huntington Beach - Newport Beach city boundary in Orange County, California (see Figure 1). The topographic relief across the Site is approximately 105 ft (32 m). A generally north-south oriented bluff subdivides the Site into two zones: the Lowland Area, effectively the river mouth zone, and the Upland Area associated with the Newport Mesa, as shown in Figure 2.

The elevation of the Lowland Area ranges from 0 to 10 ft (0 to 3 m) above mean sea level. The Lowland Area consists of a relatively flat, undulating surface having no overall directional surface sloping trend. The western boundary of the Lowland Area, is lined with levees constructed as part of the ACOE Santa Ana River Flood Control Project. From 19th Street to the Pacific Ocean, levee heights in the ACOE marsh area vary from 10 to 15 ft (3 to 4.5 m) above the surrounding grade.

The Lowland Area is bounded to the east by the Upland Area. The elevation of the Upland Area at the Site ranges from 10 to 105 ft (3 to 32 m) above mean sea level. The westerly dipping slopes of the Upland Area and the southern section slopes of the Upland Area (along the Pacific Coast Highway) vary from approximately 10 to 65 percent, with the exception of a north-south area where soil was historically excavated for a planned road that exhibits a gradual change of elevation from Pacific Coast Highway extending north approximately 1,000 ft. The Upland Area mesa dips in a generally west-southwesterly direction at approximately 1 to 3 percent.

2.3 Geology and Hydrogeology

2.3.1 Geology

The Site is located within the Orange County Coastal Plain, one of the coastal alluvial basins of the Los Angeles Sedimentary Basin. The Orange County Coastal Plain is bounded to the north by the Puente Hills, to the east by the Santa Ana Mountains, to the west by the San Gabriel River, and to the southwest by the San Joaquin Hills and the Pacific Ocean. The central portion of the Orange County Coastal Plain forms the broad alluvial floodplain of the Santa Ana River. The Santa Ana River originates in the San Bernardino Mountains. The river flows approximately 80 miles (130 km) from the San Bernardino Mountains and discharges into the Pacific Ocean, southwest of the Site.

The stratigraphy of the Orange County Coastal Plain consists of recent alluvial deposits overlying older sediments and bedrock. The Santa Ana River has eroded a channel across the alluvial deposits of the Orange County Coastal Plain and through the consolidated mesa sediments forming the 2.5-mile (4.2-km) wide Santa Ana Gap. This gap, a typical feature of Orange County, is located between the Huntington Beach Mesa to the northwest of the Site and the Newport Mesa which forms the Upland Area of the Site. The Newport-Inglewood fault zone runs through the southern portion of the Site, trending in a direction parallel to the Pacific Coast Highway [Earth Technology, 1986].

The portion of the Newport Mesa which forms the eastern, Upland Area consists of consolidated alluvial sediments which have been uplifted along the fault zone. The Lowland Area of the Site consists of recent alluvial sediments. These alluvial sediments consist of fine to coarse sand, with fine silty sands, clayey silt, and silty clay. The alluvial sediments are underlain by older terrace and alluvial deposits. The bedrock formation consists of complex crystalline metamorphic and igneous rocks [Department of Water Resources (DWR), 1967]. Detailed information regarding the type of soil encountered at the Site can be found in the log of trenches excavated and borings drilled at the Site [Geosyntec, 2001].

2.3.2 Hydrogeology

The groundwater in the uppermost water-bearing zones below the Site is not used as a potable water source, irrigation supply, or for other domestic water use because of its poor quality and questionable availability. Because of its direct hydraulic connection with sea water and the resulting salt water intrusion, groundwater at the Site is brackish. There are no fresh potable water zones between these brackish shallow waters and the shallow oil reservoirs.

The Site is located at the extreme seaward edge of the Orange County Groundwater Basin. The Newport-Inglewood fault zone, located along the southern boundary of the Site, is the predominant hydrogeologic feature in the area, generally acting as a barrier to groundwater flow in the aquifers below the uppermost water-bearing units [DWR, 1967; MWDSC, 2007] within the Basin. The water-bearing formations in the Orange County Groundwater Basin are composed of three intra-connected confined aquifer systems: the Lower, Principal (or Middle), and Upper Aquifer systems [DWR, 1967; MWDSC, 2007]. The groundwater below the Site, while salt-water intruded, may be hydraulically connected with the Principal (or Middle) and Upper Aquifer systems. A brief description of these aquifer systems follows:

- The Lower Aquifer system consists of a series of hydraulically interconnected aquifers overlying the non-water-bearing formations of consolidated sedimentary and basement rock. This system is generally considered to be isolated from the Upper and Principal (or Middle) Aquifer systems that may be hydraulically connected to the geologic strata immediately below the Site.
- The Principal (or Middle) Aquifer system consists of a series of aquifers mostly of the water-bearing San Pedro Formation. The predominant aquifer within the Middle Aquifer system (and the primary source of groundwater for Orange County) is the Main Aquifer system. The Main Aquifer system consists of coarse sand and gravel, with interbedded layers of finer deposits. Groundwater studies of the Santa Ana Gap have concentrated on the hydrogeologic conditions of the Middle Aquifer system, specifically the Main Aquifer system, because it is the primary source of domestic water in the area.
- The Upper Aquifer system consists of discontinuous lenses of coarse sand and gravel confined by lenses of clay sediments (generally less than 200 ft in depth). The uppermost aquifer within the Upper Aquifer system is the Talbert Aquifer. Layers of fine-grained material exist above the Talbert Aquifer resulting in perched or semi-perched water overlying the partially confined Talbert Aquifer. These perched aquifers serve as recharge sources through the local confining layers. The Talbert Aquifer acts as an unconfined aquifer in certain locations where the confining layer is absent or where the piezometric surface is below the base of the confining layer [DWR, 1967; MWDSC, 2007].

The area underlying the Site is hydraulically bounded to the west by the mouth of the Santa Ana River and to the southwest by marsh channels. The marsh channels are connected by a culvert to the mouth of the Santa Ana River. As water in the Santa Ana River mouth and marsh channels are directly connected to the Pacific Ocean, the shallow water zones located below the Site are in direct connection with sea water. The water

table elevation in the lowlands at the Site fluctuates at approximately mean sea level and is generally influenced by tidal fluctuations (i.e., depending on surface topography within the lowlands, the water table may be encountered from the ground surface to 5 ft below ground surface).

2.4 History and Features

The Site has been used as an oil and natural gas production facility since the 1940s [WNOC, Personal Communication, 1993a,b]. Before that, the Site was used for agricultural purposes. In addition, small areas of the Site have been used for the following activities: military coast watch station, equipment storage and maintenance, and miscellaneous peripheral operations (including areas leased to welders, pipe storage, and equipment operators) [WNOC, 2004].

The Site previously included the 92-acre Santa Ana River Marsh area (also known as the ACOE wetlands restoration area), the location of which is shown in Figure 2. The marsh area was purchased from the previous landowners by the ACOE and restored as a wetlands as part of the ACOE Santa Ana River Flood Control Project in the late 1980s.

Primary Site infrastructure consists of oil and natural gas production equipment and appurtenances. Present at the Site are both active, idle, and previously abandoned oil production wells, and equipment associated with the production of oil and natural gas including pipeline networks used to transport crude oil, produced water, or natural gas, tanks and tank farms, maintenance areas, various small buildings, pole-mounted utilities including transformers, and other miscellaneous equipment used for oil production operations (see Figure 4). Steam/air/water injection wells were used to inject steam, air, and water into crude oil reservoirs to increase the production quantities of crude oil from production wells. The steam/air/water injection practices for the purpose of increased oil production have been discontinued.

The oil operations currently produce over 180 barrels of oil per day from approximately 85 wells on the 401 acres. As is typical of oil fields, the efficient development of the underground oil reserves included the drilling, repair, and replacement of wells throughout the producing history. Over the 70+ years of oil production at the Site, over 475 locations were used for these original and replacement wells to produce the oil as efficiently as possible. Sixty six (66) of the remaining 85 active and idle wells on the property are located outside of the oil consolidation areas.

The oil well locations, field facilities and supporting infrastructure that are outside of the oil consolidation area (see Figure 3) are the main focus of the A&R process and this RAP. The continuation of the TFDS Sump remediation will also be outlined as its activities will

coincide with the overall field remediation work and it will utilize the project resources. While the majority of impacts that were identified in earlier assessments are located within known operational areas of the Site, additional minor impacts may be discovered during the oil field abandonment process and Site development work. These impacts have been considered in the range of volumes expected and will also be addressed as part of the Site A&R process.

3. REGULATORY OVERSIGHT FRAMEWORK

3.1 Introduction

There are two principal regulatory frameworks under which Site environmental work has been conducted in the past. First, the Site initiated a voluntary clean-up action designated, at the time, as the Environmental Restoration Plan (ERP). The ERP was initially developed in 1992 by WNOC to guide the abandonment of long idled oil wells and the clean-up of the associated well pads areas. Second, following the issuance and resolution of a Cleanup and Abatement Order (CAO No. 01-77) in 2001 [RWQCB, 2001a,b], the RWQCB assumed the role as lead agency over both the CAO issues and the TFDS Sump remediation issue which was identified in the earlier 2001 Environmental Assessment field work. The TFDS Sump remediation continues to be conducted and monitored under the RWQCB Site Cleanup Program (SCP), formally the Spills, Leaks, Investigation, and Cleanup (SLIC) program.

The key regulatory agencies which have been involved in the environmental aspects at the Site oil operations and remediation include:

- the Orange County Health Care Agency (OCHCA);
- the California Regional Water Quality Control Board, Santa Ana Region (RWQCB);
- the California Department of Gas and Geothermal Resources (DOGGR);
- the South Coast Air Quality Management District (SCAQMD); and
- the California Department of Fish and Wildlife (CDFW, formerly the Department of Fish and Game).

3.2 Voluntary Cleanup - ERP

The OCHCA had been the lead regulatory agency for approval and implementation of the voluntary ERP at the Site. The OCHCA was responsible for establishing and approving action levels for petroleum hydrocarbons and for approving remedial activities based on the requirements of the ERP. In addition, the OCHCA was involved in the oversight of an underground storage tank (UST) removal action performed by WNOC [WNOC, 2005]. Since the ERP involved on-site bioremediation of impacted soils, the RWQCB had also been involved to regulate the operation of the biotreatment cell in the Lowland Area and, at the request of the OCHCA, to help establish soil remediation action levels for the Site.

Remediation action levels for soil were first established in the ERP and approved by the OCHCA. At the time, OCHA required that soil impacted by crude oil be remediated until the concentration of Total Recoverable Petroleum Hydrocarbons (TRPH) remaining in the soil was less than 1,000 milligrams per kilogram (mg/kg) [OCHCA, 1993a,b]. Action levels for other chemical compounds, such as volatile organic compounds (VOCs), semi-VOCs, and metals had not been specified by OCHCA because these chemicals had not been detected in soil samples collected around oil production wells when TRPH concentrations in these samples were less than 1,000 mg/kg [Geosyntec, 1994]. Later, in 1996, the action levels for the Site were modified at the request of OCHCA. In addition, the RWQCB was consulted and a set of action levels were established for the Site as shown in Appendix B-1. The primary modification of the action levels included reducing the maximum allowable TRPH concentration at the Site from 1,000 mg/kg to 100 mg/kg for soil within the top 10 feet in potential residential areas.

The ERP work was conducted from 1992 to about 1999 while the biotreatment cell continued operating until about 2001. Since that time, OCHCA had not been actively involved at the Site for remediation-related activities. Based on a conversation with Mr. Luis Lodrigueza [OCHCA, 2005], the OCHCA closed the Site oversight case because of a lack of further remediation activity at the Site. Following meetings in 2014 with the OCHCA and RWQCB, both agencies have re-engaged in the A&R process at the request of NBRLLC and will approve key components of the Site remediation, including this RAP.

3.3 RWQCB CAO No. 01-77 and the Site Cleanup Program

In July of 2001 the RWQCB issued Cleanup and Abatement Order No. 01-77 to the oil field operator, WNOC, and the landowners. The CAO was for alleged violations of Clean Water Act Section 404 for improper discharges and filling of wetlands in the Lowlands by the oil operator, with concrete debris materials from the earlier ERP well abandonment operations.

The RWQCB issued the CAO because of the agencies authority over waters of the State. The CAO included recommended clean-up and re-use criteria for the Site established by OCHCA, including criteria previously established for the Aera Energy Yorba Linda Oil Field Abandonment project in 1998 and updated/revised in 2001 (see Appendix B-2 for both sets of criteria). The application of these action levels to the Site were not clearly defined in the CAO, therefore Section 5 of this RAP provides the remediation action levels to be used during implementation of A&R activities.

In anticipation of a future re-use of the property, and previous to the issuance of the CAO, the Site owners of the time, Aera Energy and Rancho Santiago Partnership, had been conducting a comprehensive Environmental Assessment of the property. During the assessment field investigations a historic large sump location was identified within the TFDS. Though surface indications of the sump had been abandoned in the 1970s, testing indicated that below surface impacts remained and were in contact with the shallow brackish groundwater. This resulted in a limited area of crude oil free-product on the groundwater. Immediate remedial actions were initiated, including withdrawals of the free-product, followed by the submission of an interim Remedial Action Plan which was approved by the RWQCB. Since that time, the project has been conducting remediation of the shallow lowland groundwater at the TFDS Sump site, including free product withdrawals, testing and monitoring. The assessment testing and the monitoring well testing indicate that the free-product impacts are contained and not expanding.

The issues related to the CAO were addressed by the oil operator and Site owners as documented in Appendix C; the RWQCB rescinded the CAO on 6 March 2006 [RWQCB, 2006]. The remaining remedial work for the free-product within the TFDS Sump site is being conducted under the SCP, formally the SLIC program. This RAP will outline the next steps in that continuing remediation site and how those actions will be coordinated with the overall field abandonment and remediation activity outside of the TFDS.

3.4 Peripheral Regulatory Provisions

In addition to the two original regulatory frameworks for the Site environmental activities, there are other regulatory agencies and requirements which will apply or impact the A&R work. These agencies have been previously engaged and consulted as part of the City of Newport Beach Environmental Impact Report (EIR) process and the CCC CDP permitting process. The EIR and CDP process includes, among other things, vegetation impact studies and biological/endangered species studies and the final CDP approval will include conditions and mitigations for the abandonment, remediation and development processes. Some of the primary agencies that will be involved are outlined below:

- The Site is located within the Coastal Zone thus the A&R work and the proposed development will be reviewed by the CCC. As part of the CDP application the CCC is also reviewing the impacts of the A&R work and how those impacts will be mitigated within the overall project.
- The DOGGR is responsible for regulating oil field operations in California, including oil and injection well drilling, shut-in, and abandonment. The

DOGGR has been involved in permitting and oversight of previous abandonment of oil wells at the Site, working directly with the oil operator, WNOC. The DOGGR will continue oversight of the well and field abandonments in addition to the continuing oil operations in the consolidation areas.

- The South Coast Air Quality Management District (SCAQMD) is responsible for enforcing air quality regulations within the South Coast Basin (majority of Los Angeles, Orange, San Bernardino, Riverside, and San Diego Counties). The SCAQMD is involved at the Site with equipment air toxics permitting. During abandonment activities the SCAQMD regulations will apply to particulate and fugitive emissions monitoring and mitigation.
- The California Department of Fish and Wildlife (CDFW) is responsible for protection of the sensitive habitat and wildlife species California. The CDFW has been involved at the Site and has been consulted on issued related to the proposed Site development CDP Application.
- The United States Fish and Wildlife Service (USFWS) has also been consulted as part of the proposed Site development CDP and impacts to resources in both the Lowland and Upland Areas.

4. SITE ASSESSMENT AND INVESTIGATION

4.1 Environmental Site Assessment and Condition Summary

Site investigations and remedial actions have been conducted at the Site by the oil operator since 1986. The Appendix D table provides a history and a summary of the environmental work performed at the Site. To augment the existing Site information at the time, in early 2001 the property owners commissioned a comprehensive Site Investigation/Environmental Assessment (EA) of the Site. This EA was conducted by Geosyntec with a final report issued to the RWQCB in November 2001. The report is included here as Appendix E. After researching both historical and current uses, the investigation focused on 23 areas of potential environmental concern (PEC). See attached Figure 5, for both Recognized Environmental Concerns (RECs)/Potential Environmental Concerns (PECs). The goals of the investigation were to:

- 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 investigation included over 550 field and laboratory tests. Seven of the 23 PECs investigated showed crude oil impacts to surface and shallow soils. The EA also identified historic production sumps in and adjacent to the TFDS which resulted in the initiation of remedial efforts in that area. The TFDS Sump contained a small, localized area where impacted soils were in contact with the shallow brackish groundwater. The RWQCB assumed oversight of the remedial efforts and approved a Remedial Action Plan after further sampling that was conducted in 2002. Additional remediation wells were installed in 2006 and 2007 and remedial free-product withdrawals, testing and monitoring have been conducted since that time.

A later Phase I Environmental Site Assessment (ESA) [Geosyntec, 2008] served to update the EA with issues, testing, and clean-ups that were conducted between 2001 and 2008 and to evaluate if there were significant changes to the historical impacts to the Site. The number of PECs was updated to a total of 27.

The results of investigations indicated that the Site is primarily impacted by crude oil and that these impacts were generally confined to specific operating areas including, for example, oil well locations, pipelines, tank farms, sumps, and roadways. The data indicated that some areas of the Site were impacted by generally low concentrations of chemicals other than crude oil, such as VOCs and metals. The results indicated non-hazardous conditions; no levels of any materials exceeded hazardous waste criteria as

defined by state and federal guidelines. Details regarding the known environmental impacts are summarized below, and presented in more detail in the sampling events and reports listed in Appendix D. The summary below presents the Site assessment data by environmental media (e.g., soil, groundwater), as well as by Site area (e.g., facility operation or area of Potential Environmental Concern, PEC). The Site PECs are shown in Figure 5 and are listed in Table 1.

As described in Section 3, Site remediation of a limited number of oil well locations in the 1990s was managed under the OCHCA-reviewed and approved voluntary ERP. The ERP required that oil-impacted soils from these areas be identified, excavated, and treated in an on-site biotreatment cell by the oil operator. Activities associated with the handling of oil-impacted soil associated with the biotreatment cell were reviewed and approved by the RWQCB on an on-call basis; however, the results were not documented in a report. In the early 2000s the remediation work outside of the TFDS (oil consolidation area) related to the ERP was discontinued.

4.2 Ground-Truthing of Historical Impacts

As part of the CCC CDP permitting application for the overall Project, an analysis was conducted by the project biology team to evaluate the impacts of the Project to Site vegetation and sensitive resources. In estimating these biological impacts, it was assumed that the entirety of the Historic Oil Field Operations Areas shown on Figure 4 would require remediation in some way by the A&R work. This worst case assumption was developed by aggregating each of the areas used by the oil operations during the 70-year oil field history including: roads, well pads, facilities, and work areas. The assumption was made that surface areas were at some time covered with oil sands, asphalt, gravel, or other oil operation materials and that those areas would require remediation in some way in the A&R work. The current vegetation and/or sensitive resources in these areas were then considered to be the worst case potential impacts when the A&R work was carried out, though the actual impacts would likely be less. Some of these surface work areas were more likely always bare dirt and eventually were re-vegetated thus not requiring actual A&R work or impacts.

To further define the boundaries and limits of the required A&R work, a process to ground-truth the assumed impacts will be the first field activity performed. This activity will include assessing potential worst case impact areas by performing a detailed on-the-ground review. This review will be conducted on foot using predominantly visual methods but may be supplemented with soil sampling and laboratory analyses (if needed) to evaluate if the A&R work is in fact necessary in these field reconnaissance areas. The ground-truthing efforts may reveal some impact areas that do not actually contain either

infrastructure items (including gravels, road materials, and crude oil asphaltic materials) or crude oil operations impacts (those constituents required to be remediated per the approved RAP criteria). These areas would therefore be reclassified as no impact, and the actual boundaries of the historic oil operation areas would be updated.

This process, to be conducted by Geosyntec personnel with support from the project biology team, will document areas where actual impacts can be reduced over those assumed in the original analysis. While a requirement of the Abandonment Process is to remove infrastructure and historical impacts, there is expected to be some historical use areas where vegetation has simply overgrown once bare dirt and where no materials were ever placed or left.

The field process will begin after the Project has received the necessary agency approvals and NBRLLC gives notice to the oil operator, WNOC, to shut down oil operations across the Site except for those operating in the remainder/consolidation oil areas. The field process will involve the following:

- In locations where it appears that vegetation has overgrown past oil field use areas, two-man crews will walk the edges and within accessible areas to examine ground conditions.
- Observations will be made whether infrastructure materials such as gravel, asphalt, or crude oil remnants are visible on the surface or within the first six to eight inches of easily disturbed soils.
- The edges of actual impacts will be flagged at approximately every 100 feet. If the area has no non-native materials it will be noted as no impact to vegetation by the project biology team. Questionable areas may be sampled for laboratory analysis.
- The results will be documented onto area maps showing the original assumed worst case impacts and the observed actual edges of infrastructure. These maps may also include photo evidence of the findings.
- The findings will be compiled into a letter report to document changes to the original assumptions and to plan for more detailed targeted removals.

4.3 Media-Specific Environmental Condition Summary

The results of the EA, previous investigations and environmental observations have been summarized by general environmental media, including:

- soil,
- soil gas, and
- groundwater.

4.3.1 Soil

The results of soil sampling and testing at the Site are shown in Table 2, summarized by constituent suites and approximate concentration ranges. Crude oil in soils is the primary Site contaminant. In many locations, there is asphalt-like material (ALM), soil staining, and soil containing TPH at concentrations measured to be in excess of 1,000 mg/kg. However, hydrocarbon concentrations decrease rapidly (i.e., within a few feet) with depth or distance away from a crude oil impacted area or source. Results of laboratory chemical analyses of soil samples from oil-impacted areas indicate that concentrations of VOCs and semi-VOCs are generally below detection limits except when TRPH concentrations were on the order of 50,000 mg/kg or higher. In soil samples analyzed for TRPH, VOCs, and semi-VOCs, those soil samples with TRPH concentrations below 1,000 mg/kg generally had VOC and semi-VOC concentrations below the method detection limit.

For samples indicating petroleum hydrocarbon impacts, the carbon chain composition of the petroleum compounds detected at the Site is generally indicative of the presence of weathered crude oil except for a few samples where lighter chain hydrocarbons or other VOCs (likely laboratory contaminants) were detected. For example, very low levels (i.e., below U.S. Environmental Protection Agency [EPA] Region IX Industrial Regional Screening Levels [RSLs]) of acetone, methylene chloride, and vinyl acetate were detected in soil samples from the Maintenance Shop area (PEC01, Figure 5). However, these are also common analytical laboratory contaminants and may indicate laboratory contamination of soil samples. Metals concentrations were well below the Total Threshold Limit Concentration listed in Title 22 of the California Code of Regulations and were generally similar to metal concentrations observed in regional background soil. There were no recorded exceedances of the EPA Region IX Industrial RSLs.

4.3.2 Soil Gas

Upland Area: A soil gas survey was conducted at the Site in 1993 to evaluate if methane gas was present in select areas of the operating oil and gas operations [Geosyntec, 1993]. As these surveys were conducted in, and impacted by, the active oil operations they are not useful for the current Site analysis. Full surface combustible gas investigations on the Upland portion of the Site will be conducted once the oil operations are abandoned and impacted soils that may produce emissions are removed and remediated. These investigations will be conducted according to the requirements defined in the Orange County Fire Authority (OCFA) Guideline C-03 [OCFA, 2014; Appendix A], and the results will be used to develop mitigation measures (as warranted) to be implemented throughout the development area.

Lowland Area: The lowlands contains some areas of wetlands and marsh like conditions which often contain naturally occurring biogenic "swamp gas" or methane. Soil gas was observed seeping to the surface in one location through a shallow pond in the Lowland Area to the west of PEC02 – TFDS (oil consolidation area). Two soil gas samples collected from this area, indicated methane concentrations of up to 73.2 percent. In addition, benzene was detected at concentrations in excess of 2,000 micrograms per liter (µg/L). Hydrogen sulfide was not detected above the detection limit of the instrument. Since this region along the coast is prone to natural oil and gas seeps and/or shallow biogas associated with the fluvial deposits over vegetation at the mouth of the Santa Ana River, this is likely a natural occurrence.

4.3.3 Groundwater

The results of the most recent on-going groundwater sampling and testing at the Site are summarized in Tables 3 and 4 for the TFDS Sump remediation site (PEC02) and from the Maintenance Shop (PEC01), respectively. These data are being collected due to historical detections of free crude oil product and VOCs at the TFDS Sump, and VOCs near the Maintenance Shop. Historical groundwater samples from three wells in the Lowland Area collected by Levine-Fricke [1986] contained low (<1.0 mg/L) concentrations of VOCs (ethylbenzene, toluene, xylenes, acetone, vinyl chloride, 2-hexanone, and vinyl acetate). Geosyntec resampled the Site groundwater, including one groundwater sample collected in the same area where Levine-Fricke detected vinyl chloride.

Utilizing the groundwater data collected over the period from 2001 to present, groundwater quality in the vicinity of the following PECs is summarized as follows:

- Maintenance Shop (PEC01) – Low levels of VOCs, specifically benzene, cis-1,2-dichloroethene, methylene chloride, styrene, trans-1,2-dichloroethene, toluene, and vinyl chloride were reported in the shallow groundwater samples collected in 2001 at concentrations above laboratory reporting limits. Of these 7 VOCs, only the initial reported concentrations of benzene, methylene chloride, and vinyl chloride from the 2001 sampling event were above their respective drinking water standards maximum contaminant levels (MCLs). Though this shallow brackish water is not considered a drinking water MCLs are used as a reference level. Since the resumption of groundwater monitoring and sampling in 2010, no VOCs have been reported above their respective MCLs.

- TFDS (PEC02) – dissolved phase petroleum hydrocarbons and crude oil free-product have been observed in groundwater samples collected from the Sump remediation site within the TFDS since 2001. VOCs, specifically methylene chloride, xylenes, styrene, and toluene were reported in groundwater samples collected in 2001 at concentrations above laboratory reporting limits. Of these 4 VOCs, only the reported concentrations of methylene chloride (a known laboratory contaminant) were above its MCL. After the drilling of additional extraction wells, groundwater monitoring and sampling was resumed in 2006, and no VOCs have been reported above their respective MCLs since that time. Based on the observations and chemical analyses performed during past groundwater monitoring events, free-product does not appear to be migrating beyond the location of the former sump within the TFDS.

In California, the RWQCB has authority over the waters of the State. The uppermost water-bearing zone below the Site is prone to sea water intrusion [DWR, 1967; MWDSC, 2007].

The groundwater in these shallowest water-bearing zones below the Site is not used as a potable water source, irrigation supply, or for other domestic water use because of its poor quality and questionable availability. Because of its direct hydraulic connection with sea water and the resulting salt water intrusion, groundwater at the Site is brackish. The concentration of total dissolved solids (TDS) detected in a sample of groundwater collected from the Lowland Area was 8,150 mg/L. The chloride concentration in this sample was 3,010 mg/L. These TDS and chloride concentrations were expected as a chloride concentration of 18,800 mg/L had been measured in the Bolsa Chica-Sunset Gap along the Orange County Coast north of the Site [DWR, 1968]. For comparison purposes, general chloride concentration in sea water is on the order of 19,000 mg/L. The measured TDS and chloride concentrations in the Site groundwater are well above the State of California drinking water standards maximum contaminant levels (MCL) of 500 mg/L

for TDS and 250 mg/L for chloride [CCR, 2013]. For these reasons, the groundwater at the Site is not the focus of this RAP, yet will continue to be monitored as part of on-going RWQCB-approved environmental activities at the TFDS.

4.4 PEC Information Summary

A total of 27 PECs were identified by Geosyntec to have impacted the environmental media described above based on Phase I Environmental Site Assessments and Phase II assessments and investigations performed at the Site. The PECs are shown in Figure 5 and are listed in Table 1. Site investigations performed at some of the PECs and additional information regarding each of the PECs are included in documents listed in Appendix D. These investigations indicated that impacts existed at 11 of the 27 PECs. This RAP was developed to manage environmental impacts at the following 11 of the 27 PECs:

- PEC01, Maintenance Shop / Warehouse,
- PEC02, TFDS (limited to only the TFDS Sump and soil excavations outside the TFDS to the west),
- PEC03, Air Compressor Plant,
- PEC04, Steam Generation Plant,
- PEC06, City of Newport Beach Tank Farm (Abandoned),
- PEC08, Former Sump/Clarifier,
- PEC09, Utility Shack Transformer Storage,
- PEC10, Approximate Location of Edison Transformers,
- PEC15, Gasoline Underground Storage Tank,
- PEC25, Oil Well Pads and Linear Features (roadways/pipelines), and
- PEC26, Drilling Mud Sumps / Oil Well Sumps.

Impacts were also detected in other PECs. For example, PEC07, Pilot-Scale Biotreatment Cell / Stockpiled Soil, and PEC20, Soil / Debris Stockpiles, both contain crude-oil-impacted soil that is awaiting treatment near the existing biotreatment cell within the Lowland Area. These areas will be incorporated as part of the overall soil management process described in Section 5. It should also be pointed out that no intrusive sampling

was conducted at several PECs due to the lack of obvious contamination that would cause significant impacts to soil or groundwater. These PECs include:

- PEC11, Personnel Changing Room and Showers,
- PEC16, Coast Watch Station,
- PEC18, Soil / Debris Stockpile,
- PEC21, Soil / Debris Stockpiles,
- PEC23, Equipment/Debris Stockpiles, and
- PEC24, Field Offices.

There will, however, be confirmation sampling conducted at these locations after any required facility abandonments and as part of the closure activities. Generally, at most PECs, the issue of concern is crude oil-impacted soil.

5. REMEDIATION APPROACH AND SCOPE

5.1 General

Completing the comprehensive oil facilities consolidation, abandonment, and remediation at the Site will be a multiple-step process that will likely span a period of approximately two to three years. The remediation portion of this process is expected to take the bulk of that time; however some type of remediation and environmental oversight will actually occur during all three of the major phases of an approved development project: oil field facility abandonment, full field remediation, and development area grading. The following sub-sections outline the following:

- Section 5.2 – Overview of abandonment/remediation approach;
- Section 5.3 – Expected environmental impacts and volumes;
- Section 5.4 – Clean-up levels;
- Section 5.5 – Remediation scope;
- Section 5.6 – Remediation process; and
- Section 5.7 – Remediation project controls.

5.2 Overview of Abandonment/Remediation Approach

The abandonment and remediation of the historic oil field operations areas will be a complex and costly undertaking. While the proposed abandonment and remediation approach is comprehensive, its implementation has been designed to be a targeted and efficient plan that seeks to reduce the overall impacts of the work to the surrounding community and environment. The approach for the Site was developed using the following guiding strategies:

1. Recycle or reuse salvageable materials.
2. Remediate soil on-site, whenever feasible, using natural bioremediation processes.
3. Reuse remediated soil and recycled materials (e.g., concrete and ALM) in grading area development fills whenever possible.
4. Reduce off-site traffic, hauling, and disposal.
5. Work in collaboration with appropriate regulatory stakeholders and resource agencies to limit disturbance to desirable on-site vegetation and avian species.

These strategies, which have been used in other oil field abandonment and remediation programs in Orange County, align with the principles and elements recommended for Greener Clean-ups as outlined by the US EPA Office of Solid Waste and Emergency Response (OSWER). These elements will continue to be referred to in efforts to keep the A&R field work conducted in an efficient manner.

The proposed Site abandonment and remediation approach utilizes remediation methods and strategies that have proven successful in oil field abandonment projects in Orange County, and have been approved and performed under the oversight of the OCHCA and the RWQCB (including previously at this Site as described in Section 3). In developing this RAP, significant efforts were made to recognize the "big picture" impacts of oil field abandonment and remediation operations in order to reduce impacts to resources, both within the Site boundaries and on resources and communities surrounding the Site. To this end, one of the key elements of the plan's design is the utilization of available areas on the Upland Area of the Site (see Figure 2) for soil and other materials stockpiling, remediation, and placement of remediated/recycled materials. Since these areas are already disturbed by ongoing oil field operations, it will reduce the impacts to the Lowland Area which contains designated wetlands, and other sensitive natural resources. Sensitive species impact avoidance and potential mitigation efforts for the development-related project are addressed in the project biological studies. Utilization of the Upland Area also allows the majority of the abandonment and remediation work to remain within the Site.

The oil well abandonment and consolidation process will commence upon receipt of the necessary agency approvals, and oil operations across the Site will begin a phased cessation except for those operating in the oil consolidation areas. Plugging and abandoning of the remaining active/potentially active Lowland and Upland Area oil wells will commence, together with demolishing and/or removing/recycling the oil wellhead equipment, oil pipelines, utility poles, and other related oil production equipment, buildings, debris, and oil field access road surface materials. These abandonment efforts will include full-time environmental oversight, field observations, and soil testing during the removal of the oil facilities, and after the oil wells have been abandoned. These actions will seek to confirm whether the soil immediately adjacent to the oil wells and below oil facilities meets the approved clean-up criteria or requires remediation. As described in Section 4, many of these oil facilities are already known to have documented soil impacts present (see presentation of the PECs and the several previous environmental assessments) and are specifically targeted for remediation following the abandonment of their surface appurtenances. In addition to these known areas, the environmental oversight activities proposed during abandonment will serve to expose and identify the

potential existence of additional impacts that may be encountered and require remediation.

The remediation process involves the removal and on-site bioremediation of: (i) impacted soil encountered during the abandonment process, (ii) impacted soil generated from full field remediation of known impacted areas, and (iii) impacted soil encountered during development area grading. Once the impacted soil has been bioremediated and samples of the remediated soils are tested to verify that it meets the approved clean-up criteria, it will be reused and placed in the borrow site excavation in the Upland Area of the Site, no shallower than 10 feet from final grade elevations. In addition, ALM from road surfaces and concrete from oil field operations and facilities will be removed, processed on-site, and placed in the deep fill areas no shallower than 15-20 feet from final grade elevations, in accordance with the geotechnical specifications of the project. The clean soil from the borrow site excavation will be used as backfill for the impacted area excavations in the Lowland and Upland Areas and as a final cover over the ALM, concrete and soils placed within the site. Figure 7 illustrates the general areas involved in the abandonment and remediation process, key areas are summarized below:

- Borrow/Placement Areas – these were chosen from areas of natural fill soils that would require geotechnical over-excavation as part of any development corrective grading. Soil will be excavated from within these areas and stockpiled at the adjacent Clean Soil Flip areas. ALM/concrete and bioremediated soil will then be placed at the bottom of these excavated areas and, once backfill is completed, will be covered with the Clean Soil Flip material (to specified depths and clean-up criteria).
- Staging/Stockpiling Areas – these areas are located in the Lowland Area of the Site and may be used to stage and accumulate soil that is excavated in the Lowland.
- Bioremediation Areas –
  - Soil In – these areas will be used to stage and accumulate impacted soil that is excavated from the remediation project and transported to the remediation process areas.
  - Bioremediation Cells – these areas are the primary areas to be used for the impacted soil bioremediation process.
  - Soil Testing/Verification – these areas will be used to stage bioremediated soil batches for verification testing.

  - Note: depending on space limitations, timing constraints, and/or transportation efficiencies that reduce dust and/or fuel consumption, soil may be staged, bioremediated, and tested at any of the above areas.
  - Haul-off Stockpile – this area will be used to stage impacted soil that is not amenable to the bioremediation process (e.g., containing more mobile crude oil fractions and/or tar-like material) and requires profile sampling and testing for off-site disposal.
- Concrete/ALM Processing Areas – these areas will be used to stage accumulated concrete/ALM and for processing (i.e., crushing and stockpiling) prior to on-site reuse.
- Equipment/Materials Salvage Areas – these areas will be used to accumulate oil facility abandonment materials (e.g., pipe, metal debris) for salvage and recycling.

5.3 Expected Environmental Impacts and Volumes

5.3.1 Soil, ALM, and Concrete

As outlined in Section 4, investigations and testing indicate that the Site is predominantly impacted by petroleum hydrocarbons in soil, specifically degraded and weathered crude oil. The majority of this Site soil is lightly impacted from the crude oil operations but, as has been observed and documented in previous environmental reports, some areas will have an older, heavier accumulation of weathered crude oil from historical operations. No hazardous levels of impacts were found during the sampling and testing events and assessments.

The Site also includes roads built to access various parts of the oil field in both the Upland and Lowland Areas made up of varying amounts of ALM, gravel, crude oil, or crude oil tank sediments, and large amounts of concrete used in oil field operations and facilities. These soil, ALM, and concrete materials will be addressed during the remediation phase.

Table 1 shows a summary of the types of impacts that were found at the Site and the estimated remediation volumes at those areas. The impacted areas are outlined in the EA report [Geosyntec, 2001], along with estimated depths and volumes, and are the basis and scope for the remediation program with the exception of the consolidation areas. Figure 6 shows the expected remedial excavation areas of the Site. The initial estimate from the 2009 draft RAP was a total of 246,000 cubic yards of materials, later updated to 271,000 cubic yards. Considering an updated high side contingency, it is now estimated that a range of between 222,000 and up to approximately 362,000 cubic yards of materials may

be addressed during the Site remediation activities covered by this RAP. The mid-point expectation of this range is 292,000 cubic yards.

Of this range, up to approximately 182,000 cubic yards are hydrocarbon impacted soil and up to an additional 180,000 cubic yards are surface road materials/ALM and concrete. Because of the size and history of the Site, some unexpected conditions may exist and the volumes actually encountered may vary. Reasonable unexpected conditions (possibly associated with scattered oil sumps or undocumented historic pipeline leaks) are considered in the high end range and will be addressed as they are discovered. It is expected that additional signs of smaller impacts will be identified during the oil field facility abandonment and demolition phase, and during development area grading.

5.3.2 Methane Gas, VOCs, and Groundwater

The crude oil produced in the Site oil operations is a heavy, low gravity oil that has very little associated methane gas. There were no indications of soil gas observed in the Upland Area and the single temporal observation of bubbling gas in a Lowland Area pond near the TFDS was determined to be a natural occurrence, likely from shallow biogas associated with the fluvial deposits over vegetation at the mouth of the Santa Ana River. As described in Section 4, the oil field abandonment activities are managed in accordance with DOGGR regulations (for required downhole abandonment) and full surface use methane mitigation measures, as defined in the OCFA Guideline C-03, will be implemented throughout the future development area. The well-established OCFA guidance (Appendix A) provides detailed designs for mitigation of potential impacts due to methane and vapor intrusion in and around developments and has been implemented in most Orange County developments over former oil field operations. These designs include subsurface oil well venting systems, structure sub-slab barriers, structure vent guidelines, and surface vent guidelines. To satisfy the OCFA guidance for gas mitigation associated with different surface uses, a hazard gas assessment will be conducted after the potential sources (e.g., oil wells and facility production areas) are abandoned and remediated.

During the environmental Site assessments, there were no VOCs detected in soil samples above residential RSLs. As described in Section 4, low levels of VOCs were historically detected in subsurface water in isolated locations in the Lowland Area only. Multiple sample events of well networks associated with two areas within the Lowland Area indicate that groundwater sample reported VOC concentrations (where detected) are below MCLs, and that TPH impacts (free crude oil product and dissolved phase) are contained to the area around the TFDS Sump. There is no indication that groundwater

underlying the Upland future development area, and above the shallow oil reservoirs, is impacted.

5.4 Clean-up Levels

The proposed clean-up levels for the remediation project are provided in Table 5. The clean-up levels were developed using the more recent and conservative clean-up levels that were provided in the CAO described in Section 3. The clean-up levels vary for each constituent and are based on a multi-depth approach considering depth below final grade and final Site use (residential or open space/parks/streets). As indicated on Table 5, remediated soil meeting the agency-approved clean-up levels will only be placed in deep fill areas located in the Upland Area of the Site and no shallower than 10 feet from final grade elevations. Processed ALM and concrete will also only be placed in the Upland deep fill areas and no shallower than 15-20 feet from final grade elevations. These materials will be placed according to appropriate geotechnical criteria needed for development, to be established separately. No remediated soil will be used to backfill impacted area excavations in the Lowland.

5.5 Remediation Scope

5.5.1 Oil Wells

Upon cessation of oil field production activities, each active or idle oil well outside of the remaining oil consolidation area will be cleared of production equipment and piping surrounding the well head on the well pad. Staged process controls will be implemented within work areas to confirm appropriate utility isolation and safe work zones. The recovered equipment and piping will be moved to the Equipment/Materials Salvage areas for staging and recycling. Each oil well will then be plugged and abandoned to the requirements of DOGGR who will inspect and approve each completed downhole oil well abandonment. The plugging and abandonment of oil wells is a currently permitted activity at the Site and the work will be carried out by a standard oil field work-over rig which is already in use at the Site to clean out, repair, and rework the existing oil wells. Based on a review of past records, documentation and testing, certain previously abandoned wells may also require re-abandonment to meet the current DOGGR standards. It is currently anticipated that approximately 66 oil wells in the Lowland and Upland Areas will be plugged and abandoned as part of this process.

For each oil well abandoned, or previously abandoned, a focused soil excavation will be performed around each well head based on previous observations of impacts evident at oil well locations. This excavation will consist of a 10-foot by 10-foot excavation footprint, centered on the former well head, and will extend to a depth of 8 feet below

ground surface (for Upland wells) and to a depth of 3 feet below ground surface (for Lowland wells). The excavation and loading process is described in Section 5.6.1 and the environmental oversight is described in Section 5.6.3. Following completion of the soil excavation, the excavation bottom and sidewalls will be sampled and tested (Section 5.6.4 and Table 6) to confirm that the remaining soil in place meets the clean-up levels. Additional 'step-out' excavation areas may be required if confirmation soil samples do not meet the required clean-up levels. The soil removed from the excavation will either be staged adjacent to the well or at the local Staging/Stockpiling areas, and will be sampled and tested (Section 5.6.4 and Table 6) to confirm that it meets the clean-up levels. If the confirmation soil sample results indicate that the excavated soil meets the clean-up levels, it will be backfilled into the excavation and re-compacted. If confirmation soil sample results indicate that the excavated soil does not meet the clean-up levels, it will be transported to the Soil In and/or Bioremediation Cell areas for bioremediation (Section 5.6.2) and soil from the Clean Soil Flip areas will be tested for compliance with the clean-up levels and used to backfill the excavation (Table 6).

It is currently anticipated that each of the oil wells at the Site that are located outside the oil consolidation area will have this remedial soil excavation performed as part of this process (Figure 6). The oil wells to be abandoned during this process will already be partially excavated in order to cut the well casing off at least six feet below the surface. Soil observations and testing will be coordinated with this well abandonment process in order to avoid duplicative work. The abandoned oil wells in the development areas will be managed per the DOGGR Construction Site Review process, and the potential for combustible gases in the subsurface will be mitigated in the development areas according to OCFA Guideline C-03.

5.5.2 Infrastructure, Facilities, and PECs

Concurrent with the oil well plugging and abandonment process, the demolition and removal/recycling of oil production infrastructure and related facilities will commence. This includes the removal of surface and near-surface infrastructure, facility, and production related impacts from the Site including: pumping units, equipment, machinery, and metal debris; power poles and utility infrastructure; facility tanks, vessels, pumps, and other equipment; production offices, buildings, garages, sheds, and covers; facility foundations, drains, and pipes; sumps and fluid containment areas. Oil pipelines and roads (which are part of this abandonment program) are discussed separately in Sections 5.5.3 and 5.5.4 below, respectively.

As facilities are abandoned, recovered materials and equipment will be moved to the Equipment/Materials Salvage areas for staging, recycling and/or disposal. Experienced

oil field crews and demolition contractors will be used for infrastructure removal and work will follow appropriate State and local guidelines. Staged process controls will be implemented within work areas to confirm appropriate utility isolation and safe work zones. The facility abandonment efforts will include full-time environmental oversight (Section 5.6.3) and soil testing (as observations warrant, Table 6) during the removal of the surface oil facilities to confirm that the surface soil remaining in these post-abandonment areas meets the clean-up levels. If soil samples confirm visual observations that soil is impacted above clean-up levels, targeted remedial excavations will be performed to remove the material (Section 5.6.1) and another round of confirmation soil sampling and testing will be performed. Additional 'step-out' remedial excavation areas may be required if confirmation soil samples do not meet the required clean-up levels. Impacted soil will be transported to the Soil In and/or Bioremediation Cell areas for bioremediation (Section 5.6.2). Soil from the Clean Soil Flip areas will be tested for compliance with the clean-up levels and used to backfill remedial excavations.

In addition to those impacts that may be encountered during facility abandonment, many oil facilities are already known to have documented soil impacts present (PECs) and are specifically targeted for remediation following the abandonment of their surface appurtenances. Table 1 provides a list and summary of the PECs and the estimated remediation volumes at those sites. The impacted areas are outlined in the EA report, along with estimated depths and volumes, and are the basis and scope for the remediation program. These areas are shown on Figure 6. It is currently estimated that up to approximately 182,000 cubic yards of hydrocarbon impacted soil will be addressed as part of this remediation effort. At these areas, known impacted soil will be excavated as described in Section 5.6.1 and under the environmental oversight described in Section 5.6.3. Following completion of the soil excavation, the excavation bottom and sidewalls will be sampled and tested (Section 5.6.4 and Table 6) to confirm that the remaining soil in place meets the clean-up levels. Additional 'step-out' excavation areas may be required if confirmation soil samples do not meet the required clean-up levels. The soil removed from the excavation will be transported to the Soil In and/or Bioremediation Cell areas for bioremediation (Section 5.6.2) and soil from the Clean Soil Flip areas will be tested for compliance with the clean-up levels and used to backfill the excavation.

5.5.3 Oil Pipeline Corridors

As part of the facility abandonment, oil pipelines, supports, and anchors will be removed and recovered materials will be moved to the Equipment/Materials Salvage areas for staging, recycling and/or disposal. Identified oil pipelines are shown on Figure 6 and include those areas where one or more pipelines exist, or previously existed, to convey oil and produced water from each well to larger group lines, and then on to each

processing facility. Most pipelines are above ground with some sitting on pipeline support structures that are cemented into the ground to raise the actual pipeline above the ground surface. Some older lines may still exist up to 3 feet below the ground surface in road crossings and general work areas. It is anticipated that additional pipelines and appurtenances will be identified as facility abandonment progresses.

The pipeline abandonment efforts will include full-time environmental oversight (Section 5.6.3) and soil testing (as observations warrant; Section 5.6.4 and Table 6) during the removal of the pipelines and appurtenances to confirm that the surface soil remaining in these post-abandonment areas meets the clean-up levels. In addition to the soil testing based on environmental oversight observations (Section 5.6.3), confirmation surface soil samples will be collected every 250 feet of pipeline or pipe-rack length along former pipe centerlines (Table 6) and tested to confirm that the surface soil remaining in these post-abandonment pipe corridors meets the clean-up levels. If soil samples indicate that soil is impacted above clean-up levels, targeted remedial excavations will be performed to remove the material (Section 5.6.1) and another round of confirmation soil sampling will be performed. Additional 'step-out' remedial excavation areas may be required if confirmation soil samples do not meet the required clean-up levels. Impacted soil will be transported to the Soil In and/or Bioremediation Cell areas for bioremediation (Section 5.6.2). Soil from the Clean Soil Flip areas will be tested for compliance with the clean-up levels and used to backfill remedial excavations performed along the pipeline corridors.

5.5.4 Roads

As part of the facility abandonment, the surface road materials/ALM associated with oil field access roads will be scraped using heavy equipment up to a depth of approximately 1.5 feet below ground surface (i.e., to native soil), processed on-site at the Concrete/ALM Processing areas (Section 5.6.5), and subsequently placed in the deep fill areas no shallower than 15-20 feet from final grade elevations. The roads initially anticipated to require this remedial excavation are shown on Figure 6, although it is anticipated that the ground-truthing effort may alter the final removal locations. It is currently estimated that up to approximately 150,000 cubic yards of surface road materials/ALM will be addressed as part of this remediation effort.

Following the removal of the surface road materials/ALM, environmental oversight observations (Section 5.6.3) and soil testing (as observations warrant, Table 6) will confirm that the surface soil remaining below these former roads meets the clean-up levels. In addition, confirmation surface soil samples will be collected every 500 feet of scraped road length along former road centerlines (Table 6) to confirm that the surface

soil remaining meets the clean-up levels. If soil samples indicate that soil is impacted above clean-up levels, targeted remedial excavations will be performed to remove the material (Section 5.6.1) and another round of confirmation soil sampling will be performed. Additional 'step-out' remedial excavation areas may be required if confirmation soil samples do not meet the required clean-up levels. Impacted soil will be transported to the Soil In and/or Bioremediation Cell areas for bioremediation (Section 5.6.2). Soil from the Clean Soil Flip areas will be tested for compliance with the clean-up levels and used to backfill remedial excavations performed along the road alignments.

5.5.5 Concrete

As facility abandonment progresses, concrete materials will be generated from well abandonments and demolition of facility structures, supports, and foundations. In addition, there is approximately 15,000 cubic yards of salvaged concrete currently stockpiled on Site from previous abandonment activities. Concrete materials will be broken down in-place into transportable pieces, processed on-site at the Concrete/ALM Processing areas (Section 5.6.5), and subsequently placed in the deep fill areas no shallower than 15-20 feet from final grade elevations. It is currently estimated that up to approximately 30,000 cubic yards of concrete materials will be addressed as part of this remediation effort.

5.5.6 Development Area Grading

Development area grading is the most comprehensive type of visual confirmation possible. Upon completion of the oil field facility abandonment and full field remediation, full-time environmental oversight, soil testing (as observations warrant), and remediation (as required to address impacts) will be performed during grading activities to confirm that the surface soil remaining at the Site meets the clean-up levels. These processes will follow the same approach/methodology described herein.

5.6 Remediation Process

5.6.1 Soil Excavation and Removal

5.6.1.1 Pre-Excavation

Pre-excavation remediation activities will generally include the following:

- Coordinate with Agencies on the schedule for fieldwork activities, following receipt of necessary Agency approvals to commence work.

- Conduct the ground-truthing effort to evaluate the boundaries of A&R work in areas where vegetation may be impacted.
- Review the construction contractor's South Coast Air Quality Management District (SCAQMD) Rule 402/403 nuisance and fugitive dust control plans and implement the recommended appropriate dust control measures (anticipated control measures are described in Section 5.7.1). SCAQMD Rule 403 requires that fugitive dust be controlled with Best Available Control Measures so that the presence of such dust does not remain visible in the atmosphere beyond the property line of the emission source. This requirement shall be included as notes on the contractor specifications.
- Review the construction contractor's Site-specific SCAQMD Rule 1166 VOC Contaminated Soil Mitigation Plan for control of potential VOC emissions during soil excavation, handling, and remediation (anticipated control measures and procedures are described in Section 5.7.1).
- Review the development project Storm Water Pollution Prevention Plan (SWPPP) and implement the recommended appropriate control measures for the A&R work (anticipated control measures are described in Section 5.7.1).
- Prepare a Site-specific Health and Safety Plan (HASP) (Section 5.7.2).
- Clear and grub vegetation at the staging/processing/handling areas involved in the abandonment and remediation process (areas shown on Figure 7) using methods that would limit the potential for the generation of sparks and impacts to ecologically sensitive areas. Grade these areas level in preparation for the commencement of abandonment and remediation activities. Prepare Site areas to accommodate the deployment of heavy equipment.
- Clear underground utilities for each of the work zones with Underground Service Alert (USA) and clear work activities with WNOC operations. USA will continue to be contacted periodically through the abandonment and remediation project to maintain active dig clearances. Subcontracted private utility-locating geophysical contractors may be used, if deemed necessary by WNOC, to locate and identify potential subsurface obstructions. Before remediation activities begin, nearby facility areas will be confirmed to have already been isolated and locked out from any energized power or fluid sources, and surface appurtenances will have been cleared in each excavation work area.
- Locate and delineate the estimated outline of known impacted excavation areas using a combination of existing surface features (e.g., oil wells), previous sample location stakes, and global positioning satellite (GPS) technology.

Initial excavation areas will be demarcated in the field (e.g., stakes, tape) and will be refined, as needed, based on the results of confirmation sampling.

- For impacted areas that are identified through environmental oversight observations and soil sampling during facility abandonment (e.g., under existing surface appurtenances, pipelines, roads) delineate the estimated outline of impacted material using GPS technology.
- Perform a Site walk with the excavation contractor to plan equipment and personnel needs.
- Outline an equipment storage and fueling area and establish procedures to isolate impacts that may occur within these areas.

5.6.1.2 Excavation

Excavation activities will generally include the following:

- Full-time environmental oversight (Section 5.6.3) and implementation of dust, emissions, and storm water controls (Section 5.7.1). Site personnel will follow the protocols outlined in the HASP including the use of explosive gas and hydrogen sulfide gas monitors during excavation activities to evaluate Site conditions and whether potentially hazardous conditions develop.
- Excavations will be advanced in a surgical manner to the delineated lateral extent and depths specified in the pre-excavation tasks and according to the remediation scope outlined in Section 5.5. While it is anticipated that the majority of the excavations will have near-vertical sidewalls to reduce the amount of soil to be removed to the full target depth of the excavation, some excavation sidewalls may require a degree of sloping. Excavations will likely be performed using conventional track-mounted excavators and rubber-tired backhoes, supported by front-end loaders. Road scraping will likely be performed by rubber-tired motor graders and track-mounted dozers, supported by front-end loaders. In areas where access to equipment is severely limited, excavation may be accomplished using a mini-excavator, and where necessary hand tools and wheelbarrows will be used to conduct excavations. Contractors will select and utilize the most efficient equipment capable of effectively and safely completing planned excavation tasks.
- Excavations at oil well locations will involve the placement of the soil removed from within the excavation directly adjacent to the well itself or at local Staging/Stockpiling areas.

- Excavations at known impacted locations will involve the direct loading of excavated soil, as soon as feasible, into awaiting vehicles (i.e., rubber-tired end-dump trucks or heavy haul trucks) for transport to the Soil In and Bioremediation Cell areas.
- As described in Section 5.6.3, excavated soil will be field screened for evidence of visible staining, deleterious material, or showing signs of olfactory (e.g., odors/photoionization detector [PID]) impacts. Soil that this is not amenable to the bioremediation process (e.g., containing crude and/or tar-like material) will be separately transported to the lined and segregated Haul-Off Stockpile, to await profile sampling for off-site disposal. If materials are identified that have constituents exceeding hazardous criteria, they will be separately stockpiled at the Haul-Off Stockpile and handled/managed separately (note that no materials having concentrations exceeding hazardous criteria have yet been identified).
- Soil that requires off-site disposal will be transported under waste manifest to appropriately licensed recycling/disposal facilities by a state-licensed waste hauler for appropriate recycling or disposal. Soils will be pre-profiled and approval will be obtained from the recycling/disposal facilities before hauling activities begin. Impacted soil at the Haul-Off Stockpile will be direct loaded from the lowest feasible height using front-end loaders into approved waste haulers for transport to reduce the potential for spills or dust generation. Appropriate care will be taken to: keep soil within and below the sides and rear of the hauler; spray water to suppress potential dust; appropriately tarp or cover the hauler; and clean-off the exterior of the hauler prior to leaving the Site. A manifest will be prepared for each truckload and a generator's copy will be retained by field personnel for logging and tracking purposes.
- Should concrete or other material/debris remnants be uncovered during the excavation, these materials will be loaded into end-dump trucks or heavy haul trucks and transported to the Concrete/ALM Processing or Equipment/Materials Salvage Areas, as required.
- Excavations will initially be left open, in accordance with Site safety protocols and marked using caution tape, orange cones, etc. In an effort to reduce the time for which the excavation is left open, backfilling will occur as backfill soil becomes available (i.e., sampled, tested, and confirmed to meet the approved clean-up levels).

5.6.1.3 Backfill

Backfilling operations will generally include the following:

- Remedial excavations – will use the soil that is generated from the clean soil borrow sites. This soil will be excavated from within the Borrow/Placement areas, stockpiled at the adjacent Clean Soil Flip areas, sampled and tested to confirm that it meets the approved clean-up levels, and then used as backfill.
- Oil well excavation – will use the soil originally removed from the excavation (if sampled, tested, and confirmed that it meets the clean-up levels) or the soil stockpiled at the Clean Soil Flip areas (if sampled, tested, and confirmed that it meets the clean-up levels).
- Borrow/Placement areas – ALM from road surfaces and concrete from oil field operations and facilities will be backfilled in these deep fill areas no shallower than 15-20 feet from final grade elevations. Bioremediated soil (if sampled, tested, and verified that it meets the clean-up levels) will be backfilled in these deep fill areas no shallower than 10 feet from final grade elevations. At least the top 10 feet of soil in these areas will use the soil stockpiled at the Clean Soil Flip areas (if sampled, tested, and confirmed that it meets the clean-up levels).

Compaction methods/specifications and confirmation testing for backfill operations will be determined by the geotechnical contractor. It is anticipated that backfill soils will be moisture conditioned to near optimal moisture content, placed in lifts of limited thickness, and compacted using mechanical and/or vibratory soil compaction equipment.

5.6.2 Soil Bioremediation

The proposed soil remediation approach utilizes bioremediation methods that have successfully treated hydrocarbon impacted soil at the Site under past agency-approved clean-ups. As described previously, this approach recognizes the overall goal to remediate and/or recycle impacted materials on-site to the greatest extent possible, thus reducing overall regional impacts such as the transportation burden to local streets and the associated air emissions that would be experienced with mass soil export, or the use of landfill capacity for otherwise recyclable resources.

The treatment and testing process for bioremediation of hydrocarbon impacted soil generally consists of the following:

- Full-time environmental oversight (Section 5.6.3) and implementation of dust, emissions, and storm water controls (Section 5.7.1).

- Impacted soil derived from remedial excavations at the Site will be transported to the Soil In areas for staging and accumulation, moved to the Bioremediation Cells for treatment, and then to the Soil Testing/Verification areas for batching and verification sampling. Depending on space limitations and timing constraints, soil may be staged, bioremediated, and sampled and tested at any of the above areas.
- The bioremediation process involves the control of moisture in the soil as it is periodically mixed, disced, and turned. This process aerates the soil and encourages the growth of the indigenous hydrocarbon-reducing bacteria. Accumulated soil is first spread out, as space permits, using a combination of front-end loaders and dozers. Water is also applied using a water truck to assist the bioremediation processes and limit dust generation. The soil is then arranged into rows approximately 12 to 36 inches high, which will be refined as the project progresses. Row widths will be determined by the equipment used for aeration, typically approximately equal to the distance between the tires of the equipment. Soil in these rows is periodically mixed, disced, turned, and watered for a minimum period of 2 weeks. Based on previous remediation efforts, the remediation time is expected to be between 2 to 6 weeks, depending on the soil conditions and influent petroleum hydrocarbon concentrations. Soil will then be moved and "batched" into approximate 1,000 cubic yard piles for verification soil sampling (Section 5.6.4 and Table 6) at a frequency of 1 soil sample per 1,000 cubic yard batch. Based on the results, soil will either continue to be bioremediated, or made available for backfill into the Borrow/Placement areas no shallower than 10 feet from final grade elevations, if sampled, tested, and confirmed that it meets the clean-up levels.
- The rate of biodegradation is affected by several different factors including: temperature, moisture, initial concentrations, soil type, nutrient content and available oxygen. Some of these variables can be controlled through remediation techniques including, aeration/mixing frequency, soil blending, row size, and water addition. These variables will be adjusted in the field as the project progresses and more information is available about Site-specific parameters.
- As described in Section 5.6.3, excavated soil will be field screened for evidence of visible staining, deleterious material, or showing signs of olfactory (e.g., odors/PID) impacts. Soil that this is not amenable to the bioremediation process (e.g., containing crude and/or tar-like material) will be separately transported to the lined and segregated Haul-Off Stockpile, to await profile sampling for off-site disposal.

5.6.3 Environmental Oversight

Full-time environmental oversight will be present during all three of the major phases of the approved development project: oil field facility abandonment, full field remediation, and development area grading. The overall purpose of the oversight activities will be to observe, document, and confirm that the remedial action addresses the soil impacts at the Site to the required clean-up levels, including areas of known impacts and those that are exposed and identified during the course of the abandonment and remediation project.

Environmental oversight activities will generally include:

- Monitoring for worker health and safety in accordance with the HASP (Section 5.7.3) and for compliance with the Site-specific SCAQMD requirements (Section 5.7.1).
- Visual monitoring and field screening using a calibrated PID to evaluate the condition of soil at excavation cut faces, recently excavated soil stockpiles, and new areas exposed during the abandonment work (e.g., under slabs/footings, around oil wells and under oil pipelines, and following road scraping). Soil will be field screened for evidence of visible staining, deleterious material, or showing signs of olfactory (e.g., odors/PID) impacts. In the event that such soil is identified, it will be sampled and tested (Section 5.6.4 and Table 6) to evaluate if it meets the clean-up levels. Depending on the results, soil will either be left in place or identified for additional remedial excavation and management under the bioremediation process (Section 5.6.2).
- Using the above visual/PID field screening, identify soil that this is not amenable to the bioremediation process (e.g., containing crude and/or tar-like material) for segregation at the Haul-Off Stockpile.
- Confirmation and verification sampling program management (Section 5.6.4).
- Maintaining detailed daily field written records, soil sampling records, equipment (e.g., PID) calibration logs, and a detailed photographic log of the progress of the abandonment and remediation project (including “before” and “after” photographs of each of the remedial excavations) and to record other observations, events, or developments of significance. Photographs will be geo-referenced to the location, time, and date of the photograph.

5.6.4 Soil Sampling

The soil sampling program is summarized in Table 6, and includes a detailed list of each of the remediation scope items with a description of the sampling type, sampling frequency, and analytical program to be used. As abandonment and remediation activities make progress addressing each of the remediation scope items, the concurrent confirmation sampling program is designed to confirm whether the soil immediately adjacent to the oil wells and below oil facilities (e.g., infrastructure, pipelines, roads) meets the approved clean-up levels or requires remediation. Verification sampling is designed to verify that the bioremediated soil batches meet the approved clean-up levels. It is anticipated that implementing both the confirmation and verification sampling programs will be an iterative process, whereby additional targeted remedial excavations or additional bioremediation treatment rounds may be required, to be followed by additional confirmation/verification sampling until the soil is documented to meet the clean-up levels.

In addition to the details provided in Table 6, the following list includes information on the soil sampling procedures, methods, and nomenclature:

- Confirmation soil samples will be collected from the bottom and along each of the sidewalls of excavations, at the surface (typically 0 to 6 inches below current grade) along former pipeline and roadway alignments, from soil stockpiles, and in other locations identified as potentially impacted during environmental oversight observations.
- Excavation confirmation sampling – based on the depth of the excavation, confirmation soil samples will either be collected directly by field personnel entering the work area (e.g., shovel or hand-auger), or an excavator or backhoe will be directed to scrape surface soil from the target sampling area and field personnel will then collect the sample directly from the excavator/backhoe bucket. These work area entry procedures will be outlined in the HASP. Depths of sidewall samples will be established in the field based on visual observations and will be documented.
- Stockpile confirmation sampling (oil well head excavation soils and soil at the Clean Soil Flip areas) – soil sample locations will be determined using a grab sample procedure and will be collected from soil that is representative of the stockpile mass.
- Verification sampling – as above, soil sample locations will be determined using a grab sample procedure and will be collected from soil in the remediated batch that is representative of the soil mass.

- Soil samples will be collected by field technicians well versed in sample collection and handling techniques. Soil samples will be collected at each location using steel hand tools, such as a small hand shovel, or a hand auger if conditions warrant. Laboratory-approved sample containers (e.g., glass jars) will be filled to the top with measures taken to reduce the potential for soil to remain in the threads of the plastic lid prior to being sealed to reduce the potential for migration of soil to or from the sample. After sample containers are filled, they will be promptly labeled, placed on ice in coolers, and transferred under chain-of-custody protocol to the laboratory.
- Non-disposable sampling equipment, such as small tools, will be decontaminated after each use. The decontamination procedure will consist of the following steps: (i) equipment will be washed in a phosphate-free soap and water mixture; (ii) equipment will be rinsed thoroughly in distilled water following washing; and (iii) equipment will be rinsed again in distilled water. Decontamination procedures will be done using three 5-gallon buckets with their respective wash/rinse solutions. Solutions will be transferred into 55-gallon drums following use.
- Laboratory analytical testing will be conducted by Eurofins Calscience, Inc., a National Environmental Laboratory Accreditation Program (NELAP) and Environmental Laboratory Accreditation Program (ELAP) accredited laboratory.
- Confirmation soil sample locations (except at soil stockpiles) will be surveyed for horizontal coordinates using a GPS unit. Wooden stakes will be labeled with the sample names and used to mark the sample locations. The stakes and GPS data will be used to locate the sample locations for subsequent excavations (if needed).
- Confirmation soil samples will be named according to the following nomenclature:
  - CATEGORY – FL (floor) or SW (sidewall) or G (grab) – SAMPLE NUMBER – DEPTH (in feet)
  - CATEGORY may include: OW### (oil well and number), PEC## (PEC number), PL (pipeline), RD (road), BF (Clean Soil Flip backfill), VIS (potentially impacted soil identified by visual observations at non-PEC areas during abandonment, remediation, or development grading).

  - Since excavations may be conducted in an iterative process (if confirmation sample results exceed clean-up levels) the next available SAMPLE NUMBER would be used to name the samples collected.

- Verification soil samples will be named according to the following nomenclature:
  - B## – "B" and BATCH NUMBER
  - If verification sample results exceed clean-up levels for a batch, the bioremediation process is continued and subsequent samples collected would be named using the next available BATCH NUMBER.
- Laboratory analytical data will be compiled directly into a relational database from the electronic laboratory reports, together with the GPS data.
- The laboratory will perform instrument calibration according to instrumentation specification and method requirements. The laboratory will review the incoming samples to verify that they meet sample container and documentation requirements, and holding times. The laboratory will review the analytical data according to its internal quality assurance / quality control plan, and provide a description of rejected data, data quality issues, or deviations in the data narrative. The analytical data will also be reviewed by project personnel. Re-analysis or re-sampling may be required if dilution factors cause reporting limits to be greater than the clean-up levels.

5.6.5 Concrete and ALM Processing

As part of the effort to recycle and reuse abandonment materials, Concrete/ALM Processing areas (Figure 7) will be setup to manage concrete and ALM materials generated from the abandonment process. Concrete materials will be generated from well abandonments and demolition of facility structures, supports, and foundations (and current salvaged concrete stockpiles). ALM materials will be generated from the road scraping activities. Concrete and ALM materials processing will generally include:

- Onsite crushing to clear areas intended for remediation staging.
- As concrete materials are encountered during abandonment activities, they will be broken up in place into transportable sizes using excavator-mounted hydraulic hammers and breakers. Large concrete pieces located in the current concrete stockpiles will be broken up in the same manner. Concrete pieces will then be loaded using excavators and front-end loaders into end-dump trucks or heavy haul trucks and transported to the Concrete/ALM Processing areas for stockpiling and further processing. As ALM materials are generating from the

road scraping, they will be loaded using similar equipment for transport to the Concrete/ALM Processing areas.

- During materials loading activities, water will be applied using a water truck to limit dust generation. Stockpiles of incoming and final recycled concrete/ALM will also be sprayed with water to limit dust generation.
- Concrete/ALM processing machinery and equipment will be specifically selected and sized based on the geotechnical structural fill requirements to be developed by the geotechnical contractor. It is anticipated that this will include: metals (i.e., rebar) removal and recycling; initial crushing using a portable concrete crusher; sorting/screening of crushed concrete pieces; re-crushing, as necessary, to obtain the required dimensions for a compactible structural fill.
- Once concrete/ALM materials have been appropriately processed, it will be loaded using excavators and front-end loaders into end-dump trucks or heavy haul trucks and transported to the Borrow/Placement areas as backfill, for placement no shallower than 15-20 feet from final grade elevations.

5.7 TFDS Sump

The TFDS Sump, shown as part of PEC02, is located within the TFDS. While this RAP focuses mainly on A&R work outside of the oil consolidation areas, the TFDS Sump is an existing remediation site in which on-going and additional remedial activities will be conducted as part of the A&R field operations.

Certain tanks and vessels immediately adjacent to the TFDS Sump area will be removed as part of the facility abandonment in order to provide better access to the sump location. In addition to shallow soils that will be bioremediated, the excavation of the sump is expected to produce more heavily petroleum-impacted soils that may be transported offsite in order to not overburden the bioremediation process. Such heavily impacted sump materials would likely slow the bioremediation processes by requiring extended times for the bacteria to break down the petroleum concentrations anticipated in the former sump materials. It is estimated that up to 25,000 cubic yards of these materials may be taken offsite for handling and recycling. Clean soil from the borrow pits would be used to backfill the sump excavation. Additional details on the excavation methods will be forwarded to the RWQCB for their review and continued oversight. The TFDS will continue to serve as part of the consolidation area from which WNOC will manage the site oil operations areas.

5.8 Remediation Project Controls

5.8.1 Permitting

5.8.1.1 Dust and Emissions Control

Dust and emissions controls will be required as part of the remediation project to satisfy SCAQMD regulations and address potential off-site impacts to the community. Any required air monitoring conducted for worker health and safety will be addressed in the HASP (Section 5.7.2).

Construction contractors will be required to comply with SCAQMD Rules 402 and 403 in order to minimize short-term emissions of dust and particulates. SCAQMD Rule 402 requires that air pollutant emissions not be a nuisance off site. SCAQMD Rule 403 requires that fugitive dust be controlled with Best Available Control Measures (BACMs) so that the presence of such dust does not remain visible in the atmosphere beyond the property line of the emission source. This requirement shall be included as notes on the contractor specifications. Table 1 of Rule 403 lists potential dust source activities, BACMs, and guidance; applicable requirements may include, but not be limited to:

- Clearing and grubbing, demolition – apply water in sufficient quantity to prevent dust plumes.
- Crushing – pre-water material prior to loading into crusher; monitor crusher emissions opacity; apply water to crushed material to prevent dust plumes.
- Earth-moving activities – limit vehicular traffic and disturbances on soil areas where possible; pre-apply water to depth of proposed cuts; re-apply water as necessary to maintain soil in a damp condition and to reduce visible emissions; stabilize soil once earth-moving activities are complete.
- Stockpiles/bulk material handling – stabilize stockpiled materials; maintain required stockpile heights; allow water truck access; apply water in sufficient quantity to prevent dust plumes.
- Backfilling – mix backfill soil with water prior to moving; dedicate water truck to backfilling equipment; empty loader buckets slowly and minimize drop heights.
- Loading materials – stabilize material while loading to reduce fugitive dust emissions; maintain freeboard on haul vehicles; use tarps on offsite haul trucks; address and mitigate vehicle track-out; apply water in sufficient quantity to prevent dust plumes.

Excavation of impacted soils will be conducted and managed in accordance with SCAQMD Rule 1166, Volatile Organic Compound Emissions from Decontamination of Soil. Although VOC emissions from soil to be managed at the Site are not anticipated to exceed the criteria listed in SCAQMD Rule 1166, the contractor will prepare a Site-specific Rule 1166 Contaminated Soil Mitigation Plan for the excavation work should it be required. The plan will set notification, monitoring, and enforcement requirements on the work to include, but not be limited to, the following:

- Definition of VOC-contaminated soil and SCAQMD-notification requirements for pre-excavation and initial detections of VOCs.
- Description of required field monitoring equipment (i.e., PID) including calibration specifications, monitoring procedures, frequencies, and daily inspections.
- Description of required handling and storage procedures including excavation work face controls, stockpile controls, and use of odor suppressants (e.g., water, approved commercial vapor suppressants, plastic sheeting).
- Description of soil removal and disposal requirements, including timelines, treatment facilities, and loading procedures.
- Description of requirements to maintain written records of monitoring and calibrations data in a format approved by the SCAQMD, and submission of a written summary report upon completion of the work.

5.8.1.2 Surface and Storm Water Controls

Prior to the commencement of earth-moving activities, a Site-specific Storm Water Pollution Prevention Plan (SWPPP), Notice of Intent (NOI), and other permit registration documents will be prepared to comply with the General Permit for Construction Activities, and submitted to the State Water Resources Control Board (SWRCB). The SWPPP will be prepared in accordance with Site-specific sediment risk analyses based on the final grading plans and be developed to include measures and practices that would be in effect during remediation activities and construction to reduce the project's impact on water quality and storm water runoff volumes.

A key element of the SWPPP will be the descriptions of best management practices (BMPs) that will reduce or eliminate pollutants in storm water discharges and authorized non-storm water discharges from the Site. These measures will include erosion controls, sediment controls, tracking controls, non-storm water management practices, materials and waste management, and good housekeeping practices. These BMPs will be implemented during the abandonment and remediation phases of the project.

It is recognized that implementation of Site remedial actions will occur over a period of varying weather conditions, requiring that weather will need to be considered during day-to-day activities. Remediation work is expected to continue during the rainy season, and provisions will be included in the SWPPP to address rainwater that may accumulate in work areas and to prevent runoff from exiting work areas. At a minimum, the remediation areas shown on Figure 7 will be graded and bounded by shallow soil berms to contain runoff and limit potential erosion issues.

5.8.2 Agency Oversight Visits

It is anticipated that Agency personnel will, on a frequent basis, request access to the Site to observe remediation activities and the progress of the abandonment and remediation project. It is requested that such requests be directed to the following:

Mr. Michael Klancher
NBRLLC
(714) 924-1003, mjklancher@aeraenergy.com

5.8.3 Health and Safety

Protecting the health and safety of Site workers during implementation of remedial actions is of paramount importance to the project team. Pursuant to State of California Division of Occupational Safety and Health (OSHA) Hazardous Waste Operations Standards (Title 8, CCR Section 5192) and Code of Federal Regulations (Title 40 CFR, Section 1910.120), a project-specific Site-specific HASP will be prepared for remedial activities to be conducted at the Site.

Work will be performed in accordance with the HASP and daily Job Safety Analyses (JSAs) that will be prepared for specific work tasks and activities that will be conducted. JSAs will be prepared by the environmental field oversight personnel and the contractors (and subcontractors) performing specific work activities. Site field personnel conducting the work will review applicable JSAs at daily tailgate safety meetings. Each party that will be conducting fieldwork during the remediation project will also be required to review the HASP, prepare their own Site-specific HASP, and actively participate in the JSA process.

The project-specific Site-specific HASP will include, but not be limited, descriptions of the following:

- Detailed task descriptions and at least one JSA for each task identified.

- JSAs to identify key safety critical steps of the task and control measures to be used to mitigate the potential hazards.
- Identification of physical, chemical, and biological hazards associated with the remediation work.
- Emergency preparedness and response procedures.
- Contact information, Site maps, and hospital/urgent care route maps.
- General safe work practices.
- Key personnel and health and safety responsibilities.
- Stop work authority.
- Worker training and medical surveillance.
- Controlled work zones and Site access/control measures.
- Personal protective equipment.
- Frequency and types of air and personnel monitoring.
- Decontamination procedures.
- Spill containment procedures.

5.8.4 Security

The currently required Site security measures such as the barbed wire topped fencing and the coded entry gates, will remain during the abandonment and remediation project to prevent unauthorized public access to, or near the work activities. Security personnel will be on-site for the duration of the project and will be stationed at both the 17th Street and Pacific Coast Highway gate entrances to the Site to monitor personnel ingress and egress during working hours. The 17th Street gate entrance will be the main entrance and primary access point for visitors and others not permitted in the active work zones. A sign-in/sign-out log will be maintained for visitors allowed entry into the Site.

As described in Section 5.7.3, the HASP will describe how work zones will be established to physically control access to active work areas at the Site. Measures will be instituted to reduce the possibility of exposing unprotected personnel and to prevent visitors, vendors, and workers from entering work areas without proper medical surveillance, safety training, and/or personal protective equipment.

In the event it is necessary to shutdown the Site, operations will be terminated and the Site will be left in a safe manner. Equipment will be brought to the equipment staging

area and shutdown and secured. To satisfy SCAQMD Rule 1166 requirements (if applicable at the time of shutdown), a minimum crew will be identified to provide continued monitoring and inspections of stockpiled soil.

5.8.5 Survey

Site surveys will be conducted by a California-licensed Professional Land Surveyor. For the remediation phase of the project, it is anticipated that surveys will be required of the following:

- Boundaries and final excavated grade of the Borrow/Placement areas.
- Elevations for the processed ALM/concrete and bioremediated soil that will be backfilled into the Borrow/Placement areas. Survey controls will be used to document that: (i) processed ALM/concrete will be placed no shallower than 15-20 feet from final grade elevations, (ii) bioremediated soil will be placed no shallower than 10 feet from final grade elevations, (iii) soil from the Clean Soil Flip areas will provide a minimum of 10 feet of cover soil.

6. CLOSURE DOCUMENTATION

Remedial action completion report(s) will be prepared and submitted to the Agencies for review and approval after the conclusion of abandonment and remediation activities. Based on the details of the development schedule (not yet finalized) it is anticipated that completion reports may be submitted for separate and distinct Planning Areas (PAs), possibly including: (i) residential and commercial, (ii) Lowland open space, and (iii) Upland open space and parkland. Alternatively, separate completion reports may be submitted for the Lowland and Upland Areas of the Site, or one completion report documenting the entirety of the Site.

The remedial action completion report(s) will include:

- A summary of the remedial excavations performed at identified areas.
- A description (data tables, maps, photographs) of the nature and extent (location, depths, and volume) of previously unidentified soil contamination, and a description of the remedial excavations performed at these areas.
- Confirmation soil sampling results (tabulated and summarized by work area), laboratory analytical reports, maps, and photographic logs documenting soil remaining at remedial excavations meets clean-up levels.
- Verification soil sampling results and volume summaries documenting the successful completion of the bioremediation process (note: verification soil sample results from soil batches will not be submitted in separate interim deliverables to the Agencies for approval to use the soil as backfill).
- Documentation (profile information, manifests, volumes, and receiving facility) for soil that is disposed off-site.
- Survey reports documenting the placement of processed ALM/concrete and bioremediation soil at the specified depths from final grade elevations.

7. LIMITATIONS

Geosyntec completed this RAP in general conformance with the regulatory requirements established by RWQCB and OCHCA for previous A&R activities at the Site. The work described in this RAP updates, and incorporates by reference, information contained in the draft RAP [Geosyntec, 2009] and environmental reports prepared by Geosyntec over the period 1993-2014. The information contained in this RAP is based solely on the analysis of the conditions as observed by Geosyntec personnel and as reported by regulatory agencies and other named sources. No warranty, expressed or implied, is made regarding the professional opinions expressed in this RAP or concerning the completeness of the data presented to Geosyntec by third parties. If actual conditions are found to differ from those described in this RAP, or if new information regarding the Site is obtained, this RAP will be amended, as appropriate.

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TABLES

TABLE 1

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT UPDATE NEWPORT BANNING RANCH

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
01	Maintenance Shop / Warehouse	• waste oil sump • stockpiled transformers • hazardous chemicals and petroleum hydrocarbons in use • abandoned vehicles • 2001 testing program results indicated localized areas of soil impacts and the presence of low concentrations of VOCs in groundwater	• 5,000 to 10,000
02	Tank Farm Drill Site	• above ground storage tanks • oil and gas dewatering operations • natural gas treatment • underground sump • 2001 testing program results indicated areas of deep soil impacts (to groundwater) and the presence of free product in groundwater	• 35,000 to 42,000 (includes TFDS sump area and excavations to the west of the tank farm, outside of the oil consolidation area)

TABLE 1 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
03	Air Compressor Plant (currently inactive)	• above ground storage tanks • vehicle fueling area (near) • parts cleaning trough • underground sump • 2001 testing program results indicated localized areas of soil impacts	• 2,000 to 5,000
04	Steam Generation Plant (currently inactive)	• possible chemical spills and/or leaks from past operations • 2001 testing program results indicated localized areas of soil impacts	• 1,000 to 2,000
05	Water Softeners (currently inactive)	• above ground storage tanks • possible chemical spills and/or leaks from past operations • 2001 testing program results did not indicate impacts at this location	• 0

TABLE 1 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
06	City of Newport Beach Tank Farm (abandoned)	• above ground storage tanks • oil and gas dewatering operations • natural gas treatment • underground sump • 2001 testing program results indicated localized areas of soil impacts and no groundwater impacts	• 1,000 to 3,000
07	Pilot-Scale Biotreatment Cell / Stockpiled Soil	• bio-treatment cell area • stockpiled, unlined, impacted soil • treated soil stockpile canyons (near) • 2001 testing program results indicated localized areas of soil impacts	• 5,000 to 10,000
08	Former Sump/Clarifier (south and west of the TFDS)	• possible leaching of crude oil from the sumps/clarifiers to the ground • 2001 testing program results indicated areas of soil impacts and no groundwater impacts	• 15,000 to 20,000
09	Utility Shack Transformer Storage	• possible PCB leaks from electrical transformers • 2001 testing program results indicated localized areas of hydrocarbon soil impacts - PCBs were not detected	• 50 to 100

TABLE 1 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
10	Approximate Location of Edison Transformers	• possible PCB leaks from electrical transformers • 2001 testing program results indicated localized areas of hydrocarbon soil impacts - PCBs were detected at levels exceeding residential preliminary remediation goals (PRGs) at this location	• <2 to 10
11	Personnel Changing Room and Showers	• septic wastes • possible solid waste disposal areas (near) • 2001 testing program results did not indicate impacts at this location	• 0
12	City of Newport Beach Oil Operations	• above ground storage tanks • oil and gas dewatering operations • natural gas treatment • underground sump • 2001 testing program results indicated localized areas of soil impacts	• 0 Part of oil consolidation area, to be addressed under separate RAP document
13	Not Applicable	• this PEC was grouped with another PEC	• NA
14	Not Applicable	• this PEC was grouped with another PEC	• NA

TABLE 1 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
15	Gasoline Underground Storage Tank	• possible gasoline leaks from UST, however UST was closed per regulations • 2001 testing program results indicated a localized area of soil impacts	• <2 to 10
16	Coast Watch Station	• miscellaneous debris and municipal solid waste, although no evidence of this material currently exists • 2001 testing program results did not indicate impacts at this location	• 0
17	Oil/Gas Production Equipment Storage	• possible leaching of materials from the equipment to the ground • 2001 testing program results did not indicate impacts at this location	• 0
18	Soil / Debris Stockpile	• possible leaching of materials from the debris to the ground • 2001 testing program results indicated that additional testing would be needed in this area following concrete debris removal	• 0 (petroleum impacts) • 15,000 to 30,000 (concrete)

TABLE 1 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
19	Storage Shack	• possible chemical spills and/or leaks from past operations • 2001 testing program results did not indicate impacts at this location	• 0
20	Soil / Debris Stockpiles	• possible leaching of materials from the equipment and debris to the ground • 2001 testing program results indicated impacts to stockpiled soils awaiting treatment	• 2,000 to 5,000
21	Soil / Debris Stockpiles	• possible leaching of materials from the equipment and debris to the ground • 2001 testing program results indicated that additional testing would be needed in this area following debris removal	• 0
22	Treated Soil Stockpile Area	• possible leaching of materials from the soil to the ground • 2001 testing program results did not indicate impacts at this location	• 0

TABLE 1 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
23	Equipment/Debris Stockpiles	• possible leaching of materials from the equipment to the ground • potential oil leaks • 2001 testing program results indicated that additional testing would be needed in this area following equipment removal	• 0
24	Field Offices	• septic wastes • possible solid waste disposal areas (near) • 2001 testing program results did not indicate impacts at this location	• 0
25	Oil Well Pads and Linear Features (roadways/pipelines)	• tank bottom materials • oil-impacted soil • concrete cellar • debris • Previous testing program results indicated localized soil impacts along these features	• 50,000 to 75,000 (petroleum soils) • 90,000 to 150,000 (asphalt/roads)

TABLE 1 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
26	Drilling Mud Sumps / Oil Well Sumps	• oil-impacted soil • drilling mud • debris • Previous testing program results indicated localized soil impacts	• 4,000 to 8,000
27	Sublease Areas	• impacted soil • 2001 testing program results did not focus on sublease areas	• unknown
PRELIMINARY ESTIMATE OF MATERIAL QUANTITIES TO BE REMEDIATED (approximate)			117,000 to 182,000 (petroleum soils)
			15,000 to 30,000 (concrete)
			90,000 to 150,000 (asphalt/road material)
TOTAL			222,000 to 362,000

TABLE 2
RANGE OF SOIL SAMPLE RESULTS – ENVIRONMENTAL ASSESSMENT 2001
NEWPORT BANNING RANCH

Contaminant	Range	Comments
TPH TRPH	0 – 6,000 mg/kg 0 – 50,000 mg/kg	Typically weathered crude oil, limited areas of high saturation
SVOCs	0 – 3 µg/kg	No SVOCs detected above residential or industrial soil RSLs
VOCs	0 – 1,700 µg/kg	No VOCs detected above residential or industrial soil RSLs
Pesticides	0 – 11 µg/kg	No pesticides detected above residential or industrial soil RSLs
PCBs	0 – 290 µg/kg	PCBs were detected in two samples* at concentrations above the residential soil RSL but below the industrial soil RSL
Metals		No metals detected above TTLC

Notes:

* Samples collected at PEC#09 (Electrical and Transformer Storage) and PEC#10 (Transformer Mounts)

µg/kg – micrograms per kilogram

mg/kg – milligrams per kilogram

PCBs – Polychlorinated Biphenyls

RSL – Regional Screening Level (EPA Region IX)

SVOCs – Semi-Volatile Organic Compounds

TPH – Total Petroleum Hydrocarbons (Carbon Chain Identification)

TRPH – Total Recoverable Petroleum Hydrocarbons

TTLC – Total Threshold Limit Concentration

VOCs – Volatile Organic Compounds

TABLE 3
GROUNDWATER ANALYTICAL DATA
PEC02 - TANK FARM DRILL SITE
NEWPORT BANNING RANCH

Geosyntec consultants

Well Number	Date Sampled	Groundwater elevation (ft msl)	EPA 8015M - Carbon Chain				EPA 418.1	EPA 8260B			
			TPH C6-C12 (mg/L)	TPH C13-C22 (mg/L)	TPH C23-C44 (mg/L)	TPH Calculated C6-C44 Total[(1)] (mg/L)	TRPH (mg/L)	Benzene (ug/L)	Toluene (ug/L)	Ethybenzene (ug/L)	Total Xylenes (ug/L)
02-GW-001	9/28/2006	1.87	0.0029	0.790	0.659	1.452	NA	<0.50	<1.0	<1.0	<1.0
	12/19/2006	2.04	0.0039	0.783	0.399	1.186	<10	<0.50	<1.0	<1.0	<1.0
	3/23/2007	2.42	0.015	0.717	0.663	1.395	<10	<0.50	<1.0	<1.0	<1.0
	6/22/2007	2.35	0.044	0.505	0.271	0.820	<10	<0.50	<1.0	<1.0	<1.0
	9/28/2007	1.49	0.034	2.347	1.68	4.061	<10	<0.50	<1.0	<1.0	<1.0
	12/20/2007	0.41	ND	0.302	0.082	0.384	<10	<0.50	<1.0	<1.0	<1.0
	6/24/2008	0.31	0.0257	0.61	0.076	0.712	<10	<0.50	<1.0	<1.0	<1.0
	12/10/2008	0.33	ND	0.2497	ND	0.2497	<1.0	<0.50	<1.0	<1.0	<1.0
	6/24/2009	-0.69	ND	0.149	0.137	0.2862	<1.0	<0.50	<1.0	<1.0	<1.0
	12/15/2009	1.50	<0.500	<0.500	<0.500	1.300	<1.0	<0.50	<1.0	<1.0	<1.0
	6/25/2010	3.18	<0.500	<0.500	<0.500	0.520	<1.0	<0.50	<1.0	<1.0	<1.0
	12/15/2010	3.00	<0.500	<0.500	<0.500	0.550	<1.0	<0.50	<1.0	<1.0	<1.0
	6/23/2011	3.19	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	12/15/2011	3.04	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	7/10/2012	2.92	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	1/14/2013	3.66	<0.500	<0.500	<0.500	0.590	<1.0	<0.50	<1.0	<1.0	<1.0
	7/16/2013	3.42	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	1/21/2014	3.42	<0.500	<0.500	<0.500	<0.500	<1.0	<2.5 [(4)]	<5.0 [(4)]	<5.0 [(4)]	<5.0 [(4)]
	7/15/2014	3.11	0.022	0.779	0.386	1.187	<1.0	<2.5 [(4)]	<5.0 [(4)]	<5.0 [(4)]	<5.0 [(4)]
02-GW-003	9/28/2006	2.21	0.0580	1.680	0.573	2.311	NA	<0.50	<1.0	<1.0	<1.0
	12/19/2006	2.34	0.0710	1.660	0.361	2.092	1.3	<0.50	<1.0	<1.0	<1.0
	3/23/2007	2.68	0.100	1.790	0.658	2.548	2.2	<0.50	<1.0	<1.0	<1.0
	6/22/2007	2.70	0.085	1.240	0.355	1.680	<10	<0.50	<1.0	<1.0	<1.0
	9/28/2007	1.72	0.082	8.89	1.7874	10.759	<10	<0.50	<1.0	<1.0	<1.0
	12/20/2007	0.90	0.053	1.027	0.103	1.183	1.3	<0.50	<1.0	<1.0	<1.0
	6/24/2008	0.84	0.048	0.741	0.085	0.874	<10	<0.50	<1.0	<1.0	<1.0
	12/10/2008	0.90	ND	0.331	0.045	0.376	<1.0	<0.50	<1.0	<1.0	<1.0
	6/24/2009	0.91	0.012	0.2522	0.1344	0.3986	<1.0	<0.50	<1.0	<1.0	<1.0
	12/15/2009	1.67	<0.500	4.810	1.310	6.900	<1.0	<0.50	<1.0	<1.0	<1.0
	6/25/2010	3.48	<0.500	<0.500	<0.500	0.530	1.5	<0.50	<1.0	<1.0	<1.0
	12/15/2010	3.17	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	6/23/2011	3.45	<0.500	<0.500	<0.500	0.890	1.2	<0.50	<1.0	<1.0	<1.0
	12/15/2011	3.27	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	7/10/2012	3.33	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	1/14/2013	3.83	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	7/16/2013	3.69	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	1/21/2014	3.65	<0.500	<0.500	<0.500	<0.500	<1.0	<10.0 [(4)]	<20.0 [(4)]	<20.0 [(4)]	<20.0 [(4)]
	7/15/2014	3.29	0.041	0.610	0.286	0.937	<1.0	<2.5 [(4)]	<5.0 [(4)]	<5.0 [(4)]	<5.0 [(4)]

TABLE 3 (contd.)
GROUNDWATER ANALYTICAL DATA
PEC02 - TANK FARM DRILL SITE
NEWPORT BANNING RANCH

Geosyntec consultants

Well Number	Date Sampled	Groundwater elevation (ft msl)	EPA 8015M - Carbon Chain				EPA 418.1	EPA 8260B			
			TPH C6-C12 (mg/L)	TPH C13-C22 (mg/L)	TPH C23-C44 (mg/L)	TPH Calculated C6-C44 Total[1] (mg/L)	TRPH (mg/L)	Benzene (ug/L)	Toluene (ug/L)	Ethybenzene (ug/L)	Total Xylenes (ug/L)
02-GW-004	9/28/2006	2.17	ND	0.176	0.333	0.509	NA	<0.50	<1.0	<1.0	<1.0
	12/19/2006	2.35	ND	0.709	1.001	1.710	<10	<0.50	<1.0	<1.0	<1.0
	3/23/2007	2.75	ND	0.083	0.073	0.156	<10	<0.50	<1.0	<1.0	<1.0
	6/22/2007	2.74	ND	ND	0.011	0.011	<10	<0.50	<1.0	<1.0	<1.0
	9/28/2007	1.65	ND	0.0997	0.0467	0.1464	<10	<0.50	<1.0	<1.0	<1.0
	12/20/2007	0.63	ND	ND	ND	<0.500	<10	<0.50	<1.0	<1.0	<1.0
	6/24/2008	0.85	ND	0.0649	0.042	0.1069	<10	<0.50	<1.0	<1.0	<1.0
	12/10/2008	0.81	ND	ND	ND	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	6/24/2009	0.45	ND	ND	0.0366	0.0366	<1.0	<0.50	<1.0	<1.0	<1.0
	12/15/2009	0.64	<0.500	<0.500	1.140	2.800	<1.0	<0.50	<1.0	<1.0	<1.0
	6/25/2010	3.65	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	12/15/2010	3.20	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	6/23/2011	3.52	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	12/15/2011	3.28	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	7/10/2012	3.45	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	1/14/2013	3.89	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	7/16/2013	3.79	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	1/21/2014	3.70	<0.500	<0.500	<0.500	<0.500	<1.0	<2.5 [4]	<5.0 [4]	<5.0 [4]	<5.0 [4]
	7/15/2014	3.27	<0.050	0.186	0.348	0.534	<1.0	<2.5 [4]	<5.0 [4]	<5.0 [4]	<5.0 [4]
02-GW-005	9/28/2006	1.85	ND	0.367	0.443	0.810	NA	<0.50	<1.0	<1.0	<1.0
	12/19/2006	1.91	ND	0.306	0.240	0.546	<10	<0.50	<1.0	<1.0	<1.0
	3/23/2007	2.48	0.016	0.264	0.096	0.376	<10	<0.50	<1.0	<1.0	<1.0
	6/22/2007	2.58	0.055	0.183	0.072	0.310	<10	<0.50	<1.0	<1.0	<1.0
	9/28/2007	1.05 [2]	0.0024	0.724	0.518	1.244	<10	<0.50	<1.0	<1.0	<1.0
	12/20/2007	-0.05 [2]	ND	ND	ND	<0.500	<10	<0.50	<1.0	<1.0	<1.0
	6/24/2008	-0.25 [2]	ND	0.3026	0.068	0.371	<10	<0.50	<1.0	<1.0	<1.0
	12/10/2008	-0.22 [2]	ND	0.421	0.07	0.491	<1.0	<0.50	<1.0	<1.0	<1.0
	6/24/2009	-0.27 [2]	ND	0.2257	0.072	0.2977	<1.0	<0.50	<1.0	<1.0	<1.0
	12/15/2009	0.95 [2]	<0.500	0.690	0.590	3.400	<1.0	<0.50	<1.0	<1.0	<1.0
	6/25/2010	4.37 [2]	<0.500	<0.500	<0.500	0.800	<1.0	<0.50	<1.0	<1.0	<1.0
	12/15/2010	3.27 [2]	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	6/23/2011	3.54 [2]	<0.500	<0.500	<0.500	2.100	8.6	5.6	1.3	<1.0	3.1
	12/15/2011	3.31 [2]	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	7/10/2012	3.56 [2]	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	1/14/2013	4.14 [2]	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	7/16/2013	3.98 [2]	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	1/21/2014	3.84 [2]	<0.500	<0.500	<0.500	<0.500	<1.0	<2.5 [4]	<5.0 [4]	<5.0 [4]	<5.0 [4]
	7/15/2014	3.23 [2]	<0.050	0.503	0.627	1.130	<1.0	<2.5 [4]	<5.0 [4]	<5.0 [4]	<5.0 [4]

TABLE 3 (contd.)
GROUNDWATER ANALYTICAL DATA
PEC02 - TANK FARM DRILL SITE
NEWPORT BANNING RANCH

Geosyntec consultants

Well Number	Date Sampled	Groundwater elevation (ft msl)	EPA 8015M - Carbon Chain				EPA 418.1	EPA 8260B			
			TPH C6-C12 (mg/L)	TPH C13-C22 (mg/L)	TPH C23-C44 (mg/L)	TPH Calculated C6-C44 Total[1] (mg/L)	TRPH (mg/L)	Benzene (ug/L)	Toluene (ug/L)	Ethybenzene (ug/L)	Total Xylenes (ug/L)
02-GW-007	9/28/2007	1.62	0.035	3.82	1.5627	5.4177	<10	<0.50	<1.0	<1.0	<1.0
	12/20/2007	0.76	0.004	0.612	0.143	0.759	<10	<0.50	<1.0	<1.0	<1.0
	6/24/2008	0.72	0.183	1.02	0.226	1.429	<10	<0.50	<1.0	<1.0	<1.0
	12/10/2008	0.66	0.016	1.241	0.368	1.625	<1.0	<0.50	<1.0	<1.0	<1.0
	6/24/2009	0.73 [3]	0.086	1.261	0.3618	1.7088	3.1	<0.50	<1.0	<1.0	<1.0
	12/15/2009	1.66 [3]	<0.500	8.700	3.000	13.000	3.7	<0.50	<1.0	<1.0	<1.0
	6/25/2010	3.11 [3]	<0.500	1.010	<0.500	2.700	4.2	<0.50	<1.0	<1.0	<1.0
	12/15/2010	3.17 [3]	<0.500	1.150	<0.500	3.300	2.1	<0.50	<1.0	<1.0	<1.0
	6/23/2011	3.35 [3]	<0.500	<0.500	<0.500	1.800	3.5	<0.50	<1.0	<1.0	<1.0
	12/15/2011	3.28 [3]	<0.500	<0.500	<0.500	2.200	<1.0	<0.50	<1.0	<1.0	<1.0
	7/10/2012	3.28 [3]	<0.500	<0.500	<0.500	2.100	2.2	<0.50	<1.0	<1.0	<1.0
	1/14/2013	3.76 [3]	<0.500	<0.500	<0.500	1.700	1.3	<0.50	<1.0	<1.0	<1.0
	7/16/2013	3.68 [3]	<0.500	<0.500	<0.500	1.200	1.5	<0.50	<1.0	<1.0	<1.0
	1/21/2014	3.59 [3]	<0.500	<0.500	<0.500	0.840	1.4	<10.0 [4]	<20.0 [4]	<20.0 [4]	<20.0 [4]
	7/15/2014	3.35 [3]	0.215	1.910	0.853	2.978	1.6	<2.5 [4]	<5.0 [4]	<5.0 [4]	<5.0 [4]
02-GW-008	9/28/2007	0.51	ND	ND	ND	<0.500	<10	<0.50	<1.0	<1.0	<1.0
	12/20/2007	-0.55	ND	ND	ND	<0.500	<10	<0.50	<1.0	<1.0	<1.0
	6/24/2008	-0.83	ND	ND	ND	<0.500	<10	<0.50	<1.0	<1.0	<1.0
	12/10/2008	-0.6	ND	ND	ND	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	6/24/2009	-0.89	ND	ND	ND	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	12/15/2009	0.55	<0.500	<0.500	<0.500	0.930	<1.0	<0.50	<1.0	<1.0	<1.0
	6/25/2010	3.57	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	12/15/2010	3.32	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	6/23/2011	3.30	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	12/15/2011	3.09	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	7/10/2012	3.32	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	1/14/2013	3.94	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	7/16/2013	3.60	<0.500	<0.500	<0.500	<0.500	<1.0	<0.50	<1.0	<1.0	<1.0
	1/21/2014	3.64	<0.500	<0.500	<0.500	<0.500	<1.0	<2.5 [4]	<5.0 [4]	<5.0 [4]	<5.0 [4]
	7/15/2014	2.76	0.023	0.500	0.290	0.813	<1.0	<2.5 [4]	<5.0 [4]	<5.0 [4]	<5.0 [4]

Notes:

mg/L - Milligrams per liter, ug/L - Micrograms per liter

NA - Not analyzed.

ND - Denotes constituent not reported at lowest laboratory detection limit

TPH - Total Petroleum Hydrocarbons

TRPH - Total Recoverable Petroleum Hydrocarbons

ft msl - feet above mean sea level

[1] Reported as sum of carbon ranges reported

[2] Well casing was damaged during the third quarter of 2007, then repaired. Top of casing elevation has not been resurveyed.

[3] Well casing observed to be damaged during first half of 2009. Top of casing elevation has not been resurveyed.

[4] The analytical laboratory reported that the reporting limit is elevated resulting from matrix interference.

TABLE 4
GROUNDWATER ANALYTICAL DATA
PEC01 – MAINTENANCE SHOP
NEWPORT BANNING RANCH

WELL NUMBER	SAMPLE DATE	DEPTH TO GROUNDWATER (FEET)[2]	USEPA 418.1	USEPA 8015B(M)[1]			USEPA 8260B							
			TRPH (µg/L)	TPH as Gasoline (C6-C12) (µg/L)	TPH as Diesel (C6-C28) (µg/L)	TPH as Crude Oil (C6-C44) (µg/L)	Benzene (µg/L)	Carbon Disulfide (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	Methylene Chloride (µg/L)	Styrene (µg/L)	Toluene (µg/L)	Vinyl Chloride (µg/L)
							MCL=1.0 µg/L	NL=160 µg/L	MCL=6.0 µg/L	MCL=10.0 µg/L	MCL=5.0 µg/L	MCL=100 µg/L	MCL=150 µg/L	MCL=0.5 µg/L
01-GW-001	6/9/2001	-	<1000	<100	NA	NA	<0.5	<10	**1.8**	<1.0	**100**	**3.3**	<1.0	<0.5
	6/26/2001	-	NA	<100	<1000	<5000	<0.5	<10	**1.2**	<1.0	<10	<1.0	**3.8**	**0.51**
	7/27/2010	6.99	<1000	<500	<500	**760**	<0.5	<10	<1.0	<1.0	<10	<1.0	<1.0	<0.5
	12/16/2010	6.21	<1000	<500	<500	<500	<0.5	<10	<1.0	<1.0	<10	<1.0	<1.0	<0.5
	6/24/2011	6.95	<1000	<500	<500	<500	<0.5	<10	**1.2**	<1.0	<10	<1.0	<1.0	<0.5
	12/16/2011	6.38	<1000	<500	<500	<500	<0.5	<10	<1.0	<1.0	<10	<1.0	<1.0	<0.5
	7/10/2012	7.16	<1000	<500	<500	<500	<0.5	<10	<1.0	<1.0	<10	<1.0	<1.0	<0.5
	1/15/2013	6.04	<1000	<500	<500	<500	<0.5	<10	<1.0	<1.0	<10	<1.0	<1.0	<0.5
	7/16/2013	7.04	<1000	<500	<500	<500	<0.5	<10	<1.0	<1.0	<10	<1.0	<1.0	<0.5
	7/15/2014	7.04	<1000	**16 J**	**395**	**440**	<2.5[3]	**2.3 J**	<5.0[3]	<5.0[3]	<50[3]	<5.0[3]	<5.0[3]	<2.5[3]
01-GW-002	6/9/2001	-	<1000	<100	NA	NA	<0.5	<10	**1.4**	<1.0	**32**	<1.0	<1.0	**4.4**
	6/26/2001	-	NA	<100	<1000	<5000	<0.5	<10	**3.6**	<1.0	<10	<1.0	**3.6**	**15**
	7/27/2010	6.29	<1000	<500	<500	<500	<0.5	<10	<1.0	<1.0	<10	<1.0	<1.0	<0.5
	12/16/2010	5.60	<1000	<500	<500	<500	<0.5	<10	<1.0	<1.0	<10	<1.0	<1.0	<0.5
	6/24/2011	6.11	<1000	<500	<500	<500	<0.5	<10	<1.0	<1.0	<10	<1.0	<1.0	<0.5
	12/16/2011	5.88	<1000	<500	<500	<500	<0.5	<10	<1.0	<1.0	<10	<1.0	<1.0	<0.5
	7/10/2012	6.48	<1000	<500	<500	<500	<0.5	<10	**1.2**	<1.0	<10	<1.0	<1.0	<0.5
	1/15/2013	5.49	<1000	<500	<500	<500	<0.5	<10	<1.0	<1.0	<10	<1.0	<1.0	<0.5
	7/16/2013	6.27	<1000	<500	<500	<500	<0.5	<10	**1.4**	<1.0	<10	<1.0	<1.0	<0.5
	7/15/2014	6.07	<1000	**41 J**	**472**	**500**	<2.5[3]	**3.7 J**	<5.0[3]	<5.0[3]	<50[3]	<5.0[3]	<5.0[3]	<2.5[3]

TABLE 4 (continued)
GROUNDWATER ANALYTICAL DATA
PEC01 – MAINTENANCE SHOP
NEWPORT BANNING RANCH

WELL NUMBER	SAMPLE DATE	DEPTH TO GROUNDWATER (FEET)[2]	USEPA 418.1	USEPA 8015B(M)[1]			USEPA 8260B							
			TRPH (µg/L)	TPH as Gasoline (C6-C12) (µg/L)	TPH as Diesel (C6-C28) (µg/L)	TPH as Crude Oil (C6-C44) (µg/L)	Benzene (µg/L)	Carbon Disulfide (µg/L)	cis-1,2-Dichloroethene (µg/L)	trans-1,2-Dichloroethene (µg/L)	Methylene Chloride (µg/L)	Styrene (µg/L)	Toluene (µg/L)	Vinyl Chloride (µg/L)
							MCL=1.0 µg/L	NL=160 µg/L	MCL=6.0 µg/L	MCL=10.0 µg/L	MCL=5.0 µg/L	MCL=100 µg/L	MCL=150 µg/L	MCL=0.5 µg/L
01-GW-003	6/9/2001	-	<1000	<100	NA	NA	**1.1**	<10	<1.0	**2.5**	**100**	**2.9**	<1.0	<0.5
	7/27/2010	3.90	<1000	<500	<500	**750**	<0.5	<10	**1.6**	<1.0	<10	<1.0	<1.0	<0.5
	12/16/2010	3.30	<1000	<500	<500	<500	<0.5	<10	**1.6**	<1.0	<10	<1.0	<1.0	<0.5
	6/24/2011	4.00	<1000	<500	<500	<500	<0.5	<10	**2.1**	**1.2**	<10	<1.0	<1.0	<0.5
	12/16/2011	3.46	<1000	<500	<500	<500	<0.5	<10	**2.2**	<1.0	<10	<1.0	<1.0	<0.5
	7/10/2012	4.20	<1000	<500	<500	<500	<0.5	<10	**1.8**	**1.2**	<10	<1.0	<1.0	<0.5
	1/15/2013	3.15	<1000	<500	<500	<500	<0.5	<10	**1.6**	<1.0	<10	<1.0	<1.0	<0.5
	7/16/2013	4.00	<1000	<500	<500	<500	<0.5	<10	**1.5**	<1.0	<10	<1.0	<1.0	<0.5
	7/15/2014	3.90	<1000	<250	**390**	**560**	<2.5[3]	**2.6 J**	<5.0[3]	<5.0[3]	<50[3]	<5.0[3]	<5.0[3]	<2.5[3]

Notes:
(1) 2001 sample results for TPH by USEPA 8015B(M) were reported directly by the laboratory as totals for TPH as gasoline, diesel or crude oil. 2010 sample results for TPH by USEPA 8015B(M) were reported in specific carbon chain ranges and subsequently calculated as the sum of the specified carbon fraction, e.g., TPH as gasoline is the sum of C6-C12.
(2) Depth to static groundwater levels measured as feet below top-of-casing. The top-of-casing of wells 01-GW-001 and -002 is approximately 3 feet above the ground surface; the top-of-casing for well 01-GW-003 is cut at approximately the ground surface.
(3) The analytical laboratory reported that the reporting limit is elevated resulting from matrix interference.
J – indicates analyte was detected at a concentration below the reporting limit and above the laboratory method detection limit. Reported value is estimated.
Bold font indicates detection above laboratory reporting limits, or estimated J-flagged concentration.
Concentrations reported in micrograms per liter (µg/L).
MCL – California Drinking Water Standard Primary Maximum Contaminant Levels provided by the California Department of Public Health (CDPH).
NA – Not Analyzed; TPH – Total Petroleum Hydrocarbons; TRPH – Total Recoverable Petroleum Hydrocarbons; USEPA – United States Environmental Protection Agency.
NL – Drinking Water Notification Level provided by the California Department of Public Health (CDPH).

TABLE 5

CLEAN-UP AND SOIL REUSE CRITERIA
NEWPORT BANNING RANCH OIL FIELD ABANDONMENT

Upland Area – Residential
Maximum Allowable Concentrations For Impacted and Recycled Remediated Soil

Depth From Final Grade	EPA Method Used To Verify Concentration	Chemical Constituent	Allowable Concentration (mg/kg)
Surface to 10 feet	8015(B)M	TPH (C4-C12)	ND
	8015(B)M	TPH (C13-C23)	100/500*
	418.1 or 1664A	TRPH	100
	8260B	BTEX	EPA Region IX Residential RSLs (2014)
	8280	PCBs**	EPA Region IX Residential RSLs (2014)
Greater than 10 feet	8015(B)M	TPH (C4-C12)	100
	8015(B)M	TPH (C13-C23)	10,000
	418.1 or 1664A	TRPH	10,000
	8260B	BTEX	EPA Region IX Residential RSLs (2014)
	8280	PCBs**	EPA Region IX Residential RSLs (2014)

Notes:

* 500 mg/kg allowed if the soil has no apparent hydrocarbon odor or stain, if odor or staining is apparent, 100 mg/kg will be used

** Limited confirmation soil sampling for PCBs to be performed at PEC#09 (Electrical and Transformer Storage) and PEC#10 (Transformer Mounts)

BTEX – Benzene, Toluene, Ethylbenzene, and Total Xylenes

EPA – U.S. Environmental Protection Agency, Region IX

mg/kg – milligrams per kilogram

ND – Non-detect

PCBs – Polychlorinated Biphenyls

RSL – Regional Screening Level (EPA Region IX)

TPH – Total Petroleum Hydrocarbons (Carbon Chain Identification)

TRPH – Total Recoverable Petroleum Hydrocarbons

Remediated soil will be placed at least 10 feet below final grade

Asphaltic and concrete fill materials will be placed at least 15-20 feet below final grade

TABLE 5 (contd.)

CLEAN-UP AND SOIL REUSE CRITERIA
NEWPORT BANNING RANCH OIL FIELD ABANDONMENT

Upland Area – Open Space, Parks/Trails, Streets
Maximum Allowable Concentrations For Impacted and Recycled Remediated Soil

Depth From Final Grade	EPA Method Used To Verify Concentration	Chemical Constituent	Allowable Concentration (mg/kg)
Surface to 10 feet	8015(B)M	TPH (C4-C12)	ND
	8015(B)M	TPH (C13-C23)	100/1,000*
	418.1 or 1664A	TRPH	1,000
	8260B	BTEX	EPA Region IX Industrial RSLs (2014)
	8280	PCBs**	EPA Region IX Industrial RSLs (2014)
Greater than 10 feet	8015(B)M	TPH (C4-C12)	100
	8015(B)M	TPH (C13-C23)	15,000
	418.1 or 1664A	TRPH	15,000
	8260B	BTEX	EPA Region IX Industrial RSLs (2014)
	8280	PCBs**	EPA Region IX Industrial RSLs (2014)

Notes:

* 1,000 mg/kg allowed if the soil has no apparent hydrocarbon odor or stain, if odor or staining is apparent, 100 mg/kg will be used

** Limited confirmation soil sampling for PCBs to be performed at PEC#09 (Electrical and Transformer Storage) and PEC#10 (Transformer Mounts)

BTEX – Benzene, Toluene, Ethylbenzene, and Total Xylenes

EPA – U.S. Environmental Protection Agency, Region IX

mg/kg – milligrams per kilogram

ND – Non-detect

PCBs – Polychlorinated Biphenyls

RSL – Regional Screening Level (EPA Region IX)

TPH – Total Petroleum Hydrocarbons (Carbon Chain Identification)

TRPH – Total Recoverable Petroleum Hydrocarbons

Remediated soil will be placed at least 10 feet below final grade

Asphaltic and concrete fill materials will be placed at least 15-20 feet below final grade

TABLE 5 (contd.)

CLEAN-UP AND SOIL REUSE CRITERIA
NEWPORT BANNING RANCH OIL FIELD ABANDONMENT

Lowland Area – Open Space, Parks/Trails
Maximum Allowable Concentrations for Soil

Depth From Final Grade	EPA Method Used To Verify Concentration	Chemical Constituent	Allowable Concentration (mg/kg)
Surface to 3 feet	8015(B)M	TPH (C4-C12)	ND
	8015(B)M	TPH (C13-C23)	100/1,000*
	418.1 or 1664A	TRPH	1,000
	8260B	BTEX	EPA Region IX Industrial RSLs (2014)
	8280	PCBs**	EPA Region IX Industrial RSLs (2014)
Greater than 3 feet	8015(B)M	TPH (C4-C12)	100
	8015(B)M	TPH (C13-C23)	10,000
	418.1 or 1664A	TRPH	10,000
	8260B	BTEX	EPA Region IX Industrial RSLs (2014)
	8280	PCBs**	EPA Region IX Industrial RSLs (2014)

Notes:

* 1,000 mg/kg allowed if the soil has no apparent hydrocarbon odor or stain, if odor or staining is apparent, 100 mg/kg will be used

** Limited confirmation soil sampling for PCBs to be performed at PEC#09 (Electrical and Transformer Storage) and PEC#10 (Transformer Mounts)

BTEX – Benzene, Toluene, Ethylbenzene, and Total Xylenes

EPA – U.S. Environmental Protection Agency, Region IX

mg/kg – milligrams per kilogram

ND – Non-detect

PCBs – Polychlorinated Biphenyls

RSL – Regional Screening Level (EPA Region IX)

TPH – Total Petroleum Hydrocarbons (Carbon Chain Identification)

TRPH – Total Recoverable Petroleum Hydrocarbons

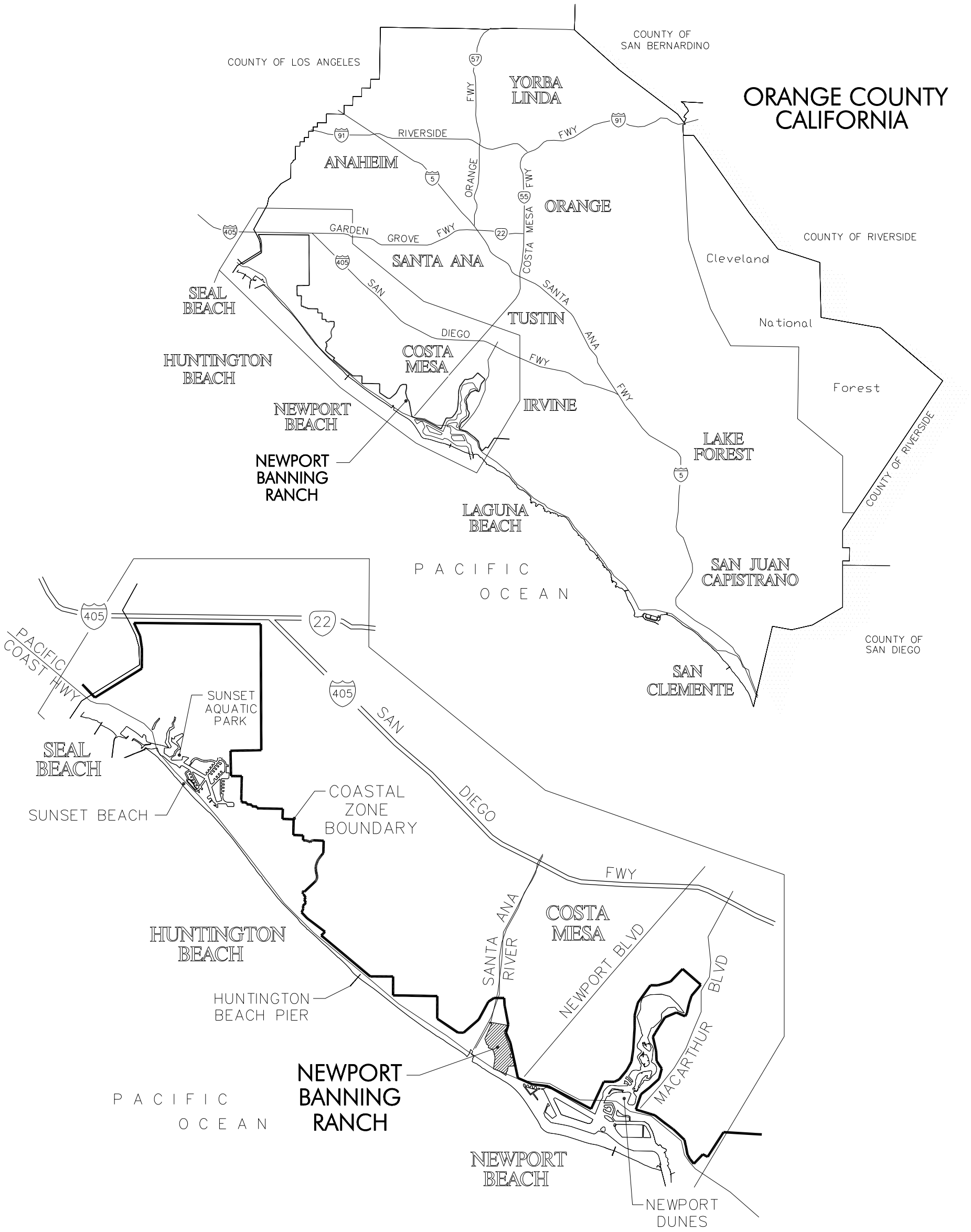
Remediated soil, asphaltic, and concrete materials will not be placed in the lowlands

TABLE 6
SOIL SAMPLING PROGRAM
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA

Remediation Scope	Sampling Type	Sampling Frequency and Location	Analytical Program
Oil Wells	Confirmation sampling of interior of remedial excavation	1 bottom surface sample and 4 sidewall surface samples (1 per sidewall)	TPH, TRPH, BTEX
	Confirmation sampling of excavated material for backfill	- If soil staged adjacent to well: 1 sample per excavated stockpile (e.g., 1 sample per 30-50 CY) - If soil staged at local Staging/Stockpiling Area: 1 sample per 250 CY	
Infrastructure, Facilities, and PECs	Confirmation sampling based on visual observations during abandonment	Surface samples to be collected at the judgment of the environmental professional, at locations with visible staining, deleterious material, or showing signs of olfactory (e.g., odors/PID) impacts	TPH, TRPH, BTEX, PCBs*
	Confirmation sampling of targeted remedial excavation footprint	As above, plus confirmation sampling of final excavation footprint: 1 bottom surface sample per 10,000 square feet of base of excavation and 1 sidewall surface sample per 100 feet of sidewall	TPH, TRPH, BTEX, PCBs*
Oil Pipeline Corridors	Confirmation sampling based on visual observations during abandonment	Surface samples to be collected at the judgment of the environmental professional, at locations with visible staining, deleterious material, or showing signs of olfactory (e.g., odors/PID) impacts	TPH and TRPH
	Confirmation sampling	1 surface sample to be collected per 250 feet of pipeline or pipe-rack length; buried pipe runs to have depth-appropriate samples collected at same frequency	TPH and TRPH
	Confirmation sampling of targeted remedial excavation footprint	1 bottom surface sample and 4 sidewall surface samples (1 per sidewall)	TPH and TRPH
Roads	Confirmation sampling	1 surface sample to be collected per 500 feet of scraped road length; additional surface samples to be collected at locations with visible staining, deleterious material, or showing signs of olfactory (e.g., odors/PID) impacts	TPH and TRPH
	Confirmation sampling of targeted remedial excavation footprint	1 bottom surface sample and 4 sidewall surface samples (1 per sidewall)	TPH and TRPH
Remediated Soil Batches	Verification sampling	1 sample per 1,000 CY	TPH, TRPH, BTEX
Backfill	Confirmation sampling of Clean Soil Flip	1 sample per 1,000 CY	TPH, TRPH, BTEX

Notes:
* Limited confirmation soil sampling for PCBs to be performed at PEC#09 (Electrical and Transformer Storage) and PEC#10 (Transformer Mounts)
BTEX – benzene, toluene, ethylbenzene, and xylene by EPA Method 8260B
CY – cubic yards
PCBs – Polychlorinated biphenyls
PECs – potential environmental conditions
PID – photoionization detector
TPH – total petroleum hydrocarbons by EPA Method 8015(B)M, C4-C12 and C13-C23 carbon chain identification
TRPH – total recoverable petroleum hydrocarbons by EPA Method 418.1 or 1664A

FIGURES



Site Location Map
Newport Banning Ranch
Newport Beach, California

Geosyntec consultants

PROJECT NO: HR1018E | October 2014

FIGURE
1

N

Talbert Nature Preserve

19th Street

Santa Ana River

Small Arroyo

Lowland Area

Whittier Ave.

18th Street

Monrovia Ave.

Middle Arroyo

17th Street

ACOE Wetlands Restoration Area

Newhall Street

NMUSD

16th Street

City Yard

Upland Area

Oxbow Loop/Semeniuk Slough

Large Arroyo

Pacific Coast Highway

Legend

- Approximate Demarcation line between Lowland and Upland areas
- Current Topography
- Lowland Area
- Upland Area
- Plan Boundary

Topographic Areas and Features Map

Newport Banning Ranch
Newport Beach, California

600 300 0 600 1,200 Feet

Geosyntec consultants

Figure 2

Project No: HR1018E

January 2015

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Legend

Open Space Preserve

- Lowland Open Space Habitat Conservation, Restoration, and Mitigation Areas
- Upland Open Space Habitat Conservation, Restoration, and Mitigation Areas
- Public Interpretive Trails
- Drainage Management Areas
- Consolidated Oil Sites (Interim Use)
- Oil Site Buffers

Parklands

- Public Community Park
- Public Bluff Park
- Public Interpretive Parks

Vilages and Colonies

- North and South Family Villages
- Urban Colony
- Resort Colony

Roadways

- Public Roads

Reference: Exhibit 3-3, CCC Alternative 2 Project [Fuscoe]

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Land Use Map

Newport Banning Ranch
Newport Beach, California

600 300 0 600 1,200
Feet

Geosyntec consultants

Project No: HR1018

January 2015

Figure 3

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Legend

- 2008 Oil Wells [Fuscoe Survey]
- Oil Wells [West Newport Oil Company]
- Utility Poles [Geosyntec, 2008]
- Oil Pipeline Corridoors
- 1947 Oil Sumps
- Oil Field Operations Areas
- Oil Consolidation Area
- Plan Boundary

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Historic Oil Field Operations Areas

Newport Banning Ranch
Newport Beach, California

600 300 0 600 1,200
Feet

Geosyntec consultants

Project No: HR1018E | February 2015

Figure 4

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N

Legend

- 2008 Oil Wells [Fuscoe Survey]
- Oil Wells [West Newport Oil Company]
- Utility Poles [Geosyntec, 2008]
- Preliminary Environmental Conditions, General Boundaries [Geosyntec]
- Oil Consolidation Area
- Plan Boundary

1 - Maintenance Shop / Warehouse
2 - Tank Farm Drill Site (Active)
3 - Air Compressor Plant
4 - Steam Generation Plant
5 - Water Softeners
6 - City of Newport Beach Tank Farm (Abandoned)
7 - Pilot Scale Biotreatment Cell / Stockpiled Soil
8 - Former Sump / Clarifier
9 - Utility Shack Transformer Storage
10 - Approximate Location of Edison Transformers
11 - Personnel Changing Room and Showers
12 - City of Newport Beach Oil Operations
15 - Gasoline UST
16 - Coast Watch Station
17 - Oil/ Gas Production Equiptment Storage
18 - Soil / Debris Stockpiles
19 - Storage Shack
20 - Soil / Debris Stockpiles
21 - Soil / Debris Stockpiles
22 - Treated Soil Stockpile Area
23 - Equipment / Debris Stockpiles
24 - Field Offices
27 - Sublease Area

NOTES:
PECs formerly designated as #13 & #14 have been grouped with other PECs
Non-specific area PECs:
PEC #25 – Oil Well Pads and Linear Features (roadways/pipelines)
PEC #26 – Drilling Mud Sumps / Oil Well Sumps

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PEC Location Map

Newport Banning Ranch
Newport Beach, California

600 300 0 600 1,200
Feet

Geosyntec consultants

Project No: HR1018E

January 2015

Figure 5

N

Legend

- 2008 Oil Wells [Fuscoe Survey]
- Oil Wells [West Newport Oil Company]
- Utility Poles [Geosyntec, 2008]
- Oil Pipeline Corridoors
- Pavement/ALM Road
- ALM Road
- 1947 Oil Sumps
- Estimated PEC Deep Excavation Areas
- Preliminary Environmental Conditions, General Boundaries [Geosyntec]
- Oil Consolidation Area
- Plan Boundary

1 - Maintenance Shop / Warehouse
2 - Tank Farm Drill Site (Active)
3 - Air Compressor Plant
4 - Steam Generation Plant
5 - Water Softeners
6 - City of Newport Beach Tank Farm (Abandoned)
7 - Pilot Scale Biotreatment Cell / Stockpiled Soil
8 - Former Sump / Clarifier
9 - Utility Shack Transformer Storage
10 - Approximate Location of Edison Transformers
11 - Personnel Changing Room and Showers
12 - City of Newport Beach Oil Operations
15 - Gasoline UST
16 - Coast Watch Station
17 - Oil/ Gas Production Equiptment Storage
18 - Soil / Debris Stockpiles
19 - Storage Shack
20 - Soil / Debris Stockpiles
21 - Soil / Debris Stockpiles
22 - Treated Soil Stockpile Area
23 - Equipment / Debris Stockpiles
24 - Field Offices
27 - Sublease Area

NOTES:
PECs formerly designated as #13 & #14 have been grouped with other PECs
Non-specific area PECs:
PEC #25 – Oil Well Pads and Linear Features (roadways/pipelines)
PEC #26 – Drilling Mud Sumps / Oil Well Sumps

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Estimated Remedial Excavation Areas

Newport Banning Ranch
Newport Beach, California

600 300 0 600 1,200
Feet

Geosyntec consultants

Project No: HR1018E

January 2015

Figure 6

N

STAGING/
STOCKPILING AREAS

STAGING/
STOCKPILING AREAS

PRIMARY SITE ACCESS/EGRESS

PRIMARY ACCESS
TO LOWLANDS

EQUIPMENT
AND SALVAGE

CONCRETE IN

CONCRETE OUT

CONCRETE
PROCESSING

BORROW/
PLACEMENT

CLEAN SOIL
FLIP

SOIL TESTING/
VERIFICATION

PIPE
SALVAGE

BIOREMEDIATION
CELLS

SOIL IN

SOIL IN

SOIL TESTING/
VERIFICATION

BINS/
EQUIPMENT

EQUIPMENT

BORROW/
PLACEMENT

CLEAN SOIL
FLIP

CLEAN SOIL
FLIP

BORROW/
PLACEMENT

ALTERNATE SITE
ACCESS/EGRESS

SOIL
IN

BIOREMEDIATION
CELLS

MATERIALS
SALVAGE

SOIL
IN

SOIL TESTING/
VERIFICATION

PIPE
SALVAGE

CONCRETE

EQUIPMENT

Legend

- Bioremediation Area
- Haul-off Soil Stockpile
- Remediated Soil Placement Location
- Concrete Processing and Salvage Area
- Equipment/Materials Salvage Area
- Crushed Concrete Stockpile
- Geotechnical/Remediated Soil Stockpile Location
- Staging/Stockpiling Areas
- Primary Transportation Routes
- Secondary Transportation Routes
- 2008 Oil Wells [Fuscoe Survey]
- Oil Wells [West Newport Oil Company]

Remediation Planning Areas

Newport Banning Ranch
Newport Beach, California

450 225 0 450 900
Feet

Geosyntec consultants

Figure
7

Project No: HR1018

January 2015

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Geosyntec
consultants

APPENDIX A

Orange County Fire Authority, Combustible Soil Gas Hazard Mitigation, Guideline C-03

ORANGE COUNTY FIRE AUTHORITY

Planning & Development Services Section

1 Fire Authority Road, Building A Irvine, CA 92602 714-573-6100 www.ocfa.org

Combustible Soil Gas Hazard Mitigation

Guideline C-03

January 1, 2014

Serving the Cities of: Aliso Viejo, Buena Park • Cypress • Dana Point • Irvine • Laguna Hills • Laguna Niguel • Laguna Woods • Lake Forest • La Palma • Los Alamitos • Mission Viejo • Placentia • Rancho Santa Margarita • San Clemente • San Juan Capistrano • Santa Ana • Seal Beach • Stanton • Tustin • Villa Park • Westminster • Yorba Linda • and Unincorporated Areas of Orange County

Combustible Soil Gas Hazard Mitigation

PURPOSE

This document is intended to serve as Orange County Fire Authority (OCFA) guidance for the scientific investigation, remediation, and/or mitigation of potentially hazardous concentrations of combustible soil gases associated with the construction and occupancy of a building or structure located within the areas specified herein.

SCOPE

These guidelines shall apply to all of the following locations:

1. Any location within an administrative boundary or a distance less than or equal to 100 feet beyond the administrative boundary of any oil/gas field that has been defined by the Division of Oil, Gas, and Geothermal Resources (D.O.G.G.R.). An administrative boundary can be determined by visiting the website for D.O.G.G.R. or by contacting the City in which your project is proposed or by contacting OCFA.

2. A distance less than or equal to 100 feet from any active or abandoned oil/gas well that is not located within the administrative boundary of an oil field as defined by the D.O.G.G.R. *Exception: This guideline shall not apply to any Hydrocarbon Free Oil/Gas Well as defined in these guidelines when complete surface to total depth data has been provided to D.O.G.G.R. for review and certification and such certification is provided to the OCFA.*

3. A distance of less than or equal to 300 feet from any gas seepage zone.

4. For locations within the city of Yorba Linda, refer to *Yorba Linda Policy 26: Methane Gas Investigation and Mitigation for Existing Homes Undergoing Expansion* or OCFA Informational Bulletin 05-03.

5. A distance less than or equal to 1000 feet from the refuse footprint of any existing or new disposal site or Class II or III Municipal Solid Waste Landfill Unit described in Title 27 CCR, Chapter 2. The landfill or disposal site may be operating or closed, abandoned or inactive.

6. Any other location identified by the OCFA as being subject to gas migration from a potential source of a combustible gas.

The following definitions are provided to facilitate the consistent application of this guideline:

Abandoned Oil/Gas Well - A well that has been plugged and abandoned to D.O.G.G.R. standards.

Active Methane Detection - A system of components designed to detect specified concentrations of combustible gas within a structure and to warn the occupants via audible/visual alarms when such concentrations are detected.

Administrative Boundary - The boundary delineating the surface area which is underlain or reasonably appears to be underlain by one or more oil and/or gas pools as defined by the State of California, Division of Oil, Gas, and Geothermal Resources (D.O.G.G.R.).

Forced Air Venting System - A mechanically operated ventilation system designed to provide the necessary number of air changes/hour for the purpose of maintaining combustible gas concentrations at a safe level within a building.

Gas Membrane Barrier - A barrier installed beneath a structure's slab foundation for the purpose of minimizing the intrusion of combustible soil gas.

Gas Seepage Zone – Any location where natural gas emerges at the surface from a subsurface source.

Hydrocarbon Free Oil/Gas Well - Any well drilled with the expectation of, but not finding, hydrocarbon accumulations in any quantity.

Mitigation Plan - A site specific plan prepared by a Registered Professional Engineer for the purpose of defining measures necessary for construction to take place within a location presenting a potential hazard due to the presence of combustible soil gases.

Registered Professional - A California Registered Professional Engineer or Registered Professional Geologist or other credentialed professional with demonstrated proficiency in the subject of soil gas investigation and mitigation and found acceptable to OCFA.

Soil Gas Investigation - A scientific investigation reviewed and approved by OCFA, conducted by a Registered Professional for the purpose of determining the locations and concentrations of combustible soil gas.

Sub-Slab Passive Venting - A non-powered system of components located beneath and/or within a structure and designed to vent accumulations of combustible soil gas to the atmosphere.

Well - Any well defined in California Public Resources Code Division 3, Chapter 1, section 3008(a)(b) and Chapter 4, section 3703, as described below:

> *3008 (a): "Well" means any oil or gas well or well for the discovery of oil or gas; any well on lands producing or reasonably presumed to contain oil or gas; any well drilled for the purpose of injecting fluids or gas for stimulating oil or gas recovery, repressuring or pressure maintenance of oil or gas reservoirs, or disposing of waste fluids from an oil or gas field; any well used to inject or withdraw gas from an underground storage facility; or any well drilled within or adjacent to an oil or gas pool for the purpose of obtaining water to be used in production stimulation or repressuring operations. (b):*

"Prospect well" or "exploratory well" means any well drilled to extend a field or explore a new, potentially productive reservoir.

3703. "Well" means any well for the discovery of geothermal resources or any well on lands producing geothermal resources or reasonably presumed to contain geothermal resources, or any special well, converted producing well or reactivated or converted abandoned well employed for reinjecting geothermal resources or the residue thereof.

SUBMITTAL REQUIREMENTS

1. Building Restriction Zone

To the ***maximum*** extent feasible, the slab or foundation for a proposed building shall not be constructed over or within 10 feet of an abandoned oil/gas well. If specific site characteristics make such a setback unfeasible, construction of structures ***may*** be allowed within the Building Restriction Zone provided that the following mitigation measures are incorporated. The proposed construction of one- or two-family dwellings within the Building Restriction Zone shall be subject to further evaluation and/or mitigation.

A. A Methane work plan shall be submitted by a Registered Professional. OCFA has a list of 'approved' methane specialists who are familiar with OCFA policies and plan submittal procedures. This list is not an endorsement of these companies. The companies on the list have submitted their qualifications to OCFA and have the necessary qualifications and experience to provide the service required. This list is available by contacting our OCFA Planning and Development section at (714) 573-6100.

B. Once the methane work plan is approved, the methane testing can be performed. Once the soil gas investigation is complete, a report, meeting the criteria contained herein, shall be conducted in the immediate vicinity (25 foot radius) of any abandoned oil/gas well that will be located within the Building Restriction Zone. The report shall be submitted to OCFA.

C. The Mandatory Procedures for Mitigation specified in Section 4 of this guideline shall be applied.

D. A Registered Professional shall review the soil gas investigation report and building plan and recommend soil gas mitigation measures, if any, that may be required for the site beyond those contained in this guideline. Any additional mitigation measures recommended shall be included in the Mitigation Plan.

E. The abandonment of oil/gas wells located within the Building Restriction Zone shall have the current approval of the D.O.G.G.R. The current approval shall meet the requirements applied by D.O.G.G.R. at the time the Mitigation Plan is submitted for review to OCFA.

***** THE OCFA ADVISES AGAINST THE CONSTRUCTION OF ANY STRUCTURE OVER ANY WELL *****

2. Soil Gas Investigation

A proposed building located within the areas specified in this guideline shall be approved only after a soil gas investigation has been completed and a report submitted to OCFA for review and approval.

A. The investigation and report shall be prepared by and conducted under the direct supervision of a Registered Professional.

B. The report shall contain a detailed description of the site investigation including the methodology and the data collection techniques utilized.

C. To the degree possible, the source(s) of any anomalous levels of methane shall be identified.

D. The soil gas investigation report shall be subject to review and approval by a third party Registered Professional, if deemed necessary by OCFA. The applicant shall pay fees charged for the third party review.

3. Soil Gas Concentrations

A. If the soil gas investigation report identifies combustible soil gas concentrations of 5,000 ppm or greater at any location(s), the Mandatory Procedures for Mitigation, as contained herein, shall be applied to all buildings within 300 feet of the affected location(s).

B. If combustible soil gas concentrations in excess of 12,500 ppm are identified at any location(s), all buildings within 300 feet of the affected location(s) shall have a specific soil gas mitigation plan approved by a Registered Professional.

C. The Mandatory Procedures for Mitigation pertaining to buildings located within the prescribed distances from abandoned oil/gas wells are required to be implemented regardless of the combustible soil gas concentrations identified during the soil gas investigation.

D. Mitigation plans shall be subject to review and approval by third party Registered Professional, if deemed necessary by OCFA as stated above.

4. Mandatory Procedures for Mitigation

Design and installation criteria for soil gas mitigation systems have been established and are detailed below. However, these criteria are not intended to limit the engineered design for any specific site (see Attachments 2 through 8 for examples). Prior to the installation of a soil gas mitigation system, plans shall be submitted to the OCFA for review/approval. All proposed designs shall be reviewed/stamped by a California Registered Professional Engineer. Proposed designs that vary significantly from the criteria below may be subject to review by a third party California Registered Professional Engineer.

A. Source Removal: If all sources of combustible soil gas, such as crude oil impacted soil or oil field sumps, have been removed, isolated, or remediated such that no potential threat to buildings due to methane generation or migration remains, then no further mitigation in that area shall be mandatory unless recommended by a Registered Professional. All remediation shall be under the oversight and approval of Orange County Health Care Agency, Environmental Health.

B. Passive Venting of Abandoned Oil/Gas Wells: All abandoned oil/gas wells within 25 feet of any proposed building shall be vented. All wells within 300 feet of a proposed building that are also under or within five feet of a paved road, paved parking lot, or other continuous impermeable surface barrier where the continuous impermeable surface barrier is within 25 feet of the proposed building, shall be vented. In the event sufficient findings are made that well venting is not feasible, the OCFA (with D.O.G.G.R. concurrence) may allow a waiver of the venting requirement provided that additional mitigation measures described in section 4.F be made a part of the mitigation plan. *NOTE: Mitigation systems may not be installed within the public right of way without prior approval from the City/County Engineer or Public Works Department. See Section 5 of this guideline.*

C. Sub-slab Passive Venting: A passive venting system shall be installed beneath the slab or foundation of a proposed building that is within:

1) 25 feet of an abandoned oil/gas well.

2) 25 feet of a continuous impermeable surface barrier (e.g., paved road or parking lot) covering an abandoned oil/gas well that is located less than 300 feet from the building.

3) 300 feet of an active gas seep zone.

4) 300 feet of other anomalous combustible soil gas areas as identified in the Soil Gas Investigation Report, except as mitigated by source removal or remediation or except as identified in the Soil Gas Investigation Report as not posing a safety threat to occupied buildings due to its characteristics.

D. The design for the sub-slab venting system shall be approved by a California Registered Professional Engineer. The design and installation shall be in accordance with the California Building, Mechanical, and Plumbing Codes and meet the following criteria:

1) Ventilation trenches shall be placed such that no portion of the foundation is more than 25 feet from a ventilation trench. Trench cross section dimensions shall not be less than 12 inches by 12 inches. Ventilation trenches shall be back filled with pea gravel (approximately 3/8 inch in diameter) or other material of similar size and porosity.

2) Ventilation trenches shall be provided with perforated pipe of not less than 4 inches in diameter. The total pipe perforation area shall be at least equal to 5% of the total surface area of the pipe. Perforated pipe shall be located a minimum of 4 inches beneath the foundation.

3) Where piping transitions through building footings, the penetration shall be accomplished in compliance with the California Building Code and with the approval of the Building Official.

4) Perforated pipe shall be connected to vertical ventilation pipe. Vertical ventilation pipe shall be not less than 3 inches in diameter and shall be constructed of materials specified by the California Plumbing and Mechanical Codes. All joints shall be tightly sealed with approved materials. Ventilation pipe may be located within walls/chases or shall be similarly protected from physical damage. Ventilation pipe shall be constructed in a manner that will allow it to be connected to an active venting system, if necessary, without modification or damage to the structure (e.g. Capped TEE fitting located near the foundation). Ventilation pipes shall terminate at a height determined acceptable by the designing engineer but not less than 18” above the adjacent level. Ventilation pipes shall be located at least three feet from a parapet wall. Ventilation pipes shall terminate at a distance of at least 10 feet from any building opening or air intake and at least four feet from any property line. Any ventilation pipe located within an open yard shall terminate at a height of not less than 10 feet above adjacent grade.

5) The termination of all ventilation pipes shall be provided with a “T” connection or other approved rain cap to prevent the intrusion of rainwater.

6) Ventilation pipe shall be clearly marked to indicate that the pipe may contain combustible gas. This may be accomplished through stencils, labels or other methods. Pipes shall be marked near their termination point and at five-foot intervals along the remainder of the ventilation pipe. This includes sections encased within walls or other enclosures. An acceptable identifier would be the words “METHANE GAS” printed in two-inch letters.

7) All underground electrical conduit penetrating the slab or foundation of the building shall be provided with a seal-off device as normally found on classified electrical installations. This device is intended to prevent the travel of gas into the occupied portion of the structure through conduit runs. Any device installed shall meet the applicable requirements of the California Electrical Code.

E. Active Methane Detection/Forced Air Venting: A structure that will be built over an abandoned oil/gas well and where the ground floor is not naturally vented may be required to have an active interior methane detection system equipped with an audible alarm and/or additional mitigation measures based on the recommendation of the Registered Professional conducting the site specific soil gas mitigation review, which may include an active interior methane detection/forced air venting system capable of providing a minimum of four air changes per hour in the event methane concentrations within the building exceed 20% of the methane Lower Explosive Limit (LEL).

F. Gas Membrane Barrier: Any building to be constructed in the areas specified by item #1 below shall be provided with a gas membrane barrier. Gas membrane barriers may be required for locations specified in items #2 through #4 unless a review and recommendation by the Registered Professional states that a gas membrane barrier is not necessary. *Exception: The building is of a structural design that provides natural ventilation to prevent the accumulation of combustible gas (e.g. an open parking garage at grade level).*

1) 10 feet of an abandoned oil or gas well.

2) 25 feet of a continuous impermeable surface barrier (e.g. paved road or parking lot) that covers an abandoned oil/gas well that is less than 300 feet from the building.

3) 300 feet of an active gas seepage zone.

4) 300 feet of other anomalous combustible soil gas level areas identified in the Soil Gas Investigation Report except as mitigated by source removal or remediation or except as identified in the Soil Gas Investigation Report as not posing a safety threat to occupied buildings due to its characteristics.

5. Mitigation Plan Approval

All reports, work plans, and mitigation plans shall be subject to the approval of the OCFA. Any methane mitigation system located within a public right of way shall also be subject to the approval of the City or County Engineer or Public Works Department. Many local agencies will restrict or prohibit the installation of methane mitigation systems within a public right of way. A public right of way includes any street, parkway, sidewalk, open space or similar area that has been or will be dedicated to a city or county.

6. Well Abandonment

Oil and gas wells to be abandoned or re-abandoned shall be done so in accordance with the current requirements of the D.O.G.G.R. The abandonment requirements will be those applied by D.O.G.G.R. at the time the mitigation plan is submitted for review to the OCFA. Documentation of final abandonment approval from the D.O.G.G.R. shall be provided to the OCFA and the building department before occupancy is approved.

7. Construction Inspection Responsibility

A Registered Professional Engineer shall perform the inspection of all gas control measures. In order to document the inspection process properly, the following signed and stamped certification shall be submitted to the OCFA prior to use of the building or OCFA's final approval of the project:

- I am a Registered Professional Engineer in the State of California and I am knowledgeable in the field of combustible soil gas control and mitigation systems.
- The soil gas control and mitigation systems installed within this project have been constructed under my direct supervision and in accordance with the plans reviewed by the OCFA. As-built plans are included with this statement.
- The building has been tested and determined to be free from any concentration of gases that the control system was designed to mitigate. A copy of the test results is included with this statement.

In order to facilitate the construction approval process, periodic correspondence may be required to be provided to the field inspector representing OCFA or to the respective building department of the city in which the project is located. Such correspondence shall be provided at intervals required by the inspector and provide updated information regarding the status of inspection activities completed by the engineer responsible for the gas control system.

8. Gas Control System Maintenance and Testing

The maintenance of all soil gas control systems shall remain the responsibility of the property owner. All systems shall be maintained as installed and as recommended by the manufacturer and/or system designer. The owner of the property shall be provided with written instructions stating the required service maintenance and testing for the soil gas mitigation systems installed. For systems requiring specialized testing to ensure proper operation, the property owner shall obtain the services of qualified personnel to accomplish such tests. Written documentation verifying that such tests were accomplished shall be retained by the property owner for a period of not less than five years and made available to the OCFA upon request. The OCFA may require any property owner to accomplish additional tests when there is reason to believe that the concentration of gas within or near the structure is elevated above the levels recorded at the time of the original soils gas investigation.

9. Additional Requirements of the California Fire Code

This document is not intended to address the requirements of the California Fire Code pertaining to the location of a building in relation to an active oil/gas well. These requirements are found in Chapter 58 of the California Fire Code. The OCFA Planning & Development Services Section may be contacted for additional information.

ATTACHMENT 1
COMBUSTIBLE GAS STUDY CHECKLIST
(to be completed by applicant)

PROJECT INFORMATION

Project Name: _____

Primary Contact:_____ Phone Number: _____

Site Address (if available):_____ City:_____

Tract/Map #:_____ Lots:_____

Parcel Map Number:_____ Assessor's Parcel #:_____

DEVELOPMENT AREA

Development Density:_____ Area (acres):_____

Open Space:_____ Paved Area:_____

GEOLOGY/HYDROLOGY

Oil Field Name: _____

Groundwater Basin/Recharge Area Name:_____

Number of Wells in Development Area:
Producers:_____ Steam Injectors:_____ Water Injectors:_____ Idle:_____

Abandoned:_____ Abandoned to Current Regulations:_____

Depth (ft. BGS) of:
Shallowest producing zone:_____ Shallowest Oil or Gas Zone:_____

Shallowest groundwater:_____ Shallowest drinking water:_____

Number of surface expressions of fault zones:_____ (Show on map)

Number of oil/gas seep zones:____ (Show on map)

1. Has a hazardous gas assessment been completed? YES / NO
2. Is the hazardous gas assessment attached hereto? YES / NO
3. Has the hazardous gas assessment included soil probes? YES / NO
4. If yes, to what depth have the soil probes penetrated? _____ feet
5. Has the hazardous gas assessment included soil borings? YES / NO
6. If yes, to what depths have the soil boring penetrated? _____ feet
7. The highest soil gas methane concentration identified was: _____ ppm (v/v)
8. The background soil gas methane concentration identified was _____ ppm (v/v)
9. Is the applicant requesting any waivers from required mitigation? YES / NO
10. If yes, what waiver(s) is being requested:

COMBUSTIBLE GAS STUDY CHECKLIST (Continued)

(to be completed by applicant)

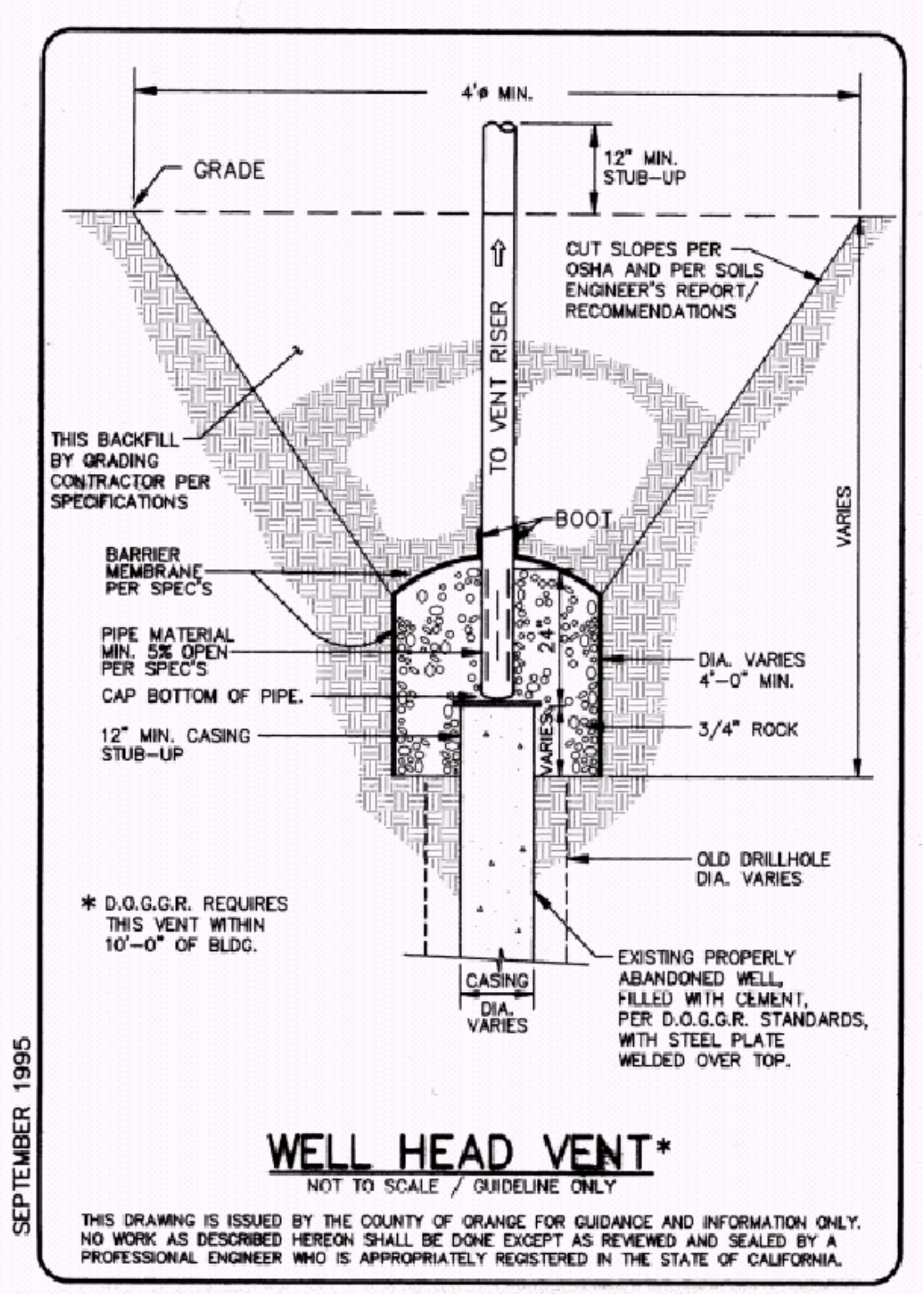
Summary of Gas Assessment Conclusions

Area (Correlate to Map)	**Methane Level** (ppm v/v range)	**Source**	**Potential to Migrate** (Yes/No)	**Migration** (Note required actions)	
				Source	**Structures**

Date

Applicant

ATTACHMENT 2



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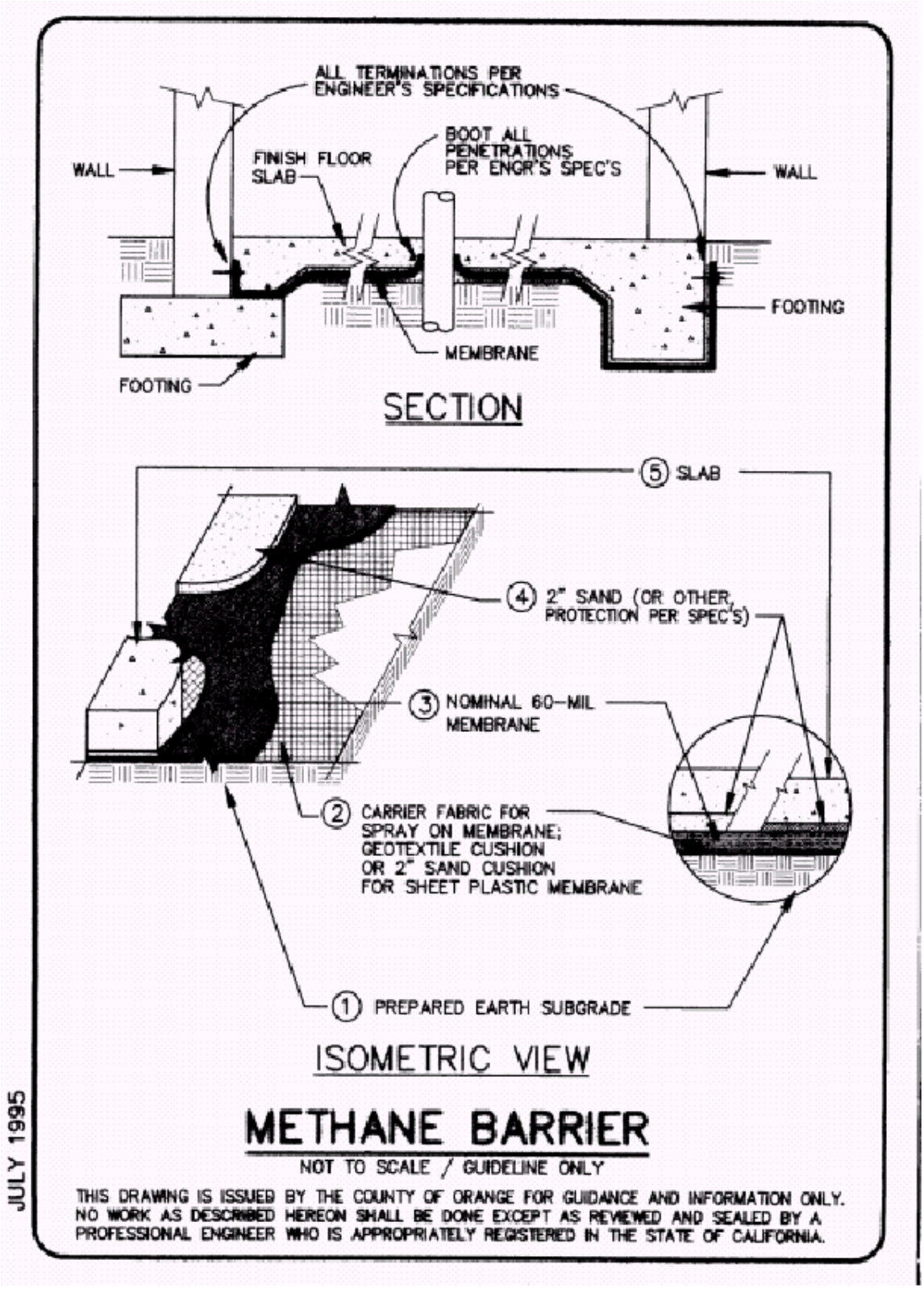

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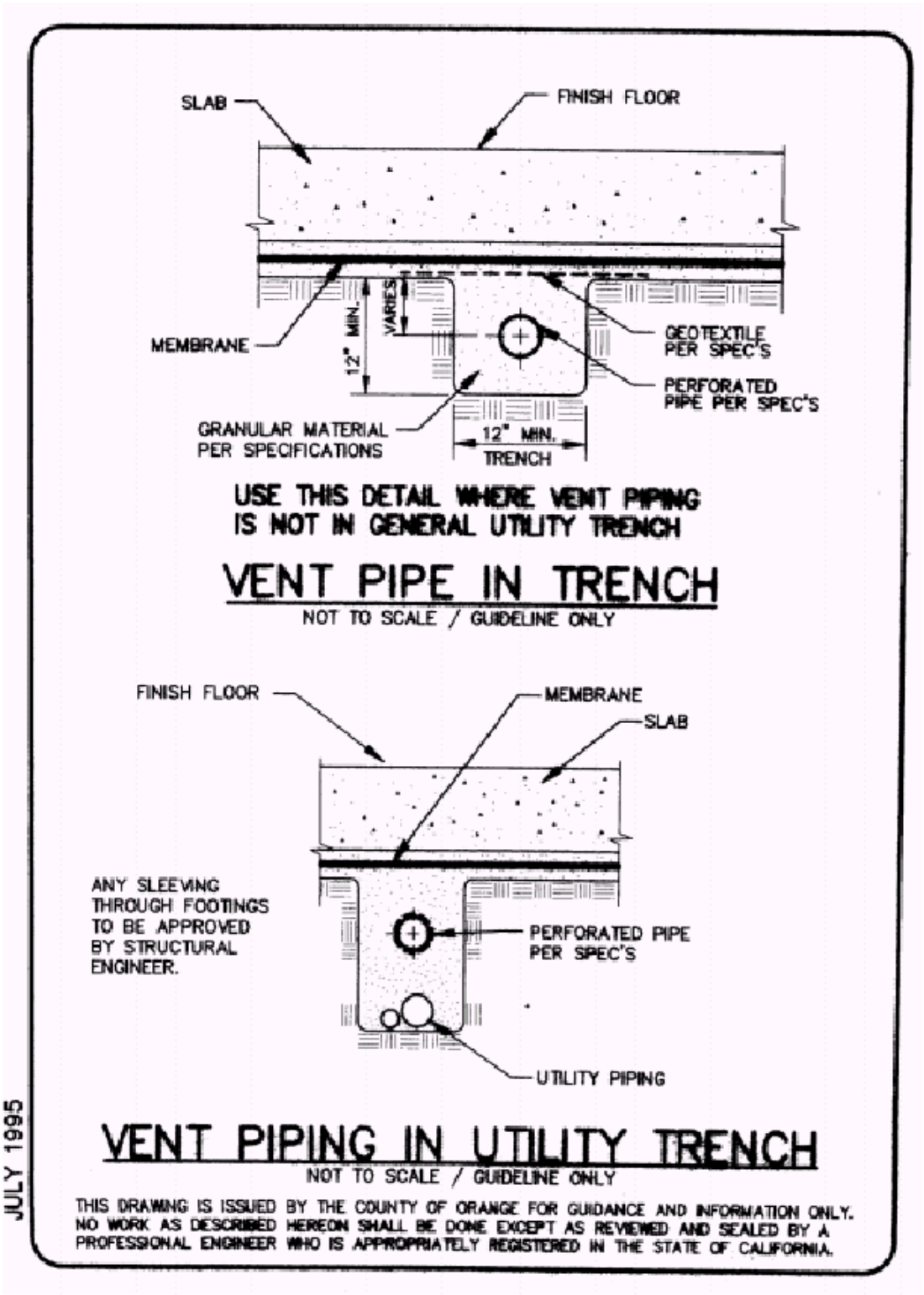

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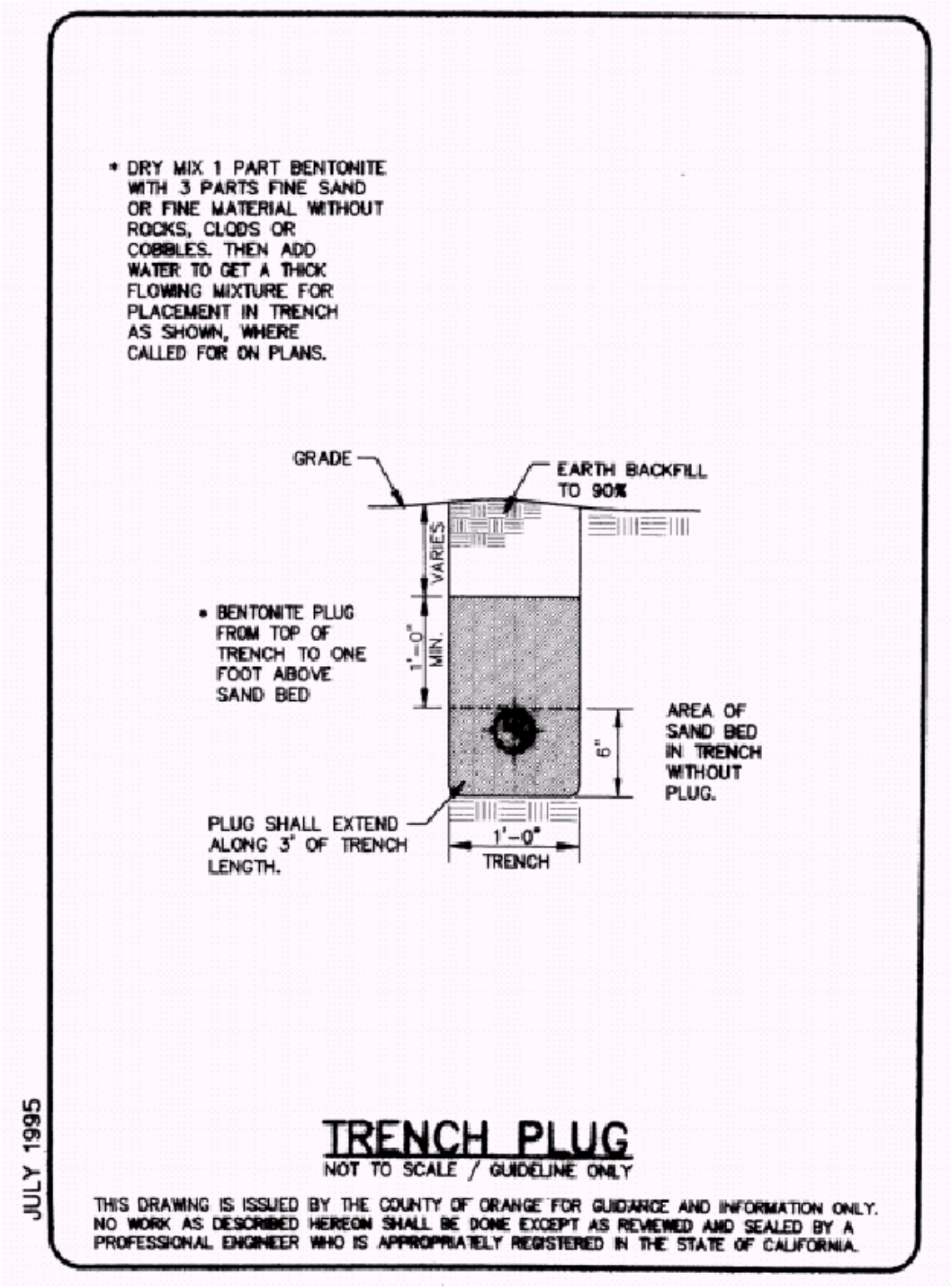

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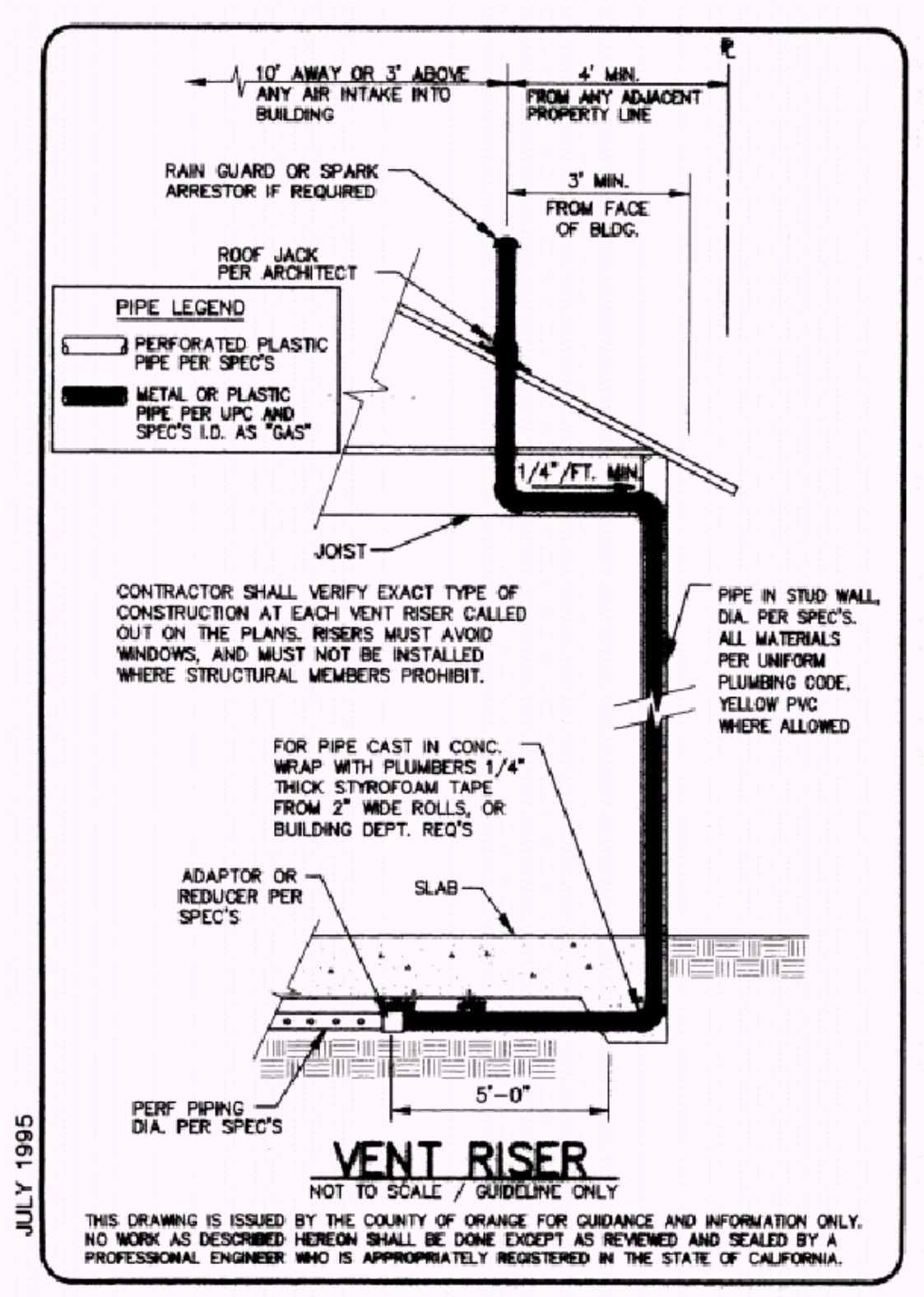
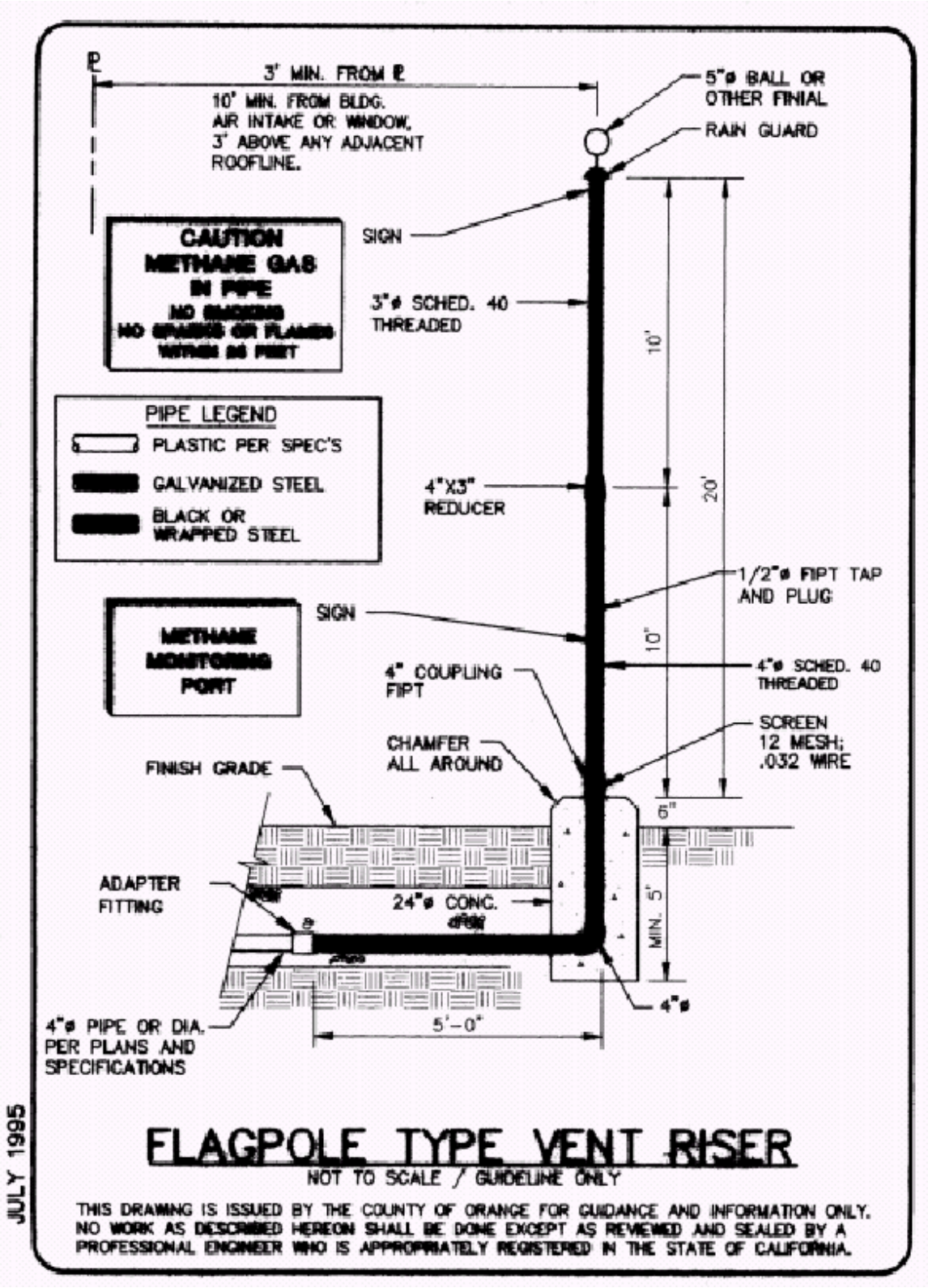


ATTACHMENT 7

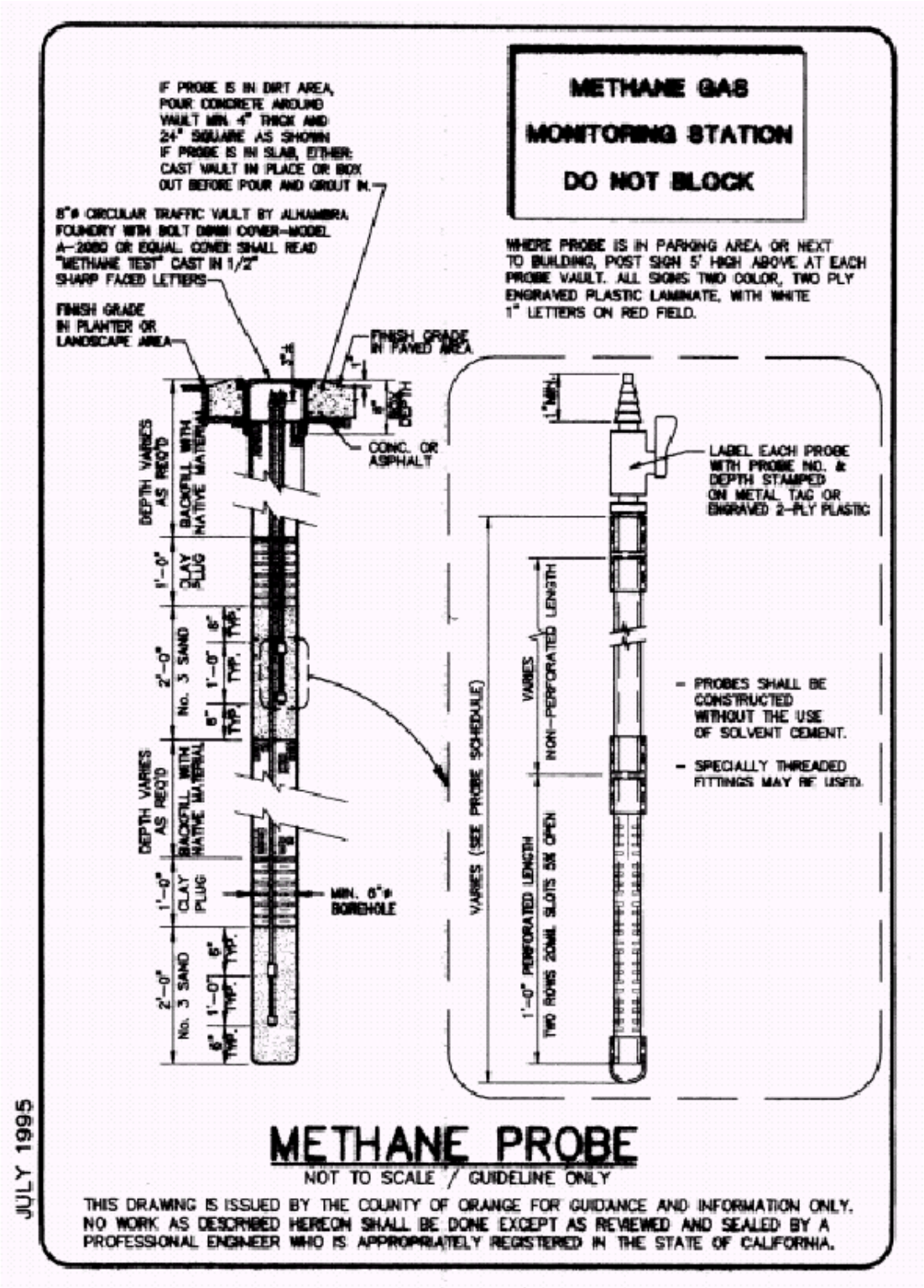


FLAGPOLE TYPE VENT RISER

NOT TO SCALE / GUIDELINE ONLY

THIS DRAWING IS ISSUED BY THE COUNTY OF ORANGE FOR GUIDANCE AND INFORMATION ONLY. NO WORK AS DESCRIBED HEREON SHALL BE DONE EXCEPT AS REVIEWED AND SEALED BY A PROFESSIONAL ENGINEER WHO IS APPROPRIATELY REGISTERED IN THE STATE OF CALIFORNIA.

ATTACHMENT 8



Geosyntec
consultants

APPENDIX B

Previous Action Levels for Newport Banning Ranch

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APPENDIX B-1

Action Levels Established in 1996 by the Orange County Health Care Agency and the California Regional Water Quality Control Board

GeoSyntec Consultants

TABLE 1 - ACTION LEVEL SUMMARY
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA
(May 1996)

LAND USE	DEPTH	ACTION LEVEL	APPROVAL REQUIRED
Residential	0 - 10 ft	100 ppm	OCHCA
	>10 ft[2]	10,000 ppm	OCHCA
		10,000 - 20,000 ppm	RWQCB
		>20,000 ppm	RWQCB + OCHCA[1] (gas)
Commercial or Open Space	0 - 3.5 ft	1,000 ppm	OCHCA
	> 3.5 ft[2]	10,000 ppm	OCHCA
		10,000 to 20,000 ppm	RWQCB
		>20,000 ppm	RWQCB + OCHCA[1](gas)

Note: [1] Surface methane gas emissions must be less than 5% of the Lower Explosive Limit (LEL) as measured using a Combustible Gas Indicator (CGI).

[2] Based on verbal authorization from the OCHCA and RWQCB, no action limit for TRPH below the indicated depths is enforced by these agencies.

APPROVED BY:

(Signature indicates approval of stated action levels for the NBR.)

ORANGE COUNTY HEALTH CARE AGENCY
(LEAD REGULATORY AGENCY)

DATE June 24/96

REGIONAL WATER QUALITY CONTROL
BOARD-SANTA ANA REGION

DATE June 19, 1996

CE4057-1//ANO96-27TBL

96 06 05/08:46

Geosyntec
consultants

APPENDIX B-2

Action Levels Included in the Clean-Up and Abatement Order Dated 12 July 2001 Issued by the California Regional Water Quality Control Board

Table 1. Maximum Allowable Concentrations for Soil in Non-Residential Areas, Paved Roads and Open Spaces (excluding the Proposed School Lot)

Depth From Final Grade	Analysis EPA Method/Constituent	Concentration (mg/kg)
less than or equal to 3.5 feet	418.1/TRPH	1,000*
"	8015/TPH-cc/id (C_{13}-C_{23} inclusive)	1,000*
"	8020/BTEX	B=nd, T=nd, E=nd, X=nd
"	8015/VFH (C_4-C_{12} inclusive)	ND
greater than 3.5 feet and/or depth of buried utilities but less than or equal to 10 feet ÷	418.1/TRPH	15,000
"	8015/TPH-cc/id (C_{13}-C_{23} inclusive)	15,000
"	8020/BTEX	B=0.1, T=10.0, E=68.0, X=175.0
"	8015/VFH (C_4-C_{12} inclusive)	400
greater than 10 feet and/or greater than depth of buried utilities ÷	418.1/TRPH	15,000
"	8015/TPH-cc/id (C_{13}-C_{23} inclusive)	15,000
"	8020/BTEX	B=0.4, T=10.0, E=68.0, X=175.0
"	8015/VFH (C_4-C_{12} inclusive)	600

Notes:

* - if odors are apparent the concentration will be 100 mg/kg - visual staining of highly weathered particles is acceptable
÷ - final depth of remediated soil will be such that potential exposure through future excavation acitivites will be minimized
mg/kg - milligrams per kilogram
cc/id - carbon chain identification
nd - not detected
EPA - Environmental Protection Agency
TRPH - total recoverable petroleum hydrocarbons
VFH - volatile fuel hydrocarbons, C_4-C_{12} inclusive
TPH - total petroleum hydrocarbons, C_{13}-C_{23} inclusive
BTEX - benzene, toluene, ethylbenzene, and total xylenes

Table 2. Maximum Allowable Concentrations For Soil Within Residential Lots and The Planned School Lot Area

Depth From Final Grade	Analysis EPA Method/Constituent	Concentration (mg/kg)
less than or equal to 3.5 feet	418.1/TRPH	100
"	8015/TPH-cc/id (C_{13}-C_{23} inclusive)	100
"	8020/BTEX	B=nd, T=nd, E=nd, X=nd
"	8015/VFH (C_4-C_{12} inclusive)	nd
greater than 3.5 feet but less than or equal to 10 feet	418.1/TRPH	500*
"	8015/TPH-cc/id (C_{13}-C_{23} inclusive)	500*
"	8020/BTEX	B=nd, T=nd, E=nd, X=nd
"	8015/VFH (C_4-C_{12} inclusive)	nd
greater than 10 feet but less than or equal to 15 feet	418.1/TRPH	15,000
"	8015/TPH-cc/id (C_{13}-C_{23} inclusive)	15,000
"	8020/BTEX	B=nd, T=0.1, E=0.68, X=1.75
"	8015/VFH (C_4-C_{12} inclusive)	100
greater than 15 feet and greater than depth of buried utilities	418.1/TRPH	15,000
"	8015/TPH-cc/id (C_{13}-C_{23} inclusive)	15,000
"	8020/BTEX	B=0.4, T=10.0, E=68.0, X=175.0
"	8015/VFH (C_4-C_{12} inclusive)	600

Notes:

* - if odors or visual staining are apparent the concentration will be 100 mg/kg
mg/kg - milligrams per kilogram
cc/id - carbon chain identification
nd - not detected
EPA - Environmental Protection Agency
TRPH - total recoverable petroleum hydrocarbons
VFH - volatile fuel hydrocarbons, C_4-C_{12} inclusive
TPH - total petroleum hydrocarbons, carbon chain identification, C_{13}-C_{23} inclusive
BTEX - benzene, toluene, ethylbenzene, and total xylenes

TABLE 1. CLEAN-UP AND REUSE CRITERIA
AERA ENERGY LLC YORBA LINDA OIL FIELD

Residential Areas - Maximum Allowable Concentrations For Impacted Soil and Remediated Soil

Depth from Final Grade	EPA Method Used to Verify Concentration*	Chemical Constituent	Allowable Concentration (mg/kg)
Surface to 15 feet	418.1	TRPH	100 (screening tool only)
	8015M w/carbon chain identification from C^{13}-C^{23}, inclusive	TPH	100***
	8021b**	BTEX	B=ND, T=0.1, E=0.68, X=1.75
	8015	VFH	ND
Greater than 15 feet	418.1	TRPH	5,000
	8015M w/carbon chain identification from C^{13}-C^{23}, inclusive	TPH	5,000
	8021b**	BTEX	B=0.10, T=10, E=68, X=175
	8015	VFH	100

Non-Residential Areas (Streets, Parking Lots, Greenbelts) - Maximum Allowable Concentrations For Impacted Soil and Remediated Soil

Depth from Final Grade	EPA Method Used to Verify Concentration*	Chemical Constituent	Allowable Concentration (mg/kg)
Surface to 15 feet	418.1	TRPH	1,000 (screening tool only)
	8015M w/carbon chain identification from C^{13}-C^{23}, inclusive	TPH	1000
	8021b**	BTEX	B=ND,T=0.1,E=0.68,X=1.75
	8015	VFH	100
Greater than 15 feet	418.1	TRPH	15,000
	8015M w/carbon chain identification from C^{13}-C^{23}, inclusive	TPH	5,000
	8021b**	BTEX	EPA Residential PRG's B=0.65, T=520, E=230, X=210
	8015	VFH	500

Notes

* Based on the type of hydrocarbon impact encountered one or more of these analysis may be required

** Positive results confirmed with EPA Method 8260

*** 1,000 mg/kg allowed if the soil has no apparent hydrocarbon odor or stain, if odor or staining is apparent, 100 mg/kg will be used

TRPH - Total Recoverable Petroleum Hydrocarbons

TPH - Total Petroleum Hydrocarbons (C^{13}-C^{23})

BTEX - Benzene, Toluene, Ethylbenzene, and Total Xylenes

VFH - Volatile Fuel Hydrocarbons

mg/kg - milligrams per kilogram

ND - Non-detect

PNAs - Polynuclear Aromatics

Asphaltic Fill Materials and Remediated Soil will be placed at least 15 feet below Final Grade

Greater than 25 feet below Final Grade - concentrations shall meet EPA Residential PRG's TRPH/TPH up to onsite concentrations VFH not to exceed 500 mg/kg

Geosyntec
consultants

APPENDIX C

Clean-Up and Abatement Order (CAO) Rescission

California Regional Water Quality Control Board
Santa Ana Region

Alan C. Lloyd, Ph.D.
Agency Secretary

3737 Main Street, Suite 500, Riverside, California 92501-3348
Phone (951) 782-4130 • FAX (951) 781-6288 • TDD (951) 782-3221
www.waterboards.ca.gov/santaana

Arnold Schwarzenegger
Governor

March 6, 2006

Mr. Leonard Anderson
West Newport Oil Company
1080 W. 17th St.
Costa Mesa, CA 92627

Mr. George Basye
Aera Energy, Fee Lands
3030 Saturn St.
Brea, CA 92821

RESCISION OF CLEANUP AND ABATEMENT ORDER NO. 01-77

Dear Messrs. Anderson and Basye:

West Newport Oil Company and Aera Energy have satisfactorily complied with the requirements of Cleanup and Abatement Order (CAO) No. 01-77. Therefore, Cleanup and Abatement Order No. 01-77 is hereby rescinded.

For the record, there are two remaining tasks that were removed from the cleanup plans submitted and approved under the CAO, which WNO and AERA Energy committed to completing as part of our Spills, Leaks, Investigations and Cleanup Program. Task No. 1 requires the removal of all oil-contaminated soil and free oil product, to the cleanup levels established under the CAO, from beneath the main processing area on the site. Task No. 2 requires the creation of 2.87 acres of wetland habitat as mitigation for impacts to the 2.87 acres that were illegally filled and subsequently cleaned up and restored in accordance with the CAO. We previously approved the plan to provide this mitigation as part of the development of the site and restoration of the lowlands, and to delay the cleanup beneath the main oil processing area until oil production ceases on site, provided that the oil is contained beneath the processing area by the extraction well and cleanup of the remaining areas is completed in accordance with the CAO.

We understand that WNO has sold its interest in the property to Cherokee Investment Partners (CIP), and that CIP, together with Aera Energy, is assuming the responsibility and liability for the remaining cleanup of the site and the wetlands mitigation.

Please call Ken Theisen at (951) 320-2028 if there are any questions regarding this matter.

Sincerely,

Gerard J. Thibeault
Executive Officer
Santa Ana Regional Water Quality Control Board

cc: John Gallagher, Cherokee Investment Partners, LLC
John Flynn, Nossaman, Gunther, Knox, and Elliott
Eric Smalstig, Geosyntech

Geosyntec
consultants

APPENDIX D

Summary of Environmental Sampling/Testing/Assessment History

APPENDIX D

SUMMARY OF ENVIRONMENTAL SAMPLING/TESTING/ASSESSMENT HISTORY
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA

APPROXIMATE SAMPLING DATE	SUBJECT/SCOPE	COMMENTS
March 1986	Soil and Surface Water Assessment (lowland western portion of the site)	Up to 14% petroleum hydrocarbons in soil samples. Low metals concentrations in soil and surface water samples. Low to non-detectable hydrocarbons concentrations in surface water samples. Low detection of VOC in surface water. No detection of polychlorinated biphenyls (PCBs).
June 1986	Surface Water and Shallow Ground Water Assessment (lowland western portion of the site)	No VOC detected in surface water samples. One chlorinated compound, vinyl chloride detected at 40 µg/l in a groundwater sample collected from the vicinity of the maintenance building sump. Several aromatic compounds (ethylbenzene, toluene, and xylenes) detected in three groundwater samples at concentrations below 1 ppm near the Maintenance Shop.
August 1990	Tank Bottom Materials and Asphalt-Like Materials Assessment (lowland western portion of the site)	Up to 32% hydrocarbons in samples, BTEX detected in some soil samples, though when hydrocarbon concentrations were below 1000 ppm, BTEX concentrations were below 0.1 ppm.
July 1991	Tank Bottom Materials Assessment (lowland western portion of the site)	Tank Bottom Materials do not exhibit the properties of a hazardous waste

APPENDIX D (continued)

SUMMARY OF ENVIRONMENTAL SAMPLING/TESTING/ASSESSMENT HISTORY
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA

APPROXIMATE SAMPLING DATE	SUBJECT/SCOPE	COMMENTS
October 1993 (Geosyntec Consultants)	Phase I Environmental Site Assessment	The following recognized or potentially-recognized environmental conditions: petroleum-impacted soils, solid waste and debris, above ground-storage tanks, underground storage tanks, parts-cleaning troughs, oil-production wells, empty 55 gallon drums, non-operative motor vehicles, construction debris, surplus equipment, a sewer main, and septic tanks.
November 1993	Soil Gas Survey (various site locations)	Organic vapors in oil well sumps and in storage tanks.
December 1994	Baseline Ground Water and Soil Study (lowland western portion of the site)	Up to 2,000 ppm hydrocarbon concentration in soil samples, metals concentrations were within the typical range of metals concentrations in soils, benzene detected at a concentration of 0.6 μg/l (0.1 μg/l above the laboratory detection limit) in one of four groundwater samples.
May 1995	Leachability of Asphalt-Like Materials	No VOC, SVOC, or hydrocarbon detected in the extract from the leached asphalt-like material. Barium was detected at a concentration of 0.8 ppm.
June 1995	Drilling Mud Pit Evaluation (limited locations)	Metals concentrations were within the typical range of metals concentrations in soils, VOC and SVOC not detected, hydrocarbons concentrations below 1,000 ppm.
September 1995	Soils beneath NBR Pipelines (primarily southern portion of the site)	Statistical sampling indicated that VOCs were not detected below natural gas pipelines, sulfite not detected below steam pipelines, metals concentrations were within the typical range of metals concentrations in soils.

APPENDIX D (continued)

SUMMARY OF ENVIRONMENTAL SAMPLING/TESTING/ASSESSMENT HISTORY
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA

APPROXIMATE SAMPLING DATE	SUBJECT/SCOPE	COMMENTS
July 1996	Soils Below Drill Site Tank Farm Area (adjacent to tank footprints)	Vertical extent of impact below the tank footprints is generally less than 8 ft (2 m). The average TRPH detected ranged from approximately 12 ppm to 41,000 ppm. VOC and SVOC not detected and metals were representative of typical background concentrations
November 2001 (Geosyntec Consultants)	Environmental Assessment	This report includes a description of the comprehensive site investigation activities conducted May through August 2001. The report presents the nature and extent of potential impacts to soil and groundwater at each of the PEC areas. Earlier VOC detections in groundwater (1986) confirmed. Also identified a free-product area on top of groundwater at the Drill Site Tank Farm and soil gas bubbling to the surface near the Tank Farm.
July 2002 (Geosyntec Consultants)	Site Assessment of Cement Return Area (near Drill Site Tank Farm)	Performed in response to the CAO issued by the RWQCB-SA. Based on the results of this preliminary evaluation, approximately 750 yd^3 of stained soil requiring mitigation was present in the cement return area. Area was mitigated and closed per RWQCB-SA.
December 2002 (Geosyntec Consultants)	Lowland Stockpile Assessment	Performed in response to the CAO issued by the RWQCB-SA. A total of 2.87 acres may have been disturbed at the Site by either concrete debris or soils, or clearing areas of vegetation. Area was mitigated and closed per RWQCB-SA.
December 2002 (Geosyntec Consultants)	Environmental Assessment Summary, Remedial Action Plan, Free Product Area	Summarizes the status of investigation in the Drill Site Tank Farm Area and proposes a remedy to address the presence of free product floating on top of groundwater. Area currently being mitigated in accordance with RWQCB-SA-approved plan.

APPENDIX D (continued)

SUMMARY OF ENVIRONMENTAL SAMPLING/TESTING/ASSESSMENT HISTORY
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA

APPROXIMATE SAMPLING DATE	SUBJECT/SCOPE	COMMENTS
March 2003 (Geosyntec Consultants)	Surface Water Sampling and Laboratory Data	Performed in response to the CAO issued by the RWQCB-SA. This transmittal documents that surface water quality is within acceptable standards. Issue is closed per RWQCB-SA.
March 2008 (Geosyntec Consultants)	Environmental Site Assessment Update	Report for the owner/developer partnership for the purpose of updating historical information and listing Site activities occurring between 2005 through early 2008.

Notes: Certain of the sampling events or data compilation activities were not documented in a formal report or study; highlights of selected sampling events are provided herein.

VOC = Volatile Organic Compound
SVOC = Semi-Volatile Organic Compounds
ppm = parts per million
mg/l = milligrams per liter
ug/l = micrograms per liter
yd^3 = cubic yards
BTEX = Benzene, Toluene, Ethylbenzene, and Xylenes
RWQCB-SA = Regional Water Quality Control Board, Santa Ana Region