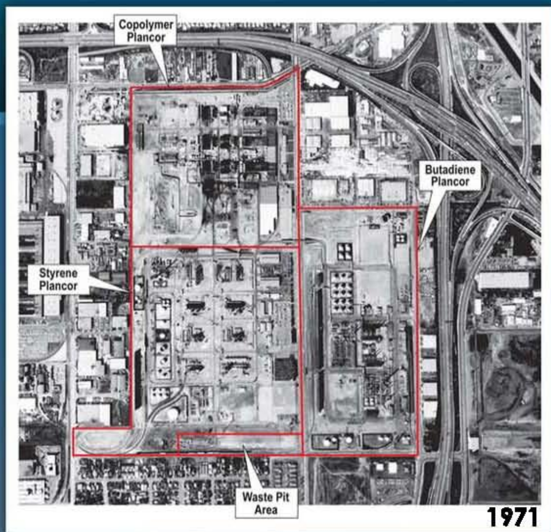
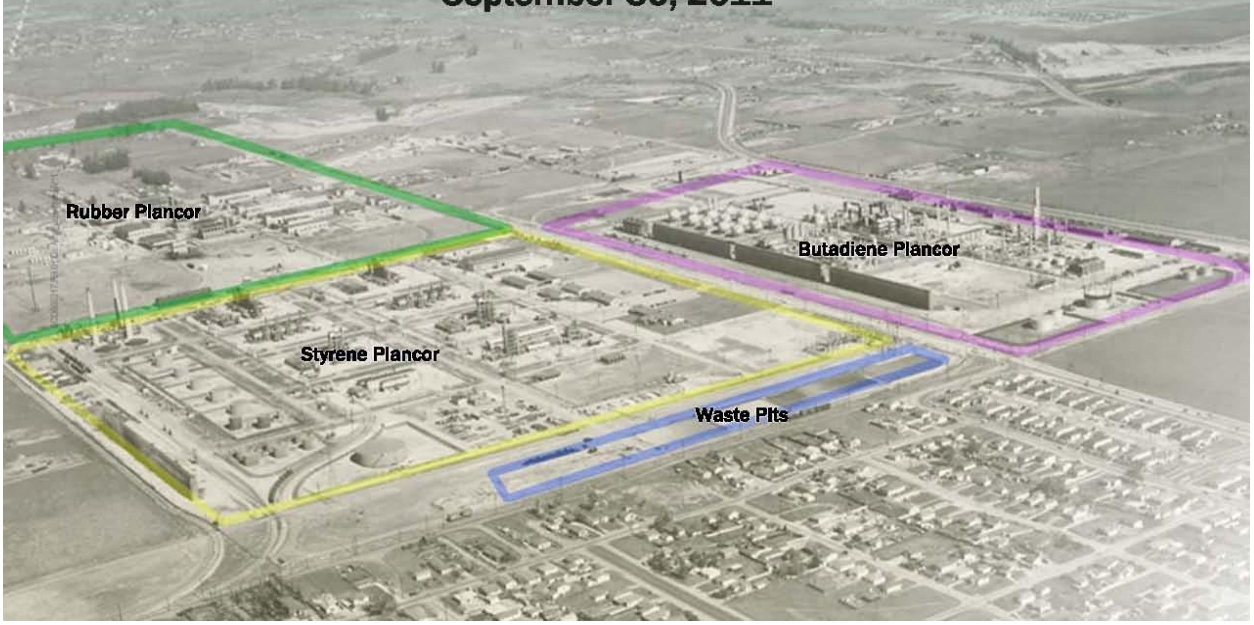


Record of Decision

Del Amo Facility Superfund Site
Soil and NAPL Operable Unit

Los Angeles, CA
September 30, 2011



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ACRONYMS

5YR	5-Year Review
ADD	average daily dose
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
BEC	building engineering control
bgs	below ground surface
BRA	Baseline Risk Assessment
BTEX	benzene, toluene, ethylbenzene, and xylene
CC&Rs	Covenants, Conditions and Restrictions
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
cfm	cubic feet per minute
CHHSL	California Human Health Screening Levels
COC	chemical of concern
COPC	chemical of potential concern
CSF	cancer slope factor
CSM	Conceptual Site Model
CT	central tendency
CY	cubic yard(s)
DAAC	Del Amo Action Committee
DDT	dichlorodiphenyltrichloroethane
DHS	State of California Department of Health Services
DL	detection limit
DNAPL	dense nonaqueous phase liquid
DTSC	California Department of Toxic Substances Control
EAPC	exposure area of potential concern
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
ERA	Ecological Risk Assessment
ERT	Environmental Review Team
ERH	electrical resistance heating
FID	flame ionization detector
FS	Feasibility Study
H&S	health and safety
HI	hazard index
HVAC	heating, ventilating, and air conditioning
IC	institutional control
ISCO	in-situ chemical oxidation
ISSH	in-situ soil heating
LADD	lifetime average daily dose
LADWP	Los Angeles Department of Water and Power

LBF	Lower Bellflower Aquitard
LNAPL	light nonaqueous phase liquid
MBFB	Middle Bellflower B Sand
MBFC	Middle Bellflower C Sand
MBFM	Middle Bellflower Mud
MCL	maximum contaminant level
NAPL	nonaqueous phase liquid
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDPA	n-nitrosodiphenylamine
NPL	National Priorities List
O&M	operations and maintenance
ODCs	other direct costs
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
pCBSA	parachlorobenzene sulfonic acid
PCE	tetrachloroethene
PHA	Public Health Assessment
PID	photoionization detector
PRG	preliminary remediation goal
PRP	potentially responsible party
RAGS	Risk Assessment Guidance for Superfund
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RfD	reference dose
RI	remedial investigation
RME	reasonable maximum exposure
ROD	Record of Decision
ROST	Rapid Optical Screening Tool
RSL	Regional Screening Levels
SA	source area
SESR	Screening Evaluation Summary Report
sf	square feet
SVE	soil vapor extraction
SVOC	semivolatile organic compound
TCE	trichloroethene
TI	Technical Impracticability
TPH	total petroleum hydrocarbon(s)
TMV	toxicity, mobility and volume
TRV	toxicity reference value
UBF	Upper Bellflower Aquitard
U.S.	United States

UVOST	Ultraviolet Optical Screening Tool
VETS	vapor extraction and treatment system
VOC	volatile organic compound
ZIMAS	Zoning Information and Map Access System

PART I DECLARATION

1.0 Site Name and Location

Del Amo Facility Superfund Site
EPA #CAD029544731
Operable Unit 1 – "Soil and NAPL"
Los Angeles, CA

The Site is located within the Harbor Gateway portion of the City of Los Angeles, at the southwest corner of the intersection of the 405 and 110 freeways, adjacent to the cities of Torrance to the west and Carson to the east.

2.0 Statement of Basis and Purpose

This decision document presents the Selected Remedy for the Del Amo Facility Superfund Site Operable Unit 1 in Los Angeles, California, which was chosen in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the NCP. This decision is based on the Administrative Record file for this site.

The State of California concurs with the Selected Remedy.

3.0 Assessment of the Site

The response actions selected in this Record of Decision are necessary to protect the public health or welfare or the environment from actual releases of hazardous substances, pollutants and contaminants into the environment which may present an imminent and substantial endangerment to public health or welfare.

4.0 Description of the Selected Remedy

The Selected Remedy addresses Operable Unit 1, "Soils and NAPL," and is the third Operable Unit ROD for the Site. The overall Site cleanup strategy involved addressing the Waste Pits (Operable Unit 2) first, due to the imminent hazard it posed to neighboring residences. Next, EPA addressed the Dual-Site Groundwater (Operable Unit 3), due to its potential for migration. Operable Unit 3 is known as the "dual-site" operable unit because it addresses the groundwater, which has co-mingled contamination from the Del Amo Site and the neighboring Montrose Superfund Site. The Waste Pits OU ROD was signed in 1997, and the Dual-Site Groundwater OU ROD was signed in 1999. The Soils and NAPL contamination (Operable Unit 1) was not found to cause a short-term risk with the Site in its current configuration and thus is being addressed after the other two Operable Units.

The Selected Remedy addresses source materials (NAPL and vadose soil contamination) constituting principal threats by reducing their mass to the extent practicable given the constraints of the selected technology and the current land-use (i.e., land currently being utilized by active business operations).

The major components of the Selected Remedy are:

(a) **Institutional Controls, including:**

(1) Informational Outreach

(2) Permit Review Institutional Control in all areas, to be implemented cooperatively by the City of Los Angeles Planning Department and Building and Safety Department, EPA, California Department of Toxic Substances Control (DTSC), and potentially responsible parties (PRPs);

(3) City of Los Angeles General Plan footnote Institutional Control in 26 areas;

(4) Restrictive Covenant Institutional Control in 26 areas (26 separate land parcels), to be implemented by EPA, DTSC, PRPs, and the property owners;

(b) **Capping shallow soil in 4 areas.** The performance standard for capping is to contain non-VOC and VOC contaminated shallow soil where the concentrations in soil would pose a cancer risk exceeding 1E-6 or a non-cancer hazard index exceeding 1.0 if exposure were to occur to property occupants in a commercial-use setting.

(c) **Building Engineering Controls in one building.** The performance standard for building engineering controls is to prevent unacceptable indoor air exposures of Site-related VOC contaminants to building occupants by reducing the indoor air concentrations of target VOC constituents to commercial RSL/CHHSL criteria, or to background.

(d) **Soil Vapor Extraction in shallow outdoor soil in 3 areas and beneath one building.** The performance standard is the same for both the shallow outdoor soil and the shallow soil beneath the building, for the known VOC constituents that exceed action levels. The performance standard is to clean the soils to the level where the concentrations in soil would not pose a cancer risk exceeding 1E-6 or a non-cancer hazard index of 1.0 if exposure were to occur to property occupants in a commercial-use setting.

(e) **Soil Vapor Extraction in deep soil in 4 areas and In-Situ Chemical Oxidation in the saturated zone in 3 areas.** The performance standard for both ISCO and SVE in deep soil is contaminant mass removal to the extent practicable with the ISCO and SVE technologies, to the point of diminishing returns (i.e., until there is relatively little change in site conditions with continued vapor extraction or oxidant application).

(f) **Excavation,** for any areas of site-related contamination exceeding action levels encountered in the future during development or construction. If excavation is not implementable, the remedy will be Soil Vapor Extraction for VOCs, or capping for non-VOC, with implementation of a Restrictive Covenant Institutional Control (if not one already).

5.0 Statutory Determinations

5.1 Statutory Requirements

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

5.2 Statutory Preference for Treatment

This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment).

5.3 Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

6.0 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this Record of Decision. Additional information can be found in the Administrative Record file for this site.

(a) Chemicals of concern and their respective concentrations. (Table 5-1, p.44; Table 7-1, pp.56-59)

(b) Baseline risk represented by the chemicals of concern. (Table 7-1, pp. 56-59)

(c) Cleanup levels established for chemicals of concern and the basis for these levels. (Section 12.4.2, pp.136-141)

(d) How source materials constituting principal threats are addressed. (Section 11.3, p.102)

(e) Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD. (Section 6.0, p.51, and Section 12.4.1, p.136)

(f) Potential land and ground-water use that will be available at the site as a result of the Selected Remedy. (Section 12.4.1, p.136)

(g) Estimated capital, O&M, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected. (Table 12-5, p.118)

(h) Key factors that led to selecting the remedy. (Section 12.1, pp.103-108)

7.0 Authorizing Signature

[signature] — September 30, 2011

Michael M. Montgomery, Assistant Director — DATE
Superfund Division

PART II DECISION SUMMARY

1.0 Site Name, Location, Description

The Del Amo Facility Superfund Site (Del Amo Site; EPA #CAD029544731) is located in the Harbor Gateway area of Los Angeles, at the southwest corner of the intersection of the 405 and 110 freeways, adjacent to the cities of Torrance to the west and Carson to the east.

The Del Amo Site is the former location of a 280-acre synthetic rubber manufacturing plant, constructed in 1942 to produce rubber for World War II. The former plant operated from 1942 through 1972, after which the plant was sold, decommissioned, and redeveloped into the current business park. The former plant used benzene, ethylbenzene, propane, butylene, butane, styrene, and 1,3-butadeine (and lesser amounts of other chemicals) to create synthetic rubber. During its operations, chemicals were released into soil and groundwater beneath the plant. Some of the plant's releases were leaks from pipelines, storage tanks, and processing units. Plant operators also disposed of waste in unlined pits and ponds. These chemical releases contaminated soil and groundwater beneath the former rubber plant facilities.

The Del Amo Site is currently redeveloped and is primarily used for warehousing, manufacturing, and office space.

The United States Environmental Protection Agency (EPA) is the lead agency and the California Department of Toxic Substances Control (DTSC) is the support agency.

The site comprises three operable units (OU): OU-1 – Soil and nonaqueous phase liquid (NAPL), OU-2 – Waste Pits Area, and OU-3 – Dual Site Groundwater. This Record of Decision (ROD) addresses the Soil and NAPL OU (OU-1).

2.0 Site History and Enforcement Actions

2.1 Owners and Operators

The Del Amo Site was originally established in the 1940s for construction of a chemical plant to produce synthetic rubber to support defense efforts during World War II.

Initially the plant was owned by subsidiaries of the United States (U.S.) government and operated by private companies under lease, until it was purchased by Shell Chemical Company (“Shell”) in 1955. Shell operated the plant until 1972 when it was sold to a land developer and the facility was dismantled; the property was sold off in parcels to other private owners and developers.

The 280-acre former plant site currently consists of 82 parcels and is almost completely redeveloped with industrial and commercial facilities used primarily for warehouse storage/shipping, manufacturing, and office space.

2.2 Plant Operations and Releases

Operations

The synthetic rubber plant consisted of three interrelated plancors: the butadiene and styrene plancors, where the primary chemical components were produced, and the copolymer plancor, where the butadiene and styrene were polymerized to produce synthetic rubber. See Figure 2-1. The styrene plancor was located in the southwestern portion of the plant. Its primary chemical feedstocks were benzene and propane. The propane was cracked to produce ethylene, which was then reacted with the benzene to produce ethylbenzene. The ethylbenzene was then converted to styrene through a dehydrogenation process.

The butadiene plancor was located in the southeastern portion of the plant. Butadiene production feedstocks included a gas mixture of butane, butylene, and butadiene that was received via pipeline and tanker truck. Butadiene was separated from the feedstock through distillation and purification steps, and additional butadiene production was achieved through catalytic dehydrogenation of butylene gases. The butadiene product was stored in large aboveground spherical tanks on the plancor.

The copolymer plancor was located in the northwestern portion of the plant. Rubber was produced at the plancor in three parallel production lines, where styrene and butadiene were combined (polymerized) in reactor vessels. Carbon black was used to stain the rubber and increase its durability. The final product was stored in packaged bales on pallets pending off-site shipment.

Raw materials for the rubber plant were received via surface transport (truck and rail) and pipelines, and were stored along with produced chemicals in aboveground tanks within each of the three plancors. Wastewater was treated by primary treatment systems within each plancor and by a common secondary neutralization and treatment system in the butadiene plancor prior to discharge to the sanitary sewer or the Dominguez Channel. Waste disposal pits in the southern portion of the styrene plancor (Waste Pits Area) were also used during a portion of the rubber plant’s operational period. The Waste Pits Area included four evaporation ponds for aqueous waste streams and six waste pits for viscous process wastes from the styrene plancor.

Areas with Releases

Plant site investigations focused on former locations where volatile organic compounds (VOC) and polycyclic aromatic hydrocarbons (PAH) were known to have been stored, transported, or used, as determined from facility records, maps, and photographs. Releases of hazardous substances into the environment occurred throughout the plant site to varying degrees. Areas of significant releases are shown in Figure 2-2 and are listed in Table 2-1 and described in more detail below.

TABLE 2-1: Significant Release Areas

Plancor	Former Plant Area	Current Parcel Number
Styrene Plancor	Tank Farm	7351-034-015
		7351-034-050
		7351-034-056
		7351-034-057
	Styrene and Ethylbenzene Production Facilities	7351-034-069
		Magellan Drive
Butadeine Plancor	Laboratory	7351-033-034
		7351-033-017
		Hamilton Avenue
	Benzene Pipeline	7351-033-022
		7351-033-027
		7351-033-900
Copolymer Plancor	Rubber Production Facility	7351-031-020
	Pits and Trenches	7351-034-015

- **Tank farm area**, former styrene plancor (western end). VOC feedstock solutions including benzene, toluene, ethylbenzene, and styrene were stored in large aboveground tanks in this area.
- **Styrene and ethylbenzene production facilities area**, former styrene plancor (middle). Styrene production and propane cracking, styrene finishing, ethylbenzene production, benzene purification, and associated facilities were located in this area. Historical documents indicate that in addition to the chemicals listed above, the following were also used in the production of styrene and ethylbenzene, although the location of their storage facilities is unknown: hydrochloric acid, sulfuric acid, ethylchloride, aluminum chloride, iron-oxide catalyst, and tertiary butyl catechol. Byproducts of the styrene finishing process may have included heavy oils, tar, and coke. These wastes were disposed of in the Waste Pits Area or recycled and used as boiler fuel.
- **Laboratory area**, former butadiene plancor (southeast area). The former plant laboratory in this area appears to be the nearest facility to the source of a significant release in this area. Benzene, toluene, ethylbenzene, and styrene were used at the laboratory. Xylenes have been detected in association with benzene and other plant-related VOCs, in the vicinity of this laboratory. Due to their chemical similarity, xylenes may also have been present as impurities within benzene and/or ethylbenzene supplies. Based on these physical and chemical associations, xylenes are included as site-related chemicals of concern (COC).
- **Benzene pipeline area**, former butadiene plancor (southern end, middle). Benzene was transported across the southern portion of the butadiene plancor in an underground pipeline. Leaks from this pipeline caused the contamination found in this area.
- **Rubber production facility area**, former copolymer plancor (northeast area). Areas with elevated concentrations of PAHs are located in the vicinity of the copolymer plancor laboratory and machine shop.

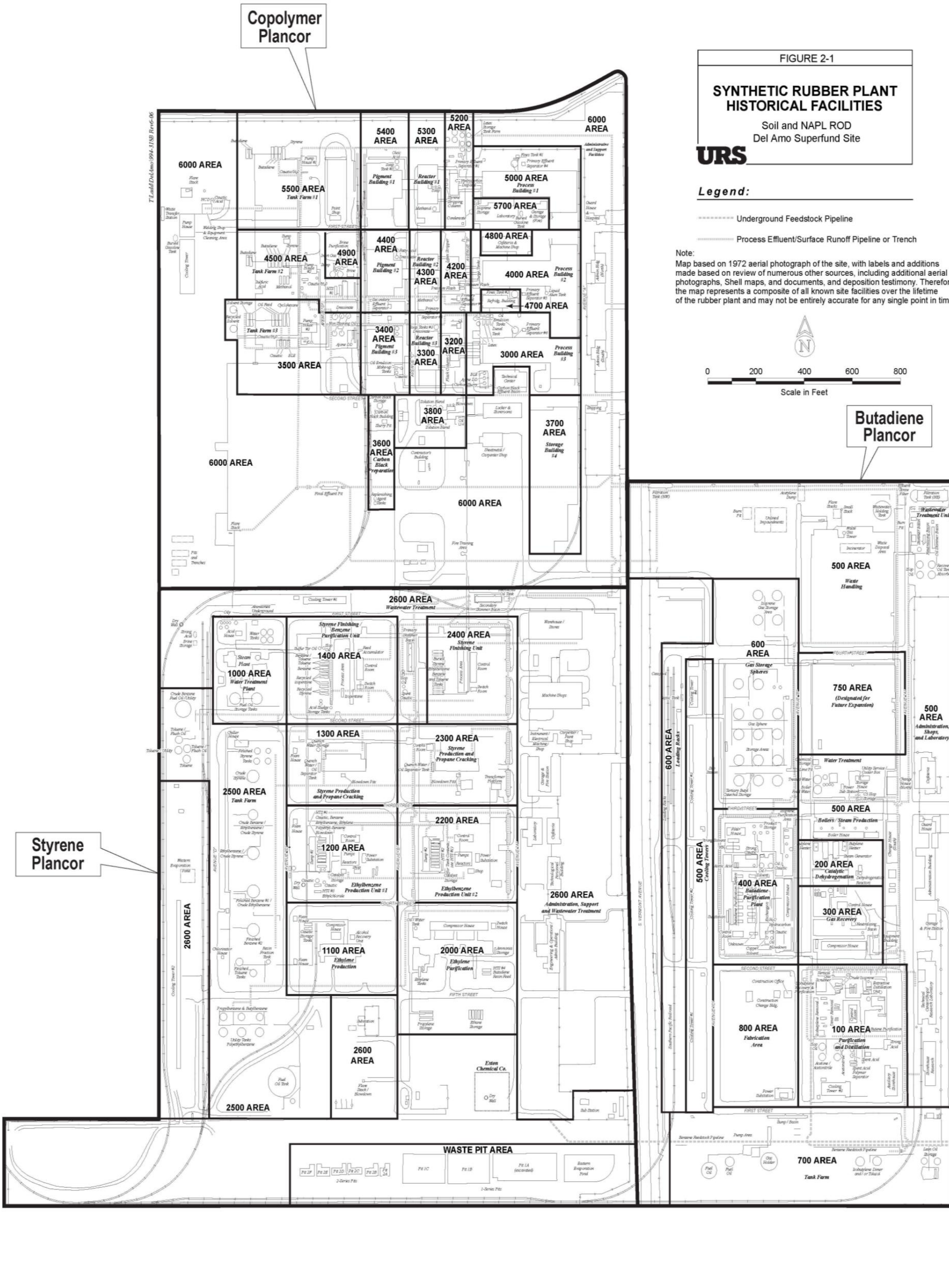
FIGURE 2-1
SYNTHETIC RUBBER PLANT HISTORICAL FACILITIES
Soil and NAPL ROD
Del Amo Superfund Site
URS
Legend:
Underground Feedstock Pipeline
Process Effluent/Surface Runoff Pipeline or Trench
Note:
Map based on 1972 aerial photograph of the site, with labels and additions made based on review of numerous other sources, including additional aerial photographs, Shell maps, and documents, and deposition testimony. Therefore, the map represents a composite of all known site facilities over the lifetime of the rubber plant and may not be entirely accurate for any single point in time.
0 200 400 600 800
Scale in Feet
Copolymer Plancor
Butadiene Plancor
Styrene Plancor
6000 AREA
5500 AREA
5400 AREA
5300 AREA
5200 AREA
5000 AREA
5700 AREA
4800 AREA
4500 AREA
4900 AREA
4400 AREA
4300 AREA
4200 AREA
4000 AREA
4700 AREA
3500 AREA
3400 AREA
3300 AREA
3200 AREA
3000 AREA
3800 AREA
3700 AREA
3600 AREA
2600 AREA
2400 AREA
1400 AREA
1000 AREA
1300 AREA
2300 AREA
2500 AREA
1200 AREA
2200 AREA
1100 AREA
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750 AREA
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300 AREA
800 AREA
100 AREA
700 AREA

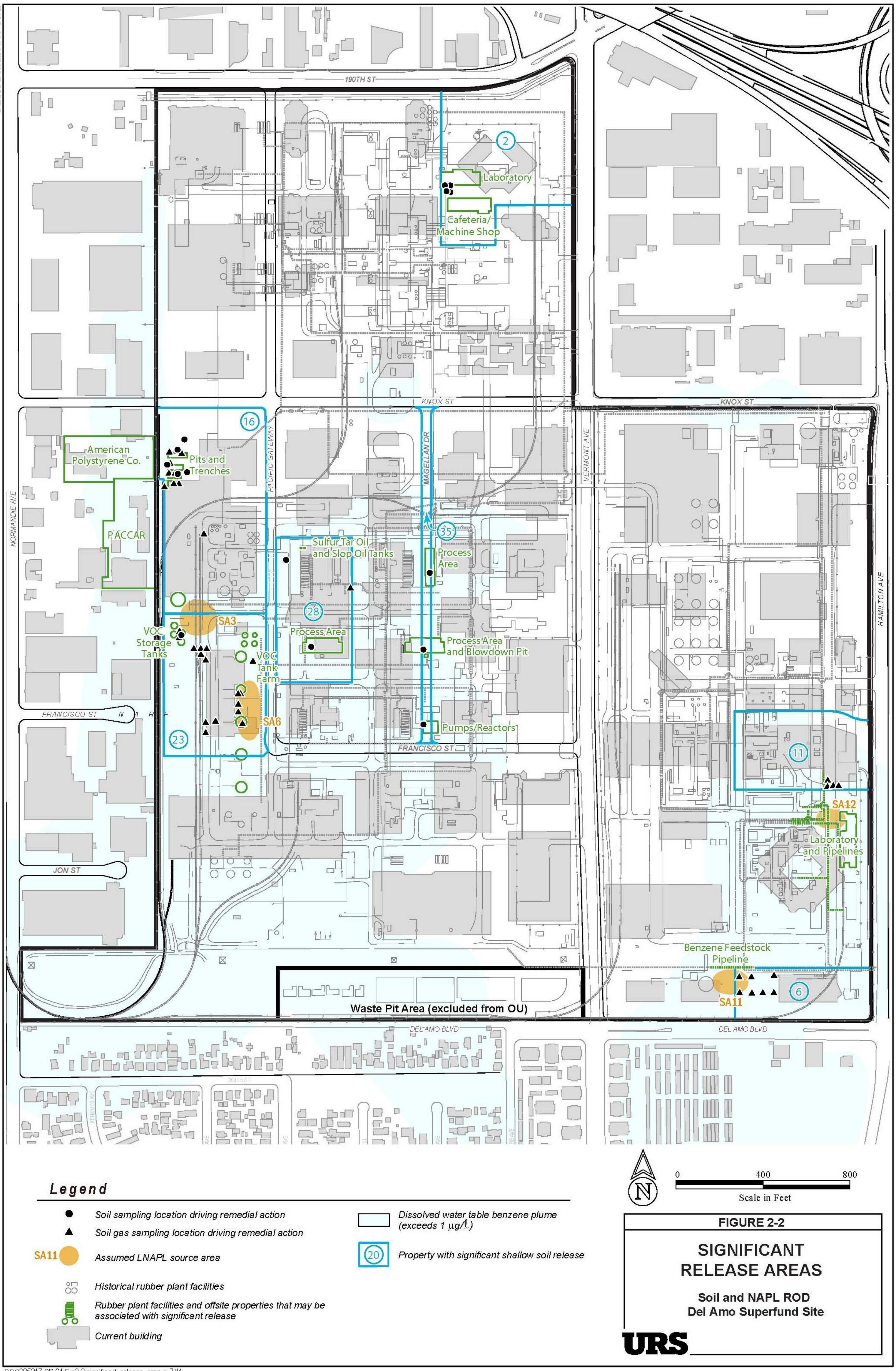


FIGURE 2-2

SIGNIFICANT RELEASE AREAS

Soil and NAPL ROD
Del Amo Superfund Site

- **Pits and trenches area**, former copolymer plancor (southwest corner). The area of elevated n-nitrosodiphenylamine (NDPA) and dichlorodiphenyltrichloroethane (DDT) concentrations is limited to the southwestern corner of the former copolymer plancor. Analysis of historical aerial photographs indicated that there appeared to be a series of excavations resembling pits and trenches in this area. NDPA is known to be used in rubber production. DDT is not known to be associated with rubber production or any rubber plant facilities. This area partially overlaps with a stained area that is apparent on historical aerial photographs taken during the operational period.

2.3 Regulatory Agency Involvement

Regulatory agency involvement at the former plant site began in 1982, when a portion of the Waste Pits Area was excavated under the direction of the State of California, Department of Health Services (DHS; predecessor to the Department of Toxic Substances Control).

National Priorities List

In July 1991, EPA proposed the Del Amo Site be added to the National Priorities List (NPL). Shortly thereafter, DHS transferred primary regulatory responsibility for the site to EPA. In June 1996, EPA re-proposed the Del Amo Site with updated technical information after having completed the first phase of the RI. The site was added to the NPL on September 25, 1997. EPA was subsequently sued by the Harbor Gateway Commercial Property Owners' Association to have the site removed from the NPL on the grounds that EPA did not obtain the required written authorization from the governor, among other things. The court ruled in favor of the plaintiff on February 19, 1999, ruling that the listing was invalid because EPA did not obtain the written authorization from the governor. EPA then proceeded to re-propose the site to the NPL and eventually listed it on the NPL once again on September 7, 2002.

Administrative Order on Consent for Investigations and Studies

On May 7, 1992, EPA and DHS entered into an Administrative Order on Consent (AOC; EPA Docket No. 92-13) with Shell and Dow Chemical Company ("Dow"), to perform a remedial investigation/feasibility study (RI/FS) for the entire 280-acre former plant site and an accelerated RI/FS for the Waste Pits Area. The investigation activities started as a site-wide effort.

The RI was conducted in two phases. Phase 1 occurred between 1992 and 1995. In 1995, EPA divided the site into three OUs. The three OUs created were: OU-1 – Soil and NAPL, OU-2 – Waste Pits Area, and OU-3 – Dual Site Groundwater. Phase 2 for the Soil and NAPL OU occurred from 1995 to 2004. Investigatory activities were concluded and the final RI report was approved on July 2, 2007 (URS, 2007). Post-RI supplemental investigations were conducted in 2009 and 2010. The approach used in the investigation is discussed in Section 2.4 and the results of the investigation are described in Section 5.0.

The Risk Assessment for the Soil and NAPL OU was started in 1999, when it was believed that sufficient investigatory data were available to successfully prepare the assessment. After the available data were analyzed, however, EPA and DTSC concluded that additional field investigations were needed to successfully prepare the risk assessment. The additional sampling was conducted in 2003 and 2004, and was incorporated into the risk assessment. The risk assessment was completed in 2006.

Feasibility Study activities were initiated in 2003 and concluded in 2010.

During EPA's preparation of the Proposed Plan for the Soil and NAPL OU, two additional field investigatory efforts were undertaken to address uncertainties that were identified during Proposed Plan preparation. The first investigatory effort, a sub-slab sampling effort targeting five buildings, was conducted in February 2009. The second effort, an investigation of the extent of NAPL in four areas, was conducted from July 2009 to May 2010. The findings from these two final investigatory efforts were incorporated into the Administrative Record for the Proposed Plan, issued in June 2010.

History Related to Dual Site Groundwater OU (OU-3)

The investigation of the neighboring Montrose Chemical Superfund Site (Montrose) identified extensive Del Amo Site-related groundwater contamination. In late 1995, the Del Amo Site groundwater investigation determined that the groundwater contamination from the Montrose and Del Amo sites was co-mingled and that a single FS was needed to address groundwater for the two sites. The Groundwater RI report was completed for the Del Amo Site in 1998. EPA issued the Proposed Plan for the Dual Site Groundwater OU (EPA, 1999a) in June 1998. The ROD for the Dual site Groundwater OU (EPA, 1999b), issued in March 1999, includes a technically impracticability waiver, pumping and treatment the chlorobenzene plume associated with the Montrose Site to achieve maximum contaminant level (MCL) limits, and monitored natural attenuation for the benzene plume associated with the Del Amo Site. The ROD deferred the decision regarding NAPL remediation to the Soil and NAPL OU for the Del Amo Site and for dense non-aqueous phase liquid (DNAPL) at the Montrose Site.

PRPs for both sites have been performing the remedial design (RD) for OU-3 pursuant to Unilateral Administrative Orders issued by EPA. EPA has issued special notice to several potentially responsible parties to conduct the remedial action.

2.4 Institutional Controls Pilot Program

The Del Amo Site has already been redeveloped for commercial uses. Most of the redevelopment occurred prior to initiation of the Superfund RI. Commercial activities including construction projects occur regularly. Consequently, it became clear during the FS process that institutional controls (ICs) would likely play a key role in the remedy selected for the site. In 2007, EPA initiated a pilot program of an IC known as the “Building Permit Review” IC. The objective of this pilot program was to involve the Superfund team (EPA, DTSC, and the AOC Respondents) in the City of Los Angeles’ (the City) existing building permit process to work with permit applicants prior to initiation of any construction projects. The pilot nature of this program enabled EPA to immediately implement a system of interacting with the City departments and permit applicants, evaluate and adjust protocols, and utilize the experience when evaluating the implementability of this IC in the FS.

In addition to referrals from the City’s building permit department, the AOC Respondents contracted the services of a “land-watch” company called Terradex. Terradex “watches” the Del Amo Site parcels for permit activity or Underground Service Alert information and passes along any relevant information to the AOC Respondents.

Remedial Actions/Environmental Reviews.

Remedial actions and/or environmental reviews associated with development activities have occurred on multiple site properties during the course of site investigations. Some of these projects occurred prior to formal implementation of the building permit review IC pilot program but nonetheless, were completed under an environmental review process overseen by EPA. EPA environmental reviews / remedial actions have been completed at the following properties:

Assessor’s Parcel Number	Address
7351-031-031	1000 W. 190th Street
7351-034-069	19780 Pacific Gateway
7351-034-058	1000 Francisco Street
7351-033-017	20101 Hamilton Avenue

7351-031-027, -028, -029 970 and 990 W. 190th Street
7351-034-052 1011 Francisco Street

The nature of the development projects and the scope of the environmental reviews and remedial actions are summarized in Table 2-2.

TABLE 2-2: Summary of Response Actions During Development Activities

APN	Year	Project Description	Characterization	Remedial Action Completed
7351-031-031	1997-2000	Construction of new building on previously vacant parcel	Test pits and soil sampling by owner; analyses for total petroleum hydrocarbons (TPH), VOCs, semivolatile organic compounds (SVOCs), metals, polychlorinated biphenyl (PCBs)	Excavation, transportation and disposal of VOC and PCB-impacted soil by owner prior to regrading of property and construction of new building
7351-034-069	2005-06	Excavation/ Construction of loading dock	Soil sampling by Respondents; analyses for VOCs, mercaptans.	Excavation, transportation, and disposal of odiferous soil by Respondents. Analytical testing did not indicate elevated levels of any VOCs or mercaptans. Excavation backfilled with clean soil prior to continuation of construction.
7351-034-058	2005-06	Expansion of existing building and excavation/ construction of loading dock	Soil sampling by owners and Respondents; analyses for VOCs	Excavation, transportation and disposal of odiferous and VOC-impacted soil by Respondents; backfill with clean soil prior to construction
7351-033-017	2008	Construction/ installation of freight elevator and utility trenches	Soil and soil vapor sampling by Respondents; analyses for TPH, VOCs, SVOCs, and metals	None; soil not impacted.
7351-031-027, -028, -029	2010	Installation of subsurface communication cable	Trench excavation completed by tenant (Herbal Life); soil testing by Respondents; analysis for TPH and VOCs	Soil not impacted but transportation and disposal by Respondents
7351-034-052	2010	Tenant (Toyota) removed hydraulic lifts upon end of lease	Soil sampling by tenant and owner; analyses for TPH and VOCs	Excavation of TPH-impacted soil by tenant; transportation and disposal by Respondents

3.0 Highlights of Community Participation

The community in the vicinity of the Del Amo Site has been engaged with the Del Amo and Montrose Superfund Sites for many years. As early as 1986, when DHS was conducting early site investigations at the Del Amo Waste Pits, and 1984, when EPA was involved in the neighboring Montrose Site, the public has been informed through newsletters, public meetings, and information repositories. During the period 1983 to 1993, community interest in these sites was modest. However, in 1993, community interest greatly increased as EPA conducted sampling activities and discovered contamination in residential yards along 204th Street, immediately adjacent to the Del Amo Waste Pits. At that time, a community group, the Del Amo Action Committee, was formed and became actively involved in the Superfund activities. Other groups and individuals with other interests and positions also existed in the community near the Montrose and Del Amo sites and became actively engaged in the process. This section discusses community involvement activities related to Operable Unit 1 “Soil and NAPL.”

3.1 Soil and NAPL Operable Unit

Activities for the Soil and NAPL OU occurred throughout EPA’s involvement at the Del Amo Site. Early fact sheets and public meetings regarding the Waste Pits Area and 204th Street activities informed the public of investigation activities for the Soil and NAPL OU.

As the Soil and NAPL OU investigation and risk assessment were completed and the FS was underway, EPA focused outreach activities on OU-1. To inform the property owners within the business park, EPA met with owners’ representatives in a series of small group and individual meetings regarding an institutional control (IC) pilot program. EPA prepared and distributed a fact sheet to the owners regarding the pilot program.

In July 1998, EPA held a public meeting to describe the contamination and preview possible remedial action alternatives. In fall 2009, EPA met with owners, property managers, elected officials’ representatives (City Councilwoman and 2 Congresswomen), and local community groups (Neighborhood Council and Del Amo Action Committee) to familiarize them with EPA’s findings and discuss forthcoming cleanup plans.

In June 2010, EPA issued the Proposed Plan for the Soil and NAPL OU (EPA, 2010), placed the administrative record in the two information repositories, and initiated a 60-day comment period. On June 30, 2011, EPA held a public meeting to present the Proposed Plan and obtain public comments. Comments received during the public meeting and during the remainder of the comment period, which ended August 16, 2010, are included along with EPA’s response in the Responsiveness Summary section of this ROD.

3.2 Community Relations Plan

A community relations plan issued in July 1985 for the neighboring Montrose Site (EPA DCN 0639-00482) was used during the early years of EPA’s involvement for the Del Amo Site. EPA issued an updated community relations plan that covered both sites in November 1996 (EPA DCN 0639-02277). On May 21, 2010, EPA updated the community relations plan (now known as a “Community Involvement Plan”) and posted it on EPA’s website. This plan is currently being reviewed by the community and will undergo further updates.

3.3 Information Repositories

EPA has maintained information repositories at the Torrance and Carson public libraries with hard copies and electronic copies of select documents related to the investigation and response actions for the Montrose Site and the Del Amo Site. In addition to the administrative record for OU-1, the repositories also contain the administrative record for the Waste Pits Operable Unit ROD and the Groundwater ROD.

4.0 Scope and Role of Operable Unit

EPA divided the site into three operable units when it became involved in 1992: (OU-1) Soil and NAPL, (OU-2) Waste Pits Area, and (OU-3) Dual Site Groundwater.

- (OU-1) Soil and NAPL – includes all soil outside the Waste Pits Area, including chemicals in NAPL form
- (OU-2) Waste Pits Area – includes the waste deposited in the waste pits as well as the surrounding impacted soil
- (OU-3) Dual-Site Groundwater – includes the groundwater contaminated by the Del Amo Site co-mingled with the contamination from the nearby Montrose Site and contamination from other neighboring facilities

Past and current actions organized in chronological order by OU are presented here. Actions selected by this ROD are described thereafter including how OU-1 fits into the overall site strategy.

4.1 OU-1: Soil and NAPL

- 1996-1997: Removed NAPL accumulated in groundwater monitoring well MW-3, located near the western edge of the former plant property in the area now designated as SA-3 [OU-1].
- 1999: Oversaw removal of contaminated soil by an owner during redevelopment activities of a property in the northwest corner of the former plant property, now designated as “Area 3” [OU-1].
- 2005-2006: Removed contaminated soil to facilitate renovation activities on properties in the western and southern areas, designated Area 24 and Area 28 [OU-1].
- 2008: Instituted a Building Permit Review IC as a pilot program with the City of Los Angeles Department of City Planning and Department of Building and Safety, to review construction plans involving excavation on any property within the former plant property [OU-1].
- 2010: Oversaw removal of contaminated soil by an owner during tenant changeover at a property in the southwestern area of the former plant property, designated as Area 22 [OU-1].

This ROD addresses soil outside the OU-2 Waste Pits Area, and includes capping select areas, implementation of soil vapor extraction (SVE) in shallow soil in select areas, implementation of institutional controls, implementation of SVE in the deep soil in select areas, and implementation of in-situ chemical oxidation (ISCO) in select areas. This ROD also addresses any additional site-related contamination that is encountered in the future during redevelopment or construction activities.

After this ROD, one additional remedy decision is anticipated. Two parcels of land, Areas 29 and 34, are not addressed in this ROD. These areas will be addressed in a ROD, ROD Amendment or Explanation of Significant Differences.

4.2 OU-2: Waste Pits Area

- 1994-1999: Removed sludge material that periodically seeped up out of the waste pits [OU-2].
- 1999: Constructed a Resource Conservation and Recovery Act (RCRA)-equivalent cap over the sludge and contaminated sediments/pond bottoms in the Waste Pits Area, including a vapor capture layer and off-gas treatment system, impermeable layers, and rainfall capture and

conveyance system. Along with the cap installation, installed SVE wells and associated soil vapor monitoring wells [OU-2].

- 2000 and 2005: Instituted restrictive covenants on the two parcels that constitute the Waste Pits Area [OU-2].
- 2006: Constructed the SVE extraction and treatment system at the Waste Pits Area [OU-2].

4.3 OU-3: Dual Site Groundwater

- Currently underway: design of the dual-site groundwater extraction, treatment and reinjection system [OU-3].
- Currently underway: design of the dual-site groundwater monitored natural attenuation system [OU-3].

The Soil and NAPL OU (OU-1) is related to the Dual Site Groundwater OU (OU-3) because the deep soil contamination, especially in NAPL form, is the source of contamination to the groundwater. The Groundwater ROD waived requirements to clean up groundwater to drinking water standards within a certain zone as shown in Figure 4-1. It was determined that it was technically impracticable to attain such standards due to the presence of the NAPL contamination and the state of cleanup technologies at the time. However, the Groundwater ROD specified that it was only making the first of two remedy decisions for groundwater, and that the second decision would address the NAPL remediation. This Soil and NAPL ROD will amend the previous decision made in the Groundwater ROD to add NAPL treatment, consisting of deep soil SVE and In-Situ Chemical Oxidation. In addition, this ROD selects restrictive covenants to address groundwater use. The lingering mass of NAPL, and its potential for migration, makes the long-term effectiveness of the OU-3 remedy less certain. To improve the certainty and long-term effectiveness of the OU-3 remedy, the OU-1 remedy includes NAPL treatment. However, this Soil and NAPL ROD does not modify the ARARs determinations or waiver set forth in the OU-3 ROD and does not otherwise change the remedial requirements selected for the technical impracticability zone or the downgradient groundwater plume.

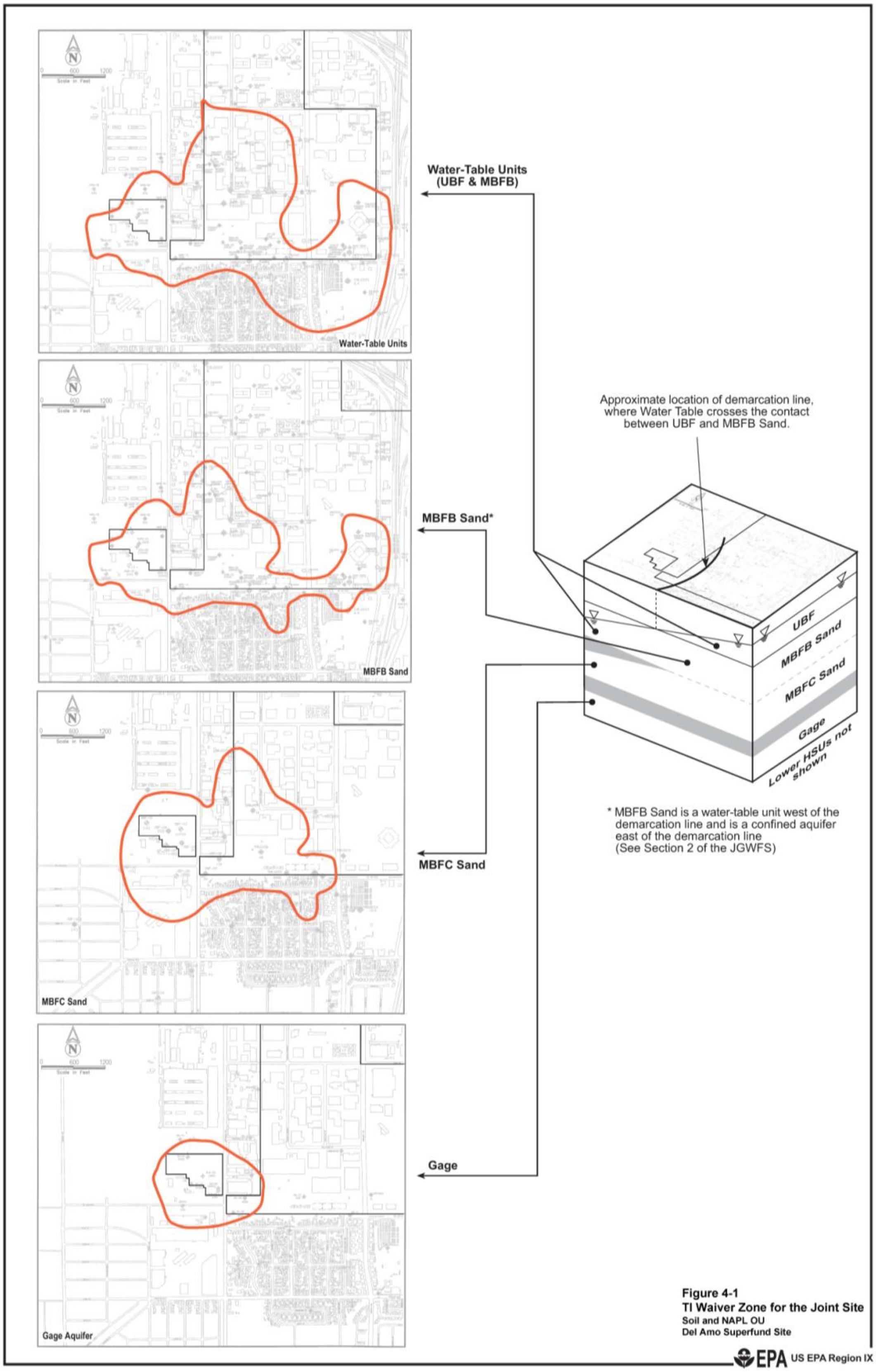


Figure 4-1
TI Waiver Zone for the Joint Site
Soil and NAPL OU
Del Amo Superfund Site

5.0 Site Characteristics

5.1 Conceptual Site Model

The Conceptual Site Model (CSM) identifies potential chemical sources, release mechanisms, impacted media, transport mechanisms, exposure routes, and potential receptors. The CSM for the Del Amo Site is presented as a flow chart on Figure 5-1 and graphically on Figure 5-2 and Figures 5-3 through 5-6. The following paragraphs explain the CSM.

Potential Chemical Sources

The primary sources of chemicals of potential concern (COPCs) are former aboveground storage tanks, processing units, and other facilities at the former plant site, which are discussed in more detail in Section 2.2 and shown on Figure 2-1, 5-3 and 5-4, and consist of (1) aboveground storage tanks from the tank farm area of the former styrene plancor, (2) styrene and ethylbenzene production facilities within the former styrene plancor, (3) laboratory area of the former butadiene plancor, (4) benzene pipeline area of the former butadiene plancor, (5) rubber production area of the former copolymer plancor, and (6) pits and trenches area of the former copolymer plancor.

Release Mechanisms

The releases from the facilities listed above are likely to have occurred from leaks and spills from storage tanks (tank farm area of styrene plancor, storage tanks in styrene/ethylbenzene production area), chemical processing units (styrene/ethylbenzene production area), and pipelines (benzene pipeline area of butadiene plancor, and possibly other areas). The site historical investigation identified pits in two of the contamination areas, including “blow down pits” in the styrene/ethylbenzene production area and pits and trenches in the copolymer plancor that could have been used for disposal. Storage buildings (styrene/ethylbenzene production area), laboratories (butadiene plancor and copolymer plancor), and a machine shop (copolymer plancor) were located in areas with actionable levels of contamination; release mechanisms associated with these facilities conceivably could have been leaks, spills, or some manner of direct disposal.

Impacted Media

Releases from the above sources impacted underlying soil and groundwater media. For the purposes of the CSM, NAPL is considered to be part of these media.

Transport Mechanisms

Contamination from the impacted media is transported either into the groundwater (in the case of the deep soil contamination) or upward to surface receptors. The deep soil contamination, consisting of VOCs, is transported into the groundwater via either direct dissolution (where contamination exists in the saturated zone) or vapor diffusion (where contamination exists in the vadose zone). VOCs in either the shallow soil, deep soil, free phase or dissolved in the groundwater can be transported via diffusion to the surface into the breathing space of surface receptors. PAHs, pesticides/PCBs, and metals in the shallow soil are transported via fugitive dust emissions into the breathing space of potential receptors or through direct contact with soil.

Exposure Routes

The “exposure route” refers to the method by which a chemical may enter the human body. Receptors can be exposed through inhalation of soil particulates or vapor, ingestion of soil particulates or water, and dermal contact with soil or water. Soil particulates and vapors transported into the breathing space can expose potential receptors through the inhalation route. Contaminants adsorbed onto soil that is inhaled by a receptor can also be ingested as the dust is caught in the mucus membranes and then swallowed. Contaminants dissolved in water can be swallowed. Contaminants adsorbed onto soil could contact and be absorbed into a receptor's bare skin. Similarly, such contaminants that directly contact the receptor's skin can also enter the receptor's mouth and be ingested when the receptor touches his hands to his mouth. Contaminants dissolved in water can also be absorbed into a receptor's bare skin.

Potential Receptors

Receptors are humans, animals, or plants that are potentially exposed to the chemicals. Human receptors are the primary focus of the Baseline Risk Assessment (BRA). Biota are evaluated in an ecological risk assessment. For the purposes of the BRA, human receptors for the former plant site were divided into three types: (1) commercial workers, which includes most of the current indoor work force for the existing businesses; (2) trench workers, who would be exposed to subsurface soil; and (3) hypothetical future residents, who would potentially be present at the former plant site on a nearly continuous basis. There are currently no residents at the former plant site, and current zoning is restricted to commercial/industrial land use, but future residential risk is evaluated as a baseline and because land uses can change over time in a mixed use area such as surrounds the Del Amo Site.

Exposure Pathways

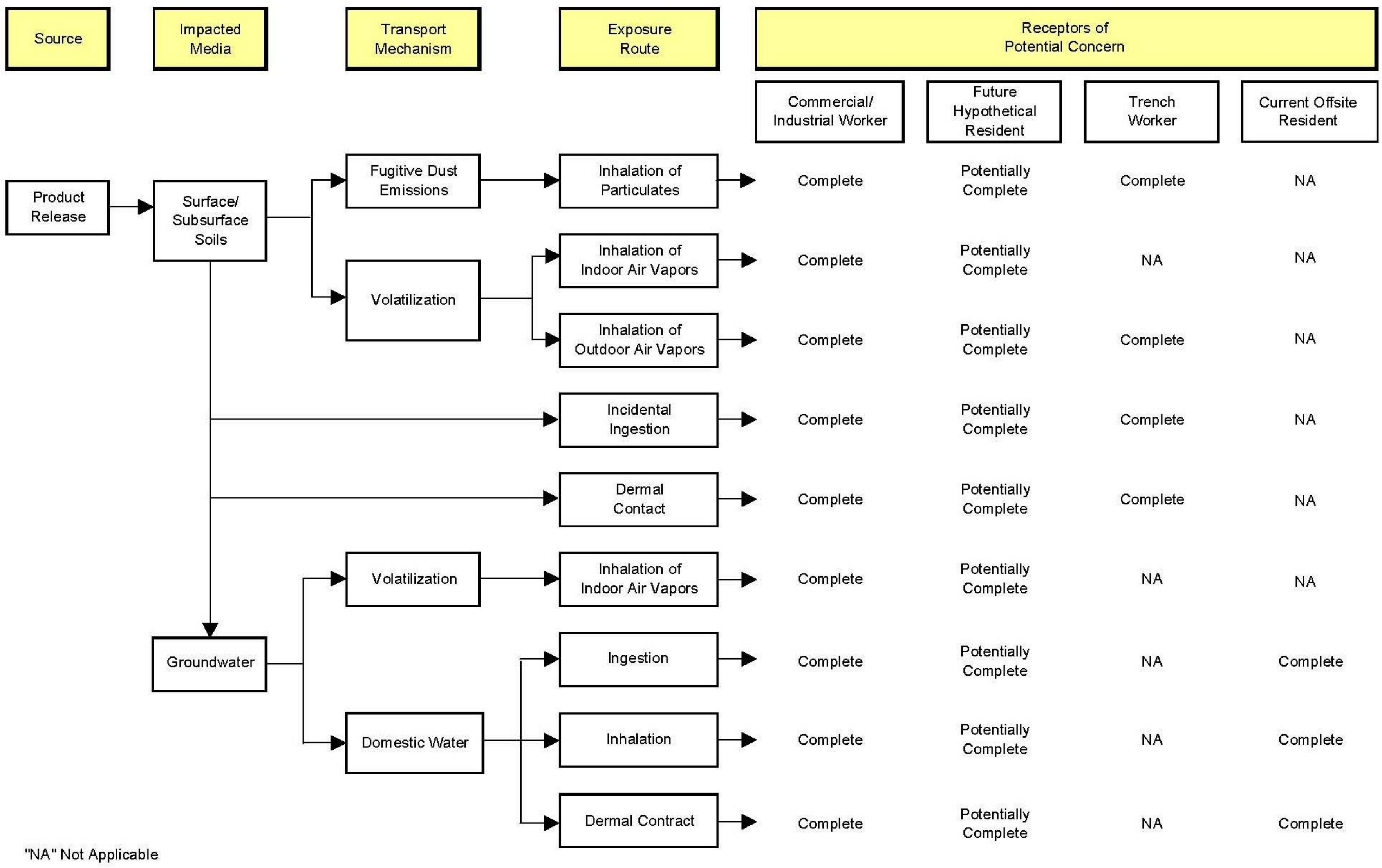
An exposure pathway consists of the route and mechanisms by which a chemical reaches a receptor. A "complete" exposure pathway exists where a continuous link exists between the chemical source, release mechanism, transport medium, exposure route, and potential receptor(s). Complete and potentially complete exposure pathways are summarized in more detail in the Figure 5-1.

5.2 Topography, Geography, Hydrogeology

The former 280-acre plant site lies in the Torrance Plain, a relatively flat area within the broad coastal plain of the greater Los Angeles area (see Figure 5-7). The closest surface water body is the Dominguez Channel (see Figure 5-7), a man-made concrete drainage channel approximately 2,000 feet northeast of the former plant site. Surface water runoff is controlled by the local streets and storm drain system. The elevation ranges from 48 feet above sea level on the western edge of the former plant site to approximately 30 feet above sea level on the eastern edge.

The former plant site overlies the West Coast Groundwater Basin, a sub-basin of the Los Angeles Coastal Groundwater Basin. The near-surface deposits in the vicinity of the former plant site are part of the Lakewood Formation, which extends to a depth of approximately 200 feet below ground surface (bgs) and consists predominantly of interbedded fine sand and mud (silt and finer sediment). The Lakewood Formation is divided into the Bellflower Aquitard and the underlying Gage aquifer. The Bellflower Aquitard is further subdivided into the following hydrostratigraphic units: the Upper Bellflower Aquitard (UBF), the Middle Bellower B Sand (MBFB), the Middle Bellflower Mud (MBFM), the Middle Bellflower C Sand (MBFC), and the Lower Bellflower Aquitard (LBF). Representative cross sections showing the interpreted positions of the various units at the former plant site are presented in Figure 5-5. For the purposes of this remedy, the soils of concern are the top 80 feet, which consist predominantly of fine sand and silt. The primary hydrostratigraphic units of concern are the UBF and MBFB, which cover the zone from the ground surface to the water table and the upper 25 feet of the saturated zone.

FIGURE 5-1
CONCEPTUAL SITE MODEL
Soil and NAPL ROD
Del Amo Superfund Site



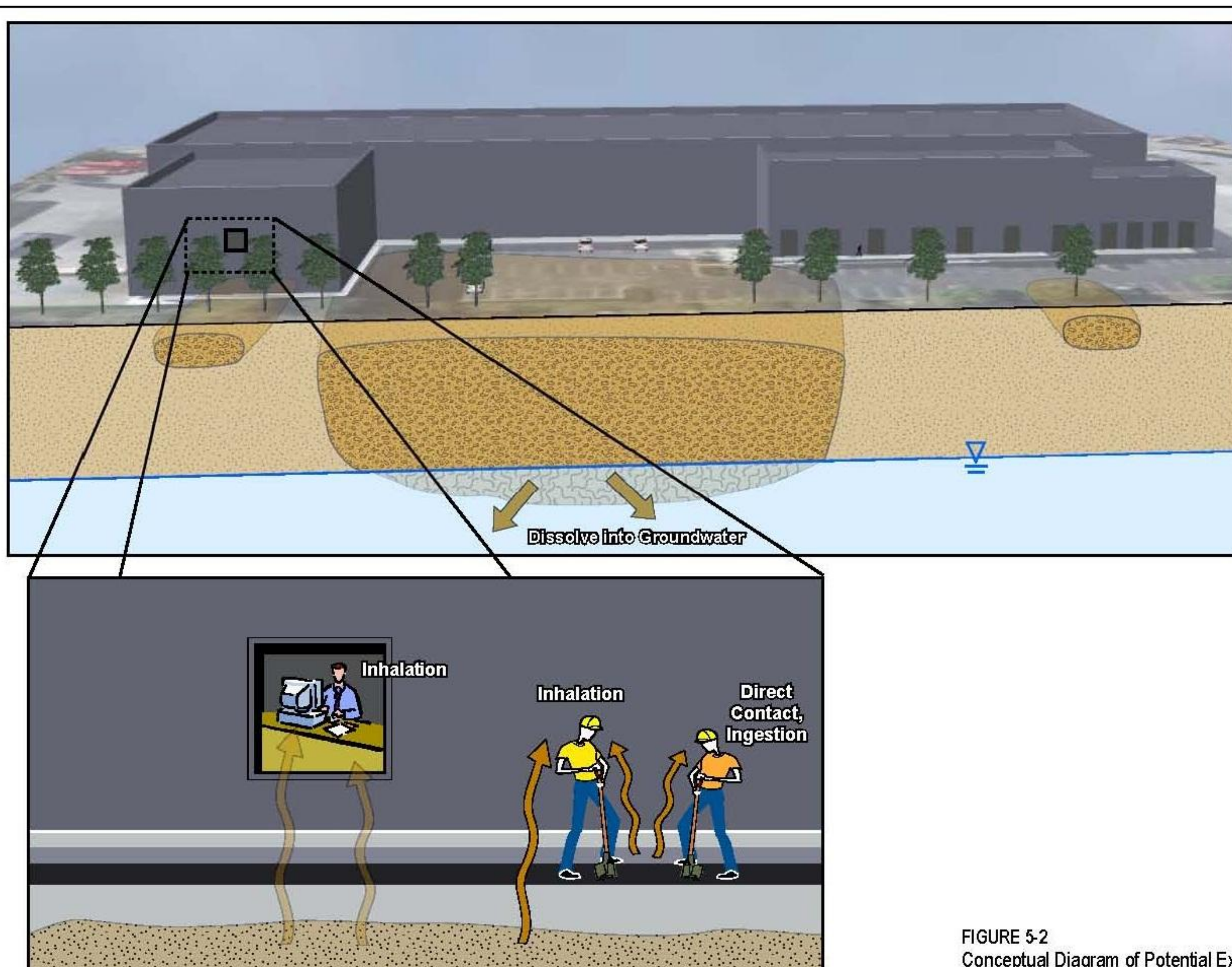
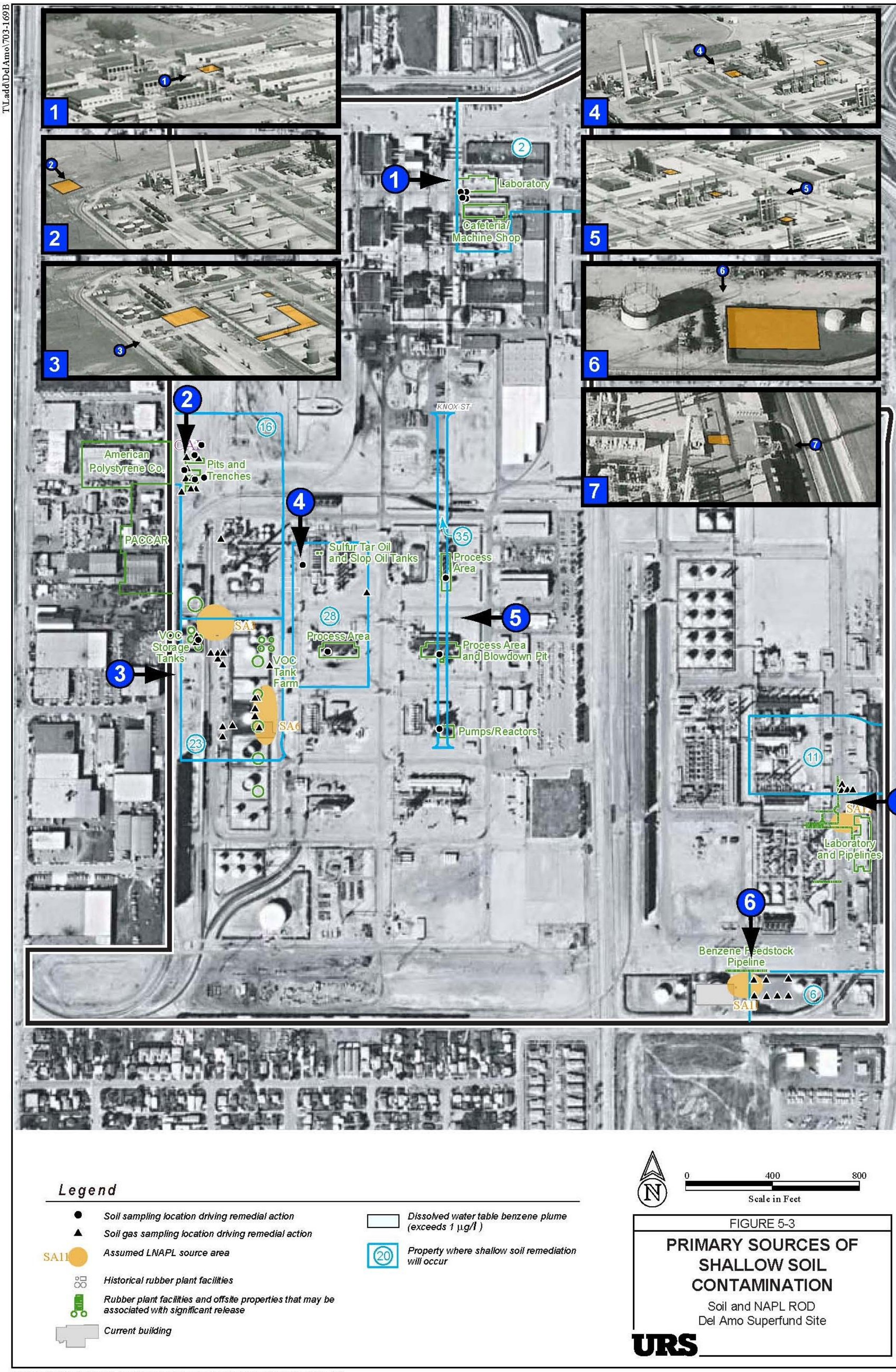


FIGURE 5-2
Conceptual Diagram of Potential Exposure Pathways
Soil and NAPL ROD
Del Amo Superfund Site

CH2MHILL

SCO385217.PR.01 LNAPL_building_v9.ai 6/11


T:\Ladd\DelAmo\703-169B
Laboratory
Cafeteria/
Machine Shop
American
Polystyrene Co.
Pits and
Trenches
PACCAR
Sulfur Tar Oil
and Slop Oil Tanks
Process
Area
KNOX ST
VOC
Storage
Tanks
SA1
VOC
Tank
Farm
Process Area
Process Area
and Blowdown Pit
SA6
Pumps/Reactors
Laboratory
and Pipelines
Benzene Feedstock
Pipeline
SA11
Legend
Soil sampling location driving remedial action
Soil gas sampling location driving remedial action
Assumed LNAPL source area
Historical rubber plant facilities
Rubber plant facilities and offsite properties that may be associated with significant release
Current building
Dissolved water table benzene plume (exceeds 1 μg/l)
Property where shallow soil remediation will occur
0
400
800
Scale in Feet
FIGURE 5-3
PRIMARY SOURCES OF SHALLOW SOIL CONTAMINATION
Soil and NAPL ROD
Del Amo Superfund Site
URS
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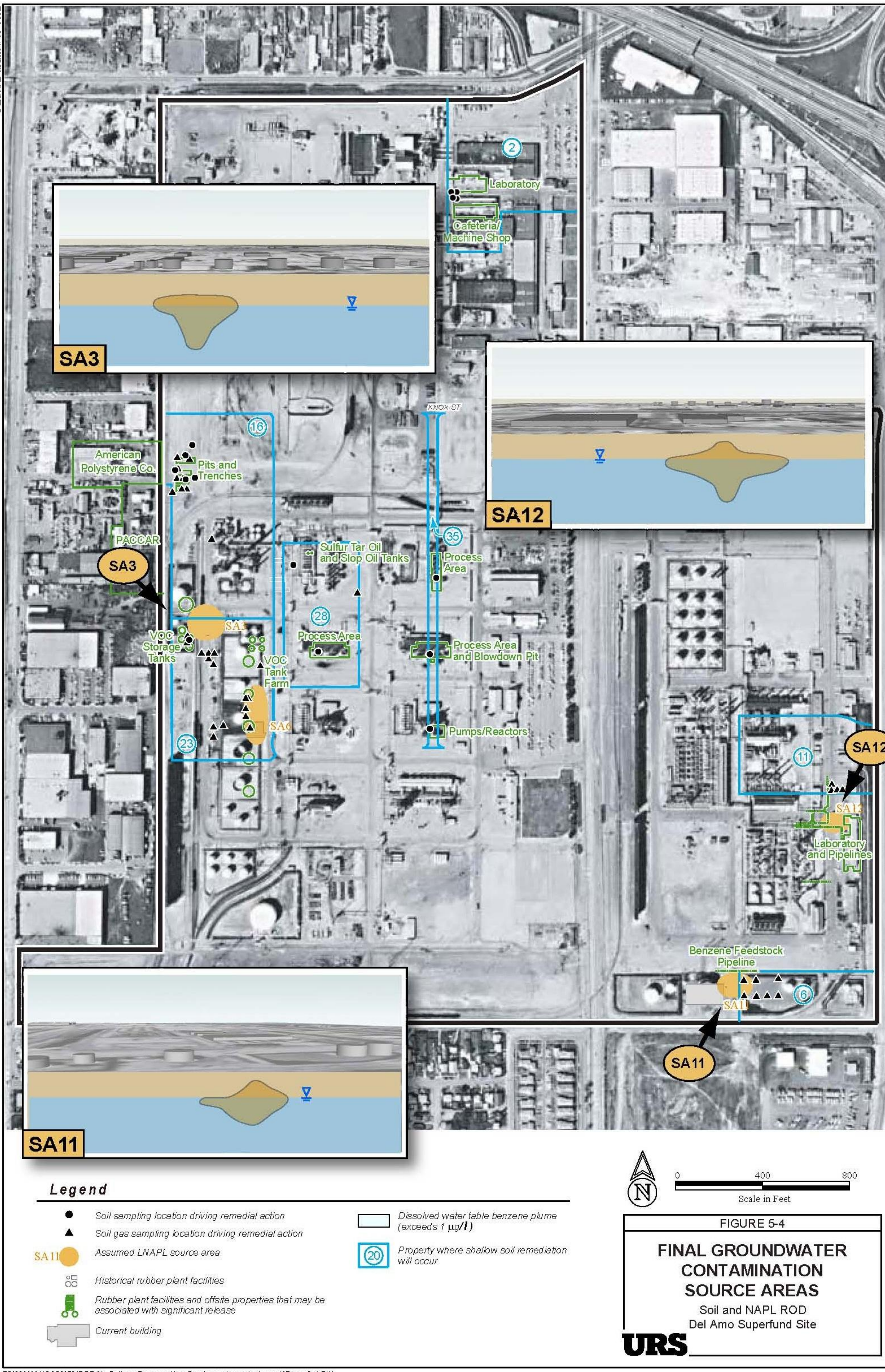


FIGURE 5-4
FINAL GROUNDWATER CONTAMINATION SOURCE AREAS

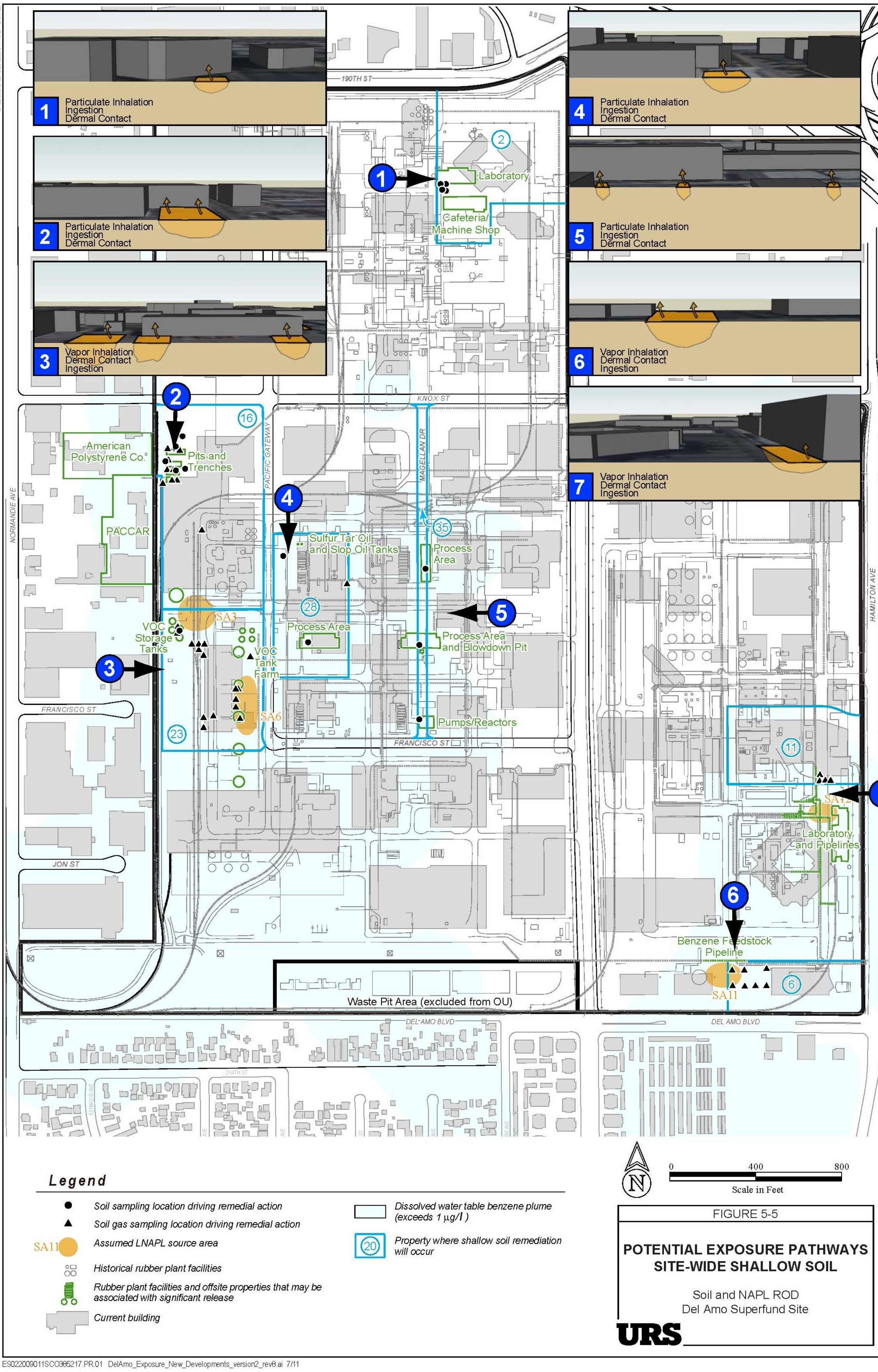
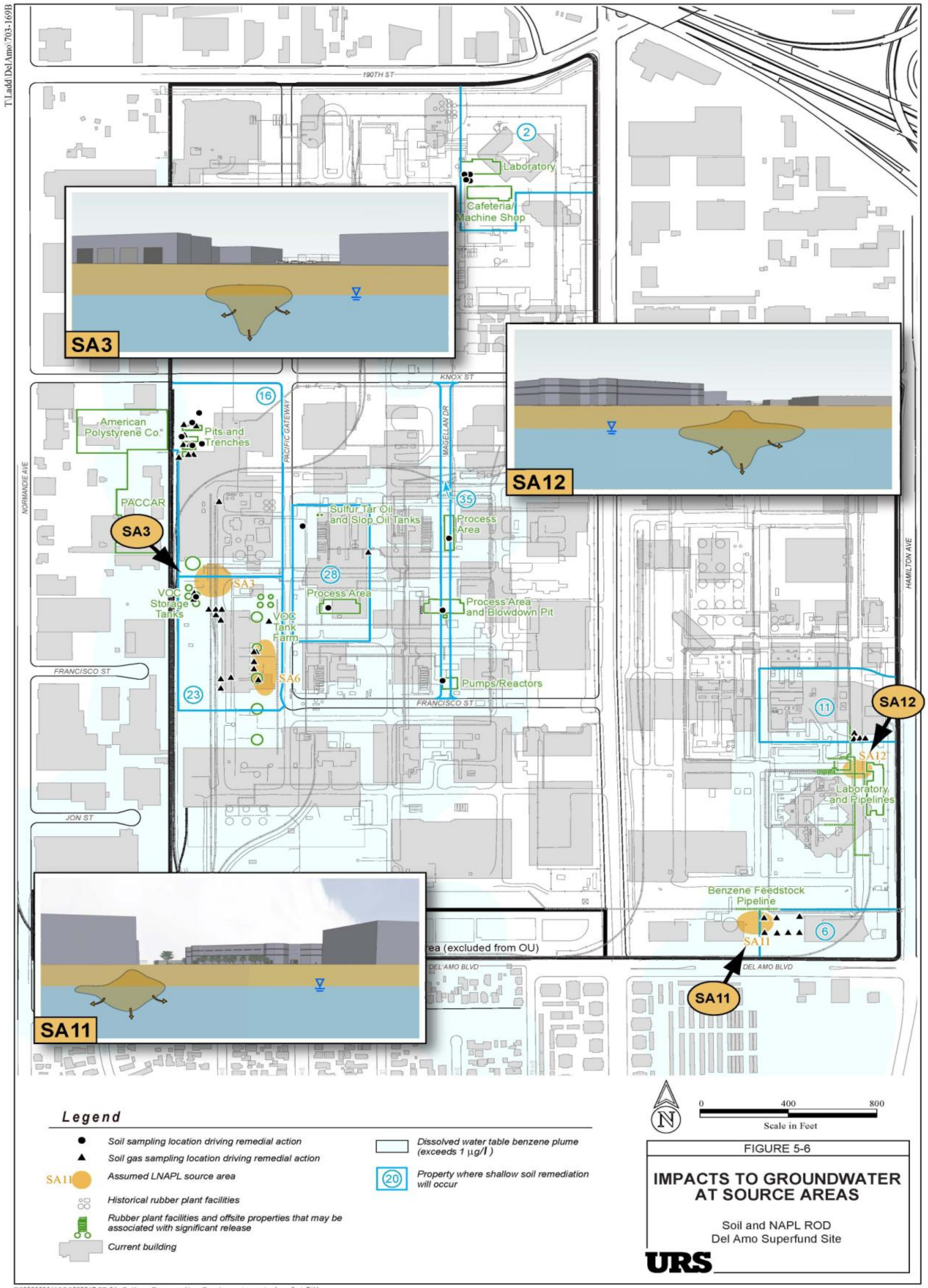


FIGURE 5-5

POTENTIAL EXPOSURE PATHWAYS SITE-WIDE SHALLOW SOIL

Soil and NAPL ROD
Del Amo Superfund Site


T:Ladd DelAmo\703-169B
190TH ST
Laboratory
Cafeteria/ Machine Shop
SA3
SA12
KNOX ST
American Polystyrene Co.
Pits and Trenches
PACIFIC GATEWAY
MAGELLAN DR
NORMANDIE AVE
PACCAR
Sulfur Tar Oil and Slop Oil Tanks
Process Area
VOC Storage Tanks
VOC Tank Farm
Process Area
Process Area and Blowdown Pit
Pumps/Reactors
SA6
FRANCISCO ST
HAMILTON AVE
JON ST
Laboratory and Pipelines
Benzene Feedstock Pipeline
SA11
DEL AMO BLVD
rea (excluded from OU)
0 400 800
Scale in Feet
Legend
Soil sampling location driving remedial action
Soil gas sampling location driving remedial action
Assumed LNAPL source area
Historical rubber plant facilities
Rubber plant facilities and offsite properties that may be associated with significant release
Current building
Dissolved water table benzene plume (exceeds 1 µg/l)
Property where shallow soil remediation will occur
FIGURE 5-6
IMPACTS TO GROUNDWATER AT SOURCE AREAS
Soil and NAPL ROD
Del Amo Superfund Site
URS
ES022009011SCO385217.PR.01 DelAmo_Exposure_New_Developments_version1_rev8.ai 7/11


Beverly Hills
SANTA MONICA BASIN
Baldwin Hills
Playa del Rey
CENTRAL BASIN
Montebello Plain
Rio Hondo
Los Angeles River
110
Rosecrans Hills
Downey Plain
405
Torrance Plain
WEST COAST BASIN
El Segundo Sand Hills
San Gabriel River
Dominguez Hills
Former Plant Site
Dominguez Channel
Coyote Creek
405
Signal Hill
Los Alamitos Channel
Palos Verdes Hills
Long Beach
Los Angeles Harbor
Seal Beach
San Pedro Bay
Legend
Groundwater Basin Boundary as defined by the California Department of Water Resources
Elevation (meters)
High : 451
Low: -5
Source:National Elevation Dataset Shaded Relief Imagery, Teale GIS Solutions Group
0 2 4 6 8 Miles
SCALE: 1" = 12,500 FEET (1:150,000)
Figure 5-7
REGIONAL PHYSIOGRAPHY AND GROUNDWATER BASINS
Soil and NAPL ROD
Del Amo Superfund Site
URS

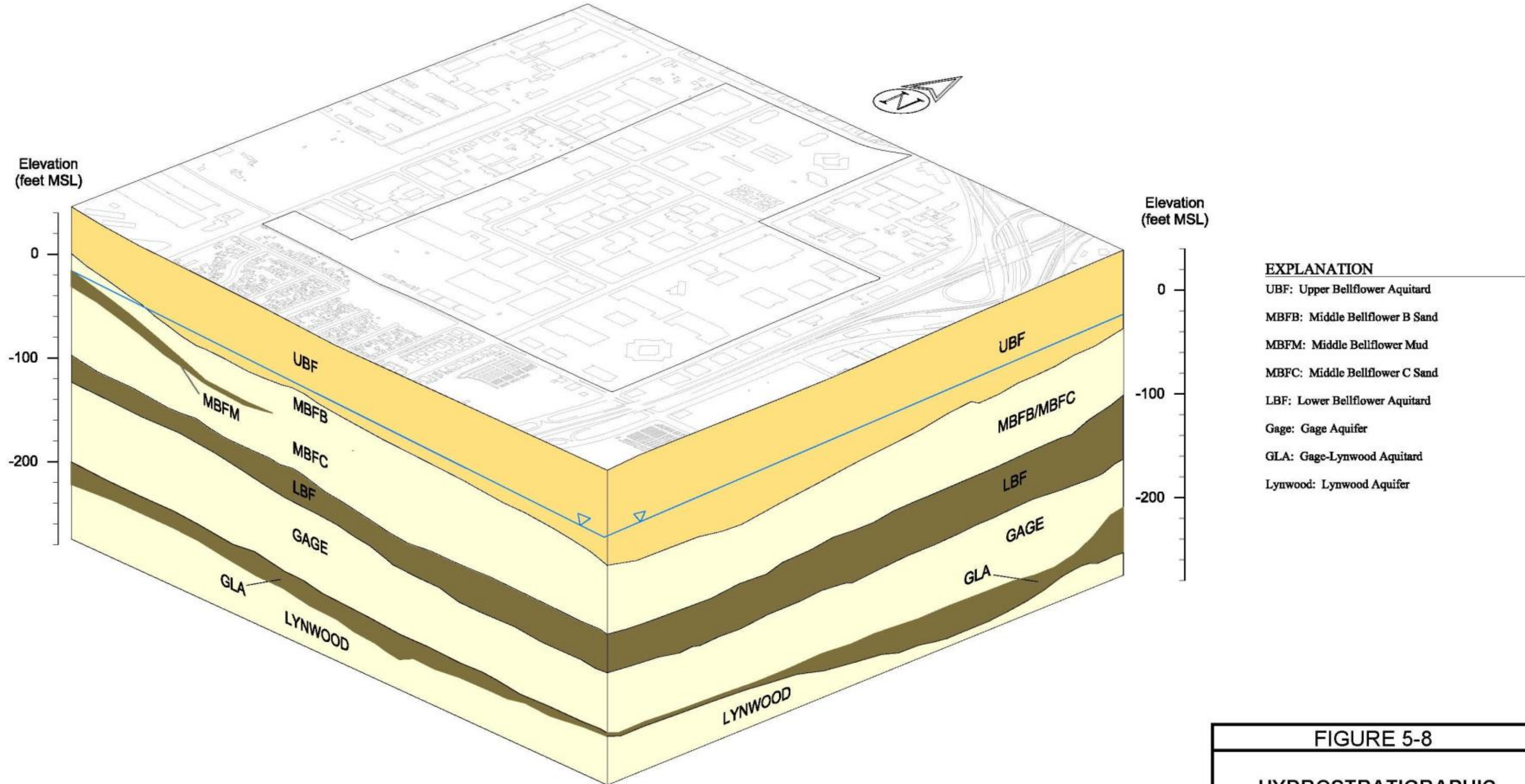


FIGURE 5-8

HYDROSTRATIGRAPHIC BLOCK DIAGRAM

Soil and NAPL ROD
Del Amo Superfund Site

URS

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The groundwater table at the former plant site is present at depths ranging from 32 to 57 feet bgs, depending upon location (based on 2004 groundwater elevation data). Groundwater flow direction is generally toward the south-southwest, but a radial flow pattern associated with local groundwater mounding is inferred in the vicinity of the Waste Pits Area and near the southeast corner of the former plant site.

The groundwater table in the vicinity of the former plant site has been rising steadily for the past 30 years. The groundwater levels were more than 20 feet lower than 2004 levels for much of the former rubber plant's operational period. The rising groundwater levels have "smeared" the light non-aqueous phase liquid (LNAPL) through the upper saturated zone and introduced dissolved phase contaminants into newly saturated soils.

5.3 Remedial Investigation Approach, Site-Wide

Figure 5-9 shows the chronology and inter-relationships of the primary investigations and associated documents for the Del Amo Site since EPA oversight began in 1992. These investigations are described in more detail below.

Phase 1 Investigations

Del Amo Site RI investigations were initiated in 1992 with investigations at the "MW-20 NAPL area" in the western styrene plancor, where LNAPL was known to be present based on observations from a monitoring well installed as part of an investigation for the neighboring Montrose Site.

In 1993, intensive, site-wide RI characterization investigations began and included the following elements:

- MW-20 Area
- Waste Pits Area
- Groundwater site-wide
- Shallow soil gas site-wide
- Surface soil site-wide
- Southwestern styrene plancor storage area
- Southern copolymer plancor stained area
- Utility tanks
- Workplace air site-wide
- Pipelines and trenches transmission system

Figure 5-10 shows the locations of these investigation components. The RI characterization investigations followed a set of guiding concepts, explained below.

Surface Exposure Pathways, NAPL, Remedial Alternatives. The RI gathered data that would be useful for evaluating the potential exposure pathways, the extent and characteristics of NAPL, and remedial alternatives. Such data included surface and shallow soil, shallow and deep soil gas, groundwater, and workplace indoor air. Shallow soil and soil gas samples are those collected between 0 and 15 feet bgs, while deep soil and soil gas samples are those collected from depths in excess of 15 feet bgs.[1]

[1] Shallow soil was defined as the soil that would be encountered during a reasonably anticipated construction project at the type of properties found at the Del Amo Site. Based on the types of buildings found at the Site, a reasonably anticipated excavation would at the most consist of a single level basement, which would be approximately 15 feet bgs.

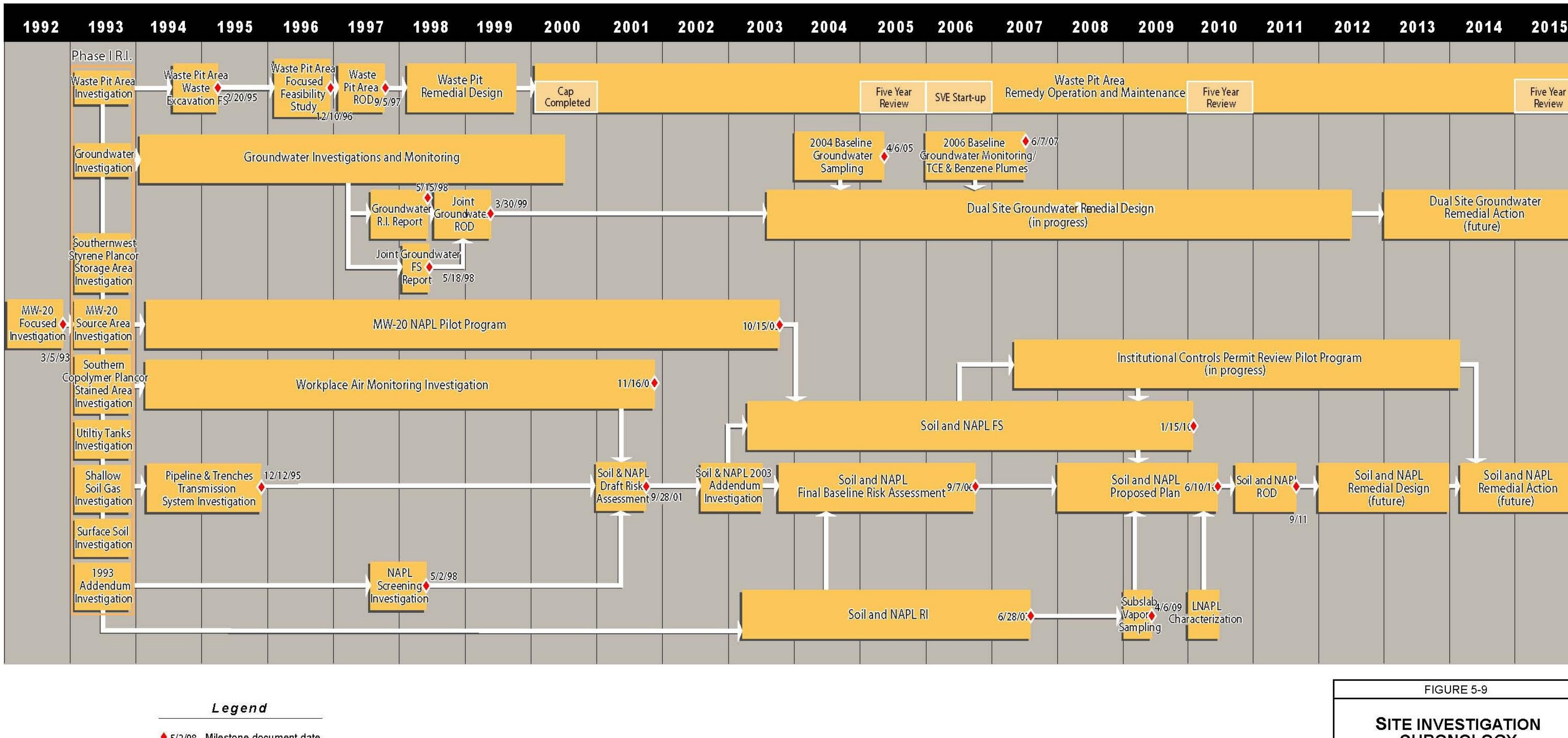

FIGURE 5-9

SITE INVESTIGATION CHRONOLOGY

Soil and NAPL ROD
Del Amo Superfund Site

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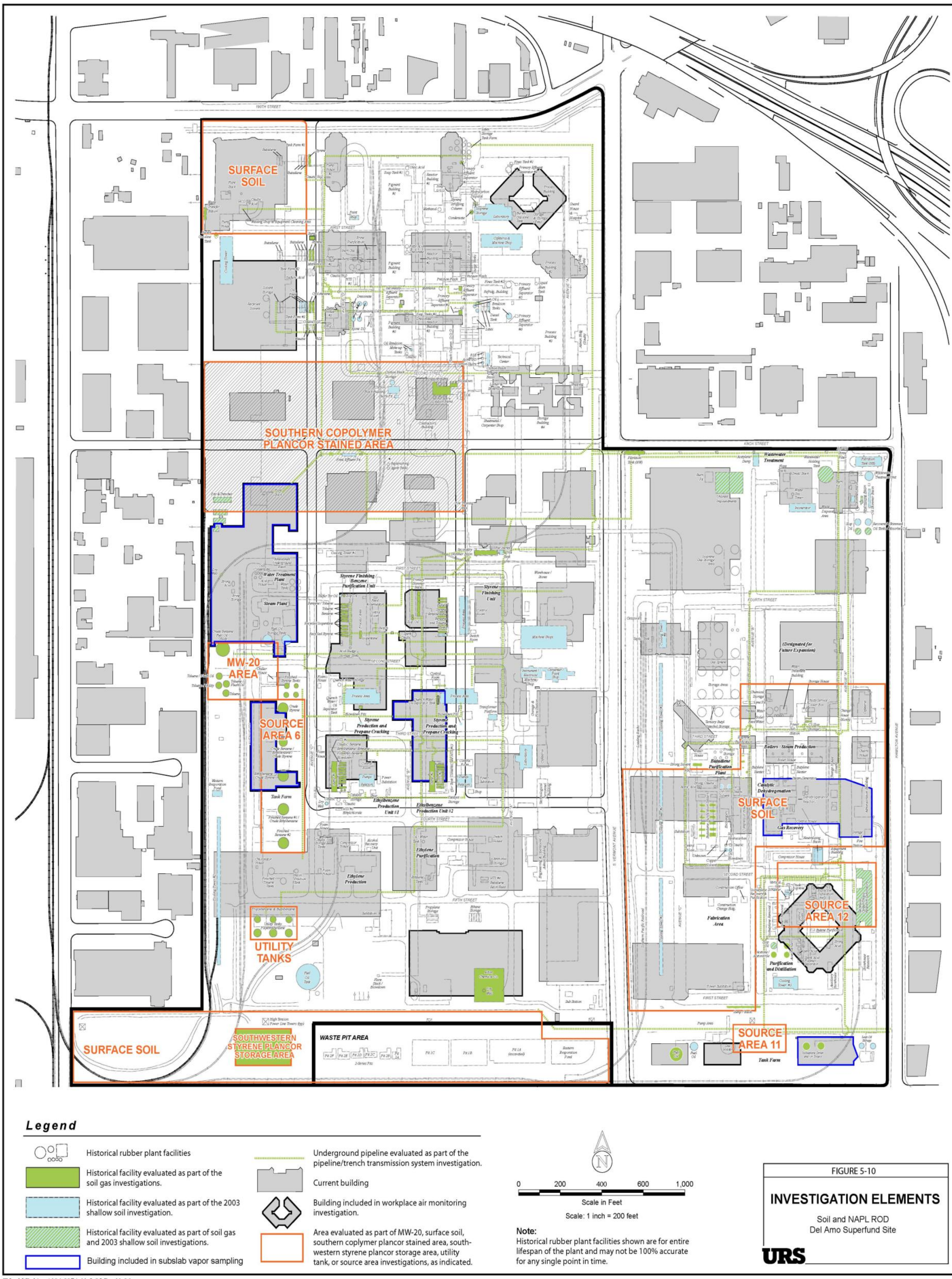

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Known Contamination or Likely Locations. Data were collected in areas where historical information, including layout, operations and facility types, indicated a potential for chemical releases. The historic plant layout had multiple areas of densely packed chemical storage and processing areas separated by large areas of open space, parking or administration facilities. Since demolition of the plant in the early 1970s, the majority of the former plant site had been redeveloped with closely spaced commercial and industrial buildings. These factors resulted in RI sampling locations being concentrated in accessible areas where the potential for contamination was judged to be highest, including former facility locations where chemicals were stored, used, transported, or disposed of. A map was produced superimposing historical plant facilities (as known from plant maps and documents, historical aerial photographs, deposition testimony, and technical papers) and current surface features (such as buildings and roads) that provided the basis for initial sampling locations.

Beneath Buildings. Although the location of former rubber plant facilities was well documented, many of the facilities of interest were found to lie partially or entirely within the footprint of existing, active business buildings. Due to the difficulty in accessing these areas and the associated disruption to the businesses, subsurface sampling beneath existing buildings was avoided. Where contamination was suspected to underlie a building, sampling was completed immediately adjacent to the building, within the water table, and the building was targeted for follow-up indoor air monitoring.

Target Analytes. Samples were analyzed for a broad spectrum of chemicals of potential concern (COPCs), as indicated below:

<u>Soil Gas</u>	<u>Soil</u>	<u>Indoor Air</u>	<u>Groundwater</u>
VOCs	VOCs	VOCs	VOCs
	SVOCs		SVOCs
	PAHs		Metals
	Metals		Pesticides/PCBs
	Pesticides / PCB		Parachlorobenzene sulfonic acid (pCBSA)
	Cyanide		

Early analytical data for the various sampling media indicated that elevated levels of VOCs, particularly benzene, were distributed across the greatest area and at the highest concentrations of all the chemicals. Given this finding and the relative toxicity of benzene and related compounds, VOCs were judged to be the primary risk-driving compounds and COCs. Therefore, the RI initially focused on former plant site facility locations where VOCs were known to have been stored, transported, or used in process areas.

Top-Down/Bottom-Up Approach. Multiple lines of evidence were gathered to identify and evaluate areas where past releases may have contributed to soil and groundwater contamination. The search for such areas proceeded in both a “top-down” and “bottom-up” approach. The top-down component started with the historical rubber plant documentation mentioned earlier, which led to focusing the shallow soil and soil gas sampling where former process units, pipelines, chemical storage and disposal areas had been located. Where elevated chemical concentrations were detected in soil, additional step-out sampling was conducted in the soil and downgradient sampling was conducted in the groundwater. The bottom-up component started with an independent water table plume delineation investigation that included sampling along multiple transects and at critical portions of the former plant site perimeter. Where elevated contaminant concentrations were detected in groundwater, additional groundwater sampling was conducted upgradient, and soil or soil gas sampling was conducted in areas that could be the sources for the groundwater contamination. Using this combined top-down and bottom-up approach, groundwater contamination source areas and potential NAPL areas were identified.

Phase 2 Investigations

After the initial investigation phase, the investigation was divided into separate efforts for the individual OUs. The second phase of the Soil and NAPL OU(OU-1) investigation is described below.

MW-20 Pilot Program. Phase 1 investigations of the NAPL in the MW-20 area led to a pilot test of hydraulic extraction at that location. Known as the MW-20 Pilot Program, work involved installation and operation of a closely spaced array of extraction and monitoring wells over a period of approximately 7 months. During the pilot program, 1.2 million gallons of impacted groundwater and 35 gallons of separate-phase benzene NAPL were extracted. The efficacy of hydraulic extraction as a NAPL removal technology was then evaluated.

Source Area Investigation. A Source Area investigation was completed in 1997–98, wherein the potential presence, nature, and mode of occurrence of NAPL were evaluated at groundwater contamination source areas 6, 11, and 12 (SA-6, SA-11, and SA-12). LNAPL characterization was completed through use of the Rapid Optical Screening Tool (ROST), analytical testing of soil and groundwater samples, and observational techniques.

2003 Shallow Soil Investigation. In 2001, a draft Baseline Risk Assessment (BRA) for the Soil and NAPL OU was completed. Review of the BRA indicated a concern that data, particularly for PAHs, represented a data gap. As a result, a 2003 shallow soil investigation[2] for the Soil and NAPL RI focused on facilities where the potential presence of PAHs was greatest, although analyses for VOCs, metals, and pesticides were also completed at selected locations.

Sub-slab Vapor Sampling. After the risk assessment was completed, potential soil vapor concerns were identified at five properties (listed below). The risk assessment was based on soil and soil gas data from outside the buildings and modeling potential for migration of soil gas into the buildings. These properties included the following:

Assessor's Parcel Number	Address
7351-033-022	20221 South Hamilton Avenue
7351-033-034	19901 South Hamilton Avenue
7351-034-015/050/056	19681 Pacific Gateway Drive
7351-034-045	19831 Magellan Drive
7351-034-057	19899 Pacific Gateway Drive

In order to further evaluate the potential for soil vapor intrusion at these properties for use in the remedy decision-making process, post-RI sampling of the soil gas was performed beneath the concrete foundation slabs. Sub-slab vapor samples were collected at each of the properties in 2009. Although the sub-slab vapor investigation was completed after the RI had been finalized, the information has been incorporated into the administrative record for this ROD.

LNAPL Characterization. In 2010, a post-RI LNAPL investigation was performed for four groundwater contamination source areas: SA-3, SA-6, SA-11, and SA-12. The investigation involved completing multiple Ultraviolet Optical Screening Tool (UVOST) incursions at each of the groundwater contamination source areas. Limited additional soil borings were also obtained.

[2] The 2003 Shallow Soil Investigation was known as the "2003 Addendum Investigation" in the administrative record.

5.4 Known or Suspected Sources of Contamination

As described in Section 2.0, Site History and Enforcement Actions, the former rubber plant used benzene, propane, butylene, and butane (and lesser amounts of other chemicals) to create synthetic rubber. Figure 5-6 shows the layout of the historical facilities at the former plant. During plant operations, chemicals were released into the environment, contaminating the soil and groundwater beneath the plant. Chemical releases occurred from many of the varied processes, pipelines, and tanks located at the former plant site. Section 2.2 discusses the following six areas of the plant that appear to be associated with the most significant releases:

- Tank farm area (styrene plancor)
- Styrene and ethylbenzene production facilities (styrene plancor)
- Laboratory area (butadiene plancor)
- Benzene pipeline area (butadeine plancor)
- Rubber production area (copolymer plancor)
- Pits and trenches area (copolymer plancor)

Section 2.2 describes the activities that occurred in each of these areas during operation of the former rubber plant, including the types of chemicals used and the activities conducted (chemical storage, transportation, processing, etc.). The characteristics of these areas, including types of contamination found, affected media, and chemical concentrations, are discussed below.

5.5 Types of Contamination and Affected Media

The remedial investigation found varying types and amounts of chemicals throughout the former plant site. The dominant type of chemical found site-wide was VOCs, mainly benzene. Lesser amounts of PAHS, pesticides/PCBs, and metals were also found. Table 5-1 summarizes the specific chemicals within these groups that were found during the investigation and that warranted further risk evaluation. Table 5-1 also identifies where the chemicals were found (in shallow soil, deep soil, or groundwater). Chemical releases contaminated the shallow soil (top 15 feet) in some locations and the deep soil (down to 80 feet) in other locations.

Deep Soil

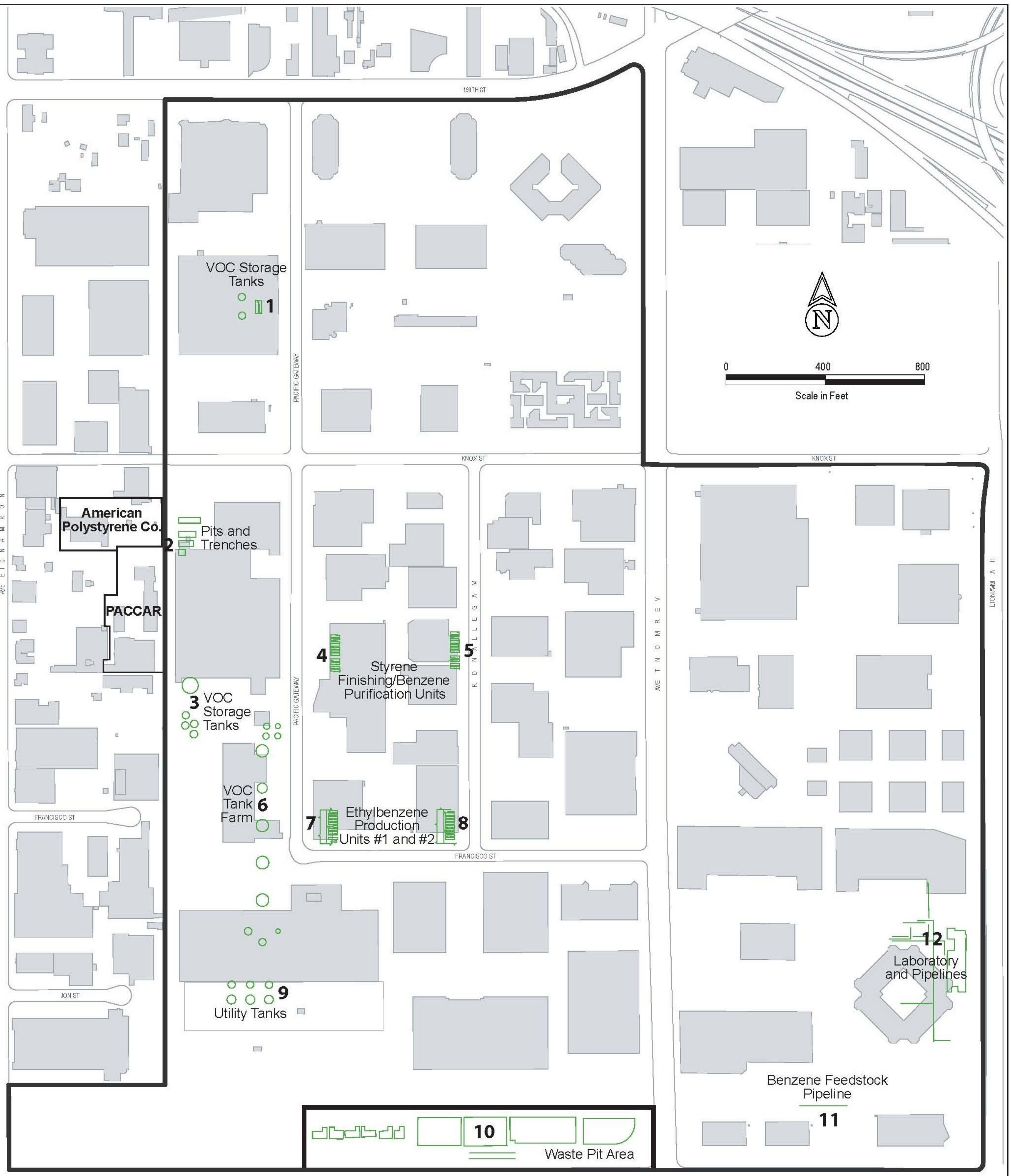
The contamination that reached the deep soil was in NAPL form, which contaminated the groundwater. The 12 areas where contamination likely entered the groundwater were called “groundwater contamination source areas (“SA”).” Of the 12 groundwater contamination source areas, nine were determined to be significant enough to be evaluated in the feasibility study for possible cleanup, and subsequently four are deemed to warrant remedial action. Figure 5-11 shows the locations of the 12 groundwater contamination source areas. Figure 5-12 shows the locations of the four source areas warranting remedial action, indicated in yellow on the figure, and designated “SA” plus a number.

TABLE 5-1: Chemicals of Concern

Chemical Name		Shallow Soil (0-15 feet bgs)	Deep Soil (>15 feet bgs)	Groundwater
VOCs	Benzene	x	x	x
	Ethylbenzene	x	x	x
	Toluene	x	x	x
	Xylene	x	x	x
	Styrene	x	x	x
	TPH (C6-C10)	x	x	x
	Trichloroethene (TCE)	x	--	--
	Tetrachloroethene (PCE)	x	--	--
	1,2,4-trimethylbenzene	x	--	--
	Cyclohexane	x	--	--
	Isopropylbenzene	x	--	--
	Isopropyltoluene	x	--	--
PAHs	Benzo(a)pyrene	x	--	--
	Benzo(a)anthracene	x	--	--
	Benzo(b)fluoranthene	x	--	--
	Benzo(k)fluoranthene	x	--	--
	Indeno(1,2,3-c,d)pyrene	x	--	--
Metals	Arsenic	x	--	--
	Copper	x	--	--
Other	TPH (C11-C23)	x	x	x
	4,4-DDT	x	--	--
	N-Nitrosodiphenylamine	x	--	--

Contaminants from off-site sources also have impacted groundwater beneath the Del Amo Site. Groundwater contamination from the nearby Montrose Site has co-mingled with the Del Amo Site groundwater plume. Chlorinated VOCs from other contaminated sites in the area have also contributed to Montrose and Del Amo sites groundwater contamination, as is discussed in more detail in the Dual-Site Groundwater ROD (EPA, 1999b).

The NAPL consists primarily of benzene. Benzene, in NAPL form, is lighter than water and tends to float upward in aqueous media. This is referred to as “light NAPL,” or LNAPL. For the purposes of this ROD, the terms LNAPL and NAPL are used interchangeably. LNAPL was directly observed floating on the groundwater surface in two areas. NAPL was also found deeper in the soil, 25 feet below the groundwater surface, possibly indicating that it had been released into the environment when the groundwater table was lower. As a result of the upward groundwater movement in the heterogeneous sediments of the Upper Bellflower aquitard, some LNAPL was trapped underneath the water table by low-permeability formations. Thus, most of the benzene LNAPL found during the remedial investigation was in the saturated zone, beneath the water table, although some was also found in the vadose zone or floating on top of the water table.



Source Area Number	Plancor	Suspected Source Facility	Primary Contaminants	NAPL?
1	Copolymer	VOC storage tanks	Cyclohexane	Unlikely
2	Copolymer	Off-site properties to west	TCE, PCE	Potential DNAPL
3	Styrene	VOC tanks	Benzene	LNAPL accumulation
4	Styrene	Styrene finishing/benzene purification unit	Benzene, cyclohexane	Potential LNAPL
5	Styrene	Styrene finishing/benzene purification unit	BTEX, styrene	Unlikely
6	Styrene	VOC tank farm	Benzene, ethylbenzene	Residual LNAPL
7	Styrene	Ethylbenzene production units #1 and #2	Benzene, ethylbenzene	Potential LNAPL
8	Styrene	Ethylbenzene production unit #1 and #2	Benzene, ethylbenzene	Potential LNAPL
9	Styrene	Utility tanks	Benzene, toluene	Potential LNAPL
10	Styrene	Waste pit area	BTEX	Potential LNAPL
11	Butadiene	Benzene feedstock pipeline	Benzene	Residual LNAPL
12	Butadiene	Laboratory and pipelines	BTEX, styrene	LNAPL accumulation

Legend

○ ○ ○ Historical rubber plant facilities inferred to be associated with groundwater contamination source area

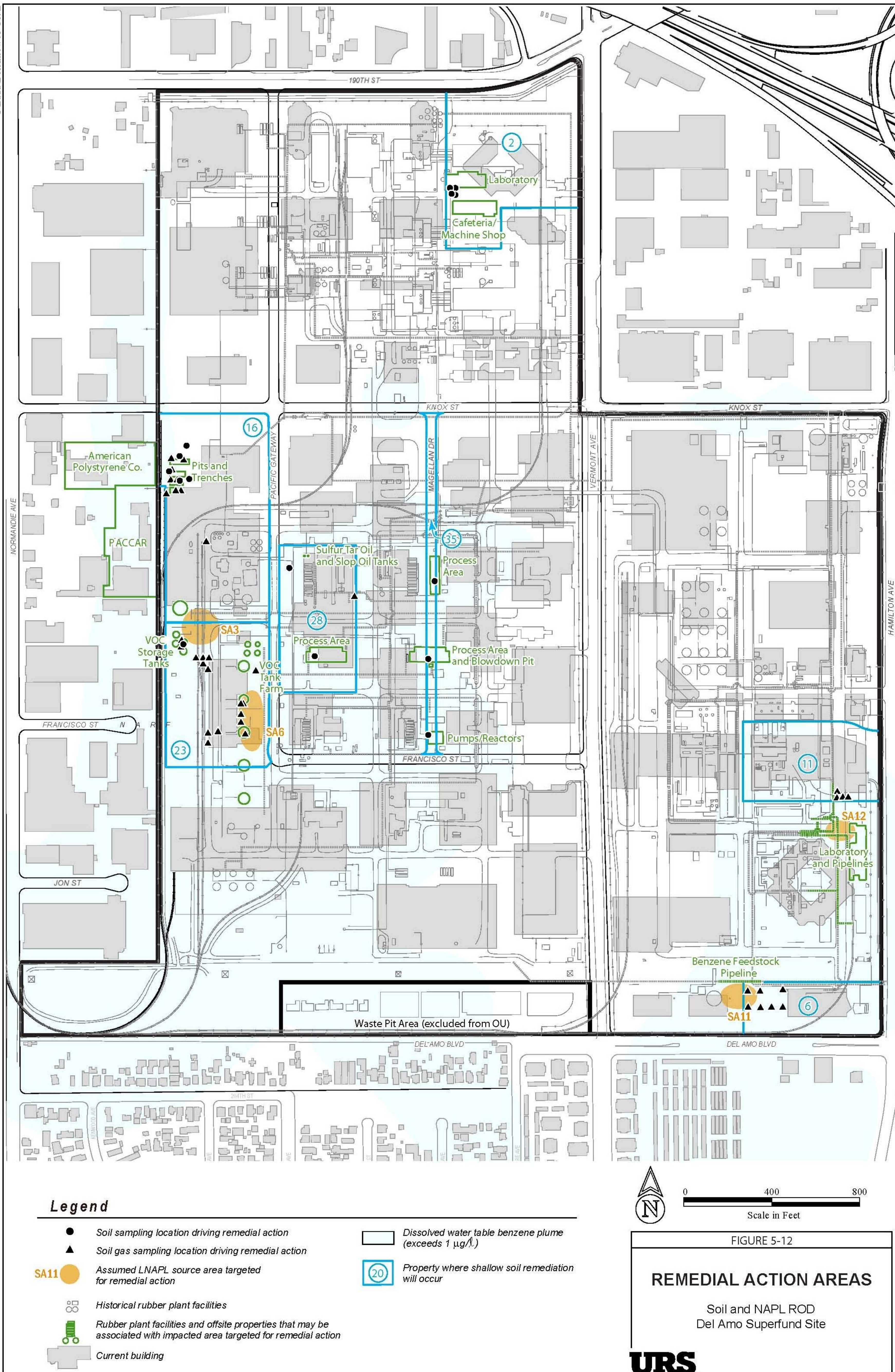
FIGURE 5-11

INITIAL GROUNDWATER CONTAMINATION SOURCE AREAS

Soil and NAPL ROD

Del Amo Superfund Site

URS


T:\Ladd\Del Amo\703-169B
190TH ST
Laboratory
Cafeteria/
Machine Shop
KNOX ST
American
Polystyrene Co.
Pits and
Trenches
PACCAR
Sulfur Tar Oil
and Slop Oil Tanks
Process
Area
SA3
VOC
Storage
Tanks
Process Area
VOC
Tank
Farm
Process Area
and Blowdown Pit
SA6
Pumps/Reactors
FRANCISCO ST
JON ST
NORMANDIE AVE
PACIFIC GATEWAY
MAGELLAN DR
VERMONT AVE
HAMILTON AVE
SA12
Laboratory
and Pipelines
Benzene Feedstock
Pipeline
SA11
Waste Pit Area (excluded from OU)
DEL AMO BLVD
204TH ST
2
16
35
28
23
11
6
Legend
Soil sampling location driving remedial action
Soil gas sampling location driving remedial action
SA11 Assumed LNAPL source area targeted for remedial action
Historical rubber plant facilities
Rubber plant facilities and offsite properties that may be associated with impacted area targeted for remedial action
Current building
Dissolved water table benzene plume (exceeds 1 µg/l)
20 Property where shallow soil remediation will occur
0 400 800
Scale in Feet
FIGURE 5-12
REMEDIAL ACTION AREAS
Soil and NAPL ROD
Del Amo Superfund Site
URS

Shallow Soil

The Baseline Risk Assessment, discussed in Section 7.0, evaluated impacts from shallow soil to receptors at each parcel. Based on the risk evaluation, seven shallow soil areas warrant remedial action (Areas 2, 6, 11, 16, 23, 28 and 35). See Figure 5-12. The seven shallow soil areas are named on Figure 5-12 by blue circles, and the blue lines outline the boundaries of the properties within which these seven areas are found. The black dots and triangles show the soil or soil gas sampling locations where exceedances of screening levels were encountered in each of the seven areas. The green lines depict the former plant facility most likely to have caused the contamination found.

The specific chemicals found to pose unacceptable risks at the various locations include benzene, tetrachloroethene, i-propyltoluene, trichloroethene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benzo(b)fluoranthene, 4,4-DDT, NDPA, and copper. When released into the environment, the VOCs mostly migrated through the shallow soil and accumulated at the water table. Some residual amounts remained in the shallow soil, enough in several locations to warrant remedial action. The PAHs, pesticides/PCBs, and metals did not migrate significantly; they remained in the shallow soil near the location of their release.

The remainder of this section will focus on describing the characteristics of the areas where remedial action is warranted, both the shallow soil and the deep soil groundwater contamination source areas.

5.6 Nature and Extent of Contamination

Six facilities of the former rubber plant appear to be associated with releases at the seven locations determined by this ROD to warrant remedial action. Section 2.0, Site History and Enforcement Actions, described the former rubber plant activities that occurred in these areas, including chemicals stored, transported, or processed. The nature and extent of contamination discussion is organized according to these six areas. Figure 5-12 shows the locations of the six areas discussed in this section.

Tank Farm Facility (Styrene Plancor)

The tank farm facility is located in the western part of the former styrene plancor, mostly within Area 23, but it extends a short distance onto Area 16 (see Figure 2-1). VOCs found in the shallow soil at actionable risk levels include benzene, chloroform, tetrachloroethene, trichloroethene, and acetone. Other contaminants contributed to the risk to a lesser degree. These VOC contaminants were found in the outdoor soil; PCE was additionally found in the subslab space beneath the southern end of the building in this area. The Area 23 property (assessor's parcel number 7351-034-057, 19875 Pacific Gateway Drive) currently contains an active warehousing and distribution business.

Two locations within the tank farm area have been identified as groundwater contamination source areas that warrant remediation. In SA-3, floating NAPL was found in monitoring well MW-20 (as discussed in Section 2.4). SA-3 is located along the northern boundary of Area 23 and extends a short distance into Area 16. Despite the initial finding of floating NAPL within well MW-20, extensive follow-up investigations found that the NAPL is present at relatively low average saturations that do not appear to be mobile. NAPL cannot migrate under natural conditions when at or below residual saturation levels. The primary contaminants present in the LNAPL site areas are benzene and ethylbenzene. NAPL is also known to be present in the vadose zone at residual saturations. The areal extent of the NAPL at SA-3 is estimated at 50,000 square feet (sf).

The second location, SA-6, is located along the eastern side of the building on the Area 23 property. NAPL was observed at residual saturations primarily in the vadose zone, although minor amounts were found in the saturated zone. The primary contaminants present are benzene and ethylbenzene. The areal extent of the NAPL at SA-6 is estimated at 33,000 sf.

Styrene and Ethylbenzene Production Facilities (Styrene Plancor)

The styrene and ethylbenzene production facilities were located in the central part of the former styrene plancor. Contamination was found in the shallow soil in two areas at levels that warrant remedial action. The two areas are designated Area 28 and Area 35. Area 28 (assessor's parcel number 7351-034-069) is located at 19780 Pacific Gateway and is used as a warehouse business. Area 35 is the street, Magellan Drive. The risk-driving contaminant found in Area 28 was benzo(a)pyrene, which was found in one limited area in front of the building and one limited area behind the building (see Figure 5-12). The risk-driving contaminants found in Area 35 were benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, benzene, and tetrachloroethene, which were found in two areas in the southern part of the street and two areas in the middle to northern part of the street.

Laboratory Facility (Butadiene Plancor)

The laboratory facility of the butadiene plancor is located on the eastern side of the former butadiene plancor, near the southern end. It is located mainly on the parcel designated Area 5 (assessor's parcel number 7351-033-017), located at 20101 Hamilton Avenue (see Figure 5-12). The property is currently used as an office building with asphalt-paved parking lots surrounding the building. The laboratory facility also extended a short distance onto what is now the property adjoining to the north, designated Area 11 (assessor's parcel number 7351-033-034), located at 19901 South Hamilton Avenue. No contaminants were found in the shallow soil of Area 5 that warranted remedial action, thus Figure 5-12 does not show the "Area 5" designation. Benzene was found in the shallow soil of Area 11 at levels that warranted remedial action.

LNAPL was also found in this area and warrants remedial action. This NAPL area is designated SA-12. The release appears to have occurred in the center of what is now the northeast parking lot of the current building, and extends out covering that entire section of the parking lot, the very southern edge of Area 11 (adjoining to the north), and eastward beneath Hamilton Avenue. The eastern edge of the NAPL occurrence has not yet been delineated, but will be during remedial design. The NAPL is inferred to be a complex of benzene, other BTEX (benzene, toluene, ethylbenzene, and xylene) compounds, styrene, and numerous other VOCs, SVOCs), and unidentified compounds in the C10-C23 range. NAPL is also known to be present in the vadose zone, but in lesser amounts. All the NAPL in SA-12 exists at residual saturations. The areal extent of the NAPL at SA-12 was initially estimated at 22,500 sf, although additional NAPL investigations conducted in 2009-2010 indicated that the area could exceed 100,000 sf.

Benzene Pipeline Facility (Butadeine Plancor)

The benzene pipeline facility is located in the southern part of the former butadiene plancor. The contamination from the pipelines spread across three parcels designated as Area 6 (assessor's parcel number 7351-033-022) located at 20221 South Hamilton Avenue; Area 9 (assessor's parcel number 7351-033-027) located at 20280 Vermont Avenue; and Area 15 (assessor's parcel number 7351-033-900), which runs behind the other two parcels (see Figure 5-12). Office buildings are present in both Area 6 and Area 9, with asphalt-paved parking lots around the buildings. Area 15 is a high-voltage power transmission corridor with asphalt-paved parking beneath the power lines. In the shallow soil, contaminants warranting remedial action were only found within Area 6. The risk-driving chemical is benzene, which was found within the parking lot on the western side of the parcel.

NAPL was also found in the benzene pipeline area, designated as SA-11. The release appears to have occurred at what is now the border of the three parcels, and spread outward onto all three but mostly onto Area 9, behind the existing building. The primary contaminants present in the LNAPL are benzene and ethylbenzene. The NAPL is found predominantly in the saturated zone with a smaller amount found in the vadose zone. All the NAPL found was at residual saturations. The areal extent of the NAPL at SA-11 was initially estimated at 38,000 sf.

Rubber Production Facility (Copolymer Plancor)

The rubber production facility is located in the northeast corner of the former copolymer plancor. It is located entirely on the parcel designated as Area 2 (assessor's parcel number 7351-031-020) located at 950 West 190th Street. The property has an office building and asphalt-paved parking surrounding the building. The contaminants found in the shallow soil that warranted remedial action were benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene. These chemicals were found in a limited area of the parking lot in the southwest corner of the parcel (see Figure 5-12).

Pits and Trenches Facility (Copolymer Plancor)

The pits and trenches facility is located in the southwest corner of the former copolymer plancor. It is located in the northwest corner of Area 16 (assessor's parcel number 7351-034-015/050/056) located at 19681 Pacific Gateway Drive. The property comprises three parcels owned by the same entity and used for a printing business. The southern end of these parcels is part of the tank farm facility, but the contamination associated with the pits and trenches is separate from the tank farm. At the pits and trenches, shallow soil contamination was found at levels warranting remedial action. The risk-driving chemicals were 4,4-DDT, benzo(a)pyrene, dibenzo(a,h)anthracene, n-nitrodiphenylamine, tetrachloroethene, benzene, chloroform, trichloroethene, 1,2,4-trimethylbenzene, and styrene. The contamination is located beneath the parking lot and loading area along the northwest corner of the building. In the loading dock area, contamination warranting remedial action was found beneath the building foundation slab. In addition, VOC contamination was found at one location farther south, beneath the center of the building.

6.0 Current and Potential Future Land and Water Uses

6.1 Current Land Uses

The former plant site (outlined in red on Figure 6-1) comprises approximately 280 acres, and has been redeveloped into a commercial/industrial business park. All surface facilities associated with the former plant have long been dismantled and removed, although some concrete foundations or other remnants of previous structures have been encountered in the subsurface during the environmental investigations. The former plant site had been subdivided into 67 separate parcels as of the date of the Soil and NAPL RI, nearly all of which are developed. (Since that time, one of the parcels was further subdivided such that there are now 83 parcels.) The parcel boundaries are depicted by white lines on Figure 6-1. Buildings, paved parking areas, streets, and landscaped areas currently cover more than 90 percent of the former plant site. The remaining undeveloped areas consist of Los Angeles Department of Water and Power (LADWP) parcels used for high-voltage power transmission lines (one is paved, one is not), the former plant site Waste Pits Area (unpaved but covered with a multi-layer cap), and an adjacent unpaved property used for bin and dumpster storage.

Currently, 68 buildings and 5 surface streets occupy the former plant site, with building footprints ranging up to 215,000 sf. The zoning for most of the parcels is for heavy or light manufacturing/industrial, and one parcel (containing a hotel) has a dual industrial/commercial zoning designation (see Figure 6-1). The buildings are used primarily for warehouse/freight operations, manufacturing, and office space. The two parcels containing the LADWP power lines are zoned as "public facilities." All current structures at the former plant site are limited to business use and there are no known residents.

The area surrounding the former plant site is zoned for manufacturing/industry to the north, east, and west. A residential area is present approximately 650 feet north of the former plant site, across the 405 freeway. Residential and industrial zoned areas border the former plant site to the south. An approximately three-block portion of the residential area immediately south of the Waste Pits Area was razed after being purchased by Shell Oil Company and the U.S. Government in 1998. This area is currently vacant.

6.2 Potential Future Site and Resource Uses

The reasonably anticipated future use of the former plant site is commercial use, the same as it is now. However, the possibility that residential use could be considered at some point in the future cannot be precluded. All but three of the current parcels of land are zoned as heavy or light manufacturing/industrial. One parcel has a dual industrial-commercial zoning designation, and two parcels are zoned as "public facilities" (which are the high voltage power transmission lines). The neighboring areas to the north (across the 405 freeway) and south (immediately across Del Amo Boulevard) are residential. This information was obtained from the City of Los Angeles General Plan. According to the city planning department, the current zoning is not expected to change.

6.3 Groundwater Use and Designations

The State of California designates all of the groundwater under the site as municipal supply beneficial use, that is, as being a potential source of drinking water. Currently, no known municipal water supply or production wells exist within the area of contaminated groundwater under the site. The nearest municipal supply wells are about 0.5 to 1 mile downgradient of the site.

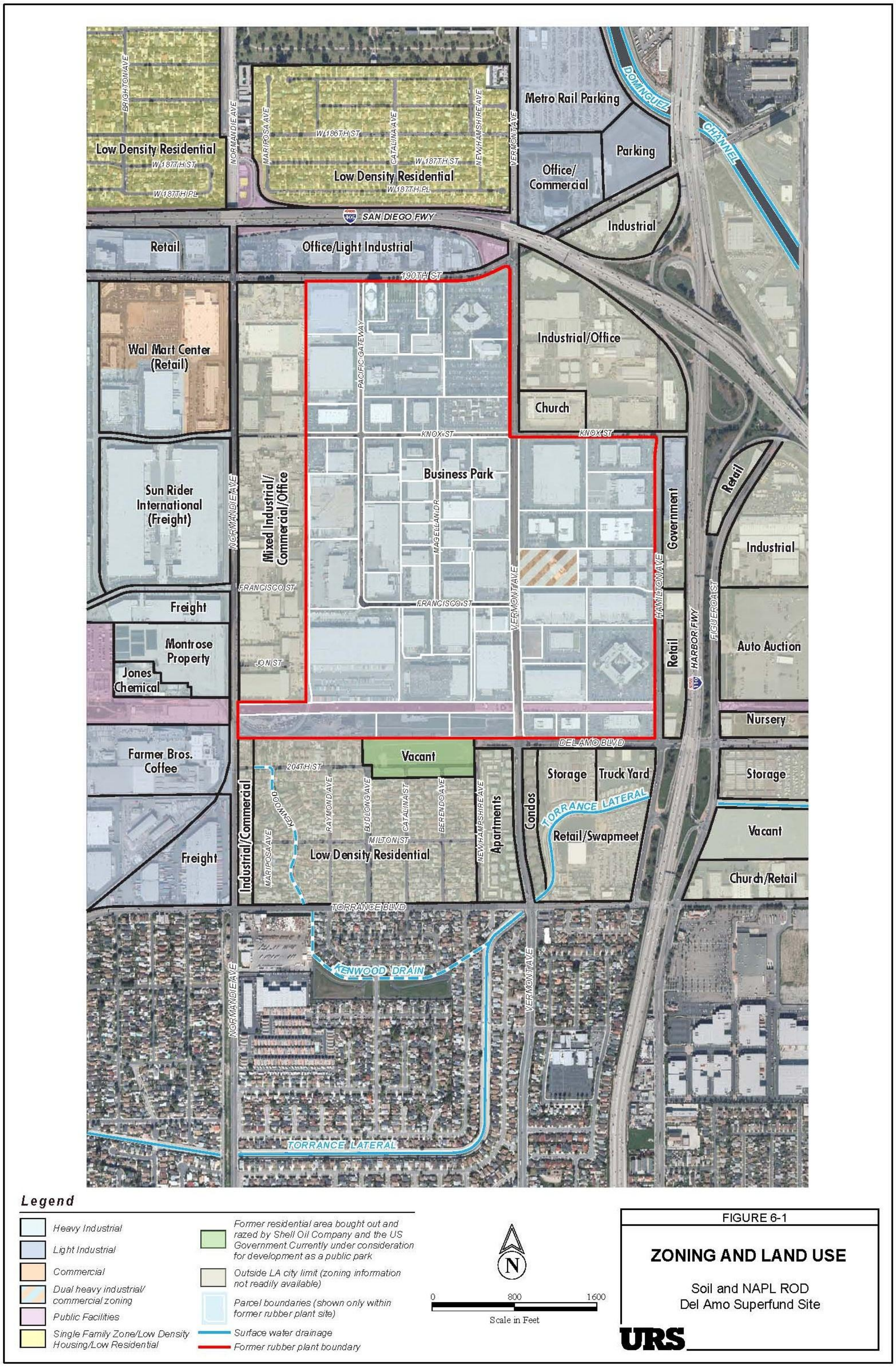


FIGURE 6-1

ZONING AND LAND USE

Soil and NAPL ROD
Del Amo Superfund Site

7.0 Summary of Site Risks

EPA completed a Baseline Risk Assessment (BRA) for the Soil and NAPL OU in 2006 (Geosyntec and URS, 2006). A revision to exposure point concentrations (EPCs) for six parcels was included in the FS in 2010 (URS, 2010). The BRA estimates the risks the site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The BRA evaluated potential health risks to commercial workers, construction workers (called “trench workers”), and hypothetical future residents at the Del Amo Site, associated with chemicals within the Soil and NAPL OU. Potential exposures to chemicals detected in surface and shallow soils were evaluated for the direct contact pathways as well as inhalation of volatile chemicals in indoor and outdoor air and fugitive dust. The potential for volatile chemicals to migrate from the subsurface to indoor air was evaluated for deeper vadose zone soils and groundwater. An ecological risk assessment was performed to evaluate potential risks from site COCs to ecological receptors. This section summarizes the results of the BRA for this site.

7.1 Summary of Human Health Risk Assessment

This summary of health risk includes sections on the identification of COCs, the exposure assessment, toxicity assessment, and risk characterization. The human health risk assessment estimated potential risks for the following groups: (1) current commercial workers, (2) current trench workers,[3] and (3) hypothetical future residents. These estimated risks for the most part are potential risks if current conditions change at the former plant site. The area is currently covered with asphalt and buildings, preventing exposure to contaminated soil. If exposures were to occur in the future, the estimated risks could be realized. The exception is two buildings with the potential for experiencing exceedances of volatile organic chemicals within the building, caused by intrusion by contaminants underlying the buildings. Although there is the potential for current exceedances, it is believed such exceedances are not being experienced due to the level of ventilation in the building.

The former plant site was divided into exposure areas. An exposure area is the area where a receptor could be exposed to Site-related contaminants. At the Del Amo Site, the receptors are the business park employees, so the exposure area would be their workplace. Therefore, the exposure areas were defined as the parcel boundaries where they are employed. The health risks were then evaluated for each parcel area.

Areas meeting one or more of the following criteria were selected as "exposure areas of potential concern" (EAPCs):

1. The parcel overlaps one or more of the 12 groundwater contamination source areas defined in the Dual Site Groundwater RI Report. Groundwater contamination source areas typically encompass areas of elevated VOCs in soil and/or soil gas samples associated with an underlying groundwater contaminant plume.

2. One or more VOCs, SVOCs, pesticides, or PCBs were detected in samples from the parcel at levels exceeding their respective Region IX or CAL-Modified preliminary remediation goal (PRG) S for

[3] The risk assessment determined that the construction activity that would result in the highest exposure to Site-related contamination would be laborers working in a trench. Thus, the construction worker exposure scenario was called the “trench worker” scenario. The scenario was concerned with workers performing routine construction activities, not hazard material related activities.

residential soil. This includes soil gas samples converted into equivalent soil matrix values. One or more metals were detected at the parcel above background and above their respective PRGs. The parcel is surrounded by other parcels that were selected as EAPCs.

A total of 37 EAPCs were identified, and risk calculations were completed for each of these EAPCs. Exposure areas not selected as an EAPC did not meet any of the above criteria.

Identification of Contaminants of Concern

Based on the data collected during the RI, COCs were identified for each EAPC, and exposure point concentrations (EPCs) were calculated. EPCs are the concentrations that are used to estimate the exposure and risk from each COC in the soil. EPCs are calculated for each of the COCs contributing. Table 7-1 presents the COCs for each EAPC that contributed to the majority of the risk and hazard (risk-driving chemicals) for the commercial risk assessment scenario.

Table 7-1 indicates that the COCs that contribute to the majority of risk from outdoor shallow soil include benzene; various PAHs including benzo(a)pyrene [B(a)P], benzo(a)anthracene, benzo(b)fluoranthene; and metals including arsenic, cadmium, thallium and vanadium. Inhalation risks in outdoor or indoor air include several VOCs, but primarily benzene, PCE, and TCE.

Exposure Assessment

The exposure assessment evaluates the magnitude, frequency, duration, and routes of potential human exposure to site-related COPCs. The assessment considers both potential risk to current and potential future site uses, and considers a range of possible exposure scenarios. The current site use is commercial, and the potential risk is to commercial workers and trench workers. The potential future site use is residential, and the potential risk in that scenario would be to residents.

Potential receptor groups are identified in the exposure assessment and estimates of exposure or chemical intake are calculated based on assumptions regarding exposure pathways and exposure parameters. The exposure assessment focuses on the COCs detected in soil, soil gas, groundwater, and indoor air at the site. The primary routes of potential human exposure include incidental ingestion, dermal contact, inhalation of fugitive dust, and inhalation of vapors in indoor and outdoor air. These routes of exposure are identified in the CSM for the Del Amo Site, in Section 4.1 of the 2006 BRA. The CSM for the Del Amo Site, illustrated in Figure 5-1, shows all potentially complete exposure pathways for human exposures.

Both central tendency (CT) and reasonable maximum exposure (RME) estimates were developed for the exposure scenarios.[4] The RME estimates used reasonable conservative modeling assumptions (those which tend to overestimate exposure point concentrations) and upper bound (or high) default values for most exposure parameters. The intent of the RME scenario is to focus the assessment on a conservative exposure that is the maximum exposure that is reasonably expected to occur (EPA, 1989). Because of the multiple conservative assumptions used in the risk assessment process, the RME is often an over-estimate of exposure and risk.

As depicted in the CSM, the exposure pathways for the site under current and future land use conditions considered in this risk assessment are presented in Table 7-2.

[4] The central tendency (CT) and reasonable maximum exposure (RME) were both developed for comparison purposes. The RME is the standard exposure utilized per EPA risk assessment guidance.

Exposure parameter values were selected based on values presented in the following EPA guidance documents: *Supplemental Guidance: Standard Default Exposure Factors* (1991); *Dermal Exposure Assessment: Principles and Applications* (1992 and 2000a); *Supplemental Guidance for Dermal Risk Assessment* (2004), *Superfund's Standard Default Exposure Factors for The Central Tendency and Reasonable Maximum Exposure* (1993a); and *Exposure Factors Handbook* (1997b). Several exposure parameters are briefly discussed below.

Commercial workers were assumed to be exposed to COPCs for 8 hours per day, 250 days per year (5 days per week for 50 weeks, accounting for a 2-week vacation) for 25 years for the RME scenario (EPA, 1991). The exposure duration was assumed to be 6.6 years for the CT exposure scenario, consistent with the average time a person works at one location (EPA, 1997b).

A trench worker (construction worker) exposure scenario was evaluated but did not result in any risk exceeding action levels.

Hypothetical future residents were assumed, for the RME scenario, to be exposed to COPCs 350 days per year (allowing 15 days per year for vacations and holidays) for 24 years for adults, and 6 years for children (EPA, 1991). For the CT residential scenario, the exposure duration was assumed to be 7 years for adults and 2 years for children, consistent with the average residence time of 9 years at one location (EPA, 1993a). The division between the child and adult exposure duration for the CT scenario is based on the assumptions used for the RME scenario, where an individual is assumed to be a child for 20 percent of the time (6 years) and an adult for 80 percent of the time (24 years) for a 30-year exposure. Therefore, for a 9-year CT exposure duration, this equates to 2 years as a child and 7 years as an adult. An average time of 25,550 days, based on lifetime exposure duration of 70 years, was used to model exposure to carcinogens. An average time equal to the exposure duration (in years) multiplied by 365 days per year was used to model exposures to non-cancer COPCs (EPA, 1989).

Toxicity Assessment

Toxicity assessment characterizes the relationship between the magnitude of an exposure and the nature and magnitude of resulting adverse health effects. Adverse health effects are classified as carcinogenic and non-carcinogenic. For carcinogenic effects, it is assumed that any amount of exposure has the possibility of causing cancer, however small. For non-carcinogens it is believed that there is a threshold dose above which the toxic endpoint results.

TABLE 7-1: COPCs Contributing to Majority of Risk and Hazard, Commercial Worker Exposure Scenario

Parcel	EAPC No.	Exposure Media	Exposure Pathway of Concern	Commercial Exposure Scenario							
				COPC Cancer Risk Drivers (1)	**Data Type**	**EPC (mg/kg)**	**Model Type**	**Chemical-Specific Cancer Risk**	**Total Cancer Risk**	**Chemical-Specific Non-cancer HI**	**Total Non-cancer Hazard**
7351-031-020	2	Outdoor Surface Soil	Ingestion/Dermal	Benzo(a)pyrene	Max	0.7600	--	5.9E-06	**7E-06**	*	*
			Inhalation	*	*	--	--	*		*	
		Outdoor Shallow Soil	Ingestion/Dermal	Arsenic	UCL	10.8	--	6.8E-06	**1E-04**	*	*
				Benzo(a)anthracene	UCL	2.47	--	1.9E-06			
				Benzo(a)pyrene	Max	13	--	1.0E-04			
				Benzo(b)fluoranthene	Max	10	--	7.8E-06			
				Benzo(k)fluoranthene	UCL	4.82	--	3.8E-06			
				Indeno(1,2,3-cd)pyrene	Max	19	--	1.5E-05			
			Inhalation	*	*	--	--	*		*	
		Indoor Air - Modeled	Inhalation	*	*	--	*	*	*	*	*
7351-033-022	6	Outdoor Shallow Soil	Ingestion/Dermal	*	*	--	--	*	**3E-06**	*	*
			Inhalation	Benzene	UCL	3.29	--	3.2E-06		*	
		Indoor Air - Modeled	Inhalation	Benzene	UCL	3.29	Tier 2	3.7E-06	**4E-06**	*	*
7351-033-034	11	Outdoor Surface Soil	Ingestion/Dermal	Arsenic	Max	14	--	8.8E-06	**9E-06**	*	*
			Inhalation	*	*	--	--	*		*	
		Outdoor Shallow Soil	Ingestion/Dermal	Arsenic	Max	14	--	8.8E-06	**2E-05**	*	*
			Inhalation	Benzene	UCL	6.27	--	6.1E-06		*	
		Indoor Air - Modeled	Inhalation	Benzene	UCL	6.27	Tier 2	7.0E-06	**7E-06**	*	*

TABLE 7-1: COPCs Contributing to Majority of Risk and Hazard, Commercial Worker Exposure Scenario

Parcel	EAPC No.	Exposure Media	Exposure Pathway of Concern	Commercial Exposure Scenario							
				COPC Cancer Risk Drivers (1)	Data Type	EPC (mg/kg)	Model Type	Chemical-Specific Cancer Risk	Total Cancer Risk	Chemical-Specific Non-cancer HI	Total Non-cancer Hazard
7351-34-15,-50,-56	16	Outdoor Shallow Soil	Ingestion/Dermal	Cadmium	UCL	14	--	--	**3E-06**	0.01	**0.1**
				Manganese	UCL	560	--	--		0.004	
				4,4'-DDD	UCL	1.2	--	1.2E-07		--	
				4,4'-DDE	UCL	0.0906	--	1.3E-08		--	
				4,4'-DDT	UCL	7.4	--	1.1E-06		0.02	
				Aroclor 1260	UCL	0.0672	--	2.3E-07		--	
				Benzo(a)pyrene	UCL/dl	7.43	--	1.8E-07		--	
				Dibenzo(a,h)anthracene	UCL/dl	14.7	--	1.8E-08		--	
				N-Nitrosodiphenylamine	UCL	280	--	1.5E-06		0.02	
				Benzene	UCL/dl	11.2	--	4.2E-09		0.00003	
				Ethylbenzene	UCL	703	--	--		0.01	
				Styrene	UCL	786	--	--		0.01	
				Tetrachloroethene	UCL/dl	11.2	--	1.1E-07		0.0001	
				Trichloroethene	UCL/dl	11.3	--	7.8E-09		0.0003	
			Inhalation	Cadmium	UCL	14	--	1.7E-08		0.0005	
				Manganese	UCL	560	--	--		0.002	
				4,4'-DDD	UCL	1.2	--	2.3E-11		--	
				4,4'-DDE	UCL	0.0906	--	2.4E-12		--	
				4,4'-DDT	UCL	7.4	--	2.0E-10		--	
				Aroclor 1260	UCL	0.0672	--	1.1E-11		--	
				Benzo(a)pyrene	UCL/dl	7.43	--	7.2E-12		--	
				Dibenzo(a,h)anthracene	UCL/dl	14.7	--	2.2E-12		--	

TABLE 7-1: COPCs Contributing to Majority of Risk and Hazard, Commercial Worker Exposure Scenario

Parcel	EAPC No.	Exposure Media	Exposure Pathway of Concern	Commercial Exposure Scenario							
				COPC Cancer Risk Drivers (1)	Data Type	EPC (mg/kg)	Model Type	Chemical-Specific Cancer Risk	Total Cancer Risk	Chemical-Specific Non-cancer HI	Total Non-cancer Hazard
				N-Nitrosodiphenylamine	UCL	280	--	2.0E-10		--	
				Benzene	UCL/dl	11.2	--	7.1E-08		0.0001	
				Ethylbenzene	UCL	703	--	--		0.02	
				Styrene	UCL	786	--	--		0.02	
				Tetrachloroethene	UCL/dl	11.2	--	7.7E-08		0.001	
				Trichloroethene	UCL/dl	11.3	--	6.0E-08		0.0001	
		Indoor Air - Modeled	Inhalation of Shallow Soil Vapors	1,2,4-Trimethylbenzene	UCL/dl	2.42	Tier 1	--	**9E-06**	0.0003	**0.3**
				1,3,5-Trimethylbenzene	UCL/dl	0.3350	Tier 1	--		0.00003	
				4-Ethyl Toluene	UCL/dl	2.23	Tier 1	--		0.000004	
				Acetone	UCL/dl	519	Tier 1	--		0.00001	
				Benzene	UCL/dl	11.2	Tier 2	8.1E-08		0.0001	
				Chloroform	UCL/dl	15.6	Tier 1	6.7E-08		0.0001	
				Ethylbenzene	UCL	703	Tier 2	--		0.01	
				Naphthalene	UCL	0.1430	Tier 1	--		0.0002	
				Styrene	UCL	786	Tier 1	--		0.2	
				Tetrachloroethene	UCL/dl	11.2	Tier 1	5.5E-06		0.07	
				Toluene	UCL/dl	11.2	Tier 2	--		0.0001	
				Trichloroethene	UCL/dl	11.3	Tier 1	3.4E-06		0.008	
				Xylenes	UCL/dl	32.4	Tier 2	--		0.0000001	
			Inhalation of Deep Soil Vapors	1,1,1-Trichloroethane	UCL/dl	0.0500	Tier 1	--	**7E-07**	0.00002	**0.004**
				1,1-Dichloroethene	UCL/dl	0.0500	Tier 1	--		0.002	
				Benzene	UCL	6.9	Tier 2	6.5E-07		0.001	

TABLE 7-1: COPCs Contributing to Majority of Risk and Hazard, Commercial Worker Exposure Scenario

Parcel	EAPC No.	Exposure Media	Exposure Pathway of Concern	Commercial Exposure Scenario							
				COPC Cancer Risk Drivers (1)	**Data Type**	**EPC (mg/kg)**	**Model Type**	**Chemical-Specific Cancer Risk**	**Total Cancer Risk**	**Chemical-Specific Non-cancer HI**	**Total Non-cancer Hazard**
				Ethylbenzene	UCL	0.6110	Tier 2	--		0.000001	
				Tetrachloroethene	UCL/dl	0.0500	Tier 1	1.5E-08		0.0002	
				Trichloroethene	UCL/dl	0.0500	Tier 1	1.7E-08		0.00004	
7351-34-57	23	Outdoor Shallow Soil	Ingestion/Dermal	Benzene	UCL	13.5	--	7.8E-07	**1E-05**	0.005	**0.05**
				Ethylbenzene	UCL	577	--	--		0.009	
				Tetrachloroethene	UCL/dl	2.78	--	2.3E-08		0.00001	
				Trichloroethene	UCL/dl	2.76	--	9.0E-12		0.0000003	
			Inhalation	Benzene	UCL	13.5	--	1.3E-05		0.02	
				Ethylbenzene	UCL	577	--	--		0.01	
				Tetrachloroethene	UCL/dl	2.78	--	1.6E-08		0.0002	
				Trichloroethene	UCL/dl	2.76	--	6.9E-11		0.0000002	
		Indoor Air - Modeled	Inhalation of Shallow Soil Vapors	1,1,1-Trichloroethane	UCL/dl	2.76	Tier 1	--	**2E-05**	0.00001	**0.05**

TABLE 7-2: Exposure Pathways

Receptor	Exposure Media	Exposure Route
Commercial worker	Surface soil	Incidental ingestion Dermal contact Fugitive dust Inhalation
	Shallow soil/soil gas	Incidental ingestion Dermal contact Fugitive dust and vapor inhalation Vapor inhalation in indoor air
	Deep soil/soil gas	Vapor inhalation in indoor air
	Groundwater (water table only)	Vapor inhalation in indoor air
	Indoor air	Vapor inhalation in indoor air
Hypothetical future resident	Shallow soil/soil gas	Incidental ingestion Dermal contact Fugitive dust and vapor inhalation Vapor inhalation in indoor air
	Deep soil/soil gas	Vapor inhalation in indoor air
	Groundwater (water table only)	Vapor inhalation in indoor air
Trench worker	Shallow soil/soil gas	Incidental ingestion Dermal contact Fugitive dust inhalation

The toxicity assessment for the Soil and NAPL OU was presented in the BRA. Appendix G of the BRA presents detailed discussions of the toxicity of the primary risk-driving COCs. The eight chemicals that contributed significantly to estimates of cancer risk or non-cancer hazard are arsenic, benzene, chloroform, carcinogenic PAHs, 1,2-DCE, methylene chloride, PCE, and TCE. Tables 7-3 and 7-4 present the cancer slope factors (CSFs) available for the carcinogenic COCs that contributed significantly to the risk. When available, California Environmental Protection Agency CSFs were also identified. Tables 7-5 and 7-6 present the non-cancer toxicity criteria for the risk-drivers, as well as the associated uncertainty factors used in their derivation.

Risk Characterization

Risk characterization integrates the results of the toxicity assessment and the exposure assessment to estimate potential carcinogenic risks and adverse non-carcinogenic health effects associated with exposure to chemicals detected at the site. This integration provides quantitative estimates of risk and non-cancer hazard that are then compared to acceptable standards.

Excess cancer risk is estimated by multiplying the lifetime average daily dose (LADD) by the chemical carcinogenic toxicity criteria or CSF. The equation used to estimate the excess cancer risk is:

Excess Cancer Risk = LADD x CSF

Chemical-specific hazard quotients are estimated by calculating the ratio of the average daily dose (ADD) to the corresponding chronic reference dose (RfD) for non-carcinogenic effects. The equation used to estimate the hazard quotient is:

Hazard Quotient = ADD/RfD

The hazard quotients are then summed to form a hazard index (HI), which is compared to an acceptable hazard level. HIs less than the benchmark HI of 1 indicate that no adverse health effects are expected.

The maximum acceptable cancer risk level ranges between 1E-06 and 1E-04 and is selected on a case-by-case basis by EPA. These values correspond to lifetime incremental cancer risks between 1 in 1 million (1E-06) and 100 in 1 million (1E-04). Non-cancer health hazards due to chemical exposures are evaluated by comparisons of the calculated (HI) to the benchmark HI of 1.

A situation arose for some EAPCs whereby elevated laboratory detection limits drove the risk. Typically, when a laboratory sample was non-detect, it was assigned a value for the risk assessment equal to one half of the detection limit (½*DL) for that analyte. At the EAPCs in question, the ½*DL value was greater than the maximum observed concentration of the analyte at the site overall, leading to substantial overestimation of risk. Therefore, the risk estimates were recalculated. The recalculation of the risk estimates was performed, in accordance with the Risk Assessment Guidance for Superfund (EPA, 2001, Part D, Chapter 5), after deleting the non-detect samples for which ½*DL > max. This situation affected EAPCs 5, 7, 16, 23, 24 and 35. The revised risk estimates are reflected in the tables presented in this section.

Potential exposures have been evaluated for the three receptor types (commercial worker, trench worker, and hypothetical future resident) for each EAPC. Table 7-8 as well as Table 7-1 present the results for the commercial worker exposure scenario.

The chemical- and pathway-specific risks for each EAPC that comprise the summary risk estimates are presented in the 2006 BRA, Appendix D and the 2010 FS, Appendix B.

7.2 Ecological Risks

The 2006 BRA was primarily focused on evaluation of potential risks to human health due to the highly developed, urban nature of the site and limited habitat for wildlife species. However, the southern margin of the site is known to provide raptor habitat, as confirmed by observations of an American kestrel (*Falco sparverius*). The 2006 BRA therefore included an Ecological Risk Assessment (ERA) that focused on evaluation of risks to the local kestrel population, based on the sightings of the individual kestrel inferred to be residing within an approximately 24-acre undeveloped area, of which approximately 15 acres are within the southern portion of the former plant site.

The ERA assumed an exposure to soils from ground surface to 1.5 feet bgs (where the kestrel was expected to find food and incidentally ingest soil), and kestrel-specific toxicity reference values (TRVs) for DDT metabolites. The ERA concluded that although adverse effects to an individual kestrel may occur from exposure to pesticides in surface soils from the on-site habitat, effects to the population are expected to be negligible. The overall approach was conservative, and the ERA indicated that using more site-specific assumptions would likely demonstrate a low potential for adverse effects to populations, and possibly even to individual kestrels.

TABLE 7-3
CANCER TOXICITY DATA - ORAL/DERMAL
Baseline Risk Assessment
Del Amo Site

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Metals							
Arsenic	1.5E+00	100%	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	CalEPA 2004	10/2004
Pesticides/PCBs							
4,4'-DDD	2.4E-01	100%	2.4E-01	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
4,4'-DDE	3.4E-01	100%	3.4E-01	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
4,4'-DDT	3.4E-01	100%	3.4E-01	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
Aroclor 1260	5.0E+00	100%	5.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
SVOCs							
Benzo(a)anthracene	1.2E+00	100%	1.2E+00	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
Benzo(a)pyrene	1.2E+01	100%	1.2E+01	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
Benzo(b)fluoranthene	1.2E+00	100%	1.2E+00	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
Benzo(k)fluoranthene	1.2E+00	100%	1.2E+00	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
Dibenzo(a,h)anthracene	4.1E+00	100%	4.1E+00	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
Indeno(1,2,3-cd)pyrene	1.2E+00	100%	1.2E+00	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
N-Nitrosodiphenylamine	9.0E-03	100%	9.0E-03	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
VOCs							
Benzene	1.0E-01	100%	1.0E-01	$(mg/kg\text{-}day)^{-1}$	A	CalEPA 2004	10/2004
Tetrachloroethene	5.4E-01	100%	5.4E-01	$(mg/kg\text{-}day)^{-1}$	N/A	CalEPA 2004	10/2004
Trichloroethene	1.3E-02	100%	1.3E-02	$(mg/kg\text{-}day)^{-1}$	N/A	CalEPA 2004	10/2004

IRIS = Integrated Risk Information System
HEAST= Health Effects Assessment Summary Tables
N/A = Not Available

(1) Refer to RAGS, Part A. Also see text in Section 4.0.

EPA Cancer Guideline Description:
- A - Human carcinogen
- B1 - Probable human carcinogen - indicates that limited human data are available
- B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as a human carcinogen
- E - Evidence of noncarcinogenicity

Source:
California Environmental Protection Agency (Cal EPA). 2004.Toxicity Criteria Database. OEHHA.
U.S. Environmental Protection Agency (USEPA). 2004. Integrated Risk Information System (IRIS) Online Database.
U.S. Environmental Protection Agency Region IX (USEPA). 2002. Preliminary Remediation Goal (PRG) Table. October.
U.S. Environmental Protection Agency (USEPA). 1997. HEAST.

TABLE 7-4
CANCER TOXICITY DATA - INHALATION
Baseline Risk Assessment
Del Amo Site

Chemical of Potential Concern	Inhalation Unit Risk	Units	Adjustment	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Metals								
Cadmium	4.2E-03	$(ug/m^3)^{-1}$	3500	1.5E+01	$(mg/kg\text{-}day)^{-1}$	B1	CalEPA 2004	10/2004
Pesticides								
4,4'-DDD	6.9E-05	N/A	N/A	2.4E-01	N/A	B2	CalEPA 2004	10/2004
4,4'-DDE	9.7E-05	N/A	N/A	3.4E-01	N/A	B2	CalEPA 2004	10/2004
4,4'-DDT	9.7E-05	$(ug/m^3)^{-1}$	3500	3.4E-01	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
Aroclor 1260	5.7E-04	$(ug/m^3)^{-1}$	3500	2.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
SVOCs								
Benzo(a)pyrene	1.1E-03	$(ug/m^3)^{-1}$	3500	3.9E+00	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
Dibenzo(a,h)anthracene	1.2E-03	$(ug/m^3)^{-1}$	3500	4.1E+00	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
N-Nitrosodiphenylamine	2.6E-06	$(ug/m^3)^{-1}$	3500	9.0E-03	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
VOCs								
1,2-Dichloroethane	2.1E-05	$(ug/m^3)^{-1}$	3500	7.2E-02	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
Benzene	2.9E-05	$(ug/m^3)^{-1}$	3500	1.0E-01	$(mg/kg\text{-}day)^{-1}$	A	CalEPA 2004	10/2004
Chloroform	5.3E-06	$(ug/m^3)^{-1}$	3500	1.9E-02	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA 2004	10/2004
Tetrachloroethene	5.9E-06	$(ug/m^3)^{-1}$	3500	2.1E-02	$(mg/kg\text{-}day)^{-1}$	N/A	CalEPA 2004	10/2004
Trichloroethene	2.0E-06	$(ug/m^3)^{-1}$	3500	7.0E-03	$(mg/kg\text{-}day)^{-1}$	N/A	CalEPA 2004	10/2004

IRIS = Integrated Risk Information System
HEAST= Health Effects Assessment Summary Tables
N/A = Not Available

EPA Cancer Guideline Description:
- A - Human carcinogen
- B1 - Probable human carcinogen - indicates that limited human data are available
- B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
- C - Possible human carcinogen
- D - Not classifiable as a human carcinogen
- E - Evidence of noncarcinogenicity

Source:
California Environmental Protection Agency (Cal EPA). 2004.Toxicity Criteria Database. OEHHA.
U.S. Environmental Protection Agency (USEPA). 2004. Integrated Risk Information System (IRIS) Online Database.
U.S. Environmental Protection Agency Region IX (USEPA). 2002. Preliminary Remediation Goal (PRG) Table. October.

TABLE 7-5
NONCANCER TOXICITY DATA - ORAL/DERMAL
Baseline Risk Assessment
Del Amo Site

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD	Date
Metals										
Cadmium	chronic	1.0E-03	mg/kg-d	100%	1.0E-03	mg/kg-d	Kidney	10	IRIS	10/2004
Manganese	chronic	1.4E-01	mg/kg-d	100%	1.4E-01	mg/kg-d	CNS	1	IRIS	10/2004
Pesticides										
4,4'-DDT	chronic	5.0E-04	mg/kg-d	100%	5.0E-04	mg/kg-d	Liver	100	IRIS	10/2004
SVOCs										
Benzo(a)pyrene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N-Nitrosodiphenylamine	chronic	2.0E-02	mg/kg-d	100%	2.0E-02	mg/kg-d	N/A	N/A	NCEA	04/2003
VOCs										
Benzene	chronic	4.0E-03	mg/kg-d	100%	4.0E-03	mg/kg-d	Blood	300	IRIS	10/2004
Ethylbenzene	chronic	1.0E-01	mg/kg-d	100%	1.0E-01	mg/kg-d	Liver/Kidney	1000	IRIS	10/2004
Styrene	chronic	2.0E-01	mg/kg-d	100%	2.0E-01	mg/kg-d	Blood/Liver	1000	IRIS	10/2004
Tetrachloroethene	chronic	1.0E-02	mg/kg-d	100%	1.0E-02	mg/kg-d	Liver	1000	IRIS	10/2004
Trichloroethene	chronic	6.0E-03	mg/kg-d	100%	6.0E-03	mg/kg-d	Liver	N/A	USEPA 1999	10/01/99

Notes:
N/A = Not Available; RE = route extrapolation; NOAEL = No Observed Adverse Effect Level
(1) Refer to RAGS, Part A. Also see text in Section 4.0.

Source:
California Environmental Protection Agency (CalEPA). 2004.Toxicity Criteria Database. OEHHA.
NCEA: National Center for Environmental Assessment as referenced in USEPA, 2002.
U.S. Environmental Protection Agency (USEPA). 2004. Integrated Risk Information System (IRIS) Online Database.
U.S. Environmental Protection Agency Region IX (USEPA). 2002. Preliminary Remediation Goal (PRG) Table. October.
U.S. Environmental Protection Agency (USEPA). 1997. HEAST

TABLE 7-6
NONCANCER TOXICITY DATA - INHALATION
Baseline Risk Assessment
Del Amo Site

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC or REL Value	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfC:RfD	Date
Metals									
Cadmium	chronic	2.0E-05	mg/m^3	5.7E-06	mg/kg-d	Kidney	N/A	REL: CalEPA 2004	10/2004
Manganese	chronic	2.0E-04	mg/m^3	5.7E-05	mg/kg-d	CNS	N/A	REL: CalEPA 2004	10/2004
VOCs									
1,1,1-Trichloroethane	chronic	1.0E+00	mg/m^3	2.9E-01	mg/kg-d	Nervous System	N/A	REL: CalEPA 2004	10/2004
1,1-Dichloroethene	chronic	7.0E-02	mg/m^3	2.0E-02	mg/kg-d	Liver	N/A	REL: CalEPA 2004	10/2004
1,2,4-Trimethylbenzene	chronic	6.0E-03	mg/m^3	1.7E-03	mg/kg-d	CNS	3000	NCEA:USEPA 2002	10/2002
1,2-Dichloroethane	chronic	4.0E-01	mg/m^3	1.1E-01	mg/kg-d	Liver	N/A	REL: CalEPA 2004	10/2004
1,3,5-Trimethylbenzene	chronic	6.0E-03	mg/m^3	1.7E-03	mg/kg-d	CNS	3000	NCEA:USEPA 2002	10/2002
4-Ethyl Toluene (as xylenes)	chronic	7.0E-01	mg/m^3	2.0E-01	mg/kg-d	CNS	N/A	REL: CalEPA 2004	10/2004
Acetone	chronic	3.2E+00	mg/m^3	9.0E-01	mg/kg-d	Kidney	1000	IRIS:RE	10/2004
Benzene	chronic	6.0E-02	mg/m^3	1.7E-02	mg/kg-d	Blood	N/A	REL: CalEPA 2004	10/2004
sec-Butylbenzene	chronic	1.4E-01	mg/m^3	4.0E-02	mg/kg-d	Liver/Kidney	10000	NCEA:USEPA 2002/RE	10/2002
Chloroform	chronic	3.0E-01	mg/m^3	8.6E-02	mg/kg-d	Kidney	N/A	REL: CalEPA 2004	10/2004
Ethylbenzene	chronic	2.0E+00	mg/m^3	5.7E-01	mg/kg-d	Developmental	N/A	REL: CalEPA 2004	10/2004
Isopropylbenzene (cumene)	chronic	3.9E-01	mg/m^3	1.1E-01	mg/kg-d	Kidney	N/A	IRIS	10/2004
Naphthalene	chronic	9.0E-03	mg/m^3	2.6E-03	mg/kg-d	Nasal Effects	N/A	REL: CalEPA 2004	10/2004
n-Propylbenzene	chronic	1.4E-01	mg/m^3	4.0E-02	mg/kg-d	N/A	N/A	NCEA:USEPA 2002/RE	10/2002
Styrene	chronic	9.0E-01	mg/m^3	2.6E-01	mg/kg-d	CNS	N/A	REL: CalEPA 2004	10/2004
Tetrachloroethene	chronic	3.5E-02	mg/m^3	1.0E-02	mg/kg-d	Liver/Kidney	N/A	REL: CalEPA 2004	10/2004
Toluene	chronic	3.0E-01	mg/m^3	8.6E-02	mg/kg-d	CNS	N/A	REL: CalEPA 2004	10/2004
Trichloroethene	chronic	6.0E-01	mg/m^3	1.7E-01	mg/kg-d	CNS	N/A	REL: CalEPA 2004	10/2004
Xylenes	chronic	7.0E-01	mg/m^3	2.0E-01	mg/kg-d	CNS	N/A	REL: CalEPA 2004	10/2004

Notes:
N/A = Not Available; RE = route extrapolation; REL = Reference Exposure Level
(1) Adjustment made to RfC or REL: Inhalation RfD = (RfC or REL) x (20 m3/day) x (1/70 kg)

Source:
California Environmental Protection Agency (CalEPA). 2004.Toxicity Criteria Database. OEHHA.
NCEA: National Center for Environmental Assessment as referenced in USEPA, 2002.
U.S. Environmental Protection Agency (USEPA). 2004. Integrated Risk Information System (IRIS) Online Database.
U.S. Environmental Protection Agency Region IX (USEPA). 2002. Preliminary Remediation Goal (PRG) Table. October.
U.S. Environmental Protection Agency (USEPA). 1997. HEAST.

TABLE 7-7: Risk and Hazard Index Summary by Receptor and Pathway

Receptor	Pathway	EAPCs in Risk / Hazard Index Groups Using Reasonable Maximum Exposures		
		Risk ≤ 10^{-6} and HI ≤ 1	10^{-6} < Risk ≤ 10^{-4} and HI ≤ 1	Risk >10^{-4} and/or HI >1
Commercial Worker	Outdoor Soil	1, 5, 8, 9, 10, 14, 17, 18, 19, 20, 21, 22, 24, 25, 26, 27, 31, 37 (18 of 37)	2, 3, 4, 6, 7, 11, 12, 13, 15, 16, 23, 28, 29, 30, 32, 33, 34, 35, 36 (19 of 37)	(0 of 37)
	Indoor Air (Tier 1/Tier 2 Modeling)	1, 2, 3, 4*, 8, 9, 10, 12, 13, 14, 17, 18, 19, 21, 22, 25*, 26, 27*, 28, 29, 30, 31, 32, 36, 37 (25 of 37)	5, 6, 7, 11, 15**, 16, 20*, 23, 24, 33*, 34*, 35 (12 of 37)	(0 of 37)
Future Hypothetical Resident	Outdoor Soil	1, 18, 19, 20, 21, 22, 25, 26, 27, 31, 37 (11 of 37)	3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 15, 17, 24, 30, 32, 33, 35, 36 (18 of 37)	2, 10, 14, 16, 23, 28, 29, 34 (8 of 37)
	Indoor Air (Tier 1/Tier 2 Modeling)	1, 2, 3, 4*, 10, 12, 13, 14, 18, 21, 26, 29, 30, 31*, 32, 36, 37 (17 of 37)	8, 9, 11, 17,19, 20*, 22, 25*, 27*, 33*, 34* (11 of 37)	5, 6, 7, 15**, 16, 23, 24, 28, 35 (9 of 37)
Trench Worker	Outdoor Soil	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37 (35 of 37)	16, 23 (2 of 37)	(0 of 37)

Note:
Risk/hazard groups based on modeling of shallow soil/soil gas except as indicated otherwise
*The indoor air risk/hazard value for this EAPC is based on modeling of groundwater data
** The indoor air risk/hazard value for this EAPC is based on modeling of deep soil data

TABLE 7-8: Cumulative Risk and Hazard, Commercial Worker Exposure Scenario

Parcel	EAPC No.	Exposure Media	Commercial Exposure Scenario			
			RME		CT	
			Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
7351-031-020	2	Outdoor Surface Soil	7E-06	--	2E-07	--
		Outdoor Shallow Soil	1E-04	0.06	1E-06	0.02
		Indoor Air/Tier 1 - Shallow	3E-08	0.00005	4E-09	0.00003
		Indoor Air/Tier 1 - Deep	--	--	--	--
		Indoor Air/Tiers 1&2 - Groundwater	7E-09	0.00005	--	--
		Indoor Air - Workplace	8E-05	0.9	1E-05	0.3
7351-033-022	6	Outdoor Surface Soil	--	--	--	--
		Outdoor Shallow Soil	3E-06	0.007	2E-07	0.001
		Indoor Air/Tier 1 - Shallow	2E-04	0.3	1E-05	0.07
		Indoor Air/Tier 1 - Deep	5E-05	0.2	3E-06	0.03
		Indoor Air/Tiers 1&2 - Shallow	4E-06	0.006	2E-07	0.001
		Indoor Air/Tiers 1&2 - Deep	2E-07	0.0007	1E-08	0.0001
		Indoor Air - Workplace	--	--	--	--
7351-033-034	11	Outdoor Surface Soil	9E-06	0.06	6E-07	0.02
		Outdoor Shallow Soil	2E-05	0.07	9E-07	0.02
		Indoor Air/Tier 1 - Shallow	4E-04	0.7	2E-05	0.1
		Indoor Air/Tier 1 - Deep	--	--	--	--
		Indoor Air/Tiers 1&2 - Shallow	7E-06	0.01	3E-07	0.002
		Indoor Air/Tiers 1&2 - Deep	--	--	--	--
		Indoor Air - Workplace	--	--	--	--
7351-034-015, -050,-056	16	Outdoor Surface Soil	--	--	--	--
		Outdoor Shallow Soil	3E-06	0.1	2E-06	0.02
		Indoor Air/Tier 1 - Shallow	1E-05	0.6	4E-05	0.8
		Indoor Air/Tier 1 - Deep	2E-04	0.3	7E-06	0.04
		Indoor Air/Tiers 1&2 - Shallow	9E-06	0.3	2E-05	0.5
		Indoor Air/Tiers 1&2 - Deep	7E-07	0.004	5E-08	0.004
		Indoor Air - Workplace	5E-05	0.3	6E-06	0.1
7351-034-057	23	Outdoor Surface Soil	--	--	--	--
		Outdoor Shallow Soil	1E-05	0.05	6E-07	0.008
		Indoor Air/Tier 1 - Shallow	9E-04	2	4E-05	0.4
		Indoor Air/Tier 1 - Deep	2E-03	4	2E-04	1
		Indoor Air/Tiers 1&2 - Shallow	2E-05	0.05	4E-06	0.1
		Indoor Air/Tiers 1&2 - Deep	9E-06	0.01	7E-07	0.004
		Indoor Air - Workplace	8E-05	0.1	2E-05	0.1

TABLE 7-8: Cumulative Risk and Hazard, Commercial Worker Exposure Scenario

Parcel	EAPC No.	Exposure Media	Commercial Exposure Scenario			
			RME		CT	
			Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
7351-034-069	28	Outdoor Surface Soil	--	--	--	--
		Outdoor Shallow Soil	8E-06	0.2	1E-07	0.05
		Indoor Air/Tier 1 - Shallow	2E-06	0.07	1E-07	0.01
		Indoor Air/Tier 1 - Deep	--	--	--	--
		Indoor Air/Tiers 1&2 - Shallow	4E-07	0.06	--	--
		Indoor Air/Tiers 1&2 - Deep	--	--	--	--
		Indoor Air - Workplace	1E-04	1	1E-05	0.4
Magellan Drive	35	Outdoor Surface Soil	--	--	--	--
		Outdoor Shallow Soil	3E-05	0.003	2E-07	0.0004
		Indoor Air/Tier 1 - Shallow	1E-04	0.3	4E-06	0.07
		Indoor Air/Tier 1 - Deep	2E-04	0.3	3E-05	0.2
		Indoor Air/Tiers 1&2 - Shallow	2E-06	0.007	3E-07	0.03
		Indoor Air/Tiers 1&2 - Deep	6E-07	0.0009	1E-07	0.0006
		Indoor Air/Tiers 1&2 - Groundwater	2E-07	0.0008	--	--
		Indoor Air - Workplace	--	--	--	--

Notes:

1 RME = Reasonable Maximum Exposure

2 CT = Central Tendency

3 " -- " not applicable; no COPCs selected for specified medium

4 Surface soil (0 to 1' bgs); Shallow soil (0 to 15' bgs)

5 "Outdoor" Soil Pathway includes Incidental Soil Ingestion, Dermal Contact, and Outdoor Air Inhalation of particulate/VOCs

6 "Indoor Air/Tier 1" estimated risk from exposure to indoor air concentrations (IACs) predicted using Tier 1 analysis. 'Shallow' indicates modeling using shallow soil data, and 'deep' indicates deep soil data was used.

7 "Indoor Air/Tiers 1&2" estimated risk from exposure to IACs of Tier 1 non-BTEX VOCs and Tier 2 BTEX results (if Tier 1 risk or hazard ≥ 10-6 or 1)

8 "Indoor Air - Workplace" estimated risk from exposures to measured indoor air concentrations from the Workplace Air Monitoring Study

TABLE 7-9: EAPCS Exceeding Hypothetical Residential Risk

Parcel	EAPC No.	Exposure Media	Exposure Pathway of Concern	Residential Exposure Scenario		Cancer Risk > 1E-06 or Non-cancer Hazard HI >1
				Total Cancer Risk	Total Non-cancer Hazard	
7351-031-018	1	Outdoor Shallow Soil	Ingestion/Dermal	*	**2E-01**	
			Inhalation	*		
		Indoor Air - Modeled	Inhalation	*	*	
7351-031-020	2	Outdoor Shallow Soil	Ingestion/Dermal	**5E-04**	**1E+00**	**X**
		Indoor Air - Modeled	Inhalation	*	*	
7351-031-031	3	Outdoor Shallow Soil	Ingestion/Dermal	**4E-05**	**7E-01**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	*	**1E-01**	
7351-031-007	4	Outdoor Shallow Soil	Ingestion/Dermal	**1E-05**	*	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	--	--	
7351-033-017	5	Outdoor Shallow Soil	Ingestion/Dermal	**2E-05**	**3E-01**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	**4E-05**	**9E+00**	
7351-033-022	6	Outdoor Shallow Soil	Ingestion/Dermal	**8E-05**	**3E-01**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	**2E-04**	**5E-01**	
7351-033-024	7	Outdoor Shallow Soil	Ingestion/Dermal	**7E-05**	**1E+00**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	**2E-05**	**3E+01**	
7351-033-026	8	Outdoor Shallow Soil	Ingestion/Dermal	**2E-06**	*	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	**6E-06**	*	
7351-033-026	9	Outdoor Shallow Soil	Ingestion/Dermal	**1E-05**	*	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	**3E-05**	*	
7351-033-030	10	Outdoor Shallow Soil	Ingestion/Dermal	*	**3E+00**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	*	*	
7351-033-034	11	Outdoor Shallow Soil	Ingestion/Dermal	**8E-05**	**9E-01**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	**1E-04**	**3E-01**	
7351-033-040	12	Outdoor Shallow Soil	Ingestion/Dermal	**4E-05**	**7E-01**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	*	*	

TABLE 7-9: EAPCS Exceeding Hypothetical Residential Risk

Parcel	EAPC No.	Exposure Media	Exposure Pathway of Concern	Residential Exposure Scenario: Total Cancer Risk	Residential Exposure Scenario: Total Non-cancer Hazard	Cancer Risk > 1E-06 or Non-cancer Hazard HI >1
7351-033-045	13	Outdoor Shallow Soil	Ingestion/Dermal Inhalation	**5E-05**	**1E+00**	**X**
		Indoor Air - Modeled	Inhalation	*	*	
7351-033-009	14	Outdoor Shallow Soil	Ingestion/Dermal Inhalation	*	**1E+01**	**X**
		Indoor Air - Modeled	Inhalation	*	*	
7351-033-900	15	Outdoor Shallow Soil	Ingestion/Dermal Inhalation	**1E-05**	*	**X**
		Indoor Air - Modeled	Inhalation	**5E-04**	**1E+00**	
7351-034-015, -050,-056	16	Outdoor Shallow Soil	Ingestion/Dermal Inhalation	**2E-05**	**6E+00**	**X**
		Indoor Air - Modeled	Inhalation of Shallow Soil Vapors	**4E-04**	**1E+01**	
			Inhalation of Deep Soil Vapors	**8E-06**	**5E-02**	
7351-034-039	17	Outdoor Shallow Soil	Ingestion/Dermal Inhalation	**4E-06**	*	**X**
		Indoor Air - Modeled	Inhalation	**2E-05**	**9E-02**	
7351-034-041	18	Outdoor Shallow Soil	--	--	--	
		Indoor Air - Modeled	Inhalation	*	*	
7351-034-043	19	Outdoor Shallow Soil	*	*	*	**X**
		Indoor Air - Modeled	Inhalation	**4E-06**	*	
7351-034-045	20	Outdoor Shallow Soil	*	*	*	**X**
		Indoor Air - Modeled	Inhalation	**2E-06**	*	
7351-034-047	21	Outdoor Shallow Soil	--	--	--	
		Indoor Air - Modeled	Inhalation	*	*	
351-034-052	22	Outdoor Shallow Soil	*	*	*	**X**
		Indoor Air - Modeled	Inhalation	**2E-06**	*	

TABLE 7-9: EAPCS Exceeding Hypothetical Residential Risk

Parcel	EAPC No.	Exposure Media	Exposure Pathway of Concern	Residential Exposure Scenario: Total Cancer Risk	Residential Exposure Scenario: Total Non-cancer Hazard	Cancer Risk > 1E-06 or Non-cancer Hazard HI >1
7351-34-57	23	Outdoor Shallow Soil	Ingestion/ Dermal	**8E-04**	**6E+00**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation of Shallow Soil Vapors	**2E-03**	**8E+00**	
			Inhalation of Deep Soil Vapors	**1E-04**	**3E-01**	
7351-034-058	24	Outdoor Shallow Soil	Ingestion/ Dermal	**1E-06**	**3E-05**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation of Shallow Soil Vapors	**2E-07**	**2E-02**	
			Inhalation of Deep Soil Vapors	**1E-03**	**4E+00**	
7351-034-066	25	Outdoor Shallow Soil	--	--	--	
		Indoor Air - Modeled	Inhalation	*	*	
7351-034-067	26	Outdoor Shallow Soil	--	--	--	
		Indoor Air - Modeled	Inhalation	*	*	
7351-034-067	27	No Applicable Media	--	--	--	
7351-034-069	28	Outdoor Shallow Soil	Ingestion/Dermal	**9E-05**	**2E+00**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	**3E-05**	**4E+00**	
7351-034-070	29	Outdoor Shallow Soil	Ingestion/Dermal	**8E-05**	**2E+00**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	*	*	
7351-034-072	30	Outdoor Shallow Soil	Ingestion/Dermal	**9E-06**	**2E-01**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	*	*	
7351-034-073	31	Outdoor Shallow Soil	--	--	--	
		Indoor Air - Modeled	Inhalation	*	*	
7351-034-076	32	Outdoor Shallow Soil	Ingestion/Dermal	**2E-05**	*	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	*	*	

TABLE 7-9: EAPCS Exceeding Hypothetical Residential Risk

Parcel	EAPC No.	Exposure Media	Exposure Pathway of Concern	Residential Exposure Scenario Total Cancer Risk	Residential Exposure Scenario Total Non-cancer Hazard	Cancer Risk > 1E-06 or Non-cancer Hazard HI >1
7351-034-803	33	Outdoor Shallow Soil	Ingestion/Dermal	**7E-06**	*	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	*	*	
7351-034-901	34	Outdoor Shallow Soil	Ingestion/Dermal	**9E-05**	**2E+00**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	*	*	
Magellan Drive	35	Outdoor Shallow Soil	Ingestion/Dermal	**1E-04**	*	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation of Shallow Soil Vapors	**4E-05**	**2E-01**	
Pacific Gateway (N)	36	Outdoor Shallow Soil	Ingestion/Dermal	**6E-06**	**3E-01**	**X**
			Inhalation			
		Indoor Air - Modeled	Inhalation	*	*	
Pacific Gateway (S)	37	Outdoor Shallow Soil	Ingestion/Dermal	*	**2E-01**	
			Inhalation			
		Indoor Air - Modeled	Inhalation	*	*	

Notes:

1 Chemicals listed have a Cancer Risk above 10^{-6}

2 Chemicals listed have a Hazard Quotient above 0.1

" -- " not applicable; no COPCs selected for specified medium; " * " Cancer Risk is below 10^{-6} or the Non-cancer Hazard is below 0.1

"Outdoor Shallow Soil" Pathway includes Incidental Ingestion, Dermal Contact, and Outdoor Air Inhalation of particulate/VOCs in soils 0 to 15' bgs

"Data Type" Maximum detected (Max) or 1/2 the detection limit (DL) used as the EPC to calculate risk/hazard

"Model Type" The risk/hazard was estimated using Tier 1 J&E analysis or the Tier 2 DLM analysis

7.3 Basis for Action

There are two bases for action at this site: (1) contaminated shallow soil and its potential threat to human receptors, and (2) contaminated deep soil and NAPL and their threat to the groundwater.

Shallow Soil

The former plant site is currently designated for commercial use and is currently occupied by 68 commercial buildings, including offices, warehouses, and manufacturing facilities.

(a) The 2006 BRA identified nine EAPCs that warrant action where exposure of workers to contaminated soil or vapors could potentially cause an excess cancer risk above 1 in 1 million or a hazard index above 1.0. These areas are EAPCs 2, 6, 11, 16, 23, 28, 29, 34 and 35. The highest potential risk for commercial workers would be from benzo(a)pyrene, which was calculated to be a 100 in 1 million excess cancer risk at its highest concentration. Remedial action is therefore warranted to address these EAPCs, which will now be referred to as "areas." Seven of the areas will be addressed in this ROD (Areas 2, 6, 11, 16, 23, 28 and 35), and two areas will be addressed in a subsequent decision document (Areas 29 and 34).

For the seven areas of shallow soil contamination being addressed in this ROD, the exposure pathway for five of them (Areas 2, 6, 11, 28 and 35) would be from outdoor soil, and for two of these areas (Areas 16 and 23), an additional potential pathway would be volatile contaminants infiltrating into the indoor air (known as soil vapor intrusion). The shallow soil in the seven areas is currently covered by concrete, asphalt, or landscaping; however, these covers could be changed in the future in such a way as to cause exposure to the contaminated soil.

(b) In the two areas with soil vapor intrusion potential, the buildings are well ventilated warehouse and industrial facilities where it is believed the workers are not currently exposed to levels of concern.

(c) In addition to the seven areas that warrant cleanup action, the risk assessment identified 19 other areas where COCs from the former rubber plant could cause an unacceptable risk to occupants if the land use changed to residential. These other areas are Areas 4, 5, 7-10, 12-15, 17, 19, 20, 22, 24, 30, 32, 33, and 36.

Due to the presence of large buildings, portions of the site beneath these buildings were not sampled. Due to the pattern of historical contamination at the site, uncertainties in the investigation and risk assessment exist. Construction activities within existing parcels are common and could uncover previously unidentified contamination. Thus, measures are warranted to monitor ongoing construction activity and take additional investigation and remedial actions if the contamination exceeds levels of concern.

Deep Soil and NAPL

Groundwater beneath the site is classified by the State of California as a potential municipal supply beneficial use, and groundwater in deep aquifers is currently used by the Water Replenishment District of Southern California to supply drinking water to as many as 3.8 million people in southern California, although the nearest extraction wells are approximately 2 miles downgradient. According to the groundwater risk assessment performed in 1997, the groundwater would pose an extreme risk if used. The principal threat of a continued source of contamination from the Del Amo Site to the groundwater is the NAPL and deep soil contamination, which continues to slowly dissolve into the groundwater. EPA considers the principal threats to the groundwater to be actionable. EPA identified 4 groundwater contamination source areas (“source areas”) that warrant remedial action. The term “source area” will be used to identify the groundwater contamination source areas (in the deep soil), whereas the term “areas” will be used to identify the shallow soil areas.

Cleanup of the groundwater plume is being addressed under the Dual Site Groundwater OU (OU3). Pursuant to the Groundwater ROD (EPA, 1999b), the objective of NAPL remedial alternatives for the Del Amo Site Soil and NAPL OU (i.e., this ROD) with respect to groundwater is not to achieve a numeric cleanup standard, but to reduce the amount of NAPL and deep soil contamination in source areas and thus minimize effects of those source areas on the surrounding groundwater. This OU1 ROD amends the OU3 ROD to address this objective.

The response action selected in this ROD is necessary to protect the public health and welfare and the environment from actual or threatened releases of hazardous substances, pollutants or contaminants into the environment which may present an imminent and substantial endangerment.

8.0 Remedial Action Objectives

The remediation objectives are to:

- Prevent human exposure through direct contact, ingestion, or inhalation of outdoor shallow soil contaminated above levels for commercial land use or construction activities.

  This objective was established to protect property users from potential exposure to contaminants in the shallow soil that exceed the established risk-based level. The current and reasonably anticipated land use is commercial activity.

  The three response actions addressing outdoor shallow soil will reduce the potential risk to acceptable levels by removal, treatment, or containment.

- Prevent inhalation of VOCs in indoor air above levels for commercial land use.

  This objective was established to protect building occupants from potential exposure to contaminants that may infiltrate from the shallow soil into buildings at levels that exceed the established risk-based level. The current and reasonably anticipated land use is commercial activity.

  The two response actions addressing indoor air will reduce the potential risk to acceptable levels by contaminant removal or control of building systems.

- Prevent utilization of impacted groundwater and groundwater in adjacent areas.

  This objective derives from the Groundwater ROD that is being amended by this ROD. The objective was established to prevent potential exposure to contaminants in the groundwater that exceed the drinking water standards.

  ICs will prohibit property owners from installing or utilizing wells above MCLs.

- Protect the groundwater outside the impacted areas by removing NAPL to limit migration to, or contact with groundwater.

  This objective also derives from the Groundwater ROD, being amended by this ROD. The objective was established to prevent the groundwater contamination sources from impacting soil and groundwater that has not been contaminated by removing NAPL and reducing the amount of free phase NAPL on the rising water which becomes trapped in the saturated zone. There is significant uncertainty regarding the lateral and vertical stability of the impacted groundwater. The NAPL has migrated laterally and dissolved phase benzene has migrated laterally and vertically.

  Removing NAPL will reduce the source of the groundwater contamination and potentially decrease the ultimate length of time it takes to achieve cleanup standards.

9.0 Description of Alternatives

In the Feasibility Study (URS, 2010), technologies were screened and a range of remedial alternatives were assembled and evaluated. These alternatives are listed below and described in detail in the following sections.

Alternative 1

- No Action

Alternative 2

- Institutional Controls (informational outreach, building permit review)
- **Future Redevelopment and Construction:** Excavation, Building Engineering Controls, Cap, or SVE

Alternative 3

- Institutional Controls (informational outreach, building permit review, General Plan footnote, restrictive covenants)
- **Shallow Outdoor Soil:** Cap VOC and non-VOC areas
- **Shallow Soil Beneath Buildings:** Building Engineering Controls
- **Groundwater Contamination Source Areas:** Soil Vapor Extraction and Hydraulic Extraction
- **Future Redevelopment and Construction Contingencies:** Excavation, Building Engineering Controls, Cap, or SVE

Alternative 4

- Institutional Controls (informational outreach, building permit review, General Plan footnote, restrictive covenants)
- **Shallow Outdoor Soil:** Cap Non-VOC areas, Soil Vapor Extraction for VOC areas
- **Shallow Soil Beneath Buildings:** Building Engineering Controls, Soil Vapor Extraction
- **Groundwater Contamination Source Areas:** Soil Vapor Extraction, In-Situ Chemical Oxidation
- **Future Redevelopment and Construction Contingencies:** Excavation, Building Engineering Controls, Cap, or SVE

Alternative 5

- Institutional Controls (informational outreach, building permit review, General Plan footnote, restrictive covenants)
- **Shallow Outdoor Soil:** Excavate both VOC and Non-VOC areas
- **Shallow Soil Beneath Buildings:** Soil Vapor Extraction
- **Groundwater Contamination Source Areas:** In-Situ Soil Heating, Soil Vapor Extraction
- **Future Redevelopment and Construction Contingencies:** Excavation, Building Engineering Controls, Cap, or SVE

The alternatives are shown on Figure 9-1). The alternatives are organized by the type of media they apply to: shallow soil outdoors, shallow soil beneath buildings, or groundwater contamination source areas. [5] Table 9-1 presents the cost, time to construct, and operational period to meet remedial action objective (RAOs).

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[5] The remedial alternatives were evaluated in the FS for individual EAPCs. For the purposes of the Proposed Plan and ROD the alternatives have been combined to apply to similar areas site-wide. Estimates of volumes, time, etc. apply to all EAPCs for a particular type of remedial action.

Future contingencies pertain to areas encountered in the future during construction activities performed by property owners or tenants where Site-related contamination exceeds EPA's risk-based levels.

TABLE 9-1: Comparison of Alternatives

Alternative	Est. Capital Cost	Est. Annual O&M Cost	Est. Present Worth Cost	Est. Construction Time Frame	Operation
Alternative 1	$0	$0	$0	--	--
Alternative 2	$375,200	$145,725	$3,886,000	1 year	--
Alternative 3	$12,438,000	$4,260,000[1]	$49,380,000	1 year	10 years
Alternative 4	$10,043,000	$7,503,000[2]	$52,504,000	1 year	3-4 years
Alternative 5	$35,830,000	$11,770,000[3]	$81,670,000	1 year	3-4 years

Notes

Discount Rate of 5% used for Net Present Worth

Net Present Worth based on 100 year implementation of ICs

1 Operations and maintenance (O&M) costs for Alt3 are $4,260,000 (year 1 to year 4), $2,220,000 (year 5 to year 10), and $380,000 (year 11 onward)

2 O&M costs for Alt4 are $7,503,000 (year 1 to year 3 or 4) and $319,000 (year 5 onward)

3 O&M costs for Alt5 are $11,770,000 (year 1 to year 3 or 4) and $150,000 (year 5 onward)

9.1 Alternative 1: No Action

Under this alternative, no action would be taken. No remediation or monitoring of contaminated media would occur, and no institutional controls would be implemented. This alternative satisfies the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requirement for inclusion of a no-action or no-further-action alternative among the options considered. Alternative 1 would neither reduce any site-related surface risk nor prevent deep soil contamination or NAPL from continuing to threaten groundwater. There would be no cost for Alternative 1. This alternative would not comply with the Applicable or Relevant and Appropriate Requirement (ARAR), particularly regarding restrictions for properties where waste is left in place above an unrestricted use/unrestricted exposure level.

9.2 Alternative 2: Institutional Controls, Future Contingencies

Institutional Control Components

The building permit review IC, which is currently active as a pilot program, would be instituted in all areas of the site. As building permit applications are reviewed by the City of Los Angeles Building and Safety Department, applicants would be referred to the site Environmental Review Team (ERT) to review construction plans and determine whether contaminated soil or groundwater would be encountered. EPA would then require additional sampling and remedial activities if needed.

The Building Permit Review IC has two components: referral and environmental review. EPA already worked with the Los Angeles Planning Department as a feasibility study pilot to place alert "flags" in its internet-accessible zoning database system, known as Zoning Information and Map Access System (ZIMAS). Flags alert City staff and applicants of special conditions or restrictions that apply to a specific parcel. EPA's flag, placed on all the parcels within the former plant property, informs the user that the parcel is located on a Superfund site and that they need to contact EPA's project team for an environmental review. Thus the applicant is referred to EPA's project team, and the environmental review is initiated.

EPA's project team, called the Environmental Review Team (ERT), is currently composed of EPA, DTSC and the AOC Respondents. Pursuant to the pilot program, the AOC Respondents serve as the point of contact for permit applicants. Upon contact, the AOC Respondents conduct an initial review by obtaining information from the applicant regarding the nature of the proposed project, proposed land use, and locations and depths of excavations. If the proposed project involves soil penetration deeper than 18 inches bgs[6] or a change in land use is proposed, the AOC Respondents prepare a Screening Evaluation Summary Report (SESR), which includes the following information:

- A summary of the proposed project
- A summary of the risk information for the parcel (from the BRA and FS)
- A map of past sampling locations on the parcel, historical rubber plant facilities, and proposed excavations and construction activities
- A data summary table including the laboratory analytical results for each sampling location on the parcel, highlighting any concentrations exceeding regulatory screening criteria
- A summary of recommendations for further action, as appropriate. Recommendations could include additional sampling and risk assessment

Following review and approval of the SESR, EPA issues a letter to the applicant that either (1) specifies actions to be taken prior to or during the construction process that are necessary to protect human health and the environment; or (2) states that the project can proceed without further evaluation. If further action is required, the ERT will thereafter work with the applicant to either establish that there will be no unacceptable health risk to construction workers and tenants, or to remediate the impacted materials until the risks have been reduced to an acceptable level. This process used as a pilot project will remain the same for this remedy.

A variety of informational outreach methods would be used to inform owners, occupants, and the public about the environmental condition of all areas or parcels, including mailings, public registries, and a website.

Treatment/Containment Components

No treatment or containment components are included in Alternative 2 for known areas with contamination exceeding acceptable risk. However, for contamination encountered in the future in shallow soil, either outdoors or beneath a building, that exceeds action levels, Alternative 2 includes physical treatment. Action levels are described further in Section 12.2, Description of Selected Remedy. These areas would most likely be identified via the building permit review IC. If additional areas of contamination are found that exceed action levels, the remedy will be excavation, clean backfill, and off-site treatment/disposal/recycling.

If contamination is encountered beneath existing structures such that it is impractical to excavate, then building engineering controls (BECs) would be implemented. BECs are control measures applied to buildings to prevent contaminated vapors from building up inside the building and causing health concerns. Examples of the types of BECs that may be applied include but are not limited to building pressurization, sub-slab venting, floor sealing, passive vapor barriers, or modification of the heating,

[6] The 18 inch depth was selected as the depth of concern that would initiate a SESR because the Site had been graded and base material imported during redevelopment. Thus, the native soil that has the potential for containing site-related contamination would not be encountered shallower than 18 inches bgs.

ventilating, and air conditioning (HVAC) system. The type of BECs implemented would be determined by EPA on a case-by-case basis.

FIGURE 9-1
Summary of Remedial Alternatives

Soil and NAPL ROD
Del Amo SUperfund Site

Medium	Alternative 1	Alternative 2	Alternative 3	Alternative 4 (EPA's Preferred Alternative)	Alternative 5
Outdoor Shallow Soil	No Action	Institutional Controls:			
		– Building Permit review {ALL AREAS}	– Building Permit review – Zoning – Restrictive Covenant {26 AREAS}	– Building Permit review – Zoning – Restrictive Covenant {26 AREAS}	– Building Permit review – Zoning – Restrictive Covenant {26 AREAS}
			Cap		Excavation
			(VOC and non-VOC contaminants) {7 AREAS}	(non-VOC contaminants) {4 AREAS}	(VOC and non-VOC contaminants) {7 AREAS}
				SVE	
				(VOC contaminants) {3 AREAS}	
Outdoor Shallow Soil Future Unknown Areas		Excavation			
		{FUTURE AREAS} *IF contamination is beneath building and excavation is infeasible, then:* building engineering controls. *IF other interference makes excavation impractical, then:* SVE(for VOCs) and capping (for non-VOCs). {FUTURE AREAS}			
Shallow Soil Beneath Buildings			Building Engineering Controls		
			{2 AREAS}	{1 AREA}	
				SVE	
				{1 AREA}	{2 AREAS}
NAPL/ Groundwater Contamination Source Areas			SVE		
			{4 AREAS}	{4 AREAS}	{4 AREAS}
			Hydraulic Extraction	In-situ Chemical Oxidation	In-situ Soil Heating
			{4 AREAS}	{3 AREAS}	{3 AREAS}

If the new areas of contamination have other structures or infrastructure that would interfere with excavation making it impractical, then SVE (for VOCs) and capping (for non-VOCs) will be utilized. SVE is a common technology to remediate volatile organic compounds in the soil, in which vacuum wells are inserted into the ground to pull out contaminated vapors until target levels in the soil are achieved. The extracted vapors are treated using air pollution control technology on-site to meet air pollution emission requirements. Capping consists of covering contaminated soil to prevent exposure. The cover materials would consist of existing or new asphalt, concrete, building structures, or clean landscaping soils. These covers would be surveyed, inspected, repaired, and enhanced as needed to meet the RAOs.

If any contamination is left in place in the additional contamination areas ICs will be required in the form of restrictive covenant to prohibit interference with the physical remedy components, and to restrict contact with any contamination left in place above action levels.

Monitoring Components

Periodic monitoring of the individual ICs would be performed to confirm they are operating effectively over time. Specific monitoring activities would include using Underground Services Alert and land-activity monitoring services to know when permits are issued, property is sold, zoning changes are proposed, land use permits are proposed or issued, and excavations in public rights-of-way are planned. Periodic visual inspections would also occur. ICs would be monitored in perpetuity to ensure effectiveness.

Monitoring associated with excavation would include collection of confirmation samples to confirm that the excavation has removed the contaminated soil. Ambient air monitoring would be conducted during the excavation to confirm there are no contaminant air emissions above regulatory standards (described further in Section 12.2, Description of Selected Remedy. BECs would be monitored as long as the soil contamination remains above the action level. Monitoring activities for BECs would include indoor air monitoring and could include sub-slab vapor monitoring. SVE requires periodic treatment system monitoring for compliance and evaluation of performance, as well as monitoring of vapor wells, until soil contamination is reduced to below target levels (described further in Section 12.2. Capping will require long-term monitoring of the cap integrity.

Operation and Maintenance Components

Operations and maintenance (O&M) activities for SVE include upkeep of the extraction systems, mechanical components, pipeline maintenance, well maintenance, and reporting. O&M activities for BECs will depend on the type of BEC implemented, but may include inspection of subslab or HVAC systems, sampling of indoor air or subslab vapors, and pressure measurements. O&M activities related to capping include periodic long-term inspection, maintenance, and repair. O&M activities for ICs consist of administrative oversight of the IC mechanism and periodic inspections.

Expected Outcomes

Implementation of Alternative 2 would prevent exposure of commercial workers to the contaminated soil through ICs. However, source contamination would be left in place and Alternative 2 would not prohibit residential use. Some reduction of contamination left in place would be expected over time through intrinsic biodegradation of the organic contaminants. The excavation or SVE remedies for potential additional areas encountered in the future would remove or reduce source contamination in shallow soil to below target levels.

9.3 Alternative 3: Cap, Building Engineering Controls, SVE & Hydraulic Extraction, Institutional Controls, Future Contingencies

Institutional Control Components

IC components include building permit review and informational outreach applied to all areas, as in Alternative 2. ICs for Alternative 3 also include a General Plan footnote and restrictive covenants.

A General Plan documents the existing zoning rules for the City of Los Angeles that specify allowable land uses in designated areas. The City's General Plan does not currently allow residential use of the Del Amo Site. EPA would work with the City to place a footnote in the General Plan that informs readers about the Superfund site, stating that it is not safe for future residential use if the zoning changed.

Restrictive covenants are legal agreements between a property owner and the State of California whereby restrictions are placed on the use of the property. State law requires these covenants be placed on property wherever contamination is left in place above a level that is safe for unrestricted use. They are implemented pursuant to California Civil Code 1471 and DTSC regulations. These covenants would "run with the land," meaning they remain with the properties through changes in ownership.

The covenants would prevent residential or other sensitive uses of the land, require consultation with and approval by the EPA for any construction plans, and prohibit interference with any physical remedy components. The covenants for areas overlying groundwater contamination would have a provision that prohibits drilling into, and use of, groundwater.

The General Plan footnote and restrictive covenants would be instituted in 26 areas, including Areas 2, 4–17, 19, 20, 22–24, 28, 30, 32, 33, 35, and 36. The covenants for areas overlying groundwater contamination that would contain that additional provision includes Areas 4–6, 8, 9, 11, 15–17, 19, 20, 22–24, 28, 32, 33, and 35.

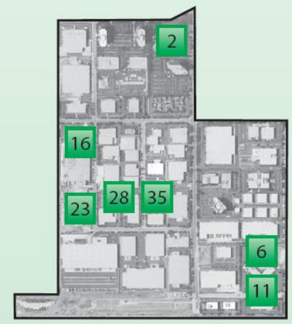
Treatment/Containment Components

Alternative 3 also applies treatment and containment technologies. Containment components include capping VOC- and non-VOC-impacted shallow outdoor soil at seven areas and implementing BECs at two areas. The BECs would address potential vapor intrusion related to shallow VOC-impacted soil beneath the buildings. Treatment components include SVE of VOCs in groundwater contamination source areas and hydraulic extraction to address dissolved VOCs in groundwater from LNAPL.

Capping would occur in seven separate areas (Areas 2, 6, 11, 16, 23, 28, and 35) where VOC and non-VOC contamination exceeds action

Alternative 3

Capped & Monitored (7 areas)



Engineering Controls (2 areas)

Soil Vapor Extraction (4 areas)

Hydraulic Extraction (4 areas)

levels. This would cover approximately 418,000 sf. The areas would be capped with asphalt, concrete, or clean soil. Each of the areas already has asphalt, concrete, or clean landscaping soil covers, which would remain and be monitored and maintained. A slurry seal would be applied over the existing asphalt, if needed, to establish effectiveness.

The two buildings that would have engineering controls are in Areas 16 and 23. BECs are described in Alternative 2.

SVE would be used over an area of approximately 155,900 sf, to remove VOCs from vadose soil in four separate groundwater contamination source areas (SA-3, SA-6, SA-11, and SA-12). SVE is also described in Alternative 2. The number of wells would be determined during RD. Preliminary design assumptions include 12 SVE wells at SA-3, 9 wells at SA-6, 9 wells at SA-11, and 6 wells at SA-12. Potential methods of removing contaminants from the air stream include adsorption, condensation, thermal oxidation, and internal combustion. The technology or combination of technologies will be determined in the RD process.

Hydraulic extraction would be used over an area of approximately 155,900 sf, to remove contaminants dissolved in the groundwater in four separate groundwater contamination source areas (SA-3, SA-6, SA-11, and SA-12). Hydraulic extraction consists of installing wells into the groundwater within the NAPL/soil contamination area and pumping out contaminated water. As the groundwater is drawn into the wells, any NAPL that was floating on the water, as well as any contamination that had dissolved into the groundwater, would be drawn in and extracted. The extracted water will be treated to remove the contaminants before being discharged.

The number of hydraulic extraction wells would be determined during RD. Preliminarily design assumptions include 56 groundwater extraction wells screened from 50 to 90 feet bgs at SA-3, 42 wells screened from 50 to 80 feet bgs at SA-6, 45 wells screened from 40 to 80 feet bgs at SA-11, and 24 wells screened from 40 to 80 feet bgs at SA-12. Costs assume that extracted groundwater will be treated using an oil-water separator, high pressure oxidation, and air stripping, with a granular activated carbon polish. Costs also assume that the treated water would be discharged to the storm drain under a National Pollutant Discharge Elimination System permit.

If additional areas of Site-related contamination are encountered, the remedies will be the same as in Alternative 2, consisting of excavation, BECs, SVE or capping.

Prior to implementing an active remedial alternative such as SVE or hydraulic extraction, additional sampling would be performed to confirm the extent of contamination requiring remediation.

Monitoring Components

Monitoring components for ICs, capping, BECs and SVE are the same as those described in Alternative 2. The IC and remedial system monitoring would continue in perpetuity to ensure effectiveness. The restrictive covenant would contain a provision to ensure the remedial systems are not disturbed while in operation.

Construction of the SVE and hydraulic extraction systems is expected to be completed in one year. SVE is expected to operate for four years, and hydraulic extraction for 10 years. Regular sampling and monitoring of influent, effluent, and air emissions would be performed during operation.

Long-term groundwater monitoring would be used to ensure containment and evaluate NAPL treatment system effectiveness and changes in remaining NAPL or dissolved-phase contaminant distributions after remedial action.

Operation and Maintenance Components

O&M components for SVE systems, BEC systems, and ICs are described in Alternative 2. Alternative 3 includes hydraulic extraction, which would require O&M during the 10 years of operation. O&M components for hydraulic extraction are similar to SVE, including regular inspection and maintenance of the wells, wellheads, piping connections, and treatment system.

Expected Outcomes

Implementation of Alternative 3 would prevent exposure to contaminated groundwater and soil through ICs, BECs, and capping. Shallow soil contamination would be left in place. Some reduction of contamination left in place would be expected over time, through intrinsic biodegradation of the organic contaminants. SVE and hydraulic extraction would be used to reduce the LNAPL and soil contamination that contribute to groundwater contamination. The FS estimates a reduction of approximately 40 to 50 percent of NAPL contaminant mass. In any additional areas of Site-related contamination encountered in the future, the excavation or SVE remedies would be expected to remove or reduce source contamination in shallow soil to below target levels.

9.4 Alternative 4: Institutional Controls, Capping, Shallow Soil SVE, Building Engineering Controls, SVE Beneath Building, Deep Soil SVE & In-Situ Chemical Oxidation, Future Contingencies

Institutional Control Components

ICs would be used in the same manner as Alternative 3.

If during the course of conducting building permit reviews for future construction projects and conducting subsequent sampling, new contamination is discovered, the contingency remedy will be the same as in Alternative 2, consisting of excavation, BECs, SVE, or capping.

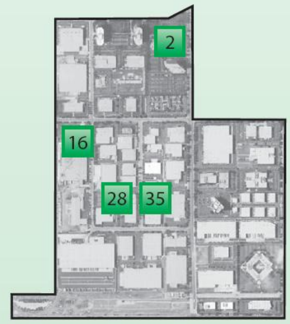
Treatment/Containment Components

This alternative also applies treatment and containment technologies. Containment components include capping non-VOC-impacted shallow outdoor soil at four areas and implementing BECs at one area. Treatment components include SVE of VOCs in outdoor shallow soil at three areas, SVE of shallow soil under buildings at one area, and SVE and ISCO in the groundwater contamination source areas. ISCO would address dissolved VOCs in groundwater from LNAPL at or below the water table. As in Alternatives 2 and 3, a combination of excavation, BECs, capping, and SVE would be implemented in shallow soil as future contingencies.

Capping would occur in the same manner as Alternative 3 but would

Alternative 4

Capped & Monitored (4 areas)



Engineering Controls (1 area)

Soil Vapor Extraction (4 Areas)

SVE and In-Situ Chemical Oxidation (3 areas)

only occur in four areas (Areas 2, 16, 28, and 35). This would cover approximately 288,000 sf.

SVE in shallow soil would occur in much the same manner as described in Alternative 3 for the deep soil. It would be used over an area of approximately 130,000 sf in three separate areas (Areas 6, 11, and 23). The number of wells would be determined during RD. Preliminary design assumptions include 35 SVE wells screened from 5 to 15 feet bgs at Area 6, eight SVE wells screened from 5 to 15 feet bgs at Area 11, and 41 wells screened from 5 to 15 feet bgs at Area 23.

In Alternative 4, BECs would be implemented at one building in Area 16, in the same manner as Alternative 3. SVE would be implemented beneath the building at Area 23.

SVE would be used in the same groundwater contamination source areas and in the same manner as Alternative 3.

ISCO would be used instead of hydraulic extraction over an area of approximately 113,900 sf to oxidize (chemically break down) the NAPL/soil contamination in the groundwater, converting it into carbon dioxide and water. This chemical reaction could also release heat, which would vaporize additional contamination above the groundwater. Therefore the SVE system is used to capture these vaporized contaminants. Oxygen is also created during this chemical reaction, which promotes natural biodegradation. ISCO would be implemented in three separate areas: SA-3, SA-11, and SA-12.

The number of wells used, whether permanent wells or temporary direct-push injection points are used, the timing of oxidant injections, and the type of oxidant used would be determined during RD. Preliminary design assumptions include Fenton's reagent as the oxidant, injections occurring semi-annually, and direct- push temporary injection points being used on 15 foot spacing.

If additional areas of Site-related contamination are encountered, the remedies will be the same as in Alternative 2, consisting of excavation, BECs, SVE or capping.

Prior to implementing an active remedial alternative such as SVE or ISCO, additional soil and/or groundwater sampling would be performed to verify the extent of contamination benefitting from remediation.

Monitoring Components

Monitoring components for ICs, capping, BECs, and SVE in shallow soil are similar to those described in Alternative 2.

SVE systems implemented to address shallow soil are expected to operate for 3 years. Regular sampling and monitoring of treatment system influent, effluent, and air emissions would be performed during operation.

ISCO injections are expected to continue for at least 4 years or until performance criteria indicate the treatments are no longer needed. SVE for the deep soil is also expected to operate at least until the ISCO treatments are suspended. Regular sampling and monitoring of treatment system influent, effluent, baseline and temporal benzene concentrations, plume dispersion, breakdown product concentrations in soil and groundwater, and air emissions would be performed during operation. Soil and groundwater sampling would be performed to monitor mass reduction, mass remaining, and the performance and effectiveness of the ISCO remedy.

Long-term monitoring of the groundwater would also occur, as in Alternative 3. Groundwater monitoring results will be used for a baseline analysis, mass reduction breakdown product analysis, mass remaining measurements, water quality parameter measurement, biological conditions and unanticipated/adverse changes in NAPL or dissolved-phase contaminant distributions in the long-term.

The ICs and remedial systems would be monitored in perpetuity or until cleanup is complete (for remedial systems) to ensure effectiveness. The restrictive covenant IC would contain a provision to ensure the remedial systems are not disturbed while in operation.

Operation and Maintenance Components

O&M components for SVE systems, BEC systems, caps, and ICs are described in Alternative 2. There are no O&M requirements associated with ISCO, only with the companion SVE systems.

Expected Outcomes

Implementation of Alternative 4 would prevent exposure to contaminated groundwater and soil through ICs, BECs and capping. After three years SVE would be expected to reduce shallow soil contamination to below target levels.

ISCO and SVE would reduce the LNAPL and soil contamination that contribute to groundwater contamination. The FS estimates a reduction of approximately 40 to 50 percent of contaminant mass after four years.

In any additional areas of Site-related contamination encountered in the future, the excavation or SVE remedies would be expected to remove or reduce source contamination in shallow soil to below target levels.

9.5 Alternative 5: Institutional Controls, Excavation, SVE Beneath Building, Deep Soil SVE & In-Situ Soil Heating, Informational Outreach, Future Contingencies

Institutional Control Components

ICs would be used in the same manner as Alternative 3.

If during the course of conducting building permit reviews for future construction projects and conducting subsequent sampling, EPA discovers new contamination areas, the contingency remedy will be the same as in Alternative 2, consisting of excavation, BECs, SVE, or capping.

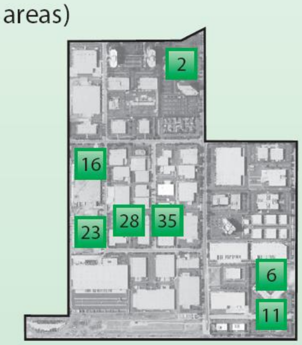
Treatment/Containment Components

This alternative also applies treatment technologies. Treatment components include excavation of shallow outdoor soil contamination, SVE of shallow soil under buildings at two areas, and SVE and in-situ soil heating (ISSH) in the groundwater contamination source areas. As in Alternatives 2, 3, and 4, a combination of excavation, BECs, and SVE would be implemented in shallow soil as future contingencies.

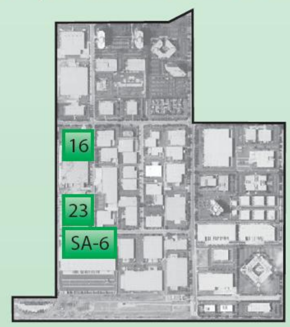
Excavation would occur in seven separate areas where VOC and non-VOC contamination exceeds action levels. This would include

Alternative 5

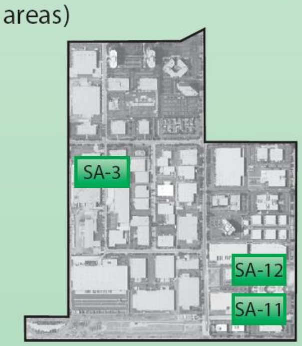
Excavate Contaminated Soil (7 areas)



Soil Vapor Extraction (3 Areas)



SVE and In-Situ Soil Heating (3 areas)



approximately 69,530 cubic yards (CY) of soil. They would be excavated to depths ranging from 5 to 15 feet bgs, and transported off-site to a permitted treatment and/or disposal facility. The areas include Areas 2, 6, 11, 16, 23, 28, and 35.

Two buildings in Areas 16 and 23 would have SVE implemented in the soil beneath them.

SVE would be used in the same groundwater contamination source areas and in the same manner as Alternative 3.

ISSH would be used over an area of approximately 155,900 sf to volatilize the NAPL/soil contamination in the groundwater and vadose zone and push it into the SVE system in the vadose zone, where it would be captured and removed. This would be implemented in three separate areas: SA-3, SA-11, and SA-12.

ISSH consists of heating the sub-surface soil to volatilize the contamination, then capturing the vapors in a SVE system. The soil is heated both above the groundwater and within the groundwater. Soil heating can be done either by heating up wells in the treatment area (thermal conduction heating), running electricity through the soil between wells (electrical resistance heating), or by injecting steam into the soil (steam injection heating). After the vapors are extracted, the treatment system would include condensation, phase separation, and vapor treatment. If steam heating is used, the condensed steam would be treated using advanced oxidation and carbon adsorption. The treated water would be discharged to the storm drain or, if the volume is small enough, it could be transported off-site for appropriate disposal.

Final design parameters for ISSH will be determined during RD. The preliminary design in the FS assumes electrical resistance heating (ERH) treatment for 2 years. Assumptions include 132 electrode SVE wells at SA-3, 99 electrode SVE wells at SA-11, and 53 electrode SVE wells at SA-12.

If additional areas of Site-related contamination are encountered, the remedies will be the same as in Alternative 2, consisting of excavation, BECs, SVE or capping.

Prior to implementing an active remedial alternative such as excavation, SVE or ISSH, additional sampling would be performed to confirm the extent of contamination requiring remediation.

Monitoring Components

Monitoring components for ICs, excavation and SVE in shallow soil are similar to those described in Alternative 2. ICs would be monitored in perpetuity to ensure effectiveness. The restrictive covenant IC would contain a provision to ensure the remedial systems are not disturbed while in operation.

SVE systems implemented to address shallow soil beneath buildings are expected to operate for 3 years. Regular sampling and monitoring of treatment system influent, effluent, and air emissions would be performed during operation.

ISSH is expected to continue for four years. SVE is also expected to operate for 4 years. Performance monitoring would be conducted during ISSH operation. Regular sampling and monitoring of SVE treatment system influent, effluent, and air emissions would be performed during operation.

Groundwater monitoring results will indicate unanticipated/adverse changes in NAPL or dissolved-phase contaminant distributions in the long-term. Groundwater monitoring would be conducted during any active remedial system operation, to confirm remedy effectiveness in the vicinity of a source area. Long-term monitoring of the groundwater would also occur, as in Alternative 3.

Operation and Maintenance Components

O&M components for SVE systems are described in Alternative 2. Alternative 5 includes ISSH, which will require O&M during the 4 years of operation. O&M components for ISSH include regular inspection and maintenance of the wells, piping connections, electrical systems and treatment enclosures.

Expected Outcomes

Implementation of Alternative 5 would prevent exposure to contaminated groundwater and soil through ICs. Excavation would permanently remove contaminated shallow soil exceeding action levels. After 3 years, SVE would be expected to reduce shallow soil contamination to below target levels.

ISSH and SVE would reduce the LNAPL and soil contamination that contribute to groundwater contamination. A reduction of approximately 60 to 90 percent of contaminant mass is expected after 4 years.

In any additional areas of Site-related contamination encountered in the future, the excavation or SVE remedies would be expected to remove or reduce source contamination in shallow soil to below target levels.

10.0 Comparative Analysis of Alternatives

This section compares the alternatives against nine evaluation criteria specified by the NCP (section 300.430). Two of the nine criteria are considered threshold criteria: (1) overall protection of human health and the environment, and (2) compliance with ARARs. If an alternative does not meet these two threshold criteria, it cannot be selected as the remedy. Five of the criteria are considered balancing criteria: (1) long-term effectiveness and permanence, (2) reduction of toxicity, mobility, or volume of contaminants through treatment, (3) short-term effectiveness, (4) implementability, and (5) cost. Two of the criteria are considered modifying criteria: (1) state agency acceptance, and (2) community acceptance. The modifying criteria are also considered in the remedy selection.

Each alternative consists of three components: (1) shallow outdoor soil, (2) shallow soil beneath buildings, and (3) NAPL/groundwater source areas. During the FS, a detailed evaluation of the alternatives for each component was conducted using the nine criteria. The FS then included a comparative analysis for each component, showing the relative performance of each alternative. The comparative analysis described below combines the evaluations for the three components.

10.1 Overall Protection of Human Health and the Environment

This criterion determines whether an alternative adequately eliminates, reduces, or controls threats to human health and the environment through ICs, BECs, or treatment.

Outdoor Shallow Soil Component

All the outdoor shallow soil alternatives except No Action (Alternative 1) are protective of human health and the environment for the intended land use. For the outdoor shallow soil component, the capping actions (Alternatives 3 and 4) would be protective because capping physically covers the contaminated soil and prevents exposure to anyone using the property. The SVE approach (Alternative 4) would be protective because it would reduce the VOC contamination in the shallow soil to levels that would no longer present an unacceptable hazard. The excavation actions (Alternative 5) would be protective because excavation physically removes the contaminated soil of concern from the site. The ICs (Alternative 2) are protective because they would inform owners and occupants about the contamination left in place and have them work with the ERT if they conduct invasive activities that could disturb the soil. This would prevent inadvertent exposures in the future. Note that the ICs are also associated with Alternatives 3, 4, and 5.

Shallow Soil Beneath Buildings Component

For shallow soil beneath the buildings, the “BEC” (Alternative 3 and Alternative 4) and the SVE (Alternative 4 and Alternative 5) alternatives would be protective of human health and the environment, but the ICs (Alternative 2) and the No Action (Alternative 1) alternatives would not be. “Building engineering controls” (Alternative 3 and Alternative 4) would be protective because they prevent contamination in the underlying soil from reaching building occupants. The SVE approach (Alternative 4 and Alternative 5) would be protective because it would reduce the VOC contamination in the shallow soil beneath the building to acceptable levels. Alternatives 3, 4, and 5 all include ICs, which would increase protectiveness by informing owners and occupants about the contamination left in place and have them work with the ERT whenever they conduct any invasive activities that could disturb the soil. This would help prevent inadvertent exposure to contaminated soil in the future.

NAPL/Groundwater Contamination Source Area Component

For the NAPL/groundwater contamination source areas, ICs alternative (Alternative 2) would be protective because it would inform owners or developers about the contamination and refer them to EPA for review of their activities on the property that could result in exposure to either the deep soil or the contaminated groundwater. The other alternatives would be more protective because they not only use ICs to prevent exposures but also actively remove some contaminant mass. Mass is removed in the alternatives via SVE (Alternative 3, Alternative 4, Alternative 5), hydraulic extraction (Alternative 3), chemical oxidation (Alternative 4), and soil heating (Alternative 5). This reduces the principal threat waste (See Section 11) that is acting as the source of contamination to the groundwater and in some cases, to the ground surface.

10.2 Compliance with Applicable or Relevant and Appropriate Requirements

This criterion evaluates whether the alternative meets the applicable or relevant and appropriate requirements of other federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

Applicable requirements are those cleanup standards, standards of control and other substantive requirements, criteria or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) site. Only those State standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not “applicable” to a hazardous substance, pollutant, contaminants, remedial action, location, or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be considered to be relevant and appropriate.

Alternatives 3, 4 and 5 would comply with federal and state applicable or relevant and appropriate requirements, but the Alternative 1 (No Action) and Alternative 2 (ICs only) would not. Alternative 1 would not provide the restrictive covenant IC as required by State regulations when wastes are left in place above an unrestricted use level. Alternative 2 would provides the informational IC and the permit review IC but not the required restrictive covenant IC. Thus, Alternative 2 would not comply with all ARARs. The other alternatives (3, 4 and 5) would comply with the state rule requiring restrictive covenants. The SVE alternatives (shallow outdoor soil Alternative 4, beneath buildings Alternatives 4 and 5, NAPL/groundwater source Alternatives 4 and 5) would comply with air treatment and emission requirements applicable to the vapor treatment system. The SVE alternatives would also comply with regulations for handling and disposing of hazardous wastes generated. The hydraulic extraction alternative (NAPL/groundwater source Alternative 3) would comply with wastewater discharge requirements. No chemical specific ARARs were identified for the groundwater, and the Groundwater ROD had waived drinking water standards as being technically impracticable to achieve. ARARs affecting the active treatment components are limited to action-specific ARARs pertinent to air emissions, wastewater discharge, and waste and hazardous material handling.

10.3 Long-term Effectiveness and Permanence

This criterion considers expected residual risk and the ability of an alternative to maintain reliable protection of human health and the environment over time, once the cleanup levels have been met. This includes the adequacy and reliability of controls.

Outdoor Shallow Soil Component

The excavation (Alternative 5) and SVE (Alternative 4) alternatives would provide the best long-term effectiveness and permanence because they would remove the contaminants of concern from the Site. Capping with SVE and ICs (Alternative 4) is the next best alternative because it removes and treats some of the contaminants (the VOCs), with the remainder (non-VOCs) being capped in place. Capping creates a physical barrier to prevent contaminant exposure, which is effective with required maintenance. Capping alone (Alternative 3) is less effective and permanent than capping combined with SVE. ICs in concert with the engineered actions serve to enhance protectiveness. ICs alone (Alternative 2) can be effective when they are properly maintained and monitored, although there is inherent uncertainty about maintaining these controls in perpetuity given potential future changes in land use and uncertainty as to whether people will follow them. Both the cap and the ICs require dedicated resources to ensure long-term maintenance and protection.

Shallow Soil Beneath Buildings Component

The SVE alternatives (Alternative 4 and Alternative 5) as well as excavation are the most effective and permanent alternatives because the hazardous substances that could impact property occupants would be removed and treated. Excavation is not one of the alternatives for the known contamination areas, but it is an alternative for future areas discovered during development or construction. The “BECs” alternative is effective because it prevents the contaminants from entering the building. However, it is not as permanent as Alternative 4 and Alternative 5 because the hazardous substances are not removed, and there is some uncertainty about the ability to maintain these physical engineering controls in perpetuity. Maintaining such controls in perpetuity requires continued attention and resources. ICs in concert with the other engineered actions serve to enhance their protectiveness. ICs alone (Alternative 2) are not considered effective because they do not prevent the contamination from entering the building.

NAPL/Groundwater Contamination Source Areas Component

The most effective alternative in the long term removes the most contaminant mass that acts as a continuing source of pollution to the groundwater. The more contaminant mass removed, the sooner the groundwater would be cleaned up. The alternative that would remove the most mass is soil heating (Alternative 5), followed by chemical oxidation (Alternative 4), then hydraulic extraction (Alternative 3), each of them being accompanied by SVE (and ICs). ICs would be a critical component of the above alternatives because they would ensure protectiveness by preventing exposures to contaminated soil and groundwater, while the groundwater is undergoing treatment. ICs (Alternative 2) alone would achieve the least permanence because they would not actively remove any contaminant mass or prevent use of groundwater.

10.4 Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

This criterion evaluates an alternative’s use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

Outdoor Shallow Soil Component

Excavation (Alternative 5) and SVE (Alternative 4 and Alternative 5) alternatives have the best reduction of toxicity, mobility, or volume through treatment. Excavation removes the contaminated soil for off-site treatment, and SVE removes the VOC contaminants from the soil and treats the vapors. Capping (Alternative 3 and Alternative 4) and ICs (Alternative 2) do not reduce the toxicity, mobility, or volume of the contaminants through treatment.

Shallow Soil Beneath Buildings Component

The SVE beneath buildings alternatives (Alternative 4 and Alternative 5) as well as excavation would have the greatest reduction of toxicity, mobility, or volume through treatment. Excavation is not an alternative for the known contamination areas, but it is an alternative for future areas discovered during redevelopment or construction. The other alternatives, BECs (Alternative 3) and ICs (Alternative 2), do not use treatment to reduce toxicity, mobility or volume.

NAPL/Groundwater Contamination Source Area Component

The soil heating (with SVE) alternative (Alternative 5) would do the most to reduce toxicity, mobility or volume through treatment, followed by chemical oxidation (Alternative 4), and then hydraulic extraction (Alternative 3), each paired with SVE. ICs alone (Alternative 2) would provide no reduction in toxicity, mobility or volume through treatment.

10.5 Short-term Effectiveness

This criterion considers the length of time needed to implement an alternative and any adverse impacts the alternative poses to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved.

Outdoor Shallow Soil Component

Capping is effective in the short-term because the areas of concern are already covered with asphalt, concrete, or landscaping, and enhancing them as needed is a simple construction project. The short-term effectiveness of the SVE alternative is moderate due to possible emissions during construction or system operation. Although the construction and system operations would be engineered and planned to control emissions, short-term vapor releases could occur. The short-term impacts of the excavation alternative would consist of possible dust emissions from the contaminated soil, although best efforts would be taken to control dust emissions. For the ICs, no short-term impacts are expected as long as the existing caps are in place and remain effective at mitigating direct contact exposures, and interim ICs currently in place control exposures during most construction projects that involve excavation in impacted areas.

Shallow Soil Beneath Buildings Component

The short-term effectiveness of the “BEC” alternative is good because ventilation systems can be adjusted with relatively little impact on building occupants. However, installing a sub-slab venting system or conducting excavation would have greater impacts on occupants due to dust and possible contaminant off-gassing. Excavation is not an alternative for known contamination areas but is an alternative for future areas discovered during redevelopment or construction. For the SVE alternative, short-term effectiveness is moderate due to possible emissions during construction or system operation. ICs, when used in combination with the BECs or SVE, would not have short-term impacts during implementation because the other components would control exposure within buildings.

NAPL/Groundwater Contamination Source Area Component

All treatment alternatives, SVE, hydraulic extraction, chemical oxidation and soil heating have the potential for short-term impacts if releases are not adequately controlled. Heating of the ground could cause vapor migration and the handling of the extracted vapors could experience explosions if not properly designed, constructed, and operated. The injection of chemical oxidants could cause NAPL migration by displacement and emergence of injected chemicals at the surface. The soil heating alternative could have a greater potential short-term impact because it involves handling a greater volume of contaminated media. Generally the more aggressive the alternative the more potential safety issues exist. SVE would have a lesser potential for short-term impacts than chemical oxidation or soil heating.

10.6 Implementability

This criterion considers the technical and administrative feasibility of implementing the alternative, from design through construction and operation. Factors such as the relative availability of goods and services, and coordination with other governmental entities are considered.

Outdoor Shallow Soil Component

The capping component is expected to be implementable because the areas of concern are already covered with asphalt, concrete, or landscaping. Inspecting, repairing, enhancing, and monitoring them is a routine project. The implementability of the SVE component is moderate because it can be technically challenging to extract soil vapor from the low permeability shallow soil at the Del Amo Site. However, there is proven use of this technology in similar conditions. The implementability of the excavation component is also moderate, with minor technical challenges due to the proximity of the excavations to occupied buildings. If excavation is to be performed beneath a building, in the case of new contamination discovered during future construction projects, then technical challenges would be expected from needing to operate excavation equipment indoors. The informational component of the ICs is highly implementable because there are no impediments to putting site information in public databases and distributing it to owners or occupants. The building permit review IC is most easily implementable because it is already being implemented on a pilot scale. However, there are some implementation challenges regarding the General Plan footnote since that requires approval of the City Council and Planning Commission. Finally, there are implementation challenges for the restrictive covenant IC because these require negotiations with individual property owners.

Shallow Soil Beneath Buildings Component

The “BECs” are expected to be implementable, but complicated by the intricacies involved in controlling a building’s ventilation system to keep the building pressurized and prevent contaminants from infiltrating the building. It is also complicated to install a venting system beneath the building foundation (if needed) because it requires cutting trenches in the foundation to install the venting pipes. Excavation beneath a building can be implementable depending on the location of the contamination and the type and use of the building. It is considered challenging due to the logistics, including location of the contamination, configuration of the building, occupancy and use of the building, and location of utilities and structural elements. Excavation is not an alternative for known contamination areas beneath buildings, but is an alternative for future areas discovered during redevelopment or construction. The implementation of the SVE system beneath buildings has some uncertainties. It is challenging to install wells horizontally and to monitor a system’s performance beneath a building. The implementation issues associated with implementing the ICs for these areas would be the same as those for the shallow soil areas.

NAPL/Groundwater Contamination Source Area Component

Implementing the ICs at NAPL/groundwater source areas would be the same as implementing them for the shallow soil areas. The SVE system and the hydraulic extraction system are both readily implementable technically, but there would be some administrative challenges in coordinating the work with operating businesses. Implementation of chemical oxidation is technically feasible, but it could be challenging due to the presence of low permeability soils in some areas. Because a portion of the property would need to be occupied by the injection and treatment systems, careful coordination with the businesses would be required. ISSH is implementable, but there are a limited number of vendors, and implementing this remedial action near active businesses would be challenging. As with chemical oxidation, careful coordination with the business would be required due to the space needed for the remediation system.

5.4 Cost

This criterion includes estimated capital and annual O&M costs, which are expressed in terms of present worth. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

The costs for the alternatives are summarized in Table 10-1. In addition, Tables 10-2 and 10-3 present the potential future costs for remediating any additional contamination discovered in the future.

TABLE 10-1: Costs for Remedial Alternatives

	Alternative	Present Worth Cost
1	No Action	$0
2	Institutional Controls (building permit review, informational outreach)	$3,890,000
3	– Institutional Controls (building permit review, General Plan footnote, restrictive covenant, informational outreach) – Cap (shallow soil outdoor) – Building Engineering Controls (contamination beneath building) – Hydraulic Extraction and Soil Vapor Extraction (NAPL)	$49,380,000
4	– Institutional Controls (building permit review, General Plan footnote, restrictive covenant, informational outreach) – Cap and Soil Vapor Extraction (shallow soil outdoor) – Building Engineering Controls and Soil Vapor Extraction (contamination beneath building) – In-Situ Chemical Oxidation and Soil Vapor Extraction (NAPL)	$52,500,000
5	– Institutional Controls (building permit review, General Plan footnote, restrictive covenant, informational outreach) – Excavation (shallow soil outdoor) – Soil Vapor Extraction (contamination beneath building) – In-Situ Soil Heating and Soil Vapor Extraction (NAPL)	$81,670,000

Notes:
EPA policy indicates that a 7% discount rate typically be used in Present Worth calculations like these. In this case, however, EPA used a 5% discount rate as a more realistic number but also presents in Table 12-5 the costs using both discount rates for comparison purposes.

The cost of the possible future cleanup of any Site-related outdoor shallow soil contamination encountered in the future would depend on how much contaminated soil is encountered. The alternatives for addressing such cases are the same as the alternatives evaluated above for known contamination, including capping, SVE, and excavation, as well as ICs (if not already in place on the parcel). The costs for these alternatives are shown in the table below, based on approximate size of the contaminated area. Table 10-2 defines the sizes of contaminated area that would be considered small, medium, or large. The ICs cost is the cost of implementing a restrictive covenant, if the parcel does not already have one, and is not dependent on size of the contaminated area.

TABLE 10-2: Costs for Possible Future Remediation – Outdoor Shallow Soil

Shallow Soil Alternative		Small	Medium	Large
1	No Action	0	0	0
2	Institutional Controls restrictive covenant for: – Protecting engineering controls – land use restrictions	 $25,000 per parcel $32,000 per parcel		
3	Cap	100 sf $23,000	625 sf $60,000	2,500 sf $186,000
4	Soil Vapor Extraction	2,500 sf $534,000	10,000 sf $880,000	40,000 sf $1,825,000
5	Excavation – 5 ft. deep, non-hazardous, no VOC – 15 ft. deep, non-hazardous, VOCs present – 15 ft. deep, mostly hazardous, VOCs present	 100 sf $42,000 100 sf $150,000 100 sf $182,000	 625 sf $105,000 625 sf $298,000 625 sf $459,000	 2,500 sf $257,000 2,500 sf $663,000 2,500 sf $1,287,000

The cost of the possible future cleanup of any Site-related shallow soil contamination beneath buildings that is encountered in the future would depend on how much contaminated soil is encountered. The costs are shown in the following table for small, medium or large sized areas.

TABLE 10-3: Costs for Possible Future Remediation – Beneath Buildings

Beneath Building Alternative		Small	Medium	Large
1	No Action			
2	Institutional Control Add restrictive covenant for: – Protecting engineering controls – land-use restrictions	 $25,000 per parcel $32,000 per parcel		
3	Building Engineering Controls	2500 sf $202,000	10,000 sf $362,000	40,000 sf $690,000
4	Building Engineering Controls *and* Soil Vapor Extraction	(see Alternative 3 and Alternative 5 separately)		
5	Soil Vapor Extraction	2500 sf $712,000	10,000 sf $1,117,000	40,000 sf $2,436,000

10.8 State Acceptance

This criterion considers whether the State agrees with the analyses and recommendations, as described in the RI/FS and Proposed Plan.

The State of California concurs with the Preferred Alternative, however, the State of California expressed concern about implementation in its Concurrence Letter dated September 30, 2011. DTSC's concurrence letter is in the Administrative Record (DTSC, 2011).

10.9 Community Acceptance

This criterion considers whether the local community agrees with EPA’s analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

The community includes neighboring residents, residential property owners, residential tenants, on-site business owners, employees, commercial property owners, and all the various stakeholders (elected city, county, state and federal representatives, neighborhood groups, environmental groups, local and state agencies, etc).

While no community members opposed the proposed remedy in its entirety, three commenters expressed concern about various aspects of the remedy. One commenter, representing a commercial property owner, disagreed with the IC assigned to his property that would prohibit residential use. Another commenter, representing the property management company and owner of a commercial property, expressed concern about siting the SVE system’s aboveground treatment equipment within their property. They expressed the desire to have the equipment located on the adjacent property, which is empty except for power transmission lines. A third commenter had several concerns, including possible use of a thermal oxidizer as a component of the SVE system, off-site disposal of excavated soil that transports waste to other communities, and about potential for vapor intrusion in the residential area south of the former plant property. As discussed in the Responsiveness Summary, Comment #4, EPA would utilize a similar stakeholder forum as used during the Waste Pits design process to involve and obtain input from stakeholders. These concerns and the other comments provided to EPA during the public comment period are addressed in Part III of this ROD, Responsiveness Summary.

11.0 Principal Threats

The NCP establishes an expectation that EPA will use treatment to address “principal threats” wherever practical. Principal threats are characterized as waste that cannot be reliably contained in place, such as liquids, highly mobile materials (e.g., solvents), and high concentrations of toxic compounds (e.g., several orders of magnitude above levels that allow for unrestricted use and unlimited exposure).

The NAPL and deep soil contamination represent high concentrations of toxic compounds that act as a continued source of groundwater contamination as contaminants slowly dissolve into the groundwater, and thus present a principal threat to the groundwater. This section describes the NAPL areas that constitute the principal threat and how the selected remedy will address them.

NAPL was observed at four of the groundwater contamination source areas: SA-3, SA-6, SA-11, and SA-12 (Figure 11-1). These four NAPL areas constitute the principal threat areas addressed in this ROD and are described in detail below. The primary contaminants present in the LNAPL areas are benzene and ethylbenzene. The LNAPL in the laboratory and pipeline area near the eastern boundary of the former plant site (SA-12) is inferred to be a complex of BTEX, styrene, and numerous other VOCs, SVOCs, and unidentified hydrocarbons.

11.1 NAPL Accumulation Areas

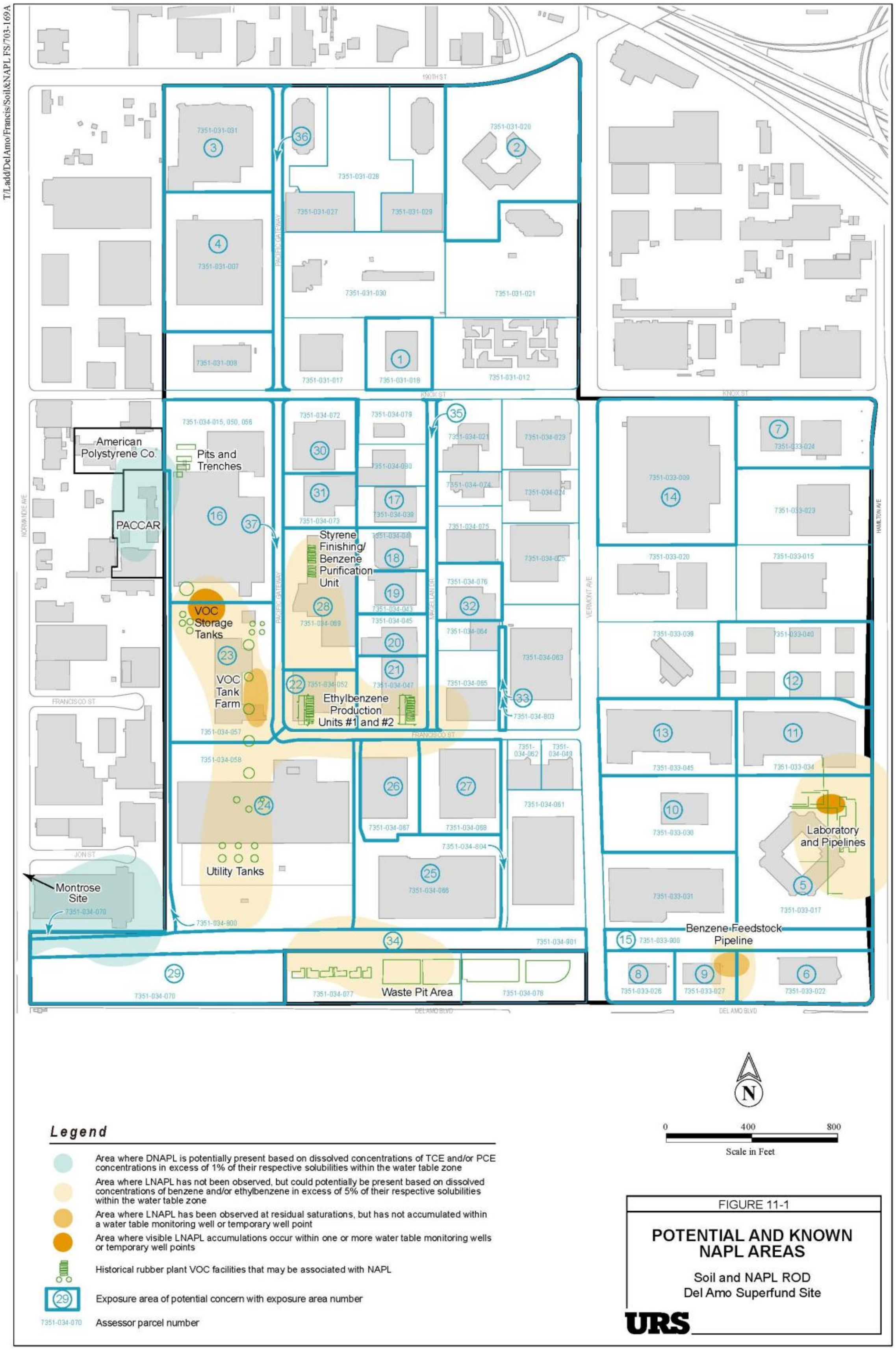
Two areas, Source Area 3 (SA-3) and Source Area 12 (SA-12) are considered to be “NAPL accumulation areas” because NAPL fluid was directly observed in groundwater samples from the water table in those areas. NAPL is present above, on and/or below the water table, however, the NAPL is present at residual (non-mobile) saturations. The NAPL was judged to exist at residual saturations based on hydrocarbon saturation testing from the MW-20 Pilot Program (URS, 2003).

Source Area 3

SA-3 is associated with the benzene storage tanks in the former styrene plancor. This area is also known as the MW-20 area, named after the monitoring well where NAPL accumulation was first observed. See Figure 11-1. SA-3 is located in Area 23, and a portion of the source area extends into Area 16. Both Area 23 and Area 16 contain shallow soil contamination that warrants remedial action, separate from the deep vadose and saturated zone NAPL contamination that act as sources of contamination to the groundwater. SA-3 is impacted by LNAPL that is composed largely of benzene (>95%). The LNAPL is residual and discontinuous and is submerged below the water table primarily in a layer extending down 5 to 10 feet from the water table, with lesser amounts extending down 30 feet (reaching to about 90 feet bgs). The lateral extent of SA-3 lies entirely outside the footprint of the building on the property and is estimated to encompass an area of 19,200 sf.

The soil in the vicinity of SA-3 consists of a top 50-foot layer of low permeability silt to sandy silt with interbedded silty sand and sand layers up to 5 feet thick. Underlying that layer and below the water table, there is a greater proportion of more permeable sand and silty sand. The water table was found at a depth of approximately 50 feet bgs based on data from January 2004 (URS, 2010).

The MW-20 Pilot Program at SA-3 successfully extracted approximately 1.2 million gallons of groundwater over a 7-month period in 1996 and 1997. It was judged, however, that hydraulic extraction would not be a particularly effective remediation method because the extraction only removed approximately 36 gallons of separate-phase benzene NAPL, while an additional 1,420 gallons of benzene NAPL were recovered in the dissolved phase.


T/Ladd/DelAmo/Francis/Soil&NAPL FS/703-169A
American Polystyrene Co.
PACCAR
Pits and Trenches
Styrene Finishing/ Benzene Purification Unit
VOC Storage Tanks
VOC Tank Farm
Ethylbenzene Production Units #1 and #2
Utility Tanks
Montrose Site
Waste Pit Area
Benzene Feedstock Pipeline
Laboratory and Pipelines
190TH ST
KNOX ST
FRANCISCO ST
JON ST
DEL AMO BLVD
VERMONT AVE
HAMILTON AVE
NORMANDIE AVE
N
0 400 800
Scale in Feet
Legend
Area where DNAPL is potentially present based on dissolved concentrations of TCE and/or PCE concentrations in excess of 1% of their respective solubilities within the water table zone
Area where LNAPL has not been observed, but could potentially be present based on dissolved concentrations of benzene and/or ethylbenzene in excess of 5% of their respective solubilities within the water table zone
Area where LNAPL has been observed at residual saturations, but has not accumulated within a water table monitoring well or temporary well point
Area where visible LNAPL accumulations occur within one or more water table monitoring wells or temporary well points
Historical rubber plant VOC facilities that may be associated with NAPL
Exposure area of potential concern with exposure area number
7351-034-070 Assessor parcel number
FIGURE 11-1
POTENTIAL AND KNOWN NAPL AREAS
Soil and NAPL ROD
Del Amo Superfund Site
URS

Source Area 12

SA-12 is a NAPL accumulation source area in the vicinity of the former butadiene plancor laboratory, located in Area 5, Area 11, and on Hamilton Avenue (Figure 11-1). Area 5 does not contain shallow soil contamination that warrants remedial action, only the NAPL and soil contamination in the deeper vadose and saturated zones that act as sources of contamination to the groundwater. Area 11 does contain shallow soil contamination that warrants remedial action due to its potential impact to surface receptors. Limited LNAPL accumulation was observed at SA-12 as a thin (less than 1/4 inch) layer of NAPL at two temporary well points. NAPL was also detected in soil samples. The LNAPL components include BTEX, styrene, cyclohexane, naphthalene, 1,2,4-TMB, butylbenzene, ketones, phthalates, phenanthrene, pyrene, and numerous unidentified compounds in the C10-C23 hydrocarbon range. The NAPL source area is adjacent to an office building and some fraction of the NAPL source area may extend under the building. The majority of the residual NAPL exists in a layer extending down 5 to 10 feet from the water table, with lesser amounts extending down to 80 feet bgs (Dames & Moore, 1998) and as shallow as 6 feet bgs. The NAPL has not been fully delineated, but it is estimated that the NAPL extends laterally over 215,000 sf, located on the northern half of Area 5 and extending onto Area 11 to the north and into the Hamilton Avenue to the east.

The soil in the vicinity of SA-12 consists of a top 60-foot layer of silt, with occasional layers of sandy silt or silty sand that are up to 5 feet thick. Underlying that layer, there is a greater proportion of silty sand and sandy silt layers. The water table was found at a depth of approximately 40 feet bgs based on data from January 2004 (URS, 2010).

11.2 Residual NAPL Areas

Two areas, Source Area 6 (SA-6) and Source Area 11 (SA-11), are considered to be "residual NAPL areas" where NAPL is present but at residual (non-mobile) saturations. These areas differ from the NAPL accumulation areas in that no NAPL accumulation was observed in these areas.

Source Area 6

SA-6 is associated with the VOC tank farm in the former styrene plancor and is located in Area 23, the same area that contains SA-3 (Figure 11-1). The NAPL is predominantly composed of benzene and ethylbenzene. The NAPL source area is adjacent to a warehouse building on the east side, and some fraction of the NAPL source area may extend under the building. The majority of the NAPL mass is located in the deep vadose zone, but there was intermittent contamination in the saturated zone down to approximately 80 feet bgs and up to approximately 10 feet bgs. It is estimated that the NAPL extends laterally 33,000 sf in area, affecting a soil volume of approximately 75,000 cy.

The soil in the vicinity of SA-6 consists of a top layer of low-permeability silt to sandy silt, with a few interbedded layers of silty sand to sandy silt up to 5 feet thick. Underlying that layer, the soil is predominantly fine or silty sand. The water table was found at a depth of approximately 50 feet bgs based on data from January 2004 (URS, 2010).

Source Area 11

SA-11 is associated with leakage from a former underground benzene pipeline in the former butadiene plancor and is located in Area 9, Area 6, and Area 15 (Figure 11-1). Area 6 also contains shallow soil contamination that warrants remedial action due to potential impacts to surface receptors. Area 9 and Area 15 do not contain shallow soil contamination warranting remedial action, only the NAPL and deeper vadose and saturated zone contamination that acts as a source of contamination to the groundwater. This NAPL is composed primarily of benzene. The NAPL source area is located behind an office building on the north side of Area 9, beneath a high voltage power transmission line on Area 15, and beneath a portion of the parking lot in the northwest corner of Area 6. A small fraction of the source area may extend beneath the building on Area 9. The majority of the NAPL mass is located in the top 5 to 10 feet of the water table zone, with some of the contamination mass in the vadose zone near ground surface and intermittently deeper in the saturated zone down to 85 feet bgs. It is estimated that the NAPL extends laterally 38,000 sf in area, affecting a soil volume of approximately 91,500 cy.

Soil in the vicinity of SA-11 consists of an upper 34-foot layer of silt with interbedded silt and fine sand. Underlying that layer is an 18-foot layer of fine to medium sand from 34 to 52 feet bgs, and then a 38-foot layer of silt and clay with interbedded fine sands from 52 to 90 feet bgs. The water table was found at a depth of approximately 40 feet bgs based on data from January 2004.

11.3 Remedial Alternatives Selected to Address NAPL Areas

The remedial actions selected for principal threat NAPL areas are a combination of ICs, SVE, and ISCO. The selected remedy for these areas includes active treatment components to decrease the amount of principal threat waste. These elements are part of Remedial Alternative 4, as discussed in Section 9.0 and summarized below.

ICs will be instituted for all four principal threat areas. ICs include building permit review, General Plan footnote and restrictive covenants to prevent residential use of the land, and to help ensure that the EPA reviews construction plans and that additional sampling needed is conducted. Informational outreach would be conducted to provide information about environmental conditions to owners, occupants, and the public. Restrictive covenants would have a provision to prohibit drilling into and use of groundwater.

The SVE treatment will be used to actively remove VOCs from the deep soil above the groundwater in each of the four principal threat areas (SA-3, SA-6, SA-11, and SA-12). SVE is the only treatment component selected for SA-6, where the principal threat waste exists almost exclusively in the vadose zone. SVE will extend beneath a portion of the building in SA-6.

ISCO will be used to treat NAPL in the water table zone in source areas SA-3, SA-11, and SA-12. ISCO consists of injecting chemicals oxidants into the groundwater in the NAPL/soil contamination area. The oxidants convert the NAPL into benign substances, carbon dioxide and water. This chemical reaction could also release heat, which would vaporize VOC contamination above the groundwater. Therefore, SVE will be implemented along with ISCO to capture these vaporized contaminants.

Prior to treatment, additional sampling will be performed to further define the extent of contamination requiring remediation.

12.0 Selected Remedy

The selected remedy for addressing soil and NAPL contamination at the Del Amo Site is Alternative 4, which includes the following components:

1. ICs (informational outreach, building permit review, General Plan footnote, restrictive covenants);
2. Capping for impacted shallow outdoor soil in Areas 2, 16, 28, and 35;
3. BECs for VOC-impacted shallow soil under the building in Area 16;
4. SVE for VOC-impacted, shallow outdoor soil in Areas 6, 11 and 23;
5. SVE for VOC-impacted shallow soil under the building in Area 23;
6. SVE for shallow soil in NAPL-impacted Source Area 6; and
7. ISCO and SVE for deep soil and groundwater in NAPL-impacted groundwater contamination Source Areas 3, 11 and 12.
8. For future areas of contamination encountered during redevelopment or construction:
   - Excavation, or
   - BECs, capping, or SVE and
   - Restrictive covenants

The site areas applicable to each of the above components are indicated in Table 12-1 and on Figure 12-1. Each component is described in more detail below. For any remedy that is selected, EPA will evaluate opportunities to lessen the overall environmental impact of the actions. The principles of EPA's Green Remediation policy will be followed.

12.1 Rationale for the Selected Remedy

The areas where each remedy component will be applied are listed in Table 12-1 and shown in Figure 12-1. In addition, if new contamination areas are discovered in the future during construction projects, where contamination exceeds risk-based levels, the remedy for such areas would be: (1) Excavation, (2) BECs (if contamination is beneath a building and excavation is infeasible), or (3) SVE for VOCs and capping for non-VOCs (if interference makes excavation impractical).

The No Action Alternative (Alternative 1) does not meet the first threshold criteria of protecting human health and the environment because it does nothing to prevent exposure, so it was eliminated from further consideration. The Institutional Controls Only Alternative (Alternative 2) is not protective for the two locations with soil vapor intrusion potential, and does not reduce the amount of contamination present or physically prevent human exposure, making its effectiveness less certain in the long-term than all other alternatives. For these reasons, it was eliminated from further consideration, even though it is fairly easy to implement and low cost.

Alternatives 3, 4, and 5 can each be subdivided into three components – shallow outdoor soil, shallow soil beneath buildings, and deep soil/groundwater contamination source areas and are discussed separately below.

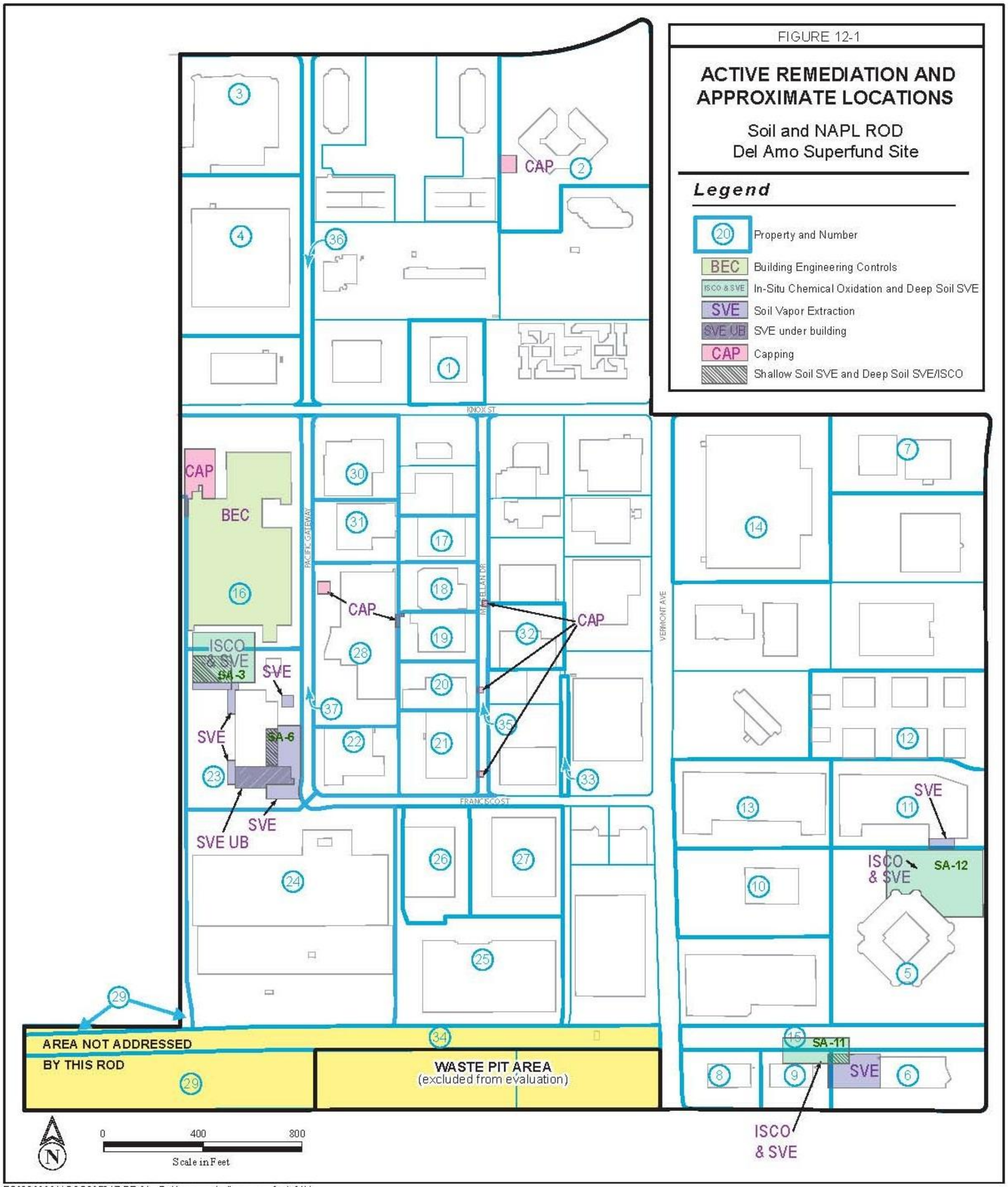
TABLE 12-1: Preferred Alternative Summary

	Active Components					Institutional Controls				
Area Number	**Cap**	**SVE (shallow)**	**BEC**	**ISCO**	**SVE (deep)**	**1**	**2**	**3**	**4**	**5**
1						X	X			
2	X					X	X	X	X	
3						X	X			
4						X	X	X	X	X
5				X (SA12)	X (SA12)	X	X	X	X	X
6		X		X (SA11)	X (SA11)	X	X	X	X	X
7						X	X	X	X	
8						X	X	X	X	X
9				X (SA11)	X (SA11)	X	X	X	X	X
10						X	X	X	X	
11		X				X	X	X	X	X
12						X	X	X	X	
13						X	X	X	X	
14						X	X	X	X	
15				X (SA11)	X (SA11)	X	X	X	X	X
16	X		X	X (SA3)	X (SA3)	X	X	X	X	X
17						X	X	X	X	X
18						X	X			
19						X	X	X	X	X
20						X	X	X	X	X
21						X	X			
22						X	X	X	X	X
23		X		X (SA3)	X (SA3, SA6)	X	X	X	X	X
24						X	X	X	X	X
25						X	X			
26						X	X			
27						X	X			
28	X					X	X	X	X	X
30						X	X	X	X	
31						X	X			
32						X	X	X	X	X
33						X	X	X	X	X
35	X					X	X	X	X	X
36						X	X	X	X	
37						X	X			
Unnumbered Areas						X	X			

TABLE 12-1: Preferred Alternative Summary

Area Number	Active Components					Institutional Controls				
	Cap	SVE (shallow)	BEC	ISCO	SVE (deep)	1	2	3	4	5

Notes:
Remedy Components
Cap = Capping
BEC = Building Engineering Controls
ISCO = In-Situ Chemical Oxidation
SVE = Soil Vapor Extraction
Institutional Controls
1 Information
2 Permit Review
3 General Plan footnote
4 Restrictive Covenants (prohibiting disruption of cleanup activities, requiring EPA review and approval of construction plans, prohibiting residential use)
5 Restrictive Covenants (requiring EPA approval prior to drilling into groundwater)
Whereas there are 26 areas requiring restrictive covenants, the exact number of individual parcels that will be covered, and the exact number of covenants needed to cover all of the areas will be determined during remedial design.



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Outdoor Shallow Soil Component – Rationale for Alternative 4

For the outdoor shallow component of Alternatives 3, 4, and 5, each alternative includes the same ICs. In addition, Alternative 3 consists of capping all the contaminated areas, Alternative 4 consists of capping the areas where non-VOCs drive the risk (VOCs present in some of the areas) and using SVE where only VOCs are present, and Alternative 5 consists of excavation for all areas.

Capping is easier and less costly to implement than SVE and excavation. Although excavation removes the most contamination, making it the most effective in the long-term, it costs more and has more negative short-term impacts than the other alternatives. Alternative 4 is a combination of capping (for the non-VOC driven areas) and SVE (VOC areas), which is less costly and less disruptive than excavation alone but more permanent and effective in the long-term than capping alone. For these reasons, Alternative 4 (Capping and SVE – along with ICs) is the selected remedy for the outdoor shallow soil component.

For any site-related outdoor shallow soil contamination encountered in the future above the action levels, the alternatives are the same – capping, SVE, or excavation. However, because these areas would be part of construction activities being performed by property owners or tenants, excavation is more cost-effective and less disruptive when conducted in conjunction with the construction. Because excavation is a more permanent alternative than capping and most effective in the long-term, reducing the cost and disruption issues makes excavation the best approach. Therefore excavation is the selected remedy for shallow soil contamination discovered in the future, unless EPA determines that interference with structures, utilities, or other infrastructure makes excavation impractical. In such cases, SVE would be implemented for VOC contamination, and capping would be implemented for non-VOC contamination.

Shallow Soil Beneath Buildings Component – Rationale for Alternative 4

For shallow soil beneath buildings, Alternative 3 consists of BECs, Alternative 5 consists of SVE, and Alternative 4 consists of both (BECs at one location and SVE at a different location). Building engineering controls cost less and are easier to implement than SVE. However, SVE is more effective in the long-term because it removes the contamination from the soil. There are two buildings requiring action, but SVE is more implementable in one than the other, due to size and configuration. Thus, the selected remedy utilizes SVE in one location and BECs in the other.

For any site-related shallow soil contamination encountered beneath buildings during future construction activities above the action levels, the alternatives are BECs, SVE, or excavation. Excavation is most effective in the long-term because it removes the contaminated soil, and it would not cause additional disruption in most situations because the construction activity would be occurring anyway. However, if EPA determines that excavation would be excessively impractical, the selected remedy will be BECs. Building engineering controls are more implementable with fewer short term impacts than both excavation and SVE, but are still effective because they prevent contaminants from accumulating indoors.

NAPL/Groundwater Contamination Source Areas Component – Rationale for Alternative 4

For the NAPL/groundwater contamination source areas, Alternatives 3, 4, and 5 include Institutional Controls (ICs) and Soil Vapor Extraction (SVE). In addition, Alternative 3 consists of hydraulic extraction, Alternative 4 consists of In-Situ Chemical Oxidation (ISCO), and Alternative 5 consists of In-Situ Soil Heating (ISSH).

The key factors in selection of this remedy are the amount of contamination the alternatives could remove, cost, and disruption to the neighbors (which affects implementability and short term effectiveness). Soil heating removes the most contamination, followed by chemical oxidation and then hydraulic extraction. Soil heating is more expensive than chemical oxidation and hydraulic extraction, which cost approximately the same amount. Soil heating and hydraulic extraction are the most disruptive alternatives in the short-term, with chemical oxidation being significantly less disruptive. Therefore, the selected remedy for this component is ISCO (with ICs and SVE). Chemical oxidation achieves the best balance of the evaluation factors because it is second best in mass removal, lowest in cost, and the least disruptive.

SA-6 will only have SVE (and ICs) because its contamination is mostly in the vadose zone. Chemical oxidation is only applicable in the saturated zone at this site. The alternatives for this source area were ICs alone or SVE (and ICs). SVE was selected because it will remove a significant amount of contamination, which makes the alternative more effective in the long-term than ICs alone.

12.2 Detailed Description of Selected Remedy

1. Institutional controls

There will be four layers of ICs included in this remedy. These layers reinforce each other. If one layer were to fail, the other layers will still be in place to prevent any potential exposure. The general goals of the ICs are to minimize the potential for future exposure to residual contamination at the site and protect the remedy. Specifically, the ICs will work together to achieve the following for all parcels:

- Make property owners, tenants, and construction personnel aware of the site-related contamination,
- Ensure that EPA is aware of and reviews construction plans before any excavation occurs that could encounter Site-related contamination.

For parcels determined by EPA to exceed action levels for residential use, the ICs will:

- Prohibit residential use;
- Prohibit interference with any other remedial activities within the property;
- Prohibit drilling into and use of groundwater, if the property overlies groundwater contamination.

The ICs to achieve these goals include informational outreach, building permit review, General Plan footnote, and restrictive covenants (Section 9). The following paragraphs discuss these ICs, where they will be applied, how they will be implemented and how the IC goals will be met.

IC Layer 1: Informational Outreach

Informational outreach (IC layer 1) will be applied to all on-site properties. The outreach will include mailings, websites, publically accessible databases and any other venue as determined by EPA. Environmental information about the properties will be made available, including data from the remedial investigation and information from the Baseline Risk Assessment and ROD and any other information as determined by EPA. The targeted audience includes owners, tenants, prospective owners and tenants, developers and other professionals supporting the above. The outreach can be used to support the other IC layers as well. The goal is to inform the public about the environmental condition of the Site and the controls and restrictions that are in place. The outreach will be accomplished by EPA, DTSC and the potentially responsible parties.

IC Layer 2: Building Permit Review

The building permit review IC (IC layer 2) will also be applied to all on-site properties (Table 12-1, Figure 12-1), with the objective of reviewing planned construction activities that could cause exposure to contaminants. This will help ensure that EPA has the opportunity to review construction plans for projects that involve soil disturbance, as described below. This IC layer is a tool for information exchange and a conduit to additional investigation and clean-up activities if deemed warranted by EPA. By itself, the building permit review IC does not restrict use or conduct clean-up actions. Rather, it identifies areas that need further clean-up. The clean-up, if warranted, shall be conducted pursuant to the "Future Areas encountered during redevelopment or construction" component of the remedy.

The building permit review program is already operating successfully as a pilot program in cooperation with the City of Los Angeles Department of Building and Safety. The program targets site properties where development activities would result in subsurface penetrations of more than 18 inches, or changes in the type of land use. These properties are identified through notifications from developers/property owners and the land watch monitoring described below. Notification from the developers/property owners is encouraged through an agreement with the City of Los Angeles wherein Del Amo Site properties are flagged on the City's internet-based Zoning Information and Map Access System (ZIMAS). When an application for a building or grading permit is issued for a ZIMAS-flagged property, the applicant is informed by city staff that the property is located on the Del Amo Superfund Site, and documentation with instructions on contacting the Del Amo Environmental Review Team (ERT) is provided.

The building permit review IC program will continue as described above and will be instituted in all areas of the site. As building permit applications are reviewed by the City of Los Angeles Building and Safety Department, applicants will be referred to the ERT to review construction plans and determine whether contaminated soil or groundwater would be encountered. EPA would then require additional sampling and remedial activities if needed.

The Del Amo Environmental Review Team (ERT), is currently composed of EPA, DTSC and the AOC Respondents. Similar to the pilot program, EPA expects that potentially responsible parties (PRPs) shall serve as the point of contact for permit applicants. Upon contact, the PRPs shall conduct an initial review by obtaining information from the applicant regarding the nature of the proposed project, proposed land use, and locations and depths of excavations. If the proposed project involves soil penetration deeper than 18 inches bgs[7] or a change in land use is proposed, the PRPs shall prepare a Screening Evaluation Summary Report (SESR), which shall include the following information:

- A summary of the proposed project
- A summary of the risk information for the parcel (from the BRA and FS)
- A map of past sampling locations on the parcel, historical rubber plant facilities, and proposed excavations and construction activities
- A data summary table including the laboratory analytical results for each sampling location on the parcel, highlighting any concentrations exceeding regulatory screening criteria

[7] The 18 inch depth was selected as the depth of concern that would initiate a SESR because the Site had been graded and base material imported during redevelopment. Thus, the native soil that has the potential for containing site-related contamination would not be encountered shallower than 18 inches bgs.

- A summary of recommendations for further action, as appropriate. Recommendations could include additional sampling and risk assessment

Following EPA's review of the SESR, EPA will determine whether or not the project can proceed without further evaluation. If EPA determines that further evaluation and/or remedial action is necessary, EPA will require that any necessary evaluation, which may include sampling and risk assessment activities, be performed. Based upon existing data and any further evaluation, the remedies described in Section 12.2.8 (Future Areas of contamination encountered during construction or redevelopment) of this ROD will be implemented.

IC Layer 3: General Plan Footnote

EPA and the PRPs will work with the City to apply a General Plan footnote (IC layer 3) to the Site for areas exceeding the action level for residential use. The action level for residential use is based on the BRA results, and is any area (known as "EAPC" in the BRA) with an excess cancer risk greater than one in one million or a non-cancer hazard index greater than 1.0. The 26 properties (Areas) where the General Plan footnote IC will be applied include Areas 2, 4-17, 19, 20, 22-24, 28, 30, 32, 33, 35, and 36 (Table 7-9, 12-1, and Figure 12-1).

The footnote will state that the land is within the Del Amo Superfund Site and is not appropriate for residential use. The current zoning for these properties does not allow residential use. The current zoning at the Site is predominantly manufacturing/industrial with one parcel having a dual commercial-industrial designation, and two parcels having a public facility designation. The purpose of this IC layer is to strengthen the existing restrictions on residential use and prevent unacceptable exposure to contaminants that could occur during residential use. A footnote about the Superfund Site will remind future planners about the contamination. Adding a footnote to the General Plan constitutes an amendment to the General Plan and requires approval of the Planning Commission and the City Council. The General Plan footnote IC supports and enhances the IC program but is not itself a key element.

IC Layer 4: Restrictive Covenants

The restrictive covenants required for site properties (Areas) are legal agreements entered into by the property owner and DTSC pursuant to California law (California Civil Code section 1471 and 22 C.C.R. 67391.1). The covenants shall run with the land and be binding upon all future owners and occupants. Each covenant shall be recorded with the county recorder's office and will contain specified restrictions on use. The restrictive covenants will also be enforceable by EPA as a third party beneficiary.

The restrictive covenants will be applied to properties (Areas) exceeding action levels for residential use. The action level for residential use is based on the baseline risk assessment (BRA) results, and is any area (known as "EAPC" in the BRA) with an excess cancer risk greater than one in one million or a non-cancer hazard index greater than 1.0. These areas, the same 26 areas as for the General Plan footnote IC, include Areas 2, 4-17, 19, 20, 22-24, 28, 30, 32, 33, 35, and 36 (see Table 7-9, 12-1, and Figure 12-1).

The restrictions contained in the covenants will vary depending on the property. Figure 12-1 presents a map of all Site areas. The restrictions and requirements for each restrictive covenant are shown in Table 12-1 and are described as follows:

- Residential use will be prohibited;
- Any construction or redevelopment plans involving excavation must obtain EPA review and approval prior to initiation of such work;

- Interference with remedial activities, systems, or components will be prohibited, including both investigation and cleanup activities;
- Drilling into and use of groundwater will be prohibited without prior approval by EPA.

The covenants recorded on properties numbered 2, 5, 6, 9, 11, 15, 16, 23, 28, and 35 (Table 12-1) will prohibit interference with any remedial activities, systems, or components (for capping, SVE, or chemical oxidation remedies).

Restrictive covenants implemented in selected areas that overlie groundwater contamination will prohibit drilling into and use of groundwater without prior approval by EPA and DTSC. This restriction will be implemented in the covenants for Areas 4, 5, 6, 8, 9, 11, 15, 16, 17, 19, 20, 22, 23, 24, 28, 32, 33, and 35 (Table 12-1).

Monitoring of the IC program shall be conducted in part through land-activity monitoring. “Land activity monitoring” is a service that monitors construction permit activity (construction, grading, well installation), land use permit activity, underground services alerts, and property transfers to identify activities that could potentially result in contact with soil or other unacceptable exposures.

2. Capping for VOC- and non-VOC-impacted shallow outdoor soil

Capping involves covering the area of impacted soil with a suitable material such as concrete, asphalt, clean soil, or other surface that eliminates the potential for direct contact exposures. Capping is the selected remedy on properties numbered 2, 16, 28, and 35. Capping will be implemented on areas of these properties where non-VOCs, and in some cases VOCs, are present above the action level. The EPA action level is the concentration in soil that would cumulatively pose a cancer risk exceeding 1E-6 or a non-cancer hazard index exceeding 1.0 if exposure were to occur to property occupants in a commercial-use setting (EPA, 2012). For arsenic, PAHs and DDT, the action level also must exceed their background levels (PAHs expressed as benzo(a)pyrene equivalents). These properties are listed in Table 12-1 and shown on Figure 12-1. The footprint of the cap within each of these properties will be determined during remedial design, as discussed in more detail in Section 12.4 “Expected Outcomes of the Selected Remedy.” The contaminants of concern that have been identified in the areas to be capped are shown in Table 12-2.

revised TABLE 12-2: Contaminants of Concern for Capping

Chemical	Background (mg/kg)
Benzo(a)pyrene equivalent	0.9
Benzo(a)pyrene	NA
Dibenzo(a,h)anthracene	NA
Benzo(a)anthracene	NA
Benzo(b)fluoranthene	NA
Benzo(k)fluoranthene	NA
Indeno(1,2,3-c,d)pyrene	NA
4,4’-DDT	10
n-Nitrosodiphenylamine	NA
Arsenic	25.0

EPA shall define the procedure for determining cumulative risk during the remedial design process, and that procedure shall be consistent with the Baseline Risk Assessment (Geosyntec and URS, 2006).

A total capped area of 38,500 sf was assumed for cost estimating purposes. These areas are already covered with asphalt, concrete, or landscaping. This remedy component is expected to involve an initial inspection and evaluation followed by repairs, enhancements or replacements of existing surfaces (e.g. slurry sealing) when needed. Periodic inspections, repairs, and replacement will occur thereafter. The capped surfaces will be monitored in perpetuity to ensure long-term effectiveness. The restrictive covenants will contain a provision to ensure the capped areas are not disturbed as long as the contaminated soils remain.

3. Building engineering controls for VOC-impacted shallow soil under a building

BECs will be applied at the building on property number 16 in the western portion of the site (see Table 12-1 and Figure 12-1) if VOC vapors from subsurface contamination accumulate within the building in excess of the action levels. Action levels shall be the higher of the outdoor background levels or the EPA Regional Screening Levels (RSLs) and the California Human Health Screening Levels (CHHSLs) for indoor air in a commercial use scenario.[2] See Table 12-3.

Both indoor air and outdoor background concentrations of the contaminants of concern will be sampled and evaluated to determine whether action levels are clearly exceeded (statistically, as determined by EPA during remedial design). Aboveground sources of the target VOCs on the property will be eliminated or minimized to the extent possible prior to indoor air sampling. The purpose of this evaluation is to address the common complication caused by the presence of indoor air contaminants from unrelated sources. Such sources, unrelated to the Superfund site, could include aboveground sources associated with the existing business operations or air pollution emanating from other sources in the region. If the action levels are not clearly exceeded, periodic monitoring of the same parameters shall be instituted. If action levels are clearly exceeded, then building engineering controls will be implemented.

The RSL and CHHSL levels for the VOC constituents known to exist in the subslab are as follows:

TABLE 12-3: RSL and CHHSL Levels for BECs

Chemical	Indoor Air	
	CHHSL (μg/m^3)	RSL (μg/m^3)
Benzene	0.14	1.6
Tetrachloroethene	0.69	2.1
Trichloroethene	2.04	6.1

If other VOCs are found in the subslab during any RD sampling activities, their concentrations will be compared to their respective action levels as well.

If building engineering controls are to be implemented, the existing building ventilation system will be modified and floor sealing performed as appropriate. The specific measures will be selected by EPA during remedial design. Modification of the ventilation system may include resizing or redesign of existing ventilation openings on the exterior walls of the building, modification of mechanical air circulation systems, or building pressurization by modifying the HVAC system. Floor sealing involves application of a sealant to the floor surfaces to retard or prevent intrusion of VOCs through the floor slab and into the building.

[2] The lower of the RSL or CHHSL levels for each contaminant of concern would be used.

If ventilation modifications and floor sealing alone are insufficient to reduce concentrations to below action levels, sub-slab venting will be implemented. Subslab venting involves extraction of sub-slab vapors by passive venting using natural pressure gradients, or active venting using extraction fans (blowers). Passive venting systems use slotted piping installed in the subsurface. Active sub-slab venting uses suction pits or horizontal wells placed under the building floor, connected by piping to a vapor extraction fan or blower. The extracted vapors may need to be treated with activated carbon depending on the VOC concentrations in them.

Data collection during the remedy design process will also help EPA to determine the control or combination of controls that are most appropriate and the portion of the building that will need the BEC. For cost estimating purposes, it was assumed that approximately 10,800 sf at the northwest corner of the building is the extent of VOC-impacted sub-slab soils that require this control.

The restrictive covenant IC for property number 16 will prohibit interference with the BECs to ensure the health and safety of the building occupants. If specific ventilation measures are required as part of the remedial action, the restrictive covenant will also require continued operation of those measures (or equivalent, as approved by EPA). Ongoing monitoring of the indoor air will occur as long as the VOC constituents of concern exist in the sub-slab at levels exceeding EPA's action levels.

4. SVE for VOC-impacted outdoor shallow soil

SVE will be implemented to remove VOCs from the shallow soil at properties numbered 6, 11, and 23, as listed in Table 12-1 and on Figure 12-1. SVE is an active remedial technology that removes VOCs from impacted soil by vacuum extraction through wells, followed by treatment of the VOC vapors by aboveground treatment equipment, such as adsorption, condensation, thermal oxidation, or internal combustion engine. Additional sampling will be performed during remedial design to determine the extent of shallow soil requiring SVE remediation at each property. SVE will be implemented on these properties where VOCs are present above the soil action levels, based on the RSLs, as shown in Table 12-4.1. This action level can be adjusted to incorporate other VOC constituents besides these, if found during additional remedial design sampling to exceed the risk levels and require action where the above had not required action. In such cases, the action level for all VOC contaminants combined would be a cumulative risk of one in one million excess cancer risk or hazard index greater than 1 for an industrial/commercial use exposure scenario (EPA, 2012). For cost estimating purposes, it was assumed SVE would be applied to a total area of 73,200 sf. Separate SVE systems are anticipated for each property.

TABLE 12-4.1: RSL Levels for Outdoor SVE

Chemical	Concentration (mg/kg)
Benzene	5.4
Chloroform	1.5
Tetrachloroethene	2.6
Trichloroethene	6.4

The SVE technology includes vapor extraction wells connected by piping to an aboveground vapor extraction and treatment system (VETS). The VETS is expected to include a high vacuum blower (e.g., positive displacement blower or a liquid ring pump capable of greater than 8 inches of mercury vacuum) connected to vapor treatment equipment. The appropriate vapor treatment technology will be selected by EPA during remedial design from a range of options that includes thermal oxidizers, vapor phase carbon adsorbers, condensers, and internal combustion engines. For SVE in outdoor soil, vertical wells screened between approximately 5 and 15 feet bgs are expected to be used. The details of well construction, spacing and layout for each SVE system will be determined during remedial design.

The total flow rate and sizing of the equipment for each SVE system will depend on both the total number of wells needed and the physical properties of the soil. The wells are typically completed flush to the surface and placed in traffic-rated well boxes with an isolation valve and a sampling port on the well head. The wells will likely be connected by piping that is placed below grade in trenches leading to the compound that houses the aboveground treatment equipment. This approach will minimize the impact on the property owners and tenants at these properties. The duration of remediation at each property was estimated to be 3 years.

The clean-up levels and system shutdown criteria are described in Section 12.4 "Expected Outcome of the Selected Remedy."The restrictive covenant IC for properties numbered 6, 11 and 23 will prohibit interference with the SVE systems, including wells, piping and treatment equipment, during system operation until EPA determines that the system is no longer needed.

5. SVE for VOC-impacted soil under a building

SVE will be implemented for soil beneath one building on property number 23, located in the western portion of the site (see Table 12-1 and Figure 12-1). Prior to implementing SVE, additional subslab sampling will be performed during remedial design to determine the extent of shallow soil under the building requiring remediation. SVE will be implemented on this property where concentrations of the target constituents exceed the action levels. The action levels shall be determined as follows: The indoor air RSL (Table 12-4.2) or the contaminant concentration in background air, whichever is higher, shall be divided by site-specific attenuation factors (approved by EPA) to obtain sub-slab contaminant concentrations and soil gas contaminant concentration in soil outside but adjacent to building.

TABLE 12-4.2: Indoor Air RSL

Chemical	Concentration ($\mu g/m^3$)
Benzene	1.6
Chloroform	0.53
Tetrachloroethene	2.1
Trichloroethene	3.0

SUMMARY OF CLEANUP APPROACH

1. **Air.** Take the higher of the indoor air RSL or the contaminant concentration in background air;
2. **Attenuation.** Divide #1 by:
   a. attenuation factor to obtain sub- slab contaminant concentrations, and
   b. attenuation factor to obtain soil gas contaminant concentration in soil outside but adjacent to building [factors (a) and (b) likely are different]
3. **Results.** Action and cleanup levels for:
   a. sub-slab
   b. soil outside but adjacent to building

Although for cost estimating purposes it was assumed that SVE will be applied under the entire building (approximately 63,000 sf), subsequent information showed that the remedy will only be needed in the southern portion of the building. The exact area requiring treatment will be determined during remedial design.

The SVE technology will include vapor extraction wells, piping, a high vacuum blower, and vapor treatment equipment as discussed earlier (Item 4). The appropriate well designs, spacing and layout for this SVE application will be determined by EPA during remedial design. The wells will typically be connected by subsurface piping to a high vacuum blower and a vapor treatment system located in a fenced compound on the surface. The vapor treatment technology options are the same as discussed earlier (Item 4) and will be selected by EPA based on site-specific considerations during remedial design.

The flow rate and equipment sizing for this SVE system will depend on the number of wells and soil physical properties. The duration of the SVE system operation was estimated to be 3 years. Shutdown of the SVE system will occur as described above for VOC-impacted outdoor soil (Item 4). The restrictive covenant IC for property number 23 will prohibit interference with the SVE system during system operation.

The cleanup levels and system shutdown criteria are described in Section 12.4

6. SVE for vadose zone soil in a NAPL-impacted groundwater contamination source area

SVE will be used to remove VOCs from the NAPL-impacted vadose zone soil in SA-6 located on property number 23, as listed in Table 12-1 and shown on Figure 12-1. SVE will also be used in SA-3, SA-11, and SA-12, but those locations will be discussed in item #7 as they will be implemented in conjunction with In-Situ Chemical Oxidation. Additional sampling will be performed during remedial design to determine the exact areal and vertical extent of NAPL-impacted soil at SA-6 requiring remediation. This SVE system will treat an estimated area of approximately 33,000 sf, adjacent to the east and southeast portions of the building. This SVE system will include the same technology components described earlier under Item

4. It is anticipated that vertical wells screened in the shallow and deep vadose zone soil will be used in this source area. Confirmatory sampling with chemical analysis will be performed during remedial design to determine the treatment zone depth. Appropriate well designs, spacing, and layout for this SVE application will be determined by EPA during remedial design.

The wells will typically be connected by subsurface piping to a high vacuum blower and vapor treatment system located in a fenced treatment compound at the surface. The vapor treatment technology will be selected by EPA based on site-specific considerations during remedial design, as discussed earlier (Item 4). The flow rate and equipment sizing for this SVE system will depend on the number of wells and physical properties of the soil. The duration of system operation is estimated to be 4 years. The cleanup levels and system shutdown criteria are described in Section 12.4. The restrictive covenant IC for property number 23 will prohibit interference with this SVE system during operation.

7. ISCO and SVE for deep soil and groundwater in NAPL-impacted groundwater contamination source areas

In-Situ Chemical Oxidation (ISCO) and SVE will be applied in combination at NAPL source areas SA-3, SA-11 and SA-12 as listed in Table 12-1 and shown on Figure 12-1. ISCO is a technology that oxidizes (chemically breaks down) VOC contamination, converting the VOCs into nontoxic byproducts, such as carbon dioxide and water. At Del Amo it will be applied in the saturated zone. SVE will be applied to remove VOC contaminants in the vadose zone soil and any VOC vapors that volatilize from groundwater during implementation of the ISCO injections. Injection of chemical oxidants into groundwater will also increase dissolved oxygen levels in the vicinity of the injection wells and promote aerobic biodegradation of the dissolved VOCs. Prior to implementing ISCO and SVE, additional sampling will be performed to refine the extent of VOC NAPL contamination requiring remediation. For cost estimating purposes, it was assumed that the NAPL source areas requiring ISCO and SVE remediation were 50,000 sf for SA-3; 22,500 sf for SA-12; and 38,000 sf for SA-11. The cleanup goals for ISCO and SVE are described in Section 12.4.

There are several chemical oxidants that EPA will consider for injection, including Fenton's reagent (hydrogen peroxide and iron), ozone, persulfate, and permanganate. Injection of the selected oxidant will be accomplished using either permanent injection points or direct-push temporary injection points. EPA will determine these details, and the appropriate frequency of oxidant injection (semiannual, quarterly, or continuous) during remedial design, based on the results of laboratory and field-based pilot studies. The expected duration of remediation will also be updated during remedial design, based on these studies.

Using semi-annual oxidant injection events, the timeframe for achieving cleanup goals at each of these source areas was estimated to be 4 to 8 years.

The SVE system to be used in concert with ISCO will include the same components described for Item 4 above. The SVE wells are anticipated to be vertical wells screened in deep soil between 15 feet bgs and the water table, placed in a staggered array at a spacing of 45 to 60 feet. The depth to the water table at these three NAPL-impacted source areas varies between 35 and 50 feet bgs. The actual well construction details, well spacing, and the number of wells will depend on soil conditions at each source area, to be determined by EPA during remedial design. The SVE wells will be connected by a high vacuum blower to a vapor treatment system on the surface at each source area. The vapor treatment technology will be selected by EPA based on site-specific considerations during remedial design as discussed earlier. The flow rate and equipment sizing for each of these SVE systems will depend on the number and type of wells needed to address the vertical and horizontal extent of the zone to be treated.

Restrictive covenant ICs requiring that the ISCO and SVE systems are not to be disturbed during operation will be applied at properties containing SA-3, SA-11 and SA-12, which include property numbers 23, 16, 5, 6, 9, and 15.

8. Future Areas of contamination encountered during redevelopment or construction

The remedy for areas of contaminated shallow soil (less than 15 feet bgs) that exceed EPA's action levels for contaminants of concern, and that are discovered in the future, will be excavation and off-site disposal, with the following exceptions:

- If VOC contamination exceeding action levels underlies a building such that excavation is impractical, then BECs will be required.
- If excavation is impractical because of interference with other structures or infrastructure (and thus less implementable), then SVE (for VOCs) and capping (for non-VOCs) will be undertaken. Such interference includes utilities, space constraints, and potential impact to structural and foundation integrity.

EPA's action levels will be the RSL or CHHSL screening levels, whichever is more conservative for the commercial use scenario. In addition, contaminant concentrations would need to exceed background levels, in addition to exceeding screening levels, for any constituents with background levels established by EPA. Thus, the action level would be the screening level or the background level, whichever is higher. Action levels based on indoor or ambient air would be calculated in the same manner as described in Part 5. The cleanup goals are discussed in Section 12.4. If contaminants of concern are left in place above a level that would not allow for unrestricted use, then the restrictive covenant ICs will be implemented if not already in place. For any future areas addressed, EPA expects that they will be substantially analogous to the areas that were evaluated pursuant to the 9-Criteria Analysis in Section 10 of this ROD, such that the 9-Criteria Analysis already performed shall be used by EPA to determine appropriate future actions. EPA will document each future action with memoranda to the site file.

12.3 Summary of the Estimated Remedy Costs

The overall present worth cost of the remedy is $52,504,000 utilizing a discount rate of 5 percent. Table 12-5 shows how this cost is further divided by the various remedy components and by capital, O&M, and contingency. Tables 12-6 through 12-13 present more detailed descriptions of the cost of each remedy component. Table 12-14 presents the estimated costs for future areas of site-related contamination encountered during redevelopment or construction. Table 12-5 shows the difference in the overall present worth cost if higher or lower discount rates are utilized. The difference between the cost presented in the Proposed Plan ($50,430,000) and the cost presented herein is discussed below.

The costs presented here were developed in the Soil and NAPL FS (URS, 2010). The following assumptions were made to generate the cost estimate:

- The total cost does not include remediation of site-related contamination encountered in the future; however, the unit cost for remediation of such contamination is presented.
- This cost estimate assumes 20 percent contingency for all remedy components, except for NAPL-related ISCO+SVE, which uses 40 percent.

The values in these cost estimate tables are based on the best available information regarding the expected scope of the remedy. The actual extent of the remedial actions and subsequently costs may vary. This estimate is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual costs of the remedy.

Difference Between Proposed Plan and ROD Costs

As shown in Table 12-5, the overall present worth of the remedy is $52,504,000. This varies from the $50,430,000 cost presented in the Proposed Plan for the following reasons:

The ICs costs for the land parcels in the Group 1 and 2 categories had not been included in the Proposed Plan. The addition of the costs for these two IC Layers is approximately $2,400,000.These 40 parcels will only have the basic building permit review IC and associated informational outreach and monitoring. This IC for these parcels did not differ between the alternatives in the Proposed Plan, so the Proposed Plan did not reflect their approximately $2.4 million cost.

For the in-situ chemical oxidation component of the remedy, the Proposed Plan cost estimate assumed use of permanent injection wells for Source Area 3. In this ROD, the cost estimate assumed use of temporary injection points for Source Area 3, to be consistent with assumptions for Source Areas 11 and 12. This change decreases the cost estimate by approximately $800,000.

EPA's cost estimate in the Proposed Plan for the capping remedy on Area 35 assumed that the area to be capped would be 2,500 sf. Based upon subsequent review, however, EPA increased that estimate of the area to be capped to 7,500 sf. This change in size increases the cost estimate by approximately $200,000.

The fourth variance pertains to indirect capital and contingency rates. For the ROD cost presentation, the IC costs were given an indirect capital rate and contingency rate that was less than the rates used for the construction-related costs of the rest of the remedy. In the Proposed Plan, they had the same rates. The change was made because it was believed that IC implementation has lower indirect capital costs and a lower chance of implementation cost variability than physical construction. This resulted in an overall savings of approximately $200,000.

The fifth cost variance also relates to contingency rates. Due to an oversight, groundwater monitoring costs in the Proposed Plan did not have the contingency rate applied to them, but in the ROD they did have contingency rates applied. This resulted in a $400,000 cost increase in the ROD.

Costs for Remediation of areas of site-related contamination encountered during Redevelopment or Construction

As described in Section 12.2, Detailed Description of Selected Remedy, Part 8, the future contingencies component addresses site-related contamination encountered in the future during construction projects that have shallow soil exceeding EPA's action levels.

Because the volume, location, and constituents of such contaminated soil is unknown at this time, EPA estimated a range of possible costs depending upon these variables. EPA estimated the costs for relatively small, medium or large areas of contamination for each type of remedial action (excavation, BECs, capping or SVE) as shown in Table 12-14. The table defines the sizes of the contaminated areas that would be considered small, medium, or large. Note that excavation costs also varied depending on the depth of the excavation. Cost estimates are provided for shallow (less than 5 feet), moderate (5 to 15 feet) and deep (more than 15 feet) excavations. Estimates also were made for whether the excavated soil qualified as hazardous or non-hazardous for disposal purposes.

TABLE 12-5: Remedy Cost Estimate Summary

Cost Type and Breakdown		Shallow Soil: ICs + Monitoring (All Properties)	Shallow Soil: Capping (#2, #16, #28, #35)	Shallow Soil: Building Engineering Controls (#16)	Shallow Soil: SVE Outdoor Soil (#6, #11, #23)	Shallow Soil: SVE Under Building (#23)	NAPL Source Areas: SVE (SA-6)	NAPL Source Areas: ISCO+SVE (SA-3, SA-11, SA-12)	Total Cost
Capital Costs	Direct	$1,099,000	$419,000	$124,000	$1,989,000	$1,113,000	$626,000	$2,985,000	$8,355,000
	Indirect	$110,000	$125,000	$45,000	$458,000	$213,000	$165,000	$572,000	$1,688,000
	Total	$1,209,000	$544,000	$169,000	$2,447,000	$1,326,000	$791,000	$3,557,000	$10,043,000
Annual O&M Costs	Year 1 to Year 3 or 4	$179,000	$68,000	$12,000	$1,236,000	$791,000	$392,000	$4,825,000	$7,503,000
	Year 5 onward	$179,000	$68,000	$12,000	-	-	$15,000	$45,000	$319,000
Annual O&M Present Worth Costs	Discount rate = 3%, 100 yrs	$5,643,000	$2,149,000	$380,000	$3,497,000	$2,237,000	$1,402,000	$17,769,000	$33,077,000
	Discount rate = 5%, 100 yrs	$3,545,000	$1,350,000	$239,000	$3,366,000	$2,154,000	$1,337,000	$16,950,000	$28,941,000
	Discount rate = 7%, 100 yrs	$2,556,000	$971,000	$172,000	$3,244,000	$2,076,000	$1,277,000	$16,192,000	$26,488,000
Contingency	Discount rate = 3%	$1,368,000	$539,000	$110,000	$1,189,000	$713,000	$534,000	$9,100,000	$13,553,000
	Discount rate = 5%	$949,000	$379,000	$82,000	$1,163,000	$696,000	$486,000	$8,561,000	$12,316,000
	Discount rate = 7%	$746,000	$303,000	$68,000	$1,138,000	$680,000	$457,000	$8,157,000	$11,549,000
Total Present Worth	Discount rate = 3%, 100 yrs	$8,214,000	$3,232,000	$659,000	$7,133,000	$4,276,000	$3,201,000	$31,848,000	$58,563,000
	Discount rate = 5%, 100 yrs	$5,715,000	$2,273,000	$490,000	$6,976,000	$4,176,000	$2,912,000	$29,962,000	$52,504,000
	Discount rate = 7%, 100 yrs	$4,529,000	$1,818,000	$409,000	$6,829,000	$4,082,000	$2,739,000	$28,549,000	$48,955,000

Notes/Assumptions

1. The costs presented here were developed in the Soil and NAPL FS dated January 2010.
2. The total cost does not include remediation of site-related contamination encountered in the future.
3. This cost estimate assumes 20% contingency for all remedy components except for NAPL related ISCO+SVE that uses 40%.
4. Some existing RI data may no longer be representative of current site conditions due to biodegradation of contaminants through time. The extent of remedial action will be based on conditions present at the time of remedy design and implementation, and actual costs may vary from the estimates presented in the table.

TABLE 12-6: Cost Estimate, Institutional Controls

		IC Layers						Capital Costs			O&M Costs			
Property	Parcel #	1	2	3	4A	4B	5	Direct	Indirect (10%)	Total	Annual	Present Worth O&M	Contingency	Total Present Worth
1	7351-031-018	✓	✓					$5,000	$500	$5,500	$2,175	$43,000	$10,000	$59,000
2	7351-031-020	✓	✓	✓	✓	✓		$34,000	$3,400	$37,400	$3,275	$65,000	$20,000	$123,000
3	7351-031-031	✓	✓					$5,000	$500	$5,500	$2,175	$43,000	$10,000	$59,000
4	7351-031-007	✓	✓	✓	✓		✓	$34,000	$3,400	$37,400	$3,275	$65,000	$20,000	$123,000
5	7351-033-017	✓	✓	✓	✓	✓	✓	$44,000	$4,400	$48,400	$3,775	$75,000	$25,000	$148,000
6	7351-033-022	✓	✓	✓	✓	✓	✓	$44,000	$4,400	$48,400	$3,775	$75,000	$25,000	$148,000
7	7351-033-024	✓	✓	✓	✓			$24,000	$2,400	$26,400	$2,775	$55,000	$16,000	$98,000
8	7351-033-026	✓	✓	✓	✓		✓	$34,000	$3,400	$37,400	$3,275	$65,000	$20,000	$123,000
9	7351-033-027	✓	✓	✓	✓	✓	✓	$44,000	$4,400	$48,400	$3,775	$75,000	$25,000	$148,000
10	7351-033-030	✓	✓	✓	✓			$24,000	$2,400	$26,400	$2,775	$55,000	$16,000	$98,000
11	7351-033-034	✓	✓	✓	✓		✓	$34,000	$3,400	$37,400	$3,275	$65,000	$20,000	$123,000
12	7351-033-040	✓	✓	✓	✓			$24,000	$2,400	$26,400	$2,775	$55,000	$16,000	$98,000
13	7351-033-045	✓	✓	✓	✓			$24,000	$2,400	$26,400	$2,775	$55,000	$16,000	$98,000
14	7351-033-009	✓	✓	✓	✓			$24,000	$2,400	$26,400	$2,775	$55,000	$16,000	$98,000
15	7351-033-900	✓	✓	✓	✓	✓	✓	$44,000	$4,400	$48,400	$3,775	$75,000	$25,000	$148,000
16	7351-034-015 7351-034-050 7351-034-056	✓	✓	✓	✓	✓	✓	$44,000	$4,400	$48,400	$3,775	$75,000	$25,000	$148,000
17	7351-034-039	✓	✓	✓	✓		✓	$34,000	$3,400	$37,400	$3,275	$65,000	$20,000	$123,000
18	7351-034-041	✓	✓					$5,000	$500	$5,500	$2,175	$43,000	$10,000	$59,000
19	7351-034-043	✓	✓	✓	✓		✓	$34,000	$3,400	$37,400	$3,275	$65,000	$20,000	$123,000
20	7351-034-045	✓	✓	✓	✓		✓	$34,000	$3,400	$37,400	$3,275	$65,000	$20,000	$123,000
21	7351-034-047	✓	✓					$5,000	$500	$5,500	$2,175	$43,000	$10,000	$59,000
22	7351-034-052	✓	✓	✓	✓		✓	$34,000	$3,400	$37,400	$3,275	$65,000	$20,000	$123,000
23	7351-034-057	✓	✓	✓	✓	✓	✓	$44,000	$4,400	$48,400	$3,775	$75,000	$25,000	$148,000
24	7351-034-058	✓	✓	✓	✓		✓	$34,000	$3,400	$37,400	$3,275	$65,000	$20,000	$123,000

TABLE 12-6: Cost Estimate, Institutional Controls

Property	Parcel #	IC Layers						Capital Costs			O&M Costs		Contingency	Total Present Worth
		1	2	3	4A	4B	5	Direct	Indirect (10%)	Total	Annual	Present Worth O&M		
25	7351-034-066	✓	✓					$5,000	$500	$5,500	$2,175	$43,000	$10,000	$59,000
26	7351-034-067	✓	✓					$5,000	$500	$5,500	$2,175	$43,000	$10,000	$59,000
27	7351-034-068	✓	✓					$5,000	$500	$5,500	$2,175	$43,000	$10,000	$59,000
28	7351-034-069	✓	✓	✓	✓	✓	✓	$44,000	$4,400	$48,400	$3,775	$75,000	$25,000	$148,000
30	7351-034-072	✓	✓	✓	✓	✓	✓	$24,000	$2,400	$26,400	$2,775	$55,000	$16,000	$98,000
31	7351-034-073	✓	✓					$5,000	$500	$5,500	$2,175	$43,000	$10,000	$59,000
32	7351-034-076	✓	✓	✓	✓	✓	✓	$34,000	$3,400	$37,400	$3,275	$65,000	$20,000	$123,000
33	7351-034-803	✓	✓	✓	✓	✓	✓	$24,000	$2,400	$26,400	$2,775	$55,000	$16,000	$98,000
35	Magellan Dr	✓	✓	✓	✓	✓	✓	$44,000	$4,400	$48,400	$3,775	$75,000	$25,000	$148,000
36	Pacific Gateway N	✓	✓	✓	✓			$24,000	$2,400	$26,400	$2,775	$55,000	$16,000	$98,000
All unnumbered properties	35 Properties	✓	✓					$175,000	$17,500	$192,500	$76,125	$1,511,000	$341,000	$2,045,000
Total Present Worth								**$1,099,000**	**$110,000**	**$1,209,000**	**$179,000**	**$3,545,000**	**$949,000**	**$5,715,000**

Notes/Assumptions:

1. Capital and O&M costs for each property are calculated by adding capital and O&M costs for each IC layer applied to the property.
2. Present worth calculated assuming 5% discount rate, 100 years. Total cost includes 10% indirect capital cost + 20% contingency
3. Six of the unnumbered parcels listed are roadway segments that are considered equivalent to properties for this cost estimate.

TABLE 12-7: Cost Estimate, Capping, Properties 2, 16, 28, 35

Cost Type	Item No.	Description	Units	Property 2			Property 16			Property 28			Property 35			Total Estimated Cost
				Estimated Quantity	Unit Cost	Extended Cost	Estimated Quantity	Unit Cost	Extended Cost	Estimated Quantity	Unit Cost	Extended Cost	Estimated Quantity	Unit Cost	Extended Cost	
Direct Capital Costs	1	Site Investigation/Delineation	ls	1	$20,000	$20,000	1	$31,100	$31,000	1	$13,000	$13,000	1	$18,000	$18,000	$82,000
	2	Site preparation	sf	4,900	$0	$2,000	23,600	$0	$9,000	2,500	$0	$1,000	7,500	$0	$3,000	$15,000
	3	Site Setup, Equipment Mobilization	sf	4,900	$1	$4,000	23,600	$1	$18,000	2,500	$1	$2,000	7,500	$1	$6,000	$30,000
	4	Slurry Seal over Existing Asphalt Pavement	sf	4,900	$5	$25,000	23,600	$5	$118,000	2,500	$5	$13,000	7,500	$5	$38,000	$194,000
	5	Parcel Cleanup/Demobilization	ls	1	$3,000	$3,000	1	$7,000	$7,000	1	$3,000	$3,000	1	$3,000	$3,000	$16,000
	6	Remedial Action Monitoring	day	1	$2,000	$2,000	5	$2,000	$10,000	1	$2,000	$2,000	1	$2,000	$2,000	$16,000
	7	Remediation Documentation/Reporting	ls	1	$10,000	$10,000	1	$14,000	$14,000	1	$10,000	$10,000	1	$10,000	$10,000	$44,000
	8	Health and Safety, ODCs	ls	1	$5,000	$5,000	1	$7,000	$7,000	1	$5,000	$5,000	1	$5,000	$5,000	$22,000
	Direct Capital Costs Subtotal			**$**		**71,000**	**$**		**214,000**	**$**		**49,000**	**$**		**85,000**	**$419,000**
Indirect Capital Costs	1	Engineering, Design, and Permitting		15%	$71,000	$11,000	12%	$214,000	$26,000	15%	$49,000	$7,000	15%	$85,000	$13,000	$57,000
	2	Project Management, Agency Reporting and Coordination		8%	$71,000	$6,000	6%	$214,000	$13,000	8%	$49,000	$4,000	8%	$85,000	$7,000	$30,000
	3	Construction Management		10%	$71,000	$7,000	8%	$214,000	$17,000	10%	$49,000	$5,000	10%	$85,000	$9,000	$38,000
	Indirect Capital Costs Subtotal			**$**		**24,000**	**$**		**56,000**	**$**		**16,000**	**$**		**29,000**	**$125,000**
O&M Costs	1	Cap Maintenance and Repair		1	$9,000	$9,000	1	$40,000	$40,000	1	$4,000	$4,000	1	$15,000	$15,000	$68,000
Totals	**Total Direct + Indirect Capital Costs**															**$544,000**
	Present Worth of Cap (5%, 100 Years) O&M Costs															**$1,350,000**
	Contingency (20% of total project cost)															**$379,000**
	Total Present Worth															**$2,273,000**

Notes/Assumptions:

1. Remediation areas are already paved with asphalt and assumes the use of the existing pavement with periodic resurfacing with a slurry seal every 10 years starting at Year 5 and asphalt replacement every 10 years starting at Year 10.
2. The O&M cost for Cap Maintenance and Repair assumes an annualized average cost to represent the assumed slurry sealing and asphalt replacement schedule at a 10-year frequency. This approach uses the present worth formula for a stream of equal annual costs and results in an approximate present worth cost estimate that is consistent with the approach used in the Feasibility Study.
3. Some existing RI data may no longer be representative of current site conditions due to biodegradation of contaminants through time. The extent of remedial action will be based on conditions present at the time of remedy design and implementation, and actual costs may vary from the estimates presented in the table.

TABLE 12-8: Cost Estimate, Building Engineering Controls, Property 16

Cost Type	Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost
Direct Capital Costs	1	Site Investigation/Delineation	1	ls	$18,000	$18,000
	2	Site preparation	10,800	sf	$0	$4,000
	3	Site Setup, Equipment Mobilization	10,800	sf	$1	$8,000
	4	Subslab Venting System under building (installed)	10,800	sf	$5	$54,000
	5	Install Vapor Monitoring Points inside building	27	ea	$500	$14,000
	6	Parcel Cleanup/Demobilization	1	ls	$3,000	$3,000
	7	Remedial Action Monitoring	7	day	$2,000	$14,000
	8	Remediation Documentation/Reporting	1	ls	$6,000	$6,000
	9	Health and Safety, Equipment Rentals, ODCs	1	ls	$3,000	$3,000
	Direct Capital Costs Subtotal					**$124,000**
Indirect Capital Costs	1	Engineering, Design, and Permitting	15%	of	$124,000	$19,000
	2	Project Management and Coordination	10%	of	$124,000	$13,000
	3	Construction Management	10%	of	$124,000	$13,000
	Indirect Capital Costs Subtotal					**$45,000**
Annual O&M Costs	1	SSV periodic monitoring, operation, maintenance	1	year	$12,000	$12,000
	Annual O&M Subtotal					**$12,000**
Totals	**Total Direct + Indirect Capital Cost**					**$169,000**
	Present Worth (5%, 100 Years) O&M Costs					**$239,000**
	Contingency (20% of total cost)					**$82,000**
	Total Present Worth					**$490,000**

Notes/Assumptions:
1. Sub-Slab Venting (SSV) is assumed as the selected BEC for the northwest corner of the building (10,800 sf).
2. SSV assumes piping laid in trenches inside building.
3. SSV system includes fan and carbon adsorbers as vapor control system.
4. SSV O&M includes periodic monitoring of vapor control system.
5. Some existing RI data may no longer be representative of current site conditions due to biodegradation of contaminants through time. The extent of remedial action will be based on conditions present at the time of remedy design and implementation, and actual costs may vary from the estimates presented in the table.

TABLE 12-9: Cost Estimate, Sve For Voc-Impacted Soil, Properties 6, 11, AND 23

				Property 23			Property 6			Property 11			
Cost Type	Item No.	Description	Unit	Estimated Quantity	Unit Cost	Extension	Estimated Quantity	Unit Cost	Extension	Estimated Quantity	Unit Cost	Extension	TOTAL
Direct Capital Costs	1	Site Investigation/Delineation	ls	1	$88,600	$89,000	1	$108,200	$108,200	1	$16,500	$16,500	$213,000
	2	Site preparation/Geophysical Survey	sf	39,300	$1	$31,000	29,400	$1	$23,520	4,500	$1	$3,600	$59,000
	3	Site Setup, Equipment Mobilization/Demobilization	sf	39,300	$1	$49,000	29,400	$1	$36,750	4,500	$1	$5,625	$92,000
	4	SVE Vertical Wells (V-SVE)	ea	41	$5,000	$205,000	35	$5,000	$175,000	8	$5,000	$40,000	$420,000
	5	Install Well Headworks/Vault	ea	41	$1,500	$61,500	35	$1,500	$52,500	8	$1,500	$12,000	$126,000
	6	Install Outdoor Vapor Monitoring Points	ea	18	$2,000	$36,000	10	$2,000	$20,000	2	$2,000	$4,000	$60,000
	7	Trenching, Piping, Backfill, Resurfacing	lf	2,100	$30	$63,000	2,500	$30	$75,000	400	$30	$12,000	$150,000
	8	Equipment Pad/Enclosure Fence/Gas, Electricity Hookup	ea	1	$37,000	$37,000	1	$50,000	$50,000	1	$50,000	$50,000	$137,000
	9	Control and Instrumentation	ls	1	$5,000	$5,000	1	$7,000	$7,000	1	$4,000	$4,000	$16,000
	10	Misc VETS Equipment (fittings, valves, manifold, tanks, pumps etc.)	ls	1	$37,000	$37,000	1	$40,000	$40,000	1	$10,000	$10,000	$87,000
	11	SVE System Installation and Startup	ea	1	$37,000	$37,000	1	$50,000	$50,000	1	$30,000	$30,000	$117,000
	12	SVE Emissions Treatment System (Thermal/Cat Ox)	ea	1	$49,000	$49,000	1	$75,000	$75,000	1	$50,000	$50,000	$174,000
	13	SVE Emissions Treatment System, (granular activated carbon [GAC]) Chlorinated VOCs 100 cubic feet per minute(cfm)	ea	1	$25,000	$25,000	0	$0	$0	0	$0	$0	$25,000
	14	Soil Confirmation Sampling and Analyses	samples	43	$1,200	$51,600	40	$800	$32,000	15	$750	$11,250	$95,000
	15	Air Monitoring/Sampling	days	12	$2,500	$30,000	15	$2,500	$37,500	6	$2,500	$15,000	$83,000
	16	Remediation Documentation/Reporting	ea	1	$12,000	$12,000	1	$19,000	$19,000	1	$15,000	$15,000	$46,000
	17	Site Closure, decommissioning, well abandonment	ls	1	$10,000	$10,000	1	$20,000	$20,000	1	$20,000	$20,000	$50,000
	18	Health and Safety, Equipment Rentals, ODCs	ls	1	$10,000	$10,000	1	$16,000	$16,000	1	$13,000	$13,000	$39,000
	Direct Capital Cost Subtotal					**$839,000**	**$838,000**			**$312,000**			**$1,989,000**
Indirect Capital Costs	1	Engineering, Design, and Permitting		8%	$839,000	$67,120	12%	$838,000	$100,560	12%	$312,000	$37,440	$205,000
	2	Project Management, Agency Reporting and Coordination		5%	$839,000	$41,950	6%	$838,000	$50,280	6%	$312,000	$18,720	$111,000
	3	Construction Management		6%	$839,000	$50,340	8%	$838,000	$67,040	8%	$312,000	$24,960	$142,000
	Indirect Capital Cost Subtotal					**$159,000**	**$218,000**			**$81,000**			**$458,000**
O&M Costs	1	SVE periodic monitoring, operation, maintenance	mths	12	$12,000	$144,000	12	$5,000	$60,000	12	$4,000	$48,000	$252,000
	2	Fuel	mths	12	$8,000	$96,000	12	$7,000	$84,000	12	$3,000	$36,000	$216,000
	3	Electricity	mths	12	$4,000	$48,000	12	$2,200	$26,400	12	$1,300	$15,600	$90,000
	4	Maintenance (hardware, filters, gauges, blower, etc.)	mths	12	$3,000	$36,000	12	$2,000	$24,000	12	$1,000	$12,000	$72,000
	5	Carbon - Vapor Phase (chlor-SVE)	mths	12	$8,000	$96,000	0	$0	$0	0	$0	$0	$96,000
	6	VETS Influent/Effluent Monitoring / Lab Costs	mths	12	$4,000	$48,000	12	$5,000	$60,000	12	$1,500	$18,000	$126,000
	7	Project Management/Consultant support/Quarterly Reports	mths	12	$6,000	$72,000	12	$6,000	$72,000	12	$4,000	$48,000	$192,000
	8	Waste/Water Disposal	mths	12	$4,000	$48,000	12	$3,000	$36,000	12	$1,000	$12,000	$96,000
	9	Misc: Equipment rentals / photoionization detector (PID)/ flame ionization detector (FID) / other direct costs (ODCs)	mths	12	$2,000	$24,000	12	$3,000	$36,000	12	$3,000	$36,000	$96,000
	Annual O&M Costs Subtotal					**$612,000**			**$398,000**			**$226,000**	**$1,236,000**

TABLE 12-9: Cost Estimate, Sve For Voc-Impacted Soil, Properties 6, 11, AND 23

Cost Type	Item No.	Description	Unit	Property 23			Property 6			Property 11			TOTAL
				Estimated Quantity	Unit Cost	Extension	Estimated Quantity	Unit Cost	Extension	Estimated Quantity	Unit Cost	Extension	
Totals	**Direct + Indirect Capital Total**												**$2,447,000**
	Present Worth of Operation and Maintenance Costs (5%, 3 Years)												**$3,366,000**
	Contingency (20% of total project cost)												**$1,163,000**
	Total Present Worth												**$6,976,000**

Notes/Assumptions:
1. Assumes vertical SVE wells screened between 5 and 15 feet bgs at a well spacing of 30 feet for each property.
2. SVE systems sized at 750 cfm at property 23; 500 cfm at Property 6, and 400 cfm at Property 11.
3. SVE operation for 3 years was assumed for all three properties.
4. Some existing RI data may no longer be representative of current site conditions due to biodegradation of contaminants through time. The extent of remedial action will be based on conditions present at the time of remedy design and implementation, and actual costs may vary from the estimates presented in the table.

TABLE 12-10: Cost Estimate, SVE for V0C-Impacted Soil Under Building, Property 23

Cost Type	Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost
Direct Capital Costs	1	Site Investigation/Delineation	1	ls	$197,000	$197,000
	2	Site Preparation/Geophysical	62,250	sf	$1	$50,000
	3	Site Setup, Equipment Mobilization/Demobilization	62,250	sf	$1	$78,000
	4	SVE Horizontal Wells (H-SVE)	14	ea	$25,000	$350,000
	5	Install Well Headworks/Vault	14	ea	$1,500	$21,000
	6	Trenching, Piping, Backfill, Resurfacing	700	lf	$30	$21,000
	7	Equipment Pad/Enclosure Fence/Gas, Electricity Hookup	1	ea	$50,000	$50,000
	8	Control and Instrumentation	1	ls	$9,000	$9,000
	9	Misc VETS Equipment (fittings, valves, manifold, tanks, pumps etc.)	900	lf	$10	$9,000
	10	SVE System Installation and Startup	1	ea	$50,000	$50,000
	11	SVE Emissions Treatment System (Thermal/Cat Ox) 1500 cfm	1	ea	$130,000	$130,000
	12	Soil Confirmation Sampling and Analyses	72	samples	$600	$43,000
	13	Air Monitoring/Sampling	30	days	$2,500	$75,000
	14	Remediation Documentation/Reporting	1	ea	$10,000	$10,000
	15	Site Closure, decommissioning, well abandonment	1	ls	$10,000	$10,000
	16	Health and Safety, Equipment Rentals, ODCs	1	ls	$10,000	$10,000
	Direct Capital Subtotal					**$1,113,000**
Indirect Capital Costs	1	Engineering, Design, and Permitting	8%	of	$1,113,000	$90,000
	2	Project Management, Agency Reporting and Coordination	5%	of	$1,113,000	$56,000
	3	Construction Management	6%	of	$1,113,000	$67,000
	Indirect Capital Subtotal					**$213,000**
O&M Costs	1	SVE periodic monitoring, operation, maintenance	12	mths	$10,000	$120,000
	2	Fuel	12	mths	$21,000	$252,000
	3	Electricity	12	mths	$7,900	$95,000
	4	Maintenance (hardware, filters, gauges, blower, etc.)	12	mths	$5,000	$60,000
	5	VETS Influent/Effluent Monitoring / Lab Costs	12	mths	$6,000	$72,000
	6	Project Management/Consultant support/Quarterly Reports	12	mths	$10,000	$120,000
	7	Waste/Water Disposal	12	mths	$3,000	$36,000
	8	Misc: Equipment rentals / PID / FID /ODCs	12	mths	$3,000	$36,000
	SVE Annual Operation and Maintenance Subtotal					**$791,000**

TABLE 12-10: Cost Estimate, SVE for V0C-Impacted Soil Under Building, Property 23

Cost Type	Item No.	Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost
Totals	**Direct + Indirect Capital Total**					**$1,326,000**
	SVE Present Worth of Operation and Maintenance Costs (5%, 3 Years)					**$2,154,000**
	Contingency (20% of total project cost)					**$696,000**
	Total Capital and O&M Cost					**$4,176,000**

Notes/Assumptions:

1 Assumes 14 horizontal SVE wells installed at 5-10 feet bgs with 150 feet average screen length.

2 Assumes thermal oxidizer treatment system with 750 standard cubic feet per minute (scfm), positive displacement blower.

3 Some existing RI data may no longer be representative of current site conditions due to biodegradation of contaminants through time. The extent of remedial action will be based on conditions present at the time of remedy design and implementation, and actual costs may vary from the estimates presented in the table.

TABLE 12-11: Cost Estimate, SVE for NAPL SA-6

Cost Type	Item	Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost
Direct Capital Costs	1	Site Investigation/Delineation	1	ls	$152,000	$152,000
	2	Mobilization/Demobilization	33,000	sf	$1	$42,000
	3	Electrical Service/Hookup/Utilities	1	ls	$25,000	$25,000
	4	Site Preparation/Geophysical	33,000	sf	$1	$27,000
	5	SVE Wells	9	ea	$6,000	$54,000
	6	Well Headworks/Vault (24" traffic rated)	9	ea	$3,000	$27,000
	7	VETS Installation and Startup	1	ls	$90,000	$90,000
	8	SVE Blower + Thermal Oxidizer; 400 cfm	1	ls	$80,000	$80,000
	9	Control and Instrumentation	1	ls	$6,000	$6,000
	10	Misc Treat System: Tanks, Piping, Pumps, Fittings	1	ls	$15,000	$15,000
	11	Trenching, Piping, Backfill and Resurfacing	600	lf	$30	$18,000
	12	Equipment Pad/Enclosure/Fence	1	ea	$20,000	$20,000
	13	Post Treatment Sampling + Analysis	14	borings	$5,000	$70,000
	Direct Capital Subtotal					**$626,000**
Indirect Capital Costs	1	Engineering, Design, and Permitting	12%	of	$626,000	$76,000
	2	Project Management, Agency Reporting/Coordination	6%	of	$626,000	$38,000
	3	Construction Management	8%	of	$626,000	$51,000
	Indirect Capital Subtotal					**$165,000**
Annual O&M Costs	1	Fuel: Natural Gas (Thermal Oxidizer)	12	mths	$8,000	$96,000
	2	Electricity: SVE blower, misc equip	12	mths	$2,700	$32,000
	3	Operations & Maintenance	12	mths	$5,000	$60,000
	4	Maintenance (hardware, filters, monitoring equipment)	12	mths	$1,000	$12,000
	5	Vapor Treatment System Influent/Effluent Monitoring/Lab Costs	12	mths	$4,500	$54,000
	6	Project Management/Consultant support/Reports	12	mths	$5,000	$60,000
	7	Waste/NAPL/Water Disposal	12	mths	$2,000	$24,000
	8	Health & Safety/Air Monitoring	1	ls	$3,000	$3,000
	9	Miscellaneous: Equipment rentals, PID/FID	12	mths	$3,000	$36,000
	SVE Annual O&M Subtotal					**$377,000**
Totals	**Total Direct + Indirect Capital Cost**					**$791,000**
	SVE Present Worth of Operation and Maintenance Costs (5%, 4 Years)					**$1,337,000**
	Present Worth of Monitoring Costs (5%, 100 Years)					**$298,000**
	20% Contingency					**$486,000**
	Total Capital and O&M Cost Present Worth					**$2,912,000**

TABLE 12-11: Cost Estimate, SVE for NAPL SA-6

Cost Type	Item	Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost

Notes/Assumptions:
1. Assumes 9 vertical SVE wells screened from 30-50 feet bgs
2. Assumes a 400 scfm thermal oxidizer vapor treatment system with positive displacement blower.
3. Assumes SVE operation for 4 years.
4. Present worth of groundwater monitoring costs based on $15,000 annual O&M cost/property
5. Some existing RI data may no longer be representative of current site conditions due to biodegradation of contaminants through time. The extent of remedial action will be based on conditions present at the time of remedy design and implementation, and actual costs may vary from the estimates presented in the table.

TABLE 12-12: Cost Estimate, ISCO and SVE for SA-3, SA-1, and SA-12

Cost Type	Item	Description	Unit	SA-3			SA-11			SA-12			TOTAL COST
				Estimated Quantity	Unit Cost	Extension	Estimated Quantity	Unit Cost	Extension	Estimated Quantity	Unit Cost	Extension	
Direct Capital Costs	1	Site Investigation/Delineation	ls	1	$205,000	$205,000	1	$177,000	$177,000	1	$115,000	$115,000	$497,000
	2	Mobilization/Demobilization	sf	50,000	$2	$75,000	41,400	$2	$63,000	22,500	$2	$34,000	$171,000
	3	Electrical Service/Hookup/Utilities	ls	1	$40,000	$40,000	1	$30,000	$30,000	1	$30,000	$30,000	$100,000
	4	Site Preparation/Geophysical survey	sf	50,000	$1	$40,000	41,400	$1	$34,000	22,500	$1	$18,000	$92,000
	5	SVE wells	ea	28	$5,500	$154,000	20	$5,500	$110,000	12	$5,500	$66,000	$330,000
	6	Vapor Extraction Sentry Wells (outdoor)	ea	0	$6,000	$0	6	$6,000	$36,000	4	$6,000	$24,000	$60,000
	7	Temperature Monitoring Well Points (outdoor)	ea	8	$10,000	$80,000	7	$10,000	$70,000	5	$10,000	$50,000	$200,000
	8	Well Headworks/Vault	ea	36	$3,000	$108,000	33	$3,000	$99,000	21	$3,000	$63,000	$270,000
	9	Treatment System Installation and Startup	ls	1	$125,000	$125,000	1	$100,000	$100,000	1	$75,000	$75,000	$300,000
	10	Misc. Treatment Sys Equipment: tanks, piping	ls	1	$40,000	$40,000	1	$30,000	$30,000	1	$25,000	$25,000	$95,000
	11	SVE Equipment (Blower, emissions control)	ls	1	$120,000	$120,000	1	$90,000	$90,000	1	$75,000	$75,000	$285,000
	12	Control and Instrumentation	ls	1	$21,000	$21,000	1	$16,000	$16,000	1	$13,000	$13,000	$50,000
	13	Trenching, Piping, Backfill and Resurfacing	lf	1,800	$50	$90,000	1,300	$50	$65,000	700	$50	$35,000	$190,000
	14	Equipment Pad/Enclosure/Fence	ea	1	$40,000	$40,000	1	$40,000	$40,000	1	$40,000	$40,000	$120,000
	15	Post Treatment Sampling + Analysis	boring	20	$5,000	$100,000	16	$5,000	$80,000	9	$5,000	$45,000	$225,000
	Direct Capital Subtotals					**$1,238,000**			**$1,040,000**			**$708,000**	**$2,985,000**
Indirect Capital Costs	1	Engineering, Design, and Permitting		8%	$1,238,000	$100,000	8%	$1,040,000	$84,000	8%	$708,000	$57,000	$241,000
	2	Project Management, Reporting, Coordination		5%	$1,238,000	$62,000	5%	$1,040,000	$52,000	5%	$708,000	$36,000	$150,000
	3	Construction Management		6%	$1,238,000	$75,000	6%	$1,040,000	$63,000	6%	$708,000	$43,000	$181,000
	Indirect Capital Subtotals					**$237,000**			**$199,000**			**$136,000**	**$572,000**
SVE O&M Costs	1	Fuel: Natural Gas	mths	12	$8,000	$96,000	12	$5,000	$60,000	12	$4,000	$48,000	$204,000
	2	Electricity/Utilities	mths	12	$3,200	$38,400	12	$2,200	$26,400	12	$1,600	$19,200	$84,000
	3	SVE System Operation and Monitoring Labor	units	12	$8,000	$96,000	12	$8,000	$96,000	12	$6,000	$72,000	$264,000
	4	SVE Maintenance Materials and Expenses	mths	12	$3,000	$36,000	12	$3,000	$36,000	12	$2,000	$24,000	$96,000
	5	SVE Treatment System Monitoring/Lab Costs	mths	12	$5,000	$60,000	12	$6,000	$72,000	12	$4,000	$48,000	$180,000
	6	Project Management/Consultant support/Reports	mths	12	$5,000	$60,000	12	$5,000	$60,000	12	$5,000	$60,000	$180,000
	7	Waste/Water Disposal	mths	12	$1,750	$21,000	12	$1,250	$15,000	12	$1,250	$15,000	$51,000
	8	Health and Safety (H&S)/Air Monitoring	ls	1	$4,000	$4,000	1	$4,000	$4,000	1	$4,000	$4,000	$12,000
	9	Miscellaneous: Equipment rentals, PID/FID, Transducers	mths	12	$3,000	$36,000	12	$2,250	$27,000	12	$2,250	$27,000	$90,000
	SVE Annual Operation and Maintenance Subtotal					**$448,000**			**$396,000**			**$317,000**	**$1,161,000**

TABLE 12-12: Cost Estimate, ISCO and SVE for SA-3, SA-1, and SA-12

				SA-3			SA-11			SA-12			
Cost Type	**Item**	**Description**	**Unit**	**Estimated Quantity**	**Unit Cost**	**Extension**	**Estimated Quantity**	**Unit Cost**	**Extension**	**Estimated Quantity**	**Unit Cost**	**Extension**	**TOTAL COST**
ISCO O&M Costs	1	Electricity/Utilities	mths	12	$1,300	$15,600	12	$800	$9,600	12	$600	$7,200	$32,000
	2	ISCO Fentons Chemicals: H2O2, Iron soln, acids	events	2	$540,000	$1,080,000	2	$210,000	$420,000	2	$210,000	$420,000	$1,920,000
	3	ISCO Vendor Labor+Equipment rental	events	2	$222,600	$445,200	2	$102,000	$204,000	2	$130,000	$260,000	$909,000
	4	ISCO Consultant Oversight, Monitoring	events	2	$60,000	$120,000	2	$27,500	$55,000	2	$35,000	$70,000	$245,000
	5	ISCO Soil and Groundwater Sampling/Lab Costs	rounds	1	$70,000	$70,000	1	$60,000	$60,000	1	$50,000	$50,000	$180,000
	6	Project Management/Consultant support/Reports	mths	12	$5,000	$60,000	12	$5,000	$60,000	12	$5,000	$60,000	$180,000
	7	Waste/Water Disposal	mths	12	$1,750	$21,000	12	$1,250	$15,000	12	$1,250	$15,000	$51,000
	8	H&S/Air Monitoring	ls	1	$4,000	$4,000	1	$4,000	$4,000	1	$4,000	$4,000	$12,000
	9	Miscellaneous: Equipment rentals, PID/FID, Transducers	mths	12	$3,000	$36,000	12	$2,250	$27,000	12	$2,250	$27,000	$90,000
	ISCO Annual Operation and Maintenance Subtotal					**$1,852,000**	**$855,000**			**$914,000**			**$3,619,000**
Totals	**Direct + Indirect Capital Total**												**$3,557,000**
	Present Worth of SVE Operation and Maintenance Costs (5%, 4 Years)												**$4,117,000**
	Present Worth of ISCO Operation and Maintenance Costs (5%, 4 Years)												**$12,833,000**
	Present Worth of Groundwater Monitoring (5%, 100 Years)												**$894,000**
	40% Contingency												**$8,561,000**
	Total Present Worth												**$ 29,962,000**

Notes/Assumptions:

1. Direct push injection of Fenton's Reagent was assumed, for cost estimating purposes, at SA-3, SA-11 and SA-12 using a total of 192, 152 and 75 injection locations respectively.
2. Total oxidant dosages for SA-3, SA-11 and SA-12 assumed to be 2.88 million gallons for SA-3 and 1.12 million gallons each for SA-11 and SA-12 of 12.5% hydrogen peroxide over a 4-year period.
3. Assumes SVE systems sized at 750 cfm for SA-3; 500 cfm for SA-11, and 400 cfm for SA-12.
4. Present worth of groundwater monitoring costs based on $15,000 annual O&M cost/property
5. Some existing RI data may no longer be representative of current site conditions due to biodegradation of contaminants through time. The extent of remedial action will be based on conditions present at the time of remedy design and implementation, and actual costs may vary from the estimates presented in the table.

TABLE 12-13: Institutional Controls Cost Summary

Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost/ Parcel	Estimated Total Cost	Comments
Implementation Costs						
Layer 1 (Applies to all 69 Parcels) [1]						
Federal/State Registries	1	per site	$250	$250	$17,250	Includes listing applicable properties on the FINDS, ICs, and Eng. Controls databases.
Web-Based Information	1	per site	$500	$500	$34,500	Includes development and implementation of a web-based information system.
Private Sector Land Activity Monitoring Alert Services	1	per site	$860	$860	$59,340	Includes $20,000 for the initial year of monitoring, $14,500 for coordination of implementation, and $25,000 for initial year responses.
Private Sector IC Monitoring, Reporting, and Compliance Support	1	per site	$500	$500	$34,500	Includes development of a reporting format, review of the initial year of IC effectiveness, and the initial annual report to agencies.
Implementation Cost Total (Layer 1)				$2,110	$145,590	
Layer 2 (Applies to 43 of the 69 Parcels)						
Building Permits	1	per site	$1,500	$1,500	$64,500	Includes coordination with the City of LA to implement program ($1,000 per site) and review and support costs associated with 4 sites ($5,000 per site).
Grading/Excavation Permits	1	per site	$1,500	$1,500	$64,500	Includes coordination with the City of LA to implement program ($1,000 per site) and review and support costs associated with 4 sites ($5,000 per site).
Layer 2 Implementation Cost Subtotal				$3,000	$129,000	
Implementation Cost Total (Layers 1 and 2 Combined)				$5,110	$274,590	
Layer 3 (Applies to 29 of the 69 Parcels)						
General Plan footnote (prohibit residential)	1	per site	$4,000	$4,000	$116,000	Includes coordination with the City of LA to place footnote on identified parcel ($1,500) and parcel owner legal fees ($2,500) associated with action.
Implementation Cost Total (Layers 1, 2, and 3 Combined)				$9,110	$390,590	

TABLE 12-13: Institutional Controls Cost Summary

Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost/ Parcel	Estimated Total Cost	Comments
Layer 4A (Applies to 29 of the 69 Parcels)						
Restrictive Covenants (land use covenants)	1	per site	$15,000	$15,000	$435,000	Cost includes technical support and parcel owners legal review/negotiation costs.
Implementation Cost Total (Layers 1, 2, 3, and 4A Combined)				$24,110	$825,590	
Layer 4B (Applies to 19 of the 69 Parcels)						
Restrictive Covenant for Engineering Control (if needed), Cap/HVAC/SSV	1	per site	$10,000	$10,000	$190,000	Cost includes additional support and additional parcel owners legal review/negotiations. The reduced cost is based on the bulk of negotiations being performed during Layer 4 negotiations.
Implementation Cost Total (Layers 1, 2, 3, 4A, and 4B Combined)				$34,110	$1,015,590	
Layer 5 (Applies to 20 of the 69 Parcels)						
Restrictive Covenant for Groundwater	1	per site	$10,000	$10,000	$200,000	Cost includes technical support and parcel owners legal review/negotiation costs.
Implementation Cost Total (Layers 1, 2, 3, 4A, 4B, and 5 Combined)				$44,110	$1,215,590	
Operation and Maintenance Annual Costs						
Layer 1 (Applies to all 69 Parcels)						
Federal/State Registries	1	per site	$75	$75	$5,175	Includes obtaining a database for the entire Site and one hour review time to confirm parcel listing status.
Web-Based Information	1	per site	$150	$150	$10,350	Includes a semi-annual database update including a total of approximately $5,000 per update event.
Private Sector Land Activity Monitoring Alert Services	1	per site	$650	$650	$44,850	Includes an annual cost of $20,000 and approximately $25,000 of support time.
Private Sector IC Monitoring, Reporting, and Compliance Support	1	per site	$300	$300	$20,700	Includes an annual IC review and report to agencies.
O&M Annual Cost Total (Layer 1)				$1,175	$81,075	

TABLE 12-13: Institutional Controls Cost Summary

Description	Estimated Quantity	Unit	Unit Cost	Estimated Cost/ Parcel	Estimated Total Cost	Comments
Layer 2 (Applies to 43 of the 69 Parcels)						
Building Permits	1	per site	$500	$500	$21,500	Includes interaction with City of LA for an estimated 4 sites with approximately $5,000 review and support costs associated with each site.
Grading/Excavation Permits	1	per site	$500	$500	$21,500	Includes interaction with City of LA for an estimated 4 sites with approximately $5,000 review and support costs associated with each site.
Layer 2 O&M Annual Cost Subtotal				$1,000	$43,000	
O&M Annual Cost Total (Layers 1 and 2 Combined)				$2,175	$124,075	
Layer 3 (Applies to 29 of the 69 Parcels)						
General Plan footnote (prohibit residential)	1	per site	$100	$100	$2,900	Includes an annual General Plan footnote confirmation.
O&M Annual Cost Total (Layers 1,2, and 3 Combined)				$2,275	$126,975	
Layer 4A (Applies to 29 of the 69 Parcels)						
Restrictive Covenants (land use covenants)	1	per site	$500	$500	$14,500	Includes property owner interaction/response.
O&M Annual Cost Total (Layers 1, 2, 3, and 4A Combined)				$2,775	$141,475	
Layer 4B (Applies to 19 of the 69 Parcels)						
Restrictive Covenant for Engineering Control (if needed), Cap/HVAC/SSV	1	per site	$500	$500	$9,500	Includes property owner interaction/response.
O&M Annual Cost Total (Layers 1, 2, 3, 4A, and 4B Combined)				$3,275	$150,975	
Layer 5 (Applies to 20 of the 69 Parcels)						
Restrictive Covenant for Groundwater	1	per site	$500	$500	$10,000	Includes property owner interaction/response.
O&M Annual Cost Total (Layers 1, 2, 3, 4A, 4B, and 5 Combined)				$3,775	$160,975	

Note:

1 This ICs costing summary lists 69 parcels compared to 71 parcels in the FS because the EAPC 16 property is composed of three parcels with one facility/owner.

TABLE 12-14: Plug-in Costs Summary Table for Soil Remediation Technologies, Small, Medium and Large Area Scenarios

	Unit Cost[1]		Impacted Soil Area	Impacted Soil Volume	Total PW[2] Cost
Area Scenarios	**$/sf**	**$/cy**	**sf**	**cy**	**$**
Capping[3]					
New Asphalt Cap					
Small Area	$230	--	100	--	$23,000
Medium Area	$96	--	1000	--	$96,000
Large Area	$74	--	10000	--	$744,000
Slurry Seal					
Small Area	$200	--	100	--	$20,000
Medium Area	$86	--	1000	--	$86,400
Large Area	$63	--	10000	--	$632,000
Excavation[4]					
<5 feet bgs (non-VOC, non-Haz)					
Small Area	--	$2,268	--	10	$22,680
Medium Area	--	$907	--	100	$90,700
Large Area	--	$555	--	1000	$555,000
<15 feet bgs (VOC, non-Haz)					
Small Area	--	$2,700	--	10	$27,000
Medium Area	--	$858	--	100	$85,800
Large Area	--	$477	--	1000	$477,000
<15 feet bgs (VOC, 33% RCRA Haz / 33% CAL Haz / 33% Non Haz)					
Small Area	--	$3,276	--	10	$32,760
Medium Area	--	$1,322	--	100	$132,200
Large Area	--	$927	--	1000	$927,000
Soil Vapor Extraction (Outdoor Soil)[5]					
Small Area (GAC)	--	$384	--	100	$38,400
Medium Area (GAC)	--	$158	--	1000	$158,000
Medium Area (CatOx)	--	$169	--	1000	$169,000
Large Area (CatOx)	--	$82	--	10000	$820,000
Soil Vapor Extraction (Under Building)[6]					
Small Area (GAC)	--	$513	--	100	$51,300
Medium Area (GAC)	--	$201	--	1000	$201,060
Medium Area (CatOx)	--	$223	--	1000	$223,000
Large Area (CatOx)	--	$110	--	10000	$1,100,000
Building Engineering Control[7]					
Small Area	--	$145	--	100	$14,500
Medium Area	--	$65	--	1000	$65,000
Large Area	--	$31	--	10000	$310,000

Notes:
1 Capping uses unit cost in $/square foot while other technologies use unit cost in $/cubic yard.
2 Present worth cost includes 20% to 30% contingency depending on technology.
3 Capping considers two scenarios: 1) resurfacing with a slurry seal (liquid asphalt) over existing pavement, or 2) constructing new

TABLE 12-14: Plug-in Costs Summary Table for Soil Remediation Technologies, Small, Medium and Large Area Scenarios

	Unit Cost[1]		Impacted Soil Area	Impacted Soil Volume	Total PW[2] Cost
Area Scenarios	$/sf	$/cy	sf	cy	$

4-inch thick asphalt cover. Capping present worth includes costs for long term maintenance indefinitely in the future (assume 100 years).

4 Excavation considers three scenarios: 1) Non-hazardous soil, impacted area < 5 feet bgs, 2) Non-hazardous soil, impacted area < 15 feet bgs, and 3) 33% RCRA hazardous, 33% California hazardous, and 33% Non hazardous soil, hazardous soil, impacted area <15 feet bgs.

5 SVE(OS) assumes operation for 2 years for all areas. Assume SVE emissions treatment system uses granular activated carbon (GAC) for small and medium areas, and Catalytic Oxidizer / Thermal for medium and large area.

6 SVE(UB) assumes use of horizontal wells that are converted to SSV and operated indefinitely (100 years).

7 Building Engineering Control (BEC) assumes SSV system operates indefinitely (100 years). Soil volume (cy) is based on 15 feet bgs depth.

Discount Rate

The current EPA RI/FS guidance (OSWER 9355.3-01, 1988; and feasibility studies under CERCLA, Interim Final) and the Office of Management and Budget Circular A-94 identify that the present worth cost estimates should use a 30-year timeframe and a 7 percent discount rate. However, subsequent cost estimating guidance (OSWER 9355.0-75, 2000) specifies the conditions when it is appropriate to diverge from the standard. Section 4.1 of the 2000 cost estimating guidance, “Define Period of Analysis,” indicates that, in general, the period of analysis should be equivalent to the project duration.

For the Del Amo project, waste will be left in place in perpetuity, at levels exceeding that which is safe for unrestricted use, in 28 separate land parcels (with many separate owners). Calculating the present worth over only 30 years would underestimate the cost of such a remedial alternative. For this reason, the present worth costs are calculated for a 100-year period, which is virtually the same as for perpetuity (less than 0.01 percent difference). However, the present worth factor for 30 years is 15 percent less than 100 years for a discount rate of 7 percent, and 23 percent less for a discount rate of 5 percent. Using a 30-year period would have underrepresented the cost of the IC remedy and exaggerated the cost difference between it and the active remedial alternatives with more costly capital and short-term O&M costs.

Section 4.3 of the 2000 cost estimating guidance, “Select a Discount Rate,” states that a 7 percent discount rate should be used because it approximates the marginal pre-tax rate of return on an average investment in the private sector in recent years, and has been adjusted to eliminate the effect of expected inflation. It also states, however, that there may be circumstances in which it would be appropriate to consider the use of a higher or lower discount rate, and that a specific explanation should be provided. For the Del Amo Site, a 5 percent discount was used. A 7 percent rate of return could not be sustained over the extremely long project period (perpetuity). Due to the anticipated cost of the IC program in perpetuity, a more conservative discount rate was used.

Table 12-3 shows the different present worth costs for the selected remedy that result from using different discount rates. The higher rate, 7 percent, is presented along with the 5 percent rate used in the FS and Proposed Plan, in addition to a lower, 3 percent rate for comparison purposes.

12.4 Expected Outcome of the Selected Remedy

12.4.1 Land and Groundwater Use

Land use at the site is currently commercial/industrial, and is expected to remain so upon completion of remediation. The selected remedy is expected to result in a reduction of the potential risk to current and future users of the land to acceptable levels. Of the 65 properties at the site, only the properties containing Area 16 and 23 are potentially experiencing unacceptable exposures under their current use and configuration. However, potentially unacceptable exposures could occur at additional properties if their use or configuration were to change in the future. The groundwater beneath the Del Amo Site is currently unavailable for use and will remain so after remedy implementation. The groundwater is the subject of a separate OU. The Groundwater ROD selected monitored natural attenuation and containment as the remedy for the groundwater underlying the Del Amo Site. The groundwater ROD also waived the groundwater ARARs on the basis of impracticability for those areas within the designated TI waiver zones but did not waiver ARARs outside those zones. So even after the remedy for this Soil and NAPL ROD is implemented, the groundwater will remain unavailable for use. However, the remedy selected for deep soil and NAPL will address the key source areas that caused the groundwater contamination. Addressing these source areas was a condition of the Groundwater ROD.

The selected remedy remediates seven shallow vadose soil areas, three contaminated with VOCs and four with non-VOCs four deep vadose soil areas with VOCs, and three areas in the submerged zone contaminated with VOC NAPL. The shallow and deep vadose soil areas will be remediated with SVE and the submerged NAPL areas will be remediated with ISCO, resulting in a decrease of the source material causing the groundwater contamination. In addition, the selected remedy will remediate any additional areas of Site-related contamination that may be encountered in the future that are contaminated above action levels for commercial use.

12.4.2 Cleanup Goals

The selected remedy includes the following components, as previously described in Section 12.2:

Component	Locations
1. ICs	All Areas, but to varying degrees
2. Capping	Areas 2, 16, 28 and 35
3. Building Engineering Controls (BECs)	Areas 16
4. Shallow Soil SVE outdoors	Areas 6, 11 and 23
5. Shallow Soil SVE beneath building	Area 23
6. Deep Soil SVE	Source Areas 3, 6, 11 and 12
7. ISCO	Source Areas 3, 11 and 12
8. Additional Areas Encountered	

Remediation through excavation, capping, SVE or BECs may additionally occur at areas of Site-related contamination that are encountered in the future through property redevelopment or construction activities.

Cleanup goals associated with each of the remedy components are described below along with their rationale. “Action levels” were described in Section 12.2, which define the location and extent of the areas to be addressed. “Cleanup goals” define the outcome of the remediation - how clean the soil must get, how low the contamination levels must get before the cleanup activity can cease, or in the case of containment (capping), what the containment system must achieve to be considered successful.

Some of the remedial actions will require additional field sampling during the remedial design process, to assist in defining the extent of the remediation. If new analytical data for one or more of the identified areas demonstrate that the described clean-up goal has been met prior to implementation of the remedy through natural attenuation or other mechanisms, the intent of this ROD will have been met and active remediation will not be required.

1. Institutional Controls (All Areas)

The ICs component of the remedy does not constitute physical cleanup activities and thus will not be discussed in this section. The goals of the ICs are discussed in Section 12.2.

2. Capping (Areas 2, 16, 28 and 35)

The clean-up goal for the four identified areas where capping will be implemented is to prevent direct contact with areas of impacted soil and prevent migration of dust from areas of impacted soil. Since capping is a containment measure and does not involve removal or treatment of impacted soil, there is no clean-up level. (Note that there is an “action level,” described in Section 12.2 that defines the necessary extent of the cap). Caps currently exist at each of the four areas in the form of asphalt or concrete covered streets, parking lots, or storage areas. These existing caps will be evaluated during remedial design to determine whether they are sufficient to meet the cleanup goal.

3. Building Engineering Controls (Area 16)

BECs will be implemented at Area 16 to address the effects of vapor intrusion from the underlying soil on the existing building. The exact controls to be implemented will be determined during the Remedial Design phase, but it is anticipated that existing or enhanced ventilation measures, building pressurization or sub-slab venting will be considered and applied as appropriate. The goal of the BECs is to prevent unacceptable exposures of Site-related contaminants to building occupants. BECs do not remove or treat impacted soil, so there is no soil clean-up level. The goal of the BECs is exposure prevention rather than removal or treatment of contaminants to a quantified concentration or risk level. The action levels and the procedures for designing the BECs are described in Section 12.2. The goals of the various possible BEC approaches are described below.

The goal of any BEC measure is to reduce the indoor air concentrations of target VOC constituents to either the commercial RSL/CHHSL criteria for indoor air or background, whichever is higher. (accounting for any contributions from other indoor air sources). Indoor air sampling data will be utilized in making this determination. If building pressurization or subslab venting are utilized, additional sampling data to be utilized will include indoor air or subslab pressure measurements. The RSL and CHHSL levels for the known constituents of concern are as follows:

TABLE 12-15: Cleanup Goal for Indoor Air

Chemical	California Human Health Screening Level (CHHSL) (µg/m^3)	EPA Regional Screening Level (RSL) (µg/m^3)
Benzene	0.14	1.6
Chloroform	None	0.53
Tetrachloroethene	0.69	2.10
Trichloroethene	2.04	6.10

4. SVE in Shallow Vadose Zone Soil Outdoors (Areas 6, 11 and 23)

The cleanup goal for the shallow outdoor soil away from the building is a VOC concentration for each constituent that does not exceed a non-cancer hazard index of 1.0 and an excess cancer risk of 1E-6 when exposed to receptors outdoors in a commercial-use setting. The cleanup goals are the same as the action levels (see Section 12.2, Part 4). Table 12-16.1 presents the outdoor soil RSL, which is the cleanup goal for SVE in outdoor soil.

5. SVE in Shallow Vadose Zone Soil Beneath Building (Area 23)

The cleanup goal for the shallow soil beneath and adjacent to the building is a VOC concentration for each constituent that does not exceed a non-cancer hazard index of 1.0 and an excess cancer risk of 1E-6 when exposed to receptors inside the building in a commercial-use setting. The cleanup goals are the same as the action levels. Table 12-16.2 presents the indoor air RSL, which is the basis for determining the cleanup goals for SVE beneath and adjacent to a building (see Section 12.2, Part 5).

TABLE 12-16.1: SVE Outdoor Soil Cleanup Goal

Chemical	Concentration (mg/kg)
Benzene	5.4
Chloroform	1.5
Tetrachloroethene	2.6
Trichloroethene	6.4

NOTE: For soil away from, not adjacent to building

TABLE 12-16.2: Indoor Air RSL

Chemical	Concentration (µg/m^3)
Benzene	1.6
Chloroform	0.53
Tetrachloroethene	2.1
Trichloroethene	3.0

Shutdown of the SVE system will occur when EPA determines that the clean-up goals (see Table 12-16) have been achieved.

EPA anticipates that procedures for shutdown evaluation will begin after the SVE system influent concentrations have decreased substantially from pretreatment levels and the treatment zone has reached asymptotic mass removal conditions. Testing procedures would then be conducted to ensure that there is not a significant rebound in soil vapor concentrations after shutdown of the system. The decision to permanently shut down the SVE system will be based on achieving target levels or asymptotic mass removal conditions and the lack of significant rebound in soil vapor concentrations after temporary system shutdown. The shutdown metrics, including rebound testing and confirmation sampling procedures will be developed and described during the remedial design process.

After the cleanup goal is attained, a residual risk would still exist if the property were to be used for residential use. Notification of this residual contamination will therefore be made through the institutional controls (which will also prohibit residential use).

6. SVE in Deep Vadose Zone Soil Areas (Source Areas 3, 6, 11, 12)

The cleanup goal for the deep soil areas contaminated with VOCs (some in a NAPL state) will be twofold. First, the SVE system must ensure that any VOCs mobilized by the ISCO treatment system in the underlying saturated zone are captured by the deep soil SVE system. Second, the VOCs in the deep vadose soil must be removed to the extent practicable with the SVE technology. The purpose of the contaminant mass reduction goal is to enhance the groundwater remedy rather than to achieve a quantifiable reduction in risk. The effectiveness of the SVE system will be assessed through monitoring key parameters in the soil and within the SVE system, both during extraction operations and during times of system shut-down. Such parameters include, but are not limited to, vacuum pressure, VOC concentrations, oxygen concentrations, and carbon dioxide concentrations. Measuring vacuum pressure in the soil can enable EPA to determine whether a capture zone has been established and maintained around the ISCO treatment area. Measuring contaminant concentrations in the soil gas can determine whether rebound is occurring. A lack of rebound indicated by long-term decreases in concentrations, and a decreasing extent of persistent concentrations, can indicate that SVE has been effective.

Monitoring will include both process monitoring and performance monitoring. Process monitoring will ensure the appropriate application of the technology and will enable adjustments to focus on areas with higher concentrations. Performance monitoring will ensure VOC emission standards are achieved as well as indicate when contaminant concentrations decrease and stabilize sufficiently below baseline levels for a sustained period, which would signal a mass removal.

The clean-up goal will have been met when EPA determines that each of the following conditions has been documented through the monitoring data:

(1) SVE has been conducted with significant reductions in soil gas VOC concentrations;

(2) Asymptotic conditions have been reached (only slight further reductions in concentrations are being achieved through continued SVE treatment); and

(3) VOC concentrations do not significantly increase when treatment is stopped (no meaningful rebound is occurring) beyond the zone affected by off-gassing from the water table.

7. ISCO in Submerged NAPL Areas (Source Areas 3, 11, 12)

The cleanup goal for the NAPL in the submerged areas is to remove as much NAPL mass as practicable with the ISCO technology, from the SA-3, SA-11, and SA-12 areas, covering approximately 110,000 to 188,000 square feet of heavily impacted soil and groundwater in the unsaturated column from ground surface to groundwater and approximately 25 feet into the saturated zone. Approximately 40 to 50 percent of the contaminant mass at these three areas is expected to be removed by chemical oxidation. The remediation strategy is to continue the remediation until the contaminant concentrations have diminished sufficiently, and there is relatively little change in site conditions with each successive application (the concept of “diminishing returns”).

The ISCO remedy will have reached the clean-up goal, be deemed complete, and will be terminated when EPA, in consultation with DTSC, determines that the remediation has reached the point of diminishing returns (i.e. additional applications of oxidant result in little to no further decreases in dissolved VOC concentrations and production of oxidation by-products). This shall be defined as the time at which the following conditions can be documented: (1) ISCO has been conducted with resultant reductions in dissolved contaminant concentrations; (2) asymptotic conditions have been reached (only slight further reductions in dissolved concentrations are being achieved through continued treatment); and (3) VOC concentrations do not significantly increase when treatment is stopped (no meaningful rebound is occurring). Performance monitoring will be used to document the progress of the remediation, plume stability, and the attainment of these conditions. Process monitoring will ensure the appropriate application of the technology.

The performance of the ISCO remediation will be assessed by first monitoring and establishing baseline conditions in each source area to be treated and estimating the existing contaminant mass. Key parameters will then be monitored through time, both during oxidant injection and following injection, to monitor remediation progress. Such parameters include, but are not limited to, dissolved contaminant concentrations, quantity of oxidant injected, subsurface oxidant distribution, dissolved oxygen concentrations, and by-product concentrations.

Groundwater sampling within and downgradient of the treatment zone will enable measurement of the contaminant, oxidant, and dissolved oxygen concentrations. Monitoring during injection will determine the extent of oxidant influence in the treatment areas. Monitoring between injection events will show if any localized rebound in groundwater concentrations is occurring, enabling injection dosages and locations to be adjusted during subsequent injection events. When dissolved contaminant concentrations decrease and stabilize below baseline levels, it signals a mass removal. A lack of rebound indicated by long-term decreases in concentrations and a decreasing extent of persistent concentrations can indicate that ISCO has been effective.

The exact performance monitoring program will be developed during remedial design. Monitoring well construction and sampling and analytical plan details will depend on the oxidant type and the injection approach that is selected, and will be determined by EPA during remedial design. It is anticipated that some SVE wells inside each treatment area will be screened in the water table zone to serve as groundwater monitoring wells during and after ISCO injection events.

Following the indication of successful mass removal to the extent practicable by dissolved contaminant concentration measurements, soil cores could be used to confirm mass removal. However, if collection and analysis of soil cores is not viable due to interference by structures or building occupant activities, and only dissolved contaminant concentrations will be used to evaluate performance, then the duration of the ISCO operation may need to be extended in order to provide more assurance of treatment effectiveness. The slow process of contaminant dissolution and migration to monitoring points implies that the timeframe for determining effectiveness using only dissolved contaminant concentration measurements may be lengthy.

The basis for the cleanup goal was established in the Groundwater ROD (EPA, 1999b). The Groundwater ROD established that the principal threat is the NAPL because it continually dissolves into the groundwater, creating a distribution of dissolved phase contamination at concentrations in excess of health-based standards. Because of these factors, EPA considered the groundwater to be actionable. Whereas the Groundwater ROD issued a waiver of the ARARs relating to groundwater restoration based on technical impracticability, the waiver determined solely that existing technologies would be incapable of practicably recovering enough NAPL to attain standards at all points in the groundwater. Hence, a waiver of the standards was issued for the portion of the groundwater surrounding the NAPL. Technologies exist that would be capable of recovering some of the NAPL, and the TI waiver guidance directs EPA to demonstrate “that contamination sources [NAPL] have been identified and have been, or will be, removed and contained to the extent practicable.” (Guidance for Evaluating the Technical Impracticability of Groundwater Restoration, U.S. EPA OSWER Directive 9234.2-25, October 1993; EPA 1993b). This Soil and NAPL ROD is therefore making the determination of the practicability and extent to which NAPL removal will occur in SA-3, SA-11 and SA-12.

The result after the NAPL remediation in Source Areas SA-3, SA-11, and SA-12 should be that NAPL has been sufficiently reduced to protect groundwater. The Groundwater ROD includes but does not solely rely upon monitored natural attenuation as a portion of the Del Amo Site OU-3 remedy. When NAPL is recovered from the ground, its mass and saturation are reduced, resulting in: (1) a reduction of the amount of time that the containment zone must be maintained, (2) a reduction of the potential for NAPL migration, and (3) an increased certainty that the groundwater remedial action will remain effective in the long-term.

8. Additional Areas of Contamination Encountered during Redevelopment or Construction

The clean-up goal for additional areas of Site-related contamination is to ensure that soil left in-place will not result in an unacceptable risk to construction workers or to the future commercial/industrial users of the property. For cases where the selected remedy removes contaminant mass (excavation, SVE), the RSL or CHHSL values for the commercial use scenario will be utilized as the cleanup goals. Evaluation of achievement of the cleanup goals will be based upon collection of soil or soil gas data.

For remedial methods that are focused on preventing direct contact, ingestion, or inhalation of impacted soil or soil vapor rather than mass removal (includes capping and BECs), the cleanup goal is to prevent unacceptable exposures to target contaminants, as described in the subsections regarding Capping and Building Engineering Controls, earlier in Section 12.4.2. The RSL/CHHSL will serve as the basis for determining the area over which these remedies will be applied, as described earlier in the section, in the discussions regarding capping and BECs.

12.4.3 Socio-Economic and Community Revitalization Impacts

While commercial/industrial use of the site has continued throughout the RI/FS process and is expected to continue into the future with little or no interruption, the presence of contamination and the associated uncertainty about potential health risks and future regulatory actions may be hindering sales and leases of properties at the site. Implementation of the remedial actions and institutional controls specified in this ROD to address the contaminated areas will benefit the business community by providing more certainty regarding the site environmental conditions.

12.4.4 Environmental and Ecological Benefits

No significant ecological benefits from the prescribed soil and NAPL remedy are anticipated. The following environmental benefits are anticipated:

- A reduction in potential health risks to land users;
- A reduction in the NAPL mass at source areas SA3, SA6, SA11 and SA12;
- Associated reductions in dissolved contaminant concentrations in the vicinity of the treated NAPL areas;
- A reduction in the time that the NAPL containment zone must be maintained;
- A reduction in the potential for NAPL to migrate laterally or vertically;
- An increase in the long-term effectiveness and certainty of the previously selected groundwater remedy.

12.4.5 Remedy Differences from the Proposed Plan

The BEC component of the remedy has one difference from its description in the Proposed Plan. The selected remedy in this ROD gives examples of the types of BECs which may be applied, including floor sealing and passive vapor barriers (among other things). Floor sealing and passive vapor barriers were not mentioned in the Proposed Plan. However, floor sealing was mentioned in the FS in the initial description of the BEC technology, although it was not part of the description of BECs in the "retained technologies" section of the FS. Regardless, both passive vapor barriers and floor sealing are common technologies used to address vapor intrusion and could be implemented at Del Amo as part of the BECs component of the remedy. Therefore they were included in the description of BECs as examples of types of BECs.

12.5 Applicable or Relevant and Appropriate Requirements (ARARs)

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as “ARARs,” unless such ARARs are waived under CERCLA section 121(d)(4). “Applicable” requirements are those cleanup standards, standards of control and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those State standards that are identified by a state in a timely manner and that are more stringent that Federal requirements maybe applicable. “Relevant and appropriate” requirements are those cleanup Standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while no “applicable” to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

The complete list of ARARs for this ROD is in Table 12-17. The selected remedy will meet all ARARs. Many of the ARARs will only be applicable or relevant and appropriate if a particular technology is selected for the SVE treatment technology. Some ARARs will relate to all of the possible technologies under consideration, while others need only be met if internal combustion or thermal oxidation is chosen by EPA during remedial design as a treatment technology. EPA may choose different treatment technologies for different SVE systems, and the use of each technology must meet the relevant ARARs. Most of these ARARs relating to the SVE treatment technologies require air emissions from the systems to meet specific requirements. In addition, several ARARs will only be triggered for excavation remedies for areas of site-related contamination that may be encountered in the future. Finally, State regulations governing land use covenants must be complied with for all properties that are not suitable for unrestricted use.

DTSC and SWRCB have identified provisions of the Regional Water Quality Control Board (Los Angeles Region) Waste Discharge Requirements (WDRs), Order No. R4-2007-0019 as potential ARARs related to the NAPL treatment remedial actions selected in this ROD. EPA does not expect that the NAPL treatment actions will have any impact on water quality outside of the TI Waiver Zone and therefore has not identified the substantive provisions of these WDRs as ARARs in this ROD. If later information indicates to EPA that the NAPL treatment actions selected in this ROD will impact ground water quality outside the TI Waiver Zone or will impact surface water, EPA will re-evaluate its decision and, if determined necessary by EPA, amend this ROD through an Explanation of Significant Differences (ESD) or ROD Amendment to identify relevant and appropriate substantive provisions of these WDRs as ARARs for the NAPL treatment actions selected in this ROD.

TABLE 12-17: Chemical-Specific ARARS

Requirement	Prerequisite	Citation	ARAR Determination	Comments
SOIL				
Resource Conservation and Recovery Act (RCRA)/HWCA*				
Characterization of RCRA hazardous waste.	Waste soil	Title 22 CCR Sections 66261.21, 66261,.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100 [40 C.F.R. sections 261.20 – 24]	Relevant and appropriate	Any site-related contamination encountered in the future during construction or development activities shall be characterized.
Characterization of Non-RCRA hazardous waste.	Waste soil	Title 22 CCR section 66261.101(a) – (d)	Relevant and appropriate	Any site-related contamination encountered in the future during construction or development activities shall be characterized.
Air Emission Standards for Process Vents	Process vents associated with RCRA hazardous wastes with organic concentrations or at least 10 ppmw	40 C.F.R. §§ 264.1030, 264.1032 – 1034; see also 22 CCR §§ 66264.1030, 66264.1032 – 1034	Relevant and appropriate	Treatment for SVE must meet air emissions standards.
Control of stormwater runoff	Remedial action sites that are greater than one acre in size.	SWRCB Order 2009-0009-DWQ §§ III, V, VI, IX, X, XI, XII, XIII and XIV	Relevant and appropriate	If current or future remedial actions include construction covering at least one acre, such actions must comply with the relevant and appropriate substantive provisions of the cited sections of SWRCB Order No. 2009-0009-DWQ.
Requirements for incinerators	Incineration	40 C.F.R. §§ 264.340 – 343, 264.345 (substantive portions), 264.347, and 264.351. See also 22 CCR §§ 66264.340-343, 66264.345 (substantive portions), 66264.347, and 66264.351.	Applicable	If the treatment for SVE chosen by EPA during remedial design is thermal oxidation, then the requirements for incinerators are applicable.
Miscellaneous Units	Miscellaneous unit defined under 40 C.F.R. 260.10	40 C.F.R. 264.600-603	Applicable	If the treatment for SVE chosen by EPA during remedial design is internal combustion, condensation, or carbon adsorption, then the requirements for miscellaneous units are applicable.

TABLE 12-17: Chemical-Specific ARARS

Requirement	Prerequisite	Citation	ARAR Determination	Comments
Thermal treatment requirements	Thermal treatment of hazardous waste	40 C.F.R. §§ 265.370, 373, 375, 377, 381, and 382. See also 22 CCR §§ 66265.370, 373, 375, 377, 381, and 382.	Relevant and appropriate	These operating, monitoring, and closure requirements are relevant and appropriate for thermal oxidation or internal combustion technologies used for SVE treatment.
AIR				
National Emission Standards for Hazardous Air Pollutants (NESHAPs)	Process equipment that treats liquids or vapors containing >10% weight hazardous air "HAPs") and is a potential source of air emissions of HAPs.	40 CFR 61.01(a)(c)(d), Subpart J, sections 61.110 and 61.112; see also SCAQMD Regulation X, Subpart J	Relevant and Appropriate	Fugitive benzene emissions from SVE treatment technologies must be controlled.
South Coast Air Quality Management District	Discharge to air containing toxics	Regulation XIV, Rule 1401	Relevant and appropriate	Rule 1401 specifies limits on maximum incremental cancer risk (MICR) and hazard index (HI) from new sources. SVE treatment technologies must meet emissions limitations for benzene.

Acronyms:

ARARs - Applicable or relevant and appropriate requirements
CCR - California Code of Regulations
CFR - Code of Federal Regulations
EPA - U.S. Environmental Protection Agency
HAPs – Hazardous Air Pollutants
HWCA - Hazardous Waste Control Act.
MICR – Maximum Incremental Cancer Risk
NESHAP – National Emission Standards for Hazardous Air Pollutants
ppmw - Parts per million by weight
RCRA - Resource Conservation and Recovery Act
SVE – Soil Vapor Extraction
SWRCB – State Water Resources Control Board

TABLE 12-18: Location-Specific ARARS

Location	Requirement	Prerequisites	Citation	ARAR Determination	Comments
Hazardous Waste Control Act (HWCA)					
Within 100-year floodplain	Facility must be designed, constructed, operated, and main-tained to avoid washout.	RCRA hazardous waste; treatment, storage, or disposal of hazardous waste.	40 C.F.R. § 264.18(b); see also 22 CCR 66264.18(b)	Relevant and appropriate	Del Amo site is in the floodplain of the Los Angeles River

Acronyms:

ARAR - Applicable or relevant and appropriate requirement.

CCR - California Code of Regulations.

CFR - Code of Federal Regulations.

HWCA - Hazardous Waste Control Act.

RCRA - Resource Conservation and Recovery Act.

TABLE 12-19: Action-Specific ARARS

Action	Requirement	Prerequisites	Citation	ARAR Determination	Comments
Onsite waste generation	Person who generates waste shall determine if that waste is a hazardous waste.	Generation of hazardous waste	40 C.F.R. 262.11; see also 22 CCR 66262.11	Applicable	
Hazardous waste accumulation	Conditions for accumulation of waste on-site for 90 days or less.	Accumulate hazardous waste.	40 C.F.R. 262.34; see also 22 CCR Section 66262.34	Applicable	Accumulation of hazardous wastes onsite for longer than 90 days would be subject to RCRA requirements for storage facilities.
Landfills, Capping of wastes in place	Capping of hazardous wastes in place to prevent migration to groundwater. • Minimize migration of liquids through cap • Promote drainage and minimize erosion	RCRA hazardous waste that is capped in place at the site as part of the long term permanent remedy. Prevent run on and run off from damaging cap	40 CFR 264.310; 22 CCR 66264.310 40 CFR 264.228; 22 CCR 66264.228	Relevant and appropriate	
Requirements for land use covenants	Land use covenants with appropriate restrictions must be executed and recorded.	Hazardous substances remaining at the property such that it is not suitable for unrestricted use	22 CCR 67391.1(a) and (d)	Relevant and appropriate	Land use covenants with appropriate land/water use restrictions will be implemented for all areas where land and/or groundwater are not suitable for unrestricted use.
Discharge to air	Limits visible emissions from any point source	Visible emission to atmosphere.	SCAQMD Regulation IV, Rule 401	Relevant and appropriate	
	Requires prevention, reduction, or mitigation of fugitive dust.	Activity capable of generating fugitive dust.	SCAQMD Regulation IV, Rule 403	Relevant and appropriate	
	Limits particulate emissions.	Discharge of particulate matter into the atmosphere.	SCAQMD Regulation IV, Rule 404	Relevant and appropriate	
	Limits particulate emissions from a combustion source to 0.1 grain per standard cubic foot at 12%	Combustion exhausts	SCAQMD Regulation IV, Rule 409	Relevant and appropriate	Applicable to thermal oxidation or internal combustion technologies for SVE treatment.

TABLE 12-19: Action-Specific ARARS

Action	Requirement	Prerequisites	Citation	ARAR Determination	Comments
	CO^2 averaged over 15 minutes				
	Standard of Performance for Stationary Spark Ignition Internal Combustion Engines	New sources	SCAQMD Regulation IX, Subpart JJJJ	Relevant and appropriate	Relevant and appropriate if EPA chooses internal combustion technology for SVE treatment during remedial design.
	Limits VOC emissions from soil excavations	Excavation, grading, handling or treating of VOC-contaminated soils	SCAQMD Regulation XI, Rule 1166	Relevant and appropriate	If site-related contamination is encountered in the future, this ARAR applies to the excavation remedy.
	New Source Review	New emissions source or modification of existing source	SCAQMD Regulation XIII, Rule 1303(a)	Relevant and appropriate	If emissions from SVE treatment technologies would exceed thresholds, Best Available Control Technology would be required to limit emissions.

Acronyms:

ARARs - Applicable or relevant and appropriate requirements
CCR - California Code of Regulations
CFR - Code of Federal Regulations
CO^2 – Carbon dioxide
RCRA - Resource Conservation and Recovery Act
SCAQMD – South Coast Air Quality Management District
SVE – Soil Vapor Extraction
VOC – Volatile Organic Compound

13.0 Statutory Determinations

13.1 Protection of Human Health and Environment

The selected remedy utilizes treatment, engineering controls, and institutional controls to protect human health and the environment from the potential risks posed by the Site. The Site poses a potential risk to current occupants and potential future users of the contaminated properties through the direct contact, ingestion, and inhalation of contaminants from the outdoor shallow soils, and the inhalation of contaminants from the shallow soil beneath two buildings. The Site poses a risk to the groundwater through the principal threat wastes in the deep soil continuing to dissolve into the groundwater. Finally, the Site poses a potential risk to receptors if contaminated groundwater is extracted and utilized for domestic purposes.

The potential risks from the outdoor shallow soils contaminated above acceptable levels are addressed by capping, soil vapor extraction (SVE), and institutional controls (ICs). Capping is an engineering control that physically prevents occupants from contacting, inhaling, or ingesting the contaminants. In the locations capping is to be applied, the caps will extend to where the contamination decreases to a 1E-6 cancer risk level and hazard index of 1.0 for a commercial exposure scenario. SVE is a treatment mechanism that physically removes volatile contaminants from the soil. SVE was selected for application in locations where the potential risk to commercial users exceeds 1E-6 cancer risk and/or a hazard index of 1.0. Four layers of ICs will work together to prevent exposure to the contaminated soil that is left in place, prevent interference with the constructed components of the remedy, and prohibit future land uses that could result in unacceptable exposure to contaminants. The ICs accomplish this by: (a) alerting parties to the presence of contamination or potential for encountering contamination prior to any excavation of soil and requiring review of excavation plans by EPA; (b) informing land-use planners and the public about the Superfund site through a footnote in the City's General Plan; (c) prohibiting property owners from interfering with the physical components of the remedy, and requiring EPA approval prior to excavation on their properties, and prohibiting residential use of their properties. These approaches will be utilized for currently identified areas of shallow soil contamination requiring remediation.

For any areas of shallow soil encountered in the future with site-related contamination exceeding acceptable risk-based levels, the remedy will address them with excavation, SVE, capping and ICs. Excavation physically removes the contaminants from the soil. Excavation would be applied to soils where concentrations of site-related contaminants exceed the Regional Screening Level and background levels. The manner in which SVE, capping and ICs address potential risks is described above.

The potential risks from the shallow soil beneath buildings that is contaminated above acceptable levels are addressed by Building Engineering Controls (BECs), SVE, and ICs. BECs are engineering controls that reduce the concentrations of site-related contaminants in the indoor air to acceptable levels. The BECs will be applied in a manner that reduces the concentrations of site-related chemicals in the indoor air, originating from below the slab, to below background or a 1E-6 cancer risk and 1.0 hazard index for a commercial exposure scenario, whichever is higher. SVE (described above) will accomplish the same risk reduction as described for the SVE system above. The IC layers mentioned above will prevent inadvertent exposure to the contaminated soil left in place beneath the building, prevent interference with the constructed components of the remedy, and prevent future land use that could result in unacceptable exposure to contaminants. The ICs accomplish these objectives as described above.

The risk to the groundwater from the principal threat wastes in the deep soil will be addressed by in-situ chemical oxidation (ISCO) and SVE. ISCO is a treatment mechanism that chemically breaks down the contaminants into harmless by-products. Treatment with ISCO and SVE will reduce the principal threat wastes to the extent practicable given the limitations of the technologies, which will increase the long-term effectiveness of the Dual-Site Groundwater Operable Unit remedy. These treatments in the deep soil are being designed to accomplish a maximum mass reduction practicable, rather than particular degree of risk reduction.

Risk from the contaminated groundwater will be addressed by the restrictive covenant IC layer. This IC layer will prohibit groundwater extraction wells from being installed or utilized on the properties.

The implementation of this remedy will not pose unacceptable short-term risks or cross-media impacts.

13.2 Compliance with Applicable or Relevant and Appropriate Requirements

The ARARs are described in Section 12.5 and Table 12-17. The selected remedy will meet all ARARs.

13.3 Cost-Effectiveness

The selected remedy, Alternative 4, is cost-effective because its costs are proportional to its overall effectiveness. Its overall effectiveness was determined by examining its balance of long-term effectiveness and permanence; reduction in toxicity, mobility, and volume; and short-term effectiveness. The cost effectiveness evaluation is summarized in Table 13-1 and discussed below.

TABLE 13-1: Cost Effectiveness Summary

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of TMV through Treatment	Short-Term Effectiveness
1	0	-	None.	None.	None.
2 ICs (permit review, information)	$3,890,000	+$3,890,000	OUTDOOR SHALLOW SOIL Possible but uncertain	No reduction	No impacts
			BENEATH BUILDING Not effective	No reduction	No impacts
			NAPL/GW SOURCE AREA Prevents exposure No removal of PTW	No reduction	No impacts
3 ICs (above and General Plan footnote, covenants), cap, BEC, HE/SVE	$49,380,000	+$45,490,000	OUTDOOR SHALLOW SOIL Physical barrier	No reduction	No or minor impacts
			BENEATH BUILDING Prevents exposure	No reduction	Range from little impact to greater
			NAPL/GW SOURCE AREA Some removal of PTW	Some reduction of volume	Potential releases
4 ICs (same as 3), cap, SVE (SS), BEC and SVE(UB), ISCO/SVE	$50,430,000	+$1,049,990	OUTDOOR SHALLOW SOIL Removes some contaminants Physical barrier	Some reduction of volume	Moderate construction impacts Potential VOC releases
			BENEATH BUILDING Prevents exposure Removes some contaminants	Some reduction of volume	Range from little impact to greater

TABLE 13-1: Cost Effectiveness Summary

Alternative	Present Worth Cost	Incremental Cost	Long-Term Effectiveness and Permanence	Reduction of TMV through Treatment	Short-Term Effectiveness
			NAPL/GW SOURCE AREA More removal of PTW	More reduction of volume	Potential releases
5 ICs (same as 3), excavation, SVE(UB), ISSH/SVE	$81,670,000	+$31,240,000	OUTDOOR SHALLOW SOIL Removes all contaminants	Complete reduction of volume	Most construction impacts Potential dust & VOC releases
			BENEATH BUILDING Removes all contaminants	Complete reduction of volume	Moderate construction impacts Potential VOC releases
			NAPL/GW SOURCE AREA Most removal of PTW	Most reduction of volume	Greatest potential releases

Notes:
ICs – Institutional Controls
BEC – Building Engineering Controls
HE – Hydraulic Extraction
SVE – Soil Vapor Extraction
SS – Shallow Soil
UB – Under Building
ISCO – In-Situ Chemical Oxidation
ISSH – In-Situ Soil Heating
VOC – Volatile Organic Compound

Alternatives 1 (No Action) and 2 (ICs – 2 layers) are not cost effective because they do not accomplish protection of potential receptors and protection of the groundwater remedy. Alternatives 3, 4 and 5 are all cost effective since they accomplish the necessary protections. Alternative 5 (ICs 4 layers, excavation, SVE(UB), in-situ soil heating and SVE) accomplishes the most reduction of toxicity, mobility and volume (TMV), but for the highest cost and the greatest potential for short-term impacts. Alternatives 3 and 4 cost significantly less than 5, and Alternative 4 (ICs 4 layers, cap, SVE(SS), building engineering controls, SVE(UB), in-situ chemical oxidation and SVE) accomplishes more waste reduction than Alternative 3 for only slightly more cost.

13.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable (MEP)

The selected remedy provides the best balance of trade-offs among the alternatives with respect to the balancing criteria such that it represents the maximum extent to which permanence and treatment can be practicably utilized at this site. The balancing criteria summary in the previous section shows that Alternatives 3, 4 and 5 all utilize treatment to varying degrees, with 3 using the least and 5 the most. The costs of each alternative align in that order as well. However, the potential short-term impacts favor Alternative 4. Thus, in selecting Alternative 4, the trade-off is less reduction of Toxicity, Mobility and Volume but less potential short-term impacts and for a lower cost. This balancing emphasizes the “long-term effectiveness” factor and the “reduction of toxicity, mobility or volume through treatment” factors, but tempers them with consideration for short-term impacts and cost. The selection also accounts for the preference for treatment and bias against off-site disposal. Off-site disposal was a significant component of Alternative 5, which was another factor that led to the selection of Alternative 4 (except additional areas encountered in the future).

The other criteria that impacted the balancing and selection was implementability, particularly the implementability of Alternative 5's in-situ soil heating (ISSH) element. One of the significant implementability issues for all of the three alternatives being discussed in this section is implementing the NAPL treatment technologies on properties that have active business operations occurring. All three alternatives face this issue, but it is greatest for ISSH because of the robust control of subsurface vapors that would need to be established and the amount of infrastructure that would need to be installed. The infrastructure issue also impacts Alternative 3, both more so than Alternative 4. Evaluation of the implementability criteria therefore favored Alternative 4.

13.5 Preference for Treatment as a Principal Element

The Selected Remedy, Alternative 4, satisfies the statutory preference for treatment by utilizing two treatment technologies, SVE and ISCO, along with several containment and exposure prevention approaches (capping and BEC). The source materials constituting the principal threats consist of contamination in non-aqueous phase liquid (NAPL) form, located in four "source areas" where treatment with SVE and ISCO will occur. In addition to the NAPL sources, SVE treatment will also be utilized in three areas where shallow soil is contaminated with VOCs present but not in NAPL form. The NAPL source areas are described in Section 11.0.

13.6 Five-Year Review Requirements

A five-year review will be required pursuant to CERCLA §121(c) and the NCP §§300.430(f)(5)(iii)(B) and 300.430(f)(3)(ii)(A) because waste will be left in place in excess of levels that would allow for unrestricted use of the land and groundwater.

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PART III RESPONSIVENESS SUMMARY

Summary of Public Comments
Del Amo Superfund Site
Proposed Plan

Comment #	Comment	Category	Source
1	Has there been ongoing monitoring of vapor intrusion in the buildings on the site?	Vapor Intrusion	1
2	What is the history of vapor intrusion monitoring in the adjacent residential areas?	Vapor Intrusion	1
3	In the afternoon the wind blows gray dust into the house. Does the dust contain DDT?	Airborne Dust	2
4	Specify how the extracted vapors will be treated under preferred alternative No. 4. We want to make sure dioxins or other chemicals are not created from a combustion technology	Treatment of Extracted Vapors	3
5	You should expand the treatment area for chemical oxidation to treat as much of the source contamination as possible	Source Removal	3
6	There should be an ongoing vapor intrusion monitoring plan	Vapor Intrusion	3
7	How old are the vapor intrusion studies that have been done, if any, and would you please send a copy of them to the Del Amo Action Committee office	Vapor Intrusion	3
8	How old is the risk assessment? If old, what has been done to incorporate new science? How have cumulative impacts been addressed?	Health/Risk Assessment	3
9	What is the difference between the federal and the state screening numbers?	Cleanup Goals	3
10	What has been done to investigate the health of the workers who redeveloped the site?	Health/Risk Assessment	3
11	Why has a technical impracticability waiver been established and where is the TI waiver zone?	TI Waiver Zone	3
12	How will you address the uncertainties around implementing General Plan footnote and restrictive covenant institutional controls?	Institutional Controls	3
13	Is the LNAPL smear zone at 25 feet getting bigger or smaller? What does this mean in terms of continued contamination?	LNAPL	3
14	What will happen to soil that is excavated. We do not want soil to go to Kettleman City	Waste Soil Disposal	3
15	More community outreach and education is needed, based on the low turnout to this public meeting.	Community Relations	3

Comment #	Comment	Category	Source
16	Please consider using the Los Angeles Department of Water and Power (LADWP) lot to house the excavation system, as well as covering the system or hiding the system with shrubs. Commenter is concerned with alarming the tenants and with maintaining all of the parking space.	Short Term Effectiveness	4
17	Please consider running piping for the planned vapor extraction system along the sidewalk or Hamilton Avenue rather than through the parking lot of 20101 Hamilton Avenue. Excavation would cause disruption in the parking lot and require offsite parking for tenants.	Short Term Effectiveness	5
18	During chemical injections please keep the affected area to a minimum and shield it from view.	Short Term Effectiveness	5
19	Please consider not installing vapor extraction treatment systems on the parking lot directly behind our buildings at 20280 and 20300 South Vermont Avenue. The best location would be in the LADWP easement.	Short Term Effectiveness	6
20	Make sure the treatment system equipment is well-screened by landscaping or fencing so as not to be unsightly or alarm potential tenants.	Short Term Effectiveness	6
21	The PCIG property, located at 1000 West 190th Street, should not be subject to institutional controls. PCIG has investigated and removed contamination to residential cleanup standards in consultation with EPA. The Site Closure Report was submitted to EPA and EPA sent PCIG a letter on February 13, 2002 stating "based on environmental data that you made available to us and the soil removal actions you under took on your property, EPA does not at this time anticipate the need for further investigation or remediation on your property."	Institutional Controls	7
22	CC&Rs for the Pacific Gateway Center already restrict use to commercial or industrial, so deed restrictions are not necessary	Institutional Controls	7
23	Who would bear responsibility for the costs of any further site investigations or for any reductions in property values caused by EPA's proposed actions? Any remedy that is selected should clarify that the Del Amo responsible parties, rather than the current property owners, should bear any costs related to the remedy.	Institutional Controls	7
24	Based on discussions with EPA, EPA will set up procedures by which the Building Department will red-flag properties so that EPA is notified in the event of redevelopment. EPA would determine the required investigation work and EPA's contractor would perform any necessary remediation. It is critical that there be established procedures and timelines for this process to avoid unreasonable and potentially costly delays.	Institutional Controls	7

Comment #	Comment	Category	Source
25	PCIG is concerned that in the future EPA may no longer be involved, or EPA personnel will not be familiar with the Del Amo site. If so, property owners with restricted properties may have no way to re-develop the property or lift the restrictions. Provide assurances that this will not occur.	Institutional Controls	7
26	The Respondents continue to believe that Intrinsic Biodegradation, ICs, and Monitoring are an appropriate remedy for the site as a whole, with the exception of NAPL source area 3 (SA 3), where the addition of SVE is appropriate. This is based on a "weighted average rating" evaluation of remedial alternatives for each property and consideration of recent Federal and State policies and guidance regarding sustainability. No complete exposure pathways currently exist at the site and implementation of Intrinsic Biodegradation, ICs, and Monitoring would be protective of human health and the environment while minimizing adverse effects to onsite businesses.	Remedy Selection	8
27	There continues to be strong evidence that intrinsic biodegradation of VOCs is actively occurring at the site, as evidenced by trends of declining VOC concentrations in many groundwater monitoring wells. Consequently, additional confirmatory sampling will be performed during the design phase wherever an active remedy is selected by EPA. The objectives of confirmatory sampling will be to verify that contaminant concentrations warranting application of the active remedy are still present in the soil and to further define the horizontal and vertical extent of the treatment zones.	Remedy Selection	8
28	**Page 8, What are Building Engineering Controls(BEC)?:** We suggest that the definition of BECs that USEPA presents in the ROD be expanded by modifying the definition text in the Proposed Plan to: "BECs are control measures applied at buildings so that contaminated vapors do not build up inside the building and cause health concerns. Examples of the types of BECs that may be applied include, but are not limited to:"	Building Engineering Controls	8

Comment #	Comment	Category	Source
29	**Page 8, What are Building Engineering Controls(BEC)?:** The types of BECs currently mentioned and described in the Proposed Plan are subslab venting, building depressurization, and normal ventilation. We suggest that in the ROD the following two types of BECs be included in the explanation: Passive Vapor Barriers Barriers made of plastic sheeting or cured-in-place materials are placed under the building slab to prevent vapor intrusion into the building. Floor Sealing Floor sealants and sealing filters are applied to existing floor slabs to reduce vapor diffusion through the slab and to seal cracks, gaps, and openings in the floor.	Building Engineering Controls	8
30	**Page 9, what is In-Situ Chemical Oxidation?:** The second and third sentences don't accurately describe the ISCO process. We would suggest modifying these sentences in the ROD as follows: "Oxidant is pumped into the saturated zone through the wells. The contaminant is oxidized in place, and an SVE system is utilized to remove the vapors created through the oxidation process along with other vadose zone vapors. In addition, residual oxygen from the process promotes natural attenuation."	ISCO	8
31	**Page 12, Alternative 4, Cost estimates**: The “Estimated Construction Time Frame” is listed as 3 to 4 years of operation. However, this is inconsistent with the capital and O&M costs presented in the FS. For Alternative 4 (ISCO+SVE), the timeframe and other implementation details will be determined during remedial design. In the FS, ISCO components of 2-year, 4-year and 8-year timeframes were discussed. The Respondents suggest inclusion of the 2-year ISCO option as well in the ROD, because pilot testing could show this to be appropriate and property owners may deem remedy impacts to be lower.	Costs	8
32	**Page 19, Table 6**: The information in Table 6 indicates that USEPA’s Preferred Alternative includes SVE for properties where VOC-contaminated outdoor shallow soil is present, including properties 6, 11 and 23. While NAPL source areas with proposed ISCO and SVE remedies are present in the vicinity of the each of these areas, stand-alone SVE systems (e.g., wells, blowers, and treatment systems), that would not otherwise be installed, would be required to address VOCs in the shallow soil. It is the Respondents’ position that Capping, ICs and Monitoring at these areas would be protective of human health while being more cost effective and less intrusive than SVE. Additional SVE in these areas would result in significant increases in complexity, cost, and intrusion on the property owners without commensurate risk reduction.	Remedy Selection	8

Comment #	Comment	Category	Source
	Risks associated with each of these three properties are within USEPA's discretionary risk range (1x10-4 to 1x10-6) and are summarized below: Property 6 (Commercial Worker): Outdoor Soil: 3x10-6 (Cancer Risk) <1 (Hazard Index) Indoor Air: 4x10-6 (Cancer Risk) <1 (Hazard Index) Property 11 (Commercial Worker): Outdoor Soil: 2x10-5 (Cancer Risk) <1 (Hazard Index) Indoor Air: 7x10-6 (Cancer Risk) <1 (Hazard Index) Property 23 (Commercial Worker): Outdoor Soil: 1x10-5 (Cancer Risk) <1 (Hazard Index) Indoor Air: 2x10-5 (Cancer Risk) <1 (Hazard Index)		
33	**Page 19, Table 6, and page 20, text in first paragraph under Shallow Soil Components – Outdoor and Beneath Buildings:** Though it is not specified in the Proposed Plan, the Respondents infer that USEPA's Preferred Alternative includes Building Engineering Controls (BECs) at property 16, and SVE beneath the building at property 23. Further, the Respondents understand that USEPA's decision to include these remedial responses in the Preferred Alternative at these two properties is based on concerns associated with chlorinated solvents in shallow soil, specifically TCE and PCE, beneath these buildings. The extensive site history investigation of the former rubber plant that was performed during the Remedial Investigation revealed no evidence that TCE and PCE were ever used at the site during the operational life of the rubber plant complex. Because there is no evidence that these compounds were used at the former rubber plant that was the subject of the RI/FS investigation, the Respondents maintain that they should not be responsible for designing, constructing and operating these components of USEPA's Preferred Alternative.	Remedy Selection	8
34	**Page 19 Table 6, and page 20 text in second paragraph under NAPL/Groundwater Contamination Source Areas Components:** Active remedial measures proposed for NAPL SA6 are limited to SVE in the vadose zone. Previous ROST and soil boring analytical data, as well as recent UVOST work in this area suggest the majority of the vadose zone contaminant mass is in the shallow subsurface (i.e., less than 15 feet below ground surface) and a complete exposure pathway is not present. Confirmatory sampling with chemical analysis should be performed in this area during the remedial design phase to assess whether elevated VOC concentrations are present in these shallow soils that would warrant a remedial response. If the results of the	Remedy Selection	8

Comment #	Comment	Category	Source
	additional assessment confirm that elevated VOC concentrations in the vadose zone are present, but are limited primarily to the shallow subsurface (<15 feet below ground surface), then the Respondents believe that any vadose zone SVE system should be designed to target only this shallow zone. However, if the results of the additional assessment show that contaminant concentrations have declined below levels that warrant an active remedial response, then an alternative remedial measure (such as Capping with ICs and Monitoring) should be considered for implementation.		
35	**Page 19 Table 6:** Properties numbered 29 and 34 are listed in the table, apparently in error, with Institutional Control layers 1 through 5 being applied as part of USEPA's preferred alternative. As indicated on Figures 3 and 4 and elsewhere in the Proposed Plan, the Respondents understand that EPA has decided to defer remedial decisions for both of these properties to the Montrose Superfund Project. Consequently, remedial decisions for properties 29 and 34 should not be included in USEPA's Record of Decision for the Del Amo Soil and NAPL Operable Unit.	Remedy Selection	8
36	**Throughout document:** Numbered areas are referred to in the Proposed Plan, sometimes referring to one or more properties (e.g. "Area 6"), but other times referring to one or more groundwater contamination source areas (e.g. "Source Area 6"). This different usage may confuse the reader. The Respondents therefore suggest that in the ROD, USEPA refer to "properties" or "property" as an alternative to "area" wherever the reference is to a numbered property rather than a NAPL source area, to more clearly distinguish them.	Readability	8

Comment Sources:

1 Marlene Canas verbal comments during Proposed Plan public meeting

2 William Straight verbal comments during Proposed Plan public meeting

3 Cynthia Babich verbal comments during Proposed Plan public meeting

4 Tinamarie Conant, written comments submitted at Proposed Plan public meeting

5 Romy Miura, written comments submitted at Proposed Plan public meeting

6 Karen Fredericks, written comments submitted via email

7 Albert M. Cohen, written comments on behalf of PCIG

8 Shell Chemical, written comments

COMMENT #1

Has there been ongoing monitoring of vapor intrusion in the buildings on the site?

RESPONSE

The potential for vapor intrusion in buildings within the OU-1 area (former plant property) was first evaluated in the Baseline Risk Assessment through vapor transport modeling using soil, soil vapor and groundwater data. Based on those results, additional vapor intrusion assessments through collection and analysis of subslab vapor samples were completed at five buildings deemed to be at risk. There has not been any other ongoing monitoring for vapor intrusion in the buildings within the OU-1 area besides these activities mentioned. Based on the results of these evaluations, USEPA's selected remedy includes Building Engineering Controls at one building (Area 16), and Soil Vapor Extraction beneath a second building (Area 23) to address the potential for vapor intrusion to be occurring at those two locations. Soil vapor monitoring activities and/or indoor air monitoring will be required at these two buildings as part of the remedial activities therein.

CATEGORY: Vapor Intrusion (see also comments #2, 6, 7)

SOURCE: 1

COMMENT #2

What is the history of vapor intrusion monitoring in the adjacent residential areas?

RESPONSE

Soil vapor intrusion evaluations in the residential areas adjacent to the Del Amo Site included activities conducted on 204th Street. Soil vapor and indoor air sampling was conducted and the results were evaluated for residences on 204th Street in 1994 and 1995. Soil vapor monitoring associated with the Waste Pits Area remediation began in 2003 and is currently conducted monthly at perimeter wells located within the former 204th Street residential area.

A 1995 Health Consultation by the U.S. Agency for Toxic Substances and Disease Registry (ATSDR)[9] evaluated the 1994 data collected at the 25 residences on 204th Street. The consultation concluded that contaminants were either below the Los Angeles County indoor air reference levels and/or below ATSDR's health comparison levels. It also concluded that the sources of contaminants could not easily be ascertained because the majority of the levels were comparable to levels in properties not impacted by the Superfund sites.

The 2004 Public Health Assessment[10] modeled potential vapor migration and vapor intrusion into residences using groundwater contaminant concentration data. The assessment found that this potential exposure pathway would not exceed the risk threshold levels.

As part of the ongoing OU-2 (Waste Pits Area) remedial action, monthly soil vapor monitoring with field analyzers is conducted monthly at 5 perimeter wells and quarterly at 7 perimeter wells, 4 of which are located within the former 204th Street residential area. The purpose of this monitoring is to ensure that contaminants in soil vapor do not migrate beyond the limits of the Waste Pits treatment area. As concluded in the Waste Pits Second 5-Year Review (September 22, 2010), "The continued low concentrations of VOCs detected at the perimeter wells indicate good control of injected air volumes, that the cover system is performing as designed, and that the contaminated soil vapors are not migrating beyond the cap boundaries."

In addition, soil gas samples were collected in 2003 and 2006 for laboratory analysis of benzene and other VOCs from the 4 perimeter wells located in the former 204th Street residential area. The laboratory results for benzene and other VOCs in all of these samples are well below conservative Human Health Screening levels developed by the State of California for residential areas to address the potential migration of VOCs from contaminated soil or groundwater into indoor air.

Investigations within the former Del Amo plant property have generally shown that vapors emanating from the water table in areas with high dissolved concentrations attenuate relatively quickly and do not reach the ground surface at concentrations of concern. It is expected that there would be even less chance of significant shallow vapor concentrations in areas of lower groundwater contaminant

[9] "Health Consultation, Health Impacts of Contaminants in Soil, Air, and Tap Water, Montrose Chemical Corporation . . . and Del Amo Facility . . .," by U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (May 1995).

[10] "Public Health Assessment, Del Amo Superfund Site, Near Torrance, Los Angeles County, California," by California Department of Health Services (July 29, 2004).

concentrations, including the residential area, where dissolved concentrations of VOCs in groundwater are much lower.

CATEGORY: Vapor Intrusion (see also comments #1, 6, 7)

SOURCE: 1

COMMENT #3

In the afternoon the wind blows gray dust into the house [adjacent to the 204th Street buy-out area]. Does the dust contain DDT?

RESPONSE

Based on the results obtained from the soil sampling and testing events described below, EPA does not have evidence suggesting that harmful concentrations of DDT are present in any dust originating from the 204th Street undeveloped property. (The referenced property was described by the commenter as being located on the south side of Berendo Avenue, adjacent to the undeveloped "buy-out" area).

Between 1995 and 1998 under the direction of EPA, DDT-impacted soil was excavated and removed from specific areas on 204th Street, within the currently undeveloped property extending from New Hampshire Avenue on the east, to Budlong Avenue on the west. Following completion of these removal actions, confirmatory soil samples were collected and submitted for analysis of pesticides, including DDT. Analytical laboratory results confirmed that no DDT concentrations exceeding the EPA action level remained. Additional soil sampling and testing was performed in this area in the years that followed this removal action as summarized below.

In 1998, additional soil samples were collected from soils exposed after residential building demolitions and foundation removals were completed within this area. Soil samples were submitted for analysis of pesticides, including DDT, and analytical laboratory results confirmed that no DDT concentrations were present exceeding the EPA action level. On June 15, 2000, EPA issued a letter to County of Los Angeles Department of Parks and Recreation stating that the levels of DDT were within acceptable risk levels and the area was suitable for use as a park.

In May 2001, upon completion of surface soil grading activities within this area, additional soil samples were collected, screened by field testing, and select samples were submitted for analysis of pesticides, including DDT. Field testing and analytical laboratory results confirmed that no DDT concentrations were present exceeding the EPA action level. On August 21, 2001 EPA issued a second letter to County of Los Angeles Department of Parks and Recreation stating that the area was suitable for use as a park.

In conclusion, soil sampling has been conducted within the undeveloped property on 204th Street, both for purposes of protecting the former residential use as well as assessing the suitability for use as a park. The results indicate that the soil from where the dust originates does not contain harmful levels of DDT.

CATEGORY: Airborne Dust

SOURCE: 2

COMMENT #4

Specify how the extracted vapors will be treated under preferred alternative No. 4. We want to make sure dioxins or other chemicals are not created from a combustion technology.

DEL AMO ACTION COMMITTEE (DAAC) REQUESTS THAT THERMAL INCINERATION TECHNOLOGIES BE TAKEN OUT OF THE REMEDIATION OPTIONS FORMALLY. DAAC also requests that EPA provide funding for an independent expert selected by DAAC to review and comment upon any proposed remedial action proposals.

RESPONSE

A range of vapor treatment technologies were discussed in the Feasibility Study. A thermal/catalytic oxidizer was assumed for cost estimating purposes but three other technologies were also identified in the Proposed Plan as part of the preferred alternative. The four vapor treatment technologies were identified in the Proposed Plan as being possible technologies to use as components of the SVE systems. The Proposed Plan stated that any or a combination of the four technologies could be used, and that the decision on which to use would be made during the remedial design. The four identified technologies are adsorption, condensation, thermal oxidation, and internal combustion.

This ROD selects the same four technologies as identified in the Proposed Plan, and specifies that any or a combination of the four technologies could be utilized to treat the vapors extracted from the SVE systems. The technology or combination thereof could differ among the various source areas. A number of factors will be considered and input from interested stakeholders will be obtained during the remedial design process in selecting the vapor treatment technology or technologies to use. A similar stakeholder forum as used during the Waste Pits design process would be utilized to involve and obtain input from stakeholders (such as the current Partnership). Concerns relating to performance capabilities, combustion by-products, air discharge regulatory limits, dioxin formation, greenhouse gas formation, impacts to neighboring businesses and residents, and other criteria of concern to stakeholders will be considered in the design decisions.

EPA has a program called Technical Assistance Services for Communities whereby EPA could fund an independent consultant to provide technical consulting services for community groups interested in a particular Superfund site. The program does not have the flexibility to allow DAAC to select its own independent expert. EPA is currently working in partnership with the Del Amo Action Committee (DAAC) to utilize this program to address priority issues.

CATEGORY: Treatment of Extracted Vapors

SOURCE: 3

COMMENT #5

You should expand the treatment area for chemical oxidation to treat as much of the source contamination as possible.

Please provide more information about the constraining factors and how they impact the effectiveness of the proposed treatment plan, including how an "unconstrained" plan would differ from the proposed plan. The more source contamination that is removed the better.

RESPONSE

The In-Situ Chemical Oxidation treatment areas will focus on NAPL-impacted soil at the "source areas." The actual size and configuration of the treatment zones will be determined during remedial design, based on soil core observations, laboratory analytical results for soil and groundwater samples, and Ultra Violet Optical Screening Tool (UVOST) logs from each area (UVOST is a field screening technique which identifies hydrocarbon impacted soils). The intent of the ISCO program using these tools is to treat as much of the NAPL-impacted source area as possible.

The main limitation to applying ISCO is the presence of existing buildings, where it would not be possible to install injection or SVE wells inside buildings. There could possibly be utilities or pipelines in locations whereby it would not be possible to install wells or injection points.

While ISCO will be limited to NAPL-impacted source areas, it is anticipated that the treatment will provide the additional benefit of increasing the oxygen content in groundwater, enhancing biodegradation of dissolved phase constituents down-gradient of the treatment area.

CATEGORY: Source Removal

SOURCE: 3

COMMENT #6

There should be an ongoing vapor intrusion monitoring plan.

Regardless of how the EPA sections up, divides, or otherwise segments this area that is impacting public health and the environment, EPA needs to have an ongoing vapor intrusion monitoring plan and EPA must ensure it is implemented. The impacts of on-going vapor intrusion are far too critical for the EPA to refuse to even monitor whether such intrusion—and the harm it causes--is occurring.

RESPONSE

Out of all the areas related to the Del Amo Superfund Site, including areas related to OU-1 “Soil & NAPL,” OU-2 “Waste Pits,” and OU-3 “Dual-Site Groundwater,” there are some areas that warrant further vapor intrusion assessment and other areas that do not. Within the OU-1 area, there are two parcels warranting further monitoring and/or remediation. Within the OU-2 area, ongoing soil vapor monitoring is warranted and is currently being conducted. In the OU-3 area, there are some areas where soil vapor monitoring has recently been conducted and further monitoring will be conducted, and other areas where additional monitoring could be pursued. Further details for each area are described in the following paragraphs.

Operable Unit 1 “Soil & NAPL”

Operable Unit 1 (OU-1) refers to the soil within the former plant property, excluding the Waste Pits area.

Indoor air data were collected between 1993 and 1995 from 13 buildings within the OU-1 area and were presented comprehensively in the 2001 Workplace Air Monitoring Program Report (in addition to being reported in interim reports in the years of the sampling). Buildings were selected for indoor air sampling because (a) their footprint covered a former plant site VOC-facility location; and/or (b) they were located immediately adjacent to an area of soil contamination, known from 1993 soil gas data to have VOC contaminant concentrations in excess of threshold values. The indoor air data was compared to screening levels available at the time to ascertain whether an immediate risk was present that warranted immediate action. It was determined that no immediate risk was present. The indoor air data was then used in the risk assessment to determine whether there was any long-term risk. Such risk was calculated for all buildings at the site. Indoor air data was used for buildings where it had been collected. Where indoor air data were not collected, potential indoor air risk was modeled using soil vapor, soil matrix, and groundwater data. An estimated indoor air risk was calculated for each property and results are presented in the 2006 Baseline Risk Assessment.

Based on the estimated indoor risks presented in the 2006 Baseline Risk Assessment, there were five properties that exceeded acceptable risk levels. The indoor risks were estimated based on modeling vapor migration from surrounding soil samples (not from indoor air sampling). The primary risk driver was generally benzene. Because benzene biodegrades over time, subslab samples were collected beneath the buildings at each of these five properties to confirm whether actual subslab concentrations correlate with the estimated indoor air risk that exceeded acceptable risk thresholds. The subslab results demonstrated that three of the five properties did not have concentrations exceeding the risk thresholds and therefore would not require remediation or further assessment of vapor intrusion. The OU-1 ROD addresses the indoor air pathway at the two remaining properties (Areas 16 and 23). Remedial actions selected consist of soil vapor extraction beneath one of the buildings and building engineering controls for the other building. In addition, soil vapor and/or indoor air monitoring activities will be required at both areas. However, based on the results of the risk assessment for OU-1, there is not a current need for an OU-wide vapor intrusion monitoring program.

Operable Unit 2 "Waste Pits"

Operable Unit 2 (OU-2) refers to the Waste Pits area, located at the southern end of the former Del Amo Plant boundary. The Waste Pits ROD was signed in 2000 and includes a RCRA cap and soil vapor extraction system to remediate benzene and other VOCs in soil. Both the RCRA cap and the SVE system include monitoring to ensure that contaminants in soil vapor do not migrate beyond the limits of the treatment area. The monitoring system includes 12 perimeter monitoring wells that surround the Waste Pits. The samples collected from these vapor monitoring wells show that contaminants in shallow soil vapor are not migrating away from the Waste Pits area. EPA will continue to monitor vapor concentrations at these perimeter wells in accordance with the OU-2 remedy.

Operable Unit 3 "Dual-Site Groundwater"

Operable Unit 3 (OU-3) refers to the Dual-Site Groundwater areas, including the areas associated with dissolved phase groundwater contamination from the former Montrose plant property, the former Del Amo rubber plant property, and other facilities on Normandie Avenue. A number of soil vapor sampling and vapor intrusion evaluations have been conducted at various locations within the OU-3 area.

A 1995 Health Consultation by ATSDR evaluated 1994 indoor air data collected at the 25 residences on 204th Street. The consultation concluded that contaminants were either below the Los Angeles County indoor air reference levels and/or below ATSDR's health comparison levels. It also concluded that the sources of contaminants could not easily be ascertained because the majority of the levels were comparable to levels in properties not impacted by either the Superfund sites.

The 2004 Public Health Assessment modeled potential vapor migration and vapor intrusion into residences using groundwater contaminant concentration data. The assessment found that this potential exposure pathway would not exceed the risk threshold levels established by DHS.

Soil vapor sampling investigations have been conducted and are still being conducted within OU-3 areas that are on or immediately surrounding the former Montrose Plant property as part of the OU-3 DNAPL investigation and feasibility study, OU-1 remedial investigation, and OU-7 remedial investigation. The investigations include sampling and evaluating soil vapor data within the Montrose former plant property and on adjacent commercial properties north and south of the former plant property. Plans are underway to expand these sampling activities. The investigations have also included indoor air sampling in commercial buildings north of the former plant property, and plans are underway to conduct similar sampling south of the former plant property.

EPA recognizes that further evaluation of vapor intrusion potential within the residential areas of the OU-3 area could be conducted. Such evaluation would first evaluate existing data to determine whether data gaps exist for which additional sampling is warranted.

CATEGORY: Vapor intrusion (see also comments #1, 2, 7)

SOURCE: 3

COMMENT #7

How old are the vapor intrusion studies that have been done, if any, and would you please send a copy of them to the Del Amo Action Committee office?

EPA has recently admitted that there are large data gaps in their information for the site, as this response will further highlight. EPA must properly evaluate and address this important avenue of harm. We request additional copies of these documents. We have tried to access the soil vapor study on EPA's website and the file states it is "corrupted and un-repairable" and therefore I am unable to download it. Please fix this problem and forward two copies of these documents to us as soon as possible.

RESPONSE

The first vapor intrusion studies began in 1994-95 for the 204th Street residential area. The evaluation utilized indoor air sampling conducted in 1994, and the assessment was conducted in 1995 (DHS Health Consultation).

Subsequent vapor intrusion studies were conducted as part of the former rubber plant Baseline Risk Assessment, completed September 7, 2006. This assessment utilized soil, soil gas, indoor air, and groundwater data collected from 1993 through 2004.

Further vapor intrusion evaluation was conducted in 2008-9, when soil vapor samples were collected beneath the floor slabs of several existing buildings located within the former rubber plant property. The results of the laboratory testing were presented in an April 2009 Technical Memorandum.

In addition to the evaluations noted above, soil vapor monitoring occurs monthly at the Waste Pits Area within the perimeter monitoring well system.

Copies of the Baseline Risk Assessment and the Technical Memorandum have been provided to the DAAC, in addition to the Remedial Investigation (RI), Feasibility Study (FS), Public Health Assessment (PHA), 5-Year Review (5YR) and Proposed Plan. (The 5YR contains the Waste Pits Area regular soil vapor monitoring results).

EPA's Draft Guidance for Evaluating Vapor Intrusion to Indoor Air (EPA530-D-02-004) describes using multiple lines of evidence for evaluating the potential impacts of the vapor intrusion pathway to indoor air, including modeling migration from groundwater and soil, conducting sampling beneath structures (subslab) and within structures (indoor). The Del Amo investigation followed these concepts, as evidenced by the variety of sampling and evaluations conducted (indoor air and subslab sampling, soil vapor monitoring, and modeling from groundwater).

CATEGORY: Vapor Intrusion (see also comments #1, 2, 6)

SOURCE: 3

COMMENT #8a

How old is the risk assessment? If old, what has been done to incorporate new science. How have cumulative impacts been addressed?

DAAC believes that risk assessments are based on made up information and the numbers mathematically manipulated by the assessor and never end up being protective enough given that fact that many of these chemicals have no risk information available. DAAC requests EPA work with DAAC and others to develop a process that is truly reflective of current trends and methods to address cumulative impacts and sensitive receptors.

RESPONSE

The risk assessment for the soil and NAPL operable unit was approved by EPA on October 23, 2006. The methods and procedures presented in the document are consistent with current EPA guidance. EPA is not aware of new science that, if applied, would materially change the conclusions of the risk assessment. Risk assessment findings for several parcels within the former rubber plant were revised in the final Feasibility Study report, approved by EPA on February 2, 2010. When there are multiple chemicals of concern present, the cumulative risk was estimated by adding together the individual risks for each chemical.

EPA risk assessments follow established guidance, "Risk Assessment Guidance for Superfund" (EPA/540/1-89/002 and associated update appendices). This guidance represents established, robust, accepted scientific methodologies.

In the case of Del Amo OU-1, EPA is confident the risk assessment provides a reliable assessment of potential risks for the potential OU-1 receptors, and EPA is utilizing this assessment to support the OU-1 ROD. The OU-1 ROD selects remedial actions to address these risks. EPA does identify in the ROD the situations where further assessment of potential risk could be needed in the future due to new development or construction activities at a parcel. Specifically, the ROD specifies that in the future, construction activities within OU-1 that involve contact with the soil will require evaluation of potential contact with site-related contaminants. This evaluation could include additional environmental sampling and risk evaluation, as well as remediation.

COMMENT #8b

We have attached a list of questions about risk assessment that we would like EPA to answer. These questions are attached to the end of this document.

Additional risk assessment questions and responses:

a. What assumptions are you making? Please provide a comprehensive list of all of the assumptions that will go into the risk assessment and how those assumptions could impact the validity of the results.

RESPONSE: The Baseline Risk Assessment (BRA) for the Soil and NAPL OU was completed by Geosyntec Consultants and URS in September 2006 and the EPA approved document is available electronically online at:

http://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/vwsoalphabetic/Del+Amo+Facility?OpenDocument

Hard copy of the document is available at the following two public repositories:

Carson Public Library
151 East Carson Street
Carson, CA
Phone: (310) 830-0901

Katy Geissert Civic Center Library
3302 Torrance Boulevard
Torrance, CA
Phone: (310) 618-5959

Risk assessment guidance requires the use of numerous assumptions which are comprehensively discussed in the BRA. The risk assessment used very conservative (high-end) values for exposure, toxicity, and contaminant concentration values to estimate Reasonable Maximum Exposure (RME) risks. This approach assumes, for example, that individuals who are most sensitive to the potential cancer effects of a chemical will also have a breathing rate and exposure duration that exceeds most of the population. With numerous high-end exposure assumptions combined, risks are typically overestimated for the population, meaning that virtually all potentially exposed individuals will have a much lower level of risk than the estimated RME risks presented in the BRA. The assumptions used in the risk assessment are intentionally conservative in nature and health-protective.

While assumptions are discussed throughout the BRA, Section 7, "Assessment of Uncertainty," focuses on many of the assumptions used and their influence on the results. Additionally, specific values assumed for various parameters used in the risk calculations are presented in Tables 13 through 19 of the BRA.

b. How will you handle uncertainty? Will you treat missing or incomplete toxicity data as posing no risk? Will the risk assessment include probabilistic analyses?

RESPONSE: Discussion of uncertainty is closely related to the discussion of assumptions, as mentioned above and in the BRA. The use of assumptions in the BRA necessarily results in some uncertainty regarding the results. However, the assumptions used for the RME estimates of risk are intentionally very conservative, resulting in a high-end, over-estimate of risk which compensates for potential inaccuracies introduced through assumptions and other uncertainties.

The primary constituents of concern (COCs) at the Del Amo site are generally well understood with respect to toxicity. For cases where the available information is less complete, the best available information was used. In some cases, this means the use of data for similar, surrogate compounds that are believed to have similar toxicities. The BRA did not assume such chemicals posed no risk.

The approach used to calculate the risks was not probabilistic in that it did not randomly simulate numerous exposures and model the outcomes to reach its conclusions. By design, the most probable risk to an individual is much less than RME estimates.

c. What are the factors that most influence the results?

RESPONSE: Numerous factors influence estimates of risk; however, the more influential factors in the BRA include the COC concentrations, the toxicity of the individual COCs, and the duration/magnitude of the exposure to the COCs.

d. Do you know the relationship between every type of exposure (i.e., each chemical, multiple chemicals, cumulative and synergistic effects) and all toxicological endpoints (i.e., cancer, mutagenicity and genetic toxicity, reproductive effects, developmental effects, immunological effects, endocrine disruption, neurological effects, effects on organs, and respiratory effects)?

RESPONSE: The risk assessment process utilizes information on the toxicity of a COC and how people are exposed. The toxicity information is based on data from the EPA Integrated Risk Information System (IRIS) or other EPA sources and considers both cancer effects (including mutagenicity data) and non-cancer effects. Potential risk for carcinogens is estimated for each chemical and then the total carcinogenic risk is determined by adding the estimated risk for all identified COCs. The particular type of cancer that may be associated with the COCs is not considered. The estimated risk is the probability, above the background cancer incidence rate, of contracting any type of cancer as a result of this exposure. For chemicals that are evaluated based on potential non-carcinogenic effects, the potential hazard of exposure is determined for each chemical, and then the hazards are added for all COCs similar to the process used for carcinogens. However, the hazards are also considered by the target organ that is potentially effected (liver, kidney, etc.). This process is consistent with EPA's Risk Assessment Guidance for Superfund (RAGS).

The potential synergistic and antagonistic effects of exposure to multiple chemicals is not considered in the risk assessment process because there are not sufficient scientific data at this time on the interaction of specific chemical mixtures. Until data are available to quantitatively evaluate these interactions, the conservative (i.e., health protective) approach adopted by EPA for Superfund is to consider the effects additive.

e. Which exposure pathways are you considering? Are you considering exposure related to soil vapor intrusion? Are you considering inhalation of outdoor air, indoor air, and exposures through baths and showers? Are you considering the ingestion of soil, surface water, ground water, homegrown produce, meat, dairy, vegetables, fish, shellfish, and breast milk. Are you considering dermal absorption through exposures to soil, water, and foliage?

RESPONSE: The risk assessment for OU-1 "Soil and NAPL" considered the following potentially complete exposure pathways:

- Ingestion of soil;
- Direct contact with soil and absorption of chemicals through the skin;
- Inhalation of dust generated from soil;
- Inhalation of vapor emanating from soil or soil gas into outdoor air; and
- Inhalation of vapor emanating from soil, soil gas, or groundwater into indoor air.

These exposure pathways were considered the most relevant at the site for commercial and hypothetical residential land use. Direct contact, ingestion and shower exposures for groundwater were not evaluated in this risk assessment because a groundwater risk assessment had been performed previously for the Dual-Site Groundwater Operable Unit. Exposures to surface water were not evaluated in this risk assessment because surface water bodies are not present at the Del Amo Site. Home agricultural, aquiculture, breast milk and foliage exposure routes were not evaluated for this operable unit because they were not determined to be exposure pathways for this Site and operable unit.

This ROD includes institutional controls that will prohibit future residential land use on 26 parcels, since their potential risk exceeded acceptable levels for such use. The ICs also will prohibit any drilling into groundwater at many properties on the site, which reduces or eliminates the possible risk of exposure to contaminated groundwater.

f. Will exposures and dose be independently verified or based upon real world measurements, such as air quality monitoring and biomonitoring?

RESPONSE: Exposure and dose are specific to each of the available pathways by which individuals could be exposed (i.e., ingestion, inhalation, direct contact, etc.). For each pathway and COC, the dose was calculated by multiplying the Exposure Point Concentration (EPC) by an intake factor. The EPC is based on real world data, specifically, the laboratory analytical results for samples from the various exposure media for the site (i.e., soil, groundwater, indoor air, etc.). The quality of this data is ensured through EPA oversight, use of accredited laboratories, quality assurance/quality control samples (including duplicates) to evaluate laboratory precision and accuracy, and data validation procedures.

The intake factor was calculated according to accepted formulas using conservative estimates of ingestion/inhalation rates, exposure frequency and duration, body weight, etc., for the receptor population being evaluated (i.e., commercial worker, potential future resident, or construction trench worker), that are compiled in various EPA guidance documents and based on peer-reviewed and documented scientific research.

Dosage was not independently verified with air monitoring and biomonitoring. Although indoor air monitoring was conducted, it was found that site-specific chemicals were too ubiquitous in the surrounding environment to ascertain contributions from the contaminated soil itself. Therefore, modeling of potential exposure and dosage was done based on the measured soil contaminant concentrations. The same applies to biomonitoring, whereby the presence of site-specific contaminants in a body would not be indicative of the actual source, since the site-specific contaminants are ubiquitous in the environment from non site-related sources.

g. Will you be using validated and certified fate and transport models to determine dose and exposures?

RESPONSE: The approach, formulas, and parameter values used in the risk assessment were reviewed and are consistent with EPA- accepted methods and guidelines. The vapor migration model used is a validated model.

h. Will the risk assessment consider multiple, additive, cumulative, and synergistic impacts?

RESPONSE: Toxicity data are generally available only for individual chemicals. The risk assessment assumes that toxicity from exposure to multiple COCs is additive, and the estimated cancer risks and hazard index for the individual COCs are therefore summed (cumulative) to estimate total cancer risk and hazard index. Exposure to multiple chemicals does involve some uncertainty, as unknown synergistic interactions between chemicals are possible, potentially leading to underestimates of risk. This is acknowledged in the risk assessment, and compensated for through the use of conservative, health-protective assumptions and input parameter values in the risk calculations.

i. How will qualitative data be incorporated into the risk assessment?

RESPONSE: The risk assessment process itself does not incorporate qualitative data. However, EPA considers qualitative data together with the risk findings during the remedial decision making process, as documented in the Record of Decision (ROD).

j. Who will make risk management decisions and what criteria will they use when making those decisions? Will those decisions be made before or after the risk assessment has been conducted? Once made, will those risk management decisions be subject to change and, if so, by whom and under what circumstances?

RESPONSE: USEPA will make risk management decisions in the form of determining whether remedy implementation is necessary (for those cases in which risk falls within the discretionary range), and what the remedy will consist of. EPA uses the criteria specified in the National Contingency Plan, section 300.430(e)(2)(i), in making its decision about whether remedial action is warranted at a Superfund site. As described in a prior response, the NCP states:

> *(1) For systemic toxicants, acceptable exposure levels shall represent concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, incorporating an adequate margin of safety;*
>
> *(2) For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6} using information on the relationship between dose and response.*

EPA uses the 10^{-4} (1 in 10,000 risk) to 10^{-6} (1 in a million risk) range as a "target range" within which EPA strives to manage risks as part of a Superfund cleanup. Once a decision has been made to take an action, it is EPA's preference to achieve the more protective end of the range (i.e. 10^{-6}), although achieving reductions in site risks anywhere within the risk range may be deemed acceptable by the EPA.

The risk management decisions are made in the ROD after the BRA, RI, and FS are completed. These decisions rely upon the risk assessment. The BRA had been previously completed, as have the RI and FS. This document constitutes the ROD. EPA is responsible for protecting human health and the environment, but it must also consider public acceptance as well as technological, economic, social, and political factors when arriving at a risk management decision. This evaluation is formally conducted as part of the nine criteria evaluation presented in the Proposed Plan and the ROD.

After issuance of the ROD, the remedy will be implemented, with remedial systems in place being regularly maintained and monitored. Once in place, the remedial actions are subject to 5 year reviews (5YR) that evaluate whether or not the remedy remains protective. The 5YR process continues as long as contamination remains on-site. Decisions made in the ROD can be revised in the future through a “ROD Amendment,” or an “Explanation of Significant Difference,” if significant changes in site conditions become known or it is determined that the selected remedy is unable to achieve its goals of protecting human health and the environment.

k. Are you willing to consider any of the alternatives to risk assessment, such as a health impact assessment, an alternatives assessment, or a community health assessment?

RESPONSE: In the Superfund program, risk assessments help answer several questions, such as which sites need cleanup, which areas of a site need cleanup, which contaminants need cleanup, and how much cleanup is needed. Health impacts associated with environmental exposures generally cannot be directly isolated and measured. Because of this, EPA scientists and others have spent more than two decades developing an extensive set of risk assessment methods, tools, and data to estimate environmental health risks. Although significant uncertainties remain, this risk assessment methodology has been extensively peer-reviewed, is widely used and understood by the scientific community, and continues to expand and evolve as scientific knowledge advances.

There are other community health evaluations that have taken place at the Del Amo and neighboring Montrose Superfund sites. For example, the California Department of Public Health (formerly California Department of Health Services) under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR) has conducted a number of Public Health Assessments (PHAs). The PHA is a document that provides the communities with information on the public health implications of specific hazardous sites and identifies those populations for which further health actions or studies are indicated. The Del Amo PHA (2004) can be found at: http://www.ehib.org/papers/FinalDelAmoPHA.pdf

CATEGORY: Health/Risk Assessment (see also comments #9, 10)

SOURCE: 3

COMMENT #9

What is the difference between the federal and the state screening numbers?

These screening numbers typically include conservative assumptions about exposure scenarios but they don't protect against every exposure possibility. In addition, as with all things relying upon risk calculations, they have assumptions built in about dose-response relationships and don't deal with the possibility of synergetic or cumulative impacts. Look at work on risk assessment and you'll see that the critique applies here. Given these facts, we would like more information about the values relied upon and how there were developed.

RESPONSE

Many of the screening criteria used in the Del Amo OU-1 Remedial Investigation and Feasibility Study (RI/FS) for soil, indoor air and groundwater are risk-based values set by both state and federal regulatory agencies. For the purposes of the Del Amo RI/FS, the more conservative (lower) of the state or federal values was used when they differed.

The screening step in the risk assessment used the federal screening values (known at the time as "Preliminary Remediation Goals" or "PRGs") to identify chemicals of potential concern on each parcel. Those chemicals present on a parcel at concentrations above the screening levels were then used in the risk calculation for that individual parcel. Those risks were calculated cumulatively – the risk from each chemical was added together.

Screening levels (formerly known as PRGs) were developed by EPA to estimate contaminant concentrations in environmental media (soils, air, and water) that are protective of human exposures (including sensitive groups) over a lifetime. Screening levels were developed for both industrial and residential settings because of the different exposure timeframe (workers would be exposed for 8 hours/day, 5 days/week whereas residents would be exposed 24 hours/day, 7 days/week). The screening values represent concentrations at or below which are unlikely to pose a health threat, and above which suggests that further evaluation is necessary. Concentrations exceeding a screening level do not automatically determine that a health threat exists, only that further evaluation is necessary.

For more information on the exposure pathways and scenarios used in EPA's screening levels, please visit http://www.epa.gov/region9/superfund/prg/ and in the text box on the right click on either "Frequently asked questions" or "User's Guide".

Screening levels do not replace Human Health Risk Assessments performed by EPA or Public Health Assessments performed by the California Department of Public Health (under a cooperative agreement with the Agency for Toxic Substances and Disease Registry, "ATSDR"). Screening levels are just the first step in a risk assessment. Both risk assessments and public health assessments take into account cumulative impacts due to multiple contaminants and multiple exposure pathways.

Synergistic effects (that is, exposure to two or more chemicals producing more of a health effect than would be expected by adding the chemical exposures together) are not accounted for in risk assessment calculations. The Del Amo risk assessment discusses this as a factor of uncertainty. If synergistic effects were a possibility for certain chemicals found at Del Amo, it is unlikely that synergism would occur at EPA's screening level concentrations, since these values are set well below health effect levels.

CATEGORY: Cleanup Goals (see also comments #8, 10)

SOURCE: 3

COMMENT #10

What has been done to investigate the health of the workers who redeveloped the site?

What is the federal EPA responsibility to follow up on past worker exposure when gross contamination issues are substantiated? Do you have to report this information to OSHA? I would like to ensure that EPA reports their findings to the appropriate agencies that will follow up with workers who can be identified, posting in the paper (trade and otherwise) and specific unions employing the types of employees possibly affected. As a victim of unexplained illness' myself it is extremely import for people to know what they have been exposed to since in these situations they must become their own best health advocate because general physicians receive little or no environmental occupational health training.

RESPONSE

Under the Superfund law, EPA is not granted the authority to investigate the health of the workers who had redeveloped the site. Redevelopment of the former plant property began in 1973 and continued until the mid-2000's. The majority of the land parcels were redeveloped by 1992, when EPA first became involved at the site. Prior to EPA's involvement, the California Department of Health Services (DHS) had overseen limited environmental investigations at the site.

CATEGORY: Health/Risk Assessment (see also comments #8, 9)

SOURCE: 3

COMMENT #11

Why has a technical impracticability waiver been established and where is the TI waiver zone?

First, we would have appreciated a response to the question that provided a focused, clear reason for why the TI waiver was used. Further, DAAC resents that large areas of the community have been determined to be waste zones. The TI waiver zone must not include any residential areas. This type of decision is exactly the kind that can and must be made along with the impacted community members and DAAC requests a focused discussion with experts to revisit this decision. DAAC views any decision to leave contamination beneath our neighborhood and homes as completely unacceptable. EPA should either get the contamination out from under our homes or get the people out of the contamination zone. Since EPA says that it will take more than 100 years to get the contamination out from under the homes, the only option is to move people out of the area. DAAC asks for EPA's support in making this happen.

RESPONSE

The Dual Site Groundwater Record of Decision (OU-3 ROD) includes a containment zone for groundwater that immediately surrounds the concentrated benzene and chlorobenzene non-aqueous phase liquids (NAPL). The benzene NAPL is located within the Del Amo former rubber plant area, and the chlorobenzene NAPL is located within the Montrose former plant area. Attaining groundwater standards in the NAPL-impacted areas would require almost complete elimination of the NAPL from the ground, which EPA determined to be technically impracticable to achieve. The NAPL-impacted areas, as well as a zone of dissolved phase contamination surrounding those areas, were therefore designated a containment zone (not a "waste zone"). Within that zone, groundwater cleanup standards were waived on the basis of technical impracticability. When containment is achieved, the containment zone will serve to isolate the NAPL, thus making it possible to clean up and restore the groundwater outside that zone.

There is an area of the benzene containment zone south of Del Amo that overlaps the undeveloped buy-out area and a small portion of residential area. (See figure). In this area, benzene levels have decreased to very low concentrations of 10-20 ppb (MCL is 1ppb). The groundwater starts 40-50 feet below ground surface in this area, and resides in fine grained sand. **These conditions do not pose a vapor intrusion threat to residents.** Any benzene vapor rising from the groundwater biodegrades well before it reaches the shallow soil. Monthly soil vapor monitoring within the undeveloped buy-out area shows that soil vapor concentrations are consistently well below the California Human Health Screening Level (CHHSL) for vapor intrusion potential in a residential setting. The presence of the containment zone does not pose a risk to the residents or to a future use of the undeveloped buy-out areas as a park.

The basis for and technical specifics of the TI Waiver Zone are explained in Section 10 of the ROD for the Montrose/Del Amo Dual Site Groundwater Operable Unit (OU-3). A summary explanation of the TI Waiver Zone concept is provided below.

As noted above, it is technically impracticable to attain cleanup levels inside the containment zone because the NAPL continues to dissolve into the groundwater there. Therefore, the containment zone is also called the Technical Impracticability (TI) waiver zone. The size of the TI waiver zone in the benzene plume is somewhat larger than the actual NAPL distribution. This is because the ability of a groundwater pump and treat system to decrease the extent of the benzene plume is very limited given the proximity of the LNAPL sources to the edge of the plume. The Waste Pits and the Benzene Pipeline areas, the two

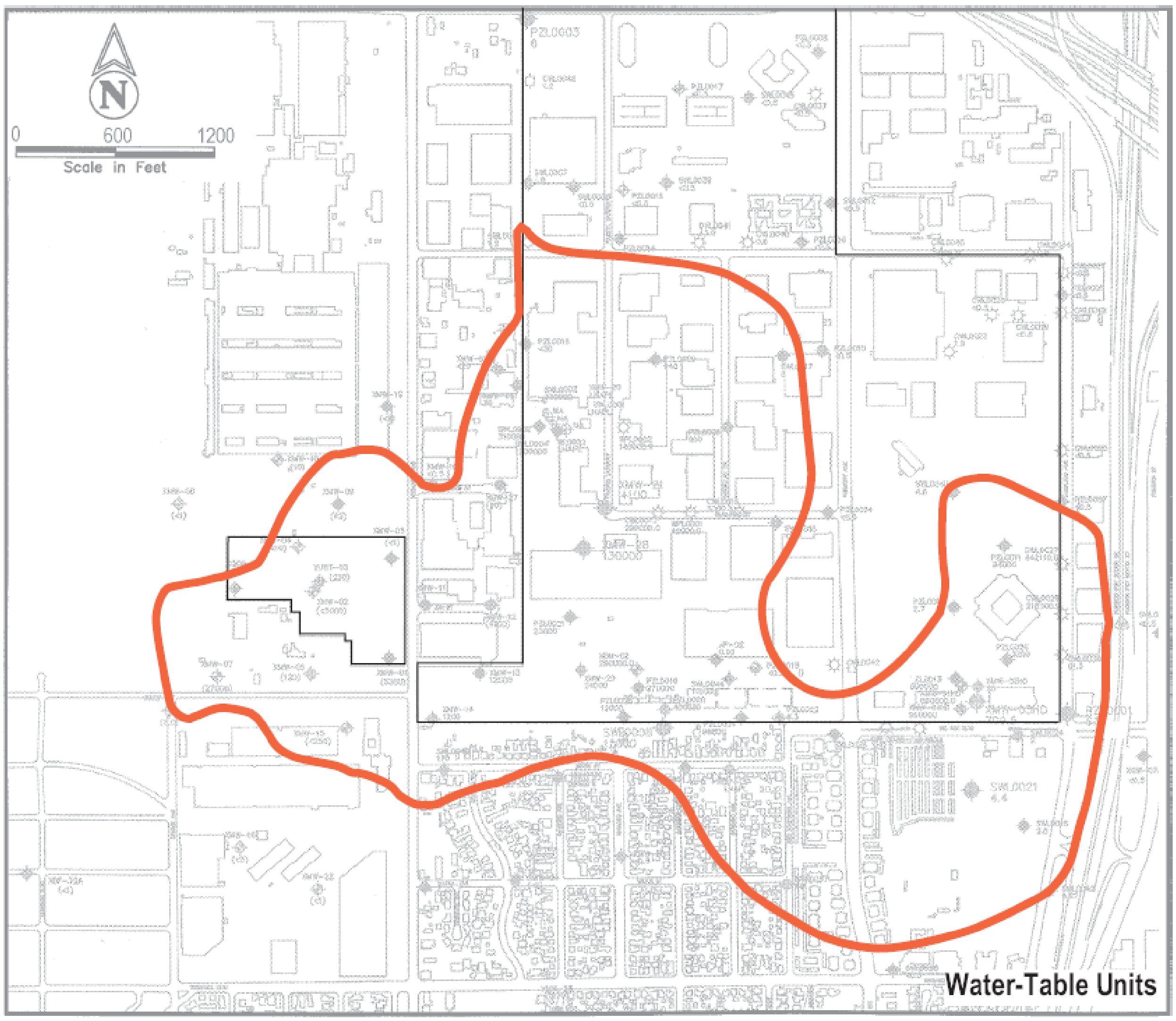
LNAPL source areas near the leading edge of the plume, are both only 1100 to 1200 feet from end of the plume. The size of the areas downgradient of these sources that would be able to be restored would not likely exceed several hundred feet. Furthermore, the restoration of this limited area will never be complete due to the continuing dissolution of LNAPL into groundwater. For these reasons, the Groundwater remedy does not to attempt to reduce the volume of the benzene plume.

Follow-up Response: This OU-1 ROD does not address decisions made by the OU-3 Groundwater ROD. The decision to establish the containment zone (also known as the TI waiver zone) was made in the Groundwater ROD, which was signed twelve years ago (March 1999). The OU-1 ROD (this ROD) addresses the sources of benzene NAPL that are affecting the groundwater. A future Montrose ROD(s) will address the sources of chlorobenzene NAPL, which are located on the former Montrose plant property. EPA will engage with concerned community members regarding the TI waiver zone issue in the context of the Dual-Site Groundwater operable unit.

CATEGORY: TI Waiver Zone

SOURCE: 3

FIGURE: Technical Impracticability Waiver Zone – Water Table



(excerpt from Figure 10-1 "TI Waiver Zone for the Joint Site," Record of Decision, Dual Site Groundwater Operable Unit)

INSTITUTIONAL CONTROLS

COMMENT #12

How will you address the uncertainties around implementing zoning controls and restrictive covenant institutional controls?

More needs to be done to ensure future workers and the public are protected. On Kenwood Ave., at a particular property where DDT removal did not occur the community has been left to monitor the situation when it comes to sewer repairs, fence replacement and foundation repairs carried out by the land owner. These incidents have occurred and the site is treated as if the soil is not tainted with a layer of DDT sediment. Dirt is plied to the side or on the street in an uncontrolled manor and children play nearby or jump the piles of dirt with their bikes. DAAC wants EPA to ENSURE that the public and others in the area do not become responsible for the tasks EPA needs to undertake to prevent waste disruption.

Institutional controls are the weakest form of “protection.” EPA hasn’t even identified those at risk, as evidenced by our meeting where they admitted they did not know who might be exposed from vapor intrusion. How can they know where institutional controls are needed? How were the decisions made as to which properties would have zoning and deed restrictions?

RESPONSE

The selected remedy includes multiple layers of ICs – General Plan footnote and restrictive covenants constitute two of those layers. Current zoning at the Site prohibits residential use and other uses specified under the City’s “R” zoning designations. Pursuant to the ROD, restrictive covenants will be implemented at 26 of the parcels at the Site. The covenants are legally enforceable documents that “run with the land,” meaning that they apply to and are enforceable against subsequent owners. The covenants will prohibit residential use, and will prohibit drilling for groundwater. In addition, the covenants will require that any future construction plans at the properties be approved by EPA in order to ensure that no unacceptable exposures to Site contaminants occur.

The 26 properties at which the restrictive covenants will be implemented are those where long-term exposure to contaminated soils could result in an unacceptable risk if the properties were used for residential purposes.

EPA has found that ICs, particularly when layered (as described in Section 12.2 of the ROD), are effective remedial actions and complement active remedies for sites. If EPA later determines that the IC remedy components are not effective at preventing exposure, EPA may revise the remedy.

Through the implementation of the permit review institutional control, the agencies and potentially responsible parties will monitor activities within OU-1 that involve contact with the soil. This institutional control has already been implemented as a pilot and has been used for the past three years to monitor construction activities in the OU-1 area. The control works by having the Los Angeles Department of Building and Safety (the agency that handles building permits) refer permit applicants within OU-1 to the Superfund Environmental Review Team (ERT), consisting of EPA, DTSC and the Responsible Parties). The Superfund ERT communicates with the permit applicant, reviews the environmental data pertaining to their work area, and requires additional sampling and cleanup as needed.

In addition, this ROD selects land-watch monitoring as a mechanism to monitor activities within the OU-1 area that could result in contact with the soil. Land-watch monitoring is a service whereby the selected contractor monitors construction permit activity (i.e. permit applications for construction, grading, well installation), land-use permitting activities, underground services alerts, and property transfers to identify activities that could come in contact with soil. The contractor notifies the EPA ERT when a permit for any activities of concern is applied for, and the team contacts the entities involved. These communications all occur in advance of actual soil work occurring. The land-watch monitoring has also already been implemented as a pilot and has been successful in preventing inadvertent contact with contaminated soil.

It should be noted that the example given in the comment pertains to DDT-contaminated soil in a residential area that is part of the Montrose Superfund Site.

CATEGORY: Institutional Controls

SOURCE: 3

COMMENT #13

Is the LNAPL smear zone at 25 feet getting bigger or smaller? What does this mean in terms of continued contamination?

DAAC requests that these smear zones be clearly indentified and presented to us in a briefing along with a projection of the time it will take for them to "degrade". Further, DAAC requests more information as to how the observations that the groundwater levels are rising impact the overall treatment plan for this site.

RESPONSE

There are areas on the site where LNAPL has been inferred to exist in a "smear zone" caused by LNAPL that originally accumulated on the water table, and subsequently became trapped in sediment below the water table as groundwater levels rose. A general trend of gradually rising groundwater levels has been observed in many monitoring wells at the site. LNAPL smear zones that formed in this manner have been documented at a limited number of locations within the footprint of the former rubber plant beginning at depths ranging from approximately 35 to 50 feet below land surface. The LNAPL in these smear zones at the Del Amo site is slowly dissolving and degrading in the groundwater and thus the volume of LNAPL present is gradually decreasing through time. The LNAPL does provide a continuing source of groundwater contamination, which is one reason why EPA is selecting active remediation, including in-situ chemical oxidation (ISCO) and vapor extraction, at four onsite areas. In addition to the proposed active remediation, natural attenuation is occurring and the dissolved-phase groundwater plume is at stable to decreasing levels in areal extent and concentration.

The four LNAPL areas that will have active remediation are Source Area 3 (SA-3), SA-6, SA-11, and SA-12. Figure 12-1 of this ROD shows the location of each of the source areas. Modeling performed during the RI/FS estimated that natural flushing action would take 12,000 years to remove all the LNAPL in these areas. Active remediation would decrease the amount of time the LNAPL would remain in the environment, proportional to the amount of mass removed. For example, if 50% of the LNAPL mass is removed, the cleanup timeframe would decrease 50%, from 12,000 years to 6,000 years. However, this modeling did not account for natural biodegradation, so the cleanup timeframe would be considerably shorter.

The continued rise of the water table will affect the remediation plan by decreasing the volume of the vadose zone (unsaturated zone) and increasing the volume of the saturated zone. This would decrease the amount of soil where SVE would be utilized and increase the amount of soil where in-situ chemical oxidation would be utilized. One outcome of this shift is that more remediation would occur in-situ, since SVE extracts contaminants and treats them above-ground and in-situ chemical oxidation treats them in-situ (below the ground). Conceptually, this would result in fewer emissions to the atmosphere.

CATEGORY: LNAPL

SOURCE: 3

COMMENT #14

What will happen to soil that is excavated? We do not want soil to go to Kettleman City.

DAAC would seriously oppose the transfer of toxic waste from our sites to another community. This option should be taken out of the equation.

If EPA sends this waste to other communities over the objections of DAAC, DAAC requests that EPA disclose at least 60 days in advance of transfer exactly which communities will be receiving the waste, the characteristics of the waste, and that EPA inform the community forced to take this waste about DAAC's objections.

RESPONSE

EPA's selected remedy includes excavation and offsite disposal only for areas of impacted soil that may be encountered at the site in the future during development or construction activities. In addition, relatively small quantities of soil that are brought to the surface during the installation of planned remedial systems and during future sampling activities, may require transport and disposal at appropriately licensed offsite facilities. Any excavated soils meeting hazardous waste criteria are required to be disposed only at appropriately permitted and licensed treatment and disposal facilities. Decisions about where to send any impacted soils that are excavated at the site in the future will be based on the nature of the impacted soils requiring disposal, the status of the permits and licenses held by the facilities available to receive the soils at that time, and the requirements of EPA's "Off-Site Rule" (40CFR §300.440 *"Procedures for planning and implementing off-site response actions"*).

Under the Off-Site Rule, EPA makes a determination of acceptability of any facility selected for the treatment, storage or disposal of CERCLA waste, pursuant to the requirements set out in the rule. The acceptability criteria include the facility having no relevant violations, such as deviations from regulations or permit conditions, that: (1) prevent releases of hazardous substances, (2) ensure early detection of releases, or (3) compel corrective action for releases. Because the facility must be acceptable under the Off-Site Rule at the time of the disposal of the CERCLA waste, EPA does not determine what facilities may or may not be acceptable in the ROD.

Other federal (and state) regulations govern the transportation and disposal of hazardous wastes too, including standards for generators (40 CFR Part 262), identifying hazardous waste (40 CFR Part 261), pre-transportation requirements (40 CFR Part 262 Subpart C), manifests (40 CFR Part 262 Subpart B), land disposal restrictions (40 CFR Part 268), and treatment standards (40 CFR Part 268 Subpart D).

Through the years of EPA's involvement at the Del Amo site, 99% of the soil that has been removed from the Site has met the criteria for being non-hazardous. This includes soil from sampling and well drilling, as well as removal actions taken during the course of property owners' construction activities.

EPA is always willing to providing timely, pertinent information to DAAC and any other member of the public regarding issues of interest. The Community Involvement Plan generally identifies the avenues through which EPA provides such information. EPA cannot commit to providing specific information within specific timeframes regarding selection of disposal facilities and timing of transport. These aspects of remediation involve constraints of other parties such as transporters and the receiving facility. EPA is willing to work with DAAC to provide such information in as timely manner as possible. EPA cannot commit to providing public notification of Del Amo related waste soil transfers to communities where the licensed treatment and disposal facilities are located. EPA also cannot commit to representing DAAC's position to outside parties.

CATEGORY: Waste Soil Disposal

SOURCE: 3

COMMENT #15

More community outreach and education is needed, based on the low turnout to this public meeting.

Let me clarify the original comment. EPA needs to ensure that there is a community involvement strategy that includes outreach properly developed for our community and opportunities for participation that are meaningful for the decisions EPA is making. DAAC and community residents want to be assured that we are provided with information in a timely manner and in a way that we can understand the options possible for addressing the contamination in our community. We want our comments and input shape the decisions that are being made and not just allow a box to be checked off on some stakeholder input form. We want to work with our Community Involvement and Environmental Justice site managers to ensure an outreach strategy has our input and is completed in a timely manner. The community involvement plan presented to us for our site at the June 30, 2010 meeting is a sham and reflects a cookie cutter document copied from some EPA policy document. DAAC requests to sit down with the appropriate staff to develop a truly relevant document that is specific to our community.

RESPONSE

EPA agrees that a robust outreach and education plan for the public will be important as we move forward to the remedial design and remedial action phases of this project. The Proposed Plan public meeting is just one public outreach activity. More outreach activities will continue to occur as EPA proceeds with design and implementation of the selected remedy. EPA has added an additional Community Involvement Coordinator to the project team and has developed a partnership with the Del Amo Action Committee (DAAC) and is currently creating an outreach strategy with integral input from DAAC.

EPA has worked extensively in the past with the Del Amo Action Committee and other stakeholders on the different aspects of work on this site (e.g., 204th Street investigation and buy-out, OU-2 Partnership).

CATEGORY: Community Relations

SOURCE: 3

COMMENT #16

Please consider using the Los Angeles Department of Water and Power (LADWP) lot to house the excavation [vapor treatment] system, as well as covering the system or hiding the system with shrubs. Commenter is concerned with alarming the tenants and with maintaining all of the parking space.

RESPONSE

The details of the remediation system will be finalized during the remedial design phase of the project. Discussions will be held with the appropriate property owners and tenants, including the LADWP, to explain the remedial objectives and to understand the concerns of all stakeholders. The remediation system will be designed to achieve cleanup objectives and maintain worker and public safety, and will take into account concerns over disruption to tenants to the extent possible.

CATEGORY: Short Term Effectiveness

SOURCE: 4

COMMENT #17

Please consider running piping for the planned vapor extraction system along the sidewalk or Hamilton Avenue rather than through the parking lot of 20101 Hamilton Avenue. Excavation would cause disruption in the parking lot and require offsite parking for tenants.

RESPONSE

A range of piping route options for the vapor extraction system will be evaluated during the remedial design phase of the project. Certain parameters will need to be met, however, such as the need to connect piping to the vapor extraction wells. The wells must be located within the contamination area, which does include portions of the parking lot. Flexibility exists as to the location of the vapor treatment unit, which will then influence the final piping routes. However, all piping will be installed below grade and will be sequenced to minimize the disruption to onsite activities. The EPA will maintain close communications with property owners and tenants throughout the remedial design process, to minimize impacts of the remediation system on site occupants and ongoing business activities.

CATEGORY: Short Term Effectiveness

SOURCE: 5

COMMENT #18

During chemical injections please keep the affected area to a minimum and shield it from view.

RESPONSE

EPA will strive to minimize the areas required for chemical injection equipment and materials storage while balancing the need for maintaining safe operations and achieving remedial objectives. Where EPA determines it is appropriate, the final design for chemical injection equipment and material storage will incorporate fencing to provide security and to shield system components from view.

CATEGORY: Short Term Effectiveness

SOURCE: 5

COMMENT #19

Please consider not installing vapor extraction treatment systems on the parking lot directly behind our buildings at 20280 and 20300 South Vermont Avenue. The best location would be in the LADWP easement.

RESPONSE

The details of the remediation system, including its location, will be developed and finalized during the remedial design phase. Discussions will be held with the appropriate property owners and tenants, including the LADWP, to communicate the remedial objectives and to understand the concerns of all stakeholders. The remediation system will be designed and located to achieve remedial objectives, and EPA will limit the disruption to onsite tenants and the public to the extent possible.

CATEGORY:	Short Term Effectiveness

SOURCE:	6

COMMENT #20

Make sure the treatment system equipment is well-screened by landscaping or fencing so as not to be unsightly or alarm potential tenants.

RESPONSE

Wherever possible, the equipment will be screened by fencing and/or landscaping. Fencing may also be needed for security purposes.

CATEGORY: Short Term Effectiveness

SOURCE: 6

COMMENT #21

The PCIG property, located at 1000 West 190th Street, should not be subject to institutional controls. PCIG has investigated and removed contamination to residential cleanup standards in consultation with EPA. The Site Closure Report was submitted to EPA and EPA sent PCIG a letter on February 13, 2002 stating "based on environmental data that you made available to us and the soil removal actions you under took on your property, EPA does not at this time anticipate the need for further investigation or remediation on your property."

RESPONSE

EPA has reviewed historical data for this property as well as the property-specific findings from the Baseline Risk Assessment. EPA has also reviewed the Site Closure Report referenced by the commenter and the owner's Phase II ESA. EPA identified a discrepancy between the raw data presented in the Phase II ESA, Appendix F, and the data presentation tables in the body of the report. Specifically, a hit of Araclor was assigned to soil boring B-2, where it really was in boring B-20. Consequently, the owner's removal action missed the highest Araclor occurrence. The remaining Araclor hit was then included in the data used by EPA in its risk assessment.

Prior to conducting the risk assessment, the data for the parcel were revised to reflect characterization and remediation activities completed by the owner's contractor, Arcadis, Geraghty and Miller, from 1997 to 1999. Historical data for two areas where soils were excavated as part of this remediation work were removed from consideration in the Baseline Risk Assessment. Data from the top three feet over the entire parcel were also removed from consideration due to the grading activities performed on behalf of the property owner. Using this revised data set, the Baseline Risk Assessment estimated the commercial risk for outdoor soil at the parcel to be $4x10^{-6}$, due primarily to arsenic. The residential risk was estimated to be $4x10^{-5}$, due primarily to arsenic and PCBs. EPA considers risks equal to or less than $1x10^{-6}$ to be acceptable. When estimated risks exceed $1x10^{-4}$, EPA requires remedial action. Estimated risks between $1x10^{-6}$ and $1x10^{-4}$ fall within a discretionary risk range, where the EPA has discretion concerning appropriate response actions. The two sampling locations at the parcel responsible for the majority of the estimated risks are as follows:

Location	Depth (ft)	Analyte	Concentration (mg/kg)
B-23	5	Arsenic	12.1
B-20	7	Arochlor 1260	0.42

Sampling locations and associated data for this property considered in the Baseline Risk Assessment are provided in Appendix A of that report. Based on the estimated risks, EPA's Proposed Plan deemed the parcel to warrant a restriction against residential land use. The IC mechanisms proposed included information, permit review, a general plan footnote, and restrictive covenants.

In response to this public comment, EPA re-examined the data set for the subject parcel. EPA found that the data set was robust enough to warrant use of the 95 Upper Confidence Limit (95UCL) value rather than the maximum value in determining the exposure point concentration used to calculate the risk. This is consistent with EPA's Risk Assessment Guidance for Superfund (RAGS). The result of this is a residential risk equal to 10^{-6}. Because the risk when utilizing the 95UCL value does not exceed 10^{-6}, the parcel would not warrant restriction from residential use. Therefore, this ROD does not require the subject parcel to be restricted from residential use.

CATEGORY: Institutional Controls

SOURCE: 7

COMMENT #22

CC&Rs for the Pacific Gateway Center already restrict use to commercial or industrial, so deed restrictions are not necessary

RESPONSE

Covenants, Conditions and Restrictions (CC&Rs) can be useful institutional controls for restricting use of a property or activities that could lead to exposure to contamination that may be present at a property. However, CC&Rs can be changed by the entity that created them, typically a property owner or association. The State and Federal government have no control over CC&Rs. Therefore, EPA cannot rely solely on CC&Rs as an institutional control on a property. Restrictive covenants are institutional controls that the State and Federal government can control directly. A restrictive covenant is a two-party agreement (that can also have a third-party beneficiary) whereby a property owner agrees to restrict use or activities on a property. Once signed, only the State government can remove the restriction. The State (or Federal government, if they are the third-party to the agreement) can enforce any violation of the agreement. The State or Federal government cannot enforce the provisions of a CC&R.

CATEGORY: Institutional Controls

SOURCE: 7

COMMENT #23

Who would bear responsibility for the costs of any further site investigations or for any reductions in property values caused by EPA's proposed actions? Any remedy that is selected should clarify that the Del Amo responsible parties, rather than the current property owners, should bear any costs related to the remedy.

RESPONSE

The ROD selects remedial actions for the Site, but does not determine what entity is responsible for implementing that remedy or what entity should pay for the remedy. The cost of any further environmental investigations associated with releases from the Site would be the responsibility of the Potentially Responsible Parties (PRPs) identified by EPA. Generally, EPA enters into an enforceable agreement with the PRPs to implement the remedy and EPA expects to do that here after issuance of the ROD. CERCLA, the Superfund law, does not have provisions covering liability for reductions in property values due to contamination.

CATEGORY: Institutional Controls

SOURCE: 7

COMMENT #24

Based on discussions with EPA, EPA will set up procedures by which the Building Department will red-flag properties so that EPA is notified in the event of redevelopment. EPA would determine the required investigation work and EPA's contractor would perform any necessary remediation. It is critical that there be established procedures and timelines for this process to avoid unreasonable and potentially costly delays.

RESPONSE

EPA's pilot program for building permit review has been implemented since 2008 and is working as intended. Upon submittal of an application for a grading or building permit at a parcel within the Del Amo Superfund site, The City of Los Angeles instructs the applicant to contact the Del Amo Environmental Review Team (ERT) via the website: http://www.delamosuperfund.com. The ERT includes representatives from EPA, DTSC and the Del Amo Respondents. The ERT may also become aware of onsite development activities through a land-watch monitoring service that tracks planned excavation work and the permits issued for construction activities at the site. Upon notification of planned development activities onsite, the ERT reviews the proposed project, the existing data and historical information for the subject property, to evaluate the potential for future workers or tenants to be exposed to contaminants.

Every effort is made to work closely with the property owner and developer to avoid construction delays. EPA cannot establish timelines ahead of time that would be generic for all reviews, since the timing depends on the scale of the project and conditions of that property. EPA has found that once the landowner/developer and EPA have begun to communicate about a project, an estimated timeline can be developed. It should be noted that, contrary to the commenter's statement, EPA does not plan for its contractor to perform any necessary remediation.

CATEGORY: Institutional Controls

SOURCE: 7

COMMENT #25

PCIG is concerned that in the future EPA may no longer be involved, or EPA personnel will not be familiar with the Del Amo site. If so, property owners with restricted properties may have no way to re-develop the property or lift the restrictions. Provide assurances that this will not occur.

RESPONSE

Pursuant to CERCLA, EPA is required to review the implemented remedy for the Site and assess protectiveness every five years. These five-year reviews not only insure continued protection of human health and the environment and effectiveness of the remedy, they also provide for continued public involvement and comment on the effectiveness of the remedy. If EPA determines that an institutional control is no longer needed for a particular property, EPA may amend the ROD or sign an Explanation of Significant Difference. The individual restrictive covenant would have to be released by DTSC. In addition, the restrictive covenants have variance and termination provisions that allow an owner to apply to DTSC for a variance for a specific project or a termination of the restrictions. EPA would be involved in and have input into that process.

CATEGORY: Institutional Controls

SOURCE: 7

COMMENT #26

The Respondents continue to believe that Intrinsic Biodegradation, ICs, and Monitoring are an appropriate remedy for the site as a whole, with the exception of NAPL source area 3 (SA 3), where the addition of SVE is appropriate. This is based on a "weighted average rating" evaluation of remedial alternatives for each property and consideration of recent Federal and State policies and guidance regarding sustainability. No complete exposure pathways currently exist at the site and implementation of Intrinsic Biodegradation, ICs, and Monitoring would be protective of human health and the environment while minimizing adverse effects to onsite businesses.

RESPONSE

EPA believes that Intrinsic Bioremediation, Institutional Controls and Monitoring would be an inappropriate remedy for the site as a whole. Section 121 of CERCLA mandates that a remedy utilize permanent solutions to the maximum extent practicable and satisfy the preference for treatment as a principal element. Intrinsic bioremediation and institutional controls do not utilize permanent solutions or utilize treatment. Furthermore, the NCP (Sec. 300.430(a)(1)(iii)) sets forth that containment will be considered for wastes that pose a relatively low long-term risk, and that institutional controls are most useful as a supplement to engineering controls and should not substitute for more active measures. Intrinsic bioremediation and institutional controls do not constitute containment for those areas at the site that contain relatively low long-term threats. EPA’s Proposed Plan states a preference for capping as a containment measure in some of those types of areas. Intrinsic bioremediation does not constitute an active measure, so the commenter is proposing institutional controls alone for most areas of the site. The NCP states that institutional controls should not substitute for more active measures. Finally, the commenter stated that an active measure, soil vapor extraction (SVE), would be appropriate in one location. This ignores all the other locations where principal threat wastes are located. The NCP sets forth that principal threats are to be treated wherever practicable. The locations, constitution, and media where the other principal threat wastes are located make their treatment practicable.

CATEGORY: Remedy Selection

SOURCE: 8

COMMENT #27

There continues to be strong evidence that intrinsic biodegradation of VOCs is actively occurring at the site, as evidenced by trends of declining VOC concentrations in many groundwater monitoring wells. Consequently, additional confirmatory sampling will be performed during the design phase wherever an active remedy is selected by EPA. The objectives of confirmatory sampling will be to verify that contaminant concentrations warranting application of the active remedy are still present in the soil and to further define the horizontal and vertical extent of the treatment zones.

RESPONSE

EPA recognizes that hydrocarbons such as benzene may be attenuating due to natural processes. The ROD selects a remedy based on the results of the RI/FS process and the available data. Confirmatory sampling is expected to be performed during the design of the selected remedy to determine the current extent of the treatment zone and the appropriate design of the remedy.

CATEGORY: Remedy selection

SOURCE: 8

COMMENT #28

Page 8, What are Building Engineering Controls (BEC)?: We suggest that the definition of BECs that USEPA presents in the ROD be expanded by modifying the definition text in the Proposed Plan to: "BECs are control measures applied at buildings so that contaminated vapors do not build up inside the building and cause health concerns. Examples of the types of BECs that may be applied include, but are not limited to:"

RESPONSE

The proposed change in wording is acceptable. EPA incorporated the proposed wording in Part II, Section 9.2 “Alternative 2…” of the ROD, where defining BECs.

CATEGORY: Building engineering controls

SOURCE: 8

COMMENT #29

"Page 8, What are Building Engineering Controls(BEC)?: The types of BECs currently mentioned and described in the Proposed Plan are subslab venting, building depressurization, and normal ventilation. We suggest that in the ROD the following two types of BECs be included in the explanation:

Passive Vapor Barrier

Barriers made of plastic sheeting or cured-in-place materials are placed under the building slab to prevent vapor intrusion into the building.

Floor Sealing

Floor sealants and sealing filters are applied to existing floor slabs to reduce vapor diffusion through the slab and to seal cracks, gaps, and openings in the floor."

RESPONSE

The proposed additional types of BECs are valid technologies or approaches for mitigating potential vapor intrusion. It should be noted that passive vapor barriers are valid for new construction only and was not mentioned in the FS. Since this ROD applies BECs only to existing buildings, passive vapor barriers were not mentioned in the ROD. Floor sealing is applicable to existing structures and is briefly mentioned in the FS but is not included in the discussion of the retained technologies in the FS. Regardless, passive vapor barriers are mitigation measures that could be implemented at Del Amo and EPA adding their descriptions to the ROD text in Part II, Section 9.2 “Alternative 2…”

CATEGORY: Building engineering controls

SOURCE: 8

COMMENT #30

Page 9, what is In-Situ Chemical Oxidation?: The second and third sentences don't accurately describe the ISCO process. We would suggest modifying these sentences in the ROD as follows: "Oxidant is pumped into the saturated zone through the wells. The contaminant is oxidized in place, and an SVE system is utilized to remove the vapors created through the oxidation process along with other vadose zone vapors. In addition, residual oxygen from the process promotes natural attenuation."

RESPONSE

Both statements are valid descriptions of the process. EPA described the concepts from the suggested wording in the ROD description of ISCO in Part II, Section 9.4 “Alternative 4…” and Section 12.2 “Description of Selected Remedy.”

CATEGORY: isco

SOURCE: 8

COMMENT #31

Page 12, Alternative 4, Cost estimates: The "Estimated Construction Time Frame" is listed as 3 to 4 years of operation. However, this is inconsistent with the capital and O&M costs presented in the FS. For Alternative 4 (ISCO+SVE), the timeframe and other implementation details will be determined during remedial design. In the FS, ISCO components of 2-year, 4-year and 8-year timeframes were discussed. The Respondents suggest inclusion of the 2-year ISCO option as well in the ROD, because pilot testing could show this to be appropriate and property owners may deem remedy impacts to be lower.

RESPONSE

The Proposed Plan correctly indicates 3-4 years for operations, but also provides costs for years 5-8 of operations. The cost table will be corrected in the ROD. Timeframes for operations are as follows: the FS discusses a 2 year ISCO option with 4 years of SVE. The FS addenda discusses an option 5A1, an 8 year option that includes fewer injection wells and peroxide injection over a longer period of time, and 5A2, injection of oxidant by means of direct push rather than injection wells over a 4 year period. The ROD recognizes the variability in approaches and states that the exact approach and associated timeframe will be selected during remedial design.

CATEGORY: costs

SOURCE: 8

COMMENT #32

"Page 19, Table 6: The information in Table 6 indicates that USEPA's Preferred Alternative includes SVE for properties where VOC-contaminated outdoor shallow soil is present, including properties 6, 11 and 23. While NAPL source areas with proposed ISCO and SVE remedies are present in the vicinity of the each of these areas, stand-alone SVE systems (e.g., wells, blowers, and treatment systems), that would not otherwise be installed, would be required to address VOCs in the shallow soil. It is the Respondents' position that Capping, ICs and Monitoring at these areas would be protective of human health while being more cost effective and less intrusive than SVE. Additional SVE in these areas would result in significant increases in complexity, cost, and intrusion on the property owners without commensurate risk reduction. Risks associated with each of these three properties are within USEPA's discretionary risk range ($1x10^{-4}$ to $1x10^{-6}$) and are summarized below:

Property 6 (Commercial Worker):

Outdoor Soil: $3x10^{-6}$ (Cancer Risk) <1 (Hazard Index)

Indoor Air: $4x10^{-6}$ (Cancer Risk) <1 (Hazard Index)

Property 11 (Commercial Worker):

Outdoor Soil: $2x10^{-5}$ (Cancer Risk) <1 (Hazard Index)

Indoor Air: $7x10^{-6}$ (Cancer Risk) <1 (Hazard Index)

Property 23 (Commercial Worker):

Outdoor Soil: $1x10^{-5}$ (Cancer Risk) <1 (Hazard Index)

Indoor Air: $2x10^{-5}$ (Cancer Risk) <1 (Hazard Index)"

RESPONSE

The risk associated with shallow soil contamination in these areas is actionable and EPA has selected an active remedy. Because the surface pathway and NAPL pathway evaluations were performed and costed separately, the FS includes separate SVE systems for treatment of the shallow and deep soil at the areas identified in the comment (EAPCs 6, 11, and 23). Generally the same contaminants (primarily benzene) are being addressed in the shallow and deep vadose zone, so in most cases the shallow and deep vadose zone remedies can be combined. This is the case for the shallow and deep benzene-impacted areas on the properties at EAPCs 6, 11, and 23. Additional design considerations, such as blower size, pipe diameter, and length of trenching/piping will be necessary to combine the treatment systems. The additional cost of increased design may offset the cost savings of having a single SVE system. SVE system locations proposed in the FS could also be adjusted to accommodate multiple treatment areas.

Confirmation sampling during Remedial Design will be performed in areas selected for this active remedy. Confirmation sample results will be used to determine where, not whether, a remedy is needed. An assessment of the viability of designing one SVE system to treat both the shallow and deep vadose zone will be performed at that time.

At EAPC 6, UVOST data collected in 2009 suggest that the eastern extent of the NAPL associated with SA11 may occur at over 150 feet from the building, and more than 300 feet from the SVE system location proposed in Appendix E of the FS. It is expected that the SVE wells required to treat the soil west of the building can be tied into the SVE system installed to remediate the NAPL-impacted soil. For reference, at the Del Amo Waste Pits, Extraction Well 20A is piped a distance of over 400 feet to the SVE system. The cost of trenching and other design elements may offset the cost savings from using a single SVE system.

EAPC 11 is situated adjacent to the north of NAPL SA12. Results of the 2009 UVOST screening at SA12 suggest that contamination associated with SA12 extends onto the southern portion of the EAPC 11 property. Therefore, the SVE system associated with the NAPL remedy will be able to tie in any additional shallow SVE wells needed to mitigate shallow VOCs at the southeast corner of EAPC 11.

There are multiple areas requiring SVE at EAPC 23, on the northwest, northeast, east, and southwest sides of the building. The impacted shallow soil in the north and east areas are very close to SA3 and SA6, respectively, and therefore could be tied into the NAPL/deep soil remedy. The PCE-impacted area at the southwest corner of the building at EAPC 23 is within approximately 150 feet of the proposed SA6 SVE system location, but would most likely require a separate system because the thermal or catalytic oxidizer proposed for treating the benzene would require a scrubber to treat the PCE, which would raise the cost dramatically. Two separate systems are costed in Appendix E of the FS.

CATEGORY: Remedy selection

SOURCE: 8

COMMENT #33

Page 19, Table 6, and page 20, text in first paragraph under Shallow Soil Components – Outdoor and Beneath Buildings: Though it is not specified in the Proposed Plan, the Respondents infer that USEPA's Preferred Alternative includes Building Engineering Controls (BECs) at property 16, and SVE beneath the building at property 23. Further, the Respondents understand that USEPA's decision to include these remedial responses in the Preferred Alternative at these two properties is based on concerns associated with chlorinated solvents in shallow soil, specifically TCE and PCE, beneath these buildings. The extensive site history investigation of the former rubber plant that was performed during the Remedial Investigation revealed no evidence that TCE and PCE were ever used at the site during the operational life of the rubber plant complex. Because there is no evidence that these compounds were used at the former rubber plant that was the subject of the RI/FS investigation, the Respondents maintain that they should not be responsible for designing, constructing and operating these components of USEPA's Preferred Alternative.

RESPONSE

EPA's Proposed Plan specifies that the preferred alternative includes building Engineering Controls, as stated on page 13, second paragraph, "One building, on the property in Area #16, would have engineering controls, in the same manner as Alternative 3, to ensure vapors do not accumulate within the building." The Proposed Plan also specifies that the preferred alternative includes SVE beneath the building in Area 23, as stated on page 13, third paragraph, "One building would have soil vapor extraction implemented in the soil beneath the buildings… The building would be in Area #23."

The Record of Decision selects the remedy for the site. The Record of Decision does not assign responsibility for designing, constructing and operating the remedial actions, in whole or in part.

CATEGORY: Remedy Selection

SOURCE: 8

COMMENT #34

Page 19 Table 6, and page 20 text in second paragraph under NAPL/Groundwater Contamination Source Areas Components: Active remedial measures proposed for NAPL SA6 are limited to SVE in the vadose zone. Previous ROST and soil boring analytical data, as well as recent UVOST work in this area suggest the majority of the vadose zone contaminant mass is in the shallow subsurface (i.e., less than 15 feet below ground surface) and a complete exposure pathway is not present. Confirmatory sampling with chemical analysis should be performed in this area during the remedial design phase to assess whether elevated VOC concentrations are present in these shallow soils that would warrant a remedial response. If the results of the additional assessment confirm that elevated VOC concentrations in the vadose zone are present, but are limited primarily to the shallow subsurface (<15 feet below ground surface), then the Respondents believe that any vadose zone SVE system should be designed to target only this shallow zone. However, if the results of the additional assessment show that contaminant concentrations have declined below levels that warrant an active remedial response, then an alternative remedial measure (such as Capping with ICs and Monitoring) should be considered for implementation.

RESPONSE

Confirmation sampling during Remedial Design will be performed in areas selected for an active remedy. Confirmation sample results will be used to determine where, not whether, a remedy is needed. Previous ROST data at SA6 indicate contamination at a depth of approximately 35 feet in CPL0067 and at 15 feet bgs in CPL0065. UVOST data collected in 2009 do not show strong responses, but there appear to be indications of contamination at depths below 15 feet, for example in CPL0114. The only previous soil boring (SBL0125) was advanced to 12.5 feet bgs and indicated shallow contamination. Soil matrix samples have not been collected deeper than 12.5 feet. Deep soil gas samples at 59 and 48 feet bgs contained significant concentrations of benzene; however those depths are believed to be below the current water table. The overall body of previous sampling data does not indicate a lack of contamination below 15 feet bgs in the vicinity of NAPL SA6. Benzene in the SA6 area has contributed to overall EAPC risk levels considered actionable by EPA. EPA agrees that the extent of shallow and deep vadose zone impacts should be confirmed as part of the Remedial Design sampling activities and results used to refine the treatment zone.

CATEGORY: Remedy selection

SOURCE: 8

COMMENT #35

Page 19 Table 6: Properties numbered 29 and 34 are listed in the table, apparently in error, with Institutional Control layers 1 through 5 being applied as part of USEPA's preferred alternative. As indicated on Figures 3 and 4 and elsewhere in the Proposed Plan, the Respondents understand that EPA has decided to defer remedial decisions for both of these properties to the Montrose Superfund Project. Consequently, remedial decisions for properties 29 and 34 should not be included in USEPA's Record of Decision for the Del Amo Soil and NAPL Operable Unit.

RESPONSE

Properties 29 and 34 will not be included in this Del Amo ROD. They will be addressed at a later date in a subsequent decision document.

CATEGORY: Remedy selection

SOURCE: 8

COMMENT #36

Throughout document: Numbered areas are referred to in the Proposed Plan, sometimes referring to one or more properties (e.g. "Area 6"), but other times referring to one or more groundwater contamination source areas (e.g. "Source Area 6"). This different usage may confuse the reader. The Respondents therefore suggest that in the ROD, USEPA refer to "properties" or "property" as an alternative to "area" wherever the reference is to a numbered property rather than a NAPL source area, to more clearly distinguish them.

RESPONSE

EPA acknowledges that there is more than one way to describe a concept. In the Proposed Plan, EPA designated the shallow soil contamination areas as "Area 1, Area 2" etc., and the NAPL source areas as "Source Area 1, Source Area 2" etc. The commenter suggests designating the shallow soil contamination areas as "Property 1, Property 2" etc. EPA prefers to use the term "Area" because it carries the connotation that EPA wants to communicate (an area of contamination within the larger Superfund Site). The term "property" carries the connotation of current ownership, which is not what we need to convey. The creation of the property boundaries in existence today occurred after the former rubber plant was dismantled; today's property boundaries have nothing to do with the former rubber plant. EPA prefers to present the areas of contamination as areas within the larger Superfund Site, without regard to current property boundaries.

The commenter suggested that the wording used was confusing, and the suggested wording would be clearer. However, what is clearer for one reader could be more confusing for another.

CATEGORY: Readability

SOURCE: 8