Prepared for

Newport Banning Ranch LLC

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DRAFT REMEDIAL ACTION PLAN

(FOR INFORMATION AND PLANNING PURPOSES ONLY)

NEWPORT BANNING RANCH

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ORANGE COUNTY, CALIFORNIA

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Project Number HR1018

August 2009

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GLOSSARY OF ABBREVIATIONS

ASTM – American Society for Testing and Materials
BMP – Best Management Practice
BTEX – Benzene, Toluene, Ethylbenzene, and Xylenes
CAO – Cleanup and Abatement Order
CCA – California Coast Act
CCC – California Coastal Commission
DFG – Department of Fish and Game
DOGGR – Division of Gas and Geothermal Resources
dRAP – Draft Remedial Action Plan
EA – Environmental Assessment
EPA – Environmental Protection Agency
ESA – Environmental Site Assessment
FWS – US Fish and Wildlife Service
HDLLC – Horizontal Drilling, LLC
MCL – Maximum Contaminant Level
NBR – Newport Banning Ranch
NBRLLC – Newport Banning Ranch, LLC
OCHCA – Orange County Health Care Agency
PEC – Potential Environmental Condition
RAP – Remedial Action Plan
REC – Recognized Environmental Condition
RSL – Regional Screening Level
RWQCB-SA – Regional Water Quality Control Board, Santa Ana Region
SVOC – Semi-Volatile Organic Compound
SWPPP – Storm Water Pollution Prevention Plan
TPH – Total Petroleum Hydrocarbons
TRPH – Total Recoverable Petroleum Hydrocarbons
TTLC – Total Threshold Limit Concentration
USACE – US Army Corps of Engineers
VFH – Volatile Fuel Hydrocarbons
VOC – Volatile Organic Compound
WNOC – West Newport Oil Company

1. INTRODUCTION AND PURPOSE

This document presents a draft Remedial Action Plan (dRAP) for the approximately 400 ac Newport Banning Ranch property (the Site, Figure 1). The purpose of this document is to:

- Describe the scope of the oil field remediation project and the processes and methods that are anticipated to be used at the Site if the proposed development project is approved; and

- Describe the regulatory framework for approval of a final Remedial Action Plan (to be submitted at a later date) and the monitoring and approval process to be followed during field remediation work.

Environmental investigations and some limited restoration/remediation work have been performed at various times over the past 20 years at the Site. The Site landowner has proposed a development plan for the Site that includes a mix of residential, commercial, and open space. On 6 November 2006, the City of Newport Beach adopted its updated General Plan and listed two designations for the Site:

- Priority Alternative – Site to be made available for purchase as open space,

- Second Alternative – Site to have at least 50% preserved as open space, limited development to be permitted on the upper portion of the Site (residential, resort, commercial, and community parks).

The topographic area and features of the site and vicinity are shown in Figure 2 which highlights the division of the property between a near sea level lowland area and higher elevation uplands areas. One of the significant benefits of an approved Site development project would be the consolidation of current active oil production operations (which currently effectively utilize the entire 400-acre Site) into two interconnected oil consolidation areas totaling approximately 20 acres (Figure 3). This consolidation would free up the remainder of the Site for restoration, development, and public use. The dRAP will apply to those areas outside of the two oil consolidation areas and the interconnecting pipeline and access areas.

As is the normal process, a final Remedial Action Plan will be submitted to the Site environmental oversight agencies at a later date once the permitting and development planning process is further along and there is a better understanding of the potential of the oil field consolidation actually occurring in a specified timeframe. If the

development project does not move forward the current oil field operations are expected to continue as-is pushing abandonment and remediation work out potentially 30 to 40 years. This early dRAP is presented for informational and scoping purposes only. A key assumption in all development planning is that any residential construction will be contingent upon the completion of the remediation work and agency closure of each residential planning area.

2. SITE BACKGROUND AND HISTORICAL USES

The Site is approximately 400 acres in extent and is located east of the mouth of the Santa Ana River near the Huntington Beach – Newport Beach city boundary in Orange County, California. A map showing the location of the Site is presented in Figure 1. The Site is currently operated as a crude oil and gas production facility. The Site oil and gas production operations are being managed by Horizontal Drilling, LLC (HDLLC) and their operating affiliate, West Newport Oil Company (WNOC). The surface estate is managed by NBRLLC, a partnership including Aera Energy LLC, Cherokee Investment Partners, LLC, and Brooks Street.

Oil operations including exploration, development, and production have been conducted continuously within the boundaries of the Site since 1944. Most of the Site has been heavily impacted by these historic oil operations and the related access roads and work areas. The majority of the Site is still used today in active oil and gas production operations. There are currently over 470 producing/potentially producing and abandoned oil wells at the Site, together with related roads, transport pipeline networks, above-ground crude oil storage tanks and processing equipment, service buildings and other facilities (see Figure 3). Other historical Site uses have included: agriculture, military coast watch station, equipment storage and maintenance, and miscellaneous peripheral operations (including areas leased to welders, pipe storage, and equipment operators).

The oilfield operator, WNOC, has approximately 90 active/idle wells available for oil operations with approximately 50 operating at any one time. The City of Newport Beach operates approximately 16 wells and an oil processing facility located at the West Coast Highway entrance area (located at the southern oil operations site shown in Figure 4).

Figure 3 provides a composite picture as to the extent of the Site that has been impacted by both historic and current oil wells, pipelines, utility poles, and related facilities, as well as oilfield operation work areas like graded roads and equipment areas surfaced with gravel, asphalt, crude oil, or crude oil tank sediments, and historic sumps which held produced oil and fluids within in-ground surface impoundments. This map was assembled from a variety of in-field evaluations, technical maps, aerial photography, and other sources, and illustrates that the over 65 years of oil producing operations have resulted in substantial impacts to the Site. Additional small impacts, currently unknown, may be encountered during the facility abandonment, remediation, and grading programs. This is typical of remediation of oilfields of this size. These oil field use areas will be the focus of Site remediation efforts and both known and potential

impacts have been accounted for in the scope and schedule of the remediation effort, and in the biological technical and mitigation evaluations.

As shown on Figure 3, over 470 individual well-site pads have been cleared, cut, and leveled as part of oilfield operations; miles of supporting service roads between the well sites and facilities have been constructed; and numerous power poles and facility and equipment areas required in oil and gas operations have been cleared and constructed. There currently remains over 40 miles of pipelines throughout the Site for the conveyance of oil, water, and gas produced from the wells to various separation and treatment facilities on the Site.

Figure 3 shows that these operations are spread across both the upland and lowland areas of the Site. These oil field operations areas will be the primary focus of the remediation program and can be generally described as follows:

- Oil Wells and Pads – The surface locations of the existing or abandoned oil wells. A typical oil well pad generally includes an area of 10 to 30 feet around each oil well that contains pipelines, concrete pads, pumping and power equipment, and the work area for large workover rigs, trucks, and tanks.

- Oil Pipeline Corridors – Areas where one or more pipelines exist, or existed, to convey oil, water, and gas from each well to larger group lines, and then on to each processing facility. Most lines 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 below the surface.

- Utility Poles – Power poles to support the electrical system throughout the field. These treated wood poles support transformers, power lines, electrical panels, and other equipment to serve the oil operations. Poles were often left in place (even at abandoned well locations) to support potential future drilling.

- Oilfield Operations Areas – All areas historically used in the oil- and gas-producing operations. This includes roads, wells, and surrounding wellpads, tanks and facilities, pipeline and utility corridors and general staging and work areas. These areas have generally been graded and may be surfaced with gravel, asphalt, crude oil, crude oil tank sediments, or other materials. There are numerous facility areas throughout the Site. These vary from large facility areas that include extensive piping, oil separation and processing tanks, power facilities, mechanics and workshops, and other equipment, to smaller

individual tanks, vessels, equipment storage yards, sheds, and staging areas. In some cases vegetation has grown around or amongst these facilities and surface materials. These same areas are typically targeted for demolition and removal during an oilfield abandonment process and may require additional soil work as part of the remediation process.

- Historic Oil Sumps – In-ground produced oil and fluids storage locations identified from a 1947 aerial photograph (also included in Figure 3). This photograph showed the widest extent of sumps identified during a review of site aerial photographs.

- Continuing Oil Operations Areas – Areas containing oil tanks piping and processing equipment. These include two oil consolidation sites, and a related access road and utility corridor, which are proposed to become the only on-going oil production areas with the Site, prior to the remediation, restoration, and/or development of the other areas within the Site (Figure 4).

Because the oil operations predated the establishment of the California Coastal Act (CCA) and other related regulatory definitions and codes, oilfield operations at Newport Banning Ranch were granted a permit exemption by the California Coastal Commission (CCC) in 1973 that covers ongoing and future oil production operations and also includes abandonments and equipment/pipeline removals and cleanup as exempt activities.

A portion of the original oilfield has already undergone abandonment and remediation. A parcel of the original lowland oilfield property (92 acres along the westerly edge adjacent to the Santa Ana River) was purchased by the U.S. Army Corps of Engineers (USACE) in the late 1980s as part of the USACE Santa Ana River Flood Control Project [Mitech, 1988; USACE, 1988]. The parcel was converted to a tidally-influenced coastal wetland habitat by the USACE by the early 1990s as a wetland off-set or mitigation measure for work completed elsewhere along their project corridor. This conversion involved similar abandonment and remediation activities that are outlined in this dRAP.

3. REGULATORY OVERSIGHT FRAMEWORK

3.1 Existing Regulatory Oversight

The actual oil field operations are governed by regulations of the California Department of Conservation, Department of Oil, Gas, and Geothermal Resources (DOGGR). The DOGGR has specific guidelines for the abandonment, or reabandonment if necessary, of oil wells. DOGGR also has a process called the Construction Site Review that must be followed for oilfields that are abandoned for future development purposes.

The Site has a history of environmental oversight by both the state Regional Water Quality Control Board - Santa Ana Region (RWQCB) and the Orange County Health Care Agency (OCHCA). Since about 1992 both agencies have been involved with oversight of certain aspects of cleanup activities and site operations. Currently, the lead regulatory agency for the site (RWQCB) has approved a Remedial Action Plan [Geosyntec, 2002c; RWQCB, 2003] and is overseeing remediation efforts to recover an isolated pocket of crude oil located on top of the shallow brackish groundwater in the main drillsite area (northern portion of the consolidation areas identified on Figure 4). No other area of the Site currently requires remediation under its present use as an operating oilfield. The nature and extent of future remediation for this and other areas of the Site will depend on the ultimate reuse of the property.

This existing oversight structure is expected to continue through field abandonment and remediation activity as both agencies have the most experience of any agencies with oilfield-to-development type projects. There have been many such projects in Orange County over the years and these agencies have had the lead for environmental resource and human health matters. In the case of the NBR Site where there are no hazardous wastes or levels of contaminants, and where the groundwater levels in the lowlands are shallow and of prime importance to the State, it is expected that the RWQCB will continue to be the lead agency until the Site receives closure.

3.2 Wetland and Habitat Considerations

Since the late 1980s when the USACE was involved in the restoration of the parcel between the Santa Ana River and the current Site area, biological resource agencies, specifically the California Department of Fish & Game (DFG) and the United States Fish & Wildlife Service (FWS) have been involved in wetlands, sensitive habitat and species determinations.

As part of the project, biologists have conducted general biological surveys for the property, recording flora and fauna observed on Site, as well as recording sensitive species/habitat locations, and mapping Site vegetation [Glenn Lukos, 2009a]. Impacts from the abandonment and remediation of existing, and potentially encountered environmental impacts, were considered in these studies. Biologists have also conducted habitat assessments for special-status animals and plants, including species listed or proposed for listing as endangered or threatened by the federal or state government [Glenn Lukos, 2009b].

The resource agencies actively provide input on sensitive areas not to be disturbed during specific times of the year. These agencies will be consulted for similar determinations prior to and during the site-wide abandonment and remediation, when it occurs.

4. SITE ASSESSMENTS AND INVESTIGATIONS

4.1 Overview

Numerous environmental sampling and testing events occurred as part of the historic oil and gas production activities between 1986 and 2000 providing basic field assessment information. In late 2000, the landowners commissioned a comprehensive, site-wide Phase II Environmental Assessment (EA) [Geosyntec, 2001] with field sampling conducted between May and August 2001. This study was a comprehensive field investigation of the impacts from the historic oil operations. The final report was submitted to the Regional Water Quality Control Board – Santa Ana Region in November 2001. More recently an updated Phase I Environmental Site Assessment (ESA) Report [Geosyntec, 2008] was completed as part of the development proposal studies. Table 1 provides a brief history of environmental sampling activities performed at the Site.

4.2 Phase II Site EA Investigation

In 2000, the overall Site Environmental Assessment (EA) work plan was developed. The objective of the EA was to characterize the nature and extent of potential impacts to soil and groundwater at areas determined to be a potential environmental concern (PECs), and to evaluate location and potential volumes of impacted materials that may require remediation (Figure 5). The EA fieldwork was then completed in phases during 2001 and consisted of collecting and evaluating over 550 samples from 222 test pits/borings, 10 ground water monitoring wells, surface water, and soil gas sampling points [Geosyntec, 2001]. The excavated test pits also allowed for visual observations of hydrocarbon impacts, as well as soils that did not appear to be impacted by hydrocarbons. The EA incorporated results of the previous sampling events, providing a more comprehensive Phase II characterization in key areas.

Twenty three (23) areas were identified as PECs. As anticipated, the Site is impacted primarily by petroleum hydrocarbons. Only 7 of the 23 PECs investigated showed any significant hydrocarbon impacts beyond surface areas. During the soil evaluation, soil gas was observed (i.e., bubbling) in a lowland pond near PEC #02 – Main Site Tank Farm. Samples were collected using Tedlar bags. Analytical results indicated elevated methane concentrations (up to 73.2 percent). No hydrogen sulfide was detected. This area is adjacent to the future Main Drillsite and not within the development area. There were no indications of soil gas observed in the upland areas (e.g., odors indicating a release from soils or abandoned wells).

At each of the areas tested, no contaminant levels were found to exceed the hazardous waste criteria (i.e., concentration levels defined by state and federal guidelines). The state Hazardous waste levels are provided in the California Code of Regulations (CCR), Title 22. Table 3 provides a summary of the soil sample analytical results from the Phase II Environmental Assessment [Geosyntec, 2001]. The hydrocarbon impacts observed were generally confined to the upper soil layers (i.e., within approximately 6 feet of the surface). These types of impacts are consistent with other oil fields of this age and similar to other oil fields that have been remediated for residential development. Aera has engaged in clean-up operations at other oil fields in Southern California, including Yorba Linda, Brea, and Bolsa Chica.

TABLE 3
RANGE OF SOIL SAMPLE RESULTS – EA (2001)

Contaminant	Range	Comments
TPH	0 – 6,000 ppm	Typically weathered crude oil, limited areas of high saturation
SVOCs	0 – 3 ppb	No SVOCs detected above residential or industrial soil RSLs
VOCs	0 – 1,700 ppb	No VOCs detected above residential or industrial soil RSLs
Pesticides	0 – 11 ppb	No pesticides detected above residential or industrial soil RSLs or residential or industrial soil CHHSLs
PCBs	0 – 290 ppb	PCBs were detected in two samples at concentrations above the residential, but below the industrial soil RSL and industrial soil CHHSL
Metals		No Metals detected above TTLC

The groundwater beneath the site is a shallow (in the lowland area), non-potable brackish zone that is tidally influenced. Table 4 provides a summary of the groundwater sample analytical results from the Phase II Environmental Assessment. One area, at the existing oil operations tank farm (northern extent of the future oil consolidation area – Figure 4), encountered crude oil as free-product on the shallow groundwater in one monitoring well. The free-product well is bounded by other wells thus the impact is contained and isolated.

TABLE 4
RANGE OF GROUNDWATER SAMPLE RESULTS – EA (2001)

Area (PEC No.)	Contaminant	Range	Comment
Main Site Tank Farm, (PEC02)	TPH	N/A – Free product	Wells within former sump area
Main Site Tank Farm, (PEC02)	TPH Methylene Chloride	0 – 26 ppm 0 – 91 ppb	Perimeter Wells Methylene Chloride detected above MCL
Maintenance Shop / Warehouse (PEC01)	Benzene Methylene Chloride Vinyl Chloride	0 – 1.1 ppb 0 – 100 ppb 0 – 15 ppb	Benzene, Methylene Chloride, and Vinyl Chloride detected above MCLs
Former Sump / Clarifier (PEC08)	Methylene Chloride	0 – 25 ppb	Methylene Chloride detected above MCL

This impact area has since been submitted into the RWQCB-SA voluntary cleanup program and after approval of an initial area-focused free-product Remedial Action Plan [Geosyntec, 2002c] has been undergoing free-product removal and monitoring since 2001. Additional free-product recovery wells and monitoring wells have been installed in that interim time and the pumping system has been upgraded to two solar powered skim pumps. The second phase of the free-product Remedial Action Plan includes removal of the deeper crude oil impacted soils once the adjacent operating facilities are abandoned and demolished. While this site is located within one of the oil consolidation areas and is not directly associated with the development project, it is anticipated that additional work would be done here at the same time as the field consolidation abandonment and remediation program upon the development approval.

4.3 Updated Phase I ESA

The most recent Phase I ESA [Geosyntec, 2008] served to update the EA with issues, testing and cleanups that were conducted between 2001 and 2008. Based on modifications to the process by which Phase I environmental site assessments are performed as well as evaluating areas on Site that were subleased, the number of identified Recognized Environmental Conditions (RECs) included a total of 27 on-site

RECs, three historical RECs, and four off-site facilities as RECs. The on-site RECs are shown on Figure 5 (for the purposes of this draft RAP they are identified as Potential Environmental Conditions – PECs) and additional background information on the identified RECs is presented in Table 2. The total number of PECs has been adjusted slightly over the years due the changing methods used to define PEC. For example, the list of RECs (per the definition of Recognized Environmental Conditions by the American Society for Testing and Materials, ASTM, classification in standard Phase I ESA guidance) identified in the Phase I ESA included the 21 PECs (Potential Environmental Conditions) and three additional "historical RECs" per the updated ASTM guidance. The three historical RECs include the Cement Return Area, Wetland Fill Area, and Storm water/surface water quality issues. These historical RECs have been addressed and closed by the current Site owner and operator.

4.4 Past Soil Cleanup Activity

During the low oil price environment of the 1990's and in conjunction with earlier development planning, the oil operator, WNOC, embarked on a program to abandon the least productive wells of the time. As part of this effort, and based on results of the early 1986 to 2000 site testing, a basic hydrocarbon cleanup plan (initially referred to as the Environmental Restoration Plan) was developed to cleanup soils associated with abandoned oil wells. The plan outlined basic hydrocarbon cleanup levels (Table 5) and a bio-remediation pilot scale treatment area to remediate impacted soils. The plan was initially submitted to the OCHCA who approved it in October 1992. The plan was also submitted to and reviewed by the RWQCB and other agencies including the DFG and the FWS. The plan was updated in 1994 and was used to excavate and manage well abandonment soils from 1994 to about 2001 [Geosyntec, 2001].

As outlined in previous sections, the 2008 Phase I EA Update discusses additional focused areas of the Site (or issues) that were remediated and closed. These efforts were under the direction of the RWQCB who recommended cleanup levels similar to those used in the Yorba Linda Oil Field which was also converted to residential development (Table 5).

5. PROPOSED REMEDIATION SCOPE AND PROCESS

5.1 General

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 remedial efforts will actually occur in all of the three major early phases of the approved development project. These include oil field facility demolition, full field remediation, and development area grading. The discussion in this dRAP assumes that the oil field facility demolition phase has been completed. The impacted areas outlined in the Phase II EA report, along with estimated depths and volumes, will provide the basis and scope of the Remediation cleanup plan. Figure 6 shows the expected remedial excavation areas of the Site.

In addition to the PEC areas it is expected that additional impacted soils will be identified during the oilfield facility demolition phase. The removal of all pipelines, facilities, power poles, and other structures will be monitored by third party environmental consultants to identify and document further indications of impacts for the remediation phase. Also, as development area grading is the most comprehensive type of visual confirmation possible, environmental monitoring will be present at that time also to address signs of smaller impacts. An estimate of these expected impacts from these phases is included in the total volume numbers.

5.2 Expected Environmental Impacts and Volumes – Soils, Asphalt and Concrete

Investigations and testing indicate the Site is predominantly impacted by petroleum hydrocarbons, specifically degraded and weathered crude oil. No hazardous levels of any materials were found during the sampling events and assessments. The Site also includes road materials made up of varying amounts of gravel, asphalt, crude oil, or crude oil tank sediments, and large amounts of concrete used in oil field operations and facilities. These materials are expected to be addressed during the remediation phase.

Table 2 shows a summary of the types of impacts that were found at the PECs and the estimated remediation volumes at those sites. The table also includes current estimates of additional soils at oil wells, pipelines and the free-product site. The current estimate is that approximately 246,000 cubic yards of materials will be addressed during the remediation. Of this, approximately 138,000 cubic yards are hydrocarbon impacted soils and an additional 108,000 cubic yards are surface road materials and concrete. As

with all remediation projects these estimates can vary substantially when actual removals begin.

5.3 Expected Environmental Impacts – Methane and VOCs

The crude oil produced in the Site oil operations is a heavy, high gravity oil that has very little associated methane gas. Though no indications of soil gas in the uplands were observed, one site in a lowland wetland pond was observed to have small amounts of soil gas emanating from the water. That site was not near an oil well and is assumed to be a natural occurrence in the wetlands.

There were no VOCs detected in soil samples above residential RSLs. Very low levels of VOCs were detected in subsurface water in isolated locations in the lowlands. Though no significant areas of VOC impacted soil or groundwater exists at the site, all the low-level detections are associated with facility areas that are targeted for remediation thus will have full verification sampling conducted to confirm health based levels are attained.

5.4 Remediation Process Approach

5.4.1 General

Abandonment and Remediation of the historic oil field operations areas will be a tremendously complex and costly undertaking. Upon initiation of the consolidation process, plugging and abandoning of the approximately 90 remaining active/potentially active lowland and upland wells will commence, together with demolishing and removing the pipelines, utility poles, and other related production equipment, buildings, and road surface materials. These activities will not only clear the Site for the remediation phase but they may also expose, identify, and verify the existence of additional smaller impacts requiring remediation. It is expected that the remediation program will follow shortly after the well and facility demolition and abandonment process.

Significant efforts will be made at the Site to recognize the "big picture" impacts of such operations in order to minimize impacts to resources, especially potential Special Status Habitats, both within the Site and in surrounding areas. These efforts will include such things as minimizing what is disposed of in landfills, which, in turn, will minimize both traffic impacts and the resulting emissions from large transportation truck usage. Impact avoidance and potential mitigation efforts for the development related project work is addressed in the project biological studies.

The following are guiding strategies for both the oilfield abandonment and remediation effort:

1. Recycle or reuse all salvageable materials.

2. Remediate soils on-site, whenever feasible, using natural bio-remediation processes.

3. Remove heavy hydrocarbons from the site and recycle into offsite roadway materials.

4. Reuse remediated soils and restored materials in development fills whenever possible.

5. Minimize off-site traffic, hauling, and disposal.

6. Work in collaboration with appropriate regulatory stakeholders and resource agencies to limit disturbance to desirable on-site vegetation whenever possible.

In addition, as described earlier, the oil field abandonment activities are managed in accordance with DOGGR regulations, and the potential for combustible gases in the subsurface will be evaluated and mitigated according to OCFA Guideline C-03.

5.4.2 Methane and VOC Mitigation

Both methane and VOC impacts, at levels of significance, could pose vapor intrusion concerns for overlying developments. The two accepted approaches to these concerns are source remediation and engineering controls. Though no significant levels of either methane or VOCs have been detected at the Site, both source remediation and engineering controls are proposed to be used for added measures of safety.

In the uplands, all the detected low-level impacts and potential sources are targeted for remediation. These include facility areas and all immediate well sites. There are no indications that groundwater underlying the upland future development area is impacted by VOCs. Similarly, in the lowlands, all the detected low-level impacts and potential sources are targeted for remediation. This includes facility areas, well sites, and the isolated water impacts. There were no significant levels detected in groundwater and those areas with low-level impacts are isolated, contained, and do not extend under the upland area.

Engineering controls, or mitigation, for both methane and VOCs are essentially identical for structures. Though no indications of soil gas or significant VOC impacts by the oil field operations were observed in the upland area, full mitigation measures, as defined in the Orange County Fire Authority Guideline C-03 [OCFA, 2008] – Combustible Soil Gas Hazard Mitigation document will be implemented throughout the development area. This well-established 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 with former oil field operations. These designs include subsurface oil well venting systems, structure sub-slab barriers, structure vent guidelines, and surface vent guidelines. As part of the OCFA Guideline, a hazard gas assessment must be conducted at the beginning of the process. This assessment will be conducted once the potential sources are remediated and will include a screening of VOC components.

5.4.3 Clean-Up Levels and Re-Use of Materials

Previous cleanups have established RWQCB and OCHCA regulatory-approved clean-up levels for each constituent of concern or Site area (Table 5). The established TRPH clean-up levels vary based on a multi-depth approach considering depth below final grade and final site use (commercial or residential or open space). The currently applicable levels are those provided in the first page of Table 5 (based on 2001 correspondence with RWQCB). The final RAP will propose clean-up levels for the full field remediation and development and may include additional levels for other non-TRPH constituents of concern at the site. Proposed clean-up levels in the final RAP will consider:

- historic and regulatory suggested levels;
- approved clean-up levels from other oil field development sites;
- risk-based calculations; and
- EPA Regional Screening Levels.

Certain, agency-approved materials may be re-used as part of Site development. For specific materials that result from the demolition and remediation activities, such as treated soil and concrete, these materials may be used as fill. The materials will meet clean up criteria similar to approved standards for this project, based on depth of placement below grade. For example treated soils may be used 10 feet below final grade, and crushed concrete below 15 feet. These materials will also be subject to appropriate geotechnical criteria needed for development.

5.4.4 Remediation Areas and Methods

The remediation process consists of two distinct components: remediation of known areas of impact, and remediation of areas encountered during the consolidation and grading of the Site.

In the known areas of impact, it is estimated that over 138,000 cubic yards of soil will require some degree of remediation due to non-hazardous hydrocarbon (i.e., crude oil) impacts. These are the known impacts (Table 3). The majority of these soils are lightly impacted from the crude oil operations. Some areas will have an older, heavier accumulation of weathered crude oil from historical operations. Removals and excavation sites will be tested and verified to meet the RAP criteria by third party State-approved laboratories.

No hazardous levels (per state and federal concentration criteria) of any materials were found at the Site in the EA. The potential for soil gas impacts will be addressed primarily through the application of the OCFA Guideline C-03. Based on the groundwater assessments performed at the site, there were no historical groundwater impacts detected under or in the immediate vicinity of the development area. Table 4 provides a summary of the groundwater sample analytical results compiled from the Phase II Environmental Assessment [Geosyntec, 2001]. Groundwater impacts were noted in the following areas of the site: the mechanics shop, the Main Site Tank Farm (also referred to as the Main Drill Site), and a former sump location to the south of the Main Drill Site. Groundwater impacts detected near the Main Drill Site area are currently being remediated through the implementation of an agency-approved Remedial Action Plan [Geosyntec, 2002c]. The low level groundwater impacts in the other areas will be addressed in the final RAP.

Under the past approved cleanups, hydrocarbon impacted soils have been successfully bioremediated in a pilot-scale bioremediation cell (i.e., biocell). Thus, a continuation of the soil bioremediation method to treat and clean hydrocarbon impacted soils is appropriate. The bioremediation of hydrocarbon containing materials generally consists of: siting and layout of large treatment areas, construction of containment and handling areas, and operation of the treatment area. The actual bioremediation process involves the control of moisture in the soils as they are periodically mixed and turned. This process aerates the soils and encourages the growth of the indigenous hydrocarbon reducing bacteria. The process is monitored by periodic sampling of the treated soil, until the agency-approved clean-up levels are achieved. Upon approval of the oversight agencies, the treated soils are removed and re-used. Details of this process including location of the on-site treatment areas, stormwater control and design details, as well as

maintenance and closure specifications will be provided in the final RAP for these impacts.

The PECs where some remediation is likely to be required are listed in Table 2. In general, the remediation process will consist of:

1. Sampling materials within known areas of impact to evaluate the extent of removal needed in each area (note that this may conducted simultaneously with remedial excavation operations).

2. Impacted materials will be removed and stockpiled in specified areas of the site. Materials will be stockpiled with respect to their potential for re-use as fill on site, or potential for haul off (dependent on concentration and nature of impacts, i.e., ability to be bioremediated on-site). Areas will be contained to limit erosion and runoff issues from stockpiling operations.

3. For materials that are not likely to be effectively treated by on-site bioremediation (e.g., highly weathered crude oil), these materials will be segregated near transportation access points for recycling at an approved off-site facility. Materials identified that have constituents exceeding hazardous criteria will be stockpiled and handled separately (note that no materials having concentrations exceeding hazardous criteria have yet been identified).

4. The stockpiles will be adjacent to treatment locations (i.e., biocells). Materials will be spread and handled to enhance natural biodegradation of petroleum hydrocarbons.

5. Confirmation sampling will occur within the biocell areas. Samples of soil will be collected at a specified frequency and agency-approved treatment batch volume. These samples will be subjected to laboratory analysis. Based on the results, materials will either continue to be treated, or moved to re-use areas if sample results indicate that agency-approved criteria have been achieved.

As described previously, this will be a time-intensive and complex process. For example, soils with very heavy hydrocarbon impacts may be isolated for longer term, more intense bioremediation, may be taken off-site to acceptable recycling units, or may be treated on-site by thermal methods to the appropriate cleanup level. These options recognize the overall goal to remediate and/or recycle impacted materials onsite 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. Material export options would be used sparingly as appropriate.

Development of portions of the Site will require substantial grading for road infrastructure, geotechnical stability work, and for general site improvements. In the event that some impacts are encountered during development, similar remediation procedures will be enacted pursuant to contaminants found. In some of the open space and road areas requiring backfill, treated and lightly impacted soils may be recycled into the substructure. The abandoned oil wells in the development areas will be managed per DOGGR regulations, and the potential for combustible gases in the subsurface will be mitigated in the development areas according to OCFA Guideline C-03.

5.4.5 Verification and Documentation

As remediation and restoration activities are concluded in each area, a verification sampling program will be performed. This sampling program is designed to verify that the area meets the agency-approved criteria for environmental closure. This will involve collection of samples from appropriate environmental media (e.g., soil, groundwater, surface water) in each area, laboratory analysis of specified constituents, and evaluation of the results. This will likely be an iterative process, whereby additional targeted remediation and verification sampling may need to be performed until verification samples meet agency-approved criteria.

In addition, the remediation activities will be monitored to evaluate compliance with appropriate Site dust, odor and emission control requirements. Following approval of the development project, a Storm Water Pollution Prevention Plan (SWPPP) will be prepared prior to initiating site-wide remediation activities. The SWPPP will document best management practices (BMPs) that will be in place and monitored during the course of remediation activities.

The results of the verification process will be documented and submitted to the agencies in a Cleanup and Closure Report for their review and approval. Each area will be deemed complete when the environmental Oversight Agencies approve the Report and grant closure or No Further Action.

6. SUMMARY AND CONCLUSIONS

Since actual remediation activities are dependent on the final approved development alternative, this dRAP is for informational and planning purposes only. As is the normal procedure, a formal and detailed RAP will be finalized and submitted to the environmental oversight agencies at a later date when:

1. there is a better understanding of the potential of the development permitting and of the oil field consolidation actually occurring, and

2. there is a better understanding of the timeframe in which the oil field consolidation and remediation may actually happen after approvals are granted.

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Tables

TABLE 1

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

TABLE 1 (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.

TABLE 1 (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.

TABLE 1 (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

TABLE 2

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT UPDATE NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (March 2008)

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	• 5,500
02	Drill Site Tank Farm	• 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	• 44,500

TABLE 2 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (March 2008)

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
03	Air Compression 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
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
05	Water Softening Plant (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 2 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (March 2008)

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
06	Secondary Tank Farm (currently out-of-service)	• 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	• 1,500
07	Pilot-Scale Bioremediation Cell	• 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
08	Former Sumps and Clarifiers (south of the Drill Site Tank Farm)	• 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	• 19,500

TABLE 2 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (March 2008)

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
09	Electrical and Transformer Storage	• possible PCB leaks from electrical transformers • 2001 testing program results indicated localized areas of hydrocarbon soil impacts - PCBs were not detected	• 50
10	Transformer Mounts	• 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
11	Offices / Changing Rooms	• septic wastes • possible solid waste disposal areas (near) • 2001 testing program results did not indicate impacts at this location	• 0

TABLE 2 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (March 2008)

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
12	Area immediately adjacent to City of Newport Beach Tank Farm (boundary conditions)	• above ground storage tanks • oil and gas dewatering operations • natural gas treatment • underground sump • 2001 testing program results indicated localized areas of soil impacts	• <2
13	Not Applicable	• this PEC was grouped with another PEC	• NA
14	Not Applicable	• this PEC was grouped with another PEC	• NA
15	Underground Storage Tanks and Fuel Pump	• possible gasoline leaks from UST, however UST was closed per regulations • 2001 testing program results indicated a localized area of soil impacts	• <2
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

TABLE 2 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (March 2008)

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
17	Oil and 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	Concrete Cellar Stockpile and Miscellaneous Debris Stockpiles	• 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 (concrete)
19	Abandoned Shack	• possible chemical spills and/or leaks from past operations • 2001 testing program results did not indicate impacts at this location	• 0

TABLE 2 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (March 2008)

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
20	Miscellaneous Debris and Soil 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
21	Miscellaneous 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	Soil Stockpiles	• possible leaching of materials from the soil to the ground • 2001 testing program results did not indicate impacts at this location	• 0

TABLE 2 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT NEWPORT BANNING RANCH ORANGE COUNTY, CALIFORNIA (March 2008)

PEC	DESIGNATION	ORIGINAL RATIONALE FOR PEC LISTING	ESTIMATED SOIL TO BE MANAGED (cubic yards)
23	Equipment Storage	• 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	Main Office	• 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 and pipelines)	• tank bottom materials • oil-impacted soil • concrete cellar • debris • Previous testing program results indicated localized soil impacts along these features	• 52,500 (petroleum soils) • 93,000 (asphalt/roads)

TABLE 2 (continued)

POTENTIAL ENVIRONMENTAL CONDITIONS
IDENTIFIED IN PHASE II EA AND PHASE I ENVIRONMENTAL SITE ASSESSMENT
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA
(March 2008)

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	• 4,500
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)			138,000 (petroleum soils) 108,000 (concrete, asphalt/road material) 246,000 Total

TABLE 5
SUMMARY OF HISTORIC CLEANUP LEVELS
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA

LAND USE	DEPTH FROM FINAL GRADE (below ground surface)	CHEMICAL CONSTITUENT AND EPA METHOD USED TO VERIFY CONCENTRATION*	ALLOWABLE CONCENTRATION (mg/kg)
2001 RWQCB-SA			
Residential (Impacted & Remediated Soil)	0 – 15 feet	TRPH (EPA 418.1) TPH (EPA 8015M w/ carbon chain identification from C13-C23 inclusive) BTEX (EPA 8021b)** VFH (EPA 8015M)	100 (screening tool only) 100/1,000*** B=ND, T=0.1, E=0.68, X=1.75 ND
	> 15 feet	TRPH (EPA 418.1) TPH (EPA 8015M w/ carbon chain identification from C13-C23 inclusive) BTEX (EPA 8021b)** VFH (EPA 8015M)	5,000 5,000 B=0.10, T=10, E=68, X=175 100
Non – Residential (Impacted & Remediated Soil)	0 – 15 feet	TRPH (EPA 418.1) TPH (EPA 8015M w/ carbon chain identification from C13-C23 inclusive) BTEX (EPA 8021b)** VFH (EPA 8015M)	1,000 (screening tool only) 1,000 B=ND, T=0.1, E=0.68, X=1.75 100
	> 15 feet	TRPH (EPA 418.1) TPH (EPA 8015M w/ carbon chain identification from C13-C23 inclusive) BTEX (EPA 8021b)** VFH (EPA 8015M)	15,000 5,000 EPA Residential PRGs B=0.65, T=520, E=230, X=210 500

Notes: * Based on the type of hydrocarbon impact encountered one or more of these analyses 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
BTEX = Benzene, Toluene, Ethylbenzene, and Xylenes
VFH = Volatile Fuel Hydrocarbons
mg/kg = milligrams per kilogram
ND = Non-detect
PRG = Preliminary Remediation Goal (EPA Region IX)
C13-C23 = Carbon Chain length (numbers indicative of number of carbon atoms in the hydrocarbon chain)
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 PRGs, TRPH/TPH up to on-site concentrations, VFH not to exceed 500 mg/kg

TABLE 5 (continued)

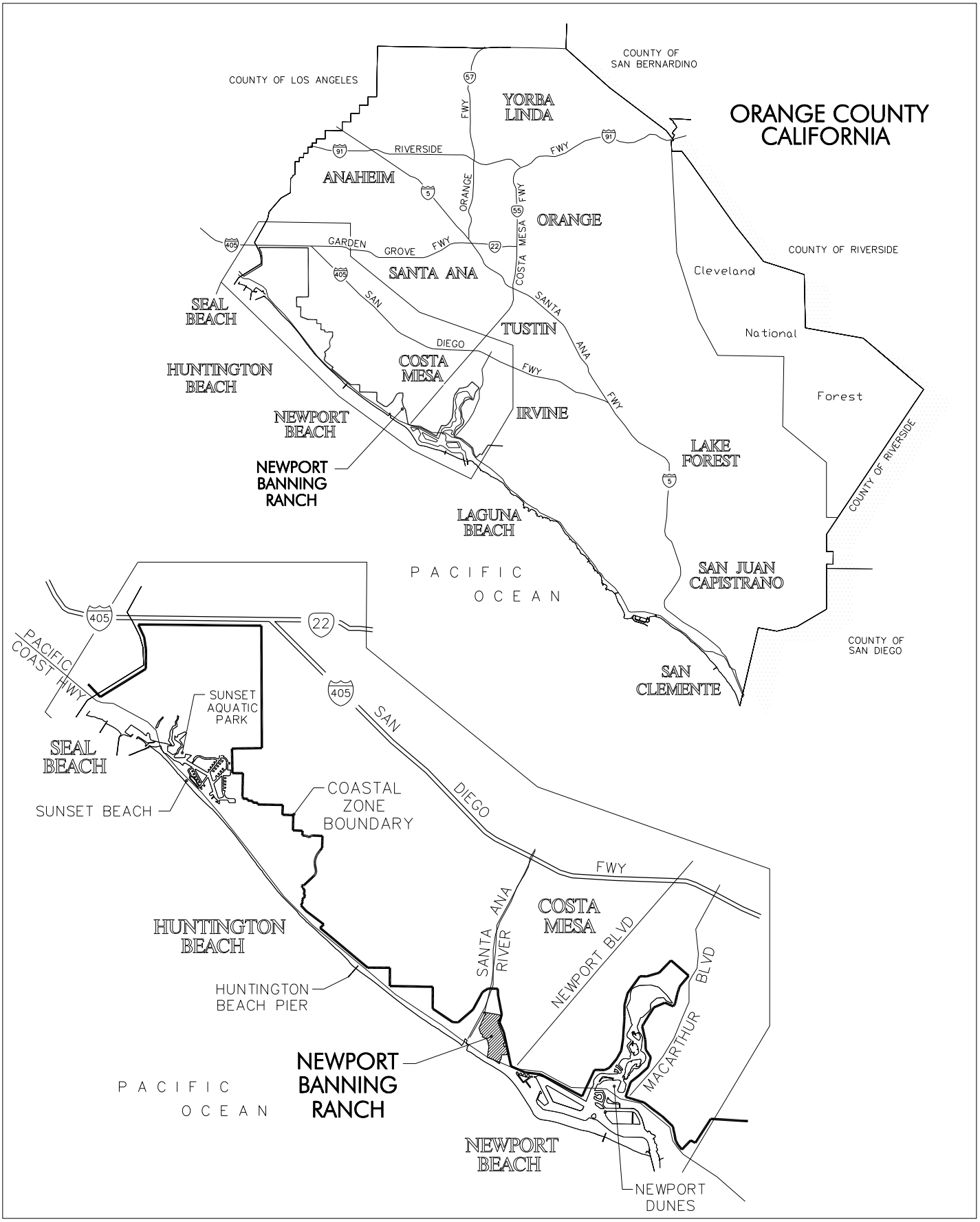
SUMMARY OF HISTORIC CLEANUP LEVELS
NEWPORT BANNING RANCH
ORANGE COUNTY, CALIFORNIA

LAND USE	DEPTH FROM FINAL GRADE (below ground surface)	CHEMICAL CONSTITUENT AND EPA METHOD USED TO VERIFY CONCENTRATION*	ALLOWABLE CONCENTRATION (mg/kg)
1996 Agency – Approved			
Residential	0 – 10 feet	TPH (method not specified)	100
	> 10 feet	TPH (method not specified)	10,000 (OCHCA Review Required)
		TPH (method not specified)	10,000 – 20,000 (RWQCB-SA Review Required)
		TPH (method not specified)	>20,000(1) (OCHCA & RWQCB-SA, Review Required)
Commercial or Open Space	0 – 3.5 feet	TPH (method not specified)	1,000
	>3.5 feet	TPH (method not specified)	10,000 (OCHCA Review Required)
		TPH (method not specified)	10,000 – 20,000 (RWQCB-SA Review Required)
		TPH (method not specified)	>20,000(1) (OCHCA & RWQCB-SA, Review Required)

Notes: OCHCA = Orange County Health Care Agency
RWQCB-SA = Regional Water Quality Control Board, Santa Ana Region

(1) Areas having values of soil TPH > 20,000 mg/kg would require gas monitoring with methane <5% Lower Explosive Limit to remain in-place

Figures



NEWPORT BANNING RANCH

Figure 1
Site Location Map

REMEDIAL ACTION PROGRAM
City of Newport Beach - California

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Geosyntec consultants FUSCOE FORMA

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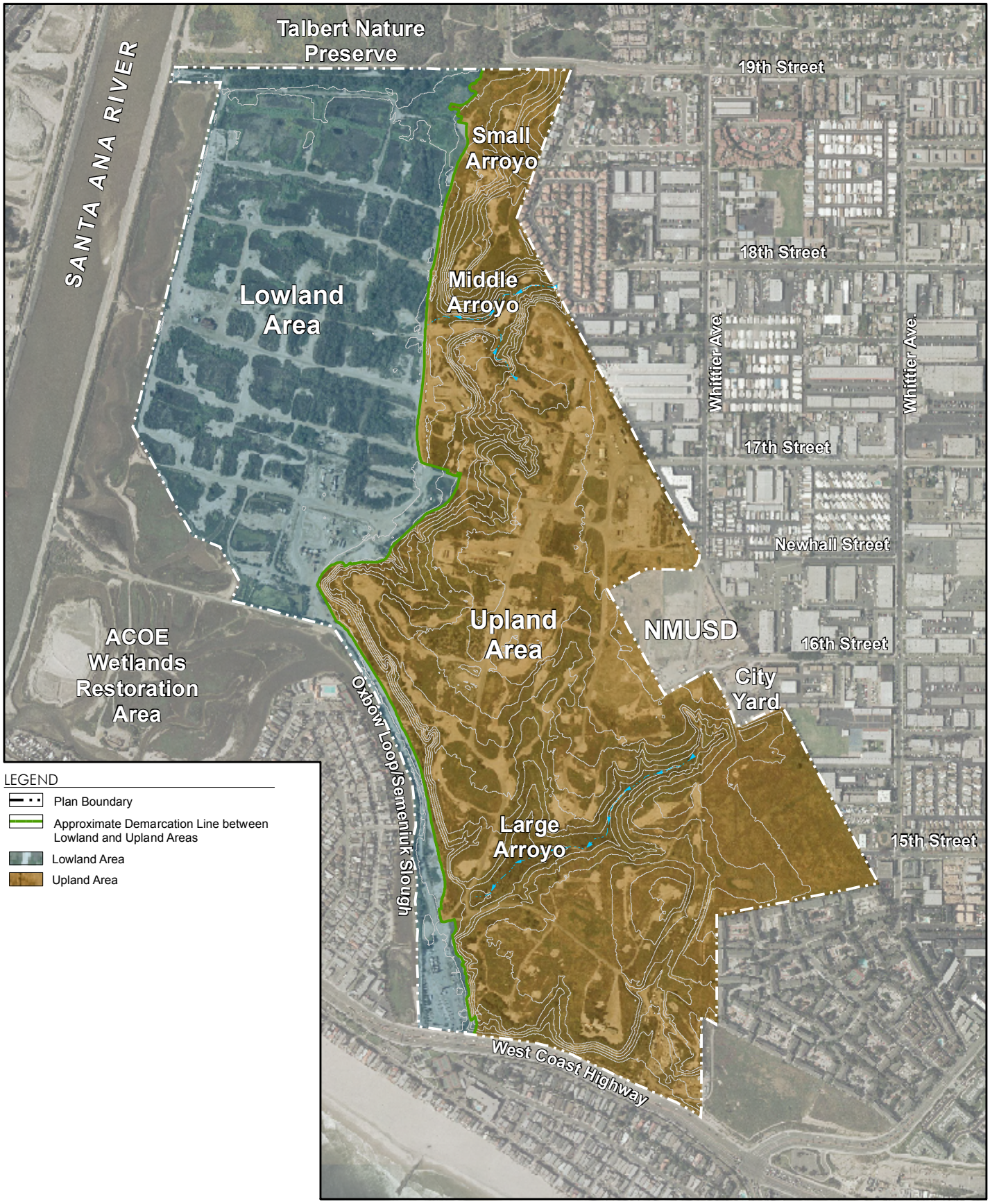

NEWPORT BANNING RANCH

Figure 2

Topographic Areas and Features Map

REMEDIAL ACTION PROGRAM
City of Newport Beach - California

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Geosyntec consultants

FUSCOE ENGINEERING

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07 • 14 • 2009

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LEGEND

- Plan Boundary
- Abandoned Oil Wells
- Active / Potentially Active Oil Wells
- Utility Poles
- Oil Pipeline Corridors
- 1947 Oil Sumps
- Oilfield Operation Areas

NEWPORT BANNING RANCH

Figure 3

Historic Oilfield Impacts Map

REMEDIAL ACTION PROGRAM
City of Newport Beach - California

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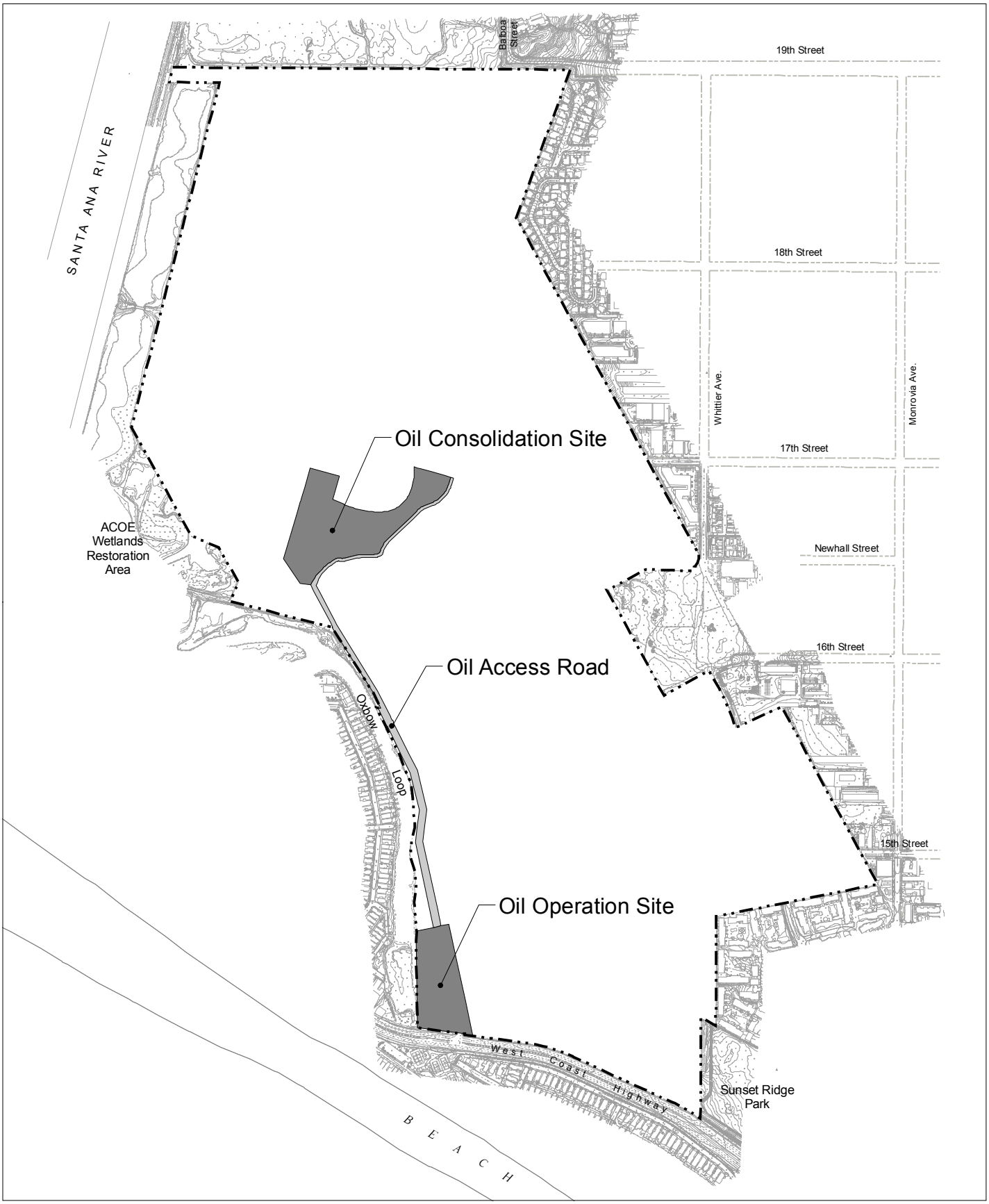

NEWPORT BANNING RANCH

REMEDIAL ACTION PROGRAM
City of Newport Beach - California

Figure 4
Oil Consolidation Areas

0 900

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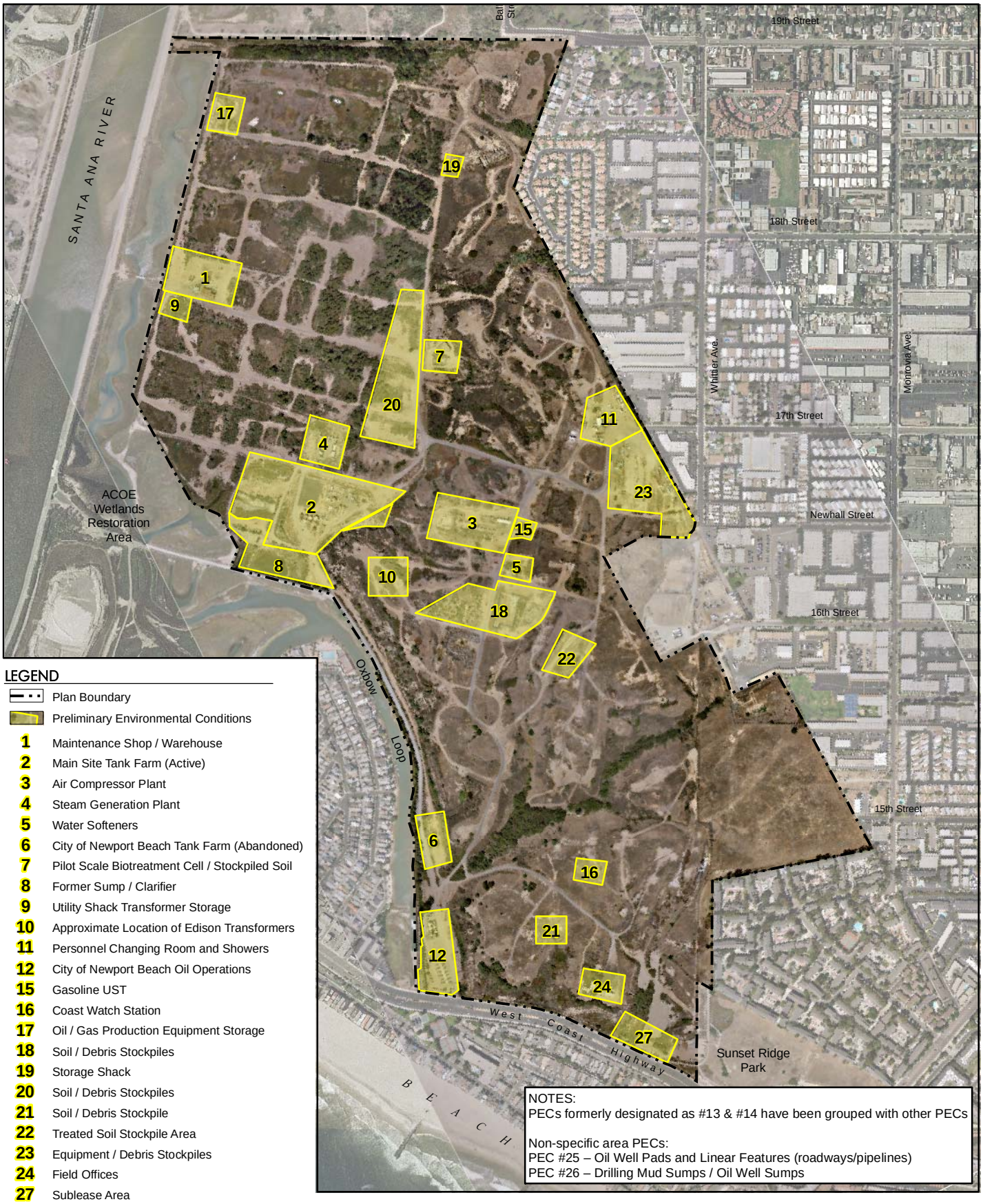

LEGEND

- Plan Boundary
- Preliminary Environmental Conditions

1 Maintenance Shop / Warehouse
2 Main Site Tank Farm (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 Equipment Storage
18 Soil / Debris Stockpiles
19 Storage Shack
20 Soil / Debris Stockpiles
21 Soil / Debris Stockpile
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

NEWPORT BANNING RANCH

Figure 5
PEC Location Map

REMEDIAL ACTION PROGRAM
City of Newport Beach - California

0 900

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07 • 14 • 2009

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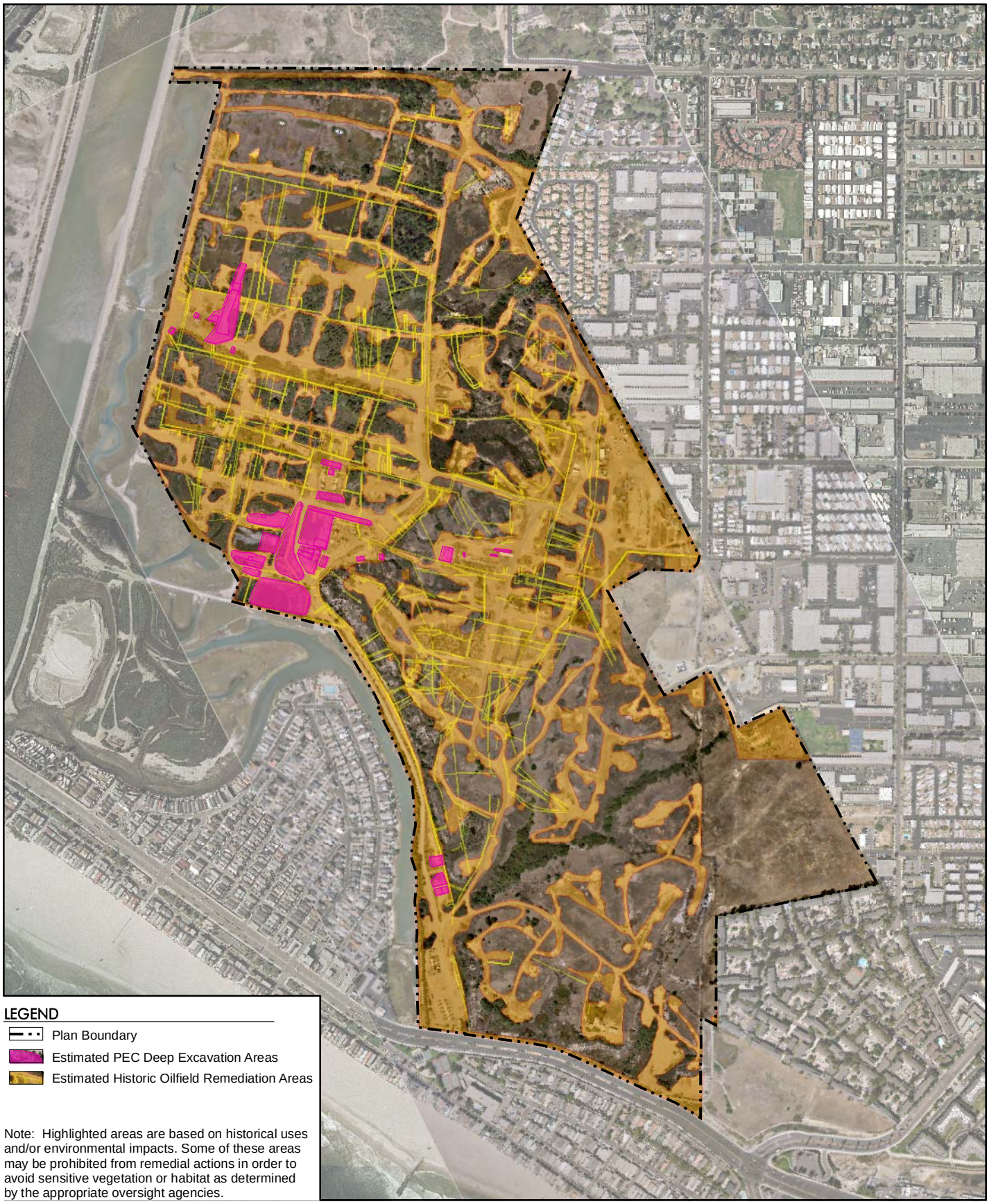

NEWPORT BANNING RANCH

Figure 6

Estimated Remedial Excavation Areas

REMEDIAL ACTION PROGRAM
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0 900

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Appendix A

Orange County Fire Authority Guideline C-08
Combustible Soil Gas Hazard Mitigation

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

Approved and Authorized by

Guideline C-03

Laura Blaul
Fire Marshal / Assistant Chief

Date: January 1, 2008

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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.).

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 soil gas investigation and 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.

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

C. 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.

D. The abandonment of oil/gas wells located within the Building Restriction Zone shall have the current approval of the D.O.G.G.R. Their website is www.conservation.ca.gov/dog/for_operators/Pages/construction_site_review_faqs.aspx. 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 Uniform 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 Uniform 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 Uniform 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 35 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)

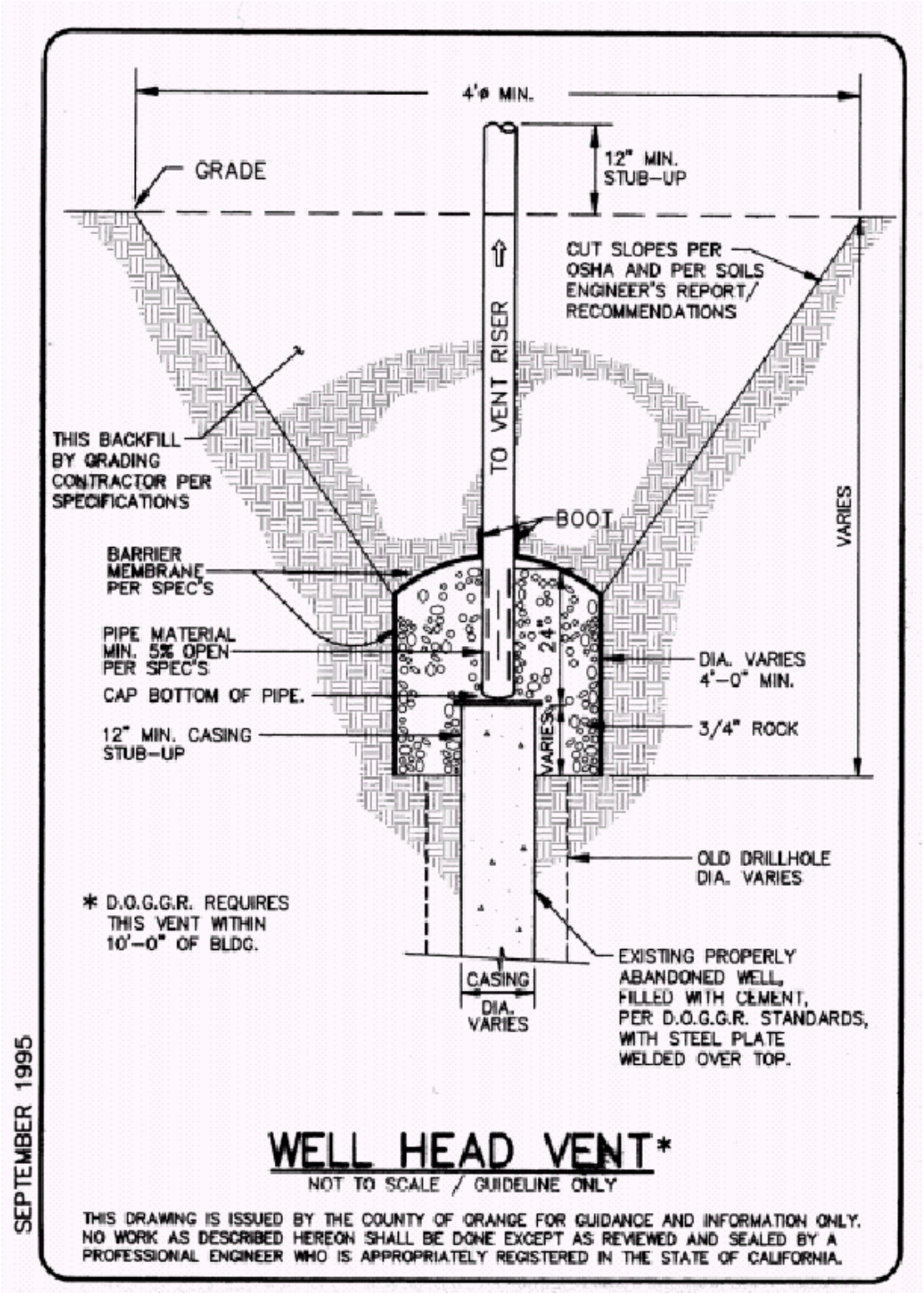
Summary of Gas Assessment Conclusions

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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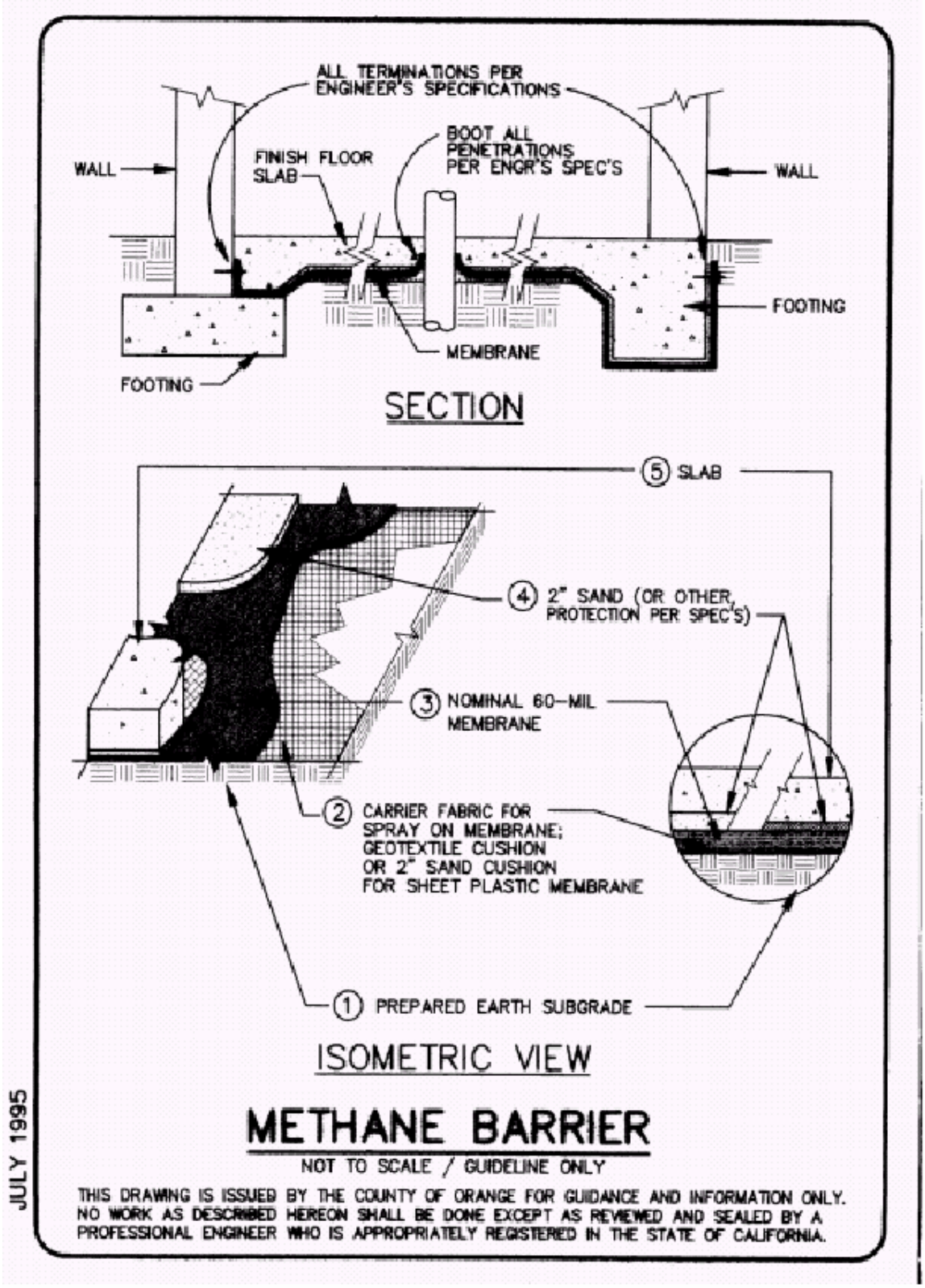

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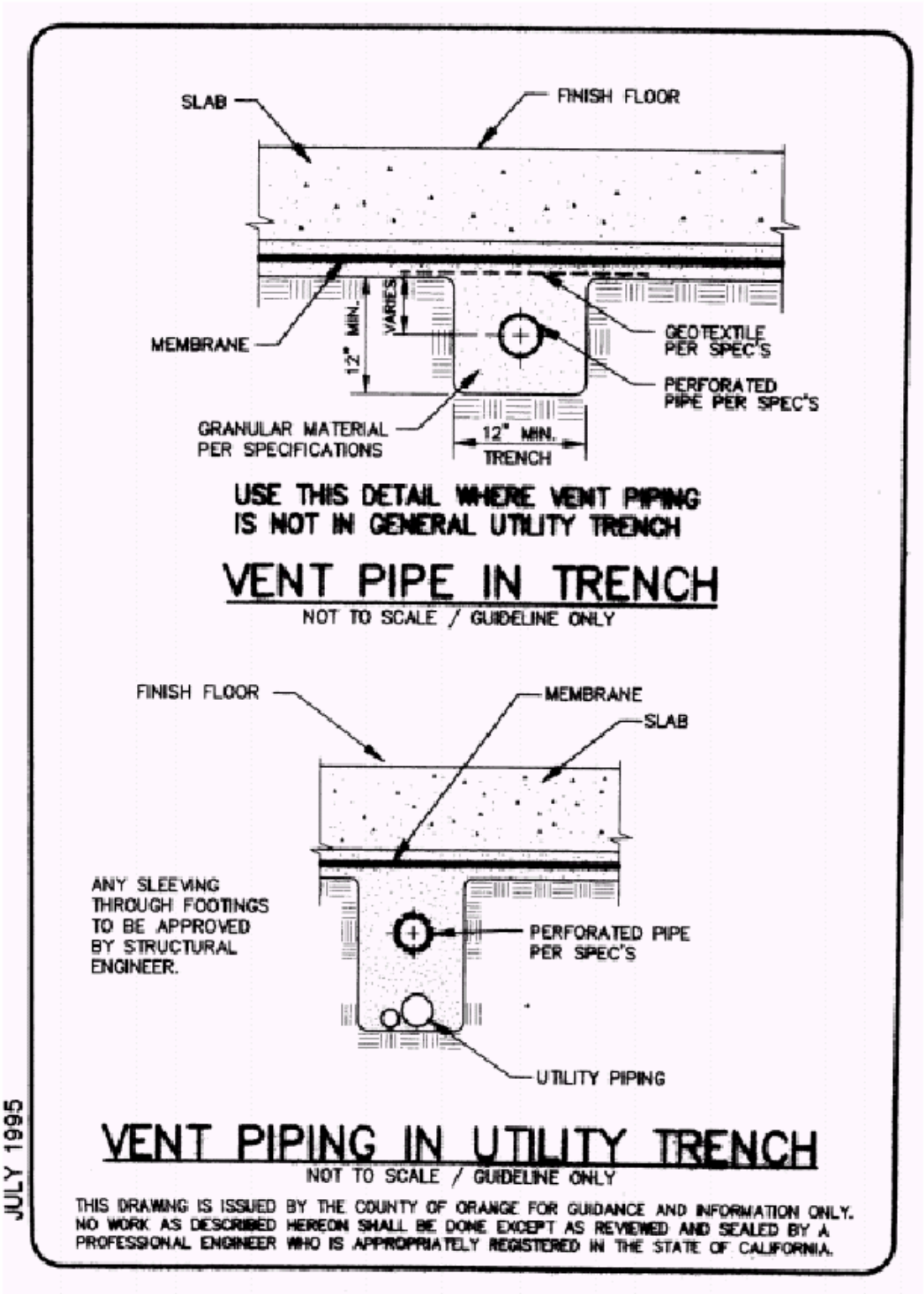

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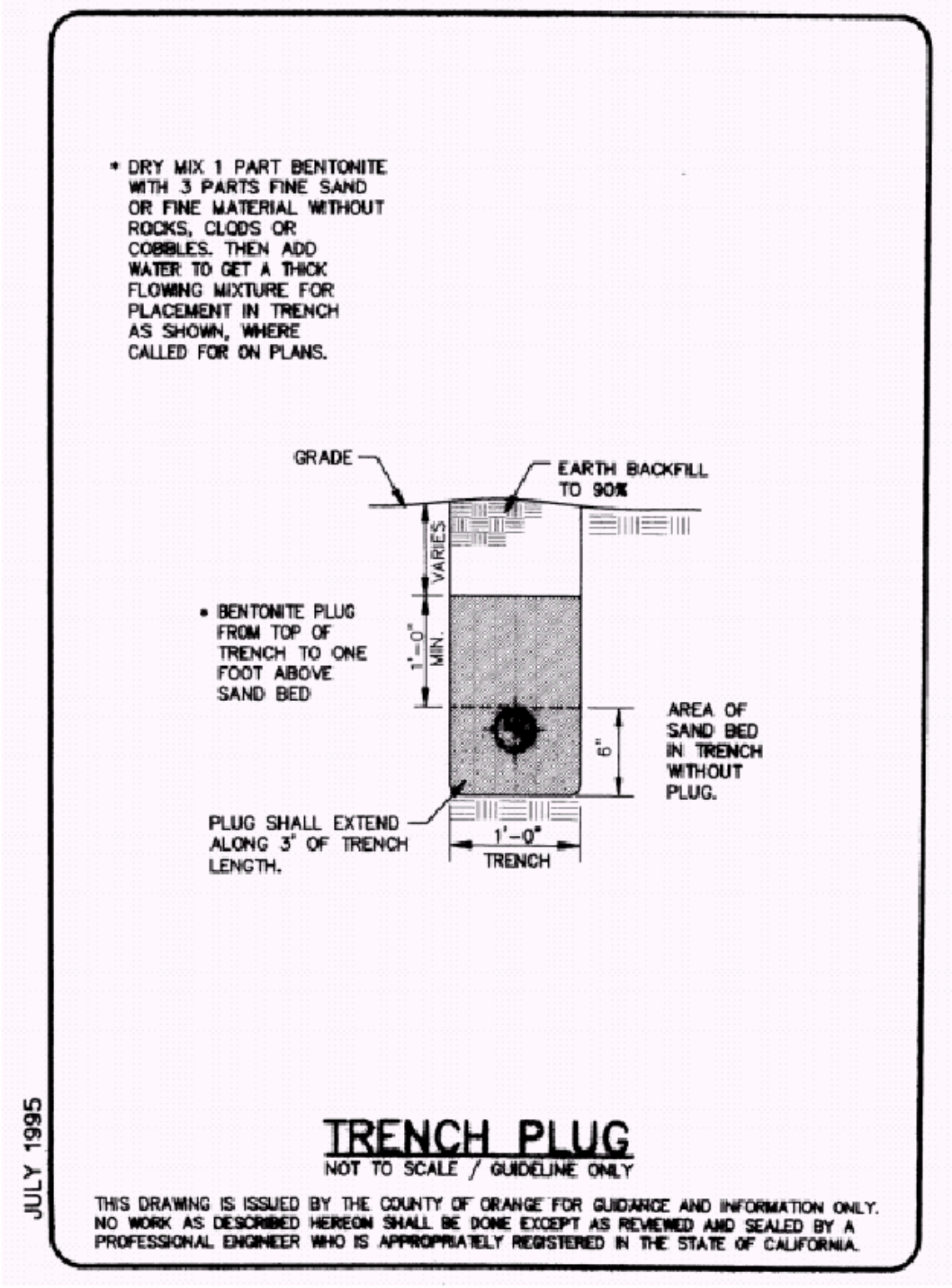

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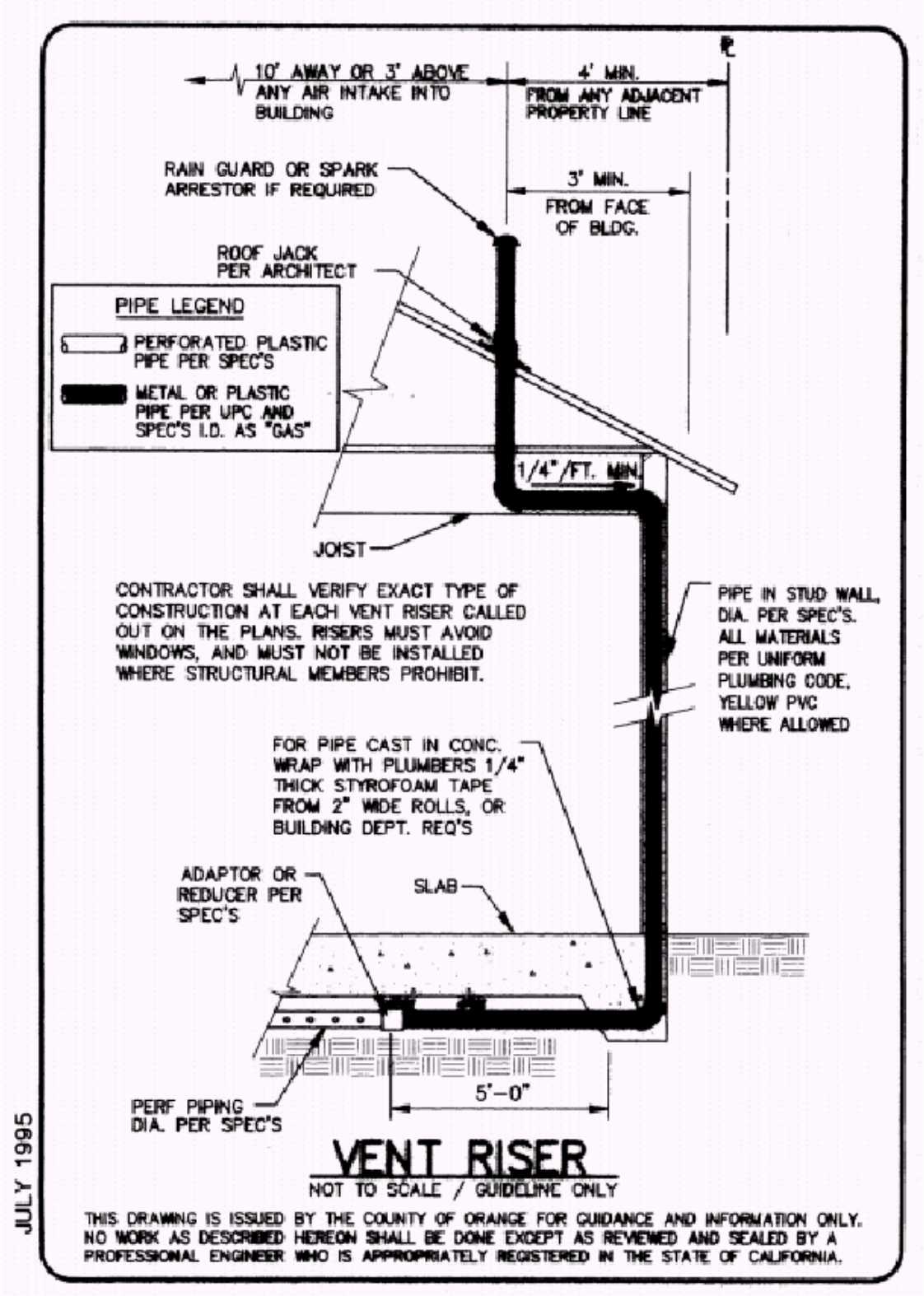

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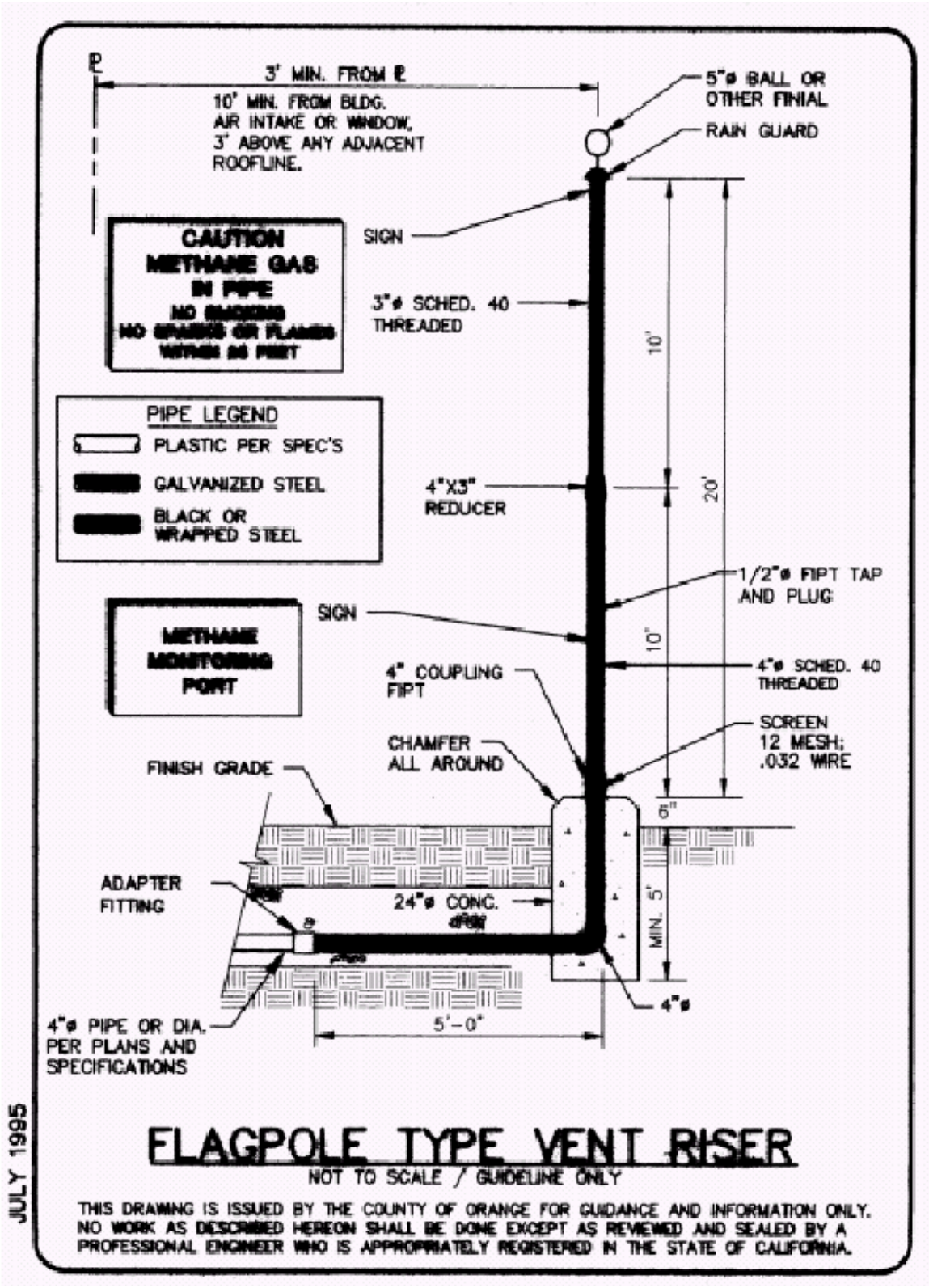

FLAGPOLE TYPE VENT RISER

NOT TO SCALE / GUIDELINE ONLY

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ATTACHMENT 8