4.11 Hazards and Hazardous Materials

This section discusses potential 'risk of upset' and hazardous materials impacts associated with the Project. Specifically, 'risk of upset' refers to scenarios that could immediately affect public safety in an adverse manner. This section describes those potential impacts to public health and safety posed by the Project. Current and future soil and groundwater contamination issues are also addressed. Potential impacts include fires, explosions, and releases of hazardous materials from activities associated with remediation and future construction and operation of the facilities that would handle hazardous materials.

The information in this section outlines the environmental setting, regulatory setting, significance criteria, potential toxic risk scenarios and their significance, and the levels of risk to the public or environment associated with these scenarios. This section also includes an overview of the site's soil and groundwater contamination issues and how they may impact future development.

4.11.1 Environmental Setting

The environmental setting or baseline conditions are associated with existing facilities and site contamination. The Project Site is characterized by several hazards associated with the existing soil and groundwater contamination, as well as the close proximity to the San Luis Obispo County Regional Airport (SLOCRA) where there is an elevated risk of an aircraft accident. Baseline hazards are summarized in the following sections.

4.11.1.1 Existing Site Contamination

From 1910 until the early 1980s, the Project Site stored crude oil transported from the San Joaquin Valley via pipeline. Storage facilities at the Project Site included six large earthen reservoirs, ranging in capacity between 775,000 and 1,350,000 barrels (bbl) [32,550,000 and 56,700,000 gallons], and 21 steel aboveground storage tanks, each with a capacity of 55,000 bbl. The reservoirs were constructed by excavating a circular or elliptical depression, which was then lined with concrete reinforced with wire mesh. The walls were also reinforced concrete, but they were constructed either vertically or integrated into the sloping sides of the depression. The walls and floors of the aboveground storage tanks were constructed of heavy plate steel secured with rivets. The roofs of both the reservoirs and aboveground storage tanks were wood and composition. All together, the Project Site had capacity to store more than 6 million bbl of petroleum.

On April 7, 1926, a lightning strike ignited a fire at the Project Site. At that time, 933,577 bbl of oil were stored in the aboveground storage tanks, and another 5,374,927 bbl of oil were stored in the reservoirs. The total inventory was 6,308,504 bbl of various grades of oil. Eyewitnesses reported that a lightning strike simultaneously ignited the vapors in Reservoirs 5, 6, and 7. The

power of the resulting explosion registered on the Weather Bureau barograph in downtown San Luis Obispo at 7:35 a.m. A second lightning strike ignited Reservoir 3 sometime between 7:50 and 7:55 a.m.

Despite suppression efforts by the facility staff, over the next four days the fire spread to the other reservoirs and to 12 of the existing 15 steel aboveground storage tanks with a combination of burning embers and boil-overs, where the heated oil flowed out of the reservoirs and onto the ground surrounding the tanks. By April 11, 1926, all but a few thousand of the 6 million bbl inventory was released; some of which burnt to coke and spread across the Project Site. Petroleum coke is defined as a black solid residue, obtained mainly in refineries by cracking (burning) of residue feedstocks. The burning of the heavy oil during the fire had a similar effect to the refining cracking process, creating the coke. This release is considered responsible for most of the numerous surface occurrences (i.e., expressions) of highly weathered and burned petroleum that cover the ground in topographically low areas of the Project Site.

Subsequently, Unocal (now Chevron) resumed operations at the Project Site, including reconstructing ten of the steel aboveground storage tanks (AST's) and Reservoirs 3, 4, 5, and 6. Reservoirs 2 and 7 were never used again for petroleum storage. In addition to the reservoirs and ASTs utilized for petroleum storage, the facility included a series of pipelines to move oil to and from the Project Site and between the on-site tanks and facilities. Regional pipeline operations were also conducted at the Project Site, primarily from the Northwest Area of the Project Site (see Project Description Figure 2-2). Facilities to support pipeline operations included a pumphouse, boilers (for heating crude oil to reduce viscosity) and an associated blow-down area (a blow-down area is a normal part of the operation of a steam boiler and a blow-down safely depressurizes the system in the event of an emergency), a petroleum physical properties testing laboratory, and an electrical equipment house. The Northwest Area also included areas for general equipment storage and maintenance, as well as underground storage tanks that contained diesel fuel and gasoline (England, Shahin & Associates 1994). The underground storage tanks were removed in 1987.

Other historical activities at the Project Site include the operation of a fire training school in the unpaved eastern portion of the Northwest Area. The school consisted of several simulated sumps, flares, and tanks where students practiced techniques for extinguishing petroleum-fed fires. Off-specification gasoline and diesel fuel were fed to these fixtures from a set of three aboveground storage tanks via a system of buried metal pipes.

The four reservoirs repaired after the 1926 fire continued in service for several more decades, but they were progressively decommissioned from the late 1950s through the mid 1970s.

Site Characterization Activities

Numerous field investigations and related studies have been conducted at the Project Site since the early 1990s. These studies have been used to delineate the presence of both surface Total Petroleum Hydrocarbons (TPH) and subsurface contamination.

In 2002, the San Luis Obispo Tank Farm Surface Evaluation, Restoration, and Remediation Team (SERRT), a multi-agency collaborative stakeholder group convened to evaluate the potential impacts to human and ecological health from petroleum and other chemicals at the Site.

In addition to Chevron (Union Oil pre-2005), SERRT members have included: California Environmental Protection Agency (Cal/EPA) Office of Environmental Health Hazard Assessment (OEHHA), the California Central Coast Regional Water Quality Control Board (CCRWQCB), the San Luis Obispo County Environmental Health Services Division (SLO County EHS), and the San Luis Obispo County Air Pollution Control District (SLOAPCD).

Some of the more relevant summary studies and technical reports used in the preparation of the present assessment include:

- Report on Additional Site Assessment, Unocal Tank Farm, San Luis Obispo, California Groundwater Technology, August 25, 1995.
- Wetland Delineation for Unocal Tank Farm, San Luis Obispo County, California EDAW, July 23, 1999.
- Additional Site Characterization, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California England & Associates, April 1999 (1999a).
- Petroleum Hydrocarbon Issues For the Proposed Unocal Tank Farm Development and Ecological Preserve, San Luis Obispo, England & Associates, August 1999 (1999b).
- Background Metals Evaluation, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California, England Geosystem, Inc., February 20, 2003 (2003a).
- Characterization of Petroleum Fractions in Surface Exposures and Shallow Soil, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California, England Geosystem, Inc., November 26, 2003 (2003b).
- Soil Gas Monitoring Report September 2002, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California England Geosystem, Inc., January 30, 2003 (2003c).
- Supplemental Evaluation of Surface Water, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California England Geosystem, Inc., February 20, 2003 (2003d).
- Additional Sampling of Surface Monitoring Location SW-9, Former San Luis Obispo Tank Farm, San Luis Obispo, California Padre Associates, Inc. May 7, 2007 (Padre 2007).
- An Analysis of the Geographic Extent of Waters of the U.S., Including Wetlands at the Chevron Tank Farm Facility, San Luis Obispo, California Padre Associates, Inc. August 5, 2008 (Padre 2008).
- Report of Findings, Assessment of Shallow Soils for Chlorinated Dibenzodioxins and Chlorinated Dibenzofurans, Former San Luis Obispo Tank Farm, San Luis Obispo, San Luis Obispo County, California Padre Associates, Inc. March 2011 (Padre 2011b).
- First Semi-Annual (1S11) Surface Water Monitoring Report, Former San Luis Obispo Tank Farm Facility, San Luis Obispo, California, Padre Associates, April 11, 2011 (Padre 2011c).
- Second Semi-Annual (2S11) Groundwater Monitoring Report, Former San Luis Obispo Tank Farm, San Luis Obispo, California Padre Associates, Inc. October 14, 2011 (Padre 2011d).
- Report of Findings, Soil Gas Assessment, Former Unocal Tank Farm, San Luis Obispo, California, Padre Associates, Inc., January 2012 (Padre 2012a).

- Report Of Findings, Geologic Evaluation Of Naturally Occurring, Asbestos And Material Durability Assessment, Former San Luis Obispo Tank Farm, 276 Tank Farm Road, San Luis Obispo, San Luis Obispo County, California, December 2012 (Padre 2012b).

Investigations of the nature and extent of groundwater and soil contamination at the Site began in 1988. As summarized in the Additional Site Characterization (England & Associates, 1999b), approximately 10 investigations between 1988 and 1999 resulted in the drilling of over 120 soil borings and the installation of 60 groundwater monitoring wells at the Site.[1] Summaries of these investigations, as well as the associated data, are provided by England & Associates (1999b).

Overall, these investigations identified three principal subsurface crude oil plumes:

1. Northwest plume – underlying the former pipeline operations area in the northwest corner of the Project Site. This area includes several smaller, separate occurrences that underlie former pipelines and steel aboveground storage tanks (ASTs) located north and northeast of the field offices. Vertically, petroleum in this area is limited to a depth of approximately 25 feet, but mostly occurs in the 10- to 15-foot depth range.

2. Northeast plume – beneath former Reservoir 4. Petroleum-impacted soil and bedrock were found to extend from the ground surface to depths of up to 50 feet in the eastern part of the former reservoir.

3. Southern plume – large occurrence that underlies much of the Project Site south of Tank Farm Road. Borings drilled within the area indicate that impacted soil occurs primarily in the 5- to 25-foot depth range. Locally, impacted soil extends as deep as 50 feet below Reservoirs 2 and 3.

Studies conducted following those summarized by England and Associates (1999b) that characterized the nature and extent of the contamination at the Project Site are summarized below.

Additional Site Characterization, England & Associates, April 1999.
Based on the findings to date, England & Associates conducted its Additional Site Characterization in 1999(b). This investigation focused on refining the delineation of crude oil in the subsurface, characterizing the physiochemical nature of crude oil in surface soils and at depth, and examining areas of the Project Site not used exclusively for petroleum storage (e.g., boiler blow-down pond, fire school area, cutting shed, pump house) for other potential contaminants of concern. Specific work included drilling 16 borings to better delineate the subsurface plumes relative to Project Site property lines, 42 borings to better delineate the extent of crude oil plumes, five borings to examine contamination in the area of the boiler blow-down pond, and 58 shallow soil samples (0.5 to 2.5 feet below ground surface (bgs)) to determine concentrations of benzene, toluene, ethylbenzene, and xylene (BTEX) and total petroleum hydrocarbon (TPH), as well as other chemicals of potential concern (COPCs), such as metals,

1. Investigators included Brown & Caldwell, Dames & Moore, Earth Systems Environmental, England & Associates, Ground water Technology, and Unocal.

volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs) in the vicinity of the Northwest operations area. Sampling also focused on wetland and riparian areas, including surface tars, soils, sediments, and surface waters, to examine the nature and extent of contamination in habitat areas of likely ecological interest. Findings included:

- Hydrocarbons detected below 5 feet are dominated by compounds in the C10-C25 range (60%; the remaining 40% composed of C25-C40 hydrocarbons);
- There is a limited contribution of BTEX constituents to the crude oil (i.e., <0.5 mg/kg wet weight in 3 of 17 samples);
- There are no significant concentrations of VOCs (<0.092 mg/kg wet weight in 7 of 39 samples) or PCBs (< 0.09 mg/kg wet weight Aroclor 1254 in 6 of 38 samples) in soil or tar samples;
- PAH concentrations generally below 1 milligram per kilogram (mg/kg wet weight);
- Of the 17 CAM (California Administrative Manual) metals, only arsenic and lead were detected in concentrations significantly above background concentrations; and
- Movement of crude oil in the subsurface has reached its maximum limit of travel.

- In addition, this report characterized the surface hydrocarbon expressions at the Project Site. The expressions are defined as remnants of the crude oil deposited on the land surface as a result of the 1926 fire and are present in the form of surficial crude oil. These expressions occur in a variety of forms including: (1) solid, vesicular material similar in appearance and consistency to volcanic rock (green areas on Figure 2-6); (2) pliable non-flowing weathered crude (blue areas on Figure 2-6); (3) pliable with evidence of recent plastic flow (purple areas on figure 2-6); and (4) liquid petroleum which is capable of creating sheen in surface water (red areas on Figure 2-6). Detailed results are provided in the April 1999 report.

Former Boiler Blow-Down Area Investigation. England & Associates, January 1999.
In conjunction with the Additional Site Characterization, England & Associates investigated the former boiler blowdown area and documented the findings in a separate report (1999a). The primary objective of the investigation was to determine whether discharges of the boiler blow-down water adversely impacted groundwater quality. Boiler-related operations were conducted in the operations area of the Site, and cooled blow-down water discharged to a small pond 250 feet east of the boiler in the southwest corner of the northwest marsh (in the vicinity of B-33, see Figure 2-6). The investigation involved drilling five borings, collecting soil samples from a variety of depths (including 0.5, 2.5, and 5 feet), and completing the borings as ether temporary piezometers or permanent groundwater wells. Soil samples contained detectable concentrations of TPH, primarily at depths less than 15 feet, but contained no detectable BTEX or PAHs. The authors determined that the only metal exceeding background was zinc, and that this occurred in only one sample. In groundwater, TPH but not PAHs or BTEX was detected. A variety of metals were detected in groundwater. Overall, the report concluded that soil and groundwater beneath the boiler blow-down pond may have been impacted by discharged boiler water, but that the area of impact is generally limited to the former pond area itself.

Supplemental Site Characterization, England Geosystem Inc., October 2001.
England Geosystem, Inc. (formerly England & Associates) performed a Supplemental Site Characterization (England Geosystem, Inc., 2001) to address data gaps at the Site. Specifically, the investigation was designed to:

- Characterize the vertical and localized horizontal direction of groundwater flow in areas of hydrocarbon seepage (such as Reservoir 7 and adjacent to Reservoir 2);
- Measure chemical and physical properties of light non-aqueous phase liquid (LNAPL) in wells;
- Assess vertical variations in the occurrence and chemistry of residual liquid-phase petroleum hydrocarbons in soil;
- Characterize the composition and flux of soil gas in petroleum-impacted areas of the Site under consideration for future development;
- Assess the potential mobility of the liquid-phase petroleum; and
- Measure the activity of natural attenuation processes.

England Geosystem, Inc.'s 2001 report details the findings of this investigation. Briefly, it was determined that, while it was unlikely that vertical groundwater gradients were responsible for seepage observed in the vicinity of Reservoir 2, the vertical groundwater gradient contribution to seepages in Reservoir 7 could not be determined. LNAPL detected in wells at the Site exhibited low density and high viscosity, and had chemical and physical properties consistent with San Joaquin Valley crude oil. England Geosystem, Inc observed no apparent relationships between TPH composition, BTEX composition, or PAH composition with sample depth. Finally, the low density and high viscosity of average LNAPL at the Site makes it 750 times less mobile than water; in addition, the low permeabilities/transmissivities measured in the subsurface soils impede the lateral movement of LNAPL.

Reservoir Bottom Hydrocarbon Seepage Study Report. England Geosystem Inc., November 2002.
In 2002, England Geosystem, Inc. performed a study to identify the processes responsible for the production of hydrocarbon sheen in Reservoirs 5 and 7 at the Site. Hypotheses evaluated included (1) the development of sheen when water contacted oil residue present in reservoir bottoms, and (2) rising groundwater or density inversion forcing LNAPL to the surface. Based on observed surface water/groundwater relationships and the accumulation of LNAPL, it was concluded that rising groundwater is a significant contributor to the hydrocarbon seeps in Reservoirs 5 and 7 and that seepage appears to be related to shallow seasonally fluctuating groundwater and LNAPL, as well as discontinuities in the formation underlying the reservoirs (England Geosystem, Inc, 2002).

Analysis for Pesticides and Herbicides, Unocal San Luis Obispo Tank Farm. Earth Systems Pacific, July 2002.
Earth Systems Pacific conducted surface sampling at the Site in May 2002 to evaluate the presence of pesticides and herbicides in soils. Twenty-three surface soil samples, from locations scattered over the entire Site, were analyzed for organochlorine pesticides and chlorinated/phenoxy acid herbicides. No organochlorine pesticides or chlorinated/phenoxy acid

herbicides were detected, with detection limits ranging from 0.002 to 1.5 mg/kg wet weight and 0.02 to 20 mg/kg wet weight, respectively (Earth Systems Pacific, 2002a).

Groundwater Monitoring Results, September 2002, Monitoring and Reporting Program 93-120 – Unocal Tank Farm. Earth Systems Pacific, October 2002.

Ongoing groundwater and surface water monitoring is conducted at the Site, pursuant to the Regional Water Quality Control Board (RWQCB) Monitoring and Reporting Program (MRP) 93-120 (Earth Systems Pacific, 2002b). The MRP (initiated in 1993), calls for semi-annual groundwater monitoring and currently includes 26 groundwater monitoring wells, five off-site supply wells, and 10 surface water locations analyzed for TPH (purgeable [C4-C10 compounds] and extractable [>C10 compounds]) and BTEX. When the Predictive Ecological Risk Assessment (pERA) activities were initiated, the most recent semi-annual groundwater monitoring had occurred in September 2002. At that time, only the groundwater and off-site supply wells were sampled. The groundwater gradient was determined to be to the west-southwest, at an average slope of 0.007. Purgeable TPH was detected in only one of the four monitoring wells analyzed. Extractable TPH was detected in 16 of 24 wells sampled and in two of the five supply wells. However, following silica gel cleanup, extractable TPH was detected in only two monitoring wells and in no off-site supply wells. BTEX constituents were detected in only one monitoring well and in no off-site supply wells (Earth Systems Pacific, 2002b).

2010 Dioxin Sampling

A collaborative evaluation of dioxin (Attachment 8 of the 2004 Baseline Human Health Risk Assessment (HHRA), and Attachment 3 of the updated 2013 HHRA) during the SERRT process concluded that any dioxins originally sourced from the 1926 fire and still present at the Site would be indistinguishable from levels expected to be associated with local ambient sources. Therefore, dioxin was not evaluated as a site-related COPC in the 2004 HHRA. Comments provided during the CEQA peer review process noted that the 1926 fire may have produced dioxins that have not been adequately characterized by previous studies, and suggested that dioxin generated by the fire would be distinguishable from other anthropogenic sources (i.e. nearby roads, the airport, or local forest fires). To respond to stakeholder concerns, Padre, at the direction of Chevron and following a work plan reviewed by the SERRT (Padre 2010), conducted additional on-site and background (i.e., off-site) shallow soil sampling in August 2010 to characterize on-site dioxin and furan concentrations and to determine whether dioxins generated by the 1926 fire are present on-site at concentrations greater than those in local background soils (Padre 2011b; included as Attachment 3). A total of 10 on-site drill holes were advanced, with samples collected at three depths: 0-6 inches, 5 feet and 10 ft bgs. Ten off-site reference samples also were collected from surface soil (0-6 inches). All soil samples were analyzed for dioxins and furans (USEPA method 8290/High-resolution), percent moisture, and total organic carbon content (TOC). A Tier IV data validation was conducted, concluding that qualified data were usable for the project objectives. Dioxin toxic equivalents (TEQs) at the Site ranged from non-detect to 0.023 µg/kg-dry weight at the Site. As discussed further in the site evaluation, the evaluation of supplemental dioxin data concluded that "the fire in 1926 did not generate significant quantities of dioxins" (Geosyntec 2010).

Soil Characterization Summary

As discussed above, soil samples were collected extensively at various Site locations from 1988 through 2003, and resulted in the collection of over 350 soil samples from within 0-10 ft bgs (see

Figure 4.11-1). Most of these have been analyzed for the presence of total petroleum hydrocarbons (TPH), volatile organic compounds (VOCs) including BTEX, and other petroleum hydrocarbon constituents such as polycyclic aromatic hydrocarbons (PAHs), as well as for metals, polychlorinated biphenyls (PCBs), and pesticides. As illustrated in Figure 2-6, petroleum hydrocarbons exceeding 1,000 mg/kg in soil >5 feet bgs occurs across a significant portion of the Site. Of the 278 samples analyzed for TPH in soil collected from up to 10 ft bgs, motor oil range petroleum hydrocarbons (TPH-m; detected in 159 samples at concentrations ranging from 12.5 to 35,000 mg/kg) and diesel range petroleum (TPH-d; detected in 149 samples at concentrations ranging from 12.5 to 58,000 mg/kg) were most frequently detected. Gasoline range TPH (TPH-g) was analyzed in 71 of the samples, and detected only 20 times at concentrations ranging from 12.5 to 2,500 mg/kg. Inorganics were detected in Site samples, with the most frequently detected arsenic (ranging from 1.4 to 388 mg/kg, with the highest detections occurring in the former Northwest Operations Area), barium, chromium, cobalt, copper, lead, nickel, vanadium and zinc. Other chemical detected in soil/sediment at the Project Site include various semi-volatile organic compounds (SVOCs) including PAHs, and less frequently the PCB Aroclor 1254 as well as VOCs including BTEX.

Surface Hydrocarbon Expressions

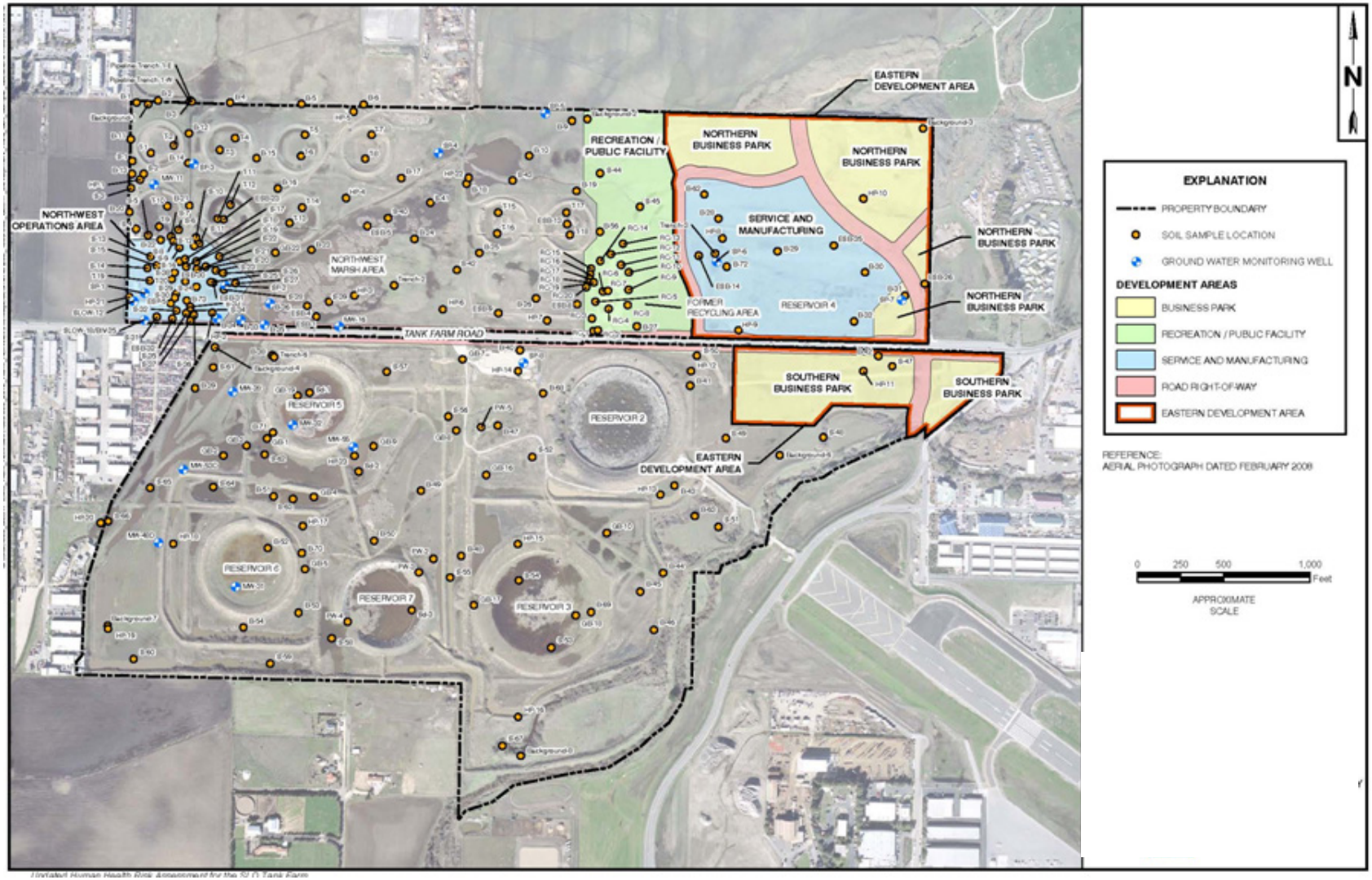
Some of the crude oil that was released during the 1926 fire is present today in the form of surface crude oil deposits. The distribution of the various types of "surface hydrocarbon expressions" is illustrated in Project Description Figure 2-6. These surface hydrocarbon expressions range from solid material similar in appearance to volcanic rock and/or asphalt (shown in green), to viscous liquid petroleum, which has been observed to create a sheen in nearby surface water (shown in red). The blue and green surface expressions shown in Figure 2-6 are pliable, highly weathered crude oil with the purple showing evidence of "recent plastic flow".

With respect to the more tar-like hydrocarbon expressions, the SERRT agreed that while these areas are of concern because they may include elevated concentrations of PAHs (specifically the more fluid/tar-like/less weathered blue and purple areas), as well as create physical hazards to small animals during periods of warm weather, they represent a unique exposure scenario. Specifically, the most likely human exposure at the Site would be analogous to coming into contact with tacky tar at the beach and having it adhere to bare feet, hands or other exposed skin (primarily dermal exposure).

Soil Vapor Characterizations

In 1992 and 2002, soil vapor monitoring studies were conducted by England Geosystem to determine if the inhalation pathway of exposure poses a human health concern (report included as Attachment 3 of the 2004 Baseline HHRA). Sampling locations including the LNAPL areas identified around the Northwest Operations and Reservoir 4 areas. Eighteen soil gas samples were collected in September 2002 and analyzed for the presence of fixed gases and C1 to C5 hydrocarbons. Methane was the predominant gas found in soil gas monitoring and accounted for 93% of the C1 to C5 hydrocarbons found, followed by butane, propane, pentane, and ethane isomers. Some low levels of benzene were also detected in soil gas samples across the Site, and did not appear to be associated with any one area. As detailed in Section 4.1.4 of the 2004

Figure 4.11-1 Soil Sampling Locations



Source: AVOCET, 2007.

Baseline HHRA, the SERRT agreed that the inhalation of VOCs from soil was not a likely potential source of human exposure given future land uses (recreational and commercial uses with residential deed restriction) and was not assessed in the risk assessment.

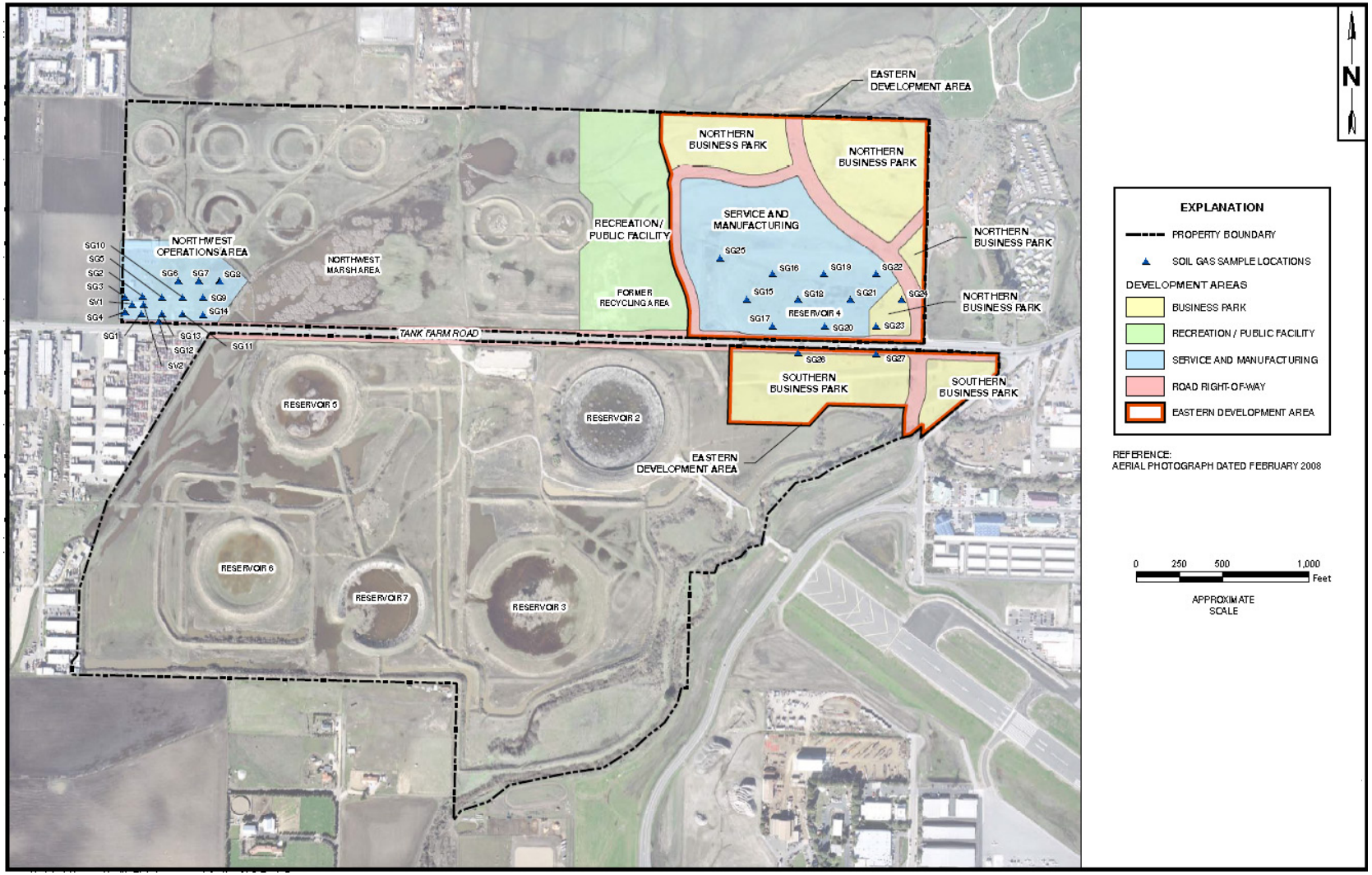
During the CEQA review process, additional soil gas sampling was recommended for areas of the Site identified for development. To address this request, Padre, at the direction of Chevron and following a work plan reviewed by the SERRT (Padre 2011a), undertook supplemental soil gas sampling at the Site to characterize the nature and extent of soil gas conditions and to provide adequate data for an evaluation of potential human health risks from subsurface vapor intrusion associated with soil and groundwater impacted by petroleum hydrocarbons (Padre 2012, included as Attachment 4). This assessment included the construction of 29 soil gas probes within the former Northwest Operations and Reservoir 4 areas, within the approximate footprints of the documented BTEX and LNAPL plumes in the Northwest Operations Area as follows and shown in Figure 4.11-2: two sub-slab probes (SV1 and SV2) immediately below the concrete slab foundation of an existing building; four probes (SG1 through SG4) below the asphalt parking surface surrounding building 1, and 10 probes (SG5 through SG14) in areas with exposed soil in the Northwest Operations Area; and 13 probes (SG15 through SG27) in areas with exposed topsoil within the footprint of the documented LNAPL plume in the Reservoir 4 area. Soil gas probes SG1 through SG27 were constructed at depths of approximately 5.5 ft bgs; additional soil gas probes were nested with probes SG15, SG17 and SG25 at depths of approximately 15 ft bgs, the only locations where groundwater was not encountered.

Sub-slab vapor probes (SV1 and SV2) were installed on August 25, 2011, with samples collected on August 25 and December 2, 2011. Soil gas sampling across the rest of the Site, which resulted in the collection of 30 samples, was conducted from October 18 to 21, 2011. All samples were collected into 100% laboratory-certified clean 1-liter SUMMA canisters and submitted to H&P mobile laboratory on-site for chemical analyses for the full suite of VOCs, TPHv, and speciated TPHv via TO-15, as well as fixed gases (ASTM 1496), and hydrogen sulfide (hand-held Jerome 631X meter). In addition, two soil samples (SG14-5' and SG15-5') were collected and submitted to PTS Laboratories, Inc. for analysis of vapor transport properties.

Oxygen levels in the sub-slab samples ranged from 8.7-11% in SV1 to 17-19% in SV2; carbon dioxide ranged from 7.3-8.5% in SV1 and 1.1-2.2% in SV2, and no methane was detected. As noted by Padre (2012), only ethylbenzene in sub-slab vapor exceeded screening levels (based on residential California Human Health Screening Levels [CHHSLs] and/or RWQCB Environmental Screening Levels [ESLs]), with 120 µg/m3 detected in SV2 collected during the August 2011 sampling event; it was not detected in samples during the December 2011 event. Generally only low levels of aliphatic (C5-C8 and C9-C12) and aromatic (C6-C8 and C9-C10) TPHv were present in sub-slab vapor samples, although concentrations of TPHv C9-C12 aliphatics and C6-C8 aromatics exceeded 1,000 µg/m3 at SV1 and SV2, respectively, during the August 2011 sampling event; however these analytes were not detected above analytical reporting limits or screening levels during the December 2011 sampling event.

Fixed gases exhibited wide variability in the soil gas samples. In the Northwest Operations Area, oxygen levels ranged from 4.4-22%, carbon dioxide from not detected (<0.2%) to 11%, and methane from not detected (<10 parts per million volume [ppmv]) to 200,000 ppmv.

Figure 4.11-2 Soil Gas Sampling Locations



Source: AVOCET, 2007.

The ranges fixed gas levels are similar in the Reservoir 4 area: oxygen levels ranged from 5-21%, carbon dioxide from not detected (<0.2%) to 10%, and methane from not detected (<10 ppmv) to 210,000 ppmv. Benzene and toluene VOCs were detected in all soil gas samples analyzed, with additional detections of acetone, carbon disulfide, chloroform, ethylbenzene, naphthalene, 1,2,4-trimethylbenzene, and xylenes. As noted by Padre (2012), only benzene (detections ranging from 7.8 to 51,000 µg/m3) and ethylbenzene (23 to 8,900 µg/m3) were detected at concentrations above residential shallow soil gas CHHSLs and/or ESLs. TPHv aromatics (either carbon range) were detected in 86 percent of the samples collected from the Northwest Operations Area and 56 percent of the samples collected from the Reservoir 4 area. Maximum concentrations of TPHv aromatics were detected in soil gas samples in the Northwest Operations Area collected from probes SG7, SG10 and SG11 (320,000 µg/m3, 84,000 µg/m3, and 33,000 µg/m3, respectively). TPHv aliphatics (either carbon range) were detected in all soil gas samples collected at the Site except SG1-5.5, with the highest concentrations detected in samples collected from the Northwest Operations Area (C5-C8 maximum of 13,000,000 µg/m3). Nearly all of the maximum soil gas detections within the Reservoir 4 area, where deeper samples could be collected, occurred in the shallow samples

Surface Water Characterizations

Surface water assessments have been conducted at the Site since 1995, with sampling locations shown in 4.11-3. Historically, surface water samples have been collected from twenty locations around the Site and chemically analyzed for at least one of the following chemical groups: TPH, VOCs including BTEX, PAHs, and inorganics, with TPH, toluene, xylenes and various inorganics detected. A 2003 evaluation of ten surface water samples collected from the Site concluded that overall the surface water samples appeared to have low levels of organic material (measurable as C10-C40 TPH), but that the lack of detectable aliphatic/aromatic material, detectable PAHs, and the removal of this organic material by silica gel coupled with the mass spectral analysis, site observations, and field observations of water color and clarity "suggest that the petroleum is unlikely to be a major source of the organic material" (AGSI 2003a). However, no conclusive determination regarding the TPH source could be made for two of the three samples for which the aliphatic/aromatic and/or spectral analyses were conducted.

Currently, semi-annual monitoring at ten locations on and around the Site (SW-1 through SW-10) is conducted by Padre; samples collected during these semi-annual events are analyzed for "extractable" TPH (e.g., petroleum hydrocarbons in the C10-C40 range) and, if TPH is detected, then the surface water sample is pre-treated with a silica gel clean-up and re-analyzed for the TPH C10-C40. Since March 2006, TPH has been detected in samples from all ten sampling locations ranging from 0.055 mg/L to 6.4 mg/L prior to silica gel clean-up, but is rarely detected following silica gel clean-up (Padre 2011c).

Groundwater Characterizations

Since 1988, groundwater monitoring activities have resulted in the construction of a network of up to 30 wells at the Site (Figure 4.11-3). Historically, groundwater samples were analyzed for at least one of the following chemical groups: TPH, VOCs including BTEX, PAHs, and inorganics. The most frequently detected chemicals at the Site were TPH and BTEX. For a period of time (approximately 1999 to 2004), groundwater samples analyses included a re-analysis of TPH C10-C40 following silica gel clean-up, with the TPH removed from nearly all samples, although detections frequently remained in samples collected from monitoring wells SLOW-12 and

SLOW-18 in the Northwest Operations Area (see Padre 2011d, included as Attachment 6). Less frequent detections of arsenic, barium, molybdenum, nickel, and vanadium, sec-butylbenzene, isopropylbenzene, MTBE, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzne, and some PAHs were observed in some of the historic groundwater samples.

Currently, wells are monitored semi-annually with all samples analyzed for TPH C10-C40 (with no silica gel clean-up comparison is conducted); a subset of samples are analyzed for TPH-g and BTEX. During the most recently reported monitoring event (September 2011), the depth to groundwater ranged from 5.75 feet (MW-39) to 21.51 feet (MW-46) below the top of the casings, with groundwater calculated to flow generally toward the southwest (Padre 2011d). Only TPH (C10-C40) was detected above laboratory reporting limits, with detections in nine of the 24 groundwater samples analyzed ranging from 530 µg/L (SLOW-12) to 3,600 µg/L (SLOW-18).

The most frequent and highest detections of TPH are in samples collected from the Northwest Operations Area. As described in Section 4.11.1.1 above, , a unique set of conditions in the Northwest Operations Area resulted in the LNAPL in the saturated zone containing a lighter hydrocarbon range (C5-C20 including benzene) which co-occurs with, and is dissolved in, the heavier oil. Thus, the detections of TPH in groundwater samples collected from this area likely reflect a combination of free- (LNAPL) and dissolved-phase impacts.

Naturally Occurring Asbestos

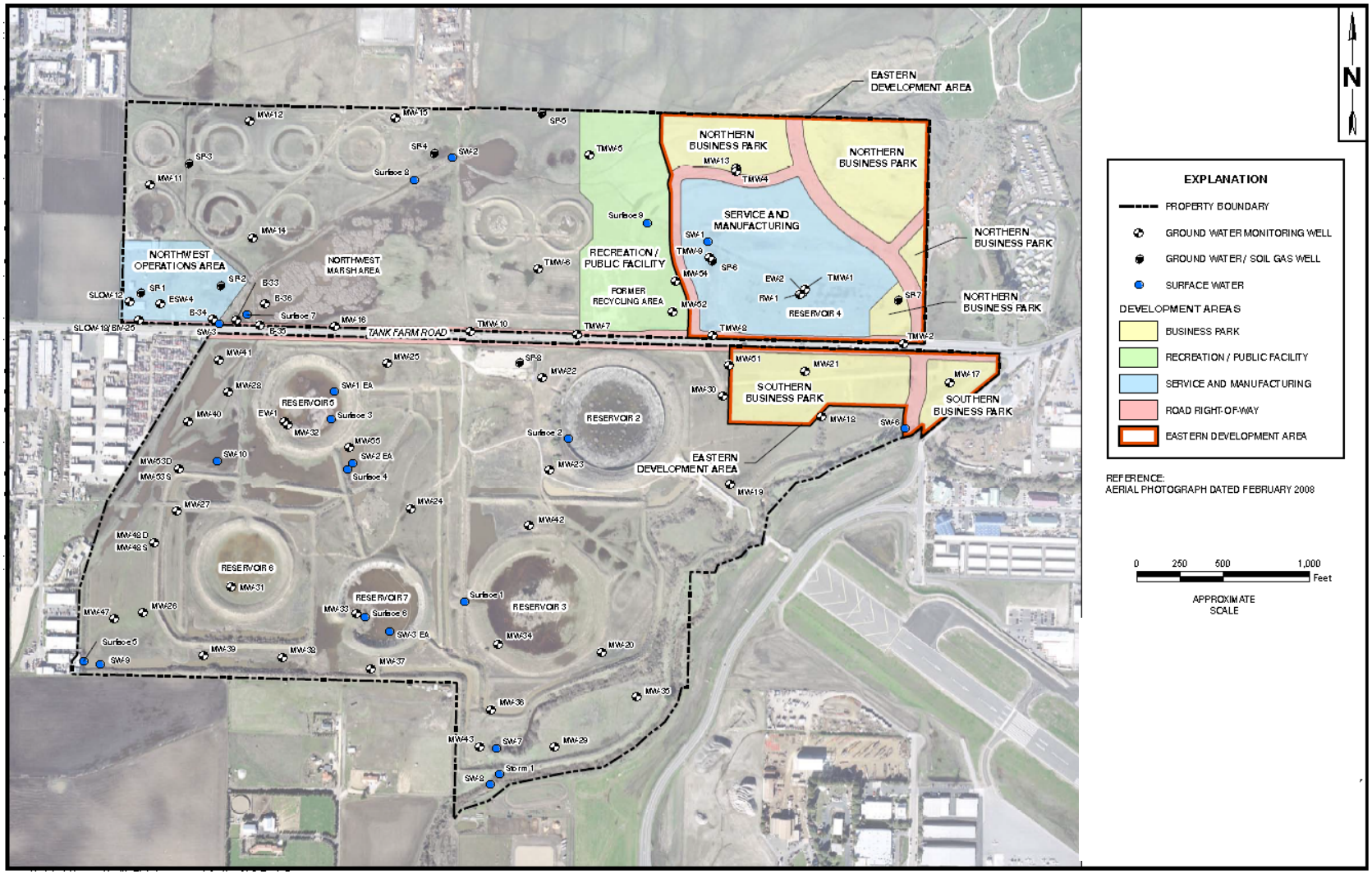
Padre (2012b) prepared a Naturally Occurring Asbestos (NOA) assessment and material durability assessment (Material Assessment) to support the development of the engineering analysis and asbestos related monitoring plans associated with the proposed Project. The NOA investigation and Material Durability Assessment was completed in the vicinity of the Former Quarry Area of the former San Luis Obispo Tank Farm Facility.

Based on a review of available geologic maps, soil maps and other published data, and observations of surfical geology and rock cores collected from drill holes at the Project Site, bedrock material at the site is likely ultramafic in nature and contains zones of secondary mineralization (aphanitic texture and acicular habit) of possible serpentine and amphibole minerals. Fibrous and/or asbestiform minerals were not observed.

Asbestos was not indicated above the analytical detection limit of 0.25% in any of the rock or soil samples submitted for microscopic analysis by CARB Method 435. However, the microscopic analyses indicated that several rock core samples contained trace concentrations of chrysotile (serpentinite) asbestos but could not be quantified due to the method quantification criteria. The findings of the microscopic analyses and field observations will be utilized in the development of a dust mitigation plan associated with proposed future grading activities at the Project Site.

Four rock core samples were submitted for physical testing including durability index, abrasion resistance, specific gravity and absorption. The results of the tests are compiled in the report prepared by NV5 – BTC Labs and will be utilized to determine suitability for use in planned restoration activities at the Project Site.

Figure 4.11-3 Surface and Ground Water Sampling Locations



Source: AVOCET, 2007.

Off-site Contamination

There are three areas of off-site, or potential off-site contamination. Under the proposed Project no cleanup activities are proposed. The following summarizes the off-site contamination issues and proposed actions under the proposed Project:

1) There is BTEX in the groundwater that originates under the Northwest Operations Area that is slowly moving west. Chevron proposes to leave BTEX in place but obtain a Land Use Covenant/Deed Restriction to keep the contamination from being exposed. Chevron would also continue to monitor the movement of this groundwater plume. There is currently no threat to humans or wildlife from this off-site contamination.

2) An area off-site on the Betita property has TPH/LNAPL contamination. Chevron proposes to leave TPH/LNAPL in place but obtain a Land Use Covenant/Deed Restriction to keep the contamination from being exposed. There is currently no threat to humans or wildlife from this off-site contamination.

3) In 1926 a burning stream of oil flowed along San Luis Obispo Creek that extended from the Unocal Tank Farm Road Facility to Avila Beach. There is a potential for residual crude oil and combustion byproducts in and along San Luis Obispo Creek. However, to date, no evidence has been found of any existing contamination in the creek. It is possible that almost a century of stream flow and floods have removed any residual contamination. No action is proposed at this time to address potential residual contamination from the 1926 spill and fire.

4.11.1.2 Peer Review of Human and Ecological Risk

An in-depth peer review of the Applicant prepared documents that address human and ecological risk of the Project was conducted as part of this EIR. The following five reports were reviewed and evaluated:

- Human Health Risk Assessment (HHRA) for the Unocal San Luis Obispo Tank Farm, ratified May 25, 2004
- Predictive Ecological Risk Assessment (pERA), ratified May 25, 2004
- Risk Management Study (RMS), ratified December 12, 2005
- Feasibility Study (FS), dated March 15, 2007
- Remedial Action Plan (RAP), dated December 18, 2007

Additionally, many other Project-related reports and descriptions were reviewed in order to place the above-referenced reports in the proper context (e.g., the site assessment reports summarized in Section 4.11.1). Therefore, the review involved the evaluation of more than 3,000 pages of highly technical information.

Overall, these three reports are very well organized, well written, and very well documented. All three reports are excellent and the findings and recommendations are supported by the technical documentation provided. They appear to be complete, technically accurate, and their preparation has followed correct Cal/EPA DTSC and U.S. EPA procedures and protocols.

However, despite this overall conclusion, a few discrepancies in the site characterization and resultant HHRA were noted that required further sampling and analysis. This is understandable given that sampling, analysis, and the HHRA were prepared over five years ago and some methodologies have changed in that period. As a result, additional assessments were conducted to evaluate dioxins in soil and Site soil gas, as summarized in Section 4.11.1 and an updated HHRA prepared (see Section 4.11.3).

The intent of our review was not supplant our opinions for those of the pERA authors or the Ecological Risk Working Group (ERWG) but rather to offer a fresh perspective on whether the risk management alternatives selected were supported by the data. Towards this, it is believed that if the pERA is soundly based, the RMS is soundly based. The obverse is also true; if the pERA lacks a sound basis, the RMS becomes suspect. It is not our intent to recommend different or alternative risk management (remedial) options; we have limited our opinions in this matter to pointing out data gaps, inconsistencies, and areas for further documentation in the pERA and a general recommendation that the risk management approach as outlined in the RMS be revisited.

We found that these two reports are well organized and well written. While they generally appear to be complete, are mostly technically accurate, and their preparation has generally followed Cal/EPA DTSC and U.S. EPA procedures and protocols, some aspects of the pERA do not follow DTSC or EPA protocol and thus several questions remain about the extent and scope of the pERA. Both reports, although well written, contain findings and recommendations that are not entirely supported by the technical documentation provided. Because the Risk Management Study (RMS) relies almost entirely on the findings of the pERA, errors in data gathering and interpretation in the pERA necessarily will impact the recommendations found in the RMS. Therefore, these two reports were reviewed and evaluated together. And, due to this interlinking, comments about the pERA also applied to the RMS.

Human Health Risk Assessment for the Unocal San Luis Obispo Tank Farm, ratified May 25, 2004.

The 2004 baseline human health risk assessment (HHRA) prepared by McDaniel Lambert, Inc. evaluated potential human health risks at the Project Site using current U.S. EPA and CalEPA methodologies. Risks determined in the HHRA are driven by the presence of arsenic, total petroleum hydrocarbons (TPH) and benzo(a)pyrene in soil.

As part of our review, we constructed a model to calculate risks and hazards to the off-site resident under Scenario 1 (post-remediation). This spreadsheet was used to confirm the results reported in the HHRA and to evaluate the validity of certain assumptions made, as well as test the effects of alternative values on resulting risks and hazards.

Specific points of this review are below.

Site Characterization

The characterization of the site, as presented in the HHRA, seems appropriate and complete. It is notable and reasonable that Reservoirs 5 and 7 (where hydrocarbon sheen has been observed) and all areas of surface hydrocarbon expression are excluded from the risk assessment. Remedial action objectives for these locations are designed to keep potential receptors from contacting

liquid hydrocarbons through the preferred remedy (capping, deed restrictions, long-term monitoring, etc.).

Chemicals of Potential Concern

An extensive database including results of soil and surface water sampling activities to date is included in the HHRA. The HHRA refers to soil gas sampling data in Attachment 13, but it was not included.

A background metals evaluation was conducted such that cumulative probability plots were used to estimate threshold values between anomalous and background populations, and to identify apparent data distributions and outliers. In this way, background concentrations of metals were developed based on the distribution of metals in the soil, on and in the vicinity of the Site. Metals reported below these derived background levels were excluded from the risk assessment. In the absence of site-specific background metals concentrations, this approach seems appropriate.

Two scenarios are evaluated in the HHRA:

- Scenario 1 is based on contaminant data from the "whole site" (excluding Reservoirs 5 and 7 and all surface hydrocarbon expressions as noted above).
- Scenario 2 is considered a post-remediation scenario in which metals data from the Northwest Operations Area are excluded.

Arsenic

Arsenic reported in shallow soil (down to about 2 feet below ground surface) at the Northwest Operations Area is the key substance that drives the risk assessment under Scenario 1. Since remedial action objectives at this location are designed to keep potential receptors from contacting this soil (through the preferred remedy of constructing a minimum 4 foot thick soil cap, deed restrictions, etc.), arsenic is not assessed under Scenario 2, which is an appropriate approach.

Total Petroleum Hydrocarbons

Total petroleum hydrocarbons, as sampled and analyzed, are comprised of several fractions: aliphatic, aromatic and NSO/asphaltene[2]. In the HHRA, the NSO/asphaltene fraction is not evaluated for health risk due to inadequate human toxicity information in the literature. Additionally, the C4-C10 fraction of TPH in soil is excluded because this fraction represents less than 5% of total TPH in soil to 10 feet below ground surface and it was concluded that the TPH distribution in soils, sediment and surface tars at the site is adequately represented by analysis of TPH in the C10-C40 range. These assumptions may not be appropriate as the toxicity of a C4-C10 fraction is usually significantly greater than the toxicity of a C10-C40 range. Suitable surrogates should be used to assess the risk and hazard posed by the C4-C10 fraction.

It appears that in order to assess the toxicity of TPH, further testing was conducted to quantify the aliphatic and aromatic fractions. Soil samples to 10' bgs were assessed and it was determined

[2] NSO: nitrogen, sulfur, oxygen

that the aliphatic fraction represents 21.2 to 51.3% of total TPH (median 33.6%) and the aromatic fraction represents 7.9 to 35.3% of total TPH (median 17.3%). In the risk assessment, the median percentage values were used to estimate soil concentrations of aliphatic and aromatic TPH. However, since TPH is the risk driver in the chronic hazard analysis, the median values may not be health protective, and further analysis is warranted using an appropriately-derived UCL of the arithmetic mean as EPCs.

Polychlorinated Dibenzodioxins

PCDDs/PCDFs were not evaluated in the 2004 HHRA because, as the 2004 HHRA claimed, soil sampling and analysis for dioxins at this site would be difficult to interpret. The 2004 HHRA claimed that laboratory analysis would not be able to distinguish between residual dioxin from the 1926 fire and dioxin from other sources, such as vehicle exhaust, that may have been deposited at the site since the fire. According to the 2004 HHRA (page 16) "Based on current knowledge and assumptions, the SERRT concluded that any dioxins originally sourced from the 1926 fire and still present at the site would be indistinguishable from the expected levels associated with local ambient sources."

While reluctant to disagree with the distinguished and highly experienced members of the SERRT, we nevertheless found that the reason for not analyzing for dioxins was suspect That a COPC at this site – or any site - should be removed from consideration due to an alleged difficulty in interpreting the data undermines the completeness of the HHRA and the pERA. Polychlorinated dibenzodioxins and polychlorinated dibenzofurans are highly toxic to human and ecological receptors, are bioaccumulated, and are highly persistent in the environment. They are known to be produced during uncontrolled petroleum fires. If, as the HHRA claimed, any dioxins/furans produced from the 1926 fire are indeed "indistinguishable" from background levels coming from other anthropogenic sources, a sampling and analysis plan could easily be designed and implemented to support that contention. Sampling soil in areas known to have been impacted by the fire, along with nearby areas known to not have been impacted by the fire, would establish the appropriateness of removing PCDDs/PCDFs as COPC. We recommended that additional soil sampling and analysis be conducted for PCDDs/PCDFs to ensure that levels are indeed "indistinguishable" from background levels coming from other anthropogenic sources and thus do not pose a significant incremental or cumulative risk to human or ecological receptors. A dioxin sampling was conducted in 2010 to address this issue and the HHRA was updated to evaluate potential dioxin risk.

Benzene

Low levels of benzene were reported in soil vapor monitoring activities although this could not be verified as the soil gas sampling data in Attachment 13 was not included in the 2004 HHRA. Additionally, benzene was detected in 3% of the surface and subsurface soil samples analyzed for benzene. The 2004 HHRA indicates that the ERWG/HHWG3 concluded that there is low or negligible risk from inhalation of volatile hydrocarbons in soil, including BTEX (benzene, toluene, ethylbenzene and xylene), and accordingly recommended that the vapor/inhalation exposure pathway need not be addressed.

---

[3] Ecological Risk Work Group and Human Health Risk Assessment Work Group

In reviewing the 2004 HHRA Work Plan, Dr. Jim Carlisle of OEHHA conducted a benzene assessment using the Johnson-Ettinger vapor intrusion model to evaluate the potential for exposure due to vapor intrusion of benzene from soil gas into indoor air. Dr. Carlisle's modeling results show risks due to inhalation of benzene vapors intruding into indoor airspace to be on the order of 4 - 9 E-08,

We calculated total risks to the off-site resident due to inhalation of both vapors and particulates in outdoor air to be about 9.6E-09. Given the reportedly low levels of benzene in soil vapor on-site and the low frequency of soil samples containing benzene, elimination of vapor inhalation as an exposure pathway appears supported.

Dry versus wet sampling results.

The issue of when to use "dry weight" or "wet weight" results for COCs when calculating an Exposure Point Concentration (EPC) was discussed in the 2004 HHRA. Section 2.1.1 Data Characterization (p.14) states that for the pERA BBL converted "wet weight" soil concentrations to "dry weight" concentrations to standardize the data for use in risk assessment. The wet-to-dry weight conversion was accomplished using a conversion factor of 0.799. The conversion factor was developed by England Geosystem based on moisture data available from near the Site along Tank Farm Road. However, on page 21 of the 2004 HHRA, it indicates that "wet weight" values were used in the calculation of the EPC for the human health risk assessment: "Data were converted back to wet-weight concentrations (by multiplying results by 0.799), as human health risk assessments typically rely on wet weight concentrations estimation."

We found that it was appropriate to convert soil data wet results to dry results for the pERA and would also have been appropriate to use the dry weight values in the HHRA. However, since the conversion value was ~0.8, we found that, based upon its experience, the use of wet weight or dry weight values in a HHRA does not make a significant difference in the calculation of the EPC or in the risks/hazards posed.

Exposure Point Concentrations

In the 2004 HHRA, the 95%UCL of the arithmetic mean of data distributions of COPCs were used as the exposure point concentrations in the risk assessment. For soil, the EPCs were based on wet-weight soil and sediment concentrations, 0-10' bgs (excluding samples from Reservoirs 5 and 7 and surface expressions, as noted previously) using USEPA's ProUCL statistical analysis program.

In our review, the most recent methodology for calculating an UCL for use as an EPC – the ProUCL method - was used. (*It is acknowledged that the EPA ProUCL method was not available to the authors of the HHRA at the time the 2004 HHRA was prepared*.) We used this method to evaluate the EPCs chosen for arsenic and total TPH in soil, using the analytical data presented in the HHRA. In order to accomplish this, all the data printed in the HHRA were manipulated and sorted such that all arsenic and all TPH data were isolated. The data for each, including non-detects, was entered into ProUCL and the statistical analyses were performed.

The results for UCLs obtained in our review support the values of the EPCs for arsenic and TPH used in the HHRA. In our review, the ProUCL program recommended a UCL to use for arsenic at 12.4 mg/kg, compared to the value used in the HHRA of 12.0 mg/kg. For TPH, ProUCL

calculated the UCL to be 2258 mg/kg while the HHRA used 2871 mg/kg. Thus, we can confirm that, for at least arsenic and TPH, the HHRA used the appropriate EPCs.

Exposure Assessment

The Reasonable Maximum Exposure (RME) approach was used in the HHRA, as per US EPA and CalEPA guidance. The RME approach is designed to provide a conservative exposure case that is within the range of possible exposures.

The following potentially exposed populations were evaluated in the HHRA:

- Off-site resident (adult and child)
- Recreational open space user (adult and child)
- Business park employee
- Intrusive construction worker

The following potential exposure pathways were evaluated in the HHRA:

- Inhalation of dust from soil
- Soil ingestion
- Dermal contact with soil
- Incidental ingestion of surface water
- Dermal contact with surface water

Elimination of the groundwater exposure pathway was appropriate, in our view, due to the poor quality of the shallow groundwater in the vicinity of the former tank farm. The shallow groundwater does not meet drinking water standards, and is thus not likely to be used now or in the future as a drinking water source. It should be noted that the site has deeper groundwater that does meet drinking water standards, and has not been affected by the site contamination. This is discussed further in the Water Resources Section (Section 4.5).

Another unlikely exposure pathway, yet one that should be discussed nonetheless, is the potential for exposure through ingestion of beef from cattle grazing on-site.

For the most part, appropriate exposure assumptions and exposure algorithms were used although the following discussion is noteworthy:

- The off-site resident and the recreational open space user are assumed to use the site in the same manner (same exposure pathways and exposure assumptions), with the exception of the inhalation pathway. For inhalation exposure, the off-site resident is assumed to be exposed to dust from on-site soil while at the site and while at home, resulting in exposure for 16 hours/day, 350 days/year. Under this scenario, however, the standard inhalation rate is assumed for the adult resident (20 m^3/day or 0.83 m^3/hr) and light activity inhalation rate for the child (0.27 m^3/hr). Neither of these rates account for probable increased inhalation while using the recreational and/or sports field facilities at the site. The recreational user is assumed to visit the site 3 days/week or 156 days/year, for 4 hours each time. The inhalation rate assumed for the adult recreational user is for moderate activity (1.6 m^3/hr) and heavy activity for the child (0.81 m^3/hr). In order to not underestimate risk from the inhalation exposure

pathway to the off-site residential receptor, the higher activity inhalation rates should be applied to 4 hours/day exposure and the standard/light activity rates to the remainder of the day.

- For the soil ingestion and dermal contact exposure pathways, the off-site resident and the recreational open space user are assumed to visit the site 3 days/week or 156 days/year. This is likely an underestimation for the off-site resident, as proximity to the site may encourage almost daily use for activities such as dog walking, jogging, after school sports, etc.
- The off-site residential adult and the recreational user adult are assumed to have dermal contact with soil for 30% of the time compared to children. This assumption is based on a CalEPA recommendation of dermal soil contact exposure frequencies of 2 events/week for an adult and 7 events/week for a child. In the HHRA, the child's exposure frequency of 156 days/year is adjusted by a factor of 30% to give an adult exposure frequency via dermal soil contact of 45 days/year. This assumption does not seem consistent with the assumption that the adult is exposed to soil by ingestion 156 days/year, since the majority of the soil ingested is probably as a result of dermal contact (i.e., hands, fingers). Additionally, the assumption of 45 days/year for dermal exposure seems low when compared to the assumption made for the business park employee for dermal exposure which is 100 days/year, as it seems plausible that the recreational user would be more likely to have dermal contact with soil than a business park employee.
- With the exception of the dermal exposure frequency for the business park employee, other assumptions made for that receptor and for the construction worker appear to be appropriate.

Oral Bioavailability Factor

Oral bioavailability can account for differences in absorption of contaminants from different media (soil, air, water) such that significant impacts on estimated risks can result from even a relatively small adjustment of oral bioavailability (USEPA 2007). USEPA 1989 recommends that bioavailability of substances in soil, food and water should be considered equivalent (a bioavailability factor of 1.0), unless reliable site-specific data indicates otherwise. The Agency indicates that, if risks predicted at a site using default bioavailability assumptions exceed the level of concern for the site, collection of site-specific bioavailability data may be conducted, and guidance is offered.

In the HHRA, the oral bioavailability factor of contaminants in soil was assumed to be 1.0 for organic substances, 0.25 for arsenic and 0.50 for PAHs. The arsenic factor is based on a 2002 study in monkeys in which the relative bioavailability of arsenic in soil is reported to be 10.7 to 24.7% (Roberts 2002). In another primate study by Roberts (2007), the relative oral bioavailability of arsenic in 14 soil samples from 12 sites was reported to range from 5 to 31%, with most values in the 10-20% range. According to the HHRA, bioavailability factors for PAHs in soil reported in the literature range from 0.07 to 0.76. The HHWG decided an estimate of PAH bioavailability of 0.50 was health protective.

The effect of using the bioavailability factors of 0.25 for arsenic and 0.50 for PAHs was evaluated in our spreadsheet for off-site residential risks created for this review. Results indicate that if oral bioavailability is assumed to be 1.0 for all substances, Scenario 1 risks go from 8.5E-06 to 2.0E-05 and the HQ goes from 0.31 to 0.48, indicating little effect.

Dermal Absorption Factor

In Section 6.6.1 of the HHRA, the dermal absorption factor for arsenic from soil is listed as 0.01. The correct value, however, is 0.03 (CalEPA 1994). The tables for dermal exposure to soil list the correct value. Use of the correct value in the derivation of the pathway-specific intake factors for dermal exposure to soil was verified.

Risk Assessment

The toxicity criteria used in the risk assessment are appropriate. Hazard quotients are not delineated by target organ, which results in overestimation of hazard.

PAH surrogates were used for PAH substances that did not have reference dose (RfD) or reference concentration (RfC) values. It is common to use naphthalene as the non-carcinogenic surrogate because it has the lowest RfD and RfC of the PAHs, The effect of using naphthalene as surrogate was evaluated in the model for off-site residential risks created for this review, and was found to raise the total Hazard Quotient from 0.311 to 0.312, thereby indicating an insignificant effect.

We were able to verify the risk and hazard results reported in the HHRA through use of the model for off-site residential receptors created for this review. Cancer risk under this scenario reported in the HHRA is 8.2E-06, compared to 8.5E-06 determined by our model. Chronic hazard index in the HHRA is 0.29, compared to 0.31 determined by our model.

A risk assessment based on shallow soil samples (95%UCL of substances found in soil 0-2' bgs) found slightly higher risks and hazards than the risk assessment based on soil to 10' bgs. For soils to 2' bgs, risk was found to be 1.0E-05 and hazard to be 0.64, while for soils to 10' bgs, risk was found to be 8.2E-06 and hazard to be 0.29.

Exposure to lead in soil was evaluated using the DTSC LeadSpread model for a hypothetical on-site resident (an unrealistic exposure scenario as there will be residential deed restrictions for the property). For soil to 10' bgs, blood lead was found to be below the CDC action level of 10 µg lead/dl blood, with the highest value predicted for a pica child (7.7 µg/dl at the 99th percentile). For soil to 2' bgs, the blood lead level predicted for the pica child approaches the CDC action level, and is 9.9 µg/dl at the 99th percentile. While this appears to be an unrealistic, overly conservative approach to evaluating the potential for adverse health effects due to the presence of lead in soil at this site, the fact that blood lead predicted for the pica child is so close to the CDC action level warrants further investigation.

Health-Based Protective Concentration

A health-based protective concentration (HBPC) for TPH under the business park employee exposure scenario was determined in the HHRA, under the simplifying assumption that all TPH is of the more toxic aromatic fraction. The HBPC is the concentration found in soil that corresponds to a hazard quotient of 1.0 for aromatic TPH in soil, and is determined in the HHRA to be 40,130 mg/kg. Using a risk assessment model for this review, a less conservative level of 48,000 mg/kg was determined, verifying the appropriateness of the level proposed in the HHRA.

A risk-based protective concentration (RBPC) was also calculated for benzo(a)pyrene for the business park employee scenario, under Scenario 2 (post-remediation, removal of arsenic in

soil). It was determined that a soil concentration of benzo(a)pyrene of 0.38 mg/kg corresponds to a risk of 1 in 1 million (10^{-6}).

Conclusions and Additional Actions

The following summarizes the review of the 2004 HHRA:

- The site characterization appears to be appropriate and complete but with a few exceptions noted below for dioxins, TPH, and lead.
- Elimination of arsenic as a COPC from Scenario 2[4] was an appropriate approach.
- Further analysis of the values used for the aliphatic and aromatic fractions of TPH is recommended because proper surrogate chemicals were not used for the C4-C10 fraction and median values were used for the aromatic fraction.
- The methodology used in the derivation of the 95%UCLs used as exposure point concentrations was appropriate.
- Appropriate exposure assumptions and exposure algorithms were used, with these exceptions:
  - Inhalation exposure for the off-site resident may be underestimated because the inhalation rate used does not account for probable increased inhalation while using the recreational and/or sports field facilities.
  - Soil ingestion for the off-site resident may be underestimated because the risk assessment assumes this receptor visits the site 3 days/week. However proximity to the site may encourage almost daily use for activities such as dog walking, jogging, after school sports, etc.
  - Dermal exposure for the adult off-site resident and recreational user may be underestimated (dermal contact assumed 45 days/year while soil ingestion is assumed to occur 156 days/year). Dermal exposure for the business park employee may be overestimated (it is assumed to occur 200 days/year).
- The oral bioavailability factors used for arsenic and PAHs may be inaccurate but use of the most recent factors was found not to impact the risk or hazard calculations.
- Toxicity criteria used are appropriate.
- Hazard quotients are not delineated by target organ which results in overestimation of hazard.
- The use of PAH surrogates in the risk assessment is appropriate.
- We were able to verify the risk and hazard results reported in the HHRA through an independent risk calculation.

[4] Scenario 2 assumes that remedial action, including a 4 foot thick soil cap, deed restrictions, etc., will prevent receptors from contacting arsenic in shallow soil at the Northwest Operations Area.

- Blood lead levels were estimated based on lead concentrations in soil to 2' bgs as 9.9 µg/dl at the 99th percentile for the pica child, close to the CDC action level of 10 µg/dl. This may warrant further investigation.
- Derivation of the health-based protective concentration of TPH in soil for the business park scenario employee is appropriate.
- A risk-based protective concentration for benzo(a)pyrene in soil should be calculated.

In order to address the issues raised above, additional sampling was conducted, as noted in Section 4.11.1, and the HHRA was revised in 2012 and approved by the SERRT in early 2013. The revised HHRA is summarized in Section 4.11.1.3 below.

Feasibility Study, March 15, 2007

The Feasibility Study (FS) contains many references to the human health risk assessment and ecological risks (HHRA and pERA) both prepared in 2004.

The purpose of an FS is to evaluate various remedial alternatives that address the contamination issues at the site, and to select a preferred remedy. Remedial action objectives (RAOs) are developed with the intent to protect human health and the environment, in ways that are consistent with and based upon the results of the human and ecological risk assessments. In order to accomplish this, the site was divided into five Operable Units (OUs), some with subordinate Areas of Concern (AOCs), based on physical and chemical considerations as well as location and anticipated future use. RAOs and General Response Actions (GRAs) designed to achieve the RAOs were identified, remedial alternatives were proposed for each OU, and then preferred alternatives were selected.

Section 2.3.1 of the FS report accurately summarizes the findings and conclusions of the human health risk assessment. The HHRA identified arsenic as a potential human health risk for both open space and commercial development, and the FS assumes the entire 7 acres of the Northwest Operations Area will be subject to remediation of arsenic contamination.

Benzene in soil and soil gas was evaluated at the Northwest Operations Area and the FS reported levels up to 26 mg/kg benzene in soil and 0.26 ppmv in soil gas. These values were compared in the FS to Environmental Screening Levels (ESLs) developed by the San Francisco Bay Regional Water Quality Control Board (SFRWQCB). Partial intent in developing ESLs was to provide small business and property owners a tool to evaluate site contamination and guide decisions regarding need for additional site investigation, remedial action, or a more detailed risk assessment. This is accomplished by comparing sampling data to ESLs. According to the SFRWQCB (2007), additional evaluation is generally necessary at sites where a chemical is present at concentrations that exceed its ESL. The FS lists media-specific ESLs for benzene from 2005, which are higher than current ESLs:

Media	Benzene Levels Reported	2005 ESL	2007 ESL
Soil	<0.005 – 26 mg/kg	0.51 mg/kg	0.27 mg/kg
Soil Gas	<0.001 – 0.26 ppmv	0.12 ppmv	0.088 ppmv
Groundwater	<0.5 – 950 µg/l	1800 µg/l	540 µg/l

As indicated in the table above, maximum benzene concentrations reported in soil gas and groundwater exceed current ESLs, indicating that additional evaluation is necessary. The FS proposes that additional evaluation might include using the 95%UCL for benzene as the exposure point concentration. That value is 0.27 mg/kg which is equivalent to the current, more stringent ESL. We found that the conclusion in the FS that "the localized presence of volatile hydrocarbons in the Northwest Operations Area may pose a risk to future on-site commercial workers" is reasonable. However, this issue was also evaluated in our review of the HHRA and discussed above under the topic "benzene". Although the information from the FS evaluated here appears to give support to a finding that more in-depth risk analysis of benzene in soil and soil gas at the Northwest Operations Area should be conducted. The assessment of vapor intrusion by Dr. Carlisle demonstrates that further analysis would not result in a conclusion that risks would be significant or that other remedial alternatives would be appropriate. Therefore, we do not recommend further analysis of benzene risks or vapor intrusion.

Remedial Action Plan, December 18, 2007

The intent of the Remedial Action Plan (RAP) is to provide detailed information on how the preferred remedial alternative from the Feasibility Study will be implemented. The RAP contains multiple references to human health, ecological risk, and occupational health that are reviewed and evaluated in this report.

The RAP refers to the findings of the FS regarding BTEX[5] and benzene present in soil, groundwater and soil gas, indicating that the FS determined that "BTEX does not pose a significant risk to building occupants, provided adequate institutional controls (e.g., vapor barriers) are in place" (RAP page 14).

The RAP indicates that institutional controls are designed to protect building occupants from possible vapors from the underlying hydrocarbons. Institutional controls include deed restrictions limiting land use to commercial/industrial purposes, excavation notification requirements, a soil management plan, groundwater use restrictions in impacted areas, and a vapor barrier requirement for any new buildings that are constructed in the Northwest Operations Area. We found that the conclusions in the RAP are appropriate and we do not recommend further assessment. While institutional controls are useful and vapor barriers may fail over time, it appears that the full spectrum of risks posed to future workers without such a barrier in place would be less than significant.

Predictive Ecological Risk Assessment (pERA)

General Comments

There were two major issues with the predictive Ecological Risk Assessment (pERA) that were satisfactorily resolved after further review and discussion with the SERRT:

1. Executive decisions made by the ERWG affected the data and methodology used in the pERA. Several critical components of the pERA were discarded or excluded from evaluation

[5] Benzene, toluene, ethylbenzene and xylene

based on executive decisions made by the ERWG. It was unclear during the peer review if some decisions were the best for protecting the ecological environment.

Recommendations made by the ERWG, and approved by the SERRT, regarding the data and the methodology used in the pERA allowed for a focused, quantitative risk assessment. These decisions were based on data and analyses presented in previous investigations for the site, as well as technical memoranda prepared by the ERWG. There is no indication that any of these decisions resulted in a remediation plan that is not sufficiently protective of the environment.

2. It appears that the ERWG acted as both risk assessor and risk manager. There is no clear separation of risk assessment and risk management functions in the pERA report. The peer review questioned this methodology.

   The regulatory process at the San Luis Obispo Tank Farm was unique in that it was a voluntary, cooperative process working with a number of stakeholders with interest in the environmental resources at the site. Therefore, it was managed differently than the standard environmental cleanup site that is under an order and has clearly defined risk managers and regulatory oversight.

   For the San Luis Obispo Tank Farm, the ERWG provided technical support to the SERRT regarding the details of the pERA and provided a recommendation for approval to the SERRT when it was ready to be ratified. Neither the ERWG nor the SERRT are risk managers for this site. The Regional Water Quality Control Board is the risk manager for this site. While SERRT members may be affiliated with the risk management agencies or with other stakeholder groups, their role was to provide technical support and oversight, not risk management.

   The SERRT ratified the Risk Management Summary which provided a set of recommendations of areas that required further evaluation in the Feasibility Study. The FS then evaluated remedial alternatives for those areas and identified a preferred alternative. The FS was also ratified by the SERRT. The FS formed the basis for the Remedial Action Plan. The SERRT has concurred that the RAP reflects the preferred alternative identified in the FS. The RAP will be the first document that will be formally evaluated and approved by the risk managers once the environmental review process (CEQA) is complete.

Risk Assessment/Risk Management

Regarding Risk Assessment/Risk Management functions, the U.S. Environmental Protection Agency (USEPA) and California Environmental Protection Agency (Cal/EPA) guidance establish that Risk Assessment and Risk Management should be distinct and independent environmental assessment processes. For example, the USEPA states "Risk Management is a distinctly different process from risk assessment. Risk assessment establishes whether a risk is present and, if so, the range or magnitude of that risk. In the risk management process, the results of the risk assessment are integrated with other considerations, such as economic or legal concerns, to reach decisions regarding the need for and practicability of implementing various risk reduction activities." US EPA and CalEPA DTSC guidelines also echo this separation of functions.

Therefore, the pERA should only describe the site, provide background information, describe the process used to assess the threat posed by the site to ecological receptors and then describe the uncertainties associated with the evaluation. Risk management considerations should not be included in the risk assessment report and instead included only in the RMS.

Both the SERRT and the ERWG were established to oversee and direct both the risk assessment and risk management activities for the site. Thus, right from the start, risk assessment and risk management functions were combined and the direction given the consultant was therefore inclusive of both tasks. Since there was no clear definition of Risk Assessment and Risk Management functions and executive decisions were taken by the ERWG about what to include and what to exclude from evaluation, the pERA is open to criticism that the risk assessment was written to support risk management decisions made *a priori* by the ERWG. That being said, we are confident that this did not occur.

4.11.1.3 Updated Baseline Human Health Risk Assessment

The *Human Health Risk Assessment for the Unocal San Luis Obispo Tank Farm* (McDaniel Lambert, Inc. 2004; McDaniel Lambert, Inc. 2013) evaluated the potential cancer risk and noncancer hazard to current and possible future Site users from chemicals known to be present at the Project Site. As part of the CEQA process the EIR team conducted a peer review of the 2004 Baseline HHRA. As a result of this peer review and subsequent consultation with SERRT members it was decided that additional Project Site characterization studies were required. Specific characterization activities have included the re-evaluation of the source(s) of dioxins at the Site (Padre 2011a) and the 2011 soil gas assessment (Padre 2012a). The HHRA was revised based on the additional site characterization and updated exposure assumptions, with the results summarized in Table 4.11.1 below[6]. OEHHA on behalf of the RWQCB and County Environmental Health have conducted extensive reviews of the HHRA and have found the document to be adequate. These letters are included in Appendix H.2.

Exposure assumptions were made in accordance with regulatory guidance (Cal/EPA 1994, USEPA 1989), zoning for the Project Site, previous Site risk assessments, information from local residents, future proposed land uses, and best professional judgment. Potential risk was evaluated for future on-site recreational, commercial and off-site residential land use under two scenarios: (1) the whole site, and (2) a possible "post-remediation" spatial scenario, which assumed that exposure to elevated metals concentrations (i.e. arsenic and lead) in the Northwest Operations Area would be eliminated. Exposure pathways considered in the 2004 Baseline HHRA included incidental ingestion of soil and surface water, dermal contact with soil and surface water, and inhalation of particulates from soil. Based on Site monitoring data and evaluation by the SERRT, HHWG, and OEHHA, risk from direct vapor inhalation exposure was determined to be negligible for future commercial and recreational users of the Site.

[6] A Project-specific HHRA was prepared in 2009 and updated in 2012 to address potential health risk following site cleanup and closure activities. The HHRA and update is discussed in Section 4.11-4.

The estimated incremental lifetime cancer risks (ILCRs) were within the 1 in 1,000,000 ($1x10^{-6}$) to 1 in 10,000 ($1x10^{-4}$) risk management range stipulated by the USEPA (1990) for all receptors in both exposure scenarios. Cancer risk at the Site under Scenario 1 was driven by arsenic and benzo(a)pyrene (BaP). Risk under Scenario 2 was driven by BaP only. The estimated noncancer hazards were below the level of concern of 1.0 for all receptors in Scenarios 1 and 2. For Scenario 1, the primary hazard drivers for the recreational child and off-site resident child were TPH and arsenic in soil. For Scenario 2, TPH alone drove the noncancer hazard for the recreational child and off-site resident child. For all receptors and exposure scenarios, the blood lead levels calculated using the California Department of Toxic Substances Control (DTSC) LeadSpread model were below the CDC action level of 10 µg lead/dl blood (the benchmark at the time), based on a model run for a hypothetical on-site resident, even though there will be a residential deed restriction for the property, who was exposed to lead in Scenario 1.

Table 4.11-1 Summary of Project Site 2004 Baseline HHRA Results

Receptor	Total Cancer Risk[1]	Total Noncancer Hazard
Scenario 1 – Including Northwest Operations Area		
Off-site Resident Adult	8.2E-06	0.03
Off-site Resident Child	NA	0.29
Recreational User Adult	8.2E-06	0.03
Recreational User Child	NA	0.29
Business Park Employee	2.9E-06	0.03
Intrusive Construction Worker	2.8E-07	0.23
Scenario 2 – Excluding Northwest Operations Area[2]		
Off-site Resident Adult	4.4E-06	0.03
Off-site Resident Child	NA	0.21
Recreational User Adult	4.4E-06	0.03
Recreational User Child	NA	0.21
Business Park Employee	1.7E-06	0.02
Intrusive Construction Worker	1.7E-07	0.21

Note: 8.2E-06 = 0.0000082 = 8.2 excess cancers per million people exposed.
[1] Cancer risk is age-adjusted and assumes 6 years of exposure as a child and 24 years as an adult.
[2] Scenario 2 assumes that remedial activities would eliminate exposure to metals in the Northwest Operations Area and arsenic was not included in the risk and hazard calculations.
NA=Not Applicable

4.11.1.4 Predictive Ecological Risk Assessment

In 2004 a predictive ecological risk assessment (pERA) was prepared to provide a screening-level evaluation of potential ecological risks associated with the Project Site using the existing site data and site characterization reports. Key elements of the pERA included:

- pERA consists of Tier 1 and Tier 2 assessment.
- Tier 2 evaluates 2 risk scenarios
  - Site-wide

- Site minus the former operations area

- Important habitats evaluated include both terrestrial and wetland.
- COPECs selected include arsenic, lead, PAHs, and TPH.
- CSM identified complete exposure pathways between impacted site media and plant, invertebrate, and wildlife receptors.
- Eight terrestrial and eight wetland receptors evaluated.

The pERA generally followed the California Department of Toxic Substances Control (DTSC) "Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities Part A: Overview" (DTSC, 1996). The pERA consists of four basic components: problem formulation, exposure assessment, effects assessment, and risk characterization. Due to the conservatism of the evaluation, any determinations of Level 1 or Level 2 risk should not be considered definitive conclusions, but, rather, should be interpreted as conservative estimates of potential risk.

As part of the cooperative process with the ERWG, there were a number of specific changes to the spatial scope of the pERA. Most significantly, Reservoirs 5 and 7 and all surface hydrocarbon expressions (solid, pliable or liquid oil on the surface) were excluded from the pERA. These areas were excluded because it was generally agreed that the tar would likely exceed toxicity thresholds and that many of these areas are physical hazards to the ecological receptors and would have to be removed or caped as part of the remediation project. As such, it was acknowledged that evaluation of risk from these areas would not add resolution to the risk assessment and management process since they would be removed or capped as part of the remediation.

The pERA includes a two tier analysis. Tier 1 includes a site assessment using the most conservative exposure and effects assumptions. The results are used to focus the Tier 2 assessment. The Tier 2 assessment uses refined exposure estimates and a range of effects criteria to evaluate site-wide risks. Those compounds that demonstrate Level 1 site-wide risk are evaluated spatially (i.e., on an individual sample-specific location basis). In addition, the Tier 2 assessment includes evaluation of two different risk scenarios. Scenario 1 evaluates what is referred to as "the whole site" for the rest of the document, but which actually is composed of the whole site minus Reservoirs 5 and 7 and all surface hydrocarbon expressions. Scenario 2 is a "possible post-remediation" scenario and excludes the former operations area from the exposure estimates, as well as Reservoirs 5 and 7 and surface hydrocarbon expressions.

In general terms, terrestrial/wetland plants and terrestrial/sediment invertebrates are the most sensitive receptors evaluated in the pERA, especially in terms of risk due to petroleum exposure. Potential risk to wildlife (i.e., birds and mammals) from exposure to petroleum (either as TPH or PAHs) is generally de minimus. Spatially the majority of TPH benchmark exceedances are on or near identified surface hydrocarbon expressions. A few notable exceptions include several samples within Reservoir 4 and two samples in the wetland areas in the southwest corner of the site (B-52 in Reservoir 6 and S-59). The main potential risks to wildlife identified in the pERA are from exposure to lead and to a lesser extent arsenic. Elevated concentrations of both

compounds are localized and limited to the former Northwest Operations Area (arsenic and lead) and tank bottoms in the northeastern portion of the site (lead).

While the pERA has identified the potential for risk, as described above, the screening-level framework resulted in conservative estimates of risk. A validation study focused on the most significant sources of uncertainty would further refine the evaluation and could corroborate these initial findings or result in a finding of de minimus risk. Results of the pERA, and potential impacts to biological resources, are discussed and evaluated in Section 4.2.4 (Biological Resources) of this EIR.

4.11.1.5 Airport Land Use and Hazards

The Project Site is located beneath the departure pattern for Runway 11-29 of San Luis Obispo County Regional Airport (SLOCRA), which extended Runway 29 by approximately 500 feet in 2001. This expanded the airport safety zones beyond those originally considered in the City's Airport Area Specific Plan (AASP). The State of California Department of Transportation's Airport Land Use Planning Handbook provides recommendations, based on runway length, for the size and configuration of aviation safety zones, those safety zones are depicted in Figure 2-4 (refer to Section 2.0, Project Description).

Airport Safety Areas

The entire Project Site is located within one of the various SLOCRA Safety Areas (see Project Description Figure 2-25). The City's AASP provides a list allowable land uses for each of zoning designations. In addition, the Airport Land Use Plan (ALUP) provides guidance on what types of land uses are allowed within each airport safety zone.

Runway protection zones (RPZs) are trapezoidal-shaped areas located at ground level beyond each end of a runway. The dimensions of RPZs vary depending upon the type of landing approach available at the airport (visual, non-precision, or precision) and the characteristics of the critical aircraft operating at the airport (weight and approach speed). Ideally, each runway protection zone should be entirely clear of all objects. On portions of the RPZ not under airport control, the Federal Aviation Administration (FAA) recommends that churches, schools, hospitals, office buildings, shopping centers, and other places of public assembly such as recreational facilities, as well as fuel storage facilities, be prohibited. Automobile parking is considered acceptable only on the outer edges of RPZs (outside the extended object free area).

Safety Area S-1 is the area within the vicinity of which aircraft operate frequently or in conditions of reduced visibility at altitudes less than 500 feet above ground level (AGL). Safety Area S-1 is further divided into the following zones, each with different hazards and development limitations.

Airport Safety Area S-1a

Airport Safety Area S-1a includes the area which is within 500 feet on either side of the extended runway centerline and is within 500 feet of an existing or planned runway end. This is an area with frequent or low visibility aircraft operations at less than 500 feet above ground level which are located within 250 feet of extended runway centerlines and within 3000 feet of a runway end.

Airport Safety Area S-1b

Airport Safety Area S-1b is comprised of those portions of Safety Area S-1 which are not included in Safety Area S-1a, but are within probable gliding distance for aircraft on expected approach or departure courses; also includes State-defined sideline Safety Areas, inner turning zones and outer safety zones for both Runway 11-29 and Runway 7-25 and portions of existing Airport Land Use Zone 3. Aviation safety hazards to be particularly considered in this area include mechanical failures, fuel exhaustion, deviation from glideslope or minimum descent altitude (MDA) during instrument flight rules (IFR) operations (due to pilot error or equipment malfunction), loss of control during short approach procedures, stall/spin incidents during engine-out maneuvers in multi-engine aircraft, loss of control during "go around" or missed approach procedures, and midair collisions.

Airport Safety Area S-1c

Airport Safety Area S-1b is comprised of those portions of Safety Area S-1 which are not included in Safety Areas S-1a or S-1b, but are adjacent to (within 0.5 nautical mile (nm)) frequent or low-visibility aircraft operations at less than 500 feet above ground level. Aviation safety hazards to be considered in this area include mechanical failures, deviation from localizer or VOR during IFR operations (due to pilot error or equipment malfunction), stall/spin incidents during engine-out maneuvers in multi-engine aircraft, loss of control during "go around" or missed approach procedures, and loss of visual references by aircraft performing circle-to-land procedures. The outer border of Airport Safety Area S-1c is rectangular in shape. It is 3.68 nm (22,382 feet) in length and 1 nm (6076.115 feet) in width. The long sides of the rectangle are parallel to and 1/2 nm from the extended runway centerline, while the short sides are located 8,542 feet northwest of the threshold of Runway 11 and 7,542 feet southeast of the threshold of Runway 29.

ALUP Policies

The ALUP contains several safety-related policies to address future development. Under the ALUP a proposed general plan, general plan amendment, specific plan, specific plan amendment, zoning ordinance, zoning ordinance amendment, building regulation modification, or individual development proposal would be determined to be inconsistent with the ALUP if the proposed project or local action:

Policy S-1 – Would permit or lack sufficient provisions to prohibit structures and other obstacles within the Runway Protection Zones for any runway at the Airport, as depicted in ALUP Figure 4. Refer to Section 2.0, Project Description, Figure 2-4.

Policy S-2 – Would permit or fail to adequately prohibit any future residential or nonresidential development or redevelopment which would create, within the site to be developed or redeveloped, a density greater than specified in ALUP Table 7 or any mixed-use development or redevelopment which would create, within the site to be developed or redeveloped, densities greater than illustrated in ALUP Figures 5 through 8. Refer to Table 4.11-2 and Figure 4.11-4 below.

Policy S-3 – Would permit or fail to adequately prohibit any future development project which specifies, entails, or would result in a greater building coverage than permitted by ALUP Table 7. Refer to Table 4.11-2 below.

Table 4.11-2 Planning Requirements and Density Adjustments for Land Uses within the SLOCRA Aviation Safety Areas

Aviation Safety Area	Maximum Building Coverage (% of gross area)	Maximum Density of Use (Non-Residential) persons/acre[1]	Maximum Density of Residential Development d.u./acre[2]	Special Function Land Uses Allowed	High Intensity Land Uses Allowed
Runway Protection Zone	0	5	0	no	no
Airport Safety Area 1a	5	30	0.2	no	no
With approved ACOS	n/a	40	0.2	no	no
Airport Safety Area 1b	10	40	0.2	no	no
With approved ACOS	n/a	50[6]	0.2	no	no
Airport Safety Area 1c	15	50	0.2	no	no
With approved ACOS	n/a	60[6]	0.2	no	no
With approved ACOS and Detailed Area Plan (DAP)[3]	n/a	80	0.2	no	no
Within CDZ specified by an approved ACOS	n/a	90	0.2	no	no
Within CDZ specified by approved ACOS and DAP[3]	n/a	120	0.2	no	no
Airport Safety Area 2	20	150	6	no	no
With approved ACOS	n/a	150	12	no	no
With approved ACOS and Detailed Area Plan[3]	n/a	150	18[5]	yes[4]	yes[4]
Within CDZ specified by an approved ACOS	n/a	180	18	no	no
Within CDZ specified by approved ACOS and DAP[3]	n/a	Unlimited	Unlimited	yes[4]	yes[4]

[1] Refers to the maximum number of persons that a development may be expected to attract during the course of normal operations.

[2] Refers to the maximum number of dwelling units (as defined by this ALUP) per acre of gross land area allowable on any parcel under the terms of a proposed project or local action.

[3] Requires that the development be controlled by a Detailed Area Plan that has been developed in consultation with the ALUC and has been reviewed by the ALUC and has been determined to be consistent with the ALUP after the date of adoption of this amendment.

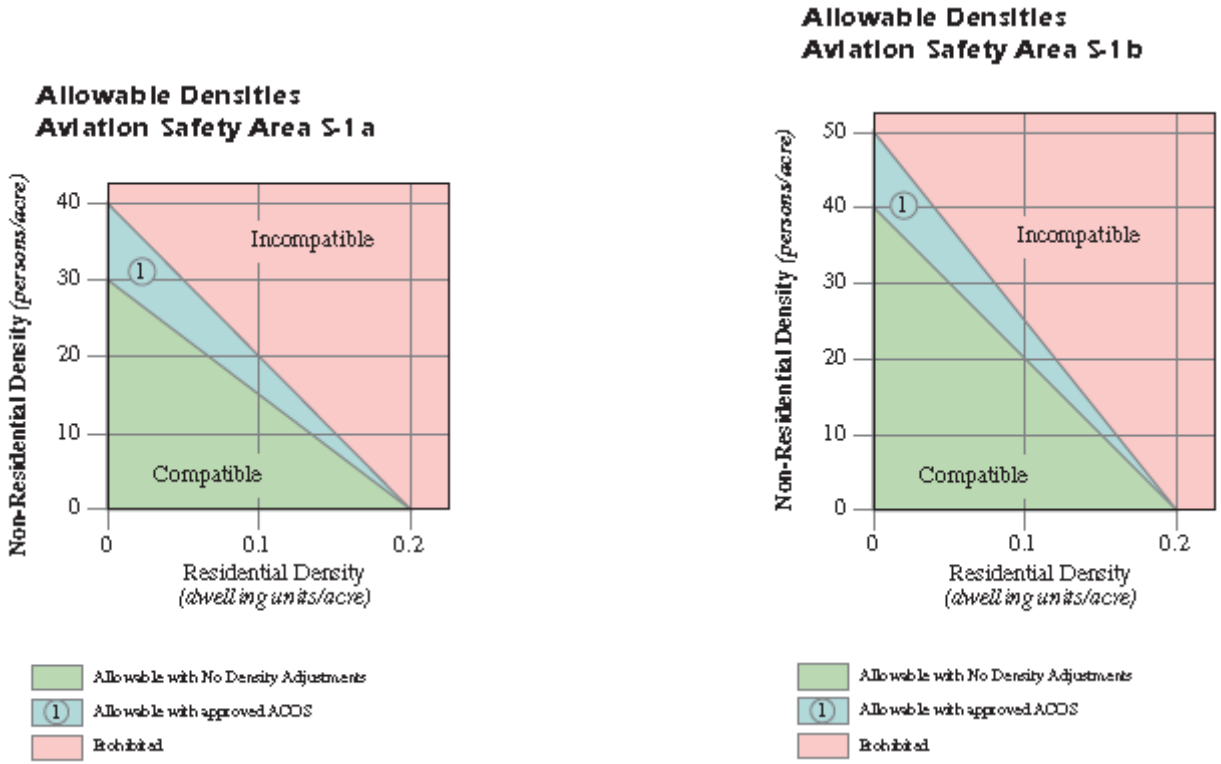
[4] Location and type of Special Function and/or High Intensity land uses shall be designated by Detailed Area Plan and shall be subject to ALUC approval.

[5] Although a maximum residential density of up to 18 d.u./acre may be allowed for designated parcels within the Detailed Area Plan, the Detailed Area Plan must also provide for areas of lesser allowable densities, so that the maximum number of dwelling units which can be established within the Detailed Plan area, under conditions of maximum build-out, will not exceed 15 d.u./acre.

[6] Except that, in those portions of Safety Areas S 1b and S 1c which are a distance of 1 nm or greater from the end of any active runway, a maximum non-residential density of up to 75 persons/acre will be allowed.

Source: ALUC, 2005.

Figure 4.11-4 Allowable Population Densities within the SLOCRA Aviation Safety Areas



Source: ALUP, 2005.

Policy S-4 – Would permit or fail to adequately prohibit high intensity land uses or special land use functions (impaired egress uses or unusually hazardous uses), except that, when conditions specified by ALUP Table 7 for density adjustments have been determined to be met by the ALUC, high intensity land and/or special function uses may be allowed in Aviation Safety Area S-2. Refer to Table 4.11-2 below.

The Project Site is currently clear of any residential units or large scale non-residential activities. Therefore, the current land use meets the ALUP compatibility requirements and does not create a safety risk

Aircraft Wildlife Strike Hazards

Wetlands are often used as forms of mitigation for projects on or near airports, and the Project Site currently contains several wetland areas that will be restored and enhanced. However, wetlands are typically considered wildlife hazard attractants. According to the FAA, wetland conservation, preservation, or mitigation is strongly discouraged on airport property (i.e., owned by the airport) and is recommended to remain outside the separation areas within an Airport Influence Area (AIA) (Caltrans, 2011). The entire Project Site is within the AIA; therefore, the FAA policies would discourage additional wetland conservation, preservation, or mitigation at the Project Site.

Many types of agricultural areas are considered wildlife hazard attractants due to the presence of livestock and an available food source for wildlife. The FAA discourages agricultural activities, including hay crops, on airport property (Caltrans, 2011).

Parks, golf courses, natural resources, and natural areas have the potential to create wildlife hazard attractants on or near airports. These areas may provide wildlife corridors, roost sites, rookeries, migratory flyway stop over sites or numerous other functions that may benefit wildlife but, due to their location, may create situations where wildlife are crossing airspace for approach, departing, or training aircraft (Caltrans, 2011).

Based on a wetland delineation of the Project Site conducted in 2008, the Project Site contains 49 acres of Federal wetlands, 3.4 acres of “one-parameter” wetlands, and 3.9 acres falling under the category of Other Waters of the U.S (Padre 2008b). The frequency of aircraft bird strikes, referred to as wildlife strikes, varies substantially based on airport location and surrounding habitat. Figure 4.11-5 shows the wildlife strike frequency for various airports in California, including the SLOCRA within a five mile radius, while Figure 4.14-6 normalizes the wildlife strike frequency based on airport traffic volume. The Statewide average is one wildlife strike per 4,350 takeoffs and landings, while SLOCRA experiences one wildlife strike per 4,656 takeoffs and landings. The median wildlife strike rate in California is one wildlife strike per 4,670 takeoffs and landings. Therefore, wildlife strike rates at the SLOCRA are about average.

A closer examination of wildlife strikes at the SLOCRA shows that there is a considerable amount of interannual variability as shown in Figure 4.11-7. Since reporting of wildlife strikes are voluntary, it is unclear how much of this interannual variability is related to pilot awareness and reporting, or if there are substantial variations in bird populations in the airport area.

Figure 4.11-5 Number of Wildlife Strikes at Primary Commercial Airports in California (1990-2010)

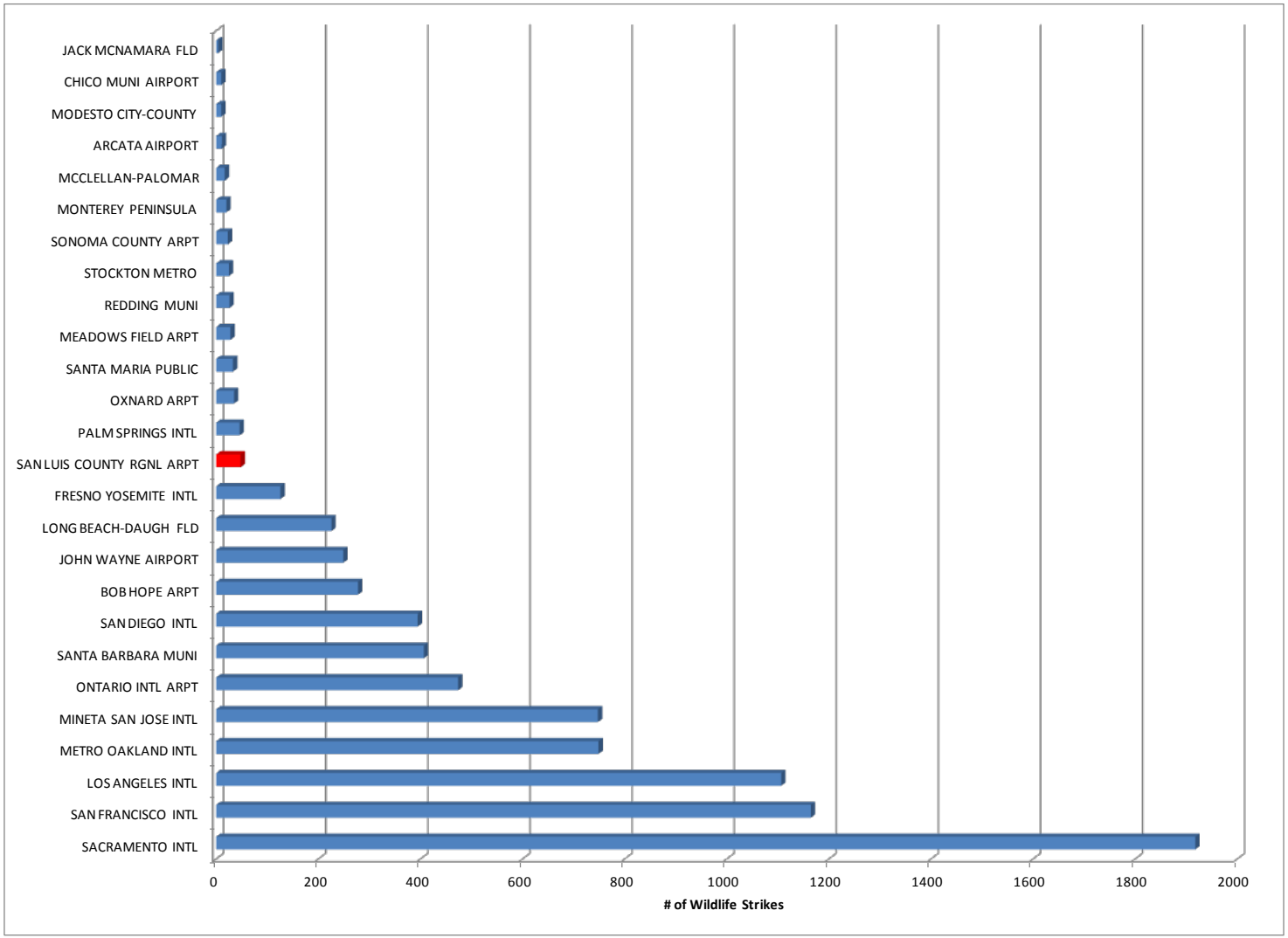


Figure 4.11-6 Number of Take-off and Landings per Strike at Primary Commercial Airports in California (1990-2010)

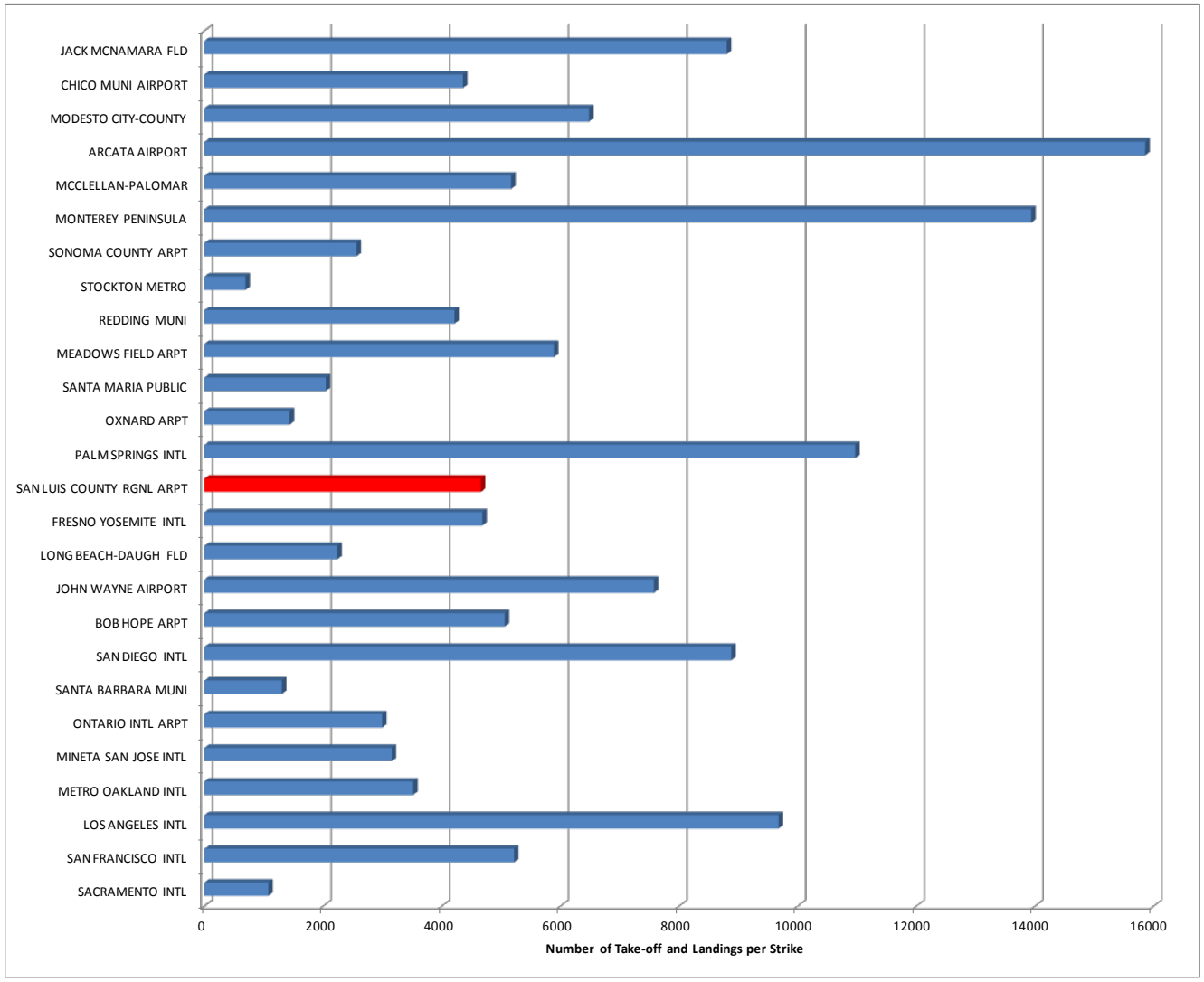
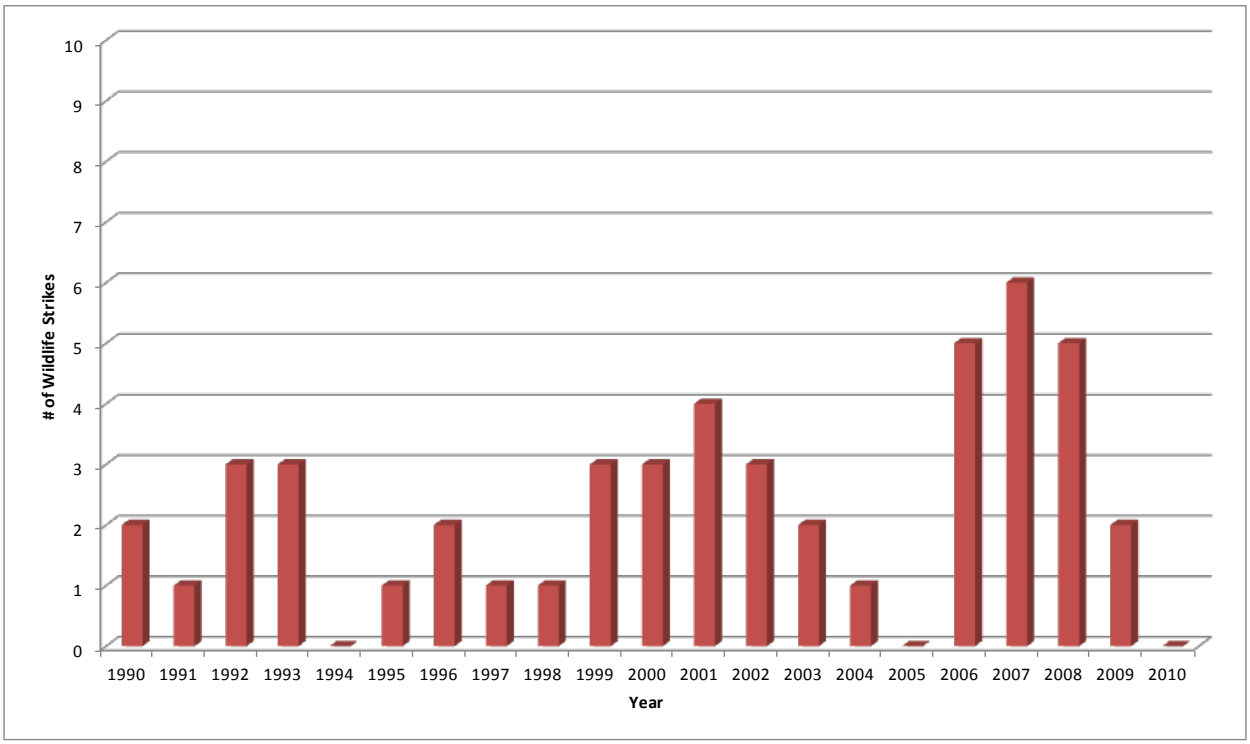


Figure 4.11-7 Number of Wildlife Strikes at SLOCRA



A breakdown of wildlife strikes as a function of flight phase is presented in Figure 4.11-8. As would be expected, a majority of the wildlife strikes occur in the air, with fewer strikes while the aircraft is on the ground (takeoff run and landing roll). Wildlife strikes by phase of flight and the effect the strikes have had are presented in Figures 4.11-8 and 4.11-9. In most cases, aircraft flight is unaffected by a wildlife strike, although there have been numerous precautionary landings (10 over the 1990-2010 period), and two aborted takeoffs. However, no aircraft crashes have occurred at the SLOCRA as a result of a wildlife strike.

Aircraft damage has also been relatively minor as a result of wildlife strikes (Figure 4.11-10). In most cases, no damage is reported from the wildlife strike. Where damage has been reported, parts included the radome, nose, engine, prop, wing, ingested in jet turbine, and a damaged windshield wiper. Of the 48 wildlife strikes at SLOCRA, 12 flights were adversely affected and 13 aircraft received minor to moderate damage. Species that have been involved in aircraft strikes include seagulls, hawks, pigeons, blackbirds, sparrows, finches, ducks, owls, American kestrels, meadowlarks and turkey vultures. Hawks are the most frequently impacted species.

Figure 4.11-8 Number of Wildlife Strikes at SLOCRA by Phase of Flight

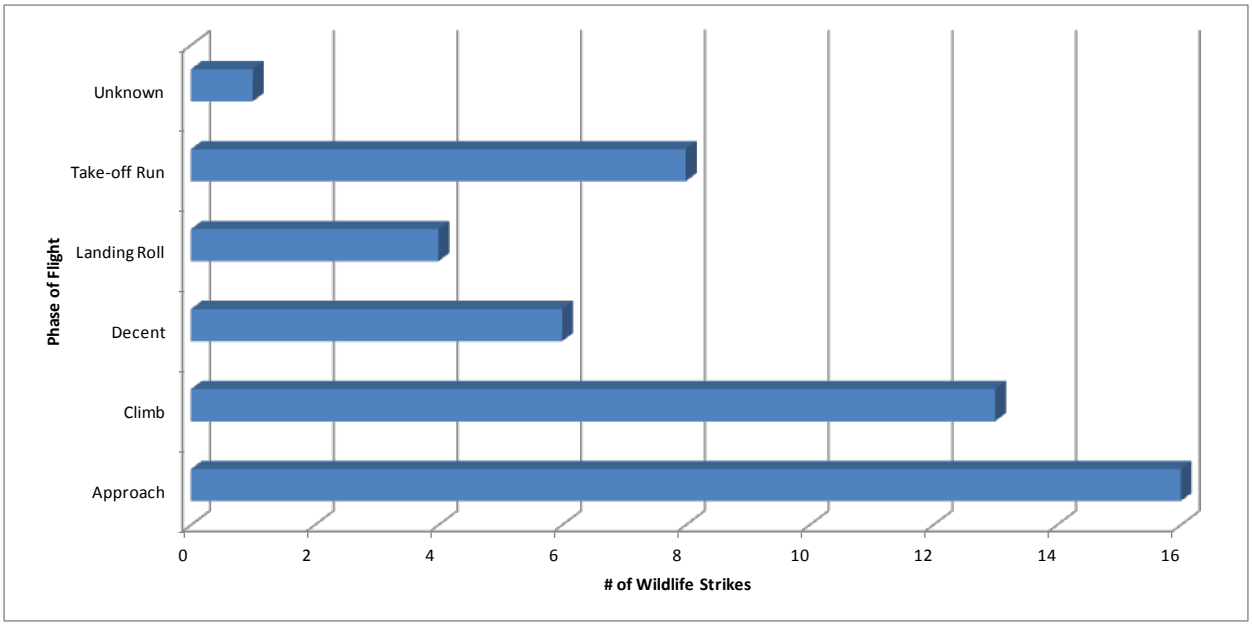


Figure 4.11-9 Effect of Wildlife Strike on Aircraft Flight at SLOCRA

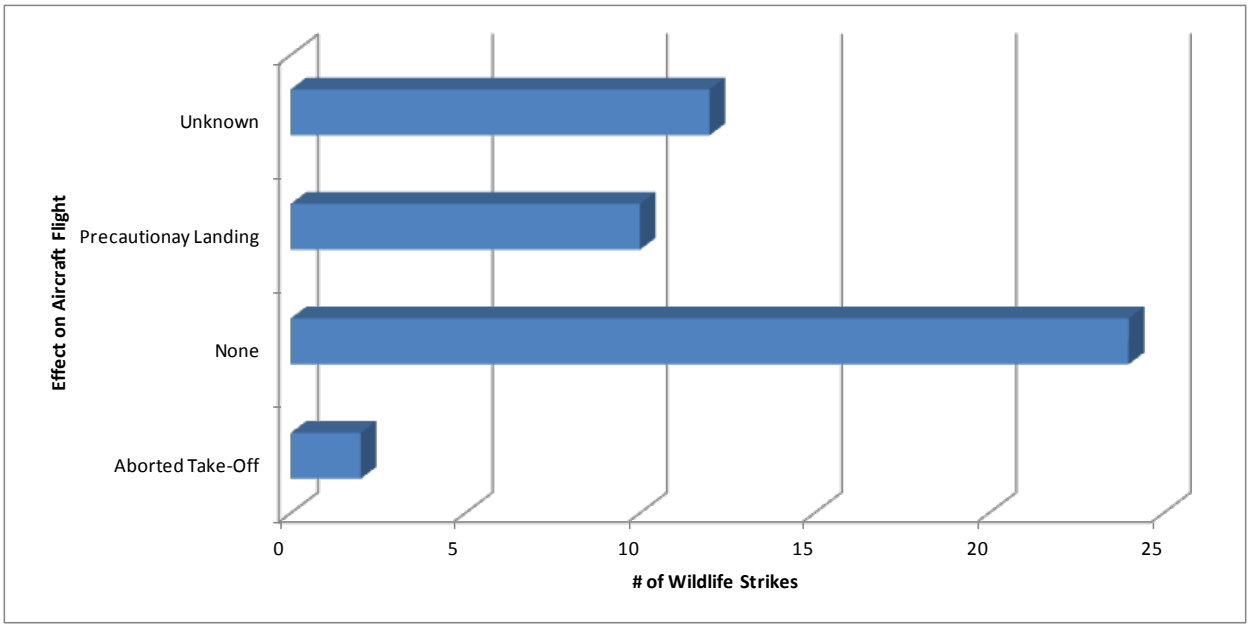
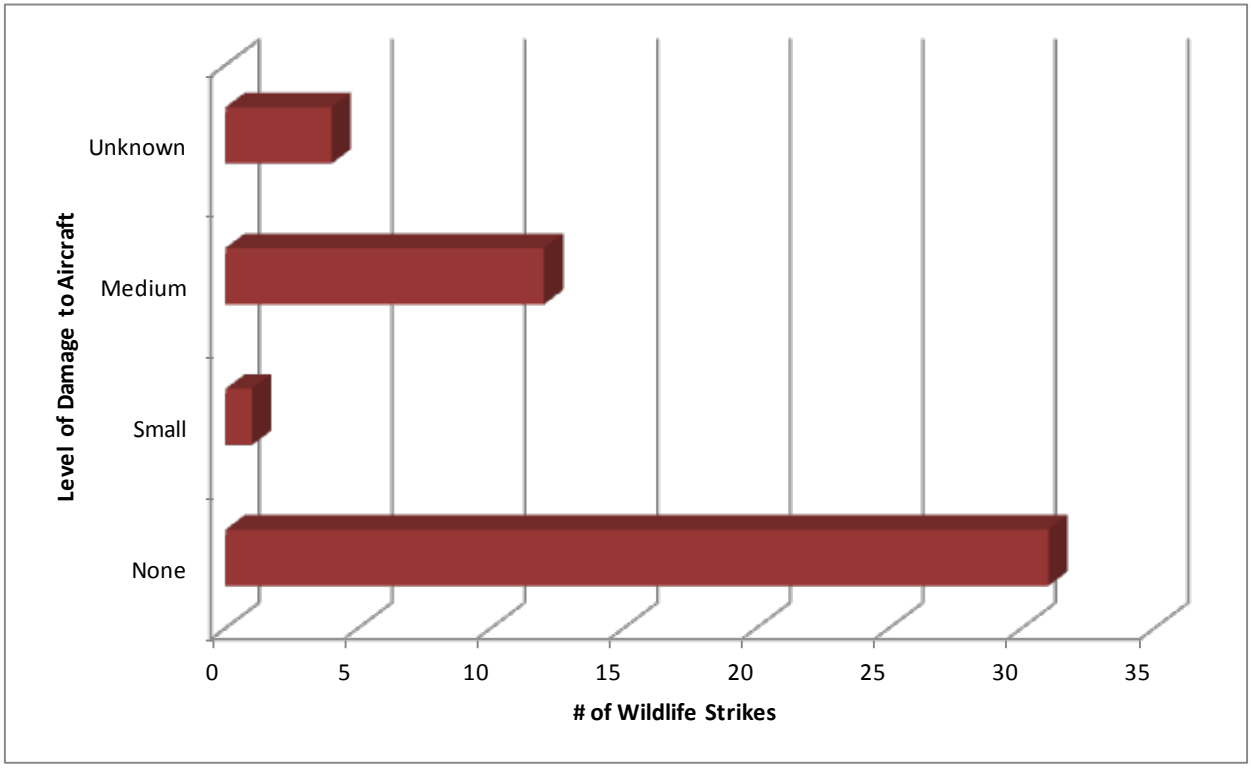


Figure 4.11-10 Level of Damage to Aircraft from Wildlife Strike at SLOCRA



4.11.1.6 Study Area

The area that could be impacted by a release includes the Project Site and any transportation routes associated with proposed trucking of hazardous materials to the landfill destinations identified in Section 2.0, Project Description. An upset condition from Project operations that subsequently release hazardous materials at the Project Site or along transportation routes could adversely impact public safety and/or environmental resources in the region. The potentially affected area includes:

- Businesses and residences near the Project Site; and
- Trucking routes between the Project Site and the three proposed landfills (i.e., Santa Maria, Kettleman Hills, and Buttonwillow).

Populations in the residential areas were estimated using the US Census Bureau Year 2010 information on average populations per household. Aerial photographs were utilized to determine exact residence locations. Specific population densities were calculated for the residential areas near the Project Site by examining aerial photographs and structural densities, and estimating population densities using the census average for persons per household. Vehicular traffic along area roadways is based on traffic counts available from the County of San Luis Obispo and the California Department of Transportation (Caltrans).

4.11.2 Regulatory Setting

Remediation and development activities at the Project Site would be covered by a wide variety of federal, state, and local regulations, especially in the areas of worker safety and waste disposal.

4.11.2.1 Federal

There are numerous federal laws that cover hazardous materials and hazardous waste sites, as well as future hazardous material usage associated with future development.

Hazardous Waste Handling Requirements

Resource Conservation and Recovery Act and Associated Hazardous and Solid Waste Amendments, 40 CFR 260

Implementation of Resource Conservation and Recovery Act (RCRA) resulted in the creation of a major federal hazardous waste regulatory program that is administered by the EPA. Under RCRA, the EPA regulates the generation, transportation, treatment, storage, and disposal of hazardous waste (crude tank sediments, for example). RCRA was amended by the Associated Hazardous and Solid Waste Amendments (HSWA), which affirmed and extended the concept of regulating hazardous wastes from generation through disposal. HSWA specifically prohibits the use of certain techniques for the disposal of some hazardous wastes. Under RCRA, individual states may implement their own hazardous waste programs instead of RCRA, as long as the state program is at least as stringent as the Federal RCRA requirements. The EPA approved California's program to implement Federal hazardous waste regulations on August 1, 1992.

Asbestos and Lead

National Emissions Standards for Hazardous Air Pollutants, 40 CFR 61 Subpart M

Under Subpart M, an asbestos containing materials survey must be performed prior to renovation or demolition activities. Notification to the lead agency is required 14 days prior to the start of work (disturbance of asbestos containing materials). Additional Federal- and State-level asbestos requirements related to OSHA standards in 29 CFR 1926.1101 are covered by the Asbestos Construction Standard, Title 8, CCR Section 1529, which is described separately below.

The Worker Protection Rule (40 CFR 763, Subpart G, and 29 CFR 1910.1001) provides worker protection measures through engineering controls, worker training, labeling, respiratory protection, and waste management; the rule also defines asbestos containing materials and sets the permissible exposure level for asbestos.

Emergency Planning and Community Right-to-Know Act

Under the Emergency Planning and Community Right-to-Know Act, or Title III of the Superfund Amendments and Reauthorization Act of 1986, the EPA requires local agencies to regulate the storage and handling of hazardous materials and requires development of a plan to mitigate the release of hazardous materials. Businesses that handle any of the specified hazardous materials must submit to government agencies (i.e., fire departments or Public Health Departments), an inventory of the hazardous materials, an emergency response plan, and an employee training program. The business plans must provide a description of the types of hazardous materials/waste on-site and the location of these materials. The information in the

business plan can then be used in the event of an emergency to determine the appropriate response action, the need for public notification, and the need for evacuation.

Hazardous Materials Management Planning

Section 112(r) of the Clean Air Act Amendments of 1990, 40 CFR 68

The EPA requires facilities that handle listed regulated substances to develop Risk Management Programs (RMP) to prevent accidental releases of these substances. RMP materials are submitted to both local agencies (generally the fire department) and the Federal EPA. Stationary sources with more than a threshold quantity of a regulated substance shall be evaluated to determine the potential for, and impacts of, accidental releases of that substance. Under certain conditions, the owner or operator of a stationary source may be required to develop and submit a Risk Management Program. Risk Management Programs consist of three main elements: a hazard assessment that includes off site consequences analyses and a five-year accident history; a prevention program; and an emergency response program.

National Contingency Plan Requirements

Spill Prevention Control and Countermeasures Plans, 40 CFR 112.3 and 112.7

Facilities that store large volumes of hazardous materials are required to have a Spill Prevention Control and Countermeasures Plans (SPCCP) per the requirements of 40 CFR 112 submitted to the EPA. The SPCCP is designed to prevent spills from on-site facilities and includes requirements for secondary containment, provides emergency response procedures, and establishes training requirements.

Hazardous Materials Transportation

The Hazardous Materials Transportation Act, 49 CFR 171, Subchapter C

The DOT, Federal Highway Administration, and the Federal Railroad Administration regulate transportation of hazardous materials at the Federal level (The State also has requirements. See below). The Hazardous Materials Transportation Act requires that carriers report accidental releases of hazardous materials to DOT at the earliest practical moment. Other incidents that must be reported include deaths, injuries requiring hospitalization, and property damage exceeding $50,000.

Worker Health and Safety

Occupational Safety and Health Act, 29 CFR et seq.

Under the authority of the Occupational Safety and Health Act of 1970, the federal OSHA has adopted numerous regulations pertaining to worker safety (29 CFR) and provides oversight and enforcement (along with CalOSHA in California). These regulations set standards for safe workplaces and work practices, including the reporting of accidents and occupational injuries. Some OSHA regulations contain standards relating to hazardous materials handling, including workplace conditions, employee protection requirements, first aid, and fire protection, as well as material handling and storage. Relevant citations are summarized below.

Hazard Communication, 29 CFR 1910.1200

The purpose of the OSHA Hazard Communication law is to ensure that the hazards of all chemicals produced or imported are evaluated, and that information concerning any potential hazards is transmitted to employers and employees. This transmittal of information is to be accomplished by means of comprehensive hazard communication programs, which are to include

container labeling and other forms of warning, material safety data sheets, and employee training.

Process Safety Management, 29 CFR 1910.119

Under this section, facilities that use, store, manufacture, handle, process, or move hazardous materials are required to:

- Conduct employee safety training;
- Have an inventory of safety equipment relevant to potential hazards;
- Have knowledge on use of the safety equipment;
- Prepare an illness prevention program;
- Provide hazardous substance exposure warnings;
- Prepare an emergency response plan; and
- Prepare a fire prevention plan.

In addition, 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals, OSHA specifically requires prevention program elements to protect workers at facilities that have toxic, flammable, reactive or explosive materials. Prevention program elements are aimed at preventing or minimizing the consequences of catastrophic releases of chemicals and include process hazard analyses, formal training programs for employees and contractors, investigation of equipment mechanical integrity, and an emergency response plan.

Overview of 6 CFR Part 27

Chemical Facility Anti-Terrorism Standards, 6 CFR 27. The Federal Department of Homeland Security established the chemical facility anti-terrorism standards of 2007. This 2007 rule established risk-based performance standards for the security of chemical facilities. It requires covered chemical facilities to prepare Security Vulnerability Assessments, which identify facility security vulnerabilities, and to develop and implement Site Security Plans, which include measures that satisfy the identified risk-based performance standards.

Federal Aviation Administration

Federal Aviation Regulation, Part 77 Objects Affecting Navigable Airspace

A Notice of Proposed Construction or Alteration (Form 7460-1) maybe required by the FAA. The FAA Airport Design Guide, Advisory Circular (AC) 150/5300-13, contains guidance pertaining to land uses within the RPZ. As part of FAA grant assurances, if an airport sponsor receives federal funds for an airport, it is required that use of land adjacent to or in the immediate vicinity of the airport be restricted to activities and purposes compatible with normal airport operations.

4.11.2.2 State

State laws address gas and liquid pipelines, oil and gas facilities and hazardous materials and waste. The following sections discuss each of these.

California Health and Safety Code

Division 20, Chapter 6.5, §25100-25249, Hazardous Waste Control (administered by the CalEPA and the California Department of Toxic Substances Control);

Division 20, Chapter 6.95, §255500, et seq. Hazardous Materials Management Plan and Community Right-to-Know and Hazardous Materials Release Response Plans and Inventory (Business Plan Program, administered by local fire departments and the Certified Unified Program Agencies (CUPA));

Proposition 65 Compliance, H&SC §25249.5 et seq., administer by the CARB and the local APCDs;

H&SC §§25340-25392, Carpenter-Presley-Tanner Hazardous Substance Account Act (administered by the CalEPA and the California Department of Toxic Substances Control); and

H&SC §§25531-255413, California Accidental Release Prevention Program, administered by local fire departments and the Certified Unified Program Agencies (CUPA)

California Water Code

Division 7, Water Quality (Porter-Cologne Water Quality Control Act), administered by the State Water Resources Control Board

California Code of Regulations

- Title 4, California Civil Code, §1102.6, §1103.4, and §1353 cover disclosure requirements for property transfers in the vicinity of an airport.
- Title 8, §1529, Asbestos Construction Standard administered by the Department of Industrial Relations and CalOSHA);
- Title 8, §1532.1, Lead Construction Standard administered by the Department of Industrial Relations and CalOSHA);
- Title 8, §5189 and §5192, Accidental Release Plan administered by local fire departments and the Certified Unified Program Agencies (CUPA);
- Title 14, Division 2, Department of Conservation, administered by DOGGR;
- Title 16, §11010; Subdivided Lands, Investigation, Regulation and Report. Requires any person who intends to offer subdivided lands within this state for sale or lease shall file with the Department of Real Estate an application for a public report consisting of a notice of intention and a completed questionnaire on a form prepared by the department. This includes limitations on development due to FAA land use regulations for airport runway and safety zones.
- Title 19, §2729, Employee Training Program, administered by the California Emergency Management Agency (Cal EMA) and local fire departments and departments of public health;
- Title 22, Division 4, Chapter 30, Hazardous Wastes (administered by the CalEPA and the California Department of Toxic Substances Control);

- Title 22, Division 4.5, §§66260-67786, Hazardous Waste Requirements (administered by the CalEPA and the California Department of Toxic Substances Control); and
- Title 22, §66265.50-.56, Contingency/Emergency Response Plan administered by local fire departments and the Certified Unified Program Agencies (CUPA).

California Accident Release Prevention

The California Accident Release Prevention program mirrors the Federal Risk Management program, except that it adds external events and seismic analysis to the requirements and includes facilities with lower inventories of materials. A California Accident Release Prevention or Risk Management Plan, as administered by the Fire Departments and the EPA, if applicable, is a document prepared by the owner or operator of a stationary source containing detailed information including:

- Regulated substances held on-site at the stationary source;
- Off-site consequences of an accidental release of a regulated substance;
- The accident history at the stationary source;
- The emergency response program for the stationary source;
- Coordination with local emergency responders;
- Hazard review or process hazard analysis;
- Operating procedures at the stationary source;
- Training of the stationary source's personnel;
- Maintenance and mechanical integrity of the stationary source's physical plant; and
- Incident investigation.

Hazardous Materials and Hazardous Waste

Hazardous Waste Control Law

The Hazardous Waste Control Law is administered by the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC). DTSC has adopted extensive regulations governing the generation, transportation, and disposal of hazardous wastes. These regulations impose cradle-to-grave requirements for handling hazardous wastes in a manner that protects human health and the environment. The Hazardous Waste Control Law regulations establish requirements for identifying, packaging, and labeling hazardous wastes. They prescribe management practices for hazardous wastes; establish permit requirements for hazardous waste treatment, storage, disposal, and transportation; and identify hazardous wastes that cannot be disposed of in landfills. Hazardous waste is tracked from the point of generation to the point of disposal or treatment using hazardous waste manifests. The manifests list a description of the waste, its intended destination, and regulatory information about the waste.

Hazardous Materials Management Planning

The Office of Emergency Services, in support of local government, coordinates overall state agency response to major disasters. The office is responsible for assuring the State's readiness to respond to and recover from natural, manmade, and war-caused emergencies, and for assisting

local governments in their emergency preparedness, response, and recovery efforts. During major emergencies, Office of Emergency Services may call upon all State agencies to help provide support. Due to their expertise, the California National Guard, California Highway Patrol (CHP), Department of Forestry and Fire Protection, Conservation Corps, Department of Social Services, and Caltrans are the agencies most often asked to respond and assist in emergency response activities.

Hazardous Materials Transportation in California

California regulates the transportation of hazardous waste originating or passing through the State in Title 13 of the California Code of Regulations. The CHP and Caltrans have primary responsibility for enforcing Federal and State regulations and responding to hazardous materials transportation emergencies. The CHP enforces materials and hazardous waste labeling and packing regulations that prevent leakage and spills of material in transit and provide detailed information to cleanup crews in the event of an incident. Vehicle and equipment inspection, shipment preparation, container identification, and shipping documentation are all part of the responsibility of the CHP. The CHP conducts regular inspections of licensed transporters to ensure regulatory compliance. Caltrans has emergency chemical spill identification teams at locations throughout the State.

Hazardous waste must be regularly removed from generating sites by licensed hazardous waste transporters. Transported materials must be accompanied by hazardous waste manifests.

Hazardous Material Worker Safety, California Occupational Safety and Health Act

The California Occupational Safety and Health Administration (Cal/OSHA) is responsible for assuring worker safety in the handling and use of chemicals in the workplace. Cal/OSHA assumes primary responsibility for developing and enforcing workplace safety regulations in Title 8 CCR. Cal/OSHA hazardous materials regulations include requirements for safety training, availability of safety equipment, hazardous substance exposure warnings, and emergency action and fire prevention plan preparation.

Cal/OSHA also enforces hazard communication program regulations, which contain training and information requirements, including procedures for identifying and labeling hazardous substances. The hazard communication program also requires that Material Safety Data Sheets be available to employees and that employee information and training programs be documented.

Asbestos and Lead

Asbestos-containing construction materials are defined by Cal/OSHA as any internal building component containing greater than 0.1 percent asbestos. This is more stringent than Federal definitions of asbestos-containing materials, which contain asbestos in concentrations greater than 1 percent. Asbestos containing materials apply to all building components, including exterior materials and roofing. Lead-containing paint is defined as paint containing 0.006 milligrams per kilogram (mg/kg) lead by weight. Lead-based paint is defined as paint containing 0.05 mg/kg lead by weight. Existing asbestos containing materials and lead-based paint surveys cannot identify all materials, especially in or on internal building components. Compliance with 29 CFR 1926.1101, 40 CFR 61 Subpart M (NESHAPS), San Luis Obispo APCD District Rule 701, and similar State laws listed below, requires sampling of suspect or presumed asbestos containing materials before they are disturbed, if it is in a quantity of more than 260 linear feet

on pipes, or 160 square feet on other facility components, or 35 cubic feet. Cal/OSHA requires registered asbestos abatement contractors to remove asbestos-containing construction materials in quantities greater than 100 square feet.

The Asbestos Construction Standard, Title 8 CCR Section 1529. The Cal/OSHA asbestos standard for construction activities applies to all asbestos work where asbestos-containing construction materials may be disturbed in quantities provided above.

The Asbestos Construction Standard regulates asbestos exposure in all construction work as defined in Title 8 CCR Section 1502, including, but not limited to, the following:

- Demolition or salvage of structures where asbestos is present;
- Removal or encapsulation of materials containing asbestos;
- Construction, alteration, repair, maintenance, or renovation of structures, substrates, or portions thereof, that contain asbestos;
- Installation of products containing asbestos;
- Asbestos spill/emergency cleanup;
- Transportation, disposal, storage, containment of and housekeeping activities involving asbestos or products containing asbestos, on the site or location at which construction activities are performed;
- Excavation which may involve exposure to asbestos as a natural constituent that is not related to asbestos mining and milling activities;
- Routine facility maintenance; and
- Erection of new electric transmission and distribution lines and equipment, and alteration, conversion and improvement of the existing transmission and distribution lines and equipment.

Cal/OSHA Lead Construction Standard, Title 8 CCR Section 1532.1. The Lead Construction Standard applies to all construction work where an employee may be occupationally exposed to lead. The standard applies to any construction activity that may release dust or fumes including, but not limited to, manual scraping, manual sanding, heat gun applications, power tool cleaning, rivet busting, abrasive blasting, welding, cutting, or torch burning of lead based coatings. Unless otherwise determined by approved testing methods, all paints and other surface coatings are assumed to contain lead at prescribed concentrations, depending on the application date of the paint or coating.

All construction work excluded from coverage in the general industry standard for lead by Section 5198(a)(2) is covered by this standard. Construction work is defined as work for construction, alteration, or repair, including painting and decorating. It includes, but is not limited to, the following:

- Demolition or salvage of structures where lead or materials containing lead are present;
- Removal or encapsulation of materials containing lead;

- New construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead;
- Installation of products containing lead;
- Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed; and
- Maintenance operations associated with the construction activities.

4.11.2.3 Local

County Conservation and Open Space Element

In 1995, the County of San Luis Obispo adopted the Energy Element as part of the County's General Plan, subsequently merged with the Conservation and Open Space Element (COSE). The COSE was updated in 2010 and contains a goal of protecting public health, safety, and environment and several policies that promote the stated goal. The applicable policies include:

- Policy E 7.1 (19). To reduce the possibility of injury to the public, facility employees, or the environment, the applicant shall submit an emergency response plan which details response procedures for incidents that may affect human health and safety or the environment. The plan shall be based on the results of the comprehensive risk analysis. In the case of a facility modification, the existing response plan shall be evaluated by the safety review committee and revisions made as recommended.
- Policy E 7.1 (23). Encourage existing and proposed facilities to focus on measures and procedures that prevent oil, gas, and other toxic releases into the environment. This policy is to ensure that facilities: (1) take measures to prevent releases and spills; (2) prepare for responding to a spill or release; and (3) provide for the protection of sensitive resources. A review of a facilities spill response plan, or reports from other agencies, shall be completed to monitor compliance.

County Land Use Ordinance

These regulations were established and adopted to protect and promote the public health, safety and welfare, and more particularly:

A. To implement the General Plan and to guide and manage the future growth of the county in compliance with the General Plan;

B. To regulate land use in a manner that will encourage and support the orderly development and beneficial use of lands within the county;

C. To minimize adverse effects on the public resulting from the inappropriate creation, location, use or design of building sites, buildings, land uses, parking areas, or other forms of land development by providing appropriate standards for development;

D. To protect and enhance the significant natural, historic, archaeological and scenic resources within the county as identified by the county General Plan; and

E. To assist the public in identifying and understanding regulations affecting the development and use of land.

The following sections of the County Land Use Ordinance address potential hazards associated with the proposed Project and Site:

- Flammable and Combustible Liquid Storage. County Land Use Ordinance section 22.10.070 includes requirements for flammable and combustible liquid storage relating to: applicability, permit requirements, limitation on use, limitation on quantity, setbacks, and including California Department of Forestry and Fire Prevention (CAL FIRE) recommendations, as applicable. Without approval through a Conditional Use Permit, above ground storage of combustible liquid is 20,000 gallons and 2,000 gallons for flammable liquids.
- Explosives Storage. County Land Use Ordinance section 22.10.050 includes storage location requirements based on land use category, setback requirements and facility construction and buffering requirements.
- Flood Hazard Area. County Land Use Ordinance section 22.14.060 includes construction standards for flood hazard areas, and a prohibition of the storage or processing of materials that in time of flooding are buoyant, flammable, or explosive; that could be injurious to human, animal, or plant life; or that may unduly affect floodway capacity or unduly increase flood heights.

County Safety Element

This Safety Element has two basic principles: to be ready for disaster, and manage development to reduce risk. The following policies, programs and standards would apply to the proposed Project.

- Policy S-24 Aircraft Hazards. Reduce the potential for disaster from airport and land use conflicts in conjunction with the Airport Land Use plans.
  - Program S-64 Coordinate County and City planning at airport safety zones.
  - Standard S-65 General plan and zoning for land uses situated off the end of active runways should be low density, and preferably open space or agriculture. Update and rezone airport safety zones for appropriate land uses to comply with adopted airport land use plans.
  - Program S-66 Maintain Aircraft Rescue Fire Fighting (ARFF) response, training and equipment to Federal Aviation Administration (FAA) standards and work to continue to achieve National Fire Protection Association (NFPA) recommendations for ARFF.
- Policy S-26 Hazardous Materials. Reduce the potential for exposure to humans and the environment by hazardous substances.
  - Program S-68 Review commercial projects which use, store, or transport hazardous materials to ensure necessary measures are taken to protect public health and safety.
  - Standard S-69 Work with CalTrans to require all transport of hazardous materials to follow CalTrans approved routes.

- Program S-70 Inform residents along approved haul routes of the potential for hazard release.

Airport Compatible Open Space Plan

On July 21, 2004, the ALUC voted to amend the ALUP with an Airport Compatible Open Space Plan (ACOS) to address concerns that previous amendments, adopted in 2002, were too restrictive to development, and were inconsistent with the City's General Plan goals for housing production and job creation.

The ACOS establishes open spaces in the areas around the airport that can serve as reserve spaces (for aircraft emergency situations). By maintaining reserve spaces that keep certain land adjacent to the airport free and clear from obstruction or from buildings and uses where people congregate, the ACOS improves airport safety while allowing for more intense development of urban areas. The areas identified as reserve space in the ACOS include land that is close to the airport, in line with the main airport runway, or along an over-flight area where aircraft typically operate at lower altitudes. Identification of these areas in the ACOS plan adds airport safety to the list of reasons why these lands should not be developed.

The ACOS provides the ability to make density adjustments within the ALUP, as shown in Table 4.11-2, that allow for increased development potential within specific Aviation Safety Areas defined in the Plan. Such adjustments are allowable if advanced levels of planning analysis are performed.

The ACOS identifies two reserve spaces within the Project Site (Airport Area 1 and Airport Area 2). Although the ACOS plan, as adopted in 2004, includes a portion of the area proposed for development within the Reserve Zone (northeast corner), the City is proposing to change the boundaries of the two reserves spaces on the northern parcel of the Project Site, north of Tank Farm Road to: (1) remove the current reserve space designation from areas proposed for development by replacing that area with additional open space acreage at a 1:1 ratio, (2) to designate all of the proposed open space as reserve space, and (3) to split the Margarita Area and Airport Area 1 reserve spaces. Figure 2-25 shows the proposed changes to the ACOS plan reserve space boundaries. The proposed ACOS Amendment would be processed by the City subsequent to or concurrent with Project approval. Based on discussions with City staff, with adoption of the proposed Reserve Zone changes, and by designating the area as a Cluster Development Zone (CDZ), the Project can be developed at the proposed densities, in accordance with the requirements and density adjustments listed on Table 7 of the ALUP, consistent with the ACOS.

City General Plan Safety Element

The city of San Luis Obispo General Plan Safety Element includes several policies to minimize injury and loss of life, damage to public and private property, and social and economic disruptions resulting from injury, death, and property damage. Policies are included to address flooding, fire, earthquakes and other geologic hazards, hazardous materials, electromagnetic fields, airport hazards, hazardous trees, and emergency preparedness. Policies that are directly relevant to the proposed Project include:

Hazardous Materials

S 4.1: Minimizing Hazardous Materials Exposure. People's exposure to hazardous substances should be minimized.

S 4.2: Hazardous Materials in City Operations. The City should avoid using hazardous materials in its own operations to the greatest extent practical, and will follow all established health and safety practices when they are used.

Airport Hazards

S 6.1: Airport Land Use Plan. Development should be permitted only if it is consistent with the San Luis Obispo County Airport Land Use Plan. Prospective buyers of property that is subject to airport influence should be so informed (see discussion above).

A preliminary analysis of the project's consistency with applicable hazards and hazardous material plans and polices is provided in Appendix E.

4.11.3 Significance Criteria

As defined in CEQA Appendix G (VII) (the Environmental Checklist Form), a significant safety effect is one in which the proposed project "create[s] a potential health hazard or involve[s] the use, production or disposal of materials which pose a hazard to people, animal or plant populations in the area affected."

The analysis used in this report is based on the risk associated with the facility. Therefore, an impact would result in a significant impact if any of the following were to occur:

- Be within the amber or red regions of the Santa Barbara County Safety Criteria (see below for a discussion of these criteria), or
- Non-compliance with any applicable design code, regulation, NFPA standard, or generally acceptable industry practice; or
- For site contamination, result in mobilization of contaminants currently existing in the soil and groundwater, creating potential pathways of exposure to humans or other sensitive receptors that would result in exposure to contaminant levels that would be expected to be harmful, which is defined as an excess cancer risk of 10 in a million or an acute or chronic non-cancer risk level of 1.0.; or
- A transportation accident fatality risk level of one in one thousand (1.0×10^{-3}) per year.
- For site contamination, result in the presence of contaminated soils or groundwater within the project area, and as a result, expose workers and/or the public to contaminated or hazardous materials during construction activities at levels in excess of those permitted by the Cal/OSHA in CCR Title B and OSHA in Title 29 CFR Part 1910; or
- Any proposed development component that would be inconsistent with ALUP policies or designated land use compatibility (see Table 4.11-2 and Figure 4.11-4).

Santa Barbara County established a quantitative, risk-based criteria that has been utilized by various state agencies, including the California Coastal Commission and the California State Lands Commission. Santa Barbara County adopted Public Safety Thresholds in August 1999. The thresholds provide specific zones (i.e., green, amber, and red) on a risk profile curve to guide the determination of significance or insignificance based on the estimated probability and consequence of an accident. In general, risk levels in the green area would be less than significant and therefore acceptable, while risk levels in the amber and red zones would be significant. Risk profiles plot the frequency of an event against the consequence in terms of fatalities or injuries; frequent events with high consequence have the highest risk level. The Santa Barbara County quantitative risk-based criteria were used to evaluate potential fire and explosion hazards at the Project Site.

4.11.4 Remediation Project Impacts and Mitigation Measures

Impact #	Impact Description	Phase	Residual Impact
HM.1	Potential health risk due to exposure to residual contamination following site remediation for future site uses.	Remediation	Class III

A Human Health Risk Assessment (HHRA) was prepared in 2009, and an updated HHRA in 2013, that was based upon the process agreed upon by the SERRT during the preparation of the 2004 Baseline HHRA, with modifications generally related to incorporation of the additional characterization data, the Development Plan exposure areas, as well as relevant updates in risk assessment methodologies and toxicity factors. Therefore, the updated HHRA evaluated the potential cancer risk and noncancer hazard to future site users identified in the Development Plan from chemicals known to be present in soil, soil gas, surface water and groundwater at the Project Site, as summarized in Table 4.11-3 below.

The 2009 HHRA was peer reviewed by the EIR consultants and several regulatory agencies and included a number of recommendations for additional sampling, analysis and revised risk calculations. The HHRA peer review is summarized in Section 4.11.1.2 and included numerous independent evaluations and modeling to confirm the validity of the HHRA risk estimates, as well as the sensitivity of the HHRA results to various exposure assumptions. Based on this peer review, the 2013 HHRA was prepared to address several deficiencies and include additional soil and soil gas sampling. In addition to the EIR consultant review, the California Office of Environmental Health Hazard Assessment (OEHHA) and the County of San Luis Obispo Environmental Health Services have both submitted letters to the County explicitly stating that the revised HHRA is adequate. The complete 2013 HHRA is provided in Appendix H.1 and is summarized below.

Although land use at the site is currently zoned industrial, the Development Plan land uses would include recreators (adults and children), indoor and outdoor commercial employees (adults), and intrusive workers (adults). This updated HHRA also re-examined the potential risks to off-site residents and recreators in a “no development” scenario for the site. Information regarding the types and concentrations of residual chemicals is available in the risk assessment dataset and is summarized in Appendix H.1 for the seven different exposure/development areas evaluated in this risk assessment. The chemical of potential concern (COPC) selection process included the

results of the soil background evaluation conducted during the preparation of the 2004 Baseline HHRA, and therefore only considered arsenic and lead as potential site soil COPCs.

Exposure assumptions are generally the same as those in the 2004 Baseline HHRA and were made in accordance with current regulatory guidance (Cal/EPA 1994; USEPA 2002, 2004a and 2011a) and/or best professional judgment. Exposure pathways evaluated in the updated HHRA include incidental ingestion of soil, dermal contact with soil, inhalation of soil particles and associated vapors, inhalation of indoor air (indoor employees) and trench air vapors (intrusive workers) via subsurface contamination, and incidental ingestion of and dermal contact with surface water and shallow groundwater (intrusive workers only). With respect to exposure to soil, USEPA guidance recommends evaluating the inhalation of wind-blown dust exposure using surface soil (USEPA 1989), therefore off-site resident outdoor air COPC concentrations were modeled using soil exposure point concentrations (EPCs) calculated for the 0-2 foot depth horizon (95% upper confidence level [UCL], as the data allowed). Recreators and indoor employees are most likely to come in contact with shallow soil (for the indoor employee – indoor dust), and 95% UCL soil concentrations for the 0-2 feet below ground surface (ft bgs) horizon were used to evaluate exposure. Although outdoor employees also are most likely to have contact with shallow soil over the exposure duration of 25 years, 95% UCL soil concentrations for both the shallow and deeper (0-10 ft bgs) soil horizons were evaluated. Intrusive workers were assumed to be exposed to the maximum soil COPC concentrations up to 10 ft bgs, although trenching activities greater than 4 ft bgs fall under Occupational Health and Safety Administration (OHSA) oversight (e.g., 29 CFR 1926.651(g)(1)(i)). Maximum COPC soil gas concentrations in each development area, as available, were used as the EPCs for calculating indoor air concentrations using the Johnson & Ettinger model assuming default commercial structures (Cal/EPA 2005a and 2011), as well as default and site-specific soil information. To provide risk managers with as much information as possible, indoor air concentrations and associated risks were calculated using both shallow (5.5 ft bgs) and deeper (15 ft bgs) soil gas samples, as available, with the depth resulting in the maximum total health risk included in the totals presented in Table 4.11-3. Intrusive worker exposure to volatiles in trench air was evaluated based on shallow soil gas COPCs. Recreator, outdoor employee, and intrusive worker contact with surface water was evaluated using EPCs based on 95% UCLs or maximums, depending on the amount of data available. Contact with groundwater by intrusive workers was based on maximum concentrations.

Table 4.11-3 summarizes the potential health risks to future site users identified in the Development Plan in terms of the incremental lifetime cancer risk (ILCR) and the noncarcinogenic hazard index (HI), based on current environmental conditions in the seven development/exposure areas. Table 4.11-3 identifies the risk drivers for areas where cancer risks exceed the low end of the USEPA risk management range of 1 in 1,000,000 ($1x10^{-6}$) or noncancer hazards exceed the Cal/EPA and USEPA threshold of 1.0. A detailed discussion of the HHRA results follows and can be summarized as follows:

- Under the No Development Scenario, on-site adult and child recreator excess cancer risk would exceed acceptable levels due to elevated arsenic in soil and two elevated soil lead samples. Off-site risk would be considered acceptable.

Table 4.11-3 Summary of Potential Health Effects Associated with Development Areas

Receptor (soil scenario)	**ILCR**[1]	**HI**	**Site Data Considered in Evaluation**[2]	**Primary Risk Driver(s)**[3]
Significance Level	**1E-05**	**1.0**		
Site Wide/No Development				
Off-site Resident Adult	6E-08	0.001	• Site-wide soil (0-2 ft bgs) • Site-wide surface water (recreator)	• Recreator cancer risk is driven by arsenic in soil. • Lead in two soil samples collected from 0-2 ft bgs just exceeds 1,000 mg/kg benchmark.
Off-site Resident Child		0.001		
Adult Recreator	**2E-04**	0.06		
Child Recreator		0.7		
Development - Open Space				
Adult Recreator	4E-06	0.08	• Open Space soil (0-2 ft bgs) • Open Space surface water	• Recreator cancer risk driven by PAHs in soil. • Lead in two soil samples collected from 0-2 ft bgs just exceeds 1,000 mg/kg benchmark.
Child Recreator		0.9		
Northwest Operations Area (NWA)				
Indoor Employee (0-2 ft bgs)	**3E-05**	0.7	• NWA soil (0-2 ft and 0-10 ft bgs) • NWA soil (0-10 ft bgs; intrusive worker) • NWA soil gas • No surface water features • Shallow groundwater (B-34, SP-2, SLOW-12, SLOW-18/BIV-25; intrusive worker)	• Indoor employee cancer risk driven by arsenic in soil and estimated benzene concentrations in indoor air. • Outdoor employee cancer risk driven by arsenic in soil. • Intrusive worker cancer risk driven by arsenic in soil.
Outdoor Employee (0-2 ft bgs)	**6E-05**	0.1		
Outdoor Employee (0-10 ft bgs)	**6E-05**	0.1		
Intrusive Worker (0-10 ft bgs)	6E-06	0.8		
Recreation/Public Facility				
Adult Recreator (0-2 ft bgs)	3E-07	0.01	• REC soil (0-2 ft and 0-10 ft bgs) • REC soil (0-10 ft bgs; intrusive worker) • EDA soil gas – western most sampling locations (SG-15 to -17 and SG-25) • Surface water (Surface 9) • Shallow groundwater (MW-54 and TMW-5; intrusive worker)	
Child Recreator (0-2 ft bgs)		0.1		
Indoor Employee (0-2 ft bgs)	2E-08	0.03		
Outdoor Employee (0-2 ft bgs)	5E-07	0.03		
Outdoor Employee (0-10 ft bgs)	5E-07	0.02		
Intrusive Worker (0-10 ft bgs)	9E-09	0.02		
EDA Service & Manufacturing (EDA-SM)				
Indoor Employee (0-2 ft bgs)	2E-08	0.2	• EDA soil (0-2 and 0-10 ft bgs) • EDA soil gas • EDA surface water (SW-1) • Shallow groundwater (TMW-9; intrusive worker)	
Outdoor Employee (0-2 ft bgs)	5E-07	0.7		
Outdoor Employee (0-10 ft bgs)	7E-07	0.7		
Intrusive Worker (0-10 ft bgs)	5E-09	0.5		

Table 4.11-3 Summary of Potential Health Effects Associated with Development Areas

Receptor (soil scenario)	**ILCR**[1]	**HI**	**Site Data Considered in Evaluation**[2]	**Primary Risk Driver(s)**[3]
Significance Level	**1E-05**	**1.0**		
EDA Northern Business Park				
Indoor Employee (0-2 ft bgs)	2E-08	0.2	• EDA soil (0-2 and 0-10 ft bgs) • EDA soil gas • No surface water features • Shallow groundwater (no COPC analytical data available – used SBP values; intrusive worker)	
Outdoor Employee (0-2 ft bgs)	ND	0.3		
Outdoor Employee (0-10 ft bgs)	3E-07	0.3		
Intrusive Worker (0-10 ft bgs)	2E-09	0.5		
EDA Southern Business Park				
Indoor Employee (0-2 ft bgs)	1E-08	0.1	• EDA soil (0-2 and 0-10 ft bgs) • SBP soil gas • No surface water features • Shallow groundwater (MW-17; intrusive worker)	
Outdoor Employee (0-2 ft bgs)	ND	0.3		
Outdoor Employee (0-10 ft bgs)	3E-07	0.3		
Intrusive Worker (0-10 ft bgs)	2E-09	0.4		

Potentially significant risk levels, defined as an ILCR greater than 1E-05 (1.0×10^{-5} or 10 in one million)or an HI greater than 1.0, shown in **bold** font.

6E-08 = 0.00000006 = six in one hundred million

ND = No carcinogenic COPCs detected

[1]Cancer risk is age-weighted and assumes 6 years of exposure as a child and 24 years as an adult; ILCR is the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen.

[2]Health risks from indoor air were evaluated based on both the shallow (5.5 ft bgs) and deep (15 ft bgs) results, with the highest total risk estimate reported. The highest indoor air total health risks are associated with shallow soil gas.

[3]Risk drivers are identified if the ILCR exceeds 1×10^{-6}, if the HI exceeds 1.0, or if the lead EPC exceeds the Childhood Lead Poisoning Prevention Program thresholds of 400 mg/kg for childhood play areas (REC) and 1,000 mg/kg for areas where children may be present (Open Space recreation scenarios).

- Northwest Operations Area indoor employee excess cancer risk would exceed acceptable levels due to elevated arsenic in soil and estimated indoor benzene concentrations. Intrusive construction worker risk would be considered acceptable due to infrequent exposure associated with these activities.
- Public Recreation Facility risk would be considered acceptable under all exposure scenarios for both adults and children.
- Eastern Development Area risk would be acceptable under all exposure scenarios for the proposed development scenarios, including:
  - EDA Service & Manufacturing (EDA-SM),
  - EDA Northern Business Park, and
  - EDA Southern Business Park.
- Development Open Space would be considered acceptable under all exposure scenarios for both adults and children.

Under the no development scenario, total cancer risks for the off-site residents and recreational user are $6x10^{-8}$ (0.06 cancer cases per million individuals exposed) and $2x10^{-4}$ (200 cancer cases per million individuals exposed), respectively. Cancer risk for the recreational user under the no development scenario exceeds the USEPA risk management range of 1 in 1,000,000 (one in a million or $1x10^{-6}$) to 1 in 10,000 (100 in a million risk or $1x10^{-4}$), and is driven by ingestion of and dermal contact with arsenic in soil (98%). The majority of arsenic in shallow soil above the site-specific background inflection point is located within the Northwest Operations Area (NWA) of the Site. The total noncancer hazards for these receptors are below the threshold value of 1.0, ranging from 0.0012 (off-site resident adult and child) to 0.7 (recreational child).

Under the Development Plan, the total cancer risk for recreational use of Open Space is $4x10^{-6}$, which is heavily influenced by maximum detections of carcinogenic PAHs detected in a sample collected at 0.5 feet below the ground surface. This risk is at the low end of the USEPA and CalEPA risk management range of 10^{-6} to 10^{-4}, below the California Proposition 65 significant risk level of 1×10^{-5}, and within an acceptable risk range typically used for recreational and commercial receptors. . The Open Space recreational cancer risk results primarily from incidental ingestion of and dermal contact with PAHs (especially benzo[a]pyrene equivalents, BaP TEQ) in soil (80%), which was detected at concentrations ranging from 0.0048 to 5.4 mg.kg dry weight with a 95% UCL of 1.1 mg/kg dry weight. It is notable that the 95% UCL is heavily influenced by the maximum Open Space detect (S-63-0.5, located between Reservoirs 5 and 6 on the south side of Tank Farm Road; see Figure 1-6), as the next highest detection is 0.44 mg/kg dry weight. Recreational use of the Recreation/Public Facility (REC) results in a cancer risk of $3x10^{-7}$ (0.3 cancer cases per million individuals exposed, which is below the low end of the USEPA risk management range. Recreational use of a developed Site results in noncancer hazards below the threshold of 1.0, with the child values ranging from 0.1 (REC) to 0.8 (Open Space).

Total cancer risks for indoor employees in default buildings range from $1x10^{-8}$ in the Eastern Development Area-Southern Business Park (EDA-SBP) to $3x10^{-5}$ in the NWA, and exceed $1x10^{-6}$ in only the NWA. In the NWA, arsenic in soil (53%) and benzene in soil gas (46%) are

the primary risk contributors. The total noncancer hazards for all indoor employees are below the threshold level of 1.0, ranging from 0.03 (REC) to 0.7 (NWA).

Based on the 0-2 ft bgs soil exposure horizon, the total cancer risks for outdoor employees range from no carcinogenic COPC exposure (e.g., no carcinogenic COPCs detected) in the EDA Southern and Northern Business Parks (EDA-SBP and -NBP) to $6x10^{-5}$ in the NWA. When the deeper soil horizon is included in the evaluation, the total cancer risks range from $2x10^{-7}$ in the EDA-SBP and -NBP to $6x10^{-5}$ in the NWA. These outdoor employee cancer risks exceed $1x10^{-6}$ in only the NWA where arsenic in soil (96 to 99%) is the risk driver. The total noncancer hazards for all outdoor employees are below the threshold level of one, ranging from 0.03 (REC) to 0.7 (EDA-SM) when shallow soil is evaluated and from 0.02 (REC) to 0.7 (EDA-SM) when 0-10 ft bgs soil is included in the risk estimates.

Total cancer risks for intrusive workers range from $2x10^{-9}$ in the EDA-SBP and -NBP to 6×10^{-6} in the NWA, and exceed 1×10^{-6} in only the NWA where arsenic in soil (96%) is the cancer risk driver. The total noncancer hazards for all intrusive workers are below the threshold level of one, ranging from 0.02 (REC) to 0.8 (NWA).

In exposure/development areas where lead was carried forward as a COPC, the potential for lead-related health effects was evaluated by comparing the exposure/development area EPC to Cal/EPA's commercial lead soil CHHSL (Cal/EPA 2009d) and/or a "recreational-equivalent" lead soil CHHSL; no CHHSL exceedances occurred. To address SLO County EHS concerns with respect to the Childhood Lead Poisoning Prevention Program, comparisons were made to the 400 mg/kg threshold for childhood play areas and the 1,000 mg/kg threshold for areas where children may be present. Only two shallow soil samples just exceed the 1,000 mg/kg threshold (T-8-0.5 [1,151 mg/kg] and T-10-0.5 [1,001 mg/kg]). Both of these samples were collected from tank rings in the northwest portion of the Site, which are located in the Open Space of the Development Plan. In the REC, the maximum lead concentration is 50 mg/kg, which is well below the 400 mg/kg benchmark.

Major uncertainties that may have resulted in an overestimation of risk in this HHRA are (1) the use of maximum soil concentrations, as opposed to 95% UCLs, for some COPCs in some development areas, (2) modeling surface water exposures based on full body immersion, and (3) assuming all extractable TPH (C10-C40) detected in surface water and groundwater is truly dissolved TPH-diesel and comprised entirely of the more toxic aromatic fraction. Multiple uses by a single receptor would result in an underestimation of risk; for example, risks to off-site residents who also recreate at the Site are best characterized by the recreational user risk results.

Major assumptions and conclusions reached in this updated HHRA include the following:

- Health risks were evaluated based on current environmental conditions and land uses identified in the Development Plan, which includes commercial use of specific development areas and recreational use of Open Space and a Recreation/Public Facility. If the Site changes dramatically due to a catastrophic event (e.g., natural disaster such as an earthquake), or development plans become inconsistent with land uses and default structures evaluated in this risk assessment, additional evaluation of potential health risks may be necessary.

- This risk assessment follows the process established during the preparation of the 2004 Baseline HHRA, with modifications generally related to incorporation of requested additional characterization data, the Development Plan exposure areas, and updates in risk assessment methodologies and toxicity factors.
- As in the 2004 Baseline HHRA, this updated risk assessment does not quantitatively evaluate potential exposure to surface hydrocarbon expressions at the Site. The health risks associated with exposure to weathered hardened asphaltic debris was determined to be minimal given the low toxicity of asphalt. Although semi-fluid tar contains elevated levels of PAHs that could represent a health hazard, the 2004 Baseline HHRA recommended that people using the Site should avoid contact with the surface tar that is pliable.
- Surface water features at the Site are ephemeral, shallow, and would best be characterized as an attractive nuisance. Recreator, outdoor employee, and intrusive worker exposures assume that these features are swimmable, and therefore likely result in an overestimation of associated risk.
- Estimated cancer risks exceed low end of the USEPA risk management range ($1x10^{-6}$) for Site-wide (no development) recreational use, all receptors in the NWA, and recreational use of Open Space at a developed site. Under the site-wide no development recreational scenario, the majority of the cancer risk results from ingestion of and dermal contact with arsenic in soil, which is located primarily within the NWA. In the NWA, cancer risks for outdoor employees and intrusive workers also result almost exclusively from direct contact with arsenic in soil. For indoor employees, ingestion of arsenic in indoor dust and benzene in indoor air are the primary cancer risk drivers. In Open Space, recreational exposure to PAHs (as BaP TEQ) in soil is the primary risk driver, with most of this exposure associated with the maximum detection on the southern side of the site (S-63-0.5).
- Estimated cancer risks are below $1x10^{-6}$ (an excess cancer risk of one in a million risk) for all other receptors – off-site residents (no development), recreational use of the REC area, and all commercial/intrusive worker activities in the REC and EDA Service and Manufacturing area and Northern and Southern Business Parks.
- Estimated total noncancer hazards are below 1.0 for all receptors.
- None of the exposure/development area lead EPCs exceeded the commercial or "recreational-equivalent" CHHSLs.
- Methane in soil gas exceeds the 10% lower explosive limit (LEL) in both the NWA and EDA, primarily due to natural methane formation in wetland areas.

The HHRA did not address potential health risks associated with the active remediation of the site. Off-site public exposure during remediation activities would be very short-term in nature, thus minimizing long-term health risks. The main driver in off-site health risk associated with site remediation would result from exposure to diesel particulate emissions from remediation activities and truck transportation. Potential health risks associated with off-site exposure to diesel particulate emissions were evaluated in Section 4.1.4, Impact AQ.1, and were found to be less than significant with mitigation.

In the absence of site development, potential health risks were found to be potentially significant for individuals that would use the vacant Project Site for recreation. However, potential off-site

health risks at neighboring properties would be considered less than significant (see Table 4.11-3). Since the undeveloped site would not be made available for active recreation under a site-wide/no development scenario, these potentially significant health risks to recreators would not be realized. However, under the Development - Open Space scenario, potential health risk to recreators would be considered less than significant. In addition, the Project would include building pad construction and capping of these areas of potential exposure. Therefore, potential health risk associated with the remediated site would be considered less than significant.

Mitigation Measures

HM-1 Prior to issuance of grading or other related permits authorizing initiation of the remediation and restoration component of the project, the Applicant shall submit to the City and County written verification from the RWQCB that the Remedial Action Plan has been finalized and approved.

Residual Impacts

Potential health risks associated with exposure to residual contamination are considered *less than significant (Class III).*

Impact #	Impact Description	Phase	Residual Impact
HM.2	Public accident risk associated with truck traffic during site remediation.	Remediation	Class III

Most hydrocarbon-affected soils would be disposed of at the Non-hazardous Hydrocarbon-Impacted Soil (NHIS) facility at the City of Santa Maria Landfill. Use of NHIS by the Santa Maria Landfill as cover material is consistent with the requirements included in Title 27 of the California Code of Regulations and has been approved by the California Integrated Waste Management Board (CIWMB) and the Central Coast Regional Water Quality Control Board (RWQCB). NHIS material includes, but is not limited to, soils from oil field sumps, tank farms, pipeline leaks, or petroleum product spills. The Santa Maria Landfill has an NHIS program addressing the types and monitoring of the NHIS received at the landfill that the project would comply with.

The proposed truck route for transporting petroleum-containing soil and demolition debris from the Project Site is as follows:

- Westbound on Tank Farm Road;
- Southbound on South Higuera Street;
- Either westbound on Los Osos Valley Road to the Highway 101 on-ramps or continue south to the South Higuera Highway 101 on ramps;
- Southbound Highway 101, trucks would exit at Betteravia Road in Santa Maria, travel east on Betteravia Road to Philbric Road, then north on Philbric Road to the City of Santa Maria Landfill entrance.

An alternate route would include the following:

- East on Tank Farm Road; Southbound on Highway 227;
- Westbound on Price Canyon Road;
- South on Price Street to the southbound Highway 101 onramp. The route from Highway 101 to the City of Santa Maria Landfill would be same.

The route would be the same in reverse for inbound trucks. The Applicant estimates that 10,500 truck trips (round trips) would be necessary to transport the NHIS to the Santa Maria Landfill. Hours of work are planned to occur as feasible pre-dawn and during daylight hours, Monday through Friday all year round. Figure 2-13 shows the truck routes between the site and Highway 101.

The material would be used at the landfill as cover for closing landfill cells. The materials to be transported would be tested to ensure it meets the Santa Maria Landfill's specifications for NHIS. Any material that does not meet the NHIS specifications will be separated and handled appropriately. Soil that does not meet the NHIS criteria will be sent to another licensed facility able to accept hydrocarbon-affected soil, to either Clean Harbor's Class I disposal facility in Buttonwillow, California or the Chemical Waste Management Class I disposal facility in Kettleman Hills, California. The truck route to the Buttonwillow facility would include the following:

- Access Northbound Highway 101 either via Los Osos Valley Road as described above or via the Prado Road on-ramp;
- Highway 101 northbound; East on Highway 46; South on Highway 33; and,
- East on Lokern Road to the landfill entrance.

The designated highway route to CWM Kettleman Hills Landfill would be as follows:

- Highway 101 northbound;
- East on Highway 46; and,
- Northeast on Highway 41 to the landfill entrance.

The Applicant requested that disposal of up to one-third, or 50,000 cubic yards entailing approximately 3,500 round trips, of the soil at either of these two locations be evaluated by the EIR as a contingency plan.

Truck trips would be generated off-site by the transportation of contaminated and hydrocarbon affected soils and demolition materials. Total export of affected materials is estimated at 157,000 cubic yards, or approximately 10,500 truck trips (round trips). Given the uncertainty with estimating the amount of affected soil from remediation projects, the Applicant has request that the EIR include a 25% contingency. This contingency would increase the total exported affected material to 196,250 cubic yards, or approximately 13,125 truck trips (round trips). Total import of fill materials is estimated to be 82,000 cubic yards, and 5,467 truck trips (round trips).

Estimated total round trips and peak day trips for the remediation project are summarized in Table 2-6 (ATE 2007). The Applicant schedule indicates that grading and remediation would take 2.5 years until completion. All grading and remediation would occur in advance of the development phases of the proposed Project.

Transportation hazards are related to those components of a project where there is the possibility of a traffic accident resulting from the increased level of traffic on the local area roadways due to the project. This traffic increase would be primarily associated with increases in traffic associated with truck transportation of NHIS to the Santa Maria Landfill and material not meeting the NHIS criteria needing to be transported to Kettleman Hills or Buttonwillow. Employee commuter traffic is generally not considered because it is assumed that these trips would be located on area roadways for other, unrelated employment projects if the proposed Project did not go forward.

The County and City Safety Element do not specifically address the significance criteria associated with traffic accidents. However, significance criteria have been developed based on the risk level deemed acceptable in the Santa Barbara County Safety Element. The DOT (DOT 2003) maintains data on the rate of fatal truck accidents on a nationwide basis. This data was utilized to generate an estimate of the frequency of fatalities. Information related to the details of the project is utilized to estimate the annual number of miles traveled by all trucks carrying NHIS. These are then compared to the threshold criteria for fatality frequency to determine significance.

The large number of truck trips associated with this Project has the potential to produce a significant impact to public safety due to the number of trucks on the roads. The Avila Beach and Guadalupe remediation projects generated a large number of truck trips, and the only areas that produced safety issues associated with those projects were trucking related. For example, the Guadalupe Remediation Project included up to 860,000 truck-miles annually for two years during the course of the project. As shown in Table 4.11-4, annual average truck mileage would be 189,000 or 381,500 for the Santa Maria or Kettleman Hills/Buttonwillow destinations, respectively. Based on the DOT truck fatality rate of 2.5×10^{-9} fatalities/mile-year, the project risks would be less than 1×10^{-3} fatal accidents per year (see table 4.11-4). Therefore, potential truck accident risk would be considered less than significant.

Table 4.11.4 Truck Transport Fatality Frequency – Proposed Project

Element	Santa Maria Landfill	Kettleman Hills/ Buttonwillow
Annual Average Trips	5,250	3,500
Miles per Trip	36	109
Total Annual Miles	189,000	381,500
Fatality Frequency without mitigation	4.73E-04	9.54E-04
Significance Threshold	1.00E-03	1.00E-03
Significant with mitigation?	No	No

Note: Based on DOT base truck fatality rate with corrections of 2.5×10^{-9} fatalities per mile-year.

Mitigation Measures
No mitigation required.

Residual Impacts
Potential hazards associated with truck transportation of petroleum-containing soil and demolition debris are considered *less than significant (Class III)*.

Impact #	Impact Description	Phase	Residual Impact
HM.3	Asbestos exposure risk during site remediation activities.	Remediation	Class II

Asbestos is a term used for several types of naturally occurring silicate minerals that occur as asbestiform fibers that are a human health hazard when airborne. Asbestos is a known carcinogen and inhalation may result in the development of lung cancer or mesothelioma, and was commonly used as an insulation material. Chrysotile and amphibole asbestos are common to geologic settings in California. Serpentinite may contain chrysotile asbestos, especially near fault zones. Ultramafic rock, a rock closely related to serpentinite, may also contain asbestos minerals. Asbestos was identified as a toxic air contaminant by the California Air Resources Board (CARB) in 1986.

Four buildings at the Project Site in the Northwest Operations Area are proposed to be demolished during remediation. Three of these buildings were constructed to support former operations at the Project Site, but are now primarily vacant office space. The fourth, a modular building adjacent to the northernmost original building, was constructed within the last eight years to provide additional office space.

Given the age of the three older buildings, the Applicant is assuming that lead-containing materials and asbestos-containing materials are present. Consequently, surveys and abatement would precede physical demolition of the buildings. A California-licensed Asbestos Consultant and California-certified Lead Consultant, respectively, would conduct asbestos and lead-based paint surveys for each building. Positive surveys would require abatement.

Prior to abatement, a National Emissions Standard for Hazardous Air Pollutants demolition notification form, asbestos survey report, and an asbestos abatement work plan would be submitted to the San Luis Obispo County APCD. Asbestos-containing materials would be abated in accordance with local, state, and federal regulations. Any suspect material found during abatement and not previously identified would be presumed asbestos-containing materials unless contradicted by specific laboratory data. Asbestos-containing materials would be properly wrapped, placed in covered roll-off bins, and disposed of at a licensed disposal facility (e.g., Kettleman Hills).

The Flower Mound is an area on and off of the Project Site proposed by the Applicant to be used as a borrow site due to its available rock material for backfill of excavation areas and so the elevation of the Flower Mound can be lowered to allow for the Santa Fe Road extension to go through that area as proposed. The Flower Mound area is approximately 17.3 acres in and extending off of the northeast corner of the Project Site within OU #3, which is approximately

55.1 acres. It is an outcrop of the basement bedrock complex known as the Franciscan Formation.

The Franciscan Formation is a chaotic mixture of fault blocks and slices of graywacke, shale and greenstone with subordinate chert, conglomerate, serpentinite, diabasegabbro, and blueschist metamorphic rocks set in a sheared and shaly matrix; a tectonic unit. Serpentinite and ultramafic rocks release asbestos when crushed or broken. Asbestos can be released to the atmosphere due to construction and grading projects, quarry activity, traffic on unpaved roads, etc. Natural weathering and erosion processes can also act on asbestos-bearing rock and make it easier for asbestos fibers to become airborne if such rock is disturbed.

The Applicant is proposing to excavate 350,000 cubic yards of material from this location. Due to the composition of the rock, the Applicant is proposing to do so by blasting with directed explosive charges. It is uncertain how much of the Flower Mound excavation will require blasting. Processing of the blasted materials would include crushing with a rock crushing machine, and may include sorting with loaders, stationary static sorting screens, and possibly washing, depending upon what materials are required by the Project. Material produced from the Flower Mound would be crushed and screened to meet project materials specifications.

Under the CARB Air Toxics Control Measure (ATCM) for Construction, Grading, Quarrying, and Surface Mining Operations, prior to any grading activities at a site, a geologic analysis is necessary to determine if serpentine rock is present. Grading projects larger than 1 acre in serpentine rock would require prior APCD approval of an Asbestos Dust Mitigation Plan and an Asbestos Health and Safety Program.

Padre Associates conducted a Geologic Evaluation of Naturally Occurring Asbestos and Material Durability Assessment for the Project Site. Asbestos was not found above the analytical detection limit of 0.25% in any of the rock or soil samples submitted for microscopic analysis by CARB Method 435. However, the microscopic analyses indicated that several rock core samples contained trace concentrations of chrysotile (serpentinite) asbestos, but could not be quantified due to the method quantification criteria. The findings of the microscopic analyses and field observations will be utilized in the development of a dust mitigation plan associated with proposed future grading activities at the Project Site. As such impacts from asbestos exposure could be significant.

Mitigation Measures

Implement Mitigation Measures AQ-1b and AQ-1c.

Residual Impacts

Implementation of Mitigation Measures AQ.1-8 and AQ.1-9 would substantially reduce the potential exposure to asbestos to a level that is considered *less than significant with mitigation (Class II)*.

Impact #	Impact Description	Phase	Residual Impact
HM.4	Increased aircraft wildlife strike risk due to wetland restoration within the airport Runway Protection Zone and Safety Areas.	Remediation	Class I

Remediation would require soil excavation and associated ground disturbance within four Operational Units (OU) identified in the Project Execution Plan (CEMC 2007). This would result in loss of wetlands. An updated delineation of wetland resources at the Project Site was completed by Padre and WSP (Padre 2008b). The more recent delineation determined that there were 49 acres of Federal wetlands, 3.4 acres of "one-parameter" wetlands, and 3.9 acres falling under the category of Other Waters of the U.S.

The proposed remediation and restoration efforts would result in direct impacts to 27.22 acres of Waters of the U.S. including federal wetland areas. In addition, accidental spills and sediment and erosion from remediation areas could flow into sensitive wetland habitats causing indirect impacts.

The proposed conceptual restoration approach was documented in the report by Padre and WSP titled "Landscape Restoration for the Chevron San Luis Obispo Tank Farm 75% Basis of Design Report" (Padre 2009). The report presents a landscape-level design at the 75% level of completion for the wetland habitat and special status species affected by the Project.

As detailed in the 75% draft restoration plan (Table 1), of the 31.8 acres of vernal pool fairy shrimp (VPFS) habitat at the Project Site, approximately 10.34 acres would be impacted by remediation and restoration activities. The most recent survey results conducted by Padre (spring 2012) updates the extent of occupied habitat which would result in a total of 12.9 acres of VPFS habitat being impacted by project remediation and restoration. As described in the 75% draft restoration Plan, impacts to VPFS habitat would be mitigated by restoring vernal depressions, as well as creating vernal swale habitats within the upland ecosystems and remediated reservoirs. Repopulation of newly created or restored pools would be stimulated by inoculation, consisting of material collected from topsoil of impacted occupied VPFS habitat or, if needed, gathered from "donor" pools unaffected by remediation.

Mitigation measure ***BIO-1c*** requires the preparation of a final restoration plan that shall provide for a 1:1 replacement of all VPFS habitat impacted by remediation efforts (or at least 14.78 acres of VPFS habitat depending on final disturbance acreages). In addition, the implementation of the restoration plan would result in a 1:1 replacement ratio of restored wetlands to wetlands lost due to Project disturbances. The EIR-proposed mitigation (***BIO-4a***) requires a 1:1 habitat replacement. Mitigation Measure ***BIO-8d*** requires a 2:1 replacement for wetlands (3.71 acres) that would be permanently lost due to the development project. This would serve to increase the overall amount of wetland at the project site by 3.71 acres.

Proposed restoration activities are designed to improve the value and function of the existing on-site wetlands (Padre and WSP 2009). As detailed in the Conceptual Restoration Plan and clarified in Padre 2013c, the proposed remediation and restoration activities would impact a total of 29.04 acres of federal wetland habitat. The Applicant would obtain a Section 404 permit prior to disturbance of wetland areas. Consultation with the USFWS and National Marine Fisheries

Service (NMFS) would be completed during the Section 404 permitting process. The Applicant would comply with all measures issued by USFWS and NMFS for the Project.

The potentially significant impact to wetlands would be mitigated with the proposed mitigation of 1:1 habitat replacement (MM BIO-3b). In addition, with the re-establishment of normal water flow throughout the site, other additional degraded wetlands could recover and provide additional habitat functions. Padre reports that an additional 11.37 acres of degraded habitat would recover naturally with the return of historical water connectivity (Padre and WSP 2009). The natural recovery of degraded wetlands, combined with mitigation measures, particularly restoration of on-site, existing wetlands, would result in a potential increase in the quantity and quality of wetland habitat, and could result in an increase in the bird population in the immediate vicinity of the SLOCRA.

Since the remediation phase of the project would result in an increase in habitat, and a potential increase in the local bird population associated with wetlands (see Section 4.2.4 Biological Resources for more details), the Project could significantly increase bird strike hazards at the SLOCRA.

Mitigation Measures

HM-4 *The applicant shall limit the on-site wetland replacement to a ratio of 1:1 for a total on-site wetland restoration of 46.64 acres (42.93 acres for remediation and 3.71 acres for development area).*

Residual Impacts

Limiting wetland restoration following remediation to the same acreage as currently exists would prevent a measurable increase in local bird populations. Minimizing wetlands and local bird populations in the Runway Protection Zone and Safety Area S-1 would prevent a project-related increase in wetland habitat and local bird populations.

The Applicant originally proposed replacing wetland impacted by the Remediation Phase of the Project at a 1.7 to 1 ratio. The biological resources section of the EIR has a mitigation measure that would require offsetting the Remediation Project impacts to wetland at a ratio of 1 to 1. However, even at the 1 to 1 replacement ratio, the restoration activities would improve the value and functions of the wetlands, which could make them more attractive to birds. In addition, with the re-establishment of normal water flow throughout the site, other additional degraded wetlands could recover and provide additional habitat functions. The natural recovery of degraded wetlands, combined with mitigation measures, particularly restoration of on-site, existing wetlands, would result in a potential increase in the quantity and quality of wetland habitat and therefore possibly increase bird populations. Therefore, the impact associated with bird strike risk has remained *significant and unavoidable (Class I)*.

Impact #	Impact Description	Phase	Residual Impact
HM.5	Potential aircraft safety hazards due to changes in topography of the project site.	Remediation	Class IV

The remediation and restoration would result in some minor changes to the overall site topography. However, these changes would not represent a potential aircraft safety hazard. The Applicant proposes to make a number of modifications to Reservoir 2 to improve airport safety by addressing concerns raised by the Airport Land Use Commission (ALUC). Reservoir 2 was a 600-foot diameter crude oil storage reservoir constructed by Union Oil of California in 1910. The reservoir had concrete walls and a wooden roof and was surrounded by a roughly trapezoidal berm approximately 15 feet high and 150 feet wide at its base for secondary containment. The 1926 fire damaged the reservoir and left an asphalt layer over the berm slopes and concrete floor. The reservoir was never rebuilt.

In later decades the SLOCRA was constructed to the southeast of the Project Site. The main runway alignment intersects the reservoir, which is now a significant feature within the Runway Protection Zone (RPZ). The ALUC identified this feature as a safety concern if an aircraft had to make an emergency landing within the RPZ.

As part of site work activities, the Applicant is proposing to cut the wall and grade the berm to a more gentle topography. The standing portions of wall, approximately 12 feet high, would be cut approximately two feet above the ground and laid flat on the adjacent concrete floor. The asphaltic material, which may impede plant growth if left on the surface, would be scraped from the berm surface and placed against the outer side of the wall. The berm material would be graded to flatten the slopes while providing at least two feet of soil cover above the concrete wall. The finished surface would be scarified, except at the access roads, to promote re-vegetation and would be restored as part of the restoration program.

The berm height would be lowered between four and eight feet, depending upon the surrounding topography. This would reduce slope grades from approximately 50 percent to between 5 and 12 percent. The direction of slope and slope breaks would be positioned to ensure that the interior wetlands capture at least the same amount of rainwater as the existing condition.

The broad flat slope created on the west side of the reservoir would facilitate access by large emergency vehicles. In addition, compacted gravel all-weather roads designed per applicable CALFIRE requirements would provide permanent access to the interior of the former reservoir and to existing trails serving the runway light system. The existing paved pad would be retained for future use as an emergency staging area. Any gates to this area would be set back from Tank Farm Road to allow emergency vehicles to pull off of the road while gaining access to the site.

This change in topography at the site would be considered a beneficial impact to aircraft safety in the event an aircraft had to make an emergency landing within the RPZ.

Mitigation Measures

No mitigation measures are required since the impact is less than significant.

Residual Impacts

The proposed modifications to Reservoir 2 would serve to improve aircraft safety in the event an aircraft has to make an emergency landing in the RPZ. Therefore, residual impacts of this component of the Project would be *beneficial (Class IV)*.

4.11.5 City Development Plan Impacts and Mitigation Measures

The City Development Plan component of the Project would include permanent conversion of the Project Site to commercial and recreational uses, as well as open space. All of the impacts described above for the proposed remediation would be identical to the City Development Plan impacts, since remediation activities are a necessary predecessor to future development.

Impact #	Impact Description	Phase	Residual Impact
HM.6	Potential health risk from exposure to residual contamination following site cleanup and development.	Development	Class II

In most cases, the potential health risks associated with exposure to residual contamination following remediation activities would be considered acceptable and less than significant (see Table 4.11-3). Potential health risk for the various development areas include:

- Northwest Operations Area (NWA) indoor employee excess cancer risk would exceed acceptable levels due to elevated arsenic in soil and estimated indoor benzene concentrations. Intrusive construction worker risk would be considered acceptable due to infrequent exposure associated with these activities.
- Methane in soil gas exceeds the 10% lower explosive limit (LEL) in both the NWA and EDA. Methane was indicated in 15 of the 16 soil gas samples (including duplicates) collected in the Reservoir 4 area. Two of these soil gas samples were indicated at concentrations above 10% of the LEL, and three of the soil gas samples were indicated at concentrations within or above the explosive range for methane. Since these areas are proposed for development, high soil gas methane levels could result in high levels within confined spaces and pose a significant fire and explosion risk to building inhabitants.
- Public Recreation Facility risk would be considered acceptable under all exposure scenarios for both adults and children.
- Eastern Development Area risk would be acceptable under all exposure scenarios for the proposed development scenarios, including:
  - EDA Service & Manufacturing (EDA-SM),
  - EDA Northern Business Park, and
  - EDA Southern Business Park.
- Development Open Space would be considered acceptable under all exposure scenarios for both adults and children.

Applicant Proposed Controls

The Applicant has proposed several measures to address potentially significant health risks in the NWA in order to prevent human and ecological exposure as summarized below.

Area of Concern #1 – Groundwater

The remedial action objectives for OU #1 and AOC #1 established in the Feasibility Study intend to prevent human contact with TPH- or benzene-affected groundwater and ensure that groundwater resources down-gradient of existing impacts are not affected. Therefore, the Applicant proposed remedial method for AOC #1 is monitored natural attenuation with institutional controls and long-term monitoring on-site and off-site. Monitored natural attenuation includes regular sampling of the existing groundwater monitoring network on and surrounding AOC #1; chemical analyses on collected samples; and reporting findings to the RWQCB in accordance with an approved monitoring and reporting program.

The Applicant is also proposing institutional controls that would include deed restrictions limiting on-site land use to commercial and industrial purposes, a soil management plan implemented in the event contaminated soils are disturbed, and groundwater use restrictions in affected areas.

Area of Concern #2 – Soil

Area of Concern #2 includes shallow soil, which is contaminated with arsenic and, to a more limited extent, by TPH and PAH, and deeper (4 to 28 feet bgs) soil affected by LNAPL containing a light fraction. The arsenic is relatively widespread and limited to shallow (less than 2 feet) soil, which is consistent with its probable former use at the Project Site as an herbicide.

The arsenic and PAH have been identified as potential threats to human and ecological receptors (if the area were converted to open space). With regard to the deeper soil, the LNAPL was not considered by the Applicant to be a direct contact risk, but vapor intrusion by the volatile fraction may pose a risk to future on-site commercial workers. Remedial action objectives were primarily focused on preventing human and ecological receptor contact with arsenic, TPH, PAH, and volatile hydrocarbons. Since the area is proposed to be developed, it is not proposed to support suitable ecological habitat.

The Applicant-proposed remedy for OU #1 and AOC #2 includes constructing a soil cap, a minimum of 4 feet in thickness. The cap would provide a barrier between the affected soil and potential receptors and also provide a soil layer of sufficient thickness to facilitate foundation construction and utility installation. A geotextile, placed between the cap and the existing ground surface, is intended by the Applicant to act as an identifying marker to reduce the likelihood of inadvertently excavating into the affected soils.

Residual Health Risk

The proposed soil cap would require long-term monitoring and maintenance. Institutional controls would include deed restrictions limiting land use to commercial and industrial purposes; excavation notification requirements; a soil management plan; groundwater use restrictions in affected areas; and a vapor barrier requirement for any new buildings constructed in the OU, which would protect the building occupants from possible vapors from the underlying hydrocarbons.

Chronic health risks for intrusive workers was considered less than significant due to limited exposure duration (see Table 4.11-4). However, during construction activities, such as trenching for utilities and foundations, there is some potential for short-term acute exposure to workers and damage to the containment cap. The Applicant has proposed a soil cap of at least 4 feet in thickness, which is sufficient for utility installation. Trenching depths up to 10 feet could occur in some areas, but not in the areas that will utilize a soil cap. However, it is possible that intrusive workers could over-excavate in the area of the soil cap, resulting in potential acute exposure to residual contamination.

Mitigation Measures

The Applicant-proposed mitigation of a cap, vapor barriers for buildings and institutional controls are sufficient to reduce potential health risks and subsurface methane hazards to acceptable levels for most development scenarios. However, excessive trenching could result in short-term acute exposure to workers. Therefore, the following mitigation measure is required:

HM-6 *Prior to recordation of applicable tract map, the Applicant shall include deed restrictions on development parcels identifying specific limits on trenching activities and procedures for conducting subsurface construction activities. The Applicant shall maintain responsibility for air quality monitoring during any subsurface excavation activities.*

Residual Impacts

Potential hazards associated with residual contamination that would remain following remediation of the site, and implementation of subsurface excavation controls and air quality monitoring, would be considered *less than significant with mitigation (Class II)*.

Impact #	Impact Description	Phase	Residual Impact
HM.7	Potential public risk associated with development within the SLOCRA safety areas.	Development	Class III

The Project would result in an increase in the working and recreational population in the immediate vicinity of the airport, and within ALUP/SLOCRA Safety Area S-1 (and Subareas S-1a, S-1b and S-1c) and Airport Compatibility Open Space Plan (ACOS) Reserve Areas 1 and 2. The ACOS establishes open spaces in the areas around the airport that can serve as reserve spaces. Reserve space improves airport safety by allowing for more intense development of urban areas, while keeping certain land adjacent to the airport free and clear from obstruction or from buildings and uses where people congregate. The areas identified as reserve space in the ACOS include land that is close to the airport, in line with the main airport runway, or along an over-flight area where aircraft typically operate at lower altitudes. Identification of these areas in the ACOS plan simply adds airport safety to the list of reasons why these lands, including portions of the Project Site, should not be developed.

The ACOS identifies two reserve spaces that partially overlap with the Project Site (Airport Area 1 and Airport Area 2). The Airport Area 1 reserve space is connected to Margarita Area reserve space.

The City is proposing to change the boundaries of the two reserves spaces on the Project Site to: (1) reconfigure the existing reserve spaces on the northern and southern parcels of the Project Site so that they do not overlap with the City Development Plan footprint (excluding the area proposed to be designated Public Facility and used as a ball field complex), (2) reconfigure the existing reserve spaces on the northern and southern parcels to fully coincide with the proposed open space areas (excluding the area proposed to be designated Public Facility and used as a ball field complex), and (3) to split the Margarita Area and Airport Area 1 reserve spaces in a manner so that the Margarita Area reserve space is no longer part of the Project Site. Figure 2-26 shows the proposed changes to the ACOS reserve space boundaries.

The proposed changes in the Reserve Area boundaries would result in open space being the primary land use within the Runway Protection Zone and Safety Area S-1a, with some of the reserve space being in Safety Area S-1b and S-1c. The proposed ACOS Amendment would be processed by the City subsequent to or concurrent with consideration of the Project.

The City is also proposing to change the boundaries of the Cluster Development Zone (CDZ) in the AASP to eliminate some of the property to the southeast, which has already been developed under a County permit. The CDZ modifications would processed by the City subsequent to or concurrent with Project approval as part of the changes to the AASP. Figure 2-24 shows the proposed new boundaries of the CDZ. Table 4.11-4 shows the breakdown of zoning within the modified CDZ.

Table 4.11-4 Zoning Breakdown of CDZ Area

Zoning	Acres
Business Park	131.4
Manufacturing/Service/Commercial	329.0
Medium Density Residential	7.0
Open Space	263.4
Non-Airport Public Facility	15.1
Total	**745.8**
% Open Space	**35.31**

The ALUP requires that 35 percent of the gross CDZ area be set aside as reserve space, not including property zoned as Public Facility for airport use. However, in the AASP, which was approved by the Airport Land Use Commission, a requirement that 35 percent of the gross CDZ area be set aside as open space not including property zoned as Public Facility for airport use. The data in Table 4.11-4 shows that the proposed modifications to the CDZ would meet the 35 percent open space requirement that was used in the approved AASP, and therefore it would qualify for the CDZ density adjustments specified in the ALUP.

A conceptual site plan prepared by the Cal Ripken Baseball Association has been submitted to the Applicant (see Figure 2-19). The proposed ballfield project area would be rezoned as a part of the Project with implementation to be completed by Cal Ripkin at a future date. The Applicant's involvement with the Cal Ripken project is limited to donation of the property. The area would be comprised of up to three baseball fields and amenities that may include the following characteristics:

- A 147,500 ft^2 championship baseball field with sports lighting, scoreboard, built-in terrace seating, and bleachers;
- A 104,500 ft^2 baseball field with lighting, scoreboard, bleachers, and scorekeepers booth;
- A 108,000 ft^2 flexible-use field (Baseball and Softball) with scoreboard, bleachers, and scorekeepers booth;
- Batting cages totaling 3,500 ft^2;
- Restrooms, a plaza, and a playground totaling 17,000 ft^2;
- Parking area totaling 45,000 ft^2; and
- Open grass areas for team warm-up, general use, picnic tables, and benches totaling 236,580 ft^2.

As shown in Figure 2-26, the baseball field complex would be partially within the Runway Protection Zone, with the remainder of the complex falling in Safety Area S-1b. The SLOCRA ALUP allows for outdoor sports and recreation within the Runway Protection Zone, but prohibits structures that could interfere with aircraft navigation and safety, while some structures are allowed in Safety Area S-1b. The FAA has reviewed the facility and issued determinations of "No Hazard to Air Navigation" for each structure in the ball field complex. Since the SLOCRA ALUP allows for this type of land use, the average non-residential population densities would be within the ALUP guidance, and the FAA has determined that facility structures would not pose a hazard to air navigation, the baseball field complex would not pose a significant risk to airport safety or users of the baseball field complex.

The proposed Project would have development with Safety Areas S-1b, S-1c. The project would be developed with an approved ACOS and CDZ specified in an approved Detailed Area Plan (the AASP). This would allow non-residential densities of 50 persons per acre in S-1b and 120 persons per acre in S-1c (see Table 4.11-2). Table 4.11-5 provides a breakdown of the density calculations for the proposed development.

The data in Table 4.11-5 shows that the proposed Project would be well below the allowable population densities in the ALUP. Therefore, potential impacts associated with the proposed Project are considered less than significant (Class III).

Mitigation Measures
No mitigation required.

Residual Impacts
The potential risk associated with development within the ALUP/SLOCRA RPZ and Safety Area S-1 is considered *less than significant (Class III)*.

Table 4.11-5 Population Density Calculations for City Development Plan

Land Use Type	Zoning	Population in Each Safety Zone				
		RP Zone	SA S-1a	SA S-1b	SA S-1c	Total
Light Manufacturing	S-C	0	0	585	265	850
Industrial Research and Development	S-C	0	0	172	78	250
Business Park (Offices)	BP	0	0	1,563	1,917	3,480
General Retail	S-C	0	0	0	50	50
Vehicle Services -Repair and Maintenance-Major	S-C	0	0	100	0	100
Veterinary Clinic/Hospital, Boarding, Large Animal	S-C	0	0	25	0	25
Photo and Film Processing Lab	S-C	0	0	50	0	50
Printing and Publishing	BP	0	0	50	0	50
Warehousing, Indoor Storage	S-C	0	0	34	16	50
Wholesaling and Distribution	S-C	0	0	115	52	167
Hotel (115 rooms)	BP	0	0	0	549	549
Specialized Education/Training Facility	BP	0	0	111	0	111
Public Transit Maintenance and Storage Facility	PF	0	0	50	0	50
Public Fire Station and Training Facility	PF	0	0	25	0	25
Total Population		0	0	2,881	2,926	5,806
Population Density (persons per acre based on gross area)		0	0	9	9	
Allowable Population Density		5	40	50	120	
Maximum Building Coverage (% gross area)		0	0	2.4%	2.0%	
Allowable Building Coverage (% gross area)		0	n/a	n/a	n/a	

1. Population density and gross area are based upon acreage of entire development project including the open space.
2. Allowable population density is based upon data in Table 7 of the ALUP for CDZ specified by approved ACOS and DAP for non-residential in SA S-1c, and for approved ACOS in SA S-1b.
3. Assumes half of the building square footage is made up of two story buildings in the calculation of maximum building coverage.

Impact #	Impact Description	Phase	Residual Impact
HM.8	Potential risk associated with the future use of acutely hazardous materials in the SLOCRA safety areas.	Development	Class II

Businesses associated with the future development scenario could potentially utilize chemical substances that are defined as Acutely Hazardous Materials (AHM). California Health and Safety Code §2770.5, California Accidental Release Program (CalARP) List of Substances, and California Code of Regulations §5189, Process Safety Management of Acutely Hazardous Materials identify AHMs and reportable quantities. The storage of large quantities of AHMs in SLOCRA Safety Area S-1 would have the potential to result in a significant accidental release in the event of an aircraft strike.

Aviation risk management identifies areas of significant aviation hazard. The Airport Land Use Commission has determined that the considerations of primary importance in this determination are:

a. The flight paths most heavily utilized by aircraft departing from or approaching to land at the San Luis Obispo County Regional Airport – Flight paths utilized by a relatively high proportion of arriving or departing aircraft are associated with an increased accident risk.

b. The flight paths utilized by aircraft departing from or approaching to land at the San Luis Obispo County Regional Airport during adverse weather conditions – Maintaining control of an aircraft in conditions that make visualization of the horizon and the ground impossible is one of the most challenging tasks that a pilot can face. Flight paths which have been designated by the Federal Aviation Administration for use during reduced-visibility conditions, therefore, are of significant concern to the ALUC.

c. The anticipated altitude of aircraft operations – A critical operational element in ensuring the safety of persons and property on the ground is the ability of the pilot of a disabled airplane to avoid impact with inhabited structures. The likelihood of the pilot accomplishing this is directly related to the time and gliding distance available, and both of these are dependent on the aircraft's altitude at the time a malfunction occurs.

Consideration of the factors discussed above has lead to the delineation of three fundamental areas with respect to aviation safety risks:

a. Runway Protection Zones – Areas immediately adjacent to the ends of each active runway, within which the level of aviation safety risk is very high and in which, consequently, structures are prohibited and human activities are restricted to those which require only very low levels of occupancy. The size and configuration of the Runway Protection Zones are specified by Federal Aviation Regulations. The Runway Protection Zones are also referred to as the "clear zones" for each runway.

b. Safety Area S-1 – The area within the vicinity of which aircraft operate frequently or in conditions of reduced visibility at altitudes ≤500 feet above ground level (AGL).

c. Safety Area S-2 – The area within the vicinity of which aircraft operate frequently or in conditions of reduced visibility at altitudes between 501 and 1000 feet above ground level (AGL). Aviation safety hazards to be considered in this area include mechanical failures, fuel exhaustion, loss of control during turns from downwind to base legs or from base to final legs of the traffic pattern, stall/spin incidents during engine-out maneuvers in twin engine aircraft, and midair collisions. Operational factors of concern include circle-to land instrument approaches south of Runway 11-29, extensive "pattern work" by student pilots in fixed-wing aircraft (predominantly, but not exclusively to the south and west of the airport), and extensive practice flight by students in rotary-wing aircraft to the north of the airport. Nonetheless, because aircraft in Area S-2 are at greater altitude and are less densely concentrated than in other portions of the Airport Planning Area, the overall level of aviation safety risk is considered to be lower than that in Area S-1 or the Runway Protection Zones.

The Project Site development is located within Safety Area S-1, which represents some of the highest risk areas for an aircraft accident near the airport. An aircraft strike on a facility that has AHMs stored in large quantities would likely result in a breach on containment and the release of hazardous materials over a wide area. The risk of an aircraft strike in Safety Area S-1 is sufficiently high that an accidental AHM release would be considered potentially significant.

Mitigation Measures

HM-8 The Applicant shall include deed restrictions on development parcels limiting on-site storage of AHMs to amounts less than the lowest reportable quantities as currently defined in California Health and Safety Code §2770.5, California Accidental Release Program (CalARP) List of Substances, and California Code of Regulations §5189, Process Safety Management of Acutely Hazardous Materials, Appendix A.

Residual Impacts

Limiting the volume of AHM storage in facilities that would be located in ALUP Safety Area S-1 would minimize the potential consequences of an accidental AHM release to a level that is considered *less than significant with mitigation (Class II)*.

Impact #	Impact Description	Phase	Residual Impact
HM.9	Risk associated with land use changes and aircraft wildlife strikes and other aircraft hazards.	Development	Class III

The City Development Plan portion of the Project would include land uses that could result in increased wildlife, mainly birds, in SLOCRA Safety Area S-1. Specifically, the proposed inclusion of recreational facilities, such as the ball fields, could lead to additional wildlife. Parks, golf courses, natural resources, and natural areas have the potential to create wildlife hazard attractants on or near airports. These areas may provide wildlife corridors, foraging opportunities (e.g., grass fields, food/trash from ball field users), roost sites, rookeries, migratory flyway stop over sites or numerous other functions that may benefit wildlife but, due to their location, may create situations where wildlife are crossing airspace for approach, departing, or training aircraft (Caltrans, 2011).

However, it is unlikely that the proposed ball fields would result in any substantial change in the amount of wildlife over the current baseline (see Section 4.2 Biological Resources; specifically Section 4.2.1.9, Birds), but may only serve to change the species that forage at the Project Site, and the times that these species are present. The area is currently characterized by grassland, which attracts various species of birds, including birds of prey that feed on rodents. Species that have been involved in aircraft strikes include seagulls, hawks, pigeons, blackbirds, sparrows, finches, ducks, owls, American kestrels, meadowlarks and turkey vultures. Hawks are the most frequently impacted species. Subsequent to development, it is likely that opportunistic species, such as seagulls, pigeons, blackbirds, sparrows, finches, ducks, etc. would be attracted to the area, while predatory species, such as hawks, white-tailed kite, prairie falcon, northern harrier, and golden eagle (all observed at the Project Site) would be expected to decrease due to the decrease in feeding opportunities. Therefore, potential increase in aircraft wildlife strikes, if any, is considered to be less than significant.

Mitigation Measures
No mitigation required.

Residual Impacts
Potential hazards associated with increase aircraft wildlife strikes that could result from the proposed recreational facilities are considered *less than significant (Class III).*

4.11.6 County Development Plan Impacts and Mitigation Measures

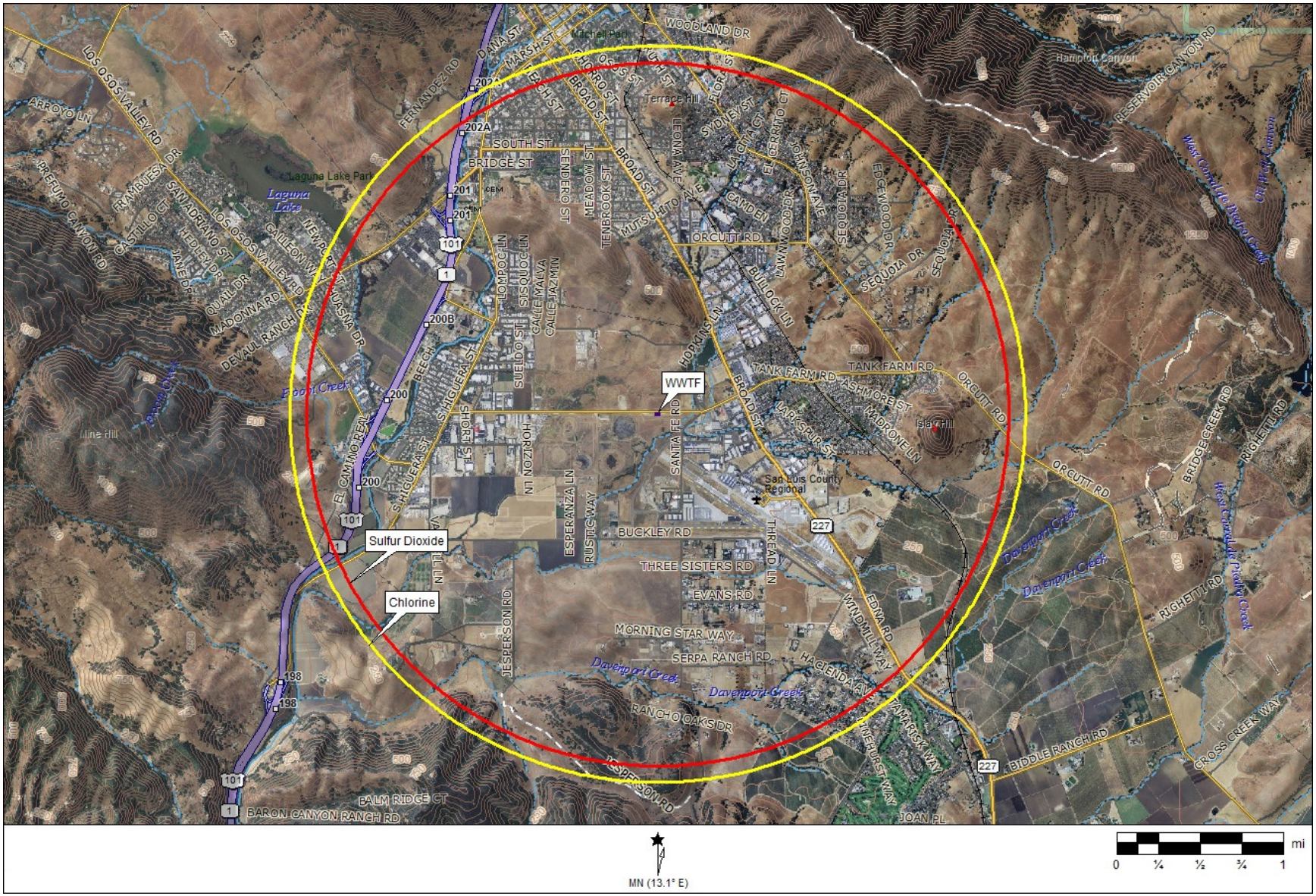
The County Development Plan component of the Project would create commercial facilities that include 433,000 sq. ft. of business park space, 370,000 sq. ft. for service and light manufacturing businesses, and an approximate 14-acre recreational/ball field facility. The County Development Plan would also include the construction of an on-site wastewater treatment plant on one acre located within the development envelope south of Tank Farm Road, on the southern parcel (refer to Figure 2-22). All of the impacts described above for the proposed remediation and City Development Plan components of the Project would be identical for the respective portions of the County Development Plan impacts with the exception of impact HM.7. Portions of HM.7 would be different since the County does not have Detailed Area Plan, ACOS or CDZ.

Impact #	Impact Description	Phase	Residual Impact
HM.10	Risk associated with chemical spills due to aircraft strikes for both the direct discharge and polishing pond wastewater treatment facility (WWTF) options.	Development	Class II

Wastewater treatment frequently requires the use of acutely hazardous materials such as gaseous chlorine and sulfur dioxide. The proposed WWTF would require that all waste be treated to tertiary standards, which is typically accomplished using chlorine and sulfur dioxide. Given the proposed location of the WWTF in ALUP/SLOCRA Safety Area S-1b, the storage and use of acutely hazardous materials could pose a hazard in the event of an aircraft accident and strike on the WWTF. As noted in Impact HM.8 the Project Site development is located within Safety Area S-1, which represents some of the highest risk areas for an aircraft accident near the airport. An aircraft strike on a facility that has AHMs stored in large quantities would likely result in a breach on containment and the release of hazardous materials over a wide area.

A WWTF typically stores chlorine and sulfur dioxide in ton containers or larger pressure vessels. Using ton containers as an example, the EPA RMP*Comp program was used to estimate worst-case injury hazard zones, which were 2.2 and 3.1 miles for chlorine and sulfur dioxide, respectively. Potential hazard zones would be considerably larger if the chlorine and sulfur dioxide were stored in larger pressure vessels. As shown in Figure 4.11-11, potential worst-case chlorine and sulfur dioxide hazard zones would be substantial and encompass a significant portion of the City. The acute toxicity of chlorine and sulfur dioxide, combined with the large quantities required to operate a WWTF, have been a driving force in using alternative chemicals and/or treatment methods for wastewater treatment.

Figure 4.11-11 Wastewater Treatment Facility Chlorine and Sulfur Dioxide Hazards



Mitigation Measures

HM-10 Prior to recordation of applicable tract map, the Applicant shall include deed restrictions on the WWTF parcel limiting on-site storage of reportable quantities of chlorine and sulfur dioxide, and requiring the use of alternative chemicals that are not classified as acutely hazardous materials, or other non-chemical technologies in order to achieve tertiary treatment of wastewater.

Residual Impacts

A wide variety of treatment options are available as substitutes for chlorine in the disinfection process and sulfur dioxide in the dechlorination process prior to discharge of the treated effluent. Sodium hypochlorite and sodium hydroxide are common substitutes for chlorine and sulfur dioxide at California WWTFs. In addition, methods such as ultraviolet radiation and ozonation are also available to disinfect wastewater. The use of an alternative wastewater treatment technology would reduce potentially significant to a level that is considered *less than significant with mitigation (Class II)*.

Impact #	Impact Description	Phase	Residual Impact
HM.11	Risk associated with polishing ponds WWTF option could affect aircraft bird strikes.	Development	Class II

The locations of the proposed treatment plant and disposal facility structures are restricted by the Airport Land Use Plan, which was developed in compliance with the State Aeronautics Act. The Airport Land Use Plan designates safety areas surrounding the airport, runway and landing/take off flight paths. The restrictive zones limit any development which causes an obstruction to air navigation. The entire Project Site is located within designated airport safety areas. These areas are shown in Figure 4.11-12. The most restrictive zone is the Runway Protection Zone (RPZ) as outlined in red. Runway Protection Zones are areas immediately adjacent to the ends of each active runway. The level of aviation safety risk is very high, consequently, structures are prohibited and human activities are limited to very low levels.

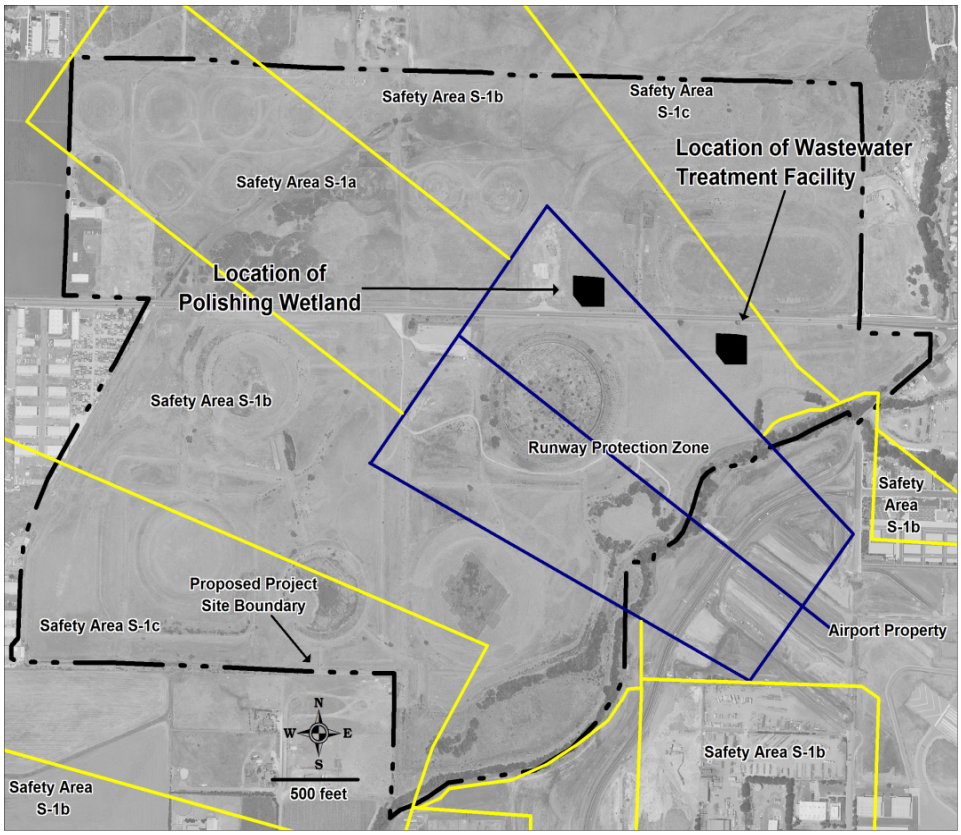
The proposed WWTF has, therefore, been proposed to be located outside of the RPZ, within Safety Area S-1b, just south of Tank Farm Road on the east side of the tank farm property (see Figure 4.11-12. Safety Areas labeled as S-1b are less restrictive than a RPZ zone, however, aviation safety hazards are considered relatively greater within these areas and development is limited as to total building coverage, density, special function land use, etc.

Although the wastewater treatment facility is proposed to be located outside of the Runway Protection Zone, the 0.7 acre of the polishing wetlands option would be located within the Runway Protection Zone (see Figure 4.11-12).

The polishing wetland discharge option consists of a constructed wetland design as a supplemental effluent treatment option. Effluent would be released from the wastewater treatment facility and conveyed into the wetlands. The effluent would be contained within the

wetlands for several days to allow for further removal of nitrogen. The treated effluent would then be released from the wetlands and discharged into Tank Farm Creek.

Figure 4.11-12 Airport Safety Areas and Proposed Wastewater Treatment Facility



Although the polishing wetlands are designed to hold water for a temporary period, the development of the wetlands and regular introduction of water would create an environment that would attract wildlife including birds. The polishing wetland option would create an environment that would attract birds and create a significant hazard to aircraft and be inconsistent with the Airport Land Use Plan. Mitigation measures commonly used for the reduction of bird populations surrounding airports include habitat management practices, including the reduction of standing water, thinning of brush, grass, etc., all of which would limit the efficiency and effectiveness of the polishing wetlands. The use of the wetland polishing ponds would represent a significant aircraft hazard due to the potential for bird strikes.

Mitigation Measures

HM-11 *Polishing ponds shall not be allowed as part of the design of the WWTF unless the applicant can demonstrate, to the satisfaction of the County, that engineering methods are available and can be incorporated in the polishing pond design that would ensure no increase in bird or other wildlife populations on the site will result from the construction and operation of the polishing pond. Such measures could include, but not be limited to covers over the ponds, special netting, and hazing devices.*

Residual Impacts

The FAA Advisory Circular No. 150/5200-33B, dated 8/28/07, and the UC Davis Bird Hazing Manual, dated 2008, were reviewed for information on widely accepted engineering controls that could be applied to a polishing pond associated with a wastewater treatment plan. Both reports include methods for deterring birds from being attracted to open water ponds, including wastewater ponds.

Examples included in the FAA Circular include bird balls, floating pillows, wire grids, and netting. The UC Davis Bird Hazing Manual also recommends use of netting and wire grids on fixed facilities. Floating pillows or bird balls are recommends for use on small areas of open water. Both documents indicate that there are accepted engineering controls that could be implemented to mitigate the attraction to wildlife and bird strike hazards should the polishing pond be constructed.

Avoiding the use of, or adequately including engineering controls of polishing ponds to prevent an increase in the bird population on the site, would reduce potential bird strike impacts to a level that is considered *less than significant with mitigation (Class II)*.

Impact #	Impact Description	Phase	Residual Impact
HM.12	Potential public risk associated with development within the SLOCRA Safety Areas.	Development	Class III

The proposed County Development Plan would include development within Safety Areas S-1b, S-1c. The County Plan would be developed without any Detailed Area Plan, ACOS or CDZ. This would allow non-residential densities of 40 persons per acre in S-1b and 50 persons per acre in S-1c (see Table 4.11-2). Also without and density adjustments, the allowable maximum building coverage would be limited to 10 and 15 percent of gross project area for S-1b and S-1c respectively. Table 4.11-6 provides a breakdown of the density calculations for the proposed County Development Plan.

The data in Table 4.11-6 shows that the Project would be well below the allowable population and maximum building coverage densities in the ALUP.

A conceptual site plan prepared by the Cal Ripken Baseball Association has been submitted to the Applicant (see Figure 2-19). The proposed ballfield project area would be rezoned as a part of the Project with implementation to be completed by Cal Ripkin at a future date. The Applicant's involvement with the Cal Ripken project is limited to donation of the property. The area would be comprised of up to three baseball fields and amenities that may include the following characteristics:

- A 147,500 ft^2 championship baseball field with sports lighting, scoreboard, built-in terrace seating, and bleachers;
- A 104,500 ft^2 baseball field with lighting, scoreboard, bleachers, and scorekeepers booth;

Table 4.11-6 Population Density Calculations for County Development Plan

Land Use Type	Zoning	Population in Each Safety Zone				
		RP Zone	SA S-1a	SA S-1b	SA S-1c	Total
Light Manufacturing	I	0	0	563	287	850
Industrial Research and Development	I	0	0	166	84	250
Business Park (Offices)	CS	0	0	1,563	1,917	3,480
General Retail	CS	0	0	0	50	50
Vehicle Services -Repair and Maintenance-Major	I	0	0	100	0	100
Veterinary Clinic/Hospital, Boarding, Large Animal	I	0	0	25	0	25
Photo and Film Processing Lab	I	0	0	50	0	50
Printing and Publishing	I	0	0	50	0	50
Warehousing, Indoor Storage	I	0	0	33	17	50
Wholesaling and Distribution	I	0	0	110	56	167
Hotel (115 rooms)	CS	0	0	0	549	549
Specialized Education/Training Facility	I	0	0	111	0	111
Wastewater Treatment	CS	0	0	5	0	5
Total Population		0	0	2,777	2,959	5,736
Population Density (persons per acre based on gross area)		0	0	9	9	
Allowable Population Density		5	30	40	50	
Maximum Building Coverage (% gross area)		0	0	2.3%	2.1%	
Allowable Building Coverage (% gross area)		0	5	10%	15%	

1. Population density and gross area are based upon acreage of entire development project including the open space.
2. Allowable population density is based upon data in Table 7 of the ALUP with no ACOS, CDZ or ADP.
3. Assumes half of the building square footage is made up of two story buildings in the calculation of maximum building coverage.

- A 108,000 ft^2 flexible-use field (Baseball and Softball) with scoreboard, bleachers, and scorekeepers booth;
- Batting cages totaling 3,500 ft^2;
- Restrooms, a plaza, and a playground totaling 17,000 ft^2;
- Parking area totaling 45,000 ft^2; and
- Open grass areas for team warm-up, general use, picnic tables, and benches totaling 236,580 ft^2.

As shown in Figure 2-26, the baseball field complex would be partially within the Runway Protection Zone, with the remainder of the complex falling in Safety Area S-1b. The SLOCRA ALUP allows for outdoor sports and recreation within the Runway Protection Zone, but prohibits structures that could interfere with aircraft navigation and safety, while some structures are allowed in Safety Area S-1b. The FAA has reviewed the facility and issued determinations of "No Hazard to Air Navigation" for each structure in the ball field complex. Since the SLOCRA ALUP allows for this type of land use, the average non-residential population densities would be

within the ALUP guidance, and the FAA has determined that facility structures would not pose a hazard to air navigation, the baseball field complex would not pose a significant risk to airport safety or users of the baseball field complex.

Therefore, potential impacts associated with the Project are considered less than significant (Class III).

Mitigation Measures
No mitigation required.

Residual Impacts
Potential hazards associated with development within SLOCRA Safety Area S-1 are considered *less than significant (Class III)*.

4.11.7 Cumulative Analysis

As stated in Chapter 3.0, Cumulative Scenario and Methodology, under the CEQA Guidelines, "a cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the environmental impact report ("EIR") together with other projects causing related impacts." Section 15130 of the CEQA Guidelines requires that an Environmental Impact Report (EIR) discuss cumulative impacts of a project when the project's incremental effect is cumulatively considerable, as defined in section 15065(c).

The Cumulative Projects list shown in Table 3-1 identifies specific City and County Development Plans that, depending on location and timing could, in combination with the proposed remediation, restoration and City and County Development Plan elements of the Project, result in cumulative impacts to public safety. Each of the impacts identified in Section 4.11.4 were considered as they relate to impacts to hazards and hazardous materials and are discussed in this section as they relate to the Project's contribution to cumulative impacts.

4.11.7.1 Cumulative Public Health Risk

The HHRA prepared for the Project found that off-site health risks were less than significant. In addition, following mitigation the Project was found to have a less than significant health risk for Project Site users following development. Most of the cumulative projects identified in Table 3.1 are too far from the Project Site to contribute to a cumulative health risk. The industrial project on Buckley Road (#21) is fairly close to the Project Site, but at this point it would be speculative to assume there would be a cumulative health risk when the use of this industrial site has not been established. Even if the site is eventually developed where a facility emits toxic air contaminants, the project would need to meet the SLOAPCD's health risk criteria at the facility boundary. Given the low off-site health risk associated with the Project, any cumulative health risk would remain below the SLOAPCD's risk limits in the vicinity of the Project Site and the proposed Buckley Road industrial buildings.

4.11.7.2 Cumulative Truck Transportation Risk

Most of the projects listed in Table 3.1 will generate additional passenger vehicle and truck traffic, thus adding to the cumulative project risk. However, it is unlikely that any of these projects will generate enough truck trips, especially during the period of active remediation and restoration, to result in a significant truck transportation risk. As noted in Impact HM.2, the Project truck accident fatality risk was about half of the significance criteria for impacted soil transportation to the Santa Maria Landfill. The proposed Project truck accident fatality risk for impacted soil transport to the Kettleman Hills/Buttonwillow area is close to the significance criteria due to the longer distance. However, in terms of cumulative risk, the Project risk is calculated for the entire distance between the Project Site and the destination landfills. As such, very little of the truck accident risk occurs in the immediate project area and in the vicinity of the cumulative projects. Therefore, the cumulative truck transportation risk is considered less than significant in the project area.

4.11.7.3 Cumulative Aircraft Wildlife Strike Risk

Of the projects listed in Table 3.1, the Green Waste Management Facility is the only facility that would have the potential to attract wildlife, especially birds, due to green waste composting. The Green Waste Management Facility would be located on Orcutt Road west of the airport. Since the Project would not result in an increase in wildlife populations at the Site, it would not contribute to a cumulative impact. Therefore, cumulative aircraft wildlife strike risk would be less than significant.

4.11.7.4 Cumulative Aircraft Strike Risk

Many of the cumulative projects that are listed in Table 3.1 are within one of the airport Safety Areas. As such, their development would be limited to the Airport Area Specific Plan population densities for each Safety Area. As a result, cumulative development within the Airport Area Specific Plan area would not contribute to a significant increase in risk associated with an aircraft strike. Therefore, cumulative aircraft strike risk is considered less than significant.

4.11.7.5 Cumulative Acutely Hazardous Material Accidental Release Risk

The Project includes mitigation to severely limit the use of acutely hazardous materials on the Project Site following development. None of the projects listed in Table 3.1 would substantially contribute to Project-related impacts, nor would the Project substantially contribute to cumulative impacts of the listed projects. Therefore, potential hazardous material cumulative impacts are considered less than significant.

4.11.8 Mitigation Monitoring Plan

4.11.8.1 Remediation Project Mitigation Monitoring Plan

Mitigation Measure	Requirements	Compliance Verification		
		Method	Timing	Responsible Party
HM-1	Prior to issuance of grading or other related permits authorizing initiation of the remediation and restoration component of the project, the Applicant shall submit to the City and County written verification from the RWQCB that the Remedial Action Plan has been finalized and approved.	Review of written verification from RWQCB	Prior to issuance of grading permit for remediation	County Department of Planning and Building
HM-4	The applicant shall limit the on-site wetland replacement to a ratio of 1:1 for a total on-site wetland restoration of 46.64 acres (42.93 acres for remediation and 3.71 acres for development area).	County Department of Planning and Building to review and approve restoration plan and independent biological monitor to conduct regular monitoring.	Plan approved prior to permit issuance and monitoring conducted throughout construction and restoration phases	County Department of Planning and Building

4.11.8.2 City Development Plan Mitigation Monitoring Plan

Mitigation Measure	Requirements	Compliance Verification		
		Method	Timing	Responsible Party
HM-6	Prior to recordation of applicable tract map, the Applicant shall include deed restrictions on development parcels identifying specific limits on trenching activities and procedures for conducting subsurface construction activities. The Applicant shall maintain responsibility for air quality monitoring during any subsurface excavation activities.	County Department of Planning and Building to review and approve deed restrictions in conjunction with the City.	Prior to recordation of applicable tract map.	City of San Luis Obispo
HM-8	The Applicant shall include deed restrictions on development parcels limiting on-site storage of AHMs to amounts less than the lowest reportable quantities as currently defined in California Health and Safety Code §2770.5, California Accidental Release Program (CalARP) List of Substances, and California Code of Regulations §5189, Process Safety Management of Acutely Hazardous Materials, Appendix A.	County Department of Planning and Building to review and approve deed restrictions in conjunction with the City.	Prior to recordation of applicable tract map.	City of San Luis Obispo

4.11.8.3 County Development Plan Mitigation Monitoring Plan

Mitigation Measure	Requirements	Compliance Verification		
		Method	Timing	Responsible Party
HM-10	Prior to recordation of applicable tract map, the Applicant shall include deed restrictions on the WWTF parcel limiting on-site storage of reportable quantities of chlorine and sulfur dioxide.	County Department of Planning and Building to review and approve deed restrictions.	Prior to recordation of applicable tract map.	County of San Luis Obispo
HM-11	Polishing ponds shall not be allowed as part of the design of the WWTF unless the applicant can demonstrate, to the satisfaction of the County, that engineering methods are available and can be incorporated in the polishing pond design that would ensure no increase in bird or other wildlife populations on the site will result from the construction and operation of the polishing pond. Such measures could include, but not be limited to covers over the ponds, special netting, and hazing devices.	County Department of Planning and Building to review and approve wastewater treatment design drawings.	Prior to issuance of applicable grading permit.	County of San Luis Obispo

4.11.9 References

The Airport Land Use Commission (ALUC) for San Luis Obispo County. 2005. Airport Land Use Plan for the San Luis Obispo Regional Airport. San Luis Obispo, CA: The Airport Land Use Commission for San Luis Obispo County; May 18, 2005.

Applied Geochemical Strategies, Inc. (AGSI). 2003a. Memorandum: Characterization of Total Petroleum Hydrocarbons Detected in Surface Water from Unocal's Former San Luis Obispo Tank Farm – Version 2.0. Attachment 10 of McDaniel Lambert, Inc.'s 2004 Baseline HHRA.

Applied Geochemical Strategies, Inc. (AGSI). 2003b. Memorandum: Characterization of TPH and PAH's in Soils and Sediment, and Surface Tars from Unocal's Former San Luis Obispo Tank Farm. Attachment 7 of McDaniel Lambert, Inc.'s 2004 Baseline HHRA.

Avocet Environmental, Inc. (Avocet). 2007. Remedial Action Plan, San Luis Obispo Tank Farm. December 18, 2007.

Avocet Environmental, Inc. (Avocet). 2007. Feasibility Study, Former San Luis Obispo Tank Farm. March 15, 2007.

California Department of Transportation (Caltrans). 2011. California Airport Land Use Planning Handbook. October.

California Environmental Protection Agency (Cal/EPA). 1994. Benzo[a]pyrene as a Toxic Air Contaminant. Part B. Health Effects of Benzo[a]pyrene. Air Toxicology and Epidemiology Section, Office of Environmental Human Health Assessment, Berkeley, CA.

California Environmental Protection Agency (Cal/EPA). 1994. Preliminary Endangerment Assessment Guidance Manual. Dept. of Toxic Substances Control, Sacramento, CA. Reprinted in 1999.

California Environmental Protection Agency (Cal/EPA). 1997. Selecting Inorganic Constituents as Chemicals of Potential Concern and Risk Assessments At Hazardous Waste Sites and Permitted Facilities, Human and Ecological Risk Division, California Department of Toxic Substances Control (DTSC). February.

California Environmental Protection Agency (Cal/EPA). 1999. Department of Toxic Substances Control Lead Risk Spreadsheet Version 7.0. Updated January 2009. California Department of Toxic Substances Control (DTSC), Sacramento, CA.

California Environmental Protection Agency (Cal/EPA). 2002. Air Toxics Hot Spots Program Risk Assessment Guidelines – Part II Technical Support Document for Describing Available Cancer Potency Factors.

California Environmental Protection Agency (Cal/EPA). 2012. Advisory – Active Soil Gas Investigations. Letter from Department of Toxic Substance Control and LA California Regional Water Quality Control Board. April.

California Environmental Protection Agency (Cal/EPA). 2005a. Human-Exposure-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil. External Review Draft. Office of Environmental Health Hazard Assessment. January.

California Environmental Protection Agency (Cal/EPA). 2005b. Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties. January.

California Environmental Protection Agency (Cal/EPA). 2005c. Advisory on Methane Assessment and Common Remedies at School Sites. Department of Toxic Substances Control. June.

California Environmental Protection Agency (Cal/EPA). 2007. Arsenic Strategies – Determination of Arsenic Remediation, Development of Arsenic Cleanup Goals for Proposed and Existing School Sites. Department of Toxic Substance Control. March 21.

California Environmental Protection Agency (Cal/EPA). 2012. Office of Environmental Health Hazard Assessment Table of Acute, 8-hour and Chronic Reference Exposure Levels (RELs). Available online: http://www.oehha.org/air/allrels.html

California Environmental Protection Agency (Cal/EPA). 2009a. Interim Guidance for Evaluating Human Health Risks from Total Petroleum Hydrocarbons (TPH). Human and Ecological Risk Division, California Department of Toxic Substance Control. June 16.

California Environmental Protection Agency (Cal/EPA). 2009b. Technical Support Document for Cancer Potency Factors: Methodologies for derivation, listing of available values, and adjustments to allow for early life stage exposures. Air Toxicology and Epidemiology Branch, Office of Environmental and Human Health Assessment. May.

California Environmental Protection Agency (Cal/EPA). 2009c. Human Health Risk Assessment (HHRA) Note 3. Dept. of Toxic Substances Control, Office of Human and Ecological Risk. May.

California Environmental Protection Agency (Cal/EPA). 2009d. Revised California Human Health Screening Level for Lead. Office of Environmental Health and Hazard Assessment. September. Available online: http://www.oehha.org/risk/pdf/LeadCHHSL091709.pdf

California Environmental Protection Agency (Cal/EPA). 2009e. Human Health Risk Assessment (HHRA) Note 2. Remedial Goals for Dioxins and Dioxin-like Compounds for Consideration at California Hazardous Waste Sites. Interim, May 2009. http://www.dtsc.ca.gov/AssessingRisk/upload/HHRA_Note2_dioxin-2.pdf

California Environmental Protection Agency (Cal/EPA). 2010. List of California Human Health Soil-Screening Levels (CHHSLs). Office of Environmental Health and Hazard Assessment. September. Available online: http://oehha.ca.gov/risk/chhsltable.html

California Environmental Protection Agency (Cal/EPA). 2011. Guidance for the Evaluation and Mitigation of Subsurface Vapor Intrusion to Indoor Air. Final. California Department of Toxic Substances Control (DTSC). October.

California Environmental Protection Agency (Cal/EPA). 2012. Office of Environmental Health Hazard Assessment Toxicity Criteria Database. Available online: http://www.oehha.ca.gov/risk/ChemicalDB/index.asp

Chevron Environmental Management Company. 2007. Project Execution Plan for the Chevron San Luis Obispo Tank Farm Project, San Luis Obispo, CA. December 20, 2007.

Earth Systems Pacific, 2002a. Analysis for Pesticides and Herbicides, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California. July.

Earth Systems Pacific, 2002b. Groundwater Monitoring Results, September 2002, Monitoring and Reporting Program 93-120 –, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California. October.

EDAW, Inc. (EDAW). 1999. Wetland Delineation for Unocal Tank Farm, San Luis Obispo, California. Project No. 8T148.01. Delineation certified by United States Department of Agriculture, Natural Resources Conservation Service in a letter dated September 10, 1999, entitled Verification of Jurisdictional Delineation of Wetlands at Unocal Tank Farm, San Luis Obispo County, California. July 23.

England & Associates. 1999a. Additional Site Characterization, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California. April.

England & Associates. 1999b. Petroleum Hydrocarbon Issues For the Proposed Unocal Tank Farm Development and Ecological Preserve, San Luis Obispo, California. August.

England Geosystem, Inc. 2001. Supplemental Site Characterization, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California. October.

England Geosystem, Inc. 2002. Reservoir Bottom Hydrocarbon Seepage Study, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California. November.

England Geosystem, Inc. 2003a. Background Metals Evaluation, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California. February. Attachment 11 of McDaniel Lambert, Inc.'s 2004 Baseline HHRA.

England Geosystem, Inc. 2003b. Characterization of Petroleum Fractions in Surface Exposures and Shallow Soil, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California. November 26.

England Geosystem, Inc. 2003c. Soil Gas Monitoring Report September 2002, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California. January 30.

England Geosystem, Inc. 2003d. Supplemental Evaluation of Surface Water, Unocal San Luis Obispo Tank Farm, San Luis Obispo, California. February 20.

England, Shahin & Associates. 1994. Supplemental Ground Water Investigation Unocal Tank Farm Facility. May 11, 1994.

JENESIS Ecological Services, 2003. Wetland Delineation of the Former San Luis Obispo Tank Farm, San Luis Obispo, California.

McDaniel Lambert, Inc. 2011. Supplemental Human Health Risk Assessment for the Unocal Avila Tank Farm. Version 3.0. Prepared for the Avila Tank Farm Collaborative Assessment Team. May 2, 2011. Agencies' Acceptance Letter dated July 20, 2011.

Padre Associates, Inc. (Padre). 2007. Additional Sampling of Surface Monitoring Location SW-9, Former San Luis Obispo Tank Farm, San Luis Obispo, California. May 7, 2007.

Padre Associates, Inc. (Padre) and WSP Environment and Energy. 2008a. An Analysis of the Geographic Extent of Waters of the U.S., Including Wetlands at the Chevron Tank Farm Facility, San Luis Obispo, California. Prepared for Chevron Environmental Management Corporation. August 5, 2008.

Padre Associates, Inc. (Padre) and WSP Environment & Energy (WSP). 2008b. An Analysis of the Geographic Extent of Waters of the U.S., Including Wetlands at the Chevron Tank Farm Facility, San Luis Obispo, California. Consultant's report developed for Chevron EMC, San Luis Obispo, California.

Padre Associates, Inc. (Padre) and WSP Environment & Energy (WSP). 2009. Landscape Restoration for the Chevron San Luis Obispo Tank Farm 75% Basis of Design Report. Consultant's report developed for Chevron EMC, San Luis Obispo, California.

Padre Associates, Inc. (Padre). 2010. Technical Work Plan, Assessment of Shallow Soils for Chlorinated Dibenzodioxins and Dibenzofurans, Former San Luis Obispo Tank Farm, San Luis Obispo, California. March.

Padre Associates, Inc. (Padre). 2011a. Technical Work Plan, Soil Gas Assessment Activities Former Unocal Tank Farm, San Luis Obispo, California. May.

Padre Associates, Inc. (Padre). 2011b. Report of Findings, Assessment of Shallow Soils for Chlorinated Dibenzodioxins and Chlorinated Dibenzofurans, Former San Luis Obispo Tank Farm, San Luis Obispo, San Luis Obispo County, California. March.

Padre Associates, Inc. (Padre). 2011c. First Semi-Annual (1S11) Surface Water Monitoring Report, Former San Luis Obispo Tank Farm Facility, San Luis Obispo, California. April.

Padre Associates, Inc. (Padre). 2011d. Second Semi-Annual (2S11) Groundwater Monitoring Report, Former San Luis Obispo Tank Farm, San Luis Obispo, California. October.

Padre Associates, Inc. (Padre). 2012a. Report of Findings, Soil Gas Assessment, Former Unocal Tank Farm, San Luis Obispo, California. January.

Padre Associates, Inc. (Padre). 2012b. Report Of Findings, Geologic Evaluation Of Naturally Occurring, Asbestos And Material Durability Assessment, Former San Luis Obispo Tank Farm, 276 Tank Farm Road, San Luis Obispo, San Luis Obispo County, California, December.

U.S. Environmental Protection Agency (USEPA). 1989. Risk Assessment Guidance for Superfund (RAGS), Vol. I, Human Health Evaluation Manual, Part A, Interim Final. Office of Emergency and Remedial Response. EPA/540/1-89/002.

U.S. Environmental Protection Agency (USEPA). 1990. National Oil and Hazardous Substances Pollution Contingency Plan, Final Rule, Federal Register, Vol. 55, No. 46, Rules and Regulations, March 8.

U.S. Environmental Protection Agency (USEPA). 1991. Risk Assessment Guidance for Superfund (RAGS), Vol. I, Human Health Evaluation Manual, Part C, Risk Evaluation of Remedial Alternatives, Interim Final. Office of Emergency and Remedial Response. EPA 9285, 7-01C.

U.S. Environmental Protection Agency (USEPA). 1992a. Guidance for Data Useability in Risk Assessment, Final. Office of Emergency and Remedial Response. EPA/540/G90/008.

U.S. Environmental Protection Agency (USEPA). 1992b. Guidance on Risk Characterization for Risk Assessors and Risk Managers, Memorandum, Feb. 26.

U.S. Environmental Protection Agency (USEPA). 1999. Derivation of a volatilization factor to estimate upper bound exposure point concentration for workers in trenches flooded with groundwater off-gassing volatile organic chemicals. Region 8. Ref: 8EPR-PS. July 29, 1999. As cited in URS 2008.

U.S. Environmental Protection Agency (USEPA). 2002. Supplemental Guidance for Developing Soil Screening Levels at Superfund Sites. December. OSWER 9355.4-24.

U.S. Environmental Protection Agency (USEPA). 2004a. Risk Assessment Guidance for Superfund (RAGS), Vol., I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment, Final. EPA/540/R/99/005.

U.S. Environmental Protection Agency (USEPA). 2004b. Users Guide for Evaluating Subsurface Vapor Intrusion into Buildings. Office of Emergency and Remedial Response. EPA/68-W-01-58. DTSC modification of Advanced Soil Gas model downloaded from http://www.oehha.ca.gov/risk/jefiles/jande.html, but no longer available.

U.S. Environmental Protection Agency (USEPA). 2005. Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. March. EPA/630/R-03/003F.

U.S. Environmental Protection Agency (USEPA). 2009a. Risk Assessment Guidance for Superfund (RAGS), Vol. I, Human Health Evaluation Manual, Part F, Supplemental Guidance for Inhalation Risk Assessment, Final.

U.S. Environmental Protection Agency (USEPA). 2009b. Toxicological Review of Thallium and Compounds (CAS No. 7440-28-0) In Support of Summary Information on the Integrated Risk Information System (IRIS). September.

U.S. Environmental Protection Agency (USEPA). 2011a. Exposure Factors Handbook: 2011 Edition. Office of Health and Environmental Assessment. October. EPA/600/C-99/001.

U.S. Environmental Protection Agency (USEPA). 2011b. ProUCL Software, Version 4.1. Environmental Sciences Division, National Exposure Research Laboratory. Available from worldwide web: www.epa.gov/esd/tsc/software.htm. User Guide dated May 2010.

U.S. Environmental Protection Agency (USEPA). 2012a. Integrated Risk Information System (IRIS) database. February. Available online: http://www.epa.gov/iris/

U.S. Environmental Protection Agency (USEPA). 2012b. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. November. Available online: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm